**Description of the U.S. Geological Survey's water-quality sampling and
water-level monitoring program at the Hallam Nuclear Facility
June through September 1996**

A water-quality and water-level program of the U.S. Department of Energy (USDOE) in cooperation with the U.S. Geological Survey (USGS) was re-established in June 1996 to develop six new USDOE observation wells, collect one set of water-quality samples from 17 of the 19 USDOE observation wells, and take monthly water-level measurements for a 3-month period in all 19 USDOE observation wells at the Hallam Nuclear Facility, Hallam, Nebraska. Thirteen of the observation wells were installed by HWS Consulting Group, Inc., in June 1993 and the remaining six were installed by Applied Research Associates in August 1995.

Well development and collection of water-quality data

The six new observation wells (OBS2B2, OBS2C2, OBS7B, OBS7C, OBS8B, and OBS8C) were developed on June 28, 1996, using a surge-block technique. Surge-block technique involves hanging a weight near the bottom of the well and rapidly moving it vertically for about 15 minutes. This forces water into and out of the well screen, removing fine sediments from the screen and the gravel pack surrounding the screen. Surging also stirs up residual material that may have settled to the bottom of the observation well since the well was installed. Following the surging, all wells were bailed with dedicated polyvinylchloride bailers. Well OBS7C could not be bailed below about 53 feet. At this depth the casing seemed to be constricted, prohibiting the bailer from being lowered below that depth, which prevented completion of the development of the well. The other five observation wells were completely developed. All effluent from developing and decontamination of equipment was discarded into appropriate solid or liquid waste containers.

Seventeen observation wells owned by the USDOE (excluding wells OBS6A and OBS6B) were purged with dedicated bailers on July 1, 1996, 24 hours prior to sampling. Purging involved computing the saturated well volume, in gallons, and removing three times that amount or until the wells were dry. All effluent from purging and decontamination of equipment was discarded into the appropriate solid or liquid waste containers. Blockage in well OBS7C prevented complete purging of this well.

On July 2, 1996, following a 24-hour recovery period after purging, water-quality samples for radchem and Resources Conservation and Recovery Act (RCRA) metals analyses were collected from 17 observation wells. Three duplicate quality-assurance samples also were collected at this time. All water samples were collected with new, decontaminated, dedicated bailers and immediately poured into dedicated 1-gallon containers provided by Battelle Memorial Institute. All observation wells except OBS3A, OBS3B, and OBS7C yielded the requested 1-gallon sample. Due to insufficient recoveries from purging, observation wells OBS3A, OBS3B, and OBS7C only yielded about one-half to three-fourths gallon of water. All solid and liquid waste generated from the sampling was discarded into the appropriate solid or liquid waste container.

One composite water sample, for RCRA metals analysis, was collected from the liquid waste container that held waste-water from all 17 observation wells as well as water used for decontamination purposes. The water sample was collected with a new, decontaminated, dedicated bailer and immediately poured into a decontaminated polyethylene bucket. The water sample for major RCRA cations was filtered through a 0.45-micron disposable filter into a 250-milliliter (mL) bottle and immediately acidified to a pH of 2 or less using 1.0 mL of reagent grade nitric acid. Samples for analysis of mercury were filtered through a 0.45-micron disposable filter into a 200-mL bottle and immediately preserved with 10 mL of nitric acid/potassium dichromate solution. Samples for major anions were transferred to a 250-mL bottle without filtering.

Paperwork, excluding the water-quality field sheets, but including the chain of custody sheets, was completed at the USGS District Office in Lincoln, Nebraska. The 20 samples for radchem analysis were sent overnight to Battelle Memorial Institute in Ohio. Samples for RCRA metals analysis were sent to the US Geological Survey National Water Quality Laboratory in Arvada, Colorado. All samples were sent on the same day they were collected. All water-quality field measurements are listed in an attached table.

Collection of monthly water-level data

Water-level data was collected monthly from July to September 1996 at all 19 USDOE observation wells except observation wells OBS6A and OBS6B. These two wells were inaccessible in July, but were measured in August and September. All water-level measurements are listed in an attached table.

All observation wells (excluding wells OBS6A and OBS6B as mentioned above) were measured in July using an electronic tape. In August and September 1996 all 19 USDOE observation wells were measured using a graduated steel tape. The accuracy of both methods of measurement is about ± 0.02 foot. Personnel wore clean disposable latex gloves, a hard hat, and safety glasses during all contact with the observation wells. Prior to and directly following each measurement the electronic or steel tape was rinsed with distilled water and the effluent was collected in a 5-gallon bucket. All effluent and solid waste generated from the measurements were discarded into designated 55-gallon solid or liquid waste drums.

DISCLAIMER

This report 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, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of 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 or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Observation Well ID, Number, Latitude, Longitude, and depth—Hallam Nuclear Facility, Hallam, Nebraska

Observation well identification	Well number by township, range, and section number	Latitude, in DMS	Longitude, in DMS	Well depth, in feet
OBS1A	7N 6E 19DABB1	40° 33' 31"	096° 47' 02"	23.5
OBS1B	7N 6E 19DABB2	40° 33' 31"	096° 47' 02"	49.0
OBS2A	7N 6E 19DABC1	40° 33' 29"	096° 47' 02"	25.0
OBS2B	7N 6E 19DABC2	40° 33' 29"	096° 47' 02"	53.0
OBS2B2	7N 6E 19DABC5	40° 33' 29"	096° 47' 02"	53.0
OBS2C2	7N 6E 19DABC6	40° 33' 29"	096° 47' 02"	76.0
OBS3A	7N 6E 19DABC3	40° 33' 28"	096° 47' 05"	24.0
OBS3B	7N 6E 19DABC4	40° 33' 28"	096° 47' 05"	53.0
OBS4A	7N 6E 19DBAD1	40° 33' 31"	096° 47' 05"	24.0
OBS4B	7N 6E 19DBAD2	40° 33' 31"	096° 47' 05"	54.0
OBS4C	7N 6E 19DBAD3	40° 33' 31"	096° 47' 05"	74.0
OBS5A	7N 6E 19ACDD1	40° 33' 34"	096° 47' 05"	24.0
OBS5B	7N 6E 19ACDD2	40° 33' 34"	096° 47' 05"	49.0
OBS6A	7N 6E 19DABB3	40° 33' 33"	096° 47' 03"	16.0
OBS6B	7N 6E 19DABB4	40° 33' 33"	096° 47' 03"	51.0
OBS7B	7N 6E 19DACB1	40° 33' 28"	096° 47' 02"	45.0
OBS7C	7N 6E 19DACB2	40° 33' 28"	096° 47' 02"	75.0
OBS8B	7N 6E 19DBDA1	40° 33' 37"	096° 47' 07"	45.0
OBS8C	7N 6E 19DBDA2	40° 33' 37"	096° 47' 07"	68.0

NOTE: The well numbers are based on the land subdivisions within the U.S. Bureau of Land Management's survey of Nebraska. The numeral preceding the N (north) indicates the township, the numeral preceding E (east) indicates the range, and the numeral preceding the terminal letters indicates the section in which the well is located. The terminal letters denote, respectively, the quarter section (160 acres), the quarter-quarter section (40 acres), the quarter-quarter-quarter section (10 acres), and the quarter-quarter-quarter-quarter section (2.5 acres). They are assigned in a counterclockwise direction beginning with "A" in the northeast corner of each subdivision. If two or more wells are located in the same 2.5-acre tract, they are distinguished by adding a sequential digit to the well number.

Water-quality data for U.S. Department of Energy observation wells, Hallam Nuclear Facility, Hallam, Nebraska, 1996
 [no samples were collected for OBS6A and OBS6B; ---, no data]

Name	Site	Local number	Date	Time	Specific conductance, at 25 °C	pH, in standard units	Water temperature, in °C	Air temperature, in °C
OBS1A	403331096470201	7N 6E19DABB1	7-02-96	0930	1,060	6.88	18.8	---
OBS1B	403331096470202	7N 6E19DABB2	7-02-96	0900	1,100	6.97	21.0	---
OBS2A	403329096470201	7N 6E19DABC1	7-02-96	1030	885	6.96	18.5	---
OBS2B	403329096470202	7N 6E19DABC2	7-02-96	1100	1,200	6.89	18.3	---
OBS2B2	403329096470203	7N 6E19DABC5	7-02-96	1130	1,550	7.00	19.5	---
¹ OBS2C2	403329096470204	7N 6E19DABC6	7-02-96	1300	---	---	---	---
OBS3A	403328096470501	7N 6E19DABC3	7-02-96	0850	864	7.45	21.5	---
OBS3B	403328096470502	7N 6E19DABC4	7-02-96	0853	1,520	7.37	21.5	26.5
OBS4A	403331096470501	7N 6E19DBAD1	7-02-96	0950	1,380	7.27	17.1	33.3
OBS4B	403331096470502	7N 6E19DBAD2	7-02-96	1025	855	7.51	19.8	33.3
OBS4C	403331096470503	7N 6E19DBAD3	7-02-96	1050	994	7.29	18.3	33.3
OBS5A	403334096470501	7N 6E19ACDD1	7-02-96	1250	929	7.26	20.1	33.3
OBS5B	403334096470502	7N 6E19ACDD2	7-02-96	1215	766	7.19	20.5	33.3
OBS7B	403333096470301	7N 6E19DACB1	7-02-96	0936	622	7.45	23.3	26.5
OBS7C	403328096470202	7N 6E19DACB2	7-02-96	0937	628	6.95	18.0	---
OBS8B	403327096470701	7N 6E19DBDA1	7-02-96	1225	730	7.32	18.0	33.0
OBS8C	403327096470702	7N 6E19DBDA2	7-02-96	1245	717	7.37	18.5	33.0

¹Not enough water to determine field measurements

Water-level data for U.S. Department of Energy observation wells, Hallam Nuclear Facility, Hallam, Nebraska, 1996
[---, no measurement or no data]

Name	Site	Local	Date	Water level	Date	Water level ¹	Date	Water level	Date	Water level
OBS1A	403331096470201	7N 6E19DABB1	7-01-96	---	7-02-96	4.79	8-07-96	3.75	9-13-96	4.14
OBS1B	403331096470202	7N 6E19DABB2	7-01-96	---	7-02-96	25.66	8-07-96	3.83	9-13-96	4.30
OBS2A	403329096470201	7N 6E19DABC1	7-01-96	---	7-02-96	6.22	8-07-96	4.67	9-13-96	5.19
OBS2B	403329096470202	7N 6E19DABC2	7-01-96	---	7-02-96	5.95	8-07-96	4.35	9-13-96	5.15
OBS2B2	403329096470203	7N 6E19DABC5	6-28-96	4.98	7-02-96	5.50	8-07-96	3.03	9-13-96	5.16
OBS2C2	403329096470204	7N 6E19DABC6	6-28-96	6.65	7-02-96	33.04	8-07-96	2.20	9-13-96	0.36
OBS3A	403328096470501	7N 6E19DABC3	7-01-96	---	7-02-96	28.55	8-07-96	7.81	9-13-96	7.67
OBS3B	403328096470502	7N 6E19DABC4	7-01-96	---	7-02-96	11.59	8-07-96	3.25	9-13-96	5.83
OBS4A	403331096470501	7N 6E19DBAD1	7-01-96	---	7-02-96	4.86	8-07-96	3.49	9-13-96	4.82
OBS4B	403331096470502	7N 6E19DBAD2	7-01-96	---	7-02-96	20.81	8-07-96	6.10	9-13-96	6.49
OBS4C	403331096470503	7N 6E19DBAD3	7-01-96	---	7-02-96	50.08	8-07-96	25.87	9-13-96	20.10
OBS5A	403334096470501	7N 6E19ACDD1	7-01-96	7.66	7-02-96	7.83	8-07-96	7.31	9-13-96	7.32
OBS5B	403334096470502	7N 6E19ACDD2	7-01-96	8.06	7-02-96	8.77	8-07-96	7.74	9-13-96	8.01
OBS6A	403333096470301	7N 6E19DABB3	7-01-96	---	7-02-96	---	8-07-96	5.44	9-13-96	5.61
OBS6B	403333096470302	7N 6E19DABB4	7-01-96	---	7-02-96	---	8-07-96	6.33	9-13-96	6.23
OBS7B	403333096470301	7N 6E19DACB1	6-28-96	3.85	7-02-96	32.63	8-07-96	3.99	9-13-96	4.89
OBS7C	403328096470202	7N 6E19DACB2	6-28-96	4.46	7-02-96	8.11	8-07-96	4.30	9-13-96	5.28
OBS8B	403327096470701	7N 6E19DBDA1	6-28-96	6.59	7-02-96	6.83	8-07-96	6.46	9-13-96	6.22
OBS8C	403327096470702	7N 6E19DBDA2	6-28-96	6.93	7-02-96	7.20	8-07-96	6.34	9-13-96	6.14

¹Water level 24-hours after purging observation well and prior to collection of water-quality sample.

Water-quality data for U.S. Department of Energy observation wells composite sample,
Hallam Nuclear Facility, Hallam, Nebraska, July 1996
[cm, centimeter; °C, degrees Celsius; mg/L, milligrams per liter;
µg/L, micrograms per liter; <, less than]

Date	Time	Constituent	Reporting unit	Value
7-02-96	1300	Specific conductance	microsiemens/cm at 25 °C	894
		pH	standard units	7.8
		Hardness, as CaCO ₃	mg/L	320
		Calcium	mg/L	80
		Magnesium	mg/L	30
		Sodium	mg/L	57
		Silica	mg/L	22
		Arsenic	µg/L	< 1
		Barium	µg/L	110
		Beryllium	µg/L	< 0.5
		Cadmium	µg/L	< 1
		Chromium	µg/L	< 5
		Cobalt	µg/L	< 3
		Copper	µg/L	< 10
		Iron	µg/L	< 3
		Lead	µg/L	10
		Lithium	µg/L	55
		Manganese	µg/L	390
		Molybdenum	µg/L	100
		Mercury	µg/L	< .1
		Nickel	µg/L	< 10
		Selenium	µg/L	16
		Silver	µg/L	< 1
		Strontium	µg/L	590
		Vanadium	µg/L	< 6
		Zinc	µg/L	8

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.