CHARACTERIZATION OF THE UPPER AQUIFER BENEATH SMELTERVILLE FLATS WITH IMPLICATIONS FOR MITIGATION OF GROUND WATER CONTAMINATION

A Thesis

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Douglas Kunkel

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Major Professor: Roy E. Williams, Ph.D.

AUTHORIZATION TO SUBMIT

THESIS

This thesis of Douglas C. Kunkel, submitted for the degree of Master with a major in Hydrology and titled "Characterization of the Upper Aquifer Beneath Smelterville Flats With Implications for Mitigation of Ground Water Contamination," has been reviewed in final form, as indicated by the signatures and dates given below. Permission is now granted to submit final copies to the College of Graduate Studies for approval.

Major Professor Roy E. Williams Date 12/9/93
Dr. Roy E. Williams

Committee Members [signature] Date 12-13-93
Dr. Dale Ralston

A T Wallace Date 12/13th 1993
Dr. Alfred T. Wallace

Department Administrator Rolland R. Reid Date 12-13-93
Dr. Rolland R. Reid

Discipline's College Dean [signature] Date 12/13/93

Final Approval and Acceptance by the College of Graduate Studies

Jean'ne M Shreeve Date 1/27/94
Jean'ne M. Shreeve

ABSTRACT

In the early part of this century, the Smelterville Flats area near Kellogg, Idaho received mining, milling, and metallurgical wastes. Mine wastes were deposited on the flood plain or in the channel of the South Fork of the Coeur d'Alene River. In the early 1900s, a series of dams were built across the South Fork of the Coeur d'Alene River at the western end of Smelterville Flats in an attempt to control the downstream transport of mine wastes. Mine wastes and other sediments were deposited behind this dam. The site, known as Smelterville Flats, is the largest uncontrolled deposit of mining wastes that remains in the South Fork of the Coeur d'Alene River Valley.

Water levels and water quality samples were collected from existing monitoring wells within the Smelterville Flats study area. A more intensive study was conducted on a small sub-area of the Smelterville Flats study area known as the Bureau of Land Management (BLM) sub-area. Ten sets of piezometers were installed to monitor water quality and water levels in the upper aquifer beneath Smelterville Flats in the BLM sub-area. A pumping well and observation wells were installed in the BLM sub-area in order to conduct a pumping test in the upper aquifer to determine aquifer coefficients. Ground water level gradients in the study area indicate that the ground water flow direction is from east to west, following the general gradient of the valley of the South Fork of the Coeur d'Alene River. Water levels also indicate that the South Fork of the Coeur d'Alene River is a losing stream in the east end of the study area and a gaining stream in the west end of the study area.

Shallower monitoring wells in the upper aquifer within the BLM sub-area consistently had higher concentration of ions associated with mining wastes than deeper monitoring wells installed in the same aquifer at the same location.

Oxidation of the mine wastes may occur in the unsaturated zone in the presence of oxygen, or in the presence of oxygen and water if the film of water is thin enough to allow the diffusion of oxygen to the reaction sites. The thin layer of water surrounding the wastes may become a concentrated solution of soluble reaction products. Infiltration of precipitation, and rises in ground water levels flush and transport the soluble reaction products from the reaction sites on the wastes into the shallow ground water system. The oxidation products are removed from the reaction sites, thereby producing fresh reaction sites for the next influx of oxygen. The reaction products may then be transported by the ground water flow system, which ultimately discharges to the South Fork of the Coeur d'Alene River at the western end of Smelterville Flats. Based on the data collected, potential mitigative measures were evaluated and analyzed in order to minimize the adverse long-term effects of mine waste on the ground water and surface water systems. Potential mitigative measures that are evaluated include treatment of the shallow aquifer water, elimination or reduction of ground water flow through the shallow aquifer, removal of the major sources of metal ions, and no action. The continuation of research to identify or develop a mechanism to extract marketable metals from the wastes on Smelterville Flats appears to constitute the most appropriate course of action.

ACKNOWLEDGEMENTS

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INTRODUCTION

Statement of the Problem

Mine wastes were deposited on the flood plain of the South Fork of the Coeur d'Alene River in northern Idaho during the late nineteenth century and the first half of this century. Early mine wastes were in the form of jig tailings until about 1928 (Norton, 1980). Jig tailings are the remnants of ore and country rock left after use of a gravity separation process which extracted only galena, an ore of lead. The tailings included sphalerite, pyrite, and other metal ores whose specific gravity was not sufficiently high to be separated from the gangue. Lead assays for typical jig tailings were 0.90 to 1.5 percent; the jigging removed only the heaviest ores (Mink, 1972). Beginning in 1916, a flotation process was implemented to separate ore from gangue materials. This process completely replaced the jigging method by about 1928. In this process, ore is crushed in jaw crushers then ground to about 200 mesh in ball mills. The powdered ore is then mixed with water to form a slurry. Chemicals which bind with the metal ion to be recovered are added to the slurry which is beaten to a froth in which valuable ore minerals cling to the bubbles of the froth. The froth is then skimmed off and sent to thickeners where the ore settles before being filtered into the final concentrate (Norton, 1980). This process is repeated for each metal to be extracted with the remaining pulp discharged as tailings (Mink, 1972). The flotation process is a much more complete extraction method, extracting not just galena but other ores of economic importance. Metals such as antimony, copper, lead, silver, iron, and zinc still remain in the waste material but the lead, zinc, and silver will be in lower concentrations than in jig tailings.

Prior to 1968, most of the tailings were dumped onto the flood plain or directly into the South Fork of the Coeur d'Alene River or its tributaries. Mine wastes were washed downstream, all the way to Coeur d'Alene Lake. The water quality of the river was severely degraded by these early practices. In 1910, pressure from downstream water users, who were complaining about dead or dying livestock, caused the mining companies to build a dam at the west end of the floodplain of the South Fork of the Coeur d'Alene River at Smelterville Flats. The dam allowed much of the tailings to settle out onto the valley floor before the water was then discharged to the stream. In 1920 and again in 1933, the dam was washed out by spring runoff (Norton, 1980). After 1933 the dam was never rebuilt, thereby allowing the river to rework the tailings deposits and mix them with native river alluvium (Norton, 1980). In the 1940s the mine waste deposits were mined on portions of the valley floor where ore concentrations made this economical; however, on Smelterville Flats, the mining of these deposits was incomplete due to the high degree of heterogeneity caused by mixing with river alluvium (Norton, 1980).

The waste deposits in the river channel, on the floodplains, and in the lake pose physical, chemical and biological problems. Wind and river erosion continue to rework and expose the wastes to river channel and floodplain environments. The chemical problems are complex, involving acid formation with the consequent leaching of heavy metals into both the ground water and surface water systems. Ground water from the upper aquifer beneath Smelterville Flats discharges directly into the South Fork of the Coeur d'Alene River. Surface water studies by Mink (1971) and Calcott (1989) show that the ground water discharging at the western end of Smelterville Flats is coincident with the location of the greatest increase in metal ion concentration along the flow path of the South Fork of the Coeur d'Alene River. It has been concluded by Mink (1971) and Calcott (1989) that the ground water discharge contributes a significant amount of metal ions to the river. A better understanding of the processes that control the transport of poor quality water in the upper aquifer is needed to evaluated alternative mitigative measures.

Purpose and Objectives

The purpose of this study is to gain a better understanding of the hydrogeology and hydrochemistry of the upper aquifer underlying Smelterville Flats. The general objectives of the study are to collect and analyze hydrologic and hydrochemical data in order to delineate a conceptual model of the upper aquifer as an aid to the evaluation of possible mitigative measures.

The specific objectives of this study are as follows:

- Review all existing literature pertaining to the hydrogeology or hydrochemistry of the Smelterville Flats study area.

- Design and install a piezometer network to study changes in water quality due to fluctuations in the ground water levels and recharge events.

- Collect water level data from piezometers in Smelterville Flats and create hydrographs and water level contour maps.

- Collect and analyze water samples from piezometers in Smelterville Flats

- Perform and analyze an aquifer test in the upper aquifer underlying Smelterville Flats.

- Define the hydrologic framework of the upper aquifer as an aid to developing alternative mitigative measures for the ground water contamination problem.

- Select and assess alternative procedures for the mitigation of ground water and surface water degradation in the Smelterville Flats area.

Previous Investigations

Beginning in December of 1968, a program was started by the University of Idaho, Federal agencies and private companies to study the water quality of the Coeur d'Alene River. A study conducted by Mink (1971) showed that in some parts of the South Fork of the Coeur d'Alene River the concentration of cadmium and zinc exceeded the toxic limits for fish. Concentrations of other elements were slightly higher or comparable to the concentrations in the Coeur d'Alene River above the confluence with the South Fork. Water quality data clearly indicate two sources of contamination with a third source occurring during high flow in the South Fork of the Coeur d'Alene River. Two sources of contamination which occur during both low and high flow are: 1) Canyon Creek near Wallace; and 2) the South Fork of the Coeur d'Alene River east of Smelterville. The third source, which is thought to contribute contaminants during high flow is believed to be jig and flotation tailings that had been deposited on the valley floor of the South Fork and its tributaries in the early part of the century (Mink, 1971, p. 23-26).

Tailings ponds were constructed by mining companies beginning in 1968 in a attempt to improve water quality in the South Fork of the Coeur d'Alene River. Mink (1972) noted that because the tailings ponds receive effluent from sources other than ore concentrating processes, several elements were not effectively removed by the tailings ponds. Mink (1972) speculated that the elements that were not removed from the water passing through the tailings ponds could pose a health risk to the Coeur d'Alene mining district.

Galbraith (1971) determined that ground water passing through mine wastes could leach heavy metals, especially when aided by the action of microorganisms. Plants growing over areas of mixed tailings and river alluvium accumulate heavy metals in their cells. When these contaminated plants are ingested by herbivores, metal poisoning and even death may result. Redtop (Argrostis alba), a grass which is common in the mine waste alluvium mix, was found to accumulate lead, zinc, manganese, silver, iron, copper, and magnesium from the soil and ground water. Galbraith (1971) stated that some animals grazing on this redtop demonstrated symptoms of metal poisoning. This observation was verified when the bone marrow of a horse diagnosed as having lead poisoning was shown to have abnormally high concentrations of lead (Galbraith, 1971, p. 90-123).

Reece (1974) conducted research studying the leaching of metal-rich sediments in the Coeur d'Alene River and the possible use of sulfuric acid leaching to recover heavy metals from the mine waste contaminated sediments. He also studied the formation of acid mine water in the Bunker Hill mine.

Norbeck (1974) undertook a field study to map the distribution of alluvial mine waste in the South Fork of the Coeur d'Alene River valley. Aerial photos and field observations were used in the mapping process. The alluvial thickness was evaluated using well logs, depth soundings, electrical resistivity, and seismic refraction. An estimation of zinc mass transport through the valley alluvium was made based on water quality samples from a Bunker Hill Company well. A value of 3,330 pounds of zinc per day at a total flow rate of 3,250,000 gallons per day during the month of August, 1971 was obtained using Darcy's Law (150 kilograms of zinc at a total flow of 1,300,000 liters per day) (Norbeck, 1974, p. 1-40). A water level contour map was drawn based on 88 water level measurements throughout the valley. this number is wrong; see Norbeck p40

Trexler and others (1975) studied the hydrogeology associated with the production of acid mine drainage in the Bunker Hill mine. Trexler concluded that the rate of production of acid mine drainage depends upon the oxygen concentration, presence of water vapor, and the availability of pyrite and other heavy metal minerals. The role of water as a liquid is to flush oxidation products and transport them through the mine.

Marcy (1979) studied the chemistry of tailings deposits in the Smelterville Flats area and their impact on the South Fork of the Coeur d'Alene River. He documented the mechanisms of pyrite oxidation and acid water production and the impact that they have on the quality of the ground water on the flats. Chemical analyses of various sediments on Smelterville Flats showed high concentrations of lead and zinc in red sandy material and gray silty material. Marcy found no correlation between the physical appearance of sediments and metal concentrations. Marcy proposed that oxidation of mine waste material occurs mainly during the dry season such as the summer and early winter when oxygen can reach the sediments. When winter and spring rains arrive the reaction sites are flushed as the water moves downward through the sediments. If the oxidation sites are within the region alternately flooded or aerated owing to seasonal change in water levels, the reaction products can be removed directly by the ground water (Marcy, 1979). In either case, the oxidation products are removed from the reaction sites, producing fresh sites for the next influx of oxygen (Marcy, 1979).

Norton (1980) installed a piezometer network on Smelterville Flats to study the hydrogeology and hydrochemistry of the ground water system. He also sampled surface water and analyzed soil profiles from shallow pits and auger holes. Norton concluded that the lower limit of the mine wastes in the Smelterville Flats study area is the top of the river gravel, which is generally between five and ten feet below the surface. Norton noted that a "zone of concentration" of metals is present in the soil of the Smelterville Flats study area. This zone was exhibited by elevated metallic ion concentrations in most of the size fractions and extends six feet below the land surface (Norton, 1980). Norton found that ground water flow in the upper aquifer is from east to west with discharge to the South Fork of the Coeur d'Alene River occurring in the western portion of Smelterville Flats. Based on chemical analyses of ground water samples from piezometers installed on Smelterville Flats, Norton concluded that the mineralogical character of the material around individual piezometer screens is the predominant influence affecting ground water quality at any particular piezometer. Norton concluded that the amount of zinc transported by the upper aquifer and discharged into the South Fork of the Coeur d'Alene River is 0.61 percent of the total zinc transported by the river at low flow. During high flow the percentage is even less (0.14 percent).

Calcott (1989) repeated Mink's 1971 study of the chemistry of the water in the South Fork of the Coeur d'Alene River. Calcott concluded that the most significant sources of metal ions entering the river are ground water discharges along the banks of the South Fork of the Coeur d'Alene River at the western end of Smelterville Flats. A statistical comparison between Calcott's data set and Mink's data set showed no significant differences, indicating that water quality, exclusive of sediment load, has not changed significantly in the 20 years between studies.

Adams (1989) studied the hydraulic properties of the lower confined aquifer and the clay layer separating the upper and lower aquifers beneath Smelterville Flats. Results of two large-scale pumping test of the lower aquifer showed that the lower aquifer is highly transmissive and responds quickly to recharge events. Hydrographs from multi-level piezometers show a strong upward gradient in the lower aquifer and in the confining layer at the site of the piezometers. The gradient in the lower aquifer was consistently upward throughout the study period.

Swope (1990) performed a water level and water quality investigation in the BLM sub-area of Smelterville Flats. Swope attempted to determine a correlation between zinc concentrations and the field parameters pH and electrical conductivity. Swope determined an overall positive correlation between zinc concentrations and electrical conductivity collectively; well by well the correlation is not consistent. Swope determined that zinc correlates negatively with pH in the deeper wells but the relationship is inconclusive in the shallow wells.

DESCRIPTION OF THE SMELTERVILLE FLATS STUDY AREA

Introduction

Smelterville Flats was chosen as the study area for this investigation for several reasons. This site is the largest uncontrolled deposit of mine and mill wastes in the South Fork of the Coeur d'Alene River valley. The area contains wastes in the form of jig tailings and flotation tailings representing two distinct periods of concentrating processes. Drilling logs, hydrographs, soil analyses and water quality analyses already existed for this area. The Bunker Hill Company and the Bureau of Land Management (BLM) own all of the land on which the study was conducted, and permission to conduct research was obtained from both parties.

Location

The Smelterville Flats study area is contained within the Coeur d'Alene River basin which lies in the Coeur d'Alene Mountains in northern Idaho (Figure 1). These mountains are part of the metamorphic and igneous Bitterroot Range of the Northern Rocky Mountains. The Bitterroot Range is itself a northward extension of the Rocky Mountain massif. Generally, the terrain of the basin is rugged with narrow valleys cut in a dendritic pattern into the steep hillsides.

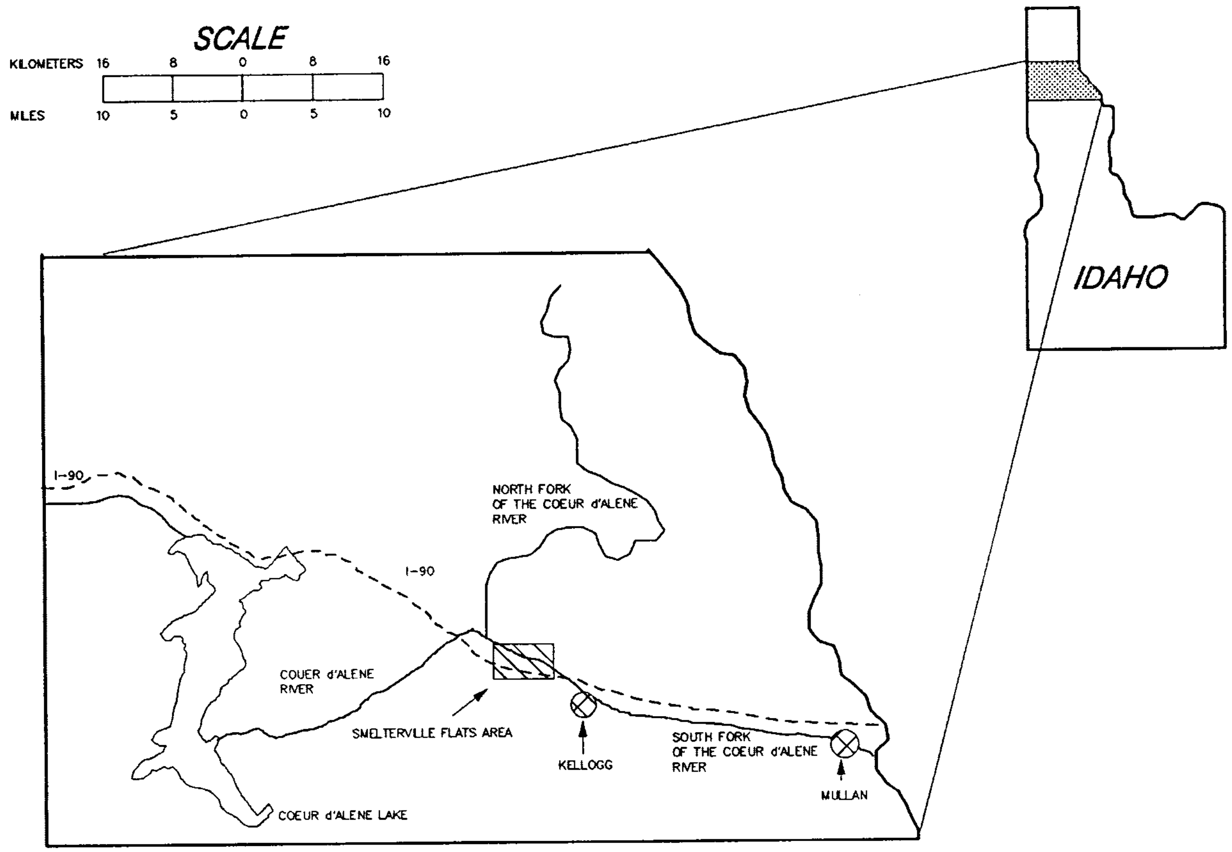

Figure 1. Location of Smelterville Flats study area within northern Idaho.

The Smelterville Flats study area lies on the flood plain of the South Fork of the Coeur d'Alene River north of the town of Smelterville, Idaho. The flood plain ranges in width from about 0.1 miles east of Kellogg to approximately 0.9 miles near Smelterville (CH2M HILL, 1989). The elevation of the valley floor ranges from 2160 feet at the west end of the valley to 2320 feet at the east end of the valley (CH2M HILL, 1989). Rich ore deposits of the Coeur d'Alene mining district, also known as the Silver Valley, are located within this basin.

Boundaries of the Smelterville Flats study area are shown in Figure 2. Study area boundaries were chosen to include existing piezometers in the upper aquifer and include the land administered by the Bureau of Land Management (BLM) where piezometers were installed during this study.

There are several uses of the study area in addition to research. The Shoshone County airport is bounded by the study area and receives moderate use. A motorcycle race track is located on the 30 acre tract of land owned by the BLM within the study area (Figure 2). The motorcycle track is not maintained, and owing to dust problems receives little use. Interstate 90 (I-90) runs through the study area south of Smelterville Flats. I-90 is built on what was once part of the uncontrolled tailings disposal area. The controlled tailing piles from the Page mine are shown in Figure 2. The Page tailings piles are now used as the site of a sewage lagoon. Discharge from the sewage lagoon is piped under Interstate 90 and enters the South Fork of the Coeur d'Alene River at the west end of Smelterville Flats.

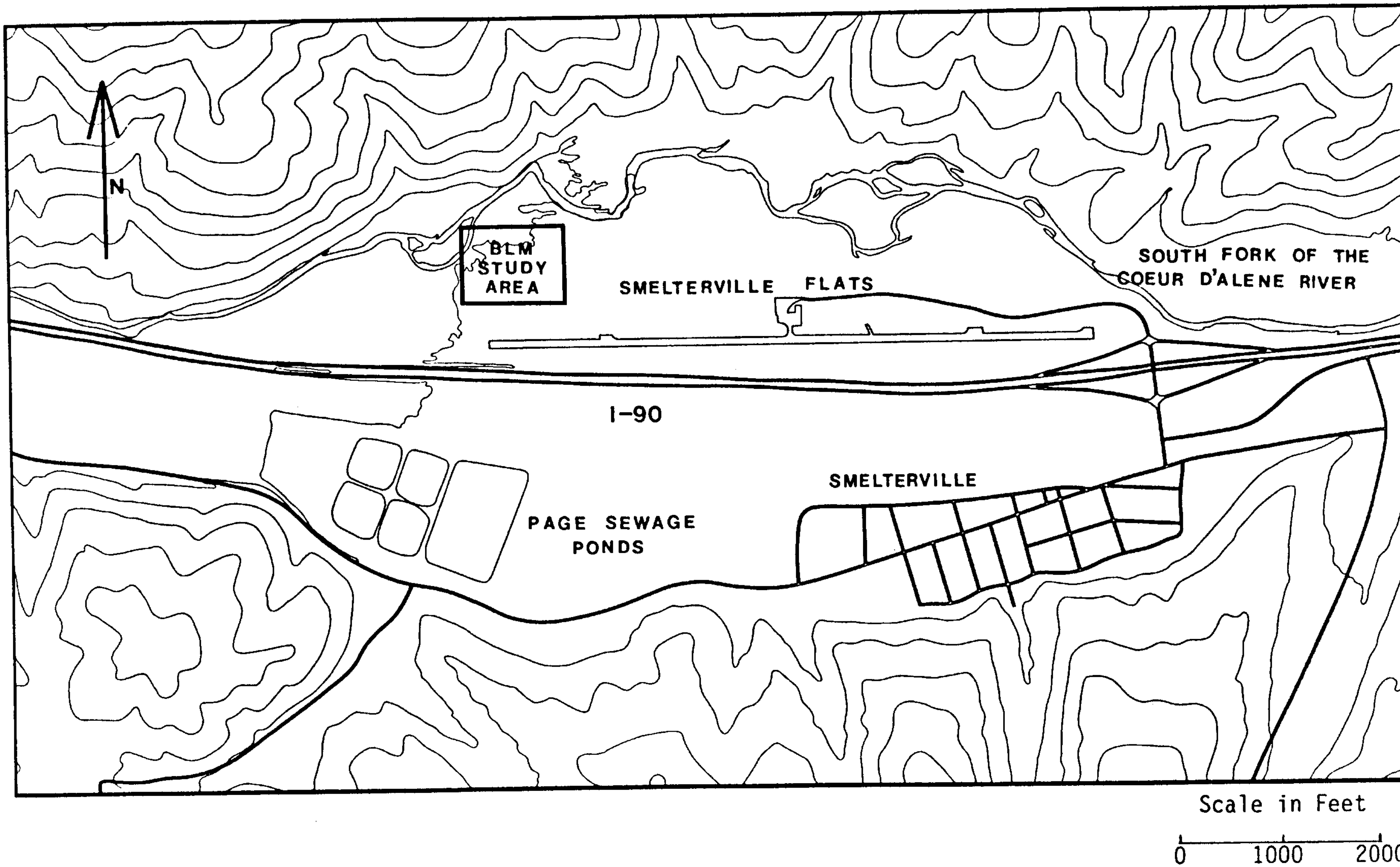

Figure 2. Location of study area within the Smelterville Flats area.

Little topographic relief exists on the site other than steep river banks where the South Fork of the Coeur d'Alene River has cut through the tailings deposits on the flats. At the east end of Smelterville Flats, tailings have been eroded away by floods of the South Fork of the Coeur d'Alene River.

Two ponds are present throughout much of the year on Smelterville Flats. Both ponds are expressions of the ground water table and rise and fall according to ground water levels. Localized surface ponding which is not an expression of the water table occurs at several locations due to precipitation and snow melt events. The importance of localized ponding to the chemistry of the ground water is discussed in a later section.

Climate

The climate of the Coeur d'Alene River valley is designated as "highland climate" under Trewarth's variation of the Koppen climatic classification (Gedzelman, 1980). The area is dominated by mountain-valley climatic influences such as upvalley-downvalley wind patterns. Average annual precipitation at Kellogg is 30.4 inches (National Weather Service, 1985) with a maximum of 47.6 inches and a minimum of 17.4 inches. An average of 70 percent of the annual precipitation at Kellogg occurs from October to April, mostly in the form of snow. Snow may persist until early summer in the higher elevations in the basin. The annual mean temperature in Kellogg is 47.2°F based on data from the weather stations maintained by the National Weather Service from 1951 to 1980. A record high of 111° F was reached on August 5, 1961, and a record low of

-36°F was reached on December 30, 1968. On the average, 28 days per year reach a maximum temperature of 90° F or greater. An average of 143 days reached a minimum of 32° F or lower (CH2M HILL, 1989).

Winds in the valley are dominated by the mountain valley topography of the region, resulting in a predominantly upvalley-downvalley flow regime. Early morning wind patterns are commonly east to west, following the long axis of the valley. Ground heating of the valley floor and mountain slopes causes a mid- to late-morning reversal of the wind pattern that is stronger than the early morning downvalley wind. When sediments on the Smelterville Flats are dry, the afternoon west to east wind often carries dust contaminated with heavy metals from the west end of Smelterville Flats toward Smelterville and Kellogg.

GEOLOGY

Bedrock

The Coeur d'Alene district is underlain by the Belt Series rocks of Precambrian age. The Belt is a slightly metamorphosed thick sequence of fine-grained sedimentary rocks originally deposited in a middle Proterozoic geosyncline (Hobbs and others, 1965). The bedrock has a very low saturated hydraulic conductivity where it is sound (Trexler and others, 1975). Fractures and faults in many locations increase the saturated hydraulic conductivity along preferential pathways (Levens, personal communication, 1989). Bedrock geology is not considered to be important to the hydrogeology of the upper aquifer at Smelterville Flats except where it acts as a boundary along the edges of the aquifer.

Unconsolidated Sediments

Three major layers of unconsolidated sediments occur above the bedrock in the vicinity of the Smelterville Flats study area. A generalized cross section of the geology beneath Smelterville Flats is presented in Figure 3. Beginning with the bottom layer, these three layers are; the lower confined aquifer, the clay aquitard, and the upper unconfined aquifer. The unconsolidated sediments underlying Smelterville Flats were deposited during at least three separate depositional events.

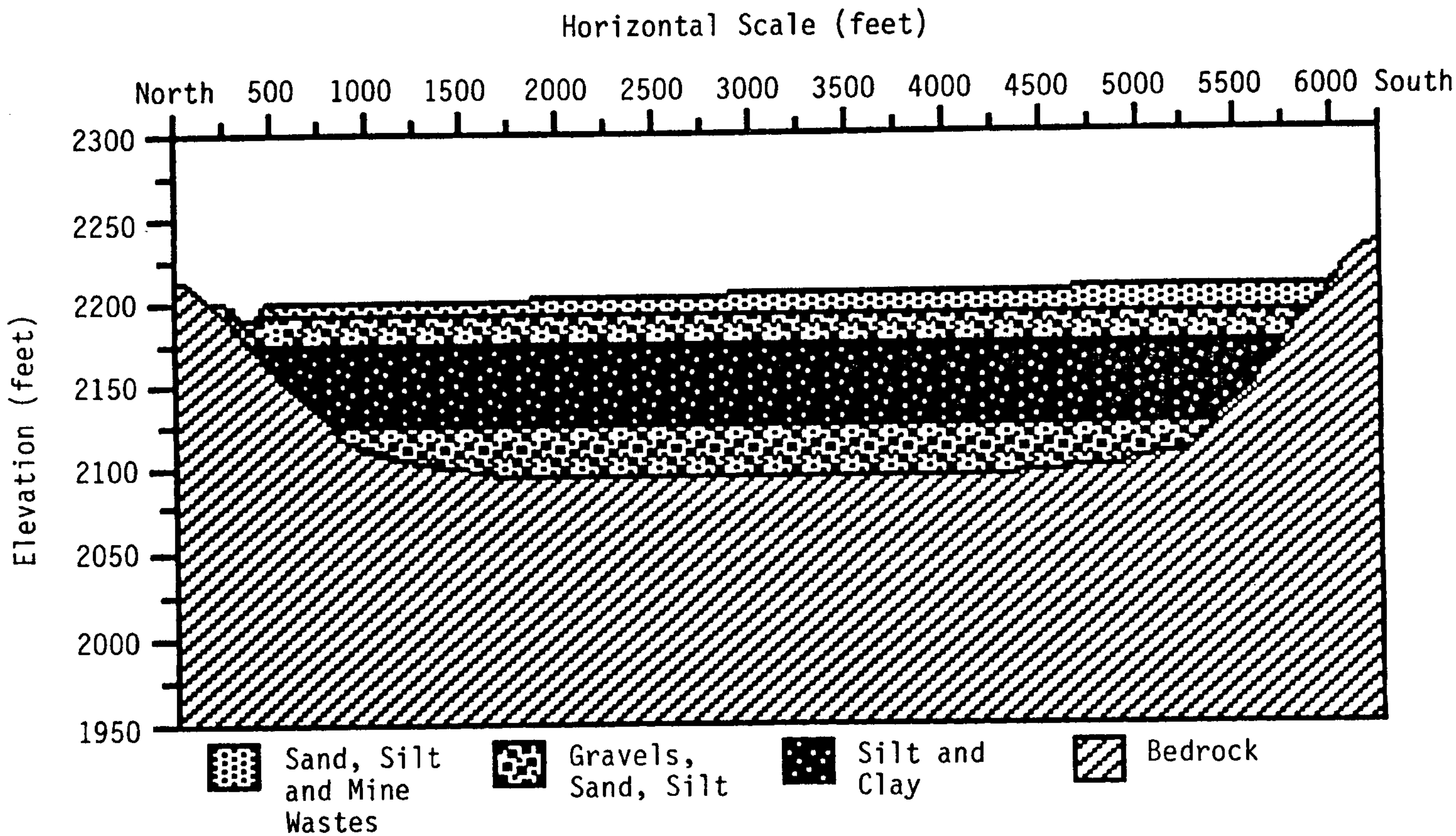

Figure 3 Generalized north-south cross section of the South Fork of the Coeur d'Alene River valley at the Smelterville Flats study area near Kellogg, Idaho.

Prior to basalt flows of the middle Tertiary, the channel of the Coeur d'Alene River was incised to a depth comparable to the present (Norton, 1980). During the middle Tertiary the Coeur d'Alene River was dammed by the Columbia River Basalt near the Idaho-Washington border causing deposits of alluvial material behind the basalt dam to thicknesses of up to 1,100 feet (Hobbs and others, 1965). Streams flowing toward the west cut through the basalt dam and eroded most of the gravel deposited behind the dam (Norton, 1980).

During the Pleistocene, advancing lobes of the Cordilleran ice sheet dammed the Coeur d'Alene River near the present town of Coeur d'Alene, Idaho. The ice dam created a large lake that formed backwaters extending nearly to the present town of Wallace, Idaho. Streams discharged and deposited their sediment load into the ice-dammed lake. The lacustrine deposits in the vicinity of Smelterville Flats consist of approximately 50 feet of silt and clay covering a layer of Tertiary gravel. As the Cordilleran ice sheet retreated northward due to a warming trend, the ice dam failed and allowed the South Fork of the Coeur d'Alene River to cut a channel into but not through the silt and clay layer. During the Wisconsin period of glaciation, large amounts of sediments were deposited when the valley glaciers melted (Norton, 1980). Glacial sediments consisting of silt, sand, gravel, and cobbles were carried downstream, covering the valley floor and forming the upper aquifer. The eastern part of the valley floor is covered with coarser sediments because it was closer to the headwaters. Finer sediments cover the western part of the valley (Ioannou, 1979).

Throughout most of the mining history of the Silver Valley, mining wastes were discharged onto the floodplains of the South Fork of the Coeur d'Alene River or into its tributaries. The river carried large quantities of mining wastes along with natural river sediments and redeposited them downstream. A dam was built across the South Fork of the Coeur d'Alene River at the west end of Smelterville Flats in the early 1900s in an attempt to limit the downstream migration of mine wastes. Norton (1980) reported that the first dam was constructed in 1901. This dam was washed out once, rebuilt, and remained in operation until May, 1933, when a major flood destroyed the dam. Large quantities of waste from mining companies upstream of the Smelterville Flats area settled out of the pond formed behind the dam. As would be expected, after the dam was destroyed in 1933, the South Fork of the Coeur d'Alene River began reworking the unconsolidated mining waste material.

Mining wastes, especially the jig tailings, contain an appreciable concentration of metals. In the 1940s the wastes were reworked for zinc in some places where the accumulations were thick and rich enough to be profitable. Because only the richest deposits of mine wastes were removed in the surface mining operation, much of the remaining lower grade mine waste was disturbed and mixed with native alluvium (Ioannou, 1979).

Erosion of river banks and meandering of the river have also reworked, transported, and mixed the tailings with natural alluvium throughout much of the study area. Consequently, the top five to seven feet of the upper aquifer are a heterogeneous mix of river alluvium and lenses of finer-grained mine and mill wastes.

METHOD OF STUDY

Several avenues of study were pursued in order to evaluate conceptual models of the hydrogeology and hydrochemistry of the upper aquifer beneath Smelterville Flats.

Soil samples were collected and logged during the drilling of 20 piezometers and two wells within the BLM sub-area on Smelterville Flats. Soil samples and drill hole logs were used to construct lithologic logs and sections and aid in the formulation of a conceptual model of the upper aquifer. Lithologic logs were used to evaluate the thickness and lateral extent of mine wastes in and above the upper aquifer.

Water samples were taken over a period of 16 months in an attempt to characterize the temporal and spatial patterns of water quality in the upper aquifer. Water-level data from piezometers were used to create hydrographs and water table contour maps. Water-level data also were used to document spatial and temporal trends and to evaluate whether a gradient, either upward or downward, exists in the upper aquifer. The relationship of the upper aquifer to the South Fork of the Coeur d'Alene River was evaluated using water level data. Water samples were collected from piezometers in the BLM sub-area in order to evaluate upper aquifer water quality and the temporal and spatial distribution of elevated metal ion concentrations in the ground water. An aquifer test was conducted in the BLM sub-area in order to evaluate the hydraulic coefficients within that portion of the upper aquifer. Hydraulic coefficients, water levels, soil analyses, and water quality data were used to formulate a conceptual model of the hydrochemistry and hydrogeology in the upper aquifer underlying Smelterville Flats. This conceptual model was then used to evaluate the viability of various mitigative measures for the upper aquifer beneath Smelterville Flats.

Piezometer and Well Installation

Purpose and Design

Piezometers and wells were installed in the upper aquifer within the BLM sub-area in order to facilitate hydrogeologic and hydrochemical data collection. One fully-penetrating, fully-screened, pumping well and one fully-penetrating, fully-screened observation well were installed in the upper aquifer within the BLM sub-area. These wells were installed so that a pumping test of the upper aquifer, considering the delayed yield response as presented in Neuman (1972), could be performed.

Pairs of piezometers, one shallow and one deep, were installed in the upper aquifer at ten locations within the BLM sub-area (Figure 4). The shallow piezometers are screened over a two-foot interval, approximately five to seven feet below the surface. The deeper piezometers are screened over a two-foot interval, approximately 22 to 24 feet below the surface. The pairs of piezometers serve the purpose of water level collection sites, water sample collection sites, and observation wells during aquifer tests.

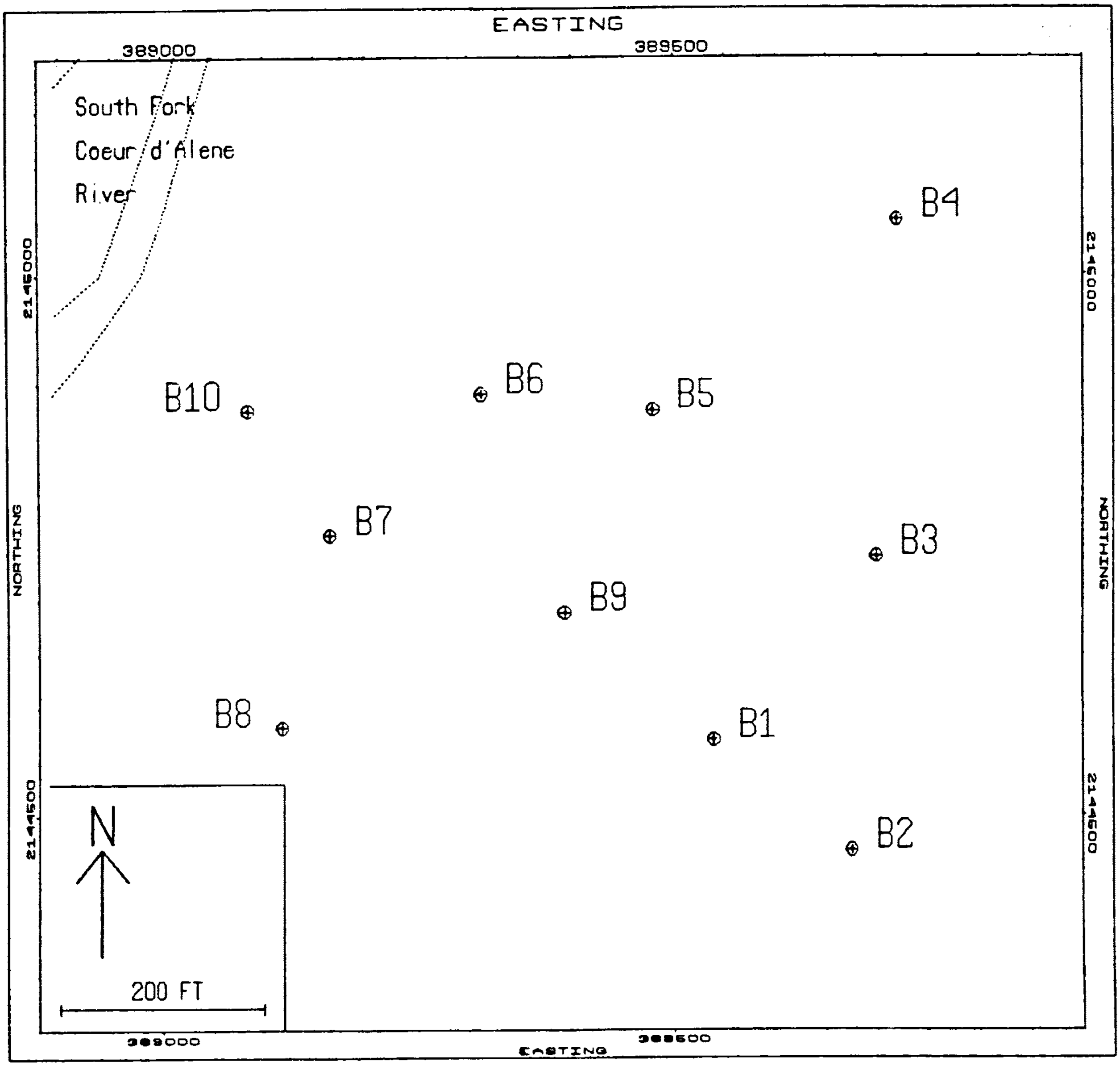

Figure 4. Locations of upper aquifer piezometers within the BLM study area on Smelterville Flats.

In addition to the piezometers and wells installed in the BLM sub-area during this study, piezometers installed by Norton (1980) were used for water level and quality sample collection points (Figure 5). Each of Norton's piezometer locations contains a pair of piezometers, one screened over a one-foot interval at approximately 12 to 17 feet below the surface, and one screened over a one-foot interval at a depth of approximately 20 feet below ground surface. Piezometer location 6Y contains an additional piezometer screened 50 feet below the surface. Piezometer location 8Y contains only one piezometer screened over a one-foot interval at a depth of 12 feet below the surface.

Piezometer Location

Locations of the pumping well, the fully-penetrating, fully-screened observation well, and the paired piezometers within the BLM sub-area are shown in Figure 4. Piezometer locations were selected using the following criteria: 1) sample a large enough portion of the sub-area to account for heterogeneities in the aquifer; 2) remain within the BLM property; and 3) chose sites accessible to drilling rigs.

The Neuman (1972) pumping test analysis of an unconfined aquifer considering delayed yield was used as a model for the design and location of the fully-screened, fully-penetrating pumping and observation wells. The observation well was installed 50 feet north of the pumping well installed by Adams (1989) so that it could be used in a ratio method test of the lower aquifer as well as in the test of the upper aquifer. The pumping well was installed 100 feet north of the observation well as shown in Figure 5.

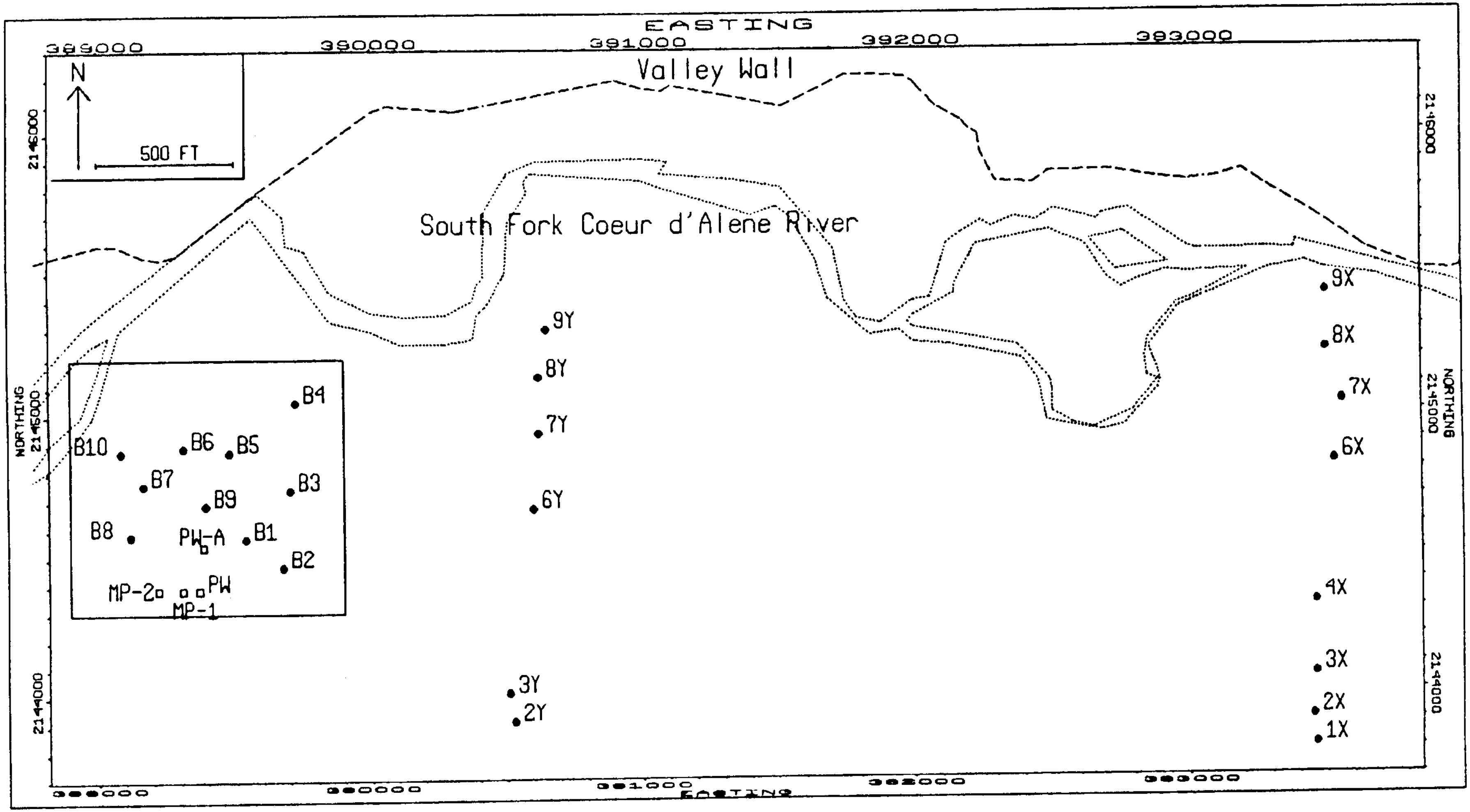

Figure 5. Locations of Norton's piezometers and the BLM study area piezometers on Smelterville Flats.

As is discussed in a later section, the 100-foot distance between the pumping well and observation well is too great to detect a delayed yield response at the pumping rate used during the pumping test of the upper aquifer.

Norton's piezometers are located in two lines trending south to north on Smelterville Flats as shown on Figure 5. The eastern line of piezometers is known as the "X" line and the western line of piezometers is known as the "Y" line.

Sediment Samples

Sediment samples were collected while drilling boreholes for the installation of 20 piezometers, one pumping well, and one observation well in the upper aquifer within the BLM sub-area. A 6.5-inch inside diameter (ID) hollow stem auger was used to drill all of the boreholes except the pumping well. An air rotary rig equipped with a 10-inch bit and casing hammer was used to drill the borehole for the pumping well. Sediment samples were collected by driving 2.5-inch ID split-spoon sample tubes ahead of the auger bit every five feet and at all changes in lithology. Grab samples of auger returns were logged and noted but not archived. All split-spoon samples were logged, labeled, and stored in sealed plastic bags. Changes in drilling rate were noted. From the surface to a depth of approximately two to three feet, the upper aquifer is composed of rust-colored, medium-grained, angular to subangular solid wastes as shown in Figure 6. Sticks, roots, pieces of wood, and other organic debris are present in this layer.

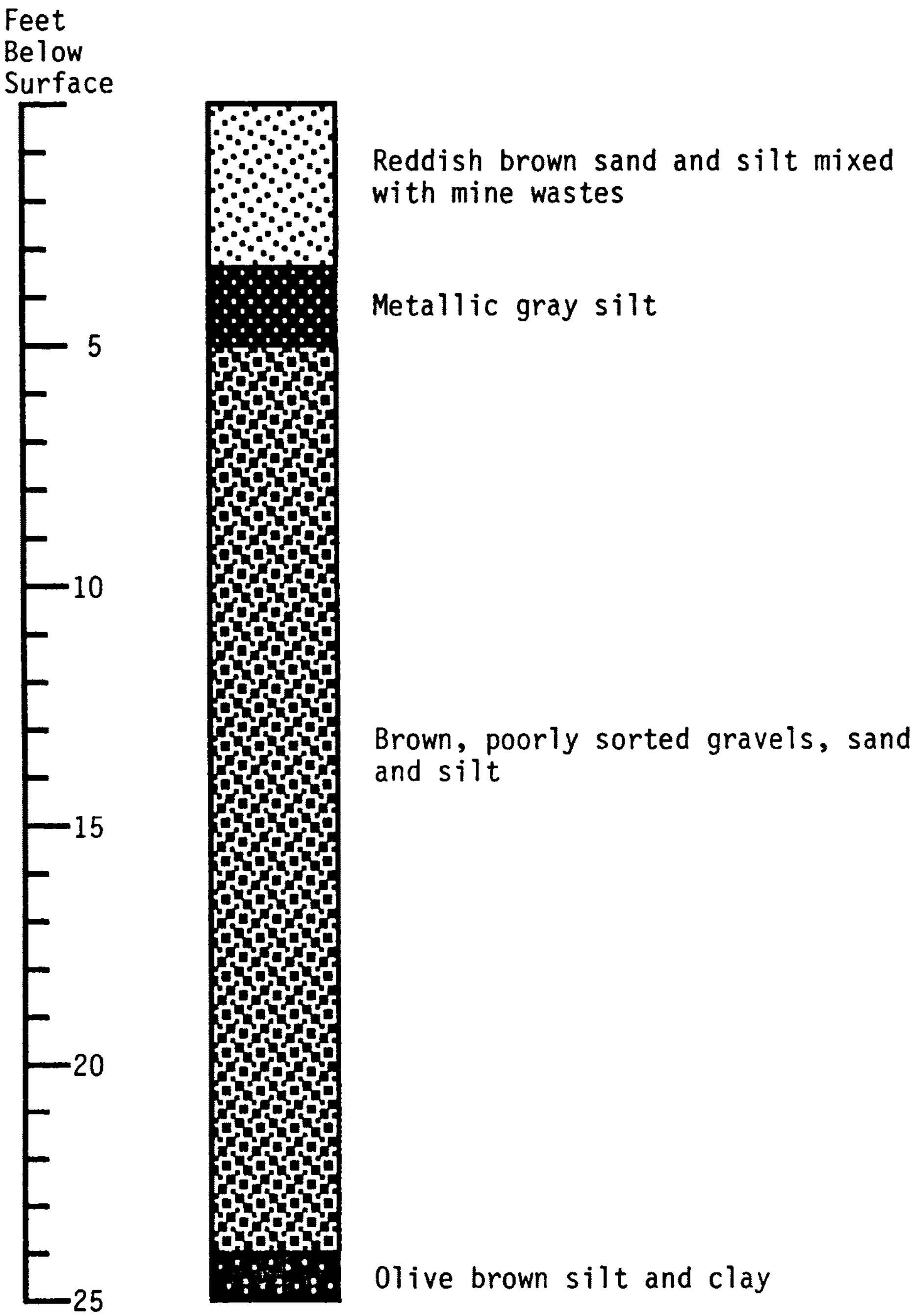

Figure 6. Generalized lithologic log of the upper aquifer beneath Smelterville Flats.

The next distinct layer is composed of a "metallic" gray silt- to clay-sized sediment believed to be dominantly mill waste (Figure 6). Other studies have referred to this layer as "slimes". This layer begins at a depth of two to three feet below the surface in the BLM sub-area. Thickness of this layer varies with location from just under one foot thick to over two feet thick. At the site of piezometers 6C and 6D, this layer is absent, based on analysis of the sediments from the auger returns.

The subsurface layer beneath the "metallic" gray clayey silt layer is composed of well-graded (poorly-sorted) alluvial material ranging in size from silt to cobbles. The alluvial sediment layer extends to a depth of approximately 24 feet beneath the surface. This layer overlies a thick layer of silt and clay which is the aquitard separating the upper unconfined aquifer and the lower confined aquifer at the site. Lithologic logs for all piezometers and wells drilled as part of this investigation are presented in Appendix 1.

Paired Piezometer Construction

Each of the 10 piezometer locations contains two piezometers. One is completed just above the clay confining layer (approximately 24 feet deep) and one is completed in the zone of sediments alternately flooded and aerated by seasonal changes in water levels (approximately 6 feet deep). Piezometer locations are presented in Figure 4. The piezometers were installed in this particular configuration in order to document the vertical hydraulic gradient and the vertical distribution of water quality in the upper aquifer. Piezometers are approximately five feet apart laterally at each location.

Piezometers are constructed of 2-inch diameter, flush-threaded, polyvinyl chloride (PVC) pipe. The bottom two feet of each piezometer is constructed of two-inch diameter, 40-slot, machine-cut, well screen with a PVC cap (Figures 7 and 8).

The PVC casing was lowered into the holes through the inside of the hollow stem auger. Two feet of stickup pipe height was left on the surface. The screened section was backfilled with 20-30 mesh Colorado silica sand. Measurements were taken during installation of the filter pack to ensure proper placement of the sand filter pack within the well borehole.

Piezometers were sealed in a standardized fashion with bentonite chips from the top of the sand pack to approximately 1.5 feet from the surface. The bentonite chips were then hydrated with potable water. Locking steel protective casing were installed into concrete pads around each piezometer. Generalized diagrams of piezometer construction are shown in Figures 7 and 8.

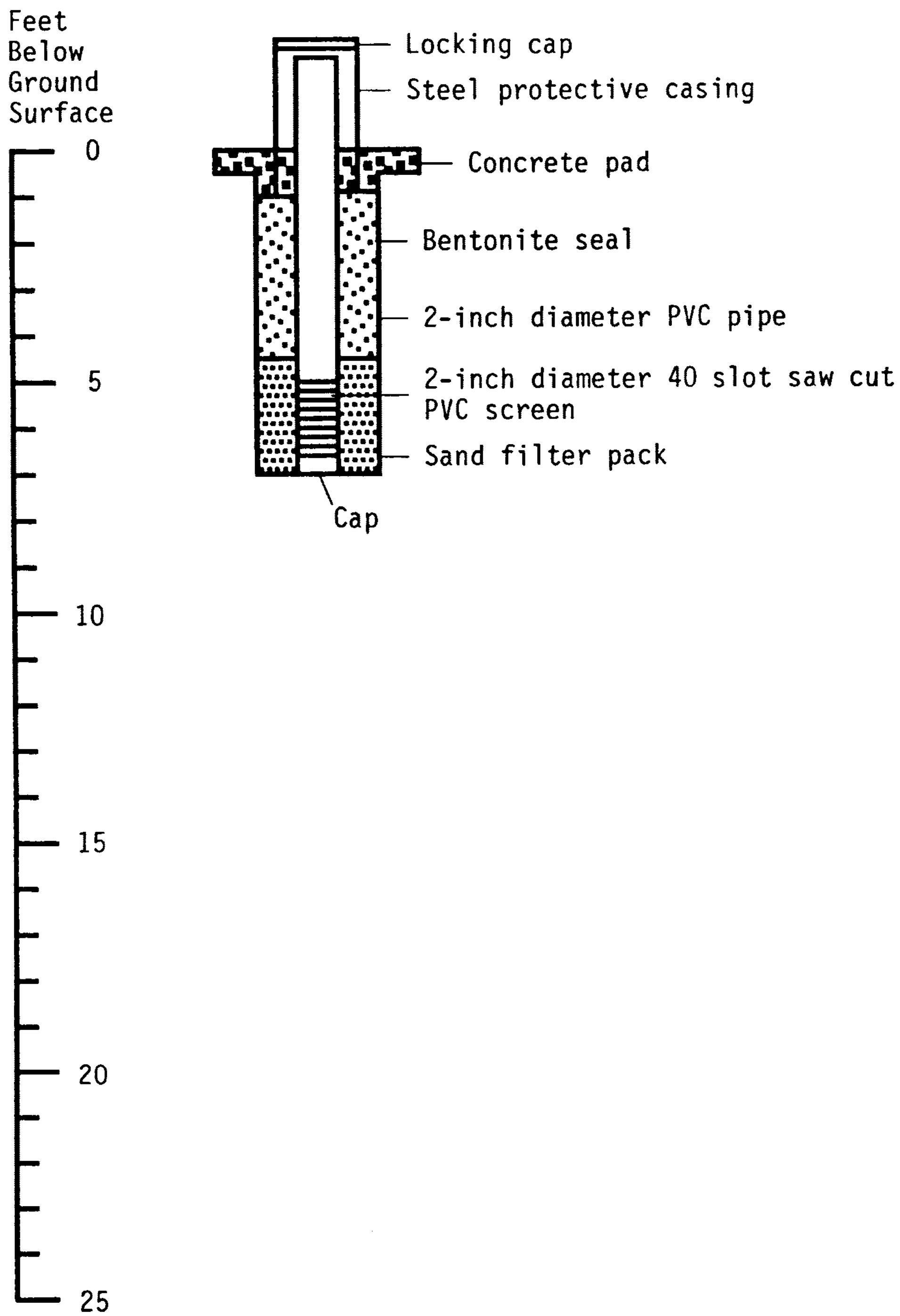

Figure 7. Generalized diagram of piezometer construction for shallow paired piezometers within the BLM study area on Smelterville Flats.

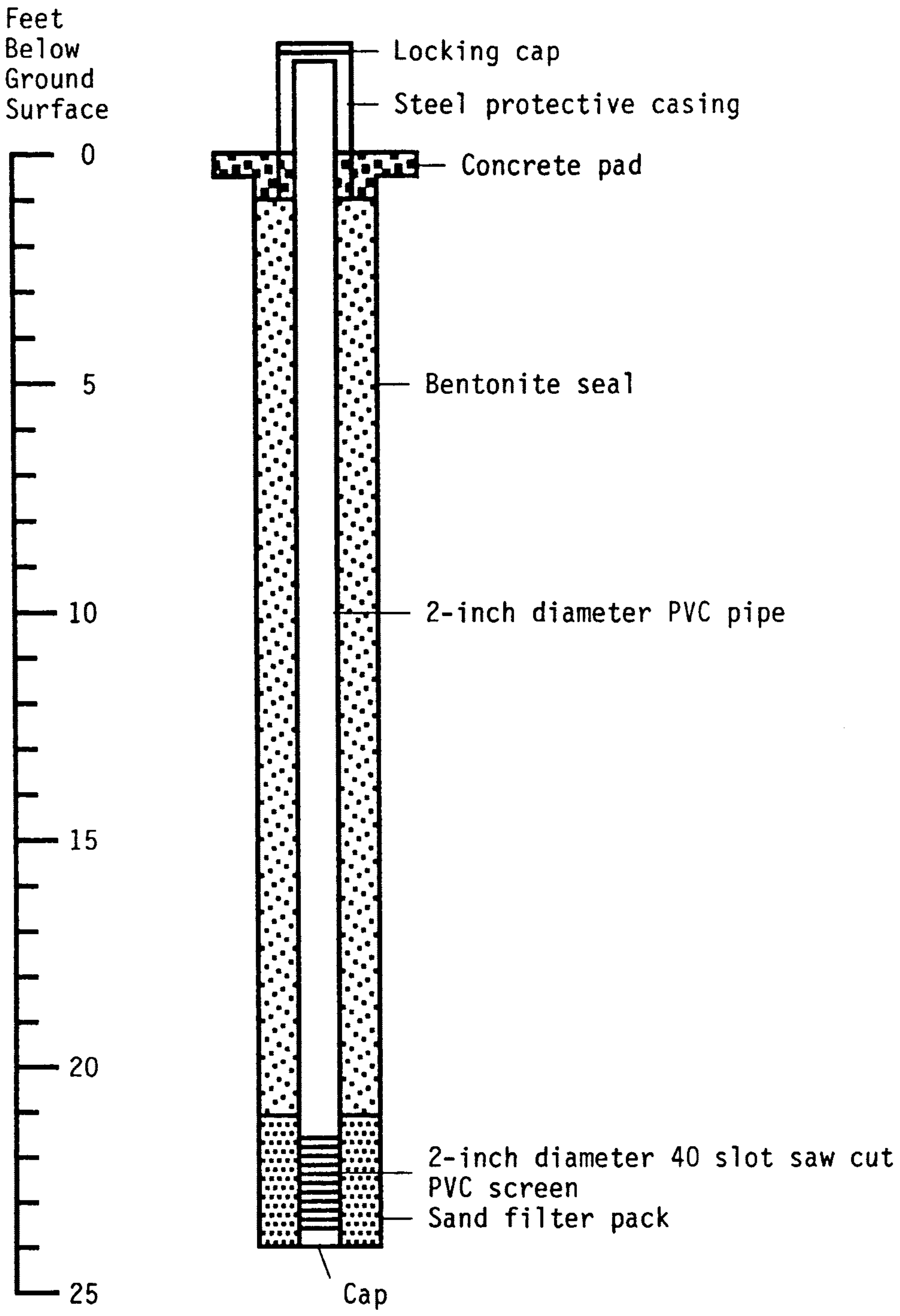

Figure 8. Generalized diagram of piezometer construction for deeper paired piezometers within the BLM study area on Smelterville Flats.

Observation Well Construction

One fully-penetrating, fully-screened, observation well was installed in the BLM sub-area. The observation well was drilled with a 6.5-inch ID hollow stem auger. Samples were collected every five feet and at all changes in lithology using a 2.5-inch ID split-spoon sampler. The observation well is constructed of two-inch diameter, flush-threaded, PVC pipe. Machine-cut, 40-slot, two-inch ID, flush-threaded, PVC well screen was installed from approximately 24 feet to four feet below ground surface. Sand filter pack consisting of 20-30 mesh Colorado silica sand was installed from the bottom of the borehole to approximately two feet below ground surface (Figure 9). Locking steel protective casing was set in a concrete pad around the observation well.

Pumping Well Construction

One fully-penetrating, fully-screened, pumping well was installed in the BLM sub-area to allow aquifer tests in the upper unconfined aquifer. The pumping well was drilled using an air rotary drilling rig equipped with a casing hammer and a 10-inch diameter bit. Grab samples were collected and logged during drilling; however, no split-spoon samples were taken.

The entire 20-foot saturated thickness of the upper unconfined aquifer was screened using six-inch diameter, flush-threaded, ten-slot, wire-wrapped, PVC well screen as shown in Figure 10. A 30-40 mesh Colorado silica sand filter pack was installed

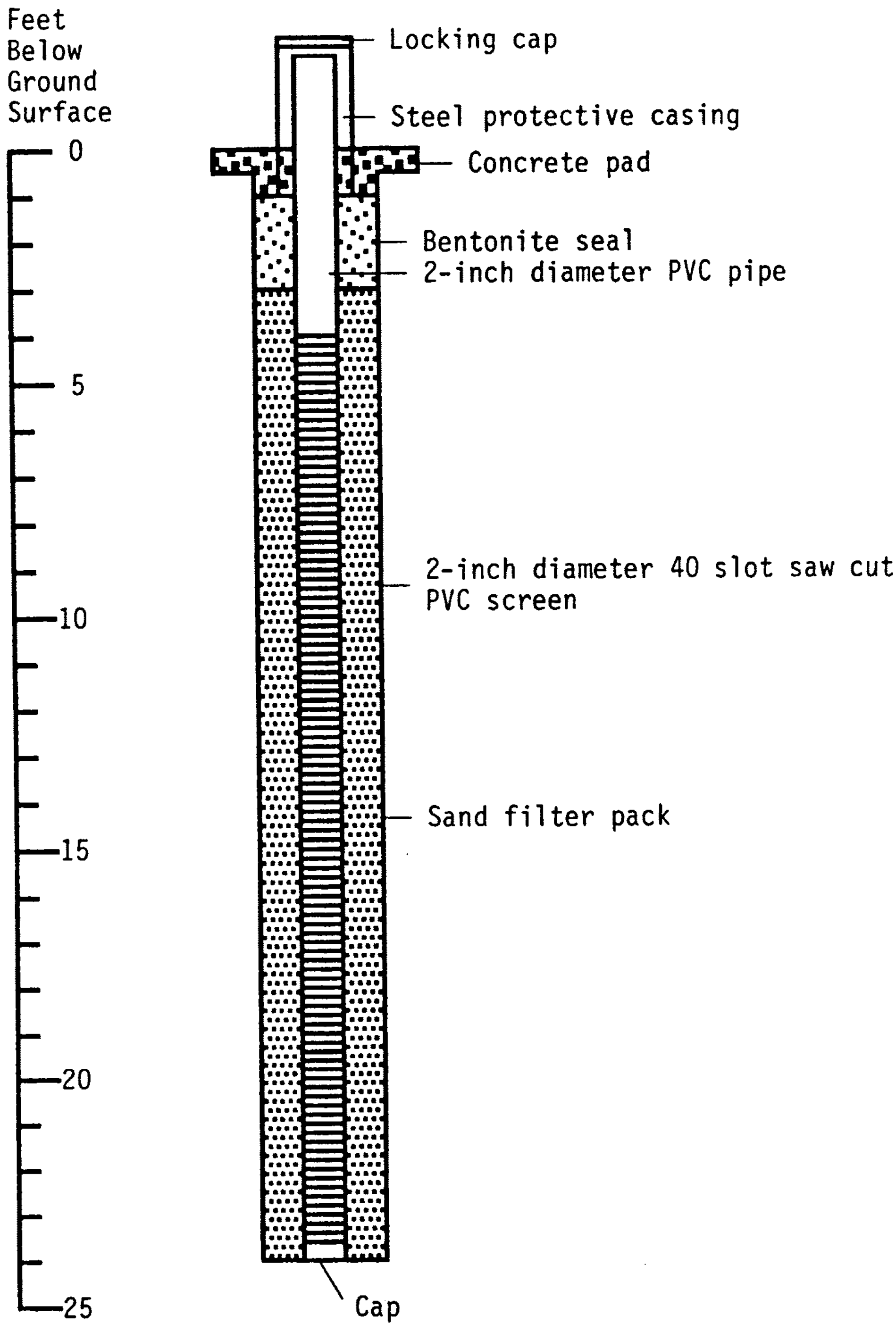

Figure 9. Diagram of fully penetrating, fully screened observation well construction within the BLM study area on Smelterville Flats.

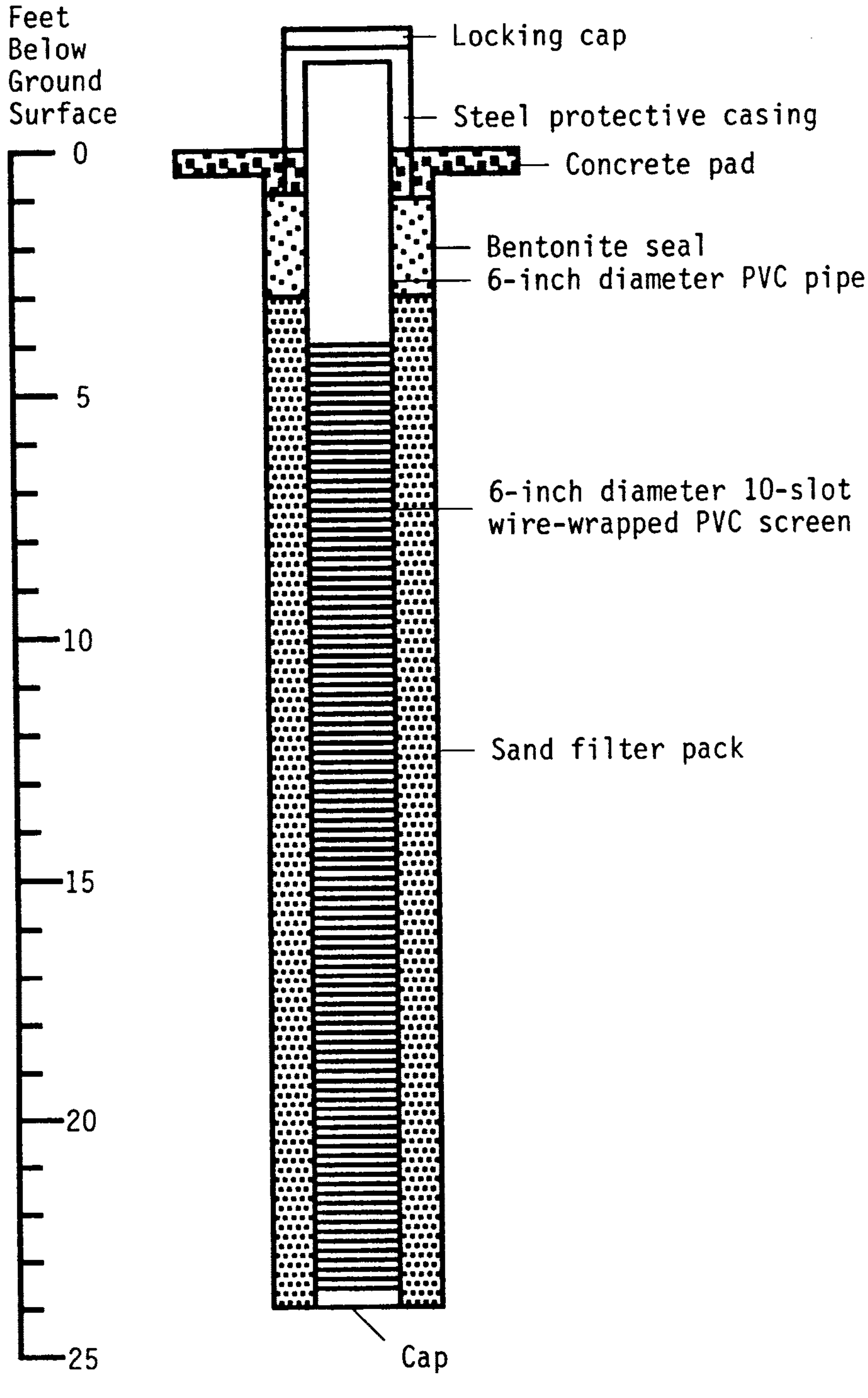

Figure 10. Diagram of fully penetrating, fully screened pumping well construction within the BLM study area on Smelterville Flats.

around the well screen. The remaining approximately three feet of annular space was sealed with bentonite chips. A ten-inch diameter steel casing with locking cap was installed into a concrete pad around the well.

DATA COLLECTION

Water Level Measurements

Water-level data were collected in X and Y line piezometers using a chalked steel tape. The data collection interval was approximately every two weeks from January, 1988 through June, 1989. Water levels in production wells installed by Bunker Hill were measured early in the study; however, these wells were excluded from the research effort because they are completed in the lower confined aquifer.

Water-level data were collected weekly in piezometers installed in the BLM sub-area from October, 1988 through June, 1989. A listing of water level measurements collected during this study is presented in Appendix 2.

Piezometer locations and elevations were surveyed using standard land surveying techniques. Pertinent data for each piezometer are presented in Table 1.

Water Quality Sampling

During the first few months of water sampling a PVC bailer was used to bail three borehole volumes of water from piezometers and collect sample volumes.

TABLE 1

CONSTRUCTION DATA FOR SMELTERVILLE FLATS PIEZOMETERS

PIEZOMETER DESIGNATION	WELL DEPTH (FEET)	SAND PACK INTERVAL (FEET)	PERFORATED INTERVAL (FEET)	MEASURING POINT ELEVATION*
X1S	17	NONE	16 TO 17	2220.20
X1D	20	NONE	19 TO 20	2220.75
X2S	17	NONE	16 TO 17	2223.46
X2D	20	NONE	19 TO 20	2222.57
X3S	17	NONE	16 TO 17	2223.17
X3D	20	NONE	19 TO 20	2222.86
X4S	17	NONE	16 TO 17	2221.11
X4D	20	NONE	19 TO 20	2221.41
X6S	15	NONE	14 TO 15	2222.23
X6D	20	NONE	19 TO 20	2222.15
X7S	12	NONE	11 TO 12	2220.98
X7D	20	NONE	19 TO 20	2220.55
X8S	12	NONE	11 TO 12	2216.94
X8D	20	NONE	19 TO 20	2215.17
X9S	15	NONE	14 TO 15	2216.93
X9D	20	NONE	19 TO 20	2216.91

TABLE 1 (CONTINUED)

CONSTRUCTION DATA FOR SMELTERVILLE FLATS PIEZOMETERS

PIEZOMETER DESIGNATION	WELL DEPTH (FEET)	SAND PACK INTERVAL (FEET)	PERFORATED INTERVAL (FEET)	MEASURING POINT ELEVATION*
Y2S	12	NONE	11 TO 12	2209.02
Y2D	20	NONE	19 TO 20	2209.34
Y3S	17	NONE	16 TO 17	2207.78
Y3D	20	NONE	19 TO 20	2208.48
Y6S	12	NONE	11 TO 12	2207.95
Y6M	20	NONE	19 TO 20	2205.88
Y6D	50	NONE	49 TO 50	2204.80
Y7S	15	NONE	14 TO 15	2206.37
Y7D	20	NONE	19 TO 20	2204.94
Y9S	12	NONE	11 TO 12	2204.88
Y9D	20	NONE	19 TO 20	2206.02
1C	7	3.5 TO 7	5 TO 7	2205.60
1D	24	20 TO 24	22 TO 24	2205.64
2C	6.5	3.5 TO 6.5	4.5 TO 6.5	2206.89
2D	24	20.5 TO 24	22 TO 24	2206.61
3C	6	3 TO 6	4 TO 6	2205.62
3D	24	20.5 TO 24	22 TO 24	2205.48

TABLE 1 (CONTINUED)

CONSTRUCTION DATA FOR SMELTERVILLE FLATS PIEZOMETERS

PIEZOMETER DESIGNATION	WELL DEPTH (FEET)	SAND PACK INTERVAL (FEET)	PERFORATED INTERVAL (FEET)	MEASURING POINT ELEVATION*
4C	6	3 TO 6	4 TO 6	2204.46
4D	26	19 TO 26	24 TO 26	2204.33
5C	6.5	3.5 TO 6.5	4.5 TO 6.5	2204.93
5D	25	22 TO 25	23 TO 25	2204.88
6C	6.5	3.7 TO 6.5	4.5 TO 6.5	2204.19
6D	25.5	22.5 TO 25	23.5 TO 25.5	2203.97
7C	7	4 TO 7	5 TO 7	2203.04
7D	26	22 TO 26	24 TO 26	2203.19
8C	7	4 TO 7	5 TO 7	2204.38
8D	26	21 TO 26	24 TO 26	2204.23
9C	6	3 TO 6	4 TO 6	2204.51
9D	26	22 TO 26	24 TO 26	2204,47
10C	6.5	3.7 TO 6.5	4.5 TO 6.5	2202.20
10D	25.5	22 TO 25.5	23.5 TO 25.5	2202.26
PW	24	3 TO 24	4 TO 24	2205.23
TYPE B	24	3 TO 24	4 TO 24	2204.31

This method proved too slow and difficult in the X and Y line piezometers because of their small diameter (0.75-inches). During later sampling, an ISCO peristaltic pump was used to purge three borehole volumes from each piezometer and collect a sample. The ISCO pump also was used to collect water samples from BLM sub-area piezometers.

While in use, the bailer was rinsed three times with distilled water before being lowered into each piezometer. Concern was expressed that the polypropylene rope attached to the bailer might hold water in its fibers and cross contaminate samples. Cross contamination was not evident in the results of sample analysis. The ISCO pump was rinsed between piezometers by pumping tap water followed by distilled water prior to sampling at each piezometer.

After a minimum of three borehole volumes of water was purged from the piezometer, approximately 500 milliliters (ml) of water was extracted as a sample and collected into an acid-washed 500 ml linear polyethylene (LPE) bottle.

Electrical conductivity (EC) and temperature were measured in the field with a Yellow Springs Instrument Model 33 temperature/conductivity/salinity meter. pH was measured in the field with a Sargent Welch pH meter. Samples were then taken to the Bunker Hill laboratory for filtration and acidification.

Samples were filtered through a 0.45 micron acetate filter in a Millipore filtration apparatus. The filtrate was transferred to a new 135 ml LPE bottle. Ten drops of concentrated nitric acid were added to the filtrate to bring the pH down to less than 2. The water samples were then sent to the United States Bureau of Mines Research Center in Spokane, Washington for analysis.

Analysis was done on a Perkin Elmer Inductively Coupled Plasma Spectrometer (ICP). Each water sample was analyzed three times on the ICP and the percent cumulative variance and standard deviation were reported for each sample. A reported cumulative variance of over ten percent was considered to invalidate the results of the analysis (Zahl, personal communication, 1988). The most common reason for a cumulative variance of over ten percent is that the concentration of the particular ion being analyzed is below the detection limit of the ICP (Zahl, personal communication, 1988).

Lab blanks, field blanks, split samples, and duplicate samples were sent for analysis with each batch of samples in an effort to evaluate quality control. No detectable levels of metals were found in the lab blanks or field blanks. Minor differences occurred in some of the split and duplicate samples; when these differences occurred, the two values were averaged.

Piezometers located in the X line were sampled eight times during the period from March, 1988 to June, 1989. Piezometers located in the Y line were sampled 14 times during the period from February, 1988 to June 1989. Piezometers located in the BLM sub-area were sampled nine times during the period from October, 1988 to June, 1989. On three occasions, October 5, 1988, December 16, 1988, and June 1, 1989, piezometers from the X and Y lines and BLM sub-area were sampled during the same sampling event.

Hydraulic Property Testing of the Upper Aquifer

A 24-hour aquifer test was performed on February 7, and February 8, 1989. The pumping well, PW-1, was pumped at an average rate of 173 gallons per minute (gpm). Water levels in piezometers 1C, 1D, 2C, 2D, 3C, 3D, 4C, 4D, 5C, 5D, 6C, 6D, 7C, 7D, 8C, 8D, 9C, 9D, 10C, and 10D (Figure 4) were monitored using chalked steel tapes. Water levels in piezometers MP1-A, MP2-A, (well installed by Adams, 1989), and the observation well were monitored using pressure transducers connected to a Campbell Scientific data logger. Discharge measurements were collected every 30 minutes using an in-line totalizing flow meter. Water was piped approximately 700 feet to the South Fork of the Coeur d'Alene River through four-inch diameter plastic pipe.

Measurements of electrical conductivity (EC) and pH of the discharge water were collected at approximately hourly intervals during the first eight hours of the test. Measurements of EC and pH were collected at more widely spaced intervals later in the test after the measurements had stabilized. Several water samples were collected from the discharge pipe during the aquifer test. These water samples were analyzed for metal ion concentrations. Results of these analyses are presented in Appendix 3.

WATER LEVELS

Surface Water Ground Water Interaction

The South Fork of the Coeur d'Alene River flows across Smelterville Flats from east to west. Norton (1980) concluded that the South Fork of the Coeur d'Alene is in direct hydraulic connection with the ground water of the upper aquifer beneath Smelterville Flats. Norton (1980) also concluded that the South Fork of the Coeur d'Alene is a losing stream in the eastern portion of the study area and a gaining stream in the western portion of the study area. Water-level data collected during this study support Norton's findings.

Water-level elevations were collected from sampling points located in the Smelterville Flats study area. Locations of the water level sampling points are found in Figure 11. Water-level elevations in the eastern portion of Smelterville Flats, (the X line), are highest closest to the river and lowest farthest from the river indicating that water from the South of the Coeur d'Alene River is being lost to the ground water flow system in this area. Piezometers located farther to the west (the Y line) do not exhibit the same trend as piezometers in the X line. No consistent gradient exists toward or from the river in this portion of the Smelterville Flats; this zone may be a transition zone in which the river changes from a losing stream to a gaining stream. A plot of ground water elevations versus stream elevations along the South Fork of the Coeur d'Alene River is presented in Figure 12.

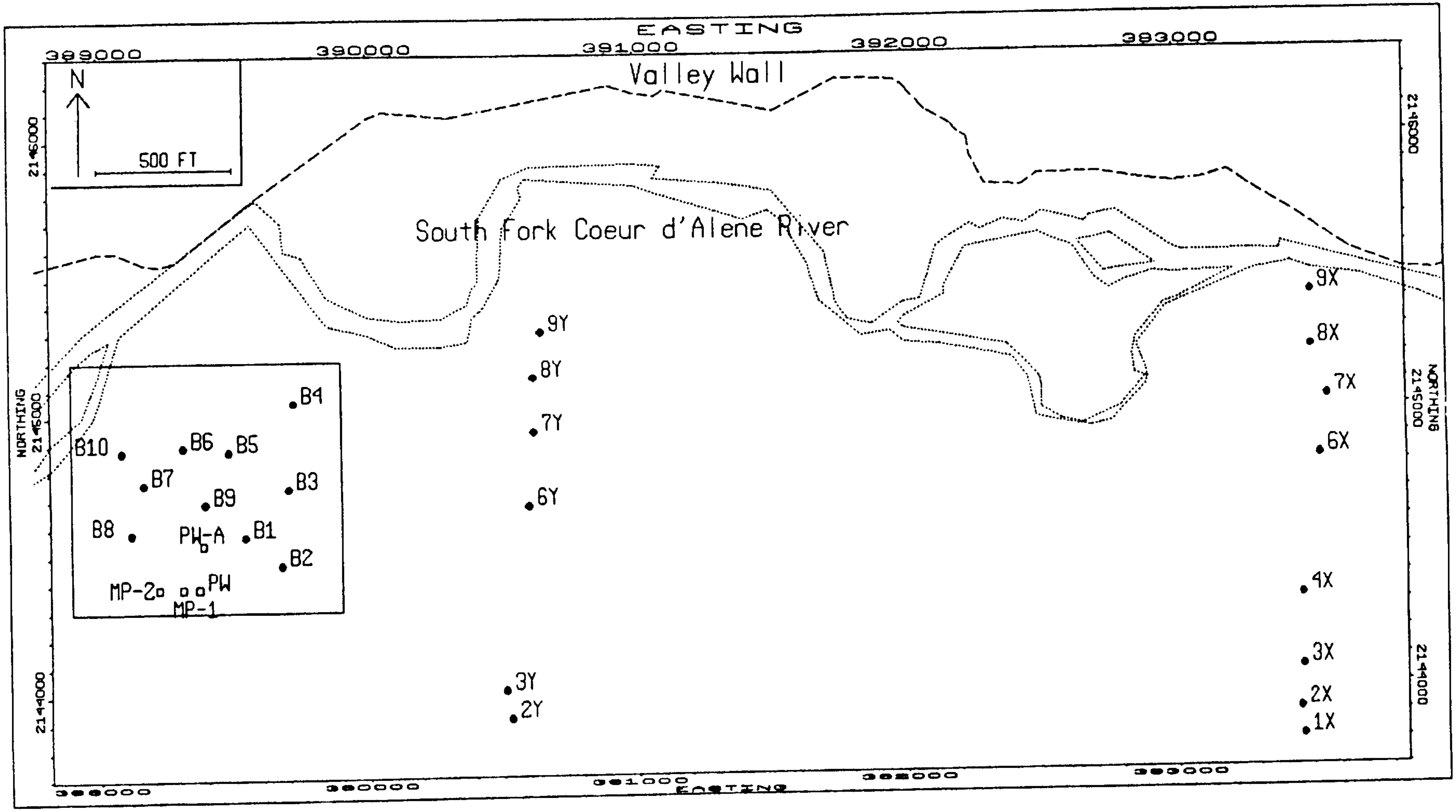

Figure 11. Locations of upper aquifer water level sampling points on Smelterville Flats.

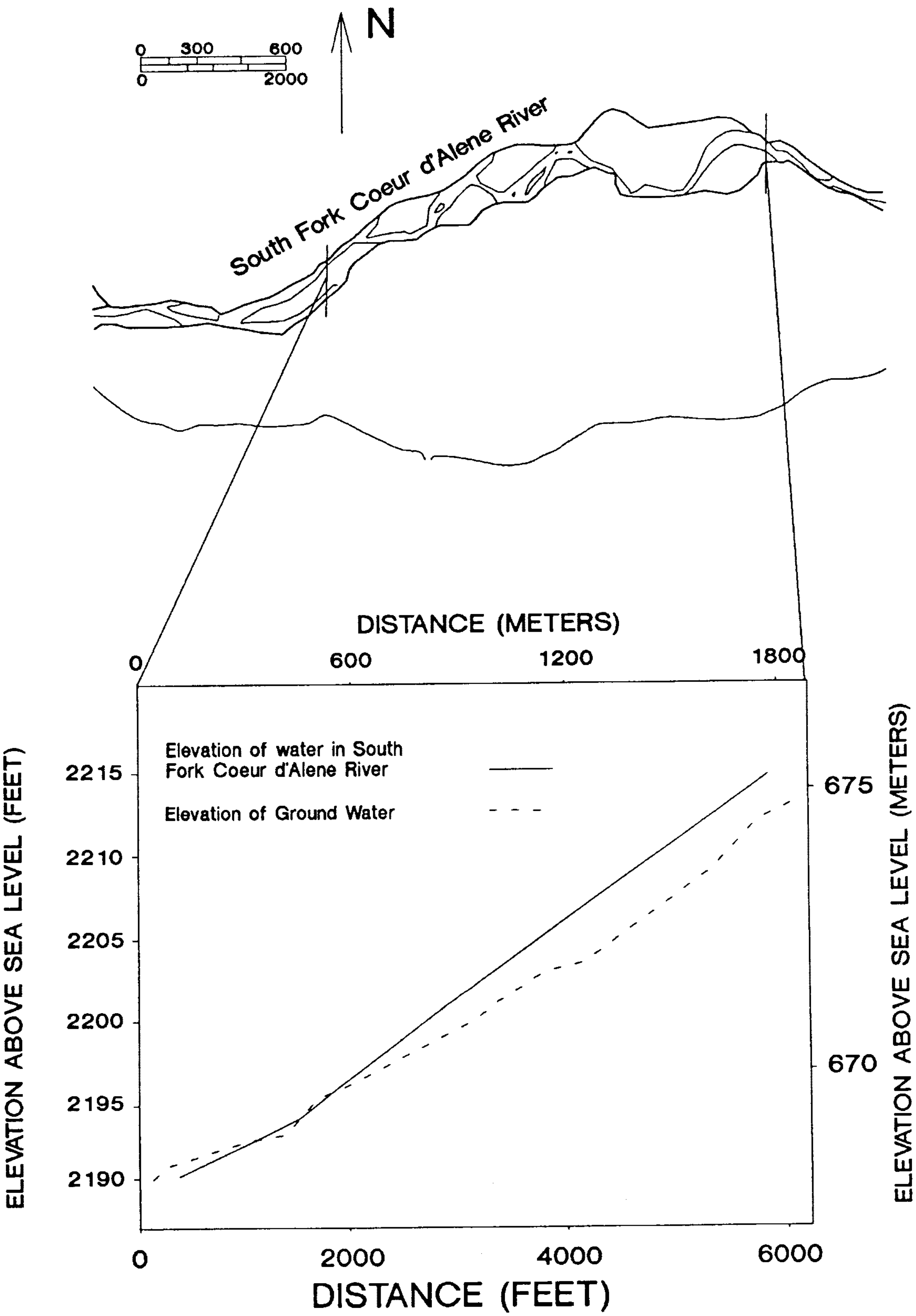

Figure 12. Plot of ground water elevation versus elevation of water level of the South Fork of the Coeur d'Alene River, Smelterville Flats study area (adapted from Norton, 1980).

Figure 12 which has been adapted from Norton (1980) illustrates the transition from losing stream to gaining stream along the South Fork of the Coeur d'Alene River through Smelterville Flats.

The piezometers installed on the BLM sub-area during this study are the most westerly piezometers in the Smelterville Flats area. Water levels in the BLM piezometers are lower close to the river and higher farther away from the river, indicating that water from the aquifer is being lost to the river in this area. The precise locations and extent of the boundaries of gaining and losing reaches of the river cannot be determined from these data.

Relationship of Upper and Lower Aquifers

Hydrographs presented by Adams (1989) for multi-level piezometers completed in the lower aquifer, clay layer (aquitard), and upper aquifer show an upward gradient exists at the BLM sub-area. However, no vertical gradient is apparent in his data from the upper aquifer. Hydrographs of the piezometers in the study area and BLM sub-area are presented in Appendix 4.

Spatial and Temporal Distribution of Water Levels

Spatial Distribution

Water levels collected October 5, 1988 are generally the lowest levels measured in 1988. A contour map of October 5, 1988 water levels (Figure 13) shows that ground water flow is east to west, following the topographic gradient of the valley.

Water levels in piezometers in the X and Y lines exhibited greater seasonal fluctuation than did piezometers in the BLM sub-area. The greatest seasonal water level fluctuations occurred in the X line as shown in Figure 14. A relationship is evident between the seasonal water level fluctuations and the piezometers' spatial location. The greatest seasonal water level fluctuations occur in piezometers located along the X line, closest to sources of recharge. The smallest seasonal water level fluctuations occurred in the BLM sub-area piezometers, closest to areas of discharge.

Figures 15 and 16 show hydrographs from piezometers at locations X4 and X9 respectively. These hydrographs show that a seasonal water level fluctuation of 6.2 feet occurred during the study period in the piezometers installed at location X4, and a seasonal water level fluctuation of 7.8 feet occurred during the study period at piezometer location X9.

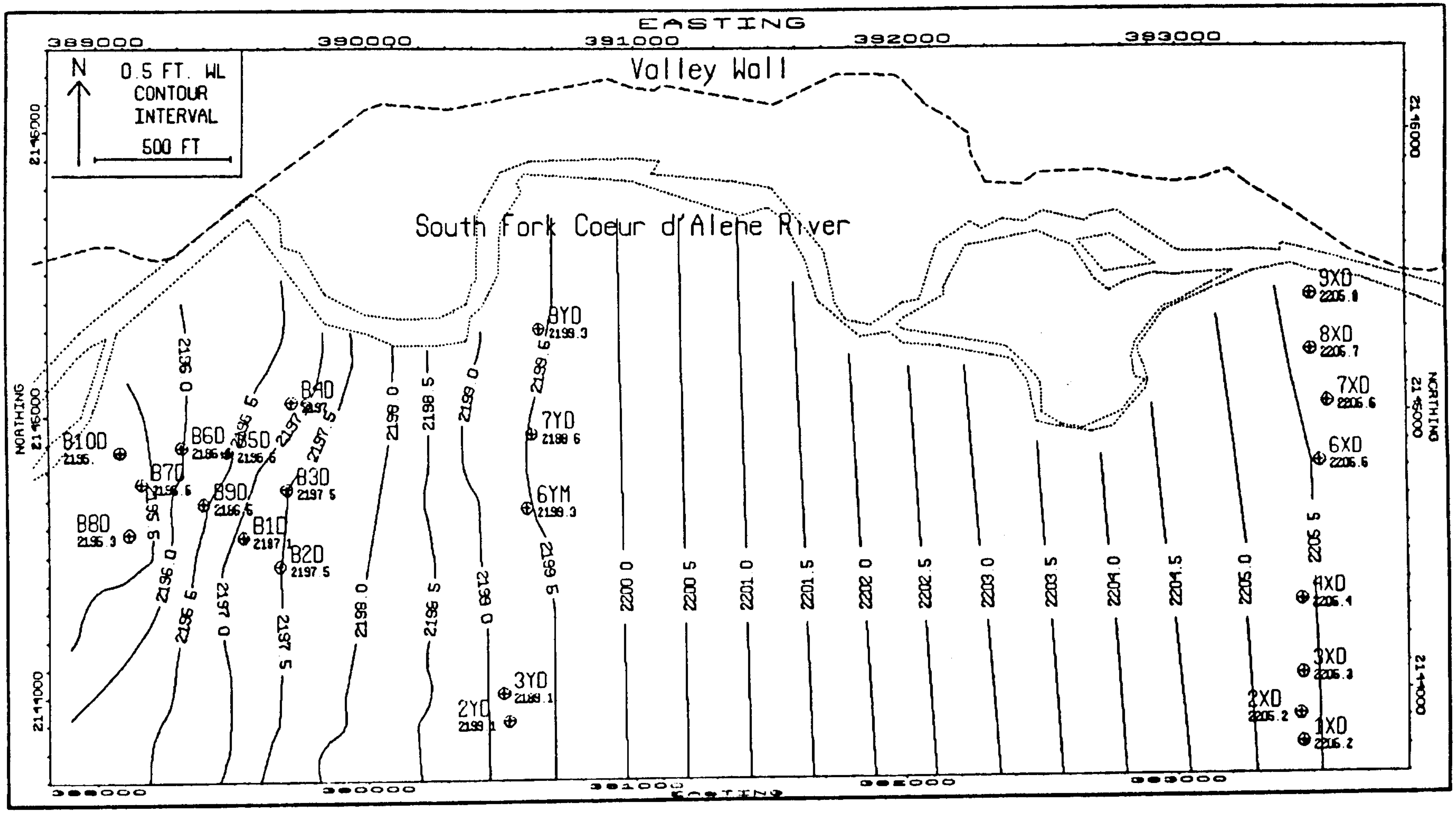

Figure 13. Contour map of water levels taken October 5, 1988 showing east to west ground water gradient within Smelterville Flats.

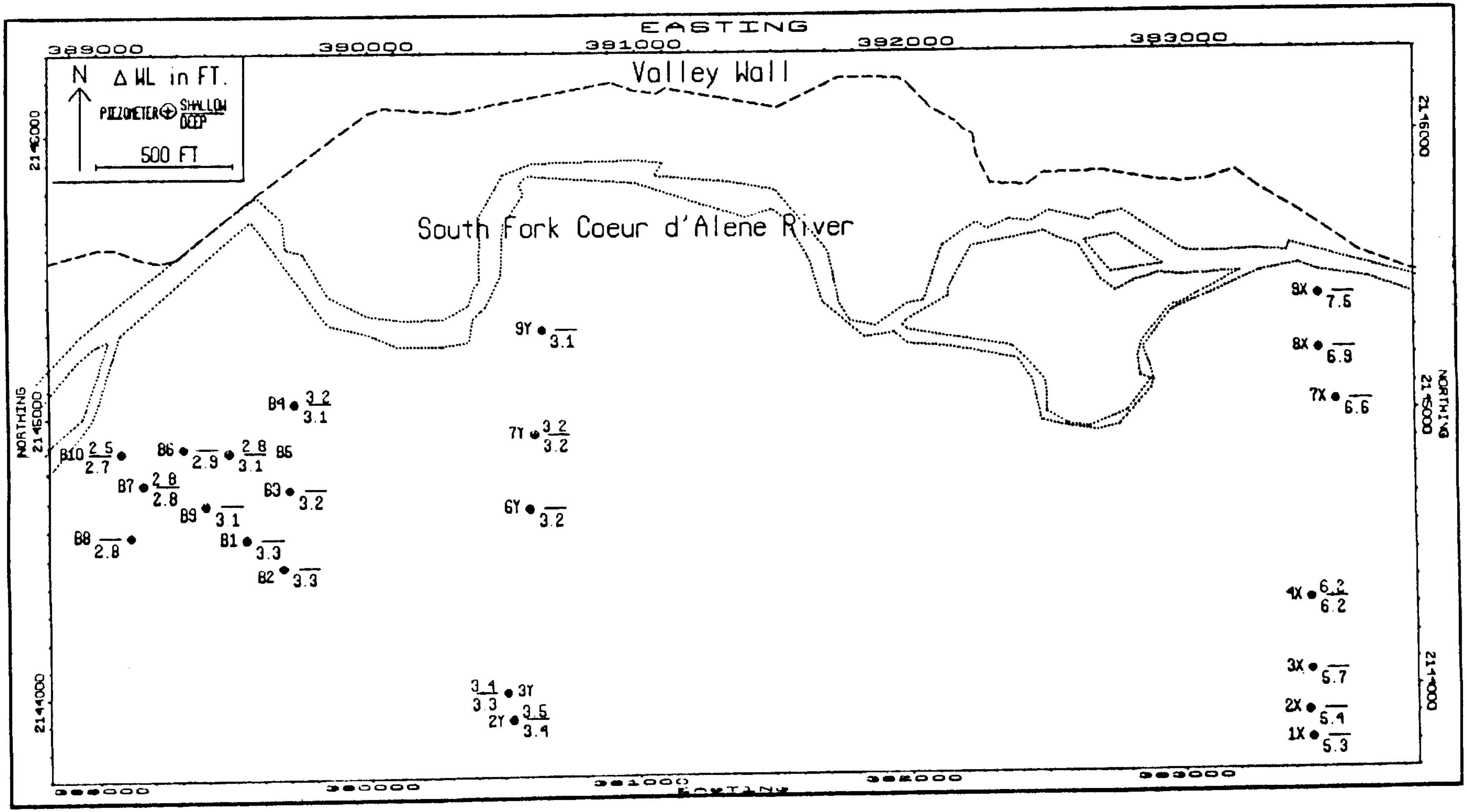

Figure 14. Rise in upper aquifer piezometer water levels from October 5, 1988 to April 26, 1989. Upper number at each location represents shallower piezometer, lower number represents the deeper piezometer. A blank in the upper number location means the shallower piezometer was dry on October 5.

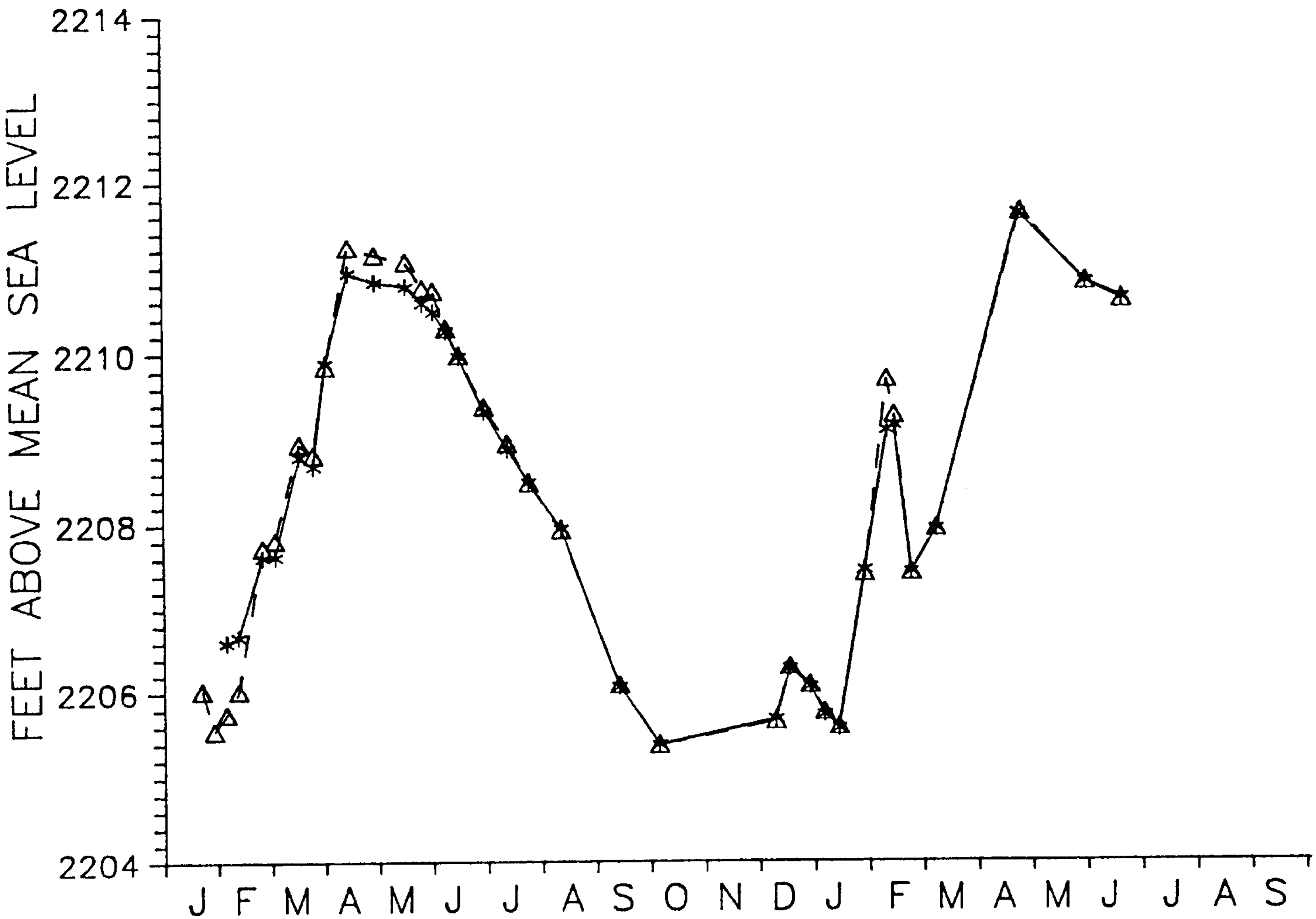

Figure 15. Water level elevations at piezometer location X4 from January, 1988 to September, 1989. Dashed line represents the deeper piezometer; solid line represents the shallower piezometer.

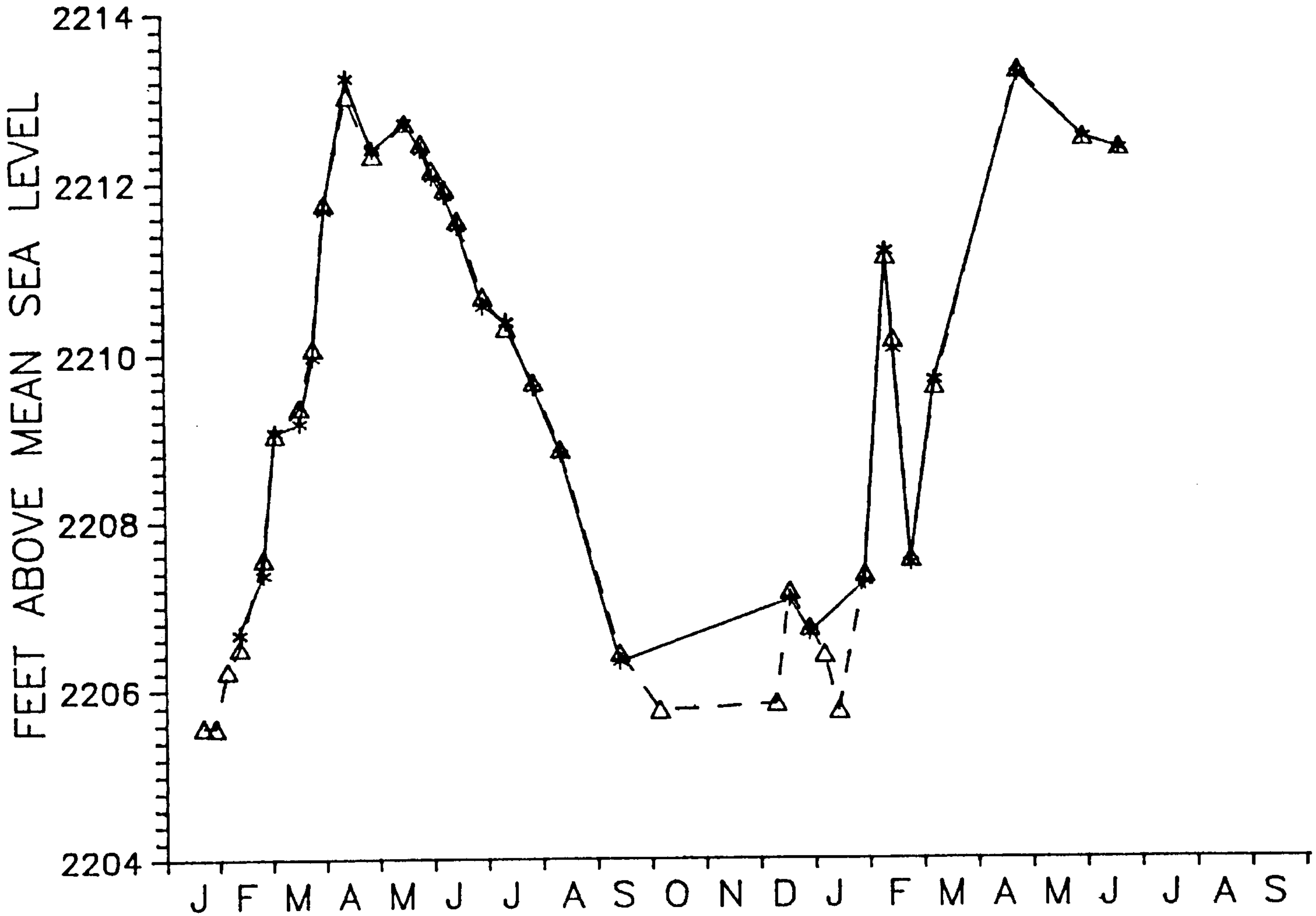

Figure 16. Water level elevations at piezometer location X9 from January, 1988 to September, 1989. Dashed line represents the deeper piezometer; solid line represents the shallower piezometer.

Hydrographs of piezometers at locations Y2 and Y3 are shown in Figures 17 and 18. These hydrographs show that during the study period, seasonal water level fluctuations in piezometers in the Y line are considerably less than those in piezometers in the X line. The seasonal water level fluctuations in piezometers at locations Y2 and Y3 were 3.4 feet. Hydrographs of piezometers located within the BLM sub-area (Figures 19 and 20) show that seasonal water level fluctuations in this portion of Smelterville Flats are the least variable. Hydrographs of piezometers at locations 6 and 10 within the BLM sub-area (Figures 19 and 20) show that seasonal water level fluctuations were 3.1 and 2.6 feet respectively for the study period.

The South Fork of the Coeur d'Alene River is a significant source of recharge in the eastern portion of this study area, although it should be recognized that other sources of recharge also influence water levels on Smelterville Flats. The greatest water level fluctuations occurred in piezometers 9XS and 9XD due to their close proximity to the South Fork of the Coeur d'Alene River as shown in Figure 13.

Lesser fluctuations in seasonal water levels occur in piezometers further from the river in the X line (Figure 13). These water level responses probably reflect sources of recharge other than the river. The smallest water level fluctuations occurred in the BLM sub-area piezometers near the ground water discharge area.

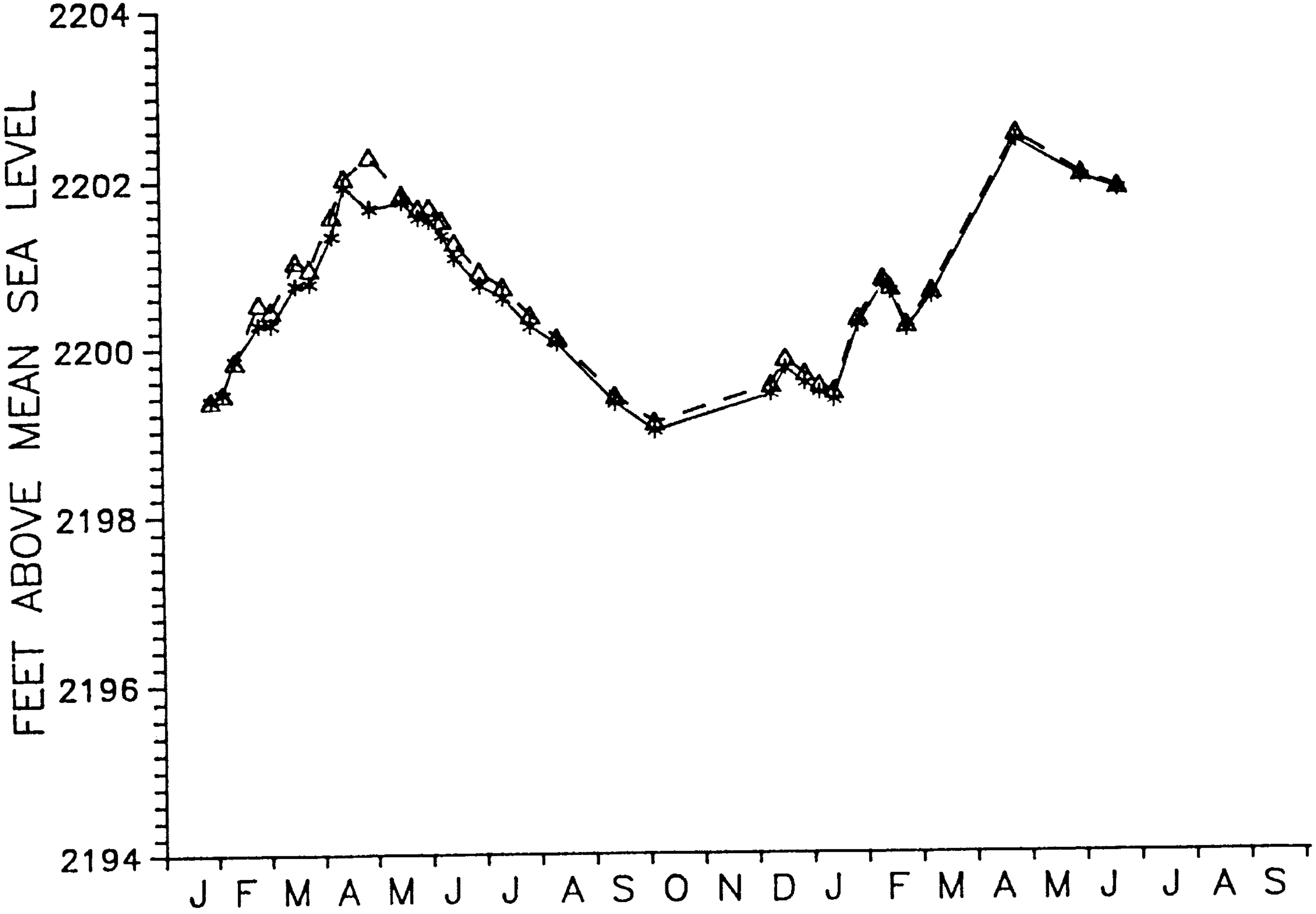

Figure 17. Water level elevations at piezometer location Y2 from January, 1988 to September, 1989. Dashed line represents the deeper piezometer; solid line represents the shallower piezometer.

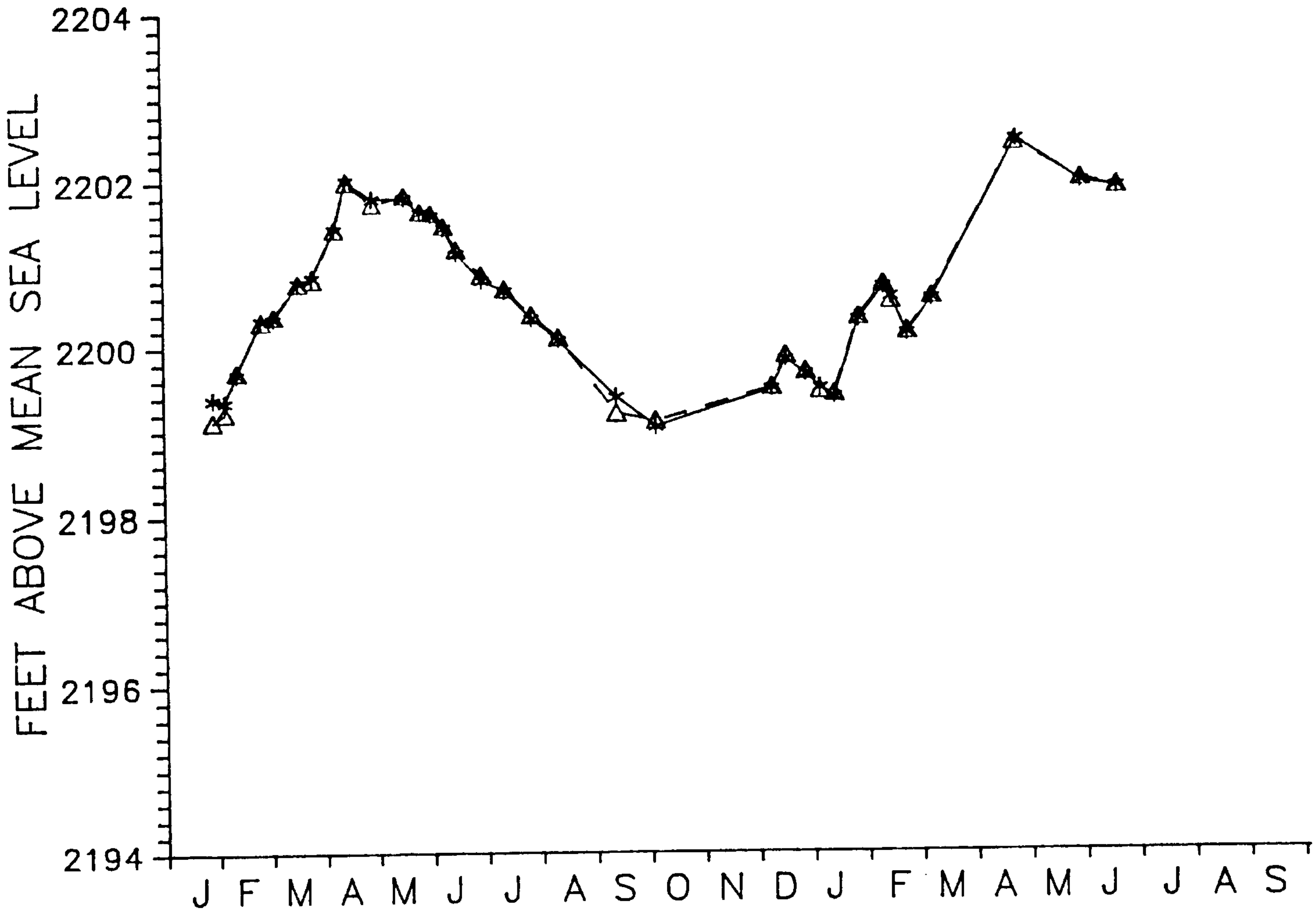

Figure 18. Water level elevations at piezometer location Y3 from January, 1988 to September, 1989. Dashed line represents the deeper piezometer; solid line represents the shallower piezometer.

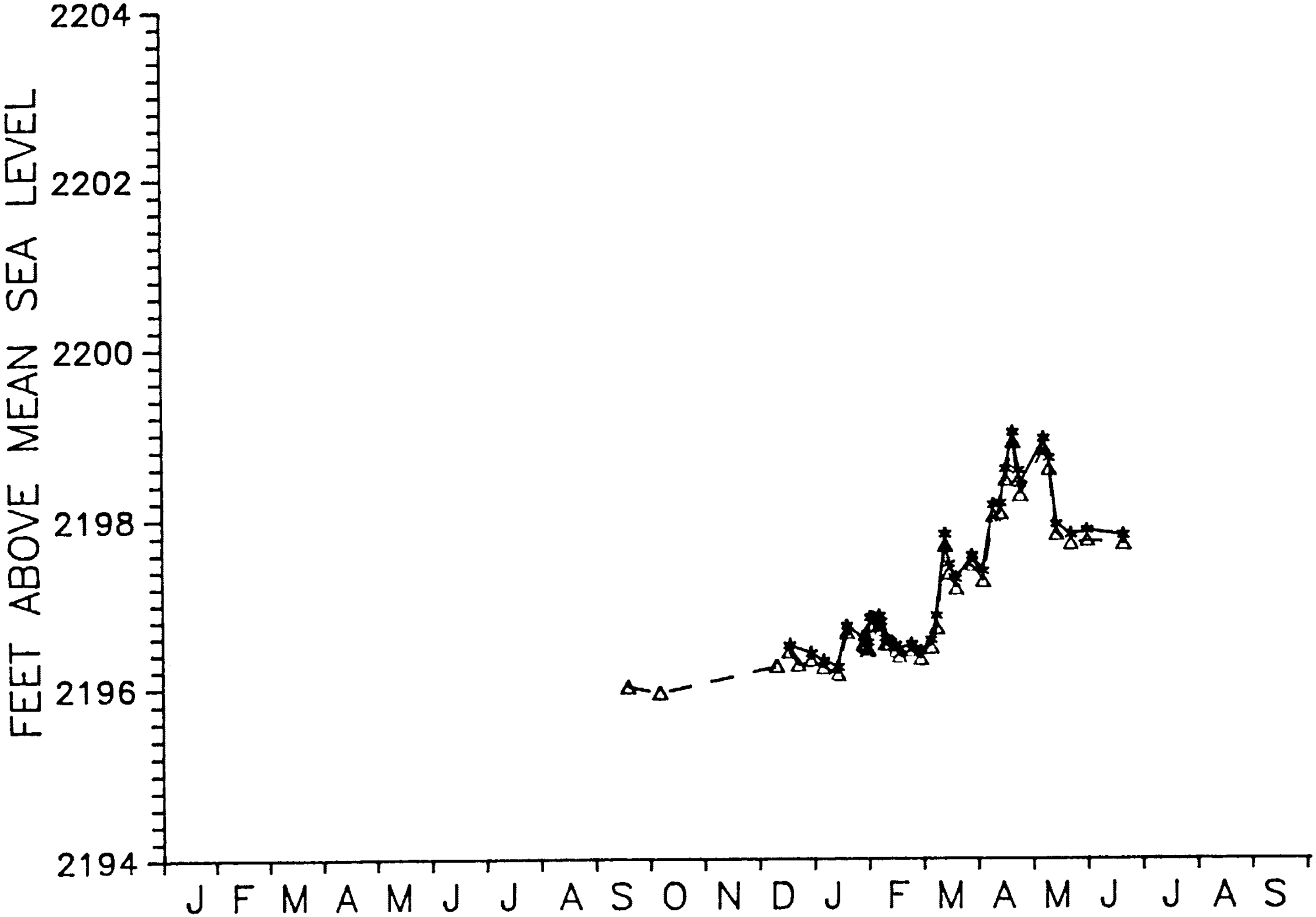

Figure 19. Water level elevations at piezometer location BLM 6 from January, 1988 to September, 1989. Dashed line represents the deeper piezometer; solid line represents the shallower piezometer.

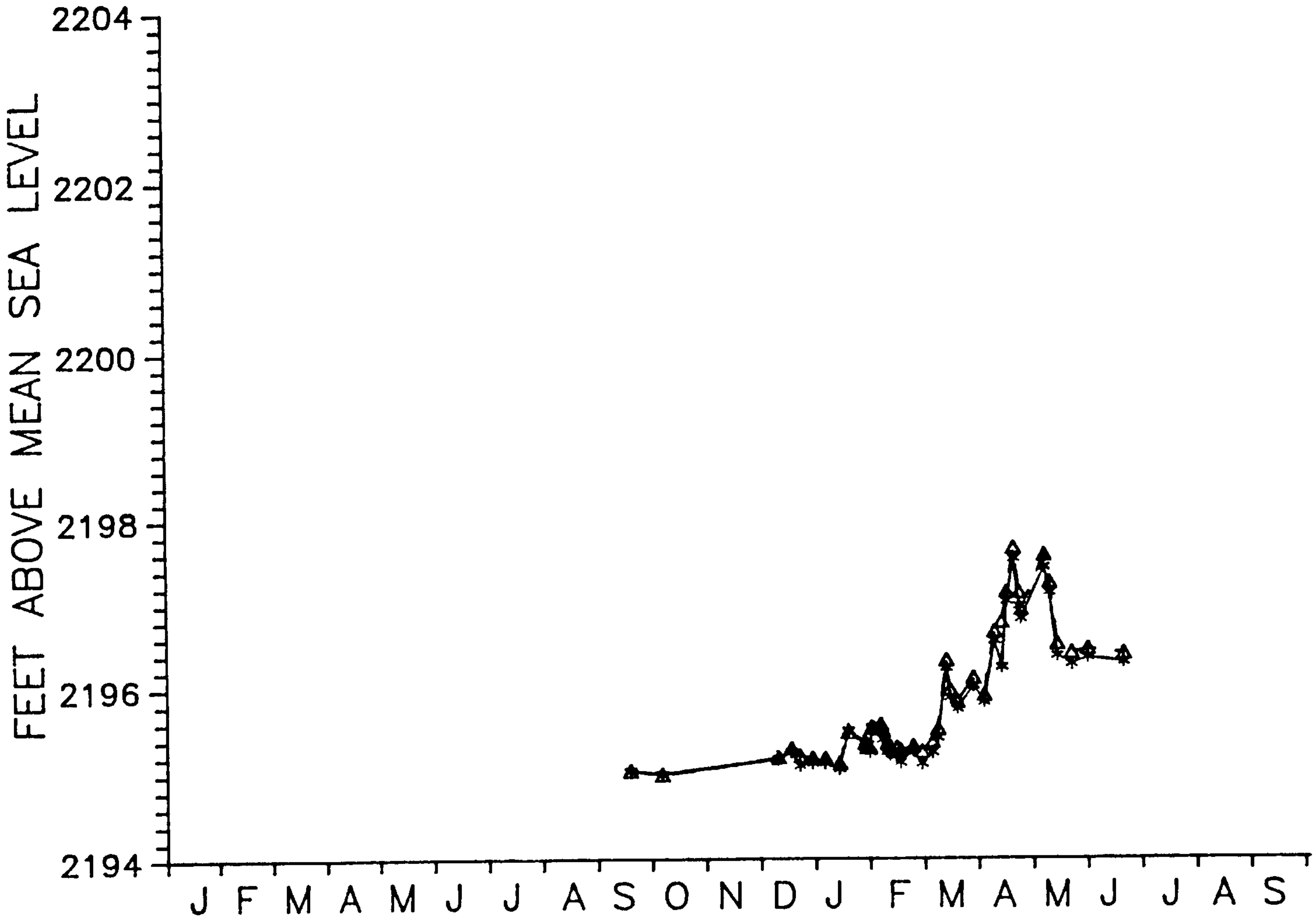

Figure 20. Water level elevations at piezometer location BLM 10 from January, 1988 to September, 1989. Dashed line represents the deeper piezometer; solid line represents the shallower piezometer.

Temporal Distribution

Hydrographs of piezometers installed in the shallow aquifer have an annual pattern of high water levels in the spring that recede during the summer months. The lowest water levels occur in the fall or early winter. During the 1988-1989 sampling period, the lowest water levels recorded occurred in October, 1988, and the highest water levels recorded occurred in late April, 1989. Figures 15 and 16 show hydrographs of two pairs of piezometers (X4 and X9 respectively) installed in the X line. Figures 17 and 18 show hydrographs of two pairs of piezometers (Y2 and Y3 respectively) installed in the Y line. Figures 19 and 20 show hydrographs of two pairs of piezometers (6 and 10 respectively) installed in the BLM sub-area. Figure 21 is a graph of streamflow in the South Fork of the Coeur d'Alene River and precipitation versus time. Comparing Figure 21 with Figures 15 through 20 shows that the ground water levels in the upper aquifer respond quickly to both changes in river stage and to precipitation.

All of the hydrographs presented show that shallow and deep piezometers have similar hydrographs, indicating that no significant vertical gradient exists in the shallow aquifer. Hydrographs are presented in Appendix 4.

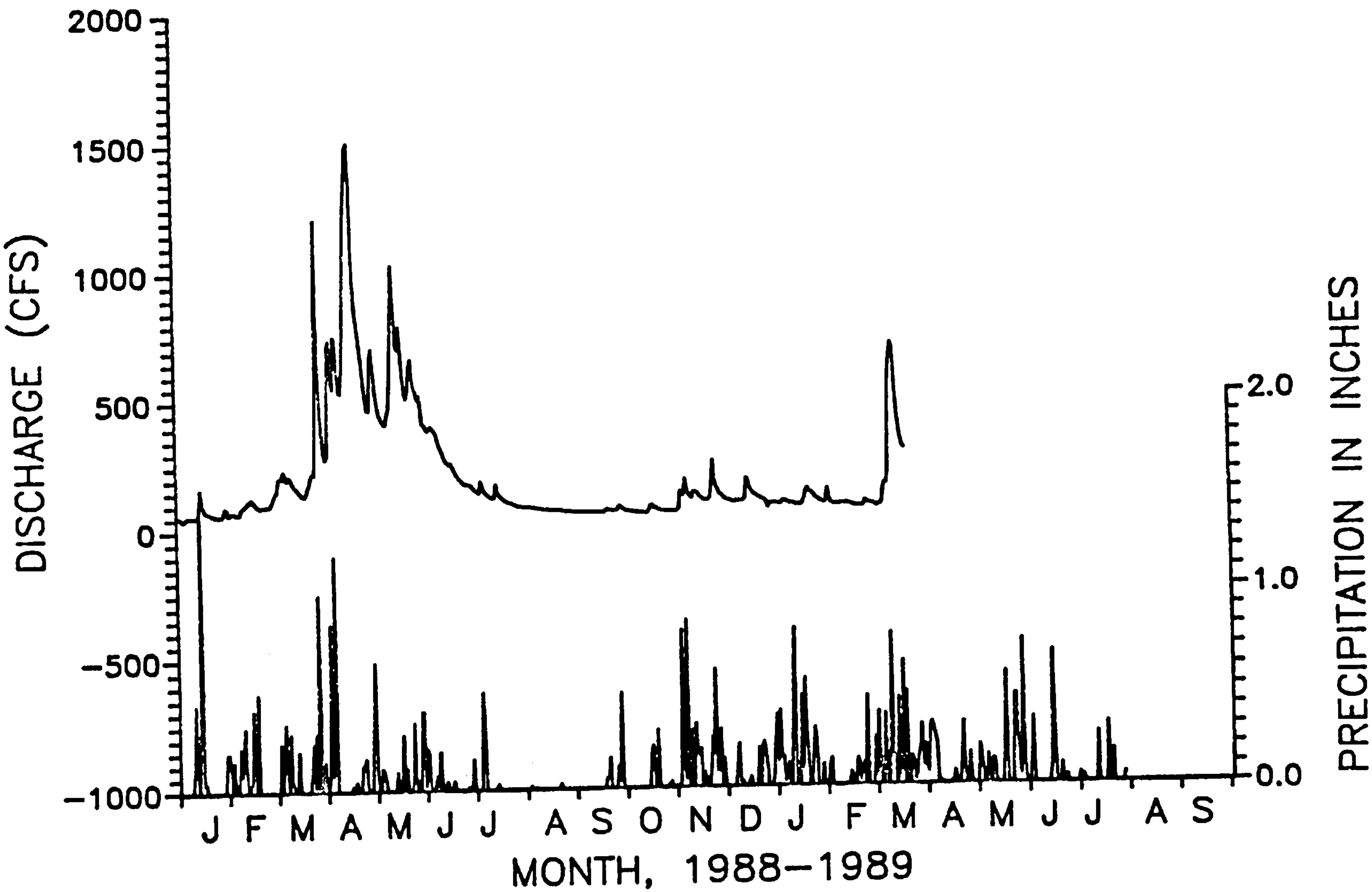

Figure 21. Discharge of the South Fork of the Coeur d'Alene River (Elizabeth Park Station) and precipitation in the Kellogg area over time.

WATER QUALITY

Conceptual Model of the Hydrochemical System

The concentration of metal ions in the ground water beneath Smelterville Flats has been conceptualized in previous investigations by Marcy (1979) and Norton (1980) to be controlled by the oxidation of wastes and subsequent flushing of the soluble oxidation products by water. Water levels decline in all portions of the field area throughout the summer. The decline in water levels creates a thicker unsaturated zone or zone of aeration above the water table. Wastes that previously had been in the saturated zone become exposed to oxygen as the unsaturated zone thickens owing to the decline of the water table. Individual mineral grains are still covered by a thin film of water that allows the diffusion of oxygen to reach reaction sites. The thin film of water becomes a concentrated solution of soluble reaction products (Marcy, 1979). Recharge events in the late winter and early spring are envisioned to flush metal oxides from reaction sites by ground water rises or direct infiltration of precipitation and snow melt. In either case, the soluble oxidation products are removed from the reaction sites, thereby producing fresh sites for the next influx of oxygen (Marcy, 1979).

Zinc, lead, and cadmium are the only ions discussed in detail in this study because of their presence in the wastes deposited on Smelterville Flats and elsewhere in the valley. An understanding of the chemical reactions that mobilize these ions during the oxidation of wastes is important in understanding their presence and their distribution in the ground water. A discussion of their significance in water and several possible chemical reactions that can lead to the mobilization of zinc, lead, and cadmium is presented in the next three sections. A more complete description of the chemical reactions that are common to mine wastes and which lead to the mobilization of metal ions was presented by Marcy (1979).

Zinc

Concentrations of zinc as high as 11 to 27 mg/l have been found in municipal water supplies with no harmful effects (Bartow and Weigle, 1932). Zinc concentrations above four mg/l give water an astringent taste. Because of taste factors rather than public health factors, the maximum concentration of zinc allowed in domestic water supplies has been set at five mg/l (EPA, 1976).

Zinc concentration in the shallow aquifer underlying Smelterville Flats also is important because of zinc's toxicity to aquatic life. The toxicity of zinc is affected by several environmental factors, particularly water hardness, dissolved oxygen, pH, and temperature (Marcy, 1979). The fish most sensitive to zinc in the Smelterville Flats area is the rainbow trout (Marcy, 1979). The acute toxicity, TL_{50}, 96 hour (50 percent of population dies within 96 hours), ranges from 0.10 to 2.6 mg/l depending on the size of the fish and on the environmental factors listed above (Marcy, 1979).

Calcott (1989) showed that the concentration of zinc in the South Fork of the Coeur d'Alene River in the vicinity of Smelterville Flats exceeded 2.6 mg/l partially because of the ground water discharges along the river in the western portion of Smelterville Flats.

Oxygen in the presence of water vapor and the zinc mineral sphalerite make the following reactions possible (Marcy, 1979):

(1) $2H_2O + 2CO_2 = 2H_2CO_3$

(2) $ZnS + 2H_2CO_3 = Zn^{2+} + 2HCO_3^- + H_2S$

(3) $H_2S + 2O_2 = SO_4^{2-} + 2H^+$

(4) $2H^+ + 2HCO_3^- = 2H_2O + 2CO_2$

When reactions (1) through (4) are added, the sum is reaction

(5) $ZnS + 2O_2 = Zn^{2+} + SO_4^{2-}$ (Marcy, 1979).

The conclusion is that water and carbon dioxide act as agents in the oxidation of sphalerite (Marcy, 1979).

Biological agents such as bacteria may also act as catalysts in the oxidation of sphalerite. Sato (1960) proposed another possible mechanism for the oxidation of sulfide ores. In this mechanism, oxygen and water form trace amounts of hydrogen peroxide which acts as an oxidizing agent. The reaction may be written as

(6) $2H_2O(g) + O_2(g) = 2H_2O_2(g)$

(7) $H_2O_2(g) + ZnS(s) = Zn^{2+} + SO_4^{2-} + 4H_2O.$

Equation (7) is thought to be rate controlling (Marcy, 1979). Evidence in support of this latter mechanism has been provided by Marcy (1979) who observed that the redox potential for mine water lies at the vicinity of the O_2 - H_2O_2 couple

(8) $H_2O_2 = O_2 + 2H^+ + 2e-$ $\quad$ $Eh = 1.22 - 0.059\ pH$

instead of the theoretical O_2 - H_2O couple

(9) $2H_2O = O_2 + 4H^+$ $\quad$ $Eh = 0.68 - 0.059\ pH$

Other possible mechanisms for the production of acid water also exist but a discussion of them is beyond the scope of this document.

Lead

The lead ion is a cumulative poison that affects the central nervous system. Lead intoxification in children can result in irreversible brain damage (EPA, 1976). The limit for domestic water supplies has been set at 0.05 mg/l (Calcott, 1989). Fish are less sensitive to lead than humans. The lead concentration limit established for sensitive fresh water fish such as the rainbow trout is 4.71 mg/l (Marcy, 1979). This value, as in the case of zinc toxicity, is dependent on the temperature, pH, alkalinity, and hardness of the water (EPA,1976).

Mine wastes containing the lead ore galena, PbS, are the primary source of lead on Smelterville Flats. Galena can be oxidized in the unsaturated zone according to the reactions (Marcy, 1979)

(10) $H_2O + CO_2 = H_2CO_3$

(11) $PbS + 2H_2CO_3 = Pb^{2+} + 2HCO_3^- + H_2S$

(12) $H_2S + 2O_2 = SO_4^{2-} + 2H^+$

(13) $H^+ + HCO_3^- = H_2O + CO_2$

The reactions indicate that in the presence of water and carbon dioxide, galena can be oxidized to lead sulfate (Marcy, 1979).

The presence of pyrite oxidation can generate ferric ions which could oxidize the galena according to the reaction

(14) $PbS + 8Fe^{3+} + 4H_2O = 8Fe^{2+} + Pb^{2+} + SO_4^{2-} + 8H^+$

In spite of the fact that galena can oxidize, the quantity of Pb^{2+} in the ground water under equilibrium conditions is low due to the low solubility of lead salts (Marcy, 1979). Work done by Jurinak and Santillan-Merano, (1974) shows that the activity of Pb^{2+} maintained in equilibrium ranges from 0.002 mg/l to 0.2 mg/l.

Cadmium

Cadmium has been shown to be toxic to humans, whether ingested or inhaled; it has no known beneficial nutritional properties (Marcy, 1979). The EPA has set a 0.01 mg/l maximum cadmium concentration for domestic water supplies.

Recommended cadmium levels for maintenance of aquatic life depend on environmental factors such as pH, alkalinity, and hardness of the water (Marcy, 1979). Rainbow trout require cadmium levels below 0.0004 mg/l in soft water or 0.0012 mg/l in hard water (EPA, 1976).

The cadmium present on Smelterville Flats was probably deposited as greenockite, CdS, substituted into sphalerite. Greenockite is highly insoluble, but Cd^{2+} could enter the ground water through the oxidation of the sulfide (Marcy, 1979). The oxidation reactions are similar to those described for sphalerite and galena (Marcy, 1979)

(15) $H_2O + CO_2 = H_2CO_3$

(16) $CdS + 2H_2CO_3 = Cd^{2+} + 2HCO_3^- + H_2S$

(17) $H_2S + 2O_2 = SO_4^{2-} + 2H^+$

$$(18)\quad H^+ + HCO_3^- = H_2CO_3.$$

The ferric ion, Fe^{3+}, derived from the oxidation of pyrite could be the oxidant rather than oxygen. In this case the reaction would be:

$$(19)\quad CdS + 8Fe^{3+} + 4H_2O = 8Fe^{2+} + Cd^{2+} + SO_4^{2-} + 8H^+$$ (Marcy, 1979).

The oxidation products formed in the tailings material in the unsaturated zone during the summer or other times of low water levels remain mainly in the hygroscopic water bound by surface tension to the pore spaces in the unsaturated zone.

Large-scale recharge events such as heavy rains in the fall of the year or snow melt in the late winter or early spring may flush these soluble oxides into the ground water.

WATER QUALITY ANALYSIS

Each ground water sample was analyzed for 20 metal ions, electrical conductivity, and pH. Concentrations of metal ions are reported in milligrams per liter (mg/l). The concentrations of most metal ions are consistently below the detection limits of the ICP. Three metal ions, zinc, lead, and cadmium are of primary interest because of their presence in ground water at the Smelterville site and because of their toxicity to humans or to aquatic life. Figures 22, 23 and 24 are graphs of zinc, lead, and cadmium, respectively, versus time for piezometer X4. Figures 25, 26, and 27 are graphs of zinc, lead, and cadmium, respectively, versus time for piezometer Y2. Finally, Figures 28, 29, and 30 are graphs of zinc, lead, and cadmium, respectively, versus time for piezometer #7 in the BLM sub-area. These graphs show clearly that concentrations of metal ions are considerably higher in the shallower piezometer at the location of each pair.

The differences in ion concentration between the shallow and deeper piezometer are most evident in the piezometers installed in the BLM sub-area. One possible reason for the greater difference in ion concentration is the depth of the shallower piezometers in comparison to the depth of the aforementioned "metallic" silty layer. The shallower piezometers installed by Norton (1980) along the X and Y lines are screened at depths ranging from 12 to 17 feet below the surface; these depths are at least seven to 12 feet below this "metallic" silty layer.

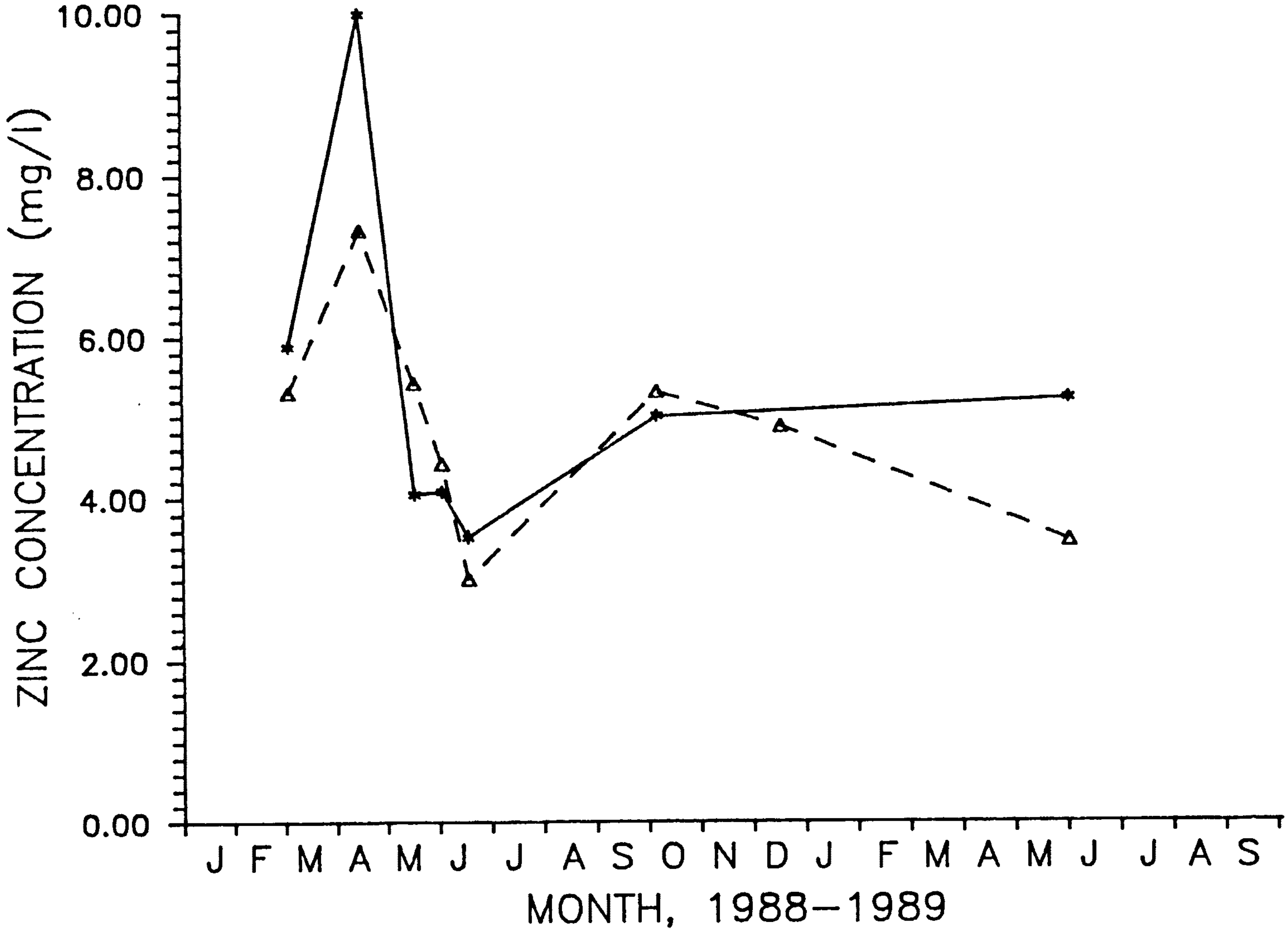

Figure 22. Zinc concentration versus time in ground water from piezometers at location X4 in Smelterville Flats. Dashed line represents the deeper piezometer; solid line represents the shallower piezometer.

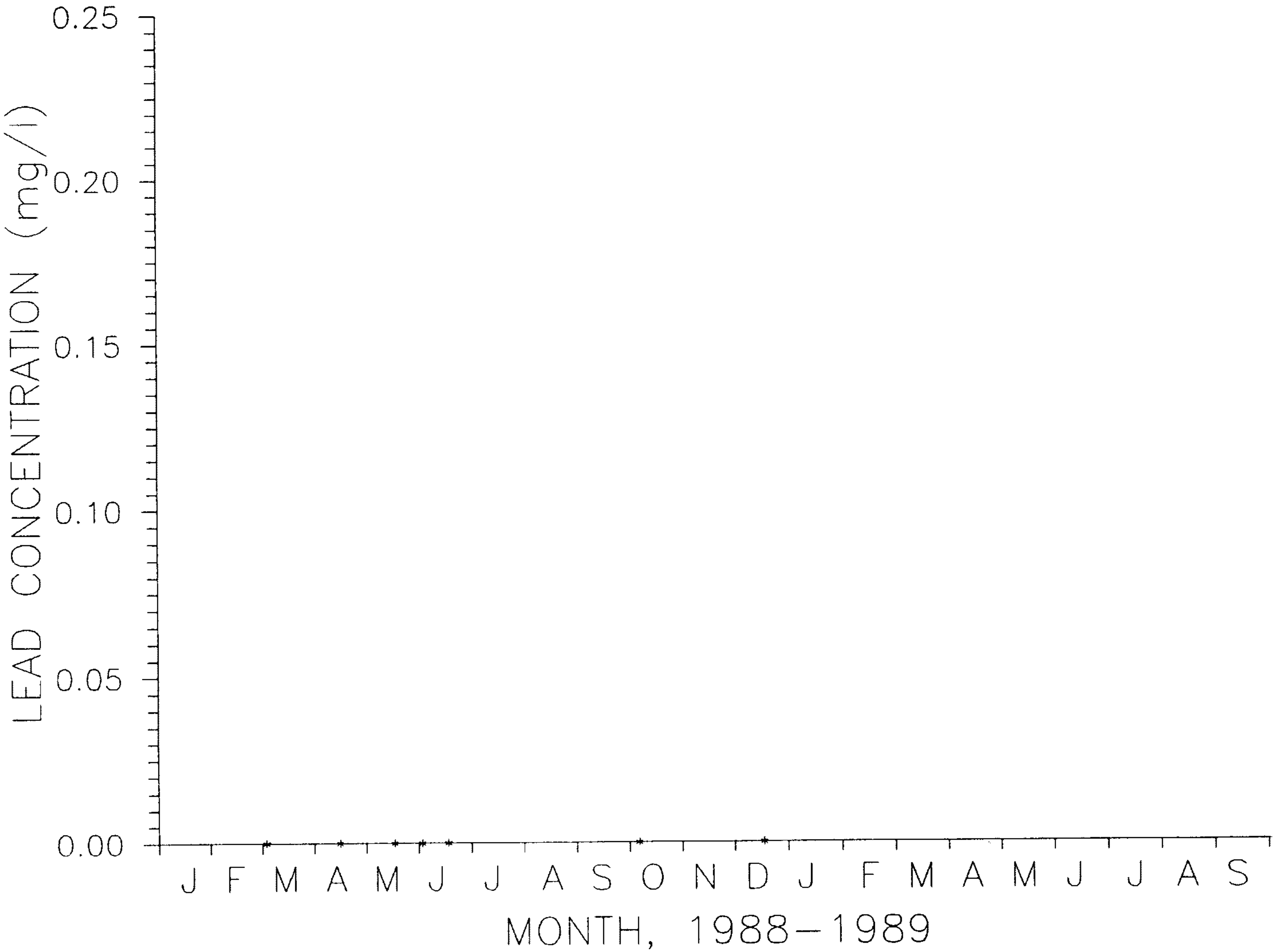

Figure 23. Lead concentration versus time in ground water from piezometers at location X4. All samples had lead concentrations below the detection limit of 0.05 mg/l for the ICP.

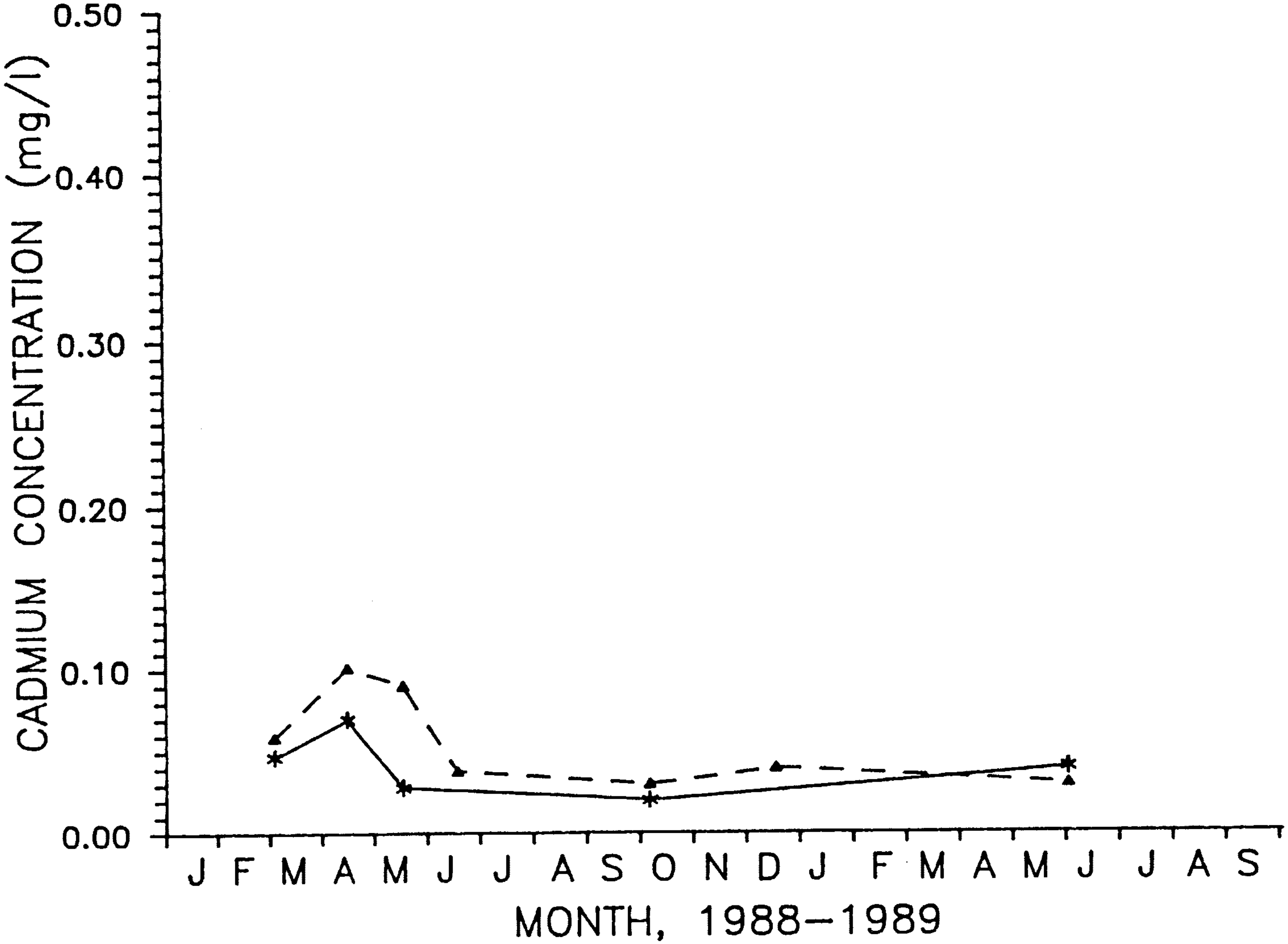

Figure 24. Cadmium concentration versus time in ground water from piezometers at location X4. Dashed line represents the deeper piezometer; solid line represents the shallower piezometer.

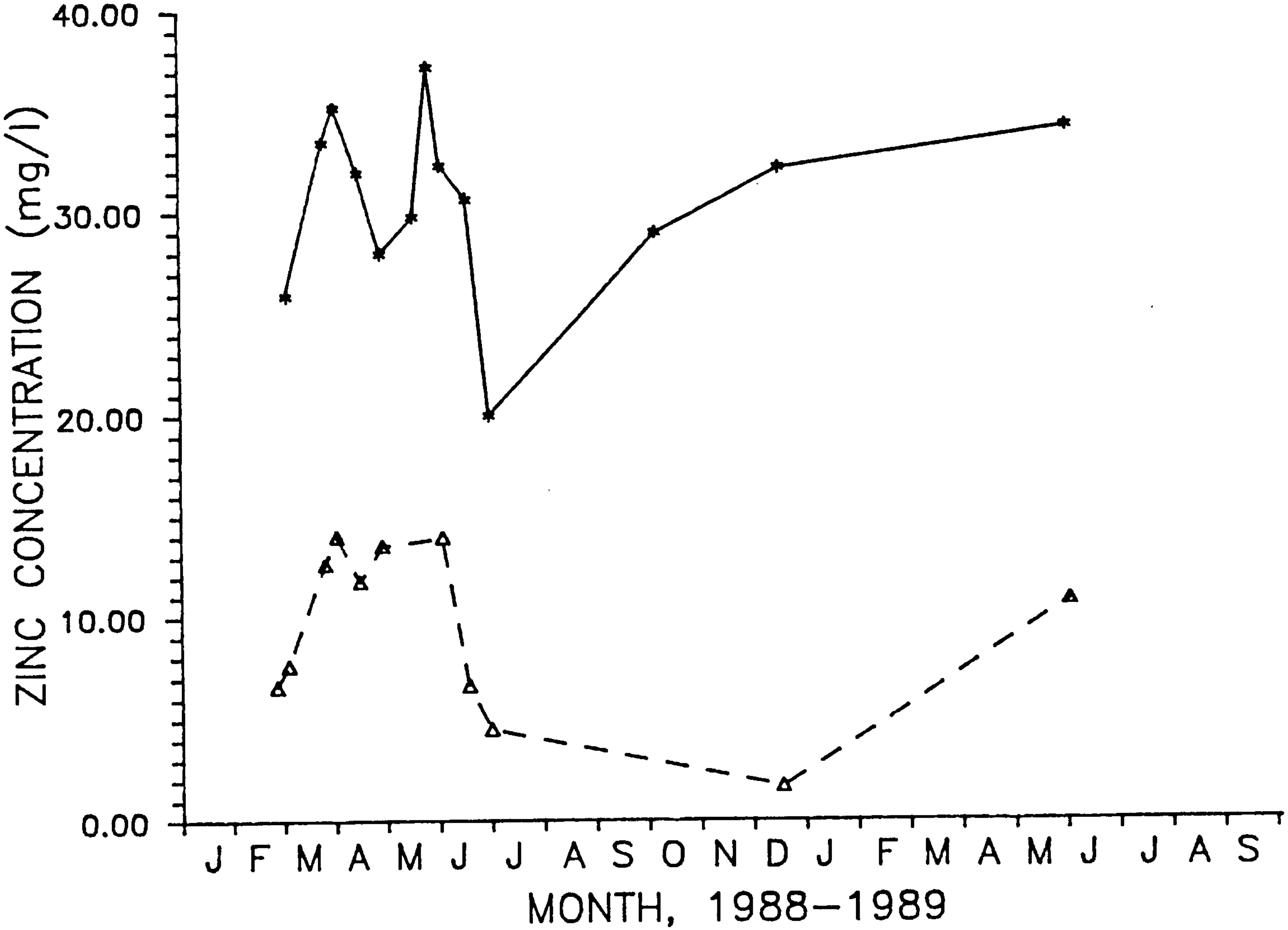

Figure 25. Zinc concentration versus time in ground water from piezometers at location Y2. Dashed line represents deeper piezometer; solid line represents shallower piezometer.

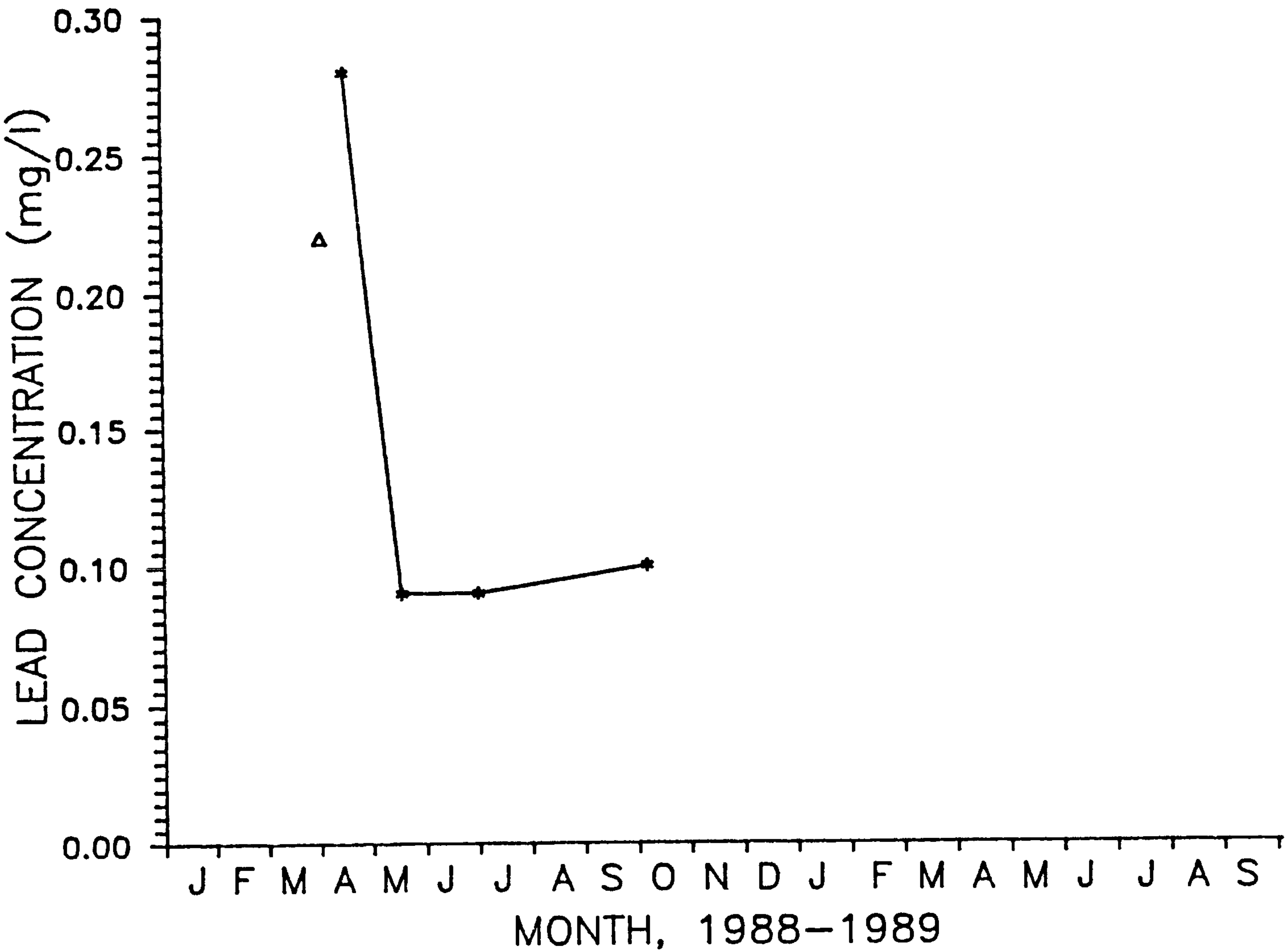

Figure 26. Lead concentration versus time in ground water from piezometers at location Y2. Solid line represents shallower piezometer. Deeper piezometer had one lead concentration above detection limit of 0.05 mg/l.

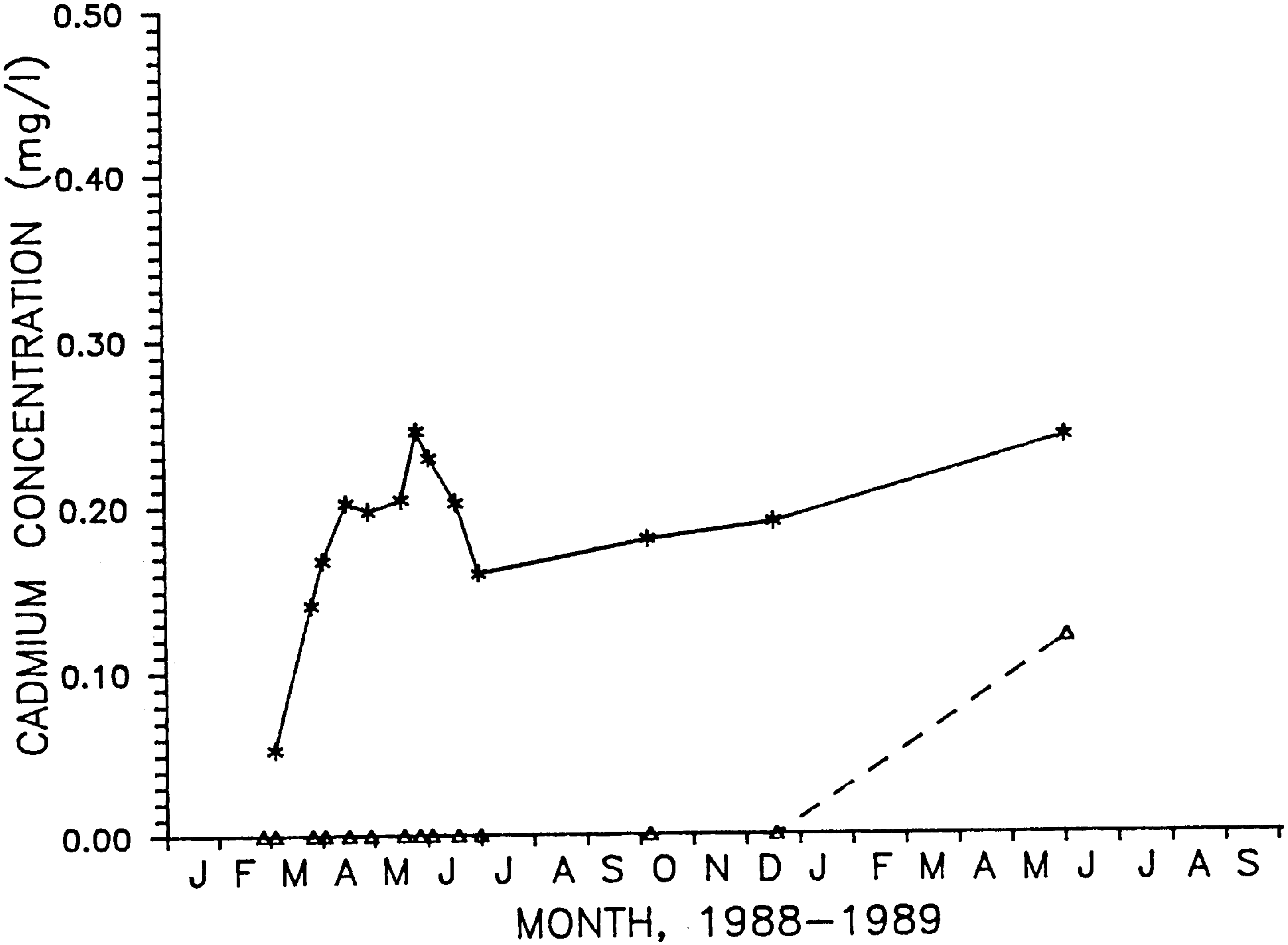

Figure 27. Cadmium concentration versus time in ground water from piezometers at location Y2. Dashed line represents deeper piezometer; solid line represents shallower piezometer. Deeper piezometer had cadmium concentration below detection limit of 0.01 mg/l until June, 1989.

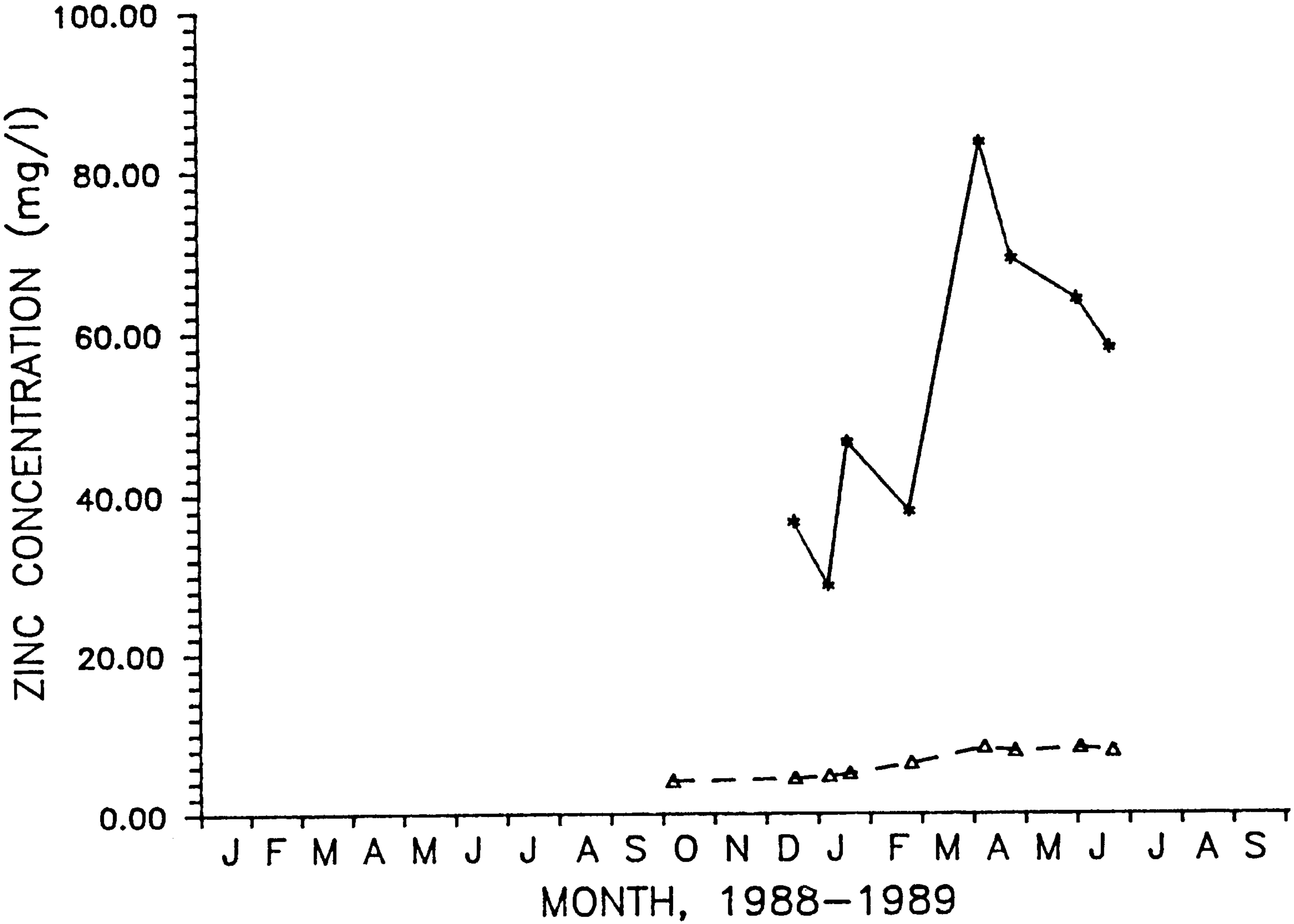

Figure 28. Zinc concentration versus time in ground water from piezometers at location 7 in the BLM study area. Dashed line represents deeper piezometer; solid line represents shallower piezometer.

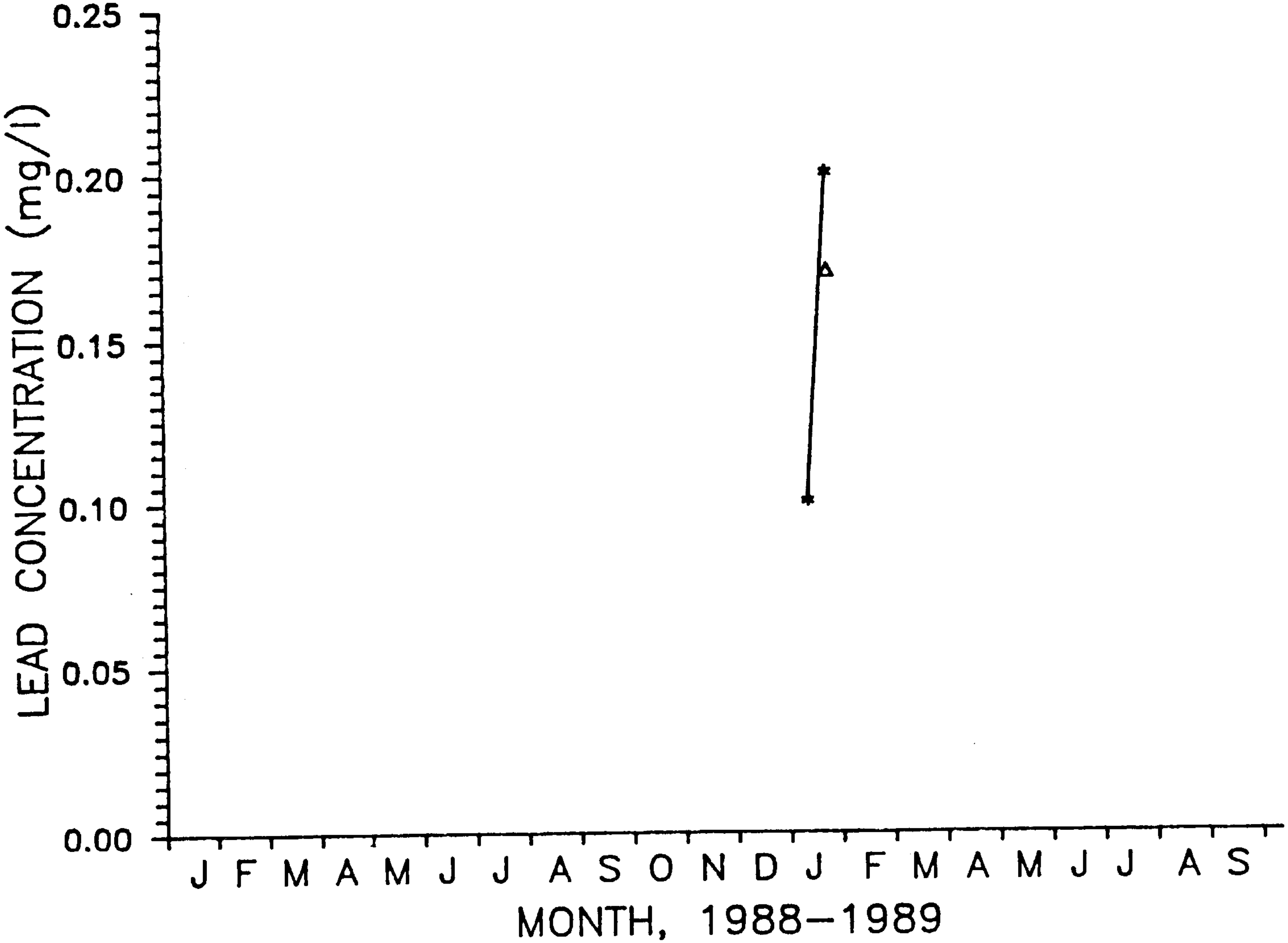

Figure 29. Lead concentration versus time in ground water from piezometers at location 7 in the BLM study area. Solid line represents shallower piezometer. Lead concentrations in deeper piezometer were below detection limit of 0.05 mg/l except on January 18, 1989.

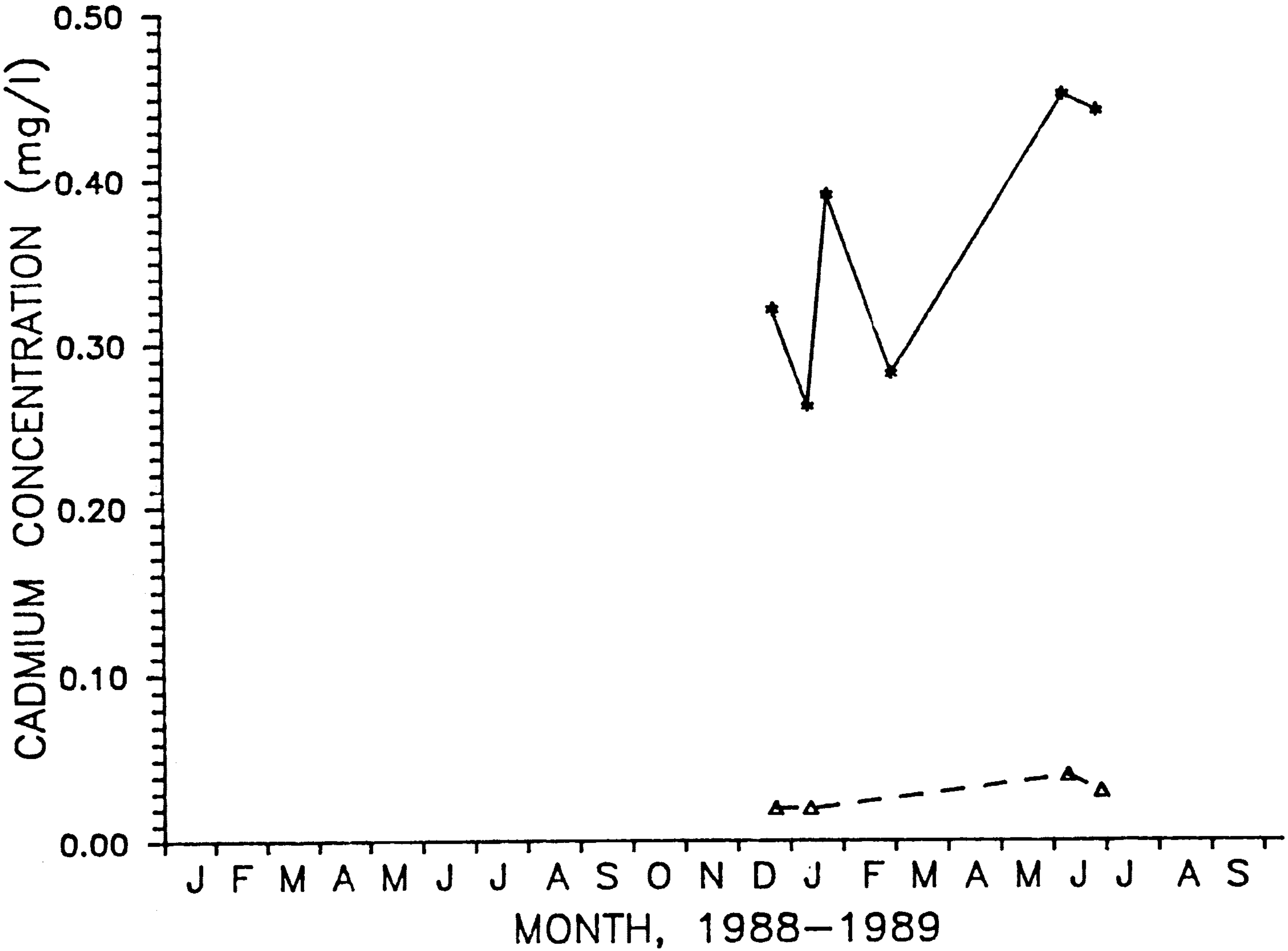

Figure 30. Cadmium concentration versus time in ground water from piezometers at location 7 in the BLM study area. Dashed line represents deeper piezometers at location 7 in the BLM study area. Dashed line represents deeper piezometer; solid line represents shallower piezometer.

The shallower piezometers installed in the BLM sub-area are screened at depths ranging from 4.5 to 7.0 feet below the surface. The screens of these piezometers are near and in some cases in direct contact with the "metallic" silty layer. Water samples taken from shallower piezometers in the BLM sub-area represent water directly affected by the chemistry of the "metallic" silty layer with little or no dilution.

Zinc is used in this report as the primary indicator of water quality associated with solid wastes on Smelterville Flats because it is prevalent throughout the Flats and because of its propensity to remain in solution rather than to form hydrolysis precipitates (Bretherton, 1989) or to be adsorbed. Electrical conductivity is not used as an indicator of water quality due to its poor correlation with zinc-
ion concentrations in some cases (Riley, 1990).

High EC values frequently are associated with high concentrations of metals; however, it is true also that the high EC values may not be caused by the metal ions of primary interest in this study (zinc, lead, and cadmium).

Values of pH are not used as an indicator of water quality due to the poor correlation of pH and metal ion concentrations and because of unreliable pH data collected in the early portion of the study. Results of water sample analyses are presented in Appendix 5.

Spatial Distribution of Water Quality

Figures 22 through 30 illustrate that the depth of the screened interval in piezometers installed in the upper aquifer beneath Smelterville Flats has a considerable influence on water quality. Shallow piezometers on the BLM land are screened near, and in some cases in direct contact with the "metallic" layer of silt that is believed to be a major source of metal ions in the shallow ground water. Shallow piezometers in the X and Y lines are screened at least five feet deeper than piezometers in the BLM sub-area. The greater depth of the screened intervals in these piezometers may allow considerable dilution of water from this "metallic" silty layer during sample collection.

Deeper piezometers in the upper aquifer beneath Smelterville Flats are all screened at approximately the same depth, 20 to 26 feet below the surface. Because water quality has been shown to vary with depth, lateral distribution of water quality is best shown using comparable data from the deeper piezometers. Vertical distribution of water quality is best shown using piezometers completed at different depths at the same location.

Lateral Water Quality Distribution

Zinc concentrations from water samples collected in deep piezometers on October 5, 1988 represent water quality of the aquifer when water levels were near their lowest during that year. Figure 31 is a map of zinc concentrations measured in water samples taken from all deeper piezometers in the upper aquifer on Smelterville Flats that were not dry and did not pump dry at the time of sampling. Zinc-ion concentrations ranged from 2.2 mg/l to 8.6 mg/l in the deeper piezometers during this sample period. The zinc concentrations on October 5, 1988, presented in Figure 31, do not show any consistent pattern of spatial distribution. Figure 32 shows zinc concentrations in deeper piezometers during December 16, 1988. Because of higher water levels, samples could be obtained from more piezometers at this time. Zinc concentrations generally were somewhat higher than during the October 5, 1988 sampling period, possibly because of greater recharge through the "metallic" silty layer caused by winter rains.

Zinc-ion concentrations appear to be low in piezometers in the X and Y lines located near the South Fork of the Coeur d'Alene River. Piezometers at locations 8X and 9X are in an area in which much of the mine waste material has been eroded away by the South Fork of the Coeur d'Alene River. As would be expected, zinc-ion concentrations at these two piezometer locations are low, commonly below detection limits. Deeper piezometers at locations 7X, 8X, and 9Y are close to the South Fork of the Coeur d'Alene River but in areas in which mine wastes are still present. Water samples from these piezometers display low concentrations of zinc ions throughout the year.

The low concentrations of zinc may be due to relatively uncontaminated recharge from the South Fork of the Coeur d'Alene River. The South Fork of the Coeur d'Alene River is a losing stream in the vicinity of the X and Y lines (Figure 12).

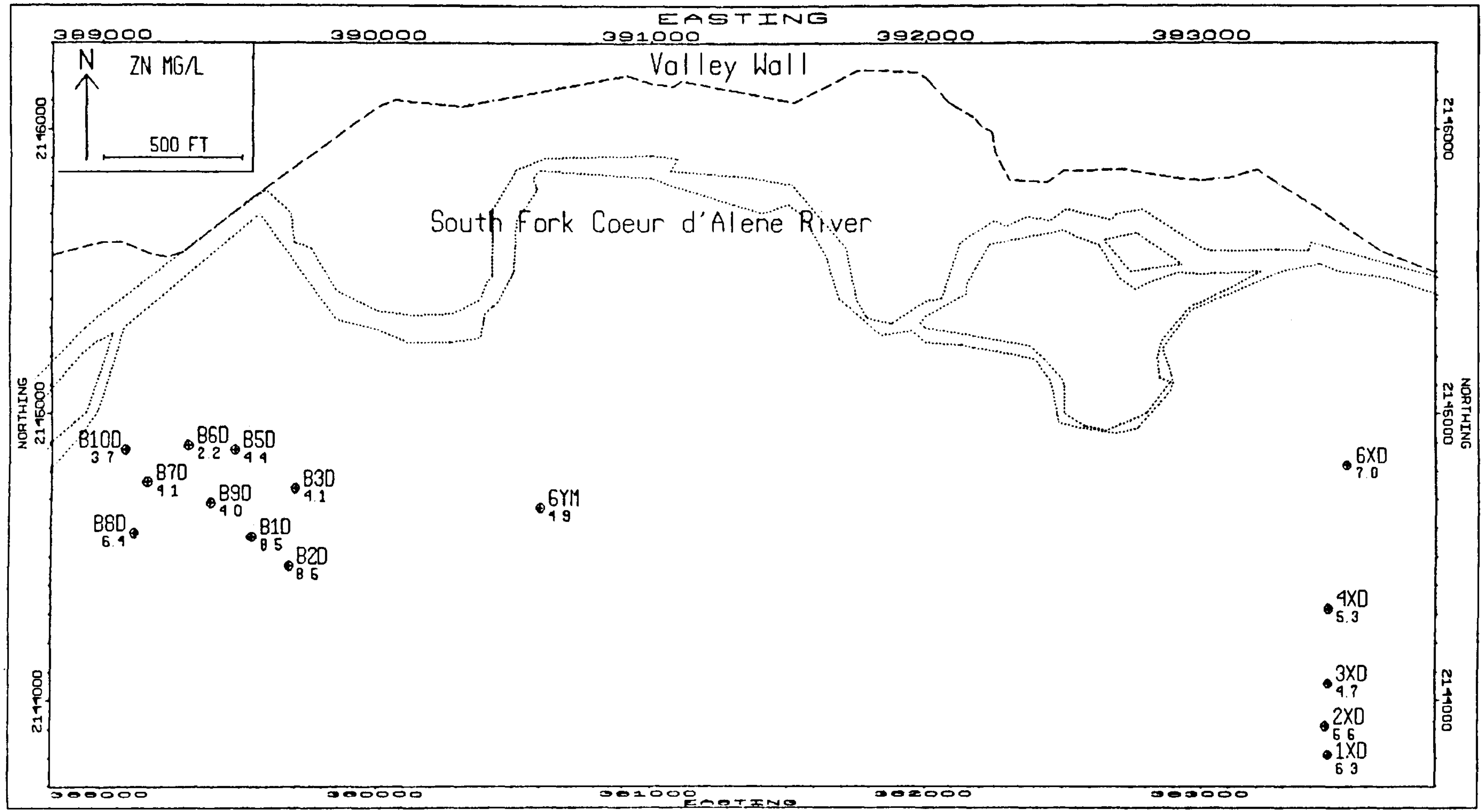

Figure 31. Zinc ion concentrations in deeper piezometers installed in the upper aquifer beneath Smelterville Flats on October 5, 1988.

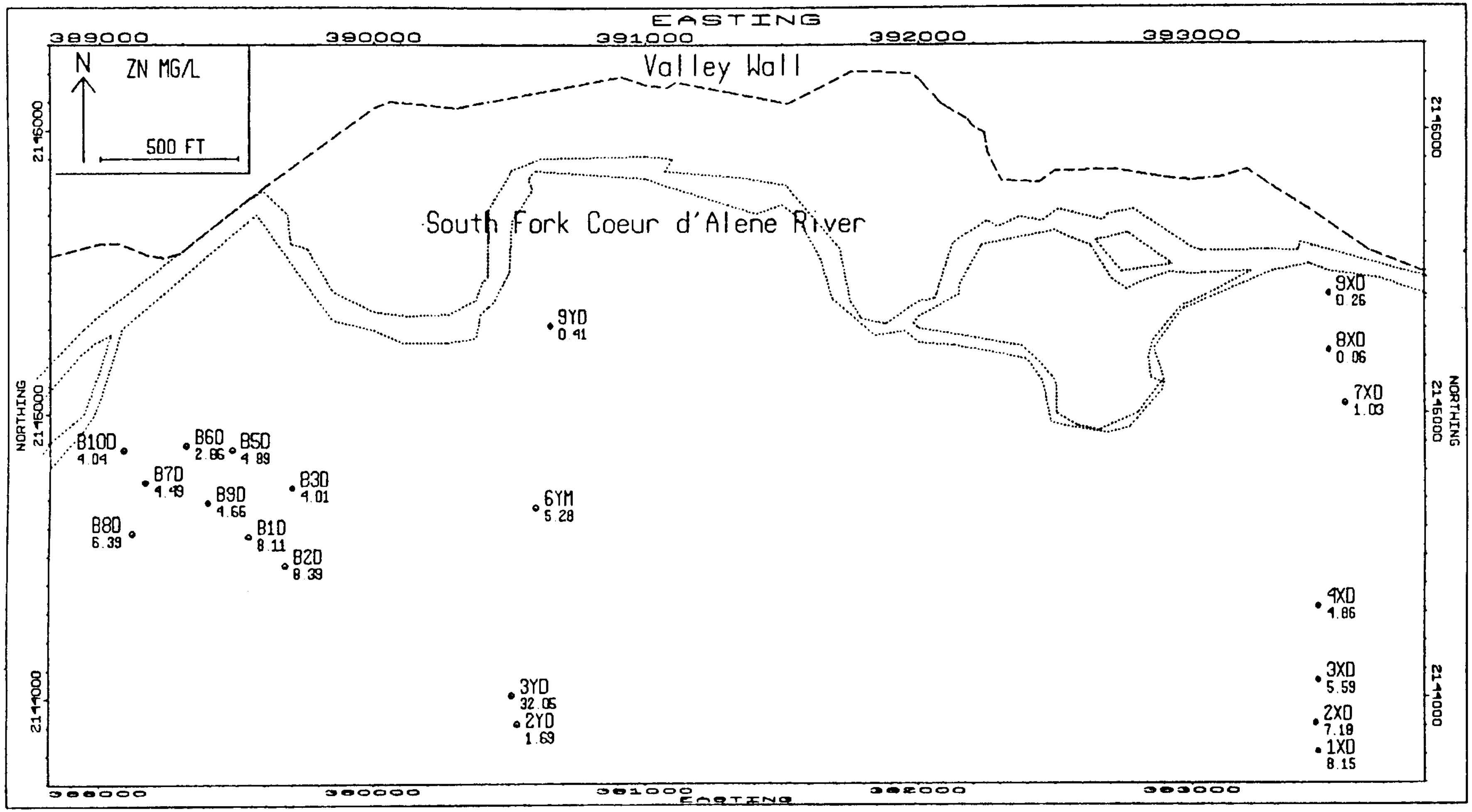

Figure 32. Zinc ion concentration in deeper piezometers installed in the upper aquifer beneath Smelterville Flats on December 16, 1988.

Studies by Mink (1971) and Calcott (1989) indicated that the zinc-ion concentrations in the South Fork of the Coeur d'Alene River above the west end of Smelterville Flats are relatively low. The good quality water from the river may dilute poorer quality ground water in losing portions of the river. The effects of dilution by the river would be most evident in piezometers located closest to the river.

Metal ion concentrations in the deeper piezometer at location 3Y are anomalously high throughout the year. The zinc concentrations at this piezometer are similar to those observed in the shallow piezometer at this location. It is possible that a break exists in the PVC pipe or a joint may have pulled apart in this piezometer. Such a break would allow poorer quality water from the shallower portion of the upper aquifer to mix with water coming in through the screened interval deeper in the aquifer. Another possibility is that the borehole was not properly backfilled at this location, thereby allowing vertical communication and mixing of water. This possibility is supported by a small sinkhole-like depression next to the pair of piezometers at this location.

Deeper piezometers in the BLM sub-area are located along a portion of the river where ground water discharge occurs. As would be expected, no evidence of dilution of zinc-ion concentration in the ground water by relatively uncontaminated river water was noted in this area.

Vertical Water Quality Distribution

Zinc-ion concentrations in shallow and deep piezometers at the same locations in the upper aquifer beneath Smelterville Flats generally are significantly different. Figures 22 through 30 show that depth has a considerable influence on water quality within the upper aquifer. In most cases shallow piezometers display the poorest quality water. The extremely high concentrations of zinc recorded in several shallow piezometers in the BLM land are not present in the piezometers of the X and Y lines. Differences in shallow piezometer completion depths may account for the lack of zinc concentrations in excess of 100 mg/l in the X and Y lines.

Drilling logs show that the "metallic" silty layer is present at a depth of approximately five feet in a few piezometer locations in the X and Y lines. Shallow piezometers in the X and Y lines are completed to a minimum of 12 feet and a maximum of 17 feet below land surface (Table 1). Shallow piezometers in the BLM sub-area are completed near and in some cases in direct contact with the "metallic" silt layer at depths ranging from six to seven feet below land surface.

Graphs of zinc concentration versus time for some of the paired piezometers located within the BLM sub-area show a greater difference in zinc-ion concentration between the shallow and deep piezometers than piezometers in the X and Y lines owing to their construction. Graphs are presented in Figures 33-36.

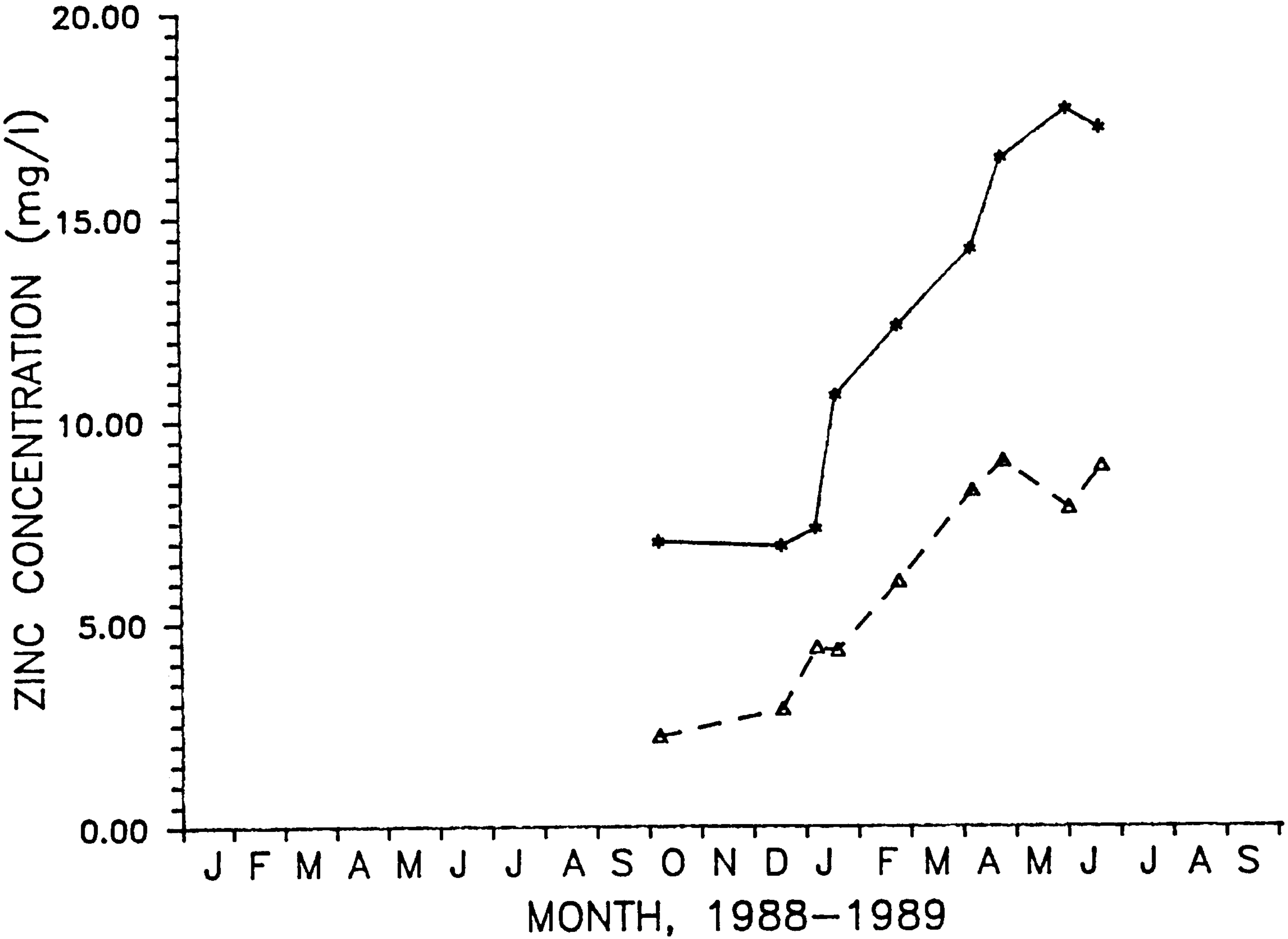

Figure 33. Zinc concentration versus time in ground water from piezometers at location 6 in the BLM study area. Dashed line represents deeper piezometer; solid line represents shallower piezometer.

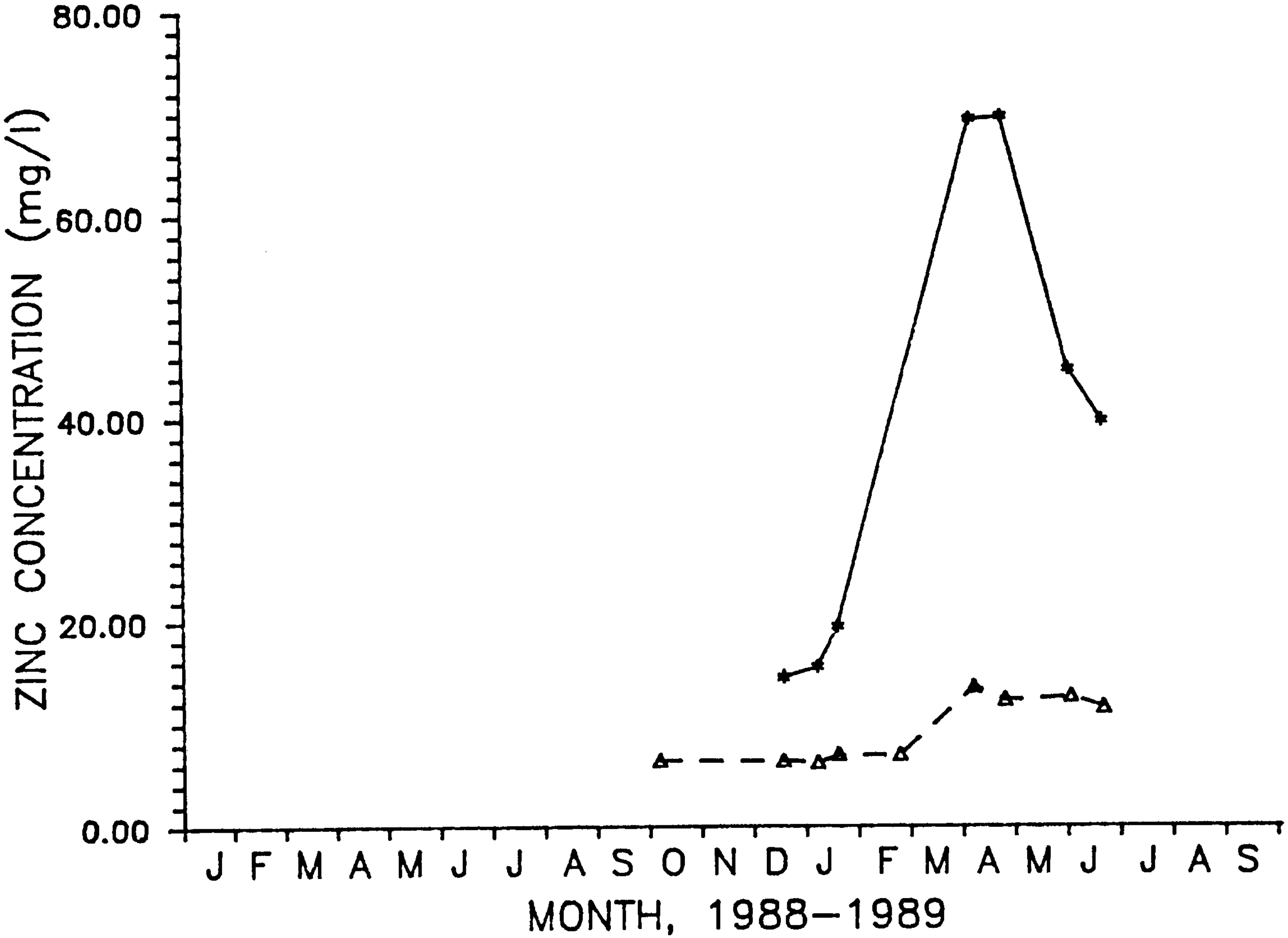

Figure 34. Zinc concentration versus time in ground water from piezometers at location 2 in the BLM study area. Dashed line represents deeper piezometer; solid line represents shallower piezometer.

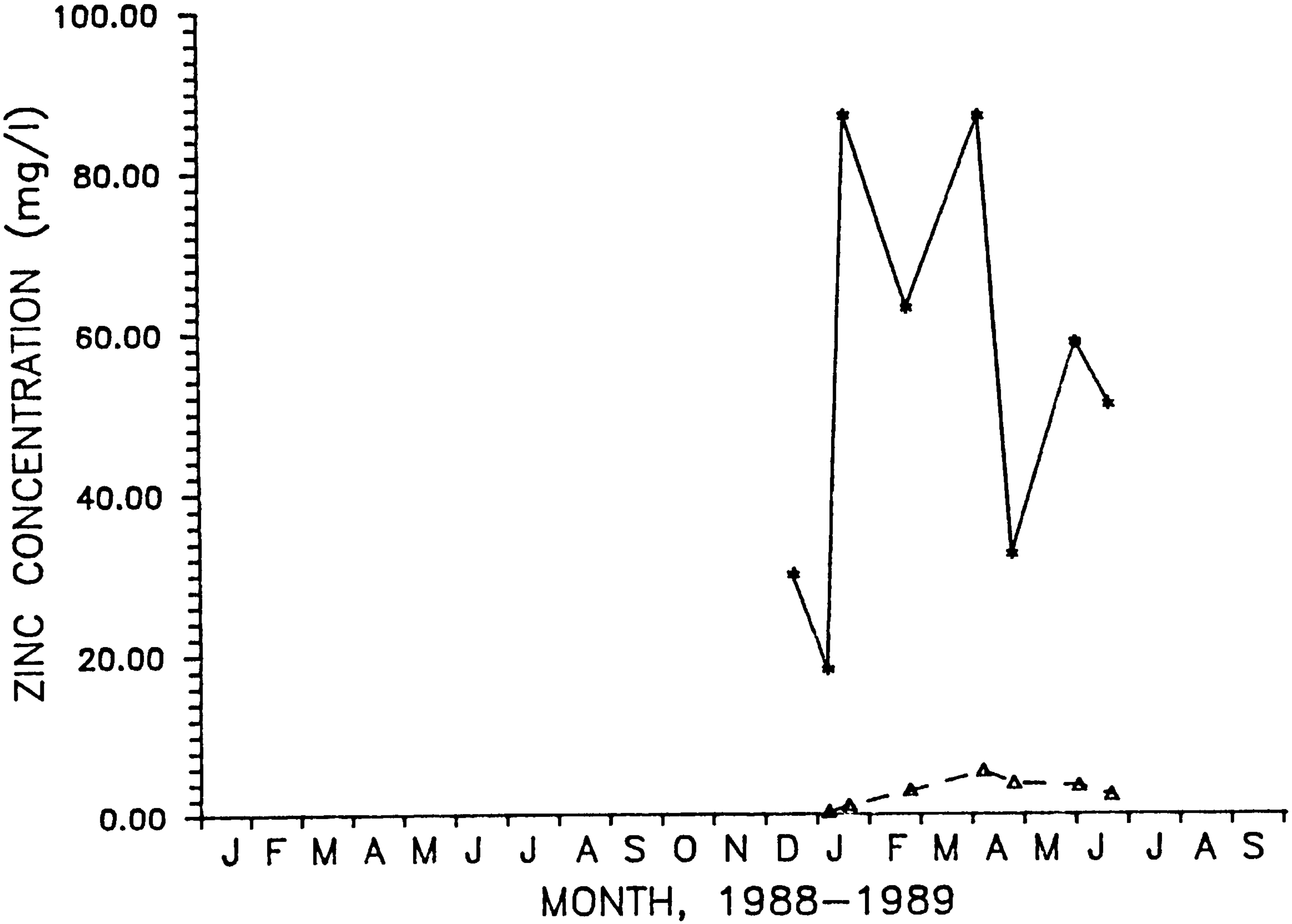

Figure 35. Zinc concentration versus time in ground water from piezometers at location 4 in the BLM study area. Dashed line represents deeper piezometer; solid line represents shallower piezometer.

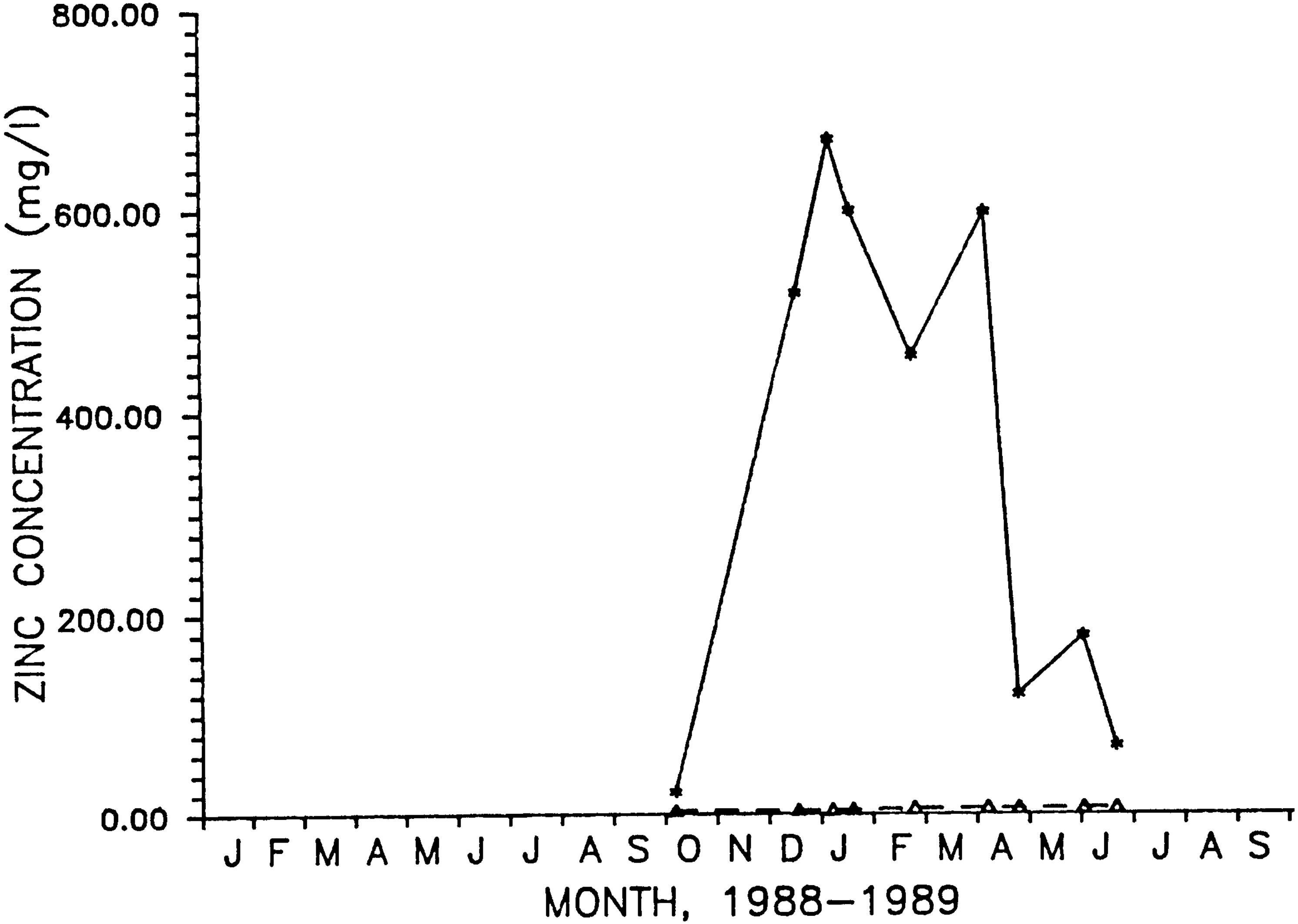

Figure 36. Zinc concentration versus time in ground water from piezometers at location 10 in the BLM study area. Dashed line represents deeper piezometer; solid line represents shallower piezometer.

The graphs show that zinc concentrations rose significantly in most shallow piezometers during the spring recharge while zinc concentrations in the deeper piezometers within the upper aquifer remained virtually unchanged during the same period. This observation suggests that zinc-ion concentrations respond more rapidly to downward percolation of recharge water that to poor quality ground water moving laterally downgradient from upgradient sources such as the Central Impoundment Area.

Temporal Variations in Water Quality

Temporal variations in water quality within the upper aquifer beneath Smelterville Flats may occur due to infiltration and recharge through the surficial cover of mine wastes or from variations caused by upgradient sources. Water levels rise throughout Smelterville Flats during recharge in the late winter and early spring. The first major recharge event of 1989 occurred on January 18, 1989. The greatest change in water levels occurred in areas in which localized ponding occurs during the precipitation event. Localized ponding occurs due to heavy rainfall or rapid snow melt in areas on Smelterville Flats where depressions occur in the topography. Limited erosion occurs because of overland flow. Silt and clay-sized particles are deposited in depression areas creating thin layers of low hydraulic conductivity material. The ponds may remain for several days after a precipitation event as the water slowly infiltrates and/or evaporates.

Water levels at most piezometer locations did not rise into the "metallic" silty layer during the January 18, 1989 recharge event; however, recharge water infiltrating through this layer apparently flushed the dissolved metal oxides present in the film of water coating the particles of mine wastes into the saturated ground water system.

The highest zinc concentrations recorded in the BLM sub-area piezometers occurred in April, 1989, when water levels in most of the piezometers rose into the "metallic" silty layer for the first time during that recharge season. Similar rises in water levels occurred in the deeper piezometers within the shallow aquifer due to the January 18, 1989 and subsequent recharge events; however, large increases in zinc concentrations were not observed in the samples collected from these piezometers because of their much deeper screened interval. The screened intervals are far enough away from the major source of metal ions for considerable dilution to occur.

Figures 37 and 38 show construction and screened intervals in relation to the "metallic" silty layer for shallow piezometers in the BLM sub-area. These figures illustrate how changes in water levels, most notably water level rises into the "metallic" silty layer, correspond to rises in zinc concentrations in the ground water. The thicknesses and depths of the "metallic" silty layer were taken from drilling records for each piezometer.

Drilling records are as accurate as the equipment and sampling conditions allow; however, it is important to keep in mind that actual depths and thicknesses of the "metallic" silty layer may differ slightly from those presented in Figures 37 and 38 at some locations. In some cases water levels apparently rise into the "metallic" silty layer but are not accompanied by large increases in zinc-ion concentrations in the water. In other cases large increases in zinc-ion concentrations are not accompanied by water level rises into the "metallic" silty layer.

These discrepancies may be due to inaccurate delineation of the upper and lower limits of the "metallic" silty layer. Water levels presented in Figures 37 and 38 are accurate relative to the ground surface; depths and thicknesses of the "metallic" silty layer may not be represented as accurately.

All shallow piezometers in the BLM sub-area are presented in Figures 37 and 38; however, the relationship between ground water levels and zinc-ion concentration in the ground water is more apparent at some piezometer locations. Six examples are discussed in detail below.

Shallow Piezometers

Piezometer 1C: Figure 37 shows that during the 1/6/89 sampling period the water level and zinc concentration (62.7 mg/l) were both low in piezometer 1C. The recharge event of 1/18/89 caused the water level to rise approximately 0.5 feet at this location. The water level did not rise into the "metallic" silty layer at this time, but water passing through this layer may have flushed metal oxides bound in the hygroscopic water surrounding particles of the overlying wastes causing a rise in zinc concentration from 62.7 mg/l on 1/6/89 to 104.9 mg/l on 1/18/89.

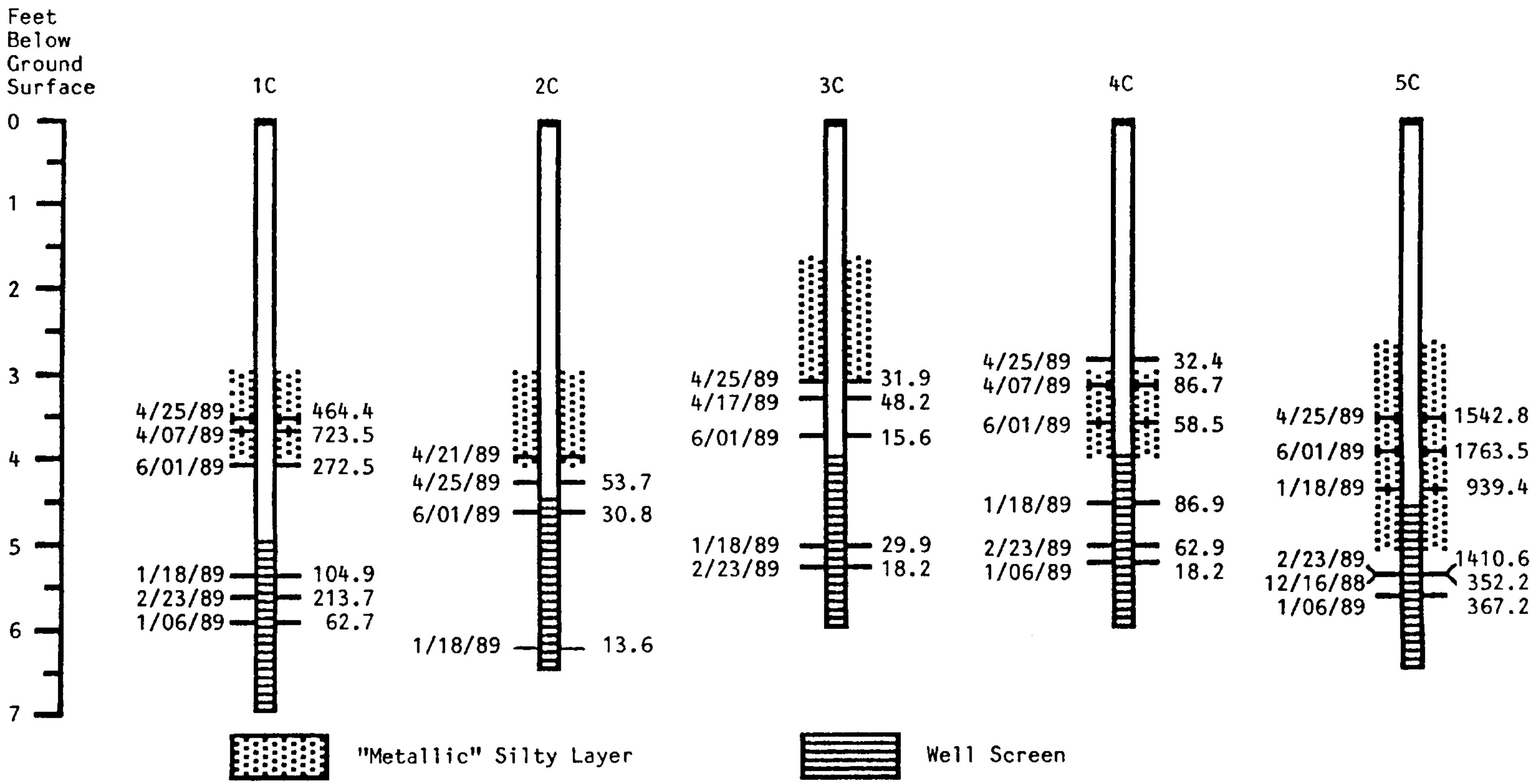

Figure 37. Water levels and zinc concentrations in ground water in relation to mine wastes and screened intervals in shallow paired piezometers 1 through 5 in the BLM study area.

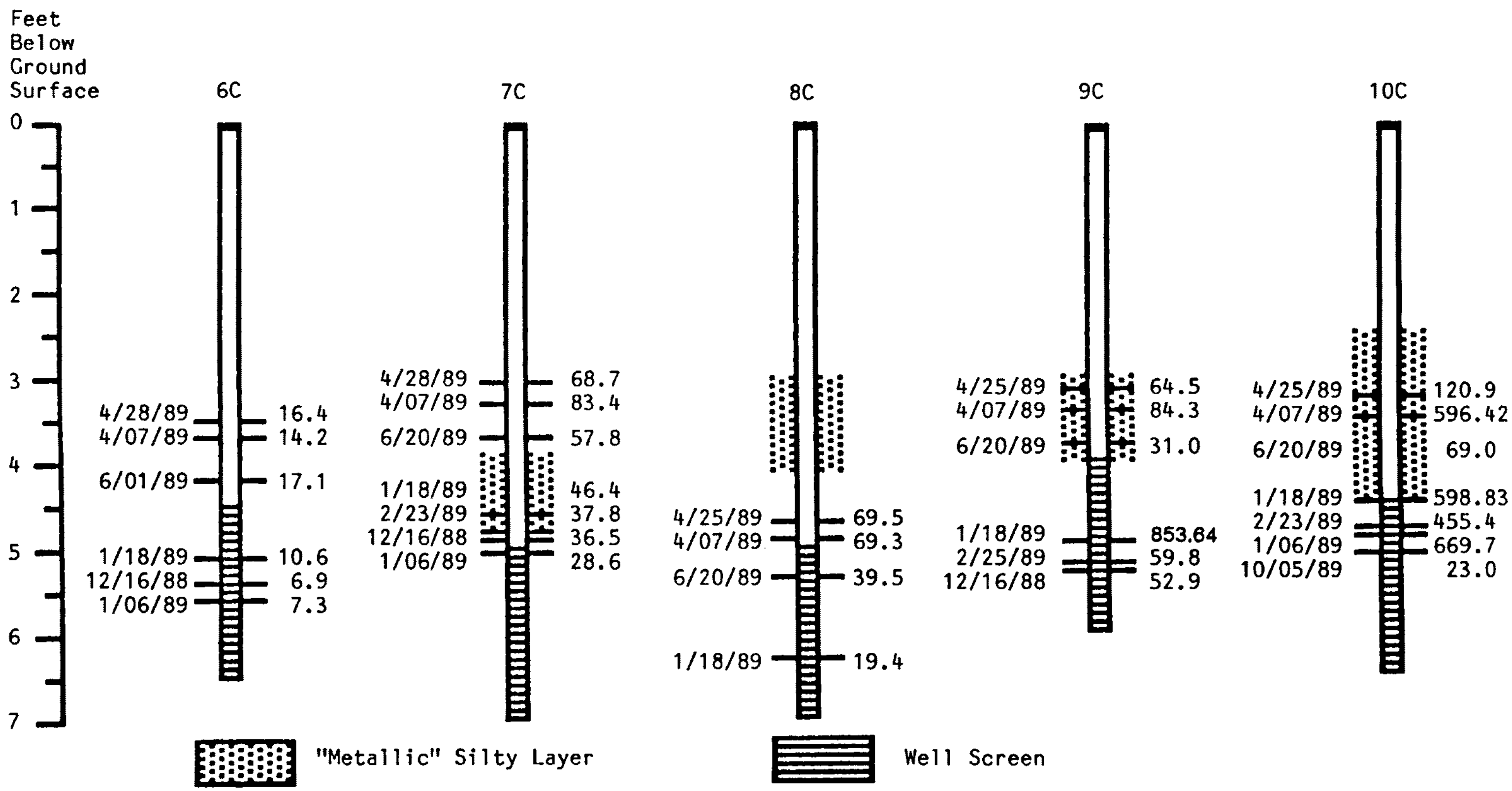

Figure 38. Water levels and zinc concentrations in ground water in relation to mine wastes and screened intervals in shallower paired piezometers 6 through 10 in the BLM study area.

Water levels dropped somewhat in February probably because of the lack of snow melt caused by several weeks of cold weather. In late February, precipitation and snow melt occurred. The infiltrating recharge water flushed additional metal ion-rich hygroscopic water from the wastes and transported the ions to the ground water. Zinc concentrations rose from 104.9 mg/l on 1/18/89 to 213.7 mg/l on 2/23/89. The recharge event prior to the 4/7/89 sample collection may have caused the water level in piezometer 1C to rise into the "metallic" silty layer for the first time in several months. The corresponding rise in zinc concentration was significant. Zinc-ion concentration rose from 213.7 mg/l on 2/23/89 to 723.5 mg/l on 4/7/89.

Water levels continued to rise at this location until they peaked on 4/21/89. After the peak water level occurred in piezometer 1C, water levels dropped into wastes that already had much of their metal oxides flushed away. As would be expected, the zinc-ion concentration in the ground water at this location dropped to 464.4 mg/l on 4/25/89.

Water levels generally continued to decline throughout the spring at this location. A water sample collected on 6/1/89 had a zinc concentration of 272.5 mg/l. Following continued declines in water levels at this piezometer location, a water sample had a zinc concentration of 218.7 mg/l on 6/20/89.

Piezometer 2C: Piezometer 2C (Figure 37) was dry during most of the sampling periods. Water samples were collected from this piezometer on three occasions during the year, 1/18/89, 4/25/89, and 6/1/89. On 1/18/89 the water level rose into the screened interval of piezometer 2C for the first time since the piezometers were installed in August, 1988. The zinc concentration was low, 13.6 mg/l, at this time. A low zinc concentration is expected at this location because the water level was still below the "metallic" silty layer.

Water levels did not rise into the "metallic" silty layer until 4/14/89 at this location. Unfortunately, a water sample was not collected on 4/14/89; however, a sample was collected eleven days later on 4/25/89. As expected, when the water level rose into the "metallic" silty layer the zinc concentration increased significantly, from 13.6 mg/l on 1/18/89 to 53.7 mg/l on 4/25/89. The zinc concentration probably was higher than 53.7 mg/l on 4/21/89, during the peak water level but a water sample was not collected until 4/25/89. Another possible reason that the zinc concentration was not very high on 4/25/89 is that the infiltration of recharge water associated with the peak water level had already passed through the wastes by that time and flushed much of the soluble reaction products from the wastes.

No recharge events capable of flushing large amounts of soluble reaction products occurred between 4/25/89 and the next sampling period on 6/1/89. As would be expected without additional flushing, zinc concentrations in the ground water dropped to 30.8 mg/l on 6/1/89.

Piezometer 5C: Piezometer 5C (Figure 37) exhibits the highest zinc concentrations of any of the BLM sub-area piezometers. This result may be due in part to the thickness and the zinc concentration of "metallic" silty layer at this location and the localized ponding that occurs in this area. Soluble metal oxides are washed into the ground water as the ponded water infiltrates into the aquifer through the "metallic" silty layer.

The first water sample collected at piezometer 5C was on 12/16/88. At this time the zinc concentration was 352.2 mg/l. This zinc concentration is very high in spite of the fact that the water level was well below the "metallic" silty layer. The high zinc concentration at this location may be due to the sustained infiltration from ponded water in the area. Infiltration of ponded water over a long period of time (compared to a short- term recharge event) may allow more complete flushing of poor quality hygroscopic water from the mine wastes to ground water.

A water sample taken from piezometer 5C on 1/6/89 contained approximately the same zinc concentration as the previous sample collected 12/16/88. No appreciable recharge events occurred between sampling events that would have caused a change in water quality.

A recharge event which occurred just prior to the 1/18/89 sampling event raised the water level in piezometer 5C by approximately 1.5 feet. Recorded water levels rose slightly into the "metallic" silty layer for the first time in 1989. The corresponding rise in zinc concentration, presumably due to this recharge event, was dramatic. Zinc concentration rose from 367.2 mg/l on 1/6/89 to 939.4 mg/l on 1/18/89.

Rapid snow melt in late January, 1989 caused a small pond to form near piezometer 5C. This pond, and water infiltrating to the ground water beneath the pond, froze in early February owing to extremely cold weather. In late February the weather warmed enough to allow this pond and the water in the upper sediments to thaw. The measured water level did not rise into the "metallic" silty layer at this time but the thaw released water that could infiltrate through the "metallic" silty layer at this location.

Piezometer 5C was sampled on 2/23/89; the water had a zinc concentration of 1410.6 mg/l. The extremely high zinc concentrations at this piezometer location may be due in part to the localized ponding allowing a long residence time for water in contact with metal ion yielding sediments, the thickness of the "metallic" silty layer, and the nearness of the screened interval to the "metallic" silty layer.

As water levels rose into the "metallic" silty layer during the month of April, 1989 zinc concentrations rose too. The zinc concentration was 1487.7 mg/l on 4/7/89 and 1542.8 mg/l on 4/25/89. Three possible reasons why the zinc concentration did not rise dramatically when the water level entered the "metallic" silty layer at this location are: 1) the zinc concentrations were already high due to the flushing effect of ponded water in the area; 2) the continual flushing due to ponding at this location may have flushed most of the metal oxide-rich hygroscopic water from the mine wastes prior to the water level entering the "metallic" silty layer; or 3) the lower limit of the metal-rich zone was not accurately logged during well drilling.

Water samples collected on 6/1/89 and 6/20/89 at this location reflected zinc concentrations of 1763.5 mg/l and 1604.4 mg/l respectively. This piezometer location is unique in that zinc concentrations increased rather than decreased from April to June during a period of declining water levels. It is probable that the small precipitation events that occurred during the period between 4/25/89 and 6/1/89 were not large enough to flush large volumes of soluble reaction products from the wastes at most other piezometer sites but localized ponding at this site resulted in more complete flushing.

Piezometer 6C: The "metallic" silty layer was not encountered during the drilling of piezometers 6C and 6D. Its absence may be due to heterogeneities within the upper aquifer caused by post-depositional erosion, but more likely by reworking of the sediments by man to recover metal-rich mine waste. Piezometer 6C is not presented as an example of how water moving through or into the "metallic" silty layer causes increases in zinc and other metal ion concentrations, but rather as an example of what occurs, or does not occur, when this layer is absent.

Zinc concentrations presented in Figure 38 for piezometer 6C were low throughout the sampling period from 10/5/88 to 6/20/89. The lowest zinc concentration, 6.9 mg/l, occurred on 12/16/88 during a period when the water level was low at this location. The highest zinc concentration, 17.6 mg/l, occurred on 6/1/89 after a period when the water level was at its maximum. The greatest rise in zinc concentration occurred after the 1/18/89 recharge event. The rise in zinc concentration was from 7.3 mg/l on 1/6/89 to 10.6 mg/l on 1/18/89 (Figure 38). Although this is the greatest increase in zinc concentration that occurred at this piezometer location, the increase is insignificant compared to other piezometer locations where the "metallic" silty layer is present. Zinc concentrations and responses in piezometer 6C are similar to those found in deeper piezometers (where the "metallic" silty layer is not near the screened interval) within the BLM sub-area.

Piezometer 8C: The water level in piezometer 8C was well below the "metallic" silty layer until April, 1989, at which time the water level rose to approximately one foot below this layer as shown in Figure 38. The corresponding rise in zinc concentration due to water infiltrating through the "metallic" silty layer was significant; from 19.4 mg/l on 1/18/89 to 69.3 mg/l on 4/7/89. Prior to the water level rising near the "metallic" silty layer, zinc concentrations were fairly consistent, between 14 mg/l and 20 mg/l. Samples collected on 4/7/89, and 4/25/89, after the water level rose significantly, had zinc concentrations of 69.3 mg/l and 69.5 mg/l respectively. Water levels declined through May and June.

Water samples collected on 6/1/89 and 6/20/89 reflected zinc concentrations of 44.8 mg/l and 39.5 mg/l respectively. The water level did not rise into the "metallic" silty layer at this piezometer location; therefore, this mechanism for flushing of the "metallic" silty layer was not a factor in water quality at this site. Water infiltrating through the mine wastes apparently was the most significant flushing mechanism influencing water quality in piezometer 8C during the study period.

Piezometer 10C: Piezometer location 10C is similar to piezometer 5C in that ponding occurs near this area as a consequence of precipitation and snow melt water that fills shallow depressions in these areas. The ponded water near piezometer 10C may pass through the "metallic" silty layer flushing poor-quality hygroscopic water from the mine wastes into the ground water. Drilling logs indicate that the "metallic" silty layer is relatively thick at this piezometer location as shown in Figure 38. The screened interval of this piezometer is near the "metallic" silty layer.

The first water sample was from piezometer 10C on 10/5/88. The water level was low at this time; more importantly no recharge events or ponding occurred at this site since the previous spring. Because conditions which cause dissolution and flushing of metal oxides were not present at this time, the zinc concentration in the ground water was low (only 23.0 mg/l). Snow melt events in early December, 1988 caused a small pond to form near this location. The ponded water infiltrated through the "metallic" silty layer for at least two weeks. A water sample collected on 12/16/88 had a zinc concentration of 518.1 mg/l. This dramatic increase in zinc concentration shows how significant the effects of infiltration of ponded water and screen location may be on the quality of the ground water. The ponding in this area persisted until late December, 1988. The zinc concentration rose to 669.7 mg/l on 1/6/89, possibly owing to the infiltration of ponded water in the area of piezometer 10C.

The large recharge event that occurred just prior to the 1/18/89 sampling run raised the water level at this location by 0.37 feet since the last sample collection period. Water levels rose into the "metallic" silty layer for the first time in 1989 on 1/18/89. At other piezometer locations the rise in the water level into the "metallic" silty layer was accompanied by a rise in zinc concentration. This particular location is unique in that ponding occurred at this location beginning in early December, 1988. Ponding and associated infiltration of ponded water may have flushed much of the poor quality hygroscopic water from the reaction sites of the mine wastes earlier in the year at this location. The zinc concentration dropped slightly to 598.8 mg/l on 1/18/89 possibly owing to dilution by recharge water.

Cold weather during early February, 1989 did not allow significant snow melt. Water levels declined owing to lack of recharge during this month. Zinc concentrations also declined to 455.4 mg/l on 2/23/89 as water levels declined below the "metallic" silty layer. Spring rains and snow melt during March and April, 1989 raised the water level considerably at this location. The water level rose into the "metallic" silty layer again, after this layer had been unsaturated for about a month. While unsaturated, the mine wastes are exposed to oxygen and water. Under these conditions they potentially form metal oxides which are held in the film of water covering the reaction sites on the wastes. A water sample collected 4/7/89 reflected a high zinc concentration of 596.4 mg/l, which possibly is due to the ground water level rising through previously exposed mine wastes thereby flushing reaction products from the mine wastes.

Water levels continued to rise into and through the "metallic" silty layer during the month of April, 1989. Much of the "metallic" silty layer became fully saturated during

April. The oxidation rate of the mine wastes in the saturated portion of the "metallic" silty layer may have slowed down owing to a decrease in the amount of oxygen available for oxidation reactions. Water flushing through the "metallic" silty layer would therefore have lower concentrations of zinc ions available for transport and the zinc concentration would decrease by dilution. A water sample collected on 4/25/89 had a zinc concentration of only 120.9 mg/l, possibly due to this dilution. Water levels declined through May and June thereby exposing the mine waste to increased oxygen and allowing reaction products to form. Small precipitation events in late May 1989 may have flushed some of the soluble reaction products into the ground water thereby raising the zinc concentration from 120 mg/l on 4/25/89 to 178.8 mg/l on 6/1/89. The absence of any substantial precipitation in June caused a decline in water levels and a decline in the influx of soluble reaction products from the mine waste to the ground water. A water sample collected on 6/20/89 had a zinc concentration of 69 mg/l. Dilution caused by ground water mixing with no flushing events may be the reason for this decline.

Deeper Piezometers

The deeper piezometers at the BLM site (BLM 1D-10D) are screened at approximately 22 to 24 feet below land surface. The large vertical distance between the screened interval and the "metallic" silty layer, as shown in Figures 39 and 40, facilitates dilution of metal ion rich water from the upper portion of the aquifer.

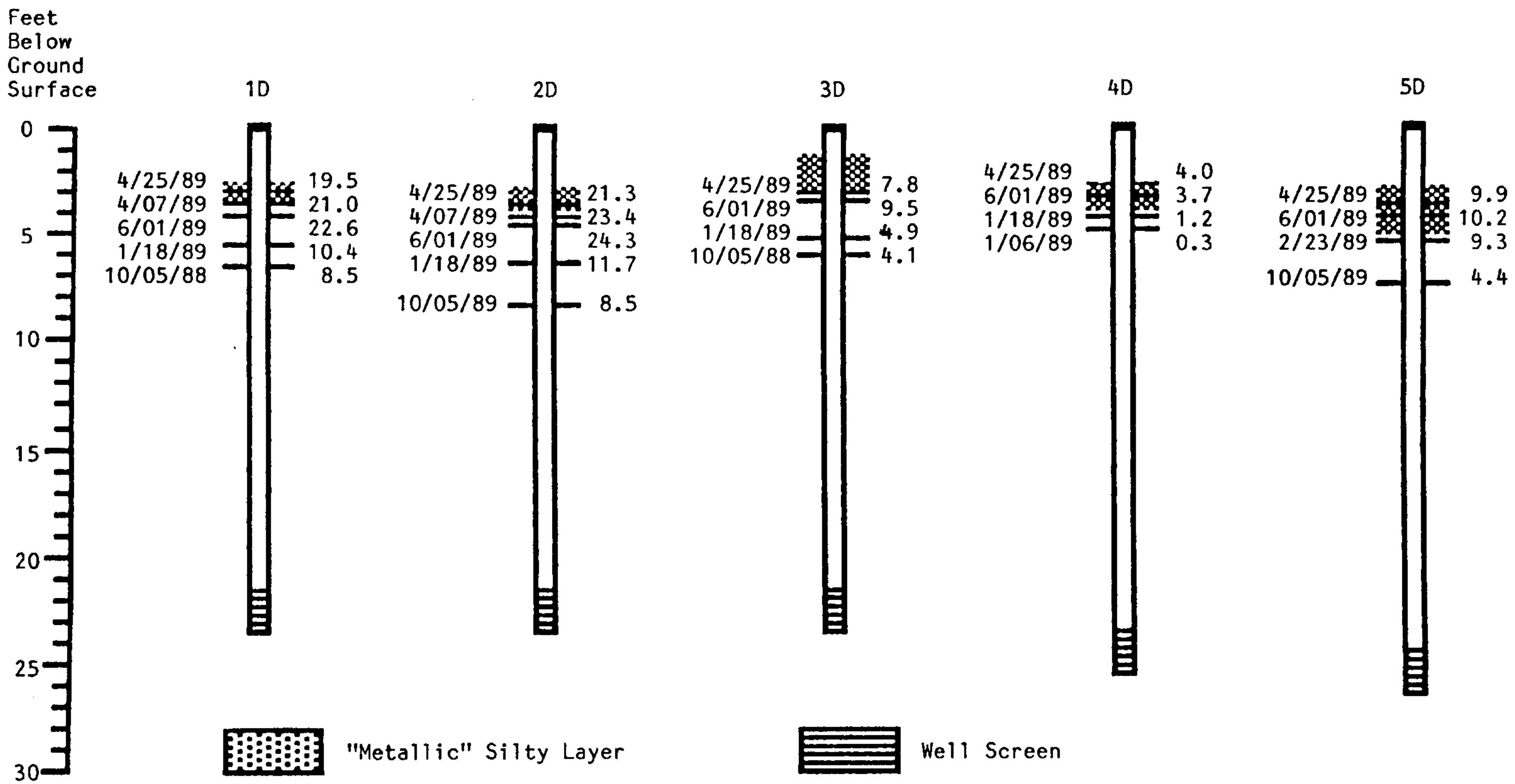

Figure 39. Water levels and zinc concentrations in ground water relative to mine wastes and screened intervals in deeper paired piezometers 1 through 5 in the BLM study area.

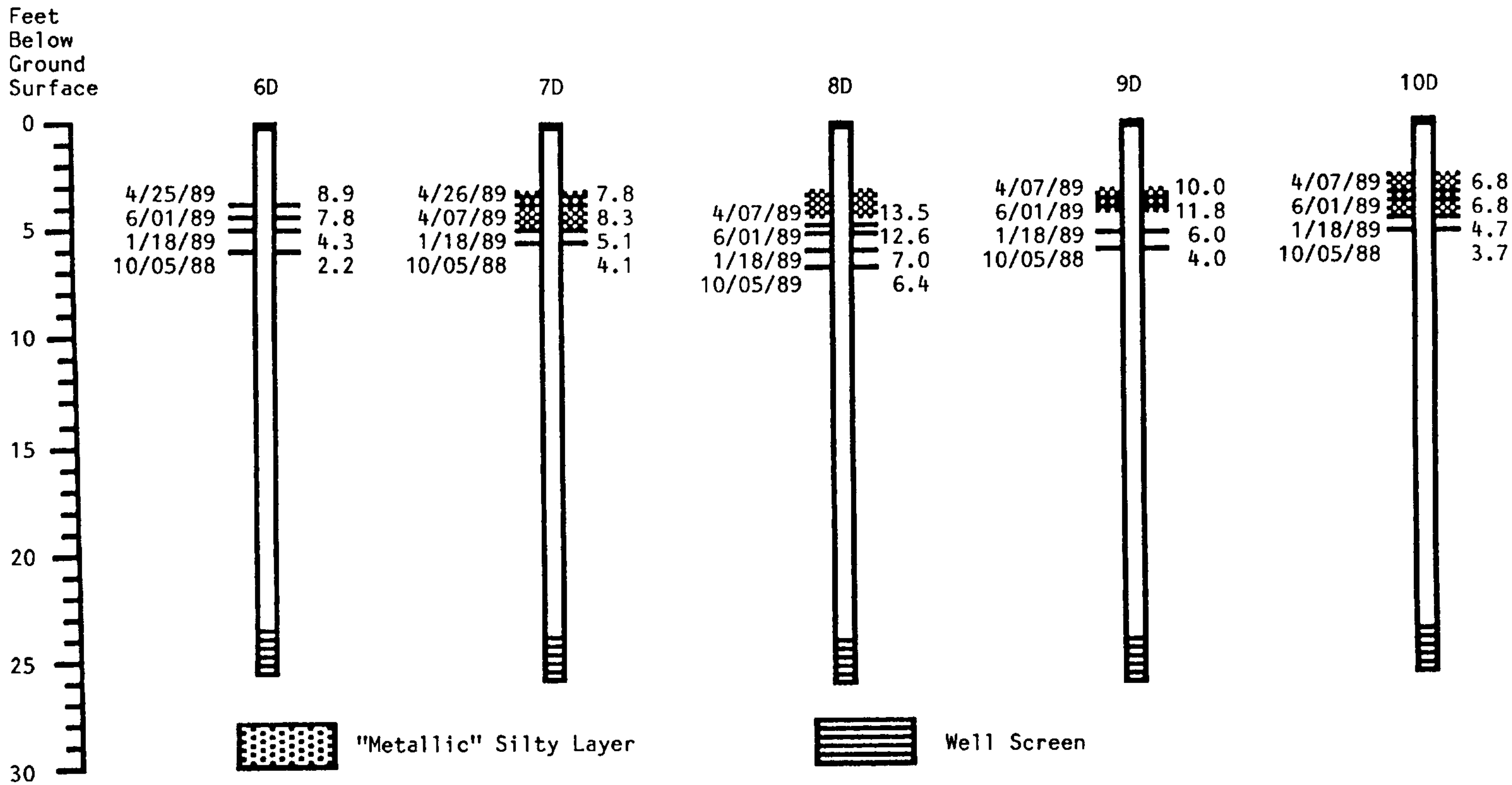

Figure 40. Water levels and zinc concentrations in ground water in relation to mine wastes and screened intervals in deeper paired piezometers 6 through 10 in the BLM study area.

Zinc-ion concentrations rise owing to recharge events in the late winter and early spring; however, these rises are delayed and dampened compared to the analogous rises in zinc-ion concentration in the shallower piezometers. The delayed response may be due to the time lag caused by the vertical distance between the screened interval of the shallow paired piezometer and the screened interval of the deeper paired piezometer.

A possible reason for the low zinc-ion concentrations and the dampened response in the deeper piezometers is that considerable dilution occurs before ions flushed from the mine wastes in the upper five to six feet of the aquifer reach the piezometer screens in the deeper portion of the upper aquifer.

Extremely high concentrations of zinc and other metal ions observed in the shallow piezometers within the BLM sub-area apparently represent a relatively small volume of water (approximately 20 percent) in comparison with the total volume of water in the entire upper aquifer. Dilution by ground water from other recharge sources lowers the zinc-ion concentrations considerably in the lower portions of the upper aquifer.

Ground water samples collected from some of the deeper piezometers in the shallow aquifer had zinc-ion concentrations within drinking water standards. These relatively low zinc-ion concentrations observed in piezometers screened just above the clay layer can be attributed to: 1) better quality water flowing upward through the aquitard; in this case the driving force would be the upward gradient in the lower aquifer and in the aquitard as documented by Adams (1989); 2) water moving horizontally along the top surface of the aquitard; this water derives from the recharge sources where the aquitard does not exist, as shown by Adams (1989); or 3) recharge from the river.

Recharge to the aquifer during the spring adds water volume to the upper aquifer; the volume of water in the upper aquifer is approximately 10 to 20 percent greater during the spring than during the late summer and early winter. Increased water volume in the spring dilutes the concentration of zinc ions in the upper aquifer somewhat; however, the dilution of zinc concentrations does not affect the mass of zinc ions in solution. Consequently, the increase in the actual mass of zinc ions in solution is greater than the measured increase in the concentration of zinc ions.

Conclusions Based on Water Quality Data

Several conclusions can be derived from the foregoing interpretation of water level and water quality data. These conclusions are:

- The highest concentrations of metal ions in the ground water appear to be associated with a single layer of fine-grained waste that is approximately two to three feet thick and metallic in appearance. Water quality encountered depends heavily on the location of the open interval of each piezometer relative to this layer.

- Water recharging through this "metallic" silty layer apparently flushes poor-quality water from the wastes in the unsaturated zone into the ground water in the saturated zone beneath. The influx of this poor-quality water increases metal ion concentrations in the ground water in the upper part of the shallow aquifer.

- Ponding of precipitation in localized areas may increase the duration and volume of water recharging through the mine wastes in localized areas. Consequently, areas in which ponding occurs generally exhibit higher concentrations of zinc and other metal ions in the ground water.

- Water table rises into the "metallic" silty layer may cause large increases in zinc and other metal ion concentrations in the ground water. Ground water levels rising into the "metallic" silty layer allow considerably more time for the ground water to accept and transport dissolved metal oxides than does water passing more rapidly through this layer during infiltration. In addition, ground water level rises into the "metallic" silty layer are under saturated conditions, in which a greater proportion of the metal oxide reaction sites come into contact with the ground water. During infiltration of precipitation, which is under unsaturated flow conditions, metal ions may be bypassed by infiltrating precipitation which tends to follow preferential pathways.

- Concentrations of zinc and other metal ions drop in piezometers in which the water level has previously risen above the top of the "metallic" silty layer and has remained above this layer for some time. In this case, metal ions are flushed from the mine wastes during the water table rise and are continuously transported away by horizontal saturated flow of ground water. High concentrations are not reached at these sites because of the constant flushing and dilution by ground water flow.

- Piezometers screened nearer the "metallic" silty layer have higher zinc-ion concentrations than piezometers screened deeper in the aquifer. This difference may be due in part to limited vertical mixing of ground water in the shallow aquifer which would allow stratification of metal ion concentrations. Deeper piezometers, screened approximately 22 to 24 feet below the surface, consistently reflect concentrations of zinc and other metal ions that are lower than concentrations found in water collected from piezometers screened near ground surface.

- Concentrations of zinc and other metal ions rise slightly in water from the deeper piezometers during recharge events in the spring; however, the response is delayed and dampened when compared to the shallower piezometers, indicating that some vertical mixing may take place within the aquifer.

TESTING THE HYDRAULIC PROPERTIES OF THE SHALLOW AQUIFER

Pumping Test Design

Based on drilling logs from this study and previous studies, the conceptual model of the upper aquifer is an unconfined aquifer composed of unconsolidated alluvium overlain by deposits of jig tailings and flotation tailings. The Neuman (1972) analytical equation for an unconfined aquifer that considers the delayed yield response was used as a model for analysis and for design of well installations. The Neuman (1972) solution is desirable for unconfined aquifers because it yields values of elastic storage coefficient, horizontal hydraulic conductivity, degree of anisotropy, and vertical hydraulic conductivity, as well as specific yield and transmissivity.

Well-construction requirements for the Neuman equation are: a pumping well screened through the entire saturated thickness of the aquifer and, at least one observation well installed at a small radial distance from the pumping well. This observation well also must be screened through the entire saturated thickness of the aquifer. In this study the observation well screened through the entire saturated thickness of the aquifer was installed at a radial distance of 100 feet from the pumping well. Twenty additional wells were installed in the sub-area for the purposes of water level measurements, water quality sampling and measurements of drawdown during pumping tests. These multi-purpose wells are partially penetrating. Neuman (1975) stated that when the pumping well or the observation well is perforated only through a portion of the saturated thickness of the aquifer, the standard delayed yield type curves cannot be used to analyze the field data. The effects of partial penetration on the drawdown in an unconfined aquifer decrease with radial distance from the pumping well. If the observation well is located far from the pumping well, transmissivity (T) and specific yield (Sy) can be determined by conventional methods such as the Theis (1935) curve. The Theis curve should not be used to analyze late field data without first verifying that the effect of partial penetration has actually dissipated at the radius of the observation well. The installation of two piezometers at the same radial distance from the pumping well, one at a shallow depth beneath the water table and the other at a substantially greater depth, allows for testing the extent of partial penetration effects (Neuman, 1975). Plotting drawdown from both piezometers on a single sheet of log-log paper should yield two curves which tend to converge at later times in the test. When the distance between these two curves becomes very small, from a practical standpoint, no vertical flow is taking place and the effect of partial penetration can be considered negligible (Neuman, 1975).

Well locations 1 through 10 (Figure 4) each contain two wells installed at the same radial distance from the pumping well. One well is screened near the top of the aquifer at a depth of approximately six feet, the other well is screened at a depth of approximately 25 feet. These well pairs were used to determine when the effects of partial penetration are negligible and when the Theis curve may be used to evaluate aquifer coefficients.

Removal of Antecedent Trend

A major recharge event occurred during the week immediately prior to the pumping test of the upper aquifer. Water levels rose approximately 0.4 feet in the upper aquifer owing to a rapid snow melt event that occurred on the evening of January 30, 1989. Water levels remained high for several days before beginning to decline. On February 5, just one day before the pumping test, water levels began to fall in the upper aquifer as shown in Figure 41. The changing water levels created a downward antecedent trend that affected the drawdowns measured in the piezometers during the pumping test. The measured drawdown in each piezometer is a composite of the influence of pumping and the decline in water levels due to the receding limb of the hydrograph of the recharge event. The recession portion of the measured drawdown curve must be removed in order for the drawdown analysis to be valid. A baseflow recession equation by Domenico (1972) was used as the analytical procedure to remove the antecedent trend. The equation represents the decay in water levels after a water level peak caused by a recharge event.

Common equations for baseflow recession suggest that water levels decay as a power function. Several water level measurements taken before and after the pumping test were plotted against time and matched to a best fit power function using GRAPHER® software. The equations for each best fit line were similar, indicating that water level recession was nearly uniform in most of the piezometers on Smelterville Flats.

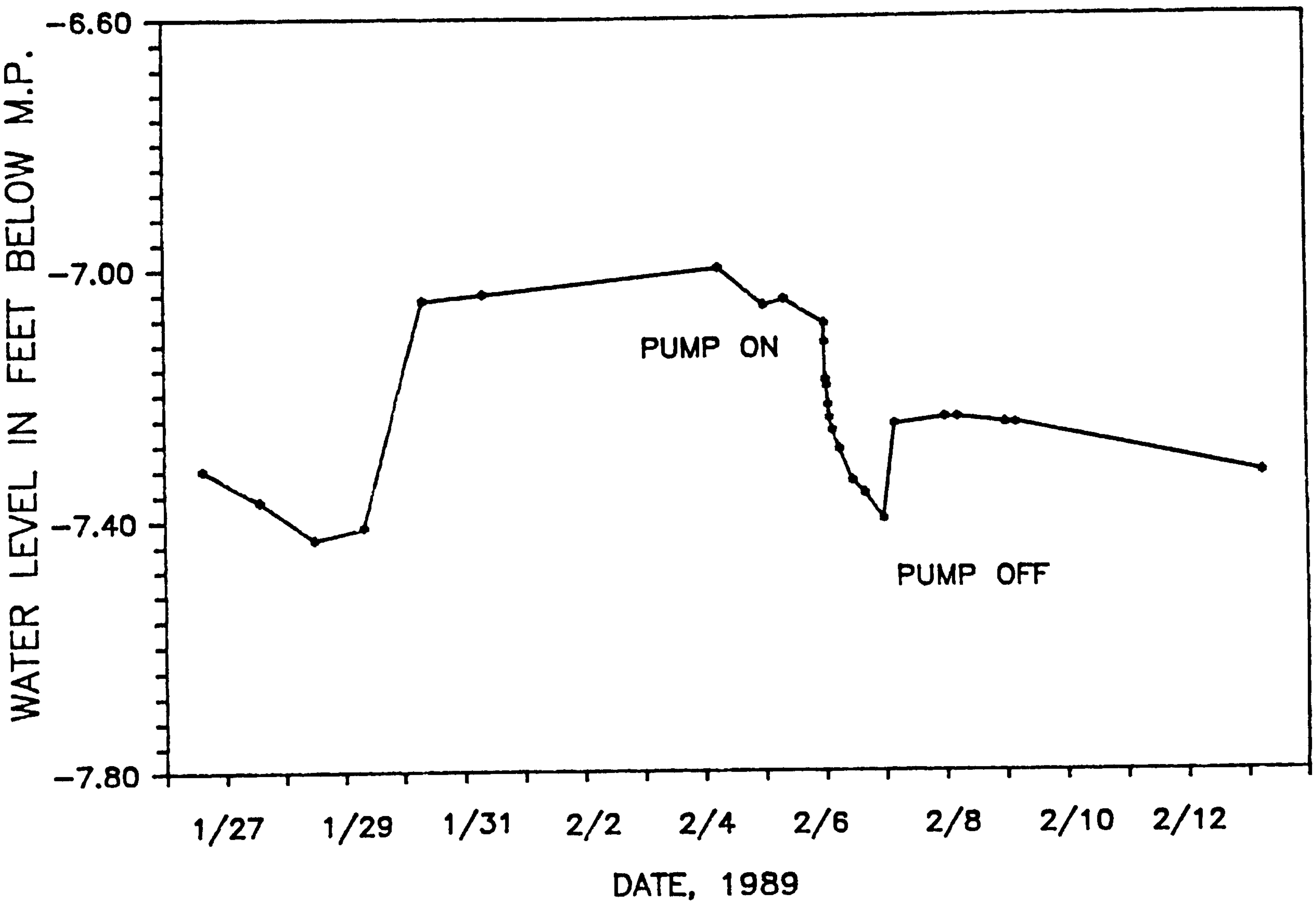

Figure 41. Water levels before, during, and after pumping test of February 6 and 7 showing antecedent trend measured at piezometer location 9 within the BLM study area.

Figure 42 shows the match between the antecedent trend and a power function equation for piezometers 1C, and 9C. Recession curves for piezometers 4C, 5C, and 8D had different slopes than the curves for the other wells, probably owing to measurement errors or different water level decay responses caused by localized heterogeneities in the aquifer.

The best fit power function equations for each piezometer were used to remove the baseflow recession component of drawdown from each data set. Few water level data from before or after the pumping test were available for piezometers MP1-A, MP2-A, and the type B observation well. For these piezometers the best approximation of antecedent trend was a linear best fit line. The antecedent trend accounted for more than half the measured water level decline, especially in wells located far from the pumping well.

Water level declines owing to pumping are so small relative to the water level changes caused by the recharge event that measurement errors plus or minus 0.02 feet are significant.

The greatest measured drawdown occurred in wells 9C, 9D, and the fully penetrating observation well (Type B) located closest to the pumping well. Drawdown values of as much as 0.3 feet were recorded in these wells.

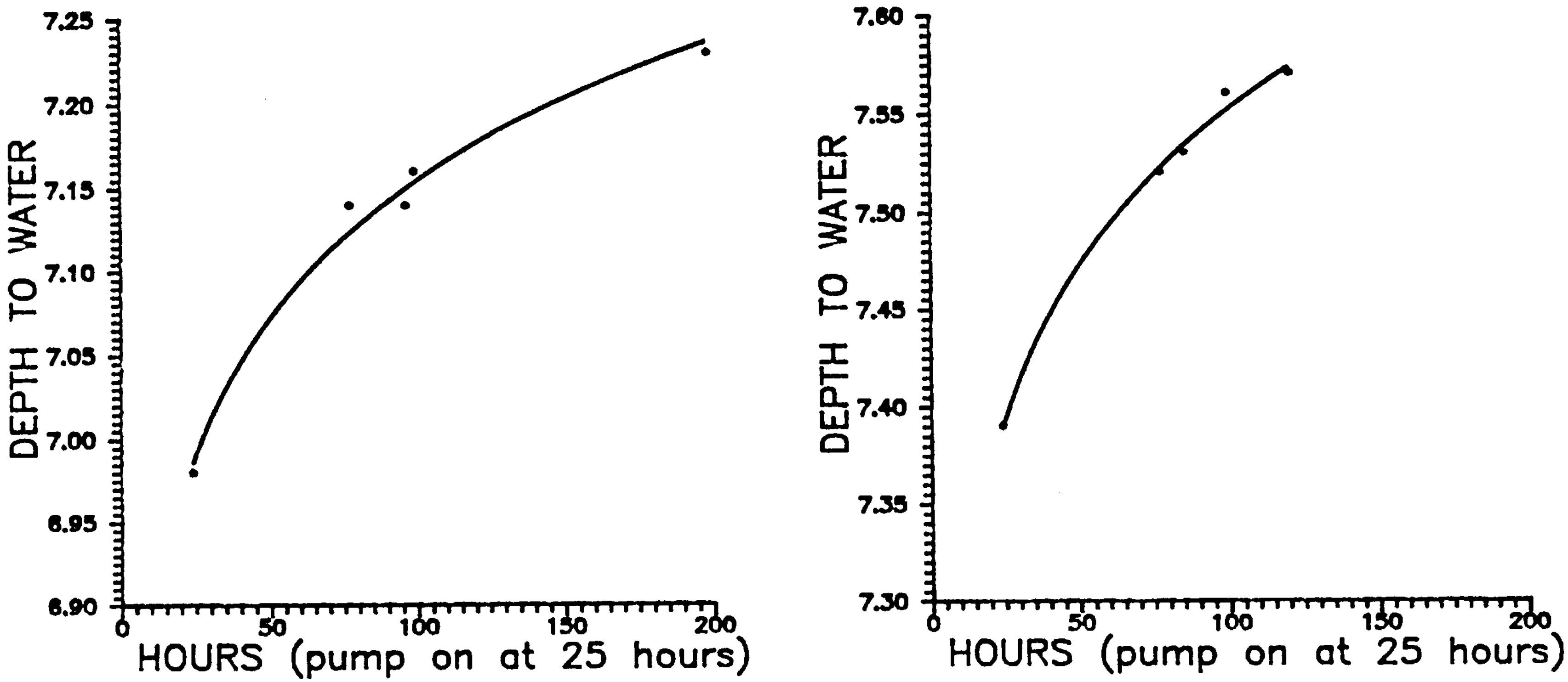

Figure 42. Antecedent trend matched to power function equations in shallower paired piezometers at locations 1 and 9 respectively in the BLM study area.

Analysis of Pumping Test Data

A delayed yield response was not observed in the Type B well owing to a combination of factors. The most important factors probably are the location of the Type B well, and the pumping rate. This observation well is located too far from the pumping well for the maximum achievable pumping rate to create a delayed yield response.

The Theis (1935) solution was used to analyze the drawdown data from all of the piezometers. This solution yields values of transmissivity and specific yield. The Theis solution is a curve-matching solution intended for use in confined aquifers. Because the saturated thickness of the aquifer changed insignificantly during the test (less than 3 percent), the Theis solution can be used without applying the Jacob correction factor (Jacob, 1944) for water table conditions.

Boundaries were considered in the analysis of the pumping test data. The South Fork of the Coeur d'Alene River is a potential positive boundary in the vicinity of the pumping test. Drawdown data for several piezometers plotted on semi-log paper plot as straight line with no deviations indicating boundary conditions.

Analyzable log-log curves of drawdown versus time for use in the Theis equation were obtained for most of the piezometers monitored in the sub-area. Locations 4 and 10, the two piezometer locations most distant from the pumping well, yielded drawdown curves that were not analyzable. Several explanations for the less than ideal drawdown curves from these piezometer locations are possible. Water level changes related to the stage of the South Fork of the Coeur d'Alene River may have been more significant at these sites. Furthermore, the very small amount of drawdown measured at these piezometer locations increases the significance of measurement errors on the data.

The drawdown curve for piezometer 5C was also difficult to analyze, possibly owing to the fact that the screened portion of the piezometer was located in a layer of silt with low hydraulic conductivity. The silt layer may retard or delay the drawdown in this piezometer.

Theis Solution Results

Transmissivity values obtained from Theis curve matches range from 45,000 ft^2/day to 75,000 ft^2/day. Specific yield values from Theis curve matches range from 0.02 to 0.09. Transmissivity and specific yield values for all of the piezometers monitored are presented in Table 2. Considerable data scatter in many of the drawdown graphs made matches to the Theis curve somewhat subjective. The scatter in the drawdown graphs is probably related to the accuracy of each method of water level measurement and to the small drawdowns. The steel tapes available for measuring drawdown are marked in 0.01 foot intervals. Water levels were declining at a rate less than 0.01 feet between measurement intervals during the early portion of the test, thereby causing the same drawdown to be reported for several measurement intervals. Drawdown graphs for piezometers measured during the aquifer test are presented in Appendix 6. Tables of data including drawdown and time since pumping was initiated for each piezometer are presented in Appendix 7.

TABLE 2: RESULTS OF THEIS ANALYSES ON PIEZOMETERS MONITORED DURING FEBRUARY 6 AND 7 PUMPING TEST

PIEZOMETER	TRANSMISSIVITY (ft^2/day)	Sy
1C	57,000	0.04
1D	61,000	0.02
2C	57,000	0.06
2D	51,000	0.04
3C	65,000	0.04
3D	65,000	0.04
4C		
4D		
5C		
5D	58,000	0.04
6C	62,000	0.09
6D	62,000	0.08
7C	75,000	0.04
7D	58,000	0.09
8C	45,000	0.04
8D	62,000	0.04
9C	54,000	0.02
9D	58,000	0.02
10C		
10D		
TYPE B	58,000	0.03
MP1-A	61,000	0.02

Note: Where blanks occur, T and Sy could not be estimated because there was too much scatter in the drawdown curves.

Aquifer Test Conclusions

The following conclusions regarding the hydraulic coefficients of the upper aquifer can be derived from the acquired aquifer test data:

- The upper aquifer beneath Smelterville Flats behaved as unconfined during this aquifer test. Water-level responses to pumping were indicative of dewatering of pore space rather than the effects of water expansion and aquifer compaction caused by changes in fluid pressure.

- Transmissivity values calculated from the February 7, 1989 pumping test data for the upper aquifer range from 45,000 ft^2/day to 75,000 ft^2/day.

- Specific yield values calculated from the February 7, 1989 pumping test data for the upper aquifer range from 0.02 to 0.09.

- Good agreement of transmissivity and specific yield values derived from drawdown curves of all piezometers monitored indicate that an approximation of homogeneity and isotropy was achieved for the upper aquifer at the scale of the pumping test.

IMPLICATIONS OF RESEARCH RESULTS WITH RESPECT TO ALTERNATIVE MITIGATIVE MEASURES TO IMPROVE GROUND WATER QUALITY

Introduction

Water-quality data collected during this study reveal significant metal ion contamination in the ground water of the shallow aquifer beneath Smelterville Flats. Ground water quality beneath Smelterville Flats varies with location, depth, presence of mine waste, and recharge events. Seasonal variations in water quality are a consequence of the flushing of metal ion salts and their introduction to the ground water flow system. Only portions of Smelterville Flats were sampled during this study; but it can be safely assumed that comparable water quality is present beneath areas that contain similar deposits of waste material.

Water-level data collected during this study and previous studies show that recharge to the shallow aquifer beneath Smelterville Flats occurs as direct infiltration of precipitation, loss from the South Fork of the Coeur d'Alene River, and recharge from upstream sources such as Government Gulch, Milo Creek and the Central Impoundment Area (CIA). Recharge to the shallow aquifer from the South Fork of the Coeur d'Alene River occurs in the eastern portion of Smelterville Flats; discharge from the aquifer to the river occurs in the western portion of Smelterville Flats.

Results of the 24-hour pumping test run in the shallow aquifer underlying Smelterville Flats show that the aquifer is highly transmissive. Transmissivity values obtained by the Theis (1935) method range from 45,000 ft^2/day to 75,000 ft^2/day.

Superfund clean-up activities on Smelterville Flats may include consideration of treatment or containment of ground water in the shallow aquifer. Evaluating the need or justification for clean-up on Smelterville Flats is beyond the scope of this study. However, the results and implications of this study are useful for assessing some of the alternative mitigative measures. Four potential forms of action are considered below: 1) removal and treatment of shallow-aquifer water, 2) elimination or reduction of ground water flow through the shallow aquifer in the Smelterville Flats area, 3) removal of the major source of metal ions, and 4) no action. Other actions were not considered because they would require continual maintenance.

Alternative Mitigative Measures

Treatment of Shallow Aquifer Water

Treatment of water from the shallow aquifer would require removal by pumping, treatment, and disposal. The economic and technical viability of ground water treatment is dependent in part on available treatment technologies and site-specific hydrogeologic considerations. Two important hydrogeologic considerations regarding treatment of water from the shallow aquifer are: 1) the minimum volume of water present in the shallow aquifer that would require extraction and treatment (theoretically, one pore volume), and 2) the effects that pumping would have on the ground water flow system and on the South Fork of the Coeur d'Alene River.

Estimating the volume of water present in the shallow aquifer is difficult owing to the variability of the saturated thickness of the aquifer. For the purpose of estimating one aquifer pore volume of water, a saturated thickness of 20 feet is assumed for the entire shallow aquifer on Smelterville Flats. Porosity of the aquifer can be estimated using specific yield (Sy) values obtained from the pumping test and porosity ranges for similar unconsolidated sediments listed in Freeze and Cherry (1979). A reasonable estimation of porosity for an aquifer comprised of poorly-sorted silt, sand and gravel is 10 percent. The areal extent of the aquifer has been calculated by Adams (1989) as 1.5 square miles. Using these values, one aquifer volume would equal approximately 600,000,000 gallons of water.

The purpose of pumpage is to remove the poor-quality ground water from the aquifer with the assumption that the aquifer would refill with good-quality water. If one pore volume of water were removed from the shallow aquifer, water levels would recover after pumpage because of recharge from the river and from direct infiltration of precipitation. However, it is probable that the mechanisms which oxidize, flush, and transport metals, would repeat the water quality degradation process over time.

Pumping large volumes of water from the shallow aquifer would increase recharge from the South Fork of the Coeur d'Alene River. Leakage from the river would increase to equilibrate with the gradient created by pumping, and the aquifer would never be dewatered. At best, leakage from the river to the aquifer would increase the amount of water to be extracted and treated. The only limiting factor would be a pumping rate that eventually would dry up the river.

Evaporation clearly is the most economical method of disposal for the waste water that would be extracted from the shallow aquifer if it were pumped. Unfortunately, storage area for large volumes of water in the study area is limited; in addition, effective evaporation in the area appears to be negligible (Dames and Moore, 1989). Therefore, evaporation is not a viable alternative.

Standard lime treatment could be used to raise the pH of the ground water pumped from the upper aquifer water and precipitate metals as hydroxides. A great deal of neutralization may be necessary to precipitate the metal ions as hydroxides (Kelly, 1988). A minimum pH of 10.6 is required for complete precipitation of the manganese (2) ion (Kelly, 1988). Large volumes of metal hydroxides and calcium sulfate floc would be produced by the lime treatment of the water pumped from the upper aquifer (Kelly, 1988). Treatment or containment of this waste would be required before disposal.

More sophisticated treatment methods, such as biosorption or reverse osmosis could be used to remove the contaminants. However, the cost and scale of such a treatment facility required to treat the very large volume of water present in the shallow aquifer make this alternative impractical.

Elimination or Reduction of Ground Water Flow Through the Shallow Aquifer

Water flow through the wastes could be reduced by sealing the land surface in an effort to lower the regional ground water levels so that the annual high water table is always below the waste. Surface sealing would require a natural (clay) or artificial (hypalon, asphalt, HDPE) barrier covering the entire Smelterville Flats area including the Shoshone County airport. New drainage patterns would have to be established to route runoff from precipitation events off of Smelterville Flats.

Channelization of the river would be necessary for a surface sealing project to be successful. Construction of a concrete river channel would provide controls on recharge to the shallow aquifer from the river in the eastern part of the Flats. Ground water seeps in the western portion of Smelterville Flats would not be able to discharge poor-quality water into the South Fork of the Coeur d'Alene River if the river were contained in a concrete channel. The ground water would remain in the aquifer and continue to travel down the valley. Unfortunately, upstream sources would continue to recharge the aquifer through lateral flow.

Several major drawbacks are associated with such a project. The initial cost of this project could be high. Maintenance costs related to maintaining a seal on the surface and upkeep of the artificial river channel would be high. Excavation and re-routing of the river might create more severe contamination problems in the South Fork of the Coeur d'Alene River during installation of the artificial river channel. The environmental impact created by such a project would be major.

Removal of the Major Source of Metal Ions

Elimination or control of the wastes that produce acid water and leaching of heavy metals might alleviate some of the existing contamination of ground water. The acid-producing conditions include the presence of pyrite, and other minerals in the solid wastes, oxygen and water in the shallow aquifer. Elimination of metal-rich wastes from the top of the shallow aquifer would require the removal of the upper five to seven feet of the Smelterville Flats waste/sediment mixture, or in-situ leaching of the metals from the wastes. Extraction of metals from the wastes using new metallurgical technologies may offset some of the costs of excavation. In-situ leaching of metals from the mine wastes would require the design and installation of an injection and pump back well network.

No Action

A fourth and final alternative is to do nothing with regard to renovating the shallow aquifer. The shallow ground water quality should fluctuate within the reported ranges for the foreseeable future. Increasing shallow aquifer degradation is unlikely. Poor quality water would continue to discharge into the South Fork of the Coeur d'Alene River. Metal ion concentrations in the water discharging from the shallow aquifer should remain fairly stable as long as the existing sources are not intensified and new sources are not created.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The following conclusions regarding the shallow aquifer beneath Smelterville Flats can be drawn from this study:

- Water levels in the shallow aquifer are highest in the spring; they decline through the summer, fall, and early winter.

- Ground water flows from east to west in the shallow aquifer beneath Smelterville Flats.

- The South Fork of the Coeur d'Alene River is a losing stream in the eastern portion of the flats and a gaining stream in the western portion of the Flats.

- Borehole logs and water-quality data show that a layer with a "metallic" appearance located approximately five feet below ground is a major contributor of metal ions to the ground water in the upper portion of the aquifer.

- Metal ion concentrations in the ground water increase significantly after major ground water recharge events on Smelterville Flats in late winter and early spring. Oxidation products are dissolved by the recharging ground water and metal ions are "flushed" out of the wastes as the recharge water infiltrates through.

- Pumping test results indicate that the shallow aquifer has a very high transmissivity. Transmissivity values obtained from Theis curve matches range from 45,000 ft^2/day to 75,000 ft^2/day.

- Pumping test results indicate that the shallow aquifer has a specific yield ranging from 0.02 to 0.09.

- Removal and treatment of one aquifer pore volume of water would not mitigate the ground water contamination problem unless coincident measures designed to remove the source of metal ions or eliminate the conditions that cause acid water production and leaching of heavy metals are implemented.

The most permanent alternative mitigative measure for the Smelterville Flats area is reprocessing or otherwise mining of the waste located thereon. Surface and ground water quality are being degraded on the flats because of high concentrations of heavy metals contributed by recharge events that leach the wastes on the flats. Reprocessing or in-situ leaching offer the most permanent method of removing the source of contamination. It is recommended that geophysical and geostatistical methods be used to help delineate areas containing heavy metals in concentrations high enough to warrant mining or otherwise repossessing.

Recommendations

The following recommendations are suggested for the mitigation of the ground water contamination in the upper aquifer underlying Smelterville Flats:

- Attempt to use geophysical and geostatistical methods to map the thickness and aerial extent of the "metallic" silty layer and other solid wastes underneath Smelterville Flats. These and other data that exist would help delineate the extent of the wastes as a potential ore body.

- Conduct additional research to identify metallurgical procedures that would allow the wastes on Smelterville Flats to be "mined". If such processing is feasible the removal of the "metallic" silty layer and other sources of contamination may be achievable. Metals extracted from the wastes conceivably could offset some of the costs of remediation if an appropriate extraction procedure can be identified. At present, removal is not feasible because no safe place for disposal of the wastes exists in the valley.

- Ground water quality monitoring schedules and methodologies suggested in the EPA document entitled "RCRA Ground-Water Monitoring Technical Enforcement Guidance Document" (EPA, 1986) should be revised. Data collected in this study show that valid ground water quality monitoring should be a direct function of the schedule of recharge events and the proximity of piezometer screened intervals to the source of contamination. The position of the screened interval in the aquifer also is a factor that must be considered. Under existing monitoring guidelines a knowledgeable hydrogeologist can design a ground water monitoring network that will provide data to support almost any preconception of the distribution of water quality in an "uppermost aquifer".

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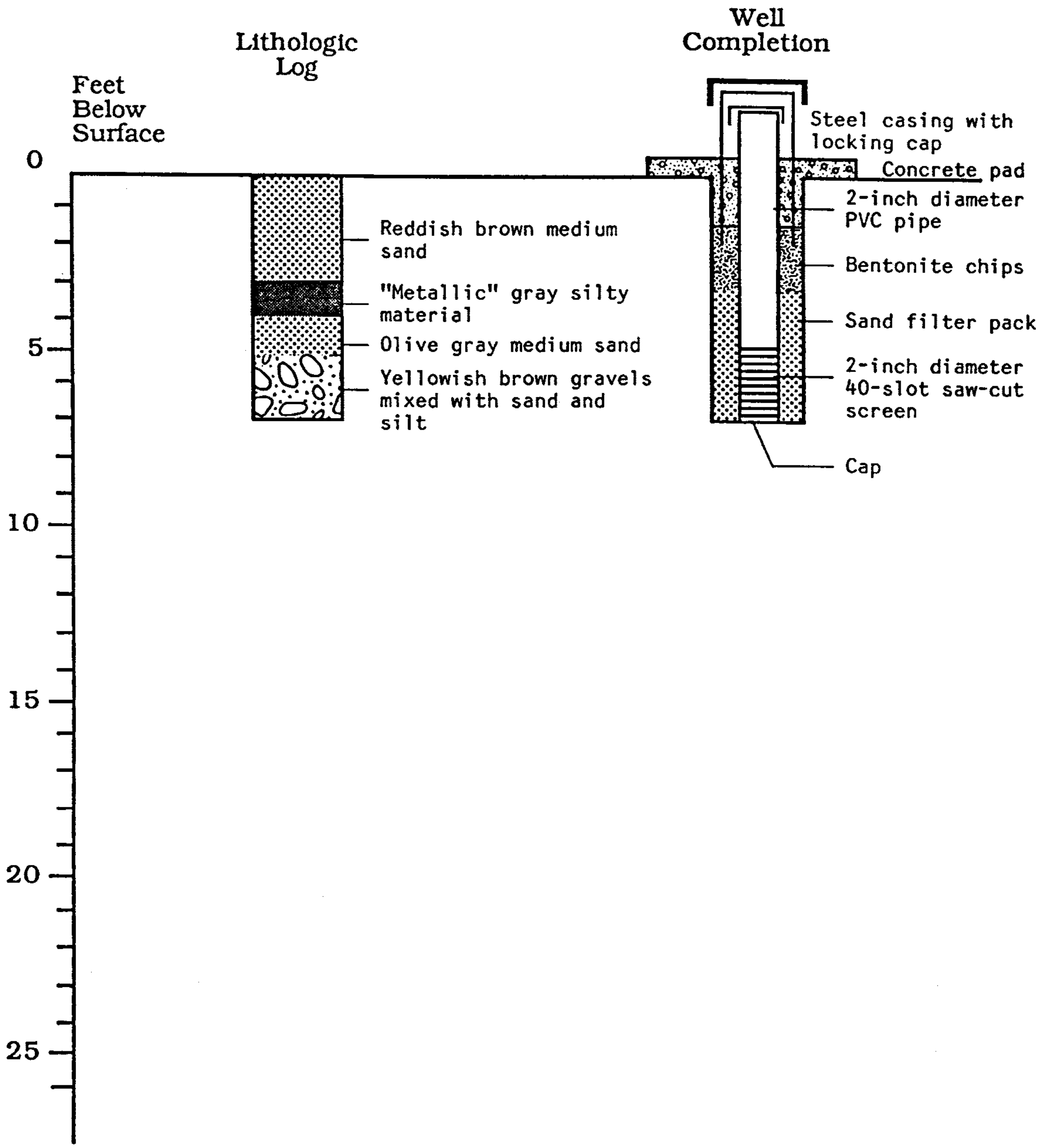
APPENDIX 1

DRILLING LOG AND WELL COMPLETION DIAGRAMS

DRILLING LOG AND WELL COMPLETION

Well Number 1C
Date Installed 8/14/89
Drilling Method Auger

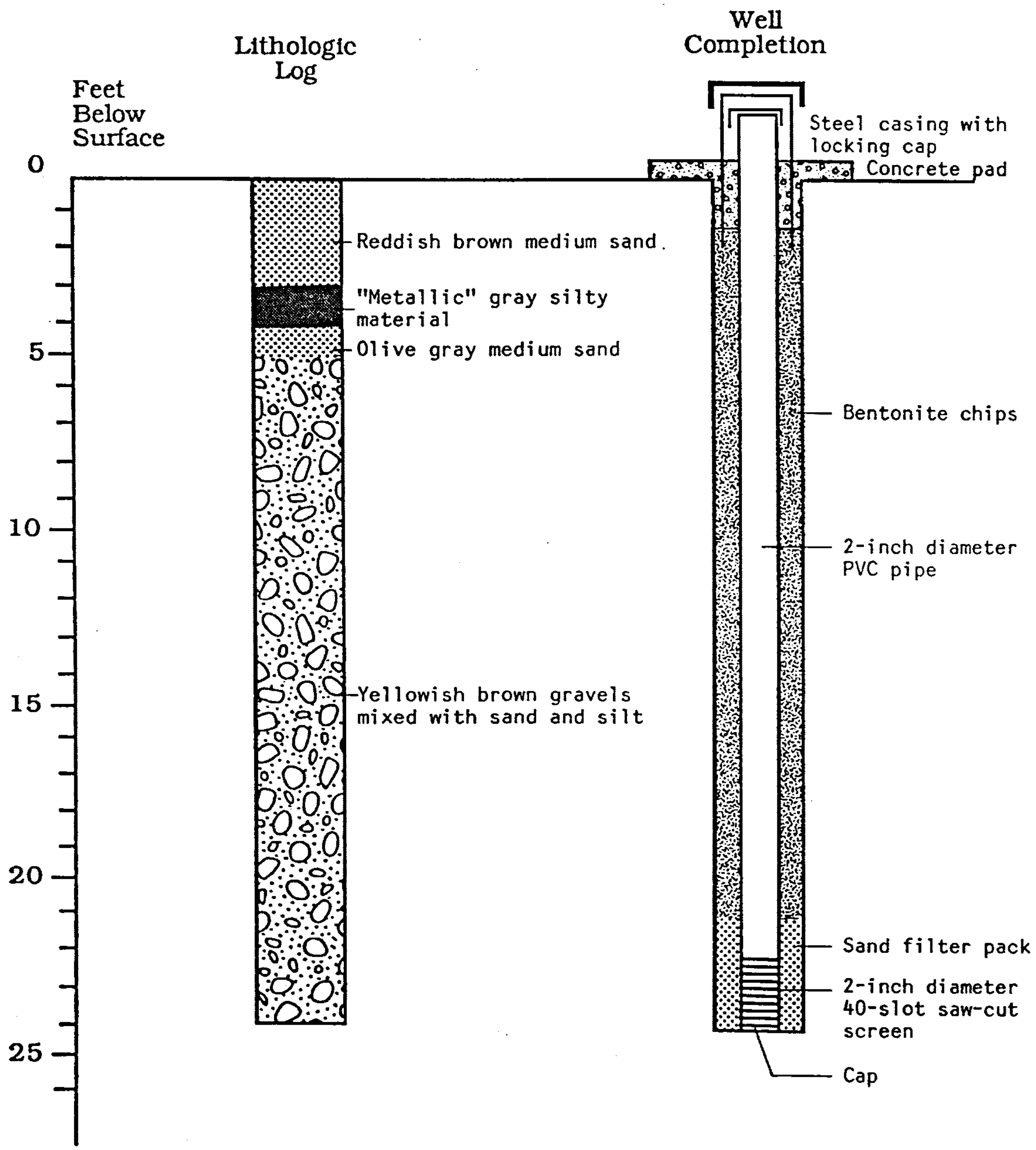
Measuring Point 2205.60
Elevation (National Geodetic Vertical Datum)
Total Depth 7 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 1D
Date Installed 8/14/88
Drilling Method Auger

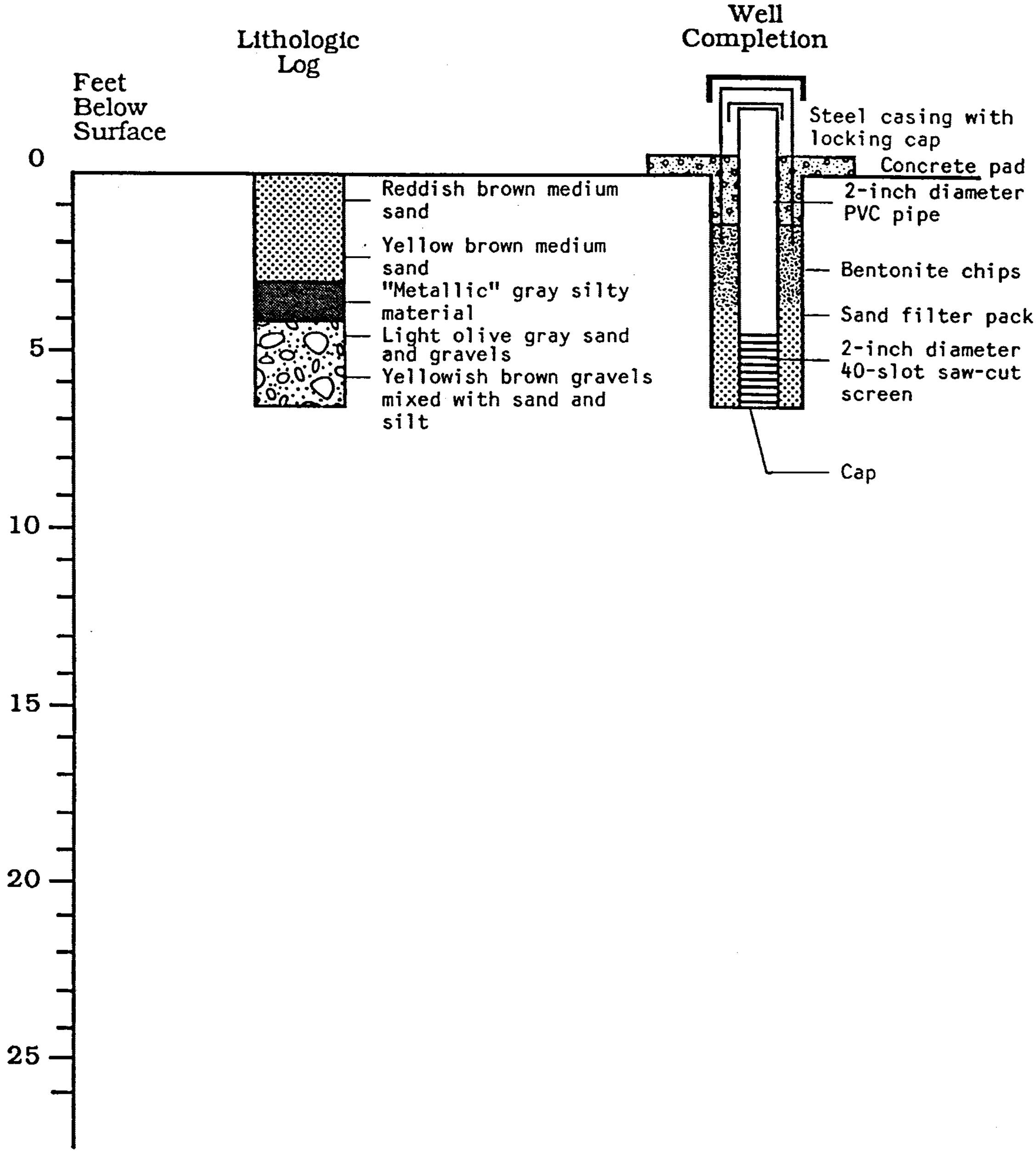
Measuring Point 2205.64 ft.
Elevation (National Geodetic Vertical Datum)
Total Depth 24 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 2C
Date Installed 8/14/88
Drilling Method Auger

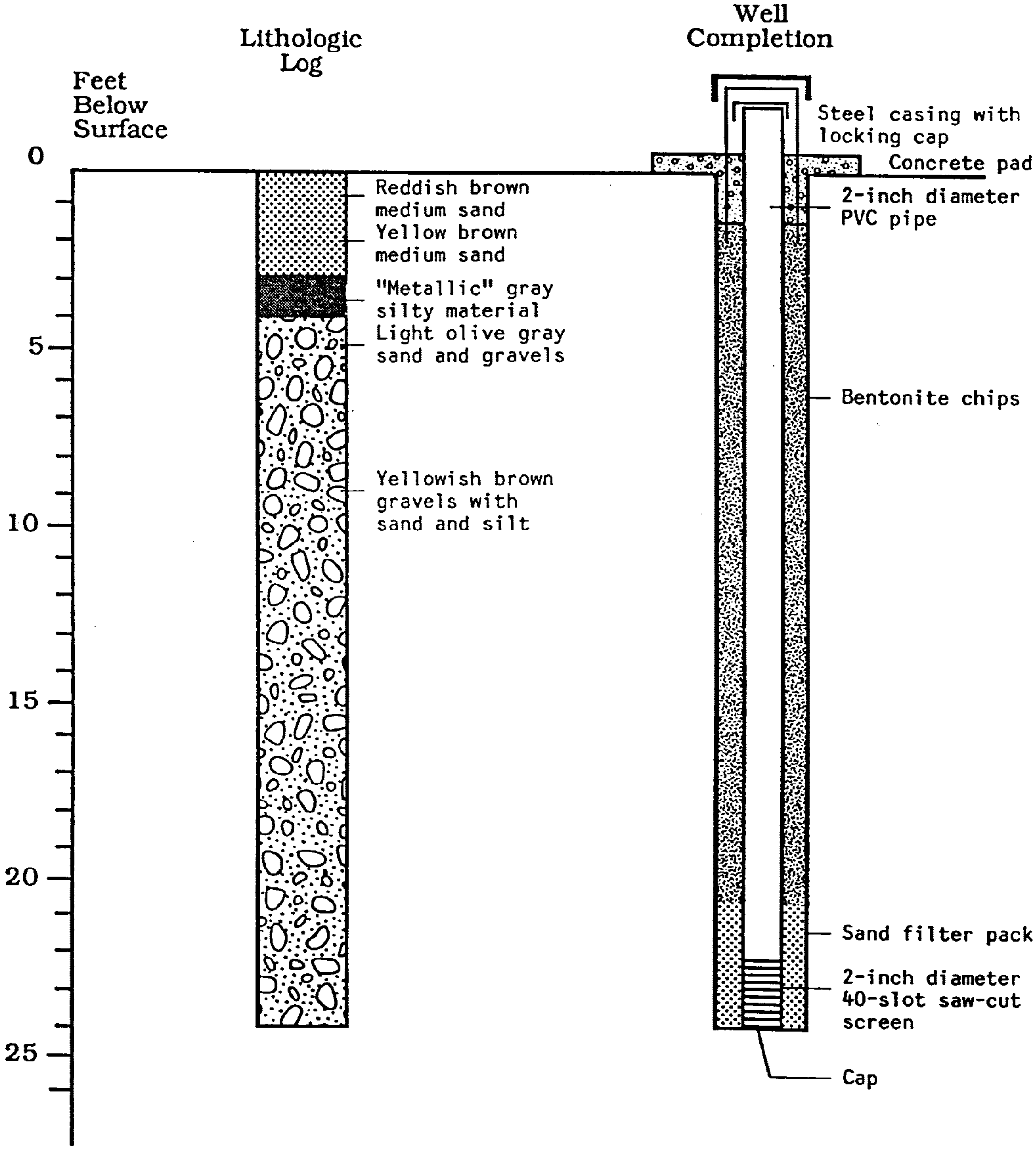
Measuring Point Elevation (National Geodetic Vertical Datum) 2206.89 ft.
Total Depth 6.5 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 2D
Date Installed 8/14/88
Drilling Method Auger

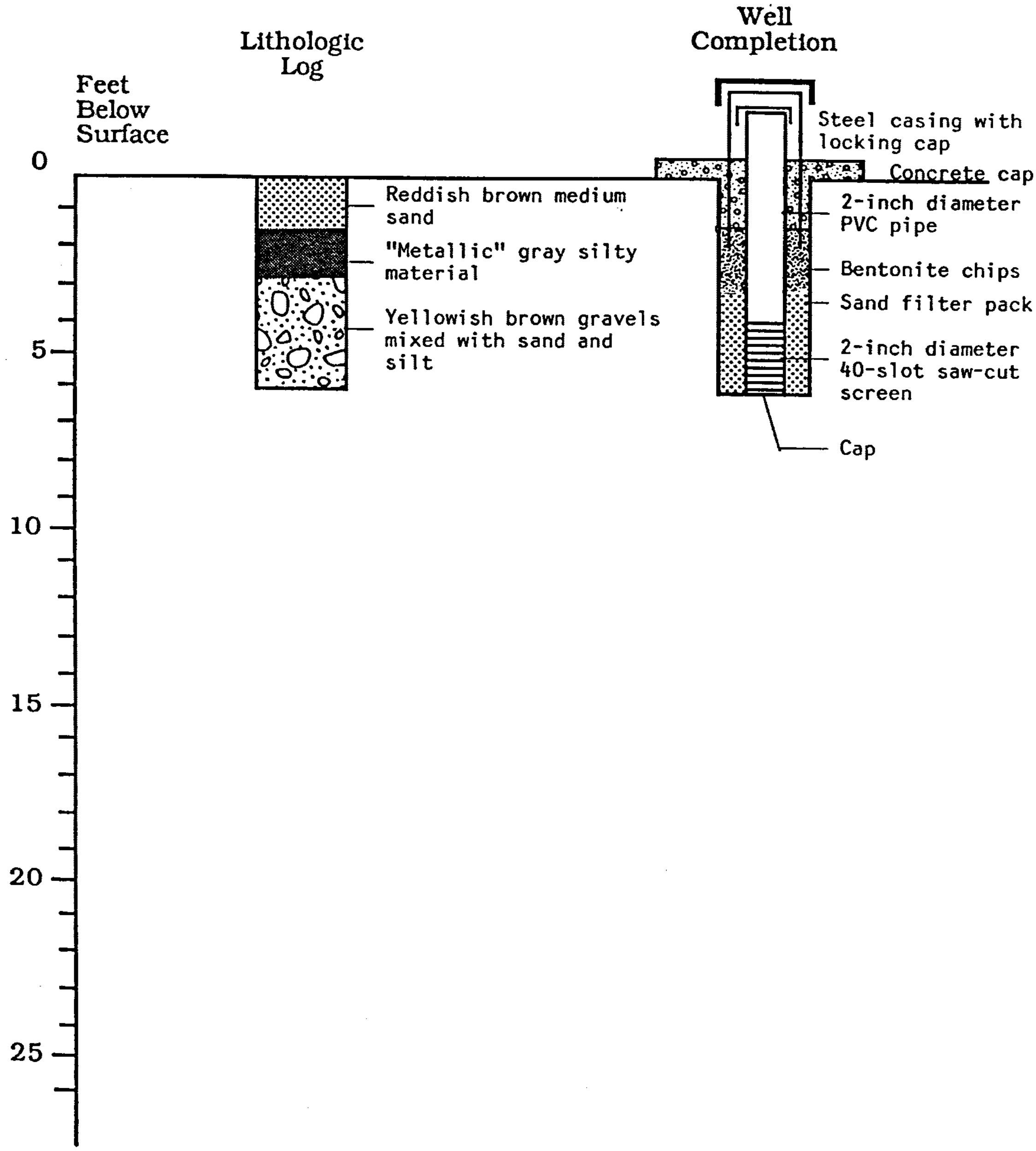
Measuring Point Elevation (National Geodetic Vertical Datum) 2206.16 ft.
Total Depth 24 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 3C
Date Installed 8/15/88
Drilling Method Auger

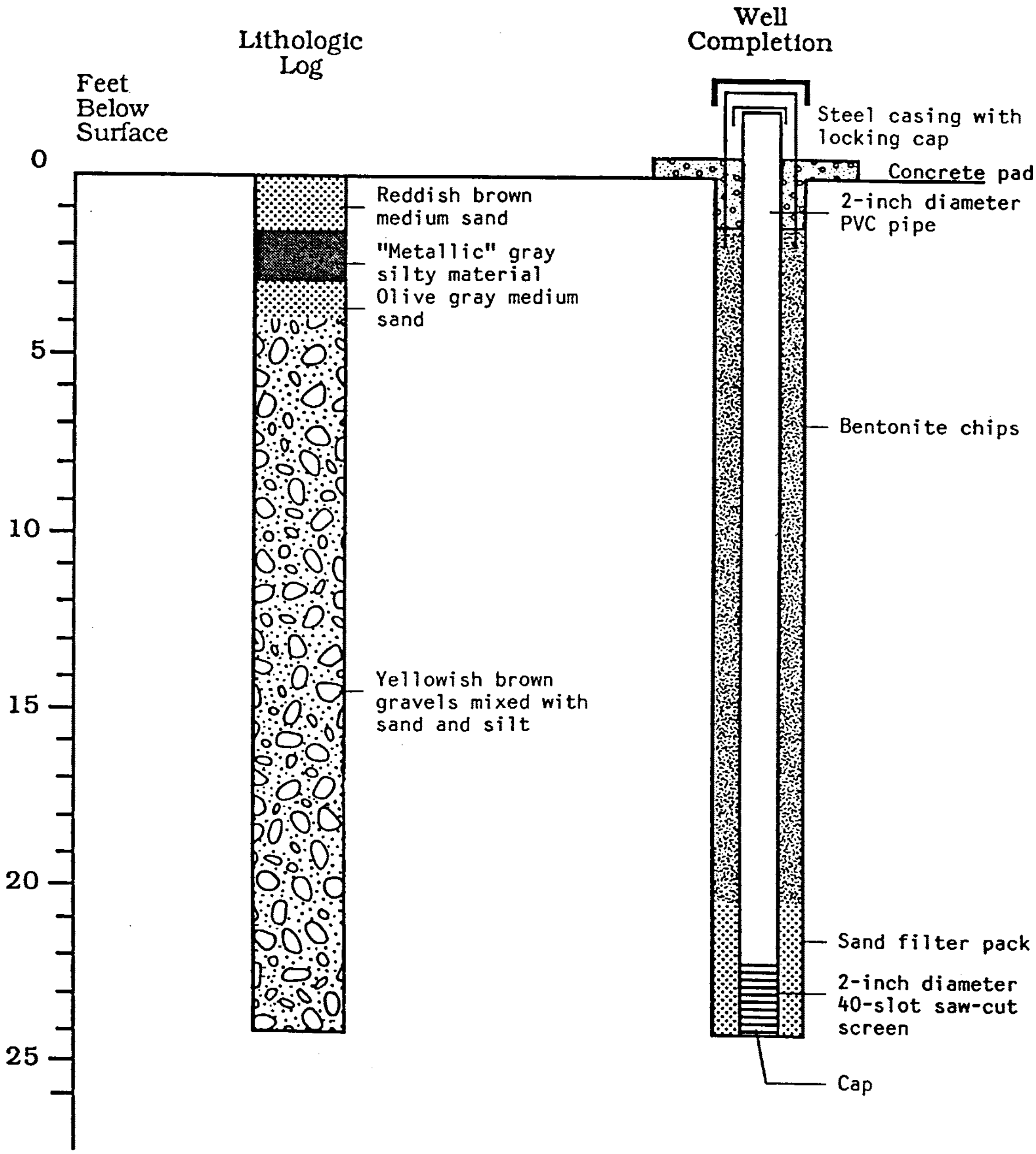
Measuring Point Elevation (National Geodetic Vertical Datum) 2205.62 ft.
Total Depth 6 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 3D
Date Installed 8/15/88
Drilling Method Auger

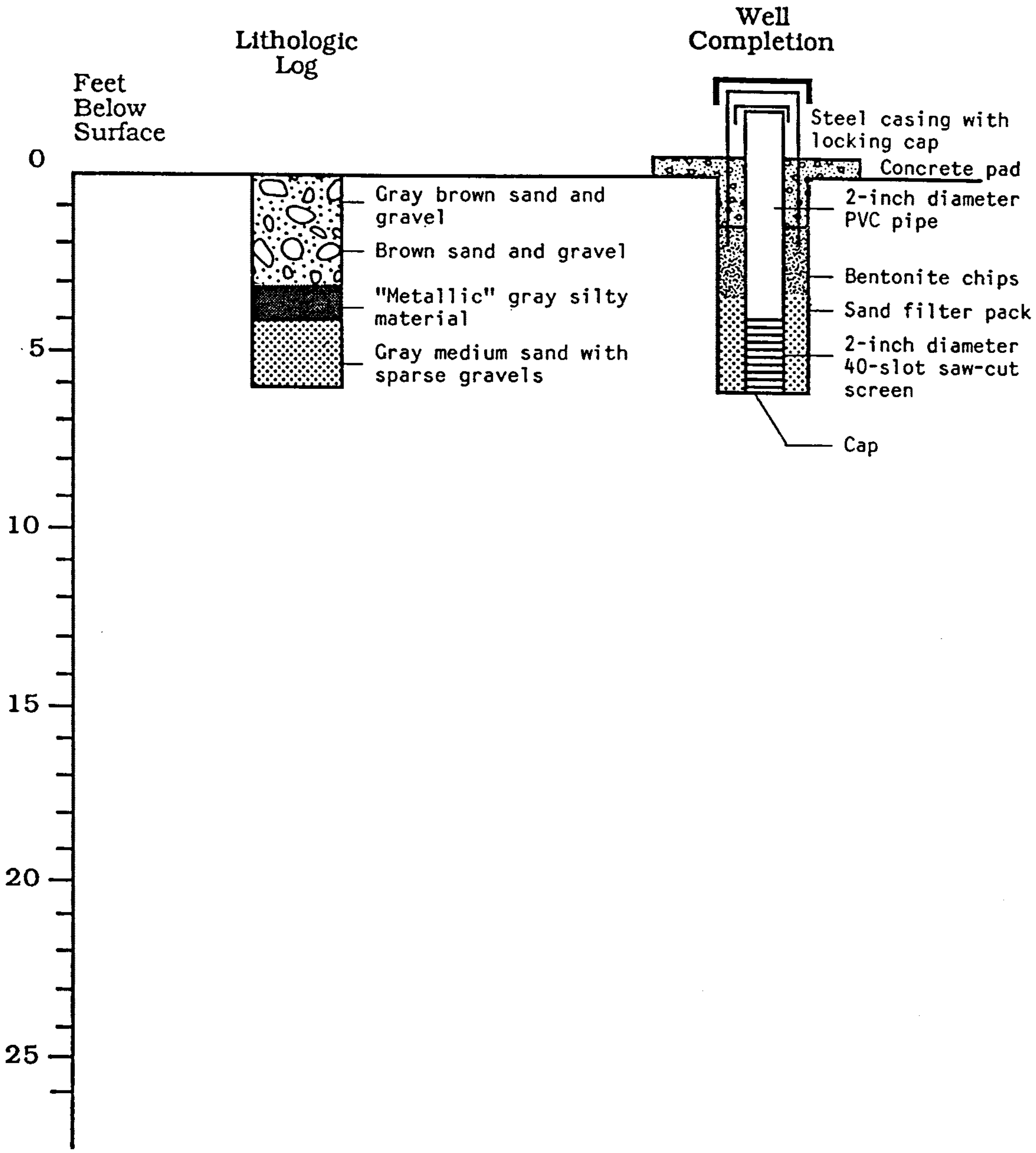
Measuring Point Elevation (National Geodetic Vertical Datum) 2205.48 ft.
Total Depth 24 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 4C
Date Installed 8/20/88
Drilling Method Auger

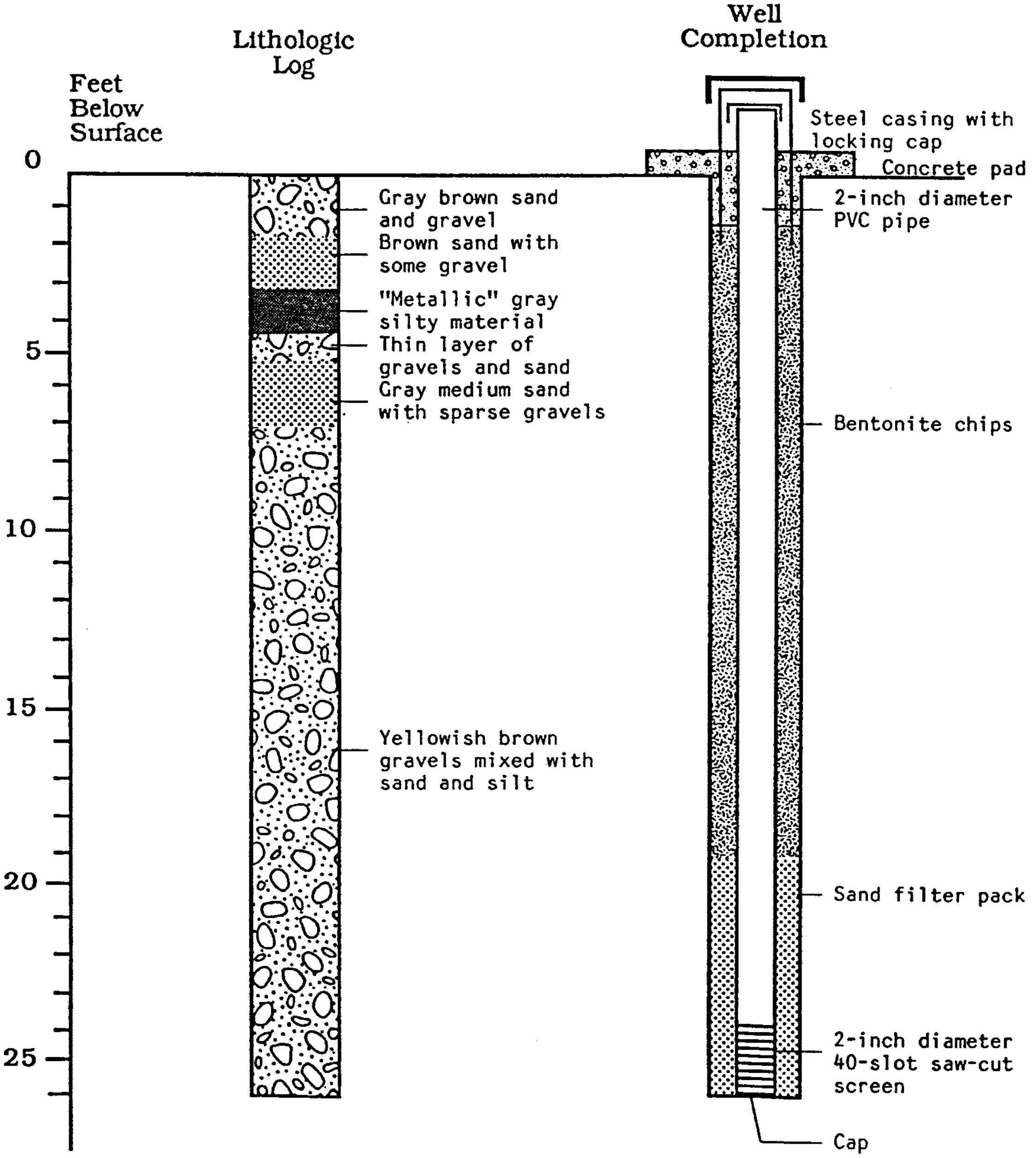
Measuring Point Elevation (National Geodetic Vertical Datum) 2204.46 ft.
Total Depth 6 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 4D
Date Installed 8/20/88
Drilling Method Auger

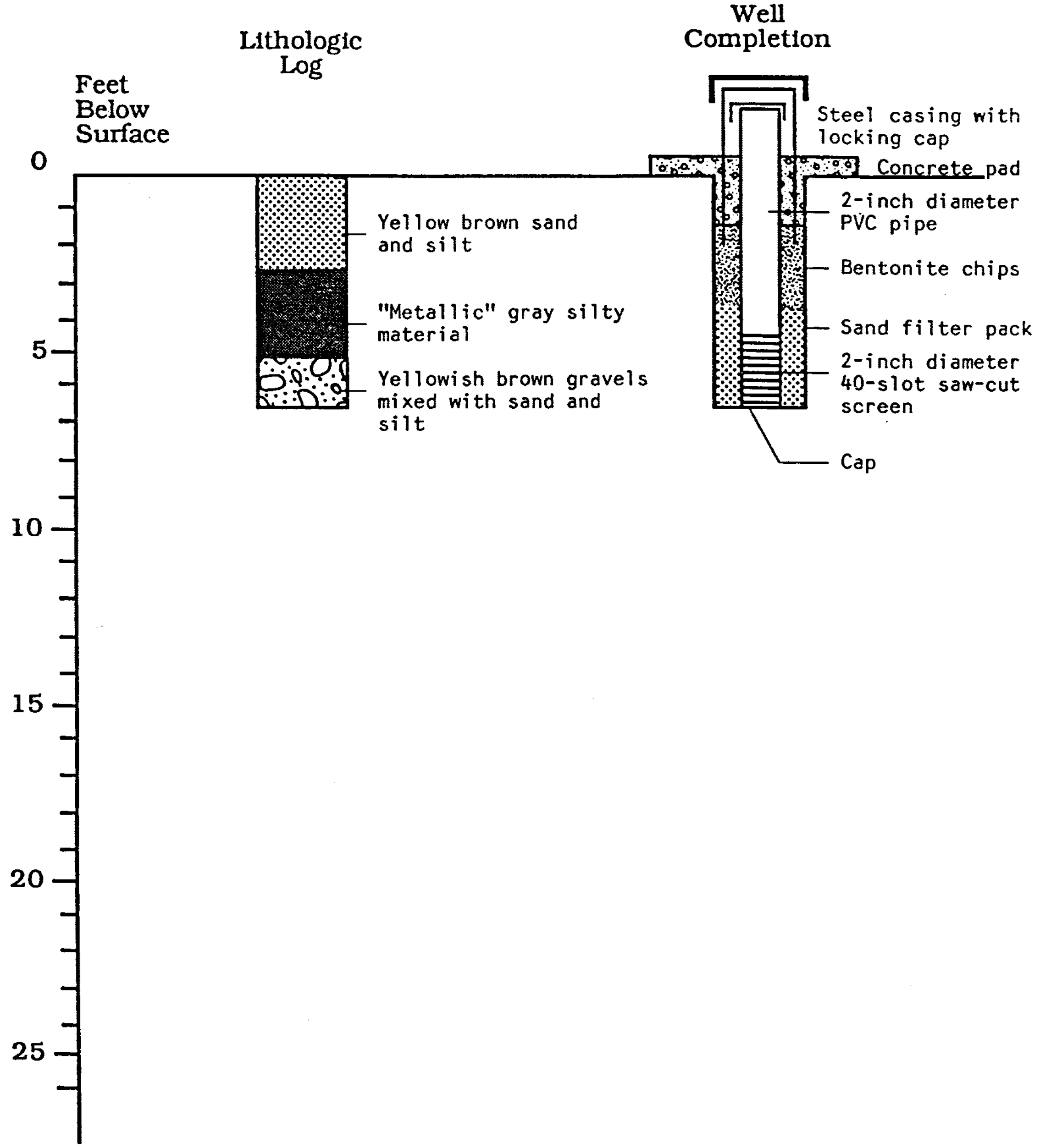
Measuring Point Elevation (National Geodetic Vertical Datum) 2204.33 ft.
Total Depth 26 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 5C
Date Installed 8/16/88
Drilling Method Auger

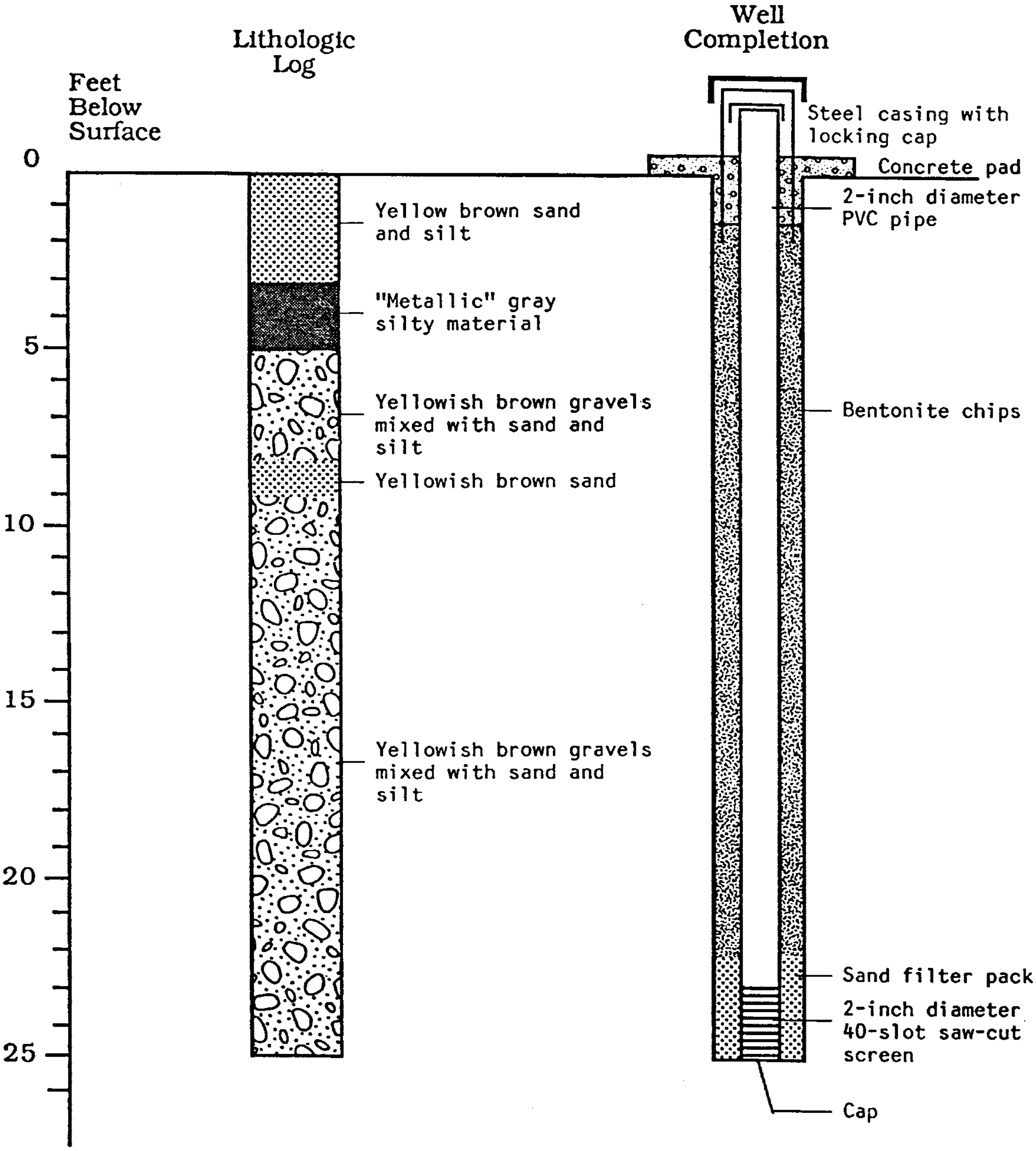
Measuring Point Elevation (National Geodetic Vertical Datum) 2204.93 ft.
Total Depth 6.5 ft.



DRILLING LOG AND WELL COMPLETION

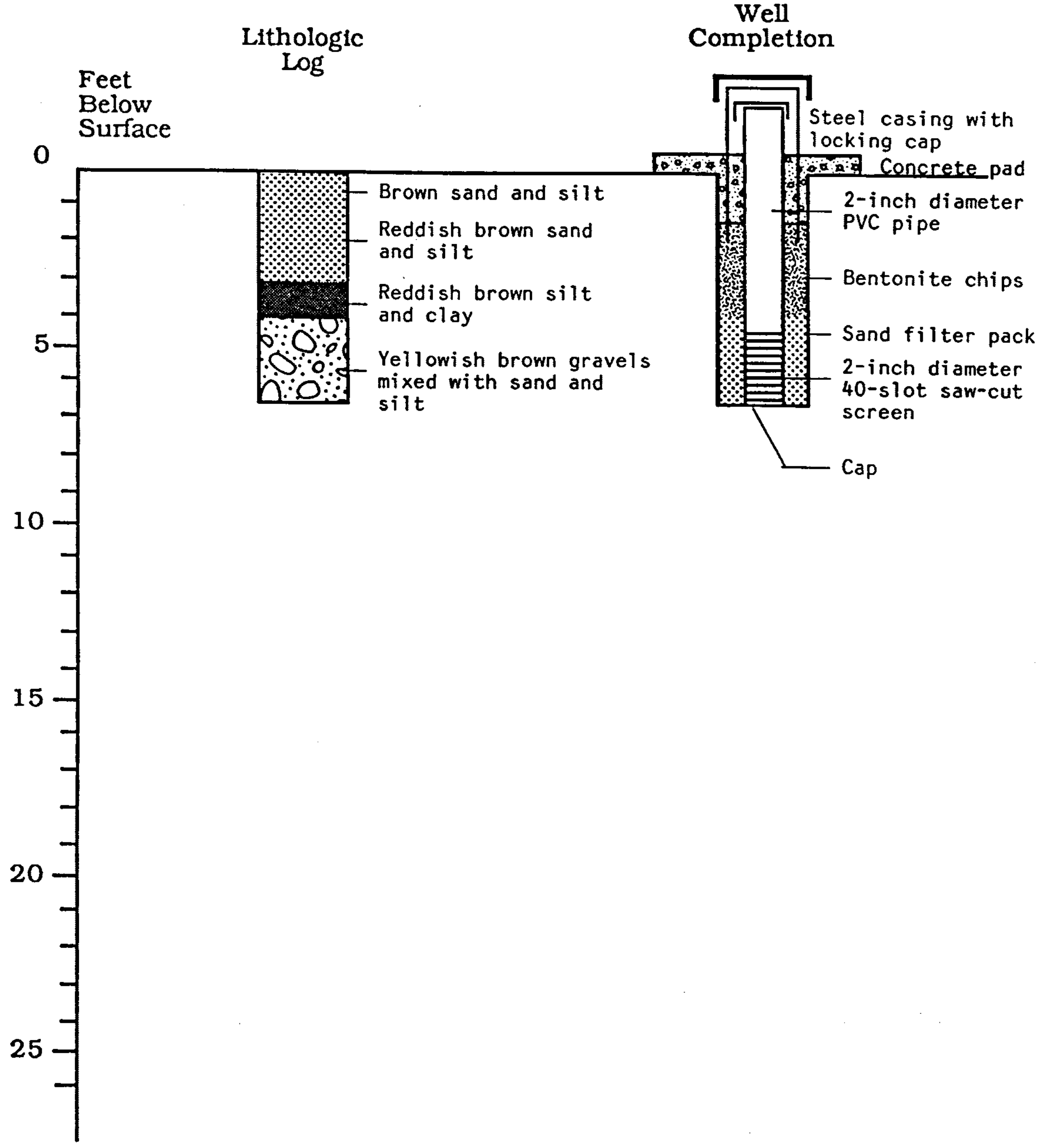
Well Number 5D
Date Installed 8/17/88
Drilling Method Auguer

Measuring Point 2204.88 ft.
Elevation (National Geodetic Vertical Datum)
Total Depth 25 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 6C
Date Installed 8/17/88
Drilling Method Auger
Measuring Point Elevation (National Geodetic Vertical Datum) 2204.19 ft.
Total Depth 6.5 ft.



DRILLING LOG AND WELL COMPLETION

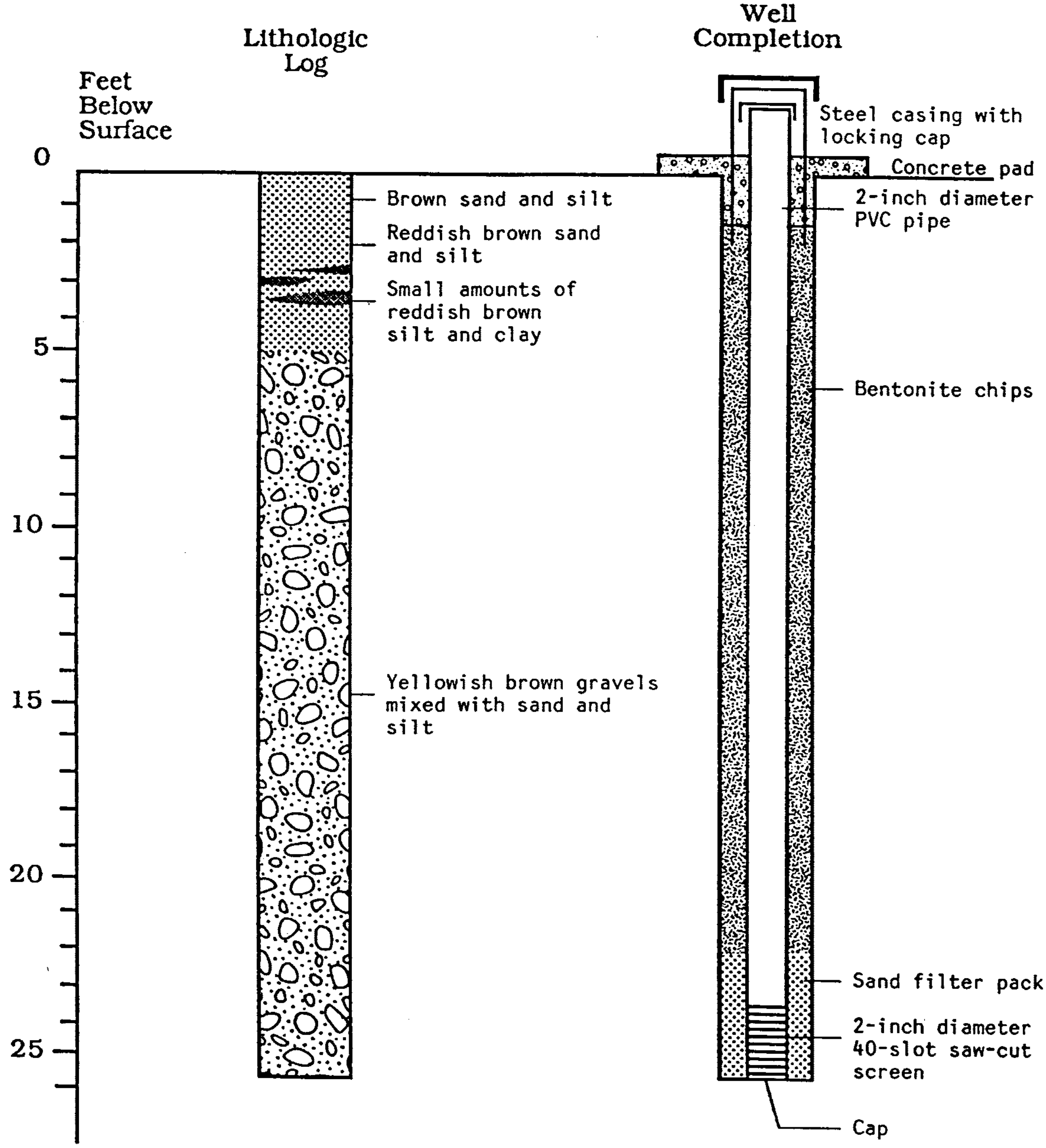
Well Number 6D

Date Installed 8/17/88

Drilling Method Auger

Measuring Point Elevation (National Geodetic Vertical Datum) 2203.97 ft.

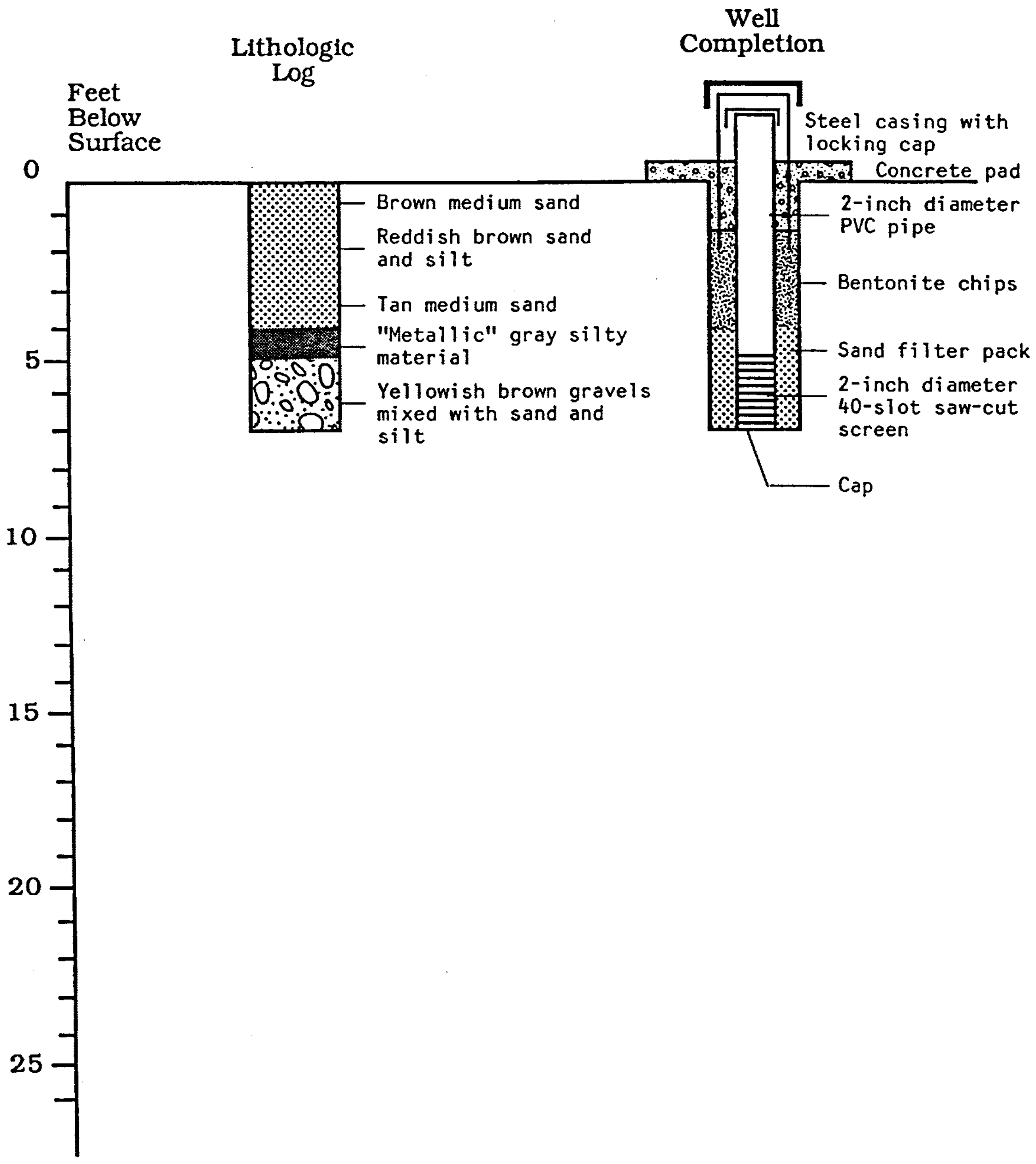
Total Depth 25.5 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 7C
Date Installed 8/18/88
Drilling Method Auger

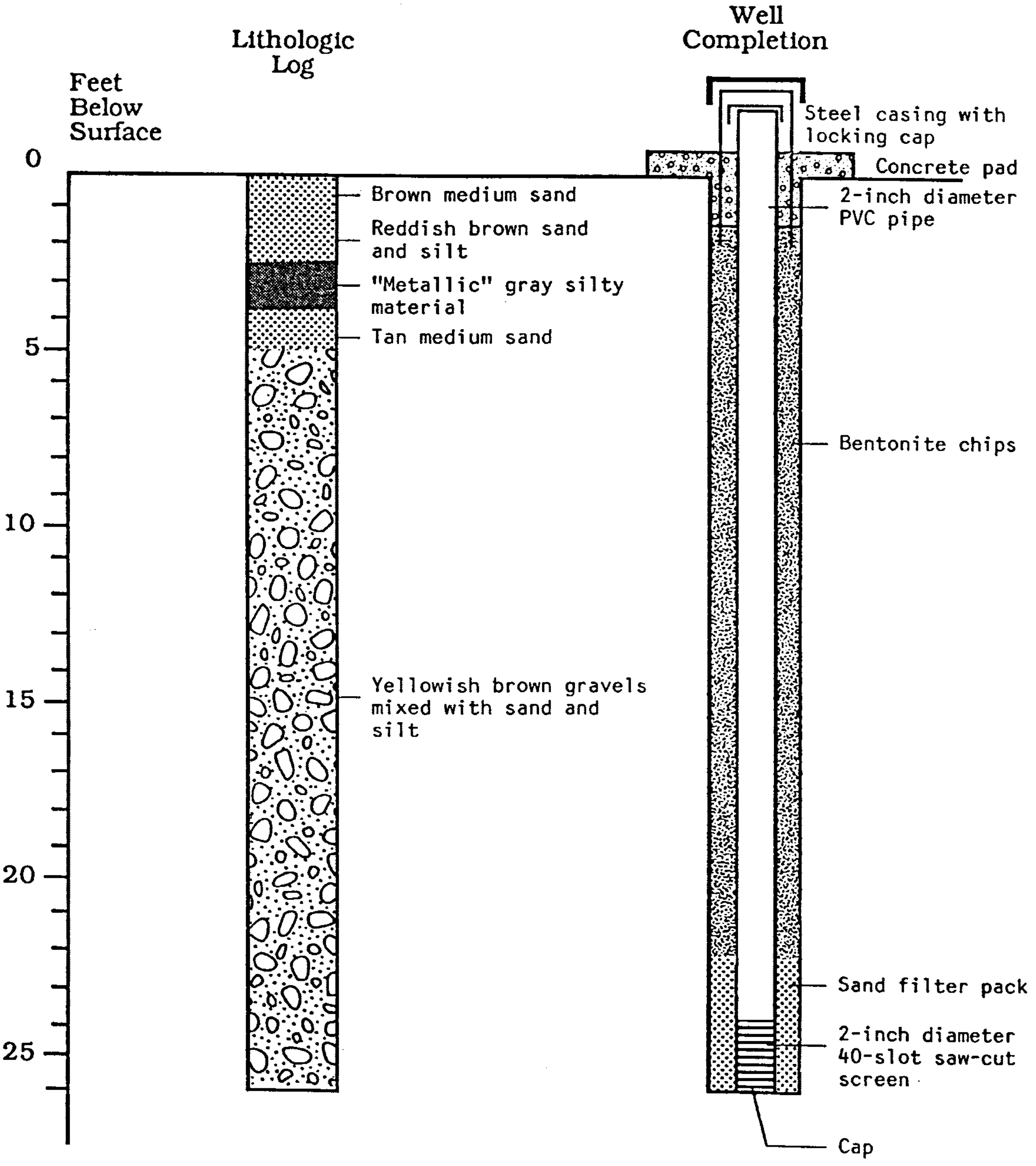
Measuring Point Elevation (National Geodetic Vertical Datum) 2203.04 ft.
Total Depth 7 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 7D
Date Installed 8/18/88
Drilling Method Auger

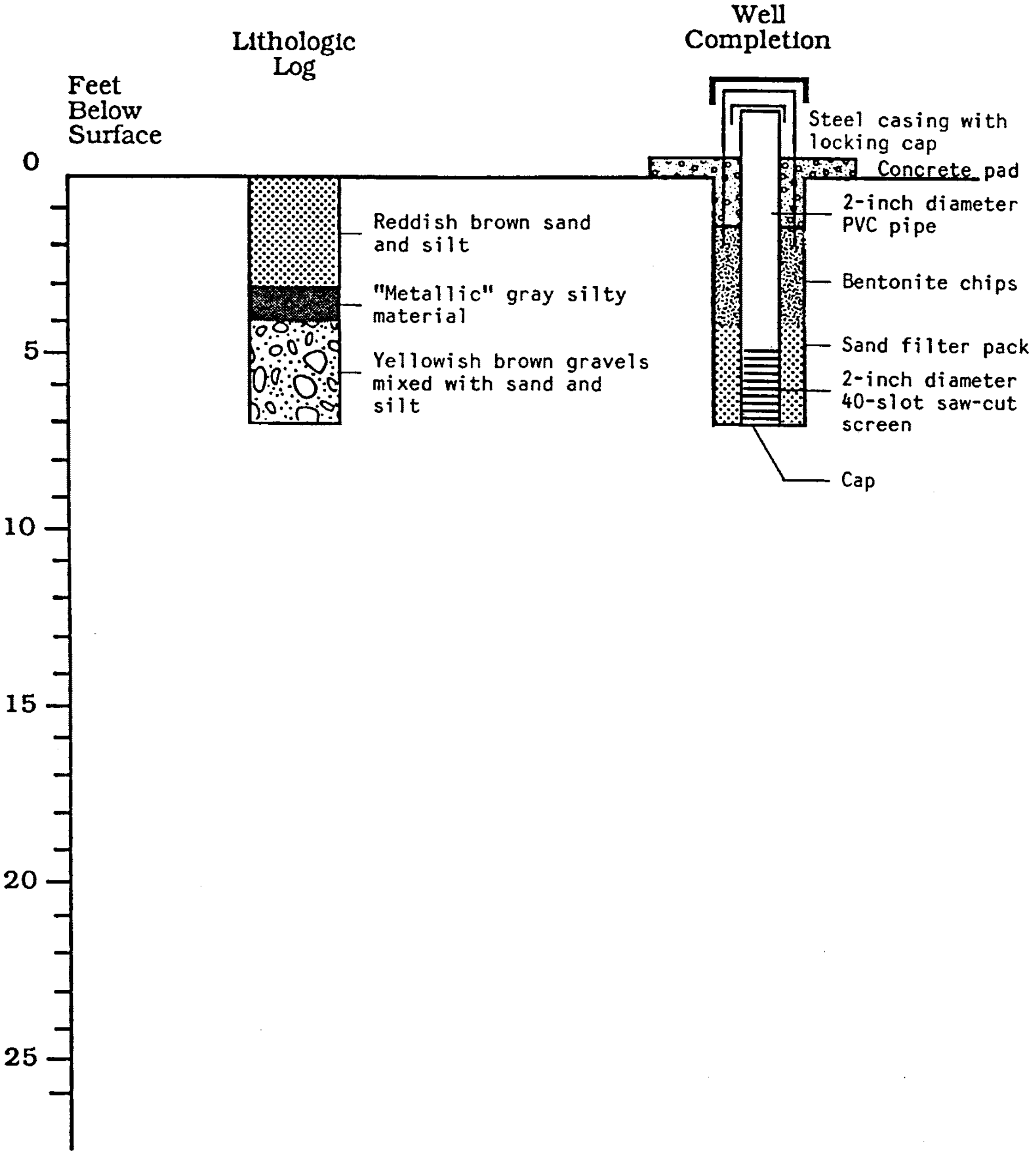
Measuring Point Elevation (National Geodetic Vertical Datum) 2203.19 ft.
Total Depth 26 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 8C
Date Installed 8/19/88
Drilling Method Auger

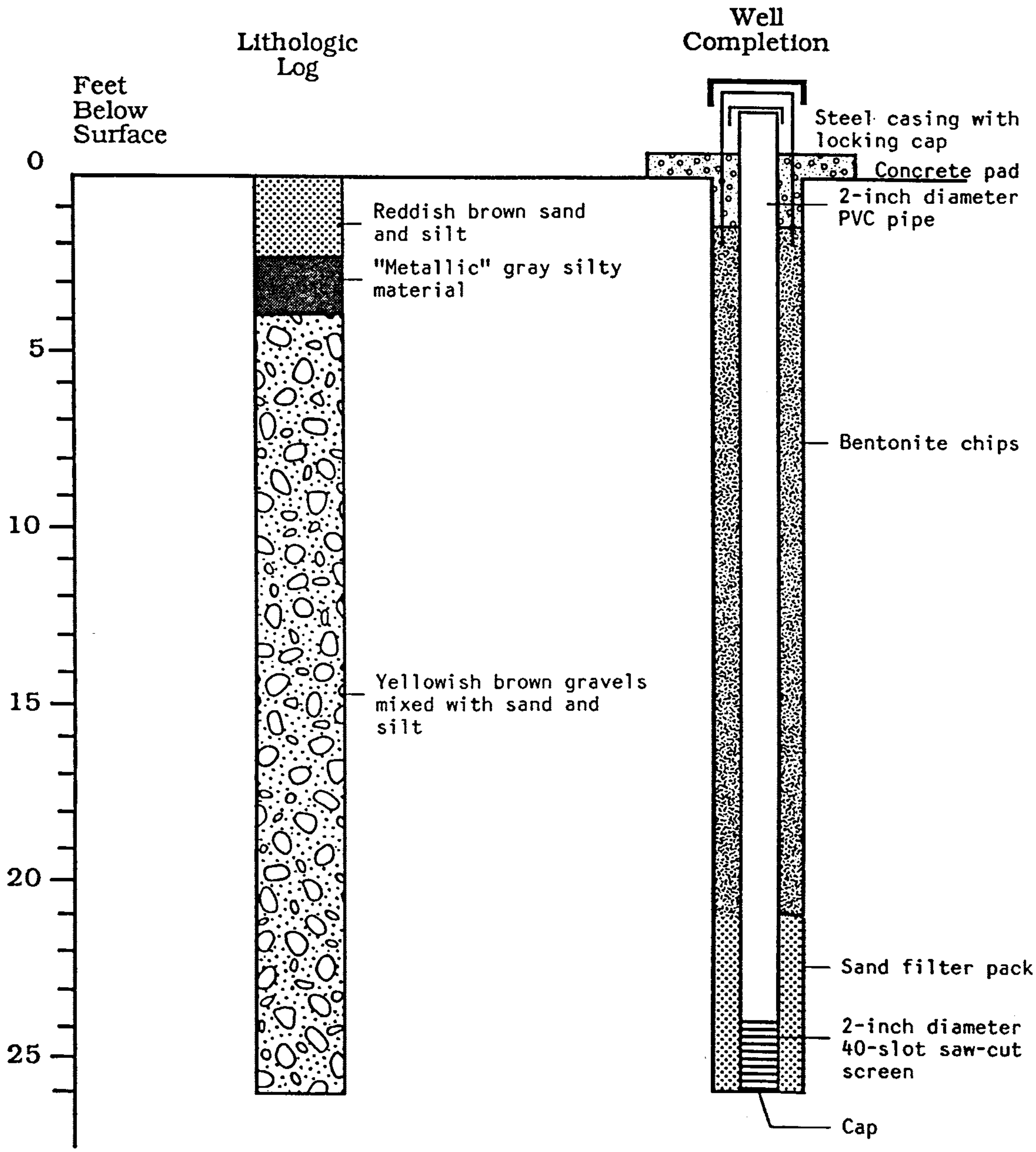
Measuring Point Elevation (National Geodetic Vertical Datum) 2204.38 ft.
Total Depth 7 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 8D
Date Installed 8/19/88
Drilling Method Auger

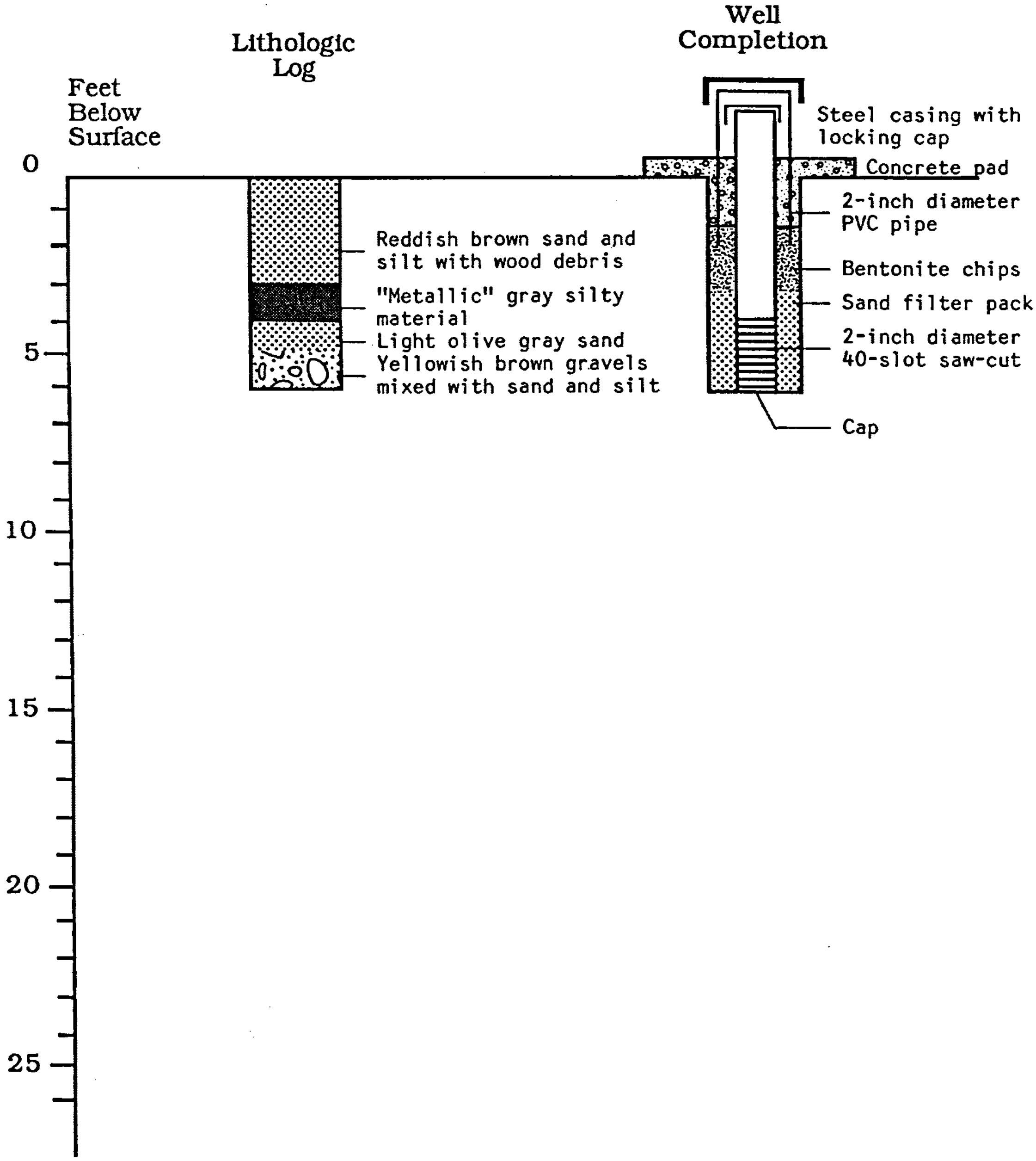
Measuring Point Elevation (National Geodetic Vertical Datum) 2206.23 ft.
Total Depth 26 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 9C
Date Installed 8/20/88
Drilling Method Auger

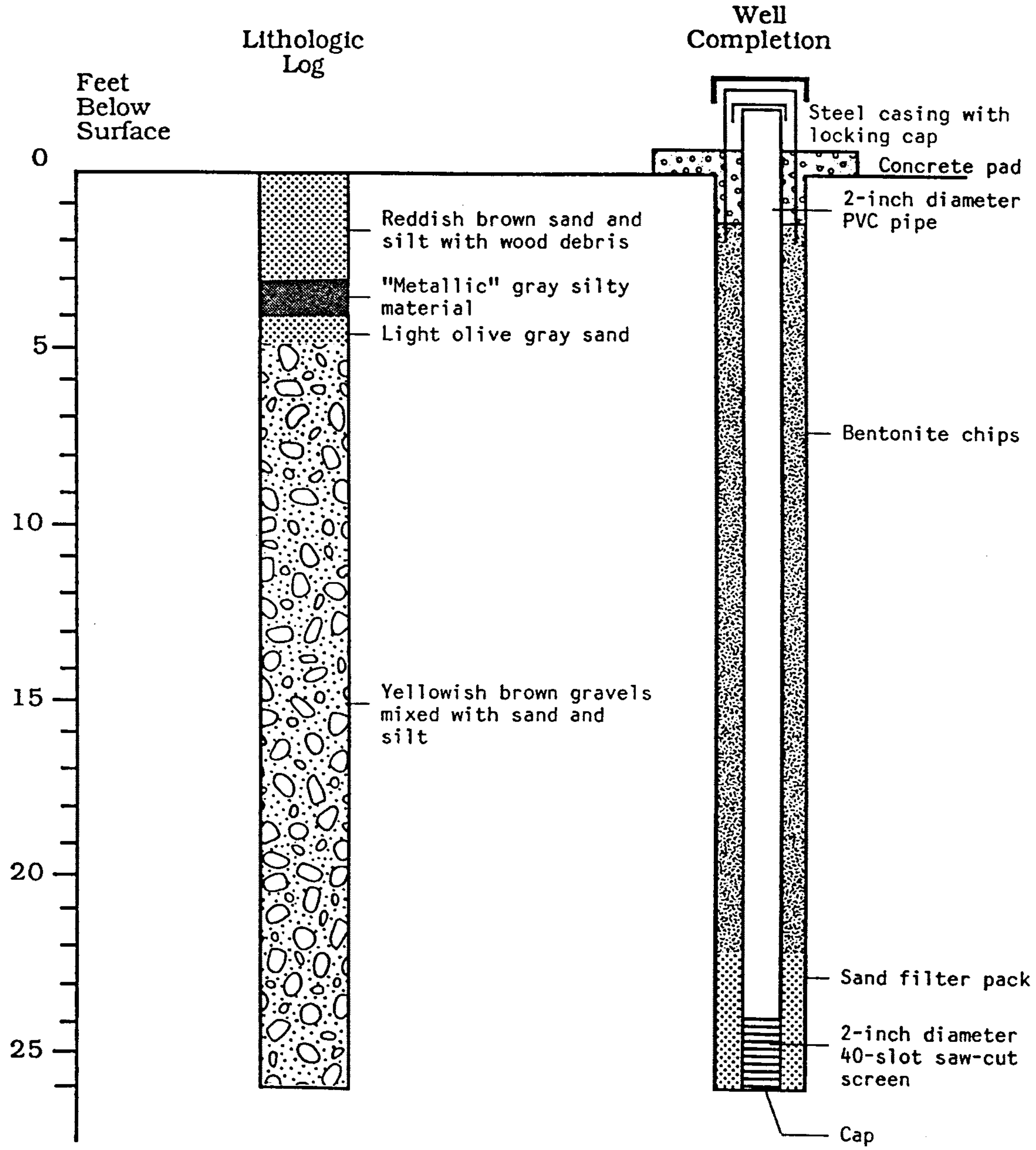
Measuring Point 2204.51 ft.
Elevation (National Geodetic Vertical Datum)
Total Depth 6 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 9D
Date Installed 8/20/88
Drilling Method Auger

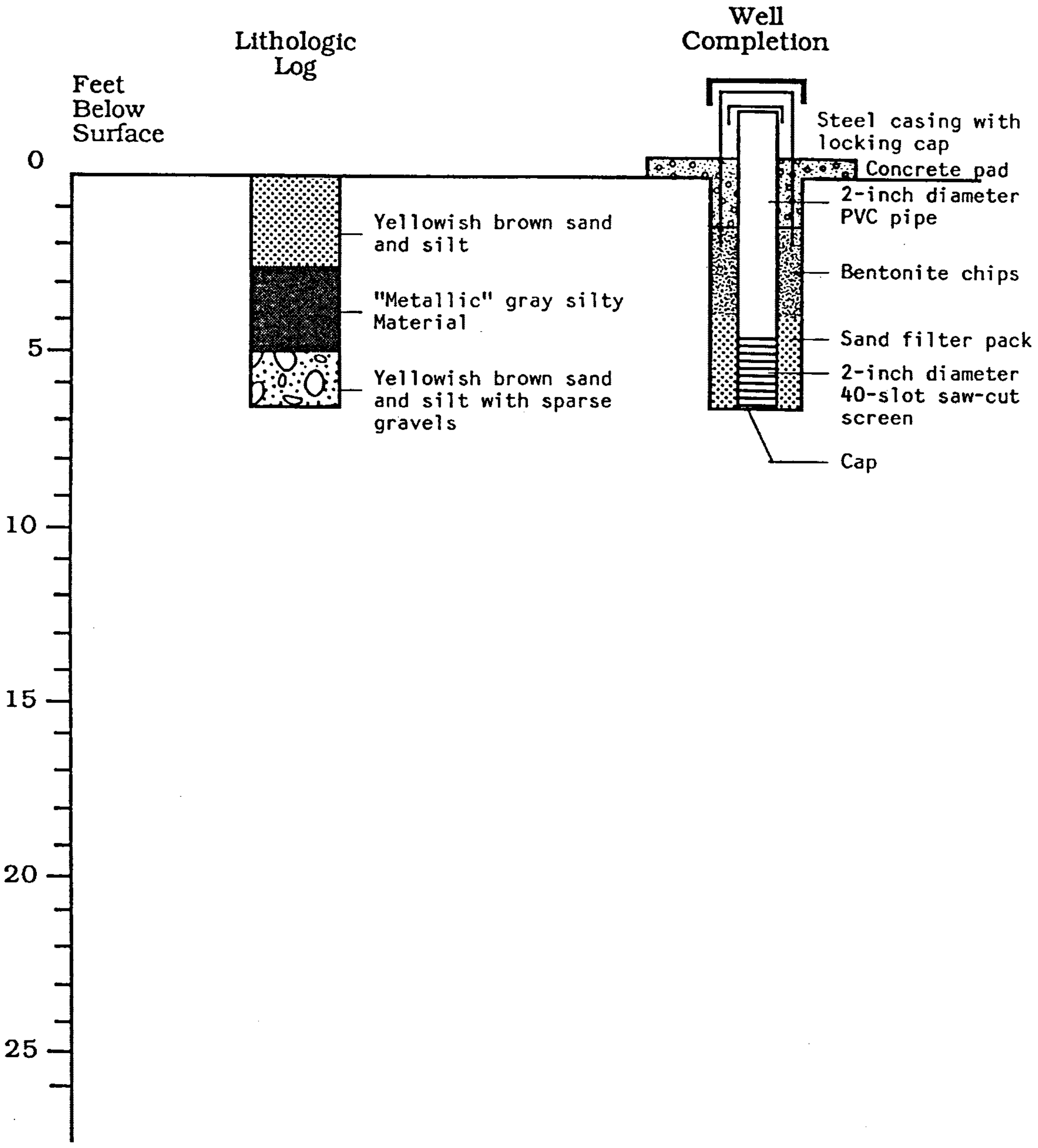
Measuring Point Elevation (National Geodetic Vertical Datum) 2204.47 ft.
Total Depth 26 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 10C
Date Installed 8/18/88
Drilling Method Auger

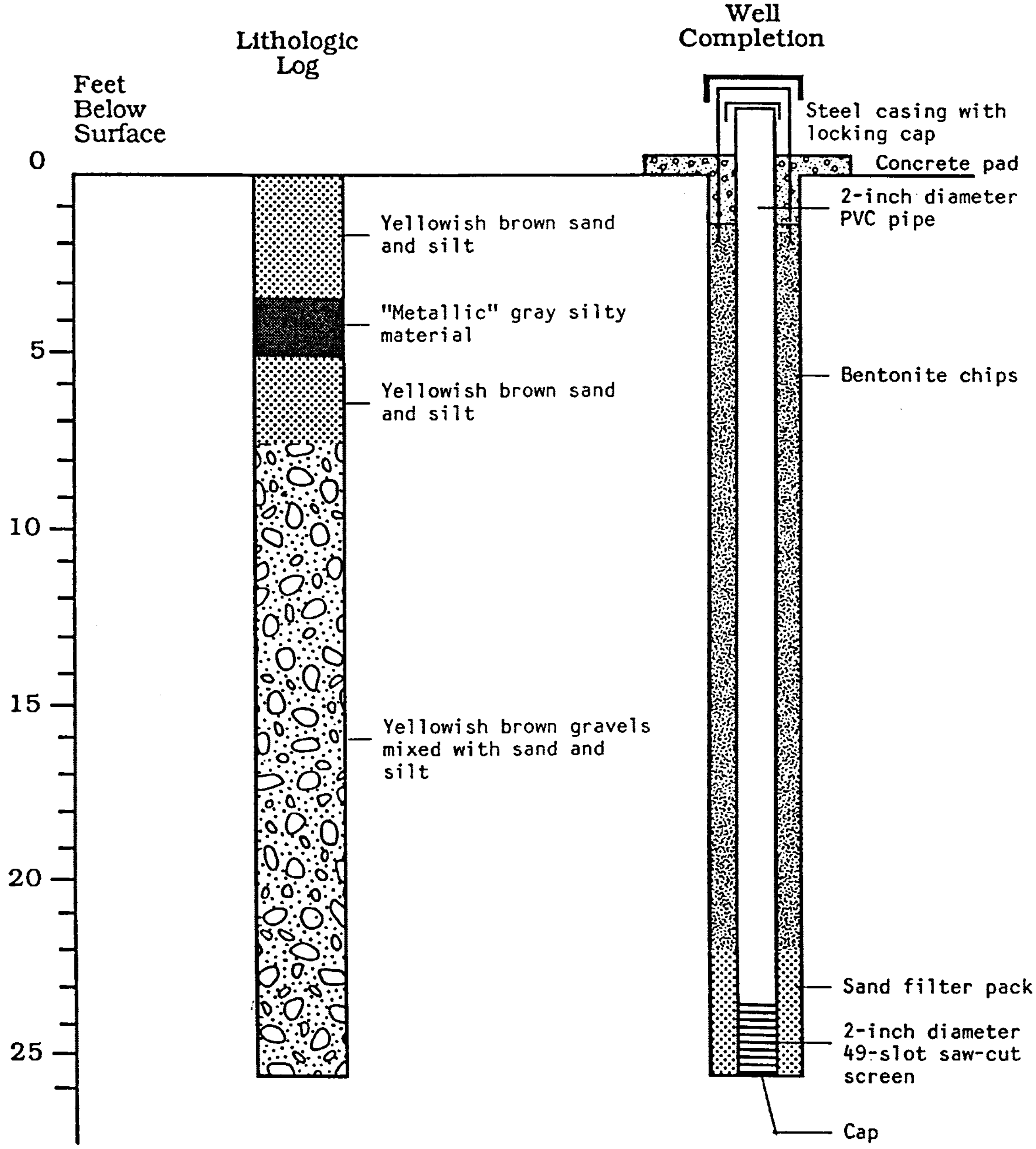
Measuring Point Elevation (National Geodetic Vertical Datum) 2202.20 ft.
Total Depth 6.5 ft.



DRILLING LOG AND WELL COMPLETION

Well Number 10D
Date Installed 8/18/88
Drilling Method Auger

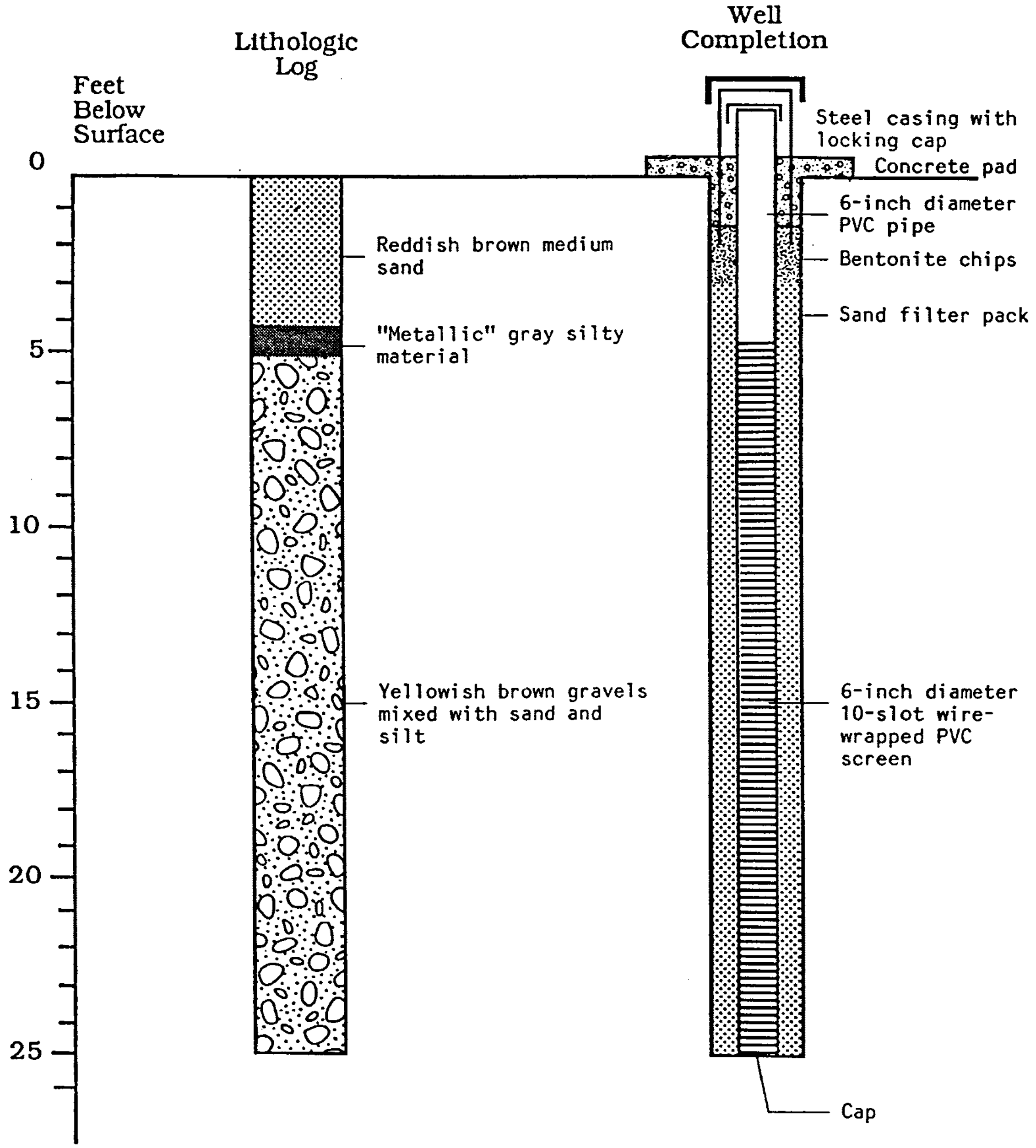
Measuring Point Elevation (National Geodetic Vertical Datum) 2202.26 ft.
Total Depth 25.5 ft.



DRILLING LOG AND WELL COMPLETION

Well Number PW
Date Installed 8/21/88
Drilling Method Air Rotary

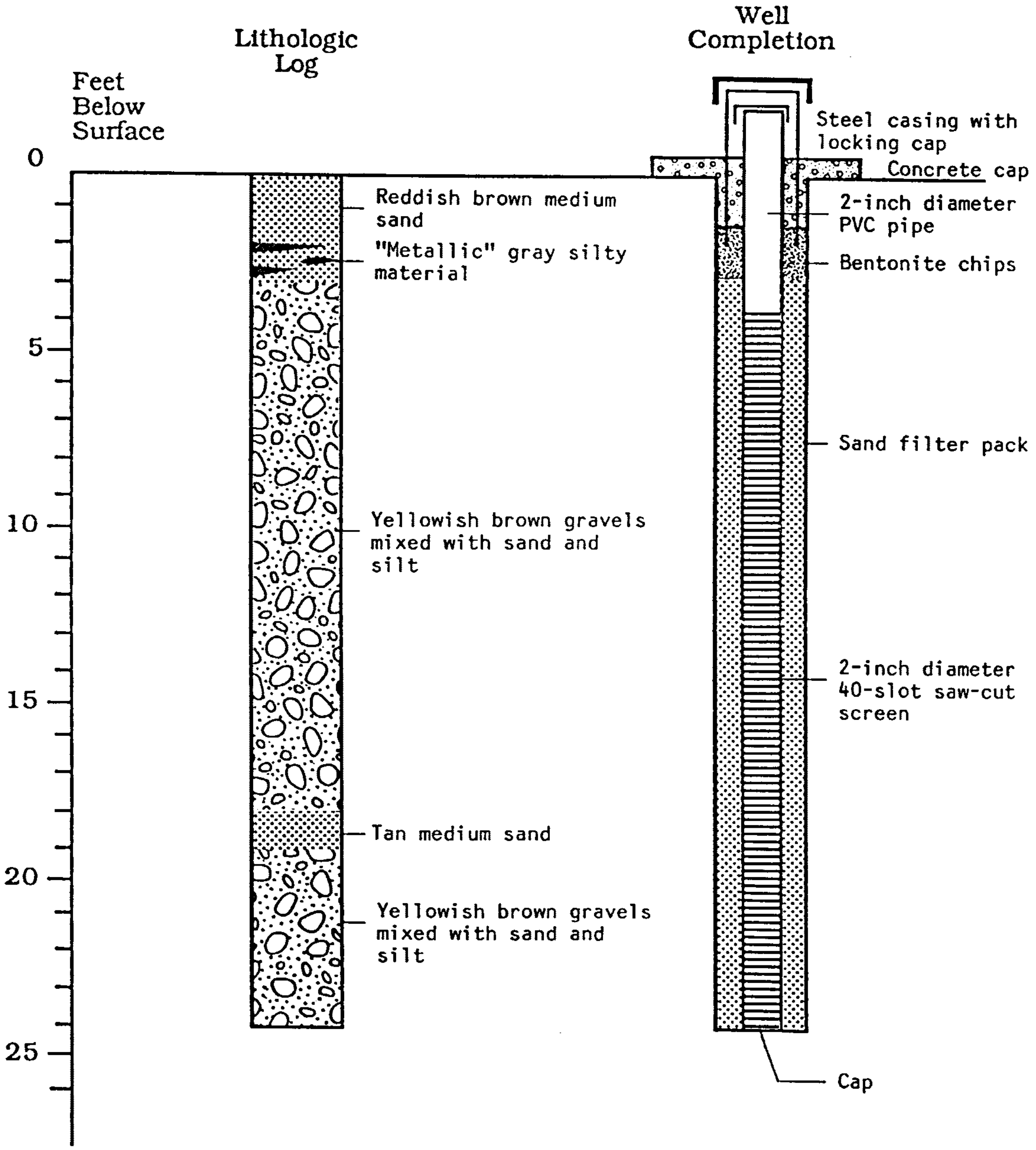
Measuring Point Elevation (National Geodetic Vertical Datum) 2205.23
Total Depth 25 ft.



DRILLING LOG AND WELL COMPLETION

Well Number Type B
Date Installed 8/13/88
Drilling Method Auger

Measuring Point Elevation (National Geodetic Vertical Datum) 2204.31 ft.
Total Depth 24 ft.



APPENDIX 2

WATER LEVEL MEASUREMENT DATA

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X1S	Sept. 2		30	dry	2220.20	dry
X1S	Jan. 21	21	31	dry	2220.20	dry
X1S	Jan. 28	28	31	dry	2220.20	dry
X1S	Feb. 4	35	31	dry	2220.20	dry
X1S	Feb. 11	42	31	dry	2220.20	dry
X1S	Feb. 25	56	31	dry	2220.20	dry
X1S	Mar. 3	63	31	dry	2220.20	dry
X1S	Mar. 17	77	33	21.17	2220.20	2208.37
X1S	Mar. 25	85	33	20.97	2220.20	2208.17
X1S	April 1	92	33	21.84	2220.20	2209.04
X1S	April 14	105	33	22.75	2220.20	2209.95
X1S	April 29	120	34	23.69	2220.20	2209.89
X1S	May 17	138	34	23.53	2220.20	2209.73
X1S	May 26	147	34	23.44	2220.20	2209.64
X1S	June 2	154	34	23.46	2220.20	2209.66
X1S	June 9	161	33	22.26	2220.20	2209.46
X1S	June 16	168	34	22.95	2220.20	2209.15
X1S	June 30	182	34	22.42	2220.20	2208.62
X1S	July 13	195	34	22.06	2220.20	2208.26
X1S	July 28	210	35	unmeasurable	2220.20	dry
X1S	Aug. 12	225	35	unmeasurable	2220.20	dry
X1S	Sept. 13	257	35	unmeasurable	2220.20	dry
X1S	Oct. 5	279	35	dry	2220.20	dry
X1S	Dec. 9	344	35	dry	2220.20	dry
X1S	Dec. 17	352	35	dry	2220.20	dry
X1S	Dec. 28	363	35	dry	2220.20	dry
X1S	Jan. 5	370	35	dry	2220.20	dry
X1S	Jan. 13	378	35	dry	2220.20	dry
X1S	Jan. 28	393	35	dry	2220.20	dry
X1S	Feb. 10	406	35	23.37	2220.20	2208.57
X1S	Feb. 14	410	35	23.27	2220.20	2208.47
X1S	Feb. 23	419	35	dry	2220.20	dry
X1S	Mar. 9	433	35	n.m.	2220.20	n.m.
X1S	Apr. 26	482	35	25.28	2220.20	2210.48
X1S	June 1	518	35	24.75	2220.20	2209.95

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X1D	Sept. 2		40	24.57	2220.75	2205.32
X1D	Jan. 21	21	40	24.84	2220.75	2205.59
X1D	Jan. 28	28	40	24.58	2220.75	2205.33
X1D	Feb. 4	35	38	22.69	2220.75	2205.44
X1D	Feb. 11	42	40	24.97	2220.75	2205.72
X1D	Feb. 25	56	38	24.79	2220.75	2207.54
X1D	Mar. 3	63	36	22.57	2220.75	2207.32
X1D	Mar. 17	77	35	22.61	2220.75	2208.36
X1D	Mar. 25	85	36	23.43	2220.75	2208.18
X1D	April 1	92	35	23.29	2220.75	2209.04
X1D	April 14	105	34	23.19	2220.75	2209.94
X1D	April 29	120	36	25.16	2220.75	2209.91
X1D	May 17	138	34	23.01	2220.75	2209.76
X1D	May 26	147	34	22.93	2220.75	2209.68
X1D	June 2	154	34	22.93	2220.75	2209.68
X1D	June 9	161	34	22.73	2220.75	2209.48
X1D	June 16	168	34	22.47	2220.75	2209.22
X1D	June 30	182	34	21.87	2220.75	2208.62
X1D	July 13	195	36	23.54	2220.75	2208.29
X1D	July 28	210	36	23.17	2220.75	2207.92
X1D	Aug. 12	225	121	107.66	2220.75	2207.41
X1D	Sept. 13	257	40	25.01	2220.75	2205.76
X1D	Oct. 5	279	40	24.42	2220.75	2205.17
X1D	Dec. 9	343	38	22.87	2220.75	2205.62
X1D	Dec. 17	352	38	23.20	2220.75	2205.95
X1D	Dec. 28	363	38	22.88	2220.75	2205.63
X1D	Jan. 5	370	38	22.77	2220.75	2205.52
X1D	Jan. 13	378	38	22.66	2220.75	2205.41
X1D	Jan. 28	393	38	24.55	2220.75	2207.30
X1D	Feb. 10	406	36	23.86	2220.75	2208.61
X1D	Feb. 14	410	36	23.73	2220.75	2208.48
X1D	Feb. 23	419	37	23.56	2220.75	2207.31
X1D	Mar. 9	433	37	23.70	2220.75	2207.45
X1D	Apr. 26	482	35	24.71	2220.75	2210.46
X1D	June 1	518	35	24.24	2220.75	2209.99

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X2S	Sept. 2			dry	2223.46	dry
X2S	Jan. 21	21	37	dry	2223.46	dry
X2S	Jan. 28	28	37	dry	2223.46	dry
X2S	Feb. 4	35	37	dry	2223.46	dry
X2S	Feb. 11	42	37	dry	2223.46	dry
X2S	Feb. 25	56	37	unmeasurable	2223.46	dry
X2S	Mar. 3	63	37	unmeasurable	2223.46	dry
X2S	Mar. 17	77	37	21.95	2223.46	2208.41
X2S	Mar. 25	85	37	21.76	2223.46	2208.22
X2S	Apr. 1	92	37	23.54	2223.46	2210.00
X2S	Apr. 14	105	37	23.54	2223.46	2210.00
X2S	Apr. 29	120	37	23.52	2223.46	2209.98
X2S	May 17	138	37	23.37	2223.46	2209.83
X2S	May 26	147	37	23.29	2223.46	2209.75
X2S	June 2	154	37	23.26	2223.46	2209.72
X2S	June 9	161	37	23.06	2223.46	2209.52
X2S	June 16	168	37	22.75	2223.46	2209.21
X2S	June 30	182	37	22.23	2223.46	2208.69
X2S	July 13	195	37	21.85	2223.46	2208.31
X2S	July 28	210	38	22.51	2223.46	2207.97
X2S	Aug. 12	225	121	104.99	2223.46	2207.45
X2S	Sept. 13	257	39	unmeasurable	2223.46	dry
X2S	Oct. 5	279	39	dry	2223.46	dry
X2S	Dec.9	344	39	dry	2223.46	dry
X2S	Dec. 17	352	38	dry	2223.46	dry
X2S	Dec. 28	363	39	dry	2223.46	dry
X2S	Jan. 5	370	38	dry	2223.46	dry
X2S	Jan. 13	378	38	dry	2223.46	dry
X2S	Jan. 28	393	38	dry	2223.46	dry
X2S	Feb. 10	406	38	23.20	2223.46	2208.66
X2S	Feb. 14	410	38	23.11	2223.46	2208.57
X2S	Feb. 23	419	39	22.85	2223.46	2207.31
X2S	Mar. 9	433	39	23.04	2223.46	2207.50
X2S	Apr. 26	482	36	23.13	2223.46	2210.59
X2S	June 1	518	37	23.61	2223.46	2210.07

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X2D	Sept. 2		40	22.86	2222.57	2205.43
X2D	Jan. 21	21	40	23.21	2222.57	2205.78
X2D	Jan. 28	28	40	22.87	2222.57	2205.44
X2D	Feb. 4	35	40	22.95	2222.57	2205.52
X2D	Feb. 11	42	40	23.23	2222.57	2205.80
X2D	Feb. 25	56	38	22.99	2222.57	2207.56
X2D	Mar. 3	63	38	22.83	2222.57	2207.40
X2D	Mar. 17	77	39	24.82	2222.57	2208.39
X2D	Mar. 25	85	38	23.67	2222.57	2208.24
X2D	Apr. 1	92	37	23.54	2222.57	2209.11
X2D	Apr. 14	105	37	23.45	2222.57	2209.02
X2D	Apr. 29	120	38	25.36	2222.57	2209.93
X2D	May 17	138	38	25.29	2222.57	2209.86
X2D	May 26	147	37	24.11	2222.57	2209.68
X2D	June 2	154	36	23.14	2222.57	2209.71
X2D	June 9	161	37	23.92	2222.57	2209.49
X2D	June 16	168	36	22.66	2222.57	2209.23
X2D	June 30	182	36	22.09	2222.57	2208.66
X2D	July 13	195	37	22.73	2222.57	2208.30
X2D	July 28	210	37	22.40	2222.57	2207.97
X2D	Aug. 12	225	122	106.88	2222.57	2207.45
X2D	Sept. 13	257	40	23.23	2222.57	2205.80
X2D	Oct. 5	279	40	22.58	2222.57	2205.15
X2D	Dec. 9	344	40	22.97	2222.57	2205.54
X2D	Dec. 17	352	40	23.38	2222.57	2205.95
X2D	Dec. 28	363	40	23.19	2222.57	2205.76
X2D	Jan. 5	370	40	22.94	2222.57	2205.51
X2D	Jan. 13	378	40	22.87	2222.57	2205.44
X2D	Jan. 28	393	40	24.64	2222.57	2207.21
X2D	Feb. 10	406	38	24.02	2222.57	2208.59
X2D	Feb. 14	410	38	23.96	2222.57	2208.53
X2D	Feb. 23	419	40	24.70	2222.57	2207.27
X2D	Mar. 9	433	39	23.88	2222.57	2207.45
X2D	Apr. 26	482	36	23.96	2222.57	2210.53
X2D	June 1	518	37	24.43	2222.57	2210.00

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X3S	Sept. 2			dry	2223.17	dry
X3S	Jan. 21	21		dry	2223.17	dry
X3S	Jan. 28	28		dry	2223.17	dry
X3S	Feb. 4	35		dry	2223.17	dry
X3S	Feb. 11	42		dry	2223.17	dry
X3S	Feb. 25	56		unmeasurable	2223.17	dry
X3S	Mar. 3	63		unmeasurable	2223.17	dry
X3S	Mar. 17	77	36	21.34	2223.17	2208.51
X3S	Mar. 25	85	37	22.27	2223.17	2208.44
X3S	Apr. 1	92	37	23.29	2223.17	2209.46
X3S	Apr. 14	105	36	23.27	2223.17	2210.44
X3S	Apr. 29	120	36	23.24	2223.17	2210.41
X3S	May 17	138	36	23.11	2223.17	2210.28
X3S	May 26	147	36	22.97	2223.17	2210.14
X3S	June 2	154	36	22.92	2223.17	2210.09
X3S	June 9	161	36	22.72	2223.17	2209.89
X3S	June 16	168	36	22.41	2223.17	2209.58
X3S	June 30	182	37	22.83	2223.17	2209.00
X3S	July 13	195	37	22.41	2223.17	2208.58
X3S	July 28	210	38	23.05	2223.17	2208.22
X3S	Aug. 12	225	121	105.52	2223.17	2207.69
X3S	Sept. 13	257	39	dry	2223.17	dry
X3S	Oct. 5	279		dry	2223.17	dry
X3S	Dec. 9	344	39	dry	2223.17	dry
X3S	Dec. 17	352	39	dry	2223.17	dry
X3S	Dec. 28	363	39	dry	2223.17	dry
X3S	Jan. 5	370	39	dry	2223.17	dry
X3S	Jan. 13	378	39	dry	2223.17	dry
X3S	Jan. 28	393	39	23.19	2223.17	2207.36
X3S	Feb. 10	406	39	24.78	2223.17	2208.95
X3S	Feb. 14	410	38	23.65	2223.17	2208.82
X3S	Feb. 23	419	39	23.19	2223.17	2207.36
X3S	Mar. 9	433	39	23.48	2223.17	2207.65
X3S	Apr. 26	482	36	23.89	2223.17	2211.06
X3S	June 1	518	37	24.24	2223.17	2210.41

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X3D	Sept. 2		40	22.49	2222.86	2205.35
X3D	Jan. 21	21	40	22.85	2222.86	2205.71
X3D	Jan. 28	28	40	22.51	2222.86	2205.37
X3D	Feb. 4	35	40	22.64	2222.86	2205.50
X3D	Feb. 11	42	40	22.95	2222.86	2205.81
X3D	Feb. 25	56	38	22.70	2222.86	2207.56
X3D	Mar. 3	63	37	21.60	2222.86	2207.46
X3D	Mar. 17	77	36	21.71	2222.86	2208.57
X3D	Mar. 25	85	37	22.55	2222.86	2208.41
X3D	Apr. 1	92	37	23.50	2222.86	2209.36
X3D	Apr. 14	105	36	23.47	2222.86	2210.33
X3D	Apr. 29	120	36	23.44	2222.86	2210.30
X3D	May 17	138	36	23.30	2222.86	2210.16
X3D	May 26	147	36	23.19	2222.86	2210.05
X3D	June 2	154	36	22.92	2222.86	2209.78
X3D	June 9	161	36	22.93	2222.86	2209.79
X3D	June 16	168	36	22.66	2222.86	2209.52
X3D	June 30	182	36	22.10	2222.86	2208.96
X3D	July 13	195	37	22.72	2222.86	2208.58
X3D	July 28	210	37	22.33	2222.86	2208.19
X3D	Aug. 12	225	121	105.79	2222.86	2207.65
X3D	Sept. 13	257	40	23.10	2222.86	2205.96
X3D	Oct. 5	279	40	22.40	2222.86	2205.26
X3D	Dec. 9	344	40	22.78	2222.86	2205.64
X3D	Dec. 17	352	40	23.25	2222.86	2206.11
X3D	Dec. 28	363	41	23.97	2222.86	2205.83
X3D	Jan. 5	370	41	23.75	2222.86	2205.61
X3D	Jan. 13	378	41	23.65	2222.86	2205.51
X3D	Jan. 28	393	41	25.46	2222.86	2207.32
X3D	Feb. 10	406	40	26.01	2222.86	2208.87
X3D	Feb. 14	410	38	23.90	2222.86	2208.76
X3D	Feb. 23	419	39	23.48	2222.86	2207.34
X3D	Mar. 9	433	39	23.77	2222.86	2207.63
X3D	Apr. 26	482	36	24.09	2222.86	2210.95
X3D	June 1	518	37	24.47	2222.86	2210.33

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X4S	Sept. 2		35	21.03	2221.11	2207.14
X4S	Jan. 21	21	35	dry	2221.11	dry
X4S	Jan. 28	28	35	dry	2221.11	dry
X4S	Feb. 4	35	35	20.49	2221.11	2206.60
X4S	Feb. 11	42	35	20.56	2221.11	2206.67
X4S	Feb. 25	56	36	22.50	2221.11	2207.61
X4S	Mar. 3	63	36	22.51	2221.11	2207.62
X4S	Mar. 17	77	37	24.68	2221.11	2208.79
X4S	Mar.25	85	36	23.57	2221.11	2208.68
X4S	April 1	92	35	23.78	2221.11	2209.89
X4S	April 14	105	35	24.82	2221.11	2210.93
X4S	April 29	120	35	24.71	2221.11	2210.82
X4S	May 17	138	35	24.66	2221.11	2210.77
X4S	May 26	147	35	24.47	2221.11	2210.58
X4S	June 2	154	34	23.37	2221.11	2210.48
X4S	June 9	161	37	26.15	2221.11	2210.26
X4S	June 16	168	34	22.86	2221.11	2209.97
X4S	June 30	182	34	22.21	2221.11	2209.32
X4S	July 13	195	34	21.76	2221.11	2208.87
X4S	July 28	210	35	22.38	2221.11	2208.49
X4S	Aug. 12	225	121	107.83	2221.11	2207.94
X4S	Sept. 13	257	39	23.95	2221.11	2206.06
X4S	Oct. 5	279	39	23.27	2221.11	2205.38
X4S	Dec. 9	344	38	22.57	2221.11	2205.68
X4S	Dec. 17	352	38	23.17	2221.11	2206.28
X4S	Dec. 28	363	38	22.95	2221.11	2206.06
X4S	Jan. 5	370	39	23.62	2221.11	2205.73
X4S	Jan. 13	378	39	23.46	2221.11	2205.57
X4S	Jan. 28	393	39	25.34	2221.11	2207.45
X4S	Feb. 10	406	39	26.97	2221.11	2209.08
X4S	Feb. 14	410	35	23.03	2221.11	2209.14
X4S	Feb. 23	419	37	23.31	2221.11	2207.42
X4S	Mar. 9	433	37	23.82	2221.11	2207.93
X4S	Apr. 26	482	34	24.50	2221.11	2211.61
X4S	June 1	518	34	23.68	2221.11	2210.79

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X4D	Sept. 2		37	21.15	2221.41	2205.56
X4D	Jan. 21	21	40	24.61	2221.41	2206.02
X4D	Jan. 28	28	38	22.14	2221.41	2205.55
X4D	Feb. 4	35	38	22.34	2221.41	2205.75
X4D	Feb. 11	42	38	22.61	2221.41	2206.02
X4D	Feb. 25	56	38	24.31	2221.41	2207.72
X4D	Mar. 3	63	36	22.40	2221.41	2207.81
X4D	Mar. 17	77	36	23.53	2221.41	2208.94
X4D	Mar.25	85	36	23.40	2221.41	2208.81
X4D	April 1	92	35	23.44	2221.41	2209.85
X4D	April 14	105	35	24.82	2221.41	2211.23
X4D	April 29	120	35	24.73	2221.41	2211.14
X4D	May 17	138	35	24.65	2221.41	2211.06
X4D	May 26	147	35	24.34	2221.41	2210.75
X4D	June 2	154	34	23.31	2221.41	2210.72
X4D	June 9	161	35	23.88	2221.41	2210.29
X4D	June 16	168	34	22.57	2221.41	2209.98
X4D	June 30	182	34	21.96	2221.41	2209.37
X4D	July 13	195	35	22.53	2221.41	2208.94
X4D	July 28	210	36	23.07	2221.41	2208.48
X4D	Aug. 12	225	124	110.51	2221.41	2207.92
X4D	Sept. 13	257	39	23.67	2221.41	2206.08
X4D	Oct. 5	279	39	22.97	2221.41	2205.38
X4D	Dec. 9	344	39	23.25	2221.41	2205.66
X4D	Dec. 17	352	39	23.89	2221.41	2206.30
X4D	Dec. 28	363	39	23.67	2221.41	2206.08
X4D	Jan. 5	370	39	23.35	2221.41	2205.76
X4D	Jan. 13	378	39	23.18	2221.41	2205.59
X4D	Jan. 28	393	39	25.00	2221.41	2207.41
X4D	Feb. 10	406	39	27.28	2221.41	2209.69
X4D	Feb. 14	410	36	23.85	2221.41	2209.26
X4D	Feb. 23	419	38	24.01	2221.41	2207.42
X4D	Mar. 9	433	37	23.53	2221.41	2207.94
X4D	Apr. 26	482	34	24.21	2221.41	2211.62
X4D	June 1	518	34	23.38	2221.41	2210.79

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X6S	Sept. 2		34	dry	2222.23	dry
X6S	Jan. 21	21	34	dry	2222.23	dry
X6S	Jan. 28	28	34	dry	2222.23	dry
X6S	Feb. 4	35	34	dry	2222.23	dry
X6S	Feb. 11	42	34	dry	2222.23	dry
X6S	Feb. 25	56	34	dry	2222.23	dry
X6S	Mar. 3	63	34	dry	2222.23	dry
X6S	Mar. 25	85	34	dry	2222.23	dry
X6S	Apr. 1	92	34	dry	2222.23	dry
X6S	Apr. 14	105	34	23.11	2222.23	2211.34
X6S	Apr. 29	120	34	23.28	2222.23	2211.51
X6S	May 17	138	34	23.11	2222.23	2211.34
X6S	May 26	147	34	23.05	2222.23	2211.28
X6S	June 2	154	34	22.91	2222.23	2211.14
X6S	June 9	161	35	23.69	2222.23	2210.92
X6S	June 16	168	34	22.38	2222.23	2210.61
X6S	June 30	182	35	22.78	2222.23	2210.01
X6S	July 13	195	35	22.27	2222.23	2209.50
X6S	July 28	210	36	22.83	2222.23	2209.06
X6S	Aug. 12	225	36	dry	2222.23	dry
X6S	Sept. 13	257	36	dry	2222.23	dry
X6S	Oct. 5	279	36	dry	2222.23	dry

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X6D	Sept. 2		40	23.28	2222.15	2205.43
X6D	Jan. 21	21	40	23.84	2222.15	2205.99
X6D	Jan. 28	28	38	21.22	2222.15	2205.37
X6D	Feb. 4	35	38	21.52	2222.15	2205.67
X6D	Feb. 11	42	38	22.01	2222.15	2206.16
X6D	Feb. 25	56	37	22.26	2222.15	2207.41
X6D	Mar. 3	63	37	22.79	2222.15	2207.94
X6D	Mar. 17	77	35	21.75	2222.15	2208.90
X6D	Mar. 25	85	37	23.97	2222.15	2209.12
X6D	Apr. 1	92	35	23.32	2222.15	2210.47
X6D	Apr. 14	105	35	24.50	2222.15	2211.65
X6D	Apr. 29	120	35	24.01	2222.15	2211.16
X6D	May 17	138	35	24.27	2222.15	2211.42
X6D	May 26	147	34	22.99	2222.15	2211.14
X6D	June 2	154	34	22.79	2222.15	2210.94
X6D	June 9	161	35	23.52	2222.15	2210.67
X6D	June 16	168	34	22.25	2222.15	2210.40
X6D	June 30	182	35	22.56	2222.15	2209.71
X6D	July 13	195	35	22.21	2222.15	2209.36
X6D	July 28	210	37	23.66	2222.15	2208.81
X6D	Aug. 12	225	122	108.07	2222.15	2208.22
X6D	Sept. 13	257	40	23.96	2222.15	2206.11
X6D	Oct. 5	279	40	23.33	2222.15	2205.48

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X7S	Sept. 2		dry	dry	2220.98	dry
X7S	Jan. 21	21	dry	dry	2220.98	dry
X7S	Jan. 28	28	dry	dry	2220.98	dry
X7S	Feb. 4	35	dry	dry	2220.98	dry
X7S	Feb. 11	42	dry	dry	2220.98	dry
X7S	Feb. 25	56	dry	dry	2220.98	dry
X7S	Mar. 3	63	dry	dry	2220.98	dry
X7S	Mar. 17	77	34	21.77	2220.98	2208.75
X7S	Mar. 25	85	34	22.16	2220.98	2209.14
X7S	Apr. 1	92	34	23.54	2220.98	2210.52
X7S	Apr. 14	105	34	24.80	2220.98	2211.78
X7S	Apr. 29	120	34	24.29	2220.98	2211.27
X7S	May 17	138	34	24.45	2220.98	2211.43
X7S	May 26	147	33	23.20	2220.98	2211.18
X7S	June 2	154	33	22.94	2220.98	2210.92
X7S	June 9	161	33	22.75	2220.98	2210.73
X7S	June 16	168	33	22.41	2220.98	2210.39
X7S	June 30	182	34	22.74	2220.98	2209.72
X7S	July 13	195	35	23.40	2220.98	2209.38
X7S	July 28	210	35	22.87	2220.98	2208.85
X7S	Aug. 12	225	117.87	105.16	2220.98	2208.27
X7S	Sept. 13	257	dry		2220.98	dry
X7S	Oct. 5	279	dry	dry	2220.98	dry
X7S	Dec. 9	344	38	dry	2220.98	dry
X7S	Dec. 17	352	35	dry	2220.98	dry
X7S	Dec. 28	363	36	dry	2220.98	dry
X7S	Jan. 5	370	36	dry	2220.98	dry
X7S	Jan. 13	378	37	dry	2220.98	dry
X7S	Jan. 28	393	37	dry	2220.98	dry
X7S	Feb. 10	406	35	24.30	2220.98	2210.28
X7S	Feb. 14	410	35	23.52	2220.98	2209.50
X7S	Feb. 23	419	35	dry	2220.98	dry
X7S	Mar. 9	433	36	23.60	2220.98	2208.58
X7S	Apr. 26	482	33	24.18	2220.98	2212.16
X7S	June 1	518	33	23.29	2220.98	2211.27

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X7D	Sept. 2		40	24.91	2220.55	2205.46
X7D	Jan. 21	21	40	25.49	2220.55	2206.04
X7D	Jan. 28	28	38	22.79	2220.55	2205.34
X7D	Feb. 4	35	38	23.16	2220.55	2205.71
X7D	Feb. 11	42	38	23.63	2220.55	2206.18
X7D	Feb. 25	56	37	23.87	2220.55	2207.42
X7D	Mar. 3	63	36	23.58	2220.55	2208.13
X7D	Mar. 17	77	35	23.35	2220.55	2208.90
X7D	Mar. 25	85	35	22.77	2220.55	2208.32
X7D	Apr. 1	92	35	25.10	2220.55	2210.65
X7D	Apr. 14	105	35	26.33	2220.55	2211.88
X7D	Apr. 29	120	35	25.72	2220.55	2211.27
X7D	May 17	138	35	25.59	2220.55	2211.14
X7D	May 26	147	33	23.72	2220.55	2211.27
X7D	June 2	154	33	23.48	2220.55	2211.03
X7D	June 9	161	34	24.30	2220.55	2210.85
X7D	June 16	168	33	22.96	2220.55	2210.51
X7D	June 30	182	34	23.27	2220.55	2209.82
X7D	July 13	195	35	23.96	2220.55	2209.51
X7D	July 28	210	35	23.43	2220.55	2208.98
X7D	Aug. 12	225	121	108.79	2220.55	2208.34
X7D	Sept. 13	257	40	25.66	2220.55	2206.21
X7D	Oct. 5	279	40	25.01	2220.55	2205.56
X7D	Dec. 9	344	40	25.04	2220.55	2205.59
X7D	Dec. 17	352	39	25.16	2220.55	2206.71
X7D	Dec. 28	363	39	24.83	2220.55	2206.38
X7D	Jan. 5	370	39	24.45	2220.55	2206.00
X7D	Jan. 13	378	39	24.00	2220.55	2205.55
X7D	Jan. 28	393	39	25.68	2220.55	2207.23
X7D	Feb. 10	406	35	24.79	2220.55	2210.34
X7D	Feb. 14	410	35	23.95	2220.55	2209.50
X7D	Feb. 23	419	38	24.71	2220.55	2207.26
X7D	Mar. 9	433	36	24.09	2220.55	2208.64
X7D	Apr. 26	482	33	24.62	2220.55	2212.17
X7D	June 1	518	33	23.75	2220.55	2211.30

WELL	DATE	DAY#	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X8S	Sept. 2		dry	dry	2216.94	dry
X8S	Jan. 21	21	dry	dry	2216.94	dry
X8S	Jan. 28	28	dry	dry	2216.94	dry
X8S	Feb. 4	35	dry	dry	2216.94	dry
X8S	Feb. 11	42	dry	dry	2216.94	dry
X8S	Feb. 25	56	dry	dry	2216.94	dry
X8S	Mar. 3	63	dry	dry	2216.94	dry
X8S	Mar. 17	77	dry	dry	2216.94	dry
X8S	Mar. 25	85	29	21.49	2216.94	2209.43
X8S	Apr. 1	92	29	22.93	2216.94	2210.87
X8S	Apr. 14	105	29	24.40	2216.94	2212.34
X8S	Apr. 29	120	30	24.66	2216.94	2211.60
X8S	May 17	138	30	24.88	2216.94	2211.82
X8S	May 26	147	30	24.60	2216.94	2211.54
X8S	June 2	154	30	24.34	2216.94	2211.28
X8S	June 9	161	30	24.13	2216.94	2211.07
X8S	June 16	168	30	23.79	2216.94	2210.73
X8S	June 30	182	30	23.05	2216.94	2209.99
X8S	July 13	195	30	22.74	2216.94	2209.68
X8S	July 28	210	dry		2216.94	dry
X8S	Aug. 12	225	dry		2216.94	dry
X8S	Sept. 13	257	dry		2216.94	dry
X8S	Oct. 5	279	dry		2216.94	dry
X8S	Dec. 9	344	dry	dry	2216.94	dry
X8S	Dec. 17	352	30	dry	2216.94	dry
X8S	Dec. 28	363	30	dry	2216.94	dry
X8S	Jan. 5	370	30	dry	2216.94	dry
X8S	Jan. 13	378	30	dry	2216.94	dry
X8S	Jan. 28	393	30	dry	2216.94	dry
X8S	Feb. 10	406	30	23.67	2216.94	2210.61
X8S	Feb. 14	410	31	23.71	2216.94	2209.65
X8S	Feb. 23	419	31	dry	2216.94	dry
X8S	Mar. 9	433	31	23.01	2216.94	2208.95
X8S	Apr. 26	481	30	25.61	2216.94	2212.55
X8S	June 1	518	30	24.68	2216.94	2211.62

WELL	DATE	DAY#	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X8D	Sept. 2		38	28.45	2215.17	2205.62
X8D	Jan. 21	21	35	25.99	2215.17	2206.16
X8D	Jan. 28	28	35	25.35	2215.17	2205.52
X8D	Feb. 4	35	33	23.67	2215.17	2205.84
X8D	Feb. 11	42	33	24.32	2215.17	2206.49
X8D	Feb. 25	56	31	23.31	2215.17	2207.48
X8D	Mar. 3	63	30	23.32	2215.17	2208.49
X8D	Mar. 17	77	31	24.96	2215.17	2209.13
X8D	Mar. 25	85	30	24.49	2215.17	2209.66
X8D	Apr. 1	92	29	24.96	2215.17	2211.13
X8D	Apr. 14	105	30	27.37	2215.17	2212.54
X8D	Apr. 29	120	30	25.55	2215.17	2210.72
X8D	May 17	138	30	26.81	2215.17	2211.98
X8D	May 26	147	30	26.57	2215.17	2211.74
X8D	June 2	154	30	26.28	2215.17	2211.45
X8D	June 9	161	30	26.09	2215.17	2211.26
X8D	June 16	168	30	25.76	2215.17	2210.93
X8D	June 30	182	30	25.01	2215.17	2210.18
X8D	July 13	195	30	24.69	2215.17	2209.86
X8D	July 28	210	30	24.05	2215.17	2209.22
X8D	Aug. 12	225	118	111.14	2215.17	2208.31
X8D	Sept. 13	257	32	23.15	2215.17	2206.32
X8D	Oct. 5	279	32	22.52	2215.17	2205.69
X8D	Dec. 9	344	32	22.56	2215.17	2205.73
X8D	Dec. 17	352	32	23.78	2215.17	2206.95
X8D	Dec. 28	363	32	23.36	2215.17	2206.53
X8D	Jan. 5	370	32	23.05	2215.17	2206.22
X8D	Jan. 13	378	33	23.48	2215.17	2205.65
X8D	Jan. 28	393	33	25.10	2215.17	2207.27
X8D	Feb. 10	406	30	25.54	2215.17	2210.71
X8D	Feb. 14	410	30	24.56	2215.17	2209.73
X8D	Feb. 23	419	31	23.18	2215.17	2207.35
X8D	Mar. 9	433	30	23.86	2215.17	2209.03
X8D	Apr. 26	482	27	24.44	2215.17	2212.61
X8D	June 1	518	27	23.53	2215.17	2211.70

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X9S	Sept. 2		dry	dry	2216.93	dry
X9S	Jan. 21	21	dry	dry	2216.93	dry
X9S	Jan. 28	28	dry	dry	2216.93	dry
X9S	Feb. 4	35	dry	dry	2216.93	dry
X9S	Feb. 11	42	31	20.73	2216.93	2206.66
X9S	Feb. 25	56	31	21.44	2216.93	2207.37
X9S	Mar. 3	63	30	22.13	2216.93	2209.06
X9S	Mar. 17	77	30	22.24	2216.93	2209.17
X9S	Mar. 25	85	30	23.03	2216.93	2209.96
X9S	Apr. 1	92	30	24.75	2216.93	2211.68
X9S	Apr. 14	105	30	26.31	2216.93	2213.24
X9S	Apr. 29	120	30	25.46	2216.93	2212.39
X9S	May 17	138	30	25.79	2216.93	2212.72
X9S	May 26	147	30	25.46	2216.93	2212.39
X9S	June 2	154	30	25.14	2216.93	2212.07
X9S	June 9	161	28	22.92	2216.93	2211.85
X9S	June 16	168	30	24.56	2216.93	2211.49
X9S	June 30	182	30	23.62	2216.93	2210.55
X9S	July 13	195	30	23.44	2216.93	2210.37
X9S	July 28	210	30	22.66	2216.93	2209.59
X9S	Aug. 12	225	114	105.87	2216.93	2208.80
X9S	Sept. 13	257	33	22.39	2216.93	2206.32
X9S	Oct. 5	279	dry	dry	2216.93	dry
X9S	Dec. 9	344	33	dry	2216.93	dry
X9S	Dec. 17	352	33	23.14	2216.93	2207.07
X9S	Dec. 28	363	33	22.73	2216.93	2206.66
X9S	Jan. 5	370	33	n.m.	2216.93	n.m.
X9S	Jan. 13	378	33	n.m.	2216.93	n.m.
X9S	Jan. 28	393	33	23.34	2216.93	2207.27
X9S	Feb. 10	406	30	24.24	2216.93	2211.17
X9S	Feb. 14	410	30	23.10	2216.93	2210.03
X9S	Feb. 23	419	33	23.55	2216.93	2207.48
X9S	Mar. 9	433	31	23.73	2216.93	2209.66
X9S	Apr. 26	482	28	24.31	2216.93	2213.24
X9S	June 1	518	28	23.56	2216.93	2212.49

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
X9D	Sept. 2		36	24.71	2216.91	2205.62
X9D	Jan. 21	21	36	24.66	2216.91	2205.57
X9D	Jan. 28	28	35	23.65	2216.91	2205.56
X9D	Feb. 4	35	35	24.32	2216.91	2206.23
X9D	Feb. 11	42	35	24.59	2216.91	2206.50
X9D	Feb. 25	56	33	23.65	2216.91	2207.56
X9D	Mar. 3	63	32	24.12	2216.91	2209.03
X9D	Mar. 17	77	30	22.45	2216.91	2209.36
X9D	Mar. 25	85	30	23.16	2216.91	2210.07
X9D	Apr. 1	92	30	24.85	2216.91	2211.76
X9D	Apr. 14	105	30	26.12	2216.91	2213.03
X9D	Apr. 29	120	30	25.41	2216.91	2212.32
X9D	May 17	138	30	25.80	2216.91	2212.71
X9D	May 26	147	30	25.56	2216.91	2212.47
X9D	June 2	154	30	25.24	2216.91	2212.15
X9S	June 9	161	30	25.02	2216.91	2211.93
X9D	June 16	168	30	24.65	2216.91	2211.56
X9D	June 30	182	30	23.75	2216.91	2210.66
X9D	July 13	195	30	23.39	2216.91	2210.30
X9D	July 28	210	30	22.74	2216.91	2209.65
X9D	Aug. 12	225	114	105.94	2216.91	2208.85
X9D	Sept. 13	257	35	24.51	2216.91	2206.42
X9D	Oct. 5	279	35	23.84	2216.91	2205.75
X9D	Dec. 9	344	35	23.92	2216.91	2205.83
X9D	Dec. 17	352	35	25.25	2216.91	2207.16
X9D	Dec. 28	363	35	24.81	2216.91	2206.72
X9D	Jan. 5	370	35	24.49	2216.91	2206.40
X9D	Jan. 13	378	35	23.83	2216.91	2205.74
X9D	Jan. 28	393	34	24.45	2216.91	2207.36
X9D	Feb. 10	406	30	24.20	2216.91	2211.11
X9D	Feb. 14	410	30	23.23	2216.91	2210.14
X9D	Feb. 23	419	33	23.62	2216.91	2207.53
X9D	Mar. 9	433	31	23.67	2216.91	2209.58
X9D	Apr. 26	482	28	24.38	2216.91	2213.29
X9D	June 1	518	28	23.57	2216.91	2212.48

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Y2S	Sept. 2		32	23.30	2209.02	2200.32
Y2S	Jan. 28	28	32	22.34	2209.02	2199.36
Y2S	Feb. 4	35	32	22.42	2209.02	2199.44
Y2S	Feb. 11	42	32	22.83	2209.02	2199.85
Y2S	Feb. 25	56	32	23.26	2209.02	2200.28
Y2S	Mar. 3	63	32	23.26	2209.02	2200.28
Y2S	Mar. 17	77	30	21.73	2209.02	2200.75
Y2S	Mar. 25	85	32	23.75	2209.02	2200.77
Y2S	April 1	92	31	23.32	2209.02	2201.34
Y2S	April 14	105	31	23.91	2209.02	2201.93
Y2S	April 29	120	31	23.65	2209.02	2201.67
Y2S	May 17	138	31	23.73	2209.02	2201.75
Y2S	May 26	147	31	23.54	2209.02	2201.56
Y2S	June 2	154	31	23.50	2209.02	2201.52
Y2S	June 9	161	30	22.33	2209.02	2201.35
Y2S	June 16	168	31	23.05	2209.02	2201.07
Y2S	June 30	182	31	22.72	2209.02	2200.74
Y2S	July 13	195	31	22.57	2209.02	2200.59
Y2S	July 28	210	32	23.23	2209.02	2200.25
Y2S	Aug. 12	225	116	107.02	2209.02	2200.04
Y2S	Sept. 13	257	34	24.29	2209.02	2199.31
Y2S	Oct. 5	279	34	23.96	2209.02	2198.98
Y2S	Dec. 9	344	34	24.39	2209.02	2199.41
Y2S	Dec. 17	352	34	24.70	2209.02	2199.72
Y2S	Dec. 28	363	34	24.52	2209.02	2199.54
Y2S	Jan. 5	370	34	24.40	2209.02	2199.42
Y2S	Jan. 13	378	34	24.31	2209.02	2199.33
Y2S	Jan. 27	393	34	25.22	2209.02	2200.24
Y2S	Feb. 10	406	33	24.70	2209.02	2200.72
Y2S	Feb. 14	410	32	23.61	2209.02	2200.63
Y2S	Feb. 23	419	32	23.16	2209.02	2200.18
Y2S	Mar. 9	433	33	24.55	2209.02	2200.57
Y2S	Apr. 26	482	31	24.41	2209.02	2202.43
Y2S	June 1	518	31	23.96	2209.02	2201.98

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Y2D	Sept. 2		34	24.01	2209.34	2199.35
Y2D	Jan. 28	28	35	25.02	2209.34	2199.36
Y2D	Feb. 4	35	35	25.10	2209.34	2199.44
Y2D	Feb. 11	42	33	23.50	2209.34	2199.84
Y2D	Feb. 25	56	33	24.20	2209.34	2200.54
Y2D	Mar. 3	63	32	23.11	2209.34	2200.45
Y2D	Mar. 17	77	32	23.70	2209.34	2201.04
Y2D	Mar. 25	85	32	23.61	2209.34	2200.95
Y2D	April 1	92	31	23.25	2209.34	2201.59
Y2D	April 14	105	31	23.70	2209.34	2202.04
Y2D	April 29	120	31	23.96	2209.34	2202.30
Y2D	May 17	138	31	23.50	2209.34	2201.84
Y2D	May 26	147	31	23.33	2209.34	2201.67
Y2D	June 2	154	31	23.35	2209.34	2201.69
Y2D	June 9	161	32	24.19	2209.34	2201.53
Y2D	June 16	168	31	22.92	2209.34	2201.26
Y2D	June 30	182	31	22.56	2209.34	2200.90
Y2D	July 13	195	31	22.38	2209.34	2200.72
Y2D	July 28	210	32	23.04	2209.34	2200.38
Y2D	Aug. 12	225	116	106.77	2209.34	2200.11
Y2D	Sept. 13	257	34	24.06	2209.34	2199.40
Y2D	Oct. 5	279	34	23.74	2209.34	2199.08
Y2D	Dec. 9	344	34	24.18	2209.34	2199.52
Y2D	Dec. 17	352	34	24.50	2209.34	2199.84
Y2D	Dec. 28	363	34	24.31	2209.34	2199.65
Y2D	Jan. 5	370	34	24.17	2209.34	2199.51
Y2D	Jan. 13	378	34	24.09	2209.34	2199.43
Y2D	Jan. 27	393	34	24.98	2209.34	2200.32
Y2D	Feb. 10	406	33	24.45	2209.34	2200.79
Y2D	Feb. 14	410	32	23.33	2209.34	2200.67
Y2D	Feb. 23	419	33	23.89	2209.34	2200.23
Y2D	Mar. 9	433	32	23.30	2209.34	2200.64
Y2D	Apr. 26	482	31	24.17	2209.34	2202.51
Y2D	June 1	518	31	23.68	2209.34	2202.02

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Y3S	Sept, 2		29	21.11	2207.78	2199.89
Y3S	Jan. 28	28	30	21.59	2207.78	2199.37
Y3S	Feb. 4	35	30	21.56	2207.78	2199.34
Y3S	Feb. 11	42	31	22.89	2207.78	2199.67
Y3S	Feb. 25	56	31	23.54	2207.78	2200.32
Y3S	Mar. 3	63	31	23.56	2207.78	2200.34
Y3S	Mar. 17	77	30	22.99	2207.78	2200.77
Y3S	Mar. 25	85	32	25.05	2207.78	2200.83
Y3S	April 1	92	30	23.64	2207.78	2201.42
Y3S	April 14	105	30	24.23	2207.78	2202.01
Y3S	April 29	120	30	24.01	2207.78	2201.79
Y3S	May 17	138	30	24.02	2207.78	2201.80
Y3S	May 26	147	30	23.84	2207.78	2201.62
Y3S	June 2	154	30	23.81	2207.78	2201.59
Y3S	June 9	161	30	23.65	2207.78	2201.43
Y3S	June 16	168	30	23.34	2207.78	2201.12
Y3S	June 30	182	30	23.01	2207.78	2200.79
Y3S	July 13	195	30	22.88	2207.78	2200.66
Y3S	July 28	210	31	23.55	2207.78	2200.33
Y3S	Aug. 12	225	116	108.29	2207.78	2200.07
Y3S	Sept. 13	257	32	23.60	2207.78	2199.38
Y3S	Oct. 5	279	32	23.25	2207.78	2199.03
Y3S	Dec. 9	344	32	23.69	2207.78	2199.47
Y3S	Dec. 17	352	32	24.04	2207.78	2199.82
Y3S	Dec. 28	363	32	23.86	2207.78	2199.64
Y3S	Jan. 5	370	32	23.69	2207.78	2199.47
Y3S	Jan. 13	378	32	23.58	2207.78	2199.36
Y3S	Jan. 27	393	32	24.51	2207.78	2200.29
Y3S	Feb. 10	406	32	24.90	2207.78	2200.68
Y3S	Feb. 14	410	31	23.78	2207.78	2200.56
Y3S	Feb. 23	419	31	23.34	2207.78	2200.12
Y3S	Mar. 9	433	32	24.75	2207.78	2200.53
Y3S	Apr. 26	482	30	24.67	2207.78	2202.45
Y3S	June 1	518	31	25.15	2207.78	2201.93

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Y3D	Sept, 2		34	24.70	2208.48	2199.18
Y3D	Jan. 28	28	33	23.63	2208.48	2199.11
Y3D	Feb. 4	35	33	23.73	2208.48	2199.21
Y3D	Feb. 11	42	32	23.22	2208.48	2199.70
Y3D	Feb. 25	56	31	22.82	2208.48	2200.30
Y3D	Mar. 3	63	31	22.89	2208.48	2200.37
Y3D	Mar. 17	77	30	22.28	2208.48	2200.76
Y3D	Mar. 25	85	32	24.32	2208.48	2200.80
Y3D	April 1	92	30	22.93	2208.48	2201.41
Y3D	April 14	105	30	23.51	2208.48	2201.99
Y3D	April 29	120	30	23.24	2208.48	2201.72
Y3D	May 17	138	30	23.35	2208.48	2201.83
Y3D	May 26	147	30	23.15	2208.48	2201.63
Y3D	June 2	154	30	23.13	2208.48	2201.61
Y3D	June 9	161	30	22.97	2208.48	2201.45
Y3D	June 16	168	30	22.68	2208.48	2201.16
Y3D	June 30	182	30	22.37	2208.48	2200.85
Y3D	July 13	195	30	22.20	2208.48	2200.68
Y3D	July 28	210	31	22.89	2208.48	2200.37
Y3D	Aug. 12	225	116	107.62	2208.48	2200.10
Y3D	Sept. 13	257	32	23.71	2208.48	2200.19
Y3D	Oct. 5	279	32	22.62	2208.48	2199.10
Y3D	Dec. 9	344	32	23.01	2208.48	2199.49
Y3D	Dec. 17	352	32	23.39	2208.48	2199.87
Y3D	Dec. 28	363	32	23.19	2208.48	2199.67
Y3D	Jan. 5	370	32	22.96	2208.48	2199.44
Y3D	Jan. 13	378	32	22.92	2208.48	2199.40
Y3D	Jan. 27	393	32	23.84	2208.48	2200.32
Y3D	Feb. 10	406	32	24.23	2208.48	2200.71
Y3D	Feb. 14	410	31	23.03	2208.48	2200.51
Y3D	Feb. 23	419	32	23.66	2208.48	2200.14
Y3D	Mar. 9	433	32	24.08	2208.48	2200.56
Y3D	Apr. 26	482	30	23.93	2208.48	2202.41
Y3D	June 1	518	31	24.48	2208.48	2201.96

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Y6S	Sept. 2		32	22.49	2207.95	2198.44
Y6S	Jan.28	28	32	23.49	2207.95	2199.44
Y6S	Feb. 4	35	30	21.67	2207.95	2199.62
Y6S	Feb. 11	42	30	21.90	2207.95	2199.85
Y6S	Feb. 25	56	30	22.58	2207.95	2200.53
Y6S	Mar. 3	63	30	22.70	2207.95	2200.65
Y6S	Mar.17	77	30	23.06	2207.95	2201.01
Y6S	Mar. 25	85	31	24.16	2207.95	2201.11
Y6S	April 1	92	30	23.76	2207.95	2201.71
Y6S	April 14	105	30	24.34	2207.95	2202.29
Y6S	April 29	120	29	23.05	2207.95	2202.00
Y6S	May 17	138	29	23.24	2207.95	2202.19
Y6S	May 26	147	29	22.92	2207.95	2201.87
Y6S	June 2	154	30	23.84	2207.95	2201.79
Y6S	June 9	161	30	23.68	2207.95	2201.63
Y6S	June 16	168	30	23.38	2207.95	2201.33
Y6S	June 30	182	30	23.08	2207.95	2201.03
Y6S	July 13	195	30	22.92	2207.95	2200.87
Y6S	July 28	210	31	23.58	2207.95	2200.53
Y6S	Aug. 12	225	116	108.41	2207.95	2200.36
Y6S	Sept. 13	257	32	23.71	2207.95	2199.66
Y6S	Oct. 5	279	32	23.40	2207.95	2199.35
Y6S	Dec. 9	344	32	23.67	2207.95	2199.62
Y6S	Dec. 17	352	32	24.07	2207.95	2200.02
Y6S	Dec. 28	363	32	23.94	2207.95	2199.89
Y6S	Jan. 5	370	32	23.76	2207.95	2199.71
Y6S	Jan. 13	378	32	23.65	2207.95	2199.60
Y6S	Jan. 27	393	32	23.44	2207.95	2199.39
Y6S	Feb. 10	406	32	24.94	2207.95	2200.89
Y6S	Feb. 14	410	31	23.76	2207.95	2200.71
Y6S	Feb. 23	419	31	23.31	2207.95	2200.26
Y6S	Mar. 9	433	31	23.73	2207.95	2200.68
Y6S	Apr. 26	482	30	24.61	2207.95	2202.56
Y6S	June 1	518	30	24.07	2207.95	2202.02

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Y6M	Sept. 2		30	23.55	2205.88	2199.43
Y6M	Jan.28	28	30	23.45	2205.88	2199.33
Y6M	Feb. 4	35	30	23.56	2205.88	2199.44
Y6M	Feb. 11	42	30	23.98	2205.88	2199.86
Y6M	Feb. 25	56	30	24.48	2205.88	2200.36
Y6M	Mar. 3	63	30	24.60	2205.88	2200.48
Y6M	Mar.17	77	30	24.92	2205.88	2200.80
Y6M	Mar. 25	85	30	25.07	2205.88	2200.95
Y6M	April 1	92	29	24.65	2205.88	2201.53
Y6M	April 14	105	29	25.25	2205.88	2202.13
Y6M	April 29	120	30	25.90	2205.88	2201.78
Y6M	May 17	138	30	26.05	2205.88	2201.93
Y6M	May 26	147	29	24.82	2205.88	2201.70
Y6M	June 2	154	30	25.84	2205.88	2201.72
Y6M	June 9	161	30	25.55	2205.88	2201.43
Y6M	June 16	168	30	25.28	2205.88	2201.16
Y6M	June 30	182	30	24.97	2205.88	2200.85
Y6M	July 13	195	30	24.89	2205.88	2200.77
Y6M	July 28	210	31	25.54	2205.88	2200.42
Y6M	Aug. 12	225	118	112.34	2205.88	2200.22
Y6M	Sept. 13	257	32	25.65	2205.88	2199.53
Y6M	Oct. 5	279	32	25.40	2205.88	2199.28
Y6M	Dec. 9	344	30	23.78	2205.88	2199.66
Y6M	Dec. 17	352	30	24.10	2205.88	2199.98
Y6M	Dec. 28	363	30	23.91	2205.88	2199.79
Y6M	Jan. 5	370	30	23.73	2205.88	2199.61
Y6M	Jan. 13	378	30	23.56	2205.88	2199.44
Y6M	Jan. 27	393	30	24.43	2205.88	2200.31
Y6M	Feb. 10	406	30	24.92	2205.88	2200.80
Y6M	Feb. 14	410	30	24.73	2205.88	2200.61
Y6M	Feb. 23	419	30	24.34	2205.88	2200.22
Y6M	Mar. 9	433	29	23.76	2205.88	2200.64
Y6M	Apr. 26	482	30	24.28	2205.88	2200.16
Y6M	June 1	518	30	26.06	2205.88	2201.94

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Y6D	Sept. 2		29	24.06	2204.80	2199.86
Y6D	Jan.28	28	30	24.66	2204.80	2199.46
Y6D	Feb. 4	35	30	24.71	2204.80	2199.51
Y6D	Feb. 11	42	30	24.70	2204.80	2199.50
Y6D	Feb. 25	56	30	25.76	2204.80	2200.56
Y6D	Mar. 3	63	30	25.55	2204.80	2200.35
Y6D	Mar.17	77	29	24.97	2204.80	2200.77
Y6D	Mar. 25	85	30	26.02	2204.80	2200.82
Y6D	April 1	92	28	23.88	2204.80	2200.68
Y6D	April 14	105	28	24.23	2204.80	2201.03
Y6D	April 29	120	29	25.21	2204.80	2201.01
Y6D	May 17	138	29	24.79	2204.80	2200.59
Y6D	May 26	147	30	22.36	2204.80	2197.16
Y6D	June 2	154	31	22.80	2204.80	2196.60
Y6D	June 9	161	31	21.92	2204.80	2195.72
Y6D	June 16	168	31	21.89	2204.80	2195.69
Y6D	June 30	182	31	22.05	2204.80	2195.85
Y6D	July 13	195	32	23.44	2204.80	2196.24
Y6D	July 28	210	32	24.28	2204.80	2197.08
Y6D	Aug. 12	225	116	108.81	2204.80	2197.61
Y6D	Sept. 13	257	31	24.42	2204.80	2198.22
Y6D	Oct. 5	279	31	24.49	2204.80	2198.29
Y6D	Dec. 9	344	32	23.80	2204.80	2196.60
Y6D	Dec. 17	352	32	24.03	2204.80	2196.83
Y6D	Dec. 28	363	33	23.27	2204.80	2195.07
Y6D	Jan. 5	370	34	23.42	2204.80	2194.22
Y6D	Jan. 13	378	34	24.04	2204.80	2194.84
Y6D	Jan. 27	393	33	23.93	2204.80	2195.73
Y6D	Feb. 10	406	33	24.60	2204.80	2196.40
Y6D	Feb. 14	410	33	23.84	2204.80	2195.64
Y6D	Feb. 23	419	32	24.14	2204.80	2196.94
Y6D	Mar. 9	433	33	25.56	2204.80	2197.36
Y6D	Apr. 26	482	30	24.28	2204.80	2199.08
Y6D	June 1	518	30	25.30	2204.80	2200.10

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Y7S	Sept. 2		29	22.49	2206.37	2199.86
Y7S	Jan. 28	28	29	22.45	2206.37	2199.82
Y7S	Feb. 4	35	29	22.48	2206.37	2199.85
Y7S	Feb. 11	42	29	22.87	2206.37	2200.24
Y7S	Feb. 25	56	28	22.37	2206.37	2200.74
Y7S	Mar. 3	63	29	23.56	2206.37	2200.93
Y7S	Mar. 17	77	27	22.08	2206.37	2201.45
Y7S	Mar. 25	85	28	23.06	2206.37	2201.43
Y7S	April 1	92	28	23.43	2206.37	2201.80
Y7S	April 14	105	28	24.16	2206.37	2202.53
Y7S	April 29	120	29	24.68	2206.37	2202.05
Y7S	May 17	138	29	24.95	2206.37	2202.32
Y7S	May 26	147	29	24.65	2206.37	2202.02
Y7S	June 2	154	30	25.52	2206.37	2201.89
Y7S	June 9	161	28	23.36	2206.37	2201.73
Y7S	June 16	168	30	25.09	2206.37	2201.46
Y7S	June 30	182	30	24.81	2206.37	2201.18
Y7S	July 13	195	30	24.73	2206.37	2201.10
Y7S	July 28	210	30	24.34	2206.37	2200.71
Y7S	Aug. 12	225	115	109.16	2206.37	2200.53
Y7S	Sept. 13	257	30	23.48	2206.37	2199.85
Y7S	Oct. 5	279	30	23.16	2206.37	2199.53
Y7S	Dec. 9	344	30	23.50	2206.37	2199.87
Y7S	Dec. 17	352	30	23.85	2206.37	2200.22
Y7S	Dec. 28	363	30	23.71	2206.37	2200.08
Y7S	Jan. 5	370	30	23.62	2206.37	2199.99
Y7S	Jan. 13	378	30	23.42	2206.37	2199.79
Y7S	Jan. 27	393	30	24.21	2206.37	2200.58
Y7S	Feb. 10	406	30	24.82	2206.37	2201.19
Y7S	Feb. 14	410	30	24.58	2206.37	2200.95
Y7S	Feb. 23	419	30	24.21	2206.37	2200.58
Y7S	Mar. 9	433	30	24.63	2206.37	2201.00
Y7S	Apr. 26	482	29	25.40	2206.37	2202.77
Y7S	June 1	518	29	24.88	2206.37	2202.25

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Y7D	Sept. 2		30	25.03	2204.94	2199.97
Y7D	Jan. 28	28	29	23.86	2204.94	2199.80
Y7D	Feb. 4	35	28	23.00	2204.94	2199.94
Y7D	Feb. 11	42	27	22.20	2204.94	2200.14
Y7D	Feb. 25	56	27	22.91	2204.94	2200.85
Y7D	Mar. 3	63	27	23.00	2204.94	2200.94
Y7D	Mar. 17	77	27	23.43	2204.94	2201.37
Y7D	Mar. 25	85	26	23.49	2204.94	2202.43
Y7D	April 1	92	26	23.13	2204.94	2202.07
Y7D	April 14	105	26	23.68	2204.94	2202.62
Y7D	April 29	120	29	26.48	2204.94	2202.42
Y7D	May 17	138	29	26.57	2204.94	2202.51
Y7D	May 26	147	29	26.19	2204.94	2202.13
Y7D	June 2	154	30	27.01	2204.94	2201.95
Y7D	June 9	161	29	25.89	2204.94	2201.83
Y7D	June 16	168	30	26.66	2204.94	2201.60
Y7D	June 30	182	30	26.35	2204.94	2201.29
Y7D	July 13	195	30	26.26	2204.94	2201.20
Y7D	July 28	210	30	25.87	2204.94	2200.81
Y7D	Aug. 12	225	110	105.69	2204.94	2200.63
Y7D	Sept. 13	257	30	24.99	2204.94	2199.93
Y7D	Oct. 5	279	30	24.66	2204.94	2199.60
Y7D	Dec. 9	344	30	24.00	2204.94	2198.94
Y7D	Dec.17	352	30	24.34	2204.94	2199.28
Y7D	Dec. 28	363	30	24.18	2204.94	2199.12
Y7D	Jan. 5	370	30	24.03	2204.94	2198.97
Y7D	Jan. 13	378	30	24.88	2204.94	2199.82
Y7D	Jan. 27	393	30	25.67	2204.94	2200.61
Y7D	Feb. 10	406	30	26.29	2204.94	2201.23
Y7D	Feb. 14	410	30	26.05	2204.94	2200.99
Y7D	Feb. 23	419	30	25.68	2204.94	2200.62
Y7D	Mar. 9	433	30	26.11	2204.94	2201.05
Y7D	Apr. 26	482	27	24.90	2204.94	2202.84
Y7D	June 1	518	27	24.39	2204.94	2202.33

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Y8	Sept. 2		32	22.97	2206.20	2197.17
Y8	Jan. 28	28	32	25.54	2206.20	2199.74
Y8	Feb. 4	35	30	23.65	2206.20	2199.85
Y8	Feb. 11	42	30	23.93	2206.20	2200.13
Y8	Feb. 25	56	28	22.41	2206.20	2200.61
Y8	Mar. 3	63	28	22.63	2206.20	2200.83
Y8	Mar. 17	77	28	22.83	2206.20	2201.03
Y8	Mar. 25	85	26	21.00	2206.20	2201.20
Y8	April 1	92	27	22.42	2206.20	2201.62
Y8	April 14	105	27	23.20	2206.20	2202.40

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Y9S	Sept. 2		dry	dry	2204.88	dry
Y9S	Jan. 28	28	dry	dry	2204.88	dry
Y9S	Feb. 4	35	dry	dry	2204.88	dry
Y9S	Feb. 11	42	dry	dry	2204.88	dry
Y9S	Feb. 25	56	dry	dry	2204.88	dry
Y9S	Mar. 3	63	dry	dry	2204.88	dry
Y9S	Mar. 17	77	25	20.96	2204.88	2200.84
Y9S	Mar. 25	85	25	21.21	2204.88	2201.09
Y9S	April 1	92	25	21.59	2204.88	2201.47
Y9S	April 14	105	25	22.43	2204.88	2202.31
Y9S	April 29	120	25	21.79	2204.88	2201.67
Y9S	May 17	138	25	22.14	2204.88	2202.02
Y9S	May 26	147	25	21.85	2204.88	2201.73
Y9S	June 2	154	26	22.63	2204.88	2201.51
Y9S	June 9	161	26	22.51	2204.88	2201.39
Y9S	June 16	168	26	22.20	2204.88	2201.08
Y9S	June 30	182	26	21.97	2204.88	2200.85
Y9S	July 13	195	26	22.00	2204.88	2200.88
Y9S	July 28	210	26	21.53	2204.88	2200.41
Y9S	Aug. 12	225	26	dry	2204.88	dry
Y9S	Sept. 13	257	26	dry	2204.88	dry
Y9S	Oct. 5	279	26	dry	2204.88	dry
Y9S	Dec. 9	344	26	dry	2204.88	dry
Y9S	Dec. 17	352	26	dry	2204.88	dry
Y9S	Dec. 28	363	26	dry	2204.88	dry
Y9S	Jan. 5	370	26	dry	2204.88	dry
Y9S	Jan. 13	378	26	dry	2204.88	dry
Y9S	Jan. 27	392	26	n.m.	2204.88	nm
Y9S	Feb. 9	405	27	22.91	2204.88	2200.79
Y9S	Feb. 14	410	27	n.m.	2204.88	n.m.
Y9S	Feb. 23	419	27	n.m.	2204.88	n.m.
Y9S	Mar. 9	433	27	22.90	2204.88	2200.78
Y9S	Apr. 26	482	26	23.46	2204.88	2202.34
Y9S	June 1	518	27	23.96	2204.88	2201.84

WELL	DATE	DAY #	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Y9D	Sept. 2		30	23.52	2206.02	2199.54
Y9D	Jan. 28	28	29	22.42	2206.02	2199.44
Y9D	Feb. 4	35	29	22.50	2206.02	2199.52
Y9D	Feb. 11	42	29	22.77	2206.02	2199.79
Y9D	Feb. 25	56	29	23.16	2206.02	2200.18
Y9D	Mar. 3	63	28	22.44	2206.02	2200.46
Y9D	Mar. 17	77	28	22.74	2206.02	2200.76
Y9D	Mar. 25	85	28	22.73	2206.02	2200.75
Y9D	April 1	92	28	23.15	2206.02	2201.17
Y9D	April 14	105	28	23.70	2206.02	2201.72
Y9D	April 29	120	30	25.74	2206.02	2201.76
Y9D	May 17	138	30	25.42	2206.02	2201.44
Y9D	May 26	147	30	25.29	2206.02	2201.31
Y9D	June 2	154	30	24.98	2206.02	2201.00
Y9D	June 9	161	28	23.09	2206.02	2201.11
Y9D	June 16	168	30	25.00	2206.02	2201.02
Y9D	June 30	182	30	24.66	2206.02	2200.68
Y9D	July 13	195	30	24.42	2206.02	2200.44
Y9D	July 28	210	30	24.19	2206.02	2200.21
Y9D	Aug. 12	225	116	110.02	2206.02	2200.04
Y9D	Sept. 13	257	30	23.51	2206.02	2199.53
Y9D	Oct. 5	279	30	23.27	2206.02	2199.29
Y9D	Dec. 9	344	30	23.52	2206.02	2199.54
Y9D	Dec. 17	352	30	23.86	2206.02	2199.88
Y9D	Dec. 28	363	30	23.65	2206.02	2199.67
Y9D	Jan. 5	370	30	23.51	2206.02	2199.53
Y9D	Jan. 13	378	30	23.45	2206.02	2199.47
Y9D	Jan. 27	392	30	24.08	2206.02	2200.10
Y9D	Feb. 9	405	30	24.53	2206.02	2200.55
Y9D	Feb. 14	410	30	24.26	2206.02	2200.28
Y9D	Feb. 23	419	30	23.92	2206.02	2199.94
Y9D	Mar. 9	433	30	24.17	2206.02	2200.19
Y9D	Apr. 26	482	28	24.35	2206.02	2202.37
Y9D	June 1	518	30	25.61	2206.02	2201.63

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 1C	261	Sept. 17	28	dry	2205.60	dry
BLM 1C	279	Oct. 5	28	dry	2205.60	dry
BLM 1C	344	Dec. 9	28	n.m.	2205.60	dry
BLM 1C	351	Dec. 16	30	n.m.	2205.60	dry
BLM 1C	356	Dec. 21	30	n.m.	2205.60	dry
BLM 1C	363	Dec. 28	31	22.86	2205.60	2197.46
BLM 1C	370	Jan. 5	31	22.93	2205.60	2197.53
BLM 1C	378	Jan. 13	31	22.85	2205.60	2197.45
BLM 1C	383	Jan. 18	31	23.47	2205.60	2198.07
BLM 1C	392	Jan. 27	31	23.40	2205.60	2198.00
BLM 1C	393	Jan. 28	31	23.34	2205.60	2197.94
BLM 1C	394	Jan. 29	31	23.29	2205.60	2197.89
BLM 1C	395	Jan. 30	31	23.30	2205.60	2197.90
BLM 1C	396	Jan. 31	31	23.65	2205.60	2198.25
BLM 1C	397	Feb. 1	31	23.70	2205.60	2198.30
BLM 1C	401	Feb. 5	31	23.66	2205.60	2198.26
BLM 1C	402	Feb. 6	31	22.65	2205.60	2197.25
BLM 1C	404	Feb. 8	31	23.45	2205.60	2198.05
BLM 1C	405	Feb. 9	31	23.48	2205.60	2198.08
BLM 1C	406	Feb. 10	31	23.45	2205.60	2198.05
BLM 1C	410	Feb. 14	31	23.36	2205.60	2197.96
BLM 1C	412	Feb. 16	31	23.27	2205.60	2197.87
BLM 1C	419	Feb. 23	31	23.24	2205.60	2197.84
BLM 1C	424	Feb. 28	31	23.18	2205.60	2197.78
BLM 1C	431	Mar. 6	31	23.20	2205.60	2197.80
BLM 1C	434	Mar. 9	31	23.59	2205.60	2198.19
BLM 1C	439	Mar. 14	30	23.84	2205.60	2199.44
BLM 1C	441	Mar. 16	30	23.52	2205.60	2199.12
BLM 1C	445	Mar. 20	30	23.36	2205.60	2198.96
BLM 1C	454	Mar. 29	31	24.57	2205.60	2199.17
BLM 1C	460	April 4	30	23.46	2205.60	2199.06
BLM 1C	466	April 10	30	24.17	2205.60	2199.77
BLM 1C	470	April 14	30	24.06	2205.60	2199.66
BLM 1C	473	April 17	30	24.49	2205.60	2200.09
BLM 1C	477	April 21	30	24.78	2205.60	2200.38
BLM 1C	480	April 24	29	23.55	2205.60	2200.15
BLM 1C	481	April 25	29	23.36	2205.60	2199.96
BLM 1C	494	May 8	29	23.79	2205.60	2200.39
BLM 1C	497	May 11	29	23.61	2205.60	2200.21
BLM 1C	501	May 15	29	22.91	2205.60	2199.51
BLM 1C	509	May 23	30	23.71	2205.60	2199.31
BLM 1C	518	June 1	30	23.80	2205.60	2199.40
BLM 1C	537	June 20	30	23.73	2205.60	2199.33

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 1D	261	Sept. 17	32	23.76	2205.43	2197.19
BLM 1D	279	Oct. 5	32	23.67	2205.43	2197.10
BLM 1D	344	Dec. 9	33	24.89	2205.64	2197.53
BLM 1D	351	Dec. 16	32	24.10	2205.64	2197.74
BLM 1D	356	Dec. 21	32	23.94	2205.64	2197.58
BLM 1D	363	Dec. 28	32	22.96	2205.64	2196.60
BLM 1D	370	Jan. 5	32	23.86	2205.64	2197.50
BLM 1D	378	Jan. 13	32	23.80	2205.64	2197.44
BLM 1D	383	Jan. 18	32	24.35	2205.64	2197.99
BLM 1D	392	Jan. 27	32	24.30	2205.64	2197.94
BLM 1D	393	Jan. 28	32	24.27	2205.64	2197.91
BLM 1D	394	Jan. 29	31	23.22	2205.64	2197.86
BLM 1D	395	Jan. 30	31	23.21	2205.64	2197.85
BLM 1D	396	Jan. 31	31	23.58	2205.64	2198.22
BLM 1D	397	Feb. 1	31	23.61	2205.64	2198.25
BLM 1D	401	Feb. 5	31	23.60	2205.64	2198.24
BLM 1D	402	Feb. 6	31	23.57	2205.64	2198.21
BLM 1D	404	Feb. 8	31	23.36	2205.64	2198.00
BLM 1D	405	Feb. 9	31	23.40	2205.64	2198.04
BLM 1D	406	Feb. 10	31	23.36	2205.64	2198.00
BLM 1D	410	Feb. 14	31	23.29	2205.64	2197.93
BLM 1D	412	Feb. 16	31	23.20	2205.64	2197.84
BLM 1D	419	Feb. 23	31	23.18	2205.64	2197.82
BLM 1D	424	Feb. 28	31	23.10	2205.64	2197.74
BLM 1D	431	Mar. 6	31	23.14	2205.64	2197.78
BLM 1D	434	Mar. 9	31	23.51	2205.64	2198.15
BLM 1D	439	Mar. 14	30	23.70	2205.64	2199.34
BLM 1D	441	Mar. 16	30	23.38	2205.64	2199.02
BLM 1D	445	Mar. 20	30	23.21	2205.64	2198.85
BLM 1D	454	Mar. 29	30	23.47	2205.64	2199.11
BLM 1D	460	April 4	30	23.46	2205.64	2199.10
BLM 1D	466	April 10	30	24.17	2205.64	2199.81
BLM 1D	470	April 14	30	24.06	2205.64	2199.70
BLM 1D	473	April 17	30	24.49	2205.64	2200.13
BLM 1D	477	April 21	30	24.78	2205.64	2200.42
BLM 1D	480	April 24	29	23.41	2205.64	2200.05
BLM 1D	481	April 25	30	24.22	2205.64	2199.86
BLM 1D	494	May 8	29	23.61	2205.64	2200.25
BLM 1D	497	May 11	29	23.48	2205.64	2200.12
BLM 1D	501	May 15	30	23.76	2205.64	2199.40
BLM 1D	509	May 23	30	23.56	2205.64	2199.20
BLM 1D	518	June 1	30	23.66	2205.64	2199.30
BLM 1D	537	June 20	30	23.57	2205.64	2199.21

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 2C	261	Sept. 17	28	dry	2206.21	dry
BLM 2C	279	Oct. 5	28	dry	2206.21	dry
BLM 2C	344	Dec. 9	28	dry	2206.89	dry
BLM 2C	351	Dec. 16	30	n.m.	2206.89	dry
BLM 2C	356	Dec. 21	30	n.m.	2206.89	dry
BLM 2C	363	Dec. 28	30	n.m.	2206.89	dry
BLM 2C	370	Jan. 5	30	dry	2206.89	dry
BLM 2C	378	Jan. 13	30	dry	2206.89	dry
BLM 2C	383	Jan. 18	30	n.m.	2206.89	dry
BLM 2C	392	Jan. 27	30	n.m.	2206.89	dry
BLM 2C	393	Jan. 28	30	n.m.	2206.89	dry
BLM 2C	394	Jan. 29	30	n.m.	2206.89	dry
BLM 2C	395	Jan. 30	31	n.m.	2206.89	dry
BLM 2C	396	Jan. 31	31	n.m.	2206.89	dry
BLM 2C	397	Feb. 1	31	frozen	2206.89	dry
BLM 2C	401	Feb. 5	31	22.70	2206.89	2198.59
BLM 2C	402	Feb. 6	31	22.66	2206.89	2198.55
BLM 2C	404	Feb. 8	31	22.56	2206.89	2198.45
BLM 2C	405	Feb. 9	31	n.m.	2206.89	dry
BLM 2C	406	Feb. 10	31	n.m.	2206.89	dry
BLM 2C	439	Mar. 14	31	23.96	2206.89	2199.85
BLM 2C	441	Mar. 16	31	23.67	2206.89	2199.56
BLM 2C	446	Mar. 20	31	23.50	2206.89	2199.39
BLM 2C	454	Mar. 29	31	23.69	2206.89	2199.58
BLM 2C	460	April 4	31	23.59	2206.89	2199.48
BLM 2C	466	April 10	30	23.30	2206.89	2200.19
BLM 2C	470	April 14	30	23.18	2206.89	2200.07
BLM 2C	473	April 17	30	23.59	2206.89	2200.48
BLM 2C	477	April 21	30	23.87	2206.89	2200.76
BLM 2C	480	April 24	30	23.69	2206.89	2200.58
BLM 2C	481	April 25	30	23.49	2206.89	2200.38
BLM 2C	494	May 8	29	22.85	2206.89	2200.74
BLM 2C	497	May 11	30	23.73	2206.89	2200.62
BLM 2C	501	May 15	30	23.02	2206.89	2199.91
BLM 2C	509	May 23	31	23.82	2206.89	2199.71
BLM 2C	518	June 1	30	22.91	2206.89	2199.80
BLM 2C	537	June 20	30	22.85	2206.89	2199.74

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 2D	261	Sept. 17	32	23.21	2206.42	2197.63
BLM 2D	279	Oct. 5	32	23.10	2206.42	2197.52
BLM 2D	344	Dec. 9	32	23.29	2206.61	2197.90
BLM 2D	351	Dec. 16	32	23.52	2206.61	2198.13
BLM 2D	356	Dec. 21	32	23.37	2206.61	2197.98
BLM 2D	363	Dec. 28	32	23.37	2206.61	2197.98
BLM 2D	370	Jan. 5	32	23.27	2206.61	2197.88
BLM 2D	378	Jan. 13	32	23.18	2206.61	2197.79
BLM 2D	383	Jan. 18	32	23.80	2206.61	2198.41
BLM 2D	392	Jan. 27	32	23.76	2206.61	2198.37
BLM 2D	393	Jan. 28	32	23.70	2206.61	2198.31
BLM 2D	394	Jan. 29	32	23.66	2206.61	2198.27
BLM 2D	395	Jan. 30	32	23.66	2206.61	2198.27
BLM 2D	396	Jan. 31	32	24.17	2206.61	2198.78
BLM 2D	397	Feb. 1	32	23.61	2206.61	2198.22
BLM 2D	401	Feb. 5	32	24.11	2206.61	2198.72
BLM 2D	402	Feb. 6	32	24.09	2206.61	2198.70
BLM 2D	404	Feb. 8	31	22.90	2206.61	2198.51
BLM 2D	405	Feb. 9	32	23.92	2206.61	2198.53
BLM 2D	406	Feb. 10	32	23.88	2206.61	2198.49
BLM 2D	412	Feb. 16	32	23.71	2206.61	2198.32
BLM 2D	419	Feb. 23	32	23.66	2206.61	2198.27
BLM 2D	424	Feb. 28	32	23.59	2206.61	2198.20
BLM 2D	431	Mar. 6	32	23.60	2206.61	2198.21
BLM 2D	434	Mar. 9	32	24.06	2206.61	2198.67
BLM 2D	439	Mar. 14	31	24.26	2206.61	2199.87
BLM 2D	441	Mar. 16	31	23.97	2206.61	2199.58
BLM 2D	445	Mar. 20	31	23.80	2206.61	2199.41
BLM 2D	454	Mar. 29	31	23.99	2206.61	2199.60
BLM 2D	460	April 4	31	23.88	2206.61	2199.49
BLM 2D	466	April 10	30	23.58	2206.61	2200.19
BLM 2D	470	April 14	30	23.46	2206.61	2200.07
BLM 2D	473	April 17	30	23.89	2206.61	2200.50
BLM 2D	477	April 21	30	24.17	2206.61	2200.78
BLM 2D	480	April 24	30	23.97	2206.61	2200.58
BLM 2D	481	April 25	30	23.78	2206.61	2200.39
BLM 2D	494	May 8	29	23.14	2206.61	2200.75
BLM 2D	497	May 11	30	24.02	2206.61	2200.63
BLM 2D	501	May 15	30	23.31	2206.61	2199.92
BLM 2D	509	May 23	31	24.12	2206.61	2199.73
BLM 2D	518	June 1	31	24.20	2206.61	2199.81
BLM 2D	537	June 20	31	24.14	2206.61	2199.75

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 3C	261	Sept. 17	28	dry	2204.97	dry
BLM 3C	279	Oct. 5	28	dry	2204.97	dry
BLM 3C	344	Dec. 9	28	dry	2205.62	dry
BLM 3C	351	Dec. 16	30	22.42	2205.62	2198.04
BLM 3C	356	Dec. 21	30	22.27	2205.62	2197.89
BLM 3C	363	Dec. 28	30	n.m.	2205.62	dry
BLM 3C	370	Jan. 5	30	n.m.	2205.62	dry
BLM 3C	378	Jan. 13	30	n.m.	2205.62	dry
BLM 3C	383	Jan. 18	30	22.68	2205.62	2198.30
BLM 3C	392	Jan. 27	30	22.61	2205.62	2198.23
BLM 3C	393	Jan. 28	30	22.56	2205.62	2198.18
BLM 3C	394	Jan. 29	30	n.m.	2205.62	dry
BLM 3C	395	Jan. 30	30	n.m.	2205.62	dry
BLM 3C	396	Jan. 31	30	22.91	2205.62	2198.53
BLM 3C	397	Feb. 1	30	frozen	2205.62	frozen
BLM 3C	401	Feb. 5	30	22.99	2205.62	2198.61
BLM 3C	402	Feb. 6	30	22.93	2205.62	2198.55
BLM 3C	404	Feb. 8	31	23.73	2205.62	2198.35
BLM 3C	405	Feb. 9	31	23.73	2205.62	2198.35
BLM 3C	406	Feb. 10	31	23.71	2205.62	2198.33
BLM 3C	410	Feb. 14	31	23.62	2205.62	2198.24
BLM 3C	412	Feb. 16	31	23.55	2205.62	2198.17
BLM 3C	419	Feb. 23	31	23.52	2205.62	2198.14
BLM 3C	424	Feb. 28	31	23.46	2205.62	2198.08
BLM 3C	431	Mar. 6	31	23.54	2205.62	2198.16
BLM 3C	434	Mar. 9	31	23.91	2205.62	2198.53
BLM 3C	439	Mar. 14	30	24.14	2205.62	2199.76
BLM 3C	441	Mar. 16	31	24.82	2205.62	2199.44
BLM 3C	445	Mar. 20	30	23.64	2205.62	2199.26
BLM 3C	454	Mar. 29	30	23.87	2205.62	2199.49
BLM 3C	460	April 4	31	24.75	2205.62	2199.37
BLM 3C	466	April 10	30	24.48	2205.62	2200.10
BLM 3C	470	April 14	30	24.41	2205.62	2200.03
BLM 3C	473	April 17	30	24.83	2205.62	2200.45
BLM 3C	477	April 21	29	24.16	2205.62	2200.78
BLM 3C	480	April 24	30	24.88	2205.62	2200.50
BLM 3C	481	April 25	30	24.71	2205.62	2200.33
BLM 3C	494	May 8	29	24.10	2205.62	2200.72
BLM 3C	497	May 11	29	23.97	2205.62	2200.59
BLM 3C	501	May 15	29	23.21	2205.62	2199.83
BLM 3C	509	May 23	30	24.04	2205.62	2199.66
BLM 3C	518	June 1	30	24.10	2205.62	2199.72
BLM 3C	537	June 20	30	24.05	2205.62	2199.67

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 3D	261	Sept. 17	30	23.07	2204.51	2197.58
BLM 3D	279	Oct. 5	30	22.97	2204.51	2197.48
BLM 3D	344	Dec. 9	31	23.40	2205.48	2197.88
BLM 3D	351	Dec. 16	31	23.62	2205.48	2198.10
BLM 3D	356	Dec. 21	31	23.48	2205.48	2197.96
BLM 3D	363	Dec. 28	31	23.51	2205.48	2197.99
BLM 3D	370	Jan. 5	31	23.40	2205.48	2197.88
BLM 3D	378	Jan. 13	31	23.27	2205.48	2197.75
BLM 3D	383	Jan. 18	31	23.88	2205.48	2198.36
BLM 3D	392	Jan. 27	31	23.81	2205.48	2198.29
BLM 3D	393	Jan. 28	31	23.76	2205.48	2198.24
BLM 3D	394	Jan. 29	31	23.72	2205.48	2198.20
BLM 3D	395	Jan. 30	31	23.71	2205.48	2198.19
BLM 3D	396	Jan. 31	31	24.06	2205.48	2198.54
BLM 3D	397	Feb. 1	30	23.06	2205.48	2198.54
BLM 3D	401	Feb. 5	31	24.12	2205.48	2198.60
BLM 3D	402	Feb. 6	31	24.07	2205.48	2198.55
BLM 3D	404	Feb. 8	31	23.85	2205.48	2198.33
BLM 3D	405	Feb. 9	31	23.86	2205.48	2198.34
BLM 3D	406	Feb. 10	31	23.84	2205.48	2198.32
BLM 3D	410	Feb. 14	31	23.75	2205.48	2198.23
BLM 3D	412	Feb. 16	31	23.66	2205.48	2198.14
BLM 3D	419	Feb. 23	31	23.64	2205.48	2198.12
BLM 3D	424	Feb. 28	31	23.57	2205.48	2198.05
BLM 3D	431	Mar. 6	31	23.63	2205.48	2198.11
BLM 3D	434	Mar. 9	31	23.98	2205.48	2198.46
BLM 3D	439	Mar. 14	30	24.19	2205.48	2199.67
BLM 3D	441	Mar. 16	30	23.85	2205.48	2199.33
BLM 3D	445	Mar. 20	30	23.68	2205.48	2199.16
BLM 3D	454	Mar. 29	30	23.92	2205.48	2199.40
BLM 3D	460	April 4	31	24.79	2205.48	2199.27
BLM 3D	466	April 10	30	24.53	2205.48	2200.01
BLM 3D	470	April 14	30	24.46	2205.48	2199.94
BLM 3D	473	April 17	30	24.88	2205.48	2200.36
BLM 3D	477	April 21	29	24.21	2205.48	2200.69
BLM 3D	480	April 24	29	23.94	2205.48	2200.42
BLM 3D	481	April 25	30	24.76	2205.48	2200.24
BLM 3D	494	May 8	30	25.16	2205.48	2200.64
BLM 3D	497	May 11	29	24.02	2205.48	2200.50
BLM 3D	501	May 15	29	23.26	2205.48	2199.74
BLM 3D	509	May 23	30	24.09	2205.48	2199.57
BLM 3D	518	June 1	30	24.14	2205.48	2199.62
BLM 3D	537	June 20	30	24.08	2205.48	2199.56

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 4C	261	Sept. 17	30	dry	2203.78	dry
BLM 4C	279	Oct. 5	29.6	22.61	2203.78	2196.79
BLM 4C	344	Dec. 9	30	22.62	2204.46	2197.08
BLM 4C	351	Dec. 16	30	22.87	2204.46	2197.33
BLM 4C	356	Dec. 21	30	22.70	2204.46	2197.16
BLM 4C	363	Dec. 28	30	22.76	2204.46	2197.22
BLM 4C	370	Jan. 5	30	22.65	2204.46	2197.11
BLM 4C	378	Jan. 13	30	n.m.	2204.46	dry
BLM 4C	383	Jan. 18	30	23.37	2204.46	2197.83
BLM 4C	392	Jan. 27	30	22.96	2204.46	2197.42
BLM 4C	393	Jan. 28	30	22.89	2204.46	2197.35
BLM 4C	394	Jan. 29	30	22.84	2204.46	2197.30
BLM 4C	395	Jan. 30	30	22.82	2204.46	2197.28
BLM 4C	396	Jan. 31	30	22.60	2204.46	2197.06
BLM 4C	397	Feb. 1	30	23.31	2204.46	2197.77
BLM 4C	401	Feb. 5	30	23.26	2204.46	2197.72
BLM 4C	402	Feb. 6	30	23.22	2204.46	2197.68
BLM 4C	404	Feb. 8	30	23.01	2204.46	2197.47
BLM 4C	405	Feb. 9	30	23.00	2204.46	2197.46
BLM 4C	406	Feb. 10	30	22.95	2204.46	2197.41
BLM 4C	410	Feb. 14	30	22.89	2204.46	2197.35
BLM 4C	412	Feb. 16	30	22.82	2204.46	2197.28
BLM 4C	419	Feb. 23	30	22.85	2204.46	2197.31
BLM 4C	424	Feb. 28	31	23.80	2204.46	2197.26
BLM 4C	431	Mar. 6	31	23.84	2204.46	2197.30
BLM 4C	434	Mar. 9	30	23.29	2204.46	2197.75
BLM 4C	439	Mar. 14	30	24.46	2204.46	2198.92
BLM 4C	441	Mar. 16	30	24.07	2204.46	2198.53
BLM 4C	445	Mar. 20	30	23.87	2204.46	2198.33
BLM 4C	454	Mar. 29	30	24.13	2204.46	2198.59
BLM 4C	460	April 4	31	24.99	2204.46	2198.45
BLM 4C	466	April 10	30	24.81	2204.46	2199.27
BLM 4C	470	April 14	30	24.69	2204.46	2199.15
BLM 4C	473	April 17	30	25.24	2204.46	2199.70
BLM 4C	477	April 21	29	24.54	2204.46	2200.00
BLM 4C	480	April 24	29	24.18	2204.46	2199.64
BLM 4C	481	April 25	29	24.04	2204.46	2199.50
BLM 4C	494	May 8	29	24.52	2204.46	2199.98
BLM 4C	497	May 11	29	24.35	2204.46	2199.81
BLM 4C	501	May 15	29	23.53	2204.46	2198.99
BLM 4C	509	May 23	30	24.31	2204.46	2198.77
BLM 4C	518	June 1	30	24.36	2204.46	2198.82
BLM 4C	537	June 20	30	24.30	2204.46	2198.76

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 4D	261	Sept. 17	31	23.93	2204.01	2196.94
BLM 4D	279	Oct. 5	31	23.99	2204.01	2197.00
BLM 4D	344	Dec. 9	30	22.77	2204.33	2197.10
BLM 4D	351	Dec. 16	30	22.81	2204.33	2197.14
BLM 4D	356	Dec. 21	30	22.72	2204.33	2197.05
BLM 4D	363	Dec. 28	31	23.72	2204.33	2197.05
BLM 4D	370	Jan. 5	31	23.64	2204.33	2196.97
BLM 4D	378	Jan. 13	31	23.66	2204.33	2196.99
BLM 4D	383	Jan. 18	31	24.20	2204.33	2197.53
BLM 4D	392	Jan. 27	31	24.02	2204.33	2197.35
BLM 4D	393	Jan. 28	31	23.97	2204.33	2197.30
BLM 4D	394	Jan. 29	31	23.94	2204.33	2197.27
BLM 4D	395	Jan. 30	31	23.96	2204.33	2197.29
BLM 4D	396	Jan. 31	31	23.32	2204.33	2196.65
BLM 4D	397	Feb. 1	31	24.31	2204.33	2197.64
BLM 4D	401	Feb. 5	30	23.43	2204.33	2197.76
BLM 4D	402	Feb. 6	30	23.33	2204.33	2197.66
BLM 4D	404	Feb. 8	30	23.12	2204.33	2197.45
BLM 4D	405	Feb. 9	30	23.11	2204.33	2197.44
BLM 4D	406	Feb. 10	30	23.08	2204.33	2197.41
BLM 4D	410	Feb. 14	30	23.02	2204.33	2197.35
BLM 4D	412	Feb. 16	31	23.95	2204.33	2197.28
BLM 4D	419	Feb. 23	31	24.02	2204.33	2197.35
BLM 4D	424	Feb. 28	31	23.90	2204.33	2197.23
BLM 4D	431	Mar. 6	31	24.07	2204.33	2197.40
BLM 4D	434	Mar. 9	30	23.36	2204.33	2197.69
BLM 4D	439	Mar. 14	30	24.46	2204.33	2198.79
BLM 4D	441	Mar. 16	30	24.14	2204.33	2198.47
BLM 4D	445	Mar. 20	30	23.92	2204.33	2198.25
BLM 4D	454	Mar. 29	30	24.24	2204.33	2198.57
BLM 4D	460	April 4	30	24.04	2204.33	2198.37
BLM 4D	466	April 10	30	24.86	2204.33	2199.19
BLM 4D	470	April 14	30	24.91	2204.33	2199.24
BLM 4D	473	April 17	30	25.34	2204.33	2199.67
BLM 4D	477	April 21	29	24.76	2204.33	2200.09
BLM 4D	480	April 24	29	24.29	2204.33	2199.62
BLM 4D	481	April 25	29	24.09	2204.33	2199.42
BLM 4D	494	May 8	29	24.67	2204.33	2200.00
BLM 4D	497	May 11	29	24.43	2204.33	2199.76
BLM 4D	501	May 15	29	23.60	2204.33	2198.93
BLM 4D	509	May 23	30	24.48	2204.33	2198.81
BLM 4D	518	June 1	30	24.50	2204.33	2198.83
BLM 4D	537	June 20	30	24.47	2204.33	2198.80

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 5C	261	Sept. 17	30	22.22	2204.43	2196.65
BLM 5C	279	Oct. 5	30	22.19	2204.43	2196.62
BLM 5C	344	Dec. 9	30	n.m.	2204.93	n.m.
BLM 5C	351	Dec. 16	30	22.17	2204.93	2197.10
BLM 5C	356	Dec. 21	30	n.m.	2204.93	n.m.
BLM 5C	363	Dec. 28	31	23.05	2204.93	2196.98
BLM 5C	370	Jan. 5	31	22.93	2204.93	2196.86
BLM 5C	378	Jan. 13	31	22.89	2204.93	2196.82
BLM 5C	383	Jan. 18	31	24.16	2204.93	2198.09
BLM 5C	392	Jan. 27	31	23.47	2204.93	2197.40
BLM 5C	393	Jan. 28	31	23.37	2204.93	2197.30
BLM 5C	394	Jan. 29	31	23.32	2204.93	2197.25
BLM 5C	395	Jan. 30	31	23.26	2204.93	2197.19
BLM 5C	396	Jan. 31	31	24.35	2204.93	2198.28
BLM 5C	397	Feb. 1	31	23.95	2204.93	2197.88
BLM 5C	401	Feb. 5	31	23.67	2204.93	2197.60
BLM 5C	402	Feb. 6	31	23.66	2204.93	2197.59
BLM 5C	404	Feb. 8	31	23.44	2204.93	2197.37
BLM 5C	405	Feb. 9	31	23.42	2204.93	2197.35
BLM 5C	406	Feb. 10	31	23.39	2204.93	2197.32
BLM 5C	410	Feb. 14	31	23.32	2204.93	2197.25
BLM 5C	412	Feb. 16	31	23.25	2204.93	2197.18
BLM 5C	419	Feb. 23	31	23.18	2204.93	2197.11
BLM 5C	424	Feb. 28	31	23.16	2204.93	2197.09
BLM 5C	431	Mar. 6	31	23.12	2204.93	2197.05
BLM 5C	434	Mar. 9	31	23.46	2204.93	2197.39
BLM 5C	439	Mar. 14	30	23.85	2204.93	2198.78
BLM 5C	441	Mar. 16	30	23.63	2204.93	2198.56
BLM 5C	445	Mar. 20	30	23.68	2204.93	2198.61
BLM 5C	454	Mar. 29	30	23.93	2204.93	2198.86
BLM 5C	460	April 4	30	23.78	2204.93	2198.71
BLM 5C	466	April 10	30	24.04	2204.93	2198.97
BLM 5C	470	April 14	30	23.91	2204.93	2198.84
BLM 5C	473	April 17	30	24.27	2204.93	2199.20
BLM 5C	477	April 21	29	23.49	2204.93	2199.42
BLM 5C	480	April 24	29	23.34	2204.93	2199.27
BLM 5C	481	April 25	30	24.09	2204.93	2199.02
BLM 5C	494	May 8	29	23.32	2204.93	2199.25
BLM 5C	497	May 11	29	23.22	2204.93	2199.15
BLM 5C	501	May 15	30	23.64	2204.93	2198.57
BLM 5C	509	May 23	30	23.45	2204.93	2198.38
BLM 5C	518	June 1	30	23.68	2204.93	2198.61
BLM 5C	537	June 20	30	23.57	2204.93	2198.50

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 5D	261	Sept. 17	31	23.23	2204.33	2196.56
BLM 5D	279	Oct. 5	31	23.16	2204.33	2196.49
BLM 5D	344	Dec. 9	31	22.90	2204.88	2196.78
BLM 5D	351	Dec. 16	31	23.10	2204.88	2196.98
BLM 5D	356	Dec. 21	31	22.96	2204.88	2196.84
BLM 5D	363	Dec. 28	31	23.01	2204.88	2196.89
BLM 5D	370	Jan. 5	31	22.93	2204.88	2196.81
BLM 5D	378	Jan. 13	31	22.83	2204.88	2196.71
BLM 5D	383	Jan. 18	31	23.38	2204.88	2197.26
BLM 5D	392	Jan. 27	31	23.24	2204.88	2197.12
BLM 5D	393	Jan. 28	31	23.18	2204.88	2197.06
BLM 5D	394	Jan. 29	31	23.14	2204.88	2197.02
BLM 5D	395	Jan. 30	31	23.16	2204.88	2197.04
BLM 5D	396	Jan. 31	31	23.46	2204.88	2197.34
BLM 5D	397	Feb. 1	31	23.49	2204.88	2197.37
BLM 5D	401	Feb. 5	31	23.56	2204.88	2197.44
BLM 5D	402	Feb. 6	31	23.51	2204.88	2197.39
BLM 5D	404	Feb. 8	31	23.30	2204.88	2197.18
BLM 5D	405	Feb. 9	31	23.31	2204.88	2197.19
BLM 5D	406	Feb. 10	31	23.29	2204.88	2197.17
BLM 5D	410	Feb. 14	31	23.22	2204.88	2197.10
BLM 5D	412	Feb. 16	31	23.15	2204.88	2197.03
BLM 5D	419	Feb. 23	31	23.19	2204.88	2197.07
BLM 5D	424	Feb. 28	31	23.09	2204.88	2196.97
BLM 5D	431	Mar. 6	31	23.21	2204.88	2197.09
BLM 5D	434	Mar. 9	31	23.50	2204.88	2197.38
BLM 5D	439	Mar. 14	30	23.60	2204.88	2198.48
BLM 5D	441	Mar. 16	30	23.25	2204.88	2198.13
BLM 5D	445	Mar. 20	30	23.06	2204.88	2197.94
BLM 5D	454	Mar. 29	30	23.34	2204.88	2198.22
BLM 5D	460	April 4	30	23.16	2204.88	2198.04
BLM 5D	466	April 10	30	23.92	2204.88	2198.80
BLM 5D	470	April 14	30	23.92	2204.88	2198.80
BLM 5D	473	April 17	30	24.34	2204.88	2199.22
BLM 5D	477	April 21	29	23.72	2204.88	2199.60
BLM 5D	480	April 24	29	23.33	2204.88	2199.21
BLM 5D	481	April 25	30	24.16	2204.88	2199.04
BLM 5D	494	May 8	30	24.65	2204.88	2199.53
BLM 5D	497	May 11	29	23.45	2204.88	2199.33
BLM 5D	501	May 15	30	23.67	2204.88	2198.55
BLM 5D	509	May 23	30	23.54	2204.88	2198.42
BLM 5D	518	June 1	30	23.59	2204.88	2198.47
BLM 5D	537	June 20	30	23.56	2204.88	2198.44

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 6C	261	Sept. 17	30	dry	2203.38	dry
BLM 6C	279	Oct. 5	30	n.m.	2203.38	n.m.
BLM 6C	344	Dec. 9	30	n.m.	2204.19	n.m.
BLM 6C	351	Dec. 16	30	22.31	2204.19	2196.50
BLM 6C	356	Dec. 21	30	n.m.	2204.19	n.m.
BLM 6C	363	Dec. 28	31	23.21	2204.19	2196.40
BLM 6C	370	Jan. 5	31	23.12	2204.19	2196.31
BLM 6C	378	Jan. 13	31	23.05	2204.19	2196.24
BLM 6C	383	Jan. 18	31	23.54	2204.19	2196.73
BLM 6C	392	Jan. 27	31	23.40	2204.19	2196.59
BLM 6C	393	Jan. 28	31	23.36	2204.19	2196.55
BLM 6C	394	Jan. 29	31	23.33	2204.19	2196.52
BLM 6C	395	Jan. 30	31	23.34	2204.19	2196.53
BLM 6C	396	Jan. 31	31	23.64	2204.19	2196.83
BLM 6C	397	Feb. 1	31	23.64	2204.19	2196.83
BLM 6C	401	Feb. 5	31	23.66	2204.19	2196.85
BLM 6C	402	Feb. 6	31	23.59	2204.19	2196.78
BLM 6C	404	Feb. 8	31	23.39	2204.19	2196.58
BLM 6C	405	Feb. 9	31	23.38	2204.19	2196.57
BLM 6C	406	Feb. 10	31	23.36	2204.19	2196.55
BLM 6C	410	Feb. 14	31	23.31	2204.19	2196.50
BLM 6C	412	Feb. 16	31	23.26	2204.19	2196.45
BLM 6C	419	Feb. 23	31	23.32	2204.19	2196.51
BLM 6C	424	Feb. 28	31	23.23	2204.19	2196.42
BLM 6C	431	Mar. 6	31	23.37	2204.19	2196.56
BLM 6C	434	Mar. 9	31	23.66	2204.19	2196.85
BLM 6C	439	Mar. 14	30	23.62	2204.19	2197.81
BLM 6C	441	Mar. 16	30	23.27	2204.19	2197.46
BLM 6C	445	Mar. 20	30	23.10	2204.19	2197.29
BLM 6C	454	Mar. 29	30	23.37	2204.19	2197.56
BLM 6C	460	April 4	30	23.19	2204.19	2197.38
BLM 6C	466	April 10	30	23.96	2204.19	2198.15
BLM 6C	470	April 14	30	23.98	2204.19	2198.17
BLM 6C	473	April 17	30	24.38	2204.19	2198.57
BLM 6C	477	April 21	29	23.80	2204.19	2198.99
BLM 6C	480	April 24	29	23.36	2204.19	2198.55
BLM 6C	481	April 25	30	24.20	2204.19	2198.39
BLM 6C	494	May 8	29	23.73	2204.19	2198.92
BLM 6C	497	May 11	29	23.50	2204.19	2198.69
BLM 6C	501	May 15	30	23.73	2204.19	2197.92
BLM 6C	509	May 23	30	23.61	2204.19	2197.80
BLM 6C	518	June 1	30	23.66	2204.19	2197.85
BLM 6C	537	June 20	30	23.62	2204.19	2197.81

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 6D	261	Sept. 17	31	23.47	2203.54	2196.01
BLM 6D	279	Oct. 5	31	23.40	2203.54	2195.94
BLM 6D	344	Dec. 9	32	24.28	2203.97	2196.25
BLM 6D	351	Dec. 16	31	23.45	2203.97	2196.42
BLM 6D	356	Dec. 21	31	23.29	2203.97	2196.26
BLM 6D	363	Dec. 28	31	23.35	2203.97	2196.32
BLM 6D	370	Jan. 5	31	23.26	2203.97	2196.23
BLM 6D	378	Jan. 13	31	23.18	2203.97	2196.15
BLM 6D	383	Jan. 18	31	23.68	2203.97	2196.65
BLM 6D	392	Jan. 27	31	23.53	2203.97	2196.50
BLM 6D	393	Jan. 28	31	23.50	2203.97	2196.47
BLM 6D	394	Jan. 29	31	23.45	2203.97	2196.42
BLM 6D	395	Jan. 30	31	23.47	2203.97	2196.44
BLM 6D	396	Jan. 31	31	23.75	2203.97	2196.72
BLM 6D	397	Feb. 1	32	24.75	2203.97	2196.72
BLM 6D	401	Feb. 5	31	23.77	2203.97	2196.74
BLM 6D	402	Feb. 6	31	23.71	2203.97	2196.68
BLM 6D	404	Feb. 8	31	23.53	2203.97	2196.50
BLM 6D	405	Feb. 9	31	23.54	2203.97	2196.51
BLM 6D	406	Feb. 10	31	23.52	2203.97	2196.49
BLM 6D	410	Feb. 14	31	23.45	2203.97	2196.42
BLM 6D	412	Feb. 16	31	23.39	2203.97	2196.36
BLM 6D	419	Feb. 23	31	23.46	2203.97	2196.43
BLM 6D	424	Feb. 28	31	23.36	2203.97	2196.33
BLM 6D	431	Mar. 6	31	23.50	2203.97	2196.47
BLM 6D	434	Mar. 9	31	23.73	2203.97	2196.70
BLM 6D	439	Mar. 14	30	23.71	2203.97	2197.68
BLM 6D	441	Mar. 16	30	23.38	2203.97	2197.35
BLM 6D	445	Mar. 20	30	23.20	2203.97	2197.17
BLM 6D	454	Mar. 29	30	23.48	2203.97	2197.45
BLM 6D	460	April 4	30	23.29	2203.97	2197.26
BLM 6D	466	April 10	30	24.05	2203.97	2198.02
BLM 6D	470	April 14	30	24.08	2203.97	2198.05
BLM 6D	473	April 17	30	24.47	2203.97	2198.44
BLM 6D	477	April 21	29	23.91	2203.97	2198.88
BLM 6D	480	April 24	29	23.46	2203.97	2198.43
BLM 6D	481	April 25	30	24.29	2203.97	2198.26
BLM 6D	494	May 8	30	24.83	2203.97	2198.80
BLM 6D	497	May 11	29	23.59	2203.97	2198.56
BLM 6D	501	May 15	30	23.83	2203.97	2197.80
BLM 6D	509	May 23	30	23.72	2203.97	2197.69
BLM 6D	518	June 1	30	23.76	2203.97	2197.73
BLM 6D	537	June 20	30	23.72	2203.97	2197.69

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 7C	261	Sept. 17	29.5	22.66	2202.40	2195.56
BLM 7C	279	Oct. 5	29.5	22.61	2202.40	2195.51
BLM 7C	344	Dec. 9	30	22.71	2203.04	2195.75
BLM 7C	351	Dec. 16	30	22.86	2203.04	2195.90
BLM 7C	356	Dec. 21	30	22.72	2203.04	2195.76
BLM 7C	363	Dec. 28	30	22.78	2203.04	2195.82
BLM 7C	370	Jan. 5	30	22.68	2203.04	2195.72
BLM 7C	378	Jan. 13	30	22.63	2203.04	2195.67
BLM 7C	383	Jan. 18	30	23.06	2203.04	2196.10
BLM 7C	392	Jan. 27	30	22.95	2203.04	2195.99
BLM 7C	393	Jan. 28	30	22.93	2203.04	2195.97
BLM 7C	394	Jan. 29	30	22.90	2203.04	2195.94
BLM 7C	395	Jan. 30	30	22.90	2203.04	2195.94
BLM 7C	396	Jan. 31	30	23.17	2203.04	2196.21
BLM 7C	397	Feb. 1	30	23.18	2203.04	2196.22
BLM 7C	401	Feb. 5	30	23.18	2203.04	2196.22
BLM 7C	402	Feb. 6	30	23.14	2203.04	2196.18
BLM 7C	404	Feb. 8	30	22.95	2203.04	2195.99
BLM 7C	405	Feb. 9	30	22.97	2203.04	2196.01
BLM 7C	406	Feb. 10	30	22.94	2203.04	2195.98
BLM 7C	410	Feb. 14	30	22.91	2203.04	2195.95
BLM 7C	412	Feb. 16	31	23.86	2203.04	2195.90
BLM 7C	419	Feb. 23	30	22.90	2203.04	2195.94
BLM 7C	424	Feb. 28	31	23.83	2203.04	2195.87
BLM 7C	431	Mar. 6	31	23.91	2203.04	2195.95
BLM 7C	434	Mar. 9	31	24.16	2203.04	2196.20
BLM 7C	439	Mar. 14	30	24.12	2203.04	2197.16
BLM 7C	441	Mar. 16	30	23.77	2203.04	2196.81
BLM 7C	445	Mar. 20	30	23.60	2203.04	2196.64
BLM 7C	454	Mar. 29	30	23.86	2203.04	2196.90
BLM 7C	460	April 4	30	23.68	2203.04	2196.72
BLM 7C	466	April 10	30	24.44	2203.04	2197.48
BLM 7C	470	April 14	30	24.46	2203.04	2197.50
BLM 7C	473	April 17	30	24.86	2203.04	2197.90
BLM 7C	477	April 21	29	24.27	2203.04	2198.31
BLM 7C	480	April 24	29	23.84	2203.04	2197.88
BLM 7C	481	April 25	30	24.67	2203.04	2197.71
BLM 7C	494	May 8	29	24.21	2203.04	2198.25
BLM 7C	497	May 11	29	23.96	2203.04	2198.00
BLM 7C	501	May 15	29	23.24	2203.04	2197.28
BLM 7C	509	May 23	30	24.08	2203.04	2197.12
BLM 7C	518	June 1	30	24.16	2203.04	2197.20
BLM 7C	537	June 20	30	24.10	2203.04	2197.14

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	.L. ELEV
BLM 7D	261	Sept. 17	30	23.15	2202.38	2195.53
BLM 7D	279	Oct. 5	30	23.10	2202.38	2195.48
BLM 7D	344	Dec. 9	31	23.51	2203.19	2195.70
BLM 7D	351	Dec. 16	31	23.66	2203.19	2195.85
BLM 7D	356	Dec. 21	31	23.56	2203.19	2195.75
BLM 7D	363	Dec. 28	31	23.59	2203.19	2195.78
BLM 7D	370	Jan. 5	31	23.51	2203.19	2195.70
BLM 7D	378	Jan. 13	31	23.46	2203.19	2195.65
BLM 7D	383	Jan. 18	31	23.90	2203.19	2196.09
BLM 7D	392	Jan. 27	31	23.77	2203.19	2195.96
BLM 7D	393	Jan. 28	31	23.74	2203.19	2195.93
BLM 7D	394	Jan. 29	31	23.70	2203.19	2195.89
BLM 7D	395	Jan. 30	31	23.71	2203.19	2195.90
BLM 7D	396	Jan. 31	30	22.99	2203.19	2196.18
BLM 7D	397	Feb. 1	31	23.99	2203.19	2196.18
BLM 7D	401	Feb. 5	31	24.00	2203.19	2196.19
BLM 7D	402	Feb. 6	30	22.97	2203.19	2196.16
BLM 7D	404	Feb. 8	31	23.80	2203.19	2195.99
BLM 7D	405	Feb. 9	31	23.81	2203.19	2196.00
BLM 7D	406	Feb. 10	31	23.79	2203.19	2195.98
BLM 7D	410	Feb. 14	31	23.75	2203.19	2195.94
BLM 7D	412	Feb. 16	31	23.70	2203.19	2195.89
BLM 7D	419	Feb. 23	31	23.74	2203.19	2195.93
BLM 7D	424	Feb. 28	31	23.66	2203.19	2195.85
BLM 7D	431	Mar. 6	31	23.75	2203.19	2195.94
BLM 7D	434	Mar. 9	31	23.98	2203.19	2196.17
BLM 7D	439	Mar. 14	30	23.94	2203.19	2197.13
BLM 7D	441	Mar. 16	30	23.59	2203.19	2196.78
BLM 7D	445	Mar. 20	30	23.49	2203.19	2196.68
BLM 7D	454	Mar. 29	30	23.68	2203.19	2196.87
BLM 7D	460	April 4	30	23.51	2203.19	2196.70
BLM 7D	466	April 10	30	24.26	2203.19	2197.45
BLM 7D	470	April 14	30	24.28	2203.19	2197.47
BLM 7D	473	April 17	30	24.70	2203.19	2197.89
BLM 7D	477	April 21	29	24.11	2203.19	2198.30
BLM 7D	480	April 24	29	23.66	2203.19	2197.85
BLM 7D	481	April 25	30	24.48	2203.19	2197.67
BLM 7D	494	May 8	30	25.06	2203.19	2198.25
BLM 7D	497	May 11	29	23.80	2203.19	2197.99
BLM 7D	501	May 15	30	24.05	2203.19	2197.24
BLM 7D	509	May 23	30	23.91	2203.19	2197.10
BLM 7D	518	June 1	30	23.99	2203.19	2197.18
BLM 7D	537	June 20	30	23.93	2203.19	2197.12

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 8C	261	Sept. 17	31	dry	2204.01	dry
BLM 8C	279	Oct. 5	31	n.m.	2204.01	n.m.
BLM 8C	344	Dec. 9	31	22.24	2204.38	2195.62
BLM 8C	351	Dec. 16	31	22.38	2204.38	2195.76
BLM 8C	356	Dec. 21	31	22.28	2204.38	2195.66
BLM 8C	363	Dec. 28	31	n.m.	2204.38	n.m.
BLM 8C	370	Jan. 5	31	n.m.	2204.38	n.m.
BLM 8C	378	Jan. 13	31	n.m.	2204.38	n.m.
BLM 8C	383	Jan. 18	31	22.63	2204.38	2196.01
BLM 8C	392	Jan. 27	31	n.m.	2204.38	n.m.
BLM 8C	393	Jan. 28	31	n.m.	2204.38	n.m.
BLM 8C	404	Feb. 8	490.5	499.95	2204.38	2213.83
BLM 8C	410	Feb. 14	31	n.m.	2204.38	n.m.
BLM 8C	412	Feb. 16	32	23.44	2204.38	2195.82
BLM 8C	419	Feb. 23	31	n.m.	2204.38	n.m.
BLM 8C	424	Feb. 28	32	23.45	2204.38	2195.83
BLM 8C	431	Mar. 6	32	23.46	2204.38	2195.84
BLM 8C	434	Mar. 9	32	23.72	2204.38	2196.10
BLM 8C	439	Mar. 14	31	23.73	2204.38	2197.11
BLM 8C	441	Mar. 16	31	23.36	2204.38	2196.74
BLM 8C	445	Mar. 20	31	23.21	2204.38	2196.59
BLM 8C	454	Mar. 29	31	23.45	2204.38	2196.83
BLM 8C	460	April 4	31	23.29	2204.38	2196.67
BLM 8C	466	April 10	31	24.04	2204.38	2197.42
BLM 8C	470	April 14	31	24.02	2204.38	2197.40
BLM 8C	473	April 17	30	23.45	2204.38	2197.83
BLM 8C	477	April 21	30	23.84	2204.38	2198.22
BLM 8C	480	April 24	30	23.44	2204.38	2197.82
BLM 8C	481	April 25	30	23.25	2204.38	2197.63
BLM 8C	494	May 8	30	23.78	2204.38	2198.16
BLM 8C	497	May 11	30	23.55	2204.38	2197.93
BLM 8C	501	May 15	31	23.81	2204.38	2197.19
BLM 8C	509	May 23	31	23.65	2204.38	2197.03
BLM 8C	518	June 1	31	23.74	2204.38	2197.12
BLM 8C	537	June 20	31	23.68	2204.38	2197.06

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 8D	261	Sept. 17	32	23.56	2203.85	2195.41
BLM 8D	279	Oct. 5	32	23.49	2203.85	2195.34
BLM 8D	344	Dec. 9	32	23.32	2204.23	2195.55
BLM 8D	351	Dec. 16	32	23.48	2204.23	2195.71
BLM 8D	356	Dec. 21	32	23.36	2204.23	2195.59
BLM 8D	363	Dec. 28	32	23.40	2204.23	2195.63
BLM 8D	370	Jan. 5	32	23.30	2204.23	2195.53
BLM 8D	378	Jan. 13	32	23.25	2204.23	2195.48
BLM 8D	383	Jan. 18	32	23.70	2204.23	2195.93
BLM 8D	392	Jan. 27	32	23.60	2204.23	2195.83
BLM 8D	393	Jan. 28	32	23.56	2204.23	2195.79
BLM 8D	394	Jan. 29	32	23.52	2204.23	2195.75
BLM 8D	395	Jan. 30	32	23.55	2204.23	2195.78
BLM 8D	396	Jan. 31	32	23.82	2204.23	2196.05
BLM 8D	401	Feb. 5	31	22.83	2204.23	2196.06
BLM 8D	402	Feb. 6	31	22.79	2204.23	2196.02
BLM 8D	404	Feb. 8	32	23.62	2204.23	2195.85
BLM 8D	406	Feb. 10	32	23.62	2204.23	2195.85
BLM 8D	410	Feb. 14	32	23.56	2204.23	2195.79
BLM 8D	412	Feb. 16	32	23.51	2204.23	2195.74
BLM 8D	419	Feb. 23	32	23.56	2204.23	2195.79
BLM 8D	424	Feb. 28	32	23.49	2204.23	2195.72
BLM 8D	431	Mar. 6	32	23.54	2204.23	2195.77
BLM 8D	431	Mar. 9	32	23.81	2204.23	2196.04
BLM 8D	439	Mar. 14	31	23.79	2204.23	2197.02
BLM 8D	441	Mar. 16	31	23.45	2204.23	2196.68
BLM 8D	445	Mar. 20	31	23.28	2204.23	2196.51
BLM 8D	454	Mar. 29	31	23.53	2204.23	2196.76
BLM 8D	460	April 4	31	23.39	2204.23	2196.62
BLM 8D	466	April 10	31	24.11	2204.23	2197.34
BLM 8D	470	April 14	31	24.12	2204.23	2197.35
BLM 8D	473	April 17	30	23.52	2204.23	2197.75
BLM 8D	477	April 21	30	23.92	2204.23	2198.15
BLM 8D	480	April 24	30	23.50	2204.23	2197.73
BLM 8D	481	April 25	30	23.31	2204.23	2197.54
BLM 8D	494	May 8	31	24.86	2204.23	2198.09
BLM 8D	497	May 11	30	23.62	2204.23	2197.85
BLM 8D	501	May 15	30	22.89	2204.23	2197.12
BLM 8D	509	May 23	31	23.73	2204.23	2196.96
BLM 8D	518	June 1	31	23.81	2204.23	2197.04
BLM 8D	537	June 20	31	23.79	2204.23	2197.02

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 9C	261	Sept. 17	29.5	22.23	2203.97	2196.70
BLM 9C	279	Oct. 5	29.5	n.m.	2203.97	n.m.
BLM 9C	344	Dec. 9	30	22.35	2204.51	2196.86
BLM 9C	351	Dec. 16	30	22.53	2204.51	2197.04
BLM 9C	356	Dec. 21	30	22.40	2204.51	2196.91
BLM 9C	363	Dec. 28	30	n.m.	2204.51	n.m.
BLM 9C	370	Jan. 5	30	n.m.	2204.51	n.m.
BLM 9C	378	Jan. 13	30	n.m.	2204.51	n.m.
BLM 9C	383	Jan. 18	30	22.87	2204.51	2197.38
BLM 9C	393	Jan. 28	30	22.70	2204.51	2197.21
BLM 9C	394	Jan. 29	30	22.68	2204.51	2197.19
BLM 9C	395	Jan. 30	30	22.66	2204.51	2197.17
BLM 9C	396	Jan. 31	30	23.02	2204.51	2197.53
BLM 9C	397	Feb. 1	30	23.06	2204.51	2197.57
BLM 9C	402	Feb. 6	30	23.02	2204.51	2197.53
BLM 9C	404	Feb. 8	31	23.83	2204.51	2197.34
BLM 9C	405	Feb. 9	31	23.85	2204.51	2197.36
BLM 9C	406	Feb. 10	31	23.85	2204.51	2197.36
BLM 9C	410	Feb. 14	31	23.77	2204.51	2197.28
BLM 9C	412	Feb. 16	31	23.67	2204.51	2197.18
BLM 9C	419	Feb. 23	31	23.68	2204.51	2197.19
BLM 9C	424	Feb. 28	31	23.60	2204.51	2197.11
BLM 9C	431	Mar. 6	31	23.69	2204.51	2197.20
BLM 9C	434	Mar. 9	31	24.00	2204.51	2197.51
BLM 9C	439	Mar. 14	30	24.11	2204.51	2198.62
BLM 9C	441	Mar. 16	30	23.79	2204.51	2198.30
BLM 9C	445	Mar. 20	30	23.63	2204.51	2198.14
BLM 9C	454	Mar. 29	30	23.85	2204.51	2198.36
BLM 9C	460	April 4	30	23.71	2204.51	2198.22
BLM 9C	466	April 10	30	24.43	2204.51	2198.94
BLM 9C	470	April 14	30	24.38	2204.51	2198.89
BLM 9C	473	April 17	30	24.80	2204.51	2199.31
BLM 9C	477	April 21	29	24.12	2204.51	2199.63
BLM 9C	480	April 24	29	23.82	2204.51	2199.33
BLM 9C	481	April 25	30	24.64	2204.51	2199.15
BLM 9C	494	May 8	29	24.07	2204.51	2199.58
BLM 9C	497	May 11	29	23.91	2204.51	2199.42
BLM 9C	501	May 15	30	24.18	2204.51	2198.69
BLM 9C	509	May 23	30	24.00	2204.51	2198.51
BLM 9C	518	June 1	30	24.10	2204.51	2198.61
BLM 9C	537	June 20	30	24.03	2204.51	2198.54

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 9D	261	Sept. 17	31	24.11	2203.44	2196.55
BLM 9D	279	Oct. 5	31	24.03	2203.44	2196.47
BLM 9D	344	Dec. 9	31	23.33	2204.47	2196.80
BLM 9D	351	Dec. 16	31	23.48	2204.47	2196.95
BLM 9D	356	Dec. 21	31	23.38	2204.47	2196.85
BLM 9D	363	Dec. 28	31	23.34	2204.47	2196.81
BLM 9D	370	Jan. 5	31	23.31	2204.47	2196.78
BLM 9D	378	Jan. 13	31	23.23	2204.47	2196.70
BLM 9D	383	Jan. 18	31	23.79	2204.47	2197.26
BLM 9D	393	Jan. 28	31	23.62	2204.47	2197.09
BLM 9D	394	Jan. 29	31	23.57	2204.47	2197.04
BLM 9D	395	Jan. 30	31	23.59	2204.47	2197.06
BLM 9D	396	Jan. 31	30	22.95	2204.47	2197.42
BLM 9D	397	Feb. 5	30	23.00	2204.47	2197.47
BLM 9D	402	Feb. 6	30	22.94	2204.47	2197.41
BLM 9D	404	Feb. 8	31	23.75	2204.47	2197.22
BLM 9D	406	Feb. 10	31	23.75	2204.47	2197.22
BLM 9D	410	Feb. 14	31	23.67	2204.47	2197.14
BLM 9D	412	Feb. 16	31	23.61	2204.47	2197.08
BLM 9D	419	Feb. 23	31	23.62	2204.47	2197.09
BLM 9D	424	Feb. 28	31	23.54	2204.47	2197.01
BLM 9D	431	Mar. 6	31	23.64	2204.47	2197.11
BLM 9D	434	Mar. 9	31	23.92	2204.47	2197.39
BLM 9D	439	Mar. 14	30	24.20	2204.47	2198.67
BLM 9D	441	Mar. 16	30	23.71	2204.47	2198.18
BLM 9D	445	Mar. 20	30	23.52	2204.47	2197.99
BLM 9D	454	Mar. 29	30	23.76	2204.47	2198.23
BLM 9D	460	April 4	30	23.61	2204.47	2198.08
BLM 9D	466	April 10	30	24.35	2204.47	2198.82
BLM 9D	470	April 14	30	24.31	2204.47	2198.78
BLM 9D	473	April 17	30	24.72	2204.47	2199.19
BLM 9D	477	April 21	29	24.07	2204.47	2199.54
BLM 9D	480	April 24	29	23.74	2204.47	2199.21
BLM 9D	481	April 25	30	24.55	2204.47	2199.02
BLM 9D	494	May 8	30	25.16	2204.47	2199.63
BLM 9D	497	May 11	29	23.83	2204.47	2199.30
BLM 9D	501	May 15	30	24.09	2204.47	2198.56
BLM 9D	509	May 23	30	23.94	2204.47	2198.41
BLM 9D	518	June 1	30	24.01	2204.47	2198.48
BLM 9D	537	June 20	30	23.96	2204.47	2198.43

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 10C	261	Sept. 17	30	23.05	2201.99	2195.04
BLM 10C	279	Oct. 5	30	23.01	2201.99	2195.00
BLM 10C	344	Dec. 9	30	22.98	2202.20	2195.18
BLM 10C	351	Dec. 16	30	23.06	2202.20	2195.26
BLM 10C	356	Dec. 21	30	22.90	2202.20	2195.10
BLM 10C	363	Dec. 28	30	22.99	2202.20	2195.19
BLM 10C	370	Jan. 5	30	22.93	2202.20	2195.13
BLM 10C	378	Jan. 13	30	22.86	2202.20	2195.06
BLM 10C	383	Jan. 18	30	23.30	2202.20	2195.50
BLM 10C	392	Jan. 27	30	23.17	2202.20	2195.37
BLM 10C	393	Jan. 28	30	23.15	2202.20	2195.35
BLM 10C	394	Jan. 29	30	23.14	2202.20	2195.34
BLM 10C	395	Jan. 30	30	23.05	2202.20	2195.25
BLM 10C	396	Jan. 31	30	23.34	2202.20	2195.54
BLM 10C	397	Feb. 1	30	23.31	2202.20	2195.51
BLM 10C	401	Feb. 5	30	23.27	2202.20	2195.47
BLM 10C	402	Feb. 6	30	23.20	2202.20	2195.40
BLM 10C	404	Feb. 8	30	23.05	2202.20	2195.25
BLM 10C	405	Feb. 9	30	23.05	2202.20	2195.25
BLM 10C	406	Feb.10	30	23.01	2202.20	2195.21
BLM 10C	410	Feb. 14	30	23.00	2202.20	2195.20
BLM 10C	412	Feb. 16	31	23.93	2202.20	2195.13
BLM 10C	419	Feb. 23	30	23.07	2202.20	2195.27
BLM 10C	424	Feb. 28	31	23.92	2202.20	2195.12
BLM 10C	431	Mar. 6	31	24.05	2202.20	2195.25
BLM 10C	434	Mar. 9	30	23.22	2202.20	2195.42
BLM 10C	439	Mar. 14	30	24.03	2202.20	2196.23
BLM 10C	441	Mar. 16	30	23.68	2202.20	2195.88
BLM 10C	445	Mar. 20	30	23.55	2202.20	2195.75
BLM 10C	454	Mar. 29	30	23.82	2202.20	2196.02
BLM 10C	460	April 4	30	23.63	2202.20	2195.83
BLM 10C	466	April 10	30	24.35	2202.20	2196.55
BLM 10C	470	April 14	30	24.04	2202.20	2196.24
BLM 10C	473	April 17	30	24.82	2202.20	2197.02
BLM 10C	477	April 21	29	24.32	2202.20	2197.52
BLM 10C	480	April 24	29	23.76	2202.20	2196.96
BLM 10C	481	April 25	30	24.61	2202.20	2196.81
BLM 10C	494	May 8	29	24.22	2202.20	2197.42
BLM 10C	497	May 11	29	23.92	2202.20	2197.12
BLM 10C	501	May 15	30	24.17	2202.20	2196.37
BLM 10C	509	May 23	30	24.07	2202.20	2196.27
BLM 10C	518	June 1	30	24.15	2202.20	2196.35
BLM 10C	537	June 20	30	24.08	2202.20	2196.28

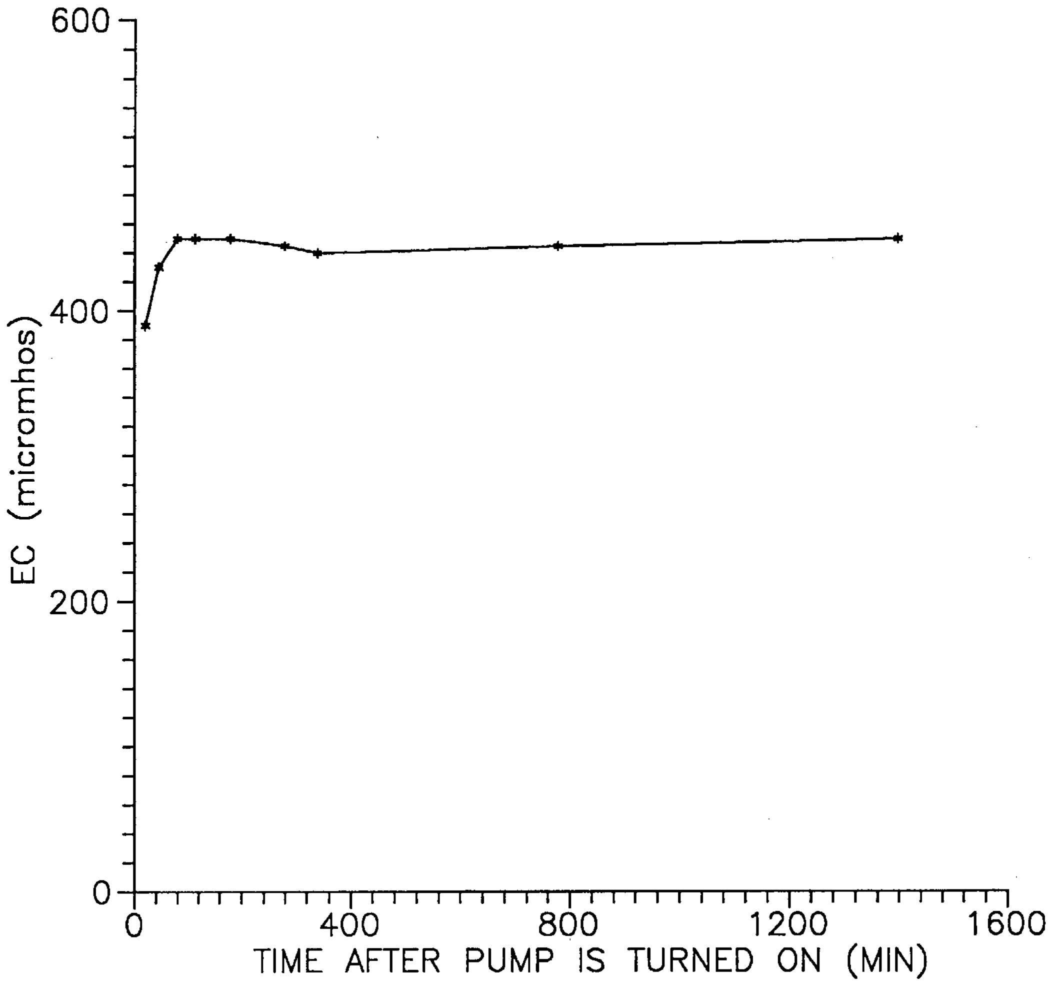
WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM 10D	261	Sept. 17	30	23.10	2201.94	2195.04
BLM 10D	279	Oct. 5	30	23.05	2201.94	2194.99
BLM 10D	344	Dec. 9	30	22.93	2202.26	2195.19
BLM 10D	351	Dec. 16	30	23.04	2202.26	2195.30
BLM 10D	356	Dec. 21	30	22.95	2202.26	2195.21
BLM 10D	363	Dec. 28	30	22.98	2202.26	2195.24
BLM 10D	370	Jan. 5	30	22.92	2202.26	2195.18
BLM 10D	378	Jan. 13	30	22.86	2202.26	2195.12
BLM 10D	383	Jan. 18	30	23.22	2202.26	2195.48
BLM 10D	392	Jan. 27	30	23.09	2202.26	2195.35
BLM 10D	393	Jan. 28	30	23.04	2202.26	2195.30
BLM 10D	394	Jan. 29	30	23.04	2202.26	2195.30
BLM 10D	395	Jan. 30	30	23.04	2202.26	2195.30
BLM 10D	396	Jan. 31	30	23.27	2202.26	2195.53
BLM 10D	397	Feb. 1	30	23.27	2202.26	2195.53
BLM 10D	401	Feb. 5	30	23.31	2202.26	2195.57
BLM 10D	402	Feb. 6	30	23.24	2202.26	2195.50
BLM 10D	404	Feb. 8	30	23.09	2202.26	2195.35
BLM 10D	405	Feb. 9	30	23.08	2202.26	2195.34
BLM 10D	406	Feb.10	30	23.06	2202.26	2195.32
BLM 10D	410	Feb. 14	30	23.04	2202.26	2195.30
BLM 10D	412	Feb. 16	30	23.01	2202.26	2195.27
BLM 10D	419	Feb. 23	30	23.06	2202.26	2195.32
BLM 10D	424	Feb. 28	30	22.99	2202.26	2195.25
BLM 10D	431	Mar. 6	31	24.11	2202.26	2195.37
BLM 10D	434	Mar. 9	30	23.26	2202.26	2195.52
BLM 10D	439	Mar. 14	30	24.06	2202.26	2196.32
BLM 10D	441	Mar. 16	30	23.71	2202.26	2195.97
BLM 10D	445	Mar. 20	30	23.57	2202.26	2195.83
BLM 10D	454	Mar. 29	30	23.85	2202.26	2196.11
BLM 10D	460	April 4	30	23.65	2202.26	2195.91
BLM 10D	466	April 10	30	24.40	2202.26	2196.66
BLM 10D	470	April 14	30	24.51	2202.26	2196.77
BLM 10D	473	April 17	30	24.87	2202.26	2197.13
BLM 10D	477	April 21	30	25.38	2202.26	2197.64
BLM 10D	480	April 24	29	23.86	2202.26	2197.12
BLM 10D	481	April 25	30	24.66	2202.26	2196.92
BLM 10D	494	May 8	30	25.30	2202.26	2197.56
BLM 10D	497	May 11	29	23.98	2202.26	2197.24
BLM 10D	501	May 15	29	23.25	2202.26	2196.51
BLM 10D	509	May 23	30	24.14	2202.26	2196.40
BLM 10D	518	June 1	30	24.19	2202.26	2196.45
BLM 10D	537	June 20	30	24.15	2202.26	2196.41

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
BLM PW	261	Sept. 17	31	23.14	2204.64	2196.78
BLM PW	279	Oct. 5	31	23.06	2204.64	2196.70
BLM PW	344	Dec. 9	32	23.79	2205.23	2197.02
BLM PW	351	Dec. 16	32	23.98	2205.23	2197.21
BLM PW	356	Dec. 21	32	23.95	2205.23	2197.18
BLM PW	363	Dec. 28	32	23.84	2205.23	2197.07
BLM PW	370	Jan. 5	32	23.75	2205.23	2196.98
BLM PW	378	Jan. 13	32	23.69	2205.23	2196.92
BLM PW	383	Jan. 18	32	24.23	2205.23	2197.46
BLM PW	392	Jan. 27	32	24.17	2205.23	2197.40
BLM PW	405	Feb. 9	31	23.29	2205.23	2197.52
BLM PW	412	Feb. 16	31	23.08	2205.23	2197.31
BLM PW	419	Feb. 23	32	24.09	2205.23	2197.32
BLM PW	439	Mar. 14	30	23.56	2205.23	2198.79
BLM PW	441	Mar. 16	30	23.26	2205.23	2198.49
BLM PW	445	Mar. 20	30	23.08	2205.23	2198.31
BLM PW	454	Mar. 29	30	23.30	2205.23	2198.53
BLM PW	460	April 4	30	23.18	2205.23	2198.41
BLM PW	466	April 10	31	24.90	2205.23	2199.13
BLM PW	470	April 14	29	22.81	2205.23	2199.04
BLM PW	473	April 17	29	23.24	2205.23	2199.47
BLM PW	477	April 21	30	23.53	2205.23	2198.76
BLM PW	480	April 24	29	23.29	2205.23	2199.52
BLM PW	481	May 8	29	23.50	2205.23	2199.73
BLM PW	494	May 11	29	23.36	2205.23	2199.59
BLM PW	501	May 15	30	23.63	2205.23	2198.86
BLM PW	509	May 23	30	23.45	2205.23	2198.68
BLM PW	518	June 1	30	23.54	2205.23	2198.77

WELL	JULIAN DATE	DATE	HOLD	WATER LEVEL	M.P. ELEV.	W.L. ELEV.
Type B	261	Dec. 9	31	23.76	2204.17	2196.93
Type B	279	Dec. 16	31	23.96	2204.17	2197.13
Type B	344	Dec. 21	31	23.83	2204.31	2197.14
Type B	351	Dec. 28	31	23.80	2204.31	2197.11
Type B	356	Jan. 5	31	23.76	2204.31	2197.07
Type B	363	Jan. 13	31	23.68	2204.31	2196.99
Type B	370	Jan. 18	31	24.22	2204.31	2197.53
Type B	378	Jan. 27	31	24.19	2204.31	2197.50
Type B	383	Jan. 30	31	24.11	2204.31	2197.42
Type B	392	Feb. 6	30	23.50	2204.31	2197.81
Type B	405	Feb. 9	31	24.32	2204.31	2197.63
Type B	410	Feb. 14	31	24.23	2204.31	2197.54
Type B	412	Feb. 16	31	24.15	2204.31	2197.46
Type B	419	Feb. 23	31	24.13	2204.31	2197.44
Type B	439	Mar. 14	30	24.61	2204.31	2198.92
Type B	441	Mar. 16	30	24.30	2204.31	2198.61
Type B	445	Mar. 20	30	24.13	2204.31	2198.44
Type B	454	Mar. 29	30	24.32	2204.31	2198.63
Type B	460	April 4	29	23.22	2204.31	2198.53
Type B	466	April 10	29	23.92	2204.31	2199.23
Type B	470	April 14	30	24.81	2204.31	2199.12
Type B	473	April 17	29	24.22	2204.31	2199.53
Type B	477	April 21	29	25.24	2204.31	2200.55
Type B	480	April 24	28	23.28	2204.31	2199.59
Type B	481	May 8	29	24.47	2204.31	2199.78
Type B	494	May 11	29	24.34	2204.31	2199.65
Type B	501	May 15	29	23.68	2204.31	2198.99
Type B	509	May 23	30	24.45	2204.31	2198.76
Type B	518	June 1	30	24.56	2204.31	2198.87

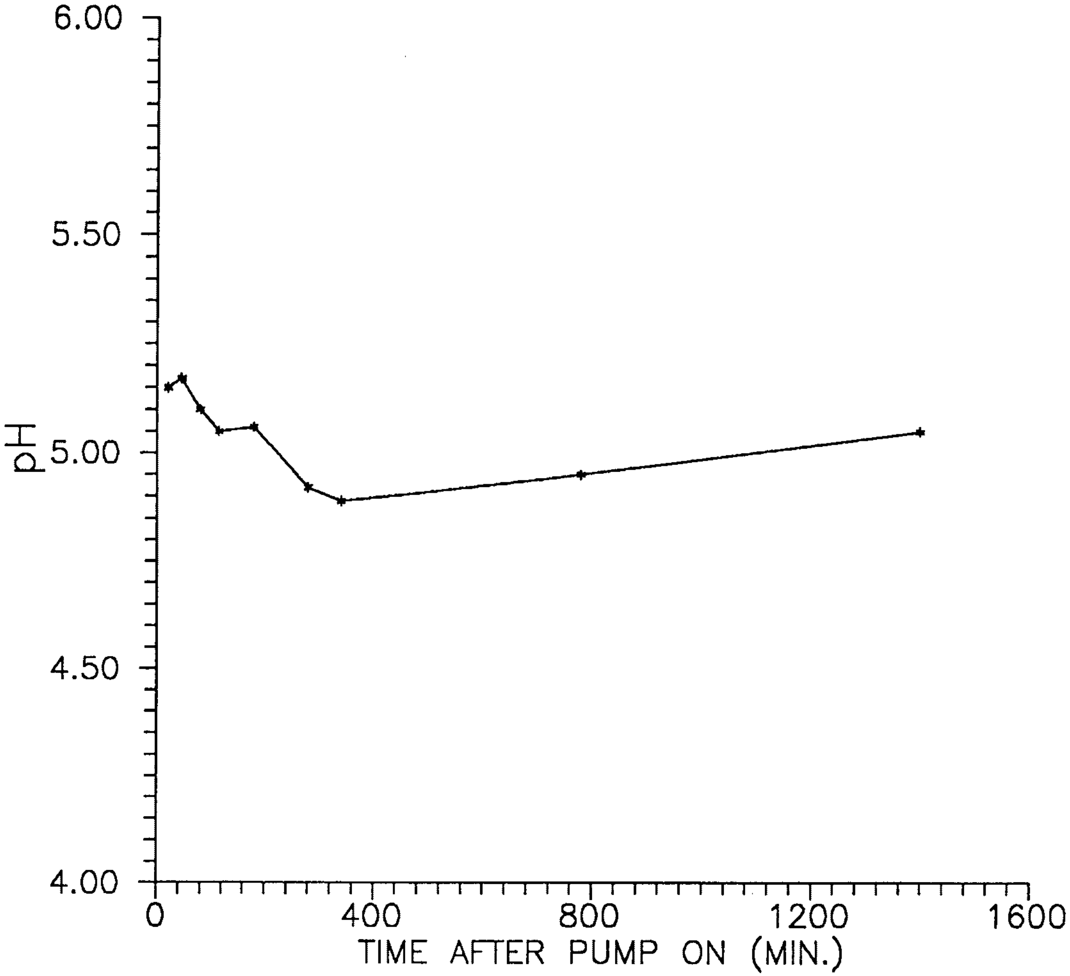
APPENDIX 3

GRAPHS OF WATER QUALITY VERSUS TIME DURING THE FEBRUARY 7, 1989 AQUIFER TEST

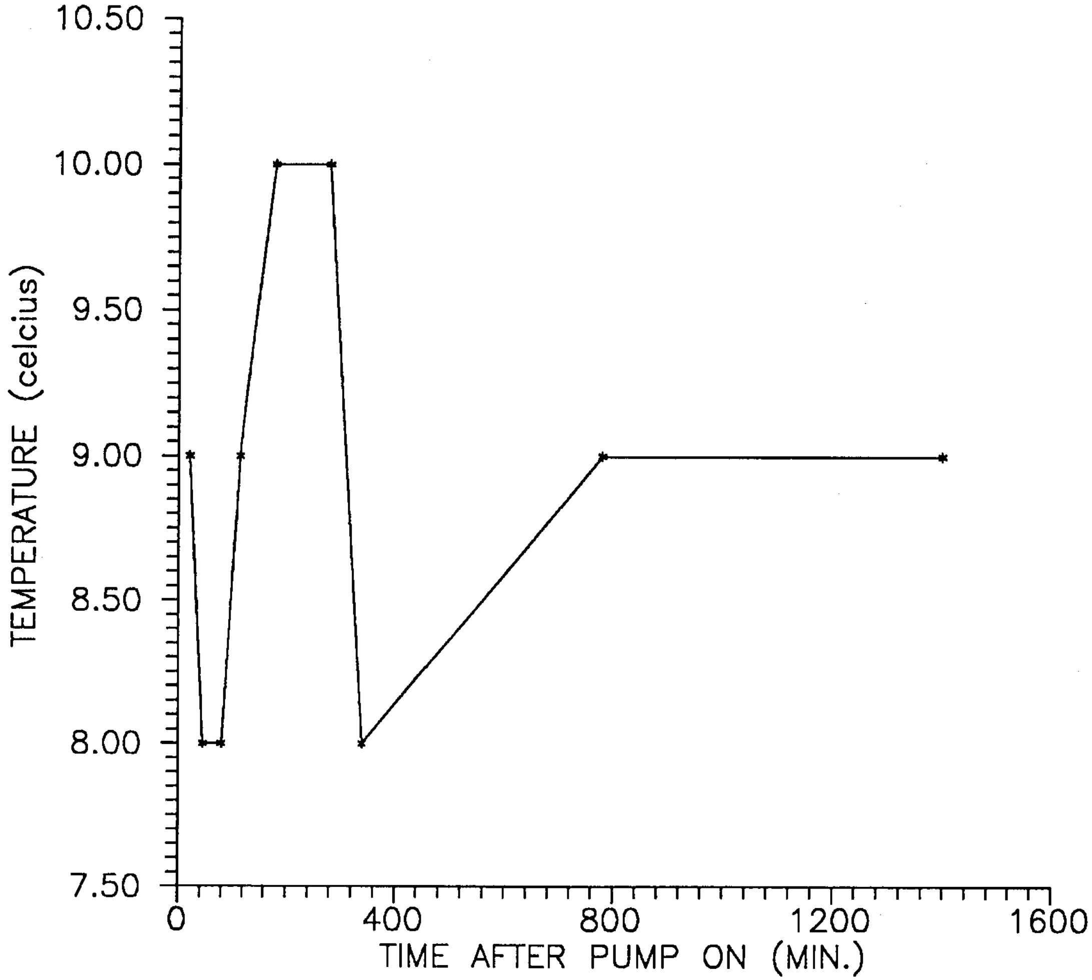


Water quality variation in upper aquifer pumping well during pumping test of Feb.7,1989.

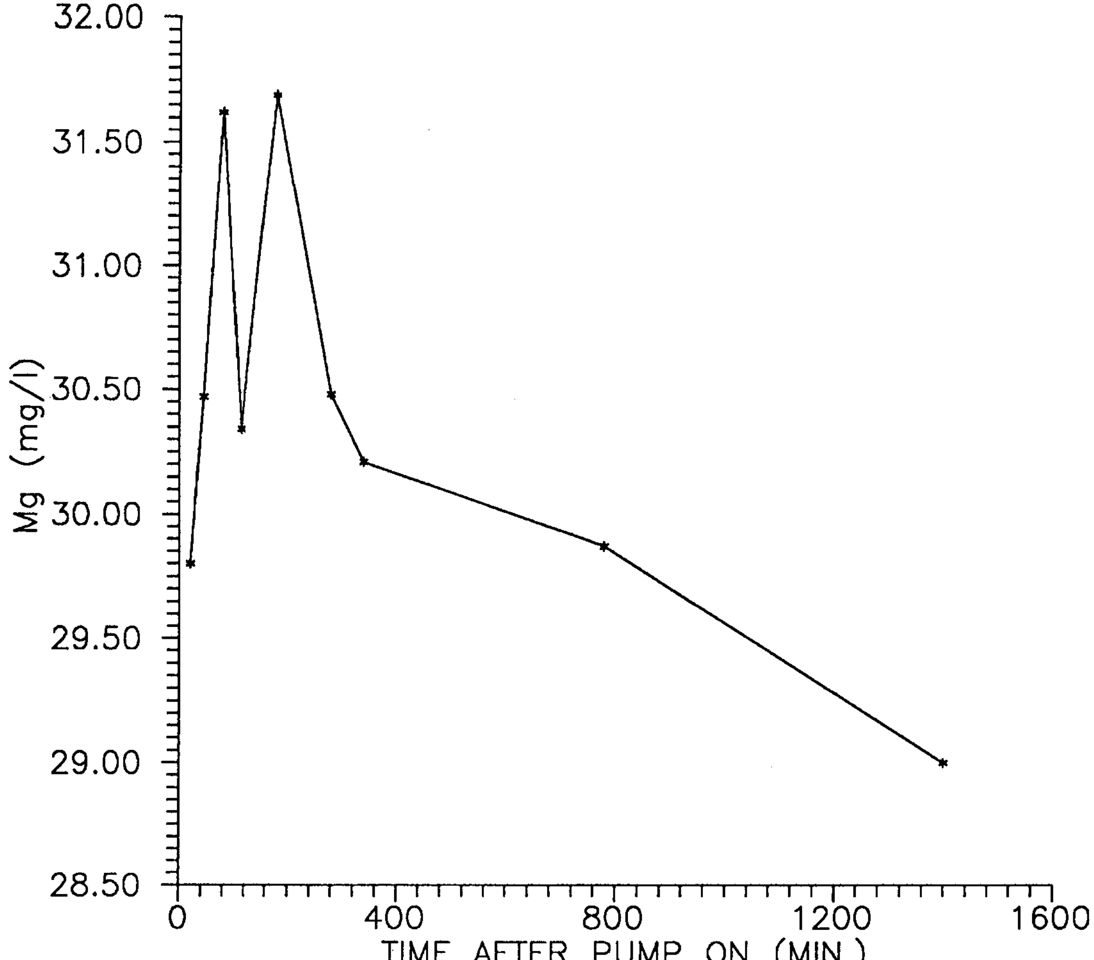
Ground water discharge from spring...390 micromhos
Surface runoff from snowmelt and
rainfall event.......................28 micromhos



Water quality variation in upper aquifer pumping well during pumping test of Feb. 7, 1989.

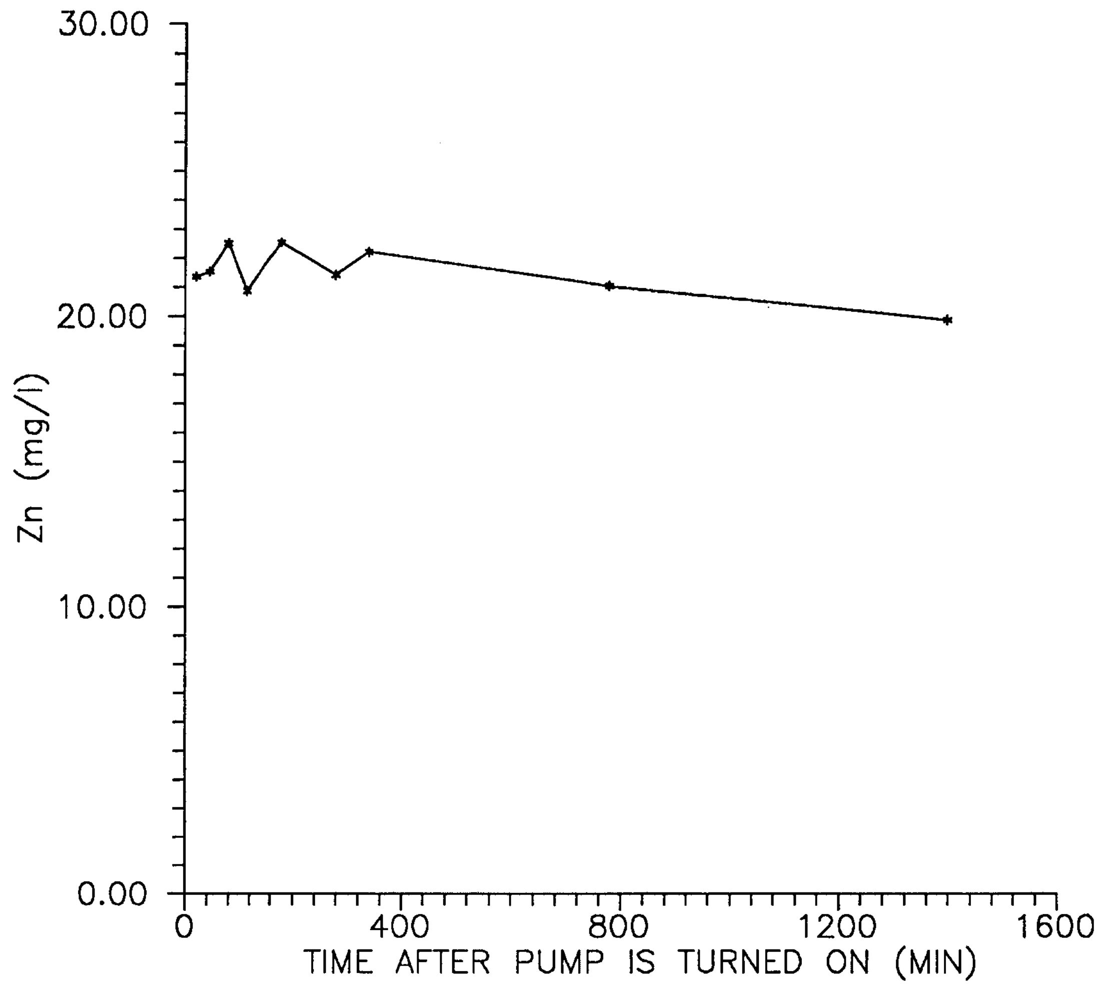


Water quality variation in upper aquifer pumping well during pumping test of Feb. 7, 1989.



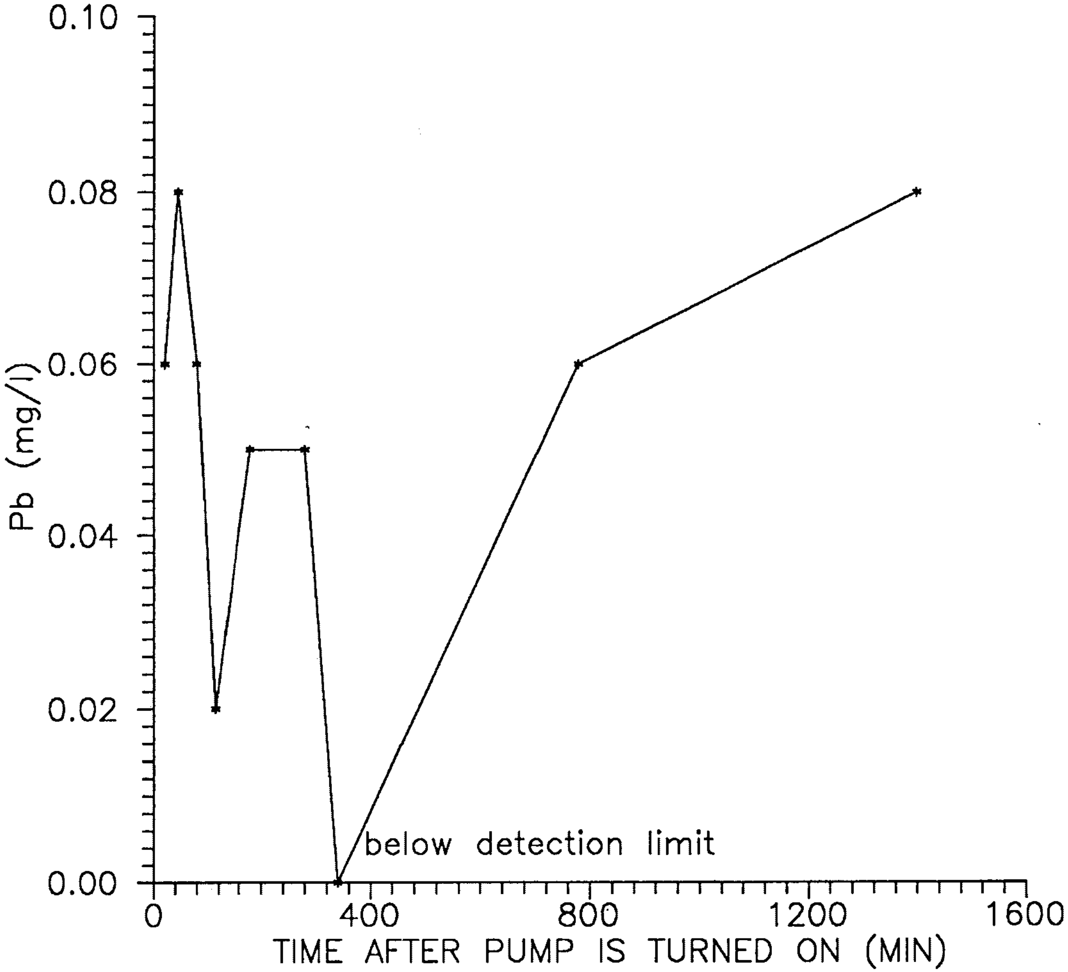
Water quality variation in upper aquifer pumping well during pumping test of Feb. 7, 1989.

Ground water discharge from spring....26.13 mg/l Mg
Surface runoff from snowmelt and
rainfall event.......................0.74 mg/l Mg



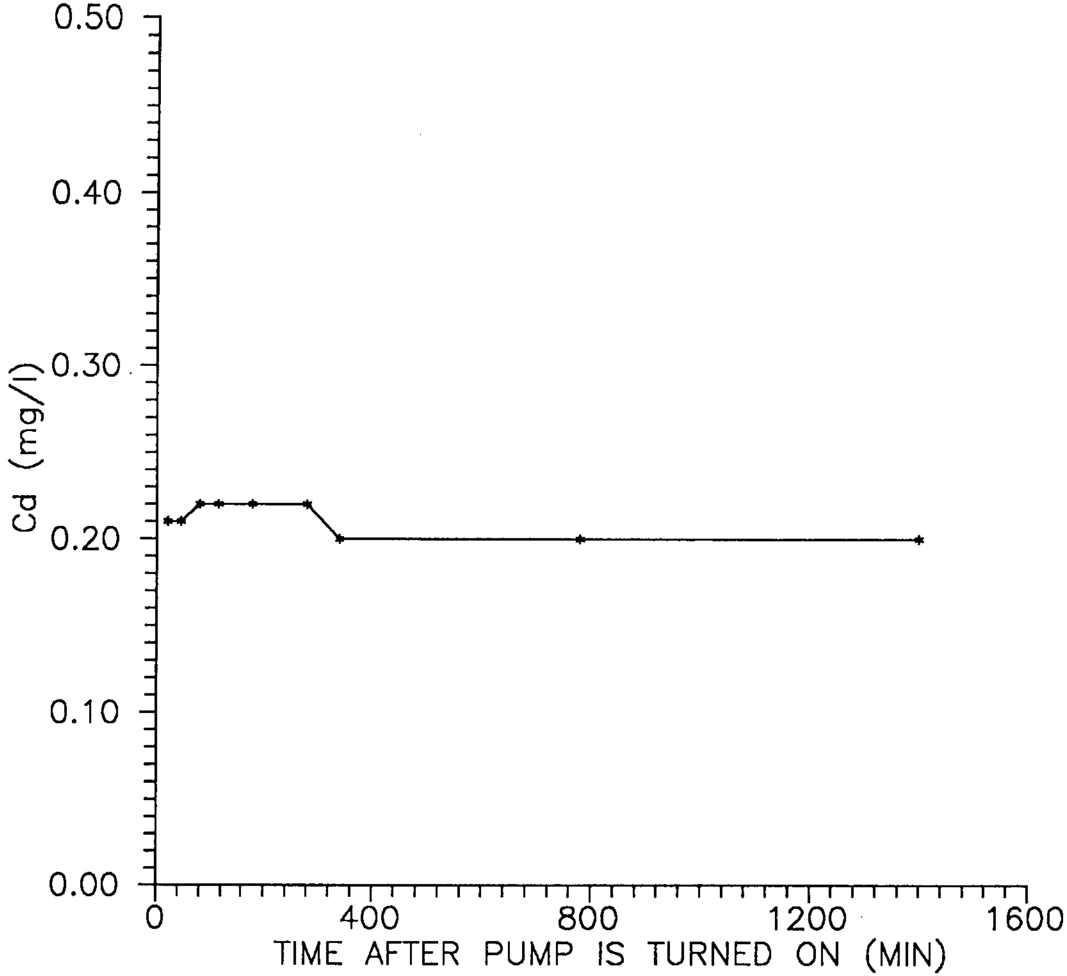
Water quality variation in upper aquifer pumping well during pumping test of Feb. 7, 1989.

Ground water discharge from spring...15.82 mg/l
Surface runoff from snowmelt and
rainfall event.......................1.29 mg/l



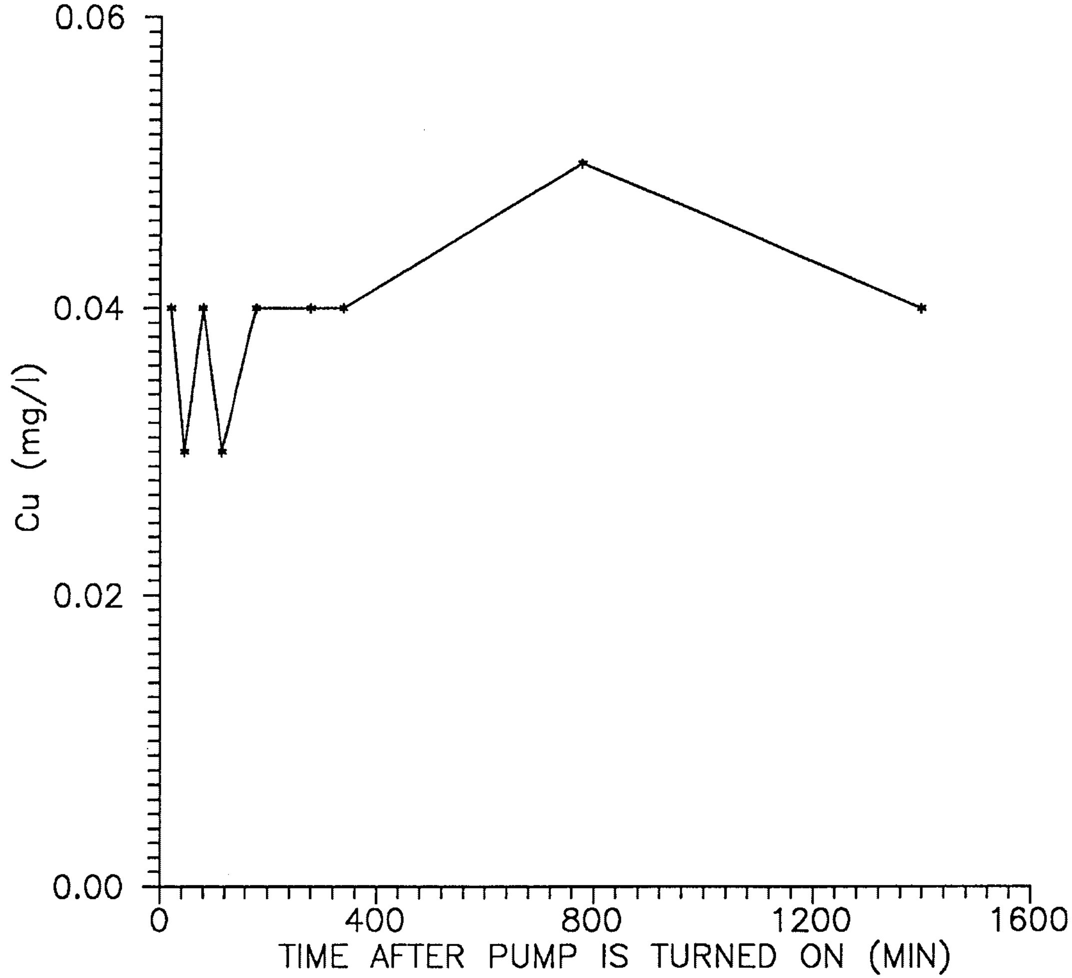
Water quality variation in upper aquifer pumping well during pumping test of Feb.7,1989.

Ground water discharge from spring...0.06 mg/l Pb
Surface runoff from snowmelt and
rainfall event......................0.03 mg/l Pb



Water quality variation in upper aquifer pumping well during pumping test of Feb.7,1989.

Ground water discharge from spring...0.12 mg/l Cd
Surface runoff from snowmelt and
rainfall event......................0.03 mg/l Cd

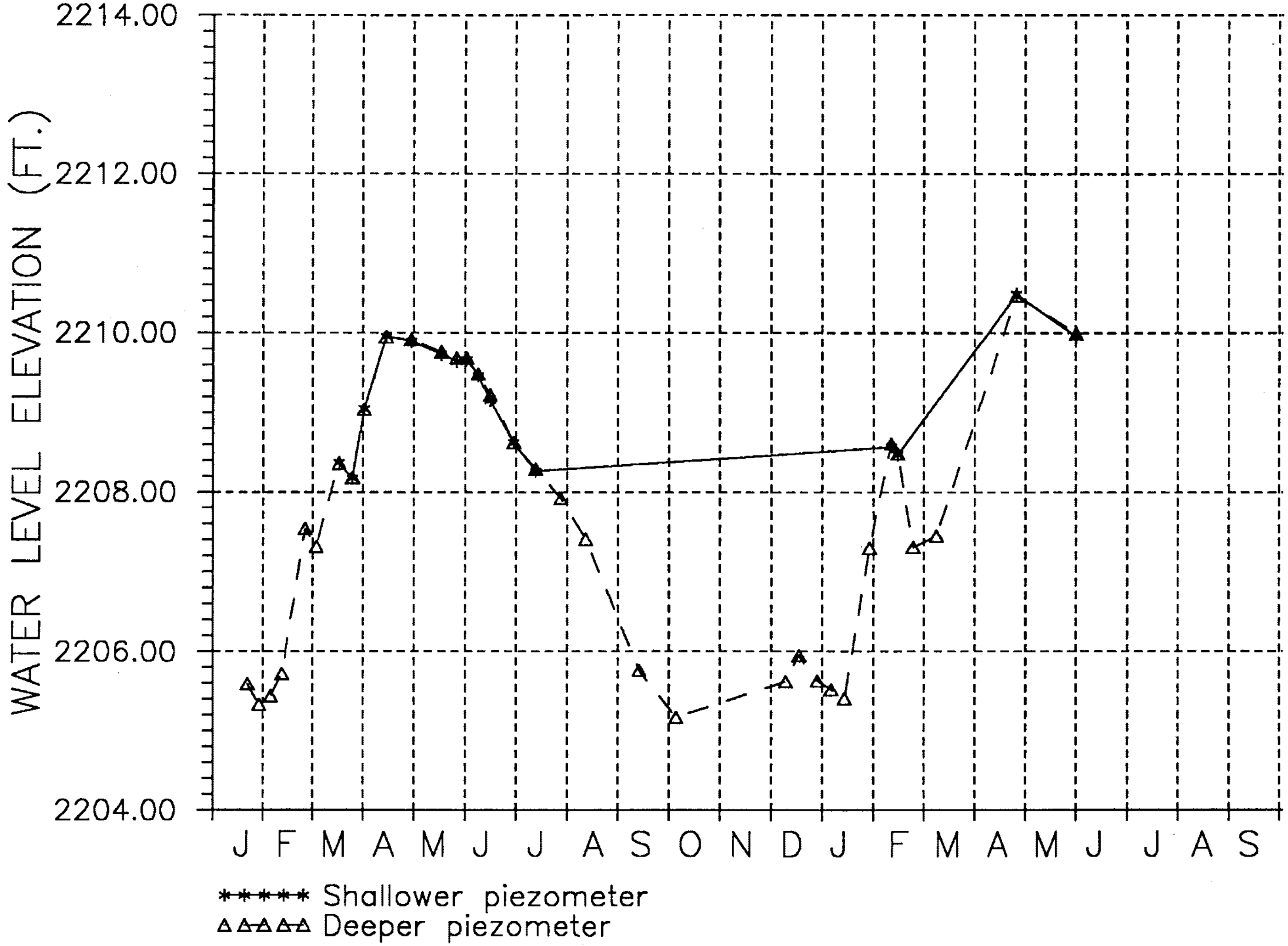


Water quality variation in upper aquifer pumping well during pumping test of Feb.7,1989.

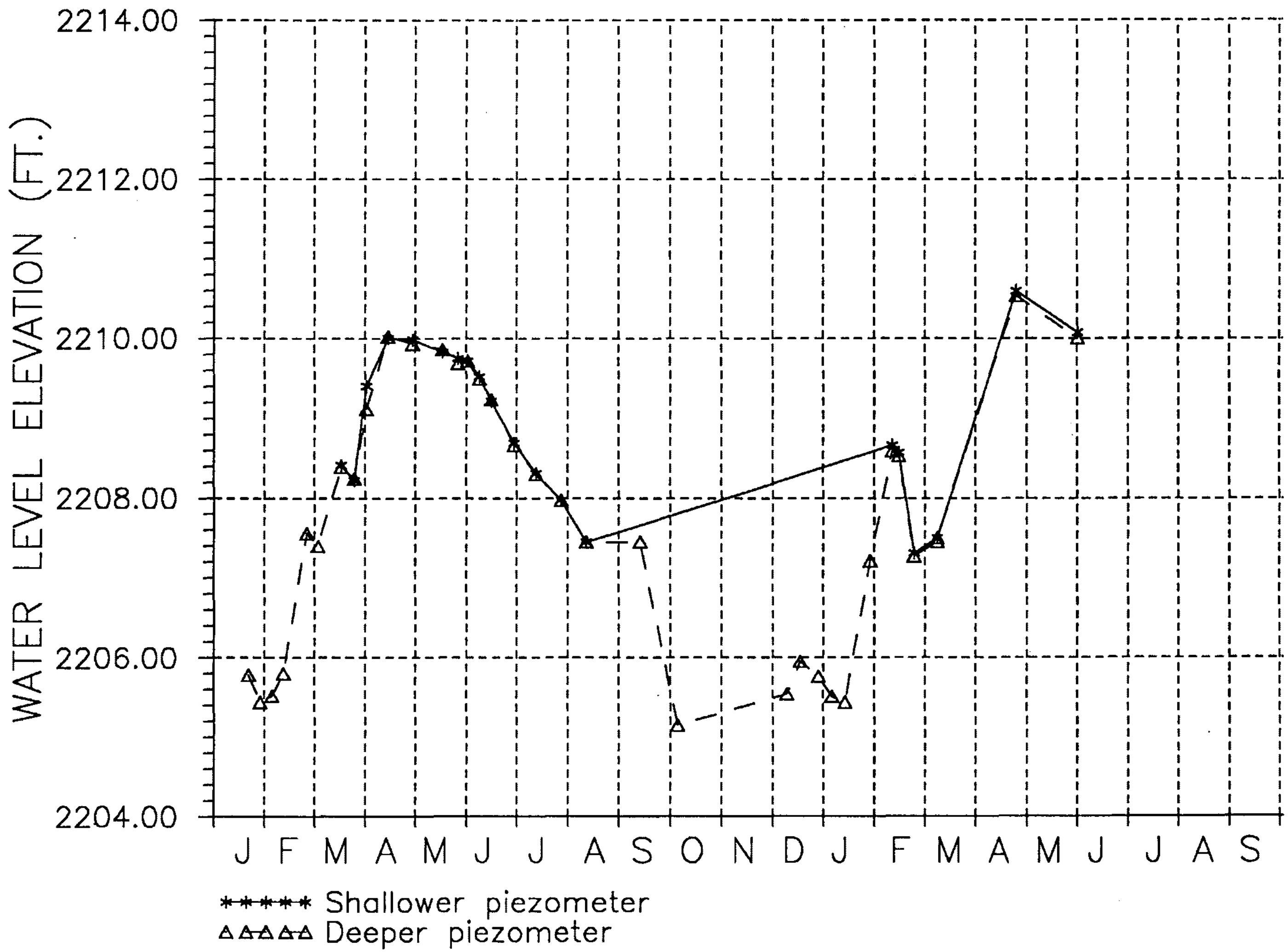
Ground water discharge from spring...0.03 mg/l Cu
Surface runoff from snowmelt and
rainfall event......................0.05 mg/l Cu

APPENDIX 4

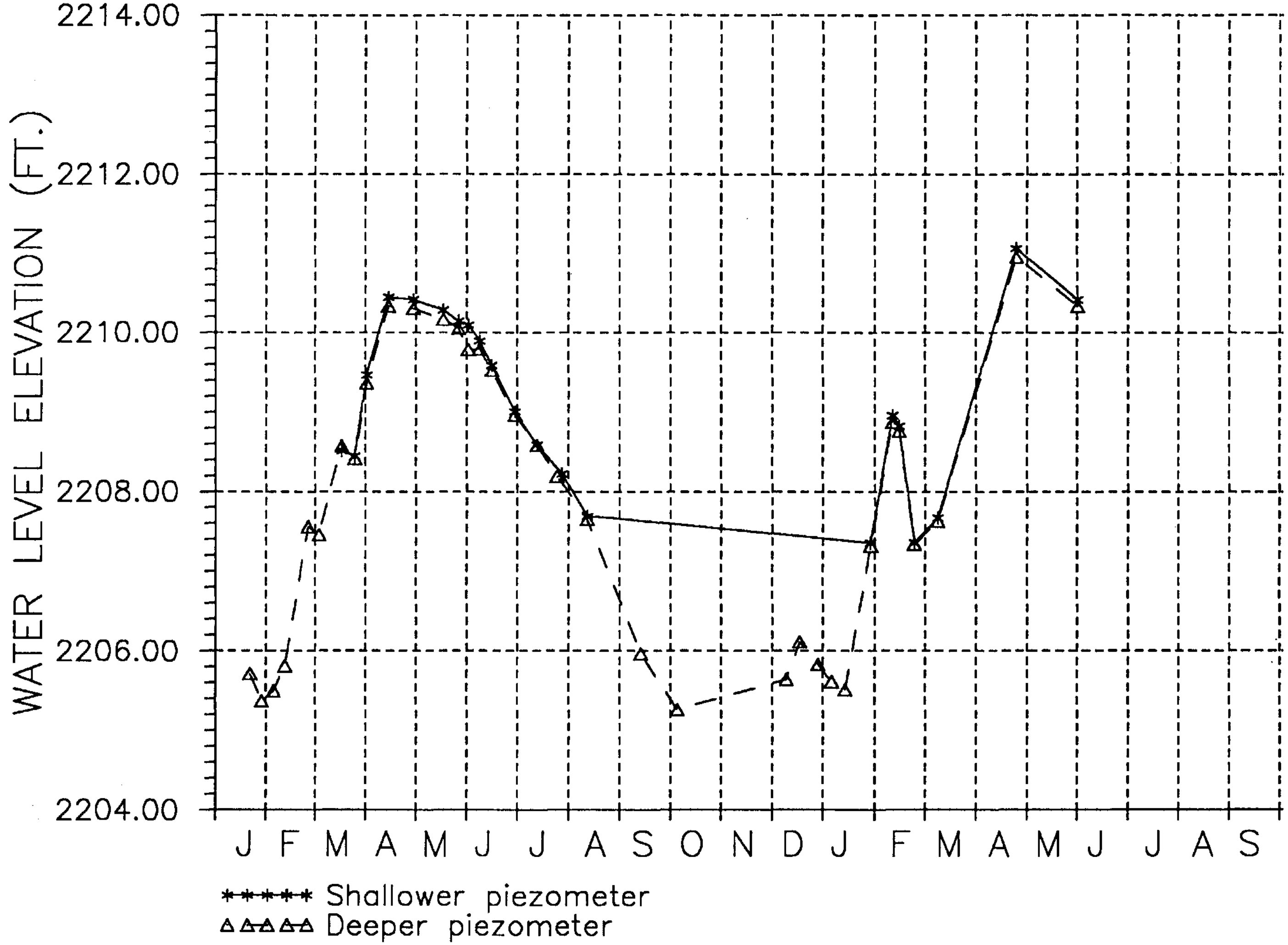
HYDROGRAPHS



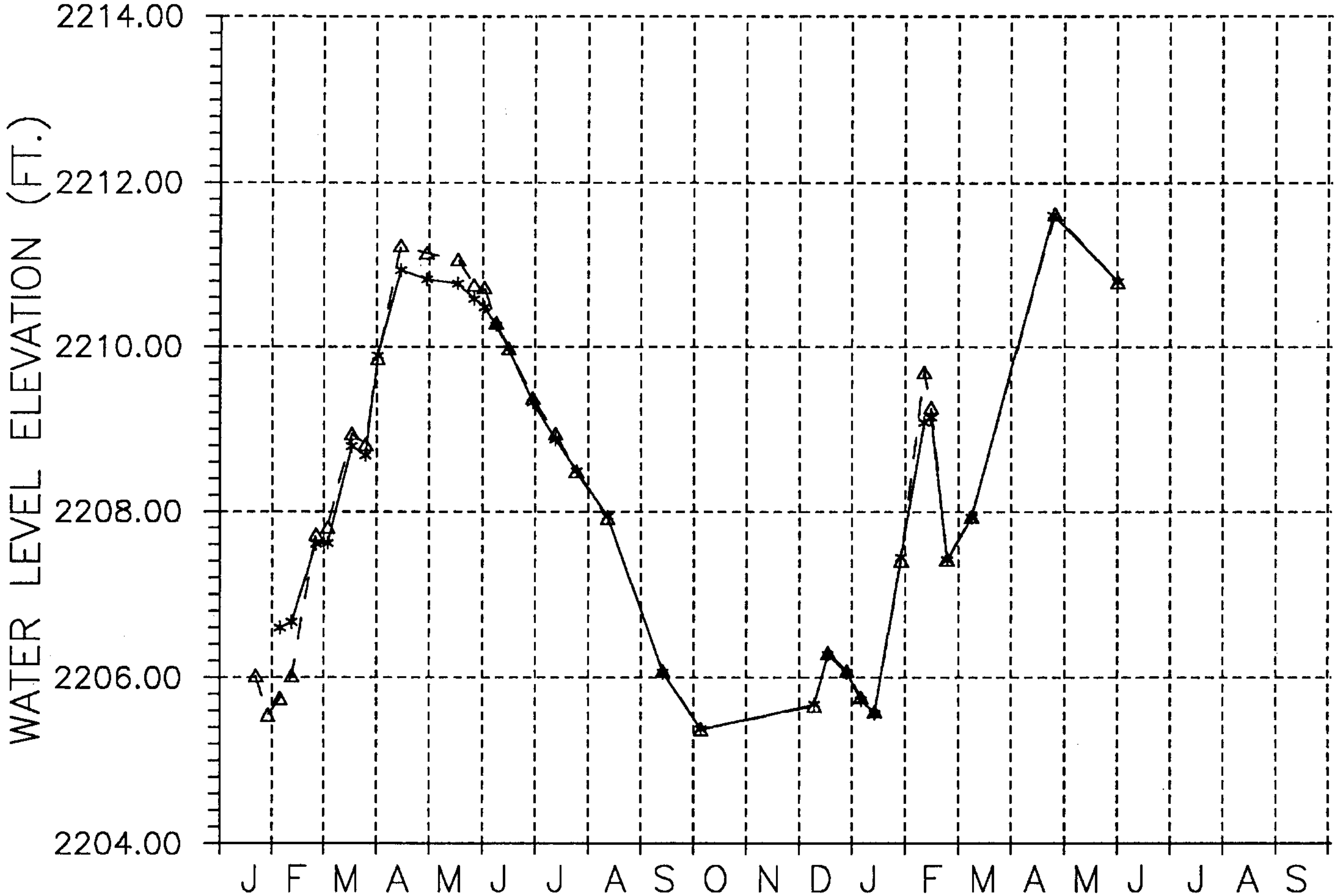
Water level elevations at piezometer location X1 from January, 1988 to September, 1989.



Water level elevations at piezometer location X2 from January, 1988 to September, 1989.

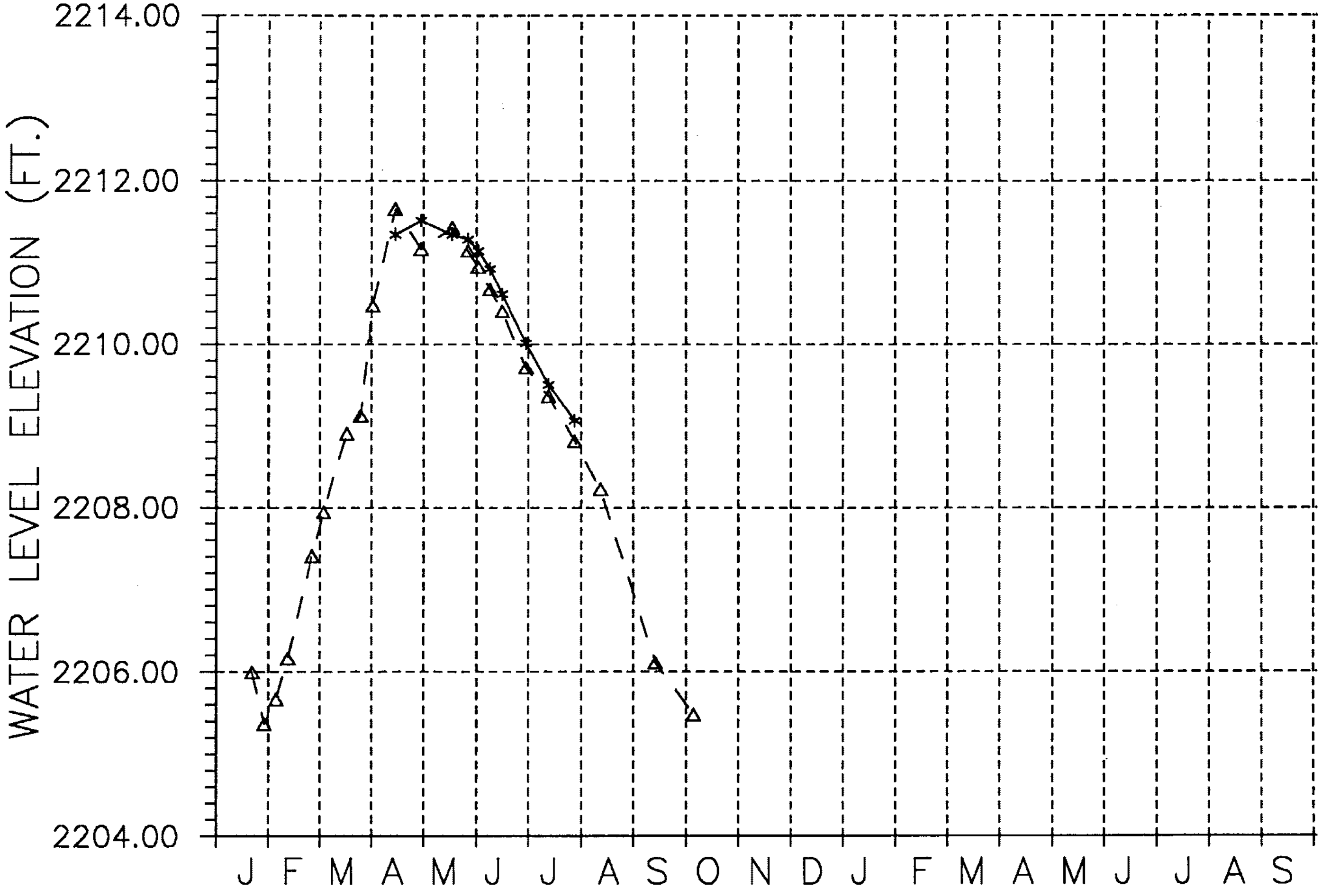


Water level elevations at piezometer location X3 from January, 1988 to September, 1989.



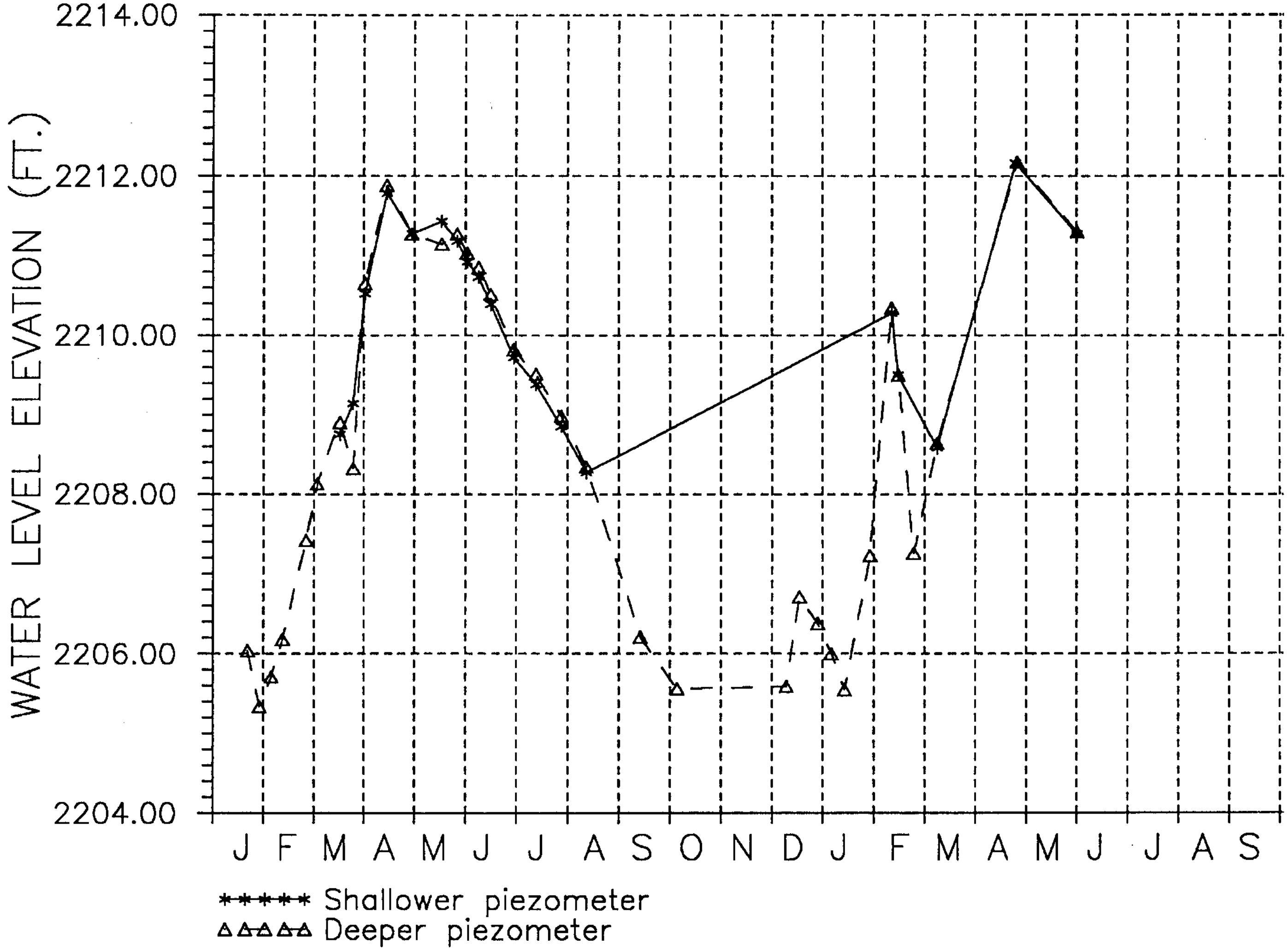
***** Shallower piezometer
ΔΔΔΔΔ Deeper piezometer

Water level elevations at piezometer location X4 from January, 1988 to September, 1989.

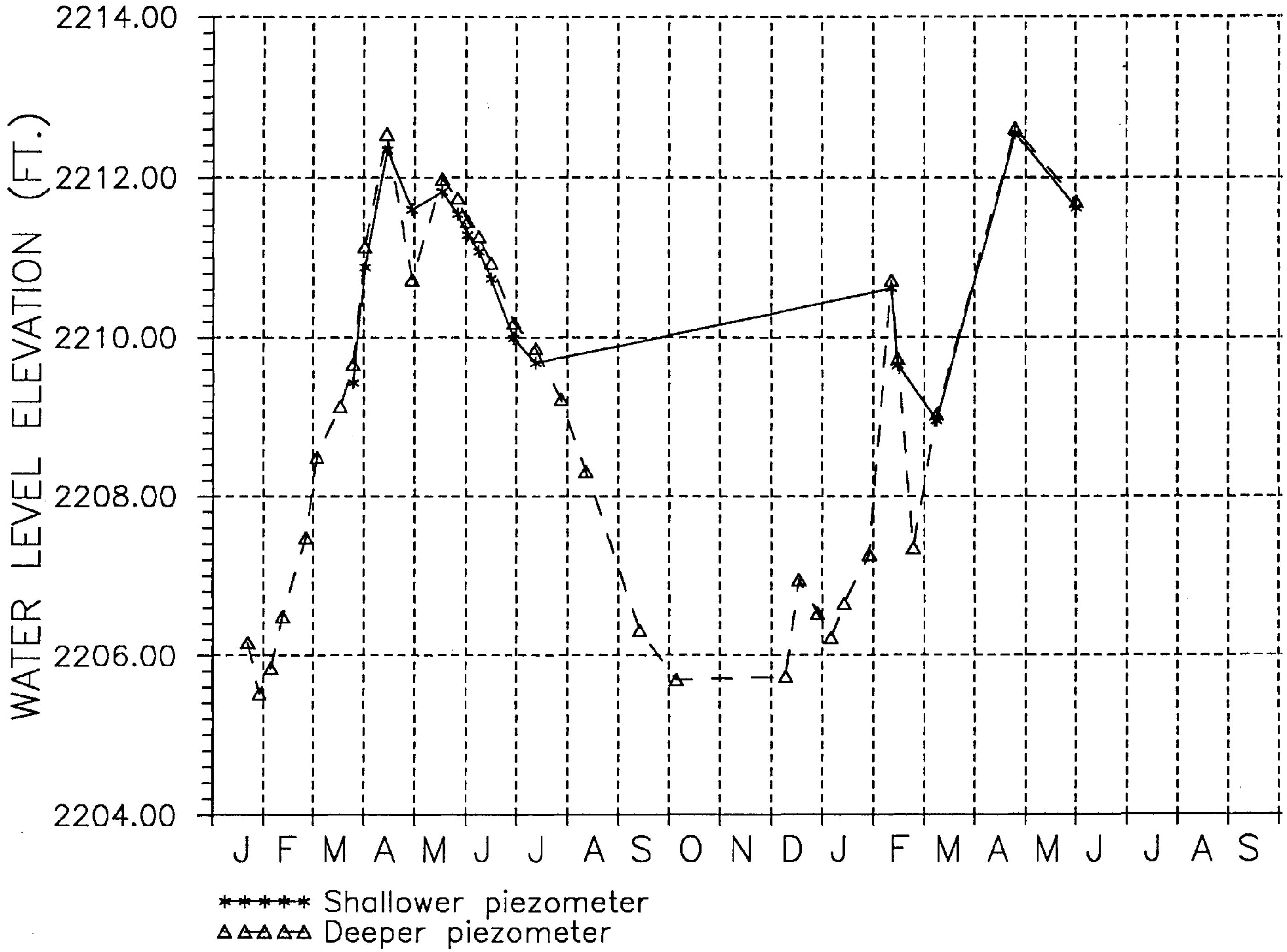


***** Shallower piezometer
ΔΔΔΔΔ Deeper piezometer

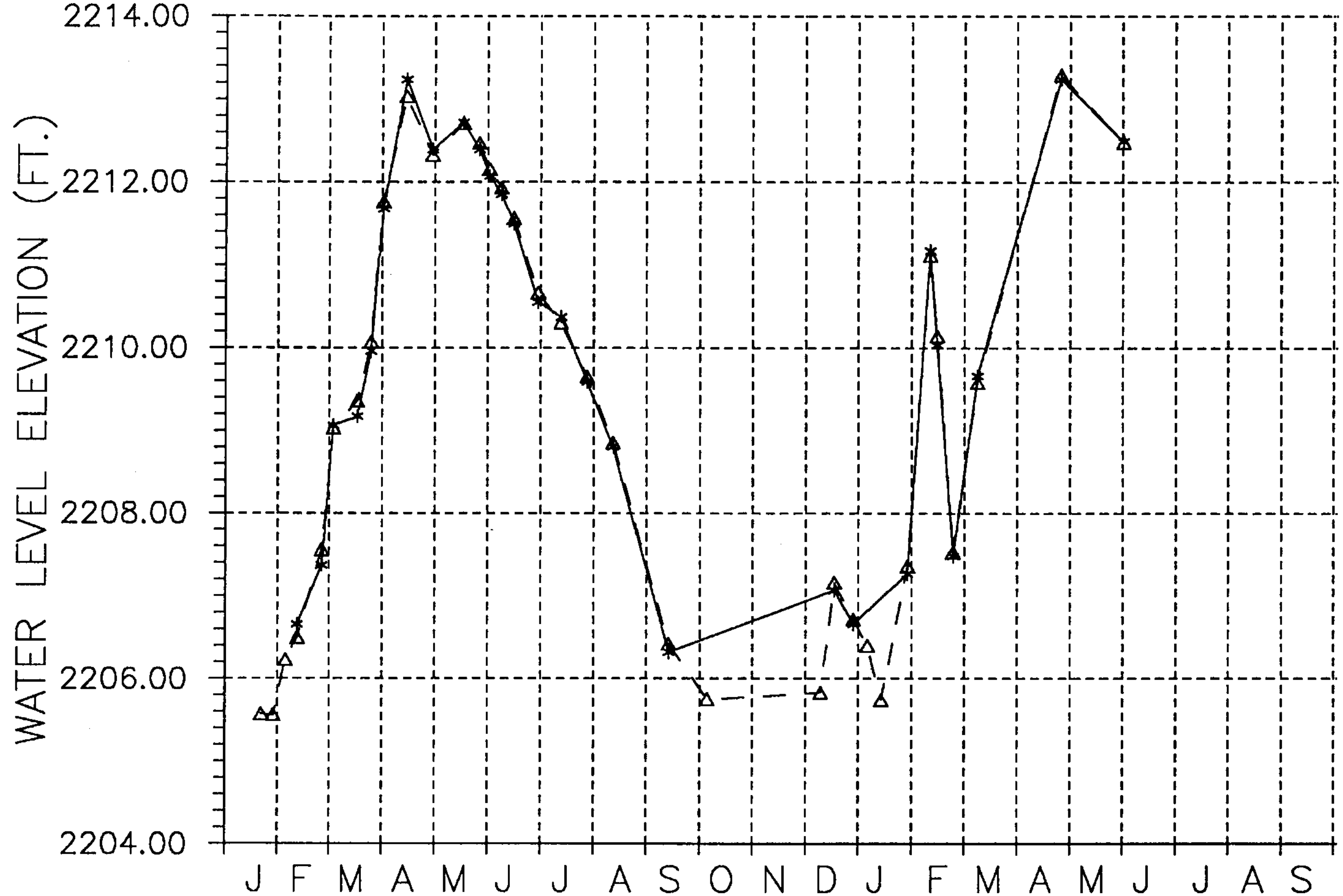
Water level elevations at piezometer location X6 from January, 1988 to September, 1989.



Water level elevations at piezometer location X7 from January, 1988 to September, 1989.

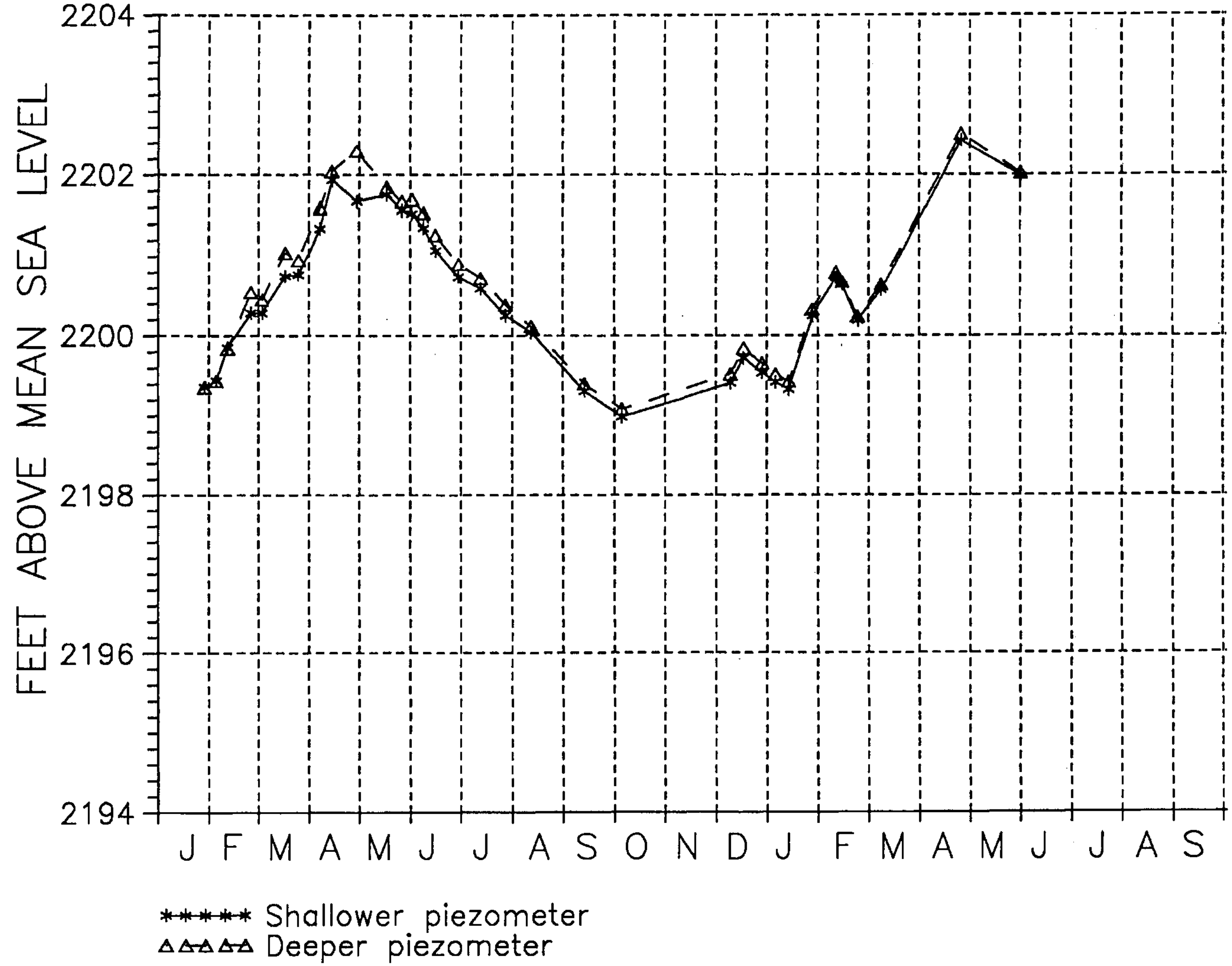


Water level elevations at piezometer location X8 from January, 1988 to September, 1989.

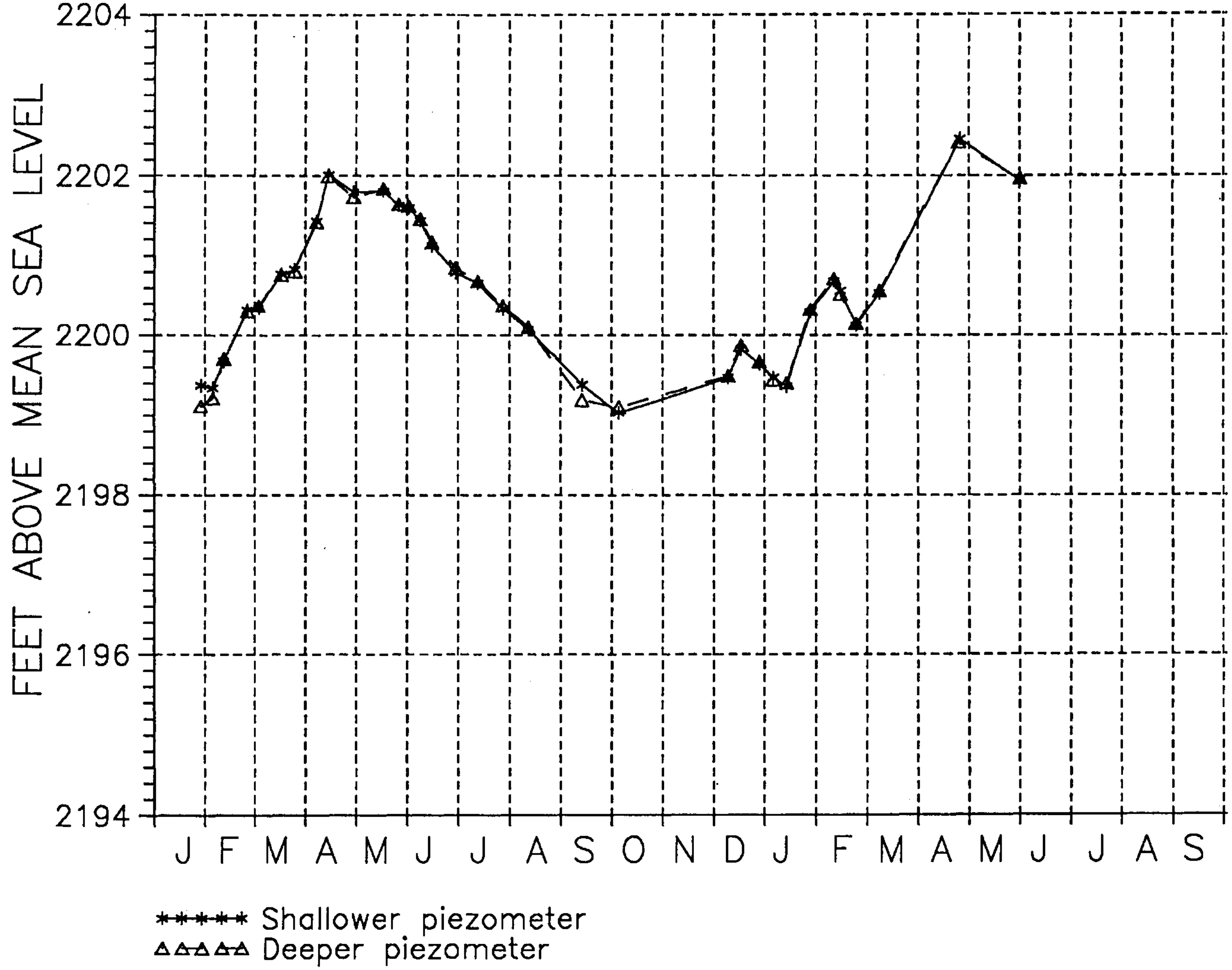


***** Shallower piezometer
ΔΔΔΔΔ Deeper piezometer

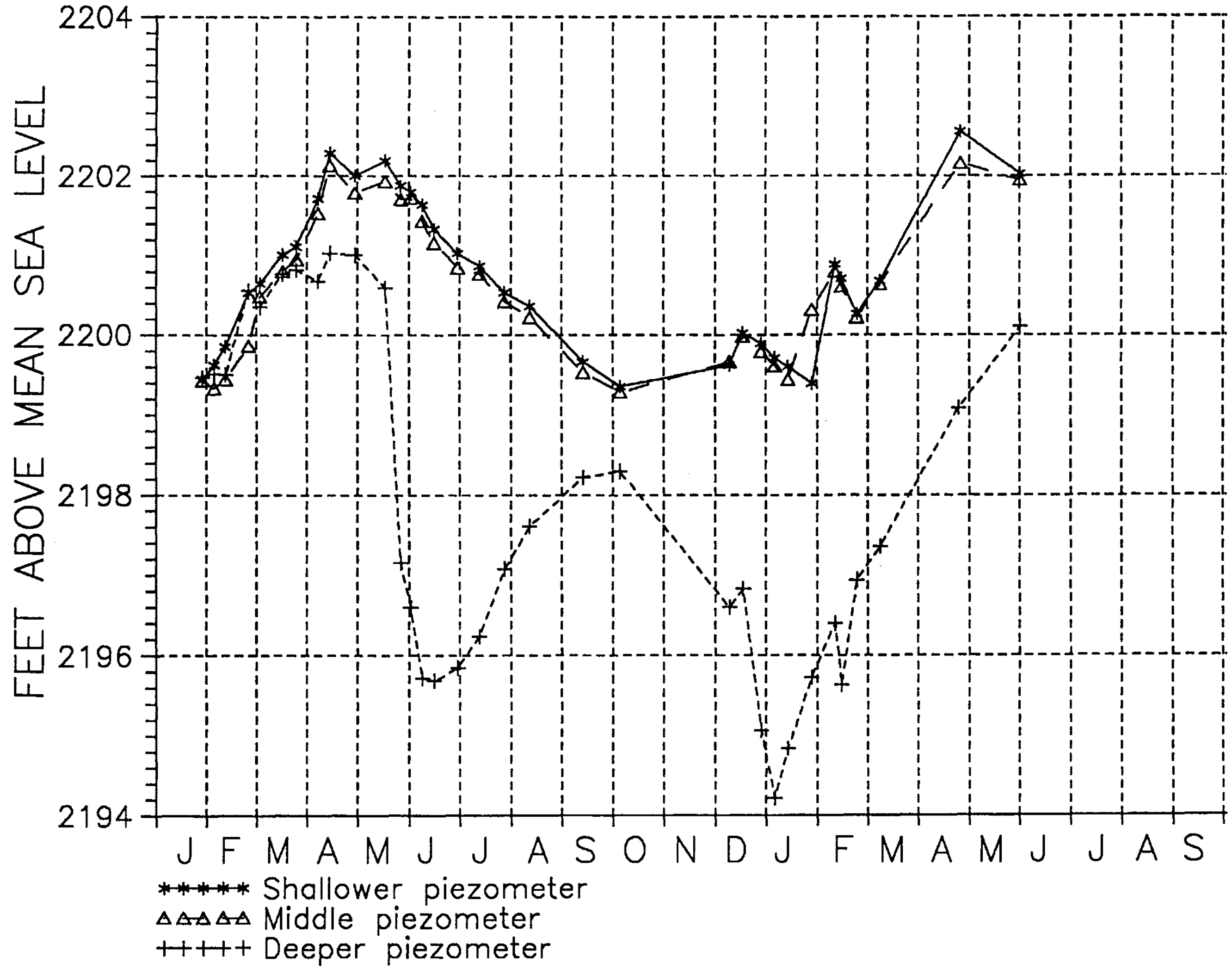
Water level elevations at piezometer location X9 from January, 1988 to September, 1989.



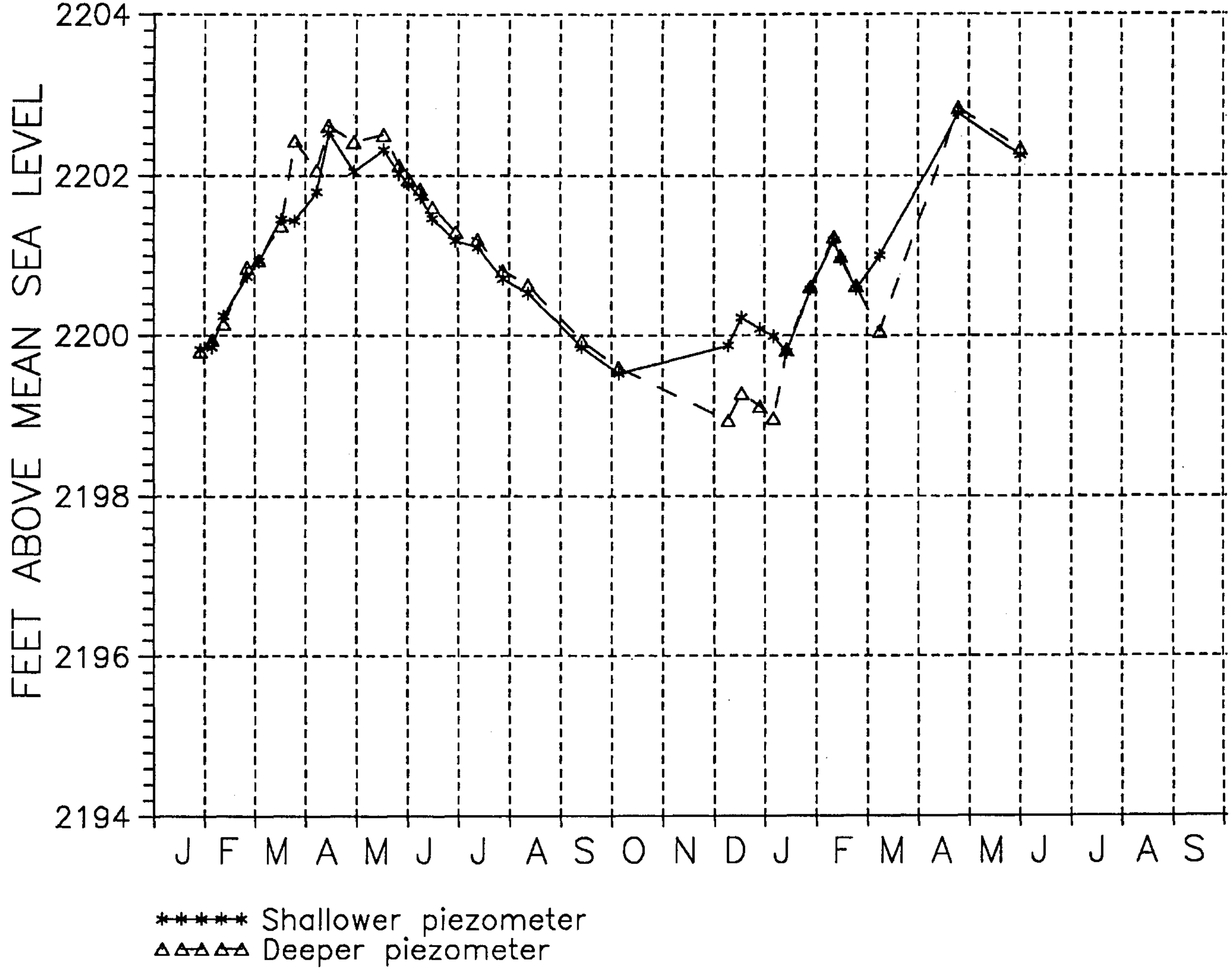
Water level elevations at piezometer location Y2 from January, 1988 to September, 1989.



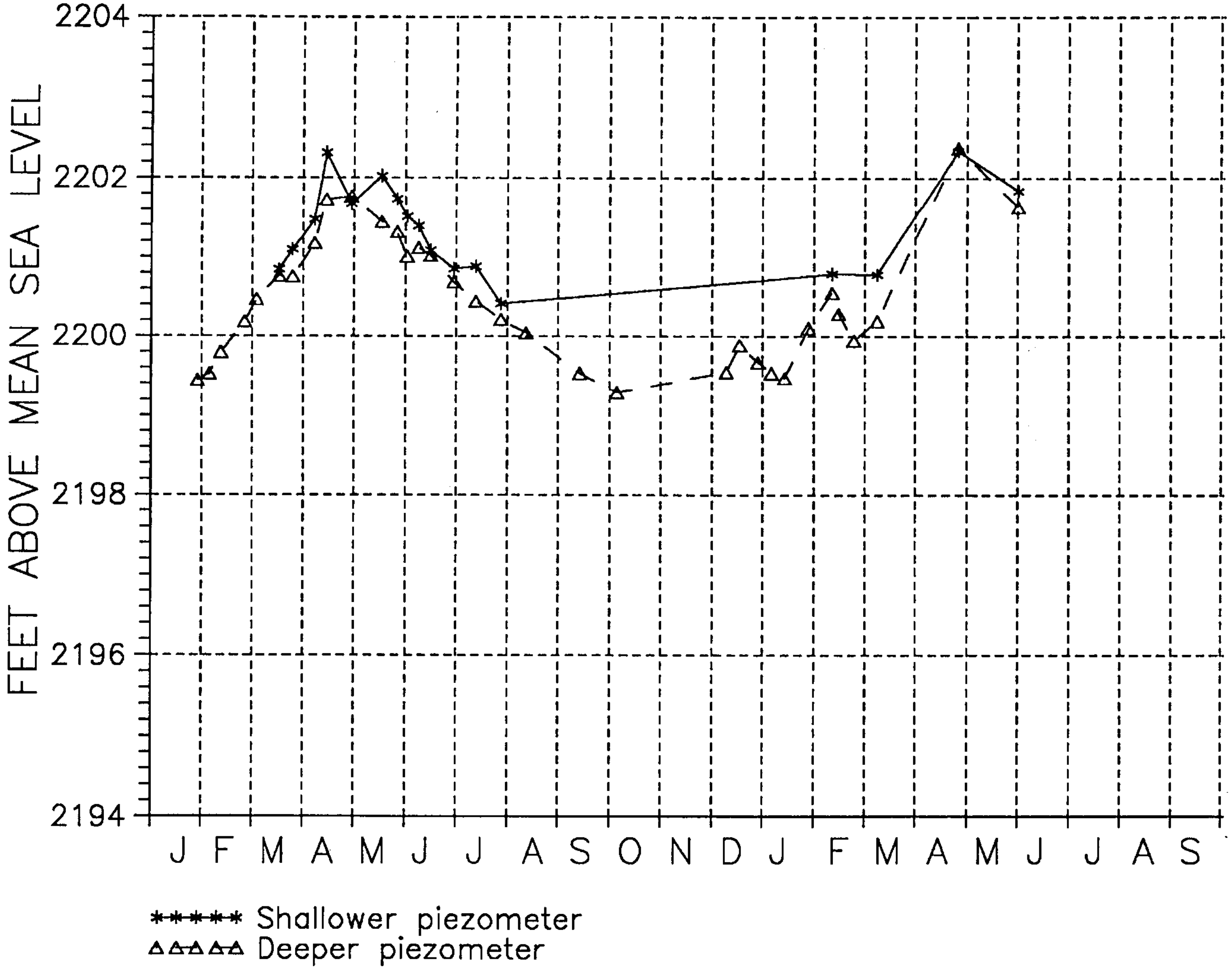
Water level elevations at piezometer location Y3 from January, 1988 to September, 1989.



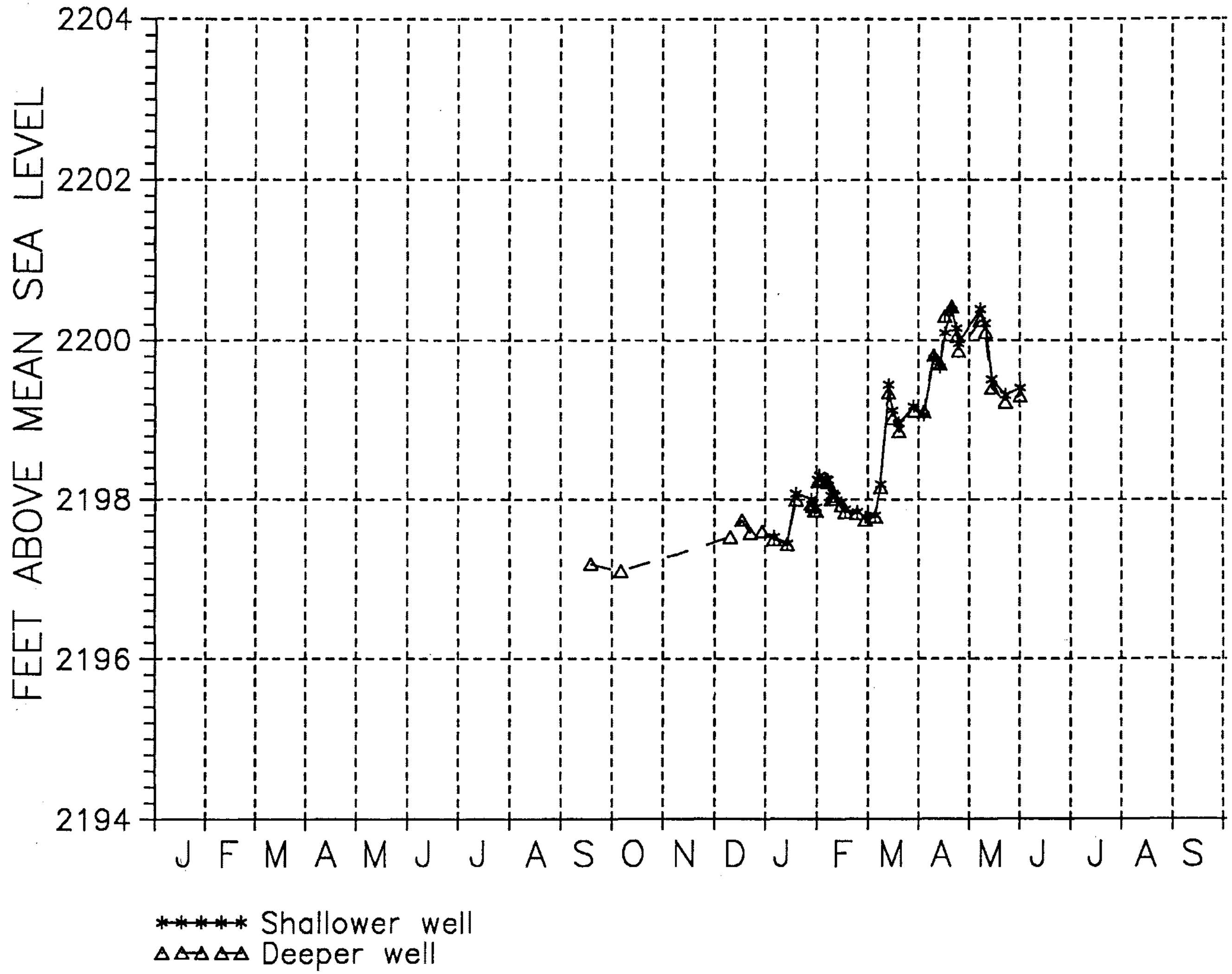
Water level elevations at piezometer location Y6 from January, 1988 to September, 1989.



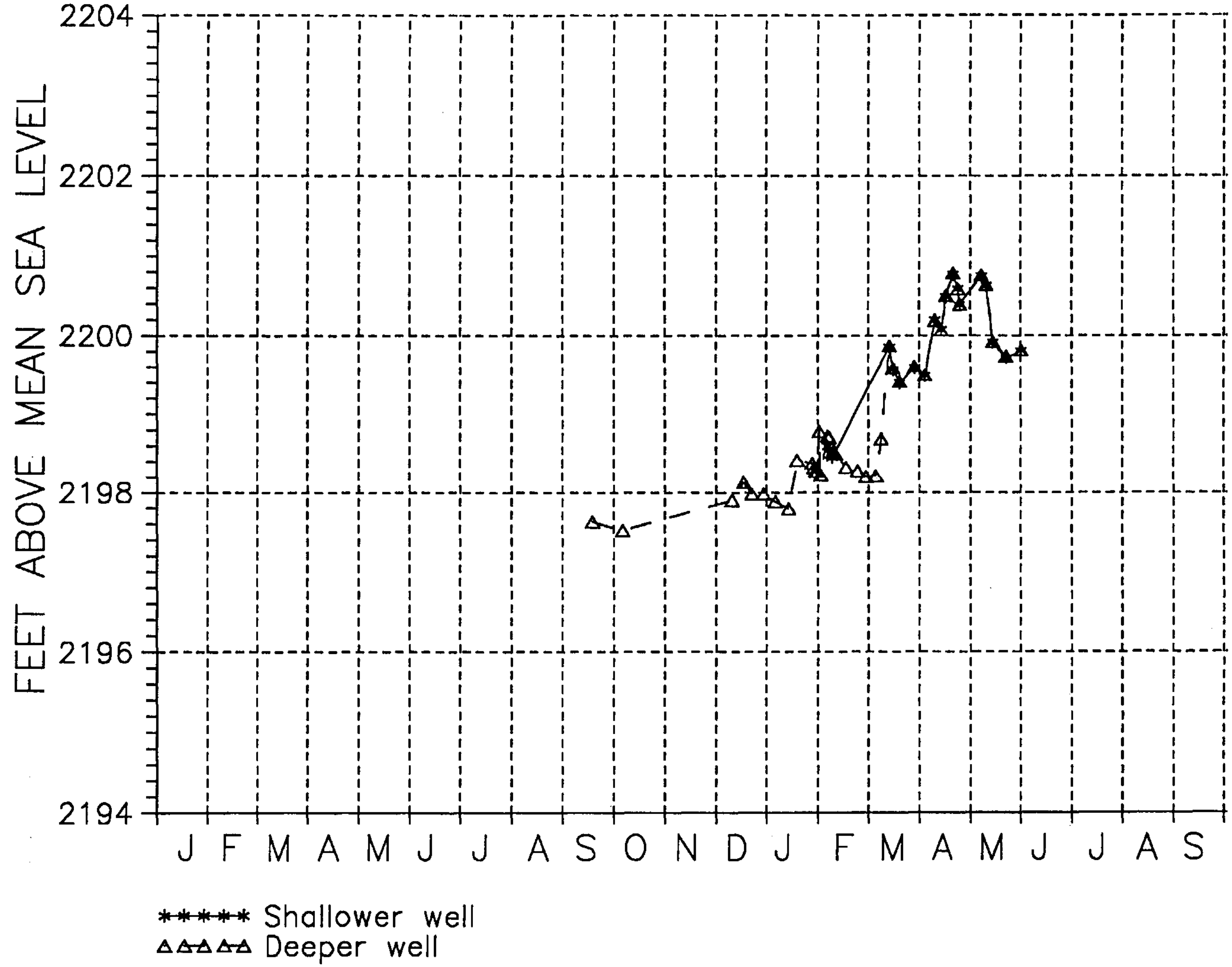
Water level elevations at piezometer location Y7 from January, 1988 to September, 1989.



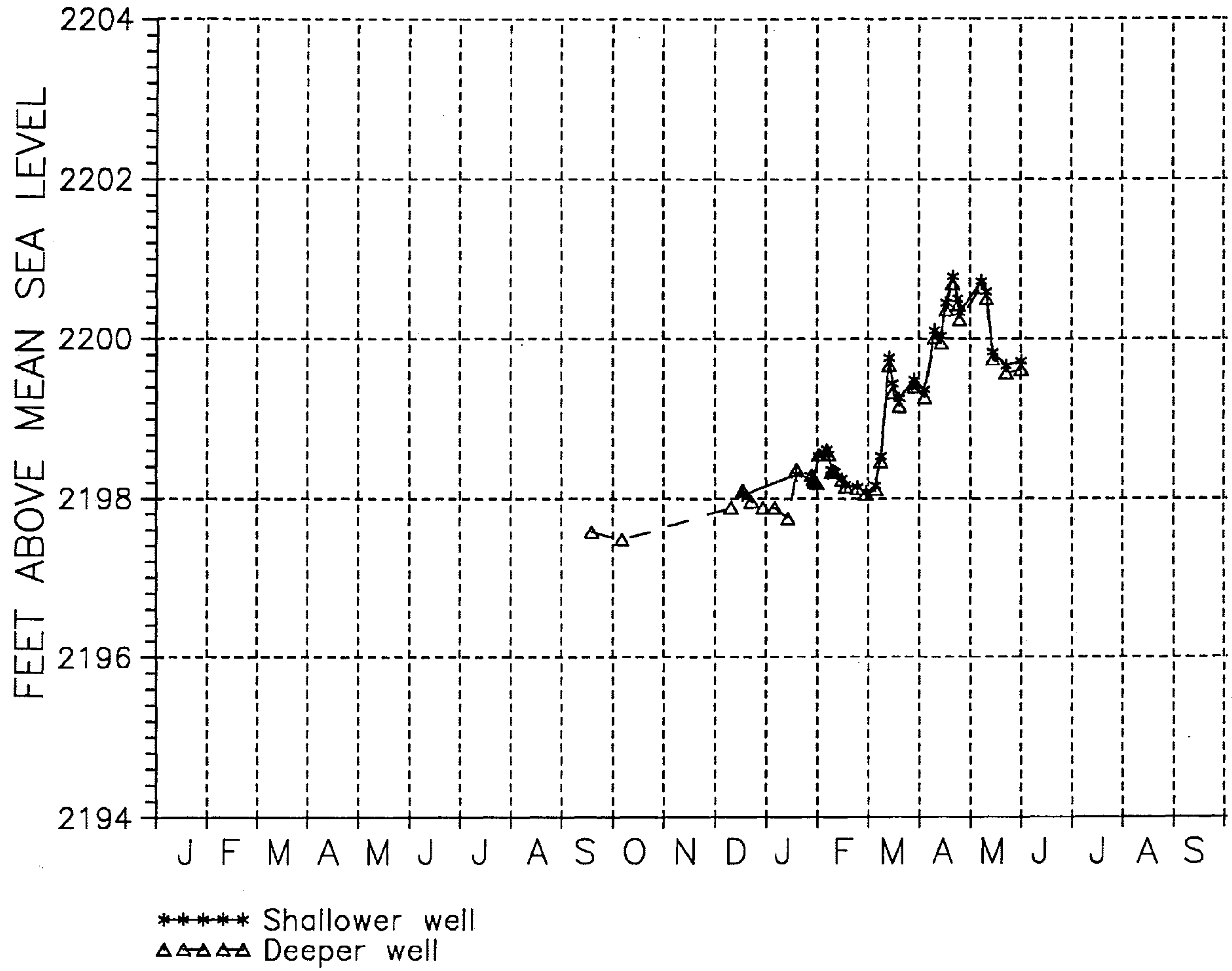
Water level elevations at piezometer location Y9 from January, 1988 to September, 1989.



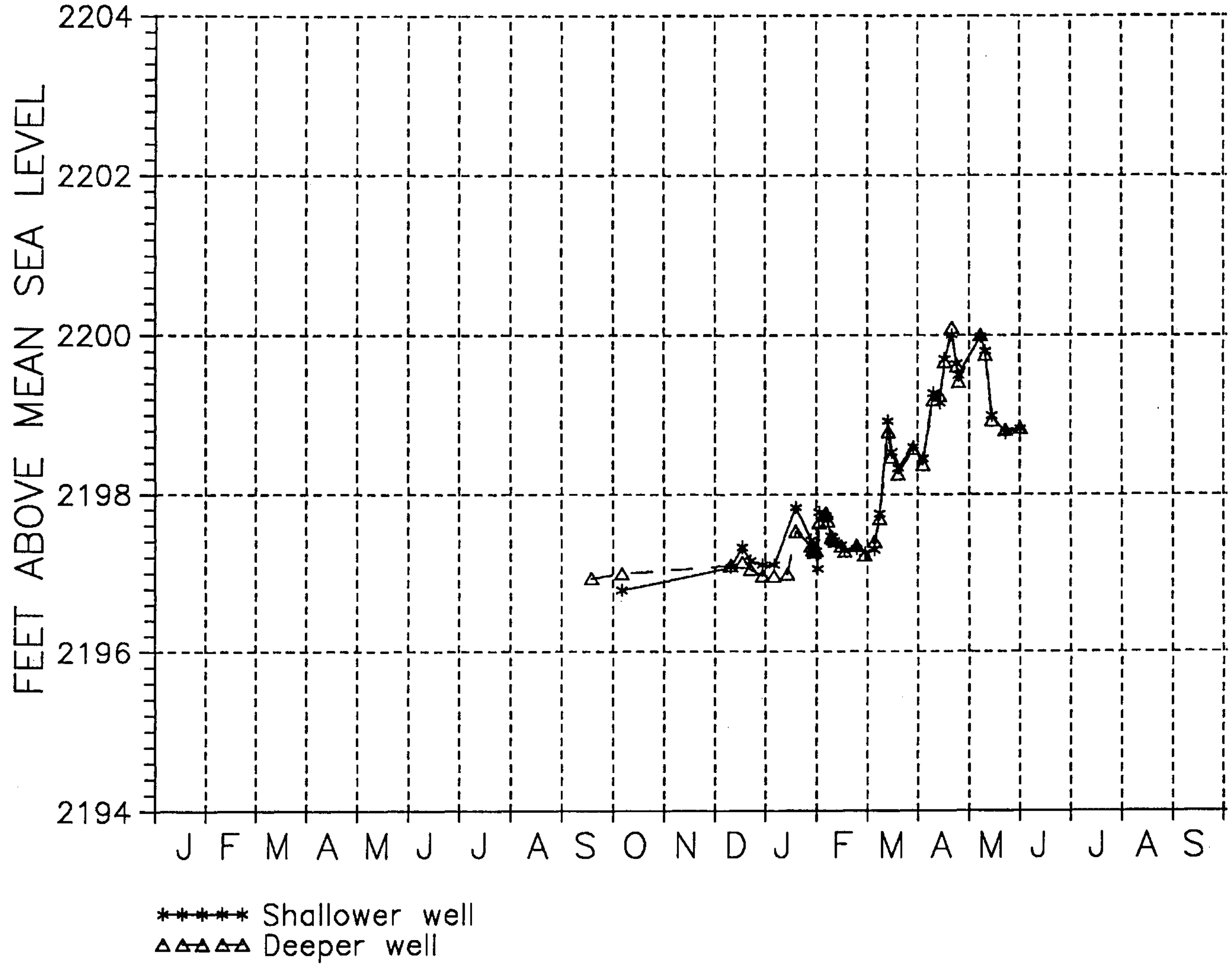
Water level elevations at well location BLM 1
from January, 1988 to September, 1989.



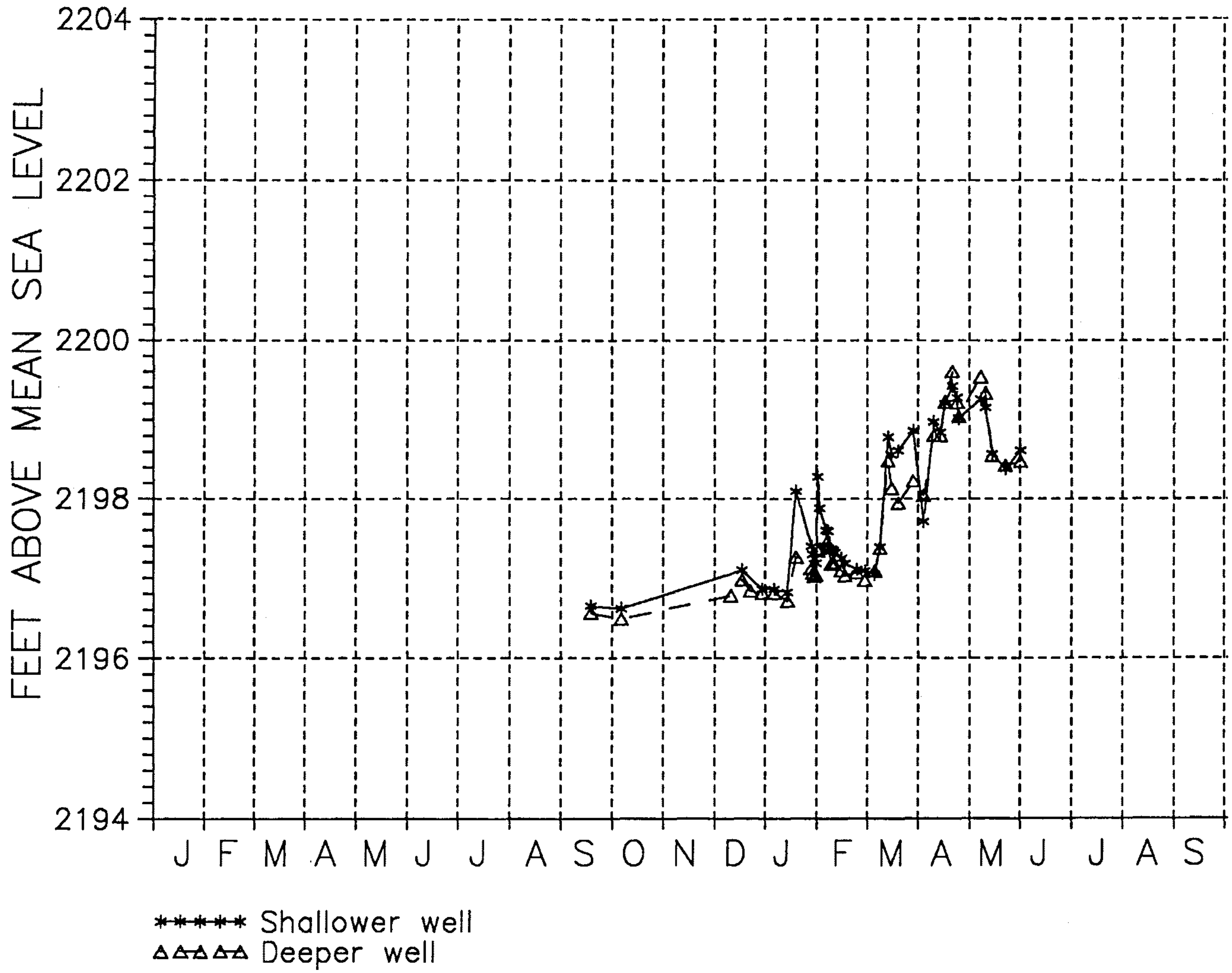
Water level elevations at well location BLM 2 from January, 1988 to September, 1989.



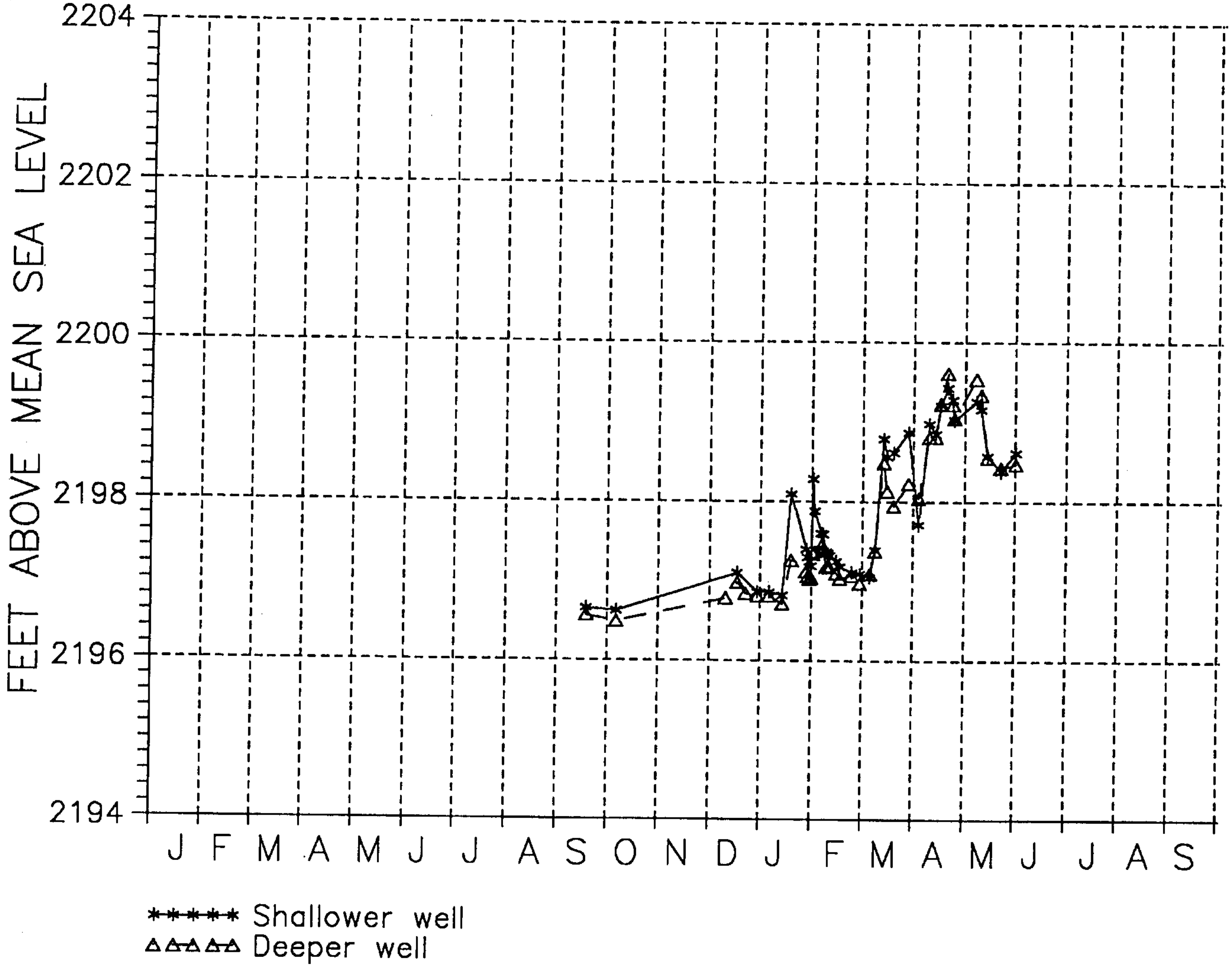
Water level elevations at well location BLM 3 from January, 1988 to September, 1989.



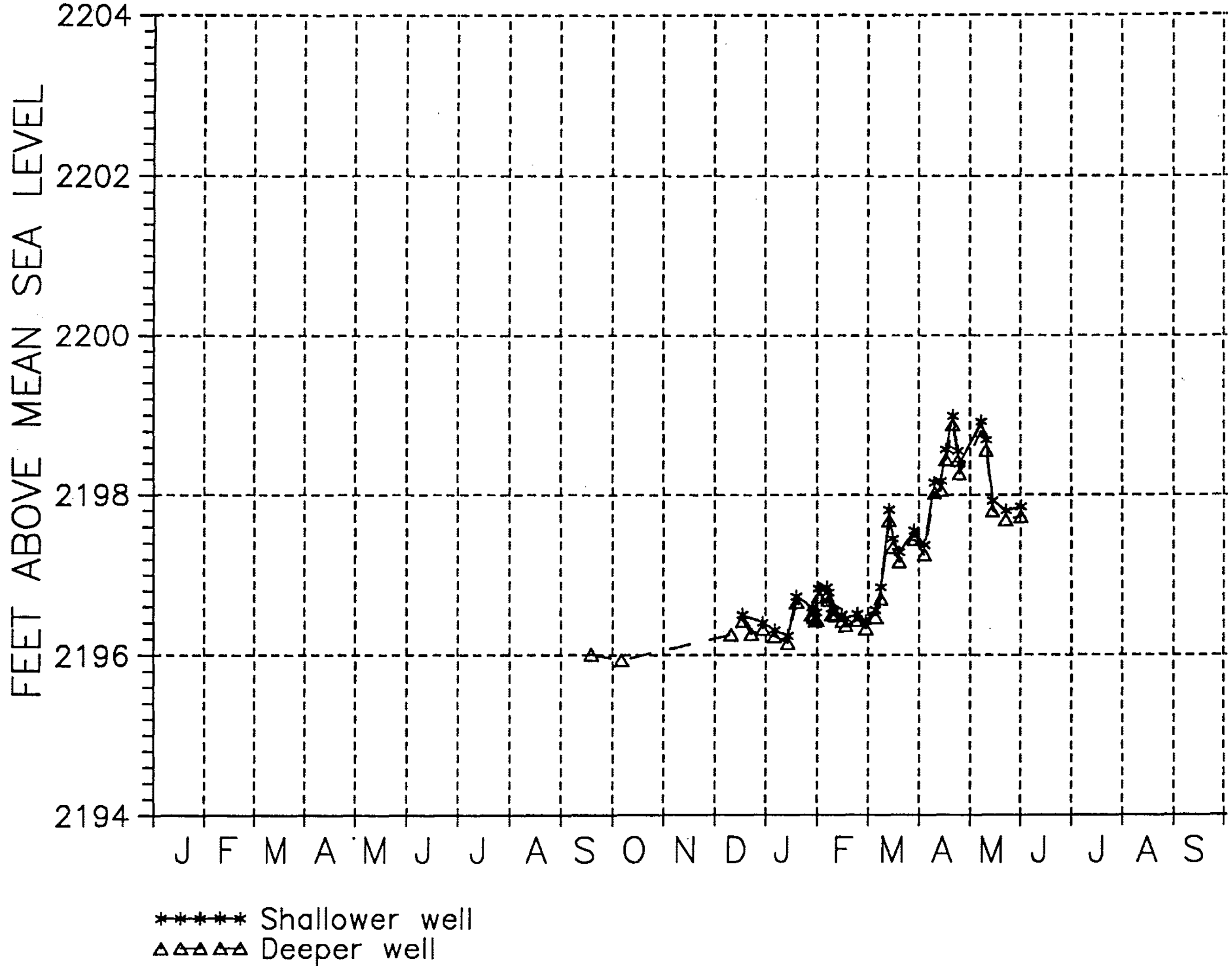
Water level elevations at well location BLM 4 from January, 1988 to September, 1989.



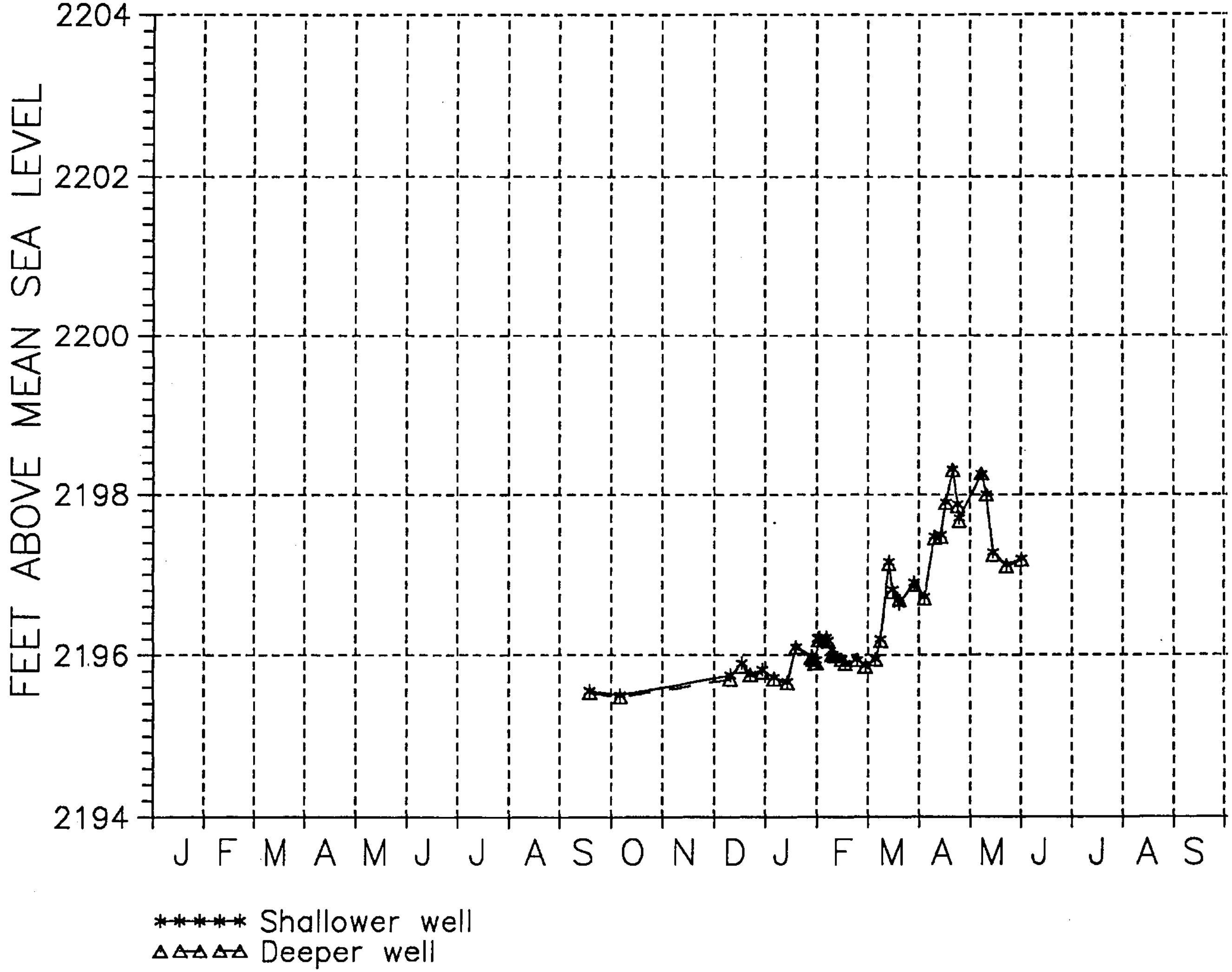
Water level elevations at well location BLM 5 from January, 1988 to September, 1989.



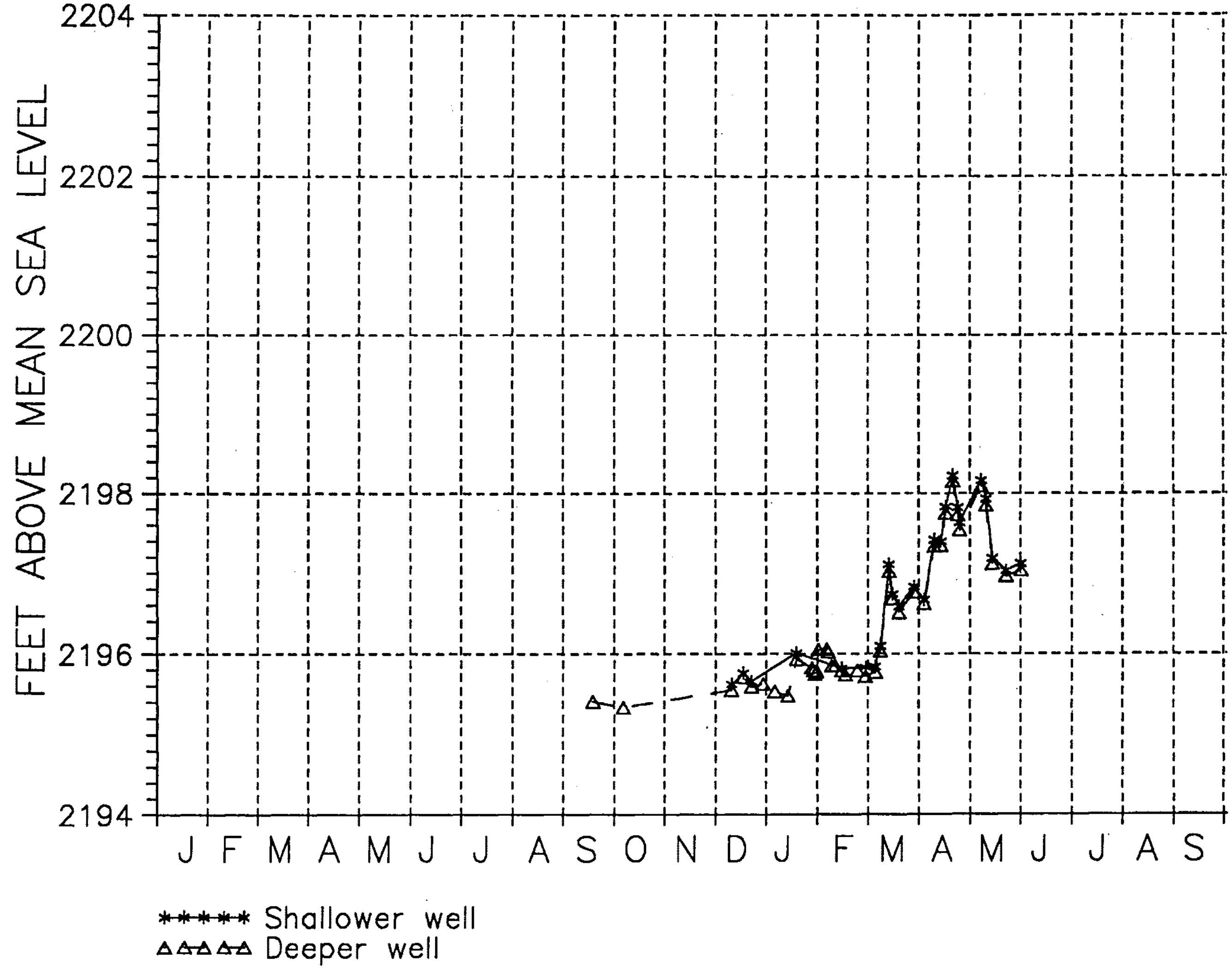
Water level elevations at well location BLM 5 from January, 1988 to September, 1989.



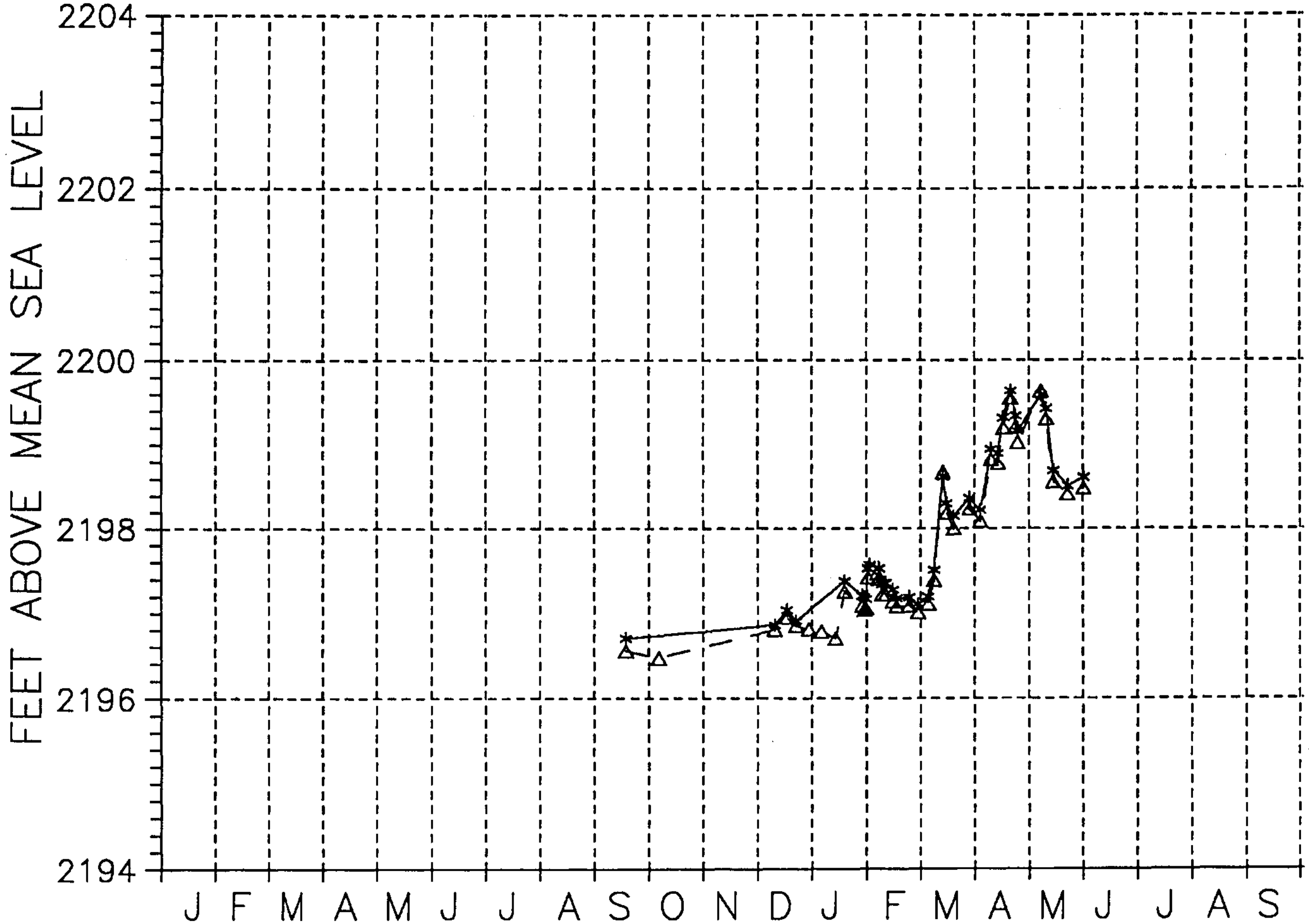
Water level elevations at well location BLM 6 from January, 1988 to September, 1989.



Water level elevations at well location BLM 7 from January, 1988 to September, 1989.

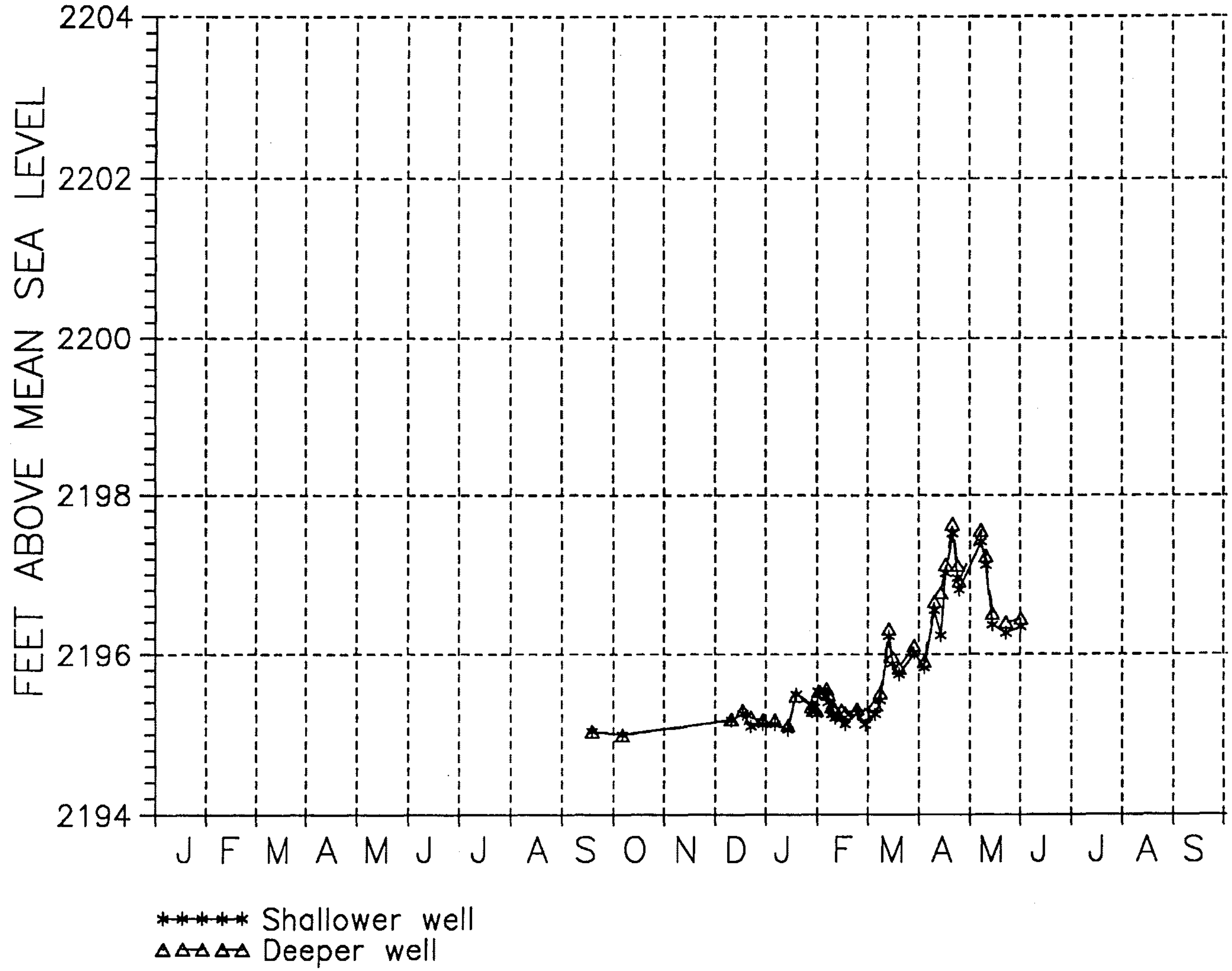


Water level elevations at well location BLM 8
from January, 1988 to September, 1989.



***** Shallower well
ΔΔΔΔΔ Deeper well

Water level elevations at well location BLM 9 from January, 1988 to September, 1989.



Water level elevations at well location BLM 10 from January, 1988 to September, 1989.

APPENDIX 5

WATER QUALITY DATA

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X1S	April, 15	14.0	5.4	340	[0.070]	1.098	[0.07]	22.03	15.181	[0.007]
X1S	May, 17	10.0	5.4	200	[0.060]	[0.074]	[0.08]	13.80	8.249	[-0.005]
X1S	June, 2	14.0	5.5	200	[-0.370]	-0.018	[-0.040]	12.06	7.128	[0.001]
X1S	June, 17	21.0	5.6	240	[-0.02]	[0.011]	[-0.11]	10.41	6.179	[0.001]
X1S	June, 1	21.0	5.5	230	[.05]	0.500	[.05]	12.60	6.440	[.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X1D	March, 3	7.5	5.4	290		[0.014]		18.62	10.289	
X1D	April, 15	14.0	5.4	310	[0.17]	[0.013]	[0.01]	20.01	10.694	[0.007]
X1D	May, 17	10.0	5.4	190	[-0.04]	[-0.004]	[-0.15]	11.96	5.690	[0.003]
X1D	June, 2	13.0	5.5	190	[-0.26]	[-0.023]	[0.01]	11.99	5.977	[0.004]
X1D	June, 17	21.0	5.7	225	[0.17]	[0.004]	[-0.07]	4.88	1.780	[0.006]
X1D	Oct. 5	18.0	5.6	315	[0]	0.140	[0]	13.00	6.300	[0]
X1D	Dec. 16	9.0	5.8	280	[0.01]	0.470	[0]	[9.53]	8.150	[0.01]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
Reported concentration may not be valid.

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X2S	April, 15	14.0	5.6	280	[0.010]	[-0.030]	[-0.010]	17.43	8.023	[0.000]
X2S	May, 17	11.0	5.5	160	[0.040]	0.006	[-0.010]	10.36	4.343	[-0.006]
X2S	June, 2	13.0	5.6	170	[-0.180]	0.046	[-0.080]	9.98	4.615	[-0.006]
X2S	June, 17	21.0	5.7	210	[-0.03]	[0.025]	[-0.12]	9.45	4.089	[0.004]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X2D	March, 3	7.2	6.0	240		0.019		14.12	7.202	
X2D	April, 15	15.0	5.8	310	[0.160]	[0.040]	[0.010]	19.43	7.968	[0.005]
X2D	May, 17	11.0	5.5	230	[-0.340]	0.016	[0.020]	15.56	5.995	[0.002]
X2D	June, 2	14.0	5.8	170	[-0.050]	-0.026	[-0.030]	9.21	3.682	[-0.001]
X2D	June, 17	23.0	5.8	220	[0.01]	[0.003]	[-0.08]	8.82	3.699	[0.002]
X2D	Oct. 5	19.0	5.6	330	[0]	[0]	[0]	14.00	5.600	[0]
X2D	Dec. 16	10.0	5.8	280	[0.09]	0.460	[0]	20.05	7.190	[0.02]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
Reported concentration may not be valid.

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X3S	April 15	14.0	5.6	290	[-0.21]	0.981	[-0.01]	20.57	11.412	[0.008]
X3S	May 17	11.0	5.4	140	[-0.12]	[-0.003]	[-0.12]	9.16	5.231	[0.006]
X3S	June 2	14.0	5.7	150	[-0.51]	-0.047	[0.00]	9.46	5.364	[0.003]
X3S	June 17	22.0	5.7	190	[0.02]	[-0.001]	[-0.06]	8.18	4.554	[0.003]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X3D	March 3	8.0	5.8	255		0.054		35.91	35.599	
X3D	April 15	14.0	6.0	250	[0.04]	[0.00]	[-0.07]	14.78	5.885	[-0.001]
X3D	May 17	11.0	5.5	130	[0.14]	0.016	[0.00]	8.81	3.434	[0.000]
X3D	June 2	14.0	5.8	145	[-0.13]	-0.045	[-0.03]	8.22	3.385	[-0.005]
X3D	June 17	22.0	5.6	180	[0.01]	0.010	[-0.02]	8.14	3.174	[0.002]
X3D	Oct. 5	20.0	5.7	370	[0]	[0]	[0]	14.00	4.700	[0]
X3D	Dec. 16	11.0	5.9	270	[0.05]	0.470	[0.1]	16.50	5.590	[0.01]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
Reported concentration may not be valid.

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X4S	March, 3	7.2	5.9	240		0.055		14.49	5.880	
X4S	April, 15	18.0	6.1	285	[-0.11]	[0.085]	[0.01]	17.47	9.983	[0.012]
X4S	May, 17	11.0	5.9	135	[-0.36]	[-0.002]	[0.04]	9.09	4.040	[0.004]
X4S	June, 2	14.0	5.9	140	[-0.29]	-0.047	[-0.02]	8.70	4.072	[0.000]
X4S	June, 16	21.0	5.8	190	[0.17]	[0.006]	[-0.09]	8.15	3.515	[0.006]
X4S	Oct. 5	15.0	5.8	400	[0]	0.180	[0]	16.00	5.000	[0]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X4D	March, 3	8.0	5.9	240		[0.033]		12.34	5.291	
X4D	April, 15	16.0	6.2	340	[-0.08]	[0.040]	[0.09]	18.44	7.318	[0.004]
X4D	May, 17	11.0	5.6	250	[0.19]	[0.001]	-0.11	14.67	5.641	[0.003]
X4D	June, 2	15.0	5.8	200	[-0.27]	-0.050	[0.01]	11.56	4.409	[0.001]
X4D	June, 16	21.0	5.9	190	[-0.18]	[0.023]	[-0.00]	8.85	3.005	[0.005]
X4D	Oct. 5	15.0	5.9	380	[0]	[0]	[0]	14.00	5.300	[0]
X4D	Dec. 16	12.0	6.0	270	[0.06]	0.470	[0]	17.26	4.860	[0.01]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
Reported concentrations may not be valid.

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X6D	April 15	14.0	6.3	200	[0.16]	[0.040]	[0.02]	10.46	3.805	[0.005]
X6D	May 17	16.0	5.4	180	[0.04]	[0.016]	[0.02]	9.87	3.151	[-0.008]
X6D	June 2	16.0	5.9	105	[-0.32]	-0.040	[-0.12]	5.02	1.960	[-0.001]
X6D	June 17	21.0	6.0	130	[0.17]	[0.004]	[-0.07]	4.88	1.780	[0.006]
X6D	Oct. 5	15.0	5.9	420	[0]	[0]	[0]	12.00	7.000	[0]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X7S	April 15	12.0	6.5	150	[-0.06]	0.027	[0.03]	8.87	2.222	[0.013]
X7S	May 17	15.0	5.6	90	[-0.41]	0.017	[-0.04]	4.86	1.407	[-0.001]
X7S	June 2	14.0	6.1	80	[-0.54]	-0.020	[-0.06]	4.26	1.278	[-0.006]
X7S	June 17	21.0	6.1	120	[0.18]	[0.005]	[-0.10]	4.89	1.362	[-0.003]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X7D	March 3	7.0	6.4	130		[0.020]		3.83	2.151	
X7D	April 15	12.0	6.5	230	[-0.03]	[0.032]	[-0.04]	7.81	1.722	[0.001]
X7D	May 17	14.0	5.5	200	[0.12]	0.032	[-0.01]	7.65	0.876	[-0.002]
X7D	June 2	14.0	6.1	185	[-0.08]	0.053	[-0.12]	7.20	0.553	[0.006]
X7D	June 17	20.0	6.1	120	[0.01]	[0.021]	[-0.01]	5.92	0.919	[0.006]
X7D	Dec. 16	10.0	6.2	260	[0.01]	0.530	[0]	14.01	1.030	[0.01]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
Reported concentration may not be valid.

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X8S	April 15	22.0	6.4	215	[0.19]	1.005	[0.05]	14.45	1.496	[0.001]
X8S	May 17	15.0	5.7	110	[-0.14]	[0.001]	[0.01]	8.57	1.292	[-0.004]
X8S	June 2	14.0	6.1	100	-0.53	-0.029	[-0.02]	7.01	1.330	[-0.001]
X8S	June 17	22.0	6.1	140	[-0.07]	[0.015]	[-0.03]	6.23	1.185	[-0.006]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X8D	March 3	6.0	6.6	185		[0.009]		7.91	1.003	
X8D	April 15	16.5	6.8	295	[0.03]	0.600	[0.12]	12.13	0.551	[0.000]
X8D	May 17	15.0	5.8	225	[-0.11]	[0.009]	[0.07]	11.57	[0.050]	[0.004]
X8D	June 2	14.0	6.3	240	[0.16]	0.939	[-0.02]	[12.41]	[0.212]	[-0.007]
X8D	June 17	20.0	6.4	260	[0.09]	[0.002]	-0.02	10.80	[0.066]	[0.005]
X8D	Dec. 16	10.0	6.4	215	[0.01]	1.030	[0]	11.40	0.060	[0]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
Reported concentration may not be valid.

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X9S	March 3	8.0	6.4	210		[0.108]		12.59	5.507	
X9S	April 15	15.0	6.6	148	[0.12]	[0.005]	[-0.04]	7.15	1.931	[0.001]
X9S	May 17	15.0	5.9	70	[0.23]	[0.010]	[0.01]	3.69	1.130	[-0.002]
X9S	June 2	13.0	6.3	100	[-0.12]	0.058	[-0.06]	4.68	1.313	[-0.002]
X9S	June 17	20.0	6.3	135	[-0.04]	[0.026]	[-0.05]	5.82	1.376	[0.005]
X9S	Dec. 16	9.0	6.3	210	[0.05]	0.470	[0]	11.72	2.330	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
X9D	March 3	5.2	6.7	180		[0.064]		7.87	1.045	
X9D	April 15	19.0	6.8	225	[0.18]	[0.003]	[0.05]	10.36	0.500	[0.005]
X9D	May 17	15.0	5.9	225	[-0.11]	0.019	[-0.06]	9.29	[0.060]	[0.000]
X9D	June 2	14.0	6.6	210	[-0.24]	[-0.011]	[-0.06]	10.69	[0.033]	[0.008]
X9D	June 17	20.0	6.3	120	[0.04]	[0.031]	[-0.04]	4.42	0.747	[0.001]
X9D	Dec. 16	10.0	6.3	210	[0.03]	0.510	[0]	10.27	0.260	[0]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
Reported concentration may not be valid.

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
Y2S	Mar. 3	10.5	5.8	530		7.190		37.95	25.937	
Y2S	Mar. 25	9.2	5.5	490	[0.04]	3.979	[0.03]	45.05	33.457	[0.005]
Y2S	Apr. 1	11.0	5.5	590	[-0.03]	3.083	[0.01]	42.83	35.223	[0.000]
Y2S	Apr. 15	16.5	5.4	680	[0.13]	0.479	[0.03]	45.89	31.958	[0.018]
Y2S	Apr, 28	15.5	5.5	620	[0.07]	[0.363]	[0.04]	41.37	27.971	[0.002]
Y2S	May 17	12.0	5.4	600	[0.11]	0.772	[0.02]	39.52	29.814	[0.002]
Y2S	May 26	16.5	5.2	610	[-0.14]	0.691	[0.02]	42.56	37.259	[-0.007]
Y2S	June 2	11.0	5.3	550	[0.09]	0.623	[0.01]	38.99	32.333	[-0.005]
Y2S	June 17	18.0	5.3	650	[-0.15]	0.842	[-0.07]	39.13	30.658	[0.003]
Y2S	June 30	16.0	5.1	600	[0]	0.550	[0]	24.00	20.000	[0]
Y2S	Oct. 5	19.0	5.4	610	[0]	1.400	[0]	33.00	29.000	[0]
Y2S	Dec. 16	8.0	5.3	550	[0.07]	2.330	[0]	43.91	32.170	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
Y2D	Feb. 25	10.0	6.1	550		0.867		29.68	6.605	
Y2D	Mar. 3	10.0	6.1	440		0.114		28.29	7.610	
Y2D	Mar. 25	9.5	5.8	500	[0.02]	0.101	[0.00]	31.89	12.629	[0.001]
Y2D	Apr. 1	10.0	5.9	490	[-0.01]	[0.020]	[0.00]	31.76	14.012	[0.002]
Y2D	Apr. 15	16.5	5.7	600	[-0.11]	[-0.148]	[-0.02]	28.97	11.754	[0.005]
Y2D	Apr, 28	13.5	6.0	580	[0.51]	[0.020]	[0.05]	38.37	13.550	[0.000]
Y2D	May 26	18.0	5.9	600	[-0.07]	[0.051]	[0.03]	33.58	[7.932]	[-0.005]
Y2D	June 2	12.0	5.7	480	[-0.08]	-0.034	[-0.10]	36.62	13.951	[-0.002]
Y2D	June 17	18.0	5.8	600	[0.00]	0.070	[-0.01]	32.87	6.637	[0.007]
Y2D	June 30	17.0	5.9	510	[0]	[0]	[0]	21.00	4.500	[0]
Y2D	Oct. 5									
Y2D	Dec. 16	7.0	5.8	350	[0.03]	0.480	[0]	28.36	1.690	[0.01]

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WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
Y3S	Feb. 25	10.5	5.4	650		0.066		34.45	32.490	
Y3S	Mar. 3	8.2	5.3	600		0.038		34.10	34.606	
Y3S	Mar. 25	9.0	5.3	580	[-0.01]	[0.040]	[0.03]	39.89	41.818	[0.005]
Y3S	Apr. 1	12.0	5.3	590	[-0.02]	[0.016]	[0.02]	34.54	37.515	[-0.002]
Y3S	Apr. 14	15.0	5.4	690	[0.00]	[0.009]	[0.01]	33.30	29.149	[0.001]
Y3S	Apr. 29	13.0	5.4	600	[0.39]	[0.041]	[0.06]	42.26	41.389	[0.005]
Y3S	May 17	14.0	5.2	600	[-0.01]	0.042	[-0.01]	36.59	31.073	[0.000]
Y3S	May 26	17.0	5.2	600	[-0.01]	0.090	[0.02]	39.54	40.166	[-0.005]
Y3S	June 2	12.0	5.2	550	[-0.49]	-0.037	[-0.05]	35.52	32.055	[0.001]
Y3S	June 17	17.0	5.2	600	[-0.04]	[0.018]	[-0.02]	36.10	31.367	[0.008]
Y3S	June 30	15.0	5.2	600	[0]	[0]	[0]	21.00	23.000	[0]
Y3S	Oct. 5	19	5.17	620	[0]	[0]	[0]	24.00	26.000	[0]
Y3S	Dec. 16	7.0	5.4	490	[0.02]	0.470	[0]	37.14	34.700	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
Y3D	Feb. 25	11.5	5.4	560		0.025		26.75	24.411	
Y3D	Mar. 3	8.0	5.3	600		0.054		35.91	35.599	
Y3D	Mar. 25	9.0	5.2	550	[0.01]	0.039	[0.05]	39.88	41.492	[0.005]
Y3D	Apr. 1	10.0	5.2	600	[-0.04]	[0.031]	[0.01]	34.01	37.974	[0.000]
Y3D	Apr. 14	14.0	5.0	680	[-0.64]	[-0.080]	[0.08]	[29.39]	27.084	[0.003]
Y3D	Apr. 29	13.0	5.4	620	[0.08]	[0.058]	[0.06]	41.71	40.071	[0.000]
Y3D	May 17	14.0	5.1	600	[-0.07]	[0.031]	[0.03]	[31.17]	27.321	[0.005]
Y3D	May 26	16.0	5.2	610	[0.01]	0.061	[0.01]	[35.51]	34.055	[-0.001]
Y3D	June 2	12.0	5.1	575	[-0.32]	-0.025	[-0.07]	34.23	32.990	[0.001]
Y3D	June 17	15.0	5.1	590	[-0.27]	[0.023]	[-0.03]	33.00	29.431	[-0.002]
Y3D	June 30	18.0	5.1	590	[0]	0.060	[0]	22.00	25.000	[0]
Y3D	Oct. 5	18.0	5.2	580						
Y3D	Dec. 16	7.0	5.3	485	[0.01]	0.480	[0]	34.97	32.050	[0.01]

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WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
Y6S	Feb. 25					0.041		17.48	0.017	
Y6S	Mar. 3	7.2	6.7	330		0.093		23.92	0.228	
Y6S	Mar. 25	12.0	6.8	410	[-0.02]	0.125	[0.06]	28.73	0.254	[0.000]
Y6S	Apr. 1	11.0	6.8	360	[-0.03]	0.018	[0.03]	22.79	0.168	[0.000]
Y6S	Apr. 15									
Y6S	Apr. 29									
Y6S	May 17									
Y6S	May 26	21.0	6.2	590	[-0.12]	0.478	[0.06]	33.72	4.586	[-0.001]
Y6S	June 2									
Y6S	June 17									
Y6S	June 30	29.0	6.7	610	0.10	[0]	[0]	14.00	0.300	[0]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
Y6M	Feb. 25	13.0	5.7	240		[0.012]		15.21	3.893	
Y6M	Mar. 3	7.8	5.5	270		0.057		21.46	5.721	
Y6M	Mar. 25	11.0	5.6	300	[0.00]	0.095	0.03	26.29	7.353	[0.003]
Y6M	Apr. 1	12.0	5.6	300	[-0.01]	[0.014]	[0.02]	21.78	6.519	[-0.001]
Y6M	Apr. 15	15.0	5.5	355	[-0.05]	[0.041]	[-0.04]	20.65	5.125	[0.001]
Y6M	Apr. 29	19.5	5.5	370	[0.22]	[0.009]	[0.03]	25.62	7.329	[-0.001]
Y6M	May 17	15.0	5.5	290	[0.08]	[0.014]	[-0.05]	18.75	4.983	[0.002]
Y6M	May 26	17.0	5.6	290	[-0.10]	0.027	[-0.04]	17.92	5.245	[-0.006]
Y6M	June 2	13.0	5.4	250	[-0.40]	-0.023	[-0.03]	17.52	5.012	[0.000]
Y6M	June 17	19.0	5.5	280	[-0.20]	[-0.011]	[-0.09]	16.21	4.831	[-0.002]
Y6M	June 30	22.0	5.9	250	[0]	[0]	[0]	11.00	4.200	[0]
Y6M	Oct. 5	18.0	5.4	280	[0]	[0]	[0]	14.00	4.900	[0]
Y6M	Dec. 16	6.0	5.6	250	[0.07]	0.460	[0]	21.78	5.280	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
Y6D	Feb. 25	12.5	5.3	300		[0.012]		16.30	0.573	
Y6D	Mar. 3	6.5	6.8	250		0.068		14.07	0.581	
Y6D	Mar. 25	10.1	6.8	260	[-0.03]	[0.239]	[0.05]	17.09	0.708	[0.007]
Y6D	Apr. 1	12.5	6.9	250	[-0.01]	0.030	[0.02]	12.43	0.322	[-0.004]
Y6D	Apr. 15	15.0	7.1	260	[-0.27]	[0.027]	[-0.02]	10.91	0.436	[-0.003]
Y6D	Apr. 29	16.5	7.2	240	[0.00]	[0.001]	[0.02]	12.46	0.266	[-0.004]
Y6D	May 17	15.0	6.1	200	[-0.19]	0.021	[0.05]	10.08	0.151	[0.008]

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Y6D	May 26	17.0	6.8	210	[0.03]	0.037	[0.01]	9.45	0.210	[0.001]
Y6D	June 2	13.0	6.8	165	[0.01]	[0.041]	[0.01]	7.00	0.207	[-0.004]
Y6D	June 17	19.0	6.8	190	[-0.26]	[0.013]	[-0.05]	7.62	0.086	[-0.000]
Y6D	June 30	20.0	6.8	200	[0]	[0]	[0]	5.20	0.060	[0]
Y6D	Oct. 5	22.0	7.1	235	[0]	0.020	[0]	6.80	0.050	[0]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
Reported concentration may not be valid.

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
Y7S	Feb. 25	13.0	6.1	345		2.874		22.41	6.237	
Y7S	Mar. 3	7.2	6.1	360		6.524		34.10	10.956	
Y7S	Mar. 25	10.0	6.2	450	[0.06]	4.142	[0.01]	56.25	15.216	[0.003]
Y7S	Apr. 1	12.0	6.0	445	[0.01]	2.221	[-0.02]	41.42	11.993	[0.001]
Y7S	Apr. 15	15.0	6.0	460	[-0.28]	0.401	[-0.01]	39.04	10.440	[0.008]
Y7S	Apr. 29	16.0	6.2	380	[0.29]	0.492	[0.08]	30.65	9.779	[-0.003]
Y7S	May 17	15.0	5.6	320	[0.15]	2.765	[0.03]	28.10	8.993	[0.007]
Y7S	May 26	17.0	6.2	330	[-0.02]	4.152	[-0.01]	23.35	8.594	[0.006]
Y7S	June 2	13.5	5.9	290	[-0.21]	2.470	[-0.11]	23.95	9.516	[0.002]
Y7S	June 17	19.0	6.1	310	[-0.90]	1.449	[-0.04]	20.16	8.281	[0.002]
Y7S	June 30	20.0	6.0	300	[0]	3.200	[0]	13.00	7.100	[0]
Y7S	Oct. 5	20.0	6.6	280	[0]	4.800	[0]	12.00	5.300	[0]
Y7S	Dec. 16	6.0	5.9	310	[0.10]	3.850	[0]	25.62	7.400	[0.02]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
Y7D	Feb. 25	13.0	6.3	285		0.189		14.66	3.389	
Y7D	Mar. 3	7.5	6.1	255		0.083		15.54	4.560	
Y7D	Mar. 25	10.0	6.3	290	[0.02]	0.766	[0.02]	18.89	5.421	[0.000]
Y7D	Apr. 1	11.5	6.3	280	[-0.02]	[0.032]	[-0.02]	17.16	[4.730]	[-0.005]
Y7D	Apr. 15	13.5	6.2	310	[-0.40]	[0.068]	[0.02]	15.19	3.111	[-0.004]
Y7D	Apr. 29	14.5	6.3	295	[0.06]	[0.011]	[0.01]	18.82	4.554	[-0.003]
Y7D	May 17	16.0	5.7	280	[0.02]	[0.031]	[0.02]	16.15	3.448	[0.006]
Y7D	May 26	17.0	6.0	280	[-0.06]	0.079	[0.00]	14.51	3.536	[0.003]
Y7D	June 2	12.0	6.0	240	[-0.52]	[-0.019]	[-0.02]	13.30	3.499	[0.003]
Y7D	June 17	19.5	6.1	210	[-0.30]	[0.009]	[-0.01]	10.30	2.663	[0.008]
Y7D	June 30	20.0	6.1	180	[0]	0.100	[0]	5.80	2.000	0.050
Y7D	Dec. 16	6.0	6.0	230						

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WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
Y8	Feb. 25	13.0	6.5	200		0.075		8.36	0.701	
Y8	Mar. 3	6.2	6.4	200		[0.059]		10.64	0.909	
Y8	Mar. 25	9.2	6.3	235	[-0.00]	0.108	[0.02]	16.29	2.032	[0.004]
Y8	Apr. 1	10.5	6.2	235	[-0.02]	[-0.006]	[0.02]	13.51	2.481	[-0.002]

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WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
Y9S	Apr. 1	8.9	6.0	650	[0.00]	[0.064]	[0.02]	67.87	32.039	[0.000]
Y9S	Apr. 15	16.0	6.0	750	[0.05]	[0.026]	[0.05]	71.97	22.745	[0.003]
Y9S	Apr. 29	16.5	6.1	590	[-0.01]	[0.045]	[0.08]	71.84	22.980	[-0.004]
Y9S	May 17	15.0	5.7	520	[0.09]	0.184	[-0.07]	56.97	12.509	[-0.003]
Y9S	May 26	17.0	6.3	600	[-0.06]	0.259	[0.02]	69.37	12.537	[0.007]
Y9S	June 2	13.0	6.2	600	[-0.03]	0.257	[-0.09]	73.60	10.723	[0.015]
Y9S	June 17	19.5	6.3	600	[-0.03]	[0.226]	[-0.03]	61.70	10.253	[-0.006]
Y9S	June 30	20.0	6.4	600	[0]	0.54	[0]	33.00	8.870	[0]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
Y9D	Mar. 3	5.0	6.2	165		[0.321]		9.27	2.621	
Y9D	Mar. 25	7.5	6.1	190	[-0.01]	0.502	[0.02]	13.18	3.610	[0.002]
Y9D	Apr. 1	8.0	6.4	190	[-0.01]	[-0.011]	[0.01]	10.58	[2.075]	[-0.002]
Y9D	Apr. 15	13.0	6.5	200	[-0.19]	[0.151]	[-0.07]	10.31	0.511	[0.006]
Y9D	Apr. 29	13.0	6.5	210	[0.07]	[0.006]	[0.05]	10.86	0.459	[-0.005]
Y9D	May 17	15.0	5.9	200	[0.29]	[0.014]	[0.05]	9.53	0.229	[-0.001]
Y9D	May 26	17.0	6.4	190	[-0.09]	[0.033]	[0.00]	9.79	0.389	[-0.003]
Y9D	June 2	11.5	6.3	150	[-0.18]	-0.025	[-0.07]	7.52	0.193	[-0.002]
Y9D	June 17	16.0	6.6	190	[-0.05]	[-0.007]	[-0.08]	7.92	0.283	[-0.002]
Y9D	June 30	20.0	6.6	170	[0]	[0]	[0]	4.80	0.120	[0]
Y9D	Dec. 16	7.0	6.2	190	[0.05]	0.48	[0]	11.75	0.410	[0.01]

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WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 1C	Dec. 16	9.0	6.28	350	[0.01]	0.83	[0]	15.18	65.04	[0]
BLM 1C	Jan. 6	7.0	4.98	300	[0]	0.56	[0]	16.00	62.74	[0]
BLM 1C	Jan. 18	11.0	5.19	550	[0.12]	0.54	[0]	21.87	104.95	[0.01]
BLM 1C	Feb. 23	11.5	5.12	750	[0.06]	0.42	[0.1]	36.54	213.69	[0.01]
BLM 1C	April 7	12.0		1350	[0.3]	0.42	[0.7]	88.77	723.53	[0.03]
BLM 1C	April 25	8.5	5.18	1150	[4.8]	0.70	[0.1]	70.37	464.38	[0.02]
BLM 1C	June 1	20.0	5.06	980	[0.05]	0.80	[0.05]	38.80	272.50	[0.01]
BLM 1C	June 20	21.0	5.09	940	[0.05]	0.50	[0.05]	30.70	218.73	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 1D	Oct. 5	26.0	4.99	420	[0]	[0]	[0]	12	8.50	[0]
BLM 1D	Dec. 16	9.0	6.00	280	[0.05]	0.31	[0]	14.12	8.11	[0]
BLM 1D	Jan. 6	7.5	4.68	285	[0.02]	0.56	[0]	18.36	9.90	[0]
BLM 1D	Jan. 18	10.0	5.08	320	[0.04]	0.40	[0]	20.32	10.39	[0]
BLM 1D	Feb. 23	12.0	5.10	470	[0.13]	0.29	[0]	33.87	17.59	[0.02]
BLM 1D	April 7	13.0		600	[0.3]	0.40	[0.7]	39.15	21.10	[0.01]
BLM 1D	April 25	9.0	5.11	550	[6.0]	0.58	[0.2]	[36.01]	[19.53]	[0]
BLM 1D	June 1	17.0	5.52	510	[0.05]	[0.5]	[0.05]	33.90	22.55	[0.01]
BLM 1D	June 20	18.0	5.50	520	[0.05]	0.70	[0.05]	34.50	20.66	[0.01]

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WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 2C	Jan. 18	10.0	5.09	325	[0.02]	0.40	[0]	24.28	13.59	[0.01]
BLM 2C	April 25	8.5	5.02	600	[5.3]	0.35	[0]	42.06	53.70	[0.01]
BLM 2C	June 1	20.0	5.63	510	[0.05]	0.50	[0.05]	35.40	30.77	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 2D	Oct. 5	23.0	5.02	380	[0]	[0]	[0]	12.00	8.50	[0]
BLM 2D	Dec. 16	9.0	5.60	295	[0]	0.31	[0.1]	14.67	8.39	[0]
BLM 2D	Jan. 6	7.0	5.10	310	[0]	0.55	[0]	19.75	10.47	[0]
BLM 2D	Jan. 18	10.0	5.00	350	[0.31]	0.39	[0]	23.22	11.72	[0]
BLM 2D	Feb. 23	12.0	5.06	520	[0.04]	0.29	[0]	32.94	18.11	[0.02]
BLM 2D	April 7	13.0		620	[0.5]	0.33	[0.5]	40.34	23.46	[0.01]
BLM 2D	April 25	8.5	5.06	550	[6.4]	0.35	[0.1]	38.01	21.31	[0.01]
BLM 2D	June 1	20.0	5.30	510	[0.05]	0.50	[0.05]	33.90	20.31	[0.01]
BLM 2D	June 20	21.0	5.40	500	[0.05]	0.50	[0.05]	31.10	19.94	[0.01]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
Reported concentration may not be valid.

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 3C	Dec. 16	9.0	5.94	290	[0]	0.35	[0]	16.19	9.87	[0]
BLM 3C	Jan. 6	10.0	4.95	290	[0.04]	0.55	[0.1]	19.16	10.36	[0]
BLM 3C	Jan. 18	10.0	5.07	400	[0.03]	0.38	[0]	29.07	29.92	[0]
BLM 3C	Feb. 23	11.0	5.05	370	[0.10]	0.30	[0]	29.27	18.17	0.01
BLM 3C	April 7	13.0	5.10	470	[0.6]	0.32	[0.3]	41.48	48.19	[0]
BLM 3C	April 25	9.0	5.13	420	[5.9]	0.36	[0.1]	34.92	31.94	[0]
BLM 3C	June 1	19.0	5.42	430	[0.05]	[0.5]	[0.05]	28.80	15.57	[0.01]
BLM 3C	June 20	20.00	5.32	440	[0.05]	[0.5]	[0.05]	24.20	11.24	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 3D	Oct. 5	22.0	5.44	390	[0]	[0]	[0]	12.00	4.10	[0]
BLM 3D	Dec. 16	10.0	6.00	280	[0.04]	0.31	[0]	15.09	4.01	[0]
BLM 3D	Jan. 6	10.0	5.12	270	[0.01]	0.55	[0]	18.34	4.60	[0]
BLM 3D	Jan. 18	10.0	5.43	280	[0.18]	0.38	[0]	20.64	4.93	[0.01]
BLM 3D	Feb. 23	12.0	5.39	340	[0.16]	0.29	[0]	24.11	6.29	[0.01]
BLM 3D	April 7	13.0	5.41	400	[0]	0.40	[0.8]	32.92	8.98	[0.02]
BLM 3D	April 25	9.0	5.45	360	[2.7]	0.35	[0.1]	27.60	7.80	[0]
BLM 3D	June 1	16.0	5.30	360	[0.05]	0.50	[0.05]	26.80	9.46	[0.01]
BLM 3D	June 20	16.0	5.30	360	[0.05]	[0.5]	[0.05]	24.40	8.07	[0.01]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
Reported concentration may not be valid.

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 4C	Dec. 16	9.0	6.33	750	[0]	30.59	[0.1]	50.81	29.89	[0]
BLM 4C	Jan. 6	9.0	5.96	750	[0]	51.46	[0.1]	43.03	18.21	[0.01]
BLM 4C	Jan. 18	10.0	6.18	800	[0.06]	6.23	[0]	77.13	86.88	[0.02]
BLM 4C	Feb. 23	11.5	6.53	890	[0.08]	38.99	[0.1]	64.83	62.92	[0.03]
BLM 4C	April 7	12.0	6.43	700	[0.6]	14.01	[0.3]	76.74	86.71	[0.02]
BLM 4C	April 25	12.0	6.35	700	[10.7]	8.39	[0]	79.47	32.42	[0.01]
BLM 4C	June 1	15.5	6.17	850	[0.05]	31.20	[0.05]	80.90	58.50	[0.01]
BLM 4C	June 20	16.0	6.14	830	[0.05]	29.20	[0.05]	85.00	50.70	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 4D	Jan. 6	9.0	5.96	260	[0]	0.56	[0]	12.99	0.34	[0]
BLM 4D	Jan. 18	11.0	6.54	290	[0.12]	0.41	[0]	16.14	1.20	0.01
BLM 4D	Feb. 23	14.0	6.50	420	[0.22]	0.34	[0]	19.66	3.12	[0.02]
BLM 4D	April 7	13.0	6.40	485	[0.2]	0.34	[0.6]	21.65	5.56	[0.01]
BLM 4D	April 25	9.0	6.39	375	[6.8]	0.36	[0]	21.02	4.00	[0]
BLM 4D	June 1	14.0	6.14	300	[0.05]	[0.5]	[0.06]	19.70	3.67	[0.01]
BLM 4D	June 20	14.0	6.10	315	[0.05]	[0.05]	[0.05]	17.40	2.49	[0.01]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
Reported concentration may not be valid.

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 5C	Dec. 16	11.0	4.97	1500	[0]	105.87	[0.2]	44.76	352.16	[0.04]
BLM 5C	Jan. 6	9.0	5.12	1550	[0.03]	111.45	[0.4]	48.37	367.15	[0.05]
BLM 5C	Jan. 18	10.0	4.50	2900	[0.04]	14.65	[0]	67.86	939.42	[0.01]
BLM 5C	Feb. 23	12.0	5.22	3600	[0.03]	5.46	[0.2]	78.72	1410.56	[0.03]
BLM 5C	April 7	14.0	5.10	3400	[0]	4.32	[0.3]	84.36	1487.66	[0]
BLM 5C	April 25	10.0	4.90	3450	[0.5]	12.05	[0.2]	86.25	1542.75	[0.03]
BLM 5C	June 1	13.0	4.89	3500	[0.05]	78.30	[0.05]	74.70	1758.84	[0.01]
BLM 5C	June 20	13.5	4.78	3600	[0.05]	141.60	[0.05]	73.40	1596.28	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 5D	Oct. 5	23.0	5.16	290	[0]	[0]	[0]	11.00	4.40	[0]
BLM 5D	Dec. 16	10.0	5.43	260	[0]	0.30	0.10	15.49	4.99	[0.01]
BLM 5D	Jan. 6	9.0	4.95	255	[0.02]	0.56	[0]	17.77	5.03	[0]
BLM 5D	Feb. 23	13.0	5.22	365	[0.11]	0.29	[0]	25.91	9.28	[0.02]
BLM 5D	April 7	29.0	5.30	400	[0.5]	0.39	[0.5]	34.05	10.91	[0.02]
BLM 5D	April 25	10.0	5.27	380	[2.3]	0.58	[0]	30.75	9.91	[0.01]
BLM 5D	June 1	14.0	5.42	400	[0.05]	[0.5]	[0.05]	28.20	10.15	[0.01]
BLM 5D	June 20	14.0	5.45	385	[0.05]	[0.5]	[0.05]	26.40	9.53	[0.01]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
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WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 6C	Oct. 5	20.0	4.93	298	[0]	[0]	[0]	12.00	7.00	[0]
BLM 6C	Dec. 16	9.0	5.16	245	[0]	0.31	[0]	13.24	6.88	[0]
BLM 6C	Jan. 6	9.0	5.02	250	[0.05]	0.55	[0]	17.78	7.31	[0]
BLM 6C	Jan. 16	10.0	5.09	295	[0.04]	0.40	[0.1]	20.45	10.60	[0.01]
BLM 6C	Feb. 23	9.5	4.89	330	[0.04]	0.29	[0]	25.47	12.31	[0.02]
BLM 6C	April 7	13.0	4.90	410	[0.6]	0.38	[0.6]	33.43	14.16	[0]
BLM 6C	April 25	10.0	4.98	435	[2.5]	0.62	[0.1]	37.45	16.38	[0.02]
BLM 6C	June 1	14.5	5.22	440	[0.05]	[0.5]	[0.05]	32.20	17.57	[0.01]
BLM 6C	June 20	15.0	5.25	435	[0.05]	[0.5]	[0.05]	29.00	17.10	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 6D	Oct. 5	18.0	5.93	302	[0]	[0]	[0]	11.00	2.20	[0]
BLM 6D	Dec. 16	9.0	5.64	235	[0.05]	0.31	[0]	13.76	2.86	[0]
BLM 6D	Jan. 6	9.0	5.34	260	[0.04]	0.55	[0]	18.41	4.35	[0]
BLM 6D	Jan. 18	11.0	5.58	280	[0.02]	0.37	[0]	18.24	4.28	[0]
BLM 6D	Feb. 23	10.0	5.42	295	[0.06]	0.29	[0]	22.62	6.00	[0]
BLM 6D	April 7	13.0	5.45	365	[0.3]	0.36	[0.5]	31.24	8.22	[0.02]
BLM 6D	April 25	10.0	5.50	360	[2.4]	0.60	[0]	30.25	[8.95]	[0.01]
BLM 6D	June 1	14.5	5.82	350	[0.05]	[0.5]	[0.05]	26.20	7.78	[0.01]
BLM 6D	June 20	14.0	5.75	360	[0.05]	[0.6]	[0.05]	24.90	8.86	[0.01]

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WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 7C	Dec. 16	9.0	5.32	400	[0]	0.37	[0]	24.46	36.51	[0]
BLM 7C	Jan. 6	9.0	5.22	320	[0.01]	0.55	[0]	21.35	28.55	[0.01]
BLM 7C	Jan. 18	11.0	5.10	480	[0.08]	0.45	[0.1]	33.32	46.44	[0.02]
BLM 7C	Feb. 23	9.0	5.10	410	[0.08]	0.37	[0]	33.56	37.80	[0]
BLM 7C	April 7	10.0	5.05	750	[0.7]	0.43	[0.7]	65.81	83.40	[0]
BLM 7C	April 25	9.5	4.95	600	[5.4]	0.72	[0.2]	46.81	68.70	[0.01]
BLM 7C	June 1	15.0	5.49	600	[0.05]	[0.5]	[0.05]	40.40	63.72	[0.01]
BLM 7C	June 20	16.0	5.40	550	[0.05]	[0.5]	[0.05]	36.50	57.79	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 7D	Oct. 5	16.0	5.33	220	[0]	[0]	[0]	11.00	4.10	[0]
BLM 7D	Dec. 16	9.0	5.33	250	[0.01]	0.37	[0]	15.50	4.49	[0]
BLM 7D	Jan. 6	9.0	5.32	250	[0.01]	0.55	[0]	17.72	4.76	[0]
BLM 7D	Jan. 18	11.0	5.19	290	[0.09]	0.40	[0.1]	20.02	5.07	[0.01]
BLM 7D	Feb. 23	11.0	5.09	315	[0]	0.28	[0]	24.31	6.35	[0.02]
BLM 7D	April 7	11.0	5.03	390	[0.3]	0.33	[0.7]	29.48	8.29	[0.01]
BLM 7D	April 25	10.0	5.02	375	[2.3]	0.36	[0]	29.05	7.80	[0.01]
BLM 7D	June 1	13.0	5.45	370	[0.05]	[0.5]	[0.05]	28.20	8.30	[0.01]
BLM 7D	June 20	13.5	5.43	360	[0.05]	[0.6]	[0.05]	26.30	7.84	[0.01]

NOTE: [ ] indicates cumulative variance greater than 10 percent.
Recorded concentration may not be valid.

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 8C	Dec. 16	9.0	5.21	310	[0]	0.32	[0]	15.82	14.42	[0]
BLM 8C	Jan. 6	10.0	5.12	335	[0.01]	0.05	[0]	19.00	15.46	[0]
BLM 8C	Jan. 18	11.0	4.99	380	[0.08]	0.39	[0]	24.14	19.42	[0.01]
BLM 8C	April 7	10.0	5.20	680	[0.5]	0.33	[0.3]	54.37	69.28	0.01
BLM 8C	April 25	9.5	4.80	650	[5.0]	0.60	[0.1]	44.41	69.52	[0.01]
BLM 8C	June 1	12.5	5.12	680	[0.05]	[0.5]	[0.05]	42.50	44.75	[0.01]
BLM 8C	June 20	13.0	5.15	680	[0.05]	[0.5]	[0.06]	38.60	39.49	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 8D	Oct. 5	17.0	4.91	262	[0]	[0]	[0]	12.00	6.40	[0]
BLM 8D	Dec. 16	9.0	5.17	250	[0.09]	0.30	[0]	15.14	6.39	[0]
BLM 8D	Jan. 6	10.0	5.14	265	[0.03]	0.55	[0]	17.38	6.20	[0]
BLM 8D	Jan. 18	11.0	5.09	300	[0.12]	0.38	[0]	21.23	6.99	[0.02]
BLM 8D	Feb. 23	11.5	5.09	370	[0.13]	0.29	[0]	27.06	9.96	[0.03]
BLM 8D	April 7	11.0	5.01	450	[0.6]	0.34	[0.5]	34.66	13.46	[0.01]
BLM 8D	April 25	10.0	4.98	420	[1.8]	0.57	[0.1]	34.65	12.22	[0.01]
BLM 8D	June 1	12.0	5.33	420	[0.05]	[0.5]	[0.06]	32.00	12.58	[0.01]
BLM 8D	June 20	12.9	5.35	430	[0.05]	[0.5]	[0.05]	29.50	11.49	[0.01]

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WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 9C	Oct. 5	16.0	4.92	270	[0]	0.67	[0]	12.00	16.00	[0]
BLM 9C	Dec. 16	9.0	5.19	410	[0]	0.65	[0]	18.35	52.91	[0]
BLM 9C	Jan. 6	9.5	5.12	320	[0]	1.44	[0]	18.95	28.65	[0.01]
BLM 9C	Jan. 18	11.0	4.90	2000	[0.20]	0.50	[0.10]	138.53	853.64	[0.02]
BLM 9C	Feb. 23	9.5	4.81	465	[0.05]	0.77	[0]	33.47	59.76	[0.01]
BLM 9C	April 7	9.0	4.80	600	[0.2]	0.57	[0.6]	46.67	84.33	[0.01]
BLM 9C	April 25	9.0	4.78	650	[0.1]	0.76	[0.2]	42.31	64.54	[0.01]
BLM 9C	June 1	13.0	5.12	480	[0.05]	[0.5]	[0.05]	34.40	39.12	[0.01]
BLM 9C	June 20	14.0	5.05	450	[0.05]	[0.5]	[0.05]	30.30	30.98	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 9D	Oct. 5	16.0	5.36	210	[0]	0.07	[0]	11.00	4.00	[0]
BLM 9D	Dec. 16	10.0	5.40	270	[0.01]	0.31	[0]	14.65	4.65	[0]
BLM 9D	Jan. 6	10.0	5.25	270	[0.06]	0.60	[0]	18.56	5.07	[0.01]
BLM 9D	Jan. 18	12.0	5.19	290	[0.21]	0.37	[0]	21.14	5.96	[0.01]
BLM 9D	Feb. 23	12.0	5.01	340	[0.10]	0.29	[0.10]	26.57	7.61	[0.02]
BLM 9D	April 7	11.0	5.08	415	[0.2]	0.34	[0.5]	32.18	9.98	[0]
BLM 9D	April 25	10.0	5.10	395	[1.3]	0.59	[0.1]	29.22	9.20	[0.01]
BLM 9D	June 1	13.0	5.36	405	[0.05]	[0.5]	[0.05]	30.70	11.83	[0.01]
BLM 9D	June 20	13.0	5.23	370	[0.05]	[0.5]	[0.05]	27.60	10.68	[0.01]

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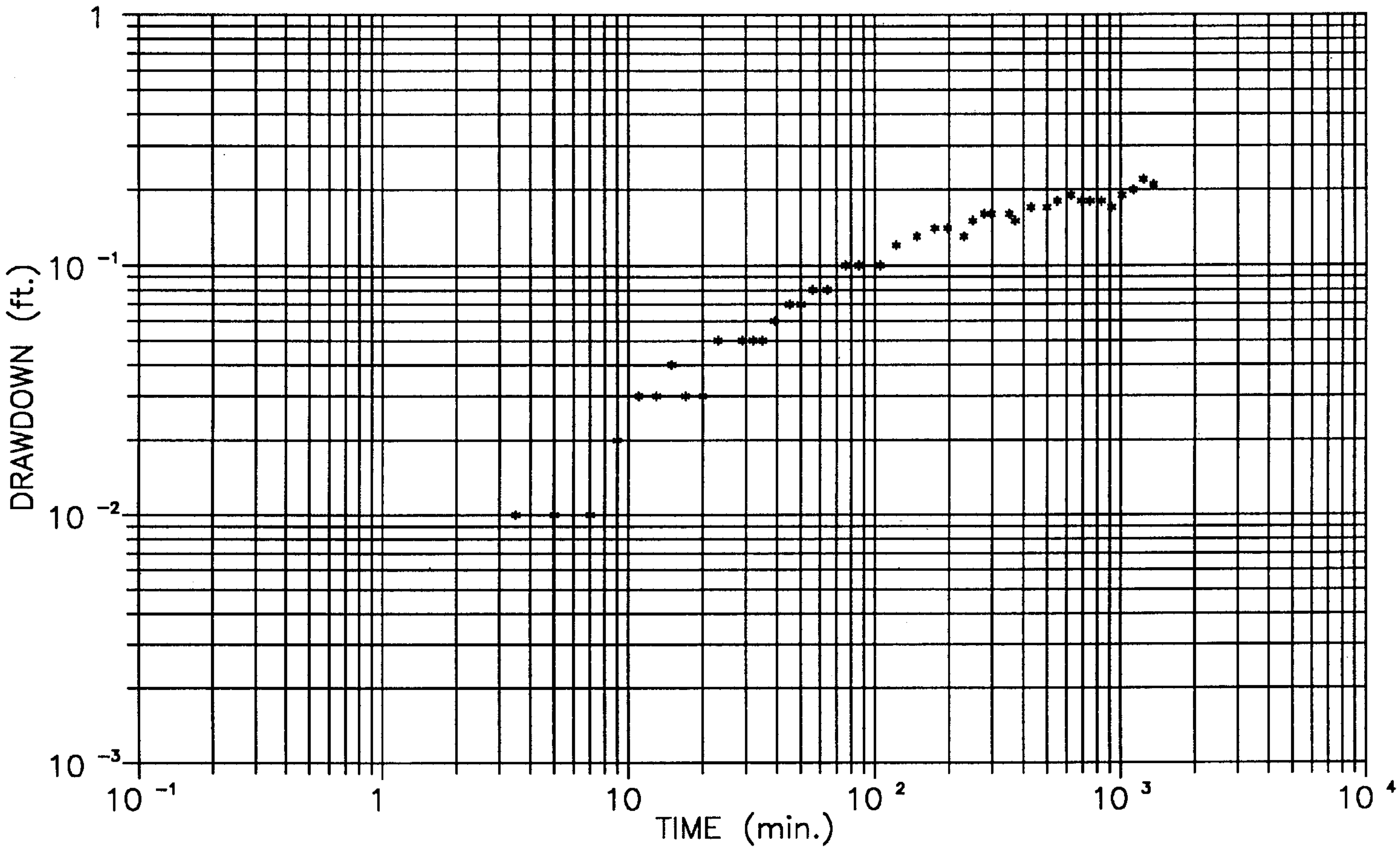
WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 10C	Oct. 5	21.0	5.92	700	[0]	23.00	[0]	26.00	23.00	[0]
BLM 10C	Dec. 16	9.0	5.56	1800	[0.01]	73.95	[0]	90.00	518.12	[0.01]
BLM 10C	Jan. 6	10.0	5.42	1950	[0.03]	101.55	[0.4]	121.80	669.73	0.04
BLM 10C	Jan. 18	11.0	5.83	2050	[0.02]	89.07	[0.2]	124.15	598.83	0.05
BLM 10C	Feb. 23	10.0	5.95	1600	[0.02]	97.22	[0.1]	117.68	455.38	0.07
BLM 10C	April 7	10.0	5.76	1750	[0.1]	63.55	[0.1]	128.83	596.42	[0.02]
BLM 10C	April 25	10.00	5.66	800	[2.3]	14.66	[0]	47.12	120.85	[0.01]
BLM 10C	June 1	14.00	5.36	1100	[0.05]	24.80	[0.05]	65.30	178.77	[0.01]
BLM 10C	June 20	15.00	5.40	1000	[0.07]	23.90	[0.05]	45.60	69.01	[0.01]

WELL	DATE	TEMP C	pH	EC	As (mg/l)	Fe (mg/l)	Sb (mg/l)	Mg (mg/l)	Zn (mg/l)	Cr (mg/l)
BLM 10D	Oct. 5	19.0	5.57	260	[0]	[0]	[0]	11.00	3.70	[0]
BLM 10D	Dec. 16	10.0	5.80	260	[0.04]	0.34	[0]	15.36	4.04	[0]
BLM 10D	Jan. 6	10.0	5.70	265	[0.01]	0.65	[0]	17.79	4.32	[0.01]
BLM 10D	Jan. 18	12.0	5.53	280	[0.12]	0.39	[0.1]	19.36	4.73	[0.01]
BLM 10D	Feb. 23	11.0	5.65	300	[0.04]	0.33	[0]	23.50	6.01	[0.01]
BLM 10D	April 7	13.0	5.69	365	[0.2]	0.33	[0.6]	26.27	6.75	[0]
BLM 10D	April 25	11.5	5.44	370	[1.9]	0.34	[0.2]	25.06	6.07	[0.01]
BLM 10D	June 1	15.0	5.75	345	[0.05]	0.50	[0.05]	24.10	6.81	[0.01]
BLM 10D	June 20	16.0	5.72	350	[0.05]	0.50	[0.05]	22.40	6.50	[0.01]

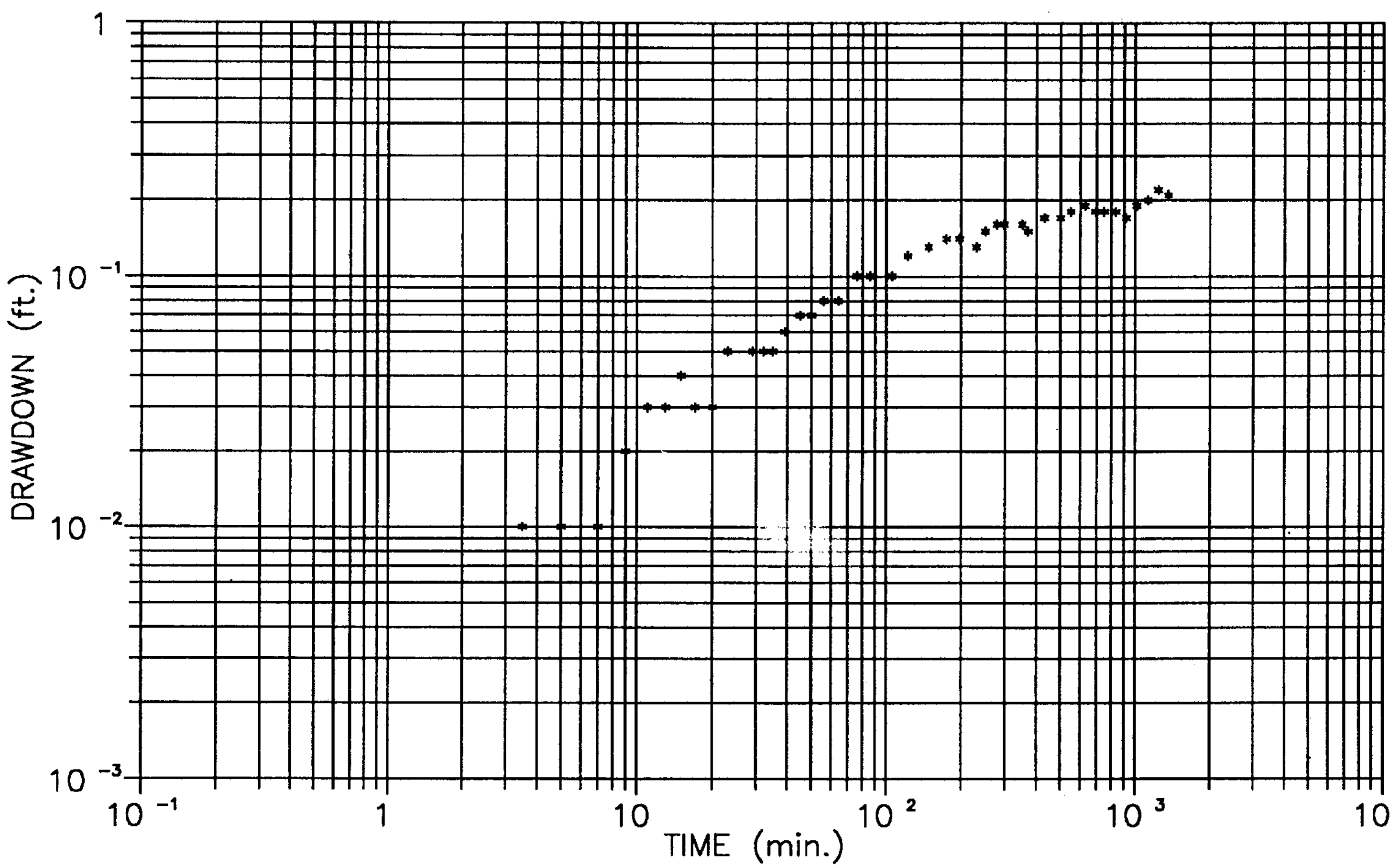
NOTE: [ ] indicates cumulative variance greater than 10 percent.
Reported concentration may not be valid.

APPENDIX 6

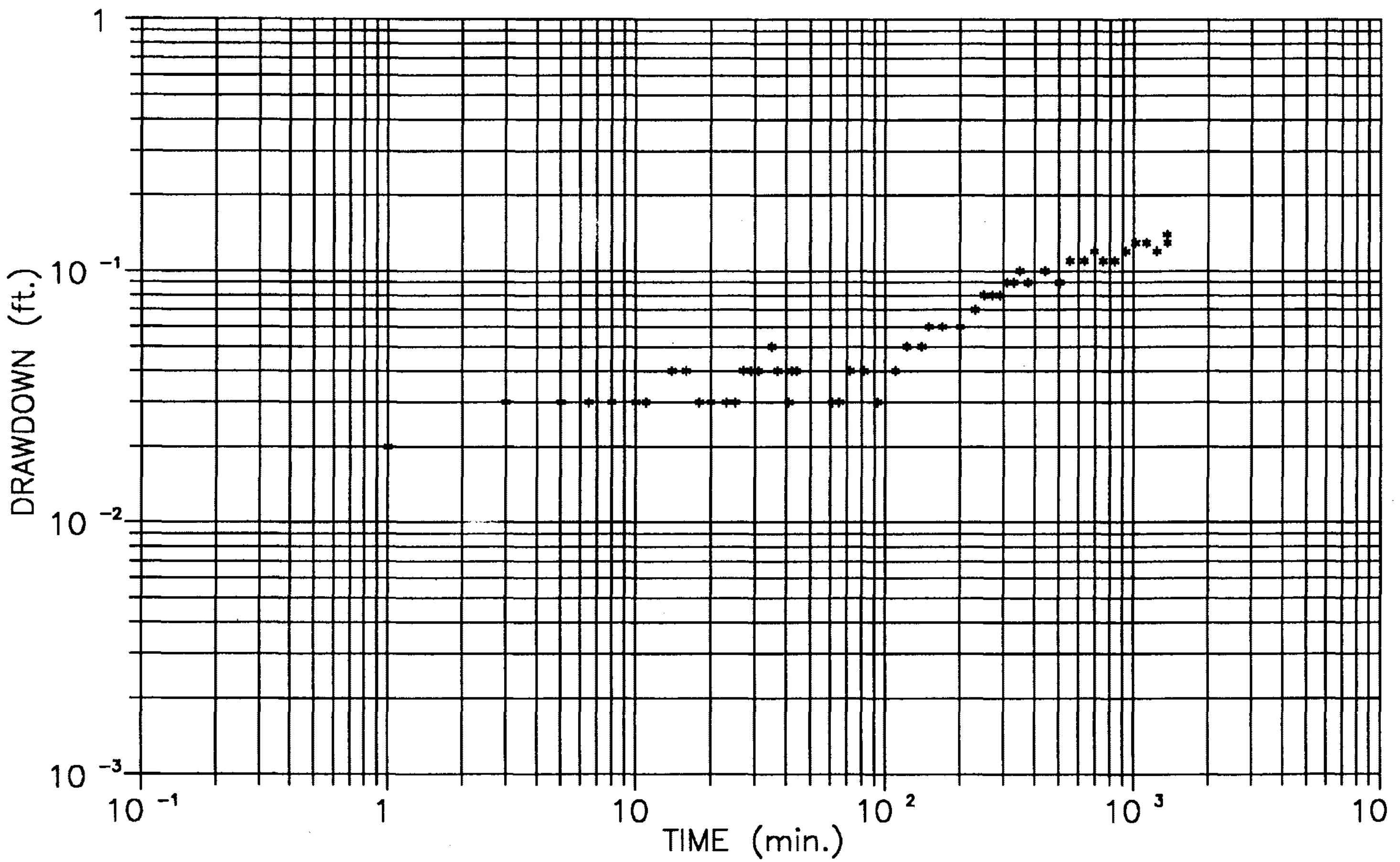
AQUIFER TEST DRAWDOWN CURVES



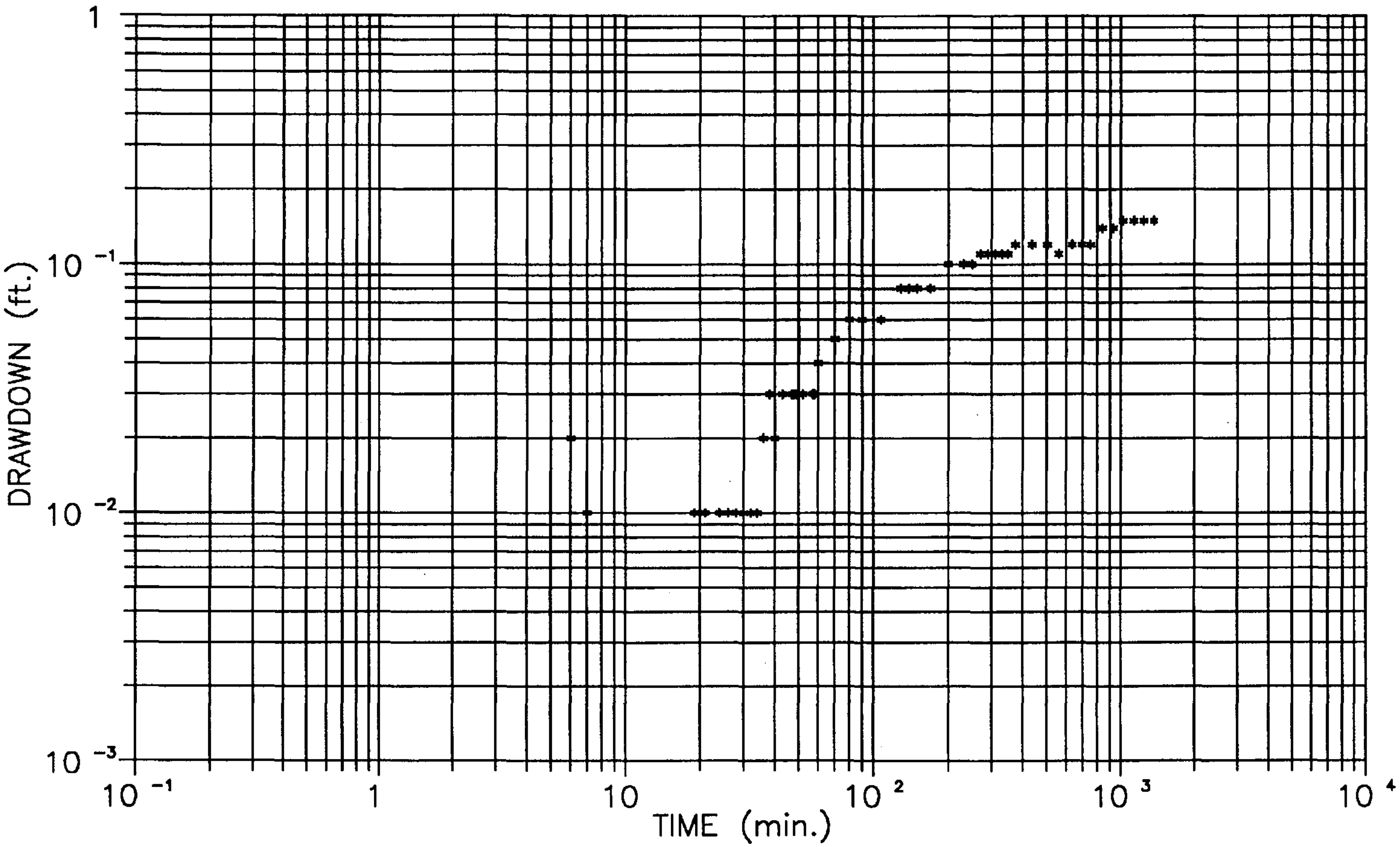
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 1C
TRANSMISSIVITY WAS CALCULATED AT 57,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.04.



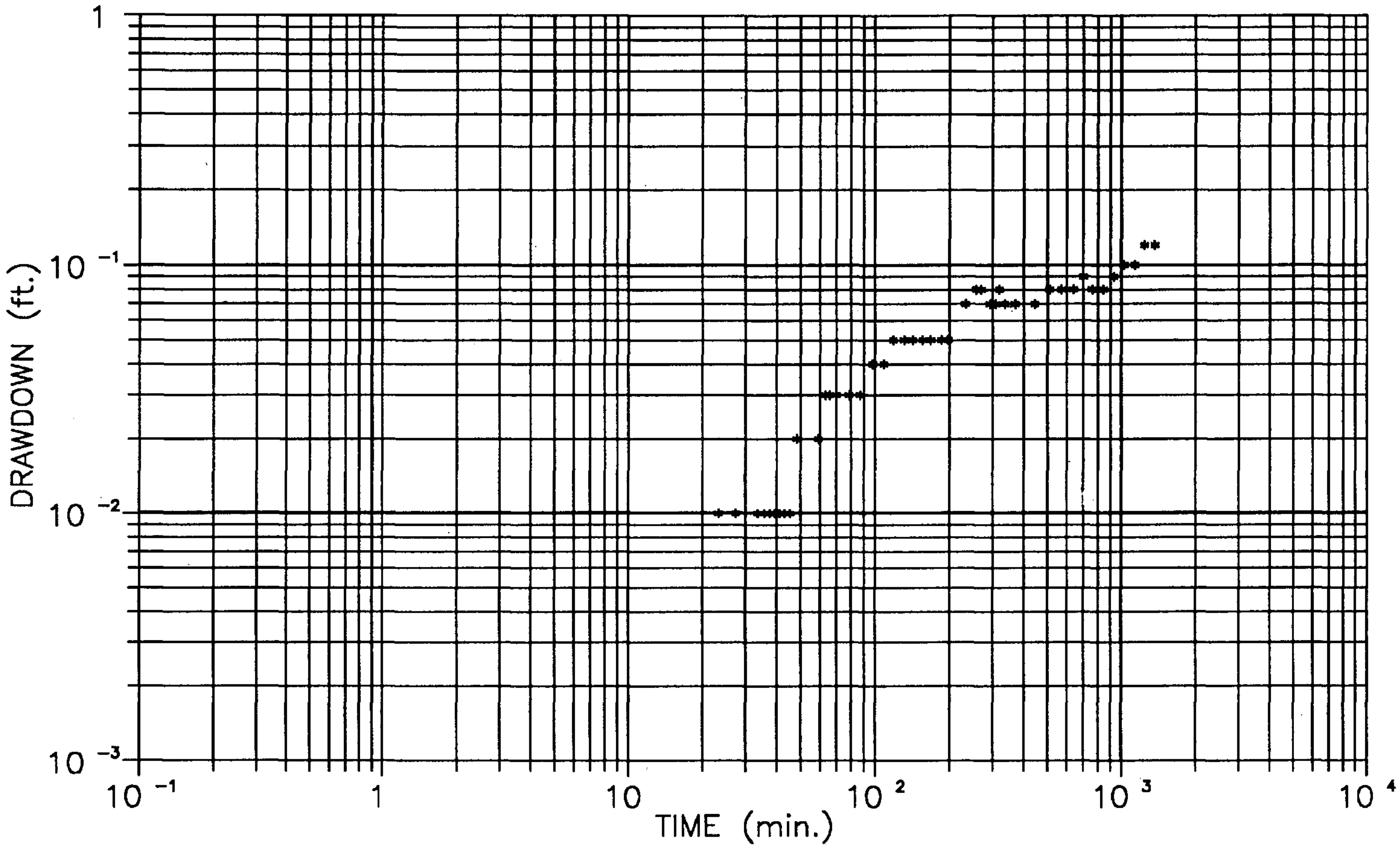
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 1D
TRANSMISSIVITY WAS CALCULATED AT 61,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.02.



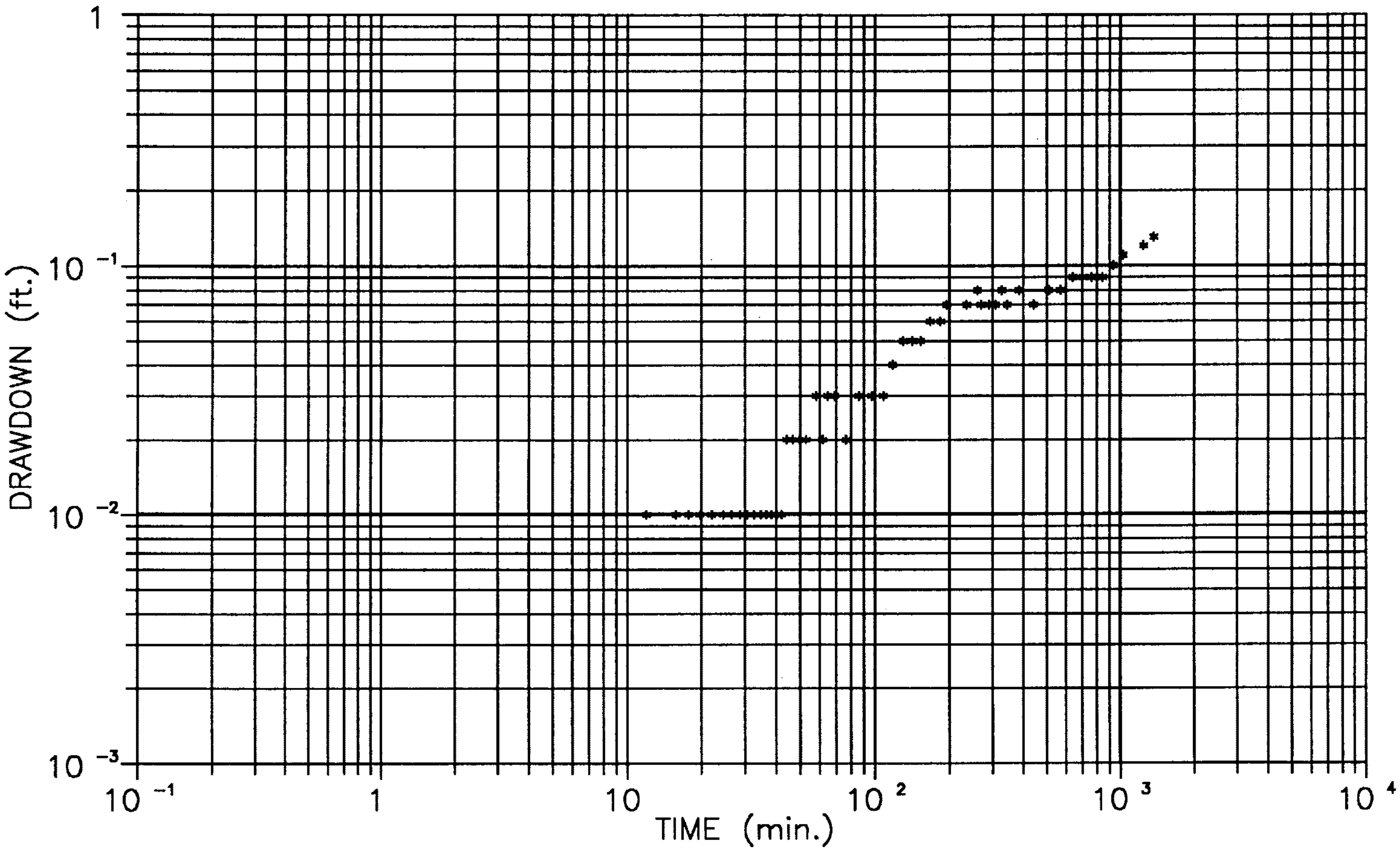
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 2C
TRANSMISSIVITY WAS CALCULATED AT 57,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.06.



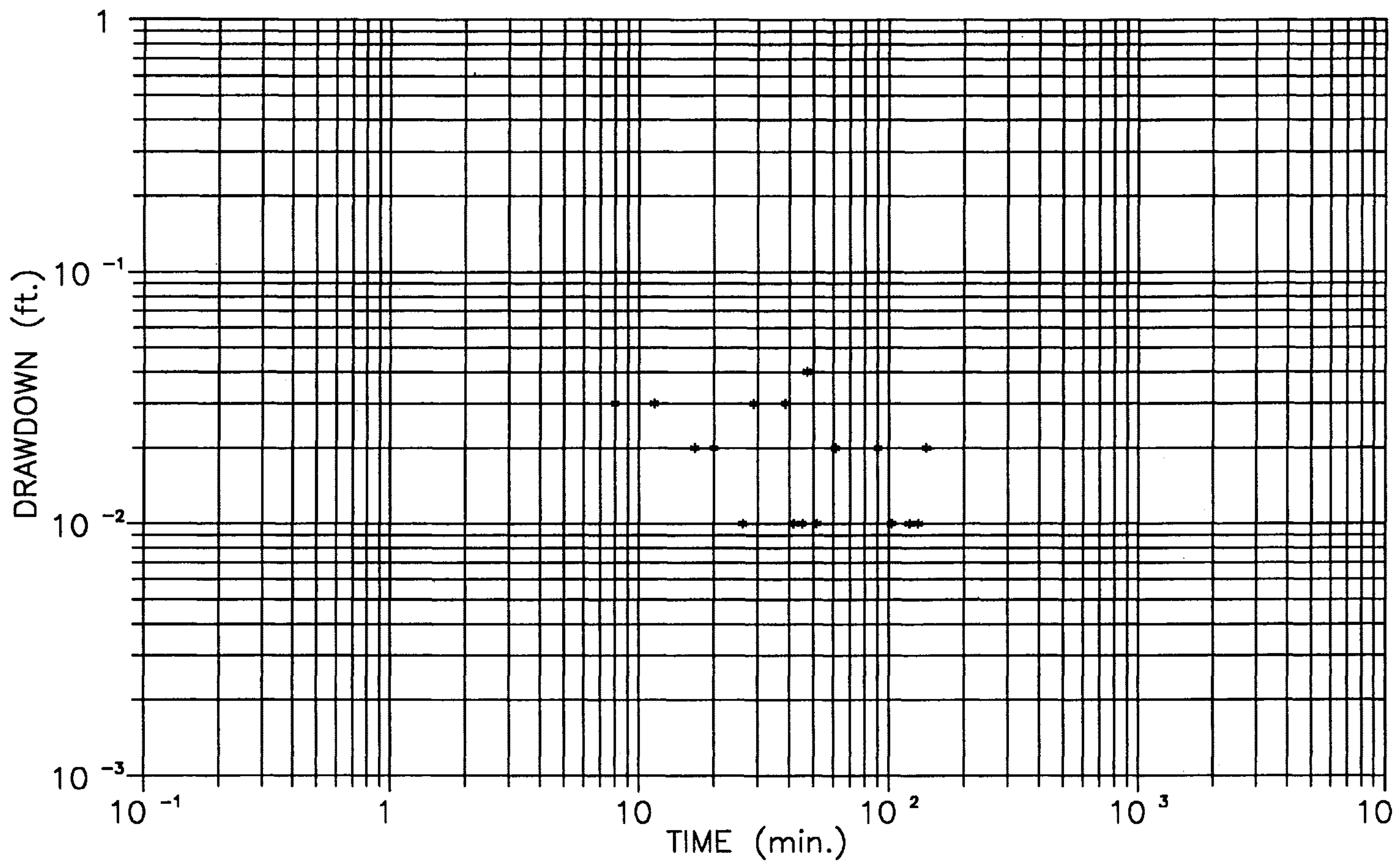
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 2D
TRANSMISSIVITY WAS CALCULATED AT 51,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.04.



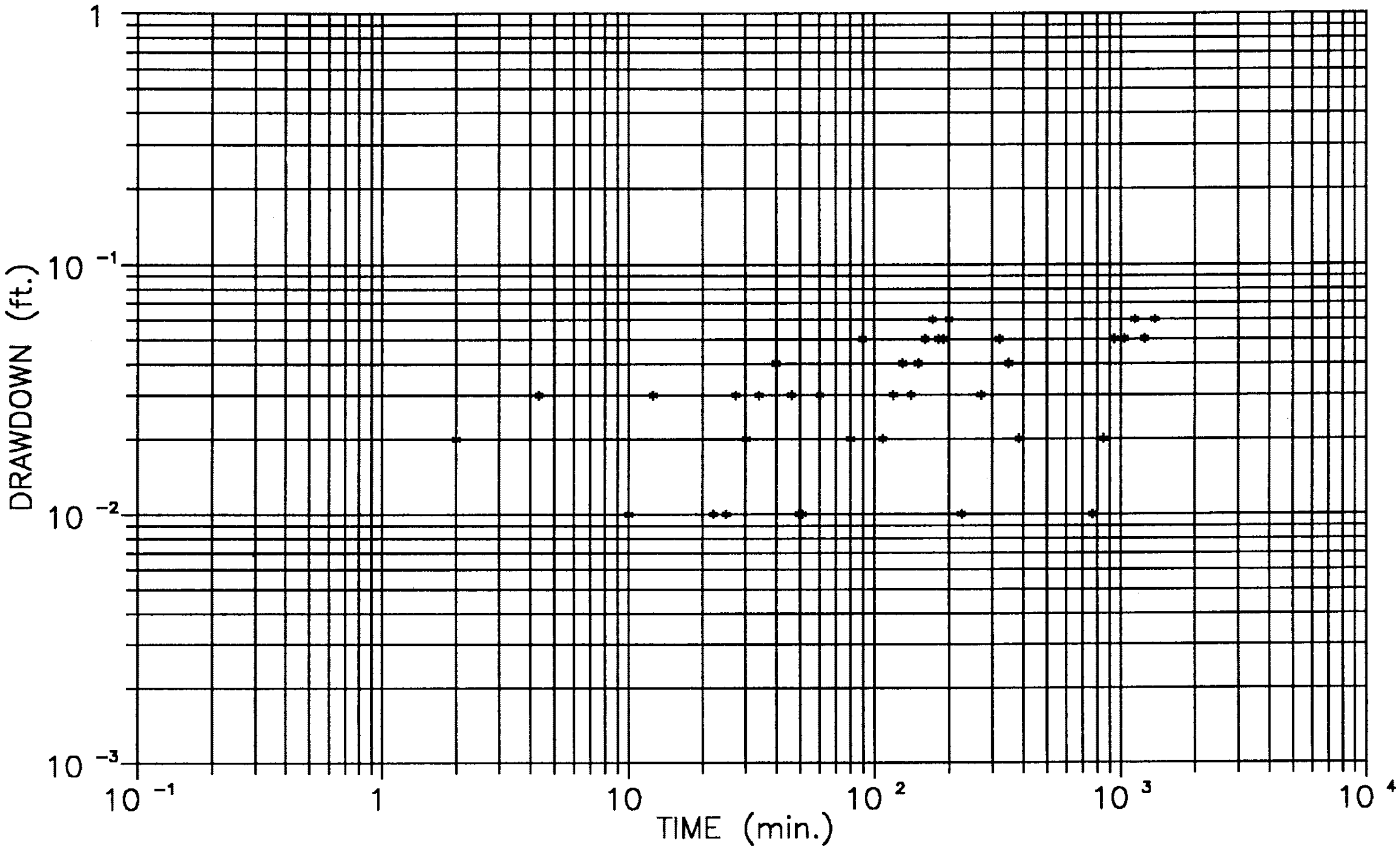
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 3C
TRANSMISSIVITY WAS CALCULATED AT 65,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.04.



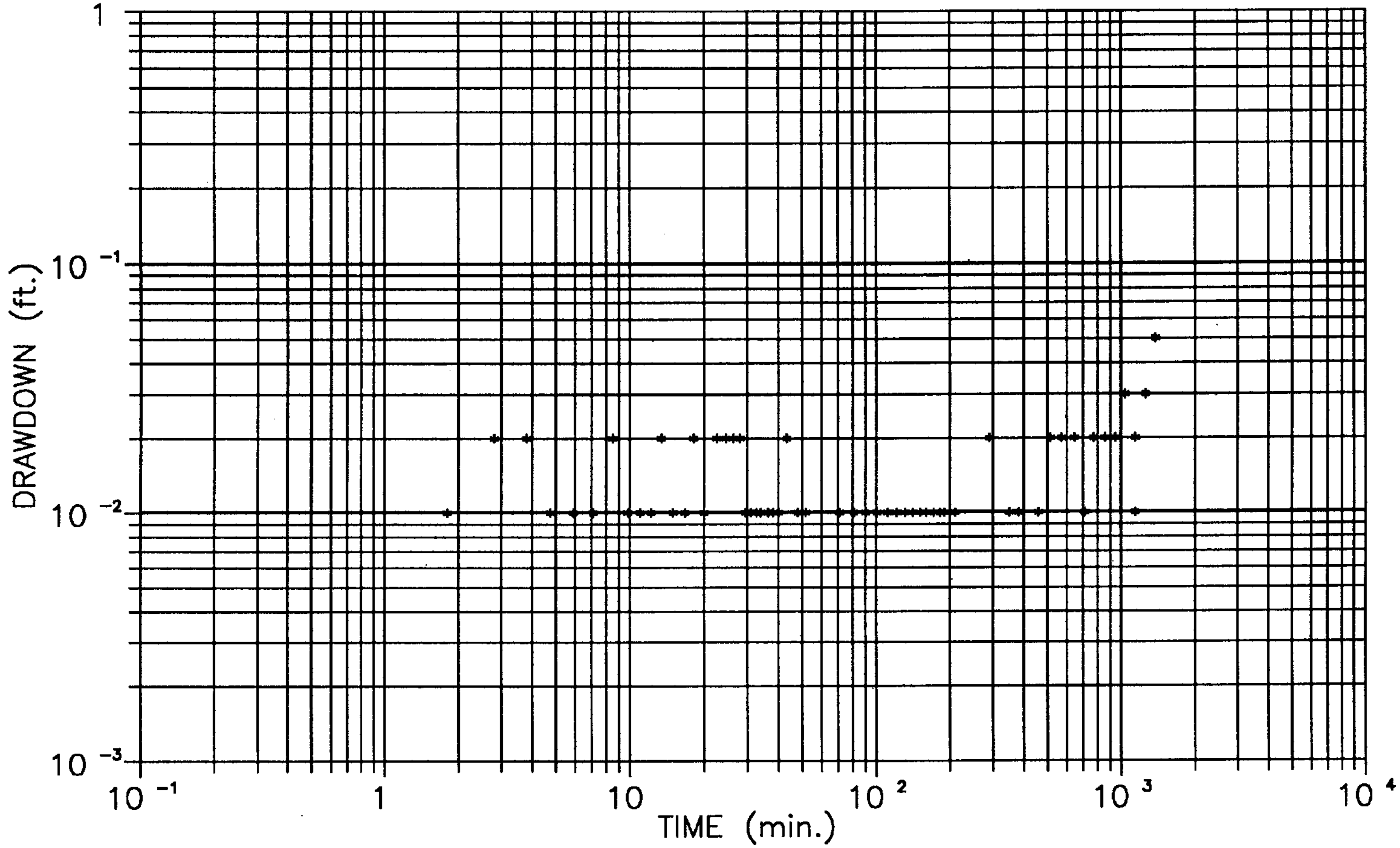
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 3D
TRANSMISSIVITY WAS CALCULATED AT 65,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.04.



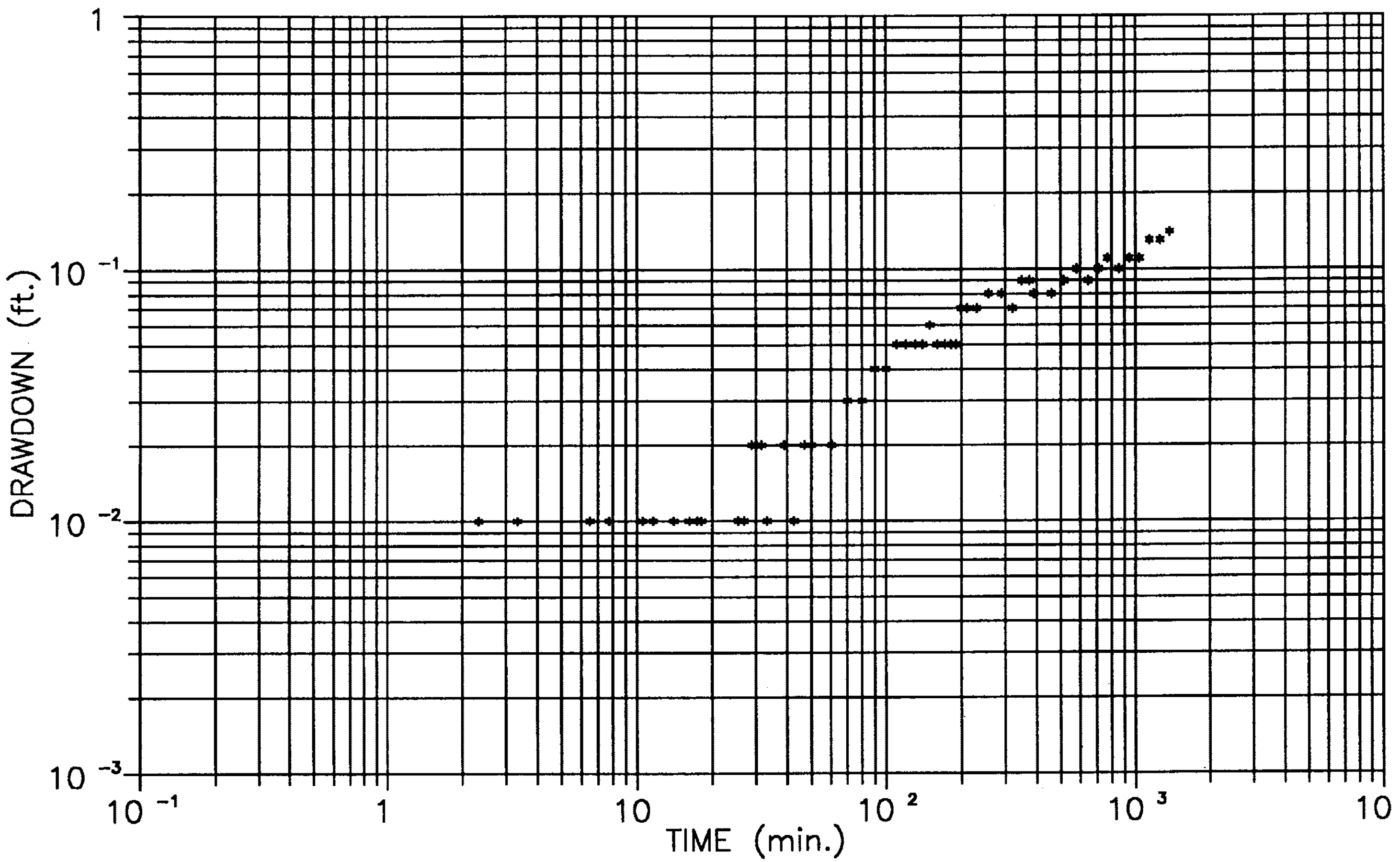
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 4C
THERE WAS TOO MUCH SCATTER IN THE DATA TO CALCULATE AQUIFER COEFFICIENTS



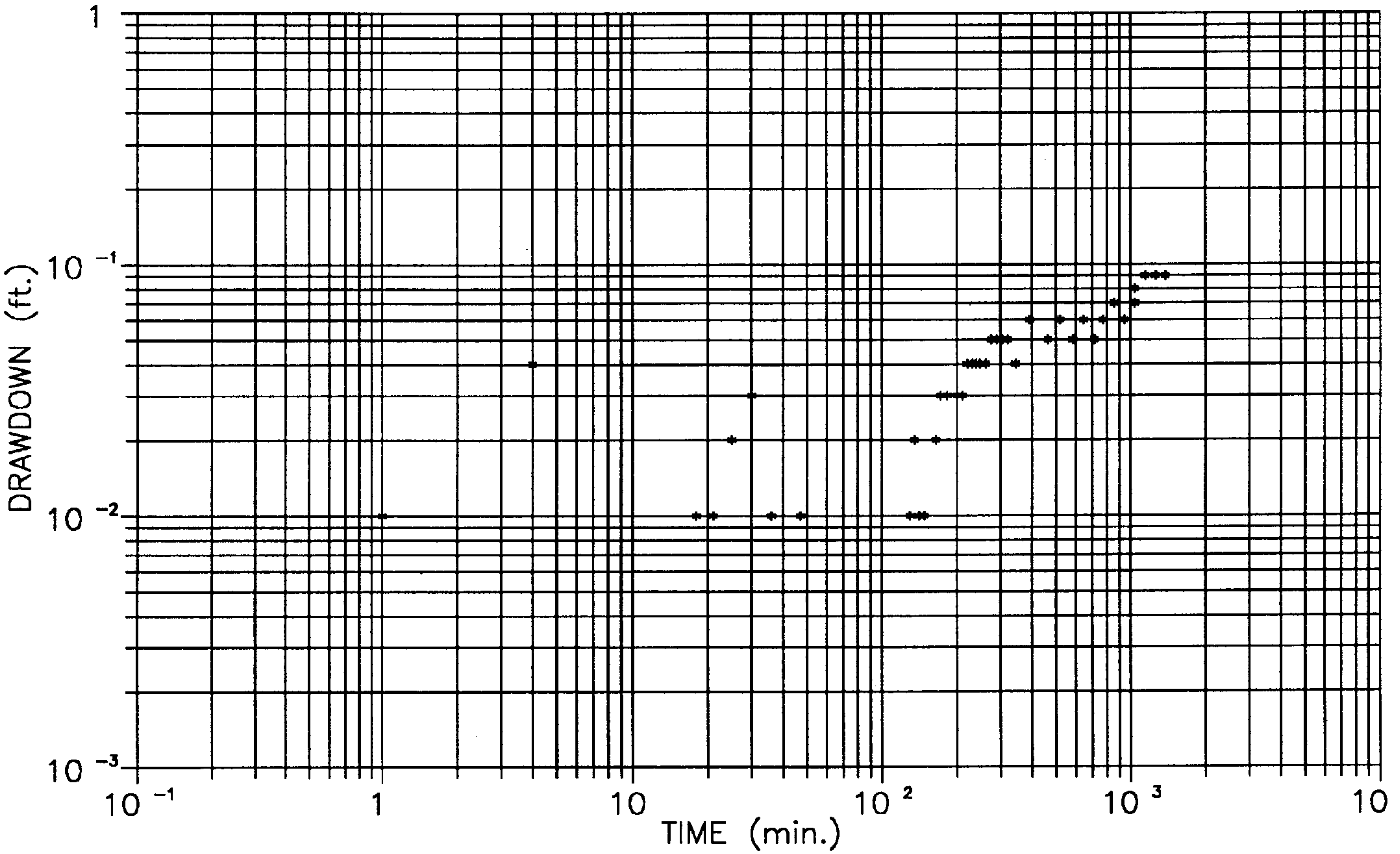
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 4D
THERE WAS TOO MUCH SCATTER IN THE DATA TO CALCULATE AQUIFER COEFFICIENTS



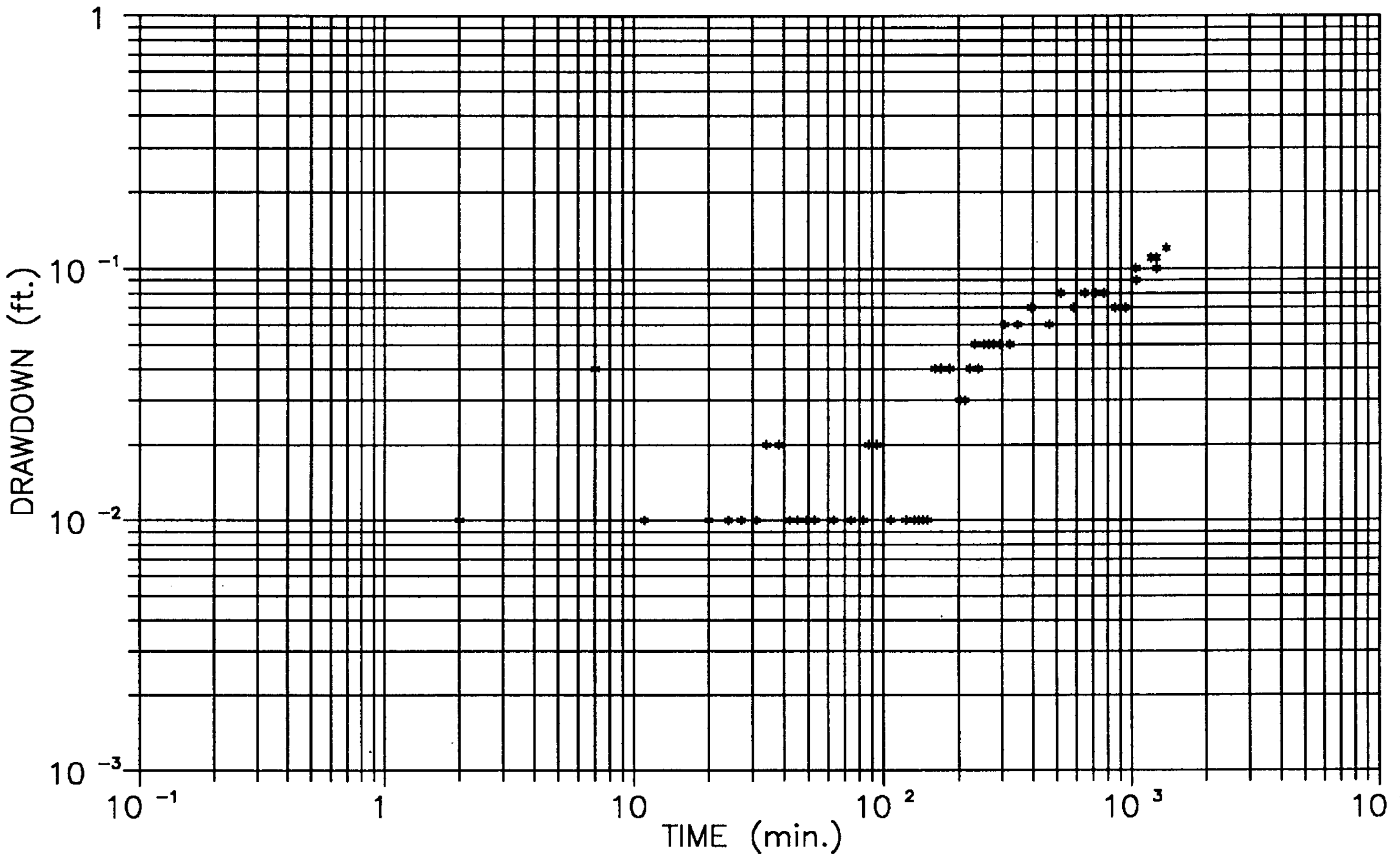
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 5C
THERE WAS TOO MUCH SCATTER IN THE DATA TO CALCULATE AQUIFER COEFFICIENTS



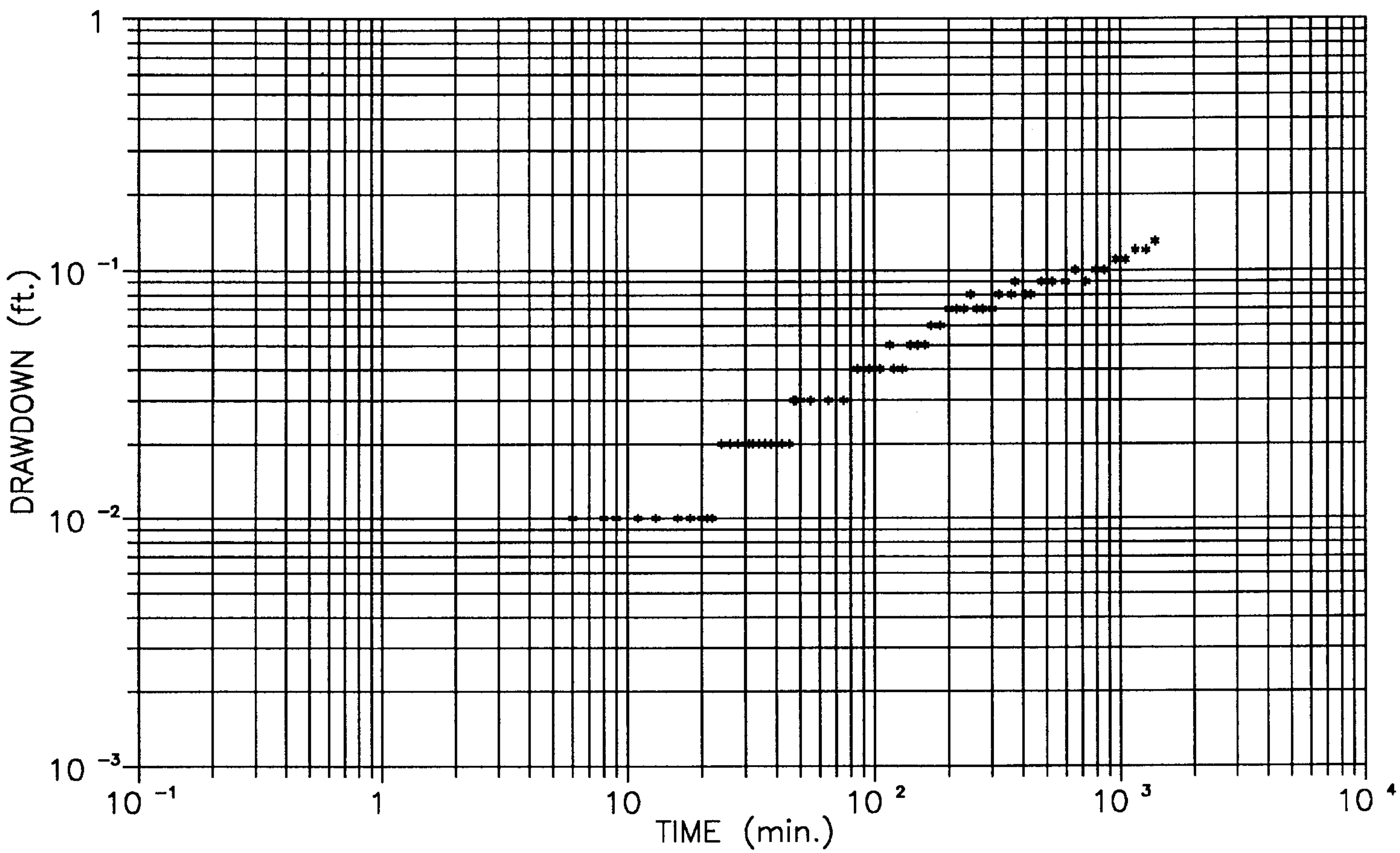
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 5D
TRANSMISSIVITY WAS CALCULATED AT 58,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.04.



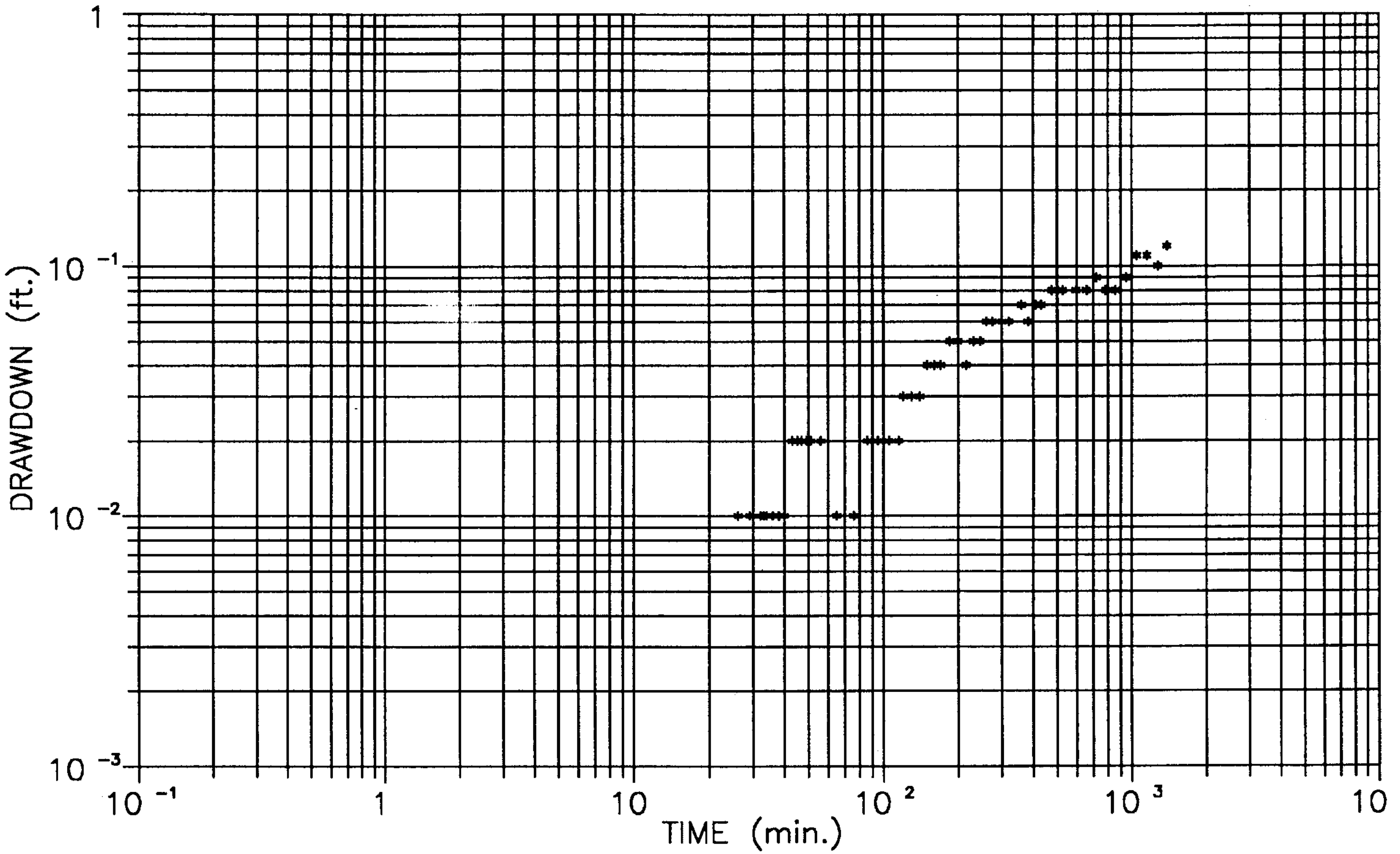
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 6C
TRANSMISSIVITY WAS CALCULATED AT 62,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.09.



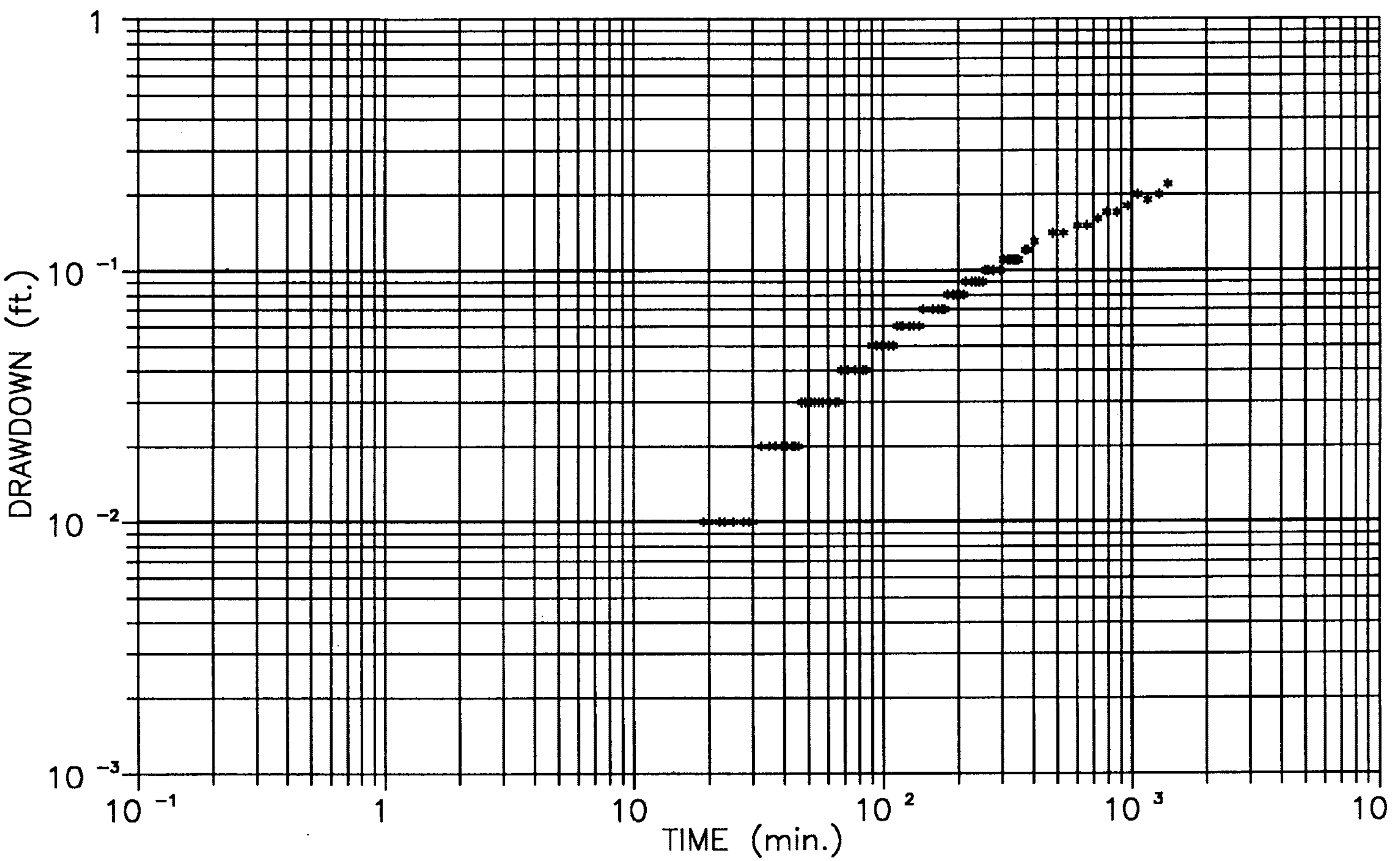
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 6D
TRANSMISSIVITY WAS CALCULATED AT 62,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.08.



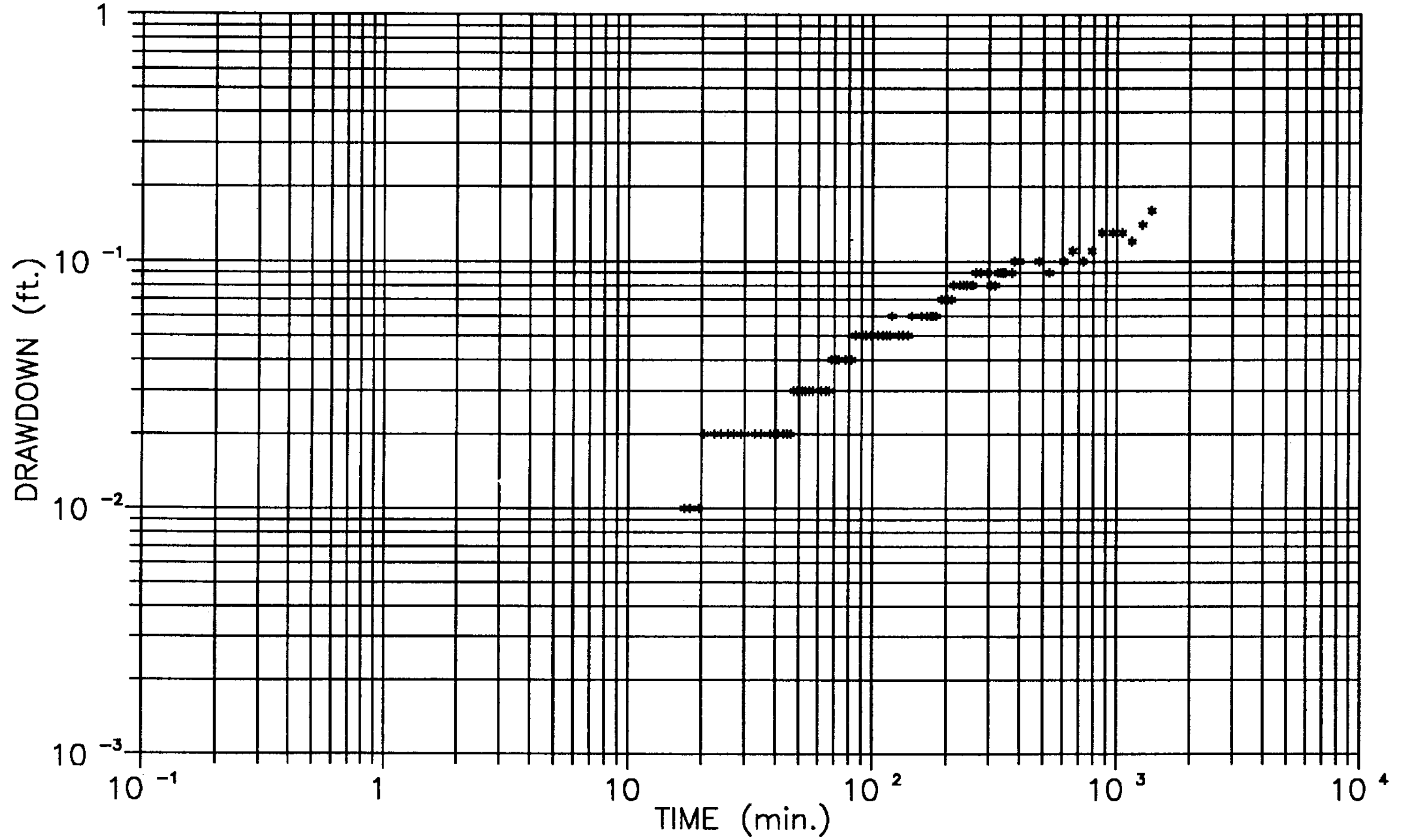
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 7C
TRANSMISSIVITY WAS CALCULATED AT 75,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.04.



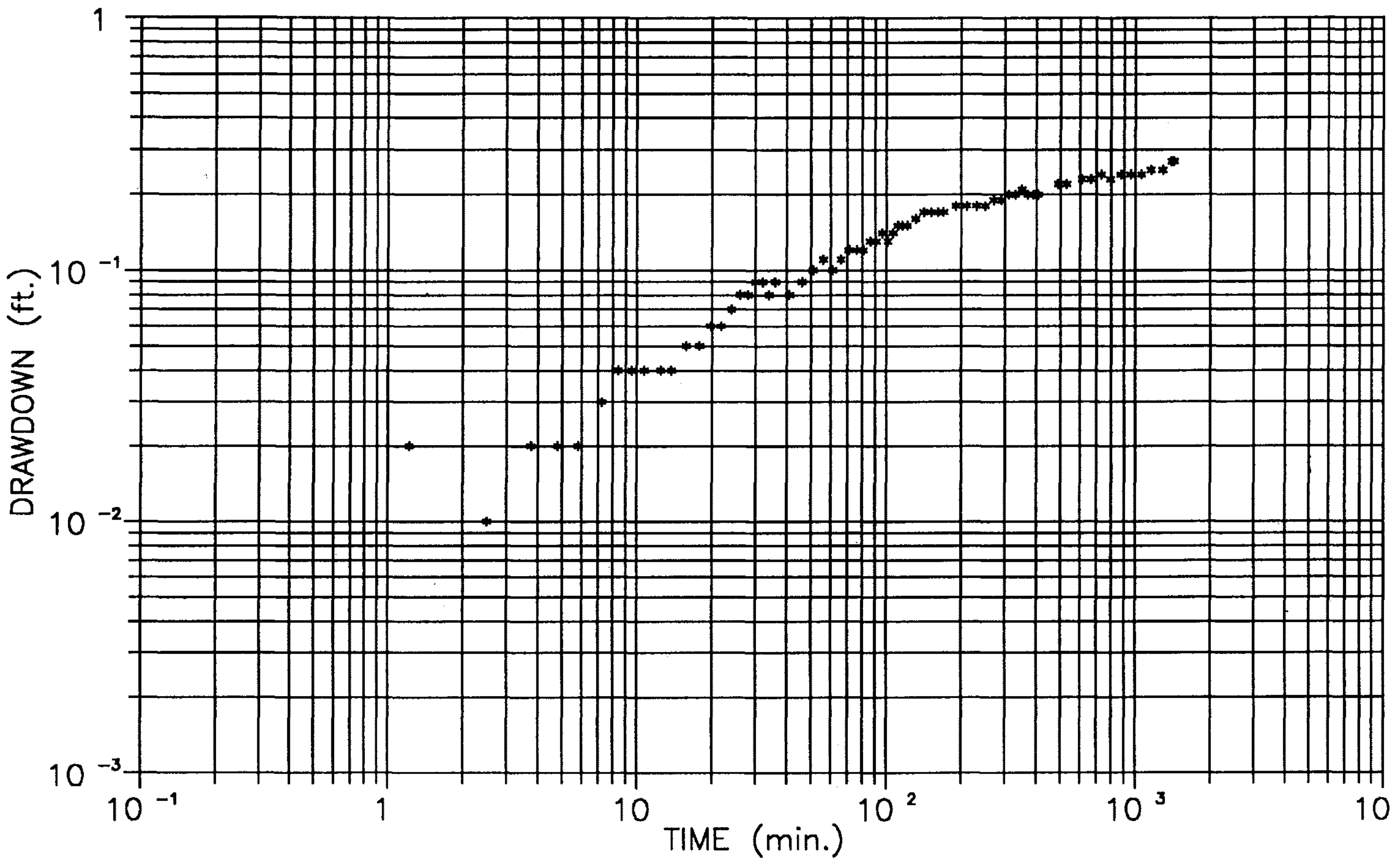
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 7D
TRANSMISSIVITY WAS CALCULATED AT 58,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.09.



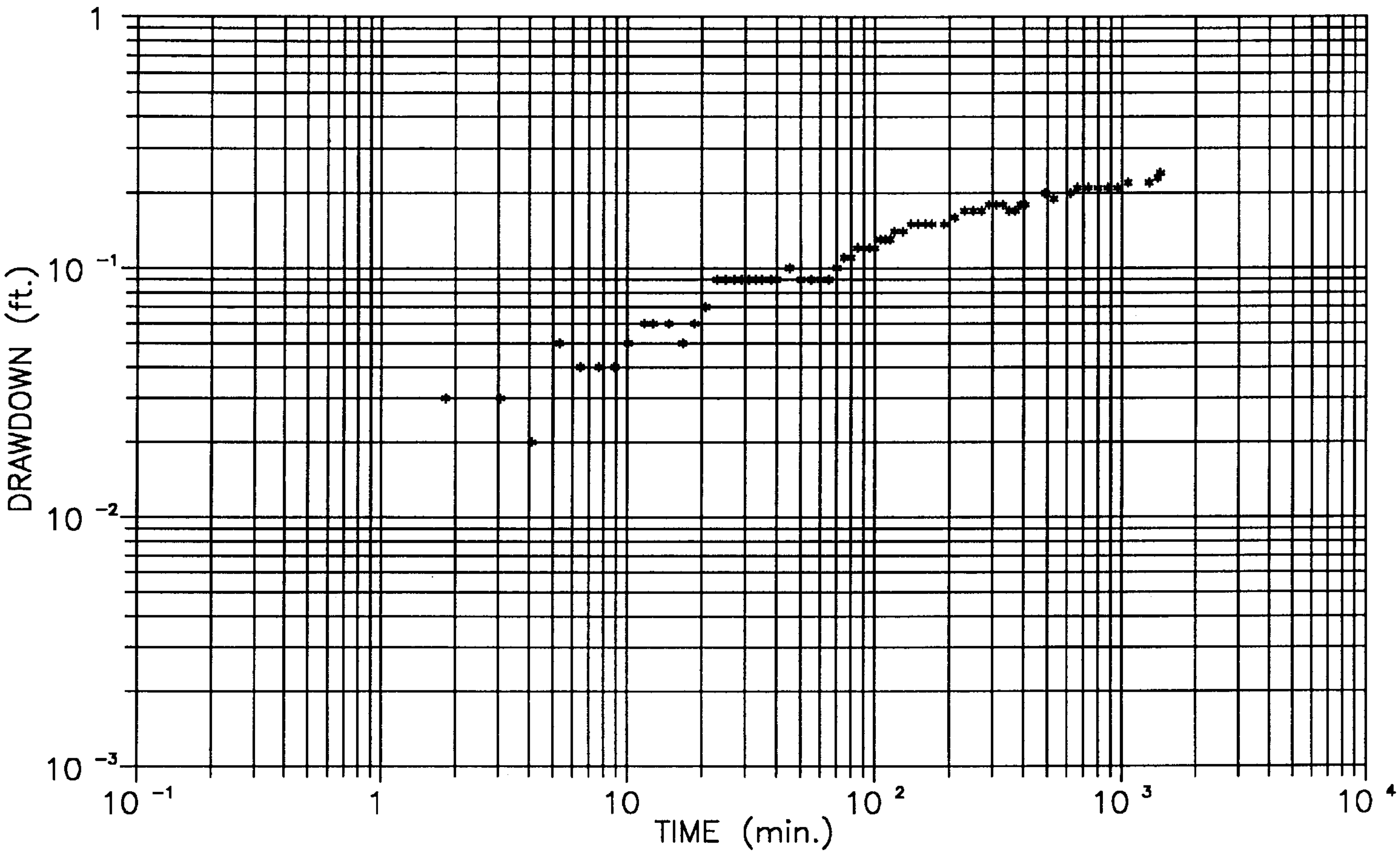
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 8C
TRANSMISSIVITY WAS CALCULATED AT 45,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.04.



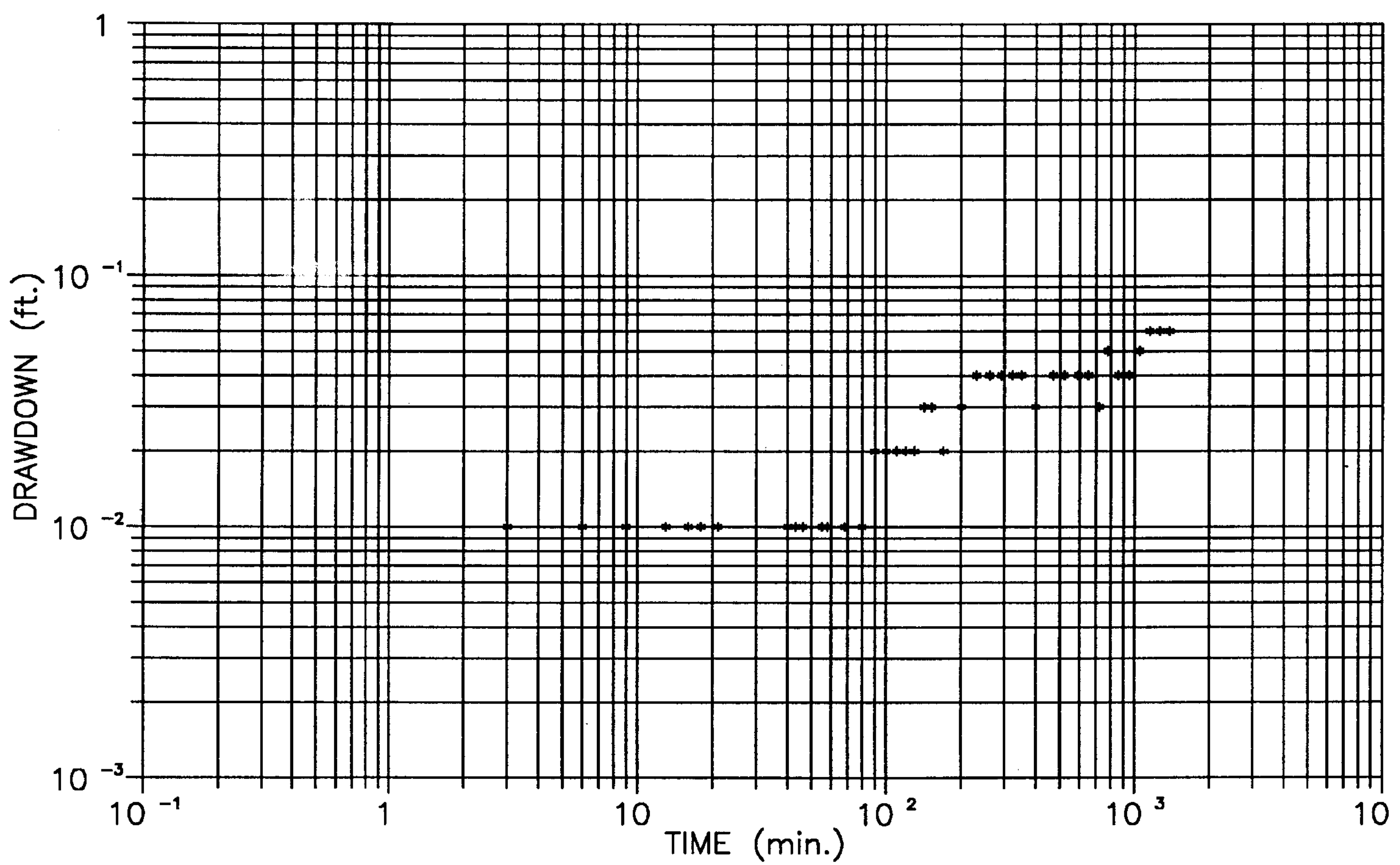
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 8D
TRANSMISSIVITY WAS CALCULATED AT 62,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.04.



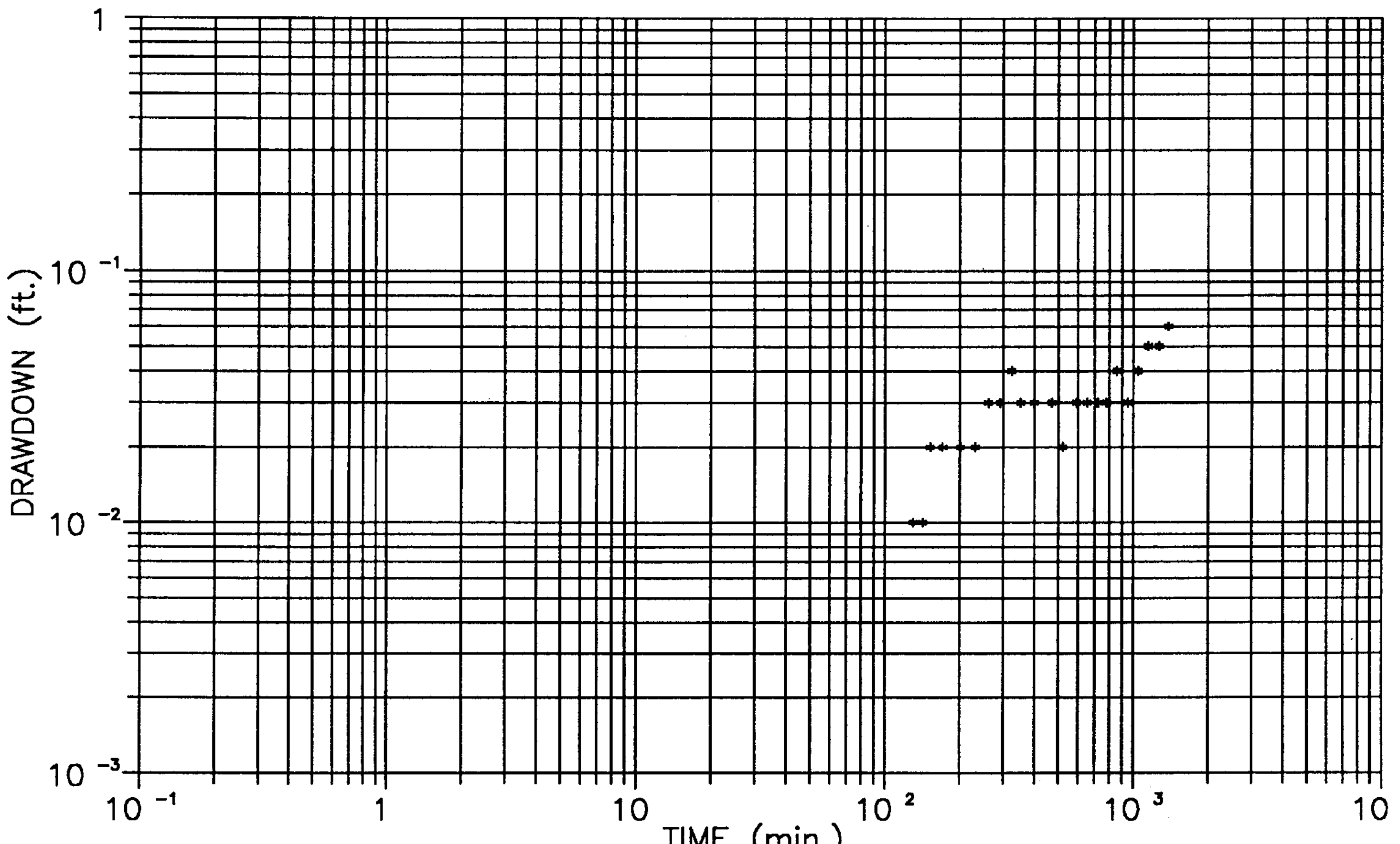
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 9C
TRANSMISSIVITY WAS CALCULATED AT 54,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.02.



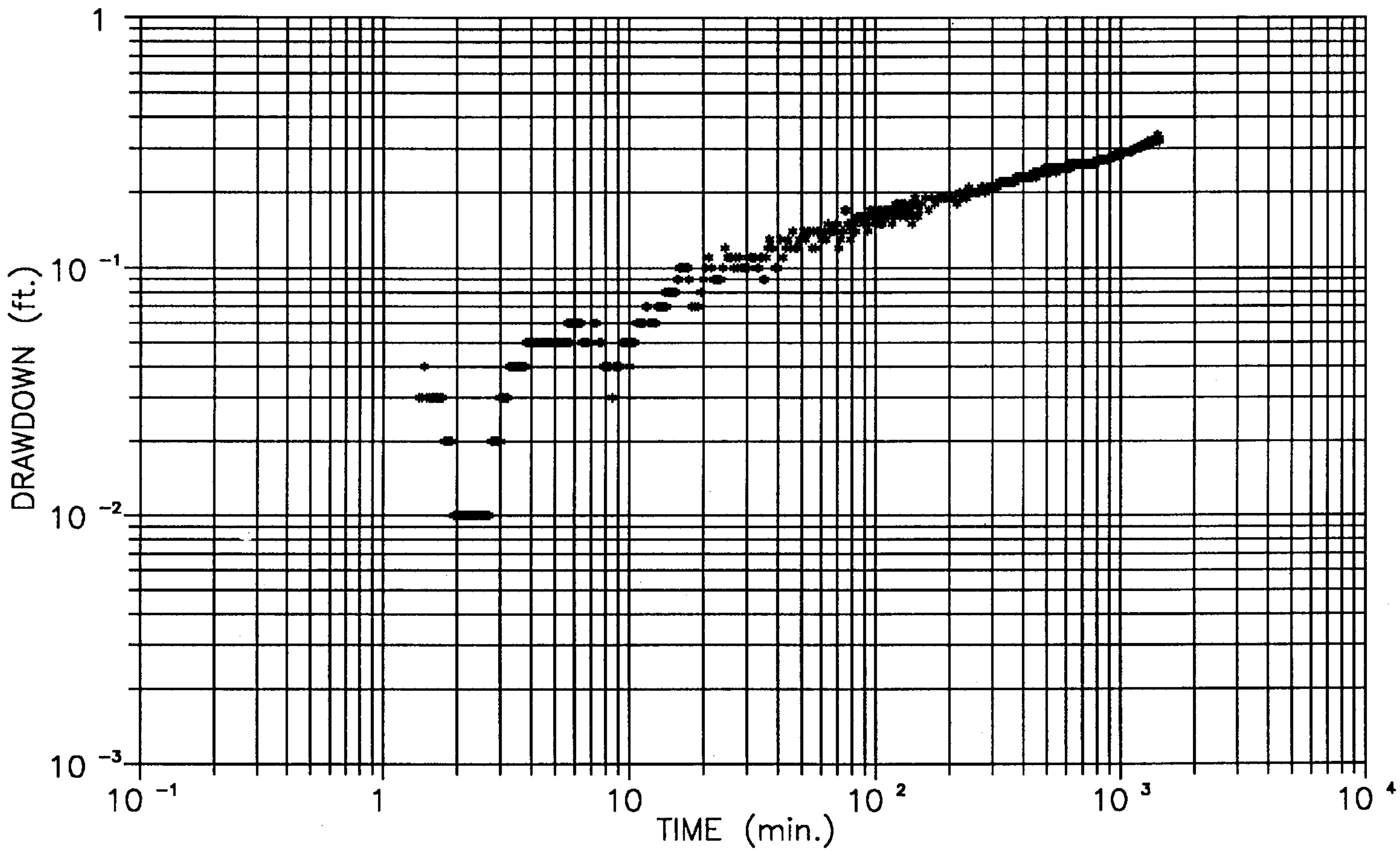
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 9D
TRANSMISSIVITY WAS CALCULATED AT 58,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.02.



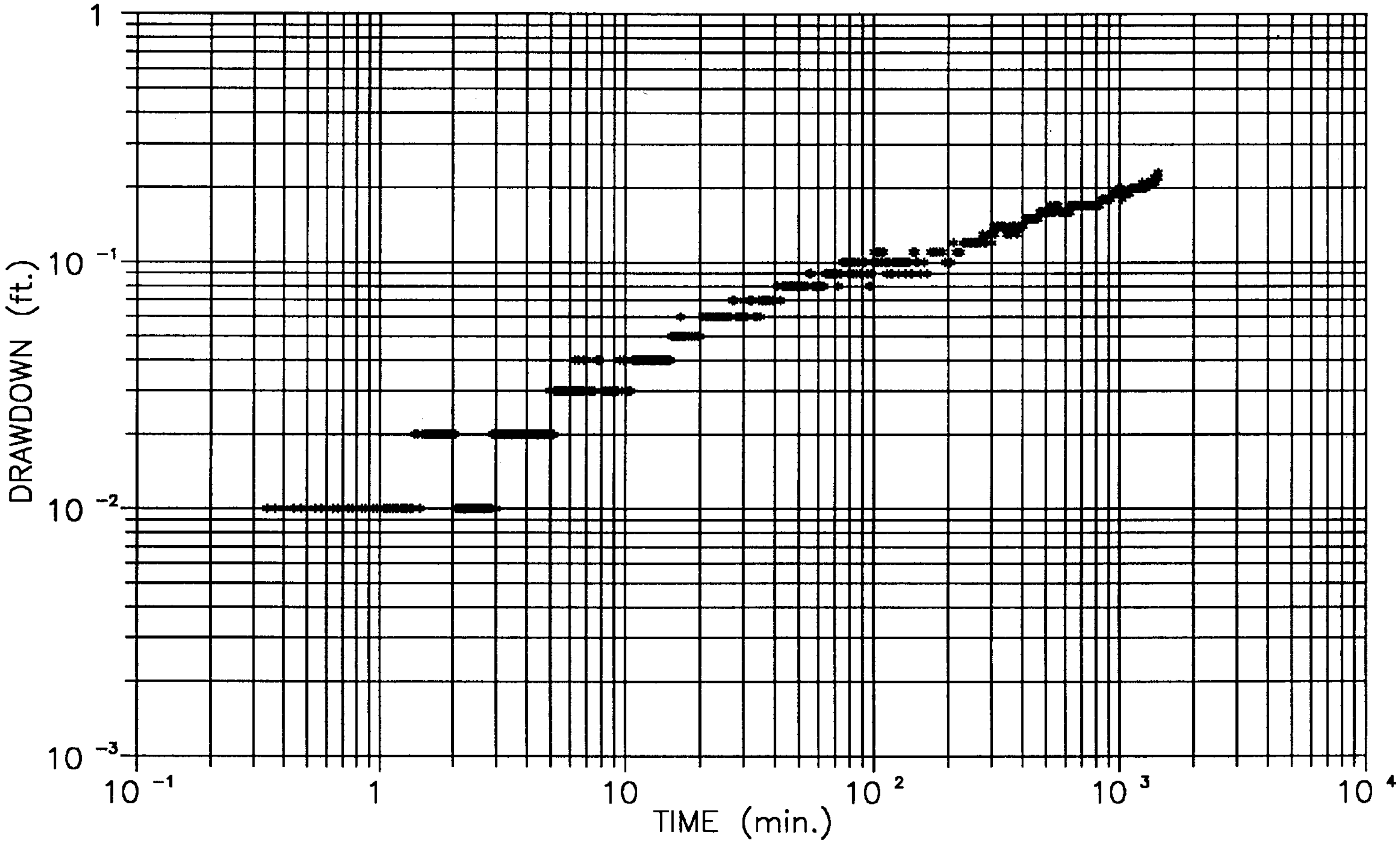
DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 10C
THERE WAS TOO MUCH SCATTER IN THE DATA TO CALCULATE AQUIFER COEFFICIENTS



DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL BLM 10D
THERE WAS TOO MUCH SCATTER IN THE DATA TO CALCULATE AQUIFER COEFFICIENTS



DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN TYPE B WELL
TRANSMISSIVITY WAS CALCULATED AT 58,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.03.



DRAWDOWN VERSUS TIME SINCE PUMPING STARTED IN WELL MP1-A
TRANSMISSIVITY WAS CALCULATED AT 61,000 ft2/day.
SPECIFIC YIELD WAS CALCULATED AT 0.02.

APPENDIX 7

AQUIFER TEST DATA

AQUIFER TEST PUMPING RATE

TIME	PUMPING RATE (GPM)
1010	180
1030	not measured
1100	177
1130	177
1200	176
1230	176
1300	175
1330	174
1400	175
1430	174
1500	174
1530	175
1600	171
1630	172
1700	173
1730	173
1800	173
1830	173
1900	175
1930	172
2000	175
2030	170
2100	172
2130	171
2200	175
2230	171
2300	170
2330	170
2400	170
2430	173
100	170
130	164
200	176
230	170
330	168
400	171
430	164
500	165
530	166
600	166
630	168
700	169
730	168
800	168
830	164
900	163
930	166
1000	168
total	8046 GPM
	48 GPM
average	168 GPM

RADIAL DISTANCE OF OBSERVATION WELLS (PIEZOMETERS) FROM THE PUMPING WELL

WELL	DISTANCE IN
1C	146
1D	151
2C	289
2D	286
3C	350
3D	352
4C	604
4D	602
5C	335
5D	331
6C	347
6D	346
7C	307
7D	308
8C	295
8D	297
9C	149
9D	146
10C	442
10D	447

PIEZOMETER 1C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.25	0.00	0.00	7.39	7.39	0.00
2.00	0.00	0.03	7.39	7.39	0.00
3.50	0.01	0.06	7.39	7.40	0.01
5.00	0.01	0.08	7.39	7.40	0.01
7.00	0.01	0.12	7.39	7.40	0.01
9.00	0.02	0.15	7.39	7.41	0.02
11.00	0.03	0.18	7.39	7.42	0.03
13.00	0.03	0.22	7.39	7.42	0.03
15.00	0.04	0.25	7.39	7.43	0.04
17.00	0.03	0.28	7.39	7.42	0.03
20.00	0.03	0.33	7.39	7.42	0.03
23.00	0.05	0.38	7.39	7.44	0.05
29.00	0.05	0.48	7.39	7.44	0.05
32.00	0.05	0.53	7.39	7.44	0.05
35.00	0.05	0.58	7.39	7.44	0.05
39.00	0.06	0.65	7.39	7.45	0.06
45.00	0.07	0.75	7.39	7.46	0.07
50.00	0.07	0.83	7.39	7.46	0.07
56.00	0.08	0.93	7.39	7.47	0.08
64.00	0.08	1.07	7.39	7.47	0.08
76.00	0.10	1.27	7.39	7.49	0.10
86.00	0.11	1.43	7.40	7.50	0.10
105.00	0.11	1.75	7.40	7.50	0.10
122.00	0.13	2.03	7.40	7.52	0.12
148.00	0.14	2.47	7.40	7.53	0.13
175.00	0.15	2.92	7.40	7.54	0.14
197.00	0.15	3.28	7.40	7.54	0.14
230.00	0.15	3.83	7.41	7.54	0.13
250.00	0.17	4.17	7.41	7.56	0.15
279.00	0.18	4.65	7.41	7.57	0.16
297.00	0.18	4.95	7.41	7.57	0.16
351.00	0.18	5.85	7.41	7.57	0.16
370.00	0.18	6.17	7.42	7.57	0.15
430.00	0.20	7.17	7.42	7.59	0.17
500.00	0.20	8.33	7.42	7.59	0.17
550.00	0.22	9.17	7.43	7.61	0.18
628.00	0.23	10.47	7.43	7.62	0.19
690.00	0.23	11.50	7.44	7.62	0.18
750.00	0.23	12.50	7.44	7.62	0.18
835.00	0.23	13.92	7.44	7.62	0.18
920.00	0.23	15.33	7.45	7.62	0.17
1015.00	0.25	16.92	7.45	7.64	0.19
1127.00	0.27	18.78	7.46	7.66	0.20
1240.00	0.29	20.67	7.46	7.68	0.22
1360.00	0.29	22.67	7.47	7.68	0.21

PIEZOMETER 1D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.00	0.00	0.00	7.48	7.48	0.00
1.00	-0.01	0.02	7.48	7.47	-0.01
2.75	0.02	0.05	7.48	7.50	0.02
4.25	0.02	0.07	7.48	7.50	0.02
6.00	0.03	0.10	7.48	7.51	0.03
8.00	0.04	0.13	7.48	7.52	0.04
10.00	0.05	0.17	7.48	7.53	0.05
12.00	0.05	0.20	7.48	7.53	0.05
14.00	0.05	0.23	7.48	7.53	0.05
16.00	0.06	0.27	7.48	7.54	0.06
18.00	0.05	0.30	7.48	7.53	0.05
21.00	0.07	0.35	7.48	7.55	0.07
25.00	0.07	0.42	7.48	7.55	0.07
30.00	0.07	0.50	7.48	7.55	0.07
33.00	0.08	0.55	7.48	7.56	0.08
36.00	0.08	0.60	7.48	7.56	0.08
41.00	0.09	0.68	7.48	7.57	0.09
46.00	0.08	0.77	7.48	7.56	0.08
51.00	0.10	0.85	7.48	7.58	0.10
57.00	0.10	0.95	7.48	7.58	0.10
65.00	0.11	1.08	7.48	7.59	0.11
77.00	0.12	1.28	7.48	7.60	0.12
86.00	0.12	1.43	7.48	7.60	0.12
104.00	0.13	1.73	7.48	7.61	0.13
123.00	0.14	2.05	7.49	7.62	0.13
151.00	0.14	2.52	7.49	7.62	0.13
177.00	0.15	2.95	7.49	7.63	0.14
195.00	0.17	3.25	7.49	7.65	0.16
199.00	0.17	3.32	7.49	7.65	0.16
230.00	0.17	3.83	7.49	7.65	0.16
254.00	0.19	4.23	7.50	7.67	0.17
290.00	0.20	4.83	7.50	7.68	0.18
350.00	0.20	5.83	7.50	7.68	0.18
375.00	0.20	6.25	7.50	7.68	0.18
435.00	0.22	7.25	7.51	7.70	0.19
500.00	0.22	8.33	7.51	7.70	0.19
552.00	0.23	9.20	7.51	7.71	0.20
630.00	0.24	10.50	7.52	7.72	0.20
690.00	0.25	11.50	7.52	7.73	0.21
750.00	0.24	12.50	7.52	7.72	0.20
835.00	0.26	13.92	7.53	7.74	0.21
920.00	0.26	15.33	7.53	7.74	0.21
1015.00	0.28	16.92	7.54	7.76	0.22
1125.00	0.29	18.75	7.54	7.77	0.23
1240.00	0.30	20.67	7.55	7.78	0.23
1360.00	0.31	22.67	7.55	7.79	0.24

PIEZOMETER 2C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
1.00	0.01	0.02	8.29	8.31	0.02
3.00	0.02	0.05	8.29	8.32	0.03
5.00	0.02	0.08	8.29	8.32	0.03
6.50	0.02	0.11	8.29	8.32	0.03
8.00	0.02	0.13	8.29	8.32	0.03
10.00	0.02	0.17	8.29	8.32	0.03
11.00	0.02	0.18	8.29	8.32	0.03
14.00	0.03	0.23	8.29	8.33	0.04
16.00	0.03	0.27	8.29	8.33	0.04
18.00	0.02	0.30	8.29	8.32	0.03
20.00	0.02	0.33	8.29	8.32	0.03
23.00	0.02	0.38	8.29	8.32	0.03
25.00	0.02	0.42	8.29	8.32	0.03
27.00	0.03	0.45	8.29	8.33	0.04
29.00	0.03	0.48	8.29	8.33	0.04
31.00	0.03	0.52	8.29	8.33	0.04
35.00	0.04	0.58	8.29	8.34	0.05
37.00	0.03	0.62	8.29	8.33	0.04
41.00	0.02	0.68	8.29	8.32	0.03
42.00	0.03	0.70	8.29	8.33	0.04
44.00	0.03	0.73	8.29	8.33	0.04
61.00	0.02	1.02	8.29	8.32	0.03
65.00	0.02	1.08	8.29	8.32	0.03
72.00	0.03	1.20	8.29	8.33	0.04
82.00	0.03	1.37	8.29	8.33	0.04
93.00	0.03	1.55	8.30	8.33	0.03
110.00	0.04	1.83	8.30	8.34	0.04
122.00	0.05	2.03	8.30	8.35	0.05
140.00	0.05	2.33	8.30	8.35	0.05
150.00	0.06	2.50	8.30	8.36	0.06
170.00	0.06	2.83	8.30	8.36	0.06
200.00	0.07	3.33	8.31	8.37	0.06
230.00	0.08	3.83	8.31	8.38	0.07
250.00	0.09	4.17	8.31	8.39	0.08
271.00	0.09	4.52	8.31	8.39	0.08
290.00	0.09	4.83	8.31	8.39	0.08
310.00	0.10	5.17	8.31	8.40	0.09
330.00	0.11	5.50	8.32	8.41	0.09
350.00	0.12	5.83	8.32	8.42	0.10
376.00	0.11	6.27	8.32	8.41	0.09
440.00	0.12	7.33	8.32	8.42	0.10
505.00	0.12	8.42	8.33	8.42	0.09
555.00	0.14	9.25	8.33	8.44	0.11
633.00	0.15	10.55	8.34	8.45	0.11
695.00	0.16	11.58	8.34	8.46	0.12
755.00	0.16	12.58	8.35	8.46	0.11
840.00	0.16	14.00	8.35	8.46	0.11
930.00	0.18	15.50	8.36	8.48	0.12
1020.00	0.19	17.00	8.36	8.49	0.13
1130.00	0.20	18.83	8.37	8.50	0.13
1245.00	0.20	20.75	8.38	8.50	0.12
1365.00	0.22	22.75	8.38	8.52	0.14
1367.00	0.21	22.78	8.38	8.51	0.13

PIEZOMETER 2D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.00	0.00	0.00	7.94	7.93	-0.01
2.00	0.00	0.03	7.94	7.93	-0.01
4.00	0.01	0.07	7.94	7.94	0.00
6.00	0.03	0.10	7.94	7.96	0.02
7.00	0.02	0.12	7.94	7.95	0.01
9.00	0.01	0.15	7.94	7.94	0.00
11.00	0.01	0.18	7.94	7.94	0.00
13.00	0.00	0.22	7.94	7.93	-0.01
15.00	0.01	0.25	7.94	7.94	0.00
17.00	0.01	0.28	7.94	7.94	0.00
19.00	0.02	0.32	7.94	7.95	0.01
21.00	0.02	0.35	7.94	7.95	0.01
24.00	0.02	0.40	7.94	7.95	0.01
26.00	0.02	0.43	7.94	7.95	0.01
28.00	0.02	0.47	7.94	7.95	0.01
30.00	0.02	0.50	7.94	7.95	0.01
32.00	0.02	0.53	7.94	7.95	0.01
34.00	0.02	0.57	7.94	7.95	0.01
36.00	0.03	0.60	7.94	7.96	0.02
38.00	0.04	0.63	7.94	7.97	0.03
40.00	0.03	0.67	7.94	7.96	0.02
43.00	0.04	0.72	7.94	7.97	0.03
47.00	0.04	0.78	7.94	7.97	0.03
48.00	0.04	0.80	7.94	7.97	0.03
49.00	0.04	0.82	7.94	7.97	0.03
52.00	0.04	0.87	7.94	7.97	0.03
57.00	0.04	0.95	7.94	7.97	0.03
58.00	0.05	0.97	7.94	7.98	0.03
60.00	0.05	1.00	7.94	7.98	0.04
70.00	0.06	1.17	7.94	7.99	0.05
80.00	0.07	1.33	7.94	8.00	0.06
90.00	0.07	1.50	7.94	8.00	0.06
107.00	0.08	1.78	7.95	8.01	0.06
129.00	0.10	2.15	7.95	8.03	0.08
139.00	0.10	2.32	7.95	8.03	0.08
150.00	0.10	2.50	7.95	8.03	0.08
170.00	0.11	2.83	7.95	8.04	0.08
200.00	0.12	3.33	7.95	8.05	0.10
230.00	0.12	3.83	7.95	8.05	0.10
250.00	0.13	4.17	7.96	8.06	0.10
270.00	0.14	4.50	7.96	8.07	0.11
290.00	0.14	4.83	7.96	8.07	0.11
310.00	0.14	5.17	7.96	8.07	0.11
330.00	0.14	5.50	7.96	8.07	0.11
350.00	0.15	5.83	7.96	8.08	0.11
375.00	0.15	6.25	7.96	8.08	0.12
437.00	0.16	7.28	7.97	8.09	0.12
505.00	0.16	8.42	7.97	8.09	0.12
560.00	0.16	9.33	7.98	8.09	0.11
634.00	0.17	10.57	7.98	8.10	0.12
695.00	0.17	11.58	7.98	8.10	0.12
755.00	0.18	12.58	7.99	8.11	0.12
840.00	0.20	14.00	7.99	8.13	0.14
930.00	0.21	15.50	8.00	8.14	0.14
1020.00	0.22	17.00	8.00	8.15	0.15
1131.00	0.23	18.85	8.01	8.16	0.15
1245.00	0.24	20.75	8.01	8.17	0.15
1368.00	0.24	22.80	8.02	8.17	0.15

PIEZOMETER 3C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.33	0.00	0.01	7.11	7.11	0.00
1.86	0.00	0.03	7.11	7.11	0.00
3.41	0.00	0.06	7.11	7.11	0.00
4.75	0.00	0.08	7.11	7.11	0.00
6.57	0.00	0.11	7.11	7.11	0.00
8.05	0.00	0.13	7.11	7.11	0.00
9.57	0.00	0.16	7.11	7.11	0.00
12.20	0.00	0.20	7.11	7.11	0.00
14.58	0.00	0.24	7.11	7.11	0.00
16.55	0.00	0.28	7.11	7.11	0.00
18.55	0.005	0.31	7.11	7.12	0.00
20.92	0.005	0.35	7.11	7.12	0.00
23.27	0.01	0.39	7.11	7.12	0.01
25.58	0.005	0.43	7.11	7.12	0.00
27.34	0.01	0.46	7.11	7.12	0.01
29.51	0.01	0.49	7.12	7.12	0.00
31.43	0.01	0.52	7.12	7.12	0.00
33.60	0.015	0.56	7.12	7.13	0.01
35.66	0.015	0.59	7.12	7.13	0.01
37.55	0.02	0.63	7.12	7.13	0.01
39.43	0.02	0.66	7.12	7.13	0.01
41.22	0.015	0.69	7.12	7.13	0.01
43.08	0.02	0.72	7.12	7.13	0.01
45.24	0.02	0.75	7.12	7.13	0.01
48.17	0.025	0.80	7.12	7.14	0.02
58.90	0.03	0.98	7.12	7.14	0.02
63.00	0.04	1.05	7.12	7.15	0.03
65.50	0.035	1.09	7.12	7.15	0.03
69.75	0.04	1.16	7.12	7.15	0.03
78.50	0.04	1.31	7.12	7.15	0.03
87.00	0.04	1.45	7.12	7.15	0.03
98.00	0.05	1.63	7.12	7.16	0.04
109.00	0.05	1.82	7.12	7.16	0.04
118.50	0.06	1.98	7.12	7.17	0.05
131.00	0.06	2.18	7.12	7.17	0.05
142.00	0.06	2.37	7.12	7.17	0.05
156.00	0.07	2.60	7.13	7.18	0.05
168.00	0.07	2.80	7.13	7.18	0.05
186.00	0.07	3.10	7.13	7.18	0.05
197.00	0.07	3.28	7.13	7.18	0.05
233.00	0.09	3.88	7.13	7.20	0.07
257.00	0.10	4.28	7.13	7.21	0.08
269.00	0.10	4.48	7.13	7.21	0.08
292.00	0.10	4.87	7.14	7.21	0.07
309.00	0.10	5.15	7.14	7.21	0.07
319.00	0.105	5.32	7.14	7.22	0.08
336.00	0.10	5.60	7.14	7.21	0.07
369.00	0.10	6.15	7.14	7.21	0.07
443.00	0.11	7.38	7.15	7.22	0.07
510.00	0.12	8.50	7.15	7.23	0.08
570.00	0.12	9.50	7.15	7.23	0.08
637.00	0.13	10.62	7.16	7.24	0.08
700.00	0.14	11.67	7.16	7.25	0.09
760.00	0.14	12.67	7.17	7.25	0.08
845.00	0.14	14.08	7.17	7.25	0.08
935.00	0.16	15.58	7.18	7.27	0.09
1025.00	0.17	17.08	7.18	7.28	0.10
1133.00	0.18	18.88	7.19	7.29	0.10

PIEZOMETER 3C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
1245.00	0.20	20.75	7.19	7.31	0.12
1369.00	0.21	22.82	7.20	7.32	0.12

PIEZOMETER 3D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
1.33	0.00	0.02	6.98	6.98	0.00
2.80	0.00	0.05	6.98	6.98	0.00
4.38	0.00	0.07	6.98	6.98	0.00
5.95	0.00	0.10	6.98	6.98	0.00
7.55	0.00	0.13	6.98	6.98	0.00
9.00	0.00	0.15	6.98	6.98	0.00
11.93	0.01	0.20	6.98	6.99	0.01
13.18	0.00	0.22	6.98	6.98	0.00
15.77	0.01	0.26	6.98	6.99	0.01
17.74	0.01	0.30	6.98	6.99	0.01
19.75	0.01	0.33	6.98	6.99	0.01
21.97	0.01	0.37	6.98	6.99	0.01
24.48	0.01	0.41	6.98	6.99	0.01
26.43	0.015	0.44	6.98	7.00	0.01
28.58	0.01	0.48	6.98	6.99	0.01
30.55	0.01	0.51	6.98	6.99	0.01
32.63	0.01	0.54	6.98	6.99	0.01
34.67	0.01	0.58	6.98	6.99	0.01
36.55	0.01	0.61	6.98	6.99	0.01
38.20	0.01	0.64	6.98	6.99	0.01
40.30	0.01	0.67	6.98	6.99	0.01
42.10	0.015	0.70	6.98	7.00	0.01
44.12	0.02	0.74	6.98	7.00	0.02
46.77	0.02	0.78	6.98	7.00	0.02
49.52	0.02	0.83	6.98	7.00	0.02
52.63	0.02	0.88	6.98	7.00	0.02
57.92	0.03	0.97	6.98	7.01	0.03
61.50	0.025	1.03	6.98	7.01	0.02
64.47	0.03	1.07	6.98	7.01	0.03
68.72	0.03	1.15	6.98	7.01	0.03
76.57	0.03	1.28	6.99	7.01	0.02
86.00	0.04	1.43	6.99	7.02	0.03
97.00	0.04	1.62	6.99	7.02	0.03
108.00	0.04	1.80	6.99	7.02	0.03
118.00	0.05	1.97	6.99	7.03	0.04
130.00	0.06	2.17	6.99	7.04	0.05
141.00	0.06	2.35	6.99	7.04	0.05
153.00	0.06	2.55	6.99	7.04	0.05
167.00	0.07	2.78	6.99	7.05	0.06
184.00	0.07	3.07	6.99	7.05	0.06
195.00	0.08	3.25	6.99	7.06	0.07
235.00	0.09	3.92	7.00	7.07	0.07
260.00	0.095	4.33	7.00	7.08	0.08
268.00	0.09	4.47	7.00	7.07	0.07
289.00	0.09	4.82	7.00	7.07	0.07
308.00	0.09	5.13	7.00	7.07	0.07
327.00	0.10	5.45	7.00	7.08	0.08
344.00	0.10	5.73	7.01	7.08	0.07
384.00	0.11	6.40	7.01	7.09	0.08
440.00	0.10	7.33	7.01	7.08	0.07
510.00	0.12	8.50	7.02	7.10	0.08
568.00	0.12	9.47	7.02	7.10	0.08
638.00	0.13	10.63	7.02	7.11	0.09
640.00	0.13	10.67	7.02	7.11	0.09
700.00	0.14	11.67	7.03	7.12	0.09
760.00	0.14	12.67	7.03	7.12	0.09
845.00	0.15	14.08	7.04	7.13	0.09
935.00	0.16	15.58	7.04	7.14	0.10

PIEZOMETER 3D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
1025.00	0.18	17.08	7.05	7.16	0.11
1245.00	0.195	20.75	7.06	7.18	0.12
1369.00	0.21	22.82	7.06	7.19	0.13

PIEZOMETER 4C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.00	0.00	0.00	6.81	6.81	0.00
3.20	-0.01	0.05	6.81	6.80	-0.01
5.66	0.00	0.09	6.81	6.81	0.00
8.00	0.03	0.13	6.81	6.84	0.03
11.50	0.03	0.19	6.81	6.84	0.03
16.75	0.02	0.28	6.81	6.83	0.02
20.00	0.02	0.33	6.81	6.83	0.02
23.50	0.00	0.39	6.81	6.81	-0.00
26.08	0.01	0.43	6.81	6.82	0.01
28.83	0.03	0.48	6.81	6.84	0.03
32.07	0.00	0.53	6.81	6.81	-0.00
35.75	0.00	0.60	6.81	6.81	-0.00
38.50	0.03	0.64	6.81	6.84	0.03
41.75	0.01	0.70	6.81	6.82	0.01
45.00	0.01	0.75	6.81	6.82	0.01
47.08	0.04	0.78	6.81	6.85	0.04
51.50	0.01	0.86	6.81	6.82	0.01
61.16	0.02	1.02	6.81	6.83	0.02
71.36	0.01	1.19	6.82	6.82	0.00
81.50	0.01	1.36	6.82	6.82	0.00
90.75	0.03	1.51	6.82	6.84	0.02
102.75	0.02	1.71	6.82	6.83	0.01
109.50	0.01	1.83	6.82	6.82	0.00
121.08	0.02	2.02	6.82	6.83	0.01
131.50	0.02	2.19	6.82	6.83	0.01
141.83	0.03	2.36	6.82	6.84	0.02
151.33	0.00	2.52	6.82	6.81	-0.01
162.00	0.02	2.70	6.83	6.83	0.00
172.75	0.01	2.88	6.83	6.82	-0.01
183.00	0.01	3.05	6.83	6.82	-0.01
191.75	0.02	3.20	6.83	6.83	0.00
201.33	0.02	3.36	6.83	6.83	0.00
230.00	0.00	3.83	6.83	6.81	-0.02
265.00	-0.01	4.42	6.84	6.80	-0.04
291.00	0.01	4.85	6.84	6.82	-0.02
321.00	0.02	5.35	6.84	6.83	-0.01
351.00	0.02	5.85	6.84	6.83	-0.01
387.00	-0.01	6.45	6.85	6.80	-0.05
415.00	-0.01	6.92	6.85	6.80	-0.05
449.00	0.00	7.48	6.85	6.81	-0.04
515.00	0.00	8.58	6.86	6.81	-0.05
565.00	0.01	9.42	6.86	6.82	-0.04
641.00	0.01	10.68	6.87	6.82	-0.05
705.00	0.02	11.75	6.87	6.83	-0.04
765.00	0.02	12.75	6.88	6.83	-0.05
850.00	0.03	14.17	6.89	6.84	-0.05
940.00	0.04	15.67	6.89	6.85	-0.04
1033.00	0.04	17.22	6.90	6.85	-0.05
1137.00	0.06	18.95	6.91	6.87	-0.04
1250.00	0.07	20.83	6.91	6.88	-0.03
1375.00	0.08	22.92	6.92	6.89	-0.03

PIEZOMETER 4D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED RAWDOWN (FT
2.00	0.02	0.00	6.78	6.80	0.02
4.33	0.03	0.03	6.78	6.81	0.03
6.50	0.00	0.07	6.78	6.78	-0.00
10.00	0.01	0.11	6.78	6.79	0.01
12.58	0.03	0.17	6.78	6.81	0.03
15.33	0.00	0.21	6.78	6.78	-0.00
18.41	0.00	0.26	6.78	6.78	-0.00
22.16	0.01	0.31	6.78	6.79	0.01
25.00	0.01	0.37	6.78	6.79	0.01
27.41	0.03	0.42	6.78	6.81	0.03
30.16	0.02	0.46	6.78	6.80	0.02
34.00	0.03	0.50	6.78	6.81	0.03
39.85	0.04	0.57	6.78	6.82	0.04
43.25	0.00	0.66	6.79	6.78	-0.01
46.08	0.04	0.72	6.79	6.82	0.03
49.50	0.02	0.77	6.79	6.80	0.01
51.00	0.02	0.83	6.79	6.80	0.01
60.26	0.04	0.85	6.79	6.82	0.03
69.85	0.01	1.00	6.79	6.79	0.00
80.16	0.03	1.16	6.79	6.81	0.02
89.75	0.06	1.34	6.79	6.84	0.05
101.08	0.00	1.50	6.79	6.78	-0.01
108.25	0.03	1.68	6.79	6.81	0.02
119.50	0.04	1.80	6.79	6.82	0.03
130.00	0.05	1.99	6.79	6.83	0.04
140.50	0.04	2.17	6.79	6.82	0.03
150.16	0.05	2.34	6.79	6.83	0.04
160.25	0.06	2.50	6.79	6.84	0.05
171.50	0.07	2.67	6.79	6.85	0.06
182.00	0.06	2.86	6.79	6.84	0.05
190.16	0.06	3.03	6.79	6.84	0.05
200.08	0.07	3.17	6.79	6.85	0.06
225.00	0.02	3.33	6.79	6.80	0.01
307.00	0.02	3.75	6.80	6.80	0.00
270.00	0.05	5.12	6.80	6.83	0.03
320.00	0.07	4.50	6.80	6.85	0.05
350.00	0.06	5.33	6.80	6.84	0.04
385.00	0.04	5.83	6.80	6.82	0.02
412.00	0.02	6.42	6.80	6.80	-0.00
451.00	0.03	6.87	6.81	6.81	0.00
564.00	0.03	7.52	6.81	6.81	0.00
642.00	0.03	9.40	6.81	6.81	-0.00
705.00	0.04	10.70	6.82	6.82	0.00
765.00	0.05	11.75	6.82	6.83	0.01
850.00	0.06	12.75	6.82	6.84	0.02
940.00	0.10	14.17	6.83	6.88	0.05
1035.00	0.10	15.67	6.83	6.88	0.05
1138.00	0.11	17.25	6.83	6.89	0.06
1250.00	0.11	18.97	6.84	6.89	0.05
1374.00	0.12	20.83	6.84	6.90	0.06

PIEZOMETER 5C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.80	0.00	0.01	7.38	7.38	-0.00
1.80	0.01	0.03	7.38	7.39	0.01
2.80	0.02	0.05	7.38	7.40	0.02
3.80	0.02	0.06	7.38	7.40	0.02
4.75	0.01	0.08	7.38	7.39	0.01
5.90	0.01	0.10	7.38	7.39	0.01
7.10	0.01	0.12	7.38	7.39	0.01
8.50	0.02	0.14	7.38	7.40	0.02
9.80	0.01	0.16	7.38	7.39	0.01
11.00	0.01	0.18	7.38	7.39	0.01
12.20	0.01	0.20	7.38	7.39	0.01
13.40	0.02	0.22	7.38	7.40	0.02
15.00	0.01	0.25	7.38	7.39	0.01
16.75	0.01	0.28	7.38	7.39	0.01
18.10	0.02	0.30	7.38	7.40	0.02
20.00	0.01	0.33	7.38	7.39	0.01
22.50	0.02	0.38	7.38	7.40	0.02
24.50	0.02	0.41	7.38	7.40	0.02
26.20	0.02	0.44	7.38	7.40	0.02
28.00	0.025	0.47	7.39	7.41	0.02
29.50	0.02	0.49	7.39	7.40	0.01
30.90	0.02	0.52	7.39	7.40	0.01
32.60	0.02	0.54	7.39	7.40	0.01
34.00	0.02	0.57	7.39	7.40	0.01
36.30	0.02	0.61	7.39	7.40	0.01
38.00	0.02	0.63	7.39	7.40	0.01
40.20	0.02	0.67	7.39	7.40	0.01
43.30	0.03	0.72	7.39	7.41	0.02
48.00	0.02	0.80	7.39	7.40	0.01
51.80	0.02	0.86	7.39	7.40	0.01
61.60	0.01	1.03	7.39	7.39	0.00
71.00	0.02	1.18	7.39	7.40	0.01
81.00	0.02	1.35	7.39	7.40	0.01
90.60	0.02	1.51	7.39	7.40	0.01
100.60	0.02	1.68	7.39	7.40	0.01
111.00	0.02	1.85	7.39	7.40	0.01
121.00	0.03	2.02	7.40	7.41	0.01
131.00	0.03	2.18	7.40	7.41	0.01
141.00	0.03	2.35	7.40	7.41	0.01
151.00	0.03	2.52	7.40	7.41	0.01
160.00	0.03	2.67	7.40	7.41	0.01
172.00	0.03	2.87	7.40	7.41	0.01
183.00	0.03	3.05	7.40	7.41	0.01
190.00	0.03	3.17	7.40	7.41	0.01
200.00	0.03	3.33	7.40	7.41	0.01
210.00	0.03	3.50	7.40	7.41	0.01
230.00	0.03	3.83	7.41	7.41	0.00
258.00	0.03	4.30	7.41	7.41	0.00
290.00	0.05	4.83	7.41	7.43	0.02
320.00	0.04	5.33	7.42	7.42	0.00
350.00	0.05	5.83	7.42	7.43	0.01
380.00	0.05	6.33	7.42	7.43	0.01
395.00	0.04	6.58	7.42	7.42	-0.00
460.00	0.06	7.67	7.43	7.44	0.01
515.00	0.07	8.58	7.43	7.45	0.02
570.00	0.08	9.50	7.44	7.46	0.02
644.00	0.08	10.73	7.44	7.46	0.02
710.00	0.08	11.83	7.45	7.46	0.01

PIEZOMETER 5C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
770.00	0.09	12.83	7.45	7.47	0.02
855.00	0.10	14.25	7.46	7.48	0.02
945.00	0.11	15.75	7.47	7.49	0.02
1038.00	0.12	17.30	7.47	7.50	0.03
1141.00	0.11	19.02	7.48	7.49	0.01
1142.00	0.12	19.03	7.48	7.50	0.02
1255.00	0.14	20.92	7.49	7.52	0.03
1378.00	0.16	22.97	7.49	7.54	0.05

PIEZOMETER 5D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.30	0.00	0.01	7.53	7.53	-0.00
1.42	0.00	0.02	7.53	7.53	-0.00
2.33	0.01	0.04	7.53	7.54	0.01
3.33	0.01	0.06	7.53	7.54	0.01
4.30	0.00	0.07	7.53	7.53	-0.00
5.30	0.00	0.09	7.53	7.53	-0.00
6.50	0.01	0.11	7.53	7.54	0.01
7.75	0.01	0.13	7.53	7.54	0.01
9.17	0.00	0.15	7.53	7.53	-0.00
10.50	0.01	0.18	7.53	7.54	0.01
11.58	0.01	0.19	7.53	7.54	0.01
12.78	0.00	0.21	7.53	7.53	-0.00
14.00	0.01	0.23	7.53	7.54	0.01
16.08	0.01	0.27	7.53	7.54	0.01
17.33	0.015	0.29	7.53	7.55	0.01
18.08	0.01	0.30	7.53	7.54	0.01
21.66	0.01	0.36	7.54	7.54	0.00
23.50	0.01	0.39	7.54	7.54	0.00
25.40	0.02	0.42	7.54	7.55	0.01
26.84	0.02	0.45	7.54	7.55	0.01
28.85	0.03	0.48	7.54	7.56	0.02
30.16	0.03	0.50	7.54	7.56	0.02
31.59	0.03	0.53	7.54	7.56	0.02
33.20	0.02	0.55	7.54	7.55	0.01
35.75	0.01	0.60	7.54	7.54	0.00
37.33	0.01	0.62	7.54	7.54	0.00
38.92	0.03	0.65	7.54	7.56	0.02
42.66	0.02	0.71	7.54	7.55	0.01
46.84	0.03	0.78	7.54	7.56	0.02
50.18	0.03	0.84	7.54	7.56	0.02
60.50	0.03	1.01	7.54	7.56	0.02
70.10	0.04	1.17	7.54	7.57	0.03
80.16	0.04	1.34	7.54	7.57	0.03
90.08	0.05	1.50	7.54	7.58	0.04
100.00	0.05	1.67	7.54	7.58	0.04
110.20	0.06	1.84	7.54	7.59	0.05
120.16	0.06	2.00	7.54	7.59	0.05
130.33	0.06	2.17	7.54	7.59	0.05
140.00	0.06	2.33	7.54	7.59	0.05
150.00	0.07	2.50	7.54	7.60	0.06
160.00	0.07	2.67	7.55	7.60	0.05
172.00	0.07	2.87	7.55	7.60	0.05
182.00	0.07	3.03	7.55	7.60	0.05
190.00	0.07	3.17	7.55	7.60	0.05
199.00	0.085	3.32	7.55	7.62	0.07
210.00	0.09	3.50	7.55	7.62	0.07
230.00	0.09	3.83	7.55	7.62	0.07
257.00	0.10	4.28	7.55	7.63	0.08
290.00	0.10	4.83	7.55	7.63	0.08
320.00	0.10	5.33	7.56	7.63	0.07
350.00	0.12	5.83	7.56	7.65	0.09
375.00	0.12	6.25	7.56	7.65	0.09
390.00	0.11	6.50	7.56	7.64	0.08
458.00	0.12	7.63	7.57	7.65	0.08
515.00	0.13	8.58	7.57	7.66	0.09
580.00	0.14	9.67	7.57	7.67	0.10
645.00	0.14	10.75	7.58	7.67	0.09
710.00	0.15	11.83	7.58	7.68	0.10

PIEZOMETER 5D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
770.00	0.16	12.83	7.58	7.69	0.11
855.00	0.16	14.25	7.59	7.69	0.10
945.00	0.17	15.75	7.59	7.70	0.11
1038.00	0.18	17.30	7.60	7.71	0.11
1140.00	0.20	19.00	7.60	7.73	0.13
1258.00	0.21	20.97	7.61	7.74	0.13
1376.00	0.22	22.93	7.61	7.75	0.14

PIEZOMETER 6C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
1.00	0.01	0.02	7.48	7.49	0.01
4.00	0.04	0.07	7.48	7.52	0.04
7.00	0.00	0.12	7.48	7.48	-0.00
10.00	0.00	0.17	7.48	7.48	-0.00
12.00	0.00	0.20	7.48	7.48	-0.00
15.00	0.00	0.25	7.48	7.48	-0.00
18.00	0.01	0.30	7.48	7.49	0.01
21.00	0.01	0.35	7.48	7.49	0.01
25.00	0.02	0.42	7.48	7.50	0.02
30.00	0.03	0.50	7.48	7.51	0.03
32.00	0.00	0.53	7.48	7.48	-0.00
36.00	0.01	0.60	7.48	7.49	0.01
39.00	0.00	0.65	7.48	7.48	-0.00
43.00	0.00	0.72	7.48	7.48	-0.00
47.00	0.01	0.78	7.48	7.49	0.01
50.00	0.00	0.83	7.48	7.48	-0.00
55.00	0.00	0.92	7.49	7.48	-0.01
60.00	0.00	1.00	7.49	7.48	-0.01
70.00	0.00	1.17	7.49	7.48	-0.01
80.00	0.20	1.33	7.49	7.68	0.19
85.00	0.00	1.42	7.49	7.48	-0.01
90.00	0.00	1.50	7.49	7.48	-0.01
100.00	0.01	1.67	7.49	7.49	0.00
106.00	0.01	1.77	7.49	7.49	0.00
116.00	0.01	1.93	7.49	7.49	0.00
130.00	0.02	2.17	7.49	7.50	0.01
135.00	0.03	2.25	7.49	7.51	0.02
141.00	0.02	2.35	7.49	7.50	0.01
148.00	0.02	2.47	7.49	7.50	0.01
165.00	0.03	2.75	7.49	7.51	0.02
172.00	0.04	2.87	7.49	7.52	0.03
183.00	0.04	3.05	7.49	7.52	0.03
200.00	0.05	3.33	7.50	7.53	0.03
210.00	0.05	3.50	7.50	7.53	0.03
220.00	0.06	3.67	7.50	7.54	0.04
230.00	0.06	3.83	7.50	7.54	0.04
239.00	0.06	3.98	7.50	7.54	0.04
249.00	0.06	4.15	7.50	7.54	0.04
261.00	0.06	4.35	7.50	7.54	0.04
275.00	0.07	4.58	7.50	7.55	0.05
290.00	0.07	4.83	7.50	7.55	0.05
305.00	0.07	5.08	7.50	7.55	0.05
320.00	0.07	5.33	7.50	7.55	0.05
345.00	0.07	5.75	7.51	7.55	0.04
392.00	0.09	6.53	7.51	7.57	0.06
464.00	0.08	7.73	7.51	7.56	0.05
520.00	0.10	8.67	7.52	7.58	0.06
585.00	0.09	9.75	7.52	7.57	0.05
647.00	0.10	10.78	7.52	7.58	0.06
715.00	0.10	11.92	7.53	7.58	0.05
775.00	0.11	12.92	7.53	7.59	0.06
860.00	0.12	14.33	7.53	7.60	0.07
945.00	0.12	15.75	7.54	7.60	0.06
1041.00	0.14	17.35	7.54	7.62	0.08
1042.00	0.13	17.37	7.54	7.61	0.07
1145.00	0.16	19.08	7.55	7.64	0.09
1147.00	0.16	19.12	7.55	7.64	0.09
1261.00	0.16	21.02	7.55	7.64	0.09
1383.00	0.17	23.05	7.56	7.65	0.09

PIEZOMETER 6D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.00	0.00	0.00	7.34	7.34	-0.00
2.00	0.01	0.03	7.34	7.35	0.01
6.00	0.00	0.10	7.34	7.34	-0.00
7.00	0.04	0.12	7.34	7.38	0.04
11.00	0.01	0.18	7.34	7.35	0.01
14.00	0.00	0.23	7.34	7.34	-0.00
17.00	0.00	0.28	7.34	7.34	-0.00
20.00	0.01	0.33	7.34	7.35	0.01
24.00	0.01	0.40	7.34	7.35	0.01
27.00	0.01	0.45	7.34	7.35	0.01
31.00	0.01	0.52	7.34	7.35	0.01
34.00	0.02	0.57	7.34	7.36	0.02
38.00	0.02	0.63	7.34	7.36	0.02
42.00	0.02	0.70	7.35	7.36	0.01
45.00	0.02	0.75	7.35	7.36	0.01
49.00	0.02	0.82	7.35	7.36	0.01
53.00	0.02	0.88	7.35	7.36	0.01
63.00	0.02	1.05	7.35	7.36	0.01
74.00	0.02	1.23	7.35	7.36	0.01
83.00	0.02	1.38	7.35	7.36	0.01
87.00	0.03	1.45	7.35	7.37	0.02
94.00	0.03	1.57	7.35	7.37	0.02
104.00	0.01	1.73	7.35	7.35	0.00
107.00	0.02	1.78	7.35	7.36	0.01
123.00	0.02	2.05	7.35	7.36	0.01
127.00	0.01	2.12	7.35	7.35	-0.00
133.00	0.02	2.22	7.35	7.36	0.01
138.00	0.02	2.30	7.35	7.36	0.01
144.00	0.02	2.40	7.35	7.36	0.01
150.00	0.02	2.50	7.35	7.36	0.01
161.00	0.05	2.68	7.35	7.39	0.04
170.00	0.05	2.83	7.35	7.39	0.04
184.00	0.05	3.07	7.35	7.39	0.04
202.00	0.05	3.37	7.36	7.39	0.03
212.00	0.05	3.53	7.36	7.39	0.03
222.00	0.06	3.70	7.36	7.40	0.04
232.00	0.07	3.87	7.36	7.41	0.05
240.00	0.06	4.00	7.36	7.40	0.04
252.00	0.07	4.20	7.36	7.41	0.05
264.00	0.07	4.40	7.36	7.41	0.05
277.00	0.07	4.62	7.36	7.41	0.05
292.00	0.07	4.87	7.36	7.41	0.05
307.00	0.08	5.12	7.36	7.42	0.06
323.00	0.07	5.38	7.36	7.41	0.05
347.00	0.08	5.78	7.36	7.42	0.06
394.00	0.10	6.57	7.37	7.44	0.07
466.00	0.09	7.77	7.37	7.43	0.06
520.00	0.11	8.67	7.37	7.45	0.08
586.00	0.11	9.77	7.38	7.45	0.07
648.00	0.115	10.80	7.38	7.46	0.08
715.00	0.12	11.92	7.38	7.46	0.08
775.00	0.12	12.92	7.38	7.46	0.08
860.00	0.12	14.33	7.39	7.46	0.07
945.00	0.12	15.75	7.39	7.46	0.07
1043.00	0.16	17.38	7.40	7.50	0.10
1044.00	0.15	17.40	7.40	7.49	0.09
1203.00	0.17	20.05	7.40	7.51	0.11
1262.00	0.16	21.03	7.40	7.50	0.10
1263.00	0.17	21.05	7.40	7.51	0.11
1382.00	0.185	23.03	7.41	7.52	0.12

PIEZOMETER 7C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.00	0.00	0.00	6.90	6.90	0.00
2.00	0.00	0.03	6.90	6.90	0.00
4.00	0.00	0.07	6.90	6.90	0.00
6.00	0.01	0.10	6.90	6.91	0.01
8.00	0.01	0.13	6.90	6.91	0.01
9.00	0.01	0.15	6.90	6.91	0.01
11.00	0.01	0.18	6.90	6.91	0.01
13.00	0.01	0.22	6.90	6.91	0.01
16.00	0.01	0.27	6.90	6.91	0.01
18.00	0.01	0.30	6.90	6.91	0.01
20.00	0.01	0.33	6.90	6.91	0.01
21.00	0.01	0.35	6.90	6.91	0.01
22.00	0.01	0.37	6.90	6.91	0.01
24.00	0.02	0.40	6.90	6.92	0.02
26.00	0.02	0.43	6.90	6.92	0.02
28.00	0.02	0.47	6.90	6.92	0.02
30.00	0.02	0.50	6.90	6.92	0.02
31.00	0.02	0.52	6.90	6.92	0.02
32.00	0.02	0.53	6.90	6.92	0.02
34.00	0.02	0.57	6.90	6.92	0.02
36.00	0.02	0.60	6.90	6.92	0.02
38.00	0.02	0.63	6.90	6.92	0.02
40.00	0.02	0.67	6.90	6.92	0.02
42.00	0.02	0.70	6.90	6.92	0.02
45.00	0.02	0.75	6.90	6.92	0.02
47.00	0.03	0.78	6.90	6.93	0.03
48.00	0.03	0.80	6.90	6.93	0.03
50.00	0.03	0.83	6.90	6.93	0.03
55.00	0.03	0.92	6.90	6.93	0.03
65.00	0.03	1.08	6.90	6.93	0.03
75.00	0.03	1.25	6.90	6.93	0.03
85.00	0.04	1.42	6.90	6.94	0.04
95.00	0.04	1.58	6.90	6.94	0.04
105.00	0.05	1.75	6.91	6.95	0.04
115.00	0.06	1.92	6.91	6.96	0.05
120.00	0.05	2.00	6.91	6.95	0.04
130.00	0.05	2.17	6.91	6.95	0.04
140.00	0.06	2.33	6.91	6.96	0.05
150.00	0.06	2.50	6.91	6.96	0.05
160.00	0.06	2.67	6.91	6.96	0.05
170.00	0.07	2.83	6.91	6.97	0.06
185.00	0.07	3.08	6.91	6.97	0.06
200.00	0.08	3.33	6.91	6.98	0.07
215.00	0.08	3.58	6.91	6.98	0.07
230.00	0.08	3.83	6.91	6.98	0.07
245.00	0.09	4.08	6.91	6.99	0.08
260.00	0.09	4.33	6.92	6.99	0.07
275.00	0.09	4.58	6.92	6.99	0.07
300.00	0.09	5.00	6.92	6.99	0.07
320.00	0.10	5.33	6.92	7.00	0.08
360.00	0.10	6.00	6.92	7.00	0.08
372.00	0.11	6.20	6.92	7.01	0.09
410.00	0.11	6.83	6.93	7.01	0.08
430.00	0.11	7.17	6.93	7.01	0.08
475.00	0.12	7.92	6.93	7.02	0.09
525.00	0.12	8.75	6.93	7.02	0.09
595.00	0.13	9.92	6.94	7.03	0.09
653.00	0.14	10.88	6.94	7.04	0.10

PIEZOMETER 7C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
720.00	0.13	12.00	6.94	7.03	0.09
790.00	0.15	13.17	6.95	7.05	0.10
860.00	0.15	14.33	6.95	7.05	0.10
955.00	0.16	15.92	6.95	7.06	0.11
1051.00	0.17	17.52	6.96	7.07	0.11
1153.00	0.18	19.22	6.96	7.08	0.12
1275.00	0.19	21.25	6.97	7.09	0.12
1390.00	0.20	23.17	6.97	7.10	0.13

PIEZOMETER 7D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.00	0.00	0.00	7.06	7.06	-0.00
3.00	0.00	0.05	7.06	7.06	-0.00
4.00	0.00	0.07	7.06	7.06	-0.00
6.00	0.00	0.10	7.06	7.06	-0.00
8.00	0.00	0.13	7.06	7.06	-0.00
10.00	0.00	0.17	7.06	7.06	-0.00
11.00	0.00	0.18	7.06	7.06	-0.00
14.00	0.00	0.23	7.06	7.06	-0.00
16.00	0.00	0.27	7.06	7.06	-0.00
18.00	0.00	0.30	7.06	7.06	-0.00
20.00	0.00	0.33	7.06	7.06	-0.00
21.00	0.00	0.35	7.06	7.06	-0.00
23.00	0.00	0.38	7.06	7.06	-0.00
25.00	0.00	0.42	7.06	7.06	-0.00
26.00	0.01	0.43	7.06	7.07	0.01
29.00	0.01	0.48	7.06	7.07	0.01
30.00	0.01	0.50	7.06	7.07	0.01
32.00	0.01	0.53	7.06	7.07	0.01
33.00	0.01	0.55	7.06	7.07	0.01
34.00	0.01	0.57	7.06	7.07	0.01
36.00	0.01	0.60	7.06	7.07	0.01
38.00	0.01	0.63	7.06	7.07	0.01
40.00	0.01	0.67	7.06	7.07	0.01
43.00	0.02	0.72	7.06	7.08	0.02
45.00	0.02	0.75	7.06	7.08	0.02
47.00	0.02	0.78	7.06	7.08	0.02
49.00	0.02	0.82	7.06	7.08	0.02
51.00	0.02	0.85	7.06	7.08	0.02
56.00	0.02	0.93	7.06	7.08	0.02
65.00	0.02	1.08	7.07	7.08	0.01
76.00	0.02	1.27	7.07	7.08	0.01
86.00	0.03	1.43	7.07	7.09	0.02
95.00	0.03	1.58	7.07	7.09	0.02
105.00	0.03	1.75	7.07	7.09	0.02
115.00	0.03	1.92	7.07	7.09	0.02
120.00	0.04	2.00	7.07	7.10	0.03
130.00	0.04	2.17	7.07	7.10	0.03
140.00	0.04	2.33	7.07	7.10	0.03
150.00	0.05	2.50	7.07	7.11	0.04
160.00	0.05	2.67	7.07	7.11	0.04
170.00	0.05	2.83	7.07	7.11	0.04
185.00	0.06	3.08	7.07	7.12	0.05
200.00	0.06	3.33	7.07	7.12	0.05
215.00	0.06	3.58	7.08	7.12	0.04
230.00	0.07	3.83	7.08	7.13	0.05
245.00	0.07	4.08	7.08	7.13	0.05
260.00	0.08	4.33	7.08	7.14	0.06
275.00	0.08	4.58	7.08	7.14	0.06
300.00	0.08	5.00	7.08	7.14	0.06
320.00	0.08	5.33	7.08	7.14	0.06
360.00	0.09	6.00	7.08	7.15	0.07
382.00	0.09	6.37	7.09	7.15	0.06
410.00	0.10	6.83	7.09	7.16	0.07
430.00	0.10	7.17	7.09	7.16	0.07
475.00	0.11	7.92	7.09	7.17	0.08
525.00	0.11	8.75	7.09	7.17	0.08
595.00	0.115	9.92	7.10	7.18	0.08
655.00	0.12	10.92	7.10	7.18	0.08

PIEZOMETER 7D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
720.00	0.13	12.00	7.10	7.19	0.09
785.00	0.13	13.08	7.11	7.19	0.08
860.00	0.13	14.33	7.11	7.19	0.08
950.00	0.15	15.83	7.12	7.21	0.09
1049.00	0.17	17.48	7.12	7.23	0.11
1153.00	0.17	19.22	7.12	7.23	0.11
1275.00	0.17	21.25	7.13	7.23	0.10
1390.00	0.19	23.17	7.13	7.25	0.12

PIEZOMETER 8D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.00	0.00	0.00	8.23	8.23	0.00
1.00	0.00	0.02	8.23	8.23	0.00
2.00	0.00	0.03	8.23	8.23	0.00
3.50	0.00	0.06	8.23	8.23	0.00
5.00	0.00	0.08	8.23	8.23	0.00
6.00	0.00	0.10	8.23	8.23	0.00
8.00	0.00	0.13	8.23	8.23	0.00
11.00	0.00	0.18	8.23	8.23	0.00
13.00	0.00	0.22	8.23	8.23	0.00
15.00	0.00	0.25	8.23	8.23	0.00
17.00	0.01	0.28	8.23	8.24	0.01
18.00	0.01	0.30	8.23	8.24	0.01
19.50	0.01	0.33	8.23	8.24	0.01
20.50	0.02	0.34	8.23	8.25	0.02
22.50	0.02	0.38	8.23	8.25	0.02
24.00	0.02	0.40	8.23	8.25	0.02
25.50	0.02	0.43	8.23	8.25	0.02
27.00	0.02	0.45	8.23	8.25	0.02
29.00	0.02	0.48	8.23	8.25	0.02
30.00	0.02	0.50	8.23	8.25	0.02
33.00	0.02	0.55	8.23	8.25	0.02
35.00	0.02	0.58	8.23	8.25	0.02
38.00	0.02	0.63	8.23	8.25	0.02
39.50	0.02	0.66	8.23	8.25	0.02
41.00	0.02	0.68	8.23	8.25	0.02
43.00	0.02	0.72	8.23	8.25	0.02
44.50	0.02	0.74	8.23	8.25	0.02
46.00	0.02	0.77	8.23	8.25	0.02
47.50	0.03	0.79	8.23	8.26	0.03
49.00	0.03	0.82	8.23	8.26	0.03
50.00	0.03	0.83	8.23	8.26	0.03
51.50	0.03	0.86	8.23	8.26	0.03
53.00	0.03	0.88	8.23	8.26	0.03
55.00	0.03	0.92	8.23	8.26	0.03
57.00	0.03	0.95	8.23	8.26	0.03
61.50	0.03	1.03	8.23	8.26	0.03
64.50	0.03	1.08	8.23	8.26	0.03
66.50	0.03	1.11	8.23	8.26	0.03
68.00	0.04	1.13	8.23	8.27	0.04
70.50	0.04	1.18	8.23	8.27	0.04
72.50	0.04	1.21	8.23	8.27	0.04
77.50	0.04	1.29	8.23	8.27	0.04
82.00	0.04	1.37	8.23	8.27	0.04
85.00	0.05	1.42	8.23	8.28	0.05
91.00	0.05	1.52	8.23	8.28	0.05
94.00	0.05	1.57	8.23	8.28	0.05
99.00	0.05	1.65	8.23	8.28	0.05
105.00	0.05	1.75	8.23	8.28	0.05
110.00	0.05	1.83	8.23	8.28	0.05
114.00	0.05	1.90	8.23	8.28	0.05
118.00	0.05	1.97	8.23	8.28	0.05
120.00	0.06	2.00	8.23	8.29	0.06
128.00	0.06	2.13	8.24	8.29	0.05
133.00	0.06	2.22	8.24	8.29	0.05
140.00	0.06	2.33	8.24	8.29	0.05
145.00	0.07	2.42	8.24	8.30	0.06
158.00	0.07	2.63	8.24	8.30	0.06
167.00	0.07	2.78	8.24	8.30	0.06

PIEZOMETER 8D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
173.00	0.07	2.88	8.24	8.30	0.06
177.00	0.07	2.95	8.24	8.30	0.06
182.00	0.07	3.03	8.24	8.30	0.06
191.00	0.08	3.18	8.24	8.31	0.07
198.00	0.08	3.30	8.24	8.31	0.07
202.00	0.08	3.37	8.24	8.31	0.07
210.00	0.08	3.50	8.24	8.31	0.07
214.00	0.09	3.57	8.24	8.32	0.08
227.00	0.09	3.78	8.24	8.32	0.08
235.00	0.09	3.92	8.24	8.32	0.08
243.00	0.09	4.05	8.24	8.32	0.08
251.00	0.09	4.18	8.24	8.32	0.08
257.00	0.09	4.28	8.24	8.32	0.08
264.00	0.10	4.40	8.24	8.33	0.09
277.00	0.10	4.62	8.24	8.33	0.09
295.00	0.10	4.92	8.24	8.33	0.09
304.00	0.10	5.07	8.25	8.33	0.08
318.00	0.10	5.30	8.25	8.33	0.08
325.00	0.11	5.42	8.25	8.34	0.09
333.00	0.11	5.55	8.25	8.34	0.09
342.00	0.11	5.70	8.25	8.34	0.09
350.00	0.11	5.83	8.25	8.34	0.09
372.00	0.11	6.20	8.25	8.34	0.09
380.00	0.12	6.33	8.25	8.35	0.10
400.00	0.12	6.67	8.25	8.35	0.10
480.00	0.12	8.00	8.25	8.35	0.10
530.00	0.12	8.83	8.26	8.35	0.09
605.00	0.13	10.08	8.26	8.36	0.10
658.00	0.14	10.97	8.26	8.37	0.11
725.00	0.14	12.08	8.27	8.37	0.10
790.00	0.15	13.17	8.27	8.38	0.11
870.00	0.17	14.50	8.27	8.40	0.13
960.00	0.18	16.00	8.28	8.41	0.13
1055.00	0.18	17.58	8.28	8.41	0.13
1156.00	0.17	19.27	8.28	8.40	0.12
1280.00	0.20	21.33	8.29	8.43	0.14
1395.00	0.22	23.25	8.29	8.45	0.16

PIEZOMETER 9C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.00	0.00	0.00	7.00	7.00	-0.00
1.22	0.02	0.02	7.00	7.02	0.02
2.50	0.01	0.04	7.00	7.01	0.01
3.75	0.02	0.06	7.00	7.02	0.02
4.80	0.02	0.08	7.00	7.02	0.02
5.80	0.02	0.10	7.00	7.02	0.02
7.22	0.03	0.12	7.00	7.03	0.03
8.40	0.04	0.14	7.00	7.04	0.04
9.55	0.04	0.16	7.00	7.04	0.04
10.72	0.04	0.18	7.00	7.04	0.04
12.46	0.04	0.21	7.00	7.04	0.04
13.75	0.04	0.23	7.00	7.04	0.04
15.75	0.05	0.26	7.00	7.05	0.05
17.75	0.05	0.30	7.00	7.05	0.05
19.75	0.06	0.33	7.00	7.06	0.06
21.75	0.06	0.36	7.00	7.06	0.06
24.00	0.07	0.40	7.00	7.07	0.07
26.00	0.08	0.43	7.00	7.08	0.08
28.00	0.08	0.47	7.00	7.08	0.08
30.00	0.09	0.50	7.00	7.09	0.09
32.00	0.09	0.53	7.00	7.09	0.09
34.00	0.08	0.57	7.00	7.08	0.08
36.00	0.09	0.60	7.00	7.09	0.09
41.00	0.08	0.68	7.00	7.08	0.08
46.00	0.09	0.77	7.00	7.09	0.09
51.00	0.10	0.85	7.00	7.10	0.10
56.00	0.11	0.93	7.00	7.11	0.11
61.00	0.11	1.02	7.01	7.11	0.10
66.00	0.12	1.10	7.01	7.12	0.11
71.00	0.13	1.18	7.01	7.13	0.12
76.00	0.13	1.27	7.01	7.13	0.12
81.00	0.13	1.35	7.01	7.13	0.12
86.00	0.14	1.43	7.01	7.14	0.13
91.00	0.14	1.52	7.01	7.14	0.13
96.00	0.15	1.60	7.01	7.15	0.14
101.00	0.14	1.68	7.01	7.14	0.13
106.00	0.15	1.77	7.01	7.15	0.14
111.00	0.16	1.85	7.01	7.16	0.15
116.00	0.16	1.93	7.01	7.16	0.15
121.00	0.16	2.02	7.01	7.16	0.15
131.00	0.17	2.18	7.01	7.17	0.16
141.00	0.18	2.35	7.01	7.18	0.17
151.00	0.18	2.52	7.01	7.18	0.17
161.00	0.18	2.68	7.01	7.18	0.17
170.00	0.18	2.83	7.01	7.18	0.17
190.00	0.19	3.17	7.01	7.19	0.18
210.00	0.19	3.50	7.01	7.19	0.18
230.00	0.20	3.83	7.02	7.20	0.18
250.00	0.20	4.17	7.02	7.20	0.18
270.00	0.21	4.50	7.02	7.21	0.19
290.00	0.21	4.83	7.02	7.21	0.19
310.00	0.22	5.17	7.02	7.22	0.20
330.00	0.22	5.50	7.02	7.22	0.20
350.00	0.23	5.83	7.02	7.23	0.21
370.00	0.22	6.17	7.02	7.22	0.20
390.00	0.23	6.50	7.03	7.23	0.20
407.00	0.23	6.78	7.03	7.23	0.20
490.00	0.25	8.17	7.03	7.25	0.22

PIEZOMETER 9C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
530.00	0.25	8.83	7.03	7.25	0.22
610.00	0.265	10.17	7.04	7.27	0.23
662.00	0.27	11.03	7.04	7.27	0.23
730.00	0.28	12.17	7.04	7.28	0.24
795.00	0.28	13.25	7.05	7.28	0.23
875.00	0.29	14.58	7.05	7.29	0.24
960.00	0.29	16.00	7.05	7.29	0.24
1059.00	0.30	17.65	7.06	7.30	0.24
1159.00	0.31	19.32	7.06	7.31	0.25
1288.00	0.32	21.47	7.07	7.32	0.25
1400.00	0.34	23.33	7.07	7.34	0.27
1435.00	0.34	23.92	7.07	7.34	0.27

PIEZOMETER 9D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.00	0.00	0.00	7.09	7.09	-0.00
1.82	0.03	0.03	7.09	7.12	0.03
3.05	0.03	0.05	7.09	7.12	0.03
4.10	0.02	0.07	7.09	7.11	0.02
5.30	0.05	0.09	7.09	7.14	0.05
6.45	0.04	0.11	7.09	7.13	0.04
7.66	0.04	0.13	7.09	7.13	0.04
8.89	0.04	0.15	7.09	7.13	0.04
10.06	0.05	0.17	7.09	7.14	0.05
11.72	0.06	0.20	7.09	7.15	0.06
12.72	0.06	0.21	7.09	7.15	0.06
14.72	0.06	0.25	7.09	7.15	0.06
16.72	0.05	0.28	7.09	7.14	0.05
18.72	0.06	0.31	7.09	7.15	0.06
20.72	0.07	0.35	7.09	7.16	0.07
23.00	0.09	0.38	7.09	7.18	0.09
25.00	0.09	0.42	7.09	7.18	0.09
27.00	0.09	0.45	7.09	7.18	0.09
29.00	0.09	0.48	7.09	7.18	0.09
31.00	0.09	0.52	7.09	7.18	0.09
33.00	0.09	0.55	7.09	7.18	0.09
35.00	0.09	0.58	7.09	7.18	0.09
38.00	0.09	0.63	7.09	7.18	0.09
40.00	0.09	0.67	7.09	7.18	0.09
45.00	0.10	0.75	7.09	7.19	0.10
50.00	0.10	0.83	7.10	7.19	0.09
55.00	0.10	0.92	7.10	7.19	0.09
60.00	0.10	1.00	7.10	7.19	0.09
65.00	0.10	1.08	7.10	7.19	0.09
70.00	0.11	1.17	7.10	7.20	0.10
75.00	0.12	1.25	7.10	7.21	0.11
80.00	0.12	1.33	7.10	7.21	0.11
85.00	0.13	1.42	7.10	7.22	0.12
90.00	0.13	1.50	7.10	7.22	0.12
95.00	0.13	1.58	7.10	7.22	0.12
100.00	0.13	1.67	7.10	7.22	0.12
105.00	0.14	1.75	7.10	7.23	0.13
110.00	0.14	1.83	7.10	7.23	0.13
115.00	0.14	1.92	7.10	7.23	0.13
120.00	0.15	2.00	7.10	7.24	0.14
130.00	0.15	2.17	7.10	7.24	0.14
140.00	0.16	2.33	7.10	7.25	0.15
150.00	0.16	2.50	7.10	7.25	0.15
160.00	0.16	2.67	7.10	7.25	0.15
170.00	0.16	2.83	7.10	7.25	0.15
190.00	0.17	3.17	7.11	7.26	0.15
210.00	0.18	3.50	7.11	7.27	0.16
230.00	0.19	3.83	7.11	7.28	0.17
250.00	0.19	4.17	7.11	7.28	0.17
270.00	0.19	4.50	7.11	7.28	0.17
290.00	0.20	4.83	7.11	7.29	0.18
310.00	0.20	5.17	7.11	7.29	0.18
330.00	0.20	5.50	7.11	7.29	0.18
350.00	0.20	5.83	7.12	7.29	0.17
370.00	0.20	6.17	7.12	7.29	0.17
390.00	0.21	6.50	7.12	7.30	0.18
407.00	0.21	6.78	7.12	7.30	0.18
490.00	0.23	8.17	7.12	7.32	0.20

PIEZOMETER 9D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
530.00	0.23	8.83	7.13	7.32	0.19
620.00	0.24	10.33	7.13	7.33	0.20
660.00	0.25	11.00	7.13	7.34	0.21
730.00	0.26	12.17	7.14	7.35	0.21
800.00	0.26	13.33	7.14	7.35	0.21
875.00	0.26	14.58	7.14	7.35	0.21
960.00	0.27	16.00	7.15	7.36	0.21
1058.00	0.28	17.63	7.15	7.37	0.22
1288.00	0.29	21.47	7.16	7.38	0.22
1400.00	0.31	23.33	7.17	7.40	0.23
1435.00	0.315	23.92	7.17	7.41	0.24

PIEZOMETER 10C AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.00	0.00	0.00	6.82	6.83	0.01
3.00	0.00	0.05	6.82	6.83	0.01
6.00	0.00	0.10	6.82	6.83	0.01
9.00	0.00	0.15	6.82	6.83	0.01
13.00	0.00	0.22	6.82	6.83	0.01
16.00	0.00	0.27	6.82	6.83	0.01
18.00	0.00	0.30	6.82	6.83	0.01
21.00	0.00	0.35	6.82	6.83	0.01
25.00	0.00	0.42	6.83	6.83	0.00
28.00	0.00	0.47	6.83	6.83	0.00
31.00	0.00	0.52	6.83	6.83	0.00
34.00	0.00	0.57	6.83	6.83	0.00
37.00	0.00	0.62	6.83	6.83	0.00
40.00	0.01	0.67	6.83	6.84	0.01
43.00	0.01	0.72	6.83	6.84	0.01
46.00	0.01	0.77	6.83	6.84	0.01
49.00	0.00	0.82	6.83	6.83	0.00
52.00	0.00	0.87	6.83	6.83	0.00
55.00	0.01	0.92	6.83	6.84	0.01
58.00	0.01	0.97	6.83	6.84	0.01
68.00	0.01	1.13	6.83	6.84	0.01
80.00	0.01	1.33	6.83	6.84	0.01
90.00	0.02	1.50	6.83	6.85	0.02
100.00	0.02	1.67	6.83	6.85	0.02
110.00	0.02	1.83	6.83	6.85	0.02
120.00	0.02	2.00	6.83	6.85	0.02
130.00	0.02	2.17	6.83	6.85	0.02
142.00	0.03	2.37	6.83	6.86	0.03
152.00	0.03	2.53	6.83	6.86	0.03
171.00	0.03	2.85	6.84	6.86	0.02
201.00	0.04	3.35	6.84	6.87	0.03
231.00	0.05	3.85	6.84	6.88	0.04
261.00	0.05	4.35	6.84	6.88	0.04
291.00	0.05	4.85	6.84	6.88	0.04
323.00	0.06	5.38	6.85	6.89	0.04
351.00	0.06	5.85	6.85	6.89	0.04
398.00	0.05	6.63	6.85	6.88	0.03
470.00	0.07	7.83	6.86	6.90	0.04
520.00	0.07	8.67	6.86	6.90	0.04
590.00	0.07	9.83	6.86	6.90	0.04
650.00	0.075	10.83	6.87	6.91	0.04
720.00	0.07	12.00	6.87	6.90	0.03
780.00	0.09	13.00	6.87	6.92	0.05
860.00	0.09	14.33	6.88	6.92	0.04
950.00	0.09	15.83	6.88	6.92	0.04
1045.00	0.10	17.42	6.88	6.93	0.05
1151.00	0.12	19.18	6.89	6.95	0.06
1265.00	0.12	21.08	6.89	6.95	0.06
1385.00	0.13	23.08	6.90	6.96	0.06

PIEZOMETER 10D AQUIFER TEST DATA

TIME (MINUTES)	DRAWDOWN (FEET)	TIME IN HOURS	PREDICTED TREND (FT)	MEASURED TREND (FT)	CORRECTED DRAWDOWN (FT)
0.00	0.00	0.00	6.79	6.79	0.00
1.00	0.00	0.02	6.79	6.79	0.00
3.00	0.00	0.05	6.79	6.79	0.00
6.00	0.00	0.10	6.79	6.79	0.00
10.00	0.00	0.17	6.79	6.79	0.00
14.00	0.00	0.23	6.79	6.79	0.00
16.00	0.00	0.27	6.79	6.79	0.00
19.00	0.00	0.32	6.79	6.79	0.00
22.00	0.00	0.37	6.79	6.79	0.00
25.00	0.00	0.42	6.79	6.79	0.00
28.00	0.00	0.47	6.80	6.79	-0.01
31.00	0.00	0.52	6.80	6.79	-0.01
34.00	0.01	0.57	6.80	6.80	0.00
38.00	0.00	0.63	6.80	6.79	-0.01
40.00	0.00	0.67	6.80	6.79	-0.01
43.00	0.00	0.72	6.80	6.79	-0.01
46.00	0.01	0.77	6.80	6.80	0.00
49.00	0.00	0.82	6.80	6.79	-0.01
52.00	0.01	0.87	6.80	6.80	0.00
55.00	0.00	0.92	6.80	6.79	-0.01
58.00	0.00	0.97	6.80	6.79	-0.01
68.00	0.01	1.13	6.80	6.80	0.00
80.00	0.01	1.33	6.80	6.80	0.00
90.00	0.01	1.50	6.80	6.80	0.00
100.00	0.01	1.67	6.80	6.80	0.00
110.00	0.01	1.83	6.80	6.80	0.00
120.00	0.01	2.00	6.80	6.80	0.00
130.00	0.02	2.17	6.80	6.81	0.01
142.00	0.02	2.37	6.80	6.81	0.01
152.00	0.03	2.53	6.80	6.82	0.02
171.00	0.03	2.85	6.80	6.82	0.02
201.00	0.04	3.35	6.81	6.83	0.02
231.00	0.04	3.85	6.81	6.83	0.02
261.00	0.05	4.35	6.81	6.84	0.03
291.00	0.05	4.85	6.81	6.84	0.03
324.00	0.06	5.40	6.81	6.85	0.04
352.00	0.06	5.87	6.82	6.85	0.03
399.00	0.06	6.65	6.82	6.85	0.03
470.00	0.06	7.83	6.82	6.85	0.03
520.00	0.06	8.67	6.83	6.85	0.02
590.00	0.07	9.83	6.83	6.86	0.03
652.00	0.07	10.87	6.83	6.86	0.03
720.00	0.08	12.00	6.84	6.87	0.03
780.00	0.08	13.00	6.84	6.87	0.03
860.00	0.09	14.33	6.84	6.88	0.04
950.00	0.09	15.83	6.85	6.88	0.03
1047.00	0.105	17.45	6.85	6.90	0.04
1150.00	0.12	19.17	6.86	6.91	0.05
1270.00	0.12	21.17	6.86	6.91	0.05
1385.00	0.13	23.08	6.86	6.92	0.06