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Y-12

**OAK RIDGE
Y-12
PLANT**

**EFFECTIVENESS EVALUATION OF THREE
RCRA CAPS AT THE Y-12 PLANT,
OAK RIDGE, TENNESSEE**

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**Prepared for the
Environmental Management Department
Health, Safety, Environment, and
Accountability Organization
Oak Ridge Y-12 Plant
Oak Ridge, Tennessee 38731**

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EXECUTIVE SUMMARY

Because installation of Resource Conservation and Recovery Act (RCRA)-engineered caps is costly, it is prudent to evaluate the effectiveness of this procedure for hydrologically isolating contaminants. The objective for installation of five-part engineered caps at the Y-12 Plant was to (1) satisfy the regulatory compliance issues, (2) minimize the risk of direct contact with the wastes, and (3) reduce rainfall infiltration. Although the original objectives of installing the caps were not to alter groundwater flow, a potential effect of reducing infiltration is to minimize leaching, thus retarding groundwater contaminant migration from the site. Hence, cap effectiveness with respect to reduced groundwater contaminant migration is evaluated using groundwater data in this report. Based on the available data at the Y-12 capped areas, evaluation of cap effectiveness includes studying water level and chemical variability in nearby monitoring wells. Three caps installed during 1989 are selected for evaluation in this report. These caps are located in three significantly different hydrogeologic settings: overlying a karst aquifer (Chestnut Ridge Security Pits [CRSP]), overlying shales located on a hill slope (Oil Landfarm Waste Management Area [OLWMA]), and overlying shales in a valley floor which is a site of convergent groundwater flow (New Hope Pond [NHP]).

Presumably, the caps have been effective in minimizing risk of direct contact with the wastes and halting direct rainfall infiltration into the sites over the extent of the capped areas, but no evidence is presented in this report to directly demonstrate this. The caps installed over the three sites appear to have had a minimal effect on groundwater contaminant migration from the respective sites. Following cap construction, no changes in the configuration of the water table were observed at any of the sites. Migration of contaminant plumes occurred at all three sites, apparently without regard to the timing of cap installation. In the OLWMA and the CRSP areas, the contaminants may have been flushed rapidly from shallow, water table zones prior to capping. Contaminants, generally dense nonaqueous phase liquids (DNAPLs), migrated to deeper levels within the bedrock where plume migration continues at a slower rate than that which likely occurred during flushing of the shallower, stormflow, and water table zones. At the time that the caps were constructed, the importance of the stormflow zone was not recognized, hence data to evaluate this process were neither collected before nor after cap installation.

Plume migration into and within the deeper zones began before cap emplacement and continued after cap installation, though perhaps at a slightly slower rate at the CRSP. However, the center of mass of dissolved plumes at both the OLWMA and the CRSP had apparently migrated beyond the site boundaries prior to cap installation. Because of this migration, capping would not be expected to significantly alter contaminant migration within the already mobilized plume. Early, rapid flushing of both sites likely occurred in both the stormflow zone and through fractures (OLWMA and CRSP) and conduits (CRSP), thus transporting a large component of the contaminants away from the site.

The OLWMA caps do not extend sufficiently far up-slope to halt shallow stormflow through the waste area, and small caps such as these appear to be largely ineffective in reducing contaminant mobility in groundwater because they do not cover up-slope, recharge sources. Larger caps (perhaps used in combination with upgradient shallow groundwater or stormflow diversion trenches) are expected to be far more effective in eliminating groundwater flow

through and contaminant transport from the waste sites.

Groundwater flow through the NHP area is controlled by its location at the valley axis which is a zone of convergent groundwater flow. Hydraulic and contaminant plume definition is poor because insufficient data have been collected at the site. Complications in understanding the area also result because of: (1) the operation of a sump pump since 1991 to prevent the Lake Reality liner from floating, and (2) possible preferential flow through conduits in the Maynardville Limestone, through excavated areas associated with underground utilities, and through the more permeable zones associated with the former stream channel. The presence of numerous upgradient sources of contaminants also complicates evaluation of cap effectiveness. It is possible that much of the contamination does not have a source within the NHP area, but is associated with upgradient sources (i.e., total U and PCE).

Secondary sources of contaminants which are currently diffusing out of the matrix intervals are likely to be providing at least a portion of the contaminants observed to be discharging from the OLWMA and CRSP. Although the capping of the OLWMA plots and the CRSP appeared to have limited effect on contaminant mobility, concentrations are decreasing and the ecological and health risks are decreasing as a result of continued natural flushing of the contaminants.

Evaluation of cap effectiveness was difficult and conclusions tentative at all three sites because the frequency and type of pre- and postcap monitoring was inconsistent and most wells were located at relatively large distances from the capped areas. Well monitoring zones at distances from the caps will respond to natural recharge, flushing and dispersion processes which mask effects the caps may have had at their sources. One type of monitoring, which has thus far been underutilized, is frequent, consistent monitoring before and after capping in first order streams draining a waste site. Discharge can be measured as a function of concentration of the target contaminant, and consistent trends between the data types have been identified in waste areas at Oak Ridge National Laboratory (ORNL) allowing contaminant concentrations to be reliably predicted based on stream flow measurements. This type of monitoring should be more seriously considered at other sites which will require performance assessment of remediation efforts.

1.0 INTRODUCTION

Low permeability, engineered caps have been installed above many waste sites across the United States in attempts to halt infiltration into contaminated areas, reduce leaching of wastes, and reduce contaminant migration in the local groundwaters. The objectives for installation of five-part engineered caps at the Y-12 Plant, Oak Ridge, Tennessee, were to (1) and to comply with requirements of environmental regulations and the Tennessee Department of Environment and Conservation (TDEC), (2) minimize the risk of direct contact with the wastes, and (3) reduce rainfall infiltration. Although the original objectives of installing the caps were not to alter groundwater flow, a potential effect of reducing infiltration is to minimize leaching, thus retarding groundwater contaminant migration from the site. Hence, cap effectiveness with respect to reduced groundwater contaminant migration is evaluated using groundwater data in this report. Because installation of engineered caps is costly, it is prudent to evaluate the effectiveness of this procedure for hydrologically isolating contaminants. Based on the available data at the Y-12 capped areas, evaluation of cap effectiveness includes studying water level and chemical variability in nearby monitoring wells. Three caps are selected for evaluation in this report and all three were installed at the Y-12 Plant during 1989. The caps selected for evaluation are located in three significantly different hydrogeologic settings: one overlies a karst aquifer, a second overlies shales located on a hill slope, and the third overlies shales and limestones in a valley floor which is a site of convergent groundwater flow. The purpose of this report is to evaluate the effectiveness of the cap installations to reduce contaminant mobility in groundwater in the different hydrogeologic settings and provide recommendations for future monitoring and remediation efforts in similar settings.

1.1 GENERAL CONSIDERATIONS

1.1.1 Capping Objectives

The primary objective of capping a waste site is to reduce the interaction between wastes and water and, thus, to decrease flushing/leaching of contaminants from the site. If these goals are achieved, the flux of contaminants from a waste site will be decreased. This accomplishes the ultimate intent of any remediation scheme: to control the source and reduce the level of contaminated groundwater leaving a site and entering the

uncontaminated environment. Ideally, remediation of a site results in immobilization of the waste source.

These goals can be attained in different ways. First, if contaminants are above the water table, a cap can reduce direct infiltration into and leaching of the wastes. If contaminants are in the lower vadose zone and periodically inundated during times of rising water levels, a cap can be used to lower the water table. If contaminants are located at or slightly below the water table, capping can be used to attempt to lower the water table, and hence decrease the interaction between wastes and groundwater. Upgradient recharge sources must be diverted because flow beneath a cap would offset any benefits of a cap.

1.1.2 Expected Effects of Capping

Effects of capping (i.e., water level changes) will occur in close proximity to the caps. Capping may result in decreased variability in contaminant concentrations in nearby wells and slight increases in contaminant concentrations in wells in and near the capped areas as less flushing of contaminants occurs, although this effect is poorly documented on the Oak Ridge Reservation (ORR). Capping may decrease the water level variability in wells located near the site as less water is being recharged locally.

Capping would be expected to be ineffective if installed over localized areas, while upgradient recharge sources remain active. Caps would be expected to have minor effects on concentrations of contaminants which have migrated vertically and laterally away from the source area. Decreasing concentrations in distant wells could reflect: (1) decreased source mobilization following capping, or (2) natural effects of contaminant flushing and dispersion.

However, decreasing concentrations in first-order streams draining a waste site give less ambiguous information from which to evaluate cap effectiveness. If water is diverted to local streams before interacting with waste sources, then contaminant concentrations and fluxes to the environment will decrease as the amount of contaminants transported from the site is reduced and stream flow dilutes the contaminant concentrations.

1.1.3 Types of Monitoring

For settings in which stream flow monitoring is not possible, monitoring of variability in contaminant concentrations (using indicator parameters) before, during, and after capping should be conducted, preferably at wells located within or very near the capped areas. Note that many effects may not appear in the groundwater for several years and the natural variability in water quality may mask the effects of capping. It is likely that the effects of natural variability masked effects of the caps evaluated at the Y-12 Plant. Monitoring zones of the wells located a distance away from the caps will respond to natural recharge, flushing, and dispersion processes, which will mask effects the cap may have had at its source.

Pre- and postcap monitoring of contaminant concentrations and water levels should occur at similar intervals. Otherwise, it will be difficult to interpret any trends identified, and distinguish between the possible effects of capping or data biases produced through inconsistent monitoring practices. For instance, water levels at Y-12 were measured weekly prior to 1987, yet only once or twice per year following 1987, making it difficult to identify any effects on water levels that the caps may have had.

Water levels should be monitored before and after cap installation, with the frequency of monitoring being determined by the hydrogeologic unit under consideration. Karst aquifers require greater frequencies of measurement (i.e., hourly, daily) because water levels can change rapidly in response to precipitation. Water levels measured at random intervals will yield data which cannot be reliably interpreted because major trends and effects of capping will be overprinted by the effects of precipitation events, dilution, flushing, etc.

In geologic settings in which an active stormflow zone (Moore, 1988; 1989) is present, typical groundwater monitoring wells will not be useful in understanding the behavior of contaminants in the stormflow zone at a waste site, nor will the effect of capping on the shallow zone be clearly understood. Water flow through the stormflow zone must be halted such that flow under caps does not occur, and stormflow monitoring tubes could be used to verify that this zone remains dry underneath a capped area.

Perhaps the most important type of monitoring, if feasible, is stream monitoring at representative sites to quantify storm event variability. Ideally, several stations should be established before capping and discharge should be measured as a function of contaminant concentrations. Consistent trends between the two data types have been identified in waste areas at ORNL, allowing contaminant concentrations to be predicted based on stream flow measurements (D. Huff, pers. comm., 1993). Relatively inexpensive post-cap monitoring at the stations for stream flow (and periodic indicator contaminant concentrations to verify the discharge to concentration relationship) would allow estimation of contaminant fluxes and evaluation of effectiveness of capping or other remedial alternatives.

1.1.4 Available Data for the Y-12 Plant

The importance of the stormflow zone was unknown at the time of capping at Y-12 in 1989 and no data related to this hydrologically active zone is available. Flow and chemical data from first-order streams are generally not available at the sites investigated at the Y-12 Plant. Measurement of water level data after capping was much less frequent than prior to capping, resulting in insufficient water level data from which to evaluate changes. Most wells are probably located too far away from the site boundaries and, thus, respond to hydrologic conditions which may have no connection to the cap. Neither chemical nor water level data were collected with the intent of providing rigorous information from which direct relationships between water level changes and contaminant fluxes and precipitation intensity could be established. Without knowledge of such relationships, it is difficult to definitively determine if changes are related to capping or natural events. These limitations in the available data are noted in the discussions related to the specific caps (Sections 2.0, 3.0, and 4.0) where specific trends in water level and concentrations are evaluated. However, due to the type of data available, conclusions are often tentative and speculative. Nevertheless, the intent of Sections 2.0, 3.0, and 4.0 is to evaluate the effectiveness of the caps based on the observed impact on contaminant migration inferred from the available data.

1.1.5 Future Improvements to Capping Programs

Based on the findings in Sections 2.0, 3.0, and 4.0, Section 6.0 provides recommendations and highlights issues which should be considered in future remediation attempts. Consistent data sets (in type and amount) should be collected before and after capping so that realistic comparisons can be made. The monitoring wells used should be within or very close to the capped boundaries for any distinct effects of the caps to be noted. When possible, stream flow monitoring should be conducted to estimate annual fluxes of contaminants.

1.2 LOCATION

The three hazardous waste disposal sites discussed in this report are located at the Y-12 Plant in Oak Ridge, Tennessee (Figure 1.1). The NHP waste disposal unit is located at the east end of the Y-12 Plant in Bear Creek Valley (BCV), the main valley running through the Y-12 Plant property (Figure 1.2). The OLWMA is located in BCV west of the Y-12 Plant, and the CRSPs are located on the crest of Chestnut Ridge, southeast of the central portion of the Y-12 Plant (Figure 1.2). All maps in this report are referenced to Y-12 grid coordinates.

1.3 GENERAL GEOLOGY

The BCV and Chestnut Ridge are located on the upper plate of the White Oak Mountain thrust sheet (King and Haase, 1987), which is in the Valley and Ridge Province of the Appalachian Orogenic Belt. The bedrock stratigraphy of the valley and adjacent ridges consists of Cambrian through Ordovician sedimentary rocks. The stratigraphic units, from oldest to youngest, are the Early Cambrian Rome Formation, Middle to Late Cambrian Conasauga Group, and the Late Cambrian to Early Ordovician Knox Group (Hatcher, et al., 1993). In the study area, the Rome Formation crops out on Pine Ridge, north of BCV; the

Figure 1.1: Generalized location map of the Y-12 Plant, Oak Ridge, TN.

Figure 1.2: Location map of New Hope Pond, the Oil Landfarm Waste Management Area, and the Chestnut Ridge Security Pits at the Y-12 Plant.

Conasauga Group underlies the valley; and the Knox Group crops out along Chestnut Ridge (Figure 1.3; King and Haase, 1987). The strike of strata varies locally from N47E to N67E and the dip of the strata varies from 35° to 50° to the southeast. The geologic units of importance to this study include the Conasauga Group and the Knox Group.

Joint sets are a common structural feature in the vicinity of the Y-12 Plant. Several studies in BCV identify one prominent joint set that roughly parallels the geologic strike and dips approximately 40° NW (Stockdale, 1951; Sledz and Huff, 1981; Ketelle and Huff, 1984; Rothschild et al., 1984; Dreier et al., 1987). A second prominent set of fractures strikes N 12° W and dips 84° SW (Geraghty and Miller, Inc., 1989). Other documented joint set orientations in BCV are N 35° W dipping 35° NE, N 46° W dipping 57° NE, and N 50° W dipping 72° SW (Geraghty and Miller, Inc., 1989). Fracture spacing may vary from one inch to more than a foot with an increase in spacing with bed thickness, regardless of the lithology (Hatcher, et al., 1993). Frequency of fracture occurrence decreases with depth. (Solomon et al., 1992). Joints and bedding planes have enhanced localized dissolution of carbonate units in the Maynardville Limestone and Copper Ridge Dolomite. Dimensions of solution cavities can range from less than an inch to several tens of feet.

1.4 GENERAL HYDROLOGY

The surface and groundwater systems within the study area have been subdivided into three hydrologic regimes: Bear Creek, upper East Fork Poplar Creek (UEFPC) and Chestnut Ridge (Geraghty and Miller, 1990a). In BCV, the topographic divide between the UEFPC and Bear Creek watersheds is located near the west end of the Y-12 Plant near the closed and capped S-3 Ponds site. A corresponding groundwater divide is also present in this area (Geraghty and Miller, Inc., 1987).

Fig. 1.3. General geologic map of the Oak Ridge Reservation. Modified from Lemiszki (1992).

The surface water flow to UEFPC is derived mostly from the Y-12 Plant storm drain system which collects runoff from approximately 893 acres, including the plant compound and surrounding hillsides (Geraghty and Miller, Inc., 1989; 1990a). Flow in UEFPC is regulated by outflow through Lake Reality (and formerly through NHP) located at the east end of the Y-12 Plant (Figure 1.2).

Groundwater in BCV generally occurs within an upper zone composed of unconsolidated material and a lower zone consisting of the rock units of the Conasauga Group. There is no sharp discontinuity of permeability between the upper and lower groundwater zones and both respond similarly with respect to water-level fluctuations and groundwater flow directions (Geraghty and Miller, Inc., 1990a). Based on studies in nearby locations on the ORR, as much as 90 to 95 percent of all groundwater flow may occur in a very shallow, transient groundwater flow zone ("stormflow" zone) (Moore, 1988; 1989). The stormflow zone on the ORR is < 1.5 to 7 ft thick in undisturbed areas and underlain by a much less permeable vadose zone. In the thin near-surface stormflow zone, transient lateral groundwater flow occurs following precipitation events and lasts for short periods of time (hours to days). Prior to cap installations, no stormflow data was acquired and the influence of stormflow on the local hydrology was not known. Groundwater flow below the stormflow zone is most active near the water table and becomes increasingly sluggish (increasing confinement) with increasing depth (Solomon, et al., 1992).

In BCV, groundwater flows toward UEFPC northeast of the drainage divide; southwest of the divide, groundwater flows toward Bear Creek (Geraghty and Miller, Inc., 1990a). Solution cavities in the Maynardville Limestone are major conduits for the shallow and intermediate depth groundwater flow, and springs discharge from the Maynardville

Limestone into Bear Creek throughout BCV (King and Haase, 1988; Geraghty and Miller, Inc. 1985).

Upward potentiometric head gradients are commonly observed in wells screened below 152 ft in the Maryville and Nolichucky formations (Geraghty and Miller, Inc. 1990a). Downward components of the gradient have been noted within the Maynardville Limestone between depths of 40 and 200 ft near the headwaters of Bear Creek and near the OLWMA (Geraghty and Miller, Inc. 1990a).

The surface water drainage system from the Chestnut Ridge watershed flows to the north down the ridge flank into UEFPC and Bear Creek; and south into the watersheds of the Clinch River, Walker Branch, and McCoy Branch. Unlike the hydrogeologic system underlying BCV, the unconsolidated materials on Chestnut Ridge are considerably thicker than those in BCV. Groundwater occurs under water table conditions within bedrock of the Copper Ridge Dolomite at depths between 80 and 140 ft. Because of the high clay content of the residuum, the saturated permeability of these materials is primarily influenced by secondary openings which provide conduits for recharge to the underlying water table in the Knox Group (Geraghty and Miller, Inc., 1989; 1990b).

Groundwater discharge from the Knox Group occurs to perennial streams and springs along the southeastern and northwestern flanks of Chestnut Ridge. Solutionally enlarged conduits act as drains to groundwater flow fed by flow through small aperture fractures and groundwater movement within the Knox Group appears to be dominated by flow through solution-enlarged conduits. Studies of the joint and fracture systems on Chestnut Ridge suggest that groundwater flow in the Knox Group is both parallel and perpendicular to the ridge crest (Geraghty and Miller, Inc., 1990b). Along the southeastern flank of Chestnut Ridge, groundwater is discharged through springs and perennial streams.

Numerous springs discharge along the northwestern flank of Chestnut Ridge near the contact between the Maynardville Limestone and Copper Ridge Dolomite.

1.5 DATA SOURCES

Groundwater samples were collected by personnel from the Oak Ridge K-25 Site (K-25 Site) Technical Services Division in accordance with the most recent version of the Y-12 Plant standard operating procedure. The K-25 Site personnel followed the field methods and procedures for water sampling described by Kimbrough, et al. (1987). The K-25 Site Analytical Chemistry Department performed most of the chemical analyses; the Y-12 Plant and ORNL Plant and ORNL analytical laboratories and subcontractor laboratories also provided some chemical analyses. Water quality data prior to 1990 were obtained from a SAS data base maintained for Y-12 Plant by ORNL Environmental Sciences Division personnel. The 1990 and 1991 water quality data are taken from the Y-12 Plant annual groundwater quality assessment reports (HSW Environmental Consultants, Inc., 1991a, 1991b, 1991c, 1992a, 1992b, 1992c). Water level data contained in this report were acquired at wells in 1985 to 1991, and the 1985 to 1987 data are previously unpublished. Note that frequent (i.e., weekly) water level measurements are only available prior to 1987, whereas chemical analyses of groundwaters are often only available after 1987. Hence, direct correlations between water level and contaminant concentrations cannot be made.

1.6 REPORT ORGANIZATION

This report addresses three different waste disposal areas that were capped in 1989. For each of the waste disposal sites, the hydrogeologic and groundwater quality

framework will be discussed for the time periods before and after the cap installation. The NHP waste disposal area is addressed in Section 2, the OLMMA is addressed in Section 3, and the CRSPs are addressed in Section 4. Section 5 provides a discussion of the effect of the caps on groundwater movement and contaminant transport in these specific waste disposal areas, whereas Section 6 provides recommendations.

2.0 NEW HOPE POND

2.1 FACILITY DESCRIPTION

The NHP was constructed in 1963 and operated until November 8, 1988, when water was diverted to Lake Reality (Figure 2.1). The pond was designed to regulate the flow and quality of water in UEFPC as it exits the Y-12 facility and flows toward the city of Oak Ridge. The capacity of NHP was approximately 26 million gallon per day (mgd) (Geraghty and Miller, 1989). Discharge from the pond was approximately 8 mgd, with water quality sampling performed in accordance with the National Pollutant Discharge Elimination System permit (TN002968).

In 1973, sediment removed from NHP was placed in the Chestnut Ridge Sediment Disposal Basin (CRSDB). These sediments contained polychlorinated biphenyls (PCBs), mercury, and uranium (HSW Environmental Consultants, Inc., 1992d). Extraction Procedure Toxicity analyses of NHP sediment indicated that the sediments did not exhibit the characteristics of a RCRA waste (Saunders, 1983; Kimbrough and McMahon, 1989a; 1989b).

Approximately 25,000 cu yd of sediment remained in NHP when it was closed in 1989. Closure was completed in accordance with standards defined for RCRA-regulated landfills. Sediments in the pond were stabilized by addition of coarse aggregate between

Figure 2.1: Detailed map of the New Hope Pond area showing geologic contacts.

January 18, 1989, and March 10, 1989, and the site was covered with a low-permeability cap (Martin Marietta Energy Systems, Inc., 1988) between September 11, 1989, and October 26, 1989 (T. Collins, person comm., 1992). The bottom elevation of NHP is approximately 894 ft at its deepest (Geraghty and Miller, 1989), which is generally at or below the water table.

Lake Reality was constructed immediately downstream of NHP (Figure 2.1) and began operation on November 8, 1988. Water in UEFPC enters Lake Reality from an extension of the NHP inlet diversion ditch and exits through a weir in the west berm. The bottom elevation of Lake Reality is approximately 892 ft above mean sea level (Geraghty and Miller, Inc., 1989). During normal operation, Lake Reality contains approximately six million gallons of water (Lee Wan & Associates, 1989). A sump pump was installed in May 1991 at a depth of 20 ft just east of Lake Reality to alleviate floatation of the flexible liner during high groundwater conditions. The pump also draws water from french drains beneath the concrete channels which lie on the southern and eastern boundaries of NHP. The pump has a maximum capacity of 440 gpm (R. Turner, pers. comm., 1992).

2.2 HYDROGEOLOGIC FRAMEWORK

Groundwater in the unconsolidated zone near NHP is unconfined, with the depth to the water table ranging from 10 to 40 ft. The unconsolidated zone consist of alluvium, pond sediment, and Maynardville and Nolichucky regolith. The alluvium deposited in an abandoned channel of EFPC may be the most transmissive of the unconsolidated materials and may provide a preferred groundwater flow path (Geraghty and Miller, Inc., 1989). The regolith of the Maynardville and Nolichucky are both generally clay-rich with varying amounts of sand-size or larger fragments. Hydraulic conductivity of the unconsolidated

zone at the Y-12 Plant has typical values ranging from 50 to 500 ft/yr (Rothschild et al., 1984).

Of the geologic units in the area of NHP, the Maynardville Limestone has the highest average transmissivity, owing to the presence of fractures and solution conduits. Groundwater may travel rapidly through solution conduits; the geometric mean transmissivity is $\approx 4 \text{ m}^2/\text{d}$ (G. Moore, pers. comm. 1992). Groundwater flow in the Nolichucky Shale is primarily controlled by the bedding and fracture characteristics of the unit (Geraghty and Miller, Inc., 1989). In comparison with the Maynardville Limestone, the transmissivities of the Nolichucky Shale are much lower, with a geometric mean from slug and injection tests of $0.06 \text{ ft}^2/\text{day}$ (Moore and Toran, 1992).

2.2.1 Precap Hydrology

Groundwater flow in the UEFPC hydrologic regime is generally along the valley axis, toward the east. The lack of well coverage prior to cap installation precludes the construction of detailed groundwater contour maps; however, new wells installed after cap installation allow better definition of the groundwater flow in the area. In the NHP area, the potentiometric surface generally mimics the surface topography. Groundwater movement is northward, toward NHP from Chestnut Ridge and flowing northward along the UEFPC drainage (Fig. 2.2, where Cn is the Nolichucky Shale, Cmn is the Maynardville Limestone, and Ccr is the Copper Ridge Dolomite). Eastward groundwater flow along the valley axis and flow off Pine Ridge produces convergent groundwater flow in this area (Fig. 2.2).

Several lines of evidence suggest that the convergent zone between GW-151 and GW-167 may be karstified and could act as a migration path to the east: (1) This zone is aligned parallel to the geologic strike, a preferred orientation for dissolution along lithologic

Figure 2.2: Potentiometric surface map at New Hope Pond (4/87). Elevations are in feet.

boundaries; (2) well GW-734, sited within this convergent trough, encountered a large cavity between 60 and 103 ft below the ground surface (Shevenell, et al., 1992a); (3) May 1992 groundwater measurements suggest that groundwaters may be draining into this zone. Future groundwater monitoring at the new wells in this area (GW-734, GW-735, and GW-750) should help to clarify the hydrology in the hydrologically complicated area of the UEFPC hydrologic regime.

There are insufficient data (Appendices B.1 and B.2) to construct detailed potentiometric surface maps prior to cap installation, therefore precap potentiometric surface maps are considered a first approximation.

Most of the fluctuations in groundwater levels in the monitor wells at NHP are generally less than 4 ft and can be correlated to precipitation or sampling events (Geraghty and Miller, Inc., 1989). The timing and magnitude of the recorded fluctuations are similar between wells in a cluster, indicating a good hydraulic connection between zones. The well clusters GW-152, GW-153, and GW-240 south of NHP (Appendix B.2), and GW-150, GW-151, and GW-220, east of NHP, show somewhat anomalous responses. Water levels in the intermediate depth well (GW-240) in the southern cluster were consistently higher than the unconsolidated well (GW-152) and the deeper well (GW-153). In contrast, water levels in the intermediate depth well (GW-220) in the eastern cluster are slightly lower than those in either GW-150 or GW-151. These anomalies may indicate that in the southern cluster, vertical movement of groundwater from the intermediate zone is to both the deeper and unconsolidated zones, and may be related to heterogeneities within the Maynardville Limestone, differences in permeability with that of the unconsolidated material, structural features in the bedrock (Geraghty and Miller, Inc., 1989), or recharge from a higher elevation on Chestnut Ridge. Similarly, the lower head in the intermediate

depth well (GW-220) in the eastern cluster may be related to cavities in the vicinity of GW-220 toward which local groundwaters may drain.

2.2.2. Postcap Hydrology

Although data are sparse between the years 1988 and 1991, there is an apparent decline in the postcap water levels in several well clusters (Appendix B.2). In particular, well Cluster GW-148 and GW-149, Cluster GW-150, GW-151, and GW-220, and Cluster GW-167, GW-168, and GW-239 show water level drops of approximately 2 to 3 ft (Appendix B.2). Well Cluster GW-152, GW-153, and GW-240 exhibits a slight decrease or no change in water level during 1990 relative to precap water levels, but the unconsolidated well (GW-152) does show a drop in water level of approximately 3 ft by 1991 (Appendix B.2).

A possible reason for the apparent decline in water level is that lower than normal rainfall prior to cap installation depressed the water table. Data from National Oceanic and Atmospheric Administration/Atmospheric Turbulence and Diffusion Division (NOAA/ATDD) stations recorded annual precipitation at 85 percent of normal for 1985, 71 percent of normal for 1986, 74 percent of normal for 1987, and 89 percent of normal for 1988 (Borders, et al., 1991), with the normal precipitation being the average for the 30-year period of record. Precipitation was 121 percent and 109 percent of normal during 1989 and 1990. If the pre- and postcap water levels were only related to the amount of annual precipitation, the postcap water levels should show a rise, not a decline.

The decline in water levels is not believed to be a result of the cap installation or lower than normal rainfall, but rather a result of drawdown from the operation of a sump pump beneath Lake Reality used to dewater the pore space beneath the liner which floors

the lake. This pump was run nearly continuously from May 1991 to September 1991, and intermittently from September 1991 to present. Pump operation generally corresponded to water level decreases in local wells (R. Turner, pers. comm., 1992).

The postcap potentiometric surface map for NHP is better constrained than those of the precap maps because of the greater number of monitoring wells drilled during 1991 and 1992 (Fig. 2.3; listed water levels are from wells in the 50- to 80-ft depth range). The difference in resolution between the pre- and postcap data make it uncertain whether cap installation has caused significant changes in the potentiometric surface. However, it appears that the general shape of the potentiometric surface has not changed dramatically.

General groundwater flow paths converge in the NHP-Lake Reality area and apparently flow northward into the UEFPC area. Recharge waters flow northward from Chestnut Ridge and east-southeast from Pine Ridge (Fig. 2.3). Approximately 1,000 ft east of Well GW-167 (Fig. 2.3) is a topographic divide which may also act as a groundwater divide; groundwaters west of this divide may flow generally westward toward NHP and UEFPC, and groundwaters east of the divide flow eastward along the valley axis. However, the hydrologic conditions in this area are poorly understood. It is currently unclear how much, if any, water flows toward the east, past the location of Well GW-734. Well GW-734, in addition to Well GW-735, are completed in cavities which may allow preferential flow of groundwaters from this area toward the east (Shevenell, et al., 1993). Additional studies are required to better evaluate this possibility.

2.3 GROUNDWATER QUALITY

Although a variety of different inorganic and organic contaminants exceed the Maximum Contaminant Levels (MCL) as mandated by the Environmental Protection

Figure 2.3: Potentiometric surface map at New Hope Pond (5/92). Elevations are in feet.

Agency (EPA), in the NHP area, only two inorganic (lead and uranium) and two organic (carbontetrachloride and tetrachloroethene) constituents will be discussed in relation to their temporal and spatial migration, as they appear to be the most significant at this site. For complete data on contaminant species and their concentrations, see HSW Environmental Consultants, Inc. (1991c, 1992c).

In the following discussion, the temporal variations of contaminant concentrations and migration are considered prior to and after cap installation (see Appendix C.2). The three zones considered are: (1) the unconsolidated zone (0 to 30 ft), (2) the shallow depth weathered bedrock zone (25 to 75 ft), and (3) the intermediate depth bedrock zone (75 to 112 ft). It should be noted that the lack of data in some wells makes contaminant concentration contouring speculative.

2.3.1 Lead

Although lead concentrations differ with depth, lead concentration maps for both the unconsolidated and shallow aquifers suggest migration downgradient (Fig 2.4). In the precap period, lead in the unconsolidated material had the highest concentration on the west side of NHP and decreased to the east and north (Fig. 2.4). In the shallow weathered bedrock, higher lead concentrations occur at the northeast-end of NHP, and may indicate lead migration to the north as the southern and western portions of the site became flushed of this contaminant. Relatively high postcap lead concentrations south (i.e., GW-152, 0.1 mg/L of Pb in February 1990) and west (i.e., (GW-381, 0.023 mg/L of Pb in May 1991) of NHP may suggest that at shallow depth intervals, upgradient lead sources

Figure 2.4: Lead concentrations (mg/L) at New Hope Pond (1/87)

may be migrating into the NHP area (Appendix C.2). However, the Pb data in Appendix C.1 is spurious and may be reflecting random variations. For instance, HSW Consultants, Incorporated (1992d) note that elevated lead concentrations fluctuated with changes in total suspended solids (TSS) levels in a nearby well (GW-603), suggesting that in unfiltered samples, high lead contents are often associated with acidification of the water sample containing suspended sediment. Hence, spurious, high values may not reflect Pb migration.

By January 1991 most lead concentrations were below the detection limit (Figure 2.5) suggesting that much of the lead had been flushed from the NHP area by early 1991.

2.3.2 Uranium

In general, uranium concentrations within the NHP area decreased prior to cap installation, with the exception of Wells GW-154, and GW-380, and GW-381 west of NHP for which data are inconclusive (Appendix C.2). Prior to cap installation, elevated uranium in the shallow zone occurred at the west end of NHP (Fig. 2.6) with concentrations decreasing generally northward, and this may reflect contaminant migration down hydraulic gradient toward Lake Reality. Within the shallow bedrock, downgradient dispersion and dilution appeared to occur, generally to the northeast (Fig. 2.6). After installation of the cap, in both the unconsolidated and shallow hydrologic regimes, relatively high concentration of uranium occur at the west edge of NHP (Fig. 2.7 and 2.8).

Figure 2.5: Lead concentrations (mg/L) at New Hope Pond (1/91)

Figure 2.6: Uranium concentrations (mg/L) at New Hope Pond (1/87)

Figure 2.8: Uranium concentrations (mg/L) at New Hope Pond (1/91 to 2/91)

In a western well (GW-154), uranium concentrations increase after cap installation (Appendix C.2) and may indicate a new, upgradient uranium source west of NHP from the Y-12 facility. Two wells (GW-605 and GW-606) were installed in March 1991 with the purpose of upgradient monitoring for NHP. These wells are located just west of the western extent of the map boundary of Fig. 2.1. Elevated U concentrations (0.154 mg/L) in GW-605 suggest the possibility of an upgradient source of U to the NHP area. However, Well GW-154, which monitors the unconsolidated aquifer, has low total uranium concentration up to the time of stabilization of NHP with coarse aggregate. Directly after stabilization, between April and August of 1989, the total uranium concentrations increased from 0.036 to 2.24 mg/L, and this increase may be a result of disruption of contaminated sediments in NHP during the stabilization process.

2.3.3 Tetrachloroethene

Within the unconsolidated water table and shallow bedrock aquifer, the data on tetrachloroethene (PCE) concentrations are inconclusive. In the shallow bedrock Well GW--153, PCE levels appear to increase slightly after cap installation, although they remain near the detection limit (Appendix C.2). More importantly, in wells GW-151 and GW-220, monitoring waters at depths of 45 to 96 ft to the east of NHP show increasing levels of PCE before and after cap installation. Migration of pure-phase material may be related to its relatively high specific gravity (1.63), yet the current dissolved concentrations of PCE in these wells appear to be too low for density driven migration to be a factor. Although data values fluctuate, generally increasing levels of PCE after cap installation are also observed in GW-383 (on the western end of NHP, depth 23.6 ft). The increases could reflect a new, upgradient source of PCE. However, the increases at GW-151, GW-220,

and GW-383 may result from decreased flushing and dilution near these wells as a consequence of the cap decreasing infiltration near these locations.

Prior to cap installation PCE concentrations were low or below detection limits east of NHP with higher concentrations in western wells (GW-154 and GW-223). Contaminant distribution maps (Figs 2.9 and 2.10) suggest PCE within the unconsolidated and shallow aquifers has been migrating northeastward and may have an upgradient source from the Y-12 area to the west. Upgradient Wells GW-605 and GW-606 contain small amounts of PCE (12 to 36 ug/L), and contributions of PCE from this area of the Y-12 Plant appear to be minor. It appears that in most wells, PCE is migrating in the general direction of groundwater movement, away from NHP regardless of the timing of cap installation.

2.3.4 Carbontetrachloride

Wells at the west- and southwest-end of NHP (i.e., GW-223, depth 90.5 ft) show decreasing carbontetrachloride (CARTET) concentrations, and concentration variability after cap installation (Appendix C.2). Well GW-381 (49.3 ft), at the southwest edge of NHP, shows a decrease in concentration variability after capping (Appendix C.2). Data from the easternmost well (GW-151), which monitors intermediate depths (96.5 ft), shows an increase in CARTET level beginning before and continuing after cap installation up to January 1990 (Appendix C.2). From January 1990 to May 1991 concentrations decrease slightly, then begin to increase again, until October 1991 (Appendix C.2). Thus, it appears that a dissolved CARTET plume began migrating eastward prior to the cap installation and was unaffected by the cap. Note that the upgradient Well GW-606 had a measured CARTET of 2,800 ug/L in August 1991, and thus some portion of the CARTET at the NHP site may originate from upgradient sources.

Figure 2.9: Tetrachloroethene concentrations (ug/L) at New Hope Pond (1/89)

Figure 2.10: Tetrachloroethene concentrations (ug/L) at New Hope Pond (1/91)

Limited data also indicate downward migration of CARTET in this area. Within the shallow bedrock aquifer, CARTET concentrations are much higher than in the unconsolidated material (i.e., GW-152 and GW-153 cluster; Appendix C.2). Pure phase CARTET is a DNAPL with a specific gravity of 1.58 and may have initially been density-driven to deeper stratigraphic levels. Using Raoult's Law, the solubility of constituents in a multiphase solution can be calculated as a function of the pure-phase solubility of the individual constituent (Feenstra, 1992). The high concentrations in GW-381 in January 1989 and January 1991 of 10,000 ug/L and 6,800 ug/L are 1.2 percent and 0.87 percent of the solubility limit of CARTET, suggesting the possible presence of DNAPL.

Figures 2.11 and 2.12 show CARTET concentrations before and after cap installation and suggest plume migration to the east. The available data are inadequate for construction of detailed concentration contours, but concentrations shown in Figure 2.11 show elevated CARTET at the west and southwest edge of NHP prior to cap installation. Figure 2.12 also indicates elevated CARTET west of NHP, although at slightly lower concentrations. Concentrations in eastern wells increase between January 1989 and January 1991 suggesting possible migration eastward below NHP. Based on the piezometric map in Figure 2.3, one would expect contaminants traveling with groundwater to migrate northeastward, rather than eastward, yet organic contaminants appear to be migrating nearly upgradient at the east end of NHP. It may be possible that CARTET is migrating along solution features within the Maynardville Limestone and Upper Nolichucky Shale.

Figure 2.11: Carbontetrachloride concentrations (ug/L) at New Hope Pond (1/89)

Figure 2.12: Carbon tetrachloride concentrations (ug/L) at New Hope Pond (1/91 to 2/91)

2.4 SUMMARY

Water level and geochemical data for the NHP area are limited and preclude accurate construction of potentiometric surface and contaminant plume maps. Thus, conclusions on the effect of the low-permeability cap on NHP are inconclusive and tentative.

A slight (2- to 3- ft) postcap drop in the water table is attributed to the nearly continuous operation of a sump pump beneath Lake Reality and not the effect of cap installation or low annual precipitation. Groundwater continues to flow beneath the NHP area, and the configuration of the potentiometric surface appears unchanged. As a result, inorganic contaminants appear to be migrating downgradient and possibly eastward. Total uranium concentrations increase upgradient regardless of the cap installation, suggesting a source from the Y-12 Plant area. Dense organic compounds appear to have migrated to deeper stratigraphic levels, are moving eastward and northeastward. As with uranium, PCE increases in upgradient wells following capping suggesting either: (1) an upgradient a source within the Y-12 facility, or (2) decreased flushing due to decreased infiltration following capping. A decrease in the concentration variability of CARTET in GW-381 (49.3) and GW-223 (90.5) may imply the cap was partially successful in decreasing a portion of direct infiltration, resulting in less dilution and flushing near these two wells. Carbontetrachloride concentrations increase to the east suggesting that the CARTET plume continues to migrate eastward, possibly within a karstified zone within the Maynardville Limestone and, hence, migrations are largely unaffected by the cap. In general, organic and inorganic contaminant plumes appear to have begun migration prior to cap installation and are unaffected by the cap.

3.0 OIL LANDFARM

3.1 FACILITY DESCRIPTION

The OLWMA is located on the south slope of Pine Ridge approximately one mile west of the main Y-12 Plant area and encompasses four separate waste disposal areas. Figure 3.1 illustrates the locations of the waste areas and the locations of wells used for groundwater assessment. Three of the sites have been closed and capped: the Oil Landfarm, the south corner of the Boneyard (Chemical Storage area or Hazardous Chemical Disposal Area), and the Sanitary Landfill.

In the Oil Landfarm, waste oils and coolants were deposited on nutrient-adjusted soils in order to assist in biodegradation of the wastes. The oils and coolants deposited in the Oil Landfarm contained beryllium compounds, depleted uranium, PCBs, and volatile organic compounds (VOCs). Between 1973 and 1982, approximately one million gallons of waste oil were disposed in the landfarm (Geraghty and Miller, 1988). Soils were removed and the site was ultimately covered with a low-permeability engineered cap as described in the RCRA closure and post-closure plans (Martin Marietta Energy Systems, 1988; Geraghty and Miller, 1991).

Disposal of magnesium chips and construction debris in shallow, unlined trenches occurred in the Boneyard until 1970. The Sanitary Landfill was used between 1968 and 1982 for disposal of nonhazardous wastes generated at the Y-12 Plant (Geraghty and Miller, 1988). The site was graded and capped in 1983 in accordance with the closure plan described by Bailey (1983). Between 1943 and 1968, pesticide containers, metal shavings, solvents, oils, laboratory chemicals, and perhaps other wastes were buried in trenches in the Burnyard. Later the Chemical Storage Area was constructed on top of the Burnyard. Chemicals associated with this storage area include the following: acids, alkalies, organics, water-reactive compounds, and shock-sensitive compounds (i.e., picric acid; Geraghty and Miller, 1988).

Prior to cap installation (between November 1, 1988, and January 13, 1989), all soils with PCB contents in excess of 25 ppm were excavated and removed to an approved

True North

 100 foot contours
Roads
Streams

▲ Well locations
OLWMA

Figure 3.1: Map of the Oil Landfarm Waste Management Area showing well locations.

storage facility. Low permeability engineered caps were constructed over the Oil Landfarm plots and Chemical Storage (Hazardous Chemical Disposal Area) areas between 5/13/89 and 6/25/89 (T. Collins, pers. comm., 1992). The caps consisted of ≈ 24 inches of compacted clay at the base overlain by a 30-mil, flexible, membrane liner. The clay barrier material was compacted to yield an approximate permeability of $\leq 1 \times 10^{-7}$ cm/sec (3.3×10^{-9} ft/sec). Next a geosynthetic drainage net overlain by a geotextile filter fabric was constructed and overlain by ≈ 18 inches of topsoil with a vegetative cover (Geraghty and Miller, 1991).

3.2 HYDROGEOLOGIC FRAMEWORK

3.2.1 Precap Hydrology

The majority of the OLWMA disposal facilities were constructed on the Nolichucky Shale (Cn), but the southern part of the Sanitary Landfill extends over the Maynardville Limestone (Cmn), and part of the Boneyard/Burnyard extends over the Maryville Limestone (Cm) on the northern portion of the OLWMA. Hence, portions of the OLWMA were placed on the aquitards of the Nolichucky Shale and Maryville Limestone, where flow is dominated by fracture flow, and portions of the OLWMA are associated with the Maynardville Limestone in which flow rates can be much higher, locally, than in the aquitards due to the presence of solutionally enlarged fractures which are capable of transmitting larger quantities of water over shorter periods.

Within the OLWMA area, all shallow (unconsolidated and shallow bedrock zones < 40 ft deep) and deeper zones (intermediate bedrock zones at 40 to 200 ft) intersected by wells respond similarly to changes in precipitation. Water level fluctuations in shallow and deep wells within any particular well cluster generally mimic one another, both increasing and decreasing, apparently in response to precipitation and seasonal changes (see Appendix B.1 data and Appendix B.2 hydrographs; in particular, see the hydrograph for the GW-006, GW-007 and GW-075 well cluster). The similar hydrologic responses between the shallow and deep wells indicate that the shallower and deeper zones

generally behave as one unit interconnected by fractures. No lag times between shallow and deeper wells can be identified because the frequency of water level measurements is insufficient.

In most well clusters the deeper well has a higher potentiometric head suggesting an upward component of flow in all but the very southern portions of the OLVMA. The northern well clusters (GW-001 and GW-002 cluster and GW-043 and GW-044 cluster) show upward gradients (illustrated with vertical arrows in Fig. 3.2) ranging between 0.013 and 0.33 (see Appendix B.1). Well clusters in the central portion of the area (i.e., GW-006, GW-007, GW-075 cluster, GW-011 and GW-012 cluster) show smaller, though more widely varying, upward gradients of near zero to 0.071. Southern wells, in the Maynardville Limestone, exhibit downward hydraulic gradients of -0.017 to -0.111 perhaps reflecting effects of active conduits, locally acting as drains (GW-225 and GW-226 cluster and GW-227 and GW-228 cluster where both wells are completed in cavities; see Appendix B.1 for detailed data listing). Cavities in the Maynardville Limestone function as groundwater drains (King and Haase, 1988) near the axis of Bear Creek Valley, and the data collected near the OLVMA support this conclusion.

A cross section illustrates a conceptualization of the groundwater flow paths expected based on the data (Figure 3.2). Well clusters are shown as one vertical line per cluster. The higher hydraulic heads measured in the deeper wells apparently result because recharge to the deeper portions of the aquifer occurs at a slightly higher elevation than those in the shallower cluster wells. Wells in the Maynardville Limestone near the OLVMA exhibit a downward component to the hydraulic gradient and this area is apparently in a losing reach of Bear Creek. The downward gradients are presumed to be influenced by conduits acting as drains in the Maynardville Limestone.

The wells closest to the assumed recharge area (GW-043 and GW-044) near the crest of Pine Ridge monitor water-bearing intervals at 45 and 60 ft below ground surface, respectively. The maximum range in water levels in 1984 is ≈ 23 ft. As expected, higher water levels are associated with the rains in the spring, and lower water levels are

Figure 3.2: Conceptual hydrologic model depicted on a north to south cross-section

associated with the drier portions of the year in the late summer months. The well cluster further down-slope (GW-001 and GW-002) exhibits smaller water level variations through time. Between 1984 and 1986, the maximum variability in water level in these wells was only ≈ 10 ft. Only a ≈ 5 ft water level variability is observed in the GW-006, GW-007, and GW-075 cluster located further down slope and closer to discharge locations near BCV. Differences in the ranges of water level fluctuations between wells may be caused by: (1) a difference in specific yield, (2) a difference in recharge amount, (3) a difference in the groundwater flux and storage depletion rates, and (4) a difference in confinement. There is no reason to believe that difference in the degree of confinement exists between the well locations, although the specific yield can vary depending on the locations of the boreholes. The greater water level fluctuations occurring up-slope are likely a function of greater amounts of recharge and perhaps larger localized fluxes in the vicinity of the well bores. Also, wells monitoring groundwater at lower elevations along the slope are closer to discharge elevations of wet weather and perennial springs, thus limiting the total range over which water levels are likely to fluctuate.

Relatively large water level fluctuations are observed within the Maynardville Limestone in BCV. The fluctuation (≈ 10 ft) in water levels occurs because both GW-227 and GW-228 are completed in small, active cavities (stippled ovals, Fig. 3.2) where groundwater flow rates and volumes increase rapidly in response to precipitation events. Cavities in the Maynardville Limestone (i.e., at ≈ 40 ft in GW-227 and at ≈ 100 ft in GW-228) act as local groundwater drains for along strike flow of water entering from the Nolichucky Shale. A precap water level contour map for May 17, 1984, illustrates the general groundwater flow directions in the OLWMA (Figure 3.3). As expected, groundwater flow is dominantly south to southwest toward the BCV axis in which the Maynardville Limestone is located. Water levels are higher in the spring months in all wells, causing the water level contours of maps, such as those illustrated in Figure 3.3, to be higher in the spring months and lower in the fall months. However, the overall direction of groundwater movement across the site does not vary with season as can be

Figure 3.3: Pre-cap potentiometric surface map at the Oil Landfarm (5/17/84). Elevations are in feet. Arrows refer to the direction of the vertical gradient.

seen by a comparison of Figure 3.3 (for May 17, 1984, data) with the contour map constructed for data collected on September 13, 1984 (Figure 3.4). In the central portion of the site, the lateral hydraulic gradients during wetter months vary between ≈ 0.029 and 0.033 , whereas they vary between ≈ 0.025 and 0.028 during drier months.

3.2.2 Postcap Hydrology

In general, much less data are available following cap construction. The hydrographs in Appendix B.2 illustrate that fairly frequent data were often collected in the time period between 1984 and 1987, whereas much less frequent data were collected after 1987. As a result, in many cases, no obvious changes in the local groundwater hydrology can be documented.

The general direction of groundwater flow following the construction of the caps (Figure 3.5a) is nearly identical to that inferred from the 1984 water level data (Figures 3.3 and 3.4). The installation of the caps has no obvious effect on the local groundwater flow patterns. Any differences between the 1991 map and those for 1984 result because water levels were obtained from a greater number of wells in 1991, thus allowing slightly greater detail to be included on the contour map. Note that Figure 3.5a has been redrawn in order to separate the unconsolidated (wells completed above the fresh bedrock contact between depths of 12 and 33 ft), shallow bedrock (wells completed below the fresh bedrock contact between depths of 40 and 80 ft), and intermediate bedrock (wells between depths of 100 and 320 ft) zones (Figures 3.5b through d), and the overall flow directions are the same for all three depth intervals, although water levels tend to be slightly higher in the deeper wells located on the hill slope.

Only very slight differences in water levels before and after cap installation can be identified, and none of the potential changes are conclusive. The lack of variability between 1984 and 1991 is a direct result of insufficient temporal data from which comparisons could be made following 1987. Also, in many cases, 1991 data are only

Figure 3.4: Pre-cap potentiometric surface map at the Oil Landfarm (9/13/84). Elevations are in feet. Arrows refer to the direction of the vertical gradient.

Figure 3.5a: Post-cap potentiometric surface map at the Oil Landfarm (4/29/91). Elevations are in feet. Arrows refer to the direction of the vertical gradient.

Figure 3.5b: Post-cap potentiometric surface map at the Oil Landfarm in the unconsolidated zone (4/29/91). Elevations are in feet.

Figure 3.5c: Post-cap potentiometric surface map at the Oil Landfarm in the shallow bedrock zone (4/29/91). Elevations are in feet.

Figure 3.5d: Post-cap potentiometric surface map at the Oil Landfarm in the intermediate bedrock zone (4/29/91). Elevations are in feet.

available from one well within a cluster, whereas water levels from both wells within a cluster are often available in the earlier years of data collection.

There is no indication from the water level data that the installation of caps had an observable effect on the local groundwater flow patterns. However, most wells are probably located too far away from the boundaries of the caps to have been influenced by cap installation.

3.3 GROUNDWATER QUALITY

3.3.1 General

Contaminant concentrations of seven contaminants detected in wells at the OLWMA were evaluated: 1,1 dichloroethane (11DCA), 1,2 dichloroethane (12DCA), 1,1 dichloroethene (11DCE), 1,2 dichloroethene (12DCE), tetrachloroethene (PCE), trichloroethene (TCE), and total uranium (U). The organic compound with the highest concentration of these listed contaminants is TCE, while both 11DCA and 12DCA were usually detected at relatively low concentrations in all wells at the OLWMA. Hence, the two organic compounds 11DCA and 12DCA will not be discussed in detail except to note that one analysis of 11DCA in Well GW-003 was quite high (1,900 ug/L on April 1988). It is suspected that this value is either an erroneous analysis or a reflection of a spill which may have later been cleaned. It is likely that this value is erroneous because following April 1988 no 11DCA exceeded a concentration of 13 ug/L was found in any well at the OLWMA. Although pure-phase 11DCA is a DNAPL with a specific gravity of 1.1835 (Mercer and Cohen, 1990) and hence sinks under density-driven flow, it is unlikely that only a single occurrence of dissolved 11DCA at 1,900 ug/L would have been observed.

3.3.2 Contaminants and Migration

Bar graphs of chemical concentrations were constructed only when sufficient data were available, when data values were consistently above detection limits, or when the data appeared anomalous (i.e., total β , in some cases).

3.3.2.1 Total β Activity

Numerous bar plots of total β activity are presented because there appears to be increasing (GW-085) and decreasing (GW-064, GW-306, GW-366, GW-367, and GW-520) trends in the data, as well as maxima (GW-007, GW-010, GW-067, GW-073, GW-097, GW-098, GW-227, GW-228, GW-229, and GW-363) that may indicate transport of contaminants from a source area. However, these trends and peaks in β are not consistent. For instance, a peak of ≈ 340 pCi/L in GW-007 occurred in September 1989, whereas larger peaks of ≈ 710 and ≈ 1175 pCi/L in downgradient wells GW-229 and GW-227 occurred earlier (December 1986). These peaks are probably not indicative of contaminant transport because a similar, smaller, maximum was observed in the upgradient well GW-084 in September 1989 ($\beta \approx 45$ pCi/L). The trends in total β activity associated with individual wells appears to be related to several factors including the location of shales which may be high in Th and K (i.e., a β emitter), poor data quality, and contaminant migration, though this is speculative.

3.3.2.2 Specific Conductance

Variations in specific conductance (SC) may provide evidence for the passage of the leading edge of a contaminant plume, or they may reflect natural variabilities such as would occur in the case of dilution during periods of recharge. Several bar graphs (Appendix C.2) illustrate SC variability as a function of time. Unfortunately, collection of frequent water level data (see hydrographs Appendix B.2) occurred through 1987, whereas sampling for water chemistry often began in or after 1987, and no direct correlation can be made between increasing water levels and decreasing SC. However, some general observations can be made. First, SC can be reasonably assumed to provide a good indicator for contaminant plume migration because measured concentrations of Cl in waste oils deposited at the OLWMA have been as high as 1,000 to 2,000 mg/L (Geraghty and Miller, 1991). This provides a significant contrast over that of background Cl contents of ≤ 1 mg/L in shallow groundwater in all lithologies. On the ORR as a whole,

deeper waters generally exhibit higher SC (i.e., Solomon, et al., 1992; also see GW-364 and GW-365 cluster, Appendix C.2). The higher SC at depth is apparently a result of longer, deeper flow paths of these waters. In the OLWMA, data from several cluster wells show that the shallower well has a higher SC than the deeper well (Appendix C.2: GW-097, GW-098, and GW-120 cluster; GW-225 and GW-226 cluster; GW-227 and GW-228 cluster; GW-366, GW-367 and GW-520 cluster). Perhaps the higher SC in the shallower wells reflects the presence of a contaminant plume. Within the Maynardville Limestone well clusters (GW-225 and GW-226 cluster; GW-227 and GW-228 cluster; GW-364 and GW-365 cluster; GW-366, GW-367, and GW-520 cluster), the shallow wells do not consistently exhibit higher SC, whereas within the Nolichucky Shale cluster (GW-097, GW-098, and GW-120), the shallow wells consistently show higher SC. The difference in response is likely caused by rapid changes in chemical composition, flow rates, and fluid volumes in conduits in the Maynardville Limestone (i.e., Shevenell, et al., 1992a). It is likely that these changes will not affect all portions of the Maynardville Limestone simultaneously, nor with equal intensity.

The overall magnitude of SC within the Maynardville wells suggests contaminants are entering the Maynardville Limestone near the southern boundary of the OLWMA. The SC in Maynardville Wells GW-064 and GW-306, located east (upgradient) of the OLWMA, have decreased from ≈ 900 to ≈ 600 umhos/cm between November 1987 and October 1991, and from $\approx 1,100$ to 700 between May 1988 and April 1991, respectively. These shallow bedrock wells have had lower SC than either GW-226 or GW-227. Two selected maps (Figs. 3.6 and 3.7) are presented to illustrate typical distributions of SC in wells monitoring shallow bedrock intervals. Although the distribution of SC suggests it may be inappropriate to contour the data, some general observations can be made. Contaminants appear to have entered the Maynardville Limestone near GW-227, with additional contaminants (higher SC) entering further downgradient near GW-226 (Fig. 3.7). There is

Figure 3.7: Map showing specific conductance (umhos/cm) values measured in shallow bedrock wells at the Oil Landfarm (5/90).

no consistent decrease in SC with time at the GW-225, GW-364, and GW-366 clusters, but there has been a decrease at the GW-227 cluster after July 1988. In summary, the SC values at the wells do not provide evidence that the installation of caps affected the local groundwater chemistry, but the data suggest that contaminants are entering the Maynardville Limestone at the southern edge of the OLOWMA.

3.3.2.3 1,1 dichloroethane and 1,2 dichloroethane

All plots of 11DCA (Appendix C.2) suggest generally decreasing concentrations in monitoring wells over time between 1987 and 1990. The trend of decreasing concentrations with time in GW-007, GW-097, GW-087, and GW-229 began before closure and cap installation in 1989 suggesting the closure procedures had little effect on the already decreasing concentrations at the OLOWMA. A similar decrease in concentration in 12DCA in GW-087 apparently began in 1988.

3.3.2.4 1,1 dichloroethene and 1,2 dichloroethene

The distribution of 11DCE suggests that the source of the small concentrations of 11DCE are from degradation of TCE and PCE within the OLOWMA rather than from any upgradient sources because the upgradient well (GW-064, near the Rust Spoil area) consistently indicated 11DCE concentrations below detection limits. Few wells contained significant contents of 11DCE or 12DCE other than GW-229, GW-364, and GW-365. The 11DCE generally decreases in the GW-364, GW-365 cluster whereas 12DCE generally increases with time. The bar graphs of Appendix C.2 show an unexplained temporary low in both wells for both contaminants around May 1990. Both 11DCE and 12DCE are in higher concentrations in GW-365 (TD = 150 ft) than in GW-364 (TD = 60.3 ft) which is not surprising considering that a downward hydraulic gradient in the conduits of the Maynardville Limestone occurs south of the OLOWMA. Well GW-003 also had a high concentration (620 ug/L) of 11DCE in April 1988, however all other samples from this well were below detection limits (< 5 ug/L). As is suggested by the high 11DCA content in

April 1988 of 1,900 ug/L, there may have been a spill in the vicinity of GW-003 or more likely, the data are of poor quality.

There are insufficient data in any sampling period to evaluate where the high concentrations of 11DCE (and 11DCA) near GW-003 may have migrated. There is also insufficient data from which to evaluate any possible changes in 11DCE concentrations or migration as a result of the installed caps.

From the 12DCE maps (Figs. 3.8, and 3.9), it appears that either the source of the 12DCE is from the western side of the OLWMA, or the 12DCE migrated in the direction of the hydraulic gradient from an upgradient source. Degradation of TCE and PCE likely occurred within the Oil Landfarm plots as well as along a flow path from the site. For both the shallow and intermediate groundwater zones, migration of this secondary contaminant plume is southwest within the OLWMA, yet proceeds westward once contaminants have entered the Maynardville Limestone. Slightly lower concentrations of 12DCE in all shallow wells are observed in September 1989 in comparison to those measured in March 1989. Although the data are limited, the distribution of 12DCE suggests the center of mass of a dissolved contaminant plume may have exited the OLWMA before initiation of cap construction. Most values of 12DCE in 1990 and 1991 are near, or below, the detection limit of 5 ug/L. TCE, PCE, and 12DCE are generally higher in the Maynardville Limestone wells suggesting that TCE and PCE may have largely migrated from the shallow zones at the OLWMA site and most of what remains are degradation products and, perhaps, small residual pools which could continue to act as a source of contaminants for many years.

3.3.2.5 Tetrachloroethene

Five wells contained detectable PCE (GW-010, GW-064, GW-087, GW-227, and GW-228). The most significant data on PCE were obtained from GW-087 which is located just southwest (downgradient) of the Boneyard/Burnyard. The bar graph in Appendix C.2 suggest a dissolved plume breakthrough from the Burnyard area in July 1987, followed by a consistent decrease in PCE concentration through March 1990 when the last sample

Figure 3.8: Contour map showing 1,2-dichloroethene (ug/L) distribution in shallow wells at the Oil Landfarm (3/89).

Figure 3.9: Contour map showing 1,2-dichloroethene (ug/L) distribution in intermediate depth wells at the Oil Landfarm (3/89).

was collected from this well. Because the concentration at this well was clearly decreasing over this entire time period, it is unlikely that the cap at the Burnyard decreased the local migration of PCE to GW-087. Lower concentrations of PCE are observed in GW-228 (TD = 100 ft, in the Maynardville Limestone) after January 1986. It is unclear if cap installation had any effect on the transport of PCE toward the Maynardville Limestone Well GW-228.

3.3.2.6 Trichloroethene

The most common VOC at the OLWMA is TCE, which has been detected in relatively high concentrations in several wells (i.e., up to ≈ 800 ug/L in GW-087). Plots of Appendix C.2 show a general trend of decreasing concentration of TCE with time. The slow concentration decreases observed in all of the wells do not appear to be related to cap installations in 1989. Well GW-087 had the highest TCE concentrations whereas GW-225 (TD = 200 ft; south of the Landfill) had the next higher concentrations. The deeper wells in all clusters represented on the plots of Appendix C.2 contain considerably higher TCE concentrations than the shallow cluster well. Because the specific gravity of pure-phase TCE is ≈ 1.47 , transport of free-phase TCE to deeper levels may be expected. No free-phase DNAPL has been encountered at the OLWMA. The higher concentrations of dissolved TCE in deeper Maynardville Limestone wells may simply reflect deeper contaminant migration due to the lower hydraulic heads in deeper Maynardville Limestone zones in this portion of BCV.

Five maps are included to illustrate the distribution of contaminants and plume migration at the OLWMA (Figs. 3.10 through 3.14). The first two maps illustrate the TCE distribution in shallow bedrock wells in September 1988 and March 1989. Figures 3.10 and 3.11 indicate that much of the TCE contamination in the shallow bedrock zones south of the OLWMA originates upgradient (from the east) within the Maynardville Limestone. There is also a general decrease in TCE between 1988 and 1991, suggesting a decreasing

Figure 3.11: Contour map showing trichloroethene (ug/L) distribution in shallow wells at the Oil Landfarm (3/89).

Figure 3.12: Contour map showing trichloroethene (ug/L) distribution in intermediate depth wells at the Oil Landfarm (9/88).

Figure 3.13: Contour map showing trichloroethene (ug/L) distribution in intermediate depth wells at the Oil Landfarm (3/89).

Figure 3.14: Contour map showing trichloroethene (ug/L) distribution in intermediate depth wells at the Oil Landfarm (5/90).

source concentration from the east. Insufficient TCE data are available to determine a possible source location within the OLWMA itself.

Contaminant distributions in the intermediate depth zones (Figs. 3.12 through 3.14) suggest TCE originates from the Oil Landfarm and sinks, perhaps along bedding planes in the down-dip direction, to the depths encountered within the Maynardville Limestone. TCE migrates generally south in the direction of the local hydraulic gradient (Figs. 3.3 and 3.4). Once within the Maynardville Limestone, dissolved contaminants appear to migrate both to the west and downward (i.e., downward, hydraulic gradient). The deeper TCE data also suggest decreasing concentrations within the plume through time, except for the value of 460 ug/L in GW-225 in May 1990, which is anomalous. A portion of the TCE in the deeper groundwaters may have had a source from the shallower groundwater plume which originated to the east of the OLWMA, but it is not clear what component may be contributed by this source.

Figure 3.15 illustrates a conceptual model which may explain the TCE distributions illustrated on the plan view maps of Figures 3.10 through 3.14. Except for at Well GW-087, TCE appears to have been largely flushed from or degraded within the shallower zones, and free-phase TCE likely sank beneath the Oil Landfarm plots before sampling at the site began and may have flowed along fractures in the Nolichucky Shale in the general direction of groundwater flow. However, shallow, near-source contaminant concentration data are not available from which the location or concentration of the source materials can be established. Whether the currently dissolved, low concentration TCE continues to sink in the Maynardville, flow beneath Chestnut Ridge or flow laterally along the strike to be discharged through springs is unknown at this time. However, it is suspected that the flow of dissolved TCE is lateral (along strike) through the Maynardville Limestone at depths of 200 to 300 ft. For instance, TCE has been detected in Maynardville Limestone exit pathway wells at Picket B (Shevenell, et al., 1993) which is $\approx$ 2,500 ft southwest of the OLWMA. TCE concentrations between 4 and 79 ug/L (HSW, 1992b) have been measured between depths of 200 to 300 ft within the Maynardville Limestone at Picket B. Limited

Figure 3.15: Cross-section depicting trichloroethene concentrations measured in May, 1990

evidence suggests that upward gradients within the Maynardville Limestone may occur to the west of the OLWMA and Picket B (unpub. water level data).

3.3.2.7 Total Uranium

Significant total uranium contents have also been detected in some wells near the OLWMA. Well GW-087 contained the highest U contents (up to ≈ 0.6 mg/L) and shows generally decreasing concentrations after April 1988. Two wells (GW-225 and GW-226) downgradient of GW-087 contain about one order of magnitude less U. Total U in these two Maynardville wells is ≤ 0.09 mg/L, and concentrations have generally increased with time between January 1986 and April 1991. The shallow wells have generally had higher U contents than intermediate depth bedrock wells. It appears that U is not as readily transported as the VOCs. As U continued to increase in the wells monitoring the presumed groundwater exit pathway within the Maynardville Limestone, VOC concentrations have generally decreased with time. The highest concentration of the dissolved VOC plume appears to have passed the location of GW-225 and GW-226 prior to 1987 or 1988, but the center of mass of the U plume may have passed this location sometime in 1991. Installation of caps may have slowed the migration of the U contaminant plume.

3.4 SUMMARY

Water level data suggest that the local groundwater flow patterns in the OLWMA area were not altered following cap construction. Groundwater flow and contaminant transport have consistently been in the southerly direction over all depth intervals in the main OLWMA site. Flow becomes more westerly within the Maynardville Limestone south of the site. No change in these general flow directions have occurred following cap constructions at the Oil Landfarm plots and Chemical Storage areas, and no changes in water levels in any of the wells occurred following cap construction. This is not surprising because the OLWMA is located on a hill slope and recharge to the local groundwater

system is dispersed throughout the hill slope (from the crest to near the valley axis). Installation of a cap over a small percentage of a recharge area will not significantly change local flow patterns, and flow beneath caps occurs both through the stormflow zone and at the water table in response to precipitation on the ORR (Moore, 1988; Solomon, et al., 1992).

As noted previously in Geraghty and Miller (1991), there is vertical segregation of VOCs in the OLWMA as a result of density contrasts between the VOCs. VOCs in the unconsolidated zone generally contains higher percentages of 12DCE and 11DCA than the bedrock wells, perhaps, in part due to active degradation of TCE and PCE to 12DCE near the water table. In contrast, TCE ($\rho \approx 1.47$) is pervasive in the shallow and intermediate groundwater zone, but is uncommon in the unconsolidated zone. TCE is observed at depth in the Maynardville Limestone (200 to 300 ft bgs, ≈ 640 to 740 ft in elevation) where it is being transported laterally to the west, becoming diluted with distance.

It is likely that density-driven flow of pure TCE and PCE occurred during the early years of disposal at the site. This process likely resulted in residual DNAPL in pore spaces of the unconsolidated zone. As DNAPL was transported to the water table, VOCs became at least partially dissolved in water. Using Raoult's Law, the solubility of constituents in a multiphase solution can be calculated as a function of the pure-phase solubility of the individual constituent (Feenstra, 1992). All concentrations discussed in relation to the OLWMA VOCs are dissolved concentrations because measured VOC values for individual constituents range from ≈ 0.01 to 1.4 percent of their solubilities, where solubilities of the OLWMA contaminants range from 1.6×10^6 ug/L to 8.52×10^6 ug/L (Mercer and Cohen, 1990, Appendix A). No evidence for the presence of pure product is available at any of the well locations for the time over which data are available.

Based on experiences at the nearby Burial Grounds (Haase and King, 1990; Kueper, et al., 1992), free-phase DNAPL in the form of residual or pools is likely to be present at the OLWMA. Numerous wells were sampled at the Burial Grounds in the mid to late 1980s, and dissolved phase concentrations of VOCs were all at levels of < 1 percent of

solubility. While three additional wells were being drilled at the Burial Grounds in 1990, free-phase DNAPL was encountered at depths of ≈ 195 to 300 ft (Haase and King, 1990; Kueper, et al., 1992). Hence, the relatively low dissolved content in wells at the OLWMA does not preclude the presence of DNAPL at the site.

Summed VOCs in wells at the site during most of the study period are higher in the deeper wells than in the unconsolidated wells indicating active flushing of the near surface zones and transport of contaminants to deeper levels both before and after cap construction. Installation of caps over localized source areas would not be expected to cause decreases in dissolved concentrations for contaminants which have been transported to the depths observed within the Maynardville Limestone.

Individual constituents are observed to decrease in monitoring wells prior to installation of caps. PCE peaked at 1,600 ug/L in GW-087 (just downgradient of the Boneyard) in 1987 and this concentration exceeds 1 percent of the solubility of pure PCE (1.5×10^5 ug/L; Mercer and Cohen, 1990, Appendix A) and is 1.39 percent of the solubility of PCE which is mixed with TCE, 11DCA, 12DCA, and 11DCE in the proportions suggested by chemical analyses. This suggests the possibility of the presence of pure product at this site. After the peak in 1987, PCE continuously decreased suggesting the center of mass of a dissolved PCE plume had passed the area prior to capping in 1989. 11DCA decreased in wells south of the Oil Landfarm plots continuously after 1987, and decreases in downgradient Maynardville Limestone wells occurred following September 1988, although measured concentrations vary widely between sampling events. This variability reflects the rapid response of conduits in the Maynardville Limestone to changes in flow conditions in response to precipitation events. TCE decreased in nearby downgradient wells (i.e., GW-225) after 1987, and decreased in wells located further downgradient within the Maynardville Limestone (i.e., GW-364) after 1988. The slow, general trends of decreasing concentrations of all detected VOCs with time prior to cap installation suggest that the largest concentration pulses had already been transported away from the source areas of the Oil Landfarm plots before the caps were installed. The

VOC concentrations generally appear to be slowly decreasing in the sampled wells following 1987. Possible residual DNAPL may continue to release VOCs, resulting in slowly declining, yet high concentrations of VOCs. Deeper transport of DNAPL beneath the site may have occurred during site operation, and much higher concentrations in dissolved contaminants may occur in areas not monitored by the current monitoring well network. Uranium, which is less mobile than the VOCs, appears to have increased in concentration over the sampling period.

In summary, the installation of caps appears to have had little effect on transport of contaminants from the OLWMA because the site is located on a hill slope, and because concentrations of contaminants in groundwaters were decreasing prior to cap construction. The majority of near-surface contaminants appear to have been flushed from the stormflow zone prior to capping or mobilized to deeper levels beneath the capped areas. However, insufficient data are available to determine source concentrations which are currently present beneath the capped areas. In addition, groundwater flow on a hill slope, such as at the OLWMA, is not impeded by placement of caps over localized recharge areas because significant flow underneath the caps can occur, thus allowing continued contaminant migration.

4.0 CHESTNUT RIDGE SECURITY PITS

4.1 FACILITY DESCRIPTION

The Chestnut Ridge Security Pits (CRSP) are located on the crest of Chestnut Ridge southeast of the main portion of the Y-12 Plant (Figure 4.1). Numerous trenches were constructed within the security pits and were used for disposal of hazardous and non-hazardous wastes. The waste trenches are located in two adjoining areas, with each trench approximately 8 to 10 ft wide, 10 to 18 ft deep, and 700 to 800 ft long. Several disposal trenches may have been open at any given time, and after an individual trench was filled with waste, it was covered with 6 to 12 inches of soil (Battelle Columbus Division, 1986). In addition, 6 auger holes were located east of the easternmost trenches.

Figure 4.1: Detailed map of the Chestnut Ridge Security Pits area showing well locations.

These large diameter (2 ft), 10 ft deep holes were used for disposal of reactive substances (Butz and Stoner, 1983).

The eastern trench area encompasses three $\approx$ 700 ft long trenches which were used for disposal between 1973 and 1982. The western trench area encompasses four trenches ranging in length from $\approx$ 720 to 780 ft. Two of the trenches received waste from December 1982 to 1985, while the other trenches were used for disposal of nonhazardous waste from 1985 through 1988. Hazardous waste disposal was discontinued in December 1984 (Battelle Columbus Division, 1986). An estimated total volume of waste material disposed in the seven CRSP trenches is $\approx$ 4300 tons (Martin Marietta Energy Systems, Inc., 1988). Details concerning the amounts and types of waste deposited in the trenches are not specifically known because the waste inventories are classified. However, the major types of waste contained in the trenches have been identified, and they include acids, beryllium, heavy metals, biological material, fiberglass, miscellaneous debris, organic constituents, thorium, and uranium (Martin Marietta Energy Systems, Inc., 1988).

The CRSP site was closed in April and May 1989 according to the revised closure plan prepared by personnel from Martin Marietta Energy Systems, Inc., (1988). During closure, a low-maintenance, low-permeability cover was placed over the trench areas. The western pits were capped between April 10, 1989, and April 26, 1989, whereas the eastern pits were capped between April 19, 1989 and May 12, 1989. The multilayer, engineered caps that were installed over the pits consisted of a 24-inch layer of compacted clay at the bottom overlain by a 30-mil flexible membrane liner, a geosynthetic drainage net covered by a geotextile filter fabric, and 18 inches of topsoil with a vegetative cover.

4.2 HYDROGEOLOGIC FRAMEWORK

4.2.2.1 Precap Hydrogeology

The CRSP are located on the crest of Chestnut Ridge and underlain by the Copper Ridge Dolomite. The pits lie at, rather than down gradient of, a recharge area. Numerous studies on the hydraulic conductivity of the residuum on Chestnut Ridge have been conducted and demonstrate a wide variability (several orders of magnitude) of hydraulic conductivities as a function of location, depth, and moisture content. Field measured hydraulic conductivities, mostly from slug tests, range from 1.7×10^{-3} to 0.15 m/d (5.6×10^{-3} to 0.5 ft/d), whereas laboratory conductivities range from 8.5×10^{-6} to $2.8 \times 10^{-3} \text{ m/day}$ (2.8×10^{-5} to $9.1 \times 10^{-3} \text{ ft/day}$) (Mishu, 1982; Woodward-Clyde Consultants, 1984; Luxmoore, 1982; Daniels and Broderick, 1983; and Ketelle and Huff, 1984). Similar variability in hydraulic conductivities have been observed in soil residuum overlying karst areas in other parts of the world (Quinlan and Aley, 1987).

Percolation of precipitation on Chestnut Ridge through the soil residuum and regolith recharges the deeper bedrock groundwaters. Recharge to the Copper Ridge Dolomite is approximately three times larger than to the ORR aquitards due to its more permeable regolith (Solomon, et al., 1992). Additional recharge may also occur through fractures and dolines. The effect of more direct recharge through sinkholes on groundwaters in conduits would result in large variations in water level elevations in monitoring wells completed in conduits as the water level responds to changes in precipitation. Widely varying water level elevations have been noted in several wells installed near the CRSP, most notably in GW-173 and GW-174 in which water levels have varied by up to 40 ft in a given year (see Appendix B.2 for hydrographs of these wells). Although solute transport through the dolomite matrix is expected to be very slow, transport through the conduits and enlarged fractures can be quite rapid once a solute has entered a conduit either through diffusion from the matrix or through more direct and rapid flow through fractures.

Although discharge routes from the CRSP area are not known in detail, flow is likely to be radial away from the ridge, particularly in wet weather conditions. Although water table contour maps are often difficult to interpret in karst terrains, those constructed for the CRSP area appear to be consistent year to year and show a groundwater high around GW-178 (over the western trench area). Away from GW-178, groundwater apparently flows to the north, east, south, and perhaps, west (see Figure 4.2). The possibility of radial flow is also suggested by the results of a dye tracer test conducted by personnel from Geraghty and Miller (1990b); such radial flow has been observed in a number of karst systems in similar topographic locations (Quinlan and Ewers, 1985).

Figure 4.2 for February 25, 1988, and Figure 4.3 for April 13, 1988, show a groundwater high near GW-178. Although the general flow patterns and shape of water level contours are nearly the same for both dates, the groundwater elevation at GW-178 is 11.64 ft higher on April 13, 1988. Water level elevations of all wells are not consistently higher, however, and it appears that each well responds to precipitation events differently. Because some of the CRSP wells intersect conduits, some intersect fractures, and others monitor less permeable zones, not all wells will respond equally to changes in recharge. Lag times to the response, and the magnitude of the responses vary between these wells. Large seasonal fluctuations in water levels are common in conduit systems, in part because cavities make up a small percentage of the rock volume and specific yields are relatively low. Seasonal- and event-related changes in water level in karst aquifers are much larger than they would be in an equivalent porous medium where specific yields are larger. There are likely to be local differences in amounts of recharge and timing of events which would contribute to large water level fluctuations in different portions of the karst system.

Packer and tracer tests have been conducted at the CRSP (Geraghty and Miller, 1990b), and several thousand feet away from the pits within the Copper Ridge Dolomite (King and Haase, 1988). Packer tests on GW-135 (west of CRSP, near the S-3 ponds) by King and Haase (1988) suggest that hydraulic conductivities in the Copper Ridge Dolomite

Figure 4.2: Pre-cap potentiometric surface map for the Chestnut Ridge Security Pits (2/25/88). Elevations are in feet.

Figure 4.3: Pre-cap potentiometric surface map for the Chestnut Ridge Security Pits (4/13/88). Elevations are in feet.

can vary from 0.06 to 1,169 ft/yr. Rapid groundwater flow rates were also suggested during two dye-tracer tests. Flow rates between 100 and 1,250 ft/day were suggested by tracer tests conducted in the Copper Ridge Dolomite to the west of CRSP, and at the CRSP (Ketelle and Huff, 1984; Geraghty and Miller, 1990b). These values are typical of conduit flow rates observed in other karst settings (Quinlan and Ewers, 1985). Results from a second dye-tracer test at the CRSP are inconclusive; no definitive dye spectra were identified (SAIC, 1992).

4.2.2 Postcap Hydrogeology

In general, much less water level data are available following cap construction. After 1988, water levels were measured in the wells infrequently (1 or 2 times per year), and water level fluctuations can not be effectively evaluated following cap installation.

Figure 4.4 is a water level contour maps for data collected $\approx$ four years (1992) following cap installation. The general groundwater flow patterns observed following cap construction are very similar to those illustrated in the precap figures (Figures 4.2 and 4.3). There is no evidence, based on water level contour maps, that the cap installation had any effect on the local groundwater flow patterns. It is likely that the caps are reducing recharge locally, but groundwater recharge occurs in areas not covered by caps, and some of this water flows through the bedrock aquifer beneath the cap. Large fluctuations in water levels in GW-173, GW-174, and GW-177 were observed prior to cap installation, and the water levels following 1988 lie within the range of those observed prior to 1988.

4.3 GROUNDWATER QUALITY

Water quality plots are constructed only where sufficient data are available, or where data values were consistently above detection limits, or where the data appear anomalous. As previously stated, fluctuations in both water level and contaminant concentrations can be strongly affected by precipitation events in karst areas. Hence,

Figure 4.4: Post-cap potentiometric surface map for the Chestnut Ridge Security Pits (1/92). Elevations are in feet.

acquired data reflect the conditions at the instant of collection rather than indicating average, local conditions at a well site. Large changes in concentrations were measured, yet it should be realized that samples were collected both before, during, and after precipitation events, and the timing of sampling is not consistent from well to well or from one precipitation event to another.

4.3.1 Tetrachloroethene

Bar graphs for PCE (Appendix C.2) in four wells show that the highest concentrations of PCE occur on the eastern side of the CRSP, thereby suggesting that the source for the PCE is within the eastern trench area. A clear, consistent decrease in PCE is observed in GW-180 after October 1988, and an apparent decrease occurs following April 1989 in GW-176. The decrease in concentration in GW-176 is coincident with the installation of caps during April and May 1989. Less consistent trends are evident in GW-173 and GW-174, both of which are completed in or near active cavities. Consistent chemical concentrations would not be expected in these wells because of the rapid water level changes.

Figures 4.5 through 4.7 illustrate the configuration of the PCE plume associated with the eastern trenches in June 1988, January 1989, May 1990, and October 1991. In June, 1988 (Figures 4.5), the highest concentration of PCE appears to be located near the GW-180 location (completed in bedrock, depth 143 ft), although the original source presumably is located within the CRSP. The dissolved plume migrated generally toward the south in 1988 and 1989, and concentrations decreased at GW-180 between these two years. The plume apparently was migrating and expanding due to dispersion between 1988 and 1991, yet a source of PCE which slowly leaked out contaminants (i.e., perhaps residual DNAPL) appeared to remain near GW-180. The transport from the source near GW-180 is likely to be retarded by matrix diffusion and dissolution of residual DNAPL, because concentrations would be expected to decrease rapidly if cleanup required only flushing of the conduits in the area of GW-180. Migration and dispersion of the PCE

Figure 4.5: Contour map of tetrachloroethene (ug/L) concentrations at the Chestnut Ridge Security Pits (6/88).

Figure 4.6: Contour map of tetrachloroethene (ug/L) concentrations at the Chestnut Ridge Security Pits (5/90).

Figure 4.7: Contour map of tetrachloroethene (ug/L) concentrations at the Chestnut Ridge Security Pits (10/91).

plume began prior to cap installation, and proceeded following cap installation. Note that in karst settings, observed data variability may not reflect long-term changes due to biases in the timing of sample collection.

4.3.2 1,1,1 trichloroethane

Higher concentrations of 1,1,1 trichloroethane (111TCA) have been measured in wells located on the eastern side of the CRSP, except in the case of GW-174 for which a maximum content of about 19 ug/L has been measured. The lower concentration in this well is a function of the location of the well in a very active portion of the karst system; a fracture (at 143 ft) and a cavity (at 140 ft) occur within the completion interval. The large water level fluctuations in this well indicate that rapid flushing, and dilution of contaminants in fractures and conduits, is likely in this portion of the system. Nevertheless, this well shows less variability in 111TCA after cap installation. Although no specific trends in 111TCA concentration are observed in GW-176, it also shows decreasing variability in 111TCA after capping. Several other wells show general decreases in concentration through time.

The bar graph for GW-177 is reminiscent of a typical break-through curve with maximum concentrations being observed in January 1989. This well exhibits rather dramatic decreases in concentrations following cap construction. Slow decreases in contaminant concentrations following 1988 are observed in three wells (GW-178, GW-179, and GW-322). These data suggest that the highest concentration of the dissolved plume had probably passed these wells prior to installation of the caps.

Figures 4.8 to 4.10 show one interpretation of dissolved plume migration from June 1988 to August 1989 to October 1991. The plume apparently migrated toward the southeast over this time period, as well as becoming dispersed. Overall, no obvious influence from cap construction is indicated by this data. Plume migration began prior to installation, and apparently proceeded following installation.

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Figure 4.8: Contour map of 1,1,1-trichloroethane (ug/L) concentrations at the Chestnut Ridge Security Pits (6/88).

Figure 4.9: Contour map of 1,1,1-trichloroethane (ug/L) concentrations at the Chestnut Ridge Security Pits (8/89).

Figure 4.10: Contour map of 1,1,1-trichloroethane (ug/L) concentrations at the Chestnut Ridge Security Pits (10/91).

4.3.3 1,1 dichloroethane

Bar graphs (Appendix C.2) show a general decrease in 11DCA in GW-177, GW-179 and GW-180 prior to installation of the caps. Concentrations of 11DCA continuously increased in downgradient Well GW-322 between 1988 and 1991.

Figures 4.11 and 4.12 illustrate the distribution of 11DCA in March 1988 and October 1991, and the data suggest plume migration and dispersion toward the southeast. Concentrations decreased through time on the northern end of the plume as 11DCA migrated toward the south and increased concentrations on the southern edge (in GW-322) as the plume migrated southeast.

4.3.4 1,1 dichloroethene

As with the other VOCs detected at the CRSP, the highest concentrations of 11DCE are located in wells in the eastern portion of the site. Limited data on 11DCE are available, yet a general decrease is observed in GW-179 following cap installation, while a slight increasing trend is observed in GW-322 (Appendix C.2). As was indicated with the 11DCA and 111TCA data, the center of mass of a dissolved 11DCE contaminant plume (Figures 4.13 and 4.14) is migrating toward the southeast, generally following the hydraulic gradient. Based on the available data, cap installation is unlikely to have had a major effect on the migration of the contaminant plume.

4.4 SUMMARY

Interpretation of water level and chemical data in karst terrains can be difficult because measurements are a strong function of precipitation events. The data presented here were not collected with the intent of providing rigorous information from which the direct relationships between water level changes and contaminant fluxes and precipitation intensity could be established. Hence, some of the trends observed could be artifacts of the sampling in that wells were sampled at different times preceding and following recharge events. In some cases, the data may reflect a slightly delayed reaction to rain in

Figure 4.11: Contour map of 1,1-dichloroethane (ug/L) concentrations at the Chestnut Ridge Security Pits (3/88).

Figure 4.12: Contour map of 1,1-dichloroethane (ug/L) concentrations at the Chestnut Ridge Security Pits (10/91).

Figure 4.13: Contour map of 1,1-dichloroethene (ug/L) concentrations at the Chestnut Ridge Security Pits (6/88).

Figure 4.14: Contour map of 1,1-dichloroethene (ug/L) concentrations at the Chestnut Ridge Security Pits (10/91).

the form of dilution of a particular contaminant in a well intersecting a conduit. In any event, no discernable changes in water levels followed cap installation in the wells, which are predominantly located at depths of 145 to 165 ft.

Very rapid transport of chemical constituents can occur when the constituents enter cavities in the Copper Ridge Dolomite. However, the groundwater system at the CRSP is not strictly dominated by conduit flow. The behavior of the system suggests there is a substantial component of slower, diffuse flow, and the lingering high concentrations of VOCs suggest residual DNAPL may occur in pores and fractures and within the vadose zone (regolith) above the water table.

The majority of the groundwater contamination occurs on the eastern side of the CRSP suggesting that the eastern trenches may have been the source of the VOCs. However, the wells in which the highest contamination is observed are down-gradient of the western trenches as well. Substantial migration of contaminants from this area may have occurred prior to initiation of sampling but following initiation of disposal in the western area in 1982.

Trends in contaminant concentrations are observed for several constituents. Prior to cap construction, 11DCA decreased in wells in the central portion of the site while increasing in the down-gradient well (GW-322); there may have been migration of the center of mass of this dissolved plume away from the source area. The 111TCA generally decreased in all wells at the site, regardless of cap installation, and the plume continued migrating toward the southeast throughout the study period. The PCE also appeared to decrease in the monitor wells regardless of the timing of the capping; this plume migrated generally toward the south. Effects of the caps may be seen in the responses of Wells GW-174 and GW-176 which exhibit less variability in 111TCA following cap installation. This suggests the cap may have reduced percolation which ultimately recharges the groundwater near these sites.

Migration and dispersion of VOC plumes to the south and east of the eastern trenches occurred both before and after cap installation. The plumes appear to have

migrated south of the eastern trenches before caps were installed, and migration continued in the general direction between GW-179 and GW-322 in the cases of the 111TCA, 11DCA and 11DCE plumes. The center of mass of the dissolved PCE plume apparently moved eastward farther and more rapidly than the other VOC plumes. The center of mass of PCE appeared to be near GW-180 by June 1988 whereas that for 111TCA and 11DCA was near GW-179 in June 1988, and that of 11DCE was near GW-322 at approximately the same time. Perhaps there was a more easterly source for PCE than for the other plumes which are generally migrating southeast between GW-179 and GW-322.

Density differences may have affected migration toward deeper levels near GW-180 (TD = 144 ft; TD of GW-179 is 117 ft). The specific gravities of pure-phase 111TCA, 11DCA, and 11DCE lie between 1.2 and 1.35 whereas that for pure phase PCE is substantially higher at ≈ 1.65 , thus allowing for a greater influence of density driven flow if pure phase product were present.

Calculations of percent of solubility of individual components in the DNAPL mixture show that all water samples analyzed for 111TCA, 11DCA, and 11DCE are at < 1 percent of their solubilities. PCE has been detected at up to 1.2 percent of its solubility in the mixture. In GW-179 water, PCE was at 1.2 percent of its solubility in April 1986, and at only 0.3 percent of its solubility in October 1991, showing that the percent of solubility of components in the mixture is decreasing with time. As at the OLWMA, the concentrations of dissolved DNAPL observed at the CRSP indicates that free-phase DNAPL may be present at the site in the form of pools, or residual in the vadose zone, although this is speculative.

The emplaced caps might have had a localized effect on the contaminant hydrology at this site because concentration variability in individual wells generally decrease with time. Most concentrations were decreasing prior to cap emplacement thereby suggesting that the individual dissolved VOC plumes were migrating and dispersing irrespective of the cap installation. The capping could only assist in decreasing direct infiltration into the trenches and continued leaching of the wastes.

5.0 DISCUSSION

The primary objective of the RCRA caps at the three Y-12 sites was to halt direct infiltration of precipitation into the waste sites, minimizing the risk of direct contact with the wastes, and to comply with TDEC regulations. Presumably, the caps were effective in halting this direct infiltration into the sites over the extent of the capped areas, but no evidence is available to directly demonstrate this. Although it may not be specifically stated as a performance criterion, the primary reason that it is desirable to halt direct infiltration into waste sites is to ultimately reduce leaching of contaminants and retard future migration of contaminants from the site (i.e., immobilize the contaminant source). Caps of small extent, which do not isolate up-gradient recharge areas, cannot be completely effective in reducing contaminant migration from a site with hydrology similar to that at Y-12, and caps can only be considered as one component of an overall remediation scheme. Because the ultimate objective of any remediation scheme is to reduce contaminant migration from a site, the effectiveness of the Y-12 caps is evaluated based on their impact on contaminant migration.

The caps installed over the three sites (OLWMA, CRSP, and NHP) appear to have had a minimal effect on contaminant migration from the respective sites. Although no changes in the configuration of the water table were expected or observed following cap construction, the well data may be insufficient to detect any changes if they did occur. Migration of contaminant plumes occurred at all three sites, apparently without regard to the timing of cap installation. The sites had been in operation a considerable period of time prior to having been capped. Contaminants migrated to deeper levels within the bedrock where dissolved plume migration continues at a slower rate than that which likely occurred during flushing of the shallower zones. At the time that the caps were constructed, the potential importance of the stormflow zone was not recognized, hence data to evaluate this process were neither collected before nor after cap installation. Water level monitoring at the water table cannot be used to evaluate the processes occurring in the stormflow zone.

Plume migration within the deeper zones began before cap emplacement and continued after cap installation, though perhaps at a slightly slower rate at the CRSP.

However, the center of mass of dissolved plumes at both the OLWMA and the CRSP had apparently migrated past the individual waste site boundaries prior to cap installation. Because of this migration, capping would not be expected to significantly alter contaminant migration. Early, rapid flushing of both sites likely occurred in the stormflow zone and through fractures (OLWMA; CRSP) and conduits (CRSP), thus transporting a large component of the contaminants away from the site. Perhaps density driven flow of DNAPLs at the sites also transported a portion of the contaminants away from the shallow portions of the site, and the existing monitoring wells may only reflect changes in the shallower portions of the system. If deeper migration of TCE into the fractured Nolichucky Shale occurred at the OLWMA, deeper monitoring wells in the shales may encounter higher concentrations than the existing wells.

Eight small caps have been installed over individual trench areas at WAG 6, ORNL (Ashwood and Spalding, 1991; Bechtel, et al., 1991), and water level measurements in intratrench wells show that the interim corrective measure caps had no effect on eliminating perched water in six of the eight capped areas. Although the caps reduced direct percolation of recharging waters as intended, they were ineffective in halting shallow stormflow, which flows under the caps and mobilizes the trench wastes. The caps were also ineffective in halting deeper groundwater flows. As expected, these small caps were largely ineffective in reducing contaminant mobility because they do not cover up-slope, recharge sources. Larger caps (perhaps used in combination with upgradient diversion trenches) designed to cover most of the upgradient recharge sources are expected to be far more effective in eliminating groundwater flow through and contaminant transport from the waste sites, and a larger cap should result in significant water level declines at the WAG 6 site (Ashwood and Spalding, 1991; Bechtel, et al., 1991).

Similarly, the OLWMA caps do not extend sufficiently far up-slope to halt shallow flow though the stormflow zone and at the water table at the waste area, although the caps were not originally intended to do so because the importance of stormflow was not recognized during cap construction. The caps were constructed to halt direct infiltration into the wastes and thereby retard contaminant leaching and transport from the site. The

differences between the OLWMA and WAG 6 are that much of the shallow contaminants may have been flushed through stormflow action prior to cap installation at the OLWMA, whereas a considerable, known contaminant source still remains at WAG 6, and remedial actions can be undertaken which may retard future contaminant migration from WAG 6.

The settings at NHP and CRSP are different than that described for the OLWMA. The CRSP overlies the karst aquifer of the Copper Ridge Dolomite, and although the cap was placed at the topographic high on the ridge, the cap appeared to result in decreased concentration variability in only a few of the wells. This is not surprising considering that complete hydrologic isolation of a conduit flow system, which periodically exhibits large flow rates through conduits in largely undefined locations, is expected to be extremely difficult.

Groundwater flow through the NHP area, on the other hand, is controlled by its location at the valley axis which is a zone of convergent groundwater flow. Much lower water level fluctuations occur at NHP in comparison to the other two sites investigated. Hydraulic and contaminant plume definition is poor because of insufficient data having been collected at the site. Complications in understanding the area also result because of: (1) the operation of a sump pump since 1991 to prevent the Lake Reality liner from floating, (2) possible preferential flow through excavated areas associated with underground utilities and the more permeable zones associated with the former stream channel, and (3) wastes were left in place, below the water table, when NHP was capped. The presence of numerous upgradient sources of contaminants also complicates evaluation of cap effectiveness. It is possible that much of the contamination discussed in Section 2 does not have a source within the NHP area but is associated with upgradient sources. Increases in concentrations following capping may reflect the effects of decreased infiltration through the capped area and, hence, decreases in the amount of dilution and flushing on the western portion of the site.

Increases in concentrations of PCE and total U after cap installation suggests there may be an upgradient source for at least these constituents. Increases in carbontetrachloride in wells on the down-gradient side of the ponds after cap installation suggests contaminant plumes may have migrated underneath the capped area. Capping of

NHP appears to have had a minimal effect on the contaminant hydrology because some of the contamination may originate from an upgradient source, and because contaminant plumes appear to be migrating from the site.

The effectiveness of the combination of chemical immobilization and capping at a fourth site at the Y-12 Plant (S-3 Ponds) has been investigated by Moore and Toran (1992) and Shevenell, et al. (1992b). Nitrate-contaminated waters have been discharging into the headwaters of Bear Creek from the S-3 Ponds, and NO_3 and metals concentrations have decreased dramatically in Bear Creek since neutralization of the ponds with limestone and NaOH in 1983. The neutralization of the ponds had a dramatic effect on contaminant mobility. Contaminants have been largely flushed from the shallow zones (Moore and Toran, 1992 and Shevenell, et al., 1992b) at the S-3 Site, as may be the case at the OLWMA and CRSP.

The primary source of contaminant releases at the S-3 Ponds was removed during neutralization of the ponds, but a secondary source of contaminants is present within the porous, low permeability matrix of the Nolichucky Shale. The higher concentrations of the primary contaminants during the early years of the S-3 Ponds operation likely resulted in diffusion of contaminants into the rock matrix. As the primary contaminant source was removed and groundwater flushing proceeds, diffusion of contaminants out of the matrix will likely occur over long periods of time. The concentrations released by this secondary source are expected to occur at decreasing rates, and the decreasing concentrations observed reflect this influence.

Secondary sources of contaminants which are currently diffusing out of the matrix intervals, are likely to be providing at least a portion of the contaminants observed to be discharging from the OLWMA and CRSP. Although the capping of the OLWMA plots and the CRSP appeared to have limited effect on contaminant mobility, concentrations are decreasing, and the ecological and health risks are decreasing as a result of continued flushing of the contaminants, perhaps similar to that observed in the S-3 Ponds area.

6.0 RECOMMENDATIONS

Based on the findings in this report, we make recommendations and highlight issues which should be considered during future remediation attempts at other sites.

6.1 GENERAL CONSIDERATIONS

6.1.1 Objectives

The objectives of any capping effort should be clearly defined before capping begins and a monitoring program is established to evaluate performance criteria. Objectives can only be clearly stated when a thorough understanding of the groundwater and surface water hydrology and the locations of the wastes at the site are available. The primary purpose of any capping action is to halt direct infiltration of recharging waters, whereas an implied purpose is to reduce leaching of contaminants from rain water infiltration and their migration from the site. Unless the caps are breached, or are too permeable, they should be effective in halting direct infiltration. However, capping alone may not be sufficient to achieve the secondary objective.

Caps are not universally applicable technologies on the ORR due to varying physical conditions at each facility. Caps are appropriate in some settings, particularly if used in conjunction with up-gradient interceptor trenches. When wastes are located at the surface or in the stormflow zone, such as at the OLWMA where oils were simply placed on nutrient adjusted soils, shallow stormflow can occur through the wastes. In this case, halting stormflow is required to decrease contaminant migration, and this cannot be accomplished by localized capping, but must be accompanied by upgradient interceptor trenches. Wastes in the lower vadose zone, which are periodically inundated during times of rising water levels, may be effectively isolated with the use of capping which can decrease average water levels beneath the sites.

6.1.2 Monitoring

Before any remedial alternatives are considered, the available geochemical data from springs, seeps, streams, and wells should be reviewed, and data gaps identified. In the case of the OLWMA, insufficient data were available on contaminant concentrations in

the most contaminated wells located nearest to the waste disposal areas. Hence, it was difficult to evaluate trends in contaminant concentrations at locations closest to the site. Unless it becomes cost prohibitive, more emphasis should be placed on monitoring these types of wells for indicator parameters in order that potential contaminant migration before and after capping can be evaluated. Without such monitoring, performance evaluation is difficult. The data evaluated in this report suggests that monitoring well data can provide ambiguous information, at least when collected at the time intervals and locations for which data were collected near the three capped areas. Monitoring discharge and concentrations in first-order streams would also be very useful in identifying changes in contaminant fluxes from a site following capping. The effects of capping can best be seen through stream monitoring which integrates the effects of changes in groundwater chemistry and fluxes. Perimeter monitoring of stream flow should also be conducted in order to evaluate any off-site migration of contaminants and possible new contaminant sources from future container breaches or migration of contaminants underneath the cap from an upgradient source.

If sufficient monitoring well, stream, and spring data are available, and if a discernable contaminant plume can be mapped, the changing plume configuration through time and its concentration should be examined before any remediation is considered. If the highest contaminant concentrations have clearly migrated away from the original site, yet the concentrations remain high and are of concern, then remedial alternatives should be investigated (i.e., interceptor trenches). If the primary source has been largely flushed, or mobilized to deeper levels, as may be the case at the OLWMA, and if concentrations within the plume have decreased below the level of concern, the no action alternative should be seriously considered.

6.1.3 Local Hydrogeology

When waste disposal facilities are located in a setting with significant topographic relief, it is possible to isolate recharge to the site from precipitation through capping if sufficiently large areas are capped and upgradient interceptor trenches are installed. Capping can be effective in reducing groundwater flow through the site and locally

lowering the water table. This lowering of the water table reduces the hydraulic gradients and, therefore, flux of contaminants. These results can only be expected, however, for caps located in non-karst systems. Also, the type of contaminants at a site should be considered. Sites with known DNAPL, which have been present for a number of years, will likely have experienced some deep migration of contaminants before a remediation alternative is selected.

One would expect that karst aquifers would not be effected by limited capping. However, small decreases in concentration variability in a few wells at the CRSP suggest caps may help reduce recharge, and hence, some of the active flushing which occurs during precipitation events. The marked water level fluctuations in karst wells relative to other wells likely mask any effect that capping may have. This observation raises the question of the merits of using water levels to monitor cap performance in areas where cavities are present (i.e., Maynardville Limestone). It is likely that only non-karst wells can be used to evaluate cap effectiveness in this manner. Cavities also have the potential for moving the contaminant mass out and away from the site rapidly, whereas in non-karst systems (i.e., Nolichucky Shale), contaminant mobility is retarded. Post-remedial monitoring would clearly need to be different in these two extreme types of hydrologic settings.

6.2 CONTAMINANT SOURCE LOCATIONS

6.2.1 Primary Sources

Wastes on the ORR have been located in a variety of settings: at the surface and in the stormflow zone (i.e., OLWMA), in the vadose zone (i.e., CRSP), and at and below the water table (i.e., NHP and WAG 6 trenches). Remediation alternatives and associated monitoring must consider the differences in each setting.

Lateral flow of water in the stormflow zone beneath caps is an important problem, particularly in the case of trench disposal areas which may occur in both the stormflow and water table zones. Upgradient diversion trenches are needed in these settings to halt flow under the caps and continued transport of the contaminants, and to help reduce the water level under a cap. Another difficulty associated with trench disposal is that the

trench fill material may be an order of magnitude more permeable than the undisturbed regolith (Davis, et al., 1984). Hydrologically, the filled trench may respond the same as would an open trench. Hence, lowering the water table through capping can be an effective isolation method when used in conjunction with upgradient diversion trenches. If the design objectives of a cap are to dewater wastes inundated by the water table, monitoring water level changes in the trenches and nearby wells is an appropriate method to evaluate effectiveness.

Hydrologic isolation through capping may be most effective for primary sources located in the vadose zone, and it can be relatively inexpensive and effective for this problem. Capping can also provide protection against future releases from container degradation. For wastes in the vadose zone, halting direct percolation of recharging waters through the wastes is the most important objective. Lowering of the water table would produce no benefits. If the wastes were never in contact with the water table (i.e., CRSP), lowering the water table would have little effect in waste isolation, and therefore, water quality.

6.2.2 Secondary Sources

In many contaminated sites on the ORR, secondary contaminant sources occur within the rock matrix. Diffusion of contaminants out of the rock matrix, into the currently lower concentration waters within fractures, may be the cause of some of the more consistent contaminant concentrations observed at some sites. Diffusion of contaminants out of the matrix into the fracture, with waters ultimately discharging to surface waters and springs may serve as long-term contaminant sources. These sources are more dispersed, and of lower concentration, than the primary sources. Remediation of the secondary sources may be difficult because some traditional measures such as pump-and-treat are not expected to significantly increase the clean-up rate of the aquifer (Solomon, et al., 1992). Because these secondary sources are below the water table, capping would be a largely ineffective means of waste isolation. Perhaps the slow release of relatively low concentration contaminants is not of concern and a no-action alternative may be appropriate for these secondary sources.

6.2.3 Releases to Surface Waters

Approximately 95 percent of the recharge on the ORR is believed to discharge locally through springs, seeps, and direct discharge to streams during storms. Contaminant transport through the stormflow zone and at the water table to local springs and streams likely occurs in many locations. These discharges may be from either primary or secondary sources. If discharge concentrations at springs are relatively high and are of concern, water treatment at known discharge locations (i.e., springs) should be considered as a remedial alternative, perhaps in conjunction with caps or other measures to decrease volumes to be treated.

6.3 REMEDIATION OF DIFFERENT WASTE TYPES

Wherever immobilization of contaminants is possible, either by neutralization or by other means which may be in development (i.e., in-situ vitrification; Buelt, et al., 1987), this alternative should be considered because permanent hydrologic isolation is difficult to achieve by capping alone. Methods for immobilization of different wastes include pH adjustment and trench grouting, and these may be relatively inexpensive and effective for radionuclide waste areas. However, hydrologic isolation of these sources may be the most cost-effective, general-purpose method. For high Curie wastes and for Sr and tritium sources, both immobilization and isolation methods may be required.

Immobilization may not be possible for some contaminants such as VOCs, and may be many times more expensive (i.e., vitrification) than simple caps and upgradient french drains. Note that immobilization has the same type of uncertainty as does hydrologic isolation. There can never be 100 percent certainty that the primary sources have been completely immobilized for all future time.

When waste immobilization is clearly not an option due to the chemical or physical characteristics of the waste, larger caps which cover as much of a recharge area as possible should be considered. If this alternative is selected, it may become necessary to construct upgradient diversion trenches to assist in decreasing the potential for shallow stormflow beneath the capped areas.

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APPENDIX A

Well Completion Information for the Wells Located
Near New Hope Pond, the Oil Landfarm Waste
Management Area, and the Chestnut Ridge
Security Pits

Note: All depths, locations and elevations are in feet. The North and East locations are in Y-12 Plant coordinates.

CON	Conasauga Group
Cm	Maryville Limestone
Cn	Nolichucky Shale
Cmn	Maynardville Limestone
KNOX	Knox Group

All well data is taken from King, et al. (1991).

APPENDIX AWell Completion Information for the Wells Located
Near New Hope Pond

Note: All depths, locations and elevations are in feet. The North and East locations are in Y-12 Plant coordinates.

CON	Conasauga Group
Cm	Maryville Limestone
Cn	Nolichucky Shale
Cmn	Maynardville Limestone
KNOX	Knox Group

All well data is taken from King, et al. (1991).

Wells Located near the New Hope Pond Area

Well	North	East	Elevation	TOWR	TOFR	TD	Finish Depth	Top Screen	Bottom Screen	Top Open	Bottom Open
GW-148	29202	63817	904.53	11.1		11.1	11.1	5.6	11.1		
GW-149	29201	63824	904.76	9	12	50.5	47.5	37.0	47.0		
GW-150	28959	64222	912.88	11.7		11.7	11.7	6.2	11.2		
GW-151	28958	64232	913.06	12	12	96.5	96.5	86.0	96.0		
GW-152	28614	63718	918.36	17.3		17.3	17.3	11.8	16.8		
GW-153	28613	63728	918.53		14	60	59.5	49.5	59.5		
GW-154	28987	63346	908.6	11.2		11.2	11.2	5.7	10.7		
GW-167	28661	65146	929.67			30.1	30.1	26.0	30.1		
GW-168	28699	65167	929.45		29	135.4	104			104.0	135.4
GW-220	28949	64225	912.74		11	45.2	45.2	34.7	44.7		
GW-222	28954	63324	908.82		10	25	25	19.5	24.5		
GW-223	28938	63311	908.97		10	90.5	90.5	80.0	90.0		
GW-239	28715	65089	928.77			433.3	404			404.0	433.3
GW-240	28604	63726	919.5		14	29.5	29	24.0	29.0		
GW-380	28714	62938	913.66	15.5		15.5	15.5	9.8	15.2		
GW-381	28715	62947	913.4	13.5	26	60.4	49.3			49.3	60.4
GW-382	28716	62956	913.16	12.7	17	173	125			125.0	173.0
GW-383	29201	63522	906	11.5		24.1	23.6	18.1	23.1		
GW-384	29216	63530	905.38	12		55.7	35.5			35.5	55.7
GW-385	29208	63526	905.87	11		178.7	123.7			123.7	178.7
GW-603	28430	64803	959.41	24	60	75.2	75.2	64.9	75.2		
GW-604	28437	64803	959.53	31	55	112.4	112.4	102.5	112.4		

Wells Located near the New Hope Pond Area (Continued)

Well	Formation	Water Breaks
GW-148	CON: Cmn	
GW-149	CON: Cmn	Water @ 4 / Large quantity of water @ 25-28
GW-150	CON: Cmn	
GW-151	CON: Cmn	Frac @ 26(w)
GW-152	CON: Cmn	
GW-153	CON: Cmn	Frac @ 29-30
GW-154	CON: Cmn	Water @ 5
GW-167	CON: Cmn	
GW-168	CON: Cmn/Cn	
GW-220	CON: Cmn	Water @ 11
GW-222	CON: Cmn	Fractured zone-cavity @ 19
GW-223	CON: Cmn	Cav(m) @ 57-59 / Frac @ 17-18, 27.5-29, 34-39, 66-67, 68.5-69.5
GW-239	CON: Cmn/Cn	
GW-240	CON: Cmn	Frac @ 29-30
GW-380	CON: Cmn	
GW-381	CON: Cmn	Cav @ 16.3, 17, 19.6, 24.5
GW-382	CON: Cmn	Cav @ 16 / Water @ 163-173
GW-383	CON: Cn	
GW-384	CON: Cn	
GW-385	CON: Cn	
GW-603	CON: Cmn	Cav @ 39, 45-47, 55-58 / Water @ 67
GW-604	CON: Cmn	Cav @ 35-39, 43-47, 52.5-54.5 / Water @ 86, 104.5

APPENDIX AWell Completion Information for the Wells LocatedNear the Oil Landfarm Waste Management Area

Note: All depths, locations and elevations are in feet. The North and East locations are in Y-12 Plant coordinates.

CON	Conasauga Group
Cm	Maryville Limestone
Cn	Nolichucky Shale
Cmn	Maynardville Limestone
KNOX	Knox Group

All well data is taken from King, et al. (1991).

Wells Located Near the Oil Landfarm Waste Management Area

Well	North	East	Elev.	TOWR	TOFR	TD	Finish Depth	Top Screen	Bottom Screen	Tom Open	Bottom Open
1048	30288	47771	981.65	3.6	25	100	30			30	100
1049	29883	47387	954.49	1	0	20	20	10	20		
1050	29370	46969	944.13	5.6	22	22	22	5	22		
1051	29797	47777	963.67	7.6	28	28	28	5	28		
1052	29836	46990	948.91	4	22	22	22	5	22		
1088	29342	49162	960.93			117.7				unknown	unknown
GW-001	30293	47538	978.49	2.5	36	45	23.1	18.1	23.1		
GW-002	30294	47547	979.06	2.5	36.4	60	57.7	52.7	57.7		
GW-003	30143	48157	970.48	8.9	18.1	35.2	26.8	21.8	26.8		
GW-004	29929	48245	962.69	18.5	35.4	58.4	0				
GW-005	29921	48242	962.37	9.7		12.5	10.5	5.3	10.3		
GW-006	29810	47995	962.40	7	16.5	46.8	42.3	37.3	42.3		
GW-007	29810	47981	962.52	7		16.5	14.3	12.3	14.3		
GW-008	29781	47597	962.11	0.6		25.5	20.7	15.7	20.7		
GW-009	29953	47572	960.72	0.3	17	63.8	0				
GW-010	29760	47220	950.78	9.6		15	12.7	7.7	12.7		
GW-011	29868	47171	949.15	6.5	34.5	60.8	45.3	40.3	45.3		
GW-012	29868	47189	949.50	6.5		15.5	13.5	11.5	13.5		
GW-013	30174	47343	962.29	5.3	10.5	33.8	10.4	8.4	10.4		
GW-043	30522	47932	1009.78	1	38	40	32.8	22.8	32.8		
GW-044	30526	47928	1010.30	1	38	70	58	48	58		
GW-062	29006	48257	959.48		20.1	56.7	51.4	49.4	51.4		
GW-063	29016	48257	958.89		16.7	35	32.7	27.7	32.7		
GW-064	29195	49168	979.17		34.7	57	52.7	50.7	52.7		
GW-065	29185	49167	979.57		30.1	35	34	29	34		
GW-066	29513	48677	957.32		16.2	55.8	54.9	52.9	54.9		
GW-067	29504	48679	957.03			16.5	16.2	11.2	16.2		
GW-073	29791	46986	948.31	6	36	81	79.8	69.8	79.8		
GW-074	29870	47228	956.33	6.42	51.42	207.42	206.02	185.42	206.02		
GW-075	29795	47988	962.10	6	14	200	199.6	179.6	199.6		
GW-076	29909	48238	962.58	12	48	81	80.3	69.7	80.3		
GW-084	30421	48801	994.37	4		34	27.8	22.8	27.8		

Wells Located Near the Oil Landfarm Waste Management Area (Continued)

Well	Formation	Water Breaks
1048	CON: Cm	
1049	CON: Cn	
1050	CON: Cmn	
1051	CON: Cn	
1052	CON: Cn	
1088	CON: Cmn	
GW-001	CON: Cm	
GW-002	CON: Cm	
GW-003	CON: Cn	
GW-004	CON: Cn	
GW-005	CON: Cn	
GW-006	CON: Cn	
GW-007	CON: Cn	
GW-008	CON: Cn	
GW-009	CON: Cn	
GW-010	CON: Cn	
GW-011	CON: Cn	
GW-012	CON: Cn	
GW-013	CON: Cn	
GW-043	CON: Cm	
GW-044	CON: Cm	
GW-062	CON: Cmn	
GW-063	CON: Cmn	
GW-064	CON: Cmn	
GW-065	CON: Cmn	
GW-066	CON: Cmn	
GW-067	CON: Cmn	
GW-073	CON: Cn	
GW-074	CON: Cn	
GW-075	CON: Cn	
GW-076	CON: Cn	
GW-084	CON: Cm	

Wells Located Near the Oil Landfarm Waste Management Area (Continued)

Well	North	East	Elev.	TOWR	TOFR	TD	Finish Depth	Top Screen	Bottom Screen	Tom Open	Bottom Open
GW-085	30002	49058	979.82	2	40	62	58.8	53.8	58.8		
GW-086	29993	49043	979.50	8		33.5	29.6	24.6	29.6		
GW-087	29534	48313	956.97	19		19	19	9	19		
GW-097	29459	46959	941.45	8.5		19.2	18	11.8	16.8		
GW-097A	29462	46959	941.79			19	19	14	19		
GW-098	29452	46959	941.84	1	7.5	104	103.4	82.4	103.4		
GW-120	29455	46942	944.19		17	180	130			130	180
GW-121	29799	47964	963.46		20	600	550			550	600
GW-225	29155	47461	940.21		30	200	150			150	200
GW-226	29156	47473	940.56		28	55	45			45	55
GW-227	29172	47802	943.91		19	40	30			30	40
GW-228	29171	47791	943.85		24	100	80			80	100
GW-229	29256	47017	945.71		32	55	40			40	55
GW-306	29346	49655	989.44		44	58.5	58.1	48.1	58.1		
GW-307	29250	49521	991.01	41.6		41.6	41.6	30.9	41.6		
GW-308	29399	49795	991.12	37.7		37.7	37.7	27.1	37.7		
GW-309	29530	50176	985.77	20		38	37	27	37		
GW-310	29437	50497	992.40	27.1		27.1	27.1	21.8	27.1		
GW-311	29267	50126	996.43	40.3		40.3	40.3	29.7	40.3		
GW-312	29216	49778	994.13			41	40.5	30.5	40.5		
GW-363	29961	46872	955.41	9	21	75	50			50	75
GW-364	29152	46508	933.39	22	30	60.3	60.3	49.8	59.8		
GW-365	29150	46490	933.03	11	15	150	126.7			126.7	150
GW-366	28886	46708	985.66	46	70	102.5	101	90.5	100.5		
GW-367	28884	46695	986.21	39	72	151.4	125			125	150
GW-368	28913	47618	998.63	18	32	245	225			225	245
GW-369	28921	47628	997.86	10.8	68	150.2	115.8			115.8	150.2
GW-376	30467	49491	998.35	9	20	218	63			63	218
GW-520	28885	46725	985.18	40	63	80.3	80.3	69.8	80.1		
GW-531	30453	49331	1002.19	25		39.5	38.5	22.5	38.2		
GW-532	30388	49300	994.15	22.4		29.7	28.7	12.7	28.4		
GW-535	30334	49469	987.29	10.6		19.5	19.5	3.5	19.3		

Wells Located Near the Oil Landfarm Waste Management Area (Continued)

Well	Formation	Water Breaks
GW-085	CON: Cn	
GW-086	CON: Cn	
GW-087	CON: Cn	
GW-097	CON: Cn	
GW-097A	CON: Cn	
GW-098	CON: Cn	
GW-120	CON: Cn	
GW-121	CON: Cn/Cm 492	Water 15-20 gpm @ 25-50
GW-225	CON: Cmn	Water 2-5 gpm @ 30-45, 5-10 gpm @ 30-70, 25-30 gpm @ 30-110
GW-226	CON: Cmn	Lost circ. @ 24 / Water 1-2 gpm @ 30-55
GW-227	CON: Cmn	Cav(m) @ 25.5-26, 34.5-35, 37-37.5 / Water 2-5 gpm @ 30-40
GW-228	CON: Cmn	Cav(m) @ 36-36.5, 40-41, 90-100 / Water 2-5 gpm @ 35-55, 30-40 gpm @ 35-100
GW-229	CON: Cmn	Lost circ. @ 25 / Cav(m) 43-55 / Water 1 gpm @ 30-40, 8 gpm @ 30-55
GW-306	CON: Cmn	Frac @ 48 / Water 2-3 gpm @ 48
GW-307	CON: Cmn	
GW-308	CON: Cmn	
GW-309	CON: Cmn	Frac @ 27, 30, 32.5, 35.7 / Water @ 27
GW-310	CON: Cmn	
GW-311	CON: Cmn	
GW-312	CON: Cmn	
GW-363	CON: Cn	
GW-364	CON: Cmn	
GW-365	CON: Cmn	Water @ 142 / Frac @ 78-81, 142-143
GW-366	KNOX/CON: Cmn	Cav @ 62
GW-367	KNOX/CON: Cmn	Frac @ 64, 68, 71 / Water @ 112, 127
GW-368	KNOX/CON: Cmn	Water @ 225-235
GW-369	KNOX/CON: Cmn	
GW-376	CON: Cm	Water @ 42, 65, 160
GW-520	KNOX/CON: Cmn	Cav @ 44-63
GW-531	CON: Cm	
GW-532	CON: Cm	
GW-535	CON: Cn	

Wells Located Near the Oil Landfarm Waste Management Area (Continued)

Well	North	East	Elev.	TOWR	TOFR	TD	Finish Depth	Top Screen	Bottom Screen	Tom Open	Bottom Open
GW-536	30290	49443	982.45	10.9		19.7	19.7	3.7	19.4		
GW-537	30057	49539	974.19	14.9		24.5	23.3	8	23		
GW-534	30393	49492	997.43	16	27.5	47	46.3	31.1	46.15		
GW-538	30329	49379	993.97	18.5	37	42.5	42.2	26.9	41.9		
GW-601	28903	47629	999.09	8	54	356	318.5			318.5	356
GW-533	30417	49486	1001.41	23		30.1	30.1	19.7	30.1		
GW-630	30316	49450	984.53	10		28.6	28.6	17.6	28.3		
GW-636	29482	46413	938.08	8	16	117	98.5			98.5	117
GW-637	29493	46402	938.26	10		27.5	27.5	17.2	27.2		
GW-638	29485	46389	938.14	8		12	11.5	6.2	11.2		
GW-644	29945	46609	956.78	3.2	16.5	23.4	23.4	12.7	23		
GW-645	28837	46649	1003.50	17.5	63.5	85.8	80.2	58.5	79.8		
GW-646	28873	47580	1002.01		29.8	75.9	75.9	64.8	75.9		
GW-649	30365	50143	981.01	7		20.8	20.7	9.9	20.3		
GW-647	28941	48770	1030.14	10	50	91	91	81	91		
GW-648	29088	49888	1026.48	49.5		80.1	80.1	70.1	80.1		

Wells Located Near the Oil Landfarm Waste Management Area (Continued)

Well	Formation	Water Breaks
GW-536	CON: Cn	
GW-537	CON: Cn	
GW-534	CON	Cav @ 21, 22.5-23
GW-538	CON	Cav @ 31, 37.5
GW-601	KNOX/CON: Cmn	Cav @ 23.5
GW-533	CON	
GW-630	CON	Frac @ 22.1
GW-636	CON: Cn	Water @ 107
GW-637	CON: Cn	
GW-638	CON: Cn	
GW-644	CON: Cn	
GW-645	CON: Cmn	Cav @ 19-23.5, 27-28, 41-45, 58-60 / Frac @ 73.5-74, 76-77.5
GW-646	CON: Cmn	Water @ 68
GW-649	CON: Cn	
GW-647	CON: Cn	Drilling break @ 54
GW-648	CON: Cmn	Cav @ 51-53, 57.5-60, 62.5-64 / Frac 70.5-73

APPENDIX A

Well Completion Information for the Wells Located
Near the Chestnut Ridge Security Pits

Note: All depths, locations and elevations are in feet. The North and East locations are in Y-12 Plant coordinates.

CON	Conasauga Group
Cm	Maryville Limestone
Cn	Nolichucky Shale
Cmn	Maynardville Limestone
KNOX	Knox Group

All well data is taken from King, et al. (1991).

Wells Located near the Chestnut Ridge Security Pits

Well	North	East	Elev.	TOWR	TOFR	TD	Finish Depth	Top Screen	Bottom Screen	Tom Open	Bottom Open
GW-173	28271	59472	1112.97	73	105	165	165	155	165		
GW-174	28205	59215	1114.06	51	80	145	145	135	145		
GW-175	28676	58686	1081.89	46	98.5	166.7	166.7	150.6	166.4		
GW-176	28294	58450	1122.13		84	145	145	135	145		
GW-177	28483	57497	1155.52	62	98	145	143	133	143		
GW-178	28552	57808	1141.06	37	95	133	132	122	132		
GW-179	28522	58569	1124.33			117	117	107	117		
GW-180	28494	59220	1101.43	58	90	144	143	132.2	143		
GW-181	28048	57736	1090.55	43	78	168	155			155	168
GW-182	28373	57663	1147.16			402.1	126.6			126.6	402.1
GW-218	29136	58878	932.77	6		27.5	27.1	17.1	27.1		
GW-219	29163	58929	931.27			11.3	11.3	5.7	11.3		
GW-322	28241	58912	1131.81	49	120	193	128			128	193
GW-511	28056	57739	1090.70	40.5	100	153.7	157.7	143.3	153.3		
GW-512	27601	57343	998.99	55		61	61	50.5	60.5		
GW-513	27607	57332	998.99	67	97	125.3	125.3	114.8	124.8		
GW-514	27575	57341	998.66	44	92	195	174			174	195
GW-607	27866	58922	1072.86		107	151.3	151.3	141	151.3		
GW-608A	27886	59759	1069.01		113	125					
GW-608	27889	59724	1071.00	113	140	220	148			148	220
GW-609	28109	60040	1109.70		107	269	269	258.7	269		
GW-612	28371	58504	1128.65	78	125	254	230.6			235	254
GW-610	28549	59472	1056.78	39	50	117.4	117.4	107.1	117.4		
GW-611	28856	58059	1045.43	30	63.8	121.6	117.3	107	117		
GW-707	29319	59579	931.16	20		26	17.2	6.9	16.9		
GW-708	29335	59530	931.03			13.9	13.7	3.4	13.4		

Wells Located near the Chestnut Ridge Security Pits (Continued)

Well	Formation	Water Breaks
GW-173	KNOX	Frac @ 103.6 / Cav @ 108.9, 140-141
GW-174	KNOX	Frac @ 143 / Cav @ 63-79.6, 91, 140
GW-175	KNOX	Cav @ 85 / Water @ 125-135 / Frac @ 160, 161
GW-176	KNOX	
GW-177	KNOX	Cav @ 68-73, 96-97.5 / Frac @ 130-133
GW-178	KNOX	Cav @ 43,45.5,52,58,64,82 / Frac @ 74,80,81,84,90,100,106,121,125
GW-179	KNOX	Cav @ 53-73 / Frac @ 112
GW-180	KNOX	Cav @ 58,68,78,81,83,85 / Frac @ 97-107, 132
GW-181	KNOX	Cav @ 147-149
GW-182	KNOX	
GW-218	CON: Cmn	Cav @ 9, 22.5 / Lost circ. @ 10.5 / Water 5 gpm @ 22.5
GW-219	CON: Cmn	
GW-322	KNOX	Cav @ 98-118, 188-190 / Frac @ 83-98, 125
GW-511	KNOX	Cav @ 85-87, 152-153
GW-512	KNOX	
GW-513	KNOX	Cav @ 75-82, 92-97
GW-514	KNOX	Cav @ 44.3-48, 78-90, 157-158 / Water(m) @ 44.3, 157
GW-607	KNOX	Water @ 143
GW-608A	KNOX	
GW-608	KNOX	Cav @ 114-135, 216-218(muddy water)
GW-609	KNOX	Water @ 97; Cav @ 125-129.5
GW-612	KNOX	Cav @ 81-84, 104-119.5
GW-610	KNOX	Cav @ 55.0-63.0
GW-611	KNOX	Cav @ 55-60/Frac @ 85-90
GW-707	CON: Cmn	
GW-708	CON: Cmn	

APPENDIX B.1

Water Level Data for the Wells Located
Near New Hope Pond, the Oil Landfarm Waste
Management Area, and the Chestnut Ridge
Security Pits

Note: All depths are in feet.

Water level data has not been previously published and is compiled here from a variety of sources (ie. databases, personal files, subcontractor files, etc.). Water levels were measured weekly (1987, and earlier) when most wells were not being sampled or purged. Later data were collected during periodic water level measurements; these data were not collected during well purging and sampling activities.

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
Water Level Data for the New Hope Pond Area					
GW-128	1/24/86	899.12	GW-130	2/6/86	911.14
GW-128	1/31/86	899.22	GW-130	2/13/86	914.45
GW-128	2/6/86	899.61	GW-130	2/20/86	914.35
GW-128	2/13/86	899.67	GW-130	2/28/86	910.91
GW-128	2/20/86	900.46	GW-130	3/5/86	902.54
GW-128	2/28/86	900.50	GW-130	3/13/86	902.71
GW-128	3/5/86	900.04	GW-130	3/20/86	904.22
GW-128	3/13/86	899.94	GW-130	3/26/86	901.30
GW-128	3/20/86	900.33	GW-130	4/3/86	902.74
GW-128	3/26/86	900.30	GW-130	4/11/86	902.67
GW-128	4/3/86	900.07	GW-130	4/18/86	902.80
GW-128	4/11/86	899.87	GW-130	4/24/86	903.07
GW-128	4/18/86	899.64	GW-130	5/1/86	902.90
GW-128	4/25/86	899.48	GW-130	5/8/86	902.87
GW-128	5/1/86	899.41	GW-130	5/16/86	902.74
GW-128	5/8/86	899.38	GW-130	5/22/86	902.51
GW-128	5/16/86	900.36	GW-130	6/4/86	902.74
GW-128	5/22/86	899.05	GW-130	6/12/86	903.53
GW-128	6/4/86	899.28	GW-130	6/19/86	902.74
GW-128	6/12/86	899.64	GW-130	6/27/86	902.41
GW-128	6/19/86	899.31			
GW-128	6/27/86	898.99	GW-148	10/30/85	901.26
			GW-148	12/12/85	901.45
GW-129	1/24/86	924.73	GW-148	12/19/85	901.36
GW-129	1/31/86	924.73	GW-148	12/27/85	901.16
GW-129	2/6/86	924.73	GW-148	1/2/86	901.26
GW-129	2/13/86	924.73	GW-148	1/9/86	901.13
GW-129	2/20/86	924.73	GW-148	1/16/86	901.03
GW-129	2/28/86	924.73	GW-148	1/23/86	901.26
GW-129	3/5/86	924.73	GW-148	1/31/86	901.16
GW-129	3/13/86	924.73	GW-148	2/6/86	901.72
GW-129	3/20/86	924.73	GW-148	2/13/86	901.52
GW-129	3/26/86	924.73	GW-148	2/20/86	901.85
GW-129	4/3/86	924.73	GW-148	2/28/86	901.95
GW-129	4/11/86	924.73	GW-148	3/5/86	901.59
GW-129	4/18/86	924.73	GW-148	3/13/86	901.75
GW-129	5/1/86	924.73	GW-148	3/20/86	901.85
GW-129	5/8/86	924.47	GW-148	3/26/86	901.49
GW-129	5/16/86	924.47	GW-148	4/3/86	901.42
GW-129	5/22/86	924.14	GW-148	4/11/86	901.42
GW-129	6/4/86	924.47	GW-148	4/18/86	901.16
GW-129	6/12/86	924.47	GW-148	4/25/86	901.09
GW-129	6/19/86	924.47	GW-148	5/1/86	901.19
GW-129	6/27/86	924.43	GW-148	5/8/86	901.19
			GW-148	7/10/86	901.13
GW-130	1/24/86	901.95	GW-148	7/16/86	901.13
GW-130	1/31/86	901.95	GW-148	7/24/86	901.00

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-148	7/30/86	900.50	GW-148	8/6/87	900.86
GW-148	8/8/86	899.81	GW-148	8/13/87	900.96
GW-148	8/14/86	899.58	GW-148	8/20/87	900.93
GW-148	8/21/86	900.73	GW-148	8/26/87	900.83
GW-148	8/28/86	900.93	GW-148	9/3/87	900.60
GW-148	9/5/86	901.32	GW-148	9/10/87	900.63
GW-148	9/11/86	901.29	GW-148	9/17/87	900.96
GW-148	9/18/86	901.29	GW-148	9/24/87	900.93
GW-148	9/25/86	901.22	GW-148	10/2/87	900.96
GW-148	10/2/86	901.29	GW-148	10/8/87	900.80
GW-148	10/9/86	901.45	GW-148	10/15/87	900.73
GW-148	10/16/86	901.52	GW-148	10/24/87	900.54
GW-148	10/24/86	901.26	GW-148	10/30/87	900.63
GW-148	10/31/86	901.42	GW-148	11/6/87	900.50
GW-148	11/6/86	901.36	GW-148	11/13/87	901.03
GW-148	11/13/86	901.72	GW-148	1/4/88	901.78
GW-148	11/20/86	901.85	GW-148	1/14/88	901.62
GW-148	12/3/86	901.78	GW-148	1/22/88	901.88
GW-148	12/12/86	902.18	GW-148	2/1/88	901.39
GW-148	12/19/86	901.91	GW-148	2/9/88	901.72
GW-148	12/29/86	901.68	GW-148	2/17/88	901.68
GW-148	1/6/87	901.45	GW-148	2/22/88	901.65
GW-148	1/13/87	901.39	GW-148	3/3/88	901.45
GW-148	1/19/87	902.31	GW-148	3/10/88	901.45
GW-148	1/26/87	902.05	GW-148	3/17/88	901.68
GW-148	2/4/87	901.82	GW-148	4/4/88	900.80
GW-148	2/9/87	901.59	GW-148	4/11/88	900.67
GW-148	2/17/87	901.91	GW-148	4/17/90	898.19
GW-148	2/25/87	902.01	GW-148	5/14/92	899.46
GW-148	3/4/87	901.91			
GW-148	3/12/87	901.59	GW-149	10/30/85	900.60
GW-148	3/17/87	901.75	GW-149	12/12/85	901.13
GW-148	3/24/87	901.82	GW-149	12/19/85	900.93
GW-148	3/31/87	901.68	GW-149	12/27/85	900.63
GW-148	4/6/87	901.91	GW-149	1/2/86	900.93
GW-148	4/13/87	901.55	GW-149	1/9/86	900.57
GW-148	4/21/87	901.78	GW-149	1/16/86	900.44
GW-148	4/27/87	901.59	GW-149	1/23/86	900.83
GW-148	5/4/87	901.45	GW-149	1/31/86	900.83
GW-148	5/14/87	901.22	GW-149	2/6/86	901.45
GW-148	5/19/87	901.36	GW-149	2/13/86	901.19
GW-148	5/26/87	901.29	GW-149	2/20/86	901.62
GW-148	6/2/87	901.26	GW-149	2/28/86	901.65
GW-148	6/9/87	901.09	GW-149	3/5/86	901.03
GW-148	6/26/87	901.42	GW-149	3/13/86	901.19
GW-148	7/7/87	901.85	GW-149	3/20/86	901.45
GW-148	7/16/87	901.32	GW-149	3/26/86	900.96
GW-148	7/23/87	901.22	GW-149	4/3/86	900.76
GW-148	7/30/87	901.09	GW-149	4/11/86	900.80

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-149	4/18/86	900.17	GW-149	4/21/87	901.29
GW-149	4/25/86	900.24	GW-149	4/27/87	900.90
GW-149	5/1/86	900.17	GW-149	5/4/87	900.57
GW-149	5/8/86	900.27	GW-149	5/14/87	900.37
GW-149	5/16/86	900.17	GW-149	5/19/87	900.50
GW-149	5/22/86	900.11	GW-149	5/26/87	900.44
GW-149	6/4/86	900.14	GW-149	6/2/87	900.34
GW-149	6/12/86	901.03	GW-149	6/9/87	900.11
GW-149	6/19/86	900.53	GW-149	6/26/87	900.57
GW-149	6/27/86	900.34	GW-149	7/7/87	901.19
GW-149	7/10/86	900.14	GW-149	7/16/87	900.60
GW-149	7/16/86	900.17	GW-149	7/23/87	900.31
GW-149	7/24/86	900.01	GW-149	7/30/87	900.17
GW-149	7/30/86	895.32	GW-149	8/6/87	899.88
GW-149	8/8/86	899.75	GW-149	8/13/87	899.94
GW-149	8/14/86	901.22	GW-149	8/20/87	899.94
GW-149	8/21/86	899.71	GW-149	8/26/87	899.81
GW-149	8/28/86	899.81	GW-149	9/3/87	899.52
GW-149	9/5/86	900.57	GW-149	9/10/87	899.55
GW-149	9/11/86	900.63	GW-149	9/17/87	900.11
GW-149	9/18/86	900.53	GW-149	9/24/87	899.98
GW-149	9/25/86	900.40	GW-149	10/2/87	900.37
GW-149	10/2/86	900.44	GW-149	10/8/87	899.98
GW-149	10/9/86	900.27	GW-149	10/15/87	899.85
GW-149	10/16/86	901.13	GW-149	10/24/87	899.65
GW-149	10/24/86	900.63	GW-149	10/30/87	899.71
GW-149	10/31/86	901.03	GW-149	11/6/87	899.49
GW-149	11/6/86	900.80	GW-149	11/13/87	899.88
GW-149	11/13/86	901.52	GW-149	1/4/88	901.49
GW-149	11/20/86	901.49	GW-149	1/14/88	901.32
GW-149	12/3/86	901.62	GW-149	1/22/88	901.62
GW-149	12/12/86	902.01	GW-149	2/1/88	900.96
GW-149	12/19/86	901.75	GW-149	2/9/88	901.42
GW-149	12/29/86	901.52	GW-149	2/17/88	901.36
GW-149	1/6/87	901.09	GW-149	2/22/88	901.39
GW-149	1/13/87	900.80	GW-149	3/3/88	900.93
GW-149	1/19/87	901.91	GW-149	3/10/88	900.99
GW-149	1/26/87	901.88	GW-149	3/17/88	901.42
GW-149	2/4/87	901.55	GW-149	4/4/88	900.24
GW-149	2/9/87	901.29	GW-149	4/11/88	900.31
GW-149	2/17/87	901.68	GW-149	4/17/90	896.35
GW-149	2/25/87	901.81	GW-149	5/14/92	897.02
GW-149	3/4/87	901.65			
GW-149	3/12/87	901.42	GW-150	10/30/85	902.50
GW-149	3/17/87	901.26	GW-150	12/12/85	902.70
GW-149	3/24/87	901.45	GW-150	12/19/85	902.60
GW-149	3/31/87	901.03	GW-150	12/27/85	902.37
GW-149	4/6/87	901.49	GW-150	1/3/86	902.47
GW-149	4/13/87	900.93	GW-150	1/9/86	902.37

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-150	1/16/86	902.50	GW-150	2/4/87	902.60
GW-150	1/23/86	902.31	GW-150	2/9/87	902.54
GW-150	1/31/86	902.31	GW-150	2/17/87	902.70
GW-150	2/6/86	902.80	GW-150	2/25/87	902.86
GW-150	2/13/86	902.60	GW-150	3/4/87	902.96
GW-150	2/20/86	903.32	GW-150	3/11/87	902.57
GW-150	2/28/86	902.80	GW-150	3/17/87	902.47
GW-150	3/5/86	902.60	GW-150	3/24/87	902.60
GW-150	3/13/86	903.13	GW-150	3/31/87	902.50
GW-150	3/20/86	903.09	GW-150	4/6/87	902.60
GW-150	3/26/86	902.80	GW-150	4/14/87	902.76
GW-150	4/3/86	902.63	GW-150	4/21/87	902.60
GW-150	4/11/86	902.60	GW-150	4/27/87	902.44
GW-150	4/18/86	902.63	GW-150	5/4/87	902.40
GW-150	4/25/86	902.57	GW-150	5/14/87	902.11
GW-150	5/1/86	902.57	GW-150	5/19/87	902.24
GW-150	5/8/86	902.63	GW-150	5/26/87	902.17
GW-150	5/16/86	902.63	GW-150	6/2/87	902.27
GW-150	5/22/86	902.50	GW-150	6/9/87	902.11
GW-150	6/4/86	902.50	GW-150	6/26/87	902.37
GW-150	6/12/86	902.63	GW-150	7/7/87	903.19
GW-150	6/19/86	902.54	GW-150	7/16/87	902.31
GW-150	6/27/86	902.47	GW-150	7/23/87	901.94
GW-150	7/10/86	902.57	GW-150	7/30/87	902.01
GW-150	7/16/86	902.63	GW-150	8/6/87	902.17
GW-150	7/24/86	902.57	GW-150	8/13/87	902.67
GW-150	7/30/86	902.63	GW-150	8/20/87	902.50
GW-150	8/8/86	902.60	GW-150	8/28/87	902.47
GW-150	8/14/86	902.70	GW-150	9/3/87	902.04
GW-150	8/21/86	902.83	GW-150	9/10/87	902.27
GW-150	8/28/86	902.96	GW-150	9/17/87	902.93
GW-150	9/5/86	902.67	GW-150	9/24/87	902.44
GW-150	9/11/86	902.73	GW-150	10/2/87	902.54
GW-150	9/18/86	902.67	GW-150	10/8/87	902.08
GW-150	9/25/86	902.63	GW-150	10/15/87	902.04
GW-150	10/2/86	902.76	GW-150	10/24/87	901.88
GW-150	10/9/86	902.57	GW-150	10/30/87	901.94
GW-150	10/31/86	902.70	GW-150	11/6/87	901.91
GW-150	11/6/86	902.63	GW-150	11/13/87	902.67
GW-150	11/13/86	902.73	GW-150	1/4/88	902.54
GW-150	11/20/86	902.80	GW-150	1/14/88	902.37
GW-150	12/3/86	902.86	GW-150	1/22/88	903.39
GW-150	12/13/86	903.75	GW-150	2/1/88	902.50
GW-150	12/19/86	902.86	GW-150	2/9/88	902.73
GW-150	12/29/86	902.57	GW-150	2/17/88	902.54
GW-150	1/6/87	902.37	GW-150	2/22/88	902.63
GW-150	1/13/87	902.27	GW-150	3/3/88	902.40
GW-150	1/19/87	903.68	GW-150	3/10/88	902.47
GW-150	1/26/87	903.09	GW-150	3/17/88	902.80

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-150	4/4/88	902.47	GW-151	10/31/86	902.49
GW-150	4/11/88	902.27	GW-151	11/6/86	902.42
GW-150	4/17/90	901.17	GW-151	11/13/86	902.52
GW-150	5/3/91	898.76	GW-151	11/20/86	902.52
GW-150	5/11/92	901.46	GW-151	12/3/86	902.62
			GW-151	12/12/86	903.96
GW-151	10/30/85	902.26	GW-151	12/19/86	902.78
GW-151	12/12/85	902.45	GW-151	12/29/86	902.29
GW-151	12/19/85	902.39	GW-151	1/6/87	902.03
GW-151	12/27/85	902.16	GW-151	1/13/87	902.06
GW-151	1/3/86	902.26	GW-151	1/19/87	903.80
GW-151	1/9/86	902.12	GW-151	1/26/87	903.21
GW-151	1/16/86	902.29	GW-151	2/4/87	902.45
GW-151	1/23/86	902.12	GW-151	2/9/87	902.32
GW-151	1/31/86	902.06	GW-151	2/17/87	902.49
GW-151	2/6/86	902.55	GW-151	2/25/87	902.75
GW-151	2/13/86	902.29	GW-151	3/4/87	903.24
GW-151	2/20/86	903.47	GW-151	3/11/87	902.39
GW-151	2/28/86	902.45	GW-151	3/17/87	902.26
GW-151	3/5/86	902.35	GW-151	3/24/87	902.42
GW-151	3/13/86	902.81	GW-151	3/31/87	902.32
GW-151	3/20/86	902.91	GW-151	4/6/87	902.42
GW-151	3/26/86	902.35	GW-151	4/14/87	902.62
GW-151	4/3/86	902.45	GW-151	4/21/87	902.52
GW-151	4/11/86	902.39	GW-151	4/27/87	902.35
GW-151	4/18/86	902.55	GW-151	5/4/87	902.39
GW-151	4/25/86	902.49	GW-151	5/14/87	902.16
GW-151	5/1/86	902.45	GW-151	5/19/87	902.29
GW-151	5/8/86	902.52	GW-151	5/26/87	902.19
GW-151	5/16/86	902.49	GW-151	6/2/87	902.32
GW-151	5/22/86	902.39	GW-151	6/9/87	902.29
GW-151	6/4/86	902.45	GW-151	6/26/87	902.39
GW-151	6/12/86	902.65	GW-151	7/7/87	903.17
GW-151	6/19/86	902.52	GW-151	7/16/87	902.42
GW-151	6/27/86	902.39	GW-151	7/23/87	902.55
GW-151	7/10/86	902.42	GW-151	7/30/87	902.19
GW-151	7/16/86	902.49	GW-151	8/6/87	902.26
GW-151	7/24/86	902.39	GW-151	8/13/87	902.52
GW-151	7/30/86	902.39	GW-151	8/20/87	902.35
GW-151	8/8/86	902.29	GW-151	8/26/87	902.42
GW-151	8/14/86	902.42	GW-151	9/3/87	902.22
GW-151	8/21/86	902.49	GW-151	9/10/87	902.22
GW-151	8/28/86	902.72	GW-151	9/17/87	902.32
GW-151	9/5/86	902.35	GW-151	9/24/87	902.16
GW-151	9/11/86	902.49	GW-151	10/2/87	902.35
GW-151	9/18/86	902.42	GW-151	10/8/87	902.09
GW-151	9/25/86	902.42	GW-151	10/15/87	902.12
GW-151	10/2/86	902.45	GW-151	10/24/87	901.96
GW-151	10/9/86	902.98	GW-151	10/30/87	902.06

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-151	11/6/87	902.12	GW-152	8/14/86	902.09
GW-151	11/13/87	902.72	GW-152	8/21/86	902.28
GW-151	1/4/88	902.32	GW-152	8/28/86	902.38
GW-151	1/14/88	902.09	GW-152	9/5/86	902.05
GW-151	1/22/88	903.47	GW-152	9/11/86	902.45
GW-151	2/1/88	902.19	GW-152	9/18/86	902.18
GW-151	2/9/88	902.52	GW-152	9/25/86	902.15
GW-151	2/17/88	902.22	GW-152	10/2/86	902.28
GW-151	2/22/88	902.29	GW-152	10/10/86	902.15
GW-151	3/3/88	902.03	GW-152	10/17/86	902.18
GW-151	3/10/88	902.12	GW-152	10/24/86	902.05
GW-151	3/17/88	902.58	GW-152	10/31/86	902.28
GW-151	4/4/88	902.26	GW-152	11/6/86	902.18
GW-151	4/11/88	902.19	GW-152	11/20/86	902.28
GW-151	4/17/90	900.97	GW-152	12/3/86	902.61
GW-151	5/14/92	900.97	GW-152	12/12/86	905.53
			GW-152	12/18/86	902.94
GW-152	10/30/85	902.41	GW-152	12/29/86	902.05
GW-152	12/12/85	902.45	GW-152	1/6/87	901.79
GW-152	12/19/85	905.53	GW-152	1/13/87	901.72
GW-152	12/27/85	902.05	GW-152	1/19/87	905.33
GW-152	1/3/86	902.25	GW-152	1/26/87	904.22
GW-152	1/9/86	902.09	GW-152	2/4/87	902.54
GW-152	1/16/86	905.30	GW-152	2/9/87	902.15
GW-152	1/23/86	902.12	GW-152	2/17/87	902.64
GW-152	1/31/86	902.02	GW-152	2/25/87	903.23
GW-152	2/6/86	902.91	GW-152	3/4/87	905.07
GW-152	2/13/86	902.41	GW-152	3/11/87	902.54
GW-152	2/20/86	906.06	GW-152	3/17/87	902.18
GW-152	2/28/86	903.04	GW-152	3/24/87	902.51
GW-152	3/5/86	902.41	GW-152	3/31/87	902.22
GW-152	3/13/86	903.00	GW-152	4/6/87	902.32
GW-152	3/20/86	903.50	GW-152	4/14/87	902.35
GW-152	3/26/86	902.61	GW-152	4/21/87	902.38
GW-152	4/3/86	902.38	GW-152	4/27/87	902.22
GW-152	4/11/86	902.28	GW-152	5/4/87	895.20
GW-152	4/18/86	902.22	GW-152	5/14/87	902.02
GW-152	4/25/86	902.15	GW-152	5/19/87	902.12
GW-152	5/8/86	902.25	GW-152	5/29/87	902.05
GW-152	5/16/86	902.09	GW-152	6/2/87	902.15
GW-152	5/22/86	902.12	GW-152	6/9/87	902.15
GW-152	6/4/86	902.09	GW-152	6/26/87	902.22
GW-152	6/12/86	902.48	GW-152	7/16/87	902.22
GW-152	6/19/86	902.25	GW-152	7/23/87	902.15
GW-152	6/27/86	902.15	GW-152	7/30/87	902.05
GW-152	7/10/86	902.15	GW-152	8/6/87	902.15
GW-152	7/16/86	902.18	GW-152	8/13/87	902.28
GW-152	7/24/86	904.38	GW-152	8/20/87	902.18
GW-152	7/30/86	902.09	GW-152	8/26/87	902.25

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-152	9/3/87	902.15	GW-153	6/12/86	902.61
GW-152	9/10/87	902.12	GW-153	6/19/86	902.38
GW-152	9/17/87	902.15	GW-153	6/27/86	902.28
GW-152	9/29/87	902.09	GW-153	7/10/86	902.28
GW-152	10/8/87	901.95	GW-153	7/16/86	902.31
GW-152	10/15/87	903.20	GW-153	7/24/86	902.21
GW-152	10/24/87	901.86	GW-153	7/30/86	902.21
GW-152	10/30/87	901.82	GW-153	8/14/86	902.21
GW-152	11/8/87	901.92	GW-153	8/21/86	902.41
GW-152	11/13/87	902.51	GW-153	8/28/86	902.51
GW-152	1/4/88	902.48	GW-153	9/5/86	902.18
GW-152	1/14/88	901.95	GW-153	9/11/86	902.35
GW-152	1/22/88	904.58	GW-153	9/18/86	902.31
GW-152	2/1/88	902.18	GW-153	9/25/86	902.31
GW-152	2/10/88	902.45	GW-153	10/2/86	902.44
GW-152	2/17/88	902.25	GW-153	10/10/86	902.28
GW-152	2/22/88	902.18	GW-153	10/17/86	902.35
GW-152	3/3/88	901.89	GW-153	10/24/86	902.18
GW-152	3/10/88	901.92	GW-153	10/31/86	902.41
GW-152	3/17/88	903.04	GW-153	11/6/86	902.31
GW-152	4/4/88	902.15	GW-153	11/13/86	902.58
GW-152	4/11/88	902.09	GW-153	11/20/86	902.41
GW-152	4/17/90	902.40	GW-153	12/3/86	902.71
GW-152	5/3/91	898.83	GW-153	12/12/86	905.53
GW-152	5/14/92	901.18	GW-153	12/18/86	902.97
			GW-153	12/29/86	902.18
GW-153	12/19/85	902.38	GW-153	1/6/87	901.92
GW-153	12/27/85	902.05	GW-153	1/13/87	901.85
GW-153	1/3/86	902.21	GW-153	1/19/87	905.30
GW-153	1/9/86	902.08	GW-153	1/26/87	904.22
GW-153	1/16/86	902.08	GW-153	2/4/87	902.54
GW-153	1/23/86	902.12	GW-153	2/9/87	902.31
GW-153	1/31/86	902.02	GW-153	2/17/87	902.64
GW-153	2/6/86	902.90	GW-153	2/25/87	903.26
GW-153	2/13/86	902.44	GW-153	3/4/87	905.10
GW-153	2/20/86	906.05	GW-153	3/11/87	902.54
GW-153	2/28/86	902.71	GW-153	3/17/87	902.31
GW-153	3/5/86	902.44	GW-153	3/24/87	902.51
GW-153	3/13/86	902.97	GW-153	3/31/87	902.35
GW-153	3/20/86	903.49	GW-153	4/6/87	902.44
GW-153	3/26/86	902.74	GW-153	4/14/87	902.48
GW-153	4/3/86	902.51	GW-153	4/21/87	902.51
GW-153	4/11/86	902.41	GW-153	4/27/87	902.31
GW-153	4/18/86	902.35	GW-153	5/4/87	895.95
GW-153	4/25/86	903.49	GW-153	5/14/87	902.12
GW-153	5/8/86	902.35	GW-153	5/19/87	902.21
GW-153	5/16/86	902.21	GW-153	5/29/87	902.18
GW-153	5/22/86	902.21	GW-153	6/2/87	902.25
GW-153	6/4/86	902.21	GW-153	6/9/87	902.28

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-153	6/26/87	902.35	GW-154	3/26/86	900.57
GW-153	7/16/87	902.31	GW-154	4/3/86	900.61
GW-153	7/23/87	902.28	GW-154	4/11/86	900.67
GW-153	7/30/87	902.18	GW-154	4/17/86	900.61
GW-153	8/6/87	902.25	GW-154	4/25/86	900.71
GW-153	8/13/87	900.28	GW-154	5/1/86	900.74
GW-153	8/20/87	902.31	GW-154	5/8/86	900.74
GW-153	8/26/87	902.38	GW-154	5/16/86	900.61
GW-153	9/3/87	902.28	GW-154	5/22/86	900.57
GW-153	9/10/87	902.21	GW-154	6/4/86	900.80
GW-153	9/17/87	902.28	GW-154	6/12/86	901.00
GW-153	9/29/87	902.21	GW-154	6/18/86	900.87
GW-153	10/6/87	902.08	GW-154	6/26/86	900.77
GW-153	10/15/87	902.15	GW-154	7/3/86	900.97
GW-153	10/24/87	901.98	GW-154	7/16/86	901.17
GW-153	10/30/87	902.08	GW-154	7/23/86	901.00
GW-153	11/6/87	902.05	GW-154	7/30/86	900.84
GW-153	11/13/87	902.67	GW-154	8/6/86	900.71
GW-153	1/4/88	902.58	GW-154	8/14/86	901.13
GW-153	1/14/88	902.08	GW-154	8/20/86	901.13
GW-153	1/22/88	904.58	GW-154	8/26/86	901.59
GW-153	2/1/88	902.31	GW-154	9/5/86	901.17
GW-153	2/10/88	902.54	GW-154	9/11/86	900.97
GW-153	2/17/88	902.35	GW-154	9/18/86	901.13
GW-153	2/22/88	902.35	GW-154	9/25/86	901.10
GW-153	3/3/88	902.02	GW-154	10/2/86	901.23
GW-153	3/10/88	902.05	GW-154	10/9/86	900.94
GW-153	3/17/88	903.03	GW-154	10/17/86	900.97
GW-153	4/4/88	902.28	GW-154	10/24/86	900.80
GW-153	4/11/88	902.25	GW-154	10/31/86	900.97
GW-153	4/17/90	901.19	GW-154	11/6/86	898.84
GW-153	5/14/92	901.14	GW-154	11/14/86	900.94
			GW-154	11/20/86	901.13
GW-154	10/30/85	900.31	GW-154	12/2/86	901.20
GW-154	12/12/85	904.18	GW-154	12/12/86	901.69
GW-154	12/19/85	900.90	GW-154	12/19/86	901.23
GW-154	12/27/85	900.64	GW-154	12/29/86	900.61
GW-154	1/2/86	901.33	GW-154	1/6/87	900.25
GW-154	1/9/86	900.71	GW-154	1/13/87	900.54
GW-154	1/16/86	900.94	GW-154	1/19/87	902.18
GW-154	1/23/86	900.38	GW-154	1/26/87	901.76
GW-154	1/31/86	902.90	GW-154	2/4/87	900.71
GW-154	2/6/86	903.00	GW-154	2/9/87	900.57
GW-154	2/13/86	902.87	GW-154	2/17/87	902.94
GW-154	2/20/86	900.87	GW-154	2/25/87	901.43
GW-154	2/28/86	900.31	GW-154	3/4/87	901.20
GW-154	3/5/86	900.35	GW-154	3/12/87	902.94
GW-154	3/13/86	901.23	GW-154	3/17/87	900.80
GW-154	3/20/86	903.10	GW-154	3/24/87	903.00

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-154	3/30/87	901.13	GW-167	10/2/86	902.61
GW-154	4/6/87	901.43	GW-167	10/16/86	903.62
GW-154	4/13/87	900.80	GW-167	10/29/86	903.62
GW-154	4/21/87	900.90	GW-167	11/13/86	904.02
GW-154	4/27/87	900.71	GW-167	12/1/86	904.67
GW-154	5/4/87	900.90	GW-167	12/18/86	908.16
GW-154	5/14/87	900.54	GW-167	1/5/87	902.54
GW-154	5/19/87	900.74	GW-167	1/20/87	912.38
GW-154	5/26/87	900.67	GW-167	2/5/87	904.31
GW-154	6/2/87	903.23	GW-167	2/23/87	907.69
GW-154	6/9/87	900.80	GW-167	3/9/87	906.12
GW-154	6/26/87	901.03	GW-167	3/30/87	903.13
GW-154	7/7/87	902.64	GW-167	4/13/87	903.03
GW-154	7/16/87	901.07	GW-167	4/27/87	902.94
GW-154	7/23/87	900.97	GW-167	5/18/87	901.85
GW-154	7/30/87	900.77	GW-167	6/1/87	901.98
GW-154	8/6/87	900.77	GW-167	6/23/87	902.80
GW-154	8/13/87	901.62	GW-167	7/22/87	902.11
GW-154	8/20/87	900.80	GW-167	8/4/87	901.66
GW-154	8/26/87	900.77	GW-167	8/17/87	902.02
GW-154	9/3/87	900.77	GW-167	9/1/87	901.66
GW-154	9/10/87	900.67	GW-167	9/14/87	902.90
GW-154	9/17/87	901.00	GW-167	9/29/87	901.92
GW-154	9/24/87	900.77	GW-167	10/15/87	901.49
GW-154	10/2/87	901.10	GW-167	10/26/87	901.46
GW-154	10/6/87	900.61	GW-167	1/11/88	902.38
GW-154	10/15/87	900.57	GW-167	1/22/88	911.43
GW-154	10/23/87	900.51	GW-167	2/5/88	909.43
GW-154	10/30/87	900.31	GW-167	2/18/88	903.39
GW-154	11/6/87	900.44	GW-167	3/1/88	902.57
GW-154	11/13/87	900.77	GW-167	3/21/88	904.12
GW-154	1/4/88	901.10	GW-167	4/19/88	903.36
GW-154	1/14/88	900.90	GW-167	4/24/90	901.17
GW-154	1/22/88	901.30	GW-167	5/3/91	899.56
GW-154	2/1/88	900.25	GW-167	5/14/92	900.28
GW-154	2/9/88	900.54			
GW-154	2/17/88	900.67	GW-168	8/27/86	902.34
GW-154	2/22/88	900.54	GW-168	9/17/86	902.57
GW-154	3/3/88	900.21	GW-168	10/2/86	902.44
GW-154	3/10/88	900.25	GW-168	10/16/86	903.29
GW-154	3/17/88	900.48	GW-168	10/29/86	903.26
GW-154	4/4/88	900.77	GW-168	11/13/86	903.55
GW-154	4/11/88	900.54	GW-168	12/1/86	903.92
GW-154	4/17/90	902.27	GW-168	12/18/86	905.59
GW-154	5/3/91	899.43	GW-168	1/5/87	902.44
GW-154	5/14/92	901.90	GW-168	1/20/87	908.28
			GW-168	2/5/87	903.75
GW-167	8/27/86	902.94	GW-168	2/23/87	905.88
GW-167	9/17/86	902.77	GW-168	3/9/87	904.70

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-166	3/30/87	903.03	GW-220	6/4/86	902.42
GW-166	4/13/87	903.06	GW-220	6/12/86	902.58
GW-166	4/27/87	902.87	GW-220	6/19/86	902.48
GW-166	5/18/87	902.18	GW-220	6/27/86	902.39
GW-166	6/1/87	902.18	GW-220	7/10/86	902.48
GW-166	6/23/87	902.60	GW-220	7/16/86	902.58
GW-166	7/22/87	902.18	GW-220	7/24/86	902.48
GW-166	8/4/87	901.88	GW-220	7/30/86	902.48
GW-166	8/17/87	902.11	GW-220	8/8/86	902.45
GW-166	9/1/87	901.85	GW-220	8/14/86	902.58
GW-166	9/14/87	902.77	GW-220	8/21/86	902.71
GW-166	9/29/87	901.88	GW-220	8/28/86	902.84
GW-166	10/15/87	901.75	GW-220	9/5/86	902.58
GW-166	10/26/87	901.75	GW-220	9/11/86	902.68
GW-166	11/11/87	902.47	GW-220	9/18/86	902.55
GW-166	1/22/88	907.98	GW-220	9/25/86	902.58
GW-166	2/5/88	906.70	GW-220	10/2/86	902.68
GW-166	2/18/88	904.54	GW-220	10/9/86	902.45
GW-166	3/1/88	902.60	GW-220	10/31/86	902.65
GW-166	3/21/88	903.55	GW-220	11/6/86	902.55
GW-166	4/19/88	903.26	GW-220	11/13/86	902.68
GW-166	4/24/90	901.53	GW-220	11/20/86	902.68
GW-166	5/3/91	899.46	GW-220	12/3/86	902.88
			GW-220	12/12/86	904.58
GW-220	10/30/85	902.32	GW-220	12/19/86	903.01
GW-220	12/12/85	902.52	GW-220	12/29/86	902.48
GW-220	12/19/85	902.45	GW-220	1/6/87	902.25
GW-220	12/27/85	902.22	GW-220	1/13/87	902.16
GW-220	1/3/86	902.39	GW-220	1/19/87	904.35
GW-220	1/9/86	902.25	GW-220	1/26/87	903.53
GW-220	1/16/86	902.42	GW-220	2/4/87	902.62
GW-220	1/23/86	902.19	GW-220	2/9/87	903.70
GW-220	1/31/86	902.22	GW-220	2/17/87	902.78
GW-220	2/6/86	902.88	GW-220	2/25/87	903.07
GW-220	2/13/86	902.58	GW-220	3/4/87	903.27
GW-220	2/20/86	903.70	GW-220	3/11/87	902.58
GW-220	2/28/86	902.75	GW-220	3/17/87	902.42
GW-220	3/5/86	902.55	GW-220	3/24/87	902.58
GW-220	3/13/86	903.01	GW-220	3/31/87	902.42
GW-220	3/20/86	903.14	GW-220	4/6/87	902.58
GW-220	3/28/86	902.71	GW-220	4/14/87	902.65
GW-220	4/3/86	902.55	GW-220	4/21/87	902.62
GW-220	4/11/86	903.70	GW-220	4/27/87	902.45
GW-220	4/18/86	902.58	GW-220	5/4/87	902.39
GW-220	4/23/86	902.48	GW-220	5/14/87	902.09
GW-220	5/1/86	902.48	GW-220	5/19/87	902.22
GW-220	5/8/86	902.58	GW-220	5/26/87	902.16
GW-220	5/16/86	902.52	GW-220	6/2/87	902.25
GW-220	5/22/86	902.42	GW-220	6/9/87	902.12

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-220	6/26/87	902.39	GW-222	3/13/86	903.62
GW-220	7/7/87	903.30	GW-222	3/20/86	903.22
GW-220	7/16/87	902.32	GW-222	3/26/86	903.26
GW-220	7/23/87	902.19	GW-222	4/3/86	903.36
GW-220	7/30/87	902.02	GW-222	4/11/86	903.19
GW-220	8/6/87	902.19	GW-222	4/18/86	903.32
GW-220	8/13/87	902.65	GW-222	4/25/86	903.22
GW-220	8/20/87	902.52	GW-222	5/1/86	903.29
GW-220	8/26/87	902.52	GW-222	5/8/86	903.42
GW-220	9/3/87	902.12	GW-222	5/16/86	904.57
GW-220	9/10/87	902.29	GW-222	5/22/86	903.29
GW-220	9/17/87	902.58	GW-222	6/4/86	903.39
GW-220	9/24/87	902.42	GW-222	6/12/86	903.52
GW-220	10/2/87	902.58	GW-222	6/19/86	903.78
GW-220	10/8/87	902.06	GW-222	6/27/86	903.42
GW-220	10/15/87	902.06	GW-222	7/10/86	903.32
GW-220	10/24/87	901.86	GW-222	7/16/86	903.62
GW-220	10/30/87	901.99	GW-222	7/24/86	903.55
GW-220	11/6/87	901.89	GW-222	7/30/86	903.79
GW-220	11/13/87	902.65	GW-222	8/6/86	903.36
GW-220	1/4/88	902.52	GW-222	8/14/86	903.62
GW-220	1/14/88	902.32	GW-222	8/21/86	903.45
GW-220	1/22/88	903.63	GW-222	8/28/86	903.29
GW-220	2/1/88	902.52	GW-222	9/5/86	903.39
GW-220	2/9/88	902.78	GW-222	9/11/86	903.36
GW-220	2/17/88	902.52	GW-222	9/18/86	903.42
GW-220	2/22/88	902.62	GW-222	9/25/86	903.39
GW-220	3/3/88	902.35	GW-222	10/2/86	903.19
GW-220	3/10/88	902.42	GW-222	10/9/86	903.19
GW-220	3/17/88	902.68	GW-222	10/17/86	903.09
GW-220	4/4/88	902.45	GW-222	10/24/86	903.13
GW-220	4/11/88	902.29	GW-222	10/31/86	903.26
GW-220	4/17/90	899.57	GW-222	11/6/86	903.16
GW-220	5/14/92	899.54	GW-222	11/13/86	903.03
			GW-222	11/20/86	903.19
GW-222	10/30/85	903.59	GW-222	12/3/86	902.99
GW-222	12/12/85	903.36	GW-222	12/12/86	902.96
GW-222	12/19/85	903.36	GW-222	12/19/86	902.96
GW-222	12/27/85	903.26	GW-222	12/29/86	902.80
GW-222	1/2/86	903.22	GW-222	1/6/87	902.04
GW-222	1/9/86	903.13	GW-222	1/13/87	902.90
GW-222	1/16/86	903.16	GW-222	1/19/87	903.09
GW-222	1/23/86	902.93	GW-222	1/26/87	902.70
GW-222	1/31/86	902.90	GW-222	2/4/87	902.60
GW-222	2/6/86	902.93	GW-222	2/9/87	902.57
GW-222	2/13/86	904.04	GW-222	2/17/87	903.91
GW-222	2/20/86	902.96	GW-222	2/25/87	902.76
GW-222	2/28/86	903.49	GW-222	3/4/87	902.83
GW-222	3/5/86	903.09	GW-222	3/12/87	902.54

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-222	3/17/87	902.84	GW-223	12/12/85	903.39
GW-222	3/24/87	902.83	GW-223	12/19/85	903.29
GW-222	3/30/87	902.80	GW-223	12/27/85	903.22
GW-222	4/8/87	902.73	GW-223	1/2/86	903.29
GW-222	4/13/87	902.76	GW-223	1/9/86	903.12
GW-222	4/21/87	902.93	GW-223	1/16/86	903.16
GW-222	4/27/87	902.90	GW-223	1/23/86	902.99
GW-222	5/4/87	902.86	GW-223	1/31/86	902.96
GW-222	5/14/87	902.67	GW-223	2/6/86	902.99
GW-222	5/19/87	902.76	GW-223	2/13/86	902.93
GW-222	5/26/87	902.96	GW-223	2/20/86	903.09
GW-222	6/2/87	903.09	GW-223	2/28/86	903.29
GW-222	6/9/87	903.09	GW-223	3/5/86	903.16
GW-222	6/26/87	903.06	GW-223	3/13/86	903.75
GW-222	7/7/87	903.06	GW-223	3/20/86	903.39
GW-222	7/16/87	903.09	GW-223	3/26/86	903.35
GW-222	7/23/87	903.06	GW-223	4/3/86	903.45
GW-222	7/30/87	902.93	GW-223	4/11/86	903.32
GW-222	8/6/87	902.96	GW-223	4/25/86	903.35
GW-222	8/13/87	903.06	GW-223	5/1/86	903.42
GW-222	8/20/87	902.93	GW-223	5/8/86	903.52
GW-222	8/26/87	902.90	GW-223	5/16/86	903.45
GW-222	9/3/87	902.73	GW-223	5/22/86	903.39
GW-222	9/10/87	902.70	GW-223	6/4/86	903.48
GW-222	9/17/87	902.67	GW-223	6/12/86	903.61
GW-222	9/24/87	902.54	GW-223	6/19/86	903.81
GW-222	10/2/87	902.73	GW-223	6/27/86	903.48
GW-222	10/8/87	902.63	GW-223	7/10/86	903.42
GW-222	10/15/87	902.60	GW-223	7/18/86	903.68
GW-222	10/30/87	902.50	GW-223	7/24/86	903.65
GW-222	11/6/87	902.70	GW-223	7/30/86	903.45
GW-222	11/13/87	902.99	GW-223	8/8/86	903.39
GW-222	1/4/88	902.37	GW-223	8/14/86	903.68
GW-222	1/14/88	903.42	GW-223	8/21/86	903.55
GW-222	1/22/88	902.37	GW-223	8/28/86	903.42
GW-222	2/1/88	901.65	GW-223	9/5/86	903.45
GW-222	2/9/88	901.98	GW-223	9/11/86	903.42
GW-222	2/17/88	901.88	GW-223	9/18/86	903.45
GW-222	2/22/88	901.91	GW-223	9/25/86	903.45
GW-222	3/3/88	901.72	GW-223	10/2/86	903.29
GW-222	3/10/88	901.81	GW-223	10/9/86	903.29
GW-222	3/17/88	901.62	GW-223	10/17/86	903.19
GW-222	4/4/88	902.27	GW-223	10/24/86	903.19
GW-222	4/11/88	902.21	GW-223	10/31/86	903.32
GW-222	4/17/90	902.24	GW-223	11/6/86	903.22
GW-222	5/3/91	899.29	GW-223	11/13/86	903.12
GW-222	5/14/92	901.82	GW-223	11/20/86	903.29
GW-223	10/30/85	903.52	GW-223	12/3/86	903.06
			GW-223	12/12/86	903.09

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-223	12/19/86	903.06	GW-223	2/17/88	902.07
GW-223	12/29/86	902.89	GW-223	2/22/88	902.07
GW-223	1/8/87	902.14	GW-223	3/3/88	901.84
GW-223	1/13/87	902.99	GW-223	3/10/88	901.94
GW-223	1/19/87	903.29	GW-223	3/17/88	901.81
GW-223	1/26/87	902.89	GW-223	4/4/88	902.43
GW-223	2/4/87	902.76	GW-223	4/11/88	902.40
GW-223	2/9/87	902.70	GW-223	4/17/90	901.38
GW-223	2/17/87	902.76	GW-223	5/3/91	898.79
GW-223	2/25/87	902.89	GW-223	5/14/92	901.72
GW-223	3/4/87	902.96			
GW-223	3/12/87	902.83	GW-239	8/27/86	902.93
GW-223	3/17/87	902.83	GW-239	9/17/86	903.16
GW-223	3/24/87	902.70	GW-239	10/2/86	903.09
GW-223	3/30/87	902.93	GW-239	10/16/86	903.72
GW-223	4/6/87	902.89	GW-239	10/29/86	903.85
GW-223	4/13/87	902.86	GW-239	11/13/86	903.81
GW-223	4/21/87	903.06	GW-239	12/1/86	904.50
GW-223	4/27/87	903.02	GW-239	12/18/86	905.88
GW-223	5/4/87	902.30	GW-239	1/5/87	905.62
GW-223	5/14/87	902.79	GW-239	1/20/87	905.45
GW-223	5/19/87	902.93	GW-239	2/5/87	904.37
GW-223	5/26/87	903.12	GW-239	2/23/87	904.47
GW-223	6/2/87	903.25	GW-239	3/9/87	905.13
GW-223	6/9/87	903.22	GW-239	3/30/87	903.65
GW-223	6/26/87	903.22	GW-239	4/13/87	903.58
GW-223	7/7/87	903.22	GW-239	4/27/87	902.70
GW-223	7/16/87	903.22	GW-239	5/18/87	902.67
GW-223	7/23/87	903.22	GW-239	6/1/87	902.67
GW-223	7/30/87	903.09	GW-239	6/23/87	902.93
GW-223	8/6/87	903.12	GW-239	7/22/87	902.63
GW-223	8/13/87	903.32	GW-239	8/4/87	903.26
GW-223	8/20/87	903.12	GW-239	8/17/87	902.44
GW-223	8/26/87	903.06	GW-239	9/1/87	902.17
GW-223	9/3/87	902.86	GW-239	9/14/87	902.86
GW-223	9/10/87	902.86	GW-239	9/29/87	904.47
GW-223	9/17/87	902.83	GW-239	10/15/87	902.08
GW-223	9/24/87	902.66	GW-239	10/26/87	902.04
GW-223	10/2/87	902.89	GW-239	1/11/88	902.76
GW-223	10/8/87	902.76	GW-239	1/22/88	907.00
GW-223	10/15/87	902.73	GW-239	2/5/88	904.86
GW-223	10/30/87	902.63	GW-239	2/18/88	903.62
GW-223	11/6/87	902.60	GW-239	3/1/88	903.09
GW-223	11/13/87	903.09	GW-239	3/21/88	904.04
GW-223	1/4/88	902.50	GW-239	4/19/88	903.22
GW-223	1/14/88	902.34	GW-239	4/24/90	902.34
GW-223	1/22/88	902.56	GW-239	5/3/91	899.56
GW-223	2/1/88	901.74			
GW-223	2/9/88	902.14	GW-240	12/19/85	903.02

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-240	12/27/85	902.89	GW-240	1/13/87	902.49
GW-240	1/3/86	902.89	GW-240	1/19/87	905.94
GW-240	1/9/86	902.72	GW-240	1/26/87	904.86
GW-240	1/16/86	902.76	GW-240	2/4/87	903.21
GW-240	1/23/86	902.72	GW-240	2/9/87	902.95
GW-240	1/31/86	902.89	GW-240	2/17/87	903.28
GW-240	2/6/86	903.54	GW-240	2/25/87	903.90
GW-240	2/13/86	903.05	GW-240	3/4/87	905.74
GW-240	2/20/86	906.69	GW-240	3/11/87	903.21
GW-240	2/28/86	903.54	GW-240	3/17/87	902.95
GW-240	3/5/86	903.05	GW-240	3/24/87	903.15
GW-240	3/13/86	903.61	GW-240	3/31/87	902.99
GW-240	3/20/86	904.13	GW-240	4/6/87	903.05
GW-240	3/28/86	903.38	GW-240	4/14/87	903.08
GW-240	4/3/86	903.15	GW-240	4/21/87	903.15
GW-240	4/11/86	903.05	GW-240	4/27/87	902.95
GW-240	4/18/86	902.99	GW-240	5/4/87	897.11
GW-240	4/25/86	902.92	GW-240	5/14/87	902.76
GW-240	5/3/86	902.99	GW-240	5/19/87	902.82
GW-240	5/16/86	902.82	GW-240	5/29/87	902.82
GW-240	5/22/86	902.85	GW-240	6/2/87	902.89
GW-240	6/4/86	902.82	GW-240	6/9/87	902.89
GW-240	6/12/86	903.18	GW-240	6/28/87	902.95
GW-240	6/19/86	902.99	GW-240	7/18/87	902.95
GW-240	6/27/86	902.85	GW-240	7/23/87	902.92
GW-240	7/10/86	902.89	GW-240	7/30/87	902.79
GW-240	7/16/86	902.92	GW-240	8/6/87	902.85
GW-240	7/24/86	902.79	GW-240	8/13/87	903.15
GW-240	7/30/86	902.79	GW-240	8/20/87	902.95
GW-240	8/14/86	902.82	GW-240	8/28/87	902.99
GW-240	8/21/86	903.02	GW-240	9/3/87	902.89
GW-240	8/28/86	903.12	GW-240	9/10/87	902.85
GW-240	9/5/86	902.99	GW-240	9/17/87	902.89
GW-240	9/11/86	902.95	GW-240	9/29/87	902.85
GW-240	9/18/86	902.95	GW-240	10/8/87	902.72
GW-240	9/25/86	902.92	GW-240	10/15/87	902.76
GW-240	10/2/86	903.05	GW-240	10/24/87	902.62
GW-240	10/10/86	902.89	GW-240	10/30/87	902.72
GW-240	10/17/86	902.95	GW-240	11/6/87	902.69
GW-240	10/24/86	902.79	GW-240	11/13/87	903.28
GW-240	10/31/86	903.05	GW-240	1/4/88	903.21
GW-240	11/6/86	902.95	GW-240	1/14/88	902.76
GW-240	11/13/86	903.21	GW-240	1/22/88	905.22
GW-240	11/20/86	903.05	GW-240	2/1/88	902.95
GW-240	12/3/86	903.35	GW-240	2/10/88	903.21
GW-240	12/12/86	906.17	GW-240	2/17/88	902.99
GW-240	12/19/86	903.61	GW-240	2/22/88	902.99
GW-240	12/29/86	902.82	GW-240	3/3/88	902.62
GW-240	1/6/87	902.56	GW-240	3/10/88	902.69

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-240	3/17/88	903.67	GW-293	2/17/88	947.10
GW-240	4/4/88	902.89	GW-293	2/22/88	946.77
GW-240	4/11/88	902.82	GW-293	3/3/88	946.45
GW-240	4/17/90	901.29	GW-293	3/10/88	946.12
GW-240	5/14/92	901.70	GW-293	3/17/88	949.07
			GW-293	4/4/88	947.43
GW-292	8/26/87	956.53	GW-293	4/11/88	947.43
GW-292	9/3/87	956.20	GW-293	4/18/90	953.20
GW-292	9/10/87	956.20	GW-293	1/16/92	950.90
GW-292	9/17/87	956.86			
GW-292	9/24/87	956.53	GW-294	8/20/87	983.83
GW-292	10/2/87	957.51	GW-294	8/26/87	986.46
GW-292	10/7/87	957.19	GW-294	9/3/87	982.19
GW-292	10/15/87	956.86	GW-294	9/10/87	981.86
GW-292	10/24/87	956.53	GW-294	9/17/87	982.19
GW-292	10/30/87	955.22	GW-294	9/24/87	981.86
GW-292	11/6/87	954.89	GW-294	10/2/87	981.54
GW-292	11/13/87	954.56	GW-294	10/7/87	981.54
GW-292	1/4/88	955.55	GW-294	10/15/87	981.21
GW-292	1/15/88	955.55	GW-294	10/24/87	980.88
GW-292	2/1/88	958.83	GW-294	10/30/87	980.55
GW-292	2/9/88	959.81	GW-294	11/6/87	980.22
GW-292	2/17/88	959.15	GW-294	11/13/87	979.90
GW-292	2/22/88	958.83	GW-294	11/18/87	980.22
GW-292	3/3/88	958.17	GW-294	1/15/88	982.52
GW-292	3/10/88	958.17	GW-294	2/1/88	986.46
GW-292	3/17/88	961.12	GW-294	2/9/88	988.10
GW-292	4/4/88	959.48	GW-294	2/17/88	987.44
GW-292	4/11/88	959.48	GW-294	2/22/88	987.44
GW-292	4/18/90	962.15	GW-294	3/3/88	985.80
GW-292	1/16/92	962.70	GW-294	3/10/88	985.47
			GW-294	3/17/88	988.10
GW-293	8/20/87	945.46	GW-294	4/4/88	986.13
GW-293	8/26/87	944.48	GW-294	4/11/88	985.80
GW-293	9/3/87	944.15	GW-294	4/18/90	985.99
GW-293	9/10/87	943.82	GW-294	1/16/92	989.30
GW-293	9/17/87	944.15			
GW-293	9/24/87	944.15	GW-295	2/22/88	950.32
GW-293	10/2/87	944.48	GW-295	3/3/88	949.67
GW-293	10/7/87	944.48	GW-295	3/10/88	949.34
GW-293	10/15/87	943.82	GW-295	3/16/88	952.62
GW-293	10/24/87	943.49	GW-295	4/4/88	949.67
GW-293	10/30/87	943.17	GW-295	4/11/88	949.67
GW-293	11/6/87	942.84	GW-295	4/17/88	950.65
GW-293	11/13/87	943.17	GW-295	4/20/90	949.96
GW-293	1/4/88	943.82	GW-295	5/3/91	948.05
GW-293	1/15/88	943.49	GW-295	1/16/92	952.90
GW-293	2/1/88	943.49			
GW-293	2/9/88	947.10	GW-296	8/20/87	967.63

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-296	8/26/87	971.24	GW-297	4/11/88	978.60
GW-296	9/3/87	971.24			
GW-296	9/10/87	970.91	GW-298	2/22/88	940.18
GW-296	9/17/87	970.91	GW-298	3/3/88	938.86
GW-296	9/24/87	970.91	GW-298	3/10/88	938.86
GW-296	10/2/87	971.24	GW-298	3/16/88	942.80
GW-296	10/7/87	970.91	GW-298	4/4/88	939.19
GW-296	10/15/87	970.91	GW-298	4/11/88	939.85
GW-296	10/24/87	970.58	GW-298	4/17/88	940.50
GW-296	10/30/87	970.91	GW-298	4/20/90	943.40
GW-296	11/8/87	969.93	GW-298	1/16/92	944.80
GW-296	11/13/87	970.26			
GW-296	1/4/88	970.91	GW-299	2/22/88	949.20
GW-296	1/15/88	970.91	GW-299	3/3/88	948.55
GW-296	2/1/88	972.22	GW-299	3/10/88	948.87
GW-296	2/9/88	973.21	GW-299	3/16/88	950.51
GW-296	2/17/88	972.88	GW-299	4/4/88	949.86
GW-296	2/22/88	972.55	GW-299	4/11/88	949.86
GW-296	3/3/88	972.22	GW-299	4/17/88	949.53
GW-296	3/10/88	971.90	GW-299	4/20/90	963.16
GW-296	3/17/88	974.52	GW-299	1/16/92	961.00
GW-296	4/4/88	973.21			
GW-296	4/11/88	973.21	GW-303	4/18/90	918.79
GW-296	4/18/90	973.00	GW-303	1/16/92	921.70
GW-296	1/16/92	973.70			
			GW-380	4/17/90	903.66
GW-297	8/20/87	978.60	GW-380	5/3/91	903.54
GW-297	8/26/87	978.60	GW-380	5/14/92	902.65
GW-297	9/3/87	978.60			
GW-297	9/10/87	978.60	GW-381	4/17/90	902.65
GW-297	9/17/87	978.60	GW-381	5/3/91	903.18
GW-297	9/24/87	978.60	GW-381	5/14/92	903.36
GW-297	10/2/87	978.60			
GW-297	10/7/87	978.60	GW-382	4/17/90	902.16
GW-297	10/15/87	978.60	GW-382	5/3/91	902.18
GW-297	10/24/87	978.60			
GW-297	10/30/87	978.60	GW-383	4/17/90	898.42
GW-297	11/8/87	978.60	GW-383	5/3/91	896.25
GW-297	11/13/87	978.60	GW-383	5/14/92	898.90
GW-297	1/4/88	978.60			
GW-297	1/15/88	978.60	GW-384	4/17/90	896.69
GW-297	2/1/88	978.60	GW-384	5/3/91	893.32
GW-297	2/9/88	978.60	GW-384	5/14/92	897.28
GW-297	2/17/88	978.60			
GW-297	2/22/88	978.60	GW-385	4/17/90	904.77
GW-297	3/3/88	978.60	GW-385	5/3/91	902.19
GW-297	3/10/88	978.60			
GW-297	3/17/88	978.60	GW-603	4/17/90	903.03
GW-297	4/4/88	978.60	GW-603	5/14/92	902.32

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-804	4/17/90	902.53			
GW-804	5/3/91	901.76			
GW-804	1/16/92	904.20			
GW-804	5/14/92	901.46			
GW-808	4/18/90	961.06			
GW-808	5/3/91	964.01			
GW-808	1/16/92	955.50			
GW-733	5/14/92	901.34			
GW-735	5/14/92	900.98			
GW-744	5/14/92	900.73			
GW-745	5/14/92	900.96			
GW-746	5/14/92	901.68			
GW-747	5/14/92	915.26			
GW-748	5/14/92	914.37			
GW-749	5/14/92	913.69			
GW-750	5/14/92	905.56			
GW-751	5/14/92	906.75			
GW-752	5/14/92	908.08			
GW-753	5/14/92	918.69			
GW-754	5/14/92	916.69			
GW-755	5/14/92	921.76			
GW-756	5/14/92	921.02			

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
Water Level Data for the Oil Landfarm Waste Management Area					
GW-001	3/15/84	966.16	GW-001	5/1/86	964.46
GW-001	3/22/84	970.69	GW-001	5/8/86	964.29
GW-001	4/6/84	970.00	GW-001	5/15/86	963.73
GW-001	4/13/84	967.31	GW-001	5/22/86	963.70
GW-001	4/19/84	966.03	GW-001	5/29/86	964.52
GW-001	4/26/84	967.38	GW-001	6/5/86	964.23
GW-001	5/3/84	970.30	GW-001	6/13/86	963.67
GW-001	5/17/84	968.10	GW-001	6/20/86	963.34
GW-001	5/25/84	966.03	GW-001	6/26/86	962.98
GW-001	6/1/84	965.77	GW-001	7/10/86	962.82
GW-001	6/7/84	964.78	GW-001	7/18/86	963.83
GW-001	6/14/84	964.46			
GW-001	7/5/84	964.85	GW-002	3/15/84	968.64
GW-001	7/26/84	965.83	GW-002	3/22/84	974.81
GW-001	8/23/84	964.39	GW-002	4/6/84	974.19
GW-001	9/6/84	963.96	GW-002	4/13/84	970.22
GW-001	9/13/84	963.64	GW-002	4/19/84	968.51
GW-001	9/20/84	963.24	GW-002	4/26/84	970.71
GW-001	9/26/84	963.05	GW-002	5/3/84	975.20
GW-001	10/4/84	963.24	GW-002	5/17/84	971.49
GW-001	10/11/84	963.11	GW-002	5/25/84	968.38
GW-001	10/18/84	962.98	GW-002	6/1/84	967.92
GW-001	10/25/84	965.21	GW-002	6/7/84	967.07
GW-001	11/1/84	964.26	GW-002	6/14/84	966.64
GW-001	11/10/84	964.19	GW-002	7/5/84	966.77
GW-001	11/16/84	965.96	GW-002	7/25/84	967.92
GW-001	11/30/84	966.62	GW-002	8/8/84	967.56
GW-001	12/6/84	966.16	GW-002	8/23/84	966.18
GW-001	12/20/84	967.80	GW-002	9/6/84	965.92
GW-001	12/28/84	967.21	GW-002	9/13/84	965.46
GW-001	1/11/85	966.36	GW-002	9/20/84	965.23
GW-001	1/17/85	964.59	GW-002	9/26/84	964.97
GW-001	1/24/85	965.24	GW-002	10/4/84	965.16
GW-001	2/7/85	969.34	GW-002	10/11/84	965.03
GW-001	2/14/85	968.66	GW-002	10/18/84	964.70
GW-001	2/22/85	968.33	GW-002	10/25/84	967.43
GW-001	3/1/85	967.01	GW-002	11/1/84	965.82
GW-001	3/14/85	966.49	GW-002	11/10/84	965.88
GW-001	3/21/85	965.54	GW-002	11/16/84	968.28
GW-001	3/27/85	965.90	GW-002	11/30/84	969.33
GW-001	3/28/85	966.52	GW-002	12/6/84	968.35
GW-001	4/4/85	966.36	GW-002	12/20/84	970.90
GW-001	4/12/85	966.00	GW-002	12/28/84	969.95
GW-001	4/22/85	966.03	GW-002	1/11/85	968.54
GW-001	4/30/85	964.85	GW-002	1/17/85	967.62
GW-001	5/3/85	966.36	GW-002	1/24/85	967.07

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-002	2/7/85	972.71	GW-002	2/14/86	969.82
GW-002	2/14/85	971.99	GW-002	2/21/86	973.00
GW-002	2/22/85	971.27	GW-002	2/28/86	970.44
GW-002	3/1/85	969.33	GW-002	3/14/86	970.08
GW-002	3/7/85	967.98	GW-002	3/21/86	972.51
GW-002	3/14/85	968.54	GW-002	3/27/86	968.74
GW-002	3/21/85	967.69	GW-002	4/4/86	967.59
GW-002	3/28/85	968.61	GW-002	4/10/86	967.56
GW-002	4/4/85	968.64	GW-002	4/18/86	966.93
GW-002	4/12/85	968.57	GW-002	4/25/86	966.77
GW-002	4/22/85	968.41	GW-002	5/1/86	966.51
GW-002	4/30/85	967.23	GW-002	5/8/86	965.98
GW-002	5/3/85	969.30	GW-002	5/15/86	965.95
GW-002	5/9/85	967.52	GW-002	5/22/86	965.72
GW-002	5/16/85	967.10	GW-002	5/29/86	966.64
GW-002	5/23/85	966.70	GW-002	6/5/86	966.05
GW-002	5/31/85	966.34	GW-002	6/13/86	965.95
GW-002	6/7/85	966.08	GW-002	6/20/86	965.36
GW-002	6/14/85	966.11	GW-002	6/26/86	965.06
GW-002	6/21/85	966.25	GW-002	7/10/86	964.83
GW-002	6/27/85	966.05	GW-002	7/18/86	965.72
GW-002	7/3/85	966.02	GW-002	4/28/91	964.96
GW-002	7/11/85	965.75			
GW-002	7/18/85	965.46	GW-005	2/21/84	961.91
GW-002	7/26/85	966.74	GW-005	3/1/84	961.39
GW-002	7/30/85	967.03	GW-005	3/9/84	960.96
GW-002	8/8/85	966.34	GW-005	3/15/84	960.86
GW-002	8/14/85	966.02	GW-005	3/22/84	961.46
GW-002	8/22/85	968.64	GW-005	4/6/84	961.19
GW-002	8/30/85	970.12	GW-005	6/21/85	960.27
GW-002	9/5/85	967.43	GW-005	6/27/85	960.54
GW-002	9/13/85	966.38	GW-005	7/3/85	960.34
GW-002	9/20/85	966.28	GW-005	7/11/85	960.27
GW-002	9/26/85	965.95	GW-005	7/18/85	959.78
GW-002	10/3/85	966.61	GW-005	7/26/85	960.50
GW-002	10/10/85	966.02	GW-005	7/30/85	961.00
GW-002	10/24/85	965.59	GW-005	8/8/85	960.86
GW-002	10/31/85	965.65	GW-005	8/14/85	960.57
GW-002	11/7/85	966.74	GW-005	8/22/85	960.96
GW-002	11/15/85	966.08	GW-005	8/30/85	961.06
GW-002	11/22/85	967.30	GW-005	9/5/85	960.67
GW-002	12/6/85	967.98	GW-005	9/13/85	960.80
GW-002	12/12/85	966.74	GW-005	9/20/85	960.08
GW-002	12/27/85	966.28	GW-005	9/26/85	959.91
GW-002	1/9/86	966.90	GW-005	10/3/85	960.31
GW-002	1/16/86	966.51	GW-005	10/10/85	960.11
GW-002	1/23/86	966.11	GW-005	10/24/85	959.88
GW-002	1/31/86	967.30	GW-005	10/31/85	959.98
GW-002	2/7/86	971.92	GW-005	11/7/85	960.31

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-005	11/15/85	960.34	GW-006	8/23/84	956.06
GW-005	11/22/85	960.47	GW-006	9/6/84	955.76
GW-005	12/6/85	960.67	GW-006	9/13/84	955.27
GW-005	12/12/85	960.90	GW-006	9/20/84	954.97
GW-005	12/27/85	960.31	GW-006	9/26/84	954.58
GW-005	1/9/86	960.60	GW-006	10/4/84	954.48
GW-005	1/16/86	960.27	GW-006	10/11/84	954.32
GW-005	1/23/86	960.44	GW-006	10/18/84	953.99
GW-005	1/31/86	960.57	GW-006	10/25/84	957.60
GW-005	2/7/86	960.96	GW-006	11/1/84	956.78
GW-005	2/14/86	960.80	GW-006	11/10/84	956.71
GW-005	2/21/86	960.96			
GW-005	2/28/86	960.86	GW-007	2/21/84	957.92
GW-005	3/14/86	961.09	GW-007	3/1/84	958.51
GW-005	3/21/86	960.93	GW-007	3/9/84	957.76
GW-005	3/27/86	960.77	GW-007	3/15/84	957.59
GW-005	4/4/86	960.77	GW-007	3/22/84	959.30
GW-005	4/10/86	960.60	GW-007	4/6/84	958.84
GW-005	4/18/86	960.60	GW-007	4/13/84	957.85
GW-005	4/25/86	960.54	GW-007	4/19/84	957.43
GW-005	5/2/86	960.47	GW-007	4/26/84	957.89
GW-005	5/9/86	960.47	GW-007	5/3/84	959.40
GW-005	5/15/86	960.18	GW-007	5/17/84	957.95
GW-005	5/22/86	960.04	GW-007	5/25/84	957.30
GW-005	5/29/86	960.54	GW-007	6/1/84	957.30
GW-005	6/5/86	960.34	GW-007	6/7/84	956.31
GW-005	6/13/86	960.31	GW-007	7/5/84	957.13
GW-005	6/20/86	959.82	GW-007	7/25/84	957.23
GW-005	6/26/86	959.52	GW-007	8/8/84	957.33
GW-005	7/10/86	958.99	GW-007	8/23/84	955.92
GW-005	7/18/86	959.88	GW-007	9/6/84	955.43
			GW-007	9/13/84	955.30
GW-006	2/21/84	958.16	GW-007	9/20/84	954.93
GW-006	3/1/84	958.98	GW-007	9/29/84	954.64
GW-006	3/9/84	958.12	GW-007	10/4/84	954.54
GW-006	3/15/84	957.60	GW-007	10/11/84	954.38
GW-006	3/22/84	959.34	GW-007	10/18/84	953.98
GW-006	4/6/84	959.17	GW-007	10/25/84	957.46
GW-006	4/13/84	958.12	GW-007	11/1/84	957.10
GW-006	4/19/84	957.50	GW-007	11/10/84	957.03
GW-006	4/26/84	957.96	GW-007	4/16/90	955.90
GW-006	5/3/84	959.47	GW-007	4/29/91	956.22
GW-006	5/17/84	958.39			
GW-006	5/25/84	957.44	GW-008	2/21/84	951.31
GW-006	6/1/84	958.29	GW-008	3/1/84	952.91
GW-006	6/7/84	956.42	GW-008	3/9/84	951.17
GW-006	7/5/84	957.21	GW-008	3/15/84	950.94
GW-006	7/26/84	957.66	GW-008	3/22/84	952.62
GW-006	8/8/84	957.40	GW-008	4/6/84	952.36

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-008	4/13/84	951.27	GW-008	1/18/86	950.58
GW-008	4/19/84	950.85	GW-008	1/23/86	950.94
GW-008	4/26/84	951.01	GW-008	1/31/86	951.14
GW-008	5/3/84	952.88	GW-008	2/7/86	952.42
GW-008	5/17/84	951.57	GW-008	2/21/86	952.68
GW-008	5/28/84	950.72	GW-008	2/28/86	952.22
GW-008	6/1/84	950.72	GW-008	3/14/86	952.68
GW-008	6/7/84	949.93	GW-008	3/21/86	952.36
GW-008	7/5/84	950.81	GW-008	3/27/86	951.60
GW-008	7/25/84	951.04	GW-008	4/4/86	951.14
GW-008	8/8/84	950.75	GW-008	4/10/86	951.24
GW-008	8/23/84	949.70	GW-008	4/18/86	950.62
GW-008	9/6/84	949.37	GW-008	4/25/86	950.16
GW-008	9/13/84	949.14	GW-008	5/2/86	950.26
GW-008	9/20/84	948.94	GW-008	5/8/86	950.03
GW-008	9/26/84	948.48	GW-008	5/15/86	949.76
GW-008	10/4/84	948.42	GW-008	5/22/86	949.34
GW-008	10/11/84	948.39	GW-008	5/29/86	951.11
GW-008	10/18/84	948.39	GW-008	6/5/86	950.32
GW-008	11/1/84	950.12	GW-008	6/13/86	950.09
GW-008	11/10/84	950.12	GW-008	6/20/86	948.76
GW-008	12/25/84	951.08	GW-008	6/28/86	949.37
GW-008	2/14/85	951.63	GW-008	7/10/86	949.44
GW-008	6/21/85	949.96	GW-008	7/18/86	950.45
GW-008	6/27/85	950.26			
GW-008	7/3/85	950.29	GW-010	2/21/84	949.35
GW-008	7/11/85	950.39	GW-010	3/1/84	949.81
GW-008	7/18/85	949.96	GW-010	3/9/84	949.09
GW-008	7/26/85	950.58	GW-010	3/15/84	949.02
GW-008	7/30/85	951.27	GW-010	3/22/84	950.14
GW-008	8/8/85	951.11	GW-010	4/6/84	950.10
GW-008	8/14/85	950.58	GW-010	8/8/84	948.72
GW-008	8/22/85	951.67	GW-010	6/27/85	949.54
GW-008	8/30/85	951.77	GW-010	7/3/85	948.56
GW-008	9/5/85	951.17	GW-010	7/11/85	948.56
GW-008	9/13/85	950.78	GW-010	7/18/85	948.13
GW-008	9/20/85	950.49	GW-010	7/26/85	948.92
GW-008	9/26/85	950.29	GW-010	7/30/85	949.48
GW-008	10/3/85	950.88	GW-010	8/8/85	949.09
GW-008	10/10/85	950.42	GW-010	8/14/85	948.72
GW-008	10/24/85	950.29	GW-010	8/30/85	949.91
GW-008	10/31/85	950.42	GW-010	9/5/85	949.35
GW-008	11/7/85	950.55	GW-010	9/13/85	948.86
GW-008	11/15/85	950.42	GW-010	9/20/85	948.66
GW-008	11/22/85	950.91	GW-010	9/26/85	948.56
GW-008	12/6/85	951.63	GW-010	10/3/85	948.99
GW-008	12/12/85	950.45	GW-010	10/10/85	948.59
GW-008	12/27/85	950.72	GW-010	10/24/85	948.63
GW-008	1/9/86	951.11	GW-010	10/31/85	948.95

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-010	11/7/85	948.72	GW-011	9/13/84	948.22
GW-010	11/15/85	948.59	GW-011	9/20/84	947.99
GW-010	11/22/85	949.09	GW-011	9/28/84	947.70
GW-010	12/6/85	949.51	GW-011	10/4/84	947.70
GW-010	12/27/85	948.79	GW-011	10/11/84	947.60
GW-010	1/9/86	949.22	GW-011	10/18/84	947.57
GW-010	1/16/86	949.05	GW-011	10/25/84	949.64
GW-010	1/23/86	949.15	GW-011	11/1/84	949.21
GW-010	1/31/86	949.38	GW-011	11/10/84	949.14
GW-010	2/7/86	950.30	GW-011	11/16/84	949.88
GW-010	2/14/86	950.04	GW-011	11/30/84	950.03
GW-010	2/21/86	950.73	GW-011	12/6/84	950.13
GW-010	2/28/86	950.07	GW-011	12/20/84	950.55
GW-010	3/14/86	950.53	GW-011	12/28/84	950.26
GW-010	3/21/86	950.36	GW-011	1/11/85	950.13
GW-010	3/27/86	949.45	GW-011	1/17/85	949.86
GW-010	4/10/86	949.35	GW-011	2/22/85	950.29
GW-010	4/18/86	948.89	GW-011	3/1/85	949.96
GW-010	4/25/86	948.82	GW-011	3/7/85	949.96
GW-010	5/2/86	948.49	GW-011	3/14/85	949.93
GW-010	5/8/86	948.10	GW-011	3/21/85	949.83
GW-010	5/15/86	947.90			
GW-010	5/22/86	947.77	GW-012	2/21/84	949.08
GW-010	5/29/86	949.05	GW-012	3/1/84	948.35
GW-010	6/6/86	948.23	GW-012	3/9/84	948.88
GW-010	6/13/86	948.36	GW-012	3/15/84	948.71
GW-010	6/20/86	947.87	GW-012	3/22/84	949.27
GW-010	7/18/86	948.66	GW-012	4/8/84	949.90
GW-010	4/16/90	948.81	GW-012	4/13/84	950.29
GW-010	4/30/91	947.49	GW-012	4/19/84	948.75
			GW-012	4/26/84	948.98
GW-011	2/21/84	950.19	GW-012	5/3/84	951.90
GW-011	3/9/84	949.93	GW-012	5/17/84	949.17
GW-011	3/15/84	950.00	GW-012	5/25/84	948.58
GW-011	3/22/84	950.85	GW-012	6/1/84	948.58
GW-011	4/8/84	951.24	GW-012	6/7/84	947.89
GW-011	4/13/84	950.49	GW-012	7/5/84	948.26
GW-011	4/19/84	950.06	GW-012	7/26/84	948.65
GW-011	4/26/84	950.46	GW-012	8/8/84	948.35
GW-011	5/3/84	949.44	GW-012	8/23/84	947.47
GW-011	5/17/84	950.55	GW-012	9/6/84	947.14
GW-011	5/25/84	949.96	GW-012	9/13/84	947.01
GW-011	6/1/84	949.80	GW-012	9/20/84	946.61
GW-011	6/7/84	949.27	GW-012	9/28/84	946.42
GW-011	7/5/84	949.80	GW-012	10/4/84	946.29
GW-011	7/26/84	950.00	GW-012	10/11/84	946.35
GW-011	8/8/84	949.73	GW-012	10/18/84	946.35
GW-011	8/23/84	948.75	GW-012	10/25/84	948.26
GW-011	9/6/84	948.68	GW-012	11/1/84	947.93

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-012	11/10/84	947.83	GW-043	11/1/84	980.97
GW-012	11/16/84	948.62	GW-043	11/10/84	980.97
GW-012	11/30/84	948.58	GW-043	11/16/84	980.74
GW-012	12/6/84	948.65	GW-043	11/30/84	981.00
GW-012	12/20/84	949.17	GW-043	12/6/84	979.98
GW-012	12/28/84	948.91	GW-043	12/20/84	981.75
GW-012	1/11/85	948.94	GW-043	12/28/84	980.97
GW-012	1/17/85	948.22	GW-043	1/17/85	982.44
GW-012	1/24/85	948.55	GW-043	1/24/85	981.98
GW-012	2/7/85	949.34	GW-043	2/7/85	985.58
GW-012	2/14/85	949.37	GW-043	2/14/85	986.28
GW-012	2/22/85	949.27	GW-043	2/22/85	986.41
GW-012	3/1/85	949.17	GW-043	3/1/85	986.58
GW-012	3/7/85	948.62	GW-043	3/7/85	986.28
GW-012	3/14/85	948.88	GW-043	3/14/85	986.74
GW-012	3/21/85	948.65	GW-043	3/21/85	986.51
			GW-043	11/11/85	982.61
GW-013	2/21/84	962.95	GW-043	4/16/90	996.53
GW-013	3/1/84	963.08	GW-043	4/26/91	996.13
GW-013	3/9/84	962.81			
GW-013	3/15/84	962.26	GW-044	3/9/84	989.54
GW-013	3/22/84	963.31	GW-044	3/15/84	989.77
GW-013	4/6/84	963.24	GW-044	3/22/84	993.64
GW-013	8/6/84	961.90	GW-044	4/6/84	999.58
GW-013	4/26/91	958.46	GW-044	4/13/84	997.74
			GW-044	4/19/84	995.84
GW-043	3/9/84	989.07	GW-044	4/26/84	997.15
GW-043	3/15/84	988.54	GW-044	5/3/84	1002.50
GW-043	3/22/84	993.07	GW-044	5/17/84	1004.89
GW-043	4/6/84	997.86	GW-044	5/25/84	1000.53
GW-043	4/13/84	995.83	GW-044	6/1/84	997.91
GW-043	4/19/84	993.92	GW-044	6/7/84	994.99
GW-043	4/26/84	995.30	GW-044	6/14/84	992.79
GW-043	5/3/84	1000.65	GW-044	7/5/84	990.52
GW-043	5/17/84	1002.03	GW-044	7/26/84	988.36
GW-043	5/25/84	998.03	GW-044	8/8/84	987.31
GW-043	6/1/84	995.53	GW-044	8/23/84	986.09
GW-043	6/7/84	993.04	GW-044	9/6/84	984.85
GW-043	6/14/84	991.07	GW-044	9/13/84	984.55
GW-043	7/5/84	988.94	GW-044	9/20/84	984.09
GW-043	7/26/84	987.00	GW-044	9/26/84	983.54
GW-043	8/23/84	985.20	GW-044	10/4/84	984.00
GW-043	9/6/84	984.18	GW-044	10/11/84	983.90
GW-043	9/13/84	983.72	GW-044	10/18/84	982.35
GW-043	9/26/84	982.97	GW-044	10/25/84	981.96
GW-043	10/4/84	982.77	GW-044	11/1/84	981.40
GW-043	10/11/84	982.67	GW-044	11/10/84	981.53
GW-043	10/18/84	981.79	GW-044	11/16/84	981.37
GW-043	10/25/84	981.46	GW-044	11/30/84	981.60

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-044	12/6/84	981.24	GW-062	2/22/85	932.80
GW-044	12/20/84	981.73	GW-062	3/1/85	942.02
GW-044	12/28/84	981.80	GW-062	3/7/85	931.81
GW-044	1/11/85	982.95	GW-062	3/14/85	931.88
GW-044	1/17/85	982.88	GW-062	3/21/85	931.88
GW-044	1/24/85	982.49	GW-062	3/28/85	931.88
GW-044	2/7/85	985.64	GW-062	4/4/85	931.88
GW-044	2/14/85	986.75	GW-062	4/12/85	931.75
GW-044	2/22/85	986.98			
GW-044	3/1/85	987.24	GW-063	4/13/84	932.57
GW-044	3/7/85	986.85	GW-063	4/19/84	941.85
GW-044	3/14/85	987.44	GW-063	4/26/84	942.34
GW-044	3/21/85	987.41	GW-063	5/3/84	939.55
GW-044	4/28/91	987.87	GW-063	5/11/84	944.21
			GW-063	5/17/84	933.62
GW-062	4/13/84	932.83	GW-063	5/25/84	942.02
GW-062	4/19/84	941.62	GW-063	6/1/84	932.01
GW-062	4/26/84	939.49	GW-063	6/7/84	931.32
GW-062	5/3/84	939.46	GW-063	6/14/84	931.42
GW-062	5/11/84	944.54	GW-063	7/5/84	931.45
GW-062	5/17/84	933.81	GW-063	7/26/84	931.39
GW-062	5/25/84	942.41	GW-063	8/8/84	931.42
GW-062	6/1/84	932.37	GW-063	8/23/84	930.99
GW-062	6/7/84	931.98	GW-063	9/6/84	930.93
GW-062	6/14/84	931.65	GW-063	9/13/84	930.83
GW-062	7/5/84	931.71	GW-063	9/20/84	930.40
GW-062	7/26/84	931.65	GW-063	9/26/84	930.60
GW-062	8/8/84	932.04	GW-063	10/4/84	930.53
GW-062	8/23/84	931.25	GW-063	10/11/84	930.70
GW-062	9/6/84	931.06	GW-063	10/18/84	930.63
GW-062	9/13/84	931.02	GW-063	10/25/84	932.50
GW-062	9/20/84	930.89	GW-063	11/1/84	931.19
GW-062	9/26/84	930.86	GW-063	11/10/84	931.19
GW-062	10/4/84	930.76	GW-063	11/16/84	931.81
GW-062	10/11/84	930.80	GW-063	11/30/84	932.30
GW-062	10/18/84	930.83	GW-063	12/6/84	931.75
GW-062	10/25/84	932.67	GW-063	12/20/84	931.39
GW-062	11/1/84	931.39	GW-063	12/28/84	932.34
GW-062	11/10/84	931.35	GW-063	1/11/85	931.78
GW-062	11/16/84	932.17	GW-063	1/17/85	931.25
GW-062	11/30/84	931.71	GW-063	1/24/85	931.25
GW-062	12/6/84	931.68	GW-063	2/7/85	933.71
GW-062	12/20/84	931.12	GW-063	2/14/85	932.57
GW-062	12/28/84	932.53	GW-063	2/22/85	932.50
GW-062	1/11/85	932.01	GW-063	3/1/85	941.82
GW-062	1/17/85	931.12	GW-063	3/7/85	931.94
GW-062	1/24/85	931.48	GW-063	3/14/85	931.68
GW-062	2/7/85	933.94	GW-063	3/21/85	931.75
GW-062	2/14/85	932.76	GW-063	3/28/85	931.91

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-063	4/4/85	931.91	GW-063	4/17/86	931.48
GW-063	4/12/85	931.91	GW-063	4/24/86	931.19
GW-063	4/22/85	931.78	GW-063	5/1/86	931.35
GW-063	4/30/85	931.22	GW-063	5/8/86	930.86
GW-063	5/3/85	932.07	GW-063	5/15/86	930.34
GW-063	5/9/85	931.32	GW-063	5/22/86	930.99
GW-063	5/16/85	931.22	GW-063	5/29/86	931.45
GW-063	5/23/85	930.99	GW-063	6/5/86	931.12
GW-063	5/31/85	930.79	GW-063	6/12/86	931.12
GW-063	6/7/85	930.76	GW-063	6/19/86	930.73
GW-063	6/14/85	930.93	GW-063	6/26/86	930.76
GW-063	6/21/85	930.86	GW-063	7/10/86	930.76
GW-063	6/27/85	930.86	GW-063	7/17/86	931.29
GW-063	7/3/85	930.89	GW-063	4/16/90	932.21
GW-063	7/11/85	930.93	GW-063	4/28/91	929.28
GW-063	7/18/85	930.83			
GW-063	7/26/85	931.48	GW-064	4/13/84	955.97
GW-063	7/30/85	931.42	GW-064	4/19/84	958.53
GW-063	8/6/85	931.19	GW-064	4/26/84	957.25
GW-063	8/14/85	930.76	GW-064	5/3/84	963.45
GW-063	8/22/85	931.91	GW-064	5/11/84	963.22
GW-063	8/30/85	932.17	GW-064	5/17/84	959.18
GW-063	9/5/85	931.32	GW-064	5/25/84	957.25
GW-063	9/13/85	931.09	GW-064	6/1/84	956.53
GW-063	9/20/85	930.83	GW-064	6/7/84	955.61
GW-063	9/26/85	930.93	GW-064	6/14/84	954.79
GW-063	10/3/85	944.74	GW-064	7/5/84	955.25
GW-063	10/10/85	931.65	GW-064	7/26/84	955.31
GW-063	10/24/85	931.12	GW-064	8/9/84	955.74
GW-063	10/31/85	931.16	GW-064	8/23/84	953.97
GW-063	11/7/85	931.45	GW-064	9/6/84	954.00
GW-063	11/15/85	931.19	GW-064	9/13/84	953.64
GW-063	11/22/85	931.35	GW-064	9/20/84	953.51
GW-063	12/6/85	931.52	GW-064	9/26/84	953.12
GW-063	12/12/85	931.78	GW-064	10/4/84	953.12
GW-063	12/27/85	931.02	GW-064	10/11/84	952.98
GW-063	1/9/86	930.96	GW-064	10/18/84	953.12
GW-063	1/16/86	930.83	GW-064	10/25/84	956.95
GW-063	1/23/86	930.99	GW-064	11/1/84	954.82
GW-063	1/30/86	931.65	GW-064	11/10/84	954.62
GW-063	2/6/86	932.63	GW-064	11/16/84	956.46
GW-063	2/14/86	932.04	GW-064	11/30/84	955.87
GW-063	2/20/86	939.98	GW-064	12/6/84	955.74
GW-063	2/27/86	932.40	GW-064	12/20/84	955.02
GW-063	3/13/86	932.40	GW-064	12/28/84	956.26
GW-063	3/20/86	933.65	GW-064	1/11/85	955.94
GW-063	3/27/86	932.27	GW-064	1/17/85	954.66
GW-063	4/3/86	931.84	GW-064	1/24/85	954.82
GW-063	4/10/86	931.71	GW-064	2/7/85	958.13

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-064	2/14/85	957.31	GW-065	4/4/85	954.76
GW-064	2/22/85	956.89	GW-065	4/12/85	955.41
GW-064	3/1/85	956.43	GW-065	4/22/85	955.22
GW-064	3/7/85	955.87	GW-065	4/30/85	954.07
GW-064	3/14/85	955.64	GW-065	5/3/85	955.87
GW-064	3/21/85	955.38	GW-065	5/9/85	954.49
GW-064	4/17/90	956.88	GW-065	5/16/85	954.03
GW-064	4/28/91	954.72	GW-065	5/23/85	953.44
			GW-065	5/31/85	953.25
GW-065	4/13/84	944.19	GW-065	6/7/85	953.08
GW-065	4/19/84	955.74	GW-065	6/14/85	953.41
GW-065	4/26/84	956.83	GW-065	6/21/85	953.67
GW-065	5/2/84	952.07	GW-065	6/27/85	953.31
GW-065	5/11/84	953.35	GW-065	7/3/85	953.41
GW-065	5/17/84	958.46	GW-065	7/11/85	953.35
GW-065	5/25/84	956.33	GW-065	7/18/85	953.31
GW-065	6/1/84	958.66	GW-065	7/26/85	954.26
GW-065	6/7/84	954.69	GW-065	7/30/85	954.53
GW-065	6/14/84	954.07	GW-065	8/6/85	954.13
GW-065	7/5/84	954.40	GW-065	8/14/85	953.15
GW-065	7/26/84	954.53	GW-065	8/22/85	955.22
GW-065	8/6/84	954.89	GW-065	8/30/85	955.64
GW-065	8/23/84	953.38	GW-065	9/5/85	954.30
GW-065	9/6/84	953.31	GW-065	9/13/85	953.74
GW-065	9/13/84	953.02	GW-065	9/20/85	953.18
GW-065	9/20/84	952.76	GW-065	9/26/85	959.74
GW-065	9/26/84	952.72	GW-065	10/3/85	954.23
GW-065	10/4/84	952.59	GW-065	10/10/85	953.35
GW-065	10/11/84	952.56	GW-065	10/24/85	953.64
GW-065	10/18/84	952.62	GW-065	10/31/85	953.41
GW-065	10/25/84	956.33	GW-065	11/7/85	954.23
GW-065	11/1/84	954.10	GW-065	11/15/85	956.73
GW-065	11/10/84	953.84	GW-065	11/22/85	953.08
GW-065	11/10/84	955.41	GW-065	12/6/85	956.86
GW-065	11/30/84	955.61	GW-065	12/12/85	953.94
GW-065	12/6/84	955.18	GW-065	12/27/85	953.48
GW-065	12/20/84	954.26	GW-065	1/9/86	953.51
GW-065	12/28/84	955.51	GW-065	1/16/86	950.03
GW-065	1/11/85	955.15	GW-065	1/23/86	949.93
GW-065	1/17/85	954.33	GW-065	1/30/86	953.84
GW-065	1/24/85	954.03	GW-065	2/6/86	955.51
GW-065	2/7/85	957.48	GW-065	2/14/86	954.82
GW-065	2/14/85	956.43	GW-065	2/20/86	960.30
GW-065	2/22/85	956.33	GW-065	2/27/86	960.33
GW-065	3/1/85	954.03	GW-065	3/13/86	956.00
GW-065	3/7/85	954.99	GW-065	3/20/86	956.43
GW-065	3/14/85	955.12	GW-065	3/27/86	954.00
GW-065	3/21/85	954.56	GW-065	4/3/86	954.76
GW-065	3/28/85	955.12	GW-065	4/10/86	954.53

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-066	4/17/86	953.97	GW-066	3/14/85	953.09
GW-066	4/24/86	953.58	GW-066	3/21/85	953.06
GW-066	5/1/86	953.48	GW-066	3/28/85	953.71
GW-066	5/8/86	953.25	GW-066	4/4/85	953.58
GW-066	5/15/86	953.02	GW-066	4/12/85	954.04
GW-066	5/22/86	952.72	GW-066	4/22/85	953.75
GW-066	5/29/86	953.94	GW-066	4/30/85	952.93
GW-066	6/5/86	953.28	GW-066	5/3/85	954.17
GW-066	6/12/86	953.15	GW-066	5/9/85	953.26
GW-066	6/19/86	952.79	GW-066	5/16/85	952.93
GW-066	6/26/86	952.59	GW-066	5/23/85	952.60
GW-066	7/10/86	952.33	GW-066	5/31/85	952.60
			GW-066	6/7/85	952.27
GW-066	4/13/84	954.50	GW-066	6/14/85	952.60
GW-066	4/19/84	954.01	GW-066	6/21/85	952.86
GW-066	4/26/84	954.08	GW-066	6/27/85	952.47
GW-066	5/3/84	955.32	GW-066	7/3/85	952.73
GW-066	5/17/84	954.76	GW-066	7/11/85	952.96
GW-066	5/25/84	954.08	GW-066	7/18/85	952.44
GW-066	6/1/84	952.24	GW-066	7/26/85	953.58
GW-066	6/7/84	953.12	GW-066	7/30/85	953.81
GW-066	6/14/84	952.80	GW-066	8/6/85	953.39
GW-066	7/5/84	953.52	GW-066	8/14/85	952.86
GW-066	7/26/84	954.14	GW-066	8/22/85	953.78
GW-066	8/8/84	953.71	GW-066	8/30/85	954.14
GW-066	8/23/84	952.93	GW-066	9/5/85	953.62
GW-066	9/6/84	953.06	GW-066	9/13/85	953.29
GW-066	9/13/84	952.70	GW-066	9/20/85	953.09
GW-066	9/20/84	952.34	GW-066	9/26/85	953.16
GW-066	9/26/84	951.94	GW-066	10/3/85	953.62
GW-066	10/4/84	952.01	GW-066	10/10/85	952.47
GW-066	10/11/84	951.91	GW-066	10/24/85	953.29
GW-066	10/18/84	952.44	GW-066	10/31/85	953.81
GW-066	10/25/84	954.24	GW-066	11/7/85	953.35
GW-066	11/1/84	953.42	GW-066	11/15/85	952.80
GW-066	11/10/84	942.17	GW-066	11/22/85	953.35
GW-066	11/16/84	954.40	GW-066	12/6/85	954.24
GW-066	11/30/84	954.34	GW-066	12/12/85	953.78
GW-066	12/6/84	954.24	GW-066	12/27/85	952.76
GW-066	12/20/84	954.37	GW-066	1/9/86	953.45
GW-066	12/28/84	954.27	GW-066	1/16/86	952.96
GW-066	1/11/85	954.14	GW-066	1/23/86	953.45
GW-066	1/17/85	953.88	GW-066	1/31/86	953.52
GW-066	1/24/85	953.78	GW-066	2/7/86	953.94
GW-066	2/7/85	954.53	GW-066	2/14/86	953.94
GW-066	2/14/85	954.44	GW-066	2/21/86	954.57
GW-066	2/22/85	954.40	GW-066	2/28/86	954.11
GW-066	3/1/85	954.08	GW-066	3/14/86	953.81
GW-066	3/7/85	953.88	GW-066	3/21/86	954.24

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-066	3/27/86	953.88	GW-067	2/22/85	952.54
GW-066	4/4/86	953.58	GW-067	3/1/85	952.02
GW-066	4/10/86	953.49	GW-067	3/7/85	952.38
GW-066	4/18/86	953.26	GW-067	3/14/85	952.15
GW-066	4/25/86	953.26	GW-067	3/21/85	952.18
GW-066	5/1/86	953.09	GW-067	3/28/85	952.41
GW-066	5/8/86	952.80	GW-067	4/4/85	952.38
GW-066	5/15/86	952.80	GW-067	4/12/85	952.05
GW-066	5/22/86	952.47	GW-067	4/22/85	952.08
GW-066	5/29/86	952.96	GW-067	4/30/85	951.89
GW-066	6/5/86	952.99	GW-067	5/3/85	952.58
GW-066	6/12/86	953.09	GW-067	5/9/85	952.18
GW-066	6/20/86	952.44	GW-067	5/16/85	951.72
GW-066	6/26/86	952.17	GW-067	5/23/85	951.59
GW-066	7/10/86	951.91	GW-067	5/31/85	951.66
GW-066	7/18/86	953.16	GW-067	6/7/85	951.40
			GW-067	6/14/85	951.79
GW-067	4/13/84	952.61	GW-067	6/21/85	951.99
GW-067	4/19/84	952.38	GW-067	6/27/85	951.69
GW-067	4/26/84	952.64	GW-067	7/3/85	951.79
GW-067	5/3/84	953.56	GW-067	7/11/85	952.02
GW-067	5/17/84	952.61	GW-067	7/18/85	951.46
GW-067	5/25/84	952.31	GW-067	7/26/85	952.44
GW-067	6/1/84	952.41	GW-067	7/30/85	952.61
GW-067	6/7/84	951.79	GW-067	8/8/85	952.41
GW-067	6/14/84	951.66	GW-067	8/14/85	949.10
GW-067	7/5/84	952.35	GW-067	8/22/85	952.28
GW-067	7/28/84	952.71	GW-067	8/30/85	952.54
GW-067	8/8/84	952.54	GW-067	9/5/85	952.38
GW-067	8/23/84	951.72	GW-067	9/13/85	952.08
GW-067	9/6/84	952.02	GW-067	9/20/85	952.18
GW-067	9/13/84	951.69	GW-067	9/26/85	952.25
GW-067	9/20/84	951.62	GW-067	10/3/85	952.58
GW-067	9/26/84	951.62	GW-067	10/10/85	952.05
GW-067	10/11/84	951.46	GW-067	10/24/85	952.41
GW-067	10/18/84	951.59	GW-067	10/31/85	952.77
GW-067	10/25/84	952.77	GW-067	11/7/85	952.25
GW-067	11/1/84	952.18	GW-067	11/15/85	952.25
GW-067	11/10/84	952.15	GW-067	11/22/85	952.15
GW-067	11/16/84	952.67	GW-067	12/6/85	951.36
GW-067	11/30/84	952.61	GW-067	12/12/85	952.25
GW-067	12/6/84	952.90	GW-067	12/27/85	951.53
GW-067	12/20/84	952.51	GW-067	1/9/86	952.05
GW-067	12/28/84	952.31	GW-067	1/16/86	951.76
GW-067	1/11/85	952.31	GW-067	1/23/86	951.72
GW-067	1/17/85	952.22	GW-067	1/31/86	951.99
GW-067	1/24/85	952.38	GW-067	2/7/86	952.41
GW-067	2/7/85	952.58	GW-067	2/14/86	952.22
GW-067	2/14/85	952.48	GW-067	2/21/86	952.41

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-067	2/28/86	952.28	GW-073	12/28/84	947.48
GW-067	3/14/86	952.18	GW-073	1/11/85	947.55
GW-067	3/21/86	952.51	GW-073	1/17/85	947.22
GW-067	3/27/86	952.25	GW-073	1/24/85	947.22
GW-067	4/4/86	951.92	GW-073	2/7/85	948.34
GW-067	4/10/86	951.53	GW-073	2/14/85	948.50
GW-067	4/18/86	951.92	GW-073	2/22/85	948.47
GW-067	4/25/86	951.79	GW-073	3/1/85	947.68
GW-067	5/1/86	951.66	GW-073	3/7/85	947.65
GW-067	5/8/86	951.69	GW-073	3/14/85	947.75
GW-067	5/15/86	951.33	GW-073	4/30/91	945.30
GW-067	5/22/86	951.13			
GW-067	5/29/86	952.44	GW-075	4/13/84	962.28
GW-067	6/5/86	951.69	GW-075	4/19/84	961.78
GW-067	6/12/86	951.79	GW-075	4/26/84	962.34
GW-067	6/20/86	951.40	GW-075	5/17/84	963.23
GW-067	6/26/86	951.17	GW-075	5/25/84	962.01
GW-067	7/10/86	951.23	GW-075	6/1/84	961.78
GW-067	7/18/86	951.99	GW-075	6/7/84	961.19
GW-067	4/16/90	950.03	GW-075	7/5/84	961.23
GW-067	4/28/91	947.48	GW-075	7/26/84	961.49
			GW-075	8/8/84	961.59
GW-073	4/6/84	949.26	GW-075	8/23/84	961.03
GW-073	4/13/84	948.43	GW-075	9/6/84	960.11
GW-073	4/19/84	947.48	GW-075	9/13/84	960.08
GW-073	4/26/84	947.75	GW-075	9/20/84	959.59
GW-073	5/3/84	948.99	GW-075	9/26/84	959.45
GW-073	5/17/84	948.14	GW-075	10/4/84	959.45
GW-073	5/25/84	947.25	GW-075	10/11/84	958.96
GW-073	6/1/84	947.12	GW-075	10/18/84	958.60
GW-073	6/7/84	946.40	GW-075	10/25/84	961.03
GW-073	7/5/84	946.50	GW-075	11/1/84	960.73
GW-073	7/26/84	946.93	GW-075	11/10/84	960.73
GW-073	8/8/84	946.63	GW-075	4/28/91	959.43
GW-073	8/23/84	945.84			
GW-073	9/6/84	945.25	GW-076	4/6/84	963.29
GW-073	9/13/84	945.35	GW-076	8/8/84	961.88
GW-073	9/20/84	945.15	GW-076	6/21/85	961.52
GW-073	9/26/84	944.89	GW-076	6/27/85	961.22
GW-073	10/4/84	944.79	GW-076	7/3/85	961.15
GW-073	10/11/84	944.86	GW-076	7/11/85	961.22
GW-073	10/18/84	944.92	GW-076	7/18/85	960.83
GW-073	10/25/84	946.30	GW-076	7/26/85	961.58
GW-073	11/1/84	945.97	GW-076	7/30/85	962.07
GW-073	11/10/84	946.01	GW-076	8/8/85	961.88
GW-073	11/16/84	946.73	GW-076	8/14/85	961.32
GW-073	11/30/84	946.99	GW-076	8/22/85	962.30
GW-073	12/6/84	947.09	GW-076	8/30/85	962.63
GW-073	12/20/84	947.52	GW-076	9/5/85	962.01

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-076	9/13/85	961.84	GW-084	7/26/84	984.92
GW-076	9/20/85	961.35	GW-084	8/8/84	983.21
GW-076	9/26/85	961.09	GW-084	8/23/84	981.93
GW-076	10/3/85	961.61	GW-084	9/6/84	981.57
GW-076	10/10/85	961.32	GW-084	9/13/84	981.25
GW-076	11/7/85	961.52	GW-084	9/20/84	981.05
GW-076	11/15/85	961.48	GW-084	9/26/84	980.88
GW-076	11/22/85	961.81	GW-084	10/4/84	980.66
GW-076	12/6/85	962.47	GW-084	10/11/84	980.49
GW-076	12/12/85	961.32	GW-084	10/18/84	980.33
GW-076	12/27/85	961.32	GW-084	10/25/84	985.25
GW-076	1/9/86	961.78	GW-084	11/1/84	981.80
GW-076	1/16/86	961.45	GW-084	11/10/84	981.67
GW-076	1/23/86	961.58	GW-084	11/16/84	985.48
GW-076	1/31/86	961.78	GW-084	11/30/84	986.30
GW-076	2/7/86	962.79	GW-084	12/6/84	985.12
GW-076	2/14/86	962.50	GW-084	12/20/84	986.86
GW-076	2/21/86	963.16	GW-084	12/28/84	985.81
GW-076	2/28/86	962.93	GW-084	1/11/85	984.17
GW-076	3/14/86	963.09	GW-084	1/17/85	983.08
GW-076	3/21/86	962.83	GW-084	1/24/85	982.75
GW-076	3/27/86	962.27	GW-084	2/7/85	987.84
GW-076	4/4/86	962.17	GW-084	2/14/85	986.63
GW-076	4/10/86	961.94	GW-084	2/22/85	987.02
GW-076	4/18/86	961.81	GW-084	3/1/85	984.99
GW-076	4/25/86	961.81	GW-084	3/7/85	983.77
GW-076	5/2/86	961.65	GW-084	3/14/85	984.85
GW-076	5/8/86	961.35	GW-084	3/21/85	983.61
GW-076	5/15/86	961.19	GW-084	3/28/85	984.85
GW-076	5/22/86	961.06	GW-084	4/4/85	984.62
GW-076	5/29/86	961.94	GW-084	4/12/85	984.46
GW-076	6/5/86	961.52	GW-084	4/22/85	984.43
GW-076	6/13/86	961.38	GW-084	4/30/85	982.89
GW-076	6/20/86	960.83	GW-084	5/3/85	986.82
GW-076	6/26/86	960.70	GW-084	5/9/85	983.51
GW-076	7/10/86	960.14	GW-084	5/16/85	982.89
GW-076	7/18/86	961.32	GW-084	5/23/85	982.39
GW-076	4/28/91	958.59	GW-084	5/31/85	982.13
GW-084	4/13/84	985.64	GW-084	4/16/90	982.90
GW-084	4/19/84	983.97	GW-084	4/28/91	979.97
GW-084	4/26/84	986.43	GW-085	4/13/84	971.45
GW-084	5/3/84	990.66	GW-085	4/19/84	969.98
GW-084	5/17/84	986.30	GW-085	4/26/84	970.47
GW-084	5/25/84	983.80	GW-085	5/3/84	972.08
GW-084	6/1/84	983.35	GW-085	5/17/84	971.91
GW-084	6/7/84	982.53	GW-085	5/25/84	969.81
GW-084	6/14/84	982.23	GW-085	6/1/84	969.06
GW-084	7/5/84	982.16	GW-085	6/7/84	967.81

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-085	6/14/84	967.15	GW-085	8/8/85	966.47
GW-085	7/5/84	966.50	GW-085	8/14/85	966.01
GW-085	7/26/84	967.25	GW-085	8/30/85	966.34
GW-085	8/8/84	967.29	GW-085	9/5/85	967.91
GW-085	8/23/84	966.47	GW-085	9/13/85	967.22
GW-085	9/6/84	965.81	GW-085	9/20/85	966.89
GW-085	9/13/84	965.55	GW-085	9/26/85	966.50
GW-085	9/20/84	965.19	GW-085	10/3/85	966.50
GW-085	9/26/84	964.96	GW-085	10/10/85	966.37
GW-085	10/4/84	964.89	GW-085	10/24/85	965.97
GW-085	10/11/84	964.79	GW-085	10/31/85	966.10
GW-085	10/18/84	964.37	GW-085	11/7/85	966.14
GW-085	10/25/84	965.22	GW-085	11/15/85	966.07
GW-085	11/1/84	965.65	GW-085	11/22/85	966.53
GW-085	11/10/84	965.61	GW-085	12/6/85	966.04
GW-085	11/16/84	966.14	GW-085	12/12/85	966.04
GW-085	11/30/84	966.86	GW-085	12/27/85	967.97
GW-085	12/6/84	966.89	GW-085	1/9/86	968.17
GW-085	12/20/84	967.97	GW-085	1/16/86	967.94
GW-085	12/28/84	968.14	GW-085	1/23/86	967.78
GW-085	1/11/85	968.76	GW-085	1/31/86	968.17
GW-085	1/17/85	968.86	GW-085	2/7/86	968.93
GW-085	1/24/85	968.50	GW-085	2/14/86	968.96
GW-085	2/7/85	970.40	GW-085	2/21/86	971.09
GW-085	2/14/85	970.40	GW-085	2/28/86	972.11
GW-085	2/22/85	970.40	GW-085	3/14/86	970.30
GW-085	3/1/85	970.27	GW-085	3/21/86	970.57
GW-085	3/7/85	969.62	GW-085	4/4/86	969.75
GW-085	3/14/85	969.98	GW-085	4/10/86	969.48
GW-085	3/21/85	969.42	GW-085	4/18/86	968.86
GW-085	3/28/85	969.78	GW-085	4/25/86	968.66
GW-085	4/4/85	969.75	GW-085	5/1/86	968.37
GW-085	4/12/85	970.27	GW-085	5/9/86	967.91
GW-085	4/22/85	970.01	GW-085	5/15/86	967.38
GW-085	4/30/85	968.34	GW-085	5/22/86	967.06
GW-085	5/3/85	969.06	GW-085	5/29/86	967.71
GW-085	5/9/85	968.66	GW-085	6/5/86	967.68
GW-085	5/16/85	968.27	GW-085	6/12/86	967.52
GW-085	5/23/85	967.61	GW-085	6/20/86	967.02
GW-085	5/31/85	967.02	GW-085	6/26/86	966.53
GW-085	6/7/85	966.79	GW-085	7/10/86	966.07
GW-085	6/14/85	966.60	GW-085	7/17/86	966.83
GW-085	6/21/85	966.40	GW-085	4/16/90	968.90
GW-085	6/27/85	966.20			
GW-085	7/3/85	965.97	GW-086	4/13/84	971.34
GW-085	7/11/85	965.88	GW-086	4/19/84	969.70
GW-085	7/18/85	965.58	GW-086	4/26/84	970.26
GW-085	7/26/85	965.88	GW-086	5/3/84	971.57
GW-085	7/30/85	966.43	GW-086	5/17/84	971.90

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-086	5/25/84	969.60	GW-086	7/18/85	965.31
GW-086	6/1/84	968.88	GW-086	7/28/85	965.50
GW-086	6/7/84	967.34	GW-086	7/30/85	966.06
GW-086	6/14/84	966.72	GW-086	8/8/85	966.19
GW-086	7/5/84	966.65	GW-086	8/14/85	965.63
GW-086	7/26/84	967.01	GW-086	8/30/85	968.00
GW-086	8/8/84	967.04	GW-086	9/5/85	967.50
GW-086	8/23/84	966.03	GW-086	9/13/85	966.78
GW-086	9/6/84	965.37	GW-086	9/20/85	966.55
GW-086	9/13/84	965.14	GW-086	9/26/85	966.09
GW-086	9/20/84	964.88	GW-086	10/3/85	966.19
GW-086	9/26/84	964.55	GW-086	10/10/85	965.90
GW-086	10/4/84	964.35	GW-086	10/24/85	965.47
GW-086	10/11/84	964.12	GW-086	10/31/85	964.95
GW-086	10/18/84	963.93	GW-086	11/7/85	965.77
GW-086	10/25/84	964.85	GW-086	11/15/85	965.93
GW-086	11/1/84	965.17	GW-086	11/22/85	966.36
GW-086	11/10/84	965.17	GW-086	12/6/85	967.57
GW-086	11/16/84	965.77	GW-086	12/12/85	966.88
GW-086	11/30/84	966.68	GW-086	12/27/85	967.34
GW-086	12/6/84	966.85	GW-086	1/9/86	967.60
GW-086	12/20/84	967.57	GW-086	1/16/86	967.50
GW-086	12/28/84	967.77	GW-086	1/23/86	967.37
GW-086	1/11/85	968.49	GW-086	1/31/86	967.57
GW-086	1/17/85	968.19	GW-086	2/7/86	968.23
GW-086	1/24/85	968.00	GW-086	2/14/86	968.42
GW-086	2/7/85	970.03	GW-086	2/21/86	970.72
GW-086	2/14/85	970.23	GW-086	2/28/86	970.19
GW-086	2/22/85	970.26	GW-086	3/14/86	970.06
GW-086	3/1/85	970.00	GW-086	3/21/86	970.56
GW-086	3/7/85	969.37	GW-086	4/4/86	969.34
GW-086	3/14/85	969.64	GW-086	4/10/86	969.08
GW-086	3/21/85	969.21	GW-086	4/18/86	968.13
GW-086	3/28/85	969.54	GW-086	4/25/86	968.03
GW-086	4/4/85	969.47	GW-086	5/1/86	967.80
GW-086	4/12/85	969.70	GW-086	5/8/86	967.50
GW-086	4/22/85	969.64	GW-086	5/15/86	967.08
GW-086	4/30/85	968.36	GW-086	5/22/86	966.85
GW-086	5/3/85	968.72	GW-086	5/29/86	967.41
GW-086	5/9/85	968.42	GW-086	6/5/86	967.24
GW-086	5/16/85	967.93	GW-086	6/12/86	967.08
GW-086	5/23/85	967.04	GW-086	6/20/86	966.59
GW-086	5/31/85	967.18	GW-086	6/26/86	966.36
GW-086	6/7/85	966.22	GW-086	7/10/86	965.80
GW-086	6/14/85	966.26	GW-086	7/17/86	966.39
GW-086	6/21/85	965.90	GW-086	4/28/91	966.04
GW-086	6/27/85	965.96			
GW-086	7/3/85	965.63	GW-087	8/8/84	953.22
GW-086	7/11/85	965.47	GW-087	4/16/90	950.24

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-087	4/28/91	948.39	GW-120	11/13/85	940.84
GW-094	4/18/80	905.33	GW-120	11/21/85	940.87
GW-097A	8/22/85	935.44	GW-120	12/6/85	941.82
GW-097A	8/30/85	935.87	GW-120	12/12/85	941.79
GW-097A	9/5/85	935.37	GW-120	12/18/85	941.79
GW-097A	9/13/85	934.95	GW-120	12/26/85	941.53
GW-097A	9/20/85	934.65	GW-120	1/2/86	941.89
GW-097A	9/26/85	934.98	GW-120	1/9/86	941.59
GW-097A	10/10/85	934.69	GW-120	1/23/86	941.56
GW-097A	10/31/85	934.29	GW-120	1/30/86	941.63
GW-097A	11/7/85	934.91	GW-120	2/6/86	942.41
GW-097A	11/15/85	934.91	GW-120	2/13/86	942.12
GW-097A	11/22/85	934.91	GW-120	2/20/86	943.20
GW-097A	12/6/85	935.64	GW-120	2/28/86	943.10
GW-097A	12/12/85	935.96	GW-120	3/5/86	942.35
GW-097A	12/27/85	934.36	GW-120	3/13/86	942.64
GW-097A	1/9/86	934.98	GW-120	3/20/86	942.97
GW-097A	1/16/86	934.91	GW-120	3/26/86	942.28
GW-097A	1/23/86	935.28	GW-120	4/3/86	941.96
GW-097A	1/31/86	935.54	GW-120	4/10/86	941.79
GW-097A	2/7/86	937.08	GW-120	4/17/86	941.53
GW-097A	2/14/86	936.49	GW-120	4/24/86	941.00
GW-097A	2/21/86	936.92	GW-120	5/1/86	941.23
GW-097A	2/28/86	935.90	GW-120	5/8/86	940.91
GW-097A	3/14/86	936.98	GW-120	5/15/86	940.64
GW-097A	3/21/86	936.16	GW-120	5/22/86	940.61
GW-097A	3/27/86	935.54	GW-120	6/4/86	940.77
GW-097A	4/4/86	934.23	GW-120	6/12/86	940.87
GW-097A	4/10/86	935.34	GW-120	6/18/86	940.12
GW-097A	4/18/86	934.91	GW-120	6/26/86	939.66
GW-097A	4/25/86	934.85	GW-120	4/16/90	942.19
GW-097A	5/2/86	934.59	GW-120	4/29/91	944.19
GW-097A	5/8/86	934.36	GW-121	10/29/85	431.79 ??
GW-097A	5/15/86	933.90	GW-121	12/6/85	385.86 ??
GW-097A	5/22/86	933.93	GW-121	12/12/85	595.84
GW-097A	5/29/86	935.37	GW-121	12/18/85	595.84
GW-097A	6/5/86	934.59	GW-121	12/26/85	595.84
GW-097A	6/13/86	934.36	GW-121	1/2/86	599.12
GW-097A	6/20/86	933.86	GW-121	1/9/86	596.85
GW-097A	6/26/86	933.31	GW-121	1/16/86	597.34
GW-097A	7/10/86	932.91	GW-121	1/23/86	598.76
GW-097A	7/18/86	934.55	GW-121	1/30/86	382.97 ??
GW-120	9/13/85	942.58	GW-121	2/6/86	382.51 ??
GW-120	10/11/85	940.77	GW-121	3/5/86	382.58 ??
GW-120	10/29/85	940.77	GW-225	12/6/85	926.34
GW-120	11/6/85	940.94	GW-225	12/12/85	925.20
			GW-225	12/18/85	925.26

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-225	12/26/85	923.62	GW-226	4/24/86	927.82
GW-225	1/2/86	923.23	GW-226	5/1/86	927.75
GW-225	1/9/86	922.93	GW-226	5/8/86	927.52
GW-225	1/16/86	924.74	GW-226	5/16/86	927.00
GW-225	1/23/86	923.52	GW-226	5/22/86	926.63
GW-225	1/30/86	923.42	GW-226	6/4/86	927.00
GW-225	2/6/86	927.43	GW-226	6/12/86	927.13
GW-225	2/13/86	926.28	GW-226	6/18/86	926.50
GW-225	2/20/86	934.68	GW-226	6/26/86	926.08
GW-225	2/28/86	928.35	GW-226	4/16/90	931.73
GW-225	3/5/86	926.44	GW-226	4/29/91	929.93
GW-225	3/13/86	926.54			
GW-225	3/20/86	930.91	GW-227	12/6/85	934.91
GW-225	3/26/86	927.56	GW-227	12/12/85	934.39
GW-225	4/3/86	925.82	GW-227	12/18/85	934.16
GW-225	4/10/86	925.43	GW-227	12/26/85	934.32
GW-225	4/17/86	924.87	GW-227	1/2/86	934.42
GW-225	4/24/86	924.64	GW-227	1/9/86	934.42
GW-225	5/1/86	924.54	GW-227	1/16/86	934.35
GW-225	5/8/86	924.34	GW-227	1/23/86	934.45
GW-225	5/16/86	923.79	GW-227	1/30/86	934.42
GW-225	5/22/86	923.42	GW-227	2/6/86	936.68
GW-225	6/4/86	923.82	GW-227	2/13/86	934.78
GW-225	6/12/86	924.02	GW-227	2/20/86	940.78
GW-225	6/18/86	923.23	GW-227	2/28/86	935.90
GW-225	6/26/86	922.83	GW-227	3/5/86	934.71
GW-225	4/16/90	925.91	GW-227	3/13/86	936.98
GW-225	4/29/91	922.95	GW-227	3/20/86	937.90
			GW-227	3/26/86	935.24
GW-226	12/6/85	928.90	GW-227	4/3/86	934.29
GW-226	12/12/85	927.91	GW-227	4/10/86	933.99
GW-226	12/18/85	928.08	GW-227	4/17/86	933.24
GW-226	12/26/85	926.93	GW-227	4/24/86	932.78
GW-226	1/2/86	927.78	GW-227	5/1/86	932.75
GW-226	1/9/86	927.13	GW-227	5/8/86	931.76
GW-226	1/16/86	926.83	GW-227	5/16/86	931.89
GW-226	1/23/86	927.62	GW-227	5/22/86	931.40
GW-226	1/30/86	927.88	GW-227	6/4/86	931.70
GW-226	2/6/86	930.97	GW-227	6/12/86	930.71
GW-226	2/13/86	929.75	GW-227	6/18/86	931.17
GW-226	2/20/86	931.69	GW-227	6/26/86	932.02
GW-226	2/28/86	931.13	GW-227	4/16/90	934.20
GW-226	3/5/86	929.42	GW-227	4/29/91	931.96
GW-226	3/13/86	930.57			
GW-226	3/20/86	933.33	GW-228	12/6/85	930.72
GW-226	3/26/86	930.21	GW-228	12/12/85	929.64
GW-226	4/3/86	928.83	GW-228	12/18/85	929.90
GW-226	4/10/86	928.57	GW-228	12/26/85	928.82
GW-226	4/17/86	928.01	GW-228	1/2/86	929.51

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-228	1/9/86	929.21	GW-307	3/4/88	961.28
GW-228	1/16/86	927.67	GW-307	3/12/88	964.66
GW-228	1/23/86	928.88	GW-307	3/17/88	964.53
GW-228	1/30/86	929.57	GW-307	4/19/90	962.39
GW-228	2/6/86	931.90			
GW-228	2/13/86	931.51	GW-308	4/19/90	961.62
GW-228	2/20/86	938.07			
GW-228	2/28/86	933.51	GW-309	2/25/88	965.75
GW-228	3/5/86	931.67	GW-309	3/4/88	965.99
GW-228	3/13/86	931.51	GW-309	3/12/88	967.40
GW-228	3/20/86	934.59	GW-309	3/17/88	966.98
			GW-309	4/19/90	965.85
GW-229	12/18/85	922.43	GW-309	4/28/91	964.67
GW-229	12/26/85	921.18			
GW-229	1/2/86	922.49	GW-310	4/19/90	973.16
GW-229	1/9/86	922.59	GW-310	4/28/91	971.49
GW-229	1/16/86	922.36			
GW-229	1/23/86	926.03	GW-311	2/25/88	961.62
GW-229	1/30/86	923.80	GW-311	3/4/88	960.57
GW-229	2/6/86	928.76	GW-311	3/12/88	965.07
GW-229	2/13/86	925.90	GW-311	3/17/88	964.54
GW-229	2/20/86	933.12	GW-311	4/17/88	960.80
GW-229	2/28/86	933.02	GW-311	4/19/90	961.96
GW-229	3/5/86	925.12	GW-311	4/28/91	961.55
GW-229	3/13/86	928.89			
GW-229	3/20/86	932.10	GW-312	2/25/88	960.79
GW-229	3/26/86	926.40	GW-312	3/4/88	959.94
GW-229	4/3/86	924.26	GW-312	3/12/88	961.81
GW-229	4/10/86	924.16	GW-312	3/17/88	963.26
GW-229	4/17/86	923.41	GW-312	4/17/88	960.24
GW-229	4/24/86	923.34	GW-312	4/19/90	961.54
GW-229	5/1/86	923.74			
GW-229	5/8/86	923.38	GW-363	4/16/90	952.08
GW-229	5/15/86	922.39	GW-363	4/28/91	950.53
GW-229	5/22/86	920.88			
GW-229	6/12/86	922.13	GW-364	4/16/90	918.37
GW-229	6/18/86	920.62	GW-364	4/29/91	915.17
GW-229	6/24/86	921.93			
GW-229	6/26/86	919.31	GW-365	4/16/90	924.71
GW-229	4/29/91	924.52	GW-365	4/29/91	922.06
GW-306	2/25/88	957.92	GW-366	4/16/90	920.12
GW-306	3/4/88	957.00	GW-366	4/29/91	918.08
GW-306	3/12/88	961.24			
GW-306	3/17/88	960.15	GW-367	4/16/90	917.21
GW-306	4/19/90	957.60	GW-367	4/29/91	914.94
GW-306	4/28/91	957.59			
			GW-368	4/16/90	932.63
GW-307	2/25/88	962.27	GW-368	4/29/91	930.49

Well	Date	Elevation (ft) Water Level
GW-369	4/16/90	916.09
GW-369	4/29/91	914.01
GW-520	4/16/90	924.43
GW-520	4/29/91	922.93
GW-531	4/19/90	986.70
GW-531	4/28/91	987.54
GW-532	4/19/90	980.94
GW-535	4/19/90	971.45
GW-536	4/19/90	972.46
GW-537	4/19/90	969.65
GW-537	4/28/91	967.83
GW-601	4/16/90	933.48
GW-601	4/29/91	934.10
GW-630	4/28/91	977.67
GW-636	4/29/91	938.47
GW-637	4/29/91	933.60
GW-638	4/29/91	935.88
GW-644	4/28/91	950.72
GW-645	4/29/91	929.73
GW-646	4/29/91	964.60
GW-647	4/28/91	964.35
GW-648	4/28/91	963.14
GW-649	4/28/91	975.84

Well	Date	Elevation (ft) Water Level
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Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
Water Level Data for the Chestnut Ridge Security Pits					
GW-173	10/30/85	957.62	GW-173	2/12/87	970.22
GW-173	2/13/86	963.66	GW-173	2/20/87	970.38
GW-173	2/20/86	965.80	GW-173	2/28/87	983.34
GW-173	3/5/86	975.57	GW-173	3/5/87	988.69
GW-173	3/13/86	970.02	GW-173	3/12/87	982.13
GW-173	3/20/86	974.29	GW-173	3/17/87	977.50
GW-173	3/26/86	974.09	GW-173	3/27/87	975.37
GW-173	4/4/86	969.07	GW-173	4/2/87	972.71
GW-173	4/10/86	967.60	GW-173	4/9/87	973.01
GW-173	4/17/86	965.63	GW-173	4/14/87	971.34
GW-173	4/24/86	963.79	GW-173	4/24/87	973.11
GW-173	5/1/86	962.31	GW-173	4/28/87	970.94
GW-173	5/8/86	960.97	GW-173	5/14/87	965.53
GW-173	5/16/86	959.53	GW-173	5/21/87	963.63
GW-173	5/22/86	957.92	GW-173	5/28/87	962.41
GW-173	6/4/86	959.23	GW-173	6/5/87	960.87
GW-173	6/11/86	959.36	GW-173	6/11/87	960.08
GW-173	6/18/86	958.51	GW-173	7/7/87	959.00
GW-173	6/26/86	957.00	GW-173	7/16/87	961.72
GW-173	7/9/86	955.10	GW-173	7/24/87	959.69
GW-173	7/16/86	954.14	GW-173	7/30/87	958.28
GW-173	7/23/86	954.64	GW-173	8/7/87	956.77
GW-173	7/30/86	954.57	GW-173	8/11/87	956.67
GW-173	8/8/86	953.16	GW-173	8/21/87	955.75
GW-173	8/15/86	954.21	GW-173	8/28/87	955.52
GW-173	8/21/86	954.28	GW-173	9/4/87	954.87
GW-173	8/28/86	953.82	GW-173	9/10/87	954.37
GW-173	9/11/86	958.28	GW-173	9/17/87	954.21
GW-173	9/18/86	956.70	GW-173	9/25/87	954.47
GW-173	9/25/86	956.11	GW-173	10/2/87	954.34
GW-173	10/2/86	955.52	GW-173	10/8/87	954.31
GW-173	10/9/86	954.60	GW-173	10/15/87	954.24
GW-173	10/24/86	956.83	GW-173	10/23/87	953.65
GW-173	10/31/86	960.94	GW-173	10/30/87	953.36
GW-173	11/6/86	959.36	GW-173	11/6/87	952.96
GW-173	11/13/86	962.58	GW-173	11/13/87	952.67
GW-173	11/20/86	961.92	GW-173	1/13/88	957.62
GW-173	12/5/86	967.40	GW-173	2/4/88	968.02
GW-173	12/12/86	987.41	GW-173	2/10/88	973.34
GW-173	12/19/86	981.21	GW-173	2/17/88	969.37
GW-173	12/29/86	970.75	GW-173	2/23/88	967.73
GW-173	1/7/87	965.63	GW-173	3/4/88	964.32
GW-173	1/13/87	963.72	GW-173	3/12/88	969.14
GW-173	1/20/87	971.73	GW-173	3/17/88	974.58
GW-173	1/27/87	981.70	GW-173	4/13/88	963.82
GW-173	2/4/87	976.22	GW-173	4/18/90	981.64

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-173	5/3/91	983.89	GW-174	10/2/87	979.09
GW-173	1/17/92	987.00	GW-174	10/8/87	986.46
GW-174	10/30/85	986.11	GW-174	10/15/87	978.33
GW-174	10/21/86	985.45	GW-174	10/23/87	977.71
GW-174	10/24/86	985.35	GW-174	10/30/87	978.36
GW-174	10/31/86	989.55	GW-174	11/6/87	980.83
GW-174	11/6/86	988.67	GW-174	11/13/87	976.00
GW-174	11/13/86	989.81	GW-174	1/13/88	981.45
GW-174	11/20/86	989.81	GW-174	2/4/88	996.15
GW-174	12/5/86	994.41	GW-174	2/10/88	999.56
GW-174	12/12/86	1002.35	GW-174	2/17/88	998.51
GW-174	12/19/86	1003.82	GW-174	2/23/88	998.02
GW-174	12/29/86	1001.43	GW-174	3/4/88	998.08
GW-174	1/7/87	998.28	GW-174	3/12/88	995.56
GW-174	1/13/87	995.65	GW-174	3/17/88	998.54
GW-174	1/20/87	996.31	GW-174	4/13/88	993.82
GW-174	1/27/87	1001.43	GW-174	4/18/90	1007.73
GW-174	2/4/87	1002.64	GW-174	5/3/91	1007.27
GW-174	2/12/87	1000.58	GW-174	1/17/92	1011.30
GW-174	2/20/87	999.23	GW-175	4/18/90	986.31
GW-174	2/28/87	1004.38	GW-176	10/30/85	1004.02
GW-174	3/5/87	1008.19	GW-176	2/13/86	1005.33
GW-174	3/12/87	1006.02	GW-176	2/20/86	1005.07
GW-174	3/17/87	1004.71	GW-176	3/5/86	1005.76
GW-174	3/27/87	1003.17	GW-176	3/13/86	1005.82
GW-174	4/2/87	1001.59	GW-176	3/20/86	1006.97
GW-174	4/9/87	1001.13	GW-176	3/26/86	1006.15
GW-174	4/14/87	1000.05	GW-176	4/4/86	1005.99
GW-174	4/24/87	1000.08	GW-176	4/10/86	1006.12
GW-174	4/28/87	999.23	GW-176	4/17/86	1005.89
GW-174	5/4/87	997.59	GW-176	4/24/86	1005.50
GW-174	5/14/87	994.97	GW-176	5/1/86	1005.36
GW-174	5/21/87	992.37	GW-176	5/8/86	1005.27
GW-174	5/28/87	990.63	GW-176	5/16/86	1005.10
GW-174	6/5/87	988.24	GW-176	5/22/86	1004.54
GW-174	6/11/87	987.06	GW-176	6/4/86	1004.18
GW-174	7/7/87	983.65	GW-176	6/11/86	1004.38
GW-174	7/16/87	986.11	GW-176	6/18/86	1004.35
GW-174	7/24/87	985.81	GW-176	6/26/86	1004.05
GW-174	7/30/87	984.70	GW-176	7/9/86	1003.43
GW-174	8/7/87	982.76	GW-176	7/18/86	1003.92
GW-174	8/11/87	981.97	GW-176	7/23/86	1003.04
GW-174	8/21/87	980.66	GW-176	7/30/86	1003.17
GW-174	8/28/87	980.33	GW-176	8/8/86	1002.08
GW-174	9/4/87	979.28	GW-176	8/15/86	1002.28
GW-174	9/10/87	978.86	GW-176	8/21/86	1003.27
GW-174	9/17/87	978.86	GW-176	8/28/86	1004.15
GW-174	9/25/87	978.96			

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-176	9/4/86	1003.66	GW-176	9/25/87	1003.66
GW-176	9/11/86	1001.69	GW-176	10/2/87	1004.32
GW-176	9/18/86	1002.97	GW-176	10/8/87	1003.72
GW-176	9/25/86	1003.20	GW-176	10/15/87	1003.36
GW-176	10/2/86	1003.04	GW-176	10/23/87	1003.07
GW-176	10/9/86	1002.87	GW-176	10/30/87	1002.97
GW-176	10/17/86	1004.12	GW-176	11/6/87	1004.64
GW-176	10/24/86	1003.04	GW-176	11/13/87	1002.71
GW-176	10/31/86	1004.61	GW-176	1/5/88	1004.18
GW-176	11/6/86	1003.86	GW-176	1/13/88	1002.90
GW-176	11/13/86	1006.25	GW-176	2/4/88	1005.63
GW-176	11/20/86	1004.58	GW-176	2/10/88	1005.30
GW-176	12/5/86	1005.56	GW-176	2/17/88	1005.40
GW-176	12/12/86	1005.66	GW-176	2/23/88	1005.14
GW-176	12/19/86	1001.92	GW-176	3/4/88	1004.84
GW-176	12/29/86	1005.14	GW-176	3/12/88	1005.79
GW-176	1/13/87	1005.00	GW-176	3/17/88	1005.46
GW-176	1/20/87	1005.46	GW-176	4/13/88	1005.33
GW-176	1/27/87	1005.36	GW-176	4/18/90	1007.29
GW-176	2/4/87	1005.92	GW-176	5/3/91	1005.76
GW-176	2/12/87	1005.99	GW-176	1/17/92	1009.10
GW-176	2/20/87	1005.56			
GW-176	2/28/87	1006.15	GW-177	10/30/85	1038.10
GW-176	3/5/87	1005.56	GW-177	7/23/86	1037.80
GW-176	3/12/87	1005.46	GW-177	7/30/86	1021.96
GW-176	3/17/87	1005.56	GW-177	8/8/86	1026.35
GW-176	3/27/87	1005.59	GW-177	8/15/86	1030.62
GW-176	4/2/87	1005.43	GW-177	8/21/86	1037.51
GW-176	4/9/87	1005.73	GW-177	8/28/86	1038.92
GW-176	4/14/87	1005.46	GW-177	9/4/86	1037.48
GW-176	4/24/87	1005.50	GW-177	9/11/86	1037.41
GW-176	4/28/87	1005.46	GW-177	9/18/86	1037.57
GW-176	5/4/87	1005.40	GW-177	9/25/86	1037.57
GW-176	5/14/87	1005.27	GW-177	10/2/86	1037.61
GW-176	5/21/87	1005.23	GW-177	10/9/86	1037.31
GW-176	5/28/87	1005.14	GW-177	10/17/86	1037.28
GW-176	6/5/87	1004.91	GW-177	10/24/86	1037.21
GW-176	6/11/87	1004.97	GW-177	11/6/86	1037.44
GW-176	7/7/87	1006.12	GW-177	11/13/86	1037.57
GW-176	7/16/87	1005.27	GW-177	11/20/86	1037.64
GW-176	7/24/87	1004.87	GW-177	12/5/86	1038.39
GW-176	7/30/87	998.77	GW-177	12/12/86	1038.56
GW-176	8/7/87	1004.22	GW-177	12/19/86	1038.62
GW-176	8/11/87	1004.32	GW-177	12/29/86	1038.20
GW-176	8/21/87	1004.05	GW-177	1/7/87	1021.37
GW-176	8/28/87	1003.89	GW-177	1/13/87	1038.13
GW-176	9/4/87	1003.63	GW-177	1/20/87	1038.39
GW-176	9/10/87	1002.79	GW-177	1/27/87	1028.42
GW-176	9/17/87	1004.74	GW-177	2/4/87	1029.01

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-177	2/12/87	1039.05	GW-177	1/17/92	1040.90
GW-177	2/20/87	1028.45			
GW-177	2/28/87	1032.55	GW-178	2/25/88	1047.20
GW-177	3/5/87	1039.25	GW-178	3/4/88	1046.21
GW-177	3/12/87	1038.92	GW-178	3/12/88	1048.74
GW-177	3/17/87	1038.85	GW-178	3/17/88	1051.13
GW-177	3/27/87	1038.89	GW-178	4/13/88	1058.84
GW-177	4/2/87	1038.72	GW-178	4/18/90	1051.68
GW-177	4/9/87	1038.89	GW-178	5/3/91	1051.79
GW-177	4/14/87	1038.66	GW-178	1/17/92	1055.70
GW-177	4/24/87	1038.82			
GW-177	4/28/87	1038.75	GW-179	6/11/86	1012.22
GW-177	5/4/87	1043.35	GW-179	6/18/86	1012.26
GW-177	5/14/87	1038.62	GW-179	6/26/86	1012.19
GW-177	5/21/87	1038.69	GW-179	7/9/86	1012.16
GW-177	5/28/87	1038.69	GW-179	7/16/86	1012.16
GW-177	6/5/87	1038.43	GW-179	7/23/86	1012.03
GW-177	6/11/87	1038.59	GW-179	7/30/86	1012.13
GW-177	7/7/87	1038.62	GW-179	8/8/86	1011.34
GW-177	7/16/87	1038.56	GW-179	8/15/86	1011.80
GW-177	7/24/87	1038.62	GW-179	8/21/86	1012.32
GW-177	7/30/87	1028.35	GW-179	8/28/86	1012.35
GW-177	8/7/87	1038.13	GW-179	9/4/86	1012.49
GW-177	8/11/87	1037.87	GW-179	9/11/86	1012.85
GW-177	8/21/87	1039.25	GW-179	9/18/86	1012.52
GW-177	8/28/87	1039.44	GW-179	9/25/86	1012.16
GW-177	9/4/87	1039.31	GW-179	10/2/86	1011.96
GW-177	9/10/87	1039.31	GW-179	10/9/86	1011.86
GW-177	9/17/87	1039.18	GW-179	10/16/86	1011.86
GW-177	9/25/87	1038.96	GW-179	10/24/86	1007.30
GW-177	10/2/87	1039.18	GW-179	10/31/86	1011.93
GW-177	10/8/87	1033.80	GW-179	11/6/86	1012.03
GW-177	10/15/87	1038.72	GW-179	11/13/86	1012.06
GW-177	10/23/87	1038.46	GW-179	11/20/86	1012.13
GW-177	10/30/87	1038.36	GW-179	12/5/86	1012.68
GW-177	11/6/87	1038.07	GW-179	12/12/86	1016.75
GW-177	11/13/87	1038.10	GW-179	12/19/86	1014.68
GW-177	1/5/88	1037.21	GW-179	12/29/86	1012.95
GW-177	1/13/88	1037.31	GW-179	1/7/87	1012.55
GW-177	2/4/88	1039.41	GW-179	1/13/87	1011.93
GW-177	2/10/88	1040.43	GW-179	1/20/87	1016.85
GW-177	2/17/88	1040.43	GW-179	1/27/87	1016.59
GW-177	2/23/88	1040.20	GW-179	2/4/87	1013.47
GW-177	3/4/88	1039.90	GW-179	2/12/87	1012.78
GW-177	3/12/88	1040.49	GW-179	2/20/87	1014.16
GW-177	3/17/88	1041.25	GW-179	2/28/87	1017.18
GW-177	4/13/88	1040.59	GW-179	3/5/87	1015.47
GW-177	4/18/90	1040.69	GW-179	3/12/87	1013.50
GW-177	5/3/91	1038.27	GW-179	3/17/87	1012.98

Well	Date	Elevation (ft) Water Level	Well	Date	Elevation (ft) Water Level
GW-179	3/27/87	1013.24	GW-180	4/18/90	999.28
GW-179	4/2/87	1012.78	GW-180	5/3/91	1001.74
GW-179	4/9/87	1013.04	GW-180	1/17/92	1007.30
GW-179	4/14/87	1012.62			
GW-179	4/24/87	1012.78	GW-181	4/18/90	1003.05
GW-179	4/28/87	1012.58			
GW-179	5/4/87	1012.58	GW-322	2/25/88	973.31
GW-179	5/14/87	1012.55	GW-322	3/4/88	972.30
GW-179	5/21/87	1012.52	GW-322	3/12/88	975.41
GW-179	5/28/87	1012.49	GW-322	3/17/88	977.64
GW-179	6/5/87	1012.45	GW-322	4/13/88	973.25
GW-179	6/11/87	1012.35	GW-322	4/18/90	993.77
GW-179	7/7/87	1012.29	GW-322	5/3/91	993.76
GW-179	7/16/87	1012.29	GW-322	1/17/92	dry
GW-179	7/24/87	1012.22			
GW-179	7/30/87	1012.29	GW-511	4/18/90	1003.03
GW-179	8/7/87	1012.19	GW-511	1/15/92	999.40
GW-179	8/11/87	1007.73			
GW-179	8/21/87	1012.29	GW-512	4/18/90	985.66
GW-179	8/28/87	1012.26			
GW-179	9/4/87	1012.26	GW-513	4/18/90	985.68
GW-179	9/10/87	1012.16	GW-513	1/15/92	984.90
GW-179	9/17/87	1012.16			
GW-179	9/25/87	1012.19	GW-514	4/18/90	985.37
GW-179	10/2/87	1012.55	GW-514	1/15/92	984.90
GW-179	10/8/87	1008.52			
GW-179	10/15/87	1011.17	GW-607	4/18/90	995.03
GW-179	10/23/87	1011.96	GW-607	1/15/92	989.20
GW-179	10/30/87	1012.32			
GW-179	11/6/87	1012.19	GW-608	4/18/90	981.06
GW-179	11/13/87	1011.21	GW-608	1/15/92	955.50
GW-179	1/5/88	1011.93			
GW-179	1/13/88	1011.99	GW-609	4/18/90	948.87
GW-179	2/4/88	1012.45			
GW-179	2/10/88	1013.18	GW-610	4/18/90	974.59
GW-179	2/17/88	1012.55	GW-610	1/16/92	979.64
GW-179	2/23/88	1012.45			
GW-179	3/4/88	1011.17	GW-611	4/18/90	948.83
GW-179	3/12/88	1007.47	GW-611	1/16/92	950.18
GW-179	3/17/88	1007.20			
GW-179	4/13/88	1012.78	GW-612	4/18/90	1009.40
GW-179	4/18/90	1012.69			
GW-179	5/3/91	1008.72			
GW-179	1/17/92	1013.40			
GW-180	2/25/88	984.14			
GW-180	3/4/88	982.50			
GW-180	3/17/88	991.03			
GW-180	4/13/88	986.11			

APPENDIX B.2

Hydrographs for the Wells Located
Near New Hope Pond, the Oil Landfarm Waste
Management Area, and the Chestnut Ridge
Security Pits

Note: TD refers to the total depth of each well

Water level data has not been previously published and is compiled here from a variety of sources (i.e., databases, personal files, subcontractor files, etc.)

APPENDIX B.2

Hydrographs for the Wells Located

Near New Hope Pond

Note: TD refers to the total depth of each well

Water level data has not been previously published and is compiled here from a variety of sources (ie. databases, personal files, subcontractor files, etc.)

Hydrograph for GW-148 and GW-149 Cluster

Hydrograph for GW-150, GW-151, and GW-220 Cluster

Hydrograph for GW-152, GW-153, and GW-240 Cluster

Hydrograph for GW-167, GW-168 and GW-239

APPENDIX B.2

Hydrographs for the Wells Located

Near the Oil Landfarm Waste

Management Area

Note: TD refers to the total depth of each well

Water level data has not been previously published and is compiled here from a variety of sources (i.e., data bases, personal files, subcontractor files, etc.)

Hydrograph for GW-001 and GW-002 Cluster

Hydrograph for GW-005 and GW-076 Cluster

Hydrograph for GW-006, GW-007 and GW-075 Cluster

Hydrograph for GW-008 (TD=25.5 ft)

Hydrograph for GW-010 (TD=15 ft)

Hydrograph for GW-011 and GW-012 Cluster

Hydrograph for GW-013 (TD=33.8)

3 of 4

Hydrograph for GW-043 and GW-044 Cluster

Hydrograph for GW-062 and GW-063 Cluster

Hydrograph for GW-064 and GW-065 Cluster

Hydrograph for GW-066 and GW-067 Cluster

Hydrograph for GW-073 (TD=81 ft)

Hydrograph for GW-085 and GW-086 Cluster

Hydrograph for GW-097A and GW-120 Cluster

Hydrograph for GW-225 and GW-226 Cluster

Hydrograph for GW-227 and GW-228 Cluster

Hydrograph for GW-229 (TD=55 ft)

APPENDIX B.2

Hydrographs for the Wells Located

Near the Chestnut Ridge

Security Pits

Note: TD refers to the total depth of each well

Water level data has not been previously published and is compiled here from a variety of sources (i.e., data bases, personal files, subcontractor files, etc.)

Hydrograph for GW-174 (TD=145 ft)

Hydrograph for GW-176 (TD= 145 ft)

Hydrograph for GW-177 (TD= 145 ft)

Hydrograph for GW-178 (TD= 133 ft)

Hydrograph for GW-179 (TD= 117 ft)

Hydrograph for GW-180 (TD = 144 ft)

L61

Hydrograph for GW-322 (TD = 193 ft)

APPENDIX C.1

Selected Chemical Data from Wells Located
Near New Hope Pond, the Oil Landfarm Waste
Management Area, and the Chestnut Ridge
Security Pits

Note: Chemical Data compiled from a Y-12 data base (B.K. Harrington, 1992) and 1991 and 1992 groundwater quality assessment reports (HSW 1991a, 1991b, 1991c, 1992a, 1992b, 1992c).

Well	DATE	Pb (mg/L)	U (mg/L)	CARTET (ug/L)	PCE (ug/L)
Selected Chemical Constituents at NHP					
GW-148	Jan-86				
GW-148	Feb-86	0.077	0.008	<5	<5
GW-148	Mar-86				
GW-148	Apr-86	0.013	0.023	<5	<5
GW-148	May-86				
GW-148	Jun-86				
GW-148	Jul-86			<5	<5
GW-148	Aug-86	0.01	0.005		
GW-148	Sep-86				
GW-148	Oct-86				
GW-148	Nov-86	0.015	0.005	<5	2
GW-148	Dec-86				
GW-148	Jan-87	<.004	0.003	<5	1
GW-148	Feb-87				
GW-148	Mar-87				
GW-148	Apr-87				
GW-148	May-87		0.004	<5	<5
GW-148	Jun-87	0.006			
GW-148	Jul-87				
GW-148	Aug-87	0.004	0.003	<5	<5
GW-148	Sep-87				
GW-148	Oct-87	0.004	<.001	<5	<5
GW-148	Nov-87				
GW-148	Dec-87				
GW-148	Jan-88				
GW-148	Feb-88				
GW-148	Mar-88	0.004	<.001	<5	<5
GW-148	Apr-88				
GW-148	May-88				
GW-148	Jun-88	0.03	0.002	<5	2
GW-148	Jul-88				
GW-148	Aug-88	0.011	<.001	<5	<5
GW-148	Sep-88				
GW-148	Oct-88	0.008	<.001	<5	<5
GW-148	Nov-88				
GW-148	Dec-88				
GW-148	Jan-89	0.039	0.001	3	4
GW-148	Feb-89				
GW-148	Mar-89				
GW-148	Apr-89	0.006	0.001	<5	1
GW-148	May-89				
GW-148	Jun-89				
GW-148	Jul-89				
GW-148	Aug-89	0.006	<.001	13	13
GW-148	Sep-89				CAP
GW-148	Oct-89	0.006	0.002	7	2
GW-148	Nov-89				
GW-148	Dec-89				
GW-148	Jan-90	<.004	<.001	<5	<5
GW-149	Jan-86				
GW-149	Feb-86	0.008	0.004	<5	<5
GW-149	Mar-86				
GW-149	Apr-86	0.007	0.002	<5	<5
GW-149	May-86				
GW-149	Jun-86				
GW-149	Jul-86	0.005	0.002	<5	22
GW-149	Aug-86				

Well	DATE	Pb (mg/L)	U (mg/L)	CARTET (ug/L)	PCE (ug/L)
GW-149	Sep-86				
GW-149	Oct-86				
GW-149	Nov-86		0.004	<5	1
GW-149	Dec-86				
GW-149	Jan-87	0.015	0.003	<5	<5
GW-149	Feb-87				
GW-149	Mar-87				
GW-149	Apr-87				
GW-149	May-87	0.004	0.002	<5	<5
GW-149	Jun-87				
GW-149	Jul-87				
GW-149	Aug-87	<.004	<.001	<5	<5
GW-149	Sep-87				
GW-149	Oct-87	0.032	0.002	<5	<5
GW-149	Nov-87				
GW-149	Dec-87				
GW-149	Jan-88				
GW-149	Feb-88				
GW-149	Mar-88	0.045	<.001	<5	
GW-149	Apr-88				
GW-149	May-88				
GW-149	Jun-88	0.046	0.001	<5	<5
GW-149	Jul-88				
GW-149	Aug-88	<.004	<.001	<5	<5
GW-149	Sep-88				
GW-149	Oct-88	<.004	<.001	<5	<5
GW-149	Nov-88				
GW-149	Dec-88				
GW-149	Jan-89	<.004	<.001	4	<5
GW-149	Feb-89				
GW-149	Mar-89				
GW-149	Apr-89	<.004	<.001	1	<5
GW-149	May-89				
GW-149	Jun-89				
GW-149	Jul-89				
GW-149	Aug-89	0.048	<.001	<5	<5
GW-149	Sep-89				CAP
GW-149	Oct-89	<.004	<.001	<5	<5
GW-149	Nov-89				
GW-149	Dec-89				
GW-149	Jan-90	0.004	<.001		<5
GW-149	Feb-90				
GW-149	Mar-90				
GW-149	Apr-90			<5	
GW-149	May-90	<.004	<.001	<5	<5
GW-149	Jun-90				
GW-149	Jul-90				
GW-149	Aug-90	<.004	<.001	<5	<5
GW-149	Sep-90				
GW-149	Oct-90	<.004	<.001	<5	<5
GW-149	Nov-90				
GW-149	Dec-90				
GW-149	Jan-91	<.004	<.001		<5
GW-149	Feb-91			<5	
GW-149	Mar-91				
GW-149	Apr-91	0.004	<.001	<5	<5
GW-150	Feb-86	0.37	0.001	<5	<5
GW-150	Apr-86	0.018	0.008	<5	<5
GW-150	Aug-86	0.018	0.001	<5	1

Well	DATE	Pb (mg/L)	U (mg/L)	CARTET (ug/L)	PCE (ug/L)
GW-150	Nov-86	<0.004	0.002	<5	3
GW-150	Jan-87	<0.004	0.002	<5	<5
GW-150	May-87	0.025	0.003	<5	<5
GW-150	Aug-87	0.17	0.004	<5	<5
GW-150	Oct-87	0.037	<0.001	<5	<5
GW-150	Mar-88	0.019	<0.001	<5	<5
GW-151	Jan-86				
GW-151	Feb-86	<.004	0.003	7	<5
GW-151	Mar-86				
GW-151	Apr-86	0.005	0.003	11	<5
GW-151	May-86				
GW-151	Jun-86				
GW-151	Jul-86	<.004	0.001	11	<5
GW-151	Aug-86				
GW-151	Sep-86				
GW-151	Oct-86				
GW-151	Nov-86	<.004	0.002	15	2
GW-151	Dec-86				
GW-151	Jan-87	0.007	0.002	14	<5
GW-151	Feb-87				
GW-151	Mar-87				
GW-151	Apr-87				
GW-151	May-87	<.004	0.004	21	1
GW-151	Jun-87				
GW-151	Jul-87				
GW-151	Aug-87	0.005	<.001	26	<5
GW-151	Sep-87				
GW-151	Oct-87	0.017	<.001	21	2
GW-151	Nov-87				
GW-151	Dec-87				
GW-151	Jan-88				
GW-151	Feb-88				
GW-151	Mar-88	0.007	<.001	20	<5
GW-151	Apr-88				
GW-151	May-88				
GW-151	Jun-88	<.004	0.006	52	2
GW-151	Jul-88				
GW-151	Aug-88	<.004	<.001	200	5
GW-151	Sep-88				
GW-151	Oct-88	<.004	<.001	220	7
GW-151	Nov-88				
GW-151	Dec-88				
GW-151	Jan-89	<.004	0.002	220	6
GW-151	Feb-89				
GW-151	Mar-89				
GW-151	Apr-89	<.004	<.001	200	9
GW-151	May-89				
GW-151	Jun-89				
GW-151	Jul-89				
GW-151	Aug-89	<.004	<.001	260	10
GW-151	Sep-89				CAP
GW-151	Oct-89	<.004	<.001	280	11
GW-151	Nov-89				
GW-151	Dec-89				
GW-151	Jan-90	<.004	<.001	440	17
GW-151	Feb-90				
GW-151	Mar-90				
GW-151	Apr-90				
GW-151	May-90	<.004	<.001	300	14

Well	DATE	Pb (mg/L)	U (mg/L)	CARTET (ug/L)	PCE (ug/L)
GW-151	Jun-90				
GW-151	Jul-90				
GW-151	Aug-90	<.004	<.001	310	16
GW-151	Sep-90				
GW-151	Oct-90	<.004	<.001	380	17
GW-151	Nov-90				
GW-151	Dec-90				
GW-151	Jan-91	<.004	<.001	270	15
GW-151	Feb-91				
GW-151	Mar-91				
GW-151	Apr-91	<.004	<.001		
GW-151	May-91			160	10
GW-151	Jun-91				
GW-151	Jul-91				
GW-151	Aug-91	<.004	<.001	250	17
GW-151	Sep-91				
GW-151	Oct-91	<.004	<.001	410	18
GW-151	Nov-91				
GW-151	Dec-91				
GW-152	Jan-86				
GW-152	Feb-86	<2.21	0.003	<5	<5
GW-152	Mar-86				
GW-152	Apr-86	0.3	0.003	6	<5
GW-152	May-86				
GW-152	Jun-86				
GW-152	Jul-86			12	
GW-152	Aug-86	0.06	<.001		1
GW-152	Sep-86				
GW-152	Oct-86				
GW-152	Nov-86	0.024	0.004	6	11
GW-152	Dec-86				
GW-152	Jan-87	0.005	0.042	5	<5
GW-152	Feb-87				
GW-152	Mar-87				
GW-152	Apr-87				
GW-152	May-87	0.12	0.003	3	<5
GW-152	Jun-87				
GW-152	Jul-87				
GW-152	Aug-87	0.063	0.001	11	<5
GW-152	Sep-87				
GW-152	Oct-87	0.094	<.001	9	<5
GW-152	Nov-87				
GW-152	Dec-87				
GW-152	Jan-88				
GW-152	Feb-88				
GW-152	Mar-88	0.044	<.001	5	<5
GW-152	Apr-88				
GW-152	May-88				
GW-152	Jun-88				
GW-152	Jul-88				
GW-152	Aug-88	0.082	0.002	7	<5
GW-152	Sep-88				
GW-152	Oct-88				
GW-152	Nov-88				
GW-152	Dec-88				
GW-152	Jan-89	0.067	<.001	0.3	<5
GW-152	Feb-89				
GW-152	Mar-89				
GW-152	Apr-89	0.026	<.001	2	<5

Well	DATE	Pb (mg/L)	U (mg/L)	CARTET (ug/L)	PCE (ug/L)
GW-152	May-89				
GW-152	Jun-89				
GW-152	Jul-89				
GW-152	Aug-89	0.24	<.001	2	<5
GW-152	Sep-89				CAP
GW-152	Oct-89				
GW-152	Nov-89				
GW-152	Dec-89				
GW-152	Jan-90				
GW-152	Feb-90	0.096	<.001	<5	<5
GW-153	Jan-86				
GW-153	Feb-86	0.004	0.002	74	<5
GW-153	Mar-86				
GW-153	Apr-86	0.013	0.002	150	<5
GW-153	May-86				
GW-153	Jun-86				
GW-153	Jul-86	0.004	0.002	94	2
GW-153	Aug-86				
GW-153	Sep-86				
GW-153	Oct-86				
GW-153	Nov-86	0.007	0.004	150	4
GW-153	Dec-86				
GW-153	Jan-87	0.006	0.04	73	3
GW-153	Feb-87				
GW-153	Mar-87				
GW-153	Apr-87				
GW-153	May-87	0.009	0.005	99	3
GW-153	Jun-87				
GW-153	Jul-87				
GW-153	Aug-87	<.004	0.002	115	3
GW-153	Sep-87				
GW-153	Oct-87	0.004	0.004	35	2
GW-153	Nov-87				
GW-153	Dec-87				
GW-153	Jan-88				
GW-153	Feb-88				
GW-153	Mar-88	0.005	<.001	88	3
GW-153	Apr-88				
GW-153	May-88				
GW-153	Jun-88	0.007	0.002	97	3
GW-153	Jul-88				
GW-153	Aug-88	0.004	0.003	150	4
GW-153	Sep-88				
GW-153	Oct-88	0.005	<.001	200	5
GW-153	Nov-88				
GW-153	Dec-88				
GW-153	Jan-89	0.004	0.001	130	5
GW-153	Feb-89				
GW-153	Mar-89				
GW-153	Apr-89	0.009	0.001	130	5
GW-153	May-89				
GW-153	Jun-89				
GW-153	Jul-89				
GW-153	Aug-89	<.004	<.001	190	5
GW-153	Sep-89				CAP
GW-153	Oct-89				
GW-153	Nov-89				
GW-153	Dec-89				
GW-153	Jan-90				

Well	DATE	Pb (mg/L)	U (mg/L)	CARTET (ug/L)	PCE (ug/L)
GW-153	Feb-90	0.004	0.002	120	4
GW-153	Mar-90				
GW-153	Apr-90				
GW-153	May-90	<.004	0.001	220	7
GW-153	Jun-90				
GW-153	Jul-90				
GW-153	Aug-90	<.004	0.001	190	6
GW-153	Sep-90				
GW-153	Oct-90	<.004	0.007	140	4
GW-153	Nov-90				
GW-153	Dec-90				
GW-153	Jan-91	<.004	<.005	42	<5
GW-153	Feb-91				
GW-153	Mar-91				
GW-153	Apr-91				
GW-153	May-91	0.005	<.005	120	5
GW-154	Jan-86				
GW-154	Feb-86	0.027	0.021	<5	32
GW-154	Mar-86				
GW-154	Apr-86	0.038	0.025	<5	<5
GW-154	May-86				
GW-154	Jun-86				
GW-154	Jul-86	0.006		<5	41
GW-154	Aug-86		0.022		
GW-154	Sep-86				
GW-154	Oct-86				
GW-154	Nov-86	0.004	0.019	<5	18
GW-154	Dec-86				
GW-154	Jan-87	0.117	0.002	<5	6
GW-154	Feb-87				
GW-154	Mar-87				
GW-154	Apr-87				
GW-154	May-87	0.005	0.017	<5	3
GW-154	Jun-87				
GW-154	Jul-87				
GW-154	Aug-87	0.005	0.021	<5	4
GW-154	Sep-87				
GW-154	Oct-87	0.004	0.013	<5	<5
GW-154	Nov-87				
GW-154	Dec-87				
GW-154	Jan-88				
GW-154	Feb-88				
GW-154	Mar-88	<.004	0.023	0.08	16
GW-154	Apr-88				
GW-154	May-88				
GW-154	Jun-88	0.008	0.029	<5	2
GW-154	Jul-88				
GW-154	Aug-88	0.016	0.05	<5	<5
GW-154	Sep-88				
GW-154	Oct-88	0.058	0.025	<5	<5
GW-154	Nov-88				
GW-154	Dec-88				
GW-154	Jan-89	<.004	0.11	<5	<5
GW-154	Feb-89				
GW-154	Mar-89				
GW-154	Apr-89	0.022	0.027	<5	<5
GW-154	May-89				
GW-154	Jun-89				
GW-154	Jul-89				

Well	DATE	Pb (mg/L)	U (mg/L)	CARTET (ug/L)	PCE (ug/L)
GW-154	Aug-89	<.004	2.24	8	<5
GW-154	Sep-89				CAP
GW-154	Oct-89	0.014	2.68	<5	<5
GW-154	Nov-89				
GW-154	Dec-89				
GW-154	Jan-90	<.004	2.35	3	<5
GW-154	Feb-90				
GW-154	Mar-90				
GW-154	Apr-90				
GW-154	May-90	0.018	1.1	<5	<5
GW-154	Jun-90				
GW-154	Jul-90				
GW-154	Aug-90	0.005	0.751	<5	0.9
GW-154	Sep-90				
GW-154	Oct-90		1.02	<5	2
GW-154	Nov-90	<.004			
GW-154	Dec-90				
GW-154	Jan-91	<.004	0.81		<5
GW-154	Feb-91			<5	
GW-154	Mar-91				
GW-154	Apr-91	<.004	0.386	<5	<5
GW-167	May-90	0.051	<0.001	<5	<5
GW-167	Aug-90	1.4	0.004	<5	<5
GW-167	Nov-90	0.3	0.002	<5	<5
GW-167	Feb-91	0.045	<0.001	<5	<5
GW-167	May-91	0.081	0.001	<5	<5
GW-167	Aug-91	<0.008	0.001	<5	<5
GW-220	Jan-86				
GW-220	Feb-86	0.005	<.001	<5	<5
GW-220	Mar-86				
GW-220	Apr-86	0.01	0.001	<5	<5
GW-220	May-86				
GW-220	Jun-86				
GW-220	Jul-86	0.005	0.001	<5	<5
GW-220	Aug-86				
GW-220	Sep-86				
GW-220	Oct-86				
GW-220	Nov-86	<.004	0.002	<5	<5
GW-220	Dec-86				
GW-220	Jan-87	0.011	0.002	<5	<5
GW-220	Feb-87				
GW-220	Mar-87				
GW-220	Apr-87				
GW-220	May-87	<.004	0.004	<5	1
GW-220	Jun-87				
GW-220	Jul-87				
GW-220	Aug-87	0.005	0.003	<5	<5
GW-220	Sep-87				
GW-220	Oct-87	0.007	<.001	<5	<5
GW-220	Nov-87				
GW-220	Dec-87				
GW-220	Jan-88				
GW-220	Feb-88				
GW-220	Mar-88	<.004	<.001	<5	<5
GW-220	Apr-88				
GW-220	May-88				
GW-220	Jun-88	<.004	<.001	<5	<5
GW-220	Jul-88				

Well	DATE	Pb (mg/L)	U (mg/L)	CARTET (ug/L)	PCE (ug/L)
GW-220	Aug-88	0.008	<.001	<5	<5
GW-220	Sep-88				
GW-220	Oct-88	<.004	<.001	26	2
GW-220	Nov-88				
GW-220	Dec-88				
GW-220	Jan-89	<.004	<.001	15	<5
GW-220	Feb-89				
GW-220	Mar-89				
GW-220	Apr-89	0.007	<.001	14	<5
GW-220	May-89				
GW-220	Jun-89				
GW-220	Jul-89				
GW-220	Aug-89	<.004	<.001	51	10
GW-220	Sep-89				CAP
GW-220	Oct-89	0.0056	<.001	79	3
GW-220	Nov-89				
GW-220	Dec-89				
GW-220	Jan-90	<.004	<.001	98	5
GW-220	Feb-90				
GW-220	Mar-90				
GW-220	Apr-90				
GW-220	May-90	0.0079	<.001	160	8
GW-220	Jun-90				
GW-220	Jul-90				
GW-220	Aug-90	<.004	<.001	150	8
GW-220	Sep-90				
GW-220	Oct-90	0.0076	<.001	190	15
GW-220	Nov-90				
GW-220	Dec-90				
GW-220	Jan-91	<.004	<.001	150	7
GW-220	Feb-91				
GW-220	Mar-91				
GW-220	Apr-91	0.01	0.001	160	10
GW-220	May-91				
GW-220	Jun-91				
GW-220	Jul-91				
GW-220	Aug-91	<.004	<.001	280	15
GW-220	Sep-91				
GW-220	Oct-91	0.012		270	16
GW-220	Nov-91				
GW-220	Dec-91				
GW-222	Feb-86	0.005	0.029	<5	9
GW-222	Apr-86	0.009	0.029	12	<5
GW-222	Jul-86	0.005	0.012	<5	2
GW-222	Nov-86	<0.004	0.026	<5	5
GW-222	Jan-87	<0.004	0.036	16	24
GW-222	May-87	<0.004	0.019	8	13
GW-222	Aug-87	<0.004	0.012	3	5
GW-222	Oct-87	<0.004	0.009	2	6
GW-222	Mar-88	0.005	0.019	320	390
GW-222	Jun-88	<0.004	0.014	150	220
GW-222	Aug-88	<0.004	0.013	96	170
GW-222	Oct-88	<0.004	0.013	18	52
GW-222	Jan-89	<0.004	0.012	190	130
GW-222	Apr-89	<0.004	0.009	470	160
GW-222	Oct-89	0.023	0.09	2	44 CAP
GW-222	Jan-90	<0.004	0.099	20	99
GW-222	May-90	<0.004	0.354	<5	17
GW-222	Aug-90	<0.004	0.364	<5	<5

Well	DATE	Pb (mg/L)	U (mg/L)	CARTET (ug/L)	PCE (ug/L)
GW-222	Oct-90	<0.004	0.093	<5	2
GW-222	Feb-91	<0.004	0.141	<5	11
GW-222	May-91	0.0055	0.115	<5	15
GW-223	Jan-86				
GW-223	Feb-86	0.008	0.009	20	54
GW-223	Mar-86				
GW-223	Apr-86	<0.004	0.0013	15	44
GW-223	May-86				
GW-223	Jun-86				
GW-223	Jul-86	<0.004	0.009	2	21
GW-223	Aug-86				
GW-223	Sep-86				
GW-223	Oct-86				
GW-223	Nov-86	<0.004	0.0021	8	37
GW-223	Dec-86				
GW-223	Jan-87	<0.004	0.013	27	39
GW-223	Feb-87				
GW-223	Mar-87				
GW-223	Apr-87				
GW-223	May-87	<0.004	0.008	34	120
GW-223	Jun-87				
GW-223	Jul-87				
GW-223	Aug-87	<0.004	0.004	37	91
GW-223	Sep-87				
GW-223	Oct-87	<0.004	0.008	12	70
GW-223	Nov-87				
GW-223	Dec-87				
GW-223	Jan-88				
GW-223	Feb-88				
GW-223	Mar-88	<0.004	0.008	160	510
GW-223	Apr-88				
GW-223	May-88				
GW-223	Jun-88	0.0051	0.009	110	370
GW-223	Jul-88				
GW-223	Aug-88	<0.004	0.006	79	290
GW-223	Sep-88				
GW-223	Oct-88	0.0047	0.008	83	310
GW-223	Nov-88				
GW-223	Dec-88				
GW-223	Jan-89	0.005	0.003	600	710
GW-223	Feb-89				
GW-223	Mar-89				
GW-223	Apr-89	<0.004	<0.001	1000	24
GW-223	May-89				
GW-223	Jun-89				
GW-223	Jul-89				
GW-223	Aug-89				
GW-223	Sep-89				CAP
GW-223	Oct-89	<0.004	0.002	83	380
GW-223	Nov-89				
GW-223	Dec-89				
GW-223	Jan-90	0.001	<0.004	53	270
GW-223	Feb-90				
GW-223	Mar-90				
GW-223	Apr-90				
GW-223	May-90	0.004	<0.004	57	260
GW-223	Jun-90				
GW-223	Jul-90				
GW-223	Aug-90	0.004	<0.004	53	180

Well	DATE	Pb (mg/L)	U (mg/L)	CARTET (ug/L)	PCE (ug/L)
GW-223	Sep-90				
GW-223	Oct-90	0.004	<0.004	32	170
GW-223	Nov-90				
GW-223	Dec-90				
GW-223	Jan-91				
GW-223	Feb-91	<0.004	0.005	26	190
GW-223	Mar-91				
GW-223	Apr-91				
GW-223	May-91	<0.004	0.007	30	160
GW-240	Feb-86	0.007	0.004	<5	<5
GW-240	Apr-86	0.012	0.004	14	<5
GW-240	Jul-86	0.004	0.007	30	2
GW-240	Nov-86	0.007	0.008	32	6
GW-240	Jan-87	<0.004	0.004	7	1
GW-240	May-87	0.016	0.004	3	<5
GW-240	Aug-87	<0.004	0.005	23	<5
GW-240	Oct-87	0.005	0.004	18	1
GW-240	Mar-88	<0.004	0.003	8	<5
GW-240	Jun-88	0.0064	0.004	15	<5
GW-240	Aug-88	0.0049	0.006	30	<5
GW-240	Oct-88	0.0044	0.001	49	3
GW-240	Jan-89	0.013	<0.001	6	<5
GW-240	Apr-89	0.0054	0.001	4	<5
GW-240	Aug-89	<0.004	<0.001	13	0.7 CAP
GW-240	Feb-90	<0.004	0.001	4	<5
GW-240	May-90	<0.004	0.002	20	<5
GW-240	Aug-90	<0.004	0.004	14	0.9
GW-240	Oct-90	<0.004	0.006	19	<5
GW-240	Jan-91	<0.004	0.003	11	<5
GW-240	Apr-91	<0.004	0.002	8	<5
GW-240	Aug-91	<0.004	0.003	13	<5
GW-240	Oct-91	<0.004	0.005	7	<5
GW-380	Dec-88	0.03	0.002	2	1
GW-380	Jan-89	0.026	0.004	8	<5
GW-380	Feb-89				
GW-380	Mar-89				
GW-380	Apr-89	0.0048	<.001	<5	2
GW-380	May-89				
GW-380	Jun-89				
GW-380	Jul-89				
GW-380	Aug-89	0.0086	<.001	6	<5
GW-380	Sep-89				CAP
GW-380	Oct-89	0.016	<.001	1	<5
GW-380	Nov-89				
GW-380	Dec-89				
GW-380	Jan-90	0.006	<.001	11	<5
GW-380	Feb-90				
GW-380	Mar-90				
GW-380	Apr-90				
GW-380	May-90	0.0057	<.001	<5	<5
GW-380	Jun-90				
GW-380	Jul-90				
GW-380	Aug-90	0.0092	0.001	0.9	0.8
GW-380	Sep-90				
GW-380	Oct-90	0.0083	0.001	<5	<5
GW-380	Nov-90				
GW-380	Dec-90				
GW-380	Jan-91	0.005	0.001	<5	<5

Well	DATE	Pb (mg/L)	U (mg/L)	CARTET (ug/L)	PCE (ug/L)
GW-380	Feb-91				
GW-380	Mar-91				
GW-380	Apr-91	<0.004	<.001	<5	<5
GW-380	May-91				
GW-380	Jun-91				
GW-380	Jul-91				
GW-380	Aug-91	0.019	0.002	<5	0.6
GW-380	Sep-91				
GW-380	Oct-91	0.03	<.001	<5	<5
GW-381	Dec-88	<.004	<.001	4400	6
GW-381	Jan-89	0.01	<.001	10000	500
GW-381	Feb-89				
GW-381	Mar-89				
GW-381	Apr-89	0.009	<.001	3000	6
GW-381	May-89				
GW-381	Jun-89				
GW-381	Jul-89				
GW-381	Aug-89	0.008	<.001	6900	130
GW-381	Sep-89				CAP
GW-381	Oct-89	<.004	<.001	8700	250
GW-381	Nov-89				
GW-381	Dec-89				
GW-381	Jan-90	<.004	<.001	8500	<250
GW-381	Feb-90				
GW-381	Mar-90				
GW-381	Apr-90				
GW-381	May-90	<.004	<.001	6800	10
GW-381	Jun-90				
GW-381	Jul-90				
GW-381	Aug-90	<.004	<.001	5900	9
GW-381	Sep-90				
GW-381	Oct-90	<.004	<.001	6400	<250
GW-381	Nov-90				
GW-381	Dec-90				
GW-381	Jan-91			6800	<250
GW-381	Feb-91	<.004	<.001		
GW-381	Mar-91				
GW-381	Apr-91				
GW-381	May-91	0.023	0.001	6700	<250
GW-381	Jun-91				
GW-381	Jul-91				
GW-381	Aug-91	0.02	0.001	7100	<250
GW-381	Sep-91				
GW-381	Oct-91	<.004	<.001	5300	<250
GW-383	Aug-88	<.004		12	270
GW-383	Sep-88				
GW-383	Oct-88	<.004		7	190
GW-383	Nov-88				
GW-383	Dec-88		<.001		
GW-383	Jan-89	0.01	<.001	11	250
GW-383	Feb-89				
GW-383	Mar-89				
GW-383	Apr-89	<.004	<.001	25	250
GW-383	May-89				
GW-383	Jun-89				
GW-383	Jul-89				
GW-383	Aug-89	<.004	<.001	19	190
GW-383	Sep-89				CAP

Well	DATE	Pb (mg/L)	U (mg/L)	CARTET (ug/L)	PCE (ug/L)
GW-383	Oct-89	<.004	0.002	26	280
GW-383	Nov-89				
GW-383	Dec-89				
GW-383	Jan-90	<.004	<.001	19	200
GW-383	Feb-90				
GW-383	Mar-90				
GW-383	Apr-90				
GW-383	May-90	0.0046	<.001	26	290
GW-383	Jun-90				
GW-383	Jul-90				
GW-383	Aug-90	<.004	<.001	<10	76
GW-383	Sep-90				
GW-383	Oct-90	0.0076	<.001	14	290
GW-383	Nov-90				
GW-383	Dec-90				
GW-383	Jan-91	<.004		19	380
GW-383	Feb-91		<.001		
GW-383	Mar-91				
GW-383	Apr-91	<.004		14	320
GW-383	May-91		<.001		
GW-383	Jun-91				
GW-383	Jul-91				
GW-383	Aug-91	<.004	<.001	8	370
GW-383	Sep-91				
GW-383	Oct-91	<.004	0.001	<5	180
GW-384	Aug-88	<0.004	0.003	<5	<5
GW-384	Oct-88	<0.004	<0.001	<5	0.9
GW-384	Jan-89	<0.004	<0.001	<5	<5
GW-384	Apr-89	<0.004	<0.001	<5	<5
GW-384	Aug-89	<0.004	<0.001	<5	<5
GW-384	Oct-89	<0.004	<0.001	<5	<5 CAP
GW-384	Jan-91	<0.004	<0.001	<5	0.9
GW-603	Feb-90	<0.004	<0.001		
GW-603	May-90	0.031	<0.001	<5	<5
GW-603	Aug-90	0.19	0.001	<5	<5
GW-603	Oct-90	0.16	0.001	<5	<5
GW-603	Jan-91	0.0068	<0.001	<5	<5
GW-603	Apr-91	<0.004	<0.001	<5	<5
GW-603	Sep-91	<0.008	<0.001	<5	<5
GW-603	Nov-91	<0.004	<0.001	<5	<5
GW-604	Feb-90	<0.004	<0.001	<5	<5
GW-604	May-90	0.081	<0.001	<5	<5
GW-604	Aug-90	0.033	<0.001	<5	<5
GW-604	Oct-90	0.023	<0.001	<5	<5
GW-604	Jan-91	0.063	<0.001	<5	<5
GW-604	Apr-91	0.025	<0.001	<5	<5
GW-604	Sep-91	0.015	<0.001	<5	<5
GW-604	Nov-91	0.0066	<0.001	<5	<5

WELL	Date	Cond.	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
Selected Chemical Constituents at the OLWMA										
Note: The first listing on a given date is from the unfiltered sample, and the second listing is from the filtered sample. Conductivity (Cond) is in umhos/cm										
GW-003	Apr-88	475	<0.001	64	1900	2	620		<5	<5
GW-003	Apr-88		<0.001							
GW-003	Jul-88	351	<0.001	0	2000	<5	620		<5	<5
GW-003	Jul-88		<0.001							
GW-007	Mar-87	110	0.004	4.3	9	<5	5		43	16
GW-007	Mar-87		0.003							
GW-007	Jun-87	120	0.003	<2	11	<5	5		100	20
GW-007	Jun-87		0.002							
GW-007	Sep-87	150	0.006	6	<5	<5	2		100	19
GW-007	Sep-87		<0.001							
GW-007	Nov-87	230	0.004	<4	10	<5	<5		75	<5
GW-007	Nov-87		<0.001							
GW-007	Apr-88	112	<0.001	0.72	7	<5	4		64	14
GW-007	Apr-88		<0.001							
GW-007	Jul-88	131	0.002	11	8	<5	4		77	17
GW-007	Jul-88		<0.001							
-----CAP-----										
GW-007	Aug-89	125	<0.001	2	4	<5	2	67	46	7
GW-007	Aug-89		<0.001							
GW-007	Sep-89	239	<0.001	350	4	<5	<5	84	48	8
GW-007	Sep-89		<0.001							
GW-007	Dec-89	152	<0.001	9	6	<5	3	150	70	13
GW-007	Dec-89		<0.001							
GW-007	Feb-90	207	<0.001	9.83	4	<5	1	110	52	8
GW-007	Feb-90		<0.001							
GW-010	Mar-87	520	0.001	<2	12	<5	8		7	5
GW-010	Mar-87		0.004							
GW-010	Jun-87	600	<0.001	9.8	14	<5	7		6	6
GW-010	Jun-87		<0.001							
GW-010	Sep-87	530	0.002	15	<5	<5	4		4	6
GW-010	Sep-87		0.001							
GW-010	Nov-87	580	0.003	16.3	14	<5	5		6	5
GW-010	Nov-87		<0.001							
GW-010	Apr-88	3500	<0.001	9	11	<5	5		6	5
GW-010	Apr-88		<0.001							
GW-010	Jul-88	779	<0.001	16	8	<5	4		3	5
GW-010	Jul-88		<0.001							
-----CAP-----										
GW-010	Aug-89	669	<0.001	6	14	<5	7	25	10	8
GW-010	Aug-89		<0.001							
GW-010	Sep-89	598	<0.001	222	14	<5	6	23	8	7
GW-010	Sep-89		<0.001							
GW-010	Dec-89	540	0.002	14.3	9	<5	2	16	4	4
GW-010	Dec-89		0.002							
GW-010	Feb-90	517	<0.001	3.68	16	<5	6	30	7	7
GW-010	Feb-90		<0.001							
GW-043	Mar-87	100	0.002	<2	<5	<5	<5		<5	<5
GW-043	Mar-87		0.003							
GW-043	Jun-87	140	0.003	2.1	<5	<5	<5		3	<5
GW-043	Jun-87		<0.001							

WELL	Date	Cond	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-043	Sep-87	130	<0.001	52	<5	<5	<5		<5	<5
GW-043	Sep-87		<0.001							
GW-043	Apr-88	250	0.001	2	<5	<5	<5		1	<5
GW-043	Apr-88		<0.001							
-----CAP-----										
GW-043	Mar-90	105	<0.001	4.58	<5	<5	<5	<5	<5	<5
GW-043	Mar-90		<0.001							
GW-043	May-90	143	<0.001	0.67	<5	<5	<5	<5	<5	<5
GW-043	May-90		<0.001							
GW-043	Aug-90	204	<0.001	0.47	<5	<5	<5	<5	<5	<5
GW-043	Aug-90		<0.001							
GW-043	Oct-90	90	<0.001	3.03	<5	<5	<5	<5	<5	<5
GW-043	Oct-90		<0.001							
GW-043	Jan-91	161	<0.001	-2.05	<5	<5	<5	<5	<5	<5
GW-043	Jan-91		<0.001							
GW-043	May-91	129	<0.001	3.93	<5	<5	<5	<5	<5	<5
GW-043	May-91		<0.001							
GW-043	Aug-91	124	<0.001	5.02	<5	<5	<5	<5	<5	<5
GW-043	Aug-91		<0.001							
GW-043	Oct-91	107	<0.001	0.08	<5	<5	<5	<5	<5	<5
GW-043	Oct-91		<0.001							
GW-063	Mar-87	530	0.005	20.9	<5	<5	<5		<5	52
GW-063	Mar-87		0.004							
GW-063	Jun-87	692	<0.001	25.1	<5	<5	<5		<5	57
GW-063	Jun-87		0.004							
GW-063	Sep-87	580	0.005	26	<5	<5	<5		<5	34
GW-063	Sep-87		0.004							
GW-063	Oct-87	720	0.006	24	<5	<5	<5		<5	40
GW-063	Oct-87		0.005							
GW-063	Apr-88	779	<0.001	0	<5	<5	<5		<5	26
GW-063	Apr-88		0.002							
GW-063	Jul-88	754	<0.001	24	<5	<5	<5		<5	51
GW-063	Jul-88		<0.001							
GW-063	Sep-88	807	0.003	18	<5	<5	<5		<5	33
GW-063	Sep-88		0.002							
GW-063	Dec-88	834	0.001	42.3	<5	<5	<5	<5	<5	65
GW-063	Dec-88		<0.001							
GW-063	Mar-89	571	0.001	16	<5	<5	<5	<5	<5	29
GW-063	Mar-89		<0.001							
-----CAP-----										
GW-063	Jul-89	573	0.002	4	<5	<5	<5	<5	<5	26
GW-063	Jul-89		0.001							
GW-063	Sep-89	689	0.002	25.7	<5	<5	<5	<5	<5	34
GW-063	Sep-89		0.003							
GW-063	Dec-89	591	<0.001	17	<5	<5	<5	<5	<5	34
GW-063	Dec-89		<0.001							
GW-063	Feb-90	355	<0.001	11.05	<5	<5	<5	<5	<5	17
GW-063	Feb-90		<0.001							
GW-063	Jun-90	511	0.002	24.88	<5	<5	<5	<5	<5	21
GW-063	Jun-90		0.001							
GW-063	Aug-90	726	0.003	17.11	<5	<5	<5	<5	<5	24
GW-063	Aug-90		0.003							
GW-063	Oct-90	673	0.003	24.41	<5	<5	<5	<5	<5	37
GW-063	Oct-90		0.003							
GW-063	Feb-91	537	0.002	16	<5	<5	<5	<5	<5	33

WELL	Date	Cond.	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-083	Feb-91		0.002							
GW-083	May-91	529	0.002	10	<5	<5	<5	<5	<5	21
GW-083	May-91		0.001							
GW-083	Aug-91	1139	0.002	13	<5	<5	<5	<5	<5	38
GW-083	Aug-91		0.002							
GW-083	Oct-91	607	0.002	8	<5	<5	<5	<5	<5	22
GW-083	Oct-91		0.002							
GW-084	Nov-87	610	<0.001	52	3	<5	<5		53	210
GW-084	Nov-87		<0.001							
GW-084	Apr-88	900	<0.001	88	<5	<5	<5		2	160
GW-084	Apr-88		<0.001							
GW-084	Jul-88	864	<0.001	135	<5	<5	<5		1	160
GW-084	Jul-88		<0.001							
GW-084	Sep-88	912	0.003	48	<5	<5	<5		<5	170
GW-084	Sep-88		<0.001							
GW-084	Nov-88	884	0.001	63	<5	<5	<5	13	2	170
GW-084	Nov-88		<0.001							
GW-084	Mar-89	703	0.001	48	<5	<5	<5	10	1	130
GW-084	Mar-89		<0.001							
-----CAP-----										
GW-084	May-89	752	0.003	48	<5	<5	<5	7	1	130
GW-084	May-89		0.001							
GW-084	Sep-89	650	<0.001	41	<5	<5	<5	9	1	110
GW-084	Sep-89		0.001							
GW-084	Dec-89	544	<0.001	14	<5	<5	<5	16	2	150
GW-084	Dec-89		<0.001							
GW-084	Jan-90	531	<0.001	3.8	<5	<5	<5	11	1	110
GW-084	Jan-90		0.008							
GW-084	May-90	679	<0.001	4.2	<5	<5	<5	9	<5	110
GW-084	May-90		<0.001							
GW-084	Aug-90	697	0.001	4.5	<5	<5	<5	13	<5	100
GW-084	Aug-90		0.001							
GW-084	Mar-90	695	<0.001	4.5	<5	<5	<5	98	<5	130
GW-084	Mar-90		<0.001							
GW-084	Feb-91	528	0.001	23	<5	<5	<5	9	<5	89
GW-084	Feb-91		0.001							
GW-084	May-91	589	<0.001	23	<5	<5	<5	6	<5	82
GW-084	May-91		0.001							
GW-084	Aug-91	593	0.001	23	<5	<5	<5	9	<5	110
GW-084	Aug-91		0.001							
GW-084	Oct-91	585	<0.001	10	<5	<5	<5	12	<5	110
GW-084	Oct-91		<0.001							
GW-067	Mar-87	760	0.017	3.3	2	<5	<5		<5	<5
GW-067	Mar-87		0.016							
GW-067	Jun-87	800	0.008	6.4	1	<5	<5		1	5
GW-067	Jun-87		0.007							
GW-067	Sep-87	760	0.014	14	<5	<5	<5		<5	<5
GW-067	Sep-87		0.011							
GW-067	Nov-87	760	0.012	6	<5	<5	<5		<5	<5
GW-067	Nov-87		0.01							
GW-067	Apr-88	814	0.01	2	2	<5	<5		<5	<5
GW-067	Apr-88		0.001							
GW-067	Jul-88	926	0.009	4	2	<5	<5		<5	<5
GW-067	Jul-88		0.008							

WELL	Date	Cond	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-067	Sep-88	955	0.013	37	<5	<5	<5		<5	<5
GW-067	Sep-88		0.01							
GW-067	Nov-88	874	0.008	8	1	<5	<5	<5	0.9	3
GW-067	Nov-88		0.008							
GW-067	Mar-89	965	0.008	9	2	<5	<5	1	<5	<5
GW-067	Mar-89		0.008							
CAP										
GW-067	Dec-89	835	0.007	5	1	<5	<5	<5	<5	<5
GW-067	Dec-89		0.007							
GW-067	Mar-90	856	0.007	3.35	<5	0.6	<5	<5	<10	<5
GW-067	Mar-90		0.005							
GW-073	Mar-87	270	0.004	<2	<5	<5	<5		<5	<5
GW-073	Mar-87		0.003							
GW-073	Jun-87	270	0.003	2.3	<5	<5	<5		6	<5
GW-073	Jun-87		<0.001							
GW-073	Sep-87	330	0.003	10	<5	<5	<5		<5	1
GW-073	Sep-87		0.002							
GW-073	Nov-87	420	<0.001	4	2	<5	3		<5	<5
GW-073	Nov-87		<0.001							
GW-073	Apr-88	367	<0.001	0	<5	<5	<5		0.9	0.7
GW-073	Apr-88		<0.001							
GW-073	Jul-88	408	<0.001	6	<5	<5	<5		<5	<5
GW-073	Jul-88		<0.001							
GW-073	Sep-88	419	<0.001	9	1	<5	1		2	2
GW-073	Sep-88		<0.001							
GW-073	Dec-88	396	<0.001	2.2	<5	<5	1	7	1	1
GW-073	Dec-88		<0.001							
GW-073	Mar-89	353	<0.001	0	<5	<5	<5	4	<5	<5
GW-073	Mar-89		<0.001							
CAP										
GW-073	Jul-89	399	<0.001	0	<5	<5	<5	7	<5	<5
GW-073	Jul-89		<0.001							
GW-073	Sep-89	387	<0.001	101	<5	<5	2	9	2	2
GW-073	Sep-89		<0.001							
GW-073	Dec-89	322	<0.001	0	<5	<5	<5	13	<5	<5
GW-073	Dec-89		<0.001							
GW-073	Jan-90	369	<0.001	2.12	<5	<5	<5	<5	<5	<5
GW-073	Jan-90		<0.001							
GW-084	Mar-87	240	0.002	<2	<5	<5	<5		<5	<5
GW-084	Mar-87		0.001							
GW-084	Jun-87	280	0.001	<2	<5	<5	<5		1	<5
GW-084	Jun-87		0.001							
GW-084	Sep-87	270	0.002	8	<5	<5	<5		<5	<5
GW-084	Sep-87		<0.001							
GW-084	Nov-87	330	0.002	30.2	<5	<5	<5		<5	<5
GW-084	Nov-87		0.001							
GW-084	Apr-88	327	<0.001	0.927	<5	<5	<5		0.3	<5
GW-084	Apr-88		<0.001							
GW-084	Jul-88	316	<0.001	33	10	<5	<5		<5	<5
GW-084	Jul-88		<0.001							
GW-084	Sep-88	284	<0.001	0.64	<5	<5	<5		<5	<5
GW-084	Sep-88		0.01							
GW-084	Dec-88	276	<0.001	2	<5	<5	<5	<5	<5	<5
GW-084	Dec-88		<0.001							

WELL	Date	Cond	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-084	Mar-89	285	<0.001	0	<5	<5	<5	<5	<5	<5
GW-084	Mar-89		<0.001							
-----CAP-----										
GW-084	Jul-89	327	<0.001	0	<5	<5	<5	<5	<5	<5
GW-084	Jul-89		<0.001							
GW-084	Sep-89	292	<0.001	46	<5	<5	<5	<5	<5	<5
GW-084	Sep-89		<0.001							
GW-084	Dec-89	210	<0.001	2	<5	<5	<5	<5	<5	<5
GW-084	Dec-89		<0.001							
GW-084	Feb-90	276	<0.001	3.24	<5	<5	<5	<5	<5	<5
GW-084	Feb-90		<0.001							
GW-084	May-90	362	<0.001	0.22	<5	<5	<5	<5	<5	<5
GW-084	May-90		<0.001							
GW-084	Aug-90	264	<0.001	0.466	<5	<5	<5	<5	<5	<5
GW-084	Aug-90		<0.001							
GW-084	Oct-90	246	<0.001	1.86	<5	<5	<5	<5	<5	<5
GW-084	Oct-90		<0.001							
GW-084	Jan-91	308	<0.001	1.35	<5	<5	<5	<5	<5	<5
GW-084	Jan-91		<0.001							
GW-084	May-91	264	<0.001	0.3	<5	<5	<5	<5	<5	<5
GW-084	May-91		<0.001							
GW-084	Aug-91	269	<0.001	-0.97	<5	<5	<5	<5	<5	<5
GW-084	Aug-91		0.001							
GW-084	Oct-91	261	<0.001	2.4	<5	<5	<5	<5	<5	<5
GW-084	Oct-91		<0.001							
GW-085	Nov-87	500	0.001	17	<5	<5	<5		20	3
GW-085	Nov-87		0.003							
GW-085	Apr-88	913	<0.001	19	<5	<5	<5		0.5	<5
GW-085	Apr-88		<0.001							
GW-085	Jul-88	1051	0.003	14	<5	<5	<5		<5	<5
GW-085	Jul-88		<0.001							
-----CAP-----										
GW-085	Aug-89	1764	<0.001	26	<5	<5	<5	<5	<5	<5
GW-085	Aug-89		<0.001							
GW-085	Sep-89	1460	<0.001	25	<5	<5	<5	<5	<5	<5
GW-085	Sep-89		<0.001							
GW-085	Dec-89	543	<0.001	68	<5	<5	<5	<5	<5	<5
GW-085	Dec-89		<0.001							
GW-085	Feb-90	999	<0.001	41.76	<5	<5	<5	<5	<5	<5
GW-085	Feb-90		<0.001							
GW-085	May-90	1170	<0.001	59.43	<5	<5	<5	<5	<5	<5
GW-085	May-90		<0.001							
GW-085	Aug-90	1066	<0.001	64.6	<5	<5	<5	<5	<5	<5
GW-085	Aug-90		<0.001							
GW-085	Oct-90	1091	<0.001	62.64	<5	<5	<5	<5	<5	<5
GW-085	Oct-90		<0.001							
GW-085	Jan-91	1153	<0.001	69	<5	<5	<5	<5	<5	<5
GW-085	Jan-91		<0.001							
GW-085	May-91	1081	<0.001	72	<5	<5	<5	<5	<5	<5
GW-085	May-91		<0.001							
GW-085	Aug-91	1220	<0.001	89	<5	<5	<5	<5	<5	<5
GW-085	Aug-91		<0.001							
GW-085	Oct-91	1359	<0.001	25	<5	<5	<5	<5	<5	<5
GW-085	Oct-91		<0.001							

WELL	Date	Cond.	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-087	Mar-87	480	0.237	63.9	7	21	8		400	410
GW-087	Mar-87		0.225							
GW-087	Jun-87	420	0.49	106.1	9	27	10		1600	320
GW-087	Jun-87		0.44							
GW-087	Sep-87	520	0.552	155	8	20	17		1400	340
GW-087	Sep-87		0.382							
GW-087	Nov-87	460	0.424	158	<5	18	<5		1000	800
GW-087	Nov-87		0.418							
GW-087	Apr-88	536	0.495	165	6	14	<5		360	170
GW-087	Apr-88		0.63							
GW-087	Jul-88	418	0.14	88	8	27	9		430	460
GW-087	Jul-88		0.2							
GW-087	Sep-88	272								
GW-087	Nov-88	431								
GW-087	Mar-89	240	0.153	43	8	11	7	190	360	260
GW-087	Mar-89		0.147							
CAP										
GW-087	Dec-89	481	0.522	102	4	7	4	140	290	360
GW-087	Dec-89		0.36							
GW-087	Mar-90	377	0.146	42	4	6	5	98	240	330
GW-087	Mar-90		0.167							
GW-097	Mar-87	780	0.005	3.1	14	<5	<5		3	<5
GW-097	Mar-87		0.004							
GW-097	Jun-87	740	0.003	4.3	12	<5	<5		3	<5
GW-097	Jun-87		0.003							
GW-097	Sep-87	730	0.002	<4	12	<5	<5		<5	<5
GW-097	Sep-87		<0.001							
GW-097	Nov-87	850	<0.001	16.6	17	<5	<5		<5	2
GW-097	Nov-87		0.001							
GW-097	Apr-88	875	<0.001	495	13	<5	<5		<5	<5
GW-097	Apr-88		<0.001							
GW-097	Jul-88	1005	<0.001	0	12	<5	<5		<5	<5
GW-097	Jul-88		<0.001							
GW-097	Sep-88	947	<0.001	2	15	<5	<5		<5	<5
GW-097	Sep-88		<0.001							
GW-097	Nov-88	839	0.001	4	11	<5	<5	8	<5	0.5
GW-097	Nov-88		<0.001							
GW-097	Mar-89	824	0.002	0	13	<5	<5	8	<5	<5
GW-097	Mar-89		<0.001							
CAP										
GW-097	Jul-89	904	<0.001	0	10	<5	<5	6	<5	<5
GW-097	Jul-89		<0.001							
GW-097	Sep-89	907	0.001	0	10	<5	<5	6	<5	<5
GW-097	Sep-89		<0.001							
GW-097	Dec-89	943	<0.001	4	10	<5	<5	6	<5	<5
GW-097	Dec-89		<0.001							
GW-097	Jan-90	893	<0.001	5.25	9	<5	<5	6	<5	<5
GW-097	Jan-90		<0.001							
GW-098	Mar-87	530	0.003	2.7	3	<5	2		2	6
GW-098	Mar-87		0.003							
GW-098	Jun-87	500	<0.001	5.2	2	<5	3		<5	6
GW-098	Jun-87		<0.001							
GW-098	Sep-87	550	0.003	<5	3	<5	1		<5	7
GW-098	Sep-87		0.003							

WELL	Date	Cond.	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-098	Nov-87	570	0.001	6	5	<5	<5		<5	<5
GW-098	Nov-87		<0.001							
GW-098	Apr-88	721	<0.001	0	3	<5	<5		<5	6
GW-098	Apr-88		<0.001							
GW-098	Jul-88	773	<0.001	30	4	<5	3		0.9	10
GW-098	Jul-88		0.001							
GW-098	Sep-88	770	<0.001	6	3	<5	2		<5	8
GW-098	Sep-88		<0.001							
GW-098	Nov-88	724	0.001	5	5	<5	3	22	1	10
GW-098	Nov-88		<0.001							
GW-098	Mar-89	815	0.001	1	6	<5	4	30	1	12
GW-098	Mar-89		<0.001							
-----CAP-----										
GW-098	Jul-89	814	<0.001	0	4	<5	2	21	<5	8
GW-098	Jul-89		<0.001							
GW-098	Sep-89	799	<0.001	0	4	<5	2	29	<5	9
GW-098	Sep-89		<0.001							
GW-098	Dec-89	769	<0.001	6	4	<5	3	32	1	9
GW-098	Dec-89		<0.001							
GW-098	Dec-89	770	<0.001	9	5	<5	3	33	1	9
GW-098	Dec-89		<0.001							
GW-098	Jan-90	791	0.001		5	<5	3	35	<5	9
GW-098	Jan-90		<0.001							
GW-120	Mar-87	310	0.003	<2						
GW-120	Mar-87		0.001							
GW-120	Mar-87		0.003	<2	<5	<5	<5		<5	<5
GW-120	Mar-87		0.006							
GW-120	Jun-87	320	0.001	5.2	<5	<5	<5		<5	<5
GW-120	Jun-87		0.001							
GW-120	Sep-87	330	0.002	8	<5	<5	<5		<5	<5
GW-120	Sep-87		0.003							
GW-120	Nov-87	370	0.002	13.9	<5	<5	<5		<5	<5
GW-120	Nov-87		<0.001							
GW-120	Nov-87		<0.001	19.5	<5	<5	<5		<5	<5
GW-120	Nov-87		<0.001							
GW-120	Apr-88	338	<0.001	5	<5	<5	<5		<5	<5
GW-120	Apr-88		<0.001							
GW-120	Jul-88	425	<0.001	54	<5	<5	<5		<5	<5
GW-120	Jul-88		0.001							
GW-120	Jul-88	397	<0.001	48	<5	<5	<5		<5	<5
GW-120	Jul-88		<0.001							
GW-120	Sep-88	398	0.013	2	<5	<5	<5		<5	<5
GW-120	Sep-88		<0.001							
GW-120	Dec-88	357	<0.001	9	<5	<5	<5	<5	<5	<5
GW-120	Dec-88		<0.001							
GW-120	Mar-89	343	<0.001	0	<5	<5	<5	<5	<5	<5
GW-120	Mar-89		<0.001							
-----CAP-----										
GW-120	Jul-89	411	<0.001	0	<5	<5	<5	<5	<5	<5
GW-120	Jul-89		<0.001							
GW-120	Sep-89	410	0.001	0.3	<5	<5	<5	<5	<5	<5
GW-120	Sep-89		0.001							
GW-120	Dec-89	458	<0.001	3	<5	<5	<5	<5	<5	<5
GW-120	Dec-89		0.003							
GW-120	Jan-90	318	<0.001	3.68	<5	<5	<5	<5	<5	<5

WELL	Date	Cond.	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-120	Jan-90		<0.001							
GW-225	Jan-86	728	0.005	10	<5	<5	5		<5	500
GW-225	Jan-86		0.003							
GW-225	May-86		0.005	10.3	<5	<5	9		<5	520
GW-225	May-86		0.002							
GW-225	Sep-86		0.004	11	<5	<5	<5		<5	350
GW-225	Sep-86		0.002							
GW-225	Dec-86	910	0.003	9	1	2	8		4	500
GW-225	Dec-86		0.003							
GW-225	Dec-86		0.004	12	<10	2	7		4	470
GW-225	Dec-86		0.004							
GW-225	Mar-87	850	0.004	12.4	1	1	6		4	450
GW-225	Mar-87		0.005							
GW-225	Jun-87	880	0.003	14.2	<5	2	6		5	500
GW-225	Jun-87		0.002							
GW-225	Sep-87	840	0.005	28	<5	1	3		3	320
GW-225	Sep-87		0.005							
GW-225	Nov-87	900	0.004	32.6	<5	<5	6		5	440
GW-225	Nov-87		0.004							
GW-225	Apr-88	1287	<0.001	0	0.9	1	5		5	430
GW-225	Apr-88		<0.001							
GW-225	Jul-88	1050	<0.001	19	<5	<5	5		5	400
GW-225	Jul-88		<0.001							
GW-225	Jul-88	1063	<0.001	20	<5	<5	5		4	380
GW-225	Jul-88		<0.001							
GW-225	Sep-88	1114	0.002	51	<5	<5	5		5	440
GW-225	Sep-88		0.001							
GW-225	Nov-88	1010	0.003	46	2	<5	<5	<5	<5	11
GW-225	Nov-88		0.006							
GW-225	Nov-88	1014	<0.001	10	<5	<5	7	3	6	400
GW-225	Nov-88		<0.001							
GW-225	Mar-89	1034	<0.001	17	1	<5	5	3	5	400
GW-225	Mar-89		<0.001							
-----CAP-----										
GW-225	Jul-89	1109	<0.001	50	<5	<5	6	<5	5	360
GW-225	Jul-89		<0.001							
GW-225	Sep-89	807	0.002	0	<25	<5	<25	<25	5	360
GW-225	Sep-89		0.002							
GW-225	Dec-89	978	0.001	31	<25	<5	<25	<25	<25	360
GW-225	Dec-89		<0.001							
GW-225	Feb-90	933	<0.001	33.87	<5	<5	6	4	7	410
GW-225	Feb-90		<0.001							
GW-225	May-90	1353	0.002	30.18	<5	<5	7	<5	7	460
GW-225 D	May-90		0.001							
GW-225	May-90	1291	0.002	32.86						480
GW-225 D	May-90		0.002							
GW-225	Aug-90	1306	0.002	31.54	<5	<5	6	<5	7	300
GW-225	Aug-90		0.002							
GW-225	Nov-90	1148	0.002	43.6	<10	<10	6	<10	7	380
GW-225	Nov-90		0.002							
GW-225	Feb-91	951	0.002	42	<10	<10	5	<10	6	400
GW-225	Feb-91		0.002							
GW-225	May-91	1181	0.002	34	<10	<10	5	<10	5	350
GW-225	May-91		0.002							
GW-225	Aug-91	1192	0.002	30	<10	<10	4	<10	5	300

WELL	Date	Cond.	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-225	Aug-91		0.002							
GW-225	Nov-91	1041	0.002	23	<30	<30	3	<30	2	370
GW-225	Nov-91		0.002							
GW-226	Jan-86	806	0.009	50	<5	<5	<5		<5	130
GW-226	Jan-86		0.007							
GW-226	May-86		0.066	6.6	<5	<5	<5		<5	93
GW-226	May-86		0.004							
GW-226	Sep-86		0.008	6	<5	<5	<5		<5	72
GW-226	Sep-86		0.006							
GW-226	Dec-86	890	0.002	3	<10	<10	<10		<10	1
GW-226	Dec-86		0.006							
GW-226	Mar-87	830	0.007	4.8	<5	<5	<5		<5	32
GW-226	Mar-87		0.008							
GW-226	Jun-87	1020	0.004	12	2	<5	2		5	20
GW-226	Jun-87		0.005							
GW-226	Sep-87	850	0.006	37	2	<5	<5		<5	24
GW-226	Sep-87		0.008							
GW-226	Oct-87	800	0.008	35.3	<5	<5	<5		<5	21
GW-226	Oct-87		0.007							
GW-226	Apr-88	1100	0.034	19	2	<5	<5		1	11
GW-226	Apr-88		0.021							
GW-226	Jul-88	1122	0.004	30	<5	<5	<5		<5	12
GW-226	Jul-88		0.003							
GW-226	Sep-88	1143	0.007	13	2	<5	<5		1	21
GW-226	Sep-88		0.013							
GW-226	Nov-88	986	0.003	6	<5	<5	<5	14	<5	15
GW-226	Nov-88		0.006							
GW-226	Nov-88	1001	0.008	16	<5	<5	<5	14	<5	16
GW-226	Nov-88		0.006							
GW-226	Mar-89	1064	0.009	9	3	<5	<5	16	0.8	16
GW-226	Mar-89		0.005							
-----CAP-----										
GW-226	Jul-89	1066	0.01	14	2	<5	<5	16	<5	14
GW-226	Jul-89		0.012							
GW-226	Sep-89	994	0.017	28	<5	<5	<5	19	7	13
GW-226	Sep-89		0.013							
GW-226	Dec-89	1124	0.014	23	3	<5	<5	16	<5	13
GW-226	Dec-89		0.012							
GW-226	Feb-90	1056	0.014	13.41	<5	<5	<5	15	<5	22
GW-226	Feb-90		0.009							
GW-226	May-90	1240	0.04	16	2	<5	<5	16	<5	11
GW-226	May-90		0.038							
GW-226	Aug-90	1043	0.055	12	3	<5	<5	34	<5	6
GW-226	Aug-90		0.068							
GW-226	Oct-90	1225	0.092	49	3	<5	3	37	<5	5
GW-226	Oct-90		0.087							
GW-226	Feb-91	1183	0.088	41						
GW-226	Feb-91		0.089							
GW-226	May-91	1414	0.056	33						
GW-226	May-91		0.078							
GW-227	Jan-86	955	0.173	176	<5	<5	<5		<5	23
GW-227	Jan-86		0.163							
GW-227	May-86		0.07	105	<5	<5	<5		<5	34
GW-227	May-86		0.068							

WELL	Date	Cond.	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-227	Sep-86		0.086	116	<5	<5	<5		<5	18
GW-227	Sep-86		0.109							
GW-227	Dec-86	1050	0.247	1189	<10	<10	<10		2	18
GW-227	Dec-86		0.233							
GW-227	Mar-87	700	1.66	118.9	<5	<5	<5		<5	10
GW-227	Mar-87		0.184							
GW-227	Jun-87	890	0.152	110.6	<5	<5	<5		<5	35
GW-227	Jun-87		0.109							
GW-227	Sep-87	930	0.072	178	<5	<5	<5		2	82
GW-227	Sep-87		0.071							
GW-227	Oct-87	990	0.078	225.9	<5	<5	<5		2	67
GW-227	Oct-87		0.068							
GW-227	Apr-88	1252	0.205	123	<5	<5	<5		2	22
GW-227	Apr-88		0.135							
GW-227	Apr-88		0.187	368	<5	<5	<5		2	21
GW-227	Apr-88		0.204							
GW-227	Jul-88	1373	0.098	1154	<5	<5	<5		<5	68
GW-227	Jul-88		0.107							
GW-227	Sep-88	1259	0.187	189	<5	<5	<5		2	38
GW-227	Sep-88		0.203							
GW-227	Nov-88	1119	0.238	152	<5	<5	<5	5	1	29
GW-227	Nov-88		0.212							
GW-227	Nov-88	770	0.175	125	<5	<5	<5	<5	<5	19
GW-227	Nov-88		0.201							
GW-227	Mar-89	680	0.133	99	<5	<5	<5	4	1	13
GW-227	Mar-89		0.139							
CAP										
GW-227	Jul-89	857	0.124	82	<5	<5	<5	<5	<5	18
GW-227	Jul-89		0.143							
GW-227	Sep-89	815	0.09	201	<5	<5	<5	4	1	17
GW-227	Sep-89		0.102							
GW-227	Dec-89	736	0.093	82	<5	<5	<5	7	1	22
GW-227	Dec-89		0.089							
GW-227	Feb-90	644	0.03	29	<5	<5	<5	<5	<5	14
GW-227	Feb-90		0.034							
GW-227	May-90	712	0.059	45	<5	<5	<5	<5	<5	3
GW-227	May-90		0.065							
GW-227	Aug-90	667	0.075	52	<5	<5	<5	<5	<5	3
GW-227	Aug-90		0.085							
GW-227	Oct-90	909	0.196	150	<5	<5	<5	<5	<5	9
GW-227	Oct-90		0.183							
GW-227	Feb-91	747	0.118	80						
GW-227	Feb-91		0.119							
GW-227	May-91	927	0.085	65						
GW-227	May-91		0.1							
GW-227	Aug-91	736	0.034	50						
GW-227	Aug-91		0.035							
GW-227	Nov-91	852	0.024	52						
GW-227	Nov-91		0.024							
GW-228	Jan-86	514	0.01	85	<5	<5	<5		36	160
GW-228	Jan-86		0.002							
GW-228	May-86		0.003	19.3	<5	<5	<5		<5	82
GW-228	May-86		0.003							
GW-228	Sep-86		0.002	10	<5	<5	<5		<5	62
GW-228	Sep-86		0.003							

WELL	Date	Cond.	U (mg/L)	Beta (pCl/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-228	Dec-86	560	0.002	10	4	<10	<10		1	72
GW-228	Dec-86		0.002							
GW-228	Mar-87	610	0.007	7.8	2	<5	5		2	98
GW-228	Mar-87		0.007							
GW-228	Jun-87	620	0.005	11.1	5	<5	<5		1	89
GW-228	Jun-87		0.002							
GW-228	Sep-87	800	0.006	30	4	<5	<5		<5	75
GW-228	Sep-87		0.005							
GW-228	Nov-87	810	0.004	43	5	<5	<5		2	76
GW-228	Nov-87		0.002							
GW-228	Apr-88	1208	0.005	43	4	<5	<5		2	76
GW-228	Apr-88		0.003							
GW-228	Jul-88	1111	0.004	31	5	<5	<5		5	81
GW-228	Jul-88		0.004							
GW-228	Sep-88	1084	0.007	69	4	0.4	0.9		2	82
GW-228	Sep-88		0.007							
GW-228	Nov-88	907	0.002	18	3	<5	<5	<5	<5	68
GW-228	Nov-88		0.005							
GW-228	Mar-89	963	0.005	44	5	<5	<5	9	2	79
GW-228	Mar-89		0.007							
-----CAP-----										
GW-228	Jul-89	1135	0.006	26	4	<5	<5	9	2	77
GW-228	Jul-89		0.008							
GW-228	Sep-89	982	0.005	271	3	<5	<5	8	1	61
GW-228	Sep-89		0.003							
GW-228	Dec-89	972	0.009	44	<5	<5	<5	9	1	60
GW-228	Dec-89		0.008							
GW-228	Feb-90	921	0.005	48	4	<5	<5	12	1	78
GW-228	Feb-90		0.008							
GW-229	Jan-86	1048	0.015	19	8	<5	<5		<5	<5
GW-229	Jan-86		0.016							
GW-229	May-86		0.011	13.1	6	<5	<5		<5	<5
GW-229	May-86		0.013							
GW-229	Sep-86		0.011	8	20	<5	<5		<5	<5
GW-229	Sep-86		0.019							
GW-229	Dec-86	1180	0.021	717	9	<10	<10		<10	<10
GW-229	Dec-86		0.019							
GW-229	Mar-87	980	0.021	26.7	6	<5	1		24	4
GW-229	Mar-87		0.021							
GW-229	Jun-87	1130	0.025	17.2	8	<5	<5		<5	<5
GW-229	Jun-87		0.026							
GW-229	Aug-87	1130	0.026	5	9	<5	1		1	3
GW-229	Aug-87		0.025							
GW-229	Aug-87		0.024	<5	8	<5	5		<5	2
GW-229	Aug-87		0.029							
GW-229	Oct-87	1060	0.025	42	8	<5	3		<5	3
GW-229	Oct-87		0.031							
GW-229	Apr-88	1607	0.017	94	8	<5	1		<5	<5
GW-229	Apr-88		0.017							
GW-229	Jul-88	1406	0.021	258	8	<5	<5		<5	<5
GW-229	Jul-88		0.016							
GW-229	Sep-88	1249	0.042	20	9	<5	4		<5	2
GW-229	Sep-88		0.042							
GW-229	Nov-88	1147	0.014	15	9	0.5	3	0.7	0.4	2
GW-229	Nov-88		0.019							

WELL	Date	Cond.	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-229	Mar-89	1059	0.01	5	7	<5	<5	38	<5	<5
GW-229	Mar-89		0.014							
-----CAP-----										
GW-229	Jul-89	1274	0.017	17	5	<5	<5	27	<5	<5
GW-229	Jul-89		0.017							
GW-229	Sep-89	1222	0.021	24	5	<5	<5	29	<5	<5
GW-229	Sep-89		0.022							
GW-229	Dec-89	1295	0.015	18	5	<5	<5	29	<5	<5
GW-229	Dec-89		0.013							
GW-229	Feb-90	1003	0.013	10	4	<5	<5	20		<5
GW-229	Feb-90		0.01							
GW-306	Feb-88	800	<0.001	58						
GW-306	Feb-88		<0.001							
GW-306	May-88	1117	<0.001	72.58						
GW-306	May-88		0.007							
GW-306	May-88	1124	0.001	58.35						
GW-306	May-88		0.004							
GW-306	Aug-88	990	0.003	26						
GW-306	Aug-88		<0.001							
GW-306	Oct-88	1069	<0.001	43						
GW-306	Oct-88		<0.001							
GW-306	Oct-88	1025	<0.001	46						
GW-306	Oct-88		<0.001							
GW-306	May-89	771	0.019	57	<5	<5	<5	7	<5	65
GW-306	May-89		0.015							
-----CAP-----										
GW-306	Nov-89	699	0.003	27.7	2	<5	<5	12	1	89
GW-306	Nov-89		<0.001							
GW-306	Jan-91	592	<0.001	24	<5	<5	<5	9	<5	65
GW-306	Jan-91		<0.001							
GW-306	Apr-91	647	<0.001	12	<5	<5	<5	8	<5	71
GW-306	Apr-91		0.001							
GW-307	Feb-88	920	<0.001	74						
GW-307	Feb-88		<0.001							
GW-307	May-88	1187	0.007	21						
GW-307	May-88		0.004							
GW-307	Aug-88	1071	0.002	73						
GW-307	Aug-88		<0.001							
GW-307	Oct-88	1168	<0.001	45						
GW-307	Oct-88		<0.001							
-----CAP-----										
GW-307	Nov-89	891	0.003	47.02	4	<5	<5	18	4	72
GW-307	Nov-89		0.001							
GW-307	Jan-91	735	0.001	32	4	<5	<5	<5	1	37
GW-307	Jan-91		0.001							
GW-307	Apr-91	875	0.001	27	3	<5	<5	16	<5	54
GW-307	Apr-91		0.001							
GW-308	Feb-88	950	0.002	48						
GW-308	Feb-88		<0.001							
GW-308	May-88	940	0.002	0						
GW-308	May-88		0.004							
GW-308	May-89	1269	0.058	43	3	<5	<5	6	<5	22
GW-308	May-89		0.061							

WELL	Date	Cond.	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
CAP										
GW-308	Aug-89	1031	0.001	27.7	<5	<5	<5	6	0.9	23
GW-308	Aug-89		0.007							
GW-308	Nov-89	978	0.001	49.7	3	<5	<5	16	1	34
GW-308	Nov-89		<0.001							
GW-308	Jan-91	727	0.002	32	2	<5	<5	<5	1	54
GW-308	Jan-91		0.002							
GW-308	Apr-91	992	0.003	17	2	<5	<5	11	0.7	37
GW-308	Apr-91		0.003							
GW-309	Feb-88	1010	<0.001	34						
GW-309	Feb-88		<0.001							
GW-309	Feb-88		<0.001	45						
GW-309	Feb-88		<0.001							
GW-309	May-88	1389	0.017	2102						
GW-309	May-88		0.01							
GW-309	May-89	1283	0.003	50	<5	<5	<5	40	2	41
GW-309	May-89		0.003							
GW-309	May-89	1279	0.002	45	<5	<5	<5	37	2	39
GW-309	May-89		0.002							
CAP										
GW-309	Aug-89	1125	<0.001	43.9	<5	<5	<5	34	2	36
GW-309	Aug-89		<0.001							
GW-309	Aug-89	1082	<0.001	34	<5	<5	<5	38	2	37
GW-309	Aug-89		<0.001							
GW-309	Nov-89	1049	0.003	49.93	<5	<5	<5	20	2	21
GW-309	Nov-89		0.002							
GW-309	Jan-91	982	0.002	46	<5	<5	<5	8	<5	10
GW-309	Jan-91		0.002							
GW-309	Apr-91	1020	0.002	39	<5	<5	<5	8	1	11
GW-309	Apr-91		0.002							
GW-309	Aug-91	1120	0.002	57	<5	<5	<5	9	2	11
GW-309	Aug-91		0.002							
GW-309	Oct-91	895	0.001	21	<5	<5	<5	6	2	7
GW-309	Oct-91		0.001							
GW-310	Feb-88	631	<0.001	86						
GW-310	Feb-88		<0.001							
GW-310	May-88	974	0.007	51						
GW-310	May-88		0.004							
GW-310	Aug-88		0.002	196.87						
GW-310	Aug-88		0.001							
GW-310	Aug-88		0.001	181.1						
GW-310	Aug-88		0.003							
GW-310	Oct-88	747	<0.001	38						
GW-310	Oct-88		0.001							
GW-310	May-89	560	<0.001	28	<5	<5	<5	200	2	120
GW-310	May-89		<0.001							
CAP										
GW-310	Aug-89	682	0.001	27.7	<5	<5	<5	82	2	72
GW-310	Aug-89		<0.001							
GW-310	Nov-89	712	0.002	24.91	<5	<5	<5	35	3	44
GW-310	Nov-89		0.001							
GW-310	Nov-89	704	0.001	31.08	<5	<5	<5	36	3	46
GW-310	Nov-89		0.001							
GW-310	Jan-91	753	0.001	39	<5	<5	<5	20	3	52

WELL	Date	Cond.	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-310	Jan-91		0.001							
GW-310	Apr-91	673	0.001	23	<5	<5	<5	34	3	48
GW-310	Apr-91		0.001							
GW-311	Feb-88	266	<0.001	7						
GW-311	Feb-88		<0.001							
GW-311	May-88	491	0.01	54						
GW-311	May-88		0.003							
GW-311	Oct-88	439	<0.001	15						
GW-311	Oct-88		0.001							
GW-311	May-89	402	0.003	0	<5	<5	<5	<5	1	28
GW-311	May-89		0.005							
-----CAP-----										
GW-311	Aug-89	450	<0.001	0.2	<5	<5	<5	<5	<5	38
GW-311	Aug-89		<0.001							
GW-311	Nov-89	411	0.001	2.91	<5	<5	<5	<5	<5	36
GW-311	Nov-89		<0.001							
GW-311	Jan-91	371	0.001	0.21	<5	<5	<5	<5	<5	30
GW-311	Jan-91		0.001							
GW-311	Apr-91	353	0.001	4.34	<5	<5	<5	<5	<5	27
GW-311	Apr-91		0.001							
GW-312	Feb-88	2940	<0.001	127						
GW-312	Feb-88		<0.001							
GW-312	May-88	1809	<0.001	403						
GW-312	May-88		<0.001							
GW-312	Oct-88	4100	<0.001	122						
GW-312	Oct-88		<0.001							
GW-312	May-89	4660	0.002	24	<5	<5	<5	<5	<5	42
GW-312	May-89		<0.001							
-----CAP-----										
GW-312	Aug-89	2150	<0.001	29.2	<5	<5	<5	<5	<5	24
GW-312	Aug-89		<0.001							
GW-312	Nov-89	2320	<0.001	12.14	<5	<5	<5	<5	<5	68
GW-312	Nov-89		<0.001							
GW-312	Jan-91		<0.001							
GW-312	Jan-91		<0.001							
GW-312	Apr-91		<0.001							
GW-312	Apr-91		<0.001							
GW-363	Sep-88	406	<0.001	18	<5	<5	<5		<5	<5
GW-363	Sep-88		0.001							
GW-363	Nov-88	433	<0.001	8	<5	<5	<5	<5	0.4	<5
GW-363	Nov-88		<0.001							
GW-363	Mar-89	395	<0.001	5	<5	<5	<5	<5	<5	<5
GW-363	Mar-89		<0.001							
-----CAP-----										
GW-363	Jul-89	474	<0.001	5	<5	<5	<5	<5	<5	<5
GW-363	Jul-89		<0.001							
GW-363	Sep-89	451	<0.001	971	<5	<5	<5	<5	<5	<5
GW-363	Sep-89		0.002							
GW-363	Dec-89	475	<0.001	3	<5	<5	<5	<5	<5	<5
GW-363	Dec-89		<0.001							
GW-363	Feb-90	324	<0.001	12	<5	<5	<5	<5	<5	<5
GW-363	Feb-90		<0.001							

WELL	Date	Cond	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-364	Sep-88	528	0.002	19	6	<5	8		0.8	25
GW-364	Sep-88		0.001							
GW-364	Dec-88	516	<0.001	1.3	6	<5	9	7	1	26
GW-364	Dec-88		0.001							
GW-364	Mar-89	619	0.003	22	6	<5	6	6	<5	16
GW-364	Mar-89		<0.001							
-----CAP-----										
GW-364	Jul-89	597	0.001	6	5	<5	6	7	<5	19
GW-364	Jul-89		<0.001							
GW-364	Sep-89	571	0.002	8	6	<5	7	9	<5	18
GW-364	Sep-89		<0.001							
GW-364	Dec-89	666	<0.001	13	6	<5	6	10	<5	19
GW-364	Dec-89		0.001							
GW-364	Feb-90	401	<0.001	8	4	<5	3	6	<5	13
GW-364	Feb-90		<0.001							
GW-364	May-90	537	0.001	8	6	<5	6	10	<5	14
GW-364	May-90		0.001							
GW-364	Aug-90	634	<0.001	14	4	<5	4		<5	12
GW-364	Aug-90		0.001							
GW-364	Oct-90	611	0.001	14	6	<5	6		<5	15
GW-364	Oct-90		<0.001							
GW-364	Feb-91	605	0.001	8	5	<5	5	12	<5	15
GW-364	Feb-91		0.001							
GW-364	May-91	699	0.001	6	5	<5	5	10	<5	15
GW-364	May-91		0.001							
GW-364	Aug-91	564	0.002	15	3	<5	3	8	<5	12
GW-364	Aug-91		0.002							
GW-364	Oct-91	572	0.002	3	5	<5	5	12	<5	13
GW-364	Oct-91		0.001							
GW-365	Sep-88	754	<0.001	13	7	<5	27		2	84
GW-365	Sep-88		<0.001							
GW-365	Sep-88	769	<0.001	16	6	<5	23		2	82
GW-365	Sep-88		0.004							
GW-365	Nov-88	660	<0.001	6	7	<5	26	25	3	84
GW-365	Nov-88		<0.001							
GW-365	Mar-89	718	<0.001	0	8	<5	25	31	3	73
GW-365	Mar-89		<0.001							
GW-365	Mar-89	689	<0.001	0	8	<5	25	31	2	70
GW-365	Mar-89		<0.001							
-----CAP-----										
GW-365	Jul-89	803	<0.001	0	6	<5	19	31	2	62
GW-365	Jul-89		<0.001							
GW-365	Sep-89	783	<0.001	15	6	<5	20	28	3	63
GW-365	Sep-89		0.002							
GW-365	Dec-89	729	<0.001	6	6	<5	19	40	3	64
GW-365	Dec-89		<0.001							
GW-365	Jan-90	643	<0.001	2	7	<5	22	50	4	63
GW-365	Jan-90		<0.001							
GW-365	May-90	955	<0.001	5	3	<5	7	15	<5	15
GW-365	May-90		<0.001							
GW-365	Aug-90	713	<0.001	1	7	<5	21	69	<5	59
GW-365	Aug-90		<0.001							
GW-365	Nov-90	872	<0.001	8	4	<5	8	26	0.9	22
GW-365 D	Nov-90		<0.001							
GW-365	Nov-90	843	<0.001	8	4	<5	11	32	<5	30

WELL	Date	Cond.	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-365 D	Nov-90		<0.001							
GW-365	Feb-91	732	0.001	3.44	5	<5	12	52	<5	16
GW-365	Feb-91		0.001							
GW-365	May-91	983	0.001	3.49	4	<5	11	42	1	26
GW-365	May-91		0.001							
GW-365	Aug-91	829	0.001	6.07	5	<5	16	50	2	44
GW-365	Aug-91		0.001							
GW-365	Oct-91	861	0.001	6.1	5	<5	13	51	1	27
GW-365	Oct-91		0.001							
GW-366	Sep-88	283	0.004	21	<5	<5	<5		0.6	10
GW-366	Sep-88		<0.001							
GW-366	Nov-88	274	0.001	30	<5	<5	<5	<5	<5	13
GW-366	Nov-88		<0.001							
GW-366	Mar-89	403	0.002	22	<5	<5	<5	<5	<5	2
GW-366	Mar-89		<0.001							
-----CAP-----										
GW-366	Jul-89	419	0.001	0	<5	<5	<5	<5	<5	2
GW-366	Jul-89		<0.001							
GW-366	Sep-89	521	0.002	2	<5	<5	<5	<5	<5	2
GW-366	Sep-89		0.001							
GW-366	Dec-89	442	<0.001	0.32	<5	<5	<5	<5	<5	3
GW-366	Dec-89		<0.001							
GW-366	Jan-90	325	<0.001	4	<5	<5	<5	<5	<5	2
GW-366	Jan-90		<0.001							
GW-366	May-90	389	0.001	2	<5	<5	<5	<5	<5	1
GW-366	May-90		<0.001							
GW-366	Aug-90	511	0.001	13	<5	<5	<5	<5	<5	1
GW-366 D	Aug-90		0.001							
GW-366	Aug-90	493	<0.001	7	<5	<5	<5	<5	<5	1
GW-366 D	Aug-90		0.001							
GW-366	Oct-90	493	0.001	5	<5	<5	<5	<5	<5	2
GW-366	Oct-90		0.001							
GW-366	Feb-91	459	0.001	5	<5	<5	<5	<5	<5	<5
GW-366	Feb-91		0.001							
GW-366	May-91	558	0.001	6	<5	<5	<5	<5	<5	<5
GW-366	May-91		0.001							
GW-366	Aug-91	460	<0.001	4	<5	<5	<5	<5	<5	0.5
GW-366	Aug-91		0.001							
GW-366	May-91	514	0.001	5	<5	<5	<5	<5	<5	0.8
GW-366	May-91		<0.001							
GW-367	Sep-88	445	0.009	27	<5	<5	0.8		5	26
GW-367	Sep-88		0.008							
GW-367	Nov-88	395	0.007	27	<5	<5	<5	<5	<5	25
GW-367	Nov-88		0.009							
GW-367	Mar-89	407	0.006	21	<5	<5	<5	<5	<5	26
GW-367	Mar-89		0.007							
-----CAP-----										
GW-367	Jul-89	396	0.004	17	<5	<5	<5	<5	<5	19
GW-367	Jul-89		0.003							
GW-367	Sep-89	391	0.007	9	<5	<5	<5	<5	<5	20
GW-367	Sep-89		0.005							
GW-367	Dec-89	328	0.004	16	<5	<5	<5	<5	<5	18
GW-367	Dec-89		0.005							
GW-367	Jan-90	253	0.001	29	<5	<5	<5	<5	<5	23

WELL	Date	Cond	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-367	Jan-90		0.004							
GW-367	May-90	309	0.005	9	<5	<5	<5	<5	<5	19
GW-367	May-90		0.004							
GW-367	Aug-90	364	0.005	7	<5	<5	<5	<5	<5	17
GW-367	Aug-90		0.004							
GW-367	Oct-90	346	0.004	5	<5	<5	<5	<5	<5	16
GW-367	Oct-90		0.004							
GW-367	Feb-91	364	0.004	7	<5	<5	<5	<5	<5	19
GW-367	Feb-91		0.005							
GW-367	May-91	393	0.005	9	<5	<5	<5	<5	<5	17
GW-367	May-91		0.004							
GW-368	Sep-88	496	<0.001	27	<5	<5	0.7		0.6	130
GW-368	Sep-88		0.001							
GW-368	Nov-88	423	<0.001	6	<5	<5	0.8	<5	0.6	120
GW-368	Nov-88		<0.001							
GW-368	Mar-89	496	0.001	10	<5	<5	<5	<5	<5	110
GW-368	Mar-89		0.003							
-----CAP-----										
GW-368	Jul-89	396	<0.001	13	<5	<5	<5	<5	<5	92
GW-368	Jul-89		<0.001							
GW-368	Jul-89	384	<0.001	3	<5	<5	<5	<5	<5	93
GW-368	Jul-89		<0.001							
GW-368	Sep-89	593	0.001	10.7	<5	<5	<5	<5	<5	120
GW-368	Sep-89		0.001							
GW-368	Dec-89	390	<0.001	10	<5	<5	<5	<5	<5	120
GW-368	Dec-89		<0.001							
GW-368	Jan-90	506	0.001	9	<5	<5	<5	<5	1	120
GW-368 D	Jan-90		0.001							
GW-368	Jan-90	510	0.001	20	<5	<5	<5	<5	<5	120
GW-368 D	Jan-90		<0.001							
GW-369	Sep-88	626	<0.001	17	<5	<5	<5		0.6	120
GW-369	Sep-88		0.001							
GW-369	Nov-88	585	<0.001	29	<5	<5	<5	<5	0.9	100
GW-369	Nov-88		<0.001							
GW-369	Mar-89	643	<0.001	21	<5	<5	<5	<5	<5	99
GW-369	Mar-89		<0.001							
-----CAP-----										
GW-369	Jul-89	678	<0.001	11	<5	<5	<5	<5	<5	88
GW-369	Jul-89		<0.001							
GW-369	Sep-89	428	<0.001	26	<5	<5	<5	<5	<5	100
GW-369	Sep-89		<0.001							
GW-369	Dec-89	937	<0.001	20	<5	<5	<5	<5	<5	98
GW-369	Dec-89		<0.001							
GW-369	Jan-90	500	<0.001	13	<5	<5	<5	<5	<5	96
GW-369	Jan-90		<0.001							
GW-369	May-90	518	<0.001	14	<5	<5	<5	<5	<5	66
GW-369	May-90		<0.001							
GW-369	Aug-90	531	0.001	13	<5	<5	<5	<5	<5	46
GW-369	Aug-90		0.001							
GW-369	Nov-90	406	0.001	23	<5	<5	<5	26	<5	53
GW-369	Nov-90		<0.001							
GW-369	Feb-91	397	0.001	13						
GW-369	Feb-91		<0.001							
GW-369	May-91	526	<0.001	20						

WELL	Date	Cond	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
GW-369	May-91		0.001							
GW-376	Dec-88	407	<0.001	18						
GW-376	Dec-88		0.003							
GW-376	Dec-88	406	<0.001	6.8						
GW-376	Dec-88		0.001							
GW-376	Mar-89	400	<0.001	6						
GW-376	Mar-89		<0.001							
-----CAP-----										
GW-376	Dec-89	397	0.004	6	<5	5	<5	<5	<5	<5
GW-376	Dec-89		0.006							
GW-376	Dec-89	398	0.007	5	<5	<5	<5	<5	<5	<5
GW-376	Dec-89		0.007							
GW-376	Jan-90	472	<0.001	<1	<5	<5	<5	<5	2	1
GW-376 D	Jan-90		<0.001							
GW-376	Jan-90	480	<0.001	1.12	<5	<5	<5	<5	<5	1
GW-376 D	Jan-90		<0.001							
GW-520	Sep-88	2900	<0.001	150	<5	<5	<5		<5	2
GW-520	Sep-88		<0.001							
GW-520	Nov-88	2820	0.004	39	<5	<5	<5	<5	9	4
GW-520	Nov-88		<0.001							
GW-520	Mar-89		<0.001	10	<5	<5	<5	<5	1	2
GW-520	Mar-89		<0.001							
-----CAP-----										
GW-520	May-90	854	<0.001	11	<5	<5	<5	<5	<5	2
GW-520	May-90		<0.001							
GW-520	Aug-90	990	<0.001	6	<5	<5	<5	<5	<5	1
GW-520	Aug-90		<0.001							
GW-520	Oct-90	723	<0.001	10	<5	<5	<5	<5	<5	1
GW-520	Oct-90		<0.001							
GW-520	Mar-91	345	<0.001	9	<5	<5	<5	<5	<5	<5
GW-520	Mar-91		<0.001							
GW-520	May-91	743	<0.001	11	<5	<5	<5	<5	<5	<5
GW-520	May-91		<0.001							
GW-520	Aug-91	611	<0.001	6	<5	<5	<5	<5	<5	0.6
GW-520	Aug-91		<0.001							
GW-520	Oct-91	606	<0.001	7	<5	<5	<5	<5	<5	<5
GW-520	Oct-91		<0.001							
GW-531	Dec-88	90	0.007	9.3						
GW-531	Dec-88		<0.001							
GW-531	Mar-89	82	0.009	14						
GW-531	Mar-89		0.002							
GW-531	Mar-89	81	0.009	9						
GW-531	Mar-89		<0.001							
-----CAP-----										
GW-531	Dec-89	55	0.01	15.7	<5	<5	<5	<5	<5	<5
GW-531	Dec-89		0.01							
GW-531	Mar-91	54	0.004	16	<5	<5	<5	<5	<5	<5
GW-531	Mar-91		<0.001							
GW-531	Jun-91	64	0.003	7	<5	<5	<5	<5	<5	<5
GW-531	Jun-91		<0.001							
GW-532	Mar-89	312	0.004	2						
GW-532	Mar-89		0.013							

WELL	Date	Cond	U (mg/L)	Beta (pCi/L)	11DCA (ug/L)	12DCA (ug/L)	11DCE (ug/L)	12DCE (ug/L)	PCE (ug/L)	TCE (ug/L)
-----CAP-----										
GW-532	Nov-89	280	0.007	-3.69	<5	<5	<5	<5	<5	<5
GW-532	Nov-89		0.008							
GW-532	Mar-91	282	<0.001	3.38	<5	<5	<5	<5	<5	<5
GW-532	Mar-91		<0.001							
GW-532	Jun-91	325	<0.001	1.66	<5	<5	<5	<5	<5	<5
GW-532	Jun-91		<0.001							
-----CAP-----										
GW-535	Dec-89	351	<0.001	-3.7	<5	<5	<5	<5	<5	<5
GW-535	Dec-89		<0.001							
GW-535	Mar-91	443	<0.001	4.92						
GW-535	Mar-91		<0.001							
GW-535	Jun-91	455	<0.001	2.39						
GW-535	Jun-91		0.001							
-----CAP-----										
GW-536	Dec-89	337	0.003	0	<5	<5	<5	<5	<5	<5
GW-536	Dec-89		0.003							
-----CAP-----										
GW-537	Dec-89	4000	<0.001	79	<5	<5	<5	<5	<5	<5
GW-537	Dec-89		0.001							
GW-537	Mar-91	4590	0.001	158						
GW-537	Mar-91		0.001							
GW-537	Jun-91	4650	0.001	235						
GW-537	Jun-91		0.001							
GW-537	Aug-91	5630	0.001	404						
GW-537	Aug-91		0.001							
GW-537	Oct-91	4500	0.001	134						
GW-537	Oct-91		0.001							

Well	Date	U (mg/L)	11DCA (ug/L)	11DCE (ug/L)	PCE (ug/L)	111TCA (ug/L)
Selected Chemical Constituents for the CRSP						
GW-173	Feb-86	0.015	<5	<5	<5	<5
GW-173	Feb-86	0.01				
GW-173	Apr-86	0.001	<5	<5	7	<5
GW-173	Apr-86	0.002				
GW-173	Jul-86	0.003	<5	<5	4	5
GW-173	Jul-86	0.002				
GW-173	Oct-86	0.002	<5	<5	22	3
GW-173	Oct-86	0.002				
GW-173	Jan-87	0.001	<5	<5	15	2
GW-173	Jan-87	<0.001				
GW-173	Apr-87	0.003	<5	<5	12	5
GW-173	Apr-87	0.004				
GW-173	Aug-87	0.003	<5	<5	14	2
GW-173	Aug-87	<0.001				
GW-173	Oct-87	0.002	<5	<5	15	6
GW-173	Oct-87	0.005				
GW-173	Mar-88	0.009	<5	<5	15	1
GW-173	Mar-88	0.003				
GW-173	Jun-88	0.003	<5	<5	17	2
GW-173	Jun-88	0.003				
GW-173	Aug-88	0.002	<5	<5	15	2
GW-173	Aug-88	0.002				
GW-173	Oct-88	<0.001	<5	<5	19	2
GW-173	Oct-88	<0.001				
GW-173	Jan-89	0.001	<5	<5	20	2
GW-173	Jan-89	<0.001				
GW-173	Apr-89	0.001	<5	<5	15	1 CAP
GW-173	Apr-89	0.001				
GW-173	Aug-89	<0.001	<5	<5	14	<5
GW-173	Aug-89	<0.001				
GW-173	Oct-89	<0.001	<5	<5	16	<5
GW-173	Oct-89	<0.001				
GW-173	Feb-90				13	
GW-173	Feb-90	<0.001				
GW-173	May-90				11	
GW-173	May-90	0.003				
GW-173	Jul-90				13	
GW-173	Jul-90	<0.001				
GW-173	Oct-90				14	
GW-173	Oct-90	<0.001				
GW-173	2/1/91					
GW-173	2/1/91	<0.001			11	
GW-173	5/3/91					
GW-173	5/3/91	<0.001			12	
GW-173	8/6/91					
GW-173	8/6/91	<0.001			11	
GW-173	10/10/91					
GW-173	10/10/91	<0.001			13	
GW-174	02/04/86	0.008	<5	<5	20	<5
GW-174	02/04/86	0.004				
GW-174	01/08/87	0.002	<5	1	41	8
GW-174	01/08/87	0.001				
GW-174	04/02/87	0.003	<5	<5	59	19

Well	Date	U (mg/L)	11DCA (ug/L)	11DCE (ug/L)	PCE (ug/L)	111TCA (ug/L)
GW-174	04/02/87	0.002				
GW-174	08/07/87	0.004	1	1	27	5
GW-174	08/07/87	0.001				
GW-174	10/08/87	0.001	<5	<5	<5	1
GW-174	10/08/87	0.001				
GW-174	03/12/88	0.001	<5	<5	35	<5
GW-174	03/12/88	0.001				
GW-174	06/07/88	0.003	<5	<5	39	4
GW-174	06/07/88	0.005				
GW-174	08/05/88	0.001	1	1	41	6
GW-174	08/05/88	0.002				
GW-174	10/24/88	0.001	1	0.9	49	6
GW-174	10/24/88	0.001				
GW-174	01/05/89	0.001	1	<5	42	7
GW-174	01/05/89	0.001				
GW-174	04/03/89	0.005	<5	<5	33	4 CAP
GW-174	04/03/89	0.001				
GW-174	08/11/89	0.001	1	<5	37	4
GW-174	08/11/89	0.001				
GW-174	10/10/89	0.001	1	1	40	4
GW-174	10/10/89	0.001				
GW-174	1/27/90				45	6
GW-174	1/27/90	<0.001				
GW-174	5/23/90				32	3
GW-174	5/23/90	<0.001				
GW-174	7/25/90				34	3
GW-174	7/25/90	0.001				
GW-174	10/27/90				44	4
GW-174	10/27/90	0.001				
GW-174	2/1/91				39	3
GW-174	2/1/91	0.001				
GW-174	5/3/91				35	3
GW-174	5/3/91	0.001				
GW-174	8/6/91				36	3
GW-174	8/6/91	0.001				
GW-174	10/11/91				34	2
GW-174	10/11/91	<0.001				
GW-175	08/17/88	0.005	<5	<5	8	3
GW-175	08/17/88	0.005				
GW-175	10/24/88	0.003	<5	<5	10	5
GW-175	10/24/88	0.006				
GW-175	01/06/89	0.002	<5	<5	6	2
GW-175	01/06/89	0.001				
GW-175	04/06/89	0.001	<5	<5	69	4 CAP
GW-175	04/06/89	0.001				
GW-175	08/14/89	0.001	<5	<5	16	5
GW-175	08/14/89	0.001				
GW-175	10/20/89	0.001	<5	<5	17	5
GW-175	10/20/89	0.002				
GW-175	3/5/90			<5	32	10
GW-175	3/5/90					
GW-175	5/22/90			2	35	12
GW-175	5/22/90					8
GW-175	7/24/90			<5	27	
GW-175	7/24/90					4

Well	Date	U (mg/L)	11DCA (ug/L)	11DCE (ug/L)	PCE (ug/L)	111TCA (ug/L)
GW-175	10/26/90			<5	12	
GW-175	10/26/90					
GW-175	1/31/91				23	8
GW-175	1/31/91	<0.001				
GW-175	5/1/91				5	5
GW-175	5/1/91	0.001				
GW-175	8/8/91				41	11
GW-175	8/8/91	0.002				
GW-175	10/13/91				25	6
GW-175	10/13/91	0.001				
GW-176	02/04/86	0.01	22	<5	<5	260
GW-176	02/04/86	0.002				
GW-176	04/14/86	0.003	26	11	<5	270
GW-176	04/14/86	0.002				
GW-176	04/14/86	0.005	31	12	5	330
GW-176	04/14/86	0.004				
GW-176	07/29/86	0.001	16	10	7	200
GW-176	07/29/86	0.001				
GW-176	10/15/86	0.001	8	6	11	115
GW-176	10/15/86	0.001				
GW-176	10/15/86	0.001	6	5	10	112
GW-176	10/15/86	0.001				
GW-176	01/07/87	0.001	8	5	10	99
GW-176	01/07/87	0.001				
GW-176	04/06/87	0.002	50	21	12	280
GW-176	04/06/87	0.003				
GW-176	08/07/87	0.001	22	12	7	160
GW-176	08/07/87	0.001				
GW-176	10/06/87	0.008	13	9	8	100
GW-176	10/06/87	0.005				
GW-176	03/11/88	0.001	83	30	14	390
GW-176	03/11/88	0.001				
GW-176	06/07/88	0.001	26	12	10	130
GW-176	06/07/88	0.006				
GW-176	08/11/88	0.001	16	10	10	130
GW-176	08/11/88	0.001				
GW-176	08/11/88	0.001	16	9	9	130
GW-176	08/11/88	0.001				
GW-176	10/25/88	0.001	12	8	8	100
GW-176	10/25/88	0.001				
GW-176	01/06/89	0.001	64	14	11	150
GW-176	01/06/89	0.001				
GW-176	04/03/89	0.001	170	39	15	350 CAP
GW-176	04/03/89	0.003				
GW-176	08/11/89	0.001	25	10	8	110
GW-176	08/11/89	0.001				
GW-176	10/12/89	0.001	32	11	8	110
GW-176	10/12/89	0.001				
GW-176	1/27/90		93	32	6	220
GW-176	1/27/90	<0.001				
GW-176	5/24/90		57	19	10	150
GW-176	5/24/90	<0.001				
GW-176	7/28/90		27	16	5	100
GW-176	7/28/90	<0.001				
GW-176	10/29/90		45	15	2	120

Well	Date	U (mg/L)	11DCA (ug/L)	11DCE (ug/L)	PCE (ug/L)	111TCA (ug/L)
GW-176	10/29/90	<0.001				
GW-176	2/4/91		65	21	7	110
GW-176	2/4/91	<0.001				
GW-176	5/4/91		61	24	7	150
GW-176	5/4/91	<0.001				
GW-176	8/9/91		25	13	6	90
GW-176	8/9/91	0.001				
GW-176	14-Oct		20	12	5	63
GW-176	14-Oct	<0.001				
GW-177	02/04/86	0.004	<5	<5	<5	<5
GW-177	02/04/86	0.001				
GW-177	04/17/86	0.003	<5	<5	<5	6
GW-177	04/17/86	0.001				
GW-177	07/29/86	<0.001	<5	<5	<5	12
GW-177	07/29/86	0.003				
GW-177	10/10/86	0.007	<5	<5	6	17
GW-177	10/10/86	0.007				
GW-177	01/07/87	0.002	3	1	<5	38
GW-177	01/07/87	<0.001				
GW-177	04/02/87	0.007	4	<5	1	38
GW-177	04/02/87	0.008				
GW-177	08/07/87	0.005	9	<5	<5	36
GW-177	08/07/87	0.003				
GW-177	10/06/87	0.004	4	<5	3	24
GW-177	10/06/87	0.004				
GW-177	03/12/88	<0.001	14	2	<5	57
GW-177	03/12/88	0.002				
GW-177	06/06/88	0.049	19	4	3	79
GW-177	06/06/88	0.005				
GW-177	08/11/88	0.004	19	3	1	79
GW-177	08/11/88	0.002				
GW-177	10/24/88	0.01	27	3	1	82
GW-177	10/24/88	0.007				
GW-177	01/04/89	0.001	32	5	1	96
GW-177	01/04/89	0.001				
GW-177	04/04/89	0.001	21	2	0.8	49 CAP
GW-177	04/04/89	0.003				
GW-177	08/31/89	<0.001	8	<5	5	25
GW-177	08/31/89	<0.001				
GW-177	10/11/89	0.004	7	1	<5	14
GW-177	10/11/89	0.002				
GW-177	2/27/90		5	<5	<5	13
GW-177	2/27/90	0.002				
GW-177	5/23/90		4	<5	<5	6
GW-177	5/23/90	0.002				
GW-177	7/26/90		4	<5	<5	12
GW-177	7/26/90	0.002				
GW-177	10/27/90		8	1	<5	20
GW-177	10/27/90	0.001				
GW-177	2/2/91		7	<5	<5	12
GW-177	2/2/91	0.002				
GW-177	5/3/91		5	1	<5	10
GW-177	5/3/91	0.002				
GW-177	8/8/91		8	2	<5	19
GW-177	8/8/91	0.002				

Well	Date	U (mg/L)	11DCA (ug/L)	11DCE (ug/L)	PCE (ug/L)	111TCA (ug/L)
GW-177	10/13/91		11	3	1	27
GW-177	10/13/91	0.001				
GW-178	03/12/88	0.001	<5	<5	<5	23
GW-178	03/12/88	0.001				
GW-178	06/06/88	0.001	2	<5	<5	27
GW-178	06/06/88	0.001				
GW-178	09/15/88	0.001	4	<5	<5	37
GW-178	09/15/88	0.001				
GW-178	10/24/88	0.001	4	2	4	44
GW-178	10/24/88	0.001				
GW-178	01/06/89	0.001	5	2	<5	39
GW-178	01/06/89	0.001				
GW-178	04/04/89	0.001	6	2	0.8	38 CAP
GW-178	04/04/89	0.001				
GW-178	08/11/89	0.001	5	2	<5	33
GW-178	08/11/89	0.001				
GW-178	10/06/89	0.001	6	2	0.9	32
GW-178	10/06/89	0.003				
GW-178	1/28/90		6	<5	0.8	33
GW-178	1/28/90	<0.001				
GW-178	5/17/90		<5	<5	<5	27
GW-178	5/17/90	<0.001				
GW-178	7/21/90		<5	<5	<5	6
GW-178	7/21/90	<0.001				
GW-178	10/22/90		3	<5	<5	16
GW-178	10/22/90	<0.001				
GW-178	1/15/91		4	<5	<5	23
GW-178	1/15/91	<0.001				
GW-178	4/22/91		6	2	2	25
GW-178	4/22/91	<0.001				
GW-178	8/8/91		6	2	<5	34
GW-178	8/8/91	<0.001				
GW-178	10/13/91		5	2	<5	27
GW-178	10/13/91	<0.001				
GW-179	02/10/86	0.008	160	54	42	790
GW-179	02/10/86	<0.001				
GW-179	04/23/86	0.009	190	77	8	1100
GW-179	04/23/86	0.008				
GW-179	08/05/86	0.002	240	52	11	790
GW-179	08/05/86	0.001				
GW-179	10/20/86	0.004	240	19	4	500
GW-179	10/20/86	0.004				
GW-179	01/09/87	0.002	230	64	11	820
GW-179	01/09/87	<0.001				
GW-179	04/06/87	0.007	200	7	15	700
GW-179	04/06/87	0.004				
GW-179	08/07/87	0.004	207	75	<5	710
GW-179	08/07/87	0.002				
GW-179	10/07/87	0.002	130	27	6	330
GW-179	10/07/87	0.002				
GW-179	03/14/88	0.002	300	71	12	990
GW-179	03/14/88	<0.001				
GW-179	06/10/88	0.003	250	62	11	700
GW-179	06/10/88	0.001				

Well	Date	U (mg/L)	11DCA (ug/L)	11DCE (ug/L)	PCE (ug/L)	111TCA (ug/L)
GW-179	08/11/88	0.001	240	62	10	880
GW-179	08/11/88	0.003				
GW-179	04/20/89	<0.001	200	75	12	550 CAP
GW-179	04/20/89	<0.001				
GW-179	3/21/90		120	59	<25	290
GW-179	3/21/90	<0.001				
GW-179	6/9/90		120	51	5	280
GW-179	6/9/90	0.001				
GW-179	9/24/90		110	40	4	210
GW-179	9/24/90	<0.001				
GW-179	12/11/90		110	52	6	310
GW-179	12/11/90	<0.001				
GW-179	2/8/91		89	44	5	220
GW-179	2/8/91	<0.001				
GW-179	5/8/91		99	43	4	230
GW-179	5/8/91	<0.001				
GW-179	8/12/91		90	31	3	170
GW-179	8/12/91	0.001				
GW-179	10/17/91		75	36	4	170
GW-179	10/17/91	<0.001				
GW-180	03/11/88	0.001	20	<5	160	8
GW-180	03/11/88	0.001				
GW-180	06/07/88	0.001	16	<5	160	7
GW-180	06/07/88	0.001				
GW-180	06/07/88	0.011	26	18	180	8
GW-180	06/07/88	0.001				
GW-180	09/15/88	0.001	15	<5	150	11
GW-180	09/15/88	0.001				
GW-180	10/24/88	0.001	8	1	180	10
GW-180	10/24/88	0.001				
GW-180	01/05/89	0.001	19	<5	96	6
GW-180	01/05/89	0.001				
GW-180	04/04/89	0.001	13	1	140	7 CAP
GW-180	04/04/89	0.001				
GW-180	08/10/89	0.001	7	<5	120	5
GW-180	08/10/89	0.001				
GW-180	10/11/89	0.004	6	<5	110	6
GW-180	10/11/89	0.001				
GW-180	3/5/90		5	<5	100	4
GW-180	3/5/90	<0.001				
GW-180	5/24/90		4	<5	67	3
GW-180	5/24/90	<0.001				
GW-180	7/26/90		3	<5	89	4
GW-180	7/26/90	<0.001				
GW-180	10/29/90		2	<5	73	3
GW-180	10/29/90	<0.001				
GW-180	2/2/91		<5	<5	61	2
GW-180	2/2/91	<0.001				
GW-180	5/4/91		4	<5	73	3
GW-180	5/4/91	<0.001				
GW-180	8/9/91		5	3	68	3
GW-180	8/9/91	<0.001				
GW-180	10/14/91		2	<5	58	2
GW-180	10/14/91	<0.001				

Well	Date	U (mg/L)	11DCA (ug/L)	11DCE (ug/L)	PCE (ug/L)	111TCA (ug/L)
GW-181	08/16/88	0.002	1	<5	<5	3
GW-181	08/16/88	0.003				
GW-181	10/25/88	0.001	2	<5	<5	4
GW-181	10/25/88	0.001				
GW-181	01/06/89	0.001	2	<5	<5	5
GW-181	01/06/89	0.001				
GW-181	01/06/89	0.005	2	<5	<5	4
GW-181	01/06/89	0.001				
GW-181	04/04/89	0.001	<5	<5	<5	<5 CAP
GW-181	04/04/89	0.001				
GW-181	08/09/89	0.001	<5	<5	<5	<5
GW-181	08/09/89	0.001				
GW-181	08/09/89	0.001	<5	<5	<5	<5
GW-181	08/09/89	0.001				
GW-181	10/05/89	0.001	<5	<5	<5	<5
GW-181	10/05/89	0.001				
GW-181	10/05/89	0.001	<5	<5	<5	<5
GW-181	10/05/89	0.001				
GW-181	3/2/90					
GW-181	3/2/90	<0.001				
GW-181	5/21/90					
GW-181	5/21/90	<0.001				
GW-181	7/23/90					
GW-181	7/23/90	<0.001				
GW-181	10/25/90					
GW-181	10/25/90	<0.001				
GW-181	1/29/91					
GW-181	1/29/91	<0.001				
GW-181	4/30/91					
GW-181	4/30/91	<0.001				
GW-181	8/5/91					
GW-181	8/5/91	<0.001				
GW-181	10/8/91					
GW-181	10/8/91	<0.001				
GW-322	03/12/88	0.001	30	87	4	670
GW-322	03/12/88	0.001				
GW-322	06/07/88	0.003	34	95	6	620
GW-322	06/07/88	0.001				
GW-322	08/05/88	0.003	37	93	7	790
GW-322	08/05/88	0.003				
GW-322	08/05/88	0.002	34	82	7	760
GW-322	08/05/88	0.002				
GW-322	10/24/88	0.001	34	94	6	670
GW-322	10/24/88	0.001				
GW-322	01/05/89	0.001	41	95	5	630
GW-322	01/05/89	0.004				
GW-322	04/03/89	0.001	40	98	5	530
GW-322	04/03/89	0.001				
GW-322	04/03/89	0.001	39	100	6	560 CAP
GW-322	04/03/89	0.001				
GW-322	08/11/89	0.001	35	80	5	530
GW-322	08/11/89	0.001				
GW-322	10/11/89	0.001	45	90	<25	550
GW-322	10/11/89	0.001				
GW-322	1/28/90		53	98	6	590

Well	Date	U (mg/L)	11DCA (ug/L)	11DCE (ug/L)	PCE (ug/L)	111TCA (ug/L)
GW-322	1/28/90	<0.001				
GW-322	5/25/90		54	110	6	560
GW-322	5/25/90	<0.001				
GW-322	7/26/90		63	110	7	590
GW-322	7/26/90	<0.001				
GW-322	10/29/90		59	96	<25	520
GW-322	10/29/90	<0.001				
GW-322	2/4/91		62	130	8	480
GW-322	2/4/91	<0.001				
GW-322	5/4/91		60	110	<25	480
GW-322	5/4/91	<0.001				
GW-322	8/13/91		78	110	7	460
GW-322	8/13/91	<0.001				
GW-322	10/21/91		64	100	6	470
GW-322	10/21/91	<0.001				
GW-511	08/16/88	0.002	<5	<5	<5	3
GW-511	08/16/88	0.001				
GW-511	10/25/88	0.001	1	<5	<5	3
GW-511	10/25/88	0.001				
GW-511	01/09/89	0.001	1	<5	<5	4
GW-511	01/09/89	0.001				
GW-511	04/04/89	0.001	<5	<5	<5	1 CAP
GW-511	04/04/89	0.001				
GW-511	08/10/89	0.001	<5	<5	<5	<5
GW-511	08/10/89	0.001				
GW-511	10/06/89	0.001	<5	<5	<5	<5
GW-511	10/06/89	0.001				
GW-511	2/28/90					
GW-511	2/28/90					
GW-511	5/18/90					
GW-511	5/18/90					
GW-511	7/21/90					
GW-511	7/21/90					
GW-511	10/24/90					
GW-511	10/24/90					
GW-511	1/29/91					
GW-511	1/29/91	<0.001				
GW-511	4/30/91					
GW-511	4/30/91	0.001				
GW-511	8/5/91					
GW-511	8/5/91	<0.001				
GW-511	10/8/91					
GW-511	10/8/91	<0.001				
GW-512	12/06/88	0.001				
GW-512	12/06/88	0.001				
GW-512	01/28/89	0.001				
GW-512	01/28/89	0.001				
GW-512	06/05/89	0.002	<5	<5	<5	<5 CAP
GW-512	06/05/89	0.001				
GW-512	08/22/89	0.001	<5	<5	<5	<5
GW-512	08/22/89	0.001				
GW-512	11/04/89	0.001	<5	<5	<5	<5
GW-512	11/04/89	0.001				
GW-512	3/19/91					

Well	Date	U (mg/L)	11DCA (ug/L)	11DCE (ug/L)	PCE (ug/L)	111TCA (ug/L)
GW-512	3/19/91	<0.001				
GW-512	6/16/91					
GW-512	6/16/91	<0.001				
GW-512	9/6/91					
GW-512	9/6/91	<0.001				
GW-512	11/16/91					
GW-512	11/16/91	<0.001				
GW-513	12/03/88	0.001				
GW-513	12/03/88	0.001				
GW-513	12/03/88	0.001				
GW-513	12/03/88	0.001				
GW-513	01/28/89	0.001				
GW-513	01/28/89	0.001				
GW-513	01/28/89	0.001				
GW-513	01/28/89	0.001				
GW-513	06/05/89	0.001	<5	<5	<5	<5 CAP
GW-513	06/05/89	0.002				
GW-513	08/22/89	0.001	<5	<5	<5	<5
GW-513	08/22/89	0.001				
GW-513	11/04/89	0.001	<5	<5	<5	<5
GW-513	11/04/89	0.001				
GW-513	11/04/89	0.001	<5	<5	<5	<5
GW-513	11/04/89	0.001				
GW-513	3/19/91					
GW-513	3/19/91	<0.001				
GW-513	6/16/91					
GW-513	6/16/91	<0.001				
GW-513	9/6/91					
GW-513	9/6/91	<0.001				
GW-513	11/16/91					
GW-513	11/16/91	<0.001				
GW-514	12/08/88	0.005				
GW-514	12/08/88	0.001				
GW-514	02/11/89	0.001				
GW-514	02/11/89	0.001				
GW-514	06/20/89	0.001	<5	<5	<5	4 CAP
GW-514	06/20/89	0.001				
GW-514	06/20/89	0.001	<5	<5	<5	3
GW-514	06/20/89	0.001				
GW-514	08/22/89	0.001	<5	<5	<5	3
GW-514	08/22/89	0.001				
GW-514	08/22/89	0.001	<5	<5	<5	3
GW-514	08/22/89	0.001				
GW-514	11/07/89	0.001	<5	<5	<5	2
GW-514	11/07/89	0.001				
GW-514	3/20/91					
GW-514	3/20/91	<0.001				
GW-514	6/17/91					
GW-514	6/17/91	<0.001				
GW-514	9/7/91					
GW-514	9/7/91	<0.001				
GW-514	11/16/91					
GW-514	11/16/91	<0.001				

APPENDIX C.2

Selected Bar Graphs of Chemical Species in Wells Located
Near New Hope Pond, the Oil Landfarm Waste
Management Area, and the Chestnut Ridge
Security Pits

Note: Chemical Data compiled from a Y-12 data base (B.K. Harrington, 1992) and 1991 and 1992 groundwater quality assessment reports (HSW 1991a, 1991b, 1991c, 1992a, 1992b, 1992c). The symbol "***" on a plot indicates that no data were collected in the indicated time interval.

APPENDIX C.2

Selected Bar Graphs of Chemical Species in Wells Located
Near New Hope Pond

Note: Chemical Data compiled from a Y-12 data base (B.K. Harrington, 1992) and 1991 and 1992 groundwater quality assessment reports (HSW 1991a, 1991b, 1991c, 1992a, 1992b, 1992c). The symbol "***" on a plot indicates that no data were collected in the indicated time interval.

Lead Concentrations for GW-148 and GW-149 Cluster

Lead Concentrations for GW-152 and GW-153 Cluster

Lead Concentrations for GW-380 and GW-381 Cluster

Total Uranium for GW-148 and GW-149 Cluster

Total Uranium for GW-151 and GW-220 Cluster

Total Uranium for GW-380 and GW-381 Cluster

Tetrachloroethene for GW-151 (TD=96.5 ft)

Tetrachloroethene for GW-152 and GW-153 Cluster

Tetrachloroethene for GW-154 (TD=11.2 ft)

Tetrachloroethene for GW-223 (TD=90.5 ft)

Tetrachloroethene for GW-383 (TD=23.6 ft)

Carbontetrachloride for GW-151 (TD=96.5)

Carbontetrachloride for GW-152 and GW-153 Cluster

Carbontetrachloride for GW-223 (TD=90.5 ft)

Carbontetrachloride for GW-381 (TD=49.3 ft)

APPENDIX C.2

Selected Bar Graphs of Chemical Species in Wells Located

Near the Oil Landfarm Waste

Management Area

Note: Chemical Data compiled from a Y-12 data base (B.K. Harrington, 1992) and 1991 and 1992 groundwater quality assessment reports (HSW 1991a, 1991b, 1991c, 1992a, 1992b, 1992c). The symbol "***" on a plot indicates that no data were collected in the indicated time interval.

Total Beta Activity for GW-007 (TD=16.5 ft)

Total Beta Activity for GW-010 (TD=15 ft)

Total Beta Activity for GW-063 (TD=35 ft)

Total Beta Activity for GW-064 (TD=57 ft)

Total Beta Activity for GW-067 (TD=16.5 ft)

Total Beta Activity for GW-073 (TD=81 ft)

Total Beta Activity for GW-084 (TD=34 ft)

Total Beta Activity for GW-087 (TD=19 ft)

Total Beta Activity for GW-097, GW-098, and GW-120 Cluster

Total Beta Activity for GW-225 and GW-226 Cluster

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Total Beta Activity for GW-227 and GW-228 Cluster

Total Beta Activity for GW-306 (TD=58.5 ft)

Total Beta Activity for GW-363 (TD=75 ft)

Total Beta Activity for GW-366, GW-367, and GW-520 Cluster

Total Beta Activity for GW-368 and GW-369 Cluster

Specific Conductance (umhos/cm) for GW-010 (TD=15 ft)

Specific Conductance for GW-063 (TD=35 ft)

Specific Conductance (umhos/cm) for GW-085 (TD=62 ft)

Specific Conductance (umhos/cm) for GW-097, GW-098, and GW-120 Cluster

Specific Conductance (umhos/cm) for GW-225 and GW-226 Cluster

Specific Conductance (umhos/cm) for GW-229 (TD=55 ft)

Specific Conductance (umhos/cm) for GW-306 (TD=58.5 ft)

Specific Conductance (umhos/cm) for GW-364 and GW-365 Cluster

Specific Conductance (umhos/cm) for GW-366, GW-367, and GW-520 Cluster

1,1-dichloroethane for GW-007 (TD=16.5 ft)

'1,1 dichloroethane for GW-097 and GW-098 Cluster

1,1-dichloroethane for GW-229 (TD=55 ft)

1,1-dichloroethene for GW-087 (TD=19 ft)

'1,2-dichloroethene for GW-064 (TD=57 ft)

1,2 dichloroethene for GW-364 and GW-365 Cluster

Tetrachloroethene for GW-010 (TD=15 ft)

Tetrachloroethene for GW-087 (TD=19 ft)

Trichloroethene for GW-007 (TD=16.5 ft)

Trichloroethene for GW-063 (TD=35 ft)

Trichloroethene for GW-087 (TD=19 ft)

Trichloroethene for GW-227 and GW-228 Cluster

Trichloroethene for GW-366, GW-367, and GW-520 Cluster

Trichloroethene for GW-368 and GW-369 Cluster

Total Uranium Content for GW-087 (TD=19 ft)

Total Uranium for GW-227 and GW-228 Cluster

APPENDIX C.2

Selected Bar Graphs of Chemical Species in Wells Located

Near the Chestnut Ridge

Security Pits

Note: Chemical Data compiled from a Y-12 data base (B.K. Harrington, 1992) and 1991 and 1992 groundwater quality assessment reports (HSW 1991a, 1991b, 1991c, 1992a, 1992b, 1992c). The symbol "***" on a plot indicates that no data were collected in the indicated time interval.

Tetrachloroethene for GW-173 (TD=165 ft)

Tetrachloroethene for GW-174 (TD=145 ft)

Tetrachloroethene for GW-176 (TD=145 ft)

Tetrachloroethene for GW-180 (TD=144 ft)

1,1,1 Trichloroethane for GW-174 (TD=145 ft)

1,1,1 Trichloroethane for GW-176 (TD=145 ft)

1,1,1 Trichloroethane for GW-177 (TD=145 ft)

'1,1,1 Trichloroethane for GW-178 (TD=133 ft)

1,1,1 Trichloroethane for GW-178 (TD=133 ft)

1,1-dichloroethane for GW-176 (TD=145 ft)

1,1-dichloroethane for GW-177 (TD=145)

1,1-dichloroethane for GW-179 (TD=117 ft)

'1,1-dichloroethane for GW-180 (TD=144 ft)

1,1-dichloroethane for GW-322 (TD=193 ft)

1,1-dichloroethene for GW-176 (TD=145 ft)

'1,1-dichloroethene for GW-179 (TD=117 ft)

'1,1-dichloroethene for GW-322 (TD=193 ft)

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