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OAK RIDGE NATIONAL LABORATORY

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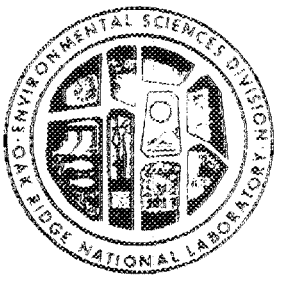
Results After One Year

C. W. Francis
R. G. Stansfield

Environmental Sciences Division
Publication No. 2787



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ENVIRONMENTAL SCIENCES DIVISION

GROUNDWATER MONITORING AT THREE OAK RIDGE NATIONAL LABORATORY INACTIVE WASTE IMPOUNDMENTS:

Results After One Year

C. W. Francis and R. G. Stansfield

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Publication No. 2787

NUCLEAR AND CHEMICAL WASTE PROGRAMS
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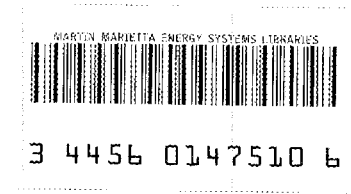

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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ABSTRACT

FRANCIS, C. W., and R. G. STANSFIELD. 1986. Groundwater monitoring at three Oak Ridge National Laboratory inactive waste impoundments: results after one year. ORNL/TM-10193. Oak Ridge National Laboratory, Oak Ridge, Tennessee. 133 pp.

To determine if the migration of potential contaminants from three inactive waste impoundments at Oak Ridge National Laboratory poses a threat to groundwater quality, at least one upgradient groundwater monitoring well and three downgradient monitoring wells were installed at each impoundment in early 1985. These three unlined impoundments (also called waste basins or ponds) were formerly used to collect and, in some instances, treat wastewater. There are (1) the 3513 impoundment, (2) the Old Hydrofracture Facility (OHF) impoundment, and (3) the Homogeneous Reactor Experiment No. 2 (HRE) impoundment.

Groundwater samples were collected quarterly for one year. Analyses were conducted for the groundwater protection parameters promulgated by the Resource Conservation and Recovery Act (RCRA). The groundwater samples were also analyzed for polychlorinated biphenyls; copper; nickel; zinc; and the radioisotopes ^{90}Sr, ^{137}Cs, and tritium. The contaminants found most often to affect groundwater quality at all three waste impoundments were radionuclides. For example, mean concentrations of gross beta and gross alpha activity exceeded drinking water limits at all three sites. The gross beta limit (4 mr/year, assuming a person drinks 2.2 L of water per day for a year) was exceeded at the 3513 and OHF impoundments by either ^{90}Sr or tritium levels. At the 3513 impoundment, there was substantial evidence that the downgradient groundwater has been contaminated by chromium and lead and possibly by halogenated organic compounds. At the OHF impoundment, the mean level of tritium measured in the upgradient well (about 91,000 Bq/L as compared with 80,000 Bq/L in the downgradient wells) indicated that the groundwater quality has been affected by the radioactive wastes buried in the low-level radioactive waste burial ground solid waste storage area-5 upgradient of the

impoundment. Testing for groundwater contamination, using the indicator parameters outlined in Title 40, CFR (Subpart F, Groundwater Protection, para. 265.92), disclosed statistically significant contamination at all three sites.

1. INTRODUCTION

One of the objectives in the operation of a large research facility such as Oak Ridge National Laboratory (ORNL) is to ensure that the treatment and/or disposal of wastes comply fully with federal and state regulations. In response to some recent regulations promulgated under the Resource Conservation and Recovery Act (RCRA), the Laboratory has begun to evaluate more thoroughly the environmental impacts of some of its former waste management practices. One such practice was the use of unlined impoundments (also called waste basins or ponds) to collect and, in some instances, treat the liquid waste. To determine the environmental impact of such a practice on the groundwater quality, a groundwater monitoring program was established at three impoundments that are no longer being used to collect wastewater: (1) the 3513 impoundment, (2) the Old Hydrofracture Facility (OHF) impoundment, and (3) the Homogeneous Reactor Experiment No. 2 (HRE) impoundment. At each impoundment, three downgradient wells and at least one upgradient well were installed. This report contains the groundwater analyses data collected over the first year (four quarterly sample periods) and evaluates the influence of each impoundment on the near-field groundwater quality.

2. BACKGROUND AND DESCRIPTION OF SITES

The intent of this section is to introduce, in an abbreviated form, some background material to acquaint the reader with the past history and some general characteristics of each impoundment. A more complete description of the construction and operation of each of the impoundments, as well as the dominant geologic and hydrologic characteristics of each of the sites, is presented in several previous ORNL reports (Stansfield and Francis 1986a, 1986b, 1986c, 1986d; Francis and Stansfield 1986).

Also contained in the above reports are estimated inventories of radionuclides and potentially hazardous chemicals in the standing water phase and sediments of each of the impoundments. Sediments from each of the impoundments have been subjected to leaching by the extraction procedure (EP) leaching test promulgated under the (RCRA). Only the sediment from the 3513 impoundment was found have a toxic characteristic because of elevated levels of mercury in the extract. Thus, sediment from the 3513 impoundment is considered to be a hazardous waste.

2.1 3513 IMPOUNDMENT

The 3513 impoundment was constructed in 1944 to serve as a holding basin for wastewaters prior to their discharge into White Oak Creek. This unlined impoundment, which is ~67 by 67 m wide and 1 m deep, received Laboratory liquid wastes until 1976 when a new process waste treatment plant began operating. Its location is illustrated in Fig. 1. On the east and north of the 3513 impoundment are three similar unlined impoundments (a large holding basin, 3524, and two smaller holding ponds, 3539 and 3540), which are presently being used to receive wastewater from ORNL. These holding basins, as well as leaking underground waste lines (F. J. Homan, Operations Division, personal communication, February 1986), represent potential sources of contamination to the groundwater, which is sampled from monitoring wells around 3513.

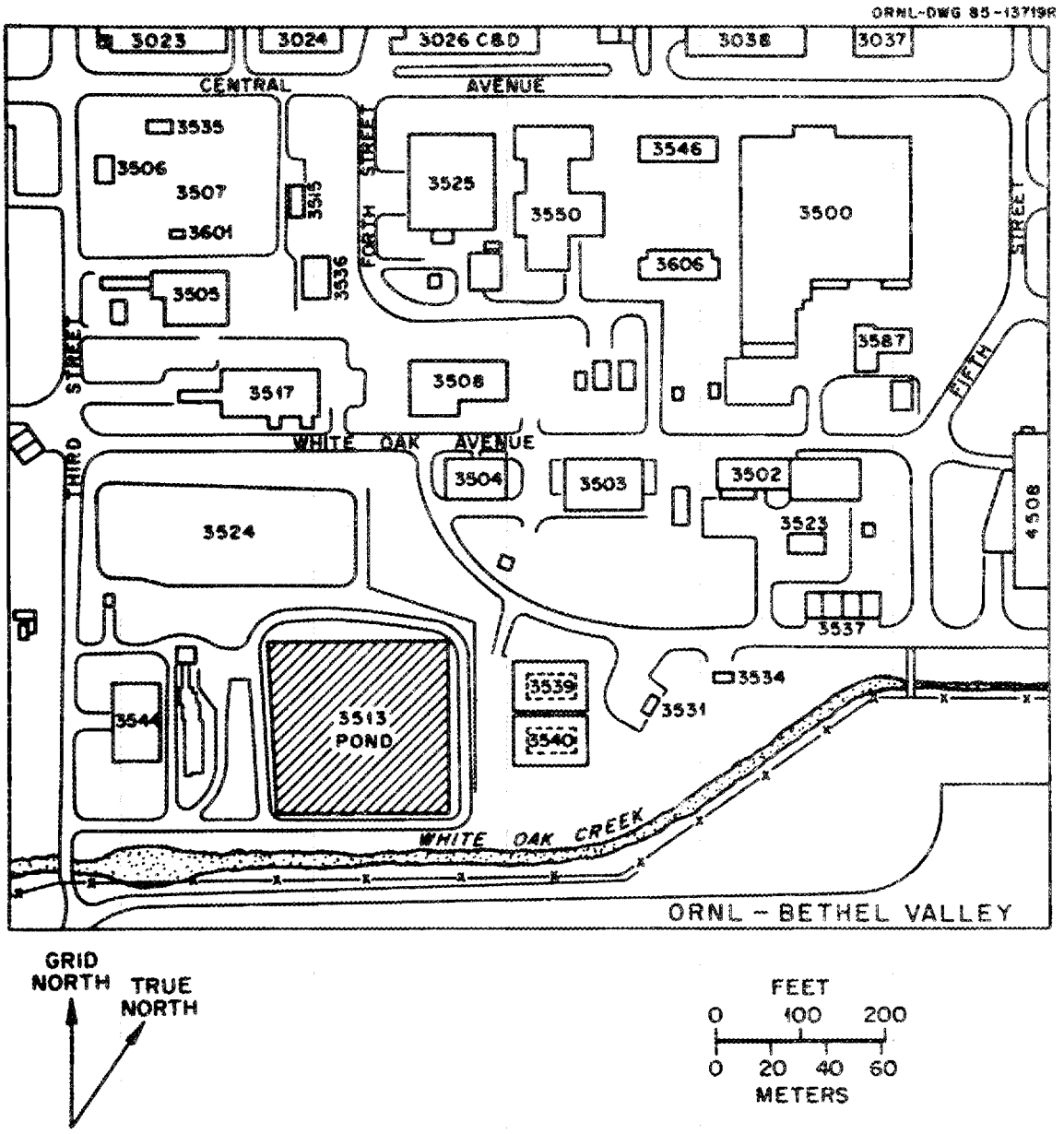

Fig. 1. Location of 3513 impoundment within ORNL.

The estimated capacity of the impoundment is 7.1×10^6 L. The net annual precipitation input to the pond is ~56 cm (which corresponds to ~2.5×10^6 L). The water level is maintained by pumping the overflow water to the 3524 impoundment where it is processed.

2.2 OLD HYDROFRACTURE FACILITY IMPOUNDMENT

The old Hydrofracture Facility (OHF) was used for the permanent disposal of liquid radioactive waste in impermeable shale formations from 1964 to 1979. The facility is located at the confluence of Melton Branch and White Oak Creek, ~1.5 km southwest of the ORNL main complex (see Fig. 2). The impoundment is downslope, ~50 m to the northwest, of building 7852, which contains the control room that was used in injecting liquid radioactive waste, in the form of a grout, into impermeable shale formations at depths ranging from ~230 to 300 m. The impoundment, which is ~30 m long and 6 m wide and 1 to 2 m deep, was constructed in 1963 to serve as an emergency containment basin for possible spillage of grout. The design capacity is ~3.8×10^5 L. Stansfield and Francis (1986b) estimated the pond to contain ~3.0×10^5 L in August of 1985. Differences between mean annual precipitation (~140 cm) and mean annual evaporation indicate that ~140,000 L is leaking annually from the pond and entering the groundwater.

2.3 HOMOGENEOUS REACTOR EXPERIMENT NO. 2 IMPOUNDMENT

The Homogeneous Reactor Experiment No. 2 (HRE) impoundment was built in 1955 to serve as a settling basin for low-level radioactive waste generated by the homogeneous reactor experiments. The HRE facility is located in Melton Valley, ~900 m southeast of the main ORNL complex (see Fig. 3). When constructed, the capacity of the impoundment was ~1.2×10^6 L (20 by 20 m and ~3 m deep). The impoundment received liquid wastes intermittently from 1957 through 1962. In 1970 the impoundment was drained and backfilled with soil and partially weathered shale from the surrounding area. The filled impoundment was then capped with crushed limestone and asphaltic concrete.

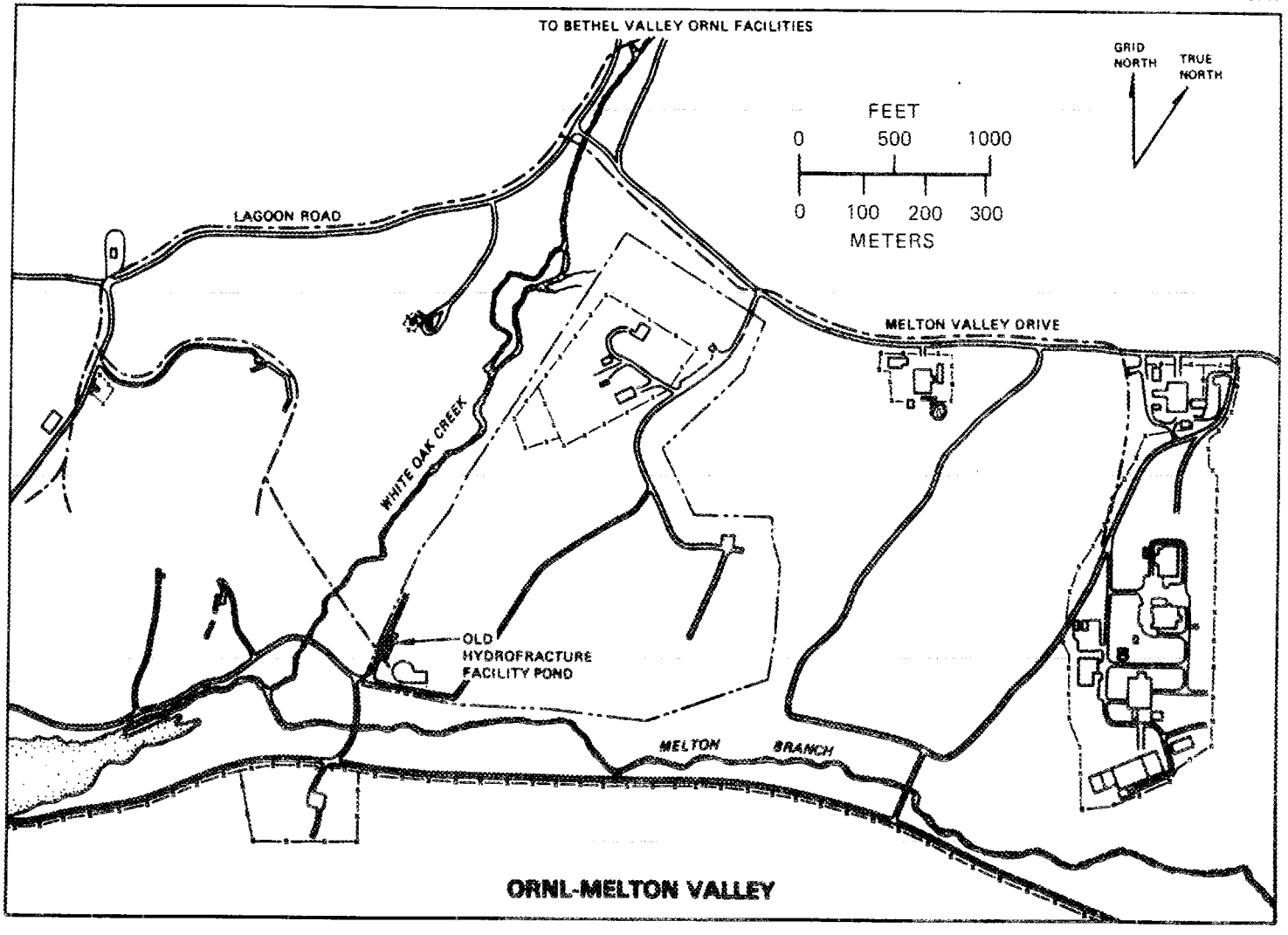

Fig. 2. Location of Old Hydrofracture Facility at ORNL.

ORNL/TM-10193

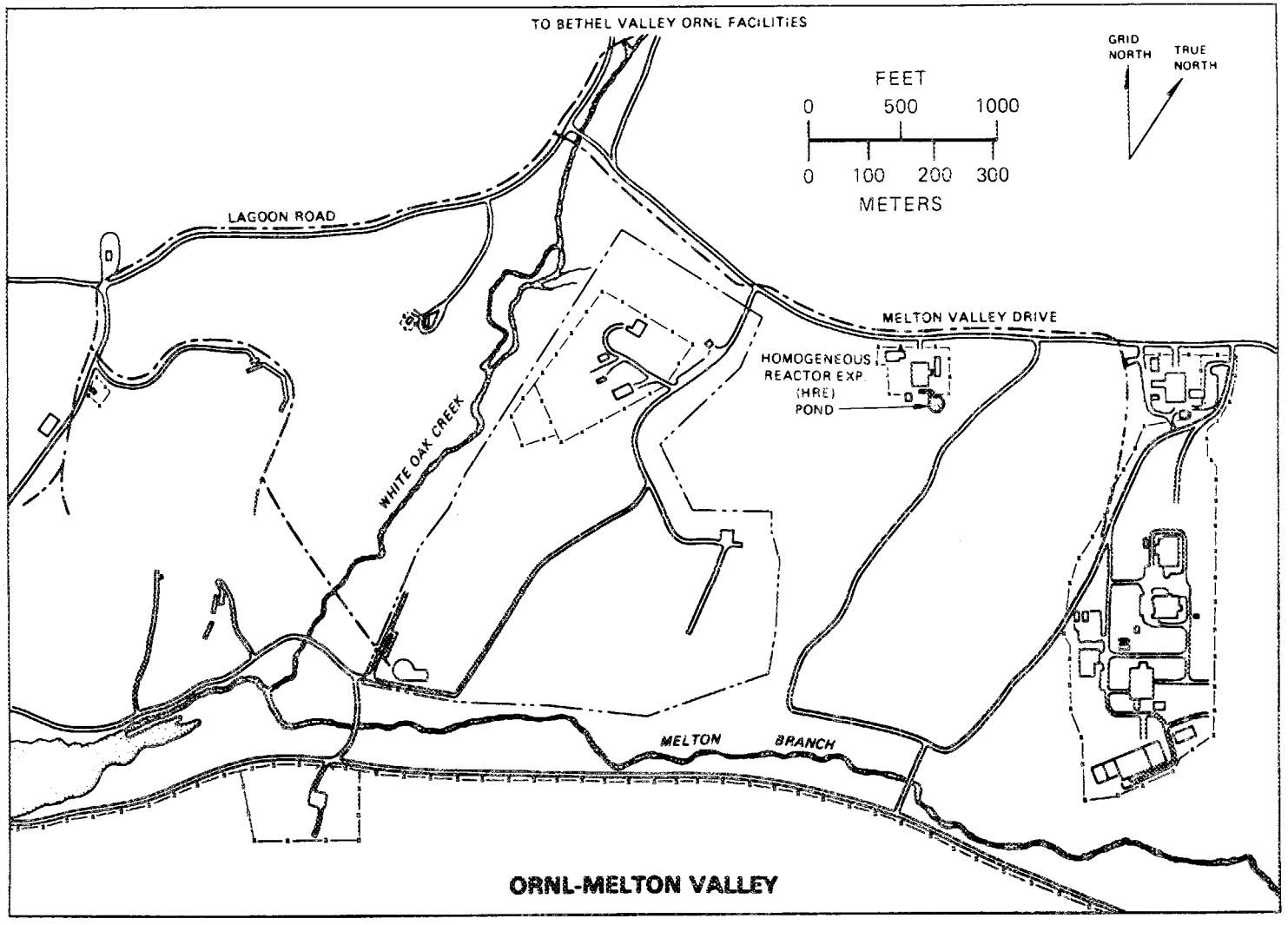

Fig. 3. Location of Homogeneous Reactor Experiment at ORNL.

3. METHODS AND MATERIALS

3.1 LOCATION AND CONSTRUCTION OF MONITORING WELLS

3.1.1 3513 Impoundment

Five monitoring wells were installed around the perimeter of the 3513 impoundment in January 1985 (Fig. 4). Monitoring wells 1 and 1A were located to sample groundwater upgradient from the impoundment. "Upgradient" is defined here as the direction of increasing static head of the groundwater table. Monitoring well 1 (the bottom of which is 2.4 m below the ground surface) is not as deep as well 1A (the bottom of which is 7.6 m below the ground surface). The major difference is that well 1 does not penetrate the limestone bedrock underlying the clay soil. Well 1A, on the other hand, penetrates ~1 m into the limestone bedrock. The other three wells (2, 3, and 4) were located with the intent of sampling groundwater downgradient from the impoundment. These wells penetrate ~0.6 m into the limestone bedrock. Thus, approximately one-third of the well screen (which is 2.1 m in length) is located in the limestone bedrock. A geologic cross section of the 3513 impoundment area, illustrating the elevation of the groundwater in relation to the monitoring wells, is presented in Fig. 5. The grid coordinates and pertinent elevations for each of the monitoring wells are presented in Table 1.

Table 1. Grid coordinates and elevations for 3513 monitoring wells

	Monitoring well				
	1	1A	2	3	4
ORNL grid coordinates, m					
North	6542.0	6541.7	6455.8	6455.8	6486.7
East	9496.8	9496.1	9491.9	9451.6	9439.7
Elevations, m					
Top of well casing	239.8	239.7	239.6	239.3	238.7
Ground surface	238.8	238.8	238.7	238.4	238.0
Top of well screen	237.1	234.5	236.6	233.5	236.0
Bottom of well screen	236.5	232.3	234.5	234.4	233.8
Top of sand pack	237.3	234.6	237.1	236.9	236.5
Bottom of well hole	236.4	231.2	234.5	234.4	233.8

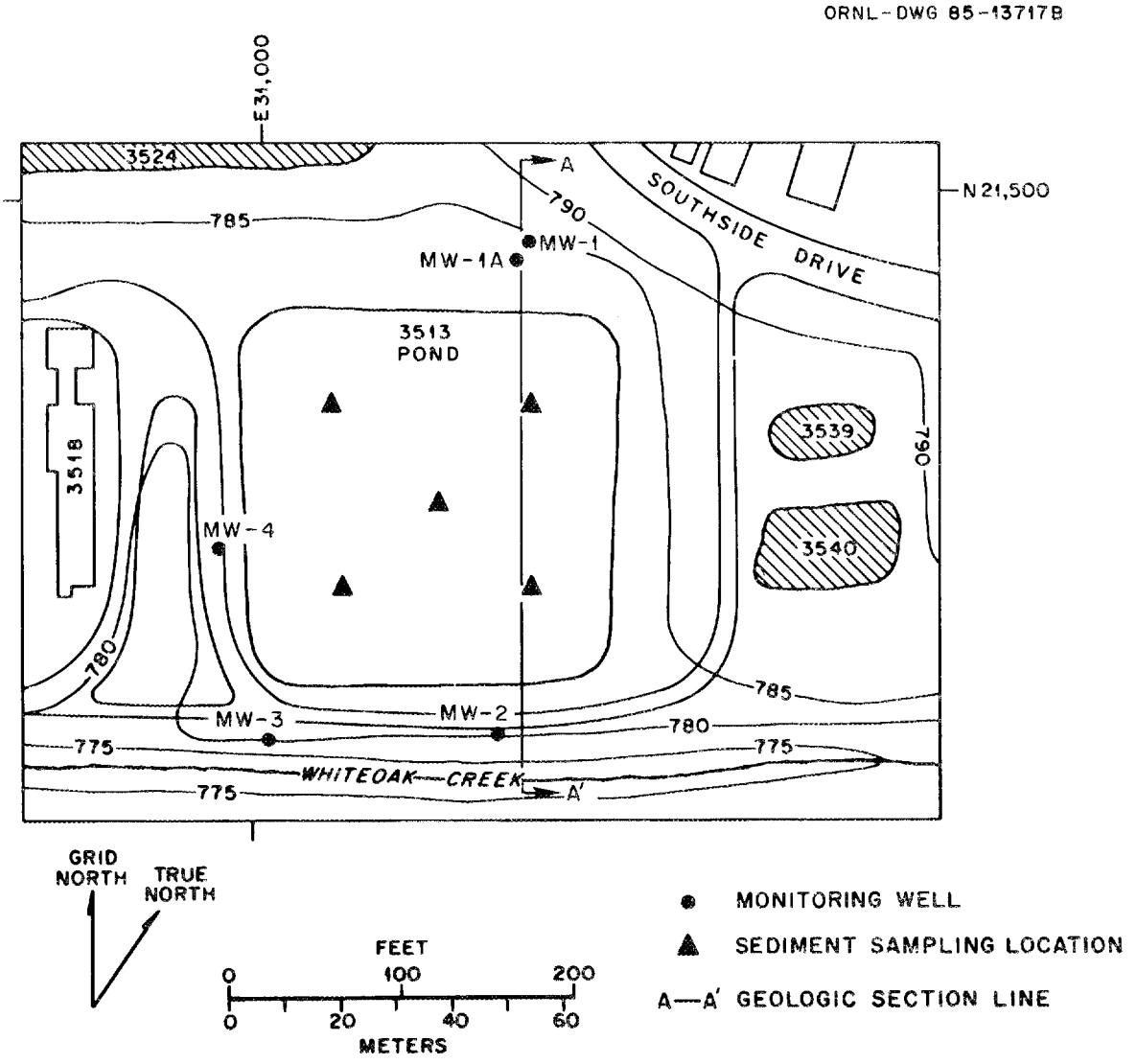

Fig. 4. Locations of groundwater monitoring wells at the 3513 impoundment.

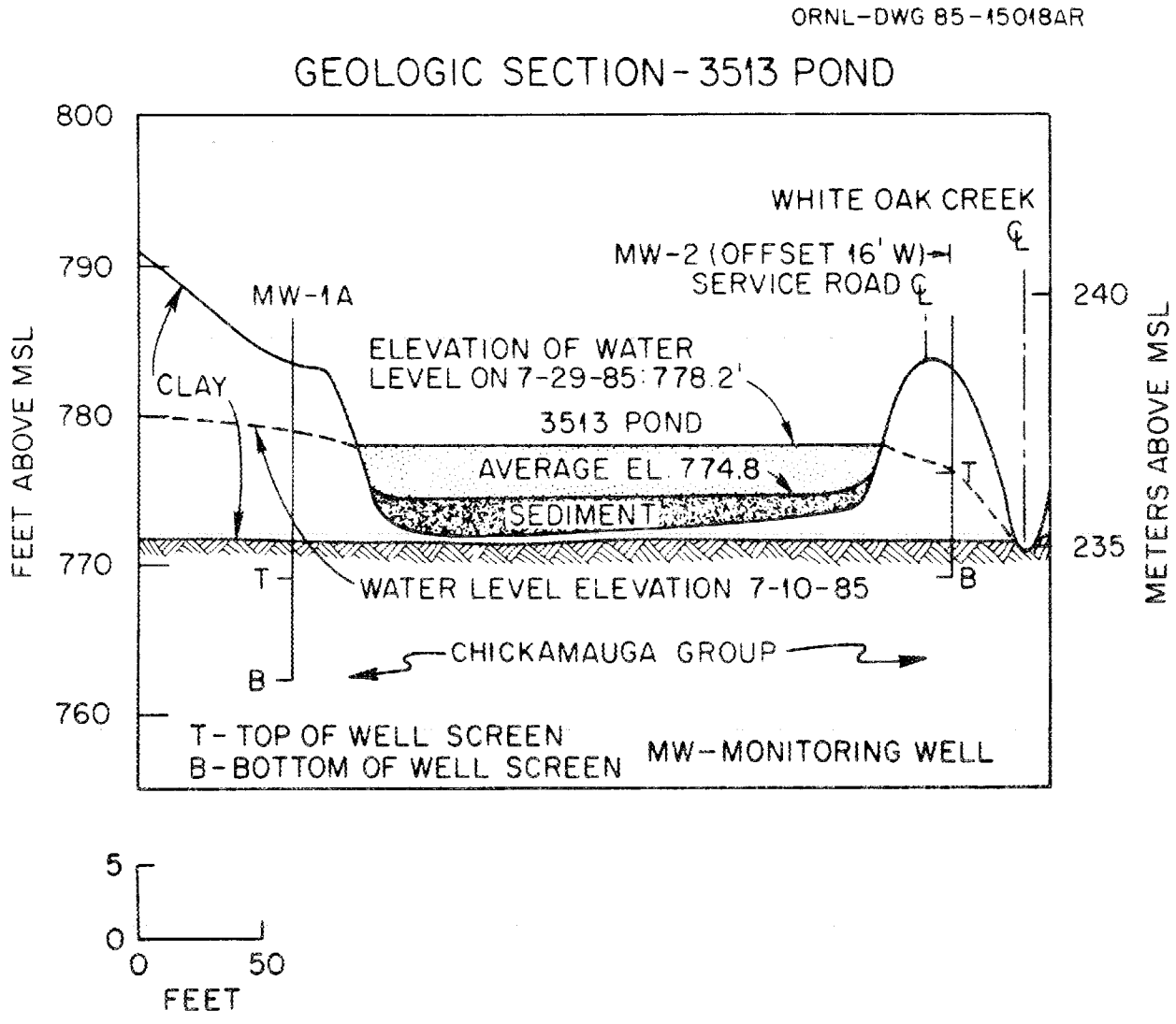

Fig. 5. Geologic section through 3513 impoundment.

ORNL/TM-10193

The monitoring wells are constructed of 5.1-cm-diam stainless steel well screen and casing. The well screens have a continuous slot, 0.25-mm wide. The length of well screens ranges from 0.6 to 2.1 m, and all are surrounded by a sand pack of medium-grained quartz sand which extends a minimum height of 30 cm above the elevation of the top of the well screen. A detailed description of the coring and construction of the wells is given in Appendices A and B of Stansfield and Francis 1986a.

3.1.2 Old Hydrofracture Facility Impoundment

Four monitoring wells were installed in March 1985 around the perimeter of the OHF impoundment (see Fig. 6). Monitoring well 1 was located to sample groundwater upgradient from the impoundment. This well is located at the northeast corner of the impoundment ~15 m from the edge of the standing water contained in the impoundment. However, it is located ~30 m downgradient from a disposal trench in a low-level solid waste storage area (SWSA-5), which is a potential source of contamination. Monitoring wells 2, 3, and 4 were located to collect groundwater downgradient from the impoundment.

The depth from ground surface of monitoring well 1 is ~10 m as compared with ~7 m for monitoring wells 2, 3, and 4. The grid coordinates and elevations to specific parts of each of the monitoring wells are presented in Table 2. A geologic cross section of the

Table 2. Grid coordinates and elevations for Old Hydrofracture Facility monitoring wells

	Monitoring well			
	1	2	3	4
ORNL grid coordinates, m				
North	280.7	875.6	5272.7	5285.0
East	8717.4	8688.3	8685.8	8692.6
Elevations, m				
Top of well casing	238.4	236.8	235.8	235.8
Ground surface	237.5	236.0	234.9	234.9
Top of well screen	231.7	232.0	231.8	231.8
Bottom of well screen	228.6	229.2	228.7	228.8
Top of sand pack	234.6	234.1	233.1	232.4
Bottom of well hole	226.9	228.7	227.6	227.6

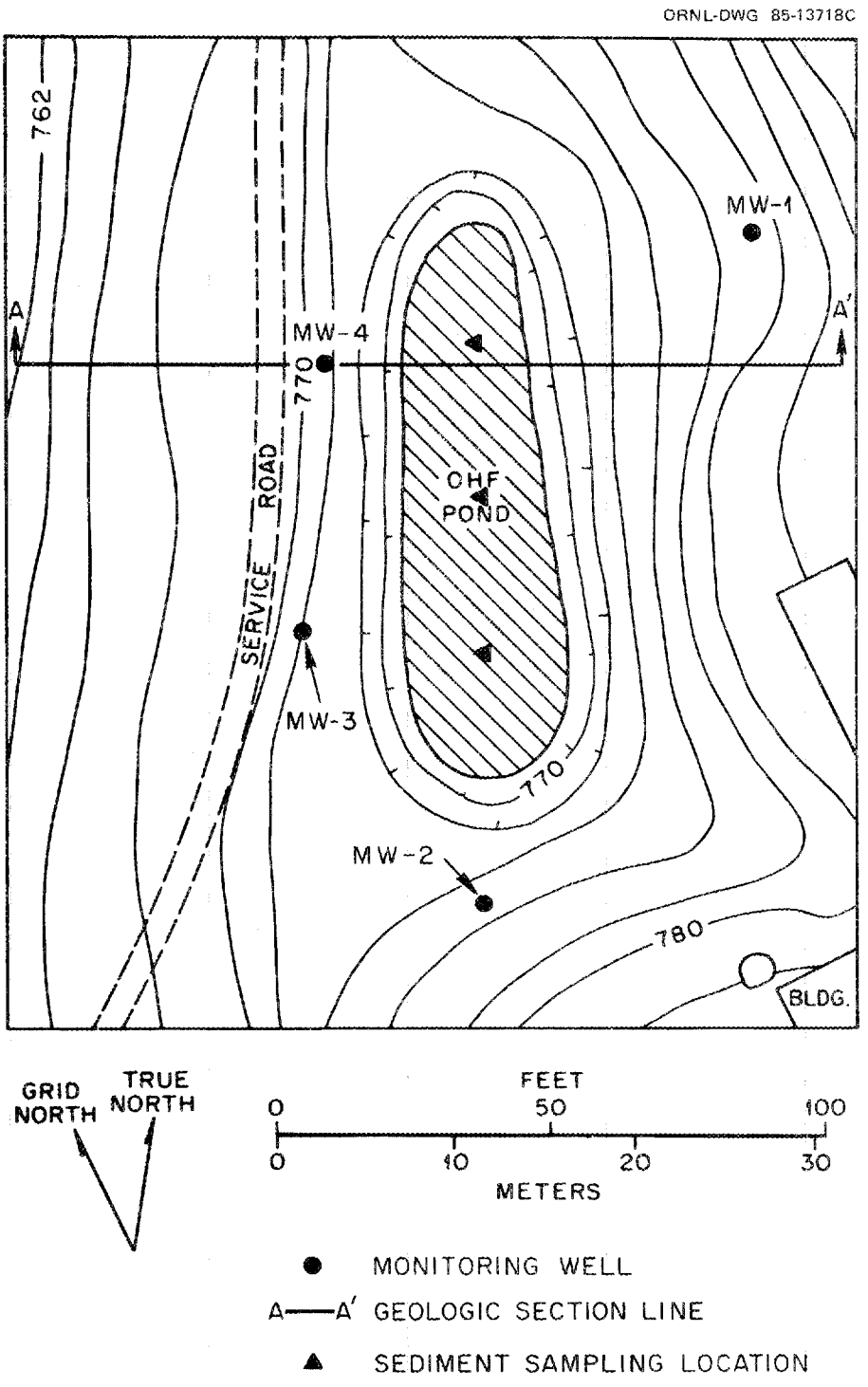

Fig. 6. Locations of groundwater monitoring wells at the Old Hydrofracture Facility impoundment.

impoundment, illustrating the relative position of the water table and the monitoring wells, is presented in Fig. 7. Note that sediments in the bottom of the impoundment were in direct contact with the water table on July 29, 1985.

The monitoring wells were constructed of 7.60-cm-diam fiberglass well screen and casing. The 3.0-m long well screens contain two rows of slots, each 0.25-mm wide, to allow the movement of groundwater into the wells. A medium-grained quartz sand was packed around the screen extending to ~30 cm above the top of the well screen. A bentonite clay seal of ~30 cm in length was place on top of the sand pack. The remainder of the boring was backfilled with portland cement concrete. Detailed descriptions of each of the drillings as well as the construction of the monitoring wells are given in Appendices A and B of Stansfield and Francis 1986b.

3.1.3 Homogeneous Reactor Experiment No. 2 Impoundment

Four monitoring wells were installed during February and March of 1985 around the perimeter of the HRE impoundment (Fig. 8). Monitoring well 1 was installed at the far northwest corner of the asphaltic cap. The location of monitoring well 1 further upslope and off the asphaltic cap area was restricted by aboveground and belowground structures. This well is considered to be upgradient from the impoundment, based on water level measurements (see Fig. 9). None of the other wells (2, 3, and 4), which were installed to sample groundwater downgradient of the covered impoundment, were located within the area of the enclosed asphaltic cap. Depths from ground level to the bottom of the monitoring wells range from 9 m for monitoring well 1 to ~7.5 m for the downgradient wells. The grid coordinates and elevations for specific parts of the monitoring wells are listed in Table 3.

The construction of the monitoring wells at the HRE impoundment is similar to the construction of the wells at the OHF impoundment; i.e., the well screens and casings are made of 7.6-cm-diam fiberglass rather than stainless steel, which was used for the 3513 impoundment wells. Detailed descriptions of each of the drillings, as well as the construction of the monitoring wells, are given in Appendices B and C of Stansfield and Francis 1986c.

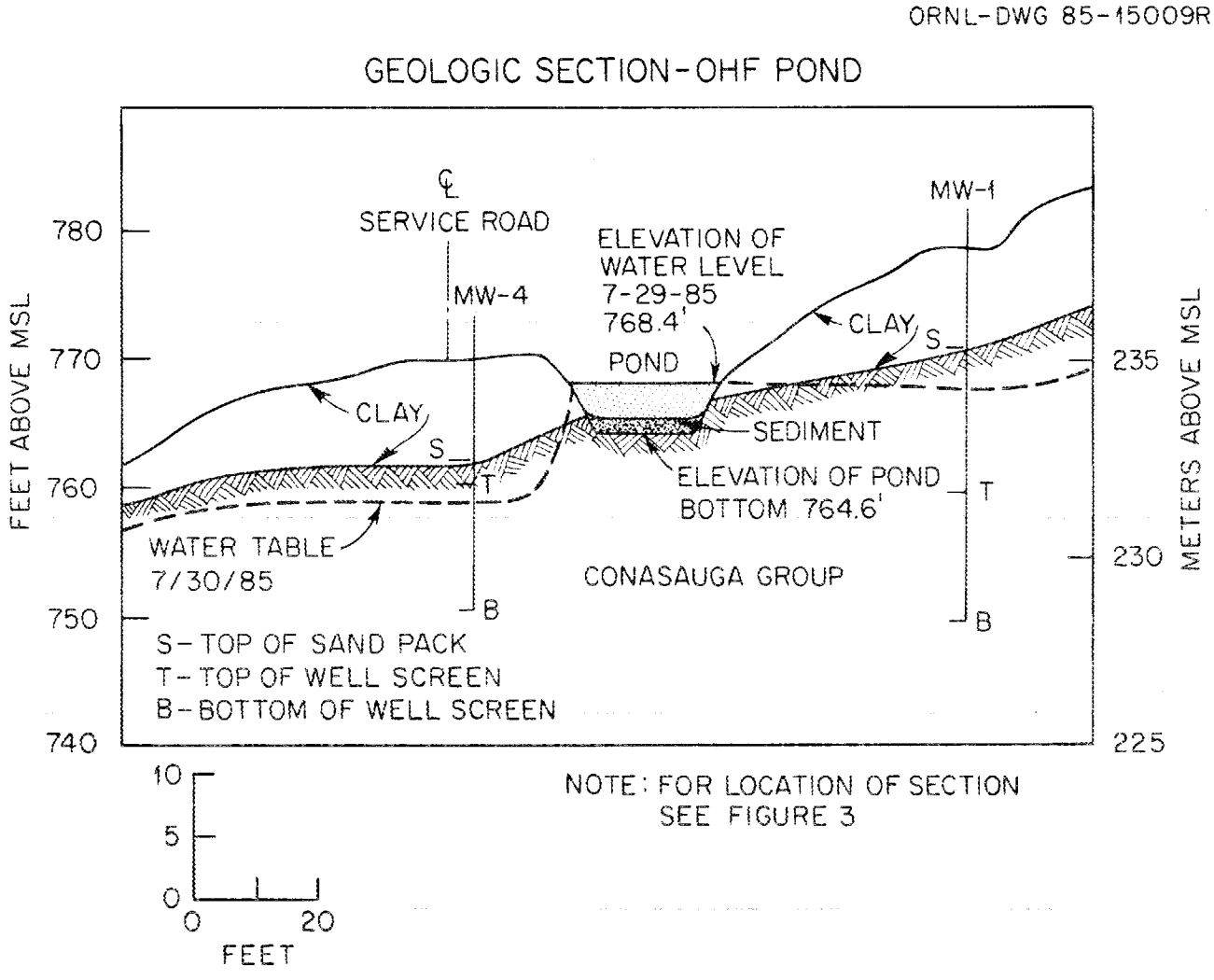

Fig. 7. Geologic section through the Old Hydrofracture Facility impoundment.

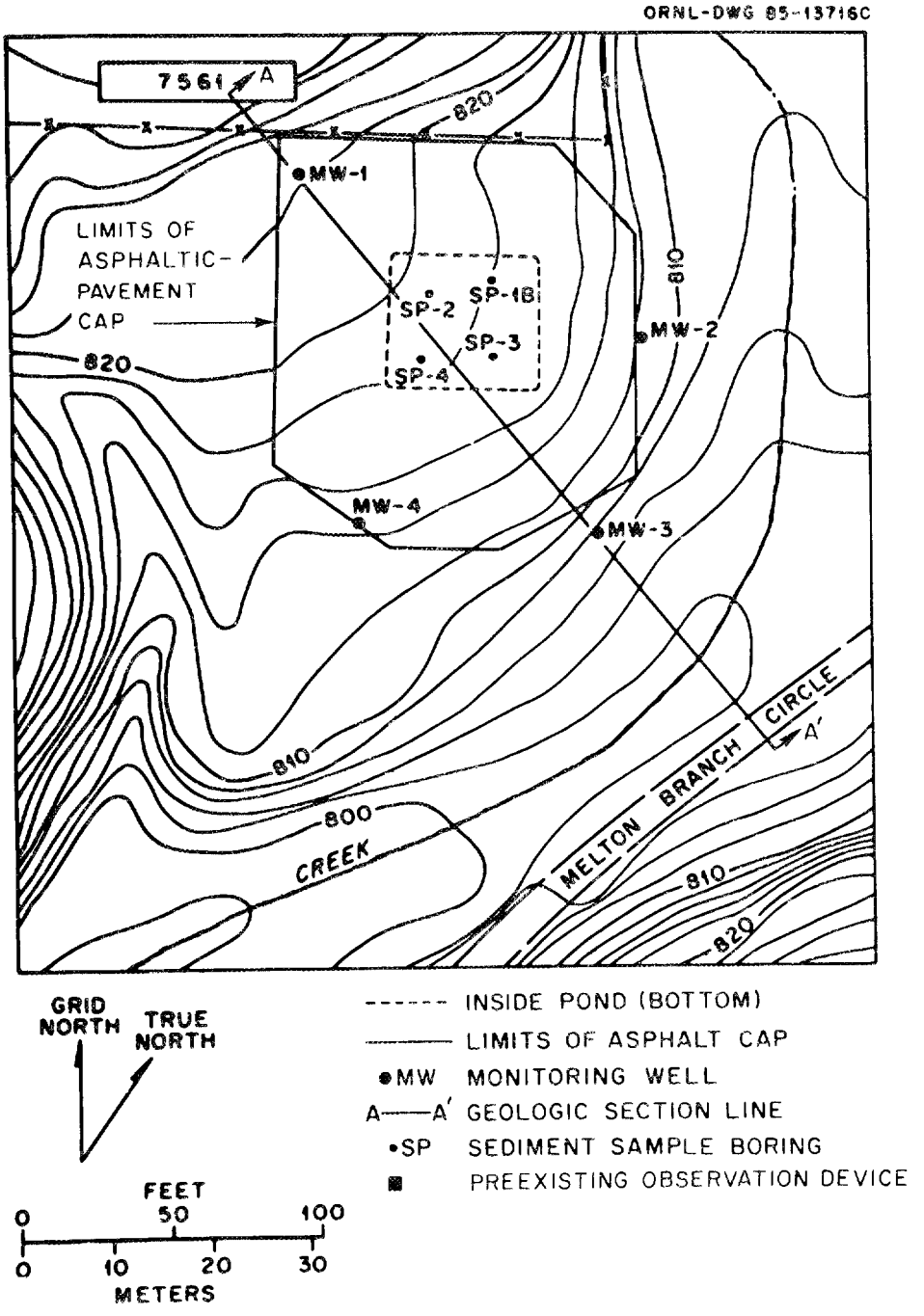

Fig. 8. Locations of groundwater monitoring wells at the Homogeneous Reactor Experiment impoundment.

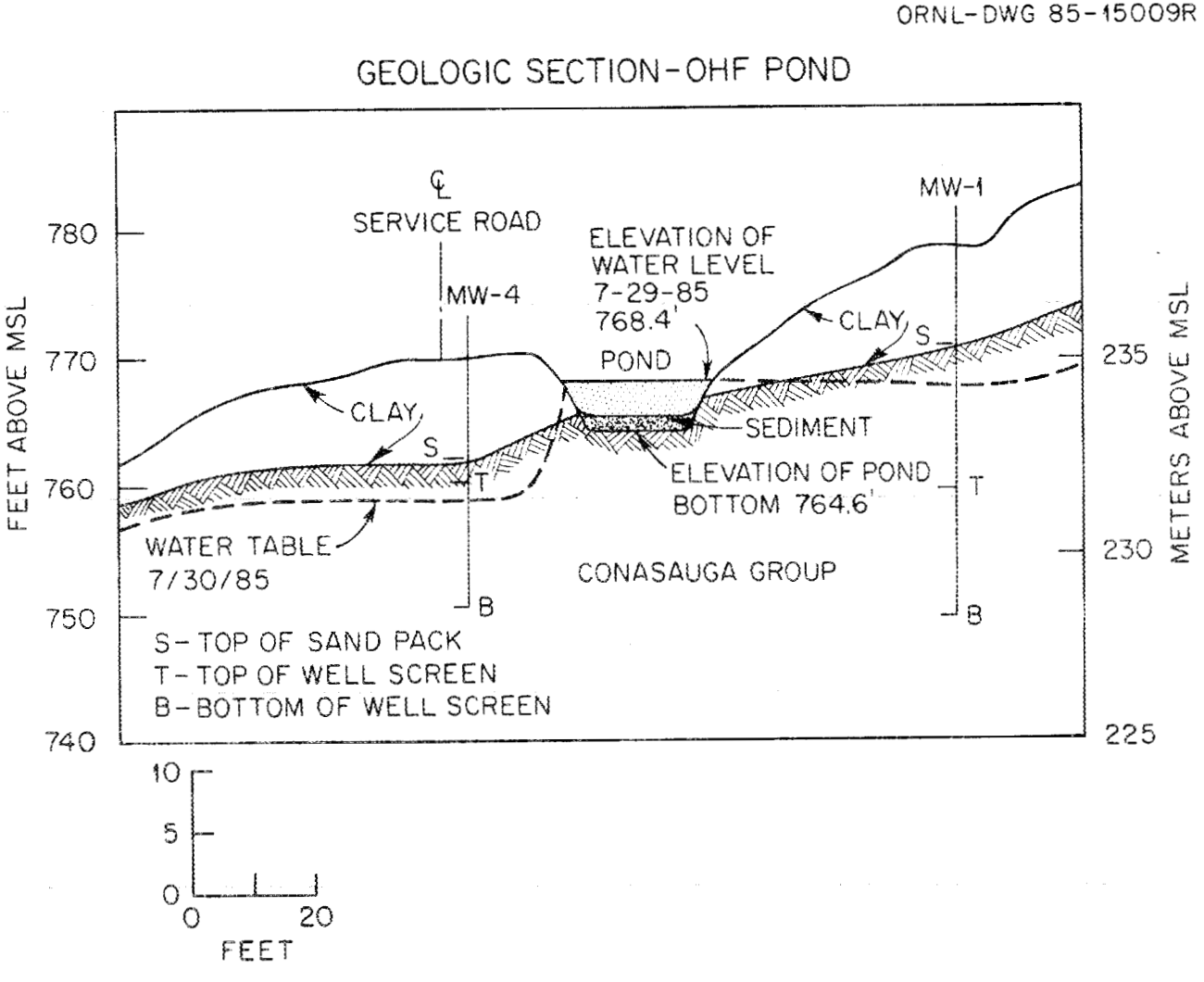

Fig. 9. Geologic section through the Homogeneous Reactor Experiment impoundment.

Table 3. Grid coordinates and elevations for Homogeneous Reactor Experiment monitoring wells

	Monitoring well			
	1	2	3	4
Grid coordinates, m				
North	5679.9	5663.6	5644.5	5643.5
East	9577.7	9611.4	9609.1	9584.3
Elevations, m				
Top of well casing	252.1	248.6	247.1	248.7
Ground surface	250.9	247.9	246.3	247.8
Top of well screen	246.0	244.1	242.6	245.2
Bottom of well screen	242.9	241.0	239.5	242.1
Top of sand pack	241.9	240.3	238.8	240.3
Bottom of well hole	241.9	240.3	238.8	240.3

3.2 SAMPLING PROCEDURES

3.2.1 Sample Collection

The monitoring wells at each impoundment were sampled quarterly over a 12-month period (February 1985 to January 1986) (Table 4). Before water samples were taken, the water level of each well was measured with an electric tape. To avoid cross-contamination between wells, the immersed portion of the tape was rinsed with deionized water after samples were taken from each well. The water levels recorded throughout the sampling year are presented in Table 5.

A bottom-loading, stainless steel bailer was used to purge and sample the wells. To ensure a thorough cleaning, the bailer was disassembled and washed with hot water and detergent after each well was sampled. During the first quarter of sampling, the bailer was then rinsed with dilute nitric acid followed by distilled water rinses. In subsequent quarters, the acid rinse was replaced by a methanol rinse followed by distilled water rinses. A new nylon line was attached to the bailer prior to sampling each well. Before a sample was taken, the well was purged by removing a volume of water equal to five times the volume contained within the well screen and casing. The water removed

Table 4. Sampling dates for each waste impoundment

Impoundment	Quarter 1	2	3	4
	Month/year			
3513	2/85	4/85[a]	9/85	1/86
Old Hydrofracture Facility (OHF)	3/85[b]	5/85	9/85	1/86
Homogeneous Reactor Experiment No. 2 (HRE)	2/85	5/85	10/85	1/86

[a]All monitoring wells at the 3513 impoundment were also sampled in June 1985 for total organic carbon.

[b]Well 1 at the OHF impoundment was sampled twice in March 1985 for all groundwater quality parameters.

Table 5. Water levels (m) in monitoring wells

Date	Monitoring well 1A	1	2	3	4
	3513 impoundment				
2/6/85	237.6	237.8	236.7	235.9	236.8
4/8/85	237.5	237.5	236.7	235.7	236.6
4/16/85	237.2	237.5	236.6	235.7	236.7
6/16/85	237.4	237.5	236.8	235.7	236.5
7/1/85	237.4	237.5	236.7	235.7	236.6
9/10/85	237.6	237.5	236.7	235.8	236.5
12/16/85	236.4	237.6	236.7	235.8	236.6
	Old Hydrofracture Facility impoundment				
4/8/85		235.0	230.6	230.8	231.9
5/23/85		234.5	230.3	230.7	231.6
6/4/85		234.4	230.2	230.5	231.5
7/1/85		234.2	230.2	230.5	231.5
7/30/85		234.1	230.3	230.6	231.5
9/17/85		234.2	230.4	230.6	231.6
1/06/86		234.2	230.2	230.6	231.6
	Homogeneous Reactor Experiment No. 2 impoundment				
4/8/85		248.3	246.3	245.0	245.5
5/20/85		248.0	246.1	244.9	245.5
6/04/85		248.0	246.3	244.8	245.5
7/01/85		248.5	246.3	245.0	245.5
10/1/85		248.2	246.3	NT[a]	245.5
1/13/86		248.1	246.1	244.9	245.5

[a]NT = measurement not taken.

for purging purposes was measured and then discarded into the impoundment. In the case of the wells at the HRE impoundment, the purged water was transported to the process waste system for disposal.

The pH and specific conductivity were measured at the well site, except for the first quarter samples taken at the 3513 impoundment wells. In that instance, samples were taken promptly to the laboratory and measured.

3.2.2 Sample Preservation

The groundwater samples that were to be analyzed for RCRA-regulated contaminants were transferred directly from the stainless steel bailer into glass containers with polytetrafluoroethylene-lined caps. These samples were delivered to ORNL's Analytical Chemistry Division for analysis on the day they were collected, or were stored overnight in a refrigerator for delivery the next day. The samples to be analyzed for organic compounds, nitrates, sulfates and chlorides were stored under refrigeration in the Analytical Chemistry Division prior to analysis. Separate aliquots were taken for metal analyses and then acidified with nitric acid to a pH <2. The groundwater samples that were to be analyzed for gamma-emitting radioisotopes were counted directly in the 1-L plastic containers in which they were collected and thus required no refrigeration.

3.2.3 Chain of Custody

A record was made for all samples collected in which the following information was recorded: name of collector, identifying list of samples, date and location where collected, inclusive dates when the samples were in the collector's custody, and date when samples were transferred to the laboratory for analyses. A copy of this record accompanied the samples to the analytical laboratory.

3.3 GROUNDWATER QUALITY PARAMETERS MEASURED

The principal goal in analyzing the groundwater in the vicinity of former wastewater impoundments was to determine if it had been contaminated. Regulations have been promulgated under RCRA to protect groundwater quality at RCRA-permitted facilities. The wastewater

impoundments discussed here are not RCRA-permitted sites; however, they were included under section 3004(u) of the 1984 Hazardous and Solid Waste Amendments of the reauthorization of RCRA when ORNL applied to the U. S. Environmental Protection Agency (USEPA) for a hazardous waste storage facility at building 7652 (J. H. Scarbrough, Chief of the Residual Management Branch, Region IV, USEPA, personal communication to J. A. Lenhard, Oak Ridge Operations, U. S. Department of Energy, May 1986). Under these regulations, the permittee is required to identify and characterize all solid waste management units currently or previously located within its boundary. The intent of this regulation is to determine whether a prior or continuing release of hazardous waste or hazardous constituents has occurred or is occurring and/or to characterize the nature and extent of the releases. Groundwater protection standards under RCRA are defined in Title 40, Subpart F, of the Code of Federal Regulations (CFR). The only parameters that have regulated limits are those defined by the National Interim Primary Drinking Water Standards (NIPDWS) (see Table 6). Other parameters that require monitoring in groundwater are those establishing groundwater quality and those chosen to be indicators of groundwater contamination (these parameters are also listed in Table 6). The groundwater quality parameters are to be used as the basis for comparison in the event a groundwater quality assessment is required, and the indicator parameters are used to determine if groundwater has been contaminated by the facility. During the first year, the operator or owner, on a quarterly basis, must establish initial background concentrations, or values, of all parameters for all monitoring wells. For each of the indicator parameters, at least four replicate measurements must be obtained for each sample and the initial background arithmetic mean and variance determined by pooling the replicate measurements for the respective parameter concentrations, or values, in samples obtained from the upgradient wells during the first year. These groundwater parameters, as well as PCBs, copper, nickel, zinc, and the radioisotopes ^{90}Sr, ^{137}Cs, and tritium, were measured in the groundwater samples taken from the monitoring wells. Measurements of temperature and dissolved oxygen were also made.

Table 6. Groundwater parameters measured

Parameter[a]	Maximum level allowed[a,b]
National Interim Primary Drinking Water Standards (NIPDWS)	
Arsenic	0.05
Barium	1
Cadmium	0.01
Chromium	0.05
Coliform bacteria, count/100 mL	1
Endrin	0.0002
Fluoride	1.4-2.4
Gross alpha, Bq/L	0.556
Gross beta, mR/year	4
Lead	0.05
Lindane	0.004
Mercury	0.002
Methoxychlor	0.1
Nitrate-N	10
^{226}Ra, Bq/L	0.19
Selenium	0.01
Silver	0.05
Toxaphene	0.005
2,4,5-TP Silvex	0.01
2,4-D	0.1
Parameters establishing groundwater quality	
Chloride	ND
Iron	ND
Manganese	ND
Phenols	ND
Sodium	ND
Sulfate	ND
Parameters used as indicators of groundwater contamination	
pH	ND
Specific conductance, μS/cm	ND
Total organic carbon	ND
Total organic halides	ND

[a]Concentrations are in mg/L unless otherwise stated.
[b]ND = maximum level for that parameter not defined.

3.4 METHODS OF CHEMICAL ANALYSIS

The methods used to analyze the groundwater are those described in USEPA methods manuals (USEPA 1982, 1983). For elemental concentrations, it was necessary to use atomic absorption spectroscopy to reach the detection levels required by the NIPDWS. The recommended USEPA methods are 7061, 7081, 7131, 7191, 7421, 7470, 7741, and 7761 for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver, respectively. Inductively coupled plasma (ICP) spectroscopy (method 200.7 in USEPA 1983) was also used to determine the concentrations of nonregulatory elements, namely copper, nickel, and zinc. The concentrations of pesticides and herbicides as well as the PCBs in the groundwater were determined by method 8080 (USEPA 1982), except the analyses were by liquid chromatography instead of gas chromatography. Coliform bacteria were determined by method 405.1 (USEPA 1983). Concentrations of fluoride, chloride, nitrate, and sulfate were determined using methods 340.2 and 300.0 (USEPA 1983). Phenol concentrations were measured by method 420.1 (USEPA 1983). Total organic carbon (TOC) and total organic halides (TOX) were determined using methods 9060 and 9020, respectively (USEPA 1982).

The radionuclide concentrations were determined using solid state alpha and beta detectors. Aliquots of groundwater were dried on counting planchets, and the levels of gross alpha and gross beta activity were determined using Tennelec LB5100 Series II equipment. This automated system is programmed to convert raw data to activity units as well as utilizing material weights or volumes to produce activity per unit (weight or volume). Analyses of gamma-emitting radionuclides were conducted using high-resolution germanium detectors. The detectors were shielded from extraneous background and were calibrated for the respective sample geometries, using certified mixtures of gamma-emitting radionuclide standard solutions from the National Bureau Standards (NBS). Calibration procedures and assessment have been described by Larsen and Cutshall (1981). Tritium concentrations were measured using established liquid-scintillation

counting procedures. Strontium-90 was separated from other cations in the groundwater by precipitation as the oxalate salt and then counted on a beta proportional counting system.

3.5 STATISTICAL PROCEDURES

Two strategies were used to determine statistical differences in the concentrations of parameters measured in groundwater. In the first procedure, all parameters were statistically analyzed for differences in concentrations between monitoring wells across the four quarters of sample collection. In this case, the statistical variability for each well was determined by differences in the concentration of the parameter determined over four quarters of sampling; i.e., the sample quarter was treated as a statistical replicate. Thus, this method of statistical analysis is confounded with respect to time (over the sampling interval of one year). Statistical differences between mean concentrations in individual monitoring wells were determined by Duncan's multiple-range test, as conducted by the GLM procedure of the SAS Institute Inc. statistical software package (SAS 1985). For observations below the analytical detection level, the analytical detection level was used as an estimate for that concentration, a conservative approach.

The second method of statistical analysis that was used is outlined in Subpart F, (Groundwater Monitoring, of Title 40, CFR). In this procedure, for each of the indicator parameters (pH, specific conductance, total organic carbon, and total organic halides), the arithmetic mean and variance must be calculated, based on at least four replicate measurements on each sample for each well monitored, and compared with its initial background arithmetic mean. The initial background arithmetic means for each of the indicator parameters are determined from the measurements made in the upgradient monitoring wells over four quarters of sampling. The comparison must consider individually each of the wells in the monitoring system and must use the Student's t-test at the 0.01 level of significance to determine statistically significant increases (and decreases, in the case of pH) over initial background. This method of statistical analysis was

determined using the T TEST procedure as outlined in SAS (1985). Unequal variances were assumed between the background measurements and those determined from a quarterly sample. Measurements for indicator parameters were all above the analytical detection level.

4. RESULTS AND DISCUSSION

Reported in Table A-1 in the Appendix are the concentrations of groundwater quality parameters observed in each of the monitoring wells for each of the four quarters of sampling at the three waste impoundments. (Negative values in these tables indicate the analytical detection level. Data are also reported to five decimal points, but only two digits should be considered significant.) Mean values over four quarters of sampling for each of the monitoring wells are presented in Table A-2 in the Appendix. Comparisons between parameter concentrations sampled from downgradient and upgradient wells are listed in Table A-3. Discussions pertinent to each of the impoundments follow.

4.1 3513 IMPOUNDMENT

4.1.1 Groundwater Measurements That Exceeded RCRA Limits

The mean concentrations of chromium, lead, gross alpha, gross beta, and mean counts of coliform bacteria in the downgradient wells exceeded the maximum allowable levels established by RCRA. The maximum levels were also exceeded for the mean counts of coliform bacteria and mean concentrations of gross alpha and gross beta in the upgradient wells, indicating possible migration of contaminant from one of the adjacent unlined impoundments (impoundments 3524, 3539, or 3940; see Fig. 1) or leakage from a broken transfer line (Stansfield and Francis 1986a).

The high mean values for chromium in the downgradient wells appear to be due to the high chromium values measured in wells 2 and 4 during the first quarter of sampling (see Table 7 and Tables A-1 and A-2 in the Appendix). The high concentrations of lead in the downgradient wells appears to have been caused by the high values observed in monitoring well 3 during the last three quarters of sampling (see Table A-1). For this well, all three samples were in excess of the RCRA limit (0.05 mg/L).

The groundwater from downgradient wells 2 and 4 contained considerably more gross alpha and gross beta activity than the

Table 7. Mean groundwater concentrations measured in monitoring wells at the 3513 impoundment

Parameter[a]	Maximum level allowed[a,b]	Measured[a]	
		Upgradient	Downgradient
National Interim Primary Drinking Water Standards (NIPDWS)			
Arsenic	0.05	<0.0033	<0.0040
Barium	1	<0.24	0.35
Cadmium	0.01	<0.0014	<10.0
Chromium	0.05	<0.029	0.18
Coliform bacteria, count/100 mL	1	1.3	10.0
Endrin	0.0002	<0.0002	<0.0001
Fluoride	1.4-2.4	<1.0000	<1.0000
Gross alpha, Bq/L	0.556	1.9	<5.1
Gross beta, Bq/L	0.13[c]	5.4	23
Lead	0.05	<0.010	0.15
Lindane	0.004	<0.0011	<0.0011
Mercury	0.002	0.0002	<0.0002
Methoxychlor	0.1	<0.0041	<0.0041
Nitrate-N	10	<5.0	<3.5
^{226}Ra, Bq/L	0.19	<0.03	<0.0609
Selenium	0.01	<0.0050	<0.0050
Silver	0.05	<0.03	<0.03
Toxaphene	0.005	<0.0035	<0.0035
2,4,5-TP Silvex	0.01	<0.0075	<0.0079
2,4-D	0.1	<0.0075	<0.0078
Parameters establishing groundwater quality			
Chloride	ND	6.4	18
Iron	ND	2.7	24
Manganese	ND	1.5	3.9
Phenols	ND	<0.0010	<0.0002
Sodium	ND	23	31
Sulfate	ND	80	<13
Parameters used as indicators of groundwater contamination			
pH	ND	6.5	6.4
Specific conductance, µS/cm	ND	820	660
Total organic carbon	ND	4.8	5.9528
Total organic halides	ND	0.067	0.14
Nonregulated parameters			
Copper[d]	ND	<0.025	<0.028
^{137}Cs, Bq/L	ND	1.3	0.39
Dissolved oxygen	ND	5.0	4.5
Nickel[d]	ND	0.06	0.36
Polychlorinated biphenyls (PCBs)	ND	0.0001	0.0001
^{90}Sr, Bq/L	0.13[c]	2.4	13
Temperature, ↓C	ND	15	18
Tritium, Bq/L	670[c]	350	4800
Zinc[d]	ND	<0.061	0.15

[a]Concentrations are in mg/L unless otherwise stated.
[b]ND = maximum level for that parameter not defined.
[c]Level of activity necessary to give a total body dose of 4 mR/year to a person drinking 2.2 L of water per day for a year.
[d]Hazardous substance guidelines issued by the State of Tennessee (L. W. Gregory, Division of Solid Waste Management, Department of Health and Environment, State of Tennessee, personal communication, 1985).

groundwater from well 3 (the other downgradient well). Well 2 contained especially high concentrations of gross beta activity (mean value >50 Bq/L). One of the gross alpha measurements involved an analytical detection level greater than the RCRA limit (the measurement of the sample taken the first quarter from well 4; see Table 8). However, its inclusion or omission in the data set had little effect on the mean values of gross alpha in the downgradient wells. For example, the mean value for gross alpha in downgradient wells was <4.7 Bq/L when all measurements were used and 4.8 Bq/L when the measurement involving a detection level greater than the RCRA limit was deleted. In either case, both mean values exceeded the RCRA limit.

The mean levels of tritium and ^{90}Sr in groundwater from the downgradient wells were considerably greater than the level of activity necessary to give a total body dose of 4 mR/year to a person drinking 2.2 L of water per day for a year (see Table 7). However, only one tritium measurement in the upgradient wells (a measurement of 760 Bq/L taken the third quarter from well 1A) exceeded the calculated limit of 670 Bq/L .

Those concentrations measured in groundwater that exceeded the RCRA maximum limits are listed in Table 9. Measurements in which the analytical detection level exceeded the RCRA limit were not included in Table 9 (e.g., those measurements of gross alpha, ^{226}Ra, and silver listed in Table 8). Excessive levels of chromium were observed in all three downgradient wells the first quarter of sampling, but measurements from the same wells at later sampling dates were below the RCRA limit. The dominant contaminants appear to be radionuclides; i.e., excessive levels of gross alpha and gross beta were observed in groundwater samples taken from all monitoring wells. There appears to be a trend in elevated levels of lead in groundwater sampled from well 3 as compared with the other downgradient wells.

4.1.2 Statistically Significant Differences Between Monitoring Wells

One method of comparing concentrations of the measured parameters between monitoring wells is to make statistical comparisons between the wells over the four quarters of sampling, i.e., to treat the

Table 8. List of samples whose detection levels exceeded Resource Conservation and Recovery Act (RCRA) limits

Parameter	Unit	RCRA limit	Well no.	Sampling quarter	Detection level
		3513 impoundment			
Gross alpha	Bq/L	0.55	4	1	3.0
^{226}Ra	Bq/L	0.18	4	4	0.2
Silver	mg/L	0.05	1	1	0.07
Silver	mg/L	0.05	1	2	0.07
Silver	mg/L	0.05	2	1	0.07
Silver	mg/L	0.05	2	2	0.07
Silver	mg/L	0.05	3	1	0.07
Silver	mg/L	0.05	3	2	0.07
Silver	mg/L	0.05	4	1	0.07
Silver	mg/L	0.05	4	2	0.07
		Old Hydrofracture Facility impoundment			
Gross alpha	Bq/L	0.55	2	2	2.0
Gross alpha	Bq/L	0.55	4	2	3.0
^{226}Ra	Bq/L	0.19	1	3	0.40
^{226}Ra	Bq/L	0.19	2	1	0.20
^{226}Ra	Bq/L	0.19	3	1	0.20
^{226}Ra	Bq/L	0.19	3	3	0.60
^{226}Ra	Bq/L	0.19	3	4	0.20
^{226}Ra	Bq/L	0.19	4	1	0.20
^{226}Ra	Bq/L	0.19	4	3	0.60
Silver	mg/L	0.05	1	1	0.07
Silver	mg/L	0.05	1	2	0.07
Silver	mg/L	0.05	2	1	0.07
Silver	mg/L	0.05	2	2	0.07
Silver	mg/L	0.05	3	1	0.07
Silver	mg/L	0.05	3	2	0.07
Silver	mg/L	0.05	4	1	0.07
Silver	mg/L	0.05	4	2	0.07
		Homogeneous Reactor Experiment impoundment			
Chromium	mg/L	0.05	1	2	0.20
Silver	mg/L	0.05	1	1	0.07
Silver	mg/L	0.05	1	2	0.07
Silver	mg/L	0.05	2	1	0.07
Silver	mg/L	0.05	2	2	0.07
Silver	mg/L	0.05	3	1	0.07
Silver	mg/L	0.05	3	2	0.07
Silver	mg/L	0.05	4	1	0.42
Silver	mg/L	0.05	4	2	0.07

Table 9. Measured concentrations in groundwater at 3513 impoundment that were in excess of Resource Conservation and Recovery Act (RCRA) maximum limits for groundwater

Parameter	Unit	RCRA limit	Sampling quarter[a] 1	2	3	4
Well 1						
Coliform bacteria	count/100 mL	1	8	BL	BL	BL
Gross alpha	Bq/L	0.55	2	1	2	2
Gross beta	Bq/L	0.13	5	2	5	3
^{90}Sr	Bq/L	0.13	ND	1	2	2
Well 1A						
Chromium	mg/L	0.05	0.14	BL	BL	BL
Coliform bacteria	count/100 mL	1	2	BL	BL	BL
Gross alpha	Bq/L	0.55	1	1	6	4
Gross beta	Bq/L	0.13	7	5	13	8
^{90}Sr	Bq/L	0.13	ND	3	3	3
Tritium	Bq/L	670	ND	BL	760	BL
Well 2						
Chromium	mg/L	0.05	1.20	BL	BL	BL
Gross alpha	Bq/L	0.55	4	1	18	17
Gross beta	Bq/L	0.13	54	45	65	62
^{90}Sr	Bq/L	0.13	ND	26	33	32
Tritium	Bq/L	670	ND	3600	3500	2900
Well 3						
Chromium	mg/L	0.05	0.07	BL	BL	BL
Coliform bacteria	count/100 mL	1	2	BL	8	120
Gross alpha	Bq/L	0.55	BL	BL	2	2
Gross beta	Bq/L	0.13	4	1	4	2
Lead	mg/L	0.05	BL	1.4	0.06	0.08
^{90}Sr	Bq/L	0.13	ND	0.40	0.64	1.40
Tritium	Bq/L	670	ND	2300	2800	2400
Well 4						
Chromium	mg/L	0.05	0.69	BL	BL	BL
Gross alpha	Bq/L	0.55	BL	BL	4	5
Iron	Bq/L	0.13	9	7	15	19
^{90}Sr	Bq/L	0.13	ND	5	7	7
Tritium	Bq/L	670	ND	2200	20000	3600

[a]BL = below RCRA groundwater limit; ND = not determined.

concentrations taken at the four sampling periods as replicates. Treatment in this manner confounds any analysis with respect to time. For example, there is no assurance that an observation at each of the wells is independent of time or that any response to time, if there is one, is the same for each well. Obviously, such treatment is much less dangerous at inactive sites than it is at active sites (those sites that continue to receive wastes). To make simple comparisons between upgradient and downgradient wells at specific points in time, at least three to four upgradient wells are needed for comparison with the same number of downgradient wells. Regardless of the implications, a statistical comparison was made between monitoring wells for each one of the measured parameters, as described in Sect. 3.5, Statistical Procedures. Those parameters that showed significant differences at the 0.05 level are listed in Table 10.

One evidence of groundwater pollution is a significant difference between upgradient and downgradient wells in the concentration of those parameters defined by RCRA for monitoring groundwater characteristics (see the list of those parameters in Table 6). In a statistical sense, taking into consideration those parameters for which an RCRA limit exists (i.e., NIPDWS), only the gross beta measurements in groundwater from wells 2 and 4 were significantly different ($P < 0.05$) from similar measurements in groundwater taken from upgradient wells (combined measurements from wells 1 and 1A over the four quarters of sampling; see Table 10). There were significant statistical differences in mean concentrations of a number of groundwater parameters between monitoring wells. For example, significantly higher concentrations of chloride, iron, tritium, manganese, ^{90}Sr, TOC, TOX, and zinc were observed in groundwater sampled from one or more of the downgradient wells as compared with the upgradient wells (Table 10). Interestingly, the concentrations of sulfate were significantly lower in downgradient wells than in upgradient wells. The same was true for measurements of specific conductance; i.e., the groundwater from the downgradient wells measured significantly lower in conductivity than that sampled from the upgradient wells. These measurements strongly indicate that the plume

Table 10. Significant differences in water quality parameters between monitoring wells at the 3513 impoundment

Parameter	Concentrations in monitoring wells 1-4[a,b]			
	1	2	3	4
Chloride, mg/L	6.4§	36*	12†	6.6§
Dissolved oxygen, mg/L	4.6*	3.5†	4.6*	5.4*
Iron, mg/L	2.7†	8.8†	51*	12†
Gross beta, mR/year	5.4§	54*	2.6§	11†
Tritium, Bq/L	35†	3300*†	2500*†	8600*
Manganese, mg/L	1.5†	4.8*	3.8*	3.2*
pH	6.5†	6.7*	6.3†§	6.3§
Sulfate, mg/L	80*	20†	6†	13†
Specific conductance, µS/cm	820*	602*†	620†	730*†
^{90}Sr, Bq/L	2.3§	30*	0.8§	6.4†
Total organic carbon, mg/L	4.8†	3.6†	7.1†	7.2*
Total organic halides, mg/L	0.07†	0.07†	0.17*	0.19*
Zinc, mg/L	0.06†	0.07*†	0.29*	0.09*†

[a]Concentrations are statistically different (0.05 level) between wells if they do not have similar superscripts (*, †, §). The statistical comparisons were determined using the Duncan's multiple-range test of the GLM procedure, as outlined in SAS 1985.

[b]Concentrations found in monitoring well 1A were combined with those in monitoring well 1 for statistical comparison.

from the 3524 impoundment or leaks in underground waste lines seriously impacted the water quality of the upgradient monitoring wells for the 3513 impoundment. A considerably more valid interpretation can be made regarding the effect of the 3524 impoundment when the analyses for the groundwater sampling program around the 3524 impoundment are completed (data covering four quarters of sampling are expected to be available in late summer to early fall of 1986).

4.1.3 Testing for Groundwater Contamination Using Indicator Parameters

Title 40, CFR (Subpart F, Groundwater Protection, para. 265.92) requires that each of the indicator parameters listed in Table 6 for every sample taken from a monitoring well be compared with background levels in the upgradient wells averaged over the first four quarters of groundwater monitoring. The comparison must consider each of the wells in the monitoring system individually, and must use the Student's t-test at the 0.01 level of significance to determine statistically significant increases (and decreases, in the case of pH) over initial background levels. Means and other statistical information pertaining to the concentrations of the indicator parameters measured in the upgradient wells over the first year of data collection are tabulated in Table A-5 of the Appendix.

Comparisons of indicator parameters in each of the upgradient and downgradient wells with background levels over the four quarters sampled at the 3513 monitoring wells are presented in Table 11. Unfortunately, four replicated measurements were not made on all sampling dates. For example, with respect to the measurements for pH and specific conductance, only in the fourth quarter were four replicated measurements made. Measurements of pH in the fourth quarter showed significantly higher values for groundwater taken from well 2 as compared with the control, whereas samples taken from wells 3 and 4 were significantly lower in pH than the control (mean pH of 6.4). Measurements of groundwater pH from the upgradient wells (wells 1A and 1) in the fourth quarter were not significantly different from the background levels determined over the sampling year (Table 11). The measurements taken in the fourth quarter for specific conductance

Table 11. Student's t-test for indicators of groundwater contamination at the 3513 impoundment

Well	Sampling quarter	pH		Specific conductance (μS/cm)		Total organic carbon (mg/L)		Total organic halides (mg/L)	
		Mean	Significance[a]	Mean	Significance[a]	Mean	Significance[a]	Mean	Significance[a]
Background[b]		6.5		820		4.8		0.067	
1A	1	6.4	SV	590	SV	2.3	SV	0.072	SV
	2	6.6	SV	810	SV	8.4	**	0.022	SV
	2A[c]	ND	ND	4.1	NS		ND		
	3	6.4	SV	740	SV	3.1	**	0.040	*
	4	6.4	NS	790	NS	5.0	SV	0.17	**
1	1	6.7	SV	570	SV	2.7	SV	0.062	SV
	2	6.5	SV	940	SV	8.1	**	0.004	SV
	2A[c]		ND		ND	3.6	**		ND
	3	6.4	SV	310	SV	3.1	**	0.039	*
	4	6.5	NS	1100	**	4.0	SV	0.048	NS
2	1	6.2	SV	440	SV	1.5	SV	0.055	SV
	2	7.1	SV	680	SV	5.7	*	0.022	SV
	2A[c]		ND		ND	3.0	**		ND
	3	6.5	SV	650	SV	1.6	**	0.11	**
	4	6.8	**	680	*	8.0	SV	0.046	NS
3	1	6.4	SV	460	SV	3.7	SV	0.060	SV
	2		ND		ND	9.4	**	0.032	SV
	2A[c]		ND		ND	5.1	NS		ND
	3	6.3	SV	370	SV	3.8	NS	0.28	**
	4	6.2	**	700	NS	22	SV	0.18	**
4	1	6.4	SV	500	SV	2.9	SV	0.08	SV
	2	ND	ND	9.7	**	0.042	SV		
	2A[c]	ND	ND	5.6	NS		ND		
	3	6.3	SV	450	SV	6.7	**	0.34	**
	4	6.2	**	830	NS	10.	SV	0.053	NS

[a]SV = single value; ND = not determined; NS = not significant; * = significant at the 0.05 level; ** = significant at the 0.01 level.

[b]Mean background concentrations determined from upgradient monitoring wells over four quarters of sampling (see Table A-5 of the Appendix).

[c]A replicate sampling taken for total organic carbon in June 1985.

showed no significant difference at the 0.01 level; however, a significantly lower specific conductance, at the 0.05 level, was observed in well 2 in the fourth quarter as compared with the background measurement. The general trend was a lower specific conductance in the groundwater downgradient as compared with the upgradient wells.

An additional sample (designated 2A in Table 11) was taken from the monitoring wells in the second quarter (June 6, 1985) for total organic carbon (TOC) analyses. Samples taken at this date were consistently lower in TOC than the samples collected earlier in the quarter (April 15, 1985) but were closer to the TOC values determined in the third quarter. The early second quarter samples from wells 3 and 4 showed significantly higher levels of TOC (at the 0.01 level) than the background samples. These and the sample taken the third quarter from well 4 were the only samples that showed TOC values significantly ($P < 0.01$) higher than the mean background level (4.8 mg/L). Five samples taken from downgradient wells contained concentrations of TOC that were significantly different ($P < 0.01$) from the background level. Three of these samples contained TOC concentrations greater than background values, and two contained lower concentrations. The high value (a single value of 22 mg/L) measured in the fourth quarter in well 3 appears to be an outlier.

Four replicated measurements of total organic halides (TOX) were made in the third and fourth quarters. The third quarter sampling showed significantly elevated levels in all three downgradient wells. Well 3 also showed significantly higher concentrations of TOX in the fourth quarter. These data indicate that the 3513 impoundment is contaminating the downgradient groundwater with organic halides.

4.2 OLD HYDROFRACTURE FACILITY IMPOUNDMENT

4.2.1 Groundwater Measurements That Exceeded RCRA Limits

Except for the radioactivity (gross alpha and gross beta measurements) and the counts of coliform bacteria, the mean concentrations of NIPDWS contaminants determined in downgradient wells were below RCRA maximum limits (see Table 12). The major contaminants

Table 12. Mean groundwater concentrations measured in monitoring wells at the Old Hydrofracture Facility impoundment

Parameter[a]	Maximum level allowed[a,b]	Measured[a]	
		Upgradient	Downgradient
National Interim Primary Drinking Water Standards (NIPDWS)			
Arsenic	0.05	<0.0028	<0.0033
Barium	1	0.45	0.57
Cadmium	0.01	<0.0011	<0.0020
Chromium	0.05	<0.027	<0.031
Coliform bacteria, count/100 mL	1	5.2	<6.4
Endrin	0.0002	<0.0001	<0.0002
Fluoride	1.4-2.4	<1.0	<1.0
Gross alpha, Bq/L	0.556	<1.2	<58
Gross beta, Bq/L	0.13[c]	4.8	710
Lead	0.05	<0.01	<0.0420
Lindane	0.004	<0.0009	<0.0011
Mercury	0.002	<0.0001	<0.0047
Methoxychlor	0.1	<0.0033	<0.0041
Nitrate-N	10	2.7	<3.8
^{226}Ra, Bq/L	0.19	<0.11	<0.19
Selenium	0.01	0.0033	<0.0037
Silver	0.05	<0.042	<0.036
Toxaphene	0.005	<0.0032	<0.0035
2,4,5-TP Silvex	0.01	<0.0070	<0.0075
2,4-D	0.1	<0.0070	<0.0075
Parameters establishing groundwater quality			
Chloride	ND	12	19
Iron	ND	2.7	17
Manganese	ND	0.20	2.9
Phenols	ND	<0.0012	<0.0012
Sodium	ND	13	24
Sulfate	ND	20	16
Parameters used as indicators of groundwater contamination			
pH	ND	6.5	6.3
Specific conductance, µS/cm	ND	710	450
Total organic carbon	ND	4.5	5.7
Total organic halides	ND	0.11	0.13
Nonregulated parameters			
Copper[d]	1	<0.0200	<0.0261
^{137}Cs, Bq/L	ND	1.2	1.7
Dissolved oxygen	ND	6.9	7.4
Nickel[d]	5	<0.06	<0.06
Polychlorinated biphenyls (PCBs)	ND	0.0001	0.0001
^{90}Sr, Bq/L	0.13[c]	1.9	460
Temperature, °C	ND	16	16
Tritium, Bq/L	670[c]	91000	80000
Zinc[d]	5	<0.06	<0.1476

[a]Concentrations are in mg/L unless otherwise stated.

[b]ND = maximum level for that parameter not defined.

[c]Level of activity necessary to give a total body dose of 4 mR/year to a person drinking 2.2 L of water per day for a year.

[d]Hazardous substance guidelines issued by the State of Tennessee (L. W. Gregory, Division of Solid Waste Management, Department of Health and Environment, State of Tennessee, personal communication, 1985).

in downgradient wells appear to be ^{90}Sr and tritium (mean concentrations of 460 and 80,000 Bq/L, respectively, over four quarters of sampling). The tritium concentrations appear to be derived from a source other than the impoundment, as the mean concentration of tritium in the upgradient wells over the same four quarters of sampling was slightly higher (91,000 Bq/L) than the mean for the downgradient wells. The most likely source of tritium in these groundwater samples is the low-level radiological waste disposed of in the burial ground (SWSA-5) northeast of the OHF. Tritium has been observed in groundwater sampled immediately below this waste burial ground. For example, in 1974 water samples from seeps at the bottom of the hill on the south side of the burial grounds contained 10^9 Bq/L of tritium (Duguid 1976).

Other than the radiological measurements and coliform counts, there were instances where the concentrations of barium, chromium, and lead in the downgradient wells exceeded the RCRA maximum limits (see Table 13). The degree to which these concentrations exceeded the limit was generally very small: for example, the concentration of barium was 1.09 mg/L and the limit was 1; the concentration of chromium was 0.08 mg/L (limit, 0.05); and the concentration of lead was 0.09 mg/L (limit, 0.05). Lead concentrations in monitoring well 3 were 0.08, 0.08, and 0.09 mg/L, respectively, in the last three quarters sampled.

4.2.2 Statistically Significant Differences Between Monitoring Wells

Statistical analysis of the water quality parameters, taken as replicate samples across the four sampling quarters, showed some significant differences ($P < 0.05$) between monitoring wells for the parameters analyzed (Table 14). However, none of these contaminants were those designated as primary drinking water contaminants in the NIPDWS (see Table 6). Well 3, across the four sampling quarters, yielded significantly ($P < 0.05$) higher mean concentrations of chloride, iron, manganese, and sodium than the mean concentrations determined for the upgradient well over the same sampling period. On the other hand, well 4 contained significantly higher ($P < 0.05$) mean concentrations of gross beta and ^{90}Sr than the upgradient well (1) or

Table 13. Measured concentrations in groundwater at the Old Hydrofracture Facility impoundment that were in excess of Resource Conservation and Recovery Act (RCRA) maximum limits for groundwater

Parameter	Unit	RCRA limit	Sampling quarter[a] 1	2	3	4
Well 1						
Coliform bacteria	count/100 mL	1	5	16	BL	BL
Gross alpha	Bq/L	0.55	BL	2	1	3
Gross beta	Bq/L	0.13	4	5	7	
^{90}Sr	Bq/L	0.13	ND	2	2	2
Tritium	Bq/L	670	ND	79,000	75,000	120,000
Well 2						
Coliform bacteria	count/100 mL	1	BL	10	BL	BL
Gross alpha	Bq/L	0.55	BL	BL	1	3
Gross beta	Bq/L	0.13	2	2	3	3
Lead	mg/L	0.05	BL	BL	0.10	BL
^{90}Sr	Bq/L	0.13	ND	BL	0.41	BL
Tritium	Bq/L	670	ND	190,000	58,000	140,000
Well 3						
Barium	mg/L	1	BL	1.09	BL	BL
Chromium	mg/L	0.05	BL	0.08	BL	BL
Coliform bacteria	count/100 mL	1	48	BL	BL	BL
Gross alpha	Bq/L	0.55	1	1	1	52
Gross beta	Bq/L	0.13	8	380	570	220
Lead	mg/L	0.05	BL	0.08	0.08	0.09
^{90}Sr	Bq/L	0.13	ND	250	240	120
Tritium	Bq/L	670	ND	60,000	5,000	210,000
Well 4						
Coliform bacteria	count/100 mL	1	18	BL	BL	BL
Gross alpha	Bq/L	0.55	11	3	1	620
Gross beta	Bq/L	0.13	600	1,300	2,700	2,700
^{90}Sr	Bq/L	0.13	ND	420	1,400	1,700
Tritium	Bq/L	670	ND	33,000	11,000	14,000

[a]BL = below RCRA groundwater limit; ND = not determined.

Table 14. Significant differences in water quality parameters between monitoring wells at the Old Hydrofracture Facility impoundment

Parameter	Concentrations in monitoring wells 1–4[a]			
	1	2	3	4
Chloride, mg/L	12†	18*†	25*	14†
Iron, mg/L	2.7†	11*†	37*	2.3†
Gross beta, mR/year	5†	2†	300†	1800*
Manganese, mg/L	0.2†	1.5†	6.1*	1.0†
Sodium, mg/L	13†	16†	39*	17†
pH	6.5*	6.4*	6.4*	6.1†
Sulfate, mg/L	20*	12†	18*	18*
Specific conductance, μS/cm	710*	630*	440†	220§
^{90}Sr, Bq/L	1.9†	0.3†	200†	1200*

[a]Concentrations are statistically different (0.05 level) between wells if they do not have similar superscripts (*, †, §). The statistical comparisons were determined using the Duncan's multiple-range test of the GLM procedure, as outlined in SAS 1985.

the other downgradient wells (2 and 3). Well 4 also yielded groundwater whose mean pH was significantly lower than the mean pH of the groundwater taken from the other wells (Table 14). Interestingly, the mean specific conductivity measurements for wells 3 and 4 were significantly lower than those from upgradient wells 1 and 2.

4.2.3 Testing for Groundwater Contamination Using Indicator Parameters

As described in Sect. 4.1.3, for every sample taken from a monitoring well, each of the indicator parameters listed in Table 6 must be compared with background levels averaged from the upgradient wells over the first four quarters of groundwater monitoring. As was

the case for the 3513 data, there were a number of sampling quarters where four replicate measurements were not taken. In cases where only single values were determined (denoted by "SV" in Table 15), statistical analysis could not be performed.

Compared to the background pH (the mean of these pH measurements taken from the upgradient well over the first year), significantly lower ($P < 0.01$) mean pH measurements were observed in well 2 (fourth quarter sampling) and well 4 (second and fourth sample quarters). During the second quarter, the pH measurements in wells 1 and 2 were significantly higher than the background level (Table 15).

As indicated in Sect. 4.2.2, measurements of specific conductance in groundwater taken from wells 3 and 4 were significantly lower than those in groundwater from the upgradient well (see Table 15). For example, measurements taken in the second quarter (243 and 161 μS/cm for groundwater from wells 3 and 4) were significantly lower ($P < 0.01$) than the background level (709 μS/cm). These measurements, like those of tritium concentrations, indicate potential contamination from the low-level radioactive waste burial ground (SWSA-5) upgradient and northeast of the OHF impoundment.

Measurements of total organic carbon (TOC) varied erratically from one sample period to another; for example, in wells 1 and 4 values significantly higher as well as significantly lower than the background levels were observed (Table 15). A similar trend was observed in TOC measurements at the 3513 impoundment, indicating either a sampling and/or an analytical analysis error.

Four samples, from four different monitoring wells, showed significantly higher concentrations of total organic halides than were found in samples taken from the upgradient background monitoring wells (Table 15). All four samples were collected in the third quarter. These high values on this one sampling date (if not a result of either contamina- tion of the samples or a procedural error in their analysis) might indicate general contamination of the groundwater with organic halides.

Table 15. Student's t-test for indicators of groundwater contamination at the Old Hydrofracture Facility impoundment

Well	Quarter	pH		Specific conductance (μS/cm)		Total organic carbon (mg/L)		Total organic halides (mg/L)	
		Mean	Significance[a]	Mean	Significance[a]	Mean	Significance[a]	Mean	Significance[a]
Background[b]		6.4		820		4.8		0.067	
1	1	6.2	SV	820	SV	3.4	NS	0.020	NS
	2	6.8	**	610	NS	7.0	**	0.010	SV
	3	6.4	NS	670	NS	5.2	NS	0.223	**
	4	6.4	*	820	*	1.9	**	0.073	NS
2	1	6.3	SV	760	SV	6.3	SV	0.013	SV
	2	6.9	**	580	*	8.3	**	0.009	SV
	3	6.4	NS	640	NS	3.2	*	0.23	**
	4	6.1	**	650	NS	3.3	NS	0.044	*
3	1	6.5	SV	710	SV	3.2	SV	0.033	SV
	2	6.5	NS	240	**	7.0	**	0.029	SV
	3	6.5	NS	310	**	8.9	**	0.27	**
	4	6.3	*	680	NS	3.9	NS	0.061	NS
4	1	6.2	SV	260	SV	2.2	SV	0.049	SV
	2	6.2	**	160	**	5.7	*	0.037	SV
	3	5.5	SV	200	SV	9.0	**	0.26	**
	4	6.1	**	280	**	2.4	**	0.069	NS

[a]SV = single value; ND = not determined; NS = not significant; * = significant at the 0.05 level; ** = significant at the 0.01 level.

[b]Mean background concentrations determined from upgradient monitoring wells over four quarters of sampling (see Table A-5 in the Appendix).

ORNL/TM-10193

4.3 HOMOGENEOUS REACTOR EXPERIMENT IMPOUNDMENT

4.3.1 Groundwater Measurements That Exceeded RCRA Limits

Mean values for the RCRA groundwater-protection parameters in upgradient and downgradient monitoring wells over the four quarters of sample collection are presented in Table 16. As in the case of the 3513 and OHF impoundments, the major contaminants in groundwater downgradient of the HRE impoundment appear to be alpha and beta radionuclides. Mean counts of coliform bacteria in downgradient as well as in upgradient wells are also in excess of drinking water standards. It is not clear why excessive counts of coliform bacteria are present in upgradient wells. Similar high counts were observed in the 3513 and OHF impoundments (see Tables 7 and 12). Waterfowl, as well as muskrat and woodchucks, are known to inhabit the ponds and adjoining areas and most likely contribute to the bacteria counts in downgradient wells, but their presence should not have a major impact on upgradient wells.

The mean concentration of chromium in the upgradient wells was found to exceed the drinking water standard (<0.065 as compared with the limit of 0.05 mg/L); however, this is an artifact resulting from the analytical detection levels being in excess of the drinking water limit. For example, Table 8 shows that the detection limit for the second quarter sample from monitoring well 1 was 0.2 mg/L. If this value is deleted from the data set, the mean chromium concentration in the upgradient wells is 0.0203 mg/L (see Table A-4 in the Appendix). A similar relationship exists for silver. For example, the mean concentration for silver in the downgradient wells was <0.0645 mg/L if all measured values were used and the analytical detection level was used as an estimate for that value. The analytical detection level for silver for many samples was 0.07 mg/L, and in one case the detection level was as high as 0.42 (Table 8). When those detection levels in excess of the RCRA drinking water limit are deleted from the data set, the mean value for silver in the downgradient wells over the four quarters of sampling is <0.007 mg/L (see Table A-4 in the Appendix).

Table 16. Mean groundwater concentrations measured in monitoring wells at the Homogeneous Reactor Experiment No. 2 impoundment

Parameter[a]	Maximum level allowed[a,b]	Measured[a]	
		Upgradient	Downgradient
National Interim Primary Drinking Water Standards (NIPDWS)			
Arsenic	0.05	<0.0028	<0.0044
Barium	1	<0.30	<0.74
Cadmium	0.01	<0.0006	<0.0010
Chromium	0.05	<0.065	<0.031
Coliform bacteria, count/100 mL	1	3.0	3.3
Endrin	0.0002	<0.0002	<0.0002
Fluoride	1.4-2.4	<1.0	<1.0
Gross alpha, Bq/L	0.556	4.0	<22
Gross beta, Bq/L	0.13[c]	3.9	380
Lead	0.05	<0.022	<0.020
Lindane	0.004	<0.0014	<0.0014
Mercury	0.002	<0.0001	<0.0001
Methoxychlor	0.1	<0.0043	<2.5
^{226}Ra, Bq/L	0.19	<0.0063	<0.053
Selenium	0.01	<0.0033	<0.0033
Silver	0.05	<0.035	<0.06
Toxaphene	0.005	<0.0035	<0.0039
2,4,5-TP Silvex	0.01	<0.0075	<0.0075
2,4-D	0.1	<0.0075	<0.0075
Parameters establishing groundwater quality			
Chloride	ND	8.5	5.5
Iron	ND	1.9	24
Manganese	ND	0.13	4.5
Phenols	ND	<0.0018	0.0012
Sodium	ND	6.3	14.
Sulfate	ND	46.	44.
Parameters used as indicators of groundwater contamination			
pH	ND	6.8	6.7
Specific conductance, μS/cm	ND	500	590
Total organic carbon	ND	5.0	3.7
Total organic halides	ND	0.10	0.06
Nonregulated parameters			
Copper[d]	1	<0.02	<0.04
^{137}Cs, Bq/L	ND	0.13	0.48
Dissolved oxygen	ND	4.2	4.5
Nickel[d]	5	<0.06	<0.11
Polychlorinated biphenyls (PCBs)	ND	0.0001	0.0001
^{90}Sr, Bq/L	0.13[c]	0.17	130
Temperature, °C	ND	18	17
Tritium, Bq/L	670[c]	12	190
Zinc[d]	5	<0.02	0.08

[a]Concentrations are in mg/L unless otherwise stated.

[b]ND = maximum level for that parameter not defined.

[c]Level of activity necessary to give a total body dose of 4 mR/year to a person drinking 2.2 L of water per day for a year.

[d]Hazardous substance guidelines issued by the State of Tennessee (L. W. Gregory, Division of Solid Waste Management, Department of Health and Environment, State of Tennessee, personal communication, 1985).

Those measurements in groundwater sampled from the HRE monitoring wells that were found to be in excess of the RCRA maximum limits for groundwater are listed in Table 17. As mentioned above, the principal parameters in excess of the limits are radionuclides and counts for coliform bacteria. There were a few instances where concentrations of barium, lead, chromium, and nitrate exceeded the limits; however, those instances were few and the degree of excess was generally quite small.

4.3.2 Statistically Significant Differences Between Monitoring Wells

Comparisons of RCRA groundwater parameters between monitoring wells revealed some significant differences ($P < 0.05$) between wells (Table 18). Well 2 appears to be in the path of ^{90}Sr leaching from the impoundment (e.g., the mean concentration over the four quarters of sample collection was 370 Bq/L as compared with 28 Bq/L for well 4 and 0.2 for the upgradient well). The mean concentrations of tritium measured in groundwater from wells 2 and 3 were significantly higher ($P < 0.05$) than those measured in wells 1 and 3. The mean tritium concentration measured in groundwater from well 3 (390 Bq/L) was also significantly higher ($P < 0.05$) than that measured from well 2 (170 Bq/L). Well 3 also showed the highest concentration of sodium (Table 18). The mean chloride level measured in groundwater from well 1 (the upgradient well) was significantly higher ($P < 0.05$) than those measured in groundwater from wells 3 or 4, but similar to that measured in well 2 groundwater.

4.3.3 Testing for Groundwater Contamination Using Indicator Parameters

As described in Sect. 4.1.3, for every sample taken from a monitoring well, each of the indicator parameters listed in Table 6 had to be compared with background levels of these parameters in groundwater from the upgradient wells, averaged over the first four quarters of groundwater monitoring. As was the case for the 3513 and OHF groundwater monitoring data, four replicate measurements were not taken in a number of sampling quarters. Where only single values were determined (denoted by "SV" in Table 19), statistical analysis could not be performed.

Four groundwater samples were significantly lower ($P < 0.05$) in pH than the background samples (Table 19). Two of the samples were from

Table 17. Measured concentrations in groundwater at the Homogeneous Reactor Experiment No. 2 impoundment that were in excess of Resource Conservation and Recovery Act (RCRA) maximum limits for groundwater

Parameter	Unit	RCRA limit	Sampling quarter[a] 1	2	3	4
Well 1						
Coliform bacteria	count/100 mL	1	8	4	BL[a]	BL
Gross alpha	Bq/L	0.55	1	1	BL	9
Gross beta	Bq/L	0.13	10	4	1	1
Lead	mg/L	0.05	0.07	BL	BL	BL
Nitrate-N	mg/L	10	24	BL	BL	BL
Well 2						
Coliform bacteria	count/100 mL	1	30	BL	BL	2
Endrin	mg/L	0.0002	0.0008	BL	BL	BL
Gross alpha	Bq/L	0.55	6	6	BL	200
Gross beta	Bq/L	0.13	720	950	810	840
^{226}Ra	Bq/L	0.185	0.33	BL	BL	BL
^{90}Sr	Bq/L	0.13	ND[b]	540	140	430
Well 3						
Barium	mg/L	1	2	BL	BL	BL
Coliform bacteria	count/100 mL	1	BL	2	BL	BL
Gross alpha	Bq/L	0.55	1	BL	BL	2
Gross beta	Bq/L	0.13	24	4	2	1
Lead	Bq/L	0.05	0.09	BL	BL	BL
^{90}Sr	Bq/L	0.13	ND	1.3	BL	BL
Toxaphene	mg/L	0.005	0.005	BL	BL	BL
Well 4						
Barium	mg/L	1	2.7	BL	BL	BL
Chromium	mg/L	0.05	BL	0.06	BL	BL
Coliform bacteria	count/100 mL	1	BL	6	BL	BL
Gross alpha	Bq/L	0.55	24	BL	BL	BL
Gross beta	Bq/L	0.13	900	210	65	61
^{90}Sr	Bq/L	0.13	ND	1	50	32

[a]BL = below RCRA groundwater limit; ND = not determined.

Table 18. Significant differences in water quality parameters between monitoring wells at the Homogeneous Reactor Experiment No. 2 impoundment

Parameter	Concentrations in monitoring wells 1-4[a]			
	1	2	3	4
Chloride, mg/L	8.5*	7.2*†	4.6†	4.6†
Tritium, Bq/L	12§	170†	390*	24§
Sodium, mg/L	6.3†	12†	25*	5.8†
pH	6.8*†	6.6†	6.7*†	6.9*
Sulfate, mg/L	46*†	57*	41†	35†
^{90}Sr, Bq/L	0.2†	370*	0.5†	28†
Temperature, °C	18*	17*†	16†	17*†

[a]Concentrations are statistically different (0.05 level) between wells if they do not have similar superscripts (*, †, §). The statistical comparisons were determined using the Duncan's multiple-range test of the GLM procedure as outlined in SAS 1985.

well 2 (third and fourth quarters), and the remaining two samples were taken from wells 3 and 4 in the fourth quarter of sampling. There seemed to be considerable variation in specific conductance measurements. For example, significantly smaller as well as significantly larger values were observed in samples from the same well over the four quarters of sample collection. There does not seem to be a pattern with respect to time. For example, well 2 showed lower specific conductance measurements in the fourth quarter relative to those measured during the second and third quarter. Well 3, on the other hand, revealed significantly lower measurements than the background in the second quarter of sampling, and in the third and fourth quarter had measurements that were significantly higher than the background measurements (Table 19).

The total organic carbon (TOC) in downgradient wells appeared to be generally lower than the background measurements. For example, three of the four significant differences observed between the measurements in groundwater downgradient from the impoundment contained lower rather than higher TOC levels. In one instance, in well 3 (where the sample was taken the second quarter) there was an increase in TOC in groundwater downgradient from the impoundment.

Only one groundwater sample showed a total organic halide (TOX) content that was significantly higher ($P < 0.01$) than that measured in the background samples. This sample was taken from well 2 during the first quarter of sampling (Table 19). Samples taken from the same well at later dates showed a mean concentration of TOX less than one-fourth of that measured the first quarter.

Table 19. Student's t-test for indicators of groundwater contamination at the Homogeneous Reactor Experiment No. 2 impoundment

Well	Quarter	pH		Specific conductance (μS/cm)		Total organic carbon (mg/L)		Total organic halides (mg/L)	
		Mean	Significance[a]	Mean	Significance[a]	Mean	Significance[a]	Mean	Significance[a]
Background[b]		6.8		500		5.0		0.10	
1	1	6.8	SV	640	SV	2.9	SV	0.540	SV
	2	6.9	NS	520	NS	6.5	NS	0.014	SV
	3	6.7	NS	440	NS	8.3	**	0.086	NS
	4	6.7	NS	520	NS	0.71	**	0.023	NS
2	1	6.7	SV	720	SV	2.3	SV	0.410	**
	2	6.7	NS	720	**	5.9	NS	0.015	SV
	3	6.5	**	720	**	4.5	NS	0.075	NS
	4	6.5	**	240	**	0.95	**	0.029	NS
3	1	6.9	SV	730	SV	2.1	SV	0.36	SV
	2	6.6	NS	290	**	8.2	**	0.013	SV
	3	6.9	NS	750	**	3.4	NS	0.029	NS
	4	6.5	**	730	**	0.83	**	0.024	NS
4	1	6.7	SV	630	SV	0.24	SV		
	2	6.6	*	560	NS	6.1	NS	0.006	SV
	3	7.5	NS	610	**	2.7	*	0.023	NS
	4	6.6	**	580	*	1.0	**	0.016	NS

[a]SV = single value; ND = not determined; NS = not significant; * = significant at the 0.05 level; ** = significant at the 0.01 level.

[b]Mean background concentrations determined from upgradient monitoring wells over four quarters of sampling, see Table A5 of Appendix A.

5. SUMMARY AND CONCLUSIONS

As one would expect, the contaminants that most often were found to impact groundwater quality at all three waste impoundments were radionuclides. The mean concentrations of gross beta activity in the groundwater from downgradient wells exceeded the drinking water limits of 4 mR/year at all three sites. At the 3513 and OHF impoundments, this limit (4 mR/year, assuming a person drinks 2.2 L of water per day for a year) was exceeded by concentrations of either ^{90}Sr or tritium. At the HRE impoundment, the limit was exceeded only by the level of ^{90}Sr in the groundwater. The mean concentrations of alpha activity in the downgradient groundwater also exceeded drinking water standards at all three impoundments. The mean counts of coliform bacteria in downgradient and upgradient monitoring wells at all impoundments were in excess of the RCRA drinking water standards. The source of the bacteria in the groundwater has not been identified but is assumed to be the excrement of waterfowl and animals such as woodchuck and muskrat that inhabit the areas.

At the 3513 impoundment, there is substantial evidence that the downgradient groundwater has been contaminated by chromium and lead and possibly by halogenated organic compounds. Groundwater quality upgradient of the 3513 impoundment is believed to be strongly impacted by the leaching of constituents from leaking underground waste lines or the 3524 waste holding basin located ~25 m to the northwest of the 3513 impoundment. The 3524 basin is presently being used to store laboratory wastewater effluent before treatment at the process waste treatment plant. Indications of impact by the 3524 basin are higher measurements of specific conductivity and sulfate in groundwater from upgradient wells than from downgradient wells at 3513.

At the OHF impoundment, lead concentrations of 0.08, 0.08, and 0.09 mg/L were observed in groundwater samples (taken the second, third, and fourth quarter, respectively) from one of the downgradient monitoring wells. These values are slightly in excess of the RCRA limit for groundwater (0.05 mg/L). A lead concentration of 0.10 mg/L was also observed in a groundwater sample taken from one of the other downgradient monitoring wells, indicating possible contamination by lead. The high

mean concentration of tritium measured in the upgradient well (~91,000 as compared with the 80,000 Bq/L in the downgradient wells) indicates that groundwater quality has been affected by radioactive wastes buried in the low-level radioactive waste burial ground (SWSA-5) upgradient of the impoundment. Another indication that this burial site is affecting water quality at the OHF impoundment is the significantly ($P < 0.01$) higher readings for specific conductance in the upgradient well as compared with the downgradient wells.

Two groundwater samples at the HRE site contained levels of herbicides in excess of the RCRA limit. For example, in the first quarter of sample collection, Endrin was measured in groundwater from well 2 at a concentration of 0.0008 mg/L (slightly higher than the 0.0002 mg/L limit). Toxaphene was also found during the first quarter in well 3 to be at the RCRA limit of 0.005 mg/L. This is the first instance of detection of herbicides or pesticides in groundwater at any of the three impoundments in concentrations in excess of the RCRA limits. There is a record of sodium borate being added to kill weeds during backfilling of the HRE impoundment (Stansfield and Francis 1986c), but there is no record of the use of Endrin or Toxaphene. These compounds were not detected in any of the groundwater samples taken at later dates.

There were also instances at all three sites where lead, barium, and chromium were detected at levels in excess of the RCRA maximum limit. However, none of these metals were in excess of the limit more than twice over the four quarters of sampling (4 wells x 4 sample periods), and in no case was an excess observed twice in the same well. Statistical analyses, in which sample quarters were used as replicate analyses, revealed no statistical differences between monitoring wells for the RCRA parameters for which limits have been set (the primary drinking water standards). The exception was gross beta measurements at both the 3513 and OHF impoundments.

Testing for groundwater contamination, using the indicator parameters outlined in Title 40, CFR (Subpart F, Groundwater Protection, para. 265.92), disclosed statistically significant contamination at all three sites. This testing procedure is the one prescribed by USEPA to determine

if there is an indication of groundwater contamination at RCRA-permitted sites. The procedure involves a comparison of pH, specific conductance, total organic carbon, and total organic halides concentrations at each of the wells at a specific sample time with the initial background levels taken from the upgradient well over four quarters of sample collection. The Student's t-test at the 0.01 level of significance is used to determine statistically significant increases (and decreases, in the case of pH) over initial background levels.

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APPENDIX

CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=HRE WELL NUMBER=1

			SAMPLING QUARTER							
			1		2		3		4	
			MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION	
PARAMETER	UNITS	LIMIT	MEAN	IN	MEAN	IN	MEAN	IN	MEAN	IN
ARSENIC	MG/L	0.05	-0.002000	1	-0.001000	1	-0.005000	1	-0.003000	1
BARIUM	MG/L	1	0.083000	1	0.120000	1	-0.500000	1	-0.500000	1
CADMIUM	MG/L	0.01	-0.001000	1	-0.001000	1	-0.000020	1	-0.000020	1
CESIUM-137	BQ/L	ND	0.262770	1	0.000000	1	.	.	.	.
CHLORIDE	MG/L	ND	12.000000	1	7.000000	1	7.000000	1	7.900000	1
CHROMIUM	MG/L	0.05	-0.050000	1	-0.200000	1	0.002000	1	0.009000	1
COLIFORM	COL/100	1	8.000000	1	4.000000	1	0.000000	1	0.000000	1
COPPER	MG/L	1	-0.020000	1	-0.020000	1	.	.	.	.
DISS. OXYGEN	MG/L	ND	.	.	.	.	4.450000	4	3.950000	4
ENDRIN	MG/L	0.0002	-0.000010	1	-0.000010	1	-0.000020	1	-0.000020	1
FLUORIDE	MG/L	1.4-2.4	-1.000100	1	-1.000000	1	-1.000000	1	-1.000000	1
G-ALPHA	BQ/L	0.555	1.000000	1	0.900000	1	0.060000	1	8.900000	2
G-BETA	BQ/L	0.29	10.000000	1	3.500000	1	0.800000	1	1.300000	1
IRON	MG/L	ND	0.480000	1	4.590000	1	.	.	0.680000	1
LEAD	MG/L	0.05	0.070000	1	-0.001000	1	0.010000	1	0.005000	1
LINDANE	MG/L	0.004	.	.	-0.000100	1	-0.002000	1	-0.002000	1
MANGANESE	MG/L	ND	0.150000	1	0.198000	1	.	.	0.048000	1
MERCURY	MG/L	0.002	0.000006	1	-0.000005	1	0.000020	1	-0.000010	1
METHOXY-CHLOR	MG/L	0.1	0.000800	1	-0.000200	1	-0.008000	1	-0.008000	1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=HRE WELL NUMBER=1

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
NICKEL	MG/L	15	-0.060000	1	-0.060000	1	.	.	.	.
NITRATE-N	MG/L	110	24.000000	1	-1.000000	1	.	.	.	.
PCB	MG/L	ND	.	.	0.000009	1	.	.	.	.
PH	PH	ND	6.800000	1	6.900000	4	6.650000	4	6.675000	4
PHENOLS	MG/L	ND	-0.001000	1	-0.001000	1	-0.001000	1	0.004000	1
RADIUM-226	UG/L	10.185	0.010000	1	-0.002000	1	-0.003000	1	-0.010000	1
SELENIUM	MG/L	10.01	-0.005000	1	-0.001000	1	-0.005000	1	-0.002000	1
SILVER	MG/L	10.05	-0.070000	1	-0.070000	1	-0.000500	1	-0.001000	1
SODIUM	MG/L	ND	.	.	6.800000	1	.	.	5.800000	1
SP.COND.	UMHOS/CM	ND	1636.000000	1	1522.250000	4	1438.750000	4	1519.000000	4
STRONTIUM-90	BQ/L	10.3	.	.	0.260000	1	0.120000	1	0.140000	1
SULFATE	MG/L	ND	54.000000	1	42.000000	1	44.000000	1	44.000000	1
T. ORG. CARBON	MG/L	ND	2.850000	1	6.475000	4	8.275000	4	0.707500	4
T. ORG. HALOGEN	MG/L	ND	0.540000	1	0.014000	1	0.085750	4	0.023000	4
TEMPERATURE	DEG. C	ND	.	.	.	.	18.550000	4	17.075000	4
TOXAPHENE	MG/L	10.005	-0.002000	1	-0.002000	1	-0.005000	1	-0.005000	1
TRITIUM	BQ/L	1740	.	.	20.000000	1	3.000000	1	13.000000	1
ZINC	MG/L	15	-0.020000	1	-0.020000	1	.	.	.	.

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=HRE WELL NUMBER=1

			SAMPLING QUARTER							
			1		2		3		4	
			MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION	
PARAMETER	UNITS	LIMIT	MEAN	IN	MEAN	IN	MEAN	IN	MEAN	IN
2,4-D	MG/L	0.1	-0.00500	1	-0.00500	1	-0.01000	1	-0.01000	1
2,4-5 T	MG/L	0.01	-0.00500	1	-0.00500	1	-0.01000	1	-0.01000	1

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=HRE WELL NUMBER=2

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
ARSENIC	MG/L	0.05	-0.005000	1	-0.001000	1	-0.005000	1	-0.003000	1
BARIUM	MG/L	1	0.950000	1	0.163000	1	-0.500000	1	-0.500000	1
CADMIUM	MG/L	0.01	-0.001000	1	-0.001000	1	0.000200	1	-0.000200	1
CESIUM-137	PCI/L	NO	2.079940	1	0.000000	1	.	.	.	.
CHLORIDE	MG/L	NO	13.000000	1	5.000000	1	6.000000	1	4.800000	1
CHROMIUM	MG/L	0.05	-0.060000	1	-0.020000	1	0.025000	1	0.010000	1
COLIFORM	COL/100	1	30.000000	1	0.000000	1	0.000000	1	2.000000	1
COPPER	MG/L	1	-0.020000	1	-0.020000	1	.	.	.	.
DISS. OXYGEN	MG/L	NO	.	.	.	.	3.575000	4	3.550000	4
ENDRIN	MG/L	0.0002	0.000080	1	-0.000010	1	-0.000020	1	-0.000020	1
FLUORIDE	MG/L	1.4-2.4	-1.000000	1	-1.000000	1	-1.000000	1	-1.000000	1
G-ALPHA	PCI/L	0.555	5.000000	1	5.600000	1	-0.100000	1	200.000000	1
G-BETA	PCI/L	0.29	720.000000	1	950.000000	1	810.000000	1	840.000000	1
IRON	MG/L	NO	24.000000	1	2.880000	1	.	.	1.500000	1
LEAD	MG/L	0.05	0.030000	1	-0.001000	1	0.030000	1	0.008000	1
LINDANE	MG/L	0.004	.	.	-0.000010	1	-0.002000	1	-0.002000	1
MANGANESE	MG/L	NO	6.300000	1	0.789000	1	.	.	0.710000	1
MERCURY	MG/L	0.002	0.000005	1	-0.000005	1	0.000200	1	-0.000100	1
METHOXY-CHLOR	MG/L	0.1	0.002300	1	-0.000200	1	-0.008000	1	-0.008000	1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=HRE WELL NUMBER=2

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
NICKEL	MG/L	15	-0.060000	1	-0.060000	1	.	.	.	.
NITRATE-N	MG/L	10	5.000000	1	-1.000000	1	.	.	.	.
PCB	MG/L	ND	.	.	0.000150	1	.	.	.	.
PH	PH	ND	6.700000	1	6.725000	4	6.500000	4	6.475000	4
PHENOLS	MG/L	ND	-0.001000	1	-0.001000	1	-0.001000	1	0.001000	1
RADIUM-226	BQ/L	0.185	0.330000	1	-0.020000	1	-0.030000	1	-0.010000	1
SELENIUM	MG/L	0.01	-0.005000	1	-0.001000	1	-0.005000	1	-0.002000	1
SILVER	MG/L	0.05	-0.070000	1	-0.070000	1	-0.000500	1	-0.001000	1
SODIUM	MG/L	ND	.	.	12.700000	1	.	.	11.000000	1
SP.COND.	UMHOS/CM	ND	721.000000	1	715.500000	4	724.000000	4	241.250000	4
STRONTIUM 90	BQ/L	0.3	.	.	540.000000	1	140.000000	1	430.000000	1
SULFATE	MG/L	ND	75.000000	1	55.000000	1	51.000000	1	46.000000	1
T. ORG. CARBON	MG/L	ND	2.290000	1	5.875000	4	4.500000	4	0.947500	4
T. ORG. HALOGEN	MG/L	ND	0.410000	1	0.015000	1	0.074750	4	0.029250	4
TEMPERATURE	DEG. C	ND	.	.	.	.	18.425000	4	16.100000	4
TOXAPHENE	MG/L	0.005	0.003000	1	-0.002000	1	-0.005000	1	-0.005000	1
TRITIUM	BQ/L	740	.	.	230.000000	1	95.000000	1	190.000000	1
ZINC	MG/L	15	0.052000	1	-0.020000	1	.	.	.	.

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=HRE WELL NUMBER=2

			SAMPLING QUARTER							
			1		2		3		4	
			MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION	
PARAMETER	UNITS	LIMIT	MEAN	IN	MEAN	IN	MEAN	IN	MEAN	IN
2,4-D	MG/L	0.1	-0.005001	1	-0.005001	1	-0.010001	1	-0.010001	1
2,4-5 T	MG/L	0.01	-0.005001	1	-0.005001	1	-0.010001	1	-0.010001	1

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=HRE WELL NUMBER=3

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	IN	2 MEASURED CONCENTRATION MEAN	IN	3 MEASURED CONCENTRATION MEAN	IN	4 MEASURED CONCENTRATION MEAN	IN
ARSENIC	MG/L	0.05	0.01500	1	-0.00100	1	-0.00500	1	-0.00300	1
BARIUM	MG/L	1	1.50000	1	0.10500	1	-0.50000	1	-0.50000	1
CADMIUM	MG/L	0.01	-0.00100	1	0.00350	1	-0.00020	1	-0.00020	1
CESIUM-137	BQ/L	ND	0.35899	1	0.00000	1	.	.	.	.
CHLORIDE	MG/L	ND	6.00000	1	4.00000	1	5.00000	1	3.40000	1
CHROMIUM	MG/L	0.05	-0.05000	1	0.02120	1	0.00400	1	0.02700	1
COLIFORM	COL/100	1	0.00000	1	2.00000	1	0.00000	1	0.00000	1
COPPER	MG/L	1	-0.02000	1	-0.02000	1	.	.	.	.
DISS. OXYGEN	MG/L	ND	.	.	.	.	6.92500	4	4.25000	4
ENDRIN	MG/L	0.0002	-0.00010	1	-0.00010	1	-0.00020	1	-0.00020	1
FLUORIDE	MG/L	1.4-2.4	-1.00000	1	-1.00000	1	-1.00000	1	-1.00000	1
G-ALPHA	BQ/L	0.555	1.00000	1	0.10000	1	-0.10000	1	1.50000	1
G-BETA	BQ/L	0.29	24.00000	1	3.60000	1	1.50000	1	0.70000	1
IRON	MG/L	ND	83.00000	1	4.14000	1	.	.	4.90000	1
LEAD	MG/L	0.05	0.09000	1	-0.00100	1	0.00500	1	0.01200	1
LINDANE	MG/L	0.004	.	.	-0.00010	1	-0.00200	1	-0.00200	1
MANGANESE	MG/L	ND	7.80000	1	0.16000	1	.	.	0.24000	1
MERCURY	MG/L	0.002	-0.00005	1	-0.00005	1	0.00020	1	-0.00010	1
METHOXY-CHLOR	MG/L	0.1	0.00030	1	-0.00020	1	-0.00800	1	-0.00800	1

(CONTINUED)

TABLE 4-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=HRE WELL NUMBER=3

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
NICKEL	MG/L	15	0.068000	1	-0.060000	1	.1	.1	.1	.1
NITRATE-N	MG/L	110	-5.000000	1	-1.000000	1	.1	.1	.1	.1
PCB	MG/L	ND	.1	.1	0.000111	1	.1	.1	.1	.1
PH	PH	ND	6.900000	1	6.600000	4	6.875000	4	6.475000	4
PHENOLS	MG/L	ND	-0.001000	1	-0.001000	1	-0.001000	1	0.001000	1
RADIUM-226	BQ/L	10.185	-0.001000	1	-0.010000	1	-0.005000	1	-0.070000	1
SELENIUM	MG/L	10.01	-0.005000	1	-0.001000	1	-0.005000	1	-0.002000	1
SILVER	MG/L	10.05	-0.070000	1	-0.070000	1	-0.000050	1	-0.001000	1
SODIUM	MG/L	ND	.1	.1	21.700000	1	.1	.1	28.000000	1
SP.COND.	UMHOS/CM	ND	725.000000	1	264.750000	4	744.750000	4	726.000000	4
STRONTIUM-90	BQ/L	10.3	.1	.1	1.300000	1	0.120000	1	0.180000	1
SULFATE	MG/L	ND	39.000000	1	43.000000	1	42.000000	1	42.000000	1
T. ORG. CARBON	MG/L	ND	2.080000	1	8.225000	4	3.425000	4	0.827500	4
T. ORG. HALOGEN	MG/L	ND	0.360000	1	0.013000	1	0.028750	4	0.024250	4
TEMPERATURE	DEG. C	ND	.1	.1	.1	.1	17.025000	4	15.000000	4
TOXAPHENE	MG/L	10.005	0.005200	1	-0.002000	1	-0.005000	1	-0.005000	1
TRITIUM	BQ/L	1740	.1	.1	370.000000	1	430.000000	1	360.000000	1
ZINC	MG/L	15	0.130000	1	-0.020000	1	.1	.1	.1	.1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=HRE WELL NUMBER=3

			SAMPLING QUARTER							
			1		2		3		4	
			MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION	
PARAMETER	UNITS	LIMIT	MEAN	IN	MEAN	IN	MEAN	IN	MEAN	IN
2,4-D	MG/L	0.1	-0.005000	1	-0.005000	1	-0.010000	1	-0.010000	1
2,4-5 T	MG/L	0.01	-0.005000	1	-0.005000	1	-0.010000	1	-0.010000	1

TABLE 4-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=HRE WELL NUMBER=4

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
ARSENIC	MG/L	0.05	0.004000	1	-0.001000	1	-0.005000	1	-0.003000	1
BARIUM	MG/L	1	2.700000	1	0.494000	1	-0.500000	1	-0.500000	1
CADMIUM	MG/L	0.01	-0.001000	1	0.003500	1	-0.000200	1	-0.000200	1
CESIUM-137	PC/L	ND	0.303480	1	0.151740	1	.	.	.	.
CHLORIDE	MG/L	ND	6.000000	1	4.000000	1	4.000000	1	4.400000	1
CHROMIUM	MG/L	0.05	-0.050000	1	0.059100	1	0.025000	1	0.032000	1
COLIFORM	COL/100	1	0.000000	1	6.000000	1	0.000000	1	0.000000	1
COPPER	MG/L	1	-0.120000	1	0.032000	1	.	.	.	.
DISS. OXYGEN	MG/L	ND	.	.	.	.	4.225000	4	4.200000	4
ENDRIN	MG/L	0.0002	-0.000100	1	-0.000100	1	-0.000200	1	-0.000200	1
FLUORIDE	MG/L	1.4-2.4	-1.000000	1	-1.000000	1	-1.000000	1	-1.000000	1
G-ALPHA	PC/L	0.555	24.000000	1	0.100000	1	-0.100000	1	.	.
G-BETA	PC/L	0.29	1900.000000	1	210.000000	1	65.000000	1	61.000000	1
IRON	MG/L	ND	51.000000	1	29.000000	1	.	.	13.000000	1
LEAD	MG/L	0.05	0.035000	1	-0.001000	1	0.020000	1	0.012000	1
LINDANE	MG/L	0.004	.	.	-0.000100	1	-0.002000	1	-0.002000	1
MANGANESE	MG/L	ND	22.000000	1	1.750000	1	.	.	0.780000	1
MERCURY	MG/L	0.002	-0.000005	1	-0.000051	1	-0.000010	1	-0.000010	1
METHOXY-CHLOR	MG/L	0.1	0.003200	1	-0.000020	1	-0.003600	1	-0.008000	1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=HRE WELL NUMBER=4

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 N	2 MEASURED CONCENTRATION MEAN	2 N	3 MEASURED CONCENTRATION MEAN	3 N	4 MEASURED CONCENTRATION MEAN	4 N
NICKEL	MG/L	15	.	.	-0.210001	2	.	.	.	.
NITRATE-N	MG/L	110	2.000001	1	-1.000001	1	.	.	.	.
PCB	MG/L	IND	.	.	0.000091	1	.	.	.	.
PH	PH	IND	6.700001	1	6.625001	4	7.475001	4	5.550001	4
PHENOLS	MG/L	IND	0.002001	1	-0.001001	1	-0.001001	1	0.002001	1
RADIUM-226	PCI/L	10.195	0.050001	1	-0.010001	1	-0.006001	1	-0.090001	1
SELENIUM	MG/L	10.01	-0.005001	1	-0.001001	1	-0.005001	1	-0.002001	1
SILVER	MG/L	10.05	-0.420001	1	-0.070001	1	-0.000501	1	-0.001001	1
SODIUM	MG/L	IND	.	.	5.650001	1	.	.	6.000001	1
SP.COND.	UMHOS/CM	IND	632.000001	1	562.250001	4	610.250001	4	583.500001	4
STRONTIUM BC	UG/L	10.3	.	.	3.580001	1	50.000001	1	32.000001	1
SULFATE	MG/L	IND	42.000001	1	34.000001	1	32.000001	1	31.000001	1
T. ORG. CARBON	MG/L	IND	5.320001	1	6.075001	4	2.650001	4	1.022501	4
T. ORG. HALOGEN	MG/L	IND	0.235001	1	0.006001	1	0.022751	4	0.016001	4
TEMPERATURE	DEG. C	IND	.	.	.	.	18.500001	4	15.300001	4
TOXAPHENE	MG/L	10.005	-0.002001	1	-0.002001	1	-0.005001	1	-0.005001	1
TRITIUM	PCI/L	1740	.	.	37.000001	1	10.300001	1	25.000001	1
ZINC	MG/L	15	0.140001	1	0.083101	1	.	.	.	.

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=HRE WELL NUMBER=4

			SAMPLING QUARTER							
			1		2		3		4	
PARAMETER	UNITS	LIMIT	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N
[illegible]	MG/L	0.1	-0.005000	1	-0.005000	1	-0.010000	1	-0.010000	1
[illegible] T	MG/L	0.01	-0.005000	1	-0.005000	1	-0.010000	1	-0.010000	1

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=OHF WELL NUMBER=1

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
ARSENIC	MG/L	0.05	-0.001500	2	-0.001000	1	-0.005000	1	-0.005000	1
BARIUM	MG/L	1	0.252000	2	0.257000	1	-0.500000	1	-1.000000	1
CADMIUM	MG/L	0.01	-0.001000	2	0.003000	1	-0.000020	1	-0.000050	1
CESIUM-137	BQ/L	ND	1.[illegible]	2	[illegible]	1	.	.	.	.
CHLORIDE	MG/L	ND	12.000000	2	12.000000	1	12.000000	1	13.000000	1
CHROMIUM	MG/L	0.05	-0.050000	2	-0.020000	1	0.007000	1	0.006000	1
COLIFORM	COL/100	1	5.000000	2	16.000000	1	0.000000	1	0.000000	1
COPPER	MG/L	1	-0.020000	2	-0.020000	1	.	.	.	.
DISS. OXYGEN	MG/L	ND	.	.	.	.	6.175000	4	7.575000	4
ENDRIN	MG/L	0.0002	-0.000010	2	-0.000010	1	-0.000020	1	-0.000020	1
FLUORIDE	MG/L	1.4-2.4	-1.000000	2	-1.000000	1	-1.000000	1	-1.000000	1
G-ALPHA	BQ/L	0.555	0.030000	2	1.800000	1	0.600000	1	2.900000	1
G-BETA	BQ/L	0.29	3.850000	2	4.600000	1	6.600000	1	5.200000	1
IRON	MG/L	ND	0.390000	2	0.587000	1	.	.	8.500000	1
LEAD	MG/L	0.05	0.000500	2	0.006000	1	0.030000	1	0.013000	1
LINDANE	MG/L	0.004	-0.000010	2	-0.000010	1	-0.002000	1	-0.002000	1
MANGANESE	MG/L	ND	0.246500	2	0.033400	1	.	.	0.270000	1
MERCURY	MG/L	0.002	-0.000005	2	-0.000005	1	-0.000100	1	-0.000100	1
METHOXY-CHLOR	MG/L	0.1	-0.000020	2	-0.000020	1	-0.000600	1	-0.000600	1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=OHF WELL NUMBER=1

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 N	2 MEASURED CONCENTRATION MEAN	2 N	3 MEASURED CONCENTRATION MEAN	3 N	4 MEASURED CONCENTRATION MEAN	4 N
NICKEL	MG/L	15	-0.060000	2	-0.060000	1	.	.	.	.
NITRATE-N	MG/L	110	1.000000	2	6.000000	1	.	.	.	.
PCB	MG/L	IND	.	.	0.000120	1	.	.	.	.
PH	PH	IND	6.200000	1	6.840000	4	6.350000	4	6.300000	4
PHENOLS	MG/L	IND	-0.001000	2	0.002000	1	-0.001000	1	-0.001000	1
RADIUM-226	PC/L	10.185	-0.025000	2	-0.005000	1	-0.400000	1	-0.100000	1
SELENIUM	MG/L	10.01	-0.004000	2	-0.001000	1	-0.005000	1	-0.005000	1
SILVER	MG/L	10.05	-0.070000	2	-0.070000	1	-0.000500	1	-0.002000	1
SODIUM	MG/L	IND	14.000000	2	.	.	.	.	10.000000	1
SP.COND.	UMHOS/CM	IND	817.000000	1	609.750000	4	672.750000	4	816.750000	4
STRONTIUM 90	PC/L	10.3	.	.	1.800000	1	2.200000	1	1.300000	1
SULFATE	MG/L	IND	19.000000	2	20.000000	1	22.000000	1	22.000000	1
T. ORG. CARBON	MG/L	IND	3.350000	2	6.975000	4	5.175000	4	1.850000	4
T. ORG. HALOGEN	MG/L	IND	0.020000	2	0.011000	1	0.226250	4	0.073500	4
TEMPERATURE	DEG. C	IND	.	.	.	.	17.650000	4	14.700000	4
TOXAPHENE	MG/L	10.005	-0.002000	2	-0.002000	1	-0.005000	1	-0.005000	1
TRITIUM	PC/L	1740	.	.	790000	1	750000	1	1200000	1
ZINC	MG/L	15	0.084050	2	-0.020000	1	.	.	.	.

(CONTINUED)

TABLE 4-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=OHF WELL NUMBER=1

			SAMPLING QUARTER							
			1		2		3		4	
PARAMETER	UNITS	LIMIT	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN
2,4-D	MG/L	0.1	-0.005001	2	-0.005001	1	-0.010001	1	-0.010001	1
2,4-5 T	MG/L	0.01	-0.005001	2	-0.005001	1	-0.010001	1	-0.010001	1

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=OHF WELL NUMBER=2

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
ARSENIC	MG/L	0.05	-0.002000	1	-0.001000	1	-0.005000	1	-0.005000	1
BARIUM	MG/L	1	0.420000	1	0.258000	1	-0.500000	1	-1.000000	1
CADMIUM	MG/L	0.01	-0.001000	1	-0.002000	1	-0.000200	1	-0.000500	1
CESIUM-137	BQ/L	IND	.	.	0.999260	1	.	.	.	.
CHLORIDE	MG/L	IND	19.000000	1	20.000000	1	17.000000	1	19.000000	1
CHROMIUM	MG/L	0.05	-0.050000	1	0.024200	1	0.030000	1	0.015000	1
COLIFORM	COL/100	1	0.000000	1	10.000000	1	0.000000	1	0.000000	1
COPPER	MG/L	1	-0.020000	1	-0.020000	1	.	.	.	.
DISS. OXYGEN	MG/L	IND	.	.	.	.	9.400000	3	5.325000	4
ENDRIN	MG/L	0.0002	-0.000100	1	-0.000100	1	-0.000200	1	-0.000200	1
FLUORIDE	MG/L	1.4-2.4	-1.000000	1	-1.000000	1	-1.000000	1	-1.000000	1
G-ALPHA	BQ/L	0.555	0.310000	1	-2.000000	1	0.700000	1	2.600000	1
G-BETA	BQ/L	0.29	2.100000	1	1.700000	1	2.500000	1	3.200000	1
IRON	MG/L	IND	3.800000	1	4.000000	1	.	.	24.000000	1
LEAD	MG/L	0.05	0.020000	1	0.015000	1	0.100000	1	0.042000	1
LINDANE	MG/L	0.004	-0.000100	1	-0.000100	1	-0.002000	1	-0.002000	1
MANGANESE	MG/L	IND	1.300000	1	0.563000	1	.	.	2.600000	1
MERCURY	MG/L	0.002	-0.000005	1	-0.000005	1	-0.000100	1	-0.000100	1
METHOXY-CHLOR	MG/L	0.1	-0.000200	1	-0.000200	1	-0.000800	1	-0.000800	1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=DHF WELL NUMBER=2

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
NICKEL	MG/L	15	-0.060000	1	-0.060000	1	.	.	.	.
NITRATE-N	MG/L	110	2.000000	1	8.000000	1	.	.	.	.
PCB	MG/L	NO	.	.	0.000011	1	.	.	.	.
PH	PH	NO	8.300000	1	6.900000	4	6.375000	4	6.12500	4
PHENOLS	MG/L	NO	-0.001000	1	-0.001000	1	-0.001000	1	0.00200	1
RADIUM-226	BQ/L	0.185	-0.200000	1	-0.008000	1	-0.100000	1	-0.05000	1
SELENIUM	MG/L	10.01	0.005000	1	-0.001000	1	-0.005000	1	-0.00500	1
SILVER	MG/L	10.05	-0.070000	1	-0.070000	1	-0.000050	1	-0.00200	1
SODIUM	MG/L	NO	17.000000	1	13.800000	1	.	.	17.000000	1
SP.COND.	UMHOS/CM	NO	750.000000	1	575.750000	4	644.250000	4	648.500000	4
STRONTIUM-90	BQ/L	10.3	.	.	0.210000	1	0.410000	1	0.26000	1
SULFATE	MG/L	NO	13.000000	1	12.000000	1	12.000000	1	12.000000	1
T. ORG. CARBON	MG/L	NO	6.330000	1	8.250000	4	3.150000	4	3.30000	4
T. ORG. HALOGEN	MG/L	NO	0.023000	1	0.009000	1	0.230500	4	0.04475	4
TEMPERATURE	DEG. C	NO	.	.	.	.	17.100000	4	13.750000	4
TOXAPHENE	MG/L	10.005	-0.002000	1	-0.002000	1	-0.005000	1	-0.00500	1
TRITIUM	BQ/L	1740	.	.	190000	1	58000	1	140000	1
ZINC	MG/L	15	0.210000	1	-0.020000	1	.	.	.	.

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=DHF WELL NUMBER=2

			SAMPLING QUARTER							
			1		2		3		4	
PARAMETER	UNITS	LIMIT	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N
2,4-D	MG/L	0.1	-0.005001	1	-0.005001	1	-0.010001	1	-0.010001	1
2,4-5 T	MG/L	0.01	-0.005001	1	-0.005001	1	-0.010001	1	-0.010001	1

TABLE 4-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=DHF WELL NUMBER=3

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
ARSENIC	MG/L	0.05	-0.002000	1	0.002000	1	-0.005000	1	-0.005000	1
BARIUM	MG/L	1	0.380000	1	1.090000	1	-0.500000	1	-1.000000	1
CADMIUM	MG/L	0.01	0.006000	1	0.010000	1	-0.000200	1	-0.000500	1
CESIUM-137	BQ/L	NO	0.717990	1	0.925240	1	.	.	.	.
CHLORIDE	MG/L	NO	17.000000	1	40.000000	1	22.000000	1	21.000000	1
CHROMIUM	MG/L	0.05	-0.050000	1	0.079700	1	0.012000	1	0.033000	1
COLIFORM	COL/100	1	48.000000	1	-0.100000	1	0.000000	1	0.000000	1
COPPER	MG/L	1	-0.020000	1	0.056700	1	.	.	.	.
DISS. OXYGEN	MG/L	NO	.	.	.	.	7.150000	4	8.350000	4
ENDRIN	MG/L	0.0002	-0.000010	1	-0.000010	1	-0.000020	1	-0.000020	1
FLUORIDE	MG/L	1.4-2.4	-1.000000	1	-1.000000	1	-1.000000	1	-1.000000	1
G-ALPHA	BQ/L	0.555	0.060000	1	1.200000	1	1.100000	1	52.000000	1
G-BETA	BQ/L	0.29	8.000000	1	380.000000	1	570.000000	1	220.000000	1
IRON	MG/L	NO	3.200000	1	57.900000	1	.	.	50.000000	1
LEAD	MG/L	0.05	0.025000	1	0.080000	1	0.080000	1	0.093000	1
LINDANE	MG/L	0.004	-0.000010	1	-0.000010	1	-0.002000	1	-0.002000	1
MANGANESE	MG/L	NO	1.500000	1	8.850000	1	.	.	8.000000	1
MERCURY	MG/L	0.002	-0.000006	1	-0.000005	1	-0.000100	1	-0.000100	1
METHOXY-CHLOR	MG/L	0.1	-0.000020	1	-0.000020	1	-0.006000	1	-0.008000	1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=OHF WELL NUMBER=3

			SAMPLING QUARTER							
			1		2		3		4	
			MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION	
PARAMETER	UNITS	LIMIT	MEAN	IN	MEAN	IN	MEAN	IN	MEAN	IN
NICKEL	MG/L	15	-0.06000	1	0.07350	1	.	.	.	.
NITRATE-N	MG/L	110	2.00000	1	-5.00000	1	.	.	.	.
PCB	MG/L	IND	.	.	0.00010	1	.	.	.	.
PH	PH	IND	6.50000	1	6.51250	4	6.50000	4	6.27500	4
PHENOLS	MG/L	IND	-0.00100	1	-0.00100	1	-0.00100	1	0.00200	1
RADIUM-226	PCI/L	10.198	-0.20000	1	-0.00700	1	-0.60000	1	-0.20000	1
SELENIUM	MG/L	0.01	-0.00300	1	-0.00100	1	-0.00500	1	-0.00500	1
SILVER	MG/L	0.05	-0.07000	1	-0.07000	1	-0.00050	1	-0.00200	1
SODIUM	MG/L	IND	37.00000	1	37.30000	1	.	.	44.00000	1
SP.COND.	UMHOS/CM	IND	711.00000	1	242.75000	4	311.50000	4	683.50000	4
STRONTIUM 90	PCI/L	8.3	.	.	250.00000	1	240.00000	1	120.00000	1
SULFATE	MG/L	IND	24.00000	1	13.00000	1	12.00000	1	23.00000	1
T. ORG. CARBON	MG/L	IND	3.21000	1	7.00000	4	8.87500	4	3.87500	4
T. ORG. HALOGEN	MG/L	IND	0.03300	1	0.02900	1	0.27275	4	0.06075	4
TEMPERATURE	DEG. C	IND	.	.	.	.	17.60000	4	15.65000	4
TOXAPHENE	MG/L	10.005	-0.00200	1	-0.00200	1	-0.00500	1	-0.00500	1
TRITIUM	PCI/L	1740	.	.	60000	1	5000	1	210000	1
ZINC	MG/L	15	0.12000	1	0.19300	1	.	.	.	.

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=DHF WELL NUMBER=3

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	IN	2 MEASURED CONCENTRATION MEAN	IN	3 MEASURED CONCENTRATION MEAN	IN	4 MEASURED CONCENTRATION MEAN	IN
2,4-D	MG/L	0.1	-0.005001	1	-0.005001	1	-0.010001	1	-0.010001	1
2,4-5 T	MG/L	0.01	-0.005001	1	-0.005001	1	-0.010001	1	-0.010001	1

TABLE 4-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=OHF WELL NUMBER=4

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	IN	SAMPLING QUARTER 2 MEASURED CONCENTRATION MEAN	IN	SAMPLING QUARTER 3 MEASURED CONCENTRATION MEAN	IN	SAMPLING QUARTER 4 MEASURED CONCENTRATION MEAN	IN
ARSENIC	MG/L	0.05	-0.002000	1	-0.001000	1	-0.005000	1	-0.005000	1
BARIUM	MG/L	1	0.066000	1	0.125000	1	-0.500000	1	-1.000000	1
CADMIUM	MG/L	0.01	-0.001000	1	-0.002000	1	-0.000200	1	-0.000500	1
CESIUM-137	PCI/L	ND	2.276090	1	3.626940	1	.	.	.	.
CHLORIDE	MG/L	ND	8.000000	1	17.000000	1	15.000000	1	15.000000	1
CHROMIUM	MG/L	0.05	-0.050000	1	-0.020000	1	0.003000	1	-0.005000	1
COLIFORM	COL/100	1	18.000000	1	-0.100000	1	0.000000	1	0.000000	1
COPPER	MG/L	1	-0.020000	1	-0.020000	1	.	.	.	.
DISS. OXYGEN	MG/L	ND	.	.	.	.	7.300000	1	7.350000	4
ENDRIN	MG/L	0.0002	.	.	-0.000100	1	-0.000020	1	-0.000020	1
FLUORIDE	MG/L	1.4-2.4	-1.000000	1	-1.000000	1	-1.000000	1	-1.000000	1
G-ALPHA	PCI/L	0.556	11.000000	1	-3.000000	1	0.600000	1	620.000000	1
G-BETA	PCI/L	0.29	600.000000	1	1300	1	2700	1	2700	1
IRON	MG/L	ND	0.290000	1	3.480000	1	.	.	3.300000	1
LEAD	MG/L	0.05	0.002000	1	0.018000	1	0.020000	1	0.009000	1
LINDANE	MG/L	0.004	-0.000100	1	-0.000100	1	-0.002000	1	-0.002000	1
MANGANESE	MG/L	ND	1.100000	1	0.940000	1	.	.	1.100000	1
MERCURY	MG/L	0.002	-0.000005	1	-0.000005	1	-0.000100	1	-0.000100	1
METHOXY-CHLOR	MG/L	0.1	-0.000020	1	-0.000200	1	-0.000800	1	-0.000800	1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=OHF WELL NUMBER=4

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
NICKEL	MG/L	15	-0.060000	1	-0.060000	1	.	.	.	.
NITRATE-N	MG/L	10	-1.000000	1	-5.000000	1	.	.	.	.
PCB	MG/L	ND	.	.	0.000016	1	.	.	.	.
PH	PH	ND	6.200000	1	6.187500	4	5.500000	1	6.125000	4
PHENOLS	MG/L	ND	-0.001000	1	-0.001000	1	-0.001000	1	-0.001000	1
RADIUM-226	PCI/L	10.185	-0.200000	1	0.010000	1	-0.600000	1	-0.070000	1
SELENIUM	MG/L	0.01	-0.003000	1	-0.001000	1	-0.005000	1	-0.005000	1
SILVER	MG/L	0.05	-0.070000	1	-0.070000	1	-0.000500	1	-0.002000	1
SODIUM	MG/L	ND	17.000000	1	15.100000	1	.	.	19.000000	1
SP.COND.	UMHOS/CM	ND	259.000000	1	161.000000	4	201.000000	1	275.250000	4
STRONTIUM-90	PCI/L	10.3	.	.	420.000000	1	1400	1	1700	1
SULFATE	MG/L	ND	21.000000	1	19.000000	1	15.000000	1	17.000000	1
T. ORG. CARBON	MG/L	ND	2.180000	1	5.725000	4	6.950000	4	2.425000	4
T. ORG. HALOGEN	MG/L	ND	0.049000	1	0.037000	1	0.260500	4	0.069250	4
TEMPERATURE	DEG. C	ND	.	.	.	.	19.400000	1	15.375000	4
TOXAPHENE	MG/L	10.005	-0.002000	1	-0.002000	1	-0.005000	1	-0.005000	1
TRITIUM	PCI/L	1740	.	.	330000	1	110000	1	140000	1
ZINC	MG/L	15	0.320000	1	0.022800	1	.	.	.	.

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=OHF WELL NUMBER=4

			SAMPLING QUARTER							
			1		2		3		4	
PARAMETER	UNITS	LIMIT	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN
2,4-D	MG/L	0.1	-0.005001	1	-0.005001	1	-0.010001	1	-0.010001	1
2,4-5 T	MG/L	0.01	-0.005001	1	-0.005001	1	-0.010001	1	-0.010001	1

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=1

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	IN	2 MEASURED CONCENTRATION MEAN	IN	3 MEASURED CONCENTRATION MEAN	IN	4 MEASURED CONCENTRATION MEAN	IN
ARSENIC	MG/L	0.05	-0.002001	1	-0.001001	1	-0.005001	1	-0.005001	1
BARIUM	MG/L	1	-0.088001	1	0.110001	1	-0.500001	1	0.210001	1
CADMIUM	MG/L	0.01	0.002001	1	-0.002001	1	0.000201	1	-0.002001	1
CESIUM-137	PCI/L	NO	4.885271	1	0.165051	1	.1	.1	.1	.1
CHLORIDE	MG/L	NO	6.000001	1	6.300001	1	5.000001	1	5.800001	1
CHROMIUM	MG/L	0.05	0.021001	1	-0.008001	1	0.002001	1	0.010001	1
COLIFORM	COL/100	1	9.000001	1	0.000001	1	0.000001	1	0.000001	1
COPPER	MG/L	1	0.039001	1	-0.020001	1	.1	.1	.1	.1
DISS. OXYGEN	MG/L	NO	.1	.1	.1	.1	4.200001	1	4.600001	4
ENDRIN	MG/L	0.0002	-0.000101	1	-0.000101	1	-0.000201	1	-0.000201	1
FLUORIDE	MG/L	1.4-2.4	-1.000001	1	-1.000001	1	-1.000001	1	-1.000001	1
G-ALPHA	PCI/L	0.555	2.200001	1	0.790001	1	1.500001	1	1.600001	1
G-BETA	PCI/L	0.29	4.700001	1	1.800001	1	5.400001	1	3.100001	1
IRON	MG/L	NO	0.420001	1	1.400001	1	.1	.1	1.800001	1
LEAD	MG/L	0.05	0.011001	1	0.015001	1	0.010001	1	0.007001	1
LINDANE	MG/L	0.004	.1	.1	-0.000501	2	-0.002001	1	-0.002001	1
MANGANESE	MG/L	NO	1.400001	1	2.700001	1	.1	.1	3.500001	1
MERCURY	MG/L	0.002	0.000401	1	0.000201	1	0.000201	1	-0.000201	1
METHOXY-CHLOR	MG/L	0.1	-0.000201	1	-0.000201	1	-0.000601	1	-0.000801	1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=3510 WELL NUMBER=1

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	IN	2 MEASURED CONCENTRATION MEAN	IN	3 MEASURED CONCENTRATION MEAN	IN	4 MEASURED CONCENTRATION MEAN	IN
NICKEL	MG/L	15	-0.060000	1	-0.060000	1	.	.	.	.
NITRATE-N	MG/L	110	.	.	-5.000000	1	.	.	.	.
PCB	MG/L	IND	.	.	0.000071	1	.	.	.	.
PH	PH	IND	6.700000	1	6.500000	1	6.400000	1	6.450000	4
PHENOLS	MG/L	IND	.	.	-0.001001	1	-0.001001	1	-0.001001	1
RADIUM-226	PCI/L	10.185	-0.010000	1	-0.010001	1	-0.050001	1	-0.020001	1
SELENIUM	MG/L	10.01	-0.005001	1	-0.005001	1	-0.005001	1	-0.005001	1
SILVER	MG/L	10.05	-0.070001	1	-0.070001	1	-0.000501	1	-0.010001	1
SODIUM	MG/L	IND	16.000001	1	25.000001	1	.	.	56.000001	1
SP.COND.	UMHOS/CM	IND	570.000001	1	941.000001	1	305.000001	1	1090.251	4
STRONTIUM-90	PCI/L	10.3	.	.	1.300001	1	2.100001	1	1.900001	1
SULFATE	MG/L	IND	97.000001	1	135.000001	1	85.000001	1	170.000001	1
T. ORG. CARBON	MG/L	IND	2.700001	1	5.862501	8	3.125001	4	4.000001	1
T. ORG. HALOGEN	MG/L	IND	0.062001	1	0.003901	1	0.039411	4	0.047751	4
TEMPERATURE	DEG. C	IND	.	.	.	.	21.300001	1	15.625001	4
TOXAPHENE	MG/L	10.005	-0.002001	1	-0.002001	1	-0.005001	1	-0.005001	1
TRITIUM	PCI/L	1740	.	.	9.000001	1	340.000001	1	340.000001	1
ZINC	MG/L	15	0.110001	1	-0.020001	1	.	.	.	.

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=1

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
2,4-D	MG/L	0.1	-0.005000	1	-0.005000	1	-0.010000	1	-0.010000	1
2,4-5 T	MG/L	0.01	-0.005000	1	-0.005000	1	-0.010000	1	-0.010000	1

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=1A

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 N	2 MEASURED CONCENTRATION MEAN	2 N	3 MEASURED CONCENTRATION MEAN	3 N	4 MEASURED CONCENTRATION MEAN	4 N
ARSENIC	MG/L	0.05	-0.002000	1	-0.001000	1	-0.005000	1	-0.005000	1
BARIUM	MG/L	1	0.083000	1	0.140000	1	-0.500000	1	0.300000	1
CADMIUM	MG/L	0.01	0.001000	1	-0.002000	1	0.000200	1	-0.002000	1
CESIUM-137	PCI/L	IND	0.325680	1	0.000000	1	.	.	.	.
CHLORIDE	MG/L	IND	7.000000	1	7.000000	1	7.000000	1	6.300000	1
CHROMIUM	MG/L	0.05	0.140000	1	0.029000	1	0.005000	1	0.020000	1
COLIFORM	COL/100	1	2.000000	1	0.000000	1	0.000000	1	0.000000	1
COPPER	MG/L	1	-0.020000	1	-0.020000	1	.	.	.	.
DISS. OXYGEN	MG/L	IND	.	.	.	.	5.500000	1	5.500000	4
ENDRIN	MG/L	0.0002	-0.000100	1	-0.000100	1	-0.000200	1	-0.000200	1
FLUORIDE	MG/L	1.4-2.4	-1.000000	1	-1.000000	1	-1.000000	1	-1.000000	1
G-ALPHA	PCI/L	0.555	1.000000	1	1.100000	1	5.700000	1	4.000000	1
G-BETA	PCI/L	0.29	5.600000	1	4.800000	1	13.000000	1	7.500000	1
IRON	MG/L	IND	1.200000	1	3.500000	1	.	.	7.900000	1
LEAD	MG/L	0.05	-0.001000	1	0.007000	1	0.020000	1	0.010000	1
LINDANE	MG/L	0.004	.	.	0.000021	2	-0.002000	1	-0.002000	1
MANGANESE	MG/L	IND	0.250000	1	0.540000	1	.	.	0.430000	1
MERCURY	MG/L	0.002	0.000030	1	0.000100	1	0.000100	1	-0.000200	1
METHOXY-CHLOR	MG/L	0.1	-0.000020	1	-0.000200	1	-0.004000	1	-0.004000	1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=1A

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	IN	2 MEASURED CONCENTRATION MEAN	IN	3 MEASURED CONCENTRATION MEAN	IN	4 MEASURED CONCENTRATION MEAN	IN
NICKEL	MG/L	5	-0.030000	1	-0.060000	1	.	.	.	.
NITRATE-N	MG/L	10	-5.000000	1	-5.000000	1	.	.	.	.
PCB	MG/L	ND	.	.	0.000007	1	.	.	.	.
PH	PH	ND	5.400000	1	6.600000	1	6.400000	1	6.375000	4
PHENOLS	MG/L	ND	.	.	-0.001000	1	-0.001000	1	-0.001000	1
RADIUM-226	BQ/L	0.185	-0.002000	1	-0.100000	1	-0.030000	1	-0.020000	1
SELENIUM	MG/L	0.01	-0.005000	1	-0.005000	1	-0.005000	1	-0.005000	1
SILVER	MG/L	0.05	-0.070000	1	-0.070000	1	-0.000500	1	-0.010000	1
SODIUM	MG/L	ND	13.000000	1	13.000000	1	.	.	12.000000	1
SP.COND.	UMHOS/CM	ND	690.000000	1	805.000000	1	741.000000	1	786.000000	4
STRONTIUM 90	BQ/L	0.5	.	.	2.600000	1	2.900000	1	3.300000	1
SULFATE	MG/L	ND	35.000000	1	36.000000	1	42.000000	1	41.000000	1
T. ORG. CARBON	MG/L	ND	2.250000	1	6.225000	8	3.100000	4	5.000000	1
T. ORG. HALOGEN	MG/L	ND	0.072000	1	0.022000	1	0.040019	4	0.170000	4
TEMPERATURE	DEG. C	ND	.	.	.	.	18.400000	1	13.050000	4
TOXAPHENE	MG/L	0.005	-0.002000	1	-0.002000	1	-0.005000	1	-0.005000	1
TRITIUM	BQ/L	740	.	.	200.000000	1	760.000000	1	460.000000	1
ZINC	MG/L	5	0.095000	1	-0.020000	1	.	.	.	.

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=1A

			SAMPLING QUARTER							
			1		2		3		4	
PARAMETER	UNITS	LIMIT	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN
2,4-D	MG/L	0.1	-0.005000	1	-0.005000	1	-0.010000	1	-0.010000	1
2,4-5 T	MG/L	0.01	-0.005000	1	-0.005000	1	-0.010000	1	-0.010000	1

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=2

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
ARSENIC	MG/L	0.05	-0.002001	1	-0.001001	1	-0.005001	1	-0.005001	1
BARIUM	MG/L	1	0.240001	1	0.430001	1	-0.500001	1	0.530001	1
CADMIUM	MG/L	0.01	0.002001	1	-0.002001	1	-0.000201	1	-0.002001	1
CESIUM-137	BQ/L	ND	0.251671	1	0.000001	1	.1	.1	.1	.1
CHLORIDE	MG/L	ND	33.000001	1	35.000001	1	34.000001	1	40.000001	1
CHROMIUM	MG/L	0.05	1.200001	1	0.015001	1	0.006001	1	0.020001	1
COLIFORM	COL/100	1	1.000001	1	0.000001	1	0.000001	1	0.000001	1
COPPER	MG/L	1	0.025001	1	-0.020001	1	.1	.1	.1	.1
DISS. OXYGEN	MG/L	ND	.1	.1	.1	.1	2.500001	1	3.800001	4
ENDRIN	MG/L	0.0002	-0.000101	1	-0.000101	1	-0.000201	1	-0.000201	1
FLUORIDE	MG/L	1.4-2.4	-1.000001	1	-1.000001	1	-1.000001	1	-1.000001	1
G-ALPHA	BQ/L	0.555	3.900001	1	1.400001	1	18.000001	1	17.000001	1
G-BETA	BQ/L	0.29	54.000001	1	46.000001	1	65.000001	1	62.000001	1
IRON	MG/L	ND	7.200001	1	9.300001	1	.1	.1	10.000001	1
LEAD	MG/L	0.05	0.004001	1	0.022001	1	0.050001	1	0.024001	1
LINDANE	MG/L	0.004	.1	.1	-0.000551	2	-0.002001	1	-0.002001	1
MANGANESE	MG/L	ND	4.500001	1	5.000001	1	.1	.1	5.000001	1
MERCURY	MG/L	0.002	0.000301	1	-0.000101	1	0.000201	1	0.000301	1
METHOXY-CHLOR	MG/L	0.1	-0.001201	1	-0.000201	1	-0.003001	1	-0.003001	1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=2

			SAMPLING QUARTER							
			1		2		3		4	
PARAMETER	UNITS	LIMIT	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN
NICKEL	MG/L	15	1.000001	1	-0.060001	1	.	.	.	.
NITRATE-N	MG/L	110	-2.000001	1	-5.000001	1	.	.	.	.
PCB	MG/L	IND	.	.	0.000101	1	.	.	.	.
PH	PH	IND	6.200001	1	7.100001	1	6.500001	1	6.800001	4
PHENOLS	MG/L	IND	-0.002001	1	-0.001001	1	-0.001001	1	-0.001001	1
RADIUM-226	PCI/L	10.185	-0.020001	1	-0.070001	1	-0.013001	1	-0.050001	1
SELENIUM	MG/L	10.01	-0.005001	1	-0.005001	1	-0.005001	1	-0.005001	1
SILVER	MG/L	10.05	-0.070001	1	-0.070001	1	-0.000501	1	-0.010001	1
SODIUM	MG/L	IND	37.000001	1	35.000001	1	.	.	38.000001	1
SP.COND.	UMHOS/CM	IND	442.000001	1	678.000001	1	654.000001	1	679.500001	4
STRONTIUM-90	PCI/L	10.3	.	.	26.000001	1	33.000001	1	32.000001	1
SULFATE	MG/L	IND	21.000001	1	22.000001	1	18.000001	1	20.000001	1
T. ORG. CARBON	MG/L	IND	1.460001	1	4.337501	8	1.600001	4	8.000001	1
T. ORG. HALOGEN	MG/L	IND	0.055001	1	0.022001	1	0.103801	4	0.045501	4
TEMPERATURE	DEG. C	IND	.	.	.	.	21.700001	1	15.875001	4
TOXAPHENE	MG/L	10.005	-0.002001	1	-0.002001	1	-0.005001	1	-0.005001	1
TRITIUM	PCI/L	1740	.	.	36001	1	35001	1	29001	1
ZINC	MG/L	15	0.110001	1	0.037001	1	.	.	.	.

(CONTINUED)

TABLE 4-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=2

			SAMPLING QUARTER							
			1		2		3		4	
			MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION	
PARAMETER	UNITS	LIMIT	MEAN	IN	MEAN	IN	MEAN	IN	MEAN	IN
2,4-D	MG/L	0.1	-0.00500	1	-0.00500	1	-0.01000	1	-0.01000	1
2,4-5 T	MG/L	0.01	-0.00500	1	-0.00500	1	-0.01000	1	-0.01000	1

TABLE 4-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=3

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	IN	SAMPLING QUARTER 2 MEASURED CONCENTRATION MEAN	IN	SAMPLING QUARTER 3 MEASURED CONCENTRATION MEAN	IN	SAMPLING QUARTER 4 MEASURED CONCENTRATION MEAN	IN
ARSENIC	MG/L	0.05	0.004000	1	-0.001000	1	0.005000	1	0.011000	1
BARIUM	MG/L	1	0.140000	1	0.520000	1	-0.500000	1	0.350000	1
CADMIUM	MG/L	0.01	0.001000	1	-0.000300	1	0.000400	1	-0.002000	1
CESIUM-137	BQ/L	IND	0.560888	2	0.000000	1	.	.	.	.
CHLORIDE	MG/L	IND	10.000000	1	15.000000	1	13.000000	1	13.000000	1
CHROMIUM	MG/L	0.05	0.073000	1	0.034000	1	0.018000	1	0.019000	1
COLIFORM	COL/100	1	2.000000	1	0.000000	1	4.000000	2	120.000000	1
COPPER	MG/L	1	0.022000	1	0.059000	1	.	.	.	.
DISS. OXYGEN	MG/L	IND	.	.	.	.	3.800000	1	4.825000	4
ENDRIN	MG/L	0.0002	-0.000010	1	-0.000010	1	-0.000020	1	-0.000020	1
FLUORIDE	MG/L	1.4-2.4	-1.000000	1	-1.000000	1	-1.000000	1	-1.000000	1
G-ALPHA	BQ/L	0.555	0.200000	1	0.300000	1	1.900000	1	1.500000	1
G-BETA	BQ/L	0.29	3.600000	1	1.400000	1	3.700000	1	2.100000	1
IRON	MG/L	IND	15.000000	1	72.000000	1	.	.	65.000000	1
LEAD	MG/L	0.05	0.011000	1	1.400000	1	0.060000	1	0.083000	1
LINDANE	MG/L	0.004	.	.	0.000000	2	-0.000200	1	-0.002000	1
MANGANESE	MG/L	IND	3.100000	1	4.100000	1	.	.	4.100000	1
MERCURY	MG/L	0.002	0.000010	1	-0.000010	1	-0.000010	1	-0.000020	1
METHOXY-CHLOR	MG/L	0.1	-0.000020	1	-0.000020	1	-0.008000	1	-0.008000	1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=3

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
NICKEL	MG/L	15	0.27000	1	-0.06000	1	.1	.1	.1	.1
NITRATE-N	MG/L	10	-2.00000	1	-5.00000	1	.1	.1	.1	.1
PCB	MG/L	IND	.1	.1	0.00009	1	.1	.1	.1	.1
PH	PH	IND	6.40000	1	.1	.1	6.30000	1	6.22500	4
PHENOLS	MG/L	IND	-0.00200	1	-0.00100	1	-0.00100	1	-0.00100	1
RADIUM-226	BQ/L	10.185	-0.02000	1	0.14000	1	-0.08000	1	-0.10000	1
SELENIUM	MG/L	10.01	-0.00500	1	-0.00500	1	-0.00500	1	-0.00500	1
SILVER	MG/L	10.05	-0.07000	1	-0.07000	1	-0.00050	1	-0.01000	1
SODIUM	MG/L	IND	25.00000	1	27.00000	1	.1	.1	28.00000	1
SP.COND.	UMHOS/CM	IND	460.00000	1	.1	.1	365.00000	1	702.75000	4
STRONTIUM-90	BQ/L	10.3	.1	.1	0.40000	1	0.64000	1	1.40000	1
SULFATE	MG/L	IND	-5.00000	1	-5.00000	1	-5.00000	1	8.50000	1
T. ORG. CARBON	MG/L	IND	3.71000	1	7.25000	8	3.62500	4	22.00000	1
T. ORG. HALOGEN	MG/L	IND	0.06000	1	0.03200	1	0.27925	4	0.17750	4
TEMPERATURE	DEG. C	IND	.1	.1	.1	.1	21.10000	1	16.92500	4
TOXAPHENE	MG/L	10.005	-0.00200	1	-0.00200	1	-0.00500	1	-0.00500	1
TRITIUM	BQ/L	1740	.1	.1	2300	1	2600	1	2400	1
ZINC	MG/L	15	0.16000	1	0.43000	1	.1	.1	.1	.1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=3

			SAMPLING QUARTER							
			1		2		3		4	
PARAMETER	UNITS	LIMIT	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N
2,4-D	MG/L	0.1	-0.005000	1	-0.005000	1	-0.010000	1	-0.010000	1
2,4-5 T	MG/L	0.01	-0.005000	1	-0.005000	1	-0.010000	1	-0.010000	1

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=4

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
ARSENIC	MG/L	0.05	-0.00200	1	0.00100	1	-0.00500	1	0.00600	1
BARIUM	MG/L	1	0.05900	1	0.09400	1	-0.50000	1	0.36000	1
CADMIUM	MG/L	0.01	0.00200	1	-0.00200	1	0.00020	1	-0.00200	1
CESIUM-137	BQ/L	ND	0.52184	2	0.00000	1	0.79201	2	.	.
CHLORIDE	MG/L	ND	9.00000	1	6.00000	1	6.00000	1	5.30000	1
CHROMIUM	MG/L	0.05	0.69000	1	0.02000	1	0.00700	1	0.03000	1
COLIFORM	COL/100	1	0.00000	1	0.00000	1	0.00000	1	0.00000	1
COPPER	MG/L	1	-0.02000	1	-0.02000	1	.	.	.	.
DISS. OXYGEN	MG/L	ND	.	.	.	.	4.70000	1	5.55000	4
ENDRIN	MG/L	0.0002	-0.00010	1	-0.00010	1	-0.00020	1	-0.00020	1
FLUORIDE	MG/L	1.4-2.4	-1.00000	1	-1.00000	1	-1.00000	1	-1.00000	1
G-ALPHA	BQ/L	0.555	-3.00000	1	0.03000	1	4.10000	1	4.50000	1
G-BETA	BQ/L	0.29	8.50000	1	7.00000	1	15.00000	1	19.00000	1
IRON	MG/L	ND	5.60000	1	9.60000	1	.	.	20.00000	1
LEAD	MG/L	0.05	0.00300	1	0.02400	1	0.04000	1	0.02400	1
LINDANE	MG/L	0.004	.	.	0.00000	2	-0.00200	1	-0.00200	1
MANGANESE	MG/L	ND	3.00000	1	2.70000	1	.	.	3.80000	1
MERCURY	MG/L	0.002	0.00050	1	-0.00010	1	0.00010	1	-0.00020	1
METHOXY-CHLOR	MG/L	0.1	-0.00020	1	-0.00020	1	-0.00800	1	-0.00800	1

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=4

PARAMETER	UNITS	LIMIT	SAMPLING QUARTER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
NICKEL	MG/L	15	0.690000	1	-0.060000	1	.	.	.	.
NITRATE-N	MG/L	110	-2.000000	1	-5.000000	1	.	.	.	.
PCB	MG/L	IND	.	.	0.000009	1	.	.	.	.
PH	PH	IND	6.400000	1	.	.	6.300000	1	6.200000	4
PHENOLS	MG/L	IND	-0.002000	1	0.007000	1	-0.001000	1	-0.001000	1
RADIUM-226	BQ/L	10.185	0.000300	1	-0.020000	1	-0.010000	1	-0.200000	1
SELENIUM	MG/L	10.01	-0.005000	1	-0.005000	1	-0.005000	1	-0.005000	1
SILVER	MG/L	10.05	-0.070000	1	-0.070000	1	-0.000500	1	-0.010000	1
SODIUM	MG/L	IND	31.000000	1	26.000000	1	.	.	30.000000	1
SP.COND.	UMHOS/CM	IND	500.000000	1	.	.	454.000000	1	831.000000	4
STRONTIUM-90	BQ/L	10.3	.	.	5.400000	1	7.300000	1	6.500000	1
SULFATE	MG/L	IND	11.000000	1	13.000000	1	13.000000	1	14.000000	1
T. ORG. CARBON	MG/L	IND	2.850000	1	7.612500	8	6.675000	4	10.000000	1
T. ORG. HALOGEN	MG/L	IND	0.098000	1	0.042000	1	0.335000	4	0.053500	4
TEMPERATURE	DEG. C	IND	.	.	.	.	20.800000	1	18.100000	4
TOXAPHENE	MG/L	10.005	-0.002000	1	-0.002000	1	-0.005000	1	-0.005000	1
TRITIUM	BQ/L	1740	.	.	2200	1	200000	1	3600	1
ZINC	MG/L	15	0.150000	1	0.037000	1	.	.	.	.

(CONTINUED)

TABLE A-1. CONCENTRATIONS OF GROUNDWATER QUALITY PARAMETERS
OVER FOUR QUARTERS OF SAMPLING
SITE=3513 WELL NUMBER=4

			SAMPLING QUARTER							
			1		2		3		4	
			MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION		MEASURED CONCENTRATION	
PARAMETER	UNITS	LIMIT	MEAN	IN	MEAN	IN	MEAN	IN	MEAN	IN
2,4-D	MG/L	0.1	-0.009000	1	-0.005000	1	-0.010000	1	-0.010000	1
2,4-5 T	MG/L	0.01	-0.010000	1	-0.005000	1	-0.010000	1	-0.010000	1

TABLE A-2. COMPARISON BETWEEN MONITORING WELLS OF CONCENTRATIONS OF WATER QUALITY PARAMETERS
SITE=HRE

PARAMETER	UNITS	LIMIT	WELL NUMBER 1 MEASURED CONCENTRATION MEAN	1 IN	WELL NUMBER 2 MEASURED CONCENTRATION MEAN	2 IN	WELL NUMBER 3 MEASURED CONCENTRATION MEAN	3 IN	WELL NUMBER 4 MEASURED CONCENTRATION MEAN	4 IN
ARSENIC	MG/L	0.05	0.002750	4	0.003750	4	0.006250	4	0.003250	4
BARIUM	MG/L	1	0.300750	4	0.528250	4	0.651250	4	1.048500	4
CADMIUM	MG/L	0.01	0.000600	4	0.000600	4	0.001220	4	0.001220	4
CESIUM-137	BQ/L	ND	0.131380	2	1.039970	2	0.179500	2	0.227610	2
CHLORIDE	MG/L	ND	5.475000	4	7.200000	4	4.600000	4	4.600000	4
CHROMIUM	MG/L	0.05	0.065250	4	0.026250	4	0.025550	4	0.041520	4
COLIFORM	COL/100	1	3.000000	4	8.000000	4	0.500000	4	1.500000	4
COPPER	MG/L	1	0.020000	2	0.020000	2	0.020000	2	0.076000	2
DISS. OXYGEN	MG/L	ND	4.200000	8	3.562500	8	5.587500	8	4.212500	8
ENDRIN	MG/L	0.0002	0.000150	4	0.000320	4	0.000150	4	0.000150	4
FLUORIDE	MG/L	1.4-2.4	1.000250	4	1.000000	4	1.000000	4	1.000000	4
G-ALPHA	PCI/L	0.555	3.952000	5	52.925000	4	0.675000	4	8.066670	3
G-BETA	PCI/L	0.29	3.900000	4	830.000000	4	7.450000	4	309.000000	4
IRON	MG/L	ND	1.916670	3	9.460000	3	30.680000	3	31.000000	3
LEAD	MG/L	0.05	0.021500	4	0.017250	4	0.027000	4	0.017000	4
LINDANE	MG/L	0.004	0.001370	3	0.001370	3	0.001370	3	0.001370	3
MANGANESE	MG/L	ND	0.132000	3	2.539670	3	2.740000	3	8.176670	3
MERCURY	MG/L	0.002	0.000100	4	0.000100	4	0.000100	4	0.000070	4
METHOXY-CHLOR	MG/L	0.1	0.004230	4	0.004750	4	0.004120	4	0.004850	4

(CONTINUED)

TABLE A-2. COMPARISON BETWEEN MONITORING WELLS OF CONCENTRATIONS OF WATER QUALITY PARAMETERS
SITE=HRE

			WELL NUMBER							
			1		2		3		4	
PARAMETER	UNITS	LIMIT	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN
NICKEL	MG/L	15	0.06000	2	0.06000	2	0.06400	2	0.21000	2
NITRATE-N	MG/L	10	12.50000	2	3.00000	2	3.00000	2	1.50000	2
PCB	MG/L	ND	0.00009	1	0.00015	1	0.00011	1	0.00009	1
PH	PH	ND	6.74615	13	6.57692	13	6.56923	13	6.86923	13
PHENOLS	MG/L	ND	0.00176	4	0.00100	4	0.00100	4	0.00150	4
RADIUM-226	BQ/L	0.185	0.00625	4	0.09750	4	0.02150	4	0.03900	4
SELENIUM	MG/L	0.01	0.00325	4	0.00325	4	0.00325	4	0.00325	4
SILVER	MG/L	0.05	0.03537	4	0.03537	4	0.03537	4	0.12297	4
SODIUM	MG/L	ND	6.30000	2	11.85000	2	24.85000	2	5.82500	2
SP.COND.	UMHOS/CM	ND	504.30769	13	572.61538	13	595.92308	13	588.92308	13
STRONTIUM-90	BQ/L	0.3	0.17333	3	370.00000	3	0.53333	3	27.52667	3
SULFATE	MG/L	ND	46.00000	4	56.75000	4	41.50000	4	34.75000	4
T. ORG. CARBON	MG/L	ND	4.37538	13	3.66000	13	3.99923	13	3.40846	13
T. ORG. HALOGEN	MG/L	ND	0.09890	10	0.08410	10	0.05650	10	0.03960	10
TEMPERATURE	DEG. C	ND	17.81250	8	17.26250	8	16.01250	8	16.90000	8
TOXAPHENE	MG/L	0.005	0.00350	4	0.00375	4	0.00430	4	0.00350	4
TRITIUM	BQ/L	740	12.00000	3	172.00000	3	386.66667	3	24.00000	3
ZINC	MG/L	15	0.02000	2	0.03600	2	0.07500	2	0.11155	2

(CONTINUED)

TABLE A-2. COMPARISON BETWEEN MONITORING WELLS OF CONCENTRATIONS OF WATER QUALITY PARAMETERS
SITE=HRE

			WELL NUMBER							
			1		2		3		4	
PARAMETER	UNITS	LIMIT	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N
2,4-D	MG/L	0.1	0.00750	4	0.00750	4	0.00750	4	0.00750	4
2,4-D T	MG/L	0.01	0.00750	4	0.00750	4	0.00750	4	0.00750	4

TABLE A-2. COMPARISON BETWEEN MONITORING WELLS OF CONCENTRATIONS OF WATER QUALITY PARAMETERS
SITE=CHF

PARAMETER	UNITS	LIMIT	WELL NUMBER 1 MEASURED CONCENTRATION MEAN	IN	WELL NUMBER 2 MEASURED CONCENTRATION MEAN	IN	WELL NUMBER 3 MEASURED CONCENTRATION MEAN	IN	WELL NUMBER 4 MEASURED CONCENTRATION MEAN	IN
ARSENIC	MG/L	0.05	0.00280	5	0.00325	4	0.00350	4	0.00325	4
BARIUM	MG/L	1	0.45220	5	0.54325	4	0.74500	4	0.42275	4
CADMIUM	MG/L	0.01	0.00114	5	0.00092	4	0.00417	4	0.00092	4
CESIUM-137	BQ/L	ND	1.18924	3	0.99926	1	0.82161	2	2.95152	2
CHLORIDE	MG/L	ND	12.20000	5	13.75000	4	25.00000	4	13.75000	4
CHROMIUM	MG/L	0.05	0.02660	5	0.02960	4	0.04367	4	0.01950	4
COLIFORM	COL/100	1	5.20000	5	2.50000	4	12.02500	4	4.52500	4
COPPER	MG/L	1	0.02000	3	0.02000	2	0.03835	2	0.02000	2
DISS. OXYGEN	MG/L	ND	5.87500	8	7.07143	7	7.75000	8	7.34000	5
ENDRIN	MG/L	0.0002	0.00014	5	0.00015	4	0.00015	4	0.00017	3
FLUORIDE	MG/L	1.4-2.4	1.00000	5	1.00000	4	1.00000	4	1.00000	4
G-ALPHA	BQ/L	0.555	1.23200	5	1.40250	4	13.81500	4	153.65000	4
G-BETA	BQ/L	0.29	4.82000	5	2.37500	4	294.50000	4	1825	4
IRON	MG/L	ND	2.74175	4	10.60000	3	37.03333	3	2.35667	3
LEAD	MG/L	0.05	0.01980	5	0.04425	4	0.06950	4	0.01225	4
LINDANE	MG/L	0.004	0.00086	5	0.00105	4	0.00105	4	0.00105	4
MANGANESE	MG/L	ND	0.19310	4	1.48767	3	5.11667	3	1.04667	3
MERCURY	MG/L	0.002	0.00007	5	0.00007	4	0.00008	4	0.00007	4
METHOXY-CHLOR	MG/L	0.1	0.00332	5	0.00410	4	0.00410	4	0.00410	4

(CONTINUED)

TABLE A-2. COMPARISON BETWEEN MONITORING WELLS OF CONCENTRATIONS OF WATER QUALITY PARAMETERS
SITE=CHF

PARAMETER	UNITS	LIMIT	WELL NUMBER 1 MEASURED CONCENTRATION MEAN	1 IN	2 MEASURED CONCENTRATION MEAN	2 IN	3 MEASURED CONCENTRATION MEAN	3 IN	4 MEASURED CONCENTRATION MEAN	4 IN
NICKEL	MG/L	15	0.060001	3	0.060001	2	0.066751	2	0.060001	2
NITRATE-N	MG/L	110	2.666671	3	5.000001	2	3.500001	2	3.000001	2
PCB	MG/L	IND	0.000121	1	0.000111	1	0.000101	1	0.000161	1
PH	PH	IND	6.473851	13	6.453851	13	6.434621	13	6.095001	10
PHENOLS	MG/L	IND	0.001201	5	0.001251	4	0.001251	4	0.001001	4
RADIUM-226	BQ/L	10.185	0.111001	5	0.089501	4	0.251751	4	0.220001	4
SELENIUM	MG/L	10.01	0.003801	5	0.004001	4	0.003501	4	0.003501	4
SILVER	MG/L	10.05	0.042501	5	0.035621	4	0.035621	4	0.035621	4
SODIUM	MG/L	IND	12.566671	3	15.933331	3	39.433331	3	17.033331	3
SP.COND.	UMHOS/CM	IND	708.769231	13	633.307691	13	435.538461	13	220.500001	10
STRONTIUM-90	BQ/L	10.3	1.933331	3	0.293331	3	203.333331	3	1173.331	3
SULFATE	MG/L	IND	20.400001	5	12.250001	4	18.000001	4	18.000001	4
T. ORG. CARBON	MG/L	IND	4.478571	14	5.010001	13	6.323851	13	5.429231	13
T. ORG. HALOGEN	MG/L	IND	0.113641	11	0.113801	10	0.139601	10	0.140501	10
TEMPERATURE	DEG. C	IND	16.175001	8	15.425001	9	16.625001	8	16.180001	5
TOXAPHENE	MG/L	10.005	0.003201	5	0.003501	4	0.003501	4	0.003501	4
TRITIUM	BQ/L	1740	91333.31	3	1293331	3	91666.71	3	19333.31	3
ZINC	MG/L	15	0.062701	3	0.115001	2	0.156501	2	0.171401	2

(CONTINUED)

TABLE A-2. COMPARISON BETWEEN MONITORING WELLS OF CONCENTRATIONS OF WATER QUALITY PARAMETERS
SITE=OHF

			WELL NUMBER							
			1		2		3		4	
PARAMETER	UNITS	LIMIT	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N	MEASURED CONCENTRATION MEAN	N
2,4-D	MG/L	0.1	0.00700	5	0.00750	4	0.00750	4	0.00750	4
2,4-5 T	MG/L	0.01	0.00700	5	0.00750	4	0.00750	4	0.00750	4

TABLE A-2. COMPARISON BETWEEN MONITORING WELLS OF CONCENTRATIONS OF WATER QUALITY PARAMETERS SITE=3513

PARAMETER	UNITS	LIMIT	WELL NUMBER 1 MEASURED CONCENTRATION MEAN	IN	1A MEASURED CONCENTRATION MEAN	IN	2 MEASURED CONCENTRATION MEAN	IN	3 MEASURED CONCENTRATION MEAN	IN	4 MEASURED CONCENTRATION MEAN	IN
ARSENIC	MG/L	0.05	0.003250	4	0.003250	4	0.003250	4	0.005250	4	0.003500	4
BARIUM	MG/L	1	0.227000	4	0.255750	4	0.425000	4	0.377500	4	0.253250	4
CADMIUM	MG/L	0.01	0.001550	4	0.001300	4	0.001550	4	0.001350	4	0.001550	4
CESIUM-137	PCI/L	IND	2.535160	2	0.182840	2	0.125830	2	0.339250	3	0.525540	5
CHLORIDE	MG/L	IND	5.900000	4	6.825000	4	35.500000	4	12.250000	4	6.575000	4
CHROMIUM	MG/L	0.05	0.010250	4	0.048500	4	0.310500	4	0.036000	4	0.186750	4
COLIFORM	COL/100	1	2.000000	4	0.500000	4	0.250000	4	26.000000	5	0.000000	4
COPPER	MG/L	1	0.023500	2	0.020000	2	0.022500	2	0.040500	2	0.020000	2
DISS. OXYGEN	MG/L	IND 1	4.520000	5	5.500000	5	3.540000	5	4.620000	5	5.380000	5
ENDRIN	MG/L	0.0002	0.000150	4	0.000150	4	0.000150	4	0.000150	4	0.000150	4
FLUORIDE	MG/L	1.4-2.4	1.000000	4	1.000000	4	1.000000	4	1.000000	4	1.000000	4
G-ALPHA	PCI/L	0.565	1.597500	4	2.950000	4	10.075000	4	0.975000	4	2.907500	4
G-BETA	PCI/L	0.29	3.750000	4	7.975000	4	56.500000	4	2.700000	4	12.375000	4
IRON	MG/L	IND	1.206670	3	4.200000	3	8.833330	3	50.666670	3	11.733330	3
LEAD	MG/L	0.05	0.010750	4	0.009500	4	0.025000	4	0.388500	4	0.022750	4
LINDANE	MG/L	0.004	0.001270	4	0.001060	4	0.001270	4	0.001050	4	0.001060	4
MANGANESE	MG/L	IND	2.533330	3	0.406670	3	4.833330	3	3.756670	3	3.166670	3
MERCURY	MG/L	0.002	0.000250	4	0.000170	4	0.000220	4	0.000120	4	0.000220	4
METHOXY-CHLOR	MG/L	0.1	0.004100	4	0.004100	4	0.004100	4	0.004100	4	0.004100	4

(CONTINUED)

TABLE A-2. COMPARISON BETWEEN MONITORING WELLS OF CONCENTRATIONS OF WATER QUALITY PARAMETERS
SITE=3513

			WELL NUMBER									
			1		1A		2		3		4	
PARAMETER	UNITS	LIMIT	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN	MEASURED CONCENTRATION MEAN	IN
NICKEL	MG/L	15	0.060001	2	0.060001	2	0.530001	2	0.165001	2	0.375001	2
NITRATE-N	MG/L	110	5.000001	1	5.000001	2	3.500001	2	3.500001	2	3.500001	2
PCB	MG/L	IND	0.000071	1	0.000071	1	0.000101	1	0.000091	1	0.000091	1
PH	PH	IND	6.485711	7	6.414291	7	6.714291	7	6.266671	6	6.250001	6
PHENOLS	MG/L	IND	0.001001	3	0.001001	3	0.001251	4	0.001251	4	0.002751	4
RADIUM-226	BQ/L	0.185	0.022501	4	0.038001	4	0.038251	4	0.085001	4	0.059501	4
SELENIUM	MG/L	10.01	0.005001	4	0.005001	4	0.005001	4	0.005001	4	0.005001	4
SILVER	MG/L	10.05	0.037621	4	0.037621	4	0.037621	4	0.037621	4	0.037621	4
SODIUM	MG/L	IND	33.000001	3	12.666671	3	35.666671	3	26.666671	3	29.000001	3
SP.COND.	UMHOS/CM	IND	882.428571	7	754.285711	7	641.714291	7	606.000001	6	713.000001	6
STRONTIUM-90	BQ/L	10.3	1.766671	3	2.933331	3	30.333331	3	0.813331	3	6.400001	3
SULFATE	MG/L	IND	121.750001	4	38.500001	4	20.250001	4	5.375001	4	12.750001	4
T. ORG. CARBON	MG/L	IND	4.721431	14	4.960711	14	3.611431	14	7.072141	14	7.175001	14
T. ORG. HALOGEN	MG/L	IND	0.041451	10	0.093471	10	0.067421	10	0.191901	10	0.167601	10
TEMPERATURE	DEG. C	IND	16.760001	5	14.120001	5	17.040001	5	17.760001	5	18.640001	5
TOXAPHENE	MG/L	10.005	0.003501	4	0.003501	4	0.003501	4	0.003501	4	0.003501	4
TRITIUM	BQ/L	740	229.666671	3	473.333331	3	3333.331	3	25001	3	86001	3
ZINC	MG/L	15	0.065001	2	0.059001	2	0.073501	2	0.295001	2	0.093501	2

(CONTINUED)

TABLE A-2. COMPARISON BETWEEN MONITORING WELLS OF CONCENTRATIONS OF WATER QUALITY PARAMETERS
SITE=3513

PARAMETER	UNITS	LIMIT	WELL NUMBER 2 MEASURED CONCENTRATION MEAN	IN	1A MEASURED CONCENTRATION MEAN	IN	2 MEASURED CONCENTRATION MEAN	IN	3 MEASURED CONCENTRATION MEAN	IN	4 MEASURED CONCENTRATION MEAN	IN
2,4-D	MG/L	10.1	0.007500	4	0.007500	4	0.007500	4	0.007500	4	0.008500	4
2,4-5 T	MG/L	10.0	0.007500	4	0.007500	4	0.007500	4	0.007500	4	0.008750	4

TABLE A-3. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (ALL MEASUREMENTS) SITE=HRE

PARAMETER	UNITS	LIMIT	WELL LOCATION: DOWN-GRADIENT MEASURED CONCENTRATION MEAN	DOWN-GRADIENT MEASURED CONCENTRATION MIN	DOWN-GRADIENT MEASURED CONCENTRATION MAX	DOWN-GRADIENT IN	UP-GRADIENT MEASURED CONCENTRATION MEAN	UP-GRADIENT MEASURED CONCENTRATION MIN	UP-GRADIENT MEASURED CONCENTRATION MAX	UP-GRADIENT IN
ARSENIC	MG/L	0.05	0.00442	0.00100	0.01600	12	0.00275	0.00100	0.00500	4
BARIUM	MG/L	1	0.74267	0.10500	2.70000	12	0.30075	0.08300	0.50000	4
CADMIUM	MG/L	0.01	0.00102	0.00020	0.00350	12	0.00060	0.00020	0.00100	4
CESIUM-137	BQ/L	ND	0.48236	0.00000	2.07994	6	0.13138	0.00000	0.26277	2
CHLORIDE	MG/L	ND	5.46667	3.40000	13.00000	12	8.47500	7.00000	12.00000	4
CHROMIUM	MG/L	0.05	0.03111	0.00400	0.05910	12	0.05525	0.00200	0.20000	4
COLIFORM	COL/100	1	3.33333	0.00000	30.00000	12	3.00000	0.00000	8.00000	4
COPPER	MG/L	1	0.03867	0.02000	0.12000	6	0.02000	0.02000	0.02000	2
DISS. OXYGEN	MG/L	ND	4.45417	2.70000	9.40000	24	4.20000	3.50000	6.20000	8
ENDRIN	MG/L	0.0002	0.00021	0.00010	0.00080	12	0.00015	0.00010	0.00020	4
FLUORIDE	MG/L	1.4-2.4	1.00000	1.00000	1.00000	12	1.00025	1.00000	1.00100	4
G-ALPHA	BQ/L	0.555	21.69091	0.10000	200.00000	11	3.95200	0.06000	15.00000	5
G-BETA	BQ/L	1.85	382.15000	0.70000	950.00000	12	3.90000	0.80000	10.00000	4
IRON	MG/L	ND	23.71333	1.50000	93.00000	9	1.91667	0.48000	4.59000	3
LEAD	MG/L	0.05	0.02042	0.00100	0.09000	12	0.02150	0.00100	0.07000	4
LINDANE	MG/L	0.004	0.00137	0.00010	0.00200	9	0.00137	0.00010	0.00200	3
MANGANESE	MG/L	ND	4.50544	0.18000	22.00000	9	0.13200	0.04600	0.19800	3
MERCURY	MG/L	0.002	0.00009	0.00005	0.00020	12	0.00010	0.00005	0.00020	4
METHOXY-CHLOR	MG/L	0.1	0.00457	0.00020	0.00800	12	0.00425	0.00020	0.00800	4

(CONTINUED)

TABLE A-3. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (ALL MEASUREMENTS) SITE=HRE

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRATION				MEASURED CONCENTRATION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	N	MEAN	MIN	MAX	N
NICKEL	MG/L	15	0.111331	0.060001	0.360001	6	0.060001	0.060001	0.060001	2
NITRATE-N	MG/L	10	2.500001	1.000001	5.000001	6	12.500001	1.000001	24.000001	2
PCB	MG/L	ND	0.000121	0.000091	0.000151	3	0.000091	0.000091	0.000091	1
PH	PH	ND	6.706131	6.400001	8.100001	39	6.746151	6.500001	7.000001	13
PHENOLS	MG/L	ND	0.001171	0.001001	0.002001	12	0.001751	0.001001	0.004001	4
RADIUM-226	PCI/L	0.185	0.052671	0.001001	0.330001	12	0.006251	0.002001	0.010001	4
SELENIUM	MG/L	0.01	0.003251	0.001001	0.005001	12	0.003251	0.001001	0.005001	4
SILVER	MG/L	0.05	0.064541	0.000501	0.420001	12	0.035371	0.000501	0.070001	4
SODIUM	MG/L	ND	14.175001	5.650001	28.000001	6	6.300001	5.800001	6.800001	2
SP.COND.	UMHOS/CM	ND	585.820511	241.000001	747.000001	39	504.307691	185.000001	636.000001	13
STRONTIUM90	PCI/L	0.3	132.686671	0.120001	540.000001	9	0.173331	0.120001	0.260001	3
SULFATE	MG/L	ND	44.333331	31.000001	75.000001	12	46.000001	42.000001	54.000001	4
T. ORG. CARBON	MG/L	ND	3.689231	0.760001	8.400001	39	4.975381	0.630001	8.400001	13
T. ORG. HALOGEN	MG/L	ND	0.060731	0.006001	0.410001	30	0.098901	0.014001	0.540001	10
TEMPERATURE	DEG. C	ND	16.725001	15.000001	18.600001	24	17.812501	17.000001	18.800001	8
TOXAPHENE	MG/L	0.005	0.003851	0.002001	0.005201	12	0.003501	0.002001	0.005001	4
TRITIUM	PCI/L	740	194.222221	10.000001	430.000001	9	12.000001	3.000001	20.000001	3
ZINC	MG/L	15	0.074181	0.020001	0.140001	6	0.020001	0.020001	0.020001	2

(CONTINUED)

TABLE A-3. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (ALL MEASUREMENTS)
SITE=HRE

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRATION				MEASURED CONCENTRATION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	N	MEAN	MIN	MAX	N
2,4-D	MG/L	0.1	0.00750	0.00500	0.01000	12	0.00750	0.00500	0.01000	4
2,4-5 T	MG/L	0.01	0.00750	0.00500	0.01000	12	0.00750	0.00500	0.01000	4

TABLE A-2. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (ALL MEASUREMENTS) SITE=ORF

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRA-TION				MEASURED CONCENTRA-TION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	IN	MEAN	MIN	MAX	IN
ARSENIC	MG/L	0.05	0.00333	0.00100	0.00500	12	0.00280	0.00100	0.00500	5
BARIUM	MG/L	1	0.57033	0.06600	1.09000	12	0.45220	0.25000	1.00000	5
CADMIUM	MG/L	0.01	0.00201	0.00020	0.01000	12	0.00114	0.00020	0.00300	5
CESIUM-137	PCI/L	ND	1.70910	0.71739	3.62694	5	1.18924	0.72169	2.06884	3
CHLORIDE	MG/L	ND	19.16667	8.00000	40.00000	12	12.20000	12.00000	13.00000	5
CHROMIUM	MG/L	0.05	0.03099	0.00300	0.07970	12	0.02660	0.00600	0.06000	5
COLIFORM	COL/100	1	6.35000	0.00000	49.00000	12	5.20000	0.00000	16.00000	5
COPPER	MG/L	1	0.02612	0.02000	0.05670	6	0.02000	0.02000	0.02000	3
DISS. OXYGEN	MG/L	ND	7.41000	4.30000	12.00000	20	6.87500	5.20000	10.30000	8
ENDRIN	MG/L	0.0002	0.00015	0.00010	0.00020	11	0.00014	0.00010	0.00020	5
FLUORIDE	MG/L	1.4-2.4	1.00000	1.00000	1.00000	12	1.00000	1.00000	1.00000	5
G-ALPHA	PCI/L	15	57.95583	0.31000	620.00000	12	1.23200	0.40000	2.90000	5
G-BETA	PCI/L	50	707.29167	1.70000	2700	12	4.62000	3.50000	6.60000	5
IRON	MG/L	ND	16.65333	0.29000	57.90000	9	2.74175	0.58700	6.60000	4
LEAD	MG/L	0.05	0.04200	0.00200	0.10000	12	0.01080	0.00100	0.03000	5
LINDANE	MG/L	0.004	0.00105	0.00010	0.00200	12	0.00086	0.00010	0.00200	5
MANGANESE	MG/L	ND	2.88367	0.56300	8.85000	9	0.13910	0.03340	0.29300	4
MERCURY	MG/L	0.002	0.00008	0.00005	0.00010	12	0.00007	0.00005	0.00010	5
METHOXY-CHLOR	MG/L	0.1	0.00410	0.00020	0.00800	12	0.00332	0.00020	0.00800	5

(CONTINUED)

TABLE A-3. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (ALL MEASUREMENTS) SITE=CHF

PARAMETER	UNITS	LIMIT	WELL LOCATION: DOWN-GRADIENT MEASURED CONCENTRATION MEAN	DOWN-GRADIENT MIN	DOWN-GRADIENT MAX	DOWN-GRADIENT N	UP-GRADIENT MEASURED CONCENTRATION MEAN	UP-GRADIENT MIN	UP-GRADIENT MAX	UP-GRADIENT N
NICKEL	MG/L	.5	0.062250	0.050000	0.073500	6	0.060000	0.060000	0.060000	3
NITRATE-N	MG/L	10	3.833333	1.000000	8.000000	6	2.666667	1.000000	6.000000	3
PCB	MG/L	ND	0.000012	0.000010	0.000016	3	0.000012	0.000012	0.000012	1
PH	PH	ND	6.347222	5.500000	7.700000	36	6.473385	6.200000	6.950000	13
PHENOLS	MG/L	ND	0.001171	0.001000	0.002000	12	0.001200	0.001000	0.002000	5
RADIUM-226	PCI/L	0.185	0.187708	0.007000	0.600000	12	0.111000	0.005000	0.400000	5
SELENIUM	MG/L	0.01	0.003675	0.001000	0.005000	12	0.003800	0.001000	0.005000	5
SILVER	MG/L	0.05	0.035525	0.000500	0.070000	12	0.042500	0.000500	0.070000	5
SODIUM	MG/L	ND	24.133333	13.800000	44.000000	9	12.666667	10.000000	17.000000	3
SP.COND.	UMHOS/CM	ND	447.222222	158.000000	766.000000	36	708.769231	251.000000	818.000000	13
STRONTIUM 90	PCI/L	0.3	458.386667	0.210000	1700	9	1.933333	1.600000	2.200000	3
SULFATE	MG/L	ND	16.083333	12.000000	24.000000	12	20.400000	19.000000	22.000000	5
T. ORG. CARBON	MG/L	ND	5.587769	2.180000	9.000000	39	4.478571	1.800000	7.100000	14
T. ORG. HALOGEN	MG/L	ND	0.131300	0.009900	0.284000	30	0.113636	0.011000	0.252000	11
TEMPERATURE	DEG. C	ND	16.061905	13.500000	19.400000	21	16.175000	14.600000	16.700000	8
TOXAPHENE	MG/L	0.005	0.003500	0.002000	0.005000	12	0.003200	0.002000	0.005000	5
TRITIUM	PCI/L	740	90111.11	5000	210000	9	91333.33	75000	120000	3
ZINC	MG/L	5	0.147631	0.020000	0.320000	6	0.062700	0.020000	0.090000	3

(CONTINUED)

TABLE A-3. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS
IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS
(ALL MEASUREMENTS)
SITE=CHE

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRA-TION				MEASURED CONCENTRA-TION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	N	MEAN	MIN	MAX	N
2,4-D	MG/L	0.1	0.007500	0.005000	0.010000	12	0.007000	0.005000	0.01000	5
2,4-5 T	MG/L	0.01	0.007500	0.005000	0.010000	12	0.007000	0.005000	0.01000	5

TABLE 4-2. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (ALL MEASUREMENTS) SITE=3513

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRATION				MEASURED CONCENTRATION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	N	MEAN	MIN	MAX	N
ARSENIC	MG/L	0.05	0.00400	0.00100	0.01100	12	0.00325	0.00100	0.00500	8
BARIUM	MG/L	1	0.35192	0.05900	0.53000	12	0.24137	0.08300	0.50000	8
CADMIUM	MG/L	0.01	0.00148	0.00020	0.00200	12	0.00142	0.00020	0.00200	8
CESIUM-137	BQ/L	ND	0.38971	0.00000	1.04367	10	1.34900	0.00000	4.88527	4
CHLORIDE	MG/L	ND	18.10833	5.30000	40.00000	12	6.36250	5.00000	7.00000	8
CHROMIUM	MG/L	0.05	0.17775	0.00600	1.20000	12	0.02937	0.00200	0.14000	8
COLIFORM	COL/100	1	10.07692	0.00000	120.00000	13	1.25000	0.00000	8.00000	8
COPPER	MG/L	1	0.02767	0.02000	0.05900	6	0.02475	0.02000	0.03900	4
DISS. OXYGEN	MG/L	ND	4.51333	2.50000	7.00000	15	5.01000	4.00000	6.10000	10
ENDRIN	MG/L	0.0002	0.00015	0.00010	0.00020	12	0.00015	0.00010	0.00020	8
FLUORIDE	MG/L	1.4-2.4	1.00000	1.00000	1.00000	12	1.00000	1.00000	1.00000	8
G-ALPHA	BQ/L	0.555	4.65250	0.03000	18.00000	12	2.27375	0.79000	5.70000	8
G-BETA	BQ/L	0.29	23.85833	1.40000	65.00000	12	5.86250	1.80000	13.00000	8
IRON	MG/L	ND	23.74444	5.60000	72.00000	9	2.70333	0.42000	7.90000	6
LEAD	MG/L	0.05	0.14542	0.00300	1.40000	12	0.01012	0.00100	0.02000	8
LINDANE	MG/L	0.004	0.00112	0.00010	0.00200	12	0.00117	0.00010	0.00200	8
MANGANESE	MG/L	ND	3.92222	2.70000	5.00000	9	1.47000	0.25000	3.50000	6
MERCURY	MG/L	0.002	0.00019	0.00010	0.00050	12	0.00021	0.00010	0.00040	8
METHOXY-CHLOR	MG/L	0.1	0.00410	0.00020	0.00800	12	0.00410	0.00020	0.00800	8

(CONTINUED)

TABLE A-3. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (ALL MEASUREMENTS) SITE=3513

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRATION				MEASURED CONCENTRATION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	IN	MEAN	MIN	MAX	IN
NICKEL	MG/L	IS	0.356671	0.060001	1.000001	6	0.060001	0.060001	0.060001	4
NITRATE-N	MG/L	110	3.500001	2.000001	5.000001	6	5.000001	5.000001	5.000001	3
PCB	MG/L	IND	0.000091	0.000091	0.000101	3	0.000071	0.000071	0.000071	2
PH	PH	IND	6.426321	6.100001	7.100001	19	6.450001	6.300001	6.700001	14
PHENOLS	MG/L	IND	0.001751	0.001001	0.007001	12	0.001001	0.001001	0.001001	6
RADIUM-226	BQ/L	10.185	0.060921	0.008001	0.200001	12	0.030251	0.002001	0.100001	8
SELENIUM	MG/L	10.01	0.005001	0.005001	0.005001	12	0.005001	0.005001	0.005001	8
SILVER	MG/L	10.05	0.037621	0.000501	0.070001	12	0.037621	0.000501	0.070001	8
SODIUM	MG/L	IND	30.777781	25.000001	36.000001	9	22.833331	12.000001	56.000001	6
SP.COND.	UMHOS/CM	IND	1652.947371	365.000001	833.000001	19	818.357141	305.000001	1095	14
STRONTIUM 90	BQ/L	10.3	12.515561	0.400001	33.000001	9	2.350001	1.300001	3.300001	6
SULFATE	MG/L	IND	12.958331	5.000001	22.000001	12	80.125001	35.000001	170.000001	8
T. ORG. CARBON	MG/L	IND	5.952381	1.460001	22.000001	42	4.841071	2.250001	8.700001	28
T. ORG. HALOGEN	MG/L	IND	0.142311	0.022001	0.350001	30	0.067461	0.003901	0.173001	20
TEMPERATURE	DEG. C	IND	17.813331	15.800001	21.700001	15	15.440001	5.500001	21.300001	10
TOXAPHENE	MG/L	10.005	0.003501	0.002001	0.005001	12	0.003501	0.002001	0.005001	8
TRITIUM	BQ/L	1740	4811.111	2201	2001	9	1381.500001	9.000001	760.000001	6
ZINC	MG/L	10	0.154001	0.037001	0.430001	6	0.061501	0.020001	0.110001	4

(CONTINUED)

TABLE A-4. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (DETECTION LEVELS GREATER THAN RCRA LIMITS DELETED)
SITE=HRE

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRATION				MEASURED CONCENTRATION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	N	MEAN	MIN	MAX	N
ARSENIC	MG/L	0.05	0.004421	0.001001	0.016001	12	0.002751	0.001001	0.005001	4
BARIUM	MG/L	1	0.742671	0.105001	2.700001	12	0.300751	0.093001	0.500001	4
CADMIUM	MG/L	0.01	0.001021	0.000201	0.003501	12	0.000601	0.000201	0.001001	4
CESIUM-137	BQ/L	ND	0.482361	0.000001	2.079941	6	0.131381	0.000001	0.262771	2
CHLORIDE	MG/L	ND	5.456671	3.400001	13.000001	12	8.475001	7.000001	12.000001	4
CHROMIUM	MG/L	0.05	0.031111	0.004001	0.059101	12	0.020331	0.002001	0.050001	3
COLIFORM	COL/100	1	3.333331	0.000001	30.000001	12	3.000001	0.000001	8.000001	4
COPPER	MG/L	1	0.038671	0.020001	0.120001	6	0.020001	0.020001	0.020001	2
DISS. OXYGEN	MG/L	ND	4.454171	2.700001	9.400001	24	4.200001	3.500001	6.200001	8
ENDRIN	MG/L	0.0002	0.000211	0.000101	0.000801	12	0.000151	0.000101	0.000201	4
FLUORIDE	MG/L	1.4-2.4	1.000001	1.000001	1.000001	12	1.000251	1.000001	1.001001	4
G-ALPHA	BQ/L	0.555	21.690911	0.100001	200.000001	11	3.952001	0.060001	16.000001	5
G-BETA	BQ/L	0.28	382.150001	0.700001	950.000001	12	3.900001	0.500001	10.000001	4
IRON	MG/L	ND	23.713331	1.500001	83.000001	9	1.916671	0.480001	4.590001	3
LEAD	MG/L	0.05	0.020421	0.001001	0.090001	12	0.021501	0.001001	0.070001	4
LINDANE	MG/L	0.004	0.001371	0.000101	0.002001	9	0.001371	0.000101	0.002001	3
MANGANESE	MG/L	ND	4.505441	0.180001	22.000001	9	0.132001	0.048001	0.198001	3
MERCURY	MG/L	0.002	0.000091	0.000051	0.000201	12	0.000101	0.000051	0.000201	4
METHOXY-CHLOR	MG/L	0.1	0.004571	0.000201	0.008001	12	0.004251	0.000201	0.008001	4

(CONTINUED)

TABLE A-4. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (DETECTION LEVELS GREATER THAN RCRA LIMITS DELETED)
SITE=HRE

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRATION				MEASURED CONCENTRATION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	N	MEAN	MIN	MAX	N
NICKEL	MG/L	15	0.111333	0.050000	0.360000	6	0.060000	0.050000	0.060000	2
NITRATE-N	MG/L	110	2.500000	1.000000	5.000000	6	12.500000	1.000000	24.000000	2
PCB	MG/L	ND	0.000012	0.000009	0.000015	3	0.000009	0.000009	0.000009	1
PH	PH	ND	6.706513	6.400000	8.100000	39	6.746154	6.500000	7.000000	13
PHENOLS	MG/L	ND	0.001117	0.001000	0.002000	12	0.001750	0.001000	0.004000	4
RADIUM-226	BQ/L	0.185	0.052667	0.001000	0.330000	12	0.006250	0.002000	0.010000	4
SELENIUM	MG/L	0.01	0.003250	0.001000	0.005000	12	0.003250	0.001000	0.005000	4
SILVER	MG/L	0.05	0.000750	0.000500	0.001000	6	0.000750	0.000500	0.001000	2
SODIUM	MG/L	ND	14.175000	5.650000	28.000000	6	6.300000	5.800000	6.800000	2
SP.COND.	UMHOS/CM	ND	1585.820513	241.000000	1747.000000	39	504.307692	185.000000	636.000000	13
STRONTIUM-90	BQ/L	0.3	132.686667	0.120000	540.000000	9	0.173333	0.120000	0.260000	3
SULFATE	MG/L	ND	44.333333	31.000000	75.000000	12	46.000000	42.000000	54.000000	4
T. ORG. CARBON	MG/L	ND	3.689231	0.760000	8.400000	39	4.975385	0.630000	8.400000	13
T. ORG. HALOGEN	MG/L	ND	0.060731	0.005000	0.410000	30	0.098901	0.014000	0.540000	10
TEMPERATURE	DEG. C	ND	15.725000	15.000000	18.600000	24	17.812500	17.000000	18.800000	8
TOXAPHENE	MG/L	0.005	0.003385	0.002000	0.005200	12	0.003500	0.002000	0.005000	4
TRITIUM	BQ/L	740	194.222222	10.000000	430.000000	9	12.000000	3.000000	20.000000	3
ZINC	MG/L	15	0.074181	0.020000	0.140000	6	0.020000	0.020000	0.020000	2

(CONTINUED)

TABLE A-4. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS
IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS
(DETECTION LEVELS GREATER THAN RCRA LIMITS DELETED)
SITE=HRE

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRA-TION				MEASURED CONCENTRA-TION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	N	MEAN	MIN	MAX	N
2,4-D	MG/L	0.1	0.00750	0.00500	0.01000	12	0.00750	0.00500	0.01000	4
2,4-5 T	MG/L	0.01	0.00750	0.00500	0.01000	12	0.00750	0.00500	0.01000	4

TABLE A-4. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (DETECTION LEVELS GREATER THAN RCRA LIMITS DELETED) SITE=CHF

PARAMETER	UNITS	LIMIT	WELL LOCATION: DOWN-GRADIENT MEASURED CONCENTRATION MEAN	DOWN-GRADIENT MIN	DOWN-GRADIENT MAX	DOWN-GRADIENT N	UP-GRADIENT MEASURED CONCENTRATION MEAN	UP-GRADIENT MIN	UP-GRADIENT MAX	UP-GRADIENT N
ARSENIC	MG/L	0.05	0.003833	0.001000	0.005000	12	0.002280	0.001000	0.005000	5
BARIUM	MG/L	1	0.570333	0.066000	1.090000	12	0.452200	0.250000	1.000000	5
CADMIUM	MG/L	0.01	0.002013	0.000200	0.010000	12	0.001140	0.000200	0.003000	5
CESIUM-137	PCI/L	NO	1.703103	0.717993	3.626694	5	1.189243	0.721693	2.068843	3
CHLORIDE	MG/L	NO	19.166667	8.000000	40.000000	12	12.200000	12.000000	13.000000	5
CHROMIUM	MG/L	0.05	0.030999	0.003000	0.079700	12	0.026560	0.006000	0.050000	5
COLIFORM	COL/100	1	6.350000	0.000000	49.000000	12	5.200000	0.000000	16.000000	5
COPPER	MG/L	1	0.026123	0.020000	0.056700	6	0.020000	0.020000	0.020000	3
DISS. OXYGEN	MG/L	NO	7.410000	4.300000	12.000000	20	6.875000	5.200000	10.300000	8
ENDRIN	MG/L	0.0002	0.000151	0.000100	0.000200	11	0.000141	0.000100	0.000200	5
FLUORIDE	MG/L	1.4-2.4	1.000000	1.000000	1.000000	12	1.000000	1.000000	1.000000	5
G-ALPHA	PCI/L	15.555	89.047000	0.310000	520.000000	10	1.232000	0.400000	2.900000	5
G-BETA	PCI/L	50.29	707.291671	1.700000	2700	12	4.820000	3.500000	6.600000	5
IRON	MG/L	NO	16.663333	0.290000	57.900000	9	2.741751	0.587000	8.600000	4
LEAD	MG/L	0.05	0.042000	0.002000	0.100000	12	0.010800	0.001000	0.030000	5
LINDANE	MG/L	0.004	0.001051	0.000100	0.002000	12	0.000961	0.000100	0.002000	5
MANGANESE	MG/L	NO	3.883671	0.563000	8.850000	9	0.199101	0.033400	0.293000	4
MERCURY	MG/L	0.002	0.000081	0.000051	0.000101	12	0.000071	0.000051	0.000101	5
METHOXY-CHLOR	MG/L	0.1	0.004101	0.000201	0.008001	12	0.003321	0.000201	0.008001	5

(CONTINUED)

TABLE A-4. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (DETECTION LEVELS GREATER THAN RCRA LIMITS DELETED)
SITE=OHF

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRA-TION				MEASURED CONCENTRA-TION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	N	MEAN	MIN	MAX	N
NICKEL	MG/L	5	0.062251	0.060001	0.073501	6	0.060001	0.060001	0.060001	3
NITRATE-N	MG/L	10	3.833331	1.000001	8.000001	6	2.666671	1.000001	6.000001	3
PCB	MG/L	ND	0.000121	0.000101	0.000161	3	0.000121	0.000121	0.000121	1
PH	PH	ND	6.347221	5.500001	7.700001	36	6.473861	6.200001	6.950001	13
PHENOLS	MG/L	ND	0.001171	0.001001	0.002001	12	0.001201	0.001001	0.002001	5
RADIUM-226	PCI/L	0.185	0.040831	0.007001	0.100001	6	0.038751	0.005001	0.100001	4
SELENIUM	MG/L	0.01	0.003671	0.001001	0.005001	12	0.003801	0.001001	0.005001	5
SILVER	MG/L	0.05	0.001251	0.000501	0.002001	6	0.001251	0.000501	0.002001	2
SODIUM	MG/L	ND	24.133331	13.800001	44.000001	9	12.666671	10.000001	17.000001	3
SP.COND.	UMHOS/CM	ND	447.222221	158.000001	766.000001	36	708.769231	261.000001	816.000001	13
STRONTIUM 90	PCI/L	0.3	458.966671	0.210001	17001	9	1.933331	1.800001	2.200001	3
SULFATE	MG/L	ND	16.083331	12.000001	24.000001	12	20.400001	19.000001	22.000001	5
T. ORG. CARBON	MG/L	ND	5.587591	2.160001	9.000001	39	4.478571	1.600001	7.100001	14
T. ORG. HALOGEN	MG/L	ND	0.131301	0.000001	0.284001	30	0.113641	0.011001	0.252001	11
TEMPERATURE	DEG. C	ND	16.061901	13.600001	19.400001	21	16.175001	14.500001	18.700001	8
TOXAPHENE	MG/L	0.005	0.003501	0.002001	0.005001	12	0.003201	0.002001	0.005001	5
TRITIUM	PCI/L	1740	80111.11	5000	210001	9	91333.31	75000	120001	3
ZINC	MG/L	5	0.147631	0.020001	0.320001	6	0.062701	0.020001	0.090001	3

(CONTINUED)

TABLE A-4. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS
IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS
(DETECTION LEVELS GREATER THAN RCRA LIMITS DELETED)
SITE=OHF

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRA-TION				MEASURED CONCENTRA-TION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	N	MEAN	MIN	MAX	N
2,4-D	MG/L	0.1	0.007500	0.005000	0.010000	12	0.007000	0.005000	0.010000	5
2,4-5 T	MG/L	0.01	0.007500	0.005000	0.010000	12	0.007000	0.005000	0.010000	5

TABLE 4-4. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (DETECTION LEVELS GREATER THAN RCRA LIMITS DELETED)
SITE=351

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRATION				MEASURED CONCENTRATION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	N	MEAN	MIN	MAX	N
ARSENIC	MG/L	0.05	0.004000	0.001000	0.011000	12	0.003250	0.001000	0.005000	8
BARIUM	MG/L	1	0.351923	0.059000	0.530000	12	0.241375	0.083000	0.500000	8
CADMIUM	MG/L	0.01	0.001483	0.000020	0.002000	12	0.001423	0.000020	0.002000	8
CESIUM-137	PCI/L	ND	0.389711	0.000000	1.043671	10	1.349001	0.000000	4.885271	4
CHLORIDE	MG/L	ND	18.108331	5.300000	40.000000	12	6.362501	5.000000	7.000000	8
CHROMIUM	MG/L	0.05	0.177751	0.006000	1.200000	12	0.029371	0.002001	0.140001	8
COLIFORM	COL/100	1	10.076921	0.000001	120.000001	13	1.250001	0.000001	8.000001	8
COPPER	MG/L	1	0.027671	0.020001	0.059001	6	0.024751	0.020001	0.039001	4
DISS. OXYGEN	MG/L	ND	4.513331	2.500001	7.000001	15	5.010001	4.000001	6.100001	10
ENDRIN	MG/L	0.0002	0.000151	0.000101	0.000201	12	0.000151	0.000101	0.000201	8
FLUORIDE	MG/L	1.4-2.4	1.000001	1.000001	1.000001	12	1.000001	1.000001	1.000001	8
G-ALPHA	PCI/L	0.555	4.802731	0.030001	18.000001	11	2.273751	0.790001	5.700001	8
G-BETA	PCI/L	0.29	23.858331	1.400001	65.000001	12	5.862501	1.800001	13.000001	8
IRON	MG/L	ND	23.744441	5.600001	72.000001	9	2.763331	0.420001	7.900001	6
LEAD	MG/L	0.05	0.145421	0.003001	1.400001	12	0.010121	0.001001	0.020001	8
LINDANE	MG/L	0.004	0.001121	0.000101	0.002001	12	0.001171	0.000101	0.002001	8
MANGANESE	MG/L	ND	3.922221	2.700001	5.000001	9	1.470001	0.250001	3.500001	6
MERCURY	MG/L	0.002	0.000191	0.000101	0.000501	12	0.000211	0.000101	0.000401	8
METHOXY-CHLOR	MG/L	0.1	0.004101	0.000201	0.008001	12	0.004101	0.000201	0.008001	8

(CONTINUED)

TABLE A-4. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS (DETECTION LEVELS GREATER THAN RCRA LIMITS DELETED)
SITE=3513

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRA-TION				MEASURED CONCENTRA-TION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	IN	MEAN	MIN	MAX	IN
NICKEL	MG/L	15	0.356671	0.060001	1.000001	6	0.060001	0.060001	0.060001	4
NITRATE-N	MG/L	10	3.500001	2.000001	5.000001	6	5.000001	5.000001	5.000001	3
PCB	MG/L	ND	0.000091	0.000091	0.000101	3	0.000071	0.000071	0.000071	2
PH	PH	ND	6.426321	6.100001	7.100001	19	6.450001	6.300001	6.700001	14
PHENOLS	MG/L	ND	0.001751	0.001001	0.007001	12	0.001001	0.001001	0.001001	6
RADIUM-226	BQ/L	0.185	0.048271	0.008001	0.140001	11	0.030251	0.002001	0.100001	8
SELENIUM	MG/L	0.01	0.005001	0.005001	0.005001	12	0.005001	0.005001	0.005001	8
SILVER	MG/L	0.05	0.005251	0.000501	0.010001	6	0.005251	0.000501	0.010001	4
SODIUM	MG/L	ND	30.777781	25.000001	38.000001	9	22.833331	12.000001	56.000001	6
SP.COND.	UMHOS/CM	ND	652.947371	365.000001	833.000001	19	818.357141	305.000001	1095	14
STRONTIUM-90	BQ/L	0.3	12.515561	0.400001	33.000001	9	2.350001	1.300001	3.300001	6
SULFATE	MG/L	ND	12.958331	5.000001	22.000001	12	80.125001	35.000001	170.000001	8
T. ORG. CARBON	MG/L	ND	5.952361	1.460001	22.000001	42	4.841071	2.250001	8.700001	28
T. ORG. HALOGEN	MG/L	ND	0.142311	0.022001	0.360001	30	0.067461	0.003901	0.173001	20
TEMPERATURE	DEG. C	ND	17.813331	15.800001	21.700001	15	15.440001	5.500001	21.300001	10
TOXAPHENE	MG/L	0.005	0.003501	0.002001	0.005001	12	0.003501	0.002001	0.005001	8
TRITIUM	BQ/L	740	4811.111	2200	20000	9	351.500001	9.000001	760.000001	6
ZINC	MG/L	15	0.154001	0.037001	0.480001	6	0.061501	0.020001	0.110001	4

(CONTINUED)

TABLE A-4. COMPARISON IN WATER QUALITY PARAMETER CONCENTRATIONS
IN DOWNGRADIENT AND UPGRADIENT MONITORING WELLS
(DETECTION LEVELS GREATER THAN RCRA LIMITS DELETED)
SITE=3513

			WELL LOCATION							
			DOWN-GRADIENT				UP-GRADIENT			
			MEASURED CONCENTRA-TION				MEASURED CONCENTRA-TION			
PARAMETER	UNITS	LIMIT	MEAN	MIN	MAX	N	MEAN	MIN	MAX	N
2,4-D	MG/L	0.1	0.007783	0.00500	0.01000	12	0.00750	0.00500	0.01000	8
2,4-5 T	MG/L	0.01	0.007792	0.00500	0.01000	12	0.00750	0.00500	0.01000	8

TABLE A-5. STATISTICAL SUMMARY OF BACKGROUND CONCENTRATIONS FOR INDICATORS OF GROUNDWATER CONTAMINATION

SITE	PARAMETER	MEASURED CONCENTRATION MEAN	MIN	MAX	CV	N
HRE	PH	6.746	6.500	7.000	2	13
	SP.COND.	504.308	185.000	636.000	20	13
	TOC	4.975	0.530	8.400	66	13
	TOX	0.099	0.014	0.540	160	10
CHE	PH	6.474	6.200	6.950	4	13
	SP.COND.	708.769	251.000	818.000	24	13
	TOC	4.479	1.800	7.100	47	14
	TOX	0.114	0.011	0.252	82	11
3515	PH	6.450	6.300	6.700	2	14
	SP.COND.	818.357	305.000	1095.000	28	14
	TOC	4.841	2.250	8.700	47	28
	TOX	0.067	0.004	0.173	80	20

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