Y/SUB/97-KDS15V/5

Y-12

OAK RIDGE
Y-12
PLANT

LOCKHEED MARTIN

EVALUATION OF CALENDAR YEAR 1996 GROUNDWATER AND SURFACE WATER QUALITY DATA FOR THE CHESTNUT RIDGE HYDROGEOLOGIC REGIME AT THE U.S. DEPARTMENT OF ENERGY Y-12 PLANT, OAK RIDGE, TENNESSEE

August 1997

Prepared by

AJA TECHNICAL SERVICES, INC.
Under Subcontract No. 70Y-KDS15V

for the

Water Compliance Department
Environmental Compliance Organization
Oak Ridge Y-12 Plant
Oak Ridge, Tennessee 37831

Managed by

LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. Department of Energy
Under Contract No. DE-AC05-84OR21400

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UCN-13672 (26 6-95)

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CONTENTS

List of Figures

List of Tables

List of Acronyms and Abbreviations

ASO	Analytical Services Organization
BCV	Bear Creek Valley
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Chestnut Ridge Regime	Chestnut Ridge Hydrogeologic Regime
CY	calendar year
DNAPLs	dense, nonaqueous phase liquids
DOE	U.S. Department of Energy
DQO	data quality objective
ft	feet
ft/d	feet per day
GWPP	Groundwater Protection Program
MCL	maximum contaminant level (for drinking water)
MDA	minimum detection activity
μg/L	micrograms per liter
μmho/cm	micromhos per centimeter
mg/L	milligrams per liter
msl	mean sea level
mV	millivolts
ORNL	Oak Ridge National Laboratory
PCE	tetrachloroethene
pCi/L	picoCuries per liter
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
REDOX	oxidation-reduction potential
Security Pits	Chestnut Ridge Security Pits
Sediment Disposal Basin	Chestnut Ridge Sediment Disposal Basin
SDWA	Safe Drinking Water Act
SWDF	solid waste disposal facility (non-RCRA)
TCE	trichloroethene
TDS	total dissolved solids
TSS	total suspended solids
UTL	upper tolerance limit
VOC	volatile organic compound
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCE	1,2-dichloroethene
1,1,1-TCA	1,1,1-trichloroethane
^{234}U	uranium-234
^{238}U	uranium-238
^{40}K	potassium-40

1.0 INTRODUCTION

This report presents an evaluation of the groundwater monitoring data obtained in the Chestnut Ridge Hydrogeologic Regime (Chestnut Ridge Regime) during calendar year (CY) 1996. The Chestnut Ridge Regime encompasses a section of Chestnut Ridge bordered by the U.S. Department of Energy (DOE) Y-12 Plant in Bear Creek Valley (BCV) to the north, Scarboro Road to the east, Bethel Valley Road to the south, and an unnamed drainage basin southwest of the Y-12 Plant (Figure 1). Groundwater quality monitoring is performed at hazardous and nonhazardous waste management facilities in the regime under the auspices of the Y-12 Plant Groundwater Protection Program (GWPP). The CY 1996 monitoring data are presented in *Calendar Year 1996 Annual Groundwater Monitoring Report for the Chestnut Ridge Hydrogeologic Regime at the U.S. Department of Energy Y-12 Plant, Oak Ridge, Tennessee*, along with the required evaluations of applicable site-specific monitoring data (AJA Technical Services, Inc. 1997a). This report provides additional evaluation of the CY 1996 data with an emphasis on regime-wide groundwater geochemistry and long-term concentration trends of regulated and non-regulated monitoring parameters.

2.0 BACKGROUND INFORMATION

The following sections contain background information regarding the waste management sites in the Chestnut Ridge Regime and their associated groundwater monitoring programs, a general description of topography and bedrock geology in the regime, an overview of the hydrogeologic characteristics and groundwater flow patterns in the Knox Aquifer, and a discussion of surface water drainage features.

2.1 Waste Management Sites and Groundwater Monitoring Programs

There are three general classes of waste management facilities in the Chestnut Ridge Regime: (1) Resource Conservation and Recovery Act (RCRA) hazardous waste treatment, storage, and disposal units, some of which are also subject to regulation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); (2) sites regulated as operable units or low-priority study areas under CERCLA; and (3) nonhazardous solid waste disposal facilities (SWDFs) operated in accordance with permits issued by the Tennessee Department of Environment and Conservation. Most of the sites are located in the northern part of the regime along the crest of Chestnut Ridge (Figure 2) and all the inactive waste management facilities have been closed in accordance with applicable regulations (Table 1).

Groundwater quality monitoring in the Chestnut Ridge Regime during CY 1996 was performed for the multiple programmatic purposes of: (1) RCRA interim status assessment monitoring and RCRA post-closure corrective action monitoring at the Chestnut Ridge Security Pits (Security Pits); (2) RCRA interim status detection monitoring at Kerr Hollow Quarry and RCRA post-closure detection monitoring at the Chestnut Ridge Sediment Disposal Basin (Sediment Disposal Basin) and Kerr Hollow Quarry; (3) SWDF detection monitoring at Industrial Landfills II, IV, and V and Construction/Demolition Landfills VI and VII; (4) monitoring specified in the CERCLA records of decision for the United Nuclear Corporation Site and the Kerr Hollow Quarry; and (5) monitoring performed at the Ash Disposal Basin, the Chestnut Ridge Borrow Area Waste Pile, the East Chestnut Ridge Waste Pile, the Security Pits, and Rogers Quarry as a best management practice of the Y-12 Plant GWPP (Table 1).

2.2 Topography and Bedrock Geology

Chestnut Ridge is flanked to the north by BCV and to the south by Bethel Valley (Figure 3). Ground surface elevations along the ridge crest decrease from about 1,200-feet (ft) above mean sea level (msl) west of Industrial Landfill IV, to about 1,060-ft msl east of the Sediment Disposal Basin. The northern flank of the ridge is a steep slope rising more than 200-ft above the floor of BCV, and the more gently sloped southern flank is dissected by several tributaries and is dominated by a parallel series of east-west trending hills.

The geology in the vicinity of the DOE Oak Ridge Reservation is characterized by thrust-faulted sequences of Lower Cambrian to Upper Ordovician age clastic (primarily shale and siltstone) and carbonate (limestone and dolostone) bedrock. Interbedded limestone and shale formations of the Conasauga Group directly underlie the Y-12 Plant in BCV, primarily dolostone strata of the Knox Group form Chestnut Ridge, and the argillaceous limestones and interbedded shales of the Chickamauga Group underlie Bethel Valley (Figure 3). Strike and dip of bedding in the area is generally N 55°E and 45°SE, respectively (as referenced to true north).

Red-brown to yellow-orange residuum (primarily clays and iron sesquioxides) that develops on the Knox Group directly underlies all the waste management sites in the Chestnut Ridge Regime except Kerr Hollow Quarry and Rogers Quarry. The residuum, which is thickest (>100-ft) along the ridge crest and thin or nonexistent near karst features (Ketelle and Huff 1984), contains semi-continuous, relict beds of fractured chert and other lithologic inhomogeneities (such as silt bodies) that provide a weakly connected network through which saturated flow can occur (Solomon et al. 1992).

All but the southernmost portion of the Chestnut Ridge Regime is underlain by the Knox Group (Figure 3); the depth to bedrock varies, but is usually less than 100-ft below ground surface (bgs). The Knox Group consists of about 2,600 to 3,300-ft of gray to blue-gray, thin- to thick-bedded cherty dolostone with interbedded limestone, and is divided into five formations (listed from oldest to youngest): Copper Ridge Dolomite, Chepultepec Dolomite, Longview Dolomite, Kingsport Formation, and Mascot Dolomite. Topographic and stratigraphic relationships suggest that the Copper Ridge Dolomite underlies the ridge crest and steep northern ridge flank, the Longview Dolomite forms a series of steeply-sloped hills across the middle of the southern ridge flank, and the Mascot Dolomite disconformably underlies the Chickamauga Group along the southern boundary of the regime (Hatcher et al. 1992).

The most pervasive structural features in the Chestnut Ridge Regime are extensional, hybrid, and shear fractures (Solomon et al. 1992). Three major fracture orientations are evident: one that roughly parallels bedding, one steeply dipping set that parallels geologic strike, and one steeply dipping set oriented perpendicular to strike (Dreier et al. 1987). Most fractures are short, ranging from tenths of inches to a few feet in length (Solomon et al. 1992). Dissolution of carbonates along fractures has produced many surface karst features on Chestnut Ridge, including a series of sinkholes along the crest of the ridge that show a prominent alignment parallel to strike. This linear trend may result from dissolution along a common bedding plane or fracture set (Ketelle and Huff 1984; Smith et al. 1983).

2.3 Groundwater System

The Knox Group and the underlying Maynardville Limestone formation (Conasauga Group) comprise the Knox Aquifer, which is the principal hydrogeologic unit in the Chestnut Ridge Regime. The Knox Aquifer generally consists of three vertically gradational subsystems: (1) the stormflow zone, (2) the vadose zone, and (3) the groundwater zone. The subsystems are distinguished by groundwater flux, which decreases with depth (Solomon et al. 1992).

Although detailed studies have not been conducted in the Chestnut Ridge Regime, investigations near the Oak Ridge National Laboratory (ORNL) show that groundwater occurs intermittently above the water table in a shallow "stormflow zone" that extends to a depth of about 6-ft bgs (Moore 1989). Macropores and mesopores provide the primary channels for lateral flow in the stormflow zone, which lasts only a few days or weeks after rainfall. Most groundwater within the stormflow zone is either lost to evapotranspiration or recharge to the water table, and the remaining water discharges at nearby seeps, springs, and streams (Moore 1989).

The vadose zone occurs between the stormflow zone and the water table, which typically occurs near the bedrock/residuum interface, and is unsaturated except in the capillary fringe above the water table and within wetting fronts during periods of vertical percolation from the stormflow zone (Moore 1989). Most recharge through the vadose zone is episodic and occurs along discrete permeable fractures that become saturated, although surrounding micropores remain unsaturated (Solomon et al. 1992). Based on infiltrometer test data, Moore (1988) determined a geometric mean hydraulic conductivity of about 0.006 feet per day (ft/d) for residuum on Chestnut Ridge.

Groundwater below the vadose zone occurs within orthogonal sets of permeable, planar fractures that form water-producing zones within an essentially impermeable matrix, and dissolution of bedrock carbonates has enlarged fractures and produced an interconnected conduit-flow system characteristic of karst aquifers. Because the occurrence of solution features and the frequency, aperture, and connectivity of permeable fractures decrease with depth, the bulk hydraulic conductivity of the groundwater zone is vertically gradational. Most groundwater flux occurs within the transitional horizon between residuum and unweathered bedrock (water table interval); lower flux (and longer solute residence times) occurs at successively greater depths in the bedrock (Solomon et al. 1992). Results of borehole packer tests in the Knox Group and dye-tracer studies on Chestnut Ridge suggest a wide range of hydraulic conductivity typical of karst aquifers: 0.0002-ft/d for matrix intervals, 3.1-ft/d for water-producing intervals, and at least 100-ft/d for permeable conduits (King and Hasse 1988; Ketelle and Huff 1984; Geraghty & Miller, Inc. 1990).

The water table in the Chestnut Ridge Regime generally mirrors surface topography (Figure 4). Groundwater elevation isopleths indicate eastward (strike parallel) flow along the ridge crest in the northern part of the regime, which is a recharge area and a flow divide, with components to the north (across strike) toward the Maynardville Limestone at the base of the ridge, and south (parallel to dip) toward the tributaries on the southern flank of the ridge. Radial groundwater flow directions from hilltops toward crosscutting tributaries dominate the central part of the regime, and flow in the southernmost part of the regime is south toward Melton Hill Reservoir. Seasonal water table fluctuations, which are greatest (>15-ft) in wells located along the crest of Chestnut Ridge (Table 2), do not significantly alter the directions of groundwater flow. Horizontal hydraulic gradients are highest (0.04 to 0.07) along the steep northern flank of Chestnut Ridge and in the upper reaches of tributaries on the southern ridge flank. Gradients are less steep (0.004 to 0.02) along the crest of the ridge and in drainage basins between hills in the central part of the regime, and are nearly flat (0.001 to 0.003) in Bethel Valley along the southern boundary of the regime.

Groundwater elevations in several wells located on the ridge crest, notably well GW-293 at the East Chestnut Ridge Waste Pile and well GW-322 at the Security Pits, are more than 20-ft lower than in nearby wells. These substantial differences between water levels potentially reflect localized depressions in the water table associated with highly permeable conduits that function as local drains for the shallow karst network. The location of such conduits potentially correspond with the bedding plane or fracture set associated with the strike-parallel series of sinkholes along the crest of the ridge.

2.4 Surface Water System

Surface streams in the Chestnut Ridge Regime comprise four primary drainage basins on the southern flank of Chestnut Ridge: (1) an unnamed tributary located west of Industrial Landfill II in the western part of the regime; (2) an unnamed tributary located east of Industrial Landfill II; (3) the McCoy Branch drainage basin in the central part of the regime; and (4) an unnamed drainage basin in the eastern part of the regime (Figure 3). The surface streams are mainly intermittent above an elevation of 900-ft msl and receive flow via surface runoff, stormflow discharge, and groundwater baseflow. Baseflow contributions increase downstream and spring discharge represents substantial contributions to the total flow in most of the tributaries during summer months (Lockheed Martin Energy Systems, Inc. 1996). All of the tributaries discharge into Melton Hill Reservoir (Clinch River) south of the Chestnut Ridge Regime.

3.0 SAMPLING AND ANALYSIS SUMMARY

This section provides an overview of the CY 1996 groundwater sampling and analysis activities performed in the Chestnut Ridge Regime under the auspices of the Y-12 Plant GWPP, including brief descriptions of the sampling locations, frequency, and field measurements/laboratory analytes. More detailed sampling and analysis information is provided in the *Sampling and Analysis Plan for Groundwater and Surface Water Monitoring at the Y-12 Plant during Calendar Year 1996* (HSW Environmental Consultants, Inc. 1995a), as amended in addenda issued throughout the year by the Y-12 Plant GWPP Manager.

3.1 Sampling Locations and Frequency

Groundwater samples were collected at least semiannually from forty-one monitoring wells and spring station SCR4.3SP (formerly CBS-1) that discharges into an unnamed surface stream about 1,200-ft directly south of Construction/Demolition Landfill VII (Figure 5). Several of these wells were sampled more frequently depending upon implementation of the applicable monitoring program for the associated waste management site (Table 3). Also, the nine wells used for RCRA post-closure detection monitoring at the Sediment Disposal Basin and Kerr Hollow Quarry were sampled daily over a four consecutive day period during the applicable semiannual sampling events. Twenty-seven monitoring wells in the regime were sampled only once, including five wells used for RCRA interim status assessment monitoring at the Security Pits, nineteen wells sampled as a best management practice of the Y-12 Plant GWPP, and three wells used for SWDF detection monitoring.

3.2 Sample Collection, Transportation, and Chain-of-Custody Control

Personnel from the Sampling and Environmental Support Department of the Analytical Services Organization (ASO) were responsible for collection, transportation, and chain-of-custody control of the groundwater samples. Sampling was performed in accordance with standardized Y-12 Plant GWPP technical procedures and protocols. Portable Bennet Pumps™ and disposable bailers were used to collect groundwater samples from wells; samples from spring SCR4.3SP were collected using grab sample bottles. Filtered and unfiltered groundwater samples were collected from each location. Samples collected with a Bennet Pump™ were filtered in the field using in-line 0.45 micron filters, and samples collected with bailers and grab sample bottles were filtered in the laboratory. All samples were labeled, logged, placed in ice-filled coolers, and transported to the appropriate analytical laboratory in accordance with chain-of-custody control requirements. Most laboratory analyses were performed by the ASO located at the East Tennessee Technology Park (formerly the Oak Ridge K-25 Site). Selected radiochemical analyses were performed by the ORNL and Y-12 Plant ASOs.

3.3 Field Measurements and Laboratory Analytes

Field personnel measured the depth to water before purging and sampling groundwater in each monitoring well. Sampling personnel also recorded field measurements of pH, temperature, specific conductance, dissolved oxygen, and oxidation-reduction potential (REDOX) for each sampling location. Most of the groundwater samples were analyzed for the following standard suite of laboratory analytes: (1) principal cations (calcium, magnesium, potassium, and sodium) and anions (carbonate and bicarbonate alkalinity, chloride, fluoride, nitrate, and sulfate), (2) trace metals (the term used hereafter to differentiate metals which are typically minor constituents in groundwater from those that are major ionic species), (3) volatile organic compounds (VOCs), (4) gross alpha activity and gross beta activity, and (5) pH, specific conductance, total dissolved solids (TDS), total suspended solids (TSS), and turbidity (Table 4). Unfiltered samples were analyzed for all of these analytes; filtered samples were analyzed only for the principal cations and trace metals.

Depending on the requirements of the governing monitoring program, groundwater samples from some wells were analyzed for additional parameters and constituents (Table 4). Groundwater samples collected for SWDF detection monitoring were analyzed for site-specific suites of water-quality indicators (e.g., chemical oxygen demand), organic (e.g., acrolein) and inorganic compounds (e.g., ammonia nitrogen), and radioanalytes (e.g., gamma activity). Samples from wells at the United Nuclear Corporation Site were analyzed for several radioisotopes (e.g., technetium-99), and samples collected for RCRA interim status detection monitoring at Kerr Hollow Quarry were analyzed for indicator parameters (e.g., total organic carbon and phenols) and uranium isotopes (^{234}U, ^{235}U, and ^{238}U).

4.0 DATA EVALUATION

An evaluation of the groundwater quality data reported for the network of CY 1996 sampling locations, organized by major groups of related analytes (principal ions, trace metals, VOCs, radiological parameters, and miscellaneous field and laboratory analytes), is presented in the following sections. The evaluation is based on analytical results that meet the data quality objectives (DQOs) of the Y-12 Plant GWPP, as defined in the *Y-12 Plant Groundwater Protection Program - Groundwater Monitoring Program Data Management Plan* (Martin Marietta Energy Systems, Inc. 1993). A summary of the CY 1996 groundwater quality data qualified by the applicable DQO criteria is provided in Appendix C.

4.1 Principal Ions

Principal ion data for groundwater samples from the majority of CY 1996 sampling locations reflect the calcium-magnesium-bicarbonate geochemistry of groundwater in the Knox Aquifer (Figure 6). Most of the groundwater samples are generally characterized by equal or nearly equal molar concentrations of calcium and magnesium, which is typical of water in contact with dolomite; low molar proportions (<5%) of chloride, potassium, sodium, and sulfate; and carbonate alkalinity, fluoride, and nitrate (as N) (hereafter synonymous with "nitrate") concentrations below respective analytical reporting limits (see Appendix C). Distinctive variations from these geochemical characteristics are evident for groundwater from wells GW-143, GW-145, and GW-146 at Kerr Hollow Quarry, and wells GW-184, GW-186, GW-187, and GW-188 at Rogers Quarry (Figure 6). Additionally, principal ion data for several wells located elsewhere in the Chestnut Ridge Regime are conspicuous with respect to results for chloride, nitrate, potassium, sodium, and sulfate.

Monitoring wells at Kerr Hollow Quarry and Rogers Quarry produce groundwater from the upper Knox Group and the lower Chickamauga Group. Principal ion data for groundwater samples from wells (e.g., GW-143, GW-145, GW-146, GW-184, GW-186 and GW-188) at each site are generally distinguished by enriched sulfate (>10% total anions) levels; unequal molar proportions of calcium and magnesium (Figure 6); and fluoride and potassium concentrations above 0.1 and 10 milligrams per liter (mg/L), respectively. These characteristics probably reflect the geochemical influence of secondary minerals in the bedrock. Results for wells at Rogers Quarry also show progressively higher chloride and sodium levels (and TDS) in relatively stagnant groundwater at successively lower elevations in Bethel Valley (Figure 7). Limited groundwater circulation is indicated by the very low horizontal hydraulic gradients near Rogers Quarry and the lack of dissolved oxygen in groundwater samples from wells GW-186 and GW-187 (see Section 4.5).

Sulfate levels typically exceed 10 mg/L in the groundwater at wells GW-159, GW-541, GW-742, and GW-757, whereas sulfate levels reported for other Knox Group wells (excluding those at Kerr Hollow Quarry) are usually less than 5 mg/L. Comparatively enriched sulfate concentrations in the groundwater at these wells probably reflect the geochemical influence of locally disseminated sulfides and/or sulfates rather than groundwater contamination from wastes at the Sediment Disposal Basin (GW-159), Construction/Demolition Landfill VI (GW-541), the Security Pits (GW-742), or Industrial Landfill II (GW-757). Dissolution of gypsum ($CaSO_4 \bullet 2H_2O$) or oxidation of pyrite (FeS_2), are potential sources of sulfate in the groundwater at these wells. Interestingly, results for well GW-757 show sulfate levels similar to lower Knox Group wells such as GW-159 and GW-742, but fluoride (>1 mg/L) and strontium (>0.5 mg/L) concentrations are similar to those for the upper Knox Group wells at Kerr Hollow Quarry. These geochemical differences potentially reflect a transitional change in the types of secondary minerals disseminated in the upper and lower Knox Group formations.

Chloride concentrations in the groundwater at wells GW-539 and GW-544 downgradient of Construction/Demolition Landfill VI typically exceed 10 mg/L and are about five-times higher than the chloride levels in the groundwater at upgradient wells GW-541, GW-542, and GW-827. Historical data show that chloride concentrations in the groundwater at well GW-539 increased from 10 to 34 mg/L between March 1991 and January 1994, then subsequently decreased below 15 mg/L in April and November 1996, whereas chloride levels in the groundwater at well GW-544 steadily decreased from 19 mg/L in March 1991 to 9 mg/L in October 1995 before increasing slightly to 12.3 mg/L in October 1996 (Figure 8). The landfill is an unlikely source of the chloride in either well because the elevated concentrations predate its construction and operation. However, chloride levels in the groundwater may be related to the installation of the upgradient wells. For example, two large solution cavities were noted during installation of well GW-540 (Jones et al. 1995), which is less than 250-ft north (upgradient) of GW-539 (Figure 5), including a 7-ft cavity encountered at an elevation (944 to 937-ft msl) similar to that of the monitored interval for well GW-539 (934 to 954-ft msl). If chloride-based additives were used during installation of well GW-540 to help reduce circulation of grout into the solution cavities, the chloride concentration trend for well GW-539 may indicate downgradient transport of this chloride "slug" introduced into the groundwater. A similar explanation may account for the atypical chloride levels in the groundwater at well GW-544.

Chloride concentrations above 20 mg/L and sodium levels above 10 mg/L are characteristic of the groundwater samples from wells 1090, GW-302, and GW-339 at the United Nuclear Corporation Site (see Appendix C). Elevated levels of these ions may reflect recharge of surface water containing dissolved salt used to de-ice the South Patrol Road and Mt. Vernon Road; well 1090 is located at the intersection of these roads, and wells GW-302 and GW-339 are immediately south of the South Patrol Road (Figure 5). In contrast, a gravel road provides all-weather access to wells GW-203, GW-205, and GW-221 immediately south of the United Nuclear Corporation Site, and the chloride and sodium levels reported for these wells rarely exceed 3 mg/L. Groundwater recharge containing dissolved de-icing salt may also explain the atypically high chloride (9.46 - 12.5 mg/L) and sodium (3.2 - 6.0 mg/L) levels in groundwater at wells GW-292, GW-293, and GW-294. These wells are located near the South Patrol Road at the East Chestnut Ridge Waste Pile (Figure 5).

Nitrate concentrations reported for samples from well GW-294 consistently range between 2 and 3 mg/L, whereas nitrate results for other wells at the East Chestnut Ridge Waste Pile (GW-292, GW-293, and GW-296) do not exceed 1 mg/L (see Appendix C). The results for well GW-294 are substantially below the maximum contaminant level (MCL) for drinking water (10 mg/L), but are commonly greater than or equal to the UTL (2.7 mg/L). The source of the nitrate is uncertain. Nitrate is probably not derived from contaminated soils stored at the site because it is a lined facility constructed in accordance with an approved RCRA permit. Additionally, the elevated nitrate levels in the groundwater at well GW-294 are essentially contemporaneous with construction of the site in CY 1987; the first sample collected from the well in March 1988 had a nitrate concentration of 2.54 mg/L. Infiltration of surface runoff containing traces of fertilizer is possible, especially if the elevated sodium and chloride levels in the groundwater at wells GW-292, GW-293, and GW-294 result from recharge of surface water containing dissolved de-icing salt. The lower concentrations of nitrate in the groundwater at wells GW-292 and GW-293 may result from microbial degradation of the nitrate.

Nitrate concentrations reported for samples from well GW-611 consistently exceed 3 mg/L, which is about three-times the highest nitrate levels in the groundwater at other wells associated with the Security Pits. The source of the nitrate in the groundwater at the well is uncertain. Migration from the Security Pits seems unlikely because chloroethane concentrations decreased after closure of the Security Pits while nitrate levels, which generally correlate with seasonal (and episodic) groundwater elevations in the well, remain relatively unchanged (Figure 9). Nitrate is highly mobile in groundwater and the elevated levels reported for well GW-611 potentially reflect strike-parallel, advective transport from the S-2 Site, a closed surface impoundment located on the northern flank of Chestnut Ridge about 4,000-ft to the west (upgradient) that is a confirmed source of nitrate. Seasonal water levels reported for well GW-611 (943.1 to 950.2-ft msl) are about 50-ft lower than water levels reported for well GW-255 at the S-2 Site (994.5 to 1,007-ft msl) (AJA Technical Services, Inc. 1997b). Also, groundwater in the Maynardville Limestone contains an extensive plume of nitrate originating from several sources in BCV, including the S-2 Site, and well GW-611 is completed near the contact with the overlying Knox Group (Copper Ridge Dolomite). The geometry of the nitrate plume in the Bear Creek Hydrogeologic Regime suggests migration toward a highly permeable interval in the upper Maynardville Limestone and lower Copper Ridge Dolomite. A similar migration pattern in the Upper East Fork Poplar Creek Hydrogeologic Regime (AJA Technical Services, Inc. 1997b) potentially accounts for the atypical nitrate levels in the groundwater at well GW-611.

Maximum potassium concentrations reported for samples from wells GW-731 (2 mg/L) and GW-732 (2.2 mg/L) at the Sediment Disposal Basin are significantly lower than the highest levels (>20 mg/L) reported for samples collected from each well during CY 1995. Elevated potassium concentrations in the groundwater at these wells possibly reflect grout contamination from installation of these wells and/or the plugging and abandonment of the nearby wells (GW-155 and GW-157) that they replaced. Elevated pH levels measured while purging stagnant water from the wells before collecting samples from GW-731 and GW-732 support this conclusion.

4.2 Trace Metals

Evaluation of the CY 1996 trace metal data focused on total concentrations that meet applicable DQO criteria and exceed the applicable upper tolerance limit (UTL) reported in *Determination of Reference Concentrations for Inorganic Analytes in Groundwater at the Department of Energy Y-12 Plant, Oak Ridge, Tennessee* (HSW Environmental Consultants, Inc. et al. 1995). The UTLs for each metal were determined from statistical analysis of historical (CY 1986 - CY 1993) data for specific groups of wells (i.e., clusters) differentiated by similar geochemical characteristics, and represent the maximum concentration expected in the groundwater monitored by the wells comprising each cluster.

Total concentrations of 20 metals reported for a total of 211 unfiltered groundwater samples from fifty-five monitoring wells exceeded the applicable UTLs in 1996 (Table 5). However, few of these results indicate groundwater contamination. Comparatively elevated concentrations of trace metals (e.g., boron and strontium) reported for wells at Kerr Hollow Quarry and Rogers Quarry probably reflect ambient levels in groundwater from low yield intervals in the upper Knox Group and lower Chickamauga Group (AJA Technical Services, Inc. 1996 and HSW Environmental Consultants, Inc. 1995b). Bias from preservation (acidification) of turbid groundwater samples (TSS >100 mg/L) likely is the source of elevated trace metal concentrations reported for wells GW-141, GW-159, GW-160, GW-174, GW-522, and GW-831. Similarly, corrosion of stainless steel well casing and screen may be the cause of elevated total chromium and nickel concentrations reported for wells GW-174, GW-302, GW-339, and GW-539. Chloride can enhance corrosion of stainless steel, and each of these wells yield groundwater samples with chloride concentrations above 10 mg/L. Although the chloride levels seem too low to be corrosive, elevated chromium and nickel in samples from these wells seem conspicuously coincidental in light of the overall lack of both metals in groundwater samples with equal or greater chloride concentrations from wells with PVC well screens or open-hole intervals (e.g., GW-186). Discounting results that probably reflect ambient levels or extraneous bias, elevated boron concentrations dominate the CY 1996 trace metal data.

Total boron concentrations reported for at least one groundwater sample from at least one well located at each of the waste management facilities in the Chestnut Ridge Regime exceed the applicable UTL (Table 5). Dissolution of carbonates, as suspected in the Knox Group at Kerr

Hollow Quarry, and systemic bias from the analytical environment, such as traces of detergents used to clean laboratory glassware, may account for the preponderance of elevated boron concentrations. Either possibility seems more plausible than regime-wide boron contamination in the groundwater. However, total boron concentrations in groundwater at Industrial Landfill IV (well GW-217) and the Security Pits (wells GW-175, GW-177, and GW-612) may represent impacts from disposal activities in the regime. Boron concentrations reported for well GW-217 and well GW-612 consistently exceed the UTL and are an order-of-magnitude higher than typical of all other Knox Group wells except those at Kerr Hollow Quarry.

Total boron concentrations exceed 0.1 mg/L in the groundwater at well GW-217 downgradient (east) of Industrial Landfill IV and are substantially higher than boron levels in the groundwater upgradient (west) of the site, as indicated by results for well GW-521 (0.014 - 0.019 mg/L). Moreover, historical boron data for the well show an increasing trend following a conspicuous concentration "spike" (0.69 mg/L) in January 1992 (Figure 10). Sodium concentrations in the groundwater at the well appear to have similarly increased from less than 2 mg/L to more than 5 mg/L. Increasing boron and sodium concentrations trends potentially reflect contamination from inorganic wastes in the landfill, such as borax (hydrated sodium borate) cleaning fluids.

Well GW-612 is located near the eastern end of the western disposal trenches at the Security Pits and consistently yields groundwater samples with boron concentrations above 0.1 mg/L. Historical boron data for the well also show an increasing long-term concentration trend (Figure 10). Although concentrations are substantially lower than reported for well GW-612, boron results for well GW-177, which is located near the west end of the western disposal trenches, also consistently exceed the UTL. Additionally, boron results for well GW-175, which is located north (downgradient) of the western disposal trenches, less frequently exceed the UTL but show a generally increasing concentration trend (Figure 10). Wastes disposed in the western trench area at the Security Pits may be the source of the boron in the groundwater at these wells. Boron is probably present as the borate ion (BOH_4), which is chemically stable and mobile in the groundwater.

4.3 Volatile Organic Compounds

Excluding false positive results, at least one VOC was detected (including estimated concentrations below the analytical reporting limit) in at least one groundwater sample collected during CY 1996 from wells GW-144, GW-174, GW-175, GW-177, GW-305, GW-608, GW-609, GW-611, GW-612, and GW-796 (see Table 6 and Appendix C). The presence of VOCs in the groundwater at each of these wells except [GW-144 and GW-305] reflects contaminant transport from the Security Pits to the vicinity of the wells (Figure 11). Migration from Kerr Hollow Quarry is indicated by trace levels of VOCs in groundwater at well GW-144, and Industrial Landfill IV is the potential source of VOCs in the groundwater at well GW-305.

The results for wells associated with the Security Pits that were sampled during CY 1996 are consistent with respective historical data showing dissolved chloroethanes and chloroethenes in the groundwater at the site. In general, 1,1-dichloroethane (1,1-DCA) and 1,1,1-trichloroethane (1,1,1-TCA) were most frequently detected in the groundwater samples from wells nearest to the western disposal trenches; and tetrachloroethene (PCE), trichloroethene (TCE), 1,1-dichloroethene (1,1,-DCE), and 1,2-dichloroethene (1,2-DCE) were most frequently detected in the groundwater samples from wells downgradient of the eastern disposal trenches (Figure 12). Maximum concentrations of each VOC in CY 1996 were less than 20 micrograms per liter (μg/L) except 1,2-DCE (52 μg/L), 1,1-DCA (83 μg/L), and 1,1,1-TCA (120 μg/L) reported for well GW-612 (Table 6). A number of results for PCE (GW-174, GW-175, and GW-609) and 1,1-DCE (GW-612) exceeded the drinking water MCLs of 5 μg/L and 7 μg/L, respectively.

Significant changes in the overall geometry of the dissolved VOC plume in the groundwater at the Security Pits are not indicated by the CY 1996 data (Figure 11). Elongation of the plume along the axis of Chestnut Ridge and the distribution of the plume constituents relative to the disposal trenches indicate strike-parallel groundwater transport from west to east. However, the dissolved chloroethanes in the groundwater at well GW-177, which is located about 200-ft west of the western disposal trenches, indicate migration toward a localized depression in the water table west of the Security Pits and immediately east of the United Nuclear Corporation Site. The maximum depth of vertical groundwater transport has not been determined but is at least 150-ft bgs in the western trench area, 250-ft bgs near the middle of the site, and 270-ft bgs downgradient of the eastern trench area.

Results for wells sampled during CY 1996 continue to indicate decreasing concentration trends that began after the disposal trenches at the Security Pits were closed and capped in the mid- to late-1980s. Additionally, VOC data for some wells at the site show distinctive cyclic fluctuations corresponding with seasonal groundwater flow conditions. For example, concentrations of 1,1,1-TCA show an inverse correlation with water levels in well GW-177 (i.e., concentrations are lowest when water levels are highest) suggesting greater dilution during seasonally high flow conditions (Figure 12). Conversely, results for well GW-609 show a generally positive correlation with water levels (i.e., VOC concentrations are highest when water levels are highest) suggesting greater contaminant flux during seasonally high flow conditions (Figure 12). In either case, decreasing concentrations after closure of the disposal trenches coupled with seasonal concentration fluctuations suggest that the source of the VOCs is within the residuum and bedrock underlying the disposal trenches, possibly in the form of dense non-aqueous phase liquids (DNAPLs). Steady dissolution of the DNAPL (as well as associated matrix diffusion processes) may explain the dilution-related concentration fluctuations, and flushing by seasonal recharge and discharge may explain the transport-related concentration fluctuations.

Trace levels (1 - 2 μg/L) of 1,1,1-TCA have been detected in all 11 of the groundwater samples collected from well GW-796 since May 1993. The result for the sample collected in April 1996 (2 μg/L) is considered a false positive because of 1,1,1-TCA contamination present in the associated laboratory blank sample (AJA Technical Services, Inc. 1997). Well GW-796 is located northwest (upgradient) of Industrial Landfill V about 400-ft south (downgradient) of the Security Pits. The presence of 1,1,1-TCA in the groundwater at well GW-796 strongly suggests transport from the western disposal trenches, possibly via "quickflow" conduits oriented perpendicular to geologic strike (Shevenell 1994a).

Although 1,1,1-TCA may have been present in the groundwater at an earlier date and was volatilized during sampling, the trace level (0.6 μg/L) initially detected in the groundwater sample collected from well GW-305 at Industrial Landfill IV in January 1992 has subsequently increased by an order-of magnitude to 9 μg/L in January 1996 (Figure 13). Additionally, 1,1-DCA was detected (1 μg/L) for the first time in the sample collected from well GW-305 in July 1996. The western disposal trenches at the Security Pits are a confirmed source of both chloroethanes, but they seem an unlikely source of the 1,1,1-TCA and 1,1-DCA in the groundwater at well GW-305. Not only are the Security Pits more than 4,000-ft east of well GW-305, but seasonally high and low water-level elevations in wells at the Security Pits are typically more than 20-ft lower than in well GW-305 (Figure 4). Groundwater transport from Industrial Landfill IV may be the source of the chloroethanes, assuming the waste stream has included chlorinated organic solvents.

Data obtained during CY 1996 are consistent with historical results showing low levels (<5 μg/L) of carbon tetrachloride in the groundwater at well GW-144 downgradient (south) of Kerr Hollow Quarry. Carbon tetrachloride has been detected in fourteen of the twenty-six samples collected from the well since March 1991, including those obtained in January (3 μg/L) and April (4 μg/L), 1996. However, the apparently sporadic detection of carbon tetrachloride potentially reflects volatilization during sampling and not the absence of the compound in the groundwater. In either case, results for the well suggests groundwater transport of VOCs to the south (down-dip) of Kerr Hollow Quarry.

4.4 Radioactivity

Evaluation of groundwater quality with respect to radiological contamination focused on CY 1996 results for gross alpha and gross beta that exceed the associated minimum detectable activity (MDA) and counting error (the value which expresses the degree of analytical uncertainty) reported for each sample. Gross alpha and gross beta results that meet these DQO criteria were reported for a total of thirty-five groundwater samples from fifteen monitoring wells (Table 7). All the individual gross alpha results are less than the 15 picoCuries per liter (pCi/L) annual average drinking water MCL except those reported for samples collected from wells GW-141 (16.6 ± 9.8 pCi/L) and GW-142 (16.8 ± 9.4 pCi/L) in January 1996, and from well GW-159 (450 ± 59 pCi/L) on May 14, 1996. Gross beta reported for the sample collected from well GW-159 (535 ± 70 pCi/L) on May 14, 1996 is the only result that exceeds the Safe Drinking Water Act (SDWA) screening value of 50 pCi/L. The exceptionally high gross alpha and gross beta activity reported for the single sample from well GW-159 was collected on the second day of four consecutive sampling days

(May 14 to May 17), and the results from the other daily samples were two orders-of-magnitude lower than on May 15. Elevated gross alpha and gross beta is not supported by the historical data for any of these wells, and results for these samples are probably analytical artifacts or data transcription errors.

Results for wells GW-142, GW-143, GW-145, and GW-146 are generally consistent with historical data showing low levels of gross alpha and gross beta above MDAs in groundwater upgradient and downgradient of Kerr Hollow Quarry (Table 7). Radioactive decay of naturally occurring uranium isotopes in the bedrock potentially accounts for the gross alpha and gross beta activity; low levels of uranium-234 (^{234}U) and uranium-238 (^{238}U) were detected in the samples collected during CY 1996 from each of these wells (see Appendix C). Radioactive decay of potassium-40 (^{40}K) also may contribute to the gross beta activity in the groundwater at wells GW-143, GW-145, and GW-146. Total potassium concentrations in the groundwater samples from each well typically exceed 10 mg/L (the 90th percentile of the CY 1996 potassium results), with ^{40}K equal to 0.0119 percent of total potassium (Brownlow 1979).

4.5 Miscellaneous Field and Laboratory Analytes

Field measurements obtained by sampling personnel show that groundwater samples from spring CBS-1 and most of the monitoring wells during CY 1996 are characterized by pH between 7.1 and 8.2; temperature of 13.1 to 16.3 degrees Centigrade; dissolved oxygen (field measurement) of 2.5 to 9.2 parts per million (ppm); positive REDOX ranging from 125 to 200 millivolts (mV); and specific conductance of 250 to 500 micromhos per centimeter (μmho/cm). Results for Rogers Quarry wells GW-186 and GW-187 show the most significant variation from this range of values. Also, results for several wells located elsewhere in the regime are conspicuous with regard to pH and/or dissolved oxygen.

Groundwater samples from wells GW-186 and GW-187 at Rogers Quarry are clearly distinguished by negative REDOX (-18 to -265 mV), very low dissolved oxygen (<1 ppm), and specific conductance above 900 μmho/cm. Along with the principal ion data for each well, these field measurements also indicate that both wells monitor relatively stagnant, mineralized groundwater in the Chickamauga Group with limited hydraulic connection to the shallow flow system.

The pH of the groundwater samples from well GW-731 at the Sediment Disposal Basin typically exceeds 8.2 (the 90th percentile of the CY 1996 field pH measurements) and reflects the lingering effects of localized grout contamination from well construction activities. Similarly high pH reported for groundwater samples from wells GW-796 and GW-539 may likewise reflect grout contamination, which as noted in Section 4.1, is a potential source of the chloride in the groundwater at well GW-539.

Dissolved oxygen reported for at least one groundwater sample from the following wells exceed 9.2 mg/L (the 90th percentile of the CY 1996 dissolved oxygen results): GW-145, GW-156, GW-159, GW-217, GW-539, GW-611, GW-709, and GW-757. Pumped at a rate of 1.4 to 2.2 gallons per minute, each of these wells typically go dry before three well volumes are purged (required by the current Y-12 Plant GWPP sampling protocol), and water levels in each well recover very slowly. The apparent low yield of these wells indicates that they do not intercept highly permeable groundwater flowpaths, and the atypically high dissolved oxygen potentially indicates aeration of the groundwater entering the wells after purging.

Several monitoring wells in the Chestnut Ridge Regime (notably GW-144, GW-GW-231, GW-731, GW-796, and GW-798) yield groundwater samples with a wide range of TDS. Variable TDS may be related to the dominant type of inflow into each well when the groundwater samples are collected. Hydrograph recession curves for Knox Aquifer wells are often characterized by a steeply-sloped segment representing drainage from conduits, an intermediately-sloped segment representing drainage from well connected and partially karstified fractures, and a gently-sloped segment representing drainage from the porous (matrix) aquifer intervals (Shevenell 1994b). Temporally and proportionally variable conduit-, karstic-, and matrix-inflow may account for the variable TDS of the groundwater samples from these wells. For example, samples collected when conduit inflow is dominant would be expected to have lower TDS than samples collected when inflow is primarily from matrix intervals. Moreover, low TDS suggests short residence time and implies active groundwater recharge and discharge flowpaths.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The bulk of the CY 1996 groundwater quality data obtained under the auspices of the Y-12 Plant GWPP are consistent with historical results regarding the known sources of groundwater contamination in the Chestnut Ridge Regime, the primary types of groundwater contaminants from each confirmed source area, and the extent of contaminant transport in the Knox Aquifer. Based on evaluation of results that meet the DQOs of the Y-12 Plant GWPP, and excluding results that probably reflect grout contamination from well installation and/or plugging and abandonment, groundwater contamination is indicated by results for nineteen wells that were sampled during CY 1996. Results for these wells, summarized below, support historical data showing VOCs (chloroethanes and chloroethenes) from the Security Pits as the primary groundwater contaminants in the regime.

Well No.	**Known (●)/Suspected (▲) Groundwater Contaminants**					**Known/*Suspected* Source of Contamination**
	Boron	**Chloride**	**Nitrate**	**Sodium**	**VOCs**	
1090	.	▲	.	▲	.	*Surface water recharge*
GW-144	.	.	.	.	●	Kerr Hollow Quarry
GW-217	▲	.	.	.	.	*Industrial Landfill IV*
GW-292	.	▲	.	▲	.	*Surface water recharge*
GW-293	.	▲	.	▲	.	*Surface water recharge*
GW-294	.	▲	▲	▲	.	*Surface water recharge*
GW-302	.	▲	.	▲	.	*Surface water recharge*
GW-305	.	.	.	.	●	*Industrial Landfill IV*
GW-339	.	▲	.	▲	.	*Surface water recharge*
GW-174	.	.	.	.	●	Security Pits
GW-175	▲	.	.	.	●	Security Pits
GW-177	▲	.	.	.	●	Security Pits
GW-608	.	.	.	.	●	Security Pits
GW-609	.	.	.	.	●	Security Pits
GW-611	.	.	▲	.	●	Security Pits/*S-2 Site nitrate plume*
GW-612	▲	.	.	.	●	Security Pits
GW-796	.	.	.	.	●	Security Pits

The following observations are based on evaluation and interpretation of the CY 1996 data with respect to historical results for each well.

- The vertical and horizontal extent of the dissolved VOC plume in the groundwater at the Security Pits remain essentially unchanged from that defined by the existing monitoring well network. Decreasing VOC concentrations in the groundwater at the site and correlations with seasonal water levels in some wells indicate that the eastern and western disposal trenches at the site are no longer active sources of VOCs. A continued source may now be DNAPL in the residuum and bedrock underlying the disposal trenches.

- The western disposal trenches at the Security Pits are the most likely source of 1,1,1-TCA in the groundwater at Industrial Landfill V monitoring well GW-796, which is about 400-ft south (downgradient) of the Security Pits. The presence of this compound in the groundwater at well GW-796 potentially indicates transport via "quickflow" conduits described by Shevenell (1994a).

- The concentration of 1,1,1-TCA in the groundwater at well GW-305 at Industrial Landfill IV has increased by an order of magnitude between January 1993 (0.6 μg/L) and January 1996 (9 μg/L). Additionally, a trace level 1,1-DCA (1 μg/L) was detected for the first time in the sample collected from the well in July 1996. The only confirmed source of chloroethanes in the regime are the western disposal trenches at the Security Pits, which lie more than 4,000-ft east and 20-ft hydraulically downgradient of well GW-305. This suggests that Industrial Landfill IV is the potential source of the chloroethanes in the well.

- Carbon tetrachloride was detected in some of the groundwater samples collected from well GW-144, and the results are consistent with historical data showing low levels (<5 μg/L) of chloromethanes (and chloroethenes) in the groundwater downgradient of Kerr Hollow Quarry.

- Total boron concentrations reported for at least one groundwater sample from at least one well at each of the waste management sites in the Chestnut Ridge Regime exceed the statistically-derived UTL assumed to represent the maximum ambient boron concentration expected in groundwater from the Knox Aquifer. These apparently ubiquitous elevated boron levels suggest an association with carbonate mineralogy in the Knox Group, systemic bias from the analytical laboratory, or widespread groundwater contamination. The latter possibility seems unlikely. However, total boron concentrations reported for well GW-217 (0.17 - 0.18 mg/L) at Industrial Landfill IV and well GW-612 (0.1 mg/L) at the Security Pits are consistently an order-of-magnitude or more higher than boron levels reported for all other Knox Aquifer wells in the regime except those at Kerr Hollow Quarry. Increasing long-term temporal trends also are indicated by historical boron data for each well. Additionally, wells GW-175 and GW-177 at the Security Pits repeatedly yield groundwater samples with boron concentrations that exceed the UTL, and results for well GW-175 also show an increasing concentration trend. Wastes disposed at Industrial Landfill IV, possibly borax cleaning fluids, may be the source of the boron in well GW-217, and similar types of wastes in the western disposal trenches at the Security Pits may be the source of the boron in the groundwater at wells GW-175, GW-177, and GW-612.

- Atypically high chloride and sodium concentrations reported for wells 1090, GW-302, and GW-339 at the United Nuclear Corporation Site and wells GW-293, GW-293, and GW-294 at the East Chestnut Ridge Waste Pile potentially reflect infiltration of surface water containing salt used to de-ice paved roads on Chestnut Ridge. Traces of fertilizer in the surface water also may explain the comparatively elevated nitrate levels in the groundwater at well GW-294. The extensive plume of nitrate contamination in BCV may be the source of the elevated nitrate levels in the groundwater at well GW-611.

- Gross alpha and gross beta activity reported for 35 groundwater samples collected during CY 1996 exceed the associated MDA and counting error. Activities reported for all but three of these samples are less than the 15 pCi/L MCL for gross alpha activity, and the 50 pCi/L SDWA screening level for gross beta activity, but results for these samples are probably analytical artifacts or data transcription errors. The most consistent gross alpha and gross beta results were reported for wells Kerr Hollow Quarry and probably reflect low levels of naturally occurring radionuclides in the bedrock.

- The dissolved oxygen in groundwater samples from several low yield wells is unusually high considering that the wells probably do not intercept highly permeable groundwater flow paths. Aeration of the groundwater entering the wells after purging potentially explains the atypical dissolved oxygen levels, and suggests that these samples are not representative of groundwater monitored by these wells.

Groundwater and surface water sampling and analysis activities planned for the Chestnut Ridge Regime during CY 1998 are specified in the *Sampling and Analysis Plan for Groundwater and Surface Water Monitoring at the Y-12 Plant during Calendar Year 1998* (AJA Technical Services, Inc. 1997c). Besides these planned monitoring activities, the following actions are recommended:

- Analyze for ^{40}K activity in samples from well GW-145 at Kerr Hollow Quarry to help determine the source of gross beta activity reported for samples from wells at this site.

- Collect a groundwater sample from well GW-322 at the Security Pits to determine current contaminant levels at the site. Historically, groundwater at well GW-322 has had the highest VOC concentrations of all wells at the Security Pits, and this well was last sampled in July 1992.

- Add four spring sampling locations to the Y-12 GWPP monitoring program to provide more data concerning the quality of groundwater as it leaves the regime, in areas with few monitoring wells. Collect samples from two springs (SCR2.1SP and SCR3.4SP) located along the geologic contact between the Knox Group and the Chickamauga Group in the western and central portion of the regime; a spring (SCR5.1) located south of the Sediment Disposal Basin in the eastern portion of the regime; and a spring (SCR5.4SP) located across Bethel Valley Road from Kerr Hollow Quarry.

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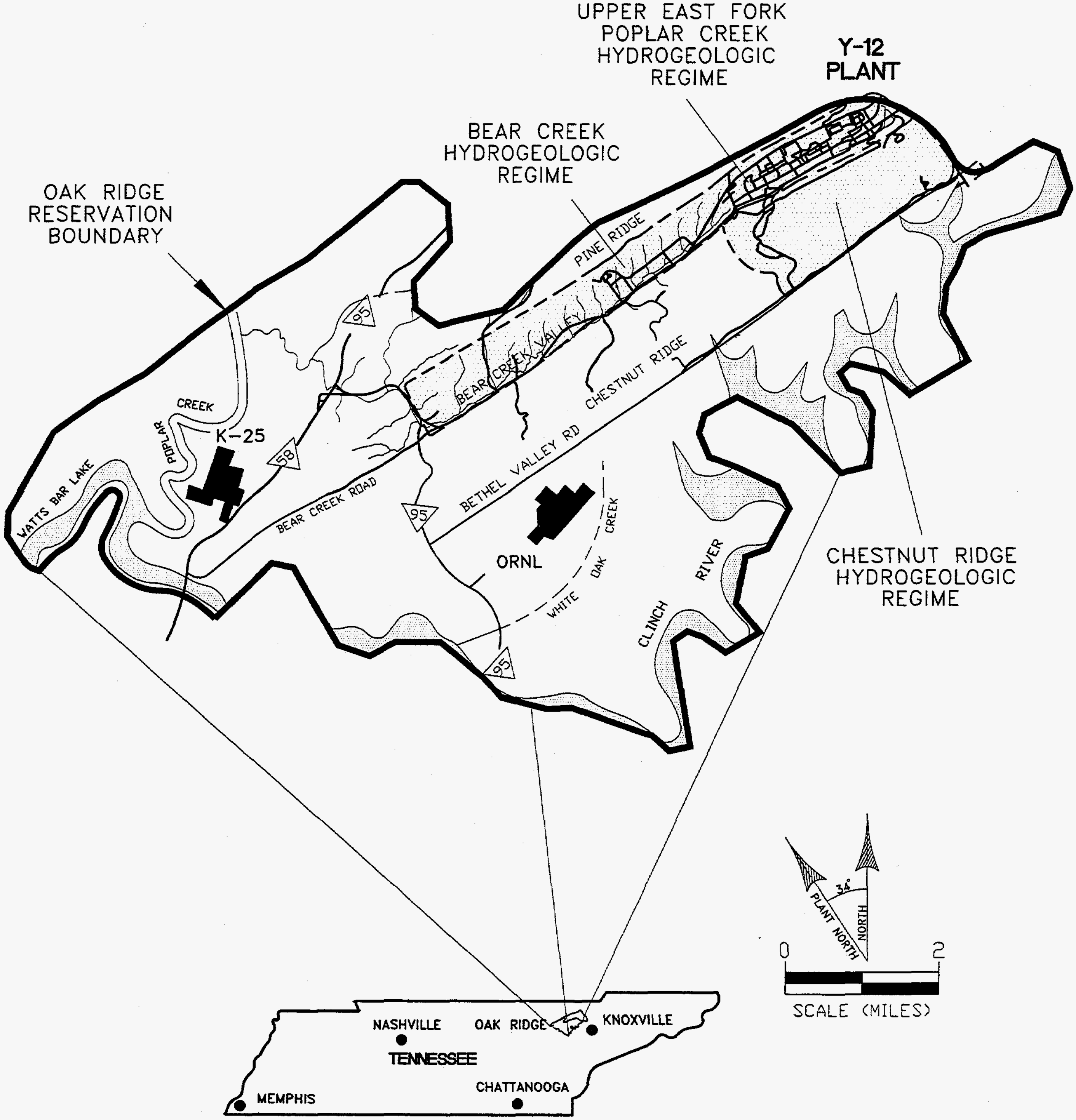
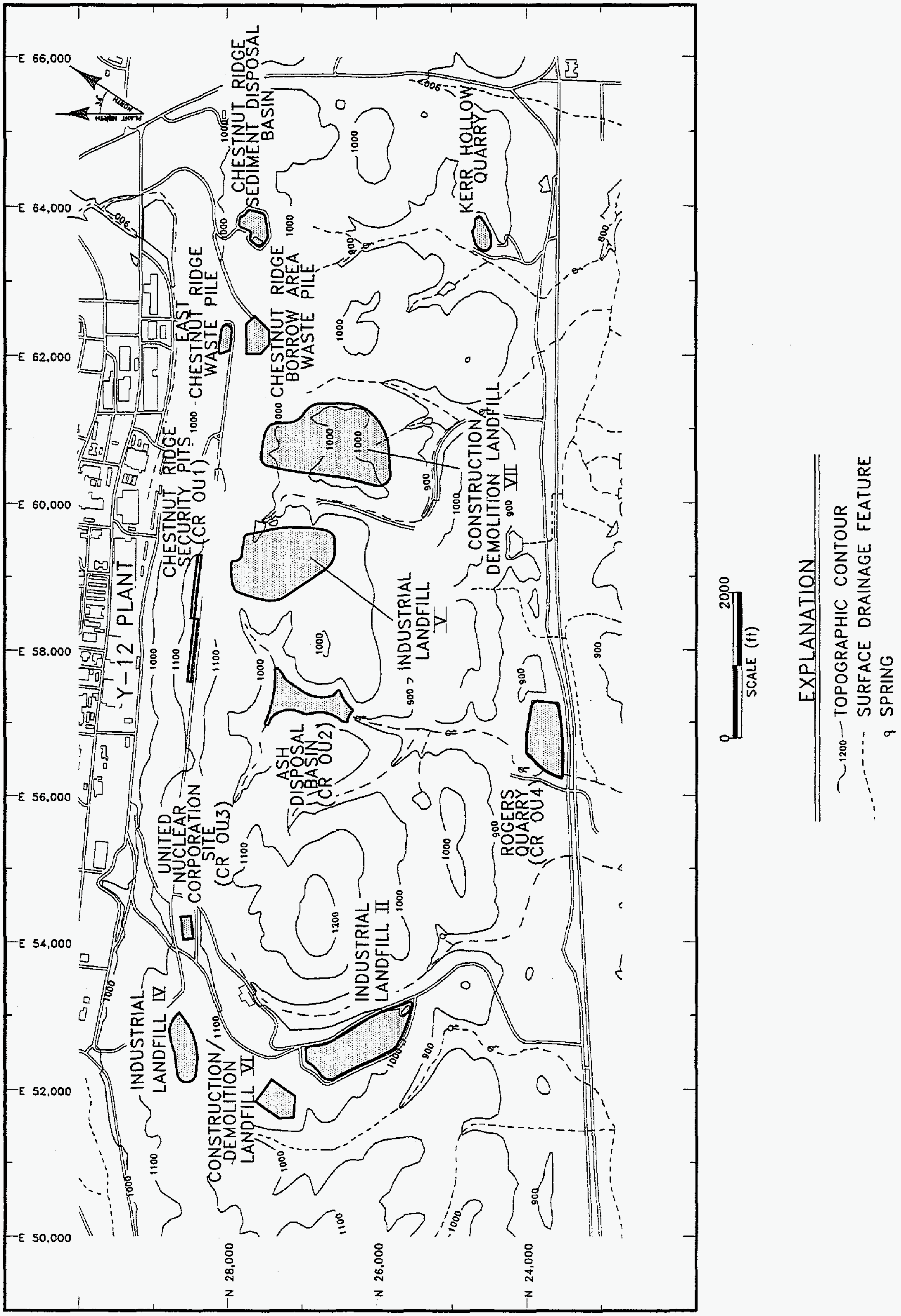
APPENDIX A

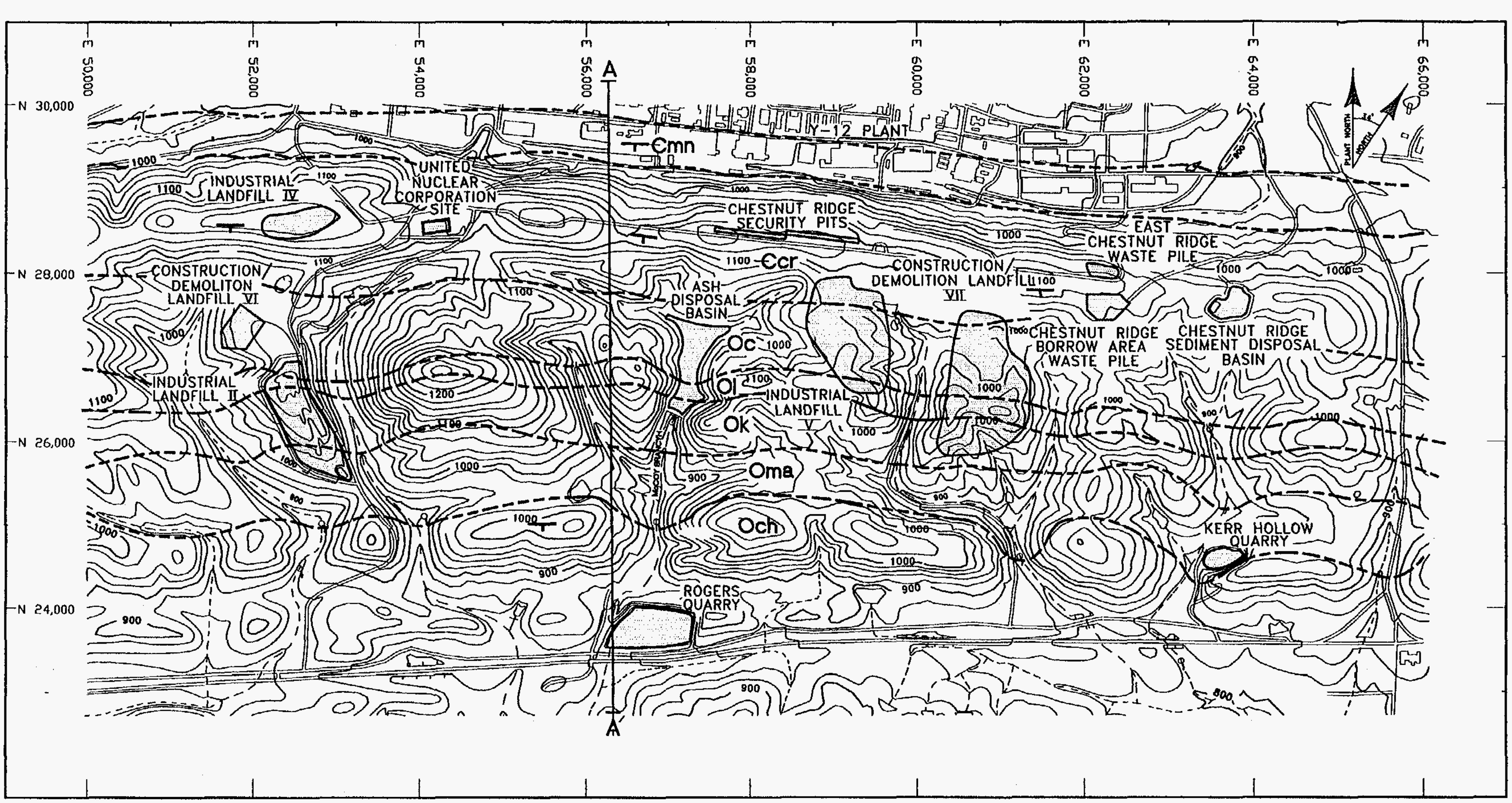
FIGURES



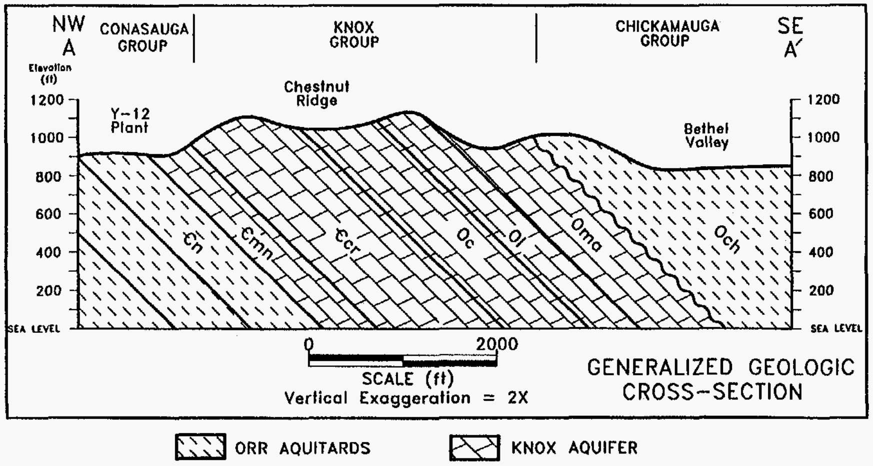
PREPARED FOR: *LOCKHEED MARTIN ENERGY SYSTEMS, INC.*	LOCATION:	Y-12 PLANT OAK RIDGE, TN.	**FIGURE 1**
PREPARED BY: *AJA TECHNICAL SERVICES, INC.*	DOC NUMBER:	97-D003	**HYDROGEOLOGIC REGIMES AT THE Y-12 PLANT**
	DWG ID.:	97-007	
	DATE:	5-10-97	



PREPARED FOR: *LOCKHEED MARTIN ENERGY SYSTEMS, INC.*	LOCATION:	Y-12 PLANT OAK RIDGE, TN.	FIGURE 2
PREPARED BY: *AJA TECHNICAL SERVICES, INC.*	DOC NUMBER:	97-D001	WASTE MANAGEMENT SITES IN THE CHESTNUT RIDGE REGIME
	DWG ID.:	97-006	
	DATE:	2-13-97	



SOURCES: King and Haase, 1987
Hatcher *et al.* 1992



GENERALIZED GEOLOGIC CROSS-SECTION

SYSTEM		HYDRO UNIT	GROUP	FORMATION	MAP SYMBOL	THICKNESS (FT)
ORDOVICIAN	UPPER	ORR AQUITARDS	CHICKA-MAUGA	UNDIFFERENTIATED	Och	1500 TO 2000
	MIDDLE	KNOX AQUIFER	KNOX	MISSING SECTION (Subaerial Erosion)		
	LOWER			MASCOT DOLOMITE	Oma	250-400
				KINGSPORT FORMATION	Ok	300-500
				LONGVIEW DOLOMITE	Ol	130-200
				CHEPULTEPEC DOLOMITE	Oc	500-700
CAMBRIAN	UPPER			COPPER RIDGE DOLOMITE	Ꞓcr	800-1,100
			CONASAUGA	MAYNARDVILLE LIMESTONE	Ꞓmn	418-450
	MIDDLE	ORR AQUITARDS		NOLICHUCKY SHALE	Ꞓn	490-590

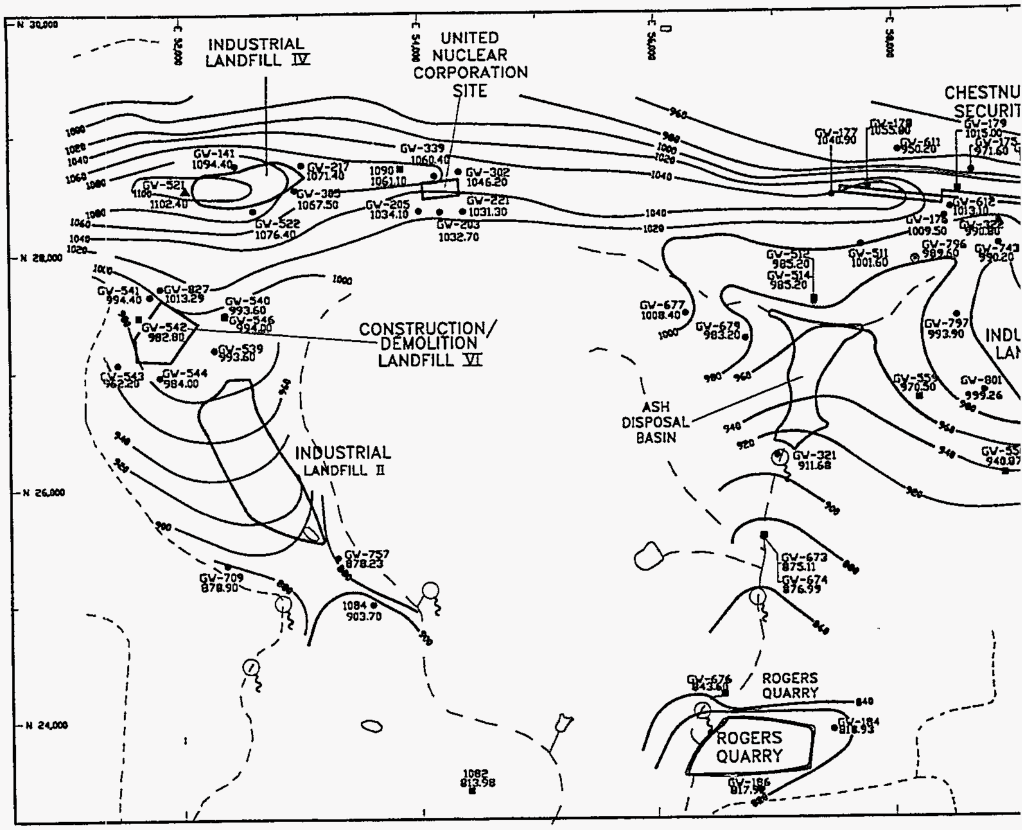
PREPARED FOR:
LOCKHEED MARTIN ENERGY SYSTEMS, INC.

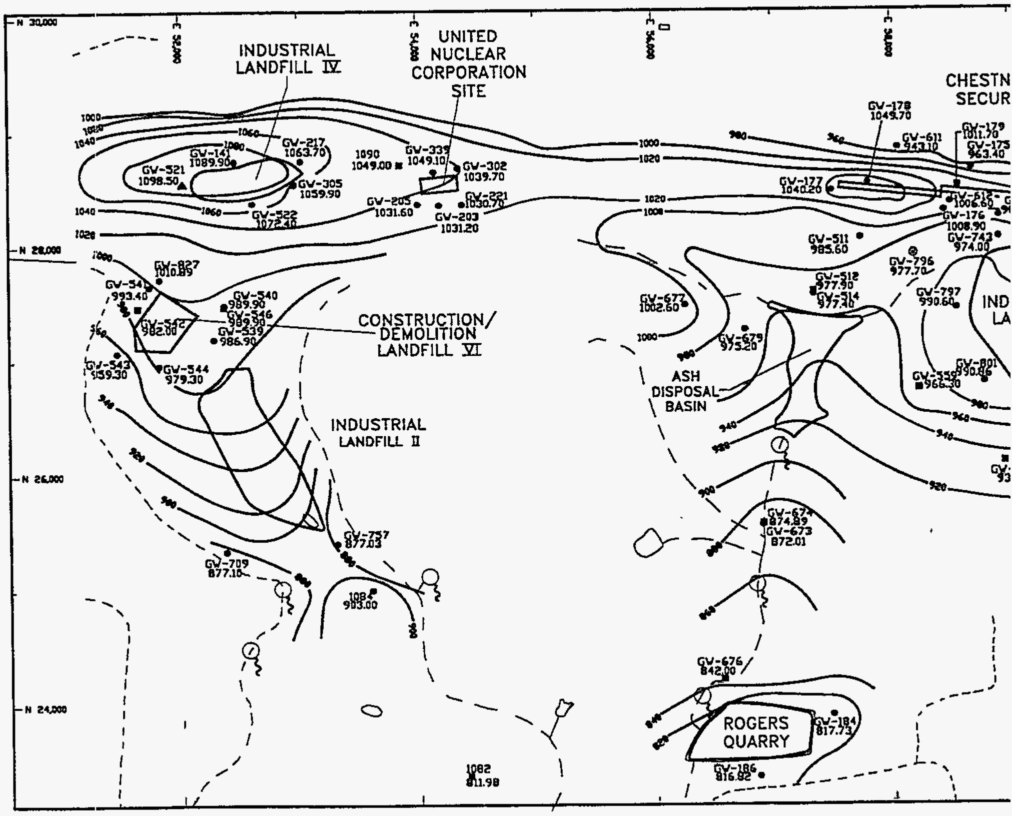
PREPARED BY:
AJA TECHNICAL SERVICES, INC.

LOCATION:	Y-12 PLANT OAK RIDGE, TN.
DOC NUMBER:	97-D001
DWG ID.:	97-005
DATE:	1-12-97

FIGURE 3

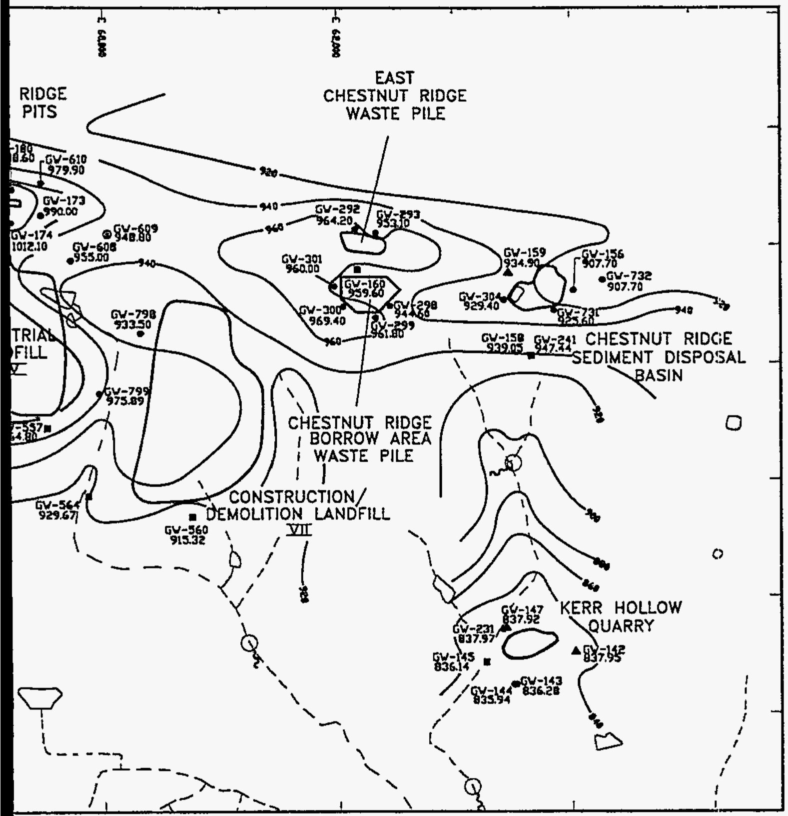
TOPOGRAPHY AND BEDROCK GEOLOGY IN THE CHESTNUT RIDGE REGIME



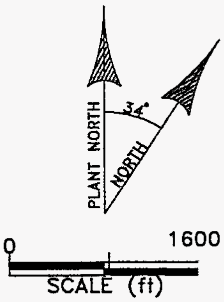


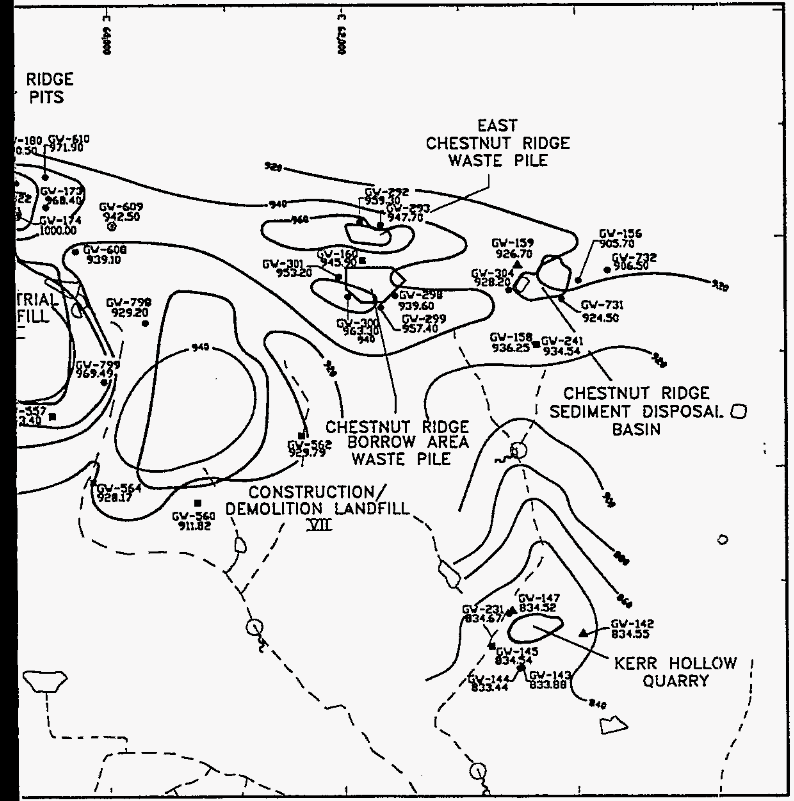
EXPLANATION

■	WATER TABLE MONITORING WELL
●	BEDROCK INTERVAL MONITORING WELL
⊗	RCRA POINT-OF-COMPLIANCE MONITORING WELL
▲	RCRA BACKGROUND/UPGRADIENT MONITORING WELL
—920—	WATER-LEVEL ISOPLETH (ft msl)
- - - -	SURFACE DRAINAGE FEATURE
♀	SPRING



GROUNDWATER ELEVATIONS
APRIL 1-4, 1996





GROUNDWATER ELEVATIONS
SEPTEMBER 30 - OCTOBER 7, 1996

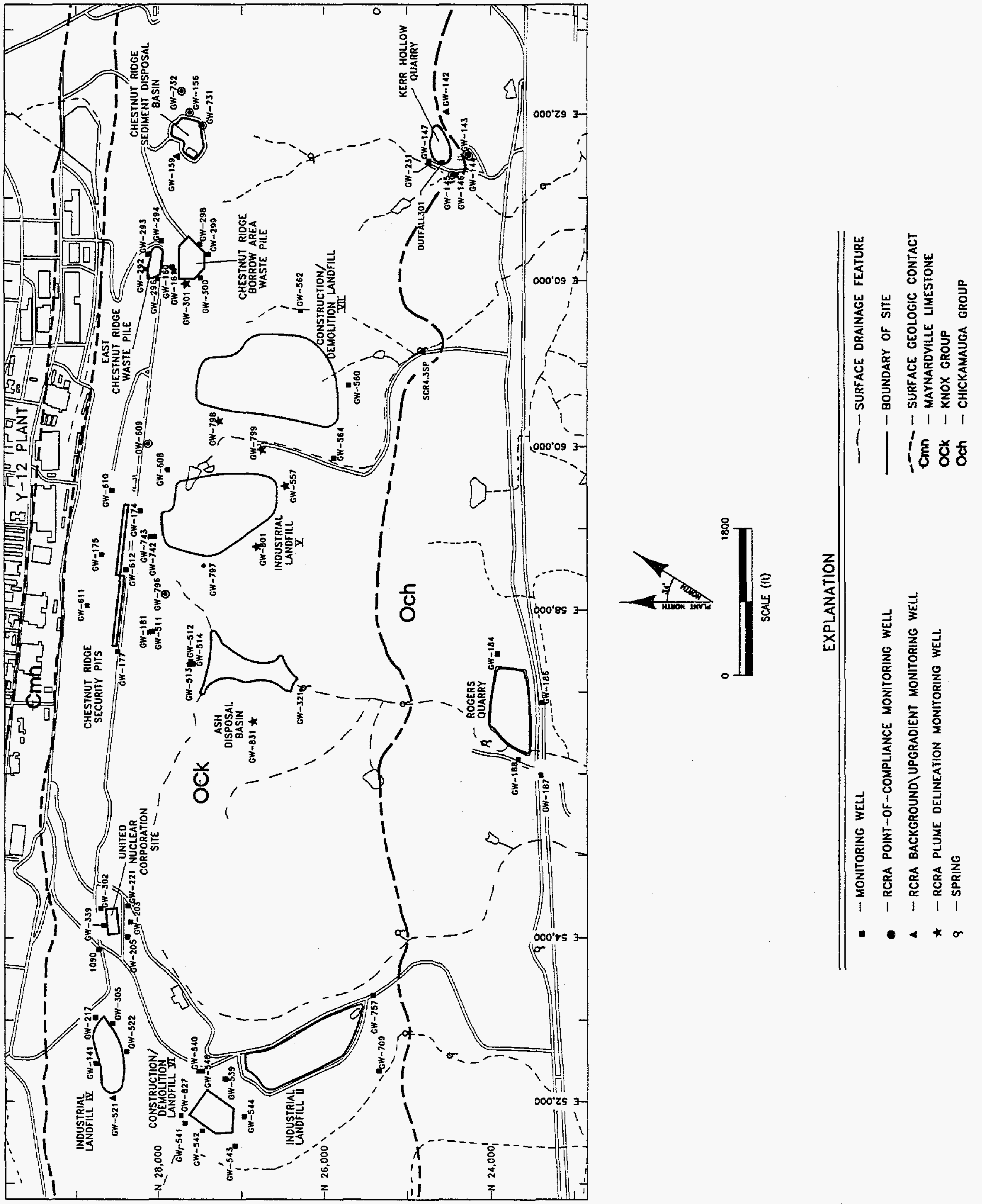
PREPARED FOR:
LOCKHEED MARTIN
ENERGY SYSTEMS, INC.

PREPARED BY:
AJA TECHNICAL
SERVICES, INC.

LOCATION:	Y-12 PLANT OAK RIDGE, TN.
DOC NUMBER:	97-001
DWG ID.:	97-002
DATE:	1-11-97

FIGURE 4

SEASONAL GROUNDWATER ELEVATIONS IN THE CHESTNUT RIDGE REGIME



PREPARED FOR:
LOCKHEED MARTIN ENERGY SYSTEMS, INC.

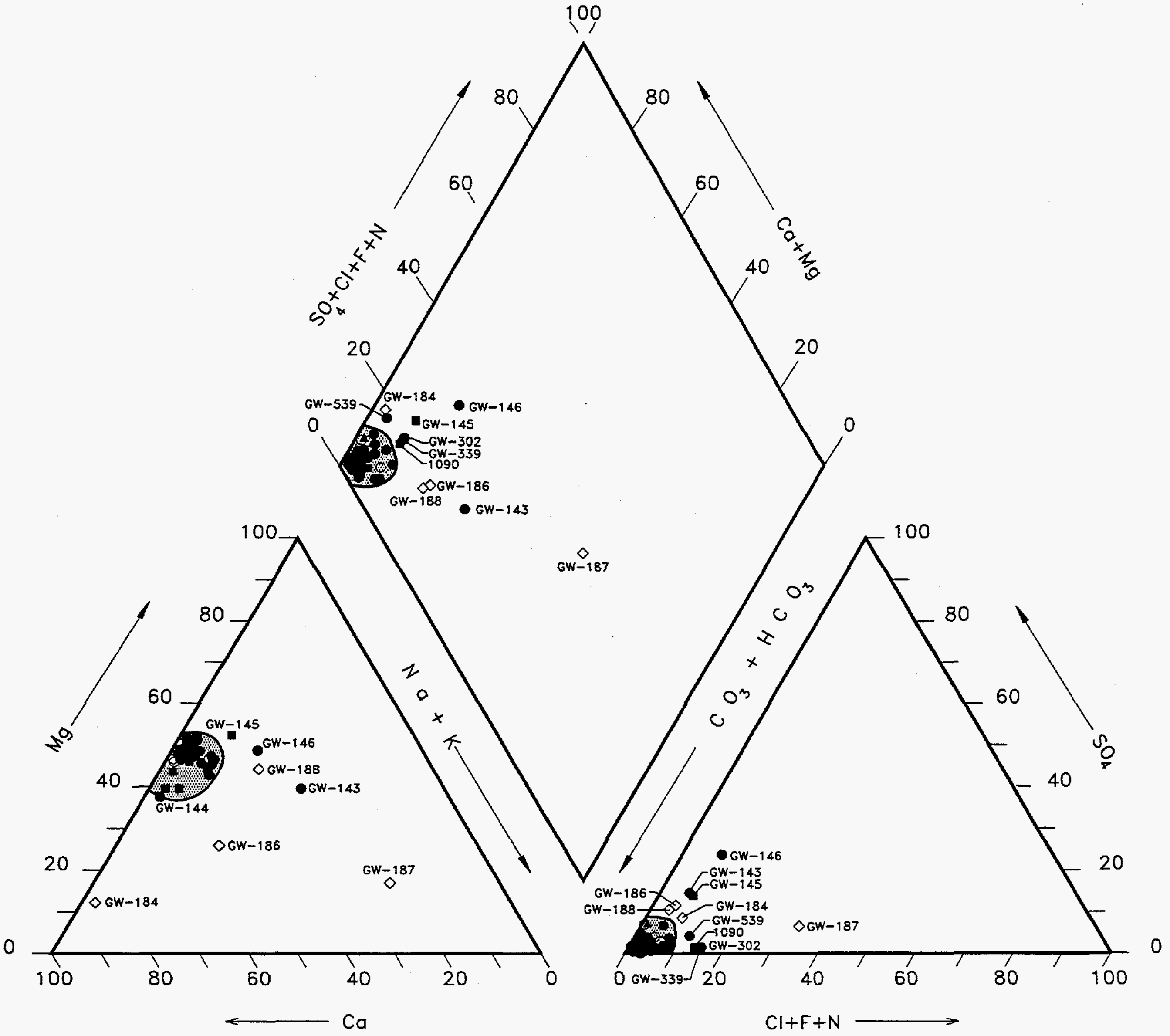
LOCATION: Y-12 PLANT OAK RIDGE, TN.

PREPARED BY:
AJA TECHNICAL SERVICES, INC.

DOC NUMBER: 97-D001
DWG ID.: 97-001
DATE: 2-12-97

FIGURE 5

CY 1996 GROUNDWATER AND SURFACE WATER SAMPLING LOCATIONS IN THE CHESTNUT RIDGE REGIME

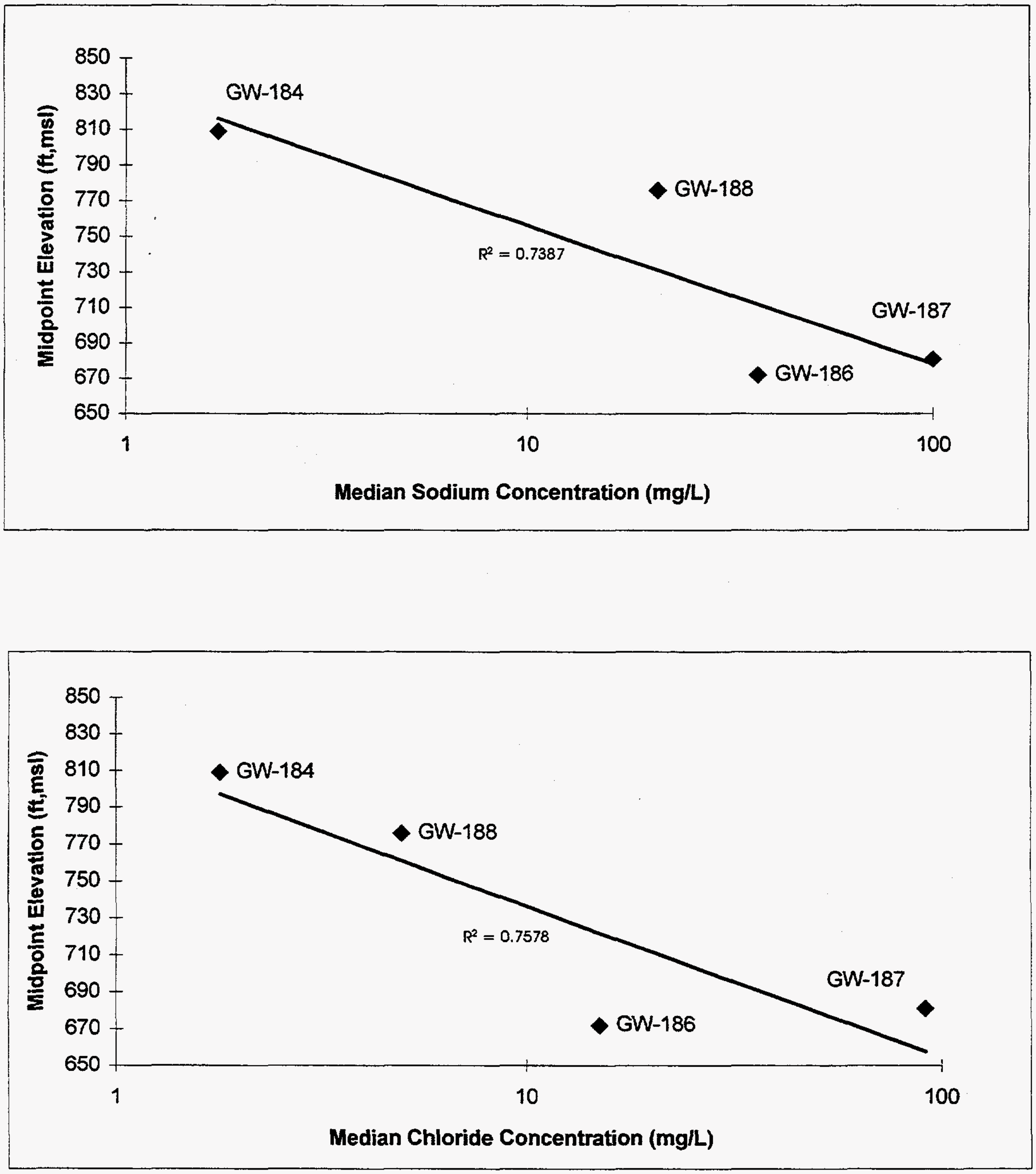


EXPLANATION

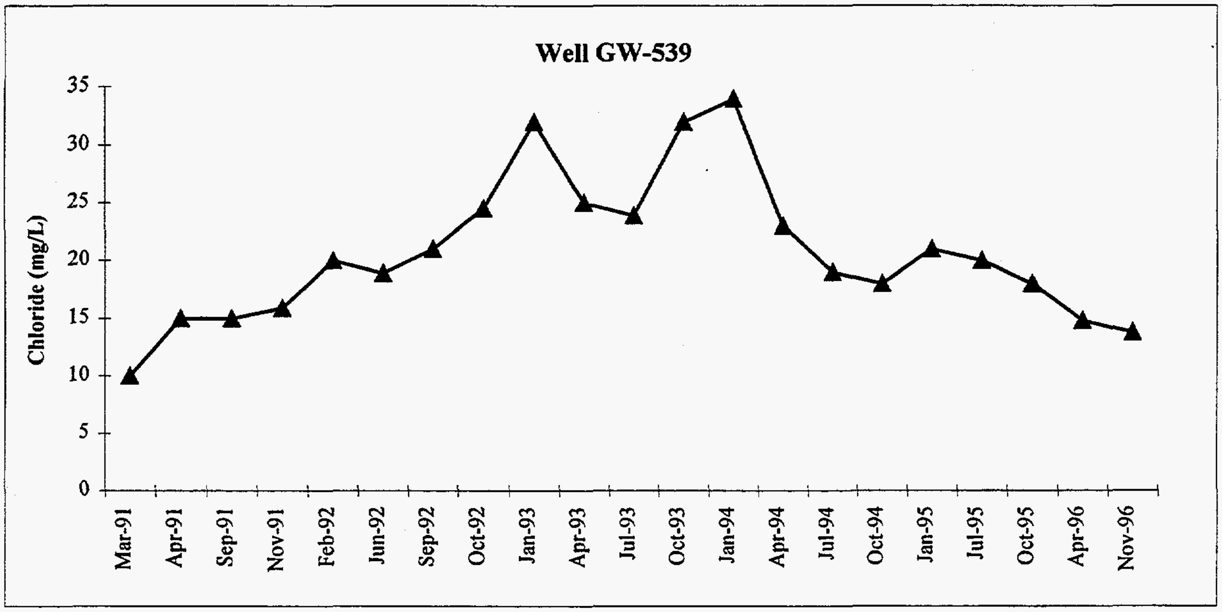
▨ — GROUNDWATER COMPOSITIONS CLUSTER IN THESE AREAS, 70 WELLS ARE PLOTTED ON THIS DIAGRAM

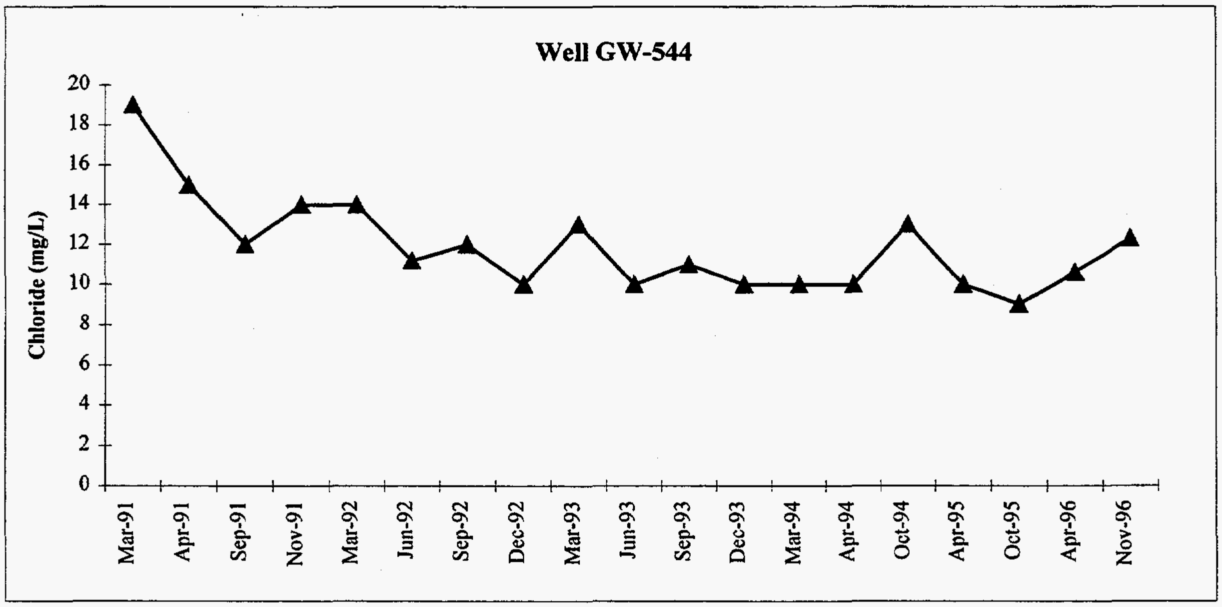
■ — WATER TABLE MONITORING WELL
○ — BEDROCK MONITORING WELL, LESS THAN 100 FT DEEP
● — BEDROCK MONITORING WELL, 100 TO 300 FT DEEP
▲ — BEDROCK MONITORING WELL, GREATER THAN 300 FT DEEP
— Knox Group
◇ — BEDROCK MONITORING WELL — Chickamauga Group

PREPARED FOR: *LOCKHEED MARTIN ENERGY SYSTEMS, INC.*	LOCATION:	Y-12 PLANT OAK RIDGE, TN.	**FIGURE 6**
PREPARED BY: *AJA TECHNICAL SERVICES, INC.*	DOC NUMBER:	97-D004	**PRINCIPAL ION CHEMISTRY OF CY 1996 GROUNDWATER SAMPLES**
	DWG ID.:	96-017	
	DATE:	5-28-97	

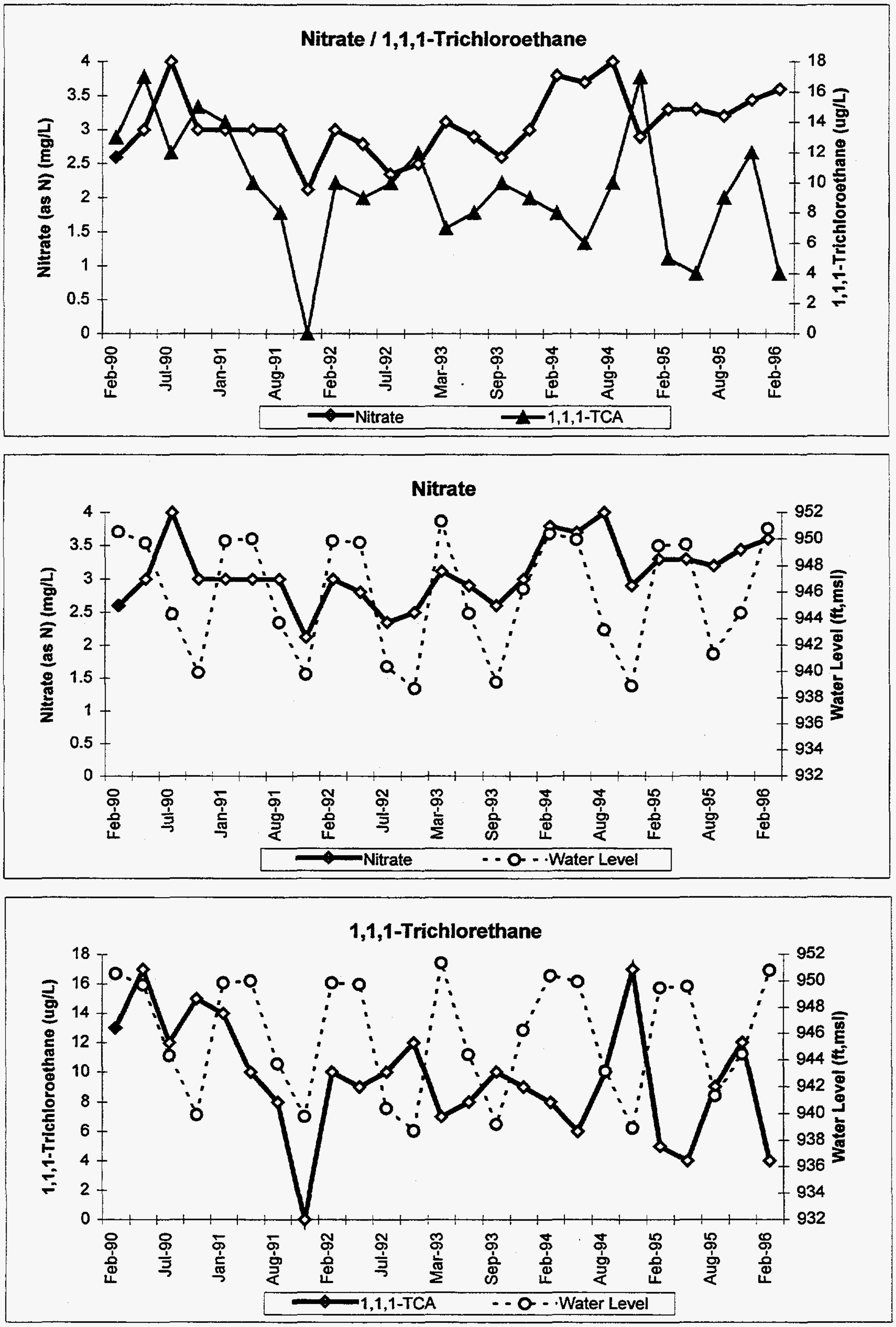


PREPARED FOR: *LOCKHEED MARTIN ENERGY SYSTEMS, INC.*	LOCATION:	Y-12 PLANT OAK RIDGE, TN.	**FIGURE 7**
PREPARED BY: *AJA TECHNICAL SERVICES, INC.*	DOC No.:	97-004	CHLORIDE AND SODIUM CONCENTRATIONS IN GROUNDWATER AT ROGERS QUARRY
	DWG ID.:	CR PT296	
	DATE:	8/20/97	



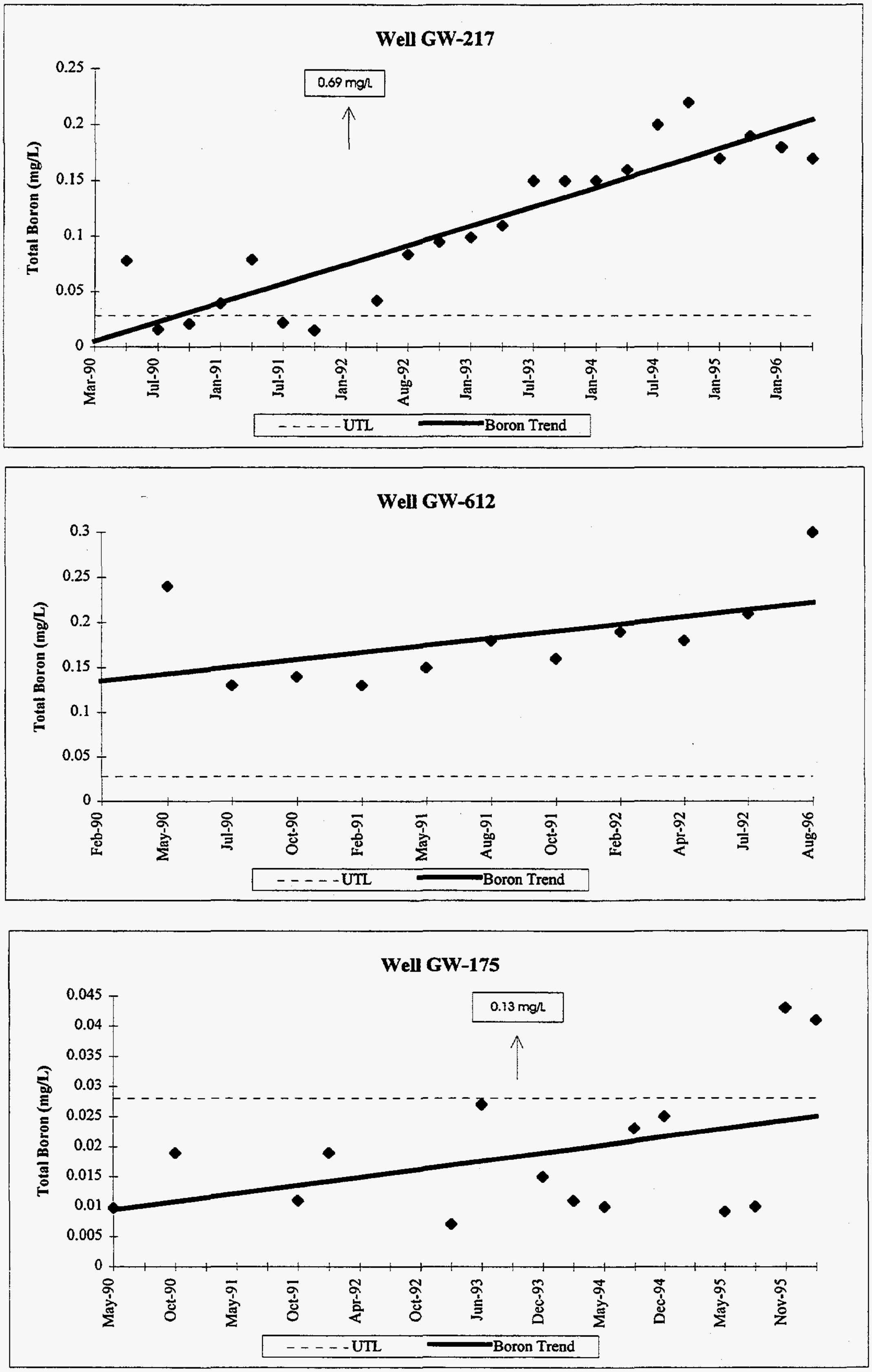


PREPARED FOR: *LOCKHEED MARTIN ENERGY SYSTEMS, INC.*	LOCATION:	Y-12 PLANT OAK RIDGE, TN.	FIGURE 8
PREPARED BY: *AJA TECHNICAL SERVICES, INC.*	DOC No.:	97-004	CHLORIDE CONCENTRATIONS IN GROUNDWATER AT WELLS GW-539 AND GW-544
	DWG ID.:	CR_PT296	
	DATE:	8/20/97	



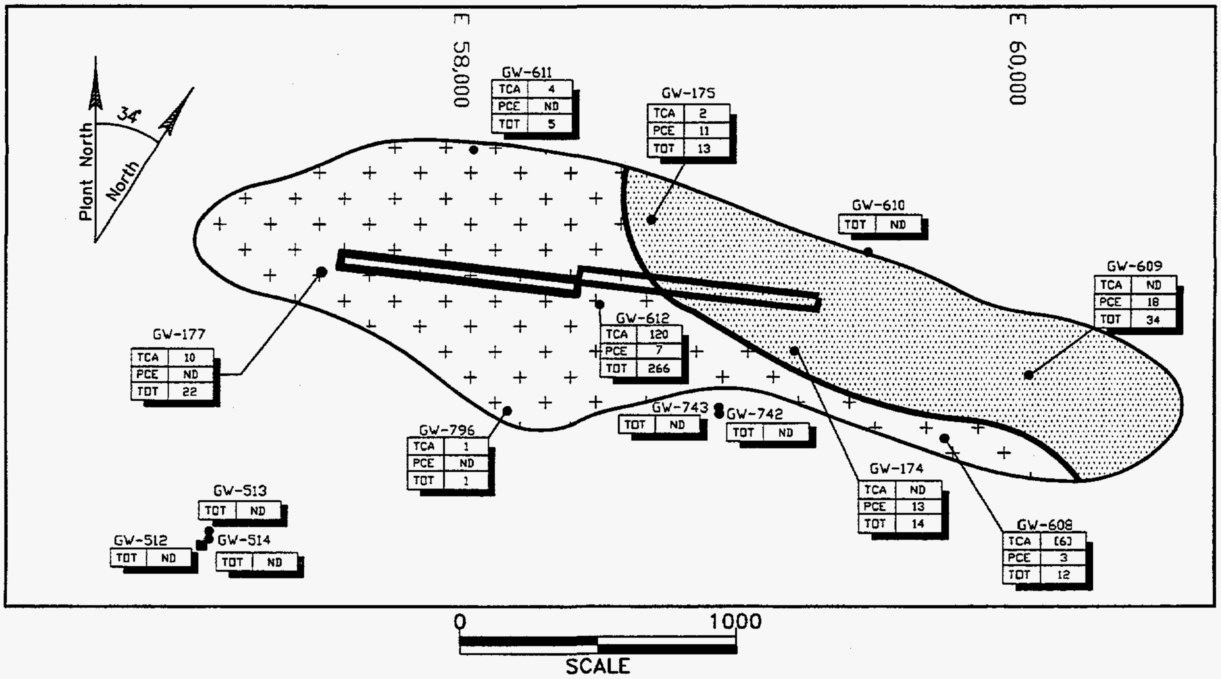
Notes: Nitrate MCL = 10 mg/L
1,1,1-TCA MCL = 200 ug/L

PREPARED FOR: *LOCKHEED MARTIN ENERGY SYSTEMS, INC.*	LOCATION:	Y-12 PLANT OAK RIDGE, TN.	**FIGURE 9**
PREPARED BY: *AJA TECHNICAL SERVICES, INC.*	DOC No.:	97-004	**NITRATE AND 1,1,1-TCA CONCENTRATIONS IN GROUNDWATER AT WELL GW-611**
	DWG ID.:	CR PT296	
	DATE:	8/20/97	



Note: Outlying observations (beyond the scale of the chart) are shown in boxes

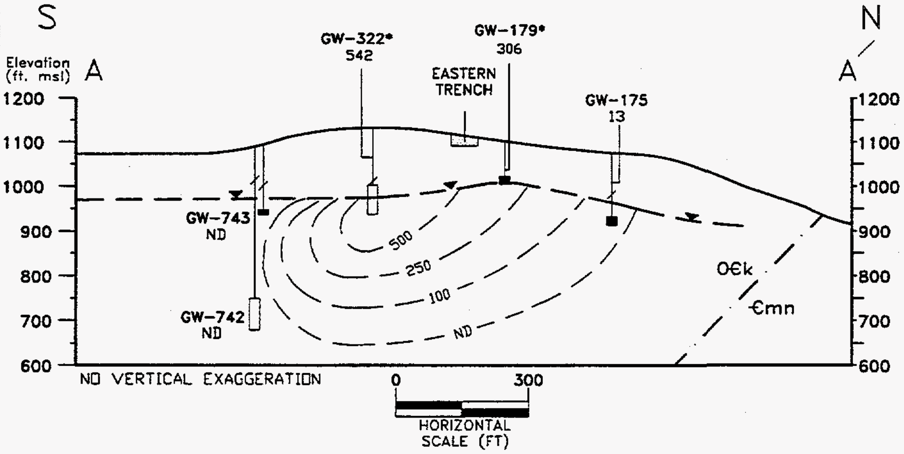
PREPARED FOR: *LOCKHEED MARTIN ENERGY SYSTEMS, INC.*	LOCATION:	Y-12 PLANT OAK RIDGE, TN.	FIGURE 10
PREPARED BY: *AJA TECHNICAL SERVICES, INC.*	DOC No.:	97-004	TOTAL BORON CONCENTRATIONS IN GROUNDWATER AT WELLS GW-175, GW-217, AND GW-612
	DWG ID.:	CR PT296	
	DATE:	8/20/97	

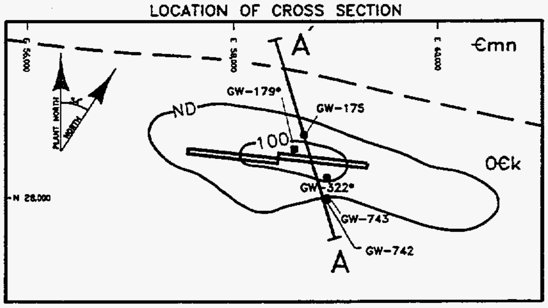


EXPLANATION

TCA — CY 1996 Maximum 1,1,1-Trichloroethane Concentration (ug/L)
PCE — CY 1996 Maximum Tetrachloroethene Concentration (ug/L)
TOT — CY 1996 Maximum Summed VOCs (ug/L)
ND — Not Detected

▨ — Choroethenes > 50% of TOT
+ — Chloroethanes > 50% of TOT
[6.6] — False Positive Result
● — Bedrock Monitoring Well





EXPLANATION

GW-177 - WELL NUMBER AND
24 - MAXIMUM CY 1996 CONCENTRATION
GW-322* - LAST SAMPLED IN CY 1992
ND - NOT DETECTED
—100— - APPROXIMATE LINE OF EQUAL CONCENTRATION (ug/L)

⸸ - TOP OF FRESH BEDROCK
■ - SCREENED WELL CONSTRUCTION
□ - OPEN-HOLE WELL CONSTRUCTION
—▼— - GROUNDWATER ELEVATION
— · — - APPROXIMATE GEOLOGIC CONTACT
O€k - KNOX GROUP
€mn - MAYNARDVILLE LIMESTONE

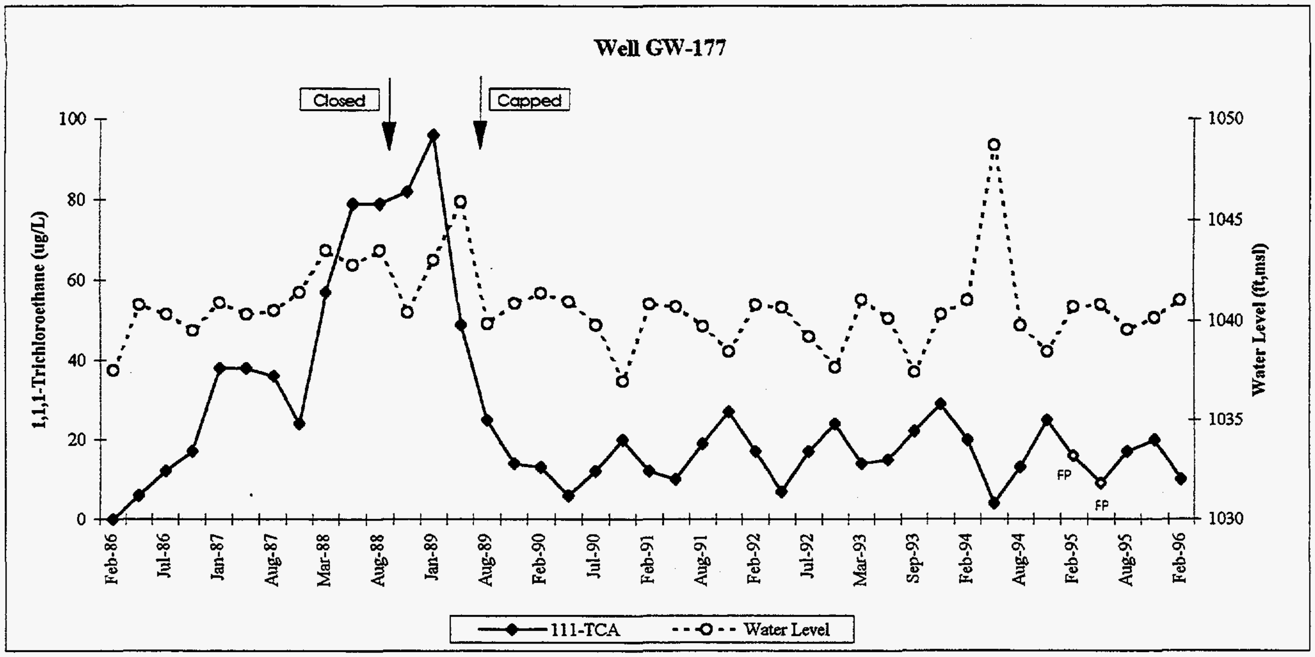
PREPARED FOR:
LOCKHEED MARTIN ENERGY SYSTEMS, INC.

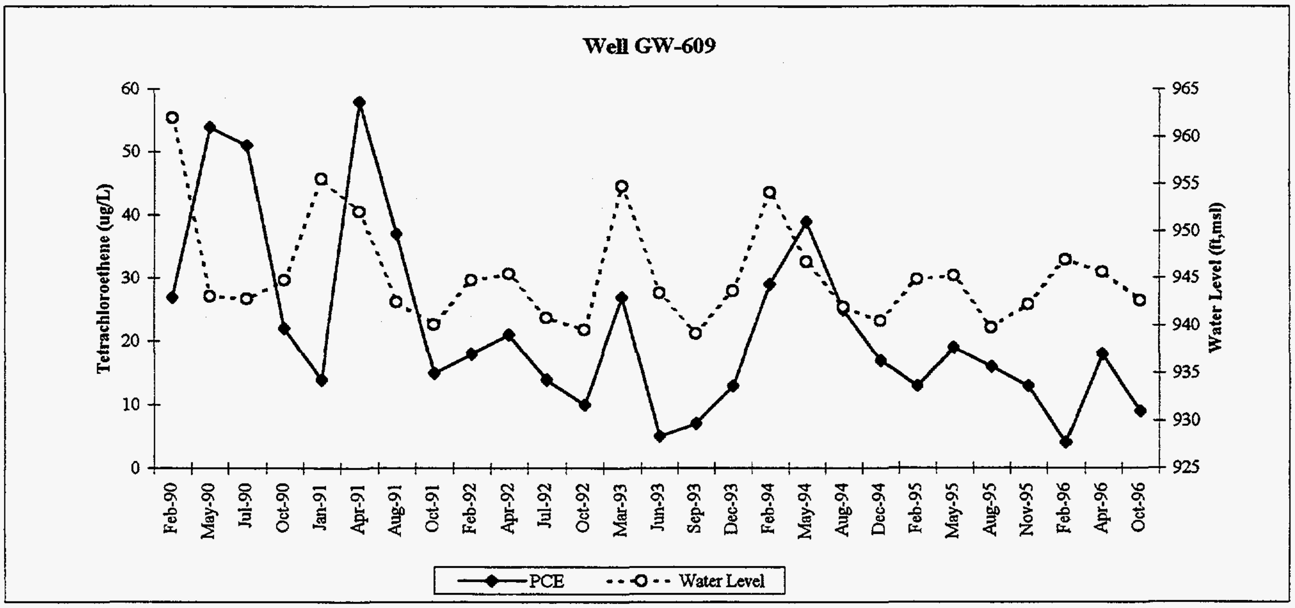
PREPARED BY:
AJA TECHNICAL SERVICES, INC.

LOCATION:	Y-12 PLANT OAK RIDGE, TN.
DOC NUMBER:	96-D001
DWG ID.:	96-015
DATE:	6-16-97

FIGURE 11

VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER AT THE SECURITY PITS





Notes: 1,1,1-TCA MCL = 200 ug/L
PCE MCL = 5 ug/L
FP = False Positive Result

PREPARED FOR:
LOCKHEED MARTIN ENERGY SYSTEMS, INC.

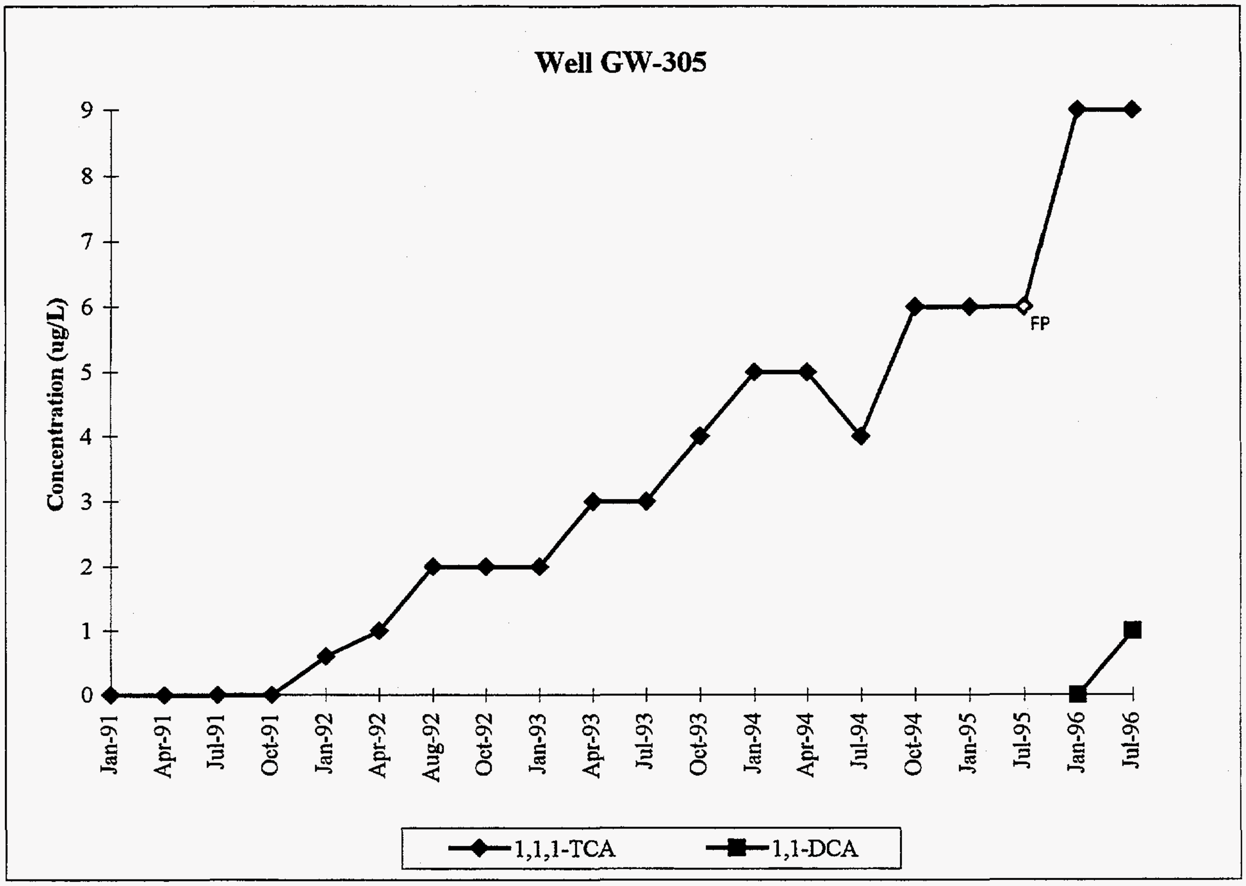
LOCATION: Y-12 PLANT OAK RIDGE, TN.

FIGURE 12

CONCENTRATIONS OF SELECTED VOCs IN GROUNDWATER AT WELLS GW-177 AND GW-609

PREPARED BY:
AJA TECHNICAL SERVICES, INC.

DOC No.: 97-004
DWG ID.: CR PT296
DATE: 8/20/97



Notes: 1,1,1-TCA MCL = 200 ug/L
1,1-DCA MCL = not applicable
FP = False Positive Result

PREPARED FOR: *LOCKHEED MARTIN ENERGY SYSTEMS, INC.*	LOCATION:	Y-12 PLANT OAK RIDGE, TN.	FIGURE 13
PREPARED BY: *AJA TECHNICAL SERVICES, INC.*	DOC No.:	97-004	CHLOROETHANE CONCENTRATIONS IN GROUNDWATER AT WELL GW-305
	DWG ID.:	CR PT296	
	DATE:	8/20/97	

APPENDIX B

TABLES

Table 1.
Waste Management Sites and Associated Groundwater Monitoring Programs in the Chestnut Ridge Regime

GROUNDWATER MONITORING PROGRAM						Best Management Practice Monitoring [5]	CERCLA Record of Decision Monitoring [4]	SWDF Detection Monitoring [3]	RCRA Interim Status Detection/RCRA Post-Closure Detection Monitoring [2]	RCRA Interim Status Assessment/RCRA Post-Closure Corrective Action Monitoring [1]
Waste Management Site	**Regulatory Classification**	**General Waste Inventory**	**Status**							
			Operation	**Active**	**Closed**					
Chestnut Ridge Sediment Disposal Basin (CRSDB)	RCRA/ CERCLA	Approximately 11,100 yd^3 of sediments from the Y-12 Plant containing heavy metals; approximately 100,000 gallons of methanol-brine waste (70/30% water/methyl alcohol); and 55-110 gallons of toluene.	1973-1987		●				●	
East Chestnut Ridge Waste Pile (ECRWP)	RCRA/ CERCLA	Contaminated soil from the Y-12 Plant.	1987		●	●				
Kerr Hollow Quarry (KHQ)	RCRA/ CERCLA	Approximately 50 tons of water-reactive materials (alkali metals, metal hydrides); unstable organic materials (picric acid, ethers, peroxides, and hydrazone); reactive metals (phosphorous and magnesium); potentially explosive materials (e.g., gas cylinders); ammonia; and inorganic acids.	1951-1988		●		●		●	
Chestnut Ridge Security Pits (CRSP)	RCRA/ CERCLA	Metals (lead); reactive materials (lithium compounds, zirconium); corrosive materials (acids); ignitable materials (alcohols); and chlorinated solvents.	1973-1988		●	●				●
Ash Disposal Basin (ADB), alias Filled Coal Ash Pond	CERCLA	Coal fly-ash slurry from the Y-12 Steam Plant.	1955-1967		●	●				
United Nuclear Corporation Site (UNCS)	CERCLA	Approximately 11,000 drums (55-gallon) of sludge fixed in cement, 18,000 drums of contaminated soil, and 288 boxes of contaminated process and demolition material.	1982-1984		●		●			
Rogers Quarry (RQ)	CERCLA	Coal fly-ash slurry that bypassed the Ash Disposal Basin via spillway into McCoy Branch.	1967-1993		●	●				

Table 1 (cont'd)

GROUNDWATER MONITORING PROGRAM						Best Management Practice Monitoring [5]	CERCLA Record of Decision Monitoring [4]	SWDF Detection Monitoring [3]	RCRA Interim Status Detection/RCRA Post-Closure Detection Monitoring [2]	RCRA Interim Status Assessment/RCRA Post-Closure Corrective Action Monitoring [1]
Waste Management Site	**Regulatory Classification**	**General Waste Inventory**	**Status**							
			Operation	**Active**	**Closed**					
Chestnut Ridge Borrow Area Waste Pile (CRBAWP)	CERCLA	Soils removed from the Oak Ridge Civic Center properties and the Oak Ridge Sewer Line Beltway contaminated with mercury and other metals, and possibly some organic compounds, that originated from the Y-12 Plant.	Mid-1980		●	●				
Industrial Landfill II (LII)	SWDF	Combustible and decomposable solid waste and construction spoil material including scrap metal, glass, paper products, plastics, wood, organic garbage, textile products, asphalt roofing materials, and special wastes such as asbestos and beryllium compounds.	1986-1996		●			●		
Industrial Landfill IV (LIV)	SWDF	Approximately 12,000 ft^3 per year of non-hazardous, nonradioactive industrial wastes including: cardboard, plastics, rubber, scrap metal, wood, paper, and special waste.	1989-	●				●		
Industrial Landfill V (LV)	SWDF	Combustible/decomposable solid wastes.	1994-	●				●		
Construction/Demolition Landfill VI (CDLVI)	SWDF	Construction spoil: concrete, wood, metal, plastic, roofing materials; soil.	1994-	●				●		
Construction/Demolition Landfill VII (CDLVII)	SWDF	No wastes emplaced to date.	1994					●		

Notes:

1 Groundwater quality assessment monitoring in accordance with Resource Conservation and Recovery Act (RCRA) interim status regulations, and RCRA post-closure corrective action monitoring per the requirements specified in the RCRA Post-Closure Permit for the Chestnut Ridge Regime.

Table 1 (cont'd)

Notes: (cont'd)

2 Detection monitoring in accordance with RCRA interim status regulations, and RCRA post-closure detection monitoring per the applicable requirements of the RCRA Post-Closure Permit for the Chestnut Ridge Regime.

3 Detection monitoring in accordance with operating permits issued by the Tennessee Department of Environment and Conservation for the specified non-hazardous solid waste disposal facility (SWDF) and applicable TDEC solid waste management regulations.

4 Monitoring in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Record of Decision for the specified facility.

5 Monitoring performed as a best management practice of the Y-12 Plant Groundwater Protection Program.

Table 2.
Depth-to-Water Measurements and Water-Level Elevations for Selected Monitoring Wells in the Chestnut Ridge Regime

Well No.[1]	Location[2]	Measuring Point Elevation [3] (ft msl)	Depth-to-Water (ft below Top of Well Casing)		Seasonal Fluctuation (+/- ft)	Water-Level Elevation (ft above mean sea level)	
			April 1 -9, 1996	September 30 - October 7, 1996		April 1 - 9, 1996	September 30 - October 7, 1996
1082	ORSF	837.28	23.3	25.3	-2.0	813.98	811.98
1084	ORSF	965.40	61.7	62.4	-0.7	903.70	903.00
1090	UNCS	1103.88	42.8	54.9	-12.1	1061.10	1049.00
GW-141	LIV	1186.06	91.7	96.2	-4.5	1094.40	1089.90
GW-142	KHQ	970.35	132.4	135.8	-3.4	837.95	834.55
GW-143	KHQ	913.18	76.9	79.3	-2.4	836.28	833.88
GW-144	KHQ	913.34	77.4	79.9	-2.5	835.94	833.44
GW-145	KHQ	840.04	3.9	5.5	-1.6	836.14	834.54
GW-147	KHQ	851.62	13.7	17.1	-3.4	837.92	834.52
GW-156	CRSDB	1049.13	141.4	143.4	-2.0	907.70	905.70
GW-158	CRSDB	983.05	44	46.8	-2.8	939.05	936.25
GW-159	CRSDB	1051.15	116.3	124.5	-8.2	934.90	926.70
GW-160	CRBAWP	1093.09	133.5	147.2	-13.7	959.60	945.90
GW-161	CRBAWP	1093.54	155.4	160.8	-5.4	938.10	932.70
GW-165	CRDT	1091.37	76.7	96.4	-19.7	1014.70	995.00
GW-166	CRDT	1093.29	79.2	98.6	-19.4	1014.10	994.70
GW-173	CRSP	1115.00	125	146.6	-21.6	990.00	968.40
GW-174	CRSP	1116.52	104.4	116.5	-12.1	1012.10	1000.00
GW-175	CRSP	1084.00	112.4	120.6	-8.2	971.60	963.40
GW-176	CRSP	1125.27	115.8	116.4	-0.6	1009.50	1008.90
GW-177	CRSP	1157.95	117.1	117.8	-0.7	1040.90	1040.20
GW-178	CRSP	1143.49	87.7	93.8	-6.1	1055.80	1049.70
GW-179	CRSP	1128.00	113	116.3	-3.3	1015.00	1011.70
GW-180	CRSP	1103.97	95.4	113.5	-18.1	1008.60	990.50
GW-184	RQ	927.63	108.7	109.9	-1.2	818.93	817.73
GW-186	RQ	831.32	13.4	14.5	-1.1	817.92	816.82
GW-203	UNCS	1105.26	72.6	74.1	-1.5	1032.70	1031.20
GW-205	UNCS	1103.97	69.9	72.4	-2.5	1034.10	1031.60
GW-217	LIV	1176.86	105.5	113.2	-7.7	1071.40	1063.70
GW-221	UNCS	1106.00	74.7	75.3	-0.6	1031.30	1030.70
GW-231	KHQ	849.47	11.5	14.8	-3.3	837.97	834.67
GW-241	CRSDB	982.64	35.2	48.1	-12.9	947.44	934.54
GW-292	ECRWP	1073.00	108.8	113.7	-4.9	964.20	959.30

Table 2 (cont'd)

Well No.[1]	Location[2]	Measuring Point Elevation [3] (ft msl)	Depth-to-Water (ft below Top of Well Casing)		Seasonal Fluctuation (+/- ft)	Water-Level Elevation (ft above mean sea level)	
			April 1 -9, 1996	September 30 - October 7, 1996		April 1 - 9, 1996	September 30 - October 7, 1996
GW-293	ECRWP	1063.90	110.8	116.2	-5.4	953.10	947.70
GW-298	CRBAWP	1049.01	104.4	109.4	-5.0	944.60	939.60
GW-299	CRBAWP	1053.86	92.1	96.5	-4.4	961.80	957.40
GW-300	CRBAWP	1073.12	103.7	109.8	-6.1	969.40	963.30
GW-301	CRBAWP	1086.38	126.4	133.2	-6.8	960.00	953.20
GW-302	UNCS	1141.67	95.5	102	-6.5	1046.20	1039.70
GW-303	CRSDB	1007.16	83	88.1	-5.1	924.20	919.10
GW-304	CRSDB	1045.49	116.1	117.3	-1.2	929.40	928.20
GW-305	LIV	1183.55	116.1	123.7	-7.6	1067.50	1059.90
GW-321	ADB	925.58	13.9	NM [4]	.	911.68	.
GW-322	CRSP	1134.25	143.5	154.3	-10.8	990.80	980.00
GW-339	UNCS	1124.59	64.2	75.5	-11.3	1060.40	1049.10
GW-511	CRSP	1093.21	91.6	107.6	-16.0	1001.60	985.60
GW-512	ADB	1001.54	16.3	23.6	-7.3	985.20	977.90
GW-514	ADB	1001.22	16	23.8	-7.8	985.20	977.40
GW-521	LIV	1182.68	80.3	84.2	-3.9	1102.40	1098.50
GW-522	LIV	1175.31	98.9	102.9	-4.0	1076.40	1072.40
GW-539	LII	1093.00	99.4	106.1	-6.7	993.60	986.90
GW-540	CDLVI	1072.12	78.5	82.2	-3.7	993.60	989.90
GW-541	CDLVI	1058.40	64	65	-1.0	994.40	993.40
GW-542	CDLVI	1051.60	68.8	69.6	-0.8	982.80	982.00
GW-543	CDLVI	1023.80	61.6	64.5	-2.9	962.20	959.30
GW-544	CDLVI	1044.99	61	65.7	-4.7	984.00	979.30
GW-546	CDLVI	1072.21	78.2	82.3	-4.1	994.00	989.90
GW-557	LV	1081.16	116.4	117.8	-1.4	964.80	963.40
GW-558	SSCR	983.97	43.1	48.2	-5.1	940.87	935.77
GW-559	SSCR	1102.79	132.3	136.5	-4.2	970.50	966.30
GW-560	CDLVII	938.92	23.6	27.1	-3.5	915.32	911.82
GW-562	CDLVII	934.49	NM	4.7	.	.	929.79
GW-564	CDLVII	937.77	8.1	9.6	-1.5	929.67	928.17
GW-608	CRSP	1073.95	119	134.9	-15.9	955.00	939.10
GW-609	CRSP	1112.11	163.3	169.6	-6.3	948.80	942.50
GW-610	CRSP	1059.44	79.5	87.5	-8.0	979.90	971.90
GW-611	CRSP	1048.38	98.2	105.3	-7.1	950.20	943.10
GW-612	CRSP	1131.03	117.9	124.4	-6.5	1013.10	1006.60

Table 2 (cont'd)

			Depth-to-Water (ft below Top of Well Casing)			Water-Level Elevation (ft above mean sea level)	
Well No.[1]	Location[2]	Measuring Point Elevation [3] (ft msl)	April 1 -9, 1996	September 30 - October 7, 1996	Seasonal Fluctuation (+/- ft)	April 1 - 9, 1996	September 30 - October 7, 1996
GW-673	ADB	882.01	6.9	10	-3.1	875.11	872.01
GW-674	ADB	883.79	6.8	8.9	-2.1	876.99	874.89
GW-676	ADB	846.50	2.9	4.5	-1.6	843.60	842.00
GW-677	ADB	1030.40	22	27.8	-5.8	1008.40	1002.60
GW-679	ADB	1026.86	43.7	51.7	-8.0	983.20	975.20
GW-709	LII	906.60	27.7	29.5	-1.8	878.90	877.10
GW-731	CRSDB	1049.18	123.6	124.7	-1.1	925.60	924.50
GW-732	CRSDB	1064.09	156.4	157.6	-1.2	907.70	906.50
GW-743	CRSP	1100.36	110.2	126.4	-16.2	990.20	974.00
GW-757	LII	961.43	83.2	84.4	-1.2	878.23	877.03
GW-796	LV	1052.42	62.8	74.7	-11.9	989.60	977.70
GW-797	LV	1059.80	65.9	69.2	-3.3	993.90	990.60
GW-798	CDLVII	1000.30	72.3	76.6	-4.3	933.50	929.20
GW-799	CDLVII	981.09	5.2	11.6	-6.4	975.89	969.49
GW-801	LV	1096.96	97.7	106.1	-8.4	999.26	990.86
GW-827	CDLVI	1051.39	38.1	40.5	-2.4	1013.29	1010.89

Notes:

1 Bold typeface denotes wells sampled during CY 1996.

2 ADB - Ash Disposal Basin (alias Filled Coal Ash Pond)
CDLVI - Construction/Demolition Landfill VI
CDLVII - Construction/Demolition Landfill VII
CRBAWP - Chestnut Ridge Borrow Area Waste Pile
CRDT - Chestnut Ridge/Deer Trap #10
CRSDB - Chestnut Ridge Sediment Disposal Basin
CRSP - Chestnut Ridge Security Pits
ECRWP - East Chestnut Ridge Waste Pile
KHQ - Kerr Hollow Quarry
LII - Industrial Landfill II
LIV - Industrial Landfill IV
LV - Industrial Landfill V
ORSF - Oak Ridge Sludge Farm

Table 2 (cont'd)

Notes: (cont'd)

RQ - Rogers Quarry
SSCR - South Side Chestnut Ridge
UNCS - United Nuclear Corporation Site

3 Measuring point (top of well casing) elevation (ft above mean sea level) as reported in Jones et al. (1995).

4 NM - Not Measured

Table 3.
CY 1996 Sampling Dates for Monitoring Wells and Springs in the Chestnut Ridge Regime

						Groundwater Monitoring Program[1]				
Sampling Point	Sampling Location [2]	Sampling Date [3]				Best Management Practice Monitoring	CERCLA Record of Decision Monitoring	SWDF Detection Monitoring	RCRA Interim Status (▲)/Post-Closure Detection Monitoring (●)	RCRA Interim Status Assessment (▲)/RCRA Post-Closure Corrective Action Monitoring (●)
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter					
1090	UNCS	.	04/23/96	.	10/30/96		●			
GW-141	LIV	01/04/96	.	07/02/96	.			●		
GW-142	KHQ	01/04/96	04/17/96	.	10/21 - 24/96				▲ ●	
GW-143	KHQ	01/18/96	04/23/96	.	10/21 - 24/96				▲ ●	
GW-144	KHQ	01/22/96	04/24/96	.	10/21 - 24/96				▲ ●	
GW-145	KHQ	01/23/96	04/25/96	.	10/21 - 24/96				▲ ●	
GW-146	KHQ	01/18/96	04/25/96	.	.				▲	
GW-147	KHQ	01/10/96	04/18/96	.	.				▲	
GW-156	CRSDB	.	05/13 - 17/96	.	10/14 - 17/96				●	
GW-159	CRSDB	.	05/13 - 17/96	.	10/14 - 17/96				●	
GW-160	CRBAWP	.	04/29/96	.	.	●				
GW-161	CRBAWP	.	04/26/96	.	.	●				
GW-174	CRSP	.	.	08/19/96	.	●				
GW-175	CRSP	02/25/96	.	.	.					▲
GW-177	CRSP	02/25/96	.	.	.					▲
GW-184	RQ	.	04/30/96	.	.	●				
GW-186	RQ	.	05/01/96	.	.	●				
GW-187	RQ	.	04/30/96	.	.	●				
GW-188	RQ	.	04/30/96	.	.	●				
GW-203	UNCS	.	04/17/96	.	10/28/96		●			
GW-205	UNCS	.	04/19/96	.	10/28/96		●			
GW-217	LIV	01/03/96	.	07/01/96	.			●		
GW-221	UNCS	.	04/22/96	.	10/29/96		●			
GW-231	KHQ	01/10/96	04/18/96	.	10/21 - 24/96				▲ ●	
GW-292	ECRWP	.	05/08/96	.	.	●				
GW-293	ECRWP	.	05/08/96	.	.	●				
GW-294	ECRWP	.	05/02/96	.	.	●				
GW-296	ECRWP	.	05/02/96	.	.	●				

Table 3 (cont'd)

Groundwater Monitoring Program[1]						Best Management Practice Monitoring	CERCLA Record of Decision Monitoring	SWDF Detection Monitoring	RCRA Interim Status (▲)/Post-Closure Detection Monitoring (●)	RCRA Interim Status Assessment (▲)/RCRA Post-Closure Corrective Action Monitoring (●)
Sampling Point	Sampling Location[2]	Sampling Date[3]								
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter					
GW-298	CRBAWP	.	05/01/96	.	.	●				
GW-299	CRBAWP	.	04/30/96	.	.	●				
GW-300	CRBAWP	.	04/30/96	.	.	●				
GW-301	CRBAWP	.	04/30/96	.	10/01/96	●				●
GW-302	UNCS	.	04/23/96	.	10/30/96		●			
GW-305	LIV	01/17/96	.	07/08/96	.			●		
GW-321	ADB	.	04/29/96	.	.	●				
GW-339	UNCS	.	04/22/96	.	10/29/96		●			
GW-512	ADB	.	05/02/96	.	.	●				
GW-513	ADB	.	04/29/96	.	.	●				
GW-514	ADB	.	05/03/96	.	.	●				
GW-521	LIV	01/16/96	04/16/96	07/02/96	10/01/96			●		●
GW-522	LIV	01/17/96	.	07/08/96	.			●		
GW-539	LII	.	04/02/96	.	11/04/96			●		
GW-540	CDLVI	.	04/09/96	.	.			●		
GW-541	CDLVI	.	04/15/96	.	.			●		
GW-542	CDLVI	.	04/16/96	.	11/05/96			●		
GW-543	CDLVI	.	04/16/96	.	11/06/96			●		
GW-544	CDLVI	.	04/16/96	.	11/06/96			●		
GW-546	CDLVI	.	04/09/96	.	.			●		
GW-557	LV	.	04/04/96	06/03/96	10/02/96			●		●
GW-560	CDLVII	.	04/02/96	06/03/96	10/02/96			●		
GW-562	CDLVII	.	04/02/96	06/03/96	10/02/96 11/25/96			●		
GW-564	CDLVII	.	04/04/96	.	10/03/96			●		
GW-608	CRSP	01/29/96	.	.	.					▲
GW-609	CRSP	02/25/96	04/16/96	.	10/07/96					▲ ●
GW-610	CRSP	02/23/96	.	.	.					▲
GW-611	CRSP	02/25/96	.	.	.					▲
GW-612	CRSP	.	.	08/29/96	.	●				
GW-709	LII	.	04/02/96	.	11/05/96			●		
GW-731	CRSDB	.	05/13-17/96	.	10/14 - 17/96				●	
GW-732	CRSDB	.	05/13-17/96	.	10/14 - 17/96				●	

Table 3 (cont'd)

Groundwater Monitoring Program[1]						Best Management Practice Monitoring	CERCLA Record of Decision Monitoring	SWDF Detection Monitoring	RCRA Interim Status (▲)/Post-Closure Detection Monitoring (●)	RCRA Interim Status Assessment (▲)/RCRA Post-Closure Corrective Action Monitoring (●)
Sampling Point	Sampling Location[2]	Sampling Date[3]								
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter					
GW-742	CRSP	02/01/96	.	.	.					▲
GW-743	CRSP	02/23/96	.	.	.					▲
GW-757	LII	.	04/04/96	.	11/05/96			●		
GW-796	LV	.	04/10/96	.	10/03/96			●		●
GW-797	LV	.	04/09/96	.	10/03/96			●		
GW-798	CDLVII	.	04/09/96	.	10/03/96			●		●
GW-799	CDLVII	.	04/08/96	.	10/02/96			●		●
GW-801	LV	.	04/10/96	.	10/07/96			●		●
GW-827	CDLVI	.	04/16/96	.	11/05/96			●		
GW-831	ADB	.	.	08/27/96	10/01/96					●
SCR4.3SP	LV	.	04/11/96	.	10/07/96			●		
OUTFALL 301	KHQ	03/13/96	.	08/06/96	.		●			

Notes:

1 See Table 4 for list of field measurements and laboratory analytes associated with each monitoring program.

2 ADB - Ash Disposal Basin (alias Filled Coal Ash Pond)
CDLVI - Construction/Demolition Landfill VI
CDLVII - Construction/Demolition Landfill VII
CRBAWP - Chestnut Ridge Borrow Area Waste Pile
CRSDB - Chestnut Ridge Sediment Disposal Basin
CRSP - Chestnut Ridge Security Pits
ECRWP - East Chestnut Ridge Waste Pile
KHQ - Kerr Hollow Quarry
LII - Industrial Landfill II
LIV - Industrial Landfill IV
LV - Industrial Landfill V
RQ - Rogers Quarry
UNCS - United Nuclear Corporation Site

3 . - Not Sampled.

Table 4.
Laboratory Analytes and Field Measurements for CY 1996 Groundwater Samples

GROUNDWATER MONITORING PROGRAM					Best Management Practice Monitoring	CERCLA Record of Decision Monitoring [3]	SWDF Detection Monitoring [2]	RCRA Interim Status/RCRA Post-Closure Detection Monitoring [1]	RCRA Interim Status Assessment/RCRA Post-Closure Corrective Action Monitoring
PRINCIPAL IONS	**Analytical Method**[4]	**RCRA Target List**[5]	**Sample Type**[6]						
			Filtered	**Unfiltered**					
Alkalinity - HCO3	SM-2320 B	.	.	●	●	●	●	●	●
Alkalinity - CO3	SM-2320 B	.	.	●	●	●	●	●	●
Calcium	EPA-6010	.	●	●	●	●	●	●	●
Chloride	EPA-300.0	.	.	●	●	●	●	●	●
Fluoride	EPA-340.2	.	.	●	●	●	●	●	●
Magnesium	EPA-6010	.	●	●	●	●	●	●	●
Nitrate (as N)	EPA-300.0	.	.	●	●	●	●	●	●
Potassium	EPA-6010	.	●	●	●	●	●	●	●
Sodium	EPA-6010	.	●	●	●	●	●	●	●
Sulfate	EPA-300.0	.	.	●	●	●	●	●	●
TRACE METALS	**Analytical Method**	**RCRA Target List**	**Sample Type**						
			Filtered	**Unfiltered**					
Aluminum	EPA-6010	.	●	●	●	●	●	●	●
Antimony	EPA-6010	.	●	●	●	●	●	●	●
Arsenic	EPA-6010	.	●	●	●	●	●	●	●
	EPA-200.8	.	●	●	●	●	●	●	●
Barium	EPA-6010	.	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Beryllium	EPA-6010	.	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Boron	EPA-6010	●	●	●	●	●	●	●	●
Cadmium	EPA-6010	●	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Cerium	EPA-200.8	.	.	●	.	●	.	.	.
Chromium	EPA-6010	●	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Cobalt	EPA-6010	.	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Copper	EPA-6010	.	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Gallium	EPA-200.8	.	.	●	.	●	.	.	.

Table 4 (cont'd)

GROUNDWATER MONITORING PROGRAM					Best Management Practice Monitoring	CERCLA Record of Decision Monitoring [3]	SWDF Detection Monitoring [2]	RCRA Interim Status/RCRA Post-Closure Detection Monitoring [1]	RCRA Interim Status Assessment/RCRA Post-Closure Corrective Action Monitoring
TRACE METALS (cont'd)	**Analytical Method**	**RCRA Target List**	**Sample Type**						
			Filtered	**Unfiltered**					
Iron	EPA-6010	.	●	●	●	●	●	●	●
Lead	EPA-6010	●	●	●	●	●	●	●	●
	EPA-7841	●	●	●	.	.	.	●	●
	EPA-200.8	●	●	●	.	●	●	●	●
Lithium	EPA-6010	.	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Manganese	EPA-6010	.	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Mercury	EPA-7470	●	●	●	●	●	●	●	●
Molybdenum	EPA-6010	.	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Nickel	EPA-6010	●	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Selenium	EPA-6010	.	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Silver	EPA-6010	●	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Strontium	EPA-6010	●	●	●	●	●	●	●	●
Thallium	EPA-200.8	.	●	●	●	●	●	●	●
	EPA-7841	.	●	●	.	.	●	.	.
Thorium	EPA-6010	.	●	●	●	●	●	●	●
	EPA-200.8	.	.	●	.	●	.	.	.
Titanium	EPA-200.8	.	.	●	.	●	.	.	.
Uranium	EPA-200.8	●	●	●	●	●	●	●	●
Vanadium	EPA-6010	.	●	●	●	●	●	●	●
Zinc	EPA-6010	.	●	●	●	●	●	●	●
Zirconium	EPA-6010	.	.	●	.	●	.	.	.
VOLATILE ORGANIC COMPOUNDS	**Analytical Method**	**RCRA Target List**	**Sample Type**						
			Filtered	**Unfiltered**					
Acetone	ACD-240040	.	.	●	●	●	●	●	●
Benzene	ACD-240040	●	.	●	●	●	●	●	●
Bromodichloromethane	ACD-240040	.	.	●	●	●	●	●	●
Bromoform	ACD-240040	●	.	●	●	●	●	●	●
Bromomethane	ACD-240040	.	.	●	●	●	●	●	●

Table 4 (cont'd)

GROUNDWATER MONITORING PROGRAM					Best Management Practice Monitoring	CERCLA Record of Decision Monitoring [3]	SWDF Detection Monitoring [2]	RCRA Interim Status/RCRA Post-Closure Detection Monitoring [1]	RCRA Interim Status Assessment/RCRA Post-Closure Corrective Action Monitoring
VOLATILE ORGANIC COMPOUNDS (cont'd)	**Analytical Method**	**RCRA Target List**	**Sample Type**						
			Filtered	**Unfiltered**					
2-Butanone	ACD-240040	.	.	●	●	●	●	●	●
Carbon Disulfide	ACD-2400-40	.	.	●	●	●	●	●	●
Carbon Tetrachloride	ACD-240040	●	.	●	●	●	●	●	●
Chlorobenzene	ACD-240040	.	.	●	●	●	●	●	●
Chlorodibromomethane	ACD-240040	.	.	●	●	●	●	●	●
Chloroethane	ACD-240040	.	.	●	●	●	●	●	●
Chloroform	ACD-240040	●	.	●	●	●	●	●	●
Chloromethane	ACD-240040	.	.	●	●	●	●	●	●
1,1-Dichloroethane	ACD-240040	●	.	●	●	●	●	●	●
1,2-Dichloroethane	ACD-240040	●	.	●	●	●	●	●	●
1,1-Dichloroethene	ACD-240040	●	.	●	●	●	●	●	●
1,2-Dichloroethene	ACD-240040	●	.	●	●	●	●	●	●
Trans-1,2-Dichloroethene	ACD-240040	●	.	●	●	●	●	●	●
1,2-Dichloropropane	ACD-240040	.	.	●	●	●	●	●	●
Cis-1,3-Dichloropropene	ACD-240040	.	.	●	●	●	●	●	●
Trans-1,3-Dichloropropene	ACD-240040	.	.	●	●	●	●	●	●
Ethylbenzene	ACD-240040	.	.	●	●	●	●	●	●
2-Hexanone	ACD-240040	.	.	●	●	●	●	●	●
4-Methyl-2-Pentanone	ACD-240040	.	.	●	●	●	●	●	●
Methylene Chloride	ACD-240040	.	.	●	●	●	●	●	●
Styrene	ACD-240040	.	.	●	●	●	●	●	●
Tetrachloroethene	ACD-240040	●	.	●	●	●	●	●	●
1,1,2,2-Tetrachloroethane	ACD-240040	.	.	●	●	●	●	●	●
Toluene	ACD-240040	.	.	●	●	●	●	●	●
1,1,1-Trichloroethane	ACD-240040	●	.	●	●	●	●	●	●
1,1,2-Trichloroethane	ACD-240040	.	.	●	●	●	●	●	●
Trichloroethene	ACD-240040	●	.	●	●	●	●	●	●
Vinyl Acetate	ACD-240040	.	.	●	●	●	●	●	●
Vinyl Chloride	ACD-240040	.	.	●	●	●	●	●	●
Xylenes	ACD-240040	.	.	●	●	●	●	●	●
ADDITIONAL ORGANIC COMPOUNDS	**Analytical Method**	**RCRA Target List**	**Sample Type**						
			Filtered	**Unfiltered**					
Acrolein	EPA-8240	.	.	●	.	.	●	.	.
Acrylonitrile	EPA-8240	.	.	●	.	.	●	.	.

Table 4 (cont'd)

GROUNDWATER MONITORING PROGRAM					Best Management Practice Monitoring	CERCLA Record of Decision Monitoring [3]	SWDF Detection Monitoring [2]	RCRA Interim Status/RCRA Post-Closure Detection Monitoring [1]	RCRA Interim Status Assessment/RCRA Post-Closure Corrective Action Monitoring
ADDITIONAL ORGANIC COMPOUNDS (cont'd)	**Analytical Method**	**RCRA Target List**	**Sample Type**						
			Filtered	**Unfiltered**					
Bromochloromethane	EPA-8240	.	.	●	.	.	●	.	.
2-Chloroethyl vinyl ether	EPA-8240	.	.	●	.	.	●	.	.
1,2-Dibromo-3-chloropropane	EPA-8240	.	.	●	.	.	●	.	.
1,2-Dibromoethane	EPA-8240	.	.	●	.	.	●	.	.
Dibromomethane	EPA-8240	.	.	●	.	.	●	.	.
1,2-Dichlorobenzene	EPA-8240	.	.	●	.	.	●	.	.
1,4-Dichlorobenzene	EPA-8240	.	.	●	.	.	●	.	.
1,4-Dichloro-2-butene	EPA-8240	.	.	●	.	.	●	.	.
Trans-1,4-Dichloro-2-butene	EPA-8240	.	.	●	.	.	●	.	.
Cis-1,2-Dichloroethene	EPA-8240	.	.	●	.	.	●	.	.
Trans-1,2-Dichloroethene	EPA-8240	.	.	●	.	.	●	.	.
Dichlorodifluoromethane	EPA-8240	.	.	●	.	.	●	.	.
Ethanol	EPA-8240	.	.	●	.	.	●	.	.
Ethyl methacrylate	EPA-8240	.	.	●	.	.	●	.	.
Iodomethane	EPA-8240	.	.	●	.	.	●	.	.
1,1,1,2-Tetrachloroethane	EPA-8240	.	.	●	.	.	●	.	.
Trichlorofluoromethane	EPA-8240	.	.	●	.	.	●	.	.
1,2,3-Trichloropropane	EPA-8240	.	.	●	.	.	●	.	.
RADIOLOGICAL ANALYTES	**Analytical Method**	**RCRA Target List**	**Sample Type**						
			Filtered	**Unfiltered**					
Gross Alpha	Y/P65-7162	●	.	●	●	●	●	●	●
Gross Beta	Y/P65-7162	●	.	●	●	●	●	●	●
Gamma Activity (Spectrum)	Y/P65-7171	.	.	●	.	.	●	.	.
Americium-241	Y/P65-7157	.	.	●	.	●	●	.	.
Iodine-129	EPA-901.1	.	.	●	.	.	●	.	.
Neptunium-237	Y/P65-7158	.	.	●	.	●	●	.	.
Plutonium-238/239	Y/P65-7159	.	.	●	.	.	●	.	.
Radium (Total)	EPA-903.0	.	.	●	.	.	●	.	.
Radium-223/224/226	Y/P65-7163	.	.	●	.	●	.	.	.
Radium-228	Y/P65-7165	.	.	●	.	●	.	.	.
Strontium (89/90)	Y/P65-7196	.	.	●	.	●	●	.	.
Technetium-99	Y/P65-7154	.	.	●	.	●	●	.	.

Table 4 (cont'd)

GROUNDWATER MONITORING PROGRAM					Best Management Practice Monitoring	CERCLA Record of Decision Monitoring [3]	SWDF Detection Monitoring [2]	RCRA Interim Status/RCRA Post-Closure Detection Monitoring [1]	RCRA Interim Status Assessment/RCRA Post-Closure Corrective Action Monitoring
RADIOLOGICAL ANALYTES (cont'd)	**Analytical Method**	**RCRA Target List**	**Sample Type**						
			Filtered	**Unfiltered**					
Tritium	EPA-906.0	.	.	●	.	●	●	.	.
	Y/P65-7150	.	.	●	.	●	.	.	.
Thorium-228/230/232/234	Y/P65-7160	.	.	●	.	●	.	.	.
Uranium-234/235/238	Y/P65-7160	.	.	●	.	●	●	●	.
MISC. LABORATORY ANALYTES	**Analytical Method**	**RCRA Target List**	**Sample Type**						
			Filtered	**Unfiltered**					
Ammonia Nitrogen	EPA-350.3	.	.	●	.	.	●	.	.
Cyanide (colorimetric)	EPA-335.2	.	.	●	.	.	●	.	.
Chemical Oxygen Demand	EPA-410.4	.	.	●	.	.	●	.	.
Phenols	EPA-9065	.	.	●	.	.	●	●	.
pH	EPA-150.1	.	.	●	●	●	●	●	●
Specific Conductance	EPA-129.1	.	.	●	●	●	●	●	●
Total Dissolved Solids	EPA-160.1	.	.	●	●	●	●	●	●
Total Organic Carbon	EPA-906.0	.	.	●	.	.	●	●	.
Total Organic Halide	EPA-902.0	.	.	●	.	.	●	●	.
Total Petroleum Hydrocarbons	TDEC - DRO	.	.	●	.	.	●	.	.
Total Suspended Solids	EPA-160.2	.	.	●	●	●	●	●	●
Turbidity	EPA-180.1	.	.	●	●	●	●	●	●
FIELD MEASUREMENTS	**Analytical Method**	**RCRA Target List**	**Sample Type**						
			Filtered	**Unfiltered**					
Depth-to-Water	ESP 302-1	.	.	.	●	●	●	●	●
Water Temperature	ESP 307-1	.	.	●	●	●	●	●	●
pH	ESP 307-2	.	.	●	●	●	●	●	●
Specific Conductance	ESP 307-8	.	.	●	●	●	●	●	●
Dissolved Oxygen	ESP 307-5	.	.	●	●	●	●	●	●

Notes:

1 Only groundwater samples collected for RCRA interim status detection monitoring at Kerr Hollow Quarry were analyzed for uranium isotopes.

2 Only the groundwater samples collected from well GW-521 at Industrial Landfill IV were analyzed for radionuclides other than gamma activity and uranium isotopes.

Table 4 (cont'd)

Notes: (cont'd)

3 Groundwater samples collected from wells at the United Nuclear Corporation Site (see Table 4) were analyzed for specified trace metals (unfiltered and filtered samples) using Inductively Coupled Plasma Spectroscopy (EPA-6010), all the specified principal ions and VOCs, gross alpha, gross beta, total radium, and uranium isotopes. Surface water samples collected from Outfall 301 at Kerr Hollow Quarry were analyzed only for specific trace metals (unfiltered samples only) using Plasma Mass Spectroscopy (EPA-200.8) and ICP with unique detection limits (very low), the principal cations, and all radiological analytes except total radium.

4 Analytical/field methods and procedures from:

- *Test Methods for Evaluating Solid Waste Physical/Chemical Methods* (U.S. Environmental Protection Agency 1986)
- *Methods for Chemical Analysis of Water and Wastes* (U.S. Environmental Protection Agency 1983)
- *Environmental Surveillance Procedures Quality Control Program* (Martin Marietta Energy Systems, Inc. 1988)
- *Tennessee Department of Environment and Conservation, Division of Underground Storage Tanks, Reference Handbook, Section 5.0.*
- *K-25 Site Analytical Chemistry Department Procedures Manual.*

Volatile organic compound (VOC) analyses performed in accordance with ACD-240040 until October 1, 1996; VOC analyses subsequently performed in accordance with EPA-8240.

5 Target compound defined in the RCRA post-closure-permit, as specified individually for the Chestnut Ridge Sediment Disposal Basin, Kerr Hollow Quarry, and the Chestnut Ridge Security Pits.

6 Groundwater samples collected with a Bennett Pump™ were filtered in the field, groundwater samples collected with bailers were filtered in the laboratory.

Table 5.
CY 1996 Trace Metal Concentrations that Exceed UTLs

Metal[1]	Well	Location[2]	Concentration (mg/L)		Number of Samples	
			UTL[3]	CY 1996 Maximum[4]	Total Analyzed	Exceeding UTL
Aluminum	GW-141	LIV	2.4	12	6	2
	GW-159	CRSDB	2.4	4.3	8	1
	GW-160	CRBAWP	2.4	14	1	1
	GW-522	LIV	2.4	2.6	2	1
	GW-539	LII	2.4	7.9	3	1
	GW-542	CDLVI	2.4	3.9	2	1
	GW-831	ADB	2.4	11	2	1
Arsenic	GW-160	CRBAWP	0.05	**0.06**	1	1
Barium	GW-142	KHQ	0.34	0.48	6	6
Beryllium	GW-141	LIV	0.00045	0.0036	2	2
	GW-160	CRBAWP	0.00045	0.0017	1	1
	GW-174	CRSP	0.00045	0.00047	1	1
	GW-522	LIV	0.00045	0.0011	2	1
	GW-539	LII	0.00045	0.00055	3	1
	GW-542	CDLVI	0.00045	0.00062	2	1
	GW-831	ADB	0.00045	0.001	2	1
Boron	GW-141	LIV	0.028	0.064	2	1
	GW-142	KHQ	0.028	0.089	6	6
	GW-143	KHQ	0.12	0.99	6	6
	GW-144	KHQ	0.028	0.21	6	4
	GW-145	KHQ	0.12	0.29	6	6
	GW-146	KHQ	0.12	0.56	2	2
	GW-147	KHQ	0.028	0.07	2	1
	GW-159	CRSDB	0.028	0.045	8	1
	GW-175	CRSP	0.028	0.041	1	1
	GW-177	CRSP	0.028	0.2	1	1
	GW-186	RQ	0.12	0.2	1	1
	GW-187	RQ	0.12	0.59	1	1
	GW-188	RQ	0.12	0.15	1	1
	GW-203	UNCS	0.028	0.03	2	1
	GW-205	UNCS	0.028	0.068	2	2
	GW-217	LIV	0.028	0.18	2	2
	GW-231	KHQ	0.028	0.17	6	3
	GW-294	ECRWP	0.028	0.033	1	1
	GW-299	CRBAWP	0.028	0.038	1	1
	GW-301	CRBAWP	0.028	0.055	2	1
	GW-302	UNCS	0.028	0.031	2	1

Table 5 (cont'd)

Metal[1]	Well	Location[2]	Concentration (mg/L)		Number of Samples	
			UTL[3]	CY 1996 Maximum[4]	Total Analyzed	Exceeding UTL
Boron (cont'd)	GW-305	LIV	0.028	0.039	2	1
	GW-321	ADB	0.028	0.08	1	1
	GW-339	UNCS	0.028	0.03	2	1
	GW-512	ADB	0.028	0.03	1	1
	GW-522	LIV	0.028	0.043	2	2
	GW-543	CDLVI	0.028	0.03	2	1
	GW-560	CDLVII	0.028	0.045	3	1
	GW-562	CDLVII	0.028	0.037	4	1
	GW-564	CDLVII	0.028	0.064	2	1
	GW-610	CRSP	0.028	0.031	1	1
	GW-611	CRSP	0.028	0.086	1	1
	GW-612	CRSP	0.028	0.3	1	1
	GW-709	LII	0.028	0.064	2	2
	GW-731	CRSDB	0.028	0.045	8	2
	GW-732	CRSDB	0.028	0.038	8	2
	GW-801	LV	0.028	0.039	2	1
Cadmium	GW-217	LIV	0.002	0.0032	2	1
	GW-305	LIV	0.002	0.0032	2	1
Chromium	GW-174	CRSP	0.029	0.065	1	1
	GW-302	UNCS	0.029	**0.58**	2	2
	GW-339	UNCS	0.029	**0.12**	2	1
	GW-539	LII	0.029	**8.5**	3	2
	GW-557	LV	0.029	**0.25**	3	1
	GW-709	LII	0.029	0.074	2	1
Cobalt	GW-539	LII	0.019	0.055	3	1
Copper	GW-141	LIV	0.012	0.016	2	1
	GW-143	KHQ	0.012	0.014	6	1
	GW-159	CRSDB	0.012	0.033	8	2
	GW-160	CRBAWP	0.012	0.021	1	1
	GW-174	CRSP	0.012	0.022	1	1
	GW-217	LIV	0.012	0.015	2	1
	GW-301	CRBAWP	0.012	0.017	2	1
	GW-539	LII	0.012	0.34	3	1
	GW-731	CRSDB	0.012	0.018	8	1
	GW-831	ADB	0.012	0.028	2	1
Iron	GW-141	LIV	4.6	10	2	2
	GW-143	KHQ	8.7	24	6	1
	GW-159	CRSDB	4.6	7.5	8	1

Table 5 (cont'd)

Metal[1]	**Well**	**Location**[2]	**Concentration (mg/L)**		**Number of Samples**	
			UTL[3]	**CY 1996 Maximum**[4]	**Total Analyzed**	**Exceeding UTL**
Iron (cont'd)	GW-160	CRBAWP	4.6	18	1	1
	GW-293	ECRWP	4.6	6.7	1	1
	GW-539	LII	4.6	91	3	1
	GW-831	ADB	4.6	12	2	1
Lead (AAS)	GW-141	LIV	0.0096	0.023	1	1
(AAS)	GW-159	CRSDB	0.0096	0.036	4	1
(PMS)	GW-159	CRSDB	0.0096	0.022	4	1
(PMS)	GW-174	CRSP	0.0096	0.01	1	1
(PMS)	GW-301	CRBAWP	0.0096	0.012	1	1
(PMS)	GW-539	LII	0.0096	**0.08**	2	1
Manganese	GW-141	LIV	0.13	0.15	2	1
	GW-159	CRSDB	0.13	0.36	8	2
	GW-160	CRBAWP	0.13	0.29	1	1
	GW-539	LII	0.13	1.2	3	1
	GW-831	ADB	0.13	0.29	2	1
Molybdenum	GW-539	LII	0.018	0.068	3	1
	GW-541	CDLVI	0.018	0.027	1	1
Nickel	GW-160	CRBAWP	0.02	0.023	1	1
	GW-174	CRSP	0.02	0.078	1	1
	GW-175	CRSP	0.02	0.058	1	1
	GW-302	UNCS	0.02	**0.36**	2	2
	GW-339	UNCS	0.02	0.087	2	2
	GW-539	LII	0.02	**2.6**	3	3
Selenium	GW-203	UNCS	0.05	**0.058**	2	1
	GW-205	UNCS	0.05	**0.051**	2	1
	GW-339	UNCS	0.05	**0.06**	2	1
	GW-521	LIV	0.05	**0.067**	4	1
	GW-557	LV	0.05	**0.066**	3	1
	GW-562	CDLVII	0.05	**0.058**	4	1
Silver	GW-142	KHQ	0.006	0.0073	6	1
	GW-145	KHQ	0.006	0.0062	6	1
	GW-217	LIV	0.006	0.013	2	1
	GW-231	KHQ	0.006	**0.057**	6	1
	GW-298	CRBAWP	0.006	0.007	1	1
	GW-301	CRBAWP	0.006	0.0095	2	1
	GW-302	UNCS	0.006	0.007	2	1

Table 5 (cont'd)

Metal[1]	Well	Location[2]	Concentration (mg/L)		Number of Samples	
			UTL[3]	CY 1996 Maximum[4]	Total Analyzed	Exceeding UTL
Strontium	GW-142	KHQ	0.079	0.54	6	6
	GW-144	KHQ	0.079	0.092	6	5
	GW-145	KHQ	4.4	8	6	6
	GW-146	KHQ	4.4	6.9	2	2
	GW-147	KHQ	0.079	2.2	2	2
	GW-159	CRSDB	0.079	0.1	8	1
	GW-539	LII	0.079	0.094	3	1
Uranium	GW-142	KHQ	0.005	0.029	6	4
Vanadium	GW-141	LIV	0.005	0.025	2	2
	GW-159	CRSDB	0.005	0.01	8	2
	GW-160	CRBAWP	0.005	0.039	1	1
	GW-301	CRBAWP	0.005	0.0071	2	1
	GW-302	UNCS	0.005	0.0068	2	1
	GW-521	LIV	0.005	0.006	4	2
	GW-522	LIV	0.005	0.0073	2	1
	GW-539	LII	0.005	0.049	3	1
	GW-542	CDLVI	0.005	0.0072	2	1
	GW-609	CRSP	0.005	0.0052	3	1
	GW-831	ADB	0.005	0.028	2	1
Zinc	GW-141	LIV	0.041	0.2	2	2
	GW-156	CRSDB	0.041	0.083	6	3
	GW-159	CRSDB	0.041	0.064	6	1
	GW-160	CRBAWP	0.041	0.11	1	1
	GW-174	CRSP	0.041	0.08	1	1
	GW-177	CRSP	0.041	0.086	1	1
	GW-217	LIV	0.041	0.059	2	1
	GW-522	LIV	0.041	0.11	2	1
	GW-539	LII	0.041	0.51	3	1
	GW-542	CDLVI	0.041	0.13	2	2
	GW-544	CDLVI	0.041	0.048	2	1
	GW-831	ADB	0.041	0.08	2	1

<u>Notes</u>:

1 Results were obtained by Inductively Coupled Plasma spectroscopy unless otherwise noted.

AAS - Atomic Absorption Spectroscopy
PMS - Plasma Mass Spectroscopy

Table 5 (cont'd)

<u>Notes</u> (cont'd):

2 ADB - Ash Disposal Basin (alias Filled Coal Ash Pond)
CDLVI - Construction/Demolition Landfill VI
CDLVII - Construction/Demolition Landfill VII
CRBAWP - Chestnut Ridge Borrow Area Waste Pile
CRSDB - Chestnut Ridge Sediment Disposal Basin
CRSP - Chestnut Ridge Security Pits
ECRWP - East Chestnut Ridge Waste Pile
KHQ - Kerr Hollow Quarry
LII - Industrial Landfill II
LIV - Industrial Landfill IV
LV - Industrial Landfill V
RQ - Rogers Quarry
UNCS - United Nuclear Corporation Site

3 UTL - Upper Tolerance Limit in milligrams per liter (mg/L) that represents a background concentration for clusters of wells grouped by geochemical characteristics. The cluster designation for each sampling location is provided in Appendix C.

4 Results shown in **bold** typeface exceed the applicable drinking water standard.

Table 6.
Maximum Summed Concentrations of VOCs Detected in CY 1996 Groundwater Samples

MCL[2]		Maximum CY 1996 Concentration[1] (µg/L)				
	Well	GW-144	GW-174	GW-175	GW-177	GW-305
	Location[3]	KHQ	CRSP	CRSP	CRSP	LIV
	Date	04/24/96	08/19/96	02/25/96	02/25/96	07/08/96
5	Carbon Tetrachloride	4	0	0	0	0
-	1,1-Dichloroethane	0	0	0	10	1
	1,2-Dichloroethane	0	0	0	0	0
7	1,1-Dichloroethene	0	0	0	2	0
-	1,2-Dichloroethene	0	1	0	0	0
5	Tetrachloroethene	0	13	11	0	0
200	1,1,1-Trichloroethane	0	0	2	10	9
5	Trichloroethene	0	0	0	0	0
Summed VOCs		**4**	**14**	**13**	**22**	**10**

MCL		Maximum CY 1996 Concentration (µg/L)				
	Well	GW-608	GW-609	GW-611	GW-612	GW-796
	Location	CRSP	CRSP	CRSP	CRSP	LV
	Date	01/29/96	04/16/96	02/25/96	08/29/96	10/03/96
5	Carbon Tetrachloride	0	0	0	0	0
-	1,1-Dichloroethane	5	0	0	83	0
	1,2-Dichloroethane	0	0	0	4	0
7	1,1-Dichloroethene	3	0	1	52	0
-	1,2-Dichloroethene	1	14	0	0	0
5	Tetrachloroethene	3	18	0	7	0
200	1,1,1-Trichloroethane	FP	0	4	120	1
5	Trichloroethene	0	2	0	0	0
Summed VOCs		**12**	**34**	**5**	**266**	**1**

Notes:

1 Concentrations are reported in micrograms per liter (µg/L). Only results for the sample date with the highest summed concentration are presented. Results less than 10 µg/L are below the analytical detection limit and are considered qualitative.

FP - False positive result (screened result = 6 µg/L)

2 MCL - Maximum Contaminant Level.

3 CRSP - Chestnut Ridge Security Pits
KHQ - Kerr Hollow Quarry
LIV - Industrial Landfill IV
LV - Industrial Landfill V

Table 7.
CY 1996 Gross Alpha and Gross Beta Activities that Exceed MDAs

Well	Location[1]	Date Sampled	Activity[2] (pCi/L)	
			Gross Alpha	Gross Beta
GW-141	LIV	01/04/96	**16.6 ± 9.8**	.
GW-142	KHQ	01/04/96	**16.8 ± 9.4**	.
		10/22/96	6.79 ± 3.3	.
		10/23/96	8.11 ± 3.5	7.43 ± 4.4
		10/24/96	6.95 ± 3.2	.
GW-143	KHQ	01/18/96	9.59 ± 5.6	20.9 ± 6.8
		04/23/96	.	15.5 ± 6.1
		10/21/96	.	16.9 ± 5.4
		10/22/96	4.83 ± 2.9	18 ± 5.1
		10/23/96	6.16 ± 3.2	14.9 ± 4.8
		10/24/96	3.78 ± 2.8	12.5 ± 4.6
GW-144	KHQ	10/21/96	3.46 ± 2.5	.
GW-145	KHQ	01/23/96	11.6 ± 5.9	13.1 ± 6
		04/25/96	.	10.5 ± 5.7
		10/21/96	12.8 ± 4.3	18.9 ± 5.6
		10/22/96	13.3 ± 4.5	11.1 [illegible] 4.5
		10/23/96	11.1 ± 4.1	9.38 ± 4.4
		10/24/96	10 ± 3.6	21.7 ± 6.2
GW-146	KHQ	01/18/96	.	16.7 ± 6.4
		04/25/96	.	13.7 ± 6
GW-156	CRSDB	05/13/96	.	10.5 ± 5.7
		05/14/96	.	10.6 ± 5.7
		10/14/96	6.92 ± 3	9.66 ± 4.7
		10/15/96	3.19 ± 2.2	8.86 ± 4.7
GW-159	CRSDB	05/14/96	**450 ± 59**	**535 ± 70**
		10/15/96	3.56 ± 2.2	10.1 ± 5.3
		10/16/96	4.68 ± 2.8	.
		10/17/96	9.11 ± 4.1	.
GW-174	CRSP	08/19/96	.	8.68 ± 6
GW-300	CRBAWP	04/30/96	12.2 ± 5.9	9.32 ± 5.6
GW-539	LII	11/04/96	8.5 ± 3.9	.
GW-542	CDLVI	11/05/96	.	6.38 ± 4.1
GW-731	CRSDB	10/14/96	.	12.9 ± 5.6
GW-757	LII	11/05/96	5.71 ± 3	.
GW-801	LV	04/10/96	.	13.5 ± 5.8

Table 7 (cont'd)

Notes:

1 CDLVI - Construction/Demolition Landfill VI
CRBAWP - Chestnut Ridge Borrow Area Waste Pile
CRSDB - Chestnut Ridge Sediment Disposal Basin
CRSP - Chestnut Ridge Security Pits
KHQ - Kerr Hollow Quarry
LII - Industrial Landfill II
LIV - Industrial Landfill IV
LV - Industrial Landfill V

2 Activity, in picoCuries per liter (pCi/L), above the sample-specific minimum detectable activity and counting error.

APPENDIX C

SCREENED DATA SUMMARY
CY 1996 GROUNDWATER AND SURFACE WATER SAMPLES

EXPLANATION

SAMPLING POINT:

SCR4.3SP - Spring sampling location (formerly CBS-1)
OUTFALL301 - Surface water outlet at Kerr Hollow Quarry

LOCATION:

ADB - Ash Disposal Basin (alias Filled Coal Ash Pond)
CDLVI - Construction/Demolition Landfill VI
CDLVII - Construction/Demolition Landfill VII
CRBAWP - Chestnut Ridge Borrow Area Waste Pile
CRSDB - Chestnut Ridge Sediment Disposal Basin
CRSP - Chestnut Ridge Security Pits
ECRWP - East Chestnut Ridge Waste Pile
KHQ - Kerr Hollow Quarry
LII - Industrial Landfill II
LIV - Industrial Landfill IV
LV - Industrial Landfill V
RQ - Rogers Quarry
UNCS - United Nuclear Corporation Site

UNITS:

ft - feet (water-level elevation is in feet above mean sea level)
mg/L - milligrams per liter
ug/L - micrograms per liter
pCi/L - picoCuries per liter

DATA QUALIFIERS:

. - Not detected or not analyzed
FLD DUP - Field Duplicate Sample differs by at least an order-of-magnitude.
TOT < DIS - Total concentration (Unfiltered Sample) is at least an order-of-magnitude less than the dissolved concentration (Filtered Sample).
FP - False positive VOC result, screened by data from the associated laboratory blank (FP1) or trip blank (FP2) sample.
<MDA - Reported activity is less than the Minimum Detectable Activity.
<CE - Reported activity is greater than the MDA, but less than the associated counting error.

EXPLANATION (cont'd)

NOTES:

Only unfiltered results that meet data quality objectives of the Y-12 Plant Groundwater Protection Program for the constituents detected at least once in CY 1996 are presented in this appendix. All of the analytical results for groundwater and surface water samples collected in 1996 are available in the Annual Groundwater Monitoring Report (AJA Technical Sevices, Inc. 1997).

Miscellaneous:

TSS - Total Suspended Solids

Major Ions:

The relative percent difference (RPD) between summed positive and negative charges (Charge Balance) is used to evaluate the accuracy of the data. Results for major ions are considered qualitative if the Charge Balance RPD is greater than 10 or less than -10.

Trace Metals:

The Cluster Designation reflects a group (numbered 1,2,3,4,6, or 10), based on similar geochemical characteristics, assigned to each sampling location (HSW Environmental Consultants, Inc 1995). Upper tolerance limits (UTLs) that represent trace metal background levels have been determined for each cluster (see Section 4.2).

All metals analyses were performed using the inductively coupled plasma (ICP) spectroscopy method unless otherwise noted.

AAS - Atomic Absorption Spectroscopy
CVAA - Cold Vapor Atomic Absorption
PMS - Plasma Mass Spectroscopy

Organics:

All results below 10 ug/L are below the analytical reporting limit, and are considered qualitative.

The maximum Summed VOCs value for each sampling location is used a plume delineation value (see Table 6, Appendix B).

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	1090		GW-141		GW-142					
Location	UNCS		LIV		KHQ					
Date Sampled	04/23/96	10/30/96	01/04/96	07/02/96	01/04/96	04/17/96	10/21/96	10/22/96	10/23/96	10/24/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	1055.11	1046.65	1093	1091.47	837.1	837.9	833.9	786.5	789	789
Water in Well (ft)	.	.	65.5	63.97	163.81	164.61	160.61	113.21	115.71	115.71
TSS (mg/L)	3.5	.	170	31	3	7	3.5	2.5	1	.
pH (Field)	7.4	7.1	7	6.7	8.2	8	7.9	7.9	7.7	7.6
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	2.1	-3.2	2.6	2	3	-0.9	0.1	1.6	-1.5	0.4
Calcium	57	58	56	52	51	50	43	45	44	42
Magnesium	37	34	34	32	33	35	31	32	31	31
Potassium	1	0.63	1.6	1.4	6.7	4	4.7	3.9	3.9	3.3
Sodium	13	13	2.3	2.1	1.3	1.5	1.3	1.1	1	0.96
Alkalinity-HCO3	266	280	247	233	236	240	234	234	244	236
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	26.3	32	2.54	1.65	2.36	2.22	1.4	1.34	1.27	1.3
Fluoride	.	.	.	.	0.53	0.54	0.6	0.56	0.54	0.57
Nitrate-N	0.77	0.81	0.78	0.57	0.6	.	.	0.14	0.39	0.495
Sulfate	4.55	4.32	2.98	3.76	5.25	5.18	6.16	5.61	6.2	5.74
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	4	4	4	4	4	4	4
Aluminum	0.087	0.021	12	2.5	0.048	0.98	0.02	0.023	0.023	.
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.029	0.029	0.041	0.025	0.46	0.48	0.44	0.47	0.46	0.45
Beryllium	.	.	0.0036	0.0017	.	.	.	.	.	.
Boron	0.02	0.011	0.064	0.015	0.07	0.069	0.052	0.042	0.089	0.063
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	0.016	0.0096	.	.	0.0058	.	.	.
Iron	0.056	0.02	10	5.1	2.9	4.5	2.5	2.3	1.8	0.76
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	0.023	.	.	.	.	.	.	.
Lead (PMS)	.	0.0012	.	0.0061	.	.	0.00051	.	0.0045	.
Lithium	.	.	0.02	.	0.021	0.025	0.026	0.024	0.023	0.022
Manganese	0.003	.	0.15	0.081	0.033	0.07	0.058	0.039	0.024	0.013
Mercury (CVAA)	.	.	.	.	.	.	0.0003	.	.	.
Molybdenum	.	.	.	.	.	.	.	.	.	.
Nickel	.	.	0.018	.	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	0.0073	.	.	.	.
Strontium	0.026	0.025	0.03	0.023	0.54	0.53	0.51	0.51	0.52	0.51
Thallium (PMS)	.	.	.	.	.	.	.	.	.	.
Uranium (PMS)	.	.	0.00076	.	0.029	0.0028	0.0016	0.0084	0.012	0.012
Vanadium	.	.	0.025	0.015	.	.	.	.	.	.
Zinc	0.003	0.0025	0.2	0.13	0.0087	0.014	0.0099	0.004	0.0036	0.003
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	16.6	<MDA	16.8	<MDA	<MDA	6.79	8.11	6.95
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	7.43	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-143						GW-144			
Location	KHQ						KHQ			
Date Sampled	01/18/96	04/23/96	10/21/96	10/22/96	10/23/96	10/24/96	01/22/96	04/24/96	10/21/96	10/22/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	836.25	836.2	833.19	743.18	741.03	740.57	835.94	835.9	834.11	832.9
Water in Well (ft)	178.21	178.16	175.15	85.14	82.99	82.53	120.46	120.42	118.63	117.42
TSS (mg/L)	34	18.5	.	.	2.5	.	.	.	8.5	.
pH (Field)	8	8.1	8.2	8	8.1	7.9	8.1	8	7.5	7.9
	.	.	.	.	.	.	.	.	.	.
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-2.3	-2.7	-0.7	-0.8	-2.3	-2.5	-3.6	-5.8	-2.1	-1.4
Calcium	32	39	31	30	31	28	40	44	41	40
Magnesium	27	29	24	24	24	24	16	17	15	16
Potassium	18	18	18	18	18	16	0.97	1.1	1.6	2
Sodium	25	24	26	27	26	25	1.1	2.4	1.6	1.1
Alkalinity-HCO3	204	205	210	208	208	210	156	167	159	163
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	6.3	6.83	6.66	6.63	5.14	6.99	2.73	2.68	2.06	1.73
Fluoride	2.7	3	2.94	2.99	3.01	2.95	0.11	0.11	0.11	.
Nitrate-N	.	.	.	.	.	.	2.63	6.21	2.24	2.16
Sulfate	39.3	44.2	34.8	33	38	35	5.55	6.37	5.4	4.58
	.	.	.	.	.	.	.	.	.	.
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	1	1	1	1	1	1	4	4	4	4
Aluminum	0.59	0.91	0.041	0.09	.	0.037	.	0.061	0.055	.
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.046	0.071	0.031	0.027	0.029	0.026	0.048	0.049	0.045	0.044
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.94	0.8	0.88	0.93	0.99	0.96	0.036	0.013	0.21	0.016
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	0.028	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	0.012	0.014	.	.	.	.	.	.	.	.
Iron	7.3	24	1.1	0.3	0.63	0.56	0.16	0.014	0.0094	.
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	0.00054	.	.	0.00053	.	.	.	.
Lithium	0.29	0.28	0.3	0.31	0.3	0.27	0.029	0.027	0.028	0.025
Manganese	0.041	0.15	0.036	0.011	0.01	0.0068	.	0.0015	.	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.	.	.	.
Nickel	0.011	.	.	.	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	2.9	3	2.5	2.4	2.5	2.3	0.086	0.091	0.092	0.081
Thallium (PMS)	.	.	.	.	.	.	.	.	.	.
Uranium (PMS)	0.0024	0.003	0.001	0.0022	0.0033	0.0019	0.0021	0.0015	0.0015	0.0016
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.021	0.024	0.0034	0.0052	0.005	0.0057	0.0046	0.016	0.0021	0.0041
	.	.	.	.	.	.	.	.	.	.
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	ND	3	4	ND	ND
Carbon tetrachloride	.	.	.	.	.	.	3	4	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.
Gross Alpha	9.59	<MDA	<MDA	4.83	6.16	3.78	<MDA	<MDA	3.46	<MDA
Gross Beta	20.9	15.5	16.9	18	14.9	12.5	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-144		GW-145						GW-146	
Location	KHQ		KHQ						KHQ	
Date Sampled	10/23/96	10/24/96	01/23/96	04/25/96	10/21/96	10/22/96	10/23/96	10/24/96	01/18/96	04/25/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	832.96	832.93	837.04	836.94	833.68	796.09	810.39	808.48	737.71	753.13
Water in Well (ft)	117.48	117.45	109.75	109.65	106.39	68.8	83.1	81.19	120.71	136.13
TSS (mg/L)	.	.	1	3	22	2	36	2	11	.
pH (Field)	7.7	7.6	7.9	8.2	8.5	7.5	7.5	7.5	8.1	8.1
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-0.7	-2	0.6	-0.6	-1.9	-3.9	-4.6	-21	-3.3	-0.5
Calcium	44	41	44	43	48	47	46	42	40	41
Magnesium	16	16	38	37	39	39	38	37	35	35
Potassium	1.7	1.5	12	12	13	13	13	12	16	15
Sodium	1.2	1.1	5.4	6.9	7.5	4.6	4.6	4.2	13	14
Alkalinity-HCO3	161	159	230	235	229	238	240	237	201	202
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	1.92	1.77	9.14	9.03	11.7	11.6	11.5	12.2	11.4	11.8
Fluoride	0.1	0.1	2.2	2.5	2.45	2.35	2.3	2.33	2.5	2.8
Nitrate-N	2.46	2.34	0.35	.	0.16	0.04	0.05	.	0.43	0.35
Sulfate	5.75	4.93	36.6	34.2	41.2	41.2	44.6	39.8	68.9	66.8
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	1	1	1	1	1	1	1	1
Aluminum	0.03	.	0.34	0.32	0.24	0.25	0.13	0.057	0.059	0.1
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.046	0.046	0.17	0.12	0.097	0.084	0.084	0.08	0.064	0.062
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.076	0.062	0.29	0.22	0.24	0.26	0.29	0.25	0.56	0.46
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	.	.	.	.	.	.	0.0087	.
Iron	.	.	0.45	0.25	0.21	0.17	0.19	0.11	5	2.8
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	.	0.00085	0.001	0.0013	0.00061	.	.
Lithium	0.025	0.024	0.096	0.097	0.1	0.11	0.1	0.096	0.23	0.23
Manganese	.	.	0.046	0.037	0.018	0.017	0.021	0.014	0.029	0.019
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	0.011	0.014	.	0.011	.	.	.	.
Nickel	.	.	.	.	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	0.0062	.	.	.	.
Strontium	0.09	0.076	7.8	7.3	8	7.5	7.1	6.5	6.9	6.8
Thallium (PMS)	0.00051	.	.	.	.	.	.	.	.	.
Uranium (PMS)	0.0017	0.0015	0.011	0.01	0.011	0.012	0.012	0.01	0.0017	0.0013
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.0044	0.0042	0.01	0.0045	0.0049	0.0068	0.006	0.0043	0.013	0.0037
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	11.6	<MDA	12.8	13.3	11.1	10	<MDA	<MDA
Gross Beta	<MDA	<MDA	13.1	10.5	18.9	11.1	9.38	21.7	16.7	13.7

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-147		GW-156							
Location	KHQ		CRSDB							
Date Sampled	01/10/96	04/18/96	05/13/96	05/14/96	05/15/96	05/16/96	10/14/96	10/15/96	10/16/96	10/17/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	838.15	837.22	906.46	906.2	906.3	906.35	905.75	904.35	904.25	904.1
Water in Well (ft)	58.74	57.81	16.56	16.3	16.4	16.45	15.85	14.45	14.35	14.2
TSS (mg/L)	44	26	2.4	1	.	.	561	2	2	.
pH (Field)	7.4	8.3	7.3	7.4	7.6	7.4	7.1	7.1	7.3	7.2
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	2.6	-0.5	-6	-3.1	-6.3	-5.9	-5.4	-0.2	-4.5	-6.2
Calcium	37	32	66	61	57	63	80	82	61	62
Magnesium	22	20	41	38	38	42	48	49	37	38
Potassium	5.4	4.8	9.1	7.6	6.1	5.3	7.4	6.2	5.2	4.8
Sodium	3.9	3.3	4.5	3.4	2.7	2.5	3.2	2.9	2.2	1.9
Alkalinity-HCO3	171	161	369	361	355	350	353	337	337	345
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	2.32	2.39	2.71	2.46	2.88	2.8	0.77	1.8	1.88	1.82
Fluoride	0.71	0.36	.	.	.	.	.	.	.	.
Nitrate-N	0.98	1.34	0.3	0.32	0.28	0.32	0.24	0.26	0.26	0.26
Sulfate	6.06	3.86	6.96	5.55	4.69	4.34	4.9	5.31	5.18	4.73
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	4	4	4	4	4	4	4
Aluminum	0.3	1.1	0.074	0.046	.	.	0.69	0.94	0.047	0.022
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.079	0.077	0.028	0.023	0.021	0.021	0.04	0.03	0.023	0.021
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.07	0.026	0.017	0.0094	0.013	0.019	.	0.0066	.	.
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	.	.	.	.	.	.	.	.
Iron	0.36	0.71	0.11	0.07	0.03	0.042	0.61	1.2	0.065	0.039
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	.	.	.	0.004	0.0042	0.0021	0.0012
Lithium	0.027	0.02	.	.	.	.	.	.	.	.
Manganese	0.034	0.12	0.0042	0.0028	0.0013	0.002	0.03	0.034	0.0034	0.0022
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.	.	.	.
Nickel	.	.	.	.	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	2.2	0.91	0.03	0.027	0.026	0.029	0.035	0.033	0.027	0.026
Thallium (PMS)	.	.	.	.	.	.	0.00072	.	0.00062	.
Uranium (PMS)	0.0027	0.0022	0.0023	0.002	0.0018	0.0015	0.0025	0.0027	0.0018	0.0015
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.013	0.012	0.042	0.024	0.014	0.013	0.083	0.049	0.023	0.029
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	6.92	3.19	<MDA	<MDA
Gross Beta	<MDA	<MDA	10.5	10.6	<MDA	<MDA	9.66	8.86	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-159								GW-160	GW-161
Location	CRSDB								CRBAWP	CRBAWP
Date Sampled	05/13/96	05/14/96	05/15/96	05/16/96	10/14/96	10/15/96	10/16/96	10/17/96	04/29/96	04/26/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	934.46	908.85	904.85	904.3	933.3	908.8	904.45	905.32	951.45	936
Water in Well (ft)	42.66	17.05	13.05	12.5	41.5	17	12.65	13.52	95.75	245.1
TSS (mg/L)	9	34	2710	105	5	17	6.5	502	162	.
pH (Field)	7.8	7.8	7.6	7.8	7.8	7.8	8.1	8.6	7.1	7.8
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-6	-5.8	-5.4	-6.4	2.4	-2.6	-5.6	-4.4	1.6	-0.3
Calcium	38	41	190	36	39	45	40	150	49	39
Magnesium	25	28	120	26	27	29	27	87	31	26
Potassium	2.1	2.5	3.2	2.4	2.4	2.6	3	2	3.8	1.6
Sodium	0.52	0.6	0.8	0.64	0.7	0.68	0.76	0.42	3.1	0.97
Alkalinity-HCO3	198	204	197	205	191	203	201	206	226	211
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	1.74	1.76	1.76	2.77	1.09	1.01	1.11	0.88	6.93	2.1
Fluoride	.	.	.	.	.	.	.	.	.	.
Nitrate-N	.	.	.	.	0.2	0.18	0.15	0.19	0.63	0.27
Sulfate	11.1	9.19	8.94	8.73	9.6	9.27	10.6	8.72	3.84	1.55
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	4	4	4	4	4	4	4
Aluminum	0.39	1.1	4.3	0.53	0.17	1.8	1.1	2.4	14	.
Arsenic	.	.	.	.	.	.	.	.	0.06	.
Arsenic (PMS)	.	.	.	.	.	.	.	0.0076	.	.
Barium	0.016	0.019	0.037	0.024	0.022	0.033	0.03	0.029	0.031	0.0099
Beryllium	.	.	.	.	.	.	.	.	0.0017	.
Boron	0.0068	0.012	0.045	0.02	0.005	0.01	.	.	0.012	0.013
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	0.02	.
Cobalt	.	.	.	.	.	.	.	.	0.0069	.
Copper	.	.	0.033	.	0.0055	0.011	0.0051	0.017	0.021	.
Iron	0.39	1.1	7.5	0.46	0.31	2.6	1.2	2.9	18	0.2
Lead	.	.	.	.	.	.	.	.	0.062	.
Lead (AAS)	.	.	0.036	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	.	0.0014	0.0068	0.0041	0.022	.	.
Lithium	.	.	0.0051	.	.	.	.	.	0.016	0.0045
Manganese	0.024	0.061	0.36	0.035	0.014	0.091	0.048	0.29	0.29	0.0047
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.	.	.	.
Nickel	.	.	0.017	.	.	.	0.011	.	0.023	.
Selenium	.	.	.	.	.	.	.	.	.	.
Silver	.	.	TOT<DIS	.	.	.	.	.	.	.
Strontium	0.029	0.033	0.1	0.028	0.023	0.029	0.026	0.055	0.026	0.012
Thallium (PMS)	.	.	.	.	.	.	.	.	.	.
Uranium (PMS)	0.0019	0.002	0.003	0.0013	0.0012	0.0015	0.0012	0.0022	0.0005	.
Vanadium	.	.	0.01	.	.	.	.	0.0076	0.039	.
Zinc	0.015	0.024	0.064	0.015	0.013	0.037	0.018	0.026	0.11	0.0029
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	.	.	.	.	.	.	.	.	ND	ND
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	450	<MDA	<MDA	<MDA	3.56	4.68	9.11	<MDA	<MDA
Gross Beta	<MDA	535	<MDA	<MDA	<MDA	10.1	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-174	GW-175	GW-177	GW-184	GW-186	GW-187	GW-188	GW-203		GW-205
Location	CRSP	CRSP	CRSP	RQ	RQ	RQ	RQ	UNCS		UNCS
Date Sampled	08/19/96	02/25/96	02/25/96	04/30/96	05/01/96	04/30/96	04/30/96	04/17/96	10/28/96	04/19/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	1012.49	972.08	1041	818.53	817.51	816.37	817.01	1033.05	1028.99	1034.07
Water in Well (ft)	43.39	56.88	30.5	23.88	160.2	146.78	50.68	86.75	82.69	96.57
TSS (mg/L)	93	.	.	3	2	2	7	10	.	.
pH (Field)	7.4	7.7	7.8	7.1	7.2	7.6	7.9	7.9	7.7	7.9
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	1.7	0.3	2	-0.7	-0.2	4.1	1.5	-1.5	-1.4	-0.5
Calcium	45	50	44	72	110	53	36	29	30	32
Magnesium	30	34	29	6.2	32	24	26	18	17	20
Potassium	2.7	.	2.3	1.1	3	2.1	2.4	.	0.72	.
Sodium	5.5	1.1	1.5	1.5	47	160	22	0.54	0.62	0.8
Alkalinity-HCO3	210	254	219	176	433	323	207	145	145	154
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	10	2.55	2.68	2.05	17.2	124	5.65	1.94	1.17	2.44
Fluoride	.	.	.	.	0.19	1.1	0.66	.	.	.
Nitrate-N	0.69	0.22	.	3.76	.	.	.	1.04	1.17	0.25
Sulfate	4.17	1.09	9.63	17.4	58.1	34.1	24.7	1.12	0.79	3.82
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	3	1	1	1	4	4	4
Aluminum	2.1	.	0.089	0.17	0.036	0.056	0.65	0.76	0.19	.
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.027	0.042	0.017	0.021	0.12	0.32	0.034	0.01	0.0088	0.015
Beryllium	0.00047	.	.	.	.	.	.	.	.	.
Boron	TOT<DIS	0.041	0.2	0.036	0.2	0.59	0.15	0.015	0.03	0.046
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	0.065	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	0.022	0.0061	0.0045	0.01	.	.	.	.	.	.
Iron	4	0.28	0.089	0.14	0.88	0.062	0.45	0.73	0.13	0.019
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	0.01	.	.	.	.	.	.	.	0.00059	.
Lithium	0.0058	.	.	.	0.036	0.21	0.02	.	.	.
Manganese	0.064	0.0054	0.0034	0.0068	0.13	0.0052	0.048	0.03	0.0039	0.0042
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.	.	.	.
Nickel	0.078	0.058	.	.	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	.	0.058	.	0.051
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.044	0.016	0.017	0.14	1.7	1.1	2	0.01	0.01	0.011
Thallium (PMS)	.	.	.	.	.	.	.	.	.	.
Uranium (PMS)	0.00071	.	0.002	.	.	.	.	.	.	0.00079
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.08	0.01	0.086	0.037	0.013	0.0092	0.0081	0.012	0.0025	0.0083
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	14	13	22	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	10	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	2	.	.	.	.	.	.	.
1,2-Dichloroethene	1	.	.	.	.	.	.	.	.	.
Tetrachloroethene	13	11	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	2	10	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	8.68	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-205	GW-217		GW-221		GW-231				
Location	UNCS	LIV		UNCS		KHQ				
Date Sampled	10/28/96	01/03/96	07/01/96	04/22/96	10/29/96	01/10/96	04/18/96	10/21/96	10/22/96	10/23/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	1028	1067.65	1068.8	1032	1028.46	838.2	837.26	833.82	833.82	833.82
Water in Well (ft)	90.5	73.35	74.5	86.6	83.06	26.3	25.36	21.92	21.92	21.92
TSS (mg/L)	11	2.8	9	.	.	.	.	.	.	.
pH (Field)	7.7	7.8	6.4	7.7	7.7	7.5	7.7	7.1	7.2	7
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-4.9	-0.8	1.1	2.4	-3.7	-1.5	-3.6	1.1	0.4	-1
Calcium	26	33	31	31	32	30	32	43	43	43
Magnesium	19	20	19	20	20	15	17	22	22	22
Potassium	4.9	3.5	3.1	.	0.66	0.92	0.95	1.5	1.9	1.3
Sodium	1.3	6.3	4.9	0.6	0.68	0.8	0.74	0.95	0.96	0.94
Alkalinity-HCO3	152	164	165	149	161	129	152	192	194	196
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	2.15	2.47	2.28	1.69	1.14	2.51	3.12	1.44	1.49	1.64
Fluoride	.	.	.	.	.	.	.	.	.	.
Nitrate-N	0.17	0.636	0.42	0.53	0.48	1.69	1.79	0.28	0.26	0.27
Sulfate	3.26	6.02	6.97	1.27	1.24	4.82	4.02	3.92	3.9	4.18
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	4	4	4	4	4	4	4
Aluminum	0.27	0.083	0.22	.	0.024	0.074	0.13	0.024	0.028	0.026
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.013	0.031	0.028	0.0065	0.0077	0.065	0.069	0.094	0.098	0.098
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.068	0.18	0.17	0.012	0.016	0.026	.	0.014	0.029	0.055
Cadmium	.	0.0032	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	0.015	.	.	.	.	.	.	.	.
Iron	1	0.041	0.27	0.038	0.032	.	0.011	0.012	0.0081	.
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	0.0016	.	0.00089	.	.	.	.	.	0.0035	.
Lithium	.	.	.	.	.	.	.	.	.	.
Manganese	0.037	0.0059	0.0077	0.0012	.	.	0.0018	0.0072	0.0051	0.0047
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.	.	.	.
Nickel	.	.	.	.	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	.	.	.	.
Silver	.	0.013	.	.	.	.	.	.	.	0.006
Strontium	0.0093	0.015	0.014	0.0098	0.01	0.027	0.031	0.044	0.042	0.047
Thallium (PMS)	.	.	.	.	.	.	.	.	.	.
Uranium (PMS)	0.00055	.	.	.	.	.	.	.	.	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.004	0.035	0.059	0.004	0.0027	0.0064	0.0032	0.013	0.0071	0.0062
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	3.84	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-231	GW-292	GW-293	GW-294	GW-296	GW-298	GW-299	GW-300	GW-301	
Location	KHQ	ECRWP	ECRWP	ECRWP	ECRWP	CRBAWP	CRBAWP	CRBAWP	CRBAWP	
Date Sampled	10/24/96	05/08/96	05/08/96	05/02/96	05/02/96	05/01/96	04/30/96	04/30/96	04/30/96	10/01/96
MISCELLANEOUS										
Water-Level Elevation	833.82	961.8	950.2	988.8	973.85	942.9	963.5	968.1	958.7	953.5
Water in Well (ft)	21.92	77.7	102.5	35.1	32.55	86.5	80.2	44.4	38.3	33.1
TSS (mg/L)			9		3.5	4			14	8.5
pH (Field)	6.6	7.2	7.3	6.7	6.8	8	7.9	7.4	7.9	7.7
MAJOR IONS (mg/L)										
CHARGE BALANCE (RPD)	1	1.1	1.5	2.7	2.9	1.4	0	-0.8	0.8	-1.3
Calcium	41	54	57	48	47	35	30	27	42	37
Magnesium	22	33	34	30	29	23	19	17	28	22
Potassium	1.3	0.73	1.4	0.94	0.77	1.6	1.4	1.7	2.1	1.3
Sodium	1.2	5.3	6	3.2	2.6	1.6	1.1	0.66	1.1	0.72
Alkalinity-HCO3	186	258	253	233	218	169	145	127	175	181
Alkalinity-CO3										
Chloride	1.76	9.68	12.5	9.46	5.58	1.44	1.66	1.67	1.63	0.89
Fluoride										
Nitrate-N	0.188	0.58	0.58	2.49					0.31	0.39
Sulfate	3.79	3.29	3.86	3.42	1.56	7.04	3.48	3.96	2.26	1.67
METALS (mg/L)										
CLUSTER DESIGNATION	4	4	4	4	4	4	4	4	4	4
Aluminum		0.032	0.075	0.077	0.047				1.3	0.2
Arsenic										
Arsenic (PMS)										
Barium	0.092	0.13	0.2	0.0097	0.011	0.013	0.0095	0.018	0.023	0.02
Beryllium										
Boron	0.17	0.019	0.027	0.033	0.025	0.016	0.038	0.0056	0.055	0.016
Cadmium										
Chromium						0.011	0.01		0.012	
Cobalt							0.005			
Copper						0.0047	0.0051	0.0046	0.017	0.0092
Iron		0.022	6.7	0.13	0.052	0.068	0.021	0.033	1.4	0.22
Lead										
Lead (AAS)									0.0074	
Lead (PMS)										0.012
Lithium						0.0044			0.0042	
Manganese	0.0051		0.044	0.0022	0.0014	0.0016	0.0016	0.0016	0.043	0.009
Mercury (CVAA)										
Molybdenum						0.012				
Nickel										
Selenium										
Silver	0.057					0.007				0.0095
Strontium	0.04	0.019	0.02	0.023	0.018	0.026	0.016	0.018	0.023	0.019
Thallium (PMS)										
Uranium (PMS)						0.0015				
Vanadium									0.0071	
Zinc	0.0035	0.014	0.0094	0.013	0.011	0.0042		0.0049	0.016	0.032
ORGANICS (ug/L)										
SUMMED VOCs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride										
1,1-Dichloroethane										
1,2-Dichloroethane										
1,1-Dichloroethene										
1,2-Dichloroethene										
Tetrachloroethene										
1,1,1-Trichloroethane										
Trichloroethene										
RADIOACTIVITY (pCi/L)										
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	12.2	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	9.32	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-302		GW-305		GW-321	GW-339		GW-512	GW-513	GW-514
Location	UNCS		LIV		ADB	UNCS		ADB	ADB	ADB
Date Sampled	04/23/96	10/30/96	01/17/96	07/08/96	04/29/96	04/22/96	10/29/96	05/02/96	04/29/96	05/03/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	1044.55	1039.7	1065.5	1061.95	910.72	1055.6	1047.05	983.68	984.03	983.61
Water in Well (ft)	39.75	34.9	64	60.45	86.22	47.4	38.85	45.69	110.34	179.95
TSS (mg/L)	14	17	.	.	1	1	1	2	2	.
pH (Field)	7.5	7.1	8.3	8	8	7.6	7.5	7.1	7.6	7.7
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	2.5	-2.4	-0.7	-0.2	-5.4	0.5	-3	-0.7	0.1	-1.3
Calcium	51	53	31	30	26	59	57	34	35	38
Magnesium	34	33	19	19	15	38	33	20	21	23
Potassium	1.2	0.87	0.66	0.66	.	0.84	1.5	3.8	1.4	0.93
Sodium	12	12	1.2	1.5	0.68	14	13	0.77	0.95	0.47
Alkalinity-HCO3	242	258	143	144	130	264	276	172	182	183
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	27.6	32.6	2.3	3.3	1.57	32.9	33.7	1.58	1.74	1.8
Fluoride	.	.	.	.	.	.	.	.	.	.
Nitrate-N	0.9	0.93	0.44	0.23	0.24	0.78	0.71	.	.	.
Sulfate	3.39	3.36	.	1.68	2	4.27	4.58	2.44	1.96	4.3
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	4	4	4	4	4	4	4
Aluminum	0.49	0.14	0.08	0.042	0.029	0.032	0.04	0.08	0.11	0.17
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.026	0.024	0.0092	0.0092	0.053	0.021	0.021	0.024	0.0076	0.007
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.031	0.018	0.021	0.039	0.08	0.021	0.03	0.03	0.025	0.024
Cadmium	.	.	0.0032	.	.	.	.	.	.	.
Chromium	0.54	0.58	.	.	.	.	0.12	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	0.0088	0.0076	.	.	.	.	.	.	.	.
Iron	4.5	3.1	0.06	0.075	TOT<DIS	0.078	0.48	0.18	0.099	0.48
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	0.0012	.	.	.	.	.	.	.	.
Lithium	.	.	.	.	.	.	.	.	.	.
Manganese	0.13	0.061	0.0038	0.0083	0.0028	0.0053	0.012	0.0049	0.0028	0.0078
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.	.	.	.
Nickel	0.24	0.36	.	0.011	.	0.063	0.087	.	.	.
Selenium	.	.	.	.	.	0.06	.	.	.	.
Silver	.	0.007	.	.	.	.	.	.	.	.
Strontium	0.019	0.019	0.011	0.013	0.018	0.024	0.024	0.024	0.021	0.022
Thallium (PMS)	.	.	.	.	.	.	.	.	.	.
Uranium (PMS)	.	.	.	.	.	.	.	.	.	.
Vanadium	0.0068	.	.	.	.	.	.	.	.	.
Zinc	0.013	0.0035	0.01	0.036	0.01	0.019	0.0033	0.015	0.0071	0.012
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	9	10	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	1	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	9	9	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-521				GW-522		GW-539			GW-540
Location	LIV				LIV		LII			CDLVI
Date Sampled	01/16/96	04/16/96	07/02/96	10/01/96	01/17/96	07/08/96	04/02/96	11/04/96	12/18/96	04/09/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	1101.08	1101.6	1100.85	1098.82	1075.75	1074.78	993.65	985.2	989.5	994.42
Water in Well (ft)	57.58	58.1	57.35	55.32	99.05	98.08	59.25	50.8	55.1	96.52
TSS (mg/L)	.	2	2.5	3	14	102	14	32	.	3
pH (Field)	7.9	8.2	6	7.7	7.9	7.5	8.1	8.2	8	7.9
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	1.2	-3.4	-0.6	-0.1	-0.2	-1.3	3.7	-1.2	95.9	1.5
Calcium	32	29	31	29	31	52	37	150	36	43
Magnesium	20	20	19	19	18	32	22	39	22	24
Potassium	0.66	0.96	.	0.78	0.76	1.5	.	1.4	0.97	0.8
Sodium	0.92	0.88	0.72	0.85	0.63	0.9	2.4	2.9	2.2	1.9
Alkalinity-HCO3	153	150	148	151	134	133	152	162	.	198
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	1.82	1.92	1.31	0.93	1.82	2.36	14.8	13.8	.	1.97
Fluoride	.	.	.	.	.	.	.	.	.	.
Nitrate-N	0.44	0.25	0.29	0.2	0.58	0.35	0.3	0.39	.	.
Sulfate	1.36	1.4	2.33	1.04	.	.	7.25	7.53	.	4.07
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	4	4	4	4	4	4	4
Aluminum	0.57	0.92	0.25	1.3	0.18	2.6	0.46	7.9	0.13	.
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.0094	0.0095	0.008	0.01	0.0076	0.011	0.012	0.16	0.011	0.0098
Beryllium	.	.	.	.	.	0.0011	.	0.00055	.	0.00035
Boron	0.018	0.016	0.014	0.019	0.031	0.043	0.011	0.015	0.013	0.019
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	0.062	8.5	0.022	.
Cobalt	.	.	.	.	.	.	.	0.055	.	.
Copper	.	.	.	.	.	0.0042	0.0064	0.34	0.0052	.
Iron	0.43	0.63	0.26	1.2	0.23	2.4	1.4	91	0.52	0.0094
Lead	.	.	.	.	.	.	.	0.073	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	0.0017	0.0044	.	0.0072	.	0.08	0.0013	.
Lithium	.	.	.	.	.	0.0042	.	.	.	.
Manganese	0.011	0.016	0.0093	0.028	0.0074	0.056	0.02	1.2	0.0088	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.	0.068	.	.
Nickel	.	.	.	.	.	.	0.16	2.6	0.12	.
Selenium	.	0.067	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.011	0.01	0.01	0.01	0.011	0.017	0.021	0.094	0.019	0.028
Thallium (PMS)	.	.	.	.	.	.	.	0.00072	.	.
Uranium (PMS)	.	0.00057	.	.	.	.	0.00084	0.0033	0.00069	.
Vanadium	.	.	0.0054	0.006	.	0.0073	.	0.049	.	.
Zinc	0.015	0.022	0.012	0.026	0.019	0.11	0.03	0.51	0.034	0.01
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	ND	ND	.	.	ND
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	FP1
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	8.5	.	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	.	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-541	GW-542		GW-543		GW-544		GW-546	GW-557	
Location	CDLVI	CDLVI		CDLVI		CDLVI		CDLVI	LV	
Date Sampled	04/15/96	04/16/96	11/05/96	04/16/96	11/06/96	04/16/96	11/06/96	04/09/96	04/04/96	06/03/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	993.77	982.49	981.68	960.72	958.59	982.75	978.82	993.85	965	965.1
Water in Well (ft)	42.47	9.99	9.18	33.12	30.99	49.55	45.62	8.65	24.4	24.5
TSS (mg/L)	.	3	48	.	.	.	.	16	3.5	.
pH (Field)	8.1	7	6.7	7.6	7.4	7.9	7.9	8.3	7.8	7.4
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-3.1	-1.1	-1.1	-0.3	-2.8	7.3	-5	-1	2.8	100
Calcium	45	27	18	52	46	53	48	33	35	34
Magnesium	23	12	8.2	28	28	28	29	18	21	21
Potassium	0.89	2.4	2.8	0.85	1	1.2	1.8	1.6	0.98	1.3
Sodium	0.62	1.4	0.98	1.2	1	4.5	4.9	2.1	0.64	0.78
Alkalinity-HCO3	187	109	76	238	230	209	246	148	166	.
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	1.72	1.84	0.83	3.22	1.92	10.6	12.3	2.26	1.92	.
Fluoride	.	.	.	.	.	.	.	.	.	.
Nitrate-N	.	0.3	0.29	0.26	0.24	0.76	0.73	.	0.89	.
Sulfate	11.4	3.17	1.72	3.72	4.06	8.73	10	3.41	1.5	.
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	4	4	4	4	4	4	4
Aluminum	0.069	1.3	3.9	0.2	0.22	0.041	.	0.24	0.12	0.029
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.0086	0.015	0.022	0.01	0.0096	0.0094	0.011	0.0044	0.024	0.01
Beryllium	.	0.00034	0.00062	.	.	0.00032	.	0.00039	.	.
Boron	0.015	0.022	0.0098	0.03	0.012	0.014	TOT<DIS	0.016	0.017	0.013
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	0.25	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	0.011	.	.	.	.	.	.	.
Iron	0.055	0.65	2.8	0.091	0.2	0.015	0.05	0.3	0.14	0.071
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	0.0054	.	.	.	.	.	.	.
Lithium	.	.	.	.	.	.	.	.	.	.
Manganese	0.0055	0.017	0.078	0.0017	0.0023	0.0012	0.0043	0.021	0.0024	0.0027
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	0.027	.	.	.	.	.	.	.	.	.
Nickel	.	.	.	.	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	.	.	0.066	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.027	0.029	0.017	0.025	0.023	0.023	0.023	0.019	0.016	0.015
Thallium (PMS)	.	.	.	.	.	.	.	.	.	.
Uranium (PMS)	0.0023	.	.	.	.	.	0.0012	.	.	.
Vanadium	.	.	0.0072	.	.	.	.	.	.	.
Zinc	0.022	0.046	0.13	0.014	0.01	0.01	0.048	0.02	0.011	0.0068
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	.	ND	.	ND	.	ND	ND	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	.
Gross Beta	<MDA	<MDA	6.38	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	.

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-557	GW-560			GW-562				GW-564	
Location	LV	CDLVII			CDLVII				CDLVII	
Date Sampled	10/02/96	04/02/96	06/03/96	10/02/96	04/02/96	06/03/96	10/02/96	11/25/96	04/04/96	10/03/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	963.62	915.17	913.52	911.42	932.34	931.97	929.74	929.23	929.52	928.05
Water in Well (ft)	23.02	48	46.35	44.25	60.48	60.11	57.88	57.37	75.4	73.93
TSS (mg/L)	.	.	.	.	4	.	.	.	1	.
pH (Field)	7.4	7.5	7.4	7.3	7.5	7.6	7.5	7.5	7.3	7.3
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-1.5	-2.5	.	0.4	-3.8	.	0.7	100	-0.9	-0.1
Calcium	35	35	.	35	37	.	38	37	30	32
Magnesium	21	15	.	15	23	.	24	22	14	16
Potassium	2	0.71	.	1.3	.	.	0.87	0.69	0.65	1
Sodium	0.69	0.63	.	0.68	0.72	.	0.82	0.68	0.6	0.94
Alkalinity-HCO3	174	145	.	147	192	.	182	.	139	146
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	1.12	1.8	.	0.79	2.18	.	1.47	.	1.81	0.88
Fluoride	.	.	.	.	.	.	.	.	.	.
Nitrate-N	0.94	.	.	0.11	0.36	.	0.63	.	0.34	0.44
Sulfate	1.27	2.22	.	1.82	2.65	.	1.95	.	1.27	1.02
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	4	4	4	4	4	4	4
Aluminum	0.025	0.024	.	0.02	0.69	.	0.078	0.2	.	.
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.011	0.22	.	0.23	TOT<DIS	.	0.013	0.011	0.012	0.014
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	FLD DUP	0.0068	.	0.045	0.037	.	0.011	0.015	0.0095	0.064
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	.	.	.	.	0.0048	.	.	.
Iron	0.038	0.0083	.	.	0.59	.	0.029	0.32	0.053	.
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	0.00097	.	.	0.0007	.	.	0.00082
Lithium	.	.	.	.	.	.	.	.	.	.
Manganese	.	0.0011	.	.	0.017	.	0.0019	0.01	.	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.	.	.	.
Nickel	.	.	.	.	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	0.058	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.016	0.022	.	0.023	0.018	.	0.019	0.018	0.017	0.019
Thallium (PMS)	.	.	.	.	.	.	.	.	.	.
Uranium (PMS)	.	.	.	.	.	.	.	.	.	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.0051	0.022	.	0.019	0.014	.	0.0076	0.0072	0.014	0.011
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	ND	ND	ND	ND	ND	ND	ND	.	ND	ND
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	.	<MDA	<MDA	.	<MDA	.	<MDA	<MDA
Gross Beta	<MDA	<MDA	.	<MDA	<MDA	.	<MDA	.	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-608	GW-609			GW-610	GW-611	GW-612	GW-709		GW-731
Location	CRSP	CRSP			CRSP	CRSP	CRSP	LII		CRSDB
Date Sampled	01/29/96	02/25/96	04/16/96	10/07/96	02/23/96	02/25/96	08/29/96	04/02/96	11/05/96	05/13/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	955.47	946.95	945.65	942.65	979.25	950.8	1012.26	878.63	877.16	927.36
Water in Well (ft)	104.47	106.25	104.95	101.95	39.85	27	137.56	55.39	53.92	60.26
TSS (mg/L)	6	.	2.5	.	.	.	.	.	26	56
pH (Field)	7.4	7.7	7.8	7.5	7.6	7.5	7.2	8.3	8	8.8
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	1.7	1.3	-2.8	20.2	4.1	-2.4	0.3	2.8	-2.8	-3.1
Calcium	34	41	37	42	46	56	42	37	40	19
Magnesium	20	27	24	26	31	37	28	22	23	15
Potassium	1.2	0.98	2.5	1.5	0.88	.	1.8	0.62	0.8	10
Sodium	0.84	0.95	0.9	0.87	1.1	1.7	0.84	0.88	0.67	3
Alkalinity-HCO3	155	207	196	132	241	286	217	179	192	117
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	12
Chloride	3.01	2.16	2.27	1.29	2.98	2.03	1.89	2.15	1.44	1.68
Fluoride	.	.	.	.	.	.	.	.	.	.
Nitrate-N	0.94	1.06	1.06	1.16	0.76	3.6	0.29	.	0.15	0.24
Sulfate	2.43	2.38	2.39	2.14	1.14	1.75	2.78	1.98	2.08	4.66
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	4	4	4	4	4	4	4
Aluminum	0.69	.	.	.	.	0.023	0.14	0.22	0.54	0.44
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.015	0.013	0.012	0.013	0.11	0.015	0.016	0.25	0.27	0.007
Beryllium	0.00031	.	.	.	.	.	.	.	.	.
Boron	0.024	0.028	0.011	0.0082	0.031	0.086	0.3	0.064	0.05	0.013
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	0.018	.	.	.	0.074	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	.	.	.	.	.	0.0083	.	.
Iron	1	0.017	0.011	0.065	0.07	0.024	0.37	0.14	0.6	0.52
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	0.0011	.	.	0.0014	.	0.0031	.
Lithium	.	.	.	.	.	.	0.0046	.	.	0.0087
Manganese	0.024	.	.	0.0026	0.0012	.	0.02	0.0046	0.012	0.013
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.	.	.	.
Nickel	.	.	.	0.012	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.015	0.015	0.014	0.014	0.018	0.019	0.017	0.03	0.033	0.02
Thallium (PMS)	.	.	.	.	.	.	.	.	.	.
Uranium (PMS)	0.00076	.	.	.	.	.	0.00052	.	.	.
Vanadium	.	.	0.0052	.	.	.	.	.	.	.
Zinc	0.014	0.0085	0.012	0.021	0.0076	0.034	0.0071	0.024	0.026	0.011
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	12	10	34	16	ND	5	266	ND	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	5	.	.	.	.	.	83	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	4	.	.	.
1,1-Dichloroethene	3	.	.	.	.	1	52	.	.	.
1,2-Dichloroethene	1	6	14	7	.	.	.	.	.	.
Tetrachloroethene	3	4	18	9	.	.	7	.	.	.
1,1,1-Trichloroethane	FP2	.	.	.	.	4	120	.	.	.
Trichloroethene	.	.	2	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-731							GW-732		
Location	CRSDB							CRSDB		
Date Sampled	05/14/96	05/15/96	05/16/96	10/14/96	10/15/96	10/16/96	10/17/96	05/13/96	05/14/96	05/15/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	926.4	926.4	925.6	924.53	924.52	924.62	924.45	906.56	906.63	906.73
Water in Well (ft)	59.3	59.3	58.5	57.43	57.42	57.52	57.35	35.86	35.93	36.03
TSS (mg/L)	1.5	1.5	.	6.5	5	5	3	5	2.5	.
pH (Field)	8.3	8.5	8.4	8.4	7.9	8.2	8.2	7.6	7.7	7.4
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-5.7	3.2	-2.5	-0.8	-3.1	-3.2	-11.5	-5.8	-4.1	-7.4
Calcium	21	37	20	24	24	22	23	30	32	29
Magnesium	14	20	14	15	15	13	14	19	21	20
Potassium	4	2.7	4.1	4.1	4	4	3.9	2	0.94	0.95
Sodium	2.1	1.3	2.3	2.3	2.1	2	1.9	0.95	0.54	0.62
Alkalinity-HCO3	119	117	120	125	126	120	122	173	178	186
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	1.72	1.7	1.72	0.79	0.91	0.83	0.88	1.68	1.65	1.67
Fluoride	.	.	.	.	.	.	.	.	.	.
Nitrate-N	.	.	0.26	0.04	0.21	0.22	0.21	.	0.3	.
Sulfate	4.96	5.03	5.04	5.05	4.98	4.81	4.73	1.87	1.75	1.66
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	4	4	4	4	4	4	4
Aluminum	0.088	0.88	0.066	0.094	0.055	0.041	0.045	0.23	0.16	0.049
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.0078	0.015	0.0086	0.007	0.008	0.0071	0.0082	0.015	0.01	0.009
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.0084	0.017	0.03	0.0068	0.045	FLD DUP	0.024	0.018	0.015	0.018
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	0.018	.	.	.	0.0051	.	.	.	.
Iron	0.085	1.1	0.066	0.19	0.049	0.03	0.048	0.16	0.089	0.042
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	.	0.001	0.00053	0.0013	0.0014	.	.	.
Lithium	.	.	.	.	.	.	.	.	.	.
Manganese	0.0039	0.055	0.0021	0.0047	0.0035	0.0028	0.0021	0.0084	.	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.	.	.	.
Nickel	.	.	.	.	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	.	.	.	.
Silver	.	FLD DUP	TOT<DIS	.	.	.	.	.	.	.
Strontium	0.026	0.03	0.029	0.021	0.023	0.023	0.025	0.027	0.018	0.015
Thallium (PMS)	.	.	.	.	.	.	.	.	.	.
Uranium (PMS)	.	.	.	.	.	.	.	.	.	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.0046	0.023	0.0039	0.015	0.0068	0.009	0.007	0.013	0.0066	0.0089
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	.	.	.	.	.	.	.	.	.	.
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	12.9	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-732					GW-742	GW-743	GW-757		GW-796
Location	CRSDB					CRSP	CRSP	LII		LV
Date Sampled	05/16/96	10/14/96	10/15/96	10/16/96	10/17/96	02/01/96	02/23/96	04/04/96	11/05/96	04/10/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	906.85	906.5	906.5	906.45	909.38	975.85	984.71	877.88	877.2	989.3
Water in Well (ft)	36.15	35.8	35.8	35.75	38.68	298.05	47.11	85.93	85.25	77
TSS (mg/L)	.	4.5	16	1.5	.	.	.	2	5	1
pH (Field)	7.6	7.6	7.7	7.9	8	7.8	7.5	8.3	8.3	8.9
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-6	-2.1	-0.9	-1.6	-2.8	0.9	-0.8	-1.7	-5.1	-1.2
Calcium	30	33	33	31	33	38	27	31	29	22
Magnesium	20	19	20	19	20	22	18	18	17	12
Potassium	0.91	1.6	0.96	1.5	0.74	0.89	1.2	1.3	3.1	2.3
Sodium	0.6	0.89	0.66	0.68	0.35	0.59	1	2.1	5.8	0.91
Alkalinity-HCO3	181	158	160	161	163	169	140	143	154	112
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	1.65	0.6	0.63	0.62	0.76	1.58	2.47	2.14	1.65	2.02
Fluoride	.	.	.	.	.	.	.	1.8	2.04	.
Nitrate-N	.	0.21	0.21	0.2	0.19	.	0.72	.	0.09	.
Sulfate	1.52	2	1.72	1.72	1.63	12.6	4.17	10.4	11.4	1.48
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	4	4	4	4	3	3	4
Aluminum	0.056	0.028	0.33	0.021	0.11	.	0.022	0.052	0.12	.
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.0089	0.013	0.012	0.012	0.0094	0.12	0.011	0.2	0.21	0.012
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	0.035	.	0.038	.	.	0.019	0.027	0.0074	0.011	0.0099
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	0.011	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	0.0045	.	.	.	.	.	.	.
Iron	0.044	0.02	0.17	0.032	0.07	0.76	0.089	0.047	0.15	0.0094
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	0.0026	0.0015	0.00054	0.00064	.	.	.	0.0007	.
Lithium	.	.	.	.	.	.	.	.	0.004	.
Manganese	.	.	0.0022	.	0.002	0.024	0.0015	.	0.0023	.
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.	.	.	.
Nickel	.	.	.	.	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.015	0.02	0.018	0.019	0.016	0.015	0.02	0.8	0.75	0.044
Thallium (PMS)	.	.	.	.	.	.	.	.	.	.
Uranium (PMS)	.	.	0.00056	0.00071	.	0.00068	0.00061	0.0044	0.0045	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.0058	0.0097	0.02	0.0078	0.0078	0.0059	0.003	0.0087	0.01	0.0024
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	.	.	.	.	.	ND	ND	ND	.	ND
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.	.	.	FP1
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	5.71	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-796	GW-797		GW-798		GW-799		GW-801		GW-827
Location	LV	LV		CDLVII		CDLVII		LV		CDLVI
Date Sampled	10/03/96	04/09/96	10/03/96	04/09/96	10/03/96	04/08/96	10/02/96	04/10/96	10/07/96	04/16/96
MISCELLANEOUS	.	.	.	.	.	.	.	.	.	.
Water-Level Elevation	977.4	993.46	990.53	933.89	929.2	975.1	969.37	997.26	993.76	1012.47
Water in Well (ft)	65.1	71.46	68.53	66.87	62.18	89	83.27	92.34	88.84	99.14
TSS (mg/L)	1	.	.	.	.	.	12	.	.	.
pH (Field)	8.7	8	7.3	7.7	7.8	7.7	7.5	8	7.8	7.8
MAJOR IONS (mg/L)	.	.	.	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	0.5	-1.6	-1.9	-3.1	-1	-5.6	-7.1	-3	-1.8	-1
Calcium	22	32	30	29	27	29	27	32	29	33
Magnesium	14	18	18	15	16	15	16	18	17	18
Potassium	2.9	1.2	1.5	1.2	1.7	0.89	1.3	0.66	.	1.2
Sodium	1	1.1	3.1	0.56	0.77	0.53	1.8	0.53	0.61	0.59
Alkalinity-HCO3	114	165	154	136	134	135	135	146	142	149
Alkalinity-CO3	.	.	.	.	.	.	.	.	.	.
Chloride	1.32	1.81	1.37	1.56	0.77	1.77	2.27	1.97	1.17	1.57
Fluoride	.	.	.	.	.	.	.	.	.	.
Nitrate-N	0.06	.	0.26	0.67	0.69	1	2.77	.	0.085	.
Sulfate	1.23	2.48	6.96	2.37	1.86	1.18	4.06	2.83	2.4	1.79
METALS (mg/L)	.	.	.	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	4	4	4	4	4	4	4
Aluminum	0.035	0.02	0.023	.	.	0.15	0.46	0.022	0.034	.
Arsenic	.	.	.	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.	.	.	.
Barium	0.012	0.0079	0.01	0.0087	0.01	0.0053	0.007	0.0019	0.0024	0.0083
Beryllium	.	.	.	.	.	.	.	.	.	.
Boron	TOT<DIS	0.016	0.017	0.013	0.028	0.0092	0.019	0.014	0.039	0.018
Cadmium	.	.	.	.	.	.	.	.	.	.
Chromium	.	.	.	.	.	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.	.	.	.
Copper	.	.	.	.	.	.	.	.	.	.
Iron	0.021	0.012	0.0092	0.0069	.	0.085	0.58	0.016	0.017	0.023
Lead	.	.	.	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.	.	.	.
Lead (PMS)	.	.	TOT<DIS	.	0.00061	.	.	.	.	.
Lithium	.	.	.	.	.	.	.	.	.	.
Manganese	0.0012	.	.	.	.	0.0051	0.032	.	.	0.001
Mercury (CVAA)	.	.	.	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.	.	.	.
Nickel	.	.	.	.	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	.	.	.	.
Silver	.	.	.	.	.	.	.	.	.	.
Strontium	0.027	0.019	0.02	0.016	0.015	0.015	0.015	0.016	0.014	0.017
Thallium (PMS)	.	.	.	.	.	.	.	.	.	.
Uranium (PMS)	.	.	.	.	.	.	.	.	.	.
Vanadium	.	.	.	.	.	.	.	.	.	.
Zinc	0.0036	0.0048	0.0081	0.0078	0.016	0.0058	0.0065	0.0086	0.0031	0.007
ORGANICS (ug/L)	.	.	.	.	.	.	.	.	.	.
SUMMED VOCs	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.	.	.	.
1,1,1-Trichloroethane	1	.	.	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	13.5	<MDA	<MDA

(CONTINUED)

APPENDIX C.1
Screened Data Summary, 1996

Sampling Point	GW-827	GW-831		OUTFALL301		SCR4.3SP	
Location	CDLVI	ADB		KHQ		CDLVII	
Date Sampled	11/05/96	08/27/96	10/01/96	03/13/96	08/06/96	04/11/96	10/07/96
MISCELLANEOUS	.	.	.	.	.	.	.
Water-Level Elevation	1009.47	965.44	963.74	.	.	.	.
Water in Well (ft)	96.14	77	75.3	.	.	.	.
TSS (mg/L)	.	75	.	.	3	.	1
pH (Field)	8	7.5	7.6	8.1	6.74	7.1	6.9
MAJOR IONS (mg/L)	.	.	.	.	.	.	.
CHARGE BALANCE (RPD)	-2.7	-2.6	-2.1	.	.	0.7	-1.4
Calcium	30	46	41	31	32	23	36
Magnesium	18	27	24	14	15	7.9	13
Potassium	1.8	5.3	1.6	1.2	1.2	0.87	1
Sodium	0.77	1.4	0.56	0.84	1.1	2.1	1.9
Alkalinity-HCO3	158	203	201	.	.	85	136
Alkalinity-CO3	.	.	.	.	.	.	.
Chloride	0.62	0.62	0.67	.	.	4.82	5.1
Fluoride	.	.	.	.	.	.	.
Nitrate-N	0.07	0.05	0.06	.	.	0.38	0.33
Sulfate	1.75	4.88	1.69	.	.	6.18	8.85
METALS (mg/L)	.	.	.	.	.	.	.
CLUSTER DESIGNATION	4	4	4	.	.	4	4
Aluminum	.	11	0.071	0.038	0.03	0.18	0.091
Arsenic	.	.	.	.	.	.	.
Arsenic (PMS)	.	.	.	.	.	.	.
Barium	0.009	0.035	0.021	.	.	0.055	0.12
Beryllium	.	0.001	.	.	.	.	.
Boron	0.026	0.027	0.016	0.0075	.	0.011	0.014
Cadmium	.	.	.	.	.	.	.
Chromium	.	0.015	.	.	.	.	.
Cobalt	.	.	.	.	.	.	.
Copper	.	0.028	0.0061	.	.	.	.
Iron	0.013	12	0.078	0.035	.	0.076	0.076
Lead	.	.	.	.	.	.	.
Lead (AAS)	.	.	.	.	.	.	.
Lead (PMS)	.	0.0083	TOT<DIS	.	0.00059	.	.
Lithium	.	0.013	.	.	.	.	.
Manganese	.	0.29	0.041	.	.	0.0038	0.0055
Mercury (CVAA)	.	.	.	.	.	.	.
Molybdenum	.	.	.	.	.	.	.
Nickel	.	.	.	.	.	.	.
Selenium	.	.	.	.	.	.	.
Silver	.	.	.	.	.	.	.
Strontium	0.016	0.037	0.02	.	.	0.045	0.065
Thallium (PMS)	.	.	.	.	.	.	0.00061
Uranium (PMS)	.	0.0017	.	0.001	0.00063	.	.
Vanadium	.	0.028	.	.	.	.	.
Zinc	0.0064	0.08	0.035	0.0051	0.021	0.0082	TOT<DIS
ORGANICS (ug/L)	.	.	.	.	.	.	.
SUMMED VOCs	.	ND	ND	.	.	ND	ND
Carbon tetrachloride	.	.	.	.	.	.	.
1,1-Dichloroethane	.	.	.	.	.	.	.
1,2-Dichloroethane	.	.	.	.	.	.	.
1,1-Dichloroethene	.	.	.	.	.	.	.
1,2-Dichloroethene	.	.	.	.	.	.	.
Tetrachloroethene	.	.	.	.	.	.	.
1,1,1-Trichloroethane	.	.	.	.	.	.	.
Trichloroethene	.	.	.	.	.	.	.
RADIOACTIVITY (pCi/L)	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

APPENDIX C.2
Screened Isotopic Data Summary, CY 1996

Sampling Point	1090		GW-142		GW-143		GW-144		GW-145	
Location	UNCS		KHQ		KHQ		KHQ		KHQ	
Date Sampled	04/23/96	10/30/96	01/04/96	04/17/96	01/18/96	04/23/96	01/22/96	04/24/96	01/23/96	04/25/96
ACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	16.8	<MDA	9.59	<MDA	<MDA	<MDA	11.6	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	20.9	15.5	<MDA	<MDA	13.1	10.5
Cesium 137	.	.	.	.	.	.	.	.	.	.
Protactinium 234M	.	.	.	.	.	.	.	.	.	.
Radium (total)	<MDA	.	.	.	.	.	.	.	.	.
Strontium 89/90	.	<MDA	.	.	.	.	.	.	.	.
Thorium 234	.	.	.	.	.	.	.	.	.	.
Uranium 234	0.699	.	9.38	1.8	2.47	2.48	1.26	1.49	7.1	8.36
Uranium 235	<MDA	.	0.239	< CE	<MDA	<MDA	<MDA	<MDA	<MDA	0.374
Uranium 238	<MDA	.	9.09	1.31	1	0.564	0.867	0.285	3.37	4.37

(CONTINUED)

Sampling Point	GW-146		GW-147		GW-203		GW-205		GW-221	
Location	KHQ		KHQ		UNCS		UNCS		UNCS	
Date Sampled	01/18/96	04/25/96	01/10/96	04/18/96	04/17/96	10/28/96	04/19/96	10/28/96	04/22/96	10/29/96
ACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	16.7	13.7	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Cesium 137	.	.	.	.	.	.	.	.	.	.
Protactinium 234M	.	.	.	.	.	.	.	.	.	.
Radium (total)	.	.	.	.	2.2	.	<MDA	.	<MDA	.
Strontium 89/90	.	.	.	.	.	<MDA	.	13	.	<MDA
Thorium 234	.	.	.	.	.	.	.	.	.	.
Uranium 234	2.27	2.06	1.78	1.56	<MDA	.	1.11	.	< CE	.
Uranium 235	<MDA	<MDA	<MDA	<MDA	<MDA	.	<MDA	.	<MDA	.
Uranium 238	0.914	0.378	0.463	0.778	<MDA	.	0.747	.	<MDA	.

(CONTINUED)

Sampling Point	GW-231		GW-302		GW-339		GW-539	GW-540	GW-541	GW-542
Location	KHQ		UNCS		UNCS		LII	CDLVI	CDLVI	CDLVI
Date Sampled	01/10/96	04/18/96	04/23/96	10/30/96	04/22/96	10/29/96	04/02/96	04/09/96	04/15/96	04/16/96
ACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
Gross Alpha	3.84	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Cesium 137	.	.	.	.	.	.	<MDA	5.83	5.37	<MDA
Protactinium 234M	.	.	.	.	.	.	<MDA	<MDA	<MDA	<MDA
Radium (total)	.	.	1.6	.	1.4	.	.	.	.	.
Strontium 89/90	.	.	.	<MDA	.	<MDA	.	.	.	.
Thorium 234	.	.	.	.	.	.	<MDA	< CE	<MDA	<MDA
Uranium 234	<MDA	<MDA	0.522	.	0.537	.	<MDA	<MDA	0.557	<MDA
Uranium 235	<MDA	<MDA	<MDA	.	<MDA	.	<MDA	<MDA	<MDA	<MDA
Uranium 238	<MDA	<MDA	<MDA	.	<MDA	.	<MDA	<MDA	0.835	<MDA

(CONTINUED)

APPENDIX C.2
Screened Isotopic Data Summary, CY 1996

Sampling Point	GW-543	GW-544	GW-546	GW-557	GW-560	GW-562	GW-564	GW-796	GW-797	GW-798
Location	CDLVI	CDLVI	CDLVI	LV	CDLVII	CDLVII	CDLVII	LV	LV	CDLVII
Date Sampled	04/16/96	04/16/96	04/09/96	04/04/96	04/02/96	04/02/96	04/04/96	04/10/96	04/09/96	04/09/96
ACTIVITY (pCi/L)	.	.	.	.	.	.	.	.	.	.
	.	.	.	.	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Cesium 137	6.28	5.28	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Protactinium 234M	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Radium (total)	.	.	.	.	.	.	.	.	.	.
Strontium 89/90	.	.	.	.	.	.	.	.	.	.
Thorium 234	303	454	<MDA	< CE	<MDA	340	<MDA	351	<MDA	194
Uranium 234	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Uranium 235	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Uranium 238	<MDA	<MDA	< CE	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA

(CONTINUED)

Sampling Point	GW-799	GW-801	GW-827	SCR4.3SP
Location	CDLVII	LV	CDLVI	CDLVII
Date Sampled	04/08/96	04/10/96	04/16/96	04/11/96
ACTIVITY (pCi/L)	.	.	.	.
	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	13.5	<MDA	<MDA
Cesium 137	5.07	6.1	<MDA	<MDA
Protactinium 234M	<MDA	<MDA	<MDA	<MDA
Radium (total)	.	.	.	.
Strontium 89/90	.	.	.	.
Thorium 234	<MDA	<MDA	469	334
Uranium 234	<MDA	<MDA	<MDA	<MDA
Uranium 235	<MDA	<MDA	<MDA	<MDA
Uranium 238	<MDA	<MDA	<MDA	< CE

APPENDIX C.2
Screened Isotopic Data Summary, CY 1996

Sampling Point	GW-521				OUTFALL301	
Location	LIV				KHQ	
Date Sampled	01/16/96	04/16/96	07/02/96	10/01/96	03/13/96	08/06/96
ACTIVITY (pCi/L)	.	.	.	.	.	.
	.	.	.	.	.	.
Gross Alpha	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Gross Beta	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Americium 241	< CE	<MDA	<MDA	<MDA	<MDA	<MDA
Iodine 129	<MDA	<MDA	<MDA	<MDA	.	.
Neptunium 237	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Plutonium 238	<MDA	<MDA	<MDA	<MDA	.	.
Plutonium 239	<MDA	0.247	<MDA	<MDA	.	.
Radium (total)	<MDA	<MDA	<MDA	.	.	.
Radium 223/224/226	.	.	.	<MDA	<MDA	<MDA
Radium 228	.	.	.	.	<MDA	<MDA
Strontium 89/90	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Technetium 99	<MDA	<MDA	<MDA	11.5	<MDA	<MDA
Thorium 228	.	.	.	.	0.276	<MDA
Thorium 230	.	.	.	.	0.219	<MDA
Thorium 232	.	.	.	.	<MDA	<MDA
Thorium 234	.	.	.	.	<MDA	0.319
Tritium (X10)	<MDA	340	<MDA	.	.	.
Tritium	.	.	.	<MDA	<MDA	<MDA
Uranium 234	0.229	<MDA	<MDA	<MDA	0.608	0.649
Uranium 235	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA
Uranium 238	<MDA	< CE	<MDA	<MDA	0.585	0.319

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