NOTICE

All drawings located at the end of the document.

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FINAL

1999 ANNUAL ROCKY FLATS CLEANUP AGREEMENT

(RFCA)

GROUNDWATER MONITORING REPORT

for the

Rocky Flats Environmental Technology Site

November 30, 2000

RMRS Rocky Mountain Remediation Services, L.L.C.
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EXECUTIVE SUMMARY

This report, which is required annually by the Rocky Flats Cleanup Agreement (RFCA, 1996), summarizes the groundwater compliance activities and results at the Rocky Flats Environmental Technology Site (RFETS) for calendar year (CY) 1999. The report is presented in one volume that contains text, tables, Figures, plates and appendices. This report is intended as a stand-alone volume where all groundwater issues at RFETS for CY 1999 can be referenced and reviewed.

Section 1 serves as an introduction to the report and summarizes the Site environmental history and hydrogeologic setting. Section 2, Data Analysis, discusses the groundwater quality data collected in CY99 with respect to exceedances of RFCA action levels. Section 3 presents groundwater flow conditions during CY99 and compares them to groundwater flow conditions documented during CY96. Hydrologic conditions during calendar year 1996 are considered to represent a sitewide baseline to be used in assessing annual changes to the groundwater flow system in the remaining years of plant closure and post-closure monitoring. Section 3 also contains a discussion of the real time groundwater monitoring network. Section 4 discusses performance monitoring of RFETS groundwater remediation systems. Section 5 presents a summary of decontamination and decommissioning (D&D) activities, with respect to groundwater, that have taken place during 1999. Section 6 presents a discussion of the Present Sanitary Landfill. Plume degradation monitoring of the Carbon Tetrachloride Plume (IHSS 118.1), the 903 Pad/Ryan's Pit Plume, and the PU&D Yard Plume is discussed in Section 7. Section 8, Groundwater Evaluations, discusses the evaluation activities that are in progress for areas of the Site having reportable concentration values or where it is known that contaminant plumes have reached surface water. Section 9 presents a summary of CY99 groundwater characterization activities at RFETS including the 903 Pad VOC Investigation, the Actinide Aseptic Drilling Project, and the Bowman's Pond Characterization. Section 10 serves to outline other Groundwater Program activities including the Well Control Program (WCP), 1999 well abandonment and installation activities, and groundwater data cleanup. Section 11 contains a data quality assessment regarding the precision, accuracy, representativeness, completeness, and comparability (PARCC parameters) of analytical data. Section 12 presents conclusions and recommendations for future RFETS groundwater characterization activities. Section 13 lists all references that are cited in the text of this document.

There are five appendices to this report. Appendix A consists of trend plots. Appendix B consists of CY99 water level data. Appendix C presents well hydrographs. Appendix D presents 1999 borehole logs and well construction diagrams. Appendix E presents Tables from section 11.

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1.0 INTRODUCTION

This Annual Groundwater Monitoring Report summarizes the groundwater monitoring activities and results at Rocky Flats Environmental Technology Site (RFETS) for calendar year 1999 (CY99), as required in the Rocky Flats Cleanup Agreement (RFCA), and outlined in the Integrated Monitoring Plan (IMP) (K-H, 1999a). Section 1 serves as a brief introduction to the report. Section 2 discusses the groundwater quality data collected in CY99. Section 3 presents baseline and CY99 hydrogeologic data for the RFCA groundwater monitoring network. Section 4 discusses the performance monitoring activities that are in process. Section 5 discusses Building Decontamination and Decommissioning (D&D) with respect to groundwater issues. Section 6 discusses the monitoring of the Present Landfill and Section 7 gives a summary of plume degradation activities. Sections 8 and 9 discuss groundwater evaluation and Site characterization activities for groundwater. Section 10 discusses other groundwater program activities and Section 11 provides a data quality assessment of the groundwater data collected.

1.1 SITE DESCRIPTION

Rocky Flats Environmental Technology Site is located 16 miles northwest of Denver in Jefferson County, Colorado. The Site is a U.S. government-owned and contractor-operated facility that encompasses approximately 6,550 acres of federally-owned land (Figure 1-1). Site ownership, however, does not include surface and subsurface minerals or water rights. Site construction was initiated in 1951 and operations were begun in 1952.

Prior to the current closure mission, RFETS was part of the nationwide nuclear weapons research, development, and production complex. The plant produced metal components for nuclear weapons from plutonium, uranium, beryllium, and stainless steel. Other production activities included chemical recovery and purification of recyclable transuranic radionuclides, metal fabrication and assembly, and related quality control functions. The plant conducted research and development programs in metallurgy, machining, nondestructive testing, coatings, remote engineering, chemistry, and physics. Parts manufactured at the Site were shipped offsite for final assembly.

Major plant structures, including all production buildings, are located within the centralized 400-acre Industrial Area (IA) of the Site that is surrounded by a 6,150-acre Buffer Zone. Industrial activity immediately adjoining the Site includes present and/or prior coal and clay mining, petroleum recovery, natural classified-aggregate quarrying, and fabricated-aggregate mining. Other activities include cattle ranching and wind energy research. Several irrigation ditches traverse the Site, transmitting water for downstream agricultural, industrial, and municipal purposes. Three ephemeral streams drain the Site and flow eastward (see Figure 1-2).

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1.2 Geology and Hydrogeology

1.2.1 Introduction

The Site is situated approximately two miles east of the Front Range of Colorado (Figure 1-1), on the western margin of the Colorado Piedmont section of the Great Plains Physiographic Province (Spencer, 1961). Haun and Kent (1965) have summarized the geologic history of the Colorado Rocky Mountain region, which includes the Site area. The elevation at the Site is approximately 6,000 feet above mean sea level (MSL). The Industrial Area of the Site is located on an alluvial-covered pediment. The upper surface of the alluvium slopes easterly 1 to 2 degrees. Most of the surrounding area in the Buffer Zone is more prominently dissected with intermittent streams. These small, eastward flowing streams include Rock Creek, Walnut Creek, Woman Creek, and several surface water diversion ditches.

1.2.2 Stratigraphy

The stratigraphic sequence that underlies the Site extends from the crystalline Precambrian gneiss, schist, and granitoids at 3,000 feet below MSL to the unconsolidated Quaternary deposits at the surface approximately 6,000 feet above MSL. Based upon aerial photographic interpretation, field geologic mapping, coal and aggregate mine development, petroleum exploration in the vicinity, and numerous borehole investigations, a substantial amount of lithologic information has been gained about the Site. The generalized lithologic section in the Rocky Flats area is shown in Figure 1-3.

The uppermost Cretaceous Pierre and Fox Hills Formations underlie the Site, with the latter exposed in quarries along the western edge of the Site. The Cretaceous Laramie and Arapahoe Formations are exposed at the surface or underlie the Site. The Quaternary Rocky Flats Alluvium, and to a limited extent Verdos Alluvium, unconformably overlie the Arapahoe and Laramie Formations in the central portion of the Site. More recent valley fill alluvium and hillslope colluvium is also present. The unconsolidated surficial deposits, combined with the weathered portion of subcropping bedrock formations, form the sequence of rocks that have the greatest importance regarding groundwater flow and contaminant transport at the Site.

1.2.2.1 Rocky Flats Alluvium

Scott (1975) identified several Quaternary alluvial formation pediment covers in the vicinity of the Site. The Rocky Flats Alluvium is an unconsolidated deposit derived from quartzites and granites of the Coal Creek Canyon provenance west of the Site. The deposit diminishes from west to east with thicknesses ranging from approximately 100 feet to less than one foot. In the central portion of the Site the deposit is approximately 15 to 25 feet thick. The Rocky Flats Alluvium is a heterogeneous deposit dominantly

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composed of angular to subrounded, poorly sorted, coarse, bouldery-gravel with a clay and sand matrix. Clay, silt, and sand lenses as well as varying amounts of caliche are also present.

Exposures of Rocky Flats Alluvium in the aggregate quarries north and west of the Site exhibit some large scale cross-stratification. Depositional processes include fluvial and debris-flow transport (Shroba and Carrara, 1994) infilling paleotopographic lows and leaving a widespread surface of erosion with extremely low relief.

1.2.2.2 Other Surficial Deposits

In addition to the pediment-forming alluvial deposits, younger Quaternary units consisting of colluvium, landslide alluvium, and valley fill alluvium mantle the hillslopes and valley bottoms below the pediment surface. Colluvial deposits are derived from Arapahoe and Laramie Formations and older alluvial deposits. This unit consists of sheetwash, soil creep, and landslide materials with a total thickness of 3 to 16 feet (Shroba and Carrara, 1994). These deposits locally flank the Rocky Flats Alluvium and generally extend to lower parts of the slopes along the principal drainages.

Landslide deposits more commonly flank the Rocky Flats Alluvium. They are often bounded by headwall scarps and lobate toes at the downslope margins. Seeps issuing from the base of the Rocky Flats Alluvium contribute to landslide colluvium generation. The landslide units include earth flows, slumps, and debris flows with thicknesses estimated between 10 to 33 feet (Shroba and Carrara, 1994).

Valley-fill alluvial deposits, present in the bottoms of modern stream channels, flood plains, and terraces, are composed of clay, silt, sand, and gravel. They are commonly less than 10 feet thick but can be tens of feet thick. Usually these deposits contain more sand and are more well sorted than the Rocky Flats Alluvium.

1.2.2.3 Arapahoe Formation

The Arapahoe Formation is composed of claystone and silty claystone with lenticular sandstone in the basal portion of the formation. The Arapahoe Formation is generally less than 25 feet thick in the Site area, occurring as erosional remnants of fine grained sandstone above the Laramie Formation at various locations on Site (EG&G, 1995a). This basal Arapahoe Formation sandstone, often referred to as the No. 1 Sandstone, is of concern as a potential contamination pathway, especially where it subcrops beneath the alluvium.

1.2.2.4 Laramie and Fox Hills Sandstone Formations

The Laramie Formation is approximately 600 to 800 feet thick and is composed of a lower sandstone/claystone/coal interval and an upper, thick claystone interval. Within the upper claystone interval, thin, lenticular sandstone lenses (i.e., Sandstones 2 through 5 in the 1991 Geologic Characterization Report (EG&G, 1991a)) occur. The discontinuous nature of these sandstone lenses coupled with the large claystone layer that encloses them mitigates their potential for transmitting groundwater contamination in both a horizontal and vertical direction.

The Fox Hills sandstone is primarily fine-grained sandstone with thin siltstone and claystone interbeds and an approximate thickness of between 75 and 125 feet. The Fox Hills sandstone is exposed in quarries and subcrops along a narrow, north-south trending pattern in the extreme western part of the Site, upgradient from known sources of contamination.

The permeable lower sandstones and coals of the Laramie, combined with the permeable sandstones of the Fox Hills, constitute a regional aquifer system known as the Laramie-Fox Hills aquifer. This aquifer system is an important water source in the South Platte River Basin (Pearl, 1980), and is the sole water supply for some residents in the Rocky Flats area. This aquifer lies approximately 500 to 600 feet below the Industrial Area and is protected from contamination by the intervening Laramie Formation claystones.

1.2.2.5 Pierre Formation

The Pierre Formation is a 7,500-foot thick, dark gray, silty bentonitic shale that acts as a lower confining layer for the Laramie-Fox Hills aquifer in the Denver Basin. This thick marine shale unit subcrops only in the extreme western part of the Site.

1.2.3 Geologic Structure

The Site is located along the western margin of the Denver Basin, an asymmetric basin with a steeply east-dipping western flank and a gentle eastern flank. The interpretation of the subsurface structure is generalized in the east-west geological cross section of the Site area presented in Figure 1-4. A monoclinal fold limb exposed west of the Site is the most significant surficial structural feature in the Site area. Along the west limb of the fold, an angular unconformity exists between the Upper Cretaceous bedrock and the base of the Quaternary Rocky Flats Alluvium.

No active faults have been identified at the Site. Several high angle bedrock faults have been inferred to exist in the IA based on various stratigraphic and borehole correlation criteria. These faults appear to have only a limited hydrologic significance with regard to vertical groundwater movement and contaminant transport (RMRS, 1996a).

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1.2.4 Hydrogeology

This section presents the basic concepts about the hydrogeologic conditions at the Site that affect groundwater monitoring and protection. Characterization of the hydrogeologic setting is based on the currently accepted conceptual geologic and hydrogeologic models described in the Sitewide Geoscience Characterization Study (EG&G, 1995a; 1995b; 1995c). These conceptual geologic and hydrogeologic models are used to predict the direction and rate of groundwater flow, identify potential pathways for contaminant migration, and determine the extent of contaminant plumes given varying physical, chemical, and biological factors.

1.2.4.1 Definition of the Uppermost Aquifer for the Site

The term *aquifer* as defined by 40 CFR Section 260.10 is a "geologic formation, group of formations, or a part of a formation that is capable of yielding a significant amount of water to a well or spring." An *uppermost aquifer* is also defined as "the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's boundary." Geologic materials with similar hydrologic properties comprise a hydrostratigraphic unit (HSU) (Fetter, 1988). For purposes of this report, the uppermost aquifer or upper hydrostratigraphic unit (UHSU) consists of the unconfined saturated zone, in which unconsolidated and consolidated groundwater-bearing strata are in hydraulic communication. The UHSU consists of the following geologic units: Rocky Flats Alluvium, valley-fill alluvium, colluvium, landslide deposits, weathered Arapahoe and Laramie Formation bedrock, and all sandstones within the Arapahoe and upper Laramie Formations in hydraulic communication with the overlying unconsolidated surficial deposits. The UHSU is considered to be equivalent to the uppermost aquifer at the Site, although in many areas of the site the amount of water available in the UHSU is insufficient to meet the definition of aquifer given above.

Beneath the surficial materials and the consolidated deposits of the UHSU are the geologic units of the lower hydrostratigraphic unit (LHSU). The LHSU consists of the consolidated, unweathered bedrock zone of the Arapahoe and upper Laramie Formations not in hydraulic communication with the overlying UHSU. The Arapahoe and upper Laramie Formations comprising the geologic units of the LHSU consist of lesser amounts of sandstone and greater amounts of adjacent claystones. Because of the low permeability of the claystones, they behave as aquitards restricting hydraulic communication with the UHSU. The lower Laramie and Fox Hills Sandstone Formations comprise a stratigraphically lower and third hydrostratigraphic unit beneath the site. Groundwater within the three hydrostratigraphic units are hydraulically separated beneath the IA. Because of monoclinal folding and erosional proximity they do converge, however, and are in contact immediately upgradient of RFETS near the western margin of the Site. Background geochemical characterization of the UHSU and LHSU revealed that these units have

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statistically different groundwater chemistry, resulting in the delineation of separate hydrostratigraphic units (EG&G, 1993a). Possible communication of the hydrostratigraphic units along other geologic structures is currently being assessed. More detailed characterization of the LHSU will be achieved as new hydrogeologic and geochemical data are generated from Site investigations currently proposed or in progress.

1.2.4.2 Groundwater Occurrence and Distribution

The Site is located in a regional groundwater recharge area (EG&G, 1991a). Groundwater recharge occurs from the infiltration of incident precipitation and as base flow near the upgradient area of the Site drainage basin that extends west to Coal Creek. Groundwater recharge occurs from the infiltration of precipitation and from stream, ditch, and pond seepage. Some of the groundwater that discharges from the UHSU to streams and seeps evaporates as it is being discharged. Limited investigation of the former OU2 area during the period of July through October 1993 indicated that the precipitation component of recharge was lost to evapotranspiration demands (EG&G, 1993b).

In the western part of the Site, where the thickness of the Rocky Flats Alluvium reaches 100 feet, the depth to the water table is 50 to 70 feet below the surface. The depth to water generally becomes shallower from west to east as the alluvial material thins and the confining claystones are closer to the ground surface. At the head of stream drainages and along valley sides, seeps are common at the base of the Rocky Flats Alluvium where it is in contact with claystones of the Arapahoe/Laramie Formations, and where the Arapahoe Formation sandstone crops out. In summary, the unconsolidated surficial materials are thicker in the western, higher elevations at the Site. Accordingly, the saturated thickness of these materials also thins eastward. The potentiometric surface of groundwater in permeable units of the UHSU has been mapped and is shown on Plates 2 and 3. The periods illustrated represent the times of year when static water levels are expected to be both high and low. Areas of unsaturated and seasonally unsaturated alluvium and colluvium are indicated east and northeast of the IA.

Groundwater in the Arapahoe Formation sandstone units, which subcrop beneath the alluvial material, is not confined when in contact with the surficial materials. In this setting, a hydraulic connection exists between the bedrock sandstone and the alluvial material allowing the bedrock groundwater to exist under unconfined conditions as part of the UHSU. The subcropping Arapahoe Formation No. 1 Sandstone, located in the eastern portion of the IA and in the area between South Walnut Creek and Woman Creek, is part of the UHSU (EG&G, 1991a). The upper discontinuous sandstones of the Laramie Formation also subcrop beneath alluvium and colluvium, but in limited areas in the valleys and along valley slopes. Groundwater in the lenticular sandstone units of the Laramie Formation occurs under confined conditions over scattered areas of the Site.

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Groundwater levels in UHSU wells fluctuate in response to seasonal recharge events. Approximately 15 percent of the monitored wells are commonly dry during at least one of the quarterly sampling events. Of the remaining wells, approximately half cannot yield sufficient water volume (4.5 gallons) necessary for well purging and collection of a full suite of laboratory samples. As a result, sampling crews must return after wells have recovered to obtain additional sample volumes.

1.2.4.3 Groundwater Flow

The shallow groundwater flow regime at the Site is illustrated by the configuration of potentiometric contours in Plates 2 and 3. These maps indicate that groundwater flow is largely controlled by the topography of the bedrock surface that is generally reflected by the topography of the ground surface. Groundwater in the ridge tops generally flows toward the east-northeast. In areas where the ridge tops are dissected by east-northeast trending stream drainages, groundwater flows to the north or south toward the bottom of the valleys. In the valley bottoms, groundwater flows to the east, generally following the course of the stream. Shallow (UHSU) groundwater flow is primarily lateral due to the low permeability of the underlying claystone bedrock.

The potential for vertical groundwater flow is limited by the low permeability of bedrock claystones, as indicated by the presence of strong downward vertical hydraulic gradients between the UHSU and underlying bedrock units. This situation implies a condition of poor hydraulic communication. For example, vertical gradients on the order of 0.79 to 1.05 ft/ft have been calculated between colluvial and bedrock sandstones. The vertical groundwater flux through claystones is assumed to be small, on the order of 10^{-10} to 10^{-7} cm/sec, based on calculations provided in RMRS (1996a). Fracturing, where evident, is most abundant in the weathered bedrock zone, but is observed to decrease with depth in unweathered bedrock. Preferential vertical groundwater flow and contaminant transport along fractures or fault zones does not appear to represent a viable pathway for contaminant migration based on an assessment of available data (RMRS, 1996a).

1.2.4.4 Hydraulic Conductivity

The UHSU at the Site has a relatively low to moderate hydraulic conductivity that typically yields small amounts of water to groundwater monitoring wells. The UHSU exhibits a wide-range of hydraulic conductivities because of the diverse nature of the individual geologic units that comprise this unit. Summary statistics for UHSU hydraulic conductivities (EG&G, 1995c, Table G-2) indicate a range of 5.0×10^{-2} cm/sec to 3×10^{-8} cm/sec. Listed in order of decreasing geometric mean hydraulic conductivity, the relative ranking of individual units of the UHSU is presented as follows: valley-fill alluvium (2.5×10^{-3} cm/sec); Arapahoe No. 1 sandstone (7.9×10^{-4} cm/sec); Rocky Flats Alluvium (2.1×10^{-4} cm/sec);

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colluvium (9.3 x 10^{-5} cm/sec); weathered Laramie Formation sandstones (3.9 x 10^{-5} cm/sec); and weathered Laramie Formation claystones (8.8 x 10^{-7} cm/sec).

Hydraulic conductivities for LHSU materials are generally the lowest measured at the Site with geometric mean values for individual lithologic groups ranging from 1.6 x 10^{-7} to 5.8 x 10^{-7} cm/sec (EG&G, 1995c, Table G-2). The low permeability and 600+ foot thickness of the upper Laramie Formation claystones act as an effective aquitard that restricts downward vertical groundwater flow and contaminant transport to the Laramie-Fox Hills aquifer (RMRS, 1996a).

In summary, the following major geologic and hydrologic parameters influence groundwater flow at the Site (EG&G, 1995a; 1995b):

(1) Topography controls the surface waters of the upslope drainage basin which in part recharges groundwater and the three principal streams draining the Site. The majority of shallow groundwater is intercepted by these drainages. The semi-arid climate sharply limits the amount of surface water available for groundwater recharge.

(2) The lithology and permeability of the unconsolidated surficial deposits permit meteoric waters to recharge the water table. The water table is contained in alluvium and weathered bedrock.

(3) Paleotopography of the bedrock pediment, which is less permeable than the overlying unconsolidated surficial deposits, serves to focus groundwater movement along bedrock "lows."

(4) Paleoweathering of shallow bedrock materials has enhanced the permeability of the upper 10 to 60 feet relative to unweathered bedrock.

The permeability of bedrock units, composed primarily of claystone with lesser amounts of siltstone and sandstone, is generally several orders of magnitude less than for unconsolidated surficial deposits. The 600+ feet of unweathered bedrock between the shallow groundwater flow system and deep regional Laramie-Fox Hills aquifer provides an effective barrier to vertical groundwater and contaminant movement.

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1.3 Environmental History

Processing and fabrication of weapons-related components began at the Site in 1952 and continued through 1989. Fabrication of stainless steel components continued, however, in one building through the early 1990's. During operation, environmental protection measures were established that seemed consistent with prudent environmental management. However, some activities resulted in the environmental contamination of portions of the Site. Efforts to document the extent of Site contamination are in progress, in accordance with the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the RFCA, a cooperative agreement between U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and Colorado Department of Public Health and Environment (CDPHE). In addition, a historical release report (HRR) (DOE, 1992a) has been developed that documents contamination arising from past practices. The HRR is updated on an annual basis with the knowledge gained from ongoing monitoring and investigative activities. The additional information is submitted on an annual basis to the EPA and CDPHE as addenda to the original document.

Documented areas of soil contamination have been designated as Individual Hazardous Substance Sites (IHSSs). Many of these IHSSs have been characterized as part of the Remedial Investigation/Feasibility Study (RI/FS) process which was conducted under the Interagency Agreement (IAG, 1991) between DOE, CDPHE and EPA. Some IHSSs have already been remediated and others are currently scheduled for remediation by the Environmental Restoration Department in accordance with a Site environmental remediation priority ranking system.

Groundwater investigations at the Site have determined that some IHSSs have released hazardous and radionuclide contaminants to groundwater. The most widespread contamination is that of volatile organic compounds (VOCs). Plate 11 shows the distribution of VOC contamination in the UHSU. Plume definition is inexact, however, because of limitations in well coverage, variability of hydrostratigraphic conditions, and local variations in groundwater transport velocity. Previously published plume maps for individual constituents can be found in the 1993 Well Evaluation Report (EG&G, 1994a), the annual RCRA Groundwater reports (EG&G, 1992, 1993c, 1994b, 1995d; RMRS/KH, 1996) and in individual Operable Unit RI/RFI reports.

Compared to all other contaminants, groundwater VOC plumes at RFETS have the greatest potential to impact surface water, based on spatial distribution and concentration considerations. These plumes have been defined on the basis of concentration values above the RFCA Tier II action level for individual constituents. Action levels at RFETS are derived from and are similar to regulated maximum concentration limits (MCLs). To delineate areas of highly contaminated groundwater, the Tier I groundwater action

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levels (equal to 100 x Tier II action levels) were compared against all groundwater data for the most common VOCs in groundwater. Values above Tier I and Tier II action levels were plotted and are shown on Plate 11. The most probable sources were identified using the results of recent field sampling programs and correlating this with the knowledge of Site processes (see RMRS, 1996b). A flow diagram (RMRS, 1996b) illustrates the method used to locate the contaminant plumes and corresponding sources, and to assist in determining which areas should be evaluated for potential remedial action. Other contaminants will also be addressed where there is a potential impact to surface water above action levels.

Six VOC groundwater contaminant plumes have been identified where contaminant concentrations are above Tier I action levels. These groundwater contaminant plumes include the IHSS 119.1 Plume, Mound Plume, 903 Pad/Ryan's Pit Plume, Carbon Tetrachloride Plume, East Trenches Plume, and Industrial Area Plume. In addition, there are two plumes with contaminant concentrations above Tier II action levels that have the potential to impact surface water. These plumes are the Present Landfill and the Property Utilization and Disposal (PU&D) Yard (RMRS, 1996b).

In addition to the VOC plumes, there is a nitrate and uranium plume that emanates from the Solar Ponds. There are other point sources with constituents that are above Tier II action levels. These are being evaluated on a case by case basis.

1.3.1 Rocky Flats Cleanup Agreement

The RFCA was officially adopted on July 19, 1996 (RFCA, 1996). The RFCA replaces the IAG as the environmental cleanup agreement for RFETS. The RFCA outlines the goals, objectives, and strategies that will lead to the RFETS cleanup and closure mission objectives. The action level Framework (ALF) attachment to the RFCA contains specific requirements for environmental monitoring and reporting, and it sets action levels for contaminant concentrations in groundwater and in other media. The IMP is required under RFCA to further define the monitoring programs for the Site.

To align the groundwater monitoring program with the new RFETS mission and RFCA requirements, the monitoring network was evaluated in 1996. A data quality objective (DQO) process was used to determine what decisions were necessary for groundwater and the function of each well in the network in supporting those decisions. DOE, CDPHE, EPA, and stakeholders were directly involved in decisions involving the monitoring network. Results of this evaluation are presented in the IMP, which is discussed below.

1.3.2 Integrated Monitoring Plan for Groundwater

The Integrated Monitoring Plan (IMP) is a summary document that outlines the goals for groundwater monitoring (and other environmental media), and describes the various components of the groundwater

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monitoring program (K-H, 1999a). To evaluate groundwater monitoring needs, one must know the RFCA ALF for groundwater, the Site history and areas of contamination, the physical and hydrogeologic setting of the Site, the effect of contaminated areas on groundwater, and the nature of the groundwater contaminant plumes. This information is presented in the IMP Background Document (K-H, 1999b). Appendices A, B, C, and D of the groundwater section of the Background Document cover these previous topics. Appendix E of the groundwater section lists the wells that will be monitored for water quality or for groundwater flow.

In the past, two plans have been required at RFETS to comply with DOE Order 5400.1 (DOE, 1988, Page III-2), a Groundwater Protection & Management Program Plan and a Groundwater Monitoring Plan. These two plans have historically been combined into one document, the Groundwater Protection and Monitoring Program Plan (GPMPP) (EG&G, 1993d), which defines and describes the groundwater protection and monitoring programs at the Site. In addition, an assessment groundwater monitoring plan was required under RCRA for the interim status units on Site. This Plan is called the Groundwater Assessment Plan (GWAP) (DOE, 1993a). Other monitoring plans have been developed to address groundwater monitoring requirements as outgrowths of various CERCLA Interim Measure/Interim Remedial Action (IM/IRA) decision documents. The IMP serves as the Groundwater Monitoring Plan for the Site, and it replaces the requirements found in the group of plans named above. It also revises the requirements of the routine groundwater monitoring portion of the IA IM/IRA decision document (DOE, 1994) and the French Drain Performance Monitoring Plan (DOE, 1992b).

The original IMP was published in May 1997. The IMP and IMP Background Document are updated annually with any changes to the monitoring programs.

The groundwater monitoring network, as defined in the IMP (K-H, 1999a), has eight categories of monitoring wells. Table 1-1 lists the wells in the current monitoring program. Table 1-2 presents the analytical suites associated with each well in the program. The decision rules presented in the original IMP have been retained for determining Tier I and II exceedances of groundwater action levels. The well types and decision rules are defined below:

Boundary (B) Monitoring Wells

These wells monitor groundwater leaving the eastern Site boundary. A reportable exceedance occurs if a measured concentration is above a Tier II action level **and** the background Mean plus 2 Standard Deviations (M2SDs). When there is no historical data, **or** a value is greater than the M2SD of the historical concentration in the well when there have been historical exceedances of Tier II action levels, the required action is to initiate monthly sampling. Appropriate parties (DOE, CDPHE and EPA) are notified and possible impacts to surface water are evaluated if contaminant levels are above action levels, by the above criteria, for three consecutive months.

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Table 1-1 2000 IMP Wells

WELL NO	FREQUENCY	CLASS	PLUME\ AREA	FORMATION	PURPOSE
00100	Semiannual	DD	Bldg 779		D & D Monitoring for Building 779 D&D
00197	Semiannual	PE	Old Landfill	AL	Plume Extent well monitoring the Industrial Area Plume
00200	Semiannual	DD	Bldg 707		D & D Monitoring for Building 707 D&D
00297	Semiannual	PD	Solar Ponds	AL	Plume Definition well monitoring the southern migration of the Solar Ponds Plume
00397	Semiannual	PE	PU&D	AL	Plume Extent well monitoring the PU&D Yard Plume
00400	Semiannual	DD	Bldg 776/777		D & D Monitoring for Building 776/777 Complex D&D
00491	Semiannual	PD	903 Pad	BD\UHSU	Plume Definition well monitoring the 903 Pad VOC Plume
00500	Semiannual	DD	Bldg 776/777		D & D Monitoring for Building 776/777 Complex D&D
00597	Semiannual	PD	PU&D\Landfill	AL	Plume Definition well monitoring the Landfill/PU&D yard Plume
00600	Semiannual	DD	Bldg 776/777		D & D Monitoring for Building 776/777 Complex D&D
00700	Semiannual	DD	Bldg 776/777		D & D Monitoring for Building 776/777 Complex D&D
00797	Semiannual	PM	881 Hillside	AL	Performance Monitoring for 881 Footing Drain Sump
00897	Semiannual	PM	Mound	BD/UHSU	Performance Monitoring on the Mound Source remediation
00900	Semiannual	DD	Bldg 371/374		D & D Monitoring for Building 371/374 Complex D&D
00997	Semiannual	D	NA	AL	Drainage Well - below Pond B-4 in South Walnut Creek Drainage
01000	Semiannual	DD	Bldg 371/374		D & D Monitoring for Building 371/374 Complex D&D
01100	Semiannual	DD	Bldg 371/374		D & D Monitoring for Building 371/374 Complex D&D
01200	Semiannual	DD	Bldg 371/374		D & D Monitoring for Building 371/374 Complex D&D
01300	Semiannual	DD	Bldg 371/374		D & D Monitoring for Building 371/374 Complex D&D
01400	Semiannual	DD	Bldg 371/374		D & D Monitoring for Building 371/374 Complex D&D
01600	Semiannual	DD	Bldg 865		D & D Monitoring for Building 865 D&D
[illegible]700	Semiannual	DD	Bldg 865		D & D Monitoring for Building 865 D&D
[illegible]1800	Semiannual	DD	Bldg 865		D & D Monitoring for Building 865 D&D
02100	Semiannual	DD	Bldg 883		D & D Monitoring for Building 883 D&D
02197	Semiannual	PE	PU&D	AL	Plume Extent well monitoring the PU&D Yard Plume
02200	Semiannual	DD	Bldg 883		D & D Monitoring for Building 883 D&D
02291	Semiannual	PM	Mound	BD/UHSU	Performance Monitoring on the Mound Source remediation
02297	Semiannual	DD	Bldg 779	AL	D&D monitoring downgradient of Bldg. 779
02397	Semiannual	DD	Bldg 779	AL	D&D monitoring upgradient of Bldg. 779
02497	Semiannual	DD	Bldg 779	AL	D&D monitoring downgradient of Bldg. 779
0386	Semiannual	B	Boundary	BD/UHSU	Boundary Well - in small drainage north of the east access gate
03991	Semiannual	PD	East Trenches	AL	Plume Definition well monitoring the East Trenches Plume
04091	Semiannual	PE	East Trenches	AL	Plume Extent well monitoring the northward migration of the East Trenches Plume
04591	Semiannual	PE	East Trenches	AL	Plume Extent well monitoring the southward migration of the East Trenches Plume
0487	Semiannual	PD	881 Hillside	AL	Plume Definition well for the 881 Hillside Plume
04991	Semiannual	PE	East Trenches	AL	Plume Extent well monitoring the eastward migration of the East Trenches Plume
05091	Semiannual	PE	East Trenches	AL	Plume Extent well monitoring the eastward migration of the East Trenches Plume
05391	Semiannual	PD	East Trenches	AL	Plume Definition well monitoring eastward concentration of VOCs from the East Trenches Plume
05691	Semiannual	PM	East Trenches	AL	Performance Monitoring well monitoring effects of remediation downgradient of Trench T-4
06091	Semiannual	PE	East Trenches	AL/BD	Plume Extent well monitoring the northeast migration of the East Trenches Plume
06491	Semiannual	B	Boundary	BD/UHSU	Boundary Well - in small drainage east of the Site at Indiana St.
07391	Semiannual	PM	903 Pad	AL\BD	Performance Monitoring well monitoring effects of remediation downgradient of Ryans Pit
08091	Semiannual	PE	Mound\E. Trench	AL	Plume Extent well monitoring the southern migration of Mound and East Trenches Plumes
1386	Semiannual	PE/PM	Drainage/Solar Ponds	AL	Performance Monitoring - SEP Treatment System, Plume Extent Monitoring for Solar Ponds Plume
1786	Semiannual	PE/PM	Solar Ponds	AL	Performance Monitoring - SEP Treatment System, Plume Extent Monitoring for Solar Ponds Plume
1986	Semiannual	PE	Ind. Area	AL	Plume Extent well monitoring the northern migration of the IA Plume
2186	Semiannual	PE	Ind. Area	BD/UHSU	Plume Extent well monitoring the northern migration of the 'IA Plume
[illegible]987**	Semiannual	PD	903 Pad	AL	Plume Definition well monitoring pathway to Woman Cr. In the 903 Pad/Ryans Pit Plume
[illegible]087	Semiannual	PD	903 Pad	BD	Plume Definition well monitoring pathway to Woman Cr. in the 903 Pad/Ryans Pit Plume

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Table 1-1 2000 IMP Wells, continued

WELL NO.	FREQUENCY	CLASS	PLUME\ AREA	FORMATION	PURPOSE
3386	Semiannual	PE	Solar Ponds	AL	Plume extent well monitoring the southern migration of the SEP Nitraate and Carbon Tet Plumes
3586	Semiannual	PE/PM	Mound	AL	Plume Extent well tracking migration of Solar Ponds nitrate Plume
3687	Semiannual	PM	East Trenches	BD\USHU	Performance Monitoring well monitoring effects of remediation downgradient of Trench T-4
4087	Quarterly	RCRA	Landfill	AL	RCRA/Plume Extent well monitoring downgradient of Landfill Plume
4787	Semiannual	PE	881 Hillside	AL	Plume Extent south of the 881 Hillside Plume
4887	Semiannual	PE	881 Hillside	AL	Plume Extent south of the 881 Hillside Plume
5387	Semiannual	PE	881 Hillside	AL	Plume Extent south of the 881Hillside Plume
5587	Semiannual	D	NA	AL	Drainage well monitoring the Woman Cr. drainage south of the 881 Hillside Plume
5887	Quarterly	RCRA	PU&D	AL	RCRA upgradient/ Plume Extent Well monitoring the PU&D Yard Plume - LF
6186	Semiannual	PE	Ind. Area	AL	Plume Extent well monitoring eastward migration of IA Plume
6286	Semiannual	PD	903 Pad	BD/USHU	Plume Definition well monitoring pathway to Woman Cr. in the 903 Pad/Ryans Pit Plume
6386	Semiannual	PD	903 Pad	AL	Plume Definition well monitoring pathway to Woman Cr. in the 903 Pad/Ryans Pit Plume
6486	Semiannual	D	NA	AL	Drainage well monitoring the Woman Cr. drainage downgradient of the 881 Hillside Plume
6586	Semiannual	D	NA	AL	Drainage well monitoring the No. side Woman Cr. below 903Pad/Ryans Pit Plume
7086	Semiannual	PE	IA\Old Landfill	AL	Plume Extent well monitoring IA Plume and Old Landfill Plume pathway in Woman Cr.
10098	Semiannual	DD	Bldg. 123	AL	D & D Monitoring for Building 123 D&D
10194	Semiannual	PE	East Trenches	AL	Plume Extent well monitoring the southern migration of the East Trenches Plume
10198	Semiannual	DD	Bldg. 123	AL	D & D Monitoring for Building 123 D&D
10294	Semiannual	B	Boundary	AL	Boundary Well - in drainage below Pond D-2 in the southeast corner of the Site
10298	Semiannual	DD	Bldg. 123	AL	D & D Monitoring for Building 123 D&D
10394	Semiannual	B	Boundary	AL	Boundary Well - in the Woman Cr. Drainage at the Indiana Street Boundary
10398	Semiannual	DD	Bldg. 123	AL	D & D Monitoring for Building 123 D&D
10498	Semiannual	DD	Bldg. 123	AL	D & D Monitoring for Building 123 D&D
10592	Semiannual	PM	881 Hillside	AL	Performance Monitoring for the French Drain
10598	Semiannual	DD	Bldg. 123	AL	D & D Monitoring for Building 123 D&D
10692	Semiannual	PM	881 Hillside	AL	Performance Monitoring for the French Drain
10792	Semiannual	PM	881 Hillside	AL	Performance Monitoring for the French Drain
10992	Semiannual	PM	881 Hillside	AL	Performance Monitoring for the French Drain
10994	Semiannual	PE	IA\Old Landfill	AL	Plume Extent IA VOA Plume\Old Landfill Plume near Woman Cr.
11092	Semiannual	PM	881 Hillside	AL	Performance Monitoring for the French Drain
11891	Semiannual	PM	East Trenches	BD\UHSU	Performance Monitoring well monitoring effects of remediation downgradient of Trench T-3
12191	Semiannual	PM	East Trenches	BD\UHSU	Performance Monitoring at edge of T3 soil excavation
12691	Semiannual	PM	East Trenches	BD\USHU	Performance Monitoring well monitoring effects of remediation downgradient of Trench T-4
15599	Semiannual	PM	Mound	AL	Performance Monitoring for the Mound groundwater treatment system
15699	Semiannual	PM	Mound	AL	Performance Monitoring for the Mound groundwater treatment system
15799	Semiannual	PM	Mound	AL	Performance Monitoring for the Mound groundwater treatment system
18199	Semiannual	PA/DD	IHSS 118.1/B771	AL	Plume Degradation well monitoring the IHSS 118.1 plume and Building D&D well monitoring Building 771
18299	Semiannual	PA	IHSS 118.1	AL	Plume Degradation well monitoring the IHSS 118.1 plume
18399	Semiannual	PA	IHSS 118.1	AL	Plume Degradation well monitoring the IHSS 118.1 plume
18499	Semiannual	PA	IHSS 118.1	AL	Plume Degradation well monitoring the IHSS 118.1 plume
18599	Semiannual	PA	IHSS 118.1	AL	Plume Degradation well monitoring the IHSS 118.1 plume
18699	Semiannual	PA	IHSS 118.1	AL	Plume Degradation well monitoring the IHSS 118.1 plume
18799	Semiannual	PA	IHSS 118.1	AL	Plume Degradation well monitoring the IHSS 118.1 plume
18899	Semiannual	PA	IHSS 118.1	AL	Plume Degradation well monitoring the IHSS 118.1 plume
20998	Semiannual	DD	Bldg 771	AL	D & D Monitoring for Building 771 Complex D&D
22596	Semiannual	PE	Ind. Area	AL	Plume Extent well monitoring the northern migration of the IA Plume
22696	Semiannual	PE	Ind. Area	AL	Plume Extent well monitoring the westward migration of the Carbon Tet Plume
22796	Semiannual	PE	Ind. Area	AL	Plume Extent well monitoring the northward migration of Carbon Tet Plume
22896	Semiannual	PE	Ind. Area	AL	Plume Extent well monitoring the northward migration of IA VOA Plume
22996	Semiannual	DD	Bldg 886	AL	Building D&D well monitoring potential rad contamination near 886 lab
23096	Semiannual	PE	903 Pad	AL	Plume Extent well monitoring the southern migration of the Ryans- OU2 VOA Plume
23196	Semiannual	PE	903 Pad	AL	Plume Extent well monitoring the southward migration of the Ryans Pit/903 Pad Plume
23296	Semiannual	PE/PM	East Trenches	AL	Plume Extent/Performance Monitoring well monitoring the East Trenches Treatment System

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Table 1-1 2000 IMP Wells, continued

WELL NO	FREQUENCY	CLASS	PLUME\ AREA	FORMATION	PURPOSE
38591	Semiannual	D	NA	AL	Drainage well in Woman Cr. Drainage below 881 Hillside Plume
40099	Semiannual	DD	Bldg 444	AL/BD	D & D Monitoring for Building 444 Complex D&D
40199	Semiannual	DD	Bldg 444	AL/BD	D & D Monitoring for Building 444 Complex D&D
40299	Semiannual	DD	Bldg 444	AL/BD	D & D Monitoring for Building 444 Complex D&D
40399	Semiannual	DD	Bldg 444	AL/BD	D & D Monitoring for Building 444 Complex D&D
40499	Semiannual	DD	Bldg 444	AL/BD	D & D Monitoring for Building 444 Complex D&D
40599	Semiannual	DD	Bldg 771	AL/BD	D & D Monitoring for Building 771 Complex D&D
40699	Semiannual	DD	Bldg 771	AL/BD	D & D Monitoring for Building 771 Complex D&D
40799	Semiannual	DD	Bldg 771	AL/BD	D & D Monitoring for Building 771 Complex D&D
40899	Semiannual	DD	Bldg 771	AL/BD	D & D Monitoring for Building 771 Complex D&D
40999	Semiannual	DD	Bldg 865/886	AL/BD	D & D Monitoring for Buildings 865 and 886 D&D
41099	Semiannual	DD	Bldg 886	AL/BD	Building D&D well monitoring potential rad contamination near 886 lab
41199	Semiannual	DD	Bldg 886	AL/BD	Building D&D well monitoring potential rad contamination near 886 lab
41299	Semiannual	DD	Bldg 444	AL/BD	D & D Monitoring for Building 444 Complex D&D
41499	Semiannual	DD	Bldg 771	AL/BD	D & D Monitoring for Building 771 Complex D&D
41591	Semiannual	B	Boundary	AL	Boundary Well - in small drainage near east access gate
41599	Semiannual	DD	Bldg 771	AL/BD	D & D Monitoring for Building 771 Complex D&D
41691	Semiannual	B	Boundary	AL	Boundary Well - in the Walnut Cr. Drainage at the Indiana Street Boundary
43392	Semiannual	PE	Ind. Area	AL	Plume Extent well monitoring southward migration of IA Plume
52894	Quarterly	RCRA	Landfill	AL	RCRA/Plume Extent well monitoring downgradient of Landfill Plume
52994	Quarterly	RCRA	Landfill	AL	RCRA/Plume Extent well monitoring downgradient of Landfill Plume
60299	Semiannual	DD	Bldg 776/777	AL/BD	D & D Monitoring for Building 776/777 Complex D&D
60499	Semiannual	DD	Bldg 707	AL/BD	D & D Monitoring for Building 707 D&D
60599	Semiannual	DD	Bldg 707	AL/BD	D & D Monitoring for Building 707 D&D
61099	Semiannual	DD	Bldg 883	AL/BD	D & D Monitoring for Building 883 D&D
[illegible]199	Semiannual	DD	Bldg 883	AL/BD	D & D Monitoring for Building 883 D&D
[illegible]499	Semiannual	DD	Bldg 707	AL/BD	D & D Monitoring for Building 707 D&D
[illegible]70099	Semiannual	PM	Solar Ponds	AL/BD	Performance Monitoring of groundwater treatment system below Solar Ponds
70193	Quarterly	RCRA	PU&D	BD/UHSU	RCRA upgradient/Plume Extent well monitoring the PU&D Yard Plume
70299	Semiannual	PM	Solar Ponds	AL/BD	Performance Monitoring of groundwater treatment system below Solar Ponds
70393	Quarterly	RCRA	PU&D	AL	RCRA upgradient /Plume Definition well monitoring the edge of the PU&D Yard Plume
70493	Quarterly	RCRA	PU&D	BD/UHSU	RCRA upgradient/Plume Definition well monitoring the edge of the PU&D Yard Plume
75992	Semiannual	PE	Mound\E. Trench	AL	Plume Extent well monitoring So. Walnut Cr. Drainage below Mound Site Plume
76992	Semiannual	PE	PU&D\Landfill	AL	Plume Extent well monitoring the eastward migration of the PU&D Yard/Landfill Plume
77392	Semiannual	PD	Landfill	AL	Plume Definition well monitoring the eastward migration of the PU&D Yard Plume
90099	Semiannual	PA	903 Pad/Ryans Pit	AL/BD	Plume Degradation well monitoring the southern migration of the 903 Pad/Ryan's Pit Plume
90199	Semiannual	PA	903 Pad/Ryans Pit	AL/BD	Plume Degradation well monitoring the southern migration of the 903 Pad/Ryan's Pit Plume
90299	Semiannual	PA	903 Pad/Ryans Pit	AL/BD	Plume Degradation well monitoring the southern migration of the 903 Pad/Ryan's Pit Plume
90399	Semiannual	PA	903 Pad/Ryans Pit	AL/BD	Plume Degradation well monitoring the southern migration of the 903 Pad/Ryan's Pit Plume
95099	Semiannual	PM	East Trenches	AL	Performance Monitoring of groundwater treatment system below East Trenches
95199	Semiannual	PM	East Trenches	AL	Performance Monitoring of groundwater treatment system below East Trenches
95299	Semiannual	PM	East Trenches	AL/BD	Performance Monitoring of groundwater treatment system below East Trenches
891COLWEL	Quarterly	PM	881 Hillside	AL	Performance Monitoring of groundwater in collection well on 881 Hillside
B206989	Quarterly	RCRA	Landfill	BD/UHSU	RCRA\Plume Extent well monitoring downgradient of Landfill Plume
B208289	Semiannual	PE	Solar Ponds	BD/UHSU	Plume Extent well monitoring the northeast migration of the SEP Nitrate Plume
B208789	Semiannual	PE	Solar Ponds	AL	Plume Extent well monitoring the northeast migration of the SEP Nitrate Plume
P114389	Semiannual	PE	Ind. Area	AL	Plume Extent well to monitor extent of Industrial Area plume pathway to Walnut Cr.
P209289	Semiannual	PD	Carbon Tet	AL	Plume Definition well in the Carbon Tet Plume
P209389	Semiannual	PD	Carbon Tet	BD	Plume Definition well in the Carbon Tet Plume
P209489	Semiannual	PD	Solar Ponds	BD\UHSU	Plume Definition well for the Carbon Tet. Plume
P218089	Semiannual	DD	Bldg 707	AL	D & D Monitoring for Building 707 D&D
P218389	Semiannual	PE	Solar Ponds	AL	Plume Extent well monitoring the northern migration of the SEP Nitrate Plume
[illegible]19189	Semiannual	PD	Carbon Tet	AL	Plume Definition well for VOC contamination coming from Carbon Tet Plume
[illegible]219489	Semiannual	PE	Solar Ponds	AL	Plume Extent well monitoring the northern migration of the SEP Nitrate Plume

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Table 1-1 2000 IMP Wells, continued

WELL NO	FREQUENCY	CLASS	PLUME AREA	FORMATION	PURPOSE
P313589	Semiannual	PE	Ind. Area	AL	Plume Extent to monitor the eastward migration of IA Plume near Bldg. 881
P314289	Semiannual	PE	Ind. Area	AL	Plume Extent to monitor the southern migration of IA Plume near Bldg. 850
P317989	Semiannual	DD	Bldg 865/886	AL	D & D Monitoring for Buildings 865 and 886 D&D
P416689	Semiannual	PE	Ind. Area	AL	Plume Extent to monitor southern migration of IA Plume south of Bldg. 440
P416789	Semiannual	PD	Ind. Area	AL	Plume Definition of IA Plume south of 400 area along pathway to Woman Cr.
P416889	Semiannual	PD	Ind. Area	AL	Plume Definition of IA Plume south of Bldg. 664 along pathway to Woman Cr.
P419689	Semiannual	DD	Bldg 444	AL/BD	D & D Monitoring for Building 444 Complex D&D
SW13494	Quarterly	PM	881 Hillside	NA	Performance Monitoring of groundwater in footing drain seep below Bldg. 881
R1-0	Semiannual	PM	Mound	NA	Performance Monitoring of groundwater treatment system below Mound
R2-E	Semiannual	PM	Mound	NA	Performance Monitoring of groundwater treatment system below Mound
ETP in	Semiannual	PM	East Trenches	NA	Performance Monitoring of groundwater treatment system below East Trenches
ETP ef	Semiannual	PM	East Trenches	NA	Performance Monitoring of groundwater treatment system below East Trenches
SW099	Quarterly	PM	Landfill	PM	Performance Monitoring of groundwater intercept system below Present Landfill
SW100	Quarterly	PM	Landfill	PM	Performance Monitoring of groundwater intercept system below Present Landfill

Well 23296 is to be sampled semiannually for "program" analytes, quarterly for VOAs only

18199 Micropurge well

** Well needs to be replaced

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Table 1-2 Analyte Suites

WELLNO	FREQUENCY	PLUME\AREA	VOC Suite	METALS Suite	TRITIUM	PU/AM	SR 89/90	URANIUM	NITRATE	FLUORIDE	SULPHATE	TDS	CYANIDE	CESIUM-137	CHLORIDE	SULFIDE	TOC	METHANE	ANIONS Suite	GASES Suite	Np-237	PCBs	TPH	GROSS a/b
00100	Semiannual	Bldg 779	X	X		X		X	X			X												
00197	Semiannual	Old Landfill	X	X	X		X	X	X	X	X	X												
00200	Semiannual	Bldg 707	X	X		X		X				X									X	X*	X*	
00297	Semiannual	Solar Ponds	X	X	X	X	X	X	X	X	X	X												
00397	Semiannual	PU&D	X	X	X			X	X	X	X	X												
00400	Semiannual	Bldg 776/777	X	X	X	X		X	X			X											X*	
00491	Semiannual	903 Pad	X	X		X		X	X		X	X												
00500	Semiannual	Bldg 776/777	X	X	X	X		X	X			X											X*	
00597	Semiannual	PU&D\Landfill	X	X	X			X	X	X	X	X												
00600	Semiannual	Bldg 776/777	X	X	X	X		X	X			X											X*	
00700	Semiannual	Bldg 776/777	X	X	X	X		X	X			X											X*	
00797	Semiannual	881 Hillside	X	X				X	X		X	X												
00897	Semiannual	Mound	X	X		X		X	X			X												
00900	Semiannual	Bldg 371/374	X	X		X		X	X			X											X*	
00997	Semiannual	Drainage	X	X		X	X	X				X												
01000	Semiannual	Bldg 371/374	X	X		X		X	X			X											X*	
01100	Semiannual	Bldg 371/374	X	X		X		X	X			X											X*	
01200	Semiannual	Bldg 371/374	X	X		X		X	X			X											X*	
01300	Semiannual	Bldg 371/374	X	X		X		X	X			X											X*	
01400	Semiannual	Bldg 371/374	X	X		X		X	X			X											X*	
01600	Semiannual	Bldg 865	X	X				X	X			X												
01700	Semiannual	Bldg 865	X	X				X	X			X												
01800	Semiannual	Bldg 865	X	X				X	X			X												
02100	Semiannual	Bldg 883	X	X				X	X			X										X*	X*	
02197	Semiannual	PU&D	X	X	X			X	X	X	X	X												
02200	Semiannual	Bldg 883	X	X				X	X			X										X*	X*	
02291	Semiannual	Mound	X	X		X		X	X			X												
02297**	Semiannual	Bldg 779	X	X		X		X	X			X												
02397	Semiannual	Bldg 779	X	X		X		X	X			X												
02497	Semiannual	Bldg 779	X	X		X		X	X			X												
0386	Semiannual	Boundary	X	X	X	X		X	X	X	X	X												
03991	Semiannual	East Trenches	X	X		X		X	X			X												
04091	Semiannual	East Trenches	X	X		X		X	X			X												
04591	Semiannual	East Trenches	X	X		X		X	X			X												
0487	Semiannual	881 Hillside	X	X				X	X		X	X												
04991	Semiannual	East Trenches	X	X		X		X	X			X												
05091	Semiannual	East Trenches	X	X		X		X	X			X												
05391	Semiannual	East Trenches	X	X		X		X	X			X												
05691	Semiannual	East Trenches	X	X		X		X	X			X												
06091	Semiannual	East Trenches	X	X		X		X	X			X												
06491	Semiannual	Boundary	X	X	X	X		X	X	X	X	X												
07391	Semiannual	903 Pad	X	X		X		X	X		X	X												
08091	Semiannual	Mound\E. Trench	X	X		X	X	X	X			X												
1386	Semiannual	Drainage/Solar Ponds	X	X	X	X	X	X+X (D&T)	X	X	X	X												
1786	Semiannual	Solar Ponds	X	X	X	X	X	X+X (D&T)	X	X	X	X												
1986	Semiannual	Ind. Area	X	X		X		X	X			X												
2186	Semiannual	Ind. Area	X	X		X		X	X			X												
2987**	Semiannual	903 Pad	X	X		X		X	X		X	X												
3087	Semiannual	903 Pad	X	X		X		X	X		X	X												
3386	Semiannual	Solar Ponds	X	X	X	X	X	X	X	X	X	X												
3586	Semiannual	Mound	X	X		X		X	X			X												
3687	Semiannual	East Trenches	X	X		X		X	X			X												
4087	Quarterly	Landfill	X	X	X			X	X	X	X	X												
4787	Semiannual	881 Hillside	X	X				X	X		X	X												
4887	Semiannual	881 Hillside	X	X				X	X		X	X												
5387	Semiannual	881 Hillside	X	X				X	X		X	X												
5587	Semiannual	Drainage	X	X			X	X	X		X	X												
5887	Quarterly	PU&D	X	X	X			X	X	X	X	X												
6186	Semiannual	Ind. Area	X	X		X		X	X			X												
6286	Semiannual	903 Pad	X	X		X		X	X		X	X												
6386	Semiannual	903 Pad	X	X		X		X	X		X	X												
6486	Semiannual	Drainage	X	X			X	X	X		X	X												
6586	Semiannual	Drainage	X	X		X		X	X			X												
7086	Semiannual	IA\Old Landfill	X	X			X	X	X		X	X												
10098	Semiannual	Bldg. 123	X	X		X		X	X			X	X	X										
10194	Semiannual	East Trenches	X	X		X		X	X			X												
10198	Semiannual	Bldg. 123	X	X		X		X	X			X	X	X										
10294	Semiannual	Boundary	X	X	X	X		X	X	X	X	X												
10298	Semiannual	Bldg. 123	X	X		X		X	X			X	X	X										

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Table 1-2 [illegible]lyte Suites

WELLNO	FREQUENCY	PLUME\AREA	VOC Suite	METALS Suite	TRITIUM	PU/AM	SR 89/90	URANIUM	NITRATE	FLUORIDE	SULPHATE	TDS	CYANIDE	CESIUM-137	CHLORIDE	SULFIDE	TOC	METHANE	ANIONS Suite	GASES Suite	Np-237	PCBs	TPH	GROSS a/b
10394	Semiannual	Boundary	X	X	X	X	X	X	X	X	X	X												
10398	Semiannual	Bldg. 123	X	X		X		X	X			X	X	X										
10498	Semiannual	Bldg. 123	X	X		X		X	X			X	X	X										
10592	Semiannual	881 Hillside	X	X				X	X		X	X												
10598	Semiannual	Bldg. 123	X	X		X		X	X			X	X	X										
10692	Semiannual	881 Hillside	X	X				X	X		X	X												
10792	Semiannual	881 Hillside	X	X				X	X		X	X												
10992	Semiannual	881 Hillside	X	X				X	X		X	X												
10994	Semiannual	IA\Old Landfill	X	X			X	X	X		X	X												
11092	Semiannual	881 Hillside	X	X				X	X		X	X												
11891	Semiannual	East Trenches	X	X		X		X	X			X												
12191	Semiannual	East Trenches	X	X		X		X	X			X												
12691	Semiannual	East Trenches	X	X		X		X	X			X												
15599	Semiannual	Mound	X			X		X				X												
15699	Semiannual	Mound	X			X		X				X												
15799	Semiannual	Mound	X			X		X				X												
18199	Semiannual	IHSS 118.1/Bldg 771	X	X	X	X		X	X		X	X			X	X	X	X			X*	X*		
18299	Semiannual	IHSS 118.1	X						X		X	X			X	X	X	X						
18399	Semiannual	IHSS 118.1	X						X		X	X			X	X	X	X						
18499	Semiannual	IHSS 118.1	X						X		X	X			X	X	X	X						
18599	Semiannual	IHSS 118.1	X						X		X	X			X	X	X	X						
18699	Semiannual	IHSS 118.1	X						X		X	X			X	X	X	X						
18799	Semiannual	IHSS 118.1	X						X		X	X			X	X	X	X						
18899	Semiannual	IHSS 118.1	X						X		X	X			X	X	X	X						
20998	Semiannual	Bldg 771	X	X	X	X		X	X			X									X*	X*		
22596	Semiannual	Ind. Area	X	X		X		X	X			X												
22696	Semiannual	Ind. Area	X	X		X		X	X			X												
22796	Semiannual	Ind. Area	X	X		X		X	X			X												
22896	Semiannual	Ind. Area	X	X		X		X	X			X												
22996	Semiannual	Bldg 886	X	X		X		X	X			X												
23096	Semiannual	903 Pad	X	X		X		X	X		X	X												
23196	Semiannual	903 Pad	X	X		X		X	X		X	X												
23296	Semiannual	East Trenches	X (Q&Semi)	X		X		X	X			X												
38591	Semiannual	Drainage	X	X			X	X	X		X	X												
40099	Semiannual	Bldg 444	X	X	X			X	X			X	X											
40199	Semiannual	Bldg 444	X	X	X			X	X			X	X											
40299	Semiannual	Bldg 444	X	X	X			X	X			X	X											
40399	Semiannual	Bldg 444	X	X	X			X	X			X	X											
40499	Semiannual	Bldg 444	X	X	X			X	X			X	X											
40599	Semiannual	Bldg 771	X	X	X	X		X	X			X									X*	X*		
40699	Semiannual	Bldg 771	X	X	X	X		X	X			X									X*	X*		
40799	Semiannual	Bldg 771	X	X	X	X		X	X			X									X*	X*		
40899	Semiannual	Bldg 771	X	X	X	X		X	X			X									X*	X*		
40999	Semiannual	Bldg 865/886	X	X		X		X	X			X												
41099	Semiannual	Bldg 886	X	X		X		X	X			X												
41199	Semiannual	Bldg 886	X	X		X		X	X			X												
41299	Semiannual	Bldg 444	X	X	X			X	X			X	X											
41499	Semiannual	Bldg 771	X	X	X	X		X	X			X									X*	X*		
41591	Semiannual	Boundary	X	X	X	X		X	X	X	X	X												
41599	Semiannual	Bldg 771	X	X	X	X		X	X			X									X*	X*		
41691	Semiannual	Boundary	X	X	X	X	X	X	X	X	X	X												
43392	Semiannual	Ind. Area	X	X		X		X	X			X												
52894	Quarterly	Landfill	X	X	X			X	X	X	X	X												
52994	Quarterly	Landfill	X	X	X			X	X	X	X	X												
60299	Semiannual	Bldg 776/777	X	X	X	X		X	X			X											X*	
60499	Semiannual	Bldg 707	X	X		X		X				X									X	X*	X*	
60599	Semiannual	Bldg 707	X	X		X		X				X									X	X*	X*	
61099	Semiannual	Bldg 883	X	X				X	X			X										X*	X*	
61199	Semiannual	Bldg 883	X	X				X	X			X										X*	X*	
61499	Semiannual	Bldg 707	X	X		X		X				X									X	X*	X*	
70099	Semiannual	Solar Ponds						X (T)	X			X												
70193	Quarterly	PU&D	X	X	X			X	X	X	X	X												
70299	Semiannual	Solar Ponds						X (T)	X			X												
70393	Quarterly	PU&D	X	X	X			X	X	X	X	X												
70493	Quarterly	PU&D	X	X	X			X	X	X	X	X												
75992	Semiannual	Mound\E. Trench	X	X		X	X	X	X			X												
76992	Semiannual	PU&D\Landfill	X	X	X			X	X	X	X	X												
77392	Semiannual	Landfill	X	X	X			X	X	X	X	X												
90099	Semiannual	903 Pad/Ryans Pit	X									X												

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Table 1-2 Analyte Suites

WELLNO	FREQUENCY	PLUME\AREA	VOC Suite	METALS Suite	TRITIUM	PU/AM	SR 89/90	URANIUM	NITRATE	FLUORIDE	SULPHATE	TDS	CYANIDE	CESIUM-137	CHLORIDE	SULFIDE	TOC	METHANE	ANIONS Suite	GASES Suite	Np-237	PCBs	TPH	GROSS a/b
90199	Semiannual	903 Pad/Ryans Pit	X									X												
90299	Semiannual	903 Pad/Ryans Pit	X									X												
90399	Semiannual	903 Pad/Ryans Pit	X									X												
95099	Semiannual	East Trenches	X									X												
95199	Semiannual	East Trenches	X									X												
95299	Semiannual	East Trenches	X									X												
891COLWEL	Quarterly	881 Hillside	X	X				X				X												
B206989	Quarterly	Landfill	X	X	X			X	X	X	X	X												
B208289	Semiannual	Solar Ponds	X	X	X	X	X	X	X	X	X	X												
B208789	Semiannual	Solar Ponds	X	X	X	X	X	X	X	X	X	X												
P114389	Semiannual	Ind. Area	X	X		X		X	X			X												
P209289	Semiannual	Carbon Tet	X	X	X	X	X	X	X	X	X	X												
P209389	Semiannual	Carbon Tet	X	X	X	X	X	X	X	X	X	X												
P209489	Semiannual	Solar Ponds	X	X	X	X	X	X	X	X	X	X												
P218089	Semiannual	Bldg 707	X	X		X		X				X									X	X*	X*	
P218389	Semiannual	Solar Ponds	X	X	X	X	X	X	X	X	X	X												
P219189	Semiannual	Carbon Tet	X	X	X	X	X	X	X	X	X	X												
P219489	Semiannual	Solar Ponds	X	X	X	X	X	X	X	X	X	X												
P313589	Semiannual	Ind. Area	X	X		X		X	X			X												
P314289	Semiannual	Ind. Area	X	X		X		X	X			X												
P317989	Semiannual	Bldg 865/886	X	X		X		X	X			X												
P416689	Semiannual	Ind. Area	X	X		X		X	X			X												
P416789	Semiannual	Ind. Area	X	X		X		X	X			X												
P416889	Semiannual	Ind. Area	X	X		X		X	X			X												
P419689	Semiannual	Bldg 444	X	X	X			X	X			X	X											
SW13494	Quarterly	881 Hillside	X	X				X				X												
R1-0	Monthly***	Mound	X	X+X (D&T)		X		X (T)	X			X							X	X				X
R1-1	Monthly***	Mound	X	X+X (D&T)				X (T)	X			X							X	X				X
R1-2	Monthly***	Mound	X	X+X (D&T)				X (T)	X			X							X	X				X
R1-3	Monthly***	Mound	X	X+X (D&T)				X (T)	X			X							X	X				X
R1-4	Monthly***	Mound	X	X+X (D&T)				X (T)	X			X							X	X				X
R1-E	Monthly***	Mound	X	X+X (D&T)				X (T)	X			X							X	X				X
R2-E	Monthly***	Mound	X	X+X (D&T)		X		X (T)	X			X							X	X				X
ETP in	Monthly***	East Trenches	X									X												
ETP ef	Monthly***	East Trenches	X									X												
SW099	Quarterly	Landfill	X									X												
SW100	Quarterly	Landfill	X									X												

NOTES

B444/771/886 SAP says after 1st round, "selected wells" will be sampled per IMP (allowing us to trim the list of wells)

IHSS 118.1 to be sampled for only TOC ***OR*** DOC, not both, so heading should be revised

Well 23296 is to be sampled semiannually for "program" analytes, quarterly for VOAs only

18199	Micropurge well
D, T	Dissolved, Total
*	Can be omitted once a complete round is collected and results indicate no contamination with these species (may never happen for all B771 wells); new D&D SAP says can be omitted "after first sampling round" (does not rule out omitting them if wells are dry)
**	Well needs to be replaced
***	Schedule to be quarterly as of FY01

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D&D (DD) Monitoring Wells

These wells monitor for releases to groundwater from decontamination and decommissioning (D&D) activities. A concentration value is reportable when a measured concentration is above the M2SD of the established historical baseline concentration downgradient of the building(s). The required action is to inform appropriate parties and initiate an evaluation of the situation.

Plume Definition (PD) Monitoring Wells

These wells are located within known contaminant plumes and produce samples with contaminant concentrations which are above Tier II action levels, but are below the Tier I action levels established in the ALF. A value is reportable when a measured concentration is above a Tier I action level, **and** the background M2SD, **and** the M2SD of the historical concentration in the well. The required action is to reclassify the well as a Tier I reportable well and evaluate possible impacts to groundwater.

Plume Extent (PE) Monitoring Wells

These wells are located at the edges of known groundwater contaminant plumes, along pathways to surface water. These wells monitor for an increase in concentrations that may result in future impacts to surface water. A value is reportable if a measured concentration is above a Tier II action level **and** the background M2SD. When there is no historical data, **or** a value is greater than the M2SD of the historical concentration in the well when there have been historical values above Tier II action levels, the required action is to initiate monthly sampling. Appropriate parties are notified and possible impacts to surface water are evaluated if contaminant levels are above action levels, by the above criteria, for three consecutive months.

Drainage (D) Monitoring Wells

These wells are located in stream drainages, downgradient of contaminant plumes. They have the same programmatic requirements as PE wells under the IMP.

A value is reportable when a measured concentration is above the Tier II action level and the background M2SD. When there are no historical data, **or** a value is greater than the M2SD of the historical concentration in the well when there have been historical values above Tier II action levels, the required action is to initiate monthly sampling. Appropriate parties are notified and possible impacts to surface water are evaluated if values are above action levels, by the above criteria, for three consecutive months.

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Performance Monitoring (PM) Wells

These wells monitor the effect of a remediation or source removal action, as required in the ALF. If an increasing trend in the concentration of a contaminant is noted, then the appropriate parties are notified and an evaluation of the situation is initiated.

RCRA Monitoring Wells

These wells monitor downgradient groundwater contaminant concentrations at RCRA units. If the mean concentration of a contaminant in a downgradient well is greater than the mean concentration in upgradient wells and concentrations at the well show an upward trend with time, a report will be made to appropriate agencies and an investigation will be initiated to investigate possible causes.

Plume Degradation (PA) Monitoring Wells

These wells monitor the downgradient portions of groundwater plumes or plume sources to establish whether natural processes are degrading (also called attenuating) the nature and extent of the plume prior to entering the surface water environment. In areas where monitoring can document a natural attenuation process for a plume, other remediation activities may not be necessary. These wells would differ from plume extent wells in that the analyte suite may include parameters that focus on measuring the attenuation process. Also, these wells would not only look at concentration of contaminants but would look at the breakdown products from these contaminants in the evaluation process. If significant natural attenuation can be substantiated, then a non-remedial decision can be promulgated for the plume.

Groundwater reporting has been integrated under the IMP. Four quarterly reports are produced annually that document concentration values above RFCA action levels. Also documented are changes in water quality for wells not monitored for comparison to action levels. A RFCA Annual Groundwater Report is also required to summarize all actions taken for groundwater compliance within each calendar year.

For documented values above action levels and Site background in the designated program monitoring wells, an evaluation of impact to surface water is required. These evaluations are determined on a case by case basis, depending on the data requirements necessary to perform an impact analysis. Section 8.0 of this report discusses the status of the current evaluations that were implemented based on elevated concentrations in 1996.

1.3.3 Changes to the Groundwater Monitoring Program

Additions to the Groundwater Monitoring Network

Wells have been added to the Site monitoring network based on the results of groundwater evaluations and remediation activities. Plate 1 shows the locations for these monitoring wells.

The East Trenches and Solar Ponds passive treatment systems were completed in FY99. The East Trenches Treatment System was constructed in the area of Plume Extent well 23296 and seep piezometer 60195 (Figure 4-4), both of which contained detections of VOCs above Tier II action levels. A performance monitoring network was installed in FY99 to evaluate the effectiveness of the treatment system in reducing the VOC load to South Walnut Creek. The Solar Ponds Treatment System was also completed in FY99 to treat nitrate and uranium contaminated groundwater that had been detected in monitoring wells downgradient of the Solar Evaporation Ponds. Performance monitoring wells were also installed for this system in FY99 to evaluate the effectiveness of the treatment system in reducing the nitrate and uranium load to Walnut Creek.

During 1999, D&D monitoring network was established around Buildings 444, 886 and 771. Building 444 was a former beryllium and uranium production building; Building 886 was a former isotope testing lab, and Building 771 was a former plutonium production facility . Six monitoring wells were installed at Building 444 and are numbered 40099 through 40499 and 41299. Six wells were installed at Building 771 and are numbered 40599 through 40899, 41499 and 41599. Well 20998 was also included in the monitoring network for Building 771. Three wells were added to the monitoring network for Building 886, which historically was monitored by well 22996. The wells are numbered 40999 through 41199.

An investigation of the eastern extent of the IA Plume was conducted in 1999. Based on the results of the investigation, VOC contamination was interpreted to extend east of a major north-south utility corridor that originally had been thought to stop contaminant migration in this area. Fourteen temporary wells were installed. Section 8.1 provides additional information on this investigation.

A real time water level monitoring network was initiated for the Site in 1998 to help qualify the affects of storm events and other recharge events on groundwater flow and transport. Twenty-five wells originally identified for water level measurements in the IMP were converted to real time monitoring stations that record water levels six times per day. In 1999 the number of stations was increased to thirty-three to provide better coverage for the Site. Section 3.4 provides additional information on this activity.

A natural attenuation study was initiated to evaluate the extent of the 903 Pad/Ryan's Pit VOC Plume. Four monitoring wells were installed to help quantify the degree of natural attenuation that is occurring. The wells were numbered 90099 through 90399.

Removals From the Groundwater Monitoring Network

Wells are proposed for removal from the site monitoring network, because of improvements to the network either from the new well installations noted above, or, because of well damage.

Because of the new installations at the 903 Pad/Ryan's Pit Plume, several poorly positioned wells have been removed from the network.

D&D activities at Building 779 destroyed D&D well 02297. It was replaced by monitoring well 02500.

As a result of the decommissioning of the 881 Hillside French Drain, sampling location 891 Collection Gallery well (COLGAL) will be removed from the network.

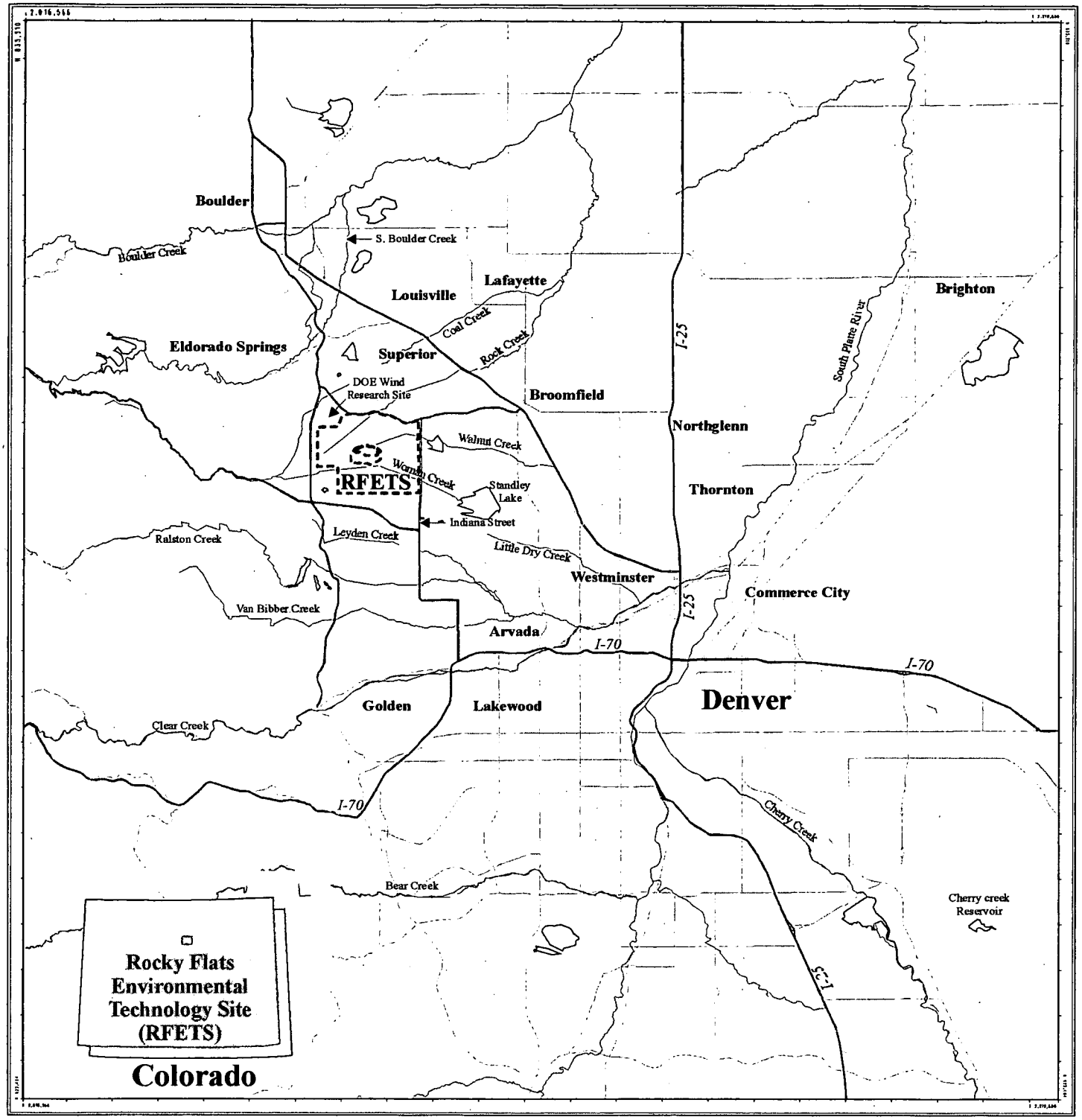


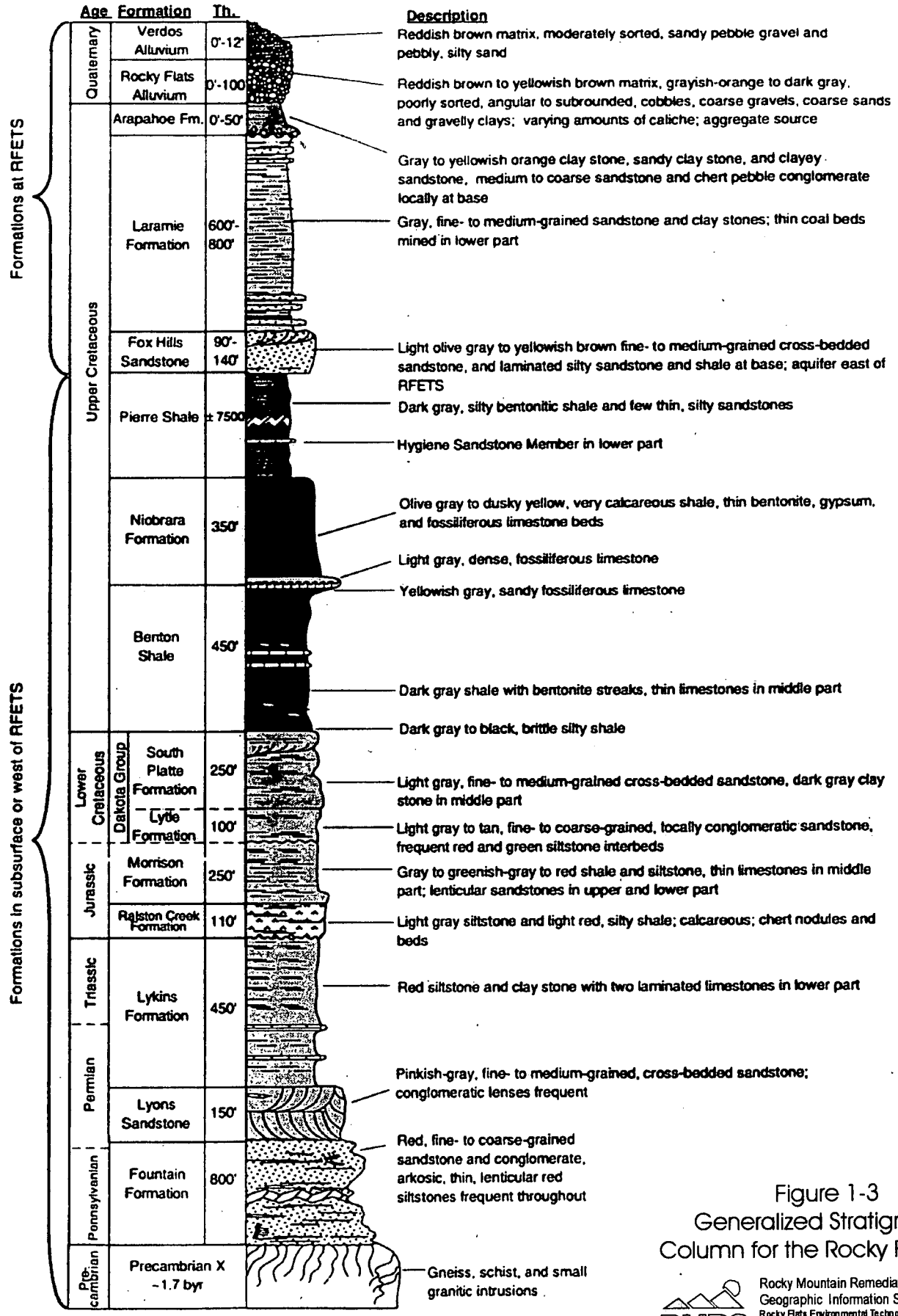
Figure 1-1 Location of Rocky Flats Environmental Technology Site (RFETS) 1999 Annual RFCA Groundwater Monitoring Report

Rocky Mountain Remediation Services, L.L.C.
Geographic Information Systems Group
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, CO 80402-0464

5,000' 0' 10,000' 20,000'
Scale in Feet

/projects/fy2k/rfca-rpt/figures/location_map

31



Modified from LeRoy and Weimer (1971)

Figure 1-3
Generalized Stratigraphic Column for the Rocky Flats Area

Rocky Mountain Remediation Services, L.L.C.
Geographic Information Systems Group
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, CO 80402-0464

/projects/fy2k/rfca-rpt/figures/stratigraphic

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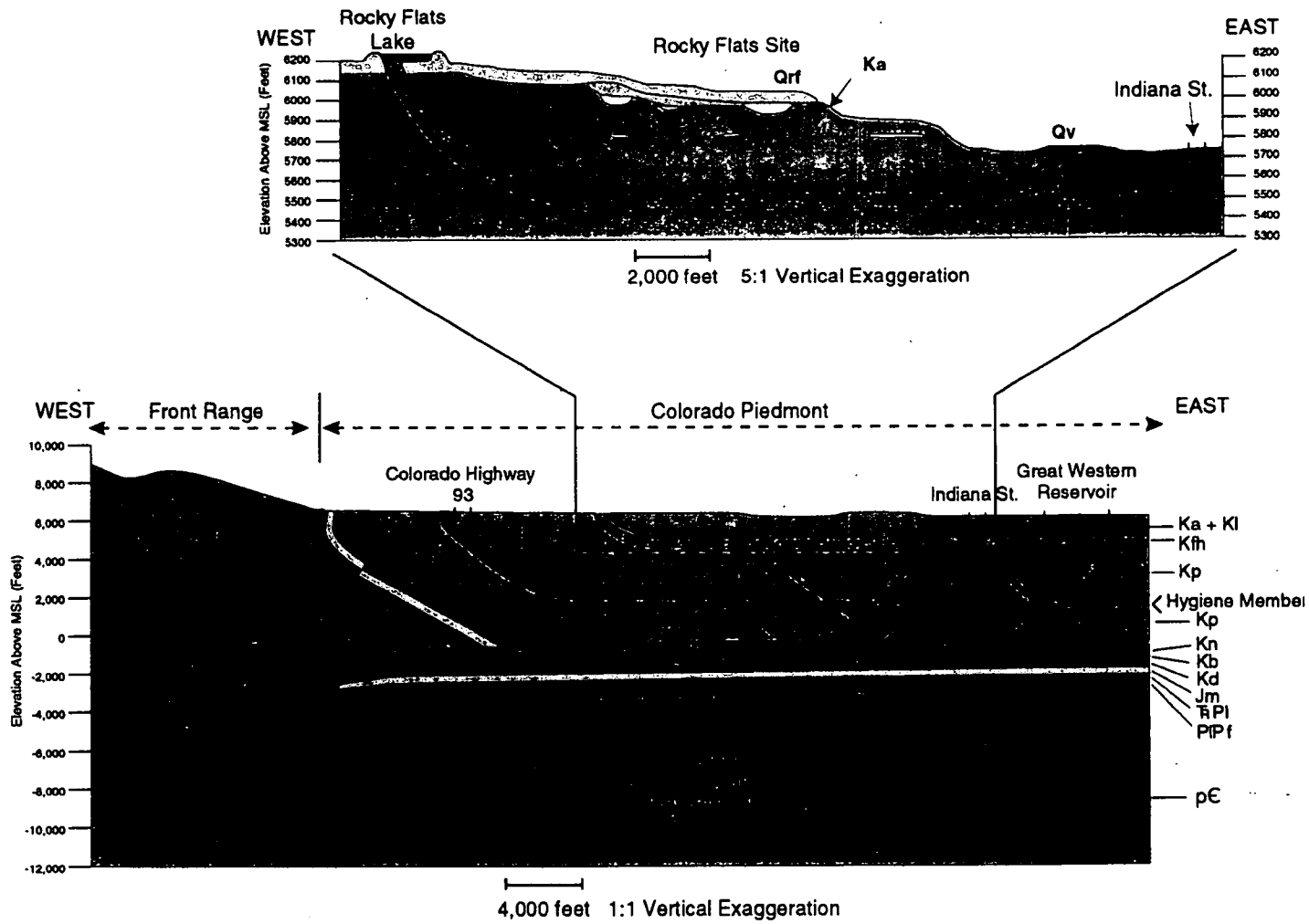
Geologic Units

- Qv — Verdos Alluvium
- Qrf — Rocky Flats Alluvium
- Ka — Arapahoe Formation
- Kl — Laramie Formation
- Kfh — Fox Hills Sandstone
- Kp — Pierre Shale/Hygiene Member
- Kn — Niobrara Formation
- Kb — Benton Shale
- Kd — Dakota Group
- Jm — Morrison Formation
- TRPl — Lykins Formation
- PIPf — Lyons & Fountain Formations
- p€ — Undivided Igneous & Metamorphic Units



Structural interpretation from EG&G, 1993a.

Figure 1-4
Generalized Geologic Cross Section of the Front Range and the Rocky Flats Area

1999 Annual RFCA
Groundwater Monitoring Report

RMRS
Rocky Mountain Remediation Services, L.L.C.
Geographic Information Systems Group
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, CO 80402-0464

projects/fy2k/rfca-rpt/figures/generalized_geo

Best Available Copy

2.0 DATA SUMMARY FOR RFCA-DESIGNATED WELLS SAMPLED IN 1999

2.1 Data Screening

RFCA groundwater analytical data for 1999 were utilized to assess compliance with RFCA well classifications as set forth in the DQOs section of the IMP. Because many well categories rely on Tier I or Tier II action level criteria to trigger further action, the Tier II action level criteria have been adopted for reducing the data set to a manageable size for presentation and discussion.

Boundary, Drainage, Plume Definition and Plume Extent wells are presented in this Section. Performance Monitoring wells, which do not employ Tier I or Tier II action levels for determining a course of action are discussed in Section 4.0. D&D monitoring wells are discussed with respect to the buildings where they were installed in Section 5.0. Non-Tier I and Tier II action level based well categories, including the RCRA monitoring well networks, are evaluated in Section 6.0 using an upgradient to downgradient groundwater quality comparison approach. Plume Degradation wells from IHSS 118.1 and the 903 Pad/Ryan's Pit Plume are examined in Section 7.0.

Table 2-1 provides a summary of 1999 IMP-related sample collecting for 140 locations performed by the Groundwater group. Table 2-2 gives a summary of 18 dry RFCA wells for 1999. Table 2-3 presents a summary of results for contaminants with concentrations greater than Tier II action levels. The Tier II values have been reported previously in the 1999 RFCA Quarterly Groundwater Monitoring Reports (RMRS, 1999k, 1999e, 2000a, 2000b). Tables 2-1 and 2-3 are found at the end of Section 2.0.

In total, 111 of 140 RFCA-designated monitoring wells had concentrations of one or more analytes above Tier II action levels (Table 2-3). Eighteen of 140 RFCA-designated wells were dry and yielded no results whatsoever (Table 2-2). Plates 4 through 6 are box plots that display the results of selected analytes (i.e., radionuclides, VOCs, and water quality parameters) at monitoring wells that had at least one analyte above Tier II action levels.

Historical trends of contaminants of concern for selected Boundary, Drainage, Plume Definition, and Plume Extent wells are shown in Figures A-1 through A-131 (Appendix A). The contaminant trend plots for Boundary, Drainage, Plume Definition, and Plume Extent wells were chosen from organic compounds that exceeded Tier I and II action levels, and other analytes that exceeded both Tier I and II action levels and background M2SD concentrations. Background values for inorganics and radionuclides were adopted from the 1993 Background Geochemical Characterization Report (DOE, 1993b) and the draft Background Comparison for Radionuclides in Groundwater (DOE, 1997a). The following sections present a

compilation of the data and information first provided in the CY99 quarterly reports. The decision rules that are described in general terms in Section 1.3 define the conditions under which values above action levels become "Reportable".

Table 2-2 Dry RFCA-Designated Wells Groundwater 1999

Well Number	IMP Well Class
00297	PLUME DEFINITION
02397	D & D
08091	PLUME EXTENT
15599	PERFORMANCE MONITORING
18899	PLUME DEGRADATION
20998	D & D
40599	D & D
40699	D & D
40799	D & D
40899	D & D
41499	D & D
41599	D & D
4787	PLUME EXTENT
4887	PLUME EXTENT
52994	RCRA
70099	PERFORMANCE MONITORING
90199	PLUME DEGRADATION
B208289	PLUME EXTENT

2.2 Values Above Tier I and Tier II Action Level Criteria

2.2.1 Boundary Wells

Six IMP designated Boundary wells, 0386, 06491, 10294, 10394, 41591, and 41691, were sampled in 1999. Boundary wells monitor groundwater leaving the eastern Site boundary through stream drainage channels. Manganese detected in wells 0386 and 10294 during the 1st Quarter 1999 was classified as reportable. In the updated RFCA, the manganese Tier II action level was raised from 183 µg/L to 1720 µg/L and therefore these results now fall below the Tier II action level (Table 2-3). The February manganese in well 0386 appears to be an aberration because subsequent samples have returned to their normal range below the Tier II action level (Figure A-13). The manganese in well 10294, in addition to shifting from being reportable to non-reportable, was below its historical M2SD benchmark (Figure A-64). Manganese concentrations in 0386 and 10294 do not seem to be increasing.

Nickel was detected in well 41591 in the 1st Quarter 1999 as described above, the Tier II action level was subsequently raised from 100 µg/L to 140 µg/L (Figure A-100). However, in the case of nickel in 41591 the Tier II level was still exceeded by these results and it remains reportable. Evaluation of the nickel

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concentration in well 41591 is complicated by the installation of a bladder pump during 1999. Previous samples were field filtered while pumped metals samples were typically not field filtered. The three-reportable 1999 metals samples have values that are considerably higher than those analyzed for either total nickel or dissolved nickel in past samples from this well. The nickel concentrations in well 41591 measured in terms of total metals have remained high for the past year.

The uranium isotopes U-233/234 and U-238 were detected above Tier II action levels in all six Boundary wells. All of the uranium isotope analytical results were below the background M2SD benchmarks, and are not considered reportable values. Because these isotopes are naturally occurring, and naturally increase in a down stream direction, these values may only be a reflection of natural processes.

2.2.2 Drainage Wells

Drainage wells are located in stream drainages on Site, downgradient of contaminant plumes. Five Drainage wells, 00997 (South Walnut Creek above Pond B-5), 38591 and 5587 ("west" Woman Creek), 6486 ("central" Woman Creek) and 6586 ("east" Woman Creek) were sampled in 1999 (Plate 10).

Manganese was recorded in well 00997 in the 1st Quarter that was above the Tier II action level and the background M2SD benchmark (Table 2-3 and Figure A-9). The change in the Tier II action level for manganese from 183 to 1720 µg/L means that this result would not now be classified as a reportable occurrence, but this result is still above the background M2SD. Subsequent results show the manganese concentration in 00997 appears to be decreasing.

Nickel was reported above the "new" Tier II action level, background M2SD, and historic M2SD for a sample collected from well 6586 (Table 2-3), and represents a reportable value. Figure A-63 shows that since 1998 the nickel content in 6586 has declined slightly from a spike centered in mid 1998 but is still above the Tier II action level.

According to the IMP, the nickel results for well 6586 require an evaluation of surface water impacts. The reason for a nickel exceedance at this well has not been ascertained. Nickel is not known to be a widespread contaminant at RFETS. The localized nature of nickel at this well suggests that it may be related to the stainless steel composition of the well casing, changes in sampling procedures, and/or the well's geochemical environment. Sampling techniques at this well has changed over the past few years (i.e. because of the installation of a bladder pump), so sampling artifacts maybe caused by changes in purging or sampling technique. Corrosion of the well components (316 stainless steel and 304 stainless steel) may represent the source of the elevated nickel concentrations.

In FY2000, an evaluation of nickel concentration in well 6586 (also in 1386 and 6486) was to have been undertaken. This was to have included a reexamination of sampling procedures and a downhole television

camera survey of well casing and screen conditions to check for corrosion. An evaluation of nickel at these locations is planned for the future.

Currently three stainless steel wells (1386, 6486 and 6586) are being specially sampled for metals to help determine the origin of anomalous nickel concentrations. Metal samples are being collected in the following manner. A sample is collected from stagnant water within the well upon first arriving at the well, either from the first bailer retrieved from the well (1386 and 6486) or from the initial flow from a pump equipped well (6586). A second metals sample is collected using the standard bailing or pumping procedures. A third sample is collected after continued purging. The purge volume for the third sample was determined on a per well basis depending on an evaluation of previous analytical results and purge volumes for each well, with the intent of making sure that fresh formation water is being collected. Nickel results for all three-sample aliquots will be examined and evaluated for possible sampling related influences. The evaluation of the impact of groundwater on surface water quality of Woman Creek will then be made.

Uranium isotopes U-233/234 and U-238 were detected above Tier II action levels in Drainage wells, 00997, 38591, 5587, 6486, and 6586. Strontium 89/98 in well 38591 was also above the Tier II action level. All of the uranium and the Sr 89/90 results were below the background benchmarks and, therefore, are not reportable values.

2.2.3 Plume Definition Wells

Plume Definition wells are located within known plumes and contain contaminants in amounts that exceed the Tier II action levels. A reportable result occurs when contaminant concentrations exceed the Tier I action level (typically 100x Tier II). Eighteen Plume Definition wells were monitored during 1999. The wells, grouped by the plume that they monitor are the 903 Pad/Ryan's Pit Plume (wells 00491, 2987, 3087, 6286 and 6386), PU&D Yard Plume (wells 00597 and 77392), East Trenches Plume (wells 03991 and 05391), 881 Hillside Plume (wells 0487, P416789 and P416889), Carbon Tetrachloride Plume (wells P209289, P209389, P209489 and P219189) and Industrial Area VOC Plume (well 22896) (Plate 11). As reported in Table 2-3, sixteen of these wells contained at least one or more contaminants that exceeded Tier II action levels. Well 00297 was dry during 1999. Well 3087 did not have any results above the Tier II action levels. Well 22896 contained two values exceeding Tier I action levels for trichloroethene. (Well 22896 was reclassified as a Plume Definition well in 1998 after unexpectedly high TCE concentrations associated with the Industrial Area VOC plume were detected in 1996 and 1997.)

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903 Pad/Ryan's Pit VOC Plume

Wells 00491, 2987, 3087, 6286 and 6386 are Plume Definition wells that monitor the 903 Pad/Ryan's Pit Plume (see also Sections 4.6 and 7.2). Well 00491 had Tier II results above the Tier II action level benchmark for carbon tetrachloride (Figure A-1), methylene chloride (Figure A-2), tetrachloroethene (Figure A-3), trichloroethene (Figure A-4), uranium-233/234 and uranium-238. VOC concentrations and uranium activities were all below their historic background M2SD benchmarks. Both the VOC and radionuclide results in 00491 were not reportable. Except for methylene chloride, which appear stable, the other three VOCs in well 00491, after declining from late 1991 to mid 1995, have stabilized from mid 1995 through the end of 1999.

In well 2987 the May sampling event contained antimony (Figure A-47), chromium (Figure A-48), molybdenum (Figure A-49), nickel (Figure A-50), selenium (Figure A-51), nitrate/nitrite (Figure A-52), sulfate (Figure A-53), uranium-233/234 and uranium-238 in amounts greater than their Tier II action levels. None of these results were greater than the Tier I action level so they are not reportable. This May sampling event was characterized by high turbidity waters, which may explain these results. Subsequent sampling of well 2987 has not been possible because of well damage. However, results from this well show it to be outside the 903 Pad/Ryan's Pit Plume.

No results greater than Tier II action levels were found in well 3087 during 1999. The well was sampled in both the 2nd and 4th Quarters.

Plume Definition well 6286 exhibited non-reportable amounts of carbon tetrachloride, selenium and uranium isotopes U-233/234 and U-238. The results were all below Tier I action levels but above the Tier II levels. The carbon tetrachloride results (Figure A-61) and uranium results were below the historic M2SD benchmark. Carbon tetrachloride concentrations have remained relatively stable in this well since 1995. The selenium results show continuation of a trend of increasing concentrations (Figure A-62). Well 6286 was one of nine wells on the south slope of the Industrial Area that contained elevated selenium during 1999. In general the selenium in these wells is above the background M2SD benchmark but within the historic M2SD for each individual well. Well 6286 was the only well that had an increasing amount of selenium. Selenium in the other locations has remained relatively constant or actually declined over time.

Well 6386 results included non-reportable activities of U-233/234 and U-238. Activities were above the Tier II action level, but, below the Tier I and the background M2SD benchmarks.

PU&D Yard Plume

Plume Definition wells 00597 and 77392 are located in the PU&D Yard Plume. Contaminants of concern in 00597 consisted of 1,1-dichloroethene and nitrate/nitrite. Both contaminants were above their Tier II but below the Tier I action levels (Table 2-3 and Figure A-5). No historical M2SD data are available for this

well. Since December of 1997 the nitrate/nitrite in 00597 has increased from 9 mg/L to 13.0 mg/L (Figure A-6). Elevated nitrate/nitrite concentrations are also present in wells 02197 (13 mg/L) and B206989

(43-58 mg/L) (Table 2-3). New wells will be installed in the PU&D yard area in late September of 2000. These wells will be used to assess the known VOC plume in the PU&D Yard area.

Plume Definition well 77392 is commonly dry but in May 1999 was successfully sampled. The results from that event indicated that fluoride and the U-233/234 and U-238 were above the Tier II action level but below the Tier I level. The lack of water in well 77392 means that the May 1999 fluoride result can be compared to only one other result collected in June 1998. Both results are similar. It is difficult to make an inference on fluoride in this case. No other wells on the plant site had a fluoride content greater than Tier II during 1999. The uranium isotopes were below the background M2SD. See Sections 6.0 and 7.3 for additional PU & D Yard discussion.

East Trenches Plume

Two Plume Definition wells monitor the East Trenches Plume, 03991 and 05391. Well 03991 contained concentrations of carbon tetrachloride (Figure A-14), tetrachloroethene (Figure A-15), trichloroethene (Figure A-16) and U-233/234 and U-238 that were above the Tier II action level but below the Tier I action level. The VOCs and uranium isotopes were below their respective historic and background M2SDs. VOC trend plots for carbon tetrachloride, tetrachloroethene and trichloroethene suggest slowly increasing concentrations.

Carbon tetrachloride (Figure A-21), tetrachloroethene (Figure A-22) and U-233/234 and U-238 were present in well 05391 at concentrations that were above the Tier II but below the Tier I action level benchmarks. Again, the VOCs and uranium isotopes were below their historic M2SDs. As shown in the trend plots VOCs do not appear to be increasing with time and may have declined slightly.

See Sections 2.2.4 and 4.3 for additional discussion of the East Trenches Plume.

881 Hillside Plume

Three Plume Definition wells (0487, P416789 and P416889) are used to monitor the 881 Hillside Plume. Well 0487 contained carbon tetrachloride (Figure A-17), tetrachloroethene (Figure A-18), trichloroethene (Figure A-19), selenium (Figure A-20) and U-233/234 and U-238 that were above Tier II, but, below Tier I action levels. Both the 1999 VOCs and selenium results in 0487 were below their historic M2SDs and the uranium isotopes were below the background M2SDs. VOC results for 1999 continue declining trends established since the 1991-1994 time frame. Selenium also continues a decreasing trend established after summer 1994.

Monitoring well P416789 samples contained concentrations of trichloroethene, nitrate/nitrite and

U-233/234 or that were above the Tier II action level but below the Tier I. The trichloroethene was below its historic M2SD (Figure A-125). Because of a frequent lack of water nitrate/nitrite does not have enough data points to calculate a historic M2SD, but, may be decreasing slightly (Figure A-126). Uranium-233/234 in P416789 was below the background M2SD benchmark.

Monitoring well P416889 contained concentrations of tetrachloroethene, and uranium isotopes U-233/234 and U-238 that were below Tier I but above Tier II action levels. The tetrachloroethene was below its historic M2SD while the isotopes were below their background M2SDs. Figure A-127 suggests that tetrachloroethene is decreasing slowly but erratically with time.

Carbon Tetrachloride Plume

The Carbon Tetrachloride Plume is monitored by Plume Definition wells P209289, P209389, P209489 and P219189. VOC contaminants in these wells include carbon tetrachloride, 1,1-dichloroethene, cis-1,3-dichloropropene and trichloroethene. All of these constituents appear to be declining in concentration.

Well P209289 contained carbon tetrachloride and U-233/234 and U-238 at levels above Tier II but below Tier I action levels. The carbon tetrachloride has decreased since sampling began in 1991 (Figure A-115); the 1999 results are the lowest recorded. The uranium isotope results were well below the background M2SD benchmarks.

Monitoring well P209389 samples contained only 1,1-dichloroethene as a contaminant of concern. Two sampling events showed it to be above the Tier II action level but below the Tier I level. Figure A-116 shows that the 1,1-dichloroethene concentration has declined since sampling began in 1991.

Well P209489 samples contained levels of carbon tetrachloride, cis-1,3-dichloropropene, and trichloroethene, nitrate/nitrite and U-233/234, U-235 and U-238 that were above the Tier II action levels. None were above the Tier I action level or M2SDs. Carbon tetrachloride (Figure A-117), trichloroethene (Figure A-119) and nitrate/nitrite (Figure A-120) appear to be decreasing slowly. Cis-1,3-dichloropropene is difficult to evaluate because most of the data points in the trend plot merely represent values plotted at half the detection limit (Figure A-118).

1,1-dichloroethene and U-233/234, U-235 and U-238 are the 1999 contaminants of concern in Plume Definition well P219189. Results for these analytes were above the Tier II but below the Tier I benchmarks. Figure A-121 shows that the 1,1-dichloroethene concentration has remained relatively constant since the end of 1993. The uranium results for well P219189 were close to the background M2SDs. Uranium-233/234 had two results just below the background and U-235 and U-238 had one result above and one result below the background. Because 1999 was the first sampling event since 1989, no

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trend plots for uranium are available for this well. Given that only two uranium samples are available, it is difficult to say whether they are increasing or decreasing. Uranium concentrations in well P219189 maybe influenced by proximity to the Solar Ponds.

Industrial Area VOC Plume

Plume Definition well 22896 monitors the Industrial Area VOC Plume. Samples from this well contained reportable results above both the Tier II and Tier I action benchmark for trichloroethene. They also contained non-reportable methylene chloride, manganese, nickel and nitrate/nitrite. As illustrated in Figure A-91, the trichloroethene concentration is at least stable and may have declined slightly in late 1998 and 1999. Results for methylene chloride are complicated by laboratory contamination in both 1999 samples and the predominance of "U" qualified laboratory results for most of its past sampling history (Figure A-90). The elevated manganese result (Figure A-92) was recorded in the 1st Quarter Report (RMRS, 1999k) as being reportable, but, due to the change in the manganese Tier II action level this result is not currently classified as reportable. The nickel Tier II action level was also increased after the 1st Quarter Report was written, but the 1st Quarter nickel result is still reportable. A subsequent sampling event in the 3rd quarter shows that nickel in well 22896 has returned to below the Tier II action level. The nitrate/nitrite results for 1999 in 22896 were both greater than the background M2SD. The only other nitrate result is from late 1996 and is similar to the value of 12 mg/L of the March 1999 sample. Additional data are required in order to conclusively describe a trend.

2.2.4 Plume Extent Wells

Thirty-nine Plume Extent wells are used to monitor the various plumes. These wells are discussed in relation to the main plume they monitor. Some wells have dual purposes, with secondary plumes monitored noted in parentheses. The East Trenches Plume is monitored by wells 04091, 04591, 04991, 05091, 06091, 08091 (plus Mound), 10194, 75992 (plus Mound) and 23296. Wells 1386, 1786, 3386, B208289, B208789, P218389 and P219489 monitor the Solar Ponds Plume. Plume Extent wells monitoring the Industrial Area VOC Plume include 10994 (plus the Old Landfill), 1986, 2186, 22596, 22696, 43392, 6186, 7086 (plus the Old Landfill), P114389, P313589, P314289 and P416689. The Carbon Tetrachloride Plume is monitored by wells 22796 and 3386 (plus Solar Pond Plume). The 903 Pad/Ryan's Pit Plume is monitored by wells 23096 and 23196. Plume Extent wells 00397, 02197 and 76992 are used to monitor the PU&D Yard/Present Landfill. Plume Extent wells 4787, 4887, and 5387 are used to monitor the 881 Hillside. The Mound Plume is monitored by well 3586 (plus the Solar Ponds Plume).

East Trenches Plume

The East Trenches Plume is monitored by nine Plume Extent wells including, 04091, 04591, 04991, 05091, 06091, 08091, 10194, and 23296. The ninth well, 75992, is located near the boundaries of the East

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Trenches and Mound plumes, and is utilized to monitor contamination that may originate from either plume. As shown in Plate 11, these wells are located along the outermost edge of the East Trenches plume to monitor plume movement and spreading away from potential source areas, such as Trench T-3, Trench T-4, and the northeast lobe of the 903 Pad/Ryan's Pit Plume. VOCs represent the primary constituents of the East Trenches plume. Additional discussion of the East Trenches Plume can be found in Sections 4.3 and 8.4.

VOCs were elevated in 1999 in only two (06091 and 23296) of the nine Plume Extent wells monitoring the East Trenches Plume (well 08091 was dry). These detections appear to be lower in both the number of wells and variety of analytes than in 1998.

Well 06091 had a suite of three monthly VOC samples collected in June, July and August and a routine VOC sample collected in November. The resulting data show a continued increase in carbon tetrachloride that began in late 1995/early 1996 (Figure A-26). All four of these results were reportable because they were above both the Tier II action level and historic M2SD for carbon tetrachloride.

Well 23296 contained reportable carbon tetrachloride, cis-1,2-dichloroethene, tetrachloroethene and trichloroethene. These VOCs were above the Tier II action levels and no historic M2SDs are available. Carbon tetrachloride in 23296 shows marked fluctuations (Figure A-94). Cis-1,2-dichloroethene increased to the highest levels ever measured in this well in late 1999 (Figure A-95). Both tetrachloroethene and trichloroethene declined through 1999(Figures A-96 and A-97 respectively).

The East Trenches Plume Treatment System was completed in September 1999. The system is designed to remove VOC's from groundwater flowing from the East Trenches Plume. The treatment System probably had a minimal effect on the groundwater collected in 23296 during 1999 given that changes in contaminant concentrations are expected to occur slowly following plume interception.

Manganese was measured in reportable concentrations in well 75992. However, because the manganese Tier II action level increased this result is no longer reportable (Figure A-98).

Uranium isotopes U-233/234 and U-238 were detected at above Tier II action levels but below background levels in all nine sampled wells, thus the values are not considered reportable.

Solar Ponds Plume

Plume Extent wells 1386, 1786, 3386, B208289, B208789, P218389, and P219489 are utilized for monitoring groundwater contamination associated with the Solar Ponds Plume. The wells are located at the edge of the Solar Ponds Plume, which primarily extends north from the Solar Ponds to North Walnut Creek, with additional minor pathways to the east and south toward South Walnut Creek (Plate 11). Nitrate and uranium are the principal contaminants associated with the Solar Ponds Plume. In 1999 nitrate and

metals were the principal contaminants found in samples from these wells. No VOC analyses above Tier II action levels were found in these wells during 1999.

Well B208289 was dry during both quarters of sampling. Plume Extent wells 3386 and P218389 had no results above Tier II action levels except for uranium isotopes as discussed below.

Well 1386 had two reportable occurrences of nickel in 1999. Nickel was above the Tier II action level, the background M2SD and historic M2SD for the well (Figure A-41). Nickel in 1386 began to rise in late 1997 and continues to increase. Well 1386 is part of a program to investigate potential sampling and well completion material artifacts (see Section 2.2.2. Drainage Wells).

Well 1786 exhibited two reportable analyses for nitrate and two for selenium during 1999. The nitrate analyses were above the Tier II action level and background M2SD benchmark but below the historic M2SD for the well. The 2nd Quarter result for selenium was above the Tier II and background M2SD but below the historic M2SD while the 4th Quarter result was above all three monitoring criteria. Nitrate in well 1786 appears to be holding steady in concentration. Selenium peaked in 1996-1997, declined through early 1998 and appears to be increasing. In general the selenium increase appears to be slow although there are marked fluctuations.

The nitrate concentration in Plume Extent well P219489 was above the Tier II action level and background M2SD but was below the historic M2SD (Figure A-122). Nitrate concentration in this well remains within the historic M2SD range calculated for the well but may be slowly increasing.

The four uranium isotopes commonly monitored at RFETS were present above Tier II action levels in all the sampled Solar Ponds Plume Extent wells. None of the isotopic results for uranium were reportable because they were all below the background M2SD. Uranium-238 was the only isotope above Tier II in P218389. Isotopes U-233/234 and U-238 were above Tier II in 1386, 3386, B208789 and P219489. Well 1786 had all four isotopes, U-233/234, U-235 and U-238 above Tier II levels.

Industrial Area VOC Plume

Plume Extent wells monitoring the Industrial Area VOC Plume include 00197 and 10994, 1986, 2186, 22596, 22696, 43392, 6186, 7086, P114389, P313589, P314289 and P416689. The Carbon Tetrachloride Plume (IHSS 18.1) has two Plume Extent monitoring wells 22796 and 3386. Wells 00197, 7086 and 10994 also monitor potential groundwater contamination originating from the Old Landfill located on the hillside South of the 130 and 400 area building complexes and north of Woman Creek. Well 3386 also monitors the Solar Ponds Plume.

As shown on Plate 11, the Industrial Area VOC Plume spans the middle of the Industrial Area in a north-northeast orientation. The plume migrates toward both Woman and North Walnut Creeks. Carbon tetrachloride, tetrachloroethene and trichloroethene are the primary VOC contaminants. The distribution of

these VOCs tends to be source-specific and non-uniform. There are no known inorganic or radiological groundwater plumes that coincide with the Industrial Area VOC plume. The Carbon Tetrachloride Plume lies north and slightly east of the VOC plume (Plate 11). It migrates from its source along an east-west axis and potentially toward North Walnut Creek.

Plume Extent well 10994 contained two selenium and one nitrate result (see below for uranium isotopes for all the wells in this section) that were above the Tier II action levels. The two selenium results were above the background M2SD but below the historical M2SD (Figure A-69). Although the data fluctuates selenium may be declining slightly with time. The 1st Quarter nitrate sample was above the Tier II action level and background M2SD while the 3rd Quarter sample was below the Tier II but still above the background (Figure A-70). The trend plot for nitrate in 1999 shows that the concentration of nitrate in the well continues to decrease slowly.

Plume Extent well 1986 exhibited two analytical results for manganese and one for thallium that were above the Tier II action level. The manganese results were above the recent Tier II action level (1720 µg/L). The June manganese was above the background M2SD and the historical M2SD for the well. The December manganese was above the background M2SD. In general manganese does not seem to be increasing in well 1986. The thallium result is "U" qualified by the laboratory and therefore is of minimal value, but, because it is below the background M2SD it was not considered reportable. Historically total and dissolved thallium concentrations fluctuate. The concentration of thallium does not appear to be increasing but is staying relatively constant between 0.5 and 3.5 µg/L.

Well 2186 contained a single thallium result that was similar to the one in well 1986 (see above). Again the result was "U" qualified and reported at the detection limit of the analysis, which was below the background M2SD and considered non-reportable. As in well 1986 dissolved and total thallium analyses in well 2186 are erratic but the concentration appears to be relatively constant between 0.5 and 3.5 µg/L.

Well 22696 results included one carbon tetrachloride and one manganese result that were above the Tier II action level and were reportable because the well has no historical M2SDs. The carbon tetrachloride sample result prompted the collection of three consecutive monthly confirmation samples (Figure A-85). Only two of the three samples could be collected but their analytical results indicate that the reportable analytical result is either an aberration or erroneous. Carbon tetrachloride is not increasing in well 22696. The manganese result no longer qualifies as reportable because of the change in Tier II action level (Figure A-86).

Well P114389 had a single reportable manganese result from the 1st quarter, which became non-reportable with the increase of the Tier II action level (Figure A-114).

A 1999 1st quarter nickel result in Plume Extent well P313589 was above the Tier II action level and reportable (Figure A-123). The new nickel Tier II action level means that this result is currently not

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reportable. This result was above the background M2SD but below the historic nickel M2SD for the well. Nickel in well P313589 appears to be decreasing with time.

A 2nd quarter nickel result in Plume Extent well P416689 was above the Tier II action level and reportable (Figure A-124). This result was also above the background M2SD, but because of frequently dry conditions no historical M2SD is available for this well.

Analytical results for uranium isotopes from Plume Extent wells associated with the Industrial Area VOC Plumes are as follows. All these results were above the Tier II action levels but were below the background M2SD so they were not reportable. Wells 10994, 1986, 2186, 22696, 6186, 7086, P114389 and P416689 each had two results above Tier II for U-233/234 and U-238. Well 3386 had one U-233/234 and one U-238 above Tier II, well 43392 had a single value for U-233/234 over Tier II and well P313589 had two U-233/234 and one U-238 over Tier II. Note that uranium isotopes were the only results over Tier II for wells 3386, 43392, 6186 and 7086.

903 Pad/Ryan's Pit VOC Plume

Potential migration of the 903 Pad/Ryan's Pit Plume toward Woman Creek is monitored by Plume Extent wells 23096 and 23196. Plate 11 illustrates the location of these wells in relationship to the distal end of the plume and Woman Creek. The plume is mainly composed carbon tetrachloride from the 903 Pad area and TCE from Ryan's Pit. A more complete listing of individual 903 Pad and Ryan's Pit plume contaminants is provided in the discussion of Plume Definition wells presented above and in Sections 4.6 and 7.2.

No VOC, metal or water quality contaminants were detected above Tier II action levels in Plume Extent wells 23096 and 23196 during 1999. The uranium isotopes U-233/234 and U-238 were detected above Tier II action levels in both 23096 and 23196. Both isotopes in both wells were below background M2SD levels.

PU&D Yard Plume

Plume Extent wells 00397, 02197 and 76992 monitor VOC contamination associated with the PU&D Yard Plume, which forms an elongate plume south of the Present Sanitary Landfill that extends from the PU&D Yard on the west to well 02197 on the east (Plate 11). The primary plume contaminants consist of PCE, TCE, and 1,1,1-trichloroethane. Further discussion of PU&D Yard plume contamination is provided in Section 7.3 of this report.

In 1999 the only contaminant exceeding Tier II action levels (other than uranium isotopes) in the PU&D Yard Plume Extent wells was nitrate in well 02197 (Figure A-10). This reportable result from 02197 was the only analysis for nitrate available for the well in 1999. The nitrate was also above the background M2SD; no historical M2SDs are available for this well. The nitrate trend plot for well 02197 indicates that

4b

the concentration may be increasing (note the limited number of samples collected over a relatively short duration).

Plume Extent wells 00397 and 76992 had single occurrences where the levels of U-233/234 and U-238 were above the Tier II action level benchmarks but not over the background M2SDs.

881 Hillside Plume / Building 881 Footing Drain Sump

Plume Extent wells 4787, 4887 and 5387 monitor the extent of the 881 Hillside Plume. Well 5387 also monitors the Building 881 Footing Drain Sump (known as Performance Monitoring location SW13494). Wells 4787 and 4887 were both dry during both semiannual monitoring visits in 1999. Well 5387 was found to contain only the uranium isotopes U-233/234 and U-238 in its two sampling events. In both events the results for both isotopes were above the Tier II levels but below the background M2SDs

Mound Plume

The Mound Plume is monitored by Plume Extent wells 3586 and 75992 (for the latter well see East Trenches Plume above). Well 3586 also serves to monitor the south eastern end of the Solar Ponds Plume. In 1999, Plume Extent well 3586 produced samples containing vinyl chloride, manganese, U-233/234 and U-238 at concentrations that exceeded their respective Tier II action levels and were therefore reportable. The vinyl chloride, while above Tier II was below the historic M2SD for the well (Figure A-55). The 1999 vinyl chloride trend plot shows a decreasing trend in the well. The manganese results from this well were all considerably above the background M2SD (Figure A-54). The 1st Quarter 1999 manganese was also above the historic M2SD for the well whereas two later samples were below the historic M2SD. (A fourth manganese sample from 2nd Quarter 1999 was below the Tier II level.) With some perturbations in the trend plot the manganese content in 3586 is fairly constant. The uranium isotope results for U-233/234 and U-238 were all above the Tier II action level but below the background M2SD and are therefore not reportable.

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Table 2-1
Summary of Samples Collected
Groundwater 1999

Well	VOC's				Metals				Radionuclides																Water Quality Parameters															
									Pu/Am				U-isotope				Tritium				$Strontium_{89/90}$				Nitrate				Total Diss. Solids				Sulfate				Fluoride			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
00197		S		D		I		D						I		D		I		D		I		D		I		D		I		D		I		D		I		D
00297		D		D		D		D		D		D		D		D		D		D		D		D		D		D		D		D		D		D		D		D
00397		S		D		S		D						S		D		S		D				D		S		D		S		D		S		D		S		D
00491	S		S		S		S		S		S		S		S										S		S		S		S		S		S					
00597	S		S		S		S						S		S		S		S						S		S		S		S		S		S		S		S	
00797	S		S		S		S						S		S										S		S		S		S		S		S					
00897		S		S		S		S		S		S		S		S										S		S		S		S								
00997	S		S		S		S	S	S		S		S		S						S		S						S		S									
02197		S		D		S		D						S		D		S		D						S		D		S		D		S		D		S		D
02291		S		S		S		S		S		S		S		S										S		S		S		S								
02297		S		D		I		D		I		D		S		D										S		D		I		D								
02397		D		D		D		D		D		D		D		D										I		D		D		D								
02497		S		S		I		S		S		S		S		S										I		S		I		I								
0386	S		S		S		S	S	S		S		S		S		S		S				S		S		S		S		S		S		S		S		S	
03991	S		S		S		S		S		S		S		S										S		S		S		S									
04091		S		S		S		S		S		S		S		S										S		S		S										
04591	S		S		S		S		S		S		S		S										S		S		S		S									
0487	S		S		S		S						S		S										S		S		S		S		S		S					
04991		S		S		S		S		S		S		S		S*										S		S		S		S								
05091	S		S		S		S		S		S		S		S										S		S		S		S									
05391	S		S		S		S		S		S		S		S										S		S		S		S									
05691	S		S		S		S		S		S		S		S										S		S		S		S									
06091		S	S	S		S		S		S		S		S		S										S	S	S		S		S								
06491	S		S		S		S		S		S		S		S		S		S						S		S		S		S		S		S		S		S	
07391	S		S		S		S		S		S		S		S										S		S		S		S		S		S					
08091		D		D		D		D		D		D		D		D						D				D		D		D		D								
10098	S		S		I		S		I		I		I		S										S		S		I		S									
10194	S		S		S		S		S		S		S		S										S		S		S		S									
10198	S		S		I		S		I		I		I		S										S		S		I		I									
10294	S		S		S		S		S		S		S		S		S		S						S		S		S		S		S		S		S		S	
10298	S		S		I		S		I		I		I		S										S		S		I		S									
10394	S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S	

Tab[illegible]
Summary of Samples Collected
Groundwater 1999

Well	VOC's				Metals				Radionuclides																Water Quality Parameters															
									Pu/Am				U-isotope				Tritium				$Strontium_{89/90}$				Nitrate				Total Diss. Solids				Sulfate				Fluoride			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
10398	S		S		I		S		I		I		I		S										I		I		I		I									
10498	S		S		S		S		S		S		S		S										S		S		S		S									
10592		S		S		S		S						S		S										S		S		S		S		S		S				
10598	S		S		S		S		S		S		S		S										S		S		S		S									
10692	S		S		S		S						S		S										S		S		S		S		S		S					
10792		S		S	S	S		S						S		S										S		S		S		S		S		S				
10992	S		S		S		S						S		S										S		S		S		S		S		S					
10994	S		S		S		S						S		S						S		S		S		S		S		S		S		S					
11092		S		D		S		D						I		D										S		D		S		D		I		D				
11891		S		S		S		S		S		S		S		S										S		S		S		S								
12191		S		S		S		S		S		S		S		S										S		S		S		S								
12691	S		S		S		S		S		S		S		S										S		S		S		S									
1386		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S
15599	D	D	D	D						D	D	D	D	D	D	D																								
15699	S	S	S	S					I	S	S	I	S	S	S	S																								
15799	D	D	S	S					D	D	I	I	D	D	S	I																								
1786		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S
18199			S	S				S				S				S				S							S	S						S					
18299			S																								S							S					
18399			S																								S							S					
18499			S																								S							S					
18599			S																								S							S					
18699			S																								S							S					
18799			S																								S							S					
18899			D																								D							D					
1986		S		S		S		S		S		S		S		S										S		S		S		S								
20998				D				D				D				D				D								D												
2186		S		S		S		S		S		S		S		S										S		S		S		S								
22596	S		S		S		S		S		S		S		S										S		S		S		S									
22696	S		S	S	S		S		I		S		S		S										S		S		I		S									
22796		S		S		S		S		S		S		S		S										S		S		S		S								
22896	S		S		S		S		S		S		S		S										S		S		S		S									

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Summary of Samples Collected
Groundwater 1999

Well	VOC's				Metals				Radionuclides																Water Quality Parameters															
									Pu/Am				U-isotope				Tritium				$Strontium_{89/90}$				Nitrate				Total Diss. Solids				Sulfate				Fluoride			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
22996	S		S	S	S		S	S	S		S	S	S		S	S					S		S					S	S		S									
23096	S		S		S		S		S		S		S		S										S		S		S		S		S		S					
23196		D		S		D		I		D		I		D		S										D		S		D		I		D		I				
23296	S		S	S	S	S	S		S		S		S		S										S		S		S		S									
2987		S		DMG		S		DMG		S		DMG		S		DMG										S		DMG		S		DMG		S		DMG				
3087		S		S		S		S		S		S		S		S										S		S		S		S		S		S				
3386		S		D		S		D		I		D		S		D		S		D		S		D		S		D		S		D		S		D		S		D
3586	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S									S	S	S	S	S	S	S	S								
3687		S		S		S		S		S		S		S		S										S		S		S		S								
38591	S		S		S		S						S		S						S		S		S		S		S		S		S		S					
40099				S				S								S				S								S												
40199				S				S								S				S								S												
40299			S	S				S								S				S								S												
40399				S				S								S				S								S												
40499				S				S								S				S								S												
40599				D				D				D				D				D								D												
40699				D				D				D				D				D								D												
40799				D				D				D				D				D								D												
4087	S	S	S	D	S	S	S	D					S	S	S	D	S	S	S	D					S	S	S	D	S	S	S	D	S	S	S	D	S	S	S	D
40899				D				D				D				D				D								D												
40999				S				S				I				S												S												
41099				S				S				S				S												S												
41199				S				S				S				S												S												
41299				S				S								S				S								S												
41499				D				D				D				D				D								D												
41599				D				D				D				D				D								D												
41591	S		S		S		S	S	S		S		S		S		S		S						S		S		S		S		S		S		S		S	
41691	S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S	
43392	S		S		S		S		S		S		S		S										S		S		S		S									
4787	D		D		D		D						D		D										D		D		D		D		D		D					
4887	D		D		D		D						D		D										D		D		D		D		D		D					
52894	D	S	S	D	D	S	S	D					D	S	S	D	D	S	S	D					D	S	S	D	D	S	S	D	D	S	S	D	D	S	S	D

Table 2-1
Summary of Samples Collected
Groundwater 1999

Well	VOC's				Metals				Radionuclides																Water Quality Parameters															
									Pu/Am				U-isotope				Tritium				$Strontium_{89/90}$				Nitrate				Total Diss. Solids				Sulfate				Fluoride			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
52994	D		D	D	D		D	D					D		D	D	D		D	D					D		D	D	D		D	D	D		D	D	D		D	D
5387		S		S		S		S						S		S*										S		S		S		S		S		S				
5587		S		D		S		D						S		D						S		D		S		D		S		D		S		D				
5887	S	S	S	S	S	S	S	S					S	S	S	S	S	S	S	S					S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
6186	S		S		S		S		S		S		S		S										S		S		S		S									
6286	S		S		S		S		S		S		S		S										S		S		S		S		S		S					
6386	S		S		I		S		I		S		I		S										S		S		I		S		I		S					
6486	S		D		S		D						S		D						S		D		S		D		S		D		S		D					
6586	S		S		S		S		S		S		S		S										S		S		S		S									
70099															D	D											D	D												
70193	S	S	S	S	S	S	S	S					S	S	S	S	S	S	S	S					S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
70299															S	S											S	S												
70393	S	S	S	S	S	S	S	S					S	S	S	S	S	S	S	S					S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
70493	S	S	S	S	S	S	S	S					S	S	S	S	S	S	S	S					S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
7086	S		S		S		S						S		S						S		S		S		S		S		S		S		S					
75992	S		S		S		S		S		S		S		S						S		S		S		S		S		S									
76992	D		S		D		S						D		S		D		S						D		S		D		S		D		S		D		S	
77392		S		D		S		D						S		D		S		D						S		D		S		D		S		D		S		D
90099			S																																					
90199			D																																					
90299			S																																					
90399			S																																					
891COLGAL	S	S	S	S	S	S	S	S					S	S	S	S																								
891COLWEL	S	S	S	S	S	S	S	S					S	S	S	S																								
B206989	S	D	S	S	I	D	S	S					I	D	S	S	I	D	S	S					S	D	S	S	I	D	I	I	I	D	I	I	I	D	I	I
B208289		D		D	D	D		D		D		D		D		D		D		D		D		D		D		D		D		D		D		D		D		D
B208789		S		S	I	S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S
P114389	S		S		S		S		S		S		S		S										S		S		S		S									
P209289		S		S		S		S		S		I		S		I		S		S		S		I		S		S		S		I		S		I		S		I
P209389	S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S	
P209489		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S		S
P218389		S		D		S		D		S		D		S		D		S		D		S		D		S		D		S		D		S		D		S		D

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Table 2-1
Summary of Samples Collected
Groundwater 1999

Well	VOC's				Metals				Radionuclides																Water Quality Parameters															
									Pu/Am				U-isotope				Tritium				$Strontium_{89/90}$				Nitrate				Total Diss. Solids				Sulfate				Fluoride			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
P219189		S		S		S		I		I		I		S		S		S		S		I		I		S		S		I		I		I		I		I		I
P219489		S		S		S		I		I		I		S		I		S		S		I		I		S		S		I		I		I		I		I		I
P313589	S		S		S		S		S		S		S		S										S		S		S		S									
P314289	S		S		I		I		I		I		I		I										I		S		I		I									
P317989				S				S				I				I												S												
P416689		S		S		S		S		S		S		S		S										S		S		S		S								
P416789		S		S		S		S		S		S		S		S										S		S		S		S								
P416889		S		S		S		S		S		S		S		S										S		S		S		S								
P419689				S				S								S				S								S												
SW099		S				S				S				S				S								S				S				S				S		
SW100		S				S				S				S				S								S				S				S				S		
SW13494	S	S	S	S	S	S	S	S					S	S	S	S																								

Blank indicates no sample attempted or required.

* = U-isotopic analysis including U-236. U-236 proved to be indistinguishable from other U-isotopes.

S = Indicates location was successfully sampled.

D = Indicates location was dry. No samples collected at this location at this time.

DMG = Well is damaged and cannot be sampled.

I = Indicates location produced insufficient water for this analyte. Other samples were collected at the location.

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Ta[illegible]1
Summary of Samples Collected
Groundwater 1999

Well	Total Cyanide				Cesium$_{137}$		Polychloriated Biphenyls	Total Suspended Solids	Neptuium$_{237}$	Total Recoverable Petroleum Hydrocarbons	Semi-VOC's	Total Organic Carbon	Dissolved Organic Carbon	Methane	Sulfide as H_2S	Chloride
	Q1	Q2	Q3	Q4	Q1	Q3	Q4	Q4	Q4	Q4	Q3	Q3	Q3	Q3	Q3	Q3
00197																
00297																
00397																
00491																
00597																
00797																
00897																
00997																
02197																
02291																
02297																
02397																
02497																
0386																
03991																
04091																
04591																
0487																
04991																
05091																
05391																
05691																
06091																
06491																
07391																
08091																
10098	I		S		I	I										
10194																
10198	I		I		I	I										
10294																
10298	I		S		I	I										
10394																

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Tab[illegible]1
Summary of Samples Collected
Groundwater 1999

Well	Total Cyanide				Cesium$_{137}$		Polychloriated Biphenyls	Total Suspended Solids	Neptuium$_{237}$	Total Recoverable Petroleum Hydrocarbons	Semi-VOC's	Total Organic Carbon	Dissolved Organic Carbon	Methane	Sulfide as H_2S	Chloride
	Q1	Q2	Q3	Q4	Q1	Q3	Q4	Q4	Q4	Q4	Q3	Q3	Q3	Q3	Q3	Q3
10398	I		I		I	I										
10498	S		S		S	S										
10592																
10598	S		S		S	S										
10692																
10792																
10992																
10994																
11092																
11891																
12191																
12691																
1386																
15599																
15699																
15799																
1786																
18199							S		S		S	S	S	S	S	S
18299											S	S	S	S	S	S
18399											S	S	S	S	S	S
18499											S	S	S	S	S	S
18599											S	S	S	S	S	S
18699											S	S	S	S	S	S
18799											S	S	S	S	S	S
18899											D	D	D	D	D	D
1986																
20998							D		D							
2186																
22596																
22696																
22796																
22896																

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Tab[illegible]1
Summary of Samples Collected
Groundwater 1999

Well	Total Cyanide				Cesium$_{137}$		Polychloriated Biphenyls	Total Suspended Solids	Neptuium$_{237}$	Total Recoverable Petroleum Hydrocarbons	Semi-VOC's	Total Organic Carbon	Dissolved Organic Carbon	Methane	Sulfide as H_2S	Chloride
	Q1	Q2	Q3	Q4	Q1	Q3	Q4	Q4	Q4	Q4	Q3	Q3	Q3	Q3	Q3	Q3
22996																
23096																
23196																
23296																
2987																
3087																
3386																
3586																
3687																
38591																
40099				S			S			S						
40199				S			S			S						
40299				S			S			S						
40399				S			S			S						
40499				S			S			S						
40599							D		D							
40699							D		D							
40799							D		D							
4087																
40899							D		D							
40999																
41099																
41199																
41299				S			S									
41499							D		D							
41599							D		D							
41591																
41691																
43392																
4787																
4887																
52894																

Tab[illegible]
Summary of Samples Collected
Groundwater 1999

Well	Total Cyanide				Cesium$_{137}$		Polychloriated Biphenyls	Total Suspended Solids	Neptuium$_{237}$	Total Recoverable Petroleum Hydrocarbons	Semi-VOC's	Total Organic Carbon	Dissolved Organic Carbon	Methane	Sulfide as H_2S	Chloride
	Q1	Q2	Q3	Q4	Q1	Q3	Q4	Q4	Q4	Q4	Q3	Q3	Q3	Q3	Q3	Q3
52994																
5387																
5587																
5887																
6186																
6286																
6386																
6486																
6586																
70099																
70193																
70299																
70393																
70493																
7086																
75992																
76992																
77392																
90099																
90199																
90299																
90399																
891COLGAL																
891COLWEL																
B206989																
B208289																
B208789																
P114389																
P209289																
P209389																
P209489																
P218389																

Table 2-1
Summary of Samples Collected
Groundwater 1999

Well	Total Cyanide				$Cesium_{137}$		Polychloriated Biphenyls	Total Suspended Solids	$Neptuium_{237}$	Total Recoverable Petroleum Hydrocarbons	Semi-VOC's	Total Organic Carbon	Dissolved Organic Carbon	Methane	Sulfide as H_2S	Chloride
	Q1	Q2	Q3	Q4	Q1	Q3	Q4	Q4	Q4	Q4	Q3	Q3	Q3	Q3	Q3	Q3
P219189																
P219489																
P313589																
P314289																
P317989																
P416689																
P416789																
P416889																
P419689				S			S			S						
SW099																
SW100																
SW13494																

Blank indicates no sample attempted or required.

S = Indicates location was successfully sampled.

D = Indicates location was dry. No samples collected at this location at this time.

I = Indicates location produced insufficient water for this analyte. Other samples were collected at the location.

DMG = Well is damaged and cannot be sampled.

Table 2-3
Values Above Tier II Action Levels And Standard Framework Criteria (ALF) In RFCA - Designated Wells
Groundwater 1999

	Location	Sample Date	Analyte	QC Type	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilution	Tier II	Tier II Ratio	Back-ground M2SD	Back-ground Ratio	Historic M2SD	Historic Ratio	Reportable Result?
Boundary	0386	2/24/99	MANGANESE	DUP	TR1	747.0	UG/L		V	0.05	1	1720.00	0.43	162.33	4.60	61.97	12.05	No
	0386	2/24/99	URANIUM-233,-234	REAL	TR1	9.60	PCI/L		V1	0.2827		1.07	8.97	60.70	0.16			No
	0386	7/26/99	URANIUM-233,-234	DUP	TR1	9.5842	PCI/L		V1	0.3512		1.06	9.04	60.70	0.16			No
	0386	2/24/99	URANIUM-238	REAL	TR1	7.54	PCI/L		V1	0.1053		0.77	9.82	41.80	0.18			No
	0386	7/26/99	URANIUM-238	DUP	TR1	7.3827	PCI/L		V1	0.2512		0.77	9.61	41.80	0.18			No
	06491	2/2/99	URANIUM-233,-234	REAL	TR1	26.11	PCI/L		V1	.2953		1.07	24.40	60.70	0.43			No
	06491	7/15/99	URANIUM-233,-234	REAL	TR1	22.9105	PCI/L		V1	0.3703		1.06	21.61	60.70	0.38			No
	06491	2/2/99	URANIUM-238	REAL	TR1	16.38	PCI/L		V1	.2248		0.77	21.33	41.80	0.39			No
	06491	7/15/99	URANIUM-238	REAL	TR1	14.9037	PCI/L		V1	0.2541		0.77	19.41	41.80	0.36			No
	10294	2/10/99	MANGANESE	REAL	TR1	515.0	UG/L		V	0.01	1	1720.00	0.30	162.33	3.17	3732.63	0.14	No
	10294	2/10/99	URANIUM-233,-234	DUP	TR1	12.54	PCI/L		V	0.2737		1.07	11.72	60.70	0.21			No
	10294	7/22/99	URANIUM-233,-234	REAL	TR1	16.0835	PCI/L		V1	0.3352		1.06	15.17	60.70	0.26			No
	10294	2/10/99	URANIUM-238	DUP	TR1	10.35	PCI/L		V	0.2737		0.77	13.48	41.80	0.25			No
	10294	7/22/99	URANIUM-238	REAL	TR1	15.3002	PCI/L		V1	0.3352		0.77	19.92	41.80	0.37			No
	10394	3/2/99	URANIUM-233,-234	REAL	TR1	3.73	PCI/L		V1	0.2472		1.07	3.48	60.70	0.06			No
	10394	8/30/99	URANIUM-233,-234	REAL	TR1	1.8054	PCI/L		V1	0.2217		1.06	1.70	60.70	0.03			No
	10394	3/2/99	URANIUM-238	REAL	TR1	3.20	PCI/L		V1	0.2078		0.77	4.16	41.80	0.08			No
	10394	8/30/99	URANIUM-238	REAL	TR1	1.6118	PCI/L		V1	0.0972		0.77	2.10	41.80	0.04			No
	41591	3/3/99	NICKEL	REAL	TR1	174.0	UG/L		V1	0.28	1	140.00	1.24	21.37	8.14	46.18	3.77	Yes
	41591	9/23/99	NICKEL	REAL	TR1	394	UG/L	B	V1	0.3	1	140.00	2.81	21.37	18.44	46.18	8.53	Yes
	41591	10/19/99	NICKEL	REAL	TR1	163	UG/L		V	0.25	1	140.00	1.16	21.37	7.63	46.18	3.53	Yes
	41591	3/3/99	URANIUM-233,-234	REAL	TR1	10.57	PCI/L		V1	0.1179		1.07	9.88	60.70	0.17			No
	41591	8/12/99	URANIUM-233,-234	DUP	TR1	6.5937	PCI/L		V1	0.199		1.06	6.22	60.70	0.11			No
	41591	3/3/99	URANIUM-238	DUP	TR1	9.04	PCI/L		V1	0.273		0.77	11.77	41.80	0.22			No
	41591	8/12/99	URANIUM-238	REAL	TR1	5.8214	PCI/L		V1	0.1455		0.77	7.58	41.80	0.14			No
	41691	7/27/99	URANIUM-233,-234	REAL	TR1	1.3473	PCI/L		V1	0.2118		1.06	1.27	60.70	0.02			No
	41691	2/25/99	URANIUM-238	REAL	TR1	0.85	PCI/L	J	V1	0.2575		0.77	1.11	41.80	0.02			No
	41691	7/27/99	URANIUM-238	REAL	TR1	1.4321	PCI/L		V1	0.2118		0.77	1.86	41.80	0.03			No
Decontamination & Decommissioning	02297	5/11/99	URANIUM-233,-234	REAL	TR1	8.1685	PCI/L		V1	0.2219		1.06	7.71	60.70	0.13			No
	02297	5/11/99	URANIUM-238	REAL	TR1	4.1029	PCI/L		V1	0.1866		0.77	5.34	41.80	0.10			No
	02497	5/11/99	AMERICIUM-241	REAL	TR1	0.2331	PCI/L		V1	0.0082		0.15	1.61			ND		No
	02497	5/11/99	URANIUM-233,-234	REAL	TR1	2.599	PCI/L		V1	0.3427		1.06	2.45	60.70	0.04			No
	02497	11/30/99	URANIUM-233,-234	REAL	TR1	1.84172	PCI/L		V1	0.0605		1.06	1.74	60.70	0.03			No
	02497	5/11/99	URANIUM-238	REAL	TR1	1.0755	PCI/L		V1	0.2057		0.77	1.40	41.80	0.03			No
	02497	11/30/99	URANIUM-238	REAL	TR1	0.917605	PCI/L	J	V1	0.0176		0.77	1.19	41.80	0.02			No
	10098	8/12/99	URANIUM-233,-234	REAL	TR1	1.3242	PCI/L		V1	0.2947		1.06	1.25	60.70	0.02			No
	10098	8/12/99	URANIUM-238	REAL	TR1	1.1033	PCI/L		V1	0.1681		0.77	1.44	41.80	0.03			No
	10298	8/12/99	MOLYBDENUM	REAL	TR1	184	UG/L		V	0.32	1	183.00	1.01	87.52	2.10	ND		No
	10398	8/12/99	URANIUM-233,-234	REAL	TR1	1.264	PCI/L		V1	0.2483		1.06	1.19	60.70	0.02			No
	10398	8/12/99	URANIUM-238	REAL	TR1	1.0074	PCI/L		V1	0.2026		0.77	1.31	41.80	0.02			No
	10498	2/17/99	NITRATE/NITRITE	REAL	TR1	17.00	MG/L		V1	0.05	20	10.00	1.70	4.66	3.64	ND		No
	10498	2/17/99	TETRACHLOROETHENE	REAL	TR1	58.90	UG/L		V1	0.7	1	5.00	11.78			ND		No
	10498	8/12/99	TETRACHLOROETHENE	REAL	TR1	24	UG/L		1	1	1	5.00	4.80			ND		No
	10498	2/17/99	URANIUM-233,-234	REAL	TR1	2.02	PCI/L		V1	0.0622		1.07	1.89	60.70	0.03			No
	10498	2/17/99	URANIUM-238	REAL	TR1	1.51	PCI/L		V1	0.1146		0.77	1.97	41.80	0.04			No
	22996	2/17/99	URANIUM-233,-234	REAL	TR1	3.57	PCI/L		V1	0.102		1.07	3.34	60.70	0.06			No
	22996	8/11/99	URANIUM-233,-234	REAL	TR1	3.3795	PCI/L		V1	0.3084		1.06	3.19	60.70	0.06			No
	22996	11/3/99	URANIUM-233,-234	REAL	TR1	3.5799	PCI/L		V1	0.3493		1.06	3.38	60.70	0.06			No
	22996	2/17/99	URANIUM-238	REAL	TR1	3.01	PCI/L		V1	0.1362		0.77	3.92	41.80	0.07			No
	22996	8/11/99	URANIUM-238	REAL	TR1	2.4751	PCI/L		V1	0.2203		0.77	3.22	41.80	0.06			No
	22996	11/3/99	URANIUM-238	REAL	TR1	2.3991	PCI/L		V1	0.2617		0.77	3.12	41.80	0.06			No
	40099	11/8/99	1,1-DICHLOROETHENE	REAL	TR2	280	UG/L	D	1	50	50	7.00	40.00			ND		No
	40099	11/8/99	cis-1,2-DICHLOROETHENE	REAL	TR2	780	UG/L	D	V1	50	50	70.00	11.14			ND		No
	40099	11/8/99	TETRACHLOROETHENE	REAL	TR2	41	UG/L	JD	1	50	50	5.00	8.20			ND		No
	40099	11/8/99	TRICHLOROETHENE	REAL	TR2	830	UG/L	D	V1	50	50	5.00	166.00			ND		No
	40199	11/8/99	URANIUM-233,-234	REAL	TR1	1.2243	PCI/L		V1	0.2851		1.06	1.16	60.70	0.02	ND		No
	40299	9/2/99	TETRACHLOROETHENE	DUP	TR2	30	UG/L	D	V1	1	2	5.00	6.00			ND		No
	40299	11/9/99	TETRACHLOROETHENE	REAL	TR2	34	UG/L	D	1	2	2	5.00	6.80			ND		No
	40499	11/9/99	TETRACHLOROETHENE	REAL	TR1	13	UG/L		V1	1	1	5.00	2.60			ND		No
	40999	11/11/99	URANIUM-233,-234	REAL	TR1	8.8833	PCI/L		V1	0.1187		1.06	8.38	60.70	0.15	ND		No
	40999	11/11/99	URANIUM-238	REAL	TR1	6.80745	PCI/L		V1	0.0619		0.77	8.86	41.80	0.16	ND		No
	41099	11/10/99	ANTIMONY	REAL	TR1	26.2	UG/L	U	V	26.2	50	6.00	4.37	39.54	0.66	ND		No
	41099	11/10/99	LEAD	REAL	TR1	26.2	UG/L	U	J	26.2	50	15.00	1.75	11.01	2.38	ND		No
	41099	11/10/99	NITRATE/NITRITE	REAL	TR1	47	MG/L		V1	0.05	25	10.00	4.70	4.66	10.09	ND		No
	41099	11/10/99	THALLIUM	REAL	TR1	10.8	UG/L	U	J	10.80	10	2.00	5.40	4.90	2.20	ND		No
	41099	11/10/99	URANIUM-233,-234	REAL	TR1	51.6469	PCI/L		V1	0.4055		1.06	48.72	60.70	0.85	ND		No
	41099	11/10/99	URANIUM-235	REAL	TR1	2.31568	PCI/L		V1	0.1455		1.01	2.29	1.79	1.29	ND		No
	41099	11/10/99	URANIUM-238	REAL	TR1	33.772	PCI/L		V1	0.1455		0.77	43.97	41.80	0.81	ND		No
	41199	11/10/99	URANIUM-233,-234	REAL	TR1	10.7424	PCI/L		V1	0.2408		1.06	10.13	60.70	0.18	ND		No
	41199	11/10/99	URANIUM-238	REAL	TR1	3.9966	PCI/L		V1	0.2780		0.77	5.20	41.80	0.10	ND		No
	41299	11/9/99	CHROMIUM	REAL	TR1	213	UG/L		V	0.18	1	100.00	2.13	12.44	17.12	ND		No
	41299	11/9/99	TETRACHLOROETHENE	REAL	TR1	290	UG/L		V1	20	20	5.00	58.00			ND		No
	41299	11/9/99	TRICHLOROETHENE	REAL	TR1	33	UG/L		V1	20	20	5.00	6.60			ND		No
	41299	12/15/99	URANIUM-233,-234	REAL	TR1	1.79692	PCI/L		V1	0.2951		1.06	1.70	60.70	0.03	ND		No
	41299	12/15/99	URANIUM-238	REAL	TR1	1.04702	PCI/L		V1	0.2180		0.77	1.36	41.80	0.03	ND		No
	P317989	11/10/99	SELENIUM	REAL	TR1	121	UG/L		V	10.2	10	50.00	2.42	43.72	2.77	ID		No
	P317989	11/10/99	THALLIUM	REAL	TR1	10.8	UG/L	U	V	10.8	10	2.00	5.40	4.90	2.20	ID		No

Note: Between 1st quarter and 2nd quarter 1999 the Tier II action levels for manganese went from 183 to 1720 ug/L and for nickel from 100 to 140 ug/L.

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Table 2-3
Values Above Tier II Action Levels And Standard Framework Criteria (ALF) In RFCA - Designated Wells
Groundwater 1999

	Location	Sample Date	Analyte	QC Type	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilution	Tier II	Tier II Ratio	Back-ground M2SD	Back-ground Ratio	Historic M2SD	Historic Ratio	Reportable Result?
	P419689	11/9/99	TETRACHLOROETHENE	REAL	TR1	16	UG/L		V1	1	1	5.00	3.20			49.44	0.32	No
Drainage	00997	2/8/99	MANGANESE	REAL	TR1	370.0	UG/L		V	0.01	1	1720.00	0.22	162.33	2.28	ND		No
	00997	2/8/99	URANIUM-233,-234	REAL	TR1	7.60	PCI/L		V	0.0936		1.07	7.11	60.70	0.13			No
	00997	8/9/99	URANIUM-233,-234	REAL	TR1	4.7947	PCI/L		V1	0.2374		1.06	4.52	60.70	0.08			No
	00997	2/8/99	URANIUM-238	REAL	TR1	5.14	PCI/L		V	0.1725		0.77	6.70	41.80	0.12			No
Drainage	00997	8/9/99	URANIUM-238	REAL	TR1	3.16	PCI/L		V1	0.0823		0.77	4.11	41.80	0.08			No
	38591	8/30/99	STRONTIUM-89,90	REAL	TR1	0.901	PCI/L	J	J1	0.54		0.85	1.06	2.85	0.32			No
	38591	1/27/99	URANIUM-233,-234	REAL	TR1	15.20	PCI/L		V1	.2836		1.07	14.21	60.70	0.25			No
	38591	8/30/99	URANIUM-233,-234	REAL	TR1	21.0327	PCI/L		V1	0.1905		1.06	19.84	60.70	0.35			No
	38591	1/27/99	URANIUM-238	REAL	TR1	10.63	PCI/L		V1	.0983		0.77	13.85	41.80	0.25			No
	38591	8/30/99	URANIUM-238	REAL	TR1	13.1608	PCI/L		V1	0.1226		0.77	17.14	41.80	0.31			No
	5587	5/10/99	URANIUM-233,-234	REAL	TR1	5.5512	PCI/L		V1	0.0822		1.06	5.24	60.70	0.09			No
	5587	5/10/99	URANIUM-238	REAL	TR1	4.2092	PCI/L		V1	0.1514		0.77	5.48	41.80	0.10			No
	6486	1/26/99	URANIUM-233,-234	REAL	TR1	3.61	PCI/L		V1	.1719		1.07	3.37	60.70	0.06			No
	6486	1/26/99	URANIUM-238	REAL	TR1	3.06	PCI/L		V1	.1445		0.77	3.99	41.80	0.07			No
	6586	8/11/99	NICKEL	REAL	TR1	242	UG/L		V	0.3	1	140.00	1.73	21.37	11.32	79	3.06	Yes
	6586	2/16/99	URANIUM-233,-234	REAL	TR1	3.15	PCI/L		V1	0.2264		1.07	2.94	60.70	0.05			No
	6586	8/11/99	URANIUM-233,-234	REAL	TR1	1.9906	PCI/L		V1	0.0884		1.06	1.88	60.70	0.03			No
	6586	2/16/99	URANIUM-238	REAL	TR1	2.42	PCI/L		V1	0.2264		0.77	3.15	41.80	0.06			No
	6586	8/11/99	URANIUM-238	REAL	TR1	1.3223	PCI/L		V1	0.1937		0.77	1.72	41.80	0.03			No
Performance Monitoring	00797	2/8/99	URANIUM-233,-234	REAL	TR1	8.68	PCI/L		NJ	.1881		1.07	8.11	60.70	0.14			No
	00797	8/9/99	URANIUM-233,-234	REAL	TR1	8.1287	PCI/L		V1	0.2979		1.06	7.67	60.70	0.13			No
	00797	2/8/99	URANIUM-238	REAL	TR1	6.89	PCI/L		NJ	.0765		0.77	8.97	41.80	0.16			No
	00797	8/9/99	URANIUM-238	REAL	TR1	6.9169	PCI/L		V1	0.254		0.77	9.01	41.80	0.17			No
	00897	5/18/99	1,1,2,2-TETRACHLOROETHANE	REAL	TR1	3	UG/L		V1	1	1	0.43	7.04			ND		No
	00897	5/18/99	TETRACHLOROETHENE	REAL	TR2	19000	UG/L	BD	V1	1000	1000	5.00	3800.00			ND		No
	00897	11/4/99	TETRACHLOROETHENE	REAL	TR2	16000	UG/L	BD	V1	1000	1000	5.00	3200.00			ND		No
	00897	5/18/99	TRICHLOROETHENE	REAL	TR2	1700	UG/L	D	V1	1000	1000	5.00	340.00			ND		No
	00897	11/4/99	TRICHLOROETHENE	REAL	TR2	1600	UG/L	D	V1	1000	1000	5.00	320.00			ND		No
	00897	5/18/99	URANIUM-233,-234	REAL	TR1	4.2889	PCI/L		V1	0.2599		1.06	4.05	60.70	0.07			No
	00897	11/4/99	URANIUM-233,-234	REAL	TR1	3.8926	PCI/L		V1	0.5336		1.06	3.67	60.70	0.06			No
	00897	5/18/99	URANIUM-238	REAL	TR1	2.7154	PCI/L		V1	0.0968		0.77	3.54	41.80	0.06			No
	00897	11/4/99	URANIUM-238	REAL	TR1	2.2985	PCI/L		V1	0.3209		0.77	2.99	41.80	0.05			No
	02291	5/19/99	TETRACHLOROETHENE	REAL	TR2	6600	UG/L	BD	V1	500	500	5.00	1320.00			4201.94	1.57	No
	02291	11/3/99	TETRACHLOROETHENE	REAL	TR2	4900	UG/L	D	V1	250	250	5.00	980.00			4201.94	1.17	No
	02291	5/19/99	TRICHLOROETHENE	REAL	TR2	720	UG/L	D	V1	500	500	5.00	144.00			453.73	1.59	No
	02291	11/3/99	TRICHLOROETHENE	REAL	TR2	600	UG/L	D	V1	250	250	5.00	120.00			453.73	1.32	No
	02291	5/19/99	URANIUM-233,-234	REAL	TR1	1.6891	PCI/L		V1	0.1629		1.06	1.59	60.70	0.03			No
	02291	11/3/99	URANIUM-233,-234	REAL	TR1	2.4435	PCI/L		V1	0.3149		1.06	2.31	60.70	0.04			No
	02291	5/19/99	URANIUM-238	REAL	TR1	1.5259	PCI/L		V1	0.1629		0.77	1.99	41.80	0.04			No
	02291	11/3/99	URANIUM-238	REAL	TR1	1.9851	PCI/L		V1	0.1222		0.77	2.58	41.80	0.05			No
	05691	2/12/99	CARBON TETRACHLORIDE	REAL	DL1	112.0	UG/L	D	V	1	5	5.00	22.40			561.21	0.20	No
	05691	7/16/99	CARBON TETRACHLORIDE	REAL	TR2	160	UG/L	D	V1	10	10	5.00	32.00			228.07	0.70	No
	05691	2/12/99	TETRACHLOROETHENE	REAL	TR2	26.60	UG/L		V	0.7	1	5.00	5.32			149.64	0.18	No
	05691	7/16/99	TETRACHLOROETHENE	REAL	TR2	37	UG/L	D	V1	10	10	5.00	7.40			62.15	0.60	No
	05691	2/12/99	TRICHLOROETHENE	REAL	TR2	11.30	UG/L		V	0.6	1	5.00	2.26			95.59	0.12	No
	05691	7/16/99	TRICHLOROETHENE	REAL	TR1	13	UG/L		V1	1	1	5.00	2.60			41.17	0.32	No
	05691	2/12/99	URANIUM-233,-234	REAL	TR1	2.88	PCI/L		NJ	.0898		1.07	2.69	60.70	0.05			No
	05691	7/16/99	URANIUM-233,-234	REAL	TR1	2.8461	PCI/L		V1	0.2787		1.06	2.69	60.70	0.05			No
	05691	2/12/99	URANIUM-238	REAL	TR1	1.52	PCI/L		NJ	.0898		0.77	1.98	41.80	0.04			No
	05691	7/16/99	URANIUM-238	REAL	TR1	1.3553	PCI/L		V1	0.0966		0.77	1.76	41.80	0.03			No
	07391	3/14/99	1,1,1-TRICHLOROETHANE	REAL	TR1	380.0	UG/L		J1	25	25	200.00	1.90			2724.60	0.14	No
	07391	8/26/99	1,1,1-TRICHLOROETHANE	REAL	TR1	930	UG/L	J	V	5000	5000	200.00	4.65			2724.6	0.34	No
	07391	3/14/99	1,1-DICHLOROETHENE	REAL	TR1	130.0	UG/L		J1	25	25	7.00	18.57			1450.00	0.09	No
	07391	3/14/99	BENZENE	REAL	TR1	10.00	UG/L	J	J1	25	25	5.00	2.00			2816.64	0.00	No
	07391	3/14/99	CARBON TETRACHLORIDE	REAL	TR1	65.00	UG/L		J1	25	25	5.00	13.00			2929.55	0.02	No
	07391	3/14/99	CHLOROFORM	REAL	DL1	1100.0	UG/L	JD	V1	10000	10000	100.00	11.00			4439.22	0.25	No
	07391	8/26/99	CHLOROFORM	REAL	TR1	2200	UG/L	J	V	5000	5000	100.00	22.00			4439.22	0.50	No
	07391	3/14/99	cis-1,2-DICHLOROETHENE	REAL	TR1	120.0	UG/L		J1	25	25	70.00	1.71			1303.00	0.09	No
	07391	3/14/99	METHYLENE CHLORIDE	REAL	TR1	41.00	UG/L	B	UJ1	25	25	5.00	8.20			2722.64	0.02	No
	07391	8/26/99	METHYLENE CHLORIDE	REAL	TR1	3000	UG/L	JB	JB	5000	5000	5.00	600.00			2722.64	1.10	No
	07391	3/14/99	NITRATE/NITRITE	REAL	TR1	37.00	MG/L		V1	0.05	50	10.00	3.70	4.66	7.93	20.00	1.85	No
	07391	8/26/99	NITRATE/NITRITE	REAL	TR1	40	MG/L		V	0.05	50	10.00	4.00	4.66	8.58	33.62	1.19	No
	07391	3/14/99	TETRACHLOROETHENE	REAL	DL1	2300	UG/L	JD	V1	10000	10000	5.00	460.00			3030.17	0.76	No
	07391	8/26/99	TETRACHLOROETHENE	REAL	TR1	2800	UG/L	J	V	5000	5000	5.00	560.00			3030.17	0.92	No
	07391	3/14/99	TRICHLOROETHENE	REAL	DL1	85000	UG/L	D	V1	10000	10000	5.00	17000.00			158350.0	0.54	No
	07391	8/26/99	TRICHLOROETHENE	REAL	TR1	120000	UG/L		V	5000	5000	5.00	24000.00			158350.0	0.76	No
	07391	3/14/99	URANIUM-233,-234	REAL	TR1	29.46	PCI/L		J	0.5272		1.07	27.53	60.70	0.49			No
	07391	8/26/99	URANIUM-233,-234	REAL	TR1	31.3237	PCI/L		V1	0.441		1.06	29.55	60.70	0.52			No
	07391	3/14/99	URANIUM-235	REAL	TR1	2.09	PCI/L		J	0.4781		1.01	2.07	1.79	1.17	1.63	1.28	No
	07391	8/26/99	URANIUM-235	REAL	TR1	1.9123	PCI/L		V1	0.4037		1.01	1.89	1.79	1.07	1.6287	1.17	No
	07391	3/14/99	URANIUM-238	REAL	TR1	63.34	PCI/L		J	0.5686		0.77	82.48	41.80	1.52	43.40	1.46	No
	07391	8/26/99	URANIUM-238	REAL	TR1	88.8031	PCI/L		V1	0.274		0.77	115.63	41.80	2.12	43.4	2.05	No
	10592	4/19/99	SELENIUM	REAL	TR1	144	UG/L		V	1.2	1	50.00	2.88	43.72	3.29	343.94	0.42	No
	10592	10/28/99	SELENIUM	REAL	TR1	131	UG/L		V1	1	1	50.00	2.62	43.72	3.00	343.94	0.38	No
	10592	4/19/99	URANIUM-233,-234	REAL	TR1	12.7256	PCI/L		V1	0.0988		1.06	12.01	60.70	0.21			No
	10592	10/28/99	URANIUM-233,-234	REAL	TR1	12.0718	PCI/L		V1	0.3488		1.06	11.39	60.70	0.20			No

Note: Between 1st quarter and 2nd quarter 1999 the Tier II action levels for manganese went from 183 to 1720 ug/L and for nickel from 100 to 140 ug/L.

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Table 2-3
Values Above Tier II Action Levels And Standard Framework Criteria (ALF) In RFCA - Designated Wells
Groundwater 1999

Location	Sample Date	Analyte	QC Type	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilution	Tier II	Tier II Ratio	Back-ground M2SD	Back-ground Ratio	Historic M2SD	Historic Ratio	Reportable Result?
10592	4/19/99	URANIUM-238	REAL	TR1	9.3646	PCI/L		V1	0.0536		0.77	12.19	41.80	0.22			No
10592	10/28/99	URANIUM-238	REAL	TR1	8.5687	PCI/L		V1	0.2540		0.77	11.16	41.80	0.20			No
10692	1/28/99	URANIUM-233,-234	REAL	TR1	14.63	PCI/L		V1	.1823		1.07	13.67	60.70	0.24			No
10692	7/19/99	URANIUM-233,-234	REAL	TR1	16.5934	PCI/L		V1	0.3133		1.06	15.65	60.70	0.27			No
10692	1/28/99	URANIUM-238	REAL	TR1	10.13	PCI/L		V1	.0832		0.77	13.19	41.80	0.24			No
10692	7/19/99	URANIUM-238	REAL	TR1	10.426	PCI/L		V1	0.1086		0.77	13.58	41.80	0.25			No
10792	1/19/99	SELENIUM	REAL	TR1	62.60	UG/L		V	1.2	1	50.00	1.25	43.72	1.43	ID		No
10792	5/10/99	SELENIUM	REAL	TR1	53.2	UG/L		V1	1.2	1	50.00	1.06	43.72	1.22	ID		No
10792	11/4/99	SELENIUM	REAL	TR1	50.5	UG/L		V1	1	1	50.00	1.01	43.72	1.16	ID		No
10792	5/10/99	URANIUM-233,-234	REAL	TR1	6.4272	PCI/L		V1	0.2626		1.06	6.06	60.70	0.11			No
10792	11/4/99	URANIUM-233,-234	REAL	TR1	6.15495	PCI/L		V1	0.2719		1.06	5.81	60.70	0.10			No
10792	5/10/99	URANIUM-238	REAL	TR1	5.2345	PCI/L		V1	0.0978		0.77	6.82	41.80	0.13			No
10792	11/4/99	URANIUM-238	REAL	TR1	4.78115	PCI/L		V1	0.2315		0.77	6.23	41.80	0.11			No
10992	1/27/99	NITRATE/NITRITE	REAL	TR1	25.00	MG/L		V1	0.05	20	10.00	2.50	4.66	5.36	ID		No
10992	7/19/99	NITRATE/NITRITE	REAL	TR1	28	MG/L		V1	0.05	25	10.00	2.80	4.66	6.00	ID		No
10992	1/27/99	SELENIUM	REAL	TR1	507.0	UG/L		V	1.2	1	50.00	10.14	43.72	11.60	ID		No
10992	7/19/99	SELENIUM	REAL	TR1	501.0	UG/L	U	V1	0.92	1	50.00	10.02	43.72	11.46	ID		No
10992	1/27/99	URANIUM-233,-234	REAL	TR1	7.79	PCI/L		V1	.2462		1.07	7.28	60.70	0.13			No
10992	7/19/99	URANIUM-233,-234	REAL	TR1	7.7602	PCI/L		V1	0.4416		1.06	7.32	60.70	0.13			No
10992	1/27/99	URANIUM-238	REAL	TR1	6.46	PCI/L		V1	.148		0.77	8.41	41.80	0.15			No
10992	7/19/99	URANIUM-238	REAL	TR1	4.517	PCI/L		V1	0.2405		0.77	5.88	41.80	0.11			No
11092	5/11/99	SELENIUM	REAL	TR1	612	UG/L		1	1.2	1	50.00	12.24	43.72	14.00	ID		No
11891	5/20/99	CARBON TETRACHLORIDE	REAL	TR1	310	UG/L		V1	25	25	5.00	62.00			737.11	0.42	No
11891	10/18/99	CARBON TETRACHLORIDE	DUP	TR1	810	UG/L		V1	50	50	5.00	162.00			737.11	1.10	No
11891	5/20/99	TETRACHLOROETHENE	REAL	TR1	150	UG/L		V1	25	25	5.00	30.00			319.91	0.47	No
11891	10/18/99	TETRACHLOROETHENE	DUP	TR1	260	UG/L		V1	50	50	5.00	52.00			319.91	0.81	No
11891	5/20/99	TRICHLOROETHENE	REAL	TR1	28	UG/L		V1	25	25	5.00	5.60			407.56	0.07	No
11891	10/18/99	TRICHLOROETHENE	REAL	TR1	67	UG/L		V1	50	50	5.00	13.40			407.56	0.16	No
11891	5/20/99	URANIUM-233,-234	REAL	TR1	2.778	PCI/L		V1	0.2924		1.06	2.62	60.70	0.05			No
11891	10/18/99	URANIUM-233,-234	DUP	TR1	3.0071	PCI/L		V1	0.3625		1.06	2.84	60.70	0.05			No
11891	5/20/99	URANIUM-238	DUP	TR1	1.5097	PCI/L		V1	0.1774		0.77	1.97	41.80	0.04			No
11891	10/18/99	URANIUM-238	DUP	TR1	1.8495	PCI/L		V1	0.1474		0.77	2.41	41.80	0.04			No
12191	6/3/99	CARBON TETRACHLORIDE	REAL	TR2	300	UG/L	D	V1	25	25	5.00	60.00			435.97	0.69	No
12191	11/30/99	CARBON TETRACHLORIDE	REAL	TR1	150	UG/L		V	20	20	5.00	30.00			435.97	0.34	No
12191	6/3/99	METHYLENE CHLORIDE	REAL	TR1	19	UG/L	JB	UJ1	10	10	5.00	3.80			29.20	0.65	No
12191	6/3/99	TETRACHLOROETHENE	REAL	TR2	290	UG/L	D	V1	25	25	5.00	58.00			486.46	0.60	No
12191	11/30/99	TETRACHLOROETHENE	REAL	TR1	260	UG/L		V	20	20	5.00	52.00			486.46	0.53	No
12191	6/3/99	TRICHLOROETHENE	REAL	TR1	29	UG/L		V1	10	10	5.00	5.80			67.86	0.43	No
12191	11/30/99	TRICHLOROETHENE	REAL	TR1	32	UG/L		V	20	20	5.00	6.40			67.86	0.47	No
12191	6/3/99	URANIUM-233,-234	REAL	TR1	2.2654	PCI/L		V1	0.1958		1.06	2.14	60.70	0.04			No
12191	11/30/99	URANIUM-233,-234	REAL	TR1	2.74051	PCI/L		V1	0.1567		1.06	2.59	60.70	0.05			No
12191	6/3/99	URANIUM-238	REAL	TR1	1.0981	PCI/L		V1	0.1062		0.77	1.43	41.80	0.03			No
12191	11/30/99	URANIUM-238	REAL	TR1	1.6088	PCI/L		V1	0.1032		0.77	2.09	41.80	0.04			No
12691	1/18/99	CARBON TETRACHLORIDE	REAL	DL1	294.0	UG/L	D	V1	2	10	5.00	58.80			2968.95	0.10	No
12691	7/21/99	METHYLENE CHLORIDE	REAL	TR1	12	UG/L	JB	JB	50	50	5.00	2.40			6.83	1.76	No
12691	1/18/99	TETRACHLOROETHENE	REAL	TR1	80.60	UG/L		J1	0.7	1	5.00	16.12			646.52	0.12	No
12691	1/18/99	TRICHLOROETHENE	REAL	TR1	42.80	UG/L		V1	0.6	1	5.00	8.56			362.45	0.12	No
12691	1/18/99	URANIUM-233,-234	REAL	TR1	2.73	PCI/L		V1	.0731		1.07	2.55	60.70	0.04			No
12691	7/21/99	URANIUM-233,-234	REAL	TR1	2.2414	PCI/L		V1	0.2314		1.06	2.11	60.70	0.04			No
12691	1/18/99	URANIUM-238	REAL	TR1	2.00	PCI/L		V1	.0731		0.77	2.60	41.80	0.05			No
12691	7/21/99	URANIUM-238	REAL	TR1	2.0372	PCI/L		V1	0.2596		0.77	2.65	41.80	0.05			No
15699	3/10/99	1,1-DICHLOROETHENE	REAL	DL1	20	UG/L		V	1	1	7.00	2.86			ND		No
15699	4/13/99	1,1-DICHLOROETHENE	REAL	TR1	69	UG/L		V1	50	50	7.00	9.86			ND		No
15699	8/18/99	1,1-DICHLOROETHENE	REAL	TR2	120	UG/L	JD	V1	200	200	7.00	17.14			ND		No
15699	11/10/99	1,1-DICHLOROETHENE	REAL	TR1	120	UG/L		V1	50	50	7.00	17.14			ND		No
15699	3/10/99	1,2-DICHLOROETHANE	REAL	DL1	7	UG/L	JD	1	50	50	5.00	1.40			ND		No
15699	4/13/99	1,2-DICHLOROETHANE	REAL	TR1	10	UG/L	J	V1	50	50	5.00	2.00			ND		No
15699	8/18/99	1,2-DICHLOROETHANE	REAL	TR1	8	UG/L		J1	1	1	5.00	1.60			ND		No
15699	11/10/99	1,2-DICHLOROETHANE	REAL	TR1	11	UG/L	J	V1	100	100	5.00	2.20			ND		No
15699	3/10/99	cis-1,2-DICHLOROETHENE	REAL	DL1	93	UG/L	D	J	50	50	70.00	1.33			ND		No
15699	4/13/99	cis-1,2-DICHLOROETHENE	REAL	TR1	180	UG/L		V1	50	50	70.00	2.57			ND		No
15699	8/18/99	cis-1,2-DICHLOROETHENE	REAL	TR2	570	UG/L	D	V1	200	200	70.00	8.14			ND		No
15699	11/10/99	cis-1,2-DICHLOROETHENE	REAL	TR1	410	UG/L		V1	50	50	70.00	5.86			ND		No
15699	4/13/99	METHYLENE CHLORIDE	REAL	TR1	16	UG/L	JB	V1	50	50	5.00	3.20			ND		No
15699	3/10/99	TETRACHLOROETHENE	REAL	DL1	98	UG/L	D	J	50	50	5.00	19.60			ND		No
15699	4/13/99	TETRACHLOROETHENE	REAL	TR1	900	UG/L		V1	50	50	5.00	180.00			ND		No
15699	8/18/99	TETRACHLOROETHENE	REAL	TR2	840	UG/L	D	V1	200	200	5.00	168.00			ND		No
15699	11/10/99	TETRACHLOROETHENE	REAL	TR1	910	UG/L		V1	50	50	5.00	182.00			ND		No
15699	3/10/99	TRICHLOROETHENE	REAL	DL1	310	UG/L	D	J	50	50	5.00	62.00			ND		No
15699	4/13/99	TRICHLOROETHENE	REAL	TR2	1400	UG/L	D	J1	100	100	5.00	280.00			ND		No
15699	8/18/99	TRICHLOROETHENE	REAL	TR2	2300	UG/L	D	V1	200	200	5.00	460.00			ND		No
15699	11/10/99	TRICHLOROETHENE	REAL	TR2	1800	UG/L	D	V1	100	100	5.00	360.00			ND		No
15699	3/10/99	URANIUM-233,-234	REAL	TR1	11.5459	PCI/L		V	0		1.06	10.89	60.70	0.19	ND		No
15699	4/13/99	URANIUM-233,-234	REAL	TR1	11.5946	PCI/L		V1	0.1764		1.06	10.94	60.70	0.19	ND		No
15699	8/18/99	URANIUM-233,-234	REAL	TR1	9.9108	PCI/L		V1	0.287		1.06	9.35	60.70	0.16	ND		No
15699	11/10/99	URANIUM-233,-234	REAL	TR1	13.3491	PCI/L		V1	0.2888		1.06	12.59	60.70	0.22	ND		No
15699	3/10/99	URANIUM-238	REAL	TR1	8.591	PCI/L		V	0.1531		1.06	8.10	60.70	0.14	ND		No

Performance Monitoring

Note: Between 1st quarter and 2nd quarter 1999 the Tier II action levels for manganese went from 183 to 1720 ug/L and for nickel from 100 to 140 ug/L.

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Table 2-3
Values Above Tier II Action Levels And Standard Framework Criteria (ALF) In RFCA - Designated Wells
Groundwater 1999

Location	Sample Date	Analyte	QC Type	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilution	Tier II	Tier II Ratio	Back-ground M2SD	Back-ground Ratio	Historic M2SD	Historic Ratio	Reportable Result?
15699	4/13/99	URANIUM-238	REAL	TR1	9.9201	PCI/L		V1	0.0657		0.77	12.92	41.80	0.24	ND		No
15699	8/18/99	URANIUM-238	REAL	TR1	8.5134	PCI/L		V1	0.1834		0.77	11.09	41.80	0.20	ND		No
15699	11/10/99	URANIUM-238	REAL	TR1	9.6759	PCI/L		V1	0.2888		0.77	12.60	41.80	0.23	ND		No
15799	8/23/99	URANIUM-233,-234	REAL	TR1	3.0934	PCI/L		V1	0.2343		1.06	2.92	60.70	0.05			No
15799	8/23/99	URANIUM-238	REAL	TR1	2.4402	PCI/L		V1	0.1608		0.77	3.18	41.80	0.06			No
3687	4/28/99	CARBON TETRACHLORIDE	REAL	TR1	480.00	UG/L	J	V1	1000	1000	5.00	96.00			1255.40	0.38	No
3687	11/5/99	CARBON TETRACHLORIDE	REAL	TR1	440.00	UG/L	J	V1	500	500	5.00	88.00			1255.40	0.35	No
3687	4/28/99	CHLOROFORM	REAL	TR1	280	UG/L	J	V1	1000	1000	100.00	2.80			1072.39	0.26	No
3687	4/28/99	METHYLENE CHLORIDE	REAL	TR1	300	UG/L	BJ	JB1	1000	1000	5.00	60.00			369.65	0.81	No
3687	4/28/99	TETRACHLOROETHENE	REAL	TR1	300	UG/L	J	V1	1000	1000	5.00	60.00			814.46	0.37	No
3687	4/28/99	TRICHLOROETHENE	REAL	TR1	18000	UG/L		V1	1000	1000	5.00	3600.00			91325.32	0.20	No
3687	11/5/99	TRICHLOROETHENE	REAL	TR1	10000	UG/L		V1	500	500	5.00	2000.00			91325	0.11	No
3687	4/28/99	URANIUM-233,-234	REAL	TR1	1.7606	PCI/L		V1	0.2005		1.06	1.66	60.70	0.03			No
3687	11/5/99	URANIUM-233,-234	REAL	TR1	1.2781	PCI/L		V1	0.2457		1.06	1.21	60.70	0.02			No
3687	4/28/99	URANIUM-238	REAL	TR1	1.2939	PCI/L		V1	0.1031		0.77	1.68	41.80	0.03			No
70299	8/24/99	URANIUM-233,-234	REAL	TR1	5.1693	PCI/L		V1	0.4304		1.06	4.88	60.70	0.09	ND		No
70299	8/24/99	URANIUM-238	REAL	TR1	2.9828	PCI/L		V1	0.2788		0.77	3.88	41.80	0.07	ND		No
70299	10/26/99	URANIUM-233,-234	REAL	TR1	11.1677	PCI/L		V	0.3559		1.06	10.54	60.70	0.18	ND		No
70299	10/26/99	URANIUM-238	REAL	TR1	10.7035	PCI/L		V	0.3559		0.77	13.94	41.80	0.26	ND		No
891COLGAL	5/10/99	LEAD	REAL	TR1	29.2	UG/L		J1	0.72	1	15.00	1.95	11.01	2.65	11.53	2.53	No
891COLGAL	1/21/99	URANIUM-233,-234	REAL	TR1	6.39	PCI/L			0.2073		1.07	5.97	60.70	0.11			No
891COLGAL	5/10/99	URANIUM-233,-234	REAL	TR1	6.8506	PCI/L		V1	0.2072		1.06	6.46	60.70	0.11			No
891COLGAL	8/9/99	URANIUM-233,-234	REAL	TR1	5.8074	PCI/L		V1	0.2524		1.06	5.48	60.70	0.10			No
891COLGAL	11/5/99	URANIUM-233,-234	REAL	TR1	6.1301	PCI/L		V1	0.3754		1.06	5.78	60.70	0.10			No
891COLGAL	1/21/99	URANIUM-238	REAL	TR1	4.15	PCI/L			0.1575		0.77	5.41	41.80	0.10			No
891COLGAL	5/10/99	URANIUM-238	REAL	TR1	4.0056	PCI/L		V1	0.243		0.77	5.22	41.80	0.10			No
891COLGAL	8/9/99	URANIUM-238	REAL	TR1	3.8751	PCI/L		V1	0.2524		0.77	5.05	41.80	0.09			No
891COLGAL	11/5/99	URANIUM-238	REAL	TR1	4.5864	PCI/L		V1	0.2764		0.77	5.97	41.80	0.11			No
891COLWEL	1/21/99	CARBON TETRACHLORIDE	REAL	TR1	8.40	UG/L		V	0.2	1	5.00	1.68			35.42	0.24	No
891COLWEL	5/11/99	CARBON TETRACHLORIDE	REAL	TR1	6	UG/L	J	V1	20	20	5.00	1.20			35.42	0.17	No
891COLWEL	5/11/99	METHYLENE CHLORIDE	REAL	TR1	10	UG/L	BJ	J1	20	20	5.00	2.00			23.24	0.43	No
891COLWEL	8/26/99	METHYLENE CHLORIDE	REAL	TR1	14	UG/L	JB	JB	50	50	5.00	2.80			23.24	0.60	No
891COLWEL	1/21/99	SELENIUM	REAL	TR1	659.0	UG/L		V	1.2	1	50.00	13.18	43.72	15.07	924.05	0.71	No
891COLWEL	5/11/99	SELENIUM	REAL	TR1	556	UG/L	U	V1	1.2	1	50.00	11.12	43.72	12.72	924.05	0.60	No
891COLWEL	8/26/99	SELENIUM	REAL	TR1	603	UG/L		V1	0.92	1	50.00	12.06	43.72	13.79	924.05	0.65	No
891COLWEL	11/5/99	SELENIUM	REAL	TR1	626	UG/L		V1	1	1	50.00	12.52	43.72	14.32	924.05	0.68	No
891COLWEL	1/21/99	TETRACHLOROETHENE	REAL	TR1	51.70	UG/L		J	0.7	1	5.00	10.34			154.00	0.34	No
891COLWEL	5/11/99	TETRACHLOROETHENE	REAL	TR1	54	UG/L		V1	20	20	5.00	10.80			154.00	0.35	No
891COLWEL	8/26/99	TETRACHLOROETHENE	REAL	TR1	68	UG/L		V	50	50	5.00	13.60			154.00	0.44	No
891COLWEL	11/5/99	TETRACHLOROETHENE	REAL	TR1	58	UG/L		V1	20	20	5.00	11.60			154.00	0.38	No
891COLWEL	1/21/99	TRICHLOROETHENE	REAL	DL1	336.0	UG/L	D	V	6	10	5.00	67.20			1234.43	0.27	No
891COLWEL	5/11/99	TRICHLOROETHENE	REAL	TR1	390	UG/L		V1	20	20	5.00	78.00			1234.43	0.32	No
891COLWEL	8/26/99	TRICHLOROETHENE	REAL	TR1	470	UG/L		V	50	50	5.00	94.00			1234.43	0.38	No
891COLWEL	11/5/99	TRICHLOROETHENE	REAL	TR1	400	UG/L		V1	20	20	5.00	80.00			1234.43	0.32	No
891COLWEL	1/21/99	URANIUM-233,-234	REAL	TR1	11.46	PCI/L			0.2495		1.07	10.71	60.70	0.19			No
891COLWEL	5/11/99	URANIUM-233,-234	REAL	TR1	10.2159	PCI/L		V1	0.1977		1.06	9.64	60.70	0.17			No
891COLWEL	8/26/99	URANIUM-233,-234	REAL	TR1	11.0321	PCI/L		V1	0.2018		1.06	10.41	60.70	0.18			No
891COLWEL	11/5/99	URANIUM-233,-234	REAL	TR1	12.115	PCI/L		V1	0.3819		1.06	11.43	60.70	0.20			No
891COLWEL	1/21/99	URANIUM-238	REAL	TR1	8.24	PCI/L			0.0865		0.77	10.73	41.80	0.20			No
891COLWEL	5/11/99	URANIUM-238	REAL	TR1	8.0046	PCI/L		V1	0.1481		0.77	10.42	41.80	0.19			No
891COLWEL	8/26/99	URANIUM-238	REAL	TR1	8.1166	PCI/L		V1	0.1697		0.77	10.57	41.80	0.19			No
891COLWEL	11/5/99	URANIUM-238	REAL	TR1	7.9	PCI/L		V1	0.2999		0.77	10.29	41.80	0.19			No
SW13494	1/15/99	TETRACHLOROETHENE	REAL	TR1	42.90	UG/L		J1	0.7	1	5.00	8.58			30.65	1.40	No
SW13494	5/10/99	TETRACHLOROETHENE	REAL	TR1	19	UG/L		V1	1	1	5.00	3.80			30.65	0.62	No
SW13494	8/9/99	TETRACHLOROETHENE	REAL	TR2	24	UG/L		V1	2	2	5.00	4.80			30.65	0.78	No
SW13494	11/5/99	TETRACHLOROETHENE	REAL	TR2	39	UG/L	D	V1	2	2	5.00	7.80			30.65	1.27	No
SW13494	1/15/99	URANIUM-233,-234	REAL	TR1	3.30	PCI/L		V1	.161		1.07	3.08	60.70	0.05			No
SW13494	5/10/99	URANIUM-233,-234	REAL	TR1	3.8974	PCI/L		V1	0.2069		1.06	3.68	60.70	0.06			No
SW13494	8/9/99	URANIUM-233,-234	REAL	TR1	9.1772	PCI/L		V1	0.1415		1.06	8.66	60.70	0.15			No
SW13494	11/5/99	URANIUM-233,-234	REAL	TR1	3.1995	PCI/L		V1	0.2768		1.06	3.02	60.70	0.05			No
SW13494	1/15/99	URANIUM-238	REAL	TR1	2.65	PCI/L		V1	.1354		0.77	3.45	41.80	0.06			No
SW13494	5/10/99	URANIUM-238	REAL	TR1	2.7302	PCI/L		V1	0.077		0.77	3.55	41.80	0.07			No
SW13494	8/9/99	URANIUM-238	REAL	TR1	6.3993	PCI/L		V1	0.1415		0.77	8.33	41.80	0.15			No
SW13494	11/5/99	URANIUM-238	REAL	TR1	2.916	PCI/L		V1	0.1362		0.77	3.80	41.80	0.07			No
00491	2/9/99	CARBON TETRACHLORIDE	REAL	DL1	169.00	UG/L	D	V	2	10	5.00	33.80			545.00	0.31	No
00491	8/10/99	CARBON TETRACHLORIDE	REAL	TR1	230	UG/L		V1	20	20	5.00	46.00			545.00	0.42	No
00491	8/10/99	METHYLENE CHLORIDE	REAL	TR1	6	UG/L	JB	JB1	20	20	5.00	1.20			34.58	0.17	No
00491	2/9/99	TETRACHLOROETHENE	REAL	TR2	25.80	UG/L		V	0.7	1	5.00	5.16			54.00	0.48	No
00491	8/10/99	TETRACHLOROETHENE	REAL	TR1	35	UG/L		V1	20	20	5.00	7.00			54.00	0.65	No
00491	2/9/99	TRICHLOROETHENE	REAL	TR2	51.00	UG/L		V	0.6	1	5.00	10.20			153.00	0.33	No
00491	8/10/99	TRICHLOROETHENE	REAL	TR1	78	UG/L		V1	20	20	5.00	15.60			153.00	0.51	No
00491	2/9/99	URANIUM-233,-234	REAL	TR1	6.16	PCI/L		V	0.1754		1.07	5.76	60.70	0.10			No
00491	8/10/99	URANIUM-233,-234	REAL	TR1	5.2384	PCI/L		V1	0.2205		1.06	4.94	60.70	0.09			No
00491	2/9/99	URANIUM-238	REAL	TR1	3.89	PCI/L		V	0.1754		0.77	5.06	41.80	0.09			No
00491	8/10/99	URANIUM-238	REAL	TR1	3.5333	PCI/L		V1	0.1652		0.77	4.60	41.80	0.08			No
00597	2/9/99	1,1-DICHLOROETHENE	REAL	TR2	8.80	UG/L		J	0.7	1	7.00	1.26			ND		No
00597	2/9/99	NITRATE/NITRITE	REAL	TR1	12.00	MG/L		V1	0.05	20	10.00	1.20	4.66	2.57	ND		No

Performance Monitoring

Note: Between 1st quarter and 2nd quarter 1999 the Tier II action levels for manganese went from 183 to 1720 ug/L and for nickel from 100 to 140 ug/L.

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Table 2-3
Values Above Tier II Action Levels And Standard Framework Criteria (ALF) In RFCA - Designated Wells
Groundwater 1999

Plume Definition

Location	Sample Date	Analyte	QC Type	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilution	Tier II	Tier II Ratio	Back-ground M2SD	Back-ground Ratio	Historic M2SD	Historic Ratio	Reportable Result?
00597	7/27/99	NITRATE/NITRITE	REAL	TR1	13	MG/L		V1	0.05	10	10.00	1.30	4.66	2.79	ND		No
03991	1/20/99	CARBON TETRACHLORIDE	REAL	TR1	21.90	UG/L		V	0.2	1	5.00	4.38			27.22	0.80	No
03991	2/26/99	CARBON TETRACHLORIDE	REAL	TR1	18.40	UG/L		V1	0.2	1	5.00	3.68			27.22	0.68	No
03991	3/16/99	CARBON TETRACHLORIDE	REAL	TR1	18.00	UG/L		V1	1	1	5.00	3.60			27.22	0.66	No
03991	7/14/99	CARBON TETRACHLORIDE	REAL	TR1	16	UG/L		V1	1	1	5.00	3.20			27.22	0.59	No
03991	1/20/99	TETRACHLOROETHENE	REAL	TR1	5.50	UG/L		J	0.7	1	5.00	1.10			6.38	0.86	No
03991	3/16/99	TRICHLOROETHENE	REAL	TR1	5.00	UG/L		V1	1	1	5.00	1.00			19.03	0.26	No
03991	1/20/99	URANIUM-233,-234	DUP	TR1	2.57	PCI/L		V1	0.225		1.07	2.40	60.70	0.04			No
03991	7/14/99	URANIUM-233,-234	REAL	TR1	1.1573	PCI/L		V1	0.3144		1.06	1.09	60.70	0.02			No
03991	1/20/99	URANIUM-238	DUP	TR1	1.91	PCI/L		V1	0.1544		0.77	2.49	41.80	0.05			No
03991	7/14/99	URANIUM-238	REAL	TR1	0.8998	PCI/L	J	V1	0.189		0.77	1.17	41.80	0.02			No
0487	1/28/99	CARBON TETRACHLORIDE	REAL	TR1	5.50	UG/L		J	0.2	1	5.00	1.10			336.64	0.02	No
0487	7/14/99	CARBON TETRACHLORIDE	REAL	TR1	5	UG/L		V1	1	1	5.00	1.00			336.64	0.01	No
0487	1/28/99	SELENIUM	REAL	TR1	128.0	UG/L		V	1.2	1	50.00	2.56	43.72	2.93	699.76	0.18	No
0487	7/14/99	SELENIUM	REAL	TR1	115	UG/L		V1	0.92	1	50.00	2.30	43.72	2.63	699.76	0.16	No
0487	7/14/99	TETRACHLOROETHENE	REAL	TR1	5	UG/L		V1	1	1	5.00	1.00			77.61	0.06	No
0487	1/28/99	TRICHLOROETHENE	REAL	TR1	77.80	UG/L		J	0.6	1	5.00	15.56			1330.10	0.06	No
0487	7/14/99	TRICHLOROETHENE	REAL	TR2	68	UG/L	D	V1	5	5	5.00	13.60			1330.10	0.05	No
0487	1/28/99	URANIUM-233,-234	REAL	TR1	13.64	PCI/L		V1	.074		1.07	12.75	60.70	0.22			No
0487	7/14/99	URANIUM-233,-234	REAL	TR1	13.0818	PCI/L		V1	0.2703		1.06	12.34	60.70	0.22			No
0487	1/28/99	URANIUM-238	REAL	TR1	9.57	PCI/L		V1	.074		0.77	12.46	41.80	0.23			No
0487	7/14/99	URANIUM-238	REAL	TR1	11.1391	PCI/L		V1	0.1855		0.77	14.50	41.80	0.27			No
05391	1/20/99	CARBON TETRACHLORIDE	REAL	TR1	13.30	UG/L		V	0.2	1	5.00	2.66			32.88	0.40	No
05391	7/15/99	CARBON TETRACHLORIDE	REAL	TR1	19	UG/L		V1	1	1	5.00	3.80			32.88	0.58	No
05391	7/15/99	TETRACHLOROETHENE	REAL	TR1	5	UG/L		V1	1	1	5.00	1.00			8.50	0.59	No
05391	1/20/99	URANIUM-233,-234	REAL	TR1	1.27	PCI/L		V1	0.2375		1.07	1.19	60.70	0.02			No
05391	7/15/99	URANIUM-233,-234	REAL	TR1	1.6756	PCI/L		V1	0.4123		1.06	1.58	60.70	0.03			No
05391	1/20/99	URANIUM-238	REAL	TR1	1.22	PCI/L		V1	0.0823		0.77	1.58	41.80	0.03			No
05391	7/15/99	URANIUM-238	REAL	TR1	1.4996	PCI/L		V1	0.2154		0.77	1.95	41.80	0.04			No
22896	3/10/99	MANGANESE	REAL	TR1	214.0	UG/L		V1	0.05	1	1720.00	0.12	162.33	1.32	ND		No
22896	3/10/99	METHYLENE CHLORIDE	REAL	TR1	240.0	UG/L	B	J	100	100	5.00	48.00			ND		No
22896	8/24/99	METHYLENE CHLORIDE	REAL	TR1	35	UG/L	JB	JB	100	100	5.00	7.00			ND		No
22896	3/10/99	NICKEL	REAL	TR1	771.0	UG/L		V1	0.28	1	140.00	5.51	21.37	36.08	ND		No
22896	3/10/99	NITRATE/NITRITE	REAL	TR1	12.00	MG/L		V1	0.05	20	10.00	1.20	4.66	2.57	ND		No
22896	8/24/99	NITRATE/NITRITE	REAL	TR1	15	MG/L		V	0.05	10	10.00	1.50	4.66	3.22	ND		No
22896	3/10/99	TRICHLOROETHENE	REAL	TR1	2300	UG/L		V	100	100	5.00	460.00			ND		Yes
22896	8/24/99	TRICHLOROETHENE	REAL	TR2	2500	UG/L	D	V	500	500	5.00	500.00			ND		Yes
2987	5/13/99	ANTIMONY	REAL	TR1	8.5	UG/L		V1	0.48	1	6.00	1.42	39.54	0.21	59.60	0.14	No
2987	5/13/99	CHROMIUM	REAL	TR1	5020	UG/L		V1	0.15	1	100.00	50.20	12.44	403.54	18.88	265.89	No
2987	5/13/99	MOLYBDENUM	REAL	TR1	334	UG/L	B	V1	0.3	1	183.00	1.83	87.52	3.82	75.98	4.40	No
2987	5/13/99	NICKEL	REAL	TR1	1760	UG/L		V1	0.3	1	140.00	12.57	21.37	82.36	1742.00	1.01	No
2987	5/13/99	NITRATE/NITRITE	REAL	TR1	13	MG/L		V	0.05	10	10.00	1.30	4.66	2.79	ID		No
2987	5/13/99	SELENIUM	REAL	TR1	306	UG/L	U	V1	1.2	1	50.00	6.12	43.72	7.00	406.00	0.75	No
2987	5/13/99	SULFATE	REAL	TR1	680	MG/L		V	1	10	500.00	1.36	435.60	1.56	690.31	0.99	No
2987	5/13/99	URANIUM-233,-234	REAL	TR1	13.6396	PCI/L		V1	0.2138		1.06	12.87	60.70	0.22			No
2987	5/13/99	URANIUM-238	REAL	TR1	9.2001	PCI/L		V1	0.0796		0.77	11.98	41.80	0.22			No
6286	1/25/99	CARBON TETRACHLORIDE	REAL	TR1	6.70	UG/L		J	0.2		5.00	1.34			9.76	0.69	No
6286	7/14/99	CARBON TETRACHLORIDE	REAL	TR1	7	UG/L		V1	1	1	5.00	1.40			9.76	0.72	No
6286	1/25/99	SELENIUM	REAL	TR1	74.90	UG/L		V	1.2	1	50.00	1.50	43.72	1.71	65.96	1.14	No
6286	7/14/99	SELENIUM	REAL	TR1	65.6	UG/L		V1	0.92	1	50.00	1.31	43.72	1.50	65.96	0.99	No
6286	1/25/99	URANIUM-233,-234	REAL	TR1	5.75	PCI/L		V1	.1527		1.07	5.37	60.70	0.09			No
6286	7/14/99	URANIUM-233,-234	REAL	TR1	4.8075	PCI/L		V1	0.3893		1.06	4.54	60.70	0.08			No
6286	1/25/99	URANIUM-238	REAL	TR1	4.14	PCI/L		V1	.1871		0.77	5.39	41.80	0.10			No
6286	7/14/99	URANIUM-238	REAL	TR1	3.7764	PCI/L		V1	0.0993		0.77	4.92	41.80	0.09			No
6386	7/15/99	URANIUM-233,-234	REAL	TR1	6.9927	PCI/L		V1	0.2056		1.06	6.60	60.70	0.12			No
6386	7/15/99	URANIUM-238	REAL	TR1	5.8607	PCI/L		V1	0.2745		0.77	7.63	41.80	0.14			No
77392	5/5/99	FLUORIDE	REAL	TR1	5.8	MG/L		V1	0.05	5	4.00	1.45	1.55	3.74	ID		No
77392	5/5/99	URANIUM-233,-234	REAL	TR1	13.2605	PCI/L		V1	0.174		1.06	12.51	60.70	0.22			No
77392	5/5/99	URANIUM-238	REAL	TR1	9.3994	PCI/L		V1	0.1463		0.77	12.24	41.80	0.22			No
P209289	5/4/99	CARBON TETRACHLORIDE	REAL	TR1	58	UG/L		V1	5	5	5.00	11.60			ID		No
P209289	10/26/99	CARBON TETRACHLORIDE	REAL	TR1	10	UG/L		V1	1	1	5.00	2.00			ID		No
P209289	5/4/99	URANIUM-233,-234	REAL	TR1	1.1831	PCI/L		V1	0.1132		1.06	1.12	60.70	0.02			No
P209289	5/4/99	URANIUM-238	REAL	TR1	0.9335	PCI/L	J	V1	0.0421		0.77	1.22	41.80	0.02			No
P209389	2/23/99	1,1-DICHLOROETHENE	REAL	TR1	36.10	UG/L		V1	0.7	1	7.00	5.16			88.48	0.41	No
P209389	8/4/99	1,1-DICHLOROETHENE	REAL	TR2	29	UG/L	D	1	2	2	7.00	4.14			88.48	0.33	No
P209489	5/12/99	CARBON TETRACHLORIDE	REAL	TR1	55	UG/L		V1	4	4	5.00	11.00			83.26	0.66	No
P209489	11/17/99	CARBON TETRACHLORIDE	REAL	TR2	43	UG/L	D		5	5	5.00	8.60			83.26	0.52	No
P209489	5/12/99	cis-1,3-DICHLOROPROPENE	REAL	TR1	4	UG/L	J	V1	4	4	0.47	8.46			7.78	0.51	No
P209489	5/12/99	NITRATE/NITRITE	REAL	TR1	130	MG/L		V	0.05	200	10.00	13.00	4.66	27.90	316.24	0.41	No
P209489	11/17/99	NITRATE/NITRITE	REAL	TR1	160	MG/L		V1	0.05	100	10.00	16.00	4.66	34.33	316.34	0.51	No
P209489	11/17/99	TRICHLOROETHENE	REAL	TR2	57	UG/L	D	V	5	5	5.00	11.40			90.4	0.63	No
P209489	5/12/99	URANIUM-233,-234	REAL	TR1	15.521	PCI/L		V1	0.1811		1.06	14.64	60.70	0.26			No
P209489	11/17/99	URANIUM-233,-234	REAL	TR1	19.0217	PCI/L		V1	0.3202		1.06	17.95	60.70	0.31			No
P209489	11/17/99	URANIUM-235	REAL	TR1	1.3844	PCI/L		V1	0.4077		1.01	1.37	1.79	0.77			No
P209489	5/12/99	URANIUM-238	REAL	TR1	13.2453	PCI/L		V1	0.264		0.77	17.25	41.80	0.32			No
P209489	11/17/99	URANIUM-238	REAL	TR1	15.0971	PCI/L		V1	0.3202		0.77	19.66	41.80	0.36			No
P219189	5/3/99	1,1-DICHLOROETHENE	REAL	TR1	23	UG/L		V1	1	1	7.00	3.29			46.76	0.49	No

Note: Between 1st quarter and 2nd quarter 1999 the Tier II action levels for manganese went from 183 to 1720 ug/L and for nickel from 100 to 140 ug/L.

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Table 2-3
Values Above Tier II Action Levels And Standard Framework Criteria (ALF) In RFCA - Designated Wells
Groundwater 1999

Zone	Location	Sample Date	Analyte	QC Type	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilution	Tier II	Tier II Ratio	Back-ground M2SD	Back-ground Ratio	Historic M2SD	Historic Ratio	Reportable Result?
	P219189	10/26/99	1,1-DICHLOROETHENE	REAL	TR2	25	UG/L	D	V1	2	2	7.00	3.57			46.76	0.53	No
	P219189	5/3/99	URANIUM-233,-234	REAL	TR1	58.9974	PCI/L		V1	0.2457		1.06	55.66	60.70	0.97			No
	P219189	10/26/99	URANIUM-233,-234	REAL	TR1	57.4913	PCI/L		V1	0.5781		1.06	54.24	60.70	0.95			No
	P219189	5/3/99	URANIUM-235	REAL	TR1	1.7335	PCI/L		V1	0.2066		1.01	1.72	1.79	0.97			No
	P219189	10/26/99	URANIUM-235	REAL	TR1	2.228	PCI/L		V1	0.6096		1.01	2.21	1.79	1.24			No
	P219189	5/3/99	URANIUM-238	REAL	TR1	43.5801	PCI/L		V1	0.1121		0.77	56.74	41.80	1.04	ID		No
	P219189	10/26/99	URANIUM-238	REAL	TR1	39.3985	PCI/L		V1	0.5037		0.77	51.30	41.80	0.94			No
	P416789	10/19/99	NITRATE/NITRITE	REAL	TR1	10	MG/L		V1	0.05	10	10.00	1.00	4.66	2.15	ID		No
	P416789	4/26/99	TRICHLOROETHENE	REAL	TR1	6	UG/L		V1	1	1	5.00	1.20			26.19	0.23	No
	P416789	4/26/99	URANIUM-233,-234	REAL	TR1	1.3009	PCI/L		V1	0.1009		1.06	1.23	60.70	0.02			No
	P416789	10/19/99	URANIUM-233,-234	REAL	TR1	1.4347	PCI/L		V1	0.2758		1.06	1.35	60.70	0.02			No
	P416889	5/17/99	TETRACHLOROETHENE	REAL	TR2	46	UG/L	D	V1	2	2	5.00	9.20			77.70	0.59	No
	P416889	11/30/99	TETRACHLOROETHENE	REAL	TR1	40	UG/L		V	2	2	5.00	8.00			77.70	0.51	No
	P416889	5/17/99	URANIUM-233,-234	REAL	TR1	1.3018	PCI/L		V1	0.2481		1.06	1.23	60.70	0.02			No
	P416889	11/30/99	URANIUM-233,-234	REAL	TR1	1.9923	PCI/L		V1	0.0996		1.06	1.88	60.70	0.03			No
	P416889	11/30/99	URANIUM-238	REAL	TR1	0.814059	PCI/L	J	V1	0.0996		0.77	1.06	41.80	0.02			No
	18199	9/13/99	CARBON TETRACHLORIDE	REAL	TR2	14000	UG/L	D	V1	500	100	5.00	2800.00			ND		No
	18199	12/27/99	CARBON TETRACHLORIDE	REAL	TR2	25300	UG/L	D	V	500	500	5.00	5060.00			ND		No
	18199	9/13/99	CHLOROFORM	REAL	TR1	2400	UG/L		V1	120	25	100.00	24.00			ND		No
	18199	12/27/99	CHLOROFORM	REAL	TR1	3790	UG/L		V	100	100	100.00	37.90			ND		No
	18199	9/13/99	HEXACHLOROETHANE	REAL	TR1	17	UG/L		V1	10	1	6.08	2.80			ND		No
	18199	9/13/99	METHYLENE CHLORIDE	REAL	TR1	130	UG/L	B	U1	120	25	5.00	26.00			ND		No
	18199	9/13/99	TETRACHLOROETHENE	REAL	TR1	39	UG/L	J	V1	120	25	5.00	7.80			ND		No
	18199	12/27/99	TETRACHLOROETHENE	REAL	TR1	60.4	UG/L	J	V	100	100	5.00	12.08			ND		No
	18199	12/27/99	THALLIUM	REAL	TR1	3.6	UG/L	U		3.6	1	2.00	1.80	4.90	0.73	ND		No
Plume Degradation	18199	9/13/99	VINYL CHLORIDE	REAL	TR1	120	UG/L		V1	120	25	2.00	60.00			ND		No
	18299	9/14/99	CARBON TETRACHLORIDE	REAL	TR1	3300	UG/L		V1	120	25	5.00	660.00			ND		No
	18299	9/14/99	CHLOROFORM	REAL	TR1	1900	UG/L		V1	120	25	100.00	19.00			ND		No
	18299	9/14/99	METHYLENE CHLORIDE	REAL	TR1	160	UG/L	B	U1	120	25	5.00	32.00			ND		No
	18299	9/14/99	TETRACHLOROETHENE	REAL	TR1	25	UG/L	J	V1	120	25	5.00	5.00			ND		No
	18399	9/14/99	1,1,1-TRICHLOROETHANE	REAL	TR2	22000	UG/L	D	1	1000	200	200.00	110.00			ND		No
	18399	9/14/99	CARBON TETRACHLORIDE	REAL	TR2	22000	UG/L	D	V1	1000	200	5.00	4400.00			ND		No
	18399	9/14/99	CHLOROFORM	REAL	TR1	4000	UG/L		V1	120	25	100.00	40.00			ND		No
	18399	9/14/99	METHYLENE CHLORIDE	REAL	TR1	150	UG/L	B	U1	120	25	5.00	30.00			ND		No
	18499	9/20/99	CARBON TETRACHLORIDE	DUP	TR1	17000	UG/L		V1	500	100	5.00	3400.00			ND		No
	18499	9/20/99	CHLOROFORM	DUP	TR1	5100	UG/L		V1	500	100	100.00	51.00			ND		No
	18499	9/20/99	HEXACHLOROBUTADIENE	REAL	TR1	4	UG/L	J	V1	10	1	1.09	3.67			ND		No
	18499	9/20/99	HEXACHLOROETHANE	DUP	TR1	50	UG/L		V1	10	1	6.08	8.22			ND		No
	18499	9/20/99	METHYLENE CHLORIDE	DUP	TR1	400	UG/L	JB	JB1	500	100	5.00	80.00			ND		No
	18599	9/20/99	CARBON TETRACHLORIDE	REAL	TR1	3800	UG/L		V1	200	40	5.00	760.00			ND		No
	18599	9/20/99	CHLOROFORM	REAL	TR1	810	UG/L		V1	200	40	100.00	8.10			ND		No
	18599	9/20/99	METHYLENE CHLORIDE	REAL	TR1	140	UG/L	JB	JB1	200	40	5.00	28.00			ND		No
	18799	9/20/99	CARBON TETRACHLORIDE	REAL	TR1	220	UG/L		V1	25	5	5.00	44.00			ND		No
	18799	9/20/99	CHLOROFORM	REAL	TR1	590	UG/L		V1	25	5	100.00	5.90			ND		No
	18799	9/20/99	CHLOROMETHANE	REAL	TR1	18	UG/L	J	V1	25	5	6.55	2.75			ND		No
	18799	9/20/99	METHYLENE CHLORIDE	REAL	TR1	21	UG/L	JB	JB1	25	5	5.00	4.20			ND		No
	18799	9/20/99	TETRACHLOROETHENE	REAL	TR1	8	UG/L	J	V1	25	5	5.00	1.60			ND		No
	90099	8/4/99	CARBON TETRACHLORIDE	REAL	TR1	430	UG/L		V1	20	20	5.00	86.00			ND		No
	90099	8/4/99	METHYLENE CHLORIDE	REAL	TR2	21	UG/L	JBD	1	50	50	5.00	4.20			ND		No
	90099	8/4/99	TETRACHLOROETHENE	REAL	TR1	27	UG/L		V1	20	20	5.00	5.40			ND		No
	90099	8/4/99	TRICHLOROETHENE	REAL	TR2	820	UG/L	D	V1	50	50	5.00	164.00			ND		No
	90399	8/2/99	CARBON TETRACHLORIDE	REAL	TR1	380	UG/L		V1	20	20	5.00	76.00			ND		No
	90399	8/2/99	TETRACHLOROETHENE	REAL	TR1	10	UG/L	J	V1	20	20	5.00	2.00			ND		No
	90399	8/2/99	TRICHLOROETHENE	REAL	TR1	220	UG/L		V1	20	20	5.00	44.00			ND		No
Plume Extent	00397	5/5/99	URANIUM-233,-234	REAL	TR1	14.1016	PCI/L		V1	0.1364		1.06	13.30	60.70	0.23			No
	00397	5/5/99	URANIUM-238	REAL	TR1	9.8586	PCI/L		V1	0.0936		0.77	12.84	41.80	0.24			No
	02197	5/25/99	NITRATE/NITRITE	REAL	TR1	13	MG/L		V	0.05	10	10.00	1.30	4.66	2.79	ND		Yes
	04091	4/13/99	URANIUM-233,-234	REAL	TR1	2.25	PCI/L		V1	0.1356		1.06	2.12	60.70	0.04			No
	04091	11/2/99	URANIUM-233,-234	REAL	TR1	1.8782	PCI/L		V1	0.23		1.06	1.77	60.70	0.03			No
	04091	4/13/99	URANIUM-238	REAL	TR1	1.1821	PCI/L		V1	0.114		0.77	1.54	41.80	0.03			No
	04091	11/2/99	URANIUM-238	REAL	TR1	1.233	PCI/L		V1	0.23		0.77	1.61	41.80	0.03			No
	04591	3/16/99	URANIUM-233,-234	REAL	TR1	3.33	PCI/L		J	0.5049		1.07	3.12	60.70	0.05			No
	04591	3/16/99	URANIUM-238	REAL	TR1	1.04	PCI/L		J	0.188		0.77	1.36	41.80	0.02			No
	04991	6/3/99	URANIUM-233,-234	REAL	TR1	4.1506	PCI/L		V1	0.1805		1.06	3.92	60.70	0.07			No
	04991	12/2/99	URANIUM-233,-234	REAL	TR1	4.74054	PCI/L			0.0467		1.06	4.47	60.70	0.08			No
	04991	6/3/99	URANIUM-238	REAL	TR1	2.5679	PCI/L		V1	0.098		0.77	3.34	41.80	0.06			No
	04991	12/2/99	URANIUM-238	REAL	TR1	2.56181	PCI/L			0.0356		0.77	3.34	41.80	0.06			No
	05091	2/15/99	URANIUM-233,-234	REAL	TR1	3.46	PCI/L		V1	0.1681		1.07	3.23	60.70	0.06			No
	05091	8/24/99	URANIUM-233,-234	DUP	TR1	3.2312	PCI/L		V1	0.232		1.06	3.05	60.70	0.05			No
	05091	2/15/99	URANIUM-238	REAL	TR1	2.73	PCI/L		V1	0.0912		0.77	3.55	41.80	0.07			No
	05091	8/24/99	URANIUM-238	DUP	TR1	2.1905	PCI/L		V1	0.1482		0.77	2.85	41.80	0.05			No
	06091	5/12/99	CARBON TETRACHLORIDE	REAL	TR1	5	UG/L		V1	1	1	5.00	1.00			4.44	1.13	Yes
	06091	6/14/99	CARBON TETRACHLORIDE	REAL	TR1	6	UG/L		V1	1	1	5.00	1.20			4.44	1.35	Yes
	06091	7/13/99	CARBON TETRACHLORIDE	REAL	TR1	7	UG/L		V1	1	1	5.00	1.40			4.44	1.58	Yes
	06091	11/3/99	CARBON TETRACHLORIDE	REAL	TR1	8	UG/L		V1	1	1	5.00	1.60			4.44	1.80	Yes
	06091	5/12/99	URANIUM-233,-234	REAL	TR1	2.8437	PCI/L		V1	0.2248		1.06	2.68	60.70	0.05			No
	06091	11/3/99	URANIUM-233,-234	REAL	TR1	3.5709	PCI/L		V1	0.2864		1.06	3.37	60.70	0.06			No

Note: Between 1st quarter and 2nd quarter 1999 the Tier II action levels for manganese went from 183 to 1720 ug/L and for nickel from 100 to 140 ug/L.

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Table 2-3
Values Above Tier II Action Levels And Standard Framework Criteria (ALF) In RFCA - Designated Wells
Groundwater 1999

Plume Extent

Location	Sample Date	Analyte	QC Type	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilution	Tier II	Tier II Ratio	Back-ground M2SD	Back-ground Ratio	Historic M2SD	Historic Ratio	Reportable Result?
06091	5/12/99	URANIUM-238	REAL	TR1	1.3829	PCI/L		V1	0.1542		0.77	1.80	41.80	0.03			No
06091	11/3/99	URANIUM-238	REAL	TR1	2.2765	PCI/L		V1	0.2597		0.77	2.96	41.80	0.05			No
10194	1/27/99	URANIUM-233,-234	REAL	TR1	1.85	PCI/L		V1	.1574		1.07	1.73	60.70	0.03			No
10194	8/23/99	URANIUM-233,-234	REAL	TR1	2.0292	PCI/L		V1	0.2024		1.06	1.91	60.70	0.03			No
10194	1/27/99	URANIUM-238	REAL	TR1	0.85	PCI/L	J	V1	.064		0.77	1.11	41.80	0.02			No
10194	8/23/99	URANIUM-238	REAL	TR1	1.1932	PCI/L		V1	0.0923		0.77	1.55	41.80	0.03			No
10994	1/28/99	NITRATE/NITRITE	REAL	TR1	11.00	MG/L		V1	0.05	10	10.00	1.10	4.66	2.36	ND		Yes
10994	1/28/99	SELENIUM	REAL	TR1	524.0	UG/L		V	1.2	1	50.00	10.48	43.72	11.99	1097.20	0.48	Yes
10994	7/19/99	SELENIUM	REAL	TR1	338	UG/L		V1	0.92	1	50.00	6.76	43.72	7.73	1097.20	0.31	Yes
10994	1/28/99	URANIUM-233,-234	REAL	TR1	8.76	PCI/L		V1	.2056		1.07	8.19	60.70	0.14			No
10994	7/19/99	URANIUM-233,-234	REAL	TR1	8.3257	PCI/L		V1	0.324		1.06	7.85	60.70	0.14			No
10994	1/28/99	URANIUM-238	REAL	TR1	5.10	PCI/L		V1	.1678		0.77	6.64	41.80	0.12			No
10994	7/19/99	URANIUM-238	REAL	TR1	6.0021	PCI/L		V1	0.207		0.77	7.82	41.80	0.14			No
1386	5/18/99	NICKEL	REAL	TR1	371	UG/L		V1	0.3	1	140.00	2.65	21.37	17.36	308.75	1.20	Yes
1386	10/26/99	NICKEL	REAL	TR1	382	UG/L		J1	0.25	1	140.00	2.73	21.37	17.88	308.75	1.24	Yes
1386	5/18/99	URANIUM-233,-234	REAL	TR1	6.6844	PCI/L		V1	0.2905		1.06	6.31	60.70	0.11			No
1386	10/26/99	URANIUM-233,-234	REAL	TR1	6.0502	PCI/L		V1	0.2338		1.06	5.71	60.70	0.10			No
1386	5/18/99	URANIUM-238	REAL	TR1	5.7906	PCI/L		V1	0.1856		0.77	7.54	41.80	0.14			No
1386	10/26/99	URANIUM-238	REAL	TR1	5.1785	PCI/L		V1	0.27		0.77	6.74	41.80	0.12			No
1786	5/11/99	NITRATE/NITRITE	REAL	TR1	410	MG/L		V	0.05	500	10.00	41.00	4.66	87.98	689.31	0.59	Yes
1786	10/27/99	NITRATE/NITRITE	REAL	TR1	600	MG/L		J1	0.05	100	10.00	60.00	4.66	128.76	689.31	0.87	Yes
1786	5/11/99	SELENIUM	REAL	TR1	243	UG/L	U	V1	1.2	1	50.00	4.86	43.72	5.56	290.81	0.84	Yes
1786	10/27/99	SELENIUM	REAL	TR2	408	UG/L		1	1	1	50.00	8.16	43.72	9.33	290.81	1.40	Yes
1786	5/11/99	URANIUM-233,-234	REAL	TR1	33.7918	PCI/L		V1	0.1438		1.06	31.88	60.70	0.56			No
1786	10/27/99	URANIUM-233,-234	REAL	TR1	33.4441	PCI/L		V1	0.2493		1.06	31.55	60.70	0.55			No
1786	5/11/99	URANIUM-235	REAL	TR1	1.1271	PCI/L		V1	0.078		1.01	1.12	1.79	0.63			No
1786	10/27/99	URANIUM-235	REAL	TR1	1.6775	PCI/L		V1	0.1562		1.01	1.66	1.79	0.94			No
1786	5/11/99	URANIUM-238	REAL	TR1	27.402	PCI/L		V1	0.078		0.77	35.68	41.80	0.66			No
1786	10/27/99	URANIUM-238	REAL	TR1	23.4665	PCI/L		V1	0.2493		0.77	30.56	41.80	0.56			No
1986	6/7/99	MANGANESE	REAL	TR1	3690	UG/L		V	0.05	1	1720.00	2.15	163.33	22.59	3304.00	1.12	Yes
1986	12/13/99	MANGANESE	REAL	TR1	2760	UG/L		V1	0.34	1	1720.00	1.60	162.33	17.00	3304.00	0.84	Yes
1986	12/13/99	THALLIUM	REAL	TR1	3.6	UG/L	U	V1	3.6	1	2.00	1.80	4.90	0.73	1.74	2.07	No
1986	6/7/99	URANIUM-233,-234	REAL	TR1	3.4105	PCI/L		V1	0.1248		1.06	3.22	60.70	0.06			No
1986	12/13/99	URANIUM-233,-234	REAL	TR1	2.74298	PCI/L		V1	0.4375		1.06	2.59	60.70	0.05			No
1986	6/7/99	URANIUM-238	REAL	TR1	1.7052	PCI/L		V1	0.1248		0.77	2.22	41.80	0.04			No
1986	12/13/99	URANIUM-238	REAL	TR1	1.68602	PCI/L		V1	0.3927		0.77	2.20	41.80	0.04			No
2186	12/13/99	THALLIUM	REAL	TR1	3.6	UG/L	U	J1	3.6	1	2.00	1.80	4.90	0.73			No
2186	6/9/99	URANIUM-233,-234	REAL	TR1	1.5361	PCI/L		V1	0.3176		1.06	1.45	60.70	0.03			No
2186	12/13/99	URANIUM-233,-234	REAL	TR1	2.57281	PCI/L		V1	0.3218		1.06	2.43	60.70	0.04			No
2186	6/9/99	URANIUM-238	REAL	TR1	0.935	PCI/L	J	V1	0.1812		0.77	1.22	41.80	0.02			No
2186	12/13/99	URANIUM-238	REAL	TR1	0.851808	PCI/L	J	V1	0.2659		0.77	1.11	41.80	0.02			No
22696	3/9/99	CARBON TETRACHLORIDE	REAL	TR1	69.00	UG/L		V	5	5	5.00	13.80			ND		Yes
22696	3/9/99	MANGANESE	REAL	TR1	579.0	UG/L		V1	0.05	1	1720.00	0.34	162.33	3.57	ND		No
22696	3/9/99	URANIUM-233,-234	REAL	TR1	13.33	PCI/L		V	0.2642		1.07	12.45	60.70	0.22			No
22696	8/4/99	URANIUM-233,-234	REAL	TR1	5.3366	PCI/L		V1	0.2132		1.06	5.03	60.70	0.09			No
22696	3/9/99	URANIUM-238	REAL	TR1	7.81	PCI/L		V	0.2642		0.77	10.17	41.80	0.19			No
22696	8/4/99	URANIUM-238	REAL	TR1	4.0748	PCI/L		V1	0.0794		0.77	5.31	41.80	0.10			No
22796	12/16/99	CHROMIUM	REAL	TR1	124	UG/L		V1	0.61	1	100.00	1.24	12.44	9.97	ND		Yes
22796	12/16/99	THALLIUM	REAL	TR1	5.8	UG/L	B	V1	3.6	1	2.00	2.90	4.90	1.18	ND		Yes
22796	6/9/99	TRICHLOROETHENE	REAL	TR1	10	UG/L		V	1	1	5.00	2.00			ND		Yes
22796	12/16/99	TRICHLOROETHENE	REAL	TR1	9	UG/L		V1	1	1	5.00	1.80			ND		Yes
22796	6/9/99	URANIUM-233,-234	REAL	TR1	3.2436	PCI/L		V1	0.2659		1.06	3.06	60.70	0.05			No
22796	12/16/99	URANIUM-233,-234	REAL	TR1	2.09019	PCI/L		V1	0.1550		1.06	1.97	60.70	0.03			No
22796	6/9/99	URANIUM-238	REAL	TR1	2.6051	PCI/L		V1	0.2659		0.77	3.39	41.80	0.06			No
22796	12/16/99	URANIUM-238	REAL	TR1	1.49128	PCI/L		V1	0.1560		0.77	1.94	41.80	0.04			No
23096	2/2/99	URANIUM-233,-234	REAL	TR1	1.74	PCI/L		V1	.1836		1.07	1.63	60.70	0.03			No
23096	7/16/99	URANIUM-233,-234	REAL	TR1	1.6436	PCI/L		V1	0.3632		1.06	1.55	60.70	0.03			No
23096	2/2/99	URANIUM-238	REAL	TR1	1.98	PCI/L		V1	.0542		0.77	2.58	41.80	0.05			No
23096	7/16/99	URANIUM-238	REAL	TR1	2.2877	PCI/L		V1	0.2916		0.77	2.98	41.80	0.05			No
23196	11/11/99	URANIUM-233,-234	REAL	TR1	24.0597	PCI/L		V1	0.2696		1.06	22.70	60.70	0.40			No
23196	11/11/99	URANIUM-238	REAL	TR1	12.8169	PCI/L		V1	0.2420		0.77	16.69	41.80	0.31			No
23296	2/15/99	CARBON TETRACHLORIDE	REAL	TR1	7.70	UG/L		V1	0.2	1	5.00	1.54			ND		Yes
23296	8/17/99	cis-1,2-DICHLOROETHENE	REAL	TR2	160	UG/L	D	V1	50	50	70.00	2.29			ND		Yes
23296	10/28/99	cis-1,2-DICHLOROETHENE	REAL	TR1	170	UG/L		V	20	20	70.00	2.43			ND		Yes
23296	2/15/99	TETRACHLOROETHENE	REAL	TR1	19.10	UG/L		V1	0.7	1	5.00	3.82			ND		Yes
23296	8/17/99	TETRACHLOROETHENE	REAL	TR1	11	UG/L		J1	1	1	5.00	2.20			ND		Yes
23296	10/28/99	TETRACHLOROETHENE	REAL	TR1	10	UG/L	J	V	20	20	5.00	2.00			ND		Yes
23296	2/15/99	TRICHLOROETHENE	REAL	DL1	422.0	UG/L	D	V1	15	25	5.00	84.40			ND		Yes
23296	8/17/99	TRICHLOROETHENE	REAL	TR2	270	UG/L	D	V1	50	50	5.00	54.00			ND		Yes
23296	10/28/99	TRICHLOROETHENE	REAL	TR1	280	UG/L		V	20	20	5.00	56.00			ND		Yes
23296	2/15/99	URANIUM-233,-234	REAL	TR1	16.98	PCI/L		V1	0.1048		1.07	15.87	60.70	0.28			No
23296	8/17/99	URANIUM-233,-234	REAL	TR1	13.0448	PCI/L		V1	0.3227		1.06	12.31	60.70	0.21			No
23296	2/15/99	URANIUM-238	REAL	TR1	11.95	PCI/L		V1	0.1048		0.77	15.56	41.80	0.29			No
23296	8/17/99	URANIUM-238	REAL	TR1	9.6944	PCI/L		V1	0.2634		0.77	12.62	41.80	0.23			No
3386	5/4/99	URANIUM-233,-234	REAL	TR1	4.4037	PCI/L		V1	0.094		1.06	4.15	60.70	0.07			No
3386	5/4/99	URANIUM-238	REAL	TR1	2.5055	PCI/L		V1	0.051		0.77	3.26	41.80	0.06			No
3586	1/15/99	MANGANESE	REAL	TR1	4880	UG/L	N	J1	0.01	1	1720.00	2.84	162.33	30.06	4357.00	1.12	Yes

Note: Between 1st quarter and 2nd quarter 1999 the Tier II action levels for manganese went from 183 to 1720 ug/L and for nickel from 100 to 140 ug/L.

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Table 2-3
Values Above Tier II Action Levels And Standard Framework Criteria (ALF) In RFCA - Designated Wells
Groundwater 1999

	Location	Sample Date	Analyte	QC Type	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilution	Tier II	Tier II Ratio	Back-ground M2SD	Back-ground Ratio	Historic M2SD	Historic Ratio	Reportable Result?
Plume Extent	3586	8/9/99	MANGANESE	DUP	TR1	3920	UG/L		V	0.05	1	1720.00	2.28	162.33	24.15	4357.00	0.90	Yes
	3586	10/19/99	MANGANESE	DUP	TR1	3910	UG/L		V	0.05	1	1720.00	2.27	162.33	24.09	4357.00	0.90	Yes
	3586	1/15/99	URANIUM-233,-234	REAL	TR1	2.36	PCI/L		V1	.21		1.07	2.21	60.70	0.04			No
	3586	4/28/99	URANIUM-233,-234	DUP	TR1	3.3766	PCI/L		V1	0.1379		1.06	3.19	60.70	0.06			No
	3586	8/9/99	URANIUM-233,-234	REAL	TR1	3.2764	PCI/L		V1	0.366		1.06	3.09	60.70	0.05			No
	3586	10/19/99	URANIUM-233,-234	DUP	TR1	3.7966	PCI/L		V1	0.2108		1.06	3.58	60.70	0.06			No
	3586	1/15/99	URANIUM-238	DUP	TR1	2.04	PCI/L		V1	.0718		0.77	2.66	41.80	0.05			No
	3586	4/28/99	URANIUM-238	DUP	TR1	2.7499	PCI/L		V1	0.0513		0.77	3.58	41.80	0.07			No
	3586	8/9/99	URANIUM-238	DUP	TR1	2.7168	PCI/L		V1	0.2255		0.77	3.54	41.80	0.06			No
	3586	10/19/99	URANIUM-238	DUP	TR1	2.8275	PCI/L		V1	0.1321		0.77	3.68	41.80	0.07			No
	3586	1/15/99	VINYL CHLORIDE	REAL	TR1	66.80	UG/L		V1	0.4	1	2.00	33.40			776.00	0.09	Yes
	3586	8/9/99	VINYL CHLORIDE	DUP	TR2	110	UG/L	D	J1	10	10	2.00	55.00			776.00	0.14	Yes
	3586	10/19/99	VINYL CHLORIDE	DUP	TR1	60	UG/L		V1	5	5	2.00	30.00			776.00	0.08	Yes
	43392	7/20/99	URANIUM-233,-234	REAL	TR1	1.097	PCI/L		V1	0.3011		1.06	1.03	60.70	0.02			No
	5387	4/19/99	URANIUM-233,-234	REAL	TR1	8.2127	PCI/L		V1	0.0557		1.06	7.75	60.70	0.14			No
	5387	11/17/99	URANIUM-233,-234	REAL	TR1	7.92084	PCI/L		V1	0.0606		1.06	7.47	60.70	0.13			No
	5387	4/19/99	URANIUM-238	REAL	TR1	5.5368	PCI/L		V1	0.0557		0.77	7.21	41.80	0.13			No
	5387	11/17/99	URANIUM-238	REAL	TR1	5.96829	PCI/L		V1	0.0412		0.77	7.77	41.80	0.14			No
	6186	1/26/99	URANIUM-233,-234	REAL	TR1	2.34	PCI/L		V1	.0696		1.07	2.19	60.70	0.04			No
	6186	7/19/99	URANIUM-233,-234	REAL	TR1	1.9498	PCI/L		V1	0.2584		1.06	1.84	60.70	0.03			No
	6186	1/26/99	URANIUM-238	REAL	TR1	1.41	PCI/L		V1	.0696		0.77	1.84	41.80	0.03			No
	6186	7/19/99	URANIUM-238	REAL	TR1	1.5123	PCI/L		V1	0.105		0.77	1.97	41.80	0.04			No
	7086	2/8/99	URANIUM-233,-234	REAL	TR1	1.85	PCI/L		NJ	.267		1.07	1.73	60.70	0.03			No
	7086	8/18/99	URANIUM-233,-234	REAL	TR1	1.2604	PCI/L		V1	0.2605		1.06	1.19	60.70	0.02			No
	7086	2/8/99	URANIUM-238	REAL	TR1	1.51	PCI/L		NJ	.2001		0.77	1.97	41.80	0.04			No
	7086	8/18/99	URANIUM-238	REAL	TR1	1.1843	PCI/L		V1	0.198		0.77	1.54	41.80	0.03			No
	75992	1/26/99	MANGANESE	REAL	TR1	213.0	UG/L	N	J	0.01	1	1720.00	0.12	162.33	1.31	ID		No
	75992	1/26/99	URANIUM-233,-234	REAL	TR1	11.66	PCI/L		V1	.1512		1.07	10.89	60.70	0.19			No
	75992	7/22/99	URANIUM-233,-234	REAL	TR1	8.459	PCI/L		V1	0.3171		1.06	7.98	60.70	0.14			No
	75992	1/26/99	URANIUM-238	REAL	TR1	9.41	PCI/L		V1	.1512		0.77	12.26	41.80	0.23			No
	75992	7/22/99	URANIUM-238	REAL	TR1	8.4572	PCI/L		V1	0.1181		0.77	11.01	41.80	0.20			No
	76992	7/20/99	URANIUM-233,-234	REAL	TR1	2.8667	PCI/L		V1	0.2598		1.06	2.70	60.70	0.05			No
	76992	7/20/99	URANIUM-238	REAL	TR1	1.6311	PCI/L		V1	0.2915		0.77	2.12	41.80	0.04			No
	B208789	11/17/99	THALLIUM	REAL	TR1	10.8	UG/L	U	V	10.8	10	2.00	5.40	4.90	2.20	ID		Yes
	B208789	4/26/99	URANIUM-233,-234	REAL	TR1	11.5208	PCI/L		V1	0.113		1.06	10.87	60.70	0.19			No
	B208789	11/17/99	URANIUM-233,-234	REAL	TR1	5.6807	PCI/L		V1	0.3053		1.06	5.36	60.70	0.09			No
	B208789	4/26/99	URANIUM-238	REAL	TR1	9.0487	PCI/L		V1	0.1007		0.77	11.78	41.80	0.22			No
	B208789	11/17/99	URANIUM-238	REAL	TR1	4.5618	PCI/L		V1	0.2117		0.77	5.94	41.80	0.11			No
	P114389	1/27/99	MANGANESE	REAL	TR1	919.0	UG/L	N	J	0.01	1	1720.00	0.53	162.33	5.66	663.52	1.39	Yes
	P114389	1/27/99	URANIUM-233,-234	REAL	TR1	2.42	PCI/L		V1	.1771		1.07	2.26	60.70	0.04			No
	P114389	7/20/99	URANIUM-233,-234	REAL	TR1	2.5672	PCI/L		V1	0.2505		1.06	2.42	60.70	0.04			No
	P114389	1/27/99	URANIUM-238	REAL	TR1	1.65	PCI/L		V1	.0614		0.77	2.15	41.80	0.04			No
	P114389	7/20/99	URANIUM-238	REAL	TR1	2.3612	PCI/L		V1	0.2938		0.77	3.07	41.80	0.06			No
	P218389	5/3/99	URANIUM-238	REAL	TR1	0.9142	PCI/L	J	V1	0.1414		0.77	1.19	41.80	0.02			No
	P219489	5/4/99	NITRATE/NITRITE	REAL	TR1	45	MG/L		V1	0.05	100	10.00	4.50	4.66	9.66	51.57	0.87	Yes
	P219489	10/26/99	NITRATE/NITRITE	REAL	TR1	44	MG/L		J1	0.05	50	10.00	4.40	4.66	9.44	51.57	0.85	Yes
	P219489	5/4/99	URANIUM-233,-234	REAL	TR1	5.9767	PCI/L		V1	0.3303		1.06	5.64	60.70	0.10			No
	P219489	5/4/99	URANIUM-238	REAL	TR1	3.162	PCI/L		V1	0.1884		0.77	4.12	41.80	0.08			No
	P313589	1/28/99	NICKEL	REAL	TR1	127.0	UG/L		V	0.05	1	140.00	0.91	21.37	5.94	254.49	0.50	Yes
	P313589	1/28/99	URANIUM-233,-234	REAL	TR1	2.22	PCI/L		V1	.2447		1.07	2.08	60.70	0.04			No
	P313589	7/21/99	URANIUM-233,-234	REAL	TR1	1.7853	PCI/L		V1	0.3327		1.06	1.68	60.70	0.03			No
	P313589	1/28/99	URANIUM-238	REAL	TR1	1.67	PCI/L		V1	.1679		0.77	2.18	41.80	0.04			No
	P416689	4/26/99	NICKEL	REAL	TR1	155	UG/L		V1	0.3	1	140.00	1.11	21.37	7.25	ID		Yes
	P416689	4/26/99	URANIUM-233,-234	REAL	TR1	3.0163	PCI/L		V1	0.1372		1.06	2.85	60.70	0.05			No
	P416689	10/19/99	URANIUM-233,-234	REAL	TR1	2.6116	PCI/L		V1	0.3681		1.06	2.46	60.70	0.04			No
	P416689	4/26/99	URANIUM-238	REAL	TR1	0.8603	PCI/L	J	V1	0.0475		0.77	1.12	41.80	0.02			No
	P416689	10/19/99	URANIUM-238	REAL	TR1	1.4096	PCI/L		V1	0.328		0.77	1.84	41.80	0.03			No
RA	4087	8/30/99	SULFATE	REAL	TR1	560	MG/L		V	1	10	500.00	1.12	435.60	1.29	940.32	0.60	Yes
	4087	3/8/99	URANIUM-233,-234	REAL	TR1	14.28	PCI/L		V	0.1639		1.07	13.34	60.70	0.24			No
	4087	5/5/99	URANIUM-233,-234	REAL	TR1	16.3356	PCI/L		V1	0.1099		1.06	15.41	60.70	0.27			No
	4087	8/30/99	URANIUM-233,-234	REAL	TR1	24.2269	PCI/L		V1	0.2916		1.06	22.86	60.70	0.40			No
	4087	3/8/99	URANIUM-238	REAL	TR1	9.85	PCI/L		V	0.2389		0.77	12.83	41.80	0.24			No
	4087	5/5/99	URANIUM-238	REAL	TR1	11.4748	PCI/L		V1	0.1602		0.77	14.94	41.80	0.27			No
	4087	8/30/99	URANIUM-238	REAL	TR1	19.7271	PCI/L		V1	0.073		0.77	25.69	41.80	0.47			No
	52894	5/5/99	URANIUM-233,-234	REAL	TR1	14.5489	PCI/L		V1	0.3211		1.06	13.73	60.70	0.24			No
	52894	8/25/99	URANIUM-233,-234	REAL	TR1	14.9074	PCI/L		V1	0.2451		1.06	14.06	60.70	0.25			No
	52894	5/5/99	URANIUM-238	REAL	TR1	10.9386	PCI/L		V1	0.165		0.77	14.24	41.80	0.26			No
	52894	8/25/99	URANIUM-238	REAL	TR1	10.7318	PCI/L		V1	0.1836		0.77	13.97	41.80	0.26			No
	70193	8/19/99	URANIUM-233,-234	DUP	TR1	2.1716	PCI/L		V1	0.1755		1.06	2.05	60.70	0.04			No
	70193	8/19/99	URANIUM-238	DUP	TR1	1.2138	PCI/L		V1	0.2088		0.77	1.58	41.80	0.03			No
	70393	2/17/99	1,1-DICHLOROETHENE	DUP	TR1	16.40	UG/L		V1	0.7	1	7.00	2.34			20.72	0.79	No
	70393	5/18/99	1,1-DICHLOROETHENE	REAL	TR1	12	UG/L		V1	1	1	7.00	1.71			20.72	0.58	No
	70393	8/16/99	1,1-DICHLOROETHENE	DUP	TR1	13	UG/L		V1	1	1	7.00	1.86			20.72	0.63	No
	70393	11/4/99	1,1-DICHLOROETHENE	DUP	TR2	15	UG/L	D	1	2	2	7.00	2.14			20.72	0.72	No
	70393	2/17/99	TETRACHLOROETHENE	REAL	TR1	6.90	UG/L		V1	0.7	1	5.00	1.38			8.88	0.78	No
	70393	5/18/99	TETRACHLOROETHENE	REAL	TR1	6	UG/L		V1	1	1	5.00	1.20			8.88	0.68	No
	70393	8/16/99	TETRACHLOROETHENE	DUP	TR1	7	UG/L		V1	1	1	5.00	1.40			8.88	0.79	No

Note: Between 1st quarter and 2nd quarter 1999 the Tier II action levels for manganese went from 183 to 1720 ug/L and for nickel from 100 to 140 ug/L.

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Table 2-3
Values Above Tier II Action Levels And Standard Framework Criteria (ALF) In RFCA - Designated Wells
Groundwater 1999

RCRA

Location	Sample Date	Analyte	QC Type	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilution	Tier II	Tier II Ratio	Back-ground M2SD	Back-ground Ratio	Historic M2SD	Historic Ratio	Reportable Result?
70393	11/4/99	TETRACHLOROETHENE	REAL	TR1	8	UG/L		V1	1	1	5.00	1.60			8.88	0.90	No
70393	2/17/99	TRICHLOROETHENE	REAL	TR1	19.10	UG/L		V1	0.6	1	5.00	3.82			36.33	0.53	No
70393	5/18/99	TRICHLOROETHENE	REAL	TR1	17	UG/L		V1	1	1	5.00	3.40			36.33	0.47	No
70393	8/16/99	TRICHLOROETHENE	DUP	TR1	21	UG/L		V1	1	1	5.00	4.20			36.33	0.58	No
70393	11/4/99	TRICHLOROETHENE	DUP	TR2	23	UG/L	D	1	2	2	5.00	4.60			36.33	0.63	No
70493	11/10/99	URANIUM-233,-234	REAL	TR1	1.5005	PCI/L		V1	0.2827		1.06	1.42	60.70	0.02			No
B206989	7/27/99	LITHIUM	REAL	TR1	1140	UG/L		J1	0.02	1	730.00	1.56	142.55	8.00	ID		Yes
B206989	10/22/99	LITHIUM	REAL	TR1	1640	UG/L		J1	0.02	1	730.00	2.25	142.55	11.50	ID		Yes
B206989	3/2/99	NITRATE/NITRITE	REAL	TR1	58.00	MG/L		V1	0.05	100	10.00	5.80	4.66	12.44	75.40	0.77	Yes
B206989	7/27/99	NITRATE/NITRITE	REAL	TR1	43	MG/L		V1	0.05	25	10.00	4.30	4.66	9.22	75.35	0.57	Yes
B206989	10/22/99	NITRATE/NITRITE	REAL	TR1	44	MG/L		V1	0.05	50	10.00	4.40	4.66	9.44	75.35	0.58	Yes
B206989	7/27/99	SELENIUM	REAL	TR1	266	UG/L		V1	0.92	1	50.00	5.32	43.72	6.08	ID		Yes
B206989	10/22/99	SELENIUM	REAL	TR1	265	UG/L		V1	1	1	50.00	5.30	43.72	6.06	ID		Yes
B206989	7/27/99	URANIUM-233,-234	REAL	TR1	47.5293	PCI/L		V1	0.5128		1.06	44.84	60.70	0.78			No
B206989	10/22/99	URANIUM-233,-234	REAL	TR1	48.7961	PCI/L		V1	0.2376		1.06	46.03	60.70	0.80			No
B206989	7/27/99	URANIUM-235	REAL	TR1	1.9524	PCI/L		V1	0.3575		1.01	1.93	1.79	1.09			Yes
B206989	10/22/99	URANIUM-235	REAL	TR1	1.8613	PCI/L		V1	0.1169		1.01	1.84	1.79	1.04			Yes
B206989	7/27/99	URANIUM-238	REAL	TR1	33.7894	PCI/L		V1	0.2678		0.77	44.00	41.80	0.81			No
B206989	10/22/99	URANIUM-238	REAL	TR1	34.6834	PCI/L		V1	0.2376		0.77	45.16	41.80	0.83			No

Note: Between 1st quarter and 2nd quarter 1999 the Tier II action levels for manganese went from 183 to 1720 ug/L and for nickel from 100 to 140 ug/L.

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3.0 GROUNDWATER FLOW CONDITIONS DURING 1999

Groundwater level data collected throughout calendar year 1999 were reviewed to determine whether significant changes in groundwater flow direction, flow velocity, and quantity have occurred to the upper hydrostratigraphic unit since 1996. This review included preparation of semiannual potentiometric surface maps, quarterly well pair linear flow velocity calculations, selected well hydrographs, and water level change maps. Comparison of the 1999 data to previous potentiometric surface maps (from previous annual reports) and historical water level trends presented in the individual well hydrographs provide a framework for identifying the type of potentiometric configurations, seasonal fluctuations, and long-term trends typically associated with pre-1996 plant operations. The 1996 data set, because it is the last year before the commencement of D&D activities (and to some extent the 1997 data set) has been adopted as a sitewide baseline that will be used for assessing annual changes to the groundwater flow system during the remaining years of plant closure and post-closure monitoring.

3.1 Potentiometric Surface Maps

Potentiometric surface maps of the Site (Plates 2 and 3) and of the Industrial Area (Plates 4 and 5) were constructed from water level data collected during the second and fourth quarters (April and October data, respectively) of 1999 for the unconsolidated surficial deposits and selected weathered bedrock components comprising the UHSU. These maps provide information on groundwater flow direction and saturated extent that were used in the selection of well pairs for velocity calculations and definition of plume extent and movement. For map construction, it was assumed that well construction details, borehole logs, and water level measurements were accurate. When the measured depth to water was below the bottom of the well screen, the well was assumed to be dry.

Maps constructed for the UHSU were based entirely on data from fully penetrating wells screened in surficial deposits and weathered bedrock units (especially the No.1 Sand) thought to be representative of regional shallow groundwater flow conditions. For this reason, wells completed in perched alluvial groundwater zones, such as wells 50494, 50694, and 51594 located west of the IA, were not utilized for construction of potentiometric contours. Likewise, where well pairs show conflicting water level elevations, the well completion data was reviewed for screen interval and depth to bedrock. The water level data most representative of the UHSU was selected for construction of potentiometric contours. Information on unsaturated areas from previous UHSU potentiometric maps, particularly the 1993 maps (EG&G, 1994b), were used in the construction of the second and fourth quarter 1999 maps. Areas previously labeled as unsaturated were evaluated and reconfigured utilizing new monitoring well coverage (i.e., IA IM/IRA, D&D wells) and recent water level data. Information on seep areas was added from the

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1995 Hydrogeologic Characterization Report (EG&G, 1995b). Non-contoured areas of the maps indicate areas where well coverage is insufficient or absent. Conceptual potentiometric contour refinements were made in areas with new well coverage such as the north IA and in respect to building footing drain elevations.

The configuration of the Site potentiometric surfaces with 20-foot contours for the second and fourth quarters of 1999 (Plates 2 and 3) generally matches the configurations depicted for earlier quarterly maps. The configuration of the IA potentiometric surfaces with 5-foot contours for the second and fourth quarters of 1999 (Plates 4 and 5) were prepared to facilitate groundwater evaluations in respect to 1) increased well coverage and 2) effect of building footing drain elevations on the potentiometric surface.

Plant operations appear to have impacted groundwater flow patterns in areas where potentiometric contours appear to deviate from topographic or bedrock topographic configurations. For example, a prominent and persistent eastward distention of the 6,000 through 6,040-foot contour lines in the west and central IA deviates significantly from the pattern expected from surface and bedrock topography. The presence of this broad, mound-like feature within an industrialized portion of the Site suggests that a greater amount of recharge is occurring in this area compared to background areas with similar geologic conditions situated to the north and south. Likewise, the convergence and/or redirection of potentiometric contour lines in the immediate vicinity of Buildings 371/374, 771/774, 881/883, and 991 suggest that foundation drains have localized impacts on groundwater flow in the IA. Unsaturated areas shown on the 1999 maps were generally less extensive for the second quarter than drawn on the 1996 and 1998 maps (which were a reflection of the 1993 maps). This condition probably reflects the effects of improved sitewide well coverage and possibly precipitation events prior to water level measurement collection. However the fourth quarter potentiometric maps indicate a large unsaturated area south and east of the 371/374 complex and north of Buildings 771/774 (Plates 3 and 5).

3.2 Average Linear Flow Velocities

Average linear groundwater flow velocities (seepage velocities) were calculated for 24 UHSU well pairs within the Industrial Area and perimeter road based on flow direction considerations derived from the 1996 and 1999 potentiometric surface maps. The Darcy equation was used to calculate the seepage velocity (v):

$$v = \frac{K}{n}(dh / dl)$$

where:

K = hydraulic conductivity
n = effective porosity
dh/dl = hydraulic gradient

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Values for hydraulic gradient were calculated from quarterly water level measurements made between well pairs located along a groundwater pathway. These well pairs were chosen on the basis of their perpendicular orientation to potentiometric contour lines. The data are not complete based on the fact that both well pairs are not necessarily visited for a water level measurement each quarter. Hydraulic conductivity values used for velocity calculations were derived from the geometric mean values reported for the Rocky Flats Alluvium, colluvium, and Arapahoe Formation sandstone (No. 1 Sandstone) presented in Table G-2 of EG&G (1995b). For each well pair, the K value chosen for the calculation was based on the predominant lithologic unit comprising the flow path between the wells. In the absence of measured values of n, a conservative value of 0.1 is assumed based on its predominant usage in previous velocity calculations performed at RFETS.

Groundwater flow velocities can be used as estimates of the migration rates for conservative (i.e., non-reactive) groundwater chemical constituents. Because they do not consider the effects of dispersion and chemical reactions (e.g., volatilization, biodegradation, dissolution/precipitation, and adsorption) on the concentrations of constituents along a flow path, seepage velocities approximate only the unattenuated rate of migration for dissolved constituents in groundwater. Attenuated, volatile, biodegradable, or redox-sensitive species will likely exhibit migration rates slower than the average linear velocity of groundwater flow.

Large-scale changes in the hydraulic gradient distribution caused by reconfiguration of the groundwater recharge and discharge regime during plant closure have the potential to impact groundwater flow directions and velocities which, in turn, can affect plume concentration, configuration, and movement. Although actual linear flow velocities at any given well pair are not known with certainty, changes in relative flow velocities, combined with potentiometric mapping and hydrograph analysis, can provide some insight into plume dynamics and movement. Linear flow velocity calculations are sensitive only to the magnitude and direction of the hydraulic gradient, assuming that the assigned values of K and n are kept constant. Temporal analysis of relative linear flow velocities using 1996 as a baseline year is expected to compliment the other available assessment tools (potentiometric and water level change maps, hydrographs, plume extent maps, etc.) in monitoring contaminant plume migration toward surface water.

As shown in Table 3.1, the calculated 1999 groundwater flow velocities ranged from a minimum of 6.9 feet per year (ft/yr) between well pair P419689/P416889, located in the IA, to a maximum of 502.3 ft/yr between well pair 3687/63395, located in the East Trenches area. Linear flow velocities below 80 ft/yr tend to be associated with the Rocky Flats Alluvium while linear flow velocities above 80 ft/yr tend to be associated with colluvial (hillslope) material. The maximum value of 502.3 ft/yr, calculated for the fourth quarter of 1999 for well pair 3687/63395, is associated with the East Trenches area and groundwater velocity within weathered sandstone of the Arapahoe Formation. The next highest value of 185.9 ft/yr,

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calculated for the second quarter of 1999 for well pair 34791/6386, is associated with the 903 Pad area and groundwater velocity within colluvial (hillslope) material.

Linear flow velocity data from 1999 are more comprehensive than for 1996. Water level data for many well pairs were reported for only one quarter in 1996. The linear velocity table for 1999 (Table 3.1) presents the second and fourth quarter linear velocities. For well pairs that had more than one quarter of data, the velocities generally are consistent between second quarter to fourth quarter during 1999. Only four well pairs had velocities that changed between quarters by more than 9.0 ft/yr, with a maximum of 10 ft/yr in two of the four well pairs. This is a response to moderate change in hydraulic gradient from quarter to quarter, and may be a result of the amount and distribution of precipitation with respect to time.

Well pair 3687/63395 is a replacement pair for well pair 3687/60295 due to the destruction of well 60295 during construction of the East Trenches Groundwater Intercept System. Linear velocity values for well pairs 3687/60295 and 3687/63395 are exceptionally high (by a factor of 4) due to the weathered sandstone (K = 7.88E-04 cm/s) in the East Trenches area. Small changes in water levels between the well pairs combined with the hydraulic gradient, which is more a result of topography, result in the high velocities observed and for the high variations in velocities between quarters. Well pair 3687/60295 changed 47 ft/yr between the second and fourth quarters of 1998 and well pair 3687/63395 changed 41 ft/yr between the second and fourth quarters of 1999. Despite these seemingly large changes, they still represent less than a 10 percent change between quarters.

In general, velocities for the 24 well pairs vary by less than 10 percent when comparing the same quarters and same well pairs from 1996 to 1999. The following exceptions occurred. For well pair P115089/P119389 in the IA, the 1999 flow velocities are 30 percent lower than the 1996 and 1998 velocity data. For well pair P313489/6186 in the IA, the 1999 flow velocities are 30 and 25 percent lower than the 1996 velocity data. For well pair 05293/3386, in the Solar Ponds area, the 1999 flow velocities are approximately 48% higher than the 1996 data and based on the 1997 and 1998 flow velocities, the 1999 data for this well pair appears to be more representative. It is interesting to note that the major changes in flow velocities between 1996 and 1999 are in well pairs located in the IA. This might be expected in the IA versus the Buffer Zone because of all the artificial features associated with the IA (building drains, pavement, piping and utility corridors, etc.). Velocities reported for 1996 through 1999 are generally higher than velocities reported in pre-1996 annual RCRA groundwater monitoring reports largely because sitewide mean K values are now employed in the calculations instead of individual operable unit mean K values.

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Table 3-1 Linear Flow Velocities

WELL PAIR	AREA	1999 QTR	WL well 1	WL well 2	dh	dl	dh/dl (gradient)	K (cm/sec)	ne	v (cm/sec)	v (ft/yr)
P416289 / P416689	Industrial Area	2	6023.63	6006.28	17.35	593.6	0.0292	2.10E-04	0.1	6.14E-05	63.5
		4	6026.2	6008.31	17.89	593.6	0.0301	2.10E-04	0.1	6.33E-05	65.5
P419689 / P416889	Industrial Area	2	6003.55	6000.15	3.4	437.1	0.0078	2.10E-04	0.1	1.63E-05	16.9
		4	6004.3	6002.91	1.39	437.1	0.0032	2.10E-04	0.1	6.68E-06	6.9
P314289 / 10492	Industrial Area	2	5995.67	no data in 99	ND	ND	ND	9.33E-05	0.1	ND	ND
		4	5998.18	no data in 99	ND	ND	ND	9.33E-05	0.1	ND	ND
5387 / 00797	881 Hillside	2	5955.33	5918.76	36.57	209.9	0.1742	9.33E-05	0.1	1.63E-04	168.2
		4	5952.59	5917.97	34.62	209.9	0.1650	9.33E-05	0.1	1.54E-04	159.2
34791 / 6386	903 Pad	2	5948.49	5885.3	63.19	328.1	0.1926	9.33E-05	0.1	1.80E-04	185.9
		4	5948.11	5886.2	61.91	328.1	0.1887	9.33E-05	0.1	1.76E-04	182.2
07291 / 07391	903 Pad	2	5957.32	5939.37	17.95	210.0	0.0855	2.10E-04	0.1	1.80E-04	185.7
		4	5958.02	dry	ND	210.0	ND	2.10E-04	0.1	ND	ND
00491 / 23196	SE Buffer Zone	2	5888.79	5790.55	98.24	620.9	0.1582	9.33E-05	0.1	1.48E-04	152.7
		4	dry	5790.47	ND	620.9	ND	9.33E-05	0.1	ND	ND
04591/10194	903 Pad	2	5905.28	5901.68	3.6	299.2	0.0120	2.10E-04	0.1	2.53E-05	26.1
		4	5905.38	5901.76	3.62	299.2	0.0121	2.10E-04	0.1	2.54E-05	26.3
05291 / 05091	East Trenches	2	5906.19	5896.24	9.95	452.3	0.0220	2.10E-04	0.1	4.62E-05	47.8
		4	5906.48	5896.9	9.58	452.3	0.0212	2.10E-04	0.1	4.45E-05	46.0
05391/06091	East Trenches	2	5905.67	5894.53	11.14	711.4	0.0157	2.10E-04	0.1	3.29E-05	34.0
		4	5906.79	5895.12	11.67	711.4	0.0164	2.10E-04	0.1	3.44E-05	35.6
4286/20291	East Trenches	2	5929.69	5916.05	13.64	701.1	0.0195	2.10E-04	0.1	4.09E-05	42.3
		4	5935.39	5919.66	15.73	701.1	0.0224	2.10E-04	0.1	4.71E-05	48.7
3687/63395	East Trenches	2	5913.34	5891.86	21.48	380.0	0.0565	7.88E-04	0.1	4.45E-04	460.9
		4	5915.9	5892.49	23.41	380.0	0.0616	7.88E-04	0.1	4.85E-04	502.3
00191/13491	903 Pad	2	5948.93	dry	ND	548.7	ND	2.10E-04	0.1	ND	ND

Table 3-1 Continued

WELL PAIR	AREA	1999 QTR	WL well 1	WL well 2	dh	dl	dh/dl (gradient)	K (cm/sec)	ne	v (cm/sec)	v (ft/yr)
		4	5951.18	5941.1	10.08	548.7	0.0184	2.10E-04	0.1	3.86E-05	39.9
1987/3586	Mound	2	5956.42	5905.08	51.34	545.9	0.0940	9.33E-05	0.1	8.77E-05	90.8
		4	5958.55	5904.98	53.57	545.9	0.0981	9.33E-05	0.1	9.16E-05	94.7
05293 / 3386	Solar Ponds	2	5974.88	5943.7	31.18	569.2	0.0548	2.10E-04	0.1	1.15E-04	119.0
		4	5973.06	5943.72	29.34	569.2	0.0515	2.10E-04	0.1	1.08E-04	112.0
P218389 / B208089	Solar Ponds	2	dry	5922.8	ND	386.4	ND	9.33E-05	0.1	ND	ND
		4	5943.68	5923.71	19.97	386.4	0.0517	9.33E-05	0.1	4.82E-05	49.9
2286 / 45793	Solar Ponds	2	5970.26	5945.97	24.29	436.9	0.0556	2.10E-04	0.1	1.17E-04	120.8
		4	5972.43	5946.12	26.31	436.9	0.0602	2.10E-04	0.1	1.26E-04	130.8
1986 / 77492	Solar Ponds	2	5941.31	5930.24	11.07	411.5	0.0269	9.33E-05	0.1	2.51E-05	26.0
		4	5940.37	5930.97	9.4	411.5	0.0228	9.33E-05	0.1	2.13E-05	22.1
P114689 / 22896	Industrial Area	2	5994.05	5980.18	13.87	550.7	0.0252	2.10E-04	0.1	5.29E-05	54.7
		4	dry	5980.29	ND	550.7	ND	2.10E-04	0.1	ND	ND
P215789 / P218089	Industrial Area	2	5987.47	5981.21	6.26	754.9	0.0083	2.10E-04	0.1	1.74E-05	18.0
		4	5987.47	5981.64	5.83	754.9	0.0077	2.10E-04	0.1	1.62E-05	16.8
P313489 / 6186	Industrial Area	2	5998.08	5991.25	6.83	714.7	0.0096	2.10E-04	0.1	2.01E-05	20.8
		4	5998.52	5990.68	7.84	714.7	0.0110	2.10E-04	0.1	2.30E-05	23.8
4486 / P115689	Industrial Area	2	6014.99	5997.58	17.41	832.5	0.0209	2.10E-04	0.1	4.39E-05	45.4
		4	6014.64	5997.33	17.31	832.5	0.0208	2.10E-04	0.1	4.37E-05	45.2
P415989 / P115489	Industrial Area	2	6036.17	6017.19	18.98	1223.0	0.0155	2.10E-04	0.1	3.26E-05	33.7
		4	6039.27	6018.61	20.66	1223.0	0.0169	2.10E-04	0.1	3.55E-05	36.7
P115089 / P119389	Industrial Area	2	6023.2	6008.34	14.86	749.7	0.0198	2.10E-04	0.1	4.16E-05	43.1
		4	6025.42	6007.2	18.22	749.7	0.0243	2.10E-04	0.1	5.10E-05	52.8

3.3 Well Hydrographs and Water Level Change Maps

Hydrograph plots for many RFCA water quality wells have been constructed in order to observe changes in water table elevation with time (see Appendix B). In addition to illustrating seasonal fluctuations in water table elevation, hydrographs are useful for evaluating long-term trends that might result from either artificial activities (plant closure) or natural causes (climate change). For example, a comparison of IA well hydrograph data to background well hydrograph data may suggest whether any of the observed trends are naturally or artificially induced. Assuming that groundwater levels within the Site have reached a quasi-steady state condition since the cessation of production operations in 1989, it is conceivable that plant closure activities could disrupt this condition and cause local water levels to rise or fall, depending on the closure action. These changes in water level elevations will be evaluated in future years using annual and life-of-closure water level change maps that will be based on water levels collected during the 1996 baseline year.

Water levels measured during 1999 were, for the most part, observed to fluctuate within normal limits. Some wells, including recharge-sensitive wells such as 20691, 4286, 12191, B200889, and P416689 exhibited recharge peaks during the spring season that were less prominent than observed in 1998. In general, for all site wells, water levels were higher during the first half of 1999 compared to the second half. Overall, water levels were similar in 1999 to the levels observed in 1996. Water levels in 1996, which were higher than average, were thought to reflect the residual influence of the record high water levels experienced in 1995. Sitewide precipitation data from 1995 through 1999 indicates that precipitation was very high in 1995 (21.6 inches), 1996 produced near average precipitation (14.4 inches), 1997 produced below average precipitation (13.8 inches), 1998 produced near average precipitation (14.4 inches), and 1999 produced above average precipitation (17.8 inches). The mean annual precipitation for the Site is 14.5 inches (EG&G, 1995b) and the average annual precipitation for the Site, referenced above, were obtained from the Site meteorological station and reported in the RFETS DOE Radionuclide Air Emissions Annual Reports for calendar years 1995 through 1999. The continuing trend of average to slightly higher than average water levels may be based on recurrent higher than average precipitation (ample recharge) since 1995. The sitewide scale of this trend, also observed in background wells, implies that climate is the dominant cause of water level changes during 1999.

Water level change maps (Plates 9 and 10) were prepared utilizing the difference between the 1999 and 1996 potentiometric surface maps. These data are used to compare the 1999 potentiometric surface for the second (April data) and fourth (October data) quarters to the 1996 second and fourth quarter potentiometric surfaces, respectively. These water level change maps indicate areas of the site where changes in saturated thickness, either positive or negative, have taken place between the 1996 base level year and the current year (1999). It is important to keep in mind that wells that have been purged for sample collection, and have a slow recharge rate, can be responsible for a large discrepancy in water level change from 1996 to the year of the current RFCA Annual Report. For example, in the fourth quarter of 1999, well P114589 (west of Building 371) shows a positive change of 30+ feet, because the 1996 water level measurements were collected after a sampling event. In addition, this well was recently found to

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be damaged and will be removed from the monitoring program. Potentiometric data from well P114589 is not included on the water level change maps.

Second Quarter 1996 compared to Second Quarter 1999. The water level change map for comparing the second quarters of 1996 and 1999 (Plate 9) generally shows negative change, indicating lower water levels during 1999, within the IA (including the PA) and east of the IA, as compared to 1996. The West Spray Field shows a positive water level change that is probably a result of ample groundwater recharge from precipitation during 1999. In contrast, the background area north and west (upgradient) of the Present Landfill shows negative water level change. Localized areas of positive water level change are observed southwest of the Building 400 complex, south of Building 881, and in the vicinity of the three storage tanks (MSTs) north of the North Perimeter Road. Areas of negative water level change are observed in monitoring wells along Woman Creek and Walnut Creek.

Fourth Quarter 1996 compared to Fourth Quarter 1999. The water level change map comparing the fourth quarters of 1996 and 1999 (Plate 10) shows that, in general, there is a zero or negative change throughout the IA and generally lesser magnitude negative change for the IA than observed on the second quarter water level change map. The central portion of the PA, encompassing Buildings 707, 776/777, and the 771 complex shows little or no water level change comparing 1996 to 1999. The area north and west (upgradient) of the Present Landfill shows positive water level change. The Walnut Creek and Woman Creek drainages generally show subtle positive or negative water level change with localized areas of appreciable water level change. A consistent positive change is observed west, north, and northeast of the T130 trailer complex. This is probably because of greater than average 1999 precipitation providing ample recharge to groundwater.

The variations in water levels and linear flow velocities are probably in response to the timing of water level measurements with respect to natural recharge (precipitation), artificial recharge, or artificial dewatering events. Artificial events may involve recharge or dewatering related to construction, demolition, onsite industrial processes, water line leaks, monitoring well sampling, and building perimeter drain activity or inactivity. The 1996 data set (and to some extent the 1997 data set) will represent the baseline for future annual evaluations.

In summary, groundwater flow conditions for 1999 appear to generally resemble flow conditions described for recent years with slight variations depending on the location within RFETS. This situation is not unexpected because only relatively minor plant closure activities have been undertaken to date. Positive water level changes observed west of the IA may be the result of higher than average precipitation recharge to those areas during 1999. Localized areas of positive water level change in the vicinity of the IA may be a result of leaking water lines.

3.4 Real Time Groundwater Monitoring Network

As a requirement of the RFETS Integrated Monitoring Plan, a real time water level monitoring network was established for the UHSU during 1998, and expanded during 1999. The network currently consists of 33 monitoring wells outfitted with In-Situ Inc., Model SP4000, Troll® data logging systems. The 33 monitoring locations were

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chosen for the program based on location, historical groundwater occurrence at each location, stratigraphic completion interval, and well construction details. The network provides for simultaneous measurement of groundwater levels at all locations. The goals of the real time groundwater monitoring network are to provide ample, concurrent, water level measurements for environmentally or hydrogeologically sensitive areas of RFETS, such as beneath and downgradient of the IA, and along stream channels to the north, south, and east of the IA. These data, when used alone or in conjunction with similarly collected surface water data, will allow a greater understanding of the effects of precipitation and surface water infiltration events on the UHSU.

The Troll® is a compact downhole instrument that contains a data logger, temperature sensor, pressure transducer, and battery in a self-contained watertight unit. The transducer is vented at the surface so as to negate the effects of barometric pressure changes. The Troll® measures and records temperature and temperature-corrected water level and allows for unattended long-term monitoring. It is programmed and downloaded with a portable computer. In-Situ Inc.'s Win-Situ® software allows the user to communicate with the Trolls® in order to program a variety of short-term tests, a long-term monitoring scheme (such as is currently being implemented at RFETS), or to download data, with withdrawing the unit from the well.

Currently, each of the Trolls® is programmed to measure the water level every four hours; twelve A.M., four A.M., eight A.M., twelve P.M., four P.M., and eight P.M. As shown on Plate 12 and Figure 3-1, monitoring wells utilized for the real time groundwater-monitoring network are located to provide sitewide coverage with extra coverage in the IA, immediately east (downgradient) of the IA, and in the north Buffer Zone. In addition, locations were chosen to monitor water levels in colluvial, alluvial, and weathered bedrock (pediment surface) deposits within the UHSU. The arrangement of Trolls® throughout RFETS will allow observation, simultaneously across the site, of the impact of a precipitation infiltration event on the UHSU. The location of the Trolls® within the various sedimentary depositional environments and weathered bedrock which comprise the UHSU will allow for a better understanding of the relationship between groundwater and surface water at various locations around RFETS.

The monitoring wells currently included in the real time groundwater-monitoring network (Figure 3-1) are 0186, 1086, 3686, 3986, 4786, 5586, 6886, 0187, 1487, 1587, 4287, P114889, P115489, P119389, P209889, P213689, P414189, P415889, P416589, B200589, B200889, B210489, 1190, 03791, 05191, 20691, 20991, 37591, 77492, 05293, 10794, 11494, and 51494.

There are certain wells from which 1999 data are incomplete. During 1999 all real time groundwater-monitoring stations were brought into compliance for year 2000 computer issues. Monitoring wells 10794, 6886, and 51494 inadvertently had some early 1999 data deleted from them while uploading the Trolls® with new Y2K compliant In-Situ, Inc. firmware. Monitoring wells 20991 and 4786 had the Trolls® initially installed during 1998 under a water column of greater than 34.5 feet. This exceeded the 15 pounds per square inch (psi) rating of the transducer diaphragms. This was remedied by raising the Trolls® in the wells so that the water column exerted less than the 15 psi. These are the only two wells in the real time groundwater monitoring system that could be affected by this phenomenon. In addition, there were a few monitoring wells for which 1998 data or partial data was inadvertently

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lost in the field because of operator error while learning to operate or download the Trolls®. Because of these errors, there was no 1998 data for real time groundwater monitoring stations 4786, 51494, and 6886.

Data collected from the real time groundwater-monitoring network has been analyzed for the period of June 17, 1998, through December 31, 1999, for presentation in the 1999 Annual RFCA Groundwater Monitoring Report. More than a full yearly cycle of water level fluctuations is displayed, allowing for more complete analysis and discussion. The eight wells added to the program in 1999 (Figure 3-1) were outfitted with Trolls® during February and March of 1999. These Trolls® will have slightly less than a year of data recorded. Plate 12 presents the 33 monitoring locations with a hydrograph of the groundwater elevation data collected from each station. Superimposed on each hydrograph is precipitation data from the nearest RFETS surface water station. The hydrographs and precipitation data indicate that responses to precipitation events are varied across RFETS. The following are general observations from the first one and one-half year of real time groundwater monitoring data:

Wells in or immediately adjacent to creek beds generally exhibit an almost immediate response to precipitation events. This includes wells B210489, 3686, 6886, 4287, and 0186. Well 10794, downstream of the A-Ponds, appears to be the exception. This well appears to only show responses to discharges from Pond A-4.

Wells east and southeast of the IA (1487, 1587, 05191, 03791, 20691, 20991, and 3986) generally exhibit baseflow conditions with little or no response to individual precipitation events. These wells show a relatively smooth decline in water level during the last six months of 1998. Well 20691, located just southeast of the southeast corner of the PA, exhibits this general trend but does have precipitation events superimposed on the baseflow in a subtle manner. This well is screened in a buried paleochannel, which may account for its sensitivity.

Wells in the IA (including the PA), of which there are 12 with Trolls®, generally exhibit baseflow superimposed with a response time to precipitation events ranging from approximately a few days to two weeks. One exception to this is well P114889, located in an extensive asphalt parking lot just southeast of the southwest corner of the PA, which exhibits a general decline and subsequent increase in baseflow with no apparent relation to precipitation events. It is situated between two wells with Trolls®, P119389 and P115489, which exhibit a marked response to precipitation events. Another exception is well P209889, located on the vegetated hillside just north of the SEPs, which exhibits a very slight baseflow decline with only very minor precipitation response. This well also shows the effect of a sampling event in late November-early December 1999. Monitoring well 05293, located in the PA downgradient of Building 707, shows groundwater elevation fluctuations that are dissimilar to any other well in the IA. This may be because the well lies in the downgradient shadow of the Building 707 foundation drain. The hydrograph from well 05293 appears more like a hydrograph from a well adjacent to a creek bed.

Well 0187, located on the hillside just southwest of Building 881, shows the greatest and most immediate response . to a precipitation event of any well, other than those adjacent to creek beds

Well 1086, located immediately upgradient of the Present Landfill, exhibits an approximately one-week response time to precipitation events.

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The series of wells trending from the southwest to the northeast in the Buffer Zone north of the IA is expected to exhibit natural flow conditions along the high pediment surface without the anthropogenic effects of the IA. These wells include 11494, 4786, 1190, B200589, and B200889. Wells 51494 and 5586 are expected to exhibit the same sort of background baseflow against which wells within the IA can be compared. This should allow a better understanding of various facility specific effects on the individual well responses to recharge or dewatering events.

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4.0 PERFORMANCE MONITORING

Performance monitoring refers to monitoring the effect of a remediation system or source removal action, as required in the ALF. If an increasing trend in the concentration of a contaminant is noted, then the appropriate parties are notified and an evaluation of the situation is initiated.

Trend plots discussed in this Section are found in Appendix A.

4.1 Mound Plume/SW059

The Mound Site consists of a former waste burial area where 1,405 drums containing uranium and beryllium contaminated lathe coolant (a mixture of approximately 70% hydraulic oil and 30% carbon tetrachloride), tetrachloroethene (PCE), other VOCs, and low levels of plutonium were stored. The drums, initially stored on the ground, were buried with soil between April 1954 and September 1958. Ten percent of the drums were suspected to have leaked. In 1970, all of the drums were exhumed from the Mound Site along with some radiologically contaminated soil. The Mound Site area has been disturbed often, generally by construction projects, since the initial source removal. Additional radioactive soils were identified during these projects and removed at later dates. Recent investigations have detected VOCs, primarily PCE, in subsurface soils at concentrations above the subsurface soil action levels that require cleanup.

From the Mound Site, the ground surface slopes steeply downward to the north, towards the incised drainage of South Walnut Creek. The Mound Site groundwater plume is located north of Central Avenue and east of the PA fence. The plume, comprised primarily of VOC contamination, discharges as seeps and subsurface flow into the South Walnut Creek drainage in the vicinity of seep SW059. The VOC contamination is found along a line of monitoring wells downgradient (north) of the Mound Site and between the Mound Site and South Walnut Creek, indicating that the Mound Site is the primary source of the plume. Figure 4-1 presents the location of the Mound Site Plume area.

An accelerated soil removal action was completed during the spring of 1997 to remove VOC contaminated soils above the Tier I action levels from the Mound Site. Low temperature thermal desorption was used to remove VOCs and treated soils were returned to the excavation. As part of this project, a permanent culvert was installed in the previously unlined Central Avenue Ditch, located immediately upgradient of the source area, which contributed water to the Mound Site Plume.

A pre-remedial groundwater investigation was performed in March and April of 1997 to examine the nature and extent of the Mound Site Plume adjacent to South Walnut Creek. The results of the investigation indicate that the water level, and quantity of groundwater present, generally declines towards the east and west margins of the plume. The most commonly detected VOCs from the source area to the distal end of the plume are PCE and TCE. Other VOCs are present in the plume, mainly towards the distal end, as degradation products of PCE and TCE (DOE, 1997c). The goal of the investigation was to provide the necessary information to support the design of an

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interception/collection trench and the proper disposal of soil removed during construction of the interception/collection trench.

The Mound Site Plume project employs an innovative technology for the collection and treatment of groundwater contaminated with chlorinated organic compounds and low levels of radionuclides. Work performed during 1998 on this project consisted of the installation of the Mound Site Plume Treatment System (MSPTS) which was completed in September, 1998. The MSPTS is a passive subsurface groundwater treatment system consisting of treatment cells containing zero valent iron; an impermeable barrier membrane constructed of high density polyethylene (HDPE) to capture and redirect contaminated groundwater; an engineered permeable filter media backfill, consisting of sand and pea gravel, and containing a 4-inch perforated HDPE pipe routed to a central collection sump; and a barrier monitoring system (piezometers). Barrier monitoring system piezometers located within the collection trench were installed during 1998. Figure 4-2 presents a schematic of the MSPTS. Two MSPTS influent/effluent samples were collected in December 1998. The results are discussed below.

The system is designed to protect surface water by reducing mass loading consistent with RFCA action levels. The zero valent iron, contained in two buried treatment cells, is used to remediate VOC and radionuclide contaminated groundwater by breaking down the VOC and sorbing the radionuclides. After treatment, the water is discharged back to groundwater on the downgradient side of the treatment system through a French drain (RMRS, 1999e). During construction of the treatment system, a buried drainpipe was discovered that was probably contributing contaminated groundwater to the SW059 seep. The treatment system also collects this water.

Work completed during 1999 on this project consisted of sampling and analysis of influent, treatment system effluent, and barrier monitoring wells, in order to ascertain the effectiveness of the MSPTS. Seven performance monitoring piezometers were installed in January 1999 for monitoring water levels upgradient and downgradient of the MSPTS. Seven MSPTS influent/effluent samples were collected during 1999 (January 27th, February 23rd, May 25th, July 7th, August 4th, September 29th, and October 26th), in addition to the two collected in December 1998 (December 10th and 30th). The results of all nine sampling rounds indicate that all of the contaminants of concern, VOCs, total uranium, and americium, were reduced to below Tier II action levels as effluent from Reactor 1, the first treatment cell.

Currently the following five wells are being sampled as performance monitoring wells for the Mound Plume remediation system: 02291, 00897, 15599, 15699, and 15799 (Figure 4-1). The PCE concentration in well 02291 (Figure A-11) is currently above the historic mean after experiencing a non-detect during summer 1998. The concentration of PCE in well 02291 appears to be increasing slightly. The same scenario is true for TCE in well 02291 (Figure A-12) except that the concentrations of TCE are an order of magnitude lower than the concentrations of PCE. All results of PCE and TCE in well 02291 constitute Tier I exceedances. Concentrations of PCE in well 00897 (Figure A-7) and TCE in well 00897 (Figure A-8) exhibit slight decreases during 1999 after a relatively low result in the fall of 1998. As in well 02291, the concentrations of PCE in well 00897 are an order of magnitude

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greater than the concentrations of TCE. All results of PCE and TCE in well 00897 constitute Tier I exceedances. There are no trend plots yet for the wells installed during 1999.

The MSPTS is fully operational and is treating contaminated groundwater to well below the specified system performance requirements. Ongoing maintenance, including raking the iron media weekly to break up the oxidized crust and collecting flow rate and water level data, are required activities. Monthly sampling will continue in FY 2000 to verify the performance of the MSPTS.

4.2 Solar Evaporation Ponds Nitrate/Uranium Plume

The RFCA set a milestone of fiscal year 1999 for the implementation of a remedial action which would control contaminated groundwater emanating from the Solar Evaporation Ponds, and prevent it from causing North Walnut Creek to exceed in-stream standards. The Solar Ponds Plume (SPP) is an area of groundwater contamination which extends from the SEPs, located in the northeastern portion of the PA, to the northeast towards North Walnut Creek and to the southeast towards South Walnut Creek (Figure 4-3). The primary analytes of concern are nitrate/nitrite and various uranium isotopes; however, other inorganic and organic compounds have also been identified at concentrations above the Tier II action levels.

VOCs have been detected in monitoring wells located in the western portion of the SEPs and south of the SEPs. The VOCs are thought to have originated from sources farther to the west and southeast of the SEPs, and therefore are thought to be distinct from the SPP. Several metal analytes have also been detected in SPP monitoring wells at concentrations above groundwater action levels.

The Interceptor Trench System (ITS) was constructed in 1981, to dewater the hillside and prevent the SPP from advancing downgradient to North Walnut Creek. The ITS traverses the hillside to the north of the SEPs and collects surface water infiltration as well as most of the alluvial groundwater; however, the ITS does not collect all of the contaminated groundwater from the alluvium and weathered bedrock found below the alluvium. Groundwater flowing through weathered bedrock may continue on towards North Walnut Creek. Water collected by the ITS since 1993 has been stored in modular storage tanks prior to treatment at Building 374.

As an initial phase in determining the appropriate remedial action for the SPP, RMRS began a study in 1997 to evaluate alternatives for the management and treatment of the water collected by the ITS. The objective of the study was to determine a permanent remedy for the SPP. Final evaluation of the alternatives required a detailed characterization of the water quality in the alluvium and weathered bedrock in the vicinity and downgradient of the SEPs (McLane Environmental, 1998). The 1998 field activities associated with this study continued to collect the data necessary to complete a SEPs conceptual hydrogeologic model and groundwater flow model, as well as evaluate the remaining feasible remedial alternatives. Groundwater characterization work completed on this project in 1998 included collection and analysis of groundwater samples from approximately ninety wells in the SEPs area, including samples outside the SPP from the North and South Walnut Creek areas and upgradient (background)

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areas. The primary objective of the sampling was to determine the nature and extent of the SPP in the alluvium, weathered bedrock, and competent bedrock during low flow (late fall/early winter) and high flow (spring) seasons.

The secondary objective of this sampling effort was to evaluate the amount and distribution of uranium in the groundwater associated with the SPP, and estimate what portion of it is attributable to past RFETS activities. Initially, low flow samples (November 1997 through February 1998) from a combination of background, Walnut Creek drainage, and SPP wells were analyzed for uranium isotopes by alpha spectroscopy. Seven SPP wells were resampled during the high flow season (April 1998). In addition to analysis by alpha spectroscopy, four low flow samples and five high flow samples were subsequently sent to Las Alamos National Laboratory (LANL) for analysis of uranium isotopes by high resolution inductively coupled plasma/mass spectroscopy (ICP/MS). The results of these analyses were used to calculate uranium isotope ratios, which can be used to differentiate between naturally occurring and anthropogenic uranium. As a first step in analyzing the source of uranium in the SPP groundwater, the alpha spectroscopy data was converted from isotope activity to isotope mass and the U-235 to U-238 ratios calculated. In naturally occurring uranium the U-235 to U-238 mass ratio is 0.0072. The resulting ratios were very inconsistent, and because the alpha spectroscopy data were determined to have insufficient resolution for the calculation of uranium isotopic ratios, the samples described above were sent to LANL for analysis by ICP/MS. The results of the ICP/MS analyses indicate that the uranium occurring in all background samples is naturally occurring. In addition, it was determined that groundwater containing anthropogenic uranium has not yet reached groundwater adjacent to North Walnut Creek (RMRS, 1999f). For additional information regarding these analyses reference the *Solar Ponds Plume Decision Document* (RF/RMRS-98-286.UN) (RMRS, 1999f).

In addition to groundwater sampling, four new monitoring wells were installed during 1998 to provide additional groundwater data where needed. One well, 03498, was installed to the north of the SEPs and three wells (03198, 03298, and 03398) were installed to the southeast of the SEPs (Plate 1). Monitoring well 03198 was dry, but the other three wells contained sufficient water for sampling and analyses.

Based on the results of the 1997 through 1998 investigation, the *Solar Ponds Plume Decision Document* was prepared. The Decision Document outlines the remediation strategy, treatment goals, applicable regulatory requirements, and implementation schedule to accomplish a long-term and cost effective remedy for the groundwater collection, management, and treatment of the SPP. A reactive barrier, consisting of a funnel system which will direct SPP groundwater to a treatment cell containing zero-valence iron and a carbon source, was selected as the preferred remedial alternative. The other alternatives described in the Decision Document were found to be ineffective in treating the contaminants or did not achieve the long-term goals for the SPP and RFETS.

Installation of the 1,100 foot long collection system along with a passive treatment cell containing reactive iron and wood chips was completed in September 1999. This system intercepts the water collected by the pre-existing ITS. The Solar Ponds Plume Treatment System is different from the passive, flow through systems installed at the Mound Plume and East Trenches Plume. Water was planned and initially designed to be intercepted and flow by gravity to the treatment cell without retention in the collection trench. Logistical problems related to Preble's Jumping Mouse

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habitat caused the flow through treatment cell to be located immediately adjacent to the collection trench and not 400 feet downgradient as originally planned. As a result, the collection trench for the Solar Ponds Plume Treatment System must collect and store approximately 12 feet of groundwater to develop enough hydraulic head for groundwater to flow through the treatment cell. By the end of CY 1999 sufficient hydraulic head had not yet built up to create flow through the treatment cell. Groundwater levels within the collection trench were fluctuating instead of exhibiting a constant rise. As of the end of CY 1999, the treatment cell had treated no groundwater. The influent location is sampled monthly. The *Quarterly Report for the Rocky Flats Groundwater Plume Treatment Systems, October through December 1999* (RF/RMRS-99-478.UN) can be referenced for more details. Surface water data from GS13 and Pond A-3 indicate that surface water standards are being maintained in North Walnut Creek. During CY 2000, the system will be monitored and evaluated along with weekly monitoring of the piezometers in the collection trench. Additional surface water samples from GS13 and Pond A-3 will monitor potential impacts to North Walnut Creek.

There are four monitoring wells that are designated for performance monitoring of the SPP Treatment System. These wells are 1386, 1786, 70099, and 70299. Nickel in well 1386 (Figure A-41) has increased steadily since spring 1992 and, except for two sample dates, has been over the Tier II action level since spring 1993. This increase in nickel with time may result from leaching from the stainless steel well casing materials. Selenium in well 1786 (Figure A-42) has been consistent about the historic mean (with the exception of a spring 1990 result) since 1990. A recent increasing concentration trend is apparent since 1998. Nitrate in well 1786 (Figure A-43) has been consistent about the historic mean and within the historic standard deviations (M2SD's) since 1990. There are no trend plots yet for the wells installed in 1999. A complete set of analytical data for CY99 can be found in the RFCA Groundwater Quarterly Reports.

4.3 B-Ponds/East Trenches Plume

The East Trenches Plume is located north of Central Avenue and east of the East Perimeter Road. This groundwater plume contains VOC contamination believed to originate from the East Trenches and 903 Pad sites and extends to the north and northeast to where the plume discharges as seeps and subsurface flow into the South Walnut Creek drainage. Recent exceedances of the Tier II RFCA VOC groundwater action levels in a designated Tier II well (23296) near South Walnut Creek and recent detections of VOCs in the B-ponds indicate that contaminated groundwater is reaching surface water. Figure 4-4 presents the site location.

A large plume of contaminated groundwater is located in the East Trenches area (Plate 11). Most of the groundwater contamination is believed to be derived from the trenches on the north side of the East Access Road, including Trenches T-3 and T-4 (RMRS, 1996c). Upgradient monitoring wells indicate that a component of the contaminated groundwater in this area is derived from VOC contamination emanating from the 903 Pad. However, the VOC concentrations in groundwater increase by more than two orders of magnitude after the groundwater passes through Trenches T-3 and T-4, which reflects previous releases from the trenches.

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Trenches T-3 and T-4 were used between 1964 and 1967 for disposal of sanitary sewage sludge contaminated with low levels of uranium and plutonium, VOCs, crushed drums, and miscellaneous waste (DOE 1992b). In 1996 these trenches were excavated as part of an accelerated source removal action. Trench T-3, located approximately 300 feet north of the East Access Road and immediately west of Trench T-4, was approximately 134 feet long, 20 feet wide, and 10 feet deep. Trench T-4 was approximately 110 feet long, 15 feet wide, and 10 feet deep. The removed soil and debris were thermally treated to remove the VOCs, which consisted primarily of carbon tetrachloride, TCE, and PCE. The remediated soil, which was then below Tier II action levels, was returned to the trench excavation and the area was revegetated. The component of the East Trenches plume derived from the VOC contamination at the 903 Pad and Lip areas is associated with drums containing plutonium and uranium contaminated soils and solvents which were stored in the area from the summer of 1958 to January 1967 (RMRS, 1996d; 1997).

Pre-remedial investigations were conducted in the fall of 1997 and the spring of 1998 to determine the extent and configuration of the distal end of the East Trenches plume in the vicinity of South Walnut Creek and to collect sufficient data to design a remedial action for the plume. A total of 32 Geoprobe boreholes were advanced and 25 temporary monitoring wells installed. Wells that contained sufficient water were monitored for water table elevation and sampled for radioisotopes and VOCs. Soil samples were collected from several boreholes and analyzed for VOCs and other analytes.

Groundwater flow in the vicinity of the East Trenches plume is to the north and northeast and discharges primarily as seeps, springs, and baseflow to South Walnut Creek. This is particularly apparent where the water bearing strata are incised by the creek. There is a spring and seep complex on the south bank of South Walnut Creek, above Ponds B-1 and B-2, where the Arapahoe No.1 Sandstone subcrops. Concentrations of VOCs above Tier I action levels were detected at this location during 1998. The presence of VOCs in the seep complex indicates that contaminants have reached South Walnut Creek. The Arapahoe No. 1 Sandstone is present beneath the East Trenches source area and constitutes a preferential groundwater flow pathway towards South Walnut Creek. This unit is continuous in the subsurface from the East Trenches to the distal end of the East Trenches plume and much of the groundwater flow and contaminant flux is through this material. In addition, contaminated groundwater from the East Trenches plume flows into the Valley Fill Alluvium underlying South Walnut Creek. This deposit may also act as a preferential pathway for contaminated groundwater (RMRS, 1999g).

During 1999, installation of a downgradient capture system along South Walnut Creek to intercept contaminated groundwater was completed. The 1,200 foot long collection system, along with two reactive iron treatment cells, was completed in September 1999 and is similar to the collection and treatment system installed for the Mound Plume. A subsurface groundwater collection system coupled with a passive reactive metal treatment system is utilized to treat VOC contaminated groundwater from the East Trenches Plume and remove contaminates to below surface water action levels. The downgradient capture system was chosen as the best remediation method, following an evaluation including other more traditional options, because it effectively treats the existing VOCs to below action levels at lower life cycle cost than other treatment options.

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An impermeable barrier groundwater collection system was keyed into the underlying claystone or low permeability colluvium, depending on the elevation of the bedrock surface. The captured groundwater gravity flows out of the collection system into a series of cells containing reactive iron filings, which breaks down the VOCs. The treated water discharges to groundwater through an infiltration gallery, however, for added flexibility the system was designed to allow discharge directly to South Walnut Creek if necessary.

Two influent/effluent samples were collected and analyzed from the East Trenches plume treatment system during the fall of 1999. The first, a grab sample collected on September 7, 1999 before the system was completed verified that the water collected and treated by the system was meeting action level criteria. All VOC contaminants were reduced to levels below the RFCA action levels with the exception of methylene chloride, which was below detection limits in the influent, but above action levels in the effluent. Although the laboratory supplied no method blank data, the methylene chloride is considered to be a laboratory artifact. On October 24 through 28, 1999, the first post completion influent/effluent samples were collected. In addition, newly installed and existing performance monitoring wells were sampled. The primary contaminants of concern for this plume are carbon tetrachloride, TCE, and PCE. Effluent concentrations of these VOCs were all below detection limit concentrations. Methylene chloride was again detected in the effluent and the laboratory method blank. Wells 95199 and 23296 are downgradient of the treatment system in the vicinity of the distal end of the East Trenches plume. The concentrations of TCE in wells 95199 (38 μg/L) and 23296 (280 μg/L) and of cis-1,2-dichloroethene in well 23296 (170 μg/L) are expected to decrease over time because the upgradient portion of the plume, which constitutes the supply of these VOC's has been intercepted.

Seven monitoring wells are currently being sampled as performance monitoring wells for the East Trenches Plume Treatment System. These wells are 3687, 05691, 11891, 12691, 95099, 95199, and 95299. Four trend plots are included for VOCs in samples from well 3687; chloroform (Figure A-56), methylene chloride (Figure A-57), PCE (Figure A-58), and TCE (Figure A-59). The trend plots for chloroform, PCE, and TCE show that the concentrations of these analytes in well 3687 are generally decreasing with time since 1990. Each of the three analytes shows a concentration high during 1998 (4th Quarter for chloroform and TCE; 3rd Quarter for PCE). The methylene chloride trend plot exhibits either "U" or "B" qualified data since 2nd Quarter 1995. Three trend plots are included for VOCs in samples from well 05691; carbon tetrachloride (Figure A-23), PCE (Figure A-24), and TCE (Figure A-25). All three trend plots show a general decrease in concentration to below Tier II action levels from 2nd/3rd Quarter 1992 through 3rd Quarter 1995, and then a steady increase to the current levels. Three trend plots are presented for VOCs in samples from well 11891; carbon tetrachloride (Figure A-71), PCE (Figure A-72), and TCE (Figure A-73). All three trend plots show uniform distribution about the historic mean and within the M2SD's. All results for PCE and TCE are above Tier II but below Tier I action levels with the exception of a PCE result in fall 1998 which was above the Tier I action level. Results for carbon tetrachloride have generally decreased to below Tier I action levels since 3rd quarter1996 except for the current result, which is above the Tier I action level. Four trend plots are presented for VOCs for well 12691; carbon tetrachloride (Figure A-78), methylene chloride (Figure A-79), PCE (Figure A-80), and TCE (Figure A-81). The trend plots for carbon tetrachloride, PCE, and TCE show a gradual, steady decline

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from 1st Quarter 1992 to near their Tier II action level at the present. Each of the three analytes has what appears to be an anomalously high concentration 3rd Quarter 1992. Methylene chloride has only one data point since winter 1992 that is not either "U" or "B" qualified. There are no trend plots yet for the wells completed during 1999.

The East Trenches Plume Treatment System is fully operational and treating contaminated groundwater to below the specified system performance requirements. Monthly sampling during FY 2000 will continue to verify the performance of the treatment system. A complete set of analytical data for CY99 can be found in the RFCA Groundwater Quarterly Reports.

4.4 881 Hillside French Drain

The former operable Unit (OU) 1 is also referred to as the 881 Hillside Area. The former OU 1 is located in the southern portion of the IA on the hillside south of Building 881, just north of Woman Creek. Building 881 was used for enriched uranium operations and stainless steel manufacturing. The laboratories in Building 881 also performed analyses of the materials generated in production. Building 881, at an elevation of approximately 6000 feet, lies approximately 170 feet above Woman Creek. Woman Creek and the South Interceptor Ditch are the two surface drainages that occur in the former OU 1. The SID crosses OU 1 flowing west to east between the Southeast Perimeter Road and Woman Creek. Figure 4-5 shows the site area.

The former OU 1 included 11 IHSSs that historical information suggests could exhibit contamination of soil, groundwater, and/or surface water (DOE 1992b). The IAG, signed in January 1991, provided guidance and direction for investigating the OU 1 IHSSs. During 1992, as an Interim Measure/Interim Remedial Action (IM/IRA), a 1,435 foot long French Drain was constructed across a significant portion of OU 1 north of the SID to protect Woman Creek from the contaminated alluvial groundwater present in OU 1. The French Drain along with an upgradient extraction well (COLWEL) constitutes the 881 Hillside groundwater collection and treatment system. The system collects VOC contaminated groundwater from within a plume that is potentially moving from OU 1 south towards Woman Creek. Groundwater collected from the COLWEL was transported, through CY 1999, to the Combined Water Treatment Facility that is located in Building 891. In July 1996 the final RFCA, which replaced the IAG, was signed and pursuant to the Operable Unit Consolidation Plan, OU 1 is continuing through the Corrective Action Decision/Record of Decision (CAD/ROD) process with the EPA as the lead regulatory agency (DOE 1997d).

The CAD/ROD presented the selected remedy for addressing contamination in subsurface soil at IHSS 119.1, a former drum and scrap metal storage area (DOE, 1992b). Previous analysis of aerial photographs indicated that the drums and scrap metal were primarily stored north of the Southeast Perimeter Road within IHSS 119.1. The IHSS is located on a south facing hillside where locally saturated, unconsolidated surficial materials overlie weathered claystone bedrock. Groundwater occurrence in the IHSS 119.1 area is limited and primarily found in the unconsolidated surficial materials and in isolated northwest-southeast trending paleochannels incised into the bedrock. Recharge to the unconsolidated surficial material is minimal and occurs primarily through infiltration of precipitation during spring and summer. Discharge occurs largely through evapotranspiration and also through

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discharge at seeps, Woman Creek, the SID, and the 881 Hillside French Drain. Residual contamination from past releases has contaminated soils and groundwater in the southwest portion of the IHSS and contributed to the degradation of groundwater quality in the immediate vicinity of the IHSS.

The selected remedial action presented in the CAD/ROD included excavation and treatment of VOC-contaminated soil by low temperature thermal desorption, extraction of groundwater entering the excavation, and treatment of the groundwater at the Building 891 treatment system (DOE, 1997d). Excavated soils were to be treated onsite and returned to the excavation. The contaminants of concern identified in the CAD/ROD at IHSS 119.1 are carbon tetrachloride, 1,1-DCE, PCE, 1,1,1-TCA, TCE, and selenium.

Since the signing of the CAD/ROD, new sampling and analysis results support the need to significantly alter the originally selected remedy. The results of these samples showed that the actual soil concentrations of the contaminants of concern were well below the ALF Tier I subsurface soil action levels (DOE, 1996b). Thus, excavation and treatment of these soils was not warranted. Based on these new sampling data and utilizing applicable provisions in the RFCA, CERCLA, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), a modification to the CAD/ROD was prepared for OU 1. The CAD/ROD Modification, which is still in progress at the time of this report, addresses and documents changes to the previous CAD/ROD declaration and presents the information gained since the time that declaration was signed, along with the rationale leading to the modification.

Decommissioning of the 881 Hillside French Drain began on August 31, 2000 and is expected to be completed by September 30, 2000. The decommissioning will result in the elimination of groundwater being sent from the collection system for treatment in the Building 891 treatment facility, and will eliminate the Collection Gallery as an IMP sampling location.

Groundwater sample results for 1999 for the COLWEL and the COLGAL (Collection Gallery; the collection sump at the 881 Hillside French Drain downgradient of IHSS 119.1) indicate that there were no Tier I exceedances for any VOC contaminants. Plate 11, the VOCs and nitrate composite plume map, has been updated to portray this. COLGAL samples collected during 1999 showed no Tier II VOC exceedances. The last Tier II exceedance for VOCs in the COLGAL occurred during 1995 (TCE at 28 µg/L on 3/15/95). In addition, there were no Tier II VOC exceedances for any of the 881 Hillside French Drain performance monitoring wells. These wells are 10592, 10692, 10792, 10992, and 11092.

Carbon tetrachloride in COLWEL (Figure A-106) generally shows a decrease since 1998 with the exception of an elevated reading in the fall of 1999. Methylene chloride in COLWEL (Figure A-107) shows a general decline since winter 1997. All samples since winter 1998 have been either "U" or "B" qualified. PCE in COLWEL (Figure A-108) has generally shown a decrease since 1994 but lately an increase since fall 1998. Results since 1998 are above Tier II action levels but below the historic mean. Lead in COLGAL (Figure A-105) has historically been below the Tier II action level with the exception of a sample in fall 1995 and a recent sample in summer 1999. Selenium trend

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plots have been prepared for 881 Hillside French Drain monitoring wells 10592 (Figure A-66), 10792 (Figure A-67), and 10992 (Figure A-68). Selenium in well 10592 has historically been above the Tier II action level but is decreasing with time since a high in winter 1996. Selenium in well 10792 is decreasing since a high in spring 1998 and is currently at approximately the Tier II action level. Selenium in well 10992 currently shows an increase since a low in late summer 1998. All results for this well are approximately an order of magnitude above the Tier II action level. A complete set of analytical data for CY99 can be found in the RFCA Groundwater Quarterly Reports.

4.5 Trenches T3 and T4 Source Removal

The Trenches T3 and T4 (IHSS 110 and IHSS 111.1 respectively) Source Removal was the second accelerated source removal action to remediate contaminated soils that were contributing to the degradation of groundwater in the area (RMRS, 1996d). This section evaluates performance of the source removal action per RFCA (DOE, 1996) with regard to groundwater. The Trenches T3 and T4 Source Removal area is located north of the East Access Road and east of the East Perimeter road (Figure 4-6). Trenches T-3 and T-4 were used between 1964 and 1967 for disposal of sanitary sewage sludge contaminated with low levels of uranium and plutonium, VOCs, crushed drums, and miscellaneous waste (DOE 1992b). The Trench T-3 excavation was approximately 136 feet long, 18-24 feet wide, and 15 feet deep. The Trench T-4 excavation was approximately 148 feet long, 19-22 feet wide, and approximately 12 feet deep, except in one area where the excavation proceeded to a depth of 26 feet.

The accelerated source removal action consisted of the excavation and treatment of approximately 3,800 cubic yards of soil contaminated with VOCs, above the Tier I ALF for subsurface soil (RMRS, 1996d). The *Completion Report for the Source Removal at Trenches T-3 and T-4 (IHSSs 110 and 111.1),* (RMRS, 1996d) summarizes the source removal action. The removed soil and debris were treated using low temperature thermal desorption treatment technology to remove VOCs, which consisted primarily of carbon tetrachloride, PCE, TCE, and additional VOCs as summarized in the Completion Report (RMRS, 1996d). The excavation and treatment activities were completed in August 1996, and the treated soils were returned to the excavations in September 1996. The area was then revegetated (RMRS, 1996d).

Samples collected at the excavation boundary identified TCE contamination at 22 mg/Kg at a depth of 26 feet in one of the subdivided grids of Primary Grid 32 of the T-4 excavation (RMRS, 1996d), which exceeded the VOC cleanup target level of 9.27 mg/Kg stated in the Proposed Action Memorandum (PAM) (RMRS, 1996e). However, it was decided that because of the difficulty of excavation deeper into the bedrock sandstone (encountered at a depth of 22 feet) and because the limiting conditions established in the PAM had been met (excavation through the highly weathered bedrock) that excavation activities would cease (RMRS, 1996d).

Contaminant trend plots were prepared for upgradient well 12191 and downgradient wells 11891 and 3687 from detections observed in the wells for PCE , TCE, carbon tetrachloride, and methylene chloride. A contaminant trend plot was also prepared for chloroform results in well 3687.

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Concentrations of PCE in upgradient well 12191 decrease slightly from a mean of 268.5 ug/L before the removal action to a mean of 253.3 ug/L after the removal action (Figure A-76). Concentrations of PCE in downgradient well 11891 increase from a mean of 187.9 ug/L before the removal action to a mean of 241.7 ug/L after the removal action (Figure A-72). Concentrations of PCE in downgradient well 3687 decrease from a mean of 444.2 ug/L before the removal action to a mean of 382.8 ug/L after the removal action (Figure A-58).

Concentrations of TCE in upgradient well 12191 decrease slightly from a mean of 43.4 ug/L before the removal action to a mean of 32.8 ug/L after the removal action (Figure A-77). Concentrations of TCE in downgradient well 11891 decrease from a mean of 60 ug/L before the removal action to a mean of 48 ug/L after the removal action (Figure A-73. Concentrations of TCE in downgradient well 3687 decrease significantly from a mean of 37,892 ug/L before the removal action to a mean of 16,971.4 ug/L after the removal action (Figure A-59).

Concentrations of carbon tetrachloride in upgradient well 12191 decrease slightly from a mean of 216.7 ug/L before the removal action to a mean of 205 ug/L after the removal action (Figure A-74). Concentrations of carbon tetrachloride in downgradient well 11891 decrease slightly from a mean of 412.8 ug/L before the removal action to a mean of 406.6 ug/L after the removal action (Figure A-71). Concentrations of carbon tetrachloride in downgradient well 3687 decrease significantly from a mean of 603.9 ug/L before the removal action to a mean of 410 ug/L after the removal action (Figure A-131).

Detections of methylene chloride in wells 3687, 11891, and 12191 are associated with "B" or "J" laboratory qualifiers and indicate possible laboratory contamination. Chloroform detections in well 3687 are variable with the mean concentration before the removal action of 426.6 ug/L to a mean of 983 ug/L after the removal action (Figure A-56). However, the data from October 1998 appears questionable as the dilution result reported is 4,700 with a "J" qualifier and a detection limit of 2,500 ug/L, while the first run estimated result was 950 ug/L with a "J" qualifier and a detection limit of 1 ug/L. The first run estimated result of 950 ug/L appears to be more representative and would yield a mean of 358 ug/L after the removal action.

In summary, the mean concentrations of Trenches T3 and T4 contaminants of concern are generally observed to decrease in downgradient wells 11891 and 3687 after the accelerated source removal action. A significant decrease in the mean concentration of TCE is observed in well 3687. However, the mean concentration of PCE in well 11891 is observed to increase since the removal action. The mean concentrations of Trenches T3/ and 4 contaminants of concern are observed to decrease slightly in upgradient well 12191. Monitoring of performance wells near trenches T3 and T4 will continue until VOC concentrations decrease to below their Tier I action levels.

4.6 Ryan's Pit Source Removal

The Ryan's Pit (IHSS 109) Source Removal was the first accelerated source removal action to remediate contaminated soils which were contributing to the degradation of groundwater in the area. This section evaluates performance of the source removal action per RFCA (RFCA, 1996) with regard to groundwater. Ryan's Pit (also

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known as Trench T-2) is located directly south of the 903 Drum Storage Area at RFETS (Figure 4-7). Ryan's Pit was ranked fourth on IHSS Ranking and Prioritization List due to high chemical concentrations in soil, high mobility, and a high potential for further release (RMRS, 1997a).

Ryan's Pit was approximately 20 feet long, 10 feet wide, and 5 feet deep. The excavation was 32 feet long, 18 feet wide, and varied in depth from 5.5 to 8 feet (RMRS, 1997A). Ryan's Pit was used from approximately 1966 to 1970 for the disposal of liquid chemical wastes. The wastes were primarily solvents (PCE, TCE, 1,1,1-TCA), paint thinners (toluene, ethylbenzene, and xylene), diesel fuel, and other construction related chemicals. Radiation screening of the wastes was performed and, if identified as nonradioactive, the liquids were dumped in the trench.

The accelerated source removal action included the excavation and treatment of approximately 180 cubic yards of soil and debris contaminated with VOCs. The soil and debris was excavated in September 1995, treated in February 1996 using low temperature thermal desorption treatment technology to remove VOCs, and the project was completed in September 1996 with the replacement of treated soil. The primary contaminants of concern in subsurface soil from Ryan's Pit were PCE, TCE, and 1,1,1-TCA along with additional contaminants summarized in the Proposed Action Memorandum (PAM) (RMRS, 1995c). The *Closeout Report for the Remediation of Individual Hazardous Substance Site 109, Ryan's Pit* (RMRS, 1997A) summarizes the source removal action. Excavation boundary samples identified VOC contamination in the south wall that were below the Programmatic Preliminary Remediation Goals that were established as the remediation goals for the source removal at that time (RMRS, 1995 and 1997a) but are above the current Tier I subsurface soil action levels (Final RFCA Attachment 5, March 21, 2000 [RFCA, 1996]). These results are summarized in Table 4-1.

Table 4-1 Ryan's Pit Excavation Boundary Sample Results

Location	Analyte	Result (mg/Kg)
10-S WALL (WEST) South Wall (West Side)	TCE	19
	4-methyle 2-pentanone	19
	PCE	250
	Toluene	100
	Ethylbenzene	28
	Xylene (total)	140

Reference: RMRS, 1997a

Well 07391 is part of the IMP and the closest downgradient well to the source removal action. Contaminant trend plots were prepared from detections observed in the well for PCE (Figure A-36), TCE (Figure A-37), chloroform (Figure A-33), carbon tetrachloride (Figure A-32), and methylene chloride (Figure A-35). Carbon tetrachloride and methylene chloride are not discussed in this section as there were no detectable concentrations observed in subsurface soils from Ryan's Pit. However carbon tetrachloride and methylene chloride are contaminants observed originating from the 903 Pad Drum Storage Area (see Sections 9.1 and 7.2).

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The following observations are made in regard to Ryan's Pit contaminants of concern with respect to detectable contaminants in downgradient well 07391 subsequent to the accelerated removal action of September 1995. Concentrations of PCE (Figure A-36) and TCE (Figure A-37) increase in early 1996 and then stay the same or decrease through March of 1998. A sharp increase is observed with both compounds in August of 1998 and the concentrations for PCE remain above 2,000 ug/L through 1999 and the concentrations of TCE remain above 80,000 ug/L through 1999. The mean concentration of TCE increased from 78,142 ug/L before the removal action to 101,500 ug/L after the removal action. However, the mean concentration of PCE decreased from 956.1 ug/L before the removal action to 713 ug/L after the removal action.

Detectable concentrations of 1,1,1-trichloroethane (1,1,1-TCA) in well 07391 appear to fluctuate with a maximum of >1600 ug/L in September 1998. Concentrations of 1,1,1-TCA were above the Tier II ALF (200 ug/L) but well under the Tier I ALF (20,000 ug/L) for the period 1996 through 1999. (Figure A-29)

Chloroform concentrations in well 07391 increase in December 1995 at 4,800 ug/L and then level off between 1,400 and 1,800 from March 1996 through September 1997 and fluctuate between 1,100 up to 3,000 ug/L from August 1998 through August 1999 (Figure A-33). The mean concentration of chloroform increases from a mean of 1,600 ug/L before the removal action to a mean of 2,187 ug/L after the removal action.

In addition to the contaminants listed above elevated activities of U-235 (Figure A-39) and U-238 (Figure A-40) are observed in well 07391. U-238 activities increased from September 1997 through December 1999, with the December 1999 datum exceeding the Tier I ALF of 76.8 pCi/L. A similar increase is observed for U-235 beginning in August 1998 with activities exceeding the Tier II ALF of 1.01 pCi/L. Both isotopes fluctuate at or around their respective Tier II ALF activities before and after the accelerated source removal at Ryan's Pit. No detectable activities were observed in well 07391 for the isotopes uranium 233/234, plutonium 238/239, and americium 241.

In summary, concentrations of Ryan's Pit contaminants of concern are observed to increase in downgradient well 07391 after the accelerated source removal action. Monitoring of this well will continue until VOC concentrations decrease to below Tier I action levels.

4.7 Mound Site Source Removal

The Mound Site (IHSS 113) Source Removal was the third accelerated source removal action at RFETS to remediate contaminated soils that were contributing to the degradation of groundwater in the area (RMRS, 1997c). This section evaluates performance of the source removal action per RFCA (RFCA, 1996) with regard to groundwater. The Mound Site (IHSS 113) is located north of Central Avenue and east of the Protected Area fence (Figure 4-1). Approximately 1,405 intact drums were placed at the Mound Site between April 1954 and September 1958 and covered with soil; thus generating a "mound". The drums originated in Buildings 444, 883, 771, and 776, and contained uranium and beryllium contaminated hydraulic oil, carbon tetrachloride, TCE, and PCE. In 1970, the drums were removed from the Mound Site along with some radiologically contaminated soil. Approximately ten

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percent of the drums were thought to have leaked by the time of their removal in 1970. The Mound Site area has been disturbed often, generally by construction projects, since the initial source removal. Additional radioactive soils were identified and removed in 1975 (RMRS, 1997b).

The accelerated source removal action included the excavation and treatment of approximately 724.5 cubic yards of soil contaminated with VOCs, predominantly PCE and TCE, above the Tier I ALF for subsurface soil (RMRS, 1997c). The excavation was completed in April 1997, soils treated in August 1997 using low temperature thermal desorption treatment technology to remove VOCs, and the treated soils were returned to the excavation in September 1997. *The Closeout Report for the Source Removal at the Mound Site, IHSS 113* (RMRS, 1997c) summarizes the source removal action. Carbon tetrachloride and methylene chloride were also identified as contaminants of concern, however, carbon tetrachloride was never detected in Mound Site samples and detections of methylene chloride were determined to be a result of laboratory contamination (RMRS, 1997c).

Excavation boundary samples identified PCE contamination in two of the fourteen excavation bottom samples (12 and 86 mg/Kg) which exceed the VOC Cleanup Target Levels for Excavation stated in the PAM (RMRS, 1997c). However, because the majority of contaminated soil had been removed, and because of the difficulty of excavation deeper into the bedrock, and because the limiting conditions established in the PAM had been met (excavation through the highly weathered bedrock), it was decided that excavation activities would cease (RMRS, 1997b and 1997c).

Well 00897 was installed in 1997 to monitor groundwater immediately downgradient of the Mound Site. Contaminant trend plots are prepared for PCE (Figure A-7), TCE (Figure A-8), and methylene chloride (Figure A-130).

Concentrations of PCE appear to fluctuate with a mean concentration of 15,280 ug/L and range from a minimum of 7,400 ug/L in November 1998 up to 20,000 ug/L in June 1998; all 1999 data is "B" qualified (Figure A-7). Concentrations of TCE are initially high at 2,000 ug/L in March and June 1998 and then trend slightly downward to 1,600 ug/L in November 1999 with a minimum of 990 ug/L in November 1998 and a mean concentration of 1,658 ug/L for 1998-99 (Figure A-8). Methylene chloride was detected at 12,000 ug/L during one sampling event in June 1998 (Figure A-130).

In summary, concentrations of Mound Site contaminants of concern are observed to remain the same or decrease slightly in downgradient well 00897 after the accelerated source removal action. Monitoring will continue until VOC concentrations decrease to below Tier I action levels.

The following paragraphs describes future groundwater monitoring activities in support of the East Trenches Plume, Mound Site Plume, and Solar Ponds Plume treatment systems.

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Future groundwater monitoring in support of the East Trenches Plume and the Mound Site Plume treatment systems will be reduced in accordance with the Decision Documents pertinent to these systems (RMRS 1999g, RMRS, 1999f). Groundwater monitoring in support of the Solar Ponds Plume will not be changed.

Samples collected at the East Trenches Plume will include VOCs, metals (in particular Ca, Fe, K, Mg, Mn, and Na), and water quality parameters (including alkalinity, sulfate, and chloride). Samples collected at the Mound Site Plume will include VOCs, Pu/Am/U, metals (in particular Ca, Fe, K, Mg, Mn, and Na), and water quality parameters (including alkalinity, sulfate, and chloride). At both treatment systems, field parameter measurements will include pH, dissolved oxygen, conductivity, temperature, turbidity, and alkalinity. Sampling will be conducted semiannually at these systems. None of the samples will be field-filtered.

Water level measurement will continue in all treatment system piezometers and selected wells on a quarterly to semiannual basis, depending on whether the location is sampled. In addition, the water levels in one piezometer upgradient of the East Trenches Plume will be monitored quarterly for information on the potentiometric surface upgradient of this system.

The various locations and their monitoring requirements are listed in Table 4-2.

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Table 4-2 Groundwater Monitoring in support of East Trenches Plume, Mound Site Plume, and Solar Ponds Plume Treatment Systems

System	Location	Sampling suite	Sampling frequency	Water level frequency
ETP	23296*	VOCs, metals, water quality parameters	Semi-annual	Quarterly
	95099	VOCs, metals, water quality parameters	Semi-annual	Quarterly
	95199	VOCs, metals, water quality parameters	Semi-annual	Quarterly
	95299	VOCs, metals, water quality parameters	Semi-annual	Quarterly
	95699	N/A	N/A	Semi-annual
	95799	N/A	N/A	Semi-annual
	95899	N/A	N/A	Semi-annual
	60195	N/A	N/A	N/A
	60295	N/A	N/A	N/A
	60395	N/A	N/A	N/A
	63395	N/A	N/A	Quarterly
	ET-influent	VOCs, metals, water quality parameters	Semi-annual	N/A
	ET-effluent	VOCs, metals, water quality parameters	Semi-annual	N/A
MP	3586*	VOCs, Pu/Am/U, metals, water quality parameters	Semi-annual	Quarterly
	15199	N/A	N/A	Semi-annual
	15299	N/A	N/A	Semi-annual
	15399	N/A	N/A	Semi-annual
	15499	N/A	N/A	Semi-annual
	15599	VOCs, Pu/Am/U, metals, water quality parameters	Semi-annual	Quarterly
	15699	VOCs, Pu/Am/U, metals, water quality parameters	Semi-annual	Quarterly
	15799	VOCs, Pu/Am/U, metals, water quality parameters	Semi-annual	Quarterly
	16199	N/A	N/A	Semi-annual
	16299	N/A	N/A	Semi-annual
	16399	N/A	N/A	Semi-annual
	16499	N/A	N/A	Semi-annual
	16599	N/A	N/A	Semi-annual
	R1-0	VOCs, Pu/Am/U, metals, water quality parameters	Semi-annual	N/A
	R1-1	N/A	N/A	N/A
	R1-2	N/A	N/A	N/A
	R1-3	N/A	N/A	N/A
	R1-4	N/A	N/A	N/A
	R1-E	N/A	N/A	N/A
	R2-E	VOCs, Pu/Am/U, metals, water quality parameters	Semi-annual	N/A
SPP**	1386*	Nitrate/nitrite, U	Semi-annual	Monthly
	1786*	Nitrate/nitrite, U	Semi-annual	Monthly
	70099	Nitrate/nitrite, U	Semi-annual	Monthly
	70299	Nitrate/nitrite, U	Semi-annual	Monthly
	70799	N/A	N/A	Monthly
	70899	N/A	N/A	Monthly
	70999	N/A	N/A	Monthly
	71099	N/A	N/A	Monthly

*Well is also monitored in support of other Groundwater needs; only analytes collected in support of treatment system are listed. **Only support provided by the Groundwater Program is listed.

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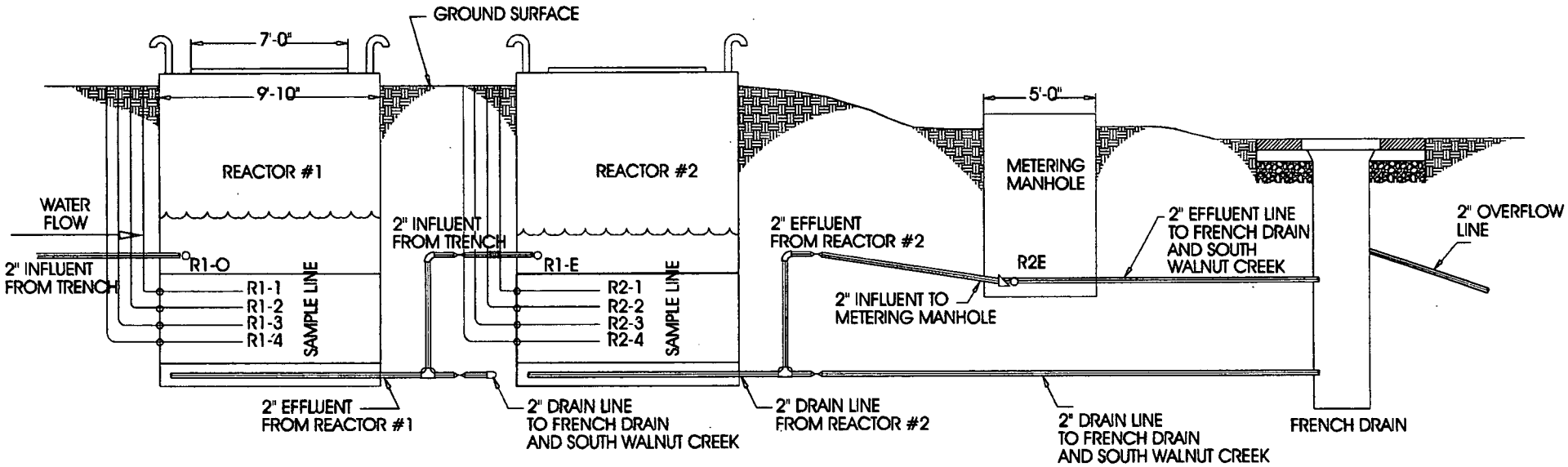

LEGEND

- REACTIVE IRON
- SAMPLE LOCATION
- WATER LINE
- SAMPLE LINE

NOT TO SCALE

Figure 4-2
Mound Plume Sample locations within the Treatment Cells

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projects/fy2k-rfca-rpt/figure/MOUND_PLUME_TRT_CELLS

contaminated relative to downgradient landfill groundwater (Figure 6-5) because of the PU&D Yard VOC plume. Data for mercury and tritium met the sample volume criteria, but non-detections exceeded 90 percent of the data sets, so it was necessary to exclude these compounds from statistical evaluation. Conclusions concerning these analytes are described following the discussion of statistical comparisons.

For analytes with greater than 10 percent quantifiable results, parametric ANOVA or nonparametric Wilcoxon Rank-Sum testing was performed, depending on the percentage of non-detections present in the sample groups and sample distribution characteristics. All UHSU results (alluvial and bedrock) were grouped by analyte into upgradient and downgradient data sets to simplify analyses and provide adequate data to perform statistical testing. This approach is justifiable because all downgradient wells are closely located in a well-defined, narrow drainage way that defines the sole groundwater flow path leading from the landfill. The Wilcoxon Rank-Sum test (also known as the Mann-Whitney U test) was selected to perform nonparametric comparisons in place of the Kruskall-Wallis test based on EPA guidance for statistical evaluations involving two data groups (EPA, 1992a). The reader is referred to the EPA guidance document for further description of the statistical methods and parameters used in this section.

Table 6-4 summarizes the results of statistical comparisons for the upgradient and downgradient data groups. Statistically significant differences (at the 1- percent significance level) in upgradient versus downgradient groundwater quality were found for fluoride, sulfate, TDS, cadmium, calcium, copper, lithium, magnesium, molybdenum, potassium, selenium, sodium, strontium, U-233/234, U-235, and U-238. These results are similar those reported in previous RCRA and Present Sanitary Landfill groundwater monitoring reports (see Section 6.2).

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Table 6-3 Groundwater Sample and Detection Summary for Present Sanitary Landfill Wells

Parameter	Number of Samples			Number of Detections			Percent Detections			Percent Non-Detects	Sample Mean	
	Upgradient	Down-Gradient	Total	Upgradient	Down-Gradient	Total	Upgradient	Down-Gradient	Total	Non-Detects	Upgradient	Down-Gradient
Water Quality (mg/L)												
Fluoride	16	5	21	14	5	19	87.5	100.0	90.5	9.5	0.31	1.88
Nitrate/Nitrite	16	8	24	16	8	24	100.0	100.0	100.0	0.0	3.3	18.3
Sulfate	16	5	21	16	5	21	100.0	100.0	100.0	0.0	23	338
Total Dissolved Solids	16	5	21	16	5	21	100.0	100.0	100.0	0.0	159	954
Metals (ug/L)												
Aluminum	16	7	23	15	7	22	93.8	100.0	95.7	4.3	20.9	23.4
Antimony	16	7	23	5	5	10	31.3	71.4	43.5	56.5	0.50	0.75
Arsenic	16	7	23	0	3	3	0.0	42.9	13.0	87.0	0.68	1.01
Barium	16	7	23	16	7	23	100.0	100.0	100.0	0.0	73.9	36.5
Beryllium	16	7	23	8	3	11	50.0	42.9	47.8	52.2	0.03	0.03
Cadmium	16	7	23	10	7	17	62.5	100.0	73.9	26.1	0.11	0.37
Calcium	16	7	23	16	7	23	100.0	100.0	100.0	0.0	22425	175886
Chromium	16	7	23	16	6	22	100.0	85.7	95.7	4.3	1.66	14.71
Cobalt	16	7	23	6	6	12	37.5	85.7	52.2	47.8	0.17	0.44
Copper	16	7	23	16	7	23	100.0	100.0	100.0	0.0	1.45	3.76
Iron	16	7	23	16	7	23	100.0	100.0	100.0	0.0	38.6	34.5
Lead	16	7	23	7	1	8	43.8	14.3	34.8	65.2	0.65	0.75
Lithium	16	7	23	16	7	23	100.0	100.0	100.0	0.0	7.9	503.3
Magnesium	16	7	23	16	7	23	100.0	100.0	100.0	0.0	5015	71214

Table 6-3, Continued

Parameter	Number of Samples			Number of Detections			Percent Detections			Percent Non-Detects	Sample Mean	
	Upgradient	Down-Gradient	Total	Upgradient	Down-Gradient	Total	Upgradient	Down-Gradient	Total	Non-Detects	Upgradient	Down-Gradient
1,1-Dichloroethane	16	8	24	1	0	1	6.3	0.0	4.2	95.8	N/D	N/D
1,1-Dichloroethene	16	8	24	6	0	6	37.5	0.0	25.0	75.0	N/D	N/D
1,1-Dichloropropene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,2,3-Trichlorobenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,2,3-Trichloropropane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,2,4-Trichlorobenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,2,4-Trimethylbenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,2-Dibromo-3-chloropropane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,2-Dibromoethane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,2-Dichlorobenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,2-Dichloroethane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,2-Dichloropropane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,3,5-Trimethylbenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,3-Dichlorobenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,3-Dichloropropane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,4-Dichlorobenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
2,2-Dichloropropane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
4-Isopropyltoluene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Benzene	16	8	24	0	1	1	0.0	12.5	4.2	95.8	N/D	N/D
Bromobenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Bromochloromethane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Bromodichloromethane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Bromoform	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Bromomethane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Carbon Tetrachloride	16	8	24	3	1	4	18.8	12.5	16.7	83.3	N/D	N/D
Chlorobenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Chloroethane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Chloroform	16	8	24	3	0	3	18.8	0.0	12.5	87.5	N/D	N/D
Chloromethane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D

Table 6-3, Continued

Parameter	Number of Samples			Number of Detections			Percent Detections			Percent Non-Detects	Sample Mean	
	Upgradient	Down-Gradient	Total	Upgradient	Down-Gradient	Total	Upgradient	Down-Gradient	Total	Non-Detects	Upgradient	Down-Gradient
Cis-1,2-Dichloroethene	16	8	24	3	0	3	18.8	0.0	12.5	87.5	N/D	N/D
Cis-1,3-Dichloropropene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Dibromochloromethane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Dibromomethane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Dichlorodifluoromethane	16	8	24	2	0	2	12.5	0.0	8.3	91.7	N/D	N/D
Ethylbenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Hexachlorobutadiene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Isopropylbenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Methylene Chloride	16	8	24	7	1	8	43.8	12.5	33.3	66.7	N/D	N/D
Naphthalene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
n-Butylbenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
n-Propylbenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
o-Chlorotoluene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
p-Chlorotoluene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Sec-Butylbenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Styrene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Tert-Butylbenzene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Tetrachloroethene	16	8	24	8	0	8	50.0	0.0	33.3	66.7	N/D	N/D
Toluene	16	8	24	1	0	1	6.3	0.0	4.2	95.8	N/D	N/D
Total Xylenes	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Trans-1,2-Dichloroethene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Trans-1,3-Dichloropropene	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
Trichloroethene	16	8	24	8	0	8	50.0	0.0	33.3	66.7	N/D	N/D
Trichlorofluoromethane	16	8	24	3	0	3	18.8	0.0	12.5	87.5	N/D	N/D
Vinyl Chloride	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D

[1]No correction made for non-detections
[2]N/D = Not determined for VOCs because most detections were estimated quantitations ("J" qualifier) below the detection limit

Table 6-4 Comparative Statistics for Groundwater Analytes with <90 Percent Sample Non-Detections and Downgradient Sample Means Greater than Upgradient Sample Means

Parameter	% Non-Detects	Shapiro-Wilk Normality Test				Levene Test				Parametric ANOVA (Single Factor)				Wilcoxon Rank-Sum Test			
		W_x	$W_{Ln\,x}$	$W_{n,0.05}$	Distribution Type	F_z	$F_{Ln\,z}$	$F_{.05}$	Variances Equal?	F_x	$F_{Ln\,x}$	$F_{.05}$	Significant	W	Z	$Z_{.01}$	Significant Difference?[1]
Water Quality																	
Fluoride	**9.5**	**0.684**	**0.838**	**0.908**	**Unknown**				**Unknown**					**80.0**	**3.269**	**2.326**	**Yes**
Nitrate/Nitrite	0	0.510	0.912	0.916	Unknown				Unknown					25.0	-2.424	2.326	No
Sulfate	**0**	**0.590**	**0.766**	**0.908**	**Unknown**				**Unknown**					**80.0**	**3.270**	**2.326**	**Yes**
TDS	**0**	**0.640**	**0.755**	**0.908**	**Unknown**				**Unknown**					**80.0**	**3.273**	**2.326**	**Yes**
Metals																	
Aluminum	4.3	0.783	0.922	0.914	LogNormal		0.727	4.325	Yes		0.973	4.325	No	N/A	N/A	N/A	N/A
Antimony	**56.5**	**N/A**	**N/A**	**N/A**	**Unknown**				**Unknown**					**103.0**	**3.142**	**2.326**	**Yes**
Arsenic	87.0	N/A	N/A	N/A	Unknown				Unknown					90.0	2.293	2.326	No
Cadmium	**26.1**	**N/A**	**N/A**	**N/A**	**Unknown**				**Unknown**					**108.0**	**3.453**	**2.326**	**Yes**
Calcium	**0**	**0.478**	**0.755**	**0.914**	**Unknown**				**Unknown**					**112.0**	**3.709**	**2.326**	**Yes**
Chromium	4.3	0.496	0.915	0.914	LogNormal		17.95	4.325	No		N/A	4.325	N/A	72.0	1.036	2.326	No
Cobalt	47.8	N/A	N/A	N/A	Unknown				Unknown					86.0	1.994	2.326	No
Copper	**0**	**0.869**	**0.888**	**0.914**	**Unknown**				**Unknown**					**100.5**	**2.942**	**2.326**	**Yes**
Lead	65.2	N/A	N/A	N/A	Unknown				Unknown					63.5	0.489	2.326	No
Lithium	**0**	**0.444**	**0.879**	**0.914**	**Unknown**				**Unknown**					**112.0**	**3.708**	**2.326**	**Yes**
Magnesium	**0**	**0.451**	**0.757**	**0.914**	**Unknown**				**Unknown**					**112.0**	**3.708**	**2.326**	**Yes**
Manganese	13.6	0.372	0.788	0.914	Unknown				Unknown					84.5	1.874	2.326	No
Molybdenum	**17.4**	**N/A**	**N/A**	**N/A**	**Unknown**				**Unknown**					**112.0**	**3.718**	**2.326**	**Yes**
Nickel	**0**	**0.7321**	**0.9716**	**0.914**	**LogNormal**		**0.185**	**4.325**	**Yes**		**17.092**	**4.325**	**Yes**	**N/A**	**N/A**	**N/A**	**N/A**
Potassium	**0**	**0.429**	**0.809**	**0.914**	**Unknown**				**Unknown**					**112.0**	**3.709**	**2.326**	**Yes**
Selenium	**30.4**	**N/A**	**N/A**	**N/A**	**Unknown**				**Unknown**					**104.0**	**3.180**	**2.326**	**Yes**
Sodium	**0**	**0.534**	**0.779**	**0.914**	**Unknown**				**Unknown**					**109.0**	**3.511**	**2.326**	**Yes**
Strontium	**0**	**0.453**	**0.781**	**0.914**	**Unknown**				**Unknown**					**112.0**	**3.710**	**2.326**	**Yes**
Thallium	82.6	N/A	N/A	N/A	Unknown				Unknown					71.0	0.993	2.326	No
Radionuclides																	
U-233/234	**47.8**	**N/A**	**N/A**	**N/A**	**Unknown**				**Unknown**					**112.0**	**3.708**	**2.326**	**Yes**
U-235	**65.2**	**N/A**	**N/A**	**N/A**	**Unknown**				**Unknown**					**112.0**	**3.710**	**2.326**	**Yes**
U-238	**47.8**	**N/A**	**N/A**	**N/A**	**Unknown**				**Unknown**					**112.0**	**3.710**	**2.326**	**Yes**

N/A = not applicable

[1] Significant difference in downgradient to upgradient sample groups shown in bold typeface

Mercury, the only trace metal reported with non-detections exceeding 90 percent of the sample set, was not detected in any sample. Similarly, tritium was absent in all samples at or above the CRDL. The elevated concentration of this analyte in well B206989, as also observed for nitrate/nitrite, lithium, and selenium in this well, may signify an association with a contaminant source other than the landfill. The elevated activity-concentrations of uranium isotopes in this well and possibly wells 4087 and 52894, compared to upgradient well activity-concentrations, could also result from some other source.

6.5.3 Trend Plots and Data Interpretation

Trend plots of analytes in downgradient wells that exceed upgradient concentrations are presented in Appendix C per the requirements of the IMP. Concentration trends for most analytes with three or more data points tend to be fluctuate somewhat, but are generally flat or declining, and therefore indicate that potentially contaminated landfill groundwater is not currently migrating eastward past the East Landfill Pond dam. Specifically, the fluoride, sulfate, TDS, cadmium, calcium, molybdenum, potassium, sodium, strontium, and U-235 concentrations in all downgradient wells (except fluoride, sulfate, and TDS in well B206989) do not appear to be increasing above historical levels. The data sets for fluoride, sulfate, and TDS in well B206989 consist of only two data points, which is insufficient for discerning trends and can not be interpreted without additional data. Copper, lithium, selenium, U-233/234, and U-238 concentrations in well B206989 show evidence of an increasing trend, making these analytes reportable occurrences under RFCA. The magnesium concentration in well B206989 also appears to be rising; however, this constituent is non-hazardous and lacks a RFCA action level criterion.

Assuming that seepage of contaminated groundwater past the dam is not appreciable enough to influence downgradient groundwater quality, the elevated concentrations of inorganic and radiological analytes in downgradient groundwater can be caused by several factors. Some potential causes include:

- lateral underflow of landfill leachate beneath the pond and dam through UHSU bedrock materials;
- evaporative concentration of solutes in pond water in combination with other factors, such as mineral build-up in soils resulting from seasonal desaturation of valley-fill alluvial materials;
- contribution of more highly mineralized groundwater from the underlying LHSU to UHSU bedrock;
- natural mineralization of groundwater resulting from prolonged contact with aquifer materials as it travels along a flow path, and
- a secondary contaminant source that is upgradient of the well, but is not associated with the landfill or pond.

Analysis of analyte trends showing concentration increases must account for these conditions in order to differentiate between natural and anthropogenic influences.

5.0 BUILDING D&D MONITORING

The DOE decontamination and decommissioning (D&D) process is the sequence of events that occurs in the disposition of surplus DOE facilities. D&D is primarily concerned with decontamination, dismantling, removal, or entombment of the surplus facilities. The primary tasks associated with D&D are:

- Surveillance and Maintenance
- Assessment and Characterization
- Environmental Review
- Close Out

Activities associated with these tasks involve the removal of fixed materials (including residual constituents of concern), equipment, piping, tanks, ducts, ceilings and other internal building structures, and the buildings themselves. In general, implementation of D&D will be performed in phases, allowing alternative interim use of most buildings before the final decommissioning of the buildings (DOE 1994b).

- Building specific D&D activities involve three major steps:
- Deactivation of Building Processes
- Demolition of Building Structures
- Remediation of Building Foundations and Surroundings

Based on the IMP, four groundwater sampling events are required to collect a data set to be used for determination of a unique baseline for each building which will undergo D&D groundwater monitoring. Monitoring will be accomplished by the installation of D&D monitoring wells immediately adjacent to the specific building. These wells, in conjunction with appropriately located existing wells, will provide the baseline data, and also be utilized for future D&D monitoring of the building specific impacts, if any, on downgradient groundwater quality. As long as time permits, baseline determination will be based on current and future data. If the D&D schedule for a given building becomes accelerated, existing monitoring wells in the vicinity of the building may be utilized, as the IM/IRA suggests, to sample for collection of baseline data utilizing the previous three years sampling data. Depending on the groundwater flow conditions existing at a specific building, it may be possible to create a baseline even though the building has previously been demolished. If linear flow velocities in the immediate vicinity of the building are relatively low, then contaminants potentially mobilized by D&D may take a year or two to reach the D&D monitoring wells.

The IM/IRA for the IA outlines groundwater monitoring activities established to ensure that building D&D activities do not inadvertently impact surface water by degrading groundwater beneath or in contact with the base of the demolished buildings. The required groundwater monitoring will provide the data necessary to determine if the

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precautions and actions taken during D&D have prevented or allowed migration of contaminants to groundwater. If existing information regarding a proposed D&D activity indicates the potential to contaminate groundwater, generally through a knowledge of historical building activity and use, then a pre-D&D groundwater baseline will be established for that building. Exceedances to the baseline are defined as detected concentrations greater than the mean + 2 standard deviations above the baseline (K-H 1998b).

This section is relatively new to the Annual RFCA Groundwater Monitoring Report. It will be expanded during each successive year to incorporate the D&D groundwater activities for that calendar year. The subsections are organized by the particular buildings addressed in a given D&D SAP. The subsections below discuss historical D&D activities through 1999 for Buildings 123, 444, 771, 886, and 779; and Buildings 707, 776/777, 371/374, 865, and 883. Buildings 707, 776/777, 371/374, 865 and 883 are discussed in the same subsection, because no D&D groundwater monitoring data has been collected for them through CY99.

5.1 Building 123

Building 123, used as a laboratory for bioassay, dosimetry, and water quality parameter analyses, was located on Central Avenue between Third and Fourth Streets at RFETS. The building underwent D&D activities, and was ultimately demolished in 1998. Subsequent to demolition, six monitoring wells (10098-10598) were installed with a Geoprobe rig immediately adjacent to the building foundation. Wells 10098 and 10198 are upgradient. The rest of the wells are downgradient, with well 10598 potentially being cross gradient. The purpose of these wells was twofold. First, to assess the potential impact of D&D activities on local groundwater quality and, second, to prepare an IHSS ranking for prioritizing the Building 123 site on the ER ranking list. This report is only concerned with the potential impact of Building 123 D&D activities on downgradient groundwater quality. Figure 5-1 presents the location of Building 123 and associated D&D monitoring wells.

As described above, four sampling events are required to collect a data set to be used for determination of a unique baseline for each building which will undergo D&D groundwater monitoring. Unfortunately, the schedule for Building 123 D&D became accelerated and it was not possible to collect the required amount of pre-demolition data to derive baseline values for the site. In addition, there were not an appropriate number or distribution of existing monitoring wells in the vicinity of Building 123 to sample for collection of baseline data utilizing the previous three years sampling data. Through 1999, three sampling rounds have been completed at the Building 123 D&D monitoring wells. One sampling round, post demolition, was accomplished at the Building 123 D&D monitoring wells during 1998. Two sampling rounds, one in the 1st Quarter and one in the 3rd Quarter, were accomplished during 1999.

Because a baseline cannot be established, water quality with respect to Building 123 must be evaluated in terms of an upgradient/downgradient comparison of water quality. Analytes are screened in terms of exceedances to Tier I and Tier II groundwater action levels, which is an effective method for determining contaminants of concern. The results of the three sampling rounds completed at Building 123 during 1998 and 1999 indicate that metals analyses

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exhibited no results above Tier II action levels. There were no Tier I exceedances for VOCs, nitrates, or radionuclide species. A few slight Tier II exceedances occurred for VOCs, nitrates, and radionuclides during 1998 and 1999. Downgradient monitoring well 10498 appears to be the most impacted to date. The Tier II exceedances are listed below.

VOCs:

- Monitoring well 10498; PCE results of 15 µg/L and 58.9 µg/L on 8/12/98 and 2/17/99, respectively

Nitrates:

- Monitoring well 10498; nitrates results of 27 mg/L and 17 mg/L on 8/12/98 and 2/17/99, respectively

Radionuclides:

- Monitoring well 10098; uranium 233/234 result of 1.13 pCi/L and uranium 238 result of 1.08 pCi/L on 8/10/98
- Monitoring well 10298; uranium 233/234 result of 1.08 pCi/L and uranium 238 result of 1.10 pCi/L on 8/11/98
- Monitoring well 10398; uranium 233/234 result of 1.264 pCi/L and uranium 238 result 1.007 pCi/L on 8/27/99
- Monitoring well 10498; uranium 233/234 results of 1.41 pCi/L and 2.02 pCi/L on 8/12/98 and 2/17/99 respectively, and uranium 238 results of 1.22 pCi/L and 1.51 pCi/L on 8/12/98 and 2/17/99, respectively

In conclusion, there are no Building 123 upgradient D&D well VOC or nitrate Tier II exceedances compared to slight PCE and nitrates exceedances in downgradient D&D well 10498. For uranium isotopes there were slight exceedances for U-233/234 and U-238 in upgradient well 10098 compared to slight U-233/23 and U-238 exceedances in three downgradient wells (10298, 10398, and 10498).

5.2 Building 444

The Sampling and Analysis Plan for the D&D monitoring of Building 444 was initiated during late 1998. The SAP was submitted Final to the Agencies in July 1999. The D&D monitoring wells associated with the building were installed before the end of 1999. Building 444 complex is currently scheduled for demolition in 2002. This will allow adequate time to construct a groundwater chemistry baseline for these facilities.

Building 444 is located on the south side of Cottonwood Avenue between fourth and Sixth Streets at RFETS. The Building 444 cluster was used for the manufacturing of depleted uranium and beryllium components, and did not handle plutonium or enriched uranium. Major processes conducted in the building included machining, welding, and cleaning. Building 444 also contained a foundry and a laboratory where parts could be etched, electroplated, and coated. Uranium and beryllium are the major constituents that were used in the building. In addition, solvents

from machining and cleaning, and other wastes associated with electroplating were generated. Figure 5-2 presents the location of Building 444 and the D&D groundwater monitoring wells associated with it.

Six new D&D monitoring wells were installed at Building 444 during the fall of 1999 (40099 – 40499, and 41299). Wells 40099 and 40199 are upgradient wells, and the rest, in addition to existing well P419689, are downgradient wells. Except for existing well P419689, Building 444 D&D monitoring wells had generally only been sampled once through CY 1999, although wells 40199 and 40299 were sampled in both 3rd Quarter and 4th Quarter, 1999. Existing well P419689 had no groundwater samples collected from it between 12/20/96 and 11/9/99 (a D&D groundwater sampling round); therefore, the previous three years of data are not available for baseline consideration.

Until a geochemical baseline is established for groundwater in the vicinity of Building 444, analytes are discussed in terms of exceedances to Tier I and Tier II groundwater action levels. The results of the D&D sampling completed through 1999 indicate that there are no Tier I exceedances for nitrates, metals, or VOCs from any Building 444 D&D well with the exception of a November 1999 sample from upgradient well 40099. This sample yielded a TCE concentration of 830 µg/L. A few Tier II exceedances occurred during 1999 for wells 40099, 40299, 40499, 41299 and existing well P419689 for VOCs. All five wells exhibited Tier II exceedances for PCE in addition to a 1,2-DCE exceedance in well 40099 and a TCE exceedance in well 41299. Well 41299 also exhibited Tier II exceedances for U-233,234 and U-238 that were below the Site M2DS's for those analytes (see Section 5.4). Monitoring wells 40199 and 40399 had no results over Tier II groundwater action levels.

5.3 Building 771

The Sampling and Analysis Plan for the D&D monitoring of Building 771 was initiated during late 1998. The SAP was submitted Final to the Agencies in July 1999. The D&D monitoring wells associated with the building were installed before the end of 1999. Building 771, including Buildings 771C and 774, is currently scheduled for demolition in 2003. This will allow adequate time to construct a groundwater chemistry baseline for Building 771.

Building 771 is located in the PA, at the northeast end of the diagonal road, immediately south of the PACS-3 entrance to the PA. Building 771 was the plutonium component production facility at Rocky Flats from 1953 through 1957. After 1957 the building was used for the chemical recovery of plutonium and americium from manufacturing residues and scrap metal. The building also contained a laundry. Building 774 is part of the Building 771 complex and is located approximately 200 east of Building 771. Building 771C connects the two buildings. Building 774 was used for the treatment of radioactive aqueous waste, waste oils, and non-radioactive photograph solutions. Buildings 771C and 774 are to be decommissioned along with Building 771. Plutonium, americium, and solvents are the major contaminants of concern. Figure 5-3 presents the location of Building 771, including Buildings 771C and 774, and the D&D groundwater monitoring wells associated with them.

Six new D&D monitoring wells (40599 through 40899, 41499, and 41599) were installed at the Building 771 area during the fall of 1999. Monitoring well 40899 and existing well 18199 are upgradient D&D wells. Wells 40599,

40699, 40799, 41499, and 41599 are downgradient D&D wells. Existing well 20998 is cross gradient to Building 771. Only existing wells 20998 and 18199 (associated with IHSS 118.1, the carbon tetrachloride site) had any sample results through CY 1999. The six new D&D monitoring wells for Building 771 failed to produce enough water for any samples to be collected from them during the fourth quarter of 1999.

Until a geochemical baseline is established for groundwater in the vicinity of Building 771, analytes will discussed in terms of exceedances to Tier I and Tier II groundwater action levels. Only one D&D sampling round (4th quarter 1999) was attempted at Building 771 through 1999. As stated above, neither existing well 20998 nor any of the new D&D wells produced enough water to collect any samples. A sample was collected from existing monitoring well 18199 during the first D&D sampling round for Building 771. This well yielded results that indicated a Tier I exceedance for carbon tetrachloride (associated with IHSS 118.1) and a Tier II exceedance for PCE. There were no metals or nitrates exceedances in samples collected from well 18199.

Previous results from well 20998 indicate Tier II carbon tetrachloride exceedances in September 1998 and April 1999 as well as a Tier II chloroform exceedance in September 1998. Only VOCs were analyzed for in these samples. Previous results from well 18199 (March and September 1999) indicate Tier I carbon tetrachloride exceedances and Tier II PCE exceedances from both samples. In addition, hexachloroethane was found above the Tier II action level in the March 1999 sample and vinyl chloride was found above the Tier II action level in the September 1999 sample. Metals and nitrates were not analyzed for in these samples. A complete data set for these wells can be found in the 1999 RFCA Quarterly Groundwater Reports.

5.4 Building 886

The Sampling and Analysis Plan for the D&D monitoring of Building 886 was initiated during late 1998. The SAP was submitted Final to the Agencies in July 1999. The D&D monitoring wells associated with the building were installed before the end of 1999. Building 886 is currently scheduled for demolition in 2003. This may allow adequate time to construct a groundwater chemistry baseline for this building.

Building 886 is located on the south side of Central Avenue at RFETS, approximately 300 feet southeast of the PACS-1 entrance to the PA. The building was first occupied in 1965 and housed the Critical Mass Laboratory that was used to conduct criticality experiments for nuclear safety research and development. Plutonium, uranium, and nitrates are the contaminants of concern at Building 886. Figure 5-4 presents the location of Building 886 and the D&D groundwater monitoring wells associated with it.

Three new D&D monitoring wells (40999, 41099, and 41199) were installed at Building 886 during the fall of 1999. Wells 40999 and existing well P317989 are upgradient D&D wells. Wells 41099, 41199, and existing well 22996 are downgradient D&D wells. New Building 886 D&D monitoring wells were sampled once during 1999 (4th Quarter). There was generally sufficient water at all wells to complete this D&D sampling round, with the exception of existing well P317989, from which only a partial suite could be collected. Existing well P317989 had

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no groundwater samples collected from it between 3/21/95 and 11/10/99 (a D&D groundwater sampling round); therefore, the previous three years of data are not available for D&D groundwater chemistry baseline consideration. Groundwater data have been collected from well 22996 for the 3rd and 4th quarters of 1996, the 1st quarter of 1998, and the 1st and 4th (D&D round) quarters of 1999.

Until a geochemical baseline is established for Building 886, analytes will be discussed in terms of exceedances to Tier I and Tier II groundwater action levels. The results of the D&D sampling round completed at Building 886 in the fall of 1999 indicate that there were no Tier I exceedances for any analytes. Tier II exceedances for the first D&D sampling round consisted of U-233,-234 and U-238 at all wells except P317989. The most impacted well, 41099, had U-233,-234 and U-238 results of 51.65 pCi/L and 33.72 pCi/L, respectively. These results are below the U-233,-234 and U-238 site background values (mean plus two standard deviations) of 60.7 pCi/L and 41.8 pCi/L, respectively. Well 41099 also had a Tier II exceedance for nitrates (47mg/L) and U-235 (2.32pCi/L). Existing well P317989 had a first D&D round Tier II exceedance for selenium (121mg/L). Historical results from existing well 22996 show consistent Tier II exceedances for U-233,-234 from 1996 through the first D&D (fall 1999) sampling round. None of these U-233,-234 results exceed Site background M2SD values.

5.5 Building 779

Building 779, placed into service in 1979, housed minor production and plutonium recovery operations, but was primarily a research and development facility. Some metal parts were assembled in this building and bulk plutonium residues were recovered in the hydride operations (DOE 1992a). The building was located in the PA approximately 200 feet south of the westernmost Solar Pond was demolished in 1999. Three D&D monitoring wells, 02297, 02397, and 02497 were installed with a Geoprobe rig in 1997. Well 02397 is for upgradient D&D monitoring; wells 02297 and 02497 are for downgradient D&D monitoring. Figure 5-5 presents the building location and the associated D&D monitoring wells. There would have been adequate time for collecting the appropriate amount of data and determining the D&D groundwater chemical baseline but the demolition schedule originally proposed for 2000 accelerated and occurred during 1999.

No sampling rounds were completed during 1997 at the Building 779 D&D monitoring wells because of lack of water. Sampling rounds were accomplished with varying success at the Building 779 D&D monitoring wells during 1998. Not all monitoring wells produced the same number of sampling rounds or amount of samples per round because the wells were either dry or did not produce enough groundwater for full sample suites. Monitoring well 02297 produced enough groundwater in 2nd Quarter 1998 for VOC analyses only. Monitoring well 02397 produced enough water in 1st Quarter 1998 for VOCs only, and in 4th Quarter 1998 for VOCs, metals and nitrates. Monitoring well 02497 produced enough water in 1st and 2nd Quarters 1998 for VOCs and nitrates only; in 4th Quarter 1998 for VOCs only. During 1999, no samples were collected from D&D well 02397 because of insufficient water. Monitoring well 02297 produced enough water in 2nd Quarter 1999 for the collection of VOCs, uranium isotopes, and nitrates. Monitoring well 02497 produced enough water during the 2nd Quarter sampling round for the

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collection of VOCs and uranium isotopes. Wells 02297 and 02497 did not produce enough water to collect any 4th quarter 1999 D&D samples.

The results of the 1998 samples indicated that there were no concentrations from any Building 779 D&D monitoring well above Tier I action levels. Wells 02297 and 02497 had no results above Tier II action levels. The only result during 1998 above Tier II action levels was at monitoring well 02397, in November, where nitrates analysis resulted in a concentration of 12 mg/L. Results of the May 1999 samples (wells 02297 and 02497 only) indicated that there were no exceedances of Tier I action levels. Each well exhibited a Tier II exceedance for U-233,-234 and U-238. All the uranium isotope results were below Site background M2SD values.

While the demolition of Building 779 was occurring, it was learned from building personnel that there was a small sub-basement area beneath the Building 779 basement. The sub-basement area contained four vaults, the bases of which are approximately 24 feet below the Building 779 ground floor. Upon inspection, it was noted that three of the vaults contained water; potentially groundwater which may have seeped into them and mobilized existing point source contamination. The CDPHE was notified and expressed their concern because the previously submitted Final Building 779 D&D Groundwater Monitoring SAP did not address the presence of these below basement structures. CDPHE requested that the vaults with water be sampled. The results of the December 1999 sampling effort indicate that water from all three vaults (Pit 1A, Pit 2A, Pit 2B) contain numerous metals (including beryllium) above Tier II but below Tier I groundwater action levels. The water in Pit 1A contained U-233,-234 and U-238 in concentrations which exceed the site background values for groundwater (60.7 pCi/L for U-233,-234 and 41.8 pCi/L for U-238). Plutonium and Americium are found above their Tier II groundwater action levels in Pits 2A and 2B. The levels found in Pit 1A (plutonium 74.9pCi/L and americium 31.3pCi/L) exceed their respective Tier I groundwater action levels. In addition, 1,1,2,2,-tetrachloroethane (PCA) was found in the Pit 1A sample at a concentration exceeding its Tier I groundwater action level. Pit 1A appeared to be the most impacted. The Building 779 sumps/vaults were pumped out after the first sampling round. A second sampling round to confirm the first was undertaken in May 2000. The results of the May 2000, confirmatory sampling round indicate that Pit 1A was the only Building 779 vault which had any results above Tier II action levels. The Tier II exceedances were for metals (cadmium, chromium, lead, and nickel) and radionuclides (americium, plutonium, uranium-238, and uranium-233/234. There were no uranium isotope results above the site background values listed above.

In addition to the Building 779 vaults, Building 783, containing three below grade vaults, and Building 782, which contains a sump, were sampled in May 2000. These below grade structures were not included in the initial, December 1999, sampling round. The results of the May 2000 sampling indicate that there is some contamination in these structures. The Building 783 vaults show some slight Tier II exceedances for americium, uranium isotopes U-233/234 and U-238, arsenic and manganese. The Building 782 sump showed Tier II exceedances for U-233/234, nitrate, and TCE.

The results of the two rounds of Building 779 vault sampling imply that the source of the contamination is material contained in the below grade vaults and not the groundwater which apparently seeps into the vaults. If the source of

the contamination was the infiltrating groundwater, then the results of the two rounds of sampling for the vaults would be similar, and wells adjacent to B770 would probably show similar contamination. PCA was detected in Pit 1A during the first round of sampling above its Tier I action level, but was not even detected above its Tier II action level in the second round. Vaults 2A and 2B showed no Tier II exceedances for any analytes for the second round after having many Tier II exceedances for metals and radionuclides during the first sampling round. The fact that the water in the vaults was pumped out between the first and second sampling events probably contributed to the vast difference in concentrations of radionuclides, PCA, and some metals.

One year of quarterly water level measurements will be collected from the vaults, including the vaults and sumps associated with Buildings 782 and 783. The vaults will be accessed through sampling hatches that were installed when the Building 779 foundation was sealed off to isolate the basement areas. At the request of CDPHE, a new D&D monitoring well (00100) will be constructed in CY 2000 northeast of Building 779 and completed to the appropriate depth to monitor groundwater downgradient of the sub-basement vaults.

5.6 Buildings 707, 776/777, 371/374, 865, and 883

A Sampling and Analysis Plan for the D&D monitoring of these buildings was prepared early in CY 2000 and submitted to the CDPHE and U.S. EPA in April 2000. Comments were received from the Agencies in early July 2000, and a meeting was held at RFETS on July 19, 2000, to resolve issues pertaining to the investigations at the individual building areas. The Final SAP for these buildings was submitted to the Agencies in August 2000. It is anticipated that well installation and groundwater sampling activities will take place during the summer and fall of 2000.

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6.0 PRESENT SANITARY LANDFILL

This section presents 1999 groundwater quality data for the Present Sanitary Landfill (previously known as Operable Unit 7). The Present Sanitary Landfill, located in the Buffer Zone north of the PA, occupies approximately 44 acres (encompassing both the landfill and East Landfill Pond) at the western end of the No Name Gulch drainage (Figure 6-1). It utilizes a surface and subsurface water intercept and diversion system to route surface run-on and upgradient groundwater around the facility, and a leachate collection and treatment system to improve the water quality of leachate exiting the toe of the landfill near the west end of the East Landfill Pond. The landfill served as a former solid waste disposal facility for RFETS and is one of three interim status units at RFETS that are regulated under RCRA. The landfill is currently scheduled for cover and final closure during year 2004.

Throughout 1999, groundwater monitoring was conducted in accordance with the requirements of the RFCA, as set forth in the IMP (K-H, 1999a). This plan, under an agreement with the U. S. EPA and the CDPHE, supersedes Title 6 of the Colorado Code of Regulations, *6 CCR 1007-2* and *6 CCR 1007-3,* as the governing authority for groundwater monitoring at RFETS.

Information presented in this section includes a review of historical activities at the Present Sanitary Landfill (Section 6.1); a summary of previous investigations (Section 6.2); the status of the current groundwater monitoring program (Section 6.3); the current understanding of the physical characteristics of groundwater flow at the site (Section 6.4); an assessment of groundwater quality (Section 6.5); an update on groundwater intercept system operation (Section 6.6); and general conclusions regarding groundwater quality and the groundwater monitoring program at the landfill (Section 6.7).

6.1 Operating History of the Present Sanitary Landfill

The Present Sanitary Landfill began operating on August 14, 1968, for the disposal of Rocky Flats sanitary waste. However, records indicated that, prior to 1986, some hazardous waste was disposed of at the landfill; therefore, in 1986, the landfill was classified as a RCRA-regulated unit. Disposal of hazardous constituents in the landfill was halted in November 1986. The landfill remained in operation, accepting only sanitary waste until March 1998. At that time, the landfill was placed in contingent operational status because it was nearing capacity, and was seeded to stabilize soils and control erosion. All RFETS sanitary waste is currently delivered to an offsite commercial Subtitle D sanitary waste landfill for disposal. The following paragraphs provide a brief historical summary of landfill operations.

In September 1973, tritium was detected in leachate draining from the landfill. In response to this detection, a sampling program was initiated to determine the location of the tritium source. In addition, radiation monitoring of waste prior to burial was initiated to prevent further disposal of radioactive material, and interim-response measures

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were undertaken to control the generation and migration of landfill leachate. Interim-response measures included the construction of two ponds (Ponds No. 1 and No. 2, also known as the West Landfill Pond and East Landfill Pond, respectively) immediately east of the landfill, and the installation of a subsurface leachate-collection system and subsurface intercept system for diverting groundwater around the landfill. Ditches were also constructed to control surface water.

The West Landfill Pond embankment was built approximately 500 ft east of the 1974 position of the advancing face of the landfill. The East Landfill Pond embankment was constructed approximately 1,000 ft east of the West Landfill Pond embankment. A cutoff wall, set in bedrock, was constructed in the East Landfill Pond embankment to reduce seepage through the embankment foundation. The embankments and ponds were built to collect and evaporate groundwater, surface water, and leachate collected by the subsurface drainage-control system. The West Landfill Pond was removed in 1981 (see discussion below). The existing (East Landfill) pond contains no outlet other than a spillway that is designed for use during extreme storm events. Groundwater exiting the landfill discharges to the East Landfill Pond where it either evaporates or is pumped to Pond A-3 via the Pond A-1 bypass for eventual discharge from the Site. Subsurface leakage of the East Landfill Pond may also occur; this would recharge the unconsolidated deposits below the pond dam and the underlying bedrock claystones. The amount of leakage is expected to be small considering the low hydraulic conductivity of the underlying bedrock materials.

An inner leachate-collection system and outer groundwater-intercept/diversion system were constructed around the north, west, and south perimeters of the landfill (Figure 6-1). The leachate collection system was designed to provide a perimeter drain for the prevention of leachate migration outside the landfill boundary and to reduce water levels within landfill refuse. The groundwater-intercept/diversion system was constructed along the outside edge of the leachate collection system to prevent groundwater from entering the landfill area. Groundwater diverted from the landfill by the intercept system is, as currently understood, directed eastward around waste materials and discharges either to the East Landfill Pond or No Name Gulch below (east of) the East Landfill Pond dam (at surface water monitoring locations SW099 and SW100).

Between 1977 and 1981, the leachate-collection trench was buried beneath waste during landfill expansion (DOE, 1996c). The west embankment and West Landfill Pond were removed in 1981, and two slurry walls were constructed, extending from the ends of the north and south groundwater-interceptor ditches. These slurry walls, ranging in depth from 10 ft to 25 ft, were reportedly seated in bedrock.

Sometime after the Present Sanitary Landfill went into operation in 1968, excess water from the landfill pond was sprayed onto a ridge south of the East Landfill Pond. The sprayed water collected on the roadway and flowed into North Walnut Creek. When this misdirected flow was discovered, the spraying activities were moved to an area north of the landfill pond adjacent to an irrigation ditch. Because the subsequent spray water then collected in local drainage channels and flowed around the landfill pond to the main drainage, the spraying activities were again moved. The final spray location was an area south of the western end of the landfill pond; excess spray water then flowed back into the East Landfill Pond.

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In 1995, a gravity flow treatment system was constructed to collect contaminated groundwater and leachate flowing from the eastern end of the Present Sanitary Landfill. The Passive Seep Interception and Treatment System (PSITS) became operational in early 1996 and was designed to treat landfill leachate to eliminate F039-listed wastes prior to discharge into the East Landfill Pond. The treatment system was originally composed of a settling basin, bag filters to remove suspended solids, and granular activated carbon to remove organic chemical constituents, but was modified in the fourth quarter of 1998 to allow passive aeration of leachate water. The treated effluent is sampled monthly for VOCs; semivolatile organics; metals; isotopic plutonium, uranium, and americium; gross alpha and beta; and tritium, with results published in the Quarterly Report for the Consolidated Water Treatment Facility and Operable Unit 7 (OU7) Passive Seep Interception System.

Groundwater monitoring was originally instituted in 1989 in accordance with *6 CCR 1007-2* and *6 CCR 1007-3, Subsection 265.90(d)*. This 1999 Annual RFCA Groundwater Monitoring report addresses monitoring requirements pertaining to RCRA units as specified in the IMP. Monitoring pertaining to RFETS RCRA units prior to 1996 are addressed in the Annual RCRA Groundwater Monitoring Reports (DOE, 1990, 1991a, 1992d, 1993c, 1994c, 1995, and 1996a). Subsequent groundwater monitoring activities conducted under the authority of RFCA during calendar years 1996 and 1997 are presented in annual Present Sanitary Landfill Groundwater Monitoring Reports (DOE, 1997b and 1998). The regulations require that the groundwater-monitoring program be capable of determining the impact of a facility on the water quality in the uppermost aquifer.

The Annual RCRA Reports for RFETS (referenced above) describe chemical and physical aspects of groundwater (for 1989 through 1995) at the Present Sanitary Landfill. The *Phase I RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan for Operable Unit 7: Present Sanitary Landfill* (DOE, 1991b) presents additional information regarding construction, operation, regulatory history, and site characterization. Work conducted for Phase I included cone-penetrometer testing, soil sampling, and the installation and sampling of additional groundwater monitoring wells outside of and within the landfill.

A closure plan for the Present Sanitary Landfill was developed in the IM/IRA decision document (DOE, 1996c), in accordance with the RFCA (RFCA, 1996) and applicable Colorado hazardous-waste regulations. Because of the Present Sanitary Landfill's position on the Environmental Restoration Ranking (26th of 357), action has been deferred until higher ranked areas are remediated. Post-closure groundwater monitoring of the Present Sanitary Landfill will be performed in accordance with the requirements of the IMP.

6.2 Summary of Previous Investigations

Annual RCRA Groundwater Monitoring Reports from 1989 through 1995 and Present Sanitary Landfill Groundwater Monitoring Reports from 1996 through 1998 describe groundwater elevations and flow rates as well as the results of the groundwater analyses. The sampling and analysis records were maintained in compliance with *6 CCR 1007-3* and *40 CFR 265.94(b)*. The *Phase I RFI/RI Work Plan for OU7 - Present Sanitary Landfill* (DOE,

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1991b) and the Operable Unit 7 Revised Draft IM/IRA Decision Document and Closure Plan (DOE, 1996c) present additional information.

The impact of the Present Sanitary Landfill on groundwater quality has been evaluated in previous Annual RCRA and Landfill Groundwater Monitoring Reports (DOE, 1990, 1991a, 1992d, 1993c, 1994c, 1995, 1996a, 1997e, 1998a). In 1992, groundwater from surficial deposits within and around the Present Sanitary Landfill had concentrations of major anions (bicarbonate, chloride, nitrate/nitrite, and sulfate), total dissolved solids (TDS), dissolved metals (calcium, chromium, lithium, magnesium, potassium, sodium, and strontium), and radionuclides that were elevated relative to mean background concentrations/activities. Some VOCs were also detected. The dissolved radionuclides present included americium-241, plutonium-239/240, uranium-233/234, uranium-238, and radium-226. Throughout 1992, concentrations of dissolved metals and radionuclides were only rarely greater than mean background concentrations.

During 1992, VOCs were detected sporadically and infrequently in wells screened in surficial materials of the UHSU. In UHSU bedrock, VOCs were detected in groundwater sampled from two wells. Methylene chloride, acetone, and toluene were detected once. The infrequent occurrence of VOCs in the UHSU bedrock indicated that the Present Sanitary Landfill had not adversely impacted groundwater in UHSU bedrock, even though some contamination of groundwater had occurred in UHSU surficial materials overlying the bedrock.

In 1993, the groundwater chemistry at the Present Sanitary Landfill was generally consistent with water-quality conditions of 1992 (DOE, 1994c). The 1993 statistical comparisons of upgradient versus downgradient UHSU groundwater at the Present Sanitary Landfill indicated statistically significant increases in downgradient concentrations of dissolved metals (calcium, lithium, magnesium, potassium, sodium, and strontium), and major anions (chloride and sulfate). None of the radionuclides or VOCs showed a statistically significant difference in upgradient versus downgradient activities or concentrations, respectively. Radionuclide activities and concentrations of VOCs, metals, and anions were notably highest within the landfill and in the area adjacent to IHSSs located southeast of the landfill, relative to other areas in the vicinity of the Present Sanitary Landfill. In groundwater from UHSU bedrock beneath and downgradient of the landfill, VOCs were detected infrequently, but radionuclides were present at activities higher than mean background.

Analysis of 1994 data by analysis of variance (ANOVA) indicated statistically significant differences in upgradient versus downgradient groundwater quality in the UHSU for radionuclides (uranium-233/234 and uranium-238), dissolved metals (calcium, lithium, magnesium, sodium, and strontium), anions (carbonate, chloride, fluoride, and sulfate), and TDS (DOE, 1995). In the UHSU bedrock, there were statistically significant differences in upgradient versus downgradient groundwater quality for dissolved metals (calcium, lithium, magnesium, sodium, and strontium), anions (bicarbonate, chloride, and sulfate), and TDS. All VOCs had less than 50-percent quantifiable results.

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For 1995 data, statistical comparisons of upgradient versus downgradient UHSU groundwater at the Present Sanitary Landfill indicated statistically significant increases in levels of dissolved barium, calcium, lithium, magnesium, silicon, sodium, strontium, uranium-233/234, and gross beta, as well as bicarbonate, chloride, sulfate, and TDS. Activities of total americium-241, plutonium-239/240, and tritium did not show statistically significant differences between upgradient and downgradient UHSU groundwater. VOCs were detected in fewer than 50 percent of the samples, so these analytes were not statistically evaluated.

Analyses of the 1996 data tend to confirm the results of previous sampling (DOE, 1997f). Approved well abandonments and deactivations combined with an inadequate volume of water for sampling of downgradient wells prevented statistical analysis for many analytes during these years. Detected analytes and concentration ranges during 1996 were generally consistent with corresponding data from prior years. Barium, calcium, chromium, lithium, magnesium, potassium, selenium, and sodium were detected in downgradient wells at levels below mean background concentrations. Nitrate and tritium were evaluated using ANOVA techniques and were determined to be statistically similar in upgradient versus downgradient samples. As in prior investigations, there was no indication of VOC contamination in downgradient wells.

For 1997, statistical analyses of groundwater data were again prevented by an insufficient number of analyses, as explained above for the 1996 data. Fluoride, sulfate, TDS, barium, copper, iron, lithium, manganese, selenium, strontium, nitrate, and zinc appeared to be elevated in one or more downgradient versus upgradient wells. Tritium and certain VOCs were detected in upgradient wells at concentrations that exceeded the downgradient well concentrations. The trends of potential contaminants detected in the downgradient wells did not, however, appear to be increasing with time, resulting in no reportable exceedances for 1997 (DOE, 1998b).

Results of hydrogeologic investigations of the Present Sanitary Landfill suggest that the groundwater-intercept system may not completely isolate the landfill from the surrounding groundwater. Hydraulic assessments for specific areas on the north, west, and south sides of the groundwater-intercept system indicate that groundwater may flow into the landfill on the north side where the leachate collection system may not have been completely keyed into bedrock (DOE, 1996c). In addition, previous reports indicate that the leachate collection trench was buried beneath waste during landfill expansion (DOE, 1996c). Therefore, the clay cutoff wall no longer extends to the surface of the landfill; this would allow groundwater to flow across the clay cutoff wall if the water table were to rise sufficiently. Landfill wastes do not extend to the surface-water interceptor ditch.

An evaluation of groundwater-elevation data for 1991 through 1995 and the hydrologic evaluation data for the OU7 IM/IRA indicate that previous conclusions made regarding the impact of the leachate/groundwater-intercept system are still valid. These conclusions are:

- The groundwater-intercept system diverts groundwater away from the landfill and is most effective in diverting flow on the west and south sides.

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- The clay barrier is an effective barrier to groundwater flow in the landfill along the west but it may not be completely keyed into bedrock on the northwest side. This may allow groundwater to enter the north side of the landfill.

6.3 Current Groundwater Monitoring Program

The Present Sanitary Landfill at RFETS currently operates under CDPHE and EPA guidelines for solid waste disposal sites and facilities. The current groundwater monitoring program was instituted in accordance with the RFCA, as further defined for RCRA units in the IMP. RCRA groundwater monitoring is conducted to detect potential releases of contamination beyond an established point of compliance based on comparisons of upgradient to downgradient groundwater quality. Under the IMP, if significant impacts to groundwater quality are detected in downgradient RCRA wells and contaminant concentrations are observed to increase with time, then the results are reported to EPA and CDPHE and an investigation into possible causes is initiated. Special attention is given to groundwater contaminants listed in the Action Levels and Standards Framework (ALF) for Surface Water, Ground Water, and Soils document, Attachment 5 (RFCA, 1996), which if exceeded, trigger an evaluation, remedial action, and/or management action. Non-ALF constituents, such as the major cation metals sodium, potassium, calcium, and magnesium, are not reportable under RFCA, and are, therefore, not emphasized in this report. Figure 6-1 illustrates the location of existing and abandoned monitoring wells in relationship to relevant surface and subsurface features at the Present Sanitary Landfill.

Recent changes to the site groundwater monitoring program are outlined in the IMP (K-H, 1999a). This plan specifies the monitoring and reporting requirements for the Present Sanitary Landfill, including well identification, sampling frequency, analytical requirements, and reporting.

For the CY99 reporting period, upgradient wells 5887, 70193, 70393, and 70493, and downgradient wells 4087, 52894, 52994, and B206989, were sampled on a quarterly basis (January-March, April-June, July-September, and October-December) to determine compliance with RFCA, as set forth in the IMP. Table 6-1 summarizes sampling activities and shows the hydrostratigraphic unit monitored and material screened for all wells sampled in and near the Present Sanitary Landfill in 1999. The limited number and position of these wells makes it infeasible to construct potentiometric surface maps and concentration isopleth maps, thus current and future reports will only assess impacts to or from the landfill at the upgradient and downgradient landfill boundaries.

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Table 6-1 Well Completion Information and Sampling Summary for Present Sanitary Landfill Wells

Well	Hydro-Stratigraphic Unit	Screened Material	Quarterly Sampling Summary Q1	Q2	Q3	Q4
Upgradient Wells						
5887	UPPER	ALLUVIUM	V,W,N,M,T,U	V,W,N,M,T,U	V,W,N,M,T,U	V,W,N,M,T,U
70193	UPPER	BEDROCK	V,W,N,M,T,U	V,W,N,M,T,U	V,W,N,M,T,U	V,W,N,M,T,U
70393	UPPER	ALLUVIUM	V,W,N,M,T,U	V,W,N,M,T,U	V,W,N,M,T,U	V,W,N,M,T,U
70493	UPPER	BEDROCK	V,W,N,M,T,U	V,W,N,M,T,U	V,W,N,M,T,U	V,W,N,M,T,U
Downgradient Wells						
4087	UPPER	ALLUVIUM	V,W,N,M,T,U	V,W,N,M,T,U	V,W,N,M,T,U	Dry
52894	UPPER	ALLUVIUM	Dry	V,W,N,M,T,U	V,W,N,M,T,U	Dry
52994	UPPER	BEDROCK	Dry	Dry	Dry	Dry
B206989	UPPER	BEDROCK	V,N	Dry	V,N,M,T,U	V,N,M.T,U

V = Volatile organic compounds
W = Water quality parameters
N = Nitrate/Nitrite
M = Metals
T = Tritium
U = Uranium isotopes

Groundwater elevations for active wells were measured quarterly as directed in the IMP. Quarterly groundwater samples were analyzed for radionuclides (tritium [liquid scintillation counting] and uranium isotopes [alpha spectroscopy]), VOCs (EPA 524.2), metals (CLP-SOW), and major anions (TDS [EPA 160.1], sulfate [SW846], fluoride [EPA 300.0], and nitrate/nitrite [EPA 353.1]), in accordance with Appendix E-2 of the IMP. The absence of complete analyte suites in most quarters for the downgradient wells listed in Table 6-1 is caused by sample volume limitations (also see dry and lacked water [LW] codes in Figure 6-2 through 6-5) imposed by slow recharge and/or thin saturation conditions. The alluvium and weathered bedrock at these localities are frequently dry or thinly saturated because the dam for the East Landfill Pond acts as a barrier to alluvial groundwater flow from the west. In addition, evapotranspiration through valley-bottom vegetation consumes much of the available shallow groundwater in the gulch during the summer months. For these reasons, it is normally not possible to collect complete sample sets for each quarterly sampling period during the year.

Some historical potential contaminants-of-concern (PCOC), such as semi-VOCs, were not included in the sampling program as a result of PCOC screening conducted during the IMP data quality objective process and acceptance of the plan by EPA and CDPHE. Table 6-2 lists the constituents monitored for in wells within and near the Present Sanitary Landfill. The records of analyses and evaluations are currently maintained in compliance with (*6 CCR 1007-2*).

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6.4 Physical Characteristics of the Groundwater System

6.4.1 Description of the "Uppermost Aquifer"

The "uppermost aquifer" is equivalent to the UHSU as described in recent RFETS reports (EG&G, 1995a, 1995b, and 1995c). In most of RFETS, including the area of the Present Sanitary Landfill, the UHSU is composed of unconsolidated surficial deposits and weathered bedrock. The unconsolidated deposits consist of Rocky Flats Alluvium, colluvium, and valley-fill alluvium. The Rocky Flats Alluvium and artificial fill (landfilled wastes and soil-cover materials) are present upgradient of and within the landfill; colluvium and valley-fill alluvium are present downgradient of the landfill. Weathered claystones and weathered sandstones (where present) that are in direct hydraulic communication with the overlying surficial deposits are also considered part of the "uppermost aquifer". The weathered claystones are generally more permeable than unweathered bedrock. Unweathered claystones are not considered as part of the uppermost aquifer, rather they are included as part of the LHSU. Bedrock wells were assigned to a hydrostratigraphic unit based on geochemical data from the well, hydraulic conductivity measurements (where available), and geological information from borehole logs.

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Table 6-2 Chemical Constituents Monitored at the Present Sanitary Landfill

Volatile Organic Compounds	Volatile Organic Compounds	Metals
1,1,1,2-Tetrachloroethane	cis-1,2-Dichloroethene	Cadmium
1,1,1-Trichloroethane	Cis-1,3-Dichloropropene	Calcium
1,1,2,2-Tetrachloroethane	Dibromochloromethane	Chromium
1,1,2-Trichloroethane	Dibromomethane	Cobalt
1,1-Dichloroethane	Dichlorodifluoromethane	Copper
1,1-Dichloroethene	Ethylbenzene	Iron
1,1-Dichloropropene	Hexachlorobutadiene	Lead
1,2,3-Trichlorobenzene	Isopropylbenzene	Lithium
1,2,3-Trichloropropane	Methylene Chloride	Magnesium
1,2,4-Trichlorobenzene	Naphthalene	Manganese
1,2,4-Trimethylbenzene	n-Butylbenzene	Mercury
1,2-Dibromo-3-chloropropane	n-Propylbenzene	Molybdenum
1,2-Dibromoethane	o-Chlorotoluene	Nickel
1,2-Dichlorobenzene	p-Chlorotoluene	Potassium
1,2-Dichloroethane	4-Isopropyltoluene	Selenium
1,2-Dichloropropane	sec-Butylbenzene	Silver
1,3,5-Trimethylbenzene	Styrene	Sodium
1,3-Dichlorobenzene	tert-Butylbenzene	Strontium
1,3-Dichloropropane	Tetrachloroethene	Thallium
1,4-Dichlorobenzene	Toluene	Tin
2,2-Dichloropropane	Total Xylenes	Vanadium
Benzene	Trans-1,2-Dichloroethene	Zinc
Bromobenzene	Trans-1,3-Dichloropropene	**Water Quality Parameters**
Bromochloromethane	Trichloroethene	Fluoride
Bromodichloromethane	Trichlorofluoromethane	Nitrate/Nitrite
Bromoform	Vinyl Chloride	Sulfate
Bromomethane	**Metals**	Total Dissolved Solids
Carbon Tetrachloride	Aluminum	**Radionuclides**
Chlorobenzene	Antimony	Tritium
Chloroethane	Arsenic	Uranium-233/234
Chloroform	Barium	Uranium-235
Chloromethane	Beryllium	Uranium-238

The Rocky Flats Alluvium is 25 to 30 feet thick on the northwest, west, and southwest sides of the landfill, and 10 to 15 feet thick on the divides north and south of the landfill pond. Colluvium is 1 to 5 feet thick on the slopes around the East Landfill Pond and below the dam. The valley-fill alluvium ranges in thickness from 3 to 8 feet in the landfill area and becomes thicker downstream to the east. The thickness of artificial fill increases from about 5 feet at the perimeter of the landfill to about 45 feet near the centerline of the valley (DOE, 1996c). Weathered bedrock thicknesses vary considerably in the vicinity of the landfill, ranging from approximately 4 to 35 feet, as indicated by weathered bedrock isopach mapping of the area (EG&G, 1995a).

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Average depth to groundwater ranges from 5 to 15 feet in surficial deposits (excluding artificial fill) (EG&G, 1995b). Within the landfill, groundwater is found at approximately 20 feet at the western end, 16 feet in the middle, and 33 feet at the eastern end (DOE, 1996c). The depth to groundwater in weathered bedrock is generally greater than in the overlying surficial deposits because of steep downward vertical gradients in bedrock materials. The saturated thickness of UHSU deposits varies widely across the landfill, with the thickest sections found in the Rocky Flats Alluvium at the western end, and thinnest sections found in colluvial and valley fill deposits east of the East Landfill Pond and in the Rocky Flats Alluvium along the south divide. EG&G (1995b) reported saturated thicknesses ranging from 0 to 20 feet for surficial deposits at the landfill.

Geometric mean hydraulic conductivities, calculated from field tests of the different geologic units, are given in Section 6.4.4.

6.4.2 Potentiometric Surface

Groundwater is present in surficial deposits and artificial fill, and in bedrock sandstones and claystones in the area of the Present Sanitary Landfill. Groundwater flow patterns in the UHSU tend to mimic the surface topography. Within landfill wastes, groundwater flows toward the center of the landfill, then flows eastward toward the East Landfill Pond. Outside the landfill, groundwater generally flows eastward within saturated UHSU surficial deposits, except near stream valleys, which disrupt UHSU flow patterns and function as drains for UHSU groundwater. For example, near the East Landfill Pond, groundwater flows from the north, west, and south toward the pond because of its topographically low position in the No Name Gulch drainage. Groundwater entering the pond mixes with surface water and is discharged by evaporation or is pumped to Pond A-3, to a limited extent, pond waters percolate downward into underlying bedrock materials or laterally through the dam. Any groundwater seepage past the dam into the lower drainage would flow eastward along the stream course until discharged via evapotranspiration, surface water, or as lateral subsurface flow at the Indiana Street east RFETS boundary.

Groundwater elevations in monitoring wells are measured at least quarterly. Water levels in the surficial deposits of the UHSU are characterized by seasonal variations of as much as 10 feet. The water-table elevation is generally lowest in late winter and early spring, prior to recharge by snowmelt, and highest during June and July. Groundwater elevations in the weathered bedrock of the UHSU typically show seasonal variations of as much as 15 feet.

6.4.3 Vertical Hydraulic Gradients

The vertical hydraulic gradient is the quotient of the differences in water levels measured concurrently in two adjacent wells with different screened intervals, and the vertical distance between the two measuring points, which are specified here as the midpoint of each screened interval. Vertical hydraulic gradient calculations provide a means to evaluate whether groundwater flow has a potential for movement either downward or upward through geologic media.

Most of the Present Sanitary Landfill well pairs have been abandoned or deactivated in recent years in preparation for landfill closure. Consequently, current water level data is unavailable for calculation of vertical gradients. The results of historical vertical hydraulic gradient calculations at 8 landfill monitoring well pairs (70093/70193, 70193/70293, 70493/70593, 70693/70893, 72393/72093, 1086/0986, 0786/0886, and B206989/B207089) monitored through 1995 (DOE, 1996a) provide information relevant to understanding groundwater conditions at the landfill. The calculated vertical hydraulic gradients for all well pairs, except 72393/72093, indicate a downward (recharging) component of flow, with values ranging from 0.022 to 1.099 ft/ft. The significance of downward gradients at well pairs 0786/0886 and B206989/B207089, located near the bottom of No Name Gulch, are, however, potentially invalid considering that the water levels in the bedrock wells at these locations recharge slowly and never fully recover between sampling episodes. At well pair 72393/72093, situated within the center of the landfill, groundwater had an upward (discharging) vertical gradient ranging from 0.020 to 0.026 ft/ft. Data from all well pairs indicate that vertical hydraulic gradients have generally remained constant over time. This condition may exist because disturbances to the landfill hydrologic system have been minimal in recent years. In addition, groundwater flow within the deeper portions of the UHSU and in LHSU bedrock is relatively insensitive to fluctuations in seasonal water levels and other short-term transient effects because of the prevalent low permeability character of bedrock materials.

6.4.4 Average Linear Groundwater-Flow Velocities

The average linear groundwater-flow velocity has historically been calculated for three flow-paths in UHSU surficial deposits and three flow-paths in UHSU bedrock in the vicinity of the Present Sanitary Landfill (DOE, 1996b). Most of the well pairs were deactivated in 1995 in preparation for landfill closure. However, the variables used in calculating flow velocities (hydraulic conductivity, porosity, and hydraulic gradient) have remained effectively constant over time. Hence, the following discussion summarized from the 1995 RCRA Groundwater Monitoring report is considered indicative of current conditions in the Present Sanitary Landfill.

Migration rates for conservative, dissolved constituents approximate the average linear groundwater-flow velocity; however, attenuated, volatile, biodegradable, or redox-sensitive species can exhibit migration rates much less than the average linear groundwater-flow velocity. The values of hydraulic conductivity used for surficial deposits and bedrock of the UHSU are the geometric means of hydraulic-conductivity values for each unit at the Present Sanitary Landfill, and include results of historic slug tests (DOE, 1994c). Values of hydraulic conductivity used for flow velocity calculations are 1.1×10^{-4} centimeters/second (cm/sec) for surficial deposits (including landfill wastes) and 5.3×10^{-7} cm/sec for UHSU bedrock materials. The assumed effective porosity for all units is 0.1 (DOE, 1991b).

Using these data, the calculated average linear groundwater-flow velocities in fill materials range from approximately 1 foot per year at the west end of the landfill to approximately 160 feet per year at the advancing eastern face of the landfill. Calculated average linear groundwater-flow velocities in UHSU bedrock at the Present Sanitary Landfill ranged from approximately 0.20 feet to 0.22 feet per year beneath the landfill, to approximately 0.07 feet to 0.41 feet per year downgradient of the landfill (DOE, 1996a). The calculated average linear

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groundwater-flow velocities for UHSU bedrock in 1995 were similar to those reported in the *1994 Annual RCRA Groundwater Monitoring Report* (DOE, 1995).

6.5 Groundwater Quality at the Present Sanitary Landfill

The assessment of groundwater chemistry at the Present Sanitary Landfill includes an evaluation of the spatial distribution of groundwater constituents in and around the landfill, and a statistical evaluation of the chemistry of downgradient groundwater with respect to upgradient groundwater, as specified in *6 CCR 1007-2* and the IMP. Statistical comparisons between downgradient and upgradient groundwater data were made using the methodology described in the *1995 Annual RCRA Groundwater Monitoring Report* (DOE, 1996a) and *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities* (EPA, 1992b).

Figures 6-2 through 6-5 depict the analytical results for each well in individual box-plots. To show as much data as possible without overcrowding, box-plots for metals include only those analytes for which the uncensored arithmetic mean of pooled downgradient well values were greater than the pooled upgradient well values. Box-plots for VOCs include all detected compounds for upgradient and downgradient wells. All data for radionuclides and water quality parameters are presented.

6.5.1 Spatial Distribution of Groundwater Constituents

6.5.1.1 Upgradient Wells

Currently, four wells (5887, 70193, 70393, and 70493) monitor groundwater chemistry in the UHSU immediately upgradient of the Present Sanitary Landfill. Wells 5887 and 70393 are completed in UHSU alluvial materials and wells 70193 and 70493 are completed in UHSU bedrock. All four wells yielded complete quarterly sample sets for a total of 16 upgradient samples per analyte.

As shown in Figure 6-2, concentrations of water quality parameters (fluoride, nitrate/nitrite, sulfate, and TDS) fall within the range of background concentrations reported for these analytes in the *1993 Background Geochemical Characterization Report* (EG&G, 1993a). A similar situation exists for all of the metal and radionuclide analytes detected in these wells (see Figures 6-3 and 6-4, respectively). Except for the major cations (calcium, magnesium, sodium, potassium, and strontium), the concentrations of most metal analytes were undetected or were reported below the CRDL ("B" qualified data). Aluminum was detected in wells 5887, 70393, and 70493 (71.2 μg/L maximum). Chromium (7.9 μg/L maximum), copper (4.6 μg/L maximum), and lead (2.4 μg/L) were detected in well 5887 (a stainless steel well). Selenium (5.5 μg/L maximum) was detected in well 70193. Well 70493 contained single detections of barium (101 μg/L), chromium (2.3 μg/L), selenium (5.8 μg/L), and silver (1.4 μg/L). Strontium in well 70493 ranged from 202 to 233 μg/L. Tritium was not detected in any of the upgradient samples. Uranium-233/234 was detected in two wells (5887 and 70493) and U-238 was detected in well 70493.

Alluvial well 70393 yielded consistent detections of ten chlorinated VOCs, including TCE (22 µg/L maximum), PCE (8 µg/L maximum), carbon tetrachloride (1 µg/L maximum), 1,1,1-TCA (25 µg/L maximum), 1,1-DCE (16.3 µg/L maximum), cis-1,2-DCE (0.4 µg/L maximum), chloroform (0.4 µg/L), and single detections of 1,1-DCA (0.1 µg/L), dichlorodifluoromethane (0.8 µg/L), and trichlorofluoromethane (0.2 µg/L). Weathered bedrock well 70493, paired with well 70393, contained generally lower concentrations and less consistent detections of the type of VOCs found in the overlying alluvium. VOCs found in this well included TCE (1 µg/L maximum), PCE (0.2 µg/L maximum), 1,1,1-TCA (0.9 µg/L maximum), 1,1-DCE (0.2 µg/L maximum), and single detections of toluene (0.1 µg/L) and trichlorofluoromethane (0.2 µg/L). Alluvial well 5887 contained 1,1,1-TCA (0.3 µg/L maximum), methylene chloride (3 µg/L maximum), and single detections of dichlorodifluoromethane (0.8 µg/L) and trichlorofluoromethane (0.3 µg/L). Weathered bedrock well 70193 contained 1,1,1-TCA (0.2 µg/L maximum), methylene chloride (0.71 µg/L maximum), and a single detection of PCE (0.2 µg/L). These results are generally consistent with the results of previous monitoring (DOE, 1998), which determined that the PU&D Yard was the source of this contamination. Results for all other VOC constituents monitored in upgradient wells were below detection.

6.5.1.2 Downgradient Wells

Four wells located east of the East Landfill Pond embankment are used to monitor the chemistry of downgradient groundwater in the UHSU (wells 4087, 52894, 52994, and B206989). Wells 52994 and B206989 monitor groundwater in the UHSU bedrock and wells 4087 and 52894 monitor the quality of alluvial groundwater. All of the well locations are consistent with *6 CCR 1007-2*, which allows alternate placement of monitoring wells downgradient of an interim-status facility where existing physical obstacles prevent installation of wells at the boundary.

In general, the sampling conditions experienced at downgradient well locations during 1999 were characteristic of previous years, with groundwater availability limited by seasonal availability. Complete sample suites could only be collected from alluvial wells 4087 (3 quarters collected) and 52894 (2 quarters collected). Only partial sample suites could be collected from well B206989 (3 quarters collected) because of low well yields, despite repeated visits to the well to obtain additional sample aliquots. Dry well conditions were prevalent at all wells during the remaining quarters, including all four quarters at bedrock well 52994. The statistical significance of these data relative to upgradient groundwater quality will be evaluated later in Section 6.5.2.

Downgradient groundwater quality monitored at wells 4087, 52894, and B206989 indicate that concentrations of all water quality parameters and selected hazardous trace metals exceed concentrations reported for upgradient wells 5887, 70193, 70393, and 70493 (Figure 6-2 and 6-3). All other ALF groundwater constituents in downgradient groundwater, including VOCs, were detected at or below upgradient concentration levels. The majority of antimony, arsenic, cadmium, cobalt, and molybdenum results were reported with a "B" qualifier, signifying that the concentration of these metals were low enough to occur below the CRDL but above the instrument detection limit

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(IDL). Apart from arsenic concentrations, these metals were also commonly reported at low concentrations in many upgradient well samples. Slightly elevated concentrations of chromium and nickel were reported in most downgradient samples, but seem to be mainly associated with wells 4087 and B206989. Well 4087 (and upgradient well 5887) is constructed with stainless steel well casing and screen, thus raising the possibility that trace quantities of some metals may have originated from well materials. Lead was reported below detection in all downgradient samples except one at well 52894 (1.8 µg/L, "B" qualified). Elevated concentrations of lithium (66.1 to 1,640 µg/L), manganese (0.87 to 75.5 µg/L), selenium (2.5 to 266 µg/L), and strontium (440 to 5,960 µg/L) were reported in downgradient samples, especially lithium and selenium at well B206989. Thallium was not detected in any downgradient sample, but is mentioned because the downgradient sample mean exceeds the upgradient sample mean (Table 6-3). Elevated concentrations of the non-hazardous metals sodium, potassium, calcium, and magnesium were also detected in downgradient wells, but have no ALF groundwater action levels and, consequently, are not shown in Figure 6-3.

The uranium isotopes U-233/234, U-235, and U-238 (Figure 6-4) also appear to have elevated activity-concentrations in downgradient wells compared to upgradient wells. Tritium was reported as being undetected in all upgradient and downgradient wells.

6.5.2 Statistical Evaluation of Groundwater Constituents

According to the IMP, the decision logic for RCRA designated wells requires the performance of a comparison of pooled upgradient groundwater sample means to individual downgradient well sample means in order to evaluate potential contaminant releases from the regulated unit into the "uppermost aquifer". This type of comparison is usually accomplished using statistical analysis procedures such as described in *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities* (EPA, 1992b). A pre-analysis assessment of the 1999 individual downgradient well data sets indicated that the number of sample analyses in all sets (maximum three samples) were insufficient for performing nonparametric analysis (minimum four samples) on an individual well basis. This situation is a result of the existence of dry conditions in all of the downgradient wells for at least one sampling quarter. To provide adequate data for nonparametric statistical analysis, which applies to the majority of analytes based on normality testing results of the data sets, it was necessary to pool the downgradient well data for comparison to the upgradient data. The rationale for this approach is further justified later in this section.

Table 6-3 presents a sampling and detection summary for each groundwater analyte monitored during 1999. Statistical comparisons were not performed for analytes with upgradient sample means that were equal to or greater than downgradient sample means; analytes with less than 10 percent quantifiable results; or for analytes with less than four quantifiable results, as recommended by EPA guidance (EPA, 1992b) for nonparametric analysis. A sufficient number of samples were collected from upgradient and downgradient well groups to perform pooled statistical comparisons for all analytes with more than 10 percent quantifiable results. Volatile organic compounds were excluded from statistical analysis because it has been shown that upgradient landfill groundwater is

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Table 6-3, Continued

Parameter	Number of Samples			Number of Detections			Percent Detections			Percent Non-Detects	Sample Mean	
	Upgradient	Down-Gradient	Total	Upgradient	Down-Gradient	Total	Upgradient	Down-Gradient	Total	Non-Detects	Upgradient	Down-Gradient
Manganese	16	7	23	16	7	23	100.0	100.0	100.0	0.0	1.5	22.5
Mercury	16	7	23	0	0	0	0.0	0.0	0.0	100.0	0.1	0.1
Molybdenum	16	7	23	12	7	19	75.0	100.0	82.6	17.4	0.87	6.20
Nickel	16	7	23	16	7	23	100.0	100.0	100.0	0.0	1.6	6.2
Potassium	16	7	23	16	7	23	100.0	100.0	100.0	0.0	966	6574
Selenium	16	7	23	9	7	16	56.3	100.0	69.6	30.4	2.3	81.5
Silver	16	7	23	3	0	3	18.8	0.0	13.0	87.0	0.30	0.27
Sodium	16	7	23	16	7	23	100.0	100.0	100.0	0.0	11754	321843
Strontium	16	7	23	16	7	23	100.0	100.0	100.0	0.0	147	2086
Thallium	16	7	23	4	0	4	25.0	0.0	17.4	82.6	0.87	1.10
Tin	16	7	23	6	0	6	37.5	0.0	26.1	73.9	1.14	0.61
Vanadium	16	7	23	12	5	17	75.0	71.4	73.9	26.1	5.03	0.43
Zinc	16	7	23	16	6	22	100.0	85.7	95.7	4.3	8.4	6.4
Radionuclides (pCi/L)												
Tritium	16	7	23	0	0	0	0.0	0.0	0.0	100.0	-104.896	-129.691
U-233/234	16	7	23	5	7	12	31.3	100.0	52.2	47.8	0.277	25.803
U-235	16	7	23	1	7	8	6.3	100.0	34.8	65.2	0.0124	1.0480
U-238	16	7	23	5	7	12	31.3	100.0	52.2	47.8	0.1532	18.7426
Volatile Organic Compounds (ug/L)												
1,1,1,2-Tetrachloroethane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,1,1-Trichloroethane	16	8	24	12	0	12	75.0	0.0	50.0	50.0	N/D	N/D
1,1,2,2-Tetrachloroethane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D
1,1,2-Trichloroethane	16	8	24	0	0	0	0.0	0.0	0.0	100.0	N/D	N/D

In general, natural processes involving evapotranspiration, upwelling of LHSU groundwater, and mineralization along the flow path do not appear to provide satisfactory explanations for the geochemistry at well B206989, mainly because the elevated nitrate/nitrite, lithium, and selenium concentrations lie well above their normal background ranges. They also do not appear to be landfill related, as the concentrations of these analytes in landfill leachate and pond water have historically been relatively low. For example, the mean concentrations of nitrate/nitrite (0.3 mg/L), lithium (40 µg/L), and selenium (2 µg/L) at surface water monitoring station SW097 (landfill leachate), and nitrate/nitrite (0.093 mg/L) and lithium (77 µg/L) at SW098 (landfill pond) (DOE, 1996a, Tables 2-2 and 2-3), are significantly lower than concentrations found in well B206989 groundwater. In addition, elevated concentrations of nitrate/nitrite (mean=143.5 mg/L), lithium (199 µg/L) and selenium (504 µg/L) have been detected in samples from UHSU bedrock well B206889, located to the south and upgradient of well B206989. Elevated concentrations of some or all of these constituents have been found in other contaminant plumes, including the Solar Evaporation Ponds and IHSS 119.1.

As suggested above and reported in the *1998 Groundwater Monitoring at the Present Sanitary Landfill* report (DOE, 1999), the most likely cause for anomalous groundwater quality at well B206989 is an unknown secondary contaminant source located upgradient of well B206889. Regardless of their source, the absence of contaminants at high concentrations in landfill groundwater and surface water indicate the presence of potential non-landfill interference in interpreting downgradient weathered bedrock groundwater quality.

6.6 Groundwater Intercept System Sampling

Observation of drain outfalls SW099 and SW100 located below the landfill pond dam was conducted periodically during 1999. Discharge at drain outfalls SW099 and SW100 is usually minimal or absent. In April 1999, flows from both outfalls were observed and a complete sample set was collected for VOCs, unfiltered metals, radionuclides (tritium and uranium isotopes), and water quality parameters. Discharges of 0.5 gallons per minute (gpm) at SW099 and 1.3 gpm at SW100 were measured prior to sampling. The analytical results for these samples reveal that no contamination above RFCA Tier II groundwater action levels was detected at these stations.

6.7 Conclusions

Groundwater conditions at the Present Sanitary Landfill in 1999 appear to be generally consistent with the results of previous monitoring. Statistical comparisons of upgradient versus downgradient UHSU groundwater at the Present Sanitary Landfill were performed for analytes meeting the minimum evaluation criteria of <90 percent non-detections and at least four samples per upgradient and downgradient data set. Significant differences (at the 1% level) in upgradient compared to downgradient groundwater quality were found for fluoride, sulfate, TDS, cadmium, calcium, copper, lithium, magnesium, molybdenum, potassium, selenium, sodium, strontium, U-233/234, U-235, and U-238. Volatile organic compounds were not evaluated statistically because the percentage of non-detections exceeded 90 percent or because contaminants were found only in upgradient samples.

Apart from copper, lithium, selenium, U-233/234, and U-238 in well B206989, the trends of potential inorganic and radionuclide contaminants do not appear to be increasing with time in the downgradient wells. The increasing trends of copper, lithium, selenium, U-233/234, and U-238 in well B206989 represent groundwater quality exceedances that are reportable under the IMP. A more complete review of available groundwater and soils data associated with potential upgradient, non-landfill contaminant sources appears to be warranted to investigate the elevated occurrences of copper, lithium, selenium, and uranium isotopes in downgradient well B206989.

7.0 PLUME DEGRADATION MONITORING

7.1 Carbon Tetrachloride Plume

This section summarizes the results of the IHSS 118.1 carbon tetrachloride plume natural attenuation study, which was initiated in 1999. The object of this report is to provide sample results for the suite of analytes that were sampled in the CY99 sampling rounds and determine whether natural attenuation is occurring given the results obtained. The overall goal of the project is to characterize the potential for natural attenuation as a significant factor in the remediation strategy for the IHSS 118.1 Dense Non-Aqueous Phase Liquid (DNAPL) source. Carbon tetrachloride is the main contaminant of concern at IHSS 118.1 and is the result of spills related to a carbon tetrachloride storage tank, which has been subsequently removed. Characterization work was initiated in 1997 to identify the extent of the DNAPL source and determine the feasibility of extracting the DNAPL through pumping or excavation. Source removal was postponed because it is presently not feasible to excavate the source due to the number of active process pipes and utilities that run through the source area. The decision was then made to evaluate the potential for the carbon tetrachloride plume to be undergoing natural attenuation processes.

A drilling and sampling program was designed to collect the data necessary for decision making with respect to natural attenuation. Eight wells were installed in a pattern so as to have two wells upgradient of the DNAPL source (18799, 18899), three wells along an east-west line where two wells were in the source, and one well located cross gradient to the source (18499, 18599, and 18699). The remaining three wells were installed in a line approximately 60 –70 feet downgradient from the source (18199, 18299, 18399). The wells were installed in February 1999 and samples were collected in March and September of 1999. In addition, data from well 21098 was added to the evaluation because of the causal relationship between carbon tetrachloride in this well and the location of IHSS 118.1 that was identified in the 1998 RFCA Annual Groundwater Report. Figure 4-9 shows the location of the wells and sampling locations.

Dedicated bladder pumps were installed in the 1999 wells so that samples could be collected with minimal aeration of the sample. This is important when collecting VOC samples and when measuring dissolved oxygen (DO) and oxidation-reduction potential (redox) parameters. A flow-through cell containing the field parameter probes was used to measure temperature, DO, redox, alkalinity, specific conductance and pH. In December 1999, Troll 8000 down-hole probes were installed to continuously measure water level, temperature, DO, redox and pH. Unfortunately the probes malfunctioned and did not provide useful data. A Hach spectrophotometer was used to measure ferrous iron. Analytical samples were sent to off-site laboratories for analysis. Full suites were obtained from seven of the eight wells. Upgradient well 18899 was dry and could not be sampled. Table 7.1 lists the analyses performed for the IHSS 118.1 study as listed in the IHSS 118.1 Sampling and Analysis Plan (RMRS, 1998c). Water levels were obtained for all wells in the project.

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Footing Drain Outfall Samples

A one time sample was collected from two outfalls which are associated with the Building 771 footing drain system. Building 771 is located approximately 120 feet due north of IHSS 118.1 and has a footing drain system that collects groundwater from the south (upgradient) side of the building. Because the footing drain system is downgradient of the carbon tetrachloride. groundwater plume, it was important to sample the outfalls from this system to determine if significant concentrations of VOCs were present. Figure 7-1 shows the sample locations. One outfall is located to the west of Building 771 and flows to a small stream which enters North Walnut Creek to the north. This outfall could be sampled directly at its terminus on the hillside, and has a location name of 771-FDOUT2. The other outfall is believed to be located under the North Perimeter Road and probably enters North Walnut Creek. The pipeline to this outfall is believed to extend out from the northwest corner of Building 771 and has two manholes that were available for sampling. Sample location 771-Manhole3 is a manhole accessing the outfall pipeline outside Building 771. The second location (NW771-Manhole) is located at the confluence of drainpipes near the North Perimeter Road.

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Table 7-1 Sample Types/Analytical Methods

Line Item Code	Analytes	Analytical Method	Media Type	Container	Preservative
SS01B005	Volatile Organic Compounds	SW-846 Method 8260	Water	2 x 40 ml VOA vials - Teflon lined septa lids	Cool, 4° C, HCl
SS01B006	Volatile Organic Compounds	SW-846 Method 8260	Soil, Waste	60-ml wide mouth glass jar with Teflon lined lid	Cool, 4°C,
SS02B006	Semivolatiles	SW-846 Method 8270B	Water	3-liter glass jar	Cool, 4°C
SS02B006	Semivolatiles	SW-846 Method 8270B	Soil	250-ml wide mouth glass jar with Teflon lined lid	Cool, 4° C
RC01B0003	Americium, Plutonium & Uranium	ASD SOW for Isotopics RC01	Soil	125-g wide mouth glass jar	Cool, 4° C
OS01A002	Gross Alpha/Beta	ASD SOW for Isotopics RC01 Module OS01A	Water	1 liter plastic bottle	Cool, 4° C
OS01A003	Gross Alpha/Beta	ASD SOW for Isotopics RC01 Module OS01A	Soil	60-g wide mouth glass jar	Cool, 4° C
SS06B037	Sulfates	SW-846, 9035, 9036	Water	1 liter plastic bottle	Cool, 4° C
SS06B039	Sulfides	SW-846 9030A	Water	1 liter plastic bottle	Cool, 4° C
SS06B002	Alkalinity	SW-846 310.1, 320.2	Water	1 Liter plastic bottle	Cool, 4° C
SS06B020	Nitrates	SW-846 , 300.0	Water	1 liter plastic bottle	Cool, 4° C
SS06B025	Total Organic Carbon	SW-846 415.1	Water	1 liter plastic bottle	Cool, 4° C pH<2 w/HCl
SS06B024	Dissolved Organic Carbon	SW-846 415.1	Water	1 liter plastic bottle	Cool, 4° C
SS06B010	Chlorides	E300.0	Water	100 ml. plastic bottle	None
Field	pH	SW9040	Water	N/A	N/A
Field	Dissolved Oxygen	E360.1	Water	N/A	N/A
Field	Oxidation-Reduction Potential	ASTM D1498	Water	N/A	N/A
Field	Temperature	E170.1	Water	N/A	N/A
Field	Conductivity	SW9050	Water	N/A	N/A

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For purposes of this preliminary evaluation, three of the seven wells were chosen for discussion. Well 18799 is the only upgradient well that had water, so it is used for background comparison. Well 18499 is north of 18799 and is screened in the DNAPL source. Samples were collected above the DNAPL in the well. Well 18199 is a downgradient well due north of well 18499. Well 21098 was added to the evaluation because it probably represents the distal western portion of the carbon tetrachloride plume emanating from IHSS 118.1. These wells comprise a representative cross section of groundwater quality across the IHSS 118.1 site. In most cases, data from the other wells conform to those found in this subset. Charts were derived to show the relative changes in water quality across the IHSS. Table 7-2 shows the pertinent data from which Figures 7-2 – 7-5 were derived. The complete analytical data set for these wells can be found in Appendix A from document RF/RMRS-98-420.UN, *Status Report for Monitoring of Natural Attenuation at IHSS 118.1(RMRS, 1999d)* and *The 1999 Third Quarter RFCA Groundwater Monitoring Report(RMRS, 2000).* Evaluation of the various parameters used for the natural attenuation project leads to a number of conclusions regarding to whether the parameters are necessary for the continued tracking of VOC degradation.

Table 7-2 Sample Results for Natural Attenuation Wells

Well	18799	18799	18499	18499	18199	18199	21099	771 FD OUT #2
1999 Sampling Results	1st Qtr	3rd Qtr	1st Qtr	3rd Qtr	1st Qtr	3rd Qtr	1st Qtr	1st Qtr
CARBON TETRACHLORIDE	927	220	57800	16000	15400	14000	1200	12
CHLOROFORM	511	590	8750	4900	2200	2400	110	23
METHYLENE CHLORIDE	12.3	21	83.5	380	12.6	590	0.09	4
CHLOROMETHANE	50	18	8.9	U	U	U	1	U
METHANE	3.1	2.5	210	50	7.4	12		
NITRATE	2.2	0.05	0.05	0.14	3	3.3		
SULFATE	46	53	21	31	35	33		
SULFIDE	0.02	0.026	0.05	0.003	0.041	0.011		
DOC	3	6	4	5	4	6		
CHLORIDE	63	72	64	90	69	72		
FERROUS IRON	0.01	1.67	1.6	0.84	0.11	0.01		
TOC	3.051	3	4	5	3	3		
DISSOLVED OXYGEN	5.37	2.6	0.063	0.5	2.23	3		

Note: VOC's in ug/L, all others in mg/L

7.1.1 Natural Attenuation

Natural attenuation is defined as an observed reduction in contaminant concentrations as contaminants migrate from the source in environmental media. This reduction in concentration can be due to a number of fate and transport processes in groundwater, including dilution, dispersion, sorption, volatilization, and biotic and abiotic

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transformations. Biodegradation and bioremediation are used to describe the portion of natural attenuation that is brought about by biological degradation mechanisms. Biological degradation typically involves bacteria that occur naturally in soil and groundwater. Under the right conditions these bacteria can break down certain fuel hydrocarbons and certain chlorinated organic compounds.

The main mechanism for the biological breakdown of chlorinated organics is through reductive dechlorination reactions. Under reductive dechlorination, a chlorinated organic compound such as carbon tetrachloride is an electron acceptor, causing the compound to gain a hydrogen atom at the expense of a chlorine atom. The successive dechlorination of carbon tetrachloride would form chloroform, methylene chloride and chloromethane chlorine atoms are progressively removed from the original carbon tetrachloride molecule.

For biodegradation to occur, there must be an electron acceptor, a source of carbon to serve as an electron donor, and a favorable environment for the metabolic reactions to take place. The IHSS 118.1 sampling program was designed to investigate whether these processes are taking place. Wiedemeier et al (1996) have developed a simple method of determining whether biodegradation is occurring to a significant degree at a site based on applying scores to the chemical parameters discussed in this report. The criteria used are summarized in Table 7-3. A score of 0 to 5 points is suggestive of inadequate evidence of biodegradation. A score of 6 to 14 suggests limited evidence of biodegradation, a score of 15 to 20 shows adequate evidence and scores above 20 show strong evidence of biodegradation.

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Table 7-3 Checklist for Determination of Biodegradation

Analyte	Concentration in most contaminated zone	Significance	Points	IHSS in Source	IHSS 118.1 Outside source
Oxygen	< 0.5 mg/L	Tolerated at this concentration	3	3	0
Oxygen	> 1.0 mg/L	Prohibits reductive dechlorination	-3	0	-3
Nitrate	< 1.0 mg/L	Competes with reductive pathway at higher concentrations	2	2	0
Ferrous Iron	> 1.0 mg/L	Reductive pathway possible	3	3	0
Sulfate	< 20 mg/L	Competes with reductive pathway at higher concentrations	2	0	0
Sulfide	> 1.0 mg/L	Reductive pathway possible	3	0	0
Methane	> 0.1 mg/L	Ultimate reductive daughter product	2	2	0
Redox	< 50 mV	Reductive pathway possible	1	1	0
Redox	< -100 mV	Reductive pathway more possible	2	0	0
TOC	> 20 mg/L	Carbon and energy source - drives dechlorination	2	0	0
Temperature	> 20 degrees C	Biochemical process accelerated	1	0	0
Carbon Dioxide	> 2x background	Ultimate oxidative daughter product	1	na	na
Alkalinity	> 2x background	Results from interaction of CO2 with aquifer	1	1	0
Chloride	> 2x background	Daughter product of organic chlorine	2	0	0
Hydrogen	> 2 nM	Reductive pathway possible	3	na	na
Chloroform	Present	Daughter product of Carbon Tetrachloride	2	2	2
Methlyene Chloride	Present	Daughter product of Chloroform.	2	2	2
Chloromethane	Present	Daughter product of Methylene Chloride	2	2	2
			Score	18	3
na - not analyzed					

7.1.2 Electron Donors

The process of natural attenuation that would degrade chlorinated organic compounds such as carbon tetrachloride is reductive dechlorination. Reductive dechlorination is the substitution of hydrogen for chlorine atoms within the chlorinated organic compound, which causes it to progressively break down into daughter products. This process requires that there be a source of electron donors, which is typically organic carbon. Carbon can be utilized either as natural carbon in the aquifer, or can be acquired from the breakdown of petroleum hydrocarbons. The following analyses were performed on groundwater samples from IHSS118.1 wells to determine the availability of electron donor activity at IHSS 118.1.

Semivolatile Organic Suite

The semivolatile organic suite was collected because of a perception that there had been a diesel spill in the area of IHSS 118.1. Diesel by-products could supply the electron donors that are necessary for reductive dechlorination of the carbon tetrachloride and breakdown products. Diesel fuel is composed of such indicator compounds as napthalene, phenanthrene, anthracene, chrysene etc., as opposed to the BTEX compounds (benzene, toluene, ethylbenzene and xylenes) which are common in gasoline. Based on the data collected in 1999, there is no evidence of either diesel or gasoline indicator compounds in the vicinity of IHSS 118.1. Therefore, the semivolatile analyte suite was discontinued.

Total Organic Carbon and Dissolved Organic Carbon

Total organic carbon (TOC) and dissolved organic carbon (DOC) were collected to ascertain the availability of carbon in the environment to serve as an energy source for reductive dechlorination. DOC was not plotted because concentrations were similar to TOC and is not used for the evaluation of biodegredation. Figure 7-2 shows that TOC is within the 3-5 mg/L range. Wiedemeier et al (1996), suggest that TOC above 20 mg/L assures that enough carbon is present to drive dechlorination. Therefore the limited amount of carbon in groundwater may be retarding the rate of reductive dechlorination at IHSS 118.1. Because the Wiedemeier paper uses TOC as an indicator parameter, but does not discuss DOC, DOC will be discontinued in future IHSS118.1 sampling rounds.

7.1.3 Electron Acceptors

In order to effect reductive dechlorination of chlorinated organic solvents, the solvents must be potential electron acceptors. This reaction mechanism occurs when there are sufficient electron donor sources present, the proper chemical environment exists, and there is a lack of other electron acceptors. The following analyses wee performed on groundwater samples from 1999 IHSS118.1 wells to determine the availability of electron acceptors in this water.

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Carbon Tetrachloride

Carbon tetrachloride is the dominant organic compound present in groundwater at IHSS 118.1. If biodegradation is occurring by reductive dechlorination, carbon tetrachloride would break down progressively to chloroform, dichloromethane, chloromethane, and ultimately to carbon dioxide and water. If reductive dechlorination was occurring, carbon tetrachloride would be seen to progressively decrease in concentration with time as the breakdown products increased in concentration. Downgradient wells would also reflect an increase in breakdown products relative to carbon tetrachloride. Figures 7-3 and 7-4 show the trends in carbon tetrachloride and daughter species. The sample from well 21098 is also included. In Figure 7-3 carbon tetrachloride can be seen to decrease in concentration from the source to downgradient well 21098. This would be expected if biodegradation was occurring. However, the trends in chloroform and chloromethane do not increase in downgradient wells 18199 and 21098. Methylene chloride exhibits a similar behavior, but must be viewed with caution because it is a common lab contaminant and was reported in the lab blank.

The data suggest that there are daughter products from reductive dechlorination of carbon tetrachloride in the source area, but increased breakdown downgradient of the source is not readily apparent. By looking at the ratio of daughter products to carbon tetrachloride with time, a better indication of in-source biodegradation would be obtained. Therefore, it is suggested that sampling for these compounds continue for a sufficient time period to establish a rate of breakdown at the source. The Building 771 outfall locations described above were also sampled for the VOC suite. Location 771-FDOUT2 shows a carbon tetrachloride concentration of 12 ug/L and a chloroform concentration of 23 ug/L. The outfall has a very low flow, which suggests that it may be shut off. Because carbon tetrachloride and chloroform are the dominant components of the carbon tetrachloride plume, it appears that some of the plume is being collected in the footing drain system. The other two sample locations showed no significant VOC detections.

Dissolved Oxygen

Dissolved oxygen is the favored electron acceptor used by bacteria for the biodegradation process. Anaerobic bacteria cannot function at DO concentrations above .5 mg/L and hence, reductive dechlorination cannot occur (Wiedemeier, et al, 1999). Figure 7-2 shows that upgradient DO concentration at well 18799 ranges from 2.5 to 5.4 mg/L and decreases to .06 - .5 mg/L in source well 18499. DO concentration rises again in downgradient well 18199. Taking the data at face value, it would appear that DO levels are detrimental for anaerobic degradation of organic compounds except at the source. DO was measured using a DO probe housed inside a flow-through cell. It may be that this method, though far superior to measurements obtained from bailed water, may allow for some oxygenation of the groundwater.

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Nitrate and Sulfate

Nitrate and sulfate were analyzed because these species, along with dissolved oxygen, can compete with chlorinated solvents as electron acceptors. If high levels of nitrate and/or sulfate were to exist in the groundwater in the vicinity of IHSS 118.1, the reductive dechlorination of carbon tetrachloride and its by products could be retarded. The graph on Figure 7-2 shows the concentrations of nitrate along the three - well cross section at IHSS 118.1. The nitrate concentration in upgradient well 18799 is .26 to 2 mg/L which is near the RFETS background mean of 1.4 mg/L for Rocky Flats Alluvium (DOE, 1993b). In Figure7-2, nitrate concentration is seen to decrease at the source and then increase again in concentration away from the source. This trend would be expected if biodegradation was occurring in the source area. Wiedemeier et al, 1996 have a scoring system for determining the potential for biodegradation. They suggest that a concentration of nitrate above 1 mg/L may impact biodegradation of chlorinated organics. Given the low concentration of nitrate in the vicinity of the IHSS (.05 mg/L at source well 18499), it appears nitrate is being removed locally but may be hampering the biodegradation process away from the source. Because nitrate is a key indicator of the efficacy of biodegradation on chlorinated solvents, continued sampling is advised.

The sulfate concentrations in upgradient well 18799 was 46 to 53 mg/L, which is above the RFETS background mean of 22 mg/L (DOE, 1993b). Figure 7-5 shows the concentration of sulfate dropping near source well 18499, and then increasing in downgradient wells. Because sulfate and nitrate behave similarly with respect to their electron acceptance, this trend would be expected if biodegradation was occurring in the source area.

Wiedemeier et al (1996) suggest that sulfate above 20 mg/L could compete with the chlorinated solvents as an electron acceptor and thus retard the biodegradation process of the latter. Given that sulfate was found at 30 mg/L in the source area and at higher levels away from the source, it can be deduced that sulfate may be retarding the biodegradation of carbon tetrachloride occurring at IHSS 118.1. Because sulfate is a key indicator of the efficacy of biodegradation on chlorinated solvents, continued sampling is advised.

7.1.4 Metabolic By-Products

Measurement of the metabolic by-products of biodegradation is a valuable indication of the predominant microbial and chemical processes occurring at IHSS 118.1. The following analyses were performed to help determine whether actual biodegradation is occurring.

Ferrous Iron

Ferric iron (Fe III) is reduced to ferrous iron (FeII) during anaerobic biodegradation of organic hydrocarbons. Therefore an increase in ferrous iron concentration in the source area can suggest the amount of biodegradation that is occurring. Figure 7-2 shows that in the first quarters, sampling event ferrous iron increases from 0.01 mg/L in background well 18799 to 1.6 mg/L in source well 18499, then decreases to 0.10 mg/L in downgradient well 18199.

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The second quarter sampling event shows a higher value of 1.61 at the upgradient well, decreasing downgradient through the source. Wiedemeier et al (1996) believe that ferrous iron above 1 mg/L would allow reductive dechlorination to take place. Given the difference in the results obtained in the two sampling rounds it is difficult to conclude whether reductive dechlorination is occurring at the source. Because ferrous iron is a key indicator of the efficacy of biodegradation on chlorinated solvents, continued sampling is advised.

Sulfide

The production of hydrogen sulfide occurs during sulfate reduction and verifies that sulfate is acting as an electron acceptor during biodegradation. Figure 7-2 shows that sulfide is 0.02 mg/L in background well 18799 and does not change in concentration in the source and downgradient wells. Wiedemeier et al (1996) believe that sulfide above 1 mg/L would allow reductive dechlorination to take place. These results suggest that though sulfate was decreasing in concentration in the source area, the amount of hydrogen sulfide generated was insufficient to support reductive dechlorination. Because of the conflicting evidence for biodegradation given by sulfate/sulfide analyses, and because sulfide is a key indicator of the efficacy of biodegradation on chlorinated solvents, continued sampling is advised.

Methane

The presence of methane in groundwater is indicative of strongly reducing conditions. Methane can be produced through the biodegradation of petroleum hydrocarbons. The presence of methane in groundwater containing chlorinated solvents suggests that the chemistry of the groundwater is favorable for reductive dechlorination. Figure 7-4 shows that methane increases from approximately 0.003 mg/L to .05 - 0.20 mg/L in the source area, then decreased to 0.007 in downgradient well 18199. Wiedemeier et al (1996) believe that methane above 0.1 mg/L would allow reductive dechlorination to take place. Methane values at IHSS118.1 were fairly low, suggesting that there is little if any petroleum hydrocarbons present there. However, the increase in methane production in the source relative to the upgradient well suggests that some reductive dechlorination is occurring. Because methane is a key indicator of the efficacy of biodegradation on chlorinated solvents, continued sampling is advised.

Chloride

The presence of elevated concentrations of chloride in groundwater relative to upgradient locations suggests that reductive dechlorination of organic solvents is taking place. This is because the replacement of hydrogen for chlorine in the chemical structure of the chlorinated organic compound during reductive dechlorination releases chlorine in the process. Figure 7-5 shows the concentrations of chloride seen in the vicinity of IHSS 118.1. Chloride concentration was reported in the 63 – 90 mg/L range and does show change across the source in the third quarter sample. The RFETS background mean concentrations for chloride in alluvial materials is 8 to 18 mg/L (DOE, 1993b). The Groundwater Geochemistry Report for RFETS (EG&G, 1995c) shows that chloride concentration increases from west to east at RFETS and that chloride concentrations in the Industrial Area range

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from 25 to 100 mg/L. Given the lack of dramatic change in chloride concentration at IHSS 118.1 relative to both upgradient and downgradient wells and the surrounding Industrial Area, it may be that only limited reductive dechlorination is occurring at the IHSS. Because chloride values on Site can be affected by the use of salt on the roadways during the winter, the data may be suspect as a key indicator of the efficacy of biodegradation on chlorinated solvents.

7.1.5 Conclusions and Recommendations

Based on the 1999 results, a number of conclusions can be made. There is evidence of biodegradation at the IHSS 118.1 source. If the assumption is made that the breakdown products found at IHSS 118.1 are not part of the original free product composition, then based on the scoring system discussed in Wiedemeier et al (1996), the source area rates a score of 18 (see Table 7-3). The upgradient and downgradient wells rate a score of 3, which suggests that the environment of the aquifer away from the source may be hostile to biodegradation. These scores are derived using data from the three wells used for the cross section discussed above. Given the downgradient score with respect to biodegradation, the decrease in composition of organic solvents away from the source must be partly attributed to physical processes such as dilution and dispersion rather than strictly to biodegradation. These preliminary results suggest that some reduction in carbon tetrachloride is occurring at the source, but the discovery of carbon tetrachloride above Tier I action levels at downgradient well 21098 suggests that natural attenuation is not completely restricting the plume from migrating towards surface water in this area. Additional monitoring will help determine the rate at which biodegradation is occurring.

One of the footing drain outfalls shows low levels of carbon tetrachloride and chloroform that is probably attributable to inflow of carbon tetrachloride plume groundwater into the footing drain system. Given the low concentration of VOCs in outfall sample 771-FDOUT2, and the very low flow from the outfall, there does not appear to be a major contribution of VOCs to surface water from this source.

The results of continuing sampling at IHSS 118.1 will be used to validate these preliminary findings and can also be used to assess possible remedial strategies. The Groundwater program will be evaluating the downgradient extent of VOC plumes in the Industrial Area in the future to determine potential impacts to surface water. This information will be incorporated with data from IHSS 118.1 and other projects to provide an integrated approach to groundwater management at the Site.

7.1.6 Sampling Recommendations

Based on the results obtained to date the following recommendations can be made with respect to future sampling:

1. The present sampling suite should be reduced for future sampling. At this point it is prudent to eliminate the semivolatile organic suite and DOC sample. The semivolatile organic suite was collected to determine whether there is evidence of fuel hydrocarbons that would aid in the breakdown of carbon tetrachloride. Since these

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compounds were not encountered in the two sampling rounds the analyses can be discontinued. DOC can be eliminated because only TOC is used in the scoring system for determining the degree of biodegradation.

2. The wells used as part of the natural attenuation study can also be reduced. The North IA Plume project identified the extent of the Carbon Tetrachloride Plume to the west of IHSS 118.1. It is suggested that wells 18799, 18499 and 18199 be retained so that this evaluation can continue in the future using the same methodology as presented here. Well 21098 should be added to the Plume evaluation because it may reflect conditions at the distal end of the plume. This well will also be designated as a Plume Extent well given the close proximity of the well to surface water. Upgradient well 18899 has been dry, and side gradient well 18699 does not appear to be in the pathway for the plume given the low VOC values encountered. Well 18399 should probably be maintained as a plume definition well given that it may be detecting a northern pathway for the carbon tetrachloride plume. Well 18299 is probably redundant to well 18199 and can be eliminated from the sampling program. Well 18599 is redundant to well 18499 and can be eliminated from the sampling program.

3. Given the probable involvement of the Building 771 French drain with carbon tetrachloride plume capture, efforts should be made to ascertain the exact nature of the outfalls from this system. Initial evaluation has shown little flow from the outfall near the creek, and the other outfall location shows no detections for VOCs at all. The former location shows detections for VOCs but little water and the latter location shows significant water but no detections for VOCs. Location 771 FD OUT #2 should be sampled to make sure significant flow with high VOC concentrations is not occurring. Efforts will be made to better understand the effluent from the French drain in the future.

7.2 903 Pad/Ryan's Pit Plume

The 903 Pad/Ryan's Pit Plume is located directly south of the southeast corner of the PA and between the 903 Pad and Woman Creek at RFETS. Two sources, the 903 Pad and Ryan's Pit, contribute to this plume of contaminated groundwater. The primary analytes comprising the 903 Pad/Ryan's Pit Plume are carbon tetrachloride, TCE, and PCE. The nearest receiving streams for the plume are the South Interceptor Ditch (SID), located approximately 150 feet north of Woman Creek, and Woman Creek. There was an agreed upon 1999 compliance milestone for characterizing 903 Pad/Ryan's Pit Plume groundwater to protect surface water quality in Woman Creek. The Ryan's Pit source removal began in September 1995, with the removal of contaminated soil. The soil was treated in February 1996, and the project was completed in August 1996, with the replacement of treated soil. The 903 Pad source removal is scheduled for 2001. Figure 7-6 presents the location of the 903 Pad/Ryan's Pit Plume area.

The 903 Pad was utilized as a drum storage area from the summer of 1958 to January 1967. The drums contained oils and VOCs contaminated with various radionuclides. Approximately 75 percent of the drums contained plutonium contaminated liquids and most of the remaining drums contained uranium contaminated liquids. Within

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the drums containing plutonium, the liquid was primarily lathe coolant and carbon tetrachloride in varying amounts. Also stored in drums were hydraulic, vacuum pump, and silicon oils, TCE, PCE, and acetone still bottoms. Leaking drums were observed in 1964 during routine handling operations. The area was fenced to restrict access, and the contents of leaking drums were transferred to new drums.

When cleanup of the 903 Pad began in 1967, there were a total of 5,237 drums at the storage site, approximately 420 of which had leaked to some degree. An estimated 50 drums had leaked their entire contents. It was estimated that approximately 5,000 gallons of contaminated liquid, containing about 86 grams of plutonium, had escaped to the subsurface. During 1968 and 1969, some of the radiologically contaminated material was removed, the area regraded, and much of the area capped with asphalt. High concentrations of VOCs are present in groundwater beneath and downgradient of the site.

Ryan's Pit (previously known as Trench T-2) is located approximately 150 feet south of the 903 Pad and was approximately 20 feet long, 10 feet wide, and 5 feet deep. The source removal excavation was 32 feet long, 18 feet wide, and varied in depth from 5.5 to 8 feet. It was originally thought that Ryan's Pit was used for disposal of sludge from the sanitary wastewater treatment plant. An extensive evaluation of aerial and low angle oblique photography, spanning the years of 1953 through 1971, indicated that Ryan's Pit did not exist until 1969 (DOE 1996b). Ryan's Pit was used from approximately 1969 to 1971 for the disposal of nonradioactive liquid chemical wastes. The wastes were primarily solvents (PCE, TCE, and carbon tetrachloride), paint thinners, diesel fuel, and other construction related chemicals Radiation screening of the wastes was performed and if identified as nonradioactive, the liquids were dumped in the trench. However, wells downgradient of Ryan's Pit contain anomalous activities of uranium 233/234 and U238 (DOE 1997b, Plates 17 and 21). Only liquids were put into the pit; containers were either reused or disposed of in other areas (DOE 1992b).

In 1998, the RFETS program to characterize the 903 Pad/Ryan's Pit Plume was approved by the EPA and the CDPHE. A field investigation was performed during 1998 to delineate the extent of groundwater contamination in areas with potential impact to surface water at the distal end of the 903 Pad/Ryan's Pit plume. The investigation included the installation of 26 Geoprobe boreholes with six yielding enough water for VOC sample collection. The results were used to develop preliminary recommendations regarding the need for remedial action(s) to contain and/or treat contaminated groundwater from this plume. The results appeared to indicate that the extent of the 903 Pad/Ryan's Pit plume adjacent to Woman Creek was limited, that VOC concentrations within the plume are relatively low, and the ability of the saturated colluvium and weathered claystone within the area of the groundwater plume to transmit significant amounts of groundwater (and therefore a significant flux of contaminants) to the Woman Creek drainage was minimal. The results also appeared to indicate that the contaminated groundwater plume was not affecting surface water quality, and there was evidence of the occurrence of natural attenuation (RMRS, 1999h). Based on the results, it was proposed that the preliminary remedial design consist of natural attenuation, which involves intrinsic biodegradation coupled with physical loss mechanisms, as a groundwater evaluation strategy for the 903 Pad/Ryan's Pit plume.

Work completed during 1999 on this project included the preparation of a SAP *(Sampling and Analysis Plan for Groundwater Monitoring at the 903 Pad/Ryan's Pit VOC Plume,* RF/RMRS-99-312) describing monitoring and characterization activities to evaluate if monitored natural attenuation is an effective means of ensuring the protection of surface water quality at Woman Creek. Four permanent downgradient monitoring wells, 90099 through 90399, were installed to monitor VOCs. One of these new wells, 90099, twinned 1998 Geoprobe well 01298. The other three wells are downgradient of the 1998 Geoprobe wells and upgradient of the SID. These wells will provide the necessary information to establish a trend in downgradient VOC concentrations.

Monitoring well 90199 has been dry since its completion. Monitoring wells 90099, 90299, and 90399 were sampled in August (3rd quarter) 1999 and in January/February (1st quarter) 2000. The results of samples collected from these wells during the two sampling rounds described above are summarized in Table 7-4 and indicate that monitoring well 90299 is relatively unaffected by VOCs; none are found above Tier II groundwater action levels. However, the samples collected from monitoring wells 90099 and 90399 exhibit elevated VOC concentrations, especially for TCE and carbon tetrachloride.

Table 7-4 903 Pad / Ryan's Pit SAP Wells Results

Monitoring Well	Sample Date	TCE (µg/L)	Carbon Tetrachloride (µg/L)	PCE (µg/L)
90099	8/4/99	***820***	**460**	**30**
90099	1/12/00	***710***	**310**	**18**
90299	8/5/99	3	Undetected	0.2
90299	1/12/00	2	1	Undetected
90399	8/2/99	**220**	**380**	**10**
90399	2/14/00	**380**	**450**	**13**

Note: Bold italicized results are Tier I exceedances; bold results are Tier II exceedances

Well 90399 lies approximately 220 feet north of Woman Creek and well 90099 lies to the north/northeast, crossgradient and potentially upgradient, of well 90399. The concentrations of TCE in well 90099 are Tier I exceedances. The remaining TCE Tier II exceedances in well 90399 and all the carbon tetrachloride Tier II exceedances in wells 90099 and 90399 are approaching Tier I concentrations.

The SAP specified that surface water samples were to be collected from the South Interceptor Ditch (SID), Woman Creek, and seeps. A surface water sample from the seep identified in Figure 7-6 had a concentration of TCE at 4

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µg/L, which is just slightly below its Tier II groundwater action level. This seep sample also contained a result of 3 µg/L of chloroform. The seep is located immediately north of Woman Creek. All other seeps in the area were dry. VOC results of the two Woman Creek samples were below detection. The Woman Creek sample locations are identified on Figure 7-6. The SID was dry at the time of sampling.

Based on groundwater and surface water data described above, there may be a pathway to surface water for VOCs. IT Corporation has previously derived calculations of contaminant flux to Woman Creek via groundwater. These calculations can be found in Appendix C of the *Final Technical Memorandum, Monitoring of the 903 Pad/Ryan's Pit Plume* (RMRS, 1999h). The conclusions of this analysis were that "Flow and contaminant flux in the weathered bedrock is negligible. The colluvium is inconsistently saturated, and the distal portion of the plume transmits little flow and contaminants to the Woman Creek drainage".

It is apparent that groundwater VOC contamination is more widespread than previously thought, although at this point there is no detectable impact to Woman Creek immediately upstream or downstream of the impacted seep. Because of the concentrations of VOCs at well 90399, natural attenuation may not be a viable mechanism to ensure that the water quality of Woman Creek is not impacted by the 903 Pad/Ryan's Pit Plume.

In an effort to determine if biodegradation of VOC species is occurring along the pathway to Woman Creek, concentrations of the major VOCs (TCE and carbon tetrachloride) and daughter species were plotted in Figure 7-7 and 7-8. As can be seen in Figure 7-7, although the PCE and TCE levels decrease downgradient along the line of wells identified from Ryan's Pit towards Woman Creek, there is not a corresponding increase in PCE and TCE daughter products that might indicate that biodegradation was occurring. Carbon tetrachloride and its daughter products are presented in Figure 7-8. It is known that groundwater diverges from the 903 Pad to the northeast and the southeast. The northeast component follows a buried paleochannel. The southeast component contributes to the 903 Pad/Ryan's Pit Plume. Groundwater only flows to the southeast if the seasonal water table is at a high enough elevation to breach the paleochannel bank. Section 9.1, 903 Pad VOC Investigation, describes groundwater samples collected in 1998 to support the 903 Pad Borehole Investigation. Even in a very wet year (1998), concentrations of carbon tetrachloride in wells southeast of the 903 Pad were low. Although it has been thought that the 903 Pad is the primary source of carbon tetrachloride, Figure 7-8 implies that the Ryan's Pit contribution of carbon tetrachloride to the 903 Pad/Ryan's Pit Plume is greater than the 903 Pad contribution of this contaminant.

Well installations and sampling performed over the past several years have led to a greater understanding of the nature and extent of groundwater contamination at the 903 Pad/Ryan's Pit Plume. These newer data and locations can be used to improve the groundwater sampling program in that area, while eliminating unnecessary and unproductive wells from the program. Figure 4-7 shows the wells in this area.

Several wells installed along the SID east of Pond C-1 are currently monitored in support of this plume, but show no contamination. These wells include well pair 2987 and 3087, and well 23196. Well 2987 is a stainless-steel alluvial well screened from 3.5 to 20.3 feet bgs; 3087 is a stainless-steel bedrock well screened from 85.8 to 94.4 feet bgs;

and 23196 is a PVC alluvial well screened from 15.0 to 25.0 feet bgs. All three are located several hundred feet east of the newly installed 903 Pad/Ryan's Pit Plume wells (90099 through 90399).

Geologic logs from these older boreholes indicate a bedrock low at 23196 (27 feet bgs) that shallows to the east and reaches 19.8 and 16.0 feet bgs at wells 2987 and 3087, respectively. These data indicate groundwater flow would be more likely in the bedrock low at 23196; however, this well is frequently dry. Water is present in the well pair, but is free of VOCs.

The primary 903 Pad/Ryan's Pit Plume pathway appears to be west of these three older wells, in the vicinity of the newer ones. Evidence supporting this conclusion includes the presence of ample water in several of the newer wells, VOCs exceeding action level thresholds in two of these wells, VOCs absent in the older eastern wells, and the subsurface configuration at the older eastern wells. These newer wells (90099 through 90399) are therefore more appropriate for monitoring the 903 Pad/Ryan's Pit Plume. In addition, well 2987 is no longer suitable for monitoring due to downhole damage.

Therefore, these eastern wells – 2987, 3087, and 23196 – should be omitted from the IMP in favor of newer wells 90099, 90199, 90299, and 90399. Wells 6286, 6386, 00491, 07391, and 23096 should continue to be sampled.

Table 7-5 Proposed 903 Pad/Ryan's Pit Plume Sampling

Well Number	In 1999 Program	Proposed for 2001 Program?	Water Levels or Sampling?
6286	Yes	Yes	Both
6386	Yes	Yes	Both
2987	Yes	No	Neither
3087	Yes	No	Neither
00491	Yes	Yes	Both
07391	Yes	Yes	Both
23096	Yes	Yes	Both
23196	Yes	No	Neither
90099	No*	Yes	Both
90199	No*	Yes	Both
90299	No*	Yes	Both
90399	No*	Yes	Both

*While these wells were sampled in 1999, sampling was driven by the 903 Pad/Ryan's Pit Plume SAP, not by the IMP.

7.3 PU&D Yard Plume Investigations

In 1997, RFETS conducted a field investigation into the nature and extent of VOC groundwater contamination found in upgradient monitoring wells at the Present Sanitary Landfill. This investigation resulted in the identification of the PU&D Yard as the probable source area and implicated the landfill groundwater intercept and diversion system as an important factor in contributing to longitudinal plume spreading (Figure 7-9). The results of

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this evaluation were summarized in the *1997 Annual RFCA Groundwater Monitoring Report* (DOE, 1998a). Further investigation into the function of the groundwater intercept and diversion system and its possible role in collecting and discharging PU&D Yard plume contaminants downgradient of the landfill were undertaken in 1998. This section summarizes the results of the 1998 investigation, including field observations of drain valving, flow, and analytical results of samples collected at the drain outfalls in 1998 and 1999.

Figure 7-9 illustrates the layout of the groundwater intercept and diversion system. Information presented in the *Phase I RFI/RI Work Plan for Operable Unit No. 7 - Present Sanitary* Landfill (DOE, 1991b) and other Operable Unit 7 documentation contain engineering design specifications and a hydrologic analysis of system effectiveness, but contain little information on system operation, such as valving configurations and discharge data. Discharge at drain outfalls SW099 and SW100, located below the East Landfill Pond dam, is usually minimal or absent despite evidence, such as an abundance of valley head-cut seeps in pre-landfill aerial photographs, that suggest flow should be greater than currently observed assuming proper drain function. Explanations for the lack of appreciable discharge at these outfalls involve at least four scenarios: 1) discharge is currently routed toward the landfill pond by valving and piping shown in design drawings, 2) the lines have been broken or breached, resulting in subsurface discharge of drain water to refuse materials, 3) the drain system was never properly functional because of leakage caused by geological irregularities, design or installation flaws, or other potential shortcomings, and 4) groundwater levels at the perimeter of the landfill drop below the elevation of the groundwater diversion system drainpipe during extended periods of the year.

A preliminary investigation into drain operation was undertaken to gain additional information on the fate of groundwater collected by the system. This investigation consisted of a records search to locate additional documentation on the historical operation and valve configuration; a field search to locate valves, drain line locations, and drain outfall locations at the landfill pond; and a monitoring program for sampling flow issuing from SW099 and SW100.

A records search resulted in the disclosure of no new information relevant to drain operation beyond that contained within DOE (1991b). The field survey, however, was more successful, resulting in the location of valving for both the north and south intercept lines, the location of apparent pond line locations indicated by subtle changes in topography and vegetation leading from the valves, and location of the south pond drain outfall during a period of low pond stage (May 1999). Significantly, no discharge was observed at this outfall during a time when SW099 and SW100 were both flowing.

Observation of drain outfalls SW099 and SW100, located on Figure 7-9, was conducted at roughly monthly intervals during the fall and winter of 1998, and spring of 1999. The outfalls can only be sampled when flow permits. In December 1998, a sufficient amount of flow was observed at SW099 (0.007 gallons per minute [gpm] on 12/18/98) to justify sampling for VOCs. The SW100 outfall was dry during all site visits prior to April 1999, except for incident precipitation that had built up inside the weir box. On April 29, 1999, flows from both outfalls were observed and a complete sample set was collected for VOCs, metals, radionuclides (Pu-239/240, Am-241,

uranium isotopes, and tritium), and water quality parameters (total dissolved solids, sulfate, fluoride, and nitrate/nitrite). Discharges of 0.5 gpm at SW099 and 1.3 gpm at SW100 were measured prior to sampling. No other SW099 and SW100 outfall samples were collected during 1999.

VOCs characteristic of PU&D Yard groundwater contamination were not detected in samples collected at either outfall. Dissolved metals, water quality constituents, Pu-239/240, Am-241, and tritium were all found below Tier II action levels for 1998. During the April 1999 sampling event, U-233/234 was detected above the Tier II action level at 1.2991 pCi/L in SW099, but below the Tier II action level at SW100 (0.9358 pCi/L). U-235 was detected below the Tier II action level and U-238 was detected above the Tier II action level at both locations. In all cases, the reported uranium isotope activities were well below their respective background M2SD activities and, as such, are not reportable values. The information collected thus far indicates that the PU&D Yard VOC plume does not contribute significant concentrations of contaminants to the landfill groundwater intercept and diversion system.

Monitoring of the drain outfalls will be continued during CY 2000, and if flow permits, samples will be collected to further investigate the potential impact of PU&D Yard contamination on groundwater and surface water quality downgradient of the landfill. In addition, during CY 2000 a SAP will be prepared and submitted to the CDPHE and U.S. EPA for natural attenuation monitoring of the PU&D Yard VOC plume. The SAP will incorporate the sampling of existing and new monitoring wells (shown in figure 7-9) to evaluate whether or not monitored natural attenuation is an effective mechanism for ensuring the protection of surface water quality with regard to the location of the PU&D Yard VOC plume. New monitoring wells associated with this SAP are expected to be installed in late CY 2000.

Figure 7- 2
Nitrate, DOC, TOC, Sulfide, Ferrous Iron and DO Concentrations at IHSS 118.1

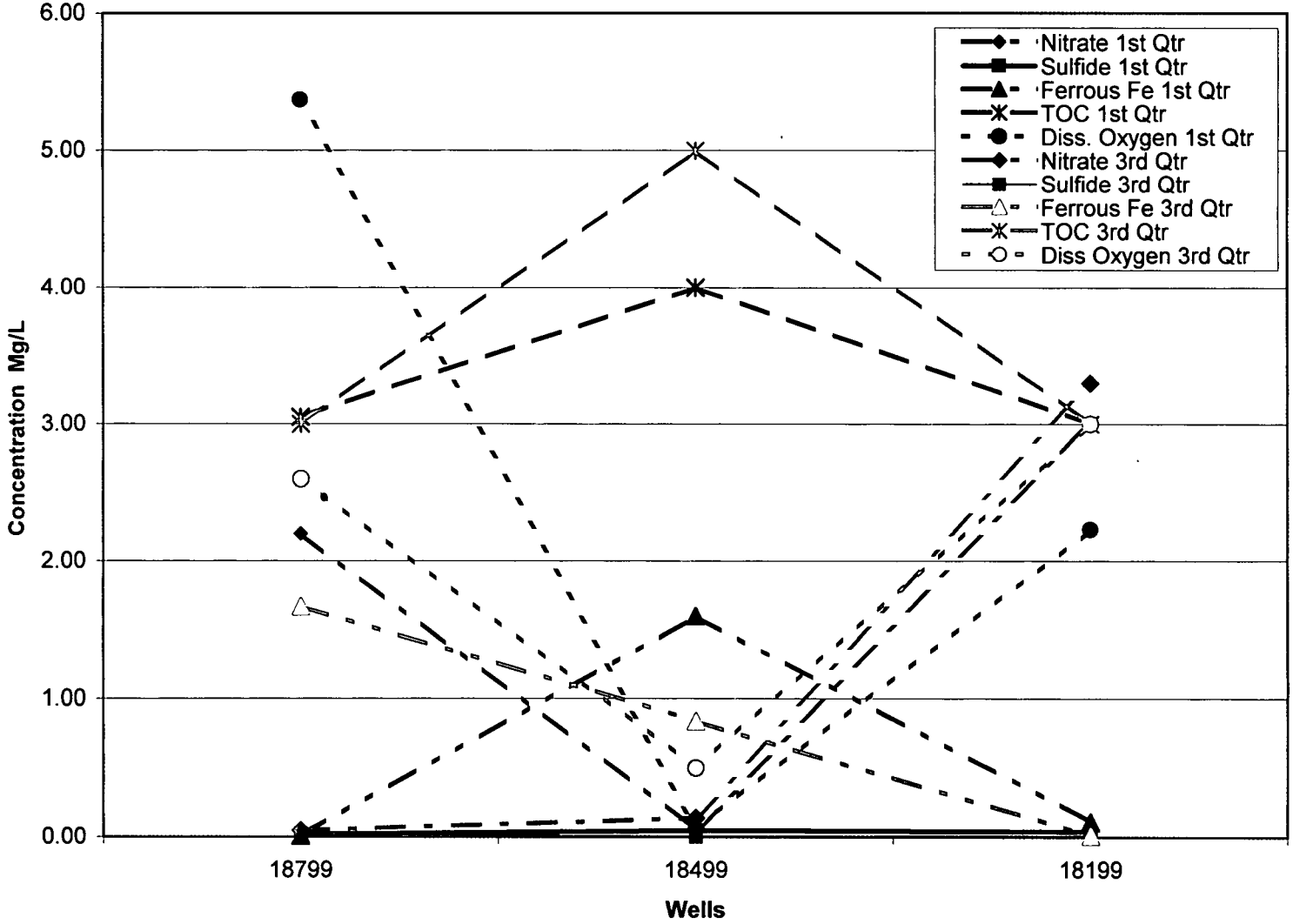

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Figure 7- 3
Carbon Tetrachloride and Chloroform Concentrations at IHSS 118.1

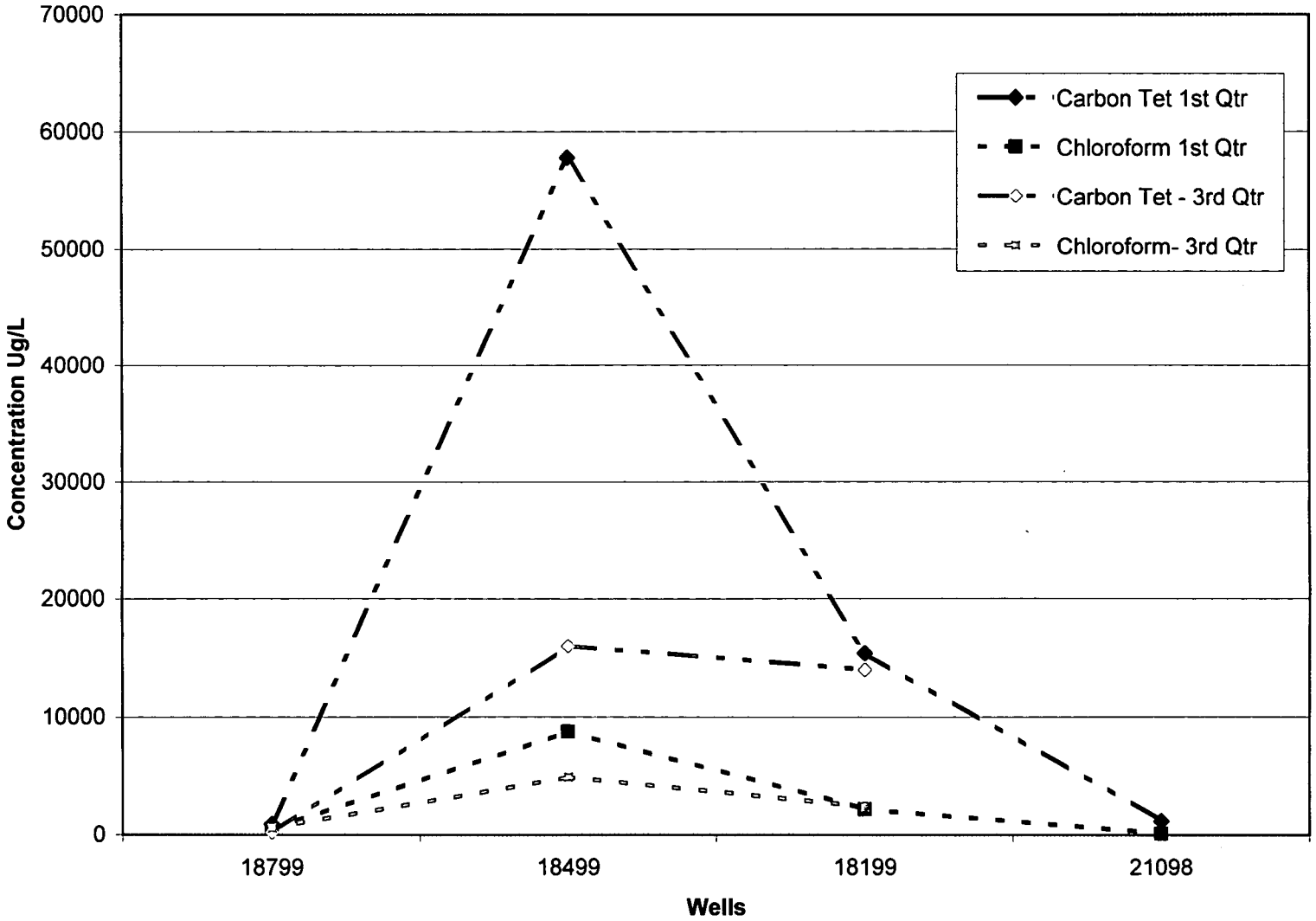


Figure 7- 4
Methylene Chloride, Chloromethane and Methane Concentrations at IHSS 118.1

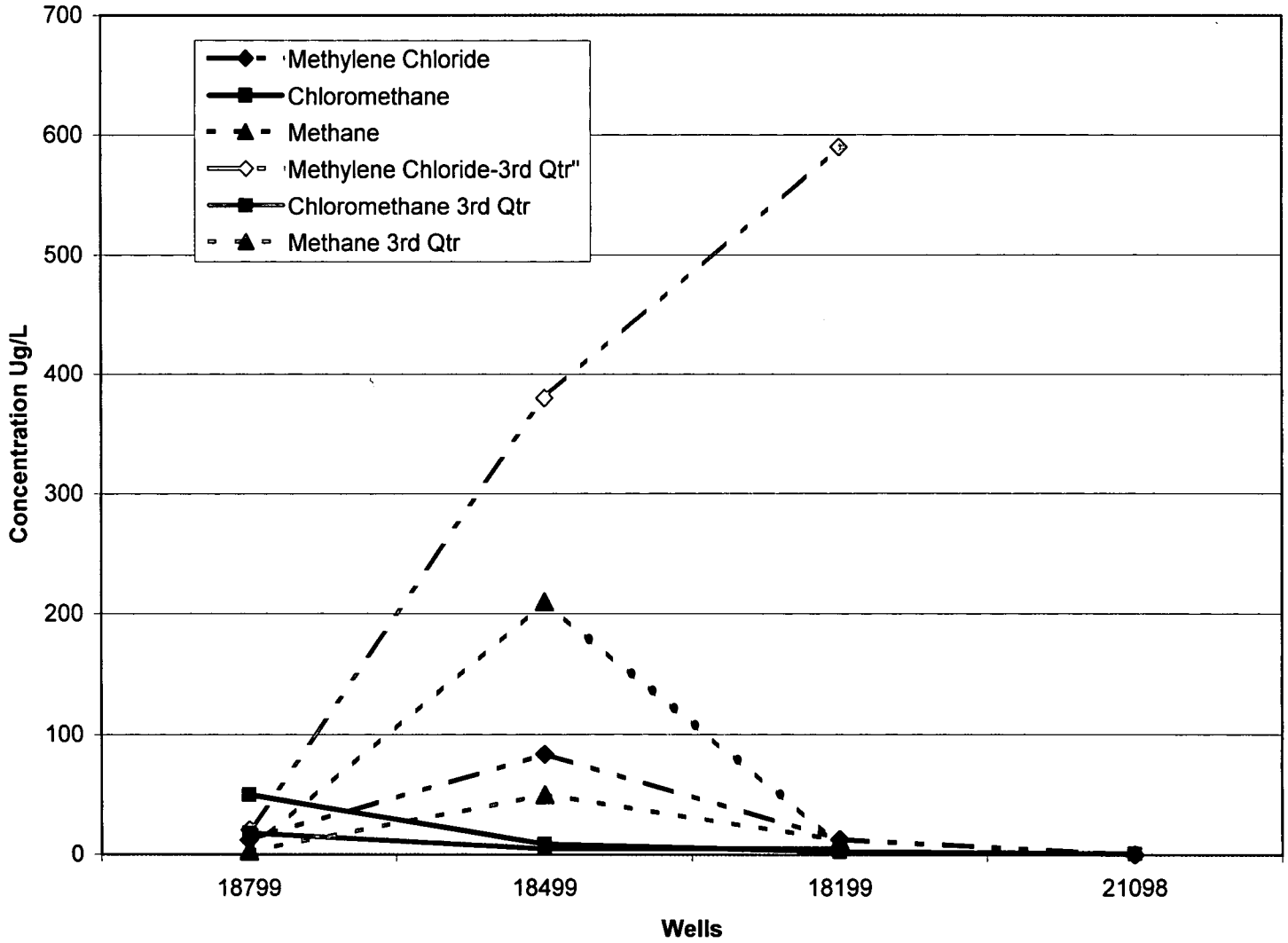


Figure 7- 5
Chloride and Sulfate Concentrations at IHSS 118.1

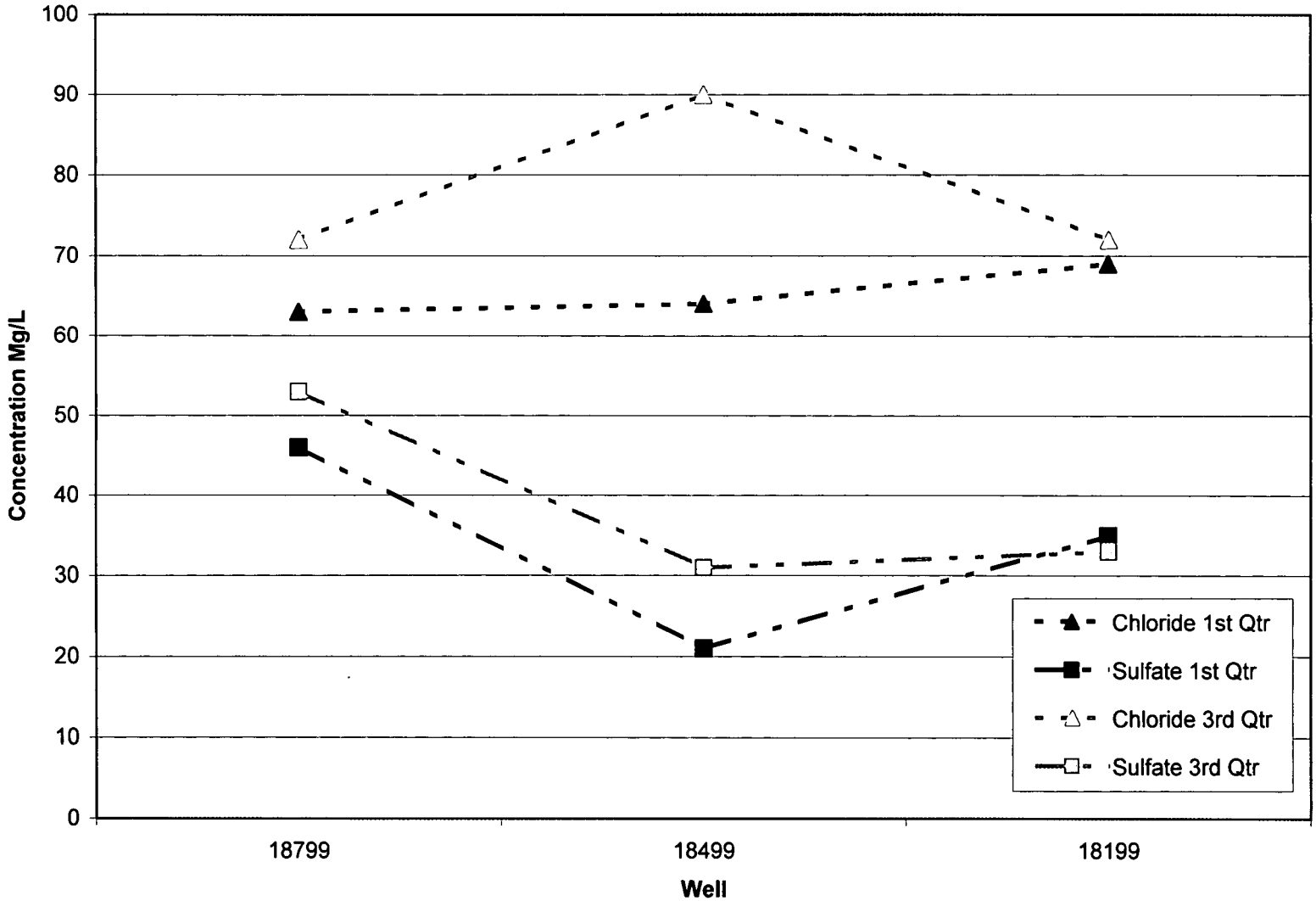


Figure 7-7: PCE, TCE, 1,2-DCE, 1,1-DCE and Vinyl Chloride - 1st Quarter 2000

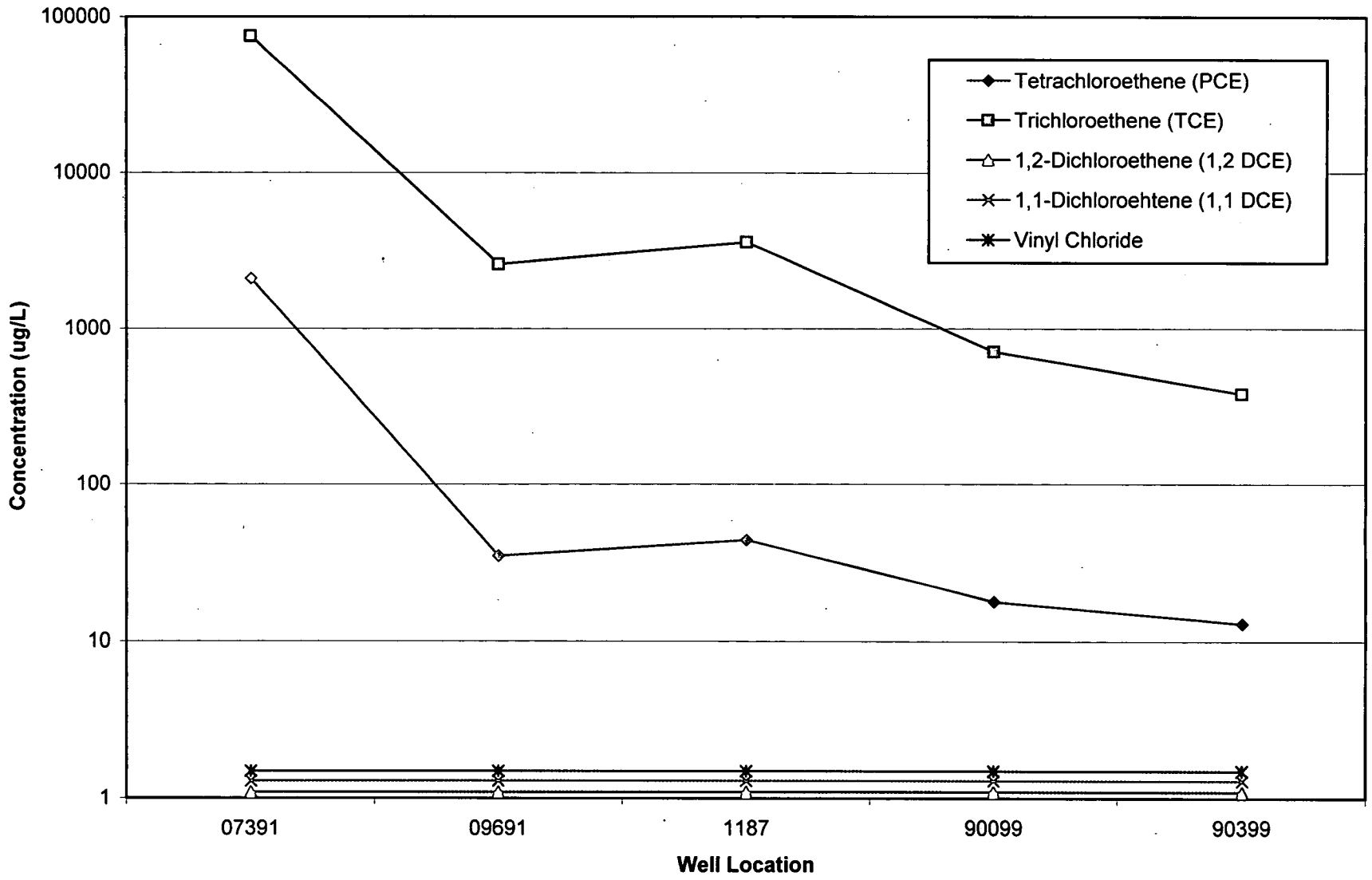
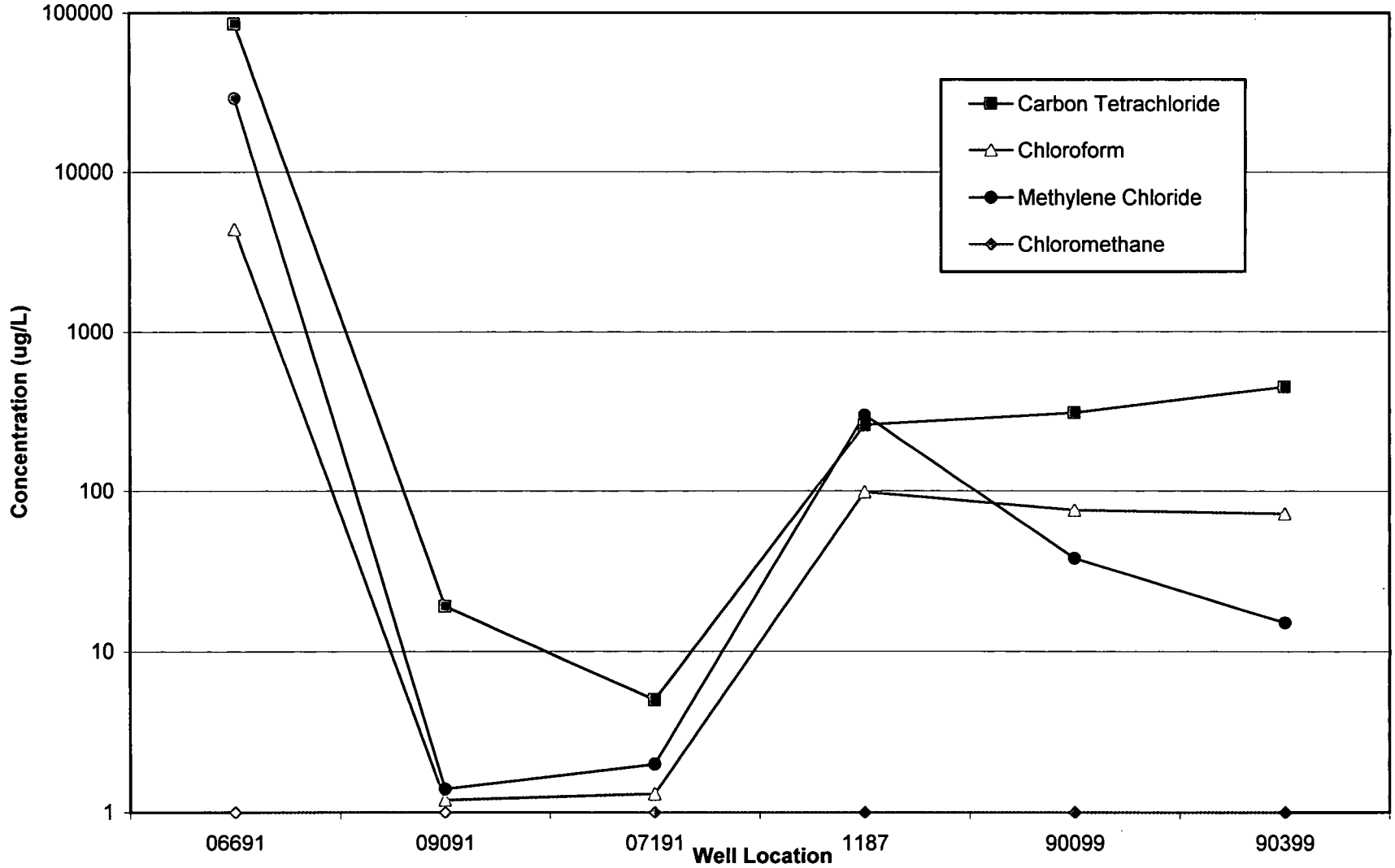


Figure 7-8 Carbon Tetrachloride and Daughter Products - 1st Quarter 2000



8.0 GROUNDWATER EVALUATIONS

8.1 East Industrial Area Plume Investigation

The major groundwater evaluation that was conducted in 1999 was an investigation of the eastern edge of the Industrial Area VOC groundwater plume. The known extent of the plume, based on the existing wells in the area, appeared to coincide with a major north-south utility corridor that occurs to the east of Eighth Street in the Industrial Area (RMRS, 1999c). The utility corridor extends along most of the width of the IA in this area and is composed of numerous power and water lines. Because well coverage in this part of the IA is sparse, a project was designed to evaluate whether contaminated groundwater makes it past this corridor. Figure 8-1 presents the site area and existing monitoring wells. Figure 8-2 shows the potentiometric surface in this area.

The general approach for the groundwater investigation was to complete a line of wells in the UHSU along the utility corridor. The line extends from the northwest corner of Building 776 in the north to the northwest corner of Building 881 in the south. Wells 60099 through 61499 were installed except for well 60999 which could not be installed because of the density of utilities at the corner of Eighth and Central Avenues. Existing well 6186 was substituted for this well and is not far from the proposed location of 60999. Wells 60799 and 61399 were installed to investigate a known bedrock scour that occurs in a northeast direction and was thought to direct groundwater preferentially in this area. Existing well 37791 was also utilized for the southernmost well in the line near Building 881.

The wells were installed in September and October of 1999 and sampling was conducted in October and November. Wells were installed with a Geoprobe and were one inch in diameter. In many cases the alluvium was very thin but averaged eight to nine feet thick in most places. The bedrock was not extensively weathered in many of the boreholes. Table 8-1 shows the depth to bedrock and the saturated thickness of the alluvium, unless the water table elevation is below the level of the bedrock. Well development and sampling was difficult because of the limited saturated thickness that occurred in the alluvial materials and recharge from the bedrock materials was limited due to the lack of weathering. The lack of groundwater recharge due to both the nature of the lithology and the time of year, was responsible for the difference in sample collection dates in Table 8-1.

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Table 8-1 Water Levels and Saturated Thickness for EIAP Line

Well	Date	Depth To Water	Units	Top of Casing Elevation	Water Table Elevation	Surface Elevation	Depth of Bedrock	Bedrock Elevation	Alluvial Saturated Thickness
Fourth Quarter 1999									
60099	11/5/99	9.18	ft	5982.75	5973.57	5983.30	9.00	5974.30	NA
60199	11/4/99	5.39	ft	5986.68	5981.29	5987.18	7.70	5979.48	1.81
60299	11/4/99	7.95	ft	5986.88	5978.93	5987.38	7.70	5979.68	NA
60399	11/4/99	9.20	ft	5986.23	5977.03	5986.70	6.70	5980.00	NA
60499	11/4/99	8.71	ft	5991.02	5982.31	5991.76	10.70	5981.06	1.25
60599	11/4/99	7.41	ft	5987.91	5980.50	5988.51	5.40	5983.11	NA
60699	11/4/99	Dry	ft	5986.92	NA	5987.42	2.30	5985.12	NA
60799	11/4/99	Dry	ft	5993.14	NA	5993.75	5.30	5988.45	NA
60899	10/11/99	8.10	ft	5995.67	5987.57	5996.09	10.20	5985.89	1.68
61099	10/11/99	9.42	ft	6001.81	5992.39	6002.29	13.60	5988.69	3.70
61199	10/11/99	9.51	ft	6002.80	5993.29	6003.31	17.00	5986.31	6.98
61299	10/11/99	7.51	ft	6003.48	5995.97	6003.88	9.80	5994.08	1.89
61399	11/4/99	5.00	ft	5983.89	5978.89	5984.47	1.50	5982.97	NA
61499	11/4/99	9.31	ft	5986.33	5977.02	5986.87	7.60	5979.27	NA
6186	11/9/99	10.31	ft	6000.60	5990.29	5999.5	11.50	5987.97	2.32
P313589	11/3/99	8.86	ft	6010.11	6001.25	6008.5	11.00	5997.50	3.75
P213689	11/9/99	10.10	ft	5996.04	5985.94	5994.3	13.00	5981.30	4.64
P317989	11/9/99	7.33	ft	5992.84	5985.51	5990.9	6.40	5984.50	1.01
P320089	11/8/99	15.02	ft	6011.87	5996.85	6009.9	18.80	5991.10	5.75
First Quarter 00									
60099	1/6/00	Dry	ft	5982.75	NA	5983.30	9.00	5974.30	NA
60199	1/6/00	6.09	ft	5986.68	5980.59	5987.18	7.70	5979.48	1.11
60299	1/6/00	8.69	ft	5986.88	5978.19	5987.38	7.70	5979.68	NA
60399	1/10/00	6.18	ft	5986.23	5980.05	5986.70	6.70	5980.00	0.05
60499	1/10/00	8.89	ft	5991.02	5982.13	5991.76	10.70	5981.06	1.07
60599	1/10/00	4.50	ft	5987.91	5983.41	5988.51	5.40	5983.11	0.30
60699	1/10/00	7.12	ft	5986.92	5979.80	5987.42	2.30	5985.12	NA
60799	1/10/00	6.92	ft	5993.14	5986.22	5993.75	5.30	5988.45	NA
60899	1/4/00	8.48	ft	5995.67	5987.19	5996.09	10.20	5985.89	1.30
61099	1/4/00	9.92	ft	6001.81	5991.89	6002.29	13.60	5988.69	3.20
61199	1/4/00	9.95	ft	6002.80	5992.85	6003.31	17.00	5986.31	6.54
61299	1/4/00	7.61	ft	6003.48	5995.87	6003.88	9.80	5994.08	1.79
61399	1/10/00	3.99	ft	5983.89	5979.90	5984.47	1.50	5982.97	NA
61499	1/6/00	8.51	ft	5986.33	5977.82	5986.87	7.60	5979.27	NA
6186	1/3/00	10.45	ft	6000.60	5990.15	5999.5	11.50	5987.97	2.18
P313589	1/3/00	9.60	ft	6010.11	6000.51	6008.5	11.00	5997.50	3.01
P317989	1/4/00	9.70	ft	5992.84	5983.14	5990.9	6.40	5984.50	NA

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The wells were sampled for volatile organic compounds using EPA method 524.2. Table 8-2 shows the sampling results for detected VOCs along the east industrial area plume (EIAP) line.

Tetrachloroethene (PCE) was the only organic compound detected above action levels except for wells 60599 and 61199, which also detected trichloroethene. Wells 61099 and 61199 showed detections of PCE at 27 and 200 ug/L respectively. Farther north, well 60599 contained concentrations of PCE at 100 ug/L. Well 61499 showed PCE at the action level of 5 ug/L and well 60199 showed PCE at a concentration of 36 ug/L. Wells located between these wells showed either no detections of VOCs or the well was dry. Table 8-2 also shows historical results from other wells in the area.

Table 8-2 VOC Detections in Groundwater for EIAP Line

Location	Sample Date	TETRACHLOROETHENE (ug/L)	Lab Qual	TRICHLOROETHENE (ug/L)	Lab Qual	Type	Detect Limit	Validation
37791	10/31/96	0.4	J	1	U	REAL	1	Y
60199	3/2/00	36		0.4	J	REAL	2	V
60299	3/23/00	0.3	J	1		REAL	1	V
60499	1/26/00	0.3	J	0.8		REAL	1	V1
60599	2/24/00	100		5	U	REAL	5	V1
60699	5/10/00	1	U	1	U	REAL	1	V1
60799	5/10/00	0.4	J	1	U	REAL	1	V1
60899	12/13/99	1		0.2	J	REAL	1	V1
61099	12/14/99	27		1	J	REAL	2	V1
61199	12/9/99	220		12	J	DUP	20	V1
61199	12/9/99	200		12	J	REAL	20	V1
61299	12/13/99	2		0.1	J	REAL	1	V1
61399	2/24/00	1	U	0.3	J	REAL	1	V1
61499	5/10/00	5		0.1	J	REAL	1	V1
6186	1/31/00	0.5	J	1	U	REAL	1	V1
39691	8/22/94	0.2	U	0.2	U	REAL	0.2	V
P213689	8/8/95	0.7	J	0.4	J	REAL	1	V
P314089	8/21/95	1	U	1	U	REAL	1	V

The results suggest that contamination is moving across the utility corridor in three areas as evidenced by the detections in wells listed above. Contaminant concentrations are all below the Tier I action level, which helps define the high concentration portion of the IA plume better than was known previously. It is possible that the concentrations of contaminants in well 61499 are an extension of those seen in well 60599; however this is not certain. The detection of PCE in the southern portion of the EIAP line is consistent with high PCE contamination near well P320089. However wells 22696 and P114689 show high TCE which is not well represented in the wells in the northern portion of the EIAP line.

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Analysis of the saturated thickness was also done for wells in the area to ascertain whether a drastic change in saturated thickness or water level would occur across the utility corridor. Given that the EAIP wells were sampled in the fall, during the dry part of the year, it is possible that water levels are not necessarily representative of the typical water levels that would be found during other times of the year. In general, saturated thickness in alluvial materials for the EIAP line are small, especially in the northern half of the line where water levels are near the bedrock contact or below it. The largest saturated thickness seen in wells east of the line occurs in wells P213689, 61099, 61199. Coincidentally, the latter two wells have significant detections of PCE. Taken as a whole, the wells east of the utility corridor tend to have an alluvial saturated thickness of 1- 2 feet. Comparison of this saturated thickness with wells to the west of the utility corridor suggests that changes may be normal for the area. Wells P313589 and P215789 have had a historic saturated thickness averaging approximately 4 feet. Farther west, wells P114689, P115689, P313489 and P320089 tend to have saturated thicknesses of 10-12 feet. The change in saturated thickness between these two sets of wells takes place over a distance of approximately 750 feet in an east-west direction in the IA. Changes from the 4 foot saturated thickness to wells with 1-2 feet occur over a similar distance. Therefore, there appears to be a natural gradient for water levels in the central Industrial Area for which strong evidence is lacking of an abrupt change at the utility corridor. Figure 8-2 presents the potentiometric surface for the EIAP area. The map reflects abrupt changes only in the area near buildings 883 and 881. This may be because of the foundation drains in the buildings.

Recommendations for additional work would involve collecting water levels and VOC samples from these wells during the spring so as to get a better picture of the amount of contamination that is moving across the utility corridor. In addition, wells may need to be installed farther east of the EIAP line near wells 61099 and 61199 to establish the extent of the IA plume in this area.

8.2 Groundwater ICP/MS Sampling Project

The Uranium ICP/MS project is a joint venture between CDPHE and RFETS to accurately determine the concentration of uranium isotopic species for areas with relatively high uranium at the Site. The project is an outgrowth of a smaller investigation done as part of the Solar Ponds Plume investigation, which was completed in 1998 (RMRS, 1999f). The ICP/MS analysis is more accurate in determining uranium species than the standard alpha spectrometry analysis done at RFETS. ICP/MS calculates an isotopic mass as opposed to an activity, which is measured by alpha spectrometry, and is therefore less influenced by count time and masking effects. The goal of the ICP/MS sampling is to determine where anthropogenic uranium contamination is occurring at RFETS as opposed to natural uranium.

Uranium samples were collected from July 1999 through August 2000. Table 8.3 lists the wells that were sampled and the concentration of isotope species. Sample locations were chosen based on the known areas with high uranium concentrations as plotted on plume maps in the 1996 RFCA Annual Groundwater Report (RMRS, 1997e). In addition, the Boundary wells near Indiana Street were also sampled along with seven upgradient background wells which were chosen south, west and north of the Industrial Area. In most cases four ICP/MS samples were collected

from the well so as to have a statistically qualified population for each location. Therefore, mean concentrations are listed in the table. In addition, QC samples were also collected at a frequency of one in twenty samples. Table 8.3 also includes the sample data from the Solar Ponds Plume investigation. Some of these wells were only sampled once and are listed with a 'Single Value' designation in the table. All samples were analyzed at the Los Alamos National Laboratory Isotope Lab (New Mexico), which has equipment capable of detecting small amounts of isotopes such as U236 with the required accuracy. Isotopic concentrations were established for U234, U235, U236 and U238. At this writing, a small percentage of samples had not been analyzed because of the recent fire near the lab. The data tables will be updated when this data is available.

From the isotopic data uranium ratios were determined. These ratios can be used to determine which locations show effects other than would be typical of natural uranium in the environment.

The ratio for U235/U238 in nature is .0072. A ratio higher than this would suggest that enriched uranium (i.e., U235) had been introduced to the environment. A ratio that is smaller than this number would suggest that depleted uranium (i.e., U238) had been added to the environment.

In addition, any detectable ratio for U236/U238 would suggest the introduction of anthropogenic uranium because U236 is a fission product and not found in nature. Table 8-3 shows the mean uranium ratios for wells in addition to those that were only sampled once.

Figure 8-3 is a plot of U235/2U38 vs. U236/U238. A horizontal line denotes the .0072 ratio point for U235/U238. The vertical line denotes the zero point for U236/U238. As can be seen from the Figure, most wells plot near the .0072 point and suggest that natural uranium is represented in the majority of wells sampled. The ratios that occur to the right of the zero point for U236/U238 suggest that some U236 may occur in these wells. Those wells that occur in the northeast or southeast quadrants of the Figure also show the effects of either enriched or depleted uranium.

Figure 8-4 shows the locations of the wells sampled along with the U235/U238 ratios. Figure 8-5 shows the U236/U238 ratio plot.

Table 8-3 Summary ICP/MS Isotope Data

Data Type	Locations	U 234	U 235	U236	U 238	U ug/l	234/238	235/238	236/238
Mean	1586	0.004028	0.440778	0.000313	62.517733	62.96	0.000066	0.007122	0.000004
Mean	3586	0.000654	0.062299	-0.000009	8.866486	8.93	0.000075	0.007144	0.000000
Mean	4087	0.003579	0.360437	0.000037	51.292162	51.66	0.000071	0.007087	0.000001
Mean	5387	0.001336	0.140144	0.000023	18.556238	18.70	0.000074	0.007656	0.000001
Mean	10294	0.002769	0.306654	-0.000054	42.715535	43.03	0.000067	0.007313	0.000000
Mean	10394	0.000477	0.038961	-0.000013	6.028885	6.07	0.000065	0.006556	0.000000
Mean	10592	0.002394	0.216995	-0.000036	30.041391	30.26	0.000081	0.007327	-0.000001
Mean	10594	0.009746	0.916240	-0.000179	129.325339	130.25	0.000086	0.007176	-0.000002
Mean	10694	0.001779	0.170900	0.000031	24.929110	25.10	0.000073	0.006812	0.000001
Mean	11294	0.000067	0.006677	-0.000012	1.002538	1.01	0.000069	0.006752	-0.000005
Mean	22996	0.000725	0.051193	0.000002	7.047342	7.10	0.000071	0.007293	0.000003
Mean	23296	0.002067	0.196020	0.000145	26.300772	26.50	0.000080	0.007407	0.000006
Mean	36391	0.002284	0.211320	-0.000041	29.462032	29.68	0.000080	0.007252	-0.000001
Mean	37791	0.001780	0.199289	-0.000031	27.581279	27.78	0.000067	0.007319	0.000000
Mean	37991	0.004748	0.366326	-0.000059	50.678761	51.05	0.000097	0.007330	-0.000001
Mean	41591	0.001470	0.168101	-0.000018	23.201038	23.37	0.000064	0.007318	-0.000001
Mean	41691	0.000207	0.020464	0.000041	3.252841	3.28	0.000067	0.006408	0.000012
Single Value	42993	0.242410	26.983200	0.187029	2960.249000	2987.70	0.000083	0.009230	0.000064
Mean	43993	0.003742	0.396439	0.001945	60.078093	60.47	0.000066	0.006782	0.000033
Mean	52894	0.003294	0.327952	-0.000048	46.659800	46.99	0.000073	0.007151	-0.000001
Mean	53194	0.002393	0.215764	-0.000004	29.310511	29.53	0.000061	0.007458	0.000001
Mean	59393	0.000925	0.090107	-0.000006	12.567129	12.66	0.000070	0.007267	0.000001
Mean	59793	0.004795	0.498053	-0.000070	68.992038	69.49	0.001583	0.007316	0.000000
Mean	61093	0.007431	1.413728	0.941030	600.071765	601.52	0.000032	0.002427	0.000042
Mean	75292	0.002514	0.220842	0.000130	30.279488	30.51	0.000082	0.007388	0.000004
Mean	75992	0.001645	0.159891	0.000300	23.797704	23.96	0.000069	0.006800	0.000013
Mean	00193	0.006032	0.576933	-0.000089	81.152072	81.74	0.000077	0.007195	-0.000001
Mean	00491	0.000959	0.090523	-0.000010	12.400294	12.49	0.000080	0.007395	-0.000001
Mean	00997	0.001045	0.091820	-0.000006	13.506709	13.60	0.000081	0.006947	0.000000
Mean	0386	0.001679	0.166965	-0.000029	23.437865	23.61	0.000074	0.007214	-0.000001
Mean	03991	0.000280	0.023597	-0.000003	3.457899	3.48	0.000084	0.006911	0.000000
Mean	0487	0.002307	0.229160	0.000039	32.136804	32.37	0.000073	0.007228	0.000001
Mean	04991	0.000889	0.064038	-0.000015	9.141401	9.21	0.000101	0.007109	-0.000001
Mean	06291	0.002267	0.131077	-0.000025	18.812863	18.95	0.000124	0.007057	-0.000001
Mean	06491	0.004060	0.365647	-0.000037	49.889794	50.26	0.000083	0.007432	0.000000
Mean	07391	0.004666	0.791799	0.010068	286.355557	287.16	0.000017	0.002806	0.000035
Mean	07991	0.001841	0.157668	0.000708	25.292882	25.45	0.000076	0.006328	0.000028
Mean	308-P-2	0.004325	0.374310	0.000038	51.934531	52.32	0.000087	0.007333	0.000001
Single Value	B102289	0.000030	0.003200	-0.000005	0.445000	0.40	0.000078	0.007360	-0.000012
Single Value	B201589	0.000120	0.014900	0.000000	2.062000	2.10	0.000061	0.007330	0.000000
Single Value	B203189	0.000370	0.027600	-0.000006	3.888000	3.90	0.000096	0.007190	-0.000001
Mean	B205589	0.023926	2.088546	-0.000125	286.951277	289.07	0.000057	0.007372	0.000000
Mean	B208689	0.012263	1.036906	-0.000099	142.741327	143.78	0.000089	0.007361	0.000000
Mean	B210489	0.004071	0.416713	0.000469	56.925560	57.35	0.000074	0.007402	0.000008
Mean	B302089	0.003974	0.318883	0.000038	43.340371	43.66	0.000088	0.007460	0.000001
Single Value	B302789	0.000170	0.020700	-0.000008	2.839000	2.90	0.000062	0.007380	-0.000003
Single Value	B305389	0.000560	0.061800	0.000002	8.590000	8.70	0.000066	0.007290	0.000000
Single Value	B405489	0.000300	0.017100	-0.000002	2.420000	2.40	0.000128	0.007170	-0.000001
Mean	P114389	0.000624	0.055216	0.000004	7.836517	7.90	0.000080	0.007135	0.000001
Mean	P207689	0.002197	0.221469	0.000032	30.780470	31.00	0.000075	0.007288	0.000001
Mean	P209189	0.000343	0.043935	0.000236	8.061863	8.11	0.000043	0.005478	0.000028
Mean	P209489	0.002230	0.248488	0.002235	38.496034	38.76	0.000062	0.006437	0.000059
Mean	P209589	0.035912	3.735736	0.018045	379.244690	383.04	0.000097	0.009934	0.000046
Mean	P209889	0.007202	0.674696	0.000106	94.217603	94.90	0.000079	0.007250	0.000001
					Mean		0.000103	0.007053	0.000007
Instument Detection Limits					Std Dev		0.000206	0.001060	0.000016
U234: 0.000015-0.000033					Mean Plus one Std Dev		0.000309	0.008114	0.000023
U235: 0.000030-0.000031					Mean Minus one Std Dev		-0.000103	0.005993	-0.000009
U236: 0.0000035-0.0000071					Mean Plus .5 Std Dev		0.000206	0.007584	0.000015
U238: 0.00095-0.00135					Mean Minus .5 Std Dev		0.000000	0.006523	-0.000001

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Interpretation of these ICP/MS values is complicated by the fact that groundwater is the medium being investigated. Groundwater can encounter both natural uranium as well as anthropogenic uranium as it migrates through the subsurface. This potential mixing of sources complicates the determination of anthropogenic influence based strictly on the ratios observed. In addition, historic processes at RFETS involved both depleted and enriched uranium, which may hamper ratio determination if these wastes accumulated in the same area (e.g. Solar Ponds). As a first approach to data analysis the U235/U238 data was screened using the mean plus one standard deviation to identify those values that clearly fall outside the 70% area of the distribution (assuming normal distribution). To identify those wells where mixing of natural and anthropogenic sources may have occurred the mean plus 1/2 Standard Deviation was used. These estimations are coupled with known information on radionuclide spills at RFETS to evaluate the results of the ICP/MS sampling.

Wells 61093, 07391 and P209189 show values less than the mean - 1Standard deviation point, which suggests the presence of a depleted uranium source. These three wells also show values for U236/U238 that are higher than the mean + 1 Standard deviation, which also suggests an anthropogenic uranium source. Well 61093 is located in the old landfill, which sits on the north bank of Woman Creek. Given that some radionuclide wastes are known to have been buried in this landfill, it seems realistic to conclude that there is a depleted uranium source influencing groundwater in this well. Wells, 59393 and 59793 which occur upgradient and downgradient of, well 61093, but not in the landfill, show normal values for U235/U236 and U236/U238. Well 07391 is used as a performance monitoring well for the Ryan's Pit source. The U235/U238 ratio is below the mean -1 Standard deviation point and the U236/U238 ratio is above the mean + 1 Standard Deviation point, suggesting that Ryan's Pit contained some depleted uranium waste. Ryan's Pit was excavated in 1996 and contaminated soil was removed. However, post remediation groundwater data show an increase of uranium and VOCs in this well. Well P209189 is located at the southwest corner of the westernmost Solar Pond (207C). The Solar Ponds were built to collect and consolidate radionuclide process wastes. The U235/U238 ratio is below the mean -1 Standard deviation point and the U236/U238 ratio is above the mean + 1Standard Deviation point, suggesting that depleted uranium waste was contained in this pond at some time. Well P209489 is located downgradient of well P209189 and downgradient of the Solar Ponds in general. This well shows a U235/U238 ratio that is below the mean -.5 Standard deviation point, which could suggest a mixed influence from a depleted uranium source.

The only other wells that suggest evidence of influence from a depleted uranium source are wells 41691, 07991, and P209489. Those wells show U235/U238 ratios that are below the mean -.5 Standard deviation point, which could suggest a mixed influence from a depleted uranium source. Wells 07991 and P209489 show U236/U238 ratios that suggest the presence of U236. Well 41691 is a boundary well located on the Woman Creek drainage at the eastern boundary of the Site. Historic data for this well has shown detections for plutonium and americium above action levels, but data from the last five years has shown no detections for these analytes. It is probable that any radionuclide contamination detected in this well is related to sediments in the Walnut Creek drainage, as this well is located very near the stream. Well 07991 is located in the former OU2 in the area of the East Trenches IHSSs. Well P209489 is located in the northwest corner of the Solar Ponds (207A).

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Wells P209589 and 42993 are located near the Solar Ponds. Both wells show values greater than the mean + 1Standard deviation point, which suggests the presence of a enriched uranium source. These two wells also show values for U236/U238 that are higher than the mean + 1 Standard. Deviation, which also suggests an anthropogenic uranium source. Well P209589 is located downgradient of the northeasternmost Solar Pond, while well 42993 is located adjacent to the westernmost Solar Ponds. The Solar Ponds were created to consolidate radionuclide waste streams primarily from the uranium production buildings, so it seems plausible that water that leaked from these ponds would contribute to groundwater locally.

The only other well that suggests evidence of influence from an enriched uranium source is well 5387. Well 5387 shows a U235/U238 ratio that is above the mean +.5 Standard deviation point, which could suggest a mixed influence from an enriched uranium source. This well does not show a U236/U238 ratio that would suggest the presence of U236. Well 5387 is located on the 881 hillside due south of Building 881. This building historically processed enriched uranium in the 1950s. Wells 10592, 36391, 37991 and 0487 were also sampled from the 881 hillside and show ratios similar to that of natural uranium.

The ICP/MS data not only showed areas that may have depleted or enriched uranium affinities, but also qualified certain wells with historic high uranium values as having natural uranium affinities. Two of these wells are B205589 and 10294. Well B205589 is located in the northernmost part of the Site near a seep complex. This well has historically high uranium values relative to nearby wells. Well 10294 is a Boundary well located in the southeasternmost corner of the Buffer zone. It is a replacement well for B303089, which had high historic U238 values. Both of these wells have ratios in the natural range and suggest that the anomalous concentrations for uranium are also natural.

As a result of the ICP/MS project, recommendations can be made about monitoring uranium in the groundwater at RFETS. Currently uranium samples are analyzed for U233/234, U235 and U238 by alpha spectrometry. In light of the data received from the ICP/MS project, it seems prudent to discontinue monitoring for uranium species because it is unlikely that the ratios would change over time. It is therefore recommended that, in the future, groundwater be monitored for total uranium by alpha spectrometry only. Should total uranium values increase in some location with time, an ICP/MS sample would be collected to verify that the uranium seen is naturally occurring. This change would result in less costly sample analysis by eliminating uranium isotope data that is insufficient for isotopic ratio determinations. In addition, the ICP/MS data can be used to limit the need for radiologic screens in groundwater for most of the Site because the uranium found is natural except in a few small areas. This information may reduce remediation concerns related to the presence of uranium at levels exceeding current RFCA action levels.

8.3 Site Wide Water Balance

Closure activities and post closure conditions have the potential to alter groundwater and surface water flow at the RFETS. Because many Site closure decisions cannot be made without first considering quantified predictions of closure effects on groundwater and surface water flow, a Site water balance is necessary to assess current conditions

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as well as various closure scenarios. The site wide water balance will address the problem of determining to what degree Site closure affects surface water and groundwater flow in the Woman Creek and Walnut Creek drainages. This information will be utilized to assess a number of Site closure issues including, but not limited to, compliance with surface water action levels, impacts to biological resources, and post closure land configuration design.

The site wide water balance will serve to quantify surface water and UHSU (tributary) groundwater flow and interactions occurring within the IA, in the drainage pathways immediately downstream, and within the eastern Buffer Zone. More specifically, modeling will focus on the Woman Creek and Walnut Creek drainages and associated upgradient groundwater source areas within the RFETS property boundary. The Rock Creek drainage and the underlying deep regional aquifer systems are excluded from consideration because of their hydrological isolation from potential IA sources and closure actions and their effects.

During 1999 the site wide water balance data quality objectives (DQOs) were identified. In the spring of 2000, thirteen (13) monitoring wells were installed with In-Situ Inc. Hermits® or Trolls® for continuous water level monitoring. In addition, 72 wells were activated for quarterly water level measurements. All of these measurements are in addition to the regularly scheduled groundwater monitoring specified in the IMP and measurements taken by the real time groundwater monitoring network described in Section 3.4.

8.4 Discussion of VOC and Nitrate Groundwater Plumes

The 1998 composite VOC (TCE, PCE, vinyl chloride, and carbon tetrachloride) and nitrate plume maps were combined into one map (Plate 11). The plumes were updated using the 1999 data for wells with at least one Tier I or Tier II VOC exceedance and at least one Tier II dissolved nitrate exceedance (Section 2.0 and Table 2-10). The 1999 groundwater chemistry data extracted from the SWD (Section 11.0 of this report) were used in constructing these maps. All monitoring wells with analytical results for the years 1991 through 1998, regardless of the number of samples collected during that time, were used to produce the 1998 plume maps (RMRS, 1999m). The 1998 composite VOC and dissolved nitrate plume maps consist of data compiled from approximately 600 wells. Plume boundaries, where drawn, represent the best estimates of the spatial distribution of concentrations of chemicals of concern in groundwater at RFETS.

8.4.1 Volatile Organic Compound Plumes

Plate 10 presents the 1998 composite of four common VOC contaminants – TCE, PCE, vinyl chloride and carbon tetrachloride and modified with 1999 data summarized in Table 2-10 and from plume maps generated in support of the *Sampling Analysis Plan for the D&D Groundwater Monitoring of Buildings 707, 776/777, 371/374, 865, and 883 (RMRS, 2000 RMRS-2000.* The VOC plume map has been updated from those published in previous Annual RFCA Groundwater Monitoring Reports (RMRS, 1997e and 1999m; and DOE, 1998a) to reflect new data collected in 1999, revised plume interpretations, and the locations of the Mound Plume, East Trenches, and Solar Ponds Groundwater Treatment Systems. Plume monitoring discussions and VOC trend evaluations are presented

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elsewhere within this year's report. The main areas of change involved modifying the Tier I and Tier II plume boundaries as summarized below:

Refinements to the Tier I and Tier II boundary were made at the leading edge of the 903 Pad/Ryan's Pit plume near the South Interceptor Ditch at Pond C-1 as a result of the Tier I exceedance in well 90099 and Tier II exceedance in well 90399.

The leading edge of the Mound plume boundary was shortened slightly to account for the Mound Plume Treatment System and only Tier II action level exceedances for vinyl chloride in well 3586 and 1,1-dichloroethene in well 15699, downgradient of the treatment system.

Refinements to the Tier I and Tier II boundary were made at the leading edge of the East Trenches Plume based on construction and data from the East Trenches Groundwater Treatment System. The Tier I plume was redrawn to intercept the East Trenches Groundwater Treatment System based on the influent and effluent VOC concentrations and Tier II exceedance observed in well 95199 (previously a Tier I exceedance). The Tier II plume was redrawn to exclude well 95099 due to VOC concentrations below Tier II observed during 1999. The Tier I plume was adjusted based on VOC concentrations in well 12191, upgradient of Trench T-3, decreasing below the Tier I action levels. Well 23296 remained a Tier II exceedance and the results from this well do not change the VOC plume configuration.

The 881 Hillside/IHSS 119.1 plume was redrawn without the Tier I exceedance due to the decrease in VOC concentrations below Tier I observed in the collection well (COLWEL). The Tier II extent was reduced to reflect the location of the french drain and the decrease in VOC concentrations below Tier II observed in the collection gallery (COLGAL).

A small area of Tier I VOC contamination centered around D&D monitoring well 40099, east of Building 444, was added. The small area of Tier II VOC contamination centered around D&D monitoring well 10498, located downgradient of Building 123, was increased to encompass the Tier I VOC contamination in well 40099 and the Tier II VOC contamination observed in well 40299, south of Building 447, and well P416789, south of Building 439.

A small area of Tier II VOC contamination centered around SW13494, the footing drain outfall for Building 881, was added.

In 1999, an evaluation of the eastern boundary of the IA VOC plume was implemented to better define the extent of VOC contamination east of the Eighth Street utility corridor and upgradient of Buildings 707, 776, 778, 883, and 865. The eastern Tier II boundary was redrawn to reflect exceedances observed in wells 60199, 60599, 61099, 61199, and 61499. The northeastern Tier I boundary was redrawn to reflect the lack of Tier I exceedances in the wells along the Eighth Street utility corridor.

The northeast boundary of the North Industrial Area Plume, northeast of the former location of Building 779, was modified as a result of the historical Tier I VOC exceedances in well P210189 and Tier II VOC exceedances in wells 2286, 5687, and P209189.

The north boundary of the North Industrial Area Plume, north of Building 774, was extended due to the Tier II exceedances observed in Bowmans Pond (see Section 9.3). The Tier II extent was also modified to include well 20698 north of Building 779.

The western boundary of the Tier I carbon tetrachloride plume originating from IHSS 118.1 was extended to encompass well 21098.

A small area of Tier II VOC contamination centered around well 30595, north of the Solar Ponds, was added based on the 1997 Tier II TCE exceedance.

8.4.2 Nitrate Plumes

The 1999 nitrate plume map has been updated slightly from those published in previous Annual RFCA Groundwater Monitoring Reports (RMRS, 1997b, 1998 and 1999) to reflect new data collected in 1999. Plate 10 shows the estimated extent of Tier I (1,000 mg/L) and Tier II (10 mg/L) groundwater nitrate contamination based on data collected from the period 1991 to 1999. For reference, the background concentration for nitrate in groundwater at RFETS is 4.7 mg/L (DOE, 1993b).

Plate 10 illustrates one major nitrate plume (Solar Ponds Plume) and four areas of more minor nitrate contamination. The Solar Ponds Plume (SPP) is located in the northeast portion of the PA and extends from the Solar Evaporation Ponds to the northeast towards North Walnut Creek. All values of nitrate over the Tier I action level are associated with this plume. The four minor areas of nitrate concentration above the Tier II action level are associated with the area north of the Original Landfill (IHSS 115), the 903 and 904 Pads, IHSS 119.1 on the 881 Hillside, and an area west of the Present Sanitary Landfill Pond.

Isolated occurrences of nitrate above the Tier II action level were also observed at the following locations:

- well 41099 (47 mg/L), north of Building 886;
- well 22896 (12 and 15 mg/L) north of Building 559;
- well 2987 (13 mg/L) north of the South Interceptor Ditch and east of Pond C1;
- well 00597 (12 and 13 mg/L) at the south perimeter of the Present Sanitary Landfill;
- well 02197 (13 mg/L) southeast of the Present Sanitary Landfill (IHSS 114); and
- well 10994 (11 mg/L) downgradient of the Original Landfill.

No modifications of the plume boundaries were required based on the 1999 data. However, monitoring of the isolated occurrences, as summarized above, will be performed and additional wells may be added for nitrate analysis, if required.

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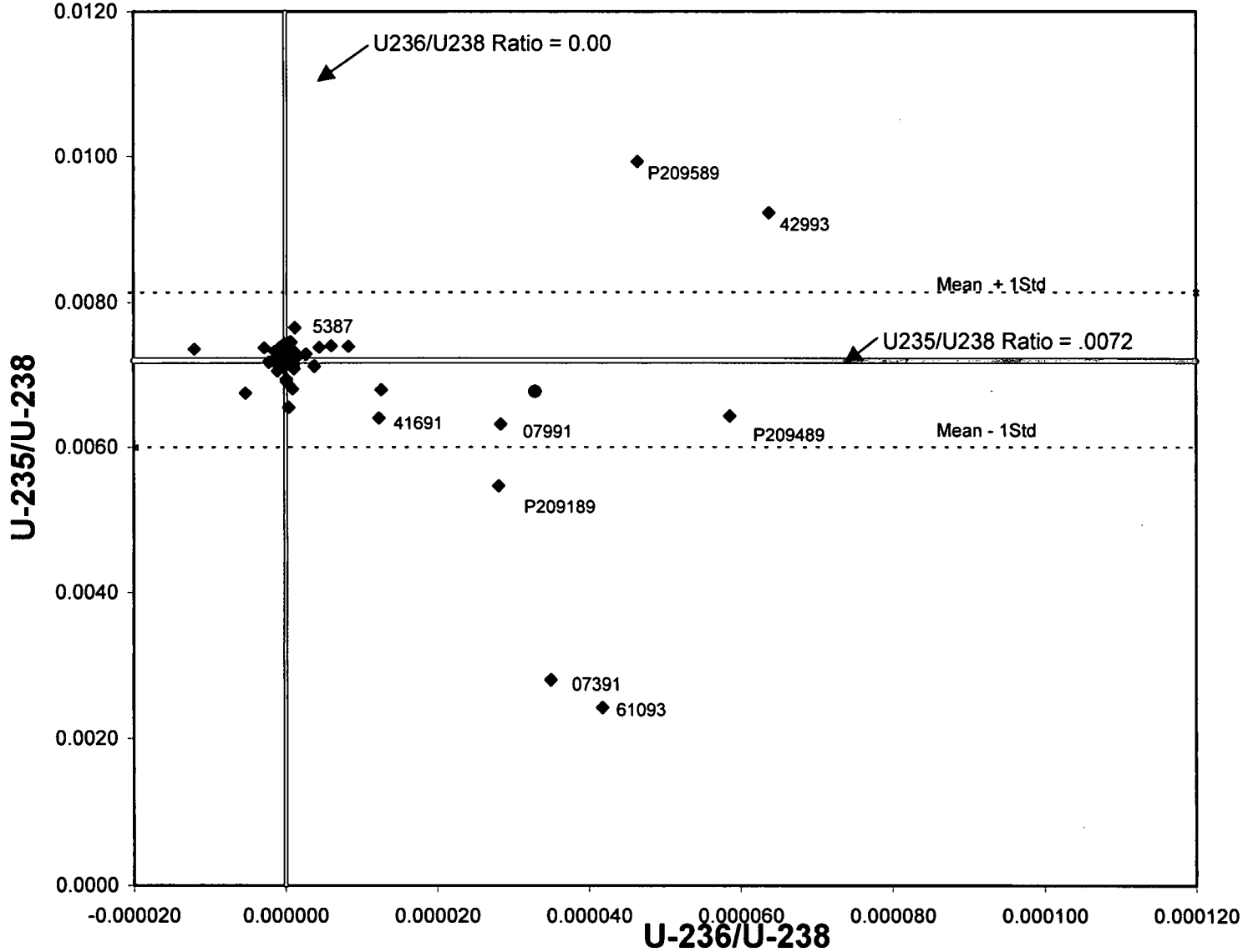
Figure 8-3 U-235/U-238 Ratio vs. U-236/U238 Ratio



9.0 GROUNDWATER CHARACTERIZATION ACTIVITIES

9.1 903 Pad VOC Investigation

As stated previously in Section 7.2, the 903 Pad was utilized as a drum storage area from the summer of 1958 to January 1967. The drums contained oils and VOCs contaminated with various radionuclides. Also stored in drums were hydraulic, vacuum pump, and silicone oils. Leaking drums were observed in 1964 during routine handling operations. When cleanup of the 903 Pad began in 1967, there were a total of 5,237 drums at the storage site, approximately 420 of which had leaked to some degree. It was estimated that approximately 5,000 gallons of contaminated liquid, containing about 86 grams of plutonium, had escaped to the subsurface. VOCs have impacted groundwater as a result of the leaking drums. Elevated concentrations of VOCs are present in groundwater beneath and downgradient of the site.

The Site Characterization of the 903 Drum Storage Area (Pad), 903 Lip Area, and Americium Zone, was completed in 1999. The investigation area is located in the Buffer Zone Operable Unit (OU). The purpose of the investigation was to estimate the volume of soil exceeding the RFCA action level Framework (ALF) Tier I soil action levels or other action levels identified as being protective of surface water for radionuclides in surface soils and VOCs in the subsurface (RMRS, 1999h). This discussion will focus on the portion of the investigation associated with the 903 Pad and the VOC contamination associated with the 903 Pad. The portion of the investigation which encompasses the 903 Lip Area and the Americium Zone deal with radiological contamination which spread from the 903 Pad to the 903 Lip Area by wind and rain and to the Americium Zone primarily by wind dispersion. The following Section 9.2 discusses the results of actinide transport and potential impacts to groundwater.

Work completed during 1999 on the 903 Pad VOC investigation, that are pertinent to this discussion, consisted of the drilling and sampling of nine soil boreholes. Boreholes were advanced using Geoprobe push drilling methodology and varied in depth from 16 to 24 feet below ground surface and were sampled every four feet or at indications of contamination. The sampling results are summarized in the *Characterization Report for the 903 Drum Storage Area, 903 Lip Area, and Americium Zone* (RMRS, 1999n). Volatile organic compounds identified consisted of tetrachloroethene, trichloroethene, methylene chloride, and 1,2-Cis-Dichloroethylene. Location of the 903 Pad and a summary of VOC detections in groundwater are presented in Figure 9-1. No new monitoring wells were installed during the investigation of the 903 Pad.

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9.2 Actinide Aseptic Drilling Project

Background

The potential migration of plutonium-239/240 (Pu-239/240) and americium-241 (Am-241) from surface soils to groundwater at RFETS is being considered as part of the long-term remedial strategy currently under evaluation for Site closure implementation by DOE, the Kaiser-Hill (K-H) Team, and the Actinide Migration Evaluation group. Existing data on actinide migration at RFETS was summarized for the development of a conceptual model designed to gain an understanding of actinide transport pathways active at the Site (DOE, 1997). Over 30 monitoring wells at RFETS were found to contain mean groundwater Pu-239/240 and Am-241 activity-concentrations that exceeded RFCA Tier II action levels (0.15 picocuries per liter [pCi/L] and 0.145 pCi/L, respectively) for these contaminants. Groundwater interactions with surface water are inevitable as virtually all shallow groundwater on Site flows toward the major stream drainages and is eventually discharged to surface water via streams or reservoirs. Consequently, groundwater was characterized as representing a potential long-term threat to surface water based on a preliminary review of the available data.

The presence of Pu-239/240 and Am-241 in groundwater samples at RFETS has been the subject of much speculation and study (DOE, 1997a; EG&G, 1995c; CDPHE, 1996; Harnish et. al., 1994 and 1996; and Litaor, et. al., 1996). These contaminants are usually considered to be relatively immobile in the soil and groundwater environment due to their low aqueous solubility and tendency to strongly sorb on soil media (Cleveland et. al., 1976 and Honeyman and Santschi, 1997). Most wells with exceedances are located near potential source areas, such as the 903 Pad, but some are located at great distances from sources, including monitoring wells located at the east Site boundary along Walnut Creek. Colloid facilitated-transport of radionuclides in groundwater has been reported in the literature as being a potentially important mechanism for increased radionuclide mobility in the subsurface. Alternatively, it has been speculated that well completion zones may have been cross-contaminated when drilling through radionuclide-bearing surface soils or sediments found near source areas.

Because a significant disparity exists between observed versus expected Pu-239/240 and Am-241 groundwater contaminant distributions, further evaluation of historical groundwater Pu-239/240 and Am-241 data and potential transport pathways was undertaken in 1998 to assess the significance of groundwater action level exceedances reported for RFETS monitoring wells (DOE, 1998c). This analysis concluded that much of the Pu-239/240 and Am-241 contamination detected in groundwater probably occurs from residual surface soil contamination introduced to the borehole during drilling and well installation operations (drilling-artifact contamination). Groundwater samples collected from these wells using historical RFETS sampling techniques (i.e., bailing) have the unavoidable effect of suspending contaminated drilling-artifact soil materials, thus creating artificially high contaminant levels. Under these circumstances, existing groundwater sampling results are unreliable indicators of groundwater contaminant concentration and transport.

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Well drilling and installation using special surface-casing techniques offer a means to minimize or eliminate drilling-artifact contamination as a source for Pu-239/240 and Am-241 detections in groundwater samples. When paired with existing monitoring wells containing Pu-239/240 and Am-241 contamination, monitoring wells installed with special surface-casing techniques can 1) provide a basis for assessing the effects, if any, of drilling-artifact contamination on groundwater sample quality, and 2) allow for the collection of groundwater samples that more accurately represent groundwater contaminant concentrations and transport conditions. Non-paired, specially-cased monitoring wells were installed in 1994 to evaluate elevated Pu-239/240 and Am-241 activity-concentrations in the lower Walnut Creek drainage and to upgrade boundary monitoring well integrity in other RFETS drainages (EG&G, 1995). No Pu-239/240 and Am-241 contamination above Tier II groundwater action levels was detected in any of the wells installed under this program. Until 1999, monitoring wells installed with special surface-casing techniques were not paired with existing monitoring wells to validate or invalidate radionuclide detections found in the original well.

9.2.1 Type and Extent of Contamination

Soils

Actinide transport to groundwater from contaminated surficial soils is a primary concern at RFETS. As shown in Figure 9-2, widespread areas of the Buffer Zone and localized areas in the IA have received windblown Pu-239/240 surface soil contamination. Vertical soil profiles of Pu-239/240 activity-concentrations for the uppermost 96 centimeters (cm) (3 feet) of RFETS soils presented in DOE (1998c) and Litaor et. al. (1994) indicate that plutonium movement is mainly restricted to the top 20 to 25 cm of soil. Pu-239/240 activity-concentrations exponentially decline below a depth of about 12 cm (Litaor et. al., 1994) to less than 1 pCi/g at 72 cm. Elevated plutonium activity-concentrations were detected in soil macropores (e.g., root channels) compared to the surrounding soil matrix, but extensive macropore development was not observed below a depth of 120 cm (3.9 feet) (Litaor et. al., 1994). This depth roughly corresponds with the average depth of most RFETS grass and forb root systems as reported in Weaver (1920). According to Weaver (1920), many grassland plants have root systems that can exceed a depth of 5 feet and some can attain maximum depths in excess of 10 feet. This information suggests that deep soil macropores may be present at RFETS, but these macropores should be relatively unimportant as a source medium for drilling-artifact contamination.

Groundwater

Figure 9-2 illustrates that wells containing unfiltered Pu-239/240 contamination (colored dots) are generally associated with surface soil contamination areas (color-shaded contours). The highest groundwater unfiltered Pu-239/240 activity-concentrations are found in alluvial wells at and east of the 903 Pad. Elevated unfiltered Pu-239/240 activity-concentrations are also found in certain bedrock wells in this area, including well 11791, as described in DOE (1998c).

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Activity-concentration plots of unfiltered Pu-239/240 and Am-241 for wells 1587, 06991, 11791, and P313489 presented in DOE (1998) indicate that, with the exception of well 1587, Pu-239/240 and Am-241 activity-concentrations have generally declined with time. The reason for this decline is thought to result from the flushing of contaminants in the borehole disturbed zone caused by routine sampling activities.

9.2.2 Project Approach

The following conditions were considered in the development of the sampling strategy for the Actinide Drilling-Artifact Contamination Project:

- The operating history of the former 903 Pad Drum Storage Area and other sites indicate that actinide contaminants, specifically Pu-239 and Am-241, have been released to the environment and transported by wind action to surface soils east and southeast of the pad.
- The physical and chemical properties of the contaminants, vertical soil actinide activity-concentration profiles, and drilling and well installation documentation indicate that cross-contamination from surface soil materials probably accounts for much, if not all, of the actinide contamination found in groundwater samples collected from 903 Pad and surrounding area wells.
- Existing groundwater analytical data indicate that actinide contamination occurs principally in the colloidal and particulate phase.
- Seasonally variable hydrologic conditions can affect well development effectiveness and sampling program success.

Additional details on project approach and sampling strategy are presented in the Actinide Drilling-Artifact Contamination Project sampling and analysis plan (SAP) (DOE, 1999a).

9.2.3 Monitoring Well Locations and Rationale

Four monitoring well locations (50099, 50199, 50299, and 50399) were chosen to evaluate actinide groundwater quality associated with Pu-239/240 and Am-241 surface soil contamination areas. These locations correspond to existing wells 1587, 06991, 11791, and P313489 respectively, all of which have a history of elevated groundwater Pu-239/240 and Am-241 activity-concentrations. Three of these wells, 1587, 06991, and 11791, are associated with wind-blown soil contamination from 903 Pad and Lip Area. The fourth well is associated with surface soil contamination in the IHSS 160 area (Building 444 parking lot). Figure 9-3 illustrates the location of these wells. The rationale for each monitoring well location is summarized in Table 9-1.

Table 9-1 Actinide Drilling-Artifact Contamination Monitoring Well Location Rationale

Well Number	Location	Rationale
50099	10 feet west of paired well 1587	Upgradient location from well 1587 for evaluating historical actinide groundwater contamination per DOE (1998). Groundwater at well 1587 has an apparent increasing Pu-239/240 trend; has a partially saturated screened interval; and was the focus of previous USGS research.
50199	10 feet west of paired well 06991	Upgradient location from well 06991 for evaluating historical actinide groundwater contamination per DOE (1998). Well 06991 has the highest average Pu-239/240 concentration of all wells not located on the 903 Pad and has a partially saturated screened interval.
50299	10 feet north of paired well 11791	Upgradient location from well 11791 for evaluating historical actinide groundwater contamination per DOE (1998). Well 11791 is completed in weathered bedrock materials in an area thought to be a bedrock groundwater discharge area. It has a fully saturated screened interval.
50399	10 feet northeast of paired well P313489	Cross gradient location from well P313489 for evaluating historical actinide groundwater contamination per DOE (1998). Well P313489 is located in the IA outside of the 903 Pad Soil Contamination Area and has a fully saturated screened interval.

9.2.4 Well Design and Installation

Well Design

Monitoring well designs selected for the program were consistent with the construction specifications prescribed in OPS GT.6, Rev. 2, *Monitoring Well and Piezometer Installation* . These wells were designed with screened intervals that closely approximate the paired well, except that the top of the screened or filter-packed interval for certain wells were set deeper than the original well to provide additional well intake zone protection. To ensure that these wells excluded drilling-artifact contamination, all wells were installed using dual ("aseptic") casing construction methods described in PRO.114, *Drilling and Sampling Using Hollow-Stem and Rotary Drilling and Rock Coring Techniques*, and as modified in the SAP.

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The depth of actinide contamination in surface soils was an important consideration for well design. Surface casing must prevent contaminated soils from entering the borehole and contaminating deeper materials. As most Pu-239/240 is mainly limited to the top 40 to 60 cm of soil, a surface casing depth of 65 cm (2.1 feet) below original grade was chosen to isolate the majority of contamination while permitting sufficient room for excess soil removal and casing cleaning. A target activity-concentration of below 1 pCi/g was adopted for determining whether the 65 cm isolation casing depth was adequate for excluding surface soil contamination from potentially entering the wellbore. Pu-239/240 or Am-241 activity-concentrations found to be higher than this criterion would result in analysis of deeper soil samples to document contamination conditions of the well intake zone and allow an assessment of cross-contamination potential for the well.

Typical well construction materials consisted of a 2.5 foot section of 16-inch inner diameter (ID) steel surface casing and concrete pad, and 2-inch ID, schedule 40 polyvinyl chloride (PVC) riser and factory cut (0.010-inch slot width) well screen with a 1 foot long PVC sump. Protective casing, consisting of a 6-inch ID or larger steel riser with locking cap and lock, was set in concrete to a depth of about 2 to 3 feet. Caution was exercised during each step of the well construction process to prevent surface contaminants from entering the borehole. All downhole equipment, including augers, rods, tools, and casing, were decontaminated and radiologically surveyed prior to advancing past the base of the isolation casing.

Borehole Drilling and Logging

Prior to drilling at each site, the uppermost 3 to 4 inches of soil was removed from a 3 x 3 foot square area surrounding the hole location. The excavated surface was then securely covered with plastic sheeting to prevent grossly contaminated soils from entering the immediate drill hole area. The work area immediately surrounding the excavation was also covered with plastic sheeting to suppress dust and minimize potential airborne contamination of the excavation soil surface. Surficial soil sampling and drilling was initiated through a pre-cut 16 to 20-inch hole cut in the plastic sheeting at the center of the square excavated area. This square area was later used for well pad construction in conjunction with cementing-in the surface isolation casing.

At each drill site, a 20-inch diameter hole was hand excavated to a depth of about 1.8 feet below the excavated soil surface in preparation for surface isolation casing installation. All soil cuttings were carefully removed in 4 to 6-inch lifts using freshly decontaminated tools in preparation for isolation casing installation. Steel surface casings were placed and seated in the boreholes to an approximate depth of 2.1 feet below original ground surface, with a 0.4 foot stick-up, to prevent potentially contaminated surface soil from entering the borehole. The plastic sheeting protecting the excavation surface was then cut at the borehole in preparation for cementing and pad construction. After sealing the top of the surface casing with plastic and duct tape, concrete was placed into the casing annulus, while causing as little disturbance to the borehole wall as possible. Once the annulus was filled, the remainder of the pad was poured to a finished dimension of 3 x 3 feet wide by 6-inches thick using a wooden frame.

After allowing for a 24 hour or longer cement set-up time, the plastic surface casing cover was removed for final clean out and sampling. The decontaminated auger string was then advanced to the estimated target total depth in

the SAP based on drilling results obtained from the existing paired well. During drilling, continuous soil cores and subsurface samples from selected depths were obtained at two-foot increments using a split spoon sampler.

Well Installation

Groundwater monitoring wells were installed in accordance with GT.06, *Monitoring Wells and Piezometer Installation* and the project SAP (DOE, 1999). Generally, the wells were installed in accordance with the design specifications set forth in the SAP, although adjustments for screen depth (wells 50199 and 50299) and screen length (well 50199) were made to account for unexpected variations in bedrock depth. Table 9-2 contains the as-built specifications for the wells.

Table 9-2 Well Construction Specifications for Actinide Drilling-Artifact Contamination Wells

Well Number	Paired Well Number	Surface Isolation Casing Depth (ft)	Depth to Bedrock (ft)	Top of Well Intake (filter pack) (ft)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Total Depth (ft)
50099	1587	2.1	20.4	9.7	10.7	20.7	21.7
50199	06991	2.1	21.0	9.5	10.7	20.7	22.5
50299	11791	2.1	<2.4	9.1	8.3	14.3	14.6
50399	P313489	2.1	20.7	15.8	17.1	22.1	22.5

Note: All depths are reported from original ground surface

Well Development

Monitoring wells were developed prior to sampling using the procedures specified in PRO.106, *Well Development*, and as modified by the SAP. The main objectives of well development were to improve well yields and reduce turbidity levels, thus ensuring that any groundwater samples obtained were as representative as possible of undisturbed conditions. All water produced during well development was handled as uncharacterized development water in accordance with FO.05, *Handling Purge and Development Water.*

9.2.5 Sample Collection

Soil Samples

Soils samples collected at new drilling sites consisted of a set of five, depth-discrete surface and subsurface samples for documentation of Pu-239/249 and Am-241 contaminant conditions for drilling-artifact contamination evaluation. Surface soil samples were collected from each new well location site using the grab sampling method specified in GT.08, *Surface Soil Sampling.* After the uppermost 3 to 4-inch layer of soil was removed, a soil sample was collected from the borehole area to a depth of approximately 5 to 6-inches below the excavated soil surface.

Following surface isolation casing installation and clean out, a subsurface soil sample was collected from the base of this casing to a depth approximately 1 to 2-inches below the casing point using hand tools, as specified in GT.08, *Surface Soil Sampling*. These samples were submitted for analysis to document the efficacy of the isolation casing in excluding surface soil contamination. Additional subsurface soil samples were collected from the 4.0 to 5.0 foot depth interval, slough deposited at the top of the well intake zone, and from undisturbed soils in the upper 1-foot of the well intake zone. These samples were stored for possible future analysis pending the results of the uppermost soil and groundwater samples.

Groundwater Samples

Groundwater sampling began after the well fully recovered from the well development process. Pu-239/240, Am-241, and total suspended solids (TSS) samples were collected from each of the wells in well pairs 11791/50299, P313489/50399, 1587/50099, and 06991/50199 using the bailer method, as specified in PRO.108, Measurement of Groundwater Field Parameters, and PRO.113, Groundwater Sampling. Variability in operator bailing technique was minimized by having the same bailer operator collect samples from both wells in a pair. Well purging focused on turbidity monitoring to a greater degree than routine sampling because plutonium and americium are strongly particle-reactive and excessive turbidity levels might compromise paired comparisons. Turbidity levels in groundwater were monitored and allowed to stabilize prior to sampling. At the time of sampling, turbidity levels ranged from 2 to 149 NTUs (clear to cloudy) in the new wells and 0 to 239 NTUs in the existing wells. All wells yielded adequate sample volumes for collecting complete sample suites proposed in the SAP.

9.2.6 Sampling Results

Soils

Table 9-3 presents the results of Pu-239/240 and Am-241 analyses for the uppermost soil samples collected at each new well site. Samples collected at the excavated soil surface (3 to 4-inches below original grade) confirm that shallow soils were contaminated with actinides (2.8632 to 489.2946 pCi/g Pu-239/240 and 0.6885 to 104.5068 pCi/g Am-241) prior to surface isolation casing installation. Soil activity-concentrations at the base of the isolation casing were below the target activity-concentration of 1 pCi/g in wells 50199, 50299, and 50399, but exceeded the criteria at well 50099 (6.0409 pCi/g Pu-239/240 and 1.0666 pCi/g Am-241). The presence of above-target Pu-239/240 and Am-241 concentrations in this sample indicate that some shallow soil contamination was present when drilling was initiated through the isolation casing. For this reason, the deeper soil samples from this borehole were subsequently submitted for analysis to further examine the possibility that surface contamination may have been introduced to the well intake zone. These results will be reported in the Actinide Pathways report scheduled for completion in FY01.

Groundwater

The results of groundwater samples for all paired wells are contained in Table 9-4. Pu-239/240 activity-concentrations in groundwater ranged from below detection to 0.0601 pCi/L in the new wells and from below detection to 0.1067 pCi/L in the existing wells. Am-241 activity-concentrations were lower than Pu-239/240 in all wells except well 06991. Generally, Pu-239/240 and Am-241 activity-concentrations were lower in the new wells compared to the existing wells, although further sampling will be required to verify these initial results. From these results, it is clear that actinide activity-concentrations at these locations are significantly lower than found in previous years, as reported in DOE (1997a). The results of verification sampling and significance of the data will be reported in the Actinide Pathways report scheduled for completion in FY01.

Table 9-3 Soil Sampling Results from New Actinide Drilling-Artifact Contamination Wells

Location	Sample Date	Depth Interval (ft)	Bottle #	Analyte	Result	Unit	Lab Qual	Valid	Detect Limit	2 Sigma	Lab
50099	10/20/99	0.0-0.5	00D0544-002.002	AMERICIUM-241	104.5068	pCi/g			0.0501	2.7246	GEL
50099	10/20/99	0.0-0.5	00D0544-002.002	PLUTONIUM-239/240	489.2946	pCi/g			0.2145	12.1989	GEL
50099	10/22/99	2.3-2.4	00D0544-003.002	AMERICIUM-241	1.0666	pCi/g			0.1031	0.3948	GEL
50099	10/22/99	2.3-2.4	00D0544-003.002	PLUTONIUM-239/240	6.0409	pCi/g			0.2041	0.6721	GEL
50199	10/21/99	0.3-0.5	00D0544-008.002	AMERICIUM-241	66.7397	pCi/g			0.1443	2.6733	GEL
50199	10/21/99	0.3-0.5	00D0544-008.002	PLUTONIUM-239/240	360.1567	pCi/g			0.2064	6.5475	GEL
50199	10/28/99	2.3-2.4	00D0544-009.002	AMERICIUM-241	0.0302	pCi/g	U		0.1851	0.0765	GEL
50199	10/28/99	2.3-2.4	00D0544-009.002	PLUTONIUM-239/240	0.189	pCi/g	U		0.2902	0.1903	GEL
50299	8/25/99	0.4-0.5	99D0069-002.002	AMERICIUM-241	26.4967	pCi/g		V1	0.0945	1.8839	GEL
50299	8/25/99	0.4-0.5	99D0069-002.002	PLUTONIUM-239/240	160.9394	pCi/g		V1	0.2471	3.794	GEL
50299	8/26/99	2.2-2.4	99D0069-003.002	AMERICIUM-241	0.0637	pCi/g	J	V1	0.0575	0.0721	GEL
50299	8/26/99	2.2-2.4	99D0069-003.002	PLUTONIUM-239/240	0.084	pCi/g	U	V1	0.2456	0.1304	GEL
50399	8/16/99	0.4-0.5	99D9513-001.002	AMERICIUM-241	0.6885	pCi/g		V1	0.0433	0.2056	GEL
50399	8/16/99	0.4-0.5	99D9513-001.002	PLUTONIUM-239/240	2.8632	pCi/g		V1	0.0725	0.5424	GEL
50399	8/17/99	2.2-2.8	99D9513-003.002	AMERICIUM-241	0.0477	pCi/g	U	V1	0.0646	0.0661	GEL
50399	8/17/99	2.2-2.8	99D9513-003.002	PLUTONIUM-239/240	0.1505	pCi/g	J	V1	0.0582	0.1115	GEL

Table 9-4 Groundwater Sampling Results from Actinide Drilling-Artifact Contamination Well Pairs

Location	Sample Date	Bottle#	Analyte	Result	Unit	Lab Qual	Detect Limit	Valid	2 Sigma Error	Lab
06991	11/29/99	00D0838-001.003	AMERICIUM-241	0.01837	pCi/L	J	0.0123	V	0.011796	GEL
50199	11/19/99	00D0822-001.003	AMERICIUM-241	0.00338	pCi/L	U	0.01243	V	0.006610	GEL
06991	11/29/99	00D0838-001.003	PLUTONIUM-239/240	0.00681	pCi/L	U	0.01836	V	0.010553	GEL
50199	11/19/99	00D0822-001.003	PLUTONIUM-239/240	0.03873	pCi/L		0.01297	V	0.016902	GEL
06991	11/29/99	00D0838-001.002	TOTAL SUSPENDED SOLIDS	13	mg/L		5	V		ACCU
50199	11/19/99	00D0822-001.002	TOTAL SUSPENDED SOLIDS	31	mg/L		5	V		ACCU
11791	9/21/99	99D0350-002.003	AMERICIUM-241	0.0709	pCi/L		0.0061	V	0.024900	GEL
50299	9/21/99	99D0350-001.003	AMERICIUM-241	0.0086	pCi/L	J	0.0058	V	0.008400	GEL
11791	9/21/99	99D0350-002.003	PLUTONIUM-239/240	0.0773	pCi/L		0.0269	V	0.029700	GEL
50299	9/21/99	99D0350-001.003	PLUTONIUM-239/240	0.0154	pCi/L	J	0.0069	V	0.012300	GEL
11791	9/21/99	99D0350-002.002	TOTAL SUSPENDED SOLIDS	27	mg/L		5	V		ACCU
50299	9/21/99	99D0350-001.002	TOTAL SUSPENDED SOLIDS	160	mg/L		5	V		ACCU
1587	11/10/99	00D0752-002.003	AMERICIUM-241	0.0465	pCi/L		0.0163	V	0.020800	GEL
50099	11/10/99	00D0752-001.003	AMERICIUM-241	0.0154	pCi/L	U	0.0162	V	0.012900	GEL
1587	11/10/99	00D0752-002.003	PLUTONIUM-239/240	0.1067	pCi/L		0.019	V	0.030100	GEL
50099	11/10/99	00D0752-001.003	PLUTONIUM-239/240	0.0601	pCi/L		0.0233	V	0.023700	GEL
1587	11/10/99	00D0752-002.002	TOTAL SUSPENDED SOLIDS	190	mg/L		5	V		ACCU
50099	11/10/99	00D0752-001.002	TOTAL SUSPENDED SOLIDS	5	mg/L	U	5	V		ACCU
P313489	9/10/99	99D0286-002.003	AMERICIUM-241	0.1321	pCi/L		0.017	V	0.034800	GEL
50399	9/10/99	99D0286-001.003	AMERICIUM-241	0.0097	pCi/L	U	0.0179	V	0.011700	GEL
P313489	9/10/99	99D0286-002.003	PLUTONIUM-239/240	0.042	pCi/L		0.0081	V	0.022000	GEL
50399	9/10/99	99D0286-001.003	PLUTONIUM-239/240	0.0021	pCi/L	U	0.0202	V	0.009500	GEL
P313489	9/10/99	99D0286-002.002	TOTAL SUSPENDED SOLIDS	150	mg/L		5	V		ACCU
50399	9/10/99	99D0286-001.002	TOTAL SUSPENDED SOLIDS	100	mg/L		5	V		ACCU

9.3 Bowman's Pond Site Characterization

The purpose of the Bowman's Pond Site Characterization was to investigate the potential nature and extent of contamination in surface soil, subsurface soil/sediment, and surface water for Bowman's Pond and surrounding depositional environments adjacent to Bowman's Pond including IHSS 139.1N (RMRS, 1999j). Bowman's Pond is referenced as a Potential Area of Concern (PAC) 700-1108 in the Historical Release Report (HRR) (DOE, 1992b). IHSS 139.1N consists of two empty, out of service, steam condensate tanks (T-107 and T-108) which are located immediately east of Bowman's Pond and within the ponds effluent drainage. Together, these Sites and the surrounding area comprise the depositional environment for the northern portion of the 700 Building area.

Bowman's Pond and the two steam condensate tanks are located within the PA immediately north of Building 774 and south of the North Patrol Road (Figure 9-4). Bowman's Pond consists of a small manmade depression approximately three to four feet (ft) deep with an areal extent of approximately 28 ft by 33 ft. Runoff water from the 700 Building Area enters the pond at several locations through culverts and from one polyvinyl chloride (PVC) pipe. Flow estimates range from 0 to 5 gallons per minute during normal weather conditions and increase to approximately 15 gallons per minute during precipitation events. The pond discharges to the east, saturating an area approximately 200 feet by 40 feet and resulting in a lush wetland depositional environment (including IHSS 139.1N).

Surface soil, subsurface soil/sediment, and surface water samples were collected from PAC 700-1108 and IHSS 139.1N in April 1999, to characterize the potentially contaminated media and provide the basis for future remedial decisions or a No Further Action (NFA) determination. Analytical data was evaluated with respect to the action levels and Standard Framework (ALF) for Surface Water, Groundwater, and Soils (Attachment 5) (RFCA, 1996) and Applicable or Relevant and Appropriate requirements (ARARS) established for the Industrial Area. In summary, there were no compounds identified from this investigation that exceeded (or approached) RFCA Tier I cleanup action levels. However, RFCA Tier II exceedances in soil and surface water were observed and are summarized herein.

9.3.1 Background

Based upon historical photographs and research identified in the HRR, Bowman's Pond was excavated in 1972 for the purpose of containing storm-water from storm and footing drains in the 700 Area. Previous investigations indicate that Bowman's Pond surface water and sediments may have been impacted by run off from upgradient storm and footing drains from Buildings 771 and 774. PCB contaminated soils were identified in and around Bowman's Pond during a sitewide sampling effort in 1991. Other possible releases to Bowman's Pond resulting from the adjacent steam condensate tanks (IHSS 139.1N) and from an Original Process Waste Line (OPWL) leak are documented in the HRR (DOE, 1992).

The steam condensate tanks (T-107 and T-108) are large aboveground tanks with a capacity of approximately 8,000-gallons each. The riveted steel tanks received steam condensate water from a nearby evaporative system and occasionally received liquid from a bermed area surrounding a sodium hydroxide product tank located immediately south and adjacent to Building 774 (Figure 9-4). The structural integrity of both tanks is noted as poor with holes present in the sides and badly corroded bottoms (DOE, 1992).

Bowman's Pond and the steam condensate tanks are located on a northward sloping colluvial surface consisting of approximately 10 to 11 ft of gravelly to sandy clay and silty clay. The top of bedrock is approximately 11 ft below ground surface and consists of Laramie Formation claystone. The depth to groundwater ranges between six to eight feet and the flow direction is north-northeast towards North Walnut Creek.

The maximum concentration of carbon tetrachloride detected in June 1998 from monitoring well P219189, which is located upgradient and west of Bowman's Pond, was 7 ug/L.

However, historically carbon tetrachloride is generally undetected in groundwater in well P219189. Consistent detections of 1,1-dichloroethene ranging from 17 up to 30 ug/L, above the Tier II action level of 7 ug/L, were observed in well P219189 during 1998 and 1999.

9.3.2 Scope of Investigation

Surface soil sampling (from 0.0 to 0.5 ft bgs) and subsurface soil sampling from 0.5 ft (at approximate 6 inch sample intervals) to the total achievable depth (total depth varied) was conducted at 11 locations within the investigation area (Figure 9-4). Sample intervals collected at the eleven locations consisted of grab samples for VOCs (non-composited) and composite samples for SVOCs, total metals, PCB/Pesticides, tritium, radionuclides, and radiological screens. For sample locations BH11099 and BH11199, soil pH composite samples were also collected.

Surface water samples from Bowman's Pond were collected to characterize variability in water chemistry throughout the pond and to compare current to previous water quality information. Two separate sampling events were conducted during which surface water sampling was performed.

The two sampling events are described as follows:

- A normal (or base level) sampling event during which runoff and flow conditions in the vicinity of the pond were considered to be at representative or average conditions occurred on April 20, 1999.
- A storm-sampling event took place on April 22, 1999 after a snowfall resulted in above average storm water runoff into the pond. Meteorological records indicate 1.28 inches of precipitation resulted from the snowfall.

For each sampling event, surface water samples were collected at the following locations: one sample from an inflow location at the southwest corner of the pond; one sample from the center of the pond; and one sample from an outflow location in the northeast corner of the pond (see Figure 9-4).

9.3.3 Soil Analytical Results

Five analytes were identified in surface and subsurface soils near or above RFCA Tier II action levels in the investigation area. They are; Benzo(a) Pyrene, Dibenzo(a,h)anthracene, Aroclor-1254, tritium and arsenic.

PCBs

Aroclor-1254 concentrations ranged from below detection to 68 mg/kg. This range of values is both well below and somewhat above the Tier II action level for surface soils of 2.86 mg/kg (industrial land use). The areas in which the levels of Aroclor-1254 exceed the Tier II levels are predominately within the soils/sediments upgradient of and within the influent, center, and south sediments of the pond. With the exception of the 0.5 to 1.5 ft interval from sample location BH11099, the sediments sampled in the effluent area and areas downgradient of the pond were all reported as being less than the Tier II threshold. The distribution of Aroclor-1254 within the surface and shallow subsurface intervals of the investigation area sediments reconfirms the same level of contamination initially identified in the 1991 sampling investigation.

Tritium

The reported values of tritium in soils range from 170 to 1300 pCi/L. There are no associated RFCA action levels for tritium in soils currently available to compare these values against however; PPRG values for an office worker exposure scenario are 44,700 pCi/g representing a 10^{-6} carcinogenic risk. Assuming a worst case scenario of 50% soil saturation, conversion calculations estimate that for this example, 1300 pCi/L is equivalent to 0.43 pCi/g. It should be noted that the laboratories are required by contract to report tritium values for soils in units of pCi/L (as opposed to pCi/g).

Semi-volatile Organics

Benzo(a)pyrene and Dibenzo(a,h)anthracene were the only reported semi-volatile organic compounds detected in the investigation area soil and sediments. The reported concentrations of benzo(a)pyrene and dibenzo(a,h)anthracene range from non-detection to 6400 µg/kg and non-detection to 1600 µg/kg, respectively. The sediments within seven of the eleven borehole locations exceeded the RFCA Tier II action level of 784 µg/kg for benzo(a)pyrene and sediments from two boreholes exceeded the respective RFCA Tier II action level for dibenzo(a,h)anthracene. Both compounds are well below the RFCA Tier I action level of 78,400 µg/kg for each compound.

Total Metals

The reported values for arsenic in soils range from 1.5 to 9.5 mg/kg. The Tier II action level for arsenic is 3.81 mg/kg (RFCA action levels for metals are the same for surface and subsurface soils). The Site-wide mean plus two

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standard deviations background concentration of arsenic in surface soils is 10.09 mg/kg (EG&G, 1995b). All reported values for arsenic in soils fall below this value.

Radionuclides

The isotopes: U-233/234, U-235, U-238, Pu-239/240, and Am-241 were evaluated using the "Sum of Ratios" method to assess any potential for remedial actions (RFCA, 1996). For each sampled interval, the reported activities for each radionuclide were divided by their respective Tier II action levels and a sum of their ratios was calculated. The highest calculated sum of ratios for any sample was 0.07.

9.3.4 Surface Water Analytical Results

Volatile organic compound and radiological analytes detected in the three surface water locations at concentrations approaching or above their respective Tier II action levels include carbon tetrachloride and tritium. Although present in the surface water of Bowman's Pond, these contaminants are not identified above RFCA action levels in downgradient Point of Evaluation (POE) and Point of Compliance (POC) monitoring stations.

Volatile Organic Compounds

The concentrations of carbon tetrachloride detected from the two sampling events (normal and storm) for surface water range from 5 to 21 ug/L. These concentrations are at or above the respective RFCA Tier II action level of 5 ug/L. The reported values suggest a general decrease in concentrations from the inflow to the outflow areas of the pond as well as an overall decrease in concentrations during the normal event to the storm event conditions. The decrease in concentration is assumed to be due to a dilution effect of influent waters with the larger volume of water contained within the pond.

Tritium

The reported concentrations of tritium in the surface waters sampled from Bowman's Pond range from 180 to 510 pCi/L. The RFCA action level established for Woman Creek and Walnut Creek, the two main surficial watershed drainages from the Site, is 500 pCi/L. Reported values for tritium fall below this action level with the exception of one sample (the Eastern normal location duplicate sample) which was reported at 510 pCi/L with an estimated error of 180 pCi/L.

Radionuclides

For surface water, each radionuclide was analyzed separately and compared to its respective RFCA action level established for Woman and Walnut Creeks (RFCA, 1996). Total uranium concentrations (the sum of U-233/234, U-235, and U-238) reported for surface water range from 0 to 4.94 pCi/L. This range falls well below the action limit of 10 pCi/L established for Walnut Creek surface water. Concentrations for Pu-239/240 and Am-241 range from 0

to 0.184 and 0 to 0.098 pCi/L, respectively. A concentration of 0.184 pCi/L for Pu-239/240 was observed in one sample from the East (outflow) sampling location of the pond during the normal sampling event.

Normal event radionuclide activities were, in general, higher than activities during the storm event sampling. This suggests that surface runoff does not significantly contribute to radiological contamination in the pond water. An example of this is shown for the one exceeded value for Pu-239/240 of 0.184 pCi/L reported during normal sampling conditions and its corresponding storm event value reported at 0.093 pCi/L.

9.3.5 Conclusions

Prior to the investigation, data from previous investigations, and general process knowledge of the Bowman's Pond soil and sediment (and surrounding areas including IHSS 139.1N) indicated that the Sites were potentially contaminated. Broken OPWLs, Under Building Contamination (UBC) concerns and adjacent IHSSs within and surrounding Buildings 771 and 774 presented potential contaminant sources to the area. Further, the foundation and storm drains from the nearby buildings provide inflow to Bowman's Pond and may be a potential migration pathway for contaminants in the future.

Upon review of available information and data gathered from the investigation, several conclusions were made. These are as follows:

- The Bowman's Pond sediments and surrounding soils (including those associated with IHSS 139.1N) are not highly contaminated. There were no compounds identified at or above the RFCA Tier I surface and subsurface soil action levels.

- PCB contamination above Tier II surface and subsurface soil action levels (Aroclor-1254) is evident in the drainage upgradient of Bowman's Pond (SED 124 and BH10499) and within the sediments of the pond and depositional area at nearly identical concentrations (and locations) as observed in 1991.

- Radionuclide concentrations in soil and sediments are one to two orders of magnitude below the RFCA Tier II surface and subsurface soil action levels and using the Tier II sum of ratios methodology. Based upon this finding, no remedial actions are required for radionuclides.

- Core logging of sediment from each of the eleven sampling locations reveals that Bowman's Pond sediments are approximately 4 feet thick near the center of the pond and between 1 and 2 feet thick at influent and effluent areas. The core logs show that sediments within the investigation area are composed of between 3 inches to 1.0 feet of organic matter over approximately one to two feet of gravelly silt and/or silty clay. Silty and highly plastic clays were predominantly observed from approximately 2 feet to the total depth of the boreholes. For boreholes completed in the wetlands outside of the pond, water levels ranged from 0 to 2 inches above ground

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surface. Water depth at borehole locations along the edge of the pond ranged from 0 to 2 inches (above sediment) to 1.9 feet at the center of the pond.

- Soil and sediments within IHSS 139.1N are not contaminated with PCOCs identified from the Bowman's Pond surface water, contaminants associated with steam condensate water stored in Tanks T-107 and T-108, or from the bermed sodium hydroxide tank located immediately adjacent to Building 774.

- Concentrations of carbon tetrachloride in surface water from Bowman's Pond exceed the RFCA action level of 5 ug/L for surface water. Although a source has not been clearly identified, it appears that upgradient groundwater contaminated with carbon tetrachloride is entering the Building 771 and/or 774 footing drains (possibly from IHSS 118.1).

Given the findings presented above, it is recommended that the investigation area adjacent to and including Bowman's Pond be evaluated to determine if the levels of contamination identified are protective of surface water and ecological resources. Specifically, PCB contamination is localized within the study area at concentrations between RFCA Tier I and Tier II action levels. Carbon tetrachloride does not exceed RFCA action levels at downgradient surface water monitoring stations; therefore it is recommended that continued monitoring and evaluation be conducted to assess water quality at Bowman's Pond.

10.0 OTHER GROUNDWATER PROGRAM ACTIVITIES

10.1 Well Control Program

The Well Control Program (WCP) establishes the administrative guidelines for the installation of all new monitoring wells and piezometers at RFETS. The procedures which comprise the WCP will be implemented through the Water Programs Division; more specifically Groundwater Operations. The WCP was integrally designed to assure compliance with the procedures for monitoring well installations at RFETS and the complete documentation of all pertinent data relative to all monitoring wells installed at RFETS. It also assures compliance with the regulations set forth by the State of Colorado, Office of the State Engineer, State Board of Examiners of Water Well Construction and Pump Installation Contractors, in 2 CCR 402-2, *Revised and Amended Rules and Regulations of the Board of Examiners of Water Well Construction and Pump Installation Contractors.* The WCP also provides guidance to the organization or individual responsible for installation of the monitoring well(s) or piezometer(s) regarding the interface between the WCP and applicable RFETS soil disturbance procedures.

A Well Control Program was originally placed in effect by EG&G on June 1, 1995. After one year the original WCP expired and was not reinstated. The new WCP described in this section was adopted in 1999. The new procedure document number is 1-K92-RFP-94-001, Revision 1.

The purpose of the WCP program is threefold. First, to protect groundwater at RFETS from improper drilling and well installation procedures, and to ensure that each installation receives a unique well name. Second, to ensure that all permitting activities required by the State of Colorado are complied with. Third, to create a central repository for data collection and management with respect to all data generated from the installation and sampling of new monitoring wells and piezometers.

10.2 Well Abandonment and Installation

During 1999 there were 69 monitoring wells or piezometers installed at RFETS. Table 10-1 summarizes the 1999 monitoring wells and piezometers and their purpose. Figure 10-1 presents the locations of the 1999 monitoring well installations and abandonments. Monitoring well logs and well construction diagrams for 1999 well installations found in appendix D. Three alluvial monitoring wells were destroyed in 1999 as a result of D&D, remediation, or other activities. These were well 2987, located above the SID and east of Pond C1, well 60295, located at south side of the East Trenches Groundwater Treatment System, and well 02297, located by Building 779. For the Solar Ponds Plume Groundwater Treatment System five monitoring wells were removed because they interfered with the collection trench at the east end. These were wells 44893, 44993, 45093, 45293, 45393.

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Table 10-1 1999 Monitoring Well Installations

Well No.	Purpose of Well
15199	Monitoring for the Mound groundwater treatment system
15299	Monitoring for the Mound groundwater treatment system
15399	Monitoring for the Mound groundwater treatment system
15499	Monitoring for the Mound groundwater treatment system
15599	Performance Monitoring for the Mound groundwater treatment system
15699	Performance Monitoring for the Mound groundwater treatment system
15799	Performance Monitoring for the Mound groundwater treatment system
16199	Monitoring the Mound Plume Treatment System
16299	Monitoring the Mound Plume Treatment System
16399	Monitoring the Mound Plume Treatment System
16499	Monitoring the Mound Plume Treatment System
16599	Monitoring the Mound Plume Treatment System
18199	Plume Degredation well monitoring the IHSS 118.1 plume and Building D&D well monitoring Building 771
18299	Plume Degredation well monitoring the IHSS 118.1 plume
18399	Plume Degredation well monitoring the IHSS 118.1 plume
18499	Plume Degredation well monitoring the IHSS 118.1 plume
18599	Plume Degredation well monitoring the IHSS 118.1 plume
18699	Plume Degredation well monitoring the IHSS 118.1 plume
18799	Plume Degredation well monitoring the IHSS 118.1 plume
18899	Plume Degredation well monitoring the IHSS 118.1 plume
40099	D & D Monitoring for Building 444 Complex D&D
40199	D & D Monitoring for Building 444 Complex D&D
40299	D & D Monitoring for Building 444 Complex D&D
40399	D & D Monitoring for Building 444 Complex D&D
40499	D & D Monitoring for Building 444 Complex D&D
40599	D & D Monitoring for Building 771 Complex D&D
40699	D & D Monitoring for Building 771 Complex D&D
40799	D & D Monitoring for Building 771 Complex D&D
40899	D & D Monitoring for Building 771 Complex D&D
40999	D & D Monitoring for Buildings 865 and 886 D&D
41099	Building D&D well monitoring potential rad contamination near 886 lab
41199	Building D&D well monitoring potential rad contamination near 886 lab
41299	D & D Monitoring for Building 444 Complex D&D
41499	D & D Monitoring for Building 771 Complex D&D
41599	D & D Monitoring for Building 771 Complex D&D
50099	Actinide Migration Evaluation 903 Lip Area/Americium Zone
50199	Actinide Migration Evaluation 903 Lip Area/Americium Zone
50299	Actinide Migration Evaluation 903 Lip Area/Americium Zone
50399	Actinide Migration Evaluation 903 Lip Area/Americium Zone
60099	East Industrial Area Plume. NW corner B776
60199	East Industrial Area Plume West side B776
60299	D&D Monitoring for Building 776/777 Complex (EIAP Well Initially)

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Table 10-1 1999 Monitoring Well Installations, continued

Well No.	Purpose of Well
60399	D & D Monitoring for Building 707 D&D (EIAP Well Initially)
60499	D & D Monitoring for Building 707 D&D (EIAP Well Initially)
60599	D & D Monitoring for Building 707 D&D (EIAP Well Initially)
60699	D & D Monitoring for Building 707 D&D (EIAP Well Initially)
60799	D & D Monitoring for Building 707 D&D (EIAP Well Initially)
60899	East Industrial Area Plume
61099	D & D Monitoring for Building 883 D&D (EIAP Well Initially)
61199	D & D Monitoring for Building 883 D&D (EIAP Well Initially)
61299	East Industrial Area Plume
61399	East Industrial Area Plume Perimeter Road
61499	D & D Monitoring for Building 707 D&D (EIAP Well Initially)
70099	Performance Monitoring of groundwater treatment system below Solar Ponds
70299	Performance Monitoring of groundwater treatment system below Solar Ponds
70799	Monitoring of groundwater treatment system below Solar Ponds
70899	Monitoring of groundwater treatment system below Solar Ponds
70999	Monitoring of groundwater treatment system below Solar Ponds
71099	Monitoring of groundwater treatment system below Solar Ponds
90099	Plume Definition well monitoring the southern migration of the 903 Pad/Ryan's Pit Plume
90199	Plume Definition well monitoring the southern migration of the 903 Pad/Ryan's Pit Plume
90299	Plume Definition well monitoring the southern migration of the 903 Pad/Ryan's Pit Plume
90399	Plume Definition well monitoring the southern migration of the 903 Pad/Ryan's Pit Plume
95099	Performance Monitoring of groundwater treatment system below East Trenches
95199	Performance Monitoring of groundwater treatment system below East Trenches
95299	Performance Monitoring of groundwater treatment system below East Trenches
95699	Monitoring of groundwater treatment system below East Trenches
95799	Monitoring of groundwater treatment system below East Trenches
95899	Monitoring of groundwater treatment system below East Trenches

10.3 Groundwater Data Quality Review

The groundwater data cleanup task was started in calendar year 1999 and consisted of reviewing survey coordinates and providing areal descriptions of 1,285 well locations in support of the FY2000 Soil Water Database (SWD) Data Quality Review effort. The SWD Data Quality Review effort was initiated to address known data quality issues in SWD resulting primarily from legacy data, and to improve overall SWD data quality in support of the Site's accelerated Closure Mission. During the effort, deficiencies, missing information, incorrect information, and other

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various data quality issues with SWD electronic data were identified and are in the process of being evaluated and addressed. Key activities include:

- Identifying and finding missing historical analytical data, and uploading data where possible.
- Adding missing electronic validation qualifiers to SWD data for samples collected prior to the completion of the SWD
- Modifying the electronic data systems to reduce redundant data entry and to provide more controlled data entry for environmental field results
- Formalizing data management procedures through development of an Environmental Data Management Procedure
- Reviewing and updating project codes and sample types
- Evaluating and repairing standard data links between location codes (Well No.) with electronic analytical data
- Developing a Master Location Table to synchronize sample geographic data between SWD and the Site's Geographic Information System (GIS), and
- Improving SWD data accessibility and usability through development of simplified user interfaces.

All of the data quality improvement activities are designed to improve the overall usability of SWD data and support increased data analysis and improved and more efficient data reporting. The SWD data quality review effort is ongoing and additional efforts are planned for FY01. The results of these efforts can be found in the Integrated Site-wide Environmental Data System (ISEDS), which provides environmental data to the Site regulators. Public stakeholders are able to access and download approved environmental reports through the Environmental Data Dynamic Information Exchange (EDDIE) web site. The EDDIE web site provides environmental monitoring information to Stakeholders on an ongoing basis. It is designed to allow easy electronic access to reports of routine and special monitoring projects at Rocky Flats Environmental Technology Site as the Site proceeds with its Closure Mission. The EDDIE web site can be accessed at http://www.RFETS.gov and select "environmental data" from the main menu.

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11.0 GROUNDWATER DATA QUALITY ASSESSMENT

All Section 11.0 Tables are found in Appendix E.

11.1 Methods

The quality of the analytical data is assessed in terms of five data-quality parameters: precision, accuracy, representativeness, completeness, and comparability, referred to as PARCC parameters (EPA, 1992a). This section summarizes the types of data available to assess the PARCC parameters.

The RFETS groundwater monitoring program, as established in the 2000 IMP, consists of 114 wells that are sampled at a quarterly or semi-annual frequency (K-H, 1999a). This report also contains data from 19 D&D wells installed in late 1999 (the 40099 and 90099 series wells) after publication of the IMP list, and three other existing wells that are being used for D&D at specific buildings (wells 20998, P317989 and P419689). A total of 287 well sampling visits were conducted during 1999. This represents all required visits and does not reflect multiple visits to wells that were dry or only provide water on a limited basis. Except in the case of one damaged (2987) well in the fourth quarter, all samples specified in the IMP were collected unless well disposition was prohibitive (i.e. dry, or went dry during sampling). For 1999, 2105 samples were to have been collected; the actual number collected was 1430 due to dry conditions, wells with insufficient water, or well damage. Table 2-1 presents a summary of sample collection and well disposition.

Quality Control (QC) samples consisting of real/duplicate pairs were collected from 15 locations and rinsate samples were collected from 10 locations. The frequency for field duplicate sampling of 1 in 9.07 locations exceeded the target rate of 1 location in 20 for the 1999 sampling program. Similarly, the frequency for field rinsate sampling of 1 location in 13.6 exceeded the target rate of 1 in 20 for 1999. PARCC analysis of the 1999 QC data is presented in the following sections. Data used to evaluate the PARCC parameters are summarized in this report, and are presented in full in the quarterly monitoring reports (RMRS 1999k; 1999l; 2000a and 2000b).

Precision

Precision is a measure of the reproducibility of analytical results. Precision is expressed quantitatively by the relative percent difference (RPD) between duplicate field samples for VOCs, metals, and water quality parameters as defined by the following equation:

$$RPD = \frac{|(S-D)|}{(S+D)/2} \times 100$$

where, S = Sample Result
D = Duplicate or Lab Replicate Result

With respect to Radionuclides the RFETS Groundwater Program uses the following "Duplicate Error Ratio" (DER) equation:

$$DER = \frac{|S-D|}{[(TPU_S^2 + TPU_D^2)]^{1/2}}$$

where,

TPUs = total propagated uncertainty of the Sample
TPU_D = total propagated uncertainty of the Duplicate or Lab Replicate
S = Sample Result
D = Duplicate or Lab Replicate Result

Because the laboratory hard copies and Electronic Data Deliverables (EDDs) rarely report TPU except for Tritium (H_3) analyses, the 2-Sigma Error has been substituted for TPU in the Uranium and Americium/Plutonium calculations made for this report. No tritium DERs were calculated because all of the tritium results were "U" qualified non-detections by the laboratories. (see below)

Between the First and Second Quarter 1999 Groundwater Reports (RMRS, 1999k and 1999l) several changes were made in the criteria that determine which real/duplicate pairs are selected for RPD/DER calculations. The RPD/DER calculation criteria are summarized in Table 11-2.

The QC criterion for RPDs is ≤30%, for DERs the criterion is ≤1.96. Tables 11-1a and 11-1b give a summary of the RPD and DER results for groundwater in 1999. Table 11-2 gives a brief summary of the overall precision compliance for RPDs and DERs from the major analytical groups. The overall precision compliance goal is 85%.

Accuracy

Accuracy is a measure of how closely an analytical result corresponds to the "true" concentration in a sample. Accuracy, as applied to groundwater analytical data from RFETS, is described in *Evaluation of Data for Usability in Final Reports* (RMRS, 1998e). This evaluation describes how to compare required analytical methods and detection limits with actual methods and detection limit for each analyte. Table 11-3 presents such a comparison between the Required and Actual Analytical Methods and Contract-Required Detection Limits (CRDLs) and Actual Detection Limits for the various analytes in 1999.

Additional information on the accuracy of laboratory analyses is given by matrix spike and laboratory control samples. Matrix spike recovery data for VOCs, metals, water quarterly parameters (WQPs) and PCBs are given in Table 11-4 and lab control sample recoveries for radionuclides are given in Table 11-5. These tables include all the matrix spike data for 1999 because these data were not included in the First and Second Quarter Groundwater Reports (RMRS, 1999k and 1999l). Acceptable criteria for matrix spike and lab control sample samples are between 80 and 120 percent recovery.

Representativeness

The discussion of representativeness in this section is limited to an evaluation of whether analytical results for field samples are truly representative of environmental concentrations or whether they may have been influenced by the introduction of contamination during their collection and handling. The potential introduction of contamination is evaluated by examination of the analytical results for equipment rinsates (Table 11-6). Equipment rinsates are used

to assess the efficacy of the decontamination process and possible cross-contamination between environmental samples. They are samples of volatile free "distilled" water that have been poured over or through decontaminated sampling equipment and subsequently handled in the same manner as environmental samples.

Although rinsates are used specifically as indicators of cross-contamination subsequent to decontamination of equipment, they are carried through the entire sampling, shipping, and laboratory process and are, consequently, also good indicators of potential contamination introduced during any of these steps.

Other aspects of representativeness such as numbers of samples and spatial distribution are fixed in the IMP (K-H, 1999a). All well visits that were required by the IMP were completed in 1999. Plate 1 presents the locations sampled for reference to the spatial distribution of the samples.

Completeness

Table 11-7 compares the actual number of samples collected in 1999 to the required number of samples. As a result of dry wells or wells with such low productivity as to prohibit sample collection, the completeness goal of 90% was not met for any of the major analyte groups. (With respect to minor analyte groups, the six Total Recoverable Petroleum Hydrocarbon samples collected in the Fourth Quarter represent the only sampling suite that was completed.)

Completeness is also a quantitative measure of data quality expressed as the percentage of valid or acceptable data obtained from a measurement system. Table 11-8 summarizes the validation completeness evaluation. Detailed validation and verification data for all analytes and samples are provided in the 1999 quarterly reports (RMRS 1999k, 1999l, 2000a, and 2000b). A completeness metric was calculated using the following formula:

Completeness = $Dp_u = \frac{DP_t - DP_n}{DP_t} \times 100$ (in percent) The completeness criterion is $\geq$ 90%.

Where:
Dp_u = Percentage of usable data points
DP_n = Non-usable data points
DP_t = Total number of data points

Comparability

During 1999 planned analytical methods for VOCs, metals, water quality parameters and radionuclides remained consistent over the entire year. Table 11-3 lists the required methods for the various analytes. Laboratory analyses were performed according to standard CLP protocols and results should be comparable to data produced by similar methods.

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11.2 Discussion of Analyte Groups

11.2.1 Metals

Precision

There were 31 duplicate sample events paired with the 202 real sample events in the data set for metals in 1999 (1 in 6.5). For the 31-real/duplicate pairs there were 837 records for analyses. From these there were 400 instances of detections in which an RPD could be calculated (Table 11-1b). Three hundred twenty nine (329) of the calculated RPDs were within the QC criterion of ≤30% (Table 11-3). With 82.3% of the RPDs meeting the QC criterion, precision for dissolved metal analysis was below the acceptable goal of 85%.

The recommended frequency for duplicate samples is 1 in 20 on a per-well basis. In 1999, 12 of 136 wells sampled were analyzed for metals as real/duplicate pairs, a ratio of 1 in 11.3. Thus duplicate sample frequency was within the requirements on both a per-well and per-analysis basis.

Accuracy

All metal analyses were performed using contract-required methods during 1999. Contract- required methods stipulate the CLP-SOW method for analysis of dissolved metals. As shown on Table 11-3, analyses were run using this method for all dissolved metal samples. Additional analyses were run using CLP-SOW for total metals. The total metals analyses were run as necessary in support of various groundwater evaluations, and to analyze samples collected with dedicated pumps using the low-flow (micropurging) techniques. Based on the Table 11-4 summary, methods used during 1999 for analysis of metals meet or exceed the requirements described in *Evaluation of Data for Usability in Final Reports (RMRS,1998e).*

Table 11-3 also presents a summary of the comparison of required to actual detection limits for analyses of samples collected in 1999. Actual detection limits for 21 metals were at or below CRDLs for 100 percent of the analyses performed. Six analytes had actual detection limits for which some analyses were above CRDLs. The analytes were, antimony with acceptable actual detection limits in 95% of the analyses, arsenic (98%), lead (96%), selenium (54%), silver (15%), and thallium (15%). Discussion and data accuracy evaluations for specific samples and analyses are presented in the quarterly reports.

Representativeness

There were 432 rinsate records versus 5454 real sample records for metals in 1999 (1 in 12.6). Most metals rinsate results were either "U" (non-detection) or "B" (detection was less than the CRDL but greater than the IDL) qualified indicating that in general no metals contamination was introduced during sampling and/or shipping activities. As shown on Table 11-6, metals were detected in 16 rinsate analyses. All analyses yielded results below Tier II limits where a Tier II limit is defined.

Completeness

The Integrated Monitoring Plan (K-H, 1999a) requires that samples be analyzed for metals in 122 wells. Sampling for metals was attempted in all the required wells during 1999 (Table 11-7). Thirty-nine wells were dry or went dry during sampling; resulting in 55 metals samples that could not be collected. One sample could not be collected because of a damaged well casing (well 2987). Of the 258 metal sample events required by the IMP, 202 were successfully completed during 1999, a success rate of 78.3% (Table 11-7). The goal, which assumes adequate groundwater production from the monitoring wells, is at least 90% successfully sampled.

All metals sampling records were either validated or verified in 1999. Validation of metals records was performed on 44.6% (3024 of 6777 analyses), which is well above the 25% criterion defined in the IMP. Of the analyses that were validated or verified, 2 were rejected (R-validated), 6775 analyses were judged to be acceptable and valid. Because of the relatively low number of rejected analyses the metals results were found to be acceptable for 99.9% (6775 of 6777) of the analyses (Table 11-8).

Comparability

No changes were made to analytical procedures during 1999. Thus analyses from 1999 are comparable to previous analyses.

11.2.2 Radionuclides

Precision

The data set for radionuclides (americium-241, plutonium-239/240, uranium isotopes U-233/234, U-235, and U-238, tritium, and strontium-89/90) contains 65 duplicate sampling events versus 422 real events (1 in 6.5). A DER could be calculated for 59 of the 140 duplicate/real analytical pairs (Table 11-1a). All but two of the DER values (U-235 in well 70393 and U-238 in well 70193) were below the 1.96 precision limit. As shown on Table 11-2, the precision metric was met in 93.2% of radionuclide duplicate/real samples.

Accuracy

All radionuclide analyses were performed using the proper contract required methods during 1999 (Table 11-3). With respect to analytical methods, the 1999 results are accurate. Required detection limits for the radionuclide analyses performed during 1999 were met except for two analyses. The plutonium analyses in well 3586 (Dup) and well 02497 exceeded the CRDL. As such, the accuracy of radionuclide analyses is generally good.

Representativeness

There were 75 rinsate records from radionuclide radionuclides (americium-241, plutonium-239/240, uranium isotopes U-233/234, U-235, and U-238 and tritium) collected at 7 locations in 1999. Ten rinsate analyses yielded detectable values (Table 11-6). Two detectable results for uranium are recorded as negative but were not "U"

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qualified by the laboratory. In any case, all detections were below Tier II Action Levels. Based on 67 of 75 (89.3%) of rinsate results being undetected, there is little indication of introduced contamination during sampling activities being a concern for 1999 radionuclide data.

Completeness

As shown on Table 11-7, 166 plutonium/americium, 263 uranium isotope, 96 tritium, 48 strontium-89/90, 12 cesium -137 and 8 neptunium-237 samples were to have been collected for analyses. All the required samples were collected or attempted. The success rate varied due to dry wells or wells that went dry during sampling. The percentages of successful sample collection were 69.9% for Pu/Am, 76.8% for U-isotopes, 69.8% for tritium, 66.7% for strontium-89/90, 33.3% for cesium-137 and 12.5% for neptunium-237. The goal is 90%, groundwater conditions permitting.

All radionuclide results (1161) except for 8 cesium -137 and 1 neptunium-237 were either validated or verified (99.2%). Of the validated/verified results (a total of 1152) 7.7% (89) were validated and 92.3% (1063) were verified. The percentage for validation is well below the 25% criterion while the percentage for verification is well above the criterion. Only 3 uranium analyses (0.26%) of the validated/verified results were rejected. As shown in Table 11-8, 100% of the plutonium/americium, tritium, strontium-89/90, cesium-137 and neptunium-237 radionuclide analyses are usable. 99.6% of the uranium analyses are usable. In general the radionuclide analyses are thought to be complete.

Comparability

No changes were made to analytical procedures during 1999. Thus the radionuclide analyses presented here are assumed to be comparable to previous analyses.

11.2.3 Volatile Organic Compounds and Semi-Volatile Organic Compounds

Precision

There were 33 duplicate sampling events versus 231 real records for VOCs in 1999 representing a ratio of 1 in 7.0 events. RPDs were calculated for the 77 duplicate/real pairs that had detections (Table 11-1b). Sixty-eight RPD values were less than the QC criterion of 30%, which equates to 88.3% meeting the QC criterion during 1999 (Table 11-3). Table 11-1b does not suggest a common reason for duplicate/real pairs that exceed the 30% QC criterion. However, the analyses of VOCs for 1999 meet the overall precision compliance goal of 85% and are therefore adequately precise. (Note that this discussion combines VOCs analyzed by two different methods; EPA 524.2 comprising 32 events and SW-846 Method 8260 comprising 1 event.)

One duplicate sample for semi-volatile organic compounds (103 analytes) was collected versus seven real samples. One pair of the SVOC duplicate/real results could be used to calculate an RPD, hexachloroethane (Table 11-1b). This RPD was within the 30% precision criterion. Results are precise for the analysis of SVOCs in 1999.

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Accuracy

All VOC and SVOC analyses performed in 1999 employed contract-required methods (Table 11-3). With respect to analytical methods, the results are accurate.

As shown on Table 11-3, the majority of the VOC analytes met CRDLs when EPA Method 524.2 was used. Fifty seven of the analytes ranged between 85% and 87% in meeting the CRDL criteria for this method given that approximately 264 analytical events were possible. Trichlorofluoromethane only met the CRDL criteria 68% of the time.

Table 11-3 shows that for the SW-846 Method 8260 technique that the range for meeting the CRDL criteria is between 12.5% and 25.0%. The CRDLs in this case were met in only 1 of 8 analyses because the sampled wells contained elevated amounts of carbon tetrachloride and chloroform and the laboratory chose not to process the samples at the CRDL.

The results from both VOC analytical methods mentioned above with detection limits higher than CRDLs come from wells that are known to contain significant concentrations of certain VOCs such as carbon tetrachloride and chloroform. The laboratories run preliminary dilution analyses for samples from those wells. To protect instrumentation, the laboratories do not run 1x dilutions on the samples from wells having significant VOC contamination. CRDLs were not met for any of the VOC analytes from samples collected at those wells. Further discussion and additional data are provided in the quarterly reports (RMRS 1999k, 1999l, 2000a, and 2000b).

All SVOC analyses met the CRDL limits. Results for nine SVOC compounds specified in the analytical statement of work were not returned in any of the analyses, see the end of the SVOC section of Table 11-3.

Representativeness

There were 19 rinsate-sampling events from ten wells for VOCs in 1999. All of these events were analyzed using EPA 524.2 method. Of the 1102 resulting records, 28 rinsate analyses contained VOCs at detectable concentrations (Table 11-6). Considering all rinsate analyses, 97.5% yielded non-detectable concentrations. Individual results are discussed in the quarterly reports (RMRS 1999a, 1999b, 2000a, and 2000b). Based on the high percentage of non-detections in the rinsate samples the VOC samples are judged to be representative.

No rinsate samples were collected for SVOCs because the wells of interest are sampled using submersible pumps that do not have equipment that can be used to collect a rinsate sample. (A pump installation has a 1-2 foot piece of tubing at the surface through which the sample is collected.)

Completeness

During 1999, the required 278 VOC and 8 SVOC sample sites were visited (Table 11-7). From these, 231 VOC and 7 SVOC samples were collected, yielding success rates of 83.1% and 87.5% respectively. In general dry well

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conditions precluded collection of samples, the goal of 90.0% was not reached for VOCs and SVOCs in 1999. One damaged well (2987) could not be sampled for VOCs.

There were 16581 VOC analytical records returned in 1999. All VOC records were either validated or verified. Of these, 25.5% of the analyses (4233) were validated, and 74.5% (12348) were verified (Table 11-8). These percentages match the the 25% validation and 75% verification criteria. Of the analyses for which validation or verification was performed, 0.07% (11) were rejected and are considered unusable data. Overall, 99.9% of VOC analyses are usable.

Similarly, there were 824 SVOC analytical records returned in 1999. All (100%) were verified, and none were validated (0%). Eight of the 824 records were rejected and are unusable. Overall, 99.0% of the SVOC results are usable.

Comparability

As stated above, no changes were made to analytical procedures during 1999. Thus the VOC analyses presented here are assumed to be comparable to previous analyses. The VOC analyses done by the SW-846 Method 8260 and SVOC analyses were new analytical suites during 1999. They probably will not be continued in the CY2000 sampling events.

11.2.4 Water Quality Parameters

Precision

For the major water quality parameters: fluoride, total dissolved solids, and sulfate, there were 95 duplicate sample records versus 504 real sample records for collected water quality parameters during 1999 (1 in 5.3). Eighty-nine of the real/duplicate pairs could be used to calculate RPD values (Table 11-1b). As shown on Table 11-2, 87 of the RPD values (97.8%) were within the QC criterion of 30%. The two RPDs that were greater than the criterion were calculated for nitrate/nitrite-real/duplicate pairs wells 0386 and 41591. Overall, the data indicates good precision for water quality parameter analyses.

For total cyanide there were four duplicate analyses for which no RPD could be calculated. There were 15 real cyanide analyses. For the other five minor water quality parameters, chloride, nitrate, total organic carbon, dissolved organic carbon and sulfide there is one duplicate record for seven real records in 1999. All these pairs gave an RPD value (Table 11-1b). The sulfide results are the only ones where the RPD exceeded the $\leq$30% criterion.

Accuracy

All water quality parameter analyses were performed using the proper contract required analytical methods in 1999 (Table 11-3). Analytical data indicate that the contract-required detection limits were met for all water quality parameter analyses in 1999 (Table 11-3). With respect to methods, the results for 1999 are accurate.

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Representativeness

There were 46 equipment rinsate analyses for water quality parameters in 1999 (total cyanide, fluoride, nitrate/nitrite, total dissolved solids and sulfate). Forty of the analyses (87.0%) were non-detects. As shown on Table 11-6, two nitrate/nitrite rinsate analyses, three TDS analyses and a sulfate had detectable concentrations. The results for these analyses are low and none of the results were above Tier II levels where such levels are defined. No significant introduced contamination is indicated.

Completeness

As shown in Table 11-7, 21 total cyanide, 79 fluoride, 246 nitrate/nitrite, 133 sulfate, 219 total dissolved solids, 8 total organic carbon, 8 dissolved organic carbon, 8 sulfide and 8 chloride samples were to have been collected for analysis. All of the required visits for sampling were made. The success rate varied because of dry wells or wells that went dry during sampling. One well was damaged (2987). The percentages of successful sample collection were 71.4% for total cyanide, 65.8% fluoride, 80.5% nitrate/nitrite, 69.9% sulfate, 73.5% total dissolved solids and 87.5% for total organic carbon, dissolved organic carbon, sulfide and chloride. The goal is 90%, groundwater conditions permitting.

All of the 701 water quality parameter analyses performed in 1999 were validated or verified (Table 11-8). Validation was done on 32.0% of the (224) results, verification was done on 68.0% (477). As shown on Table 11-8, all of the 1999-WQP analyses provided usable data points.

Comparability

As stated above no changes were made to analytical procedures during 1999. Thus the water quality parameter analyses presented here are assumed to be comparable to previous analyses. The chloride, total cyanide, nitrate, total and dissolved organic carbon and sulfide analyses were new for 1999, they will be continued in the future.

11.2.5 Polychlorinated Biphenyls (Pesticides-PCBs)

Precision

No duplicate samples for PCBs were collected in 1999. The laboratory qualified all 56 real-results from the 7 PCB samples as "U" non-detections at the detection limits.

Accuracy

Contract required detection limits were met for all PCB analyses in 1999 (Table 11-3). The EDD files show that all PCB analyses were performed using the SW-846 8080A/8081 method. However, the hard copy laboratory reports say that EPA SW-846 Third Edition, Method 8082, Revision III, June, 1997 was used. As shown in Table 11-3 the contract required detection limits are specified for SW-846 Method 8082.

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Table 11-4 gives the two matrix spike results for PCBs for the fourth quarter of 1999. Both results are within the acceptable 80-120% recovery range. Only one of the RINs submitted for analysis had matrix spike quality control samples run. Accuracy quantification for PCBs could have been better. However, because all the results were non-detects analyses for polychlorinated biphenyls are judged to be accurate for 1999. Note that multiple matrix spikes (MS1) matrix spike duplicates (MD1) are listed in Table 11-4 with results given in µg/l. These results are probably a data entry error on the part of the laboratory and are reported here for completeness.

Representativeness

No rinsate samples were collected for PCBs. The lack of detections in the real samples implies that no PCBs were contributed by the sampling process and that the collected samples are representative.

Completeness

Due to lack of water only 8 of 15 wells could be sampled for PCBs (53.3%). All of the 56 results returned were classified as usable data points. Validations were made 62.5% of the time while verifications were made the remaining 37.5% of the time. Sampling was incomplete due to dry wells, however it was complete with respect to gathering usable data.

Comparability

These were the first PCB analyses performed in 1999.

11.2.6 Total Recoverable Petroleum Products (TRPHs)

Precision

No duplicate samples for Total Recoverable Petroleum Hydrocarbons were collected with the six real sampled wells in 1999. All six results were non-detections at the detection limit.

Accuracy

Contract required detection limits were met for all TRPH analyses (Table 11-3). EPA Method 418.1 was used for analyzing all the TRPH samples it is the required method. No matrix spike data were provided with either the EDD or hard copy TRPH files.

Representativeness

No rinsate samples for TRPH were collected. The lack of detections in the real analyses implies that samples were not contaminated by petroleum hydrocarbons during the sampling process and that the collected samples are representative.

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Completeness

All six samples planned were successfully collected. Because TRPH analyses are done on a Task Order basis there is no validation or verification procedure established to classify the samples.

Comparability

Total Recoverable Petroleum Hydrocarbon samples were run for the first time in the fourth quarter 1999 by the Groundwater Program at RFETS.

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12.0 CONCLUSIONS AND FUTURE ACTIVITIES

The groundwater program experienced a number of improvements during 1999 and set projects in motion which will be accomplished in 2000. The following conclusions can be made with respect to the groundwater program based on the detailed discussions found elsewhere in the report.

Data collection and data quality for groundwater samples collected in 1999 have improved in the areas of data validation and verification. Much of this information was readily available and could be included in the data quality assessment section. Though the validation and verification percentages are not at the required levels the results show that only a small percentage of the analytical data is rejected. In addition, procedural improvements have been made in 1999 that will help collect more samples from wells that have low recharge. This will be done by timing visits based on an approximate recharge rate rather than a set time period.

The expansion of the real time monitoring network will also improve the understanding of the nature of recharge at RFETS and will potentially shed light on discharge and flow rates.

With respect to groundwater reporting, changes have been made to this years Annual RFCA Groundwater Monitoring Report based on input from the regulatory community. This report tried to focus on data evaluation as opposed to data presentation. Individual wells have been discussed more completely and the results of groundwater evaluations have been expanded. The actual data used in the current annual report will be provided in the four RFCA Quarterly reports and not reproduced here. The RFCA Quarterly reports have stayed the same except for some changes in the format of the report.

The Building D&D monitoring program was expanded with the addition of the Building 123 monitoring network. D&D monitoring for Buildings 444, 886 and 771.

The largest programmatic improvement for groundwater has been in the characterization and quantification of groundwater plume nature and extent. Evaluation of the East Trenches Plume resulted in a remedial strategy involving the construction of a passive VOC treatment system which was completed in 1999. The Solar Ponds nitrate/uranium plume also received additional characterization and modeling of contaminant fluxes. This has also resulted in the construction of a groundwater treatment system during 1999.

Characterization activities were also initiated for the Ryan's Pit/903 Pad Plume with installation of four monitoring wells along the pathway to surface water. A natural attenuation sampling project was implemented in 1999 to determine whether contaminants are naturally degrading prior to impacting surface water.

Groundwater evaluation of the eastern end of the Industrial Area plume has revealed contamination crossing to the east of a large, north-south trending utility corridor in the IA.

A natural attenuation study was also implemented for the IHSS 118.1 source area. Future groundwater evaluations will involve establishing the eastern extent of the carbon tetrachloride plume and investigating natural attenuation at the PU&D Yard Plume.

Given the large amount of new data with respect to the nature and extent of groundwater contamination at RFETS, a review of the groundwater monitoring network will be done in FY01. It is anticipated that some minor changes will be made to the monitoring based on this evaluation. Specific areas of review would include the north IA, the Present Landfill, and the Ryan's Pit source area which have shown evidence of increased extent or concentrations of contaminants.

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THIS TARGET SHEET REPRESENTS AN
OVER-SIZED MAP / PLATE FOR THIS DOCUMENT:
(Ref: 00-RF-03112)

1999 Annual RFCA Groundwater Monitoring Report

November 11, 2000

Plate 1:

IMP Monitoring Well Location Map

Map ID: fy2k/rfca-rpt

November 20, 2000

CERCLA Administrative Record Document, SW-A-004870

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

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THIS TARGET SHEET REPRESENTS AN
OVER-SIZED MAP / PLATE FOR THIS DOCUMENT:
(Ref: 00-RF-03112)

1999 Annual RFCA Groundwater Monitoring Report

November 11, 2000

Plate 2:

Potentiometric Surface of Permeable Units of the UHSU Second Quarter 1999

Map ID: fy2k/rfca-rpt/pot_maps

November 13, 2000

CERCLA Administrative Record Document, SW-A-004870

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

233

THIS TARGET SHEET REPRESENTS AN
OVER-SIZED MAP / PLATE FOR THIS DOCUMENT:
(Ref: 00-RF-03112)

1999 Annual RFCA Groundwater Monitoring Report

November 11, 2000

Plate 3:

Potentiometric Surface of Permeable Units of the UHSU Fourth Quarter 1999

Map ID: fy2k/rfca-rpt

November 15, 2000

CERCLA Administrative Record Document, SW-A-004870

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

234

THIS TARGET SHEET REPRESENTS AN
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(Ref: 00-RF-03112)

1999 Annual RFCA Groundwater Monitoring Report

November 11, 2000

Plate 4:

Industrial Area Potentiometric Surface Permeable Units of the UHSU Second Quarter 1999

Map ID: fy2k/rfca-rpt

November 13, 2000

CERCLA Administrative Record Document, SW-A-004870

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

235

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(Ref: 00-RF-03112)

1999 Annual RFCA Groundwater Monitoring Report

November 11, 2000

Plate 5:

Industrial Area Potentiometric Surface Permeable Units of the UHSU Fourth Quarter 1999

Map ID: fy2k/rfca-rpt

November 13, 2000

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U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

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1999 Annual RFCA Groundwater Monitoring Report

November 11, 2000

Plate 6:

Radionuclides in Groundwater RFCA Wells, 1999

Map ID: fy2k/rfca-rpt

November 13, 2000

CERCLA Administrative Record Document, SW-A-004870

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237

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1999 Annual RFCA Groundwater Monitoring Report

November 11, 2000

Plate 7:

VOCs in Groundwater RFCA Wells, 1999

Map ID: fy2k/rfca-rpt

November 13, 2000

CERCLA Administrative Record Document, SW-A-004870

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

238

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(Ref: 00-RF-03112)

1999 Annual RFCA Groundwater Monitoring Report

November 11, 2000

Plate 8:

Water Quality Parameters in Groundwater RFCA Wells, 1999

Map ID: fy2k/rfca-rpt

November 14, 2000

CERCLA Administrative Record Document, SW-A-004870

U.S. DEPARTEMENT OF ENERGY
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GOLDEN, COLORADO

239

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OVER-SIZED MAP / PLATE FOR THIS DOCUMENT:
(Ref: 00-RF-03112)

1999 Annual RFCA Groundwater Monitoring Report

November 11, 2000

Plate 9:

Water Level Change Map 1996 – 1999 Second Quarter Data

Map ID: fy2k/rfca-rpt/wat_lev-chg

November 15, 2000

CERCLA Administrative Record Document, SW-A-004870

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

240

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OVER-SIZED MAP / PLATE FOR THIS DOCUMENT:
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1999 Annual RFCA Groundwater Monitoring Report

November 11, 2000

Plate 10:

Water Level Change Map 1996 – 1999 Fourth Quarter Data

Map ID: fy2k/rfca-rpt/wat_lev_chg

November 15, 2000

CERCLA Administrative Record Document, SW-A-004870

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

241

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OVER-SIZED MAP / PLATE FOR THIS DOCUMENT:
(Ref: 00-RF-03112)

1999 Annual RFCA Groundwater Monitoring Report

November 11, 2000

Plate 11:

VOCs Composite & Nitrate Plumes Map

Map ID: FY2K/RFCA-RPT/VOC_PLUME

September 27, 2000

CERCLA Administrative Record Document, SW-A-004870

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

242

THIS TARGET SHEET REPRESENTS AN
OVER-SIZED MAP / PLATE FOR THIS DOCUMENT:
(Ref: 00-RF-03112)

1999 Annual RFCA Groundwater Monitoring Report

November 11, 2000

Plate 12:

Real-Time Groundwater Monitoring Location Hydrographs with Precipitation Data

Map ID: FY2K/RFCA-RPT/REAL-TIME

September 21, 2000

CERCLA Administrative Record Document, SW-A-004870

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

243

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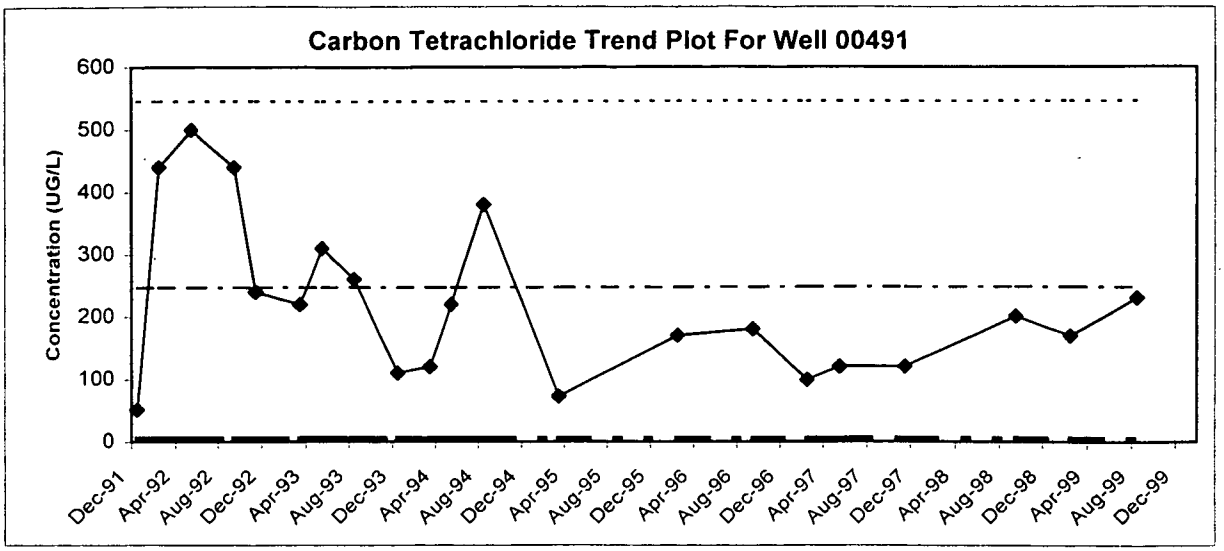

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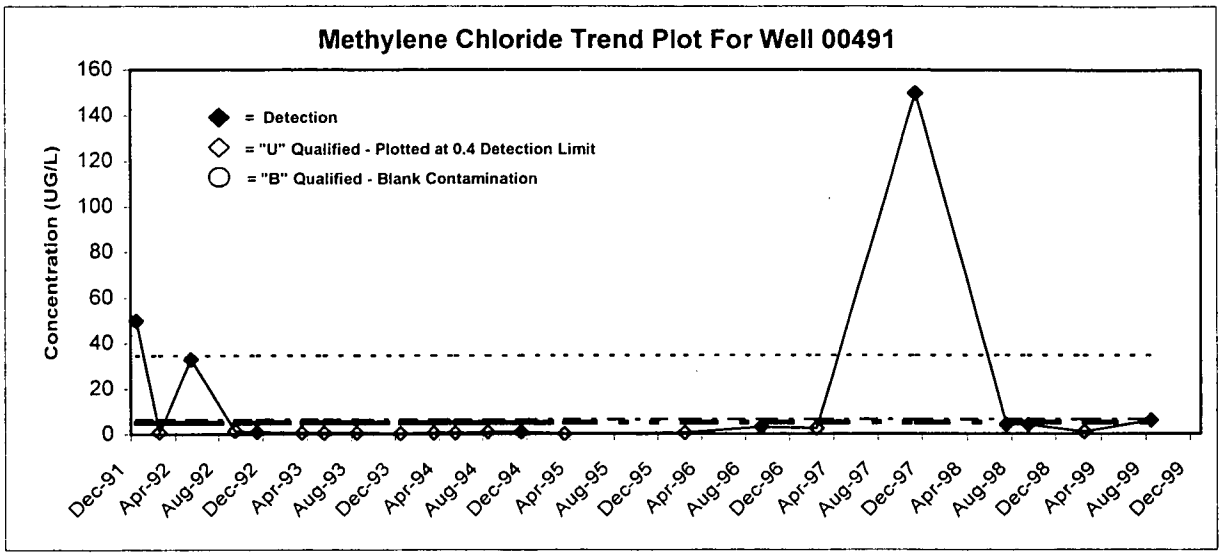

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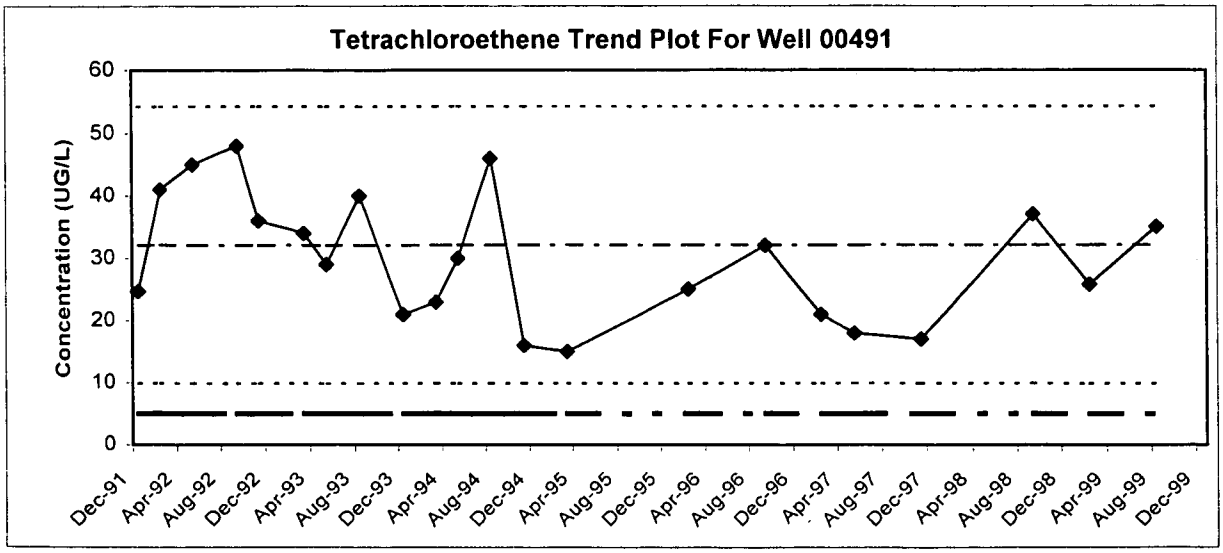

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Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

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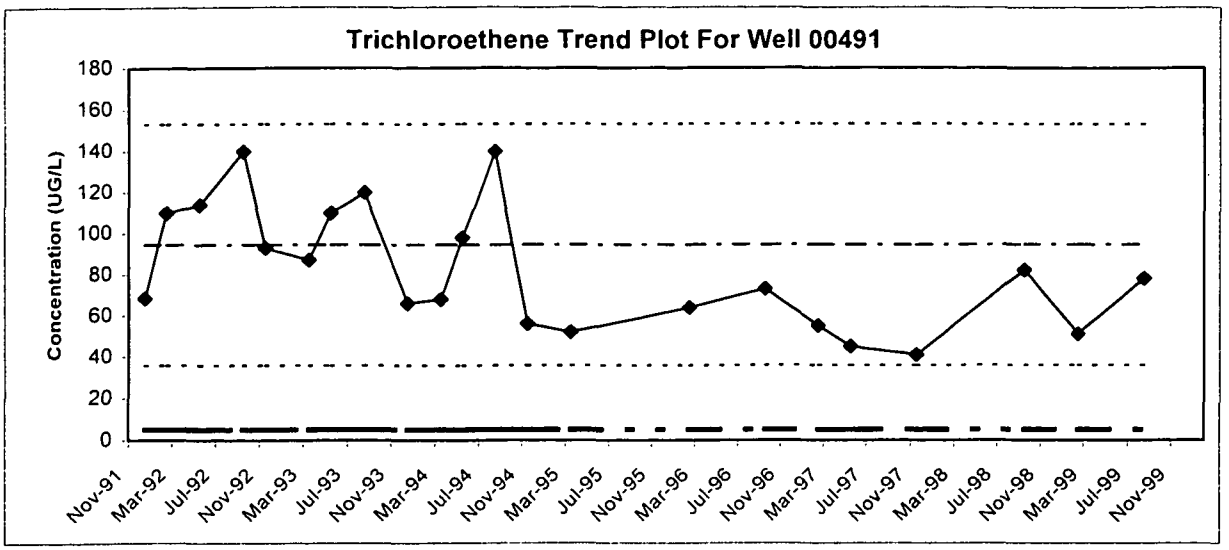

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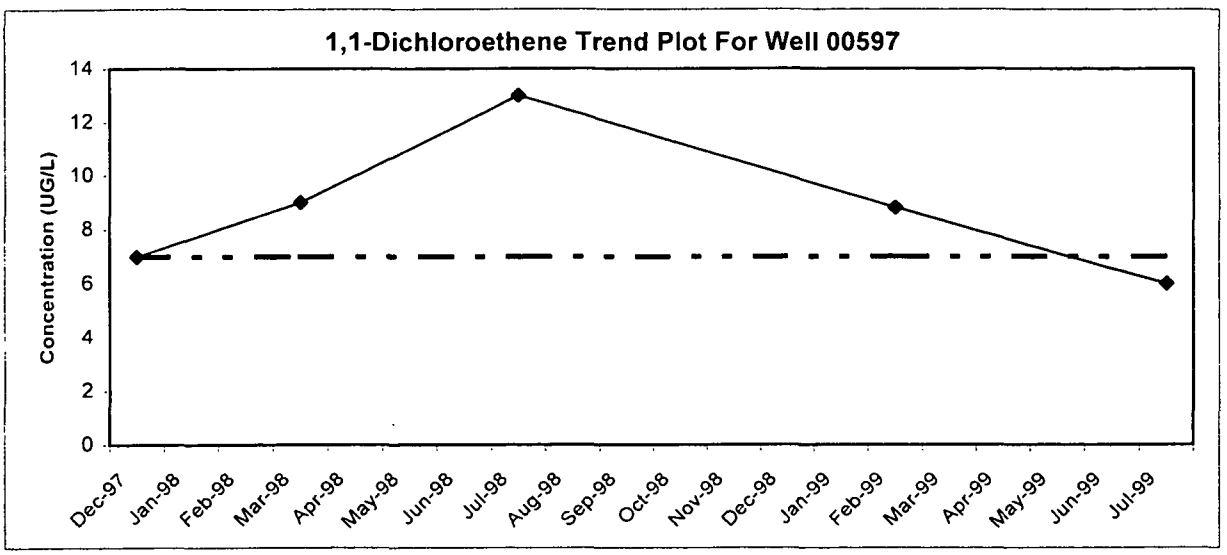

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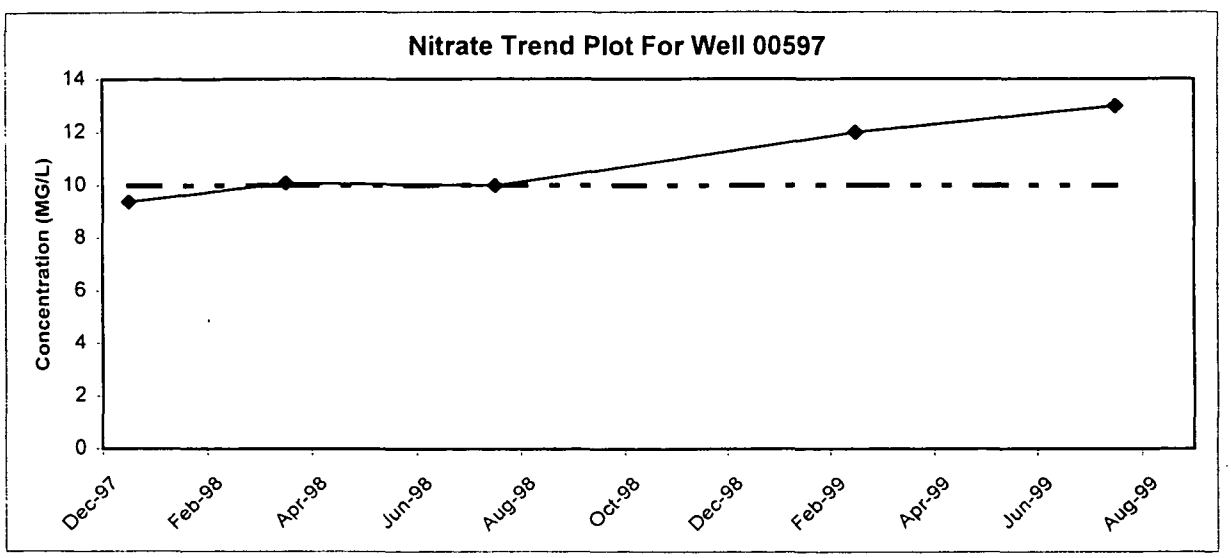

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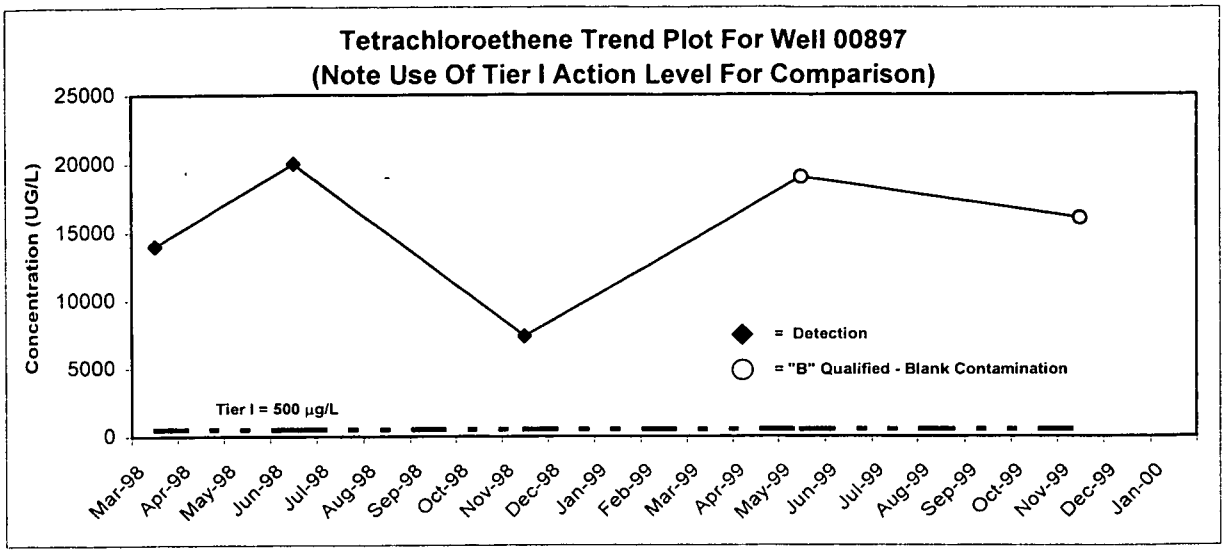

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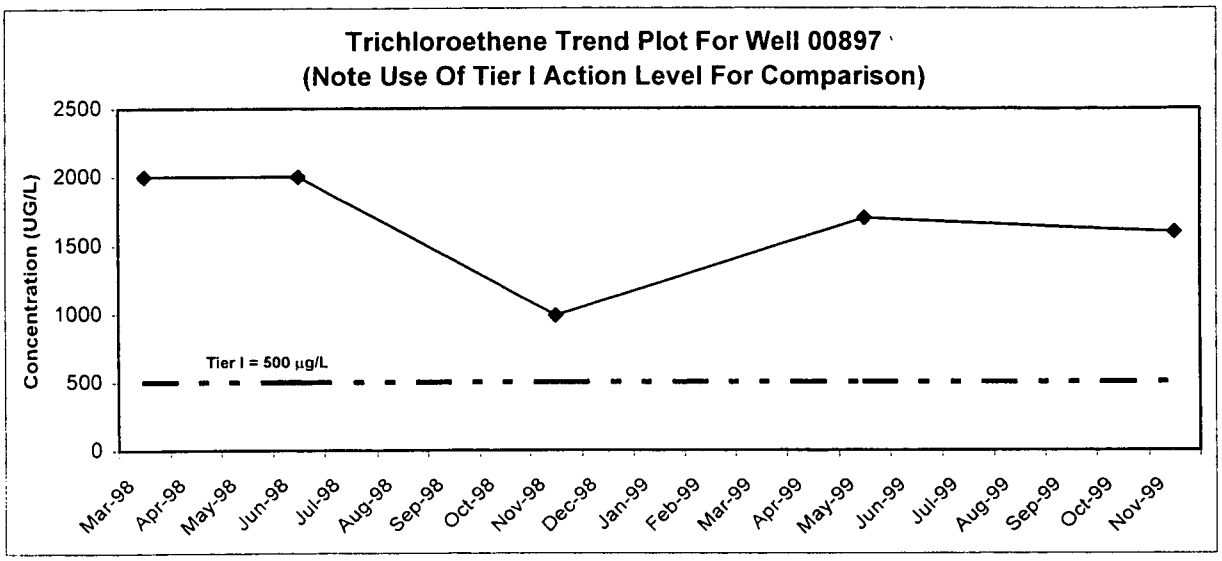

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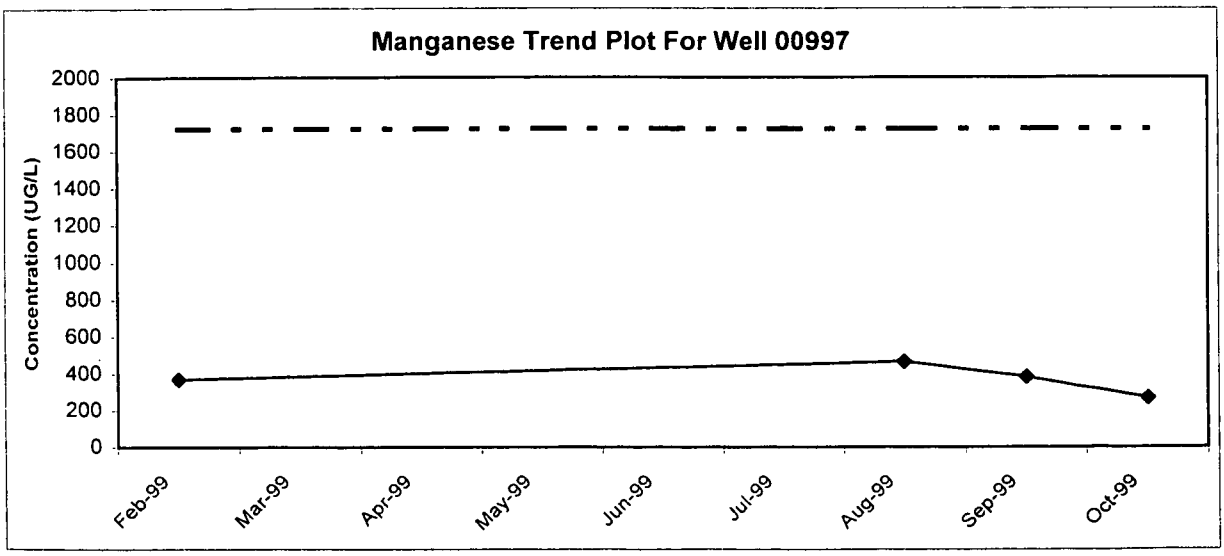

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(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

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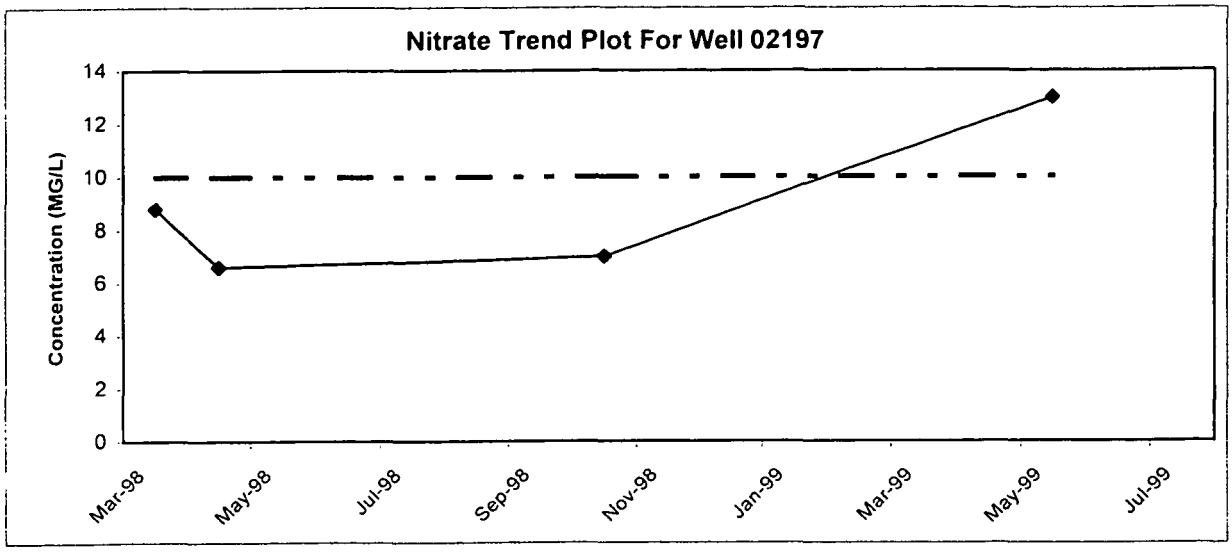

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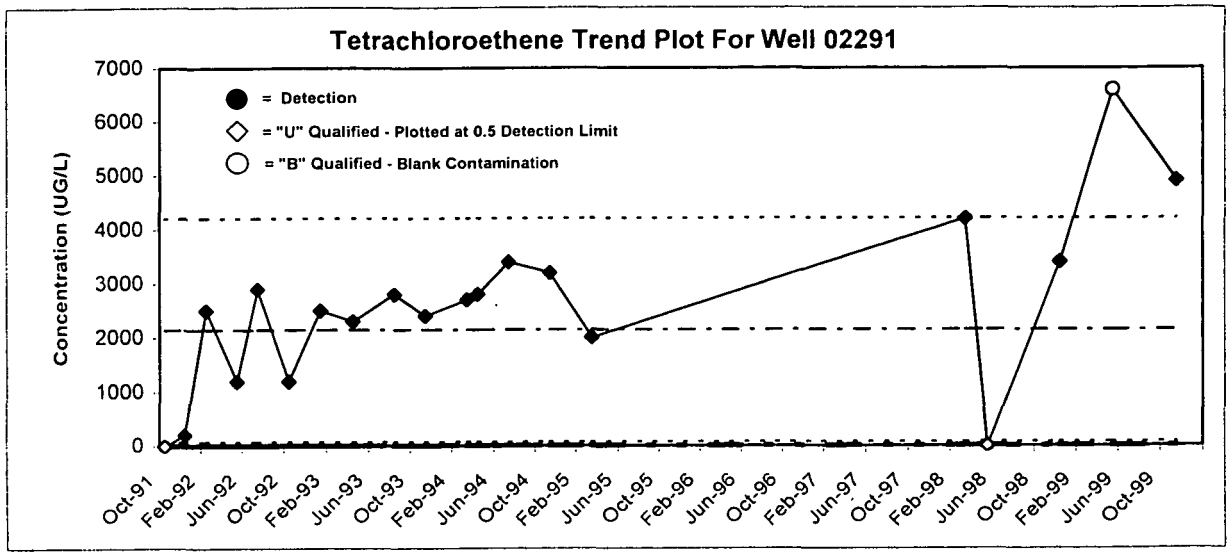

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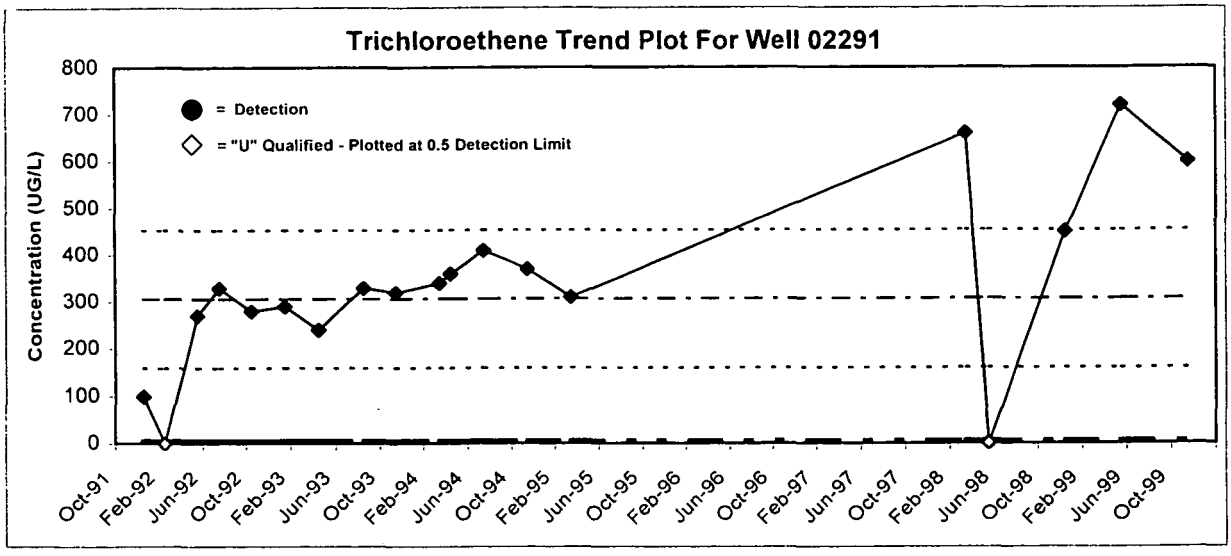

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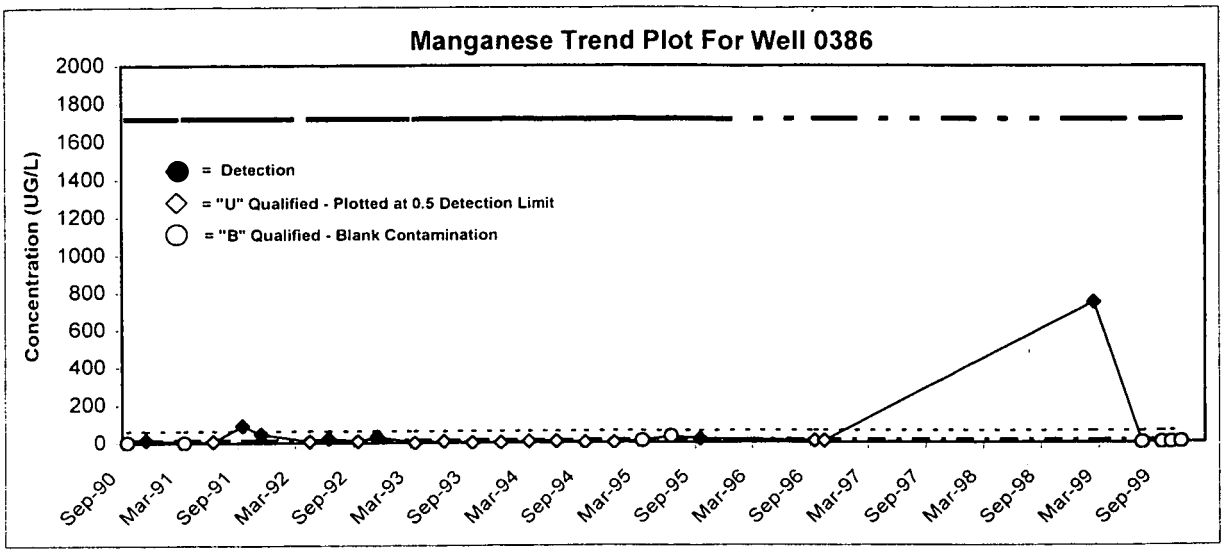

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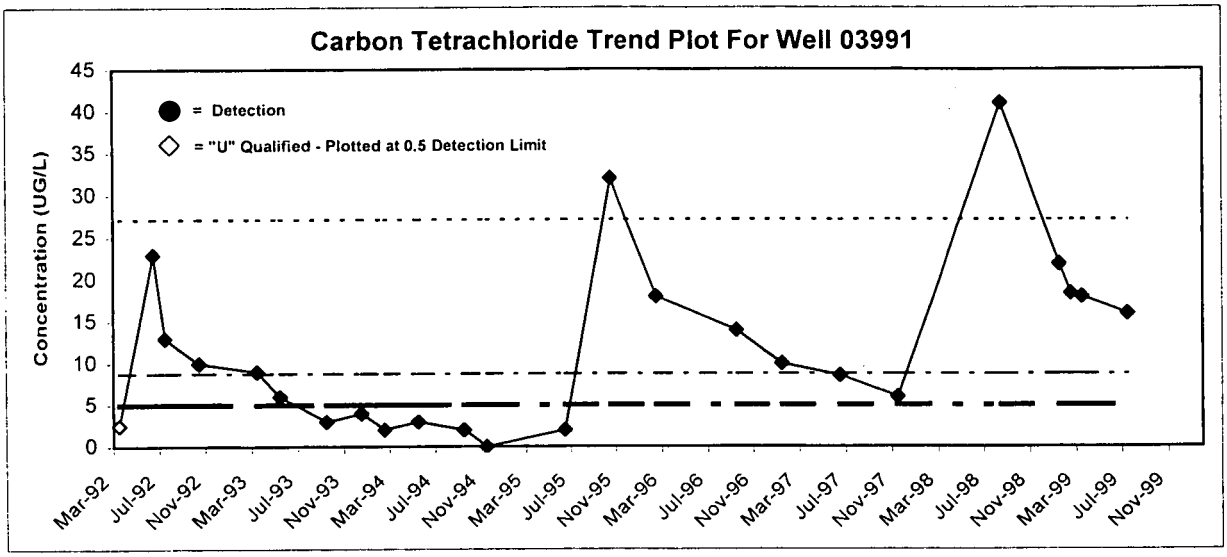

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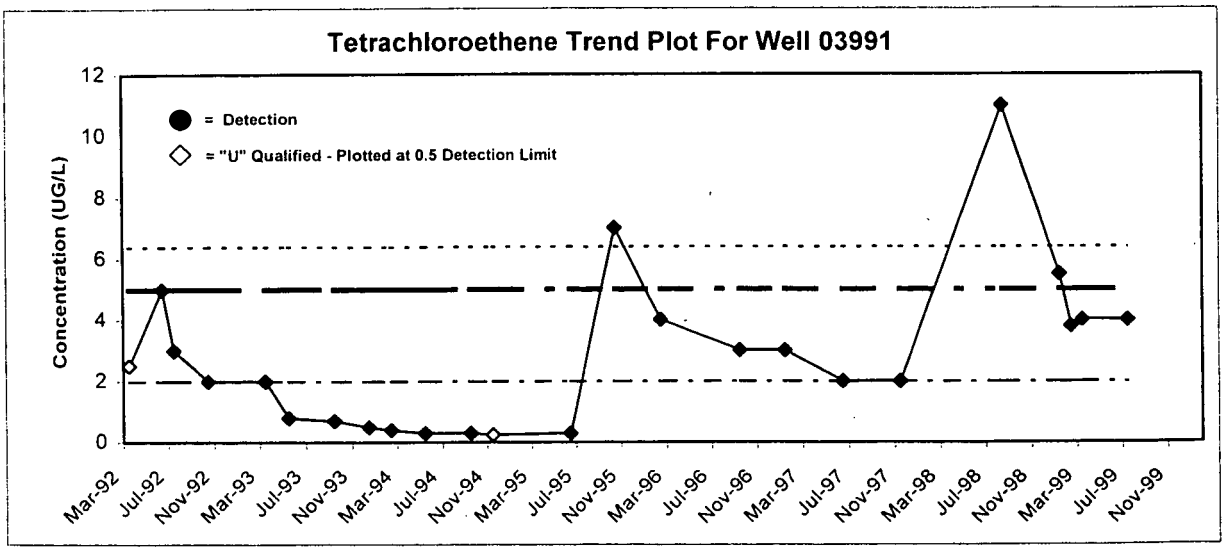

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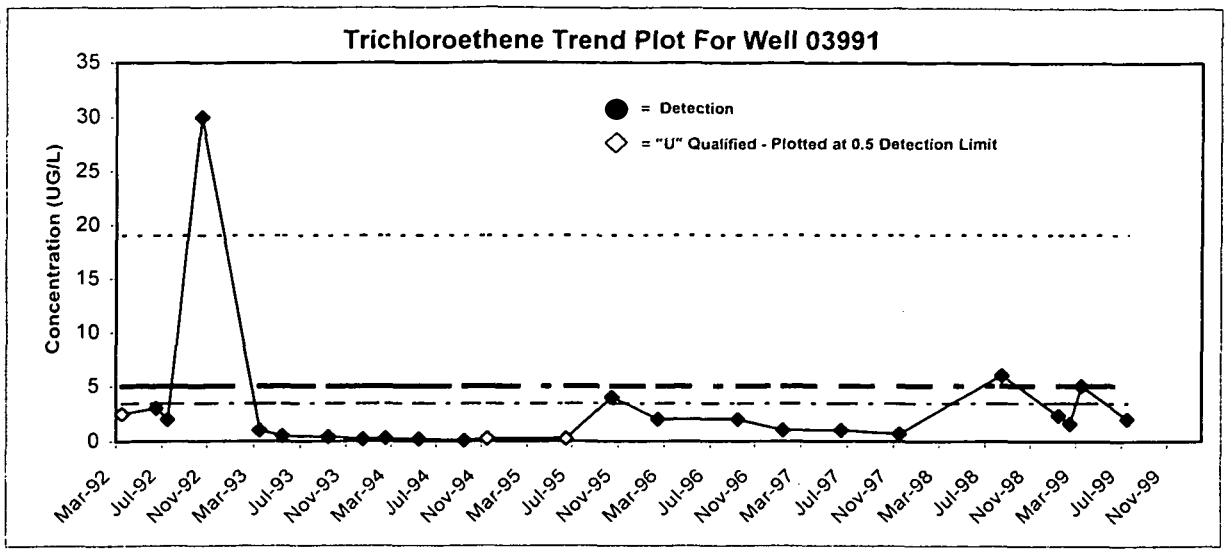

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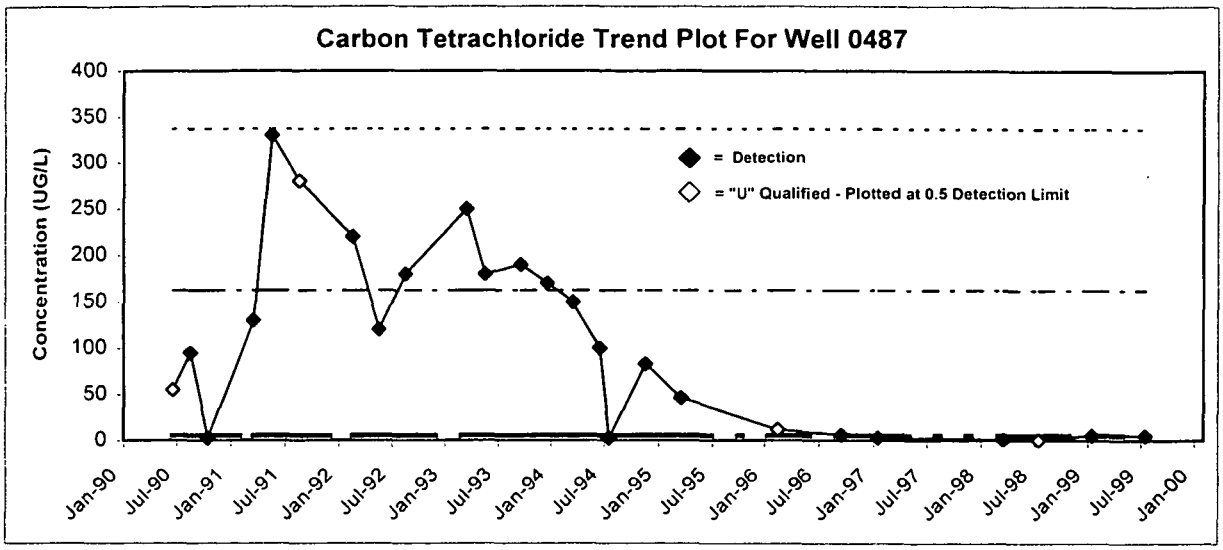

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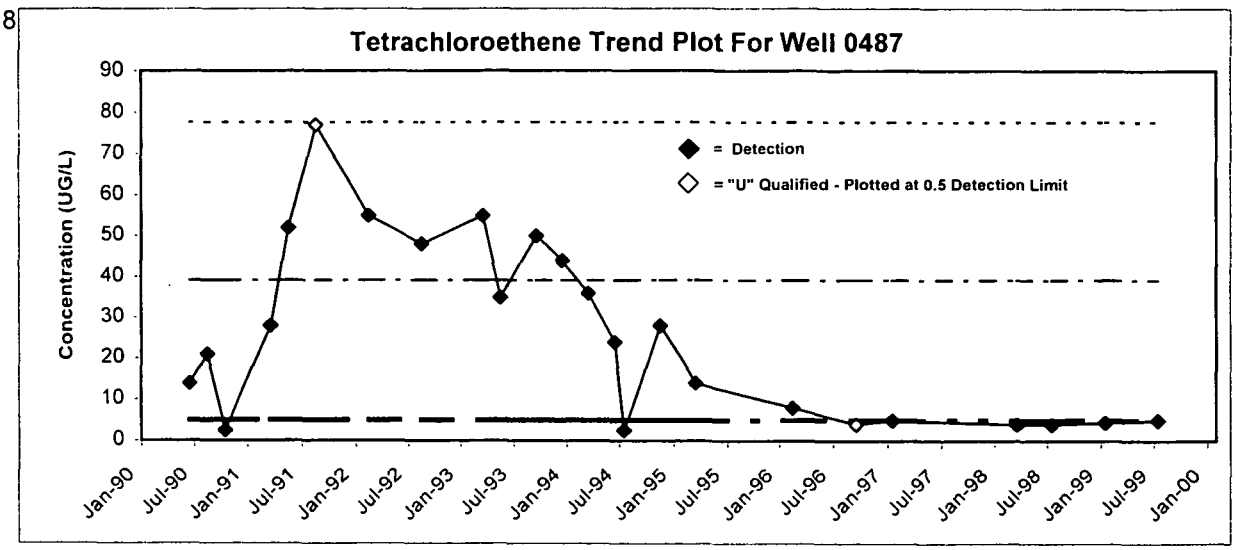

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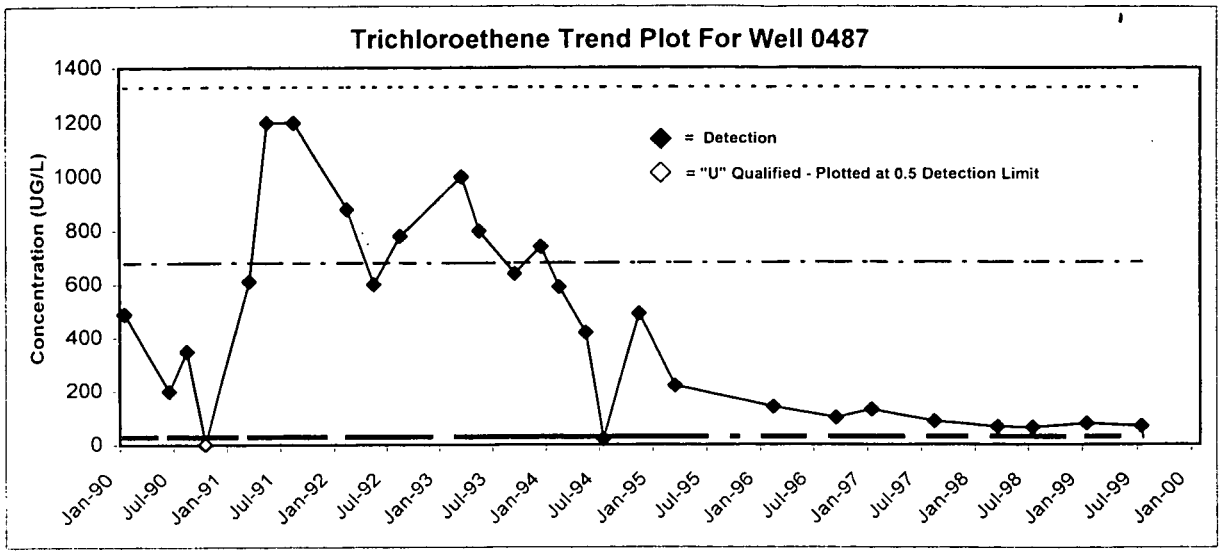

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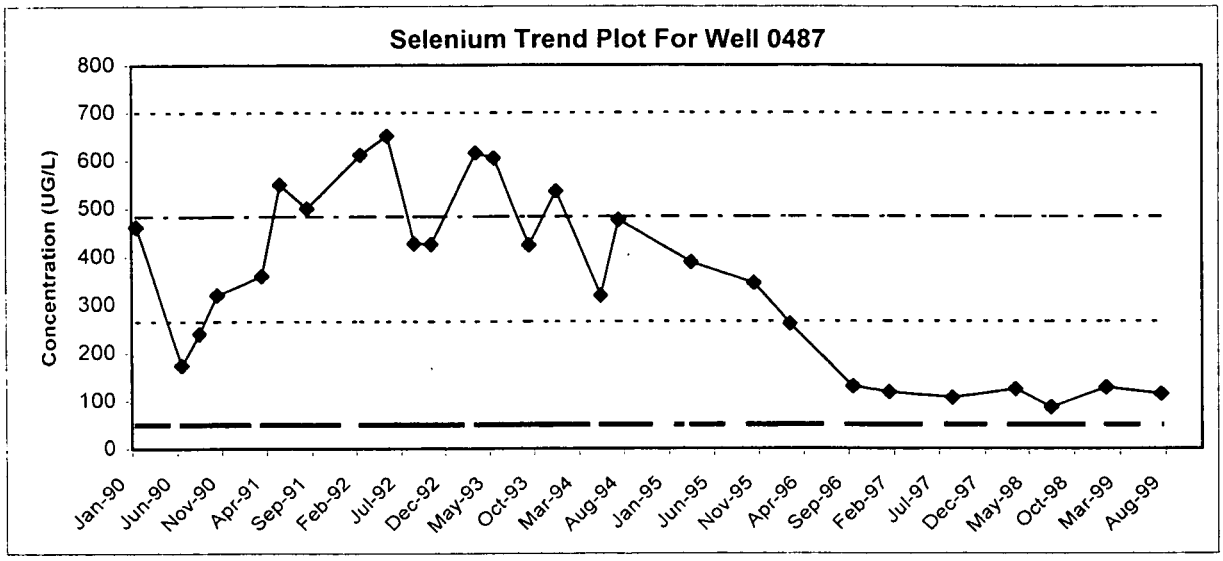

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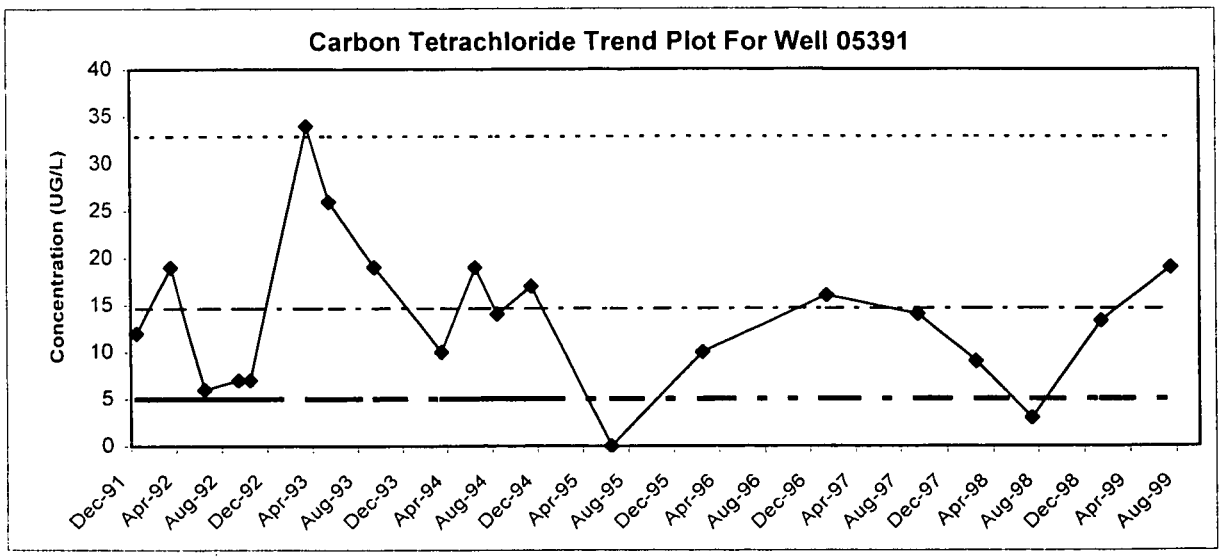

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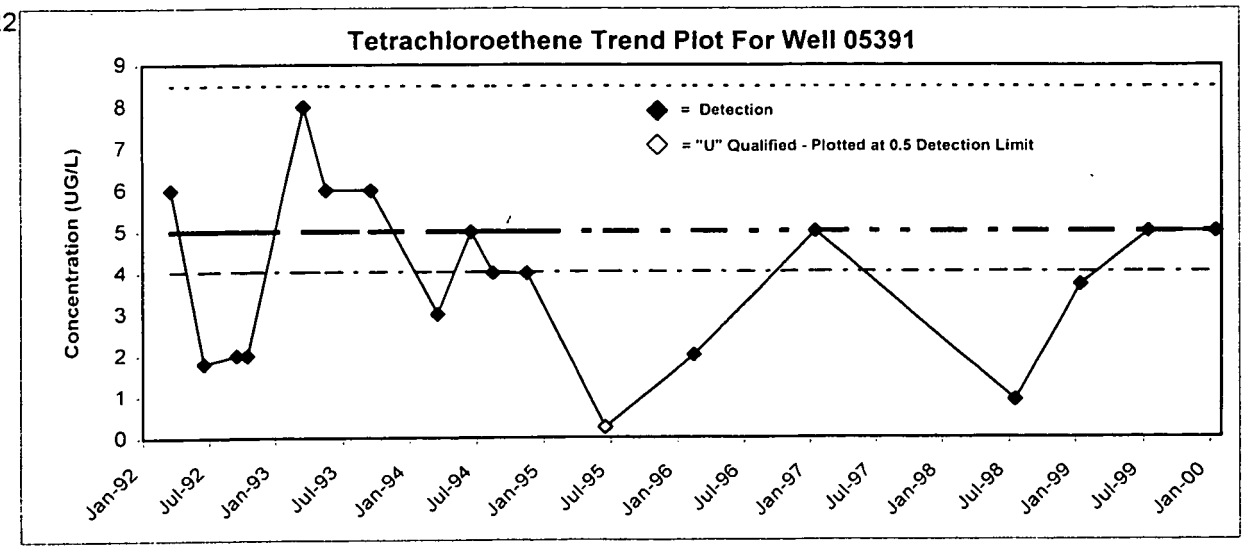

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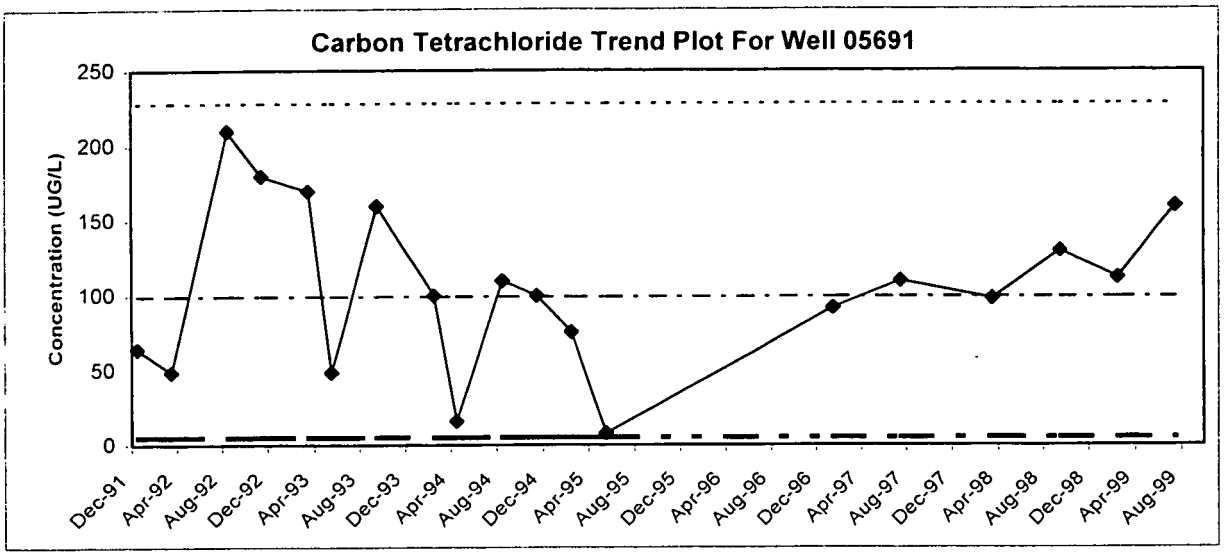

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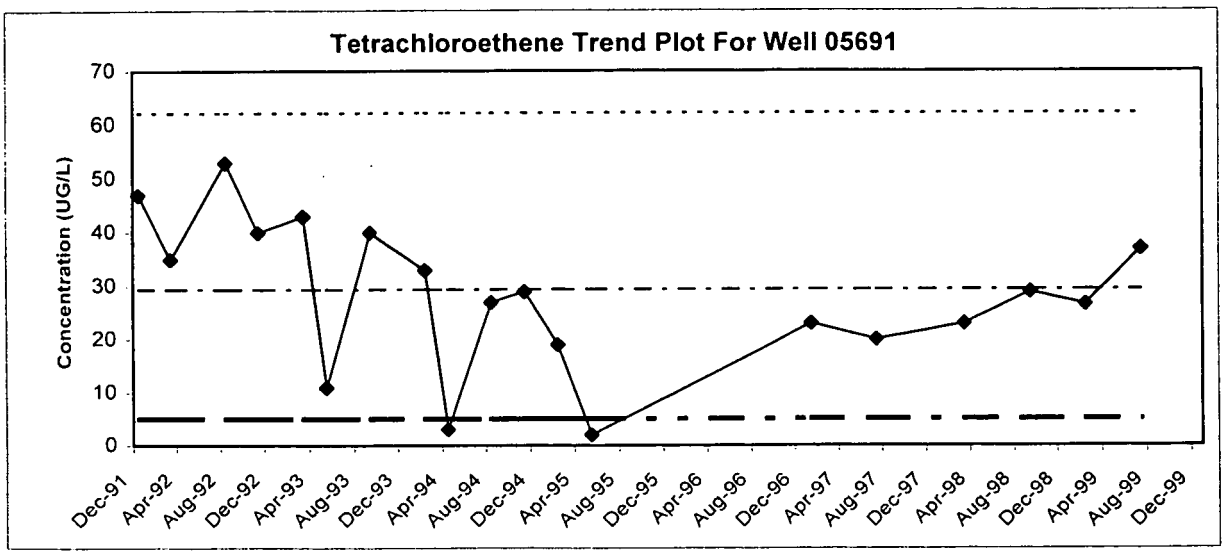

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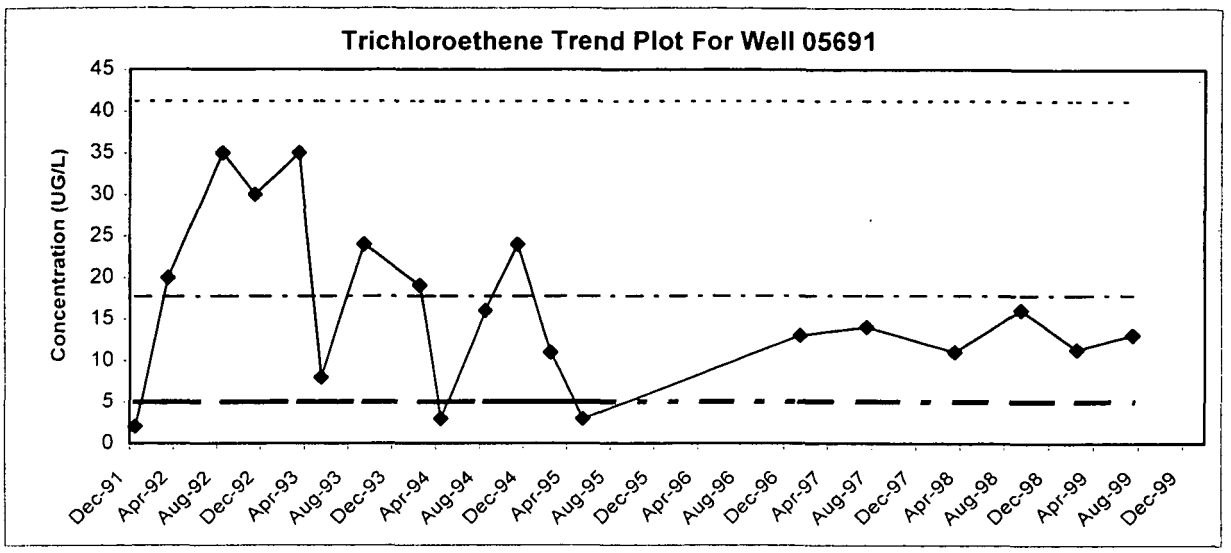

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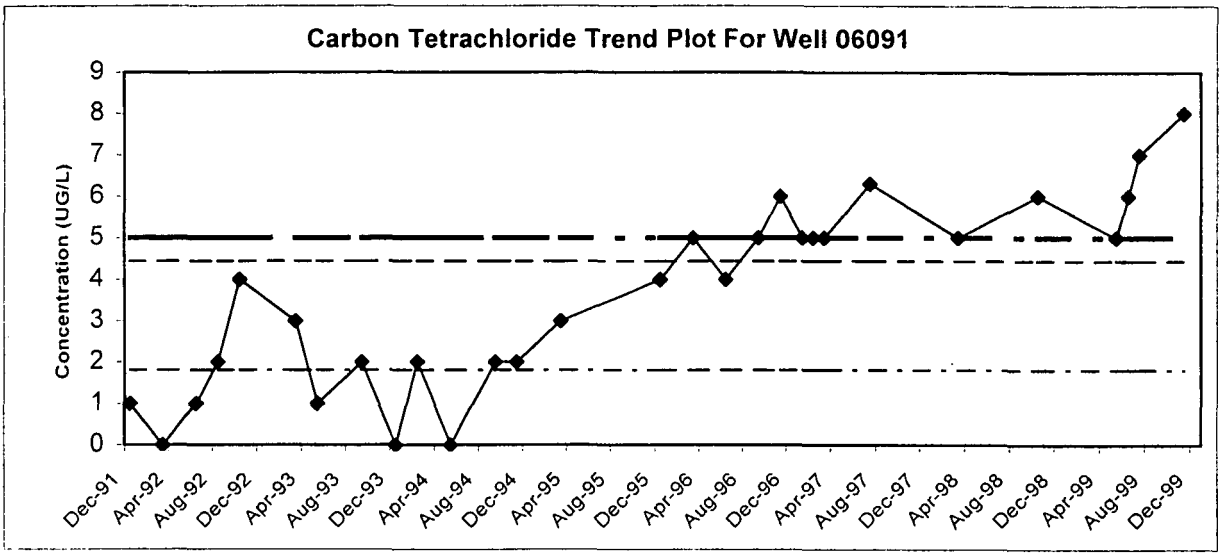

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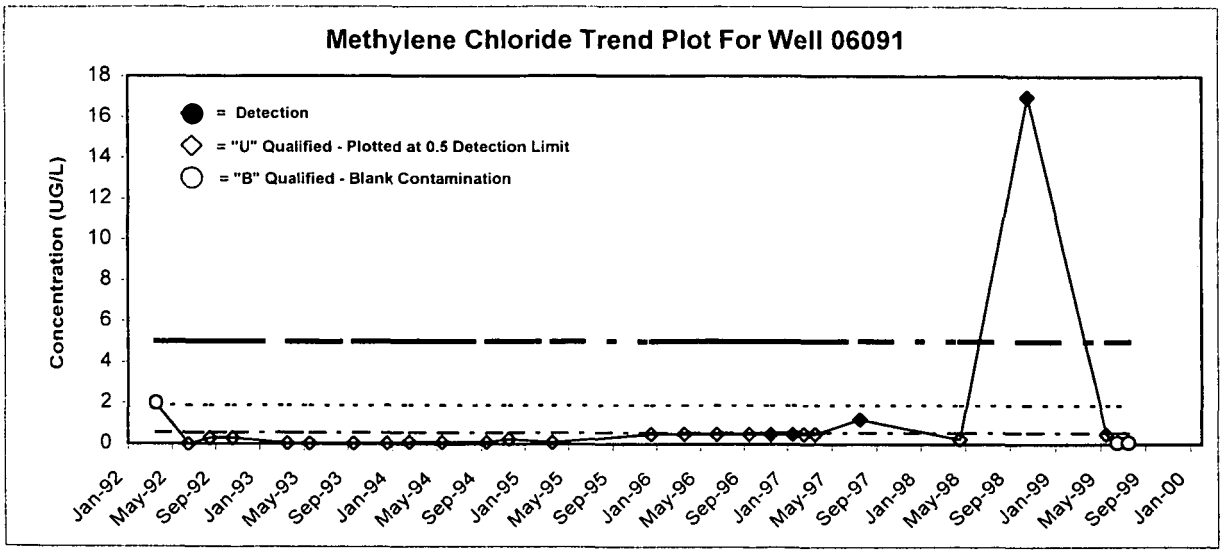

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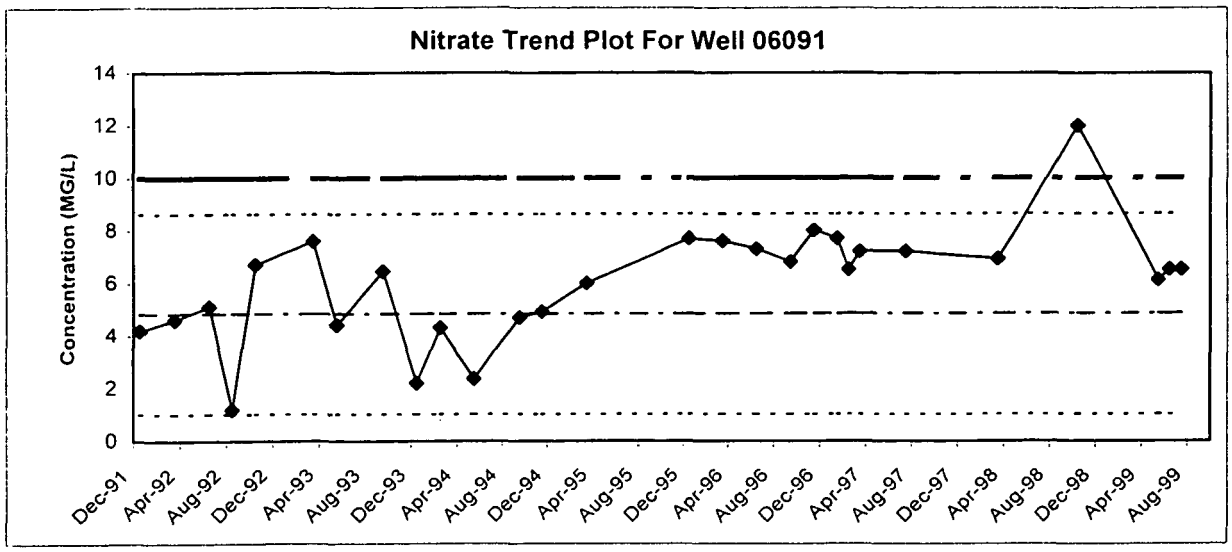

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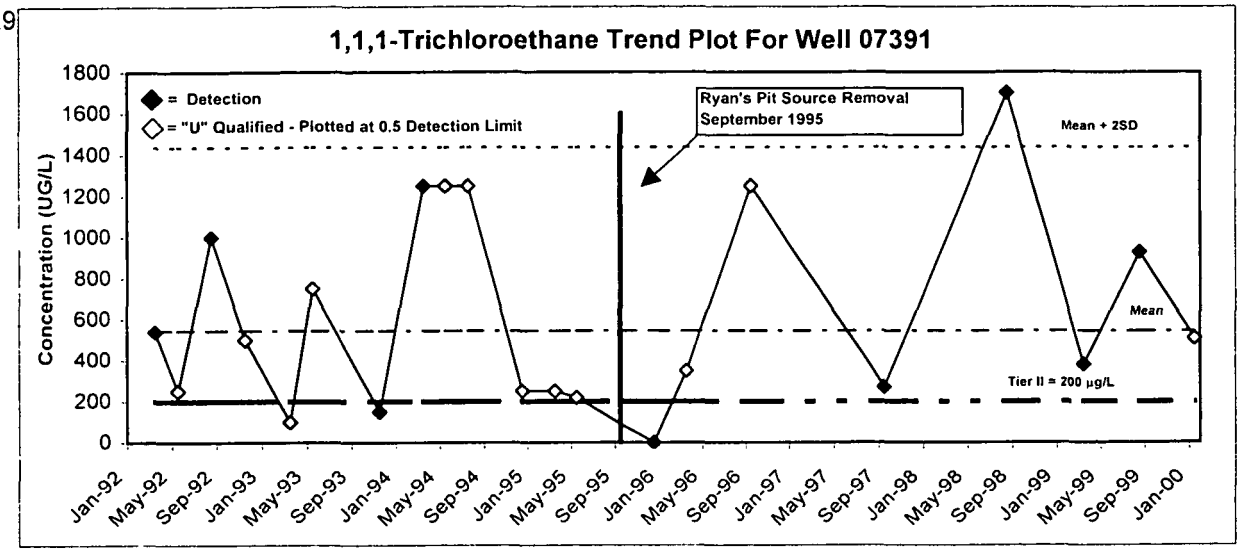

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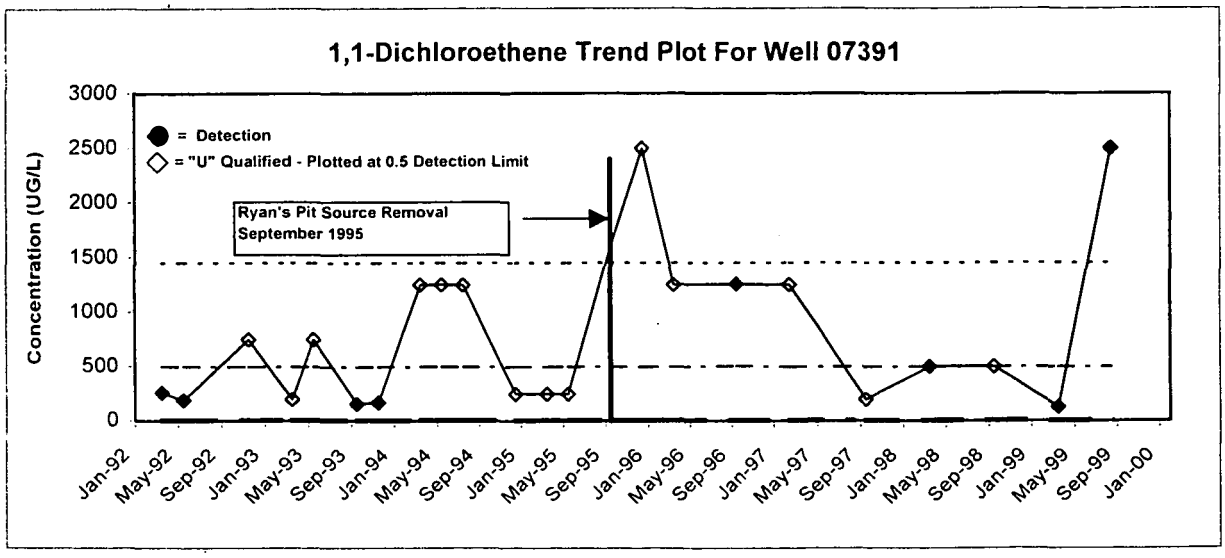

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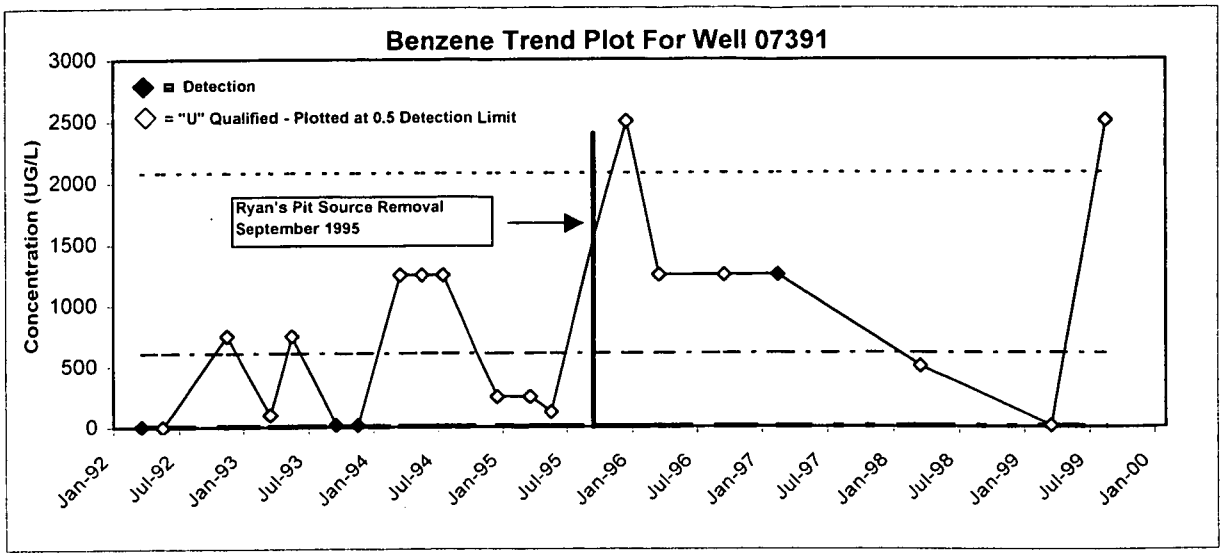

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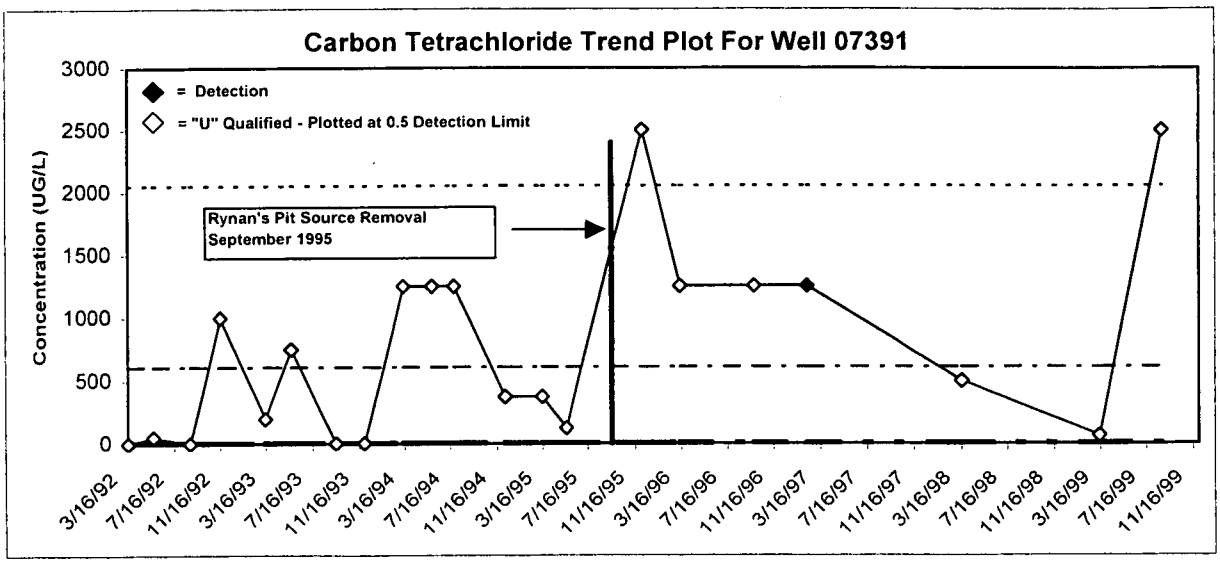

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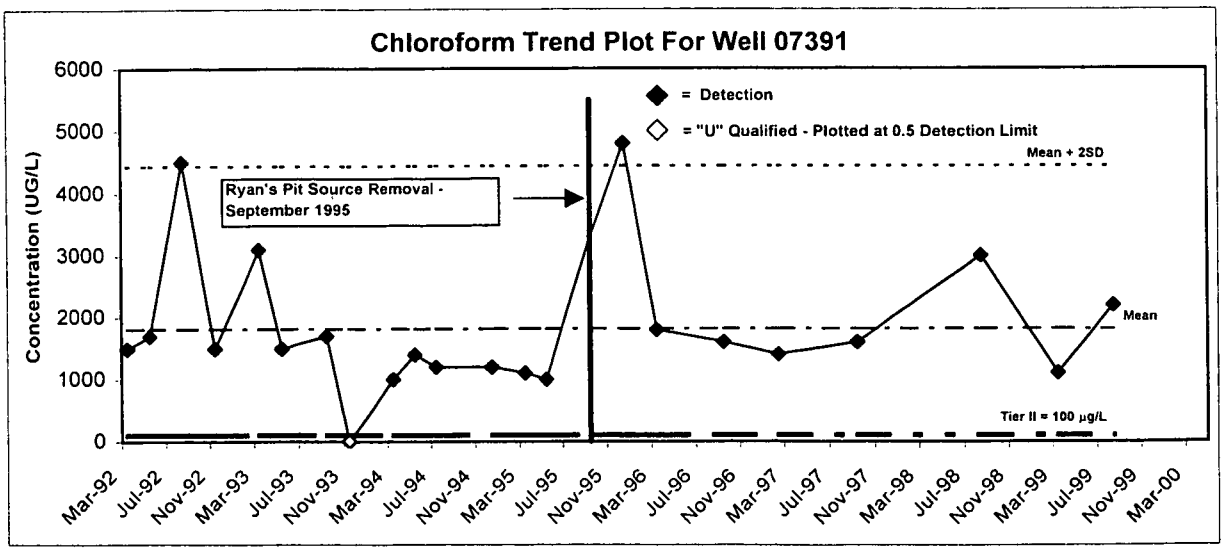

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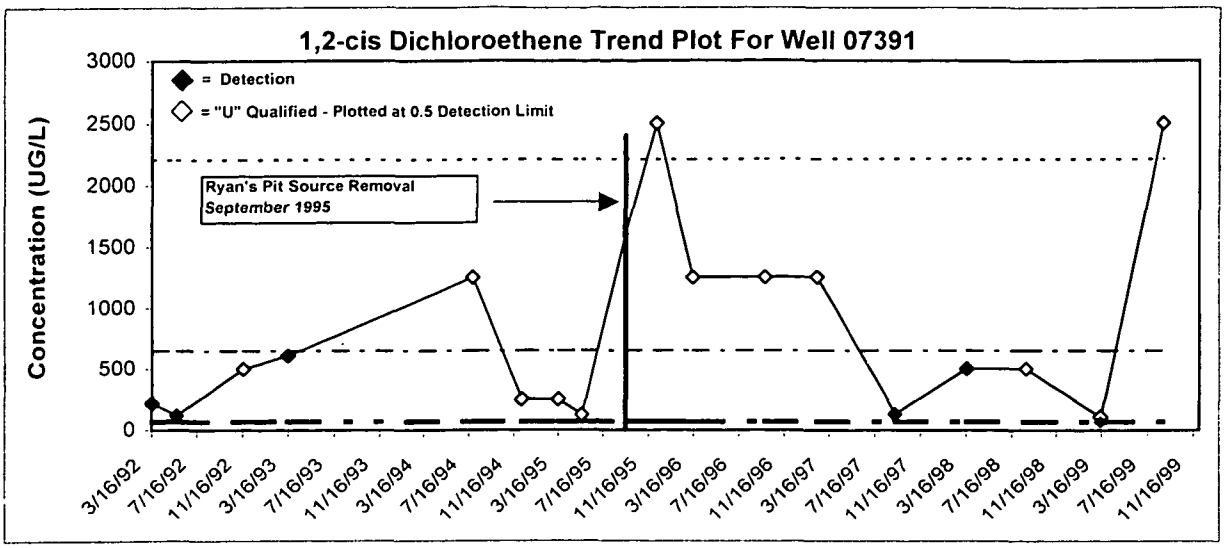

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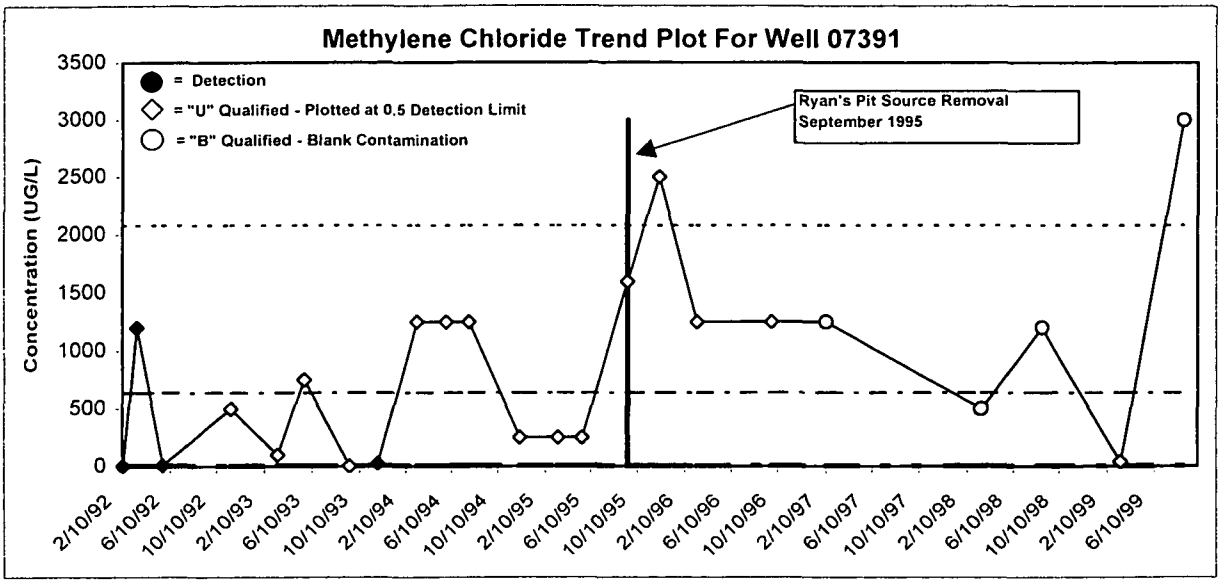

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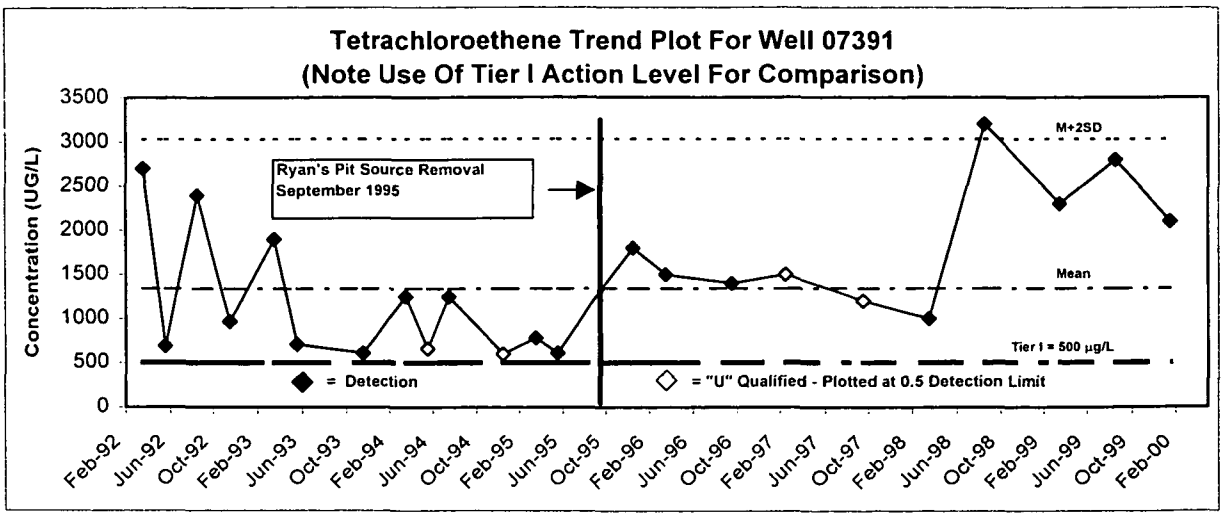

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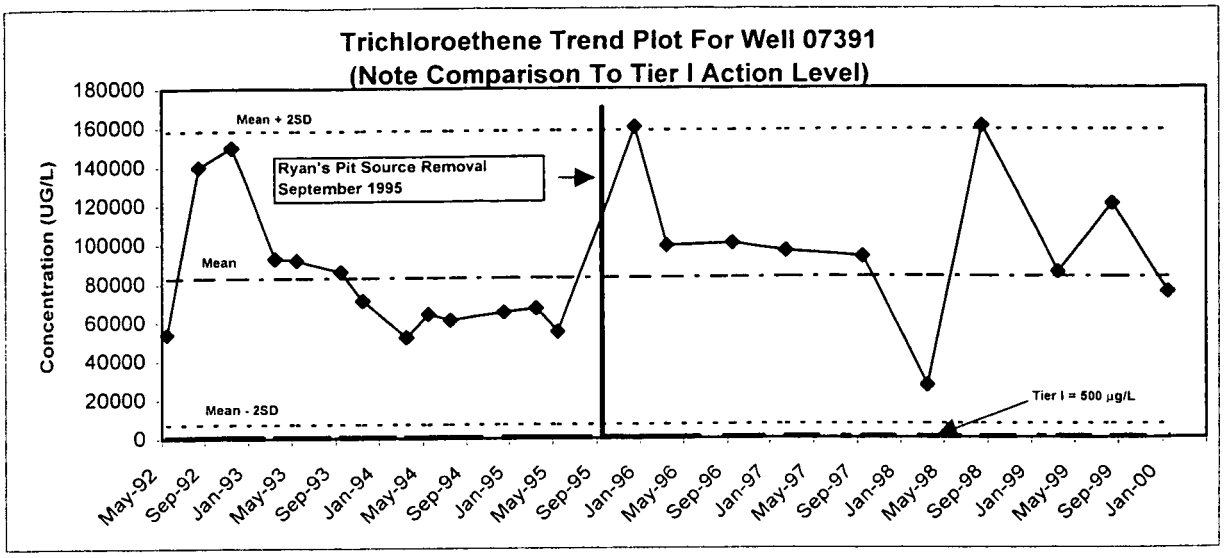

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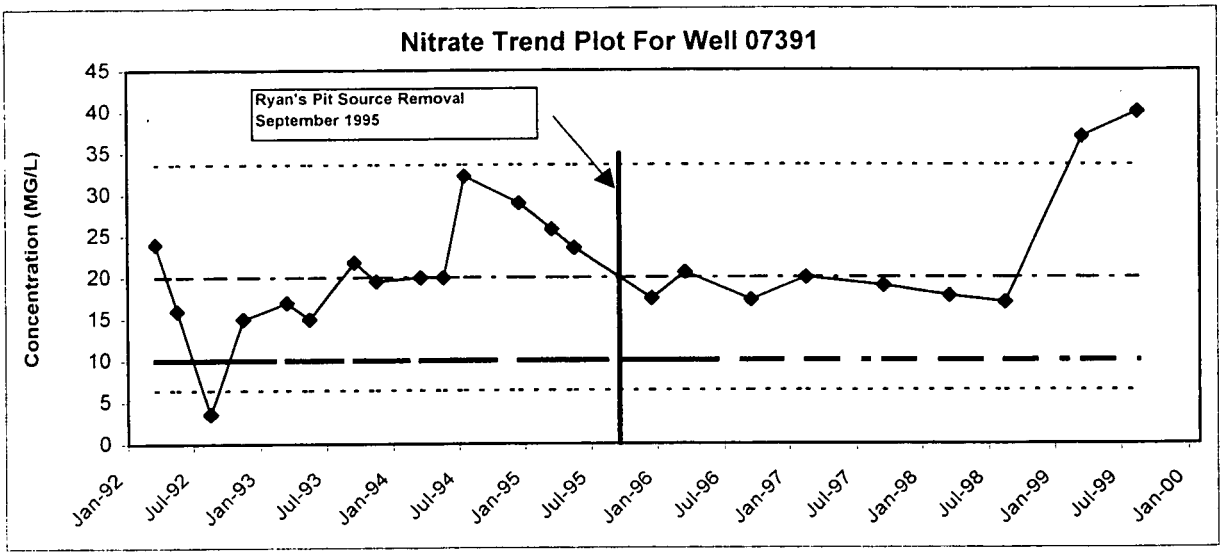

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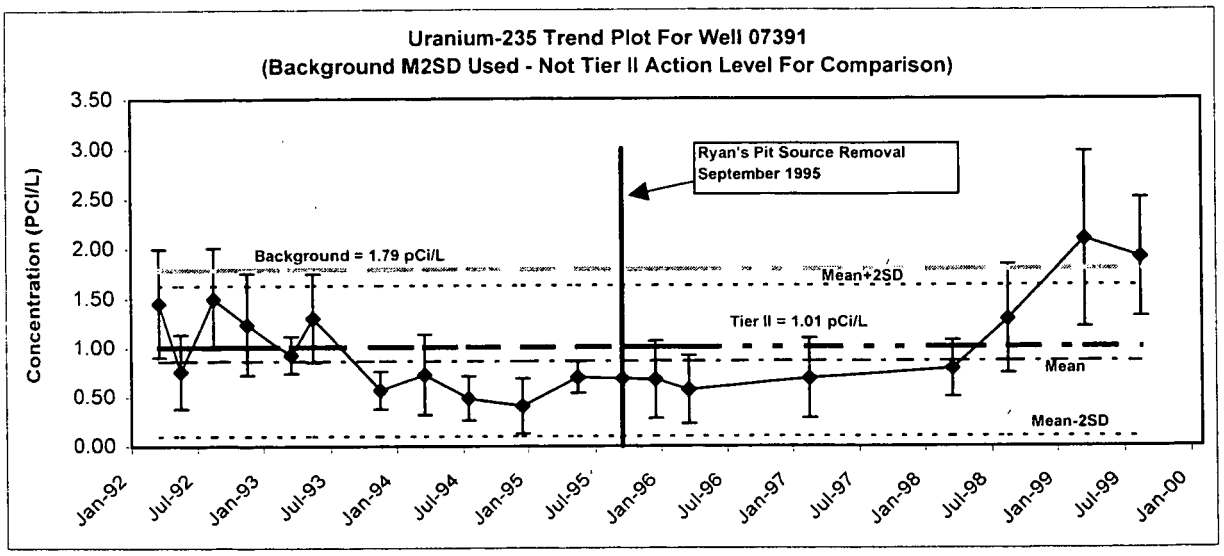

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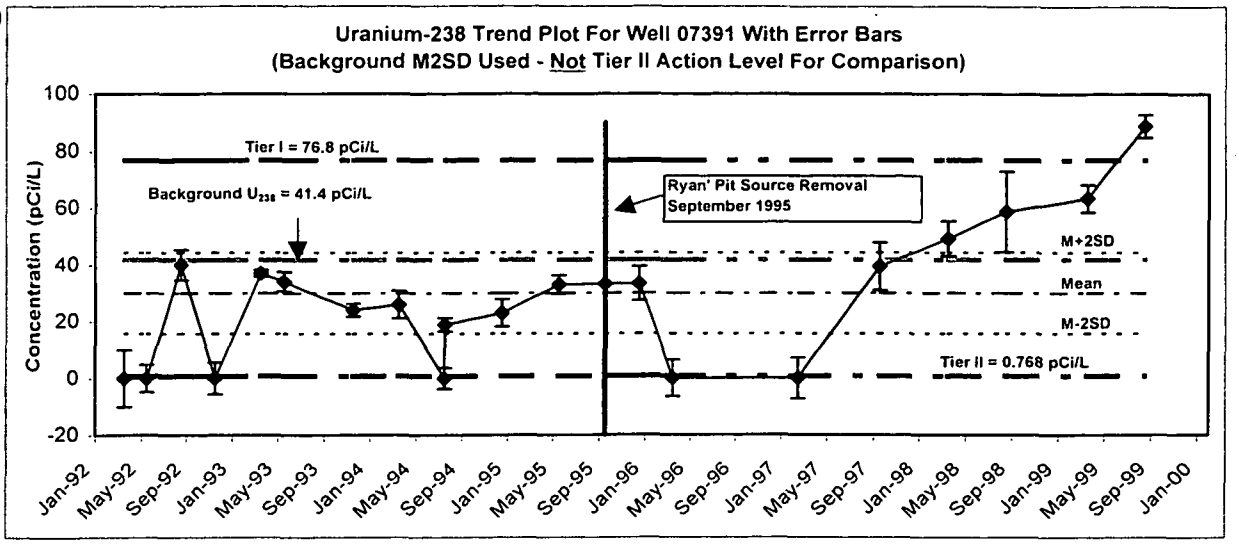

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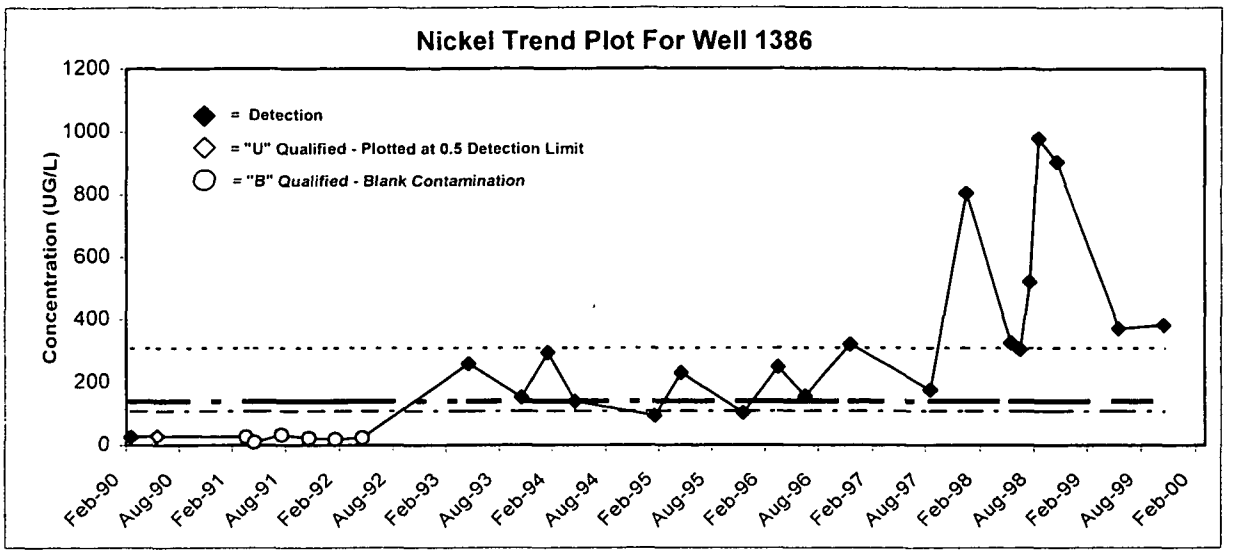

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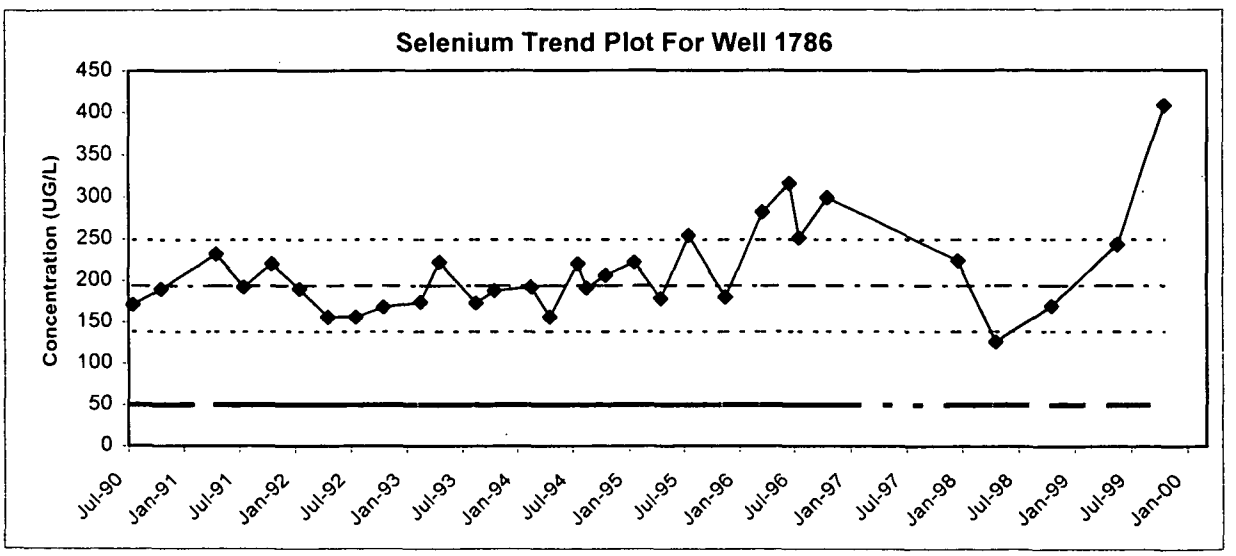

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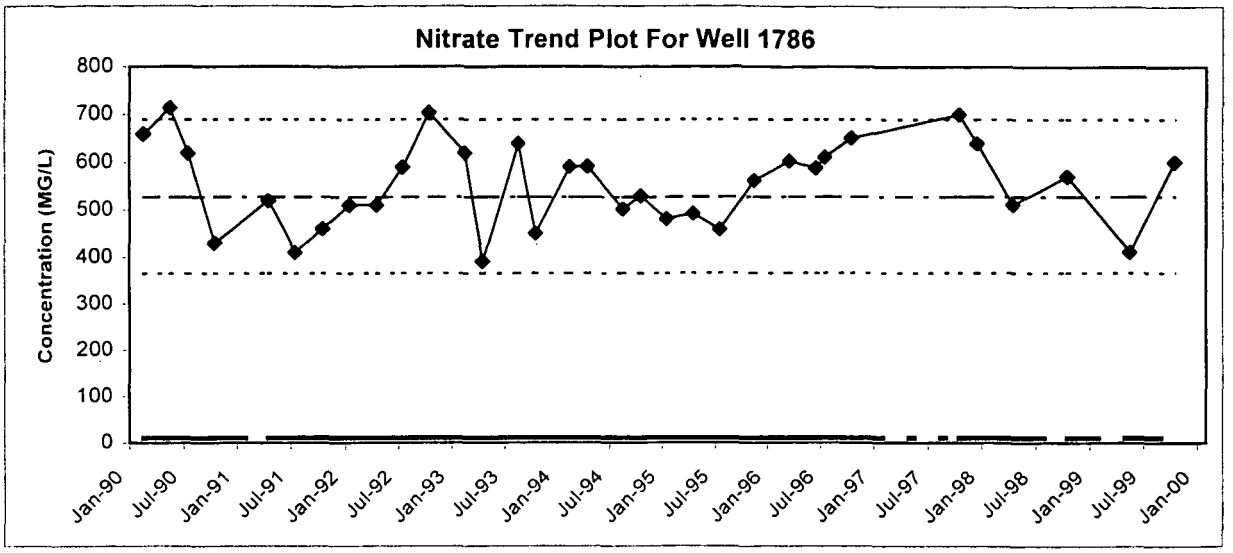
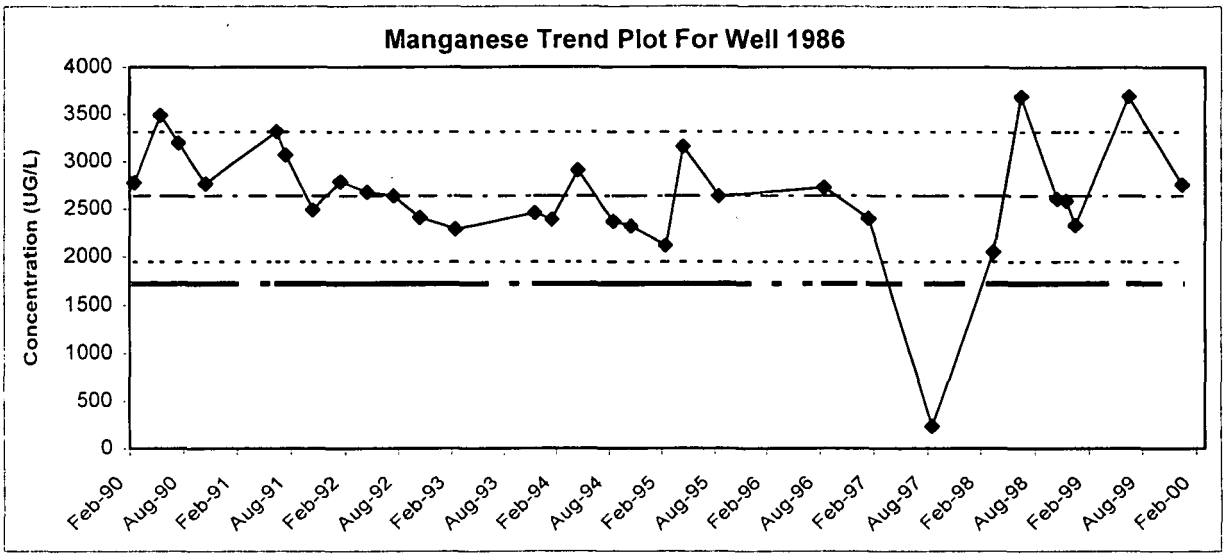
257

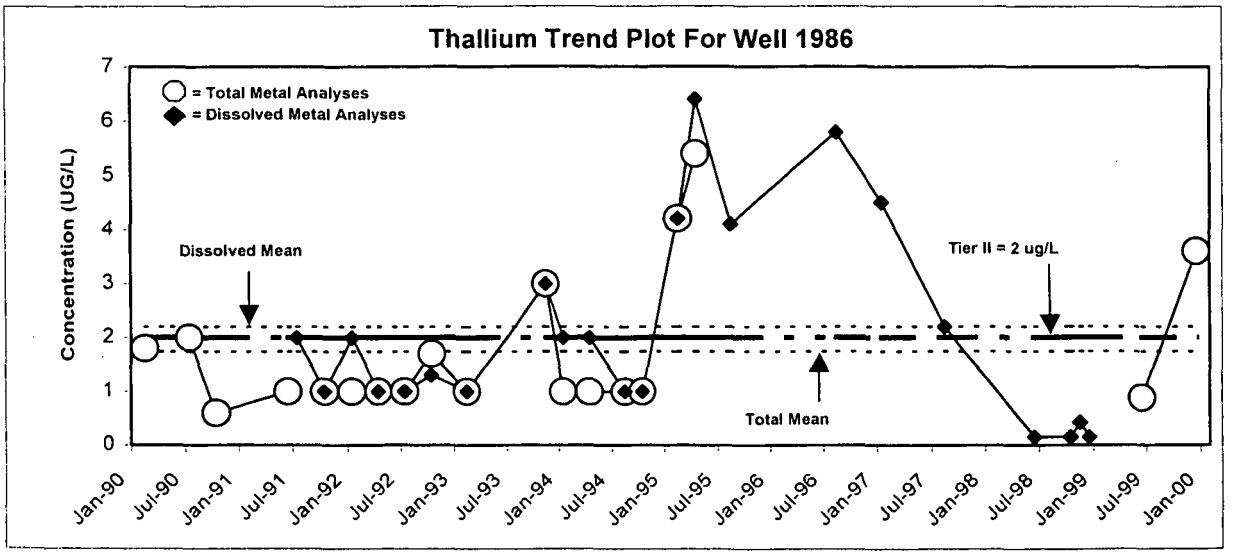
A-43



A-44



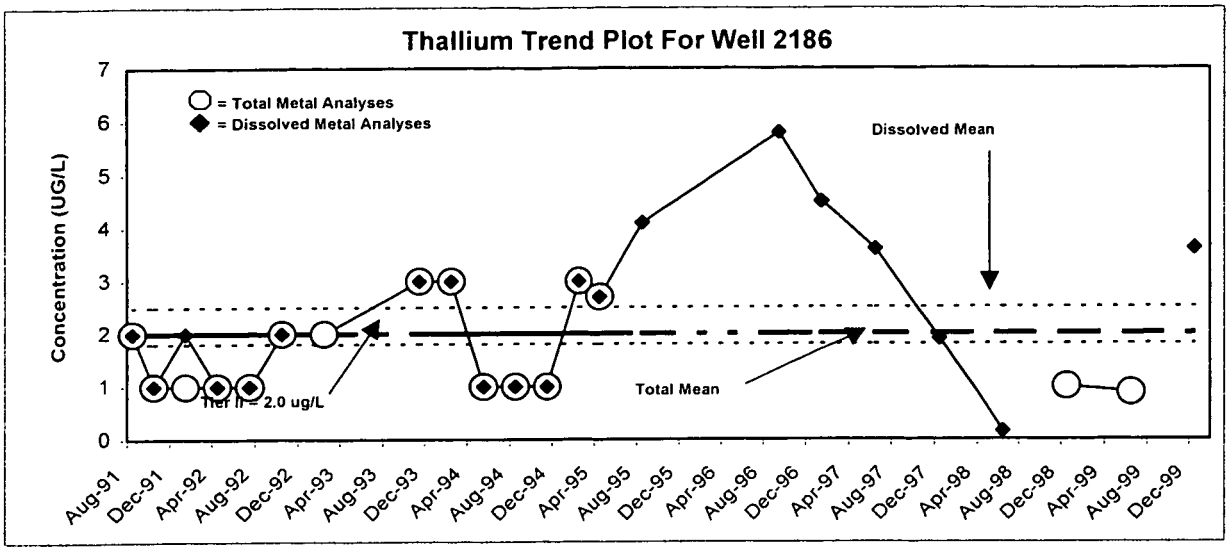
A-45



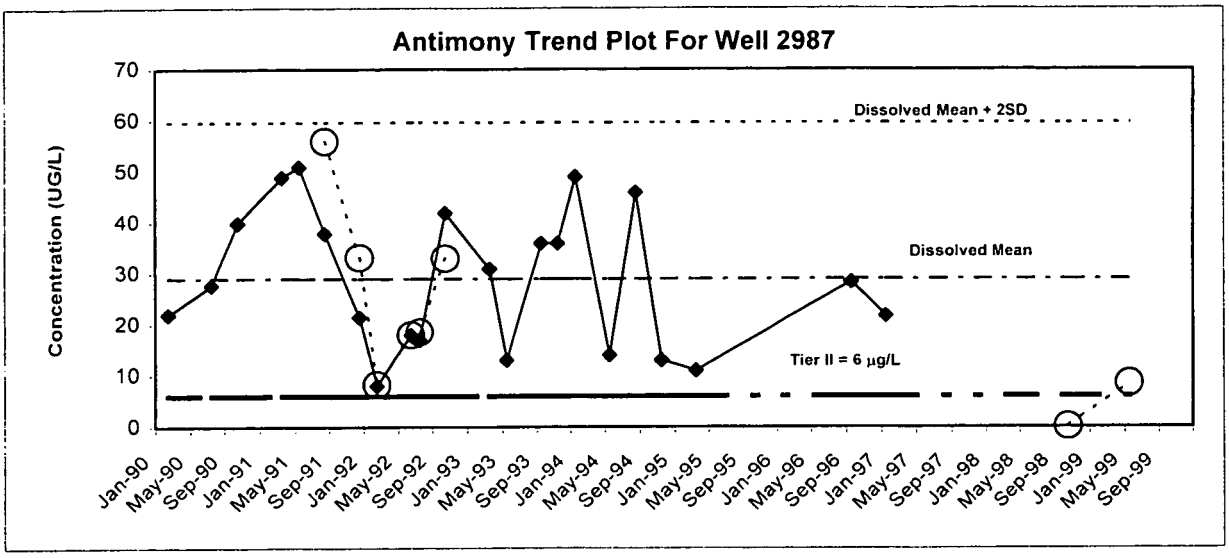
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

250

A-46



A-47



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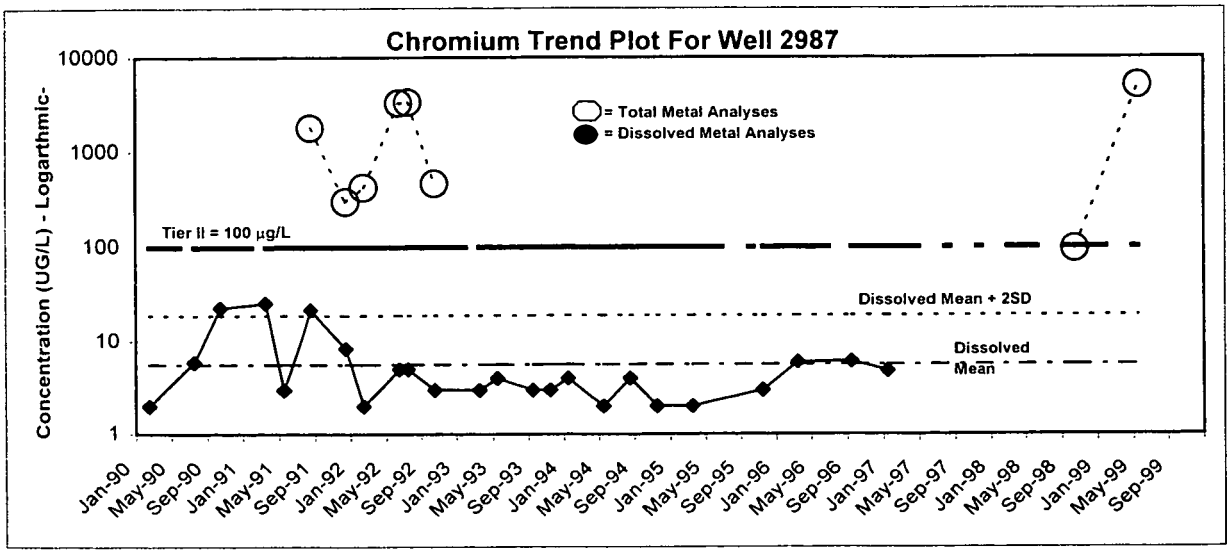
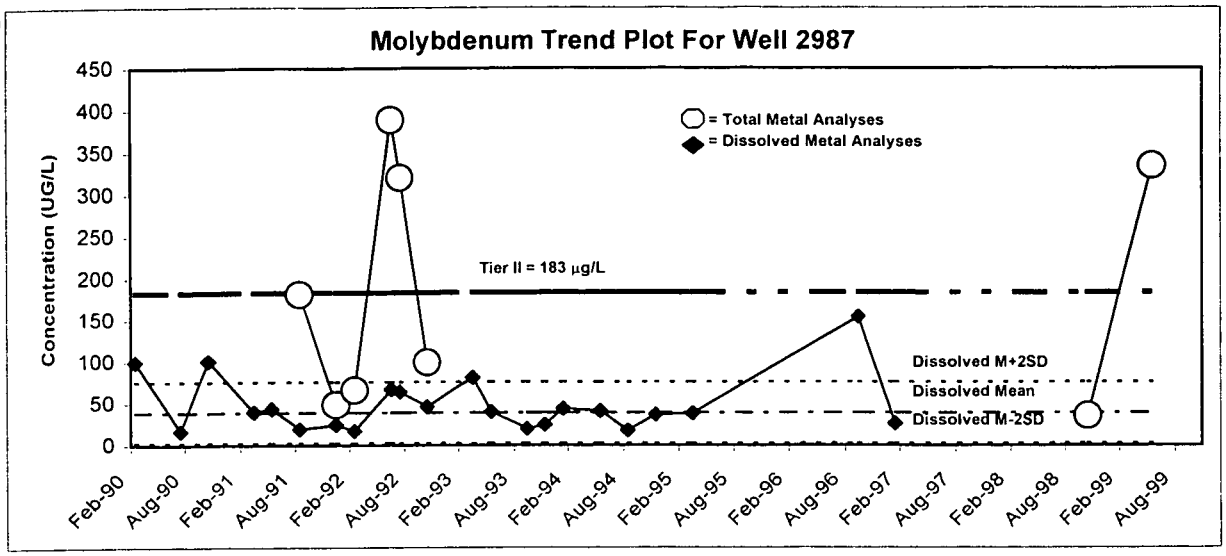


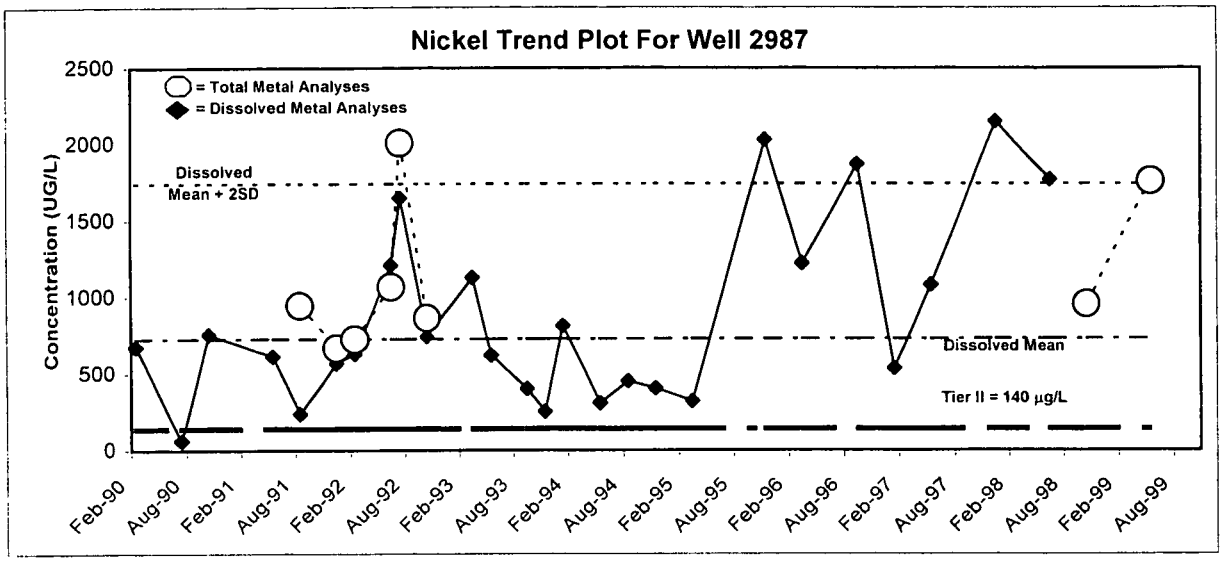
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

259

A-49



A-50



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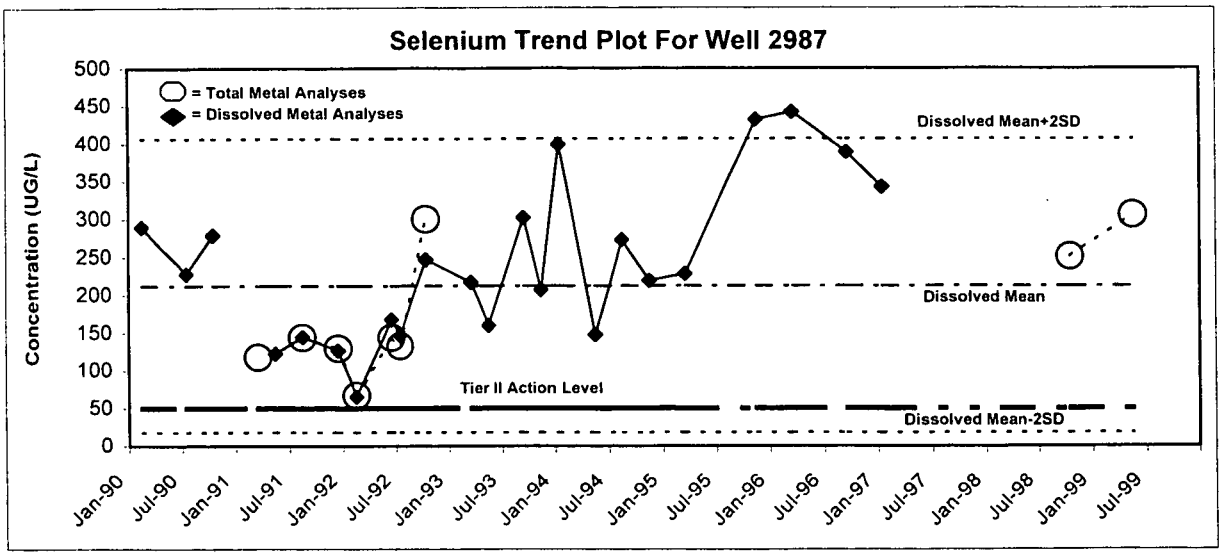
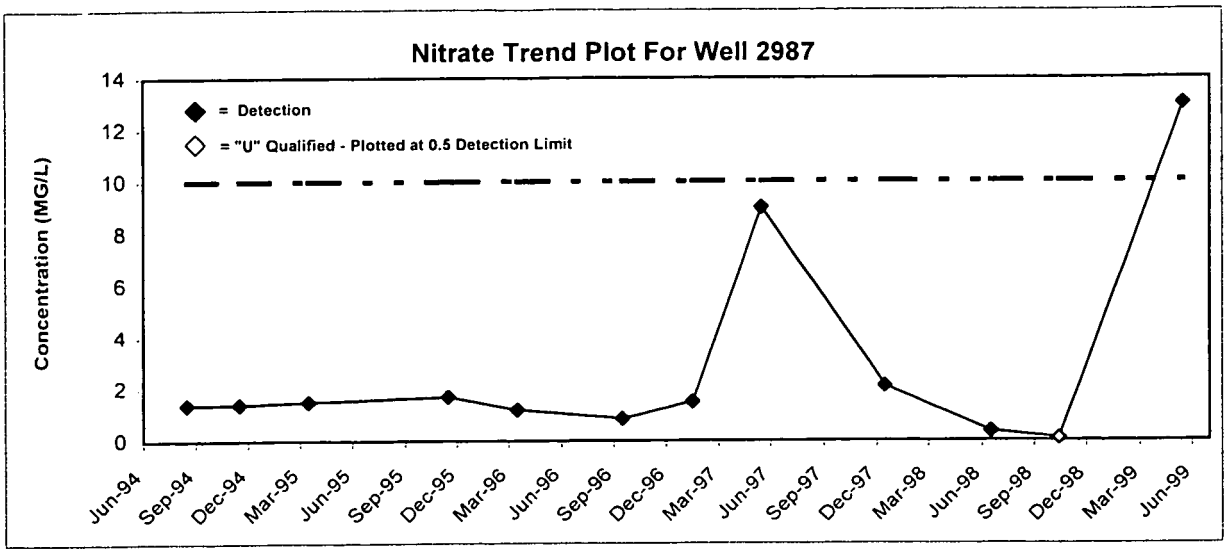


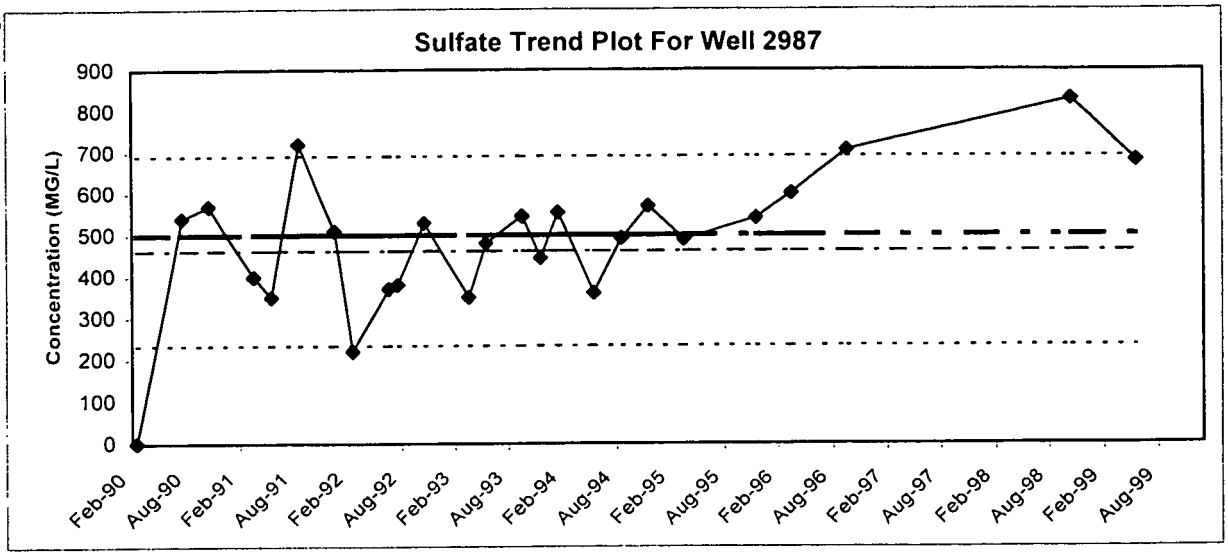
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

260

A-52



A-53



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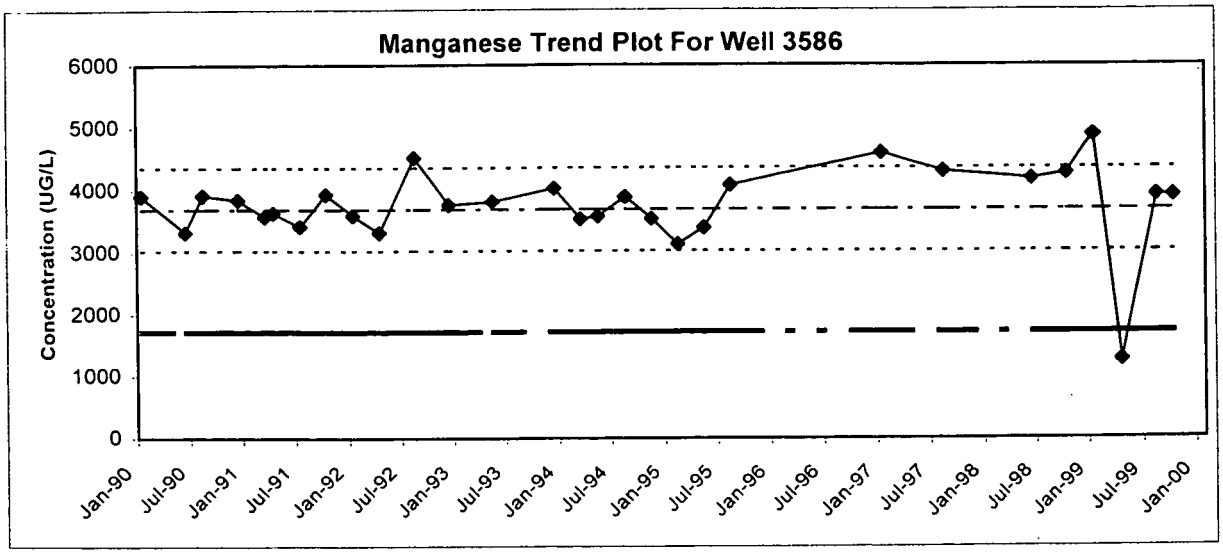
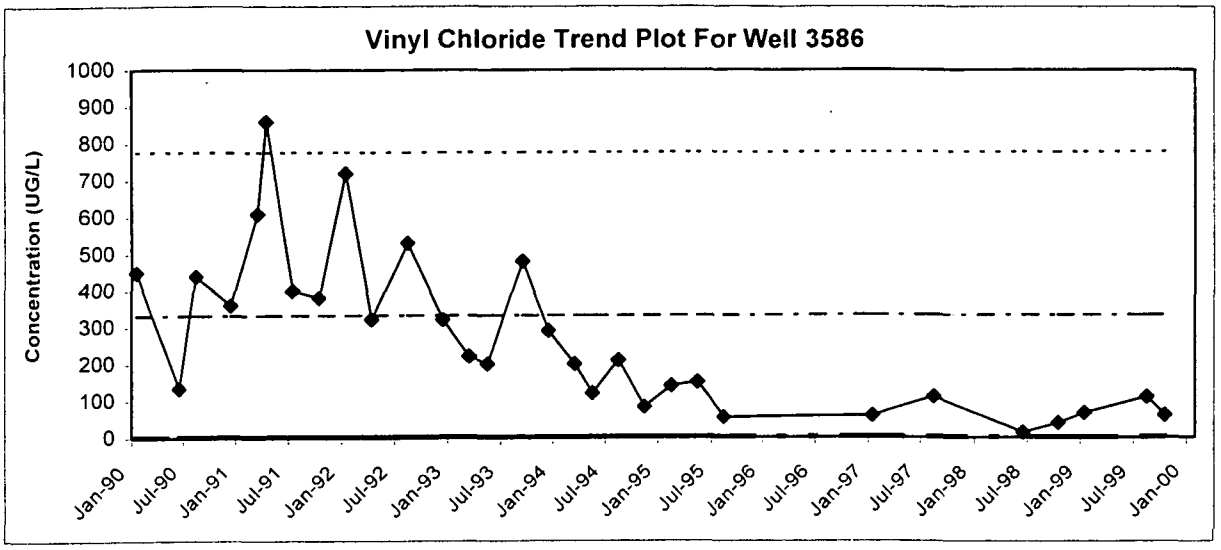


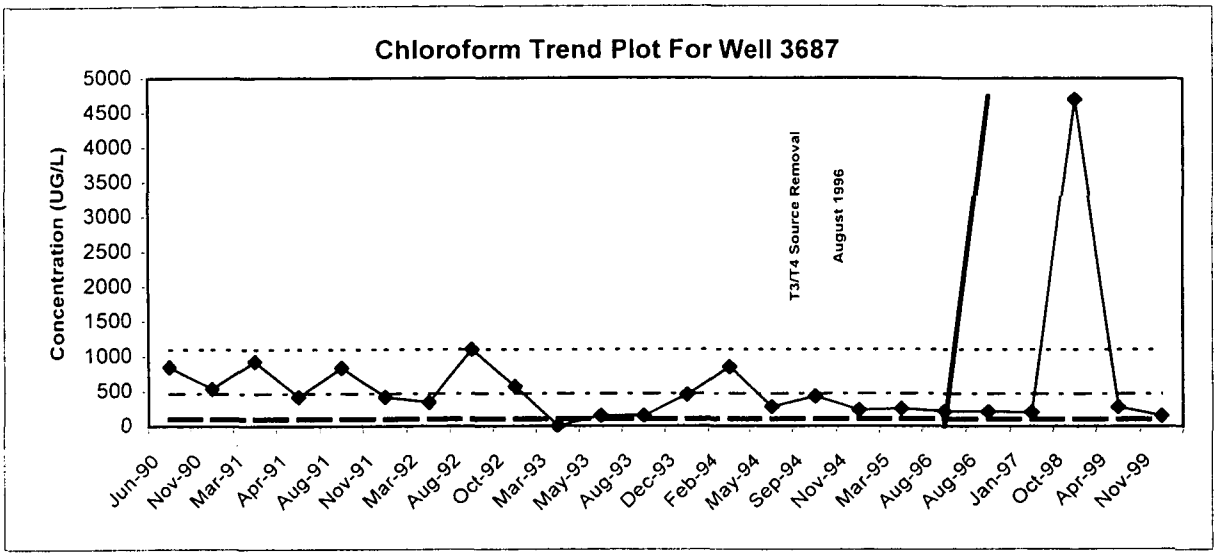
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

261

A-55



A-56



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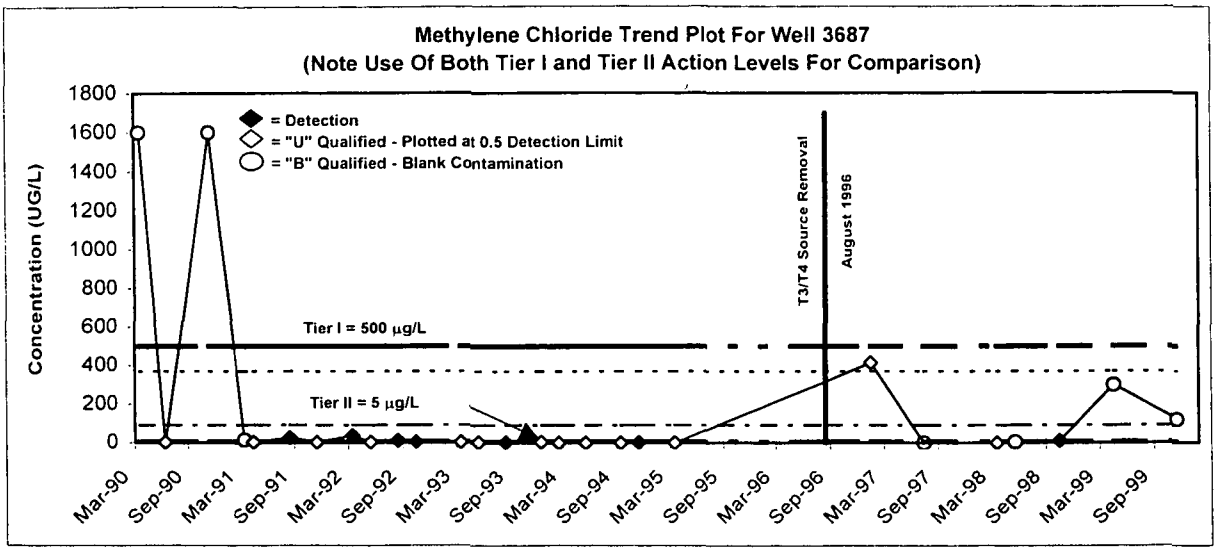
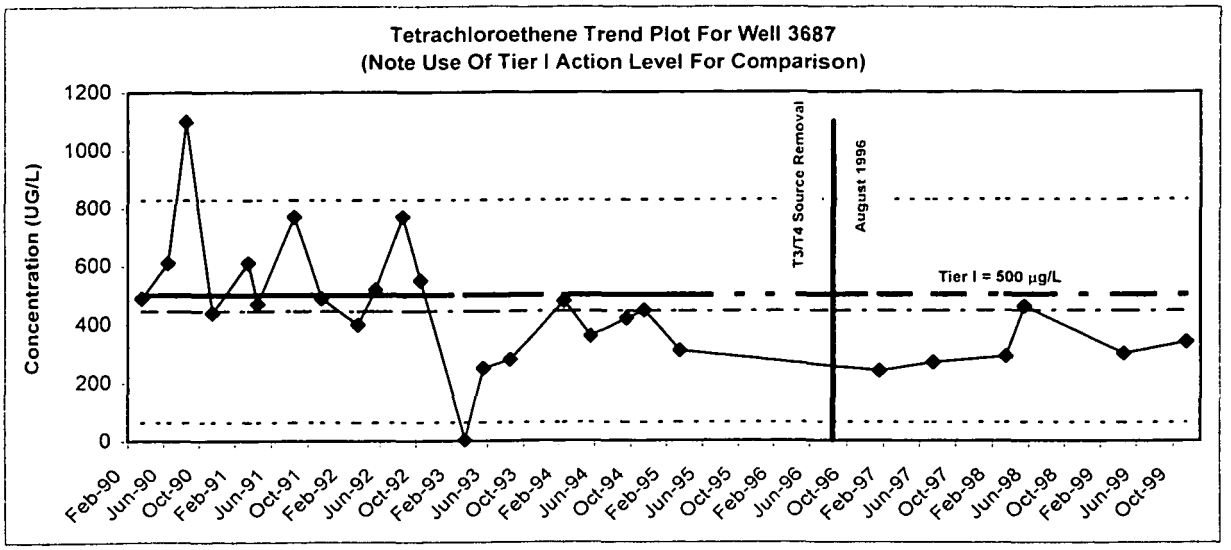


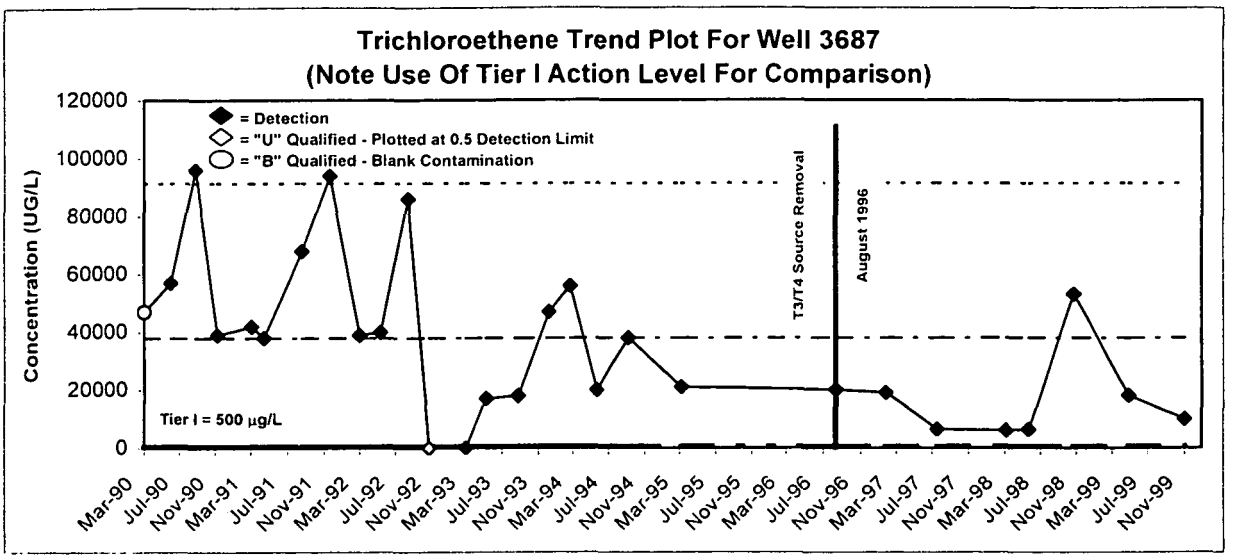
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

262

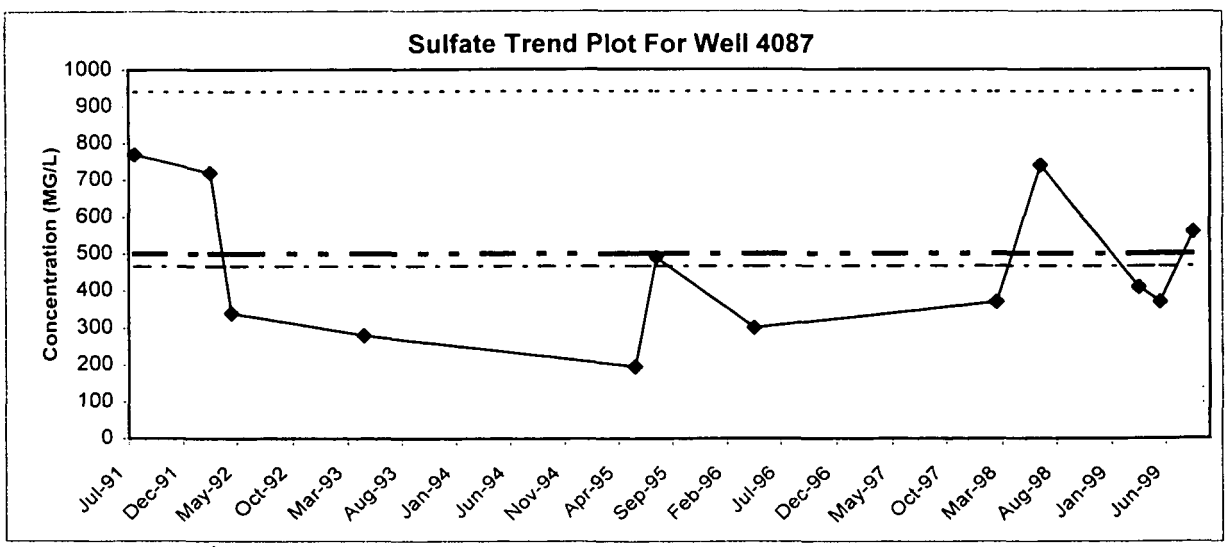
A-58



A-59



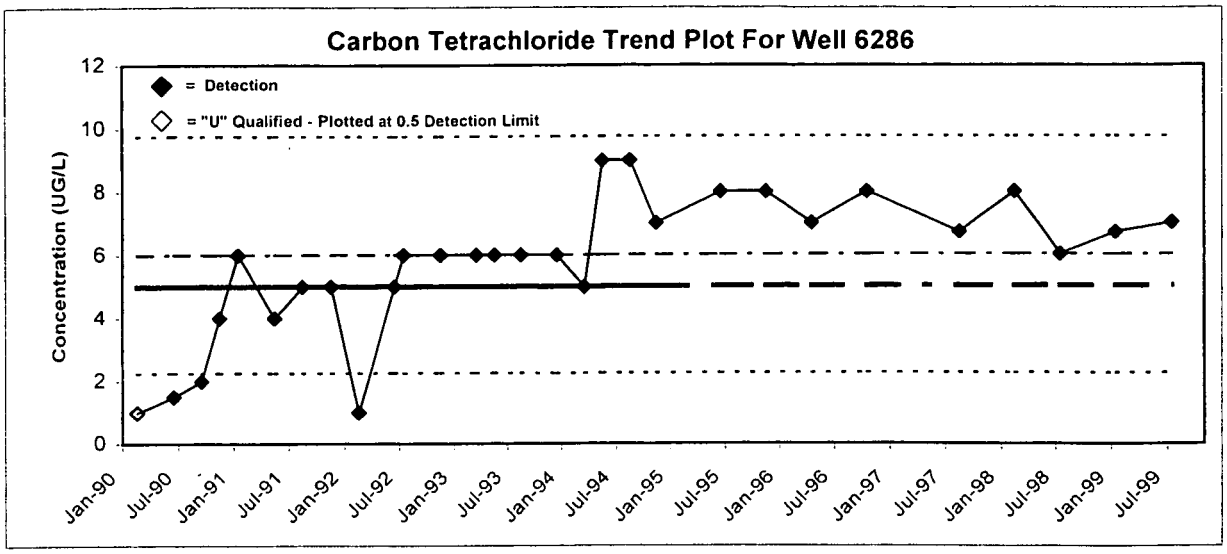
A-60



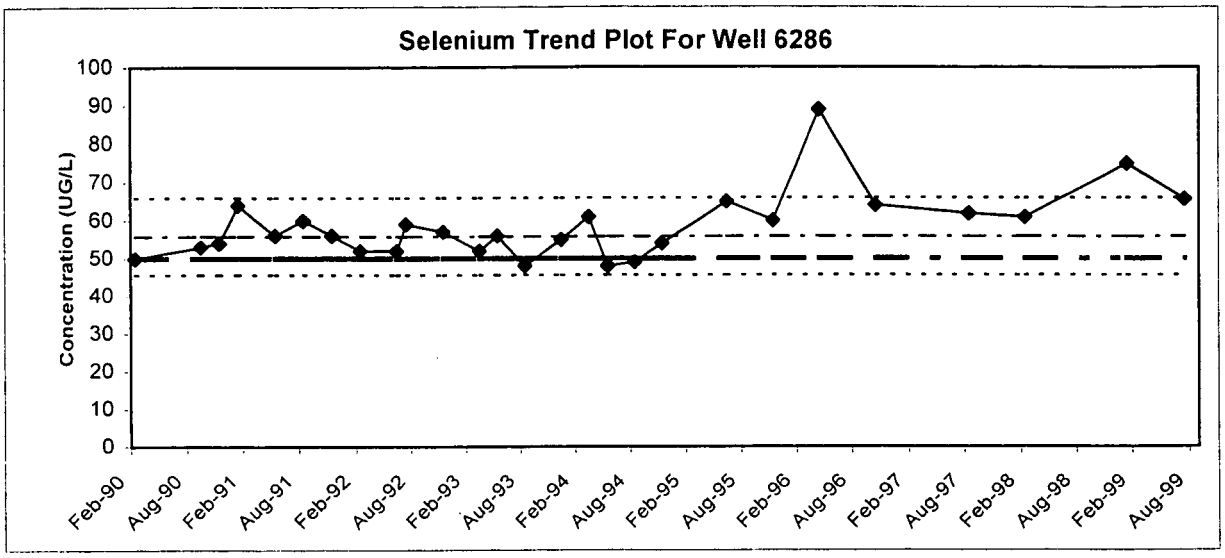
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

263

A-61



A-62



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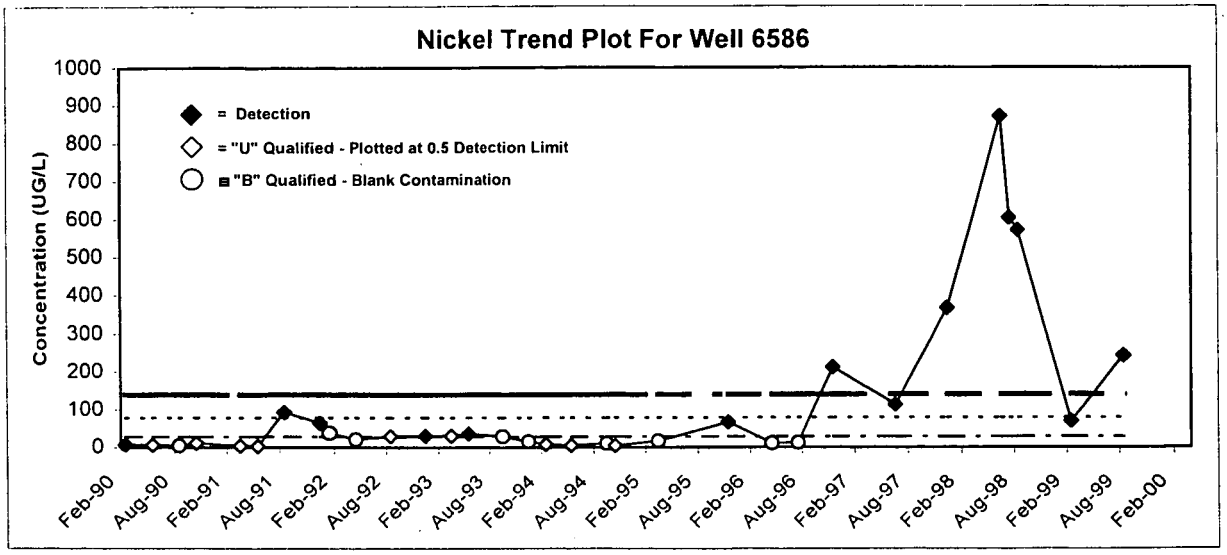
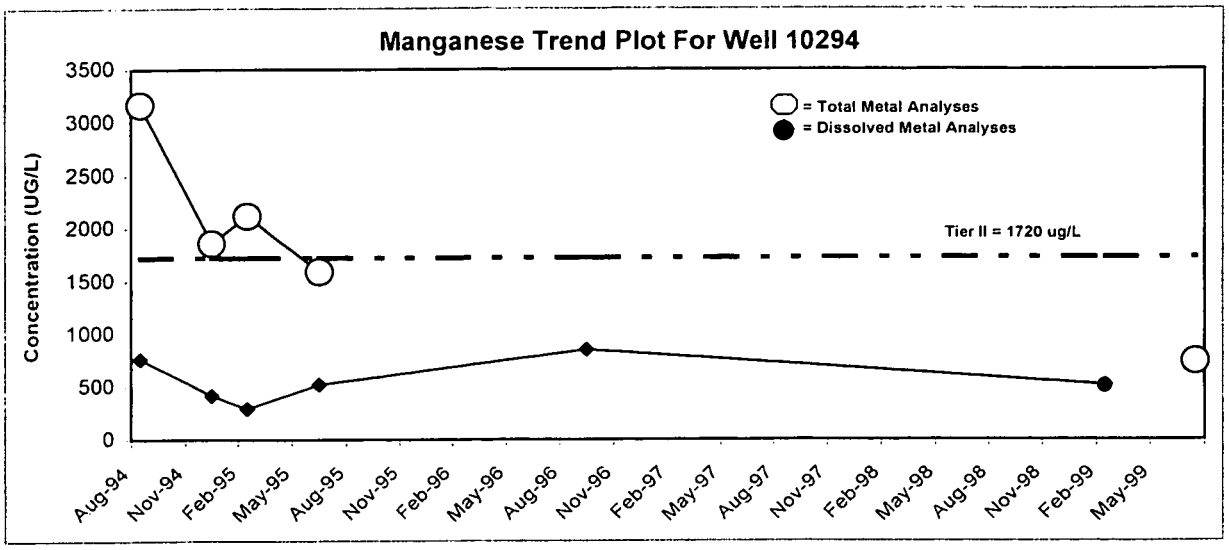


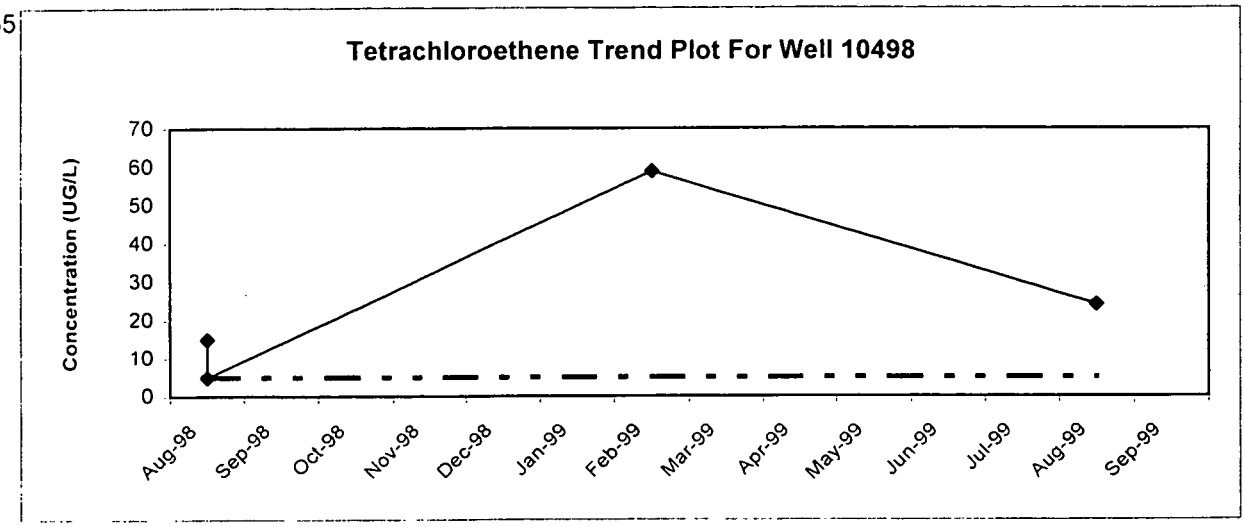
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

264

A-64



A-65



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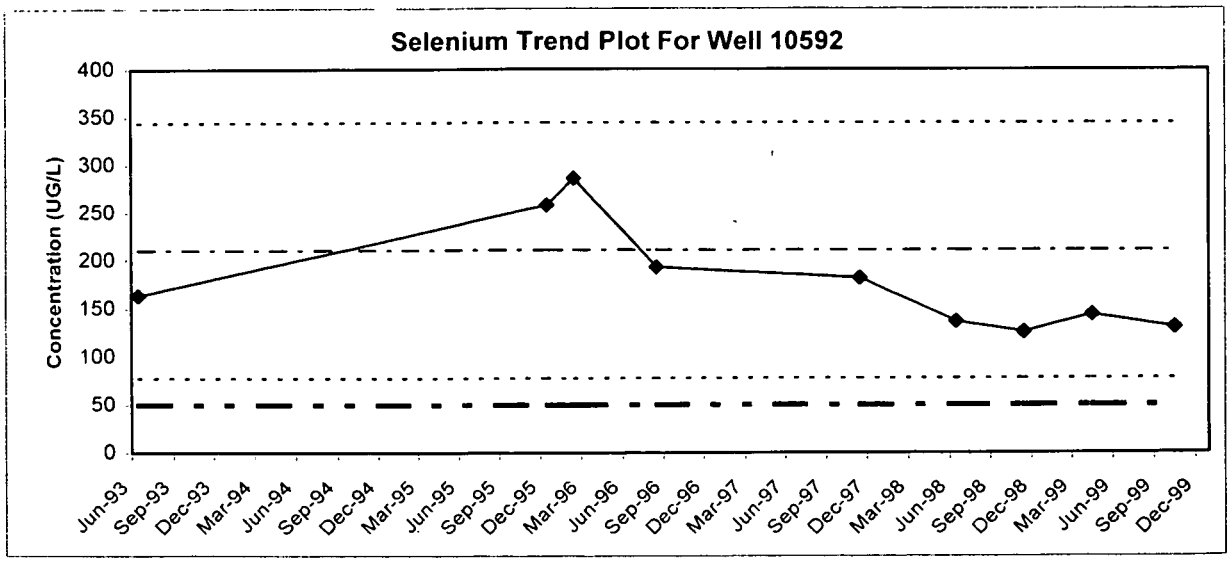
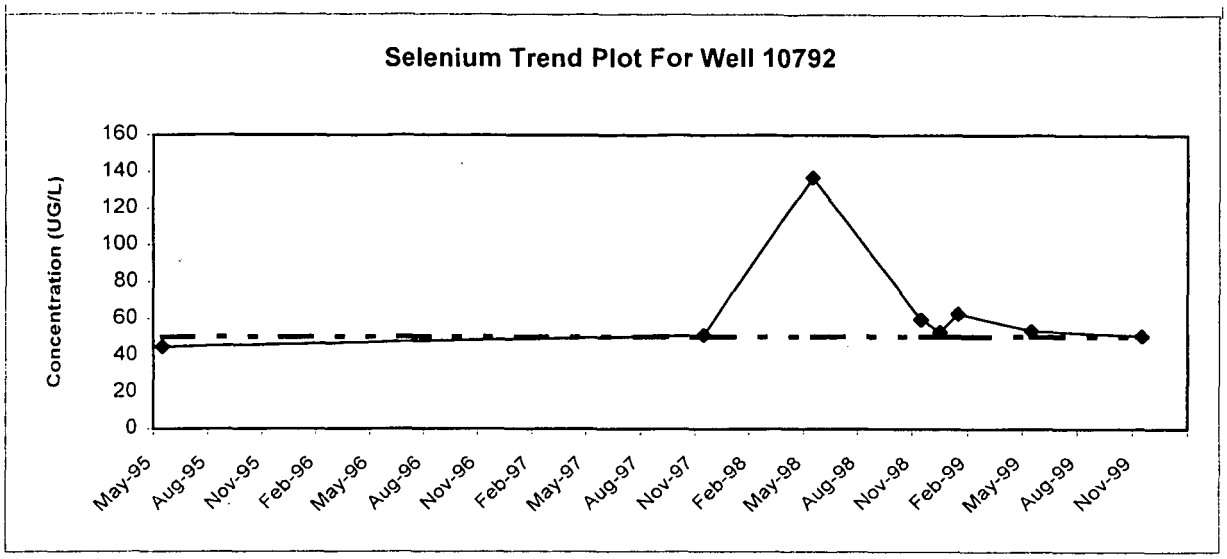


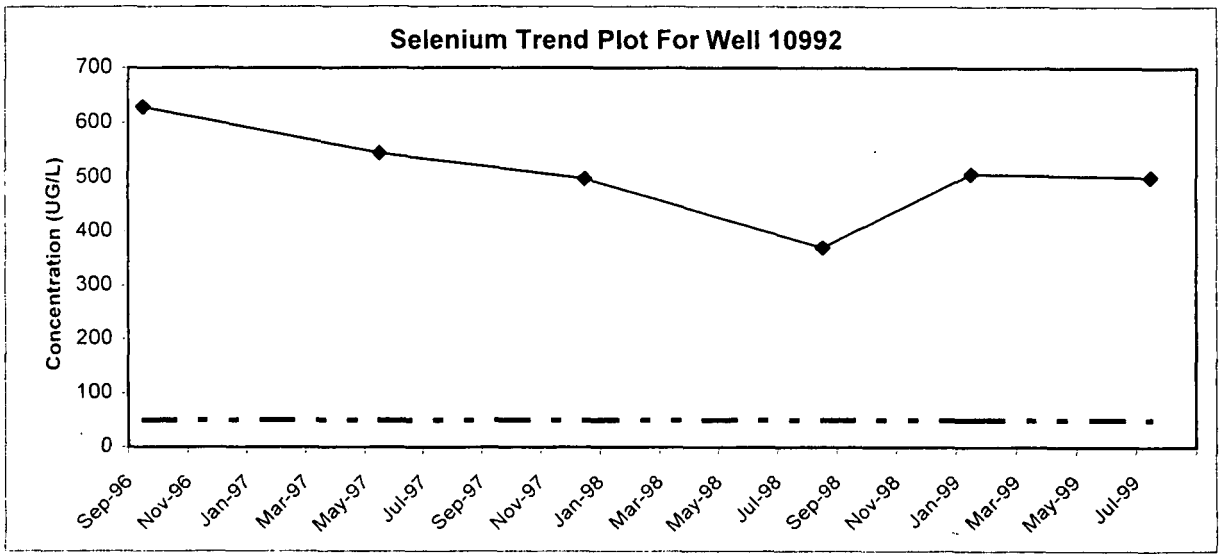
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

265

A-67



A-68



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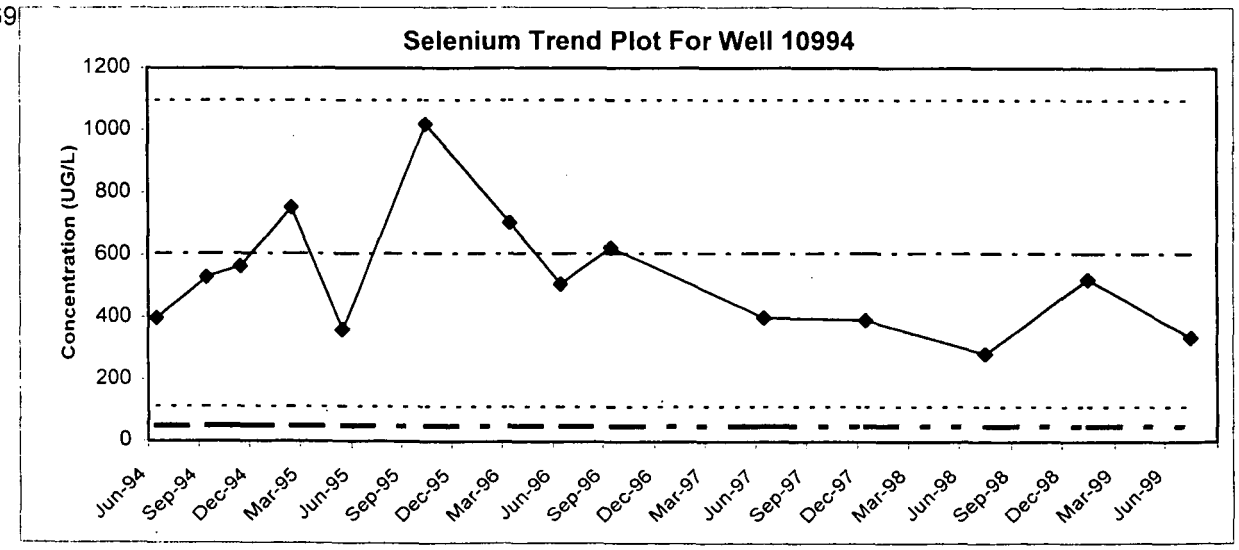
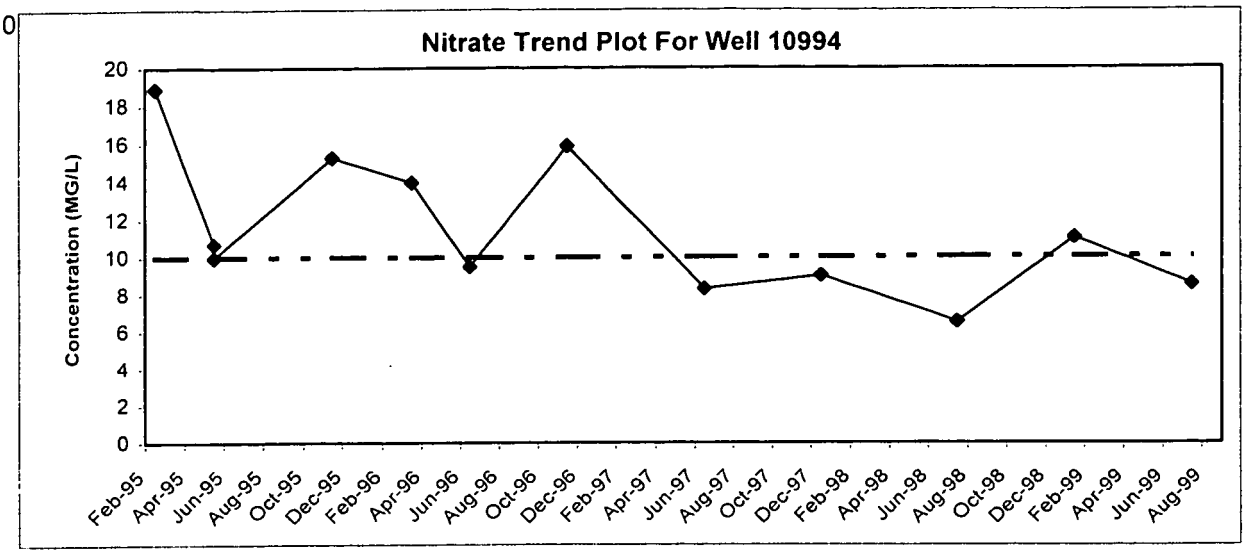


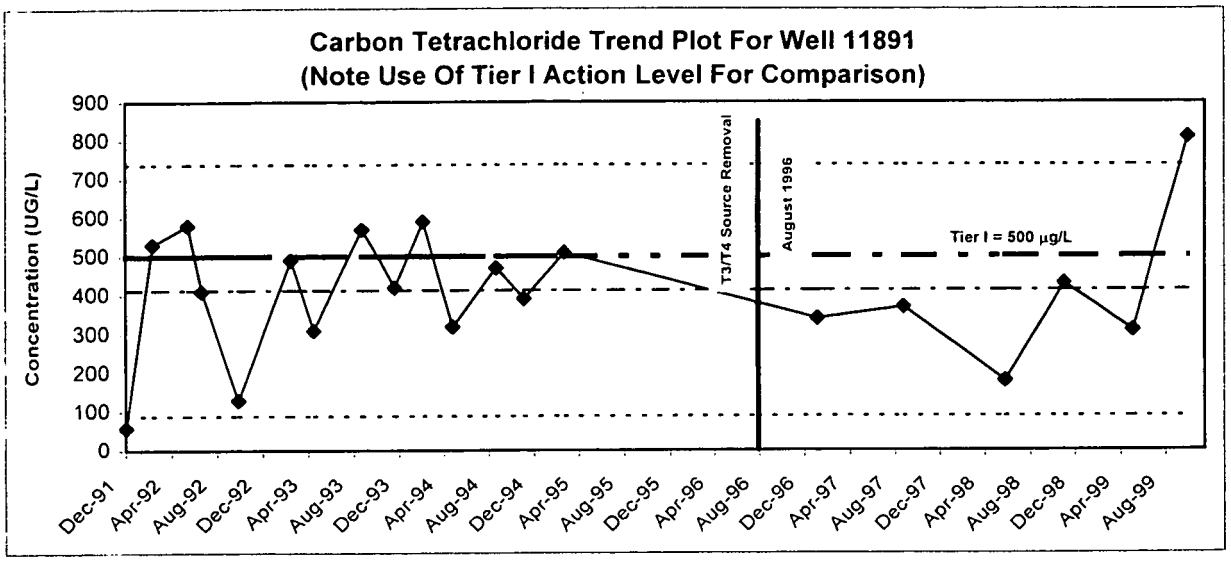
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

266

A-70



A-71



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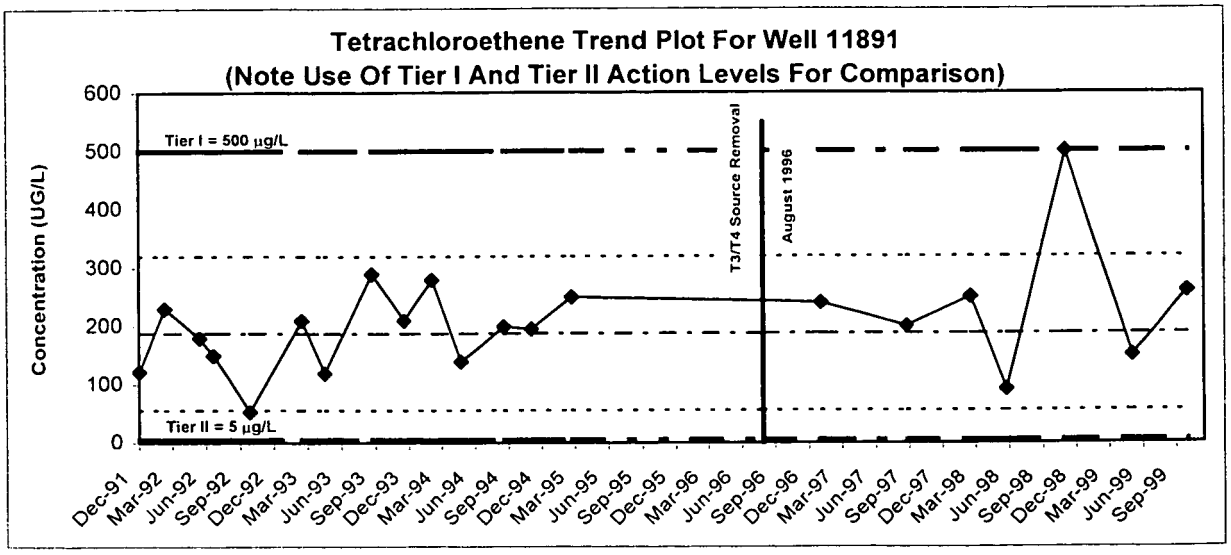
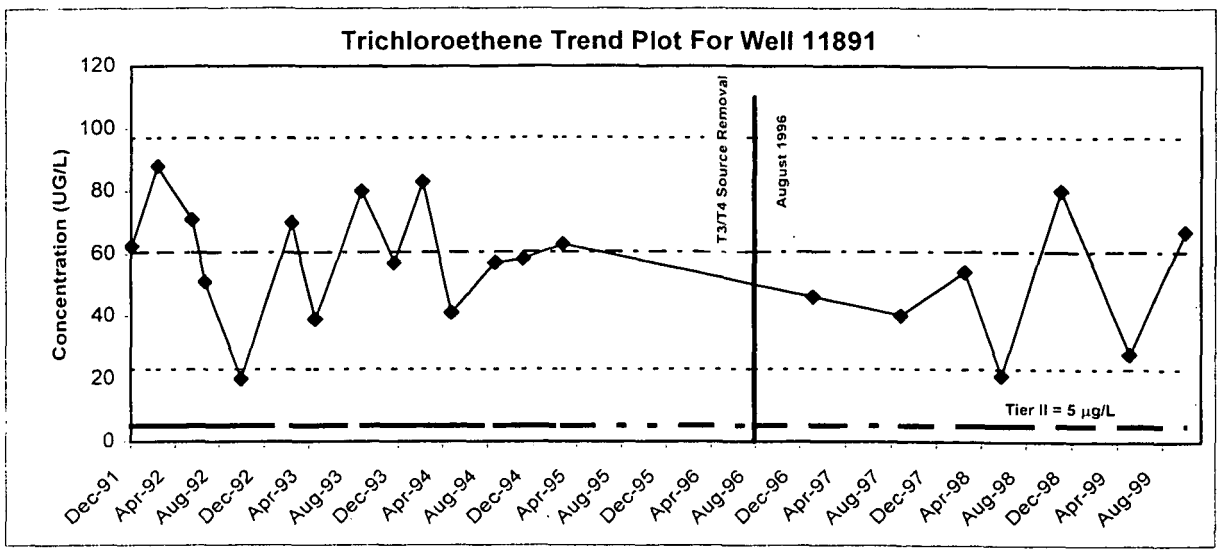


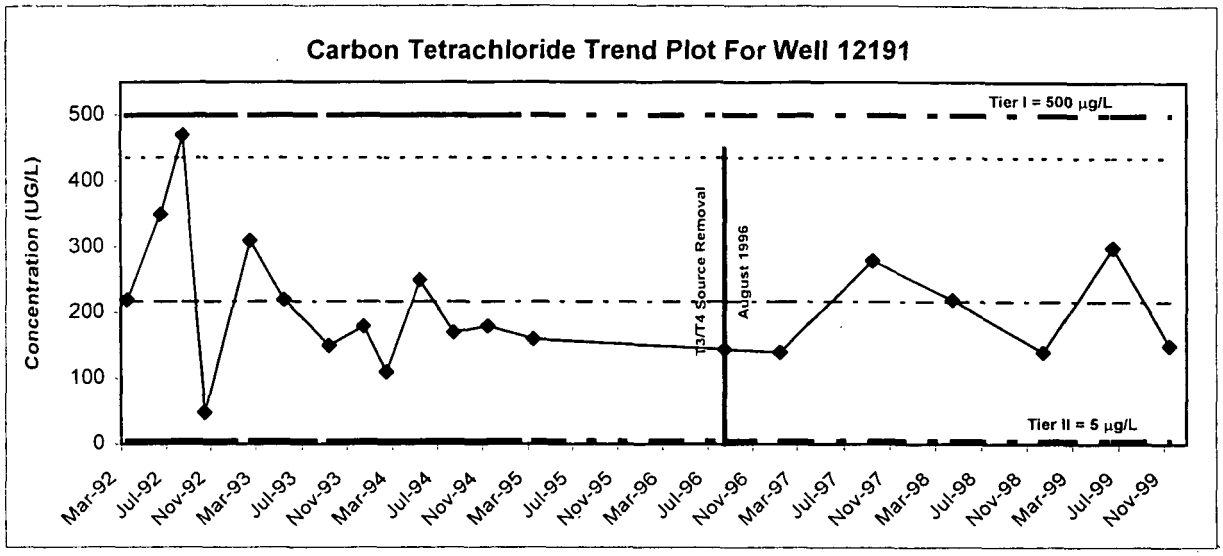
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

267

A-73



A-74



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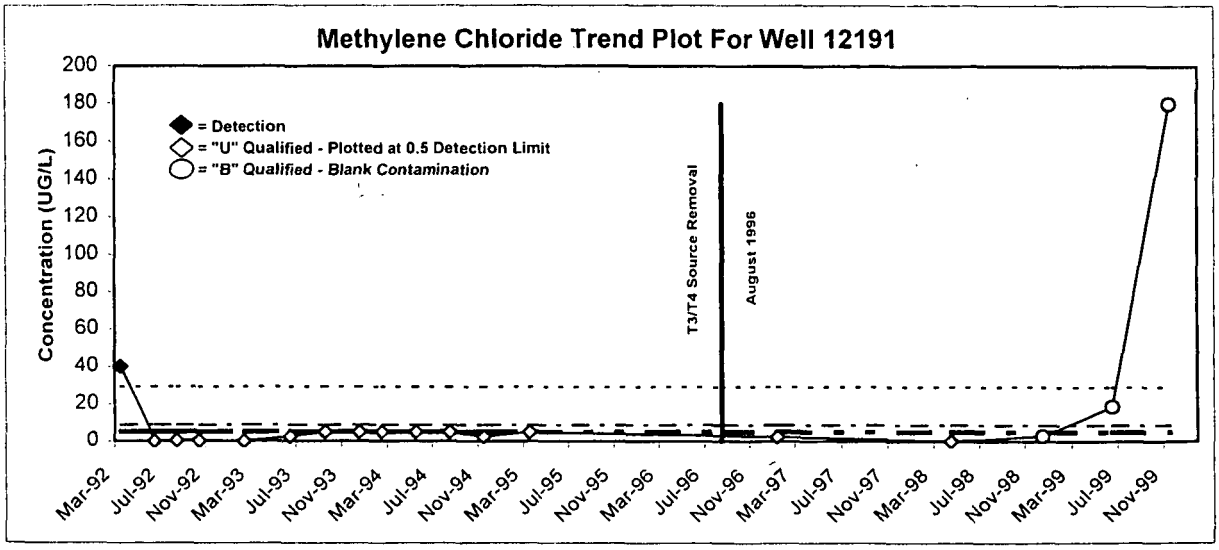
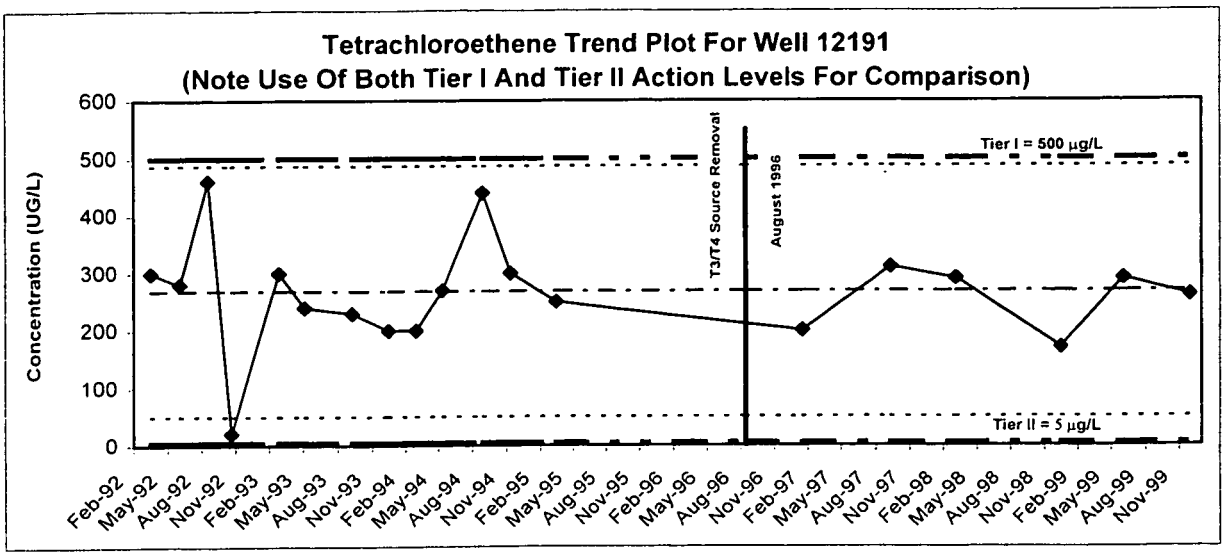


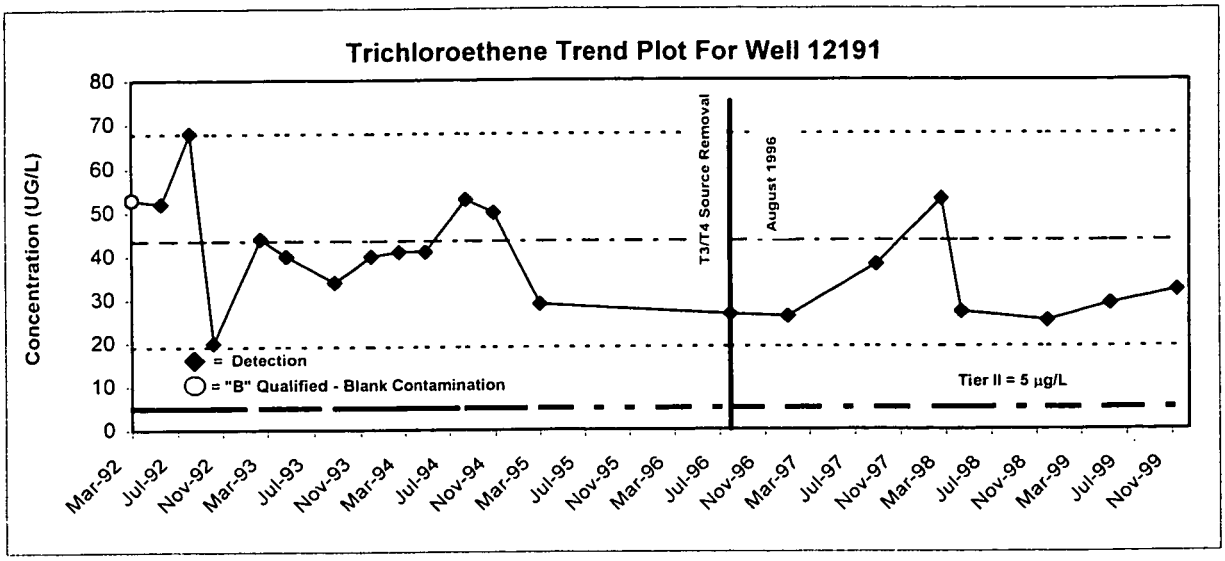
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

268

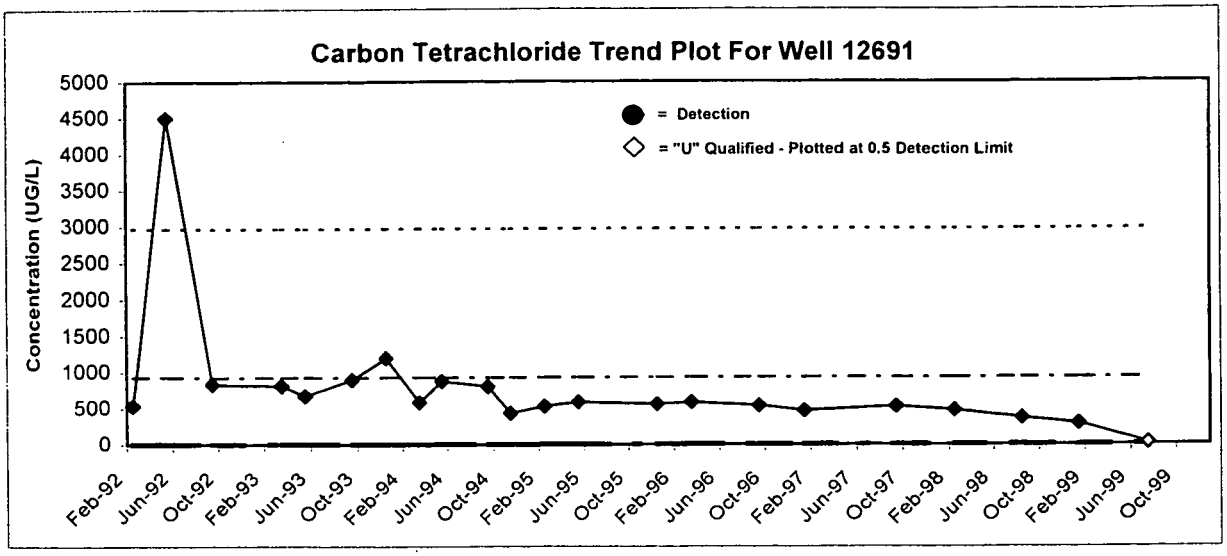
A-76



A-77



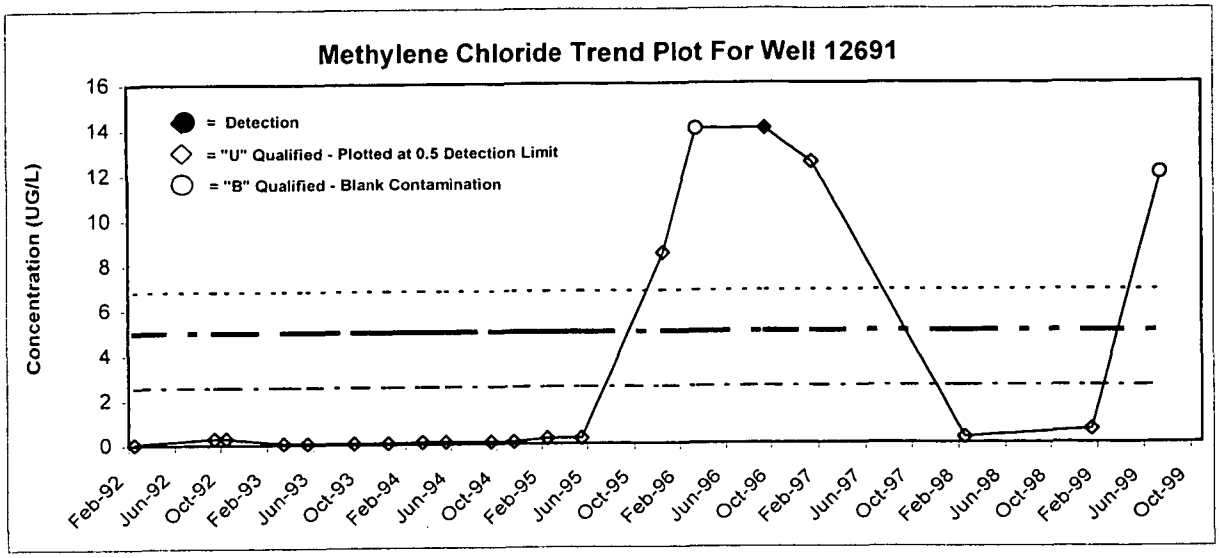
A-78



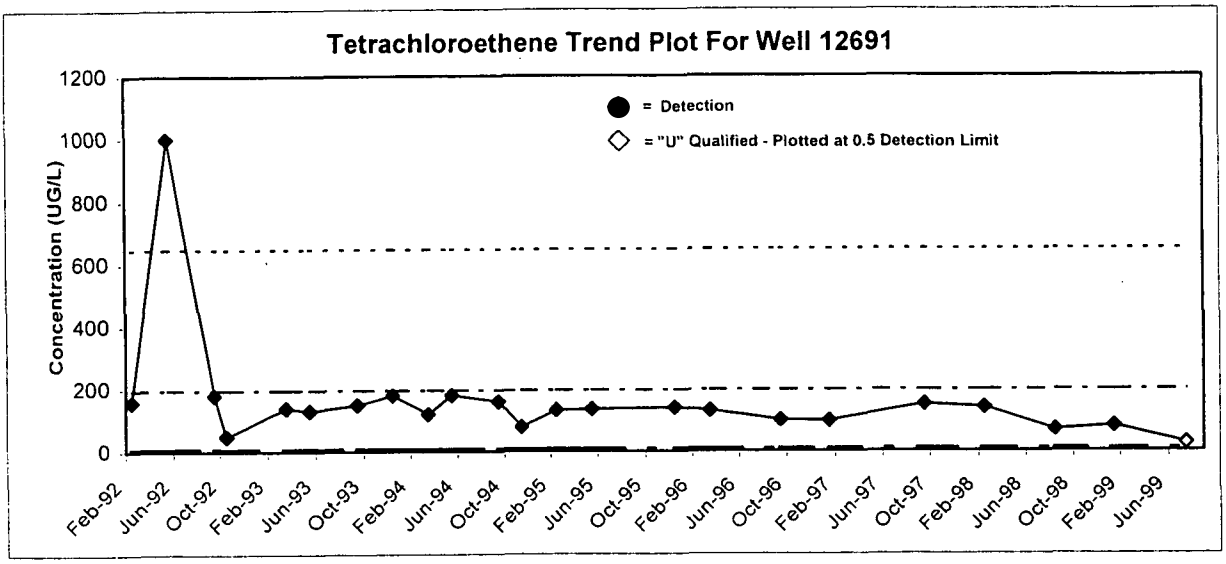
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

269

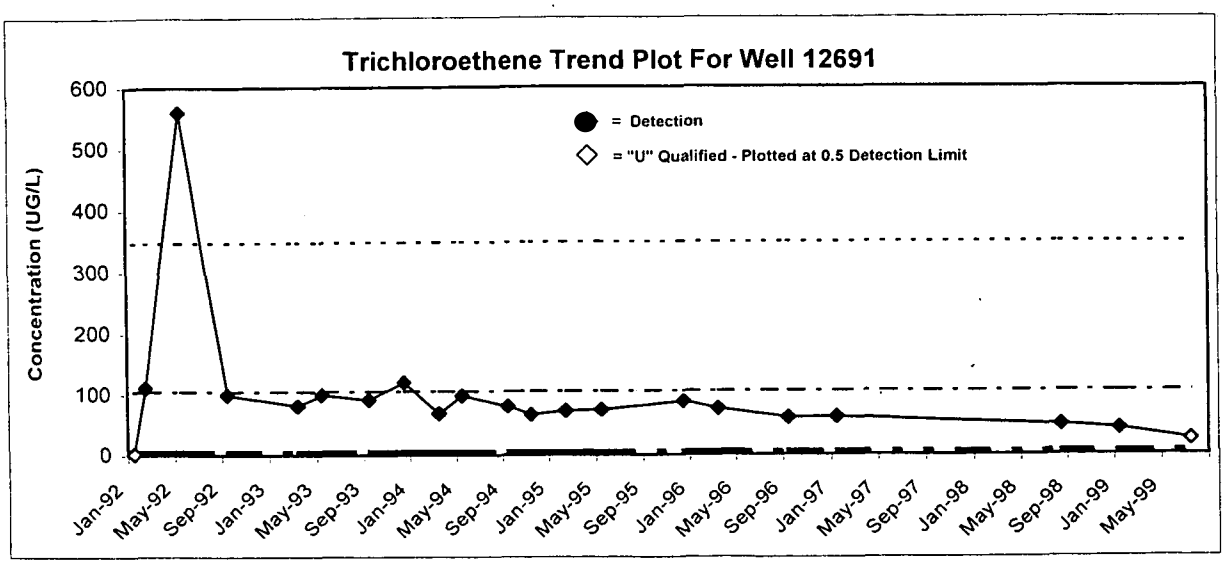
A-79



A-80



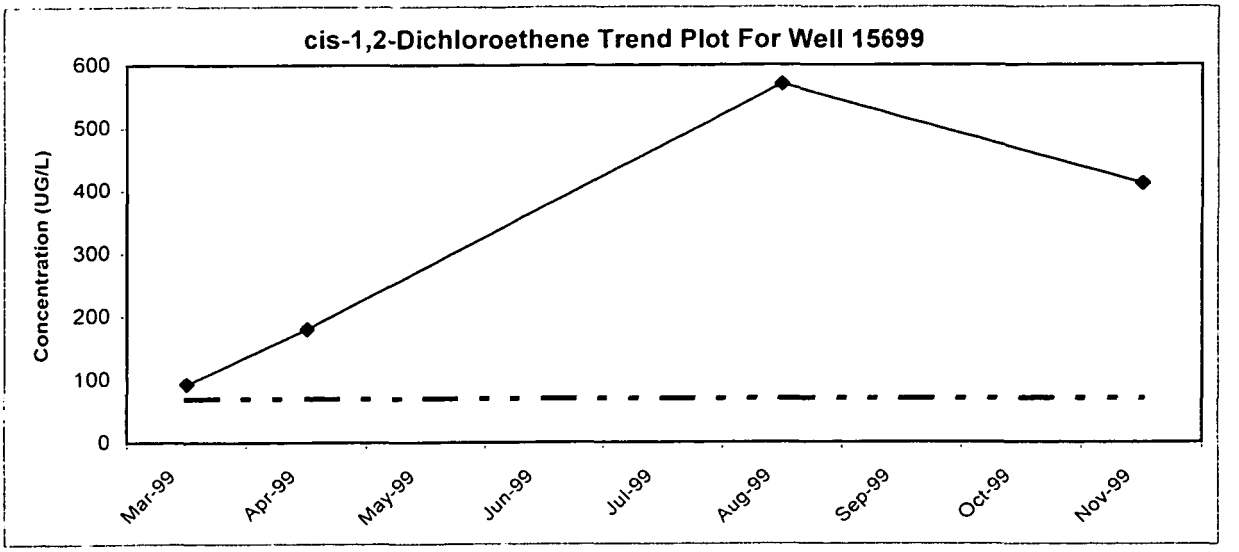
A-81



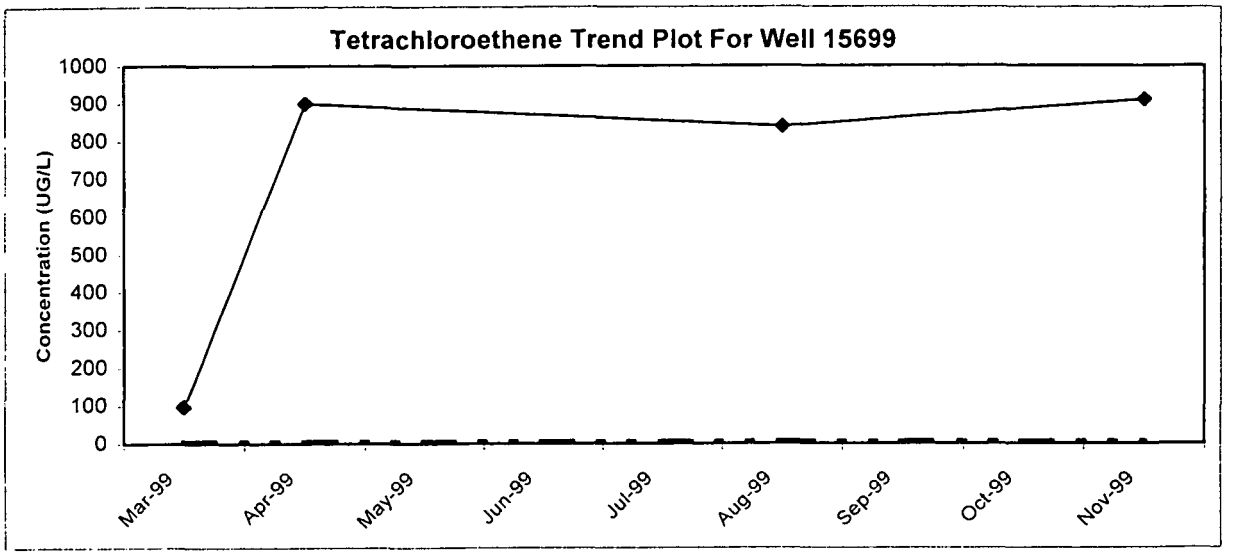
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

270

A-82



A-83



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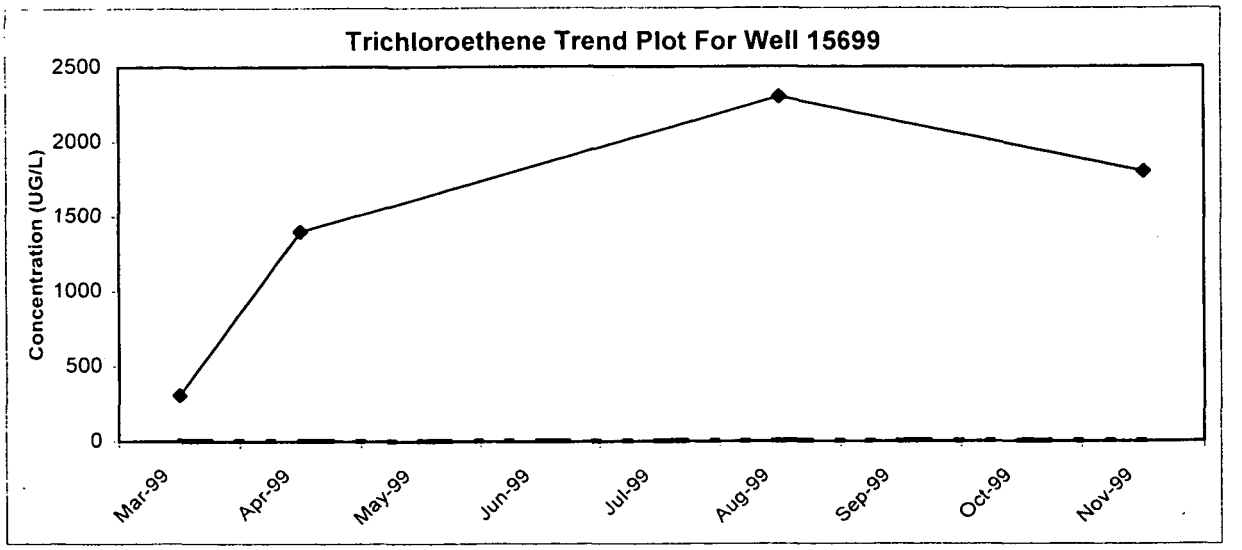
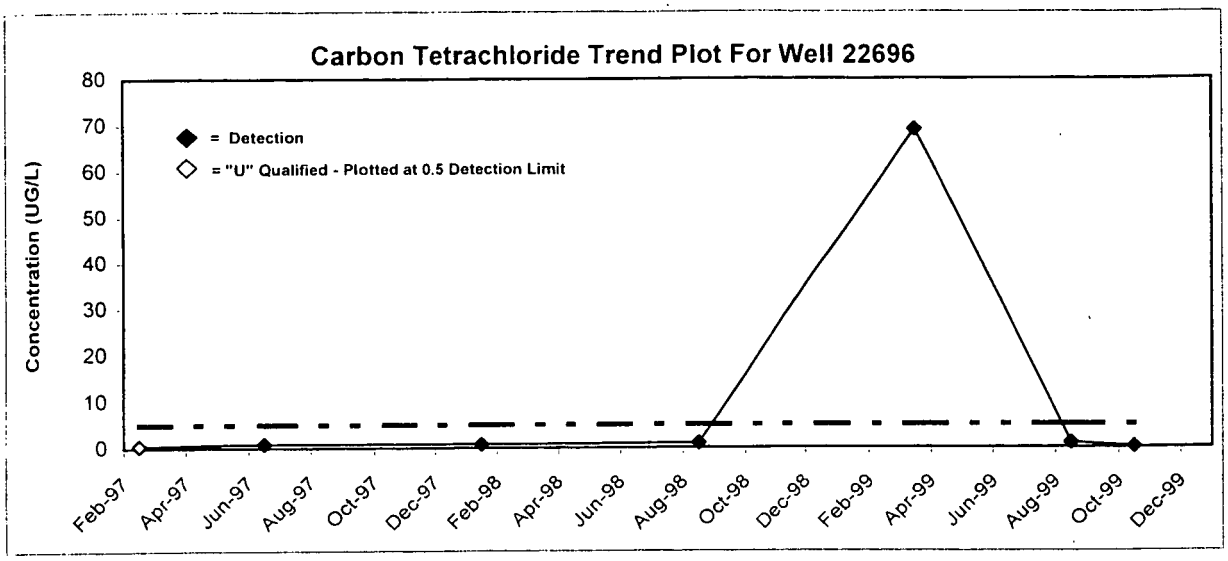


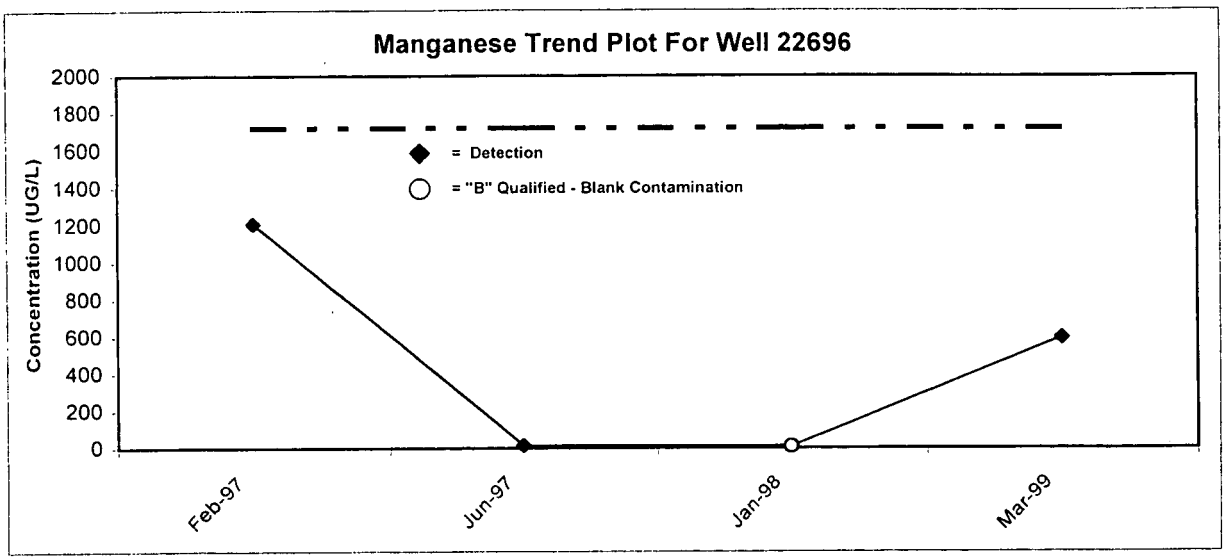
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

271

A-85



A-86



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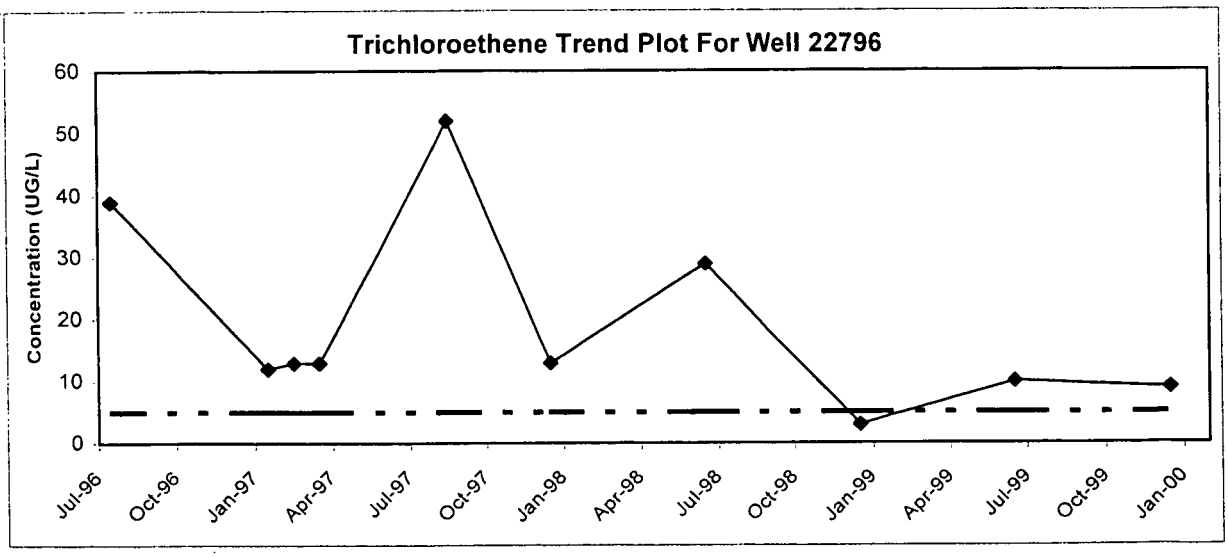
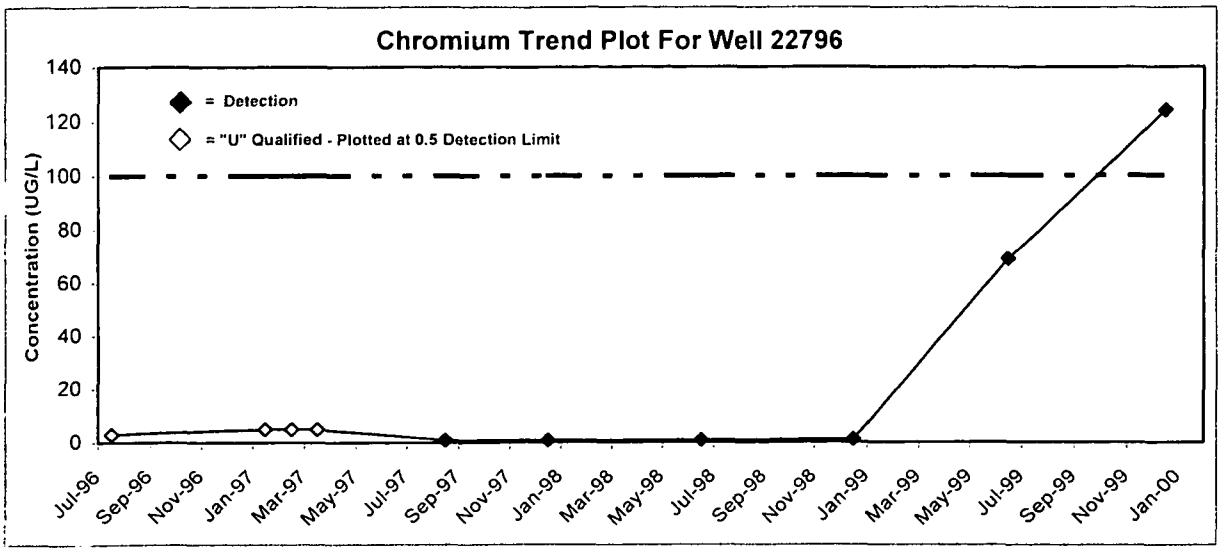


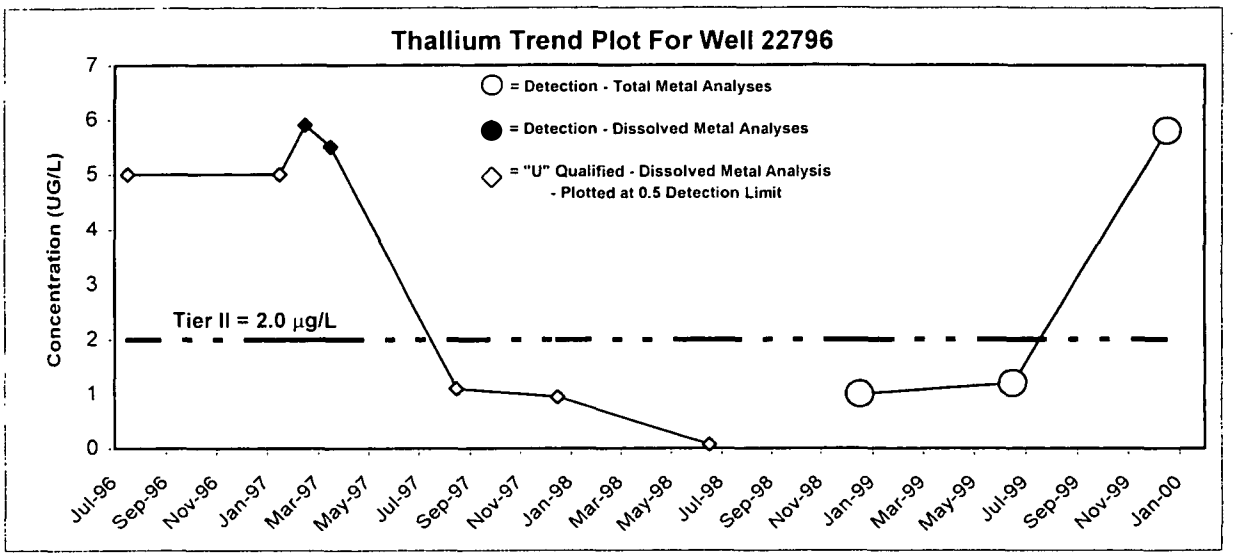
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

272

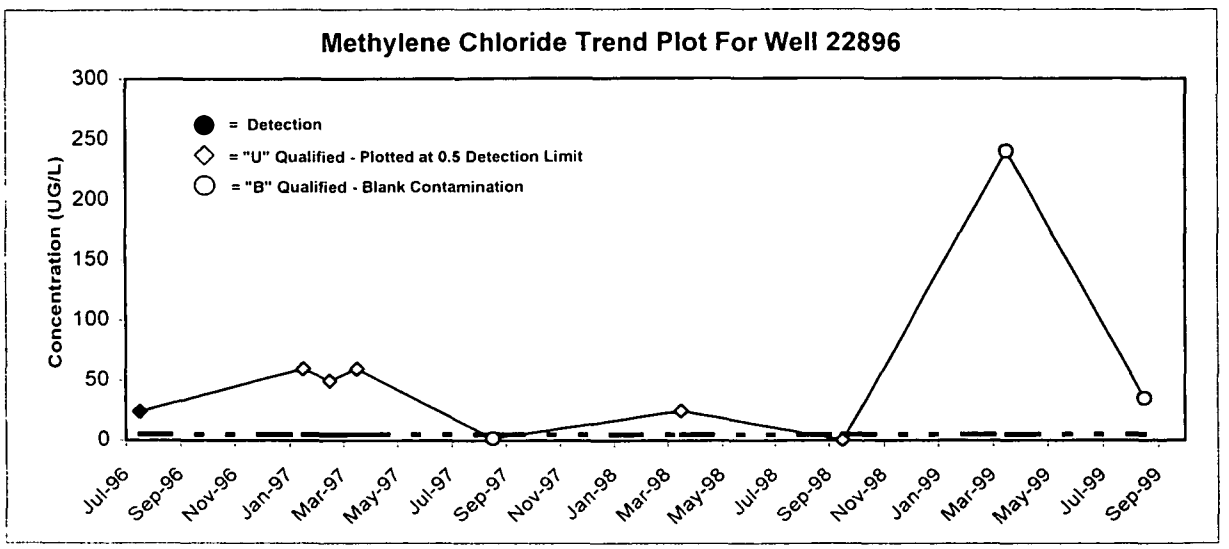
A-88



A-89



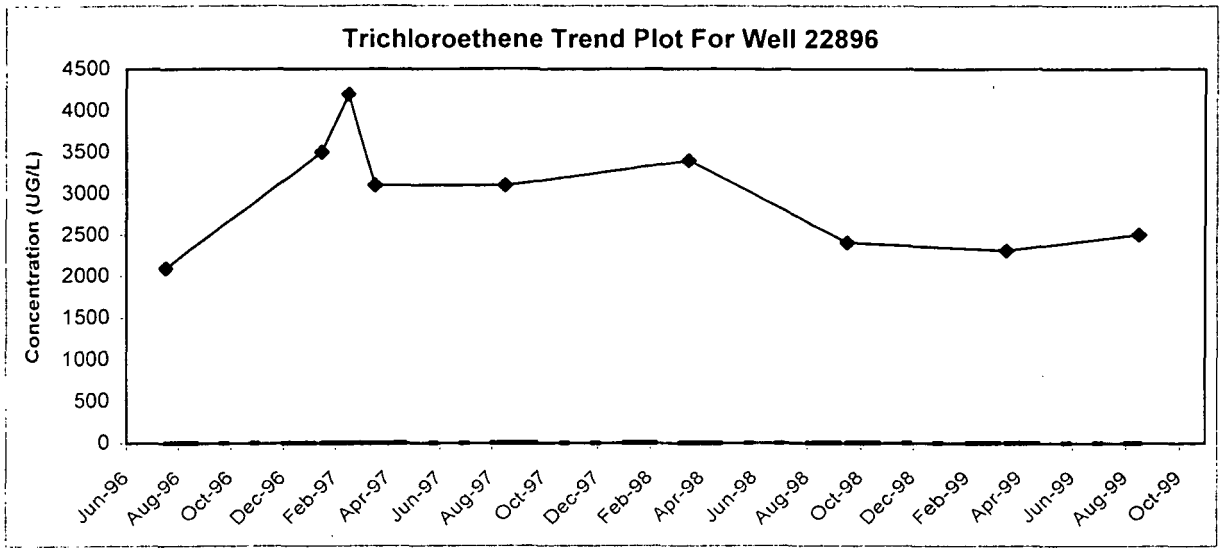
A-90



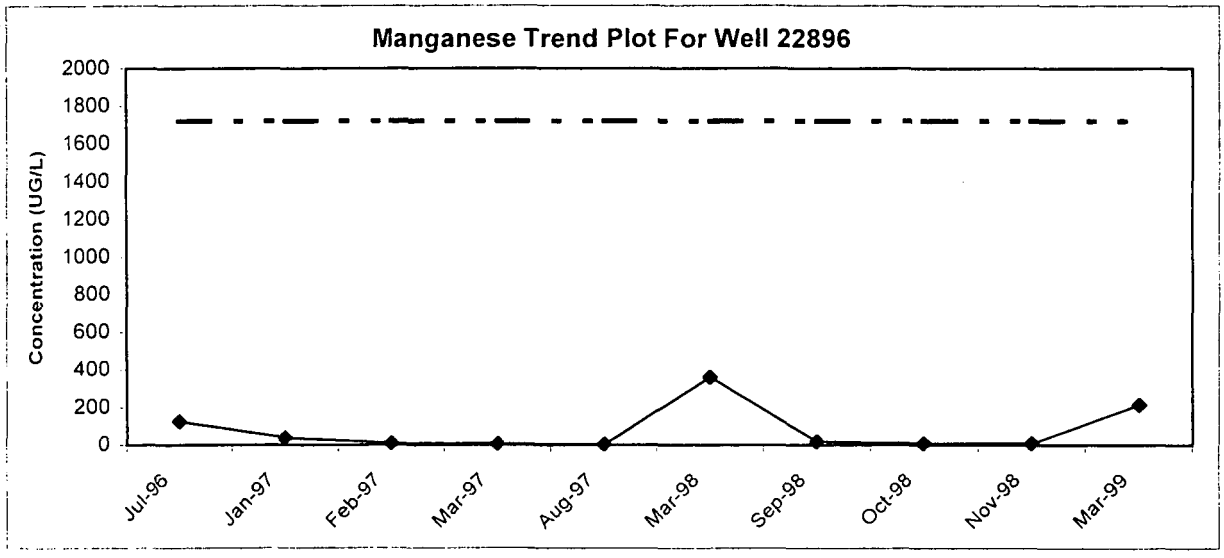
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

273

A-91



A-92



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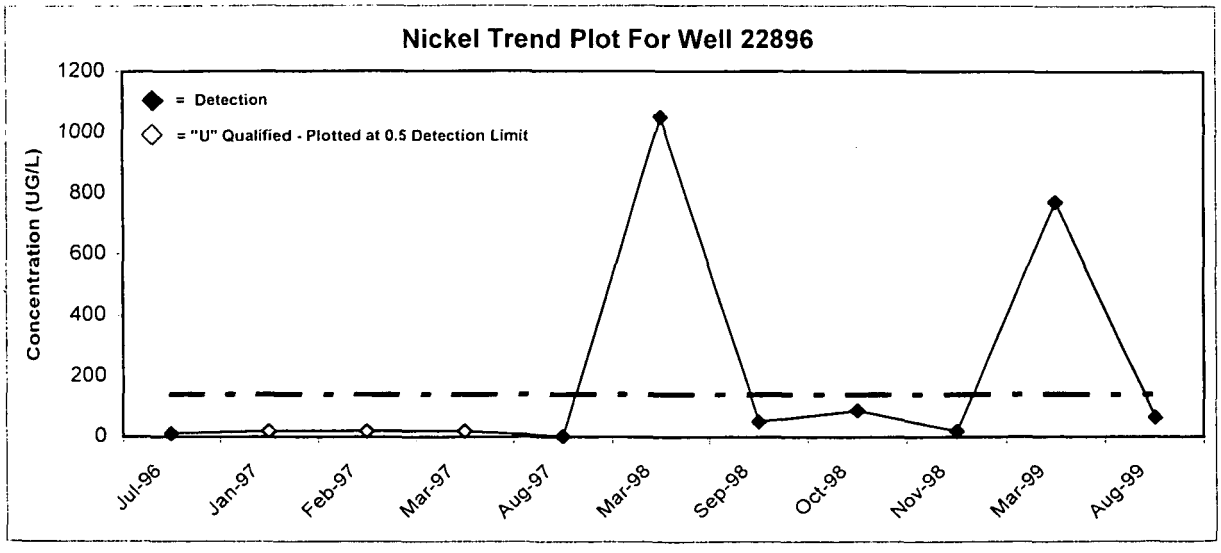
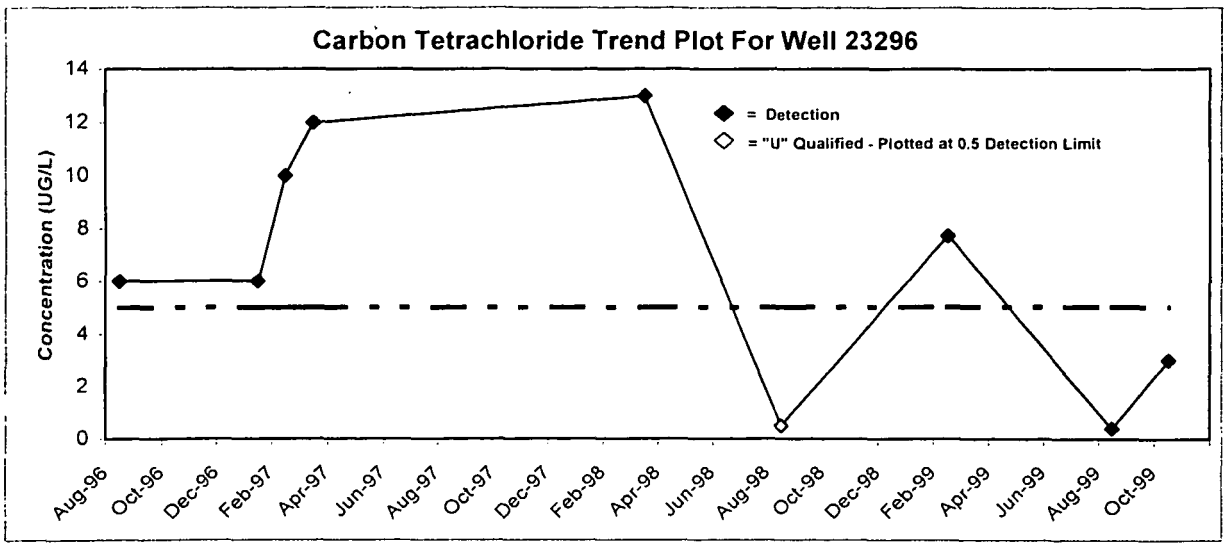


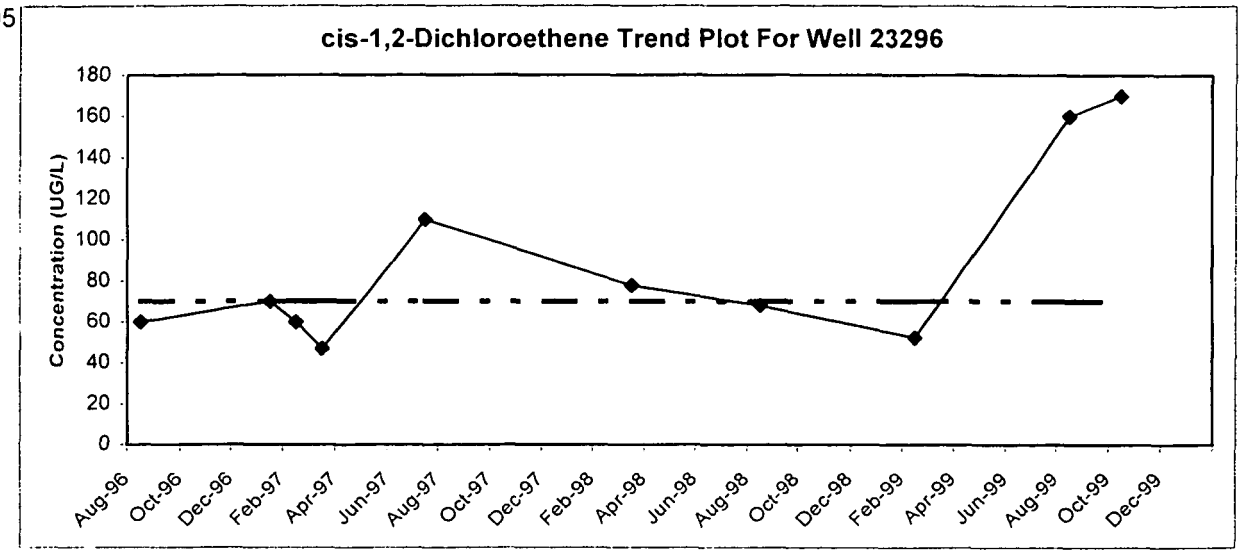
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

274

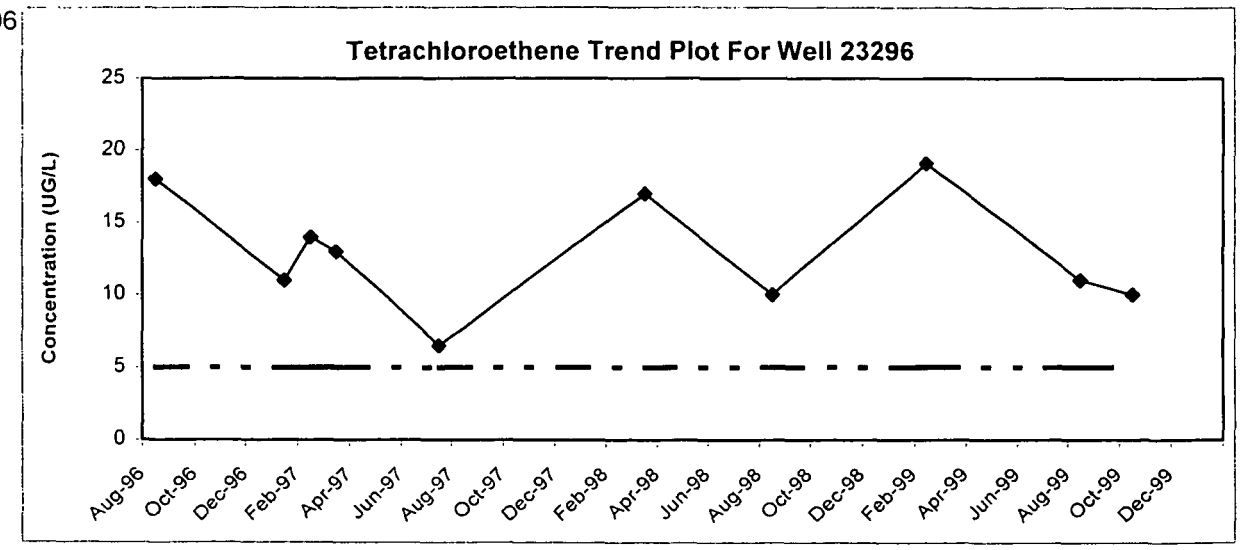
A-94



A-95



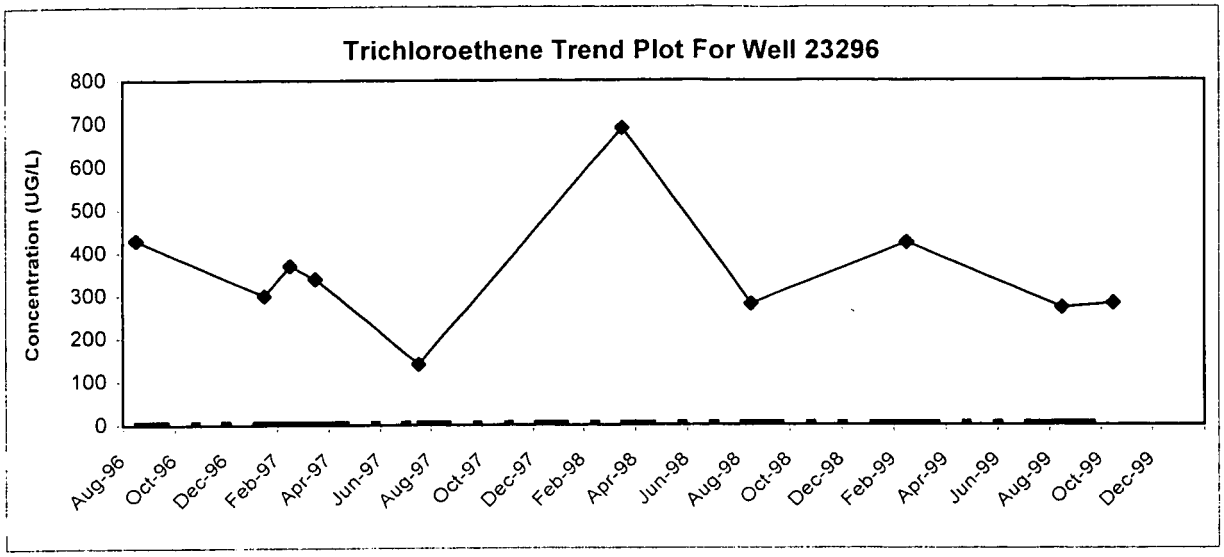
A-96



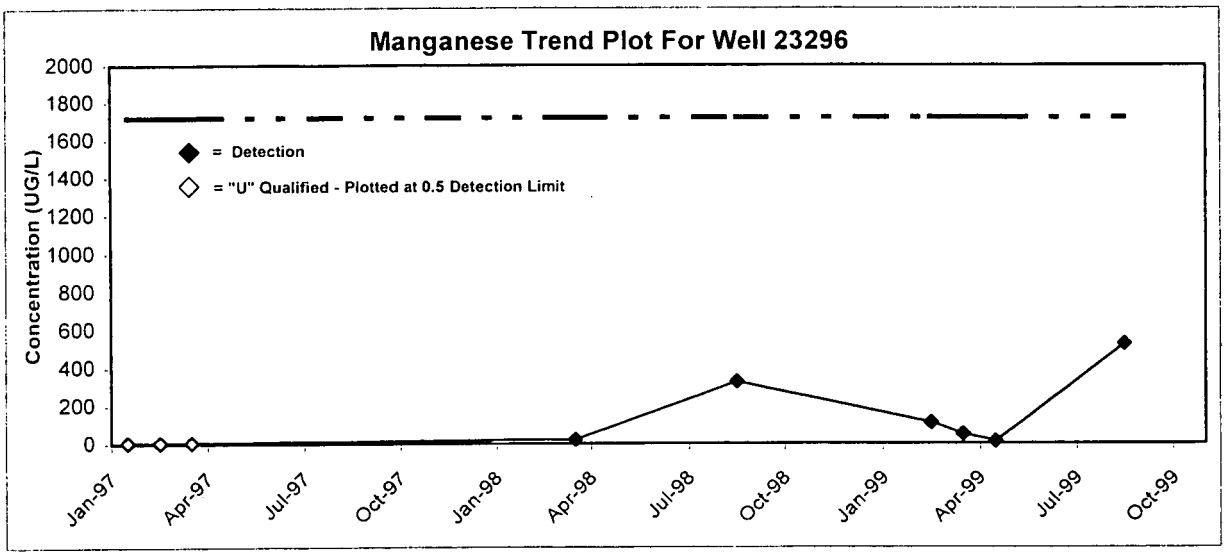
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

275

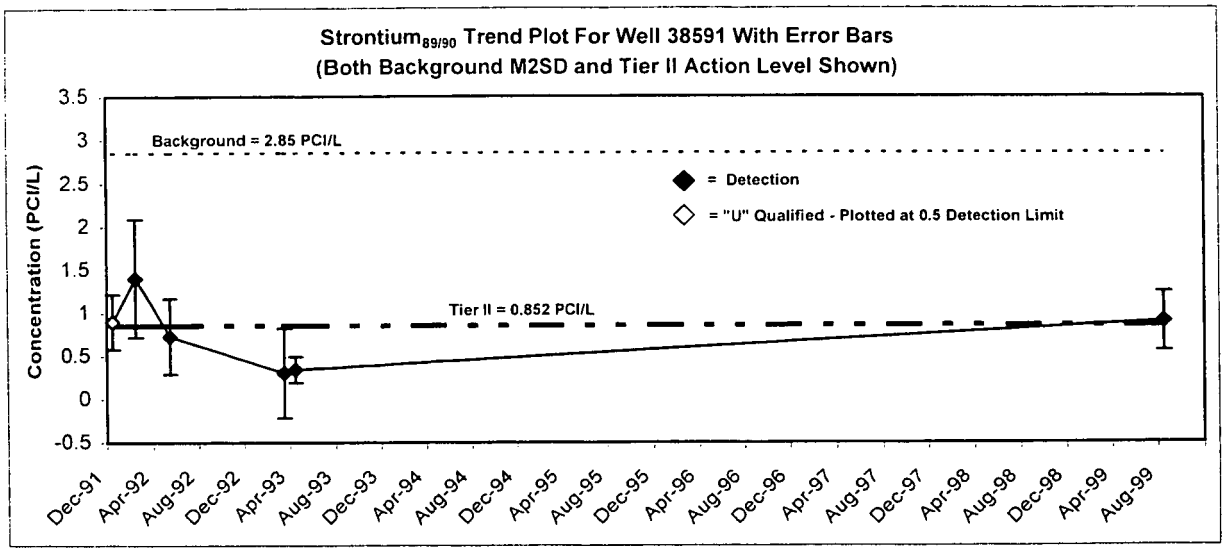
A-97



A-98



A-99



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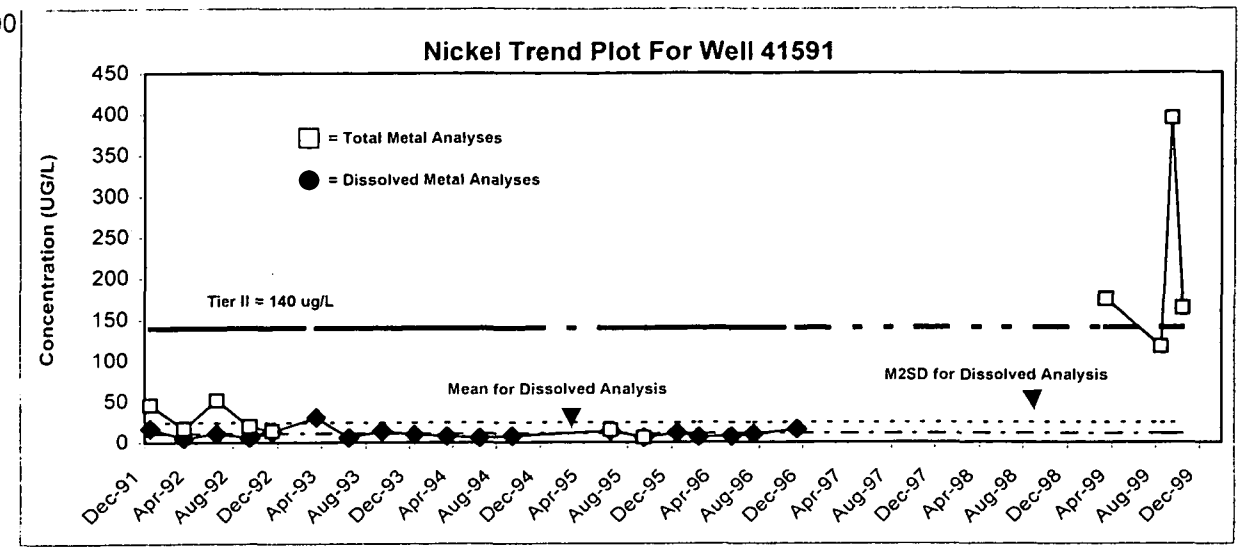
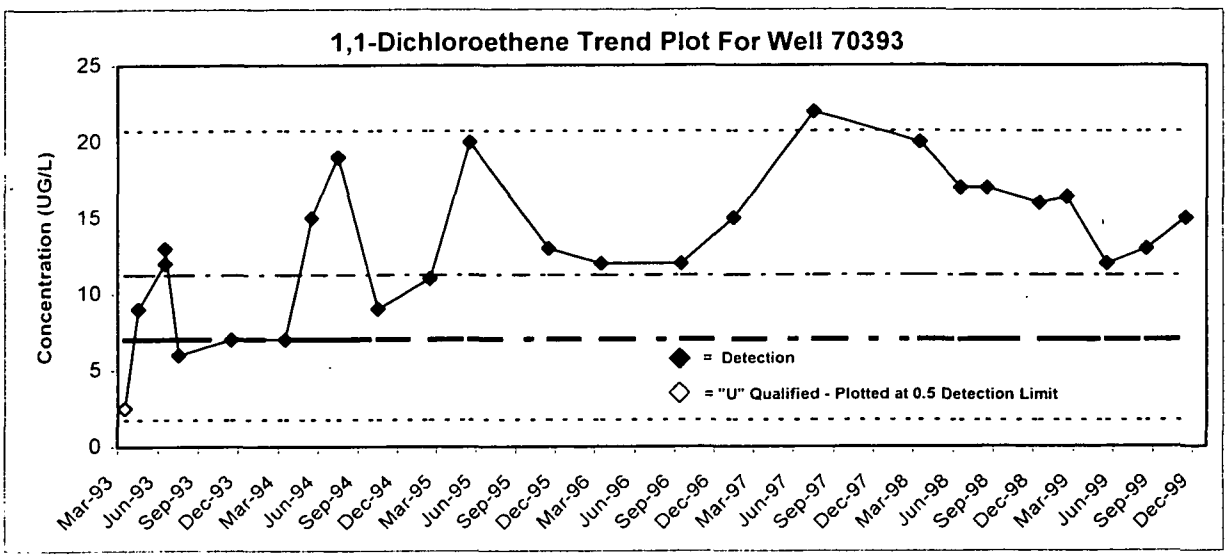
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

276

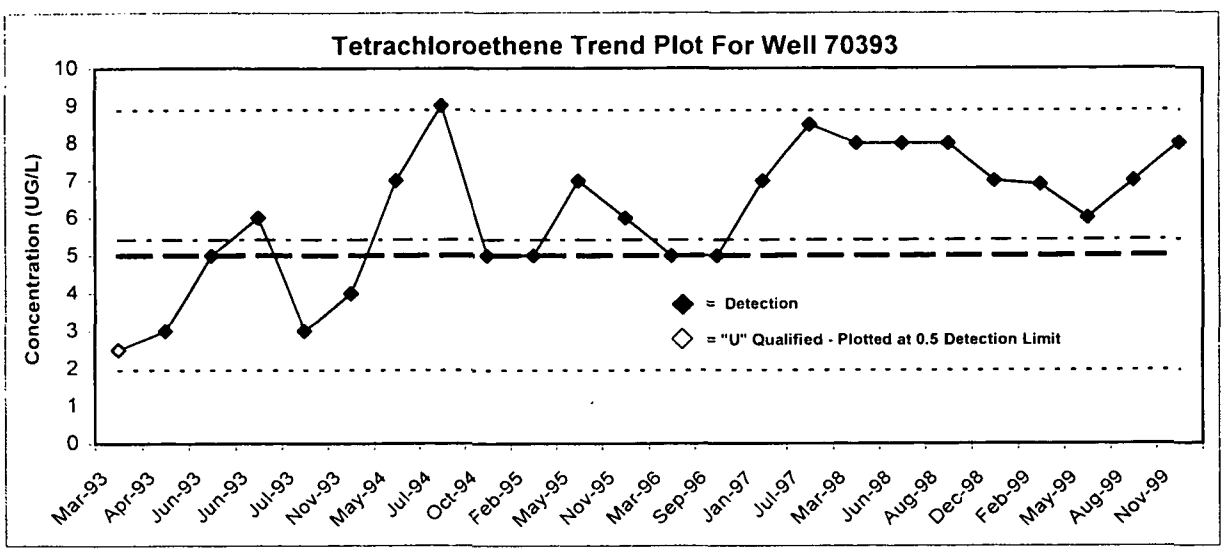
A-100



A-101



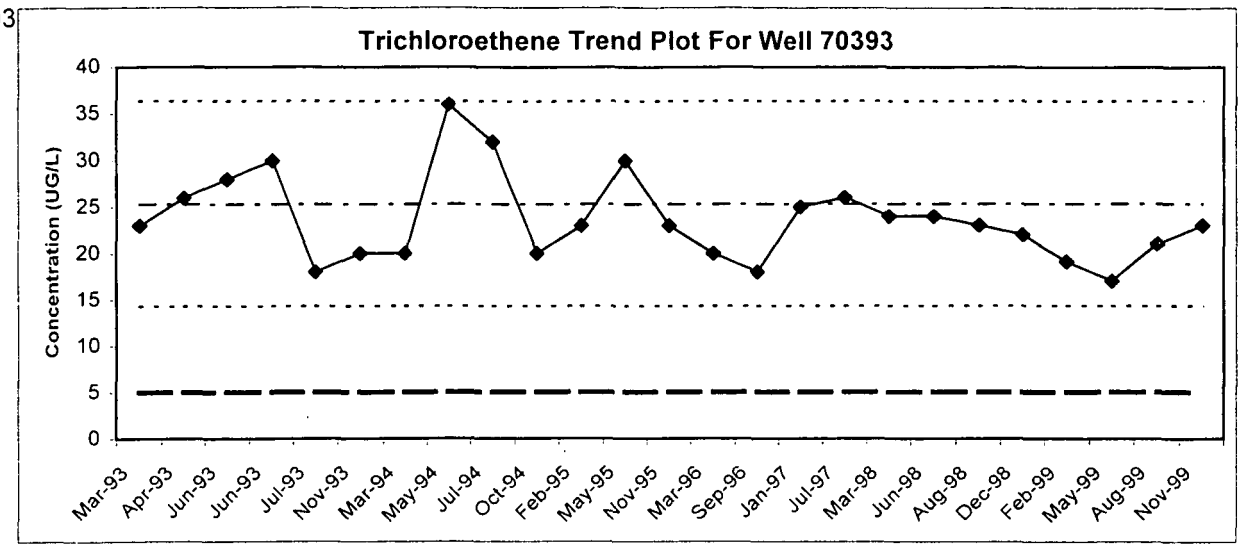
A-102



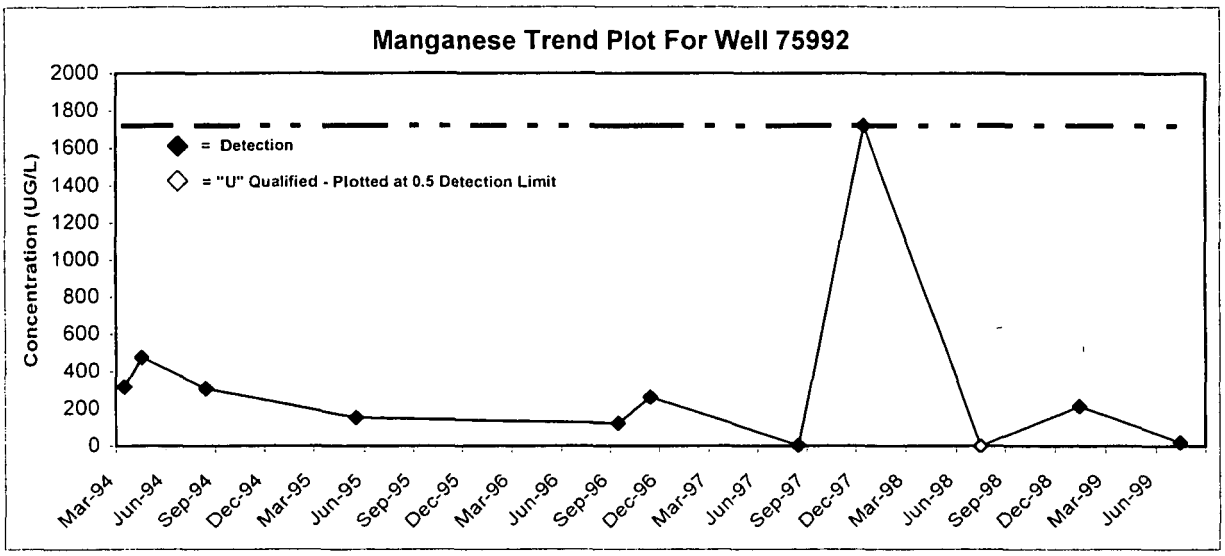
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

277

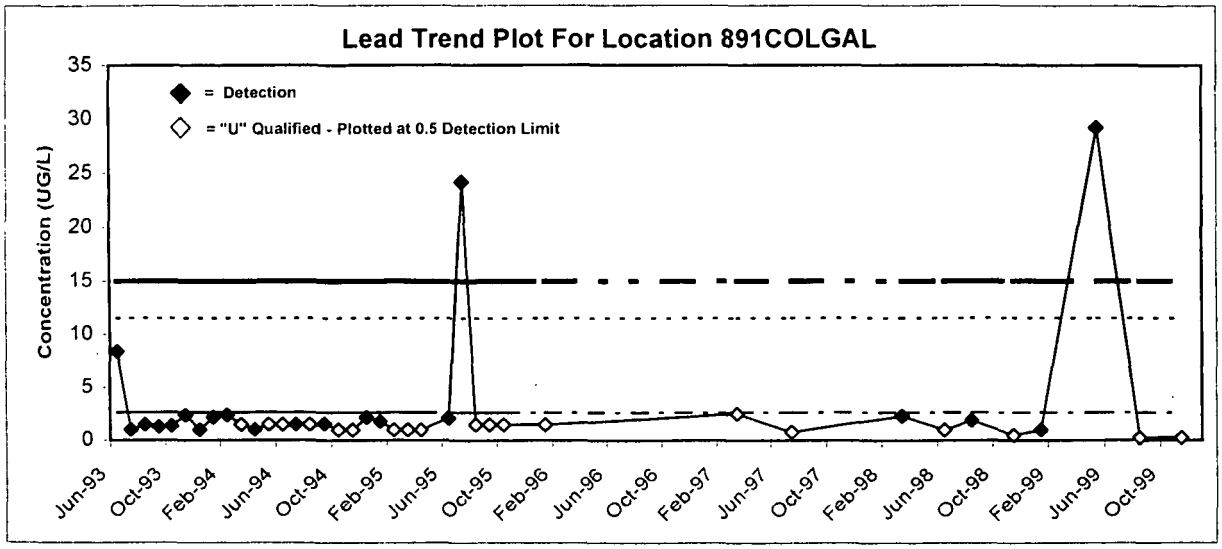
A-103



A-104



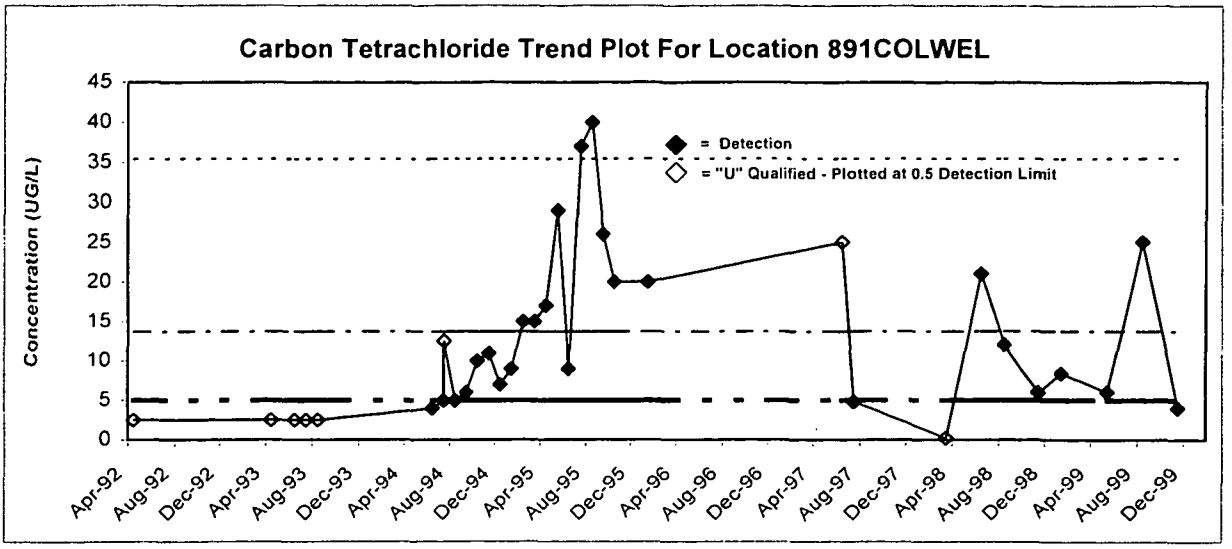
A-105



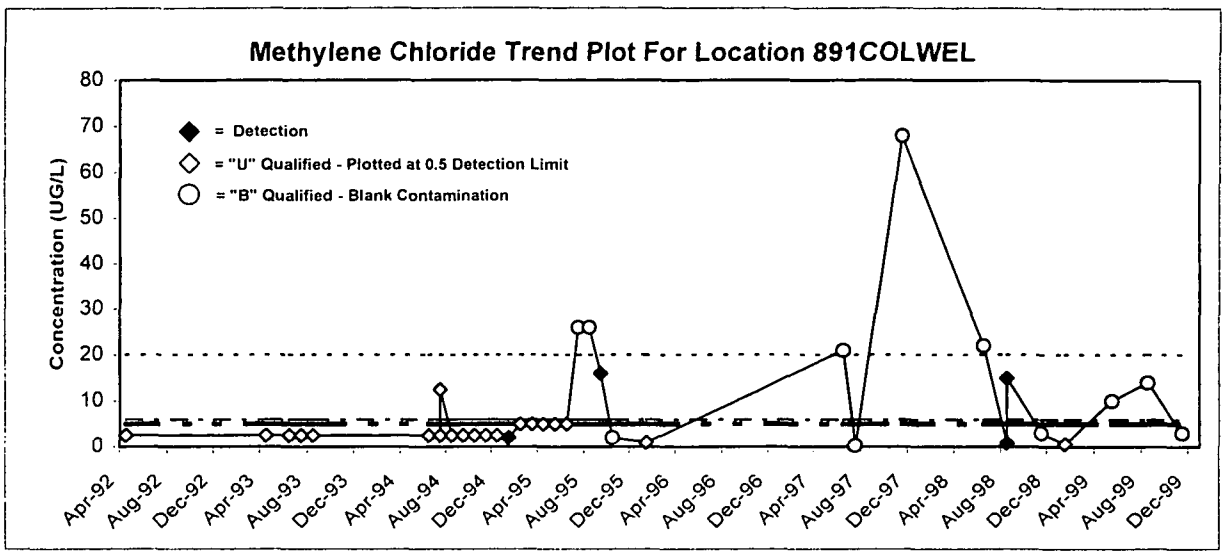
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

278

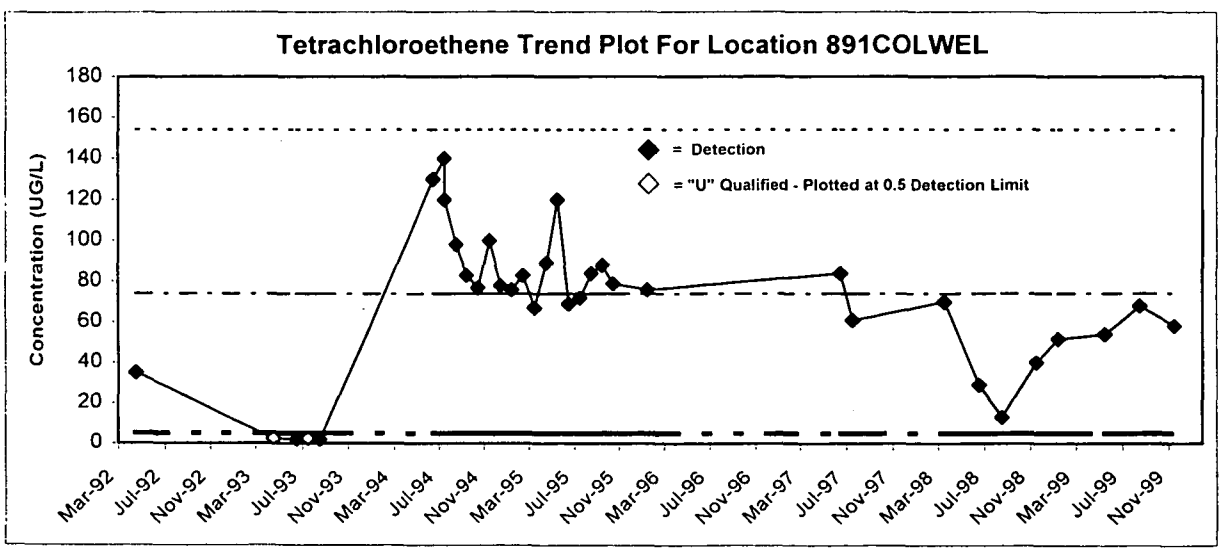
A-106



A-107



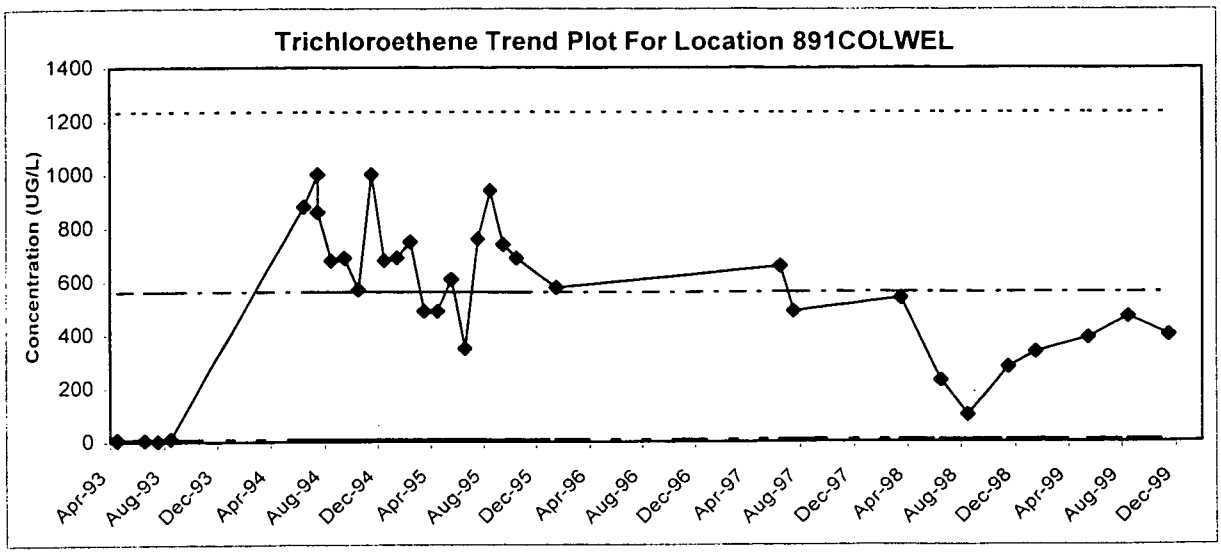
A-108



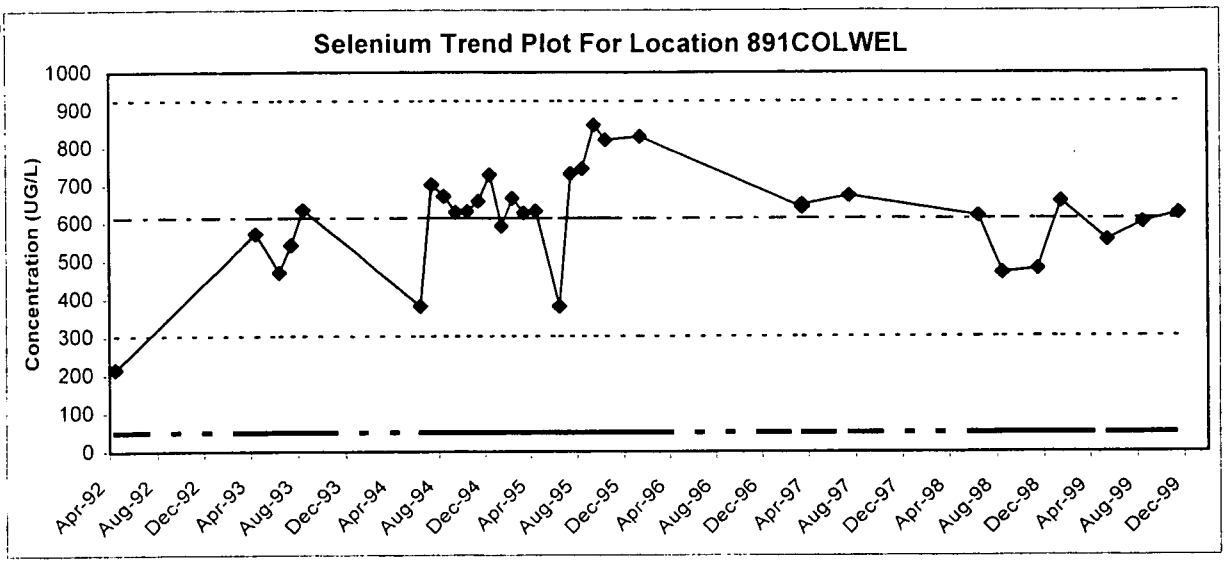
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

279

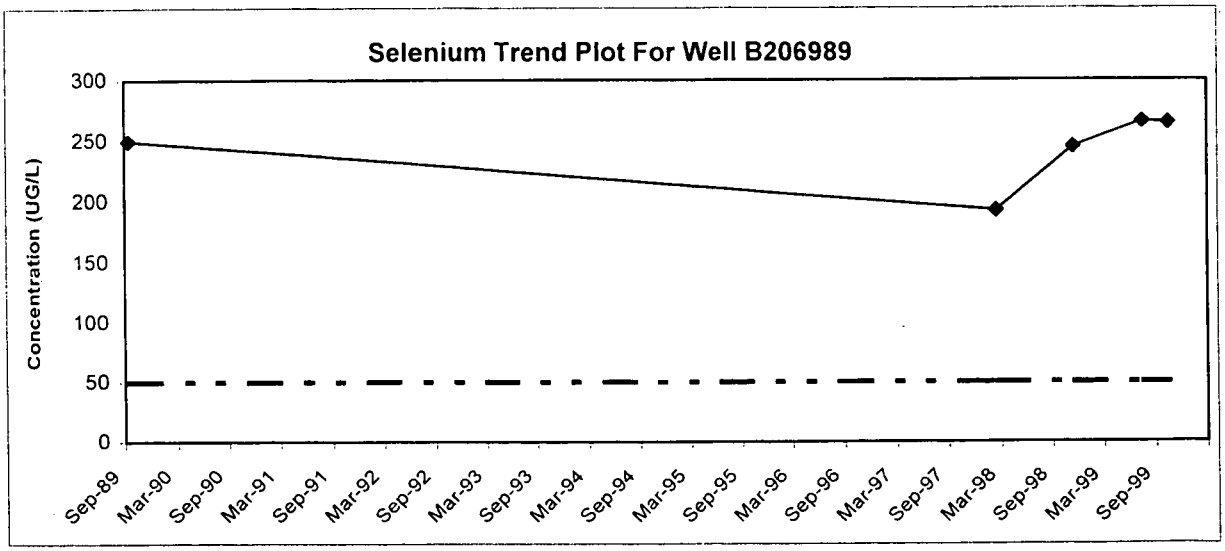
A-109



A-110



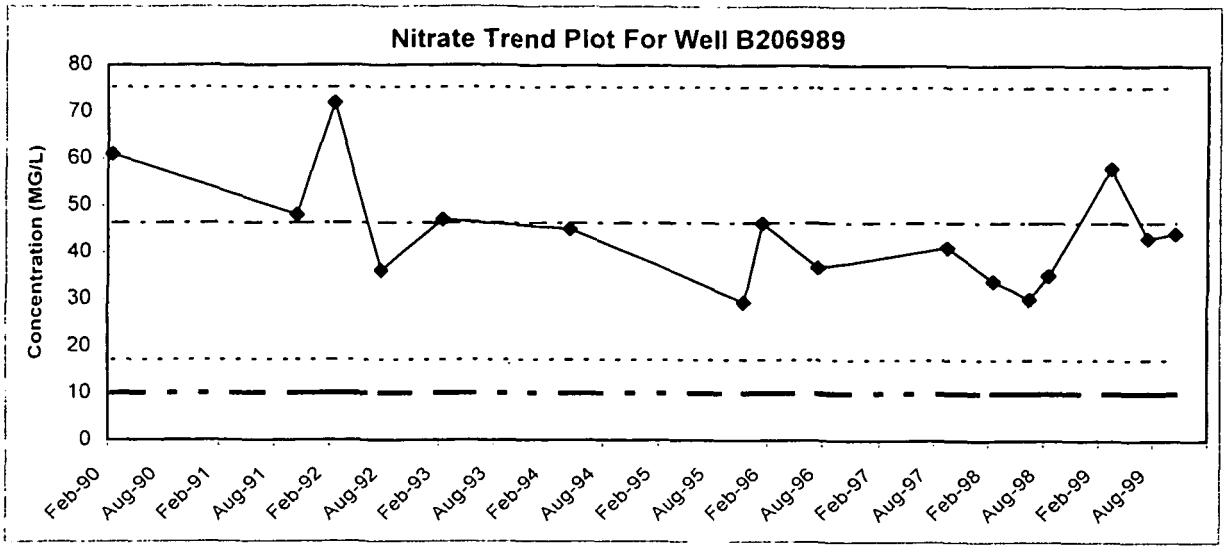
A-111



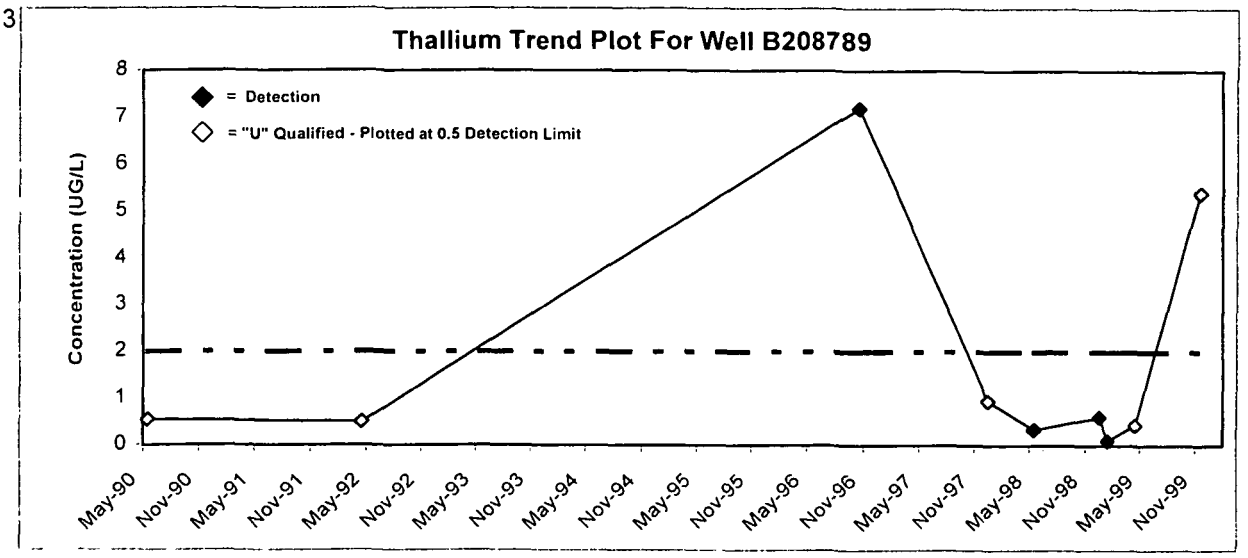
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

280

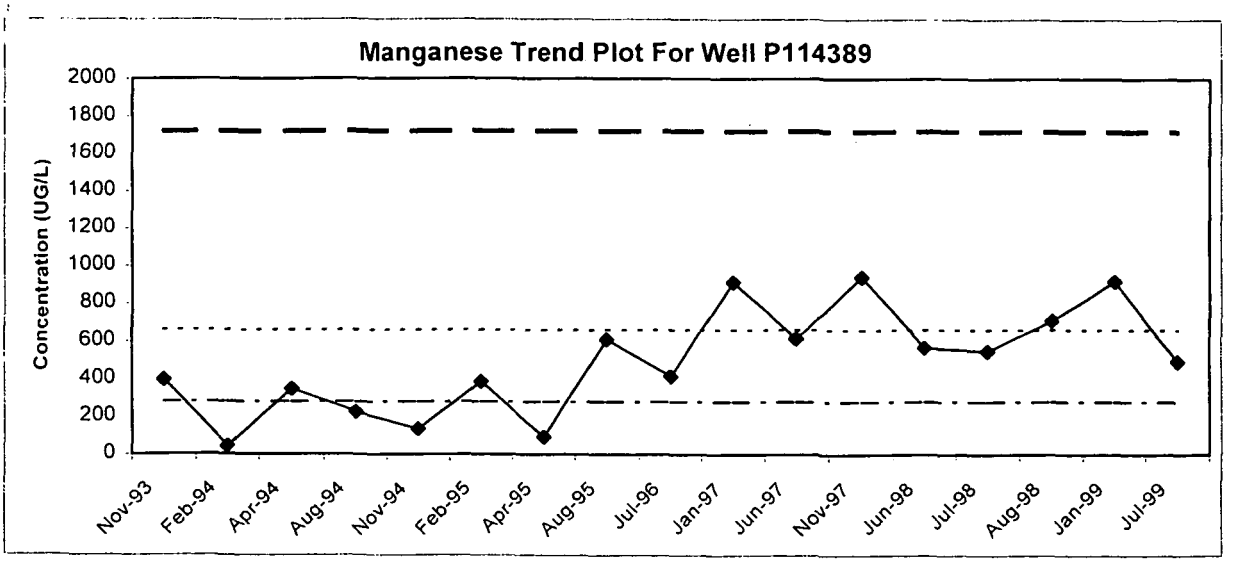
A-112



A-113



A-114



Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

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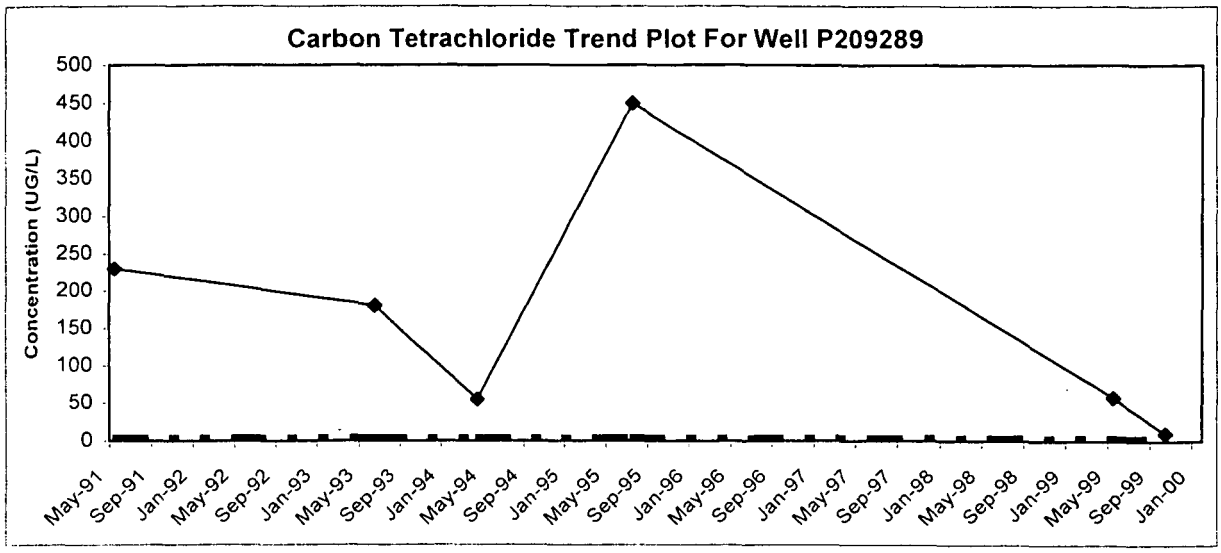
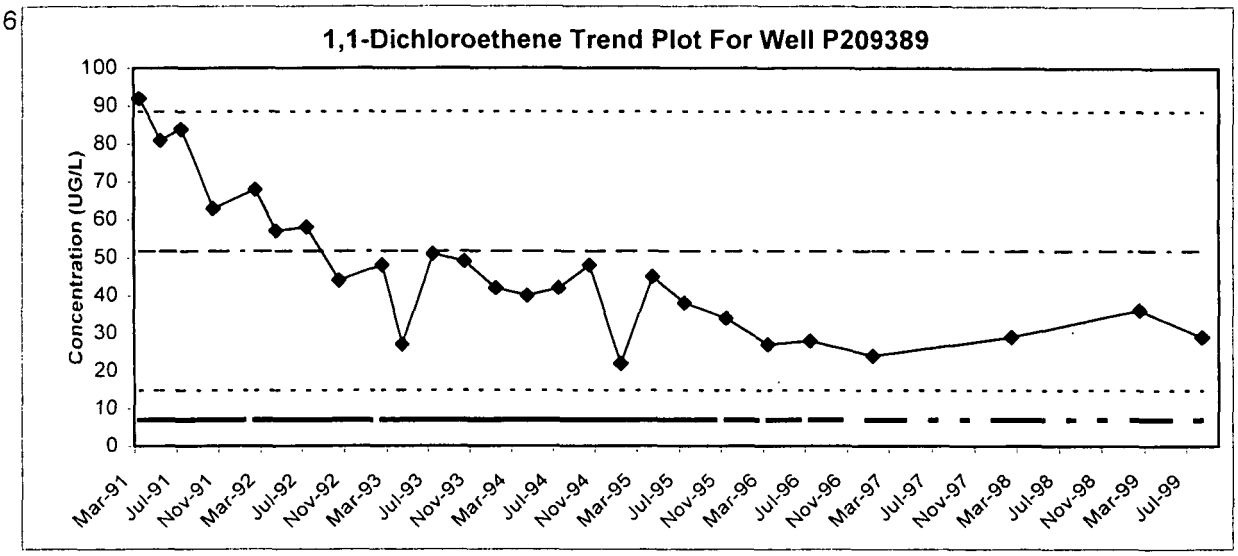
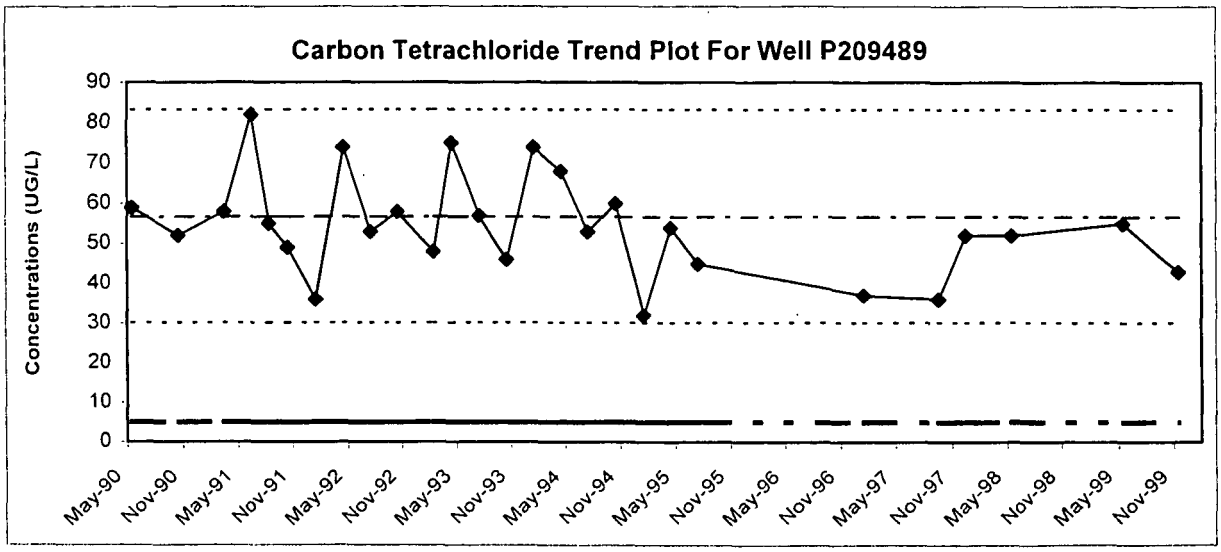
A-115



A-116



A-117



Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

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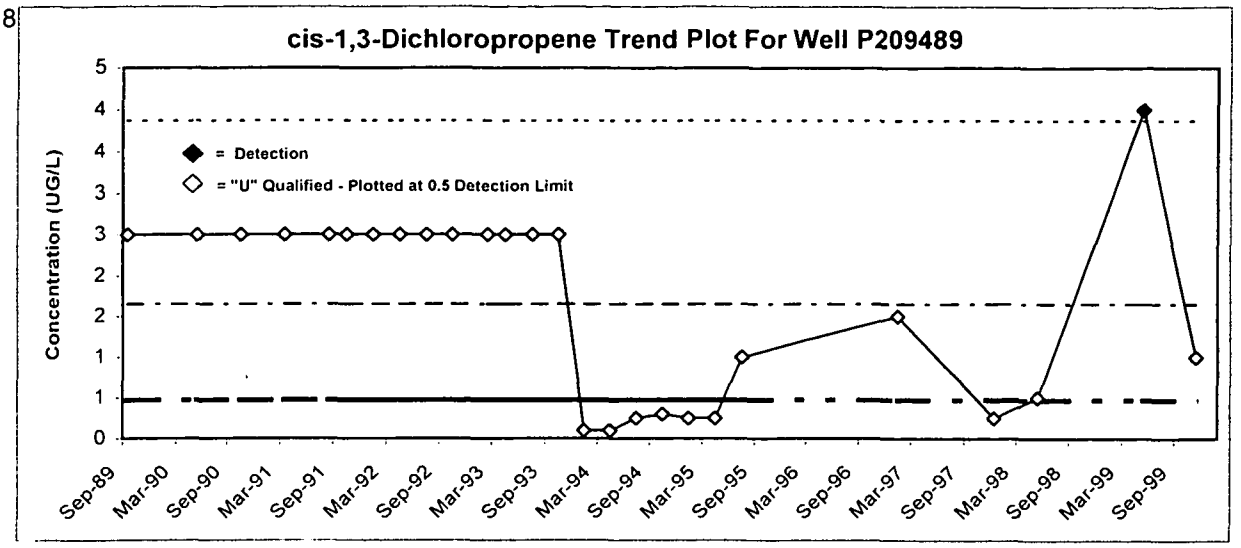
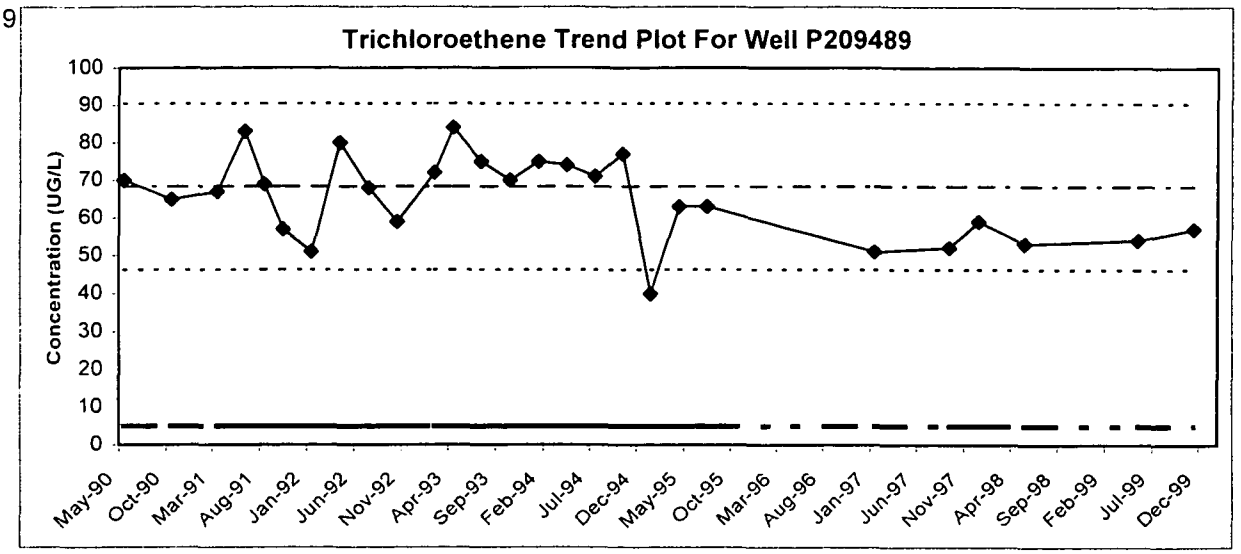
A-118



A-119



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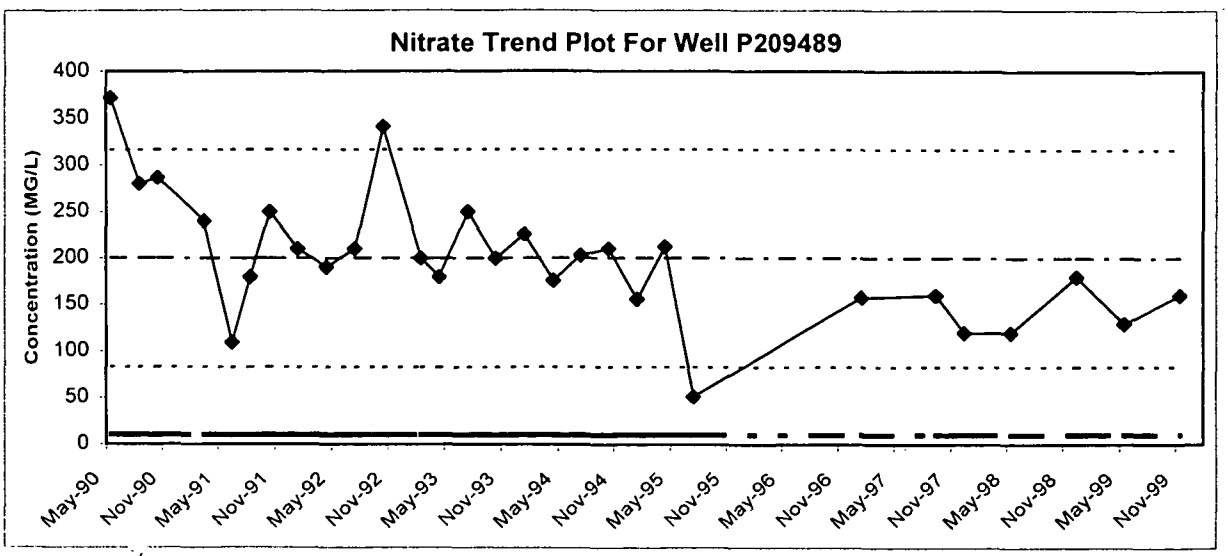

Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

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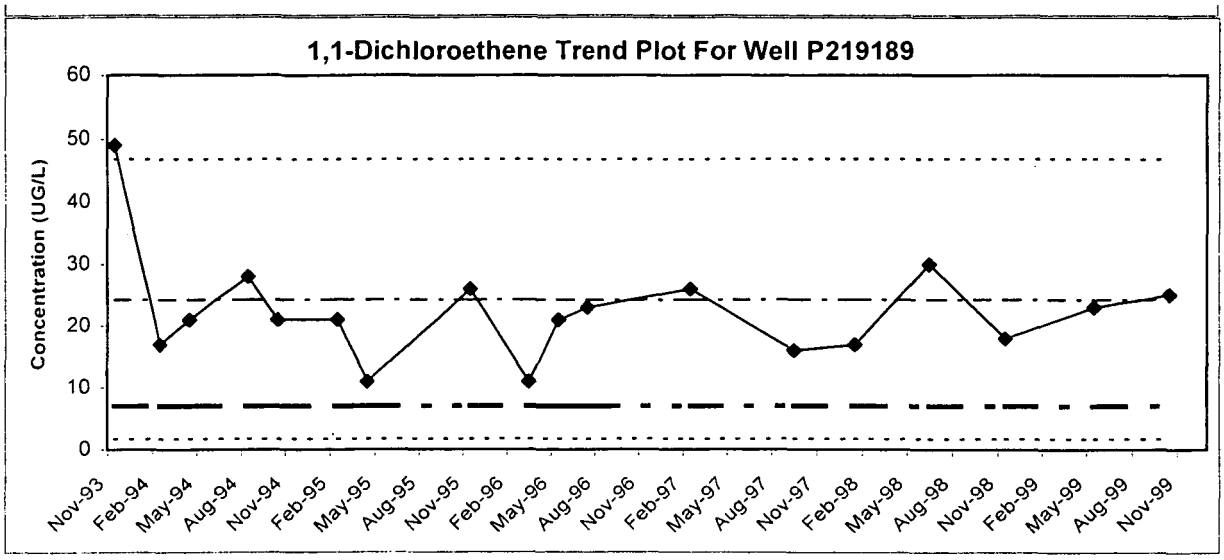
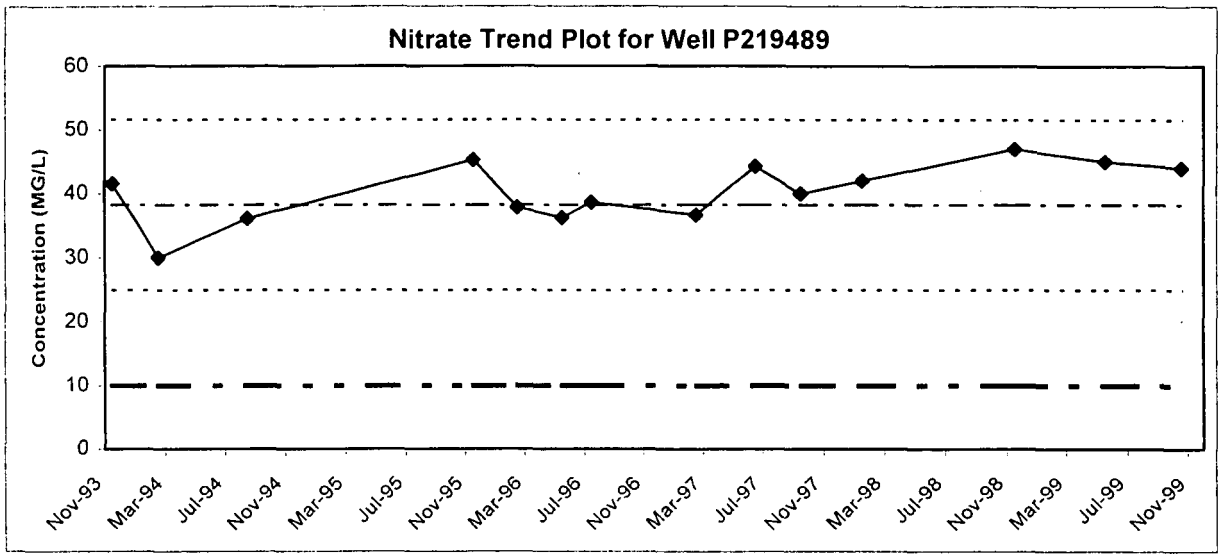
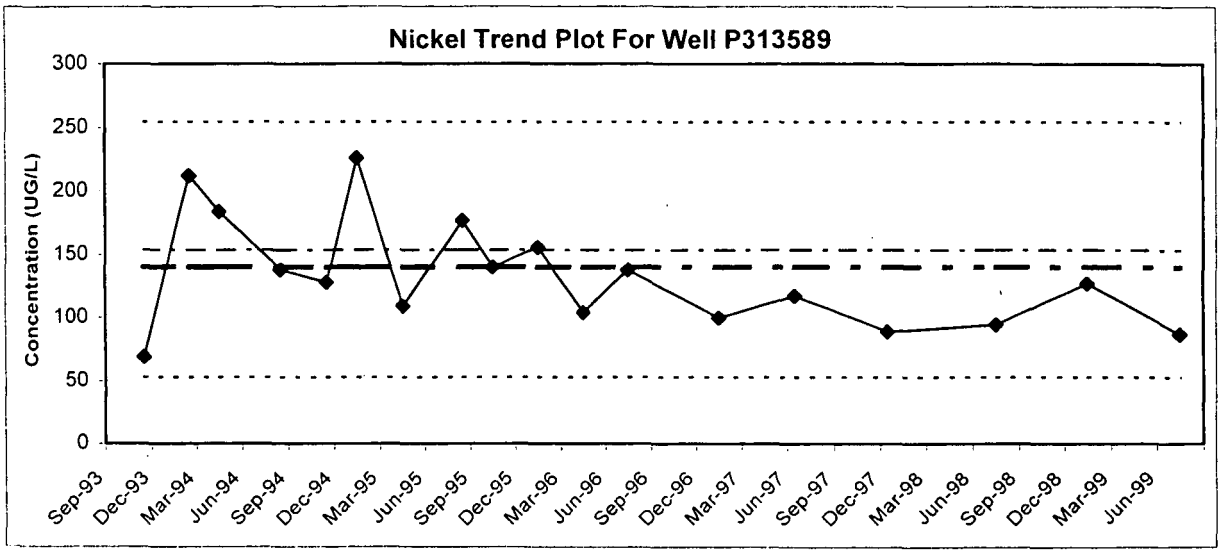
A-121



A-122



A-123



Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

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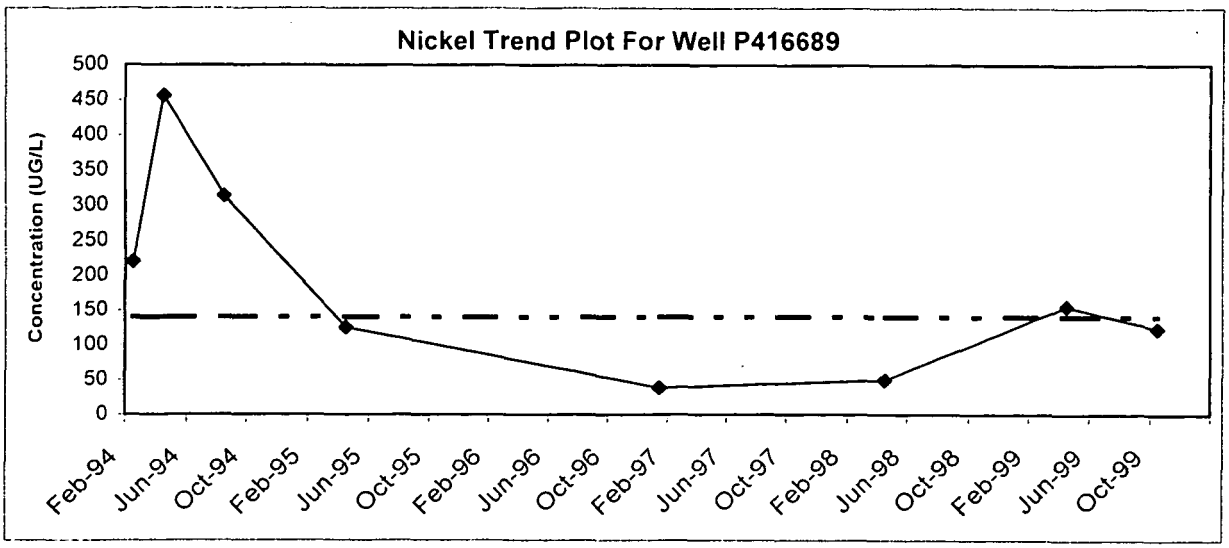
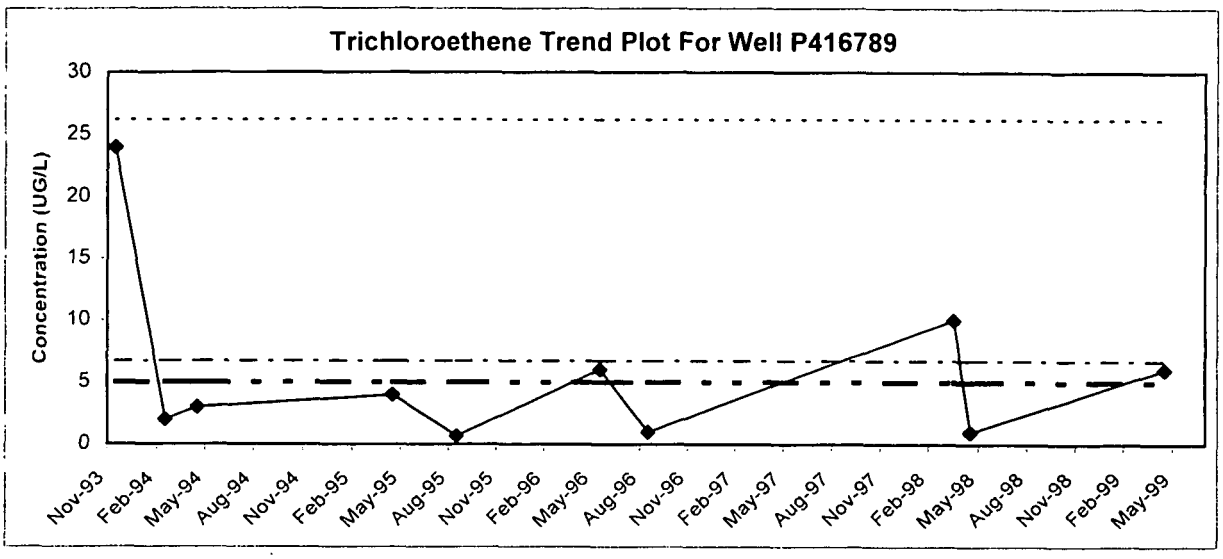
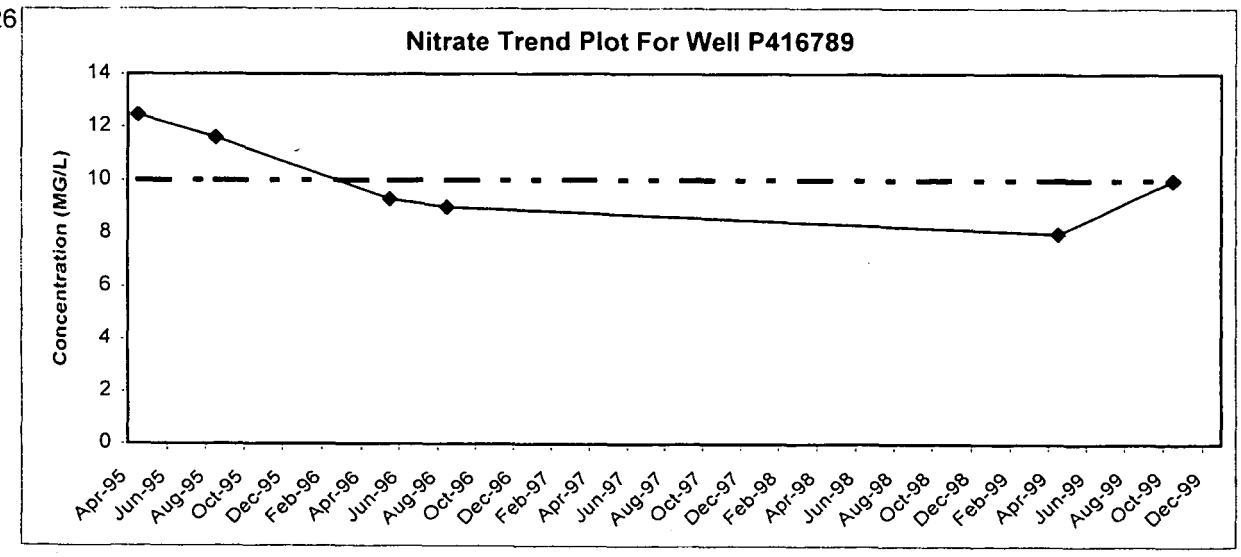
A-124



A-125



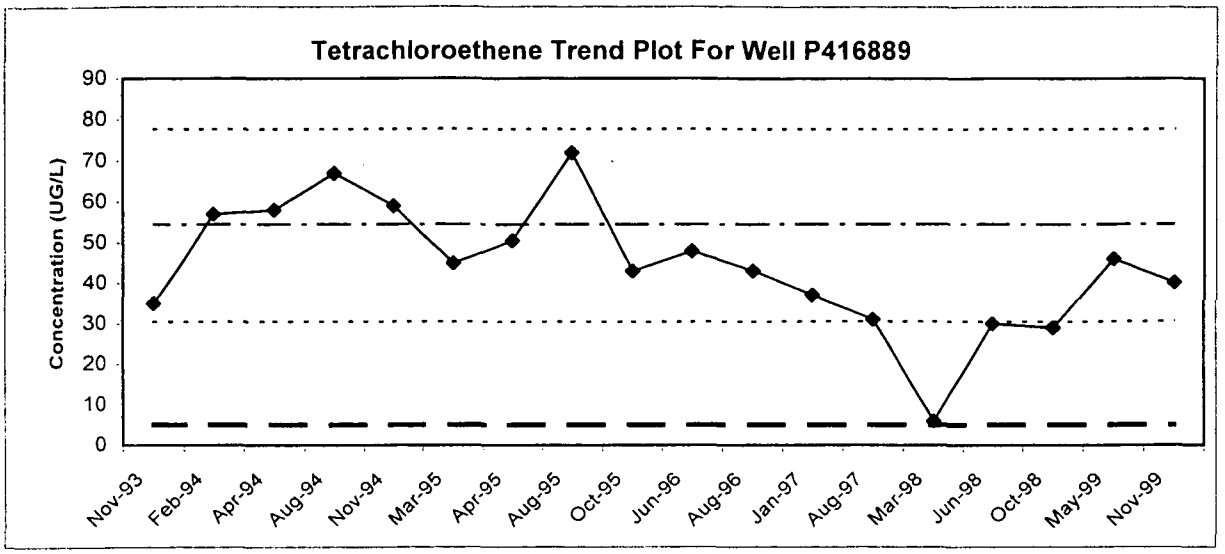
A-126



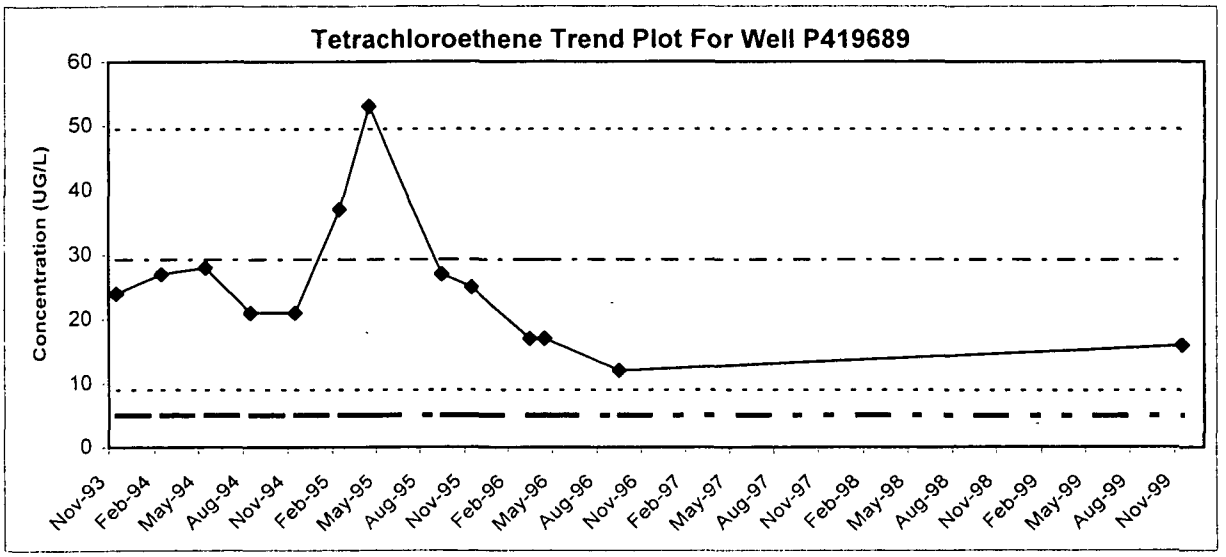
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

285

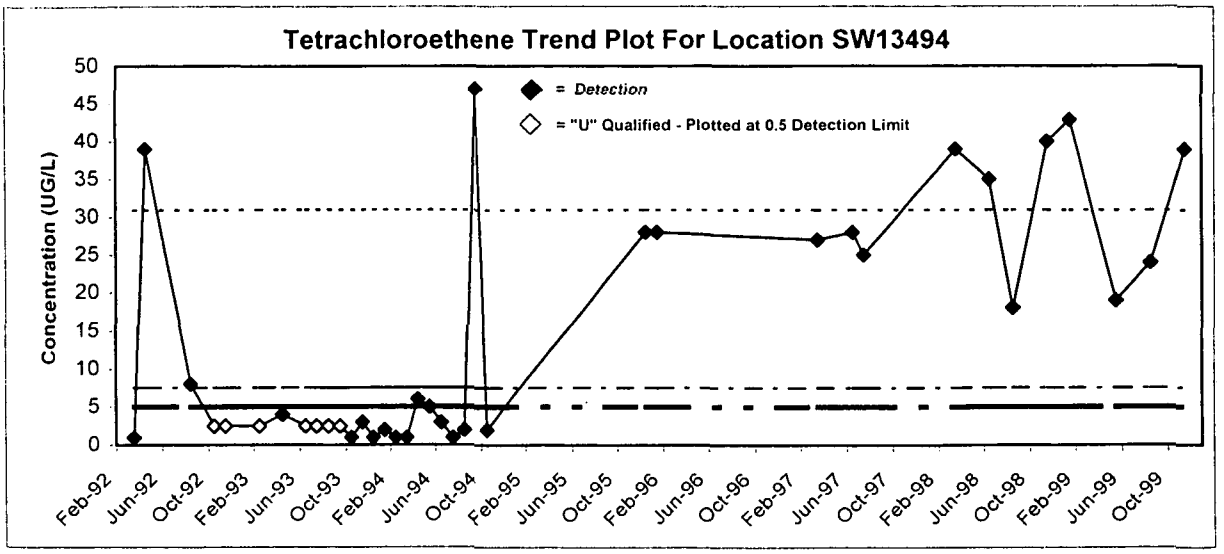
A-127



A-128



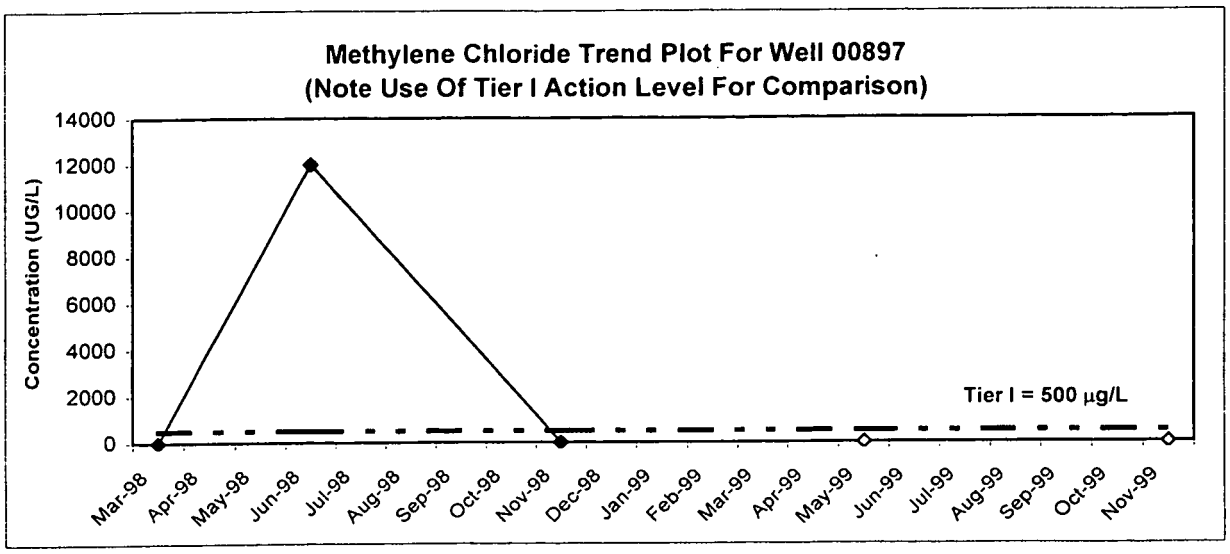
A-129



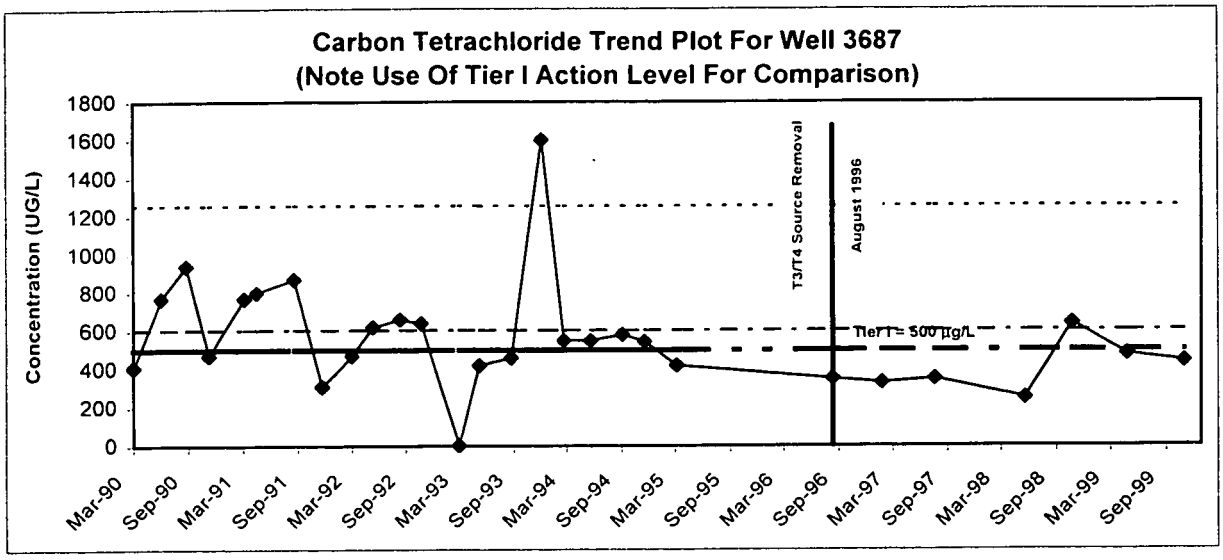
Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

286

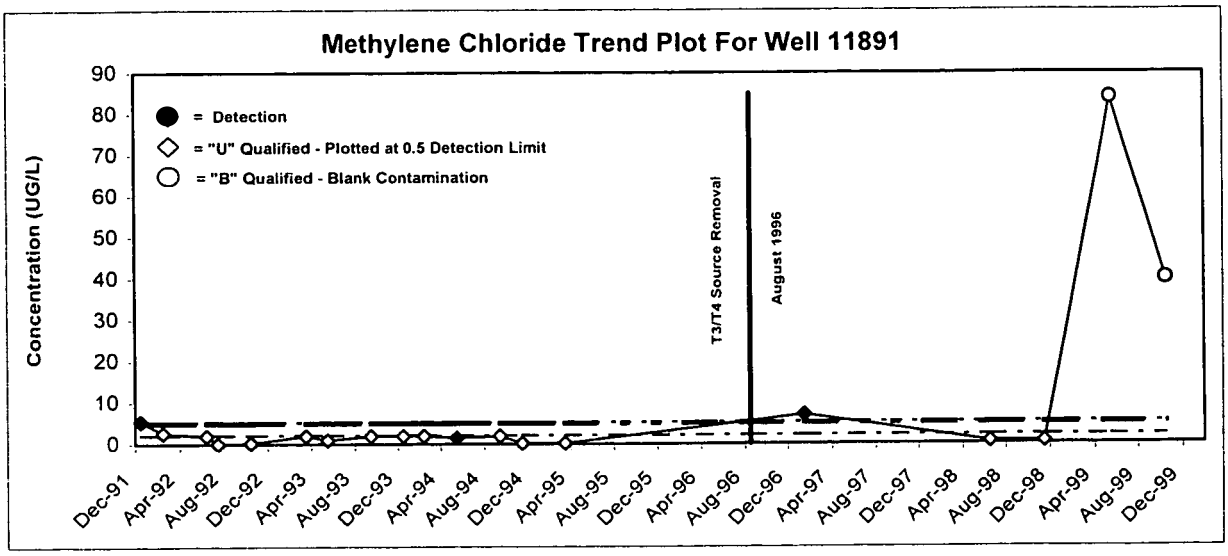
A-130



A-131



A-132



Heavy mixed dashed lines = Tier II Action Levels
Light uniform dashed lines = 2x Historic Standard Deviations (H2SD)
(-Std. Dev. not shown if <0)
Light mixed dashed lines = Historic Mean

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
00191	4/7/99	21.51	5948.93		5943.86
00191	10/12/99	19.26	5951.18		5943.86
00193	5/3/99	8.52	5759.32		5745.7
00197	1/4/99	9.49	5918.01		5917.6
00197	4/1/99			Dry	5917.6
00197	7/1/99	8.85	5918.65		5917.6
00197	10/11/99	9.55	5917.95		5917.6
00293	1/4/99	24.72	6027.72		6002.2
00293	2/1/99	25.01	6027.43		6002.2
00293	3/2/99	25.72	6026.72		6002.2
00293	4/1/99	25.73	6026.71		6002.2
00293	5/6/99	25.14	6027.3		6002.2
00293	6/1/99	23.45	6028.99		6002.2
00293	7/6/99	23.71	6028.73		6002.2
00293	8/4/99	24.02	6028.42		6002.2
00293	9/7/99	23.21	6029.23		6002.2
00293	10/5/99	23.74	6028.7		6002.2
00293	11/1/99	24.32	6028.12		6002.2
00293	12/6/99	24.5	6027.94		6002.2
00297	1/6/99	11.27	5963.65	Technically Dry	5964.7
00297	4/6/99	10.74	5964.18	Technically Dry	5964.7
00297	7/1/99	10.29	5964.63	Technically Dry	5964.7
00297	10/7/99			Dry	5964.7
00397	1/6/99	12.23	5925.8	Technically Dry	5928
00397	4/5/99	12.51	5925.52	Technically Dry	5928
00397	7/7/99			Dry	5928
00397	10/6/99			Dry	5928
00491	4/8/99	16.18	5888.79		5885.97
00491	7/6/99	15.2	5889.77		5885.97
00491	10/12/99			Dry to top pump	5885.97
00597	1/5/99	12.62	5971.91		5962.1
00597	4/5/99	13.62	5970.91		5962.1
00597	7/7/99	10.53	5974		5962.1
00597	10/6/99	11.27	5973.26		5962.1
00697	1/5/99	9.91	5966.13		5866
00697	4/1/99	10.2	5965.84		5866
00697	5/3/99	10.23	5965.81		5866
00697	7/1/99	10.53	5965.51		5866
00697	10/11/99	10.36	5965.68		5866
00797	1/5/99	16.97	5924.03		5912.2
00797	4/8/99	22.24	5918.76		5912.2
00797	7/6/99	16.43	5924.57		5912.2
00797	10/6/99	23.03	5917.97		5912.2
00897	1/6/99	21.72	5945.88		5937.5
00897	4/5/99	22.54	5945.06		5937.5
00897	7/7/99	19.62	5947.98		5937.5
00897	10/7/99	20.4	5947.2		5937.5
00997	1/5/99	6.09	5795.81		5789.6
00997	2/1/99	6.03	5795.87		5789.6
00997	3/1/99	8.28	5793.62		5789.6
00997	4/6/99	5.86	5796.04		5789.6
00997	5/4/99	3.03	5798.87		5789.6

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
00997	6/1/99	5.75	5796.15		5789.6
00997	7/8/99	5.93	5795.97		5789.6
00997	8/5/99	5.16	5796.74		5789.6
00997	9/8/99	7.38	5794.52		5789.6
00997	10/6/99	7.84	5794.06		5789.6
00997	11/2/99	8.41	5793.49		5789.6
00997	12/1/99	6.36	5795.54		5789.6
01291	4/1/99	14.74	5838.11		5837.91
01291	5/3/99	14.79	5838.06		5837.91
01291	10/6/99	14.85	5838		5837.91
01391	1/6/99	11.24	5964.06		5959.7
01391	2/1/99	11.05	5964.25		5959.7
01391	3/3/99	11.3	5964		5959.7
01391	4/5/99	11.21	5964.09		5959.7
01391	5/4/99	10.33	5964.97		5959.7
01391	6/3/99	10.09	5965.21		5959.7
01391	7/6/99	10.47	5964.83		5959.7
01391	8/2/99	10.81	5964.49		5959.7
01391	9/1/99	10.69	5964.61		5959.7
01391	10/11/99	10.82	5964.48		5959.7
01391	11/2/99	10.81	5964.49		5959.7
01391	11/9/99	11	5964.3		5959.7
01391	12/2/99	11.26	5964.04		5959.7
0186	1/5/99	10.03	5619.29		5617.47
0186	2/1/99	9.79	5619.53		5617.47
0190	1/5/99	37.39	6008.49		5999.8
0190	2/1/99	37.62	6008.26		5999.8
0190	3/2/99	38.13	6007.75		5999.8
0190	4/1/99	38.2	6007.68		5999.8
0190	5/6/99	33.56	6012.32		5999.8
0190	6/1/99	32.87	6013.01		5999.8
0190	7/12/99	35.2	6010.68		5999.8
0190	8/4/99				5999.8
0190	9/7/99	34.69	6011.19		5999.8
0190	10/5/99	35.83	6010.05		5999.8
0190	11/1/99	36.59	6009.29		5999.8
0190	12/6/99	37.09	6008.79		5999.8
02197	1/5/99			Dry	5948.1
02197	4/5/99	14.12	5946.58	Technically Dry	5948.1
02197	7/7/99	11.01	5949.69	Technically Dry	5948.1
02197	10/5/99	13	5947.7		5948.1
02297	1/6/99	12.25	5966.4		5965.98
02297	4/6/99	11.53	5967.12		5965.98
02297	7/1/99	11.13	5967.52		5965.98
02297	10/13/99	11.27	5967.38		5965.98
02397	1/6/99	11.2	5975.61		5975.03
02397	4/6/99	8.75	5978.06		5975.03
02397	7/1/99	10.64	5976.17		5975.03
02397	10/13/99	10.51	5976.3		5975.03
02497	4/6/99	8.15	5971.27		5968.05
02497	7/1/99	6.79	5972.63		5968.05
02497	10/13/99	5.74	5973.68		5968.05

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
02697	1/6/99	23.71	5894.19		5889.86
02697	4/5/99	24.58	5893.32		5889.86
02797	1/5/99	36.71	5894.81		5887.65
02797	4/5/99	37.64	5893.88		5887.65
02897	1/5/99	35.84	5893.91		5891.25
02897	4/5/99	36.58	5893.17		5891.25
0290	1/5/99	46.91	6003.74		5990.8
0290	2/1/99	47.14	6003.51		5990.8
0290	3/2/99	47.44	6003.21		5990.8
0290	4/1/99	47.6	6003.05		5990.8
0290	5/6/99	47.34	6003.31		5990.8
0290	6/1/99	46.22	6004.43		5990.8
0290	7/8/99	46.07	6004.58		5990.8
0290	8/4/99	46.33	6004.32		5990.8
0290	9/7/99	46.01	6004.64		5990.8
0290	10/5/99	46.22	6004.43		5990.8
0290	11/1/99	46.55	6004.1		5990.8
0290	12/7/99	46.73	6003.92		5990.8
03191	4/5/99	21.96	5930.06		5929.15
03191	10/13/99	19.92	5932.1		5929.15
0386	1/5/99	16.14	5661.72		5652.57
0386	2/1/99	16.22	5661.64		5652.57
0386	3/2/99	16.32	5661.54		5652.57
0386	4/6/99	16.38	5661.48		5652.57
0386	5/5/99	16.05	5661.81		5652.57
0386	6/1/99	15.59	5662.27		5652.57
0386	7/6/99	15.58	5662.28		5652.57
0386	8/2/99	15.69	5662.17		5652.57
0386	9/9/99	15.9	5661.96		5652.57
0386	10/4/99	16.02	5661.84		5652.57
0386	11/1/99	16.19	5661.67		5652.57
0386	12/1/99	16.22	5661.64		5652.57
0390	1/4/99	53.96	6025.17		6010.4
0390	2/1/99	54.21	6024.92		6010.4
0390	3/2/99	54.77	6024.36		6010.4
0390	4/5/99	54.93	6024.2		6010.4
0390	5/6/99	55.26	6023.87		6010.4
0390	6/1/99	54.83	6024.3		6010.4
0390	7/12/99	54.45	6024.68		6010.4
0390	8/4/99	54.32	6024.81		6010.4
0390	9/7/99	54	6025.13		6010.4
0390	10/5/99	53.94	6025.19		6010.4
0390	11/1/99	54.19	6024.94		6010.4
0390	12/6/99	53.98	6025.15		6010.4
03991	1/6/99	35.76	5901.11		5897.77
03991	4/5/99	36.17	5900.7		5897.77
03991	7/7/99	34.18	5902.69		5897.77
03991	10/13/99	35.34	5901.53		5897.77
04091	1/6/99	37.39	5892.75		5892.52
04091	4/5/99	37.45	5892.69		5892.52
04091	7/7/99	37.21	5892.93		5892.52
04091	10/13/99	37.37	5892.77		5892.52

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
04191	4/9/99	17.64	5939.35		5938.48
04191	10/12/99	16.75	5940.24		5938.48
04591	1/7/99	44.73	5905.52		5904.59
04591	4/7/99	44.97	5905.28		5904.59
04591	7/12/99	44.61	5905.64		5904.59
04591	10/12/99	44.87	5905.38		5904.59
0487	1/5/99	12.3	5899.28		5890.65
0487	2/1/99	12.39	5899.19		5890.65
0487	3/1/99	12.5	5899.08		5890.65
0487	4/6/99	12.37	5899.21		5890.65
0487	5/6/99	7.36	5904.22		5890.65
0487	6/1/99	8.08	5903.5		5890.65
0487	7/2/99	9.3	5902.28		5890.65
0487	9/8/99	11.32	5900.26		5890.65
0487	10/6/99	11.9	5899.68		5890.65
0487	11/2/99	12.35	5899.23		5890.65
0487	12/2/99	12.7	5898.88		5890.65
04991	1/5/99	39.56	5899.07		5896.64
04991	4/9/99	40.98	5897.65		5896.64
04991	7/12/99	40.53	5898.1		5896.64
04991	10/12/99	40.54	5898.09		5896.64
05091	1/5/99	41.63	5897.61		5893.63
05091	4/9/99	43	5896.24		5893.63
05091	7/12/99	42.15	5897.09		5893.63
05091	10/12/99	42.34	5896.9		5893.63
05193	1/6/99	12.49	5958.09		5957
05193	2/2/99	12.34	5958.24		5957
05193	3/1/99	12.19	5958.39		5957
05193	4/6/99	11.97	5958.61		5957
05193	5/6/99	7.46	5963.12		5957
05193	6/2/99	8.03	5962.55		5957
05193	7/1/99	9.32	5961.26		5957
05193	8/4/99	10.97	5959.61		5957
05193	9/9/99	11.34	5959.24		5957
05193	10/7/99	11.79	5958.79		5957
05193	11/4/99	11.86	5958.72		5957
05193	12/1/99	11.97	5958.61		5957
05197	2/4/99	11.01	5975.88		5958.22
05291	4/7/99	36.81	5906.19		5906.13
05291	10/12/99	36.52	5906.48		5906.13
05391	1/6/99	35.59	5906.08		5905.09
05391	4/5/99	36	5905.67		5905.09
05391	7/7/99	33.87	5907.8		5905.09
05391	10/13/99	34.88	5906.79		5905.09
05397	2/4/99	12.02	5975.87		5962.45
05497	2/15/99	10.3	5975.7		5963.75
05691	1/6/99	31.15	5917.84		5912.51
05691	4/5/99	32.68	5916.31		5912.51
05691	7/7/99	27.22	5921.77		5912.51
05691	10/13/99	29.07	5919.92		5912.51
05697	2/4/99	10.37	5975.78		5967.54
05897	2/4/99	10.7	5975.52		5963.37

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
05997	2/4/99	10.91	5975.87		5963.69
06091	1/5/99	35.97	5895.63		5889.38
06091	2/1/99	36.35	5895.25		5889.38
06091	3/2/99	36.73	5894.87		5889.38
06091	4/5/99	37.07	5894.53		5889.38
06091	5/5/99	36.34	5895.26		5889.38
06091	6/1/99	36.36	5895.24		5889.38
06091	7/7/99	36.18	5895.42		5889.38
06091	8/2/99	36.2	5895.4		5889.38
06091	9/8/99	36.29	5895.31		5889.38
06091	10/13/99	36.48	5895.12		5889.38
06091	11/1/99	36.65	5894.95		5889.38
06091	12/1/99	36.81	5894.79		5889.38
06191	4/5/99	33.6	5887.12		5887.11
06191	10/13/99	33	5887.72		5887.11
06291	1/5/99	24.46	5874.82		5865
06291	2/1/99	24.57	5874.71		5865
06291	3/2/99	24.93	5874.35		5865
06291	4/5/99	25.15	5874.13		5865
06291	5/5/99	25.53	5873.75		5865
06291	6/1/99	25.73	5873.55		5865
06291	7/7/99			Dry	5865
06291	8/2/99	30.82	5868.46		5865
06291	9/8/99	30.32	5868.96		5865
06291	10/13/99	29.85	5869.43		5865
06291	11/1/99	29.24	5870.04		5865
06291	12/1/99	32.75	5866.53		5865
06491	1/5/99	11.95	5661.3		5655.55
06491	4/6/99	11.8	5661.45		5655.55
06491	7/6/99	11.24	5662.01		5655.55
06491	10/4/99	12.61	5660.64		5655.55
06991	4/7/99	20.46	5954.11		5943.91
06991	10/12/99	18.72	5955.85		5943.91
07291	1/7/99	21.26	5957.54		5956.67
07291	2/2/99	21.34	5957.46		5956.67
07291	3/4/99	21.41	5957.39		5956.67
07291	4/7/99	21.48	5957.32		5956.67
07291	5/4/99	14.44	5964.36		5956.67
07291	6/4/99	17.8	5961		5956.67
07291	7/12/99	20	5958.8		5956.67
07291	8/5/99	20.24	5958.56		5956.67
07291	9/9/99	20.53	5958.27		5956.67
07291	10/12/99	20.78	5958.02		5956.67
07291	11/3/99	20.8	5958		5956.67
07291	12/1/99	20.94	5957.86		5956.67
07391	1/7/99	9.19	5941.42		5937.74
07391	4/7/99	11.24	5939.37		5937.74
07391	7/12/99	8.1	5942.51		5937.74
07391	10/12/99			Dry	5937.74
08091	1/7/99	19.49	5930.02	Technically Dry	5931.6
08091	4/9/99	19.05	5930.46	Technically Dry	5931.6
08091	7/12/99	18.96	5930.55	Technically Dry	5931.6

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
08091	10/12/99	18.31	5931.2	Technically Dry	5931.6
0990	1/4/99	7.1	6076.38		6045.5
0990	2/1/99	7.11	6076.37		6045.5
0990	3/1/99	7.45	6076.03		6045.5
0990	4/1/99	7.61	6075.87		6045.5
0990	5/3/99	2.33	6081.15		6045.5
0990	6/1/99	3.64	6079.84		6045.5
0990	7/1/99	4.96	6078.52		6045.5
0990	8/5/99	4.4	6079.08		6045.5
0990	9/8/99	5.39	6078.09		6045.5
0990	10/7/99	5.75	6077.73		6045.5
0990	11/1/99	6.16	6077.32		6045.5
0990	12/2/99	6.12	6077.36		6045.5
10098	1/6/99	5.11	6030.39		6027.3
10098	3/1/99	6.2	6029.3		6027.3
10098	4/6/99	5.09	6030.41		6027.3
10098	5/3/99	3.45	6032.05		6027.3
10098	6/3/99	3.7	6031.8		6027.3
10098	7/6/99	4.95	6030.55		6027.3
10098	8/2/99	3.29	6032.21		6027.3
10098	9/7/99	4.16	6031.34		6027.3
10098	10/11/99	4.88	6030.62		6027.3
10098	11/3/99	5.06	6030.44		6027.3
10098	12/2/99	5.41	6030.09		6027.3
10194	1/7/99	38.03	5902.35		5897.5
10194	4/9/99	38.7	5901.68		5897.5
10194	7/12/99	38.38	5902		5897.5
10194	10/12/99	38.62	5901.76		5897.5
10198	1/6/99	4.07	6031.43		6022.9
10198	3/1/99	9.99	6025.51		6022.9
10198	4/6/99	4.14	6031.36		6022.9
10198	7/6/99	3.89	6031.61		6022.9
10198	10/11/99	3.9	6031.6		6022.9
10294	1/5/99	3.07	5603.13		5589.4
10294	4/6/99	3.1	5603.1		5589.4
10294	7/6/99	4.45	5601.75		5589.4
10294	10/4/99	4.29	5601.91		5589.4
10298	1/7/99	4.58	6024.82		6014.4
10298	3/1/99	12.01	6017.39		6014.4
10298	4/7/99	6.21	6023.19		6014.4
10298	7/7/99	3.87	6025.53		6014.4
10298	10/12/99	4.45	6024.95		6014.4
10394	1/5/99	4.75	5628.38		5621.8
10394	4/6/99	4.68	5628.45		5621.8
10394	7/6/99			Dry to top pump	5621.8
10394	10/4/99	6.93	5626.2		5621.8
10398	1/6/99			Dry	6019.9
10398	3/1/99	8.76	6021.74		6019.9
10398	4/6/99	5.29	6025.21		6019.9
10398	7/6/99	5.42	6025.08		6019.9
10398	10/11/99	5.28	6025.22		6019.9
10498	1/6/99	5.17	6027.33		6021.1

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
10498	3/1/99	6.12	6026.38		6021.1
10498	4/6/99	5.08	6027.42		6021.1
10498	7/6/99	5.61	6026.89		6021.1
10498	10/11/99	6.46	6026.04		6021.1
10592	1/5/99	20.77	5917.16		5912.15
10592	4/8/99	21.56	5916.37		5912.15
10592	7/6/99	17.65	5920.28		5912.15
10592	10/6/99	15.14	5922.79		5912.15
10594	4/5/99	8.67	5812.28		5810.12
10594	10/6/99	10.67	5810.28		5810.12
10598	1/6/99	5.01	6028.39		6025.9
10598	3/2/99	7.45	6025.95		6025.9
10598	4/6/99	3.5	6029.9		6025.9
10598	7/6/99	5.72	6027.68		6025.9
10598	10/11/99	4.14	6029.26		6025.9
10692	1/5/99	5.85	5937.75		5922.1
10692	4/8/99	5.96	5937.64		5922.1
10692	7/6/99	5.3	5938.3		5922.1
10692	10/6/99	6.71	5936.89		5922.1
10694	4/5/99	5.65	5754.58		5751.59
10694	10/6/99	5.48	5754.75		5751.59
10792	1/5/99	24.45	5892.65		5892.61
10792	4/8/99	23.86	5893.24		5892.61
10792	7/6/99	24	5893.1		5892.61
10792	10/6/99	23.78	5893.32		5892.61
1087	4/6/99			Dry	5969.95
1087	10/7/99			Dry	5969.95
1087	11/9/99			Dry	5969.95
10894	4/6/99	4.75	5664.16		5658.75
10894	10/4/99	5.64	5663.27		5658.75
10992	1/5/99	26.54	5872.02		5867.41
10992	4/6/99	29.61	5868.95		5867.41
10992	7/6/99	26.28	5872.28		5867.41
10992	10/6/99	25.06	5873.5		5867.41
10994	1/5/99	16.17	5901.31		5898.21
10994	4/1/99	16.02	5901.46		5898.21
10994	7/1/99	15.64	5901.84		5898.21
10994	10/11/99			Dry	5898.21
11092	1/5/99	22.2	5873.11	Technically Dry	5874.33
11092	4/7/99	21.77	5873.54	Technically Dry	5874.33
11092	7/2/99			Dry	5874.33
11092	10/6/99	22.26	5873.05	Technically Dry	5874.33
11294	1/4/99	22.59	6150.91		6095.2
11294	2/1/99	22.63	6150.87		6095.2
11294	3/2/99	23.12	6150.38		6095.2
11294	4/1/99	22.99	6150.51		6095.2
11294	5/4/99	21.03	6152.47		6095.2
11294	6/1/99	20.67	6152.83		6095.2
11294	7/6/99	21.22	6152.28		6095.2
11294	8/2/99	21.32	6152.18		6095.2
11294	9/7/99	20.42	6153.08		6095.2
11294	10/4/99	21.01	6152.49		6095.2

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
11294	11/1/99	21.57	6151.93		6095.2
11294	12/2/99	21.69	6151.81		6095.2
11494	1/4/99	20.65	6165.98		6117.58
11494	2/1/99	20.72	6165.91		6117.58
11594	1/4/99	59.7	6056.63		6049.98
11594	2/1/99	59.81	6056.52		6049.98
11594	3/2/99	59.88	6056.45		6049.98
11594	4/1/99	59.93	6056.4		6049.98
11594	5/4/99	60.02	6056.31		6049.98
11594	6/1/99	60.11	6056.22		6049.98
11594	7/6/99	59.72	6056.61		6049.98
11594	8/4/99	59.65	6056.68		6049.98
11594	10/4/99	59.69	6056.64		6049.98
11594	11/1/99	59.78	6056.55		6049.98
11594	12/2/99	59.79	6056.54		6049.98
11891	1/6/99	26.53	5920.91		5917.51
11891	4/5/99	27.04	5920.4		5917.51
11891	7/7/99	24.58	5922.86		5917.51
11891	10/13/99	25.8	5921.64		5917.51
1190	1/4/99	19.81	5981.27		5968.7
1190	2/1/99	20.01	5981.07		5968.7
12191	1/7/99	27.82	5930.37		5923.49
12191	4/9/99	29.52	5928.67		5923.49
12191	7/12/99	22.61	5935.58		5923.49
12191	10/12/99	25.63	5932.56		5923.49
12691	1/6/99	34.9	5916.18		5886.58
12691	4/5/99	36.62	5914.46		5886.58
12691	7/7/99	30.96	5920.12		5886.58
12691	10/13/99	33.26	5917.82		5886.58
1290	4/5/99	26.91	5987.96		5977.4
1290	10/5/99	24.25	5990.62		5977.4
13091	4/7/99	21.04	5954.16		5952.38
13091	10/12/99	20.32	5954.88		5952.38
13391	4/5/99	38.24	5887.11		5884.83
13391	10/13/99	38.06	5887.29		5884.83
13491	4/5/99			Dry	5932.92
13491	10/12/99	22.32	5941.1		5932.92
13591	4/9/99			Dry	5949.92
13591	10/12/99			Dry	5949.92
1386	1/5/99	5.39	5837.2		5830.97
1386	2/1/99	5.39	5837.2		5830.97
1386	3/1/99	5.33	5837.26		5830.97
1386	4/5/99	5.17	5837.42		5830.97
1386	5/4/99	4.07	5838.52		5830.97
1386	6/1/99	5.52	5837.07		5830.97
1386	7/7/99	6.38	5836.21		5830.97
1386	8/5/99	5.78	5836.81		5830.97
1386	9/8/99	6.29	5836.3		5830.97
1386	10/6/99	5.78	5836.81		5830.97
1386	11/1/99	5.56	5837.03		5830.97
1386	12/1/99	5.4	5837.19		5830.97
1390	4/5/99	30.69	5989.93		5978.5

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
1390	10/5/99	28.31	5992.31		5978.5
1490	1/5/99	52.62	6018.66		6009.4
1490	2/1/99	52.96	6018.32		6009.4
1490	3/2/99	53.64	6017.64		6009.4
1490	4/1/99	53.77	6017.51		6009.4
1490	5/6/99	54.02	6017.26		6009.4
1490	6/1/99	52.47	6018.81		6009.4
1490	7/12/99	52.26	6019.02		6009.4
1490	8/4/99	52.41	6018.87		6009.4
1490	9/7/99	51.8	6019.48		6009.4
1490	10/5/99	52.11	6019.17		6009.4
1490	11/1/99	52.59	6018.69		6009.4
1490	12/7/99	52.49	6018.79		6009.4
15199	1/15/99	11.53	5916.47	Technically Dry	5916.7
15199	1/22/99	10.57	5917.43		5916.7
15199	1/28/99	11.12	5916.88		5916.7
15199	2/4/99	10.51	5917.49		5916.7
15199	3/1/99	8.97	5919.03		5916.7
15199	4/5/99	7.89	5920.11		5916.7
15199	5/4/99	6.95	5921.05		5916.7
15199	6/1/99	5.93	5922.07		5916.7
15199	7/6/99	5.57	5922.43		5916.7
15199	10/7/99	6.67	5921.33		5916.7
15299	1/15/99	12.49	5915.51	Technically Dry	5917
15299	1/22/99	12.29	5915.71	Technically Dry	5917
15299	1/28/99	12.87	5915.13	Technically Dry	5917
15299	2/4/99	12.76	5915.24	Technically Dry	5917
15299	3/1/99	12.5	5915.5	Technically Dry	5917
15299	4/5/99	12.26	5915.74	Technically Dry	5917
15299	5/4/99	12	5916	Technically Dry	5917
15299	6/1/99	11.59	5916.41	Technically Dry	5917
15299	7/6/99	11.32	5916.68	Technically Dry	5917
15299	10/7/99	11.05	5916.95	Technically Dry	5917
15399	1/15/99	10.47	5913.53	Technically Dry	5914.7
15399	1/22/99	9.83	5914.17	Technically Dry	5914.7
15399	1/28/99	10.54	5913.46	Technically Dry	5914.7
15399	2/4/99	9.91	5914.09	Technically Dry	5914.7
15399	3/1/99	8.12	5915.88		5914.7
15399	4/5/99	6.65	5917.35		5914.7
15399	5/4/99	5.45	5918.55		5914.7
15399	6/1/99	3.31	5920.69		5914.7
15399	7/6/99	3.4	5920.6		5914.7
15399	10/7/99	4.25	5919.75		5914.7
15499	1/15/99	2.61	5921.39		5911.5
15499	1/22/99	2.77	5921.23		5911.5
15499	1/28/99	2.74	5921.26		5911.5
15499	2/4/99	2.71	5921.29		5911.5
15499	3/1/99	2.79	5921.21		5911.5
15499	4/5/99	2.71	5921.29		5911.5
15499	5/4/99	1.11	5922.89		5911.5
15499	6/1/99	1.82	5922.18		5911.5
15499	7/6/99	2.17	5921.83		5911.5

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
15499	10/7/99	2.95	5921.05		5911.5
15599	1/15/99	10.2	5907.7	Technically Dry	5909
15599	1/22/99	9.94	5907.96	Technically Dry	5909
15599	1/28/99	10.53	5907.37	Technically Dry	5909
15599	2/4/99	10.58	5907.32	Technically Dry	5909
15599	3/1/99			Dry	5909
15599	4/5/99			Dry	5909
15599	5/4/99			Dry	5909
15599	6/1/99			Dry	5909
15599	7/6/99			Dry	5909
15599	10/7/99			Dry	5909
15699	1/15/99	11.24	5907.76	Technically Dry	5908.1
15699	1/22/99	9.91	5909.09		5908.1
15699	1/28/99	10.52	5908.48		5908.1
15699	2/4/99	9.54	5909.46		5908.1
15699	3/1/99	12.01	5906.99	Technically Dry	5908.1
15699	4/5/99	9.19	5909.81		5908.1
15699	5/4/99	7.89	5911.11		5908.1
15699	6/1/99	7.72	5911.28		5908.1
15699	7/6/99	8.29	5910.71		5908.1
15699	10/7/99	8.1	5910.9		5908.1
15799	1/15/99	11.29	5910.71	Technically Dry	5911.6
15799	1/22/99	10.88	5911.12	Technically Dry	5911.6
15799	1/28/99	11.58	5910.42	Technically Dry	5911.6
15799	2/4/99	11.15	5910.85	Technically Dry	5911.6
15799	3/1/99	11.49	5910.51	Technically Dry	5911.6
15799	4/5/99	10.58	5911.42	Technically Dry	5911.6
15799	5/4/99	10.35	5911.65		5911.6
15799	6/1/99	10	5912		5911.6
15799	7/6/99	9.69	5912.31		5911.6
15799	10/7/99	10.25	5911.75		5911.6
1586	5/4/99	5.19	5845.44		5833.99
1587	1/7/99	22.33	5950.46		5949.21
1587	2/2/99	22.43	5950.36		5949.21
1587	3/4/99	22.76	5950.03		5949.21
1786	1/5/99	6.6	5862.97		5854.45
1786	2/1/99	6.71	5862.86		5854.45
1786	3/1/99	6.8	5862.77		5854.45
1786	4/5/99	6.6	5862.97		5854.45
1786	5/4/99	4.75	5864.82		5854.45
1786	6/1/99	6.57	5863		5854.45
1786	7/7/99	6.91	5862.66		5854.45
1786	8/5/99	5.15	5864.42		5854.45
1786	9/8/99	6.43	5863.14		5854.45
1786	10/6/99	5.84	5863.73		5854.45
1786	11/1/99	5.56	5864.01		5854.45
1786	12/1/99	5.5	5864.07		5854.45
18199	3/1/99	13.61	5973.95		5964.66
18199	3/11/99	13.73	5973.83		5964.66
18199	4/6/99	13.81	5973.75		5964.66
18199	7/1/99	11.62	5975.94		5964.66
18199	10/13/99	12.84	5974.72		5964.66

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
18199	12/9/99	12.81	5974.75		5964.66
18299	2/4/99	11.67	5975.83		5966.1
18299	3/1/99	12.25	5975.25		5966.1
18299	3/11/99	12.23	5975.27		5966.1
18299	4/6/99	12.39	5975.11		5966.1
18299	7/1/99	9.97	5977.53		5966.1
18299	10/13/99	11.46	5976.04		5966.1
18299	12/9/99	11.45	5976.05		5966.1
18399	2/4/99	10.23	5974.63		5972.06
18399	3/1/99	11.2	5973.66		5972.06
18399	3/11/99	10.92	5973.94		5972.06
18399	4/6/99			Dry to top pump	5972.06
18399	7/1/99	8.47	5976.39		5972.06
18399	10/13/99	10.16	5974.7		5972.06
18399	12/9/99			Dry to top pump	5972.06
18499	3/12/99	10.85	5975.1		5964.45
18499	4/6/99	10.87	5975.08		5964.45
18499	7/1/99	8.37	5977.58		5964.45
18499	10/13/99	9.91	5976.04		5964.45
18599	3/12/99	10.42	5975.14		5964.26
18599	4/6/99	10.45	5975.11		5964.26
18599	7/1/99	7.95	5977.61		5964.26
18599	10/13/99	9.49	5976.07		5964.26
18699	3/1/99	9.87			5969.93
18699	3/12/99	10.09			5969.93
18699	4/6/99			Dry to top pump	5969.93
18699	7/1/99	7.81			5969.93
18699	10/13/99	8.73			5969.93
18799	2/4/99	7.6	5977.81		5975.01
18799	3/1/99	8.51	5976.9		5975.01
18799	4/6/99			Dry to top pump	5975.01
18799	7/1/99	6.49	5978.92		5975.01
18799	10/13/99	7.42	5977.99		5975.01
1886	4/5/99			Dry	5878.25
1886	10/6/99			Dry	5878.25
18899	2/4/99	10.23	5975.34	Technically Dry	5976.97
18899	3/1/99	10.44	5975.13	Technically Dry	5976.97
18899	4/6/99	10.3	5975.27	Technically Dry	5976.97
18899	7/1/99	6.71	5978.86		5976.97
18899	10/13/99	8.53	5977.04		5976.97
1986	1/6/99	2.71	5941.15		5930.83
1986	2/2/99	2.91	5940.95		5930.83
1986	3/1/99	3.08	5940.78		5930.83
1986	4/6/99	2.55	5941.31		5930.83
1986	5/6/99	2.61	5941.25		5930.83
1986	6/2/99	3.09	5940.77		5930.83
1986	7/1/99	3.61	5940.25		5930.83
1986	8/4/99	3.19	5940.67		5930.83
1986	9/9/99	3.73	5940.13		5930.83
1986	10/13/99	3.49	5940.37		5930.83
1986	11/4/99	3.09	5940.77		5930.83
1986	12/1/99	2.91	5940.95		5930.83

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
1986	12/9/99	2.75	5941.11		5930.83
1987	4/5/99	13.49	5956.42		5956.79
1987	10/7/99	11.36	5958.55		5956.79
20098	4/9/99	7.95	5924.6		5911
20196	4/1/99	42.6	5998.49		5973.66
20196	10/5/99	40.99	6000.1		5973.66
20198	4/9/99	2.21	5932.16		5925.2
20291	1/6/99	31	5917.58		5914.19
20291	2/1/99	31.57	5917.01		5914.19
20291	3/2/99	32.08	5916.5		5914.19
20291	4/5/99	32.53	5916.05		5914.19
20291	5/5/99	28.78	5919.8		5914.19
20291	6/1/99	28	5920.58		5914.19
20291	7/7/99	27.06	5921.52		5914.19
20291	8/2/99	27.19	5921.39		5914.19
20291	9/8/99	27.97	5920.61		5914.19
20291	10/13/99	28.92	5919.66		5914.19
20291	11/1/99	29.28	5919.3		5914.19
20291	12/1/99	29.97	5918.61		5914.19
20296	4/1/99	37.52	5998.69		5978.59
20296	10/5/99	35.83	6000.38		5978.59
20298	4/9/99	8.01	5927.57		5924.8
20396	4/1/99	34.76	6002.34		5984.27
20396	10/5/99	33.56	6003.54		5984.27
20398	4/9/99	10.74	5926.76		5915.1
20496	4/1/99	46.52	6019.36		5999.5
20496	10/5/99	44.53	6021.35		5999.5
20498	4/9/99	11.85	5927.62		5918
20596	4/8/99	54.74	6026.42		6007.9
20596	10/5/99	53.57	6027.59		6007.9
20598	4/9/99	12.81	5927.49		5925.8
20696	1/5/99	43.85	6012.17		5983.56
20696	2/1/99	44.13	6011.89		5983.56
20696	3/2/99	44.61	6011.41		5983.56
20696	4/1/99	44.76	6011.26		5983.56
20696	5/6/99	43.3	6012.72		5983.56
20696	6/1/99	41.2	6014.82		5983.56
20696	7/8/99	42.13	6013.89		5983.56
20696	8/4/99	42.83	6013.19		5983.56
20696	9/7/99	41.93	6014.09		5983.56
20696	10/5/99	42.66	6013.36		5983.56
20696	11/1/99	43.23	6012.79		5983.56
20696	12/7/99	43.58	6012.44		5983.56
20698	4/9/99	19.51	5923.19		5921.4
20796	4/1/99	48.19	6007.91		5974
20796	10/5/99	44.24	6011.86		5974
20798	4/9/99	16.63	5926.77		5917.1
20898	4/9/99	6.75	5938.75		5930.2
20998	4/12/99	10.19	5944.71		5943.4
21098	4/12/99	11.37	5947.63		5939.1
21198	4/12/99	10.38	5947.12		5927.9
21298	4/12/99	10.14	5948.56		5939.3

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
21398	2/15/99	13.38	5953.32		5952.3
21398	4/12/99	14.23	5952.47		5952.3
21498	4/12/99	3.1	5961.5		5954.3
21598	4/12/99	4.79	5964.91		5955.3
21698	2/15/99	11.76	5962.14		5957.5
21698	4/12/99	15.65	5958.25		5957.5
21798	4/12/99	14.66	5966.84		5956.3
2186	1/6/99	32.68	5973.28		5937.52
2186	4/6/99	32.6	5973.36		5937.52
2186	7/1/99	32.29	5973.67		5937.52
2186	10/13/99	32.26	5973.7		5937.52
2187	4/6/99	3.65	5926.04		5918.025
2187	10/7/99	3.47	5926.22		5918.025
21898	4/12/99	18.14	5970.46		5967.3
21998	4/12/99	8.8	5985.8		5975.3
22098	4/12/99	12.32	5987.28		5975.3
22198	4/9/99	10.35	5921.25		5914.8
22298	4/9/99	11.13	5919.47		5914.9
22596	1/6/99	25.93	5983.87		5981
22596	2/2/99	25.64	5984.16		5981
22596	3/1/99	25.05	5984.75		5981
22596	4/6/99	24.14	5985.66		5981
22596	5/6/99	20.32	5989.48		5981
22596	6/2/99	22.87	5986.93		5981
22596	7/1/99	23.77	5986.03		5981
22596	8/4/99	22.61	5987.19		5981
22596	9/9/99	23.61	5986.19		5981
22596	10/13/99	23.23	5986.57		5981
22596	11/4/99	23.8	5986		5981
22596	12/1/99	25.63	5984.17		5981
22696	1/6/99	18.37	5964.21		5962.5
22696	4/6/99	19.75	5962.83		5962.5
22696	7/1/99	14.53	5968.05		5962.5
22696	10/13/99	18.9	5963.68		5962.5
22696	12/9/99	19.45	5963.13		5962.5
22796	1/6/99	14.78	5929.72		5925
22796	4/6/99	14.88	5929.62		5925
22796	7/1/99	14.08	5930.42		5925
22796	10/7/99			Dry to top pump	5925
22796	12/9/99	14.4	5930.1		5925
2286	1/6/99			Dry to top pump	5967.57
2286	2/2/99	9.36	5970.19		5967.57
2286	3/1/99			Dry	5967.57
2286	4/6/99	9.29	5970.26		5967.57
2286	5/6/99	6.25	5973.3		5967.57
2286	6/2/99	7.41	5972.14		5967.57
2286	7/1/99	8.15	5971.4		5967.57
2286	8/4/99	8.57	5970.98		5967.57
2286	9/9/99	6.61	5972.94		5967.57
2286	10/13/99	7.12	5972.43		5967.57
2286	11/4/99	7.27	5972.28		5967.57
2286	12/1/99	8.06	5971.49		5967.57

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
22896	1/6/99	21.43	5979.99		5975.7
22896	4/6/99	21.24	5980.18		5975.7
22896	7/1/99	20.79	5980.63		5975.7
22896	10/13/99	21.13	5980.29		5975.7
22996	1/6/99			Dry to top pump	5977.5
22996	2/1/99	7.36	5981.14		5977.5
22996	3/3/99			Dry to top pump	5977.5
22996	4/6/99	7.17	5981.33		5977.5
22996	5/4/99	4.45	5984.05		5977.5
22996	6/3/99	5.63	5982.87		5977.5
22996	7/6/99			Dry to top pump	5977.5
22996	8/2/99	7.69	5980.81		5977.5
22996	9/1/99	6.66	5981.84		5977.5
22996	10/7/99	7.23	5981.27		5977.5
22996	11/2/99	7.12	5981.38		5977.5
22996	11/9/99			Dry to top pump	5977.5
22996	12/2/99	7.52	5980.98		5977.5
23096	1/5/99	12.36	5825.44		5822
23096	4/1/99	12.95	5824.85		5822
23096	7/1/99	13.3	5824.5		5822
23096	10/6/99	11.99	5825.81		5822
23196	1/5/99	26.6	5790.07		5790
23196	4/1/99	26.12	5790.55		5790
23196	7/2/99	26.76	5789.91	Technically Dry	5790
23196	10/6/99	26.2	5790.47		5790
23296	1/5/99	4.73	5853.27		5848
23296	4/5/99	4.86	5853.14		5848
23296	7/12/99	6.1	5851.9		5848
23296	10/6/99	5.82	5852.18		5848
23296	11/2/99	5.62	5852.38		5848
23296	12/1/99	5.52	5852.48		5848
2486	4/6/99	8.94	5974.62	Dry	5975
2486	10/14/99	8.94	5974.62	Dry	5975
2487	4/5/99			Dry	5944.69
2487	10/12/99	15.23	5944.46	Technically Dry	5944.69
2686	4/6/99	12.63	5964.54		5964.42
2686	10/7/99	12.6	5964.57		5964.42
2687	4/7/99	14.76	5941.14		5940.83
2687	10/12/99	14.22	5941.68		5940.83
2986	4/6/99	10.51	5950.17	Dry	5950.81
2986	10/7/99	10.5	5950.18	Dry	5950.81
2987	1/5/99	19.42	5794.87		5792.31
2987	4/1/99	17.79	5796.5		5792.31
2987	7/2/99	17.93	5796.36		5792.31
2987	10/6/99	15.87	5798.42		5792.31
3087	1/5/99	26.17	5785.6		5715.77
3087	4/1/99	25.12	5786.65		5715.77
3087	7/2/99	25.97	5785.8		5715.77
3087	10/6/99	25.1	5786.67		5715.77
3287	4/7/99	47.4	5900.57		5899.8
3287	10/12/99	47.23	5900.74		5899.8
3386	1/6/99			Dry	5944.06

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
3386	2/2/99			Dry	5944.06
3386	3/1/99			Dry	5944.06
3386	4/6/99			Dry	5944.06
3386	5/4/99			Dry	5944.06
3386	6/2/99			Dry	5944.06
3386	7/1/99			Dry	5944.06
3386	8/4/99			Dry	5944.06
3386	9/9/99			Dry	5944.06
3386	10/7/99			Dry	5944.06
3386	11/4/99			Dry	5944.06
3386	12/1/99			Dry	5944.06
3387	4/7/99			Dry	5925.78
3387	10/12/99	20.97	5926.25		5925.78
34791	4/7/99	5.42	5948.49		5943.39
34791	10/12/99	5.8	5948.11		5943.39
3586	1/6/99	7.8	5904.96		5899.15
3586	1/15/99	7.87	5904.89		5899.15
3586	1/22/99	8.03	5904.73		5899.15
3586	1/28/99	7.99	5904.77		5899.15
3586	2/1/99	7.96	5904.8		5899.15
3586	2/4/99	7.94	5904.82		5899.15
3586	3/2/99	7.85	5904.91		5899.15
3586	4/5/99	7.68	5905.08		5899.15
3586	5/4/99	6.08	5906.68		5899.15
3586	6/1/99	7.5	5905.26		5899.15
3586	7/6/99	7.79	5904.97		5899.15
3586	8/2/99	7.52	5905.24		5899.15
3586	9/1/99	7.53	5905.23		5899.15
3586	10/7/99	7.78	5904.98		5899.15
3586	11/2/99	7.81	5904.95		5899.15
3586	12/1/99	7.81	5904.95		5899.15
3687	1/6/99	36.44	5914.67		5886.32
3687	2/1/99	36.9	5914.21		5886.32
3687	3/1/99	37.25	5913.86		5886.32
3687	4/5/99	37.77	5913.34		5886.32
3687	5/5/99	37.2	5913.91		5886.32
3687	6/1/99	34.19	5916.92		5886.32
3687	7/7/99	33.61	5917.5		5886.32
3687	10/12/99	35.21	5915.9		5886.32
37191	4/7/99	10.31	5937.98		5924.84
37191	10/12/99	10.11	5938.18		5924.84
37591	11/9/99	11	5982.45		5978.82
37691	4/6/99	18.34	5966.9	Technically Dry	5967.96
37691	10/7/99	17.25	5967.99		5967.96
37691	11/9/99	17.52	5967.72	Technically Dry	5967.96
37791	10/7/99	18.34	5985.84		5981.56
37791	11/9/99	18.44	5985.74		5981.56
37991	4/6/99	19.5	5914.05		5876.25
38591	1/5/99	8.8	5857.82		5857.06
38591	4/1/99	8.41	5858.21		5857.06
38591	10/11/99			Dry	5857.06
3986	1/5/99	27.45	5881.96		5876.73

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
3986	2/1/99	27.81	5881.6		5876.73
3986	3/2/99	28.12	5881.29		5876.73
40099	10/11/99	16.7	6009.27		5998.18
40099	11/8/99	17.27	6008.7		5998.18
40199	10/11/99	13.75	6009.67		5996.02
40199	11/8/99	14.31	6009.11		5996.02
40299	10/11/99	18.85	6005.31		5997.09
40299	11/8/99	19.25	6004.91		5997.09
40399	10/11/99	12.54	6007.37		5996.08
40399	11/8/99	13.24	6006.67		5996.08
40499	10/11/99	13.55	6007.03		5996.31
40499	11/8/99	14.11	6006.47		5996.31
40599	10/13/99			Dry	5934.21
40699	10/13/99			Dry	5931.78
40799	10/13/99	9.08	5935.55		5935.08
4087	1/5/99	8.33	5876.28	Technically Dry	5876.54
4087	2/1/99			Dry	5876.54
4087	3/1/99	4.44	5880.17		5876.54
4087	4/5/99	4.38	5880.23		5876.54
4087	5/4/99	2.27	5882.34		5876.54
4087	6/1/99	3.61	5881		5876.54
4087	7/7/99	5.73	5878.88		5876.54
4087	8/5/99	7.59	5877.02		5876.54
4087	9/7/99	6.27	5878.34		5876.54
4087	10/5/99	7.09	5877.52		5876.54
4087	11/1/99	5	5879.61		5876.54
4087	12/1/99	4.75	5879.86		5876.54
40899	10/13/99			Dry	5964.88
40999	11/2/99	5.51	5983.27		5979.41
40999	11/9/99	6.01	5982.77		5979.41
41091	1/5/99	9.77	5712.08		5709.56
41091	2/1/99	9.16	5712.69		5709.56
41091	3/1/99	7.78	5714.07		5709.56
41091	4/6/99	9.28	5712.57		5709.56
41091	5/4/99	5.41	5716.44		5709.56
41091	6/1/99	8.88	5712.97		5709.56
41091	7/8/99	9.76	5712.09		5709.56
41091	8/5/99	10.11	5711.74		5709.56
41091	9/8/99	6.99	5714.86		5709.56
41091	10/6/99	9.57	5712.28		5709.56
41091	11/2/99	9.83	5712.02		5709.56
41091	12/1/99	10.19	5711.66		5709.56
41099	10/11/99	4.83	5981.61		5974.59
41099	11/9/99	5.3	5981.14		5974.59
41199	10/11/99	4.36	5983.15		5975.86
41199	11/9/99	5.03	5982.48		5975.86
41299	10/11/99	14.07	6005.61		5995.62
41299	11/8/99			Dry	5995.62
41499	10/13/99	13.06	5930.51		5930.17
41591	1/5/99			Dry to top pump	5714.54
41591	2/1/99			Dry to top pump	5714.54
41591	3/3/99			Dry to top pump	5714.54

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
41591	4/6/99			Dry to top pump	5714.54
41591	5/5/99	4.29	5722.98		5714.54
41591	6/1/99	6.85	5720.42		5714.54
41591	7/6/99	8.94	5718.33		5714.54
41591	8/2/99	9.91	5717.36		5714.54
41591	9/9/99	9.82	5717.45		5714.54
41591	10/4/99			Dry to top pump	5714.54
41591	11/1/99	9.83	5717.44		5714.54
41591	12/1/99			Dry to top pump	5714.54
41599	10/13/99	14.11	5933.02		5932.79
41691	1/5/99	9.28	5636.6		5629.25
41691	2/1/99	8.2	5637.68		5629.25
41691	3/2/99	7.66	5638.22		5629.25
41691	4/6/99	7.59	5638.29		5629.25
41691	5/5/99	6.14	5639.74		5629.25
41691	6/1/99	8.08	5637.8		5629.25
41691	7/6/99	8.79	5637.09		5629.25
41691	8/2/99	9.97	5635.91		5629.25
41691	9/9/99	7.94	5637.94		5629.25
41691	10/4/99	10.01	5635.87		5629.25
41691	11/1/99	8.93	5636.95		5629.25
41691	12/1/99	9.91	5635.97		5629.25
4286	1/6/99	25.77	5932.1		5926.57
4286	2/1/99	26.91	5930.96		5926.57
4286	3/2/99	28.76	5929.11		5926.57
4286	4/5/99	28.18	5929.69		5926.57
4286	5/5/99	15.69	5942.18		5926.57
4286	6/1/99	16	5941.87		5926.57
4286	7/7/99	18.43	5939.44		5926.57
4286	8/2/99	20.11	5937.76		5926.57
4286	9/8/99	21.25	5936.62		5926.57
4286	10/13/99	22.48	5935.39		5926.57
4286	11/1/99	22.85	5935.02		5926.57
4286	12/1/99	23.4	5934.47		5926.57
43392	1/4/99	30.67	6012.77		6011.61
43392	4/1/99	31.2	6012.24		6011.61
43392	7/1/99	28.03	6015.41		6011.61
43392	10/11/99	29.34	6014.1		6011.61
4386	1/6/99			Dry	5956.16
4386	2/1/99			Dry	5956.16
4386	3/3/99			Dry	5956.16
4386	4/5/99			Dry	5956.16
4386	5/4/99	11.47	5962.99		5956.16
4386	6/1/99	14.35	5960.11		5956.16
4386	7/6/99	16.38	5958.08		5956.16
4386	8/2/99	17.72	5956.74		5956.16
4386	9/1/99	17.45	5957.01		5956.16
4386	10/7/99	17.81	5956.65		5956.16
4386	11/2/99	17.66	5956.8		5956.16
4386	12/2/99			Dry	5956.16
4387	4/7/99	9.9	5916.51		5912.81
4387	10/12/99	9.91	5916.5		5912.81

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
43993	5/6/99	12.57	5963.82		5956.9
4486	4/6/99	6.97	6014.99		5993.68
4486	10/7/99	7.32	6014.64		5993.68
4486	11/8/99	4.71	6017.25		5993.68
44893	1/5/99			Dry	5911.8
44893	2/1/99			Dry	5911.8
44893	3/1/99			Dry	5911.8
44893	4/5/99			Dry	5911.8
44893	5/4/99			Dry	5911.8
44893	6/1/99			Dry	5911.8
45793	4/6/99	7.15	5945.97	Technically Dry	5946.4
45793	10/7/99	7	5946.12	Technically Dry	5946.4
46292	4/1/99	53.01	6044.23		6004.8
46292	10/5/99	52.22	6045.02		6004.8
46492	4/1/99	28.02	6028.79		6011.5
46492	10/5/99	24.56	6032.25		6011.5
4787	1/5/99			Dry	5875.51
4787	3/4/99	9.74	5874.9	Dry	5875.51
4787	4/7/99			Dry	5875.51
4787	7/6/99			Dry	5875.51
4787	10/6/99			Dry	5875.51
4887	1/5/99			Dry	5899.62
4887	4/7/99			Dry	5899.62
4887	7/6/99	11.97	5899.44	Technically Dry	5899.62
4887	10/6/99			Dry	5899.62
50299	9/9/99	6.77	5919.31		5909.78
50299	10/12/99	6.53	5919.55		5909.78
50399	10/7/99	16.68	5998.54		5990.72
50494	4/1/99	25.59	6068.75	Technically Dry	6070.6
50494	10/5/99	25.96	6068.38	Technically Dry	6070.6
50694	4/1/99	23.16	6064.34		6058.7
50694	10/5/99	22.95	6064.55		6058.7
51094	4/1/99	43.31	6049.94		6033.5
51094	10/5/99	41.81	6051.44		6033.5
51194	4/1/99	37.99	6035.32		6021.4
51194	10/5/99	35.89	6037.42		6021.4
51294	1/4/99	21.07	6043.61		6027.8
51294	2/1/99	21.41	6043.27		6027.8
51294	3/2/99	22.17	6042.51		6027.8
51294	4/1/99	22.16	6042.52		6027.8
51294	5/4/99	21.06	6043.62		6027.8
51294	6/1/99	19.86	6044.82		6027.8
51294	7/6/99	19.7	6044.98		6027.8
51294	8/4/99	20.08	6044.6		6027.8
51294	9/7/99	19.16	6045.52		6027.8
51294	10/5/99	19.76	6044.92		6027.8
51294	11/1/99	20.31	6044.37		6027.8
51294	12/6/99	20.86	6043.82		6027.8
51594	1/4/99	13.01	6086.48		6077.5
51594	2/1/99	13.56	6085.93		6077.5
51594	3/2/99	13.8	6085.69		6077.5
51594	4/1/99	13.54	6085.95		6077.5

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
51594	5/4/99	12.46	6087.03		6077.5
51594	6/1/99	9.49	6090		6077.5
51594	7/6/99	8.7	6090.79		6077.5
51594	9/7/99	8.49	6091		6077.5
51594	10/5/99	9.61	6089.88		6077.5
51594	11/1/99	10.91	6088.58		6077.5
51594	12/6/99	11.75	6087.74		6077.5
5287	1/6/99	9.71	5959.86		5947.6
5287	2/1/99	9.79	5959.78		5947.6
5287	3/3/99	9.81	5959.76		5947.6
5287	4/6/99	9.58	5959.99		5947.6
5287	5/3/99	8.76	5960.81		5947.6
5287	6/3/99	9.61	5959.96		5947.6
5287	7/6/99	9.96	5959.61		5947.6
5287	8/2/99	9.52	5960.05		5947.6
5287	9/1/99	9.53	5960.04		5947.6
5287	10/7/99	9.76	5959.81		5947.6
5287	11/2/99	9.83	5959.74		5947.6
5287	12/2/99	9.86	5959.71		5947.6
52894	1/5/99	6.68	5864.07	Technically Dry	5866.18
52894	4/5/99	6.38	5864.37	Technically Dry	5866.18
52894	7/7/99	7.08	5863.67	Technically Dry	5866.18
52894	10/5/99	7.07	5863.68	Technically Dry	5866.18
52994	1/5/99			Dry	5857.94
52994	4/5/99			Dry	5857.94
52994	7/7/99			Dry	5857.94
52994	10/5/99			Dry	5857.94
53194	5/5/99	3.6	5835.78		5831.81
5387	1/5/99	6.91	5954.9		5950.94
5387	4/8/99	6.48	5955.33		5950.94
5387	7/6/99	7.43	5954.38		5950.94
5387	10/6/99	9.22	5952.59		5950.94
5587	1/5/99	8.39	5851.7		5851.04
5587	2/1/99	8.17	5851.92		5851.04
5587	3/1/99	7.97	5852.12		5851.04
5587	4/1/99	7.87	5852.22		5851.04
5587	5/3/99	5.66	5854.43		5851.04
5587	6/1/99	8.85	5851.24		5851.04
5587	7/1/99	8.36	5851.73		5851.04
5587	8/2/99	8.31	5851.78		5851.04
5587	9/8/99	8.52	5851.57		5851.04
5587	10/6/99	8.73	5851.36		5851.04
5587	11/1/99	8.88	5851.21		5851.04
5587	12/2/99	9	5851.09		5851.04
5686	1/4/99	6.88	5982.05		5977.86
5686	2/1/99	6.91	5982.02		5977.86
5686	3/1/99	6.91	5982.02		5977.86
5686	4/1/99	6.84	5982.09		5977.86
5686	5/5/99	5.2	5983.73		5977.86
5686	6/1/99	6.77	5982.16		5977.86
5686	7/1/99	6.92	5982.01		5977.86
5686	8/5/99	4.53	5984.4		5977.86

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
5686	9/8/99	7.06	5981.87		5977.86
5686	10/7/99	7.06	5981.87		5977.86
5686	11/1/99	7.1	5981.83		5977.86
5686	12/2/99	7.09	5981.84		5977.86
56994	4/1/99	18.06	6003.57		5995.3
56994	10/11/99	16.93	6004.7		5995.3
57094	4/1/99	33.69	5938.43		5936.2
57094	10/7/99	33.96	5938.16		5936.2
58793	4/1/99	14.74	5999.46		5987.8
58793	10/7/99	11.83	6002.37		5987.8
5887	1/5/99	13.31	5983.46		5973.2
5887	4/5/99	14.05	5982.72		5973.2
5887	7/7/99	8.98	5987.79		5973.2
5887	10/5/99	11.15	5985.62		5973.2
59393	5/5/99	7.02	5947.68		5945.12
59493	4/1/99	5.73	5986.67		5977.86
59493	10/7/99	8.22	5984.18		5977.86
59594	10/11/99	30.05	6018.86		6009.1
59793	5/5/99	8.36	5937.44		5931.15
59893	4/1/99			Dry	5931.66
59893	10/11/99	10.74	5935.66		5931.66
60099	11/5/99	9.18	5973.57		5973.5
60195	1/5/99	7	5893		5888.5
60195	2/1/99	7.21	5892.79		5888.5
60195	3/1/99	7.3	5892.7		5888.5
60195	4/5/99	7.45	5892.55		5888.5
60195	5/4/99	5.06	5894.94		5888.5
60195	6/1/99	5.02	5894.98		5888.5
60195	7/12/99	6.76	5893.24		5888.5
60195	8/5/99	6.81	5893.19		5888.5
60195	9/9/99			Dry	5888.5
60195	10/6/99			Dry	5888.5
60195	11/2/99			Dry	5888.5
60195	12/1/99			Dry	5888.5
60199	11/4/99	5.39	5981.29		5977.48
60294	4/9/99	8.64	5913.19		
60294	10/12/99	8.35	5913.48		
60295	10/6/99				5880.2
60299	11/4/99	7.95	5978.93		5977.68
60395	4/5/99	8.02	5878.98		5878.1
60395	10/6/99			Dry	5878.1
60399	11/4/99	9.2	5977.03		5975.65
60499	11/4/99	8.71	5982.31		5976.81
60599	11/4/99	7.41	5980.5		5978.61
60693	4/1/99	16.5	6007.2		6005.81
60693	10/7/99			Dry	6005.81
60695	4/5/99	9.5	5875.5		5871.1
60695	10/13/99	9.26	5875.74		5871.1
60699	11/4/99			Dry	5977.35
60795	4/5/99	7.95	5834.05		5833.9
60795	10/13/99			Dry	5833.9
60799	11/4/99			Dry	5984.01

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
6087	4/5/99	12.65	5973.31		5956.97
6087	10/5/99	11.31	5974.65		5956.97
60899	10/11/99	8.1	5987.57		5983.89
60994	4/9/99	10.58	5921.49		5919.88
60994	10/12/99	8.06	5924.01		5919.88
61093	5/5/99	6.28	5967.32		5959.02
61099	10/11/99	9.42	5992.39		5986.34
61199	10/11/99	9.51	5993.29		5984.01
61293	4/1/99	4.5	5982.2		5977.03
61293	10/7/99	5.74	5980.96		5977.03
61295	4/1/99	3.68	5863.32		5856.6
61295	10/11/99	3.63	5863.37		5856.6
61299	10/11/99	7.51	5995.97		5991.87
61399	11/4/99	5	5978.89		5974.59
61495	4/8/99	7.34	5970.66		5965.3
61495	10/5/99	6.05	5971.95		5965.3
61499	11/4/99	9.31	5977.02		5976.94
61595	4/8/99	4.34	5968.66		5961.7
61595	10/5/99				5961.7
61695	4/8/99	6.06	5981.94		5973.1
61695	10/5/99	4.04	5983.96		5973.1
6186	1/6/99	9.9	5990.7		5987.47
6186	4/6/99	9.35	5991.25		5987.47
6186	7/6/99	10.15	5990.45		5987.47
6186	10/7/99	9.92	5990.68		5987.47
6186	11/9/99	10.31	5990.29		5987.47
62393	5/5/99	0	6064.1		6058.23
62593	1/5/99	6.27	6041.53		6039.18
62593	2/1/99	5.71	6042.09		6039.18
62593	3/1/99	5.9	6041.9		6039.18
62593	4/1/99	6	6041.8		6039.18
62593	6/1/99	1.91	6045.89		6039.18
62593	7/1/99	3.18	6044.62		6039.18
62593	8/5/99	2.84	6044.96		6039.18
62593	9/8/99	2.69	6045.11		6039.18
62593	10/7/99	4.06	6043.74		6039.18
62593	11/1/99	4.4	6043.4		6039.18
62593	12/2/99	4.45	6043.35		6039.18
62693	1/5/99	5.33	6036.47		6033
62693	2/1/99	4.96	6036.84		6033
62693	3/1/99	5.64	6036.16		6033
62693	4/1/99	6.15	6035.65		6033
62693	5/5/99	0	6041.8		6033
62693	6/1/99	0	6041.8		6033
62693	7/1/99	2.13	6039.67		6033
62693	8/5/99	2.14	6039.66		6033
62693	9/8/99	1.94	6039.86		6033
62693	10/7/99	3.16	6038.64		6033
62693	11/1/99	2.8	6039		6033
62693	12/2/99	3.6	6038.2		6033
6286	1/5/99	27.67	5875.51		5866.82
6286	4/6/99	28.37	5874.81		5866.82

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
6286	7/6/99	28.82	5874.36		5866.82
6286	10/6/99	28.49	5874.69		5866.82
62893	4/9/99	1.5	5993.7		5980.23
62893	10/11/99	0	5995.2		5980.23
63395	4/5/99	8.14	5891.86		5891.5
63395	10/6/99	7.51	5892.49		5891.5
63495	4/8/99	3.24	6007.76		6002.6
63495	10/6/99	3.07	6007.93		6002.6
6386	1/5/99	15.73	5886.28		5885.84
6386	4/6/99	16.71	5885.3	Dry	5885.84
6386	7/6/99	11.65	5890.36		5885.84
6386	10/6/99	15.81	5886.2		5885.84
6486	1/5/99	7.18	5833.87		5830.06
6486	2/1/99	7.47	5833.58		5830.06
6486	3/1/99	7.13	5833.92		5830.06
6486	4/1/99	7.15	5833.9		5830.06
6486	5/3/99	6.41	5834.64		5830.06
6486	6/1/99	7.2	5833.85		5830.06
6486	7/1/99	8.14	5832.91		5830.06
6486	8/2/99	10.53	5830.52		5830.06
6486	9/8/99	10.39	5830.66		5830.06
6486	10/6/99			Dry	5830.06
6486	11/1/99	10.66	5830.39		5830.06
6486	12/2/99	8.56	5832.49		5830.06
6586	1/5/99	6.01	5782.26		5778.66
6586	2/1/99	6	5782.27		5778.66
6586	3/1/99	6.2	5782.07		5778.66
6586	4/1/99	6.51	5781.76		5778.66
6586	5/3/99	5.45	5782.82		5778.66
6586	6/1/99			Dry to top pump	5778.66
6586	7/2/99			Dry to top pump	5778.66
6586	8/2/99			Dry to top pump	5778.66
6586	9/8/99			Dry to top pump	5778.66
6586	10/6/99			Dry to top pump	5778.66
6586	11/1/99			Dry to top pump	5778.66
6586	12/2/99	6.62	5781.65		5778.66
6686	1/5/99	4.67	5689.53		5686.07
6686	2/1/99	4.56	5689.64		5686.07
6686	3/3/99	4.46	5689.74		5686.07
6686	4/6/99	4.52	5689.68		5686.07
6686	5/3/99	4.27	5689.93		5686.07
6686	6/1/99	4.97	5689.23		5686.07
6686	7/6/99	7	5687.2		5686.07
6686	8/2/99	7.51	5686.69		5686.07
6686	9/8/99	5.34	5688.86		5686.07
6686	10/4/99	5.04	5689.16		5686.07
6686	11/1/99	4.67	5689.53		5686.07
6686	12/1/99	4.42	5689.78		5686.07
6786	4/6/99			Dry	5787.58
6786	10/4/99			Dry	5787.58
70099	10/6/99	21.95	5875.2		5874.51
70099	11/2/99	21.29	5875.86		5874.51

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
70099	12/1/99	20.73	5876.42		5874.51
70193	1/5/99	13.58	5978.42		5952.7
70193	4/5/99	14.33	5977.67		5952.7
70193	7/7/99	11.36	5980.64		5952.7
70193	10/5/99	12.17	5979.83		5952.7
70299	10/6/99	22.59	5874.59		5858.76
70299	11/2/99	23.08	5874.1		5858.76
70299	12/1/99	20.88	5876.3		5858.76
70393	1/5/99	13.51	5986.59		5975.1
70393	4/5/99	14.01	5986.09		5975.1
70393	7/7/99	8.13	5991.97		5975.1
70393	10/5/99	10.99	5989.11		5975.1
70493	1/5/99	13.3	5986.7		5954
70493	4/5/99	14.91	5985.09		5954
70493	7/7/99	8.61	5991.39		5954
70493	10/5/99	10.38	5989.62		5954
70693	4/5/99	18.39	5974.31		5962.8
70693	10/5/99	16.35	5976.35		5962.8
70799	10/26/99	18.85	5882.22		
70799	11/2/99	19.53	5881.54		
70799	12/1/99	18.23	5882.84		
7086	1/4/99	3.26	5936.13		5929.79
7086	4/1/99	3.44	5935.95		5929.79
7086	7/1/99			Dry to top pump	5929.79
7086	10/11/99	4.13	5935.26		5929.79
70899	10/26/99	20.04	5881.55		
70899	12/1/99	19.36	5882.23		
70999	10/26/99	20.57	5900.15		
70999	11/2/99	20.93	5899.79		
70999	12/1/99	21.14	5899.58		
7187	4/5/99	7.18	5958.31		5950.38
7187	10/5/99	7.45	5958.04		5950.38
75292	1/5/99	5.53	5751.37		5747.3
75292	2/1/99	5.38	5751.52		5747.3
75292	3/1/99	5.33	5751.57		5747.3
75292	4/6/99	4.83	5752.07		5747.3
75292	5/4/99	4.14	5752.76		5747.3
75292	6/1/99	5.78	5751.12		5747.3
75292	7/8/99	6.18	5750.72		5747.3
75292	8/5/99	7.22	5749.68		5747.3
75292	9/8/99	8.24	5748.66		5747.3
75292	10/6/99	4.71	5752.19		5747.3
75292	11/2/99	6.75	5750.15		5747.3
75292	12/1/99	4.94	5751.96		5747.3
75992	1/5/99	7.26	5891.84		5887.1
75992	4/5/99	7.93	5891.17		5887.1
75992	7/12/99	8.39	5890.71		5887.1
75992	10/6/99	7.24	5891.86		5887.1
76792	4/5/99	7.26	5938.24		5938
76792	10/5/99	6.92	5938.58		5938
76992	1/5/99	12.94	5945.06	Technically Dry	5945.6
76992	4/5/99	12.96	5945.04	Technically Dry	5945.6

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
76992	7/7/99	9.67	5948.33		5945.6
76992	10/5/99	12.02	5945.98		5945.6
77392	1/5/99			Dry	5955.6
77392	4/5/99			Dry	5955.6
77392	7/7/99	9.4	5956.1		5955.6
77392	10/6/99	10.13	5955.37	Technically Dry	5955.6
77492	12/9/99	13.53	5930.97		5919.9
90099	10/6/99	16.73	5839.09		5836.45
90099	11/1/99	16.64	5839.18		5836.45
90199	10/6/99			Dry	5820.72
90199	11/1/99			Dry	5820.72
90299	10/6/99	17.45	5807.77		5804.93
90299	11/1/99	16.75	5808.47		5804.93
90399	10/6/99	15.33	5825.3		5819.53
90399	11/1/99	16.11	5824.52		5819.53
95099	10/20/99	21.98	5841.34		5840.07
95099	11/2/99	21.65	5841.67		5840.07
95099	12/1/99	15.9	5847.42		5840.07
95199	11/2/99	17.65	5864.25		5856.86
95199	12/1/99	9.67	5872.23		5856.86
95299	11/2/99			Dry	5891.8
95299	12/1/99			Dry	5891.8
B102289	4/1/99	3.1	5976.96		5965.83
B102289	10/5/99	2.7	5977.36		5965.83
B102389	4/1/99	5.87	5935.31		5928.6
B102389	10/5/99	6.04	5935.14		5928.6
B110889	4/1/99	35.66	6042.11		6010.82
B110889	10/5/99	35.65	6042.12		6010.82
B110989	1/4/99	46.44	6037.92		6016.69
B110989	2/1/99	46.8	6037.56		6016.69
B110989	3/2/99	47.6	6036.76		6016.69
B110989	4/1/99	47.56	6036.8		6016.69
B110989	5/4/99	47.38	6036.98		6016.69
B110989	6/1/99	46.56	6037.8		6016.69
B110989	7/6/99	46.34	6038.02		6016.69
B110989	8/4/99	46.35	6038.01		6016.69
B110989	9/7/99	47.7	6036.66		6016.69
B110989	10/5/99	45.97	6038.39		6016.69
B110989	11/1/99	46.42	6037.94		6016.69
B110989	12/6/99	46.46	6037.9		6016.69
B111189	1/4/99	56.18	6051.34		6033.12
B111189	2/1/99	56.17	6051.35		6033.12
B111189	3/2/99	56.68	6050.84		6033.12
B111189	4/1/99	56.42	6051.1		6033.12
B111189	5/4/99	56.42	6051.1		6033.12
B111189	6/1/99	56.95	6050.57		6033.12
B111189	7/6/99	57.15	6050.37		6033.12
B111189	8/4/99	56.95	6050.57		6033.12
B111189	9/7/99	56.61	6050.91		6033.12
B111189	10/5/99	56.75	6050.77		6033.12
B111189	11/1/99	56.86	6050.66		6033.12
B111189	12/6/99	56.38	6051.14		6033.12

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
B200889	1/4/99	19.21	5918.87		5912.98
B200889	2/1/99	19.73	5918.35		5912.98
B206989	1/5/99	22.64	5861.68		5861.12
B206989	4/5/99	23.43	5860.89	Technically Dry	5861.12
B206989	7/7/99	20.91	5863.41		5861.12
B206989	10/5/99	22.36	5861.96		5861.12
B208089	1/5/99	13.84	5923.23		5922.5
B208089	2/1/99	13.98	5923.09		5922.5
B208089	3/1/99	14.12	5922.95		5922.5
B208089	4/5/99	14.27	5922.8		5922.5
B208089	5/4/99	11.38	5925.69		5922.5
B208089	6/1/99	12.22	5924.85		5922.5
B208089	7/12/99	12.79	5924.28		5922.5
B208089	8/5/99	12.84	5924.23		5922.5
B208089	9/8/99	13.11	5923.96		5922.5
B208089	10/5/99	13.36	5923.71		5922.5
B208089	11/1/99	13.55	5923.52		5922.5
B208089	12/1/99	13.74	5923.33		5922.5
B208289	1/5/99	17.71	5835.24	Technically Dry	5835.28
B208289	4/5/99	17.7	5835.25	Technically Dry	5835.28
B208289	7/7/99	17.35	5835.6		5835.28
B208289	10/6/99	16.92	5836.03		5835.28
B208689	5/4/99	8.42	5861.18		5845.8
B208789	1/5/99	3.64	5905.39		5896.17
B208789	4/5/99	3.58	5905.45		5896.17
B208789	7/7/99	4.83	5904.2		5896.17
B208789	10/6/99	5.99	5903.04		5896.17
B400389	1/4/99	24.75	6099.25		6073
B400389	2/1/99	25.04	6098.96		6073
B400389	3/1/99	25.42	6098.58		6073
B400389	4/1/99	26.26	6097.74		6073
B400389	5/3/99	19.48	6104.52		6073
B400389	6/1/99	19.32	6104.68		6073
B400389	7/1/99	20.71	6103.29		6073
B400389	8/5/99	21.1	6102.9		6073
B400389	9/8/99	21.07	6102.93		6073
B400389	10/7/99	22.09	6101.91		6073
B400389	11/1/99	23.14	6100.86		6073
B400389	12/2/99	23.33	6100.67		6073
B402689	1/4/99	4.27	6042.8		6042.12
B402689	2/1/99	4.29	6042.78		6042.12
B402689	3/1/99	4.5	6042.57		6042.12
B402689	4/1/99	4.47	6042.6		6042.12
B402689	5/3/99	2.72	6044.35		6042.12
B402689	6/1/99	3.83	6043.24		6042.12
B402689	7/1/99	5.6	6041.47	Technically Dry	6042.12
B402689	8/5/99	4.78	6042.29		6042.12
B402689	9/8/99	4.97	6042.1	Technically Dry	6042.12
B402689	10/7/99	5.22	6041.85	Technically Dry	6042.12
B402689	11/1/99	4.46	6042.61		6042.12
B402689	12/2/99	4.37	6042.7		6042.12
B410589	1/4/99	51.82	6061.98		6051.76

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
B410589	2/1/99	51.99	6061.81		6051.76
B410589	3/2/99	52.71	6061.09		6051.76
B410589	4/1/99	52.72	6061.08		6051.76
B410589	5/4/99	52.7	6061.1		6051.76
B410589	6/1/99	52.89	6060.91		6051.76
B410589	7/6/99	52.81	6060.99		6051.76
B410589	8/4/99	52.65	6061.15		6051.76
B410589	9/7/99	52.22	6061.58		6051.76
B410589	10/4/99	52.24	6061.56		6051.76
B410589	11/1/99	52.54	6061.26		6051.76
B410589	12/2/99	52.09	6061.71		6051.76
B410689	4/1/99	42.72	6050.99		6041.65
B410689	10/5/99	41.22	6052.49		6041.65
B410789	4/1/99	36.85	6046.81		6037.07
B410789	10/5/99	35	6048.66		6037.07
B411289	1/4/99	60.4	6066.9		6057.01
B411289	2/1/99	60.37	6066.93		6057.01
B411289	3/2/99	60.65	6066.65		6057.01
B411289	4/1/99	60.39	6066.91		6057.01
B411289	5/4/99	60.54	6066.76		6057.01
B411289	6/1/99	61.16	6066.14		6057.01
B411289	7/6/99	61.6	6065.7		6057.01
B411289	8/4/99	61.53	6065.77		6057.01
B411289	9/7/99	61.17	6066.13		6057.01
B411289	10/5/99	61.34	6065.96		6057.01
B411289	11/1/99	61.31	6065.99		6057.01
B411289	12/6/99	60.97	6066.33		6057.01
P114389	1/5/99	6.89	5986.28		5976.7
P114389	2/1/99	7.5	5985.67		5976.7
P114389	3/2/99	7.56	5985.61		5976.7
P114389	4/5/99	6.92	5986.25		5976.7
P114389	5/4/99	6.04	5987.13		5976.7
P114389	6/3/99	6.45	5986.72		5976.7
P114389	7/7/99			Dry	5976.7
P114389	8/2/99	7.01	5986.16		5976.7
P114389	9/7/99	7.21	5985.96		5976.7
P114389	10/6/99	7.49	5985.68		5976.7
P114389	11/2/99	7.57	5985.6		5976.7
P114389	12/2/99	7.46	5985.71		5976.7
P114489	4/5/99	15.54	6019.89		5984.6
P114489	10/11/99			Dry	5984.6
P114589	4/5/99	8.65	6017.25		5987.6
P114589	10/11/99	5.51	6020.39		5987.6
P114689	4/5/99	11.71	5994.05		5981.76
P114689	10/11/99			Dry	5981.76
P114789	4/5/99	9.91	6002.49		5984.47
P114789	10/11/99			Dry	5984.47
P114989	4/5/99	15.29	6016.55		5991.8
P114989	10/11/99			Dry	5991.8
P115089	1/6/99	16.51	6023.59		5997.4
P115089	2/1/99	16.48	6023.62		5997.4
P115089	3/2/99	17.1	6023		5997.4

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
P115089	4/5/99	16.9	6023.2		5997.4
P115089	5/3/99	10.82	6029.28		5997.4
P115089	6/3/99	11.57	6028.53		5997.4
P115089	7/6/99	13.53	6026.57		5997.4
P115089	8/2/99	14.55	6025.55		5997.4
P115089	9/7/99	13.61	6026.49		5997.4
P115089	10/7/99	14.68	6025.42		5997.4
P115089	11/3/99	15.25	6024.85		5997.4
P115089	12/2/99	15.85	6024.25		5997.4
P115589	4/5/99	8.23	6007.54		5984.62
P115589	10/11/99	6.8	6008.97		5984.62
P115689	4/5/99	11.13	5997.58		5986.7
P115689	10/11/99	11.38	5997.33		5986.7
P207689	4/6/99	7.27	5960.61		5953.22
P207689	10/7/99	8.61	5959.27		5953.22
P207889	4/6/99	10.09	5954.81	Technically Dry	5955.12
P207889	10/7/99	10.09	5954.81	Technically Dry	5955.12
P209189	5/6/99	9.75	5972.46		5945.65
P209289	1/6/99	14.31	5969.11		5968.93
P209289	4/6/99	14.74	5968.68	Technically Dry	5968.93
P209289	7/1/99	14.71	5968.71	Technically Dry	5968.93
P209289	10/13/99	14.65	5968.77	Technically Dry	5968.93
P209289	12/9/99			Dry	5968.93
P209289	12/9/99			Dry	5968.93
P209389	1/6/99	17.87	5965.52		5952.67
P209389	4/6/99	18.89	5964.5		5952.67
P209389	7/1/99	18.7	5964.69		5952.67
P209389	10/13/99	18.48	5964.91		5952.67
P209489	1/6/99	29.52	5950.58		5942.98
P209489	4/6/99	29.26	5950.84		5942.98
P209489	5/4/99	26.51	5953.59		5942.98
P209489	7/1/99	28.65	5951.45		5942.98
P209489	10/7/99	28.61	5951.49		5942.98
P209589	5/6/99	13.64	5936.4		5929.65
P209789	4/6/99	11.85	5953.09		5950.32
P209789	10/7/99	11.41	5953.53		5950.32
P209889	5/6/99	5.11	5937.29		5921.95
P213689	11/9/99	10.1	5985.94		5980.8
P215789	4/5/99	16.19	5987.47		5983.5
P215789	10/11/99			Dry	5983.5
P218089	4/6/99	6.34	5981.21		5978.37
P218089	10/14/99	5.91	5981.64		5978.37
P218289	4/5/99	9.61	6008.59		5993.4
P218289	10/7/99	8.75	6009.45		5993.4
P218289	11/8/99	9.47	6008.73		5993.4
P218389	1/6/99			Dry	5943.7
P218389	2/2/99			Dry	5943.7
P218389	3/1/99			Dry	5943.7
P218389	4/6/99			Dry	5943.7
P218389	5/3/99	5.56	5952.89		5943.7
P218389	6/2/99	12.33	5946.12		5943.7
P218389	7/1/99	13.51	5944.94		5943.7

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
P218389	8/4/99	13.76	5944.69		5943.7
P218389	9/9/99	14.61	5943.84		5943.7
P218389	10/7/99	14.77	5943.68	Technically Dry	5943.7
P218389	11/4/99	14.83	5943.62	Technically Dry	5943.7
P218389	12/1/99	14.81	5943.64	Technically Dry	5943.7
P219089	12/9/99	9.07	5940.83		5934.66
P219189	1/6/99	13.01	5930.14		5929.7
P219189	2/2/99	12.68	5930.47		5929.7
P219189	3/1/99	12.38	5930.77		5929.7
P219189	4/6/99	12	5931.15		5929.7
P219189	5/3/99	11.53	5931.62		5929.7
P219189	6/2/99	14.21	5928.94	Technically Dry	5929.7
P219189	7/1/99	13.33	5929.82		5929.7
P219189	8/4/99	12.88	5930.27		5929.7
P219189	9/9/99	12.22	5930.93		5929.7
P219189	10/7/99			Dry	5929.7
P219189	11/3/99	13.89	5929.26	Technically Dry	5929.7
P219189	12/1/99	14.1	5929.05	Technically Dry	5929.7
P219189	12/9/99	13.75	5929.4	Technically Dry	5929.7
P219489	1/6/99	24.16	5936.99		5936.6
P219489	4/6/99	23.14	5938.01		5936.6
P219489	7/1/99	24.53	5936.62		5936.6
P219489	10/7/99	23.02	5938.13		5936.6
P313489	4/6/99	15.5	5998.08		5990.6
P313489	10/7/99	15.06	5998.52		5990.6
P313589	1/6/99	10.15	5999.96		5996
P313589	2/1/99	10.42	5999.69		5996
P313589	3/4/99	10.95	5999.16		5996
P313589	4/6/99	9.74	6000.37		5996
P313589	5/4/99	6.68	6003.43		5996
P313589	6/3/99	8.29	6001.82		5996
P313589	7/6/99	8.71	6001.4		5996
P313589	8/2/99	9.25	6000.86		5996
P313589	9/1/99	8	6002.11		5996
P313589	10/7/99	8.35	6001.76		5996
P313589	11/3/99	8.86	6001.25		5996
P313589	12/2/99	9.07	6001.04		5996
P314289	1/6/99	14.45	5997.32		5996.59
P314289	2/1/99	16.66	5995.11	Technically Dry	5996.59
P314289	3/4/99	16.23	5995.54	Technically Dry	5996.59
P314289	4/5/99	16.1	5995.67	Technically Dry	5996.59
P314289	5/3/99	15.12	5996.65		5996.59
P314289	6/3/99	13.92	5997.85		5996.59
P314289	7/6/99	13.99	5997.78		5996.59
P314289	8/2/99			Dry	5996.59
P314289	9/1/99	14.37	5997.4		5996.59
P314289	10/7/99	13.59	5998.18		5996.59
P314289	11/2/99	13.85	5997.92		5996.59
P314289	11/8/99	13.95	5997.82		5996.59
P314289	12/2/99	14.38	5997.39		5996.59
P317989	4/6/99	6.99	5985.85		5983.41
P317989	10/7/99	7.5	5985.34		5983.41

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Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
P317989	11/9/99	7.33	5985.51		5983.41
P320089	4/6/99	15.2	5996.67		5991.09
P320089	10/7/99	14.76	5997.11		5991.09
P320089	11/8/99	15.02	5996.85		5991.09
P414189	11/8/99	11.54	6000.64		5992.1
P415989	4/5/99	10.54	6036.17		6018.17
P415989	10/7/99	7.44	6039.27		6018.17
P416089	1/6/99	11.68	6042.27		6017.7
P416089	2/1/99	11.55	6042.4		6017.7
P416089	3/2/99	14.36	6039.59		6017.7
P416089	4/5/99	12.84	6041.11		6017.7
P416089	5/3/99	4.18	6049.77		6017.7
P416089	6/3/99	5.5	6048.45		6017.7
P416089	7/6/99	8.81	6045.14		6017.7
P416089	8/2/99	7.83	6046.12		6017.7
P416089	9/7/99	7.38	6046.57		6017.7
P416089	10/7/99	9.9	6044.05		6017.7
P416089	11/2/99	9.7	6044.25		6017.7
P416089	12/2/99	11.31	6042.64		6017.7
P416189	4/5/99	13.83	6034.12		6015.94
P416189	10/7/99	10.27	6037.68		6015.94
P416289	4/5/99	16.59	6023.63		6015.1
P416289	10/7/99	14.02	6026.2		6015.1
P416289	11/8/99	14.46	6025.76		6015.1
P416389	4/5/99	18.96	6038.18		6025.3
P416389	10/7/99	15.24	6041.9		6025.3
P416489	1/6/99	19.92	6030.23		6022.8
P416489	2/1/99	19.42	6030.73		6022.8
P416489	3/4/99	21.45	6028.7		6022.8
P416489	4/5/99	21.62	6028.53		6022.8
P416489	5/3/99	10.17	6039.98		6022.8
P416489	6/3/99	12.52	6037.63		6022.8
P416489	7/6/99	16.56	6033.59		6022.8
P416489	8/2/99	18.21	6031.94		6022.8
P416489	9/1/99	15.77	6034.38		6022.8
P416489	10/7/99	18.12	6032.03		6022.8
P416489	11/2/99				6022.8
P416489	12/2/99	19.53	6030.62		6022.8
P416589	11/8/99	27.86	6014.95		6010.2
P416689	1/6/99	29.96	6006.59		6002.5
P416689	2/1/99	30.05	6006.5		6002.5
P416689	3/4/99	32.22	6004.33		6002.5
P416689	4/5/99	30.27	6006.28		6002.5
P416689	5/3/99	32.64	6003.91		6002.5
P416689	6/3/99	28.67	6007.88		6002.5
P416689	7/6/99	29.26	6007.29		6002.5
P416689	8/2/99	29.18	6007.37		6002.5
P416689	9/1/99	28.8	6007.75		6002.5
P416689	10/7/99	28.24	6008.31		6002.5
P416689	11/2/99	33.08	6003.47		6002.5
P416689	11/8/99	33.8	6002.75		6002.5
P416689	12/2/99	30.45	6006.1		6002.5

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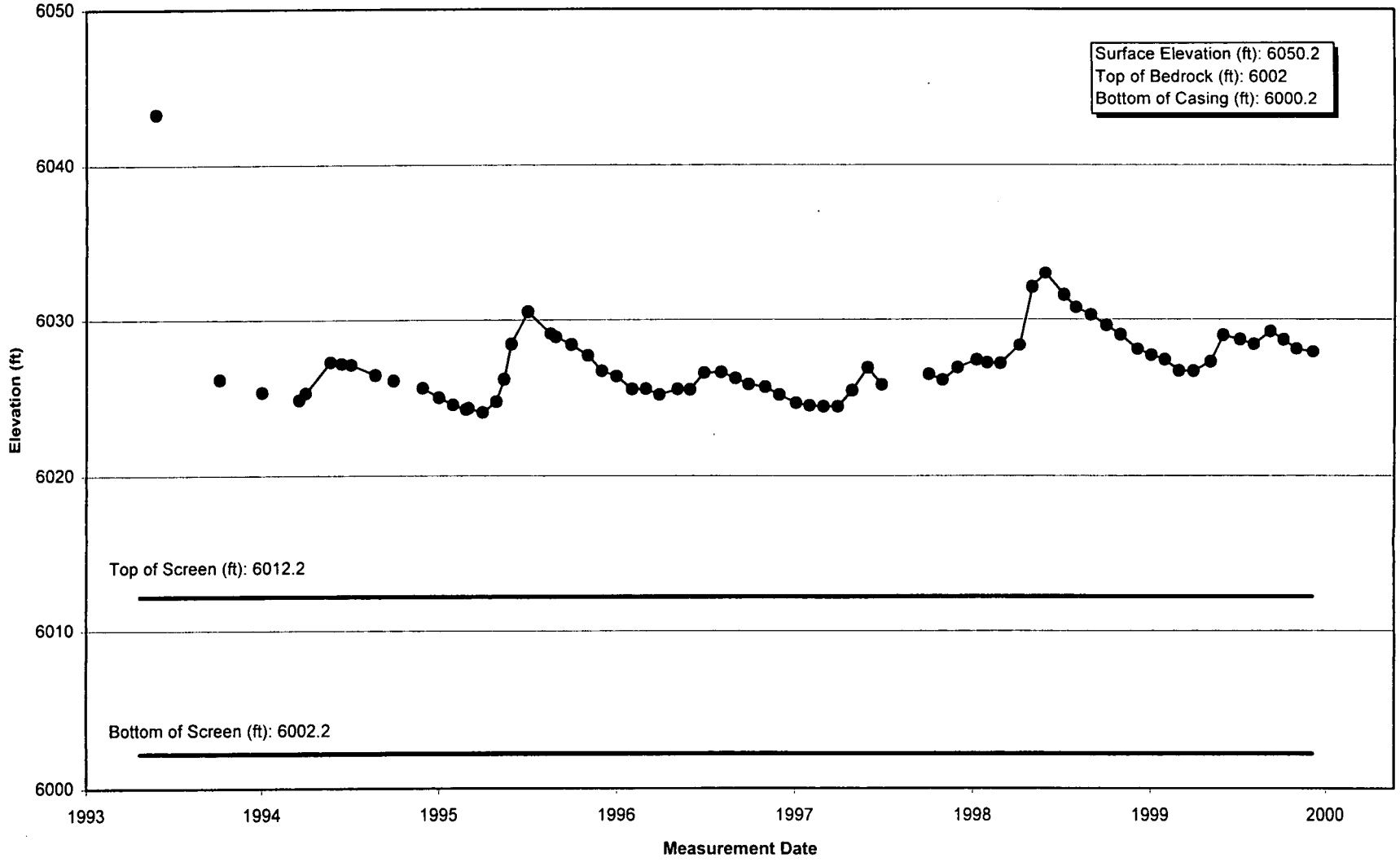
Appendix B: Water Level Data
Groundwater 1999

Location	Sample Date	Water Level from TOC (ft.)	Water Level Elevation (ft.)	Dry or Technically Dry (W.L. below screen)	Bottom Screen Elevation (ft.)
P416789	1/6/99	27.69	6001.58		6000.9
P416789	2/1/99	27.75	6001.52		6000.9
P416789	3/4/99	25.92	6003.35		6000.9
P416789	4/5/99	27.99	6001.28		6000.9
P416789	5/3/99	19.79	6009.48		6000.9
P416789	6/3/99	25.51	6003.76		6000.9
P416789	7/6/99	26.76	6002.51		6000.9
P416789	8/2/99	26.88	6002.39		6000.9
P416789	9/1/99	26.62	6002.65		6000.9
P416789	10/7/99	27.04	6002.23		6000.9
P416789	11/2/99	27	6002.27		6000.9
P416789	11/8/99	27.25	6002.02		6000.9
P416789	12/2/99	27.68	6001.59		6000.9
P416889	1/6/99	18.45	6000.34		5997.13
P416889	2/1/99			Dry to top pump	5997.13
P416889	3/4/99			Dry to top pump	5997.13
P416889	4/5/99	18.64	6000.15		5997.13
P416889	5/3/99	11.81	6006.98		5997.13
P416889	6/3/99	16.29	6002.5		5997.13
P416889	7/6/99	17.61	6001.18		5997.13
P416889	8/2/99	17.33	6001.46		5997.13
P416889	9/1/99	17.31	6001.48		5997.13
P416889	10/7/99	15.88	6002.91		5997.13
P416889	11/2/99	17.83	6000.96		5997.13
P416889	11/8/99	18.13	6000.66		5997.13
P416889	12/2/99	18.43	6000.36		5997.13
P416989	4/5/99	38.64	6008.91		5889.59
P416989	10/7/99	38.58	6008.97		5889.59
P416989	11/8/99	19.33	6028.22		5889.59
P419689	4/6/99	19.87	6003.55		5998.9
P419689	10/7/99	19.12	6004.3		5998.9

317

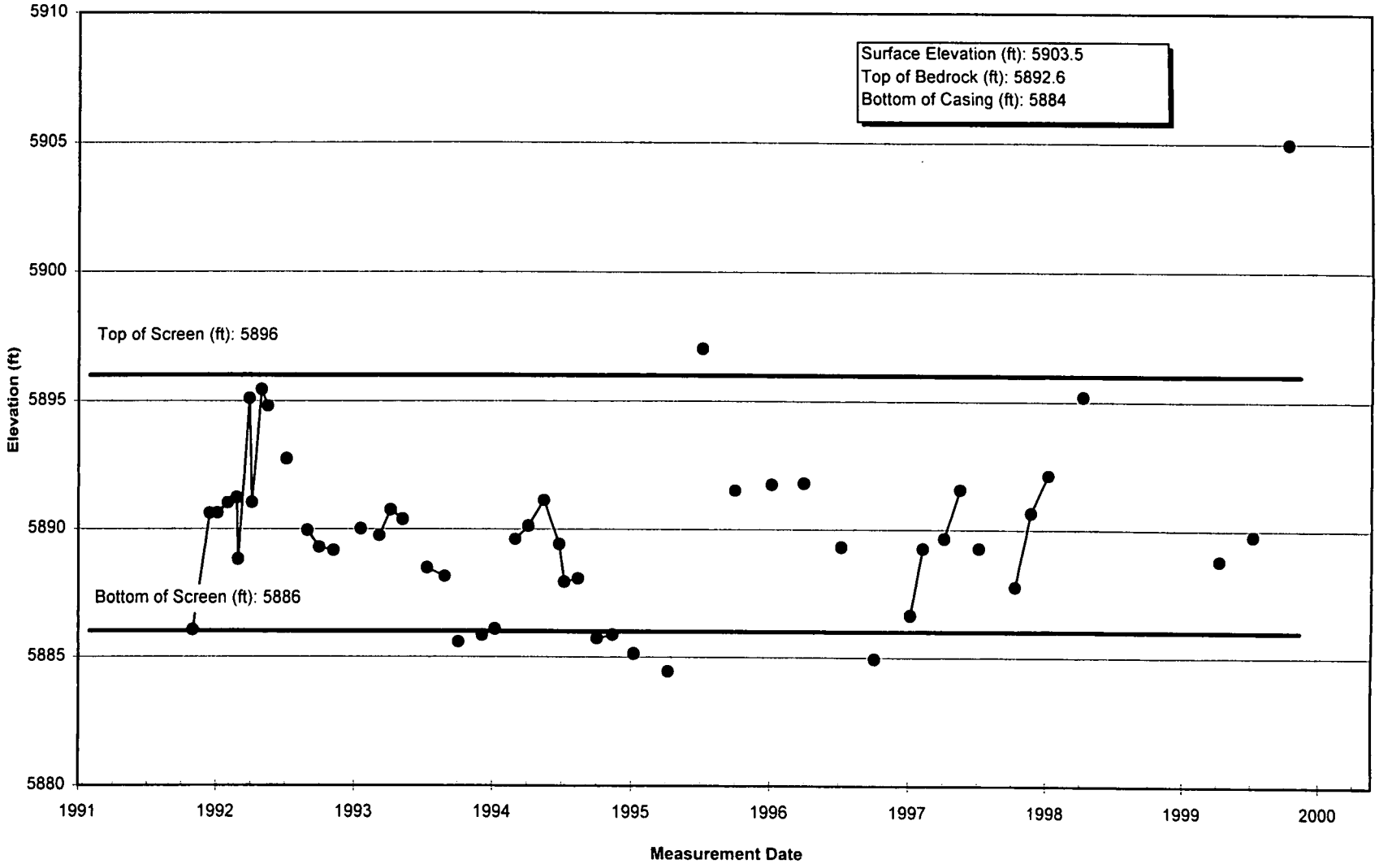
318

Hydrograph 00293



3/5

Hydrograph 00491



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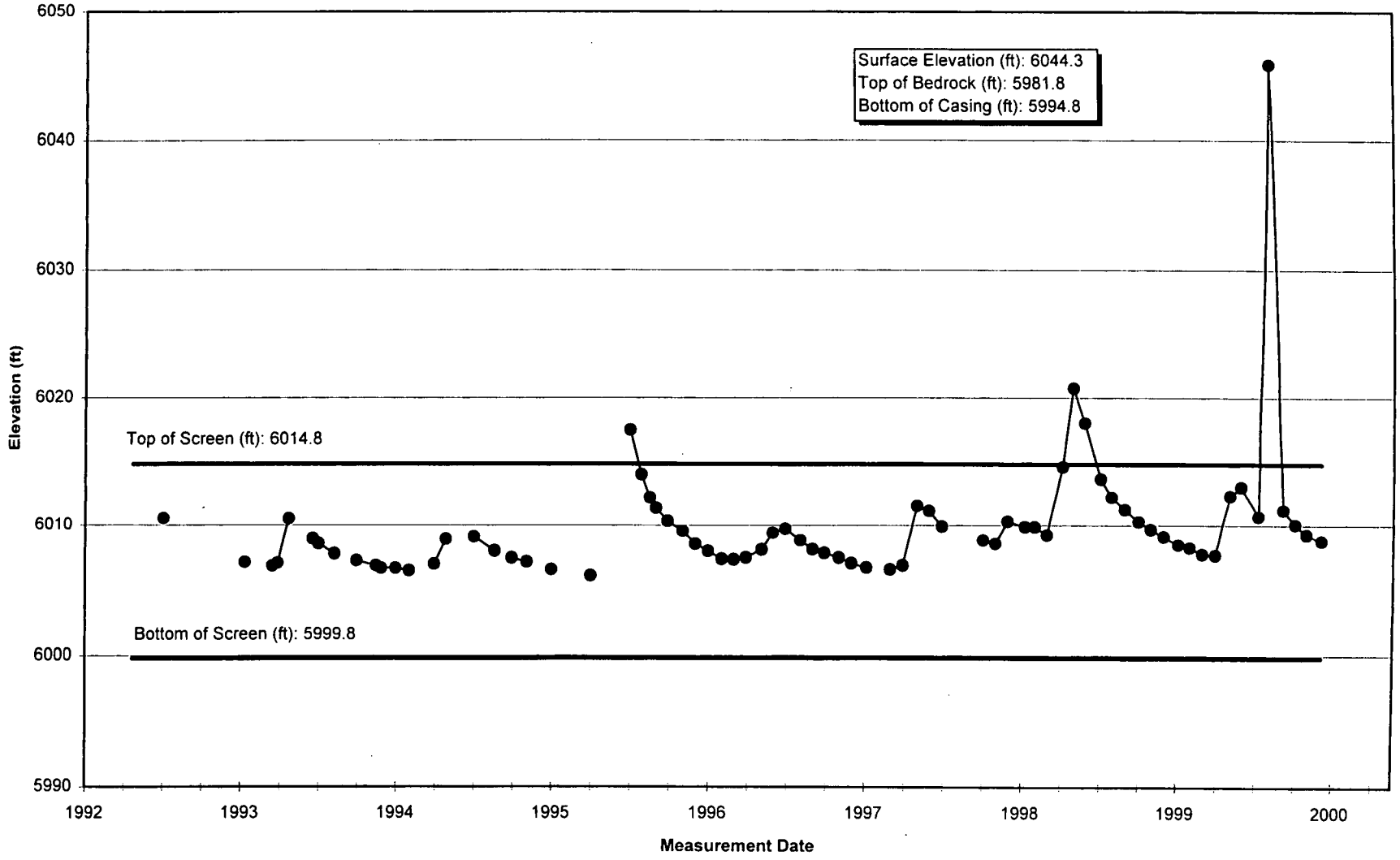
320

Hydrograph 0190



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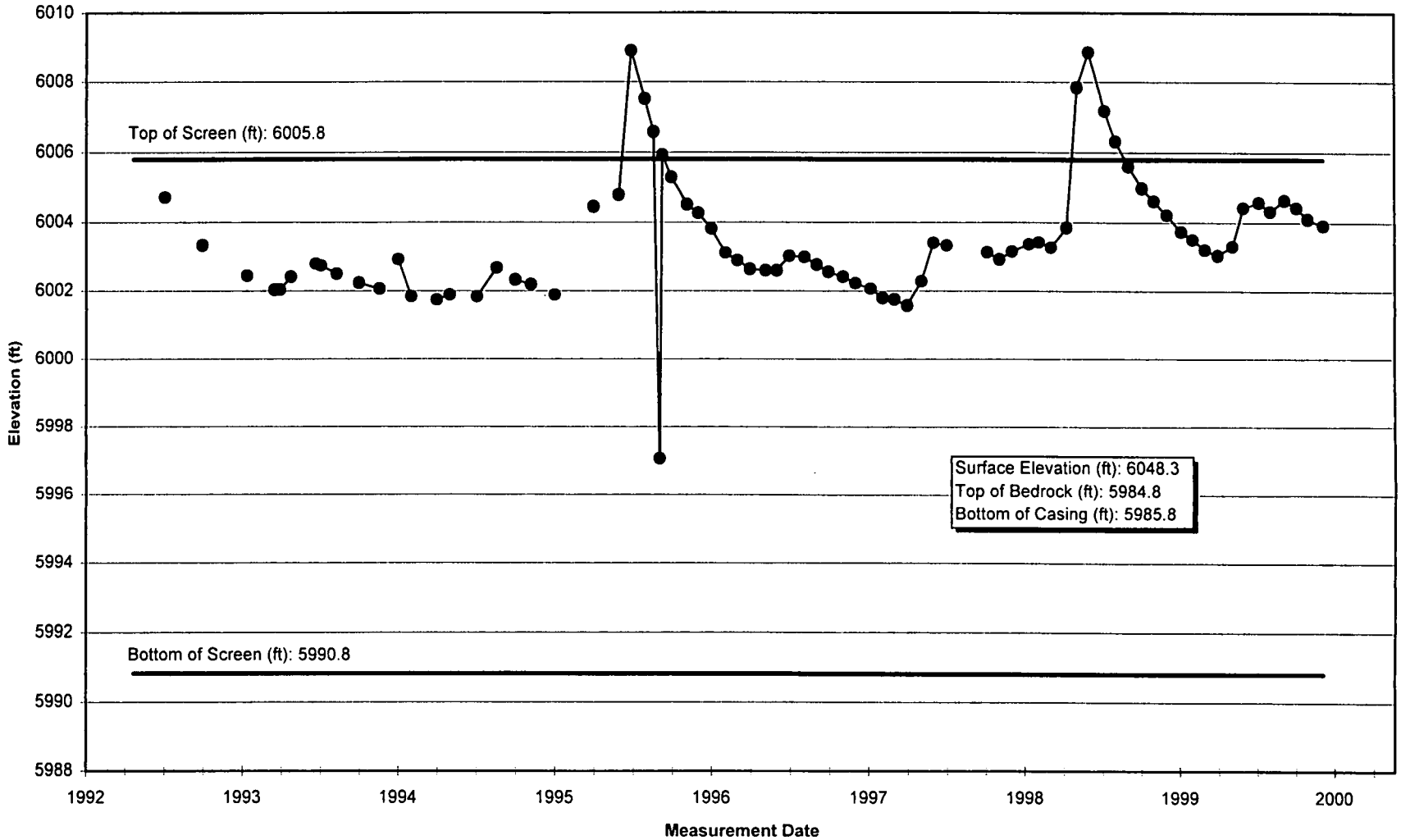
321

Hydrograph 0290



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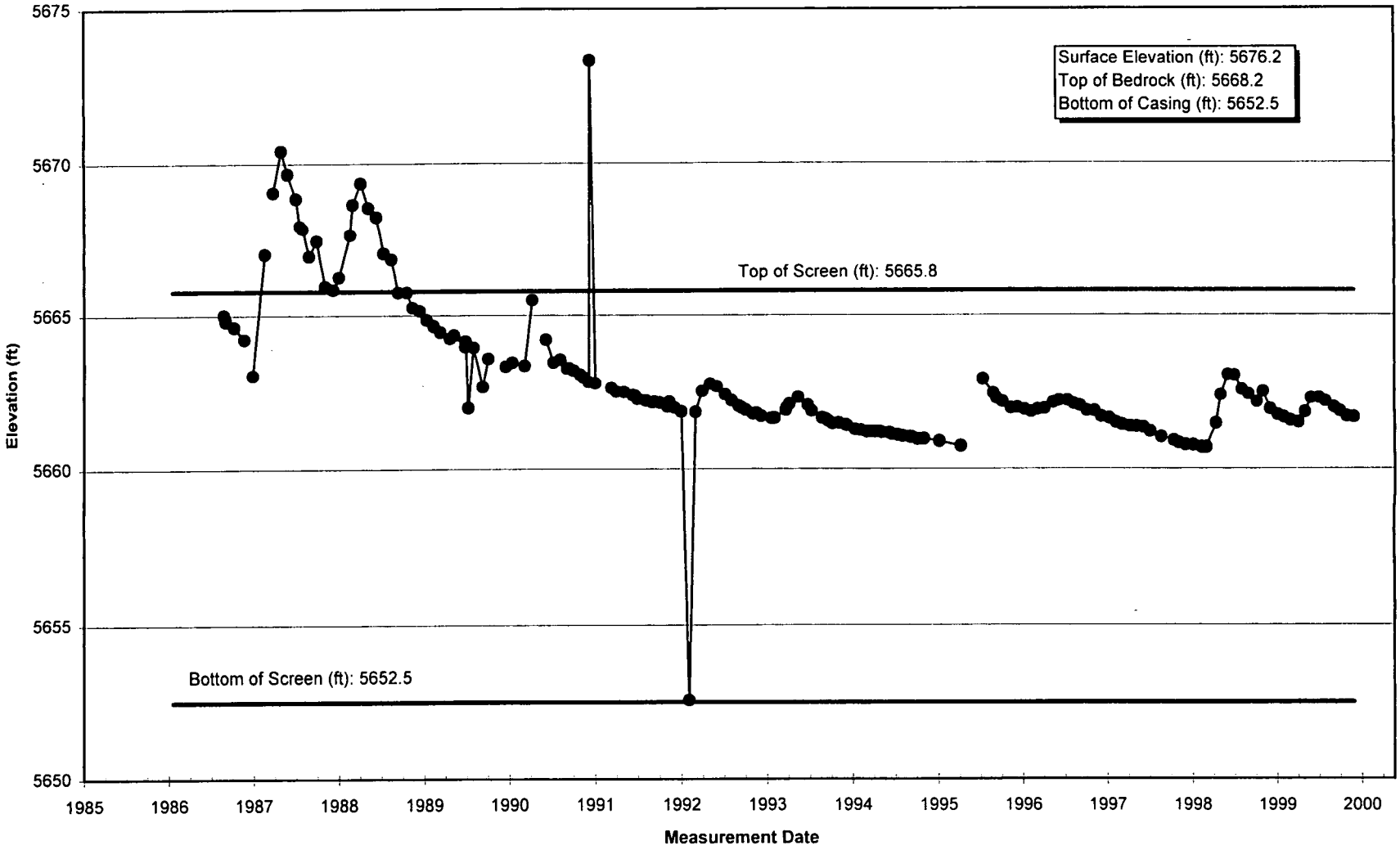
322

Hydrograph 0386



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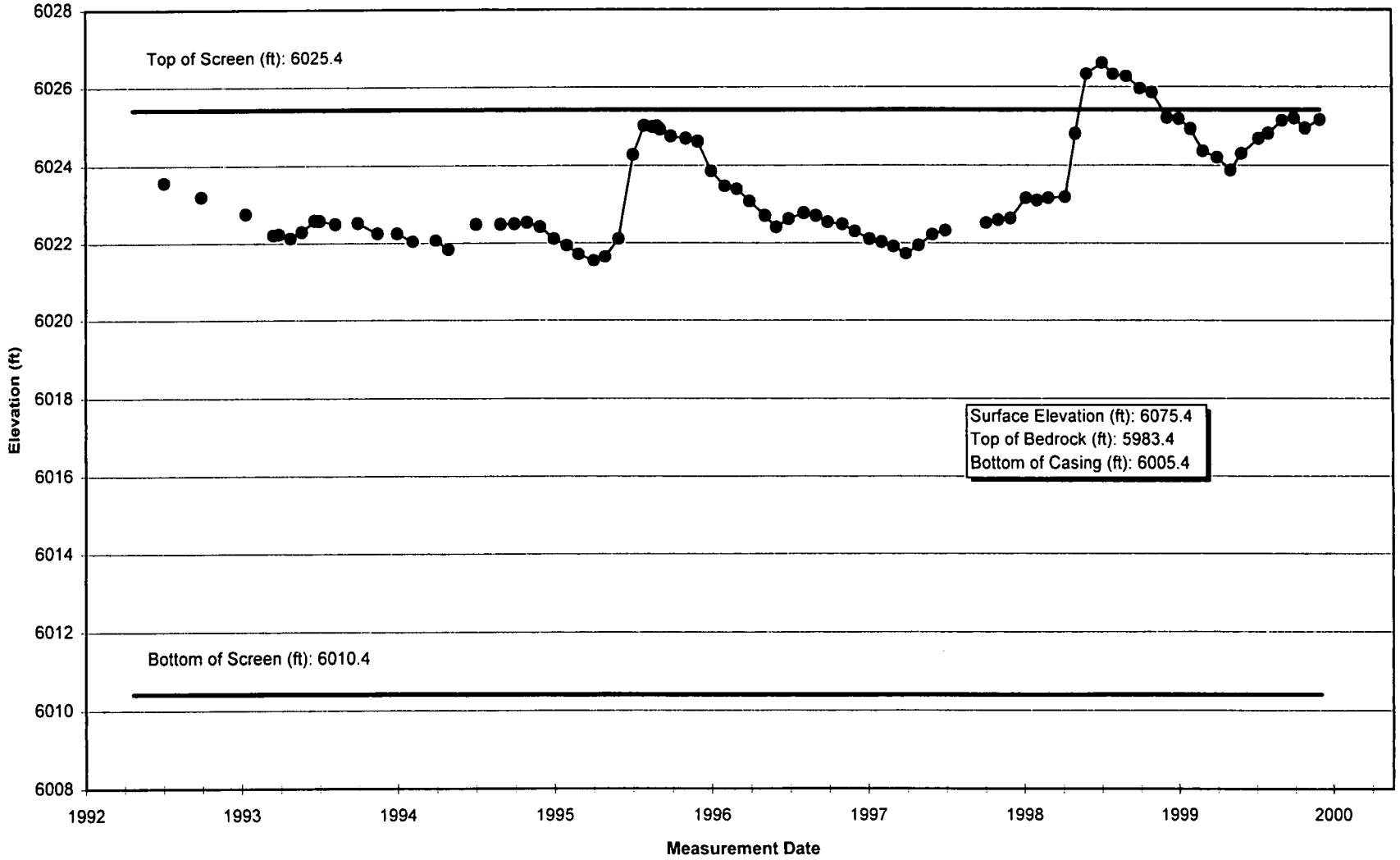
323

Hydrograph 0390



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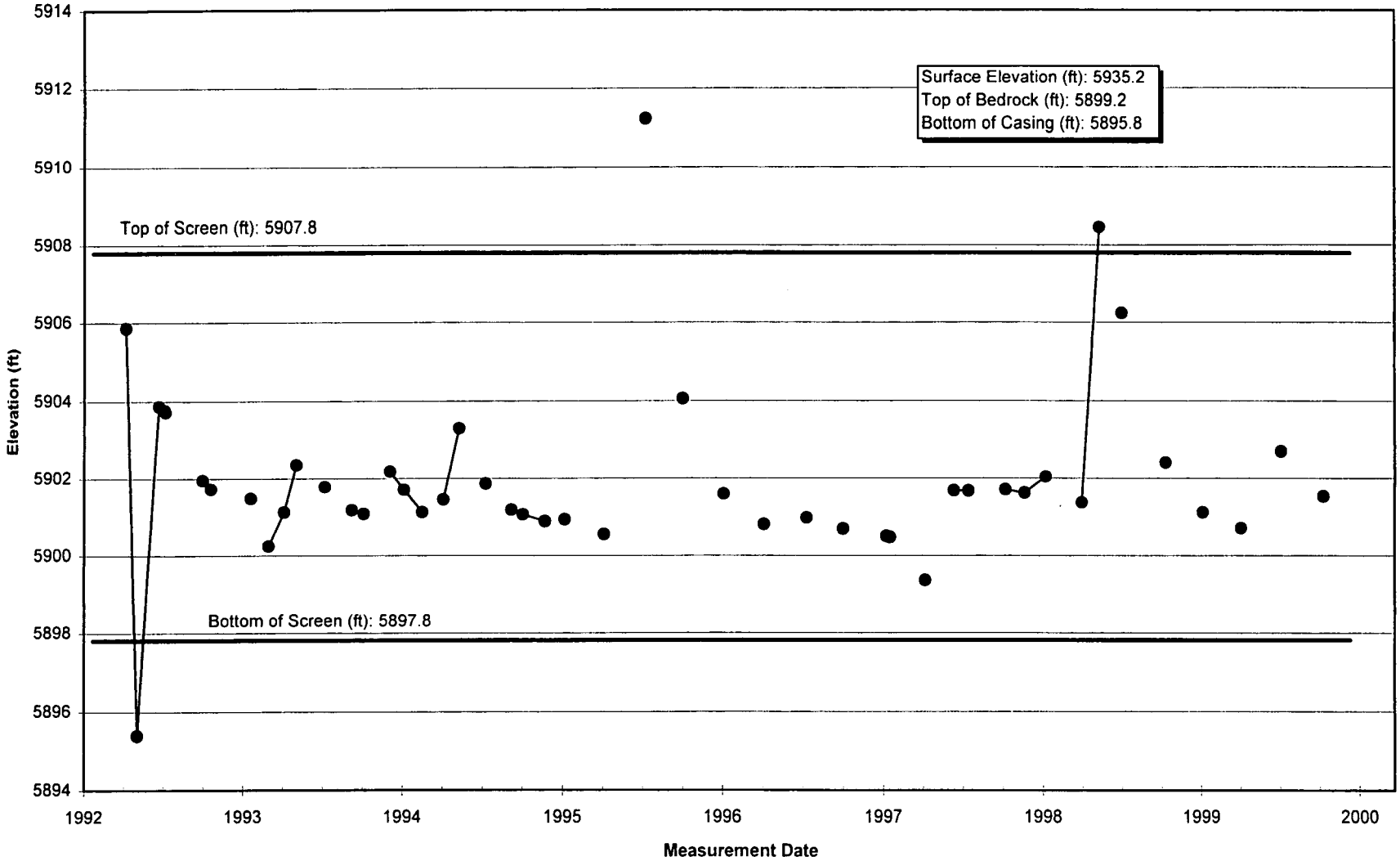
324

Hydrograph 03991



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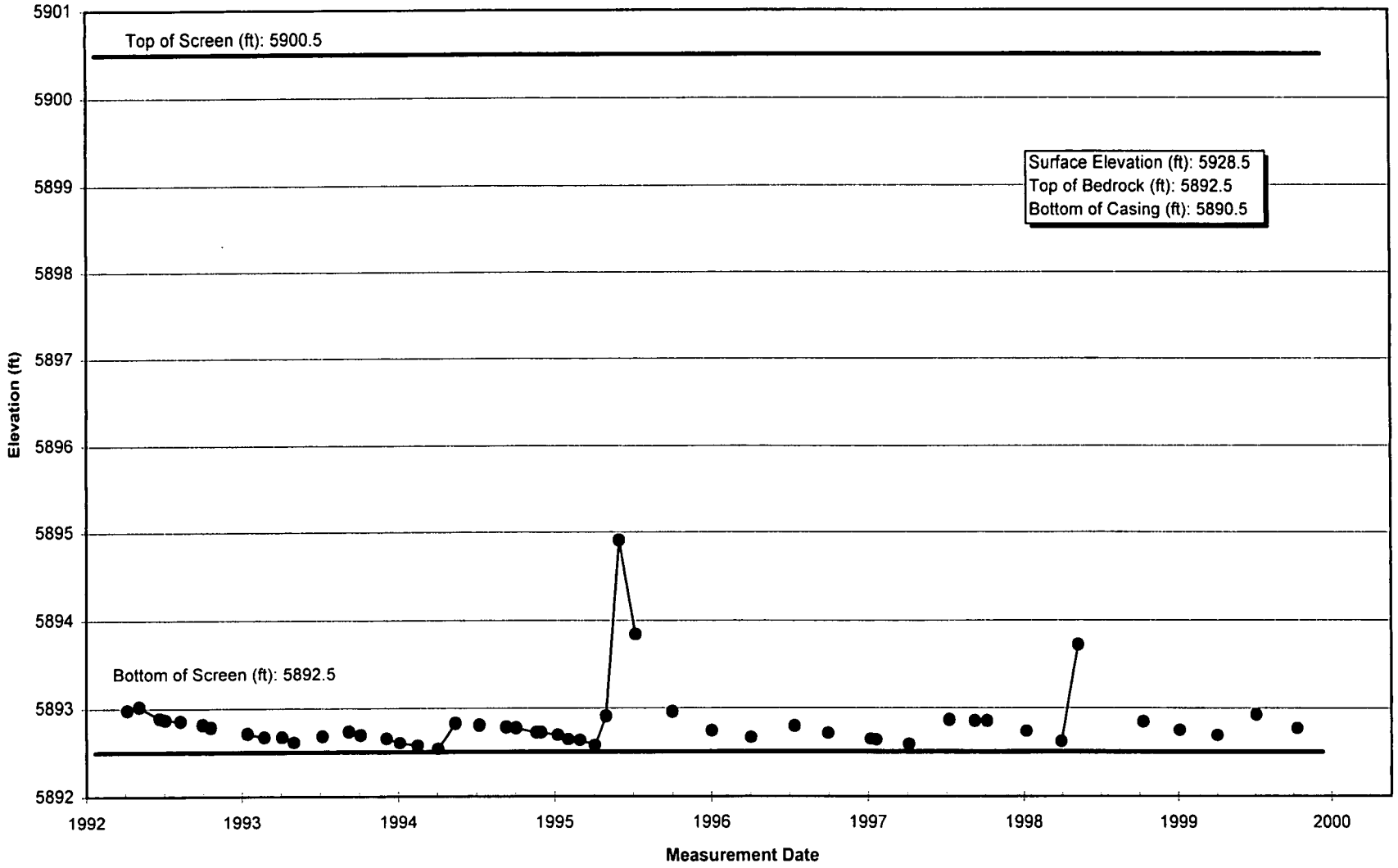
325

Hydrograph 04091



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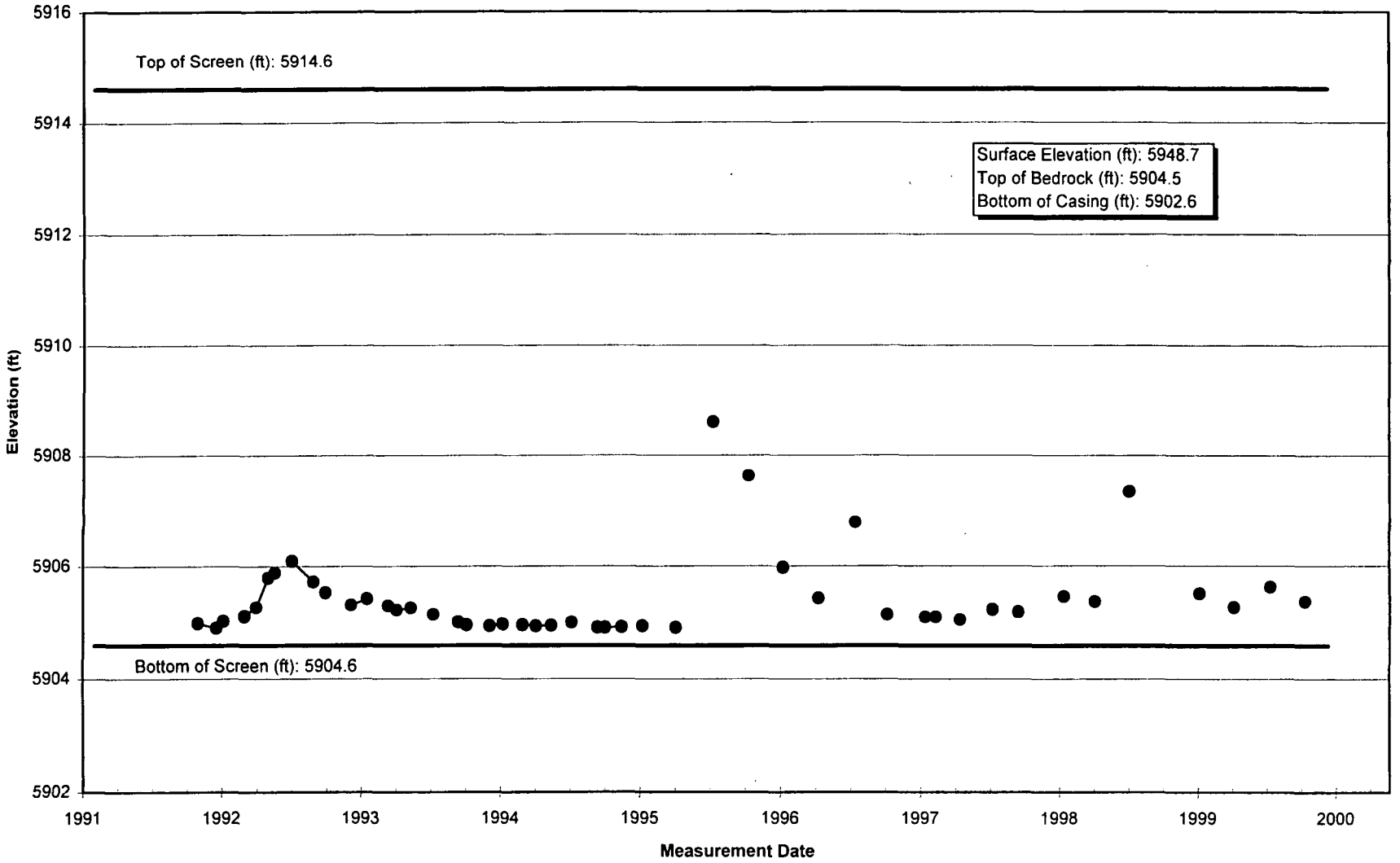
326

Hydrograph 04591



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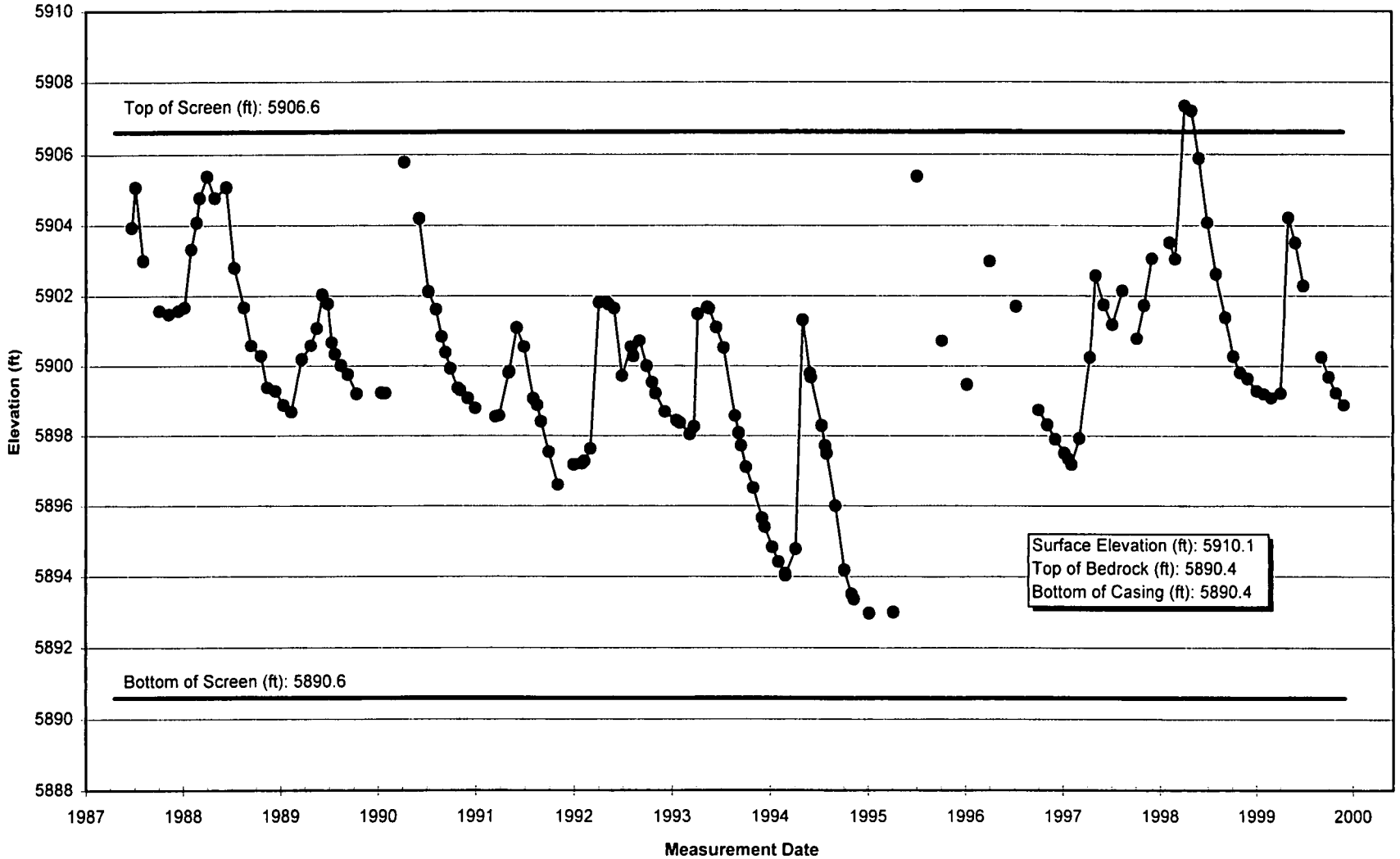
327

Hydrograph 0487



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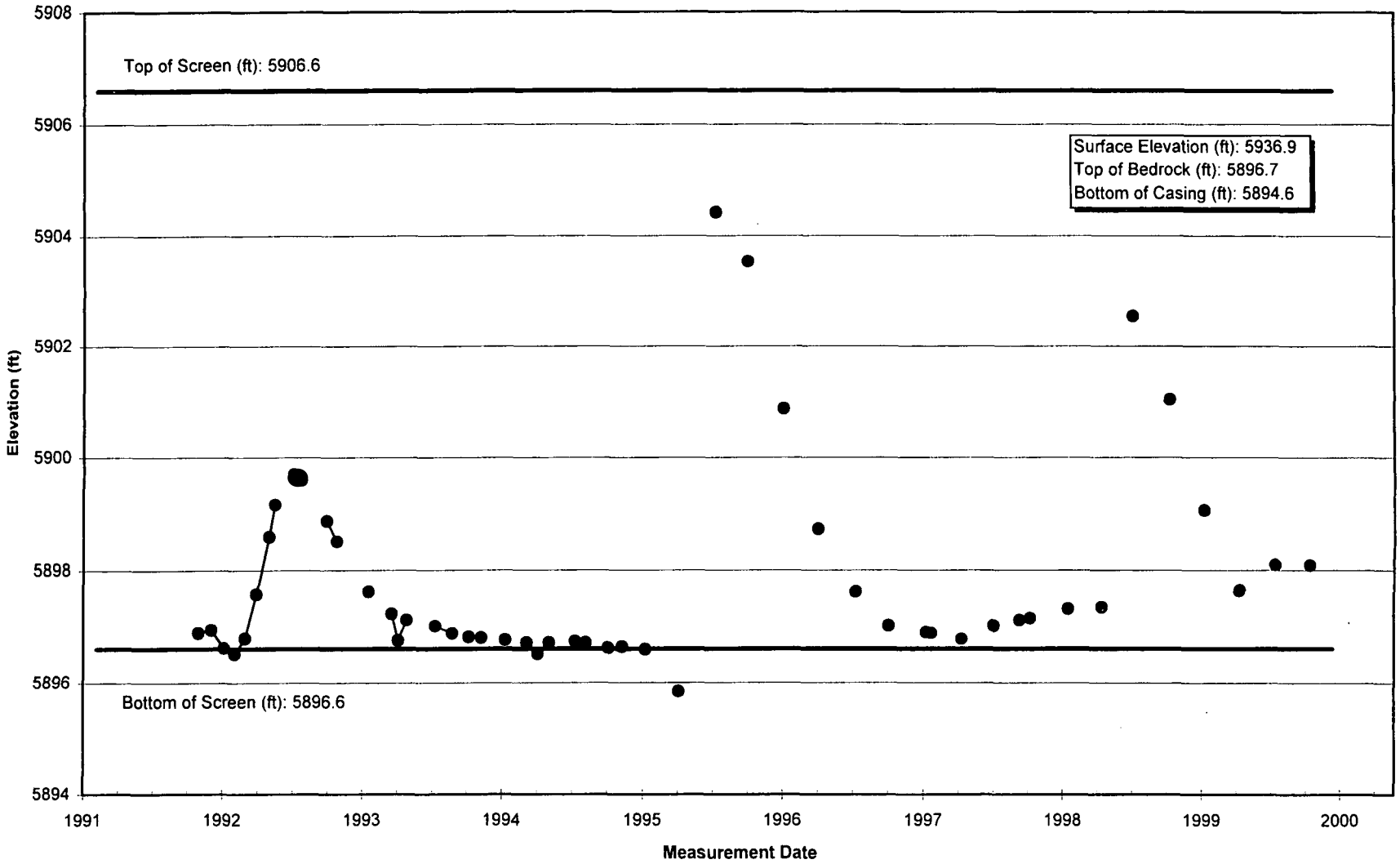
328

Hydrograph 04991



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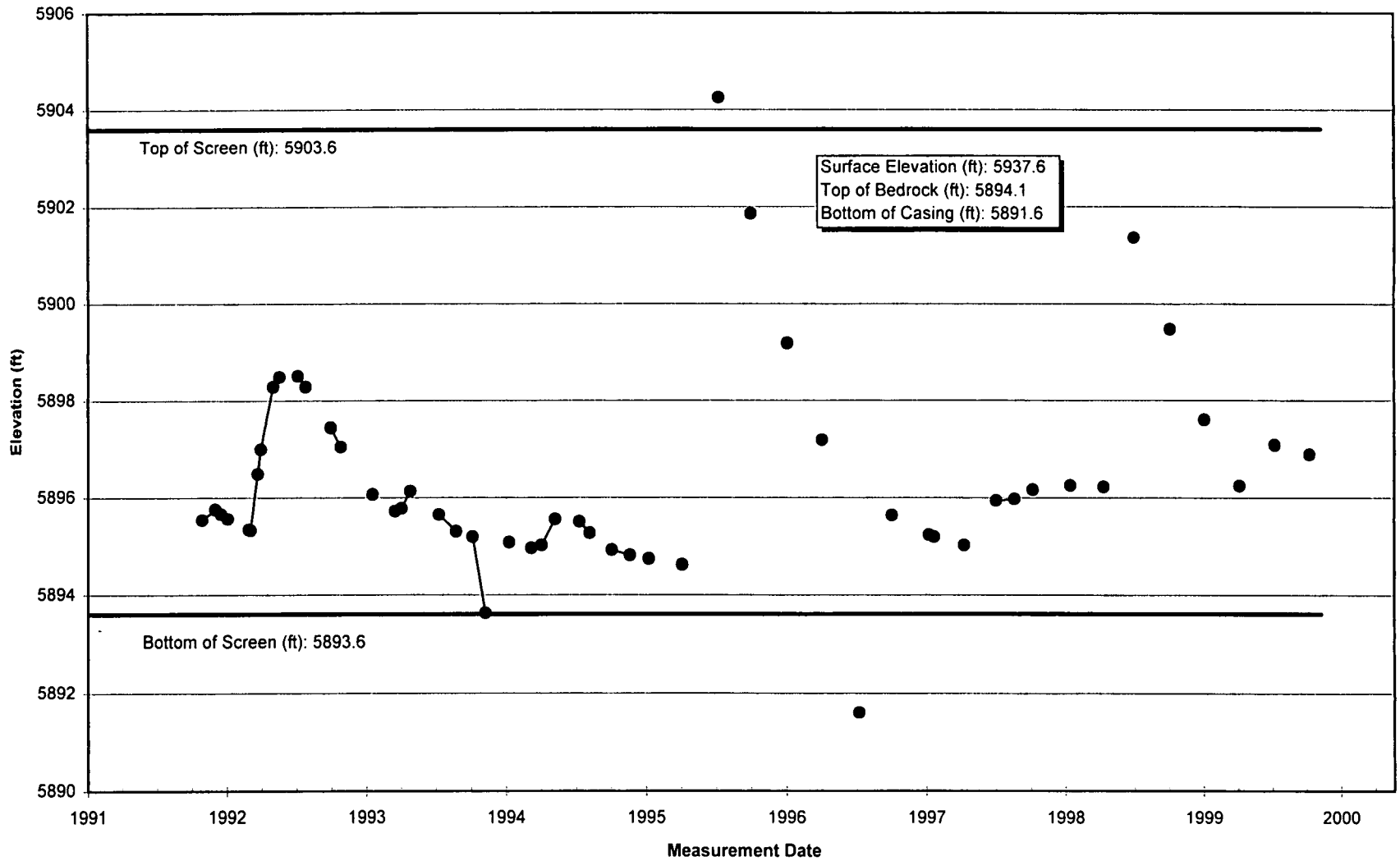
329

Hydrograph 05091



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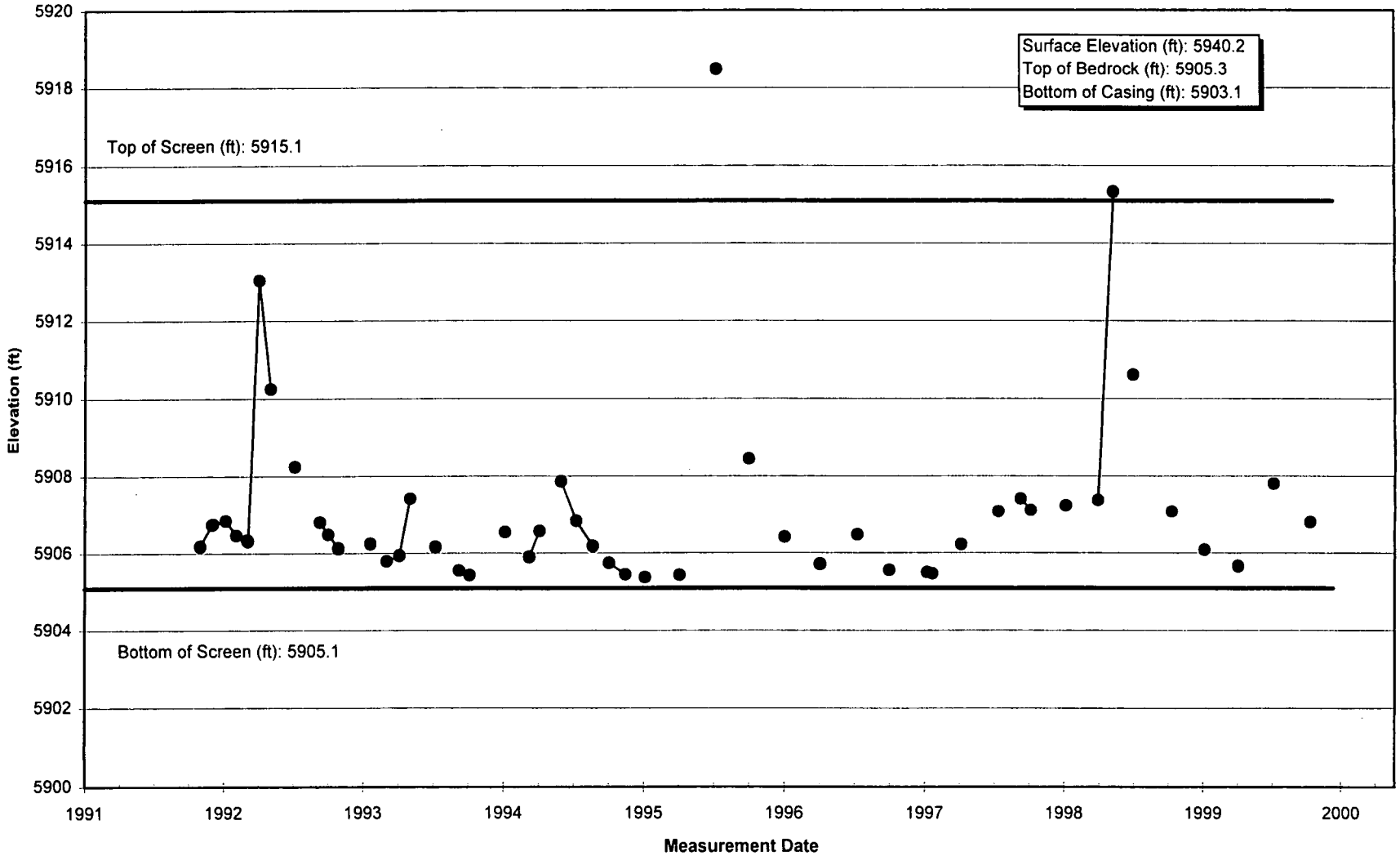
330

Hydrograph 05391



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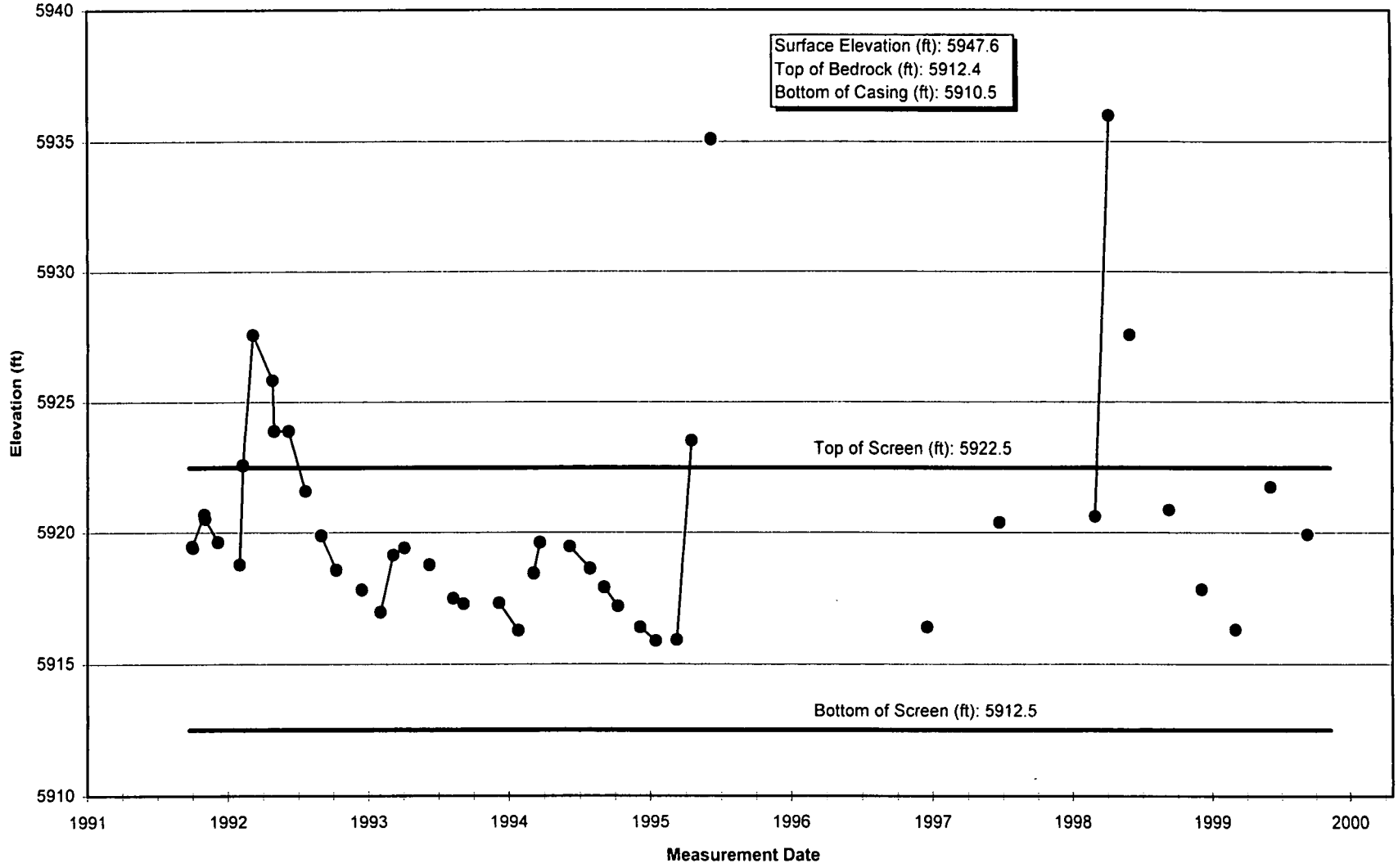
331

Hydrograph 05691



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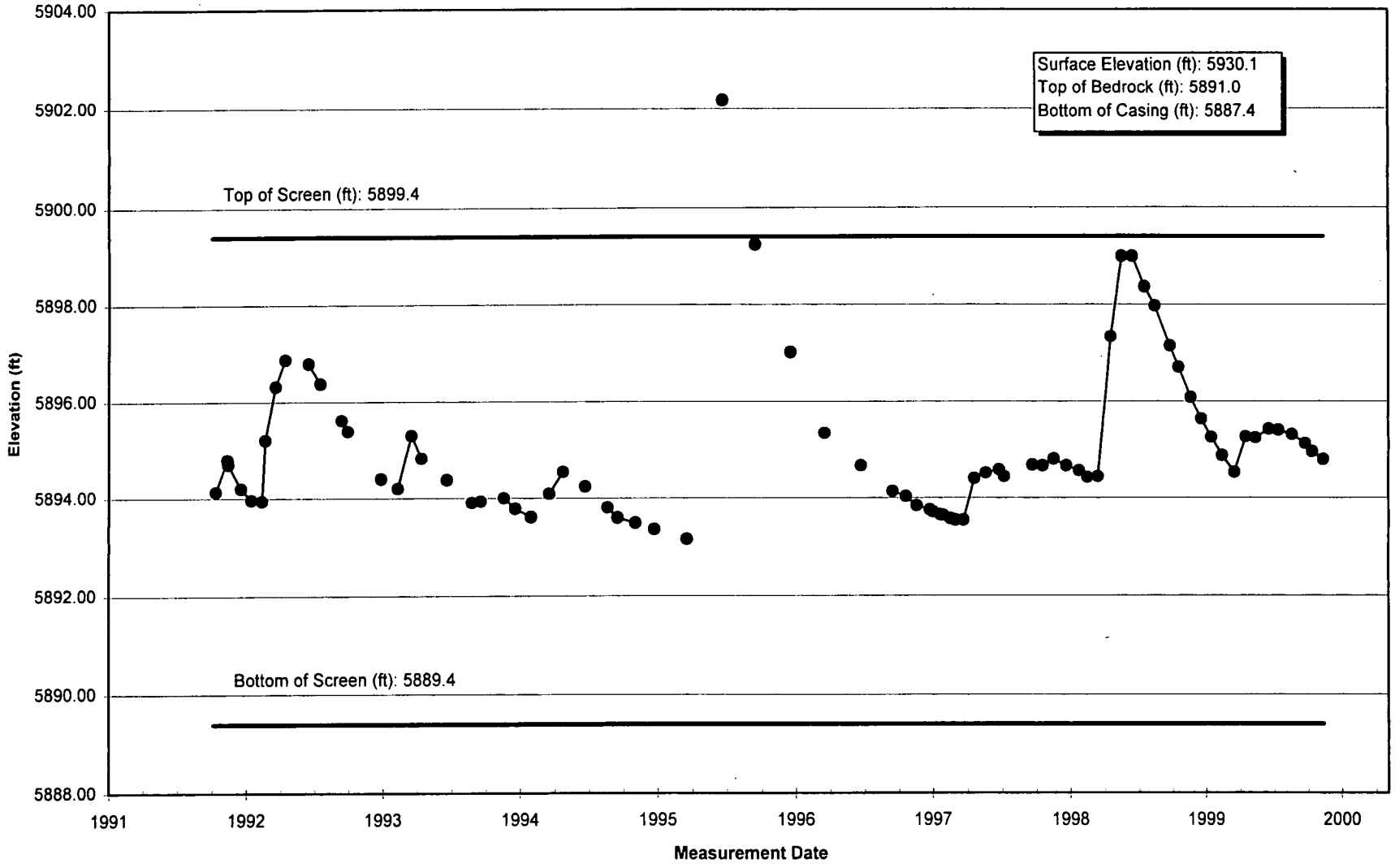
332

Hydrograph 06091



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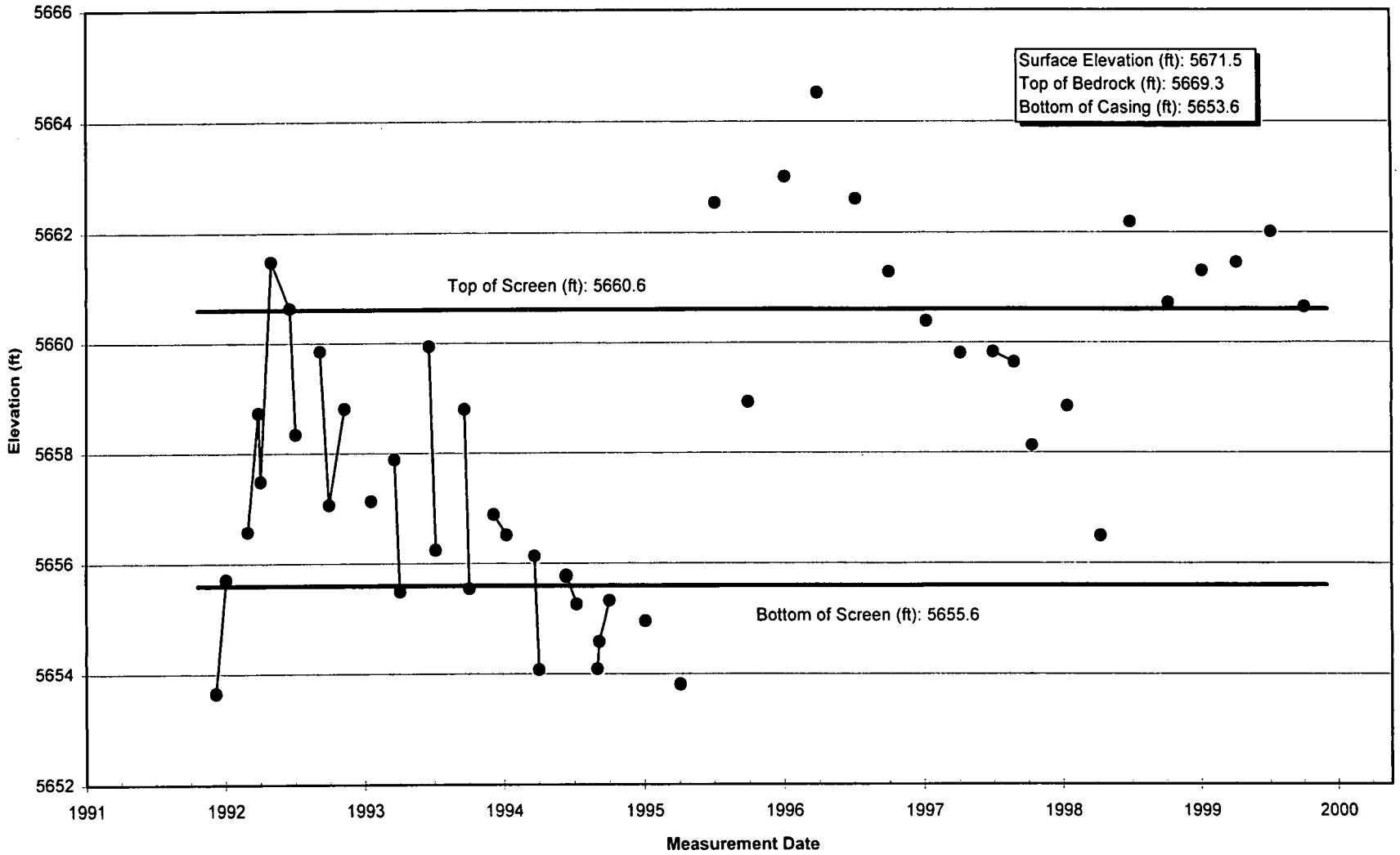
333

Hydrograph 06491



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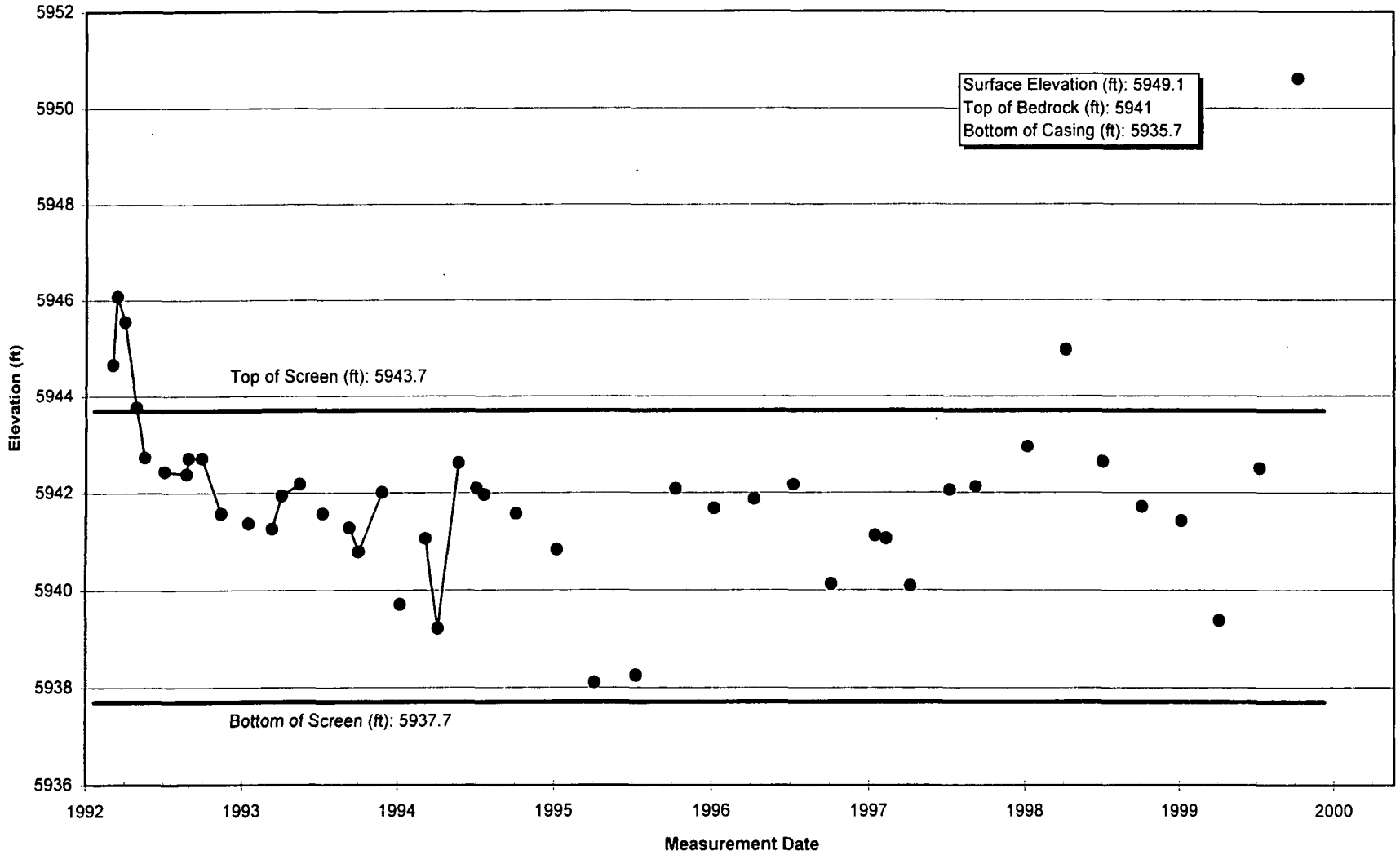
334

Hydrograph 07391



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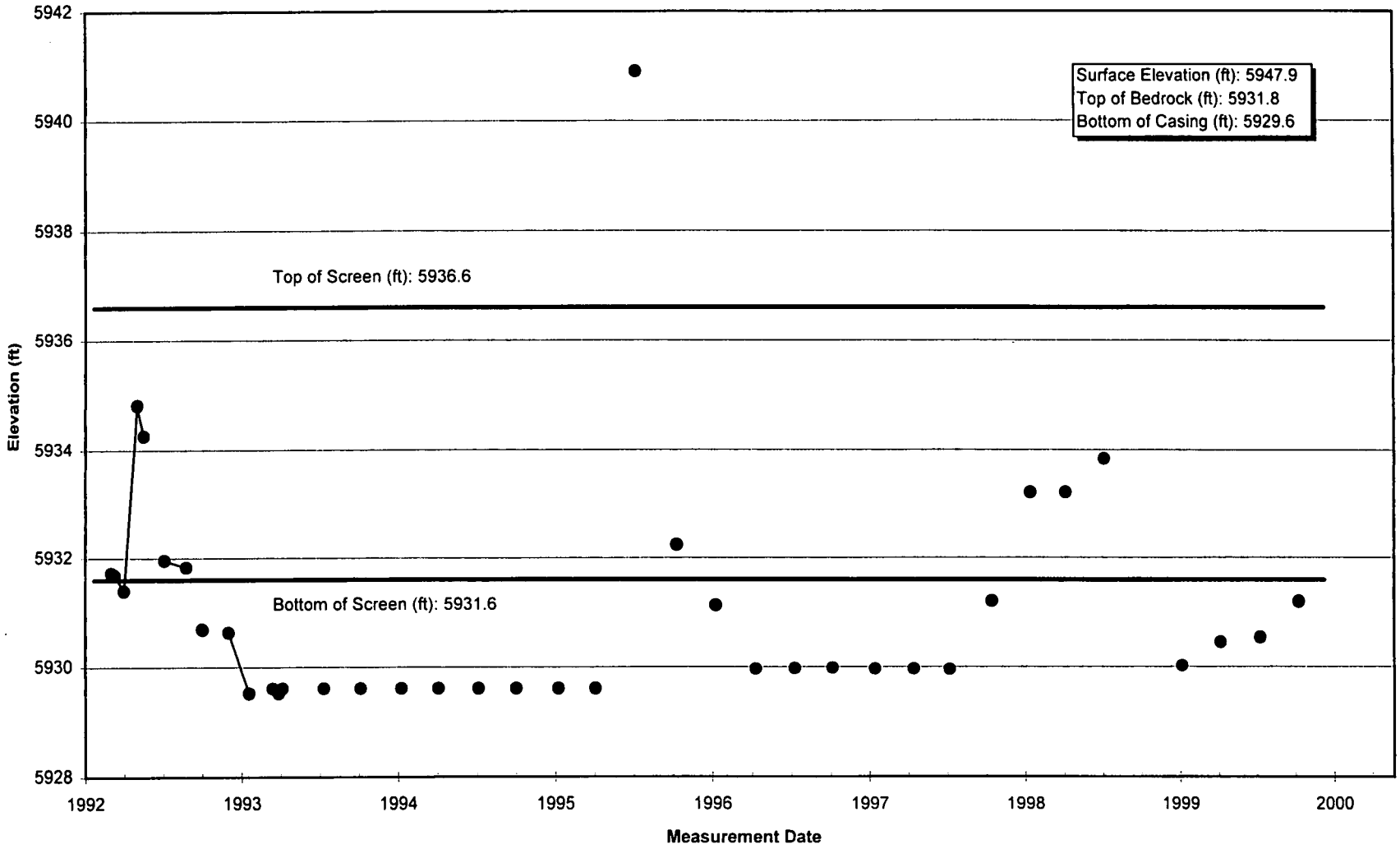
335

Hydrograph 08091



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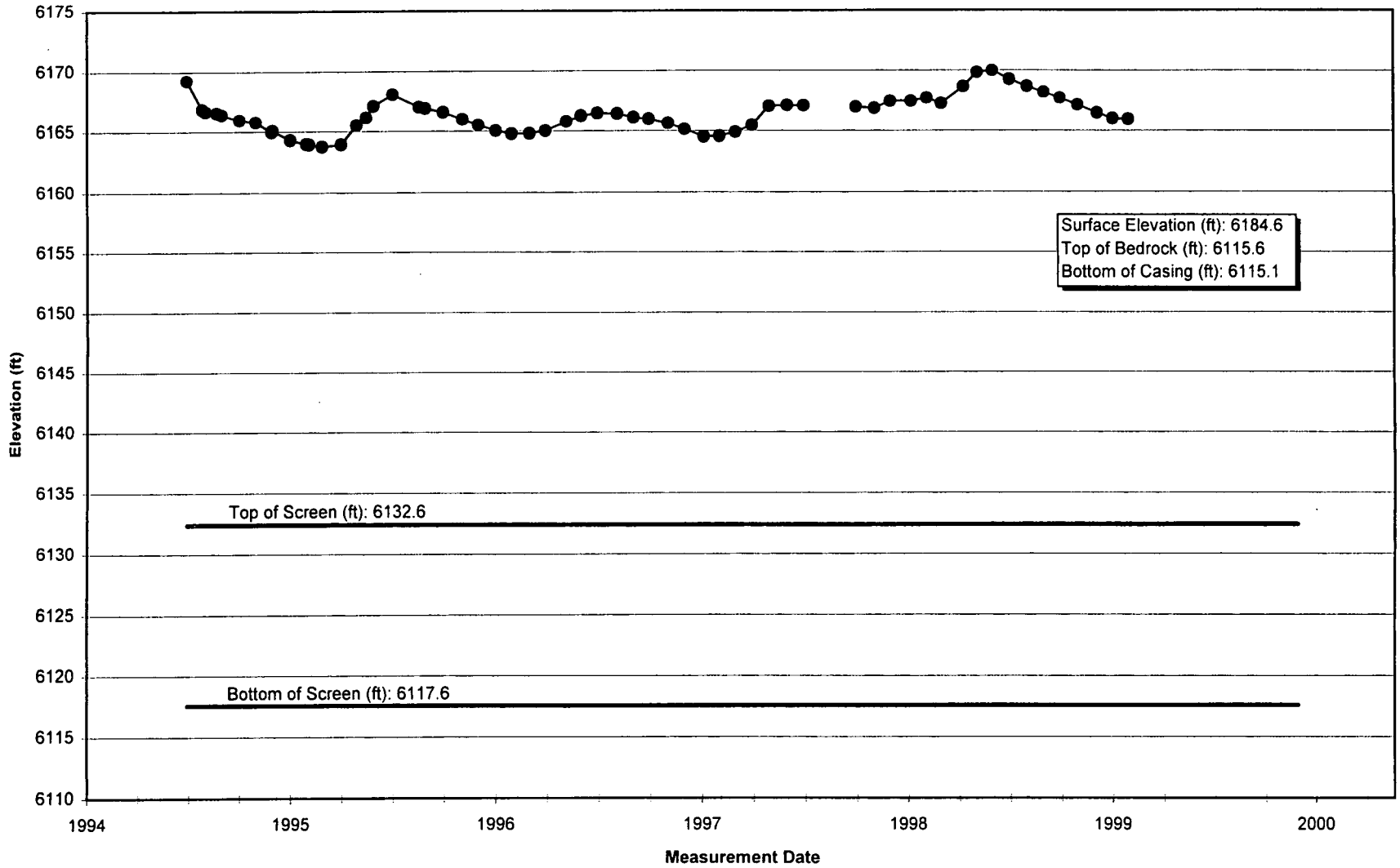
336

Hydrograph 11494



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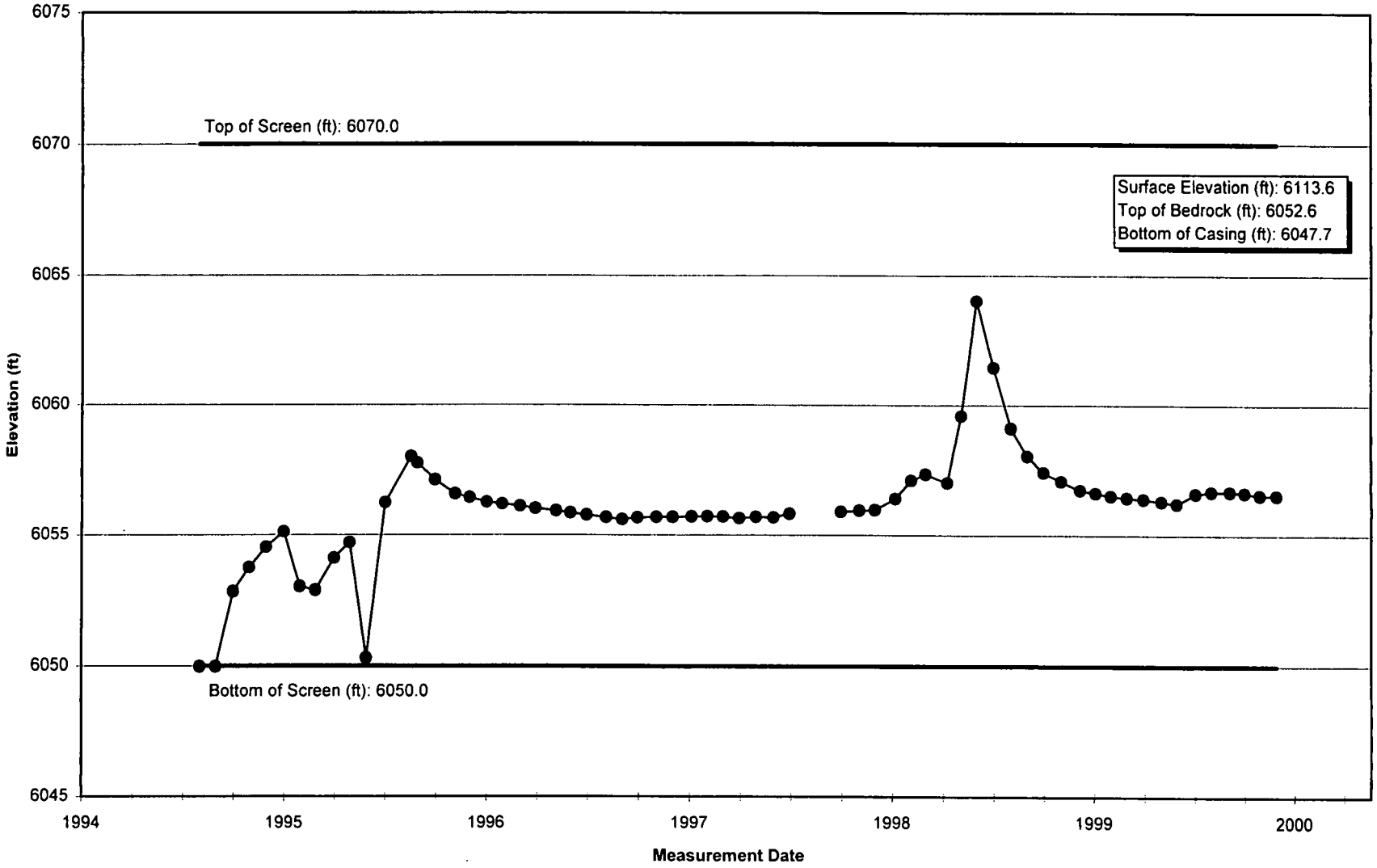
337

Hydrograph 11594



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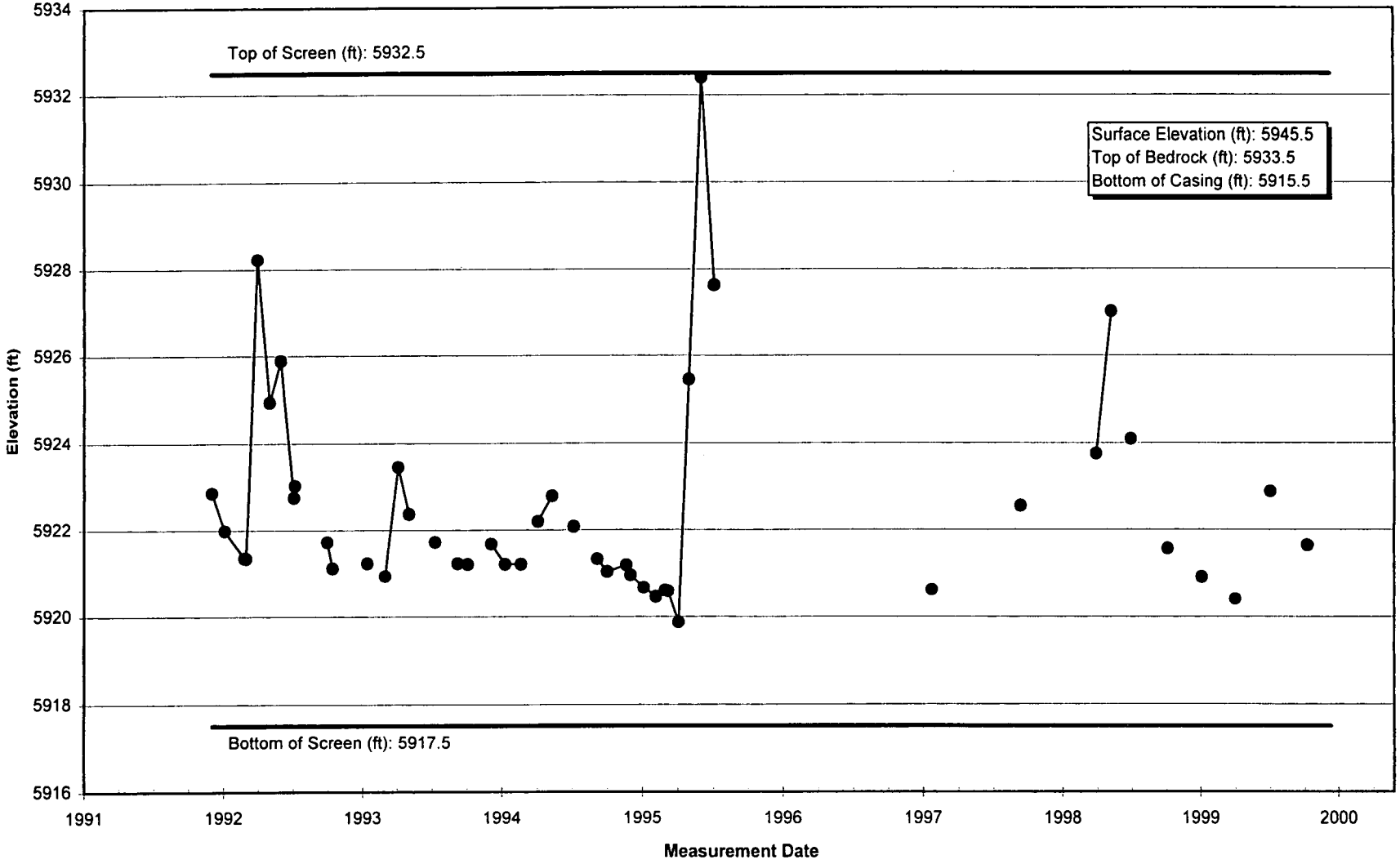
338

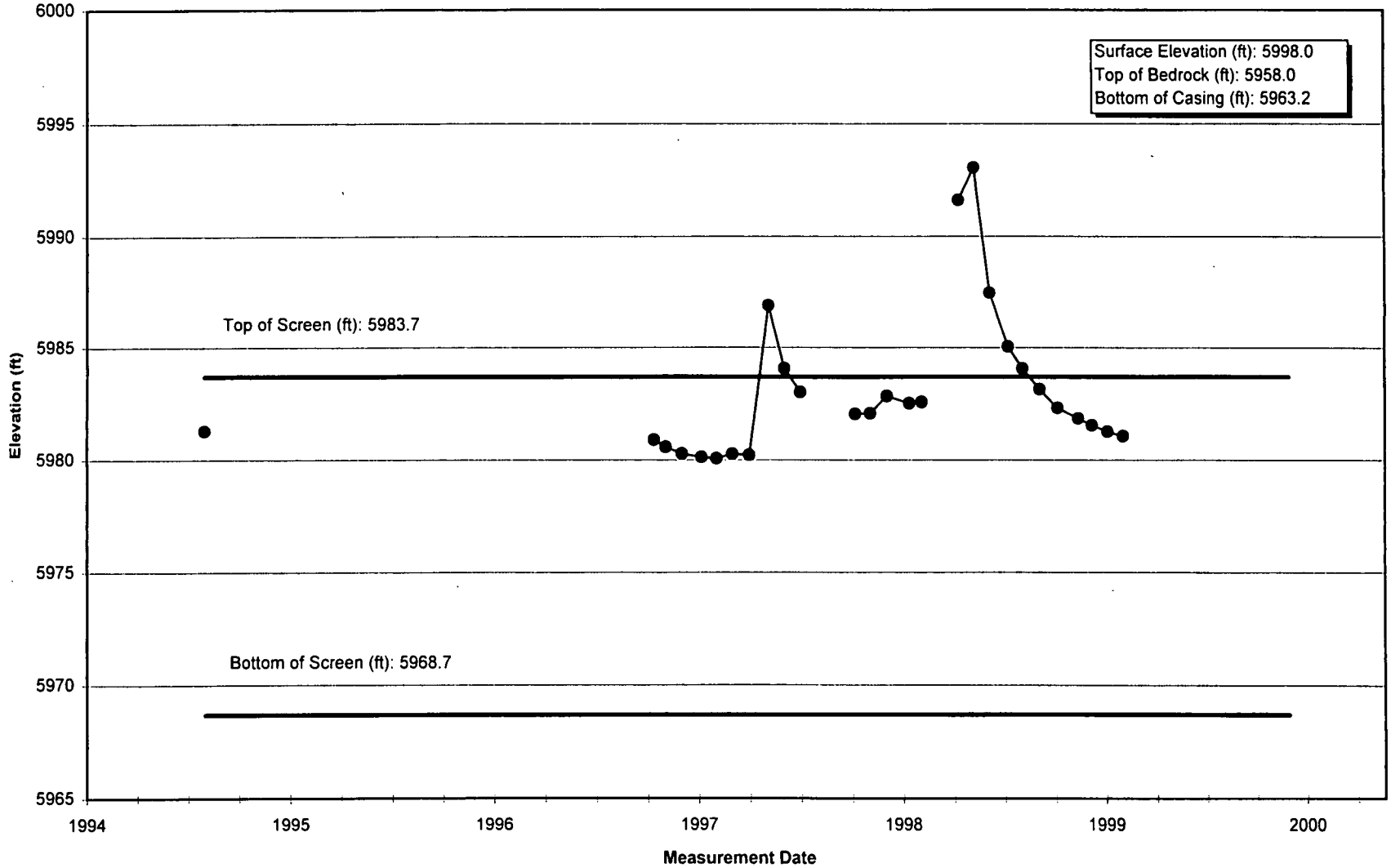
Hydrograph 11891



HG-Master S05.xls 11891 9/22/00

334

Hydrograph 1190



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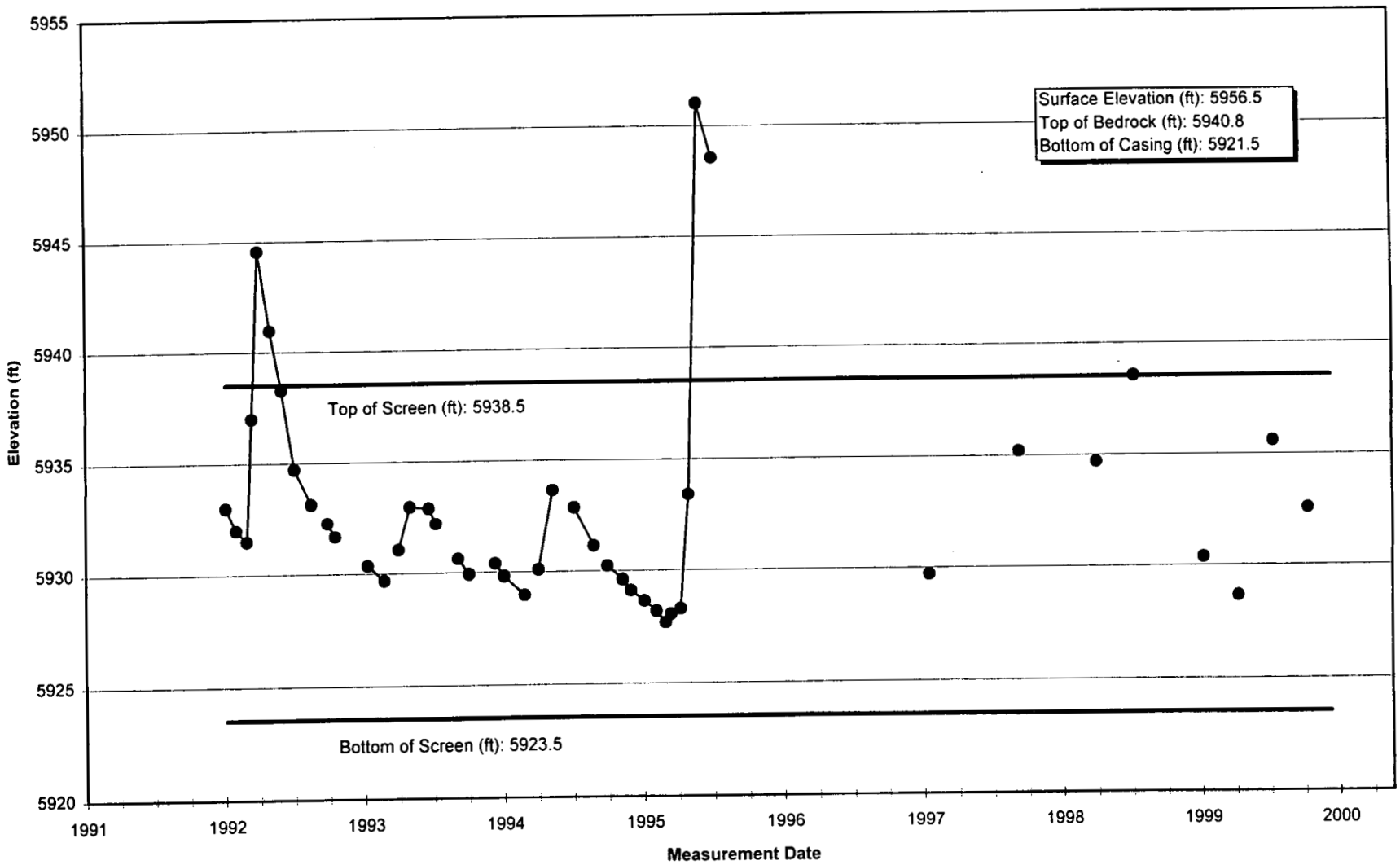
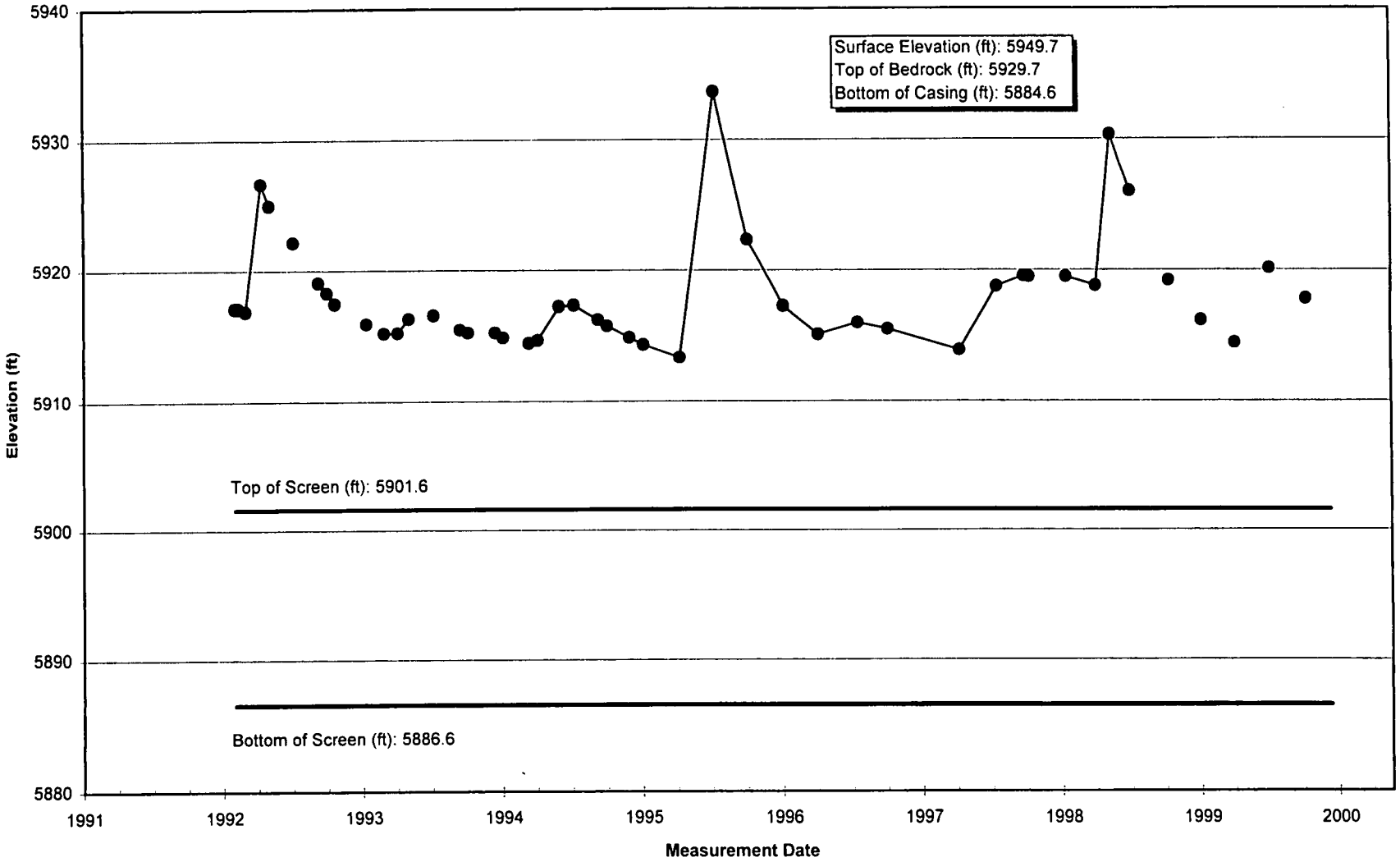
340

Hydrograph 12191



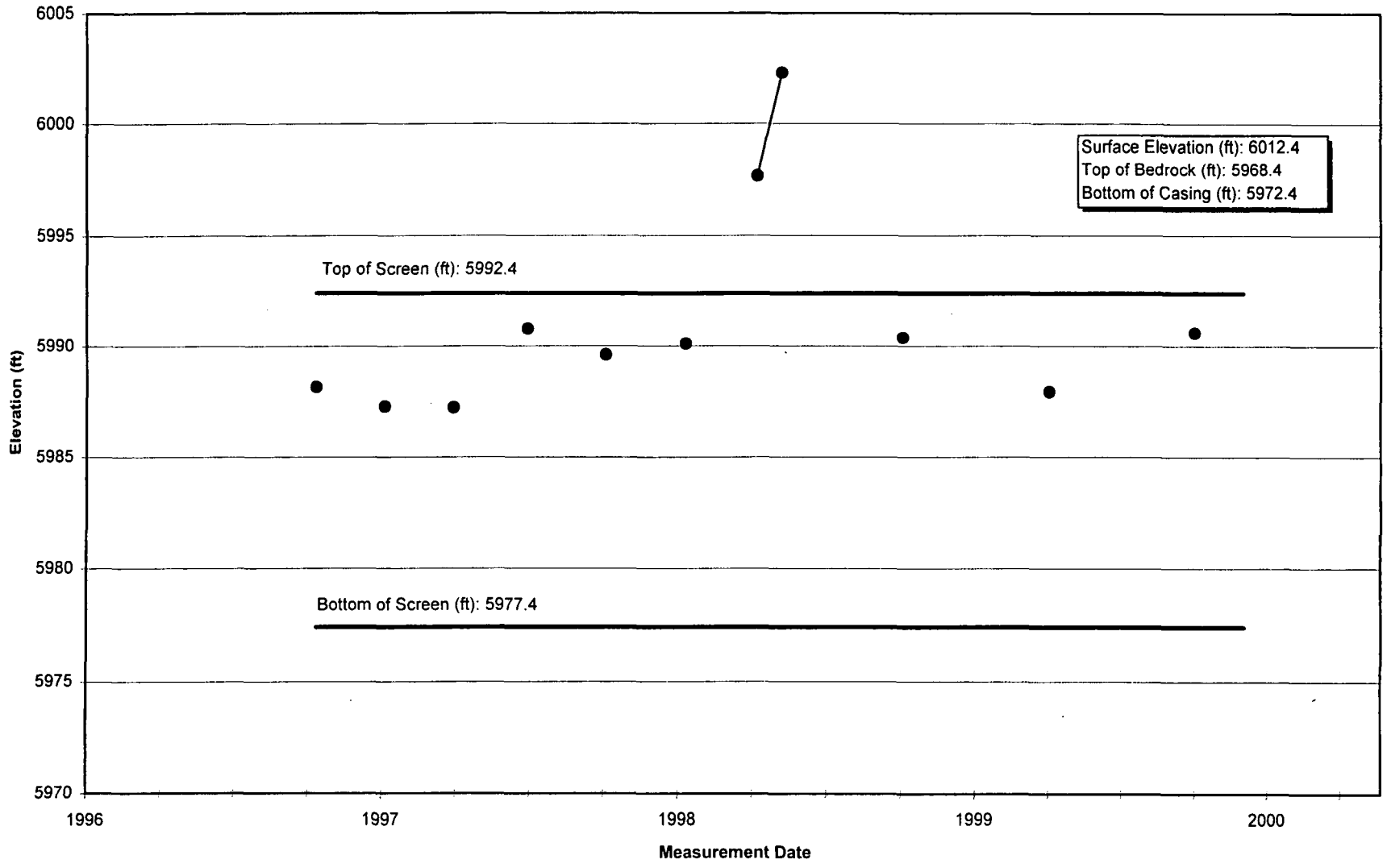
HG-Master S06.xls 12191 9/22/00

Hydrograph 12691



342

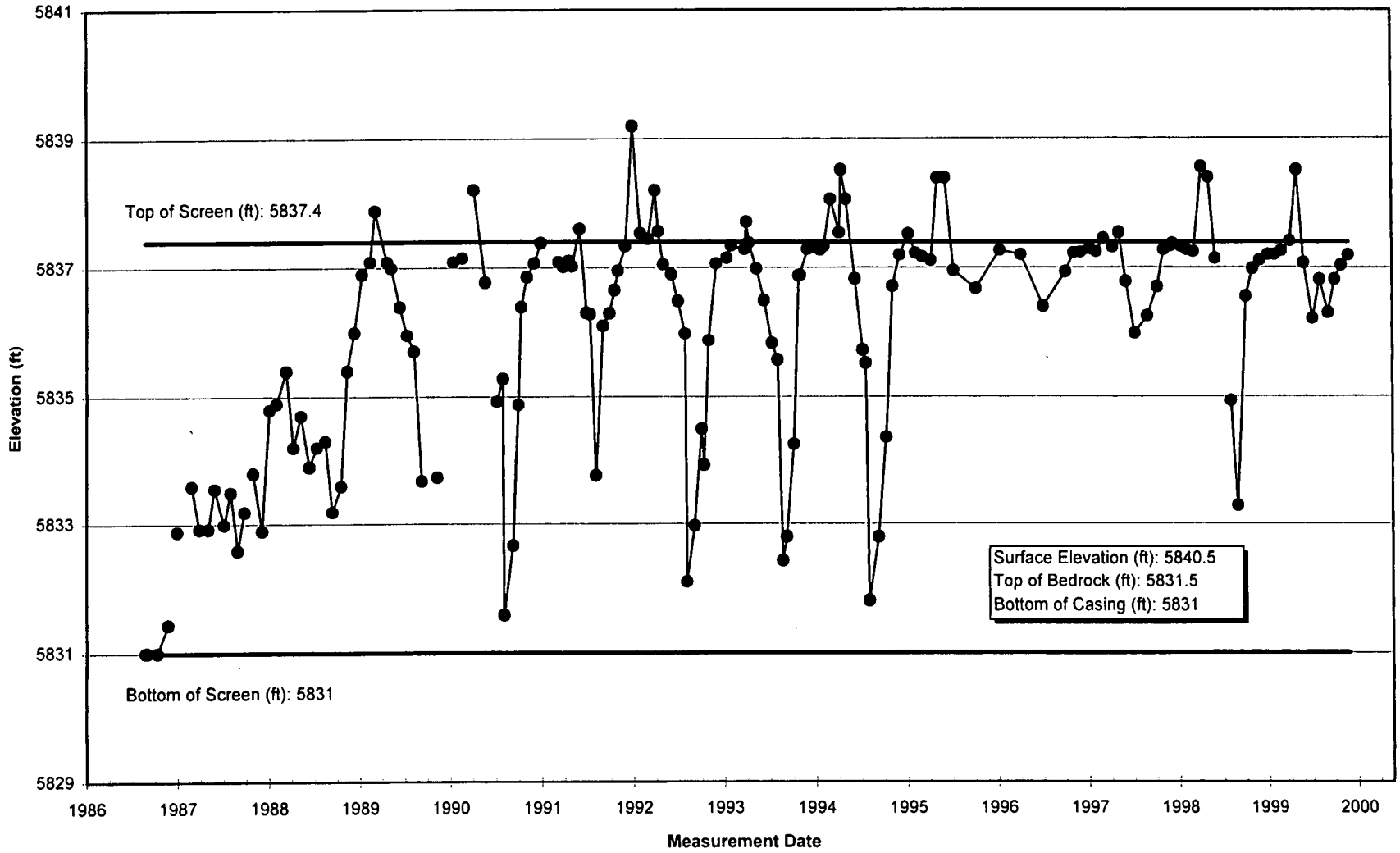
Hydrograph 1290



HG-Master S06.xls 1290 9/22/00

343

Hydrograph 1386



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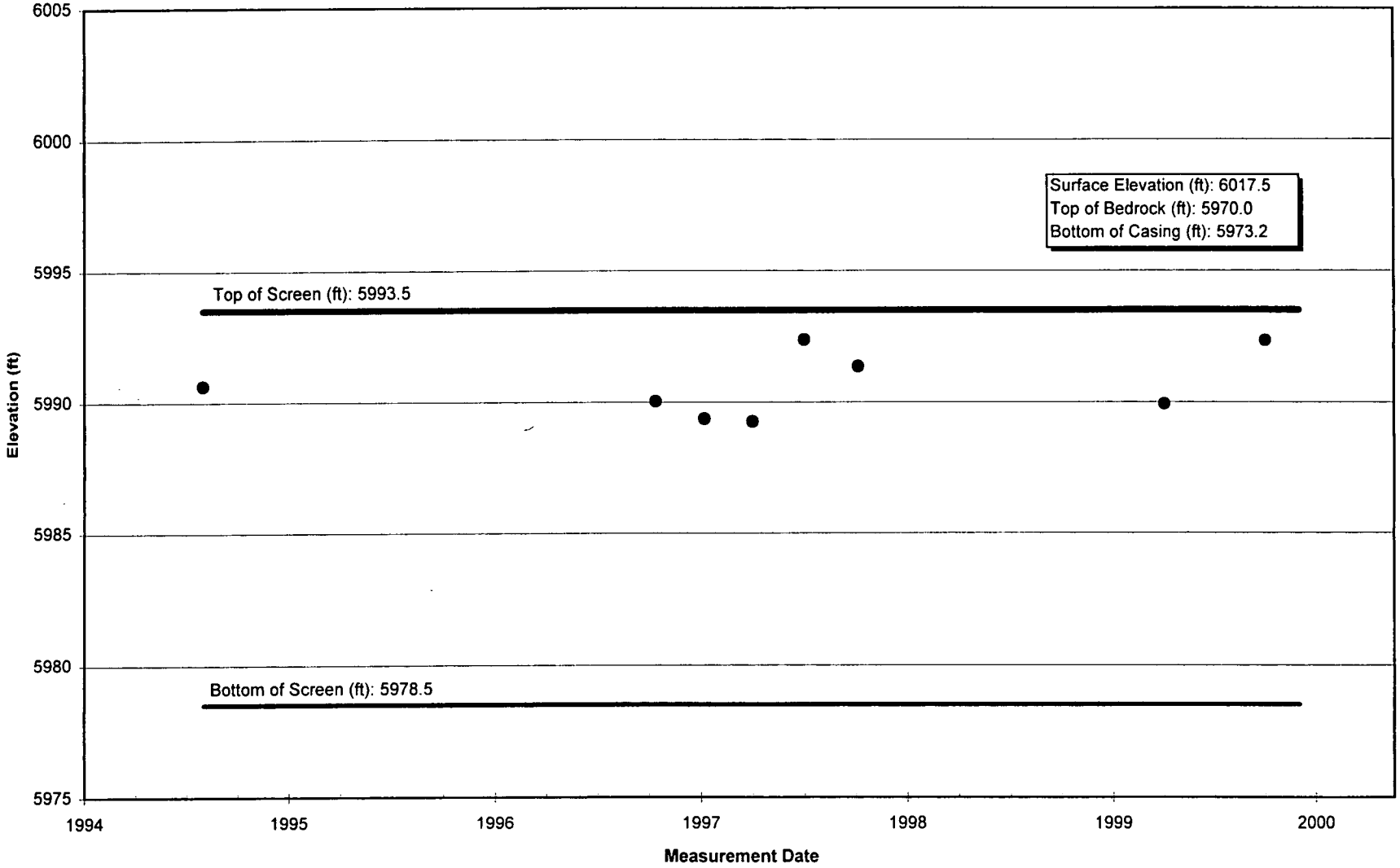
Hydrograph 1390



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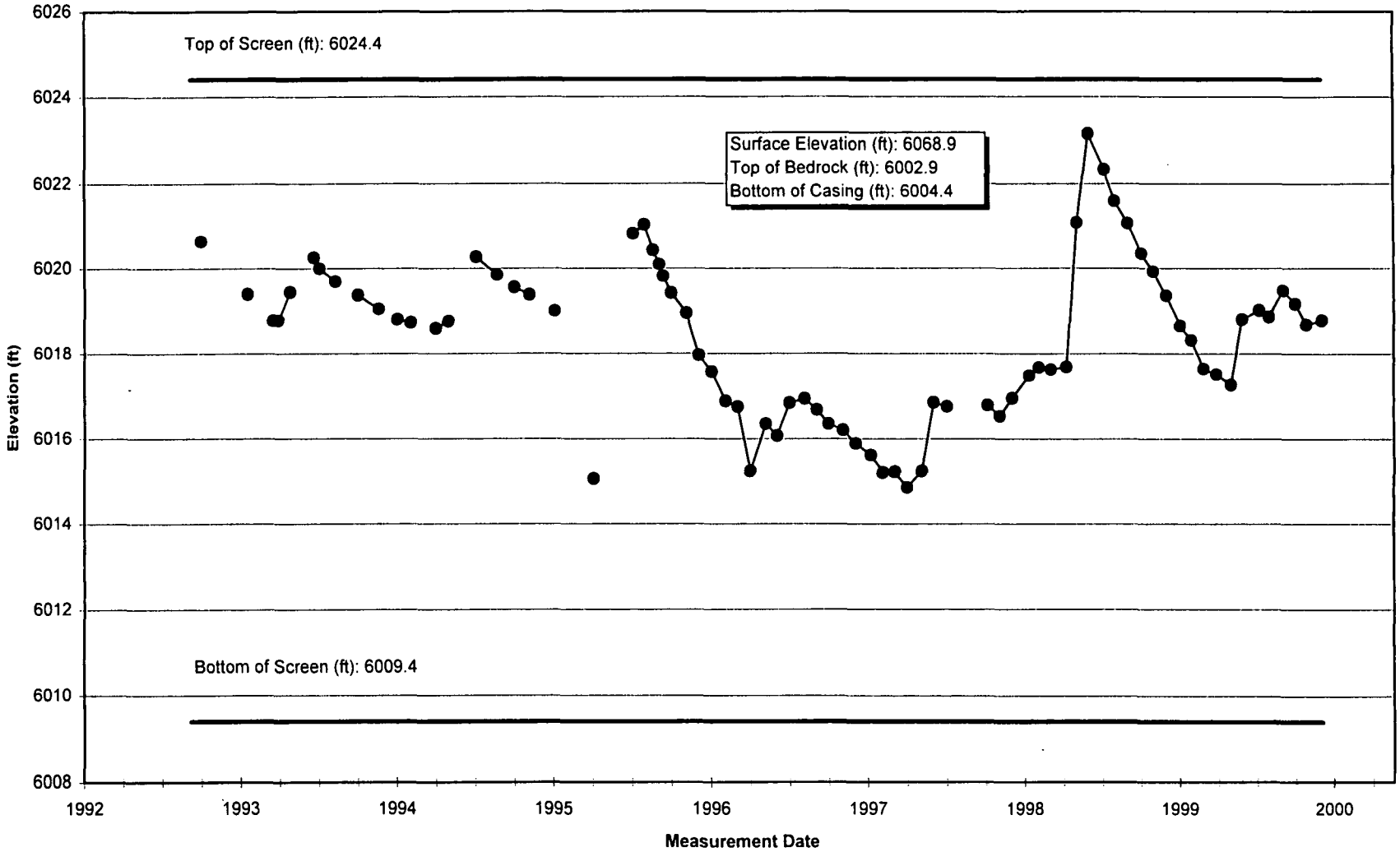
3 of 5

Hydrograph 1490



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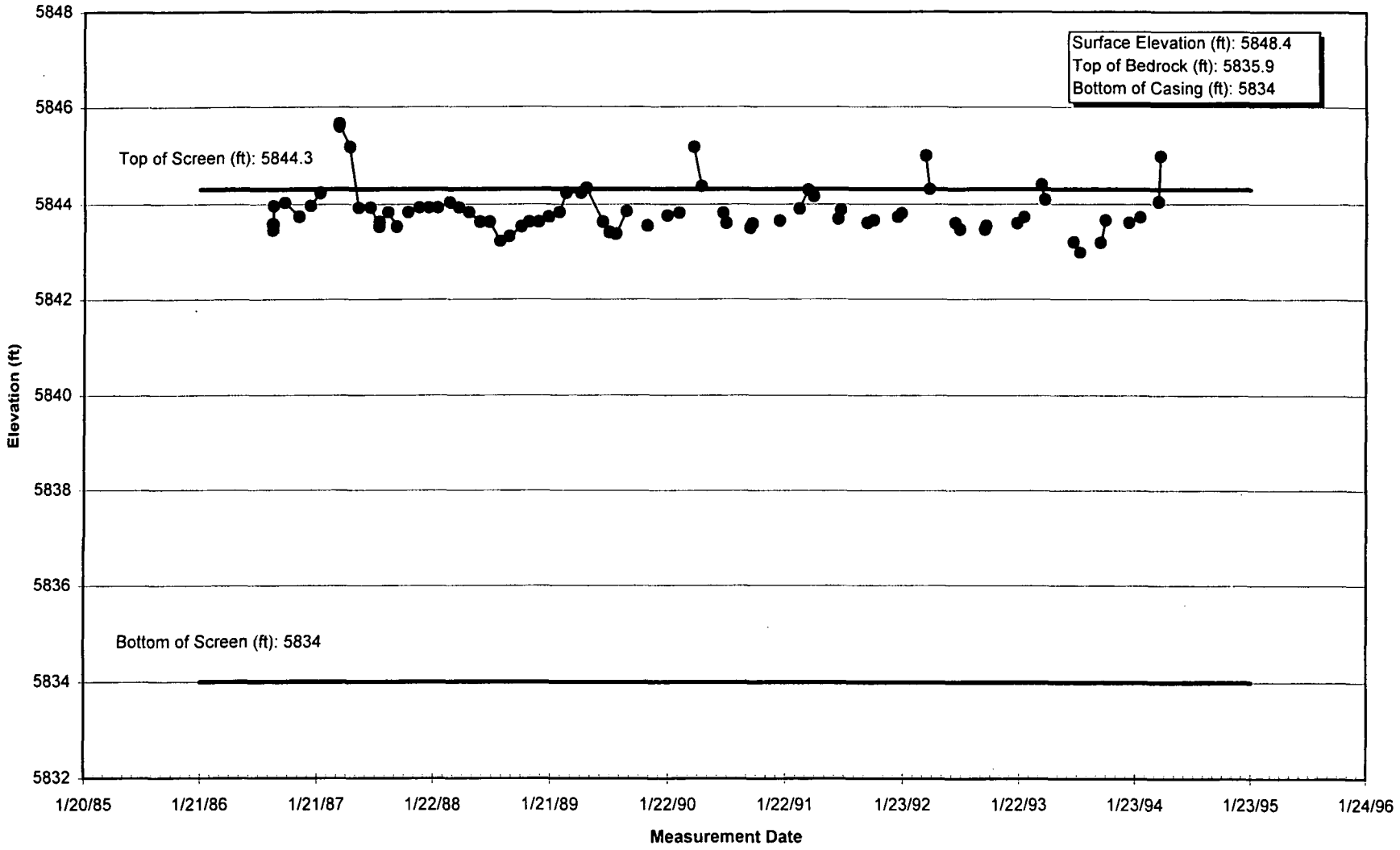
346

Hydrograph 1586



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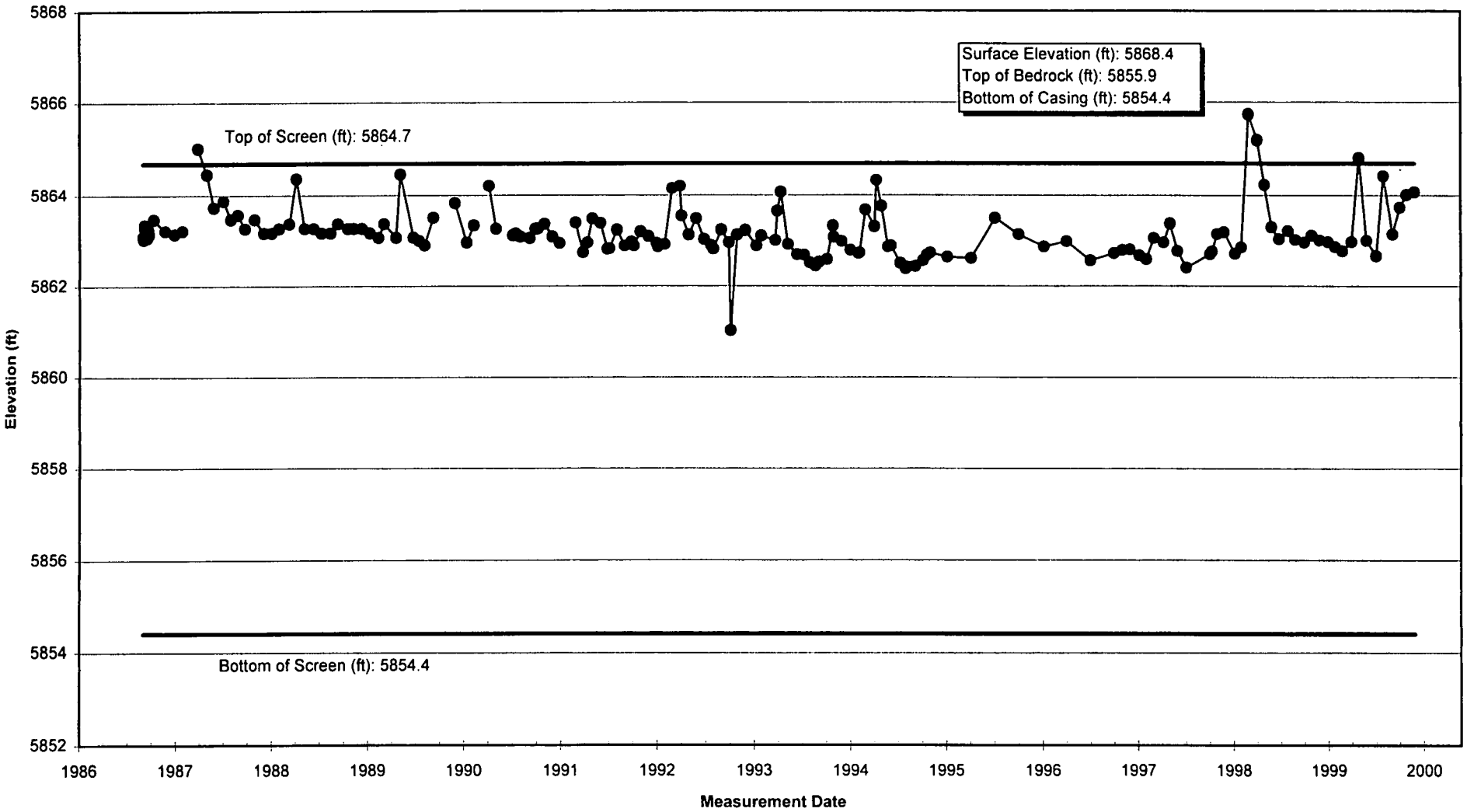
347

Hydrograph 1786



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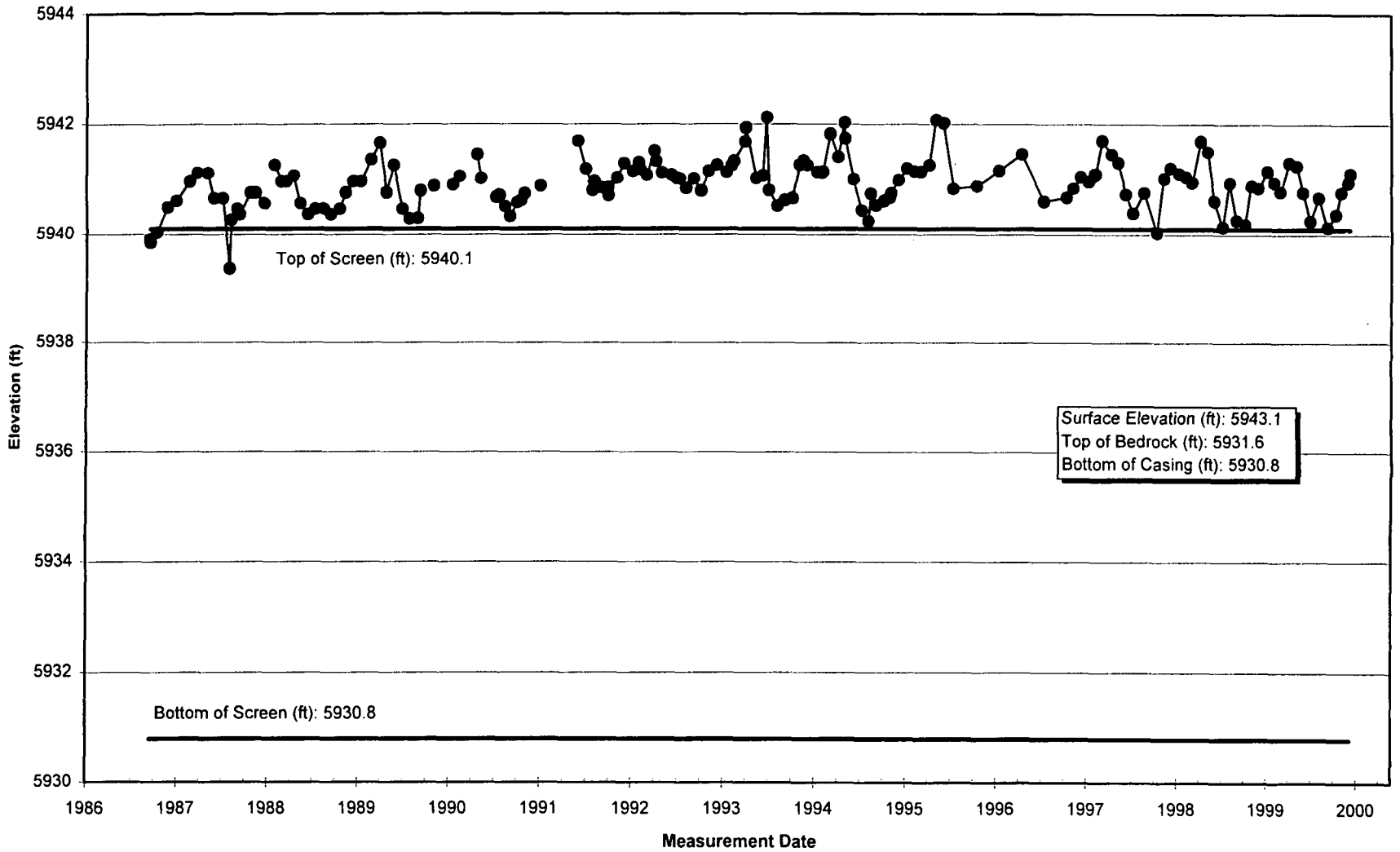
348

Hydrograph 1986



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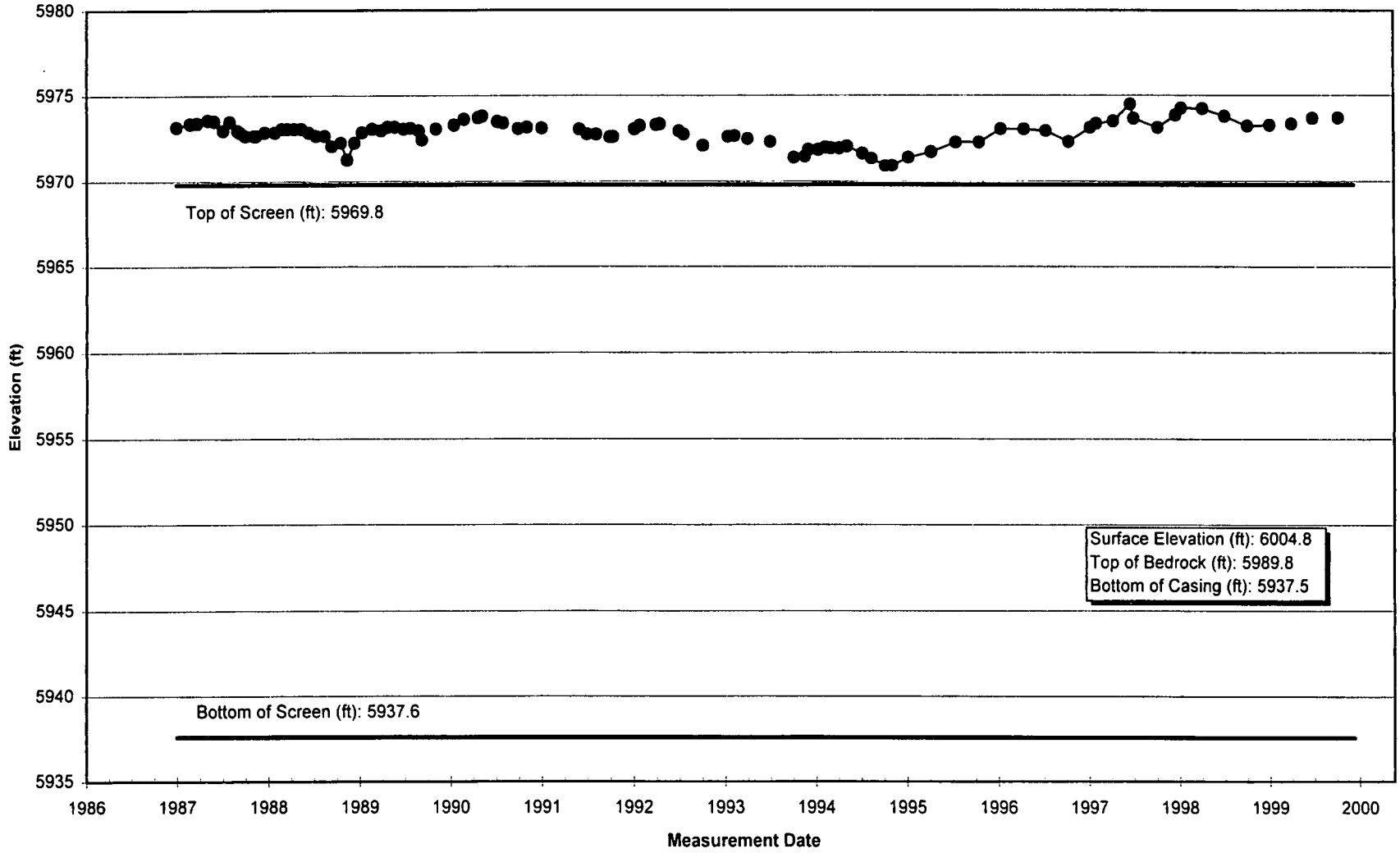
349

Hydrograph 2186



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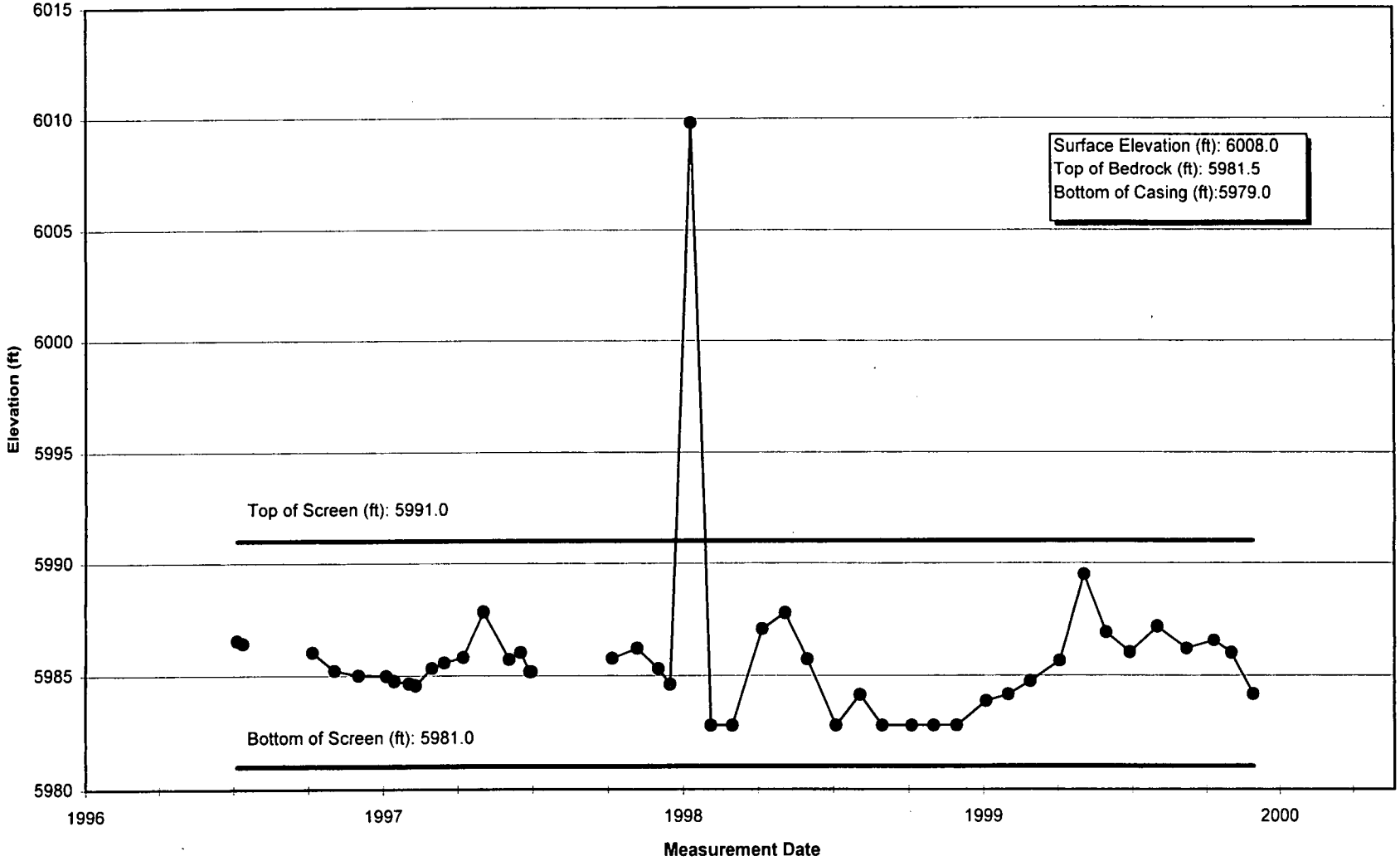
350

Hydrograph 22596



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351

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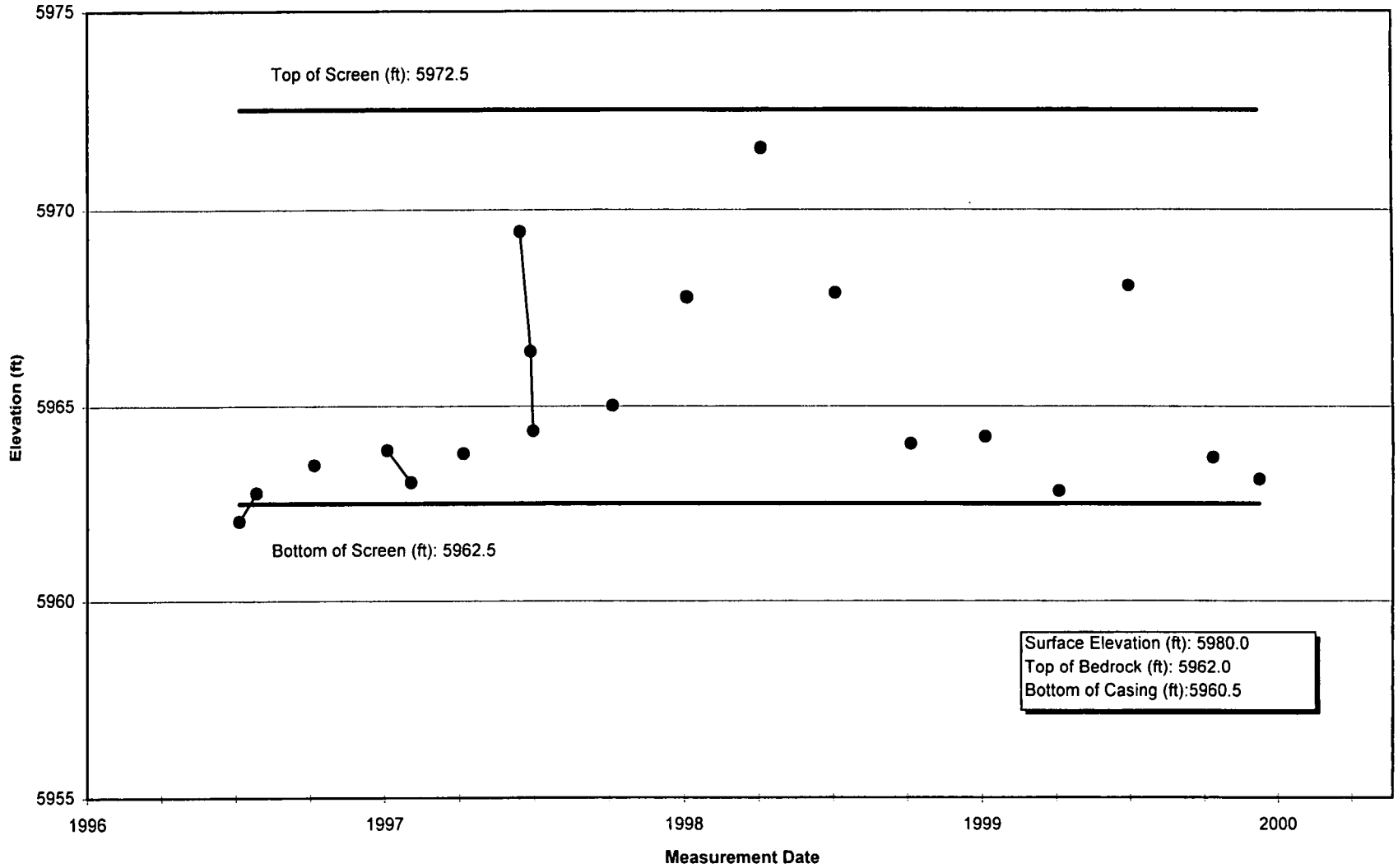
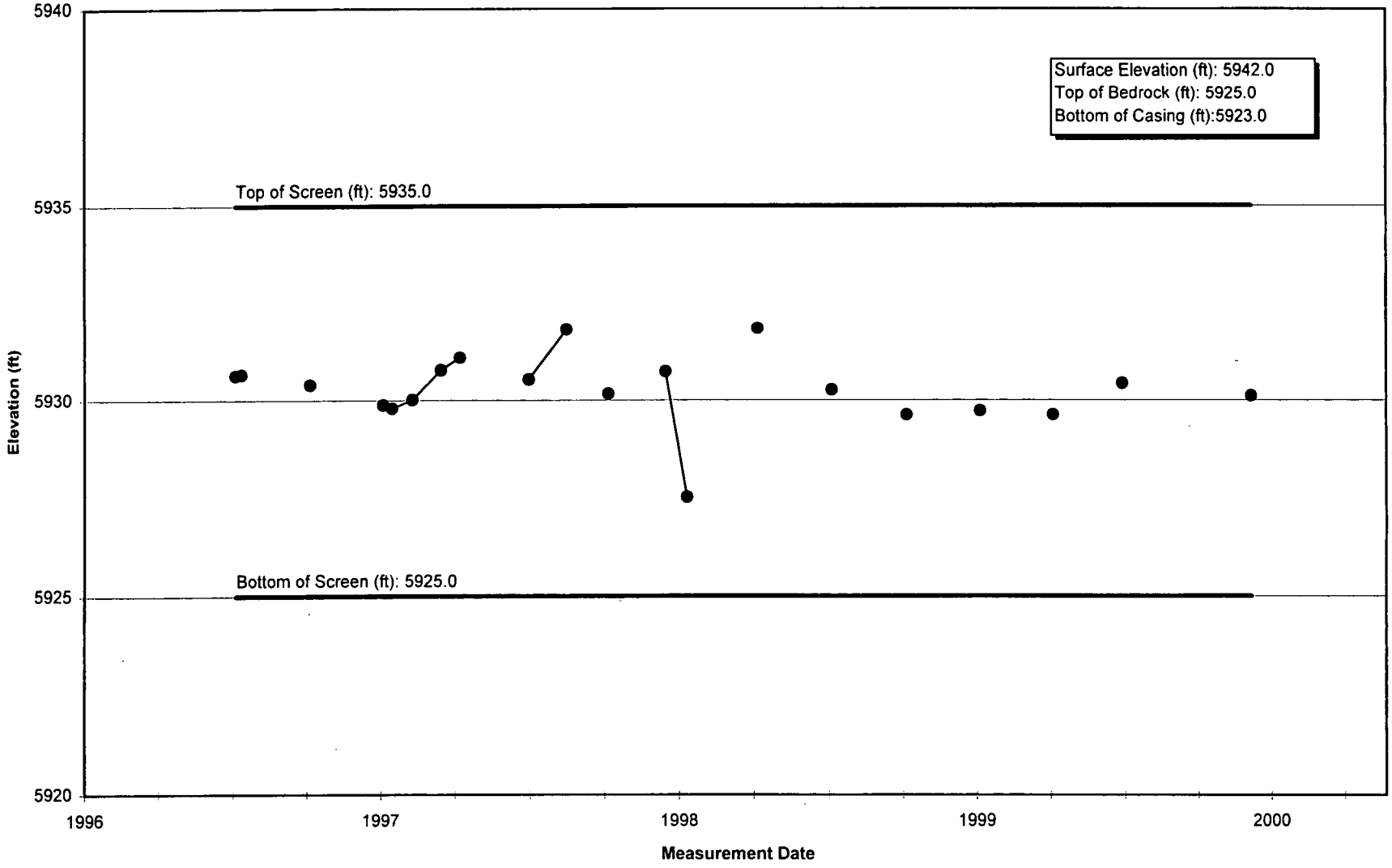


HG-Mast 97.xls 22696 9/22/00

352

Hydrograph 22796



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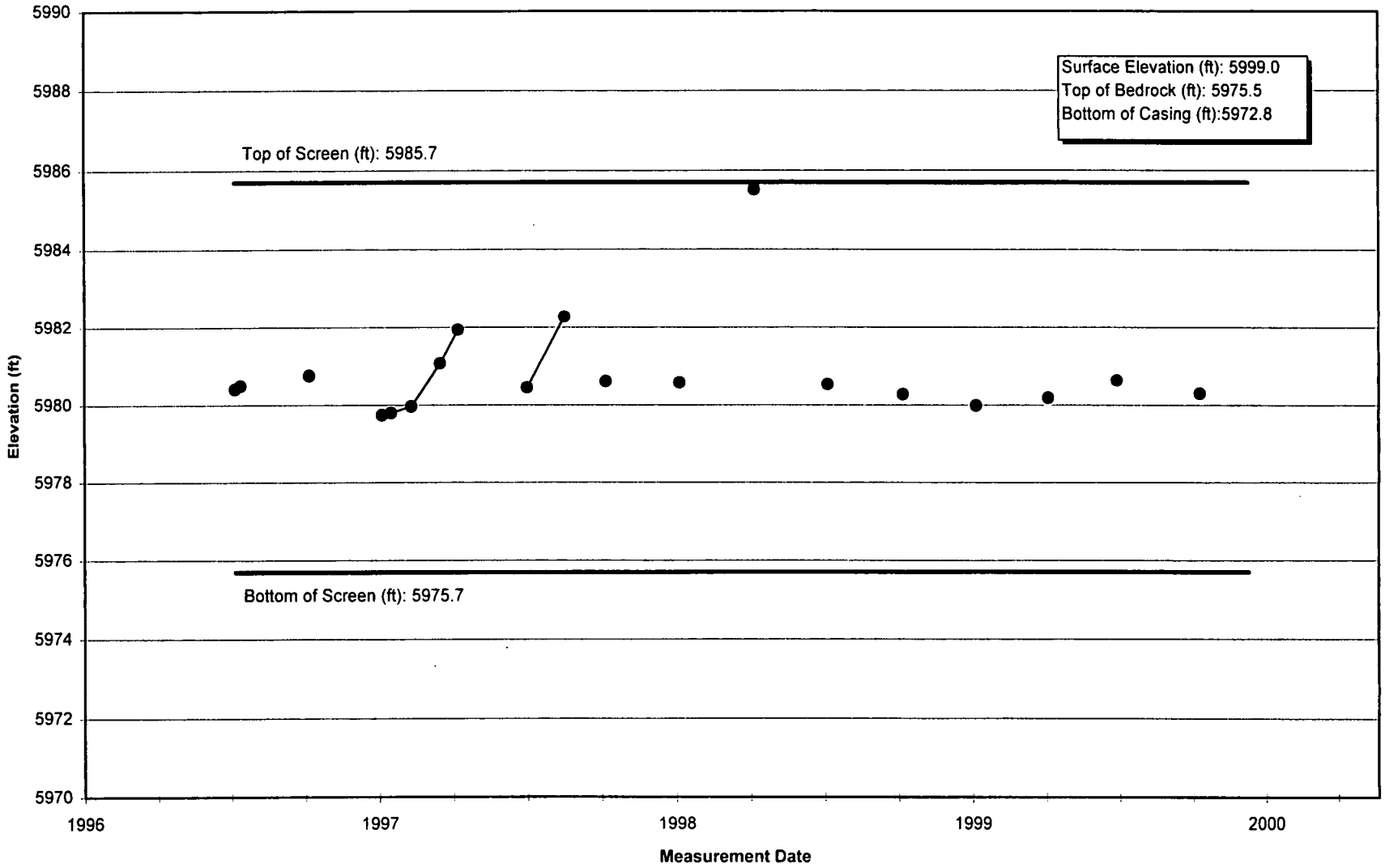

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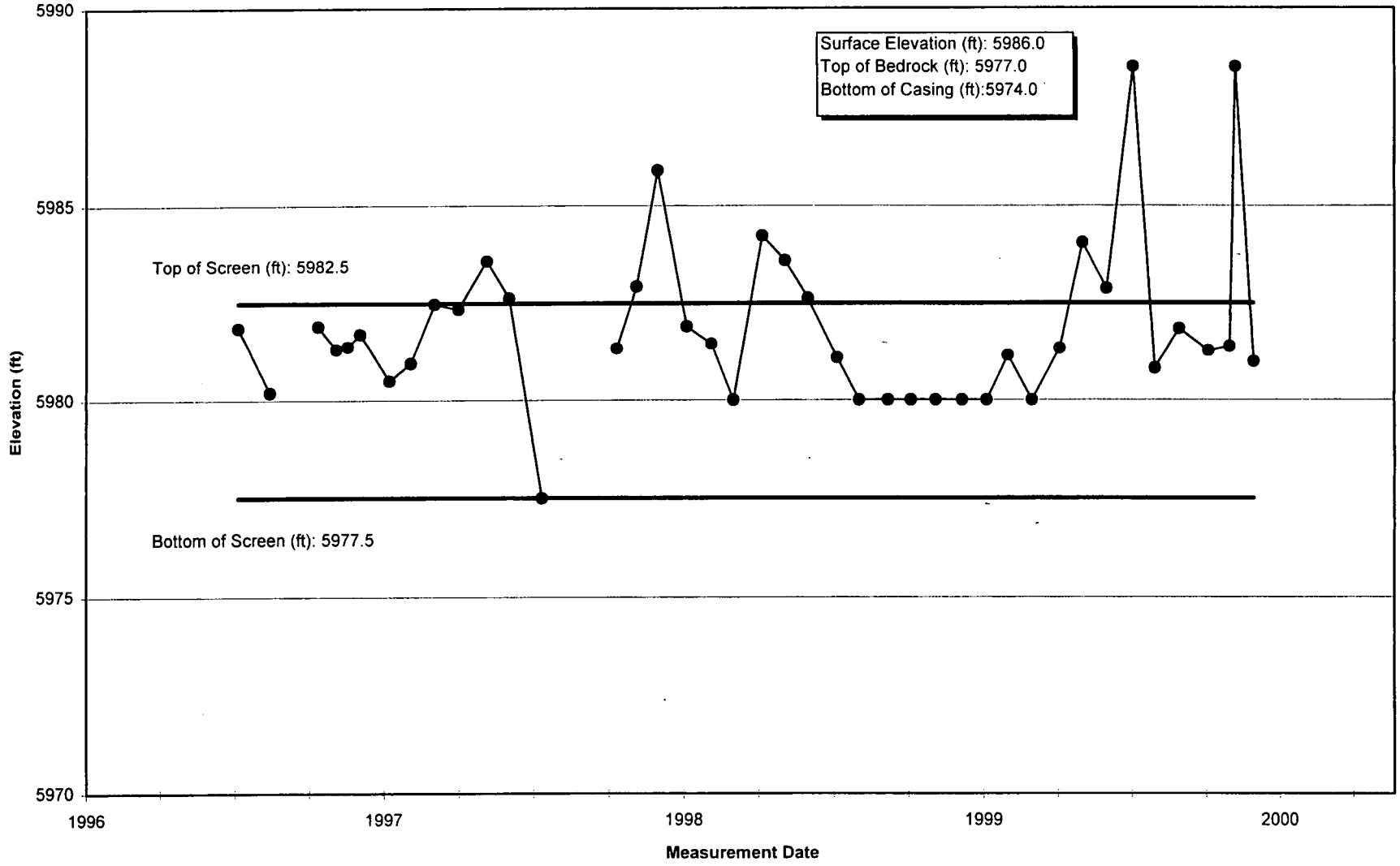
354

Hydrograph 22996



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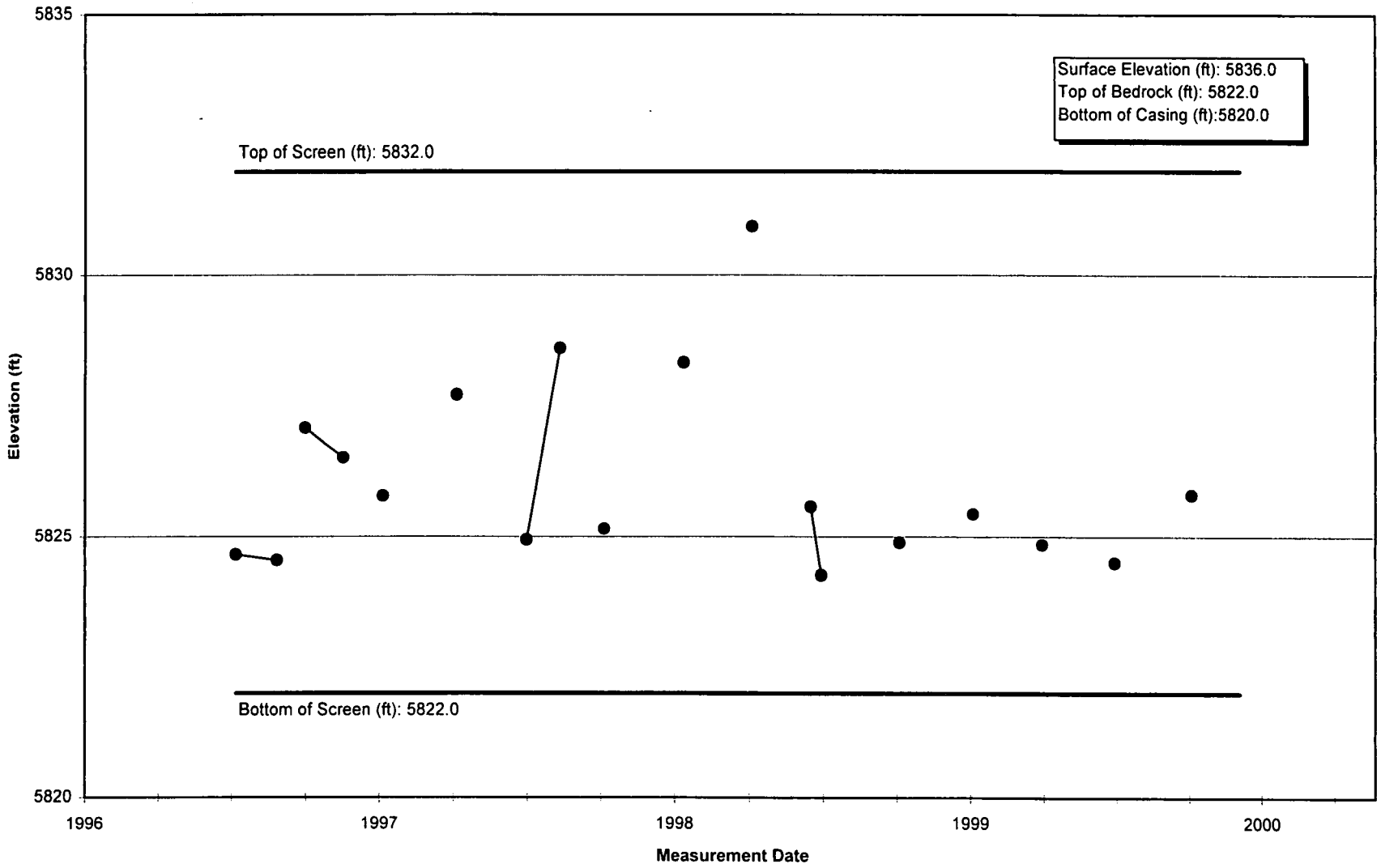
355

Hydrograph 23096



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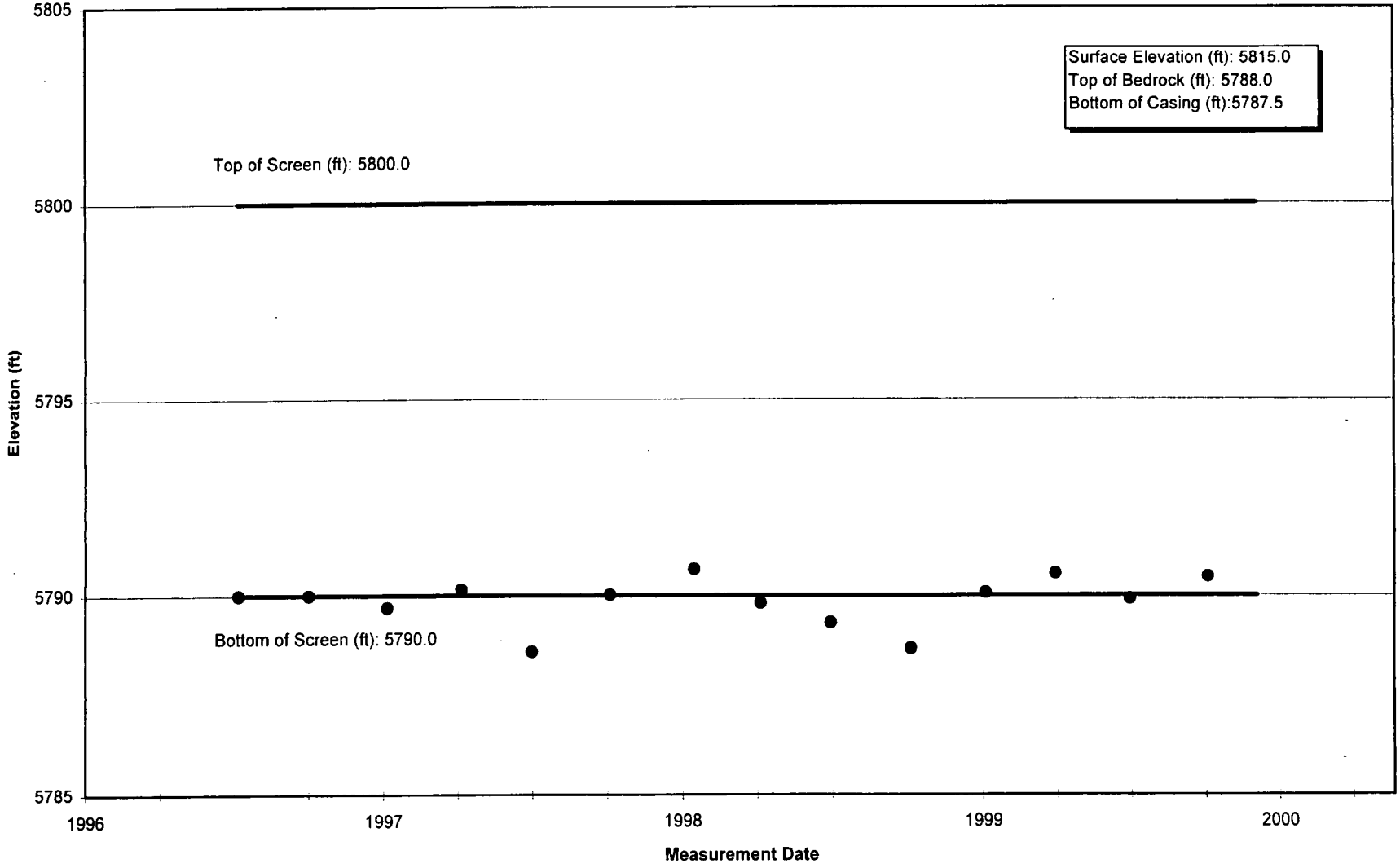
356

Hydrograph 23196



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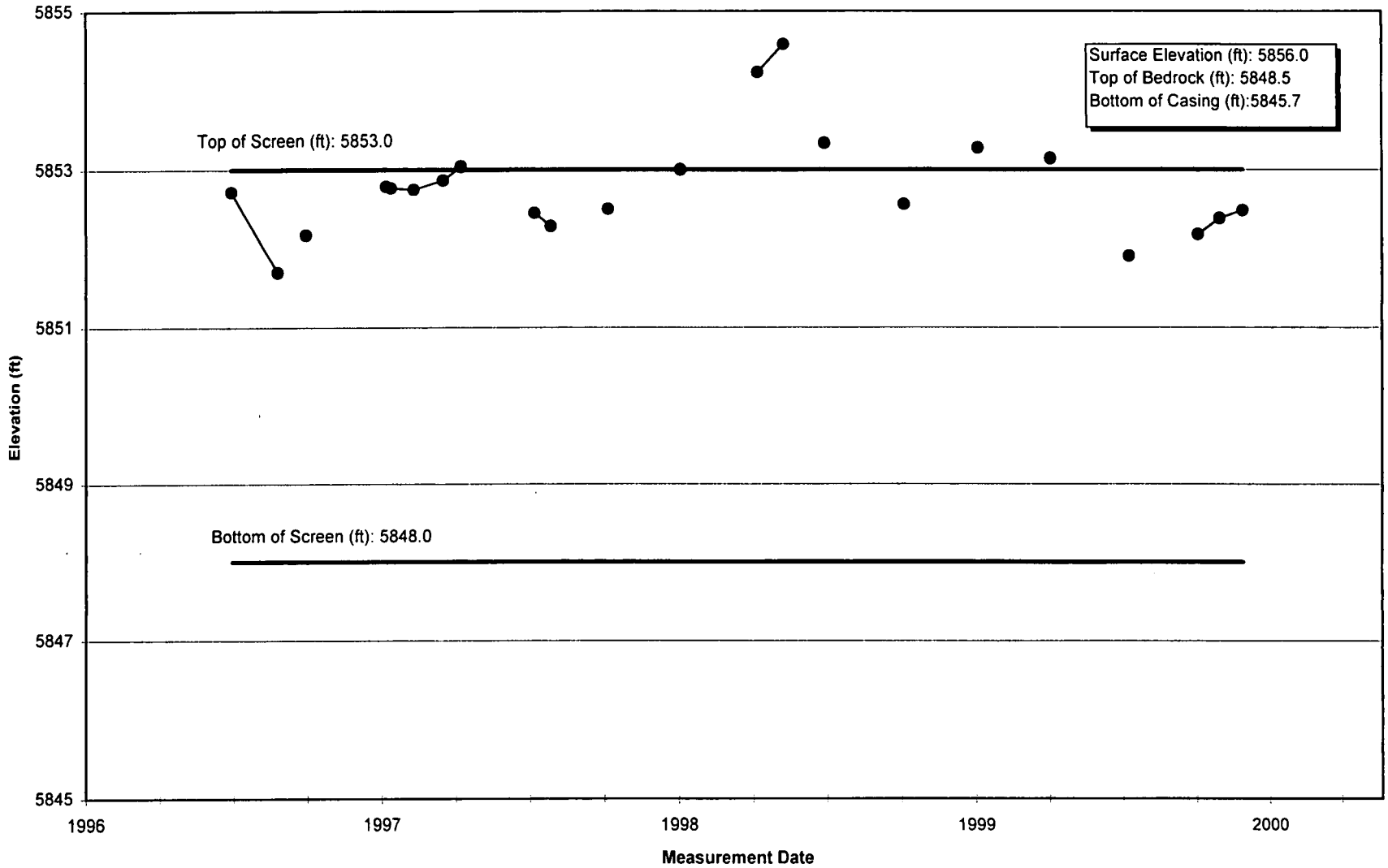
357

Hydrograph 23296



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358

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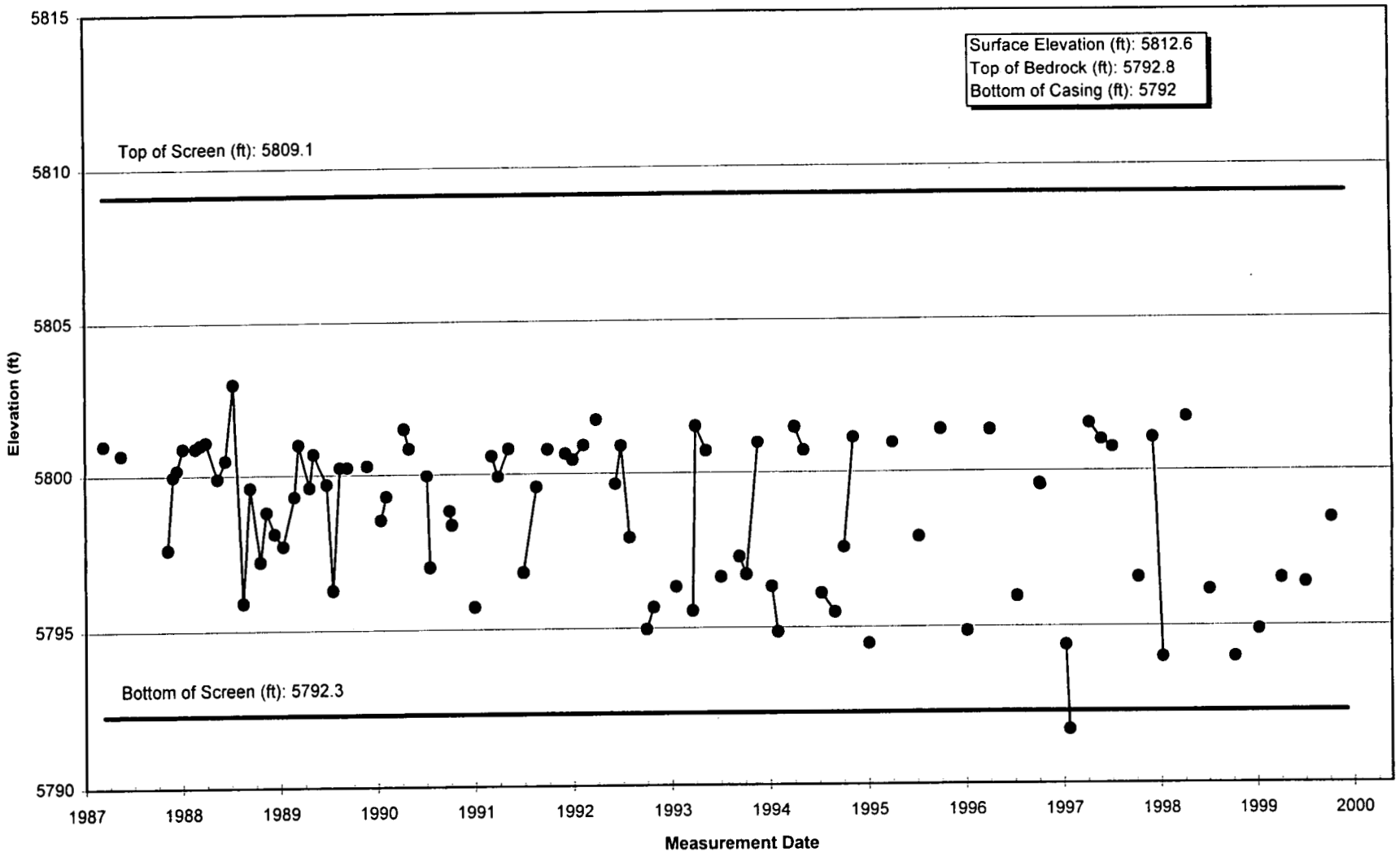

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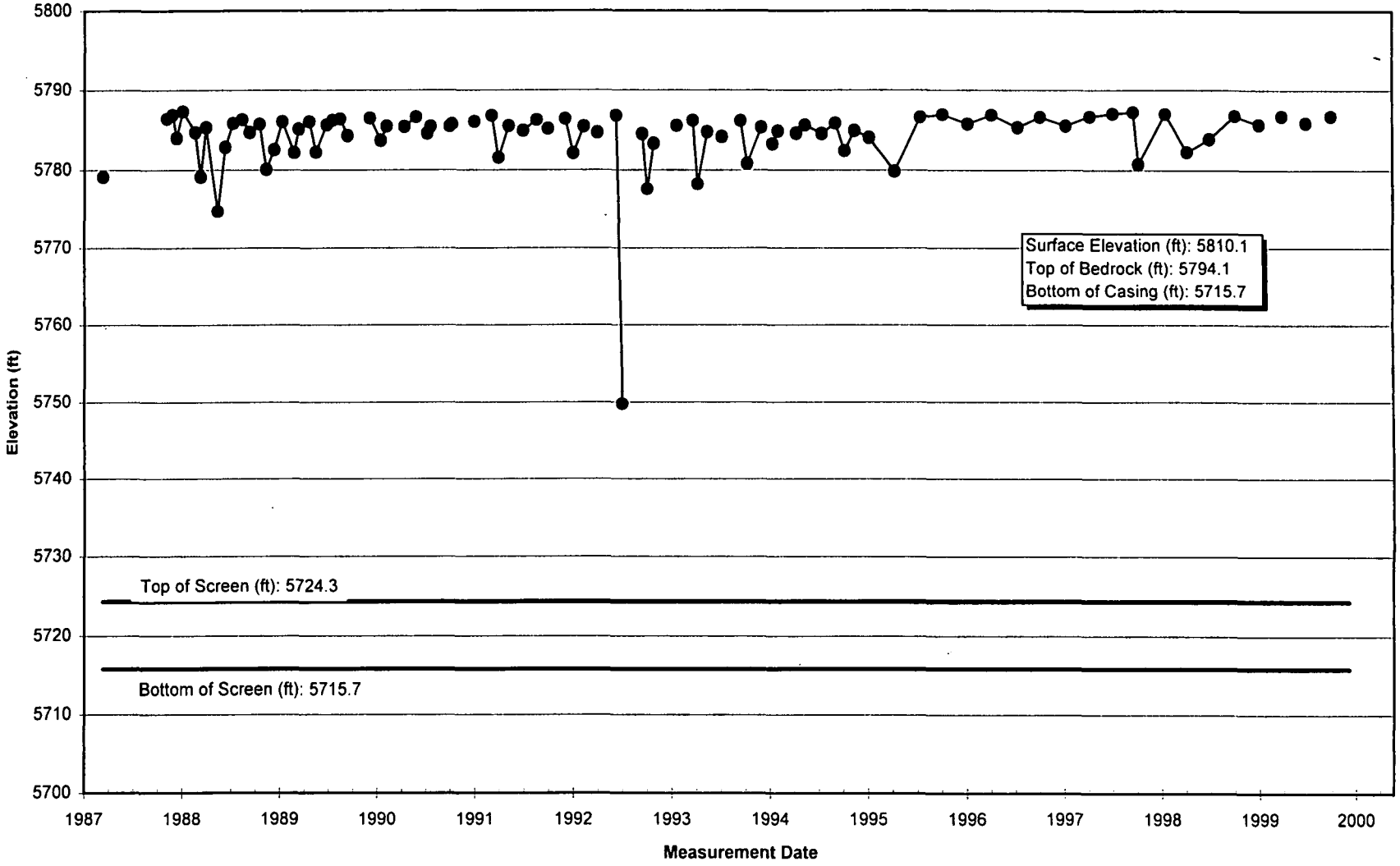
359

Hydrograph 3087



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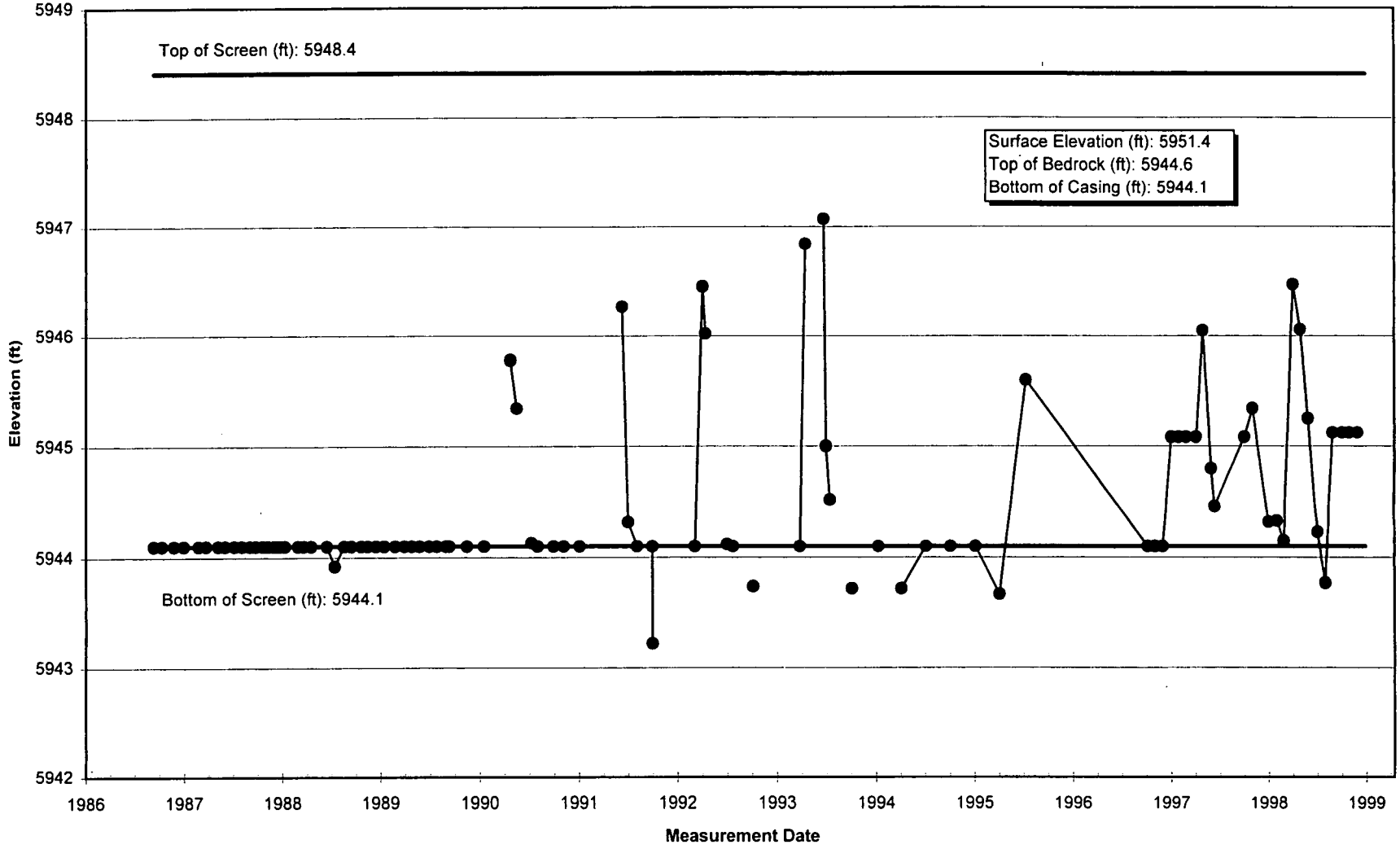
360

Hydrograph 3386



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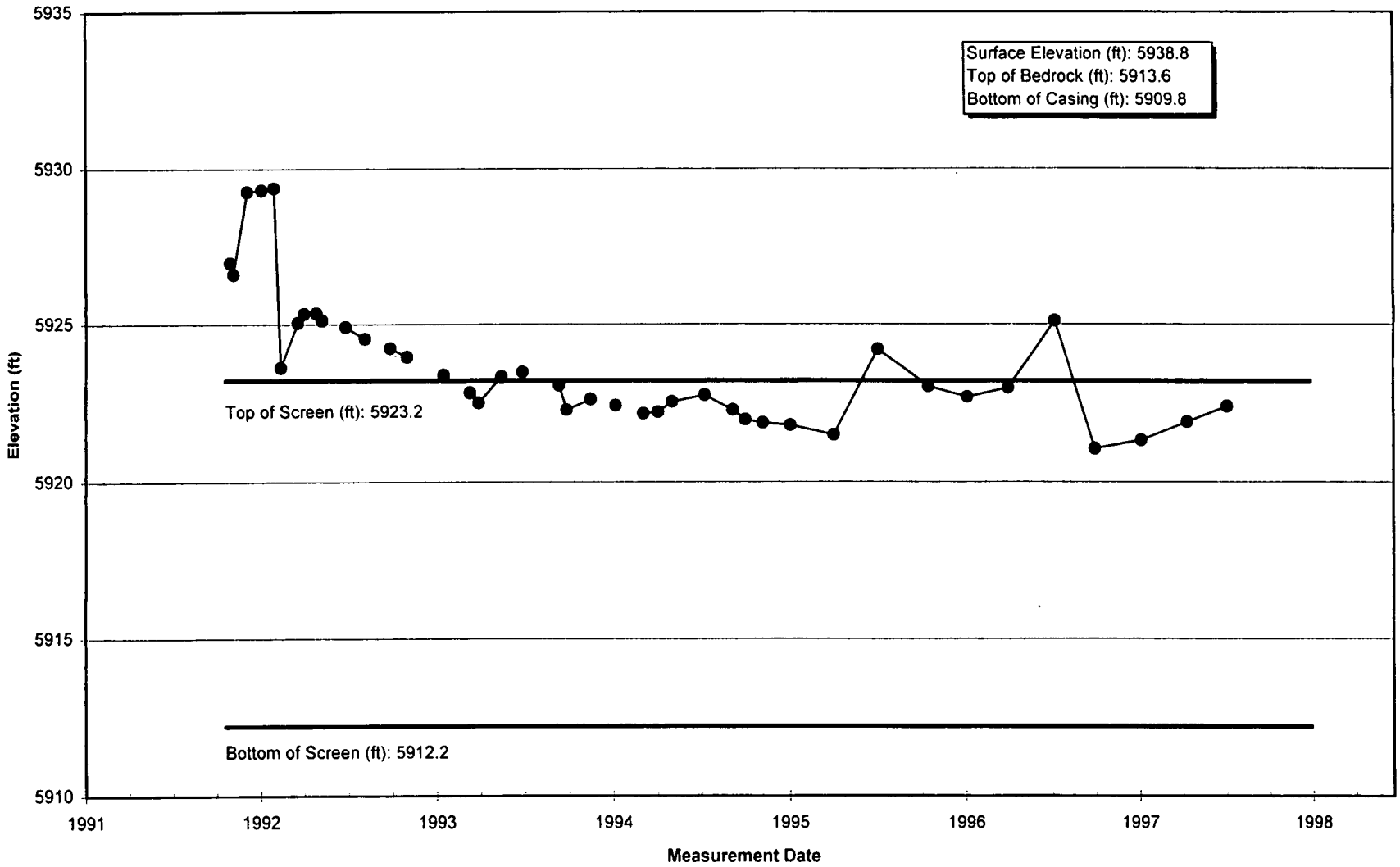
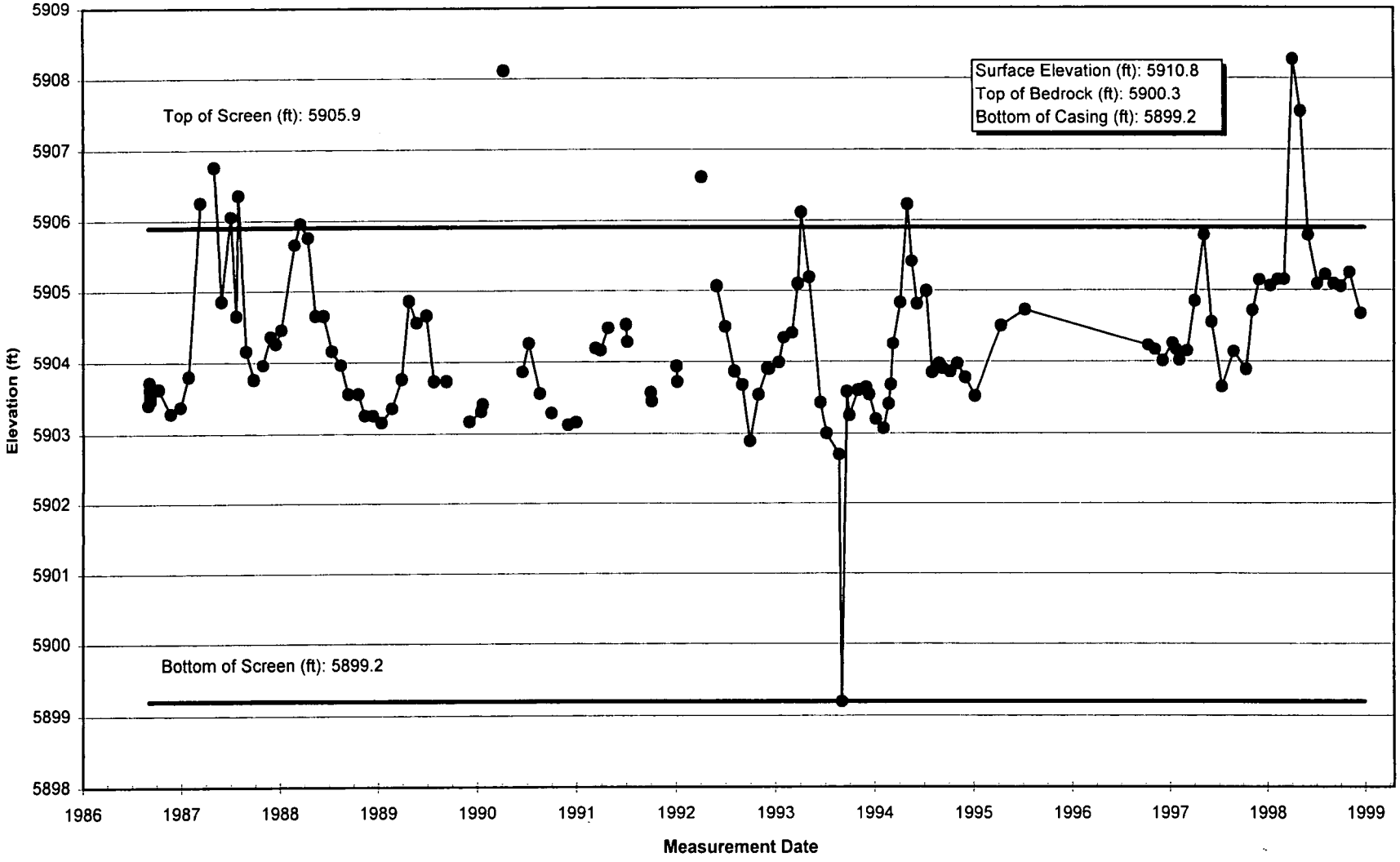
361

Hydrograph 35691



362

Hydrograph 3586



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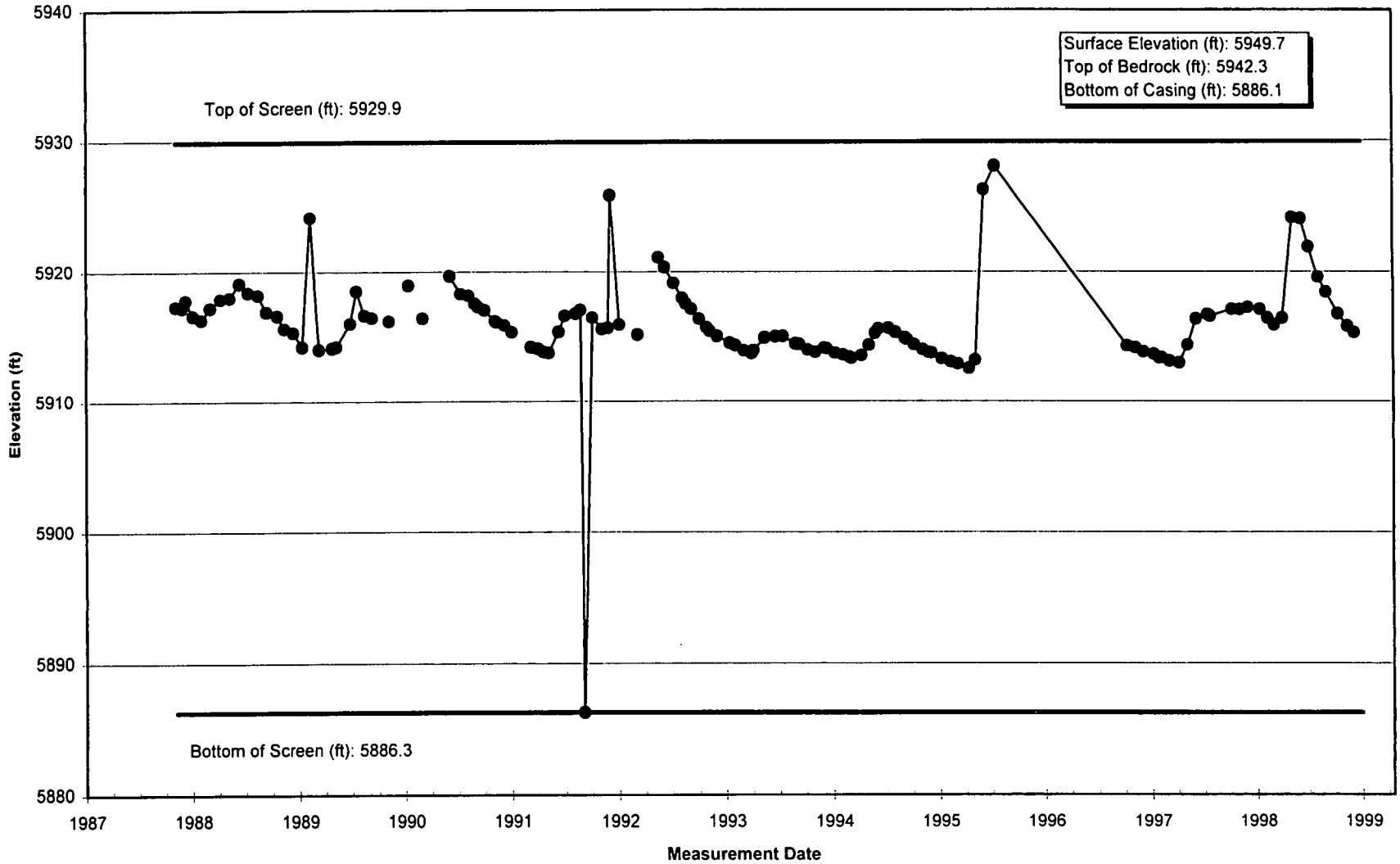
363

Hydrograph 3687



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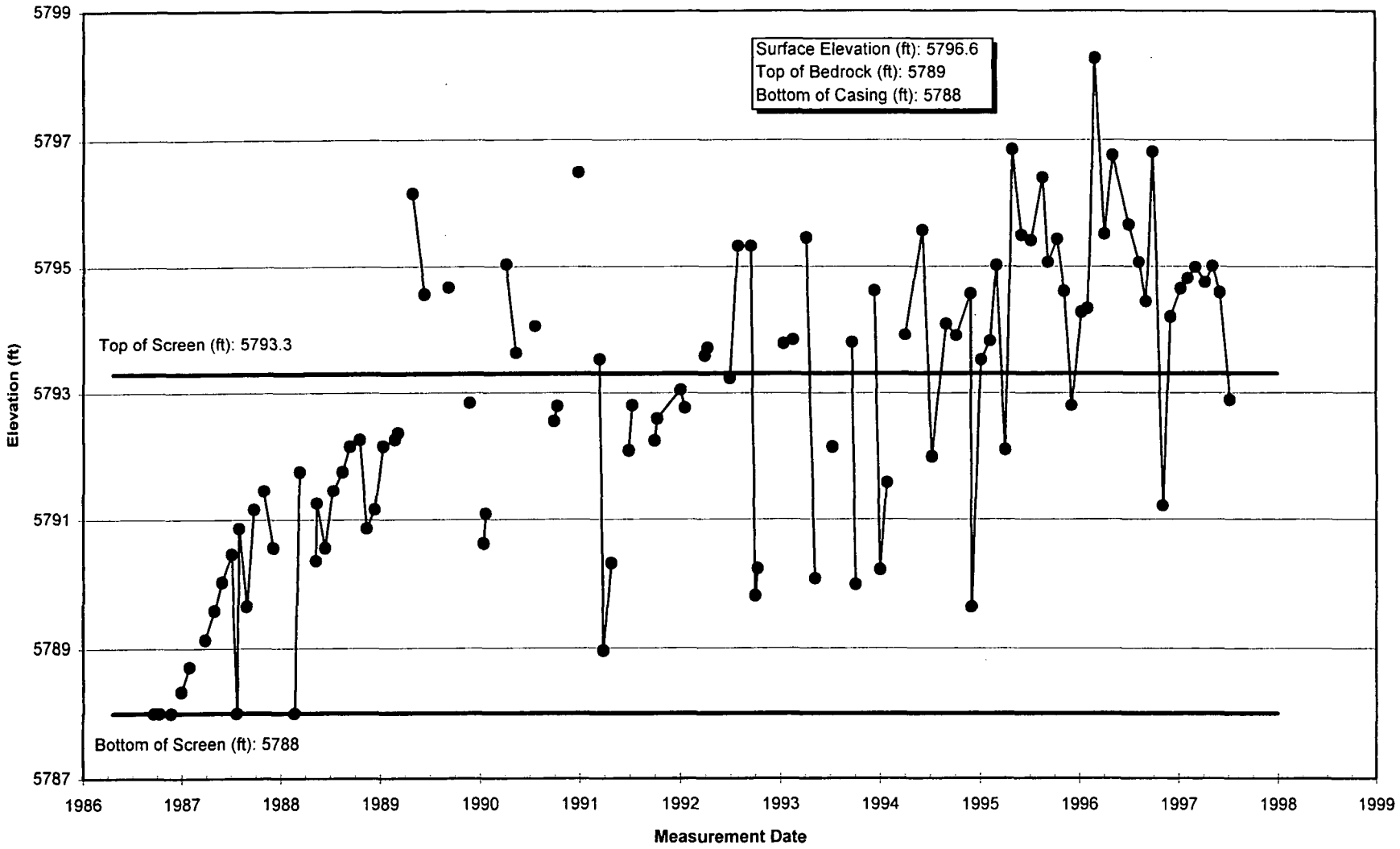
364

Hydrograph 3786



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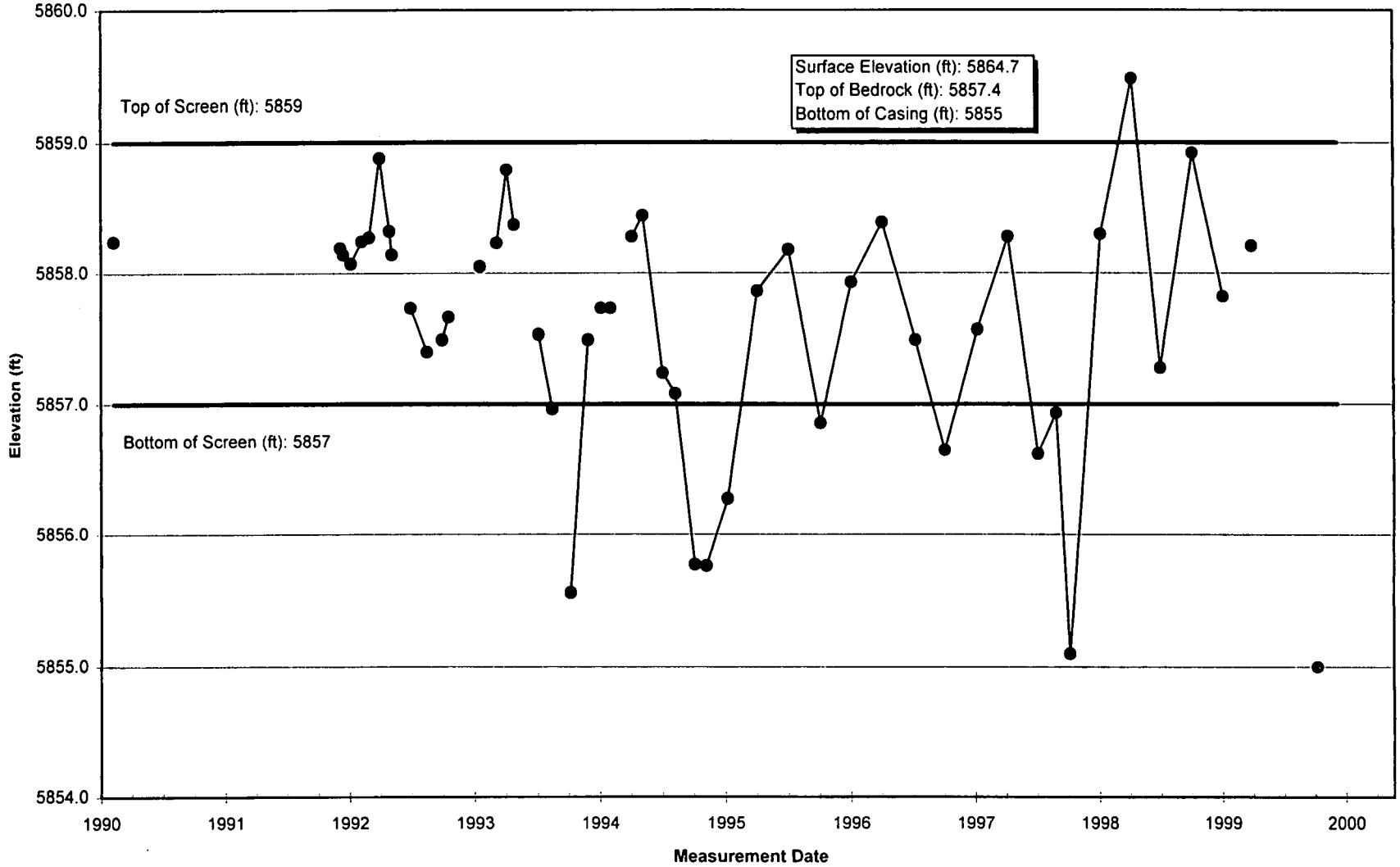
365

Hydrograph 38591



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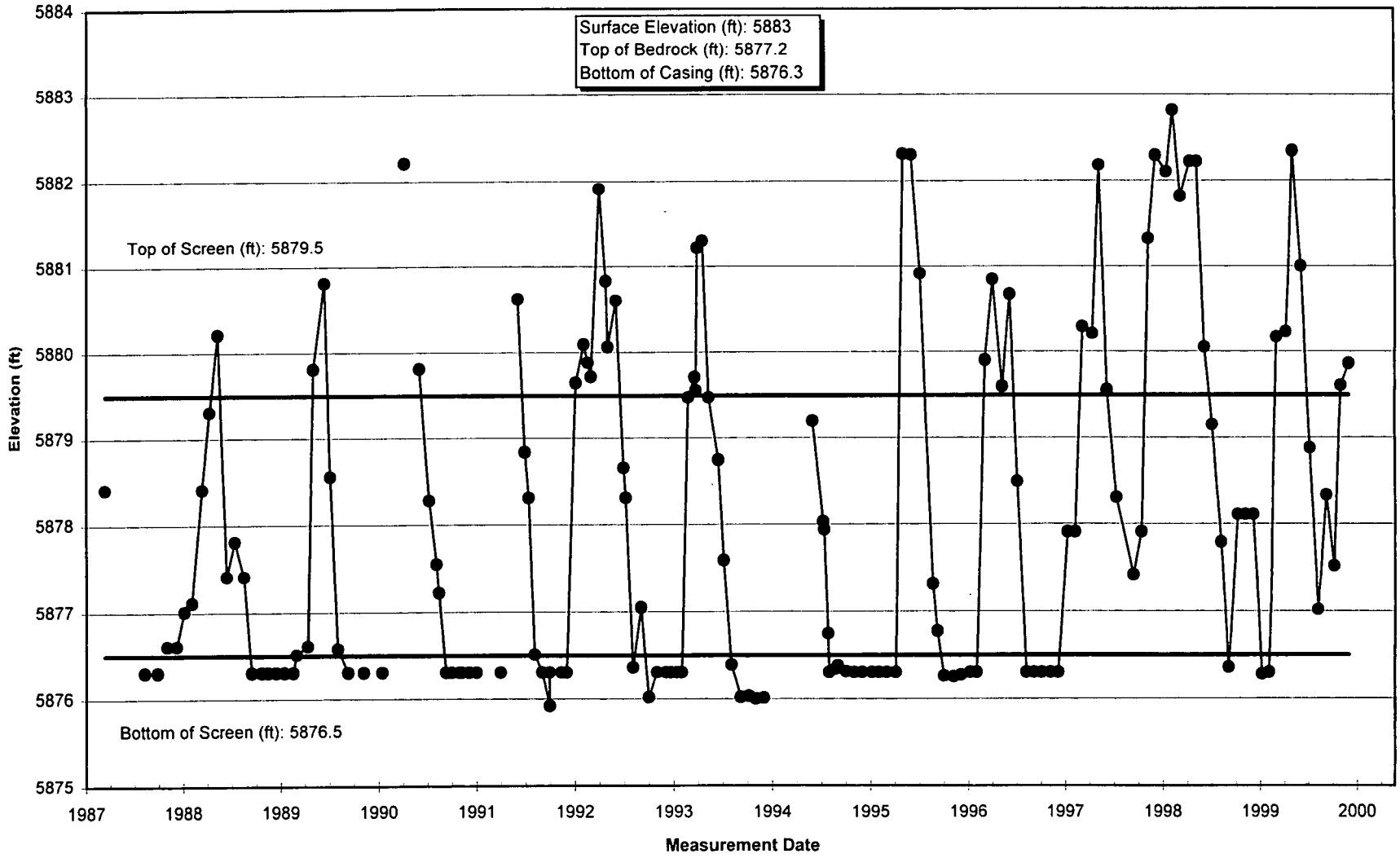
366

Hydrograph 4087



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367

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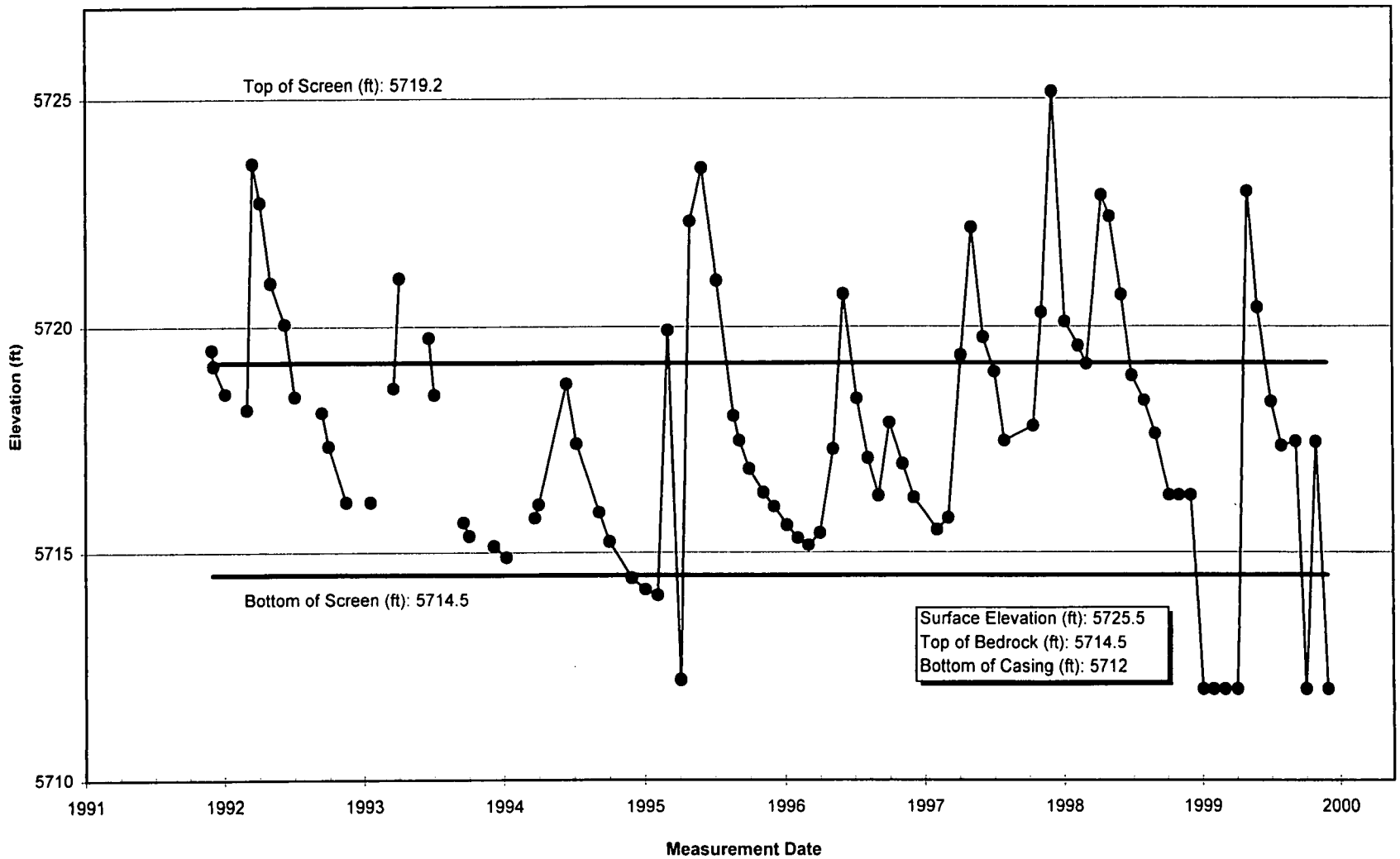

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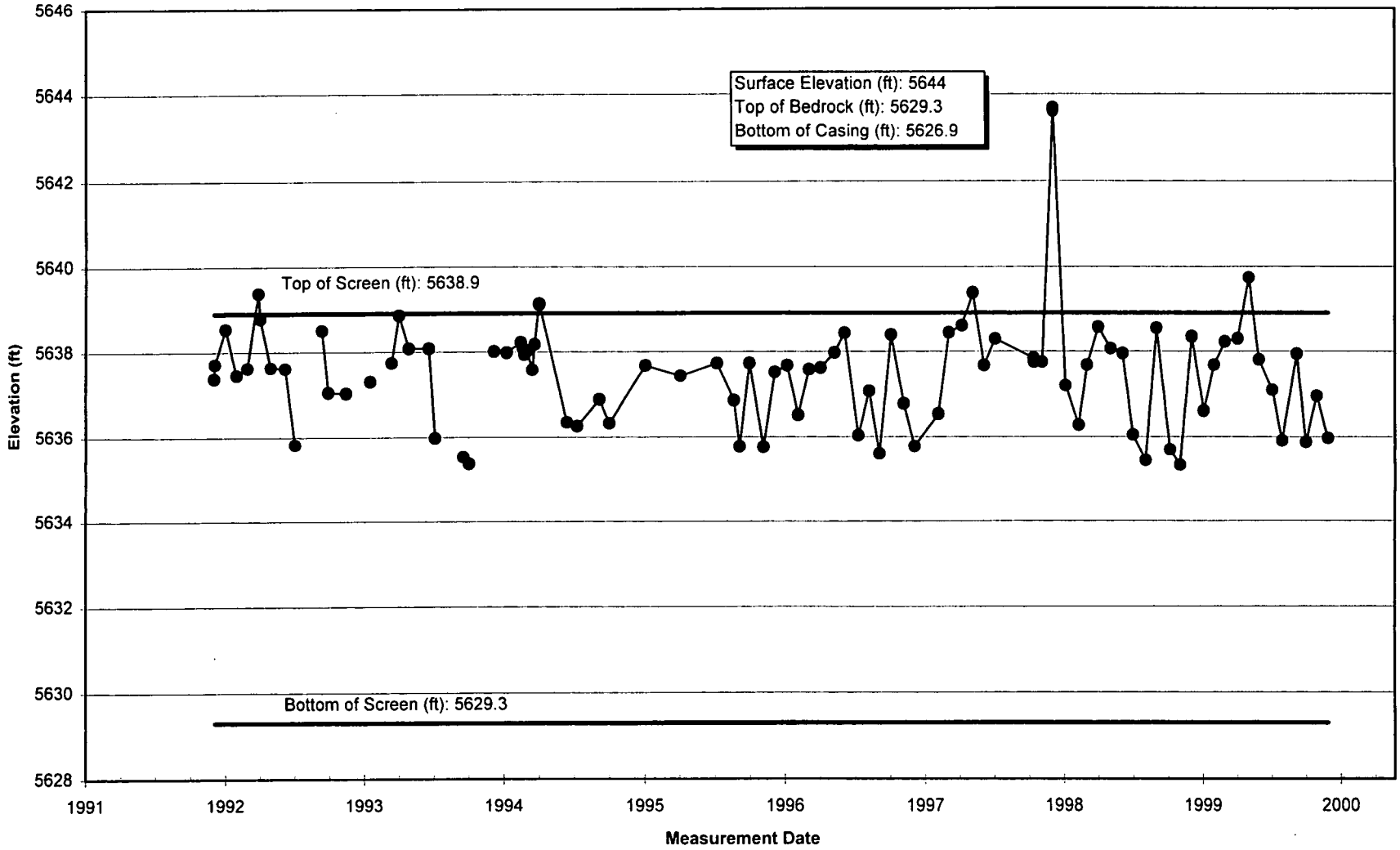
368

Hydrograph 41691



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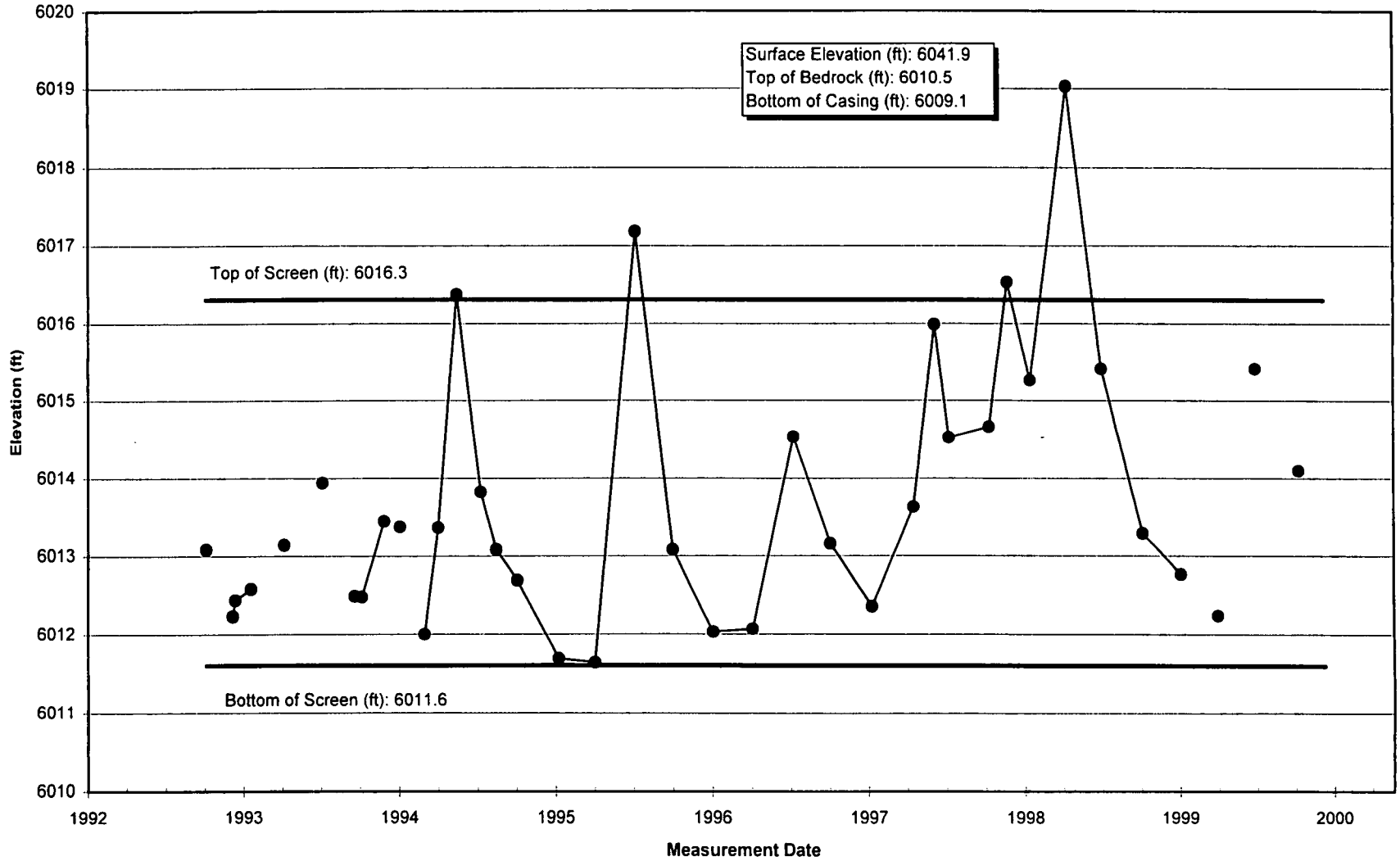
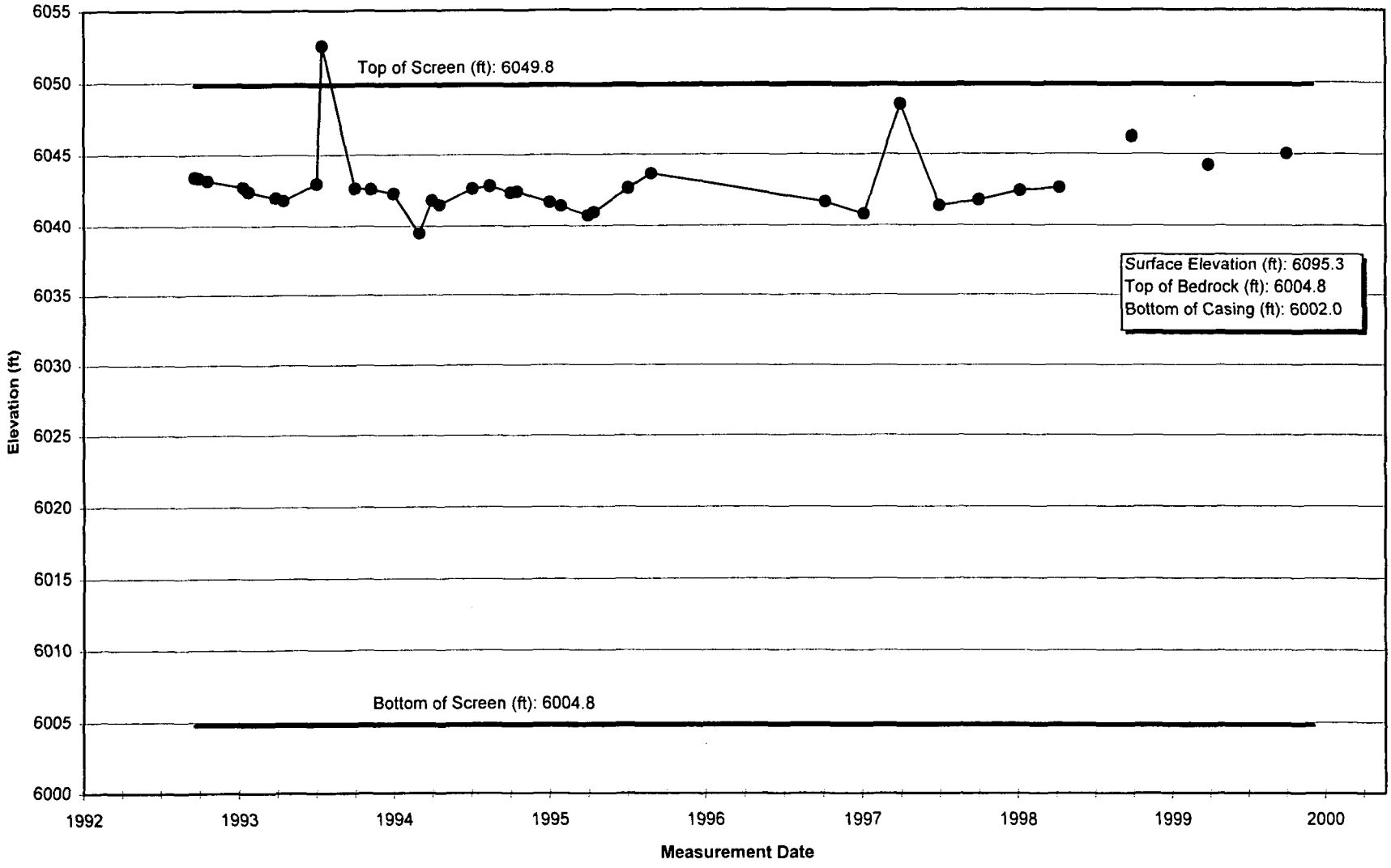
Hydrograph 43392



370

Hydrograph 46292



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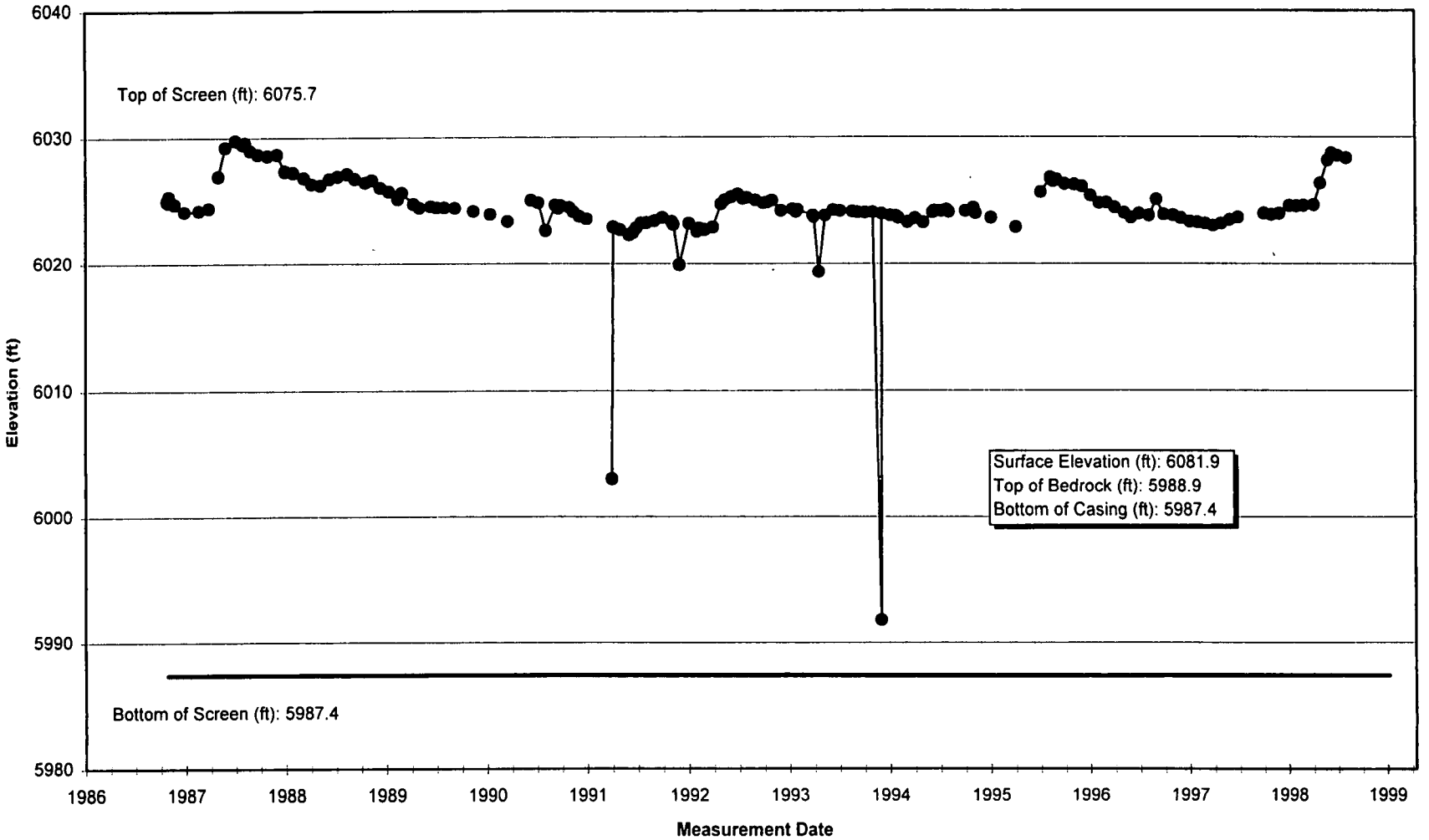
371

Hydrograph 4786



372

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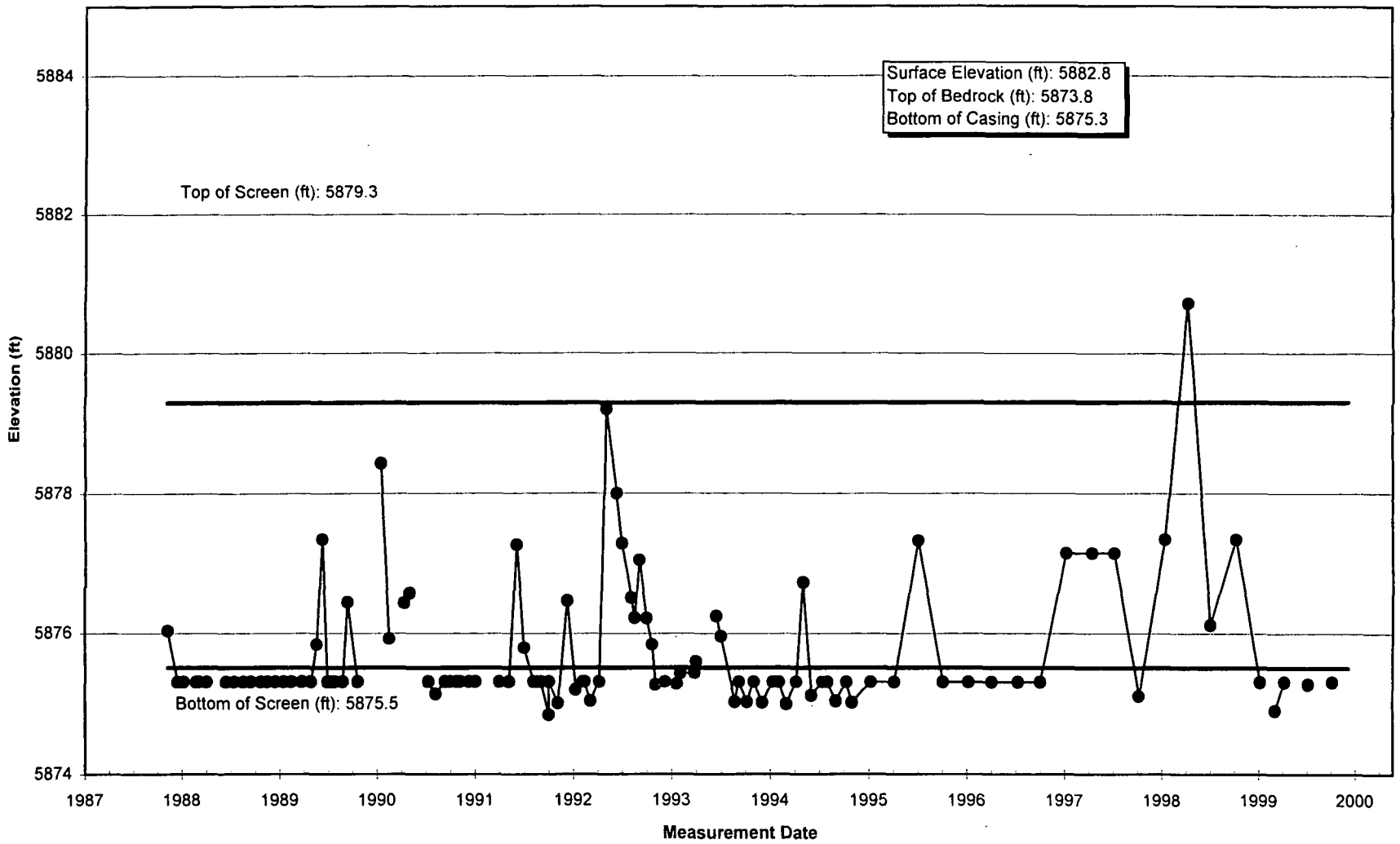

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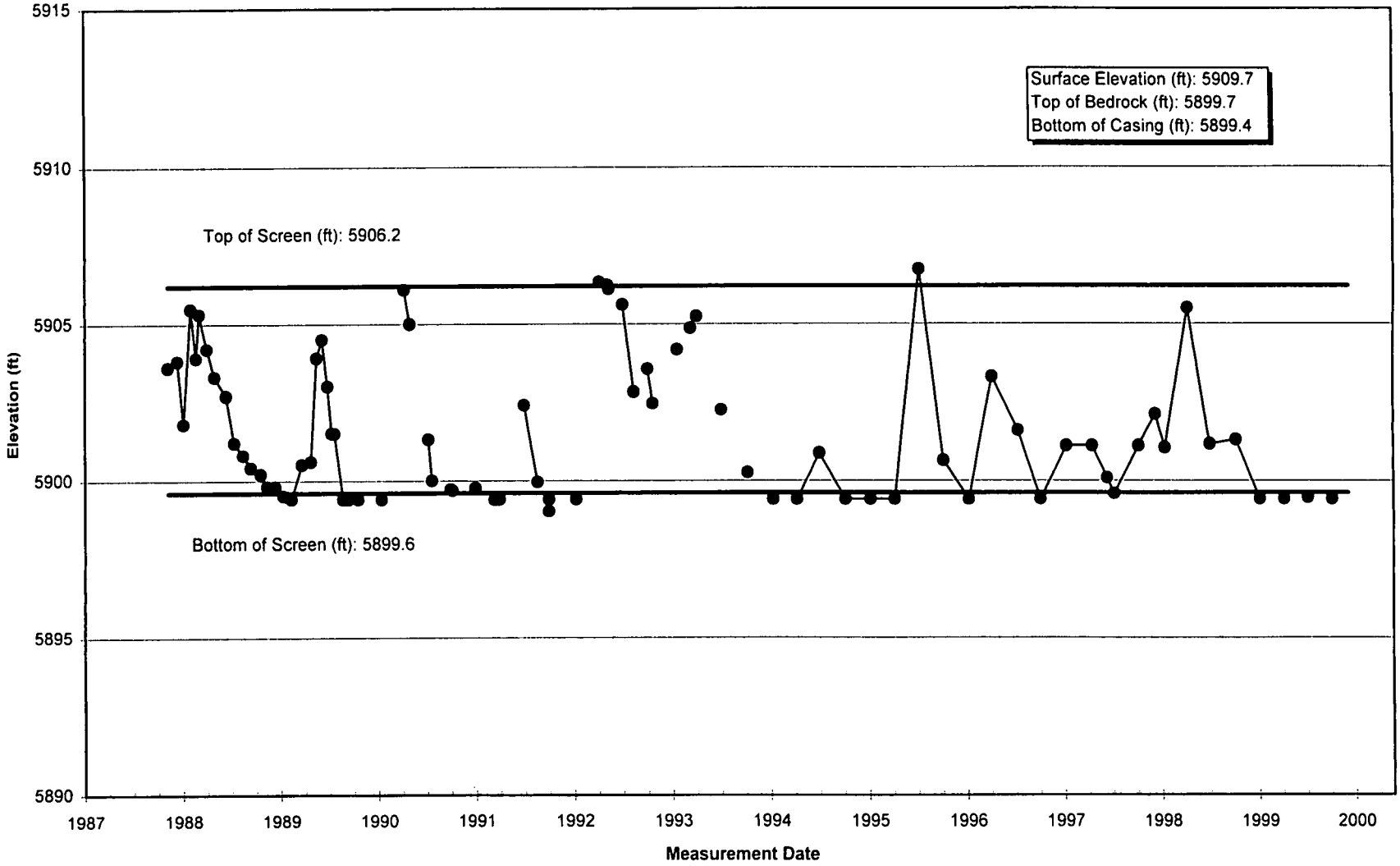
373

Hydrograph 4887



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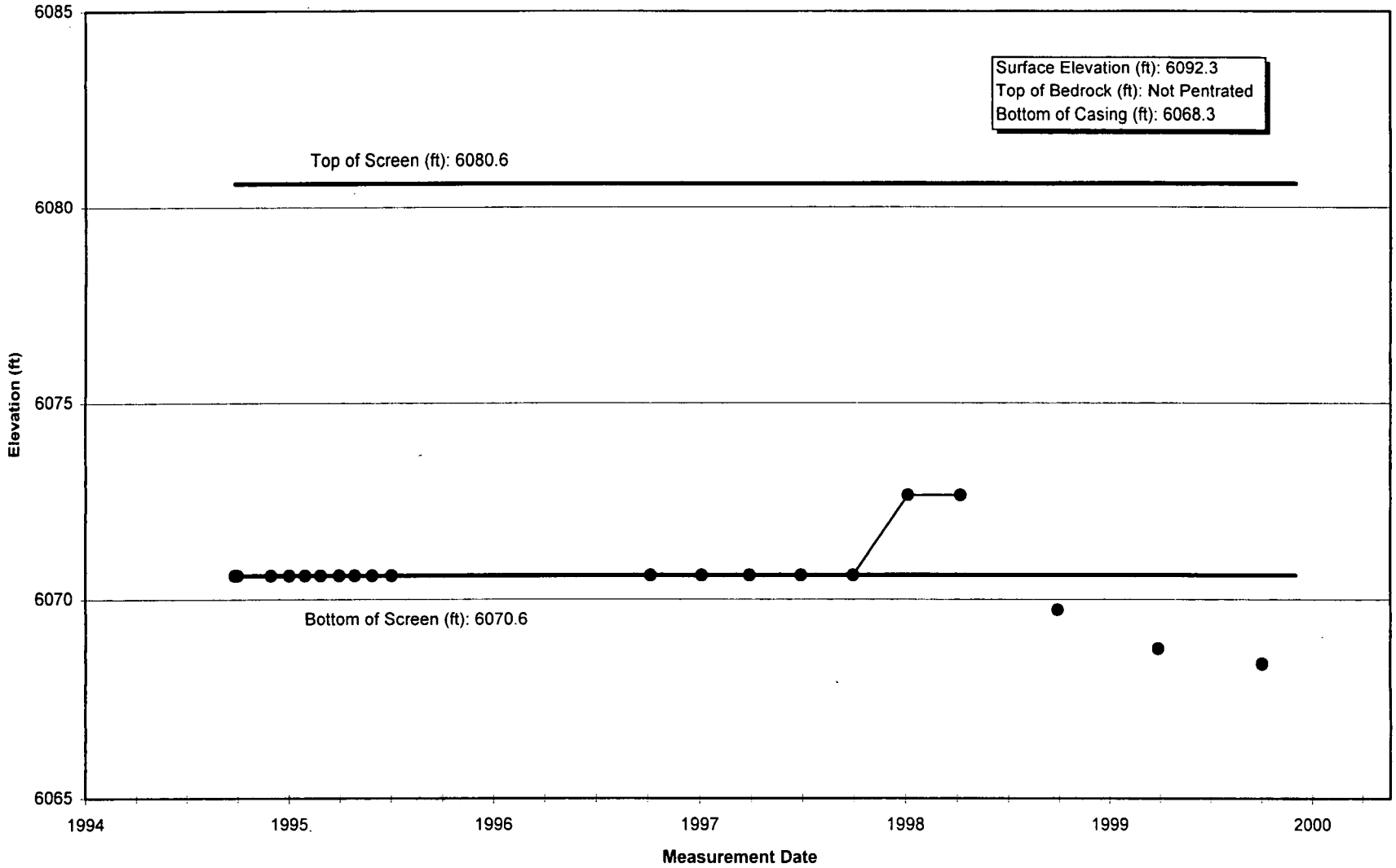
374

Hydrograph 50494



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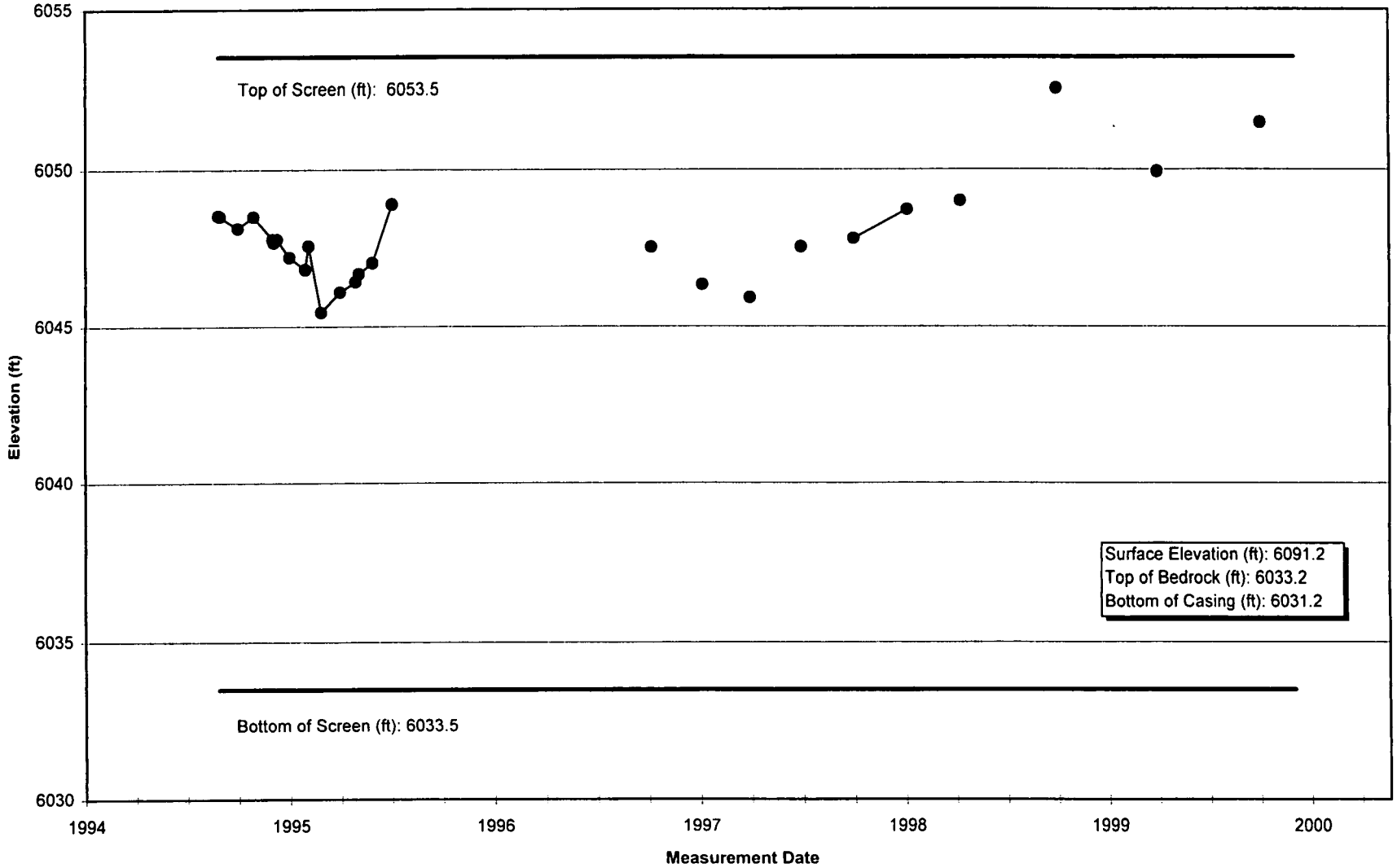
375

Hydrograph 51094



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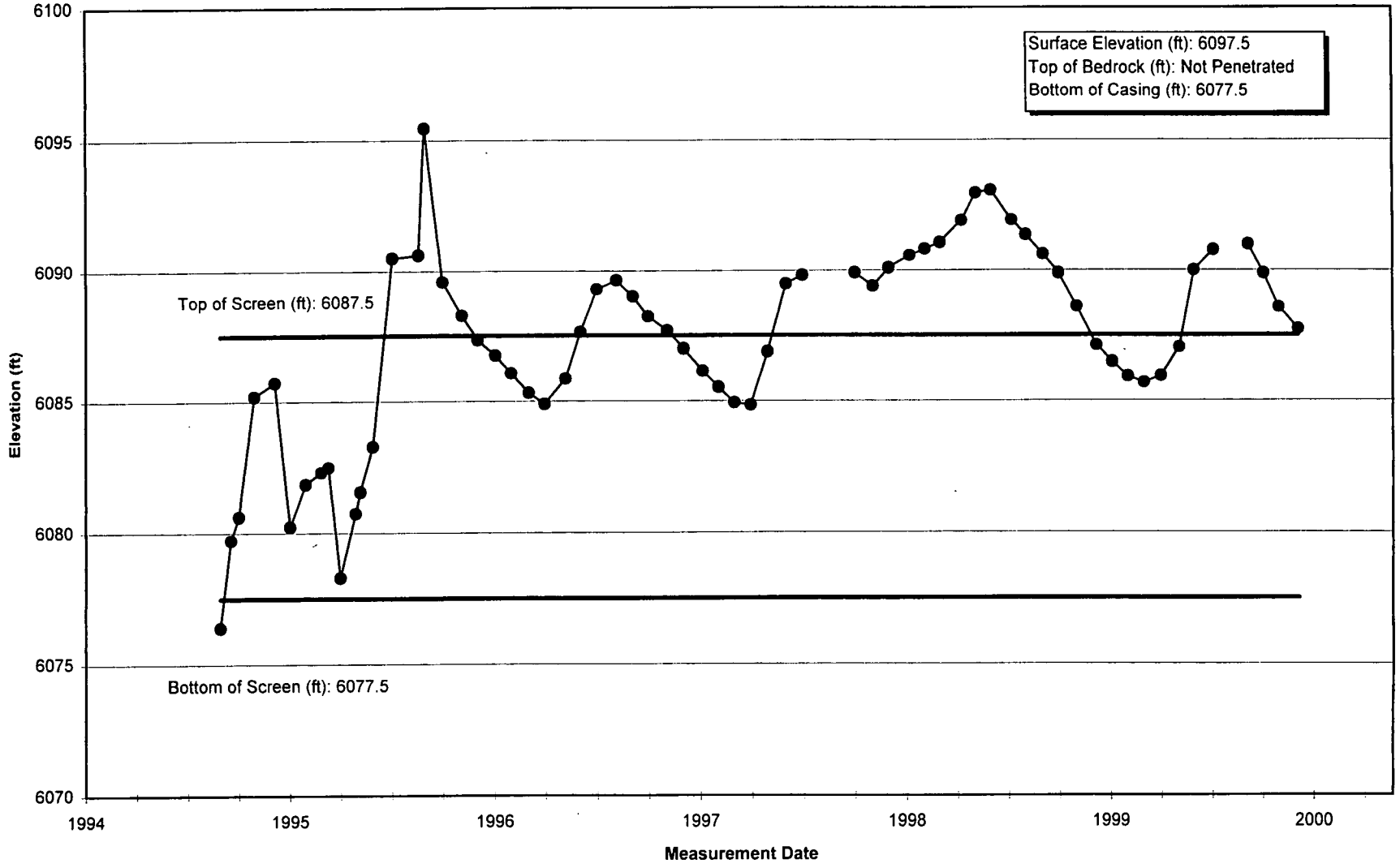
376

Hydrograph 51594



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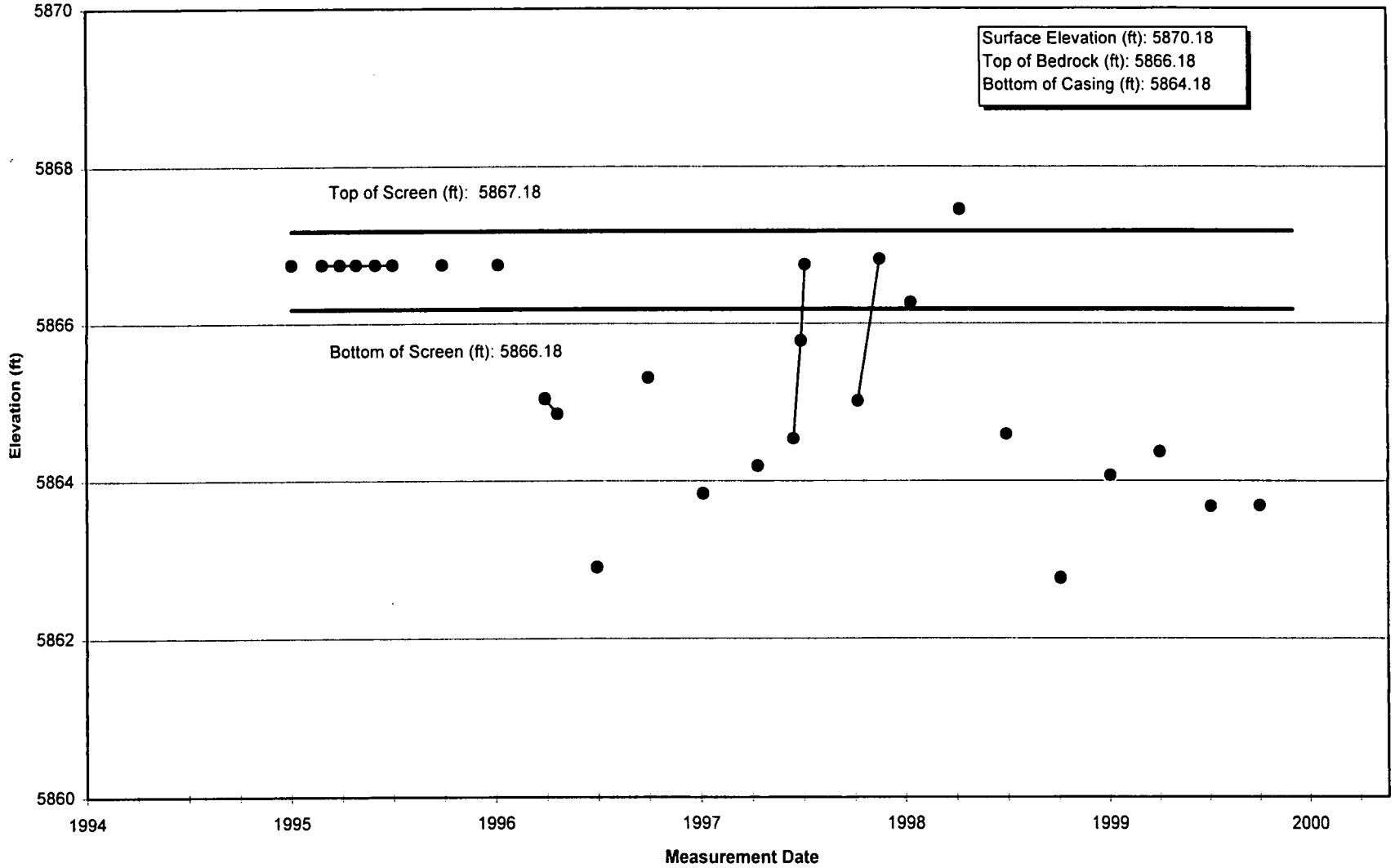
377

Hydrograph 52894



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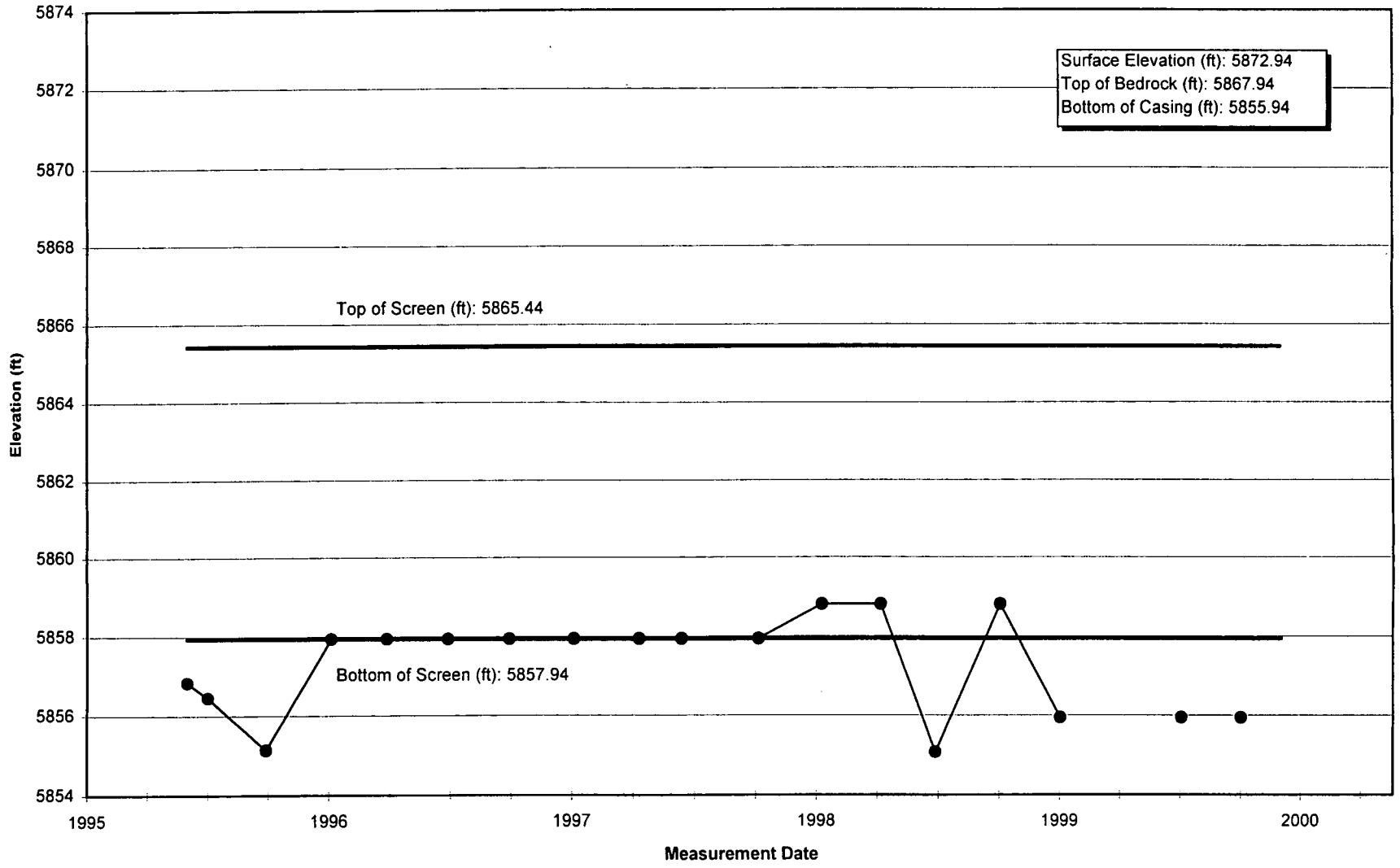
378

Hydrograph 52994



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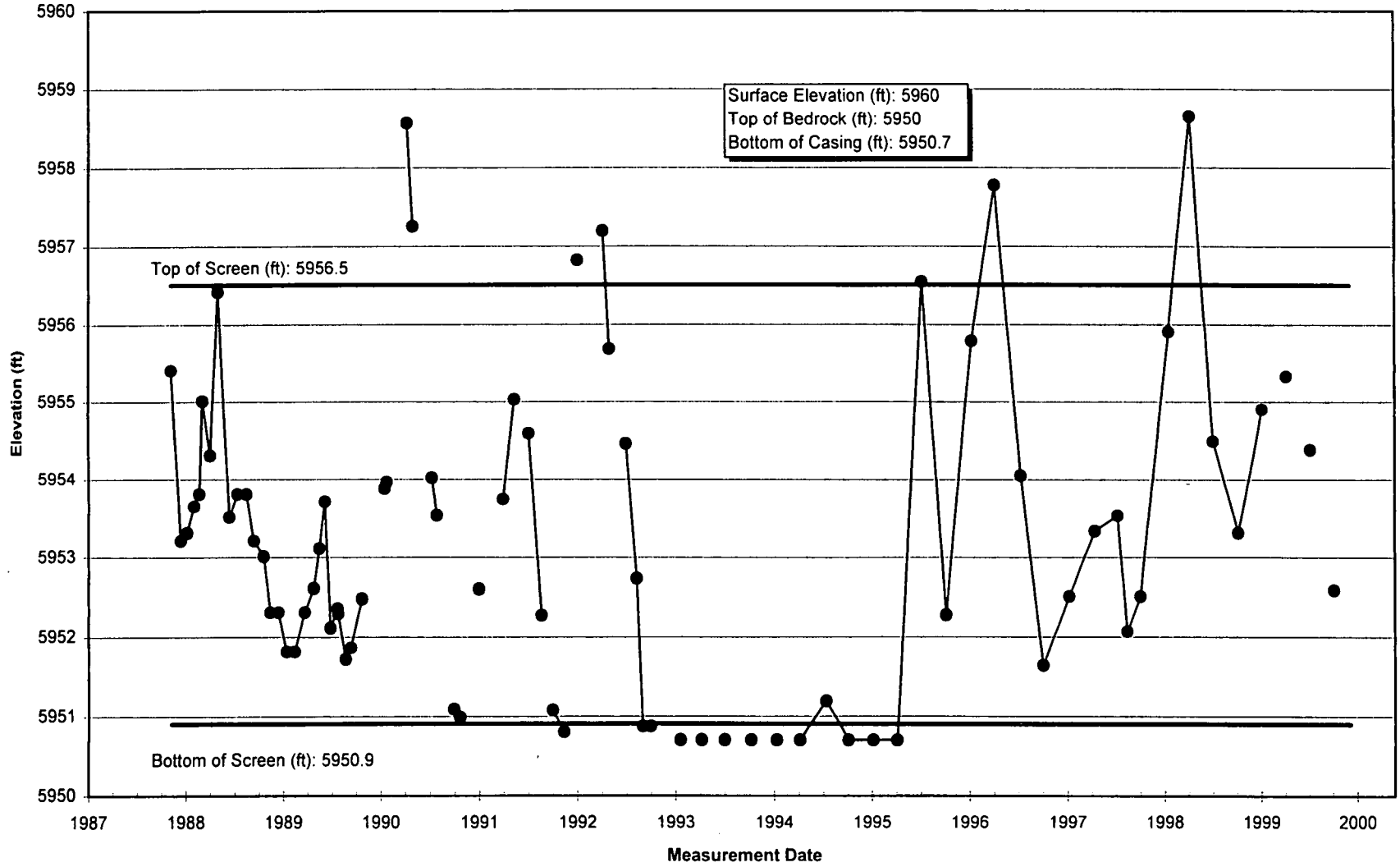
374

Hydrograph 5387



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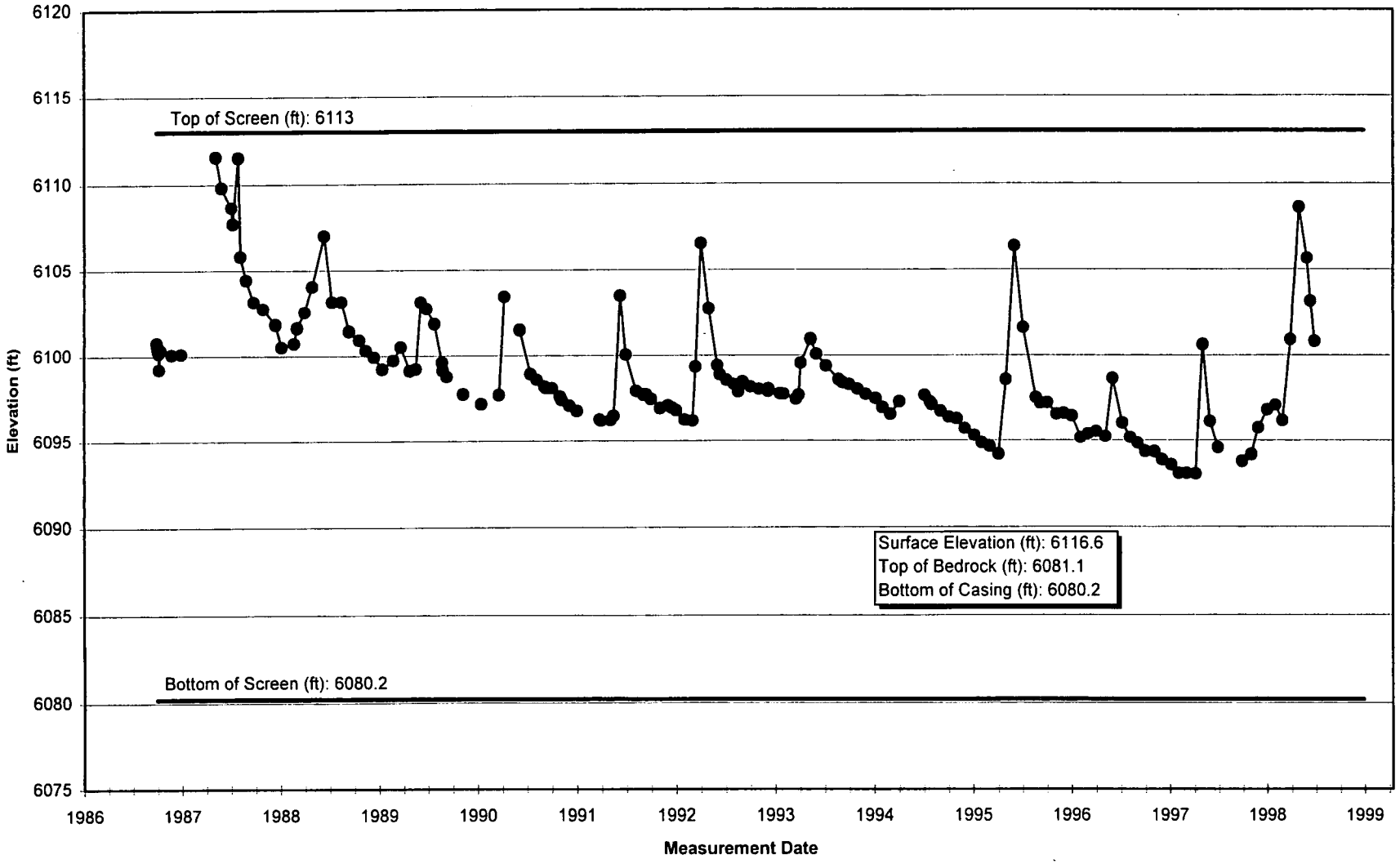
380

Hydrograph 5586



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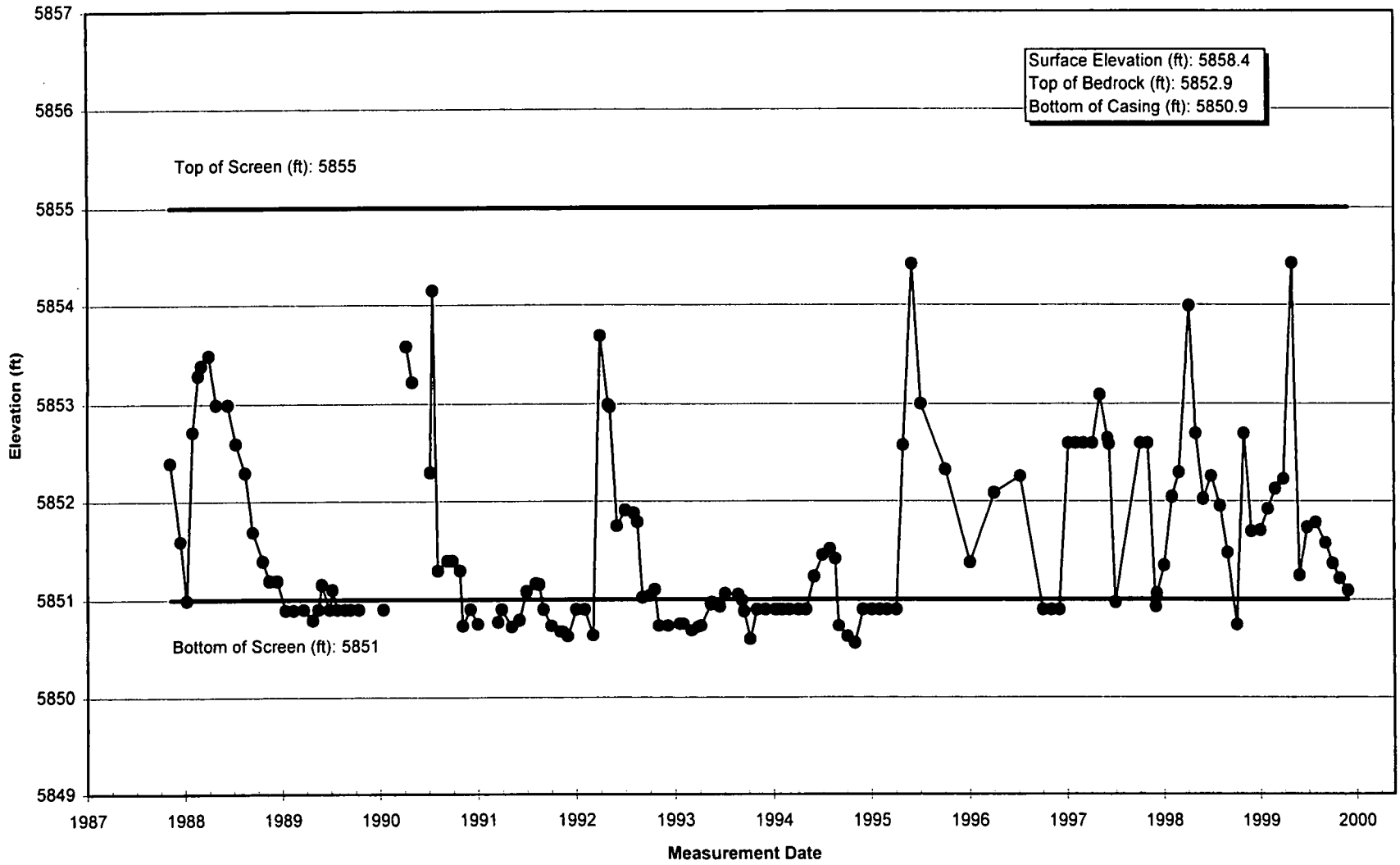
381

Hydrograph 5587



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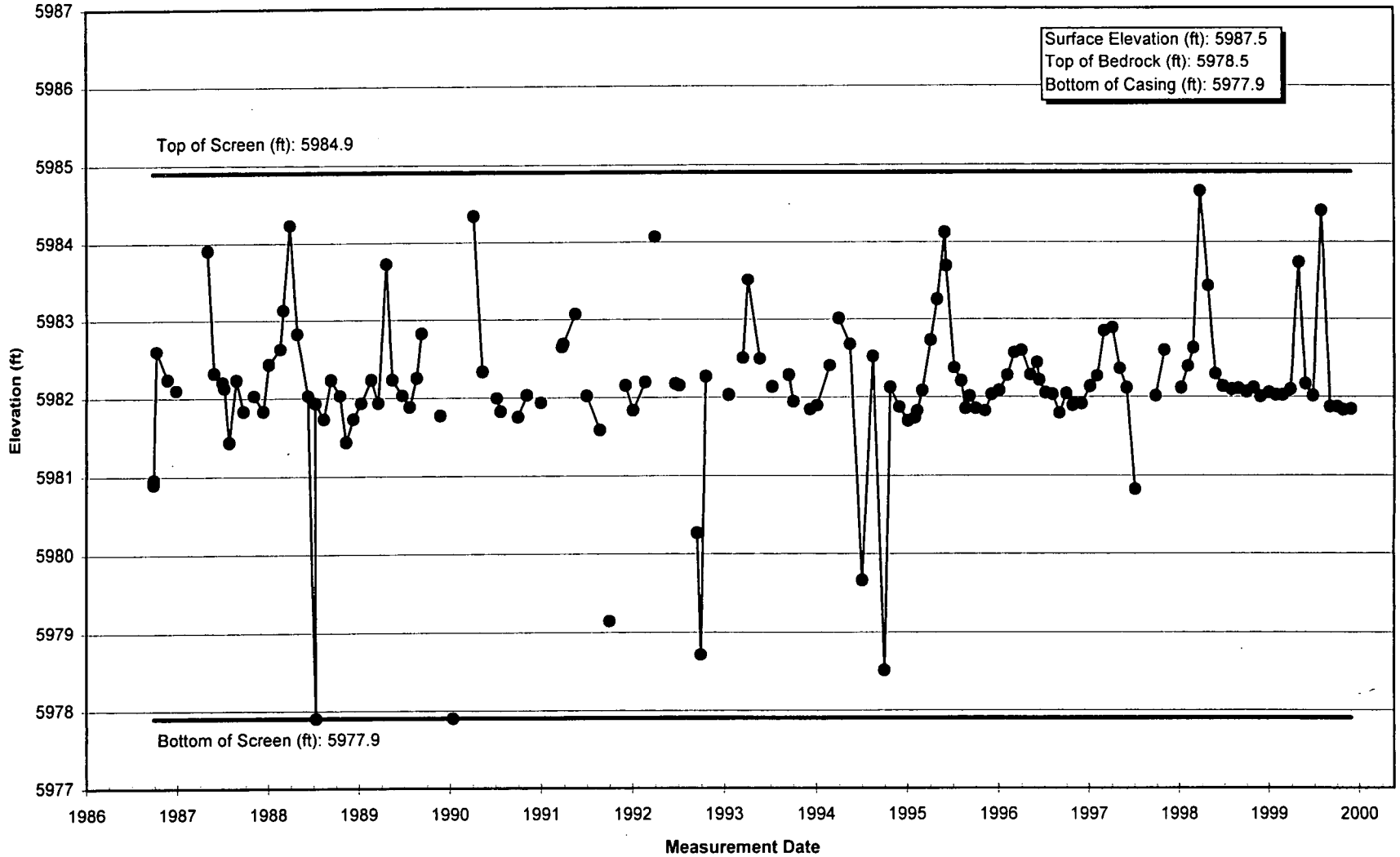
382

Hydrograph 5686



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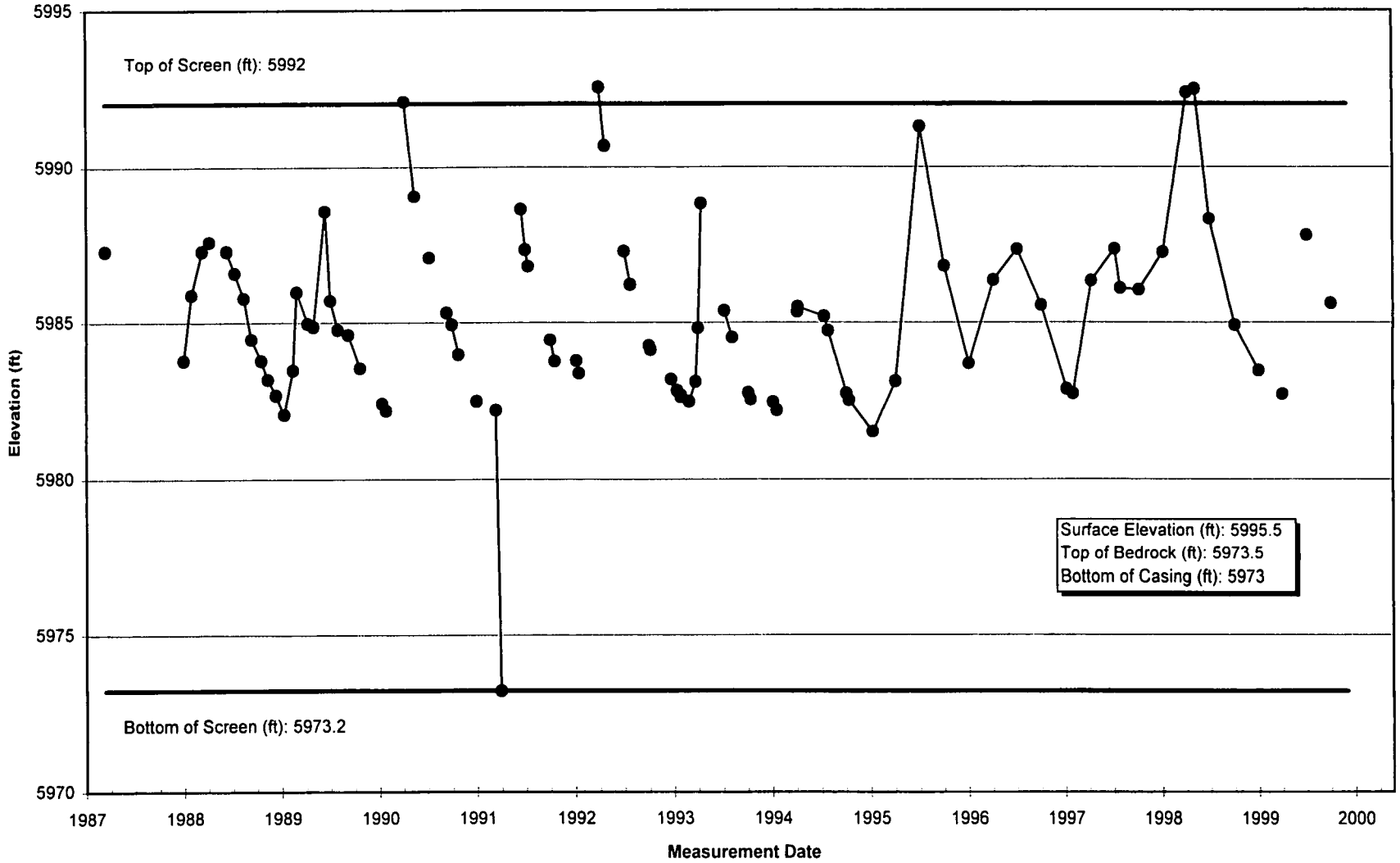
383

Hydrograph 5887



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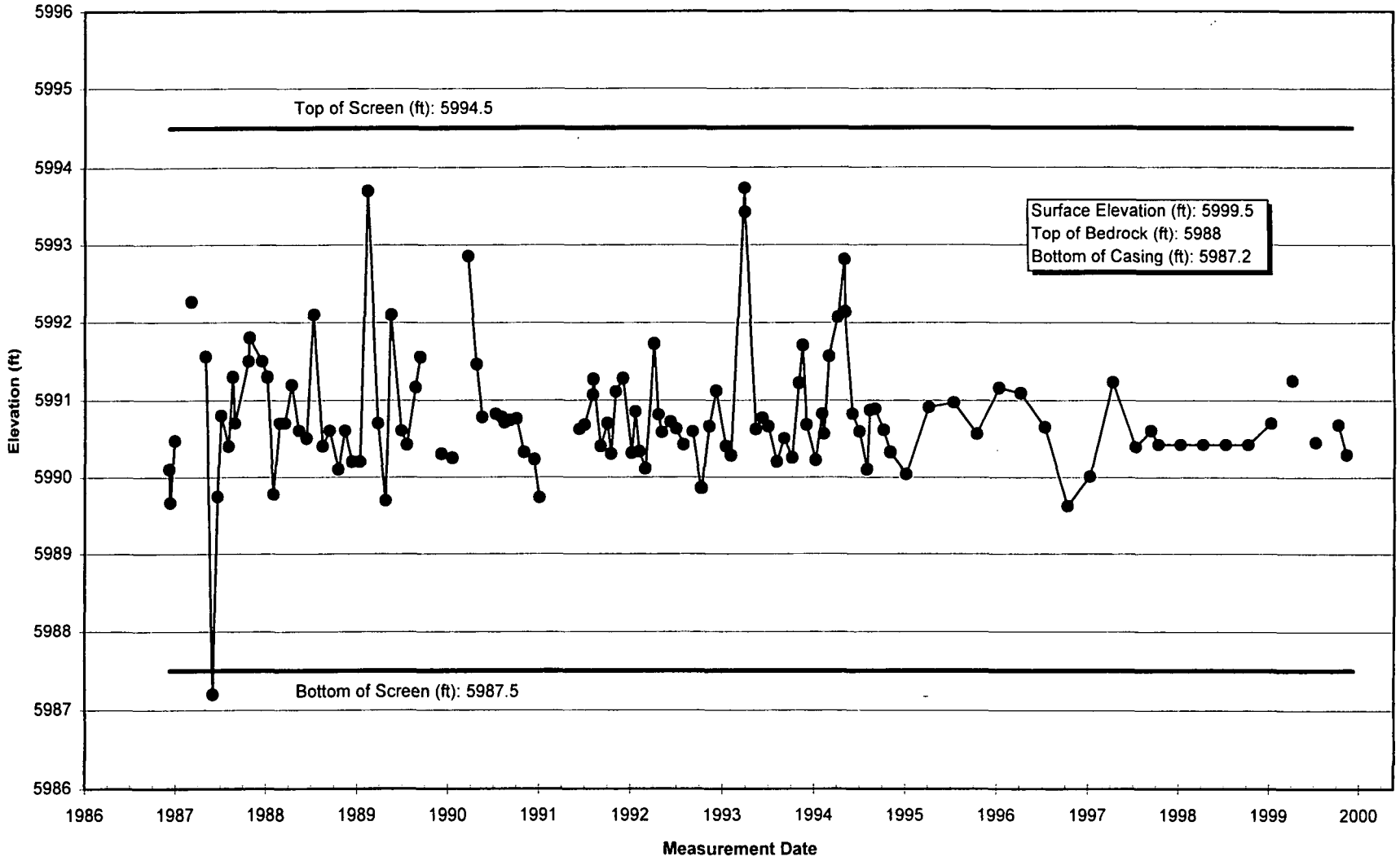
384

Hydrograph 6186



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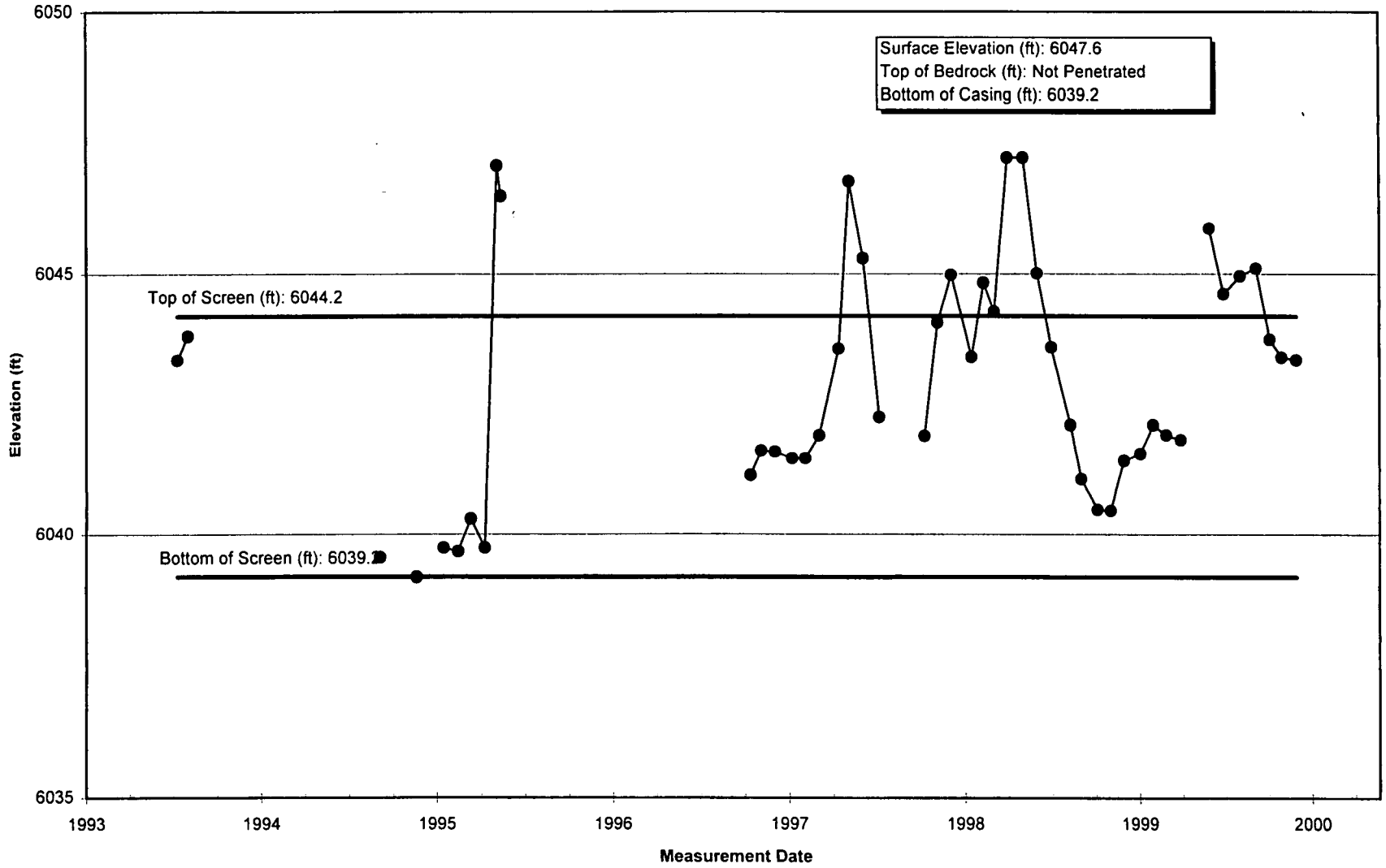
385

Hydrograph 62593



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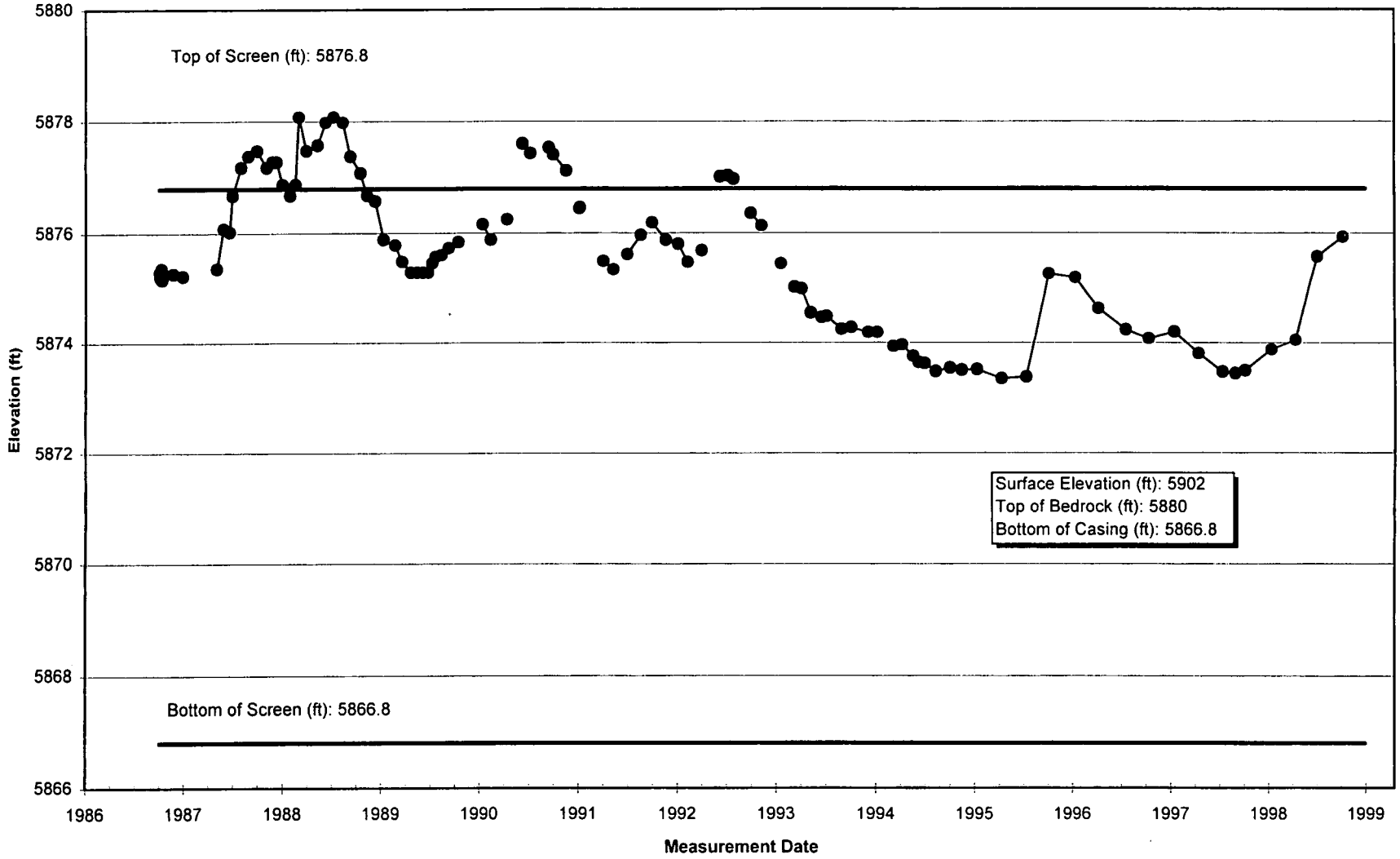
386

Hydrograph 6286



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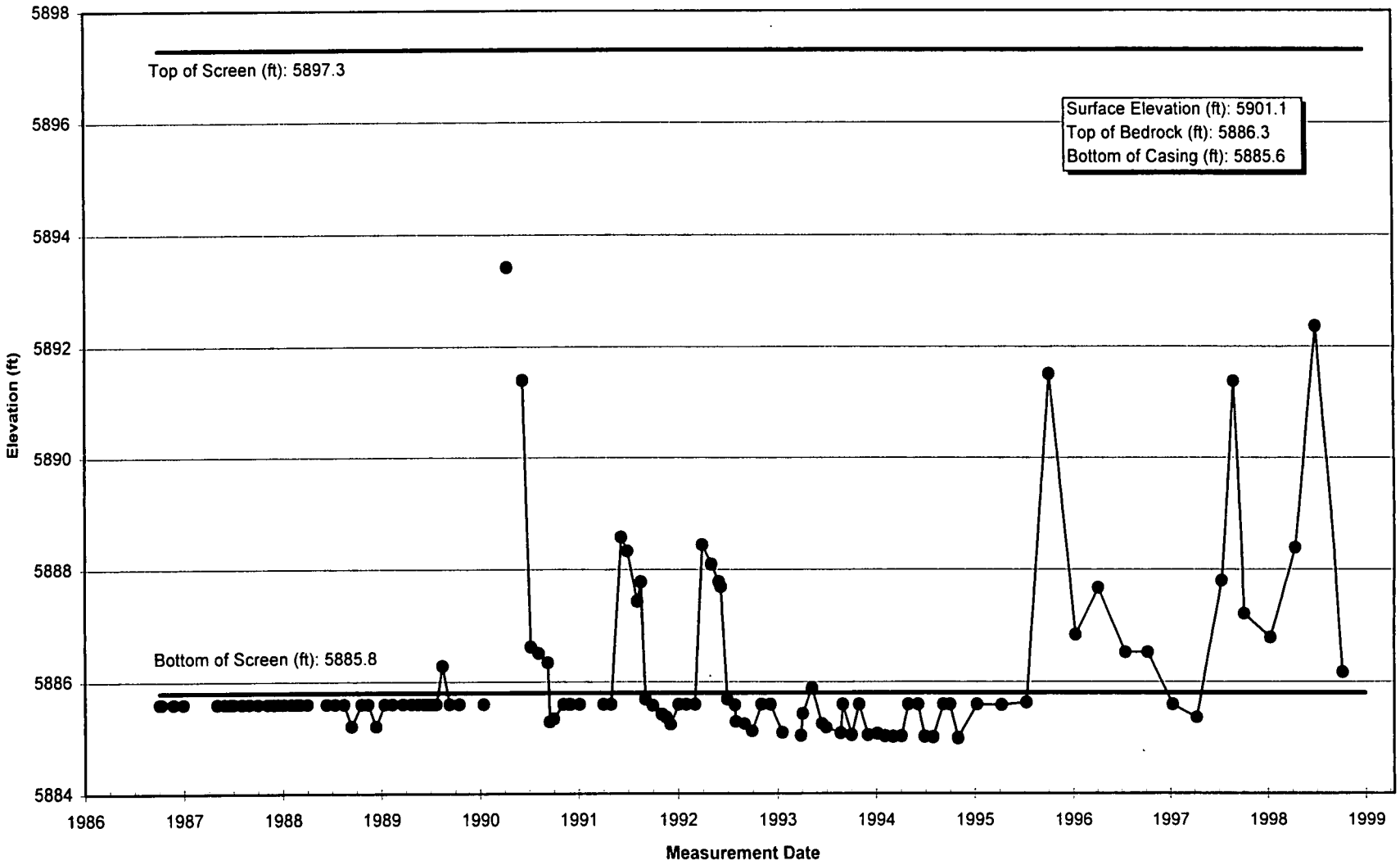
387

Hydrograph 6386



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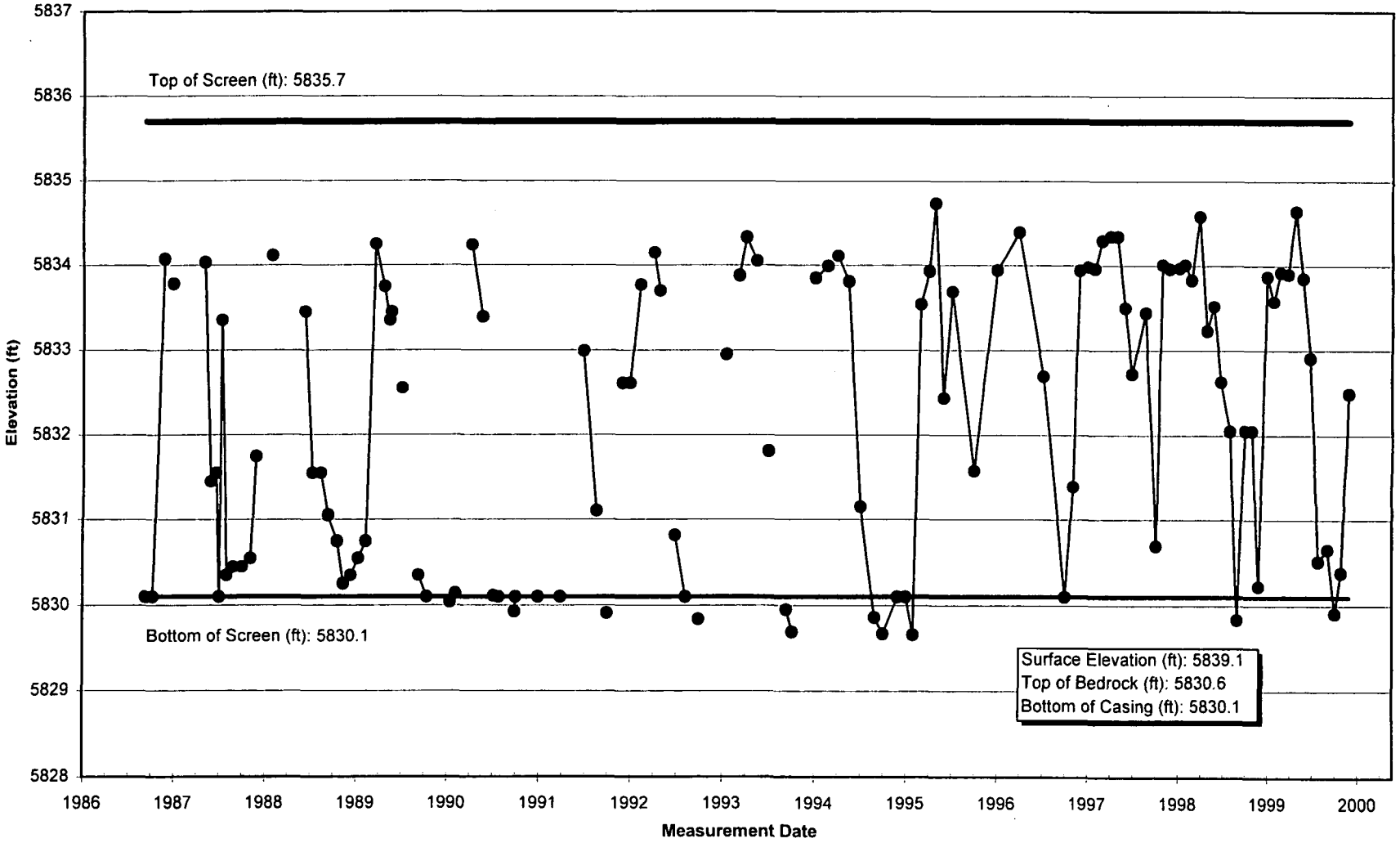
388

Hydrograph 6486



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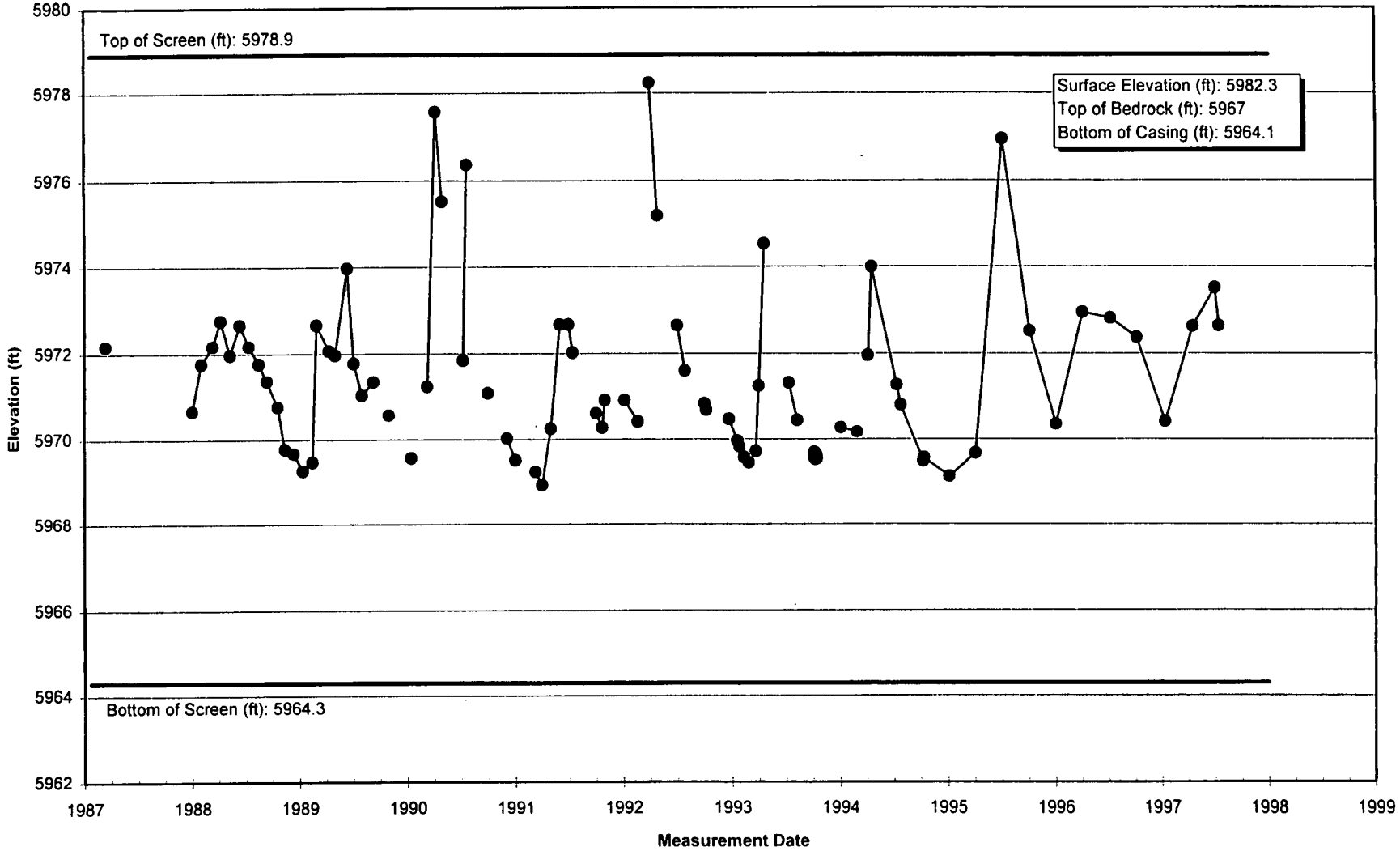
389

Hydrograph 6687



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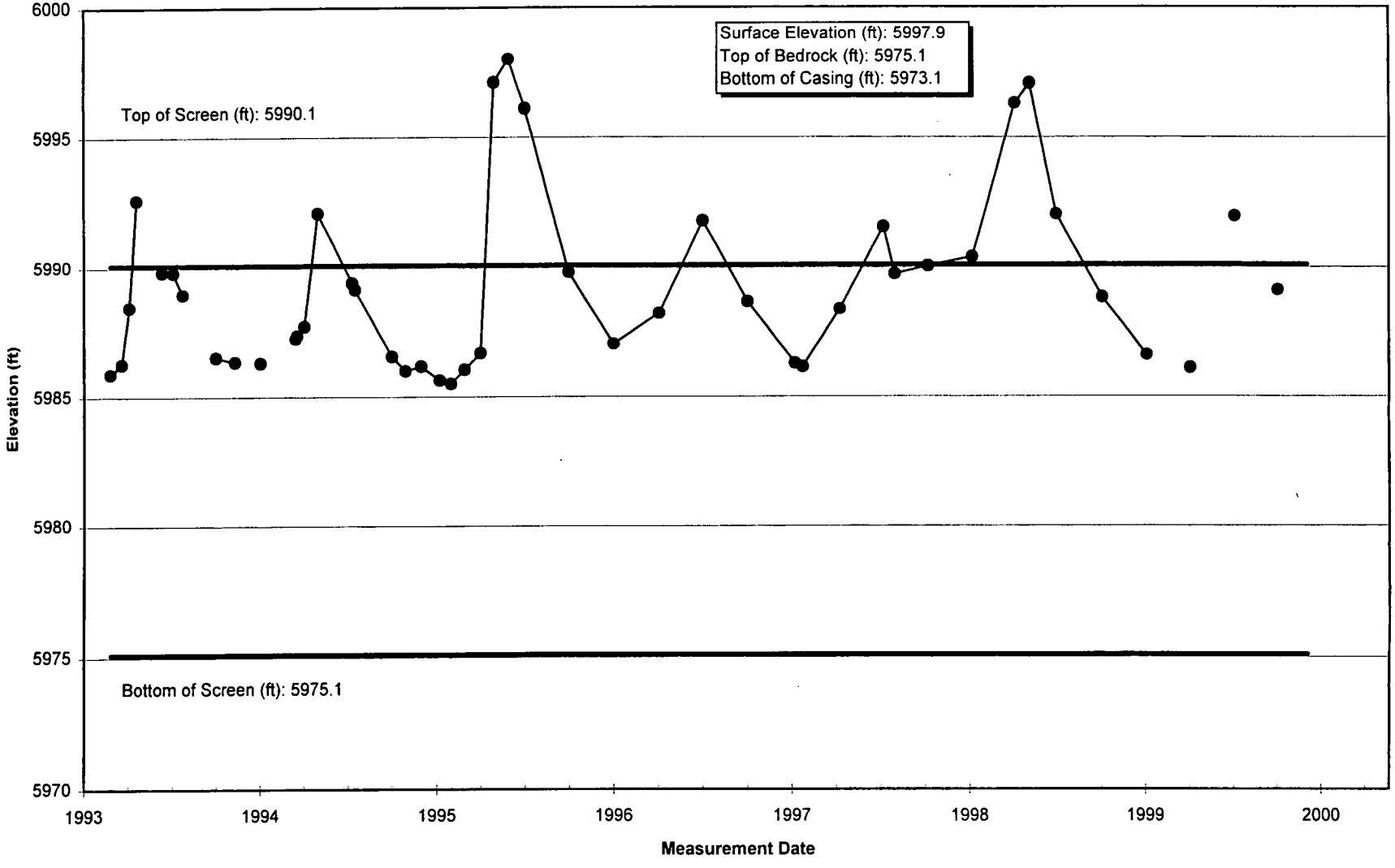

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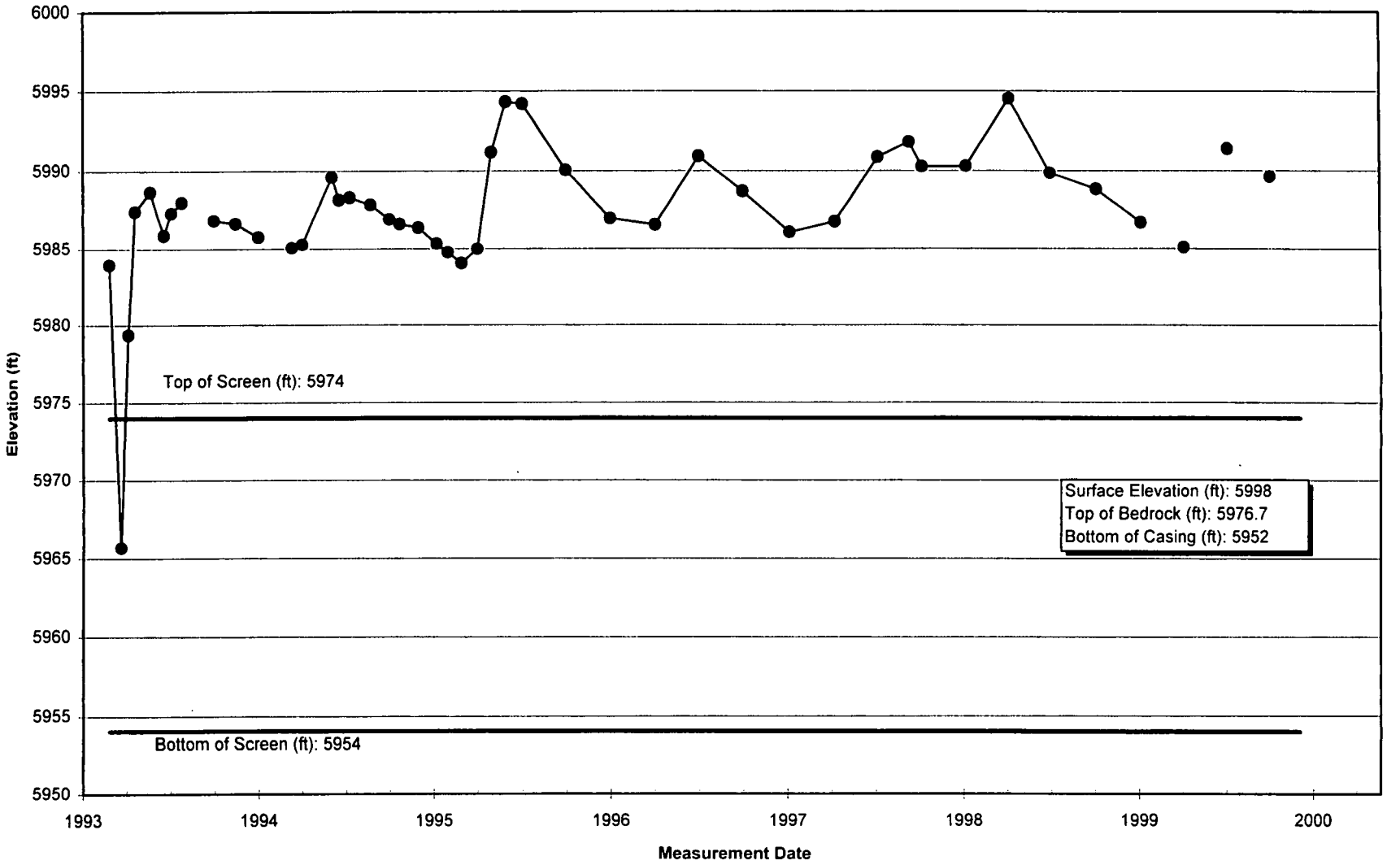
39 1

Hydrograph 70493



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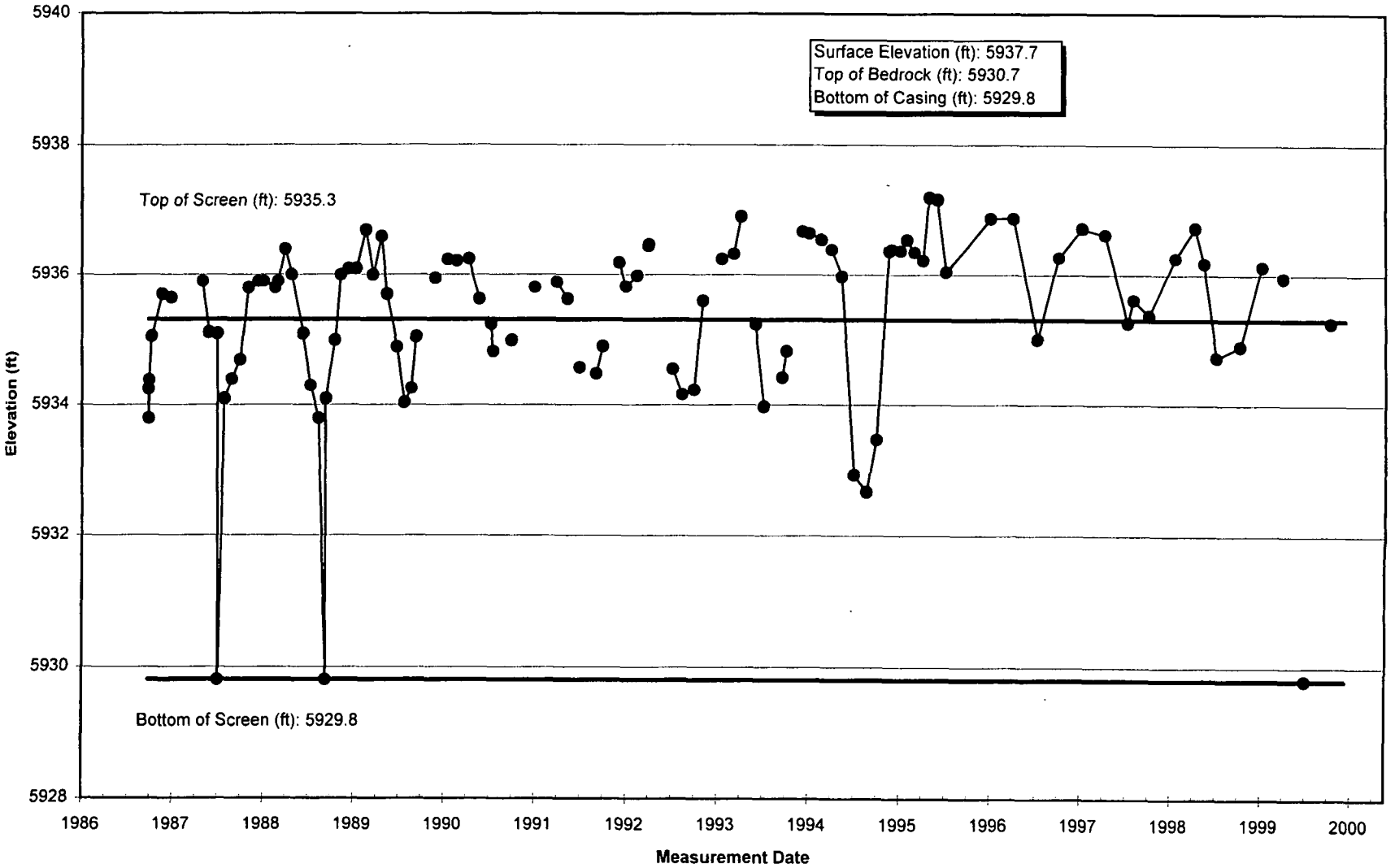
392

Hydrograph 7086



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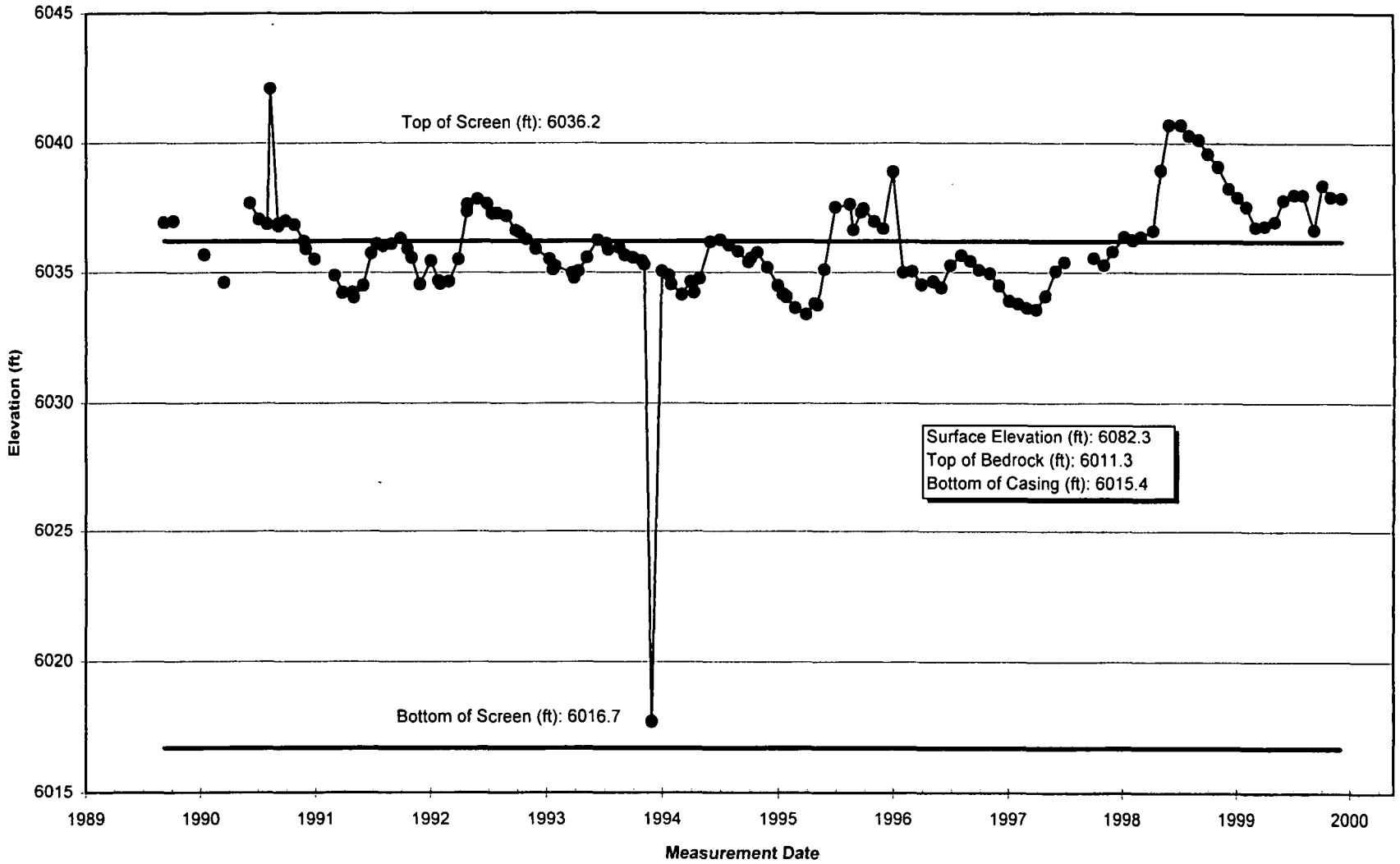
343

Hydrograph B110989



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394

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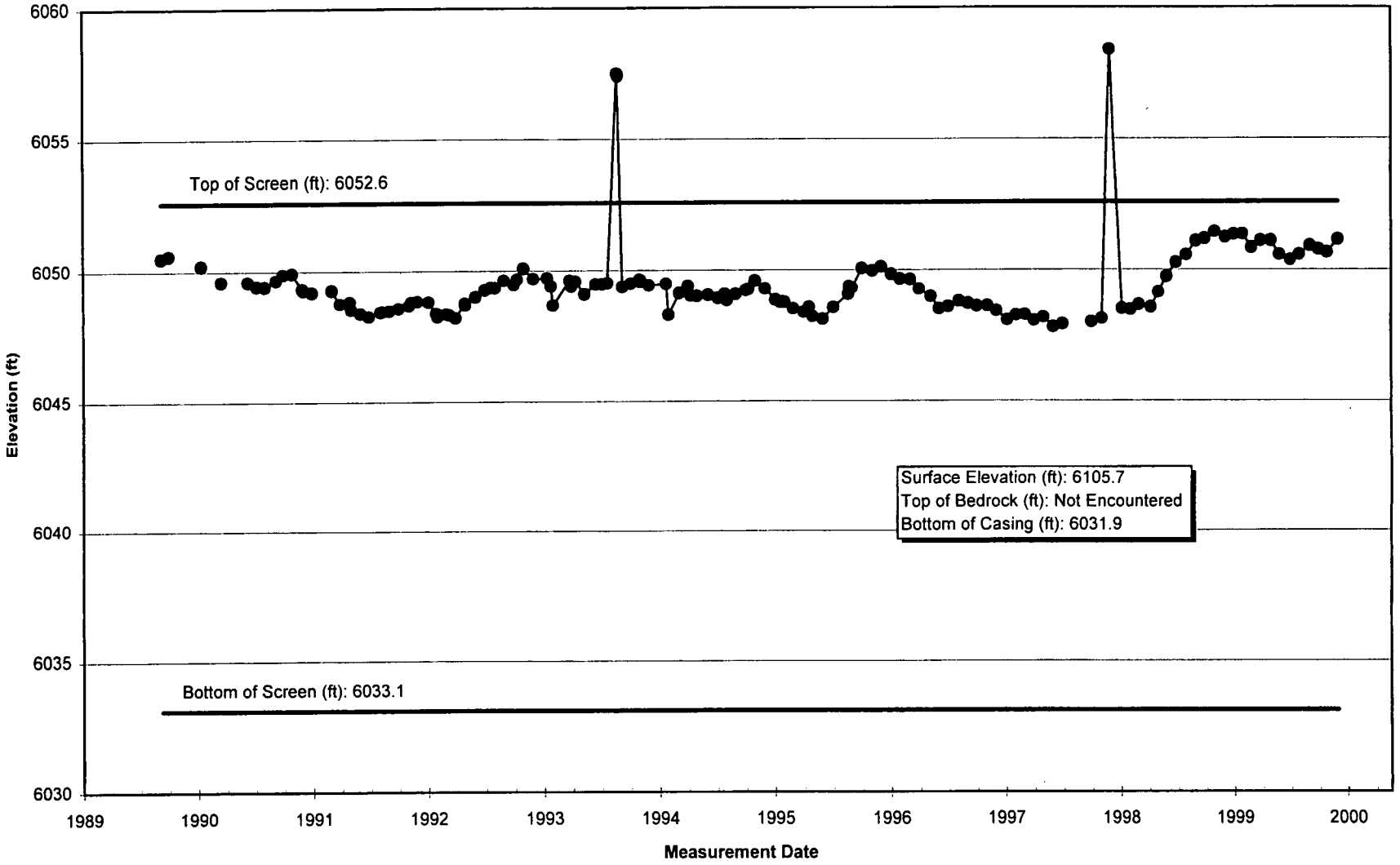

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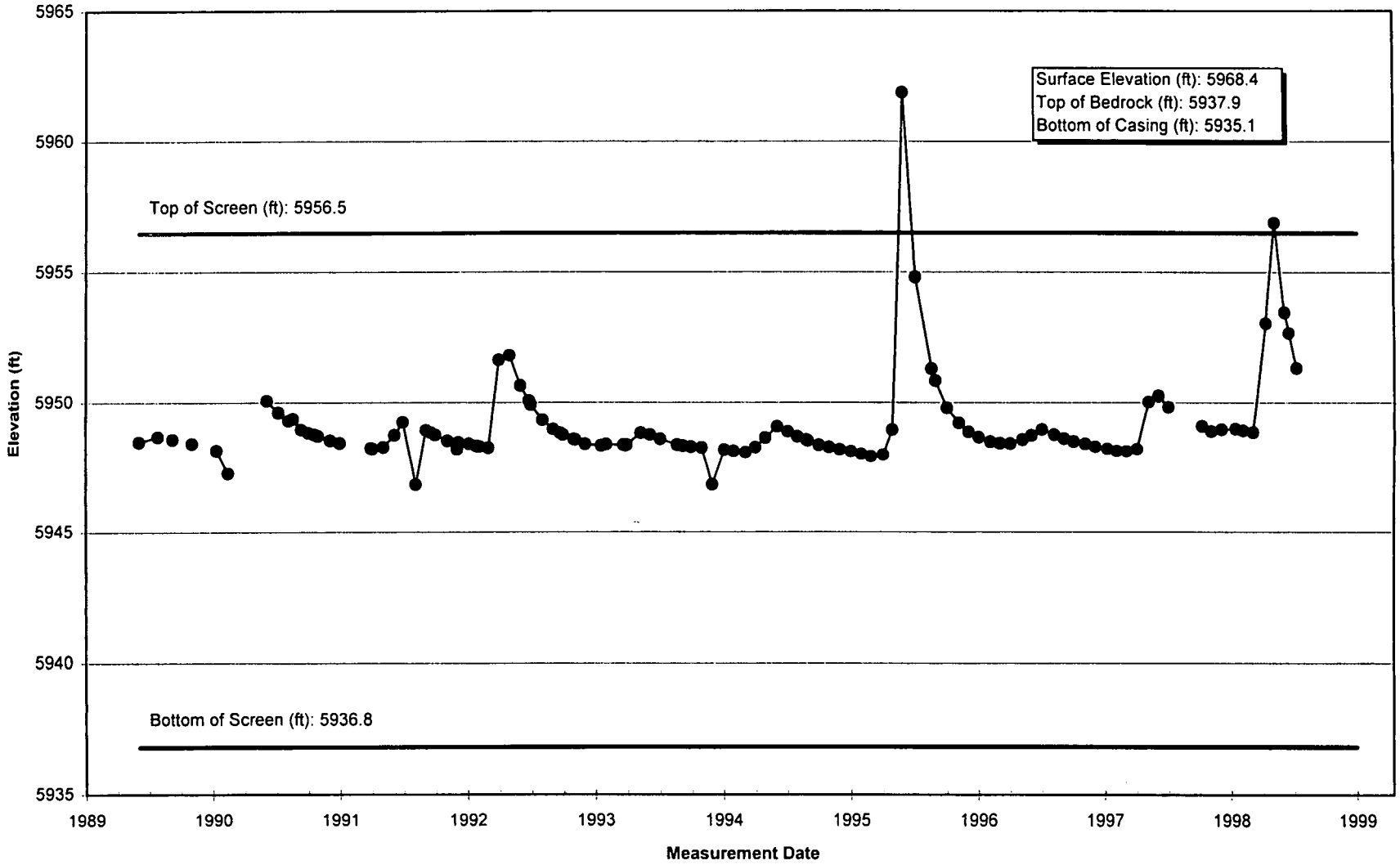
245

Hydrograph B200589



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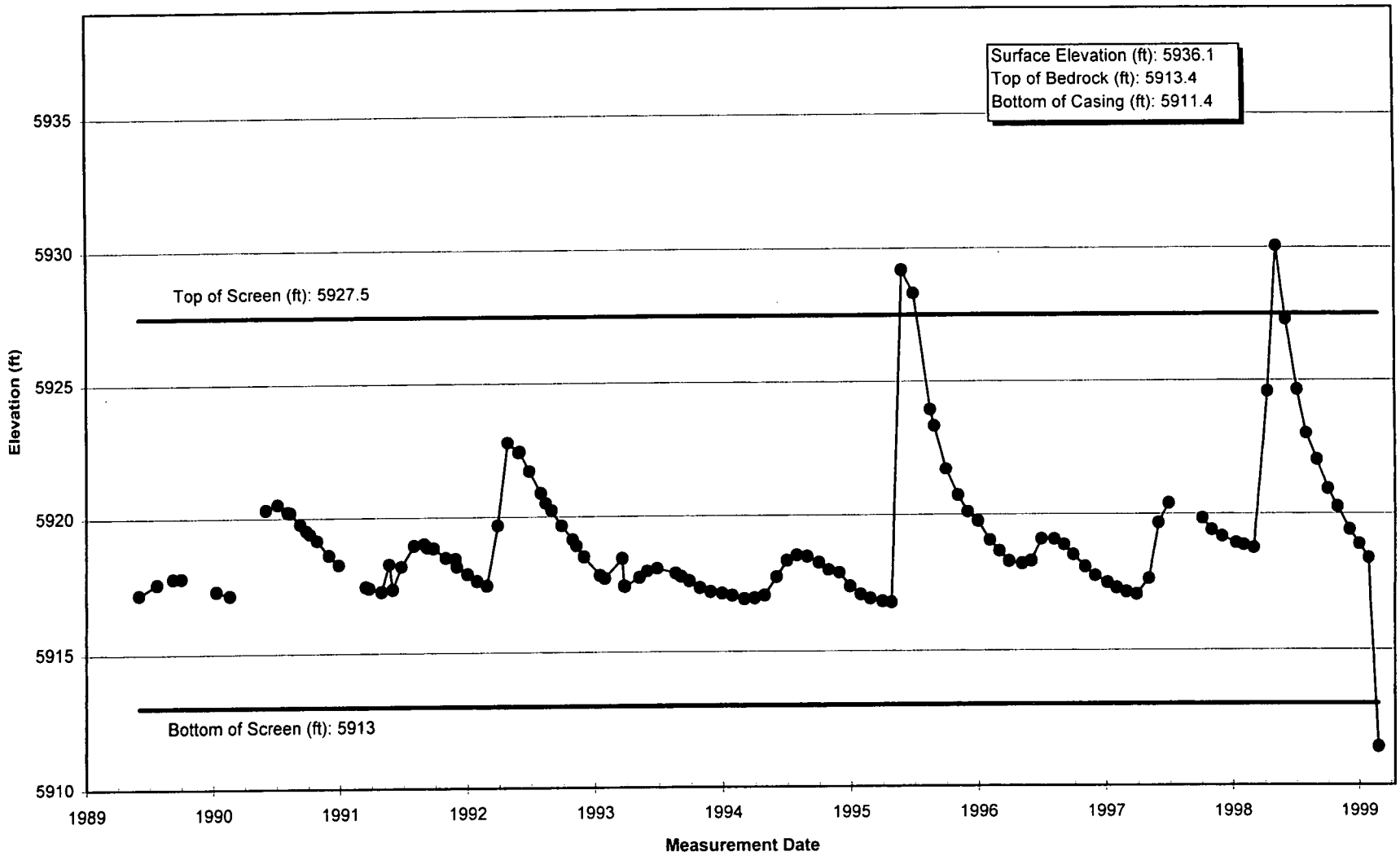

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397

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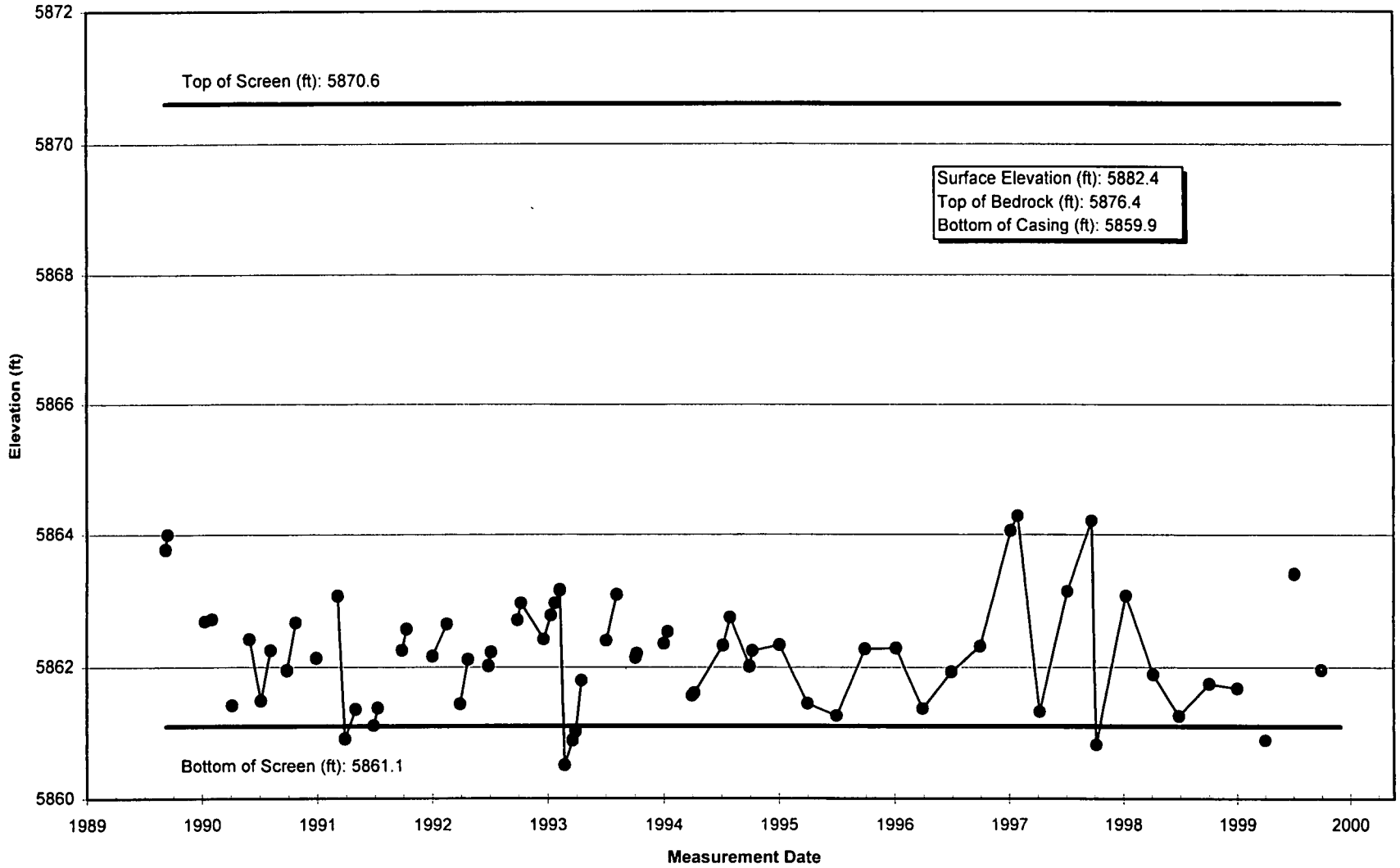

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398

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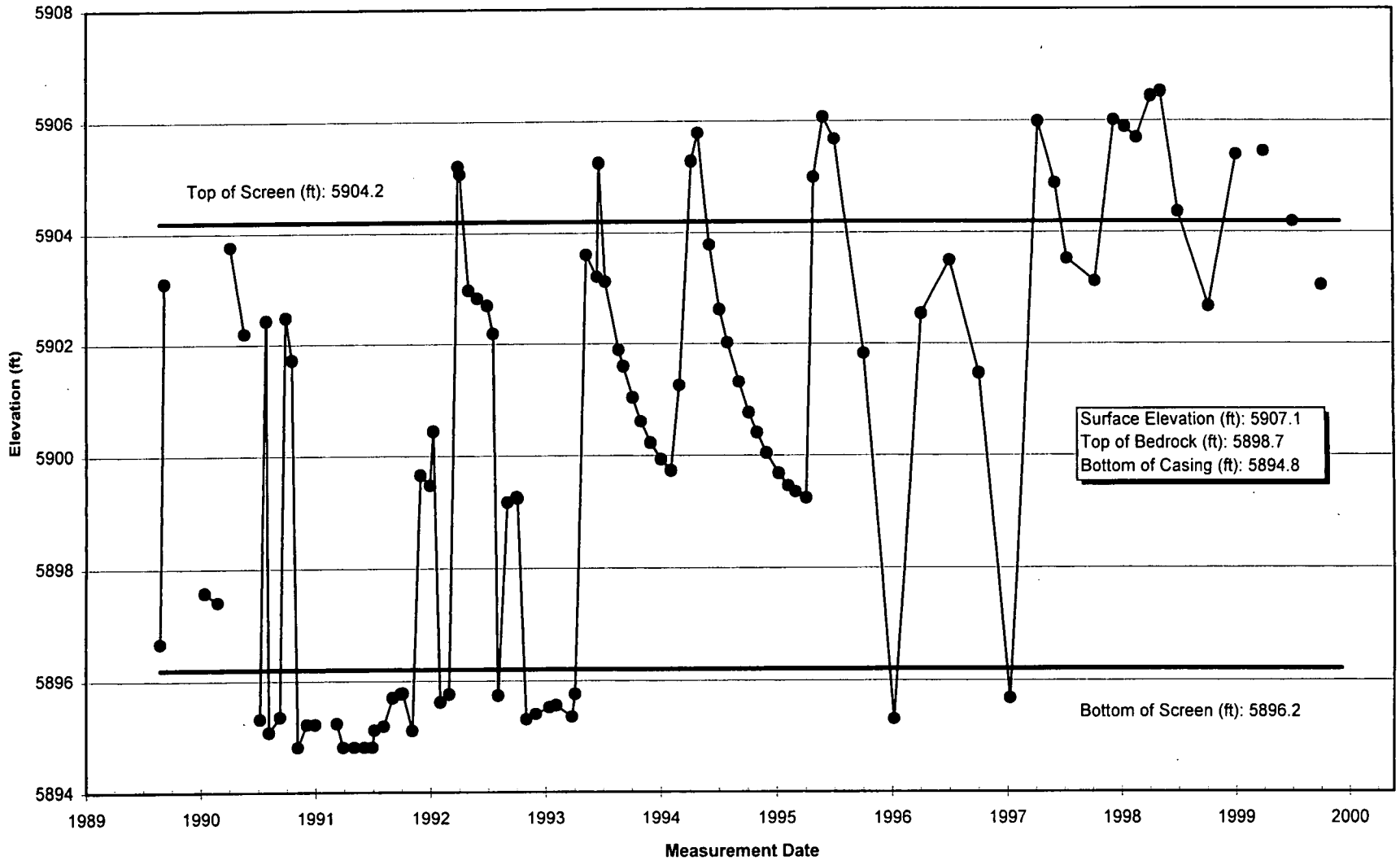

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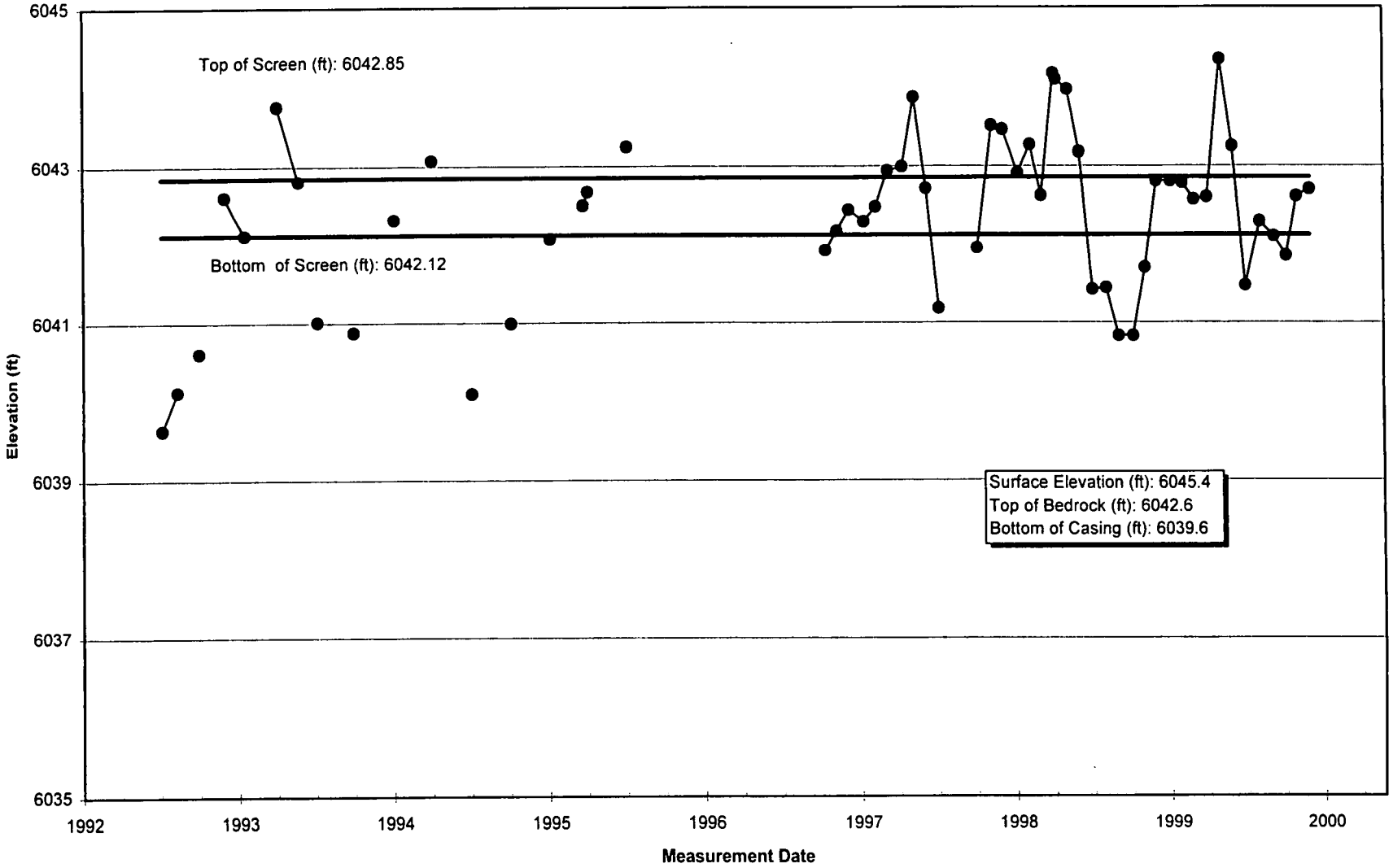
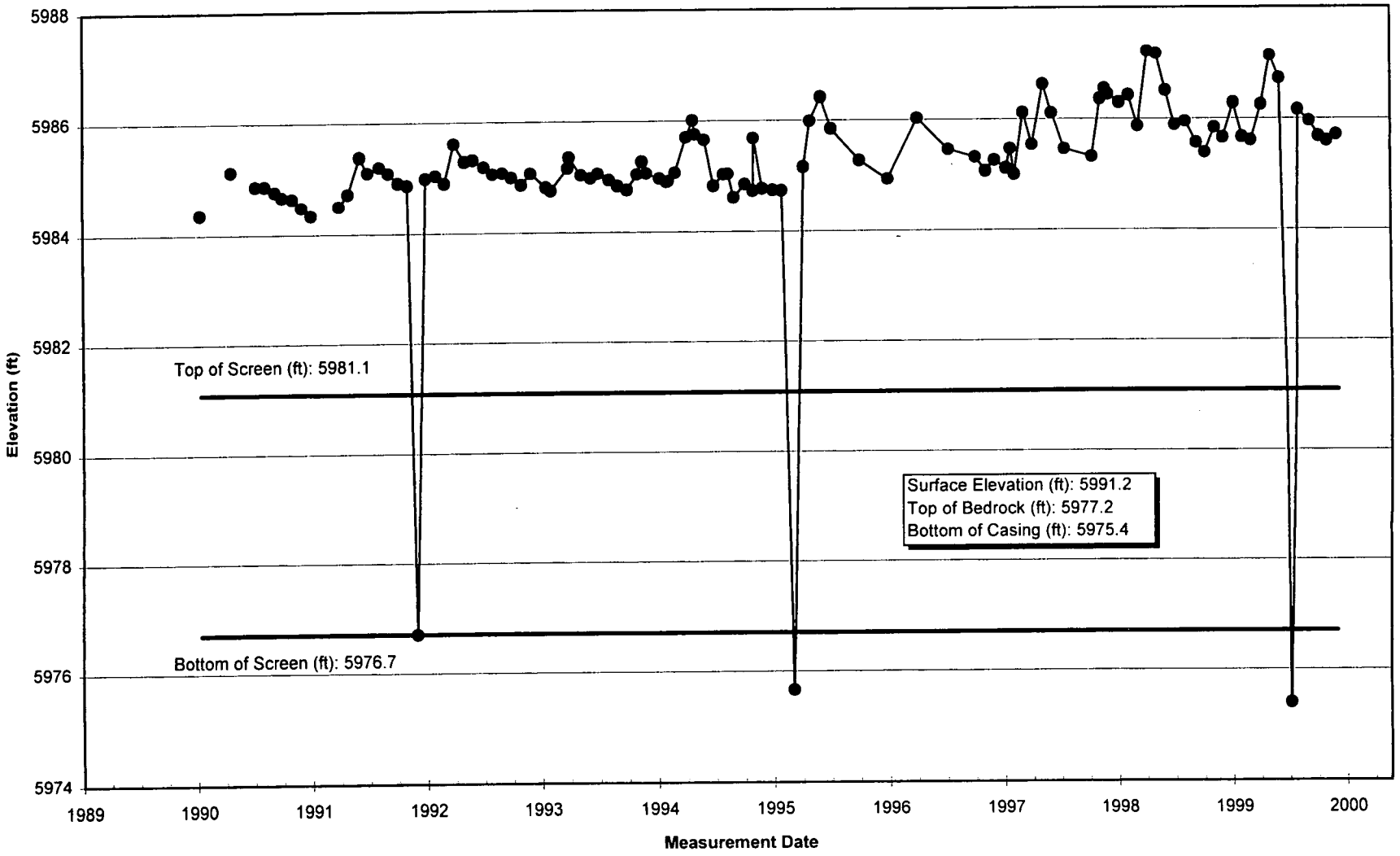
Hydrograph B402689



400

Hydrograph P114389



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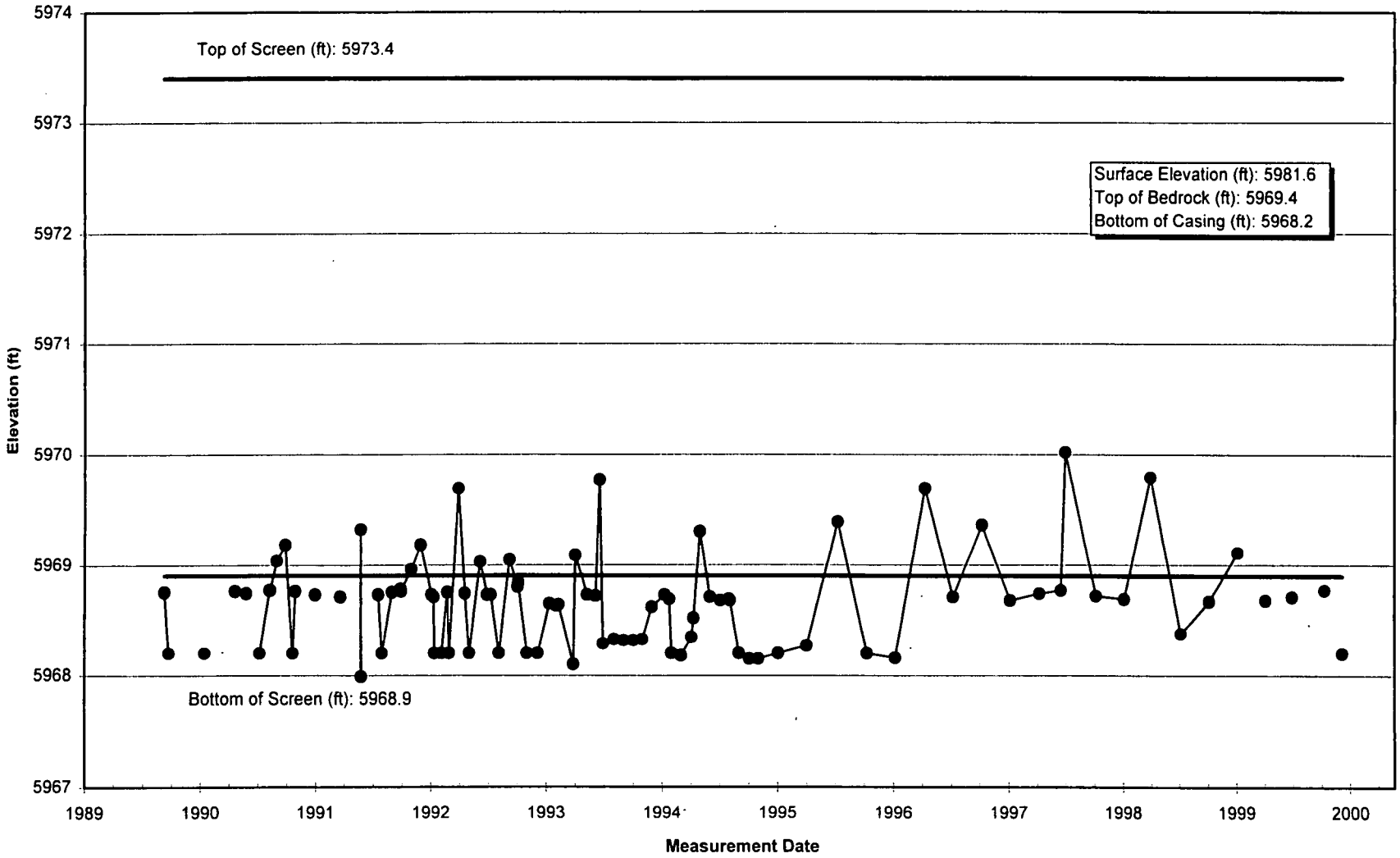
10h

Hydrograph P209289



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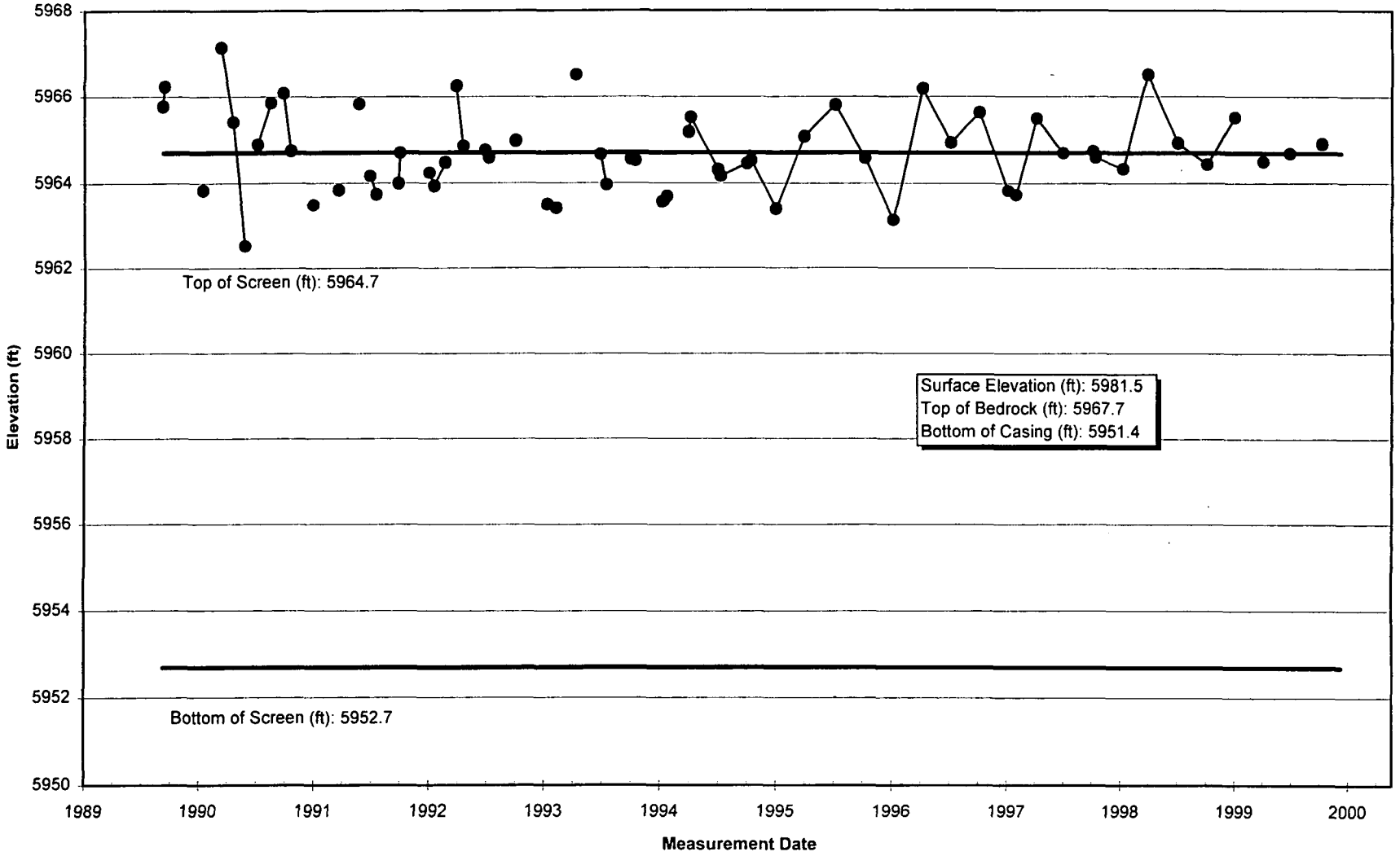
Hydrograph P209389



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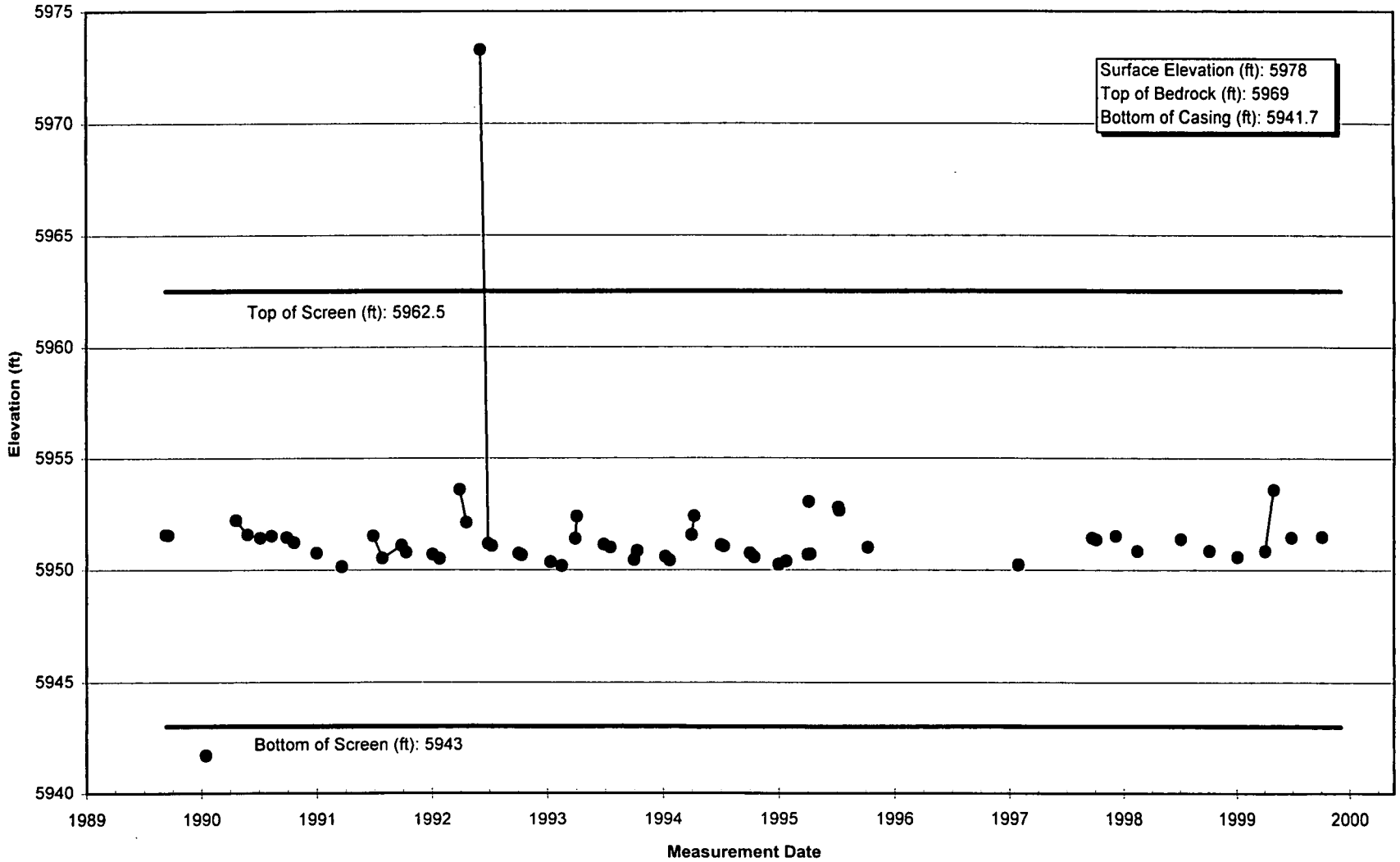
103

Hydrograph P209489



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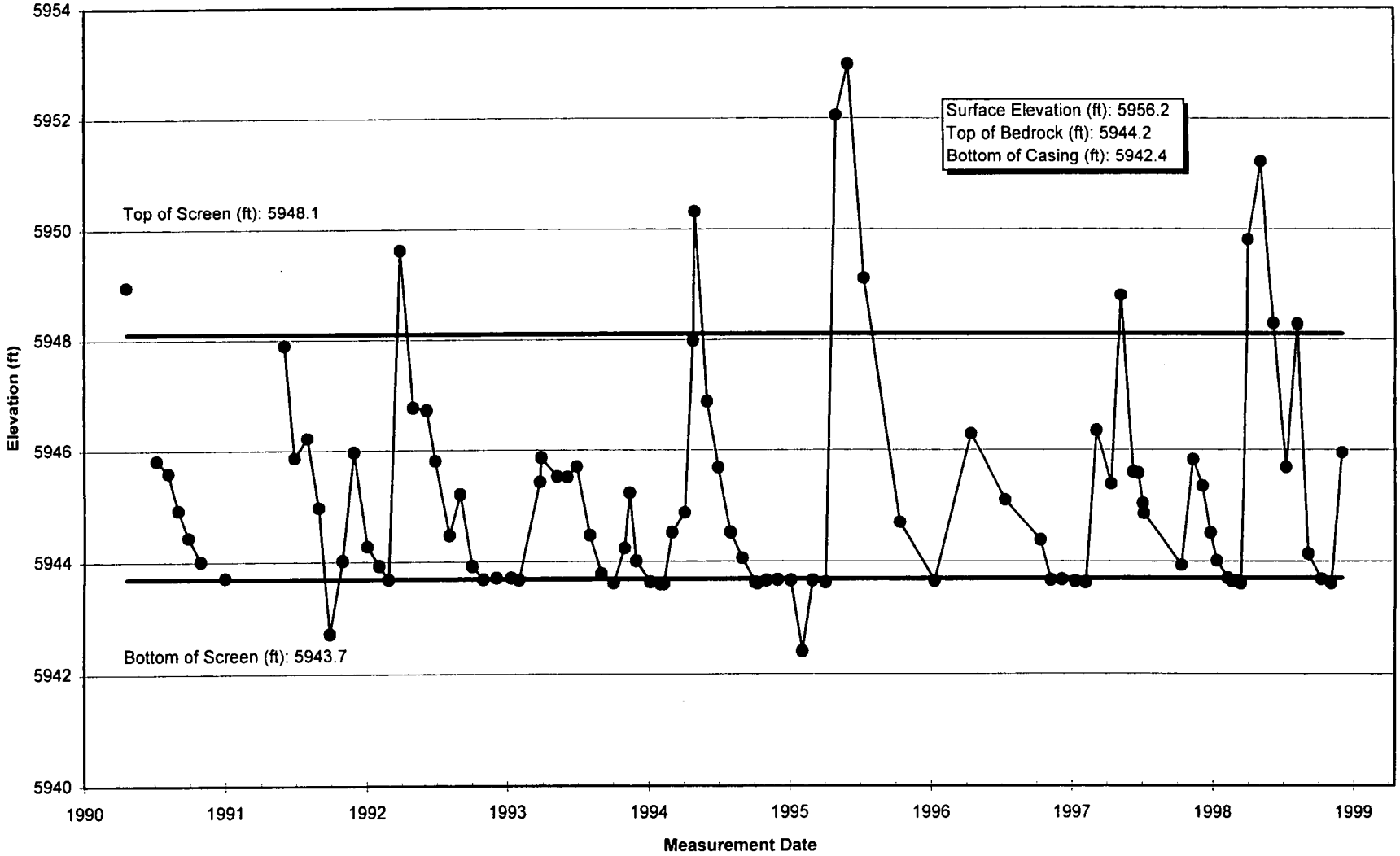
404

Hydrograph P218389



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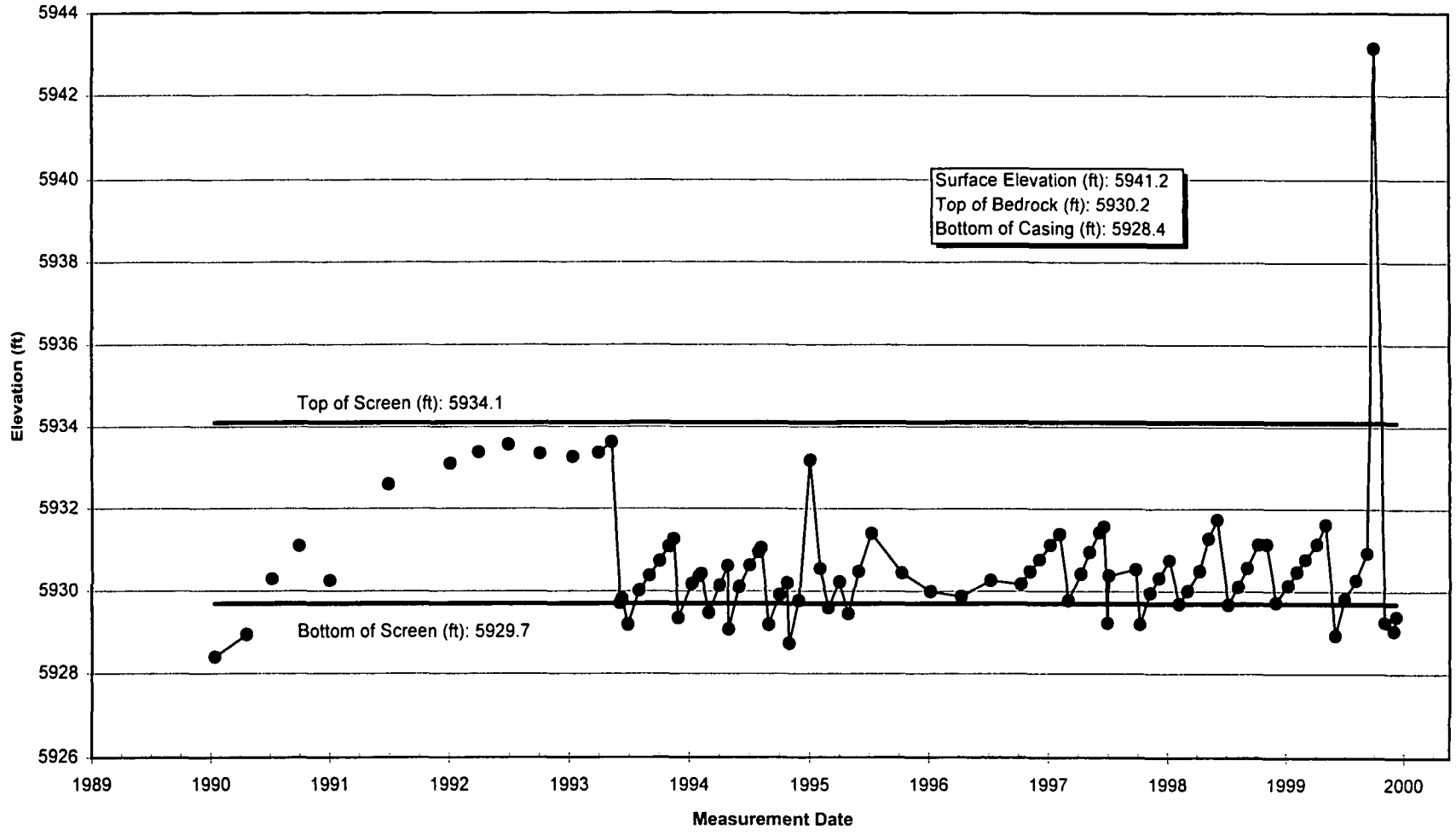
405

Hydrograph P219189



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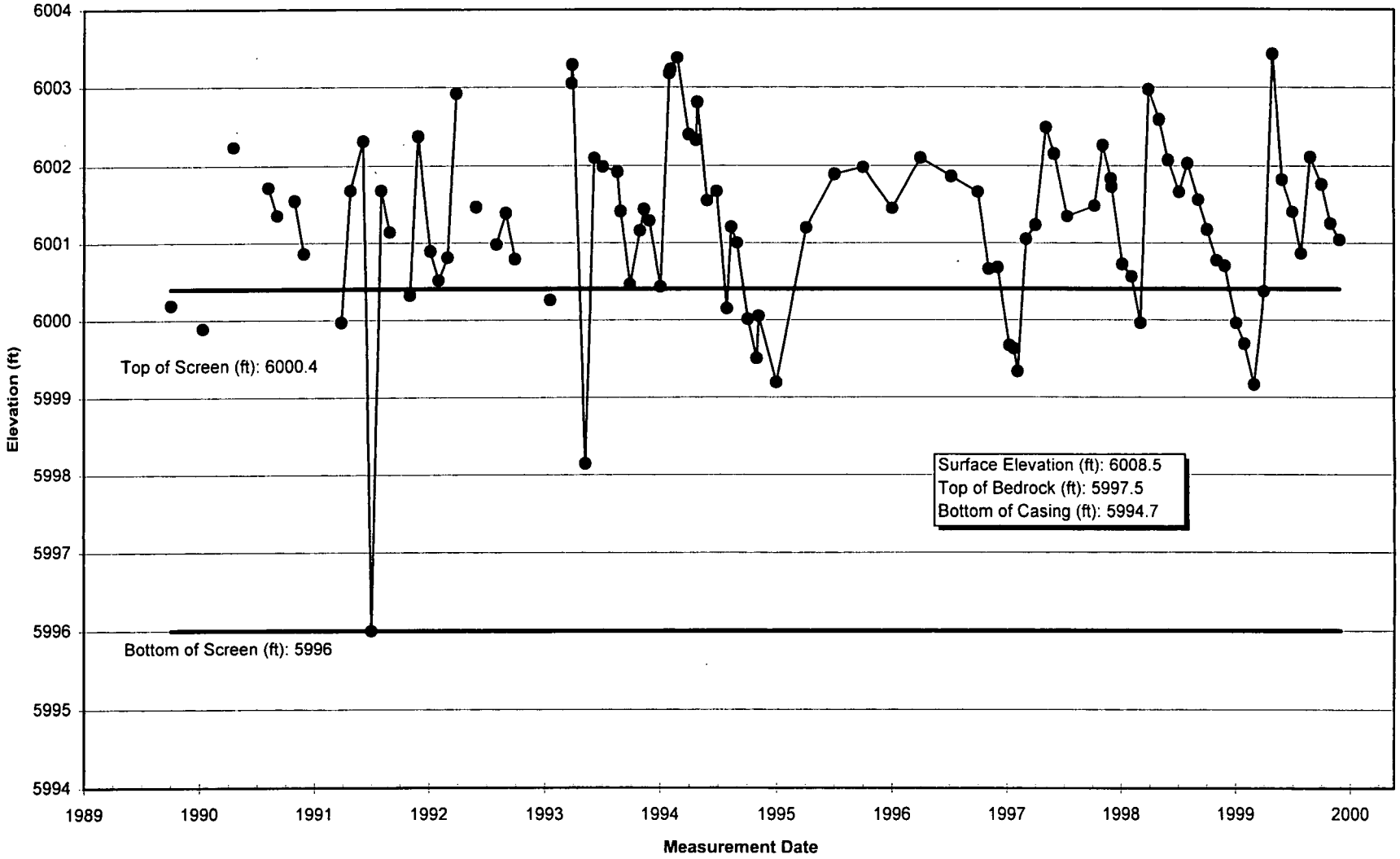
406

Hydrograph P313589



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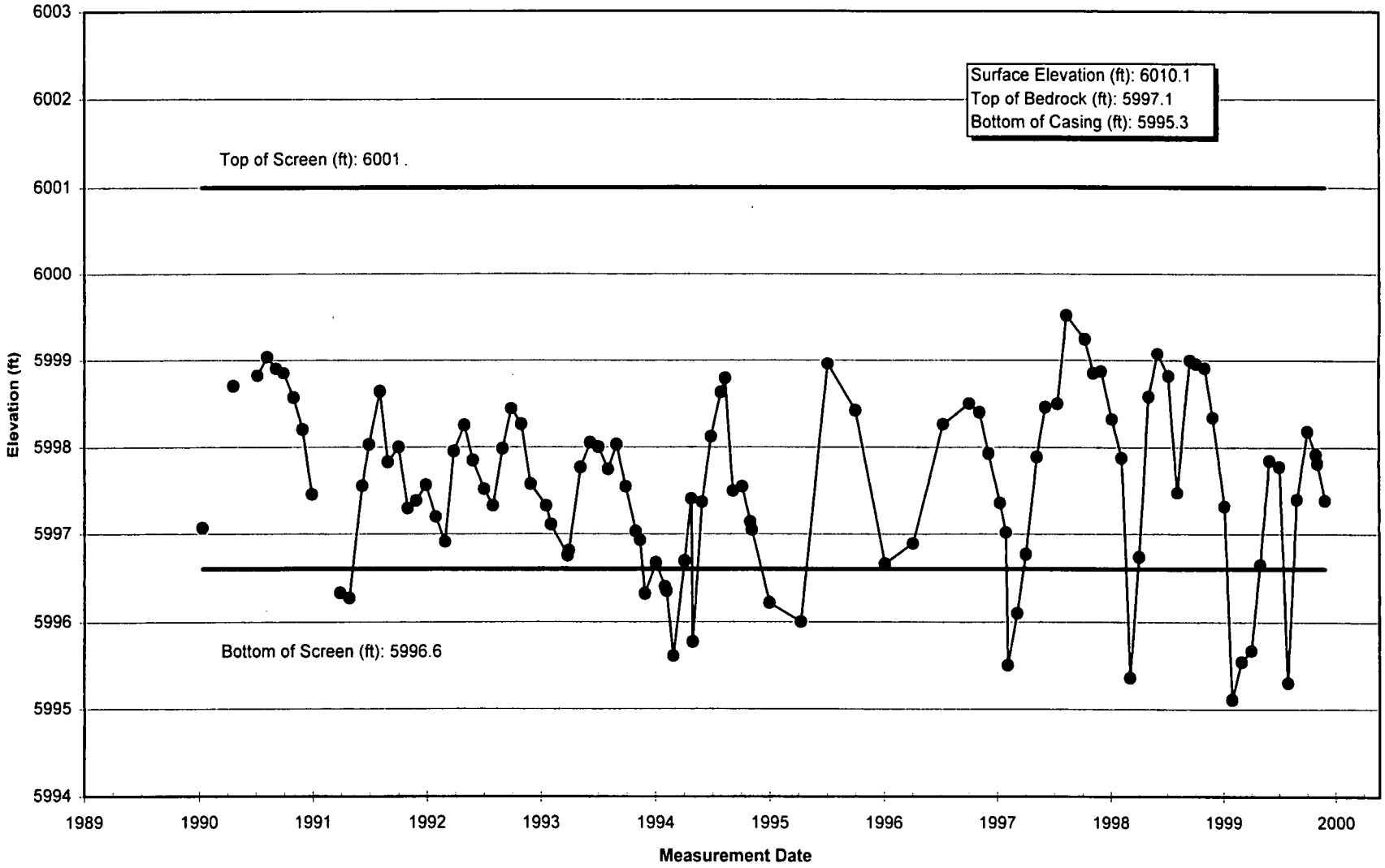
407

Hydrograph P314289



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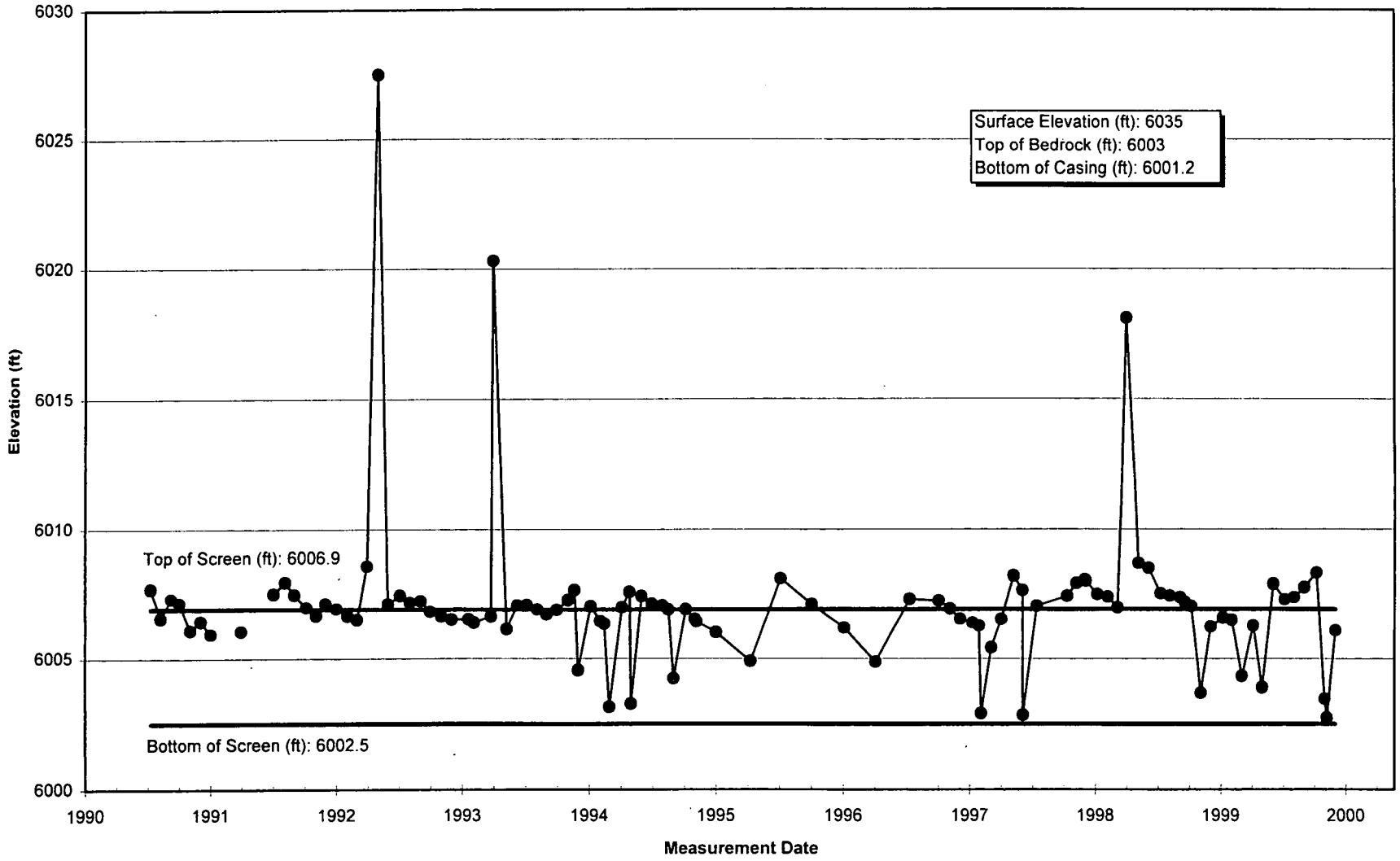
408

Hydrograph P416689



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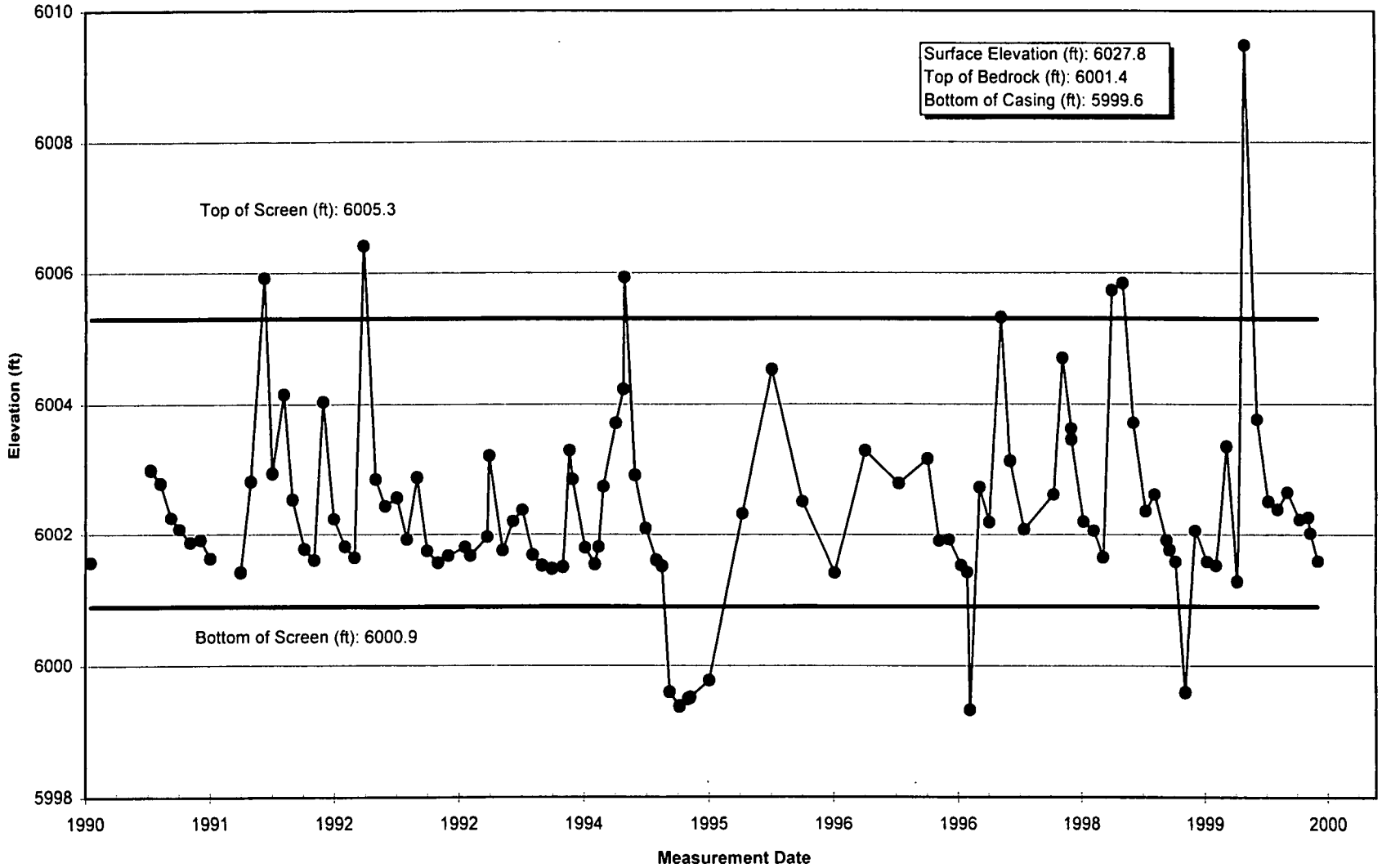
Hydrograph P416789



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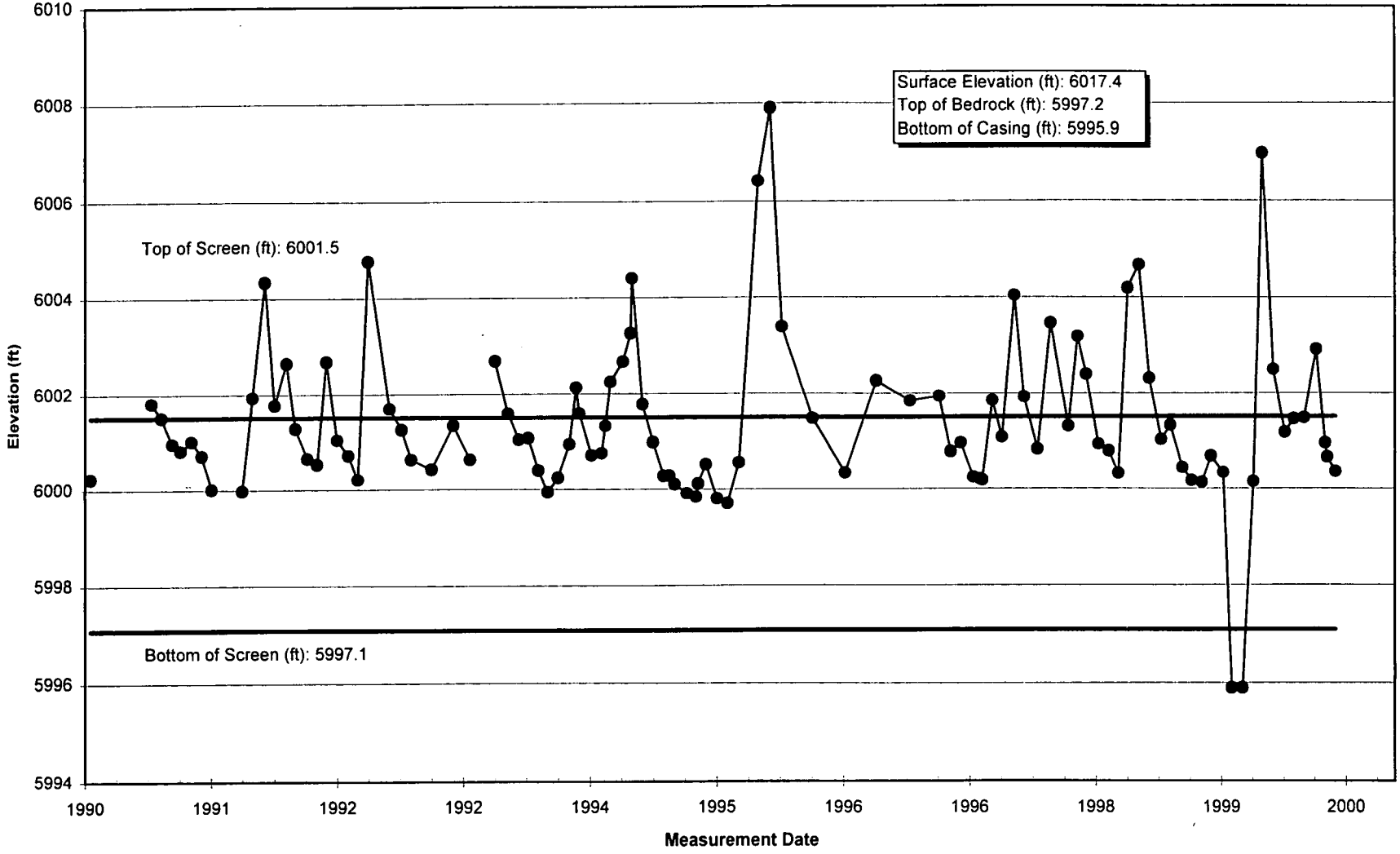
Hydrograph P416889



HG-Master S22.xls P416889 9/25/00

SW-A-004870

CON'T ON NEXT ROLL

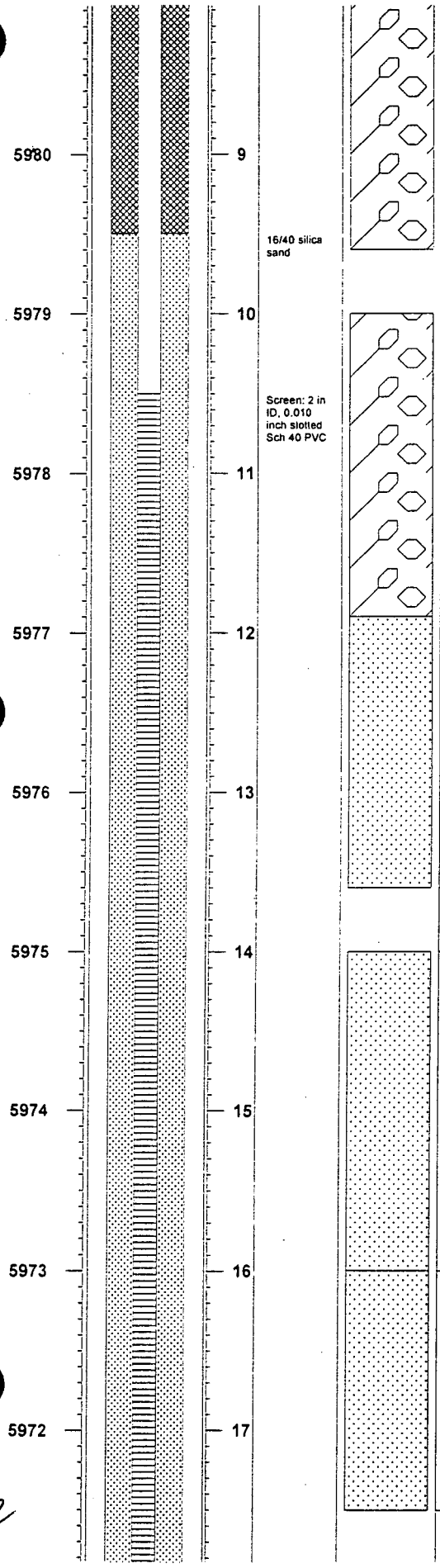
pg 411

STATE PLANE COORDINATES AREA: NORTH: 750791 EAST: 2083821 PROJECT: Borehole & Well REMARKS: IHSS 118.1	GRND ELEV. (FT): 5989.00 TOTAL DEPTH (FT): 25.70 COMPLETION DATE: 2/3/99 GEOLOGIST: Boylan	CASING DIA (IN): BH DIA. (IN): GRID LOCATOR:	LOG OF BORING NUMBER: **18199**

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5989	Cast iron flush mount set in concrete.	0			NO RECOVERY: 0-8 ft, Center bit, asphalt at 0-0.3 ft., cuttings look like, and drilling sounds like, gravelly clay to clay.
5988	Casing: 2 in ID, Sch 40 PVC Filter pack in flush mount for drainage	1			
5987	3/8 in bentonite plug pellets Borehole dia. 8 in., 0.0-24.9 ft	2			
5986		3			
5985		4			
5984		5			
5983		6			
5982		7			
5981		8			

411

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					LOG OF BORING NUMBER: **18199**



GC: 8-9.6 ft, Gravelly clay, mottled with widely varying colors (reds, browns, grays); predominant color dark yellowish brown (10YR4/2), slightly moist, shattered gravels common (mainly quartzite, some granite), trace to some caliche (esp at bottom of recovery).

NO RECOVERY: 9.6-10 ft

GC: 10-11.9 ft, Gravelly clay, overall same as above, but could be broken down into intervals of GC (10-10.2, 10.7-10.9, 11.2-11.3, 11.8-11.9) w/ intervals of pure clay (10.2-10.7) and balance is gravelly clay, sl moist, trace to some sand.

SANDSTONE: 11.9-13.6 ft, Variegated sandstone, silty sandstone, color ranges from grayish orange-dark yellowish orange (10YR7/4-6/6), vfg quartz, rounded, wet gravel at top pushed from above (not in place), clayey at 12.2-12.8 ft. (not clay lenses but increased clay content, saturated at bottom. Top bedrock = 11.9 ft.

NO RECOVERY: 13.6-14 ft

SANDSTONE: 14-16 ft, same as above 11.9-13.6, color shows some Fe staining to 15.2 ft., below color more dusky yellow (5Y6/4), wet to saturated, but does not flow, much of interval is closer to sandy siltstone.

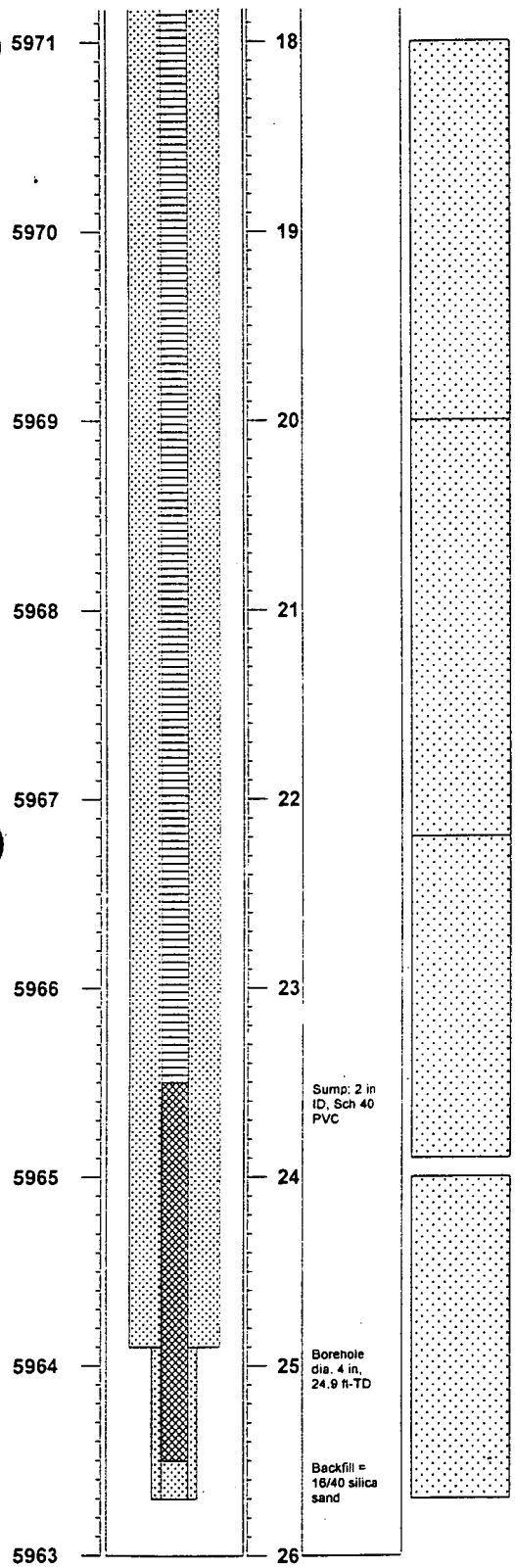
SANDSTONE: 16-17.5 ft, same as above 14.0-16.0, fined to sandy siltstone/siltstone w/sand and clay, wet to saturated, VOC hits to 5 ppm FID, 0 ppm PID.

NO RECOVERY: 17.5-18 ft

412

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 18199



SANDSTONE: 18-20 ft, same as above, 11.9-16.0 ft, saturated sandy siltstone-silty sandstone, hits to 10 ppm FID.

SANDSTONE: 20-22 ft, same as above, 11.9-20.0 ft, but fines w/ depth to clayey silstone below 21.6 ft., saturated at top losing moisture w/ depth to wet at bottom, hits to 2 ppm FID, 1 ppm PID.

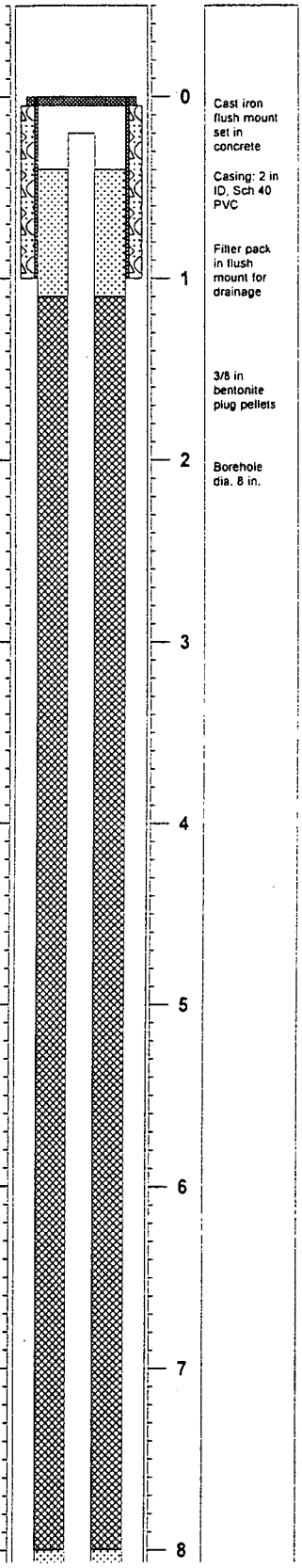
SANDSTONE: 22.2-23.9 ft, same as above 11.9-20.0, has not maintained fining trend, lens of sandy siltstone/silty sandstone @ 23.6-23.7 has flow-like consistency, no hits, wet to saturated @ sandy lens.

NO RECOVERY: 23.9-24 ft

SANDSTONE: 24-25.7 ft, same as above 11.9-23.9, mod dark yellowish brown (10YR5/4-6/6) w/contrasting material being very light gray, wet, sharp distinct color changes of varying orientation from horizontal to vertical, lighter materials slightly coarser (vf-f sand?) but this is not certain. TD =25.7 ft .

413

STATE PLANE COORDINATES AREA: NORTH: 750775 EAST: 2083872 PROJECT: Borehole & Well REMARKS: IHSS 118.1	GRND ELEV. (FT): 5988.00 TOTAL DEPTH (FT): 24.00 COMPLETION DATE: 1/27/99 GEOLOGIST: Boylan	CASING DIA (IN): BH DIA. (IN): GRID LOCATOR:	LOG OF BORING NUMBER: **18299**

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5988		0			NO RECOVERY: 0-8 ft, Center bit, asphalt @ 0.0-0.3 ft.
5987		1			
5986		2			
5985		3			
5984		4			
5983		5			
5982		6			
5981		7			
5980		8			

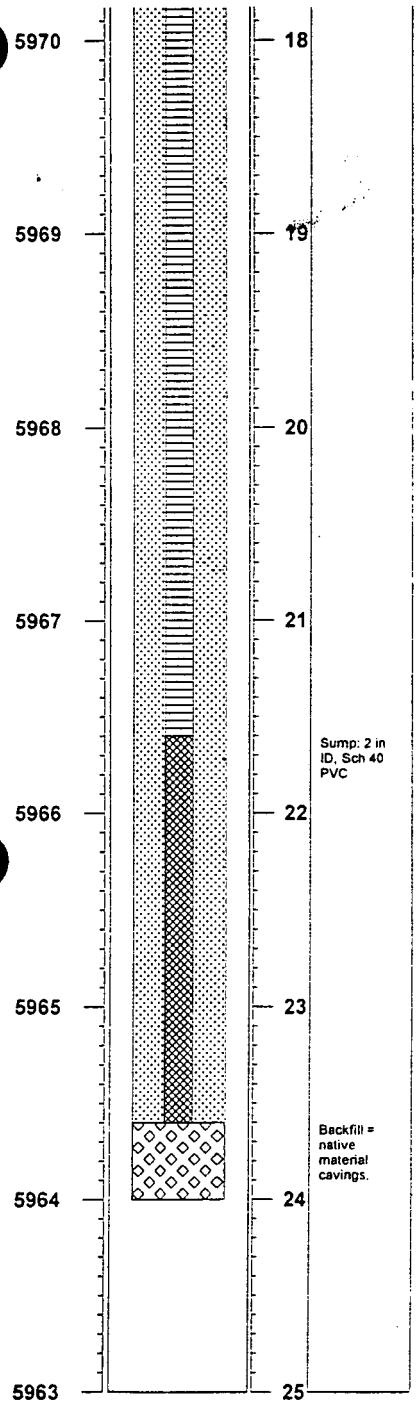
414

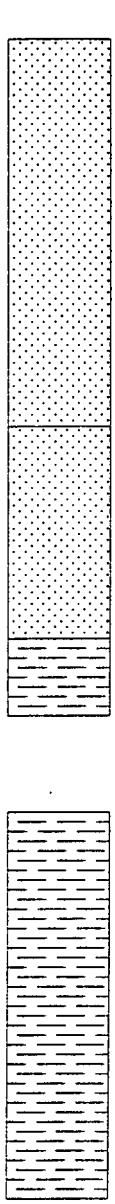
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
	16/40 silica sand Screen: 2 in ID, 0.010 in slotted Sch 40 PVC				GC: 8-9.7 ft, gravelly clay to clayey gravel, mottled, color ranges from dusky yellow (5Y6/4) to yellowish & light olive gray (5Y7/2,5/2) to heavily Fe stained dark yellowish brown/orange, much looks like reworked bedrock, sugary spar(?) nodules 8.1-8.3, abundant ironstone @9.4-9.6 ft., caliche grains common, sl moist.
5979		9			
5978		10			CLAYSTONE: 9.7-11.8 ft, Claystone to silty claystone w/trace sand, mottled yellowish gray (5Y7/2) where fresh, dark yellowish orange (10YR6/6) where Fe-rich abundant, caliche in parts 10.1-10.3, 10.5,11,11,7-11.8, sandy zones at 10.7,10.9,11.4,11.6,11.9-12.0 ft. sl moist to moist. Top bedrock = 9.7 ft.
5977		11			
5976		12			CLAYSTONE: 11.8-13.9 ft, same as above 9.7-12.0 ft. but increased sand content, sand pockets, sand lense at 12.1-12.6 (Fe satined pocket of fine, well-rounded, frosted quartz) below this it gets silty w/ clay lenses to 13.1 ft., below 13.1 ft. clayey siltstone w/trace to some sand to silty claystone, moist throughout, 1 in caliche nodule @ 12.7 ft. Sand lense 12.1-12.6 rimmed w/clay has shape of "ball & pillow" structure, could also be slump.
5975		13			
5974		14			NO RECOVERY: 13.9-14 ft.
					CLAYSTONE: 14-17 ft, same as above, 12.0-13.9 ft., interlayered clay and silt/sandy-silt layers, moist, free water in borehole at 15.8 ft., from 14-16.6 becomes sandier, then a clay layer.
5973		15			
5972		16			
5971		17			SANDSTONE: 17-17.7 ft, sandstone with occasional clay layers, rounded, frosted qtz, Fe stained, clay layer @17.2-17.3. sands may be floating, saturated.

416

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 18299





NO RECOVERY: 17.7-18 ft.

SANDSTONE: 18-20 ft, same as above 17-17.7 ft., flowing, saturated, occasional thin clay lens, plus good clay layer @ 19.2-19.9 ft.

SANDSTONE: 20-21.1 ft, same as above 18-20 ft, but sand @ 20.2-20.4 is very fine to very coarse sand to granules, coarser is subangular to subrounded with v fine to med sand rounded to well-rounded, ironstone nodules @ 20.3, 21.0-21.1 ft., balance of sand is vf to fine w/silt.

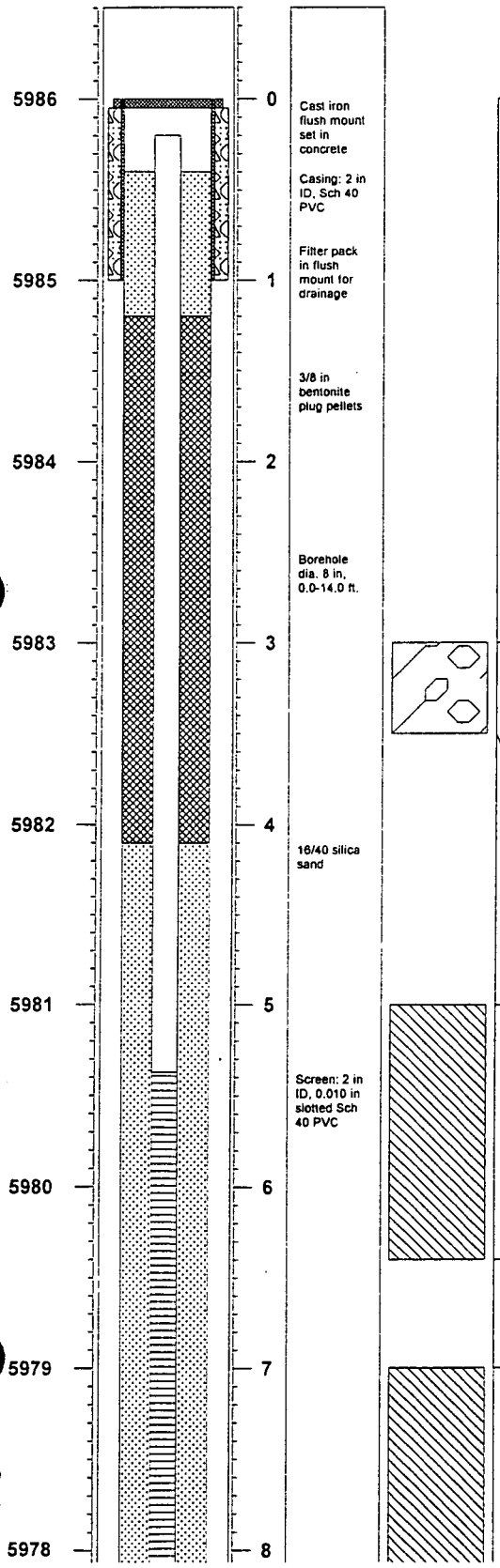
CLAYSTONE: 21.1-21.5 ft, see 22.0-24.0 interval (below) for description.

NO RECOVERY: 21.5-22 ft.

CLAYSTONE: 22-24 ft, grayish orange (10YR4/4) to dusky yellow (5Y6/4) where weathered and Fe-stained (dominant above 23.2 ft.), pale to dark yellowish brown (10YR6/2 to 4/2) where fresh (mainly below 23.2 ft.), hard, dry to slightly moist, very hard well-developed ironstone nodules at 22.2 (up to 0.75 in dia), F, Mn & carbonaceous streaks common, Fe deposition as stringers & sub-horizontal scale also present, TD is 24.0 ft.

416

STATE PLANE COORDINATES AREA: NORTH: 750778 EAST: 2083934 PROJECT: Borehole & Well REMARKS: IHSS 118.1	GRND ELEV. (FT): 5986.00 TOTAL DEPTH (FT): 16.00 COMPLETION DATE: 1/21/99 GEOLOGIST: Boylan	CASING DIA (IN): BH DIA. (IN): GRID LOCATOR:	LOG OF BORING NUMBER: **18399**

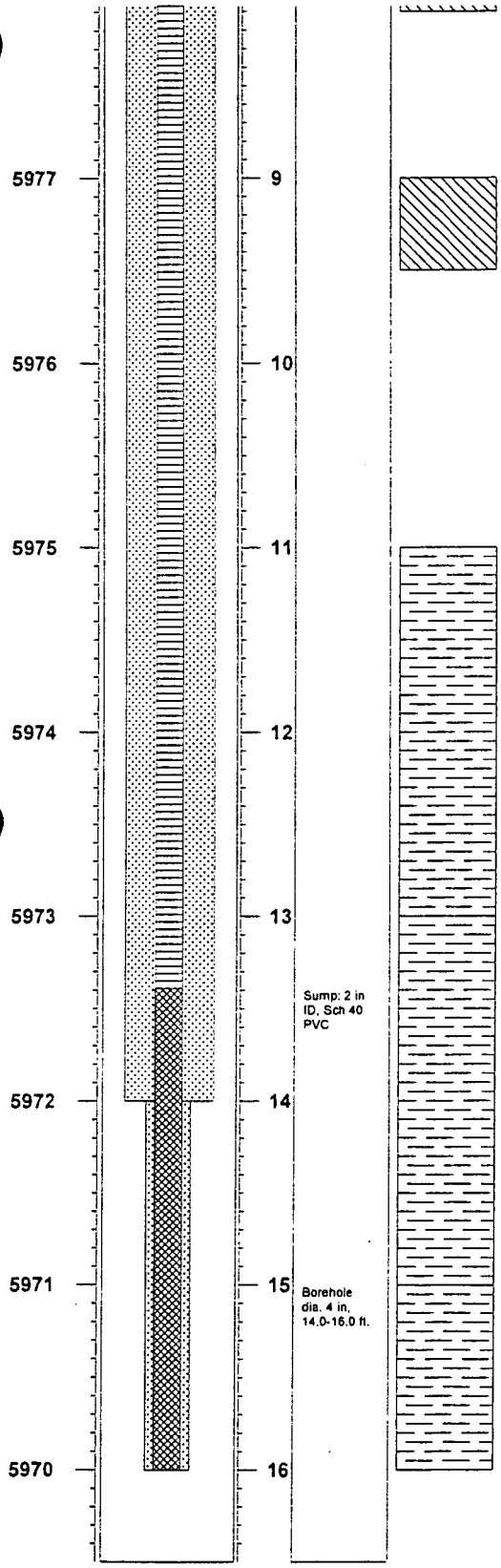


Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		NO RECOVERY: 0-3 ft Center bit, asphalt @ 0.0-0.5 ft.
	GC	GC: 3-3.5 ft, Clayey-sandy gravel, mottled, predominantly moderate yellowish brown (10YR5/4) to moderate brown (5YR4/4), slighltly moist.
		NO RECOVERY: 3.5-5 ft.
	CL	CL: 5-6.4 ft, Gravelly clay, moderate yellowish brown (10YR5/4), much like 3.0-3.5 but more clay & less gravel, moist, slightly sticky.
		NO RECOVERY: 6.4-7 ft.
	CL	CL: 7-8.1 ft, same as above 5.0 6.4 w/ more sand and silt, slightly moist-moist, coarse cobble (>2 in) at base of recovery.

417

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 18399



NO RECOVERY: 8.1-9 ft.

CL: 9-9.5 ft, same as above 5.0-8.1, color to dark yellowish brown (10YR4/2).

NO RECOVERY: 9.5-11 ft.

CLAYSTONE: 11-13 ft, Claystone with interbedded sandstone lenses, mottled colors, lots of Fe, dark yellowish orange (10YR6/6, generally in sandy zones) to yellowish gray (5Y7/2) where fresh clay, sand @ 11.1-11.4,12.1-12.2,12.8-13.0, sands not clean-lots of silt and clay-tight, slightly moist to moist, scattered carbonaceous flakes or stringers, no apparent bedding. Top bedrock = 11.0 ft.

CLAYSTONE: 13-15 ft, same as above w/ wet to saturated sand pocket @ 13.2-13.3, balance is claystone to silty claystone, laminated at 13.3-13.7 ft. w/ Mn or carbonaceous material in partings, caliche nodules at 14.5 & 14.7 ft., Fe/Mn scale (nodule parts?) @15.1, except for sand pocket material is slightly moist.

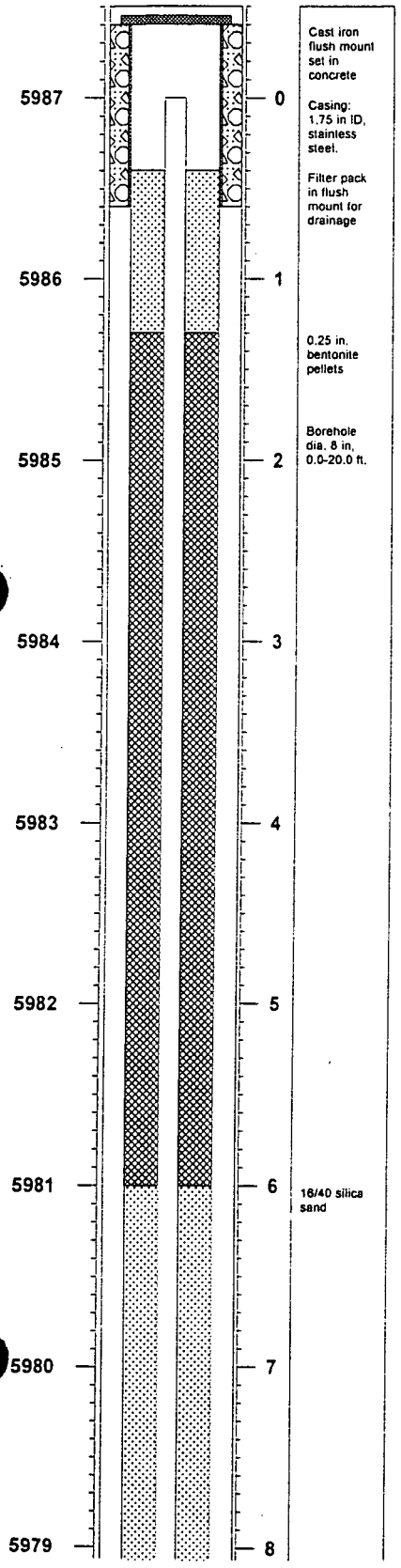
CLAYSTONE: 15-16 ft, same as above, 13-15 ft., but no sandstones, slightly moist, Fe/Mn nodules present @ 15.8 ft. (similar to 15.1 ft.). TD is 16.0 ft.

418

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5987.00	CASING DIA (IN):	LOG OF BORING NUMBER:
NORTH: 750708	TOTAL DEPTH (FT): 24.00	BH DIA. (IN):	18499
EAST: 2083853	COMPLETION DATE: 2/22/99	GRID LOCATOR:	
PROJECT: Borehole & Well	GEOLOGIST: Boylan		

REMARKS:
IHSS 118.1/NOTE: #18499 is a twin of #05497. Reference #05

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description



NO RECOVERY: NOTE: #18499 is a twin of #05497. Reference #05497 for all geologic descriptions since stratigraphy was not logged during drilling or installation of this well.

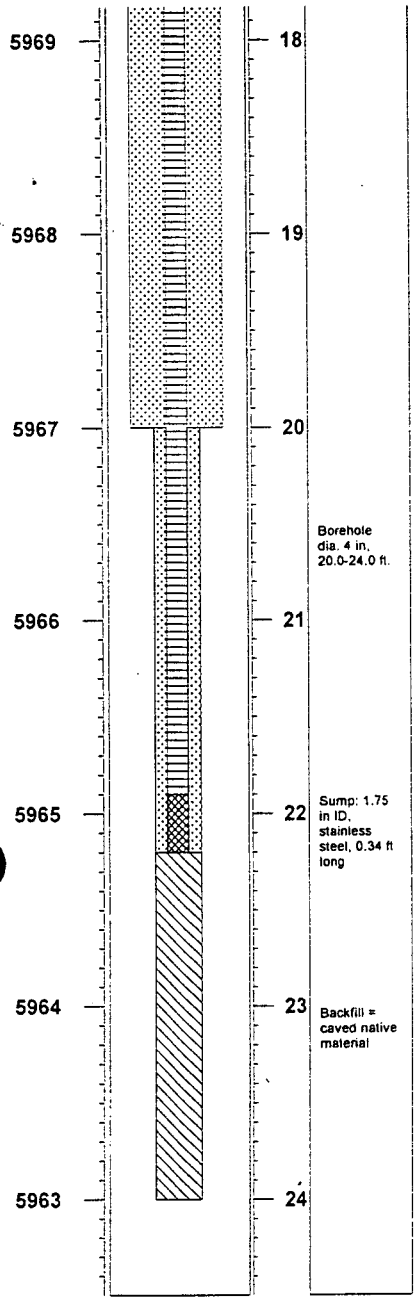
419

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5978		9			
5977		10			
5976		11			
5975	Screen: 1.75 in ID, 0.010 in slotted stainless steel	12			
5974		13			
5973		14			
5972		15			
5971		16			
5970		17			

LOG OF BORING NUMBER:
18499

420

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 18499 Lithologic Description	Page 3 of 3



421

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5986.00	CASING DIA (IN):	LOG OF BORING NUMBER:
NORTH: 750719	TOTAL DEPTH (FT): 24.00	BH DIA. (IN):	18599
EAST: 2083894	COMPLETION DATE: 2/18/99	GRID LOCATOR:	
PROJECT: Borehole & Well	GEOLOGIST: Boylan		

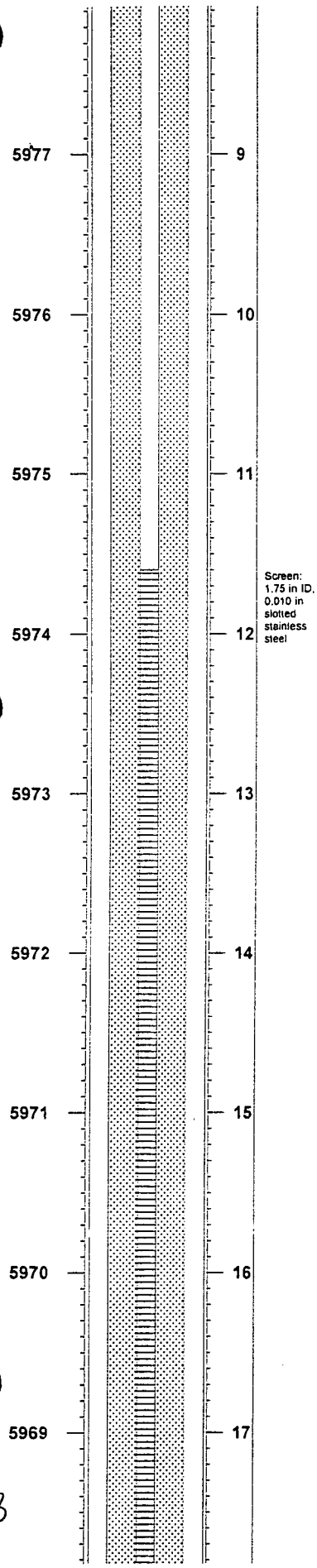
REMARKS:
IHSS 118.1/NOTE: #18599 is a twin of #05897. Reference #05

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5986	Cast iron flush mount set in concrete. Casing: 1.75 in ID, stainless steel	0			NO RECOVERY: NOTE: #18599 is a twin of #05897. Reference #05897 for all gelogic descriptions since stratigraphy was not logged during drilling or installation of this well.
5985	Filter pack in flush mount for drainage; 0.25 in bentonite pellets	1			
5984	Borehole dia. 8 in., 0.0-20.0 ft.	2			
5983		3			
5982		4			
5981		5			
5980	16/40 silica sand	6			
5979		7			
5978		8			

422

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

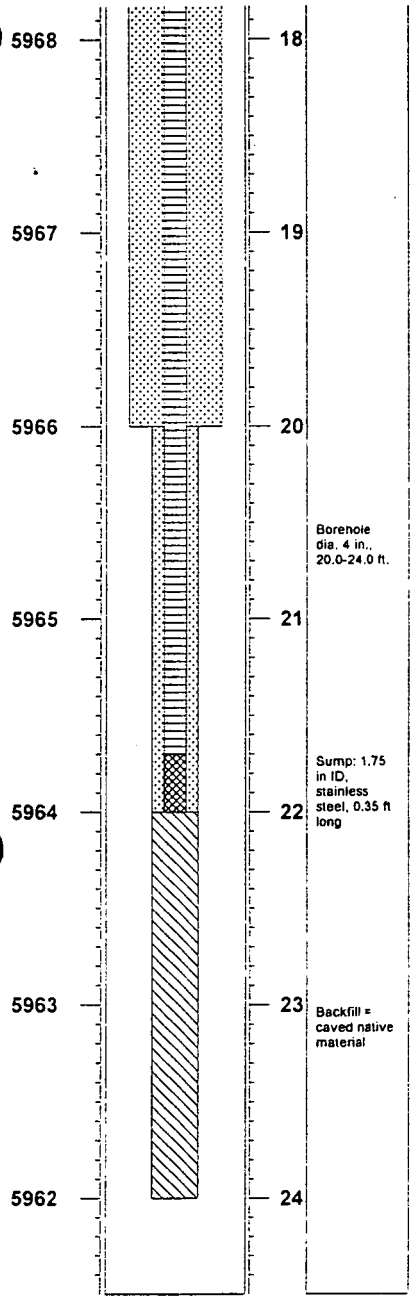
LOG OF BORING NUMBER:
18599



423

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
18599



424

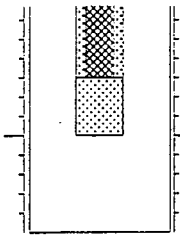
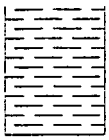
STATE PLANE COORDINATES AREA: NORTH:750718 EAST: 2083931 PROJECT: Borehole & Well REMARKS: IHSS 118.1	GRND ELEV. (FT):5986.00 TOTAL DEPTH (FT): 18.00 COMPLETION DATE: 2/17/99 GEOLOGIST: Boylan	CASING DIA (IN): BH DIA. (IN): GRID LOCATOR:	LOG OF BORING NUMBER: **18699**

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5987		1			
5986	Cast iron flush mount set in concrete Casing: 2 in ID, Sch 40 PVC Filter pack in flush mount for drainage	0			NO RECOVERY: 0-6 ft. Center bit, hits off auger bore to 26 ppm FID, 3 ppm PID, no visible product or staining.
5985	0.25 in. bentonite plug pellets	1			
5984		2			
	Borehole dia 8 in., 0.0-18.0 ft.				
5983		3			
5982	16/40 silica sand	4			
5981		5			
	Screen: 2 in ID, 0.010 inch slotted Sch 40 PVC				
5980		6			SC-SM: 6-6.7 ft, Clayey sand to gravelly-silty sand, moderate yellowish brown (10YR5/4) w/ some pink orthoclase feldspars, contains pockets of pale yellowish brown (10YR6/2) clay, slightly moist, no hits. TOP OF BEDROCK = 6.7 ft.
5979		7			CLAYSTONE: 6.7-8 ft, Claystone, silty claystone, siltstone w/ clay and trace to some v.f.g. sand, predominantly yellowish gray (5Y7/2) w/ areas Fe-stained orange, scattered black areas - carbonaceous(?) between 6.8-7.5 ft, no PID hits, coarsens w/ depth but on a finer scale

425

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					is variable, moist.
5978	8				CLAYSTONE: 8-10 ft, as above but has overall texture of clayey silstone w/trace to some sand, moist, portion below 9.5 ft. shows lots of brown flecks probably carbonaceous or Mn oxides, no PID hits, sand continues to be v.f.g. qtz.
5977	9				
5976	10				CLAYSTONE: 10-12 ft, same as above, but wet, extremely friable except @ claystone lenses 10.9-11.2, 11.5-12.0, no PID hits.
5975	11				
5974	12				CLAYSTONE: 12-14 ft, same as above 6.7-12.0 and most resembling 8.0-10.0 ft. material, w/clay lenses scattered throughout (typically 0.5 in. thick, but thicker one at 13.6-13.9), wet at top to moist below, no PID hits, sandy zones (12.1-12.3, 12.9-13.2), extremely friable, v.f.g. qtz.
5973	13				
5972	14				CLAYSTONE: 14-16 ft, same as above with good clay @ 15.0-16.0 ft., fragmented ironstone nodule @ 15.8 ft., claystone is moist, siltstone is moist to wet.
5971	15				
5970	16	Sump: 2 in ID, Sch 40 PVC			CLAYSTONE: 16-18 ft, same as above 15.0-16.0, w/ fragmented ironstone nodules between 17-17.7 ft., also a few scattered silty lenses, slightly moist, TD is 18.0 ft.
5969	17	Borehole dia. 4 in., 16.0-18.0 ft.			

426

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5968		18			

LOG OF BORING NUMBER:
18699

427

STATE PLANE COORDINATES AREA: NORTH: 750665 EAST: 2083820 PROJECT: Borehole & Well REMARKS: 1 HSS 118.1	GRND ELEV. (FT): 5986.00 TOTAL DEPTH (FT): 13.00 COMPLETION DATE: 1/19/99 GEOLOGIST: Boylan	CASING DIA (IN): BH DIA. (IN): GRID LOCATOR:	LOG OF BORING NUMBER: **18799**

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5986	0	Cast iron flush mount set in concrete Filter pack in flush mount for drainage			NO RECOVERY: 0-3 ft, Center bit, asphalt @ 0.0-0.4 ft..
5985	1	3/8 in bentonite plug pellets			
5984	2	Casing: 2 in OD, Sch 40 PVC			
5983	3	Borehole 8 in dia., 0.0-11.0 ft.			GM: 3-4.9 ft, Sandy gravel to gravelly sand, ranges across dark yellowish orange (10YR6/6), moderate yellowish brown (10YR5/4), light brown (5YR5/6), gravels fractured, shattered mostly quartzite, slightly moist, no elevated PID readings. Clayey gravel below 4.5, but this material not split out as a separate unit. Due to predominance of gravels whole unit is not sandy gravel to sand-silt.
5982	4				
5981	5	16/40 silica sand			NO RECOVERY: 4.9-5 ft.
5980	6	Screen: 2 in ID, 0.010 inch slotted Sch 40 PVC			GM: 5-6.6 ft, same as above 3.0-4.9 w/ occasional pockets of clayey gravel.
					NO RECOVERY: 6.6-7 ft.
5979	7				SM-GM: 7-8.5 ft, Sandy gravel to gravelly sand as above 3.0-6.6, but parts sand-silt mixture so call it gravel-sand-silt mixture.
5978	8				

428

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					NO RECOVERY: 8.5-9 ft.
5977		9			SANDSTONE: 9-11 ft, Sandstone w/clay to clayey siltstone with sand, mottled dark yellowish orange (10YR6/6) and yellowish gray to light olive gray (5Y7/2-5/2), interlayered gradual transitions, moist, sand is quartz, rounded v.f.g. Sandstone portions are not clean. Increasing clay content below 10.2 ft. Black Mn and/or carbonaceous flecks present, especially in clayey zones.Top Bedrock = 9.0 ft.
5976		10			
5975		11	Sump: 2 in ID, Sch 40 PVC		SANDSTONE: 11-13 ft, same as above 9.0-11.0, continues to be interlayered, sand is cleanest, best defined @ 11.3-11.8 ft., shows parting behavior that indicates bedding, but no visible bedding features obvious, Mn/carbonaceous flecks common below 12.0, possible Fe-replaced plant remains @12.6 ft., moist. TD is 13.0 ft.
5974		12	Borehole 4 in dia., 11.0-13.0 ft.		
5973		13	Backfill = 16/40 silica sand		

LOG OF BORING NUMBER: 18799

429

STATE PLANE COORDINATES AREA:
NORTH: 750671
EAST: 2083898
PROJECT: Borehole & Well
REMARKS:
IHSS 118.1

GRND ELEV. (FT): 5986.00
TOTAL DEPTH (FT): 13.00
COMPLETION DATE: 1/19/99
GEOLOGIST: Boylan

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER: 18899

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5986	0	Cast iron flush mount set in concrete			NO RECOVERY: 0-3 ft, Center bit, asphalt at 0.0-0.5 ft.
5985	1	Filter pack in flush mount for drainage			
		3/8 in. bentonite plug pellets			
5984	2	Casing: 2 in ID, Sch 40 PVC			
5983	3	Borehole dia. 8 in., 0.0-9.0 ft.			GC: 3-4 ft, Clayey gravel to clayey sand with gravel, moderate brown to strong brown (5YR4/4 to 7.5YR5/4), gravels predominantly <0.5 in., moist, slightly sticky.
5982	4	16/40 silica sand			NO RECOVERY: 4-5 ft.
5981	5				GC: 5-6 ft, Same as above 3.0-4.0 ft. w/larger fractured quartzite gravels, color changes abruptly below 5.5 ft. to yellowish gray (5Y7/2), moist.
5980	6	Screen: 2 in ID, 0.010 inch slotted Sch 40 PVC			NO RECOVERY: 6-7 ft. Top bedrock = 7.0 ft.
5979	7				CLAYSTONE: 7-9 ft, Claystone, yellowish gray (5Y7/2) where fresh, (to) dark yellowish orange (10YR6/6) were Fe-stained, Mn or carbonaceous flecks common in top 0.7 ft., strongest Fe accumulation within same zone, caliche clasts (1/4-3/8") at 8.0, 8.4, 8.8 ft.
5978	8				

430

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5977	Sump: 2 in ID, Sch 40 PVC	9			CLAYSTONE: 9-11 ft, Same as above 7.0-9.0, but trace to some silt, perhaps up to 5-8% v.f.g. sand, most is tight claystone, the coarser material is scattered in poorly developed lenses most evident below 10.4 ft.
5976	Borehole dia. 4 in., 9.0-11.0 ft.	10			
5975	Backfill = 3/8 in bentonite pellets	11			CLAYSTONE: 11-13 ft, same as above 9.0-11.0, moderate yellowish brown (10YR5/4), well developed Fe-caliche at 11.3 ft., scattered carbonaceous flecks & streamers especially below 12.3 ft., some carbonaceous fragments are really coally, TD is 13.0 ft.
5974	Borehole dia. 2 in., 11.0-13.0 ft.	12			
5973		13			

LOG OF BORING NUMBER:
18899

431

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 6026.38	CASING DIA (IN):	LOG OF BORING NUMBER:
NORTH: 748702.52	TOTAL DEPTH (FT): 28.35	BH DIA. (IN):	40099
EAST: 2082073.74	COMPLETION DATE: 8/25/99	GRID LOCATOR:	
PROJECT: Borehole & Well	GEOLOGIST: T. Lutherer		
REMARKS:			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6026	Cast iron flush mount; Sch 40-PVC; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID; Granular bentonite	0			SM-GM: 0-2.0' NO RECOVERY - Hand dug for aseptic well completion. Soil was drummed and sampled.
6025		1			
6024		2			CL: 2.0-5.0' Sandy CLAY, strong brn.(7.5YR) to lt. yellowish-brn.(2.5Y6/3), mottled, fine to coarse sand, fine to coarse gravel, sand & gravel sub-rounded to ang. Silty, mod. to low plasticity, damp. Locally grading to gravelly clay & clayey sand.
6023		3			
6022		4			
6021		5			CL: 5.0-8.0' Sandy CLAY (same as 2.0-5.0') w/less gravel, however, locally grading to clayey sand (CL/SC).
6020		6			
6019		7			
		8			

432

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6018					SC: 8.0-10.0' Clayey SAND, strong brn.(7.5YR5/8), fine to coarse sand, angular to sub-rounded, silty, low to mod. plasticity, some silt gravel, as above. Damp.
6017		9			
6016		10			SC: 10.0-12.0' Clayey SAND (same as 8.0-10.0').
6015	16-40 silica sand	11			
6014		12			CL: 12.0-13.0' CLAY intercalated w/clayey sand (same as 2.0-5.0', w/same mottled color). Tr. gravel, damp.
6013	Sch 40-PVC, 0.010" slots	13			CL: 13.0-16.0' CLAY intercalated w/clayey sand (same as 12.0-13.0') w/tr. sand, damp.
6012		14			
6011		15			
6010		16			
6009		17			

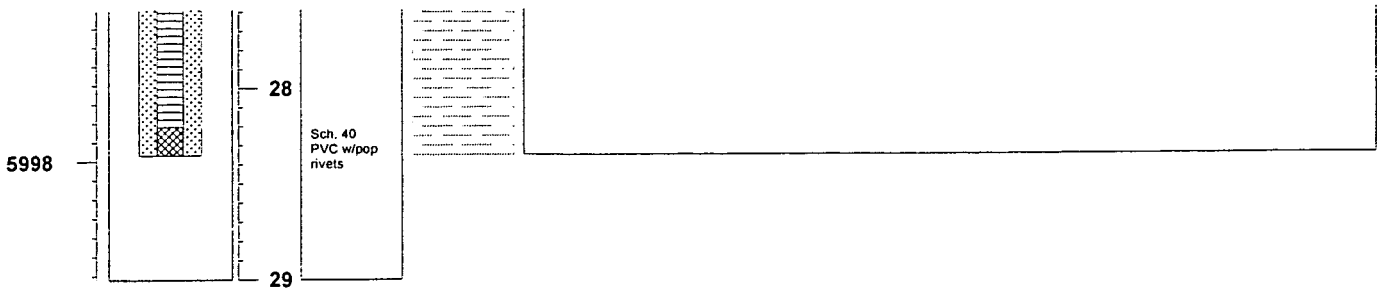
433

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		18			
6008					CL: 18.0-20.0' CLAY intercalated w/clayey sand (same as 16.0-18.0'). Some fine to med. sub-angular to sub-rounded sand @ top and bottom of intervals. Damp, slough wet.
		19			
6007					
		20			
6006					CL: 20.0-22.0' CLAY intercalated w/clayey sand (same as 18.0-20.0'). Locally increasing sand content, damp.
		21			
6005					
		22			
6004					SC: 22.0-24.0' Clayey SAND, dk. brn.(7.5YR4/4) to lt. gry.(7.5YRN7/), mottled. Fine to coarse sand, sub-angular to sub-rounded. Clay: mod. plasticity, locally silty. Gravelly zone @ 22.8-23.1', fine to coarse, sub-ang. to ang. w/clay and caliche, moist.
		23			
6003					
		24			
6002					SC: 24.0-25.5' Clayey SAND (same as 22.0-24.0') w/gravel, wet.
		25			
6001					
		26			SC: 25.5-27.0' Clayey SAND (same as 24.0-25.5') w/gravel, wet.
6000					
		27			CLAYSTONE: 27.0-28.35' CLAYSTONE (bedrock).
5999					

434

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
40099



435

STATE PLANE COORDINATES AREA:
NORTH: 748950.1
EAST: 2082211.33
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 6023.82
TOTAL DEPTH (FT): 27.95
COMPLETION DATE: 8/19/99
GEOLOGIST: T. Lutherer

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER: 40199

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6024	Cast iron flush mount; Sch 40-PVC; Granular bentonite; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID	0			SM-GM: 0-2.0' NO RECOVERY - Hand dug for aseptic well completion. Soil drummed and sampled.
6023		1			
6022		2			CL: 2.0-2.3' CLAY w/sand, dk. reddish-brn.(5YR3/3), mod. plasticity sand w/fine, angular gravel, silty, damp.
6021		3			SC: 2.3-5.0' Clayey SAND, brn.(7.5YR5/4), fine to coarse grained, sub-ang. to sub-rounded sand. Fine to coarse grained, sub-rounded to angular gravel, locally abundant. Silty, low to med. plasticity, damp.
6020		4			
6019		5			CL: 5.0-8.0' Sandy CLAY (same as 2.0-2.3'), mottled brn.(7.5YR5/4) to pale yellow (2.5Y7/3), mod. plasticity. Sand and gravel as above. Damp.
6018		6			
6017		7			
6016		8			

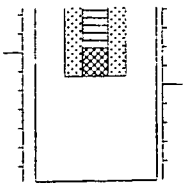
430

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6015		9			SC: 8.0-11.0' Clayey SAND, locally grading to sandy clay and clay w/sand (as above, 5.0-8.0'). Abundant K-spar sand @ 10.8', damp.
6014		10			
6013	16-40 silica sand	11			SC: 11.0-11.4' Clay w/SAND and tr. fine gravel, slough clayey sand, damp.
6012		12			CH: 11.4-13.4' CLAY - locally clay w/sand (13.4-13.5'), mottled strong brn. to lt. gry.(7.5YR5/6 to 5Y7/1). Sand is very fine to med. grained, ang. to sub-rounded, locally some silt. Mod. to highly plastic clay, damp to moist.
6011	Sch 40-PVC, 0.010" slots	13			CL: 13.4-13.5' Sandy CLAY, moist.
6010		14			CL: 13.5-17.0' CLAY w/tr. to some sand (as above, 11.4-13.4'), mottled (as above), damp.
6009		15			
6008		16			
6007		17			CL: 17.0-18.5' CLAY w/traces of sand and fine/v.fine gravel. Still mottled (as above) but now predominately strong brn.(2.5YR5/S). Damp, locally moist.
6006					

437

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		18			
6005		19			CL: 18.5-20.0' CLAY (as above, 17.0-18.5'), gravel getting coarse, predominately strong brn.(as above). Damp, locally moist.
6004		20			CL: 20.0-22.3' CLAY (same as 18.5-20.0'). Sparse sand and gravel. Damp, locally moist.
6003		21			
6002		22			CL: 22.3-23.5' CLAY (as above, 20.0-22.3') w/no gravel. Locally some v. fine to fine sand. Strong brn., damp.
6001		23			CL: 23.5-25.0' CLAY (as above 22.3-23.5') w/increasing gry. material, increasing sand and lithic gravel, moist.
6000		24			
5999		25			SC: 25.0-26.0' Clayey SAND/sandy clay, olive yellow (2.5Y6/6) to pale yellow (2.5Y8/3) clay (as above, 22.3-23.5') w/fine to coarse sand and fine to coarse lithic gravel, wet.
5998		26			CLAYSTONE: 26.0-27.95' CLAYSTONE (bedrock), gry.(2.5YR5/) locally lt. olive brn.(2.5Y6/4). Locally silty, well indurated, mod. weathered.
5997		27			

438

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5996		28	Sch. 40 PVC end cap		

439

STATE PLANE COORDINATES AREA:
NORTH: 748521.32
EAST: 2082198.43
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 6024.52
TOTAL DEPTH (FT): 29.00
COMPLETION DATE: 8/30/99
GEOLOGIST: T. Lutherer

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER: 40299

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description	
6025						
	Cast iron flush mount	0			SM-GM: 0-2.0' NO RECOVERY - Hand dug for aseptic well completion. Soil drummed and sampled.	
6024	Sch 40-PVC					
	Granular bentonite	1				
6023	BH = 2.0" OD					
		2			CL: 2.0-5.0' Sandy CLAY, v. dk. gry. (2.0-2.7') 5YR5/1, becoming yellowish-red (5YR4/6) @ bottom of interval. Mod. plasticity. Fine to coarse grained, ang. to sub-rounded sand. Fine to coarse grained, ang. to sub-rounded lithic gravel. Locally grading to	clayey gravel. Wet @ 2.0-2.7', otherwise, damp.
6022	Casing = 1.25" OD, 0.75" ID					
		3				
6021						
		4				
6020						
		5			CL: 5.0-8.0' Sandy CLAY (same as 2.0-5.0'), yellowish-red (5YR4/6) to v. pale brn.(10YR7/4), abundant gravel (as above). Locally grading to clayey sand. Damp.	
6019						
		6				
6018						
		7				
6017						
		8				

440

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6016		9			CL: 8.0-11.0' Sandy CLAY (same as 5.0-8.0'), locally grading to clayey sand, abundant gravel (as above). Damp.
6015		10			
6014	16-40 silica sand	11			SC: 11.0-14.0' Clayey SAND (same as 8.0-11.0'), sparse fine gravel, damp.
6013		12			
6012	Sch 40-PVC	13			
6011		14			SC: 14.0-16.0' Clayey SAND (same as 11.0-14.0') w/some fine gravel, damp.
6010		15			
6009		16			CL: 16.0-18.0' Sandy CLAY , locally grading to clayey sand (CL/SC). Tr. to some fine to coarse, broken to sub-angular lithic gravel, moist to wet.
6008		17			
6007					

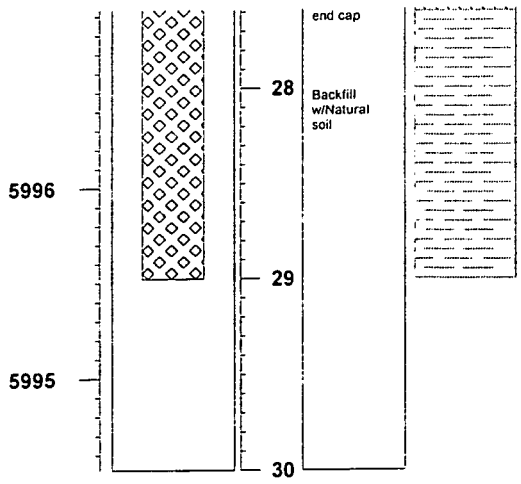
441

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		18			SC: 18.0-20.0' Clayey SAND, locally grading to sandy clay (SC/CL, same as 16.0-18.0'). Tr. fine gravel, moist to wet.
6006					
		19			
6005					
		20			SC: 20.0-21.0' Clayey SAND (same as 18.0-20.0'), damp-moist.
6004					
		21			SC: 21.0-23.0' Clayey SAND (same as 20.0-21.0'), moist, slough is wet.
6003					
		22			
6002					
		23			SC: 23.0-25.0' Clayey SAND (same as 21.0-23.0'), primary color is still strong brn.(7.5YR4/6), although, there is increased mottling w/lt. yellowish-brn.(2.5Y6/4), moist.
6001					
		24			
6000					
		25			SC: 25.0-25.2' Clayey SAND (same as 23.0-25.0'), moist w/saturated slough @ 25.2'.
5999					CL: 25.2-27.0' CLAY w/sand, grading to clay w/tr. gravel @ bottom of interval. Sand is fine to coarse grained, ang. to sub-rounded. Fine to coarse, ang. to sub-rounded lithic gravel. Clay is reworked claystone, lt. gry.(10YR7/1) to yellowish-brn.(10YR5/6) mottled, dense, w/traces of sand & gravel (as above). Damp.
		26			
5998					
		27			
5997			Sch 40-PVC		

442

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
40299



CLAYSTONE: 27.6-29.0' CLAYSTONE, lt. gry.(10YR9/1) to yellowish-brn.(10YR5/6), mottled, some gravel, dense, damp.

443

STATE PLANE COORDINATES AREA: NORTH: 748750.48 EAST: 2082575.87 PROJECT: Borehole & Well REMARKS:	GRND ELEV. (FT): 6020.43 TOTAL DEPTH (FT): 24.80 COMPLETION DATE: 9/7/99 GEOLOGIST: J. Boylan	CASING DIA (IN): BH DIA. (IN): GRID LOCATOR:	LOG OF BORING NUMBER: **40399**

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6020	0	Cast iron flush mount		SM-GM: 0-2.1' NO RECOVERY - Hand-dug for aseptic surface casing.	
6019	1	Sch 40-PVC Granular bentonite BH = 2.0" OD			
6018	2	Casing = 1.25" OD, 0.75" ID		CL: 2.1-3.7' Gravelly CLAY to clayey gravel w/sand (CL/GC), mottled, but mainly dk. yellowish-brn. to v. dk. gryish-brn.(10YR4/4 to 3/2). Slightly moist.	
6017	3				
6016	4			SM: 3.7-4.9' Gravelly silty SAND to sandy silty gravel (SM/GM). looks like artificial fill (e.g., road base). Lt. yellowish-brn.(10YR6/4) @ top, to v. dk. gryish-brn.(10YR3/2) below 4/4'. This lower material is similar to but sandier than above 2.1-3.7'	interval. Grades to clayey material (like 2.1-3.7') below 4.9'.
6015	5			CL: 4.9-7.3' Gravelly CLAY to clayey gravel w/sand (same as 2.1-3.7', CL/GC), but colors are typically a patchwork of dk. bn.(10YR3/3) and dk. reddish-brn.(2.5YR5/4). Slightly moist. Below 7.0', color includes pockets of gry. clay (5Y6/1,5/1). Portions	are sandy: brnish-yellow (10YR6/6) sandy zone @ 7.3-7.7' (SC/SM). Gravels typically shattered; rock flour common. Occasional caliche clast.
6014	6				
6013	7				
	8				

444

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description	
6012					CL: 8.2-9.8' Gravelly CLAY to clayey gravel w/sand (similar to 4.9-7.3') but somewhat more sand, less gravel (SC/CL). Some pockets closer to GC, some to SM. Clay-rich zone @ 8.8-9.4', GC @ 9.4-9.8'. Rotting gravels present. Slightly moist. Shattered	gravels w/rock flour, also present, as are caliche blebs.
6011		9				
6010		10			SM: 9.8-12.4' Silty, gravelly SAND w/clay, strong brn.(7.5YR5/6). Rotted gravels (granite, mafic frags.) commmon, mottling colors. Some zones fairly clayey to clayey-silty-gravelly sand or clayey sand w/silt & gravel. Scattered caliche grains.	
6009		11				
	16-40 silica sand	12				
6008	Sch 40-PVC, 0.010" slots	13			GC: 12.4-13.2' Clayey, sandy GRAVEL - similar to above (9.8-11.1') but more gravel and clay. Shattered gravels & rock flour common. Color is mottled, but mainly lt. brn. to brn.(7.5YR6/4 to5/4). Sl. moist.	
6007		14			SC: 13.2-13.8' Clayey, gravelly SAND, same as above, 12.4-13.2', but finer-grained and increased sand (SC). Sl. moist, Rotted gravels present; colors variable.	
6006					GC: 13.8-14.6' Clayey sandy GRAVEL (same as 12.4-13.2'), sl. moist. Rotted gravels present; colors variable.	
		15			SC-SM: 14.6-15.1' Clayey, gravelly SAND w/silt, same as 13.2-13.8' w/silt. Sl. moist. Rotted gravels present; colors variable.	
6005		16			GM: 15.1-15.5' Silty, sandy GRAVEL - saturated - mottled w/shattered and rotted gravels. No predominent color. Saturated.	
6004					GM: 15.5-17.0' Silty, sandy GRAVEL (same as 15.1-15.5'), dominant color is strong brn.(7.5YR5/6). Slough is more saturated than core, which is moist.	
6003		17			CL: 17.0-19.0' CLAY to sandy clay - pockets of "pure" clay range fm. grays to olive-brns. to reds, but predom. color is strong brn.(7.55/6, 5/8). Wet. Coarsens w/increasing depth - towards 19',	sorted, fine to medium.

445

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		18			material approaches SC (clayey sand). Sand is mod. to well
6002					
		19			SC-SM: 19.0-21.0' Silty, clayey SAND (SM/SC) - similar to above (17.0-19.0') but coarser - less clay, more silt & sand. Wet to saturated. Continues trend from 17.0, coarsening w/depth. A few isolated gravels in bottom 0.6'.
6001					
		20			
6000					
		21			SC-SM: 21.0-23.0' Silty, clayey SAND (same as above, 19.0-21.0') SM/SC, continuing to coarsen w/depth. Gravelly below 22.6'. Saturated.
5999					
		22			
5998					
		23			SC-SM: 23.0-23.8' Silty, clayey SAND (SM/SC), same as 19.0-23.0' w/clay content like that below 21.0'.
5997					
		24			CLAYSTONE: 23.8-24.8' CLAYSTONE (bedrock) to silty CLAYSTONE, lt. olive-brn.(2.5Y5/3). Sl. moist to moist. Mottled. Scattered Fe-staining. Top of Bedrock = 24.8'.
5996	Sch 40-PVC end cap Backfill w/Natural Soil				
		25			
5995					

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STATE PLANE COORDINATES AREA: NORTH: 748659.44 EAST: 2082456.69 PROJECT: Borehole & Well REMARKS:	GRND ELEV. (FT): 6021.11 TOTAL DEPTH (FT): 26.20 COMPLETION DATE: 9/1/99 GEOLOGIST: J. Boylan	CASING DIA (IN): BH DIA. (IN): GRID LOCATOR:	LOG OF BORING NUMBER: **40499**

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6021	Cast iron flush mount; Sch 40-PVC; Granular Bentonite; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID	0			SM-GM: 0-2.1' NO RECOVERY - Hand-dug for aseptic surface casing.
6020		1			
6019		2			CL: 2.1-6.0' Gravelly clay to clay w/gravel - mottled, but predom. dk. reddish-brn.(2.5YR3/4) to about 4.0', then strong brn.(7.5YR5/6) below that. Moist. Intervals of GC (2.1-2.5', 4.0', 5.6-5.7'); lattermost interval is also rich in caliche.
6018		3			
6017		4			
6016		5			
6015		6			CL: 6.0-7.5' Gravelly CLAY to clay w/gravel (same as above, 2.1-6.0'), w/ increasing gravel and none of the reddish-brn. coloration. Moist to sl. moist. Scattered caliche-rich pockets.
6014		7			GC: 7.5-9.2' Clayey GRAVEL w/sand to sandy, clayey gravel - mottled, some clay-rich/gravel-poor zones. Predom. color is brn.(7.5YR5/4). Pockets typically shattered, rock flour common.
		8			

447

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6013					of clay are often lt. olive-brn.(2.5Y5/3). Moist to sl. moist. Scattered caliche-rich pockets. Gravels
6012		9			GC: 9.2-12.2' Clayey GRAVEL w/sand to sandy, clayey gravel, (same as above, 7.5-9.2'). Clay lenses @ 10.1-10.8' and 11.9-12.2'.
6011		10			
6010		11			
6009		12			CL: 12.2-12.5' Sandy CLAY w/gravel, variable grain size distribution. Mottled colors - same ranges as above (6.0-12.2'). Gravels generally shattered w/rock flour common. Moist to slightly moist.
6008	10-40 silica sand	13			GC: 12.5-12.9' Clayey, sandy GRAVEL, variable grain size distribution. Mottled colors - same ranges as above (6.0-12.2'). Gravels generally shattered w/rock flour common. Moist to slightly moist.
6007		14			CL: 12.9-13.1' Sandy CLAY (same general description as above, 12.5-12.9').
6006	Sch 40 PVC, 0.010" slots	15			SC-SM: 13.1-13.4' Clayey, silty SAND (same general description as above, 12.9-13.1').
6005		16			CL: 13.4-13.9' Sandy CLAY (same general description as above, 13.1-13.4'). GC: 13.9-14.5' Clayey, sandy GRAVEL (same general description as above, 13.4-13.9'). SC-SM: 14.5-15.0' Clayey, silty SAND w/gravel (same general description as above, 13.9-14.5').
6004		17			GC: 15.0-15.2' Clayey, sandy GRAVEL (same general description as above, 14.5-15.0'). SC-SM: 15.2-16.8' Clayey, silty SAND w/gravel to silty, gravelly sand w/clay (similar to above, 12.2-15.2'). Slightly moist.

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Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6003		18			CL: 16.8-18.2' CLAY to clay w/traces sand & silt - mottled, but predominately reddish-brn.(5YR5/4) w/Fe-staining turning some parts orange; other pockets also lt. brnish-gry.(2.5Y6/2). Slightly moist to moist.
6002		19			SC-SM: 18.2-19.1' Clayey, silty SAND w/gravel to silty, gravelly sand w/clay, (same as above, 15.2-16.8'), w/rotted gravels becoming common.
6001		20			CL: 19.1-20.2' CLAY to clay w/traces sand & silt (same as above, 16.8-18.2'), w/occasional gravel clast.
					SC-SM: 20.2-20.7' Clayey to silty, gravelly SAND (like above, 18.2-19.1'). Slightly moist.
6000		21			CL: 20.7-22.1' Sandy, silty CLAY to clayey, silty SAND (CL/SC), predominately reddish yellow to strong brn.(7.5YR6/6 to 5/6) w/occasional clay lens of a different color. Moist. Occasional gravel clast.
5999		22			CL: 22.1-23.5' Sandy, silty CLAY to clayey, silty SAND (CL/SC) (same as above, 20.7-22.1'). Saturated.
5998		23			
5997		24			GC: 23.5-24.2' Clayey, sandy GRAVEL to clayey SAND w/gravel (GC/SC). Moist, variegated grain size distribution. Coarsest @ 23.5-23.9'.
					GC: 24.2-24.8' Clayey, sandy GRAVEL to clayey SAND w/gravel (GC/SC) - same as above, 23.5-24.2'. Saturated where coarse w/moist clay zones.
5996	Sch.40 PVC	25			CLAYSTONE: 24.8-26.2' CLAYSTONE (bedrock), lt. brnish-gry. to gryish-brn.(2.5Y6/2 to 5/2). Portions show Fe-staining. Traces dk. frags. (carbonaceous or Mn-oxides). Slightly moist. Top of Bedrock = 24.8'.
5995	Backfill w/Native soil	26			
		27			

449

STATE PLANE COORDINATES AREA:
NORTH: 751142.32
EAST: 2083646.21
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5945.06
TOTAL DEPTH (FT): 11.20
COMPLETION DATE: 9/23/99
GEOLOGIST: T. Lutherer

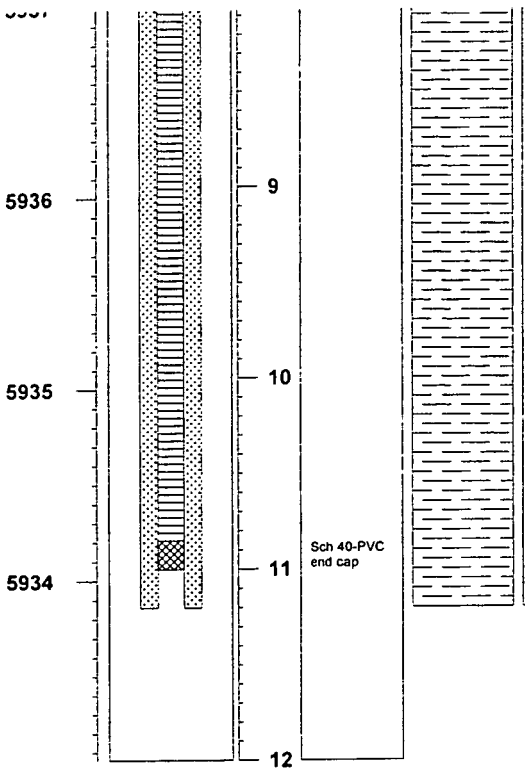
CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER: 40599

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5945	0	Cast iron flush mount; Sch 40-PVC; Granular bentonite; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID		SM-GM: 0-2.0' NO RECOVERY - Artificial fill - Hand dug for aseptic well installation.	
5944	1				
5943	2			CL: 2.0-5.0' CLAY, lt. olive brn.(2.5Y5/4) w/some olive yellow (2.5Y6/8). FeOx staining, mod. plasticity. Some silt, tr. angular med. lithic gravel @ bottom of interval, and re-worked claystone. Wet @ 2.0-3.0', otherwise, moist/damp.	
5942	3	16-40 silica sand			
5941	4	Sch 40-PVC, 0.010" slots			
5940	5			CL: 5.0-6.0' CLAY (as above, 2.0-5.0') w/increasing bedrock characteristics w/traces sand and gravel, damp.	
5939	6			CLAYSTONE: 6.0-8.0' CLAYSTONE (bedrock), lt. olive brn.(2.5Y5/4) to dk. brn.(10YR3/3), v. poorly indurated, highly friable, tr. to some silt, tr. to some FeOx, tr. caliche. Damp, weathered bedrock. Top of bedrock = 6.0'.	
5938	7				
5937	8				

450

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 40599 Lithologic Description	Page 2 of 2



CLAYSTONE: 8.0-11.2' CLAYSTONE (as above, 6.0-8.0'), becoming more competant - predominate color v. dk. gryish-brn.(10YR3/2) w/local poorly developed blocky texture. More weathered 9.7-11.0'.

451

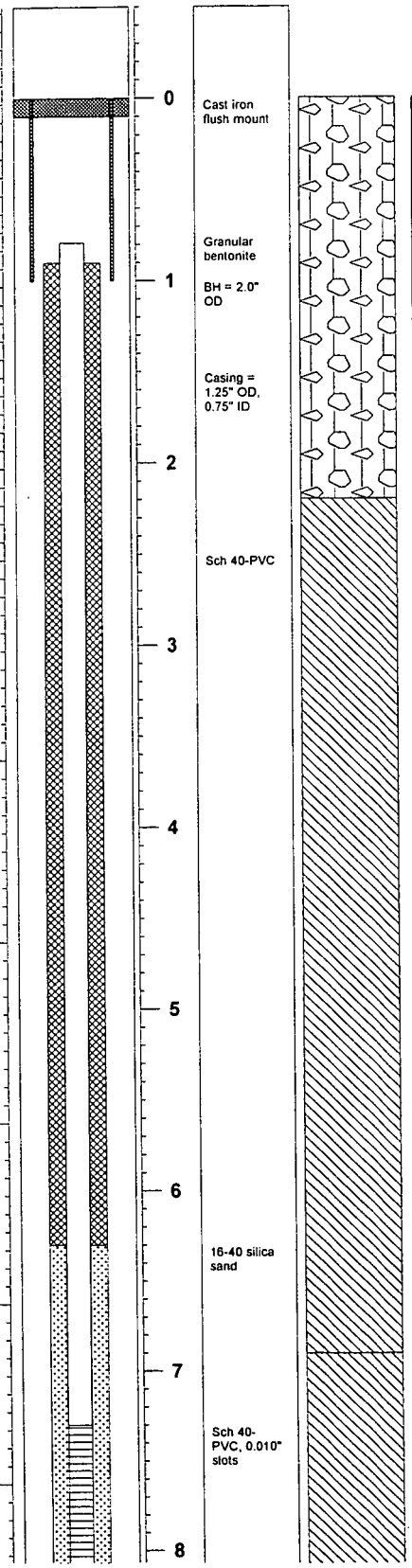
STATE PLANE COORDINATES AREA:
NORTH: 751173.47
EAST: 2083829.56
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5942.63
TOTAL DEPTH (FT): 14.20
COMPLETION DATE: 9/29/99
GEOLOGIST: F. Grigsby

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

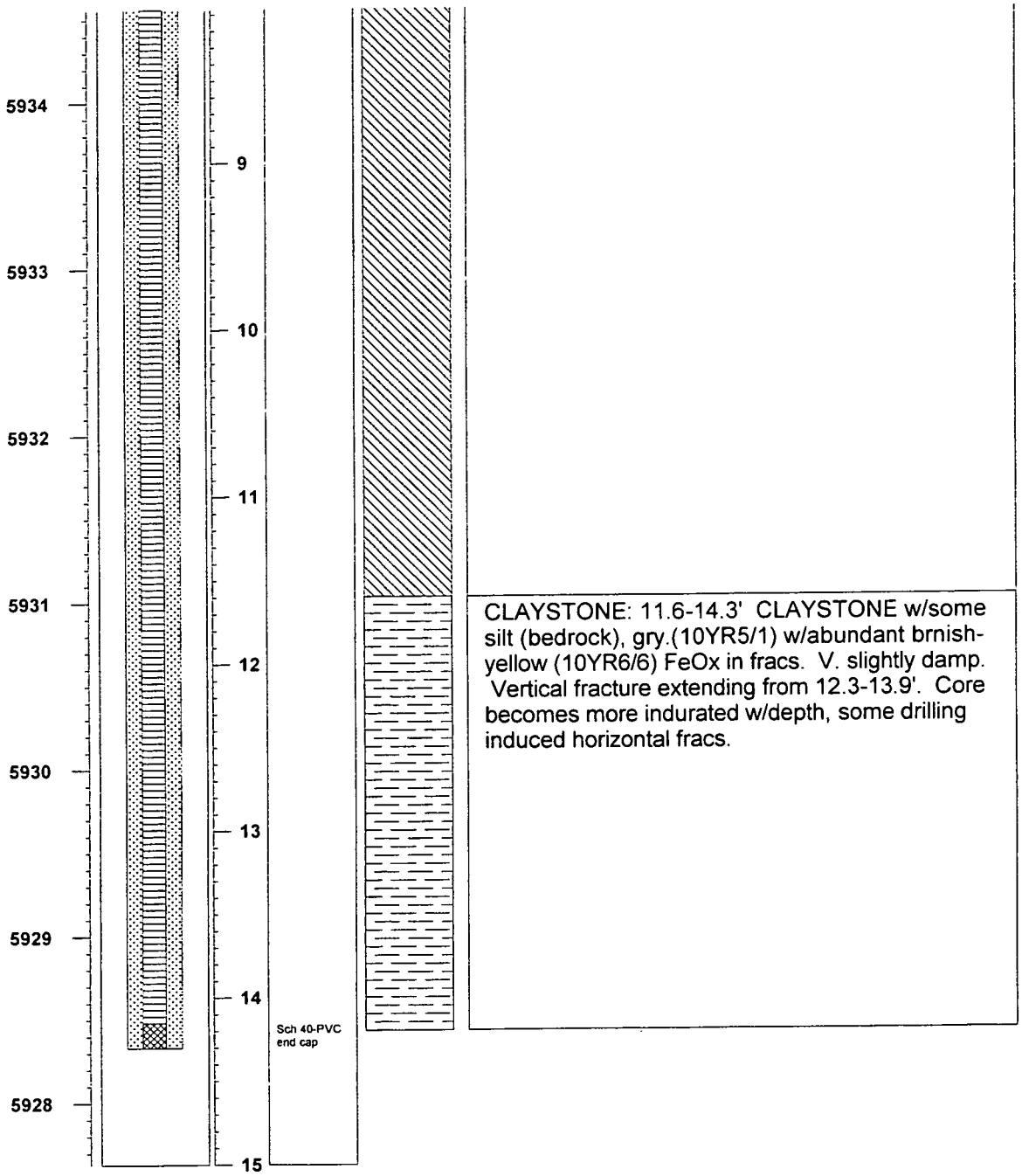
LOG OF BORING NUMBER: 40699

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description	
5943						
		0			SM-GM: 0-2.2' NO RECOVERY - Artificial fill - Hand dug for aseptic well installation.	
5942		1				
5941		2				
5940		3			CL: 2.2-6.9' CLAY w/tr. gravel, dk. olive gry.(5Y3/2) w/some olive brn.(2.5Y4/4) in upper 0.5' of interval. Concentration of gravel @ 3.1' (up to 1" schist frag.). Clay damp. Pliable, est. med. to high plasticity. Some organics @ 2.8-3.2', occasional	caliche or white altered clay in low half of interval. Slightly damp.
5939		4				
5938		5				
5937		6				
5936		7			CL: 6.9-11.6' Silty CLAY w/some claystone clasts, dk. gry.(5YR4/1) grading to gryish-brn.(2.5Y5/2). Predom. friable, some FeOx filled fracs., becomes more competant w/depth with high content of claystone. More heavy FeOx stained interval @ 11.3'. Some	organic frags. Very slightly damp.
5935		8				



452

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description	LOG OF BORING NUMBER: 40699



CLAYSTONE: 11.6-14.3' CLAYSTONE w/some silt (bedrock), gry.(10YR5/1) w/abundant brnish-yellow (10YR6/6) FeOx in fracs. V. slightly damp. Vertical fracture extending from 12.3-13.9'. Core becomes more indurated w/depth, some drilling induced horizontal fracs.

Top of Bedrock = 11.6'.

453

STATE PLANE COORDINATES AREA:
NORTH: 751120.54
EAST: 2083992.78
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5945.13
TOTAL DEPTH (FT): 10.20
COMPLETION DATE: 9/29/99
GEOLOGIST: T. Lutherer

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER 40799

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5945	0	Cast iron flush mount; Sch 40-PVC; Granular bentonite; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID; 16-40 silica sand; Sch 40-PVC, 0.010" slots			SM-GM: 0-2.0' NO RECOVERY - Artificial fill - Hand dug for aseptic well installation.
5944	1				
5943	2				CL: 2.0-3.65' CLAY, lt. olive brn. to dk. olive brn.(2.5Y5/3 to 2/5Y3/3), some v. dk. gry.(2.5Y3/1). Low to mod. plasticity, firm. Traces coarse, angular sand and angular, coarse gravel, some silt. Wet. Reworked claystone.
5942	3				
5941	4				SM-GM: 3.65-5.0' NO RECOVERY - Bedrock contact assumed @ 5.0'.
5940	5				CLAYSTONE: 5.0-8.0' CLAYSTONE (bedrock), primarily lt. olive brn.(2.5Y5/3) w/some dk. gry.(2.5Y4/1). Very poorly indurated, highly friable, tr. to some silt, dense, some poorly developed block texture. Some FeOx & MnOx staining. Damp, weathered.
5939	6				
5938	7				
	8				

454

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 40799 Lithologic Description	Page 2 of 2
5937					CLAYSTONE: 8.0-10.2' CLAYSTONE (as above, 5.0-8.0'), still weathered, predominantly lt. olive brn.(2.5Y5/3), some to abundant FeOx staining, damp.	
5936		9				
5935	Sch 40-PVC end cap	10				
		11				

455

STATE PLANE COORDINATES AREA:
NORTH: 750953.1
EAST: 2084071.96
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5979.79
TOTAL DEPTH (FT): 15.06
COMPLETION DATE: 9/30/99
GEOLOGIST: T. Lutherer

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

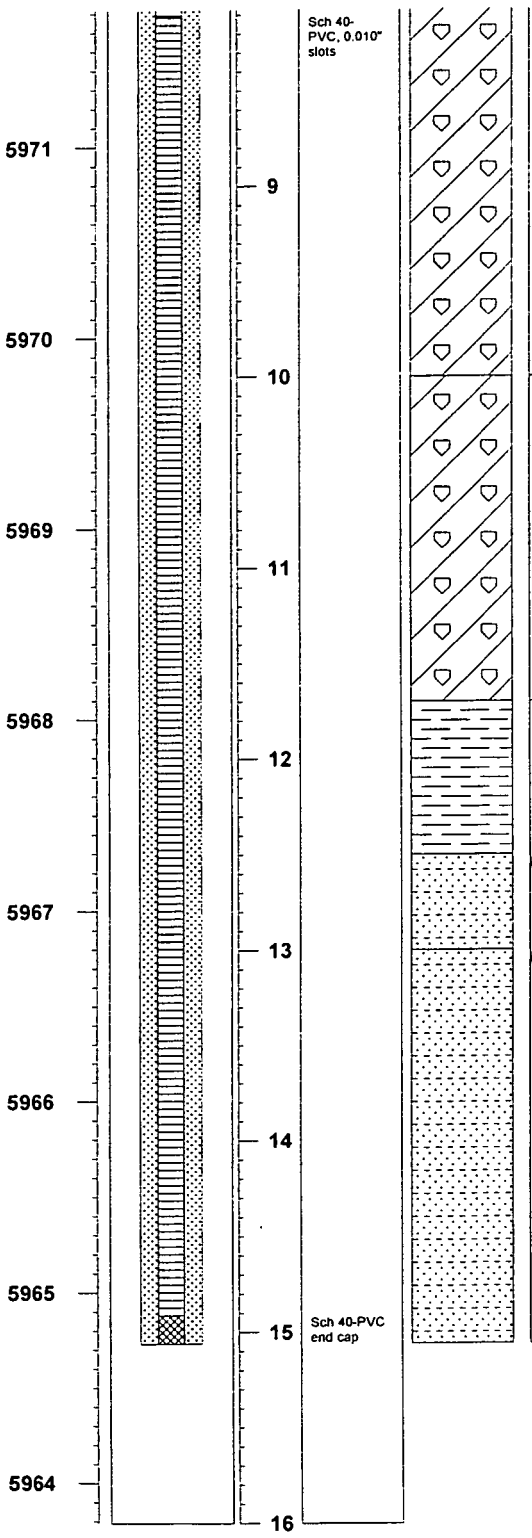
LOG OF BORING NUMBER: 40899

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5980	0	Cast iron flush mount; Sch 40-PVC; Granular bentonite; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID			SM-GM: 0-2.0' NO RECOVERY - Artificial fill - Hand dug for aseptic well installation.
5979	1				
5978	2				SC: 2.0-3.0' Clayey SAND, dk. red (2.5YR3/6), fine to coarse, angular to well rounded lithic sand. Low to mod. plasticity. Trace to some silt, tr. fine to coarse broken to sub-rounded gravel. Damp to moist. Locally grading to sandy clay.
5977	3				SC: 3.0-5.0' CALICHE, pinkish-white (7.5YR8/2), massive, w/gravel (as above, 2.0-3.0'), damp to moist, w/traces clayey sand/sandy clay (as above, 2.0-3.0').
5976	4				
5975	5				SC: 5.0-8.0' Clayey SAND, strong brn.(7.5YR4/6), components as above (2.0-3.0') w/varying amounts of caliche. Damp
5974	6	16-40 silica sand			
5973	7				
5972	8				

456

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
40899



SC: 8.0-10.0' Clayey SAND (as above, 5.0-8.0'), increasing gravel (as above), color- as above. Mottled w/dk. brn. (7.5YR3/4) and FeOx staining, damp.

SC: 10.0-11.7' Clayey SAND locally grading to sandy clay, predom. color is yellowish-brn.(10YR5/4), increasing gravel. Bedrock contact @ 11.7'.

CLAYSTONE: 11.7-12.5' CLAYSTONE (bedrock), highly oxidized, yellow (10YR7/6), tr. to some gry.(10YR6/1). Poorly indurated, mod. friable, dense, locally silty, locally sandy; v.f.g. sand, angular, unable to determine rounding w/10x lense. Locally grading to

clayey sandstone and sandstone w/clay.

CLAYEY SANDSTONE: 12.5-13.0' Clayey SANDSTONE/ sandstone w/clay (as above).

CLAYEY SANDSTONE: 13.0-15.06' Clayey SANDSTONE/sandstone w/clay grading to sandy claystone/claystone w/sand @ bottom of interval.

457

STATE PLANE COORDINATES AREA:
NORTH: 749096.66
EAST: 2084310.62
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5989.39
TOTAL DEPTH (FT): 10.20
COMPLETION DATE: 10/21/99
GEOLOGIST: T. Lutherer

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

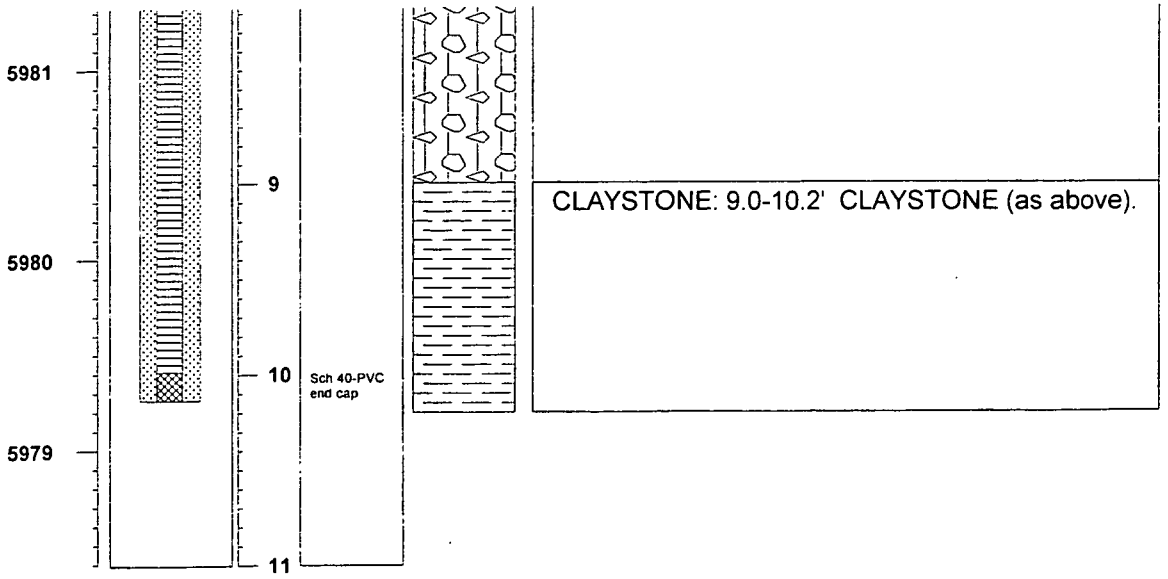
LOG OF BORING NUMBER: 40999

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5989	Cast iron flush mount; Sch 40-PVC; Granular bentonite; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID; 16-40 Silica Sand; Sch 40-PVC, 0.010" slots	0			SM-GM: 0-2.0' NO RECOVERY - Artificial fill - Hand dug for aseptic well installation. Soil sampled for characterization of drummed.
5988		1			
5987		2			SC: 2.0-6.0' SAND, reddish-brn.(5YR4/3) w/abundant wet caliche from 2.0-2.7'. Sand; fine to coarse, sub-rounded to ang. Locally abundant fine to coarse, broken to sub-ang. gravel. Tr. to some clay, tr. silt. Caliche area is wet, remainder of sample is damp. Locally grading to clayey sand.
5986		3			
5985		4			
5984		5			
5983		6			SC: 6.0-6.8' SAND/Clayey SAND (same as 2.7-6.0'), damp.
5982		7			CLAYSTONE: 6.8-7.2' CLAYSTONE, lt. olive brn. (2.5Y5/3) w/abundant FeOx staining (olive yellow), poorly indurated, tr. silt, w/poorly developed blocky texture, weathered, damp.
		8			SM-GM: 7.2-9.0' NO RECOVERY.

458

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
40999



CLAYSTONE: 9.0-10.2' CLAYSTONE (as above).

459

STATE PLANE COORDINATES AREA:
NORTH: 749207.8
EAST: 2084451.61
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5986.94
TOTAL DEPTH (FT): 12.50
COMPLETION DATE: 9/10/99
GEOLOGIST: T. Lutherer

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

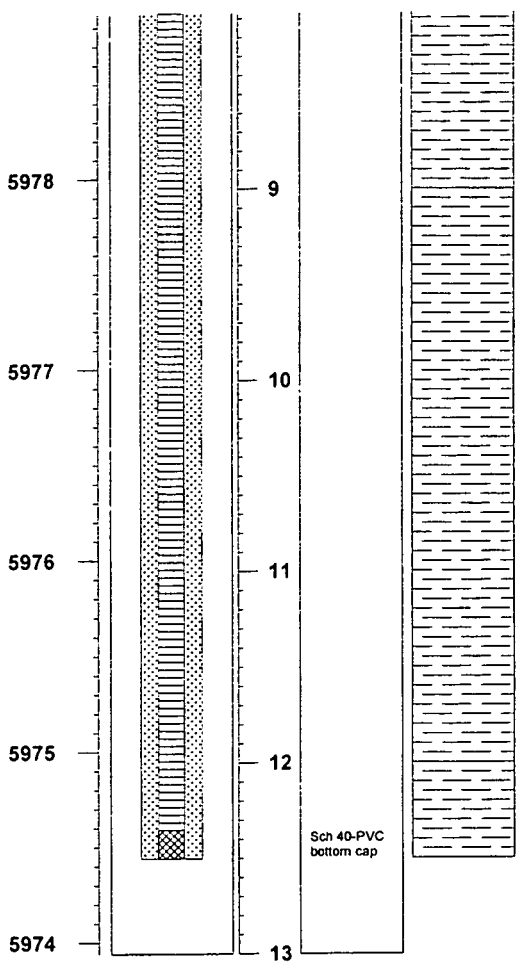
LOG OF BORING NUMBER 41099

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description	
5987	0	Cast iron flush mount; Sch 40-PVC; Granular bentonite; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID; 16-40 silica sand; Sch 40-PVC, 0.010" slots			SM-GM: 0-2.0' NO RECOVERY - Artificial fill - Hand dug for aseptic well installation	
5986	1					
5985	2				SC: 2.0-6.0' Clayey SAND, v. dk. gry.(7.5YR) fm. 2.0-2.2'. Rest of interval: lt. brn.(7.5YR6/3) to pinkish-wht.(7.5YR8/2) to strong brn.(7.5YR5/6). Fine to coarse, sub-ang. to ang. lithic sand. Non-plastic clay w/some to abundant, fine to coarse broken,	angular lithic gravel w/abundant caliche near top of interval. Dry. Locally grading to gravelly sand/sandy gravel. Bedrock contact @ approx. 6.0'.
5984	3					
5983	4					
5982	5					
5981	6				CLAYSTONE: 6.0-9.0' CLAYSTONE, olive (5Y5/4) to lt. olive-brn.(2.5Y5/4), weathered bedrock, massive w/waxy texture and locally abundant FeOx staining and white (2.5Y8/1) powdery caliche. Becoming more cohesive w/depth and also less weathered, locally silty	claystone. Dry.
5980	7					
5979	8					

460

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
41099



CLAYSTONE: 9.0-12.0' CLAYSTONE, gryish-brn.(2.5Y6/2) w/traces to some FeOx filled horizontal fracs., w/some caliche (as above) near top, becoming less weathered w/depth, dry.

CLAYSTONE: 12.0-12.5' CLAYSTONE (as above), less weathered, dry.

461

STATE PLANE COORDINATES AREA:
NORTH: 749052.05
EAST: 2084467.65
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5987.90
TOTAL DEPTH (FT): 12.19
COMPLETION DATE: 9/15/99
GEOLOGIST: T. Lutherer

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

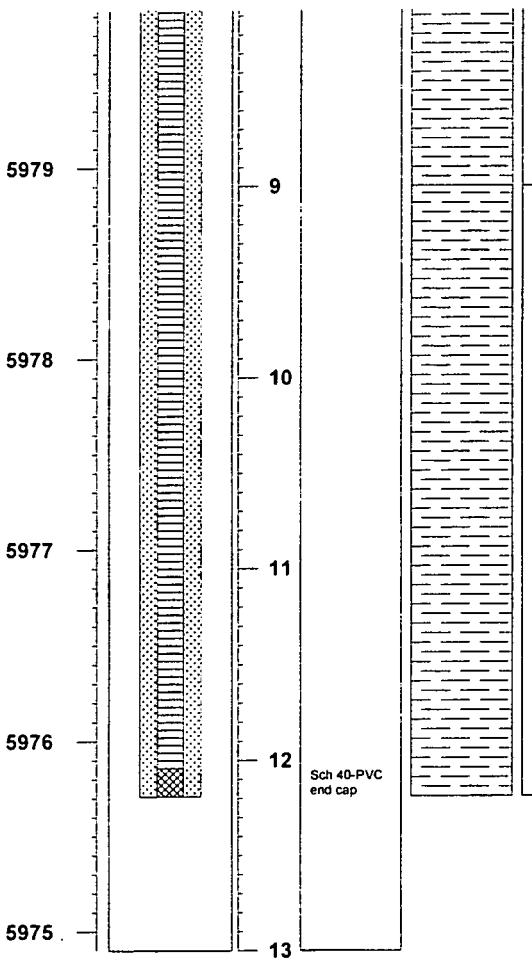
LOG OF BORING NUMBER: 41199

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5988	0	Cast iron flush mount; Sch 40-PVC; Granular bentonite; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID		SM-GM	SM-GM: 0-2.0' NO RECOVERY - artificial fill (?) - hand dug for aseptic well installation.
5987	1				
5986	2			SC	SC: 2.0-5.4' Clayey SAND, pink (7.5YR8/3) to strong brn.(7.5YR5/6), fine to coarse, angular to sub-angular sand. Fine to coarse, broken to sub-rounded gravel, some silt. Low to mod. plastic clay. Damp to moist.
5985	3				
5984	4	10-40 silica sand			
5983	5	Sch 40-PVC, 0.010" slots		SM-GM	SM-GM: 5.4-6.0' NO RECOVERY.
5982	6			SC	SC: 6.0-7.1' Clayey SAND (same as 2.0-6.0'), strong brn.(7.5YR5/6). Bedrock contact @ 7.1'.
5981	7			CLAYSTONE	CLAYSTONE: 7.1-9.0' CLAYSTONE, gry.(5Y6/1) w/some yellow (5Y7/8), mottled, dense, firm w/traces of white, powdery caliche, tr. silt.
5980	8				

462

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
41199



CLAYSTONE: 9.0-12.19' CLAYSTONE (same as 7.1-9.0'), increasing yellow to 10.3', gry. (5Y5/1) w/tr. yellow 10.3-12.0', tr. caliche (as above).

463

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 6020.47	CASING DIA (IN):	LOG OF BORING NUMBER:
NORTH: 748516.19	TOTAL DEPTH (FT): 25.00	BH DIA. (IN):	41299
EAST: 2082438.03	COMPLETION DATE: 9/9/99	GRID LOCATOR:	
PROJECT: Borehole & Well	GEOLOGIST: T. Lutherer		
REMARKS:			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6020	Cast iron flush mount; Sch 40-PVC	0		SM-GM	SM-GM: 0-2.0' NO RECOVERY - Soil sampled, bagged and drummed for aseptic well installation.
6019		1			
6018	Granular bentonite; BH = 2.0" OD	2		SC	SC: 2.0-6.0' Clayey SAND locally grading to sandy clay (SC/CL), strong brn.(7.5YR5/6) and lt. gry.(5YR7/1). Lt. brnish-gry.(2.5Y6/2) from 5.7-6.0'. V. fine to coarse, sub-ang. to angular lithic sand. Fine to coarse, sub-rounded to ang. lithic gravel. Low plasticity, silty, dry.
6017	Casing = 1.25" OD, 0.75" ID	3			
6016		4			
6015		5			
6014		6		SC	SC: 6.0-9.0' Clayey SAND, locally grading to sandy clay (SC/CL), predomminately strong brn.(7.5YR5/6) (same as 2.0-6.0'), dry.
6013		7			
		8			

464

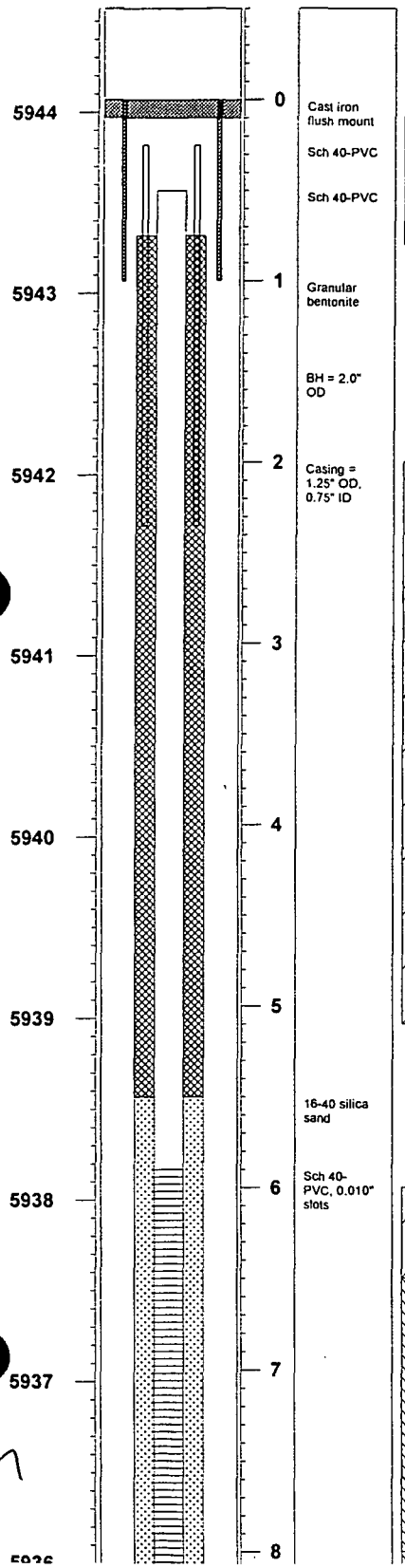
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description	
6012	16-40 silica sand					
6011		9		SC:	9.0-10.0' Clayey SAND (same as 6.0-9.0'), dry.	
6010	Sch 40-PVC, 0.010" slots	10		SC:	10.0-11.0' Clayey SAND (same as 6.0-9.0'), dry.	
6009		11		SC:	11.0-12.0' Clayey SAND (same as 9.0-11.0'), locally w/abundant gravel, dry, slough is damp to moist.	
6008		12		SC:	12.0-12.5' Clayey SAND (same as 11.0-12.0'), locally w/abundant gravel, damp.	
6007		13		CL:	12.5-14.0' CLAY locally grading to sandy clay, strong brn.(7.5YR4/6), tr. to some dk. brn.(7.5YR3/4), tr. lt. gry.(7.5YR7/1). Mod. to high plasticity, tr. to some silt. Tr. to abundant, fine to coarse, ang. to sub-rounded lithic sand. Tr. fine,	sub-ang. lithic gravel. Mottled, damp.
6006		14		CL:	14.0-14.7' CLAY (same as 12.5-14.0'), damp.	
6005		15		SC:	14.7-16.0' Clayey SAND (same as 12.0-12.5'), locally w/abundant gravel, damp.	
6004		16		SC:	16.0-17.0' Clayey SAND (same as 14.7-16.0'), locally w/abundant gravel, damp.	
6003		17		SC:	17.0-18.0' Clayey SAND (same as 16.0-17.0'), w/ some gravel, damp. Tr. to some lt. gry.(10YR7/1), highly to mod. plastic clay, damp.	

465

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		18			
6002				SC:	18.0-20.0' Clayey SAND (same as 17.0-18.0') w/tr. gravel, strong brn.(7.5YR4/6) predominately w/lt. gry.(7.5YR7/1) from 19.5-20.0'. Sand: f.g. to m.g., ang. to sub-rounded. (1) ang. peice of gravel, some silt, low plasticity clay, moist-damp, tr. to some coarse sand.
		19			
6001					
		20		SC:	20.0-21.0' Clayey SAND (same as 18.0-20.0'), tr. to some gravel, wet-moist.
6000					
		21		SC:	21.0-23.0' Clayey SAND (same as 20.0-21.0'), increased gravel and lt. gry. clay @ 22.2-23.0', wet.
5999					
		22			
5998					
		23		CL:	23.0-23.5' Clayey SAND w/gravel (same as 21.0-23.0').
5997				CL:	23.5-23.8' CLAY (see bedrock description), dense, mod. plasticity, tr. sand, damp.
		24		SC:	23.8-24.0' Clayey SAND w/gravel & caliche (same as 23.0-23.5').
5996				CLAYSTONE:	24.0-25.0' CLAYSTONE (bedrock), gryish-brn.(2.5Y5/2) mottled w/strong brn.(7.5YR5/8), dense, firm, poorly developed blocky texture, poorly indurated, highly friable, tr. silt, damp. Top of bedrock = 24.0'.
	Sch 40-PVC end cap	25			
5995					
		26			

466

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5944.07	CASING DIA (IN):	LOG OF BORING NUMBER:
NORTH: 748659.44	TOTAL DEPTH (FT): 17.00	BH DIA. (IN):	41499
EAST: 2082456.69	COMPLETION DATE: 9/23/99	GRID LOCATOR:	
PROJECT: Borehole & Well	GEOLOGIST: R. Koehler		
REMARKS:			



Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		ASPHALT: 0-0.8' ASPHALT - NOTE: 0-2.0' Dug out by hand to install well aseptically. Interval not preserved in core box.
		NO SAMPLE: 0.8-1.2' NO SAMPLE - Sand and gravel fill - Hand dug for aseptic well installation
		NO SAMPLE: 1.2-2.0' NO SAMPLE - gravelly CLAY - GC - (sample not preserved in core box).
		GC: 2.0-3.3' Gravelly CLAY, olive (5Y5/3) w/some olive yellow mottling (5Y6/8), moist, not porous, firm, plastic. Qtzite. cobble (fractured) 2.3-2.6'.
		GC: 3.3-5.1' Gravelly CLAY (as above, 2.0-3.3').
		NO RECOVERY: 5.1-6.0' NO RECOVERY.
		GC: 6.0-6.5' Gravelly CLAY (as above, 3.3-5.1'), qtzite. cobbles.
		CL: 6.5-8.0' CLAY, olive (5Y5/6), tr. med. grained sand, moist.

467

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5936					CL: 8.0-10.0' CLAY, lt. brnish-gry.(2.5Y6/2) w/(2.5Y6/2/8) olive yellow mottles, tr. med. sand in clay, tr. root hairs, moist.
5935		9			
5934		10			NO RECOVERY: 10.0-12.0' NO RECOVERY - Qtzite. cobble lodged in cutting shoe. Got some clayey shavings and the cobble as recovery. Nothing useful for description. Placed material in plastic bag in core box. Cobble is thought to have caved from uphole.
5933		11			
5932		12			CL: 12.0-15.0' CLAY (as above, 8.0-10.0'), no root hairs, dry.
5931		13			
5930	Sch 40-PVC, w/pop rivets	14			
5929	Granular bentonite	15			CL: 15.0-17.0' CLAY (as above, 12.0-15.0').
5928		16			
5927		17			

468

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 41499 Lithologic Description	Page 3 of 3
		18				

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STATE PLANE COORDINATES AREA:
NORTH: 751163.33
EAST: 2084095.89
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5947.69
TOTAL DEPTH (FT): 15.00
COMPLETION DATE: 9/30/99
GEOLOGIST: F. Grigsby

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER: 41599

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5948	0	Cast iron flush mount			ASPHALT: 0-0.6' ASPHALT - Hand dug for aseptic well installation - No sample.
5947	1	Sch 40-PVC; Granular bentonite; BH = 2.0" OD			NO SAMPLE: 0.6-2.1' NO SAMPLE - Hand dug for aseptic well installation.
5946	2	Casing = 1.25" OD, 0.75" ID			
5945	3				CL: 2.1-3.1' Gravelly CLAY w/some sand, predom. dk. gryish-brn.(10YR5/2) w/some brn.(10YR4/3) FeOx stained zones. V. sl. damp, mod. friable to pliable. Gravel consists of broken qtzite. cobbles. Some black organic matter in lower part of interval, weathered, fill(?).
5944	4				CL: 3.1-9.1' CLAY w/some silt & tr. sand, v. slightly damp, dense & pliable. Olive (5Y5/4) & yellowish-brn.(10YR5/6) mottled appearance. Predom. yellowish-brn. (oxidized) at bottom of interval.
5943	5				
5942	6				
5941	7				
5940	8				

470

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5939					
		9	16-40 silica sand		
5938		10	Sch 40-PVC, 0.010" slots		CL: 9.1-10.5' Silty CLAY w/some claystone clasts, gry.(10YR6/1) at top of interval grading to gryish-brn.(2.5YR5/2) at bottom of interval. Quantity of claystone clasts increases w/depth. Oxidized fracs. at bottom of interval. V. slightly damp, pliable to mod. friable.
5937		11			CLAYSTONE: 10.5-13.1' CLAYSTONE (bedrock) w/some silt, predom. dk. gry.(7.5YR4/1), FeOx coated vertical frac. @ approx. 12.4'. Interval appears highly reworked. Core v. slightly damp, dense to mod. friable. Top of bedrock = 13.1'.
5936		12			
5935		13			CLAYSTONE: 13.1-15.0' CLAYSTONE, predom. yellowish-brn.(10YR5/6), highly oxidized, some MnOx(?) and carbonaceous intervals. Friable zone near bottom of interval, underlain by dense claystone.
5934		14			
5933		15	Sch 40-PVC end cap		
5932		16			

471

STATE PLANE COORDINATES AREA:
NORTH: 749010.27
EAST: 2086239.21
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5971.09
TOTAL DEPTH (FT): 21.70
COMPLETION DATE: 10/26/99
GEOLOGIST: J. Boylan

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER:
50099

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5973	2	Sch 40-PVC			
5972	1				
5971	0	Concrete surface pad; Steel casing, 16" OD			SM-GM: 0-2.1' NO RECOVERY - hand-dug for surface casing. Estimated USCS = GM to GC - v. cobbly.
5970	1	Grout			
5969	2				SM-GM: 2.1-2.4' NO RECOVERY/sampling, hand-dug.
5968	3	BH = 8.0" OD			GC-GM: 2.4-2.6' Clayey to silty, sandy GRAVEL, dk. reddish-brn.(5YR3/3). Dry to slightly moist. Abundant shattered gravels, mainly qtzite.
					SM-GM: 2.6-4.0' NO RECOVERY.
5967	4	Well casing = 2.5" OD, 2.0: ID			SM: 4.0-4.8' Gravelly, silty SAND, strong brn.(7.5YR5/6). Dry to slightly moist. Shattered qtzite. commen. Loose. Most of core is consumed by sample, remainder is a composite.
5966	5				SM-GM: 4.8-5.3' NO RECOVERY
					GM: 5.3-5.6' Silty, sandy GRAVEL, Strg. brn.(7.5YR5/6) w/pockets of whitish caliche, shattered gravels (mainly qtzite.). Dry to slightly moist.
5965	6				SM-GM: 5.6-9.0' NO RECOVERY - lost recovery @ 5.6-5.7'; center bit @ 5.7-9.0'.

472

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5965					SM-GM: 5.6-9.0' NO RECOVERY - lost recovery @ 5.6-5.7'; center bit @ 5.7-9.0'.
5964	Bentonite, 1/4" pellets	7			
5963		8			
5962		9			GM: 9.0-9.6' Silty, sandy GRAVEL, same as above 5.3-5.6'. Slightly moist.
					SM-GM: 9.6-9.7' NO RECOVERY.
5961	16-40 silica sand	10			SM: 9.7-10.3' Gravelly, silty SAND (same as above, 4.0-4.8'). Sl. moist to moist. Some clay also present.
					SM-GM: 10.3-11.2' NO RECOVERY - center bit
5960	Sch 40-PVC, 0.010" slots	11			
					GC-GM: 11.2-12.5' Clayey, silty, sandy GRAVEL, brn.(7.5YR4/4) to yellowish-red (5YR4/6). Shattered qtzite., plus whole qtzite. gravels, most common. Clay-rich pockets present. Slightly moist to moist.
5959		12			
					SM-GM: 12.5-14.5' NO RECOVERY - center bit.
5958		13			
5957		14			
					SM: 14.5-15.2' Gravelly, silty SAND, same as 4.0-4.8'. Slightly moist to moist.
5956		15			
					SM-GM: 15.2-15.5' NO RECOVERY - center bit.
					SM: 15.5-16.0' Gravelly, silty SAND (same as above,4.0-4.8') w/more

473

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					clay. Slightly moist to moist.
5955		16			GC-GM: 16.0-16.4' Clayey, silty, sandy GRAVEL (same as above, 11.2-12.5'). Slightly moist to moist.
5954		17			SM-GM: 16.4-18.0' NO RECOVERY - center bit.
5953		18			GM: 18.0-18.6' Clayey, silty, sandy GRAVEL, similar to above, 16.0-16.4' but coarse dominated by shattered qtzite. gravels.
5952		19			SM-GM: 18.6-20.2' NO RECOVERY.
5951		20			GC-GM: 20.2-20.4' Clayey, silty, sandy GRAVEL (same as above, 16.0-16.4'). Slightly moist. Top of bedrock @ 20.4'.
5950	Sch 40-PVC end cap Backfill w/Native material	21			CLAYSTONE: 20.4-21.7' CLAYSTONE (bedrock), lt. yellowish-brn.(2.5Y6/3). Some portions (mainly @ 20.7-20.9') Fe-stained. Coarsens gradually w/depth to silty claystone below 21.5'. Slightly moist. No bedding observed.
5949		22			
		23			

474

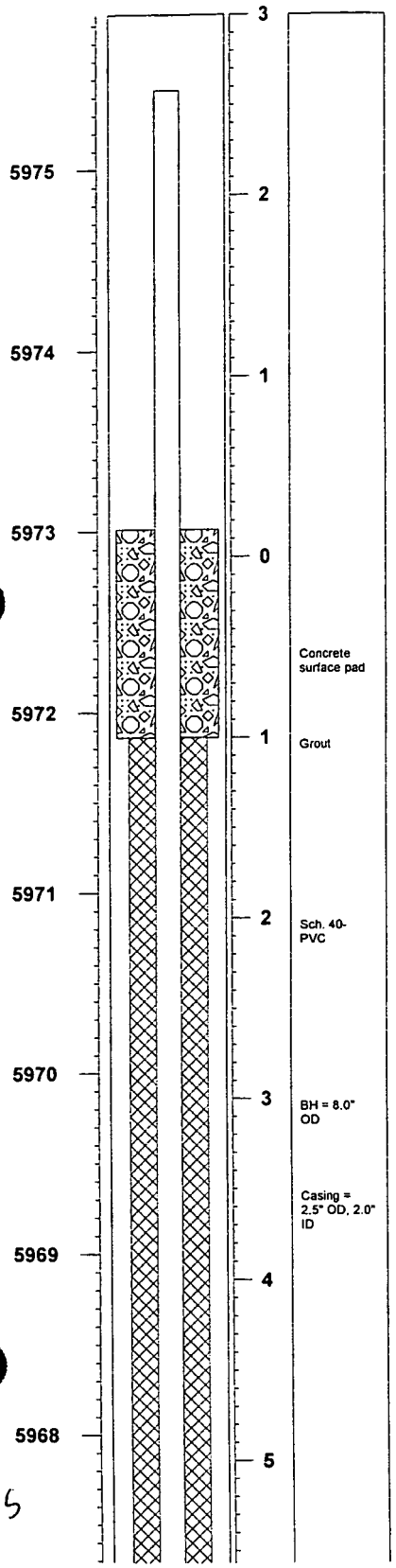
STATE PLANE COORDINATES AREA:
NORTH: 749167.64
EAST: 2085979.6
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5972.86
TOTAL DEPTH (FT): 22.50
COMPLETION DATE: 11/2/99
GEOLOGIST: R. Smith

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER:
50199

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description



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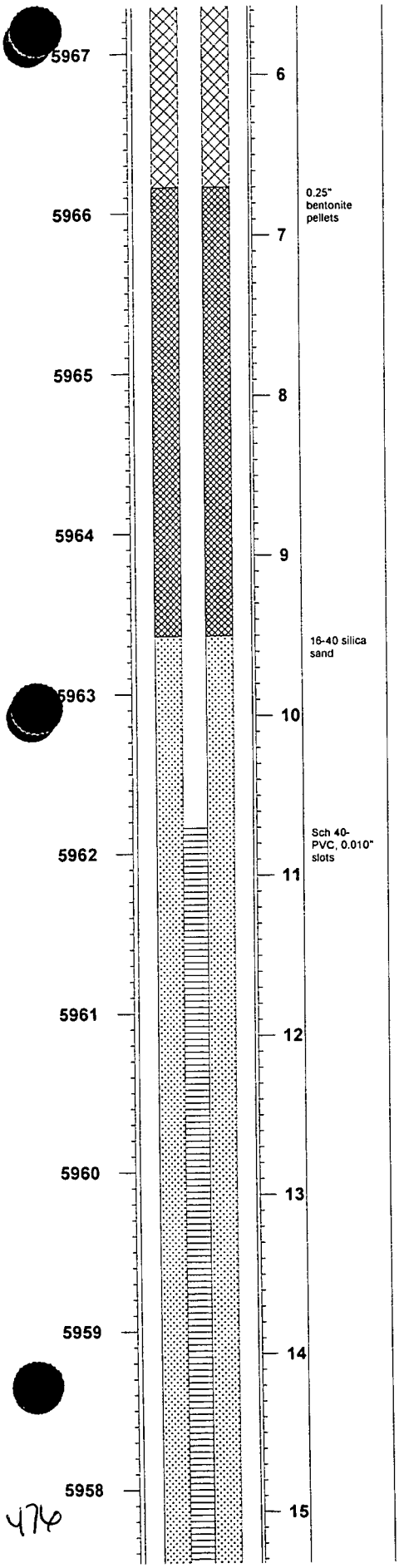
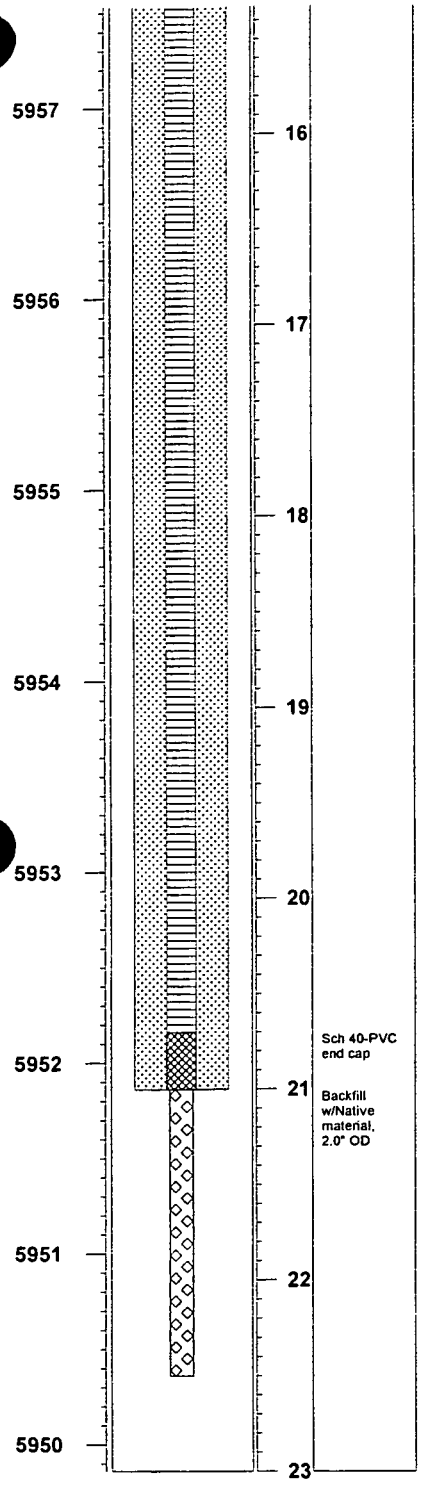
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 50199 Lithologic Description	Page 2 of 3



476

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER 50199 Lithologic Description	Page 3 of 3



477

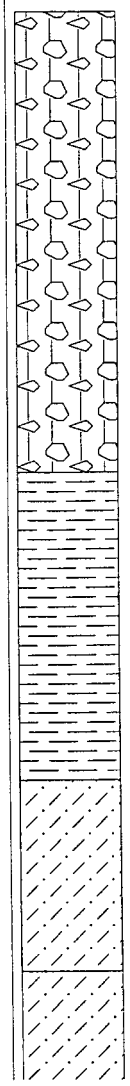
STATE PLANE COORDINATES AREA:
NORTH: 748911.13
EAST: 2086784.03
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5924.08
TOTAL DEPTH (FT): 14.60
COMPLETION DATE: 8/27/99
GEOLOGIST: J. Boylan

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER: 50299

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5927	3	Square steel pipe w/hinged lid			
5926	2	Sch. 40 - PVC			
		Concrete surface pad			
5925	1				
		Steel			
5924	0				
		0.25" pellet bentonite			
5923	1				
5922	2				
5921	3				
5920	4				
5919	5				



SM-GM: 0-2.4' - NO RECOVERY. Hand-dug; top material SM grading to CL.

CLAYSTONE: 2.4-4.0' CLAYSTONE w/silt (bedrock contact is probably around 1-2'). Mottled w/Fe-staining, but mainly lt. gry. to lt. brnish-gry.(2.5Y7/2 - 6/2). Occasional caliche clast (to 1/8"); dk. brn. carbonaceous or Fe/MnOx clasts also present. Coarsens

@ 3.8' to sandy siltstone. Roots also common throughout. No bedding apparent. Slightly moist.

SILTSTONE: 4.0-5.0' Sandy siltstone to clayey siltstone to silty claystone. NOTE: Core used for samples.

SILTSTONE: 5.0-6.2' Sandy SILTSTONE - same as above, 2.4-4.0', grading fm. sandy siltstone @ 5.0-5.5' grading to claystone w/silt 5.5-5.7' to

478

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description	
					clayey siltstone 5.7-5.8' to claystone and silty claystone 5.8-6.2'. Slightly moist. Still rooted.	
5918	6				SILTSTONE: 6.2-7.6' Variegated claystone to sandy SILTSTONE - same as above, 5.0-6.2'. Roots still present. Slightly moist to moist.	
5917	7					
5916	8				SILTSTONE: 7.6-8.8' SILTSTONE w/clay to clayey siltstone. NOTE: Core used for samples.	
5915	9	16-40 silica sand Sch 40-PVC, 0.010" slots			SILTSTONE: 8.8-10.0' SILTSTONE - same as above, 5.0-7.6'. Roots absent or rare. Moist.	
5914	10				SILTSTONE: 10.0-11.8' SILTSTONE - same as above, 5.0-10.0', but dominantly siltstone. Grades to sandy siltstone (silty sandstone below 11.2'). Fe-stone clast @ 11.1'. Colors now gryish-brn., lt. olive brn., gry.(2.5Y5/2, 5/3 and 6/1), respectively where not	heavily Fe-stnd. Latter two colors mainly in silt/sand areas. Moist to wet @ base.
5913	11					
5912	12				SM-GM: 11.8-12.0' NO RECOVERY	
5911	13				CLAYSTONE: 12.0-14.0' Silty CLAYSTONE to CLAYSTONE w/zones of clayey siltstone, same as above but pred. finer-grnd. Some sandy material @ top. Overall, interval fines w/depth. Some Fe-stnd. zones, especially @ 12.6' & 13.9', w/other, lesser-stnd. areas also.	Where not stained, color is dk. gryish-brn.(2.5Y4/2). Slightly moist to moist.
5910	14	Sch 40-PVC end cap			CLAYSTONE: 14.0-14.6' Silty CLAYSTONE to claystone w/zones of clayey siltstone - same as above, 12.0-14.0'. Slightly moist to moist.	
	15					

479

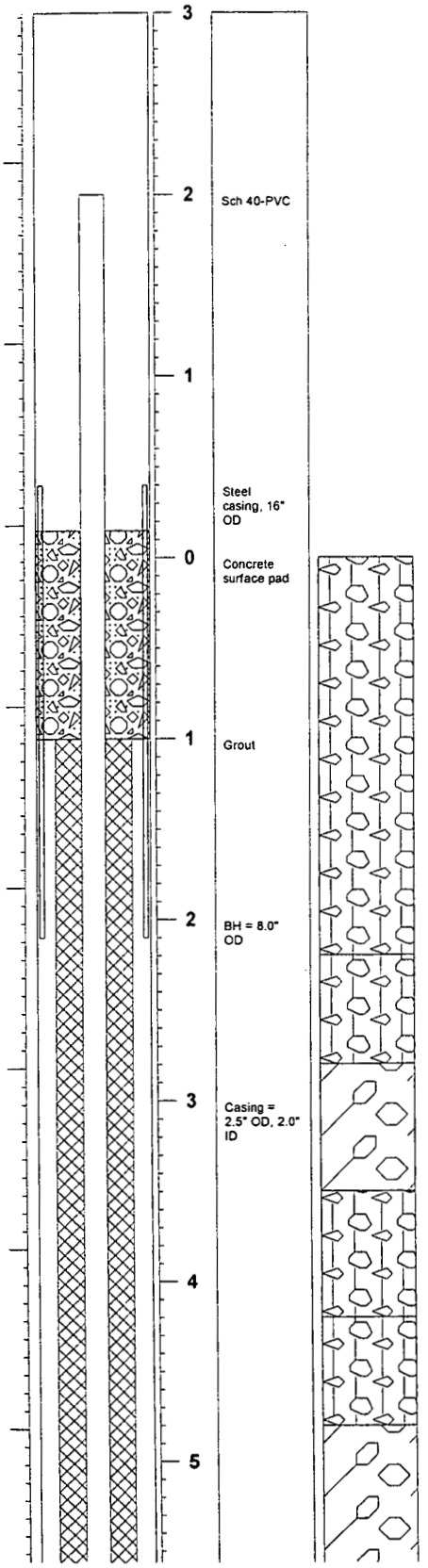
STATE PLANE COORDINATES AREA:
NORTH: 748920.26
EAST: 2083068.72
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 6012.82
TOTAL DEPTH (FT): 22.50
COMPLETION DATE: 8/18/99
GEOLOGIST: J. Boylan

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER:
50399

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6015	Sch 40-PVC	2			
6014		1			
6013	Steel casing, 16" OD	0			
6012	Concrete surface pad	1			
6011	Grout	2			
6010	BH = 8.0" OD	3			
6009	Casing = 2.5" OD, 2.0" ID	4			
6008		5			



SM-GM: 0-2.2' NO RECOVERY - Hand excavated for surface isolation casing.	
SM-GM: 2.2-2.8' NO RECOVERY - Hand sampled for rad screen, rads.	
GC: 2.8-3.5' Clayey, silty GRAVEL - mottled, w/rotted and fractured gravels common. Pred. v. dk. brn.(10YR2/2). Slightly moist.	
SM-GM: 3.5-4.2' Core used for samples.	
SM-GM	
GC: 4.8-7.0' Clayey, silty GRAVEL (same as above, 2.8-3.5'), w/pockets of caliche common, lots of mottling, abund. fractured/shattered gravels. Some sand. Portions to GM, but will	to extensive mottling. Slightly moist.

480

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description	
6007	6				retain overall GC classification. Unable to pick the predominant color due	
6006	7				SM-GM: 7.0-7.5' NO RECOVERY - Center bit.	
6005	8				GC: 7.5-8.5' Clayey, silty GRAVEL (same as above, 2.8-7.0'), w/color as 4.8-7.0'. Slightly moist.	
6004	9				SM-GM: 8.5-10.5' NO RECOVERY - Center bit.	
6003	10					
6002	11				SC-SM: 10.5-11.8' Silty SAND w/gravel & clay to gravelly, silty SAND w/clay - mottled, but commonly strg. brn.(7.5YR5/6). Slightly moist. Shattered gravels. Clayey pockets. Base of recovery (11.8-12.01') is sandy to silty clay w/carb. frags. common.	
6001	12				CL: 11.8-14.0' Sandy to silty CLAY (SC/CL)- pred. strg. brn.(7.5YR5/6 to 4/6). Carbonaceous frags. common in uppermost portion (11.0-12.0'). Occasional gravel clast. Gravelly lens @ 13.0'. Slightly moist to moist. Mottled coloration. Sandy zones,	non-sandy zones are the norm, not an overall, uniform grain-size distribution.
6000	13	0.25" bentonite pellets				
5999	14				CL: 14.0-14.7' Sandy to silty CLAY (SC/CL), same as above, 11.8-14.0'. Shoe contains rock frag. - looks like we're pushing a rock, hence loss of recovery.	
5998	15				SM-GM: 14.7-16.0' NO RECOVERY.	

481

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5997	16-40 silica sand	16			CL: 16.0-17.7' Sandy to silty CLAY (SC/CL) - NOTE: core used for samples (but was same as above, 11.8-14.7'). Gravelly lens @ 16.6-16.7'.
5996	Sch 40-PVC, 0.010" slots	17			
5995		18			SM-GM: 17.7-18.0' NO RECOVERY.
5994		19			SM: 18.0-18.8' Silty gravelly SAND w/clay to clayey sandy gravel w/silt (SM/GC) - some mottling, but mainly yellowish-brn.(10YR5/6). Shattered gravels common, especially below 18.6', where material coarsens. Slightly moist. Fines below 18.6'.
5993		20			SM-GM: 18.8-20.0' NO RECOVERY.
5992		21			CL: 20.0-20.7' Sandy to silty CLAY (SC/CL), same as above, 11.8-17.7'. Slightly moist to moist. Gravel @ base. Yellowish-brn.(10YR5/4) to strg. brn.(7.5YR5/8).
5991	Sch 40-PVC end cap	22			CLAYSTONE: 20.7-21.6' CLAYSTONE(bedrock) to claystone w/silt - lt. olive brn.(2.5Y5/4) to gryish-brn.(2.5Y5/2). Sub-horizontal, FeOx-filled fracs. @ 21.0' Slightly moist to dry.
5990		23			SM-GM: 21.6-22.50' NO RECOVERY.

482

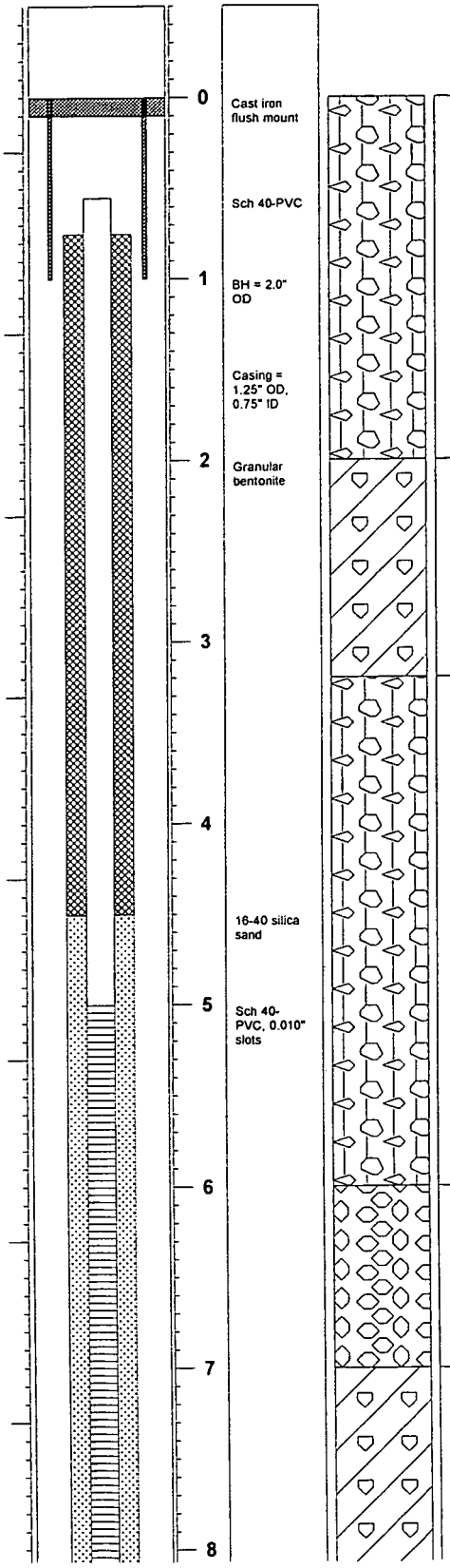
STATE PLANE COORDINATES AREA:
NORTH: 750693.38
EAST: 2083640.29
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5983.30
TOTAL DEPTH (FT): 11.00
COMPLETION DATE: 10/5/99
GEOLOGIST: T. Lutherer

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

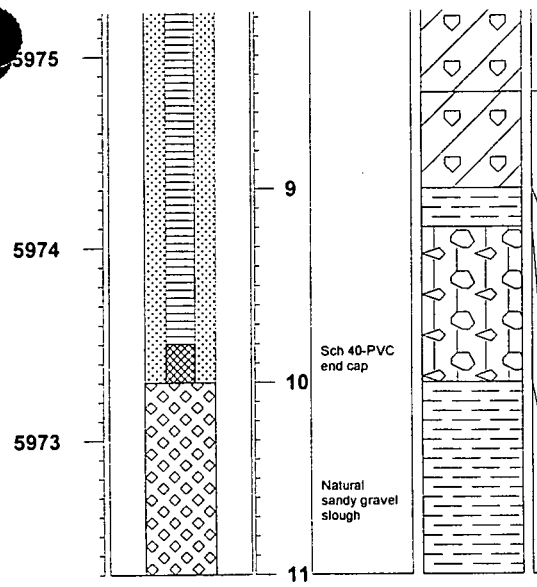
LOG OF BORING NUMBER:
60099

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		0			SM-GM: 0-2.0' NO RECOVERY.
5983					
5982		1			
5981		2			SC: 2.0-3.2' Clayey SAND, brn.(7.5YR5/4), fine to coarse sand, ang. to sub-rounded. Fine to coarse gravel, broken to sub-rounded. Tr. to some silt, loose, wet. Could be fill - looks like "squeegee".
5980		3			SM-GM: 3.2-6.0' NO RECOVERY.
5979		4			
5978		5			
5977		6			GW: 6.0-7.0' Sandy GRAVEL (GW/GP), lt. gry.(5YR7/1) to weak red (10R5/2), fine to med. grained w/some coarse, sub-ang. to sub-rounded sand. Fine ang. to sub-rounded gravel. Tr. silt, dry.
5976		7			SC: 7.0-8.5' Clayey SAND (same as 2.0-3.2').
		8			



483

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER 60099 Lithologic Description	Page 2 of 2



SC: 8.5-9.0' Clayey SAND - sub-interval of claystone/intercalated w/sandstone w/traces of gravel: reworked bedrock - transition zone. Bedrock contact @ 9.0'.

CLAYSTONE: 9.0-9.2' CLAYSTONE (bedrock), yellowish-brn.(10YR5/6) w/some v. dk. gry.(10YR3/1) to lt. gry.(10YR7/1). Some v. fine grained sand, highly oxidized planes, locally waxy, highly friable, v. poorly indurated, damp. Top of bedrock = 9.0'.

SM-GM: 9.2-10.0' NO RECOVERY.

CLAYSTONE: 10.0-11.0' CLAYSTONE (same as 9.0-9.2'), damp.

484

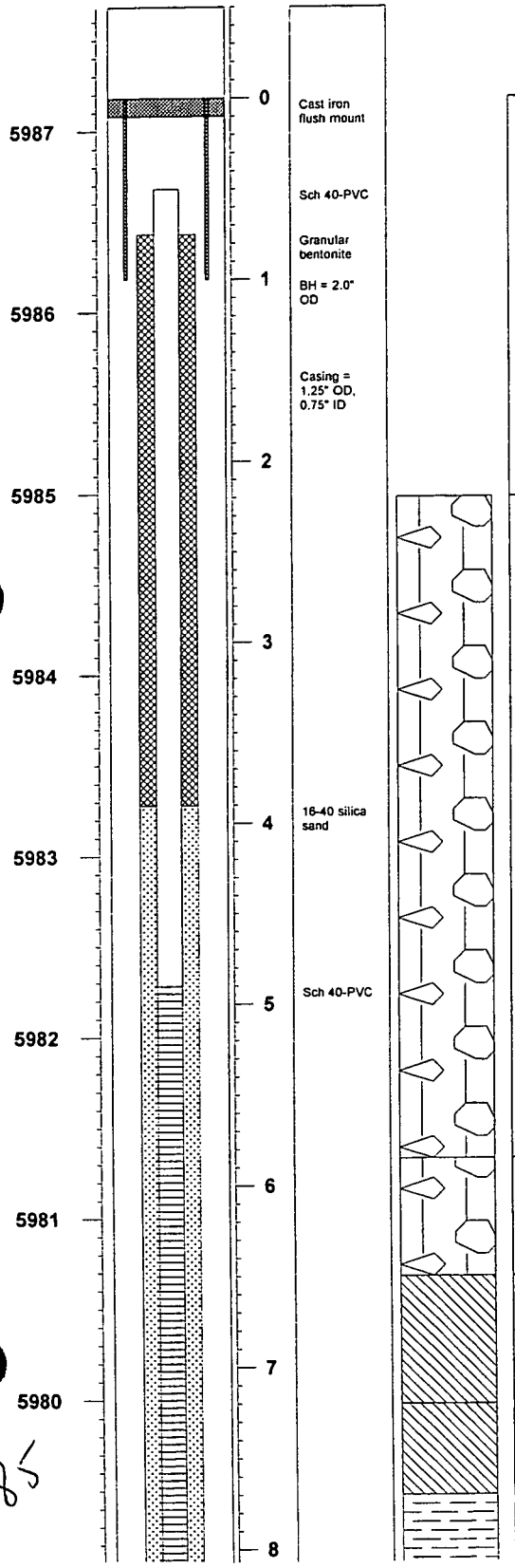
STATE PLANE COORDINATES AREA:
NORTH: 750447.08
EAST: 2083619.56
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5987.18
TOTAL DEPTH (FT): 10.20
COMPLETION DATE: 10/4/99
GEOLOGIST: F. Grigsby

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER:
60199

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description



NO SAMPLE: 0-2.2' NO SAMPLE - Hand dug for aseptic well installation.

GM: 2.2-5.85' Sandy GRAVEL w/some clay, matrix v. pale brn.(10YR7/3) w/some yellowish-brn.(10YR5/5) sandy intervals. V. slightly damp. Gravel well graded, some broken cobbles. Sand poorly graded, fine to medium. Gravel predom. qtzite., some clayey intervals, weathered.

GM: 5.85-6.5' Sandy GRAVEL (same as above, 2.2-5.85').

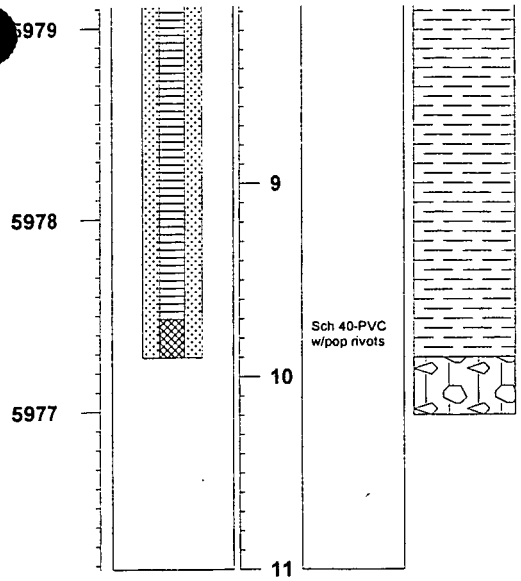
CL: 6.5-7.2' Clayey SAND w/tr. gravel, lt. brn.(7.5YR5/4), sand poorly graded, predom. fine grained, clay content varies, some feldspars and mafics. Well oxidized, weathered.

CL: 7.2-7.7' Sandy CLAY w/tr. gravel, color change to predom. lt. yellowish-brn.(2.5Y6/4) w/some brnish-yellow (10YR6/8).

485

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
60199

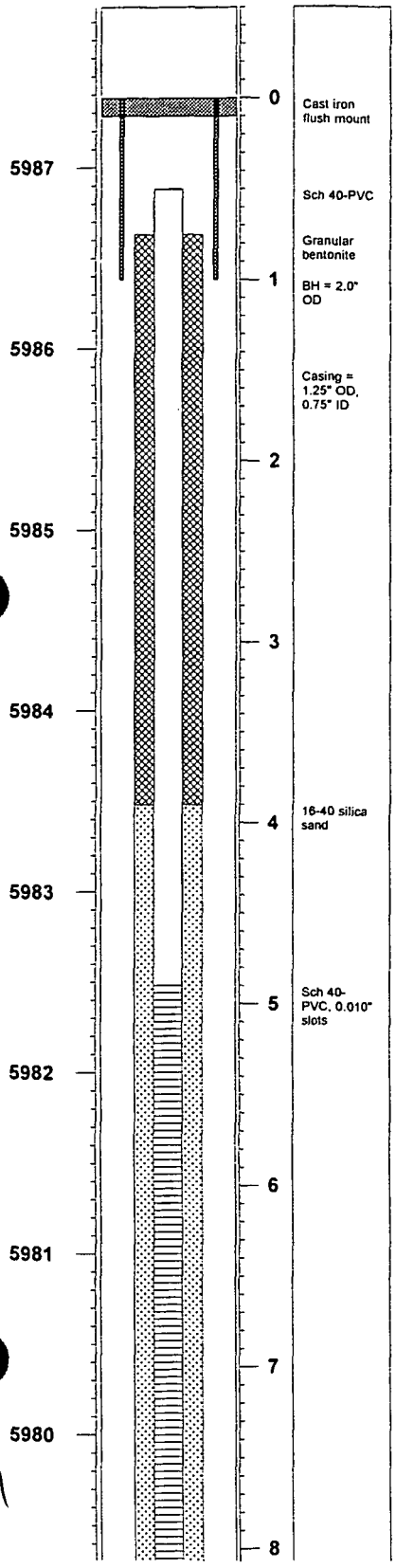


CLAYSTONE: 7.7-9.9' CLAYSTONE (bedrock), top 2.1' intermitent zones of gry.(5Y6/1) w/yellowish-brn.(10YR5/8), grades to fresh claystone - dk. gryish-brn.(2.5Y4/2) to T.D. Top of bedrock = 7.7'.

SM-GM: 9.9-10.2' NO RECOVERY.

486

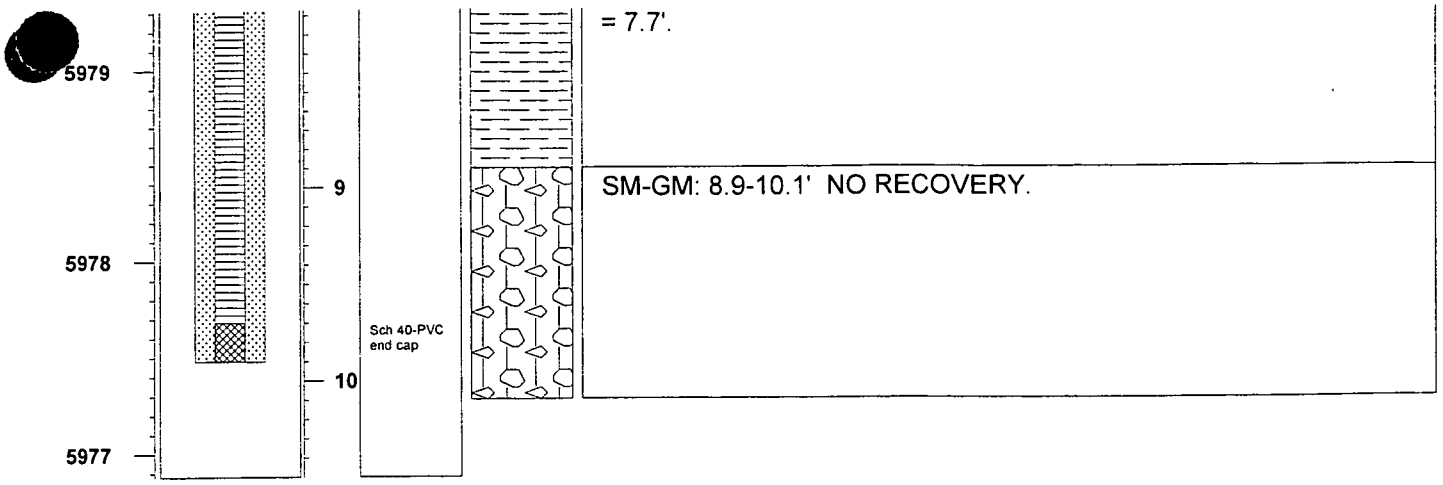
STATE PLANE COORDINATES AREA: NORTH: 750369.52 EAST: 2083628.38 PROJECT: Borehole & Well REMARKS:	GRND ELEV. (FT): 5987.38 TOTAL DEPTH (FT): 10.10 COMPLETION DATE: 10/6/99 GEOLOGIST: F. Grigsby	CASING DIA (IN): BH DIA. (IN): GRID LOCATOR:	LOG OF BORING NUMBER **60299**



Lithology	Unified Soils Classification or Rock Type	Lithologic Description
		ASPHALT: 0-0.5' ASPHALT - NOTE: 0-2.1' Hand dug for aseptic well installation - no sample.
		NO SAMPLE: 0.5-2.1' NO SAMPLE - Sandy GRAVEL (GM) - hand dug for aseptic well installation.
		GM: 2.1-2.9' Sandy GRAVEL w/some clay, matrix pale brn.(10YR6/3), well graded gravel to cobble sizes (broken), predom. qtzite. Sand is well graded, qtz., feldspar, & some mafics. Interval dry, weathered.
		CL: 2.9-3.7' CLAY, mottled coloration of lt. olive gry.(5Y6/2) and strong brn.(7.5YR4/6), clay is dense and dry, 45 deg. frac. @ 3.4' of questionable origin.
		GC: 3.7-4.7' Clayey GRAVEL w/some sand, matrix v. pale brn.(10YR8/4) & white (2.5YR8/1), core is dry & weathered. Gravel is well graded w/some feldspar clasts (granitic) and qtzite. Sand fraction is well graded.
		SM-GM: 4.7-6.1' NO RECOVERY.
		SC: 6.1-7.0' Clayey SAND w/some gravel, color from yellowish-brn.(10YR5/6) to lt. brn.(7.56/3), sand poorly graded, predominately fine & med. gravel, core dry.
		CL: 7.0-7.4' CLAY (same as 2.9-3.7').
		SC: 7.4-7.7' Clayey SAND (same as 6.1-7.0').
		CLAYSTONE: 7.7-8.9' CLAYSTONE (bedrock), rock pushed down so gravel in core, bottom 0.3' of core competant bedrock. Top of bedrock

487

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
					LOG OF BORING NUMBER: 60299



= 7.7'.

SM-GM: 8.9-10.1' NO RECOVERY.

488

STATE PLANE COORDINATES AREA:
NORTH: 750238.76
EAST: 2083649.73
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5986.70
TOTAL DEPTH (FT): 11.20
COMPLETION DATE: 10/8/99
GEOLOGIST: F. Grigsby

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

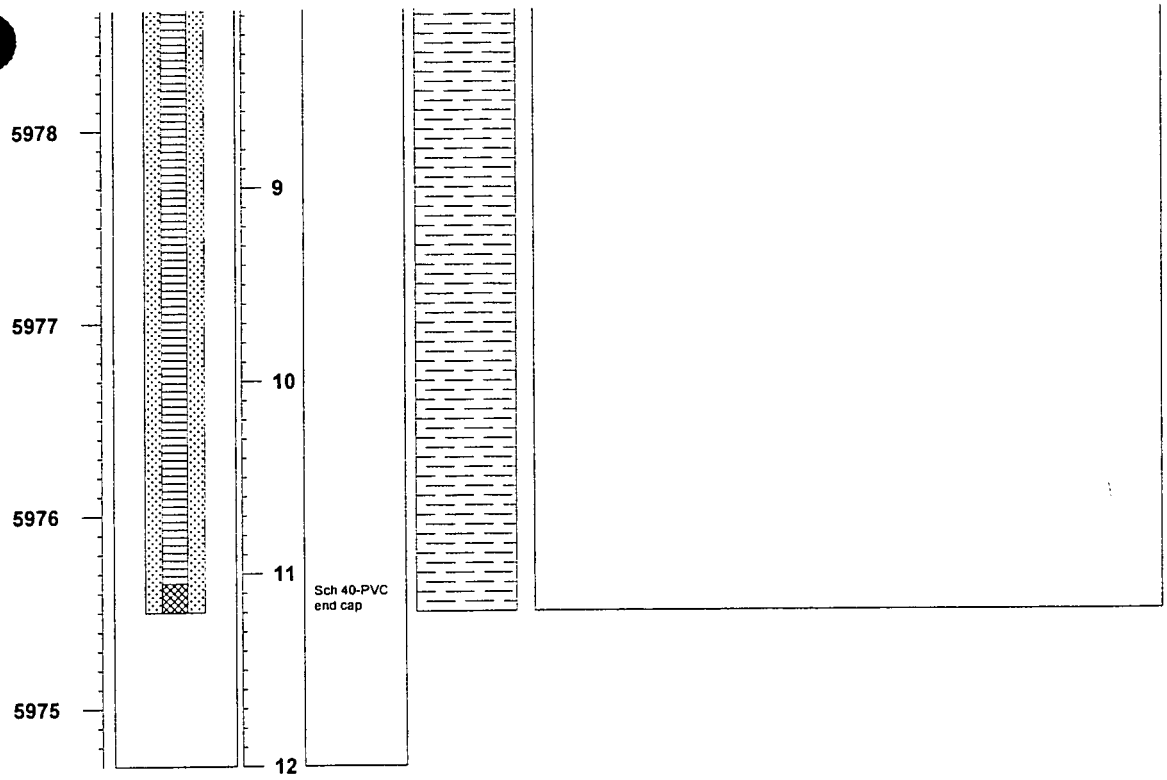
LOG OF BORING NUMBER: 60399

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description	
5987	0	Cast iron flush mount			ASPHALT: 0-0.5' ASPHALT - No sample - Hand dug for aseptic well installation.	
		Sch 40-PVC			NO SAMPLE: 0.5-2.1' NO SAMPLE - Gravelly SAND - Hand dug for aseptic well installation.	
5986	1	Granular bentonite BH = 2.0" OD				
5985		Casing = 1.25" OD, 0.75" ID				
	2				GM: 2.1-3.0' Sandy GRAVEL w/some clay, matrix lt. gry.(7.5YR7/1) w/strong brn.(7.5YR4/6). Gravel is well graded, max. dia. = 1.5", predominately qtzite. Sand is well graded, some feldspar clasts. Interval slightly damp, weathered.	
5984	3				SC: 3.0-3.5' Clayey SAND, pinkish-gry.(7.5YR6/2) & strong brn.(7.5YR5/6), sand poorly graded, predominately med. grained, slightly damp, weathered.	
5983	4				CL: 3.5-3.9' CLAY, lt. yellowish-brn.(2.5Y6/3) and yellowish-brn.(10YR5/8), mottled.	
5982	5	16-40 silica sand			GM: 3.9-6.7' Sandy GRAVEL w/some clay (same as 2.1-3.0'), some v. sandy and v. clayey intervals.	
5981	6	Sch 40-PVC, 0.010" slots				
5980	7				CLAYSTONE: 6.7-11.2' CLAYSTONE, yellowish-brn.(10YR5/6) to 9.5' (strongly oxidized - FeOx stained), some lt. brnish-gry.(2.5Y6/2). Clay in top 0.5' of interval. Color change to predom. gry.(2.5Y5/1) in lower 1.1' of interval (fresh) w/some lt. yellowish-brn.	(2.5Y6/4) FeOx stained zones (vertical in bottom of core), abundant MnOx in top and bottom of interval.
5979	8					

489

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
60399



490

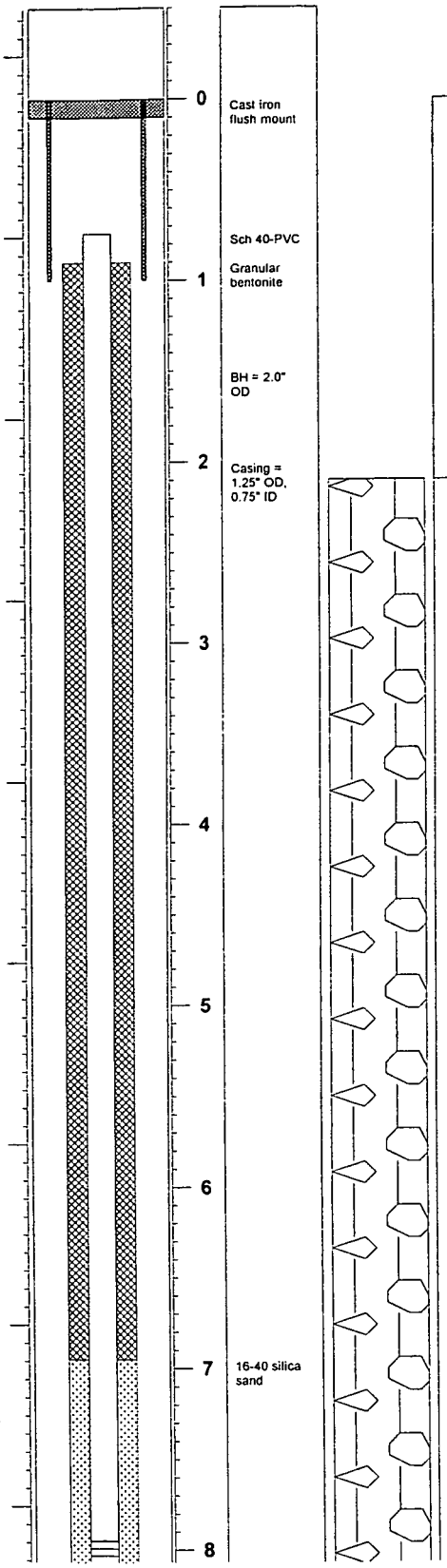
STATE PLANE COORDINATES AREA:
NORTH: 750073.6
EAST: 2083697.26
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5991.76
TOTAL DEPTH (FT): 15.10
COMPLETION DATE: 10/11/99
GEOLOGIST: F. Grigsby

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER:
60499

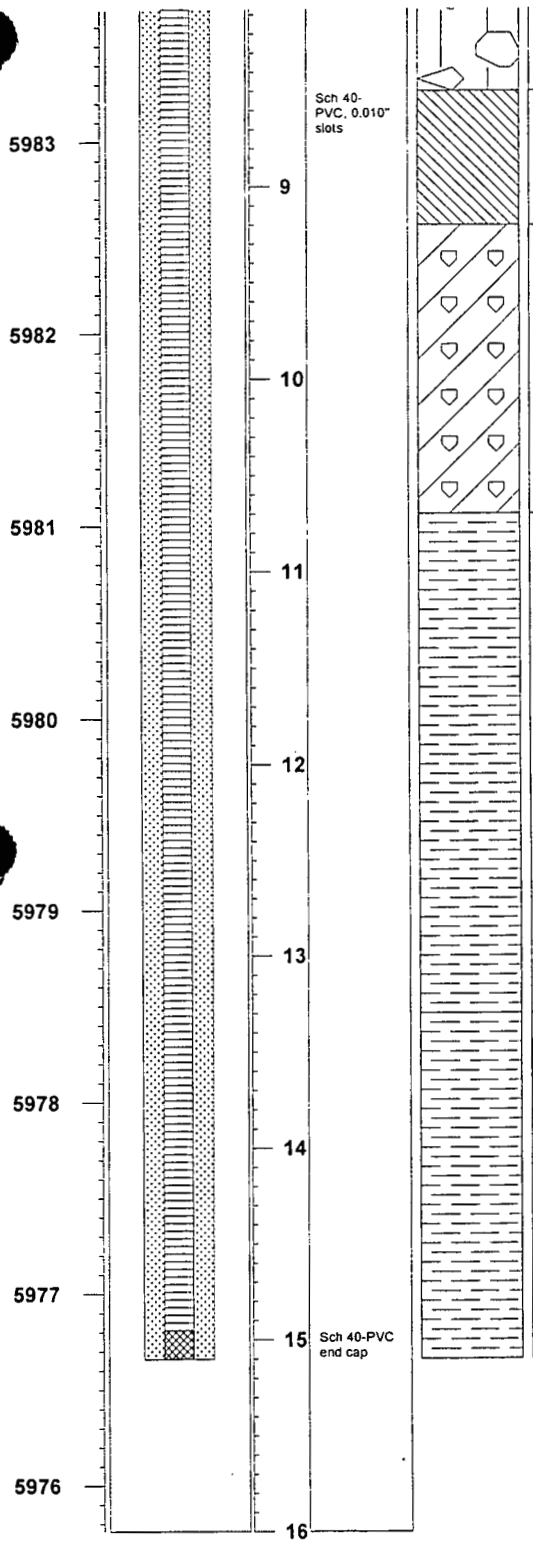
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5992		0			NO SAMPLE: 0-2.1' NO SAMPLE - Sand and gravel w/ numerous cobbles. Hand dug for aseptic well installation.
5991		1			GM: 2.1-8.5' Sandy GRAVEL w/some clay and caliche, predominately white w/some strong brn.(7.5YR5/6). Gravel well graded, predom. qtzite., well cemented w/caliche. Sand well graded w/lower 0.7' predom. gravelly sand w/tr. caliche. Dry.
5990		2			
5989		3			
5988		4			
5987		5			
5986		6			
5985		7			
5984		8			



491

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 60499



CL: 8.5-9.2' Sandy CLAY, lt. gry.(2.5Y7/1) & lt. yellowish-brn.(10YR6/4) sand, fine-grained, poorly graded becoming sandier w/depth. Dry.

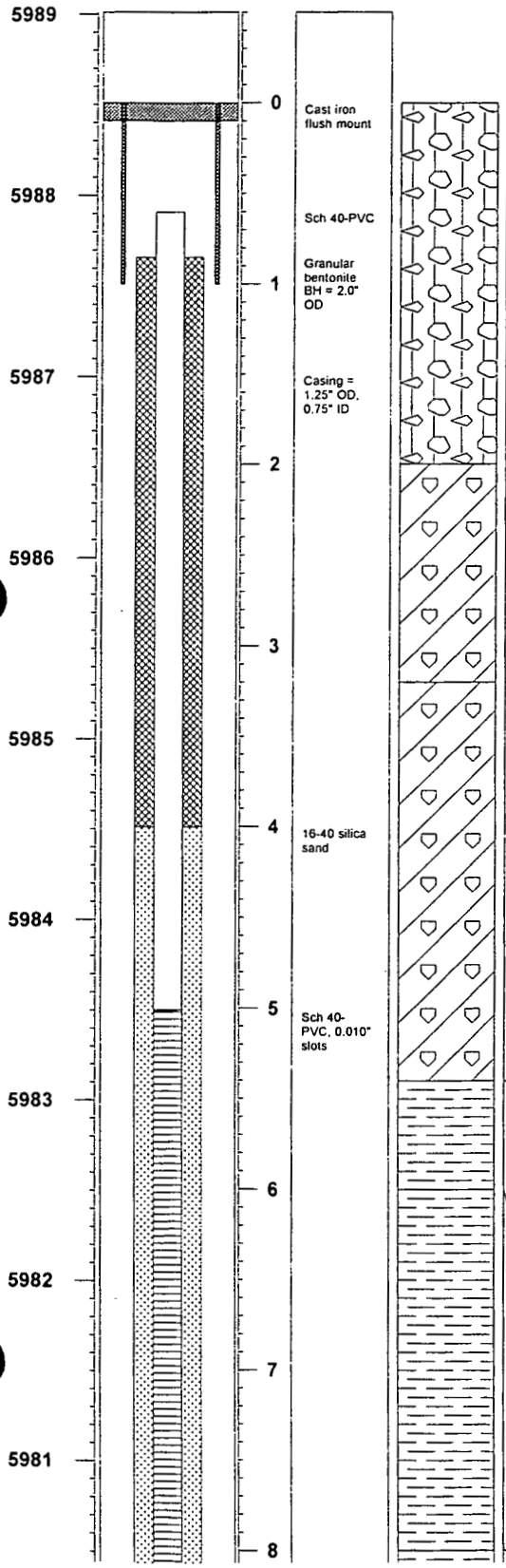
SC: 9.2-10.7' Clayey SAND w/some gravel, lt. gry.(10YR7/1) & lt. yellowish-brn.(10YR6/4). Dry.

CLAYSTONE: 10.7-13.3' CLAYSTONE (top of bedrock), lt. olive gry.(5Y6/2) and yellowish-brn.(10YR5/2). Heavily oxidized decreasing w/depth.

CLAYSTONE: 13.3-15.1' CLAYSTONE (same as above, 10.7-13.3').

4/92

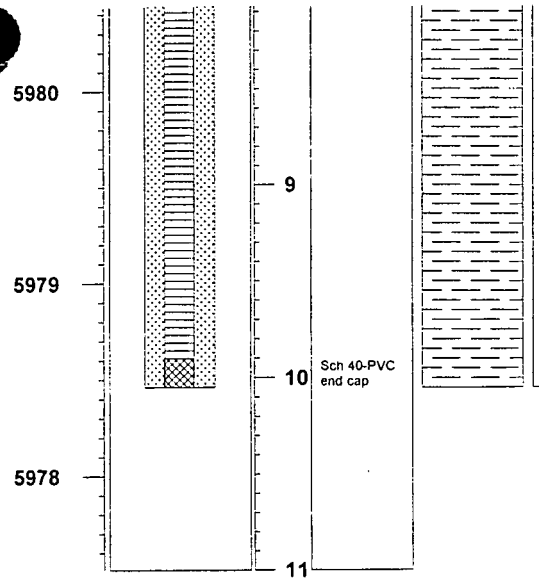
STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5988.51	CASING DIA (IN):	LOG OF BORING NUMBER:
NORTH: 749908.81	TOTAL DEPTH (FT): 10.05	BH DIA. (IN):	60599
EAST: 2083734.75	COMPLETION DATE: 10/11/99	GRID LOCATOR:	
PROJECT: Borehole & Well	GEOLOGIST: T. Lutherer		
REMARKS:			



Unified Soils Classification or Rock Type	Lithologic Description
	SM-GM: 0-2.0' NO RECOVERY - Soil sampled and drummed. Hand dug for aseptic well installation.
	SC: 2.0-3.2' Clayey SAND, strong brn.(7.5YR5/6), sand is predom. fine to med grained w/tr. v. fine and coarse, sub-angular to sub-rounded. Low to no plasticity, tr. to some silt. Abundant fine to coarse, broken to sub-rounded gravel. Damp.
	SC: 3.2-5.4' Clayey SAND (same as 2.0-3.2'). Bedrock contact @ 5.4'.
	CLAYSTONE: 5.4-6.0' CLAYSTONE (weathered bedrock), gry.(2.5Y6/1) to olive yellow (2.5Y6/6), mod. dense w/some filled fracs., prominent caliche filled area @ contact approx. 3mm. thick (10YR8/1), mod. to highly oxidized, mod.-poorly indurated, damp.
	CLAYSTONE: 6.0-8.0' CLAYSTONE, predominately gry.(2.5Y5/1) to dk. gry.(2.5Y4/1), some FeOx staining @ bottom of interval, otherwise, dense, slightly blocky texture becoming more competent. Damp.

493

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 60599 Lithologic Description	Page 2 of 2



CLAYSTONE: 8.0-10.05' CLAYSTONE (same as 5.4-6.0') w/even more weathered appearance, predom. gry.(5Y5/1) w/up to 6mm. lenticular, 2 mm. thick, mod. to sl. friable white (5Y8/1) concretions. Damp.

494

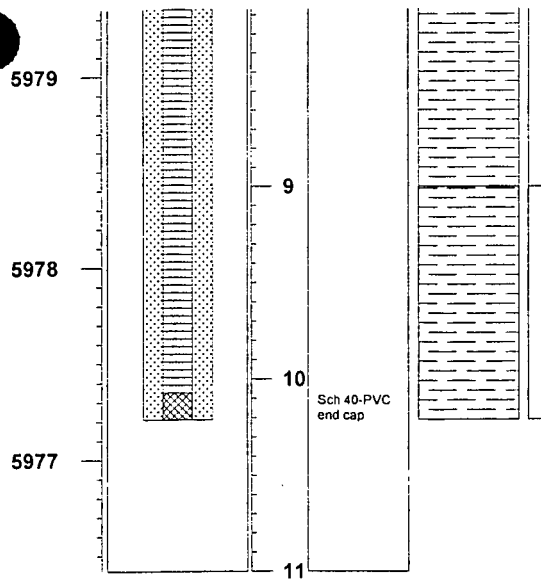
STATE PLANE COORDINATES AREA: NORTH: 749790.11 EAST: 2083741.16 PROJECT: Borehole & Well REMARKS:	GRND ELEV. (FT): 5987.42 TOTAL DEPTH (FT): 10.21 COMPLETION DATE: 10/8/99 GEOLOGIST: T. Lutherer	CASING DIA (IN): BH DIA. (IN): GRID LOCATOR:	LOG OF BORING NUMBER: **60699**

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5987 5986 5985 5984 5983 5982 5981 5980	Cast iron flush mount Sch 40-PVC Granular bentonite BH = 2.0" OD Casing = 1.25" OD, 0.75" ID 16-40 silica sand Sch 40-PVC, 0.010" slots	0 1 2 3 4 5 6 7 8			SM-GM: 0-2.0' NO RECOVERY - Soil bagged, drummed & sampled. Hand dug for aseptic well installation. CL: 2.0-2.3' CLAY, gry.(2.5Y5/1) w/abundant olive yellow (2.5Y6/6) FeOx staining, low plasticity w/traces sand and gravel. Reworked claystone, damp. Bedrock contact @ 2.3'. CLAYSTONE: 2.3-6.0' CLAYSTONE, olive gry.(5Y5/2) w/abundant FeOx staining (as above), highly weathered and locally highly fractured (filled w/FeOx & tr. wht.(10YR8/1) caliche). V. poorly to poorly indurated, locally dense w/blocky and waxy texture, damp. CLAYSTONE: 6.0-9.0' CLAYSTONE (as above, 2.3-6.0'), almost totally oxidized from 6.0-7.3', then becoming more competent fm. 7.3-9.0' - dk. gry.(7.5YR5/1) to gry.(7.5YR4/1).

495

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
60699



CLAYSTONE: 9.0-10.21' CLAYSTONE (as above) w/only slight to some oxidation, primary color is lt. gry.(5Y6/1), damp.

496

STATE PLANE COORDINATES AREA:
NORTH: 749622.85
EAST: 2083679.01
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5993.75
TOTAL DEPTH (FT): 12.20
COMPLETION DATE: 10/12/99
GEOLOGIST: F. Grigsby

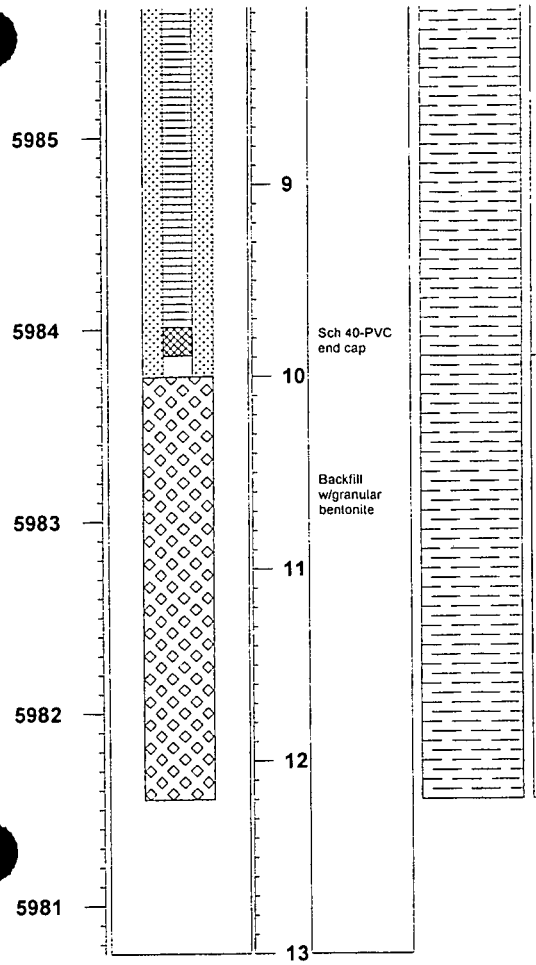
CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER: 60799

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5994		0			ASPHALT: 0-0.6' ASPHALT - Hand dug for aseptic well installation - No sample.
5993	Cast iron flush mount; Sch 40 - PVC Granular bentonite; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID	1			NO SAMPLE: 0.6-2.0' NO SAMPLE - Gravelly SAND w/some clay. No sample cored. Hand dug for aseptic well installation.
5992		2			GC: 2.0-3.8' Clayey GRAVEL w/some sand and caliche, slightly damp, yellowish-brn.(10YR5/4) and white. Gravel predom. broken cobbles and large, poorly graded (possible road base?).
5991		3			
5990	16-40 silica sand	4			CL: 3.8-5.3' Sandy CLAY w/some gravel, slightly damp, lt. yellowish-brn.(2.5Y6/2), some weathered pink feldspar clasts, core varies from dense to friable.
5989	Sch 40-PVC, 0.010" slots	5			
5988		6			CLAYSTONE: 5.3-7.9' CLAYSTONE (top of bedrock), lt. brnish-gry.(2.5Y6/2) and brnish-yellow (10YR6/6), mottled, predom. dense & pliable.
5987		7			
5986		8			

497

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 60799 Lithologic Description	Page 2 of 2



CLAYSTONE: 7.9-9.9' CLAYSTONE (same as above) w/more weathering and friable.

CLAYSTONE: 9.9-12.2' CLAYSTONE (same as above).

498

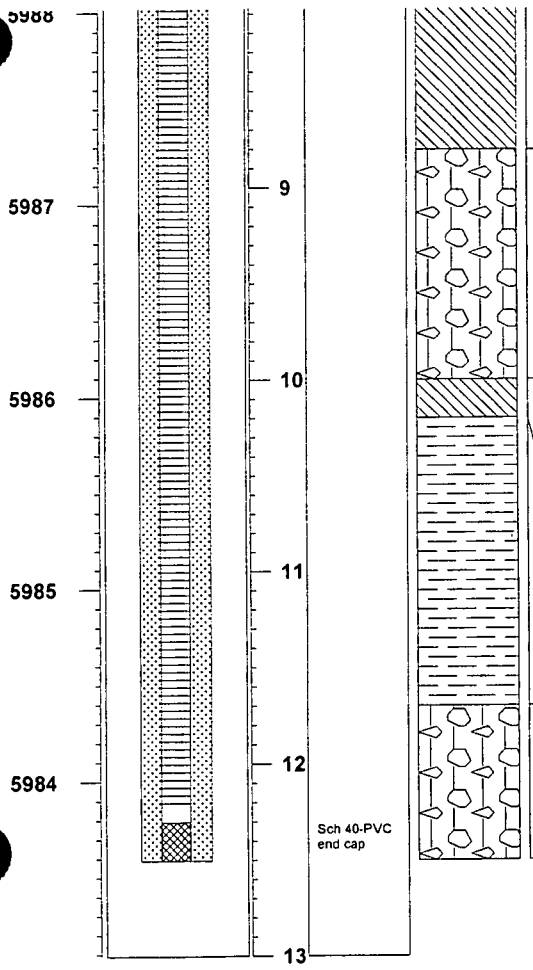
STATE PLANE COORDINATES AREA: NORTH: 749388.81 EAST: 2083670.05 PROJECT: Borehole & Well REMARKS:	GRND ELEV. (FT): 5996.09 TOTAL DEPTH (FT): 12.50 COMPLETION DATE: 9/21/99 GEOLOGIST: J. Boylan	CASING DIA (IN): BH DIA. (IN): GRID LOCATOR:	LOG OF BORING NUMBER: **60899**

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5996	Cast iron flush mount; Sch 40-PVC; Granular bentonite; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID; 16-40 silica sand; Sch 40-PVC, 0.010" slots	0			SM-GM: 0-1.1' NO RECOVERY - Hand-excavated for flush-mount.
5995		1			CL: 1.1-4.9' CLAY to clay w/gravel and silt, dk. reddish-brn. to 1.5', then grading to v. dk. gryish-brn.(2.5Y3/2) @ 2.4', grading to v. dk. gryish-brn.(10YR3/2) below 3.6'. Gravels and shattered gravels scattered throughout. Moist to slightly moist.
5994		2			
5993		3			
5992		4			
5991		5			SM-GM: 4.9-5.1' NO RECOVERY.
5990		6			CL: 5.1-6.9' CLAY to clay w/gravel and silt, same as above, 1.1-5.1', but goes from moist to saturated @ approx. 7.0' Also, a pocket of black, woody-textured material is present @ 7.1-7.3' - looks like rotting wood.
5989		7			SM-GM: 6.9-7.3' NO RECOVERY.
		8			GM: 7.3-7.8' Silty, sandy GRAVEL, dk. gryish-brn.(10YR4/2), abundant shattered gravels. Saturated. Pebbles and coarse sand @ lower contact.

499

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 60899



CL: 7.8-8.8' CLAY to clayey, silty sand w/gravel (CL/SC), finest above 8.2', coarser below. Mostly v. dk. gry.(10YR3/1) above 8.2' mottled below that (oranges, browns, olives). Saturated.

SM-GM: 8.8-10.0' NO RECOVERY.

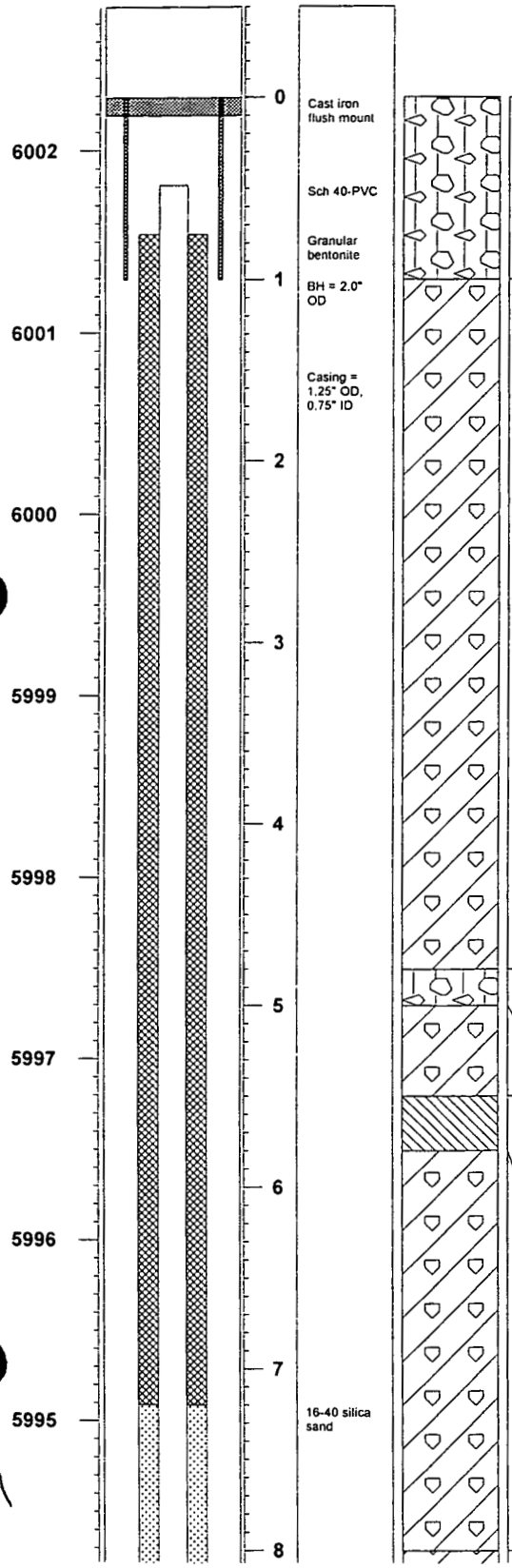
CL: 10.0-10.2' CLAY to clayey, silty sand w/gravel - CL/SC (same as above, 7.8-8.8'). Top of Bedrock = 10.2'.

CLAYSTONE: 10.2-11.7' CLAYSTONE, mottled due to Fe-oxides, ranging from brnish-yellow (10YR6/8) to - where fresh - lt. brnish-gry.(2.5Y6/2). Occasional caliche clast (sand to med. gravel-sized) present. Fe-oxides decrease erratically w/depth. Moist.

SM-GM: 11.7-12.5' NO RECOVERY.

500

STATE PLANE COORDINATES AREA: NORTH: 749078.79 EAST: 2083675.53 PROJECT: Borehole & Well REMARKS:	GRND ELEV. (FT): 6002.29 TOTAL DEPTH (FT): 16.10 COMPLETION DATE: 9/20/99 GEOLOGIST: T. Lutherer	CASING DIA (IN): BH DIA. (IN): GRID LOCATOR:	LOG OF BORING NUMBER: **61099**

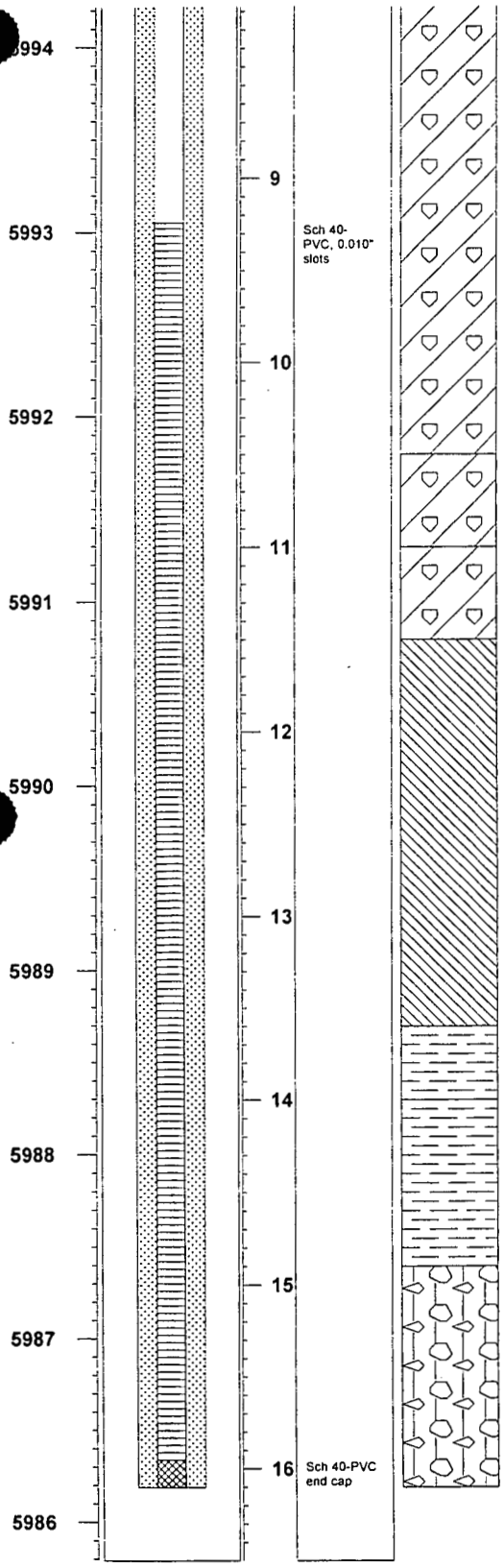


Unified Soils Classification or Rock Type	Lithologic Description
	SM-GM: 0-1.0' NO RECOVERY - Hand dug for flush mount - soil sampled and drummed.
	SC: 1.0-4.8' Clayey SAND, brn. (7.5YR5/2), fine to coarse, sub-rounded to angular sand. Tr. to some fine to coarse, sub-rounded to broken angular lithic gravel. Low plastic clay, some silt, damp. Locally some white (7.5YR8/1) caliche grains.
	SM-GM: 4.8-5.0' NO RECOVERY.
	SC: 5.0-5.5' Clayey SAND (same as 1.0-5.0') w/gravel, as above.
	CL: 5.5-5.8' CLAY w/traces to some sand. Sand - as above. Clay - lt. gry.(5Y7/1), mod. plasticity.
	SC: 5.8-8.0' Clayey SAND w/gravel (same as 5.0-5.5').

501

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
61099



SC: 8.0-10.5' Clayey SAND (same as 5.0-8.0') w/gravel, as above. Locally intercalated w/clay w/traces to some sand (same as 5.5-5.8'). Damp to moist. Predom. color, as above, 5.0-8.0', becoming strong. brn.(7.5YR5/6).

SC: 10.5-11.0' SAND, strong brn.(7.5YR5/6), fine to coarse, predom. med. grained, ang. to rounded, tr. to some clay, tr. to some silt, moist.

SC: 11.0-11.5' SAND (as above, 10.5-11.0') w/intercalated clay w/sand (as above).

CL: 11.5-13.6' CLAY w/traces to some sand and gravel, gry.(2.5Y6/1) w/some to abundant lt. olive brn.(2.5Y5/6) FeOx staining. Top of bedrock = 13.6'.

CLAYSTONE: 13.6-14.0' CLAYSTONE (bedrock), v. pale brn.(10YR7/3) mottled w/lt. olive brn.(2.5Y5/6), dense, poorly to v. poorly indurated, highly friable, some waxy texture, damp, weathered, some silt.

CLAYSTONE: 14.0-14.9' CLAYSTONE (as above, 13.6-14.0') slightly more indurated. Some MnOx staining.

SM-GM: 14.9-16.1' NO RECOVERY.

502

STATE PLANE COORDINATES AREA:
NORTH: 748892.5
EAST: 2083675.59
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 6003.31
TOTAL DEPTH (FT): 19.50
COMPLETION DATE: 9/16/99
GEOLOGIST: J. Boylan

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER: 61199

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description	
6003	Cast iron flush mount; Sch 40-PVC; Granular bentonite; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID	0			SM-GM: 0-1.1' NO RECOVERY - Hand dug for flush mount.	
6002		1			SM: 1.1-3.8' Silty SAND w/clay and gravel, v. dk. gryish-brn.(10YR3/2) to predominately v. pale brn.(10YR8/2) below 1.8' due to abundant caliche. Below 3.8', caliche decreases, color has more brns. & olives in its mottling. Dry @ top to slightly moist	below 3.8'. Some Fe-staining @ base. Large (0.2-0.4') dominantly clay pockets present below 3.8' - to SC there.
6001		2				
6000		3				
5999		4			SC-SM: 3.8-5.1' Silty SAND w/clay and gravel (as above, 1.1-3.8')	
5998		5			SM: 5.1-8.9' Silty SAND w/clay and gravel to silty, sandy gravel w/clay (SM/GM), highly mottled colors due to shattered & rotting gravels, caliche pockets, clay pockets. Brns., reddish-brns., brnish-olives predominate. Slightly moist. A few MnOx-looking	clasts (7.3', 8.1'; for example) present. Gravels mainly qtzite. w/some rotting K-spars.
5997		6				
5996		7				
	16-40 silica sand	8				

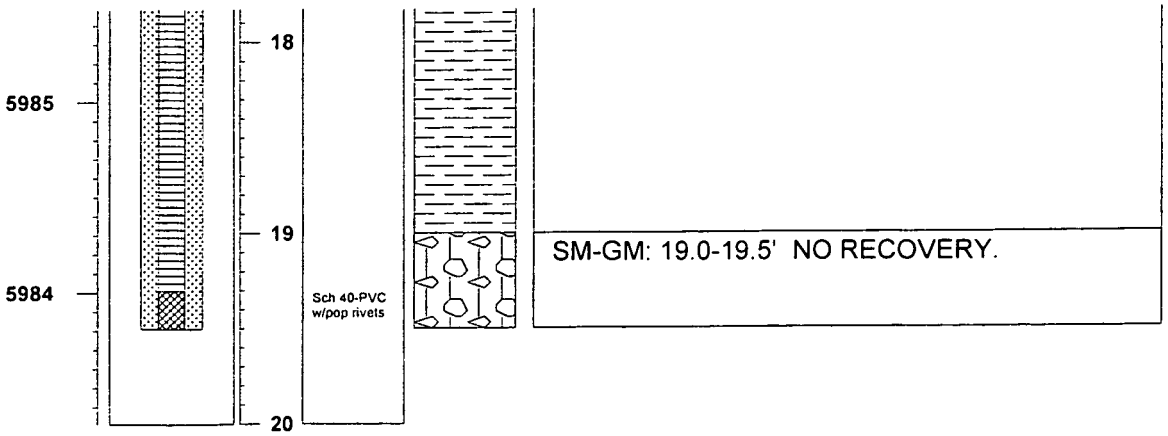
503

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description	
5995						
		9			SM-GM: 8.9-9.2' NO RECOVERY.	
5994	Sch 40-PVC, 0.010" slots				SM: 9.2-11.0' Silty SAND w/clay, gravel, gravels are scattered. Strong brn.(7.5YR5/6) w/some mottling. Slightly moist to moist. Enough clay to hold it together.	
		10				
5993						
		11			CL: 11.0-12.2' CLAY w/occasional gravel, sand - lt. olive brn.(2.5Y5/4) w/occasional gravel. Fe-Mn oxide clasts (one 1/2", several 1/8") present in a pocket @ 11.2' w/free water. Otherwise, moist. More gravel to 12.0', where color is mainly lt. brnish-	gry.(2.5Y6/2) w/FeOx streaks.
5992						
		12				
5991					SM: 12.2-13.1' Silty SAND w/clay, gravel (same as 9.2-11.0'). Moist.	
		13				
5990					SM-GM: 13.1-13.5' NO RECOVERY.	
					SM: 13.5-13.6' Silty SAND w/clay, gravel (same as 9.2-11.0'). Saturated.	Fountain Fm. gravel @ top, isolated qtzites. scattered, Lyons Fm. @ 15.8'. Except for qtzites., they are rotting. Clay @ 16.2-16.6', atop clay-gravel-sand lens.
		14			CL: 13.6-17.0' CLAY to silty clay w/sand & tr. gravel (sand & gravel often in lenses or pockets), mottled w/clay lt. brnish-gry.(2.5Y6/2) to yellowish-brn.(where Fe-stained; 10YR5/6). Coarser sandy lens are browner, present @ 14.3', 15.1' & 16.1'. Saturated	
5989						
		15				
5988						
		16				
5987						
		17			CLAYSTONE: 17.0-19.0' CLAYSTONE (bedrock), mottled w/FeOx streaks and more dispersed oxides. Most is yellowish-brn.(10YR5/6). Mosit. Some zones contain abundant thin, sub-planar FeOx laminae.	
5986						

504

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
61199



505

STATE PLANE COORDINATES AREA:
NORTH: 7488727.02
EAST: 2083675.24
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 6003.88
TOTAL DEPTH (FT): 12.00
COMPLETION DATE: 9/16/99
GEOLOGIST: T. Lutherer

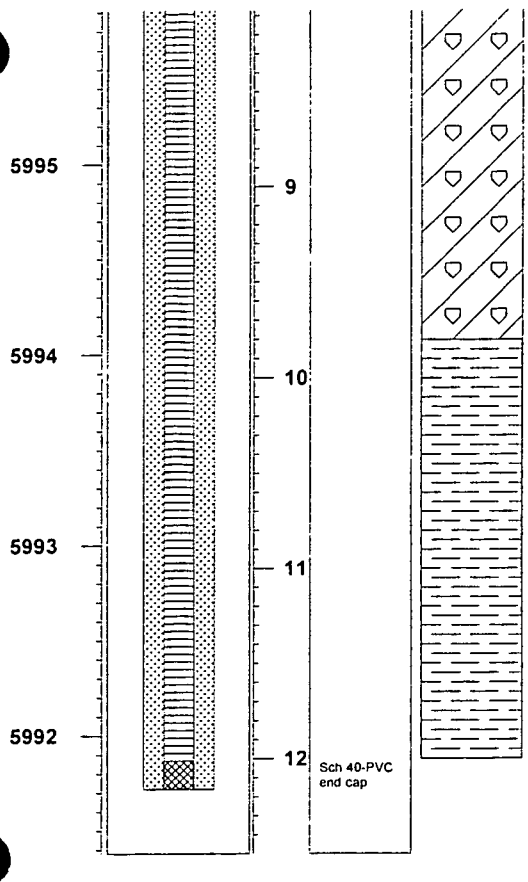
CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER 61299

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
6004	0	Cast iron flush mount; Sch 40-PVC			SM-GM: 0-1.0' NO RECOVERY - Hand dug for flush mount.
6003	1	Granular bentonite			CL: 1.0-1.2' Sandy CLAY, dk. reddish-brn.(5YR3/3) to pinkish-white (7.5YR8/2), dense, non to low plasticity, fine to coarse, angular to sub-rounded sand. Tr. to some broken to sub-rounded lithic gravel. Dry. Lots of caliche below.
6002	2	BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID			SC: 1.2-5.0' Clayey SAND, pinkish-white (7.5YR8/2) to lt. brn.(7.5YR6/4), v. fine to fine angular sand, low to non plastic clay, tr. gravel (as above). V. silty, often grading to clayey silt. Most of this material is caliche. Some lt. olive brn.(2.5YR6/3) clay.
6001	3				
6000	4				
5999	5				SC: 5.0-8.0' Clayey SAND, lt. olive brn.(2.5Y5/3) to strong brn., starting @ 6.0' primarily strong brn.(7.5YR4/6) clay (as above). Fine to coarse, sub-ang. to sub-rounded sand w/tr. gravel. Damp. Tr. lt red (2.5YR6/6).
5998	6	16-40 silica sand			
5997	7	Sch 40-PVC, 0.010" slots			
5996	8				

506

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER 61299 Lithologic Description	Page 2 of 2



SC: 8.0-9.8' Clayey SAND, lt. brnish-gry.(2.5Y6/2) predom. to tr. of strong brn.(7.5YR5/6) clay w/ fine grained sand, interbedded w/strong brn. clayey sand (as above, 5.0-8.0'), and caliche. Clay, as above, low plasticity, damp-moist.

CLAYSTONE: 9.8-12.0' CLAYSTONE (bedrock)

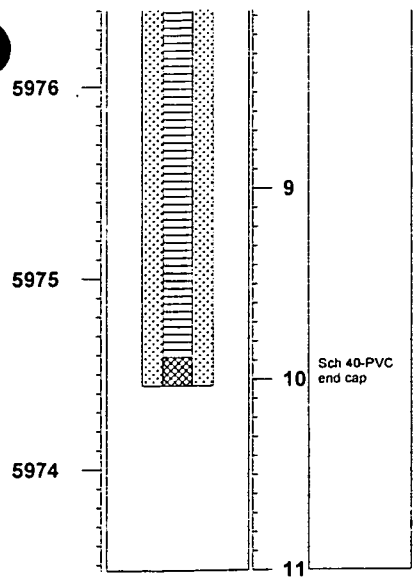
507

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5984.47	CASING DIA (IN):	LOG OF BORING NUMBER:
NORTH: 749643.14	TOTAL DEPTH (FT): 10.03	BH DIA. (IN):	61399
EAST: 2083988.59	COMPLETION DATE: 10/12/99	GRID LOCATOR:	
PROJECT: Borehole & Well	GEOLOGIST: T. Lutherer		
REMARKS:			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5984	Cast iron flush mount; Sch 40-PVC; Granular bentonite; BH = 2.0" OD	0		SC-SM	SC-SM: 0-1.5' Silty to Clayey SAND w/gravel, v. dk. brn.-blk. (10YR2/1-2/2). Tr. to some burned wood, mainly in top foot. Mod. well-graded. Gravels to >1", sub-rounded to ang. No observable bedding. Original moisture content unknown. (Logged 8/7/00 by J. Boylan, B. Walsh, P. Graham and E.A. Francisco.)
5983	Casing = 1.25" OD, 0.75" ID	1		CLAYSTONE	CLAYSTONE: 1.5-2.0' CLAYSTONE (top of bedrock), unweathered gry.(2.5Y6/1) mottled w/olive brn.(2.5Y4/4) Fe-staining. Caliche lense @ contact with fine flecks below. Original moisture content unknown.
5982	16-40 silica sand	2		CLAYSTONE	CLAYSTONE: 2.0-5.2' CLAYSTONE (same as above, 1.5-2.0'), weathered to 3.3'; fresh below - gryish-brn.(2/5Y5/2). Caliche stringer @ 2.8', carbonaceous frag. @ 4.8' w/smaller flecks elsewhere. Bottom 0.1' is weathered.
5981	Sch 40-PVC, 0.010" slots	3			
5980		4			
5979		5			NO RECOVERY: 5.2-6.0' NO RECOVERY.
5978		6		CLAYSTONE	CLAYSTONE: 6.0-6.9' CLAYSTONE, same as above 1.5-3.3" - Fe-stained portion.
5977		7			NO RECOVERY: 6.9-10.0' NO RECOVERY.
		8			

508

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 61399 Lithologic Description	Page 2 of 2



509

STATE PLANE COORDINATES AREA:
NORTH: 750236.29
EAST: 2084033.06
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5986.87
TOTAL DEPTH (FT): 10.08
COMPLETION DATE: 10/14/99
GEOLOGIST: T. Lutherer

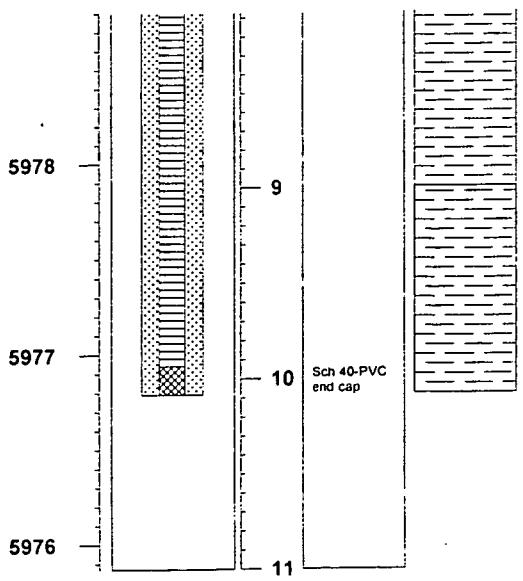
CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER: 61499

Elev (Ft)	Depth (Ft)	Well or Piezometer Construction and Materials	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5987	0	Cast iron flush mount; Sch 40-PVC; Granular bentonite; BH = 2.0" OD; Casing = 1.25" OD, 0.75" ID			SM-GM: 0-2.0' NO RECOVERY - Soil sampled for waste characterization.
5986	1				
5985	2				CL: 2.0-5.7' Sandy CLAY (SC/CL), red (2.5YR4/6) to yellowish-red (5YR4/6) predominately, fine to med, sub-ang. sand w/some coarse. Low to non plastic clay w/abundant broken to sub-ang. qtzite. gravel. Abundant caliche in lower middle of run, damp, locally — grading to clayey sand.
5984	3				
5983	4	16-40 silica sand			
5982	5	Sch 40-PVC, 0.010" slots			
5981	6				SM-GM: 5.7-6.0' NO RECOVERY.
5980	7				CL: 6.0-7.6' Sandy CLAY/clayey sand (SC/CL) - as above, 2.0-5.7'. Highly mottled, damp, abundant caliche & reworked claystone @ contact. Top of bedrock = 7.6', moist.
5979	8				CLAYSTONE: 7.6-9.0' CLAYSTONE, lt. gry.(5Y7/1) to olive yellow (5Y7/6), highly oxidized

510

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 61499 Lithologic Description	Page 2 of 2



w/caliche filled fracs. and voids near contact. Massive, dense w/tr. to some silt near bottom of interval.

CLAYSTONE: 9.0-10.08' CLAYSTONE (as above, 7.6-9.0'), grading to silty claystone @ bottom of interval. Abundant MnOx staining, becoming blocky, Damp.

511

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5894.86	CASING DIA (IN):	LOG OF BORING NUMBER:
NORTH: 751711.65	TOTAL DEPTH (FT): 37.50	BH DIA. (IN):	70299
EAST: 2084768.2	COMPLETION DATE: 8/11/99	GRID LOCATOR:	
PROJECT: Borehole & Well	GEOLOGIST: J. Boylan/T. Lutherer		
REMARKS:			

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5899		4	Sch 40-PVC		
5898		3			
5897		2			
5896		1			
5895		0	Concrete surface pad		CL: 0-1.3' CLAY w/ traces gravel, silt, sand, dk. gryish-brn. (10YR4/2) to 0.7', then mainly yellowish-brn.(10YR5/4). Mottled. Looks like reworked bedrock claystone. Moist (probably due to recent rains). Sl. rooted. Siltier and sandier @ base of recovery.
5894		1	Grout		
5893		2	BH = 8.0" OD		SM-GM: 1.3-2.0' NO RECOVERY.
5892		3	Casing = 2.5" OD, 2.0" ID		CL: 2.0-3.3' CLAY w/traces of gravel, silt, sand (as above) 0-1.3'. Very bedrock-like in appearance. Clast @ 2.8' is hard sandy siltstone/silty sandstone. Authigenic??
5891		4			SM-GM: 3.3-4.0' NO RECOVERY.

512

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5890		5			CL: 4.0-5.5' Silty CLAY (same as above, 2.0-3.3', but siltier). Strong mottling present. Still contains occasional hard silt/sand clast.
5889		6			SM-GM: 5.5-6.0' NO RECOVERY.
5888		7			CL: 6.0-7.5' CLAY w/traces gravel, silt, sand - same as above, 0-5.5', w/increased gravel content. Some portions approach GC.
5887		8			SM-GM: 7.5-8.0' NO RECOVERY.
5886		9			CL: 8.0-9.4' CLAY w/traces gravel, silt, sand, same as above, 0.0-7.5'; not as gravelly as 6.0-7.5 and dominant color is lt. olive brn.(2.5Y5/3).
5885		10			SM-GM: 9.4-10.0' NO RECOVERY.
5884		11			CL: 10.0-11.2' CLAY w/traces gravel, silt, sand, (same as 0.0-9.4').
5883		12			SM-GM: 11.2-12.0' NO RECOVERY.
5882		13			CL: 12.0-13.4' CLAY w/traces gravel, silt, sand, (same as 0.0-11.2').
					SM-GM: 13.4-14.0' NO RECOVERY.

513

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5881		14			
					CL: 14.0-14.8' CLAY w/traces gravel, silt, sand, same as above, 0.0-13.4', w/large shattered cobble frags. Wet @ base of recovery.
5880		15			SM-GM: 14.8-16.0' NO RECOVERY.
5879		16			CL: 16.0-17.2' CLAY w/traces gravel, silt, sand, same as above, 0.0-14.8', but not wet - moist.
5878		17			SM-GM: 17.2-18.0' NO RECOVERY.
5877		18			CL: 18.0-19.3' CLAY w/traces gravel, silt, sand. Same as above, 18.0-17.2' is moist, less gravel.
5876		19			SM-GM: 19.3-20.0' NO RECOVERY.
5875		20			CL: 20.0-21.0' CLAY w/gravel. Same as above, 18.0-19.3'. Moist.
5874		21			SM-GM: 21.0-22.0' NO RECOVERY.
5873		22	0.25" bentonite pellets		CL: 22.0-22.2' CLAY w/gravel. Same as above, 20.0-21.0'.
					GC: 22.2-22.3' GRAVEL, wet, med. to coarse, angular, broken qtzite. clast.
5872		23			CL: 22.3-23.2' Weathered CLAY, yellowish-brn @ top to dk. gry. @ bottom (10YR5/6).
					SM-GM: 23.2-24.0 NO RECOVERY.

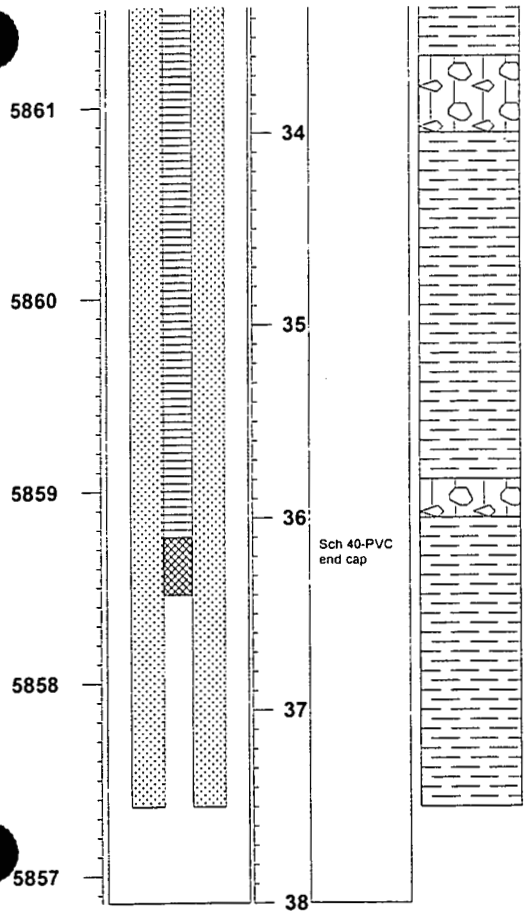
514

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5871		24			CL: 24.0-24.3' CLAY w/gravel, (same as 22.0-22.2'), mod. ind., mod.-highly friable, oxidized, homogeneous, becoming dense (gry.) @ bottom of interval. Damp @ top. Top of bedrock @ 24.3'.
5870		25	16-40 silica sand		CLAYSTONE: 24.3-26.0' CLAYSTONE (bedrock), highly oxidized. FeOx stained glide plane @ 25.5'.
5869		26	Sch 40-PVC, 0.010" slots		CLAYSTONE: 26.0-28.0' CLAYSTONE (same as above), still weathered.
5868		27			
5867		28			CLAYSTONE: 28.0-30.0' CLAYSTONE (same as above), still weathered becoming more competent.
5866		29			
5865		30			CLAYSTONE: 30.0-32.0' CLAYSTONE (same as 28.0-30.0'). Noticeably less weathered, prominent color is dk. gry.(2.5YN4) w/some olive-brn.(2.5Y4/4). Damp.
5864		31			
5863		32			CLAYSTONE: 32.0-33.6' CLAYSTONE (same as above, 30.0-32.0'). Abundant FeOx concretions the size of fine gravel - angular (@35.5-36.6'). Clay predominately olive-brn., some dk. gry. Damp.
5862		33			

515

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: **70299**



SM-GM: 33.6-34.0' NO RECOVERY

CLAYSTONE: 34.0-35.8' CLAYSTONE (as above), abundant FeOx concretions @ 34.0-34.3', also traces @ 35.6'. All material wet to damp.

SM-GM: 35.8-36.0' NO RECOVERY.

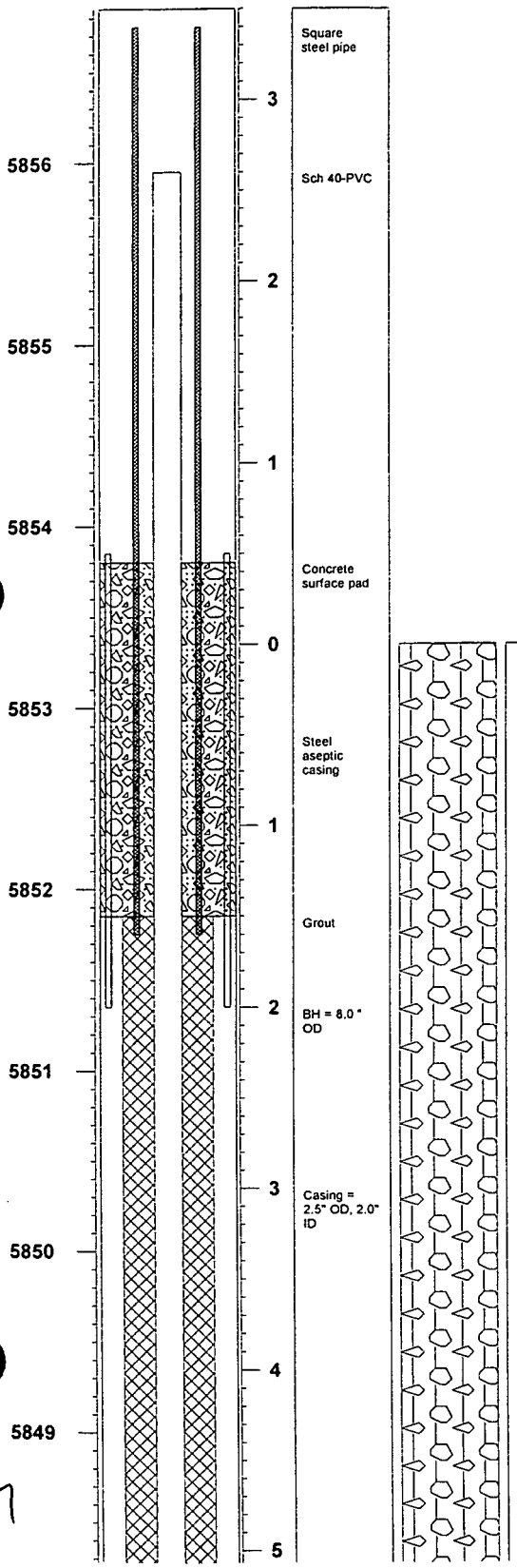
CLAYSTONE: 36.0-37.5' CLAYSTONE, as above w/no oxidation and no Fe-concretions.

516

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5853.35	CASING DIA (IN):	LOG OF BORING NUMBER:
NORTH: 748154.05	TOTAL DEPTH (FT): 19.30	BH DIA. (IN):	90099
EAST: 2086556.58	COMPLETION DATE: 7/27/99	GRID LOCATOR:	
PROJECT: Borehole & Well	GEOLOGIST: J. Boylan		

REMARKS:
NOTE: #90099 if a twin of #01298. Reference #01298 for all

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

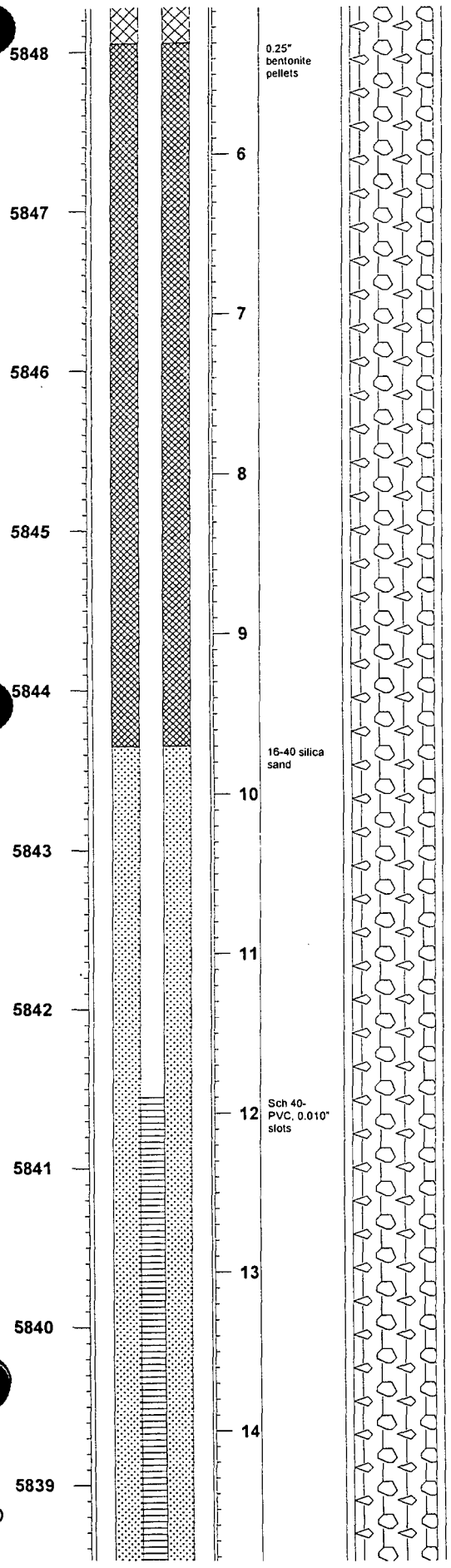


SM-GM: NOTE: #90099 is a twin of #01298. Reference #01298 for all geologic descriptions since stratigraphy was not logged during drilling or installation of this well. Estimated depth to bedrock = 15.3'.

517

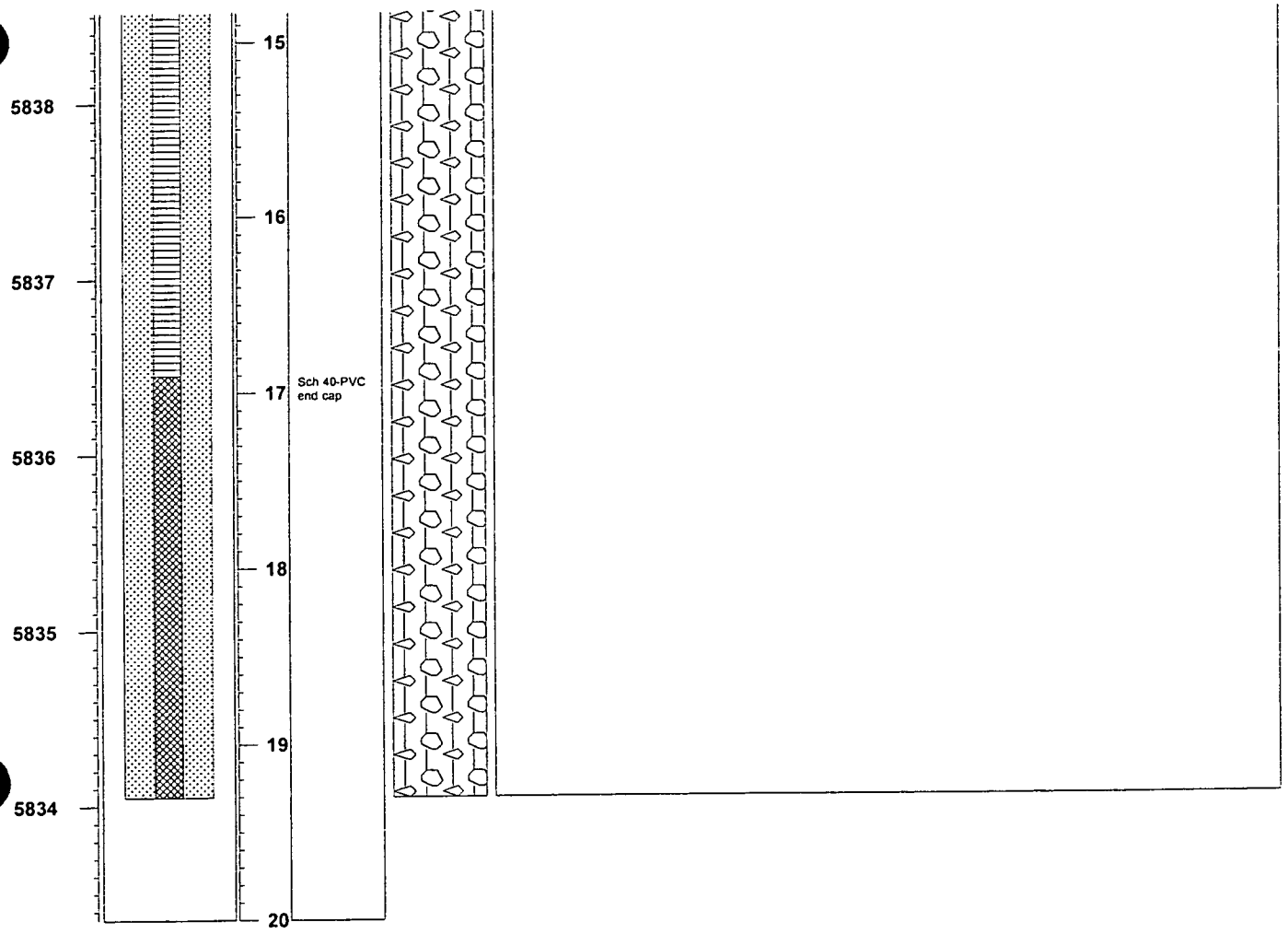
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
90099



518

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 90099 Lithologic Description	Page 3 of 3



519

STATE PLANE COORDINATES AREA:
NORTH: 748037.55
EAST: 2086717.12
PROJECT: Borehole & Well

GRND ELEV. (FT): 5831.52
TOTAL DEPTH (FT): 13.10
COMPLETION DATE: 7/30/99
GEOLOGIST: T. Lutherer

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER: 90199

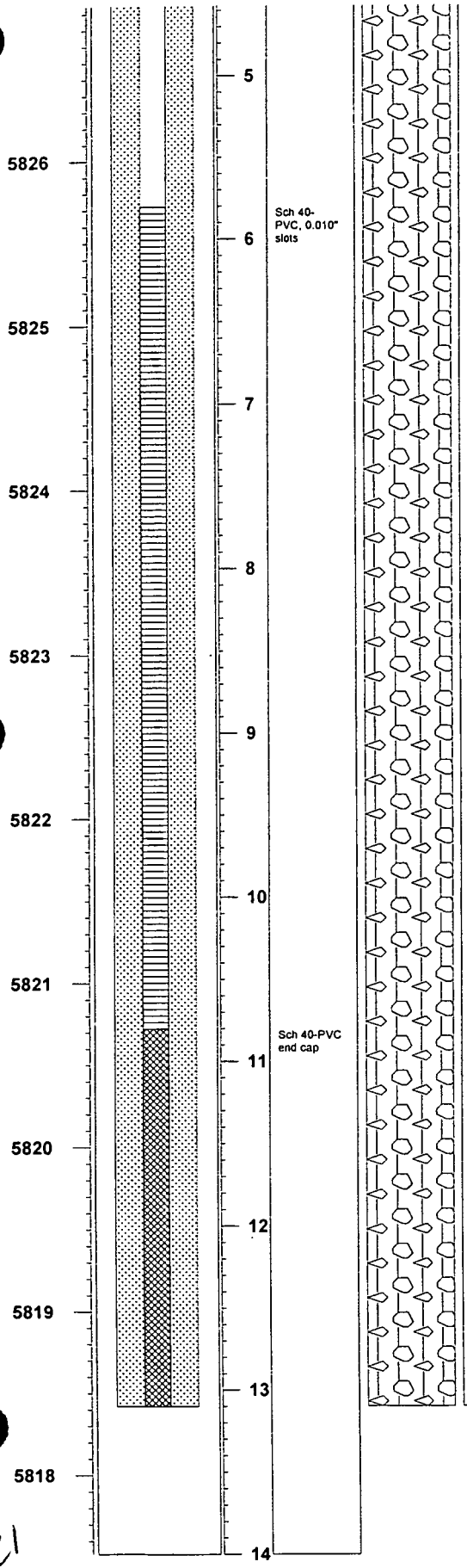
REMARKS:
NOTE: #90199 is a twin of BH91499. Reference BH91499 for a

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5835	Square steel pipe	4			
5834		3			
5833		2			
5832	Concrete surface pad	1			
5831		0			SM-GM: NOTE: #90199 is a twin of BH91499. Reference BH91499 for all geologic descriptions since stratigraphy was not logged during drilling or installation of this well. Estimated depth to bedrock = 11.0'.
5830	0.25" bentonite pellets	1			
5829	BH = 8.0" OD	2			
5828	Sch 40-PVC Casing = 2.5" OD, 2.0" ID	3			
5827	16-40 silica sand	4			

520

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
90199

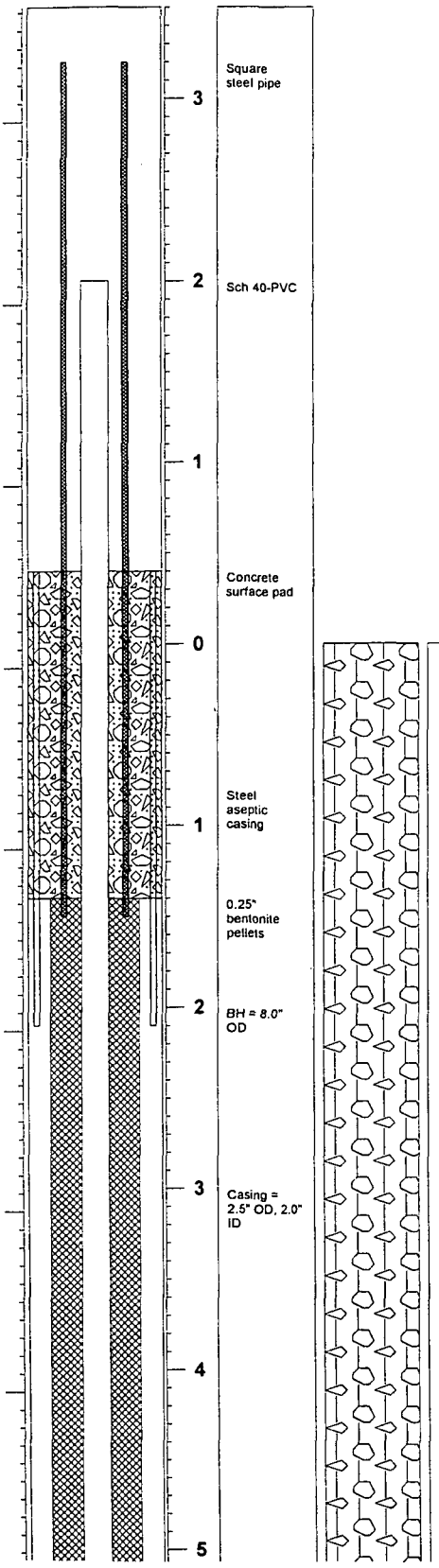


521

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5823.13	CASING DIA (IN):	LOG OF BORING NUMBER:
NORTH: 748043.01	TOTAL DEPTH (FT): 20.50	BH DIA. (IN):	90299
EAST: 2086901.66	COMPLETION DATE: 7/29/99	GRID LOCATOR:	
PROJECT: Borehole & Well	GEOLOGIST: J. Boylan		

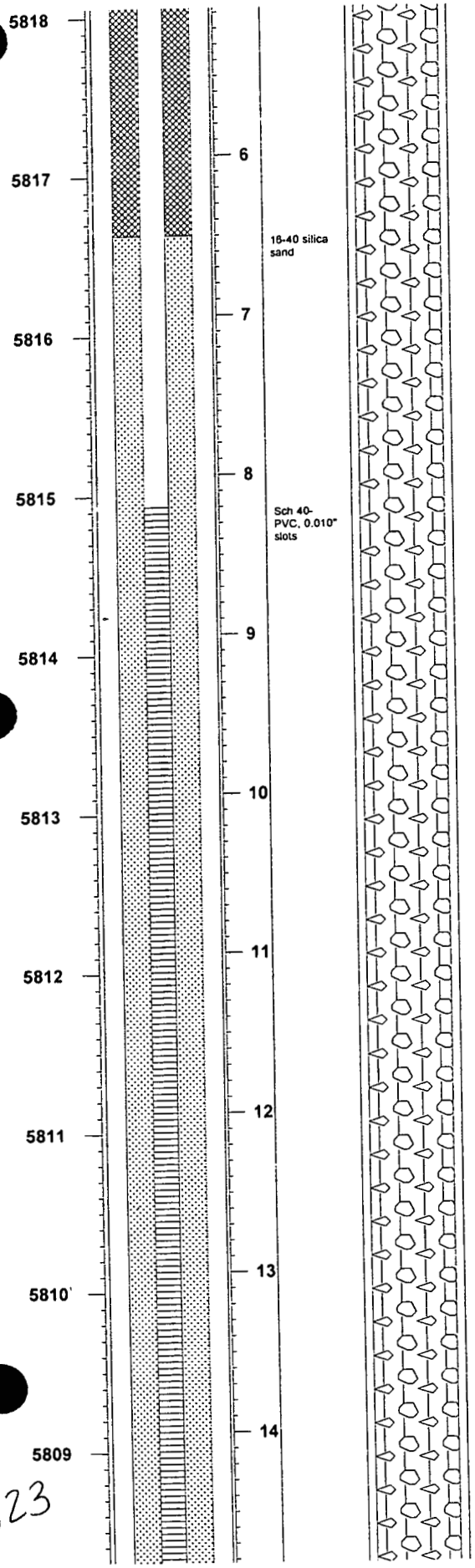
REMARKS:
NOTE: #90299 is a twin of BH92099. Reference BH92099 for a

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5826	Square steel pipe	3			
5825	Sch 40-PVC	2			
5824		1			
5823	Concrete surface pad	0			SM-GM: NOTE: #90299 is a twin of BH92099. Reference BH92099 for all geologic descriptions since stratigraphy was not logged during drilling or installation of this well. Estimated depth to bedrock = 18.0'.
5822	Steel aseptic casing	1			
5821	0.25" bentonite pellets BH = 8.0" OD	2			
5820	Casing = 2.5" OD, 2.0" ID	3			
5819		4			
		5			



522

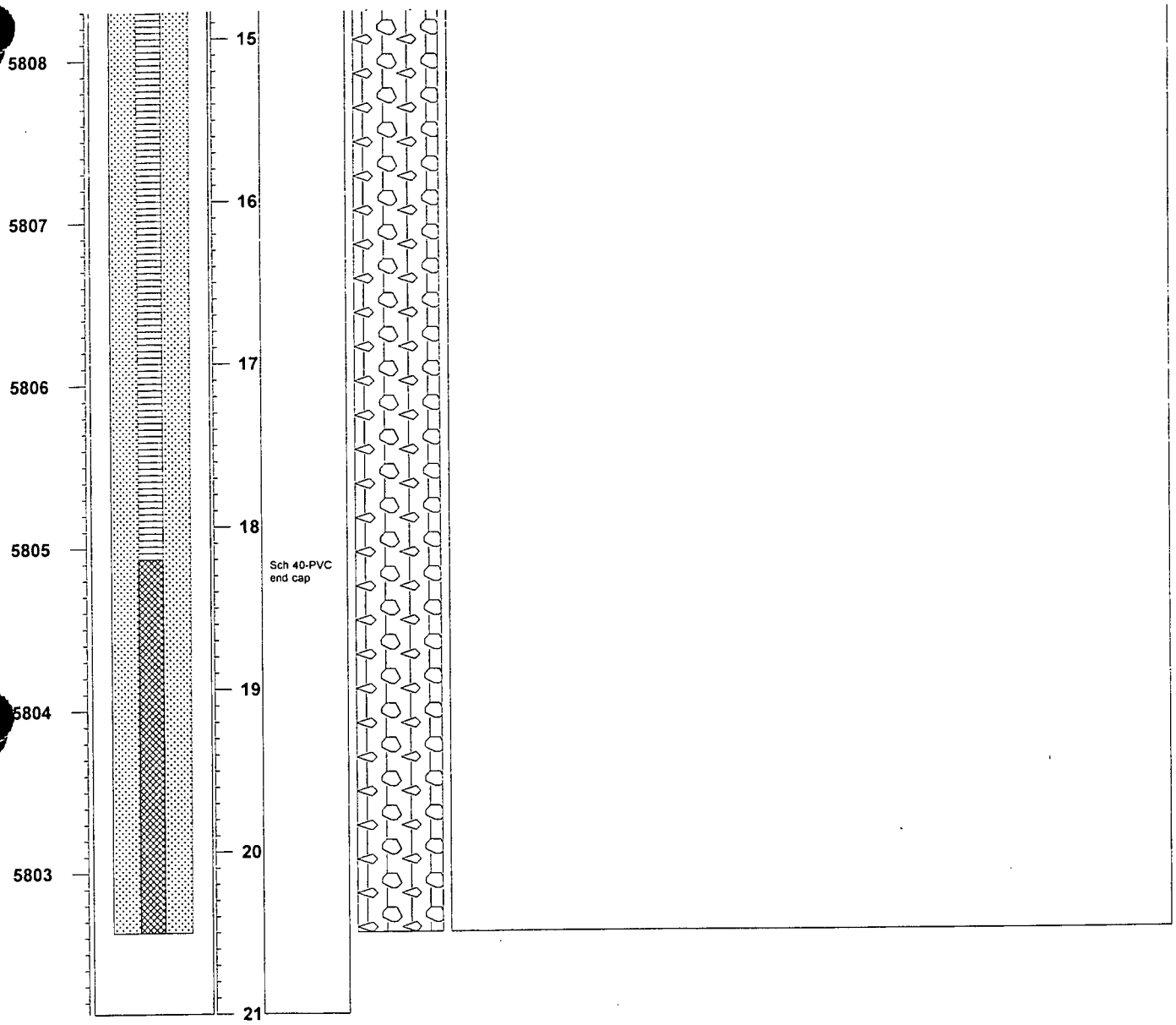
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 90299 Lithologic Description	Page 2 of 3



523

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
90299



524

STATE PLANE COORDINATES AREA:	GRND ELEV. (FT): 5838.23	CASING DIA (IN):	LOG OF BORING NUMBER:
NORTH: 748024.66	TOTAL DEPTH (FT): 21.00	BH DIA. (IN):	90399
EAST: 2086538.66	COMPLETION DATE: 7/28/99	GRID LOCATOR:	
PROJECT: Borehole & Well	GEOLOGIST: J. Boylan		

REMARKS:

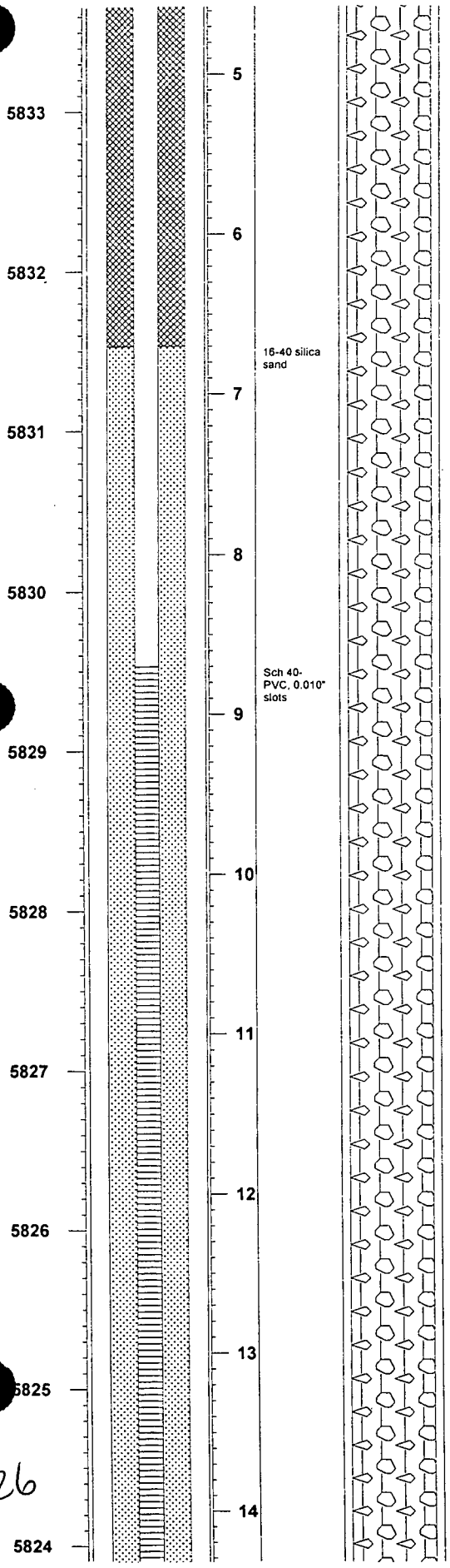
NOTE: #90399 is a twin of BH91799. Reference BH91799 for al

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5842		4			
	Square steel pipe				
5841		3			
	Sch 40-PVC				
5840		2			
5839		1			
	Concrete surface pad				
5838		0			SM-GM: NOTE: #90399 is a twin of BH91799. Reference BH91799 for all geologic descriptions since stratigraphy was not logged during drilling or installation of this well. Estimated depth to bedrock = 4.0'.
	Steel aseptic casing				
5837		1			
	0.25" Bentonite pellets				
5836	BH = 8.0" OD	2			
5835	Casing = 2.5" OD, 2.0" ID	3			
5834		4			

525

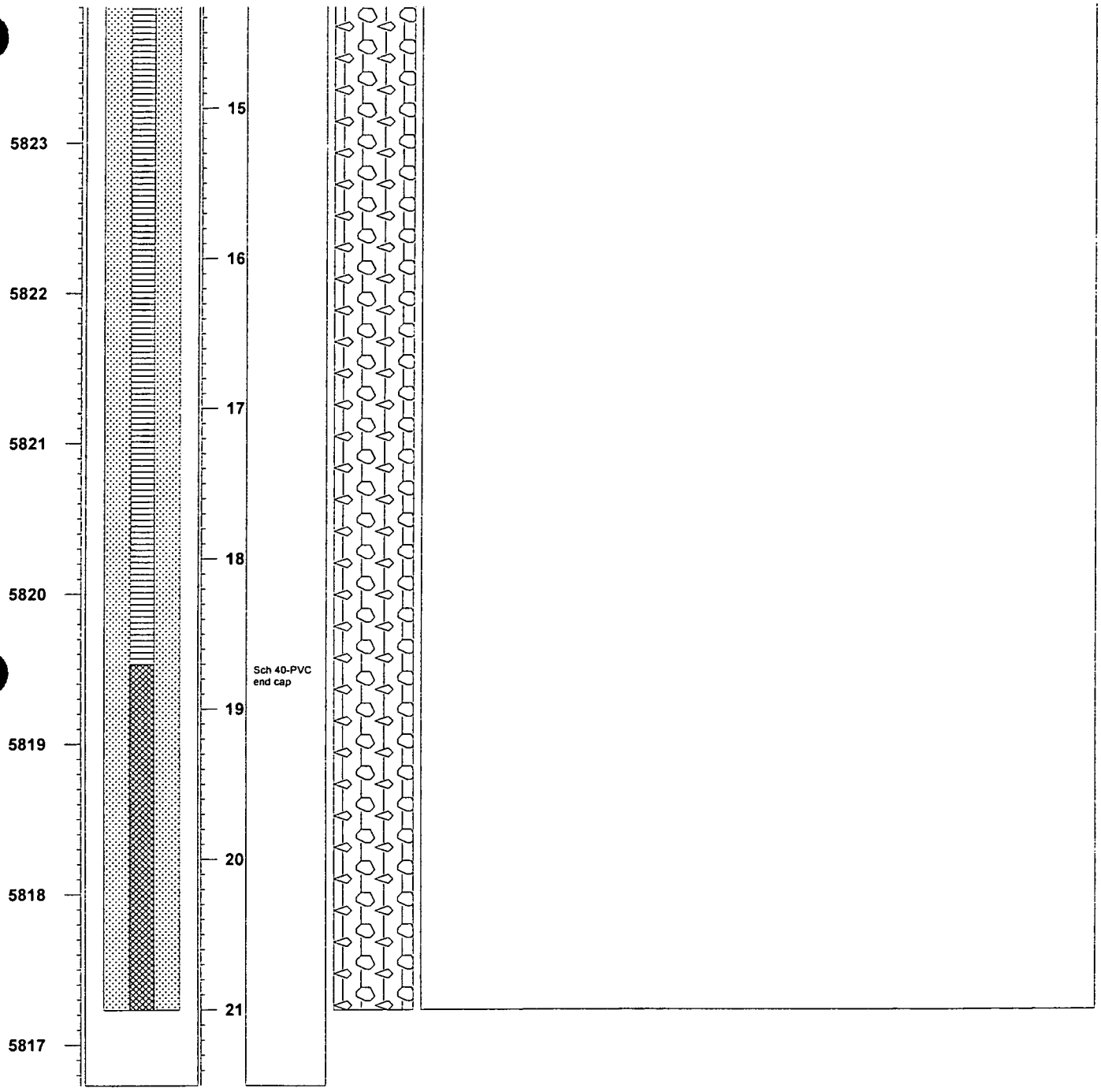
Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER:
90399



526

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 90399 Lithologic Description	Page 3 of 3



527

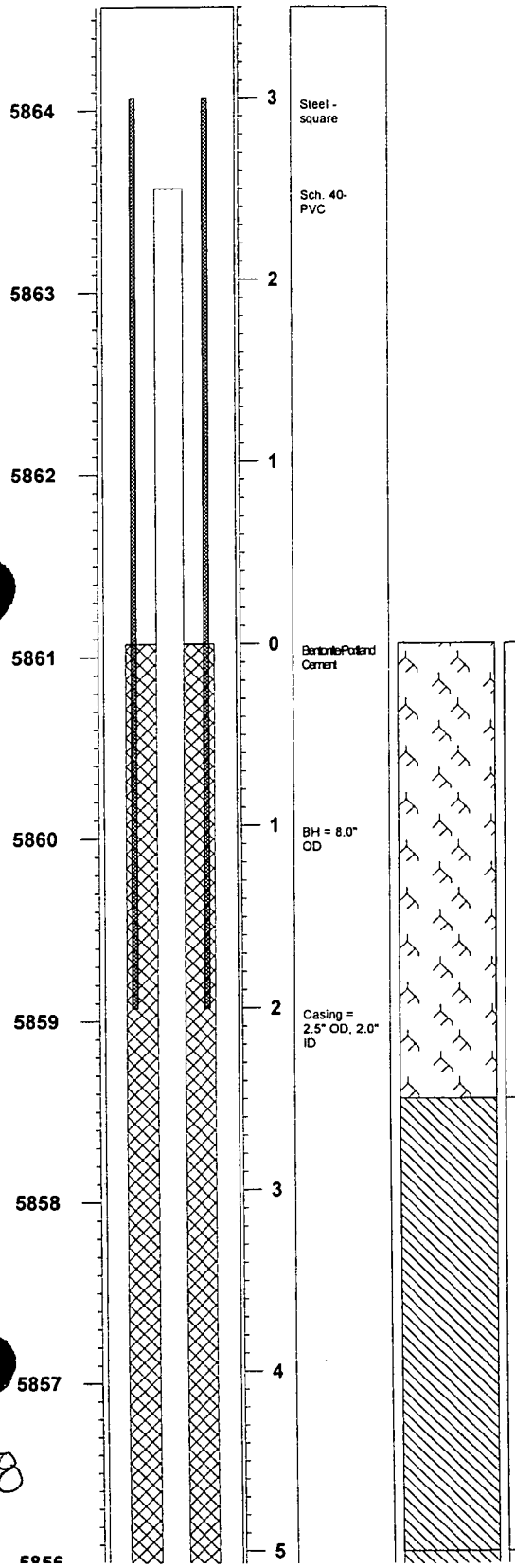
STATE PLANE COORDINATES AREA:
NORTH: 750716.85
EAST: 2088013.5
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT): 5861.07
TOTAL DEPTH (FT): 23.00
COMPLETION DATE: 9/23/99
GEOLOGIST: Gravelding

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER: 95099

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description



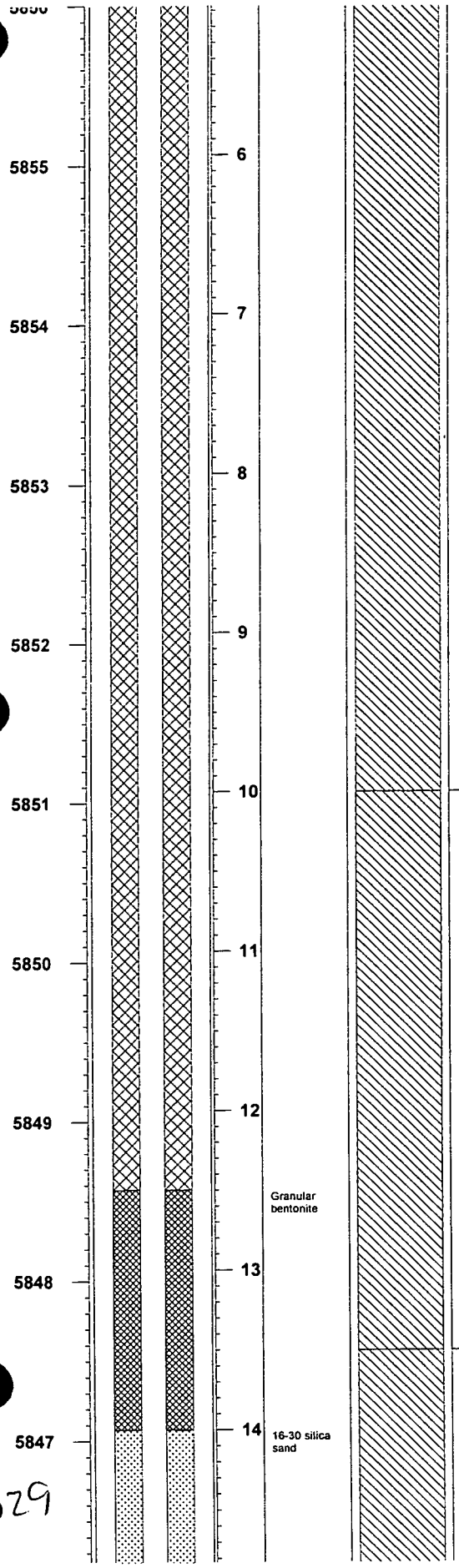
TOPSOIL: 0-2.5' ARTIFICIAL FILL - backfill material. Safety ribbon @ 2.5'. NOTE: Stratigraphy was not logged using the USCS classifications, therefore, all geologic units and material codes are "inferred" from log descriptions.

CL: 2.5-5.0' Silty CLAYEY native soil, lt. brn. to dk. brn.,, 10% clasts, sub-rounded up to 0.5" diameter. Mottled gry. clay interbedded, slightly moist.

528

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 95099



CL: 5.-10.0' CLAY (same as above, 2.2-5.0') w/less dk. brn. White caliche staining along secondary fracture/preferential flow zones. Slightly moist.

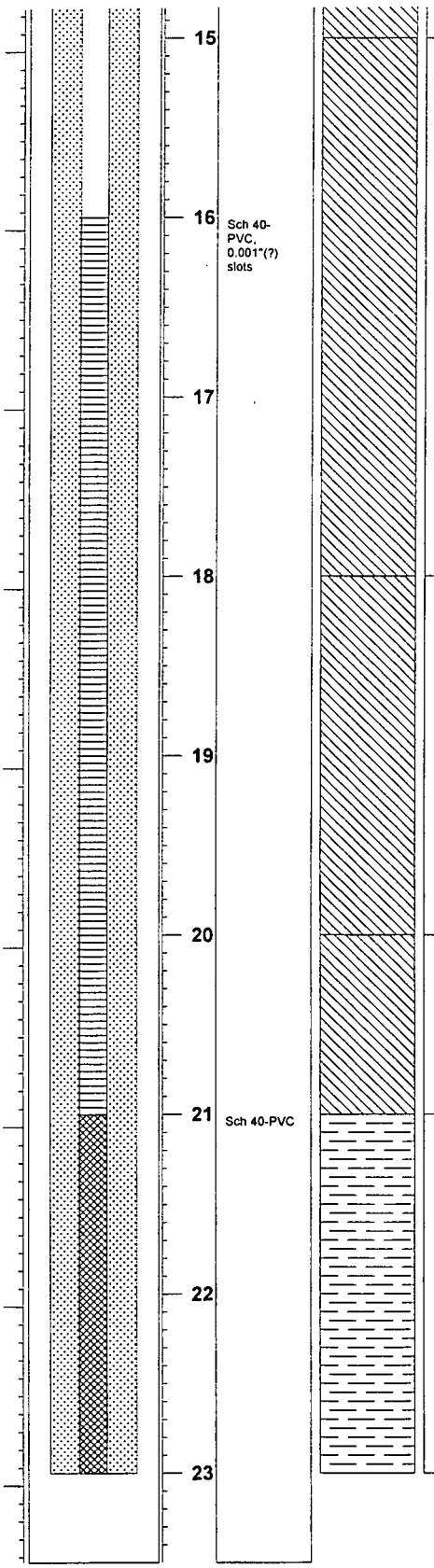
CL: 10.0-13.5' CLAY, gry., mottled w/rust reddish-brn., little to no coarse material. Large rocks (1.5-2.0" dia.) @ 13.5'. Slightly moist.

CL: 13.5-15.0' CLAY (same as above, 10.0-13.5').

529

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 95099



CL: 15.0-18.0' CLAY (same as 10.0-13.5').

CL: 18.0-20.0' CLAY (same as 10.0-13.5').

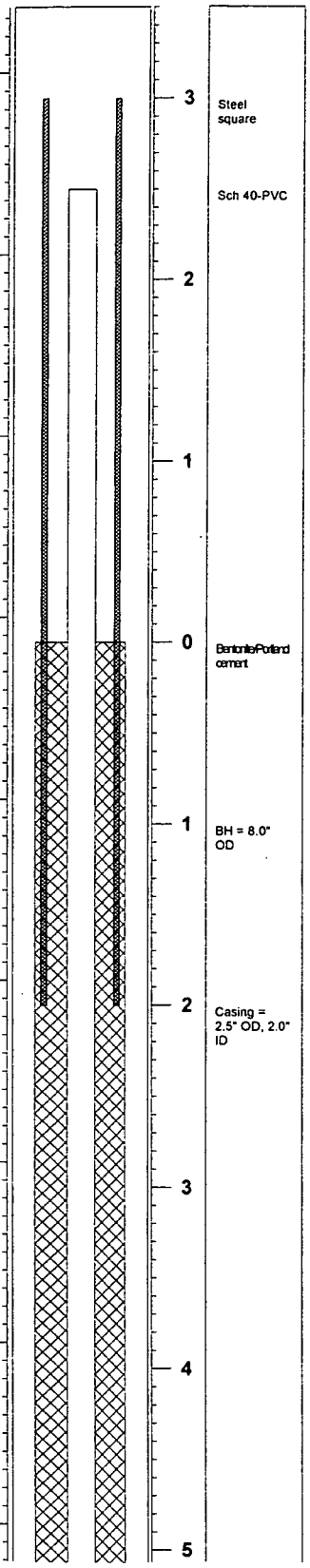
CL: 20-21.0' CLAY (?) - same as 10.0-13.5'.

CLAYSTONE: 21.0-23.0' CLAYSTONE (?) - bedrock, slightly moist.

530

STATE PLANE COORDINATES AREA: NORTH: 750524.1 EAST: 2087281.8 PROJECT: Borehole & Well REMARKS:	GRND ELEV. (FT): 5878.86 TOTAL DEPTH (FT): 24.00 COMPLETION DATE: 9/23/99 GEOLOGIST: Gravelding	CASING DIA (IN): BH DIA. (IN): GRID LOCATOR:	LOG OF BORING NUMBER: **95199**

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5882		3			
5881		2			
5880		1			
5879		0			TOPSOIL: 0-1.0' TOPSOIL - artificial fill. NOTE: Stratigraphy was not logged using the USCS classifications, therefore, all geologic units and material codes are "inferred" fm. log descriptions.
5878		1			CL: 1.0-5.0' CLAY, lt. brn./dk. brn. silty alluvium w/clay. Some 20% 0.25" dia. stones - sub-rounded. Grading to 10-15% v. fine sand. Dry.
5877		2			
5876		3			
5875		4			
5874		5			



531

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5873		6			CL: 5.0-10.0' CLAY, dk. gry., high plasticity, wet. Fm. 9.0-10.0' - rust staining w/more sand-sucrosic texture, still clayey, matrix wet.
5872		7			
5871		8			
5870		9			
5869		10			CL: 10.0-15.0' CLAY (same as above, 5.0-10.0'), gry, w/mottled rust (FeOx) staining, mottling seeems irregular and not associated w/high sand zones or factures. Coarse grains (0.25-0.5" dia.) in lower portion of sample.
5868		11			
5867		12			
5866		13			
5865	Granular bentonite	14			

532

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description
5864		15	16-30 silica sand		CL: 15.0-20.0' CLAY, grey w/rust brn. mottling, v. hard, dry.
5863		16			
5862		17	Sch 40-PVC, 0.001" (?) slots		
5861		18			
5860		19			
5859		20			SM-GM: 20.0-22.0' NO RECOVERY.
5858		21			
5857		22	Sch 40-PVC		CLAYSTONE: 22.0-24.0' CLAYSTONE (?) - bedrock. (Exact footage of this interval not recorded).
5856		23			
5855		24			

S33

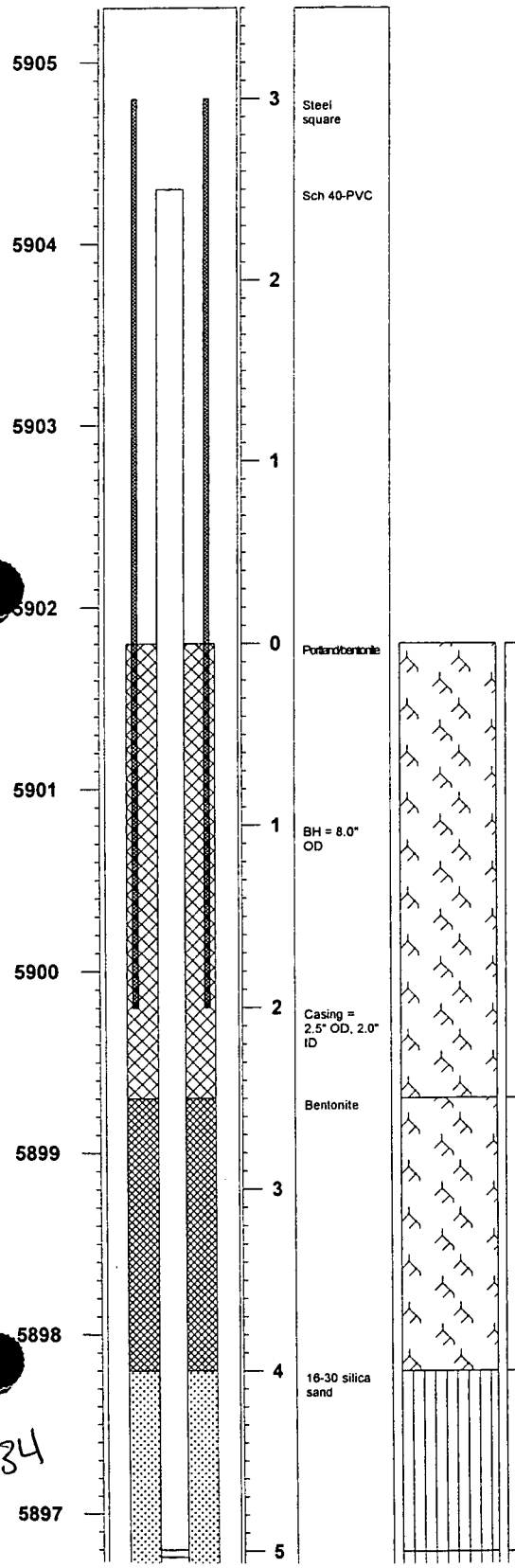
STATE PLANE COORDINATES AREA:
NORTH:750246.72
EAST: 2086804.84
PROJECT: Borehole & Well
REMARKS:

GRND ELEV. (FT):5901.80
TOTAL DEPTH (FT): 15.00
COMPLETION DATE: 9/24/99
GEOLOGIST: Gravelding

CASING DIA (IN):
BH DIA. (IN):
GRID LOCATOR:

LOG OF BORING NUMBER:
95299

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description



TOPSOIL: 0-2.5' TOPSOIL - soil horizon NOTE: Sratigraphy was not logged using the USCS classification, therefore, all geologic units and material codes are "inferred" fm. log descriptions.

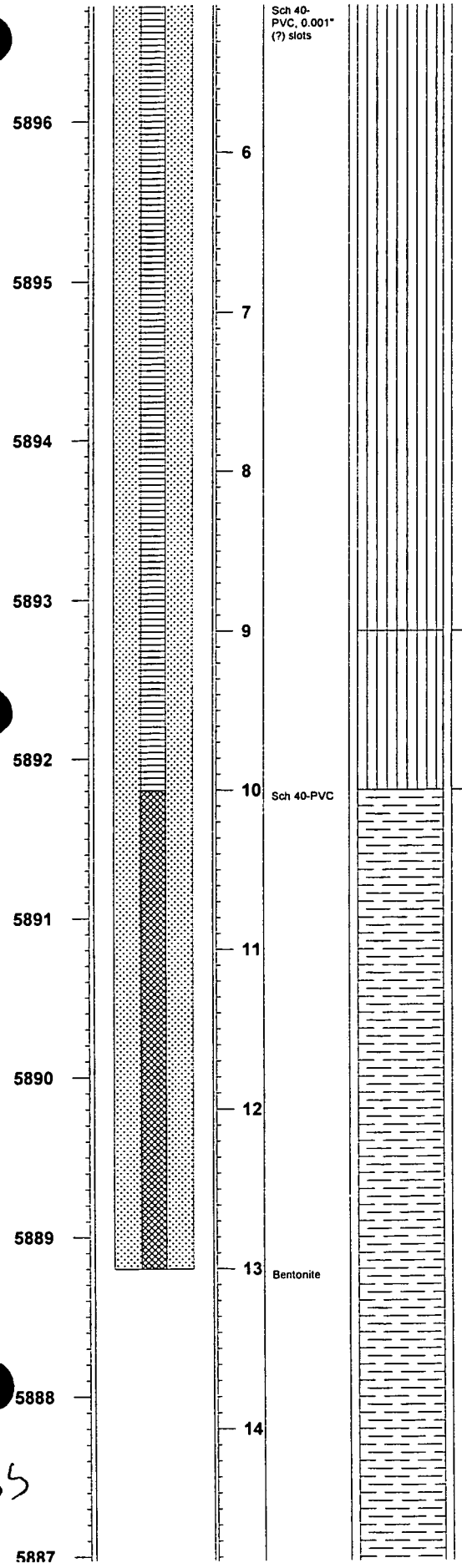
TOPSOIL: 2.5-4.0' Large rock fragments within (?) - not logged otherwise.

ML: 4.0-5.0' Clayey SILT w/v. fine sand, lt. brn-buff, has both rust and white (caliche) mottling. Dry.

534

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	Lithologic Description

LOG OF BORING NUMBER: 95299



ML: 5.0-9.0' Clayey SILT w/v. fine sand (same as above, 4.0-5.0'), increased moisture w/depth.

ML: 9.0-10.0' Clayey SILT, grey, no sand, dry. Top of bedrock @ 10.0' (?).

CLAYSTONE: 10.0-15.0' CLAYSTONE (bedrock), grey.

535

Elev (Ft)	Well or Piezometer Construction and Materials	Depth (Ft)	Lithology	Unified Soils Classification or Rock Type	LOG OF BORING NUMBER: 95299 Lithologic Description	Page 3 of 3
		15				

536

Appendix E: Table 11-1a
Duplicate Error Ratios (DERs)
Groundwater 1999

ation	Sample Date	Analyte	Real Result	Real 2 Sigma	Real LabQ / Valid	Dup Result	Dup 2 Sigma	Dup LabQ / Valid	Units	Absolute Value (Real-Dup)	Square Root of $(2Sig_R)^2+(2Sig_D)^2$	DER AbsVal/SqRt
					Radionuclides							
0386	2/24/99	Americium-241	0.0082	.0081	J/V1	0.0219	.0135	J/V1	PCI/L	0.01	0.02	0.87
0386	7/26/99	Americium-241	0.0192	0.0132	J/V1	0.0216	0.0156	J/V1	PCI/L	0.0024	0.02	0.12
05091	8/24/99	Americium-241	0.0233	0.0173	J/V1	0.0136	0.0154	J/V1	PCI/L	0.0097	0.02	0.42
10294	7/22/99	Americium-241	0.0263	0.0149	J/V1	0.0101	0.0163	U/V1	PCI/L	0.0162	0.02	0.73
10498	2/17/99	Americium-241	0.0142	0.0088	J/V1	0.0086	0.0069	J/V1	PCI/L	0.01	0.01	0.50
11891	5/20/99	Americium-241	0.0301	0.0143	/V1	0.0302	0.0156	/V1	PCI/L	0.0001	0.0212	0.00
3586	8/9/99	Americium-241	0.009	0.0146	U/V1	0.0254	0.0188	J/V1	PCI/L	0.0164	0.02	0.69
05091	8/24/99	Plutonium-239/240	0.0125	0.0109	J/V1	-0.0038	0.0053	U/V1	PCI/L	0.0163	0.01	1.34
11891	5/20/99	Plutonium-239/240	0.0085	0.0098	U/V1	0.0066	0.0065	J/V1	PCI/L	0.0019	0.0118	0.16
11891	10/18/99	Plutonium-239/240	0.0129	0.0113	J/V1	0.0080	0.0117	U/V1	PCI/L	0.0049	0.0163	0.30
0386	2/24/99	Plutonium-239/240	9.5996	1.1999	/V1	8.69	1.1195	/V1	PCI/L	0.91	1.64	0.55
0386	7/26/99	Plutonium-239/240	8.2503	1.1039	/V1	9.5842	1.2529	/V1	PCI/L	1.3339	1.67	0.80
03991	1/20/99	Plutonium-239/240	2.2633	0.4945	/V1	2.5685	0.5564	/V1	PCI/L	0.31	0.74	0.41
05091	2/15/99	Plutonium-239/240	3.4604	0.67	/V1	3.3606	0.6928	/V1	PCI/L	0.10	0.96	0.10
05091	8/24/99	Plutonium-239/240	3.0175	0.6255	/V1	3.2312	0.6113	/V1	PCI/L	0.2137	0.87	0.24
10294	2/10/99	Plutonium-239/240	11.4066	1.2252	/NJ	12.544	1.6266	/V	PCI/L	1.14	2.04	0.56
10294	7/22/99	Plutonium-239/240	16.0835	1.6902	/V1	15.3849	1.8193	/V1	PCI/L	0.6986	2.48	0.28
10498	2/17/99	Plutonium-239/240	2.0205	0.4221	/V1	1.7211	0.4064	/V1	PCI/L	0.30	0.59	0.51
10498	8/12/99	Plutonium-239/240	0.4282	0.2685	J/V1	0.9635	0.3747	J/V1	PCI/L	0.5353	0.46	1.16
11891	5/20/99	Plutonium-239/240	2.778	0.5914	/V1	1.9209	0.4728	/V1	PCI/L	0.8571	0.7572	1.13
11891	10/18/99	Plutonium-239/240	2.7564	0.9299	/V1	3.0071	0.7984	/V1	PCI/L	0.2507	1.2256	0.20
3586	1/15/99	Plutonium-239/240	2.3597	.4977	/V1	1.8822	.4378	/V1	PCI/L	0.48	0.66	0.72
3586	4/28/99	Plutonium-239/240	3.2839	0.4565	/V1	3.3766	0.4976	/V1	PCI/L	0.0927	0.6753	0.14
3586	8/9/99	Plutonium-239/240	3.2764	0.7352	/V1	2.7168	0.6322	/V1	PCI/L	0.5596	0.97	0.58
3586	10/19/99	Plutonium-239/240	3.3470	1.0572	/V1	3.7966	0.8439	/V1	PCI/L	0.4496	1.3527	0.33
41591	3/3/99	Plutonium-239/240	10.5743	1.3295	/V1	8.1857	1.2025	/V1	PCI/L	2.39	1.79	1.33
41591	8/12/99	Plutonium-239/240	6.318	0.8439	/V1	6.5937	0.8344	/V1	PCI/L	0.2757	1.19	0.23
70193	8/19/99	Plutonium-239/240	0.0851	0.1169	U/V1	2.1716	0.5429	/V1	PCI/L	2.0865	0.56	**3.76**
70393	11/4/99	Plutonium-239/240	-0.0044	0.1171	/V1	-0.0501	0.0327	/V1	PCI/L	0.0457	0.1216	0.38
0386	7/26/99	Uranium-235	0.2558	0.1964	J/V1	0.1493	0.1682	U/V1	PCI/L	0.1065	0.26	0.41
05091	8/24/99	Uranium-235	0.134	0.131	J/V1	0.0977	0.1189	U/V1	PCI/L	0.0363	0.18	0.21
10294	2/10/99	Uranium-235	0.4802	.2508	J/NJ	0.4949	0.3224	J/V	PCI/L	0.01	0.41	0.04
10294	7/22/99	Uranium-235	0.8448	0.3954	J/V1	0.6282	0.3797	J/V1	PCI/L	0.2166	0.55	0.40
11891	10/18/99	Uranium-235	0.3990	0.3825	U/V1	0.1920	0.2147	/V1	PCI/L	0.2070	0.4386	0.47
3586	4/28/99	Uranium-235	0.1891	0.1117	J/V1	0.1384	0.1062	J/V1	PCI/L	0.0507	0.1541	0.33
3586	10/19/99	Uranium-235	-0.0404	0.0395	/V1	0.0801	0.1365	U/V1	PCI/L	0.1205	0.1421	0.85
41591	3/3/99	Uranium-235	0.3055	0.2256	J/V1	0.4612	0.285	J/V1	PCI/L	0.16	0.36	0.43
41591	8/12/99	Uranium-235	0.249	0.1724	J/V1	0.1382	0.1338	U/V1	PCI/L	0.1108	0.22	0.51
70393	11/4/99	Uranium-235	-0.1082	0.0529	/V1	0.0000	0	/V1	PCI/L	0.1082	0.0529	**2.05**
0386	2/24/99	Uranium-238	7.5386	1.0608	/V1	5.9348	0.9271	/V1	PCI/L	1.60	1.41	1.14
0386	7/26/99	Uranium-238	6.0285	0.9357	/V1	7.3827	1.0972	/V1	PCI/L	1.3542	1.44	0.94
03991	1/20/99	Uranium-238	1.1142	0.3476	/V1	1.9103	0.4775	/V1	PCI/L	0.80	0.59	1.35
05091	2/15/99	Uranium-238	2.7276	0.594	/V1	2.2281	0.5641	/V1	PCI/L	0.50	0.82	0.61
05091	8/24/99	Uranium-238	1.496	0.4397	/V1	2.1905	0.5009	/V1	PCI/L	0.6945	0.67	1.04
10294	2/10/99	Uranium-238	9.7814	1.1336	/NJ	10.3506	1.4777	/V	PCI/L	0.57	1.86	0.31
10294	7/22/99	Uranium-238	15.3002	1.6486	/V1	14.521	1.7619	/V1	PCI/L	0.7792	2.41	0.32
10498	2/17/99	Uranium-238	1.5098	0.3657	/V1	1.3702	0.3606	/V1	PCI/L	0.14	0.51	0.27

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Note: DER values greater than the 1.96 QC criterion are indicated by bold font.

Appendix E: Table 11-1a
Duplicate Error Ratios (DERs)
Groundwater 1999

cation	Sample Date	Analyte	Real Result	Real 2 Sigma	Real LabQ / Valid	Dup Result	Dup 2 Sigma	Dup LabQ / Valid	Units	Absolute Value (Real-Dup)	Square Root of $(2Sig_R)^2+(2Sig_D)^2$	DER AbsVal/S
Radionuclides												
10498	8/12/99	Uranium-238	0.589	0.2799	J/V1	0.522	0.2739	J/V1	PCI/L	0.067	0.39	0.17
11891	5/20/99	Uranium-238	1.2684	0.3957	/V1	1.5097	0.4187	/V1	PCI/L	0.2413	0.5761	0.42
11891	10/18/99	Uranium-238	1.6734	0.7454	/V1	1.8495	0.6216	/V1	PCI/L	0.1761	0.9706	0.18
3586	1/15/99	Uranium-238	1.8415	.4379	/V1	2.0413	.4559	/V1	PCI/L	0.20	0.63	0.32
3586	4/28/99	Uranium-238	2.665	0.4098	/V1	2.7499	0.4476	/V1	PCI/L	0.0849	0.6069	0.14
3586	8/9/99	Uranium-238	2.5736	0.6462	/V1	2.7168	0.6322	/V1	PCI/L	0.1432	0.90	0.16
3586	10/19/99	Uranium-238	2.1864	0.8404	/V1	2.8275	0.7276	/V1	PCI/L	0.6411	1.1116	0.58
41591	3/3/99	Uranium-238	8.7031	1.2061	/V1	9.0374	1.2654	/V1	PCI/L	0.33	1.75	0.19
41591	8/12/99	Uranium-238	5.8214	0.8078	/V1	5.006	0.7253	/V1	PCI/L	0.8154	1.09	0.75
5887	8/16/99	Uranium-238	0.0271	0.0719	U/V1	0.5091	0.2719	J/V1	PCI/L	0.482	0.28	1.71
70193	8/19/99	Uranium-238	0.0676	0.0937	U/V1	1.2138	0.4083	/V1	PCI/L	1.1462	0.42	**2.74**
70393	11/4/99	Uranium-238	-0.1417	0.0606	/V1	-0.0111	0.0154	/V1	PCI/L	0.1306	0.0625	**2.09**

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Note: DER values greater than the 1.96 QC criterion are indicated by bold font.

Appendix E: Table 11-1b
Relative Percent Differences (RPDs)
Groundwater 1999

Location	Sample Date	Analyte	Real Result	Real Lab Q/ Valid	Dup Result	Dup Lab Q/ Valid	Units	Absolute Value (Real-Dup)	Average (Real+Dup)/2	RPD AbsVal/Avex100
				Metals						
0386	7/26/99	Aluminum	31.8	/UJ1	26.5	/UJ1	UG/L	5.3	29.15	18.18
05091	8/24/99	Aluminum	16.6	B/UJ1	27.7	/UJ1	UG/L	11.1	22.15	**50.11**
10294	7/22/99	Aluminum	40.7	/UJ1	32	/UJ1	UG/L	8.7	36.35	23.93
10498	2/17/99	Aluminum	93.9	/V1	65.8	/V1	UG/L	28.10	79.85	**35.19**
10498	8/12/99	Aluminum	247	/V	150	/V	UG/L	97	198.5	**48.87**
11891	5/20/99	Aluminum	9.6	B/UJ1	13.2	B/UJ1	UG/L	3.6	11.4	**31.58**
11891	10/18/99	Aluminum	122.00	/V	77.70	/V	UG/L	44.30	99.85	**44.37**
3586	4/28/99	Aluminum	6.9	U/V1	15.2	B/UJ1	UG/L	8.3	11.05	**75.11**
3586	8/9/99	Aluminum	8.5	B/UJ	10.2	B/UJ	UG/L	1.7	9.35	18.18
3586	10/19/99	Aluminum	17.70	/J	12.00	B/J	UG/L	5.70	14.85	**38.38**
41591	8/12/99	Aluminum	30.2	/UJ	32.7	/UJ	UG/L	2.5	31.45	7.95
5887	5/24/99	Aluminum	13.1	B/J1	15.9	B/J1	UG/L	2.8	14.5	19.31
5887	8/16/99	Aluminum	52	/V1	38.6	/V1	UG/L	13.4	45.3	29.58
5887	10/28/99	Aluminum	14.90	B/J1	6.60	B/J1	UG/L	8.30	10.75	**77.21**
70193	8/19/99	Aluminum	14.8	B/UJ1	11.9	B/UJ1	UG/L	2.9	13.35	21.72
70193	10/18/99	Aluminum	5.70	B/J	9.50	B/J	UG/L	3.80	7.60	**50.00**
70393	5/18/99	Aluminum	11.8	B/J1	5	U/J1	UG/L	6.8	8.4	**80.95**
70393	8/16/99	Aluminum	22.4	/UJ1	13.4	B/UJ1	UG/L	9	17.9	**50.28**
70393	11/4/99	Aluminum	15.70	B/J1	25.30	/V1	UG/L	9.60	20.50	**46.83**
10294	7/22/99	Antimony	0.62	U/V1	0.68	B/V1	UG/L	0.06	0.65	9.23
10498	8/12/99	Antimony	1.2	B/V	0.91	B/J1	UG/L	0.29	1.055	27.49
70193	5/6/99	Antimony	0.48	U/V	0.68	B/UJ	UG/L	0.2	0.58	**34.48**
70193	10/18/99	Antimony	0.52	U/V	0.56	B/J1	UG/L	0.04	0.54	7.41
70393	11/4/99	Antimony	0.52	U/V1	0.55	B/V1	UG/L	0.03	0.54	5.61
10294	7/22/99	Arsenic	2.3	B/V1	2.1	B/V1	UG/L	0.2	2.2	9.09
11891	10/18/99	Arsenic	0.72	B/V	0.68	U/V	UG/L	0.04	0.70	5.71
3586	4/28/99	Arsenic	1.8	B/V1	1.1	B/V1	UG/L	0.7	1.45	**48.28**
3586	8/9/99	Arsenic	3.1	B/V	2.9	B/J1	UG/L	0.2	3	6.67
3586	10/19/99	Arsenic	3.50	B/V	3.60	B/J1	UG/L	0.10	3.55	2.82
0386	2/24/99	Barium	203	/V	132	/V	UG/L	71.00	167.5	**42.39**
05091	2/15/99	Barium	193	/V1	197	/V1	UG/L	4.00	195	2.05
05091	8/24/99	Barium	190	/V1	192	/V1	UG/L	2	191	1.05
10294	7/22/99	Barium	66.3	B/V1	66.7	B/J1	UG/L	0.4	66.5	0.60
10498	8/12/99	Barium	57.7	B/V	58.3	B/J1	UG/L	0.6	58	1.03
11891	5/20/99	Barium	239	/V1	238	/V1	UG/L	1	238.5	0.42
11891	10/18/99	Barium	235.00	/V	240.00	/V	UG/L	5.00	237.50	2.11
3586	1/15/99	Barium	132	/V1	97.7	B/V1	UG/L	34.30	114.85	29.87
3586	4/28/99	Barium	85.9	B/V1	87.2	B/V1	UG/L	1.3	86.55	1.50
3586	8/9/99	Barium	91.3	B/V	92.4	B/J1	UG/L	1.1	91.85	1.20
3586	10/19/99	Barium	81.30	B/V	86.00	B/J1	UG/L	4.70	83.65	5.62
41591	3/3/99	Barium	156	/V1	154	/V1	UG/L	2.00	155	1.29
41591	8/12/99	Barium	214	/V	215	/V	UG/L	1	214.5	0.47
5887	5/24/99	Barium	38.3	B/V1	38.2	B/V1	UG/L	0.1	38.25	0.26
5887	8/16/99	Barium	52.1	B/V1	52.6	B/V1	UG/L	0.5	52.35	0.96
5887	10/28/99	Barium	67.50	B/V1	68.20	B/V1	UG/L	0.70	67.85	1.03
70193	5/6/99	Barium	76.5	B/V	75	B/V	UG/L	1.5	75.75	1.98
70193	8/19/99	Barium	84.8	B/V1	83.4	B/V1	UG/L	1.4	84.1	1.66
70193	10/18/99	Barium	81.10	B/V	82.00	B/J1	UG/L	0.90	81.55	1.10
70393	5/18/99	Barium	53.9	B/V1	53.2	B/V1	UG/L	0.7	53.55	1.31

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Note: RPD values greater than the 30% QC criterion are indicated in bold font.

Appendix E: Table 11-1b
Relative Percent Differences (RPDs)
Groundwater 1999

Location	Sample Date	Analyte	Real Result	Real Lab Q/ Valid	Dup Result	Dup Lab Q/ Valid	Units	Absolute Value (Real-Dup)	Average (Real+Dup)/2	RPD AbsVal/Avex100
70393	8/16/99	Barium	60.3	B/V1	60.3	B/V1	UG/L	0	60.3	0.00
70393	11/4/99	Barium	64.40	B/V1	68.00	B/V1	UG/L	3.60	66.20	5.44
0386	7/26/99	Beryllium	0.04	B/UJ1	0.04	B/UJ1	UG/L	0	0.04	0.00
10294	7/22/99	Beryllium	0.08	B/UJ1	0.08	B/UJ1	UG/L	0	0.08	0.00
11891	5/20/99	Beryllium	0.08	B/UJ1	0.08	B/UJ1	UG/L	0	0.08	0.00
3586	4/28/99	Beryllium	0.02	U/V1	0.1	B/UJ1	UG/L	0.08	0.06	**133.33**
3586	8/9/99	Beryllium	0.04	B/V	0.06	B/J1	UG/L	0.02	0.05	**40.00**
5887	5/24/99	Beryllium	0.03	B/UJ1	0.02	U/V1	UG/L	0.01	0.025	**40.00**
5887	10/28/99	Beryllium	0.02	U/J1	0.02	B/J1	UG/L	0.00	0.02	0.00
70393	11/4/99	Beryllium	0.04	B/J1	0.04	B/J1	UG/L	0.00	0.04	0.00
05091	8/24/99	Cadmium	0.16	B/V1	0.27	B/V1	UG/L	0.11	0.215	**51.16**
10294	7/22/99	Cadmium	0.19	B/UJ1	0.16	B/UJ1	UG/L	0.03	0.175	17.14
10498	8/12/99	Cadmium	0.62	B/V	0.6	B/J1	UG/L	0.02	0.61	3.28
11891	5/20/99	Cadmium	0.18	B/V1	0.16	B/V1	UG/L	0.02	0.17	11.76
3586	8/9/99	Cadmium	0.16	B/UJ	0.09	B/UJ	UG/L	0.07	0.125	**56.00**
3586	10/19/99	Cadmium	0.18	B/J	0.20	B/J	UG/L	0.02	0.19	10.53
41591	8/12/99	Cadmium	0.12	B/UJ	0.12	B/UJ	UG/L	0	0.12	0.00
5887	5/24/99	Cadmium	0.09	B/V1	0.1	B/V1	UG/L	0.01	0.095	10.53
70193	5/6/99	Cadmium	0.13	B/UJ	0.18	B/UJ	UG/L	0.05	0.155	**32.26**
70193	8/19/99	Cadmium	0.24	B/V1	0.27	B/V1	UG/L	0.03	0.255	11.76
70393	5/18/99	Cadmium	0.31	B/V1	0.08	U/V1	UG/L	0.23	0.195	**117.95**
0386	2/24/99	Calcium	73800	/V	66000	/V	UG/L	7800.00	69900	11.16
0386	7/26/99	Calcium	80600	/V1	80600	/V1	UG/L	0	80600	0.00
05091	2/15/99	Calcium	92900	N/V1	95600	N/V1	UG/L	2700.00	94250	2.86
05091	8/24/99	Calcium	89000	/V1	89800	/V1	UG/L	800	89400	0.89
10294	2/10/99	Calcium	122000	/V	113000	/V	UG/L	9000.00	117500	7.66
10294	7/22/99	Calcium	124000	/V1	136000	/V1	UG/L	12000	130000	9.23
10498	8/12/99	Calcium	26700	/V	27200	/V	UG/L	500	26950	1.86
11891	5/20/99	Calcium	120000	/V1	120000	/V1	UG/L	0	120000	0.00
11891	10/18/99	Calcium	122000	/V	125000	/V	UG/L	3000	123500	2.43
3586	1/15/99	Calcium	163000	/J1	160000	/J1	UG/L	3000.00	161500	1.86
3586	4/28/99	Calcium	113000	/V1	114000	/V1	UG/L	1000	113500	0.88
3586	8/9/99	Calcium	140000	/V	134000	/V	UG/L	6000	137000	4.38
3586	10/19/99	Calcium	124000	/V	144000	/V	UG/L	20000	134000	14.93
41591	3/3/99	Calcium	50500	/V1	49700	/V1	UG/L	800.00	50100	1.60
41591	8/12/99	Calcium	59500	/V	60100	/V	UG/L	600	59800	1.00
5887	5/24/99	Calcium	15800	/V1	15700	/V1	UG/L	100	15750	0.63
5887	8/16/99	Calcium	20000	/V1	20200	/V1	UG/L	200	20100	1.00
5887	10/28/99	Calcium	21100	/V1	21300	/V1	UG/L	200	21200	0.94
70193	1/29/99	Calcium	19300	N/J1	19400	E/J1	UG/L	100.00	19350	0.52
70193	5/6/99	Calcium	20600	/V	20300	/V	UG/L	300	20450	1.47
70193	8/19/99	Calcium	22900	/V1	22500	/V1	UG/L	400	22700	1.76
70193	10/18/99	Calcium	22600	/V	22800	/V	UG/L	200	22700	0.88
70393	5/18/99	Calcium	19100	/V1	19700	/V1	UG/L	600	19400	3.09
70393	8/16/99	Calcium	19800	/V1	20100	/V1	UG/L	300	19950	1.50
70393	11/4/99	Calcium	19700	/V1	20000	/V1	UG/L	300	19850	1.51
0386	7/26/99	Chromium	3.3	/V1	3.2	/V1	UG/L	0.1	3.25	3.08
03991	1/20/99	Chromium	8.5	/V	2.3	/V	UG/L	6.20	5.4	**114.81**
05091	2/15/99	Chromium	2	/UJ1	2.4	/UJ1	UG/L	0.40	2.2	18.18
05091	8/24/99	Chromium	1.1	B/V1	1.2	B/V1	UG/L	0.1	1.15	8.70

Note: RPD values greater than the 30% QC criterion are indicated in bold font.

Appendix E: Table 11-1b
Relative Percent Differences (RPDs)
Groundwater 1999

Location	Sample Date	Analyte	Real Result	Real Lab Q/ Valid	Dup Result	Dup Lab Q/ Valid	Units	Absolute Value (Real-Dup)	Average (Real+Dup)/2	RPD AbsVal/Avex100
10294	2/10/99	Chromium	3.1	/UJ	3.9	/UJ	UG/L	0.80	3.5	22.86
10294	7/22/99	Chromium	0.2	U/V1	0.31	B/V1	UG/L	0.11	0.255	**43.14**
10498	2/17/99	Chromium	4.3	/V1	3.8	/V1	UG/L	0.50	4.05	12.35
10498	8/12/99	Chromium	1	B/V	0.94	B/J1	UG/L	0.06	0.97	6.19
11891	5/20/99	Chromium	0.2	B/V1	0.22	B/V1	UG/L	0.02	0.21	9.52
11891	10/18/99	Chromium	0.26	B/V	0.18	U/V	UG/L	0.08	0.22	**36.36**
3586	4/28/99	Chromium	0.25	B/UJ1	0.25	B/UJ1	UG/L	0	0.25	0.00
41591	8/12/99	Chromium	33.2	/V	43.3	/V	UG/L	10.1	38.25	26.41
5887	2/16/99	Chromium	7.9	/V1	6.8	/V1	UG/L	1.10	7.35	14.97
5887	5/24/99	Chromium	0.94	B/UJ1	0.93	B/UJ1	UG/L	0.01	0.935	1.07
5887	8/16/99	Chromium	3.6	/V1	2.1	/V1	UG/L	1.5	2.85	**52.63**
5887	10/28/99	Chromium	4.20	/V1	4.50	/V1	UG/L	0.30	4.35	6.90
70193	1/29/99	Chromium	2.2	/UJ1	3	/UJ1	UG/L	0.80	2.6	**30.77**
70193	5/6/99	Chromium	0.32	B/UJ	0.59	B/UJ	UG/L	0.27	0.455	**59.34**
70193	8/19/99	Chromium	0.42	B/UJ1	0.5	B/UJ1	UG/L	0.08	0.46	17.39
70193	10/18/99	Chromium	0.25	B/V	0.25	B/J1	UG/L	0.00	0.25	0.00
70393	5/18/99	Chromium	0.28	B/UJ1	0.38	B/UJ1	UG/L	0.1	0.33	**30.30**
70393	8/16/99	Chromium	0.34	B/UJ1	0.55	B/UJ1	UG/L	0.21	0.445	**47.19**
70393	11/4/99	Chromium	1.60	B/V1	0.41	B/V1	UG/L	1.19	1.01	**118.41**
0386	7/26/99	Cobalt	0.14	B/V1	0.12	U/V1	UG/L	0.02	0.13	15.38
05091	8/24/99	Cobalt	0.28	B/V1	0.31	B/V1	UG/L	0.03	0.295	10.17
10294	7/22/99	Cobalt	2.5	B/V1	2.6	B/J1	UG/L	0.1	2.55	3.92
10498	8/12/99	Cobalt	0.25	B/V	0.26	B/J1	UG/L	0.01	0.255	3.92
3586	4/28/99	Cobalt	2.8	B/V1	2.7	B/V1	UG/L	0.1	2.75	3.64
3586	8/9/99	Cobalt	9.7	B/J	9.9	B/J	UG/L	0.2	9.8	2.04
3586	10/19/99	Cobalt	10.40	B/V	11.00	B/J1	UG/L	0.60	10.70	5.61
41591	8/12/99	Cobalt	0.92	B/V	1.1	B/J1	UG/L	0.18	1.01	17.82
5887	5/24/99	Cobalt	0.23	B/UJ1	0.3	B/UJ1	UG/L	0.07	0.265	26.42
5887	8/16/99	Cobalt	0.2	B/V1	0.12	U/V1	UG/L	0.08	0.16	**50.00**
0386	7/26/99	Copper	1	B/J1	0.66	B/J1	UG/L	0.34	0.83	**40.96**
05091	8/24/99	Copper	0.59	B/V1	0.69	B/V1	UG/L	0.1	0.64	15.63
10294	7/22/99	Copper	3.2	/V1	2.6	B/V1	UG/L	0.6	2.9	20.69
10498	8/12/99	Copper	2.9	B/V	2.8	B/J1	UG/L	0.1	2.85	3.51
11891	5/20/99	Copper	0.36	B/J1	0.35	B/J1	UG/L	0.01	0.355	2.82
11891	10/18/99	Copper	0.65	B/J	3.00	B/J	UG/L	2.35	1.83	**128.77**
3586	4/28/99	Copper	3.5	/V1	3.7	/V1	UG/L	0.2	3.6	5.56
3586	8/9/99	Copper	0.96	B/J	1.1	B/V	UG/L	0.14	1.03	13.59
3586	10/19/99	Copper	0.80	B/J	0.88	B/J	UG/L	0.08	0.84	9.52
41591	3/3/99	Copper	5.8	/UJ1	2.7	B/UJ1	UG/L	3.10	4.25	**72.94**
41591	8/12/99	Copper	2.7	B/V	2.8	B/J1	UG/L	0.1	2.75	3.64
5887	2/16/99	Copper	4.6	/V1	4.4	/V1	UG/L	0.20	4.5	4.44
5887	5/24/99	Copper	3.7	/V1	3.5	/V1	UG/L	0.2	3.6	5.56
5887	8/16/99	Copper	3.2	/V1	3.3	/V1	UG/L	0.1	3.25	3.08
5887	10/28/99	Copper	2.00	B/V1	2.00	B/V1	UG/L	0.00	2.00	0.00
70193	5/6/99	Copper	1.1	B/UJ	1.1	B/UJ	UG/L	0	1.1	0.00
70193	8/19/99	Copper	1.2	B/UJ1	1	B/UJ1	UG/L	0.2	1.1	18.18
70193	10/18/99	Copper	0.39	B/UJ	0.44	B/UJ	UG/L	0.05	0.42	12.05
70393	5/18/99	Copper	0.52	B/J1	0.25	U/J1	UG/L	0.27	0.385	**70.13**
70393	8/16/99	Copper	0.7	B/UJ1	1.1	B/UJ1	UG/L	0.4	0.9	**44.44**
70393	11/4/99	Copper	0.52	B/V1	0.33	B/V1	UG/L	0.19	0.43	**44.71**

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Note: RPD values greater than the 30% QC criterion are indicated in bold font.

Appendix E: Table 11-1b
Relative Percent Differences (RPDs)
Groundwater 1999

Location	Sample Date	Analyte	Real Result	Real Lab Q/ Valid	Dup Result	Dup Lab Q/ Valid	Units	Absolute Value (Real-Dup)	Average (Real+Dup)/2	RPD AbsVal/Avex100
0386	7/26/99	Iron	27	B/V1	19.5	B/V1	UG/L	7.5	23.25	**32.26**
05091	2/15/99	Iron	230	/V1	325	/V1	UG/L	95.00	277.5	**34.23**
05091	8/24/99	Iron	8.4	B/V1	7.5	B/V1	UG/L	0.9	7.95	11.32
10294	2/10/99	Iron	245	E/J	232	N/J	UG/L	13.00	238.5	5.45
10294	7/22/99	Iron	306	/V1	304	/V1	UG/L	2	305	0.66
10498	8/12/99	Iron	121	/J	71.3	B/J	UG/L	49.7	96.15	**51.69**
11891	5/20/99	Iron	11.2	B/UJ1	12.9	B/UJ1	UG/L	1.7	12.05	14.11
11891	10/18/99	Iron	69.80	B/V	43.70	B/J1	UG/L	26.10	56.75	**45.99**
3586	1/15/99	Iron	3400	/V1	3010	/V1	UG/L	390.00	3205	12.17
3586	4/28/99	Iron	12.6	B/UJ1	15.8	B/UJ1	UG/L	3.2	14.2	22.54
3586	8/9/99	Iron	452	/V	417	/V	UG/L	35	434.5	8.06
3586	10/19/99	Iron	1010	/V	1070	/V	UG/L	60	1040	5.77
41591	8/12/99	Iron	392	/J	472	/J	UG/L	80	432	18.52
5887	5/24/99	Iron	16.3	B/UJ1	23.3	B/UJ1	UG/L	7	19.8	**35.35**
5887	8/16/99	Iron	61.1	B/V1	44	B/V1	UG/L	17.1	52.55	**32.54**
5887	10/28/99	Iron	7.70	B/J1	5.00	B/J1	UG/L	2.70	6.35	**42.52**
70193	5/6/99	Iron	7.9	B/V	7.4	B/V	UG/L	0.5	7.65	6.54
70193	8/19/99	Iron	22.1	B/UJ1	18.1	B/UJ1	UG/L	4	20.1	19.90
70193	10/18/99	Iron	8.50	B/V	8.20	B/J1	UG/L	0.30	8.35	3.59
70393	5/18/99	Iron	13.7	B/V1	11	B/V1	UG/L	2.7	12.35	21.86
70393	8/16/99	Iron	15.5	B/UJ1	16.4	B/UJ1	UG/L	0.9	15.95	5.64
70393	11/4/99	Iron	14.20	B/J1	16.50	B/J1	UG/L	2.30	15.35	14.98
05091	8/24/99	Lead	0.52	U/V1	1.6	B/UJ1	UG/L	1.08	1.06	**101.89**
10498	8/12/99	Lead	0.96	B/UJ	0.75	B/UJ	UG/L	0.21	0.855	24.56
41591	8/12/99	Lead	1.3	B/UJ	2.2	/UJ	UG/L	0.9	1.75	**51.43**
5887	5/24/99	Lead	2.4	/J1	0.72	U/V1	UG/L	1.68	1.56	**107.69**
5887	8/16/99	Lead	0.52	U/J1	0.56	B/UJ1	UG/L	0.04	0.54	7.41
0386	7/26/99	Lithium	100	/V1	99.5	B/V1	UG/L	0.5	99.75	0.50
05091	8/24/99	Lithium	9.9	B/J1	10	B/J1	UG/L	0.1	9.95	1.01
10294	7/22/99	Lithium	98.8	B/V1	99.7	B/J1	UG/L	0.9	99.25	0.91
10498	8/12/99	Lithium	0.93	B/V	0.94	B/J1	UG/L	0.01	0.935	1.07
11891	5/20/99	Lithium	8.1	B/V1	8.1	B/V1	UG/L	0	8.1	0.00
11891	10/18/99	Lithium	8.30	B/J	8.50	B/J	UG/L	0.20	8.40	2.38
3586	4/28/99	Lithium	24.8	B/J1	25.3	B/J1	UG/L	0.5	25.05	2.00
3586	8/9/99	Lithium	25.6	B/J	25.8	B/J	UG/L	0.2	25.7	0.78
3586	10/19/99	Lithium	23.40	B/J	24.90	B/J	UG/L	1.50	24.15	6.21
41591	3/3/99	Lithium	142	/V1	139	/V1	UG/L	3.00	140.5	2.14
41591	8/12/99	Lithium	166	/V	168	/V	UG/L	2	167	1.20
5887	5/24/99	Lithium	1.6	B/V1	1.6	B/V1	UG/L	0	1.6	0.00
5887	8/16/99	Lithium	2.1	B/J1	2.1	B/J1	UG/L	0	2.1	0.00
5887	10/28/99	Lithium	4.00	B/J1	4.00	B/J1	UG/L	0.00	4.00	0.00
70193	5/6/99	Lithium	7.7	B/V	7.7	B/V	UG/L	0	7.7	0.00
70193	8/19/99	Lithium	8.3	B/J1	8.2	B/J1	UG/L	0.1	8.25	1.21
70193	10/18/99	Lithium	8.10	B/J	8.20	B/J	UG/L	0.10	8.15	1.23
70393	5/18/99	Lithium	5.4	B/V1	5.4	B/V1	UG/L	0	5.4	0.00
70393	8/16/99	Lithium	6.7	B/J1	6.7	B/J1	UG/L	0	6.7	0.00
70393	11/4/99	Lithium	7.30	B/J1	7.00	B/J1	UG/L	0.30	7.15	4.20
0386	2/24/99	Magnesium	30200	/V	16200	/V	UG/L	14000.00	23200	**60.34**
0386	7/26/99	Magnesium	32500	/V1	32500	/V1	UG/L	0	32500	0.00
05091	2/15/99	Magnesium	14000	/V1	14700	/V1	UG/L	700.00	14350	4.88

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Note: RPD values greater than the 30% QC criterion are indicated in bold font.

Appendix E: Table 11-1b
Relative Percent Differences (RPDs)
Groundwater 1999

Location	Sample Date	Analyte	Real Result	Real Lab Q/ Valid	Dup Result	Dup Lab Q/ Valid	Units	Absolute Value (Real-Dup)	Average (Real+Dup)/2	RPD AbsVal/Avex100
05091	8/24/99	Magnesium	14600	/V1	14800	/V1	UG/L	200	14700	1.36
10294	2/10/99	Magnesium	50800	E/J	48800	N/J	UG/L	2000.00	49800	4.02
10294	7/22/99	Magnesium	77900	/V1	78500	/V1	UG/L	600	78200	0.77
10498	8/12/99	Magnesium	4110	B/V	4190	B/J1	UG/L	80	4150	1.93
11891	5/20/99	Magnesium	11700	/V1	11700	/V1	UG/L	0	11700	0.00
11891	10/18/99	Magnesium	11900	/V	12100	/V	UG/L	200	12000	1.67
3586	1/15/99	Magnesium	44800	/J1	43800	/J1	UG/L	1000.00	44300	2.26
3586	4/28/99	Magnesium	28300	/V1	28700	/V1	UG/L	400	28500	1.40
3586	8/9/99	Magnesium	37200	/V	37300	/V	UG/L	100	37250	0.27
3586	10/19/99	Magnesium	33400	/V	35100	/V	UG/L	1700	34250	4.96
41591	3/3/99	Magnesium	106000	/V1	105000	/V1	UG/L	1000.00	105500	0.95
41591	8/12/99	Magnesium	123000	/V	124000	/V	UG/L	1000	123500	0.81
5887	5/24/99	Magnesium	3720	B/V1	3710	B/V1	UG/L	10	3715	0.27
5887	8/16/99	Magnesium	4760	B/V1	4850	B/V1	UG/L	90	4805	1.87
5887	10/28/99	Magnesium	4550	B/V1	4620	B/V1	UG/L	70	4585	1.53
70193	5/6/99	Magnesium	4170	B/V	4030	B/V	UG/L	140	4100	3.41
70193	8/19/99	Magnesium	4930	B/V1	4840	B/V1	UG/L	90	4885	1.84
70193	10/18/99	Magnesium	4780	B/V	4810	B/J1	UG/L	30	4795	0.63
70393	5/18/99	Magnesium	3790	B/V1	3800	B/V1	UG/L	10	3795	0.26
70393	8/16/99	Magnesium	4100	B/V1	4130	B/V1	UG/L	30	4115	0.73
70393	11/4/99	Magnesium	4020	B/V1	4060	B/V1	UG/L	40	4040	0.99
0386	7/26/99	Manganese	0.92	B/V1	0.92	B/V1	UG/L	0	0.92	0.00
05091	8/24/99	Manganese	0.27	B/UJ1	0.15	B/UJ1	UG/L	0.12	0.21	**57.14**
10294	2/10/99	Manganese	515	/V	496	/V	UG/L	19.00	505.5	3.76
10294	7/22/99	Manganese	740	/V1	742	/V1	UG/L	2	741	0.27
10498	8/12/99	Manganese	11.3	B/V	12.4	B/J1	UG/L	1.1	11.85	9.28
11891	5/20/99	Manganese	0.05	U/V1	0.09	B/UJ1	UG/L	0.04	0.07	**57.14**
11891	10/18/99	Manganese	1.90	B/V	1.90	B/J1	UG/L	0.00	1.90	0.00
3586	1/15/99	Manganese	4880	N/J1	4710	N/J1	UG/L	170.00	4795	3.55
3586	4/28/99	Manganese	1250	/V1	1270	/V1	UG/L	20	1260	1.59
3586	8/9/99	Manganese	3890	/V	3920	/V	UG/L	30	3905	0.77
3586	10/19/99	Manganese	3740	/V	3910	/V	UG/L	170	3825	4.44
41591	8/12/99	Manganese	7.1	B/V	9.2	B/J1	UG/L	2.1	8.15	25.77
5887	5/24/99	Manganese	1.3	B/V1	1.3	B/V1	UG/L	0	1.3	0.00
5887	8/16/99	Manganese	3.6	B/V1	3.3	B/V1	UG/L	0.3	3.45	8.70
5887	10/28/99	Manganese	1.10	B/V1	1.10	B/V1	UG/L	0.00	1.10	0.00
70193	5/6/99	Manganese	0.72	B/UJ	0.46	B/UJ	UG/L	0.26	0.59	**44.07**
70193	8/19/99	Manganese	0.71	B/V1	0.89	B/V1	UG/L	0.18	0.8	22.50
70193	10/18/99	Manganese	0.34	B/V	0.76	B/J1	UG/L	0.42	0.55	**76.36**
70393	5/18/99	Manganese	1.3	B/V1	1.3	B/V1	UG/L	0	1.3	0.00
70393	8/16/99	Manganese	1.7	B/V1	1.7	B/V1	UG/L	0	1.7	0.00
70393	11/4/99	Manganese	1.50	B/V1	1.80	B/V1	UG/L	0.30	1.65	18.18
0386	7/26/99	Molybdenum	3.7	B/V1	3.4	B/V1	UG/L	0.3	3.55	8.45
05091	8/24/99	Molybdenum	7.1	B/V1	7.3	B/V1	UG/L	0.2	7.2	2.78
10294	7/22/99	Molybdenum	4.6	B/V1	4.7	B/V1	UG/L	0.1	4.65	2.15
10498	8/12/99	Molybdenum	12.3	B/V	12.8	B/J1	UG/L	0.5	12.55	3.98
11891	5/20/99	Molybdenum	0.49	B/V1	0.65	B/V1	UG/L	0.16	0.57	28.07
11891	10/18/99	Molybdenum	0.32	B/V	0.28	U/V	UG/L	0.04	0.30	13.33
3586	4/28/99	Molybdenum	1.5	B/V1	1.6	B/V1	UG/L	0.1	1.55	6.45
3586	8/9/99	Molybdenum	0.78	B/J	0.62	B/J	UG/L	0.16	0.7	22.86

Note: RPD values greater than the 30% QC criterion are indicated in bold font.

Appendix E: Table 11-1b
Relative Percent Differences (RPDs)
Groundwater 1999

Location	Sample Date	Analyte	Real Result	Real Lab Q/ Valid	Dup Result	Dup Lab Q/ Valid	Units	Absolute Value (Real-Dup)	Average (Real+Dup)/2	RPD AbsVal/Avex100
3586	10/19/99	Molybdenum	0.56	B/V	0.62	B/J1	UG/L	0.06	0.59	10.17
41591	8/12/99	Molybdenum	3.2	B/V	3.5	B/J1	UG/L	0.3	3.35	8.96
5887	8/16/99	Molybdenum	0.77	B/V1	0.6	B/V1	UG/L	0.17	0.685	24.82
5887	10/28/99	Molybdenum	0.70	B/V1	0.51	B/V1	UG/L	0.19	0.61	**31.40**
70193	5/6/99	Molybdenum	0.3	U/V	0.4	B/V	UG/L	0.1	0.35	28.57
70193	8/19/99	Molybdenum	1	B/V1	1	B/V1	UG/L	0	1	0.00
70193	10/18/99	Molybdenum	0.91	B/V	1.00	B/J1	UG/L	0.09	0.96	9.42
70393	5/18/99	Molybdenum	0.3	U/V1	0.41	B/UJ1	UG/L	0.11	0.355	**30.99**
70393	11/4/99	Molybdenum	0.30	B/V1	0.34	B/V1	UG/L	0.04	0.32	12.50
0386	7/26/99	Nickel	9.3	B/V1	9.4	B/V1	UG/L	0.1	9.35	1.07
05091	8/24/99	Nickel	3.9	B/V1	4.2	B/V1	UG/L	0.3	4.05	7.41
10294	7/22/99	Nickel	9.6	B/V1	9.8	B/V1	UG/L	0.2	9.7	2.06
10498	8/12/99	Nickel	1.8	B/V	1.7	B/J1	UG/L	0.1	1.75	5.71
11891	5/20/99	Nickel	0.75	B/V1	0.51	B/V1	UG/L	0.24	0.63	**38.10**
11891	10/18/99	Nickel	0.72	B/UJ	0.80	B/UJ	UG/L	0.08	0.76	10.53
3586	4/28/99	Nickel	7.4	B/V1	7.5	B/V1	UG/L	0.1	7.45	1.34
3586	8/9/99	Nickel	13.5	B/V	13.8	B/J1	UG/L	0.3	13.65	2.20
3586	10/19/99	Nickel	13.30	B/V	13.90	B/J1	UG/L	0.60	13.60	4.41
41591	3/3/99	Nickel	174	/V1	165	/V1	UG/L	9.00	169.5	5.31
41591	8/12/99	Nickel	108	/V	117	/V	UG/L	9	112.5	8.00
5887	5/24/99	Nickel	1.7	B/J1	2	B/J2	UG/L	0.3	1.85	16.22
5887	8/16/99	Nickel	3.3	B/V1	2.8	B/V1	UG/L	0.5	3.05	16.39
5887	10/28/99	Nickel	2.90	B/J1	2.80	B/J1	UG/L	0.10	2.85	3.51
70193	5/6/99	Nickel	0.56	B/UJ	0.66	B/UJ	UG/L	0.1	0.61	16.39
70193	8/19/99	Nickel	1.1	B/UJ1	0.93	B/UJ1	UG/L	0.17	1.015	16.75
70193	10/18/99	Nickel	0.78	B/UJ	0.90	B/UJ	UG/L	0.12	0.84	14.29
70393	5/18/99	Nickel	1.6	B/V1	1.7	B/V1	UG/L	0.1	1.65	6.06
70393	8/16/99	Nickel	1.8	B/V1	3.6	B/V1	UG/L	1.8	2.7	**66.67**
70393	11/4/99	Nickel	1.70	B/J1	1.40	B/J1	UG/L	0.30	1.55	19.35
0386	7/26/99	Potassium	3340	B/J1	3510	B/J1	UG/L	170	3425	4.96
05091	8/24/99	Potassium	1950	B/J1	1980	B/J1	UG/L	30	1965	1.53
10294	7/22/99	Potassium	5670	/J1	5710	/J1	UG/L	40	5690	0.70
10498	8/12/99	Potassium	5280	/J	5240	/J	UG/L	40	5260	0.76
11891	5/20/99	Potassium	1290	B/J1	1270	B/J3	UG/L	20	1280	1.56
11891	10/18/99	Potassium	1480	B/V	1450	B/J1	UG/L	30	1465	2.05
3586	4/28/99	Potassium	8570	/J1	8540	/J1	UG/L	30	8555	0.35
3586	8/9/99	Potassium	2270	B/V	2450	B/J1	UG/L	180	2360	7.63
3586	10/19/99	Potassium	1720	B/V	1840	B/J1	UG/L	120	1780	6.74
41591	3/3/99	Potassium	678	/J1	634	B/J1	UG/L	44.00	656	6.71
41591	8/12/99	Potassium	652	B/J	644	B/J	UG/L	8	648	1.23
5887	5/24/99	Potassium	659	B/V1	659	B/V1	UG/L	0	659	0.00
5887	8/16/99	Potassium	890	B/J1	895	B/J1	UG/L	5	892.5	0.56
5887	10/28/99	Potassium	1060	B/J1	1070	B/J1	UG/L	10	1065	0.94
70193	5/6/99	Potassium	825	B/J	747	B/J	UG/L	78	786	9.92
70193	8/19/99	Potassium	1230	B/J1	1210	B/J1	UG/L	20	1220	1.64
70193	10/18/99	Potassium	1230	B/V	1240	B/J1	UG/L	10	1235	0.81
70393	5/18/99	Potassium	443	B/V1	418	B/V1	UG/L	25	430.5	5.81
70393	8/16/99	Potassium	527	B/J1	520	B/J1	UG/L	7	523.5	1.34
70393	11/4/99	Potassium	613.00	B/J1	622.00	B/J1	UG/L	9.00	617.50	1.46
0386	7/26/99	Selenium	41.7	/V1	43	/V1	UG/L	1.3	42.35	3.07

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Note: RPD values greater than the 30% QC criterion are indicated in bold font.

Appendix E: Table 11-1b
Relative Percent Differences (RPDs)
Groundwater 1999

Location	Sample Date	Analyte	Real Result	Real Lab Q/ Valid	Dup Result	Dup Lab Q/ Valid	Units	Absolute Value (Real-Dup)	Average (Real+Dup)/2	RPD AbsVal/Avex100
05091	8/24/99	Selenium	0.92	U/V1	1.1	B/V1	UG/L	0.18	1.01	17.82
10498	2/17/99	Selenium	5.7	/V1	6.2	/V1	UG/L	0.50	5.95	8.40
10498	8/12/99	Selenium	2.5	B/V	1.7	B/J1	UG/L	0.8	2.1	**38.10**
11891	5/20/99	Selenium	1.4	B/V1	1.2	U/V1	UG/L	0.2	1.3	15.38
11891	10/18/99	Selenium	1.40	B/V	1.10	B/J1	UG/L	0.30	1.25	24.00
3586	4/28/99	Selenium	6	/V1	5.8	/V1	UG/L	0.2	5.9	3.39
41591	3/3/99	Selenium	9.9	/V1	9.3	/V1	UG/L	0.60	9.6	6.25
41591	8/12/99	Selenium	5.7	/V	6.1	/V	UG/L	0.4	5.9	6.78
5887	5/24/99	Selenium	1.3	B/V1	1.2	U/V1	UG/L	0.1	1.25	8.00
70193	1/29/99	Selenium	5.5	/J1	5.9	/J1	UG/L	0.40	5.7	7.02
70193	5/6/99	Selenium	1.2	B/J	1.3	B/J	UG/L	0.1	1.25	8.00
70193	8/19/99	Selenium	5.5	/J1	5.2	/J1	UG/L	0.3	5.35	5.61
70193	10/18/99	Selenium	5.00	/V	5.50	/V	UG/L	0.50	5.25	9.52
3586	10/19/99	Silver	0.20	U/V	0.22	B/J1	UG/L	0.02	0.21	9.52
0386	2/24/99	Sodium	52100	/V	58500	/V	UG/L	6400.00	55300	11.57
0386	7/26/99	Sodium	61500	/V1	59200	/V1	UG/L	2300	60350	3.81
05091	2/15/99	Sodium	28700	/V1	95650	/V1	UG/L	66950.00	62175	**107.68**
05091	8/24/99	Sodium	29300	/V1	29900	/V1	UG/L	600	29600	2.03
10294	2/10/99	Sodium	242000	/V	227000	/V	UG/L	15000.00	234500	6.40
10294	7/22/99	Sodium	308000	/V1	309000	/V1	UG/L	1000	308500	0.32
10498	2/17/99	Sodium	98050	/V1	95650	/V1	UG/L	2400.00	96850	2.48
10498	8/12/99	Sodium	79500	/V	80900	/V	UG/L	1400	80200	1.75
11891	5/20/99	Sodium	23300	/V1	23200	/V1	UG/L	100	23250	0.43
11891	10/18/99	Sodium	18200	/V	18500	/V	UG/L	300	18350	1.63
3586	1/15/99	Sodium	196000	/J1	193000	/J1	UG/L	3000.00	194500	1.54
3586	4/28/99	Sodium	116000	/V1	117000	/V1	UG/L	1000	116500	0.86
3586	8/9/99	Sodium	154000	/V	147000	/V	UG/L	7000	150500	4.65
3586	10/19/99	Sodium	156000	/V	167000	/V	UG/L	11000	161500	6.81
41591	3/3/99	Sodium	128000	/V1	127000	/V1	UG/L	1000.00	127500	0.78
41591	8/12/99	Sodium	157000	/V	159000	/V	UG/L	2000	158000	1.27
5887	2/16/99	Sodium	9580	/V1	9670	/V1	UG/L	90.00	9625	0.94
5887	5/24/99	Sodium	4570	B/V1	4560	/V1	UG/L	10	4565	0.22
5887	8/16/99	Sodium	5120	/V1	5250	/V1	UG/L	130	5185	2.51
5887	10/28/99	Sodium	8400	/V1	8560	/V1	UG/L	160	8480	1.89
70193	1/29/99	Sodium	13700	E/J1	14600	E/J1	UG/L	900.00	14150	6.36
70193	5/6/99	Sodium	10100	/V	9800	/V	UG/L	300	9950	3.02
70193	8/19/99	Sodium	11800	/V1	11700	/V1	UG/L	100	11750	0.85
70193	10/18/99	Sodium	12100	/V	12200	/V	UG/L	100	12150	0.82
70393	2/17/99	Sodium	11400	/V1	10600	/V1	UG/L	800.00	11000	7.27
70393	5/18/99	Sodium	12200	/V1	11800	/V1	UG/L	400	12000	3.33
70393	8/16/99	Sodium	11800	/V1	11600	/V1	UG/L	200	11700	1.71
70393	11/4/99	Sodium	11800	/V1	11900	/V1	UG/L	100	11850	0.84
0386	2/24/99	Strontium	1380	/V	445	/V	UG/L	935.00	912.5	**102.47**
0386	7/26/99	Strontium	1450	/V1	1450	/V1	UG/L	0	1450	0.00
05091	2/15/99	Strontium	562	/V1	565	/V1	UG/L	3.00	563.5	0.53
05091	8/24/99	Strontium	532	/V1	537	/V1	UG/L	5	534.5	0.94
10294	2/10/99	Strontium	1670	/V	1590	/V	UG/L	80.00	1630	4.91
10294	7/22/99	Strontium	2070	/V1	2080	/V1	UG/L	10	2075	0.48
10498	8/12/99	Strontium	134	B/V	137	B/J1	UG/L	3	135.5	2.21
11891	5/20/99	Strontium	442	B/V1	440	/V1	UG/L	2	441	0.45

Note: RPD values greater than the 30% QC criterion are indicated in bold font.

Appendix E: Table 11-1b
Relative Percent Differences (RPDs)
Groundwater 1999

Location	Sample Date	Analyte	Real Result	Real Lab Q/ Valid	Dup Result	Dup Lab Q/ Valid	Units	Absolute Value (Real-Dup)	Average (Real+Dup)/2	RPD AbsVal/Avex100
11891	10/18/99	Strontium	436.00	/V	445.00	/V	UG/L	9.00	440.50	2.04
3586	1/15/99	Strontium	996	/V1	992	/V1	UG/L	4.00	994	0.40
3586	4/28/99	Strontium	823	/V1	837	/V1	UG/L	14	830	1.69
3586	8/9/99	Strontium	899	/V	911	/V	UG/L	12	905	1.33
3586	10/19/99	Strontium	817.00	/V	859.00	/V	UG/L	42.00	838.00	5.01
41591	3/3/99	Strontium	2470	/V1	2430	/V1	UG/L	40.00	2450	1.63
41591	8/12/99	Strontium	2920	/V	2940	/V	UG/L	20	2930	0.68
5887	5/24/99	Strontium	96.9	B/V1	96.4	B/V1	UG/L	0.5	96.65	0.52
5887	8/16/99	Strontium	123	B/V1	125	B/V1	UG/L	2	124	1.61
5887	10/28/99	Strontium	129.00	B/V1	131.00	B/V1	UG/L	2.00	130.00	1.54
70193	5/6/99	Strontium	123	B/V	120	B/V	UG/L	3	121.5	2.47
70193	8/19/99	Strontium	151	B/V1	149	B/V1	UG/L	2	150	1.33
70193	10/18/99	Strontium	149.00	B/V	151.00	B/J1	UG/L	2.00	150.00	1.33
70393	5/18/99	Strontium	107	B/V1	106	B/V1	UG/L	1	106.5	0.94
70393	8/16/99	Strontium	112	B/V1	113	B/V1	UG/L	1	112.5	0.89
70393	11/4/99	Strontium	114.00	B/V1	115.00	B/V1	UG/L	1.00	114.50	0.87
70193	5/6/99	Thallium	0.89	B/UJ	0.88	U/V	UG/L	0.01	0.885	1.13
70193	5/6/99	Tin	0.82	B/UJ	0.68	U/V	UG/L	0.14	0.75	18.67
05091	8/24/99	Vanadium	1.8	B/V1	1.8	B/V1	UG/L	0	1.8	0.00
10498	8/12/99	Vanadium	2.6	B/V	2.4	B/J1	UG/L	0.2	2.5	8.00
11891	5/20/99	Vanadium	0.49	B/V1	0.44	B/V1	UG/L	0.05	0.465	10.75
11891	10/18/99	Vanadium	0.45	B/V	0.49	B/J1	UG/L	0.04	0.47	8.51
3586	4/28/99	Vanadium	0.44	B/V1	0.53	B/V1	UG/L	0.09	0.485	18.56
3586	8/9/99	Vanadium	0.15	U/V	0.19	B/J1	UG/L	0.04	0.17	23.53
41591	8/12/99	Vanadium	2.7	B/V	2.9	B/J1	UG/L	0.2	2.8	7.14
5887	5/24/99	Vanadium	0.22	B/UJ1	0.31	B/UJ1	UG/L	0.09	0.265	**33.96**
5887	8/16/99	Vanadium	0.34	B/V1	0.3	B/V1	UG/L	0.04	0.32	12.50
5887	10/28/99	Vanadium	0.30	B/V1	0.22	B/V1	UG/L	0.08	0.26	**30.77**
70193	5/6/99	Vanadium	0.38	B/UJ	0.38	B/UJ	UG/L	0	0.38	0.00
70193	8/19/99	Vanadium	0.3	B/V1	0.28	B/V1	UG/L	0.02	0.29	6.90
70193	10/18/99	Vanadium	0.20	B/V	0.28	B/J1	UG/L	0.08	0.24	**33.33**
70393	8/16/99	Vanadium	0.52	B/V1	0.52	B/V1	UG/L	0	0.52	0.00
70393	11/4/99	Vanadium	0.46	B/V1	0.34	B/V1	UG/L	0.12	0.40	**30.00**
0386	7/26/99	Zinc	4.2	B/V1	5.4	B/V1	UG/L	1.2	4.8	25.00
05091	8/24/99	Zinc	2.2	B/UJ1	7.2	B/V1	UG/L	5	4.7	**106.38**
10294	7/22/99	Zinc	3.5	B/V1	7	B/V1	UG/L	3.5	5.25	**66.67**
10498	8/12/99	Zinc	8.9	B/J	8	B/J	UG/L	0.9	8.45	10.65
11891	5/20/99	Zinc	3.1	B/V1	4.8	B/V1	UG/L	1.7	3.95	**43.04**
11891	10/18/99	Zinc	2.90	B/V	3.00	B/J1	UG/L	0.10	2.95	3.39
3586	4/28/99	Zinc	4.4	B/V1	8.9	B/V1	UG/L	4.5	6.65	**67.67**
3586	8/9/99	Zinc	5.2	B/V	7.6	B/J1	UG/L	2.4	6.4	**37.50**
3586	10/19/99	Zinc	3.70	B/V	4.10	B/J1	UG/L	0.40	3.90	10.26
5887	5/24/99	Zinc	8.2	B/UJ1	7	B/UJ1	UG/L	1.2	7.6	15.79
5887	8/16/99	Zinc	5.5	B/UJ1	5.7	B/UJ1	UG/L	0.2	5.6	3.57
5887	10/28/99	Zinc	6.40	B/V1	6.60	B/V1	UG/L	0.20	6.50	3.08
70193	5/6/99	Zinc	5.4	B/V	12.1	B/V	UG/L	6.7	8.75	**76.57**
70193	8/19/99	Zinc	7.1	B/UJ1	7.1	B/UJ1	UG/L	0	7.1	0.00
70193	10/18/99	Zinc	3.70	B/V	4.30	B/J1	UG/L	0.60	4.00	15.00
70393	5/18/99	Zinc	3.5	B/V1	5.1	B/V1	UG/L	1.6	4.3	**37.21**
70393	8/16/99	Zinc	3.2	B/UJ1	3.1	B/UJ1	UG/L	0.1	3.15	3.17

Note: RPD values greater than the 30% QC criterion are indicated in bold font.

Appendix E: Table 11-1b
Relative Percent Differences (RPDs)
Groundwater 1999

Location	Sample Date	Analyte	Real Result	Real Lab Q/ Valid	Dup Result	Dup Lab Q/ Valid	Units	Absolute Value (Real-Dup)	Average (Real+Dup)/2	RPD AbsVal/Avex100
70393	11/4/99	Zinc	2.70	B/V1	2.90	B/V1	UG/L	0.20	2.80	7.14
		Volatile Organic Compounds								
3586	1/15/99	1,1,1-Trichloroethane	1	/V1	0.98	J/V1	UG/L	0.02	0.99	2.02
3586	8/9/99	1,1,1-Trichloroethane	2	/V1	2	/V1	UG/L	0	2	0.00
3586	10/19/99	1,1,1-Trichloroethane	1.00	J/J1	1.00	J/J1	UG/L	0.00	1.00	0.00
70393	2/17/99	1,1,1-Trichloroethane	25.2	/V1	25.7	/V1	UG/L	0.50	25.45	1.96
70393	8/16/99	1,1,1-Trichloroethane	5	/V1	23	/V1	UG/L	18	14	**128.57**
70393	11/4/99	1,1,1-Trichloroethane	25.00	D/V1	26.00	D/J1	UG/L	1.00	25.50	3.92
3586	1/15/99	1,1-Dichloroethane	35.3	/V1	29.2	/V1	UG/L	6.10	32.25	18.91
3586	4/28/99	1,1-Dichloroethane	9	/V1	9	/V1	UG/L	0	9	0.00
3586	8/9/99	1,1-Dichloroethane	39	D/V1	39	D/V1	UG/L	0	39	0.00
3586	10/19/99	1,1-Dichloroethane	38.00	/V1	40.00	/V1	UG/L	2.00	39.00	5.13
40299	9/2/99	1,1-Dichloroethane	20	/V1	19	/V1	UG/L	1	19.5	5.13
40299	9/2/99	1,1-Dichloroethene	2	/V1	2	/V1	UG/L	0	2	0.00
70393	2/17/99	1,1-Dichloroethene	16.3	/V1	16.4	/V1	UG/L	0.10	16.35	0.61
70393	5/18/99	1,1-Dichloroethene	12	/V1	11	/V1	UG/L	1	11.5	8.70
70393	8/16/99	1,1-Dichloroethene	3	/V1	13	/V1	UG/L	10	8	**125.00**
70393	11/4/99	1,1-Dichloroethene	14.00	D/1	15.00	D/1	UG/L	1.00	14.50	6.90
3586	8/9/99	1,2-Dichloroethane	1	J/V1	1	J/V1	UG/L	0	1	0.00
3586	10/19/99	1,2-Dichloroethane	1.00	J/V1	1.00	J/V1	UG/L	0.00	1.00	0.00
03991	1/20/99	Carbon Tetrachloride	21.9	/V	21.4	/V	UG/L	0.50	21.65	2.31
05091	2/15/99	Carbon Tetrachloride	0.84	J/V1	0.88	J/V1	UG/L	0.04	0.86	4.65
05091	8/24/99	Carbon Tetrachloride	1	/V	1	/V	UG/L	0	1	0.00
11891	5/20/99	Carbon Tetrachloride	310	/V1	300	/V1	UG/L	10	305	3.28
11891	10/18/99	Carbon Tetrachloride	740.00	/V1	810.00	/V1	UG/L	70.00	775.00	9.03
18499	9/20/99	Carbon Tetrachloride	16000	/V1	17000	/V1	UG/L	1000	16500	6.06
90299	8/5/99	Carbon Tetrachloride	1	/V1	1	/V1	UG/L	0	1	0.00
03991	1/20/99	Chloroform	1.1	/V	1	/V	UG/L	0.10	1.05	9.52
11891	10/18/99	Chloroform	30.00	J/V1	32.00	J/V1	UG/L	2.00	31.00	6.45
18499	9/20/99	Chloroform	4900	/V1	5100	/V1	UG/L	200	5000	4.00
90299	8/5/99	Chloroform	2	/V1	2	/V1	UG/L	0	2	0.00
11891	10/18/99	cis-1,2-Dichloroethene	29.00	J/V1	31.00	J/V1	UG/L	2.00	30.00	6.67
3586	1/15/99	cis-1,2-Dichloroethene	11.6	/V1	12.3	/V1	UG/L	0.70	11.95	5.86
3586	8/9/99	cis-1,2-Dichloroethene	10	/V1	13	/V1	UG/L	3	11.5	26.09
3586	10/19/99	cis-1,2-Dichloroethene	7.00	/V1	7.00	/V1	UG/L	0.00	7.00	0.00
40299	9/2/99	cis-1,2-Dichloroethene	8	/V1	7	/V1	UG/L	1	7.5	13.33
18499	9/20/99	Hexachlorobutadiene	4	J/V1	3	J/V1	UG/L	1	3.5	28.57
11891	5/20/99	Methylene Chloride	71	B/UJ1	84	B/UJ1	UG/L	13	77.5	16.77
11891	10/18/99	Methylene Chloride	40.00	JB/JB1	39.00	JB/JB1	UG/L	1.00	39.50	2.53
18499	9/20/99	Methylene Chloride	380	JB/JB1	400	JB/JB1	UG/L	20	390	5.13
3586	10/19/99	Methylene Chloride	4.00	JB/JB1	4.00	JB/JB1	UG/L	0.00	4.00	0.00
5887	8/16/99	Methylene Chloride	1	B/1	1	B/1	UG/L	0	1	0.00
5887	8/16/99	Methylene Chloride	3	/UJ1	1	/UJ1	UG/L	2	2	**100.00**
70193	8/19/99	Methylene Chloride	1	B/UJ1	1	/UJ1	UG/L	0	1	0.00
70393	5/18/99	Methylene Chloride	3	B/UJ1	3	B/UJ1	UG/L	0	3	0.00
70393	8/16/99	Methylene Chloride	2	B/UJ1	1	B/UJ1	UG/L	1	1.5	**66.67**
03991	1/20/99	Tetrachloroethene	5.5	/J	5.2	/J	UG/L	0.30	5.35	5.61
05091	2/15/99	Tetrachloroethene	2.6	/V1	2.9	/V1	UG/L	0.30	2.75	10.91
05091	8/24/99	Tetrachloroethene	4	/V	4	/V	UG/L	0	4	0.00
10498	2/17/99	Tetrachloroethene	58.9	/V1	34.2	/V1	UG/L	24.70	46.55	**53.06**

Note: RPD values greater than the 30% QC criterion are indicated in bold font.

Appendix E: Table 11-1b
Relative Percent Differences (RPDs)
Groundwater 1999

Location	Sample Date	Analyte	Real Result	Real Lab Q/ Valid	Dup Result	Dup Lab Q/ Valid	Units	Absolute Value (Real-Dup)	Average (Real+Dup)/2	RPD AbsVal/Avex100
10498	8/12/99	Tetrachloroethene	17	/V1	15	/V1	UG/L	2	16	12.50
11891	5/20/99	Tetrachloroethene	150	/V1	150	/V1	UG/L	0	150	0.00
11891	10/18/99	Tetrachloroethene	250.00	/V1	260.00	/V1	UG/L	10.00	255.00	3.92
3586	1/15/99	Tetrachloroethene	1	U/V1	1	U/V1	UG/L	0.00	1	0.00
40299	9/2/99	Tetrachloroethene	29	D/V1	30	D/J1	UG/L	1	29.5	3.39
70393	2/17/99	Tetrachloroethene	6.9	/V1	6	/V1	UG/L	0.90	6.45	13.95
70393	5/18/99	Tetrachloroethene	6	/V1	6	/V1	UG/L	0	6	0.00
70393	8/16/99	Tetrachloroethene	1	/V1	7	/V1	UG/L	6	4	**150.00**
70393	11/4/99	Tetrachloroethene	8.00	/V1	8.00	/V1	UG/L	0.00	8.00	0.00
3586	1/15/99	Toluene	1	U/UJ1	1	U/UJ1	UG/L	0.00	1	0.00
3586	1/15/99	Total Xylenes	1	U/UJ1	1	U/UJ1	UG/L	0.00	1	0.00
3586	1/15/99	*trans-1,2-Dichloroethene*	1	U/V1	1	U/V1	UG/L	0.00	1	0.00
3586	1/15/99	trans-1,3-Dichloropropene	1	U/V1	1	U/V1	UG/L	0.00	1	0.00
03991	1/20/99	Trichloroethene	2.3	/V	2.2	/V	UG/L	0.10	2.25	4.44
11891	5/20/99	Trichloroethene	28	/V1	28	/V1	UG/L	0	28	0.00
11891	10/18/99	Trichloroethene	67.00	/V1	67.00	/V1	UG/L	0.00	67.00	0.00
3586	1/15/99	Trichloroethene	1	U/V1	0.6	J/V1	UG/L	0.40	0.8	**50.00**
40299	9/2/99	Trichloroethene	3	B/V1	3	B/V1	UG/L	0	3	0.00
70393	2/17/99	Trichloroethene	19.1	/V1	18.2	/V1	UG/L	0.90	18.65	4.83
70393	5/18/99	Trichloroethene	17	/V1	17	/V1	UG/L	0	17	0.00
70393	8/16/99	Trichloroethene	4	/V1	21	/V1	UG/L	17	12.5	**136.00**
70393	11/4/99	Trichloroethene	22.00	/V1	23.00	D/1	UG/L	1.00	22.50	4.44
90299	8/5/99	Trichloroethene	3	/V1	2	/V1	UG/L	1	2.5	**40.00**
18499	9/20/99	Trichlorofluoromethane	200	JB/JB1	220	JB/JB1	UG/L	20	210	9.52
3586	1/15/99	Trichlorofluoromethane	1.7	U/V1	1.7	U/V1	UG/L	0.00	1.7	0.00
3586	1/15/99	Vinyl Chloride	66.8	/V1	65.9	/V1	UG/L	0.90	66.35	1.36
3586	8/9/99	Vinyl Chloride	100	D/J1	110	D/J1	UG/L	10	105	9.52
3586	10/19/99	Vinyl Chloride	56.00	/V1	60.00	/V1	UG/L	4.00	58.00	6.90
40299	9/2/99	Vinyl Chloride	1	/V1	1	/V1	UG/L	0	1	0.00
Semi-Volatile Organic Compounds										
18499	9/20/99	Hexachloroethane	45	/V1	50	/V1	UG/L	5	47.5	10.53
Water Quality Parameters										
0386	2/24/99	Fluoride	2.2	/V	2.2	/V	MG/L	0.00	2.2	0.00
0386	7/26/99	Fluoride	2.1	/V1	2.1	/V1	MG/L	0	2.1	0.00
10294	2/10/99	Fluoride	1.5	/V1	1.5	/V1	MG/L	0.00	1.5	0.00
10294	7/22/99	Fluoride	2	/V1	2.1	/V1	MG/L	0.1	2.05	4.88
41591	3/3/99	Fluoride	2.9	/V1	2.9	/V1	MG/L	0.00	2.9	0.00
41591	8/12/99	Fluoride	3.2	/V1	3.2	/V1	MG/L	0	3.2	0.00
5887	2/16/99	Fluoride	0.2	/V1	0.19	/V1	MG/L	0.01	0.195	5.13
5887	5/24/99	Fluoride	0.12	/V	0.12	/V	MG/L	0	0.12	0.00
5887	8/16/99	Fluoride	0.1	/V1	0.1	/V1	MG/L	0	0.1	0.00
70193	1/29/99	Fluoride	0.31	/V1	0.31	/V1	MG/L	0.00	0.31	0.00
70193	5/6/99	Fluoride	0.17	/V1	0.16	/V1	MG/L	0.01	0.165	6.06
70193	8/19/99	Fluoride	0.26	/V1	0.26	/V1	MG/L	0	0.26	0.00
70193	10/18/99	Fluoride	0.31	/V	0.31	/V	MG/L	0.00	0.31	0.00
70393	2/17/99	Fluoride	0.15	/V1	0.15	/V1	MG/L	0.00	0.15	0.00
70393	5/18/99	Fluoride	0.12	/V	0.1	/V	MG/L	0.02	0.11	18.18
70393	8/16/99	Fluoride	0.12	/V1	0.12	/V1	MG/L	0	0.12	0.00
0386	2/24/99	Nitrate/Nitrite	7.6	/V	3.1	/V	MG/L	4.50	5.35	**84.11**
0386	7/26/99	Nitrate/Nitrite	3.1	/V1	3.5	/V1	MG/L	0.4	3.3	12.12

Note: RPD values greater than the 30% QC criterion are indicated in bold font.

Appendix E: Table 11-1b
Relative Percent Differences (RPDs)
Groundwater 1999

Location	Sample Date	Analyte	Real Result	Real Lab Q/ Valid	Dup Result	Dup Lab Q/ Valid	Units	Absolute Value (Real-Dup)	Average (Real+Dup)/2	RPD AbsVal/Avex100
03991	1/20/99	Nitrate/Nitrite	5	/V1	5.2	/V1	MG/L	0.20	5.1	3.92
05091	2/15/99	Nitrate/Nitrite	6.2	/V1	6.3	/V1	MG/L	0.10	6.25	1.60
05091	8/24/99	Nitrate/Nitrite	8.2		7.9		MG/L	0.3	8.05	3.73
10498	2/17/99	Nitrate/Nitrite	17	/V1	15	/V1	MG/L	2.00	16	12.50
10498	8/12/99	Nitrate/Nitrite	7.1	/V1	6.8	/V1	MG/L	0.3	6.95	4.32
11891	5/20/99	Nitrate/Nitrite	5.2	/V	5.3	/V	MG/L	0.1	5.25	1.90
11891	10/18/99	Nitrate/Nitrite	6.90	/V1	7.50	/V1	MG/L	0.60	7.20	8.33
3586	4/28/99	Nitrate/Nitrite	1.8	/V1	1.8	/V1	MG/L	0	1.8	0.00
3586	8/9/99	Nitrate/Nitrite	0.07	/V1	0.07	/V1	MG/L	0	0.07	0.00
41591	3/3/99	Nitrate/Nitrite	0.41	/V1	0.24	/V1	MG/L	0.17	0.325	**52.31**
41591	8/12/99	Nitrate/Nitrite	0.13	/V1	0.16	/V1	MG/L	0.03	0.145	20.69
5887	2/16/99	Nitrate/Nitrite	3.9	/V1	3.9	/V1	MG/L	0.00	3.9	0.00
5887	5/24/99	Nitrate/Nitrite	2.4	/V	2.2	/V	MG/L	0.2	2.3	8.70
5887	8/16/99	Nitrate/Nitrite	3.9		4		MG/L	0.1	3.95	2.53
5887	10/28/99	Nitrate/Nitrite	3.90	/V1	3.80	/V1	MG/L	0.10	3.85	2.60
70193	1/29/99	Nitrate/Nitrite	1.9	/V1	2	/V1	MG/L	0.10	1.95	5.13
70193	5/6/99	Nitrate/Nitrite	2.5	/V1	3	/V1	MG/L	0.5	2.75	18.18
70193	8/19/99	Nitrate/Nitrite	2.5		2.4		MG/L	0.1	2.45	4.08
70193	10/18/99	Nitrate/Nitrite	1.90	/V1	1.90	/V1	MG/L	0.00	1.90	0.00
70393	2/17/99	Nitrate/Nitrite	5	/V1	4.7	/V1	MG/L	0.30	4.85	6.19
70393	5/18/99	Nitrate/Nitrite	5.1	/V	5.3	/V	MG/L	0.2	5.2	3.85
70393	8/16/99	Nitrate/Nitrite	5.9		5.6		MG/L	0.3	5.75	5.22
70393	11/4/99	Nitrate/Nitrite	5.10	/V1	5.00	/V1	MG/L	0.10	5.05	1.98
0386	2/24/99	Sulfate	93	/V	92	/V	MG/L	1.00	92.5	1.08
0386	7/26/99	Sulfate	89	/V1	90	/V1	MG/L	1	89.5	1.12
10294	2/10/99	Sulfate	340	/V1	340	/V1	MG/L	0.00	340	0.00
10294	7/22/99	Sulfate	470	/V1	480	/V1	MG/L	10	475	2.11
18499	9/20/99	Sulfate	31		31		MG/L	0	31	0.00
41591	3/3/99	Sulfate	110	/V1	130	/V1	MG/L	20.00	120	16.67
41591	8/12/99	Sulfate	99	/V1	90	/V1	MG/L	9	94.5	9.52
5887	2/16/99	Sulfate	32	/V1	32	/V1	MG/L	0.00	32	0.00
5887	5/24/99	Sulfate	24	/V	24	/V	MG/L	0	24	0.00
5887	8/16/99	Sulfate	22	/V1	22	/V1	MG/L	0	22	0.00
5887	10/28/99	Sulfate	28.00	/V1	28.00	/V1	MG/L	0.00	28.00	0.00
70193	1/29/99	Sulfate	21	/V1	21	/V1	MG/L	0.00	21	0.00
70193	5/6/99	Sulfate	23	/V1	23	/V1	MG/L	0	23	0.00
70193	8/19/99	Sulfate	22	/V1	22	/V1	MG/L	0	22	0.00
70193	10/18/99	Sulfate	22.00	/V	22.00	/V	MG/L	0.00	22.00	0.00
70393	2/17/99	Sulfate	27	/V1	27	/V1	MG/L	0.00	27	0.00
70393	5/18/99	Sulfate	30	/V	31	/V	MG/L	1	30.5	3.28
70393	8/16/99	Sulfate	29	/V1	29	/V1	MG/L	0	29	0.00
70393	11/4/99	Sulfate	31.00	/V1	30.00	/V1	MG/L	1.00	30.50	3.28
3586	1/15/99	Total Dissolved Solids	1000	/V1	1100	/V1	MG/L	100.00	1050	9.52
0386	2/24/99	Total Dissolved Solids	500	/V	470	/V	MG/L	30.00	485	6.19
0386	7/26/99	Total Dissolved Solids	530	/V1	520	/V1	MG/L	10	525	1.90
03991	1/20/99	Total Dissolved Solids	430	/V1	440	/V1	MG/L	10.00	435	2.30
05091	2/15/99	Total Dissolved Solids	480	/J1	480	/J1	MG/L	0.00	480	0.00
05091	8/24/99	Total Dissolved Solids	430	/V1	480	/V1	MG/L	50	455	10.99
10294	2/10/99	Total Dissolved Solids	1300	/V1	1200	/V1	MG/L	100.00	1250	8.00
10294	7/22/99	Total Dissolved Solids	1600	/V1	1500	/V1	MG/L	100	1550	6.45

Note: RPD values greater than the 30% QC criterion are indicated in bold font.

Appendix E: Table 11-1b
Relative Percent Differences (RPDs)
Groundwater 1999

Location	Sample Date	Analyte	Real Result	Real Lab Q/ Valid	Dup Result	Dup Lab Q/ Valid	Units	Absolute Value (Real-Dup)	Average (Real+Dup)/2	RPD AbsVal/Avex100
10498	2/17/99	Total Dissolved Solids	550	/V1	480	/V1	MG/L	70.00	515	13.59
10498	8/12/99	Total Dissolved Solids	320	/V1	330	/V1	MG/L	10	325	3.08
11891	5/20/99	Total Dissolved Solids	550	/V	580	/V	MG/L	30	565	5.31
11891	10/18/99	Total Dissolved Solids	500.00	/V	520.00	/V	MG/L	20.00	510.00	3.92
3586	4/28/99	Total Dissolved Solids	800	/V1	790	/V1	MG/L	10	795	1.26
3586	8/9/99	Total Dissolved Solids	980	/V1	940	/V1	MG/L	40	960	4.17
3586	10/19/99	Total Dissolved Solids	940.00	/V	950.00	/V	MG/L	10.00	945.00	1.06
41591	3/3/99	Total Dissolved Solids	950	/V1	950	/V1	MG/L	0.00	950	0.00
41591	8/12/99	Total Dissolved Solids	1200	/V1	1200	/V1	MG/L	0	1200	0.00
5887	2/16/99	Total Dissolved Solids	150	/V1	150	/V1	MG/L	0.00	150	0.00
5887	5/24/99	Total Dissolved Solids	120	/V	98	/V	MG/L	22	109	20.18
5887	8/16/99	Total Dissolved Solids	130	/V1	140	/V1	MG/L	10	135	7.41
5887	10/28/99	Total Dissolved Solids	150.00	/V1	160.00	/V1	MG/L	10.00	155.00	6.45
70193	1/29/99	Total Dissolved Solids	230	/V1	240	/V1	MG/L	10.00	235	4.26
70193	5/6/99	Total Dissolved Solids	120	/V1	130	/V1	MG/L	10	125	8.00
70193	8/19/99	Total Dissolved Solids	170	/V1	150	/V1	MG/L	20	160	12.50
70193	10/18/99	Total Dissolved Solids	170.00	/V	180.00	/V	MG/L	10.00	175.00	5.71
70393	2/17/99	Total Dissolved Solids	140	/V1	140	/V1	MG/L	0.00	140	0.00
70393	5/18/99	Total Dissolved Solids	130	/V	140	/V	MG/L	10	135	7.41
70393	8/16/99	Total Dissolved Solids	150	/V1	160	/V1	MG/L	10	155	6.45
70393	11/4/99	Total Dissolved Solids	140.00	/V1	150.00	/V1	MG/L	10.00	145.00	6.90
Miscellaneous Analytes										
18499	9/20/99	Di-N-Butyl Phthalate	2	J/V1	2	J/V1	UG/L	0	2	0.00
18499	9/20/99	Hexachloroethane	45	/V1	50	/V1	UG/L	5	47.5	10.53
18499	9/20/99	Methane	50		45		UG/L	5	47.5	10.52
18499	9/20/99	Dissolved Organic Carbon	5		4		MG/L	1	4.5	22.22
18499	9/20/99	Total Organic Carbon	5		4		MG/L	1	4.5	22.22
18499	9/20/99	Chloride	90		90		MG/L	0	90	0.00
18499	9/20/99	Nitrate	0.14		0.14		MG/L	0	0.14	0.00
18499	9/20/99	Sulfide	0.003		0.051		MG/L	0.048	0.027	**177.78**

550 Note: RPD values greater than the 30% QC criterion are indicated in bold font.

Appendix E: Table 11-2
Summary of DER and RPD Results
Groundwater 1999

Analytical Suite	QC Criterion for RPD or DER Value	Number of RPD/DER Pairs Calculated	Number of RPD/DER Pairs Within Criterion	Overall Precision Compliance (Goal = 85%)
Metals	< 30%	400	329	82.3%
Volatile Organic Compounds	< 30%	77	68	88.3%
Radionuclides **(Am_{241}, $Pu_{239/240}$, U_{235}, U_{238})**	< 1.96	59	55	93.2%
Water Quality Parameters (F^-, TDS, SO_4^{-2})	< 30%	89	87	97.8%

DER / RPD Calculation Criteria

Lab Qualifier	Qualifier Meaning for **Organics**	Qualifier Meaning for **Inorganics**	1st Quarter 1999	2nd-4th Quarter 1999	1st Quarter 1999	2nd-4th Quarter 1999
			Organic RPD calculation procedure	**Organic** RPD calculation procedure	**Inorganic** RPD/DER calculation procedure	**Inorganic** RPD/DER calculation procedure
"U"	Non-detect	Non-detect	If **one** of real/dup pair is "U" then calculation not made	If **both** of real/dup pair is "U" then calculation not made	If **one** of real/dup pair is "U" then calculation not made	If **both** of real/dup pair is "U" then calculation not made
"B"	Analyte present in method blank (=lab contamination)	Result less than contract required detection limit (CRDL) but greater than instrument detection limit (IDL)	**Calculation made**	No change, **calculation made**	**Calculation not made** for "B" data	**Calculation made** for "B" data
"J"	Estimate	Estimate	**Calculation made** for "J" or "JB" qualified data	**Calculation not made** for "J" or "JB" data where result is less than CRDL	**Calculation made** for "J" qualified data	**Calculation not made** for "J" data where result is less than CRDL

No "R" validated data are included in these calculations.

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Appendix E: Table 11-3
Comparison of Analytical Methods and Detection Limits
Groundwater 1999

CAS #	Analyte	Required Analytical Method	Actual Analytical Method	Contract Required Detection Limit (CRDL)	Percent At Or Below CRDL	Units
	Methane	Method 8015M (GC/FID Headsp)	Method 8015M (GC/FID Headsp)	Task Order	NA	ug/L
	Volatile Organic Compounds (VOCs) EPA Method 524.2					
630-20-6	1,1,1,2-Tetrachloroethane	EPA 524.2	EPA 524.2	1	86.74	ug/L
71-55-6	1,1,1-Trichloroethane	EPA 524.2	EPA 524.2	1	86.74	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	EPA 524.2	EPA 524.2	1	86.74	ug/L
79-00-5	1,1,2-Trichloroethane	EPA 524.2	EPA 524.2	1	86.74	ug/L
75-34-3	1,1-Dichloroethane	EPA 524.2	EPA 524.2	1	86.74	ug/L
75-35-4	1,1-Dichloroethene	EPA 524.2	EPA 524.2	1	86.74	ug/L
563-58-6	1,1-Dichloropropene	EPA 524.2	EPA 524.2	1	85.98	ug/L
87-61-6	1,2,3-Trichlorobenzene	EPA 524.2	EPA 524.2	1	85.98	ug/L
96-18-4	1,2,3-Trichloropropane	EPA 524.2	EPA 524.2	1	86.36	ug/L
120-82-1	1,2,4-Trichlorobenzene	EPA 524.2	EPA 524.2	1	85.98	ug/L
95-63-6	1,2,4-Trimethylbenzene	EPA 524.2	EPA 524.2	1	85.98	ug/L
96-12-8	1,2-Dibromo-3-chloropropane	EPA 524.2	EPA 524.2	1	83.97	ug/L
106-93-4	1,2-Dibromoethane	EPA 524.2	EPA 524.2	1	86.36	ug/L
95-50-1	1,2-Dichlorobenzene	EPA 524.2	EPA 524.2	1	85.98	ug/L
107-06-2	1,2-Dichloroethane	EPA 524.2	EPA 524.2	1	86.74	ug/L
78-87-5	1,2-Dichloropropane	EPA 524.2	EPA 524.2	1	86.74	ug/L
108-67-8	1,3,5-Trimethylbenzene	EPA 524.2	EPA 524.2	1	85.98	ug/L
541-73-1	1,3-Dichlorobenzene	EPA 524.2	EPA 524.2	1	85.98	ug/L
142-28-9	1,3-Dichloropropane	EPA 524.2	EPA 524.2	1	86.74	ug/L
106-46-7	1,4-Dichlorobenzene	EPA 524.2	EPA 524.2	1	85.98	ug/L
594-20-7	2,2-Dichloropropane	EPA 524.2	EPA 524.2	1	86.74	ug/L
[illegible]9-8	2-Chlorotoluene	EPA 524.2	EPA 524.2	1	85.98	[illegible]
106-43-4	4-Chlorotoluene	EPA 524.2	EPA 524.2	1	85.98	ug/L
71-43-2	Benzene	EPA 524.2	EPA 524.2	1	86.74	ug/L
108-86-1	Bromobenzene	EPA 524.2	EPA 524.2	1	86.36	ug/L
74-97-5	Bromochloromethane	EPA 524.2	EPA 524.2	1	86.74	ug/L
75-27-4	Bromodichloromethane	EPA 524.2	EPA 524.2	1	86.74	ug/L
75-25-2	Bromoform	EPA 524.2	EPA 524.2	1	86.74	ug/L
74-83-9	Bromomethane	EPA 524.2	EPA 524.2	1	85.98	ug/L
56-23-5	Carbon Tetrachloride	EPA 524.2	EPA 524.2	1	85.98	ug/L
108-90-7	Chlorobenzene	EPA 524.2	EPA 524.2	1	86.36	ug/L
75-00-3	Chloroethane	EPA 524.2	EPA 524.2	1	85.98	ug/L
67-66-3	Chloroform	EPA 524.2	EPA 524.2	1	86.69	ug/L
74-87-3	Chloromethane	EPA 524.2	EPA 524.2	1	85.98	ug/L
156-59-2	cis-1,2-Dichloroethene	EPA 524.2	EPA 524.2	1	86.74	ug/L
10061-01-5	cis-1,3-Dichloropropene	EPA 524.2	EPA 524.2	1	86.74	ug/L
124-48-1	Dibromochloromethane	EPA 524.2	EPA 524.2	1	86.31	ug/L
74-95-3	Dibromomethane	EPA 524.2	EPA 524.2	1	85.98	ug/L
75-71-8	Dichlorodifluoromethane	EPA 524.2	EPA 524.2	1	68.18	ug/L
100-41-4	Ethylbenzene	EPA 524.2	EPA 524.2	1	86.74	ug/L
87-68-3	Hexachlorobutadiene	EPA 524.2	EPA 524.2	1	85.98	ug/L
98-82-8	Isopropylbenzene	EPA 524.2	EPA 524.2	1	86.36	ug/L
75-09-2	Methylene Chloride	EPA 524.2	EPA 524.2	1	69.32	ug/L
91-20-3	Naphthalene	EPA 524.2	EPA 524.2	1	85.98	ug/L
104-51-8	n-Butylbenzene	EPA 524.2	EPA 524.2	1	85.98	ug/L
103-65-1	n-Propylbenzene	EPA 524.2	EPA 524.2	1	85.98	ug/L
1330-20-7	Total Xylenes	EPA 524.2	EPA 524.2	1	86.04	ug/L
99-87-6	p-Isopropyltoluene	EPA 524.2	EPA 524.2	1	85.98	ug/L
[illegible]98-8	sec-Butylbenzene	EPA 524.2	EPA 524.2	1	85.98	ug/L
[illegible]42-5	Styrene	EPA 524.2	EPA 524.2	1	85.23	[illegible]
98-06-6	tert-Butylbenzene	EPA 524.2	EPA 524.2	1	85.98	ug/L

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Appendix E: Table 11-3
Comparison of Analytical Methods and Detection Limits
Groundwater 1999

CAS #	Analyte	Required Analytical Method	Actual Analytical Method	Contract Required Detection Limit (CRDL)	Percent At Or Below CRDL	Units
127-18-4	Tetrachloroethene	EPA 524.2	EPA 524.2	1	86.74	ug/L
108-88-3	Toluene	EPA 524.2	EPA 524.2	1	86.74	ug/L
156-60-5	trans-1,2-Dichloroethene	EPA 524.2	EPA 524.2	1	86.74	ug/L
10061-02-6	trans-1,3-Dichloropropene	EPA 524.2	EPA 524.2	1	86.74	ug/L
79-01-6	Trichloroethene	EPA 524.2	EPA 524.2	1	85.98	ug/L
75-69-4	Trichlorofluoromethane	EPA 524.2	EPA 524.2	1	68.18	ug/L
75-01-4	Vinyl chloride	EPA 524.2	EPA 524.2	1	85.98	ug/L
	Volatile Organic Compounds (VOCs) EPA SW-846 Method 8260					
630-20-6	1,1,1,2-Tetrachloroethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
71-55-6	1,1,1-Trichloroethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
79-00-5	1,1,2-Trichloroethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
75-34-3	1,1-Dichloroethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
75-35-4	1,1-Dichloroethene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
563-58-6	1,1-Dichloropropene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
87-61-6	1,2,3-Trichlorobenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
96-18-4	1,2,3-Trichloropropane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
120-82-1	1,2,4-Trichlorobenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
95-63-6	1,2,4-Trimethylbenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
96-12-8	1,2-Dibromo-3-chloropropane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
106-93-4	1,2-Dibromoethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
95-50-1	1,2-Dichlorobenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
[illegible]6-2	1,2-Dichloroethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
[illegible]7-5	1,2-Dichloropropane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
108-67-8	1,3,5-Trimethylbenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
541-73-1	1,3-Dichlorobenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
142-28-9	1,3-Dichloropropane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
106-46-7	1,4-Dichlorobenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
594-20-7	2,2-Dichloropropane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
78-93-3	2-Butanone	SW-846 Method 8260	SW-846 Method 8260	10	25.00	ug/L
95-49-8	2-Chlorotoluene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
591-78-1	2-Hexanone	SW-846 Method 8260	SW-846 Method 8260	50	25.00	ug/L
106-43-4	4-Chlorotoluene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
108-10-1	4-Methyl-2-pentanone	SW-846 Method 8260	SW-846 Method 8260	50	25.00	ug/L
67-64-1	Acetone	SW-846 Method 8260	SW-846 Method 8260	100	25.00	ug/L
71-43-2	Benzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
108-86-1	Bromobenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
74-97-5	Bromochloromethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
75-27-4	Bromodichloromethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
75-25-2	Bromoform	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
74-83-9	Bromomethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
75-15-0	Carbon Disulfide	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
56-23-5	Carbon Tetrachloride	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
108-90-7	Chlorobenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
75-00-3	Chloroethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
67-66-3	Chloroform	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
74-87-3	Chloromethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
156-59-2	cis-1,2-Dichloroethene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
10061-01-5	cis-1,3-Dichloropropene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
124-48-1	Dibromochloromethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
[illegible]-3	Dibromomethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
[illegible]1-8	Dichlorodifluoromethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L

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Appendix E: Table 11-3
Comparison of Analytical Methods and Detection Limits
Groundwater 1999

CAS #	Analyte	Required Analytical Method	Actual Analytical Method	Contract Required Detection Limit (CRDL)	Percent At Or Below CRDL	Units
100-41-4	Ethylbenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
87-68-3	Hexachlorobutadiene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
98-82-8	Isopropylbenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
75-09-2	Methylene Chloride	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
91-20-3	Naphthalene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
104-51-8	n-Butylbenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
103-65-1	n-Propylbenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
99-87-6	p-Isopropyltoluene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
135-98-8	sec-Butylbenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
100-42-5	Styrene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
98-06-6	tert-Butylbenzene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
127-18-4	Tetrachloroethene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
108-88-3	Toluene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
1330-20-7	Total Xylenes	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
156-60-5	trans-1,2-Dichloroethene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
10061-02-6	trans-1,3-Dichloropropene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
79-01-6	Trichloroethene	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
75-69-4	Trichlorofluoromethane	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
75-01-4	Vinyl chloride	SW-846 Method 8260	SW-846 Method 8260	5	12.50	ug/L
	Semi-Volatile Organic Compounds (SVOCs) EPA SW-846 Method 8270					
83-32-9	Acenaphthene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
208-96-8	Acenaphthylene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
98-86-2	Acetophenone	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
[illegible]6-3	2-Acetylaminofluorene; 2-AAF	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
[illegible]-1	4-Aminobiphenyl	SW-846 Method 8270	SW-846 Method 8270	20	100.00	[illegible]
120-12-7	Anthracene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
140-57-8	Aramite	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
56-55-3	Benzo[a]anthracene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
205-99-2	Benzo[b]fluoranthene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
207-08-9	Benzo[k]fluoranthene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
191-24-2	Benzo[ghi]perylene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
50-32-8	Benzo[a]pyrene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
100-51-6	Benzyl alcohol	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
101-55-3	4-Bromophenyl phenyl ether	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
85-68-7	Butylbenzylphthalate	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
106-47-8	4-Chloroaniline	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
510-15-6	Chlorobenzilate	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
59-50-7	p-Chloro-m-cresol	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
91-58-7	2-Chloronaphthalene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
95-57-8	2-Chlorophenol	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
7005-72-3	4-Chorophenyl phenyl ether	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
218-01-9	Chrysene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
2303-16-4	Diallate	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
53-70-3	Dibenz[a,h]anthracene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
132-64-9	Dibenzofuran	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
84-74-2	Di-n-butyl phthalate	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
95-50-1	o-Dichlorobenzene (1,2-)	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
541-73-1	m-Dichlorobenzene (1,3-)	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
106-46-7	p-Dichlorobenzene (1,4-)	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
91-94-1	3,3'-Dichlorobenzidine	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
120-83-2	2,4-Dichlorophenol	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
[illegible]5-0	2,6-Dichlorophenol	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
[illegible]-2	Diethyl phthalate	SW-846 Method 8270	SW-846 Method 8270	10	100.00	[illegible]
60-11-7	p-(Dimethylamino)azobenzene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L

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Appendix E: Table 11-3
Comparison of Analytical Methods and Detection Limits
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CAS #	Analyte	Required Analytical Method	Actual Analytical Method	Contract Required Detection Limit (CRDL)	Percent At Or Below CRDL	Units
57-97-6	7,12-Dimethylbenz[a]anthracene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
119-93-7	3,3'-Dimethylbenzidene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
122-09-8	alpha, alpha-Dimethylphenethylamine	SW-846 Method 8270	SW-846 Method 8270	ND	100.00	ug/L
105-67-9	2,4-Dimethylphenol	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
131-11-3	Dimethyl phthalate	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
99-65-0	m-Dinitrobenzene	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
534-52-1	4,6-Dinitro-o-cresol	SW-846 Method 8270	SW-846 Method 8270	50	100.00	ug/L
51-28-5	2,4-Dinitrophenol	SW-846 Method 8270	SW-846 Method 8270	50	100.00	ug/L
121-14-2	2,4-Dinitrotoluene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
606-20-2	2,6-Dinitrotoluene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
117-84-0	Di-n-octyl phthalate	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
122-39-4	Diphenylamine	SW-846 Method 8270	SW-846 Method 8270	50	100.00	ug/L
62-50-0	Ethyl methanesulfonate	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
206-44-0	Fluoranthene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
86-73-7	Fluorene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
118-74-1	Hexachlorobenzene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
87-68-3	Hexachlorobutadiene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
77-47-4	Hexachlorocyclopentadiene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
67-72-1	Hexachloroethane	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
70-30-4	Hexachlorophene	SW-846 Method 8270	SW-846 Method 8270	50	100.00	ug/L
1888-71-7	Hexachloropropene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
193-39-5	Ideno(1,2,3-cd)pyrene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
465-73-6	Isodrin	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
[illegible]-1	Isophorone	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
[illegible]3-1	Isosafrole	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
143-50-0	Kepone	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
91-80-5	Methapyrilene	SW-846 Method 8270	SW-846 Method 8270	100	100.00	ug/L
56-49-5	3-Methylcholanthrene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
66-27-3	Methyl menthanesulfonate	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
91-57-6	2-Methylnaphthalene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
91-20-3	Naphthalene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
130-15-4	1,4-Naphthoquinone	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
134-32-7	1-Naphthylamine	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
91-59-8	2-Naphthylamine	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
88-74-4	o-Nitroanaline	SW-846 Method 8270	SW-846 Method 8270	50	100.00	ug/L
99-09-2	m-Nitroanaline	SW-846 Method 8270	SW-846 Method 8270	50	100.00	ug/L
100-01-6	p-Nitroanaline	SW-846 Method 8270	SW-846 Method 8270	50	100.00	ug/L
98-95-3	Nitrobenzene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
88-75-5	o-Nitrophenol	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
100-02-7	p-Nitrophenol	SW-846 Method 8270	SW-846 Method 8270	50	100.00	ug/L
56-57-5	4-Nitroquinoline 1-oxide	SW-846 Method 8270	SW-846 Method 8270	40	100.00	ug/L
924-16-3	N-Nitrosodi-n-butylamine	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
55-18-5	N-Nitrosodiethylamine	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
62-75-9	N-Nitrosodimethylamine	SW-846 Method 8270	SW-846 Method 8270	ND	100.00	ug/L
86-30-6	N-Nitrosodiphenylamine	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
621-64-7	N-Nitrosodipropylamine; Di-n-propylnitrosamine	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
10595-95-6	N-Nitrosomethylethylamine	SW-846 Method 8270	SW-846 Method 8270	ND	100.00	ug/L
59-89-2	N-Nitrosomorpholine	SW-846 Method 8270	SW-846 Method 8270	ND	100.00	ug/L
100-75-4	N-Nitrosopiperidine	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
930-55-2	N-Nitrosopyrrolidine	SW-846 Method 8270	SW-846 Method 8270	40	100.00	ug/L
99-55-8	5-Nitro-o-toluidine	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
[illegible]23-5	Pentachlorobenzene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
[illegible]-8	Pentachloronitrobenzene	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
87-86-5	Pentachlorophenol	SW-846 Method 8270	SW-846 Method 8270	50	100.00	ug/L

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Appendix E: Table 11-3
Comparison of Analytical Methods and Detection Limits
Groundwater 1999

CAS #	Analyte	Required Analytical Method	Actual Analytical Method	Contract Required Detection Limit (CRDL)	Percent At Or Below CRDL	Units
62-44-2	Phenacetin	SW-846 Method 8270	SW-846 Method 8270	20	100.00	ug/L
85-01-8	Phenanthrene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
108-95-2	Phenol	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
106-50-3	p-phenylenediamine	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
109-06-8	2-Picoline	SW-846 Method 8270	SW-846 Method 8270	ND	100.00	ug/L
23950-58-5	Pronamide	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
129-00-0	Pyrene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
94-59-7	Safrole	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
95-94-3	1,2,4,5-Tetrachlorobenzene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
58-90-2	2,3,4,6-Tetrachlorophenol	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
95-53-4	o-Toluidine	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
120-82-1	1,2,4-Trichlorobenzene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
95-95-4	2,4,5-Trichlorophenol	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
88-06-2	2,4,6-Trichlorophenol	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
99-35-4	sym-Trinitrobenzene	SW-846 Method 8270	SW-846 Method 8270	10	100.00	ug/L
297-97-2	1O,O-Diethyl O-2-pyrazinyl phosphorothioate: Thionazin	SW-846 Method 8270	SW-846 Method 8270	ND	Results for these SVOCs analytes not present in analyses returned from laboratories.	ug/L
60-51-5	Dimethoate	SW-846 Method 8270	SW-846 Method 8270	20		ug/L
298-04-4	Disulfoton	SW-846 Method 8270	SW-846 Method 8270	10		ug/L
52-85-7	Famphur	SW-846 Method 8270	SW-846 Method 8270	20		ug/L
298-00-0	Methyl parathion; Parathion methyl	SW-846 Method 8270	SW-846 Method 8270	10		ug/L
56-38-2	Parathion	SW-846 Method 8270	SW-846 Method 8270	10		ug/L
298-02-2	Phorate	SW-846 Method 8270	SW-846 Method 8270	10		ug/L
8689-24-5	Tetraethyl dithiopyrophosphate; Sulfotepp	SW-846 Method 8270	SW-846 Method 8270	40		ug/L
[illegible]68-1	O,O,O-Triethyl phosphorothionate	SW-846 Method 8270	SW-846 Method 8270	ND		ug/L
	Polychlorinated Biphenyls (PCBs) EPA SW-846 Method 8082					
12674-11-2	Aroclor-1016	SW-846 Method 8082	SW-846 Method 8082 (-Hard Copy) SW-846 8080A/8081(-Electronic)	0.50	100.00	ug/L
11104-28-2	Aroclor-1221	SW-846 Method 8082	SW-846 Method 8082 (-Hard Copy) SW-846 8080A/8081(-Electronic)	0.50	100.00	ug/L
11141-16-5	Aroclor-1232	SW-846 Method 8082	SW-846 Method 8082 (-Hard Copy) SW-846 8080A/8081(-Electronic)	0.50	100.00	ug/L
53469-21-9	Aroclor-1242	SW-846 Method 8082	SW-846 Method 8082 (-Hard Copy) SW-846 8080A/8081(-Electronic)	0.50	100.00	ug/L
12672-29-6	Aroclor-1248	SW-846 Method 8082	SW-846 Method 8082 (-Hard Copy) SW-846 8080A/8081(-Electronic)	0.50	100.00	ug/L
11097-69-1	Aroclor-1254	SW-846 Method 8082	SW-846 Method 8082 (-Hard Copy) SW-846 8080A/8081(-Electronic)	0.50	100.00	ug/L
11096-82-5	Aroclor-1260	SW-846 Method 8082	SW-846 Method 8082 (-Hard Copy) SW-846 8080A/8081(-Electronic)	0.50	100.00	ug/L

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Appendix E: Table 11-3
Comparison of Analytical Methods and Detection Limits
Groundwater 1999

CAS #	Analyte	Required Analytical Method	Actual Analytical Method	Contract Required Detection Limit (CRDL)	Percent At Or Below CRDL	Units
	Dissolved and Total Metals					
7429-90-5	Aluminum	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	17	100.00	ug/L
7440-36-0	Antimony	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	1	95.26	ug/L
7440-38-2	Arsenic	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	1	98.28	ug/L
7440-39-3	Barium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	100	100.00	ug/L
7440-41-7	Beryllium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	1	100.00	ug/L
7440-43-9	Cadmium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	0.3	100.00	ug/L
7440-70-2	Calcium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	5000	100.00	ug/L
7440-47-3	Chromium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	2	100.00	ug/L
7440-48-4	Cobalt	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	50	100.00	ug/L
7440-50-8	Copper	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	3	100.00	ug/L
7439-89-6	Iron	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	100	100.00	ug/L
7439-92-1	Lead	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	1	96.12	ug/L
7439-93-2	Lithium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	100	100.00	ug/L
7439-95-4	Magnesium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	5000	100.00	ug/L
7439-96-5	Manganese	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	15	100.00	ug/L
7439-97-6	Mercury	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	0.1	100.00	ug/L
7439-98-7	Molybdenum	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	30	100.00	ug/L
7440-02-0	Nickel	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	20	100.00	ug/L
7440-09-7	Potassium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	5000	100.00	ug/L
7782-49-2	Selenium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	1	54.31	ug/L
7440-22-4	Silver	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	0.1	15.09	ug/L
7440-23-5	Sodium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	5000	100.00	ug/L
[illegible]24-6	Strontium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	200	100.00	ug/L
[illegible]28-0	Thallium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	0.5	15.09	ug/L
7[illegible]0-31-5	Tin	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	200	100.00	ug/L
7440-62-2	Vanadium	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	40	100.00	ug/L
7440-66-6	Zinc	CLP-SOW-Dissolved/Total	CLP-SOW-Dissolved/Total	20	100.00	ug/L
	Total Recoverable Petroleum Hydrocarbons (TRPH)					
	Total Recoverable Petroleum Hydrocarbons (TRPH) in Waters and Liquid Wastes	EPA 418.1	EPA 418.1	1	100.00	mg/L
	Water Quality Parameters (WQPs)					
16887-00-6	Chloride	EPA 300.0	EPA 300.0	0.5	100.00	mg/L
10-30-0	Dissolved Organic Carbon-DOC	EPA 415.1	EPA 415.1	1.0	100.00	mg/L
16984-48-8	Fluoride	EPA 300.0	EPA 300.0	0.5	100.00	mg/L
14797-55-8	Nitrate as N	EPA 300.0	EPA 300.0	0.5	100.00	mg/L
C-005	Nitrate/Nitrite as N (Total)	EPA 353.2	EPA 353.1	0.05	100.00	mg/L
14808-79-8	Sulfate as SO_4^{2-}	EPA 375.1	EPA 375.1	5.0	100.00	mg/L
18496-25-8	Sulfide as S	EPA 376.1	EPA 376.1	0.002	100.00	mg/L
57-12-5	Total Cyanide	EPA 335.3	EPA 335.3	0.005	100.00	mg/L
10-33-3	Total Dissolved Solids-TDS	EPA 160.1	EPA 160.1	10.0	100.00	mg/L
11-59-6	Total Organic Carbon-TOC	EPA 415.1	EPA 415.1	1.0	100.00	mg/L
	Radionuclides					
14596-10-2	Americium-241	Alpha Spectrometry	Alpha Spectrometry	0.03	100.00	pCi/L
	Cesium-137	Gamma Spectrometry	GS EPI A-013	Task Order	NA	pCi/L
	Neptunium-237	Alpha Spectrometry	Alpha Spectrometry	Task Order	NA	pCi/L
10-12-8	Plutonium-239/240	Alpha Spectrometry	Alpha Spectrometry	0.03	98.61	pCi/L
11-10--9	Strontium 89/90	Gas Proportional Counting	Gas Proportional Counting	1.0	100.00	pCi/L
10028-17-8	Tritium	Liquid Scintillation Counting	Liquid Scintillation Counting	400	100.00	pCi/L
11-08-5	Uranium-233/234	Alpha Spectrometry	Alpha Spectrometry	1.0	100.00	pCi/L
15117-96-1	Uranium-235	Alpha Spectrometry	Alpha Spectrometry	1.0	100.00	pCi/L
	Uranium-236*	Alpha Spectrometry	Alpha Spectrometry	Task Order	NA	pCi/L
[illegible]-61-1	Uranium-238	Alpha Spectrometry	Alpha Spectrometry	1.0	100.00	pCi/L

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
		VOCs (SW-846 8260 Method)										
RECRL	99D0269-002.010	1,1,1,2-TETRACHLOROETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1,1,2-TETRACHLOROETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1,1-TRICHLOROETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1,1-TRICHLOROETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1,2,2-TETRACHLOROETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1,2,2-TETRACHLOROETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1,2-TRICHLOROETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1,2-TRICHLOROETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1,2-TRICHLOROTRIFLUOROETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1,2-TRICHLOROTRIFLUOROETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1-DICHLOROETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1-DICHLOROETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1-DICHLOROETHENE	MS2	87	%REC		1		25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1-DICHLOROETHENE	MS1	90	%REC		1		25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1-DICHLOROPROPENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,1-DICHLOROPROPENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,2,3-TRICHLOROBENZENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,2,3-TRICHLOROBENZENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,2,3-TRICHLOROPROPANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,2,3-TRICHLOROPROPANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,2,4-TRICHLOROBENZENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,2,4-TRICHLOROBENZENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,2-DIBROMOETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,2-DIBROMOETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,2-DICHLOROBENZENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,2-DICHLOROBENZENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,2-DICHLOROPROPANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,2-DICHLOROPROPANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,3-DICHLOROBENZENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,3-DICHLOROBENZENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,3-DICHLOROPROPANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,3-DICHLOROPROPANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,4-DICHLOROBENZENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	1,4-DICHLOROBENZENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	2,2-DICHLOROPROPANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	2,2-DICHLOROPROPANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	2-BUTANONE	MS2	250	UG/L	U	1	250	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	2-BUTANONE	MS1	250	UG/L	U	1	250	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	2-HEXANONE	MS2	250	UG/L	U	1	250	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	2-HEXANONE	MS1	250	UG/L	U	1	250	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	4-ISOPROPYLTOLUENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	4-ISOPROPYLTOLUENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	4-METHYL-2-PENTANONE	MS2	250	UG/L	U	1	250	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	4-METHYL-2-PENTANONE	MS1	250	UG/L	U	1	250	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	ACETONE	MS2	35	UG/L	JB	1	250	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	ACETONE	MS1	50	UG/L	JB	1	250	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BENZENE	MS2	95	%REC		1		25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BENZENE	MS1	96	%REC		1		25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BENZENE, 1,2,4-TRIMETHYL	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BENZENE, 1,2,4-TRIMETHYL	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BENZENE, 1,3,5-TRIMETHYL-	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BENZENE, 1,3,5-TRIMETHYL-	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BROMOBENZENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BROMOBENZENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BROMOCHLOROMETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BROMOCHLOROMETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BROMODICHLOROMETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BROMODICHLOROMETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BROMOFORM	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BROMOFORM	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BROMOMETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	BROMOMETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	CARBON DISULFIDE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	CARBON DISULFIDE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	CARBON TETRACHLORIDE	MS2	2500	UG/L		1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	CARBON TETRACHLORIDE	MS1	3800	UG/L		1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	CHLOROBENZENE	MS2	95	%REC		1		25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	CHLOROBENZENE	MS1	97	%REC		1		25	SW-846 8260	9909L125-003	99LVH376

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D0269-002.010	CHLOROETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	CHLOROETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	CHLOROFORM	MS2	1800	UG/L		1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	CHLOROFORM	MS1	1900	UG/L		1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	CHLOROMETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	CHLOROMETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	cis-1,2-DICHLOROETHENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	cis-1,2-DICHLOROETHENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	cis-1,3-DICHLOROPROPENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	cis-1,3-DICHLOROPROPENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	DIBROMOCHLOROMETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	DIBROMOCHLOROMETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	DIBROMOMETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	DIBROMOMETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	DICHLORODIFLUOROMETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	DICHLORODIFLUOROMETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	ETHYLBENZENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	ETHYLBENZENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	HEXACHLOROBUTADIENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	HEXACHLOROBUTADIENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	ISOPROPYLBENZENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	ISOPROPYLBENZENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	METHYLENE CHLORIDE	MS2	190	UG/L	B	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	METHYLENE CHLORIDE	MS1	180	UG/L	B	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	NAPHTHALENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	NAPHTHALENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	n-BUTYLBENZENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	n-BUTYLBENZENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	n-PROPYLBENZENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	n-PROPYLBENZENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	o-CHLOROTOLUENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	o-CHLOROTOLUENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	p-CHLOROTOLUENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	p-CHLOROTOLUENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	sec-BUTYLBENZENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	sec-BUTYLBENZENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	STYRENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	STYRENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	tert-BUTYLBENZENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	tert-BUTYLBENZENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	TETRACHLOROETHENE	MS2	22	UG/L	J	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	TETRACHLOROETHENE	MS1	28	UG/L	J	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	TOLUENE	MS2	92	%REC		1		25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	TOLUENE	MS1	94	%REC		1		25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	TOTAL XYLENES	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	TOTAL XYLENES	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	trans-1,2-DICHLOROETHENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	trans-1,2-DICHLOROETHENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	trans-1,3-DICHLOROPROPENE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	trans-1,3-DICHLOROPROPENE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	TRICHLOROETHENE	MS2	94	%REC		1		25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	TRICHLOROETHENE	MS1	94	%REC		1		25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	TRICHLOROFLUOROMETHANE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	TRICHLOROFLUOROMETHANE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	VINYL CHLORIDE	MS2	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D0269-002.010	VINYL CHLORIDE	MS1	120	UG/L	U	1	120	25	SW-846 8260	9909L125-003	99LVH376
RECRL	99D6287-001.002	1,1,1,2-TETRACHLOROETHANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1,1,2-TETRACHLOROETHANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1,1-TRICHLOROETHANE	MS2	2	UG/L	J		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1,1-TRICHLOROETHANE	MS1	2	UG/L	J		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1,2,2-TETRACHLOROETHANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1,2,2-TETRACHLOROETHANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1,2-TRICHLOROETHANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1,2-TRICHLOROETHANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1,2-TRICHLOROTRIFLUOROETHANE	MS2	1	UG/L	JB		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1,2-TRICHLOROTRIFLUOROETHANE	MS1	1	UG/L	JB		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1-DICHLOROETHANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[illegible]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch [illegible]
RECRL	99D6287-001.002	1,1-DICHLOROETHANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1-DICHLOROETHENE	MS1	79	%REC				1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1-DICHLOROETHENE	MS2	76	%REC				1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1-DICHLOROPROPENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,1-DICHLOROPROPENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,2,3-TRICHLOROBENZENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,2,3-TRICHLOROBENZENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,2,3-TRICHLOROPROPANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,2,3-TRICHLOROPROPANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,2,4-TRICHLOROBENZENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,2,4-TRICHLOROBENZENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,2-DIBROMOETHANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,2-DIBROMOETHANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,2-DICHLOROBENZENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,2-DICHLOROBENZENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,2-DICHLOROPROPANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,2-DICHLOROPROPANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,3-DICHLOROBENZENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,3-DICHLOROBENZENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,3-DICHLOROPROPANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,3-DICHLOROPROPANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,4-DICHLOROBENZENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	1,4-DICHLOROBENZENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	2,2-DICHLOROPROPANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	2,2-DICHLOROPROPANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	2-BUTANONE	MS1	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	2-BUTANONE	MS2	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	2-HEXANONE	MS2	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	2-HEXANONE	MS1	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	4-ISOPROPYLTOLUENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	4-ISOPROPYLTOLUENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
[illegible]RL	99D6287-001.002	4-METHYL-2-PENTANONE	MS2	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LV[illegible]
[illegible]RL	99D6287-001.002	4-METHYL-2-PENTANONE	MS1	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LV[illegible]
RECRL	99D6287-001.002	ACETONE	MS1	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	ACETONE	MS2	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BENZENE	MS2	91	%REC				1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BENZENE	MS1	90	%REC				1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BENZENE, 1,2,4-TRIMETHYL	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BENZENE, 1,2,4-TRIMETHYL	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BENZENE, 1,3,5-TRIMETHYL-	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BROMOBENZENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BROMOBENZENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BROMOCHLOROMETHANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BROMOCHLOROMETHANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BROMODICHLOROMETHANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BROMODICHLOROMETHANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BROMOFORM	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BROMOFORM	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BROMOMETHANE	MS1	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	BROMOMETHANE	MS2	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	CARBON DISULFIDE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	CARBON DISULFIDE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	CARBON TETRACHLORIDE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	CARBON TETRACHLORIDE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	CHLOROBENZENE	MS2	93	%REC				1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	CHLOROBENZENE	MS1	92	%REC				1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	CHLOROETHANE	MS1	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	CHLOROETHANE	MS2	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	CHLOROFORM	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	CHLOROFORM	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	CHLOROMETHANE	MS1	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	CHLOROMETHANE	MS2	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	cis-1,2-DICHLOROETHENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
[illegible]RL	99D6287-001.002	cis-1,2-DICHLOROETHENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH[illegible]
[illegible]RL	99D6287-001.002	cis-1,3-DICHLOROPROPENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LV[illegible]
[illegible]RL	99D6287-001.002	cis-1,3-DICHLOROPROPENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH[illegible]
RECRL	99D6287-001.002	DIBROMOCHLOROMETHANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	DIBROMOCHLOROMETHANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D6287-001.002	DIBROMOMETHANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	DIBROMOMETHANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	DICHLORODIFLUOROMETHANE	MS1	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	DICHLORODIFLUOROMETHANE	MS2	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	ETHYLBENZENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	ETHYLBENZENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	HEXACHLOROBUTADIENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	HEXACHLOROBUTADIENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	ISOPROPYLBENZENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	ISOPROPYLBENZENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	METHYLENE CHLORIDE	MS1	2	UG/L	JB		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	METHYLENE CHLORIDE	MS2	2	UG/L	JB		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	NAPHTHALENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	NAPHTHALENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	n-BUTYLBENZENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	n-BUTYLBENZENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	n-PROPYLBENZENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	n-PROPYLBENZENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	o-CHLOROTOLUENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	o-CHLOROTOLUENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	p-CHLOROTOLUENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	p-CHLOROTOLUENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	sec-BUTYLBENZENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	sec-BUTYLBENZENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	STYRENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	STYRENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	tert-BUTYLBENZENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	tert-BUTYLBENZENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	TETRACHLOROETHENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	TETRACHLOROETHENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	TOLUENE	MS2	92	%REC				1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	TOLUENE	MS1	92	%REC				1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	TOTAL XYLENES	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	TOTAL XYLENES	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	trans-1,2-DICHLOROETHENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	trans-1,2-DICHLOROETHENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	trans-1,3-DICHLOROPROPENE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	trans-1,3-DICHLOROPROPENE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	TRICHLOROETHENE	MS1	81	%REC				1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	TRICHLOROETHENE	MS2	83	%REC				1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	TRICHLOROFLUOROMETHANE	MS1	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	TRICHLOROFLUOROMETHANE	MS2	5	UG/L	U		5	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	VINYL CHLORIDE	MS1	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
RECRL	99D6287-001.002	VINYL CHLORIDE	MS2	10	UG/L	U		10	1	SW-846 8260	9904L593-001	99LVH051
		VOCs (EPA 524.2 Method)										
RECRL	00D0519-006.001	1,1,1,2-TETRACHLOROETHANE	MS1	108	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1,1,2-TETRACHLOROETHANE	MS2	104	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1,1-TRICHLOROETHANE	MS1	126	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1,1-TRICHLOROETHANE	MS2	116	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1,2,2-TETRACHLOROETHANE	MS1	99	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1,2,2-TETRACHLOROETHANE	MS2	95	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1,2-TRICHLOROETHANE	MS1	103	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1,2-TRICHLOROETHANE	MS2	100	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1-DICHLOROETHANE	MS1	115	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1-DICHLOROETHANE	MS2	111	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1-DICHLOROETHENE	MS1	118	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1-DICHLOROETHENE	MS2	107	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1-DICHLOROPROPENE	MS1	113	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,1-DICHLOROPROPENE	MS2	103	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2,3-TRICHLOROBENZENE	MS1	94	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2,3-TRICHLOROBENZENE	MS2	97	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2,3-TRICHLOROPROPANE	MS1	100	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2,3-TRICHLOROPROPANE	MS2	96	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2,4-TRICHLOROBENZENE	MS1	95	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2,4-TRICHLOROBENZENE	MS2	90	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2-DIBROMOETHANE	MS1	98	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2-DIBROMOETHANE	MS2	97	%REC		1		1	EPA 524.2	9910L499-004	99LVK463

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[redacted]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch[redacted]
RECRL	00D0519-006.001	1,2-DICHLOROBENZENE	MS1	102	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2-DICHLOROBENZENE	MS2	100	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2-DICHLOROETHANE	MS1	116	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2-DICHLOROETHANE	MS2	110	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2-DICHLOROPROPANE	MS1	104	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,2-DICHLOROPROPANE	MS2	103	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,3-DICHLOROBENZENE	MS1	101	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,3-DICHLOROBENZENE	MS2	99	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,3-DICHLOROPROPANE	MS1	98	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,3-DICHLOROPROPANE	MS2	95	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,4-DICHLOROBENZENE	MS1	103	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	1,4-DICHLOROBENZENE	MS2	99	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	2,2-DICHLOROPROPANE	MS1	108	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	2,2-DICHLOROPROPANE	MS2	103	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	4-ISOPROPYLTOLUENE	MS1	98	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	4-ISOPROPYLTOLUENE	MS2	95	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BENZENE	MS1	110	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BENZENE	MS2	105	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BENZENE, 1,2,4-TRIMETHYL	MS1	97	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BENZENE, 1,2,4-TRIMETHYL	MS2	93	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BENZENE, 1,3,5-TRIMETHYL-	MS1	103	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BENZENE, 1,3,5-TRIMETHYL-	MS2	100	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BROMOBENZENE	MS1	100	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BROMOBENZENE	MS2	99	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BROMOCHLOROMETHANE	MS1	111	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BROMOCHLOROMETHANE	MS2	106	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BROMODICHLOROMETHANE	MS1	116	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BROMODICHLOROMETHANE	MS2	111	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BROMOFORM	MS1	105	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BROMOFORM	MS2	100	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	BROMOMETHANE	MS1	106	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
[redacted]RL	00D0519-006.001	BROMOMETHANE	MS2	104	%REC		1		1	EPA 524.2	9910L499-004	99LVK[redacted]
[redacted]RL	00D0519-006.001	CARBON TETRACHLORIDE	MS1	0	%REC		1		1	EPA 524.2	9910L499-004	99LV[redacted]
RECRL	00D0519-006.001	CARBON TETRACHLORIDE	MS2	0	%REC		1		1	EPA 524.2	9910L499-004	99LVK[redacted]
RECRL	00D0519-006.001	CHLOROBENZENE	MS1	98	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	CHLOROBENZENE	MS2	94	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	CHLOROETHANE	MS1	84	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	CHLOROETHANE	MS2	109	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	CHLOROFORM	MS1	111	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	CHLOROFORM	MS2	105	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	CHLOROMETHANE	MS1	98	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	CHLOROMETHANE	MS2	97	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	cis-1,2-DICHLOROETHENE	MS1	101	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	cis-1,2-DICHLOROETHENE	MS2	94	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	cis-1,3-DICHLOROPROPENE	MS1	93	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	cis-1,3-DICHLOROPROPENE	MS2	93	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	DIBROMOCHLOROMETHANE	MS1	106	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	DIBROMOCHLOROMETHANE	MS2	108	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	DIBROMOMETHANE	MS1	115	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	DIBROMOMETHANE	MS2	109	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	DICHLORODIFLUOROMETHANE	MS1	102	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	DICHLORODIFLUOROMETHANE	MS2	97	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	ETHYLBENZENE	MS1	101	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	ETHYLBENZENE	MS2	99	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	HEXACHLOROBUTADIENE	MS1	101	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	HEXACHLOROBUTADIENE	MS2	100	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	ISOPROPYLBENZENE	MS1	101	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	ISOPROPYLBENZENE	MS2	97	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	METHYLENE CHLORIDE	MS1	145	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	METHYLENE CHLORIDE	MS2	103	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	NAPHTHALENE	MS1	76	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	NAPHTHALENE	MS2	83	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	n-BUTYLBENZENE	MS1	97	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	n-BUTYLBENZENE	MS2	97	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	n-PROPYLBENZENE	MS1	96	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
[redacted]RL	00D0519-006.001	n-PROPYLBENZENE	MS2	94	%REC		1		1	EPA 524.2	9910L499-004	99LV[redacted]
[redacted]RL	00D0519-006.001	o-CHLOROTOLUENE	MS1	102	%REC		1		1	EPA 524.2	9910L499-004	99LV[redacted]
RECRL	00D0519-006.001	o-CHLOROTOLUENE	MS2	97	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	p-CHLOROTOLUENE	MS1	100	%REC		1		1	EPA 524.2	9910L499-004	99LVK463

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	00D0519-006.001	p-CHLOROTOLUENE	MS2	99	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	107	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	94	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	sec-BUTYLBENZENE	MS1	107	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	sec-BUTYLBENZENE	MS2	102	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	STYRENE	MS1	96	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	STYRENE	MS2	94	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	tert-BUTYLBENZENE	MS1	103	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	tert-BUTYLBENZENE	MS2	98	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	TETRACHLOROETHENE	MS1	31	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	TETRACHLOROETHENE	MS2	20	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	TOLUENE	MS1	98	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	TOLUENE	MS2	97	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	TOTAL XYLENES	MS1	102	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	TOTAL XYLENES	MS2	99	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	trans-1,2-DICHLOROETHENE	MS1	114	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	trans-1,2-DICHLOROETHENE	MS2	108	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	trans-1,3-DICHLOROPROPENE	MS1	94	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	trans-1,3-DICHLOROPROPENE	MS2	91	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	TRICHLOROETHENE	MS1	97	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	TRICHLOROETHENE	MS2	89	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	TRICHLOROFLUOROMETHANE	MS1	119	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	TRICHLOROFLUOROMETHANE	MS2	119	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	VINYL CHLORIDE	MS1	110	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0519-006.001	VINYL CHLORIDE	MS2	105	%REC		1		1	EPA 524.2	9910L499-004	99LVK463
RECRL	00D0536-004.002	1,1,1,2-TETRACHLOROETHANE	MS1	94	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,1,1,2-TETRACHLOROETHANE	MS2	97	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,1,1-TRICHLOROETHANE	MS1	112	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,1,1-TRICHLOROETHANE	MS2	113	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,1,2,2-TETRACHLOROETHANE	MS1	103	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,1,2,2-TETRACHLOROETHANE	MS2	108	%REC				20	EPA 524.2	9910L551-003	99LVK604
[illegible]	00D0536-004.002	1,1,2-TRICHLOROETHANE	MS1	100	%REC				20	EPA 524.2	9910L551-003	99LVK604
[illegible]	00D0536-004.002	1,1,2-TRICHLOROETHANE	MS2	107	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,1-DICHLOROETHANE	MS1	109	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,1-DICHLOROETHANE	MS2	111	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,1-DICHLOROETHENE	MS1	102	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,1-DICHLOROETHENE	MS2	104	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,1-DICHLOROPROPENE	MS1	111	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,1-DICHLOROPROPENE	MS2	111	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2,3-TRICHLOROBENZENE	MS1	92	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2,3-TRICHLOROBENZENE	MS2	97	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2,3-TRICHLOROPROPANE	MS1	102	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2,3-TRICHLOROPROPANE	MS2	108	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2,4-TRICHLOROBENZENE	MS1	88	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2,4-TRICHLOROBENZENE	MS2	92	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2-DIBROMOETHANE	MS1	93	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2-DIBROMOETHANE	MS2	100	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2-DICHLOROBENZENE	MS1	91	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2-DICHLOROBENZENE	MS2	99	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2-DICHLOROETHANE	MS1	126	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2-DICHLOROETHANE	MS2	135	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2-DICHLOROPROPANE	MS1	113	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,2-DICHLOROPROPANE	MS2	123	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,3-DICHLOROBENZENE	MS1	92	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,3-DICHLOROBENZENE	MS2	96	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,3-DICHLOROPROPANE	MS1	97	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,3-DICHLOROPROPANE	MS2	105	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,4-DICHLOROBENZENE	MS1	93	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	1,4-DICHLOROBENZENE	MS2	101	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	2,2-DICHLOROPROPANE	MS1	115	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	2,2-DICHLOROPROPANE	MS2	116	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	4-ISOPROPYLTOLUENE	MS1	92	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	4-ISOPROPYLTOLUENE	MS2	95	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	BENZENE	MS1	109	%REC				20	EPA 524.2	9910L551-003	99LVK604
[illegible]	00D0536-004.002	BENZENE	MS2	112	%REC				20	EPA 524.2	9910L551-003	99LVK604
[illegible]	00D0536-004.002	BENZENE, 1,2,4-TRIMETHYL	MS1	95	%REC				20	EPA 524.2	9910L551-003	99LVK604
[illegible]	00D0536-004.002	BENZENE, 1,2,4-TRIMETHYL	MS2	102	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	92	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	BENZENE, 1,3,5-TRIMETHYL-	MS2	96	%REC				20	EPA 524.2	9910L551-003	99LVK604

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
RECRL	00D0536-004.002	BROMOBENZENE	MS1	100	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	BROMOBENZENE	MS2	102	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	BROMOCHLOROMETHANE	MS1	106	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	BROMOCHLOROMETHANE	MS2	108	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	BROMODICHLOROMETHANE	MS1	120	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	BROMODICHLOROMETHANE	MS2	125	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	BROMOFORM	MS1	95	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	BROMOFORM	MS2	98	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	BROMOMETHANE	MS1	101	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	BROMOMETHANE	MS2	104	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	CARBON TETRACHLORIDE	MS1	112	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	CARBON TETRACHLORIDE	MS2	114	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	CHLOROBENZENE	MS1	88	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	CHLOROBENZENE	MS2	93	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	CHLOROETHANE	MS1	109	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	CHLOROETHANE	MS2	84	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	CHLOROFORM	MS1	115	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	CHLOROFORM	MS2	120	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	CHLOROMETHANE	MS1	98	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	CHLOROMETHANE	MS2	110	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	cis-1,2-DICHLOROETHENE	MS1	62	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	cis-1,2-DICHLOROETHENE	MS2	88	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	cis-1,3-DICHLOROPROPENE	MS1	91	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	cis-1,3-DICHLOROPROPENE	MS2	94	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	DIBROMOCHLOROMETHANE	MS1	97	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	DIBROMOCHLOROMETHANE	MS2	101	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	DIBROMOMETHANE	MS1	105	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	DIBROMOMETHANE	MS2	116	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	DICHLORODIFLUOROMETHANE	MS1	98	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	DICHLORODIFLUOROMETHANE	MS2	102	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	ETHYLBENZENE	MS1	91	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	ETHYLBENZENE	MS2	95	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	HEXACHLOROBUTADIENE	MS1	86	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	HEXACHLOROBUTADIENE	MS2	87	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	ISOPROPYLBENZENE	MS1	91	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	ISOPROPYLBENZENE	MS2	92	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	METHYLENE CHLORIDE	MS1	153	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	METHYLENE CHLORIDE	MS2	166	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	NAPHTHALENE	MS1	76	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	NAPHTHALENE	MS2	83	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	n-BUTYLBENZENE	MS1	85	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	n-BUTYLBENZENE	MS2	89	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	n-PROPYLBENZENE	MS1	91	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	n-PROPYLBENZENE	MS2	97	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	o-CHLOROTOLUENE	MS1	91	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	o-CHLOROTOLUENE	MS2	94	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	p-CHLOROTOLUENE	MS1	94	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	p-CHLOROTOLUENE	MS2	97	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	97	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	94	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	sec-BUTYLBENZENE	MS1	88	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	sec-BUTYLBENZENE	MS2	92	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	STYRENE	MS1	94	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	STYRENE	MS2	95	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	tert-BUTYLBENZENE	MS1	88	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	tert-BUTYLBENZENE	MS2	90	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	TETRACHLOROETHENE	MS1	79	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	TETRACHLOROETHENE	MS2	83	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	TOLUENE	MS1	88	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	TOLUENE	MS2	91	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	TOTAL XYLENES	MS1	94	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	TOTAL XYLENES	MS2	96	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	trans-1,2-DICHLOROETHENE	MS1	105	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	trans-1,2-DICHLOROETHENE	MS2	108	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	trans-1,3-DICHLOROPROPENE	MS1	99	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	trans-1,3-DICHLOROPROPENE	MS2	105	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	TRICHLOROETHENE	MS1	44	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	TRICHLOROETHENE	MS2	70	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	TRICHLOROFLUOROMETHANE	MS1	101	%REC				20	EPA 524.2	9910L551-003	99LVK604

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	00D0536-004.002	TRICHLOROFLUOROMETHANE	MS2	117	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	VINYL CHLORIDE	MS1	104	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0536-004.002	VINYL CHLORIDE	MS2	113	%REC				20	EPA 524.2	9910L551-003	99LVK604
RECRL	00D0681-007.001	1,1,1,2-TETRACHLOROETHANE	MS1	108	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1,1,2-TETRACHLOROETHANE	MS2	104	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1,1-TRICHLOROETHANE	MS1	119	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1,1-TRICHLOROETHANE	MS2	112	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1,2,2-TETRACHLOROETHANE	MS1	107	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1,2,2-TETRACHLOROETHANE	MS2	101	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1,2-TRICHLOROETHANE	MS1	117	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1,2-TRICHLOROETHANE	MS2	113	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1-DICHLOROETHANE	MS1	114	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1-DICHLOROETHANE	MS2	109	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1-DICHLOROETHENE	MS1	113	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1-DICHLOROETHENE	MS2	101	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1-DICHLOROPROPENE	MS1	111	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,1-DICHLOROPROPENE	MS2	112	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2,3-TRICHLOROBENZENE	MS1	88	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2,3-TRICHLOROBENZENE	MS2	90	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2,3-TRICHLOROPROPANE	MS1	97	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2,3-TRICHLOROPROPANE	MS2	102	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2,4-TRICHLOROBENZENE	MS1	91	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2,4-TRICHLOROBENZENE	MS2	85	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2-DIBROMOETHANE	MS1	101	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2-DIBROMOETHANE	MS2	98	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2-DICHLOROBENZENE	MS1	98	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2-DICHLOROBENZENE	MS2	96	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2-DICHLOROETHANE	MS1	119	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2-DICHLOROETHANE	MS2	116	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2-DICHLOROPROPANE	MS1	104	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,2-DICHLOROPROPANE	MS2	102	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,3-DICHLOROBENZENE	MS1	102	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,3-DICHLOROBENZENE	MS2	99	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,3-DICHLOROPROPANE	MS1	105	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,3-DICHLOROPROPANE	MS2	101	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,4-DICHLOROBENZENE	MS1	98	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	1,4-DICHLOROBENZENE	MS2	99	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	2,2-DICHLOROPROPANE	MS1	114	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	2,2-DICHLOROPROPANE	MS2	108	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	4-ISOPROPYLTOLUENE	MS1	105	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	4-ISOPROPYLTOLUENE	MS2	102	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BENZENE	MS1	106	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BENZENE	MS2	104	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BENZENE, 1,2,4-TRIMETHYL	MS1	102	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BENZENE, 1,2,4-TRIMETHYL	MS2	99	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BENZENE, 1,3,5-TRIMETHYL-	MS1	106	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BENZENE, 1,3,5-TRIMETHYL-	MS2	100	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BROMOBENZENE	MS1	103	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BROMOBENZENE	MS2	103	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BROMOCHLOROMETHANE	MS1	105	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BROMOCHLOROMETHANE	MS2	103	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BROMODICHLOROMETHANE	MS1	111	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BROMODICHLOROMETHANE	MS2	108	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BROMOFORM	MS1	98	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BROMOFORM	MS2	93	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BROMOMETHANE	MS1	138	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	BROMOMETHANE	MS2	115	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	CARBON TETRACHLORIDE	MS1	115	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	CARBON TETRACHLORIDE	MS2	112	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	CHLOROBENZENE	MS1	102	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	CHLOROBENZENE	MS2	96	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	CHLOROETHANE	MS1	127	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	CHLOROETHANE	MS2	109	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	CHLOROFORM	MS1	113	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	CHLOROFORM	MS2	111	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	CHLOROMETHANE	MS1	110	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	CHLOROMETHANE	MS2	100	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	cis-1,2-DICHLOROETHENE	MS1	106	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	cis-1,2-DICHLOROETHENE	MS2	98	%REC		1		250	EPA 524.2	9911L655-006	99LVK625

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[illegible]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch [illegible]
RECRL	00D0681-007.001	cis-1,3-DICHLOROPROPENE	MS1	98	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	cis-1,3-DICHLOROPROPENE	MS2	93	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	DIBROMOCHLOROMETHANE	MS1	105	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	DIBROMOCHLOROMETHANE	MS2	102	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	DIBROMOMETHANE	MS1	104	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	DIBROMOMETHANE	MS2	106	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	DICHLORODIFLUOROMETHANE	MS1	111	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	DICHLORODIFLUOROMETHANE	MS2	100	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	ETHYLBENZENE	MS1	105	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	ETHYLBENZENE	MS2	101	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	HEXACHLOROBUTADIENE	MS1	98	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	HEXACHLOROBUTADIENE	MS2	96	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	ISOPROPYLBENZENE	MS1	103	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	ISOPROPYLBENZENE	MS2	99	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	METHYLENE CHLORIDE	MS1	176	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	METHYLENE CHLORIDE	MS2	158	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	NAPHTHALENE	MS1	79	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	NAPHTHALENE	MS2	82	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	n-BUTYLBENZENE	MS1	100	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	n-BUTYLBENZENE	MS2	99	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	n-PROPYLBENZENE	MS1	105	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	n-PROPYLBENZENE	MS2	102	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	o-CHLOROTOLUENE	MS1	103	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	o-CHLOROTOLUENE	MS2	98	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	p-CHLOROTOLUENE	MS1	103	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	p-CHLOROTOLUENE	MS2	101	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	88	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	98	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	sec-BUTYLBENZENE	MS1	102	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	sec-BUTYLBENZENE	MS2	104	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	STYRENE	MS1	103	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
[illegible]RL	00D0681-007.001	STYRENE	MS2	97	%REC		1		250	EPA 524.2	9911L655-006	99LVK[illegible]
[illegible]RL	00D0681-007.001	tert-BUTYLBENZENE	MS1	100	%REC		1		250	EPA 524.2	9911L655-006	99LV[illegible]
[illegible]RL	00D0681-007.001	tert-BUTYLBENZENE	MS2	97	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	TETRACHLOROETHENE	MS1	0	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	TETRACHLOROETHENE	MS2	0	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	TOLUENE	MS1	102	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	TOLUENE	MS2	97	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	TOTAL XYLENES	MS1	103	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	TOTAL XYLENES	MS2	97	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	trans-1,2-DICHLOROETHENE	MS1	99	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	trans-1,2-DICHLOROETHENE	MS2	97	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	trans-1,3-DICHLOROPROPENE	MS1	99	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	trans-1,3-DICHLOROPROPENE	MS2	97	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	TRICHLOROETHENE	MS1	90	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	TRICHLOROETHENE	MS2	82	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	TRICHLOROFLUOROMETHANE	MS1	125	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	TRICHLOROFLUOROMETHANE	MS2	117	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	VINYL CHLORIDE	MS1	118	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0681-007.001	VINYL CHLORIDE	MS2	89	%REC		1		250	EPA 524.2	9911L655-006	99LVK625
RECRL	00D0722-017.002	1,1,1,2-TETRACHLOROETHANE	MS1	105	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1,1,2-TETRACHLOROETHANE	MS2	104	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1,1-TRICHLOROETHANE	MS1	105	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1,1-TRICHLOROETHANE	MS2	101	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1,2,2-TETRACHLOROETHANE	MS1	100	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1,2,2-TETRACHLOROETHANE	MS2	102	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1,2-TRICHLOROETHANE	MS1	115	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1,2-TRICHLOROETHANE	MS2	113	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1-DICHLOROETHANE	MS1	100	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1-DICHLOROETHANE	MS2	95	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1-DICHLOROETHENE	MS1	73	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1-DICHLOROETHENE	MS2	52	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1-DICHLOROPROPENE	MS1	103	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,1-DICHLOROPROPENE	MS2	103	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,2,3-TRICHLOROBENZENE	MS1	87	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
[illegible]RL	00D0722-017.002	1,2,3-TRICHLOROBENZENE	MS2	97	%REC		1		50	EPA 524.2	9911L704-012	99LV[illegible]
[illegible]RL	00D0722-017.002	1,2,3-TRICHLOROPROPANE	MS1	100	%REC		1		50	EPA 524.2	9911L704-012	99LVK[illegible]
RECRL	00D0722-017.002	1,2,3-TRICHLOROPROPANE	MS2	101	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,2,4-TRICHLOROBENZENE	MS1	86	%REC		1		50	EPA 524.2	9911L704-012	99LVK625

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	00D0722-017.002	1,2,4-TRICHLOROBENZENE	MS2	95	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,2-DIBROMOETHANE	MS1	97	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,2-DIBROMOETHANE	MS2	98	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,2-DICHLOROBENZENE	MS1	97	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,2-DICHLOROBENZENE	MS2	101	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,2-DICHLOROETHANE	MS1	115	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,2-DICHLOROETHANE	MS2	111	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,2-DICHLOROPROPANE	MS1	103	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,2-DICHLOROPROPANE	MS2	99	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,3-DICHLOROBENZENE	MS1	98	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,3-DICHLOROBENZENE	MS2	101	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,3-DICHLOROPROPANE	MS1	99	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,3-DICHLOROPROPANE	MS2	98	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,4-DICHLOROBENZENE	MS1	96	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	1,4-DICHLOROBENZENE	MS2	100	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	2,2-DICHLOROPROPANE	MS1	109	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	2,2-DICHLOROPROPANE	MS2	103	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	4-ISOPROPYLTOLUENE	MS1	100	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	4-ISOPROPYLTOLUENE	MS2	101	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BENZENE	MS1	106	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BENZENE	MS2	100	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BENZENE, 1,2,4-TRIMETHYL	MS1	99	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BENZENE, 1,2,4-TRIMETHYL	MS2	99	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	101	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BENZENE, 1,3,5-TRIMETHYL-	MS2	101	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BROMOBENZENE	MS1	102	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BROMOBENZENE	MS2	98	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BROMOCHLOROMETHANE	MS1	100	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BROMOCHLOROMETHANE	MS2	104	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BROMODICHLOROMETHANE	MS1	109	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BROMODICHLOROMETHANE	MS2	108	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BROMOFORM	MS1	96	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BROMOFORM	MS2	94	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BROMOMETHANE	MS1	112	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	BROMOMETHANE	MS2	108	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	CARBON TETRACHLORIDE	MS1	112	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	CARBON TETRACHLORIDE	MS2	108	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	CHLOROBENZENE	MS1	96	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	CHLOROBENZENE	MS2	97	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	CHLOROETHANE	MS1	92	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	CHLOROETHANE	MS2	94	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	CHLOROFORM	MS1	104	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	CHLOROFORM	MS2	100	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	CHLOROMETHANE	MS1	81	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	CHLOROMETHANE	MS2	81	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	cis-1,2-DICHLOROETHENE	MS1	22	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	cis-1,2-DICHLOROETHENE	MS2	0	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	cis-1,3-DICHLOROPROPENE	MS1	95	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	cis-1,3-DICHLOROPROPENE	MS2	97	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	DIBROMOCHLOROMETHANE	MS1	101	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	DIBROMOCHLOROMETHANE	MS2	103	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	DIBROMOMETHANE	MS1	103	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	DIBROMOMETHANE	MS2	102	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	DICHLORODIFLUOROMETHANE	MS1	61	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	DICHLORODIFLUOROMETHANE	MS2	60	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	ETHYLBENZENE	MS1	103	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	ETHYLBENZENE	MS2	99	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	HEXACHLOROBUTADIENE	MS1	93	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	HEXACHLOROBUTADIENE	MS2	97	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	ISOPROPYLBENZENE	MS1	98	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	ISOPROPYLBENZENE	MS2	99	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	METHYLENE CHLORIDE	MS1	154	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	METHYLENE CHLORIDE	MS2	114	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	NAPHTHALENE	MS1	75	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	NAPHTHALENE	MS2	85	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	n-BUTYLBENZENE	MS1	98	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	n-BUTYLBENZENE	MS2	97	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	n-PROPYLBENZENE	MS1	99	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	n-PROPYLBENZENE	MS2	102	%REC		1		50	EPA 524.2	9911L704-012	99LVK625

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
RECRL	00D0722-017.002	o-CHLOROTOLUENE	MS1	97	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	o-CHLOROTOLUENE	MS2	98	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	p-CHLOROTOLUENE	MS1	96	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	p-CHLOROTOLUENE	MS2	104	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	92	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	93	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	sec-BUTYLBENZENE	MS1	103	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	sec-BUTYLBENZENE	MS2	96	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	STYRENE	MS1	96	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	STYRENE	MS2	98	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	tert-BUTYLBENZENE	MS1	85	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	tert-BUTYLBENZENE	MS2	99	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	TETRACHLOROETHENE	MS1	0	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	TETRACHLOROETHENE	MS2	0	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	TOLUENE	MS1	99	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	TOLUENE	MS2	101	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	TOTAL XYLENES	MS1	97	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	TOTAL XYLENES	MS2	0	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	trans-1,2-DICHLOROETHENE	MS1	104	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	trans-1,2-DICHLOROETHENE	MS2	104	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	trans-1,3-DICHLOROPROPENE	MS1	96	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	trans-1,3-DICHLOROPROPENE	MS2	98	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	TRICHLOROETHENE	MS1	0	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	TRICHLOROETHENE	MS2	0	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	TRICHLOROFLUOROMETHANE	MS1	119	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	TRICHLOROFLUOROMETHANE	MS2	112	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	VINYL CHLORIDE	MS1	94	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0722-017.002	VINYL CHLORIDE	MS2	90	%REC		1		50	EPA 524.2	9911L704-012	99LVK625
RECRL	00D0836-004.002	1,1,1,2-TETRACHLOROETHANE	MS1	110	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1,1,2-TETRACHLOROETHANE	MS2	112	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1,1-TRICHLOROETHANE	MS1	114	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1,1-TRICHLOROETHANE	MS2	115	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1,2,2-TETRACHLOROETHANE	MS1	113	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1,2,2-TETRACHLOROETHANE	MS2	111	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1,2-TRICHLOROETHANE	MS1	119	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1,2-TRICHLOROETHANE	MS2	121	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1-DICHLOROETHANE	MS1	103	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1-DICHLOROETHANE	MS2	105	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1-DICHLOROETHENE	MS1	93	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1-DICHLOROETHENE	MS2	99	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1-DICHLOROPROPENE	MS1	99	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,1-DICHLOROPROPENE	MS2	100	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2,3-TRICHLOROBENZENE	MS1	105	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2,3-TRICHLOROBENZENE	MS2	108	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2,3-TRICHLOROPROPANE	MS1	111	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2,3-TRICHLOROPROPANE	MS2	111	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2,4-TRICHLOROBENZENE	MS1	103	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2,4-TRICHLOROBENZENE	MS2	101	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2-DIBROMOETHANE	MS1	108	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2-DIBROMOETHANE	MS2	108	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2-DICHLOROBENZENE	MS1	107	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2-DICHLOROBENZENE	MS2	114	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2-DICHLOROETHANE	MS1	112	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2-DICHLOROETHANE	MS2	106	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2-DICHLOROPROPANE	MS1	101	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,2-DICHLOROPROPANE	MS2	104	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,3-DICHLOROBENZENE	MS1	110	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,3-DICHLOROBENZENE	MS2	115	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,3-DICHLOROPROPANE	MS1	108	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,3-DICHLOROPROPANE	MS2	108	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,4-DICHLOROBENZENE	MS1	110	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	1,4-DICHLOROBENZENE	MS2	116	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	2,2-DICHLOROPROPANE	MS1	87	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	2,2-DICHLOROPROPANE	MS2	83	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	4-ISOPROPYLTOLUENE	MS1	111	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	4-ISOPROPYLTOLUENE	MS2	112	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BENZENE	MS1	96	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BENZENE	MS2	100	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BENZENE, 1,2,4-TRIMETHYL	MS1	110	%REC				20	EPA 524.2	9912L867-002	99LVK739

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	00D0836-004.002	BENZENE, 1,2,4-TRIMETHYL	MS2	107	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	111	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BENZENE, 1,3,5-TRIMETHYL-	MS2	113	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BROMOBENZENE	MS1	113	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BROMOBENZENE	MS2	120	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BROMOCHLOROMETHANE	MS1	96	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BROMOCHLOROMETHANE	MS2	100	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BROMODICHLOROMETHANE	MS1	106	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BROMODICHLOROMETHANE	MS2	109	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BROMOFORM	MS1	103	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BROMOFORM	MS2	107	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BROMOMETHANE	MS1	95	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	BROMOMETHANE	MS2	97	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	CARBON TETRACHLORIDE	MS1	56	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	CARBON TETRACHLORIDE	MS2	71	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	CHLOROBENZENE	MS1	107	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	CHLOROBENZENE	MS2	107	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	CHLOROETHANE	MS1	81	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	CHLOROETHANE	MS2	86	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	CHLOROFORM	MS1	106	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	CHLOROFORM	MS2	105	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	CHLOROMETHANE	MS1	86	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	CHLOROMETHANE	MS2	104	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	cis-1,2-DICHLOROETHENE	MS1	97	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	cis-1,2-DICHLOROETHENE	MS2	96	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	cis-1,3-DICHLOROPROPENE	MS1	100	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	cis-1,3-DICHLOROPROPENE	MS2	100	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	DIBROMOCHLOROMETHANE	MS1	109	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	DIBROMOCHLOROMETHANE	MS2	109	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	DIBROMOMETHANE	MS1	95	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	DIBROMOMETHANE	MS2	96	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	DICHLORODIFLUOROMETHANE	MS1	100	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	DICHLORODIFLUOROMETHANE	MS2	90	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	ETHYLBENZENE	MS1	107	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	ETHYLBENZENE	MS2	114	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	HEXACHLOROBUTADIENE	MS1	102	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	HEXACHLOROBUTADIENE	MS2	104	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	ISOPROPYLBENZENE	MS1	108	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	ISOPROPYLBENZENE	MS2	110	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	METHYLENE CHLORIDE	MS1	47	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	METHYLENE CHLORIDE	MS2	64	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	NAPHTHALENE	MS1	99	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	NAPHTHALENE	MS2	105	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	n-BUTYLBENZENE	MS1	106	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	n-BUTYLBENZENE	MS2	111	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	n-PROPYLBENZENE	MS1	108	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	n-PROPYLBENZENE	MS2	113	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	o-CHLOROTOLUENE	MS1	106	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	o-CHLOROTOLUENE	MS2	112	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	p-CHLOROTOLUENE	MS1	110	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	p-CHLOROTOLUENE	MS2	110	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	111	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	117	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	sec-BUTYLBENZENE	MS1	109	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	sec-BUTYLBENZENE	MS2	108	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	STYRENE	MS1	104	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	STYRENE	MS2	108	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	tert-BUTYLBENZENE	MS1	111	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	tert-BUTYLBENZENE	MS2	110	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	TETRACHLOROETHENE	MS1	56	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	TETRACHLOROETHENE	MS2	68	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	TOLUENE	MS1	107	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	TOLUENE	MS2	109	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	TOTAL XYLENES	MS1	108	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	TOTAL XYLENES	MS2	110	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	trans-1,2-DICHLOROETHENE	MS1	95	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	trans-1,2-DICHLOROETHENE	MS2	97	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	trans-1,3-DICHLOROPROPENE	MS1	100	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	trans-1,3-DICHLOROPROPENE	MS2	103	%REC				20	EPA 524.2	9912L867-002	99LVK739

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[illegible]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch [illegible]
RECRL	00D0836-004.002	TRICHLOROETHENE	MS1	93	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	TRICHLOROETHENE	MS2	90	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	TRICHLOROFLUOROMETHANE	MS1	112	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	TRICHLOROFLUOROMETHANE	MS2	103	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	VINYL CHLORIDE	MS1	98	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	00D0836-004.002	VINYL CHLORIDE	MS2	105	%REC				20	EPA 524.2	9912L867-002	99LVK739
RECRL	99D0120-001.001	1,1,1,2-TETRACHLOROETHANE	MS1	110	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1,1,2-TETRACHLOROETHANE	MS2	108	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1,1-TRICHLOROETHANE	MS1	116	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1,1-TRICHLOROETHANE	MS2	119	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1,2,2-TETRACHLOROETHANE	MS1	107	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1,2,2-TETRACHLOROETHANE	MS2	106	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1,2-TRICHLOROETHANE	MS1	103	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1,2-TRICHLOROETHANE	MS2	102	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1-DICHLOROETHANE	MS1	123	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1-DICHLOROETHANE	MS2	126	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1-DICHLOROETHENE	MS1	115	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1-DICHLOROETHENE	MS2	119	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1-DICHLOROPROPENE	MS1	111	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,1-DICHLOROPROPENE	MS2	117	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,2,3-TRICHLOROBENZENE	MS1	87	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,2,3-TRICHLOROBENZENE	MS2	93	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,2,3-TRICHLOROPROPANE	MS1	96	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,2,3-TRICHLOROPROPANE	MS2	101	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,2,4-TRICHLOROBENZENE	MS1	97	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,2,4-TRICHLOROBENZENE	MS2	97	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,2-DIBROMOETHANE	MS1	106	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,2-DIBROMOETHANE	MS2	101	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,2-DICHLOROBENZENE	MS1	107	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,2-DICHLOROBENZENE	MS2	109	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,2-DICHLOROETHANE	MS1	110	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,2-DICHLOROETHANE	MS2	105	%REC		1		1	EPA 524.2	9909L986-001	99LVK[illegible]
RECRL	99D0120-001.001	1,2-DICHLOROPROPANE	MS1	108	%REC		1		1	EPA 524.2	9909L986-001	99LV[illegible]
RECRL	99D0120-001.001	1,2-DICHLOROPROPANE	MS2	108	%REC		1		1	EPA 524.2	9909L986-001	99LVK[illegible]
RECRL	99D0120-001.001	1,3-DICHLOROBENZENE	MS1	111	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,3-DICHLOROBENZENE	MS2	112	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,3-DICHLOROPROPANE	MS1	99	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,3-DICHLOROPROPANE	MS2	99	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,4-DICHLOROBENZENE	MS1	108	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	1,4-DICHLOROBENZENE	MS2	109	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	2,2-DICHLOROPROPANE	MS1	107	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	2,2-DICHLOROPROPANE	MS2	111	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	4-ISOPROPYLTOLUENE	MS1	112	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	4-ISOPROPYLTOLUENE	MS2	113	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BENZENE	MS1	108	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BENZENE	MS2	113	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BENZENE, 1,2,4-TRIMETHYL	MS1	122	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BENZENE, 1,2,4-TRIMETHYL	MS2	119	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BENZENE, 1,3,5-TRIMETHYL-	MS1	115	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BENZENE, 1,3,5-TRIMETHYL-	MS2	112	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BROMOBENZENE	MS1	108	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BROMOBENZENE	MS2	104	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BROMOCHLOROMETHANE	MS1	106	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BROMOCHLOROMETHANE	MS2	120	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BROMODICHLOROMETHANE	MS1	115	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BROMODICHLOROMETHANE	MS2	116	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BROMOFORM	MS1	109	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BROMOFORM	MS2	109	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BROMOMETHANE	MS1	111	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	BROMOMETHANE	MS2	121	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	CARBON TETRACHLORIDE	MS1	124	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	CARBON TETRACHLORIDE	MS2	127	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	CHLOROBENZENE	MS1	107	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	CHLOROBENZENE	MS2	105	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	CHLOROETHANE	MS1	124	%REC		1		1	EPA 524.2	9909L986-001	99LVK[illegible]
RECRL	99D0120-001.001	CHLOROETHANE	MS2	132	%REC		1		1	EPA 524.2	9909L986-001	99LV[illegible]
RECRL	99D0120-001.001	CHLOROFORM	MS1	116	%REC		1		1	EPA 524.2	9909L986-001	99LV[illegible]
RECRL	99D0120-001.001	CHLOROFORM	MS2	118	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	CHLOROMETHANE	MS1	107	%REC		1		1	EPA 524.2	9909L986-001	99LVK363

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D0120-001.001	CHLOROMETHANE	MS2	106	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	cis-1,2-DICHLOROETHENE	MS1	112	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	cis-1,2-DICHLOROETHENE	MS2	118	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	cis-1,3-DICHLOROPROPENE	MS1	103	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	cis-1,3-DICHLOROPROPENE	MS2	98	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	DIBROMOCHLOROMETHANE	MS1	114	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	DIBROMOCHLOROMETHANE	MS2	111	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	DIBROMOMETHANE	MS1	97	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	DIBROMOMETHANE	MS2	80	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	DICHLORODIFLUOROMETHANE	MS1	96	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	DICHLORODIFLUOROMETHANE	MS2	99	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	ETHYLBENZENE	MS1	115	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	ETHYLBENZENE	MS2	113	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	HEXACHLOROBUTADIENE	MS1	108	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	HEXACHLOROBUTADIENE	MS2	63	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	ISOPROPYLBENZENE	MS1	116	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	ISOPROPYLBENZENE	MS2	108	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	METHYLENE CHLORIDE	MS1	127	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	METHYLENE CHLORIDE	MS2	127	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	NAPHTHALENE	MS1	72	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	NAPHTHALENE	MS2	82	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	n-BUTYLBENZENE	MS1	112	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	n-BUTYLBENZENE	MS2	110	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	n-PROPYLBENZENE	MS1	120	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	n-PROPYLBENZENE	MS2	116	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	o-CHLOROTOLUENE	MS1	115	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	o-CHLOROTOLUENE	MS2	112	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	p-CHLOROTOLUENE	MS1	116	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	p-CHLOROTOLUENE	MS2	110	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	104	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	103	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
[illegible]	99D0120-001.001	sec-BUTYLBENZENE	MS1	114	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
[illegible]	99D0120-001.001	sec-BUTYLBENZENE	MS2	110	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	STYRENE	MS1	108	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	STYRENE	MS2	107	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	tert-BUTYLBENZENE	MS1	104	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	tert-BUTYLBENZENE	MS2	109	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	TETRACHLOROETHENE	MS1	118	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	TETRACHLOROETHENE	MS2	114	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	TOLUENE	MS1	109	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	TOLUENE	MS2	105	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	TOTAL XYLENES	MS1	114	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	TOTAL XYLENES	MS2	113	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	trans-1,2-DICHLOROETHENE	MS1	127	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	trans-1,2-DICHLOROETHENE	MS2	124	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	trans-1,3-DICHLOROPROPENE	MS1	97	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	trans-1,3-DICHLOROPROPENE	MS2	94	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	TRICHLOROETHENE	MS1	111	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	TRICHLOROETHENE	MS2	113	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	TRICHLOROFLUOROMETHANE	MS1	129	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	TRICHLOROFLUOROMETHANE	MS2	133	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	VINYL CHLORIDE	MS1	111	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
RECRL	99D0120-001.001	VINYL CHLORIDE	MS2	118	%REC		1		1	EPA 524.2	9909L986-001	99LVK363
GEL	99D4879-002.002	1,1,1,2-TETRACHLOROETHANE	MD1	10.4	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,1,1,2-TETRACHLOROETHANE	MS1	10.7	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,1,1-TRICHLOROETHANE	MD1	10.3	UG/L			0.2	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,1,1-TRICHLOROETHANE	MS1	10.5	UG/L			0.2	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,1,2,2-TETRACHLOROETHANE	MD1	8.7	UG/L			0.5	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,1,2,2-TETRACHLOROETHANE	MS1	8.2	UG/L			0.5	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,1,2-TRICHLOROETHANE	MD1	9.2	UG/L			0.4	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,1,2-TRICHLOROETHANE	MS1	9.4	UG/L			0.4	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,1-DICHLOROETHANE	MD1	9.7	UG/L			0.4	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,1-DICHLOROETHANE	MS1	9.9	UG/L			0.4	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,1-DICHLOROETHENE	MD1	11	UG/L			0.7	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,1-DICHLOROETHENE	MS1	11.6	UG/L			0.7	1	EPA 524.2	QC582412	141612
[illegible]	99D4879-002.002	1,1-DICHLOROPROPENE	MD1	10.2	UG/L			0.3	1	EPA 524.2	QC582413	141612
[illegible]	99D4879-002.002	1,1-DICHLOROPROPENE	MS1	10.2	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,2,3-TRICHLOROBENZENE	MD1	11.4	UG/L			0.7	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,2,3-TRICHLOROBENZENE	MS1	11	UG/L			0.7	1	EPA 524.2	QC582412	141612

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[illegible]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch [illegible]
GEL	99D4879-002.002	1,2,3-TRICHLOROPROPANE	MD1	9.7	UG/L			0.5	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,2,3-TRICHLOROPROPANE	MS1	9.2	UG/L			0.5	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,2,4-TRICHLOROBENZENE	MD1	11.3	UG/L			0.6	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,2,4-TRICHLOROBENZENE	MS1	11	UG/L			0.6	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,2-DIBROMOETHANE	MD1	9.3	UG/L			0.4	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,2-DIBROMOETHANE	MS1	9.3	UG/L			0.4	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,2-DICHLOROBENZENE	MD1	10.3	UG/L			0.4	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,2-DICHLOROBENZENE	MS1	10.4	UG/L			0.4	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,2-DICHLOROETHANE	MD1	9.4	UG/L			0.2	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,2-DICHLOROETHANE	MS1	9.4	UG/L			0.2	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,2-DICHLOROPROPANE	MD1	9.7	UG/L			0.2	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,2-DICHLOROPROPANE	MS1	10	UG/L			0.2	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,3-DICHLOROBENZENE	MD1	10.9	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,3-DICHLOROBENZENE	MS1	11.1	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,3-DICHLOROPROPANE	MD1	9.4	UG/L			0.1	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,3-DICHLOROPROPANE	MS1	9.6	UG/L			0.1	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	1,4-DICHLOROBENZENE	MD1	11.1	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	1,4-DICHLOROBENZENE	MS1	11.2	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	2,2-DICHLOROPROPANE	MD1	9.8	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	2,2-DICHLOROPROPANE	MS1	10	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	4-ISOPROPYLTOLUENE	MD1	10.3	UG/L			1	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	4-ISOPROPYLTOLUENE	MS1	10.6	UG/L			1	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	BENZENE	MD1	9.9	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	BENZENE	MS1	10.2	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	BENZENE, 1,2,4-TRIMETHYL	MD1	9.7	UG/L			0.2	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	BENZENE, 1,2,4-TRIMETHYL	MS1	9.9	UG/L			0.2	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	BENZENE, 1,3,5-TRIMETHYL-	MD1	9.2	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	9.3	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	BROMOBENZENE	MD1	10.3	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	BROMOBENZENE	MS1	10.4	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	BROMOCHLOROMETHANE	MD1	10	UG/L			0.6	1	EPA 524.2	QC582413	141612
[illegible]	99D4879-002.002	BROMOCHLOROMETHANE	MS1	10	UG/L			0.6	1	EPA 524.2	QC582412	14[illegible]
[illegible]	99D4879-002.002	BROMODICHLOROMETHANE	MD1	9.4	UG/L			0.4	1	EPA 524.2	QC582413	14[illegible]
GEL	99D4879-002.002	BROMODICHLOROMETHANE	MS1	9.5	UG/L			0.4	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	BROMOFORM	MD1	9.8	UG/L			0.4	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	BROMOFORM	MS1	9.6	UG/L			0.4	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	BROMOMETHANE	MD1	8.4	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	BROMOMETHANE	MS1	9.3	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	CARBON TETRACHLORIDE	MD1	11.3	UG/L			0.2	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	CARBON TETRACHLORIDE	MS1	11.2	UG/L			0.2	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	CHLOROBENZENE	MD1	10.2	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	CHLOROBENZENE	MS1	10.4	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	CHLOROETHANE	MD1	10.1	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	CHLOROETHANE	MS1	10.5	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	CHLOROFORM	MD1	9.5	UG/L			0.7	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	CHLOROFORM	MS1	9.8	UG/L			0.7	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	CHLOROMETHANE	MD1	8.5	UG/L			0.2	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	CHLOROMETHANE	MS1	8.4	UG/L			0.2	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	cis-1,2-DICHLOROETHENE	MD1	9.6	UG/L			0.7	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	cis-1,2-DICHLOROETHENE	MS1	9.8	UG/L			0.7	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	cis-1,3-DICHLOROPROPENE	MD1	8.3	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	cis-1,3-DICHLOROPROPENE	MS1	8.3	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	DIBROMOCHLOROMETHANE	MD1	9.6	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	DIBROMOCHLOROMETHANE	MS1	9.6	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	DIBROMOMETHANE	MD1	10	UG/L			0.2	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	DIBROMOMETHANE	MS1	10	UG/L			0.2	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	DICHLORODIFLUOROMETHANE	MD1	9.4	UG/L			1	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	DICHLORODIFLUOROMETHANE	MS1	9.1	UG/L			1	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	ETHYLBENZENE	MD1	9.7	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	ETHYLBENZENE	MS1	10.1	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	HEXACHLOROBUTADIENE	MD1	11.6	UG/L			0.5	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	HEXACHLOROBUTADIENE	MS1	11.8	UG/L			0.5	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	ISOPROPYLBENZENE	MD1	9.7	UG/L			0.2	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	ISOPROPYLBENZENE	MS1	9.6	UG/L			0.2	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	METHYLENE CHLORIDE	MD1	5.7	UG/L			1	1	EPA 524.2	QC582413	141612
[illegible]	99D4879-002.002	METHYLENE CHLORIDE	MS1	5.9	UG/L			1	1	EPA 524.2	QC582412	14[illegible]
[illegible]	99D4879-002.002	NAPHTHALENE	MD1	8.6	UG/L			0.6	1	EPA 524.2	QC582413	14[illegible]
GEL	99D4879-002.002	NAPHTHALENE	MS1	8.3	UG/L			0.6	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	n-BUTYLBENZENE	MD1	11.2	UG/L			0.4	1	EPA 524.2	QC582413	141612

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
GEL	99D4879-002.002	n-BUTYLBENZENE	MS1	11.4	UG/L			0.4	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	n-PROPYLBENZENE	MD1	9.6	UG/L			0.6	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	n-PROPYLBENZENE	MS1	9.5	UG/L			0.6	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	o-CHLOROTOLUENE	MD1	9.6	UG/L			0.2	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	o-CHLOROTOLUENE	MS1	9.8	UG/L			0.2	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	p-CHLOROTOLUENE	MD1	9.8	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	p-CHLOROTOLUENE	MS1	9.8	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MD1	9.5	UG/L			0.6	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	8.4	UG/L			0.6	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	sec-BUTYLBENZENE	MD1	9.8	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	sec-BUTYLBENZENE	MS1	9.9	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	STYRENE	MD1	9.3	UG/L			0.2	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	STYRENE	MS1	9.3	UG/L			0.2	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	tert-BUTYLBENZENE	MD1	9.5	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	tert-BUTYLBENZENE	MS1	9.5	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	TETRACHLOROETHENE	MD1	11.8	UG/L			0.7	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	TETRACHLOROETHENE	MS1	11.9	UG/L			0.7	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	TOLUENE	MD1	8.7	UG/L			0.5	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	TOLUENE	MS1	9	UG/L			0.5	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	TOTAL XYLENES	MD1	30.1	UG/L			1	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	TOTAL XYLENES	MS1	30.9	UG/L			1	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	trans-1,2-DICHLOROETHENE	MD1	9	UG/L			0.7	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	trans-1,2-DICHLOROETHENE	MS1	9	UG/L			0.7	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	trans-1,3-DICHLOROPROPENE	MD1	8.7	UG/L			0.3	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	trans-1,3-DICHLOROPROPENE	MS1	8.5	UG/L			0.3	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	TRICHLOROETHENE	MD1	10.2	UG/L			0.6	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	TRICHLOROETHENE	MS1	10.3	UG/L			0.6	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	TRICHLOROFLUOROMETHANE	MD1	10.5	UG/L			1	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	TRICHLOROFLUOROMETHANE	MS1	11.2	UG/L			1	1	EPA 524.2	QC582412	141612
GEL	99D4879-002.002	VINYL CHLORIDE	MD1	9.7	UG/L			0.4	1	EPA 524.2	QC582413	141612
GEL	99D4879-002.002	VINYL CHLORIDE	MS1	9.2	UG/L			0.4	1	EPA 524.2	QC582412	141612
	99D4989-001.003	1,1,1,2-TETRACHLOROETHANE	MD1	8.7	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
	99D4989-001.003	1,1,1,2-TETRACHLOROETHANE	MS1	9.3	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,1,1-TRICHLOROETHANE	MD1	8.9	UG/L		1	0.2	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,1,1-TRICHLOROETHANE	MS1	9.2	UG/L		1	0.2	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,1,2,2-TETRACHLOROETHANE	MD1	7.7	UG/L		1	0.5	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,1,2,2-TETRACHLOROETHANE	MS1	8.4	UG/L		1	0.5	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,1,2-TRICHLOROETHANE	MD1	8	UG/L		1	0.4	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,1,2-TRICHLOROETHANE	MS1	8.6	UG/L		1	0.4	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,1-DICHLOROETHANE	MD1	8.3	UG/L		1	0.4	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,1-DICHLOROETHANE	MS1	8.7	UG/L		1	0.4	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,1-DICHLOROETHENE	MD1	9.2	UG/L		1	0.7	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,1-DICHLOROETHENE	MS1	9.4	UG/L		1	0.7	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,1-DICHLOROPROPENE	MD1	9.6	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,1-DICHLOROPROPENE	MS1	9.9	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,2,3-TRICHLOROBENZENE	MD1	9.8	UG/L		1	0.7	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,2,3-TRICHLOROBENZENE	MS1	10.5	UG/L		1	0.7	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,2,3-TRICHLOROPROPANE	MD1	8.8	UG/L		1	0.5	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,2,3-TRICHLOROPROPANE	MS1	9.5	UG/L		1	0.5	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,2,4-TRICHLOROBENZENE	MD1	10.4	UG/L		1	0.6	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,2,4-TRICHLOROBENZENE	MS1	11.5	UG/L		1	0.6	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,2-DIBROMOETHANE	MD1	8.3	UG/L		1	0.4	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,2-DIBROMOETHANE	MS1	8.9	UG/L		1	0.4	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,2-DICHLOROBENZENE	MD1	8.8	UG/L		1	0.4	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,2-DICHLOROBENZENE	MS1	9.3	UG/L		1	0.4	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,2-DICHLOROETHANE	MD1	8.4	UG/L		1	0.2	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,2-DICHLOROETHANE	MS1	8.6	UG/L		1	0.2	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,2-DICHLOROPROPANE	MD1	8.4	UG/L		1	0.2	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,2-DICHLOROPROPANE	MS1	8.9	UG/L		1	0.2	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,3-DICHLOROBENZENE	MD1	9.5	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,3-DICHLOROBENZENE	MS1	10.2	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,3-DICHLOROPROPANE	MD1	8.2	UG/L		1	0.1	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	1,3-DICHLOROPROPANE	MS1	8.7	UG/L		1	0.1	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	1,4-DICHLOROBENZENE	MD1	9.7	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
	99D4989-001.003	1,4-DICHLOROBENZENE	MS1	10.2	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
	99D4989-001.003	2,2-DICHLOROPROPANE	MD1	8.8	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
	99D4989-001.003	2,2-DICHLOROPROPANE	MS1	9.2	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	4-ISOPROPYLTOLUENE	MD1	9.4	UG/L		1		1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	4-ISOPROPYLTOLUENE	MS1	10	UG/L		1		1	EPA 524.2	QC583974	142008

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
GEL	99D4989-001.003	BENZENE	MD1	9	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	BENZENE	MS1	9.5	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	BENZENE, 1,2,4-TRIMETHYL	MD1	8.9	UG/L		1	0.2	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	BENZENE, 1,2,4-TRIMETHYL	MS1	9.4	UG/L		1	0.2	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	BENZENE, 1,3,5-TRIMETHYL-	MD1	8.6	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	BENZENE, 1,3,5-TRIMETHYL-	MS1	9.2	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	BROMOBENZENE	MD1	9.2	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	BROMOBENZENE	MS1	10.1	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	BROMOCHLOROMETHANE	MD1	8.9	UG/L		1	0.6	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	BROMOCHLOROMETHANE	MS1	9.2	UG/L		1	0.6	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	BROMODICHLOROMETHANE	MD1	7.9	UG/L		1	0.4	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	BROMODICHLOROMETHANE	MS1	8.5	UG/L		1	0.4	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	BROMOFORM	MD1	9.3	UG/L		1	0.4	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	BROMOFORM	MS1	9.5	UG/L		1	0.4	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	BROMOMETHANE	MD1	5.6	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	BROMOMETHANE	MS1	6.9	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	CARBON TETRACHLORIDE	MD1	9	UG/L		1	0.2	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	CARBON TETRACHLORIDE	MS1	9.5	UG/L		1	0.2	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	CHLOROBENZENE	MD1	9.1	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	CHLOROBENZENE	MS1	9.7	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	CHLOROETHANE	MD1	6.7	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	CHLOROETHANE	MS1	7.4	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	CHLOROFORM	MD1	8.2	UG/L		1	0.7	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	CHLOROFORM	MS1	8.6	UG/L		1	0.7	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	CHLOROMETHANE	MD1	6.8	UG/L		1	0.2	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	CHLOROMETHANE	MS1	7.2	UG/L		1	0.2	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	cis-1,2-DICHLOROETHENE	MD1	8.7	UG/L		1	0.7	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	cis-1,2-DICHLOROETHENE	MS1	8.9	UG/L		1	0.7	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	cis-1,3-DICHLOROPROPENE	MD1	7.6	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	cis-1,3-DICHLOROPROPENE	MS1	8	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	DIBROMOCHLOROMETHANE	MD1	8.3	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	DIBROMOCHLOROMETHANE	MS1	8.6	UG/L		1	0.3	1	EPA 524.2	QC583974	14[illegible]
GEL	99D4989-001.003	DIBROMOMETHANE	MD1	8.6	UG/L		1	0.2	1	EPA 524.2	QC583975	14[illegible]
GEL	99D4989-001.003	DIBROMOMETHANE	MS1	8.9	UG/L		1	0.2	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	DICHLORODIFLUOROMETHANE	MD1	7.5	UG/L		1	1.2	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	DICHLORODIFLUOROMETHANE	MS1	8	UG/L		1	1.2	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	ETHYLBENZENE	MD1	8.8	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	ETHYLBENZENE	MS1	9.4	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	HEXACHLOROBUTADIENE	MD1	10.1	UG/L		1	0.5	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	HEXACHLOROBUTADIENE	MS1	10.7	UG/L		1	0.5	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	ISOPROPYLBENZENE	MD1	8.8	UG/L		1	0.2	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	ISOPROPYLBENZENE	MS1	9.3	UG/L		1	0.2	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	METHYLENE CHLORIDE	MD1	5.8	UG/L		1	1.2	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	METHYLENE CHLORIDE	MS1	7.3	UG/L		1	1.2	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	NAPHTHALENE	MD1	7.8	UG/L		1	0.6	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	NAPHTHALENE	MS1	8.4	UG/L		1	0.6	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	n-BUTYLBENZENE	MD1	10	UG/L		1	0.4	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	n-BUTYLBENZENE	MS1	10.8	UG/L		1	0.4	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	n-PROPYLBENZENE	MD1	8.8	UG/L		1	0.6	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	n-PROPYLBENZENE	MS1	9.3	UG/L		1	0.6	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	o-CHLOROTOLUENE	MD1	8.6	UG/L		1	0.2	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	o-CHLOROTOLUENE	MS1	9.4	UG/L		1	0.2	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	p-CHLOROTOLUENE	MD1	9	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	p-CHLOROTOLUENE	MS1	9.5	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	PROPANE, 1,2-DIBROMO-3-CHLORO-	MD1	8.7	UG/L		1	0.6	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	9.3	UG/L		1	0.6	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	sec-BUTYLBENZENE	MD1	9.1	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	sec-BUTYLBENZENE	MS1	9.4	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	STYRENE	MD1	8.5	UG/L		1	0.2	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	STYRENE	MS1	8.9	UG/L		1	0.2	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	tert-BUTYLBENZENE	MD1	8.7	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	tert-BUTYLBENZENE	MS1	9.2	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	TETRACHLOROETHENE	MD1	10.5	UG/L		1	0.7	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	TETRACHLOROETHENE	MS1	11.2	UG/L		1	0.7	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	TOLUENE	MD1	8	UG/L		1	0.5	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	TOLUENE	MS1	8.6	UG/L		1	0.5	1	EPA 524.2	QC583974	14[illegible]
GEL	99D4989-001.003	TOTAL XYLENES	MD1	27.6	UG/L		1	1	1	EPA 524.2	QC583975	14[illegible]
GEL	99D4989-001.003	TOTAL XYLENES	MS1	29.1	UG/L		1	1	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	trans-1,2-DICHLOROETHENE	MD1	8.1	UG/L		1	0.7	1	EPA 524.2	QC583975	142008

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
GEL	99D4989-001.003	trans-1,2-DICHLOROETHENE	MS1	8.5	UG/L		1	0.7	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	trans-1,3-DICHLOROPROPENE	MD1	7.8	UG/L		1	0.3	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	trans-1,3-DICHLOROPROPENE	MS1	8	UG/L		1	0.3	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	TRICHLOROETHENE	MD1	9.1	UG/L		1	0.6	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	TRICHLOROETHENE	MS1	9.2	UG/L		1	0.6	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	TRICHLOROFLUOROMETHANE	MD1	7.6	UG/L		1	1.7	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	TRICHLOROFLUOROMETHANE	MS1	7.9	UG/L		1	1.7	1	EPA 524.2	QC583974	142008
GEL	99D4989-001.003	VINYL CHLORIDE	MD1	6.9	UG/L		1	0.4	1	EPA 524.2	QC583975	142008
GEL	99D4989-001.003	VINYL CHLORIDE	MS1	7.2	UG/L		1	0.4	1	EPA 524.2	QC583974	142008
GEL	99D5061-007.001	1,1,1,2-TETRACHLOROETHANE	MD1	50.1	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,1,1,2-TETRACHLOROETHANE	MS1	48.8	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,1,1-TRICHLOROETHANE	MD1	50.2	UG/L			0.2	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,1,1-TRICHLOROETHANE	MS1	49.3	UG/L			0.2	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,1,2,2-TETRACHLOROETHANE	MD1	47.3	UG/L			0.5	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,1,2,2-TETRACHLOROETHANE	MS1	47.4	UG/L			0.5	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,1,2-TRICHLOROETHANE	MD1	48.2	UG/L			0.4	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,1,2-TRICHLOROETHANE	MS1	48.1	UG/L			0.4	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,1-DICHLOROETHANE	MD1	49.2	UG/L			0.4	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,1-DICHLOROETHANE	MS1	48.3	UG/L			0.4	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,1-DICHLOROETHENE	MD1	56.9	UG/L			0.7	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,1-DICHLOROETHENE	MS1	57.1	UG/L			0.7	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,1-DICHLOROPROPENE	MD1	50.1	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,1-DICHLOROPROPENE	MS1	48.7	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,2,3-TRICHLOROBENZENE	MD1	40.6	UG/L			0.7	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,2,3-TRICHLOROBENZENE	MS1	37.6	UG/L			0.7	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,2,3-TRICHLOROPROPANE	MD1	47.5	UG/L			0.5	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,2,3-TRICHLOROPROPANE	MS1	47.7	UG/L			0.5	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,2,4-TRICHLOROBENZENE	MD1	37.8	UG/L			0.6	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,2,4-TRICHLOROBENZENE	MS1	34.1	UG/L			0.6	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,2-DIBROMOETHANE	MD1	48.5	UG/L			0.4	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,2-DIBROMOETHANE	MS1	48	UG/L			0.4	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,2-DICHLOROBENZENE	MD1	41.8	UG/L			0.4	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,2-DICHLOROBENZENE	MS1	39.6	UG/L			0.4	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,2-DICHLOROETHANE	MD1	49.1	UG/L			0.2	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,2-DICHLOROETHANE	MS1	48	UG/L			0.2	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,2-DICHLOROPROPANE	MD1	49.9	UG/L			0.2	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,2-DICHLOROPROPANE	MS1	48	UG/L			0.2	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,3-DICHLOROBENZENE	MD1	40.1	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,3-DICHLOROBENZENE	MS1	38.2	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,3-DICHLOROPROPANE	MD1	49.5	UG/L			0.1	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,3-DICHLOROPROPANE	MS1	48.8	UG/L			0.1	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	1,4-DICHLOROBENZENE	MD1	39.7	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	1,4-DICHLOROBENZENE	MS1	37.4	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	2,2-DICHLOROPROPANE	MD1	48.7	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	2,2-DICHLOROPROPANE	MS1	47.5	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	4-ISOPROPYLTOLUENE	MD1	40.9	UG/L				1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	4-ISOPROPYLTOLUENE	MS1	39.3	UG/L				1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	BENZENE	MD1	50.3	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	BENZENE	MS1	49	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	BENZENE, 1,2,4-TRIMETHYL	MD1	43.1	UG/L			0.2	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	BENZENE, 1,2,4-TRIMETHYL	MS1	41.6	UG/L			0.2	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	BENZENE, 1,3,5-TRIMETHYL-	MD1	38.9	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	BENZENE, 1,3,5-TRIMETHYL-	MS1	37.6	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	BROMOBENZENE	MD1	44.2	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	BROMOBENZENE	MS1	43.1	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	BROMOCHLOROMETHANE	MD1	48.5	UG/L			0.6	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	BROMOCHLOROMETHANE	MS1	47.4	UG/L			0.6	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	BROMODICHLOROMETHANE	MD1	45.4	UG/L			0.4	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	BROMODICHLOROMETHANE	MS1	44	UG/L			0.4	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	BROMOFORM	MD1	47.1	UG/L			0.4	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	BROMOFORM	MS1	46.4	UG/L			0.4	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	BROMOMETHANE	MD1	53.7	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	BROMOMETHANE	MS1	53.9	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	CARBON TETRACHLORIDE	MD1	49	UG/L			0.2	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	CARBON TETRACHLORIDE	MS1	47.9	UG/L			0.2	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	CHLOROBENZENE	MD1	47.2	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	CHLOROBENZENE	MS1	45.6	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	CHLOROETHANE	MD1	53.2	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	CHLOROETHANE	MS1	51.9	UG/L			0.3	1	EPA 524.2	QC586485	142662

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

Lab	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
GEL	99D5061-007.001	CHLOROFORM	MD1	42.9	UG/L			0.7	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	CHLOROFORM	MS1	41.7	UG/L			0.7	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	CHLOROMETHANE	MD1	44.4	UG/L			0.2	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	CHLOROMETHANE	MS1	44.4	UG/L			0.2	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	cis-1,2-DICHLOROETHENE	MD1	47.6	UG/L			0.7	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	cis-1,2-DICHLOROETHENE	MS1	47.1	UG/L			0.7	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	cis-1,3-DICHLOROPROPENE	MD1	43.4	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	cis-1,3-DICHLOROPROPENE	MS1	41.6	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	DIBROMOCHLOROMETHANE	MD1	48.2	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	DIBROMOCHLOROMETHANE	MS1	47.4	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	DIBROMOMETHANE	MD1	48.1	UG/L			0.2	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	DIBROMOMETHANE	MS1	46.5	UG/L			0.2	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	DICHLORODIFLUOROMETHANE	MD1	32	UG/L			1.2	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	DICHLORODIFLUOROMETHANE	MS1	30.2	UG/L			1.2	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	ETHYLBENZENE	MD1	47.5	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	ETHYLBENZENE	MS1	46.4	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	HEXACHLOROBUTADIENE	MD1	41.6	UG/L			0.5	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	HEXACHLOROBUTADIENE	MS1	38.6	UG/L			0.5	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	ISOPROPYLBENZENE	MD1	44.6	UG/L			0.2	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	ISOPROPYLBENZENE	MS1	43.6	UG/L			0.2	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	METHYLENE CHLORIDE	MD1	44.9	UG/L			1.2	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	METHYLENE CHLORIDE	MS1	43.5	UG/L			1.2	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	NAPHTHALENE	MD1	44.1	UG/L	B		0.6	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	NAPHTHALENE	MS1	42.3	UG/L	B		0.6	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	n-BUTYLBENZENE	MD1	43.4	UG/L			0.4	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	n-BUTYLBENZENE	MS1	41.6	UG/L			0.4	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	n-PROPYLBENZENE	MD1	40.9	UG/L			0.6	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	n-PROPYLBENZENE	MS1	39.7	UG/L			0.6	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	o-CHLOROTOLUENE	MD1	43	UG/L			0.2	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	o-CHLOROTOLUENE	MS1	41.8	UG/L			0.2	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	p-CHLOROTOLUENE	MD1	41	UG/L			0.3	1	EPA 524.2	QC586486	142662
[illegible]	99D5061-007.001	p-CHLOROTOLUENE	MS1	39	UG/L			0.3	1	EPA 524.2	QC586485	14[illegible]
[illegible]	99D5061-007.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MD1	46.6	UG/L			0.6	1	EPA 524.2	QC586486	14[illegible]
[illegible]	99D5061-007.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	46.6	UG/L			0.6	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	sec-BUTYLBENZENE	MD1	46.6	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	sec-BUTYLBENZENE	MS1	45.3	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	STYRENE	MD1	47.3	UG/L			0.2	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	STYRENE	MS1	45.6	UG/L			0.2	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	tert-BUTYLBENZENE	MD1	45.4	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	tert-BUTYLBENZENE	MS1	44.5	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	TETRACHLOROETHENE	MD1	45.4	UG/L			0.7	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	TETRACHLOROETHENE	MS1	44.2	UG/L			0.7	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	TOLUENE	MD1	46.7	UG/L			0.5	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	TOLUENE	MS1	46	UG/L			0.5	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	TOTAL XYLENES	MD1	140	UG/L			1	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	TOTAL XYLENES	MS1	136	UG/L			1	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	trans-1,2-DICHLOROETHENE	MD1	46	UG/L			0.7	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	trans-1,2-DICHLOROETHENE	MS1	44.4	UG/L			0.7	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	trans-1,3-DICHLOROPROPENE	MD1	40.2	UG/L			0.3	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	trans-1,3-DICHLOROPROPENE	MS1	39.6	UG/L			0.3	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	TRICHLOROETHENE	MD1	46.3	UG/L			0.6	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	TRICHLOROETHENE	MS1	44.4	UG/L			0.6	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	TRICHLOROFLUOROMETHANE	MD1	50.4	UG/L			1.7	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	TRICHLOROFLUOROMETHANE	MS1	49.9	UG/L			1.7	1	EPA 524.2	QC586485	142662
GEL	99D5061-007.001	VINYL CHLORIDE	MD1	48.6	UG/L			0.4	1	EPA 524.2	QC586486	142662
GEL	99D5061-007.001	VINYL CHLORIDE	MS1	48.7	UG/L			0.4	1	EPA 524.2	QC586485	142662
GEL	99D5250-001.002	1,1,1,2-TETRACHLOROETHANE	MD1	54.6	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,1,1,2-TETRACHLOROETHANE	MS1	55.1	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,1,1-TRICHLOROETHANE	MD1	51.5	UG/L		1	0.2	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,1,1-TRICHLOROETHANE	MS1	51.2	UG/L		1	0.2	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,1,2,2-TETRACHLOROETHANE	MD1	49.9	UG/L		1	0.5	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,1,2,2-TETRACHLOROETHANE	MS1	49.3	UG/L		1	0.5	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,1,2-TRICHLOROETHANE	MD1	52.8	UG/L		1	0.4	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,1,2-TRICHLOROETHANE	MS1	52.5	UG/L		1	0.4	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,1-DICHLOROETHANE	MD1	50.4	UG/L		1	0.4	1	EPA 524.2	QC588694	143233
[illegible]	99D5250-001.002	1,1-DICHLOROETHANE	MS1	50.4	UG/L		1	0.4	1	EPA 524.2	QC588693	14[illegible]
[illegible]	99D5250-001.002	1,1-DICHLOROETHENE	MD1	55.9	UG/L		1	0.7	1	EPA 524.2	QC588694	14[illegible]
GEL	99D5250-001.002	1,1-DICHLOROETHENE	MS1	56.2	UG/L		1	0.7	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,1-DICHLOROPROPENE	MD1	55.5	UG/L		1	0.3	1	EPA 524.2	QC588694	143233

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
GEL	99D5250-001.002	1,1-DICHLOROPROPENE	MS1	56.3	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,2,3-TRICHLOROBENZENE	MD1	55.5	UG/L		1	0.7	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,2,3-TRICHLOROBENZENE	MS1	56.7	UG/L		1	0.7	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,2,3-TRICHLOROPROPANE	MD1	51.8	UG/L		1	0.5	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,2,3-TRICHLOROPROPANE	MS1	52	UG/L		1	0.5	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,2,4-TRICHLOROBENZENE	MD1	56.7	UG/L		1	0.6	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,2,4-TRICHLOROBENZENE	MS1	57.8	UG/L		1	0.6	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,2-DIBROMOETHANE	MD1	55.6	UG/L		1	0.4	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,2-DIBROMOETHANE	MS1	56.3	UG/L		1	0.4	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,2-DICHLOROBENZENE	MD1	50.4	UG/L		1	0.4	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,2-DICHLOROBENZENE	MS1	51.3	UG/L		1	0.4	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,2-DICHLOROETHANE	MD1	51.5	UG/L		1	0.2	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,2-DICHLOROETHANE	MS1	51.2	UG/L		1	0.2	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,2-DICHLOROPROPANE	MD1	53.1	UG/L		1	0.2	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,2-DICHLOROPROPANE	MS1	52.3	UG/L		1	0.2	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,3-DICHLOROBENZENE	MD1	49.8	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,3-DICHLOROBENZENE	MS1	51.7	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,3-DICHLOROPROPANE	MD1	53.8	UG/L		1	0.1	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,3-DICHLOROPROPANE	MS1	53.6	UG/L		1	0.1	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	1,4-DICHLOROBENZENE	MD1	49.4	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	1,4-DICHLOROBENZENE	MS1	51.3	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	2,2-DICHLOROPROPANE	MD1	51.4	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	2,2-DICHLOROPROPANE	MS1	51.6	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	4-ISOPROPYLTOLUENE	MD1	55.4	UG/L		1		1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	4-ISOPROPYLTOLUENE	MS1	57	UG/L		1		1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	BENZENE	MD1	53.6	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	BENZENE	MS1	54.2	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	BENZENE, 1,2,4-TRIMETHYL	MD1	50.3	UG/L		1	0.2	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	BENZENE, 1,2,4-TRIMETHYL	MS1	51.2	UG/L		1	0.2	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	BENZENE, 1,3,5-TRIMETHYL-	MD1	50.4	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	51.8	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
	99D5250-001.002	BROMOBENZENE	MD1	49.9	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
	99D5250-001.002	BROMOBENZENE	MS1	50.1	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	BROMOCHLOROMETHANE	MD1	55.1	UG/L		1	0.6	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	BROMOCHLOROMETHANE	MS1	55.1	UG/L		1	0.6	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	BROMODICHLOROMETHANE	MD1	50.2	UG/L		1	0.4	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	BROMODICHLOROMETHANE	MS1	50.4	UG/L		1	0.4	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	BROMOFORM	MD1	53	UG/L		1	0.4	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	BROMOFORM	MS1	51.7	UG/L		1	0.4	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	BROMOMETHANE	MD1	45.4	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	BROMOMETHANE	MS1	44.5	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	CARBON TETRACHLORIDE	MD1	51	UG/L		1	0.2	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	CARBON TETRACHLORIDE	MS1	51.2	UG/L		1	0.2	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	CHLOROBENZENE	MD1	53.2	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	CHLOROBENZENE	MS1	54.1	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	CHLOROETHANE	MD1	41.5	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	CHLOROETHANE	MS1	44.9	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	CHLOROFORM	MD1	48.4	UG/L		1	0.7	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	CHLOROFORM	MS1	48.2	UG/L		1	0.7	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	CHLOROMETHANE	MD1	39.8	UG/L		1	0.2	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	CHLOROMETHANE	MS1	37.5	UG/L		1	0.2	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	cis-1,2-DICHLOROETHENE	MD1	53.1	UG/L		1	0.7	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	cis-1,2-DICHLOROETHENE	MS1	53.7	UG/L		1	0.7	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	cis-1,3-DICHLOROPROPENE	MD1	50	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	cis-1,3-DICHLOROPROPENE	MS1	50	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	DIBROMOCHLOROMETHANE	MD1	55.5	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	DIBROMOCHLOROMETHANE	MS1	54.9	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	DIBROMOMETHANE	MD1	53.5	UG/L		1	0.2	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	DIBROMOMETHANE	MS1	53.3	UG/L		1	0.2	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	DICHLORODIFLUOROMETHANE	MD1	34.3	UG/L		1	1.2	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	DICHLORODIFLUOROMETHANE	MS1	30.7	UG/L		1	1.2	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	ETHYLBENZENE	MD1	53.6	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	ETHYLBENZENE	MS1	55.2	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	HEXACHLOROBUTADIENE	MD1	48.5	UG/L		1	0.5	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	HEXACHLOROBUTADIENE	MS1	49.4	UG/L		1	0.5	1	EPA 524.2	QC588693	143233
	99D5250-001.002	ISOPROPYLBENZENE	MD1	50	UG/L		1	0.2	1	EPA 524.2	QC588694	143233
	99D5250-001.002	ISOPROPYLBENZENE	MS1	50.4	UG/L		1	0.2	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	METHYLENE CHLORIDE	MD1	48.2	UG/L		1	1.2	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	METHYLENE CHLORIDE	MS1	48.8	UG/L		1	1.2	1	EPA 524.2	QC588693	143233

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
GEL	99D5250-001.002	NAPHTHALENE	MD1	52.2	UG/L		1	0.6	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	NAPHTHALENE	MS1	50.4	UG/L		1	0.6	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	n-BUTYLBENZENE	MD1	52.9	UG/L		1	0.4	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	n-BUTYLBENZENE	MS1	54.8	UG/L		1	0.4	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	n-PROPYLBENZENE	MD1	50.2	UG/L		1	0.6	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	n-PROPYLBENZENE	MS1	51.6	UG/L		1	0.6	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	o-CHLOROTOLUENE	MD1	49.7	UG/L		1	0.2	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	o-CHLOROTOLUENE	MS1	50.9	UG/L		1	0.2	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	p-CHLOROTOLUENE	MD1	50.2	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	p-CHLOROTOLUENE	MS1	51.7	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MD1	47.2	UG/L		1	0.6	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	48.4	UG/L		1	0.6	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	sec-BUTYLBENZENE	MD1	51.1	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	sec-BUTYLBENZENE	MS1	52.2	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	STYRENE	MD1	58.3	UG/L		1	0.2	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	STYRENE	MS1	60	UG/L		1	0.2	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	tert-BUTYLBENZENE	MD1	53.5	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	tert-BUTYLBENZENE	MS1	54.3	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	TETRACHLOROETHENE	MD1	54.7	UG/L		1	0.7	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	TETRACHLOROETHENE	MS1	57.2	UG/L		1	0.7	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	TOLUENE	MD1	53.6	UG/L		1	0.5	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	TOLUENE	MS1	54.2	UG/L		1	0.5	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	TOTAL XYLENES	MD1	170	UG/L		1	1	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	TOTAL XYLENES	MS1	174	UG/L		1	1	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	trans-1,2-DICHLOROETHENE	MD1	49	UG/L		1	0.7	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	trans-1,2-DICHLOROETHENE	MS1	49.1	UG/L		1	0.7	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	trans-1,3-DICHLOROPROPENE	MD1	42.8	UG/L		1	0.3	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	trans-1,3-DICHLOROPROPENE	MS1	42.6	UG/L		1	0.3	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	TRICHLOROETHENE	MD1	50.3	UG/L		1	0.6	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	TRICHLOROETHENE	MS1	51.1	UG/L		1	0.6	1	EPA 524.2	QC588693	143233
GEL	99D5250-001.002	TRICHLOROFLUOROMETHANE	MD1	49.4	UG/L		1	1.7	1	EPA 524.2	QC588694	143233
GEL	99D5250-001.002	TRICHLOROFLUOROMETHANE	MS1	48.7	UG/L		1	1.7	1	EPA 524.2	QC588693	14[illegible]
GEL	99D5250-001.002	VINYL CHLORIDE	MD1	47.2	UG/L		1	0.4	1	EPA 524.2	QC588694	14[illegible]
GEL	99D5250-001.002	VINYL CHLORIDE	MS1	45	UG/L		1	0.4	1	EPA 524.2	QC588693	143233
GEL	99D5474-001.004	1,1,1,2-TETRACHLOROETHANE	MD1	53.1	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,1,1,2-TETRACHLOROETHANE	MS1	53.1	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,1,1-TRICHLOROETHANE	MD1	50.9	UG/L			0.2	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,1,1-TRICHLOROETHANE	MS1	49.9	UG/L			0.2	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,1,2,2-TETRACHLOROETHANE	MD1	47.2	UG/L			0.5	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,1,2,2-TETRACHLOROETHANE	MS1	47	UG/L			0.5	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,1,2-TRICHLOROETHANE	MD1	50.3	UG/L			0.4	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,1,2-TRICHLOROETHANE	MS1	50.6	UG/L			0.4	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,1-DICHLOROETHANE	MD1	49.3	UG/L			0.4	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,1-DICHLOROETHANE	MS1	49.7	UG/L			0.4	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,1-DICHLOROETHENE	MD1	58.9	UG/L			0.7	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,1-DICHLOROETHENE	MS1	55.5	UG/L			0.7	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,1-DICHLOROPROPENE	MD1	53.7	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,1-DICHLOROPROPENE	MS1	52.5	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,2,3-TRICHLOROBENZENE	MD1	45.4	UG/L			0.7	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,2,3-TRICHLOROBENZENE	MS1	32.1	UG/L			0.7	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,2,3-TRICHLOROPROPANE	MD1	51.6	UG/L			0.5	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,2,3-TRICHLOROPROPANE	MS1	52.3	UG/L			0.5	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,2,4-TRICHLOROBENZENE	MD1	40.5	UG/L			0.6	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,2,4-TRICHLOROBENZENE	MS1	40.4	UG/L			0.6	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,2-DIBROMOETHANE	MD1	54.8	UG/L			0.4	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,2-DIBROMOETHANE	MS1	54	UG/L			0.4	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,2-DICHLOROBENZENE	MD1	43.8	UG/L			0.4	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,2-DICHLOROBENZENE	MS1	44.1	UG/L			0.4	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,2-DICHLOROETHANE	MD1	51.3	UG/L			0.2	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,2-DICHLOROETHANE	MS1	51.7	UG/L			0.2	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,2-DICHLOROPROPANE	MD1	50.8	UG/L			0.2	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,2-DICHLOROPROPANE	MS1	51	UG/L			0.2	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,3-DICHLOROBENZENE	MD1	41.2	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,3-DICHLOROBENZENE	MS1	41.2	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	1,3-DICHLOROPROPANE	MD1	52.3	UG/L			0.1	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	1,3-DICHLOROPROPANE	MS1	52.5	UG/L			0.1	1	EPA 524.2	QC591881	14[illegible]
GEL	99D5474-001.004	1,4-DICHLOROBENZENE	MD1	40.8	UG/L			0.3	1	EPA 524.2	QC591882	144[illegible]
GEL	99D5474-001.004	1,4-DICHLOROBENZENE	MS1	40.7	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	2,2-DICHLOROPROPANE	MD1	49.4	UG/L			0.3	1	EPA 524.2	QC591882	144070

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
GEL	99D5474-001.004	2,2-DICHLOROPROPANE	MS1	48.4	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	4-ISOPROPYLTOLUENE	MD1	47.8	UG/L			1	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	4-ISOPROPYLTOLUENE	MS1	46.7	UG/L			1	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	BENZENE	MD1	50.5	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	BENZENE	MS1	50.6	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	BENZENE, 1,2,4-TRIMETHYL	MD1	44.4	UG/L			0.2	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	BENZENE, 1,2,4-TRIMETHYL	MS1	44.1	UG/L			0.2	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	BENZENE, 1,3,5-TRIMETHYL-	MD1	44.9	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	BENZENE, 1,3,5-TRIMETHYL-	MS1	44.1	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	BROMOBENZENE	MD1	46.4	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	BROMOBENZENE	MS1	46.2	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	BROMOCHLOROMETHANE	MD1	54.3	UG/L			0.6	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	BROMOCHLOROMETHANE	MS1	54.9	UG/L			0.6	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	BROMODICHLOROMETHANE	MD1	48.7	UG/L			0.4	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	BROMODICHLOROMETHANE	MS1	49.2	UG/L			0.4	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	BROMOFORM	MD1	52.8	UG/L			0.4	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	BROMOFORM	MS1	51.6	UG/L			0.4	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	BROMOMETHANE	MD1	51.2	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	BROMOMETHANE	MS1	50.7	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	CARBON TETRACHLORIDE	MD1	49.7	UG/L			0.2	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	CARBON TETRACHLORIDE	MS1	50	UG/L			0.2	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	CHLOROBENZENE	MD1	48.7	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	CHLOROBENZENE	MS1	49.3	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	CHLOROETHANE	MD1	43.5	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	CHLOROETHANE	MS1	42.9	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	CHLOROFORM	MD1	47.8	UG/L			0.7	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	CHLOROFORM	MS1	47.9	UG/L			0.7	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	CHLOROMETHANE	MD1	43.4	UG/L			0.2	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	CHLOROMETHANE	MS1	38.8	UG/L			0.2	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	cis-1,2-DICHLOROETHENE	MD1	51.6	UG/L			0.7	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	cis-1,2-DICHLOROETHENE	MS1	51.3	UG/L			0.7	1	EPA 524.2	QC591881	144070
	99D5474-001.004	cis-1,3-DICHLOROPROPENE	MD1	47.2	UG/L			0.3	1	EPA 524.2	QC591882	144070
	99D5474-001.004	cis-1,3-DICHLOROPROPENE	MS1	47.3	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	DIBROMOCHLOROMETHANE	MD1	53	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	DIBROMOCHLOROMETHANE	MS1	53.4	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	DIBROMOMETHANE	MD1	55	UG/L			0.2	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	DIBROMOMETHANE	MS1	54.7	UG/L			0.2	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	DICHLORODIFLUOROMETHANE	MD1	38	UG/L			1.2	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	DICHLORODIFLUOROMETHANE	MS1	32.7	UG/L			1.2	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	ETHYLBENZENE	MD1	47.6	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	ETHYLBENZENE	MS1	47.7	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	HEXACHLOROBUTADIENE	MD1	41.9	UG/L			0.5	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	HEXACHLOROBUTADIENE	MS1	25	UG/L			0.5	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	ISOPROPYLBENZENE	MD1	45.7	UG/L			0.2	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	ISOPROPYLBENZENE	MS1	45.1	UG/L			0.2	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	METHYLENE CHLORIDE	MD1	45.6	UG/L			1.2	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	METHYLENE CHLORIDE	MS1	45	UG/L			1.2	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	NAPHTHALENE	MD1	47.5	UG/L			0.6	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	NAPHTHALENE	MS1	45.5	UG/L			0.6	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	n-BUTYLBENZENE	MD1	46.1	UG/L			0.4	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	n-BUTYLBENZENE	MS1	44.6	UG/L			0.4	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	n-PROPYLBENZENE	MD1	44.4	UG/L			0.6	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	n-PROPYLBENZENE	MS1	43.9	UG/L			0.6	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	o-CHLOROTOLUENE	MD1	44.3	UG/L			0.2	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	o-CHLOROTOLUENE	MS1	43.7	UG/L			0.2	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	p-CHLOROTOLUENE	MD1	42.3	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	p-CHLOROTOLUENE	MS1	41.9	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	PROPANE, 1,2-DIBROMO-3-CHLORO-	MD1	33.8	UG/L			0.6	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	52.4	UG/L			0.6	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	sec-BUTYLBENZENE	MD1	49.5	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	sec-BUTYLBENZENE	MS1	48.9	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	STYRENE	MD1	50.9	UG/L			0.2	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	STYRENE	MS1	51.5	UG/L			0.2	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	tert-BUTYLBENZENE	MD1	49.9	UG/L			0.3	1	EPA 524.2	QC591882	144070
	99D5474-001.004	tert-BUTYLBENZENE	MS1	49.3	UG/L			0.3	1	EPA 524.2	QC591881	144070
	99D5474-001.004	TETRACHLOROETHENE	MD1	44.8	UG/L			0.7	1	EPA 524.2	QC591882	144070
	99D5474-001.004	TETRACHLOROETHENE	MS1	44.9	UG/L			0.7	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	TOLUENE	MD1	48.6	UG/L			0.5	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	TOLUENE	MS1	48.6	UG/L			0.5	1	EPA 524.2	QC591881	144070

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[illegible]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
GEL	99D5474-001.004	TOTAL XYLENES	MD1	150	UG/L			1	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	TOTAL XYLENES	MS1	149	UG/L			1	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	trans-1,2-DICHLOROETHENE	MD1	46.6	UG/L			0.7	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	trans-1,2-DICHLOROETHENE	MS1	45.7	UG/L			0.7	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	trans-1,3-DICHLOROPROPENE	MD1	43.3	UG/L			0.3	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	trans-1,3-DICHLOROPROPENE	MS1	43.3	UG/L			0.3	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	TRICHLOROETHENE	MD1	48.2	UG/L			0.6	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	TRICHLOROETHENE	MS1	48	UG/L			0.6	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	TRICHLOROFLUOROMETHANE	MD1	50.8	UG/L			1.7	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	TRICHLOROFLUOROMETHANE	MS1	47.4	UG/L			1.7	1	EPA 524.2	QC591881	144070
GEL	99D5474-001.004	VINYL CHLORIDE	MD1	52.7	UG/L			0.4	1	EPA 524.2	QC591882	144070
GEL	99D5474-001.004	VINYL CHLORIDE	MS1	46.9	UG/L			0.4	1	EPA 524.2	QC591881	144070
RECRL	99D5839	1,1,1,2-TETRACHLOROETHANE	MS1	106	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,1,1,2-TETRACHLOROETHANE	MS1	110	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,1,1,2-TETRACHLOROETHANE	MS1	106	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,1,1-TRICHLOROETHANE	MS1	113	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,1,1-TRICHLOROETHANE	MS1	113	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,1,1-TRICHLOROETHANE	MS1	103	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,1,2,2-TETRACHLOROETHANE	MS1	110	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,1,2,2-TETRACHLOROETHANE	MS1	114	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,1,2,2-TETRACHLOROETHANE	MS1	111	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,1,2-TRICHLOROETHANE	MS1	102	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,1,2-TRICHLOROETHANE	MS1	108	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,1,2-TRICHLOROETHANE	MS1	107	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,1-DICHLOROETHANE	MS1	115	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,1-DICHLOROETHANE	MS1	114	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,1-DICHLOROETHANE	MS1	104	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,1-DICHLOROETHENE	MS1	114	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,1-DICHLOROETHENE	MS1	113	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,1-DICHLOROETHENE	MS1	95	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,1-DICHLOROPROPENE	MS1	115	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
[illegible]RL	99D5839	1,1-DICHLOROPROPENE	MS1	112	%REC				1	EPA 524.2	99LVK080-MB1	99LV[illegible]
[illegible]RL	99D5839	1,1-DICHLOROPROPENE	MS1	104	%REC				1	EPA 524.2	99LVK079-MB1	99LV[illegible]
RECRL	99D5839	1,2,3-TRICHLOROBENZENE	MS1	98	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,2,3-TRICHLOROBENZENE	MS1	105	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,2,3-TRICHLOROBENZENE	MS1	108	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,2,3-TRICHLOROPROPANE	MS1	81	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,2,3-TRICHLOROPROPANE	MS1	110	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,2,3-TRICHLOROPROPANE	MS1	110	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,2,4-TRICHLOROBENZENE	MS1	95	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,2,4-TRICHLOROBENZENE	MS1	104	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,2,4-TRICHLOROBENZENE	MS1	103	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,2-DIBROMOETHANE	MS1	106	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,2-DIBROMOETHANE	MS1	103	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,2-DIBROMOETHANE	MS1	105	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,2-DICHLOROBENZENE	MS1	102	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,2-DICHLOROBENZENE	MS1	110	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,2-DICHLOROBENZENE	MS1	106	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,2-DICHLOROPROPANE	MS1	111	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,2-DICHLOROPROPANE	MS1	114	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,2-DICHLOROPROPANE	MS1	107	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,3-DICHLOROBENZENE	MS1	105	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,3-DICHLOROBENZENE	MS1	112	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,3-DICHLOROBENZENE	MS1	106	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,3-DICHLOROPROPANE	MS1	109	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	1,3-DICHLOROPROPANE	MS1	107	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,3-DICHLOROPROPANE	MS1	111	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,4-DICHLOROBENZENE	MS1	101	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	1,4-DICHLOROBENZENE	MS1	108	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	1,4-DICHLOROBENZENE	MS1	107	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	2,2-DICHLOROPROPANE	MS1	112	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	2,2-DICHLOROPROPANE	MS1	111	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	2,2-DICHLOROPROPANE	MS1	88	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	4-ISOPROPYLTOLUENE	MS1	109	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	4-ISOPROPYLTOLUENE	MS1	110	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
[illegible]RL	99D5839	4-ISOPROPYLTOLUENE	MS1	108	%REC				1	EPA 524.2	99LVK079-MB1	99LV[illegible]
[illegible]RL	99D5839	BENZENE	MS1	110	%REC				1	EPA 524.2	99LVK081-MB1	99LV[illegible]
RECRL	99D5839	BENZENE	MS1	112	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	BENZENE	MS1	104	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D5839	BENZENE, 1,2,4-TRIMETHYL	MS1	113	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	BENZENE, 1,2,4-TRIMETHYL	MS1	113	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	BENZENE, 1,2,4-TRIMETHYL	MS1	111	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	BENZENE, 1,3,5-TRIMETHYL-	MS1	110	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	BENZENE, 1,3,5-TRIMETHYL-	MS1	113	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	BENZENE, 1,3,5-TRIMETHYL-	MS1	110	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	BROMOBENZENE	MS1	114	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	BROMOBENZENE	MS1	121	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	BROMOBENZENE	MS1	116	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	BROMOCHLOROMETHANE	MS1	109	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	BROMOCHLOROMETHANE	MS1	106	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	BROMOCHLOROMETHANE	MS1	104	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	BROMODICHLOROMETHANE	MS1	113	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	BROMODICHLOROMETHANE	MS1	113	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	BROMODICHLOROMETHANE	MS1	102	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	BROMOFORM	MS1	96	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	BROMOFORM	MS1	99	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	BROMOFORM	MS1	103	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	BROMOMETHANE	MS1	107	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	BROMOMETHANE	MS1	116	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	BROMOMETHANE	MS1	100	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	CARBON TETRACHLORIDE	MS1	108	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	CARBON TETRACHLORIDE	MS1	107	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	CARBON TETRACHLORIDE	MS1	98	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	CHLOROBENZENE	MS1	108	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	CHLOROBENZENE	MS1	103	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	CHLOROBENZENE	MS1	109	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	CHLOROETHANE	MS1	116	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	CHLOROETHANE	MS1	133	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	CHLOROETHANE	MS1	109	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	CHLOROFORM	MS1	112	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	CHLOROFORM	MS1	111	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	CHLOROFORM	MS1	102	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	CHLOROMETHANE	MS1	112	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	CHLOROMETHANE	MS1	122	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	CHLOROMETHANE	MS1	105	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	cis-1,2-DICHLOROETHENE	MS1	108	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	cis-1,2-DICHLOROETHENE	MS1	110	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	cis-1,2-DICHLOROETHENE	MS1	100	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	cis-1,3-DICHLOROPROPENE	MS1	103	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	cis-1,3-DICHLOROPROPENE	MS1	109	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	cis-1,3-DICHLOROPROPENE	MS1	105	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	DIBROMOCHLOROMETHANE	MS1	102	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	DIBROMOCHLOROMETHANE	MS1	103	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	DIBROMOCHLOROMETHANE	MS1	105	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	DIBROMOMETHANE	MS1	100	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	DIBROMOMETHANE	MS1	106	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	DIBROMOMETHANE	MS1	103	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	DICHLORODIFLUOROMETHANE	MS1	108	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	DICHLORODIFLUOROMETHANE	MS1	108	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	DICHLORODIFLUOROMETHANE	MS1	101	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	ETHYLBENZENE	MS1	108	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	ETHYLBENZENE	MS1	112	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	ETHYLBENZENE	MS1	109	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	HEXACHLOROBUTADIENE	MS1	104	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	HEXACHLOROBUTADIENE	MS1	108	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	HEXACHLOROBUTADIENE	MS1	103	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	ISOPROPYLBENZENE	MS1	111	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	ISOPROPYLBENZENE	MS1	112	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	ISOPROPYLBENZENE	MS1	109	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	METHYLENE CHLORIDE	MS1	114	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	METHYLENE CHLORIDE	MS1	93	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	METHYLENE CHLORIDE	MS1	94	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	NAPHTHALENE	MS1	97	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	NAPHTHALENE	MS1	103	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	NAPHTHALENE	MS1	100	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	n-BUTYLBENZENE	MS1	104	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	n-BUTYLBENZENE	MS1	106	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	n-BUTYLBENZENE	MS1	99	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
RECRL	99D5839	n-PROPYLBENZENE	MS1	88	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	n-PROPYLBENZENE	MS1	110	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	n-PROPYLBENZENE	MS1	108	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	o-CHLOROTOLUENE	MS1	105	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	o-CHLOROTOLUENE	MS1	111	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	o-CHLOROTOLUENE	MS1	108	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	p-CHLOROTOLUENE	MS1	100	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	p-CHLOROTOLUENE	MS1	110	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	p-CHLOROTOLUENE	MS1	106	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	93	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	94	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	103	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	sec-BUTYLBENZENE	MS1	105	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	sec-BUTYLBENZENE	MS1	109	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	sec-BUTYLBENZENE	MS1	106	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	STYRENE	MS1	105	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	STYRENE	MS1	108	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	STYRENE	MS1	109	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	tert-BUTYLBENZENE	MS1	105	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	tert-BUTYLBENZENE	MS1	109	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	tert-BUTYLBENZENE	MS1	106	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	TETRACHLOROETHENE	MS1	96	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	TETRACHLOROETHENE	MS1	108	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	TETRACHLOROETHENE	MS1	104	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	TOLUENE	MS1	106	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	TOLUENE	MS1	105	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	TOLUENE	MS1	110	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	TOTAL XYLENES	MS1	106	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	TOTAL XYLENES	MS1	111	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	TOTAL XYLENES	MS1	113	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	trans-1,2-DICHLOROETHENE	MS1	114	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	trans-1,2-DICHLOROETHENE	MS1	104	%REC				1	EPA 524.2	99LVK079-MB1	99LV[illegible]
RECRL	99D5839	trans-1,2-DICHLOROETHENE	MS1	104	%REC				1	EPA 524.2	99LVK081-MB1	99LV[illegible]
RECRL	99D5839	trans-1,3-DICHLOROPROPENE	MS1	103	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	trans-1,3-DICHLOROPROPENE	MS1	107	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	trans-1,3-DICHLOROPROPENE	MS1	103	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	TRICHLOROETHENE	MS1	107	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	TRICHLOROETHENE	MS1	109	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	TRICHLOROETHENE	MS1	108	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	TRICHLOROFLUOROMETHANE	MS1	116	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	TRICHLOROFLUOROMETHANE	MS1	116	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	TRICHLOROFLUOROMETHANE	MS1	101	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839	VINYL CHLORIDE	MS1	114	%REC				1	EPA 524.2	99LVK081-MB1	99LVK081
RECRL	99D5839	VINYL CHLORIDE	MS1	124	%REC				1	EPA 524.2	99LVK080-MB1	99LVK080
RECRL	99D5839	VINYL CHLORIDE	MS1	109	%REC				1	EPA 524.2	99LVK079-MB1	99LVK079
RECRL	99D5839-006.002	1,1,1,2-TETRACHLOROETHANE	MS1	98	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1,1,2-TETRACHLOROETHANE	MS2	107	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1,1-TRICHLOROETHANE	MS1	103	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1,1-TRICHLOROETHANE	MS2	111	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1,2,2-TETRACHLOROETHANE	MS1	113	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1,2,2-TETRACHLOROETHANE	MS2	122	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1,2-TRICHLOROETHANE	MS1	104	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1,2-TRICHLOROETHANE	MS2	117	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1-DICHLOROETHANE	MS1	103	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1-DICHLOROETHANE	MS2	111	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1-DICHLOROETHENE	MS1	86	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1-DICHLOROETHENE	MS2	94	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1-DICHLOROPROPENE	MS1	102	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,1-DICHLOROPROPENE	MS2	105	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,2,3-TRICHLOROBENZENE	MS1	84	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,2,3-TRICHLOROBENZENE	MS2	97	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,2,3-TRICHLOROPROPANE	MS1	112	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,2,3-TRICHLOROPROPANE	MS2	113	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,2,4-TRICHLOROBENZENE	MS1	84	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,2,4-TRICHLOROBENZENE	MS2	95	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,2-DIBROMOETHANE	MS1	102	%REC				1	EPA 524.2	9903L435-006	99LV[illegible]
RECRL	99D5839-006.002	1,2-DIBROMOETHANE	MS2	111	%REC				1	EPA 524.2	9903L435-006	99LV[illegible]
RECRL	99D5839-006.002	1,2-DICHLOROBENZENE	MS1	92	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,2-DICHLOROBENZENE	MS2	102	%REC				1	EPA 524.2	9903L435-006	99LVK081

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D5839-006.002	1,2-DICHLOROPROPANE	MS1	107	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,2-DICHLOROPROPANE	MS2	106	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,3-DICHLOROBENZENE	MS1	94	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,3-DICHLOROBENZENE	MS2	104	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,3-DICHLOROPROPANE	MS1	108	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,3-DICHLOROPROPANE	MS2	116	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,4-DICHLOROBENZENE	MS1	95	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	1,4-DICHLOROBENZENE	MS2	103	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	2,2-DICHLOROPROPANE	MS1	97	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	2,2-DICHLOROPROPANE	MS2	105	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	4-ISOPROPYLTOLUENE	MS1	97	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	4-ISOPROPYLTOLUENE	MS2	106	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BENZENE	MS1	100	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BENZENE	MS2	106	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BENZENE, 1,2,4-TRIMETHYL	MS1	102	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BENZENE, 1,2,4-TRIMETHYL	MS2	113	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	103	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BENZENE, 1,3,5-TRIMETHYL-	MS2	111	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BROMOBENZENE	MS1	116	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BROMOBENZENE	MS2	124	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BROMOCHLOROMETHANE	MS1	92	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BROMOCHLOROMETHANE	MS2	98	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BROMODICHLOROMETHANE	MS1	106	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BROMODICHLOROMETHANE	MS2	115	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BROMOFORM	MS1	88	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BROMOFORM	MS2	91	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BROMOMETHANE	MS1	95	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	BROMOMETHANE	MS2	103	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	CARBON TETRACHLORIDE	MS1	101	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	CARBON TETRACHLORIDE	MS2	108	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	CHLOROBENZENE	MS1	95	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	CHLOROBENZENE	MS2	107	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	CHLOROETHANE	MS1	100	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	CHLOROETHANE	MS2	114	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	CHLOROFORM	MS1	105	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	CHLOROFORM	MS2	112	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	CHLOROMETHANE	MS1	96	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	CHLOROMETHANE	MS2	101	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	cis-1,2-DICHLOROETHENE	MS1	90	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	cis-1,2-DICHLOROETHENE	MS2	98	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	cis-1,3-DICHLOROPROPENE	MS1	97	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	cis-1,3-DICHLOROPROPENE	MS2	107	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	DIBROMOCHLOROMETHANE	MS1	98	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	DIBROMOCHLOROMETHANE	MS2	108	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	DIBROMOMETHANE	MS1	90	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	DIBROMOMETHANE	MS2	93	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	DICHLORODIFLUOROMETHANE	MS1	91	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	DICHLORODIFLUOROMETHANE	MS2	102	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	ETHYLBENZENE	MS1	95	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	ETHYLBENZENE	MS2	105	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	HEXACHLOROBUTADIENE	MS1	84	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	HEXACHLOROBUTADIENE	MS2	90	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	ISOPROPYLBENZENE	MS1	62	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	ISOPROPYLBENZENE	MS2	108	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	METHYLENE CHLORIDE	MS1	74	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	METHYLENE CHLORIDE	MS2	75	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	NAPHTHALENE	MS1	83	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	NAPHTHALENE	MS2	92	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	n-BUTYLBENZENE	MS1	86	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	n-BUTYLBENZENE	MS2	94	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	n-PROPYLBENZENE	MS1	94	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	n-PROPYLBENZENE	MS2	104	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	o-CHLOROTOLUENE	MS1	96	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	o-CHLOROTOLUENE	MS2	108	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	p-CHLOROTOLUENE	MS1	96	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	p-CHLOROTOLUENE	MS2	103	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	84	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	90	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	sec-BUTYLBENZENE	MS1	91	%REC				1	EPA 524.2	9903L435-006	99LVK081

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
RECRL	99D5839-006.002	sec-BUTYLBENZENE	MS2	102	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	STYRENE	MS1	97	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	STYRENE	MS2	104	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	tert-BUTYLBENZENE	MS1	91	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	tert-BUTYLBENZENE	MS2	102	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	TETRACHLOROETHENE	MS1	74	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	TETRACHLOROETHENE	MS2	84	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	TOLUENE	MS1	98	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	TOLUENE	MS2	105	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	TOTAL XYLENES	MS1	98	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	TOTAL XYLENES	MS2	105	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	trans-1,2-DICHLOROETHENE	MS1	93	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	trans-1,2-DICHLOROETHENE	MS2	101	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	trans-1,3-DICHLOROPROPENE	MS1	100	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	trans-1,3-DICHLOROPROPENE	MS2	110	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	TRICHLOROETHENE	MS1	70	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	TRICHLOROETHENE	MS2	83	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	TRICHLOROFLUOROMETHANE	MS1	105	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	TRICHLOROFLUOROMETHANE	MS2	112	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	VINYL CHLORIDE	MS1	93	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D5839-006.002	VINYL CHLORIDE	MS2	103	%REC				1	EPA 524.2	9903L435-006	99LVK081
RECRL	99D6287-006.002	1,1,1,2-TETRACHLOROETHANE	MS1	100	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1,1,2-TETRACHLOROETHANE	MS2	96	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1,1-TRICHLOROETHANE	MS1	103	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1,1-TRICHLOROETHANE	MS2	102	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1,2,2-TETRACHLOROETHANE	MS1	91	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1,2,2-TETRACHLOROETHANE	MS2	93	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1,2-TRICHLOROETHANE	MS1	91	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1,2-TRICHLOROETHANE	MS2	98	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1-DICHLOROETHANE	MS1	98	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1-DICHLOROETHANE	MS2	98	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1-DICHLOROETHENE	MS1	97	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1-DICHLOROETHENE	MS2	102	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1-DICHLOROPROPENE	MS1	99	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,1-DICHLOROPROPENE	MS2	98	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,2,3-TRICHLOROBENZENE	MS1	82	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,2,3-TRICHLOROBENZENE	MS2	82	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,2,3-TRICHLOROPROPANE	MS1	96	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,2,3-TRICHLOROPROPANE	MS2	96	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,2,4-TRICHLOROBENZENE	MS1	77	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,2,4-TRICHLOROBENZENE	MS2	82	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,2-DIBROMOETHANE	MS1	89	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,2-DIBROMOETHANE	MS2	92	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,2-DICHLOROBENZENE	MS1	91	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,2-DICHLOROBENZENE	MS2	94	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,2-DICHLOROPROPANE	MS1	93	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,2-DICHLOROPROPANE	MS2	94	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,3-DICHLOROBENZENE	MS1	91	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,3-DICHLOROBENZENE	MS2	92	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,3-DICHLOROPROPANE	MS1	86	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,3-DICHLOROPROPANE	MS2	92	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,4-DICHLOROBENZENE	MS1	92	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	1,4-DICHLOROBENZENE	MS2	96	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	2,2-DICHLOROPROPANE	MS1	96	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	2,2-DICHLOROPROPANE	MS2	94	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	4-ISOPROPYLTOLUENE	MS1	91	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	4-ISOPROPYLTOLUENE	MS2	93	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BENZENE	MS1	96	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BENZENE	MS2	96	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BENZENE, 1,2,4-TRIMETHYL	MS1	92	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BENZENE, 1,2,4-TRIMETHYL	MS2	93	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	88	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BENZENE, 1,3,5-TRIMETHYL-	MS2	93	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BROMOBENZENE	MS1	89	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BROMOBENZENE	MS2	91	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BROMOCHLOROMETHANE	MS1	93	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BROMOCHLOROMETHANE	MS2	99	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BROMODICHLOROMETHANE	MS1	98	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BROMODICHLOROMETHANE	MS2	99	%REC				1	EPA 524.2	9904L622-003	99LVK101

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D6287-006.002	BROMOFORM	MS1	84	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BROMOFORM	MS2	87	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BROMOMETHANE	MS1	98	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	BROMOMETHANE	MS2	100	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	CARBON TETRACHLORIDE	MS1	106	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	CARBON TETRACHLORIDE	MS2	101	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	CHLOROBENZENE	MS1	87	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	CHLOROBENZENE	MS2	91	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	CHLOROETHANE	MS1	103	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	CHLOROETHANE	MS2	92	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	CHLOROFORM	MS1	98	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	CHLOROFORM	MS2	100	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	CHLOROMETHANE	MS1	91	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	CHLOROMETHANE	MS2	88	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	cis-1,2-DICHLOROETHENE	MS1	86	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	cis-1,2-DICHLOROETHENE	MS2	94	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	cis-1,3-DICHLOROPROPENE	MS1	79	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	cis-1,3-DICHLOROPROPENE	MS2	85	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	DIBROMOCHLOROMETHANE	MS1	93	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	DIBROMOCHLOROMETHANE	MS2	93	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	DIBROMOMETHANE	MS1	91	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	DIBROMOMETHANE	MS2	96	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	DICHLORODIFLUOROMETHANE	MS1	105	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	DICHLORODIFLUOROMETHANE	MS2	98	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	ETHYLBENZENE	MS1	90	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	ETHYLBENZENE	MS2	92	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	HEXACHLOROBUTADIENE	MS1	81	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	HEXACHLOROBUTADIENE	MS2	83	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	ISOPROPYLBENZENE	MS1	79	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	ISOPROPYLBENZENE	MS2	88	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	METHYLENE CHLORIDE	MS1	92	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	METHYLENE CHLORIDE	MS2	85	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	NAPHTHALENE	MS1	77	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	NAPHTHALENE	MS2	79	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	n-BUTYLBENZENE	MS1	85	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	n-BUTYLBENZENE	MS2	88	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	n-PROPYLBENZENE	MS1	89	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	n-PROPYLBENZENE	MS2	91	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	o-CHLOROTOLUENE	MS1	94	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	o-CHLOROTOLUENE	MS2	96	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	p-CHLOROTOLUENE	MS1	87	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	p-CHLOROTOLUENE	MS2	88	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	89	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	83	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	sec-BUTYLBENZENE	MS1	89	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	sec-BUTYLBENZENE	MS2	93	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	STYRENE	MS1	87	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	STYRENE	MS2	91	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	tert-BUTYLBENZENE	MS1	88	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	tert-BUTYLBENZENE	MS2	93	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	TETRACHLOROETHENE	MS1	88	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	TETRACHLOROETHENE	MS2	90	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	TOLUENE	MS1	78	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	TOLUENE	MS2	80	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	TOTAL XYLENES	MS1	88	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	TOTAL XYLENES	MS2	92	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	trans-1,2-DICHLOROETHENE	MS1	96	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	trans-1,2-DICHLOROETHENE	MS2	101	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	trans-1,3-DICHLOROPROPENE	MS1	83	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	trans-1,3-DICHLOROPROPENE	MS2	78	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	TRICHLOROETHENE	MS1	92	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	TRICHLOROETHENE	MS2	91	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	TRICHLOROFLUOROMETHANE	MS1	106	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	TRICHLOROFLUOROMETHANE	MS2	109	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	VINYL CHLORIDE	MS1	96	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6287-006.002	VINYL CHLORIDE	MS2	97	%REC				1	EPA 524.2	9904L622-003	99LVK101
RECRL	99D6808-004.002	1,1,1,2-TETRACHLOROETHANE	MS1	98	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,1,1,2-TETRACHLOROETHANE	MS2	82	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,1,1-TRICHLOROETHANE	MS1	98	%REC				1	EPA 524.2	9904L763-004	99LVH135

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

Lab	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
RECRL	99D6808-004.002	1,1,1-TRICHLOROETHANE	MS2	98	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,1,2,2-TETRACHLOROETHANE	MS1	95	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,1,2,2-TETRACHLOROETHANE	MS2	88	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,1,2-TRICHLOROETHANE	MS1	104	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,1,2-TRICHLOROETHANE	MS2	86	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,1-DICHLOROETHANE	MS1	96	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,1-DICHLOROETHANE	MS2	91	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,1-DICHLOROETHENE	MS1	92	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,1-DICHLOROETHENE	MS2	88	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,1-DICHLOROPROPENE	MS1	95	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,1-DICHLOROPROPENE	MS2	97	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,2,3-TRICHLOROBENZENE	MS1	93	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,2,3-TRICHLOROBENZENE	MS2	78	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,2,3-TRICHLOROPROPANE	MS1	95	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,2,3-TRICHLOROPROPANE	MS2	75	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,2,4-TRICHLOROBENZENE	MS1	94	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,2,4-TRICHLOROBENZENE	MS2	72	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,2-DIBROMOETHANE	MS1	96	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,2-DIBROMOETHANE	MS2	77	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,2-DICHLOROBENZENE	MS1	96	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,2-DICHLOROBENZENE	MS2	88	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,2-DICHLOROETHANE	MS2	80	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,2-DICHLOROPROPANE	MS1	100	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,2-DICHLOROPROPANE	MS2	86	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,3-DICHLOROBENZENE	MS1	96	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,3-DICHLOROBENZENE	MS2	86	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,3-DICHLOROPROPANE	MS1	99	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,3-DICHLOROPROPANE	MS2	80	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	1,4-DICHLOROBENZENE	MS1	98	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	1,4-DICHLOROBENZENE	MS2	91	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	2,2-DICHLOROPROPANE	MS1	84	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	2,2-DICHLOROPROPANE	MS2	96	%REC				1	EPA 524.2	9904L763-004	99LVH
RECRL	99D6808-004.002	4-ISOPROPYLTOLUENE	MS1	95	%REC				1	EPA 524.2	9904L763-004	99LVH
RECRL	99D6808-004.002	4-ISOPROPYLTOLUENE	MS2	101	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	BENZENE	MS1	99	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	BENZENE	MS2	95	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	BENZENE, 1,2,4-TRIMETHYL	MS1	97	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	BENZENE, 1,2,4-TRIMETHYL	MS2	96	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	97	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	BENZENE, 1,3,5-TRIMETHYL-	MS2	98	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	BROMOBENZENE	MS1	96	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	BROMOBENZENE	MS2	88	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	BROMOCHLOROMETHANE	MS1	99	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	BROMOCHLOROMETHANE	MS2	81	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	BROMODICHLOROMETHANE	MS1	96	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	BROMODICHLOROMETHANE	MS2	82	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	BROMOFORM	MS1	91	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	BROMOFORM	MS2	72	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	BROMOMETHANE	MS1	70	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	BROMOMETHANE	MS2	58	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	CARBON TETRACHLORIDE	MS1	90	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	CARBON TETRACHLORIDE	MS2	90	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	CHLOROBENZENE	MS1	97	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	CHLOROBENZENE	MS2	94	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	CHLOROETHANE	MS1	98	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	CHLOROETHANE	MS2	98	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	CHLOROFORM	MS1	98	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	CHLOROFORM	MS2	88	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	CHLOROMETHANE	MS1	95	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	CHLOROMETHANE	MS2	94	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	cis-1,2-DICHLOROETHENE	MS1	95	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	cis-1,2-DICHLOROETHENE	MS2	74	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	cis-1,3-DICHLOROPROPENE	MS1	94	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	cis-1,3-DICHLOROPROPENE	MS2	84	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	DIBROMOCHLOROMETHANE	MS1	93	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	DIBROMOCHLOROMETHANE	MS2	79	%REC				1	EPA 524.2	9904L763-004	99LVH
RECRL	99D6808-004.002	DIBROMOMETHANE	MS1	99	%REC				1	EPA 524.2	9904L763-004	99LVH
RECRL	99D6808-004.002	DIBROMOMETHANE	MS2	77	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	DICHLORODIFLUOROMETHANE	MS1	87	%REC				1	EPA 524.2	9904L763-004	99LVH135

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D6808-004.002	DICHLORODIFLUOROMETHANE	MS2	87	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	ETHYLBENZENE	MS1	96	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	ETHYLBENZENE	MS2	99	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	HEXACHLOROBUTADIENE	MS1	93	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	HEXACHLOROBUTADIENE	MS2	100	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	ISOPROPYLBENZENE	MS1	95	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	ISOPROPYLBENZENE	MS2	99	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	METHYLENE CHLORIDE	MS1	17	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	METHYLENE CHLORIDE	MS2	7	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	NAPHTHALENE	MS1	88	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	NAPHTHALENE	MS2	63	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	n-BUTYLBENZENE	MS1	92	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	n-BUTYLBENZENE	MS2	97	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	n-PROPYLBENZENE	MS1	94	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	n-PROPYLBENZENE	MS2	100	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	o-CHLOROTOLUENE	MS1	95	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	o-CHLOROTOLUENE	MS2	96	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	p-CHLOROTOLUENE	MS1	94	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	p-CHLOROTOLUENE	MS2	94	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	92	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	68	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	sec-BUTYLBENZENE	MS1	94	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	sec-BUTYLBENZENE	MS2	100	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	STYRENE	MS1	96	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	STYRENE	MS2	90	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	tert-BUTYLBENZENE	MS1	95	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	tert-BUTYLBENZENE	MS2	98	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	TETRACHLOROETHENE	MS1	86	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	TETRACHLOROETHENE	MS2	85	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	TOLUENE	MS1	97	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	TOLUENE	MS2	99	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	TOTAL XYLENES	MS1	96	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	TOTAL XYLENES	MS2	97	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	trans-1,2-DICHLOROETHENE	MS1	97	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	trans-1,2-DICHLOROETHENE	MS2	97	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	trans-1,3-DICHLOROPROPENE	MS1	92	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	trans-1,3-DICHLOROPROPENE	MS2	79	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	TRICHLOROETHENE	MS1	44	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	TRICHLOROETHENE	MS2	0	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	TRICHLOROFLUOROMETHANE	MS1	93	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	TRICHLOROFLUOROMETHANE	MS2	96	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D6808-004.002	VINYL CHLORIDE	MS1	96	%REC				1	EPA 524.2	9904L763-004	99LVH135
RECRL	99D6808-004.002	VINYL CHLORIDE	MS2	96	%REC				1	EPA 524.2	9904L763-004	99LVH136
RECRL	99D7057-002.001	1,1,1,2-TETRACHLOROETHANE	MS1	114	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1,1,2-TETRACHLOROETHANE	MS2	120	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1,1-TRICHLOROETHANE	MS1	114	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1,1-TRICHLOROETHANE	MS2	111	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1,2,2-TETRACHLOROETHANE	MS1	109	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1,2,2-TETRACHLOROETHANE	MS2	110	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1,2-TRICHLOROETHANE	MS1	110	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1,2-TRICHLOROETHANE	MS2	115	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1-DICHLOROETHANE	MS1	99	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1-DICHLOROETHANE	MS2	99	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1-DICHLOROETHENE	MS1	114	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1-DICHLOROETHENE	MS2	110	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1-DICHLOROPROPENE	MS1	108	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,1-DICHLOROPROPENE	MS2	106	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,2,3-TRICHLOROBENZENE	MS1	108	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,2,3-TRICHLOROBENZENE	MS2	102	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,2,3-TRICHLOROPROPANE	MS1	111	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,2,3-TRICHLOROPROPANE	MS2	116	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,2,4-TRICHLOROBENZENE	MS1	96	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,2,4-TRICHLOROBENZENE	MS2	105	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,2-DIBROMOETHANE	MS1	110	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,2-DIBROMOETHANE	MS2	112	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,2-DICHLOROBENZENE	MS1	110	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,2-DICHLOROBENZENE	MS2	111	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,2-DICHLOROETHANE	MS2	113	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,2-DICHLOROPROPANE	MS1	106	%REC		1		1	EPA 524.2	9904L830-006	99LVK134

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[illegible]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch [illegible]
RECRL	99D7057-002.001	1,2-DICHLOROPROPANE	MS2	109	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,3-DICHLOROBENZENE	MS1	108	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,3-DICHLOROBENZENE	MS2	110	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,3-DICHLOROPROPANE	MS1	104	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,3-DICHLOROPROPANE	MS2	108	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,4-DICHLOROBENZENE	MS1	115	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	1,4-DICHLOROBENZENE	MS2	107	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	2,2-DICHLOROPROPANE	MS1	104	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	2,2-DICHLOROPROPANE	MS2	102	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	4-ISOPROPYLTOLUENE	MS1	107	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	4-ISOPROPYLTOLUENE	MS2	111	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BENZENE	MS1	113	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BENZENE	MS2	112	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BENZENE, 1,2,4-TRIMETHYL	MS1	109	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BENZENE, 1,2,4-TRIMETHYL	MS2	111	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BENZENE, 1,3,5-TRIMETHYL-	MS1	108	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BENZENE, 1,3,5-TRIMETHYL-	MS2	108	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BROMOBENZENE	MS1	112	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BROMOBENZENE	MS2	103	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BROMOCHLOROMETHANE	MS1	115	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BROMOCHLOROMETHANE	MS2	114	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BROMODICHLOROMETHANE	MS1	112	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BROMODICHLOROMETHANE	MS2	113	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BROMOFORM	MS1	101	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BROMOFORM	MS2	105	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BROMOMETHANE	MS1	105	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	BROMOMETHANE	MS2	103	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	CARBON TETRACHLORIDE	MS1	112	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	CARBON TETRACHLORIDE	MS2	113	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	CHLOROBENZENE	MS1	106	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	CHLOROBENZENE	MS2	107	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
[illegible]RL	99D7057-002.001	CHLOROETHANE	MS1	116	%REC		1		1	EPA 524.2	9904L830-006	99LV[illegible]
[illegible]RL	99D7057-002.001	CHLOROETHANE	MS2	117	%REC		1		1	EPA 524.2	9904L830-006	99LV[illegible]
RECRL	99D7057-002.001	CHLOROFORM	MS1	113	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	CHLOROFORM	MS2	112	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	CHLOROMETHANE	MS1	100	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	CHLOROMETHANE	MS2	96	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	cis-1,2-DICHLOROETHENE	MS1	109	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	cis-1,2-DICHLOROETHENE	MS2	0	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	cis-1,3-DICHLOROPROPENE	MS1	102	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	cis-1,3-DICHLOROPROPENE	MS2	104	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	DIBROMOCHLOROMETHANE	MS1	106	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	DIBROMOCHLOROMETHANE	MS2	108	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	DIBROMOMETHANE	MS1	110	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	DIBROMOMETHANE	MS2	107	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	DICHLORODIFLUOROMETHANE	MS1	106	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	DICHLORODIFLUOROMETHANE	MS2	102	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	ETHYLBENZENE	MS1	106	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	ETHYLBENZENE	MS2	110	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	HEXACHLOROBUTADIENE	MS1	92	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	HEXACHLOROBUTADIENE	MS2	93	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	ISOPROPYLBENZENE	MS1	106	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	ISOPROPYLBENZENE	MS2	114	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	METHYLENE CHLORIDE	MS1	81	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	METHYLENE CHLORIDE	MS2	120	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	NAPHTHALENE	MS1	102	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	NAPHTHALENE	MS2	107	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	n-BUTYLBENZENE	MS1	102	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	n-BUTYLBENZENE	MS2	102	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	n-PROPYLBENZENE	MS1	106	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	n-PROPYLBENZENE	MS2	110	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	o-CHLOROTOLUENE	MS1	102	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	o-CHLOROTOLUENE	MS2	106	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	p-CHLOROTOLUENE	MS1	100	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
[illegible]RL	99D7057-002.001	p-CHLOROTOLUENE	MS2	106	%REC		1		1	EPA 524.2	9904L830-006	99LVK[illegible]
[illegible]RL	99D7057-002.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	103	%REC		1		1	EPA 524.2	9904L830-006	99LV[illegible]
[illegible]RL	99D7057-002.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	109	%REC		1		1	EPA 524.2	9904L830-006	99LV[illegible]
RECRL	99D7057-002.001	sec-BUTYLBENZENE	MS1	107	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	sec-BUTYLBENZENE	MS2	102	%REC		1		1	EPA 524.2	9904L830-006	99LVK134

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D7057-002.001	STYRENE	MS1	109	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	STYRENE	MS2	110	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	tert-BUTYLBENZENE	MS1	103	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	tert-BUTYLBENZENE	MS2	108	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	TETRACHLOROETHENE	MS1	100	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	TETRACHLOROETHENE	MS2	106	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	TOLUENE	MS1	105	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	TOLUENE	MS2	114	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	TOTAL XYLENES	MS1	108	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	TOTAL XYLENES	MS2	110	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	trans-1,2-DICHLOROETHENE	MS1	112	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	trans-1,2-DICHLOROETHENE	MS2	105	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	trans-1,3-DICHLOROPROPENE	MS1	98	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	trans-1,3-DICHLOROPROPENE	MS2	104	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	TRICHLOROETHENE	MS1	106	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	TRICHLOROETHENE	MS2	100	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	TRICHLOROFLUOROMETHANE	MS1	114	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	TRICHLOROFLUOROMETHANE	MS2	115	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	VINYL CHLORIDE	MS1	111	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7057-002.001	VINYL CHLORIDE	MS2	102	%REC		1		1	EPA 524.2	9904L830-006	99LVK134
RECRL	99D7170-001.002	1,1,1,2-TETRACHLOROETHANE	MS1	101	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1,1,2-TETRACHLOROETHANE	MS2	98	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1,1-TRICHLOROETHANE	MS1	110	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1,1-TRICHLOROETHANE	MS2	118	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1,2,2-TETRACHLOROETHANE	MS1	108	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1,2,2-TETRACHLOROETHANE	MS2	111	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1,2-TRICHLOROETHANE	MS1	104	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1,2-TRICHLOROETHANE	MS2	107	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1-DICHLOROETHANE	MS1	101	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1-DICHLOROETHANE	MS2	111	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1-DICHLOROETHENE	MS1	102	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1-DICHLOROETHENE	MS2	109	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1-DICHLOROPROPENE	MS1	110	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,1-DICHLOROPROPENE	MS2	103	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2,3-TRICHLOROBENZENE	MS1	98	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2,3-TRICHLOROBENZENE	MS2	105	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2,3-TRICHLOROPROPANE	MS1	113	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2,3-TRICHLOROPROPANE	MS2	112	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2,4-TRICHLOROBENZENE	MS1	100	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2,4-TRICHLOROBENZENE	MS2	107	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2-DIBROMOETHANE	MS1	104	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2-DIBROMOETHANE	MS2	107	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2-DICHLOROBENZENE	MS1	106	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2-DICHLOROBENZENE	MS2	104	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2-DICHLOROETHANE	MS2	117	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2-DICHLOROPROPANE	MS1	100	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,2-DICHLOROPROPANE	MS2	109	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,3-DICHLOROBENZENE	MS1	104	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,3-DICHLOROBENZENE	MS2	111	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,3-DICHLOROPROPANE	MS1	100	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,3-DICHLOROPROPANE	MS2	101	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,4-DICHLOROBENZENE	MS1	103	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	1,4-DICHLOROBENZENE	MS2	114	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	2,2-DICHLOROPROPANE	MS1	100	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	2,2-DICHLOROPROPANE	MS2	101	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	4-ISOPROPYLTOLUENE	MS1	100	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	4-ISOPROPYLTOLUENE	MS2	110	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BENZENE	MS1	102	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BENZENE	MS2	106	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BENZENE, 1,2,4-TRIMETHYL	MS1	107	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BENZENE, 1,2,4-TRIMETHYL	MS2	109	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	104	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BENZENE, 1,3,5-TRIMETHYL-	MS2	109	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BROMOBENZENE	MS1	102	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BROMOBENZENE	MS2	108	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BROMOCHLOROMETHANE	MS1	103	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BROMOCHLOROMETHANE	MS2	107	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BROMODICHLOROMETHANE	MS1	110	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BROMODICHLOROMETHANE	MS2	113	%REC		1		5	EPA 524.2	9905L921-001	99LVK145

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[illegible]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch [illegible]
RECRL	99D7170-001.002	BROMOFORM	MS1	105	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BROMOFORM	MS2	111	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BROMOMETHANE	MS1	98	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	BROMOMETHANE	MS2	101	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	CARBON TETRACHLORIDE	MS1	60	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	CARBON TETRACHLORIDE	MS2	91	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	CHLOROBENZENE	MS1	102	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	CHLOROBENZENE	MS2	106	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	CHLOROETHANE	MS1	113	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	CHLOROETHANE	MS2	99	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	CHLOROFORM	MS1	85	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	CHLOROFORM	MS2	107	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	CHLOROMETHANE	MS1	80	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	CHLOROMETHANE	MS2	87	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	cis-1,2-DICHLOROETHENE	MS1	103	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	cis-1,2-DICHLOROETHENE	MS2	109	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	cis-1,3-DICHLOROPROPENE	MS1	99	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	cis-1,3-DICHLOROPROPENE	MS2	101	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	DIBROMOCHLOROMETHANE	MS1	109	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	DIBROMOCHLOROMETHANE	MS2	114	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	DIBROMOMETHANE	MS1	104	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	DIBROMOMETHANE	MS2	107	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	DICHLORODIFLUOROMETHANE	MS1	93	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	DICHLORODIFLUOROMETHANE	MS2	100	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	ETHYLBENZENE	MS1	99	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	ETHYLBENZENE	MS2	108	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	HEXACHLOROBUTADIENE	MS1	99	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	HEXACHLOROBUTADIENE	MS2	107	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	ISOPROPYLBENZENE	MS1	86	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	ISOPROPYLBENZENE	MS2	95	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	METHYLENE CHLORIDE	MS1	84	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
[illegible]RL	99D7170-001.002	METHYLENE CHLORIDE	MS2	88	%REC		1		5	EPA 524.2	9905L921-001	99LV[illegible]
[illegible]RL	99D7170-001.002	NAPHTHALENE	MS1	96	%REC		1		5	EPA 524.2	9905L921-001	99LV[illegible]
RECRL	99D7170-001.002	NAPHTHALENE	MS2	104	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	n-BUTYLBENZENE	MS1	100	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	n-BUTYLBENZENE	MS2	105	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	n-PROPYLBENZENE	MS1	102	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	n-PROPYLBENZENE	MS2	109	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	o-CHLOROTOLUENE	MS1	100	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	o-CHLOROTOLUENE	MS2	108	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	p-CHLOROTOLUENE	MS1	102	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	p-CHLOROTOLUENE	MS2	107	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	109	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	113	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	sec-BUTYLBENZENE	MS1	102	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	sec-BUTYLBENZENE	MS2	104	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	STYRENE	MS1	100	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	STYRENE	MS2	106	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	tert-BUTYLBENZENE	MS1	104	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	tert-BUTYLBENZENE	MS2	106	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	TETRACHLOROETHENE	MS1	103	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	TETRACHLOROETHENE	MS2	108	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	TOLUENE	MS1	99	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	TOLUENE	MS2	106	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	TOTAL XYLENES	MS1	99	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	TOTAL XYLENES	MS2	104	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	trans-1,2-DICHLOROETHENE	MS1	102	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	trans-1,2-DICHLOROETHENE	MS2	107	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	trans-1,3-DICHLOROPROPENE	MS1	102	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	trans-1,3-DICHLOROPROPENE	MS2	111	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	TRICHLOROETHENE	MS1	112	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	TRICHLOROETHENE	MS2	113	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	TRICHLOROFLUOROMETHANE	MS1	112	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	TRICHLOROFLUOROMETHANE	MS2	119	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
RECRL	99D7170-001.002	VINYL CHLORIDE	MS1	97	%REC		1		5	EPA 524.2	9905L921-001	99LVK145
[illegible]RL	99D7170-001.002	VINYL CHLORIDE	MS2	86	%REC		1		5	EPA 524.2	9905L921-001	99LV[illegible]
[illegible]RL	99D7382-003.001	1,1,1,2-TETRACHLOROETHANE	MS1	99	%REC				20	EPA 524.2	9905L982-003	99LVK[illegible]
RECRL	99D7382-003.001	1,1,1,2-TETRACHLOROETHANE	MS2	101	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,1,1-TRICHLOROETHANE	MS1	124	%REC				20	EPA 524.2	9905L982-003	99LVK148

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D7382-003.001	1,1,1-TRICHLOROETHANE	MS2	120	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,1,2,2-TETRACHLOROETHANE	MS1	113	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,1,2,2-TETRACHLOROETHANE	MS2	112	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,1,2-TRICHLOROETHANE	MS1	108	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,1,2-TRICHLOROETHANE	MS2	106	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,1-DICHLOROETHANE	MS1	109	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,1-DICHLOROETHANE	MS2	109	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,1-DICHLOROETHENE	MS1	109	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,1-DICHLOROETHENE	MS2	97	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,1-DICHLOROPROPENE	MS1	104	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,1-DICHLOROPROPENE	MS2	98	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,2,3-TRICHLOROBENZENE	MS1	103	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,2,3-TRICHLOROBENZENE	MS2	98	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,2,3-TRICHLOROPROPANE	MS1	98	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,2,3-TRICHLOROPROPANE	MS2	111	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,2,4-TRICHLOROBENZENE	MS1	104	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,2,4-TRICHLOROBENZENE	MS2	101	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,2-DIBROMOETHANE	MS1	106	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,2-DIBROMOETHANE	MS2	103	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,2-DICHLOROBENZENE	MS1	113	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,2-DICHLOROBENZENE	MS2	107	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,2-DICHLOROPROPANE	MS1	105	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,2-DICHLOROPROPANE	MS2	96	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,3-DICHLOROBENZENE	MS1	110	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,3-DICHLOROBENZENE	MS2	104	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,3-DICHLOROPROPANE	MS1	99	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,3-DICHLOROPROPANE	MS2	101	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,4-DICHLOROBENZENE	MS1	113	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	1,4-DICHLOROBENZENE	MS2	107	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	2,2-DICHLOROPROPANE	MS1	114	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	2,2-DICHLOROPROPANE	MS2	100	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	4-ISOPROPYLTOLUENE	MS1	114	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	4-ISOPROPYLTOLUENE	MS2	108	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BENZENE	MS1	105	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BENZENE	MS2	101	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BENZENE, 1,2,4-TRIMETHYL	MS1	111	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BENZENE, 1,2,4-TRIMETHYL	MS2	107	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BENZENE, 1,3,5-TRIMETHYL-	MS1	110	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BENZENE, 1,3,5-TRIMETHYL-	MS2	108	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BROMOBENZENE	MS1	108	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BROMOBENZENE	MS2	105	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BROMOCHLOROMETHANE	MS1	106	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BROMOCHLOROMETHANE	MS2	100	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BROMODICHLOROMETHANE	MS1	115	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BROMODICHLOROMETHANE	MS2	107	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BROMOFORM	MS1	116	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BROMOFORM	MS2	107	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BROMOMETHANE	MS1	108	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	BROMOMETHANE	MS2	103	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	CARBON TETRACHLORIDE	MS1	119	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	CARBON TETRACHLORIDE	MS2	109	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	CHLOROBENZENE	MS1	109	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	CHLOROBENZENE	MS2	105	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	CHLOROETHANE	MS1	104	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	CHLOROETHANE	MS2	106	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	CHLOROFORM	MS1	114	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	CHLOROFORM	MS2	111	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	CHLOROMETHANE	MS1	94	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	CHLOROMETHANE	MS2	95	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	cis-1,2-DICHLOROETHENE	MS1	103	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	cis-1,2-DICHLOROETHENE	MS2	102	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	cis-1,3-DICHLOROPROPENE	MS1	102	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	cis-1,3-DICHLOROPROPENE	MS2	98	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	DIBROMOCHLOROMETHANE	MS1	112	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	DIBROMOCHLOROMETHANE	MS2	108	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	DIBROMOMETHANE	MS1	105	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	DIBROMOMETHANE	MS2	105	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	DICHLORODIFLUOROMETHANE	MS1	82	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	DICHLORODIFLUOROMETHANE	MS2	78	%REC				20	EPA 524.2	9905L982-003	99LVK148

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[illegible]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch [illegible]
RECRL	99D7382-003.001	ETHYLBENZENE	MS1	109	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	ETHYLBENZENE	MS2	105	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	HEXACHLOROBUTADIENE	MS1	111	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	HEXACHLOROBUTADIENE	MS2	104	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	ISOPROPYLBENZENE	MS1	124	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	ISOPROPYLBENZENE	MS2	117	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	METHYLENE CHLORIDE	MS1	100	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	METHYLENE CHLORIDE	MS2	103	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	NAPHTHALENE	MS1	86	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	NAPHTHALENE	MS2	82	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	n-BUTYLBENZENE	MS1	107	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	n-BUTYLBENZENE	MS2	108	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	n-PROPYLBENZENE	MS1	113	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	n-PROPYLBENZENE	MS2	109	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	o-CHLOROTOLUENE	MS1	114	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	o-CHLOROTOLUENE	MS2	109	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	p-CHLOROTOLUENE	MS1	109	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	p-CHLOROTOLUENE	MS2	104	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	104	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	97	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	sec-BUTYLBENZENE	MS1	113	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	sec-BUTYLBENZENE	MS2	110	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	STYRENE	MS1	99	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	STYRENE	MS2	102	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	tert-BUTYLBENZENE	MS1	113	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	tert-BUTYLBENZENE	MS2	106	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	TETRACHLOROETHENE	MS1	93	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	TETRACHLOROETHENE	MS2	81	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	TOLUENE	MS1	107	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	TOLUENE	MS2	103	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	TOTAL XYLENES	MS1	113	%REC				20	EPA 524.2	9905L982-003	99LVK148
[illegible]RL	99D7382-003.001	TOTAL XYLENES	MS2	103	%REC				20	EPA 524.2	9905L982-003	99LV[illegible]
[illegible]RL	99D7382-003.001	trans-1,2-DICHLOROETHENE	MS1	108	%REC				20	EPA 524.2	9905L982-003	99LV[illegible]
RECRL	99D7382-003.001	trans-1,2-DICHLOROETHENE	MS2	109	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	trans-1,3-DICHLOROPROPENE	MS1	102	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	trans-1,3-DICHLOROPROPENE	MS2	92	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	TRICHLOROETHENE	MS1	0	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	TRICHLOROETHENE	MS2	0	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	TRICHLOROFLUOROMETHANE	MS1	121	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	TRICHLOROFLUOROMETHANE	MS2	119	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	VINYL CHLORIDE	MS1	84	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7382-003.001	VINYL CHLORIDE	MS2	87	%REC				20	EPA 524.2	9905L982-003	99LVK148
RECRL	99D7743-004.002	1,1,1,2-TETRACHLOROETHANE	MS1	96	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1,1,2-TETRACHLOROETHANE	MS2	97	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1,1-TRICHLOROETHANE	MS1	106	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1,1-TRICHLOROETHANE	MS2	111	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1,2,2-TETRACHLOROETHANE	MS1	102	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1,2,2-TETRACHLOROETHANE	MS2	106	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1,2-TRICHLOROETHANE	MS1	104	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1,2-TRICHLOROETHANE	MS2	103	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1-DICHLOROETHANE	MS1	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1-DICHLOROETHANE	MS2	100	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1-DICHLOROETHENE	MS1	96	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1-DICHLOROETHENE	MS2	103	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1-DICHLOROPROPENE	MS1	97	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,1-DICHLOROPROPENE	MS2	102	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,2,3-TRICHLOROBENZENE	MS1	84	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,2,3-TRICHLOROBENZENE	MS2	90	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,2,3-TRICHLOROPROPANE	MS1	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,2,3-TRICHLOROPROPANE	MS2	95	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,2,4-TRICHLOROBENZENE	MS1	82	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,2,4-TRICHLOROBENZENE	MS2	88	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,2-DIBROMOETHANE	MS1	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,2-DIBROMOETHANE	MS2	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
[illegible]CRL	99D7743-004.002	1,2-DICHLOROBENZENE	MS1	97	%REC		1		1	EPA 524.2	9905L109-004	99LVH[illegible]
[illegible]RL	99D7743-004.002	1,2-DICHLOROBENZENE	MS2	102	%REC		1		1	EPA 524.2	9905L109-004	99LV[illegible]
[illegible]RL	99D7743-004.002	1,2-DICHLOROETHANE	MS1	104	%REC		1		1	EPA 524.2	9905L109-004	99LVH[illegible]
RECRL	99D7743-004.002	1,2-DICHLOROPROPANE	MS1	100	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,2-DICHLOROPROPANE	MS2	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D7743-004.002	1,3-DICHLOROBENZENE	MS1	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,3-DICHLOROBENZENE	MS2	100	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,3-DICHLOROPROPANE	MS1	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,3-DICHLOROPROPANE	MS2	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,4-DICHLOROBENZENE	MS1	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	1,4-DICHLOROBENZENE	MS2	104	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	2,2-DICHLOROPROPANE	MS1	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	2,2-DICHLOROPROPANE	MS2	104	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	4-ISOPROPYLTOLUENE	MS1	102	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	4-ISOPROPYLTOLUENE	MS2	110	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BENZENE	MS1	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BENZENE	MS2	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BENZENE, 1,2,4-TRIMETHYL	MS1	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BENZENE, 1,2,4-TRIMETHYL	MS2	105	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BENZENE, 1,3,5-TRIMETHYL-	MS2	108	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BROMOBENZENE	MS1	101	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BROMOBENZENE	MS2	105	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BROMOCHLOROMETHANE	MS1	100	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BROMOCHLOROMETHANE	MS2	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BROMODICHLOROMETHANE	MS1	106	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BROMODICHLOROMETHANE	MS2	104	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BROMOFORM	MS1	97	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BROMOFORM	MS2	96	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BROMOMETHANE	MS1	95	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	BROMOMETHANE	MS2	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	CARBON TETRACHLORIDE	MS1	104	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	CARBON TETRACHLORIDE	MS2	107	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	CHLOROBENZENE	MS1	97	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	CHLOROBENZENE	MS2	104	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	CHLOROETHANE	MS1	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
[illegible]	99D7743-004.002	CHLOROETHANE	MS2	106	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
[illegible]	99D7743-004.002	CHLOROFORM	MS1	105	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	CHLOROFORM	MS2	107	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	CHLOROMETHANE	MS1	68	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	CHLOROMETHANE	MS2	72	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	cis-1,2-DICHLOROETHENE	MS1	96	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	cis-1,2-DICHLOROETHENE	MS2	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	cis-1,3-DICHLOROPROPENE	MS1	94	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	cis-1,3-DICHLOROPROPENE	MS2	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	DIBROMOCHLOROMETHANE	MS1	102	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	DIBROMOCHLOROMETHANE	MS2	104	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	DIBROMOMETHANE	MS1	100	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	DIBROMOMETHANE	MS2	93	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	DICHLORODIFLUOROMETHANE	MS1	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	DICHLORODIFLUOROMETHANE	MS2	106	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	ETHYLBENZENE	MS1	97	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	ETHYLBENZENE	MS2	105	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	HEXACHLOROBUTADIENE	MS1	108	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	HEXACHLOROBUTADIENE	MS2	120	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	ISOPROPYLBENZENE	MS1	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	ISOPROPYLBENZENE	MS2	107	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	METHYLENE CHLORIDE	MS1	91	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	METHYLENE CHLORIDE	MS2	79	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	NAPHTHALENE	MS1	68	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	NAPHTHALENE	MS2	77	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	n-BUTYLBENZENE	MS1	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	n-BUTYLBENZENE	MS2	107	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	n-PROPYLBENZENE	MS1	96	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	n-PROPYLBENZENE	MS2	108	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	o-CHLOROTOLUENE	MS1	96	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	o-CHLOROTOLUENE	MS2	106	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	p-CHLOROTOLUENE	MS1	96	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	p-CHLOROTOLUENE	MS2	102	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
[illegible]	99D7743-004.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	86	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
[illegible]	99D7743-004.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	87	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
[illegible]	99D7743-004.002	sec-BUTYLBENZENE	MS1	100	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	sec-BUTYLBENZENE	MS2	109	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	STYRENE	MS1	94	%REC		1		1	EPA 524.2	9905L109-004	99LVH200

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
RECRL	99D7743-004.002	STYRENE	MS2	100	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	tert-BUTYLBENZENE	MS1	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	tert-BUTYLBENZENE	MS2	106	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	TETRACHLOROETHENE	MS1	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	TETRACHLOROETHENE	MS2	108	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	TOLUENE	MS1	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	TOLUENE	MS2	107	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	TOTAL XYLENES	MS1	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	TOTAL XYLENES	MS2	103	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	trans-1,2-DICHLOROETHENE	MS1	98	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	trans-1,2-DICHLOROETHENE	MS2	103	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	trans-1,3-DICHLOROPROPENE	MS1	93	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	trans-1,3-DICHLOROPROPENE	MS2	92	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	TRICHLOROETHENE	MS1	100	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	TRICHLOROETHENE	MS2	104	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	TRICHLOROFLUOROMETHANE	MS1	112	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	TRICHLOROFLUOROMETHANE	MS2	114	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	VINYL CHLORIDE	MS1	99	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D7743-004.002	VINYL CHLORIDE	MS2	107	%REC		1		1	EPA 524.2	9905L109-004	99LVH200
RECRL	99D8060-001.001	1,1,1,2-TETRACHLOROETHANE	MS1	110	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,1,1,2-TETRACHLOROETHANE	MS2	112	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,1,1-TRICHLOROETHANE	MS1	122	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,1,1-TRICHLOROETHANE	MS2	120	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,1,2,2-TETRACHLOROETHANE	MS1	108	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,1,2,2-TETRACHLOROETHANE	MS2	105	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,1,2-TRICHLOROETHANE	MS1	114	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,1,2-TRICHLOROETHANE	MS2	106	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,1-DICHLOROETHANE	MS1	115	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,1-DICHLOROETHANE	MS2	116	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,1-DICHLOROETHENE	MS1	119	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,1-DICHLOROETHENE	MS2	122	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,1-DICHLOROPROPENE	MS1	119	%REC		1		1	EPA 524.2	9906L251-001	99LVK[illegible]
RECRL	99D8060-001.001	1,1-DICHLOROPROPENE	MS2	114	%REC		1		1	EPA 524.2	9906L251-001	99LV[illegible]
RECRL	99D8060-001.001	1,2,3-TRICHLOROBENZENE	MS1	95	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2,3-TRICHLOROBENZENE	MS2	99	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2,3-TRICHLOROPROPANE	MS1	107	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2,3-TRICHLOROPROPANE	MS2	104	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2,4-TRICHLOROBENZENE	MS1	101	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2,4-TRICHLOROBENZENE	MS2	101	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2-DIBROMOETHANE	MS1	103	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2-DIBROMOETHANE	MS2	104	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2-DICHLOROBENZENE	MS1	107	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2-DICHLOROBENZENE	MS2	111	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2-DICHLOROETHANE	MS1	116	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2-DICHLOROETHANE	MS2	111	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2-DICHLOROPROPANE	MS1	112	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,2-DICHLOROPROPANE	MS2	112	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,3-DICHLOROBENZENE	MS1	112	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,3-DICHLOROBENZENE	MS2	109	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,3-DICHLOROPROPANE	MS1	107	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,3-DICHLOROPROPANE	MS2	104	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,4-DICHLOROBENZENE	MS1	105	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	1,4-DICHLOROBENZENE	MS2	108	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	2,2-DICHLOROPROPANE	MS1	110	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	2,2-DICHLOROPROPANE	MS2	112	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	4-ISOPROPYLTOLUENE	MS1	112	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	4-ISOPROPYLTOLUENE	MS2	113	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BENZENE	MS1	114	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BENZENE	MS2	111	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BENZENE, 1,2,4-TRIMETHYL	MS1	111	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BENZENE, 1,2,4-TRIMETHYL	MS2	109	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BENZENE, 1,3,5-TRIMETHYL-	MS1	112	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BENZENE, 1,3,5-TRIMETHYL-	MS2	107	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BROMOBENZENE	MS1	110	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BROMOBENZENE	MS2	106	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BROMOCHLOROMETHANE	MS1	107	%REC		1		1	EPA 524.2	9906L251-001	99LV[illegible]
RECRL	99D8060-001.001	BROMOCHLOROMETHANE	MS2	113	%REC		1		1	EPA 524.2	9906L251-001	99LVK[illegible]
RECRL	99D8060-001.001	BROMODICHLOROMETHANE	MS1	112	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BROMODICHLOROMETHANE	MS2	112	%REC		1		1	EPA 524.2	9906L251-001	99LVK195

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D8060-001.001	BROMOFORM	MS1	101	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BROMOFORM	MS2	95	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BROMOMETHANE	MS1	116	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	BROMOMETHANE	MS2	115	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	CARBON TETRACHLORIDE	MS1	65	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	CARBON TETRACHLORIDE	MS2	101	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	CHLOROBENZENE	MS1	108	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	CHLOROBENZENE	MS2	105	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	CHLOROETHANE	MS1	117	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	CHLOROETHANE	MS2	121	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	CHLOROFORM	MS1	112	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	CHLOROFORM	MS2	113	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	CHLOROMETHANE	MS1	102	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	CHLOROMETHANE	MS2	110	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	cis-1,2-DICHLOROETHENE	MS1	116	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	cis-1,2-DICHLOROETHENE	MS2	120	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	cis-1,3-DICHLOROPROPENE	MS1	100	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	cis-1,3-DICHLOROPROPENE	MS2	100	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	DIBROMOCHLOROMETHANE	MS1	106	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	DIBROMOCHLOROMETHANE	MS2	103	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	DIBROMOMETHANE	MS1	106	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	DIBROMOMETHANE	MS2	110	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	DICHLORODIFLUOROMETHANE	MS1	112	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	DICHLORODIFLUOROMETHANE	MS2	110	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	ETHYLBENZENE	MS1	110	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	ETHYLBENZENE	MS2	111	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	HEXACHLOROBUTADIENE	MS1	100	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	HEXACHLOROBUTADIENE	MS2	99	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	ISOPROPYLBENZENE	MS1	123	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	ISOPROPYLBENZENE	MS2	117	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	METHYLENE CHLORIDE	MS1	82	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	METHYLENE CHLORIDE	MS2	63	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	NAPHTHALENE	MS1	96	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	NAPHTHALENE	MS2	92	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	n-BUTYLBENZENE	MS1	111	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	n-BUTYLBENZENE	MS2	110	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	n-PROPYLBENZENE	MS1	115	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	n-PROPYLBENZENE	MS2	111	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	o-CHLOROTOLUENE	MS1	110	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	o-CHLOROTOLUENE	MS2	111	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	p-CHLOROTOLUENE	MS1	109	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	p-CHLOROTOLUENE	MS2	106	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	102	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	92	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	sec-BUTYLBENZENE	MS1	114	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	sec-BUTYLBENZENE	MS2	112	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	STYRENE	MS1	103	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	STYRENE	MS2	106	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	tert-BUTYLBENZENE	MS1	114	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	tert-BUTYLBENZENE	MS2	115	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	TETRACHLOROETHENE	MS1	86	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	TETRACHLOROETHENE	MS2	95	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	TOLUENE	MS1	113	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	TOLUENE	MS2	107	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	TOTAL XYLENES	MS1	111	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	TOTAL XYLENES	MS2	108	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	trans-1,2-DICHLOROETHENE	MS1	115	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	trans-1,2-DICHLOROETHENE	MS2	119	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	trans-1,3-DICHLOROPROPENE	MS1	103	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	trans-1,3-DICHLOROPROPENE	MS2	101	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	TRICHLOROETHENE	MS1	107	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	TRICHLOROETHENE	MS2	113	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	TRICHLOROFLUOROMETHANE	MS1	120	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	TRICHLOROFLUOROMETHANE	MS2	121	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	VINYL CHLORIDE	MS1	114	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8060-001.001	VINYL CHLORIDE	MS2	114	%REC		1		1	EPA 524.2	9906L251-001	99LVK195
RECRL	99D8809-001.001	1,1,1,2-TETRACHLOROETHANE	MS1	108	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,1,1,2-TETRACHLOROETHANE	MS2	108	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,1,1-TRICHLOROETHANE	MS1	114	%REC		1		1	EPA 524.2	9907L451-001	99LVK230

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[illegible]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch [illegible]
RECRL	99D8809-001.001	1,1,1-TRICHLOROETHANE	MS2	111	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,1,2,2-TETRACHLOROETHANE	MS1	99	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,1,2,2-TETRACHLOROETHANE	MS2	98	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,1,2-TRICHLOROETHANE	MS1	101	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,1,2-TRICHLOROETHANE	MS2	103	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,1-DICHLOROETHANE	MS1	103	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,1-DICHLOROETHANE	MS2	95	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,1-DICHLOROETHENE	MS1	104	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,1-DICHLOROETHENE	MS2	107	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,1-DICHLOROPROPENE	MS1	110	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,1-DICHLOROPROPENE	MS2	101	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2,3-TRICHLOROBENZENE	MS1	100	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2,3-TRICHLOROBENZENE	MS2	100	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2,3-TRICHLOROPROPANE	MS1	99	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2,3-TRICHLOROPROPANE	MS2	106	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2,4-TRICHLOROBENZENE	MS1	100	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2,4-TRICHLOROBENZENE	MS2	102	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2-DIBROMOETHANE	MS1	97	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2-DIBROMOETHANE	MS2	97	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2-DICHLOROBENZENE	MS1	113	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2-DICHLOROBENZENE	MS2	106	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2-DICHLOROETHANE	MS1	100	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2-DICHLOROETHANE	MS2	102	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2-DICHLOROPROPANE	MS1	93	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,2-DICHLOROPROPANE	MS2	90	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,3-DICHLOROBENZENE	MS1	110	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,3-DICHLOROBENZENE	MS2	110	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,3-DICHLOROPROPANE	MS1	91	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,3-DICHLOROPROPANE	MS2	95	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,4-DICHLOROBENZENE	MS1	108	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	1,4-DICHLOROBENZENE	MS2	106	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
[illegible]RL	99D8809-001.001	2,2-DICHLOROPROPANE	MS1	109	%REC		1		1	EPA 524.2	9907L451-001	99LV[illegible]
[illegible]RL	99D8809-001.001	2,2-DICHLOROPROPANE	MS2	102	%REC		1		1	EPA 524.2	9907L451-001	99LV[illegible]
[illegible]RL	99D8809-001.001	4-ISOPROPYLTOLUENE	MS1	113	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	4-ISOPROPYLTOLUENE	MS2	108	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BENZENE	MS1	102	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BENZENE	MS2	100	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BENZENE, 1,2,4-TRIMETHYL	MS1	105	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BENZENE, 1,2,4-TRIMETHYL	MS2	104	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BENZENE, 1,3,5-TRIMETHYL-	MS1	109	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BENZENE, 1,3,5-TRIMETHYL-	MS2	105	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BROMOBENZENE	MS1	93	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BROMOBENZENE	MS2	97	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BROMOCHLOROMETHANE	MS1	112	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BROMOCHLOROMETHANE	MS2	103	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BROMODICHLOROMETHANE	MS1	103	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BROMODICHLOROMETHANE	MS2	99	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BROMOFORM	MS1	101	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BROMOFORM	MS2	100	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BROMOMETHANE	MS1	104	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	BROMOMETHANE	MS2	99	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	CARBON TETRACHLORIDE	MS1	26	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	CARBON TETRACHLORIDE	MS2	100	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	CHLOROBENZENE	MS1	104	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	CHLOROBENZENE	MS2	102	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	CHLOROETHANE	MS1	84	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	CHLOROETHANE	MS2	87	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	CHLOROFORM	MS1	101	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	CHLOROFORM	MS2	103	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	CHLOROMETHANE	MS1	95	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	CHLOROMETHANE	MS2	80	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	cis-1,2-DICHLOROETHENE	MS1	104	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	cis-1,2-DICHLOROETHENE	MS2	102	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	cis-1,3-DICHLOROPROPENE	MS1	90	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	cis-1,3-DICHLOROPROPENE	MS2	87	%REC		1		1	EPA 524.2	9907L451-001	99LVK[illegible]
[illegible]RL	99D8809-001.001	DIBROMOCHLOROMETHANE	MS1	106	%REC		1		1	EPA 524.2	9907L451-001	99LV[illegible]
[illegible]RL	99D8809-001.001	DIBROMOCHLOROMETHANE	MS2	105	%REC		1		1	EPA 524.2	9907L451-001	99LV[illegible]
RECRL	99D8809-001.001	DIBROMOMETHANE	MS1	101	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	DIBROMOMETHANE	MS2	102	%REC		1		1	EPA 524.2	9907L451-001	99LVK230

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D8809-001.001	DICHLORODIFLUOROMETHANE	MS1	85	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	DICHLORODIFLUOROMETHANE	MS2	78	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	ETHYLBENZENE	MS1	106	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	ETHYLBENZENE	MS2	102	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	HEXACHLOROBUTADIENE	MS1	113	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	HEXACHLOROBUTADIENE	MS2	105	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	ISOPROPYLBENZENE	MS1	106	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	ISOPROPYLBENZENE	MS2	104	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	METHYLENE CHLORIDE	MS1	93	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	METHYLENE CHLORIDE	MS2	81	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	NAPHTHALENE	MS1	79	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	NAPHTHALENE	MS2	86	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	n-BUTYLBENZENE	MS1	109	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	n-BUTYLBENZENE	MS2	104	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	n-PROPYLBENZENE	MS1	115	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	n-PROPYLBENZENE	MS2	106	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	o-CHLOROTOLUENE	MS1	110	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	o-CHLOROTOLUENE	MS2	109	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	p-CHLOROTOLUENE	MS1	105	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	p-CHLOROTOLUENE	MS2	104	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	89	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	95	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	sec-BUTYLBENZENE	MS1	113	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	sec-BUTYLBENZENE	MS2	107	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	STYRENE	MS1	99	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	STYRENE	MS2	99	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	tert-BUTYLBENZENE	MS1	110	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	tert-BUTYLBENZENE	MS2	107	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	TETRACHLOROETHENE	MS1	83	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	TETRACHLOROETHENE	MS2	110	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	TOLUENE	MS1	101	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	TOLUENE	MS2	99	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	TOTAL XYLENES	MS1	106	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	TOTAL XYLENES	MS2	103	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	trans-1,2-DICHLOROETHENE	MS1	110	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	trans-1,2-DICHLOROETHENE	MS2	108	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	trans-1,3-DICHLOROPROPENE	MS1	89	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	trans-1,3-DICHLOROPROPENE	MS2	91	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	TRICHLOROETHENE	MS1	102	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	TRICHLOROETHENE	MS2	103	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	TRICHLOROFLUOROMETHANE	MS1	120	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	TRICHLOROFLUOROMETHANE	MS2	108	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	VINYL CHLORIDE	MS1	94	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8809-001.001	VINYL CHLORIDE	MS2	76	%REC		1		1	EPA 524.2	9907L451-001	99LVK230
RECRL	99D8961-003.001	1,1,1,2-TETRACHLOROETHANE	MS1	120	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1,1,2-TETRACHLOROETHANE	MS2	87	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1,1-TRICHLOROETHANE	MS1	130	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1,1-TRICHLOROETHANE	MS2	94	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1,2,2-TETRACHLOROETHANE	MS1	131	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1,2,2-TETRACHLOROETHANE	MS2	96	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1,2-TRICHLOROETHANE	MS1	117	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1,2-TRICHLOROETHANE	MS2	90	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1-DICHLOROETHANE	MS1	126	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1-DICHLOROETHANE	MS2	92	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1-DICHLOROETHENE	MS1	115	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1-DICHLOROETHENE	MS2	93	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1-DICHLOROPROPENE	MS1	129	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,1-DICHLOROPROPENE	MS2	86	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2,3-TRICHLOROBENZENE	MS1	110	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2,3-TRICHLOROBENZENE	MS2	87	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2,3-TRICHLOROPROPANE	MS1	113	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2,3-TRICHLOROPROPANE	MS2	91	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2,4-TRICHLOROBENZENE	MS1	110	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2,4-TRICHLOROBENZENE	MS2	84	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2-DIBROMOETHANE	MS1	115	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2-DIBROMOETHANE	MS2	87	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2-DICHLOROBENZENE	MS1	125	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2-DICHLOROBENZENE	MS2	94	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2-DICHLOROETHANE	MS1	124	%REC				50	EPA 524.2	9907L487-003	99LVK266

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
RECRL	99D8961-003.001	1,2-DICHLOROETHANE	MS2	98	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2-DICHLOROPROPANE	MS1	127	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,2-DICHLOROPROPANE	MS2	96	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,3-DICHLOROBENZENE	MS1	119	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,3-DICHLOROBENZENE	MS2	90	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,3-DICHLOROPROPANE	MS1	119	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,3-DICHLOROPROPANE	MS2	87	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,4-DICHLOROBENZENE	MS1	120	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	1,4-DICHLOROBENZENE	MS2	92	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	2,2-DICHLOROPROPANE	MS1	128	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	2,2-DICHLOROPROPANE	MS2	89	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	4-ISOPROPYLTOLUENE	MS1	117	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	4-ISOPROPYLTOLUENE	MS2	88	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BENZENE	MS1	127	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BENZENE	MS2	93	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BENZENE, 1,2,4-TRIMETHYL	MS1	108	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BENZENE, 1,2,4-TRIMETHYL	MS2	93	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BENZENE, 1,3,5-TRIMETHYL-	MS1	121	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BENZENE, 1,3,5-TRIMETHYL-	MS2	90	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BROMOBENZENE	MS1	117	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BROMOBENZENE	MS2	89	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BROMOCHLOROMETHANE	MS1	124	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BROMOCHLOROMETHANE	MS2	93	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BROMODICHLOROMETHANE	MS1	127	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BROMODICHLOROMETHANE	MS2	96	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BROMOFORM	MS1	114	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BROMOFORM	MS2	85	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BROMOMETHANE	MS1	128	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	BROMOMETHANE	MS2	80	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	CARBON TETRACHLORIDE	MS1	0	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	CARBON TETRACHLORIDE	MS2	0	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	CHLOROBENZENE	MS1	119	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	CHLOROBENZENE	MS2	89	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	CHLOROETHANE	MS1	129	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	CHLOROETHANE	MS2	98	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	CHLOROFORM	MS1	114	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	CHLOROFORM	MS2	84	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	CHLOROMETHANE	MS1	122	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	CHLOROMETHANE	MS2	88	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	cis-1,2-DICHLOROETHENE	MS1	113	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	cis-1,2-DICHLOROETHENE	MS2	85	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	cis-1,3-DICHLOROPROPENE	MS1	114	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	cis-1,3-DICHLOROPROPENE	MS2	86	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	DIBROMOCHLOROMETHANE	MS1	120	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	DIBROMOCHLOROMETHANE	MS2	87	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	DIBROMOMETHANE	MS1	125	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	DIBROMOMETHANE	MS2	95	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	DICHLORODIFLUOROMETHANE	MS1	127	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	DICHLORODIFLUOROMETHANE	MS2	91	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	ETHYLBENZENE	MS1	122	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	ETHYLBENZENE	MS2	90	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	HEXACHLOROBUTADIENE	MS1	110	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	HEXACHLOROBUTADIENE	MS2	84	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	ISOPROPYLBENZENE	MS1	122	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	ISOPROPYLBENZENE	MS2	89	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	METHYLENE CHLORIDE	MS1	96	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	METHYLENE CHLORIDE	MS2	78	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	NAPHTHALENE	MS1	104	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	NAPHTHALENE	MS2	81	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	n-BUTYLBENZENE	MS1	116	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	n-BUTYLBENZENE	MS2	82	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	n-PROPYLBENZENE	MS1	120	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	n-PROPYLBENZENE	MS2	87	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	o-CHLOROTOLUENE	MS1	123	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	o-CHLOROTOLUENE	MS2	88	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	p-CHLOROTOLUENE	MS1	119	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	p-CHLOROTOLUENE	MS2	88	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	118	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	83	%REC				50	EPA 524.2	9907L487-003	99LVK266

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D8961-003.001	sec-BUTYLBENZENE	MS1	117	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	sec-BUTYLBENZENE	MS2	90	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	STYRENE	MS1	117	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	STYRENE	MS2	86	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	tert-BUTYLBENZENE	MS1	122	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	tert-BUTYLBENZENE	MS2	89	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	TETRACHLOROETHENE	MS1	84	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	TETRACHLOROETHENE	MS2	52	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	TOLUENE	MS1	121	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	TOLUENE	MS2	90	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	TOTAL XYLENES	MS1	121	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	TOTAL XYLENES	MS2	91	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	trans-1,2-DICHLOROETHENE	MS1	124	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	trans-1,2-DICHLOROETHENE	MS2	87	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	trans-1,3-DICHLOROPROPENE	MS1	116	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	trans-1,3-DICHLOROPROPENE	MS2	82	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	TRICHLOROETHENE	MS1	103	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	TRICHLOROETHENE	MS2	68	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	TRICHLOROFLUOROMETHANE	MS1	126	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	TRICHLOROFLUOROMETHANE	MS2	93	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	VINYL CHLORIDE	MS1	102	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D8961-003.001	VINYL CHLORIDE	MS2	87	%REC				50	EPA 524.2	9907L487-003	99LVK266
RECRL	99D9332-001.002	1,1,1,2-TETRACHLOROETHANE	MS1	111	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,1,1,2-TETRACHLOROETHANE	MS2	99	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,1,1-TRICHLOROETHANE	MS1	103	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,1,1-TRICHLOROETHANE	MS2	92	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,1,2,2-TETRACHLOROETHANE	MS1	119	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,1,2,2-TETRACHLOROETHANE	MS2	106	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,1,2-TRICHLOROETHANE	MS1	109	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,1,2-TRICHLOROETHANE	MS2	95	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,1-DICHLOROETHANE	MS1	103	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
[illegible]	99D9332-001.002	1,1-DICHLOROETHANE	MS2	94	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
[illegible]	99D9332-001.002	1,1-DICHLOROETHENE	MS1	102	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,1-DICHLOROETHENE	MS2	87	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,1-DICHLOROPROPENE	MS1	98	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,1-DICHLOROPROPENE	MS2	85	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2,3-TRICHLOROBENZENE	MS1	112	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2,3-TRICHLOROBENZENE	MS2	99	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2,3-TRICHLOROPROPANE	MS1	116	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2,3-TRICHLOROPROPANE	MS2	99	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2,4-TRICHLOROBENZENE	MS1	109	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2,4-TRICHLOROBENZENE	MS2	96	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2-DIBROMOETHANE	MS1	106	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2-DIBROMOETHANE	MS2	94	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2-DICHLOROBENZENE	MS1	124	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2-DICHLOROBENZENE	MS2	108	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2-DICHLOROETHANE	MS1	107	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2-DICHLOROETHANE	MS2	92	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2-DICHLOROPROPANE	MS1	104	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,2-DICHLOROPROPANE	MS2	93	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,3-DICHLOROBENZENE	MS1	123	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,3-DICHLOROBENZENE	MS2	108	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,3-DICHLOROPROPANE	MS1	108	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,3-DICHLOROPROPANE	MS2	94	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,4-DICHLOROBENZENE	MS1	123	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	1,4-DICHLOROBENZENE	MS2	106	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	2,2-DICHLOROPROPANE	MS1	96	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	2,2-DICHLOROPROPANE	MS2	84	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	4-ISOPROPYLTOLUENE	MS1	110	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	4-ISOPROPYLTOLUENE	MS2	97	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	BENZENE	MS1	106	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	BENZENE	MS2	98	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	BENZENE, 1,2,4-TRIMETHYL	MS1	109	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	BENZENE, 1,2,4-TRIMETHYL	MS2	100	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
[illegible]	99D9332-001.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	112	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
[illegible]	99D9332-001.002	BENZENE, 1,3,5-TRIMETHYL-	MS2	96	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
[illegible]	99D9332-001.002	BROMOBENZENE	MS1	116	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	BROMOBENZENE	MS2	100	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	BROMOCHLOROMETHANE	MS1	110	%REC		1		20	EPA 524.2	9908L689-001	99LVK281

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[illegible]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch [illegible]
RECRL	99D9332-001.002	BROMOCHLOROMETHANE	MS2	92	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	BROMODICHLOROMETHANE	MS1	115	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	BROMODICHLOROMETHANE	MS2	107	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	BROMOFORM	MS1	126	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	BROMOFORM	MS2	107	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	BROMOMETHANE	MS1	121	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	BROMOMETHANE	MS2	110	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	CARBON TETRACHLORIDE	MS1	0	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	CARBON TETRACHLORIDE	MS2	0	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	CHLOROBENZENE	MS1	117	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	CHLOROBENZENE	MS2	103	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	CHLOROETHANE	MS1	100	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	CHLOROETHANE	MS2	110	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	CHLOROFORM	MS1	85	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	CHLOROFORM	MS2	75	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	CHLOROMETHANE	MS1	129	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	CHLOROMETHANE	MS2	122	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	cis-1,2-DICHLOROETHENE	MS1	102	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	cis-1,2-DICHLOROETHENE	MS2	94	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	cis-1,3-DICHLOROPROPENE	MS1	103	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	cis-1,3-DICHLOROPROPENE	MS2	90	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	DIBROMOCHLOROMETHANE	MS1	123	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	DIBROMOCHLOROMETHANE	MS2	112	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	DIBROMOMETHANE	MS1	106	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	DIBROMOMETHANE	MS2	99	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	DICHLORODIFLUOROMETHANE	MS1	106	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	DICHLORODIFLUOROMETHANE	MS2	91	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	ETHYLBENZENE	MS1	115	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	ETHYLBENZENE	MS2	98	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	HEXACHLOROBUTADIENE	MS1	99	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	HEXACHLOROBUTADIENE	MS2	86	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
[illegible]RL	99D9332-001.002	ISOPROPYLBENZENE	MS1	118	%REC		1		20	EPA 524.2	9908L689-001	99LV[illegible]
[illegible]RL	99D9332-001.002	ISOPROPYLBENZENE	MS2	99	%REC		1		20	EPA 524.2	9908L689-001	99LV[illegible]
RECRL	99D9332-001.002	METHYLENE CHLORIDE	MS1	130	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	METHYLENE CHLORIDE	MS2	123	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	NAPHTHALENE	MS1	104	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	NAPHTHALENE	MS2	93	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	n-BUTYLBENZENE	MS1	108	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	n-BUTYLBENZENE	MS2	94	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	n-PROPYLBENZENE	MS1	112	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	n-PROPYLBENZENE	MS2	99	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	o-CHLOROTOLUENE	MS1	123	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	o-CHLOROTOLUENE	MS2	106	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	p-CHLOROTOLUENE	MS1	116	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	p-CHLOROTOLUENE	MS2	101	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	109	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	106	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	sec-BUTYLBENZENE	MS1	114	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	sec-BUTYLBENZENE	MS2	99	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	STYRENE	MS1	118	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	STYRENE	MS2	98	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	tert-BUTYLBENZENE	MS1	113	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	tert-BUTYLBENZENE	MS2	99	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	TETRACHLOROETHENE	MS1	107	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	TETRACHLOROETHENE	MS2	89	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	TOLUENE	MS1	118	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	TOLUENE	MS2	99	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	TOTAL XYLENES	MS1	121	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	TOTAL XYLENES	MS2	103	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	trans-1,2-DICHLOROETHENE	MS1	103	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	trans-1,2-DICHLOROETHENE	MS2	97	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	trans-1,3-DICHLOROPROPENE	MS1	103	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	trans-1,3-DICHLOROPROPENE	MS2	91	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	TRICHLOROETHENE	MS1	7	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	TRICHLOROETHENE	MS2	2	%REC		1		20	EPA 524.2	9908L689-001	99LVK[illegible]
[illegible]RL	99D9332-001.002	TRICHLOROFLUOROMETHANE	MS1	100	%REC		1		20	EPA 524.2	9908L689-001	99LV[illegible]
[illegible]RL	99D9332-001.002	TRICHLOROFLUOROMETHANE	MS2	98	%REC		1		20	EPA 524.2	9908L689-001	99LVK[illegible]
RECRL	99D9332-001.002	VINYL CHLORIDE	MS1	114	%REC		1		20	EPA 524.2	9908L689-001	99LVK281
RECRL	99D9332-001.002	VINYL CHLORIDE	MS2	85	%REC		1		20	EPA 524.2	9908L689-001	99LVK281

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D9394-002.002	1,1,1,2-TETRACHLOROETHANE	MS1	90	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1,1,2-TETRACHLOROETHANE	MS2	99	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1,1-TRICHLOROETHANE	MS1	102	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1,1-TRICHLOROETHANE	MS2	110	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1,2,2-TETRACHLOROETHANE	MS1	88	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1,2,2-TETRACHLOROETHANE	MS2	90	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1,2-TRICHLOROETHANE	MS1	85	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1,2-TRICHLOROETHANE	MS2	91	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1-DICHLOROETHANE	MS1	106	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1-DICHLOROETHANE	MS2	111	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1-DICHLOROETHENE	MS1	88	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1-DICHLOROETHENE	MS2	90	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1-DICHLOROPROPENE	MS1	91	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,1-DICHLOROPROPENE	MS2	104	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2,3-TRICHLOROBENZENE	MS1	81	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2,3-TRICHLOROBENZENE	MS2	89	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2,3-TRICHLOROPROPANE	MS1	81	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2,3-TRICHLOROPROPANE	MS2	88	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2,4-TRICHLOROBENZENE	MS1	81	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2,4-TRICHLOROBENZENE	MS2	90	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2-DIBROMOETHANE	MS1	85	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2-DIBROMOETHANE	MS2	92	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2-DICHLOROBENZENE	MS1	86	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2-DICHLOROBENZENE	MS2	101	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2-DICHLOROETHANE	MS1	91	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2-DICHLOROETHANE	MS2	95	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2-DICHLOROPROPANE	MS1	84	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,2-DICHLOROPROPANE	MS2	91	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,3-DICHLOROBENZENE	MS1	91	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,3-DICHLOROBENZENE	MS2	101	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,3-DICHLOROPROPANE	MS1	85	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,3-DICHLOROPROPANE	MS2	92	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,4-DICHLOROBENZENE	MS1	92	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	1,4-DICHLOROBENZENE	MS2	103	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	2,2-DICHLOROPROPANE	MS1	101	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	2,2-DICHLOROPROPANE	MS2	102	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	4-ISOPROPYLTOLUENE	MS1	93	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	4-ISOPROPYLTOLUENE	MS2	104	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BENZENE	MS1	92	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BENZENE	MS2	96	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BENZENE, 1,2,4-TRIMETHYL	MS1	89	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BENZENE, 1,2,4-TRIMETHYL	MS2	106	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	93	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BENZENE, 1,3,5-TRIMETHYL-	MS2	102	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BROMOBENZENE	MS1	91	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BROMOBENZENE	MS2	94	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BROMOCHLOROMETHANE	MS1	85	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BROMOCHLOROMETHANE	MS2	88	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BROMODICHLOROMETHANE	MS1	95	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BROMODICHLOROMETHANE	MS2	98	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BROMOFORM	MS1	89	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BROMOFORM	MS2	96	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BROMOMETHANE	MS1	98	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	BROMOMETHANE	MS2	102	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	CARBON TETRACHLORIDE	MS1	101	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	CARBON TETRACHLORIDE	MS2	109	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	CHLOROBENZENE	MS1	88	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	CHLOROBENZENE	MS2	98	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	CHLOROETHANE	MS1	88	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	CHLOROETHANE	MS2	102	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	CHLOROFORM	MS1	84	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	CHLOROFORM	MS2	97	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	CHLOROMETHANE	MS1	98	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	CHLOROMETHANE	MS2	96	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	cis-1,2-DICHLOROETHENE	MS1	90	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	cis-1,2-DICHLOROETHENE	MS2	91	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	cis-1,3-DICHLOROPROPENE	MS1	81	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	cis-1,3-DICHLOROPROPENE	MS2	93	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	DIBROMOCHLOROMETHANE	MS1	88	%REC		1		1	EPA 524.2	9908L747-002	99LVK303

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[illegible]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch [illegible]
RECRL	99D9394-002.002	DIBROMOCHLOROMETHANE	MS2	100	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	DIBROMOMETHANE	MS1	87	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	DIBROMOMETHANE	MS2	84	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	DICHLORODIFLUOROMETHANE	MS1	99	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	DICHLORODIFLUOROMETHANE	MS2	102	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	ETHYLBENZENE	MS1	91	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	ETHYLBENZENE	MS2	105	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	HEXACHLOROBUTADIENE	MS1	96	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	HEXACHLOROBUTADIENE	MS2	104	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	ISOPROPYLBENZENE	MS1	94	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	ISOPROPYLBENZENE	MS2	104	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	METHYLENE CHLORIDE	MS1	60	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	METHYLENE CHLORIDE	MS2	77	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	NAPHTHALENE	MS1	64	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	NAPHTHALENE	MS2	77	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	n-BUTYLBENZENE	MS1	88	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	n-BUTYLBENZENE	MS2	100	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	n-PROPYLBENZENE	MS1	95	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	n-PROPYLBENZENE	MS2	103	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	o-CHLOROTOLUENE	MS1	94	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	o-CHLOROTOLUENE	MS2	99	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	p-CHLOROTOLUENE	MS1	90	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	p-CHLOROTOLUENE	MS2	100	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	80	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	81	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	sec-BUTYLBENZENE	MS1	95	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	sec-BUTYLBENZENE	MS2	104	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	STYRENE	MS1	87	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	STYRENE	MS2	95	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	tert-BUTYLBENZENE	MS1	93	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	tert-BUTYLBENZENE	MS2	106	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
[illegible]	99D9394-002.002	TETRACHLOROETHENE	MS1	93	%REC		1		1	EPA 524.2	9908L747-002	99LVK[illegible]
[illegible]	99D9394-002.002	TETRACHLOROETHENE	MS2	103	%REC		1		1	EPA 524.2	9908L747-002	99LVK[illegible]
[illegible]	99D9394-002.002	TOLUENE	MS1	84	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	TOLUENE	MS2	98	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	TOTAL XYLENES	MS1	95	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	TOTAL XYLENES	MS2	106	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	trans-1,2-DICHLOROETHENE	MS1	94	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	trans-1,2-DICHLOROETHENE	MS2	100	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	trans-1,3-DICHLOROPROPENE	MS1	85	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	trans-1,3-DICHLOROPROPENE	MS2	89	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	TRICHLOROETHENE	MS1	94	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	TRICHLOROETHENE	MS2	98	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	TRICHLOROFLUOROMETHANE	MS1	105	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	TRICHLOROFLUOROMETHANE	MS2	111	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	VINYL CHLORIDE	MS1	82	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9394-002.002	VINYL CHLORIDE	MS2	107	%REC		1		1	EPA 524.2	9908L747-002	99LVK303
RECRL	99D9487-003.002	1,1,1,2-TETRACHLOROETHANE	MS1	125	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1,1,2-TETRACHLOROETHANE	MS2	128	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1,1-TRICHLOROETHANE	MS1	34	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1,1-TRICHLOROETHANE	MS2	146	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1,2,2-TETRACHLOROETHANE	MS1	132	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1,2,2-TETRACHLOROETHANE	MS2	120	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1,2-TRICHLOROETHANE	MS1	839	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1,2-TRICHLOROETHANE	MS2	940	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1-DICHLOROETHANE	MS1	78	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1-DICHLOROETHANE	MS2	170	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1-DICHLOROETHENE	MS1	0	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1-DICHLOROETHENE	MS2	299	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1-DICHLOROPROPENE	MS1	102	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,1-DICHLOROPROPENE	MS2	104	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,2,3-TRICHLOROBENZENE	MS1	108	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,2,3-TRICHLOROBENZENE	MS2	105	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,2,3-TRICHLOROPROPANE	MS1	128	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,2,3-TRICHLOROPROPANE	MS2	129	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
[illegible]	99D9487-003.002	1,2,4-TRICHLOROBENZENE	MS1	114	%REC		1		1	EPA 524.2	9908L806-003	99LVH[illegible]
[illegible]	99D9487-003.002	1,2,4-TRICHLOROBENZENE	MS2	106	%REC		1		1	EPA 524.2	9908L806-003	99LVH[illegible]
RECRL	99D9487-003.002	1,2-DIBROMOETHANE	MS1	114	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,2-DIBROMOETHANE	MS2	117	%REC		1		1	EPA 524.2	9908L806-003	99LVH324

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D9487-003.002	1,2-DICHLOROBENZENE	MS1	121	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,2-DICHLOROBENZENE	MS2	113	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,2-DICHLOROETHANE	MS1	106	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,2-DICHLOROETHANE	MS2	177	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,2-DICHLOROPROPANE	MS1	127	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,2-DICHLOROPROPANE	MS2	133	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,3-DICHLOROBENZENE	MS1	117	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,3-DICHLOROBENZENE	MS2	108	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,3-DICHLOROPROPANE	MS1	129	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,3-DICHLOROPROPANE	MS2	131	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,4-DICHLOROBENZENE	MS1	119	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	1,4-DICHLOROBENZENE	MS2	111	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	2,2-DICHLOROPROPANE	MS1	106	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	2,2-DICHLOROPROPANE	MS2	102	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	4-ISOPROPYLTOLUENE	MS1	104	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	4-ISOPROPYLTOLUENE	MS2	98	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BENZENE	MS1	109	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BENZENE	MS2	117	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BENZENE, 1,2,4-TRIMETHYL	MS1	94	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BENZENE, 1,2,4-TRIMETHYL	MS2	82	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BENZENE, 1,3,5-TRIMETHYL-	MS1	106	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BENZENE, 1,3,5-TRIMETHYL-	MS2	100	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BROMOBENZENE	MS1	113	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BROMOBENZENE	MS2	110	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BROMOCHLOROMETHANE	MS1	110	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BROMOCHLOROMETHANE	MS2	115	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BROMODICHLOROMETHANE	MS1	110	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BROMODICHLOROMETHANE	MS2	114	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BROMOFORM	MS1	115	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BROMOFORM	MS2	109	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BROMOMETHANE	MS1	97	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	BROMOMETHANE	MS2	99	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	CARBON TETRACHLORIDE	MS1	105	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	CARBON TETRACHLORIDE	MS2	106	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	CHLOROBENZENE	MS1	112	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	CHLOROBENZENE	MS2	111	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	CHLOROETHANE	MS1	111	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	CHLOROETHANE	MS2	110	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	CHLOROFORM	MS1	22	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	CHLOROFORM	MS2	217	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	CHLOROMETHANE	MS1	109	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	CHLOROMETHANE	MS2	112	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	cis-1,2-DICHLOROETHENE	MS1	0	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	cis-1,2-DICHLOROETHENE	MS2	2770	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	cis-1,3-DICHLOROPROPENE	MS1	108	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	cis-1,3-DICHLOROPROPENE	MS2	110	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	DIBROMOCHLOROMETHANE	MS1	155	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	DIBROMOCHLOROMETHANE	MS2	170	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	DIBROMOMETHANE	MS1	113	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	DIBROMOMETHANE	MS2	118	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	DICHLORODIFLUOROMETHANE	MS1	96	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	DICHLORODIFLUOROMETHANE	MS2	95	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	ETHYLBENZENE	MS1	108	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	ETHYLBENZENE	MS2	105	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	HEXACHLOROBUTADIENE	MS1	106	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	HEXACHLOROBUTADIENE	MS2	101	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	ISOPROPYLBENZENE	MS1	102	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	ISOPROPYLBENZENE	MS2	97	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	METHYLENE CHLORIDE	MS1	19	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	METHYLENE CHLORIDE	MS2	25	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	NAPHTHALENE	MS1	106	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	NAPHTHALENE	MS2	99	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	n-BUTYLBENZENE	MS1	94	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	n-BUTYLBENZENE	MS2	85	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	n-PROPYLBENZENE	MS1	107	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	n-PROPYLBENZENE	MS2	100	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	o-CHLOROTOLUENE	MS1	109	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	o-CHLOROTOLUENE	MS2	105	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	p-CHLOROTOLUENE	MS1	112	%REC		1		1	EPA 524.2	9908L806-003	99LVH324

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[redacted]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch [redacted]
RECRL	99D9487-003.002	p-CHLOROTOLUENE	MS2	106	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	125	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	118	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	sec-BUTYLBENZENE	MS1	107	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	sec-BUTYLBENZENE	MS2	103	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	STYRENE	MS1	90	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	STYRENE	MS2	86	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	tert-BUTYLBENZENE	MS1	106	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	tert-BUTYLBENZENE	MS2	96	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	TETRACHLOROETHENE	MS1	0	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	TETRACHLOROETHENE	MS2	0	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	TOLUENE	MS1	107	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	TOLUENE	MS2	108	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	TOTAL XYLENES	MS1	107	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	TOTAL XYLENES	MS2	105	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	trans-1,2-DICHLOROETHENE	MS1	104	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	trans-1,2-DICHLOROETHENE	MS2	108	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	trans-1,3-DICHLOROPROPENE	MS1	105	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	trans-1,3-DICHLOROPROPENE	MS2	110	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	TRICHLOROETHENE	MS1	0	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	TRICHLOROETHENE	MS2	0	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	TRICHLOROFLUOROMETHANE	MS1	75	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	TRICHLOROFLUOROMETHANE	MS2	75	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	VINYL CHLORIDE	MS1	100	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-003.002	VINYL CHLORIDE	MS2	106	%REC		1		1	EPA 524.2	9908L806-003	99LVH324
RECRL	99D9487-005.001	1,1,1,2-TETRACHLOROETHANE	MS1	121	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,1,1,2-TETRACHLOROETHANE	MS2	119	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,1,1-TRICHLOROETHANE	MS1	115	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,1,1-TRICHLOROETHANE	MS2	114	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,1,2,2-TETRACHLOROETHANE	MS1	123	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,1,2,2-TETRACHLOROETHANE	MS2	125	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
[redacted]	99D9487-005.001	1,1,2-TRICHLOROETHANE	MS1	124	%REC		1		50	EPA 524.2	9908L806-004	99LVH[redacted]
[redacted]	99D9487-005.001	1,1,2-TRICHLOROETHANE	MS2	127	%REC		1		50	EPA 524.2	9908L806-004	99LVH[redacted]
RECRL	99D9487-005.001	1,1-DICHLOROETHANE	MS1	121	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,1-DICHLOROETHANE	MS2	120	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,1-DICHLOROETHENE	MS1	107	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,1-DICHLOROETHENE	MS2	112	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,1-DICHLOROPROPENE	MS1	102	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,1-DICHLOROPROPENE	MS2	106	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2,3-TRICHLOROBENZENE	MS1	103	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2,3-TRICHLOROBENZENE	MS2	109	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2,3-TRICHLOROPROPANE	MS1	121	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2,3-TRICHLOROPROPANE	MS2	138	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2,4-TRICHLOROBENZENE	MS1	99	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2,4-TRICHLOROBENZENE	MS2	102	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2-DIBROMOETHANE	MS1	112	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2-DIBROMOETHANE	MS2	119	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2-DICHLOROBENZENE	MS1	124	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2-DICHLOROBENZENE	MS2	122	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2-DICHLOROETHANE	MS1	116	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2-DICHLOROETHANE	MS2	120	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2-DICHLOROPROPANE	MS1	120	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,2-DICHLOROPROPANE	MS2	121	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,3-DICHLOROBENZENE	MS1	117	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,3-DICHLOROBENZENE	MS2	119	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,3-DICHLOROPROPANE	MS1	118	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,3-DICHLOROPROPANE	MS2	119	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,4-DICHLOROBENZENE	MS1	120	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	1,4-DICHLOROBENZENE	MS2	121	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	2,2-DICHLOROPROPANE	MS1	103	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	2,2-DICHLOROPROPANE	MS2	103	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	4-ISOPROPYLTOLUENE	MS1	106	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	4-ISOPROPYLTOLUENE	MS2	106	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	BENZENE	MS1	114	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	BENZENE	MS2	113	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
[redacted]	99D9487-005.001	BENZENE, 1,2,4-TRIMETHYL	MS1	94	%REC		1		50	EPA 524.2	9908L806-004	99LVH[redacted]
[redacted]	99D9487-005.001	BENZENE, 1,2,4-TRIMETHYL	MS2	93	%REC		1		50	EPA 524.2	9908L806-004	99LVH[redacted]
RECRL	99D9487-005.001	BENZENE, 1,3,5-TRIMETHYL-	MS1	111	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	BENZENE, 1,3,5-TRIMETHYL-	MS2	111	%REC		1		50	EPA 524.2	9908L806-004	99LVH325

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D9487-005.001	BROMOBENZENE	MS1	121	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	BROMOBENZENE	MS2	121	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	BROMOCHLOROMETHANE	MS1	119	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	BROMOCHLOROMETHANE	MS2	120	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	BROMODICHLOROMETHANE	MS1	118	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	BROMODICHLOROMETHANE	MS2	121	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	BROMOFORM	MS1	118	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	BROMOFORM	MS2	117	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	BROMOMETHANE	MS1	113	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	BROMOMETHANE	MS2	111	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	CARBON TETRACHLORIDE	MS1	111	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	CARBON TETRACHLORIDE	MS2	113	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	CHLOROBENZENE	MS1	113	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	CHLOROBENZENE	MS2	113	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	CHLOROETHANE	MS1	119	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	CHLOROETHANE	MS2	117	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	CHLOROFORM	MS1	122	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	CHLOROFORM	MS2	121	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	CHLOROMETHANE	MS1	104	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	CHLOROMETHANE	MS2	106	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	cis-1,2-DICHLOROETHENE	MS1	154	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	cis-1,2-DICHLOROETHENE	MS2	159	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	cis-1,3-DICHLOROPROPENE	MS1	101	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	cis-1,3-DICHLOROPROPENE	MS2	106	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	DIBROMOCHLOROMETHANE	MS1	119	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	DIBROMOCHLOROMETHANE	MS2	119	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	DIBROMOMETHANE	MS1	119	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	DIBROMOMETHANE	MS2	117	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	DICHLORODIFLUOROMETHANE	MS1	91	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	DICHLORODIFLUOROMETHANE	MS2	92	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	ETHYLBENZENE	MS1	107	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	ETHYLBENZENE	MS2	109	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	HEXACHLOROBUTADIENE	MS1	109	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	HEXACHLOROBUTADIENE	MS2	109	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	ISOPROPYLBENZENE	MS1	106	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	ISOPROPYLBENZENE	MS2	107	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	METHYLENE CHLORIDE	MS1	110	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	METHYLENE CHLORIDE	MS2	129	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	NAPHTHALENE	MS1	92	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	NAPHTHALENE	MS2	100	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	n-BUTYLBENZENE	MS1	86	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	n-BUTYLBENZENE	MS2	89	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	n-PROPYLBENZENE	MS1	110	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	n-PROPYLBENZENE	MS2	108	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	o-CHLOROTOLUENE	MS1	115	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	o-CHLOROTOLUENE	MS2	113	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	p-CHLOROTOLUENE	MS1	116	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	p-CHLOROTOLUENE	MS2	117	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS1	110	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	PROPANE, 1,2-DIBROMO-3-CHLORO-	MS2	116	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	sec-BUTYLBENZENE	MS1	111	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	sec-BUTYLBENZENE	MS2	109	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	STYRENE	MS1	94	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	STYRENE	MS2	94	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	tert-BUTYLBENZENE	MS1	104	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	tert-BUTYLBENZENE	MS2	105	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	TETRACHLOROETHENE	MS1	110	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	TETRACHLOROETHENE	MS2	117	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	TOLUENE	MS1	107	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	TOLUENE	MS2	108	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	TOTAL XYLENES	MS1	112	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	TOTAL XYLENES	MS2	111	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	trans-1,2-DICHLOROETHENE	MS1	115	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	trans-1,2-DICHLOROETHENE	MS2	114	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	trans-1,3-DICHLOROPROPENE	MS1	102	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	trans-1,3-DICHLOROPROPENE	MS2	108	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	TRICHLOROETHENE	MS1	178	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	TRICHLOROETHENE	MS2	178	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	TRICHLOROFLUOROMETHANE	MS1	72	%REC		1		50	EPA 524.2	9908L806-004	99LVH325

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

Lab	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
RECRL	99D9487-005.001	TRICHLOROFLUOROMETHANE	MS2	72	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	VINYL CHLORIDE	MS1	103	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
RECRL	99D9487-005.001	VINYL CHLORIDE	MS2	108	%REC		1		50	EPA 524.2	9908L806-004	99LVH325
PCBs (SW-846 8080A/8081)												
GEL	00D1043-001.010	AROCLOR-1016	MD1	0.1	UG/L	U	1	0.1	1	SW-846 8080A/8081	1000010120	5307
GEL	00D1043-001.010	AROCLOR-1016	MS1	0.1	UG/L	U	1	0.1	1	SW-846 8080A/8081	1000010119	5307
GEL	00D1043-001.010	AROCLOR-1221	MS1	0.1	UG/L	U	1	0.1	1	SW-846 8080A/8081	1000010119	5307
GEL	00D1043-001.010	AROCLOR-1221	MD1	0.1	UG/L	U	1	0.1	1	SW-846 8080A/8081	1000010120	5307
GEL	00D1043-001.010	AROCLOR-1232	MS1	0.1	UG/L	U	1	0.1	1	SW-846 8080A/8081	1000010119	5307
GEL	00D1043-001.010	AROCLOR-1232	MD1	0.1	UG/L	U	1	0.1	1	SW-846 8080A/8081	1000010120	5307
GEL	00D1043-001.010	AROCLOR-1242	MD1	0.1	UG/L	U	1	0.1	1	SW-846 8080A/8081	1000010120	5307
GEL	00D1043-001.010	AROCLOR-1242	MS1	0.1	UG/L	U	1	0.1	1	SW-846 8080A/8081	1000010119	5307
GEL	00D1043-001.010	AROCLOR-1248	MS1	0.1	UG/L	U	1	0.1	1	SW-846 8080A/8081	1000010119	5307
GEL	00D1043-001.010	AROCLOR-1248	MD1	0.1	UG/L	U	1	0.1	1	SW-846 8080A/8081	1000010120	5307
GEL	00D1043-001.010	AROCLOR-1254	MS1	0.1	UG/L	U	1	0.1	1	SW-846 8080A/8081	1000010119	5307
GEL	00D1043-001.010	AROCLOR-1254	MD1	0.1	UG/L	U	1	0.1	1	SW-846 8080A/8081	1000010120	5307
GEL	00D1043-001.010	AROCLOR-1260	MD1	87	%REC		1	0.1	1	SW-846 8080A/8081	1000010120	5307
GEL	00D1043-001.010	AROCLOR-1260	MS1	87	%REC		1	0.1	1	SW-846 8080A/8081	1000010119	5307
Total Metals (CLP-SOW-Total Method)												
RECRL	00D0520-001.001	MERCURY	MS1	91	%REC				1	CLP-SOW-TOTAL	9911L649-001	99C0330
RECRL	00D0569-009.001	ALUMINUM	MS1	76.8	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	ANTIMONY	MS1	85.8	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	ARSENIC	MS1	87.9	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	BARIUM	MS1	85.2	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	BERYLLIUM	MS1	80.8	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	CADMIUM	MS1	74.5	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	CALCIUM	MS1	552.4	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	CHROMIUM	MS1	77.4	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	COBALT	MS1	73.8	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	COPPER	MS1	89.8	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	IRON	MS1	52.3	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L[illegible]
RECRL	00D0569-009.001	LEAD	MS1	74.9	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L[illegible]
RECRL	00D0569-009.001	LITHIUM	MS1	133.8	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	MAGNESIUM	MS1	253.4	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	MANGANESE	MS1	80.8	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	MOLYBDENUM	MS1	79.5	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	NICKEL	MS1	71.6	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	POTASSIUM	MS1	153.9	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	SELENIUM	MS1	90.7	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	SILVER	MS1	92.8	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	SODIUM	MS1	313.3	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	STRONTIUM	MS1	167.4	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	THALLIUM	MS1	70.7	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	TIN	MS1	78.7	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	VANADIUM	MS1	83.8	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0569-009.001	ZINC	MS1	80.2	%REC		1		1	CLP-SOW-TOTAL	9911L650-004	99L0780
RECRL	00D0723-009.001	ALUMINUM	MS1	105.3	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	ANTIMONY	MS1	105.1	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	ARSENIC	MS1	107.2	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	BARIUM	MS1	100.5	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	BERYLLIUM	MS1	104	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	CADMIUM	MS1	101.6	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	CHROMIUM	MS1	102	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	COBALT	MS1	98.9	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	COPPER	MS1	100.5	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	IRON	MS1	100.7	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	LEAD	MS1	102.2	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	LITHIUM	MS1	108.9	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	MANGANESE	MS1	104.2	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	MOLYBDENUM	MS1	103.6	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	NICKEL	MS1	98.7	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	SELENIUM	MS1	104.6	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	SILVER	MS1	106.4	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	STRONTIUM	MS1	101.4	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	THALLIUM	MS1	101.4	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L[illegible]
RECRL	00D0723-009.001	TIN	MS1	103.8	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L[illegible]
RECRL	00D0723-009.001	VANADIUM	MS1	104	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836
RECRL	00D0723-009.001	ZINC	MS1	100.5	%REC				1	CLP-SOW-TOTAL	9911L796-009	99L0836

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	00D0723-011.001	MERCURY	MS1	95.3	%REC				1	CLP-SOW-TOTAL	9911L796-010	99C0378
RECRL	00D0837-005.001	ALUMINUM	MS1	95	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	ANTIMONY	MS1	93.4	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	ARSENIC	MS1	92	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	BARIUM	MS1	86.6	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	BERYLLIUM	MS1	93.3	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	CADMIUM	MS1	87.2	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	CHROMIUM	MS1	85	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	COBALT	MS1	88.2	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	COPPER	MS1	90.6	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	IRON	MS1	104.2	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0939
RECRL	00D0837-005.001	LEAD	MS1	88.6	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	LITHIUM	MS1	108.2	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	MANGANESE	MS1	92.8	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	MOLYBDENUM	MS1	89.4	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	NICKEL	MS1	87.3	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	SELENIUM	MS1	92.1	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	SILVER	MS1	92.8	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	STRONTIUM	MS1	74.6	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	THALLIUM	MS1	86.5	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	TIN	MS1	90.9	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	VANADIUM	MS1	91.9	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
RECRL	00D0837-005.001	ZINC	MS1	89.3	%REC				1	CLP-SOW-TOTAL	9912L984-003	99L0904
GEL	00D0963-001.001	ALUMINUM	MS1	94	%REC			6.5	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	ALUMINUM	MS1	94	%REC		1	6.5	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	ANTIMONY	MS1	90	%REC			2	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	ANTIMONY	MS1	90	%REC		1	2	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	ARSENIC	MS1	93	%REC			2.1	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	ARSENIC	MS1	93	%REC		1	2.1	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	BARIUM	MS1	90	%REC			0.24	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	BARIUM	MS1	90	%REC		1	0.24	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	BERYLLIUM	MS1	90	%REC			0.17	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	BERYLLIUM	MS1	90	%REC		1	0.17	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	CADMIUM	MS1	92	%REC			0.23	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	CADMIUM	MS1	92	%REC		1	0.23	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	CALCIUM	MS1	0	%REC			5.6	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	CALCIUM	MS1	-30	%REC		1	5.6	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	CHROMIUM	MS1	91	%REC			0.61	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	CHROMIUM	MS1	91	%REC		1	0.61	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	COBALT	MS1	90	%REC			0.67	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	COBALT	MS1	90	%REC		1	0.67	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	COPPER	MS1	93	%REC			1	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	COPPER	MS1	93	%REC		1	1	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	IRON	MS1	59	%REC			2	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	IRON	MS1	59	%REC		1	2	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	LEAD	MS1	93	%REC			1.1	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	LEAD	MS1	93	%REC		1	1.1	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	LITHIUM	MS1	99	%REC			0.05	5	CLP-SOW-TOTAL	1000010039	9327
GEL	00D0963-001.001	MAGNESIUM	MS1	0	%REC			7.5	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	MAGNESIUM	MS1	-94	%REC		1	7.5	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	MANGANESE	MS1	114	%REC			0.3	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	MANGANESE	MS1	57	%REC		1	0.34	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	MOLYBDENUM	MS1	89	%REC			0.8	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	MOLYBDENUM	MS1	89	%REC		1	0.81	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	NICKEL	MS1	90	%REC			1.1	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	NICKEL	MS1	90	%REC		1	1.1	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	POTASSIUM	MS1	96	%REC			41.5	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	POTASSIUM	MS1	96	%REC		1	41.5	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	SELENIUM	MS1	95	%REC			2.1	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	SELENIUM	MS1	95	%REC		1	2.1	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	SILVER	MS1	90	%REC			1.1	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	SILVER	MS1	90	%REC		1	1.1	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	SODIUM	MS1	-228	%REC	B	1	703	100	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	SODIUM	MS2	214000	UG/L	B		703	100	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	STRONTIUM	MS1	1030	UG/L			0.2	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	STRONTIUM	MS1	1030	UG/L		1	0.17	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	THALLIUM	MS1	97	%REC			3.6	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	THALLIUM	MS1	97	%REC		1	3.6	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	TIN	MS1	1.9	UG/L	U		1.9	1	CLP-SOW-TOTAL	1000010039	6838

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

[illegible]	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
GEL	00D0963-001.001	TIN	MS1	1.9	UG/L	U	1	1.9	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	VANADIUM	MS1	89	%REC			0.63	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	VANADIUM	MS1	89	%REC		1	0.63	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	ZINC	MS1	90	%REC			0.47	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-001.001	ZINC	MS1	90	%REC		1	0.47	1	CLP-SOW-TOTAL	1000010039	6838
GEL	00D0963-003.001	LITHIUM	MS1	97	%REC	B	1	0.01	1	CLP-SOW-TOTAL	1000029572	14718
GEL	00D1043-001.005	MERCURY	MD1	84	%REC			0.04	1	CLP-SOW-TOTAL	1000013122	6601
GEL	00D1043-001.005	MERCURY	MS1	92	%REC			0.04	1	CLP-SOW-TOTAL	1000013121	6601
RECRL	99D0046-003.001	ALUMINUM	MS1	122.4	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	ANTIMONY	MS1	99	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	ARSENIC	MS1	100	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	BARIUM	MS1	97.9	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	BERYLLIUM	MS1	97.2	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	CADMIUM	MS1	92.8	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	CALCIUM	MS1	202.1	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	CHROMIUM	MS1	99	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	COBALT	MS1	90.4	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	COPPER	MS1	94.4	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	IRON	MS1	112.8	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	LEAD	MS1	92.7	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	LITHIUM	MS1	114.1	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	MAGNESIUM	MS1	120	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	MANGANESE	MS1	97	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	MOLYBDENUM	MS1	96.6	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	NICKEL	MS1	93.3	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	POTASSIUM	MS1	121.9	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	SELENIUM	MS1	98.9	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	SILVER	MS1	99.2	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	SODIUM	MS1	121.7	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	STRONTIUM	MS1	112.4	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0046-003.001	THALLIUM	MS1	95.1	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
[illegible]RL	99D0046-003.001	TIN	MS1	96.9	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L[illegible]
[illegible]L	99D0046-003.001	VANADIUM	MS1	95.4	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L[illegible]
[illegible]CRL	99D0046-003.001	ZINC	MS1	93.1	%REC		1		1	CLP-SOW-TOTAL	9908L914-002	99L0634
RECRL	99D0325-002.001	ALUMINUM	MS1	103.6	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	ANTIMONY	MS1	103.2	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	ARSENIC	MS1	104.5	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	BARIUM	MS1	99.9	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	BERYLLIUM	MS1	101.6	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	CADMIUM	MS1	95.2	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	CALCIUM	MS1	96.9	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	CHROMIUM	MS1	96.6	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	COBALT	MS1	94.6	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	COPPER	MS1	101.6	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	IRON	MS1	97.3	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	LEAD	MS1	94.8	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	LITHIUM	MS1	134	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	MAGNESIUM	MS1	101.2	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	MANGANESE	MS1	98.4	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	MERCURY	MS1	98	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99C0286
RECRL	99D0325-002.001	MOLYBDENUM	MS1	99.9	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	NICKEL	MS1	92.6	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	POTASSIUM	MS1	125.5	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	SELENIUM	MS1	103.5	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	SILVER	MS1	100.8	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	SODIUM	MS1	104.4	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	STRONTIUM	MS1	99.4	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	THALLIUM	MS1	97.6	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	TIN	MS1	100.4	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	VANADIUM	MS1	102.8	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
RECRL	99D0325-002.001	ZINC	MS1	96.8	%REC		1		1	CLP-SOW-TOTAL	9909L200-001	99L0661
GEL	99D4750	ALUMINUM	MS1	2368	UG/L			0.31	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	ANTIMONY	MS1	666.9	UG/L	N		0.05	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	ARSENIC	MS1	2264	UG/L			0.64	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	BARIUM	MS1	2323	UG/L			0.02	1	CLP-SOW-TOTAL	QC581331	141323
[illegible]	99D4750	BERYLLIUM	MS1	65.61	UG/L	N		0.01	1	CLP-SOW-TOTAL	QC581331	14[illegible]
[illegible]	99D4750	CADMIUM	MS1	54.27	UG/L			0.03	1	CLP-SOW-TOTAL	QC581331	14[illegible]
GEL	99D4750	CALCIUM	MS1	49580	UG/L			9.7	5	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	CHROMIUM	MS1	220.3	UG/L			0.34	1	CLP-SOW-TOTAL	QC581331	141323

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
GEL	99D4750	COBALT	MS1	509.3	UG/L			0.01	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	COPPER	MS1	254.2	UG/L			0.04	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	IRON	MS1	1218	UG/L			2.5	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	LEAD	MS1	530.3	UG/L			0.03	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	LITHIUM	MS1	670.7	UG/L	N		0.09	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	MAGNESIUM	MS1	11860	UG/L			0.08	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	MANGANESE	MS1	540.7	UG/L			0.01	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	MERCURY	MS1	1.12	UG/L			0.12	1	CLP-SOW-TOTAL	QC579609	140868
GEL	99D4750	MOLYBDENUM	MS1	1145	UG/L			0.03	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	NICKEL	MS1	502.6	UG/L			0.05	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	POTASSIUM	MS1	6349	UG/L			7.1	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	SELENIUM	MS1	2348	UG/L			1.2	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	SILVER	MS1	54.28	UG/L			0.03	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	SODIUM	MS1	34165	UG/L			6.1	5	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	STRONTIUM	MS1	1360	UG/L			0.06	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	THALLIUM	MS1	2014	UG/L			0.05	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	TIN	MS1	1136	UG/L			0.16	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	VANADIUM	MS1	681	UG/L	N		11.2	5	CLP-SOW-TOTAL	QC581331	141323
GEL	99D4750	ZINC	MS1	643.2	UG/L			0.21	1	CLP-SOW-TOTAL	QC581331	141323
GEL	99D5061-014.004	ALUMINUM	MS1	1913	UG/L			0.31	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	ANTIMONY	MS1	636	UG/L	N		0.05	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	ARSENIC	MS1	1984	UG/L			0.64	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	BARIUM	MS1	2609	UG/L			0.02	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	BERYLLIUM	MS1	52.53	UG/L			0.01	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	CADMIUM	MS1	53.5	UG/L			0.03	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	CALCIUM	MS1	163800	UG/L			9.7	5	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	CHROMIUM	MS1	205.5	UG/L			0.34	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	COBALT	MS1	485.3	UG/L			0.01	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	COPPER	MS1	239.2	UG/L			0.04	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	IRON	MS1	1400	UG/L			2.5	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	LEAD	MS1	507.8	UG/L			0.03	1	CLP-SOW-TOTAL	QC588279	143130
[illegible]	99D5061-014.004	LITHIUM	MS1	606.6	UG/L			0.09	1	CLP-SOW-TOTAL	QC588279	143130
[illegible]	99D5061-014.004	MAGNESIUM	MS1	16180	UG/L			0.08	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	MANGANESE	MS1	514.5	UG/L			0.01	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	MERCURY	MS1	1.03	UG/L			0.12	1	CLP-SOW-TOTAL	QC589624	143465
GEL	99D5061-014.004	MOLYBDENUM	MS1	1125	UG/L			0.03	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	NICKEL	MS1	492.5	UG/L			0.05	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	POTASSIUM	MS1	5997	UG/L			7.1	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	SELENIUM	MS1	2059	UG/L			1.2	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	SILVER	MS1	51.13	UG/L			0.03	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	SODIUM	MS1	22240	UG/L	B		6.1	5	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	STRONTIUM	MS1	1700	UG/L			0.06	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	THALLIUM	MS1	1896	UG/L			0.05	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	TIN	MS1	1140	UG/L			0.16	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	VANADIUM	MS1	648	UG/L	N		11.2	5	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5061-014.004	ZINC	MS1	576.3	UG/L			0.21	1	CLP-SOW-TOTAL	QC588279	143130
GEL	99D5250-010.004	ALUMINUM	MS1	1955	UG/L		1	0.31	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	ANTIMONY	MS1	571.2	UG/L		1	0.05	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	ARSENIC	MS1	1871	UG/L		1	0.64	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	BARIUM	MS1	2096	UG/L		1	0.02	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	BERYLLIUM	MS1	47.36	UG/L		1	0.01	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	CADMIUM	MS1	48.51	UG/L		1	0.03	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	CALCIUM	MS1	23570	UG/L	BN	1	9.7	5	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	CHROMIUM	MS1	194.1	UG/L		1	0.34	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	COBALT	MS1	478.7	UG/L		1	0.01	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	COPPER	MS1	242.6	UG/L		1	0.04	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	IRON	MS1	1029	UG/L		1	2.5	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	LEAD	MS1	487	UG/L		1	0.03	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	LITHIUM	MS1	576.1	UG/L		1	0.09	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	MAGNESIUM	MS1	4517	UG/L	B	1	0.08	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	MANGANESE	MS1	490.6	UG/L		1	0.01	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	MOLYBDENUM	MS1	1068	UG/L		1	0.03	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	NICKEL	MS1	478.1	UG/L		1	0.05	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	POTASSIUM	MS1	5287	UG/L		1	7.1	1	CLP-SOW-TOTAL	QC588289	143132
[illegible]	99D5250-010.004	SELENIUM	MS1	1815	UG/L		1	1.2	1	CLP-SOW-TOTAL	QC588289	143132
[illegible]	99D5250-010.004	SILVER	MS1	45.13	UG/L		1	0.03	1	CLP-SOW-TOTAL	QC588289	143132
	99D5250-010.004	SODIUM	MS1	15360	UG/L		1	1.2	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	STRONTIUM	MS1	1119	UG/L		1	0.06	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	THALLIUM	MS1	1846	UG/L		1	0.05	1	CLP-SOW-TOTAL	QC588289	143132

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
GEL	99D5250-010.004	TIN	MS1	1090	UG/L		1	0.16	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	VANADIUM	MS1	688.5	UG/L	N	1	11.2	5	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-010.004	ZINC	MS1	557.4	UG/L		1	0.21	1	CLP-SOW-TOTAL	QC588289	143132
GEL	99D5250-013.004	MERCURY	MS1	1	UG/L		1	0.12	1	CLP-SOW-TOTAL	QC589629	143466
RECRL	99D5667-001.004	ALUMINUM	MS1	103.7	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	ANTIMONY	MS1	105.6	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	ARSENIC	MS1	105.6	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	BARIUM	MS1	103.2	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	BERYLLIUM	MS1	106.4	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	CADMIUM	MS1	99.2	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	CALCIUM	MS1	156.5	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	CHROMIUM	MS1	101.9	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	COBALT	MS1	97.8	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	COPPER	MS1	102.9	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	IRON	MS1	109.6	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	LEAD	MS1	99.6	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	LITHIUM	MS1	113.8	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	MAGNESIUM	MS1	118.4	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	MANGANESE	MS1	103	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	MERCURY	MS1	97.3	%REC				1	CLP-SOW-TOTAL	9903L419-001	99C0085
RECRL	99D5667-001.004	MOLYBDENUM	MS1	104.3	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	NICKEL	MS1	96.9	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	POTASSIUM	MS1	116.9	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	SELENIUM	MS1	103.6	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	SILVER	MS1	106.4	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	SODIUM	MS1	135.2	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	STRONTIUM	MS1	112.4	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	THALLIUM	MS1	100.2	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	TIN	MS1	102.6	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	VANADIUM	MS1	103.9	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D5667-001.004	ZINC	MS1	99.6	%REC				1	CLP-SOW-TOTAL	9903L419-001	99L0190
RECRL	99D7497-001.004	ALUMINUM	MS1	98.3	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0
RECRL	99D7497-001.004	ANTIMONY	MS1	101.4	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L
RECRL	99D7497-001.004	ARSENIC	MS1	102.9	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	BARIUM	MS1	96.1	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	BERYLLIUM	MS1	105.6	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	CADMIUM	MS1	99.9	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	CALCIUM	MS1	103.8	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	CHROMIUM	MS1	102.6	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	COBALT	MS1	101.4	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	COPPER	MS1	97.4	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	IRON	MS1	102.8	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	LEAD	MS1	101.8	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	LITHIUM	MS1	112	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	MAGNESIUM	MS1	96.3	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	MANGANESE	MS1	104.3	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	MERCURY	MS1	98.4	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99C0154
RECRL	99D7497-001.004	MOLYBDENUM	MS1	103.2	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	NICKEL	MS1	99.5	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	POTASSIUM	MS1	98.6	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	SELENIUM	MS1	99.8	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	SILVER	MS1	99.2	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	SODIUM	MS1	96.4	%REC		1		10	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	STRONTIUM	MS1	97.3	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	THALLIUM	MS1	105	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	TIN	MS1	106.8	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	VANADIUM	MS1	102.9	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D7497-001.004	ZINC	MS1	99.8	%REC		1		1	CLP-SOW-TOTAL	9905L981-001	99L0356
RECRL	99D9020-001.004	ALUMINUM	MS1	146.9	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	ANTIMONY	MS1	96.5	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	ARSENIC	MS1	98.9	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	BARIUM	MS1	93.3	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	BERYLLIUM	MS1	98.1	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	CADMIUM	MS1	92.5	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	CALCIUM	MS1	110.1	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	CHROMIUM	MS1	94.5	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L
RECRL	99D9020-001.004	COBALT	MS1	90.9	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0
RECRL	99D9020-001.004	COPPER	MS1	93.6	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	IRON	MS1	124.1	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
RECRL	99D9020-001.004	LEAD	MS1	91.8	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	LITHIUM	MS1	105.8	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	MAGNESIUM	MS1	102.1	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	MANGANESE	MS1	103.8	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	MOLYBDENUM	MS1	95.1	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	NICKEL	MS1	91.4	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	POTASSIUM	MS1	119.6	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	SELENIUM	MS1	96.4	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	SILVER	MS1	88.8	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0580
RECRL	99D9020-001.004	SODIUM	MS1	89.8	%REC		1		5	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	STRONTIUM	MS1	94	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	THALLIUM	MS1	92.9	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	TIN	MS1	96	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	VANADIUM	MS1	95.5	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-001.004	ZINC	MS1	92.7	%REC		1		1	CLP-SOW-TOTAL	9908L639-001	99L0540
RECRL	99D9020-002.004	MERCURY	MS1	94.9	%REC		1		1	CLP-SOW-TOTAL	9908L639-002	99C0235
RECRL	99D9395-001.001	MERCURY	MS1	94.9	%REC				1	CLP-SOW-TOTAL	9908L915-001	99C0262
Dissolved Metals (CLP-SOW-Dissolved Method)												
RECRL	00D0569-001.001	MERCURY	MS1	94.4	%REC		1		1	CLP-SOW-DISSOLVED	9911L650-001	99C0331
RECRL	00D0837-002.001	MERCURY	MS1	96	%REC				1	CLP-SOW-DISSOLVED	9912L984-001	00C0004
GEL	00D0837-008.001	ALUMINUM	MS2	100	%REC		1	6.2	20	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	ANTIMONY	MS1	109	%REC		1	1.4	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	ARSENIC	MS1	99	%REC		1	0.23	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	BARIUM	MS2	103	%REC		1	1.2	20	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	BERYLLIUM	MS1	112	%REC		1	0.02	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	CADMIUM	MS1	98	%REC		1	0.26	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	CALCIUM	MS2	128	%REC		1	112	20	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	CHROMIUM	MS1	98	%REC		1	0.14	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	COBALT	MS1	100	%REC		1	0.02	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	COPPER	MS1	96	%REC		1	0.08	1	CLP-SOW-DISSOLVED	1000010720	7124
[illegible]	00D0837-008.001	IRON	MS1	91	%REC		1	3.1	1	CLP-SOW-DISSOLVED	1000010720	7124
[illegible]	00D0837-008.001	LEAD	MS1	95	%REC		1	0.02	1	CLP-SOW-DISSOLVED	1000010720	7124
[illegible]	00D0837-008.001	LITHIUM	MS1	110	%REC		1	0.02	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	MAGNESIUM	MS2	127	%REC	B	1	5	20	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	MANGANESE	MS1	100	%REC		1	0.04	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	MOLYBDENUM	MS1	108	%REC		1	0.79	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	NICKEL	MS1	97	%REC		1	0.04	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	POTASSIUM	MS1	104	%REC		1	16.4	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	SELENIUM	MS1	100	%REC		1	0.6	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	SILVER	MS1	105	%REC		1	0.03	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	SODIUM	MS2	109	%REC	B	1	31.9	20	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	STRONTIUM	MS2	861	UG/L	B	1	0.4	20	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	THALLIUM	MS1	87	%REC		1	0.05	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	TIN	MS1	2.31	UG/L	B	1	0.18	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	VANADIUM	MS1	100	%REC		1	0.2	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0837-008.001	ZINC	MS1	91	%REC		1	0.28	1	CLP-SOW-DISSOLVED	1000010720	7124
GEL	00D0963-002.001	ALUMINUM	MS1	105	%REC		1	6.5	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	ANTIMONY	MS1	98	%REC		1	2	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	ARSENIC	MS1	104	%REC		1	2.1	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	BARIUM	MS1	103	%REC		1	0.24	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	BERYLLIUM	MS1	106	%REC		1	0.17	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	CADMIUM	MS1	102	%REC		1	0.23	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	CALCIUM	MS1	100	%REC		1	5.6	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	CHROMIUM	MS1	106	%REC		1	0.61	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	COBALT	MS1	105	%REC		1	0.67	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	COPPER	MS1	107	%REC		1	1	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	IRON	MS1	106	%REC		1	2	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	LEAD	MS1	104	%REC		1	1.1	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	LITHIUM	MS1	111	%REC		1	0.01	1	CLP-SOW-DISSOLVED	1000010710	7124
GEL	00D0963-002.001	MAGNESIUM	MS1	102	%REC		1	7.5	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	MANGANESE	MS1	107	%REC		1	0.34	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	MOLYBDENUM	MS1	102	%REC		1	0.81	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	NICKEL	MS1	102	%REC		1	1.1	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	POTASSIUM	MS1	104	%REC		1	41.5	1	CLP-SOW-DISSOLVED	1000025805	12622
[illegible]	00D0963-002.001	SELENIUM	MS1	104	%REC		1	2.1	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	SILVER	MS1	100	%REC		1	1.1	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	SODIUM	MS1	110	%REC		1	7	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	STRONTIUM	MS1	329	UG/L		1	0.17	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	THALLIUM	MS1	107	%REC		1	3.6	1	CLP-SOW-DISSOLVED	1000025805	12622

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

Lab	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
GEL	00D0963-002.001	TIN	MS1	1.9	UG/L	U	1	1.9	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	VANADIUM	MS1	106	%REC		1	0.63	1	CLP-SOW-DISSOLVED	1000025805	12622
GEL	00D0963-002.001	ZINC	MS1	103	%REC		1	0.47	1	CLP-SOW-DISSOLVED	1000025805	12622
RECRL	99D0046-002.001	MERCURY	MS1	98.8	UG/L		1		1	CLP-SOW-DISSOLVED	9908L914-001	99C0262
RECRL	99D0325-001.002	ALUMINUM	MS1	107.7	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	ANTIMONY	MS1	103.9	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	ARSENIC	MS1	106.7	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	BARIUM	MS1	98.3	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	BERYLLIUM	MS1	104	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	CADMIUM	MS1	99.2	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	CALCIUM	MS1	66.6	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	CHROMIUM	MS1	99.8	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	COBALT	MS1	96.5	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	COPPER	MS1	101.2	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	IRON	MS1	92.8	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	LEAD	MS1	97.5	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	LITHIUM	MS1	134.8	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	MAGNESIUM	MS1	98	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	MANGANESE	MS1	91.9	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	MOLYBDENUM	MS1	101.8	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	NICKEL	MS1	94.2	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	POTASSIUM	MS1	126	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	SELENIUM	MS1	105.6	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	SILVER	MS1	101.6	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	SODIUM	MS1	85.1	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	STRONTIUM	MS1	96.2	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	THALLIUM	MS1	98.9	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	TIN	MS1	103.4	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	VANADIUM	MS1	104.2	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
RECRL	99D0325-001.002	ZINC	MS1	99.4	%REC		1		1	CLP-SOW-DISSOLVED	9909L198-001	99L0661
GEL	99D4879-015.004	ALUMINUM	MS1	2086	UG/L			0.31	1	CLP-SOW-DISSOLVED	QC583243	141814
[illegible]	99D4879-015.004	ANTIMONY	MS1	622.4	UG/L			0.05	1	CLP-SOW-DISSOLVED	QC583243	141[illegible]
[illegible]	99D4879-015.004	ARSENIC	MS1	2071	UG/L			0.64	1	CLP-SOW-DISSOLVED	QC583243	14[illegible]
GEL	99D4879-015.004	BARIUM	MS1	2164	UG/L			0.02	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	BERYLLIUM	MS1	56.5	UG/L			0.01	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	CADMIUM	MS1	52.2	UG/L			0.03	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	CALCIUM	MS1	128800	UG/L			9.7	5	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	CHROMIUM	MS1	220.1	UG/L			0.34	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	COBALT	MS1	471.8	UG/L			0.01	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	COPPER	MS1	235.6	UG/L			0.04	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	IRON	MS1	1562	UG/L			12.5	5	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	LEAD	MS1	481.5	UG/L			0.03	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	LITHIUM	MS1	591.4	UG/L	N		0.09	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	MAGNESIUM	MS1	27010	UG/L			0.08	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	MANGANESE	MS1	503.5	UG/L			0.01	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	MERCURY	MS1	0.91	UG/L			0.12	1	CLP-SOW-DISSOLVED	QC582160	141544
GEL	99D4879-015.004	MOLYBDENUM	MS1	1163	UG/L			0.03	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	NICKEL	MS1	512.6	UG/L			0.05	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	POTASSIUM	MS1	4845	UG/L	B		7.1	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	SELENIUM	MS1	2237	UG/L			1.2	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	SILVER	MS1	45.87	UG/L			0.03	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	SODIUM	MS1	190050	UG/L			6.1	5	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	STRONTIUM	MS1	1914	UG/L			0.06	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	THALLIUM	MS1	1837	UG/L			0.05	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	TIN	MS1	1088	UG/L			0.16	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	VANADIUM	MS1	642.5	UG/L	N		11.2	5	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4879-015.004	ZINC	MS1	598.4	UG/L			0.21	1	CLP-SOW-DISSOLVED	QC583243	141814
GEL	99D4989-010.004	ALUMINUM	MS1	2124	UG/L			0.31	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	ANTIMONY	MS1	561.4	UG/L			0.05	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	ARSENIC	MS1	2047	UG/L			0.64	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	BARIUM	MS1	2045	UG/L			0.02	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	BERYLLIUM	MS1	54.48	UG/L			0.01	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	CADMIUM	MS1	51.97	UG/L			0.03	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	CALCIUM	MS1	5324	UG/L			1.9	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	CHROMIUM	MS1	214.6	UG/L			0.34	1	CLP-SOW-DISSOLVED	QC583248	141[illegible]
[illegible]	99D4989-010.004	COBALT	MS1	506.6	UG/L			0.01	1	CLP-SOW-DISSOLVED	QC583248	14[illegible]
[illegible]	99D4989-010.004	COPPER	MS1	280.9	UG/L			0.4	10	CLP-SOW-DISSOLVED	QC583248	141[illegible]
GEL	99D4989-010.004	IRON	MS1	1144	UG/L			2.5	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	LEAD	MS1	518.6	UG/L			0.03	1	CLP-SOW-DISSOLVED	QC583248	141815

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
GEL	99D4989-010.004	LITHIUM	MS1	1026	UG/L			0.9	10	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	MAGNESIUM	MS1	1109	UG/L	B		0.08	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	MANGANESE	MS1	537.4	UG/L			0.01	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	MERCURY	MS1	1.06	UG/L			0.12	1	CLP-SOW-DISSOLVED	QC583921	141997
GEL	99D4989-010.004	MOLYBDENUM	MS1	1089	UG/L			0.03	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	NICKEL	MS1	534.2	UG/L			0.05	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	POTASSIUM	MS1	5081	UG/L			7.1	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	SELENIUM	MS1	2077	UG/L			1.2	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	SILVER	MS1	54.45	UG/L			0.03	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	SODIUM	MS1	5899	UG/L			1.2	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	STRONTIUM	MS1	1019	UG/L			0.06	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	THALLIUM	MS1	1981	UG/L			0.05	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	TIN	MS1	1116	UG/L			0.16	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	VANADIUM	MS1	649.4	UG/L	N		2.2	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D4989-010.004	ZINC	MS1	665.4	UG/L	N		0.21	1	CLP-SOW-DISSOLVED	QC583248	141815
GEL	99D5061-014.004	ALUMINUM	MS1	1913	UG/L			0.31	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	ANTIMONY	MS1	636	UG/L	N		0.05	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	ARSENIC	MS1	1984	UG/L			0.64	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	BARIUM	MS1	2609	UG/L			0.02	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	BERYLLIUM	MS1	52.53	UG/L			0.01	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	CADMIUM	MS1	53.5	UG/L			0.03	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	CALCIUM	MS1	163800	UG/L			9.7	5	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	CHROMIUM	MS1	205.5	UG/L			0.34	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	COBALT	MS1	485.3	UG/L			0.01	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	COPPER	MS1	239.2	UG/L			0.04	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	IRON	MS1	1400	UG/L			2.5	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	LEAD	MS1	507.8	UG/L			0.03	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	LITHIUM	MS1	606.6	UG/L			0.09	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	MAGNESIUM	MS1	16180	UG/L			0.08	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	MANGANESE	MS1	514.5	UG/L			0.01	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	MERCURY	MS1	1.03	UG/L			0.12	1	CLP-SOW-DISSOLVED	QC589624	143465
GEL	99D5061-014.004	MOLYBDENUM	MS1	1125	UG/L			0.03	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	NICKEL	MS1	492.5	UG/L			0.05	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	POTASSIUM	MS1	5997	UG/L			7.1	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	SELENIUM	MS1	2059	UG/L			1.2	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	SILVER	MS1	51.13	UG/L			0.03	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	SODIUM	MS1	22240	UG/L	B		6.1	5	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	STRONTIUM	MS1	1700	UG/L			0.06	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	THALLIUM	MS1	1896	UG/L			0.05	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	TIN	MS1	1140	UG/L			0.16	1	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	VANADIUM	MS1	648	UG/L	N		11.2	5	CLP-SOW-DISSOLVED	QC588279	143130
GEL	99D5061-014.004	ZINC	MS1	576.3	UG/L			0.21	1	CLP-SOW-DISSOLVED	QC588279	143130
RECRL	99D7382-007.005	MERCURY	MS1	92.9	%REC		1		1	CLP-SOW-DISSOLVED	9906L208-001	99C0184
RECRL	99D7743-004.005	ALUMINUM	MS1	104.3	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	ANTIMONY	MS1	102.7	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	ARSENIC	MS1	103.6	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	BARIUM	MS1	100.9	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	BERYLLIUM	MS1	102.4	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	CADMIUM	MS1	96.8	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	CALCIUM	MS1	86.5	%REC		1		5	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	CHROMIUM	MS1	100.1	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	COBALT	MS1	96.8	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	COPPER	MS1	100.5	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	IRON	MS1	102.6	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	LEAD	MS1	97.6	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	LITHIUM	MS1	115.2	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	MAGNESIUM	MS1	99.7	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	MANGANESE	MS1	102.9	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	MOLYBDENUM	MS1	100.6	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	NICKEL	MS1	95.5	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	POTASSIUM	MS1	112.5	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	SELENIUM	MS1	101.5	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	SILVER	MS1	103.2	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	SODIUM	MS1	95.9	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	STRONTIUM	MS1	100.2	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	THALLIUM	MS1	102.4	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	TIN	MS1	102.6	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	VANADIUM	MS1	103.3	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422
RECRL	99D7743-004.005	ZINC	MS1	96.2	%REC		1		1	CLP-SOW-DISSOLVED	9906L207-003	99L0422

Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch
RECRL	99D9395-002.001	ALUMINUM	MS1	119.5	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	ANTIMONY	MS1	102.4	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	ARSENIC	MS1	103.7	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	BARIUM	MS1	97.1	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	BERYLLIUM	MS1	99	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	CADMIUM	MS1	93.6	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	CALCIUM	MS1	25.4	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	CHROMIUM	MS1	94.4	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	COBALT	MS1	91.3	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	COPPER	MS1	100.3	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	IRON	MS1	97	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	LEAD	MS1	94.2	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	LITHIUM	MS1	124.5	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	MAGNESIUM	MS1	96.5	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	MANGANESE	MS1	97.1	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	MOLYBDENUM	MS1	98	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	NICKEL	MS1	89.4	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	POTASSIUM	MS1	146.6	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	SELENIUM	MS1	103.6	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	SILVER	MS1	102.4	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	SODIUM	MS1	56.8	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	STRONTIUM	MS1	94.5	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	THALLIUM	MS1	94.3	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	TIN	MS1	97.2	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	VANADIUM	MS1	98.2	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
RECRL	99D9395-002.001	ZINC	MS1	103.3	%REC				1	CLP-SOW-DISSOLVED	9908L915-002	99L0635
Water Quality Parameters (Various EPA Methods)												
ACCU	99D0269	CHLORIDE	MS1	103	%REC			0.5		EPA 300.0	99-A19259S	589091699
ACCU	99D0348	CHLORIDE	MS1	114	%REC			0.5		EPA 300.0	99-A21029S	1137092399
ACCU	00D0723	CYANIDE	MS1	91	%REC		1	0.005		EPA 335.3	99-A25068S	5471111799
ACCU	99D0120	CYANIDE	MS1	109	%REC			0.005		EPA 335.3	99-A19261S	318091[illegible]
[illegible]	99D5250	CYANIDE	MS1	107	%REC		1	0.005		EPA 335.3	99-A3471S	123203[illegible]
[illegible]	99D9395	CYANIDE	MS1	107	%REC		1	0.005		EPA 335.3	99-A19272S	318091[illegible]
ACCU	99D0269	DISSOLVED ORGANIC CARBON	MS1	92	%REC			1		EPA 415.1	99-A20507S	1456092899
ACCU	99D0348	DISSOLVED ORGANIC CARBON	MS1	100	%REC			1		EPA 415.1	99-A21042S	2480101199
ACCU	00D0519	FLUORIDE	MS1	94	%REC			0.1		EPA 300.0	99-A23371S	3888102899
ACCU	00D0568	FLUORIDE	MS1	96	%REC		1	0.05		EPA 300.0	99-A24056S	5196111799
ACCU	00D0681	FLUORIDE	MS1	96	%REC		1	0.5		EPA 300.0	99-A24056S	5196111799
ACCU	00D0721	FLUORIDE	MS1	82	%REC			0.05		EPA 300.0	99-A25621S	6642120899
ACCU	00D0722	FLUORIDE	MS1	83	%REC		1	0.05		EPA 300.0	99-A24056S	5196111799
ACCU	99D0045	FLUORIDE	MS1	99	%REC		1	0.05		EPA 300.0	99-A18868S	9296090299
ACCU	99D0120	FLUORIDE	MS1	90	%REC			0.05		EPA 300.0	99-A21029S	1137092399
ACCU	99D0120	FLUORIDE	MS1	92	%REC			0.05		EPA 300.0	99-A19259S	432091699
ACCU	99D5250	FLUORIDE	MS1	103	%REC		1	0.05		EPA 300.0	99-A2990S	548022399
ACCU	99D5474	FLUORIDE	MS1	98	%REC			0.05		EPA 300.0	99-A3503S	1453030299
ACCU	99D5667	FLUORIDE	MS1	106	%REC			0.05		EPA 300.0	99-A4071S	2073031099
ACCU	99D6808	FLUORIDE	MS1	103	%REC			0.05		EPA 300.0	99-A7413S	7681050599
ACCU	99D7170	FLUORIDE	MS1	98	%REC		1	0.05		EPA 300.0	99-A9658S	122052799
ACCU	99D7170	FLUORIDE	MS1	107	%REC		1	0.05		EPA 300.0	99-A8571S	8820051699
ACCU	99D7382	FLUORIDE	MS1	103	%REC			0.05		EPA 300.0	99-A8950S	8820051699
ACCU	99D7497	FLUORIDE	MS1	98	%REC			0.05		EPA 300.0	99-A9660S	122052799
ACCU	99D7743	FLUORIDE	MS1	94	%REC			0.05		EPA 300.0	99-A9994S	909060399
ACCU	99D8809	FLUORIDE	MS1	103	%REC			0.05		EPA 300.0	99-A13266S	5110072099
ACCU	99D8961	FLUORIDE	MS1	84	%REC		1	0.05		EPA 300.0	99-A15927S	6554080599
ACCU	99D9020	FLUORIDE	MS1	91	%REC		1	0.05		EPA 300.0	99-A15263S	6554080599
ACCU	99D9354	FLUORIDE	MS1	104	%REC		1	0.05		EPA 300.0	99-A16593S	7421081299
ACCU	99D9394	FLUORIDE	MS1	101	%REC		1	0.05		EPA 300.0	99-A17470S	8085081999
ACCU	99D9487	FLUORIDE	MS1	99	%REC		1	0.05		EPA 300.0	99-A17894S	9296090299
ACCU	99D0269	NITRATE	MS1	112	%REC			0.05		EPA 300.0	99-A19259S	589091699
ACCU	99D0348	NITRATE	MS1	110	%REC			0.05		EPA 300.0	99-A21029S	1137092399
ACCU	00D0520	NITRATE/NITRITE	MS1	121	%REC		1	0.05		EPA 353.1	99-A25037S	5124111399
ACCU	00D0520	NITRATE/NITRITE	MS1	111	%REC		1	0.05		EPA 353.1	99-A23599S	3539102599
ACCU	00D0536	NITRATE/NITRITE	MS1	99	%REC		1	0.05		EPA 353.1	99-A24777S	5124111399
ACCU	00D0569	NITRATE/NITRITE	MS1	98	%REC		1	0.05		EPA 353.1	99-A25079S	5993112899
[illegible]	00D0569	NITRATE/NITRITE	MS1	121	%REC		1	0.05		EPA 353.1	99-A25037S	512411[illegible]
[illegible]	00D0682	NITRATE/NITRITE	MS1	121	%REC		1	0.05		EPA 353.1	99-A25037S	512411[illegible]
ACCU	00D0682	NITRATE/NITRITE	MS1	88	%REC		1	0.05		EPA 353.1	99-A24859S	5993112899
ACCU	00D0723	NITRATE/NITRITE	MS1	97	%REC		1	0.05		EPA 353.1	99-A25079S	5993112899
ACCU	00D0723	NITRATE/NITRITE	MS1	92	%REC		1	0.05		EPA 353.1	99-A26418S	7634121699

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Appendix E: Table 11-4
Matrix Spike Recovery For VOC - PCB - Metal - WQP Samples
Groundwater 1999

	Bottle # or RIN #	Analyte	Result Type	Result	Units	Lab Qual	Valid-ation	Detect Limit	Dilu-tion	Test Method	Lab Sample #	Lab Batch #
ACCU	00D0780	NITRATE/NITRITE	MS1	94	%REC		1	0.05		EPA 353.1	99-A25623S	5993112899
ACCU	00D0780	NITRATE/NITRITE	MS1	92	%REC		1	0.05		EPA 353.1	99-A26418S	7634121699
ACCU	00D0837	NITRATE/NITRITE	MS1	92	%REC			0.05		EPA 353.1	99-A26418S	7634121699
ACCU	00D0963	NITRATE/NITRITE	MS1	98	%REC		1	0.05		EPA 353.1	99-A27655S	8778010600
ACCU	00D1043	NITRATE/NITRITE	MS1	96	%REC		1	0.05		EPA 353.1	99-A27836S	9224011200
ACCU	99D0046	NITRATE/NITRITE	MS1	99	%REC			0.05		EPA 353.1	99-A18772S	9107090299
ACCU	99D0121	NITRATE/NITRITE	MS1	109	%REC		1	0.05		EPA 353.1	99-A20907S	1349092799
ACCU	99D4729	NITRATE/NITRITE	MS1	97	%REC			0.05		EPA 353.1	99-A1056S	7802012699
ACCU	99D4750	NITRATE/NITRITE	MS1	97	%REC			0.05		EPA 353.1	99-A1056S	7802012699
ACCU	99D4879	NITRATE/NITRITE	MS1	98	%REC			0.05		EPA 353.1	99-A1761S	8739020499
ACCU	99D5250	NITRATE/NITRITE	MS1	101	%REC		1	0.05		EPA 353.1	99-A2982S	877022599
ACCU	99D5474	NITRATE/NITRITE	MS1	114	%REC			0.05		EPA 353.1	99-A3509S	1650030499
ACCU	99D5667	NITRATE/NITRITE	MS1	101	%REC			0.05		EPA 353.1	99-A4072S	2520031299
ACCU	99D5959	NITRATE/NITRITE	MS1	97	%REC			0.05		EPA 353.1	99-A4946S	3939032699
ACCU	99D6808	NITRATE/NITRITE	MS1	98	%REC			0.05		EPA 353.1	99-A7410S	6807042699
ACCU	99D7170	NITRATE/NITRITE	MS1	100	%REC		1	0.05		EPA 353.1	99-A8553S	8388051299
ACCU	99D7382	NITRATE/NITRITE	MS1	99	%REC			0.05		EPA 353.1	99-A9661S	9822052599
ACCU	99D7382	NITRATE/NITRITE	MS1	96	%REC			0.05		EPA 353.1	99-A8947S	9013051899
ACCU	99D7497	NITRATE/NITRITE	MS1	100	%REC			0.05		EPA 353.1	99-A9661S	9822052599
ACCU	99D7743	NITRATE/NITRITE	MS1	104	%REC			0.05		EPA 353.1	99-A9894S	817060399
ACCU	99D7869	NITRATE/NITRITE	MS1	101	%REC		1	0.05		EPA 353.1	99-A10997S	2160061699
ACCU	99D7905	NITRATE/NITRITE	MS1	96	%REC		1	0.05		EPA 353.1	99-A11113S	2160061699
ACCU	99D8060	NITRATE/NITRITE	MS1	108	%REC		1	0.05		EPA 353.1	99-A11686S	2834062399
ACCU	99D8809	NITRATE/NITRITE	MS1	106	%REC			0.05		EPA 353.1	99-A14629S	6253080399
ACCU	99D8961	NITRATE/NITRITE	MS1	108	%REC		1	0.05		EPA 353.1	99-A15915S	6253080399
ACCU	99D9020	NITRATE/NITRITE	MS1	108	%REC		1	0.05		EPA 353.1	99-A15915S	6253080399
ACCU	99D9395	NITRATE/NITRITE	MS1	91	%REC		1	0.05		EPA 353.1	99-A18749S	9107090299
ACCU	99D9396	NITRATE/NITRITE	MS1	111	%REC		1	0.05		EPA 353.1	99-A16869S	7113081099
ACCU	99D9488	NITRATE/NITRITE	MS1	98	%REC			0.05		EPA 353.1	99-A17903S	8820082799
ACCU	00D0519	SULFATE	MS1	102	%REC			1		EPA 375.1	99-A23371S	3888102899
ACCU	00D0568	SULFATE	MS1	83	%REC		1	1		EPA 375.1	99-A24056S	5196111799
ACCU	00D0681	SULFATE	MS1	83	%REC		1	1		EPA 375.1	99-A24056S	5196111799
ACCU	00D0721	SULFATE	MS1	86	%REC			1		EPA 375.1	99-A25621S	6642120899
ACCU	00D0722	SULFATE	MS1	96	%REC		1	1		EPA 375.1	99-A24056S	5196111799
ACCU	99D0045	SULFATE	MS1	96	%REC		1	1		EPA 375.1	99-A18868S	9296090299
ACCU	99D0120	SULFATE	MS1	104	%REC			1		EPA 375.1	99-A21029S	1137092399
ACCU	99D0120	SULFATE	MS1	111	%REC			1		EPA 375.1	99-A19259S	432091699
ACCU	99D0269	SULFATE	MS1	111	%REC			1		EPA 375.1	99-A19259S	589091699
ACCU	99D0348	SULFATE	MS1	104	%REC			1		EPA 375.1	99-A21029S	1137092399
ACCU	99D4879	SULFATE	MS1	100	%REC			1		EPA 375.1	99-A1765S	8763020499
ACCU	99D4879	SULFATE	MS1	93	%REC			1		EPA 375.1	99-A1599S	8548020299
ACCU	99D5250	SULFATE	MS1	110	%REC		1	1		EPA 375.1	99-A2990S	548022399
ACCU	99D5474	SULFATE	MS1	101	%REC			1		EPA 375.1	99-A3503S	3121031899
ACCU	99D5667	SULFATE	MS1	109	%REC			1		EPA 375.1	99-A4071S	2073031099
ACCU	99D5959	SULFATE	MS1	96	%REC			1		EPA 375.1	99-A5446S	4258033099
ACCU	99D6808	SULFATE	MS1	107	%REC			1		EPA 375.1	99-A7413S	7681050599
ACCU	99D7170	SULFATE	MS1	104	%REC		1	1		EPA 375.1	99-A9658S	122052799
ACCU	99D7170	SULFATE	MS1	107	%REC		1	1		EPA 375.1	99-A8571S	8820051699
ACCU	99D7382	SULFATE	MS1	99	%REC			1		EPA 375.1	99-A9994S	909060399
ACCU	99D7382	SULFATE	MS1	107	%REC			1		EPA 375.1	99-A8950S	8820051699
ACCU	99D7497	SULFATE	MS1	104	%REC			1		EPA 375.1	99-A9660S	122052799
ACCU	99D7743	SULFATE	MS1	99	%REC			1		EPA 375.1	99-A9994S	909060399
ACCU	99D8809	SULFATE	MS1	103	%REC			1		EPA 375.1	99-A13266S	5110072099
ACCU	99D8961	SULFATE	MS1	88	%REC		1	1		EPA 375.1	99-A15927S	6554080599
ACCU	99D9020	SULFATE	MS1	98	%REC		1	1		EPA 375.1	99-A15263S	6554080599
ACCU	99D9354	SULFATE	MS1	107	%REC		1	1		EPA 375.1	99-A16593S	7421081299
ACCU	99D9394	SULFATE	MS1	110	%REC		1	1		EPA 375.1	99-A17471S	8085081999
ACCU	99D9487	SULFATE	MS1	101	%REC		1	1		EPA 375.1	99-A17894S	9296090299
ACCU	99D0269	SULFIDE	MS1	95	%REC			0.002		EPA 376.1	99-A20505S	884092199
ACCU	99D0348	SULFIDE	MS1	95	%REC			0.002		EPA 376.1	99-A21032S	1502092899
ACCU	99D0269	TOTAL ORGANIC CARBON	MS1	100	%REC			1		EPA 415.1	99-A20506S	981092799
ACCU	99D0348	TOTAL ORGANIC CARBON	MS1	92	%REC			1		EPA 415.1	99-A21031S	1796100499

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Appendix E: Table 11-5
Lab Control Sample Recovery For Radionuclides
Groundwater 1999

Lab	RIN #	Analyte	Result Type	Result	Unit	2 Sigma Error	LCS Fractional Sample Recovery	Lab Qual	Valid-ation	Detect Limit	Test Method	Lab Sample #	Lab Batch #
GEL	00D0520	AMERICIUM-241	LC1	2.956	PCI/L	0.1663	0.81		1	0.0066	ALPHA SPEC	QC670870	164078
GEL	00D0520	AMERICIUM-241	LC1	3.0643	PCI/L	0.1719	0.8554		1	0.0269	ALPHA SPEC	QC670878	164080
GEL	00D0569	AMERICIUM-241	LC1	2.956	PCI/L	0.1663	0.81		1	0.0066	ALPHA SPEC	QC670870	164078
GEL	00D0682	AMERICIUM-241	LC1	3.0643	PCI/L	0.1719	0.8554		1	0.0269	ALPHA SPEC	QC670878	164080
GEL	00D0723	AMERICIUM-241	LC1	2.35174	PCI/L	0.125606	1.0133		1	0.022775	ALPHA SPEC	1000008773	4511
GEL	00D0723	AMERICIUM-241	LC1	3.0643	PCI/L	0.1719	0.8554		1	0.0269	ALPHA SPEC	QC670878	164080
GEL	00D0780	AMERICIUM-241	LC1	2.35174	PCI/L	0.125606	1.0133			0.022775	ALPHA SPEC	1000008773	4511
GEL	00D0780	AMERICIUM-241	LC1	3.0643	PCI/L	0.1719	0.8554			0.0269	ALPHA SPEC	QC670878	164080
GEL	00D0837	AMERICIUM-241	LC1	2.38299	PCI/L	0.125609	0.9139		1	0.004673	ALPHA SPEC	1000011455	5760
GEL	00D0963	AMERICIUM-241	LC1	2.35174	PCI/L	0.125606	1.0133		1	0.022775	ALPHA SPEC	1000008773	4511
GEL	00D1043	AMERICIUM-241	LC1	2.38299	PCI/L	0.125609	0.9139		1	0.004673	ALPHA SPEC	1000011455	5760
GEL	99D0046	AMERICIUM-241	LC1	2.5908	PCI/L	0.1518	0.5725		1	0.0517	ALPHA SPEC	QC645588	157715
GEL	99D0046	AMERICIUM-241	LC1	2.8221	PCI/L	0.2279	0.4888		1	0.0396	ALPHA SPEC	QC645585	157714
GEL	99D0121	AMERICIUM-241	LC1	3.3117	PCI/L	0.1813	0.8494		1	0.0406	ALPHA SPEC	QC654186	159848
EP	99D4750	AMERICIUM-241	LC1	2.4053	PCI/L	0.1526	0.5002			0.0575	ALPHA SPEC	QC587223	142860
EP	99D5061	AMERICIUM-241	LC1	2.5608	PCI/L	0.1519	0.5118			0.0191	ALPHA SPEC	QC586038	142554
EP	99D5250	AMERICIUM-241	LC1	2.3357	PCI/L	0.1183	0.9225			0.036	ALPHA SPEC	QC600675	146339
EP	99D5474	AMERICIUM-241	LC1	2.3357	PCI/L	0.1183	0.9225			0.036	ALPHA SPEC	QC600675	146339
EP	99D5667	AMERICIUM-241	LC1	2.3357	PCI/L	0.1183	0.9225			0.036	ALPHA SPEC	QC600675	146339
EP	99D5839	AMERICIUM-241	LC1	2.3357	PCI/L	0.1183	0.9225			0.036	ALPHA SPEC	QC600675	146339
EP	99D5959	AMERICIUM-241	LC1	2.2701	PCI/L	0.1527	0.4623			0.0072	ALPHA SPEC	QC599724	146094
GEL	99D6640	AMERICIUM-241	LC1	2.1046	PCI/L	0.1233	0.9297		1	0.0136	ALPHA SPEC	QC615520	150094
EP	99D6808	AMERICIUM-241	LC1	2.1046	PCI/L	0.1233	0.9297		1	0.0136	ALPHA SPEC	QC615520	150094
GEL	99D7057	AMERICIUM-241	LC1	2.1046	PCI/L	0.1233	0.9297		1	0.0136	ALPHA SPEC	QC615520	15009
GEL	99D7170	AMERICIUM-241	LC1	2.1046	PCI/L	0.1233	0.9297		1	0.0136	ALPHA SPEC	QC615520	1500
GEL	99D7170	AMERICIUM-241	LC1	2.2305	PCI/L	0.1155	0.9366		1	0.0451	ALPHA SPEC	QC615524	150095
GEL	99D7382	AMERICIUM-241	LC1	2.2305	PCI/L	0.1155	0.9366		V1	0.0451	ALPHA SPEC	QC615524	150095
GEL	99D7382	AMERICIUM-241	LC1	2.3895	PCI/L	0.1711	0.807		V1	0.0523	ALPHA SPEC	QC624572	152447
GEL	99D7497	AMERICIUM-241	LC1	2.2305	PCI/L	0.1155	0.9366		1	0.0451	ALPHA SPEC	QC615524	150095
GEL	99D7869	AMERICIUM-241	LC1	2.3895	PCI/L	0.1711	0.807		1	0.0523	ALPHA SPEC	QC624572	152447
GEL	99D7905	AMERICIUM-241	LC1	2.3895	PCI/L	0.1711	0.807		1	0.0523	ALPHA SPEC	QC624572	152447
GEL	99D8809	AMERICIUM-241	LC1	2.8996	PCI/L	0.1495	0.9103		1	0.0215	ALPHA SPEC	QC642757	157012
GEL	99D8809	AMERICIUM-241	LC1	2.978	PCI/L	0.146	0.9194		1	0.0358	ALPHA SPEC	QC642738	157007
GEL	99D8961	AMERICIUM-241	LC1	2.8996	PCI/L	0.1495	0.9103		1	0.0215	ALPHA SPEC	QC642757	157012
GEL	99D9020	AMERICIUM-241	LC1	2.978	PCI/L	0.146	0.9194		1	0.0358	ALPHA SPEC	QC642738	157007
GEL	99D9395	AMERICIUM-241	LC1	2.3239	PCI/L	0.1223	0.981		1	0.0123	ALPHA SPEC	QC648161	158328
GEL	99D9396	AMERICIUM-241	LC1	2.8221	PCI/L	0.2279	0.4888		1	0.0396	ALPHA SPEC	QC645585	157714
GEL	99D9488	AMERICIUM-241	LC1	2.5908	PCI/L	0.1518	0.5725		V1	0.0517	ALPHA SPEC	QC645588	157715
GEL	00D0520	PLUTONIUM-239/240	LC1	2.7638	PCI/L	0.1486	0.9345		1	0.0223	ALPHA SPEC	QC673913	164837
GEL	00D0520	PLUTONIUM-239/240	LC1	2.4942	PCI/L	0.1445	1.0403		1	0.0233	ALPHA SPEC	QC673916	164838
GEL	00D0569	PLUTONIUM-239/240	LC1	2.7638	PCI/L	0.1486	0.9345		1	0.0223	ALPHA SPEC	QC673913	164837
GEL	00D0682	PLUTONIUM-239/240	LC1	2.4942	PCI/L	0.1445	1.0403		1	0.0233	ALPHA SPEC	QC673916	164838
GEL	00D0723	PLUTONIUM-239/240	LC1	2.11711	PCI/L	0.121448	0.9997		1	0.026957	ALPHA SPEC	1000008761	4508
GEL	00D0723	PLUTONIUM-239/240	LC1	2.4942	PCI/L	0.1445	1.0403		1	0.0233	ALPHA SPEC	QC673916	164838
GEL	00D0780	PLUTONIUM-239/240	LC1	2.11711	PCI/L	0.121448	0.9997			0.026957	ALPHA SPEC	1000008761	4508
GEL	00D0780	PLUTONIUM-239/240	LC1	2.4942	PCI/L	0.1445	1.0403			0.0233	ALPHA SPEC	QC673916	164838
GEL	00D0837	PLUTONIUM-239/240	LC1	2.35763	PCI/L	0.126743	0.974		1	0.016447	ALPHA SPEC	1000021926	10359
GEL	00D0837	PLUTONIUM-239/240	LC1	2.24424	PCI/L	0.134727	0.9128		1	0.014463	ALPHA SPEC	1000011205	5643
GEL	00D0963	PLUTONIUM-239/240	LC1	2.11711	PCI/L	0.121448	0.9997		1	0.026957	ALPHA SPEC	1000008761	4508
GEL	00D1043	PLUTONIUM-239/240	LC1	2.24424	PCI/L	0.134727	0.9128		1	0.014463	ALPHA SPEC	1000011205	5643
GEL	99D0046	PLUTONIUM-239/240	LC1	2.2469	PCI/L	0.1227	0.8318		1	0.02	ALPHA SPEC	QC645588	15771
GEL	99D0046	PLUTONIUM-239/240	LC1	2.0774	PCI/L	0.136	0.9505		1	0.0191	ALPHA SPEC	QC645585	1577

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Appendix E: Table 11-5
Lab Control Sample Recovery For Radionuclides
Groundwater 1999

Lab	RIN #	Analyte	Result Type	Result	Unit	2 Sigma Error	LCS Fractional Sample Recovery	Lab Qual	Valid-ation	Detect Limit	Test Method	Lab Sample #	Lab Batch #
GEL	99D0121	PLUTONIUM-239/240	LC1	2.7889	PCI/L	0.1593	0.8048		1	0.0406	ALPHA SPEC	QC654186	159848
EP	99D4750	PLUTONIUM-239/240	LC1	1.7676	PCI/L	0.1297	0.7862			0.0205	ALPHA SPEC	QC587223	142860
EP	99D5061	PLUTONIUM-239/240	LC1	2.5846	PCI/L	0.1482	0.8851			0.016	ALPHA SPEC	QC586038	142554
EP	99D5250	PLUTONIUM-239/240	LC1	2.0631	PCI/L	0.0987	0.9399			0.0095	ALPHA SPEC	QC600675	146339
EP	99D5250	PLUTONIUM-239/240	LC1	2.57	PCI/L	0.344	0.8613			0.0179	ALPHA SPEC	QC600634	144947
EP	99D5474	PLUTONIUM-239/240	LC1	2.57	PCI/L	0.344	0.8613			0.0179	ALPHA SPEC	QC600634	144947
EP	99D5667	PLUTONIUM-239/240	LC1	2.57	PCI/L	0.344	0.8613			0.0179	ALPHA SPEC	QC600634	144947
EP	99D5839	PLUTONIUM-239/240	LC1	2.57	PCI/L	0.344	0.8613			0.0179	ALPHA SPEC	QC600634	144947
EP	99D5959	PLUTONIUM-239/240	LC1	1.9548	PCI/L	0.0975	0.9784			0.0103	ALPHA SPEC	QC599724	146094
GEL	99D6640	PLUTONIUM-239/240	LC1	1.982	PCI/L	0.1215	0.9524		1	0.014	ALPHA SPEC	QC615520	150094
EP	99D6808	PLUTONIUM-239/240	LC1	1.982	PCI/L	0.1215	0.9524		1	0.014	ALPHA SPEC	QC615520	150094
GEL	99D7057	PLUTONIUM-239/240	LC1	1.982	PCI/L	0.1215	0.9524		1	0.014	ALPHA SPEC	QC615520	150094
GEL	99D7170	PLUTONIUM-239/240	LC1	1.8496	PCI/L	0.1114	1.0054		1	0.0184	ALPHA SPEC	QC615524	150095
GEL	99D7170	PLUTONIUM-239/240	LC1	1.982	PCI/L	0.1215	0.9524		1	0.014	ALPHA SPEC	QC615520	150094
GEL	99D7382	PLUTONIUM-239/240	LC1	1.8496	PCI/L	0.1114	1.0054		V1	0.0184	ALPHA SPEC	QC615524	150095
GEL	99D7382	PLUTONIUM-239/240	LC1	2.0666	PCI/L	0.1539	0.8745		V1	0.0188	ALPHA SPEC	QC624572	152447
GEL	99D7497	PLUTONIUM-239/240	LC1	1.8496	PCI/L	0.1114	1.0054		1	0.0184	ALPHA SPEC	QC615524	150095
GEL	99D7869	PLUTONIUM-239/240	LC1	2.0666	PCI/L	0.1539	0.8745		1	0.0188	ALPHA SPEC	QC624572	152447
GEL	99D7905	PLUTONIUM-239/240	LC1	2.0666	PCI/L	0.1539	0.8745		1	0.0188	ALPHA SPEC	QC624572	152447
GEL	99D8809	PLUTONIUM-239/240	LC1	2.8269	PCI/L	0.1554	0.9415		1	0.0206	ALPHA SPEC	QC642738	157007
GEL	99D8809	PLUTONIUM-239/240	LC1	2.5699	PCI/L	0.1387	1.0003		1	0.0052	ALPHA SPEC	QC642757	157012
GEL	99D8961	PLUTONIUM-239/240	LC1	2.5699	PCI/L	0.1387	1.0003		1	0.0052	ALPHA SPEC	QC642757	157012
GEL	99D9020	PLUTONIUM-239/240	LC1	2.8269	PCI/L	0.1554	0.9415		1	0.0206	ALPHA SPEC	QC642738	157007
[illegible]	99D9395	PLUTONIUM-239/240	LC1	2.0136	PCI/L	0.1016	1.0402		1	0.0159	ALPHA SPEC	QC648161	158328
[illegible]	99D9396	PLUTONIUM-239/240	LC1	2.0774	PCI/L	0.136	0.9505		1	0.0191	ALPHA SPEC	QC645585	157714
GEL	99D9488	PLUTONIUM-239/240	LC1	2.2469	PCI/L	0.1227	0.8318		V1	0.02	ALPHA SPEC	QC645588	157715
GEL	00D0520	URANIUM-233,-234	LC1	6.4256	PCI/L	1.1485	0.7622		1	0.2932	ALPHA SPEC	QC670218	163910
GEL	00D0520	URANIUM-233,-234	LC1	8.1236	PCI/L	1.2149	0.903		1	0.2043	ALPHA SPEC	QC670221	163911
GEL	00D0520	URANIUM-233,-234	LC1	7.5254	PCI/L	1.2186	0.8058		1	0.256	ALPHA SPEC	QC670224	163912
GEL	00D0520	URANIUM-235	LC1	0.4145	PCI/L	0.2958	0.7622	J	1	0.2659	ALPHA SPEC	QC670218	163910
GEL	00D0520	URANIUM-235	LC1	0.474	PCI/L	0.2929	0.903	J	1	0.128	ALPHA SPEC	QC670221	163911
GEL	00D0520	URANIUM-235	LC1	0.3085	PCI/L	0.2461	0.8058		1	0.1389	ALPHA SPEC	QC670224	163912
GEL	00D0520	URANIUM-238	LC1	6.2803	PCI/L	1.0683	0.903		1	0.2043	ALPHA SPEC	QC670221	163911
GEL	00D0520	URANIUM-238	LC1	7.5316	PCI/L	1.2186	0.8058		1	0.2217	ALPHA SPEC	QC670224	163912
GEL	00D0520	URANIUM-238	LC1	5.7396	PCI/L	1.085	0.7622		1	0.2659	ALPHA SPEC	QC670218	163910
GEL	00D0536	URANIUM-233,-234	LC1	7.2852	PCI/L	1.0244	0.8807			0.2955	ALPHA SPEC	QC670881	164081
GEL	00D0536	URANIUM-235	LC1	0.2239	PCI/L	0.1786	0.8807	J		0.1008	ALPHA SPEC	QC670881	164081
GEL	00D0536	URANIUM-238	LC1	6.1039	PCI/L	0.9342	0.8807			0.101	ALPHA SPEC	QC670881	164081
GEL	00D0569	URANIUM-233,-234	LC1	7.2852	PCI/L	1.0244	0.8807		1	0.2955	ALPHA SPEC	QC670881	164081
GEL	00D0569	URANIUM-233,-234	LC1	6.4256	PCI/L	1.1485	0.7622		1	0.2932	ALPHA SPEC	QC670218	163910
GEL	00D0569	URANIUM-235	LC1	0.2239	PCI/L	0.1786	0.8807	J	1	0.1008	ALPHA SPEC	QC670881	164081
GEL	00D0569	URANIUM-235	LC1	0.4145	PCI/L	0.2958	0.7622	J	1	0.2659	ALPHA SPEC	QC670218	163910
GEL	00D0569	URANIUM-238	LC1	6.1039	PCI/L	0.9342	0.8807		1	0.101	ALPHA SPEC	QC670881	164081
GEL	00D0569	URANIUM-238	LC1	5.7396	PCI/L	1.085	0.7622		1	0.2659	ALPHA SPEC	QC670218	163910
GEL	00D0682	URANIUM-233,-234	LC1	6.93758	PCI/L	1.06435	0.6468		1	0.233429	ALPHA SPEC	1000007955	4140
GEL	00D0682	URANIUM-233,-234	LC1	7.5254	PCI/L	1.2186	0.8058		1	0.256	ALPHA SPEC	QC670224	163912
GEL	00D0682	URANIUM-233,-234	LC1	8.1236	PCI/L	1.2149	0.903		1	0.2043	ALPHA SPEC	QC670221	163911
GEL	00D0682	URANIUM-235	LC1	0.545144	PCI/L	0.299976	0.6468	J	1	0.19871	ALPHA SPEC	1000007955	4140
GEL	00D0682	URANIUM-235	LC1	0.3085	PCI/L	0.2461	0.8058		1	0.1389	ALPHA SPEC	QC670224	163912
GEL	00D0682	URANIUM-235	LC1	0.474	PCI/L	0.2929	0.903	J	1	0.128	ALPHA SPEC	QC670221	163911
[illegible]	00D0682	URANIUM-238	LC1	6.39407	PCI/L	1.0212	0.6468		1	0.19871	ALPHA SPEC	1000007955	4140
[illegible]	00D0682	URANIUM-238	LC1	7.5316	PCI/L	1.2186	0.8058		1	0.2217	ALPHA SPEC	QC670224	163912

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Appendix E: Table 11-5
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Lab	RIN #	Analyte	Result Type	Result	Unit	2 Sigma Error	LCS Fractional Sample Recovery	Lab Qual	Valid-ation	Detect Limit	Test Method	Lab Sample #	Lab Batch #
GEL	00D0682	URANIUM-238	LC1	6.2803	PCI/L	1.0683	0.903		1	0.2043	ALPHA SPEC	QC670221	163911
GEL	00D0723	URANIUM-233,-234	LC1	6.93758	PCI/L	1.06435	0.6468		1	0.233429	ALPHA SPEC	1000007955	4140
GEL	00D0723	URANIUM-233,-234	LC1	6.6463	PCI/L	1.3011	0.7788		1	0.6728	ALPHA SPEC	QC670227	163913
GEL	00D0723	URANIUM-233,-234	LC1	7.5254	PCI/L	1.2186	0.8058		1	0.256	ALPHA SPEC	QC670224	163912
GEL	00D0723	URANIUM-235	LC1	0.545144	PCI/L	0.299976	0.6468	J	1	0.19871	ALPHA SPEC	1000007955	4140
GEL	00D0723	URANIUM-235	LC1	0.4881	PCI/L	0.3821	0.7788	U	1	0.5344	ALPHA SPEC	QC670227	163913
GEL	00D0723	URANIUM-235	LC1	0.3085	PCI/L	0.2461	0.8058		1	0.1389	ALPHA SPEC	QC670224	163912
GEL	00D0723	URANIUM-238	LC1	6.39407	PCI/L	1.0212	0.6468		1	0.19871	ALPHA SPEC	1000007955	4140
GEL	00D0723	URANIUM-238	LC1	7.7355	PCI/L	1.3885	0.7788		1	0.4494	ALPHA SPEC	QC670227	163913
GEL	00D0723	URANIUM-238	LC1	7.5316	PCI/L	1.2186	0.8058		1	0.2217	ALPHA SPEC	QC670224	163912
GEL	00D0780	URANIUM-233,-234	LC1	6.93758	PCI/L	1.06435	0.6468			0.233429	ALPHA SPEC	1000007955	4140
GEL	00D0780	URANIUM-233,-234	LC1	7.2852	PCI/L	1.0244	0.8807			0.2955	ALPHA SPEC	QC670881	164081
GEL	00D0780	URANIUM-233,-234	LC1	6.6463	PCI/L	1.3011	0.7788			0.6728	ALPHA SPEC	QC670227	163913
GEL	00D0780	URANIUM-235	LC1	0.545144	PCI/L	0.299976	0.6468	J		0.19871	ALPHA SPEC	1000007955	4140
GEL	00D0780	URANIUM-235	LC1	0.2239	PCI/L	0.1786	0.8807	J		0.1008	ALPHA SPEC	QC670881	164081
GEL	00D0780	URANIUM-235	LC1	0.4881	PCI/L	0.3821	0.7788	U		0.5344	ALPHA SPEC	QC670227	163913
GEL	00D0780	URANIUM-238	LC1	6.39407	PCI/L	1.0212	0.6468			0.19871	ALPHA SPEC	1000007955	4140
GEL	00D0780	URANIUM-238	LC1	6.1039	PCI/L	0.9342	0.8807			0.101	ALPHA SPEC	QC670881	164081
GEL	00D0780	URANIUM-238	LC1	7.7355	PCI/L	1.3885	0.7788			0.4494	ALPHA SPEC	QC670227	163913
GEL	00D0780	URANIUM-233,-234	LC1	10.6824	PCI/L	0.380394	0.8339		1	0.064925	ALPHA SPEC	1000021189	10004
GEL	00D0780	URANIUM-235	LC1	0.52631	PCI/L	0.08683	0.8339	J	1	0.0372	ALPHA SPEC	1000021189	10004
GEL	00D0780	URANIUM-238	LC1	10.7065	PCI/L	0.380111	0.8339		1	0.057488	ALPHA SPEC	1000021189	10004
GEL	00D0837	URANIUM-233,-234	LC1	10.6824	PCI/L	0.380394	0.8339		1	0.064925	ALPHA SPEC	1000021189	10004
GEL	00D0837	URANIUM-235	LC1	0.52631	PCI/L	0.08683	0.8339	J	1	0.0372	ALPHA SPEC	1000021189	1000
GEL	00D0837	URANIUM-238	LC1	10.7065	PCI/L	0.380111	0.8339		1	0.057488	ALPHA SPEC	1000021189	1000
GEL	00D0837	URANIUM-233,-234	LC1	6.93906	PCI/L	0.464014	0.5951		1	0.104845	ALPHA SPEC	1000011175	5635
GEL	00D0837	URANIUM-235	LC1	0.328375	PCI/L	0.104989	0.5951	J	1	0.074263	ALPHA SPEC	1000011175	5635
GEL	00D0837	URANIUM-238	LC1	7.25847	PCI/L	0.473421	0.5951		1	0.08609	ALPHA SPEC	1000011175	5635
GEL	00D0963	URANIUM-233,-234	LC1	6.93758	PCI/L	1.06435	0.6468		1	0.233429	ALPHA SPEC	1000007955	4140
GEL	00D0963	URANIUM-235	LC1	0.545144	PCI/L	0.299976	0.6468	J	1	0.19871	ALPHA SPEC	1000007955	4140
GEL	00D0963	URANIUM-238	LC1	6.39407	PCI/L	1.0212	0.6468		1	0.19871	ALPHA SPEC	1000007955	4140
GEL	00D1043	URANIUM-233,-234	LC1	6.93906	PCI/L	0.464014	0.5951		1	0.104845	ALPHA SPEC	1000011175	5635
GEL	00D1043	URANIUM-235	LC1	0.328375	PCI/L	0.104989	0.5951	J	1	0.074263	ALPHA SPEC	1000011175	5635
GEL	00D1043	URANIUM-238	LC1	7.25847	PCI/L	0.473421	0.5951		1	0.08609	ALPHA SPEC	1000011175	5635
GEL	99D0046	URANIUM-233,-234	LC1	9.9195	PCI/L	1.0041	1.0918		1	0.1919	ALPHA SPEC	QC645571	157710
GEL	99D0046	URANIUM-233,-234	LC1	10.8014	PCI/L	1.1009	1.036		1	0.2413	ALPHA SPEC	QC645568	157709
GEL	99D0046	URANIUM-233,-234	LC1	10.6633	PCI/L	1.1299	1.0527		1	0.3174	ALPHA SPEC	QC645578	157712
GEL	99D0046	URANIUM-235	LC1	0.5958	PCI/L	0.2485	1.0918	J	1	0.1566	ALPHA SPEC	QC645571	157710
GEL	99D0046	URANIUM-235	LC1	0.6204	PCI/L	0.2682	1.036	J	1	0.1937	ALPHA SPEC	QC645568	157709
GEL	99D0046	URANIUM-235	LC1	0.5116	PCI/L	0.2503	1.0527	J	1	0.1833	ALPHA SPEC	QC645578	157712
GEL	99D0046	URANIUM-238	LC1	11.4685	PCI/L	1.0784	1.0918		1	0.1317	ALPHA SPEC	QC645571	157710
GEL	99D0046	URANIUM-238	LC1	11.2363	PCI/L	1.121	1.036		1	0.1726	ALPHA SPEC	QC645568	157709
GEL	99D0046	URANIUM-238	LC1	10.9918	PCI/L	1.1418	1.0527		1	0.0836	ALPHA SPEC	QC645578	157712
GEL	99D0121	URANIUM-233,-234	LC1	11.1022	PCI/L	0.8363	1.007		1	0.0444	ALPHA SPEC	QC653830	159755
GEL	99D0121	URANIUM-235	LC1	0.337	PCI/L	0.1481	1.007	J	1	0.0984	ALPHA SPEC	QC653830	159755
GEL	99D0121	URANIUM-238	LC1	10.5118	PCI/L	0.8137	1.007		1	0.0444	ALPHA SPEC	QC653830	159755
EP	99D4750	URANIUM-233,-234	LC1	2.0504	PCI/L	0.216	1.0456			0.0429	ALPHA SPEC	QC590180	143605
EP	99D4750	URANIUM-233,-234	LC1	5.9412	PCI/L	0.8395	0.6568			0.2048	ALPHA SPEC	QC587204	142855
EP	99D4750	URANIUM-233,-234	LC1	7.5348	PCI/L	1.0039	0.6543			0.2311	ALPHA SPEC	QC587207	142856
EP	99D4750	URANIUM-235	LC1	0.117	PCI/L	0.0518	1.0456	J		0.0294	ALPHA SPEC	QC590180	143605
[illegible]	99D4750	URANIUM-235	LC1	0.2774	PCI/L	0.1807	0.7515	J		0.0833	ALPHA SPEC	QC587204	1428[illegible]
[illegible]	99D4750	URANIUM-235	LC1	0.2351	PCI/L	0.1805	0.6543	J		0.1731	ALPHA SPEC	QC587207	1428[illegible]

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Appendix E: Table 11-5
Lab Control Sample Recovery For Radionuclides
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Lab	RIN #	Analyte	Result Type	Result	Unit	2 Sigma Error	LCS Fractional Sample Recovery	Lab Qual	Valid-ation	Detect Limit	Test Method	Lab Sample #	Lab Batch #
EP	99D4750	URANIUM-238	LC1	2.0828	PCI/L	0.2176	1.0456			0.035	ALPHA SPEC	QC590180	143605
EP	99D4750	URANIUM-238	LC1	7.213	PCI/L	0.9802	0.6543			0.0939	ALPHA SPEC	QC587207	142856
EP	99D4750	URANIUM-238	LC1	7.1782	PCI/L	0.9218	0.7808			0.1825	ALPHA SPEC	QC587204	142855
EP	99D5061	URANIUM-233,-234	LC1	9.361	PCI/L	1.0491	1.0098			0.2218	ALPHA SPEC	QC586035	142553
EP	99D5061	URANIUM-235	LC1	0.3987	PCI/L	0.2254	1.0098	J		0.2218	ALPHA SPEC	QC586035	142553
EP	99D5061	URANIUM-238	LC1	11.1134	PCI/L	1.1418	1.0098			0.181	ALPHA SPEC	QC586035	142553
EP	99D5250	URANIUM-233,-234	LC1	6.2643	PCI/L	0.6793	1.0178			0.1887	ALPHA SPEC	QC595362	144969
EP	99D5250	URANIUM-233,-234	LC1	9.301	PCI/L	1.0605	1.012			0.157	ALPHA SPEC	QC595333	144963
EP	99D5250	URANIUM-235	LC1	0.2623	PCI/L	0.1396	1.0178	J		0.0948	ALPHA SPEC	QC595362	144969
EP	99D5250	URANIUM-235	LC1	0.2838	PCI/L	0.1849	1.012	J		0.0852	ALPHA SPEC	QC595333	144963
EP	99D5250	URANIUM-238	LC1	7.7642	PCI/L	0.7534	1.0178			0.1128	ALPHA SPEC	QC595362	144969
EP	99D5250	URANIUM-238	LC1	10.2834	PCI/L	1.1146	1.012			0.0852	ALPHA SPEC	QC595333	144963
EP	99D5474	URANIUM-233,-234	LC1	10.8617	PCI/L	1.2677	0.9232			0.1043	ALPHA SPEC	QC595323	144961
EP	99D5474	URANIUM-235	LC1	0.7633	PCI/L	0.3381	0.9232	J		0.1923	ALPHA SPEC	QC595323	144961
EP	99D5474	URANIUM-238	LC1	12.9139	PCI/L	1.3841	0.9232			0.2566	ALPHA SPEC	QC595323	144961
EP	99D5667	URANIUM-233,-234	LC1	10.8617	PCI/L	1.2677	0.9232			0.1043	ALPHA SPEC	QC595323	144961
EP	99D5667	URANIUM-235	LC1	0.7633	PCI/L	0.3381	0.9232	J		0.1923	ALPHA SPEC	QC595323	144961
EP	99D5667	URANIUM-238	LC1	12.9139	PCI/L	1.3841	0.9232			0.2566	ALPHA SPEC	QC595323	144961
EP	99D5839	URANIUM-233,-234	LC1	9.301	PCI/L	1.0605	1.012			0.157	ALPHA SPEC	QC595333	144963
EP	99D5839	URANIUM-233,-234	LC1	10.8617	PCI/L	1.2677	0.9232			0.1043	ALPHA SPEC	QC595323	144961
EP	99D5839	URANIUM-235	LC1	0.7633	PCI/L	0.3381	0.9232	J		0.1923	ALPHA SPEC	QC595323	144961
EP	99D5839	URANIUM-235	LC1	0.2838	PCI/L	0.1849	1.012	J		0.0852	ALPHA SPEC	QC595333	144963
EP	99D5839	URANIUM-238	LC1	10.2834	PCI/L	1.1146	1.012			0.0852	ALPHA SPEC	QC595333	144963
[illegible]	99D5839	URANIUM-238	LC1	12.9139	PCI/L	1.3841	0.9232			0.2566	ALPHA SPEC	QC595323	144961
[illegible]	99D5959	URANIUM-233,-234	LC1	8.0911	PCI/L	1.5626	0.88			0.2128	ALPHA SPEC	QC599727	146095
EP	99D5959	URANIUM-235	LC1	0.7879	PCI/L	0.4868	0.88	J		0.2128	ALPHA SPEC	QC599727	146095
EP	99D5959	URANIUM-238	LC1	11.1265	PCI/L	1.835	0.88			0.4325	ALPHA SPEC	QC599727	146095
GEL	99D6640	URANIUM-233,-234	LC1	5.4913	PCI/L	0.7351	0.6787		1	0.1988	ALPHA SPEC	QC615541	150099
GEL	99D6640	URANIUM-235	LC1	0.1092	PCI/L	0.1134	0.6787	U	1	0.1695	ALPHA SPEC	QC615541	150099
GEL	99D6640	URANIUM-238	LC1	6.1519	PCI/L	0.7759	0.6787		1	0.127	ALPHA SPEC	QC615541	150099
EP	99D6808	URANIUM-233,-234	LC1	5.4913	PCI/L	0.7351	0.6787		1	0.1988	ALPHA SPEC	QC615541	150099
EP	99D6808	URANIUM-235	LC1	0.1092	PCI/L	0.1134	0.6787	U	1	0.1695	ALPHA SPEC	QC615541	150099
EP	99D6808	URANIUM-238	LC1	6.1519	PCI/L	0.7759	0.6787		1	0.127	ALPHA SPEC	QC615541	150099
GEL	99D7057	URANIUM-233,-234	LC1	5.4913	PCI/L	0.7351	0.6787		1	0.1988	ALPHA SPEC	QC615541	150099
GEL	99D7057	URANIUM-235	LC1	0.1092	PCI/L	0.1134	0.6787	U	1	0.1695	ALPHA SPEC	QC615541	150099
GEL	99D7057	URANIUM-238	LC1	6.1519	PCI/L	0.7759	0.6787		1	0.127	ALPHA SPEC	QC615541	150099
GEL	99D7170	URANIUM-233,-234	LC1	10.5176	PCI/L	1.1317	1.0175		1	0.2617	ALPHA SPEC	QC615545	150100
GEL	99D7170	URANIUM-233,-234	LC1	5.4913	PCI/L	0.7351	0.6787		1	0.1988	ALPHA SPEC	QC615541	150099
GEL	99D7170	URANIUM-233,-234	LC1	11.8945	PCI/L	1.2579	0.9092		1	0.1727	ALPHA SPEC	QC624569	152446
GEL	99D7170	URANIUM-235	LC1	0.4908	PCI/L	0.248	1.0175	J	1	0.1872	ALPHA SPEC	QC615545	150100
GEL	99D7170	URANIUM-235	LC1	0.1092	PCI/L	0.1134	0.6787	U	1	0.1695	ALPHA SPEC	QC615541	150099
GEL	99D7170	URANIUM-235	LC1	0.5899	PCI/L	0.2796	0.9092	J	1	0.0937	ALPHA SPEC	QC624569	152446
GEL	99D7170	URANIUM-238	LC1	11.62	PCI/L	1.1873	1.0175		1	0.1872	ALPHA SPEC	QC615545	150100
GEL	99D7170	URANIUM-238	LC1	6.1519	PCI/L	0.7759	0.6787		1	0.127	ALPHA SPEC	QC615541	150099
GEL	99D7170	URANIUM-238	LC1	12.6557	PCI/L	1.2975	0.9092		1	0.1727	ALPHA SPEC	QC624569	152446
GEL	99D7382	URANIUM-233,-234	LC1	10.5176	PCI/L	1.1317	1.0175		V1	0.2617	ALPHA SPEC	QC615545	150100
GEL	99D7382	URANIUM-233,-234	LC1	11.8945	PCI/L	1.2579	0.9092		V1	0.1727	ALPHA SPEC	QC624569	152446
GEL	99D7382	URANIUM-235	LC1	0.4908	PCI/L	0.248	1.0175	J	V1	0.1872	ALPHA SPEC	QC615545	150100
GEL	99D7382	URANIUM-235	LC1	0.5899	PCI/L	0.2796	0.9092	J	V1	0.0937	ALPHA SPEC	QC624569	152446
GEL	99D7382	URANIUM-238	LC1	11.62	PCI/L	1.1873	1.0175		V1	0.1872	ALPHA SPEC	QC615545	150100
[illegible]	99D7382	URANIUM-238	LC1	12.6557	PCI/L	1.2975	0.9092		V1	0.1727	ALPHA SPEC	QC624569	152446
[illegible]	99D7497	URANIUM-233,-234	LC1	10.5176	PCI/L	1.1317	1.0175		1	0.2617	ALPHA SPEC	QC615545	150100

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Appendix E: Table 11-5
Lab Control Sample Recovery For Radionuclides
Groundwater 1999

Lab	RIN #	Analyte	Result Type	Result	Unit	2 Sigma Error	LCS Fractional Sample Recovery	Lab Qual	Valid-ation	Detect Limit	Test Method	Lab Sample #	Lab Batch #
GEL	99D7497	URANIUM-233,-234	LC1	11.5524	PCI/L	1.1835	1.0397		1	0.0855	ALPHA SPEC	QC616969	150471
GEL	99D7497	URANIUM-235	LC1	0.4908	PCI/L	0.248	1.0175	J	1	0.1872	ALPHA SPEC	QC615545	150100
GEL	99D7497	URANIUM-235	LC1	0.4432	PCI/L	0.2314	1.0397	J	1	0.0855	ALPHA SPEC	QC616969	150471
GEL	99D7497	URANIUM-238	LC1	11.62	PCI/L	1.1873	1.0175		1	0.1872	ALPHA SPEC	QC615545	150100
GEL	99D7497	URANIUM-238	LC1	10.5739	PCI/L	1.1323	1.0397		1	0.0855	ALPHA SPEC	QC616969	150471
GEL	99D7743	URANIUM-233,-234	LC1	11.8945	PCI/L	1.2579	0.9092		1	0.1727	ALPHA SPEC	QC624569	152446
GEL	99D7743	URANIUM-235	LC1	0.5899	PCI/L	0.2796	0.9092	J	1	0.0937	ALPHA SPEC	QC624569	152446
GEL	99D7743	URANIUM-238	LC1	12.6557	PCI/L	1.2975	0.9092		1	0.1727	ALPHA SPEC	QC624569	152446
GEL	99D7869	URANIUM-233,-234	LC1	11.8945	PCI/L	1.2579	0.9092		1	0.1727	ALPHA SPEC	QC624569	152446
GEL	99D7869	URANIUM-235	LC1	0.5899	PCI/L	0.2796	0.9092	J	1	0.0937	ALPHA SPEC	QC624569	152446
GEL	99D7869	URANIUM-238	LC1	12.6557	PCI/L	1.2975	0.9092		1	0.1727	ALPHA SPEC	QC624569	152446
GEL	99D7905	URANIUM-233,-234	LC1	11.8945	PCI/L	1.2579	0.9092		1	0.1727	ALPHA SPEC	QC624569	152446
GEL	99D7905	URANIUM-235	LC1	0.5899	PCI/L	0.2796	0.9092	J	1	0.0937	ALPHA SPEC	QC624569	152446
GEL	99D8809	URANIUM-233,-234	LC1	11.7307	PCI/L	1.7027	0.5665		1	0.4987	ALPHA SPEC	QC642751	157010
GEL	99D8809	URANIUM-233,-234	LC1	8.9616	PCI/L	1.3077	0.6138		1	0.3294	ALPHA SPEC	QC642731	157005
GEL	99D8809	URANIUM-235	LC1	0.1459	PCI/L	0.2228	0.5665	U	1	0.4253	ALPHA SPEC	QC642751	157010
GEL	99D8809	URANIUM-235	LC1	0.5097	PCI/L	0.3238	0.6138	J	1	0.3294	ALPHA SPEC	QC642731	157005
GEL	99D8809	URANIUM-238	LC1	11.6796	PCI/L	1.6922	0.5665		1	0.1729	ALPHA SPEC	QC642751	157010
GEL	99D8809	URANIUM-238	LC1	10.6425	PCI/L	1.4246	0.6138		1	0.3294	ALPHA SPEC	QC642731	157005
GEL	99D8961	URANIUM-233,-234	LC1	11.0647	PCI/L	1.3872	0.6385		1	0.3006	ALPHA SPEC	QC642754	157011
GEL	99D8961	URANIUM-233,-234	LC1	11.7307	PCI/L	1.7027	0.5665		1	0.4987	ALPHA SPEC	QC642751	157010
GEL	99D8961	URANIUM-235	LC1	0.5882	PCI/L	0.3187	0.6385	J	1	0.1222	ALPHA SPEC	QC642754	157011
GEL	99D8961	URANIUM-235	LC1	0.1459	PCI/L	0.2228	0.5665	U	1	0.4253	ALPHA SPEC	QC642751	157010
GEL	99D8961	URANIUM-238	LC1	10.6804	PCI/L	1.3613	0.6385		1	0.2252	ALPHA SPEC	QC642754	157011
GEL	99D8961	URANIUM-238	LC1	11.6796	PCI/L	1.6922	0.5665		1	0.1729	ALPHA SPEC	QC642751	157010
GEL	99D9020	URANIUM-233,-234	LC1	11.0647	PCI/L	1.3872	0.6385		1	0.3006	ALPHA SPEC	QC642754	157011
GEL	99D9020	URANIUM-233,-234	LC1	8.9616	PCI/L	1.3077	0.6138		1	0.3294	ALPHA SPEC	QC642731	157005
GEL	99D9020	URANIUM-235	LC1	0.5882	PCI/L	0.3187	0.6385	J	1	0.1222	ALPHA SPEC	QC642754	157011
GEL	99D9020	URANIUM-235	LC1	0.5097	PCI/L	0.3238	0.6138	J	1	0.3294	ALPHA SPEC	QC642731	157005
GEL	99D9020	URANIUM-238	LC1	10.6804	PCI/L	1.3613	0.6385		1	0.2252	ALPHA SPEC	QC642754	157011
GEL	99D9020	URANIUM-238	LC1	10.6425	PCI/L	1.4246	0.6138		1	0.3294	ALPHA SPEC	QC642731	157005
GEL	99D9395	URANIUM-233,-234	LC1	10.9572	PCI/L	1.278	0.9494		1	0.4911	ALPHA SPEC	QC648164	158329
GEL	99D9395	URANIUM-233,-234	LC1	11.1248	PCI/L	1.1455	0.9645		1	0.2389	ALPHA SPEC	QC648172	158331
GEL	99D9395	URANIUM-235	LC1	0.4515	PCI/L	0.2839	0.9494	J	1	0.3634	ALPHA SPEC	QC648164	158329
GEL	99D9395	URANIUM-235	LC1	0.622	PCI/L	0.2757	0.9645	J	1	0.2037	ALPHA SPEC	QC648172	158331
GEL	99D9395	URANIUM-238	LC1	10.0402	PCI/L	1.2164	0.9494		1	0.3485	ALPHA SPEC	QC648164	158329
GEL	99D9396	URANIUM-233,-234	LC1	10.8014	PCI/L	1.1009	1.036		1	0.2413	ALPHA SPEC	QC645568	157709
GEL	99D9396	URANIUM-235	LC1	0.6204	PCI/L	0.2682	1.036	J	1	0.1937	ALPHA SPEC	QC645568	157709
GEL	99D9396	URANIUM-238	LC1	11.2363	PCI/L	1.121	1.036		1	0.1726	ALPHA SPEC	QC645568	157709
GEL	99D9488	URANIUM-233,-234	LC1	11.1022	PCI/L	0.8363	1.007		V1	0.0444	ALPHA SPEC	QC653830	159755
GEL	99D9488	URANIUM-233,-234	LC1	10.6633	PCI/L	1.1299	1.0527		V1	0.3174	ALPHA SPEC	QC645578	157712
GEL	99D9488	URANIUM-235	LC1	0.337	PCI/L	0.1481	1.007	J	V1	0.0984	ALPHA SPEC	QC653830	159755
GEL	99D9488	URANIUM-235	LC1	0.5116	PCI/L	0.2503	1.0527	J	V1	0.1833	ALPHA SPEC	QC645578	157712
GEL	99D9488	URANIUM-238	LC1	10.5118	PCI/L	0.8137	1.007		V1	0.0444	ALPHA SPEC	QC653830	159755
GEL	99D9488	URANIUM-238	LC1	10.9918	PCI/L	1.1418	1.0527		V1	0.0836	ALPHA SPEC	QC645578	157712
GEL	00D0520	TRITIUM	LC1	2483	PCI/L	423.5			1	247.8	LSC	QC670472	163978
GEL	00D0520	TRITIUM	LC1	2485.5	PCI/L	456.4			1	293.8	LSC	QC670457	163974
GEL	00D0569	TRITIUM	LC1	2485.5	PCI/L	456.4				293.8	LSC	QC670457	163974
GEL	00D0682	TRITIUM	LC1	2483	PCI/L	423.5			1	247.8	LSC	QC670472	163978
GEL	00D0723	TRITIUM	LC1	2483	PCI/L	423.5				247.8	LSC	QC670472	163978
GEL	00D0723	TRITIUM	LC1	2826.1	PCI/L	480.9				253.5	LSC	QC670592	16400
GEL	00D0780	TRITIUM	LC1	1745.4	PCI/L	270.5			1	261.7	LSC	1000010530	532

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Appendix E: Table 11-5
Lab Control Sample Recovery For Radionuclides
Groundwater 1999

Lab	RIN #	Analyte	Result Type	Result	Unit	2 Sigma Error	LCS Fractional Sample Recovery	Lab Qual	Valid-ation	Detect Limit	Test Method	Lab Sample #	Lab Batch #
GEL	00D0780	TRITIUM	LC1	2826.1	PCI/L	480.9			1	253.5	LSC	QC670592	164008
GEL	00D1043	TRITIUM	LC1	2759.5	PCI/L	264.1			1	243	LSC	1000014804	7233
GEL	99D0046	TRITIUM	LC1	2053.1	PCI/L	346.5			1	215.7	LSC	QC649266	158611
GEL	99D0121	TRITIUM	LC1	1976.7	PCI/L	383.1			1	294.3	LSC	QC652832	159509
EP	99D4989	TRITIUM	LC1	2101.2	PCI/L	383.8			1	252.6	LSC	QC587129	142836
EP	99D5061	TRITIUM	LC1	2101.2	PCI/L	383.8				252.6	LSC	QC587129	142836
EP	99D5250	TRITIUM	LC1	2121.7	PCI/L	339.7			1	203.9	LSC	QC594813	144832
EP	99D5474	TRITIUM	LC1	2121.7	PCI/L	339.7			1	203.9	LSC	QC594813	144832
EP	99D5667	TRITIUM	LC1	2121.7	PCI/L	339.7			1	203.9	LSC	QC594813	144832
EP	99D5839	TRITIUM	LC1	2121.7	PCI/L	339.7			1	203.9	LSC	QC594813	144832
EP	99D6808	TRITIUM	LC1	2000.1	PCI/L	991.5			1	260.8	LSC	QC616375	150311
GEL	99D7057	TRITIUM	LC1	1913.1	PCI/L	951.5			1	258.5	LSC	QC616372	150310
GEL	99D7170	TRITIUM	LC1	1913.1	PCI/L	951.5			1	258.5	LSC	QC616372	150310
GEL	99D7382	TRITIUM	LC1	1913.1	PCI/L	951.5				258.5	LSC	QC616372	150310
GEL	99D7497	TRITIUM	LC1	1913.1	PCI/L	951.5			1	258.5	LSC	QC616372	150310
GEL	99D7743	TRITIUM	LC1	1977.9	PCI/L	0.3523	0.2685	U		101	LSC	QC624045	152304
GEL	99D8809	TRITIUM	LC1	2192.5	PCI/L	381			1	207.1	LSC	QC637574	155724
GEL	99D8961	TRITIUM	LC1	2192.5	PCI/L	381			1	207.1	LSC	QC637574	155724
GEL	99D9020	TRITIUM	LC1	2192.5	PCI/L	381			1	207.1	LSC	QC637574	155724
GEL	99D9395	TRITIUM	LC1	2053.1	PCI/L	346.5			1	215.7	LSC	QC649266	158611
GEL	99D9396	TRITIUM	LC1	2053.1	PCI/L	346.5			1	215.7	LSC	QC649266	158611
GEL	99D9488	TRITIUM	LC1	2053.1	PCI/L	346.5			1	215.7	LSC	QC649266	158611
GEL	00D0569	STRONTIUM-89,90	LC1	7.04	PCI/L	0.457	0.66		1	0.508	GPC	QC671586	164265
[illegible]	00D0780	STRONTIUM-89,90	LC1	271.419	PCI/L	2.76936	0.74		1	0.802403	GPC	1000011547	5786
[illegible]	00D0780	STRONTIUM-89,90	LC1	7.04	PCI/L	0.457	0.66		1	0.508	GPC	QC671586	164265
GEL	99D0121	STRONTIUM-89,90	LC1	7.71	PCI/L	0.57	0.73		1	0.681	GPC	QC656373	160395
EP	99D4879	STRONTIUM-89,90	LC1	87.7	PCI/L	2	52		1	1.37	GPC	QC596204	145184
EP	99D5061	STRONTIUM-89,90	LC1	87.7	PCI/L	2	52		1	1.37	GPC	QC596204	145184
EP	99D5250	STRONTIUM-89,90	LC1	87.7	PCI/L	2	52		1	1.37	GPC	QC596204	145184
EP	99D5474	STRONTIUM-89,90	LC1	87.7	PCI/L	2	52		1	1.37	GPC	QC596204	145184
EP	99D5667	STRONTIUM-89,90	LC1	87.7	PCI/L	2	52		1	1.37	GPC	QC596204	145184
GEL	99D7057	STRONTIUM-89,90	LC1	48.6	PCI/L	0.968	45		1	0.456	GPC	QC621950	151775
GEL	99D7170	STRONTIUM-89,90	LC1	48.6	PCI/L	0.968	45		1	0.456	GPC	QC621950	151775
GEL	99D7382	STRONTIUM-89,90	LC1	48.6	PCI/L	0.968	45		1	0.456	GPC	QC621950	151775
GEL	99D7497	STRONTIUM-89,90	LC1	48.6	PCI/L	0.968	45		1	0.456	GPC	QC621950	151775
GEL	99D8961	STRONTIUM-89,90	LC1	170	PCI/L	1.9	71		1	0.57	GPC	QC641832	156777
GEL	99D8961	STRONTIUM-89,90	LC1	5.1	PCI/L	0.0826	76		1	0.0394	GPC	QC637733	155763
GEL	99D9020	STRONTIUM-89,90	LC1	5.1	PCI/L	0.0826	76		1	0.0394	GPC	QC637733	155763
GEL	99D9395	STRONTIUM-89,90	LC1	4.28	PCI/L	0.0476	74		1	0.0141	GPC	QC648735	158469
GEL	99D9396	STRONTIUM-89,90	LC1	4.28	PCI/L	0.0476	74		1	0.0141	GPC	QC648735	158469
GEL	99D9488	STRONTIUM-89,90	LC1	4.28	PCI/L	0.0476	74		1	0.0141	GPC	QC648735	158469
GEL	00D1043	NEPTUNIUM$_{237}$	LC1	4.84549	PCI/L	0.175661	0.8387			0.023319	ALPHA SPEC	1000021176	10000

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Appendix E: Table 11-6
Rinsate QC Results with Detections
Groundwater 1999

tion	Sample Date	Sample #	Analyte	Result	Units	Tier II	Lab Qualifier	Validation Qualifier	Detection Limit	Dilution	2 Sigma Error	LCS Fracti Sample Recovery
Radionuclides												
05091	2/15/99	GW06211TE	AMERICIUM-241	0.0195	PCI/L	0.145	J	V1	0.0066		0.0135	0.8306
10498	2/17/99	GW06273TE	AMERICIUM-241	0.0325	PCI/L	0.145		V1	0.0278		0.0207	0.8019
10498	8/11/99	GW06448TE	AMERICIUM-241	0.0237	PCI/L	0.145	J	V1	0.017		0.0147	0.9275
11891	5/20/99	GW06347TE	AMERICIUM-241	0.0069	PCI/L	0.145	J	V1	0.0062		0.0078	0.8144
11891	10/18/99	GW06566TE	AMERICIUM-241	0.0134	PCI/L	0.145	J	V1	0.0073		0.0118	0.8152
3586	4/28/99	GW06390TE	AMERICIUM-241	0.0208	PCI/L	0.145	J	V1	0.0137		0.0132	0.8358
3586	8/9/99	GW06474TE	AMERICIUM-241	0.0259	PCI/L	0.145	J	V1	0.014		0.0227	0.4832
11891	10/18/99	GW06566TE	URANIUM-233,-234	-0.0233	PCI/L	1.06		V1	0.2891		0.0229	0.7896
11891	10/18/99	GW06566TE	URANIUM-235	-0.0117	PCI/L	1.01		V1	0.2431		0.0161	0.7896
11891	10/18/99	GW06566TE	URANIUM-238	0.037	PCI/L	0.768		V1	0.2431		0.0967	0.7896
Volatile Organic Compounds												
05091	2/15/99	GW06211TE	CHLOROMETHANE	0.58	UG/L	6.55	J	J1	0.2	1		
05091	8/24/99	GW06432TE	BENZENE	0.3	UG/L	5	J	J	1	1		
05091	8/24/99	GW06432TE	CHLOROMETHANE	4	UG/L	6.55		V	1	1		
05091	8/24/99	GW06432TE	METHYLENE CHLORIDE	0.1	UG/L	5	JB	JB	1	1		
05091	8/24/99	GW06432TE	TRICHLOROETHENE	0.1	UG/L	5	JB	JB	1	1		
10498	2/17/99	GW06273TE	CHLOROMETHANE	0.86	UG/L	6.55	J	J1	0.2	1		
10498	8/11/99	GW06448TE	TETRACHLOROETHENE	4	UG/L	5		V1	1	1		
11891	5/20/99	GW06347TE	CHLOROMETHANE	1	UG/L	6.55	J	V1	1	1		
11891	5/20/99	GW06347TE	METHYLENE CHLORIDE	1	UG/L	5	B	UJ1	1	1		
11891	10/18/99	GW06566TE	BENZENE, 1,2,4-TRIMETHYL-	0.4	UG/L		J	J1	1	1		
11891	10/18/99	GW06566TE	BENZENE, 1,3,5-TRIMETHYL-	0.1	UG/L		J	J1	1	1		
11891	10/18/99	GW06566TE	METHYLENE CHLORIDE	0.2	UG/L	5	JB	JB1	1	1		
11891	10/18/99	GW06566TE	TETRACHLOROETHENE	0.2	UG/L	5	J	V1	1	1		
11891	10/18/99	GW06566TE	TOLUENE	0.1	UG/L	1000	J	J1	1	1		
3586	4/28/99	GW06390TE	METHYLENE CHLORIDE	0.1	UG/L	5	JB	JB1	1	1		
3586	10/19/99	GW06583TE	METHYLENE CHLORIDE	0.1	UG/L	5	JB	JB1	1	1		
3586	10/19/99	GW06583TE	TETRACHLOROETHENE	0.1	UG/L	5	J	V1	1	1		
40199	9/2/99	GW06539TE	DICHLORODIFLUOROMETHANE	0.3	UG/L		J	V1	1	1		
40199	9/2/99	GW06539TE	METHYLENE CHLORIDE	0.2	UG/L	5	JB	JB1	0.5	1		
70193	1/29/99	GW06259TE	CHLOROMETHANE	3.7	UG/L	6.55		V1	0.2	1		
70193	5/6/99	GW06399TE	BENZENE, 1,2,4-TRIMETHYL-	2	UG/L			J1	1	1		
70193	5/6/99	GW06399TE	BENZENE, 1,3,5-TRIMETHYL-	0.4	UG/L		J	J1	1	1		
70193	5/6/99	GW06399TE	CHLOROMETHANE	5	UG/L	6.55		V1	1	1		
70193	5/6/99	GW06399TE	TOLUENE	0.4	UG/L	1000	J	J1	1	1		
70193	8/19/99	GW06483TE	CHLOROMETHANE	0.8	UG/L	6.55	J	V1	1	1		
70193	8/19/99	GW06483TE	METHYLENE CHLORIDE	1	UG/L	5	B	UJ1	1	1		
70193	10/18/99	GW06592TE	TETRACHLOROETHENE	0.1	UG/L	5	BJ	JB1	1	1		
90299	8/5/99	GW06414TE	TRICHLOROETHENE	0.1	UG/L	5	J	V1	1	1		

622

Does not include: "U" qualified data (non-detections) for any analytes
"B" qualified data for metals (result < CRDL)

Appendix E: Table 11-6
Rinsate QC Results with Detections
Groundwater 1999

[illegible]tion	Sample Date	Sample #	Analyte	Result	Units	Tier II	Lab Qualifier	Validation Qualifier	Detection Limit	Dilution	2 Sigma Error	LCS Fractional Sample Recovery
Metals												
03991	1/21/99	GW06302TE	CHROMIUM	6.1	UG/L	100		V	0.34	1		
11891	5/20/99	GW06347TE	MERCURY	0.29	UG/L	2		J1	0.1	1		
3586	1/15/99	GW06251TE	ALUMINUM	20.6	UG/L	36500	N	J1	0.31	1		
3586	1/15/99	GW06251TE	BARIUM	232	UG/L	2000		V1	0.02	1		
3586	1/15/99	GW06251TE	CALCIUM	117000	UG/L			J1	9.7	5		
3586	1/15/99	GW06251TE	CHROMIUM	4.7	UG/L	100		J1	0.34	1		
3586	1/15/99	GW06251TE	COPPER	3.2	UG/L	1300	N	J1	0.04	1		
3586	1/15/99	GW06251TE	IRON	348	UG/L			V1	2.5	1		
3586	1/15/99	GW06251TE	MAGNESIUM	14400	UG/L			J1	0.4	5		
3586	1/15/99	GW06251TE	SODIUM	15100	UG/L			J1	6.1	5		
3586	1/15/99	GW06251TE	STRONTIUM	480	UG/L	21900		V1	0.06	1		
3586	1/15/99	GW06251TE	ZINC	20.2	UG/L	11000	N	J1	0.21	1		
3586	4/28/99	GW06390TE	ALUMINUM	14.1	UG/L	36500		UJ1	6.9	1		
70193	1/29/99	GW06259TE	CHROMIUM	3.1	UG/L	100		UJ1	0.34	1		
70193	5/6/99	GW06399TE	ALUMINUM	28.3	UG/L	36500		J	5	1		
70193	8/19/99	GW06483TE	ALUMINUM	19	UG/L	36500		UJ1	3.1	1		
Water Quality Parameters												
05091	8/24/99	GW06432TE	NITRATE/NITRITE	0.11	MG/L	10		V	0.05			
10498	8/11/99	GW06448TE	NITRATE/NITRITE	0.18	MG/L	10		V1	0.05	2		
10498	8/11/99	GW06448TE	TOTAL DISSOLVED SOLIDS	22	MG/L			V1	10			
[illegible]586	1/15/99	GW06251TE	TOTAL DISSOLVED SOLIDS	14	MG/L			V1	10			
[illegible]193	8/19/99	GW06483TE	TOTAL DISSOLVED SOLIDS	22	MG/L			V1	10			
70193	10/18/99	GW06592TE	SULFATE	1	MG/L	500		V	1			

Does not include: "U" qualified data (non-detections) for any analytes
"B" qualified data for metals (result < CRDL)

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Appendix Table 11-7
Comparison of Required and Actual Samples Collected
Groundwater 1999

Sample Types	Required Number of Sampling Events (or Visits)					Actual Number of Attempted Sampling Events (or Visits)*					Actual Number of Samples Collected					Deviation					Success Ratio; % Samples Collected (or Wells Visited)					Discrepancy Justification
	Q1	Q2	Q3	Q4	Annual Total	Q1	Q2	Q3	Q4	Annual Total	Q1	Q2	Q3	Q4	Annual Total	Q1	Q2	Q3	Q4	Annual Total	Q1	Q2	Q3	Q4	Annual Total	
Groundwater Wells (Visits)	68	56	80	83	287	68	56	80	83	287	NA	NA	NA	NA	NA	0	0	0	0	0	100.0	100.0	100.0	100.0	100.0	NA
VOC's	65	55	80	78	278	65	55	80	78	278	58	47	73	53	231	7	8	7	25	47	89.2	85.5	91.3	67.9	83.1	Dry + 1 Damaged
Semi-VOCs	0	0	8	0	8	0	0	8	0	8	0	0	7	0	7	0	0	1	0	1			87.5		87.5	Dry
Methane	0	0	8	0	8	0	0	8	0	8	0	0	7	0	7	0	0	1	0	1			87.5		87.5	Dry
Metals	65	53	64	76	258	65	53	64	76	258	52	44	57	49	202	13	9	7	27	56	80.0	83.0	89.1	64.5	78.3	Dry/Insw/1 Dmgd
PCBs	0	0	2	15	17	0	0	2	15	17	0	0	0	8	8	0	0	2	7	9			0.0	53.3	47.1	Dry or Insw
Radionuclides																										
Pu/Am	39	36	42	49	166	39	36	42	49	166	32	25	35	24	116	7	11	7	25	50	82.1	69.4	83.3	49.0	69.9	Dry/Insw/1 Dmgd
U-isotope	65	55	67	76	263	65	55	67	76	263	51	45	59	47	202	14	10	8	29	61	78.5	81.8	88.1	61.8	76.8	Dry/Insw/1 Dmgd
Tritium	17	22	19	38	96	17	22	19	38	96	13	18	16	20	67	4	4	3	18	29	76.5	81.8	84.2	52.6	69.8	Dry or Insw
$Strontium_{89/90}$	10	14	11	13	48	10	14	11	13	48	10	8	10	4	32	0	6	1	9	16	100.0	57.1	90.9	30.8	66.7	Dry or Insw
$Cesium_{137}$	6	0	6	0	12	6	0	6	0	12	2	0	2	0	4	4	0	4	0	8	33.3		33.3		33.3	Insw
$Neptunium_{237}$	0	0	0	8	8	0	0	0	8	8	0	0	0	1	1	0	0	0	7	7				12.5	12.5	Dry
Waste Characteristics																										
TRPH	0	0	0	6	6	0	0	0	6	6	0	0	0	6	6	0	0	0	0	0				100.0	100.0	NA
Water Quality Parameters																										
Cyanide	6	0	8	7	21	6	0	8	7	21	2	0	6	7	15	4	0	2	0	6	33.3		75.0	100.0	71.4	Insw
Fluoride	17	22	17	23	79	17	22	17	23	79	13	16	15	8	52	4	6	2	15	27	76.5	72.7	88.2	34.8	65.8	Dry or Insw
Nitrate	57	51	68	70	246	57	51	68	70	246	50	42	60	46	198	7	9	8	24	48	87.7	82.4	88.2	65.7	80.5	Dry/Insw/1 Dmgd
Sulfate	32	30	40	31	133	32	30	40	31	133	25	22	34	12	93	7	8	6	19	40	78.1	73.3	85.0	38.7	69.9	Dry/Insw/1 Dmgd
Total Dissolved Solids	59	49	61	50	219	59	49	61	50	219	46	37	51	27	161	13	12	10	23	58	78.0	75.5	83.6	54.0	73.5	Dry/Insw/1 Dmgd
Total Organic Carbon	0	0	8	0	8	0	0	8	0	8	0	0	7	0	7	0	0	1	0	1			87.5		87.5	Dry
Diss. Organic Carbon	0	0	8	0	8	0	0	8	0	8	0	0	7	0	7	0	0	1	0	1			87.5		87.5	Dry
Sulfide as H_2S	0	0	8	0	8	0	0	8	0	8	0	0	7	0	7	0	0	1	0	1			87.5		87.5	Dry
Chloride	0	0	8	0	8	0	0	8	0	8	0	0	7	0	7	0	0	1	0	1			87.5		87.5	Dry
Totals	438	387	533	540	1898	438	387	533	540	1898	354	304	460	312	1430	84	83	73	228	468	80.8	78.6	86.3	57.8	75.3	Dry/Insw/1 Dmgd

*Does not reflect multiple visits to dry wells.

Dry = Well did not recharge after purging. No samples collected. Insw = Insufficient water to complete sample suite. Dmgd = Well damaged and could not be sampled.

Appendix Table 11-8
Summary of Validation / Verification Completeness
Groundwater 1999

Sample Types		Usable Data Points - Dp_u					Non-usable Data Points - DP_n					Total Data Points - DP_t					Percent of Usable Data Points					No Validation / Verification				
		Q1	Q2	Q3	Q4	Annual Total	Q1	Q2	Q3	Q4	Annual Total	Q1	Q2	Q3	Q4	Annual Total	Q1	Q2	Q3	Q4	Annual Total	Q1	Q2	Q3	Q4	Annual Total
VOC's		4349	3247	5436	3538	16570	0	1	10	0	11	4349	3248	5446	3538	16581	100	99.97	99.82	100	99.93	0	0	0	0	0
Semi-VOCs		0	0	816	0	816	0	0	8	0	8	0	0	824	0	824	NA	NA	99.03	NA	99.03	0	0	0	0	0
Methane		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	NA	NA	NA	NA	0	0	8	0	8
Metals		1863	1377	1971	1564	6775	0	0	0	2	2	1863	1377	1971	1566	6777	100	100	100	99.87	99.97	0	0	0	0	0
PCBs		0	0	0	56	56	0	0	0	0	0	0	0	0	56	56	NA	NA	NA	100	100	0	0	0	0	0
Radionuclides																										
	Pu / Am	86	58	88	56	288	0	0	0	0	0	86	58	88	56	288	100	100	100	100	100	0	0	0	0	0
	U-isotope	201	156	216	165	738	0	3	0	0	3	201	159	216	165	741	100	98.11	100	100	99.6	0	0	0	0	0
	Tritium	21	22	23	24	90	0	0	0	0	0	21	22	23	24	90	100	100	100	100	100	0	0	0	0	0
	Strontium	10	8	11	4	33	0	0	0	0	0	10	8	11	4	33	100	100	100	100	100	0	0	0	0	0
	$Cesium_{137}$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	NA	NA	NA	NA	4	0	4	0	8
	$Neptunium_{237}$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	NA	NA	NA	NA	0	0	0	1	1
Waste Characteristics																										
	TRPH	0	0	0	0	0	0	0	0		0	0	0	0	0	0	NA	NA	NA	NA	NA	0	0	0	6	6
Water Quality Parameters																										
	Cyanide	4	0	12	7	23	0	0	0	0	0	4	0	12	7	23	100	NA	100	100	100	0	0	0	0	0
	Fluoride	21	20	22	12	75	0	0	0	0	0	21	20	22	12	75	100	100	100	100	100	0	0	0	0	0
	Nitrate	66	50	74	54	244	0	0	0	0	0	66	50	74	54	244	100	100	100	100	100	0	0	0	0	0
	Sulfate	33	26	42	16	117	0	0	0	0	0	33	26	42	16	117	100	100	100	100	100	0	0	0	0	0
	Total Dissolved Solids	62	45	64	35	206	0	0	0	0	0	62	45	64	35	206	100	100	100	100	100	0	0	0	0	0
	Total Organic Carbon	0	0	10	0	10	0	0	0	0	0	0	0	10	0	10	NA	NA	100	NA	100	0	0	0	0	0
	Diss. Organic Carbon	0	0	10	0	10	0	0	0	0	0	0	0	10	0	10	NA	NA	100	NA	100	0	0	0	0	0
	Sulfide H_2S	0	0	8	0	8	0	0	0	0	0	0	0	8	0	8	NA	NA	100	NA	100	0	0	0	0	0
	Chloride	0	0	8	0	8	0	0	0	0	0	0	0	8	0	8	NA	NA	100	NA	100	0	0	0	0	0
Totals		6716	5009	8811	5531	26067	0	4	18	2	24	6716	5013	8829	5533	26091	100	99.92	99.8	99.96	99.91	4	0	12	7	23

Usable data points include the following Validation/Verification qualifiers: J/J1, JB/JB1, U/U1, UJ/UJ1, V/V1.

Non-usable data points include the following Validation/Verification qualifiers: R/R1.

Because Cesium and Methane analyses are set up via special contracts they are not being validated at this time.

With respect to TR1-DL1 or TR1-TR2 analytical series, only one Result from a pair (with a validation qualifier) is counted here.

Note: The percentages of Validated versus Verified sample events is 24.2 / 75.8 based on counting the sample numbers that were processed.

$$\text{Completeness} = Dp_u = \frac{DP_t - DP_n}{DP_t} \times 100 \text{ (in percent)}$$

The acceptable QC criterion is **>90%.**

Figure 4-7
Ryan's Pit
Area Location Map

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- Groundwater Well
- SW027
- Temporary wells installed in 1998
- Trench

VOC Composite Plume Key

- Composite VOC Groundwater Plume (concentration equal to MCL)
- Composite VOC Groundwater Plume (concentration 100 times MCL)

Nitrate Plume Key

- Nitrate concentration equal to or greater than 10 mg/L (as N)
- Nitrate concentration equal to or greater than 1000 mg/L (as N)

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by LSG (KH), Las Vegas. Digitized from the orthophotographs. USGS
Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc Info and LAS (KH) to process the DLM data to create 5-foot contours. The DLM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial flyover at ~10 meter resolution. DLM post-processing performed by MK, Winter 1997.

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Scale = 1:2470
1 inch represents approximately 206 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

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MAP ID: rfca-rpt

September 26, 2000

Original map components are preserved. Logo and data have changed.

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101

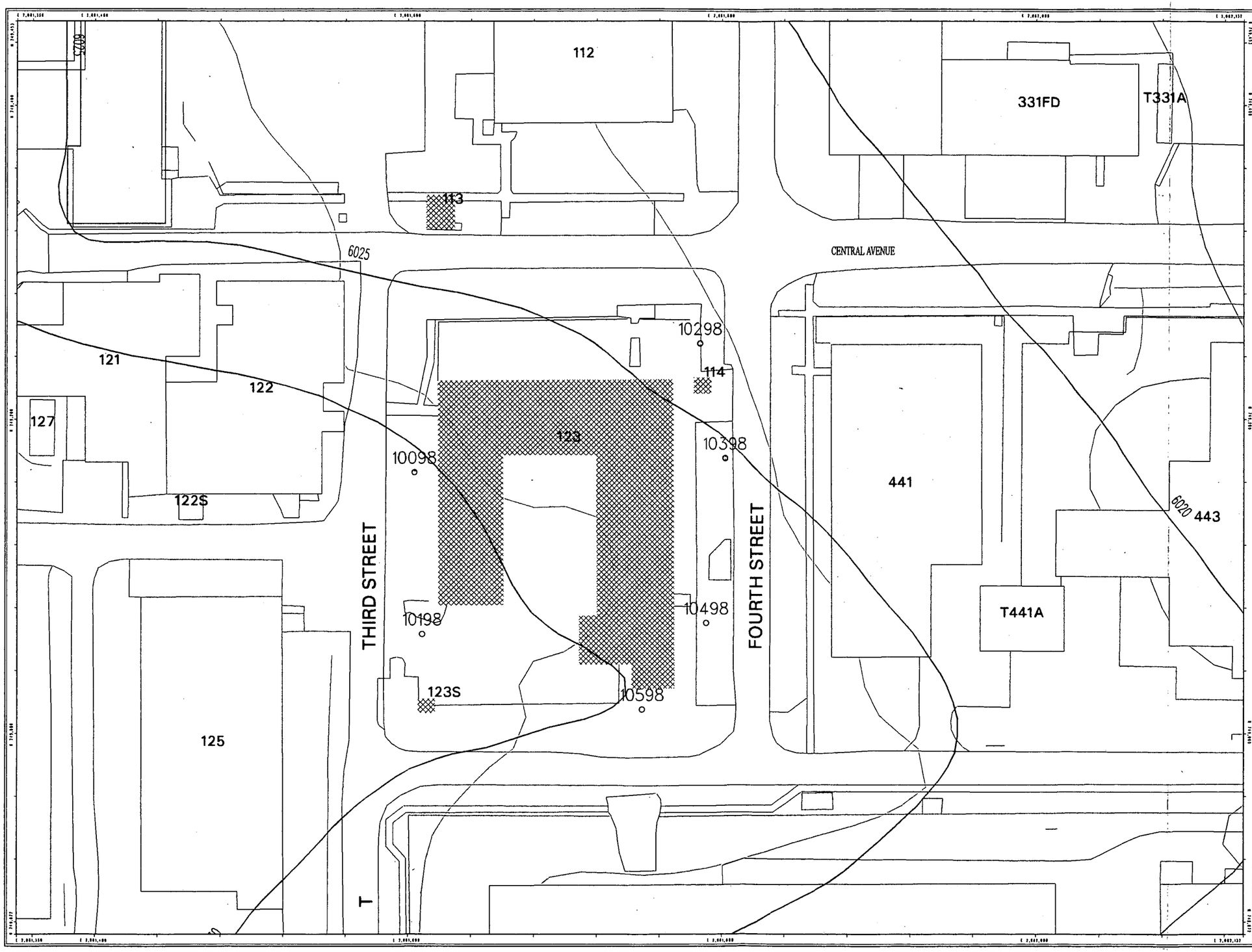

Figure 5-1
Building 123 Location Map with D&D Monitoring Wells
1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

IMP Well Type

- Water Quality Flow Monitoring
- Industrial Area Flow Monitoring
- Background Flow Monitoring
- D&D Monitoring
- Non-IMP

5-Foot Water Level Contours Second Quarter 1999

- 20-Foot Water Level Contour
- Dashed where inferred
- 5-Foot Intermediate Contour
- Dashed where inferred

Standard Map Features

- Buildings and other structures
- Demolished Buildings
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

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Scale = 1 : 750
1 inch represents approximately 63 feet

15 0 30 60 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: rfca-rpt/figures/dd_figs — November 20, 2000

Original map contents are preserved. Logo and date have changed.

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110

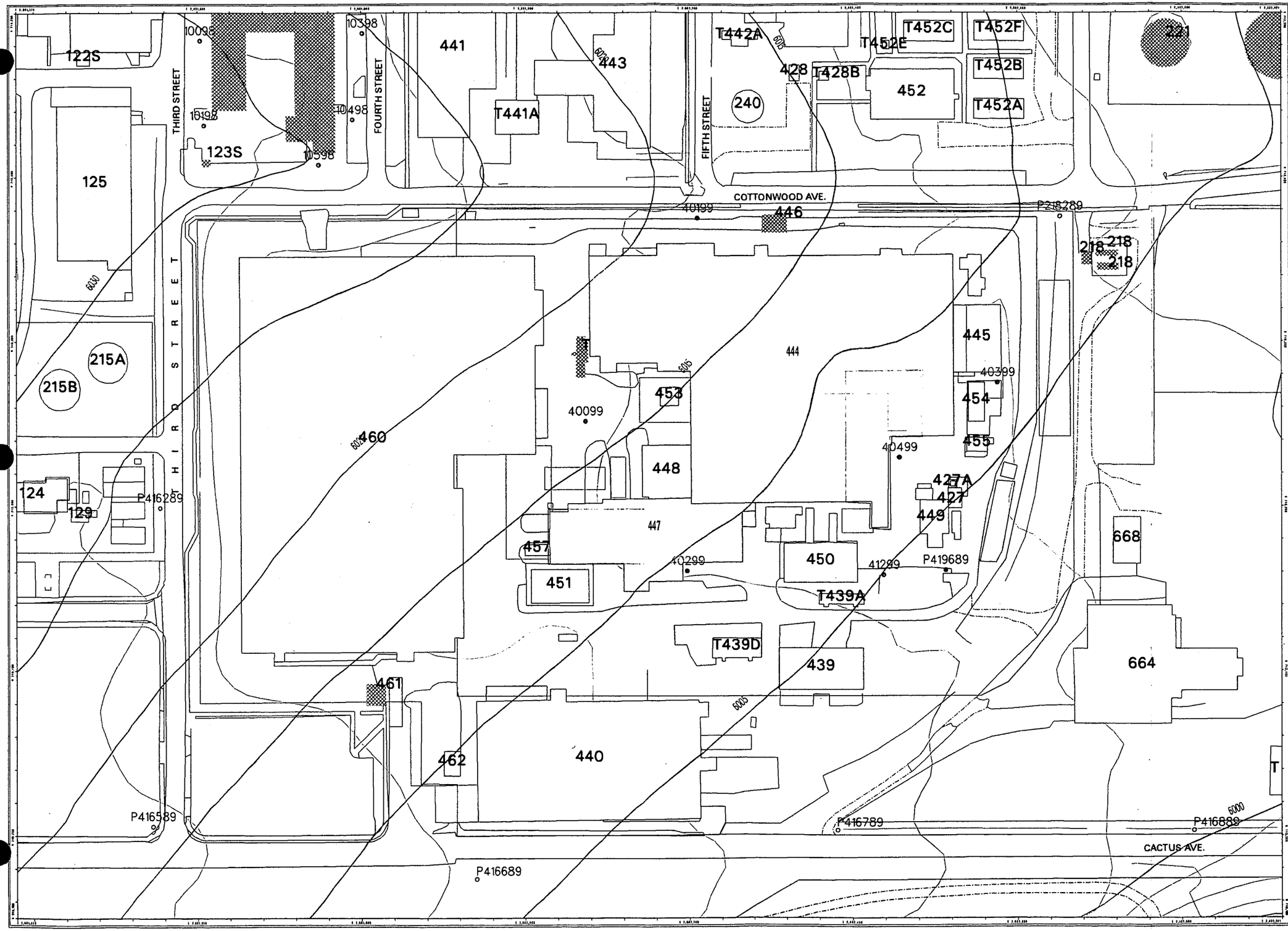

Figure 5-2

Building 444 Site Location with D&D Monitoring Wells

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

IMP Well Type

- Water Quality Flow Monitoring
- Industrial Area Flow Monitoring
- Background Flow Monitoring
- D&D Monitoring
- Non-IMP

5-Foot Water Level Contours Second Quarter 1999

- 20-Foot Water Level Contour
- Dashed where inferred
- 5-Foot Intermediate Contour
- Dashed where inferred

Industrial Area Operable Units

- Pertinant B444 IHSSs
- D&D Building Cluster

Standard Map Features

- Buildings and other structures
- Demolished Buildings
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs, 1/95
Topology (contours) was built and from digital elevation model (DEM) data by Morrison Knudsen (FAX) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours.
The DEM data was captured by the Pennsylvania Sensing Lab, Las Vegas, 11/2,1994 Aerial Flyover at ~10 meter resolution.
DEM post-processing performed by MK, Winter 1997.

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Scale = 1 : 1360
1 inch represents approximately 113 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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GIS Dept. 303-966-7707

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MAP ID: rfca-rpt5gwpoldl.fig

November 30, 2000

Original map contents are preserved. Logo and date have changed.

111

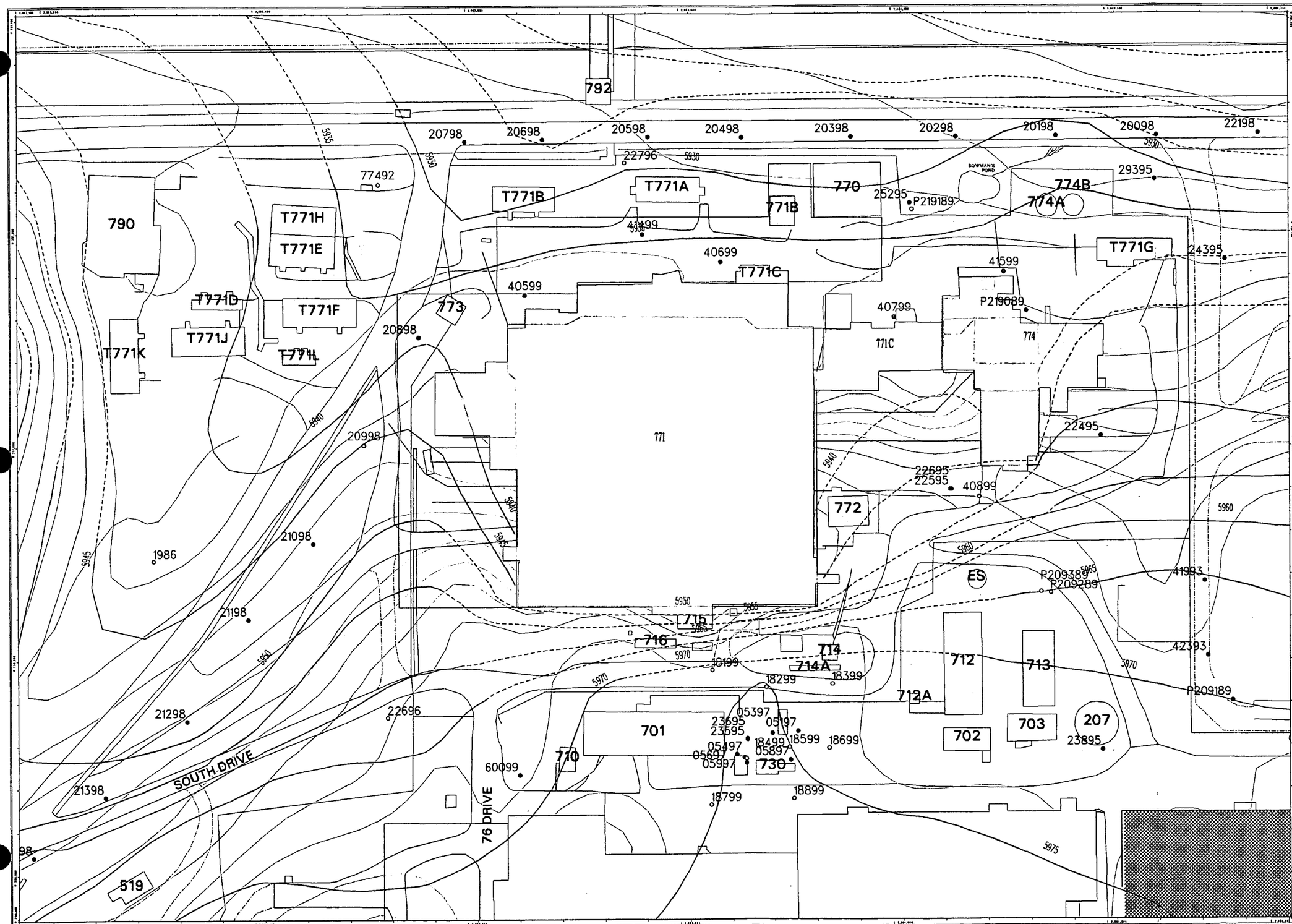

Figure 5-3

Building 771 Site Location with D&D Monitoring Wells

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

IMP Well Type

- Water Quality Flow Monitoring
- Industrial Area Flow Monitoring
- Background Flow Monitoring
- D&D Monitoring
- Non-IMP

5-Foot Water Level Contours Second Quarter 1999

- 20-Foot Water Level Contour
- Dashed where inferred
- 5-Foot Intermediate Contour
- Dashed where inferred

Industrial Area Operable Units

- Pertinent B771 IHSSs
- D&D Building Cluster

Standard Map Features

- Buildings and other structures
- Demolished Buildings
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial flyover data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs, 1/95
Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours.
The DEM data was captured by the Remote Sensing Lab, Las Vegas, 1/2, 1994 Aerial Flyover at ~ 10 meter resolution.
DEM post-processing performed by KHC, 7/Mar 1997.

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Scale = 1 : 1050
1 inch represents approximately 88 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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Rocky Flats Environmental Technology Site

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MAP ID: /fog-pdf/pproj44.fgs
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November 20, 2000

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112

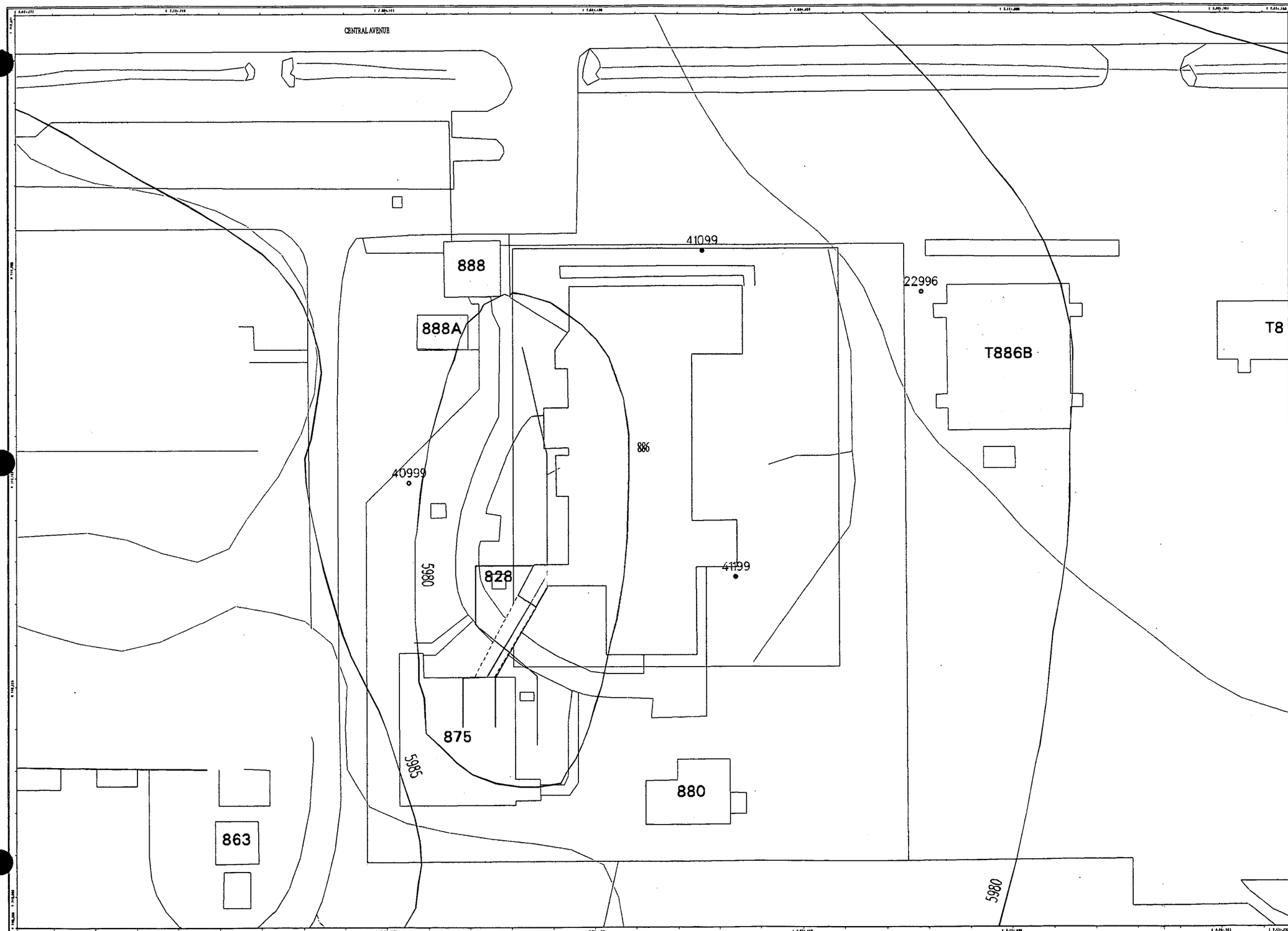

Figure 5-4

Building 886 Site Location With D&D Monitoring Wells

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

IMP Well Type

- Water Quality Flow Monitoring
- Industrial Area Flow Monitoring
- Background Flow Monitoring
- D&D Monitoring
- Non-IMP

5-Foot Water Level Contours Second Quarter 1999

- 20-Foot Water Level Contour
- Dashed where inferred
- 5-Foot Intermediate Contour
- Dashed where inferred

Industrial Area Operable Units

- Pertinent 888B IHSSs
- D&D Building Cluster

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

Rocky Flats Cleanup Project
Central Zone
Golden, Colorado

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

DynCorp
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KAISER-HILL COMPANY

Server:/projects/fy2k/rfca-rpt/figures/dd figs/bldg 886-m1.aml

Original map units are phase-red. Logo are colors have changes.

113

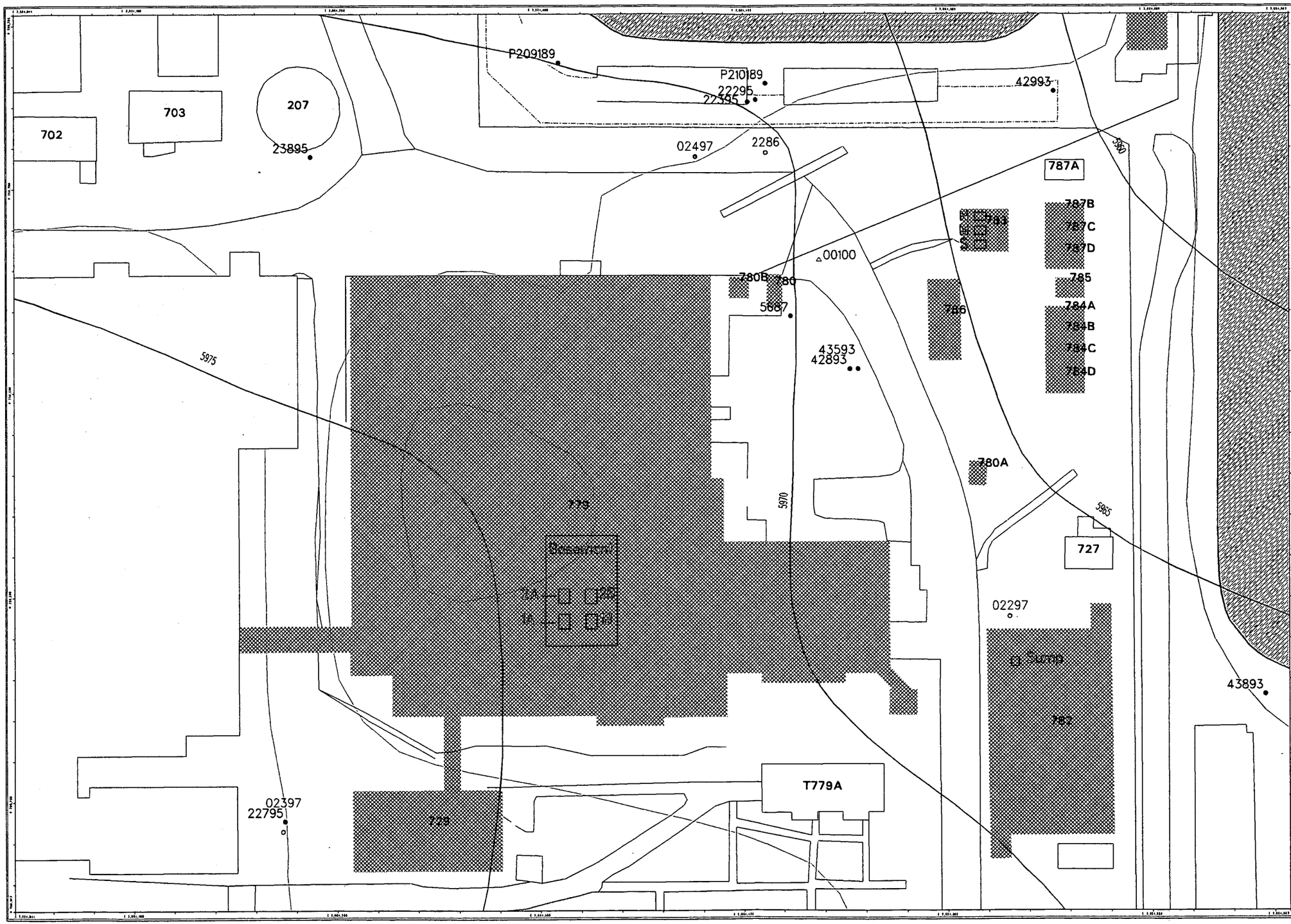

Figure 5-5
Building 779 Location Map with D&D Monitoring Wells

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

IMP Well Type

- Water Quality Flow Monitoring
- Industrial Area Flow Monitoring
- Background Flow Monitoring
- D&D Monitoring
- Non-IMP
- New D&D Well Proposed for 2000

5-Foot Water Level Contours Second Quarter 1999

- 20-Foot Water Level Contour
- Dashed where inferred
- 5-Foot Intermediate Contour
- Dashed where inferred

Standard Map Features

- Basements
- Buildings and other structures
- Demolished Buildings
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

NOTE:
Building 779 sub-basement vaults located directly below basement.

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Scale = 1:570
1 inch represents approximately 48 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER-HILL COMPANY

MAP ID: rfca rpt/figures/dd_figs

November 20, 2000

Original map contents are preserved. Logo and date have changed.

NT_Svr w:/projects/fy2k/rfca-rpt/figures/dd_figs/bldg_779-nt.aml

114

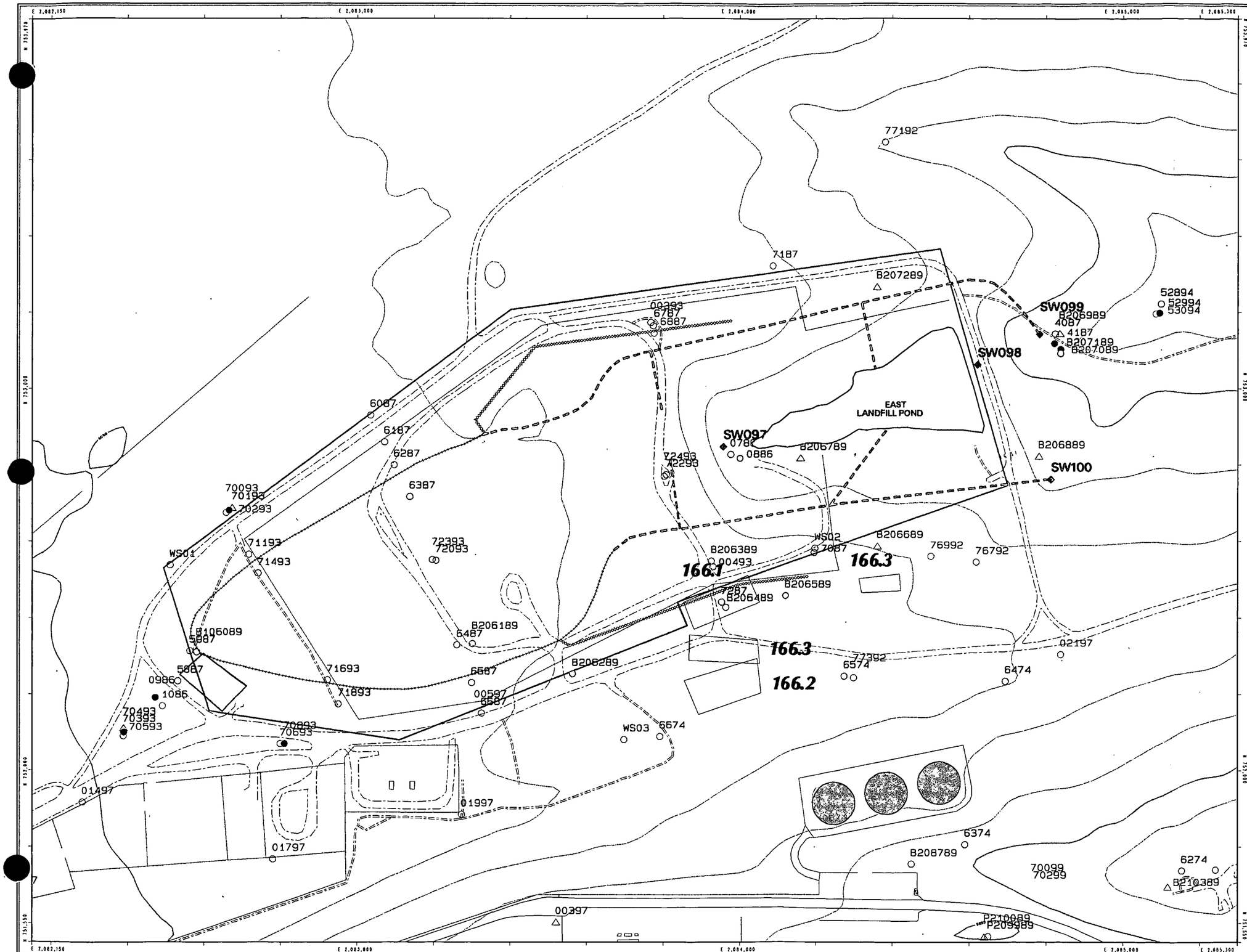

Figure 6-1

Groundwater Intercept and Diversion System Layout at the Present Sanitary Landfill

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- Groundwater Monitor Well UHSU Surficial Material
- Groundwater Monitor Well UHSU Bedrock
- Groundwater Monitor Well LHSU Bedrock
- Surface Water Monitoring Locations
- Landfill Groundwater Monitoring Wells
- All Other Existing Wells
- Abandoned Wells
- IHSS 166.1, 166.2 and 166.3
- Slurry Wall
- GW Intercept System - Perforated
- GW Intercept System - Non-Perforated
- Individual Hazardous Substance Site
- East Landfill Pond
- Tanks
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

Scale = 1 : 2930
1 inch represents approximately 244 feet

100 0 200 400ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER-HILL COMPANY

MAP ID: fy2k/rfca-rpt/box_landfill November 14, 2000

Original map contents are preserved. Logo and date have changed.

NT_Svr w:/projects/fy2k/rfca-rpt/figures/box_landfill/map-wqp/uhsu_well-loc.aml

138

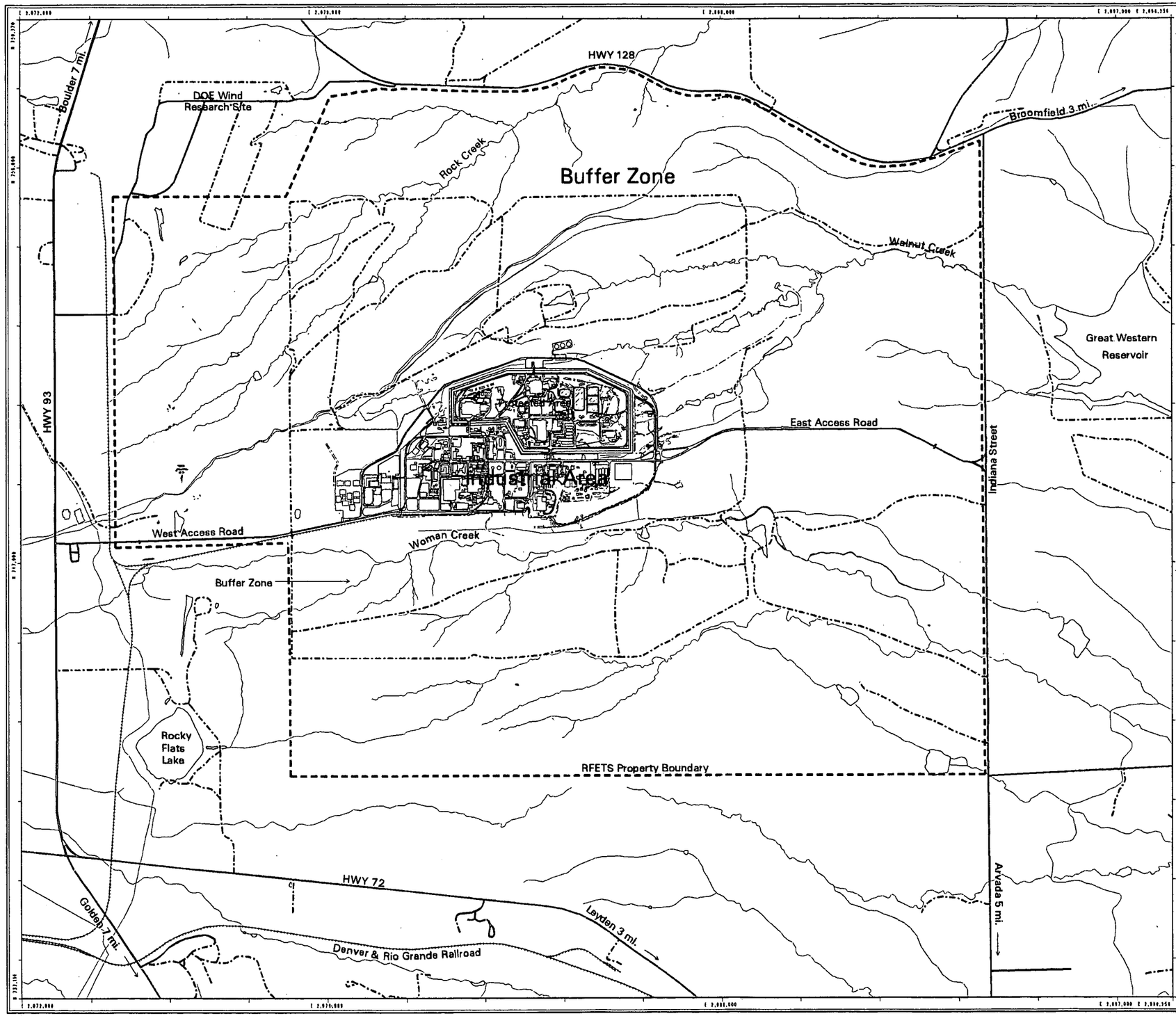

Figure 1-2

Rocky Flats Environmental Technology Site Map

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

Standard Map Features

- Buildings
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Heavy duty paved roads
- Medium duty paved roads
- Light duty paved roads
- Dirt roads
- Railroads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

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Scale = 1 : 28720
1 inch represents approximately 2393 feet

500 0 1000 2000 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: rfca-rpt

September 26, 2000

NT_Svr d:/projects/fy2k/rfca-rpt/figures/sitemap/sitemapb.aml

32

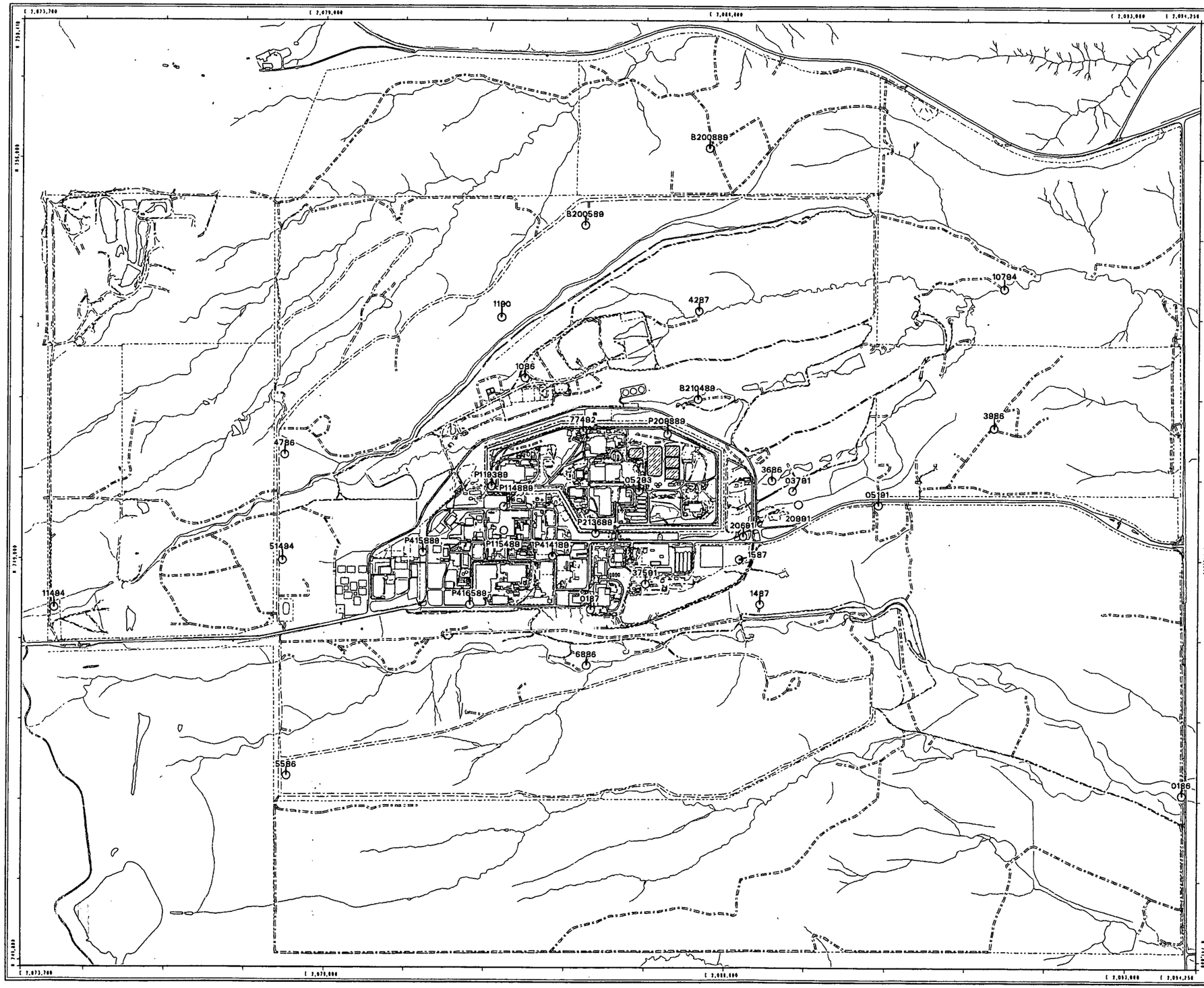

Figure 3-1
Real-Time Groundwater Monitoring Well Locations

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- Groundwater well with real time water level monitoring
- Groundwater well added to real time water level monitoring program during 1999

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Scale = 1 : 21330
1 inch represents approximately 1778 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER-HILL COMPANY

MAP ID: rfca-rpt/figures/real_time11-17 September 28, 2000

Original map contents are preserved. Logo and date have changed.

NT_Svr w:/projects/fy2k/rfca-rpt/figures/real_time11-17/wtr-level-nt.aml

78

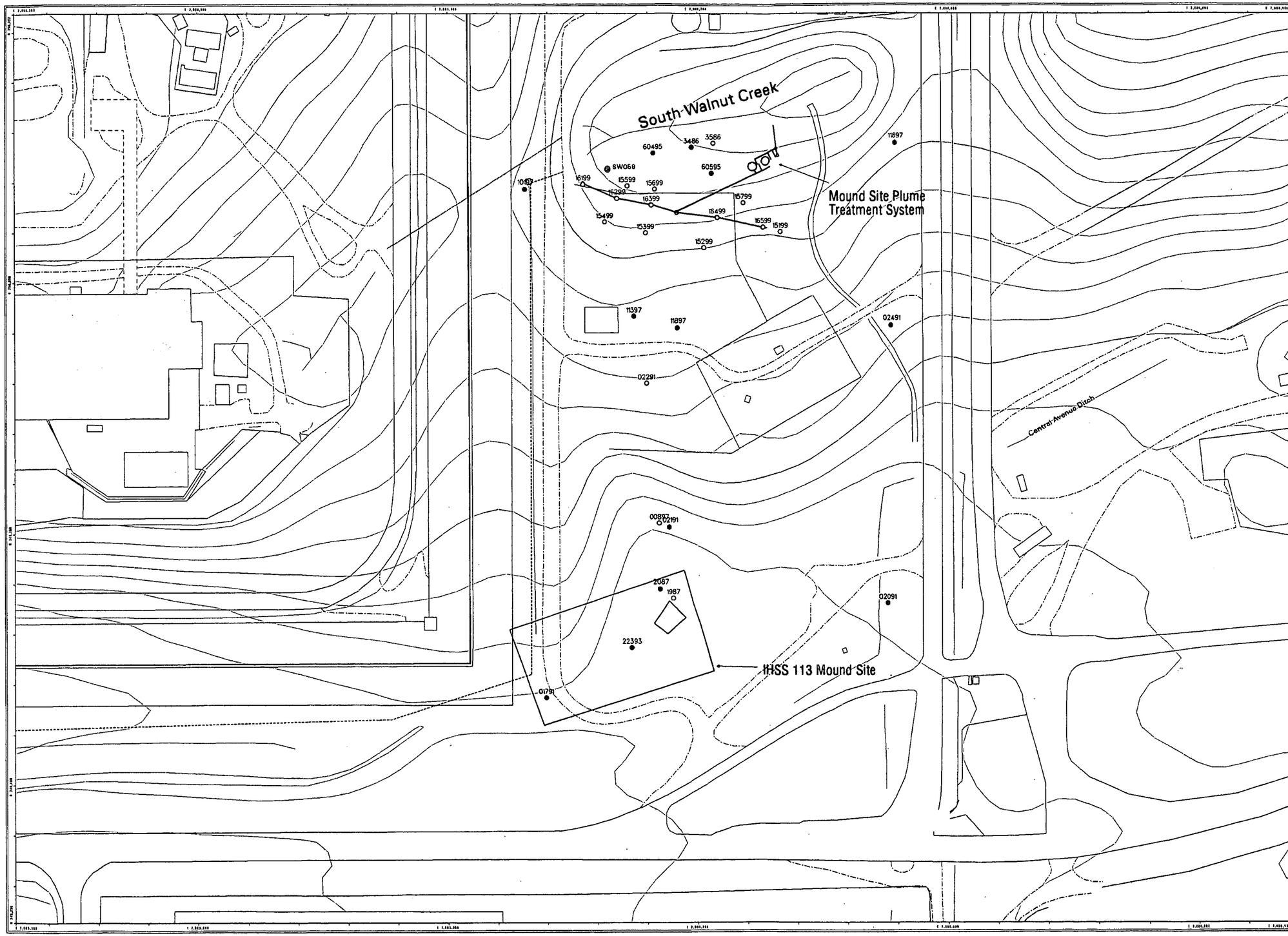

Figure 4-1
Mound Site Plume Area and Source Removal

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

IMP Well Type

- Water Quality Flow Monitoring
- Industrial Area Flow Monitoring
- Background Flow Monitoring
- D&D Monitoring
- Non-IMP
- Surface Water Monitoring Location
- Surveyed Location of Excavated area at the Mound Site Source Removal Area
- Selected IHSS Boundaries
- Approximate Location of Collection Trench
- Approximate Location of Piping and Treatment System
- Approximate Location of 72" Storm Sewer
- Large Diameter Culvert

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Rocky Flats boundary
- Paved roads
- Dirt roads

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Scale = 1 : 1400
1 inch represents approximately 117 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER-HILL COMPANY

MAP ID: RFOA-RPT

September 26, 2000

Original map contents are preserved. Logo and date have changed.

NT_Svr w:/projects/fy2k/rfca-rpt/figures/mound_site/moundsite.aml

95

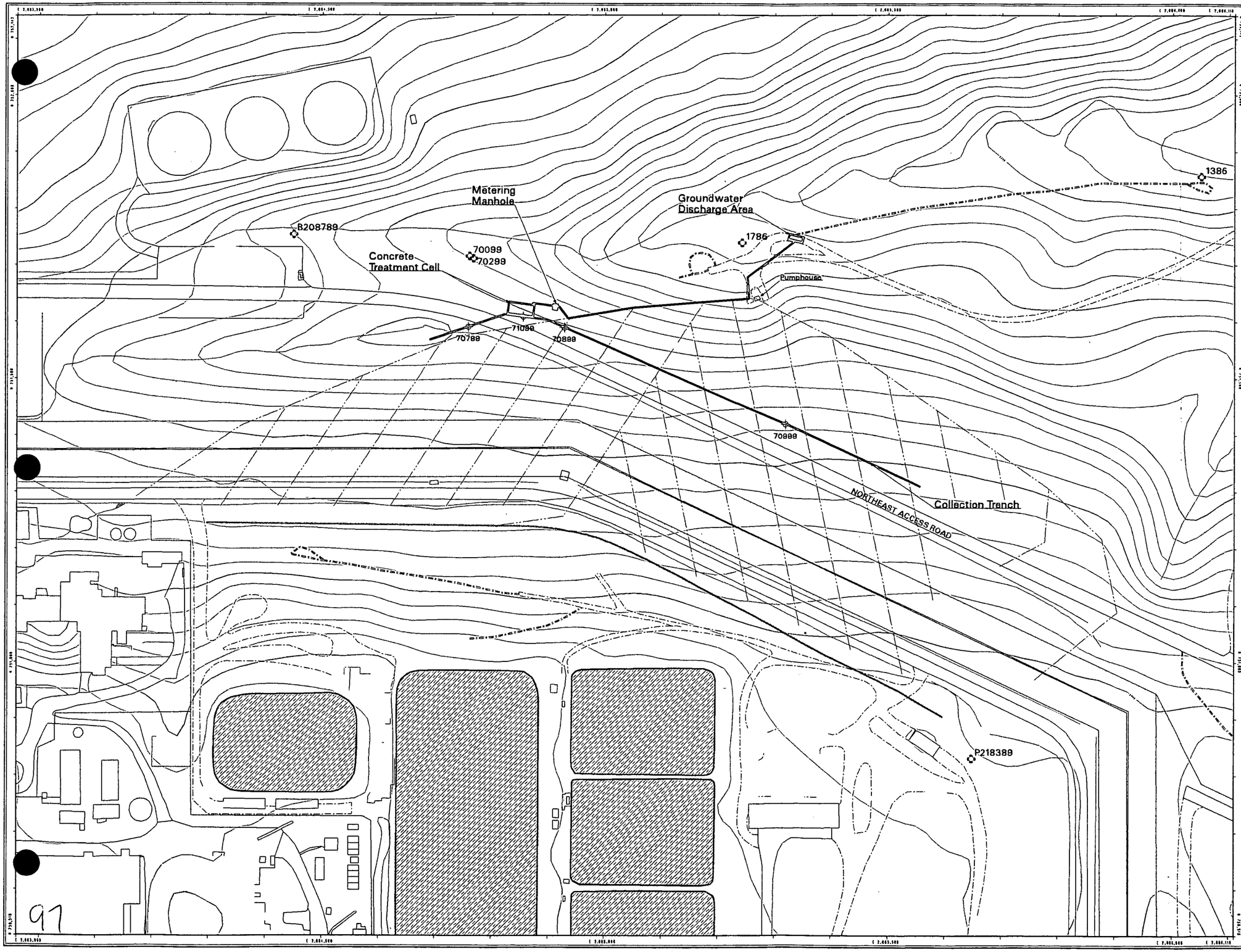

Figure 4-3

Solar Ponds Plume Treatment System Locations

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- Old ITS
- New ITS (Installed 1999)
- In Trench Piezometer Location
- Monitoring Well

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

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Scale = 1 : 1970
1 inch represents approximately 164 feet

50 0 100 200ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: rfoa-rpt/figures/solar_pond_plume/solar_pond.aml November 14, 2000

NT_Svr w:/projects/fy2k/rfoa-rpt/figures/solar_pond_plume/solar_pond.aml

97

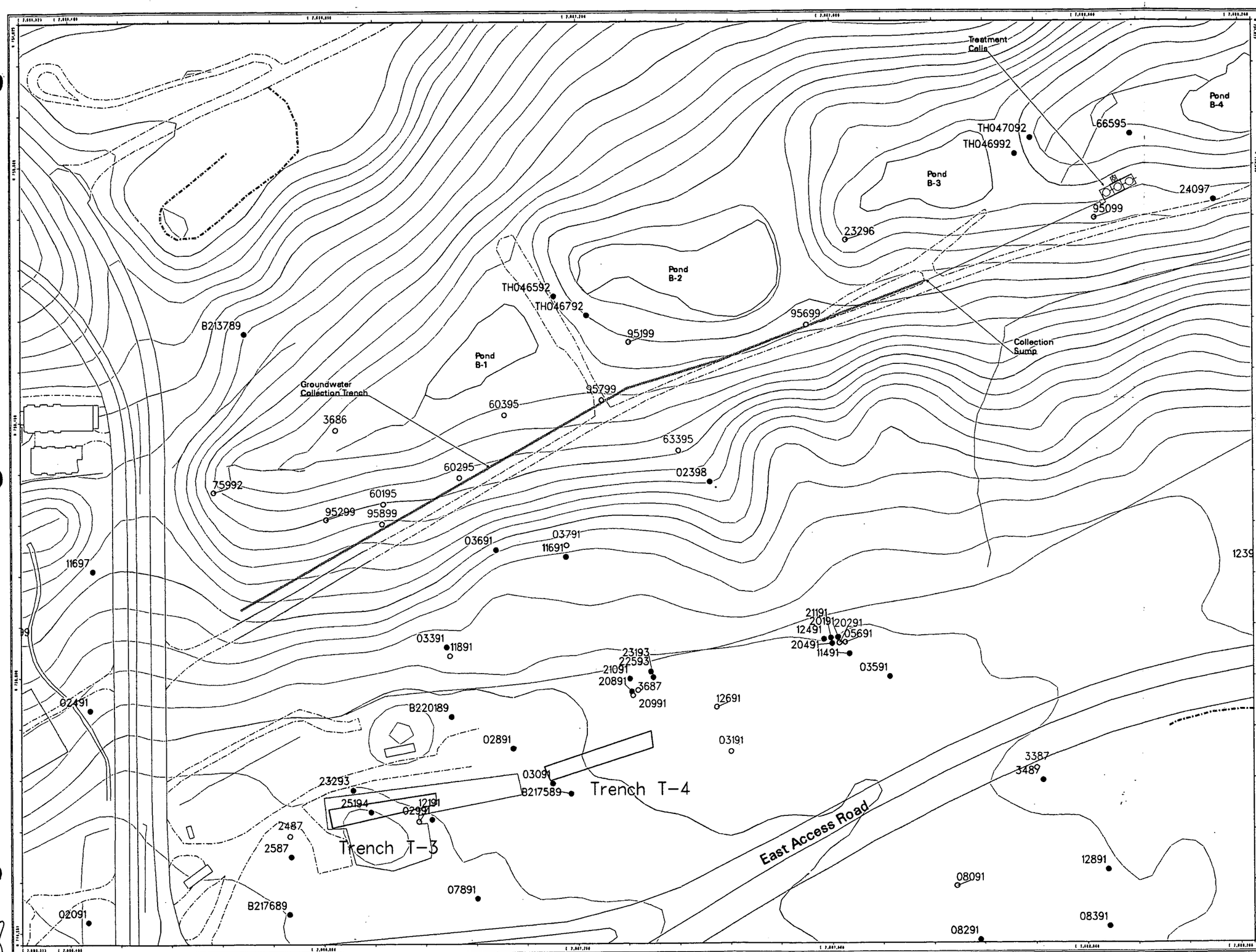

Figure 4-4

East Trenches Plume Treatment System Locations

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- WQ Flow Monitoring Well
- IA Flow Monitoring Well
- BKGD Flow Monitoring Well
- D&D Monitoring Well
- Non-IMP Monitoring Well
- Collection Trench
- Treatment Cells
- Surveyed Trench Excavation Boundary

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs. 1/95
Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~10 meter resolution. DEM post-processing performed by MK, Winter 1997.

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Scale = 1 : 1750
1 inch represents approximately 146 feet

25 0 50 100ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: rfca-rpt/figures/solar_pond plume/east trench.aml September 27, 2000

NT_Svr w:/projects/fy2k/rfca-rpt/figures/solar_pond_plume/east_trench.aml

98

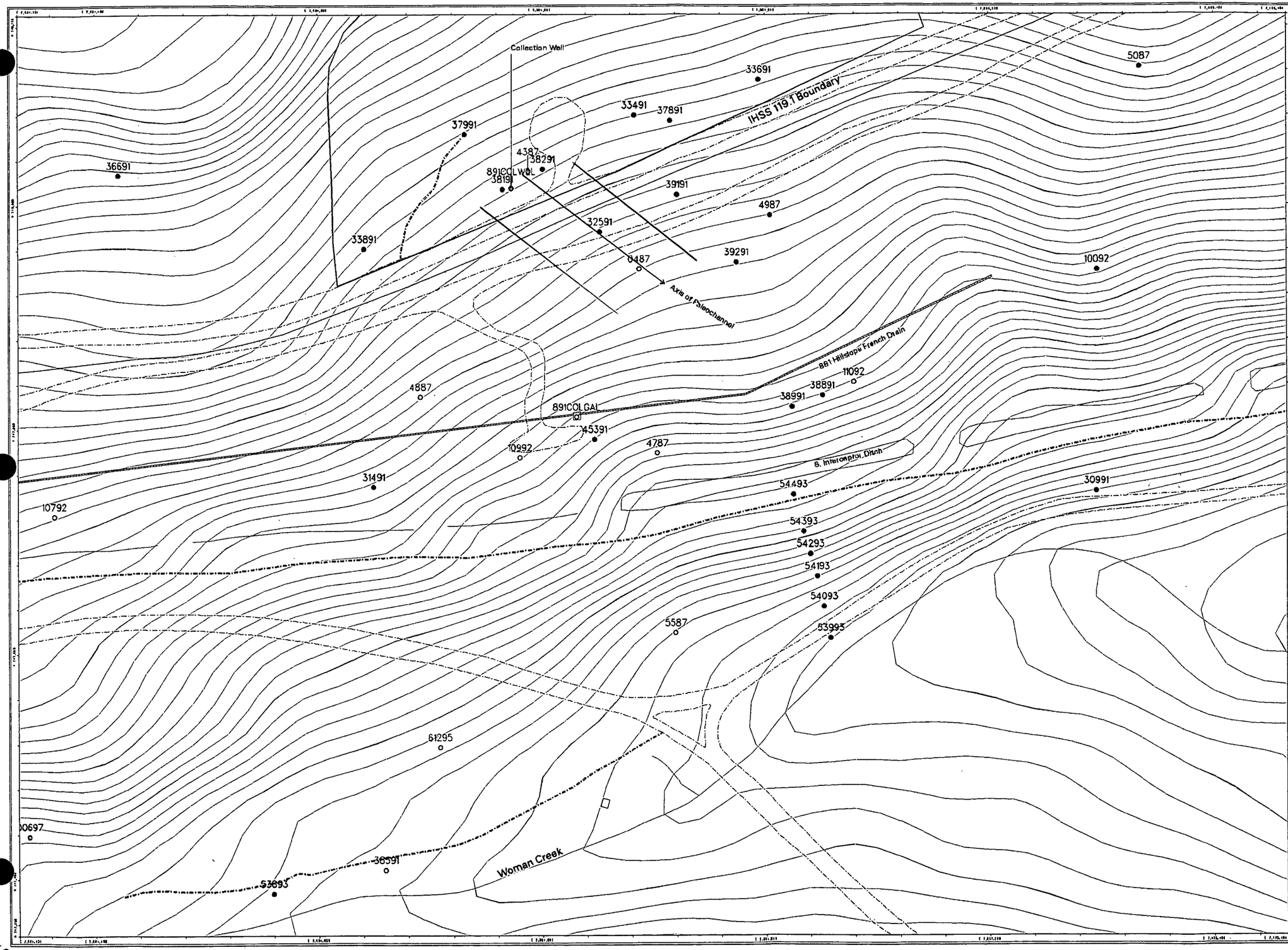

Figure 4-5

IHSS 119.1 Area

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- Water Quality Flow Monitoring Well
- Industrial Area Flow Monitoring Well
- Background Flow Monitoring Well
- D&D Monitoring Well
- Non-IMP Monitoring Well
- French Drain System
- IHSS 119.1 Boundary

Standard Map Features

- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (2-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, towers, hydrography, roads and other structures from 1994 aerial photo data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/20
Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ESRI Arc INFO and LAI IICL to process the DEM data to create 2-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV. 1994 digital Fusion at 10 meter resolution. DEM post processing performed by MK Weiss 1997.
Data Source:
Borehole and Monitoring Well data. Approved by Steve Singer (RMRS, 303-966-3361).

Individual Hazardous Substance Site (IHSR) data - Approved by Nick Demos (RMRS, 303 966 4606).

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Scale = 1:1020
inch represents 85 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: rfca-rpt/figures/ihss119-1 area/ihss119 2.aml

September 28, 2000

NT Svr w:/projects/fy2k/rfca-rpt/figures/ihss119-1 area/ihss119 2.aml

99

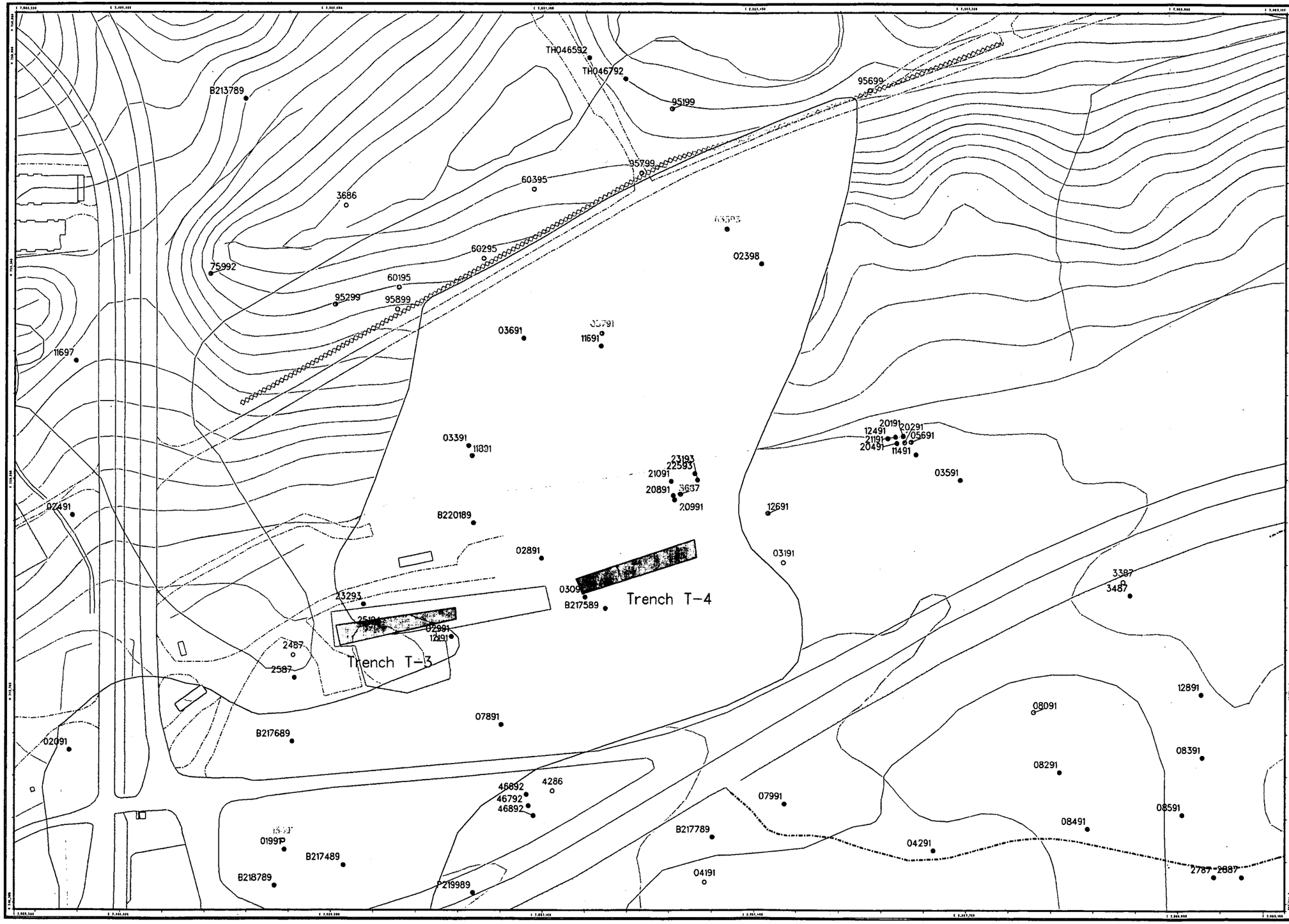

Figure 4-6

Trenches T-3/T-4 Source Removal

1999 Annual RFCA Groundwater Monitoring Report

IMP Well Type

- Water Quality Flow Monitoring
- Industrial Area Flow Monitoring
- Background Flow Monitoring
- D&D Monitoring
- Non-IMP
- Surface Water Sample Points
- Collection Trench
- Composite VOC Groundwater Plume (concentration equal to MCL)
- Composite VOC Groundwater Plume (concentration 100 times MCL)
- Surveyed T-3 & T-4 Excavation

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Rocky Flats boundary
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrographic, roads and other structures from 1994 aerial flyover data compiled by EG&G RSL, Las Vegas.
Digitized from the orthophotographs. 1/95
Spoils / Landfills were derived from digital elevation model (DEM) data by Morrison Knudsen (MK) using ZEM Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

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Scale = 1 : 1840
1 inch represents approximately 153 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

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Prepared for: KAISER-HILL COMPANY

MAP ID: RFCA-RPT

September 27, 2000

Original map contents are preserved. Logo and date have changed.

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100

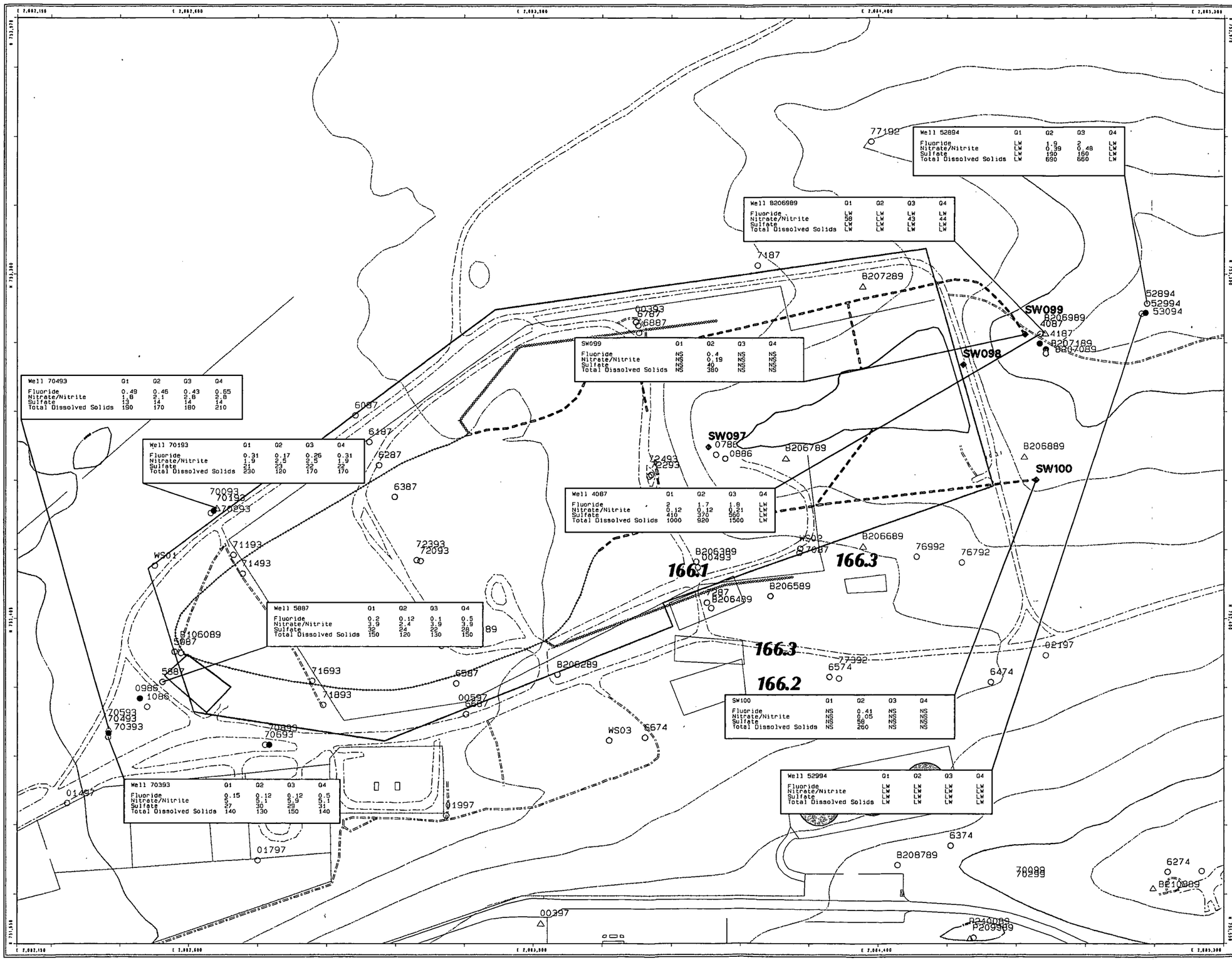


Figure 6-2

Water Quality Parameters (mg/L) at the Present Sanitary Landfill

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- Groundwater Monitor Well UHSU Surficial Material
- Groundwater Monitor Well UHSU Bedrock
- Groundwater Monitor Well LHSU Bedrock
- Surface Water Monitoring Locations
- Landfill Groundwater Monitoring Wells
- All Other Existing Wells
- Abandoned Wells
- IHSS 166.1, 166.2 and 166.3
- Slurry Wall
- GW Intercept System - Perforated
- GW Intercept System - Non-Perforated
- Individual Hazardous Substance Site
- East Landfill Pond
- Tanks
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

NOTE:
LW - Locked Water
NS - Not Sampled/Dry Conditions

Source of GIS data available upon request.

Scale = 1 : 2970
1 inch represents approximately 248 feet

60 0 100 200ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER-HILL COMPANY

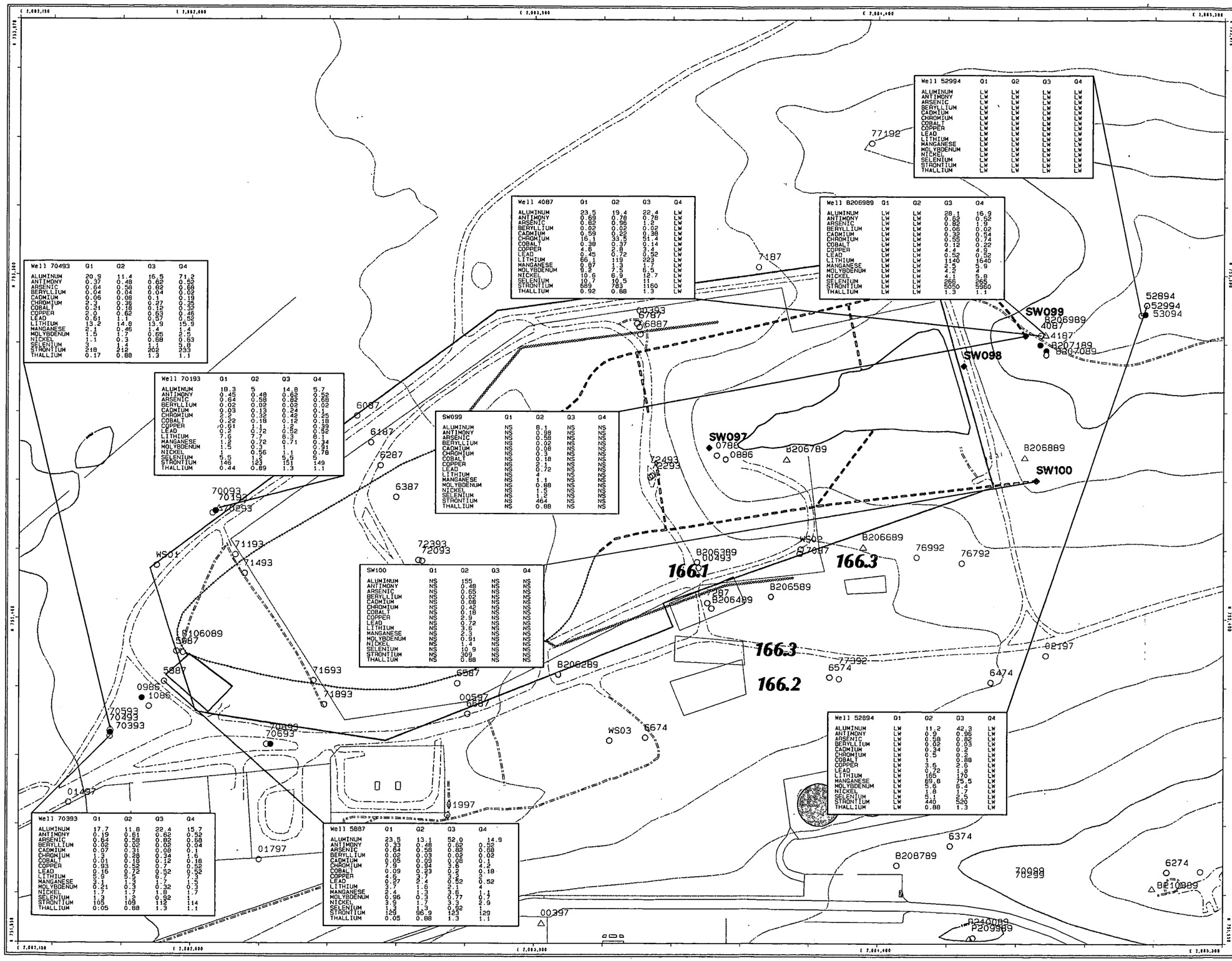
MAP ID: fy2kirfoa-rpt/box_landfill

November 14, 2000

Original map contents are preserved. Logo and date have changed.

NT_Svr w:/projects/fy2k/rfoa-rpt/figures/box_landfill/map-wqp/uhauwqp99.aml

139



Well 70493	Q1	Q2	Q3	Q4
ALUMINUM	20.9	11.4	15.5	71.2
ANTIMONY	0.37	0.48	0.62	0.52
ARSENIC	0.64	0.58	0.62	0.68
BERYLLIUM	0.04	0.04	0.04	0.02
CADMIUM	0.06	0.08	0.1	0.19
CHROMIUM	2.3	0.28	0.27	0.35
COBALT	0.21	0.18	0.12	0.32
COPPER	2.0	0.62	0.53	0.46
LEAD	0.61	1.1	0.57	0.52
LITHIUM	13.2	14.8	13.9	15.9
MANGANESE	2.1	0.46	1.4	1.4
MOLYBDENUM	1.5	1.7	0.65	2.5
NICKEL	1.1	0.3	0.68	0.63
SELENIUM	3	1.4	1.1	5.8
STRONTIUM	218	212	202	233
THALLIUM	0.17	0.88	1.3	1.1

Well 70193	Q1	Q2	Q3	Q4
ALUMINUM	18.3	5	14.8	5.7
ANTIMONY	0.45	0.48	0.62	0.52
ARSENIC	0.64	0.58	0.62	0.68
BERYLLIUM	0.02	0.02	0.02	0.02
CADMIUM	0.03	0.13	0.24	0.1
CHROMIUM	2.2	0.32	0.42	0.25
COBALT	0.22	0.18	0.12	0.18
COPPER	0.61	1.1	1.6	0.33
LEAD	0.2	0.72	0.52	0.52
LITHIUM	7.6	7.7	8.3	8.1
MANGANESE	1.2	0.72	0.71	0.34
MOLYBDENUM	1.5	0.3	1	0.91
NICKEL	1	0.56	1.1	0.78
SELENIUM	5.5	1.2	5.9	5
STRONTIUM	146	123	151	149
THALLIUM	0.44	0.89	1.3	1.1

SW099	Q1	Q2	Q3	Q4
ALUMINUM	NS	8.1	NS	NS
ANTIMONY	NS	0.88	NS	NS
ARSENIC	NS	0.58	NS	NS
BERYLLIUM	NS	0.02	NS	NS
CADMIUM	NS	0.08	NS	NS
CHROMIUM	NS	0.3	NS	NS
COBALT	NS	0.18	NS	NS
COPPER	NS	2.1	NS	NS
LEAD	NS	0.72	NS	NS
LITHIUM	NS	4	NS	NS
MANGANESE	NS	1.1	NS	NS
MOLYBDENUM	NS	0.88	NS	NS
NICKEL	NS	1.5	NS	NS
SELENIUM	NS	1.2	NS	NS
STRONTIUM	NS	464	NS	NS
THALLIUM	NS	0.88	NS	NS

SW100	Q1	Q2	Q3	Q4
ALUMINUM	NS	155	NS	NS
ANTIMONY	NS	0.48	NS	NS
ARSENIC	NS	0.65	NS	NS
BERYLLIUM	NS	0.02	NS	NS
CADMIUM	NS	0.08	NS	NS
CHROMIUM	NS	0.42	NS	NS
COBALT	NS	0.18	NS	NS
COPPER	NS	2.9	NS	NS
LEAD	NS	0.72	NS	NS
LITHIUM	NS	3.6	NS	NS
MANGANESE	NS	2.3	NS	NS
MOLYBDENUM	NS	0.91	NS	NS
NICKEL	NS	1.4	NS	NS
SELENIUM	NS	10.9	NS	NS
STRONTIUM	NS	309	NS	NS
THALLIUM	NS	0.88	NS	NS

Well 70393	Q1	Q2	Q3	Q4
ALUMINUM	17.7	11.8	22.4	15.7
ANTIMONY	0.19	0.61	0.62	0.52
ARSENIC	0.64	0.58	0.62	0.68
BERYLLIUM	0.02	0.02	0.02	0.04
CADMIUM	0.07	0.31	0.08	0.1
CHROMIUM	1.3	0.28	0.34	1.6
COBALT	0.01	0.18	0.12	0.18
COPPER	0.93	0.52	0.7	0.52
LEAD	0.16	0.72	0.52	0.52
LITHIUM	5.9	5.5	6.7	7.3
MANGANESE	3.1	1.3	1.7	1.5
MOLYBDENUM	0.21	0.3	0.32	0.3
NICKEL	1.7	1.7	1.8	1.7
SELENIUM	1.3	1.2	0.92	1
STRONTIUM	105	109	112	114
THALLIUM	0.05	0.88	1.3	1.1

Well 5887	Q1	Q2	Q3	Q4
ALUMINUM	23.5	13.1	52.0	14.9
ANTIMONY	0.33	0.48	0.62	0.52
ARSENIC	0.64	0.58	0.82	0.68
BERYLLIUM	0.02	0.03	0.02	0.02
CADMIUM	0.05	0.03	0.08	0.1
CHROMIUM	7.9	0.94	3.6	4.2
COBALT	0.09	0.23	0.2	0.18
COPPER	4.6	3.7	3.2	3
LEAD	0.57	2.4	0.62	0.52
LITHIUM	3.7	1.6	2.1	4
MANGANESE	2.4	1.3	3.6	1.1
MOLYBDENUM	0.96	0.3	0.77	0.7
NICKEL	3.9	1.7	3.3	2.9
SELENIUM	1.3	1.3	0.92	1
STRONTIUM	129	96.9	123	129
THALLIUM	0.05	0.88	1.3	1.1

Well 4087	Q1	Q2	Q3	Q4
ALUMINUM	23.5	19.4	22.4	LW
ANTIMONY	0.69	0.78	0.78	LW
ARSENIC	0.82	0.96	1.2	LW
BERYLLIUM	0.02	0.02	0.02	LW
CADMIUM	0.59	0.22	0.38	LW
CHROMIUM	16.1	33.5	51.4	LW
COBALT	0.38	0.37	0.14	LW
COPPER	4.6	2.8	3.4	LW
LEAD	0.45	0.72	0.52	LW
LITHIUM	66.1	119	223	LW
MANGANESE	0.87	1.3	1.7	LW
MOLYBDENUM	9.9	7.5	6.5	LW
NICKEL	10.6	6.9	12.7	LW
SELENIUM	10.7	10.5	11	LW
STRONTIUM	689	783	1160	LW
THALLIUM	0.92	0.88	1.3	LW

Well 52994	Q1	Q2	Q3	Q4
ALUMINUM	LW	LW	LW	LW
ANTIMONY	LW	LW	LW	LW
ARSENIC	LW	LW	LW	LW
BERYLLIUM	LW	LW	LW	LW
CADMIUM	LW	LW	LW	LW
CHROMIUM	LW	LW	LW	LW
COBALT	LW	LW	LW	LW
COPPER	LW	LW	LW	LW
LEAD	LW	LW	LW	LW
LITHIUM	LW	LW	LW	LW
MANGANESE	LW	LW	LW	LW
MOLYBDENUM	LW	LW	LW	LW
NICKEL	LW	LW	LW	LW
SELENIUM	LW	LW	LW	LW
STRONTIUM	LW	LW	LW	LW
THALLIUM	LW	LW	LW	LW

Well B206989	Q1	Q2	Q3	Q4
ALUMINUM	LW	LW	28.1	16.9
ANTIMONY	LW	LW	0.62	0.52
ARSENIC	LW	LW	0.82	1.9
BERYLLIUM	LW	LW	0.06	0.02
CADMIUM	LW	LW	0.38	0.54
CHROMIUM	LW	LW	0.55	0.74
COBALT	LW	LW	0.12	0.22
COPPER	LW	LW	4.4	4.9
LEAD	LW	LW	0.52	0.52
LITHIUM	LW	LW	1140	1640
MANGANESE	LW	LW	2.5	5.9
MOLYBDENUM	LW	LW	4.2	4
NICKEL	LW	LW	4.1	5.8
SELENIUM	LW	LW	266	265
STRONTIUM	LW	LW	5050	5960
THALLIUM	LW	LW	1.3	1.1

Well 52894	Q1	Q2	Q3	Q4
ALUMINUM	LW	11.2	42.3	LW
ANTIMONY	LW	0.9	0.86	LW
ARSENIC	LW	0.58	0.82	LW
BERYLLIUM	LW	0.02	0.03	LW
CADMIUM	LW	0.34	0.2	LW
CHROMIUM	LW	0.5	0.3	LW
COBALT	LW	1	0.88	LW
COPPER	LW	3.6	2.6	LW
LEAD	LW	0.72	1.8	LW
LITHIUM	LW	165	170	LW
MANGANESE	LW	69.8	75.5	LW
MOLYBDENUM	LW	5.6	6.4	LW
NICKEL	LW	1.6	1.7	LW
SELENIUM	LW	5.1	2.5	LW
STRONTIUM	LW	440	520	LW
THALLIUM	LW	0.88	1.3	LW

Figure 6-3

Selected Metals (ug/L) at the Present Sanitary Landfill 1999

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- Groundwater Monitor Well UHSU Surficial Material
- Groundwater Monitor Well UHSU Bedrock
- Groundwater Monitor Well LHSU Bedrock
- Surface Water Monitoring Locations
- Landfill Groundwater Monitoring Wells
- All Other Existing Wells
- Abandoned Wells
- IHSS 166.1, 166.2 and 166.3
- Slurry Wall
- GW Intercept System - Perforated
- GW Intercept System - Non-Perforated
- Individual Hazardous Substance Site
- East Landfill Pond
- Tanks
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

NOTE:
BDL - Below Detection Limit
LW - Locked Water
NS - Not Sampled/Dry Conditions

Source of GIS data available upon request.

Scale = 1 : 2970
1 inch represents approximately 248 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER+HILL COMPANY

MAP ID: fy2kfloa-rpt/box_landfill

November 14, 2000

Original map contents are preserved. Logo and date have changed.

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140

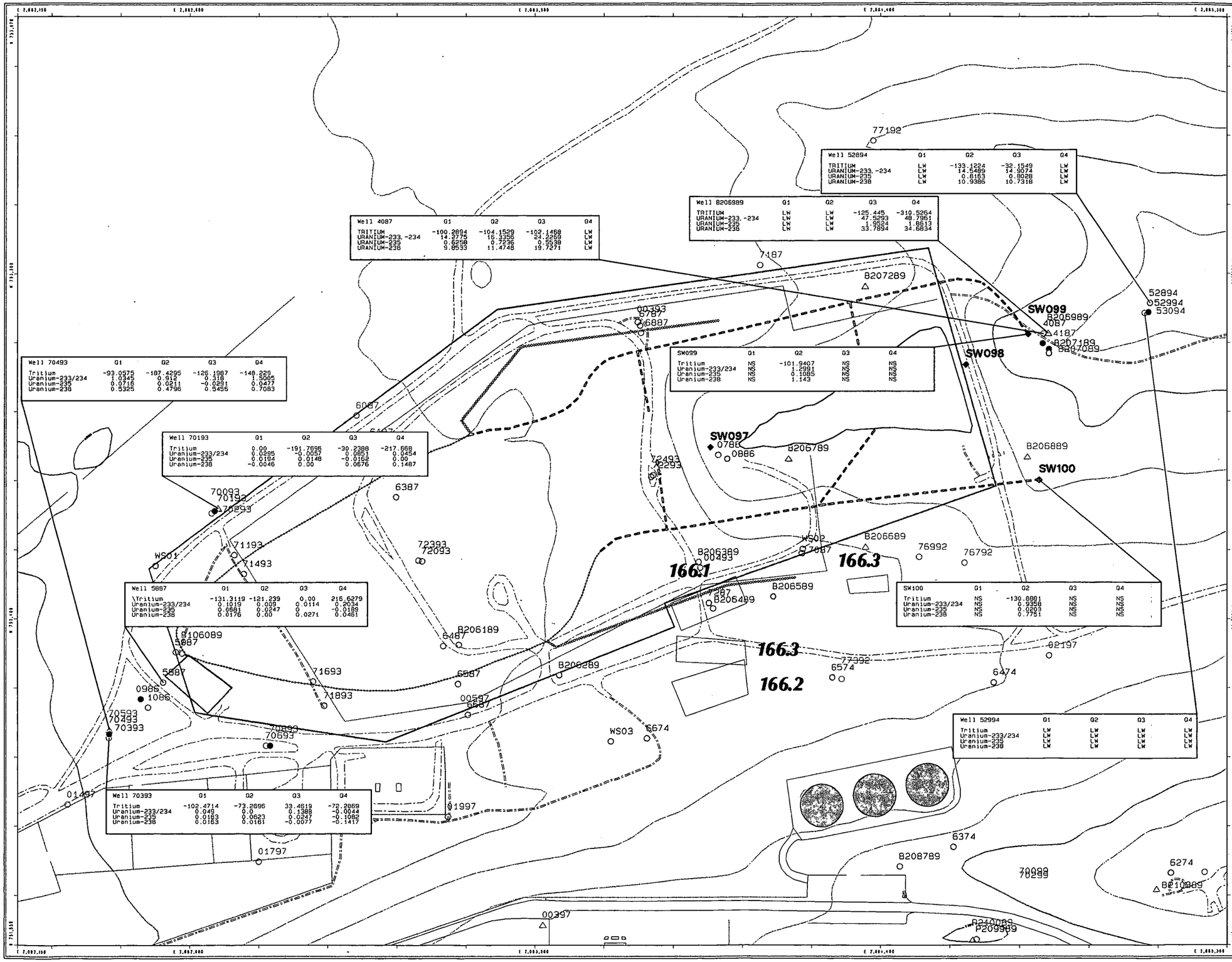

Figure 6-4

Tritium & Dissolved Uranium (pCi/L) at the Present Sanitary Landfill

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- Groundwater Monitor Well UHSU Surficial Material
- Groundwater Monitor Well UHSU Bedrock
- Groundwater Monitor Well LHSU Bedrock
- Surface Water Monitoring Locations
- Landfill Groundwater Monitoring Wells
- All Other Existing Wells
- Abandoned Wells
- IHSS 166.1, 166.2 and 166.3
- Slurry Wall
- GW Intercept System - Perforated
- GW Intercept System - Non-Perforated
- Individual Hazardous Substance Site
- East Landfill Pond
- Tanks
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

NOTE:
LW - Locked Water
NS - Not Sampled/Dry Conditions

Source of GIS data available upon request.

Scale = 1 : 2970
1 inch represents approximately 248 feet

50 0 100 200ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: fy2k/rfca-rpt/box_landfill

November 14, 2000

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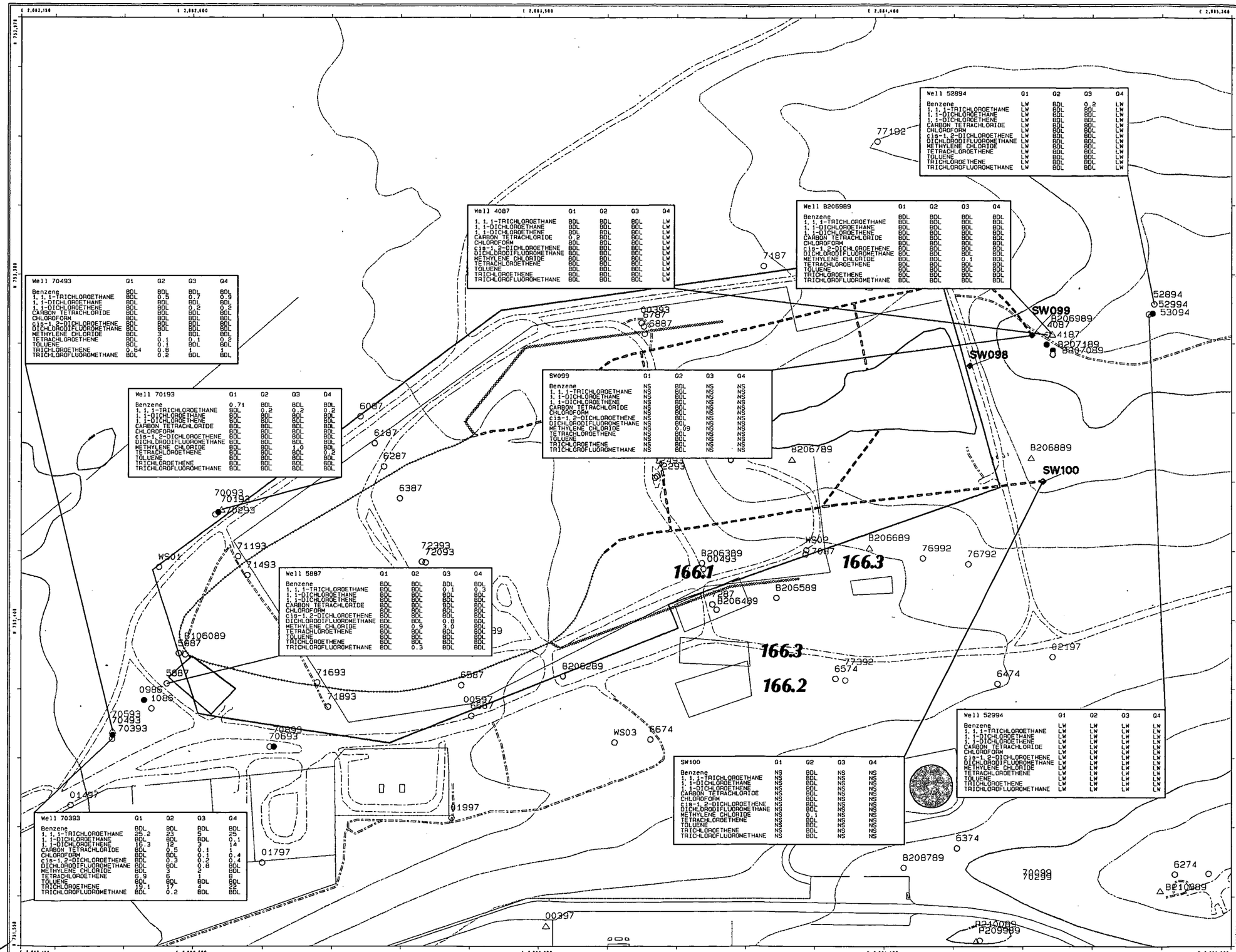

Figure 6-5

Detected Volatile Organic Compounds (ug/L) at the Present Sanitary Landfill

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- Groundwater Monitor Well UHSU Surficial Material
- Groundwater Monitor Well UHSU Bedrock
- Groundwater Monitor Well LHSU Bedrock
- Surface Water Monitoring Locations
- Landfill Groundwater Monitoring Wells
- All Other Existing Wells
- Abandoned Wells
- IHSS 166.1, 166.2 and 166.3
- Slurry Wall
- GW Intercept System - Perforated
- GW Intercept System - Non-Perforated
- Individual Hazardous Substance Site
- East Landfill Pond
- Tanks
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

NOTE:
BDL - Below Detection Limit
LW - Locked Water
NS - Not Sampled/Dry Conditions

Source of GIS data available upon request.

Scale = 1 : 2870
1 inch represents approximately 248 feet

50 0 100 200ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

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MAP ID: fy2k/rfca-rpt/box_landfill

November 14, 2000

Original map contents are preserved. Logo and date have changed.

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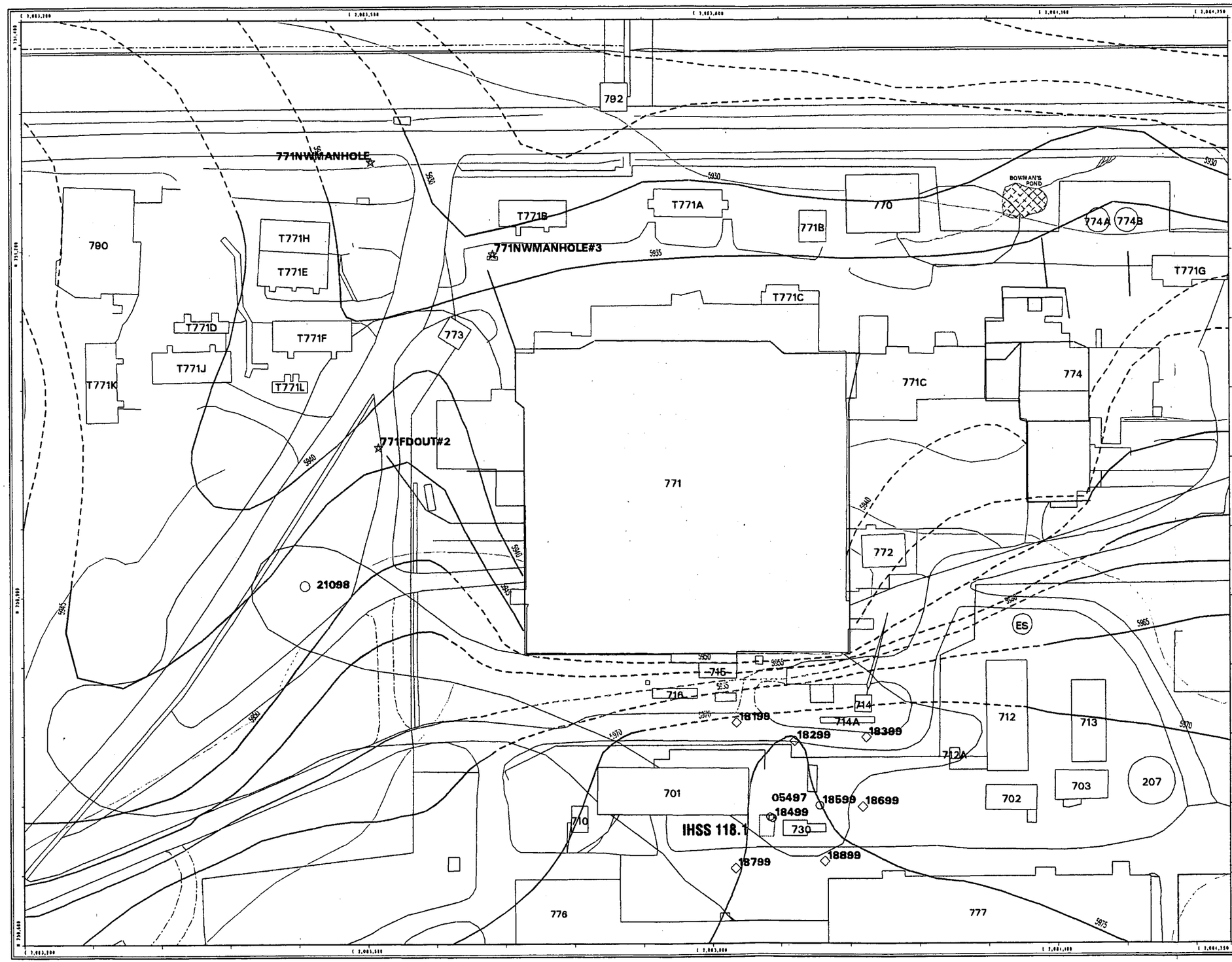

Figure 7-1
Location Map
IHSS 118.1 Wells

1999 Annual RFCA Groundwater Monitoring Report

IHSS 118.1 Wells

- Alluvial Wells
- Alluvial/Bedrock Wells
- Surface Water Monitoring Locations
- Location of IHSS 118.1

VOC Groundwater Plumes

- Carbon Tetrachloride concentration equal to or greater than 5 ug/L
- Carbon Tetrachloride concentration equal to or greater than 500 ug/L

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

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Scale = 1 : 1030
1 inch represents approximately 85 feet

25 0 50 100 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: rfca-rpt

November 14, 2000

Original map contents are preserved. Logo and date have changed.

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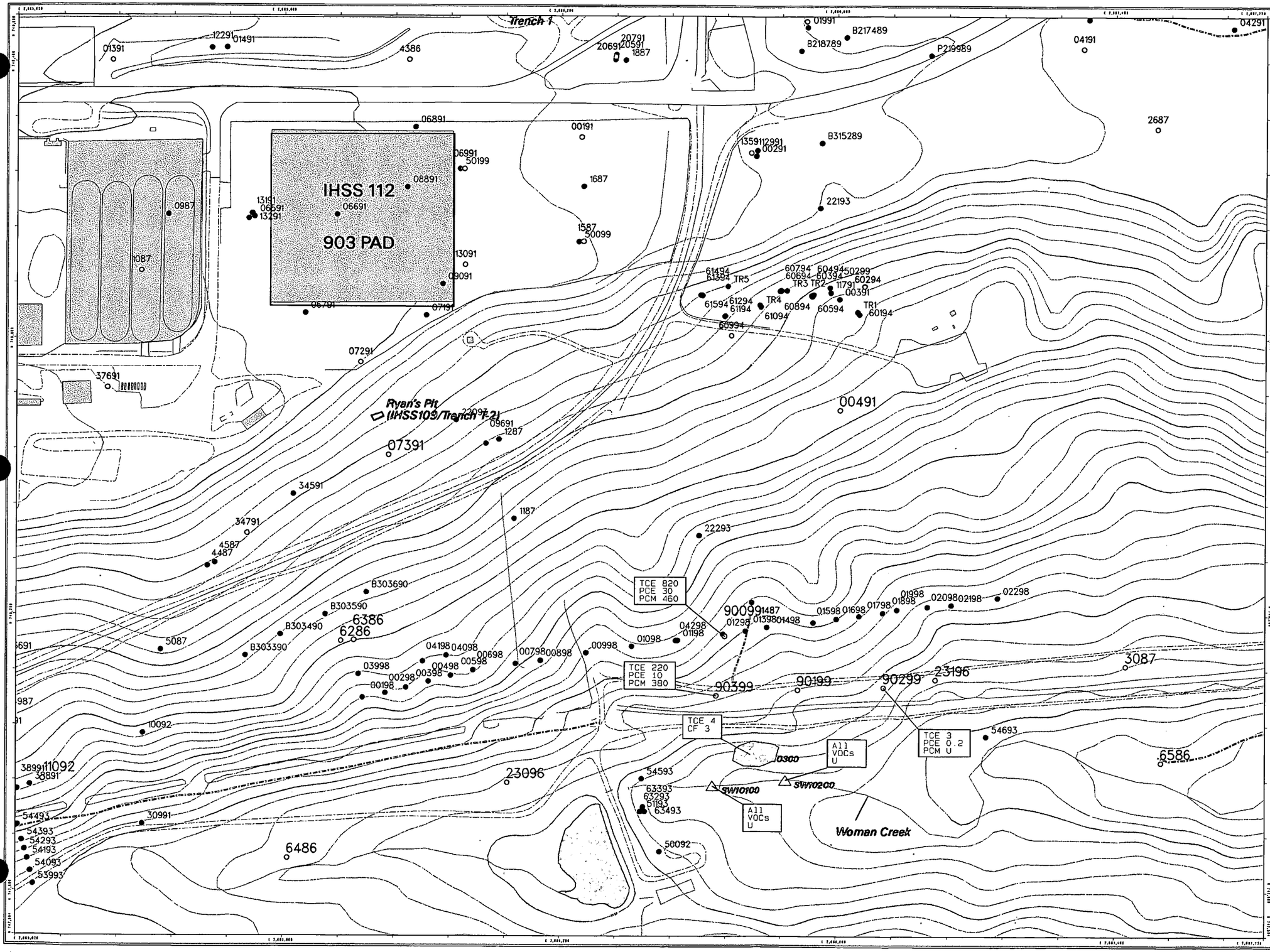

Figure 7-6
903 Pad/Ryan's Pit Area Location Map

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

IMP Well Type

- Water Quality Flow Monitoring
- Industrial Area Flow Monitoring
- Background Flow Monitoring
- D&D Monitoring
- Non-IMP
- Surface Water Sampling Locations
- Seeps

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

NOTE:
Notes:

Temporary Wells 00198-00898, 01098,01598 01898,02098-02298 and 03898-04198 are DRY.

Permanent Well 80199 is DRY

Well 00998 not sampled because of insufficient water

PCM = Carbon Tetrachloride
CF = Chloroform

All concentrations in ug/l

Scale = 1 : 2470
1 inch represents approximately 206 feet

50 0 100 200 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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MAP ID: rfoa-rpt/figures/903pad_ryan_pit

November 16, 2000

Original map contents are preserved. Logo and date have changed.

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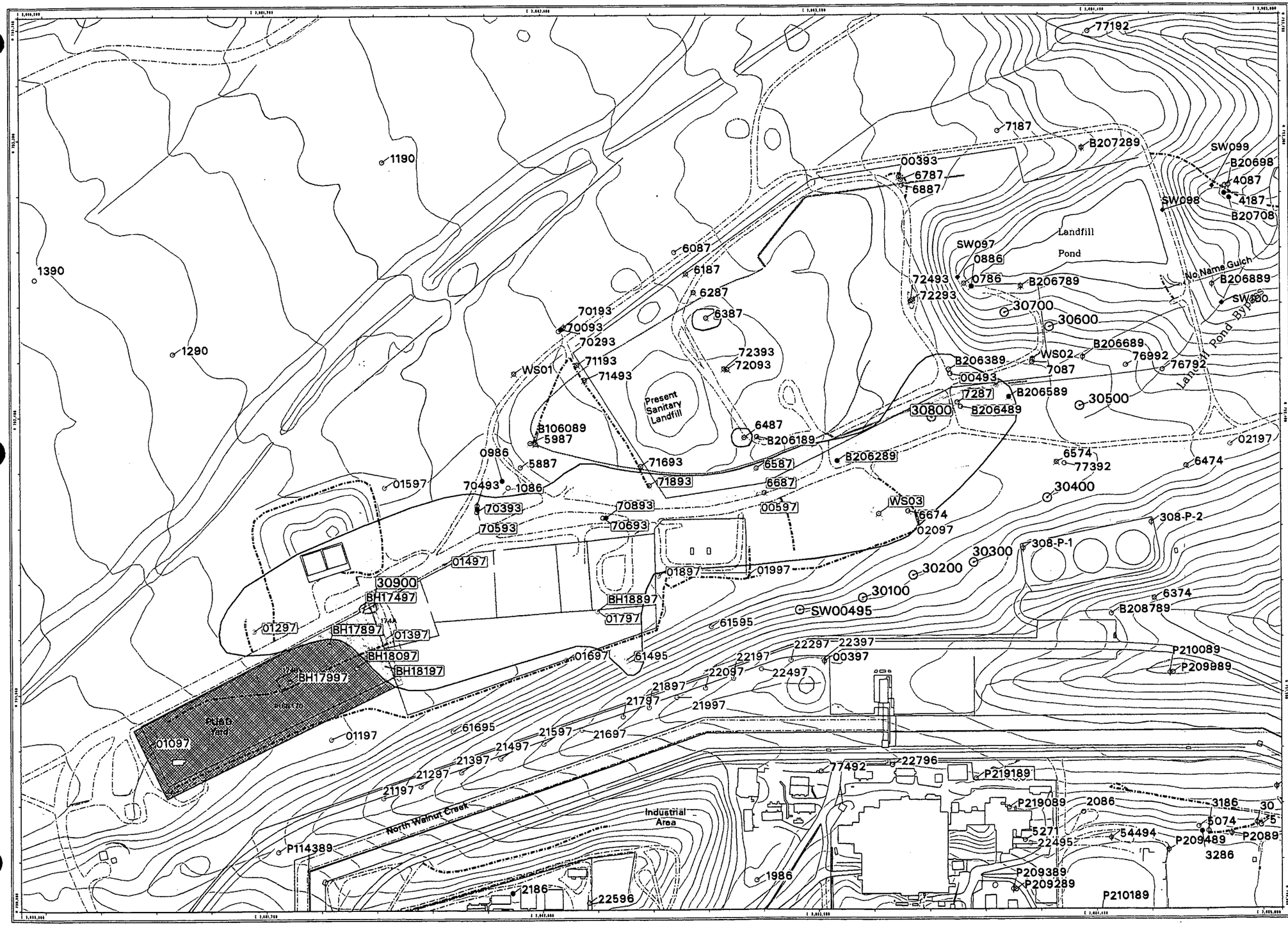

Figure 7-9
PU&D Yard Groundwater VOC Plume Location of Proposed Monitoring Wells

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- PU&D Yard Monitoring Well
- Groundwater Monitor Well UHSU Surficial Material
- Groundwater Monitor Well UHSU Bedrock
- Groundwater Monitor Well LHSU Bedrock
- Borehole Locations
- Surface Water Monitoring Locations
- Abandoned Monitor Well
- Proposed and Temporary PU&D Yard VOC Plume Monitoring Wells
- Groundwater Intercept System
- Landfill Slurry wall
- PU&D Yard IHSS

VOC Composite Plume

- Composite VOC Groundwater Plume (concentration equal to MCL)
- Composite VOC Groundwater Plume (100 X MCL)

Standard Map Features

- Buildings and other structures
- Landfill Pond
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

NOTE:
Source of GIS data available upon request.

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Scale = 1:3760
1 inch represents approximately 313 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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MAP ID: 2K-0201

September 26, 2000

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169

182

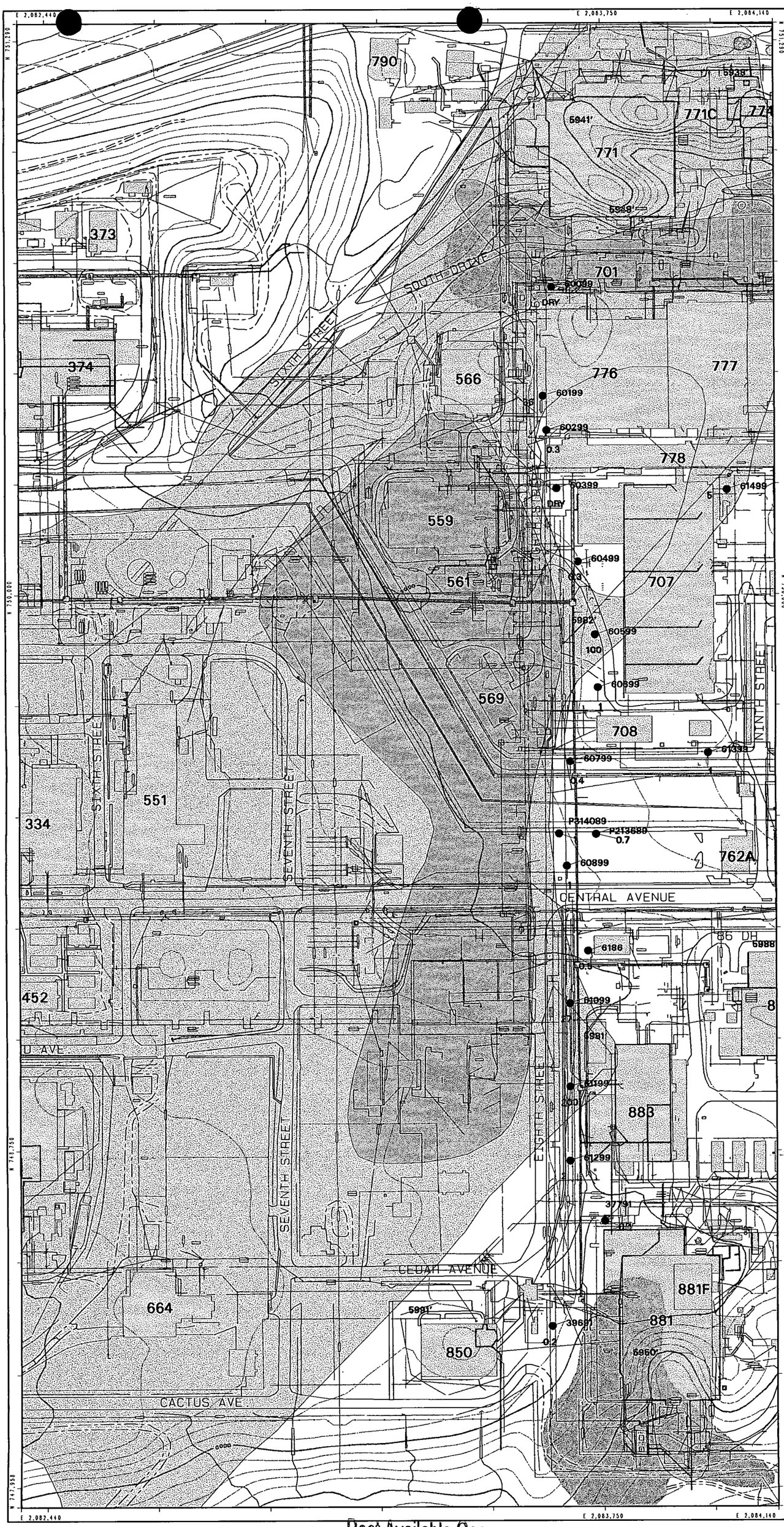

Figure 8-1

Monitoring Well Locations

East Industial Area VOC Plume

1999 Annual RFCA

Groundwater Monitoring Report

EXPLANATION

- Groundwater Monitoring Well (The red numbers indicate the 1999 Tetrachloroethene values.)
- Foundation Drain
- Composite VOC Groundwater Plume (concentration equal to MCL)
- Composite VOC Groundwater Plume (100 X MCL)
- Approximate extent of Unsaturated Area
- Utility Lines– Process Waste, Sanitary Sewer, Electrical (above/below ground), Domestic Water (above/below ground), Steam (above/below ground), and Abandoned

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95 Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

Prepared By:
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Golden, CO 80402-0464

Scale = 1 : 1804
1 inch represents approximately 150 feet

50 0 100ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy

Rocky Flats Environmental Technology Site

MAP ID: dcs-rp09

November 17, 2000

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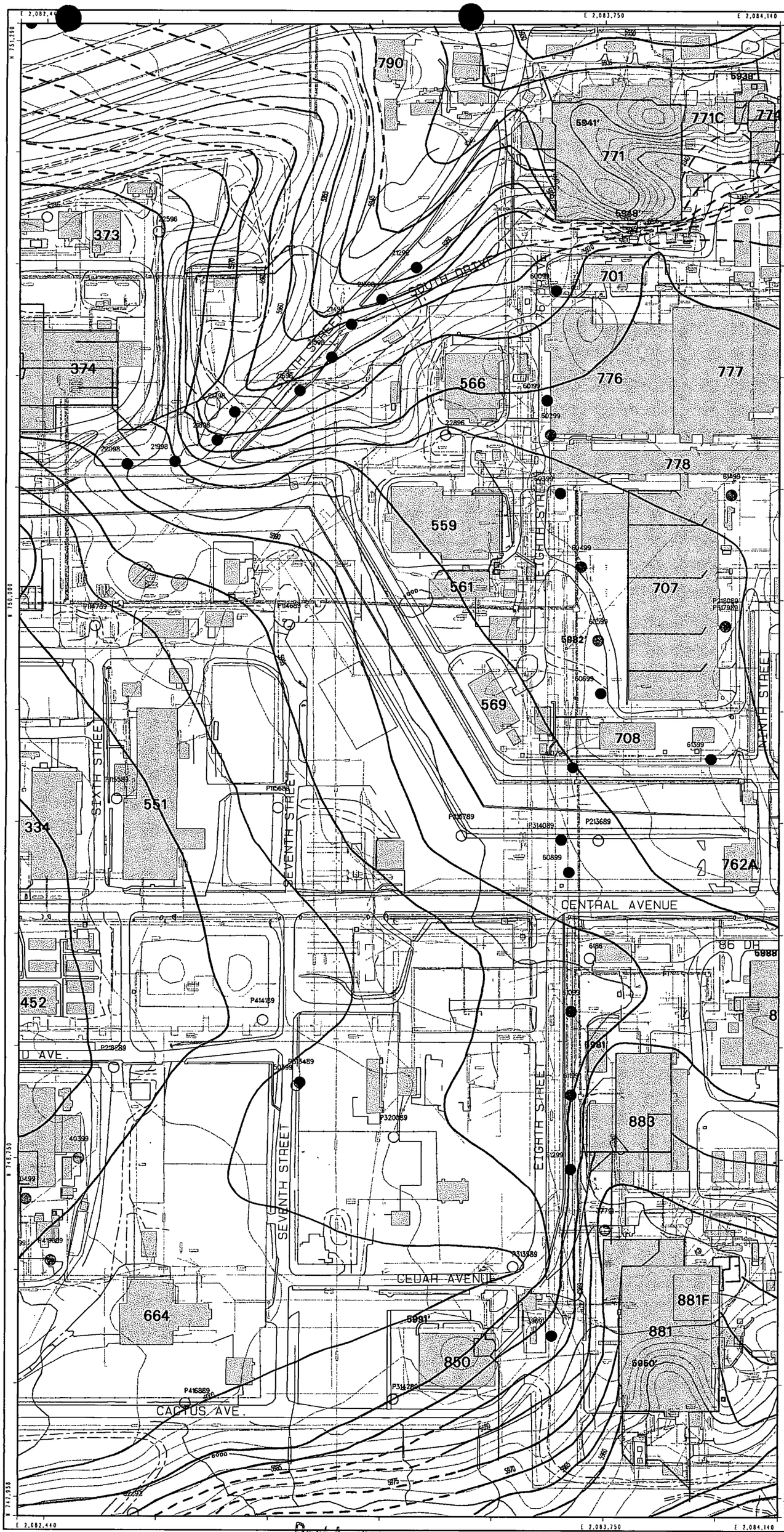

Figure 8-2

Potentiometric Surface
East Industial Area
Unconsolidated Surficial Deposits

1999 Annual RFCA
Groundwater Monitoring Report

EXPLANATION

IMP Well Type

- Water Quality Flow Monitoring
- Industrial Area Flow Monitoring
- Background Flow Monitoring
- D&D Monitoring
- Non-IMP

5-Foot Water Level Contours
Second Quarter 1999

- 20-Foot Water Level Contour
- Dashed where inferred
- 5-Foot Intermediate Water Level Contour
- Dashed where inferred
- Foundation Drain
- Approximate extent of Unsaturated Area
- Utility Lines– Process Waste, Sanitary Sewer, Electrical (above/below ground), Domestic Water (above/below ground), Steam (above/below ground), and Abandoned

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95 Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

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Golden, CO 80402-0464

Scale = 1:1804
1 inch represents approximately 150 feet

50 0 100 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy

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MAP ID: sse-rpt30 November 27, 2000

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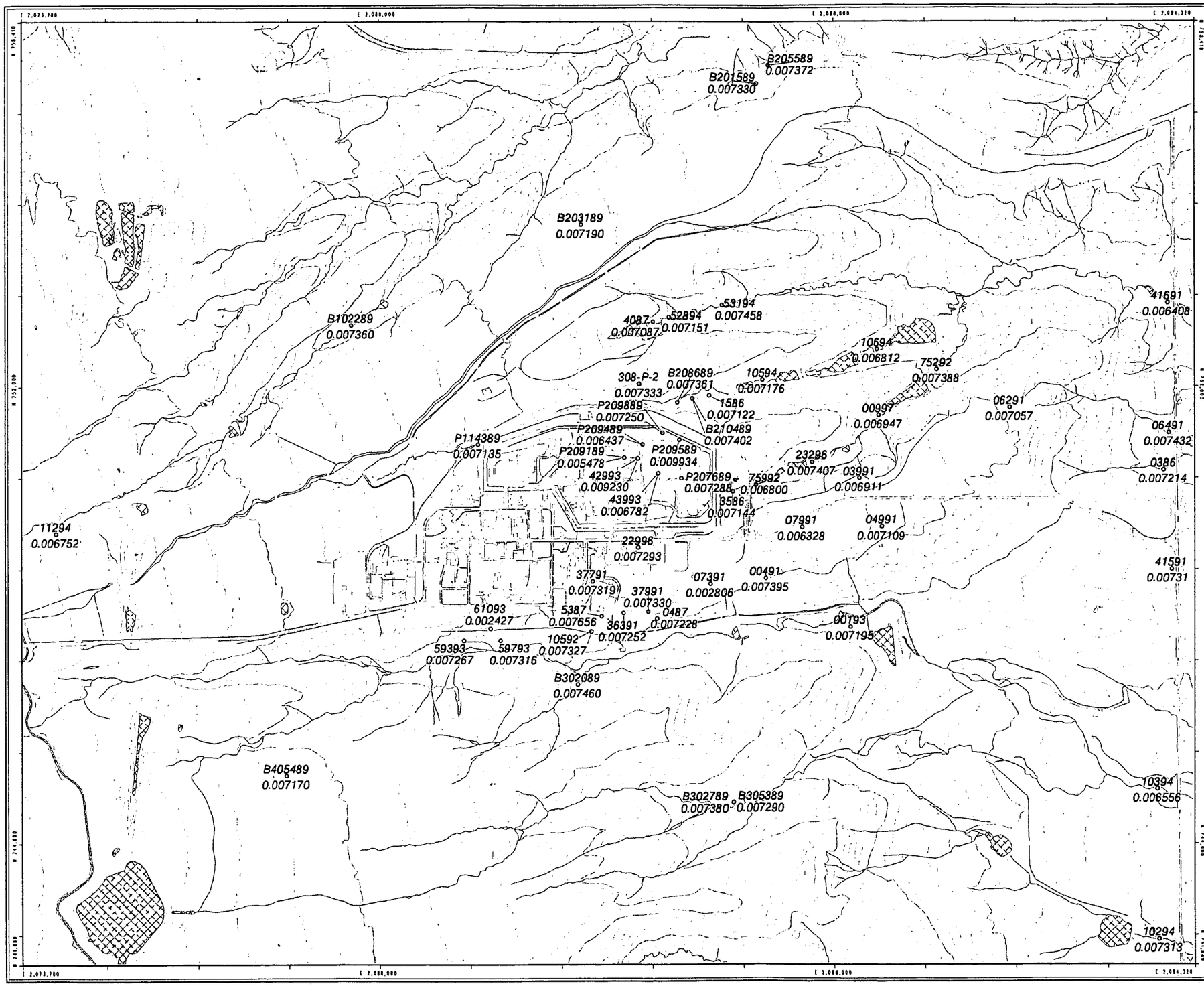

Figure 8-4

Selected Groundwater Wells and U235/U238 ICP/MS Ratios

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

○ Location in Blue
Value in Green

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Contour (20-Foot)
- Paved roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial (ir-ave) data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV. 1994 Aerial Flyover at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

Scale = 1 : 21330
1 inch represents approximately 1778 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER-HILL COMPANY

MAP ID: rfca-rpt

November 14, 2000

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185

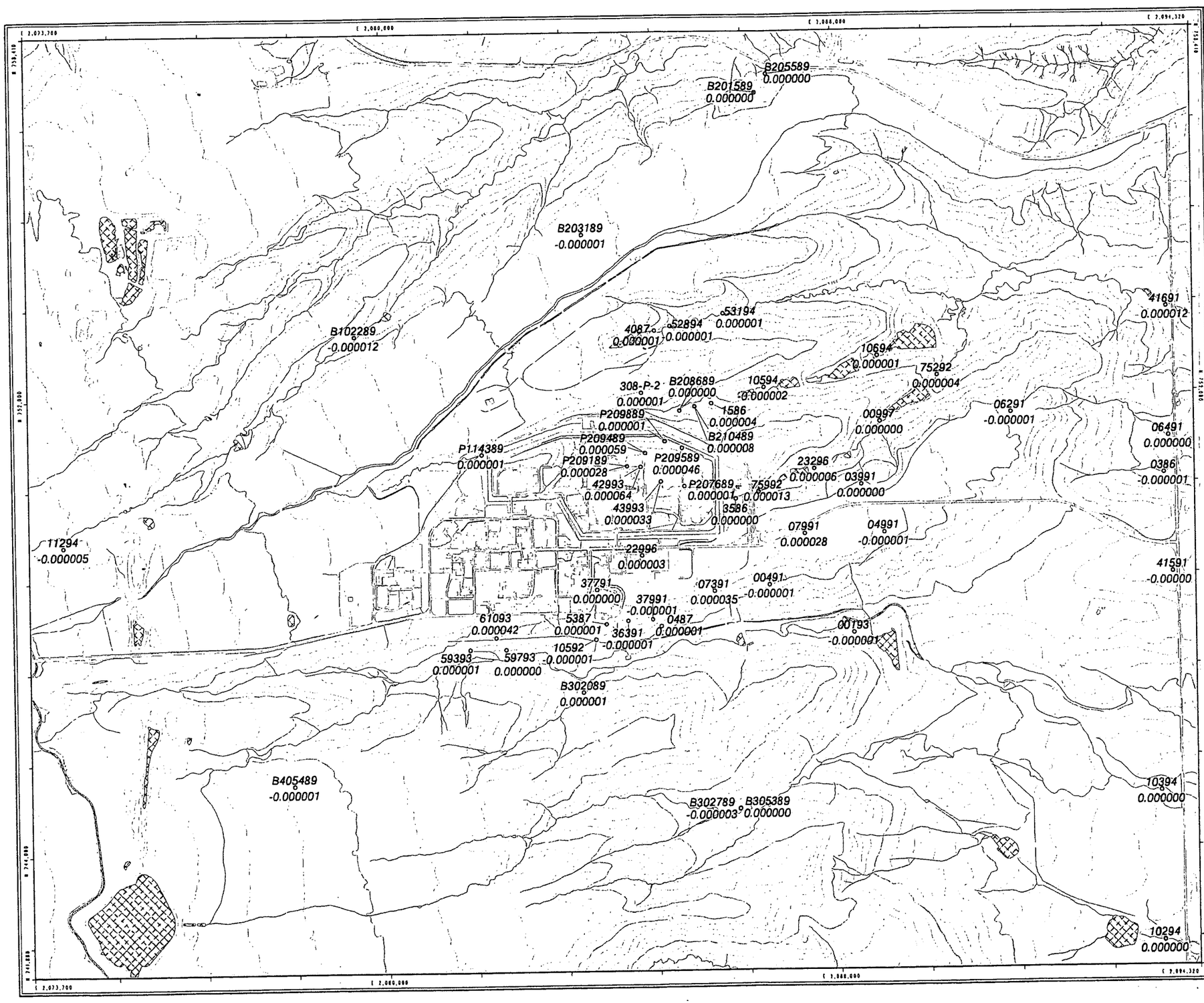

Figure 8-5

Selected Groundwater Wells and U236/U238 ICP/MS Ratios

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

○ Location in Blue
Value in Green

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Contour (20-Foot)
- Paved roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial flyover data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs. 1/95

Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV. 1994 Aerial Flyover at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

N

Scale = 1 : 21330
1 inch represents approximately 1778 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by:
DynCorp
THE ART OF TECHNOLOGY

Prepared for:
KAISER•HILL COMPANY

MAP ID: rfca-rpt

September 28, 2000

NT_Svr w:/projects/fy2k/rfca-rpt/figures/iopms_ratios/236ratio-b.aml

186

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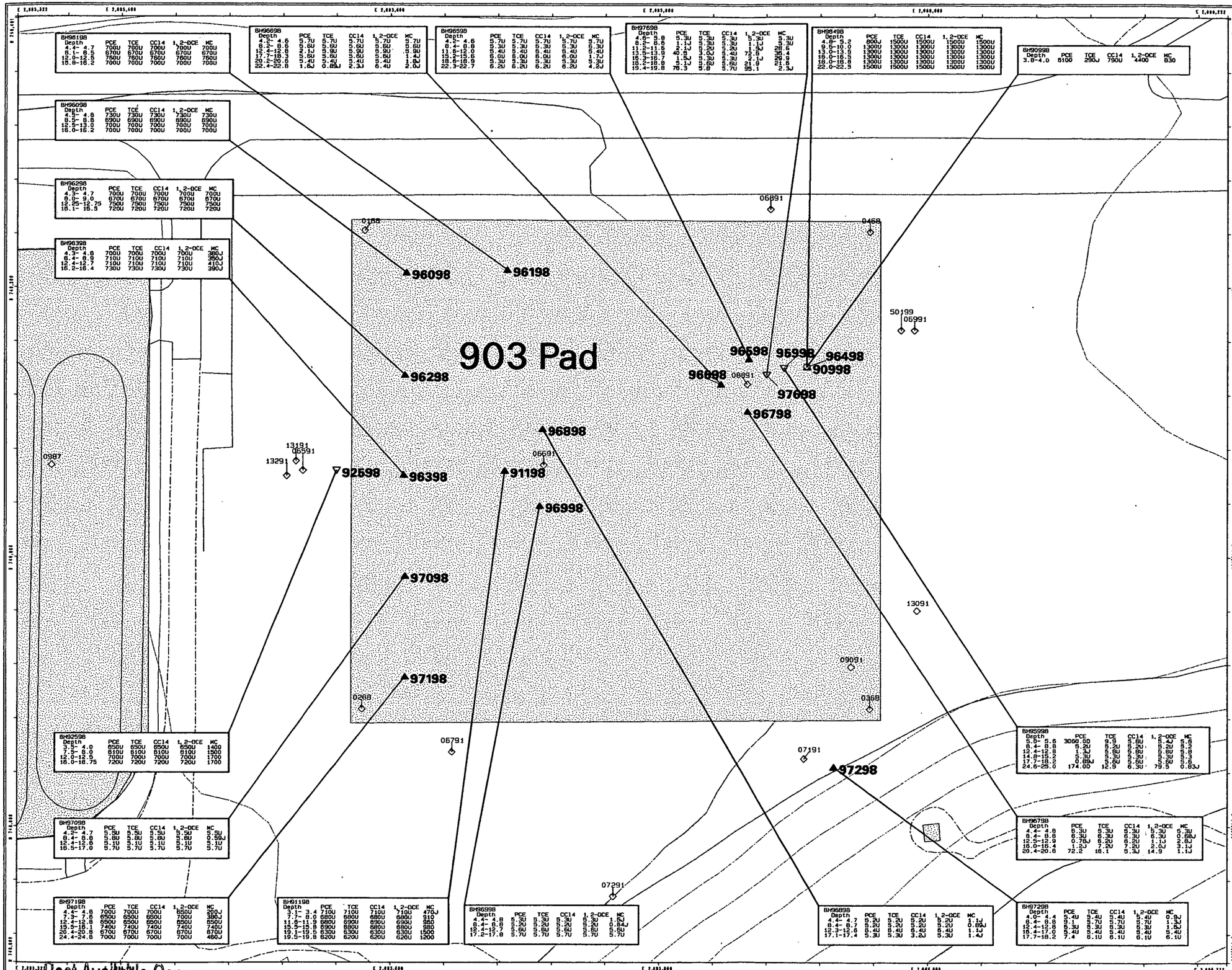

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8.1- 8.5	670U	670U	670U	670U	670U
12.0-12.5	750U	750U	750U	750U	750U
15.8-16.2	700U	700U	700U	700U	700U

BH96698 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.2- 4.6	5.7U	5.7U	5.7U	5.7U	5.7U
8.2- 8.6	5.6U	5.6U	5.6U	5.6U	5.6U
12.4-12.8	2.1U	5.9U	5.9U	5.9U	5.9U
17.7-18.3	5.6U	5.6U	5.6U	5.6U	1.4J
20.2-20.6	5.4U	5.4U	5.4U	5.4U	1.8J
22.4-22.8	1.6J	0.85J	2.3J	6.4U	2.0J

BH96598 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.2- 4.6	5.7U	5.7U	5.7U	5.7U	5.7U
8.4- 8.8	5.3U	5.3U	5.3U	5.3U	5.3U
11.6-12.0	5.4U	5.4U	5.4U	5.4U	5.4U
15.2-15.6	6.0U	6.0U	6.0U	6.0U	1.7J
18.6-18.9	5.3U	5.3U	5.3U	5.3U	4.2J
22.3-22.7	6.2U	6.2U	6.2U	6.2U	4.2J

BH97698 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.0- 5.8	5.3U	5.3U	5.3U	5.3U	5.3U
8.2- 8.6	1.1J	5.3U	5.3U	1.1J	5.3U
11.2-11.6	2.1J	5.2U	5.2U	1.3J	26.6
15.5-15.9	40.8	5.6U	5.6U	72.8	30.4
18.2-18.7	1.5J	5.3U	5.3U	2.1J	29.9
18.8-18.9	5.1J	5.6U	5.6U	21.9	21.6
19.4-19.8	78.3	5.8	5.7U	95.1	2.3J

BH96498 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.8- 5.2	800J	1500U	1500U	1500U	1500U
9.6-10.0	1300U	1300U	1300U	1300U	1300U
13.0-13.5	1300U	1300U	1300U	1300U	1300U
16.0-16.5	1300U	1300U	1300U	1300U	1300U
18.0-18.5	1300U	1300U	1300U	1300U	1300U
22.0-22.5	1500U	1500U	1500U	1500U	1500U

BH9099B Depth	PCE	TCE	CC14	1,2-DCE	MC
3.8-4.0	5100	290J	750U	4400	630

BH96098 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.5- 4.8	730U	730U	730U	730U	730U
8.5- 8.8	690U	690U	690U	690U	690U
12.5-13.0	700U	700U	700U	700U	700U
15.0-15.2	700U	700U	700U	700U	700U

BH96298 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.3- 4.7	700U	700U	700U	700U	700U
8.0- 9.0	670U	670U	670U	670U	670U
12.25-12.75	750U	750U	750U	750U	750U
16.1- 16.5	720U	720U	720U	720U	720U

BH96398 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.3- 4.8	700U	700U	700U	700U	380J
8.4- 8.9	710U	710U	710U	710U	350J
12.4-12.7	710U	710U	710U	710U	410J
16.2-16.4	730U	730U	730U	730U	390J

BH92598 Depth	PCE	TCE	CC14	1,2-DCE	MC
3.5- 4.0	650U	650U	650U	650U	1400
7.5- 8.0	910U	910U	910U	910U	1500
12.0-12.5	700U	700U	700U	700U	1700
16.0-16.75	720U	720U	720U	720U	1700

BH97098 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.2- 4.7	5.5U	5.5U	5.5U	5.5U	5.5U
8.4- 8.8	5.8U	5.8U	5.8U	5.8U	0.59J
12.4-12.8	5.1U	5.1U	5.1U	5.1U	5.1U
16.5-17.0	5.7U	5.7U	5.7U	5.7U	5.7U

BH97198 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.4- 4.8	700U	700U	700U	550J	300J
7.3- 7.6	650U	650U	650U	700U	390J
12.4-12.8	650U	650U	650U	700U	850U
15.5-16.1	740U	740U	740U	740U	740U
20.4-20.8	670U	670U	670U	670U	670U
24.4-24.8	700U	700U	700U	700U	460J

BH91198 Depth	PCE	TCE	CC14	1,2-DCE	MC
3.1- 3.4	710U	710U	710U	710U	470J
7.7- 8.0	680U	680U	680U	680U	310
11.6-11.9	680U	690U	690U	690U	950
15.5-15.8	690U	680U	680U	680U	580
19.1-19.5	630U	630U	630U	630U	1500
19.5-19.8	620U	620U	620U	620U	1200

BH96998 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.4- 4.8	5.3U	5.3U	5.3U	5.3U	1.5J
8.4- 8.8	5.2U	5.2U	5.2U	5.2U	0.64J
12.4-12.7	5.6U	5.6U	5.6U	5.6U	5.6U
17.2-17.8	5.7U	5.7U	5.7U	5.7U	5.7U

BH96898 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.4- 4.7	5.2U	5.2U	5.2U	5.2U	1.1J
8.4- 8.7	5.2U	5.2U	5.2U	5.2U	0.69J
12.3-12.6	5.4U	5.4U	5.4U	5.4U	1.1J
17.1-17.4	5.3U	5.3U	3.2J	5.3U	1.4J

BH95998 Depth	PCE	TCE	CC14	1,2-DCE	MC
5.0- 5.6	3060.00	9.9	5.6U	5.4J	5.6
8.4- 8.8	5.2U	5.2U	5.2U	5.2U	5.2
12.4-12.8	1.3J	5.6U	5.6U	5.6U	5.6
14.8-15.2	5.3U	5.3U	5.3U	5.3U	5.3
17.7-18.2	0.65J	5.6U	5.6U	5.6U	5.6
24.5-25.0	174.00	12.9	5.3U	79.5	0.83J

BH96798 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.4- 4.8	5.3U	5.3U	5.3U	5.3U	5.3U
8.4- 8.8	6.3U	6.3U	6.3U	6.3U	0.68J
12.5-12.9	0.76J	6.2U	6.2U	1.1J	2.6J
16.0-16.4	1.2J	7.2U	7.2U	2.0J	3.1J
20.4-20.8	72.2	18.1	5.3U	14.9	1.1J

BH97298 Depth	PCE	TCE	CC14	1,2-DCE	MC
4.0- 4.4	5.4U	5.4U	5.4U	5.4U	0.9J
8.4- 8.8	5.1	5.7U	5.7U	5.7U	1.3J
12.4-12.8	5.3U	5.3U	5.3U	5.3U	1.6J
16.4-17.0	5.4U	5.4U	5.4U	5.4U	5.4U
17.7-18.2	7.4	6.1U	6.1U	6.1U	6.1U

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Figure 9-1
903 Pad VOC Investigation and VOC Distribution in Soil

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- ▲ VOC Boreholes, Original
- ▽ VOC Boreholes, Stepout
- ○ Radiological Borehole
- ● Borehole location
  Borehole PCE TCE CCL4 1,2-DCE
  Sample Depth Results in Feet
  VOC Compound Results in ug/kg
- ◇ Groundwater Well

NOTE:
VOC detections in blue
Tier I Exceedances in red
Tier II Exceedances in green
PCE = Tetrachloroethene
TCE = Trichloroethene
CCL4 = Carbon Tetrachloride
1,2-DCE = 1,2-Cis-Dichloroethylene
MC = Methylene Chloride

U = Undetected, Contract Required Quantitative Limit
J = Associated Value is an Estimated Quantity
D = Dilution

Standard Map Features

- Buildings and other structures
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

*NOTE: Roads shown are approximate locations only.
CB9 Bldg. Area
CB9 Up Area
Approximate Area
Approximate Area

N

Scale = 1 : 640
1 inch represents 70 feet

25 0 50 100ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp — THE ART OF TECHNOLOGY

Prepared for: KAISER-HILL COMPANY

MAP ID: RFCA-RPT

September 27, 2000

NT_Svr h:/projects/hy2k/roa-rpt/figures/903pad/voc_boxs/figure9-1.aml

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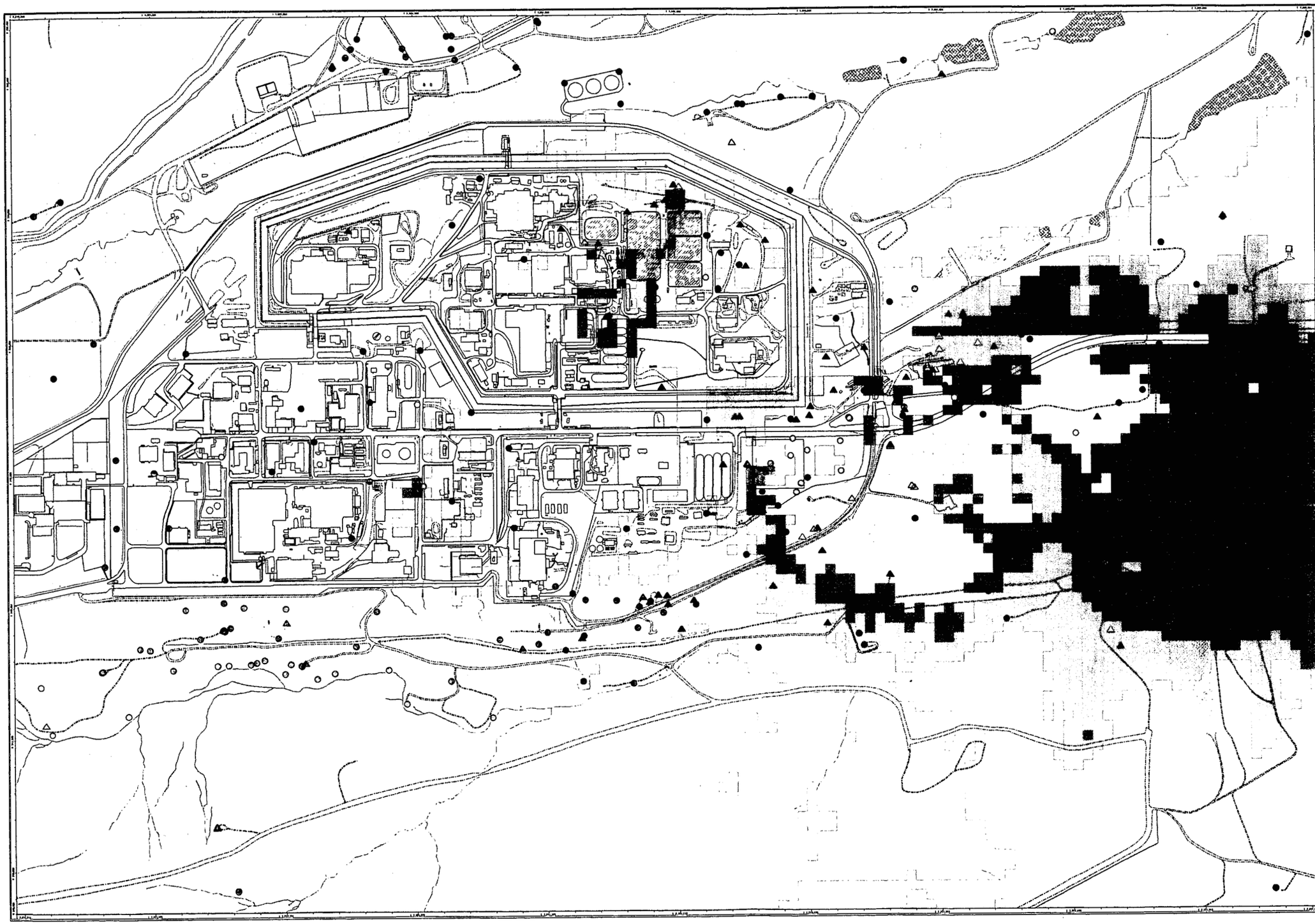

Figure 9-2

Unfiltered Plutonium 239/240 in UHSU Groundwater Superimposed on Surface Soil Plutonium 239/240 Concentrations 1991-1995

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

Plutonium 239/240 Activity in Groundwater Wells (Units = pCi/L)

Alluvium Wells		Bedrock Wells
●	0.0 to 0.05	▲
○	0.05 to 0.15	△
○	0.15 to 0.5	△
○	0.5 to 1.0	△
○	> 1.0	△

Plutonium 239/240 Activity in Surface Soils Kriged Data (Units = pCi/g)

- < = 0.1 (2365.8 Acres)
- > 0.1 and < = 1.0 (2363.5 Acres)
- > 1.0 and < = 5.0 (845.7 Acres)
- > 5.0 and < = 10.0 (184.8 Acres)
- > 10.0 and < = 25.0 (272.3 Acres)
- > 25.0 and < = 100.0 (50.6 Acres)
- > 100.0 and < = 252.0 (11.4 Acres)
- > 252.0 and < = 1429.0 (4.9 Acres)
- > 1429.0 and < = 10000.0 (2.8 Acres)
- > 10000.0 (0.6 Acres)

Standard Map Features

- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Rocky Flats boundary
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Data Source:

Soil Pu concentrations from K-H, 2000, Report on Soil Erosion and Surface Water Sediment Transport, OU-RF-01823.

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Scale = 1 : 8770

1 inch represents approximately 731 feet

100 0 200 400 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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205

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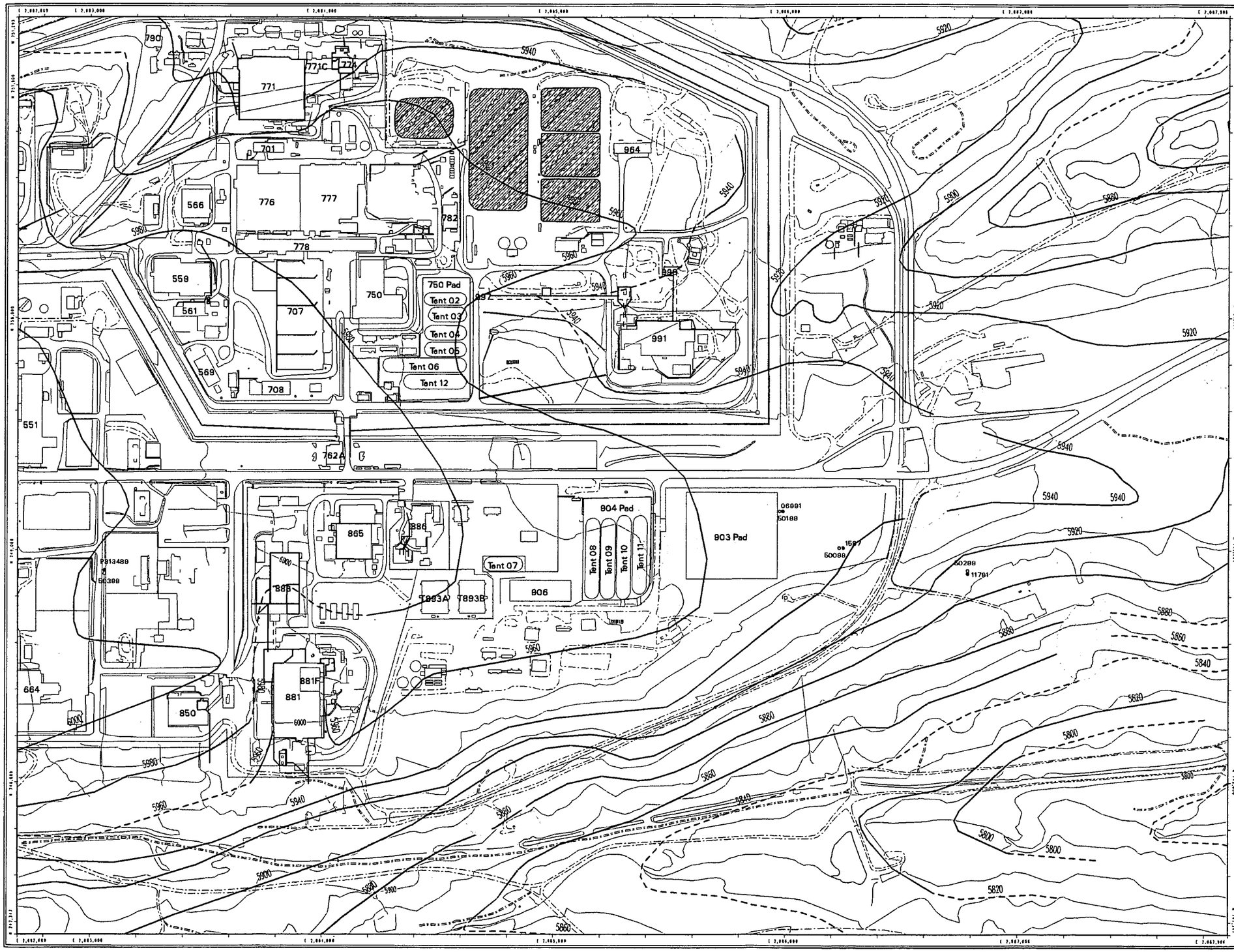

Figure 9-3

Monitoring Well Locations
Actinide Drilling Artifact Contamination Project

1999 Annual RFCA Groundwater Monitoring Report

- Actinide Monitoring Well Location
- Existing Groundwater Monitoring Well
- Water Level Contour -- 2nd Qtr. 1999
- Dashed where inferred
- Foundation Drain
- Approximate extent of Unsaturated Area

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads
- Contours (20' Intervals)

NOTE:
Contours Represent April 1999 Data

Scale = 1 : 5090
1 inch represents approximately 424 feet

100 0 200 400ft

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Colorado Central Zone
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MAP ID: rfca-rpt/figures/act_drilling_artifact

November 14, 2000

NT_Svr w:/projects/fy2k/rfca-rpt/figures/act_drilling_artifact/pot99-ii-spring.aml

206

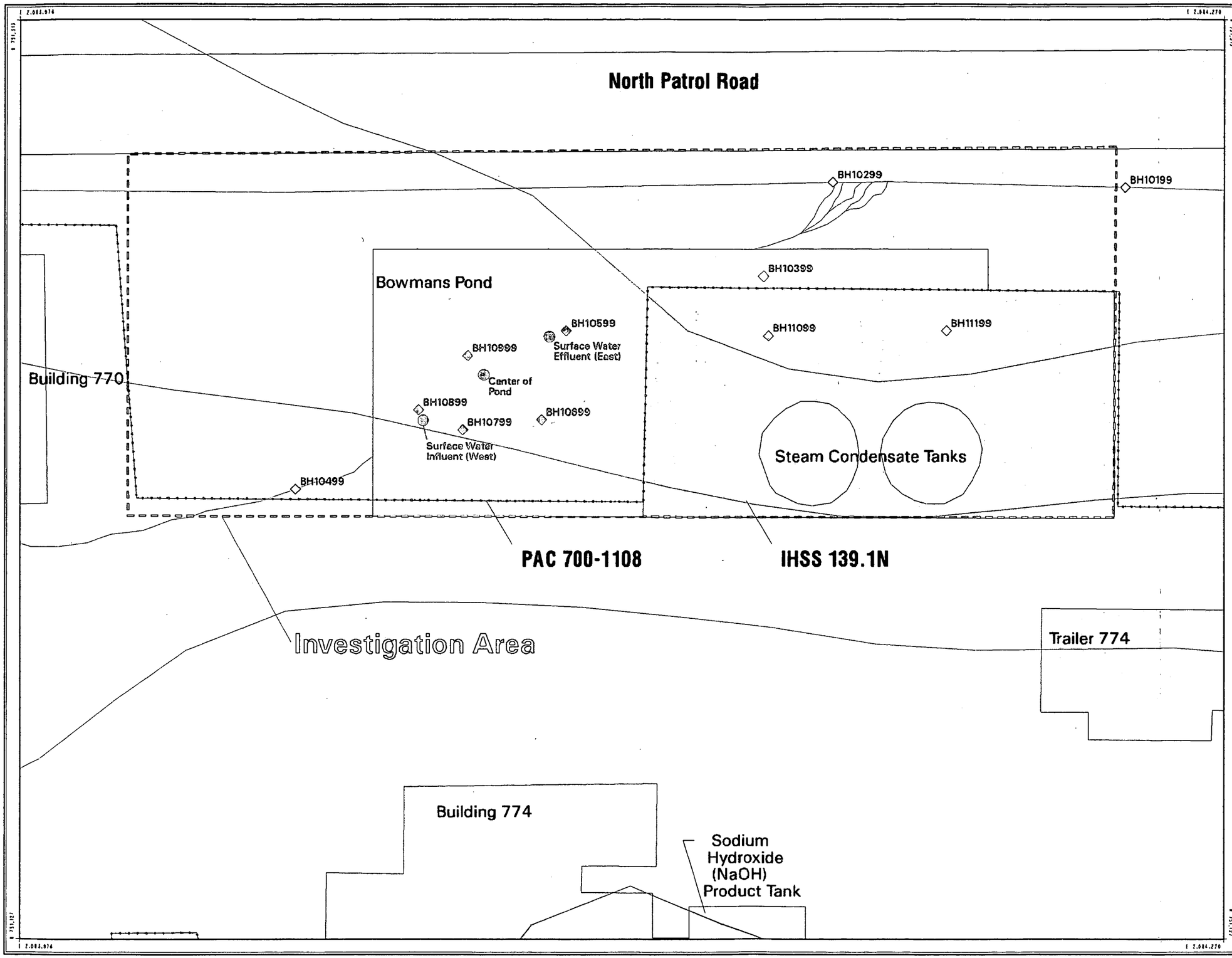

Figure 9-4

Bowmans Pond Investigation Location Map
Bowmans Pond (PAC 700-1108) and Steam Condensate Tanks (IHSS 139.1N)

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- 1999 Boreholes
- 1999 Surface Water Sampling Locations
- Investigation Area
- PAC 700-1108
- IHSS 139.1N
- North Patrol Road

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (5-Foot)

Scale = 1 : 230
1 inch represents approximately 19 feet

6 0 10 20ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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MAP ID: 99-0384

September 28, 2000

Original map contents are preserved. Logo and date have changed.

NT Svr w:/projects/fy2k/rfca-rpt/figures/bowmans pond/bowmans pond.aml

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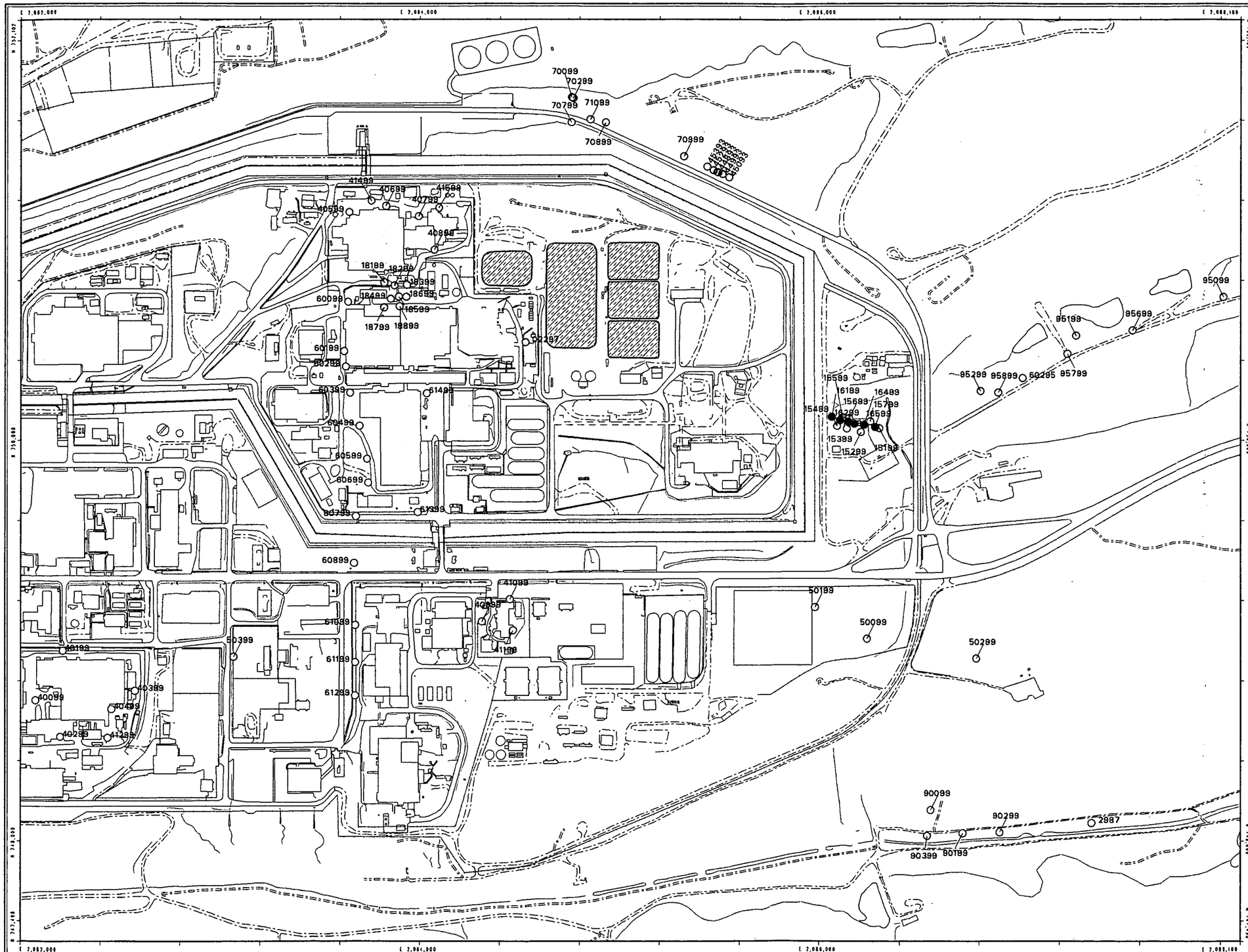

Figure 10-1
CY1999
Well Abandonments and Installations

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- 1999 Groundwater Monitoring Well Abandonments

  Note: Wells 02297, 60295, and 2987 were damaged or destroyed in 1999 and will be properly abandoned in the future.

- 1999 Groundwater Monitoring Well Completions

- 1999 Groundwater Monitoring Well Completions around the Mound Plume Nos. 16199 - 16599 (left to right)

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrographs, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs. 1/95

Scale = 1 : 5940
1 inch represents 495 feet

200 0 400 800ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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MAP ID: rfca-rpt

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212

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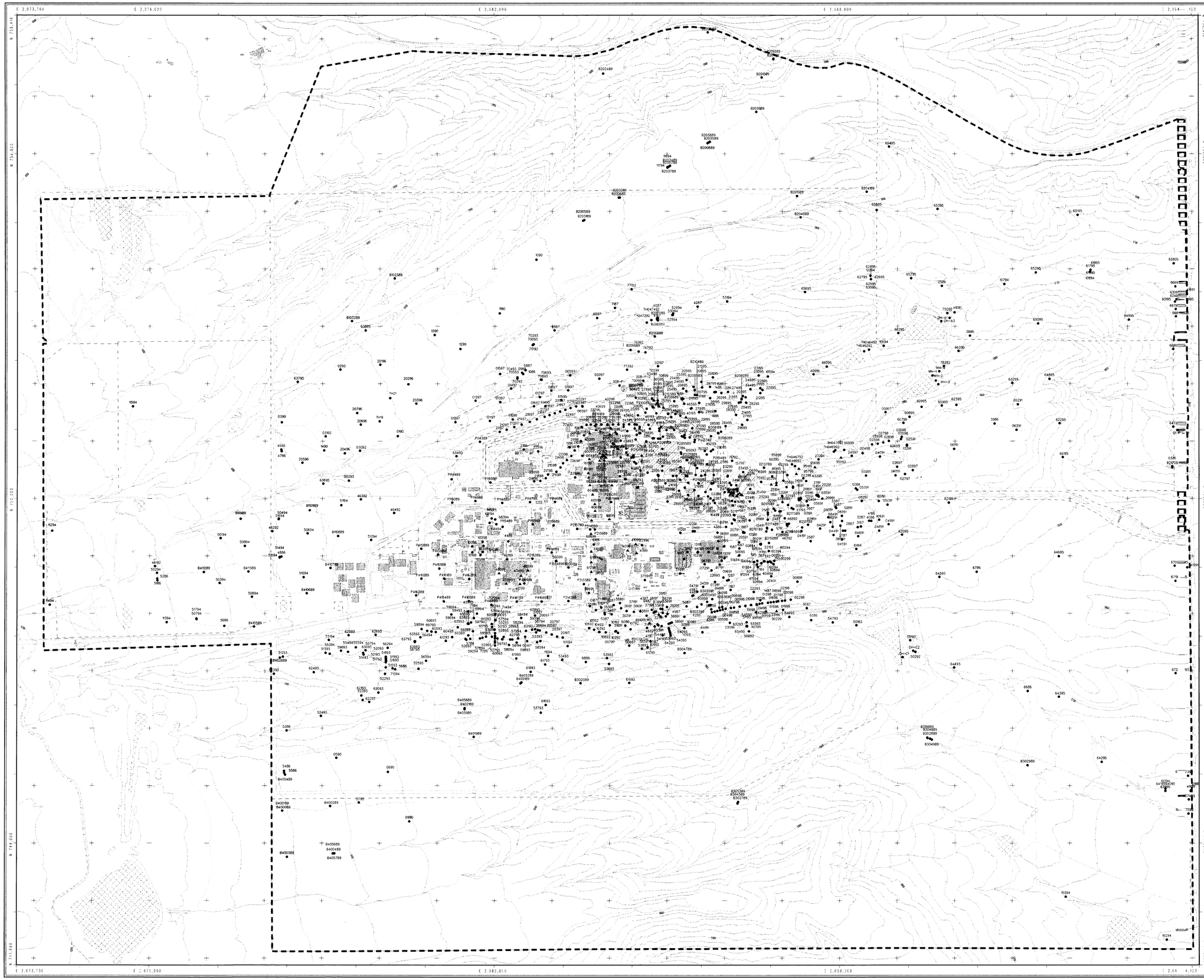

Plate 1
IMP Monitoring Well Location Map

1999 Annual RFCA Groundwater Monitoring Report

IMP Well Type

- Water Quality/Flow Monitoring
- Industrial Area Flow Monitoring
- Background Flow Monitoring
- Non-IMP
- △ 1999 Wells (color denotes IMP well type)

Standard Map Features

- Buildings
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contours (20' Intervals)
- Roads
- Rocky Flats Boundary

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs. 1/95

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Scale = 1 : 7200
1 inch represents 600 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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November 20, 2000

SW-A-004870 pg 232

Plate 2

Potentiometric Surface of Permeable Units of the UHSU Second Quarter 1999

1999 Annual RFCA Groundwater Monitoring Report

- Groundwater Monitoring Well
- Water Level Contour
- Dashed where inferred
- Foundation Drain
- Approximate extent of Unsaturated Area
- Area without Groundwater Elevation Data

Standard Map Features

- Buildings & other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contours (20' Intervals)
- Roads
- Rocky Flats Boundary

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Scale = 1 : 7200
1 inch represents 600 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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November 13, 2000

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Plate 3

Potentiometric Surface of Permeable Units of the UHSU Fourth Quarter 1999 1999 Annual RFCA Groundwater Monitoring Report

- Groundwater Monitoring Well
- Water Level Contour
- Dashed where inferred
- Foundation Drain
- Approximate extent of Unsaturated Area
- Area without Groundwater Elevation Data

Standard Map Features

- Buildings & other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contours (20' Intervals)
- Roads
- Rocky Flats Boundary

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

Scale = 1 : 7200
1 inch represents 600 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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MAP ID: fy2k/rfca-rpt

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SW-A-004870 Pg 234

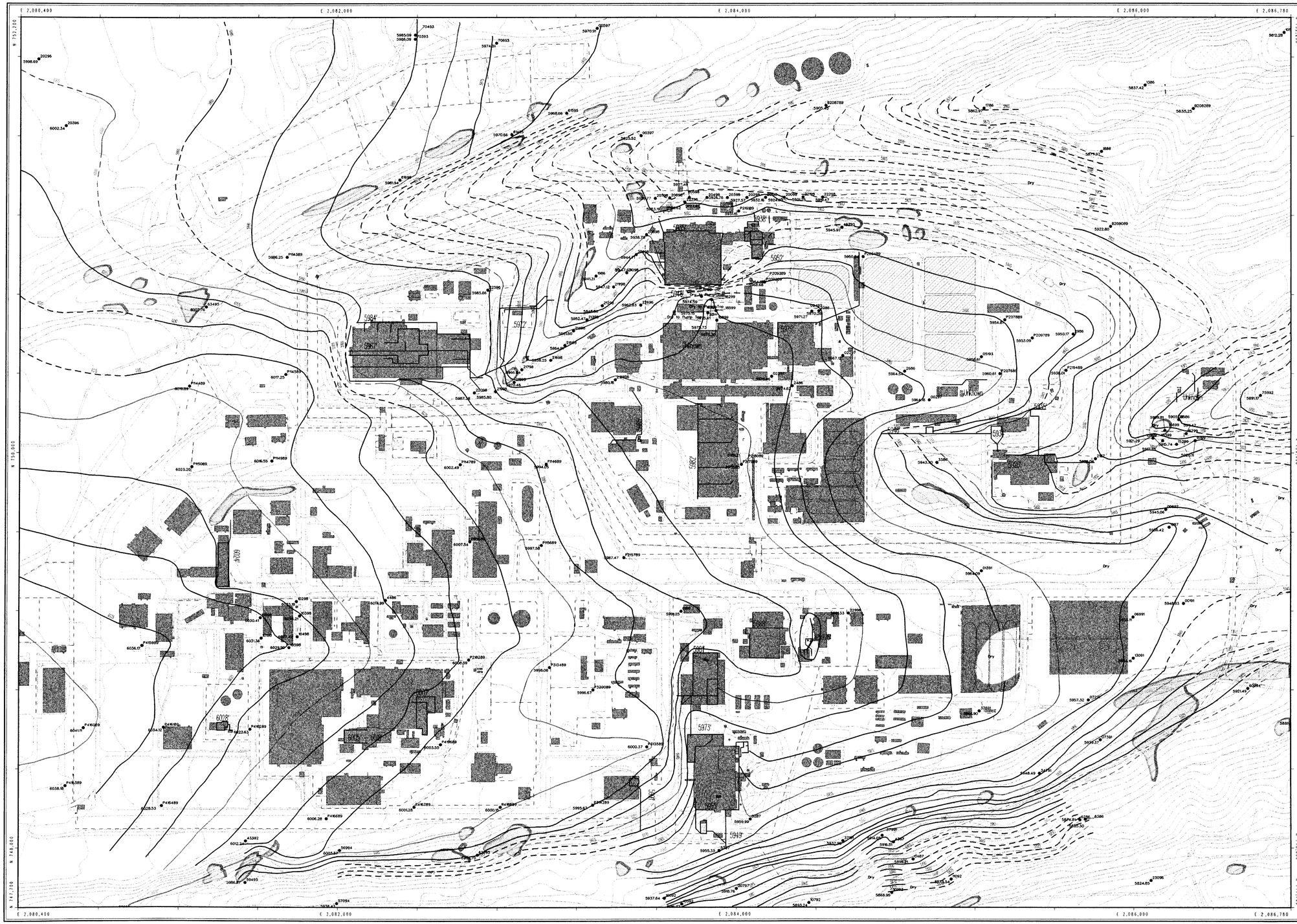

Plate 4

Industrial Area Potentiometric Surface
Permeable Units of the UHSU
Second Quarter 1999
1999 Annual RFCA
Groundwater Monitoring Report

- Groundwater Monitoring Well
- 20-Foot Water Level Contour
- Dashed where inferred
- 5-Foot Intermediate Water Level Contour
- Dashed where inferred
- Foundation Drain
- Approximate extent of Unsaturated Area
- Area without Groundwater Elevation Data

Standard Map Features

- Seeps
- Buildings & other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contours (20' Intervals)
- Roads
- Rocky Flats Boundary

DATA SOURCE BASE FEATURES:
All Potentimetric Contours and Groundwater Wells were generated by the RMRS Groundwater Program.

Point of Contact:
Singer Stephen H. RMRS
ph:(303)966-3367
pg:(303)212-6288
Trailer 71300 Rm 107

Scale = 1 : 2400
1 inch represents 200 feet

150 0 300 600ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by:
DynCorp
THE ART OF TECHNOLOGY

Prepared for:
KAISER•HILL COMPANY

MAP ID: fy2k/rfca-rpt

November 13, 2000

SW-A-004870 pg 235

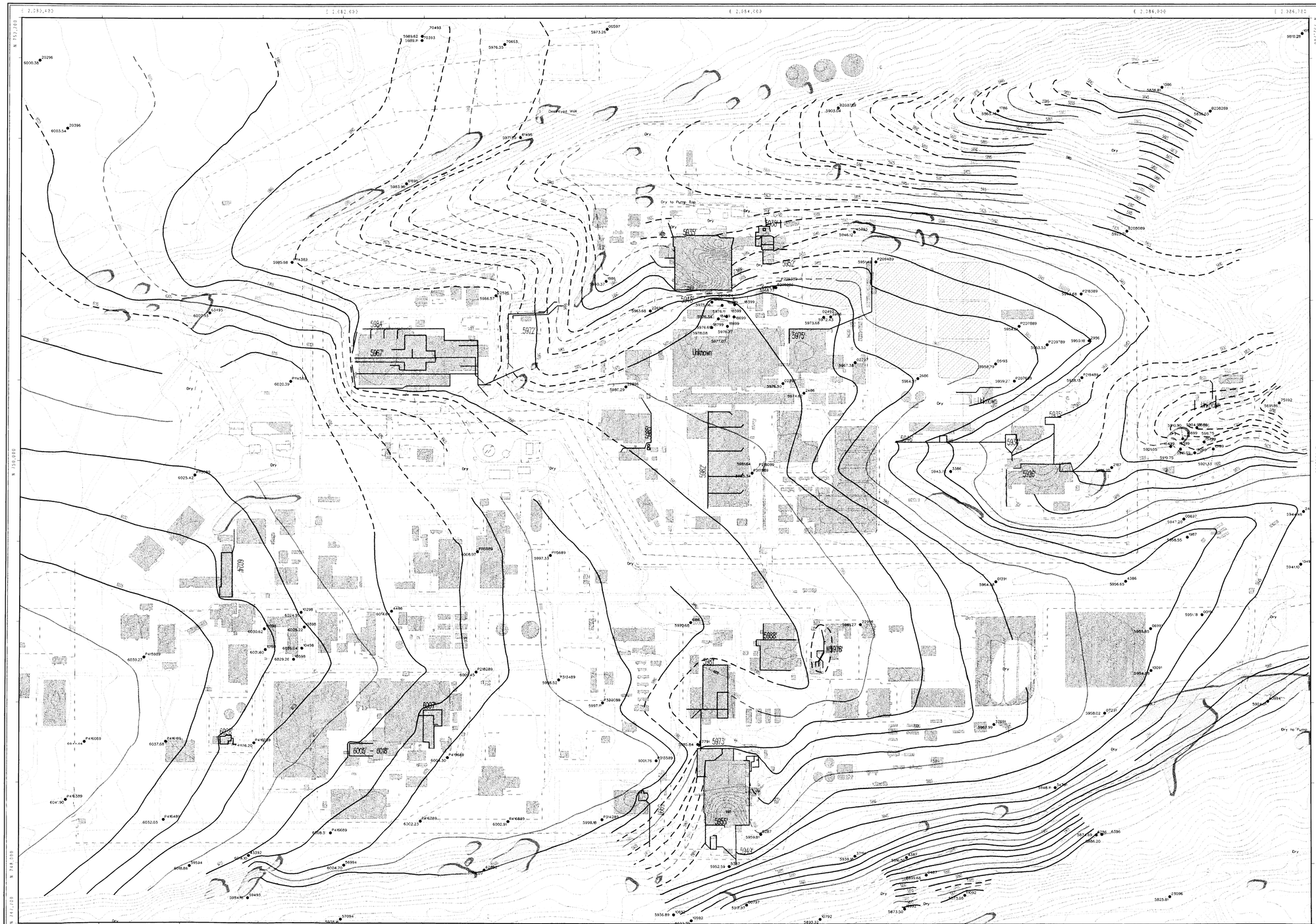

Plate 5

Industrial Area Potentiometric Surface
Permeable Units of the UHSU
Fourth Quarter 1999
1999 Annual RFCA Groundwater Monitoring Report

- Groundwater Monitoring Well
- 20-Foot Water Level Contour
- Dashed where inferred
- 5-Foot Intermediate Water Level Contour
- Dashed where inferred
- Foundation Drain
- Approximate extent of Unsaturated Area
- Area without Groundwater Elevation Data

Standard Map Features

- Seeps
- Buildings & other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contours (20' Intervals)
- Roads
- Rocky Flats Boundary

DATA SOURCE BASE FEATURES:
All Potentiometric Contours and Groundwater Wells were generated by the RMRS Groundwater Program.

Point of Contact:
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ph:(303)966-3387
pg:(303)272-6255
Trailer T130C Rm 107

Scale = 1 : 2400
1 inch represents 200 feet

150 0 300 600 ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
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GIS Dept. 303-966-7707

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Prepared for: KAISER•HILL COMPANY

MAP ID: fy2k/rfca-rpt

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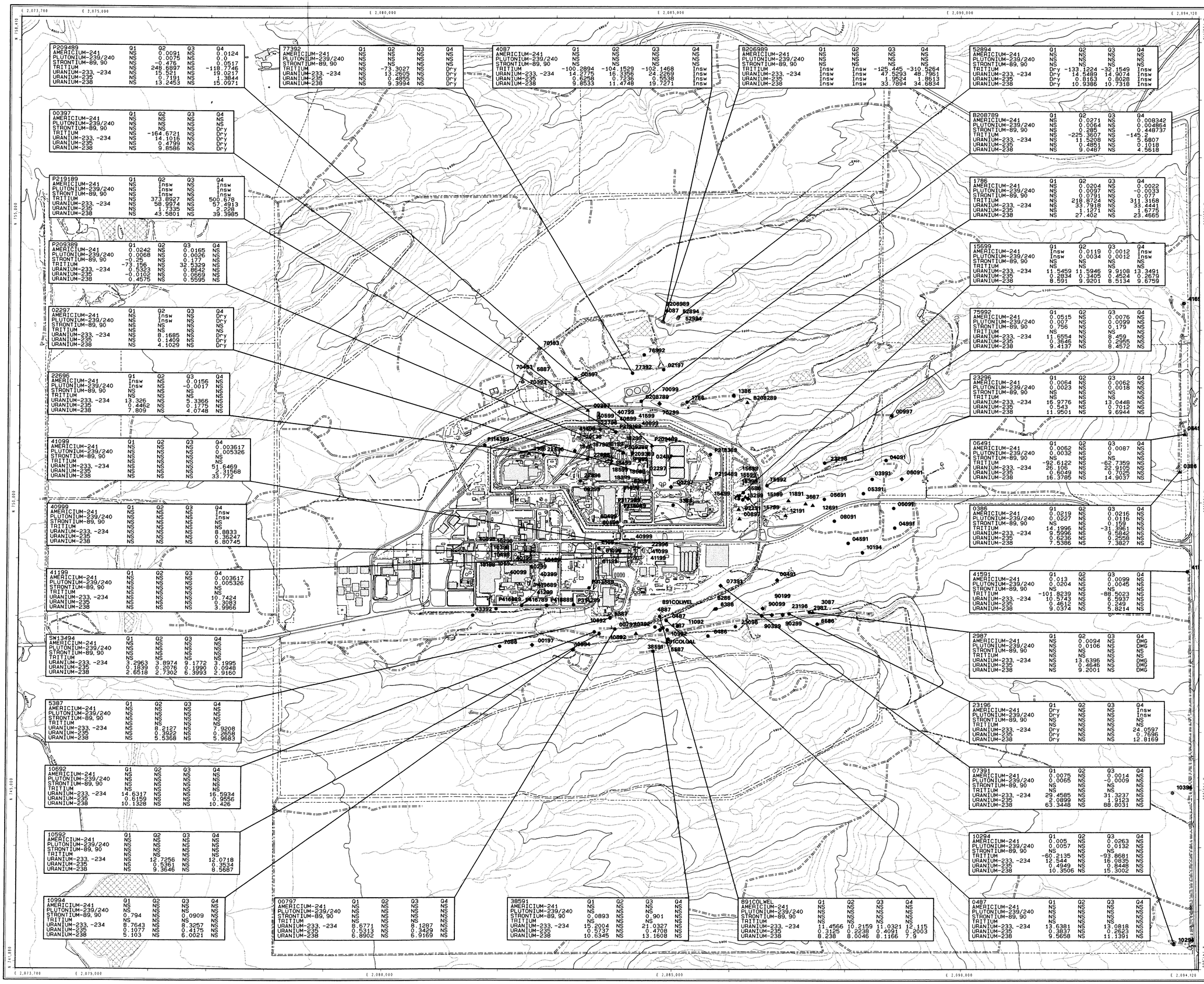
Plate 6
Radionuclides in Groundwater
RFCA Wells, 1999

1999 Annual RFCA Groundwater Monitoring Report



Well Classifications

- Plume Degradation
- Plume Definition
- Plume Extent
- Performance Monitoring
- Drainage
- Boundary
- RCRA
- D&D
- ○ Alluvial Wells
- △ Bedrock Wells
- ◇ Alluvial/Bedrock Wells
- ☆ Surface Water Monitoring Locations

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

Wells shown with box plot have at least one Uranium value above 8.0 pCi/L.

NS = Not Sampled
INSW = Insufficient water for full sample suite
DRY = No Sample Collected
DMG = Well Damaged

All results in picoCuries per liter (pCi/L)

N

Scale = 1 : 7090
1 inch represents approximately 591 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: fy2k/rfca-rpt

November 13, 2000

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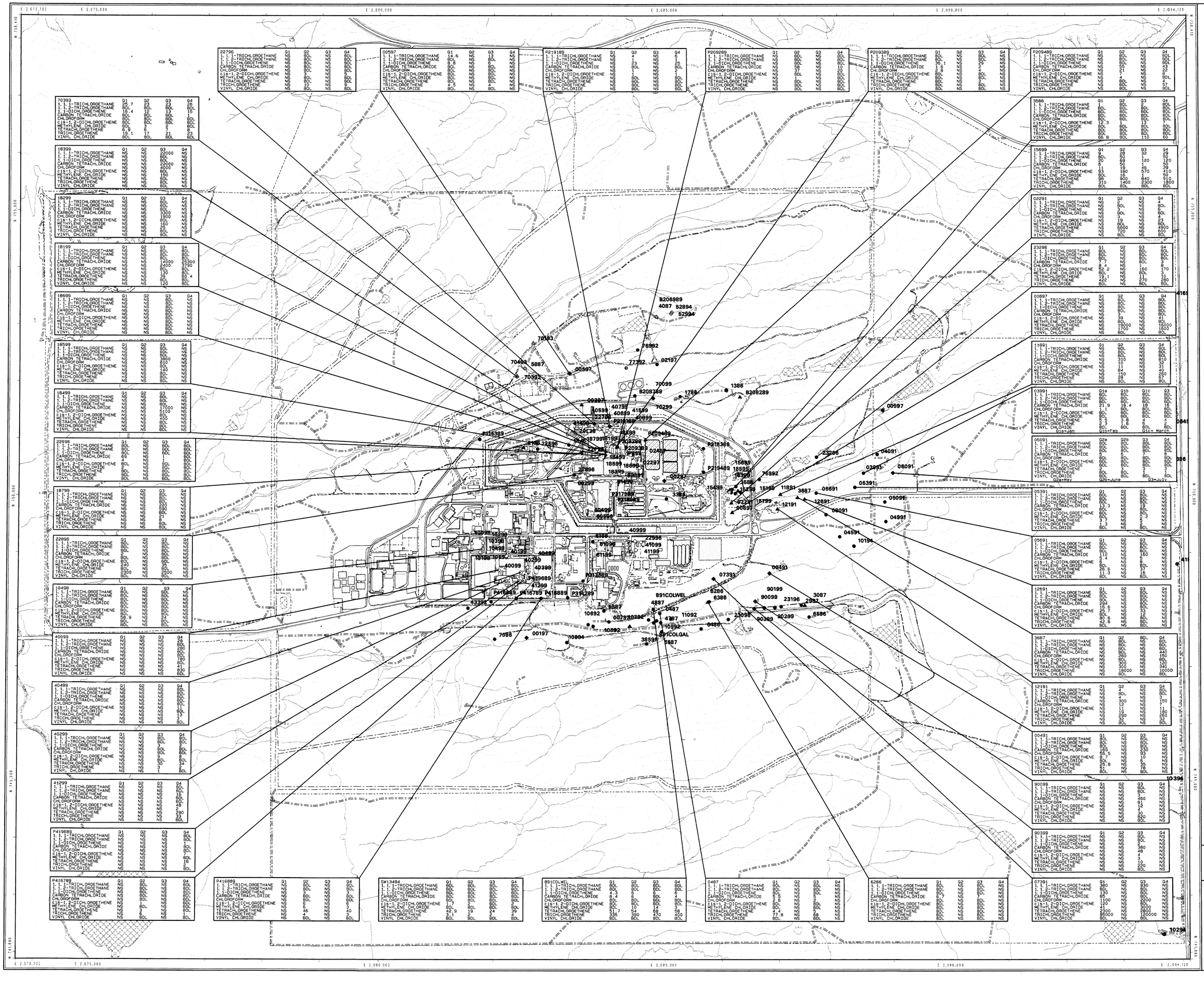

Plate 7
VOCs in Groundwater
RFCA Wells, 1999

1999 Annual RFCA Groundwater Monitoring Report

Well Classifications

- Plume Degradation
- Plume Definition
- Plume Extent
- Performance Monitoring
- Drainage
- Boundary
- RCRA
- D&D
- Alluvial Wells
- Bedrock Wells
- Alluvial/Bedrock Wells
- Surface Water Monitoring Locations

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

Wells shown with box plot have at least one value above Tier 2 Action Levels.

NS = Not Sampled
BDL = Below Detection Limit

All results in micrograms per liter (ug/L)

Scale = 1 : 7090
1 inch represents approximately 591 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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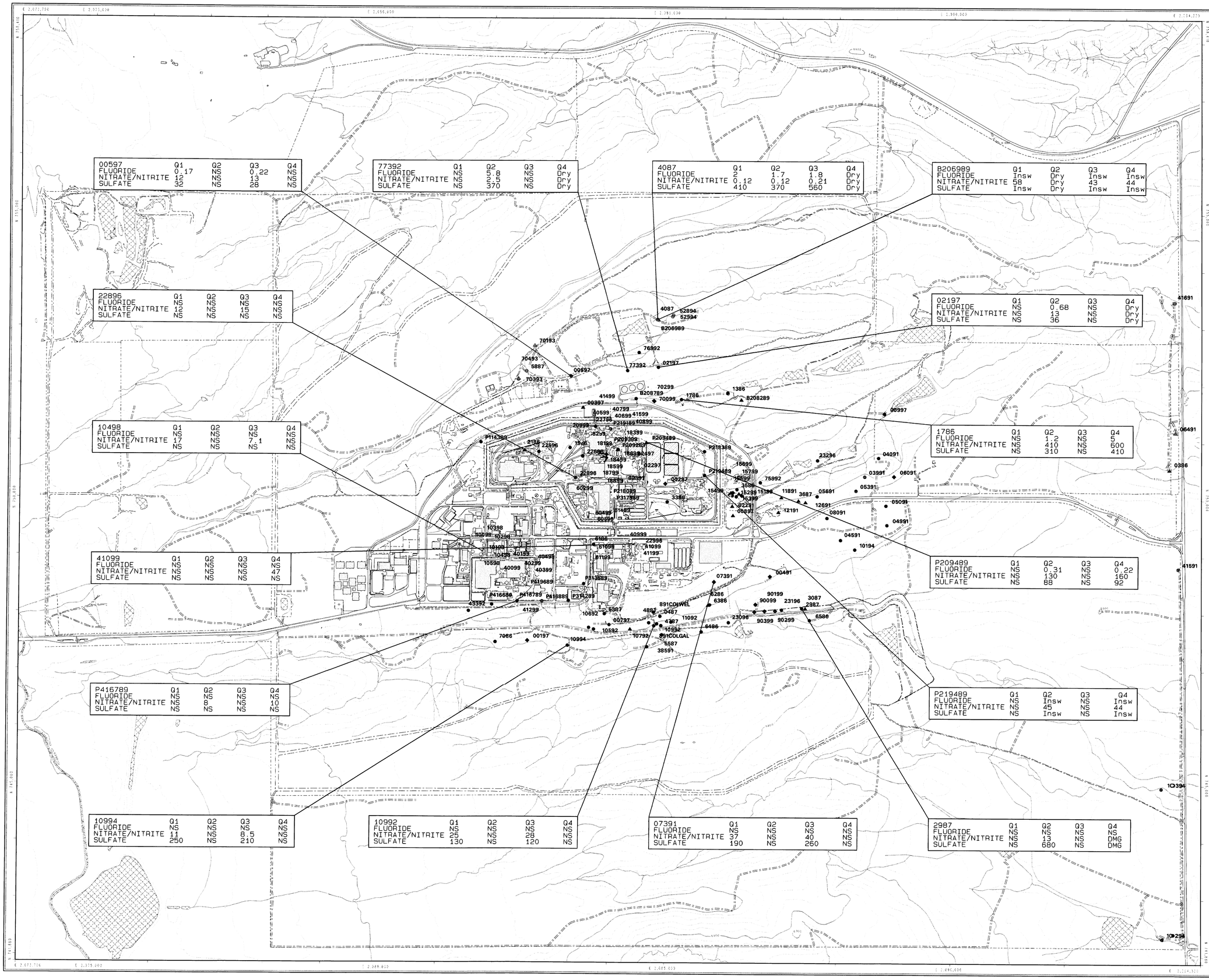
Plate 8
Water Quality Parameters in Groundwater RFCA Wells, 1999

1999 Annual RFCA Groundwater Monitoring Report



Well Classifications

- Plume Degradation
- Plume Definition
- Plume Extent
- Performance Monitoring
- Drainage
- Boundary
- RCRA
- D&D
- Alluvial Wells
- Bedrock Wells
- Alluvial/Bedrock Wells
- Surface Water Monitoring Locations

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

Wells shown with box plot have at least one value above Tier 2 Action Levels.

NS = Not Sampled
INSW = Insufficient water for full sample suite
DRY = No Sample Collected
DMG = Well Damaged

All results in milligrams per liter (mg/L)

Scale = 1 : 7150
1 inch represents approximately 596 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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Prepared by: DynCorp THE ART OF TECHNOLOGY

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MAP ID: fy2k/rfca-rpt

November 14, 2000

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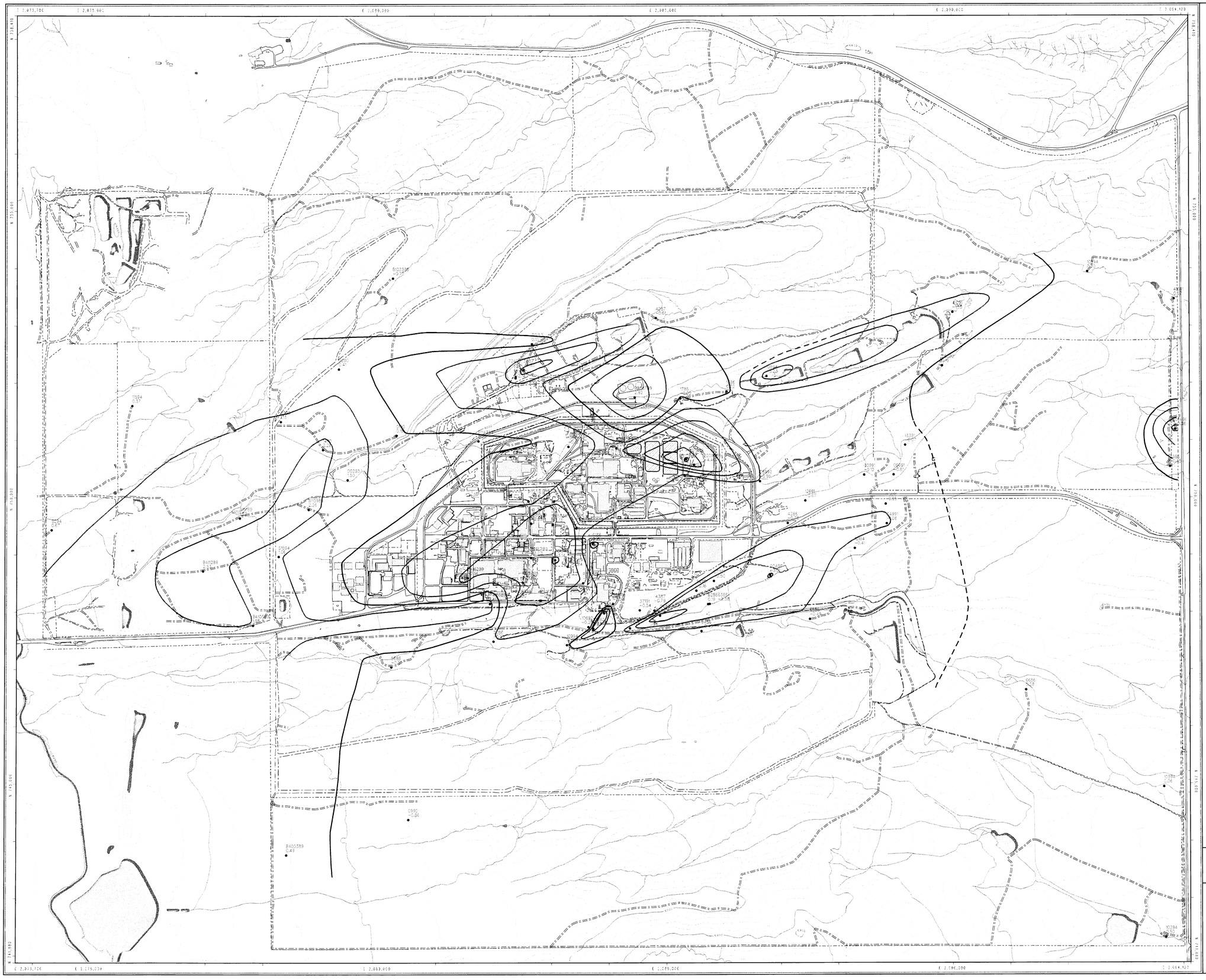

Plate 9
Water Level Change Map
1996 - 1999
Second Quarter Data

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- Groundwater Monitoring Well (with change in water level)
- 1-Foot Contour depicting Positive Change In Water Level
- 1-Foot Contour depicting Negative Change In Water Level
- 1-Foot Contour depicting Zero Change In Water Level

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95
Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~10 meter resolution. DEM post-processing performed by MK, Winter 1997.

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Scale = 1 : 7770
1 inch represents approximately 648 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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Prepared by: DynCorp THE ART OF TECHNOLOGY

Prepared for: KAISER•HILL COMPANY

MAP ID: fy2k/rfca-rpt/wat_lev_chg

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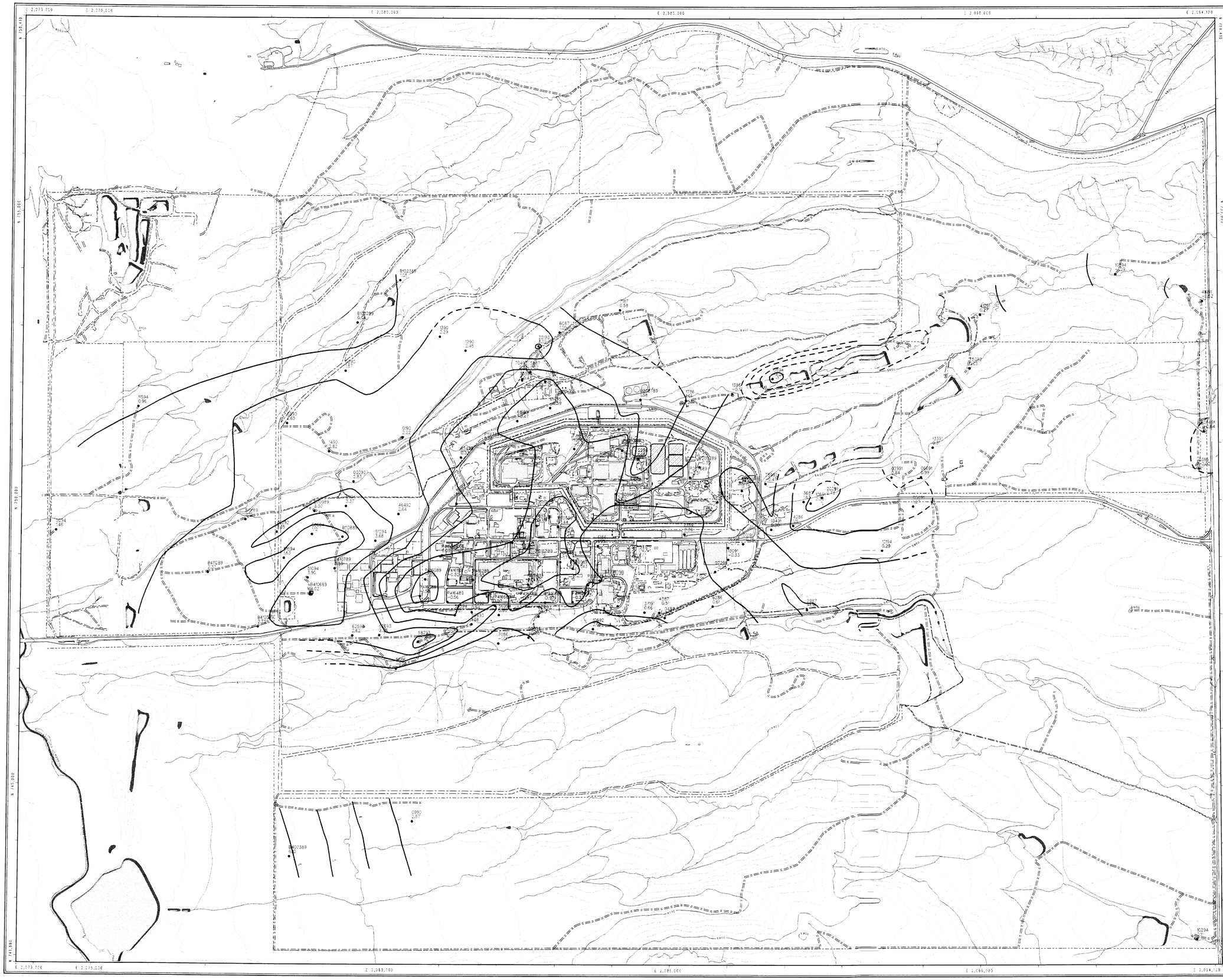

Plate 10
Water Level Change Map
1996 - 1999
Fourth Quarter Data

1999 Annual RFCA Groundwater Monitoring Report

EXPLANATION

- Groundwater Monitoring Well (with change in water level)
- 1-Foot Contour depicting Positive Change In Water Level
- 1-Foot Contour depicting Negative Change In Water Level
- 1-Foot Contour depicting Zero Change In Water Level

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Contour (20-Foot)
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:

Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the orthophotographs. 1/95

Topology (contours) were derived from digital elevation model (DEM) data by Morrison Knudson (MK) using ESRI Arc TIN and LATTICE to process the DEM data to create 5-foot contours. The DEM data was captured by the Remote Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at ~ 10 meter resolution. DEM post-processing performed by MK, Winter 1997.

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Scale = 1 : 7770
1 inch represents approximately 648 feet

500 0 1000 2000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepared by:
DynCorp
THE ART OF TECHNOLOGY

Prepared for:
KAISER•HILL COMPANY

MAP ID: fy2k/rfca-rpt/wat_lev_chg

November 15, 2000

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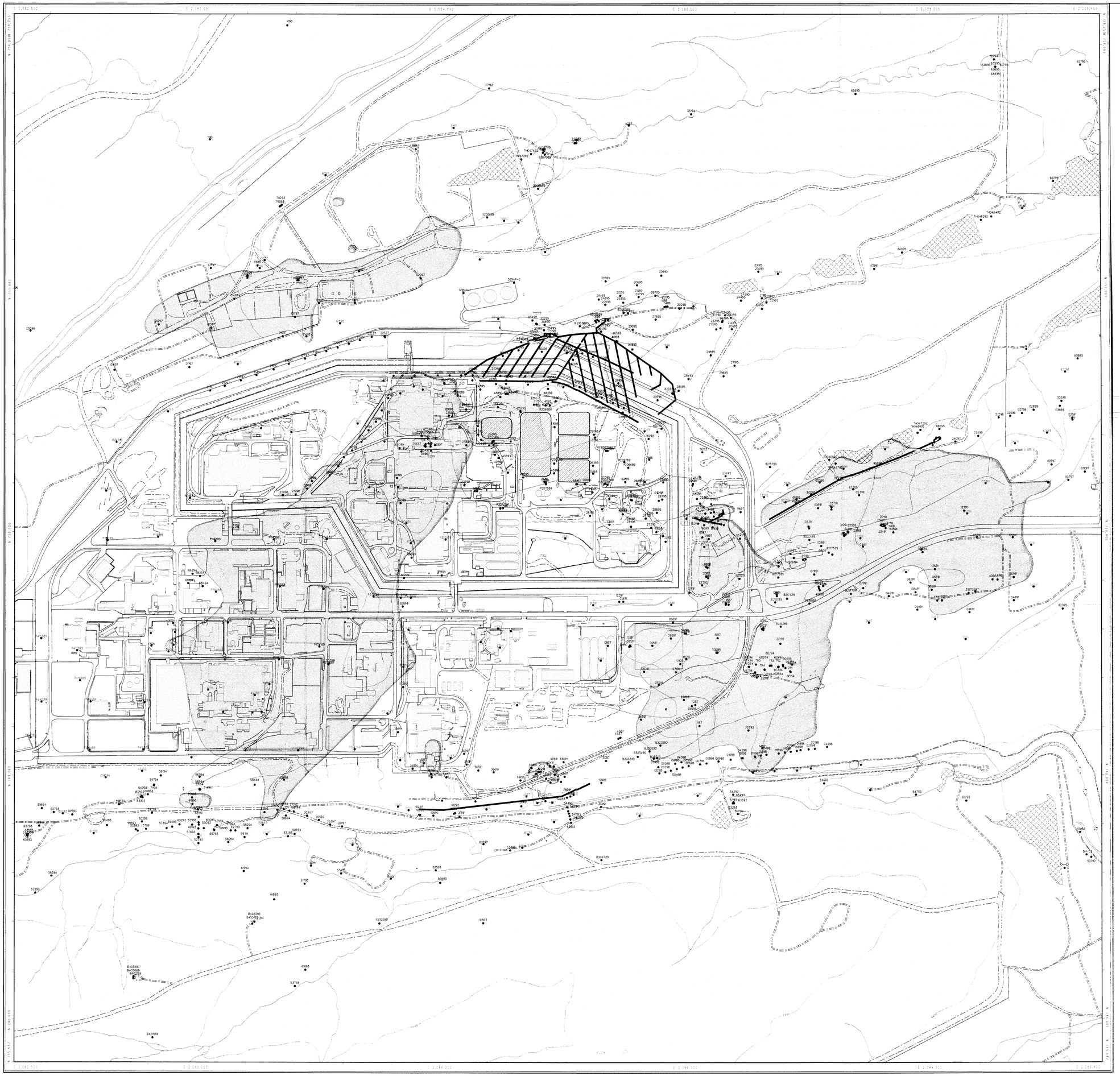

Plate 11
VOCs Composite & Nitrate Plumes Map

1999 Annual RFCA Groundwater Monitoring Report

IMP Well Type

- Water Quality Flow Monitoring
- Industrial Area Flow Monitoring
- Background Flow Monitoring
- D&D Monitoring
- Non-IMP
- 1999 Wells

Collection Trenchs

VOC Composite Plume Key

Composite VOC Groundwater Plume (concentration equal to MCL)

Composite VOC Groundwater Plume (concentration 100 times MCL)

Nitrate Plume Key

Nitrate concentration equal to or greater than 10 mg/L (as N)

Nitrate concentration equal to or greater than 1000 mg/L (as N)

Standard Map Features

Buildings and other structures

Solar Evaporation Ponds (SEP)

Lakes and ponds

Streams, ditches, or other drainage features

Fences and other barriers

Contour (20-Foot)

Paved roads

Dirt roads

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Scale = 1 : 3200
1 inch represents approximately 267 feet

250 0 500 1000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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Prepared by:

DynCorp
THE ART OF TECHNOLOGY

Prepared for:

KAISER•HILL
COMPANY

MAP ID: FY2K/RFCA-RPT/VOC_PLUME

September 27, 2000

Original map contents are preserved. Logo and date have changed.

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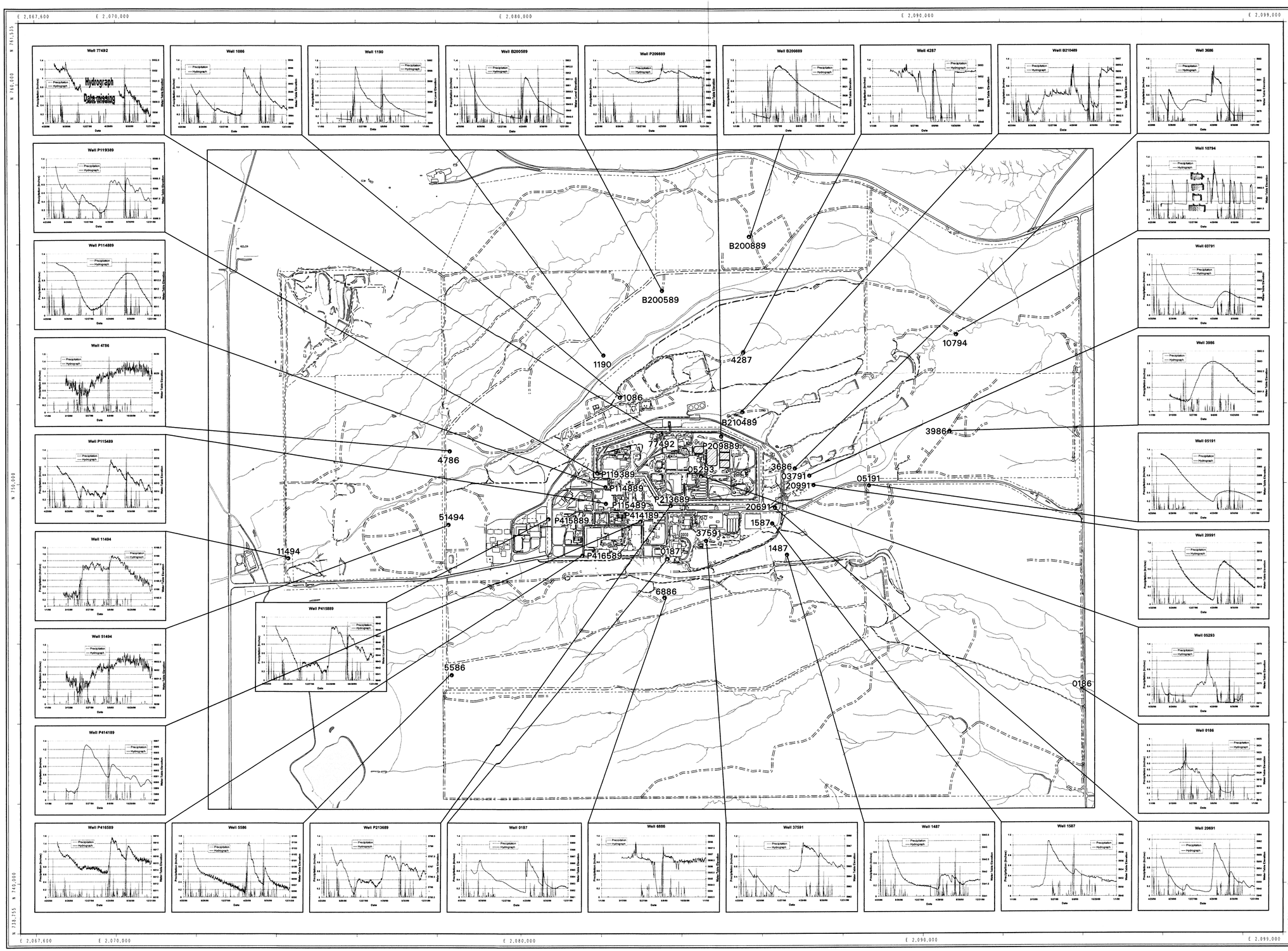

Plate 12

Real-Time Groundwater Monitoring Location Hydrographs with Precipitation Data

EXPLANATION

- Groundwater well with real time water level monitoring

Standard Map Features

- Buildings and other structures
- Solar Evaporation Ponds (SEP)
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the orthophotographs. 1/95

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MAP ID: FY2K/RFCA-RPT/REAL-TIME

September 21, 2000

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