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WATER RESOURCES DEPARTMENT

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Director

GROUNDWATER CONDITIONS OF BASALT AQUIFERS,

PARRETT MOUNTAIN,

NORTHERN WILLAMETTE VALLEY, OREGON

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PREFACE

The readability of this report is important to its understanding. To those ends, the authors have defined or limited technical language. Many readers may elect to limit their reading to only the abstract and the summary/conclusions. These readers should learn much. For those with more time or interest, the entire text gives more detail and analysis. The concepts and equations in the report are basic and should not be an impediment to the diligent reader.

The study of groundwater in fractured and faulted basalt terrains is a humbling experience. Complexities abound and this study report offers far less than the definitive groundwater description for Parrett Mountain. The quantity of data in the report should allow some readers the opportunity to improve the analyses that the report makes. The authors strongly urge such thoughtful additions.

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DEFINITIONS OF SELECTED TERMS

Alluvium: Deposits of clay, silt, sand and gravel deposited by geologically recent rivers.

Anticline: A geologic structure in which rock strata (layers) are arched upward and dip away in opposite directions from a central axis.

Aquifer: 1. A water-bearing body of naturally occurring earth material that is sufficiently permeable to yield usable quantities of water to wells and/or springs (OAR 690-08-001(1)). 2. A geologic formation, group of formations, or part of a formation that contains saturated and permeable material capable of transmitting water in sufficient quantity to supply wells and springs and that contains water that is similar throughout in characteristics such as potentiometric head, chemistry, and temperature (OAR 690-200-050(9)).

Artesian Aquifer: An aquifer in which groundwater is under sufficient hydrostatic pressure to rise above the bottom of the overlying confining bed, whether or not the water level rises above land surface. Artesian is synonymous with confined.

Basalt: A very fine grained, dark gray, brown to black volcanic rock, typically containing pyroxene, plagioclase, and olivine minerals which are relatively high in iron and magnesium.

Cascading Water: Groundwater that enters a well bore above the static water level and falls down the well.

Colluvium: A general term for loose and incoherent deposits, usually at the foot of a slope or cliff and brought there by gravity.

Commingling: 1. A general term for the phenomenon whereby groundwater moves vertically from one aquifer to another within a well bore. Cascading water is one type of commingling. 2. As derived from the context of OAR 690-210-080, a leakage of groundwaters within an individual well by gravity flow or artesian pressure from one aquifer to another.

Cone of Depression: The conical depression in a potentiometric surface or water table that forms around a well as a result of pumping.

Confining Bed: A layer of low permeability material immediately overlying a confined aquifer (OAR 690-09-020(3)).

Cuesta: A sloping plain which is terminated on one side by a steep slope.

Dip: The angle at which a stratum or any planar feature is inclined from the horizontal. The dip is at a right angle to the strike.

Donor Aquifer: An aquifer that gives up water to another aquifer by the action of commingling within wells. (Informal nomenclature unique to this report)

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Exempt Uses: Certain uses of groundwater which may legally occur without a water use permit or any other formal document normally associated with a water right (ORS 537.545).

Fault: A fracture or series of fractures in rock along which there has been displacement of one side relative to the other.

Geologic Structure: A general term for features created by movement, bending, tilting, or breaking of rock layers or units.

Head or Potentiometric Head: The level to which water in a well or aquifer will rise by hydrostatic pressure, usually expressed as an elevation above sea level.

Hydraulic Gradient: A measure of the slope of the potentiometric surface. It is the change in total head per unit distance measured in the direction of steepest change. Hydraulic Gradient = (Total Head at Point A) - (Total at Point B) ÷ Distance Between A & B.

Interference: The spreading of the cone of depression of a well or group of wells to intersect a surface water body or another well, or the reduction of the groundwater gradient and flow as a result of pumping.

Lithology: The character of a rock as defined by its color, mineral composition, and grain size.

Normal Fault: A fault at which the mass of rock above the fault plane (hanging wall) has been depressed, relative to the mass of rock below the fault plane (foot wall).

Paleomagnetism: The intensity and direction of residual magnetization in ancient rocks. The magnetic particles in the rock were oriented by the earth's magnetic field as it existed when the rock was formed.

Permeability: The ability of a rock or soil to transmit fluid such as water.

Petrography: See lithology.

Phyric (porphyritic): An igneous rock texture in which larger crystals (phenocrysts) are set in a matrix of finer grained crystals or glass.

Potentiometric Surface: A surface that represents the total head in an aquifer. It is defined by the elevation at which water stands in cased wells that penetrate the aquifer.

Receiver Aquifer: An aquifer that is recharged by the action of commingling within wells. (Informal nomenclature unique to this report)

Reverse Fault: A fault at which the mass of rock above the fault plane (hanging wall) has been raised, relative to the mass of rock below the fault plane (foot wall).
Specific Yield: The ratio of the volume of water which a saturated rock or soil will yield by gravity to the total volume of rock or soil.

Storage Coefficient: The volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head.

Strike: The course or bearing of the outcrop of an inclined bed or structure on a level surface. It is perpendicular to the direction of the dip.

Syncline: A fold in rocks that is concave upward in which strata dip inward from both sides toward the axis of the fold.

Total Head: Total Head = Elevation Head + Pressure Head.

Elevation Head: The elevation at a point of interest in an aquifer relative to a measuring point (e.g. sea level).

Pressure Head: The height of a column of water that can be supported by the pressure at a point of interest in an aquifer.

Vesicular: A textural term for rock characterized by abundant small openings formed by gas bubbles trapped during the solidification of lava.

Water Level: The distance from land surface to the top of the water column in a well. When the well is being pumped, it is called a pumping water level. It is referred to as a static water level in a well that has recovered from pumping or there has been no pumping.

Water Table Aquifer: An aquifer in which the pressure at the upper surface of the water body is atmospheric. Water table is synonymous with unconfined.

Water Use Permit: A document issued by the Oregon Water Resources Department that authorizes the diversion and beneficial use of the public waters of the State.

Well Alteration: The deepening, reaming, casing, re-casing, perforating, re-perforating, installation of liner pipe, packers, seals, and any other material change in the design or construction of a well. (OAR 690-200-050(7))

Unconformable: Not succeeding the underlying strata in order of age or in parallel position.

WELL LOCATION SYSTEM

The well location system used in this report is based on the rectangular system used for subdivision of public land. Each well location describes the township, range, and section.

For example, the well location **3S/1W-21caa** indicates a well located within Township **3** South, Range **1**West, and Section **21**. The letters following the section number indicate the well location within the section, as shown below. The first letter (**c**) represents the quarter section (160 acres), the second letter (**a**) the quarter-quarter section (40 acres), and the third letter (**a**) the 10 acre tract.

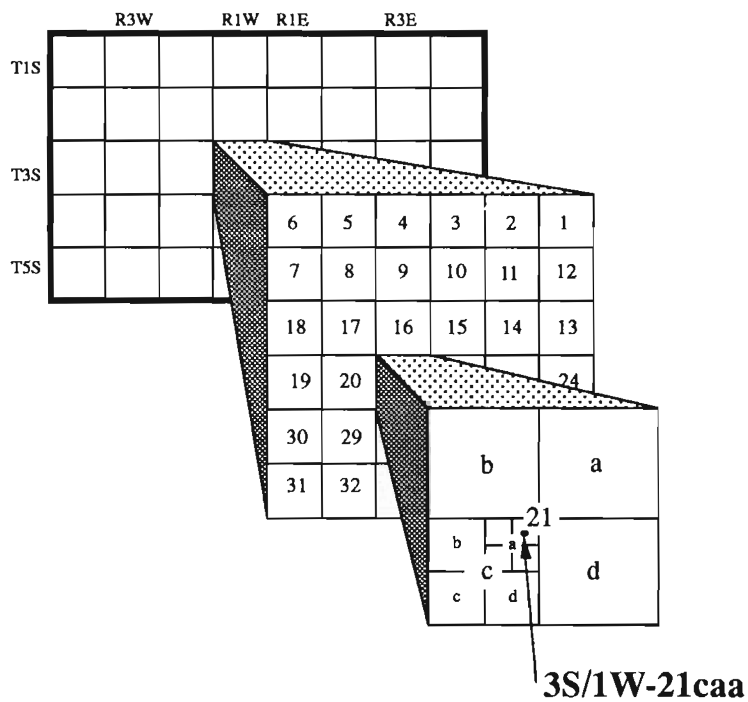

Figure 1. Well Location System

GROUNDWATER CONDITIONS OF BASALT AQUIFERS,
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by Donn W. Miller, Sarah Meyer Gates, Brett T. Brodersen, Michael J. Zwart

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ABSTRACT

The Oregon Water Resources Commission authorized a Parrett Mountain groundwater study in January 1992. The Commission sought the study in response to concerns expressed by some local residents that groundwater levels were declining.

Parrett Mountain is a dissected, fault-block upland in the northern Willamette Valley of northwestern Oregon. It comprises a total of about 28 square miles in largely rural portions of Washington, Clackamas, and Yamhill counties. The area ranges in elevation from 60 feet at the Willamette River to 1247 feet at the mountain peak.

Gaged precipitation on the western side of Parrett Mountain records an average of 42 inches annually since 1948. Most of this amount occurs as rain. The months of October through March generally account for 75% of the annual precipitation. The period 1985 through 1993 has averaged 36 inches of precipitation.

There are about 4500 residents in the study area. Parrett Mountain is basically a rural area near metropolitan Portland and is growing rapidly. Population growth is generally rural residential but some is urban in portions of Sherwood and Wilsonville.

The geologic framework of Parrett Mountain is dominated by lava flows of two separate formations of the Columbia River Basalt Group. There are 11 flows with a maximum thickness of 900 feet in the area. The lower formation (Grande Ronde) is represented by 10 flows within six units and the upper formation (Wanapum) has one flow. The flows commonly dip to the southeast at about 5 degrees or less but other local dip directions are also found.

Faulting is widespread, with several geographic orientations. Displacements along the faults range from a few feet to about 1000 feet with documented faults creating 19 separate fault blocks within the study area. Unknown faults and displacements further subdividing these blocks are entirely possible.

Basalt aquifers are the principal source of groundwater on Parrett Mountain. These aquifers are located within the several geologic units and the boundary zones between them. On a local basis, several water-bearing zones act as one aquifer and are naturally integrated. Over small areas, individual or integrated aquifers typically display water levels with common heads and head trends

that amount to aquifer "signatures." At Parrett Mountain, these aquifer signatures are usually noted over areas of less than one square mile, resulting in a pattern of great complexity. Individual wells often encounter more than one aquifer, resulting in head levels that are composites of the aquifer levels. Such commingling sometimes results in an initially unstable water level. Over time, such wells usually display the signature of the principal (highest capacity/most transmissive) aquifer within the well.

The study resulted in the collection and/or compilation of more than 2300 water level measurements from 335 wells with all but a few of these wells drawing water from the basalt aquifers. There are about 1000 active basalt wells in the study area. For most of the study wells, only two measurements are available, one from the well report at the time of construction, and a second from this investigation. For some, however, additional measurements have been obtained from previous investigations, well alteration reports, municipal workers, pump installers, and well owners.

Water level changes in Parrett Mountain wells occur principally from pumping, natural recharge, natural discharge and commingling within wells. Annual water level fluctuations at 37 wells which were measured monthly display a range of amplitudes of two to 16 feet with a single well showing 70 feet.

The study area contains 260 basalt wells for which it was possible to compare a current water level to a "seemingly" reliable historic water level for each well. In these wells, water levels have declined/dropped a <u>mean</u> average of 14 feet over 14 years. These same wells display a <u>median</u> average decline/drop of six feet over 14 years.

Well alteration can result in strong water-level changes in wells. For 25 basalt wells, the study compared a current water level with a "seemingly" reliable historic water level for the well in its <u>previous</u> construction, usually before deepening. This subgroup of the larger 260 wells has experienced an average decline/drop of 127 feet over an average 23 years. These same 25 wells display an average decline/drop of three feet over 10 years in their <u>current</u> construction (post alteration). Wells in the upland areas above 400 feet elevation are particularly prone to large drops upon deepening.

Current pumping from basalt aquifers in the study area is estimated at 558 million gallons per year. Rural residential use by 1000 individual wells accounts for 35 percent of the water pumped. Agriculture accounts for 25 percent and the remainder is water used by the City of Sherwood and Dammasch State Hospital.

Estimates of average recharge for basalt aquifers are problematical and subject to the dynamics of precipitation variability, pumping, and other factors. The general water level stability during the study at the monthly monitoring wells suggests that total recharge was balanced by total discharge. That seemingly average precipitation period recharged more than 558 million gallons.

The general stability does not preclude areas of local instability. There are six areas noted within the Parrett Mountain study area which display water level decline patterns which are the result of water use and/or commingling. These subareas show total declines of 20 to 60 feet. Combined, they total about three square miles in area.

The basalt groundwater is generally low in dissolved minerals and suitable for many uses. Groundwater temperatures are about 52°F. Tritium analyses from four sites display levels which indicate that some portion of that groundwater was recharged after 1952.

INTRODUCTION

Location

Parrett Mountain (figure 2) occupies about 28 square miles in the northern Willamette Valley of northwestern Oregon. It rests within parts of Washington, Clackamas, and Yamhill counties. The Parrett Mountain boundaries are unique to this report for the purposes of describing a study area which surrounds an upland. Local residents, particularly those in low-lying areas, would disagree with their being identified as Parrett Mountain residents.

In the course of the study, it was apparent that certain data were needed in adjacent areas in order to better understand groundwater conditions on Parrett Mountain. Therefore, groundwater data were taken from some basalt wells to the north, east, and west. This increased the study area a bit to about 35 square miles (Plate 1).

Purpose

In January 1992, the Oregon Water Resources Commission directed Department staff to conduct a groundwater study of Parrett Mountain. The Commission acted in response to concerns expressed by some local residents that groundwater levels in wells were declining due to groundwater use. There were also concerns about plans by the City of Sherwood to add another well and a timber company's interest in developing a large tract. Given the desirability of the area for further rural residential development, the potential for increased groundwater withdrawals was clear. The purpose of this study was to determine groundwater conditions on Parrett Mountain for reasons of water supply management. In order to accomplish this, the objectives of the study were to better define the geology, aquifers and groundwater flow system and identify the reasons for the documented water level declines and refine estimates of historic and potential groundwater pumpage.

To achieve these objectives, Department staff reviewed various reports, records, and hydrologic data. A field inventory of more than 330 wells provided a basis for tracking water level trends over time. Monthly water level measurements at a network of 37 wells offered a view of seasonal fluctuations. Interviews with well owners served as a means to determine the nature of any well problems that they experienced. Field observations and analyses of drill cuttings from water wells helped improve knowledge of the local basalt stratigraphy.

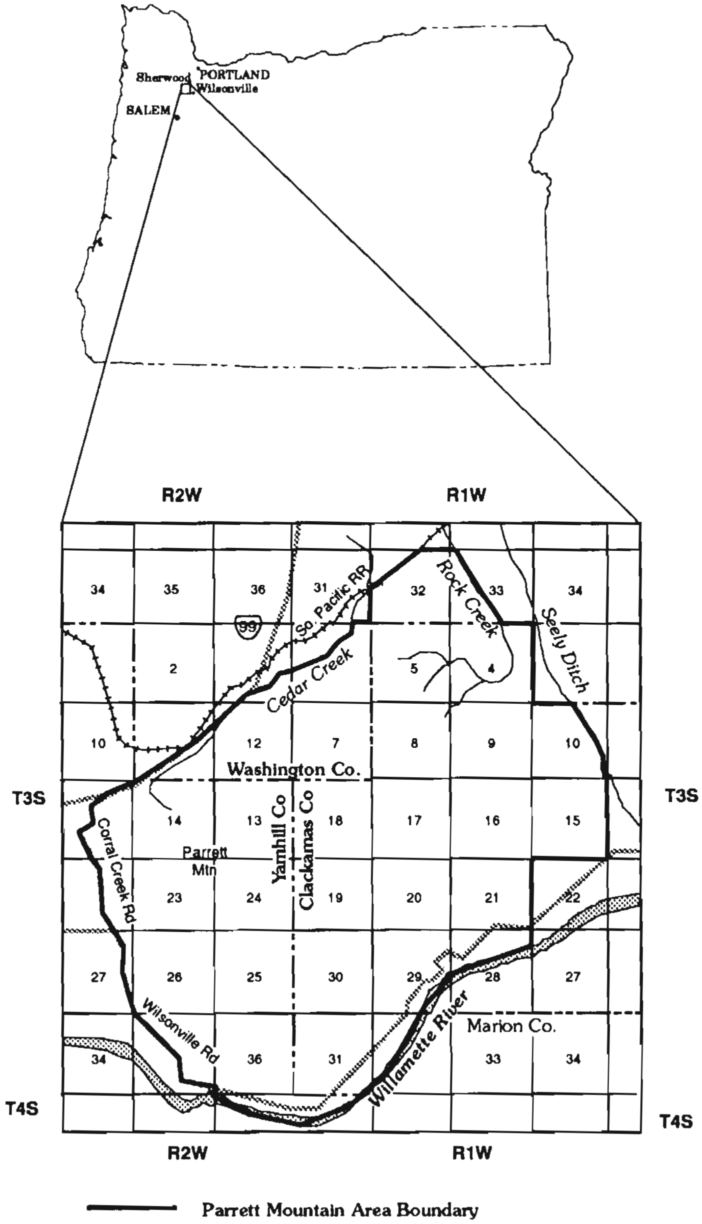

Figure 2. Location Map.

Acknowledgements

The friendly cooperation of hundreds of local well owners greatly facilitated this study by providing access to wells and groundwater data. Many well owners kindly provided monthly access to their wells for monitoring. Special thanks go to Shelby Crecraft for sharing of her personal knowledge of the area and Jerry Phillips for opening his pump business files for original water level data retrieval.

Previous Studies

Groundwater resources of the area were described in reports by Piper (1942), Hart and Newcomb (1965), and Frank and Collins (1978). Detailed geologic descriptions are found in reports by Schlicker and Deacon (1967), and Brodersen (1994, in process). Consultants' reports concerning various groundwater resource development issues are available from Boggs (1970), Frank (1983), Hughes (1983), Driscoll and Titus (1991), Luzier (1992), and Kienle (1992).

Study Methods

Study methods principally involved the review of available literature, field investigation, laboratory analyses, records research, and data analyses. Conversations with local well owners and technical professionals also contributed groundwater data and analysis insights.

The geologic investigation was conducted by Brett Brodersen, a graduate student at Portland State University. His work examined outcrops, road cuts, well cuttings, well reports, and chemical analyses of well cuttings in preparation of a geologic map, structure contour maps, and cross-sections. His work was conducted, in part, as a temporary Oregon Water Resources Department employee.

The groundwater investigation included writing landowners in the area to obtain permission to visit wells, make site inspections for well location and elevation, and collect data on groundwater level, conductivity, and temperature. Matching well reports to inspected wells was very important for aquifer determination and estimating the water level changes at wells. Monthly water level measurements at 37 wells demonstrated seasonal water level fluctuations. Water use was estimated from water rights, crop application rates, water use reports, the number of dwellings, and an average household use per dwelling.

Water level accuracy was extremely important. To insure data quality, staff usually worked in pairs, tapes were calibrated, measurements were repeated, and wells were revisited and remeasured when there was uncertainty.

PHYSICAL SETTING

Geography

Parrett Mountain is surrounded by several prominent features. The cities of Sherwood, Wilsonville and Newberg are nearby, respectively to the north, east and west. The Willamette River borders on the south and Chehalem Mountain borders on the northwest.

Parrett Mountain straddles the dividing line between the Tualatin Valley and the main-stem Willamette Valley. About one-quarter of Parrett Mountain drains to the Tualatin River, mostly through Cedar Creek and its tributaries. The rest of the area drains to the Willamette River, largely by way of Corral Creek and its tributaries. Small springs are numerous on the mountain and can be either intermittent or perennial.

Parrett Mountain study area elevations range from about 60 feet at the Willamette River to almost 1250 feet at the peak of the mountain (3S/2W-13). Typically, the area rises gradually from the valley floor to the higher ground with a gentle, ramp-like surface. Steeper slopes, however, can be found in some stream canyons and areas of structural deformation. A fault-generated scarp slope on the northwest face of the mountain is particularly prominent.

With heavy rainfall and a mild climate, a dense mat of vegetation can be found in areas of sparse development. Common trees found in the area include evergreens, ash, cottonwood, vinemaple, and white oak. Small plants include bracken, poison oak, blackberries, and native grasses. Also as a result of the rainfall and climate conditions, several landslide areas have been identified on the mountain, mostly found on the steeper, northwestern slopes.

Climate

Parrett Mountain has a temperate climate which is characterized by cool, moist winters and warm, dry summers. Gaged precipitation at the Rex 1S station (3S/1W-15) on the western side of Parrett Mountain records an average of 42 inches annually (Plate 1). Most of this amount occurs as rain. The months of October through March generally account for 75% of the annual precipitation. While no temperature data is collected at Rex 1S, the McMinnville station to the southwest records an average annual temperature of 51.9°F. January is the coldest month with an average temperature of 39.1°F and July is the warmest with 65.4° F. The average frost-free growing season is about 200 days.

Precipitation at Rex 1S is available from 1948-1993 (figure 3 and Appendix C). During the period, the annual precipitation ranged from 56 inches in 1983 to 25 inches in 1985. Average monthly precipitation ranges from more than 7 inches in December to less than 1 inch in July. Precipitation trends are displayed as cumulative departures from the long-term average. The period 1985 to 1993 recorded a strong declining trend which averaged 36 inches of precipitation annually.

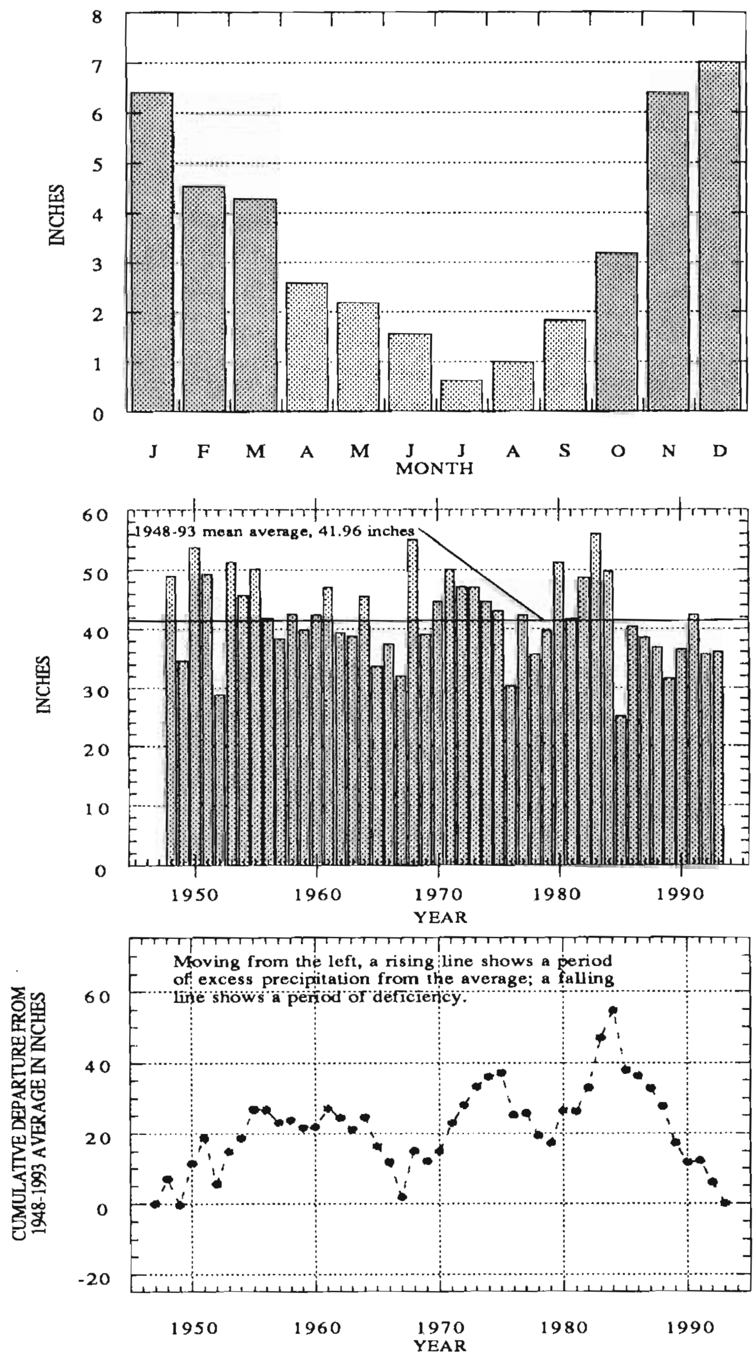

Figure 3. Precipitation: Monthly Average, Annual, and Cumulative Departures at Rex 1S.

Population and Economy

Parrett Mountain is home to at least 4500 people. There are approximately 1000 rural residential households within the area and several hundred more households within portions of Sherwood and Wilsonville. The rural population of Parrett Mountain is about 3500.

The Parrett Mountain study area is basically a rural area, within easy commuting distance of Portland and other metropolitan locations. Due to that proximity, many of the residents commute to nearby urban locations for their livelihoods, although some residents work out of their homes. Those engaged in agriculture raise such items as filberts, walnuts, blueberries, Christmas trees, nursery stock, and timber. Cattle, llamas, horses, sheep, and birds are also boarded, raised and/or sold for profit. Two rock quarries also operate in the area.

GEOLOGY

General Description

The Parrett Mountain study area is underlain by geologic units ranging in age from Oligocene to Recent. The geology of these rocks strongly controls the occurrence and movement of groundwater within the area. Basalt of the Columbia River Basalt Group underlies nearly the entire area. Aquifers within the basalt are the most important source of groundwater supply in the area, yielding water to hundreds of wells. The geology of an area is usually described by a discussion of its stratigraphy and structure. Stratigraphy is the study of the layering of the rocks, including their physical position and relative chronological order of sequence. Structure refers to the features resulting from structural processes, such as folding and faulting, as well as the attitude and relative positions of the rock masses that are involved.

The stratigraphy of the Parrett Mountain area consists of multiple layers of basalt which unconformably overlie a thick sequence of marine sedimentary rocks. Deposits of alluvium and colluvium locally overlie the basalts, especially within stream valleys and at lower elevations. The ages and formal geologic nomenclature for the stratigraphic units described in this report are shown in figure 4.

Parrett Mountain itself is a cuesta composed of basalt rocks which dip gently to the southeast. The mountain is highly dissected by streams, many of which exhibit lineated segments. Many of the lineated stream segments or lineated interstream ridges have been identified by Brodersen (1994), and previous investigators, as faults. Several sets of faults with differing directional trends are identified. The style of faulting and the sense of relative displacement for most faults could not easily be determined solely by field mapping. Map compilation, including petrographic and cross-sectional analysis aided these determinations. Most faults are interpreted as high-angle normal faults. Three of the mapped faults are interpreted as reverse or thrust faults.

The geologic map in this report (Plate 2a) was prepared by Brodersen (1994) with the use of aerial photographs, reconnaissance field mapping, petrographic and geochemical analyses of drill cuttings from 34 wells, and analysis of numerous water well reports. The map includes some revision of the work by previous investigators.

Stratigraphy

The oldest rocks in the Parrett Mountain area are undifferentiated marine sedimentary rocks, which range from Oligocene to Miocene age. These deposits underlie the entire area, but are not exposed at the surface. They are encountered in a small number of wells which completely penetrate the overlying basalt rocks. The marine sediments consist of an undetermined thickness of siltstone, sandstone, claystone and tuff. These rocks are generally poorly permeable and are not considered to be aquifers in this area, although they yield small to moderate quantities of groundwater to wells elsewhere in the Willamette Basin.

Basalts of the Columbia River Basalt Group unconformably overlie the marine sedimentary rocks. Field mapping and petrographic analysis indicates that the Columbia River Basalt Group rocks within the Parrett Mountain study area are represented by two formations: the Grande Ronde Basalt and the Wanapum Basalt, both of Miocene age. Six basalt units of the Grande Ronde Basalt are represented in the area: the Wapshilla Ridge Unit, the Ortley - Grouse Creek Units (undifferentiated), the Umtanum Unit, the Winter Water Unit and the Sentinel Bluffs Unit. The Wanapum Basalt is represented by a single basalt flow, the Gingko Flow of the Frenchmen Springs Member (figure 4). The maximum thickness of the Columbia River Basalt Group in the study area is estimated to be 900 feet in the vicinity of Rex Hill.

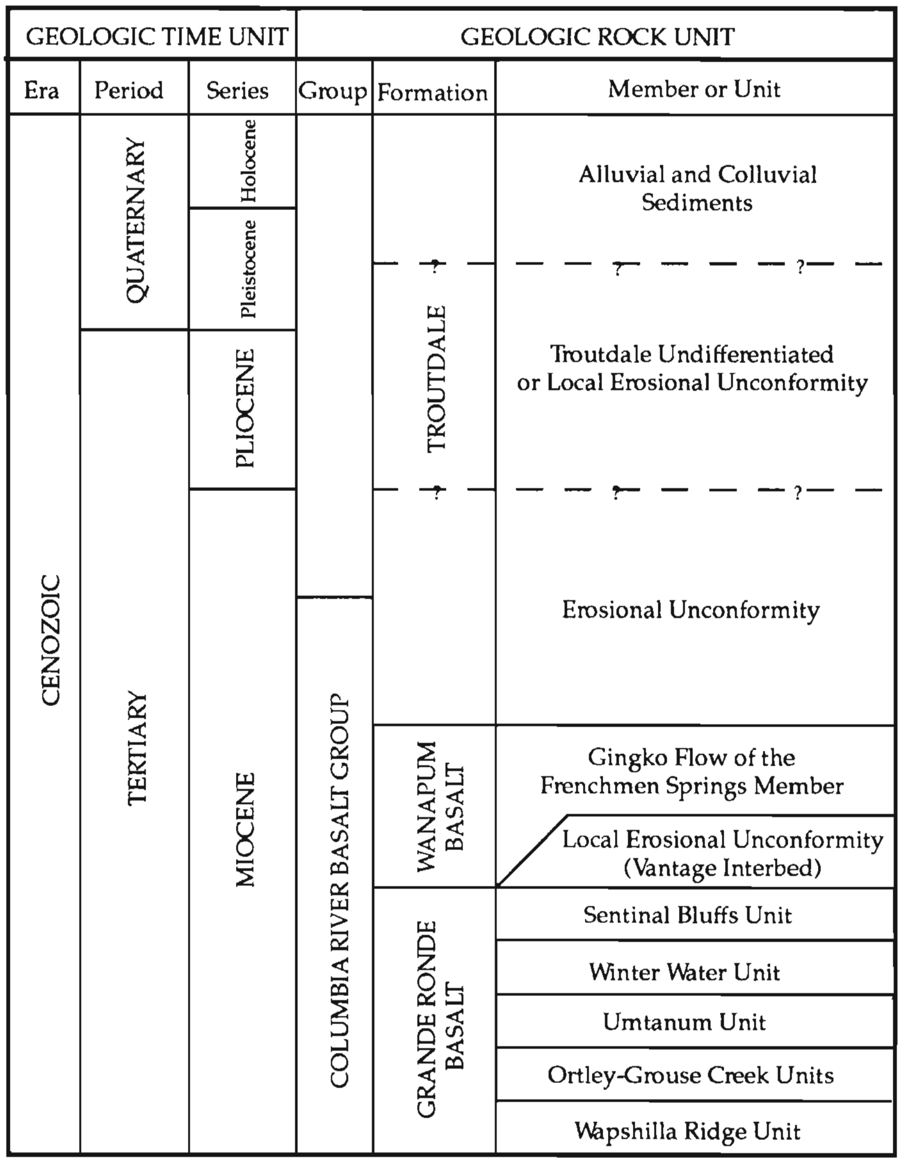

Figure 4. Stratigraphy of Rock Units on Parrett Mountain.

Grande Ronde Basalt

Wapshilla Ridge Unit

The Wapshilla Ridge Unit is the oldest of the basalt units in the study area and unconformably overlies the marine sedimentary rocks. Therefore, the emplacement and thickness of the unit was greatly influenced by paleotopography. Only one flow is believed to occur in the study area, with a maximum thickness estimated to be 250 to 300 feet. The unit is exposed on the west side of Parrett Mountain, notably within the Fernwood quarry (3S/2W-22d) and along Fernwood Road (Plate 2). This unit is the only one to have a reverse magnetic polarity signature, with all others having a normal signature. The lithologic characteristics of the unit, as well as its reverse polarity, allowed Brodersen (1994) to readily identify it. Lithologic analyses of drill cuttings revealed that the Wapshilla Ridge Unit is penetrated by numerous wells in the area, especially in the western part of the study area. The number of wells which penetrate the unit declines to the northeast.

Ortley - Grouse Creek Units

The Ortley Unit and the Grouse Creek Unit are distinguished from each other on the basis of lithology, chemical composition and magnetic signatures. However, Brodersen (1994) was unable to differentiate these units within the Parrett Mountain study area. The two units are therefore grouped together in this report.

Three basalt flows were identified on the basis of petrographic and geochemical analyses of drill cuttings. The Ortley - Grouse Creek units are exposed on the west and northwest sides of Parrett Mountain and within the valley wall of the South Fork of Corral Creek (Plate 2). The exposures are typically covered with alluvium or colluvium. The thickness of these units averages about 100 feet within the study area, with an inferred variation of from 80 to 160 feet. Maximum thickness occurs on the southwest side of the mountain. The three basalt flows are identified in many of the wells which were analyzed in the study area and they are therefore assumed to be laterally continuous. The thickness of each flow generally ranges from 25 to 30 feet, with the middle flow showing somewhat greater variation. These units unconformably overlie the Wapshilla Ridge Unit with little evidence of any strong control by paleotopography.

Umtanum Unit

Basalts of the Umtanum Unit overlie those of the Ortley - Grouse Creek Units. Two flows have been identified on the basis of petrographic analyses of drill cuttings from multiple wells. The thickness of the unit varies from 80 to 160 feet, with the maximum thickness occurring near the junction of Old Parrett Mountain Road and Parrett Mountain Road at 3S/2W-13c (Plate 2). A third flow was identified on the basis of its lithologic and chemical characteristics. This third flow is absent over most of the area, but is found along Cedar Creek, below the City of Sherwood and in a quarry at La Butte, just south of the Willamette River.

Many of the water well reports which penetrate the unit do not identify the boundary between the upper and lower flows. Petrographic analysis of drill cuttings at some wells revealed that the top of the lower flow is not easily identified. This may be due to little flowtop development, a thin flowtop, or the development of an erosional surface in some places, which makes the boundary difficult to discern. Flowtops are commonly a more permeable portion of basalt flows. They are characterized by being vesicular, and may also contain cooling fractures, flow brecciation, or weathering.

The Umtanum Unit is also difficult to differentiate from the overlying Winter Water Unit petrographically because the two units have similar lithology and geochemical signature. Other information, such as trace element concentrations, relative stratigraphic positions, correlation with known exposures of slight differences in composition, often was used to distinguish between these units.

Winter Water Unit

The Winter Water Unit overlies the Umtanum Unit and is exposed at the surface or penetrated by wells over much of the study area. Exposures are common in the drainages and at the west side of Rex Hill (Plate 2). Due to its occurrence at the surface or in the relatively shallow subsurface, this unit is not usually developed as an aquifer. It is the uppermost basalt unit which serves as the principal aquifer for any wells; only a few wells in the study area have the Winter Water unit as their principal aquifer.

Two flows have been identified on the basis of field reconnaissance and petrographic analyses of drill cuttings. The total thickness of the unit varies from about 55 feet to about 105 feet. Over much of the area, the thickness of the lower flow varies from 45 to 55 feet and the upper flow is about 50 feet thick. The variation seen in the lower flow is likely due to the influence of paleotopography. In the Roberts Hill area, both flows thin to 25 to 30 feet. The unit can be differentiated from the overlying Sentinel Bluffs Unit on the basis of lithology and its geochemical signature.

Sentinel Bluffs Unit

Surficial exposures of the Sentinel Bluffs Unit are more common than for any other units in the Parrett Mountain study area. Two flows have been mapped within the area. However, most well reports do not identify the contact between the flows. Both flows display moderate variation in thickness. The lower flow varies from 45 to 75 feet and the upper flow varies from about 40 to 65 feet in thickness. Although this unit is commonly penetrated, it is not interpreted as a principal aquifer in any wells in the study area. The Sentinel Bluffs Unit is easily identified on the basis of its distinct lithology and chemical composition. It generally is thickest to the northeast and northwest and thins to the southeast and near Pleasant Hill (Plate 2). The unit has been removed through erosion in the western part of the area.

Wanapum Basalt

Ginkgo Flow of the Frenchmen Springs Member

The Ginkgo Flow of the Frenchmen Springs Member is the only basalt within the study area which represents the Wanapum Basalt Formation. This flow is confined to the tops of the higher ridges and along the southeast dipping slopes of those same ridges (Plate 2). Its maximum thickness is about 90 feet near the junction of Old Parrett Road and Parrett Mountain Road. It is thinner or absent in other areas due to erosion. Because of its local thickness, it is believed that a single flow is present in the area. The Ginkgo Flow is usually easily differentiated from the underlying Sentinel Bluffs Unit on the basis of lithology. However, due to weathering, it was sometimes necessary to identify the flow on the basis of its distinctive blood-red to crimson soil development (Brodersen, 1994). No samples of the Ginkgo Flow were collected for geochemical analyses, again because fresh samples were scarce due to weathering.

Younger Deposits

The oldest of these deposits consists of semi-consolidated clay, silt, sand, and gravel of the Troutdale formation. These deposits are Pliocene/Pleistocene in age and do not crop out in the study area. Although the Troutdale formation can serve as an aquifer, it is relatively unimportant.

Undifferentiated deposits of alluvium and colluvium also are found in the Parrett Mountain study area. In this area, the deposits consist mostly of unconsolidated clay, silt, sand, and gravel. Where sufficient saturated thickness of the more permeable deposits occurs, the alluvium can serve as an aquifer. However, alluvium is a relatively unimportant aquifer in the study area. It was interpreted as the principal aquifer in only one well of those for which interpretations were made.

These deposits range in age from Quaternary to Recent and occur primarily along all streams and locally overlie most of the basalt bedrock units. At elevations above about 350 feet, these are primarily stream channel deposits which occur within, and adjacent to, stream beds. Below that elevation, these deposits are more widespread and include not only stream channel deposits, but also flood plain deposits, terrace deposits, and colluvial deposits. Plate 2 shows the areal distribution of these deposits in the study area where they are extensive enough to cover the bedrock.

Interbeds

An interbed is a local to regional layer of ash, sedimentary material, or weathered horizon, which was deposited or formed during a hiatus between eruptions of separate basalt flows. The occurrence, type of material, and thickness of interbeds is dependent on the source of the sediments, the type of depositional or erosional processes at work, and the length of time between eruptions (Brodersen, 1994).

Interbeds have been described in lithologic logs of numerous water well reports for the area. These are described variously as sandstone, shale, claystone or ash deposits. However, highly weathered basalt often has the appearance of sedimentary deposits, and it is possible that some of these descriptions are of weathered basalt interbeds. Of the 34 wells from which Brodersen collected drill cuttings for petrographic analyses, only two revealed the presence of a distinct ash layer. The layer is interpreted as being between the Ortley - Grouse Creek Units and the overlying Umtanum Unit. A thin ash layer has also been described by several well constructors at other wells in the study area. Based on its stratigraphic position, this layer is believed to be the same, and its presence has therefore been useful as a marker bed for correlation between wells.

Structure

The basalt rocks that comprise most of the Parrett Mountain study area were deposited as very fluid lava flows, and were therefore originally horizontal. Subsequent to their deposition, structural forces faulted the rocks. Faulting locally disrupted the stratigraphic units, resulting in numerous separate fault blocks, each of which may be displaced differently relative to the others. Then erosion of the rocks preferentially removed more of the softer materials and, in doing so, revealed some of these faults. The present structure, primarily the overall southeastern dip of the rock units on Parrett Mountain and the pattern of faulting of the rocks, is important in controlling the occurrence and movement of groundwater on Parrett Mountain.

The study area is well dissected by streams, many of which exhibit lineated stream reaches. Studies by previous investigators led them to the conclusion that many of these lineated stream reaches are the topographic expressions of faults. They were mapped largely on the basis that fault planes are more likely to be preferentially eroded, rather than through actual field observation of faulting or related features. The soil and vegetative cover in the study area limits the surface exposures of basalt. Where the basalt is exposed, it is typically deeply weathered. These facts make it difficult to identify faults solely through field reconnaissance.

Brodersen (1994) took a conservative approach to the designation of additional faults within the area. He recognized linear stream reaches as faults only if other evidence, such as field reconnaissance, map compilation, petrographic and cross-sectional analyses, indicated an apparent stratigraphic displacement. This approach likely resulted in some faults not being identified as a result of limited displacement. However, it is also likely that the faults which are mapped are not merely other linear features, such as fractures, which also were preferentially eroded to form linear stream reaches.

Eighteen faults are identified and informally named by Brodersen (1994) within the study area, based on the use of the above criteria (Plate 2). Many of them can be grouped into four fault sets having differing directional trends: north-south, northeast-southwest, northwest-southeast, and east-west. Most are interpreted as high-angle normal faults, with nearly vertical fault planes. However, two of them were interpreted as reverse or thrust faults with the support of additional data. The faults divide the study area into thirteen major fault-bounded blocks and six additional minor fault blocks. The major blocks are also informally named (Brodersen, 1994).

The four north-south trending faults on the western side of Parrett Mountain (labeled NS-1 to NS-4 on Plate 2a) are perhaps the most prominent structural features in the study area. Fault traces of from 3,200 feet to 20,000 feet can be observed. The faults appear to be terminated at their north ends by the northeast-southwest trending Sherwood fault and are overlain by alluvium to the south. These have been interpreted as high-angle normal faults. The eastern two of these faults display relatively moderate displacements of 20 to 30 feet. The western two faults have much greater displacement, approximately 100 to 200 feet for the NS-1 fault and as much as 500 feet for the NS-2 fault. A fifth north-south trending fault, the Oberst fault, is also identified. Displacement of this fault is minor, only about seven feet. The Oberst fault is also interpreted as a high-angle normal fault. It crosses two other shorter faults, the Manke fault and the Rim fault, without apparent horizontal offset of the fault traces (Plate 2a).

Only one major east-west trending fault is identified on the western part of Parrett Mountain. This fault crosses at least the eastern two of the four prominent north-south faults, NS-3 and NS-4. It may extend to the west of NS-2, but is covered by alluvial deposits in this area. This fault is interpreted to be a high-angle reverse fault in the area between NS-3 and NS-4, separating the Rex Hill block from the West Kramien block. It appears to be a high-angle normal fault between NS-2 and NS-3, where it separates the Poison Oak block from the Anna block. The displacement is estimated to be about 150 feet. Based upon the cross-cutting relationships of the faults in the study area, this fault appears to have preceded the north-south trending faults, but followed the occurrence of the northwest-southeast trending faults (Plate 2a).

The northwest-southeast faults in the study area have been assigned the following informal names: the Mill Creek fault, the Ladd Hill fault, the Heater fault, the Roberts Hill fault, and the Seely Ditch fault (Plate 2a). The Mill Creek and Ladd Hill faults are the most distinct of these faults, based on topographic expression. Both are interpreted to have a vertical displacement of about 100 feet. The Heater fault is an extension of the Ladd Hill fault, and was identified primarily because of a difference in the direction of strike of the basalt rocks in this area, since little or no vertical displacement is interpreted. This suggests that strike-slip displacement of this fault, and perhaps the other northwest-southeast trending faults, is possible.

The Roberts Hill fault separates the Roberts Hill block from the Earlwood block (Plate 2a). Ten to 50 feet of displacement is observed at this fault. The Seely Ditch fault is identified on the basis of significant displacement of the basalt stratigraphy, change in dip of the rocks and a lineated topographic ridge. The position of this fault is inferred because of the extensive alluvial cover in the area. About 100 feet of displacement has occurred on this fault, based on cross-sectional analysis. It is believed that the Seely Ditch fault terminates both the Pleasant Hill fault and the Dammasch fault, and that it is itself terminated by the Cedar Creek fault.

Seven northeast-southwest trending faults have been identified in the area and have been informally named as follows: the Sherwood fault, also called the Cedar Creek fault, the Pleasant Hill fault, the

Dammasch fault, the Willamette fault, the Corral Creek fault, the Rim fault and the Manke fault. Of these seven, only two have been identified by previous investigators, the Sherwood fault and the Corral Creek fault.

The Sherwood fault (Cedar Creek fault) was previously identified on the basis of the separation of Parrett Mountain from Chehalem Mountain. The location of the fault is inferred over much of its length as a result of being covered by alluvial and colluvial deposits. Brodersen (1994) was unable to better delineate the location, orientation and style of faulting. Examination of basalt drill cuttings from several wells located just south of the inferred fault location revealed no evidence of faulting. From this is is inferred that the fault plane is near vertical or may dip to the northwest, which has been suggested by some previous investigators. Maximum displacement on this fault is interpreted to be about 1000 feet near Rex Hill and is believed to decrease to the northeast.

The Corral Creek fault generally follows the South Fork of Corral Creek and separates the Roberts Hill and Earlwood blocks from the Parrett Mountain and East Kramien blocks. This fault is interpreted by Brodersen (1994) to be a reverse fault to the northeast, but southwest of its intersection with the east-west fault, it is interpreted as a high-angle normal fault. There are several possible explanations proposed for this by Brodersen (1994). One is that the two segments of the fault may be different faults, separated by an unmapped fault, possibly trending to the northwest. Another is that the entire fault was originally a reverse fault which was subsequently modified by northwest trending normal faults, such as the Roberts Hill fault and other similar but unmapped faults to the west. Progressive downdropping of such faults to the southwest could allow interpretation of the southwest end of the fault to be normal. The Corral Creek fault also could be a hinge fault, in which the Earlwood-Roberts block rotated about an axis perpendicular to the plane of faulting. This explanation allows the present interpretation without speculating on the existence of additional faults.

The Rim fault and the Manke fault are identified on the basis of petrographic analyses of drill cuttings and map compilation which indicated obvious displacement of the stratigraphic units. Both faults are subparallel to each other and to the ridge of Parrett Mountain. Displacement is estimated to be less than 30 feet for both. These faults are terminated by the Mill Creek fault to the northeast and by the Ladd Hill fault to the southwest (Plate 2).

The Pleasant Hill fault is interpreted as a thrust fault, which is a reverse fault with the fault plane dipping less than 45 degrees. This fault was identified based on a marked decrease in the dip of the basalt rocks across the apparent fault. It terminates at the Mill Creek fault to the southeast and at the Seely Ditch fault to the northeast (Plate 2). Maximum displacement of the fault is estimated to be 200 feet.

The Dammasch fault was delineated by Brodersen (1994) on the basis of a lineated stream segment and obvious displacement of the Ginkgo Flow of about 160 feet. This fault is inferred to terminate at the Seely Ditch fault to the northeast (Plate 2). The Willamette fault is inferred over much of its length due to alluvial deposits which cover most of this area. The linearity of the Willamette River in the area between Parrett Mountain and La Butte, south of the river, and the stratigraphic displacement of the Umtanum and Winter Water basalt units between La Butte and the Earlwood - Roberts block allowed inference of the probable location of the fault (Plate 2).

Brodersen (1994) prepared four cross-sections of the Parrett Mountain study area as part of his geologic investigation of the area. Three of these cross-sections are provided (Plate 2). Two show the stratigraphic and structural controls along dip (A-A', B-B') and one along strike (C-C'-C"). The cross-sections were prepared using reconnaissance field mapping, petrographic and geochemical analysis of drill cuttings, and analysis of numerous water well reports. The sections display the layered stratigraphy of the area, and the associated faulting, in a more easily visualized manner than does the geologic map alone. The vertical exaggeration used increases the apparent dip of the beds. The actual dip angles are generally five degrees or less (Plate 2).

In addition to the cross-sections, Brodersen prepared a series of five structure-contour maps covering most of the area where geologic mapping was completed. These maps display the elevation of the top of key contacts between basalt units where those contacts are exposed at the surface or identified in the subsurface. These maps are not included as part of this report, but they were used extensively to identify the principal aquifer penetrated by wells within the Parrett Mountain study area, which is discussed in the following section.

GROUNDWATER DEVELOPMENT

Groundwater uses can be divided into three general categories. The first includes permitted uses, which are those covered by water-use permits (water rights). The second includes exempt uses for which water-use permits are not required but which also have a right to use water. The third category includes illegal water uses, which should be covered by water-use permits, but are not.

Records of the permitted water uses in the Water Resources Department's files were searched to estimate water use in this category. Two of the permitted users in the area have been required in recent years to report annual water use to the Oregon Water Resources Department. These are the City of Sherwood and Dammasch State Hospital. Current annual water use as reported by these users is about 227.7 million gallons per year (mgy).

Other permitted water uses include primarily irrigation, nursery use and other agriculturally related uses. In addition, one permitted use is for group domestic purposes. These water users are not required to report water use to the Department, so the annual use for them was estimated. The estimates were based on the permitted rates or duties applicable to the various uses. It was assumed that all of the permitted uses are presently being exercised.

Irrigation use was estimated by using a percentage of the prevailing annual duty of 2.5 acre-feet per acre in the area. An acre-foot is a volume of water which could cover one acre to a depth of one foot, and is equivalent to 325,851 gallons. Conversations with extension agents at the North Willamette Research and Extension Center in Aurora, who reported annual water needs for typical irrigated crops in the area, resulted in an estimate of 1.5 acre-feet per acre, or 60 percent of the duty. Other uses, which are potentially year-round, were estimated at 25 percent of the permitted rate of use, 24 hours per day. The group domestic use was estimated on the basis of the average annual water-use estimate per dwelling, discussed below, for the number of dwellings presently covered by the permit. Annual water use for these other permitted uses is about 138.4 mgy.

The exempt uses of groundwater from basalt aquifers were also estimated. It was assumed that domestic use represents nearly all exempt uses in the area. Domestic use was estimated by determination of the approximate number of dwellings in the area that are likely to be using basalt wells, and then multiplying this number by a reasonable estimate of annual water use per dwelling.

The number of dwellings was estimated using records from the tax assessor's offices for the three counties included in the study area. Improved lots in areas outside the service areas for the cities of Wilsonville and Sherwood were counted. In areas where both basalt and alluvial aquifers are available, the Department's records of well reports were used to estimate the percentage of dwellings in those areas that are likely to be using basalt wells. On this basis, it is estimated that 1000 dwellings in the study area are using basalt groundwater.

Jack Donahue, the Department's Conservation Specialist, recommends the use of 150 gallons per day per capita as an estimate for domestic water use. He indicates that this figure may be high for areas where water is scarce or water conservation is practiced, but is probably a reasonable estimate for this area if it is intended to include seasonal outside water uses. If it is assumed that an average of 3.5 persons occupy each dwelling, daily water use is estimated as 525 gallons. Annual water use by exempt uses is therefore estimated to be 191.8 mgy.

No estimate is made of the annual water use by other exempt uses in the area, such as stockwatering, or by illegal uses. It is believed that the above estimate for domestic use is conservatively high, and therefore likely could include most of such uses.

The total current basalt groundwater withdrawal within the study area is estimated to be nearly 558 mgy. The information provided by the Clackamas County assessor's office included the year of build, if known, of dwellings. This allowed the progression of domestic water use through time to be estimated for the study area. This is presented in Table 1 below. It is assumed that the progression in Washington and Yamhill Counties paralleled that in Clackamas County. Similarly, the progression of permitted water uses is also estimated, using the date of priority for the water rights of record within the study area.

Table 1. Estimated Basalt Groundwater Withdrawals on Parrett Mountain.
(in million gallons per year (mgy) from 1960 to 1993)

	1960	1970	1980	1990	1993
Domestic	48 mgy	66 mgy	141 mgy	187 mgy	193 mgy
Permitted	111 mgy	197 mgy	237 mgy	367 mgy	365 mgy
Total	159 mgy	263 mgy	378 mgy	554 mgy	558 mgy

Groundwater development and water level declines in some wells have stimulated much local concern. This study is a product of that concern and the Oregon Water Resources Commission's decision to investigate groundwater further. Associated administrative actions are described in Appendix D.

GROUNDWATER

Basic Concepts

Hydrologic Cycle

The continuous circulation of water in all forms on the earth and in the atmosphere is known as the hydrologic cycle. The cycle has neither a beginning nor an end, but the oceans are conventionally presented as its origin. Radiation from the sun evaporates water from the oceans, lakes and land surface into the atmosphere. The water vapor rises, condenses to form clouds, and falls back to the earth's surface as precipitation. Precipitation that falls upon land areas is the source of essentially all fresh water supplies.

Some precipitation, after wetting the foliage and ground, runs off over the land surface to streams. A portion of this runoff is stored in lakes, ponds, and wetlands. Other water soaks into the soil. Much of the water that enters the soil is detained in the plant root zone and eventually is drawn back to the surface by plants or by soil capillarity. A portion of it, however, infiltrates below the root zone and continues moving downward until it enters the groundwater system. Groundwater moves through the pores or fractures of saturated subsurface materials and may reappear at the surface in the form of springs and seeps. These discharges of groundwater maintain the flow of streams in dry periods. The streams, carrying both surface runoff and groundwater discharge, eventually lead back to the oceans.

The hydrologic cycle is the system by which water circulates from the oceans through the atmosphere and returns both overland and underground back to the sea through diverse paths. The forces involved in this process include radiation, gravity, molecular attraction and capillarity. The time required for water to complete a circuit through the cycle can vary considerably, from a few minutes to many millennia, depending on the path taken. Circulation time for groundwater tends to be on the order of tens or hundreds of years. This slow-motion feature of groundwater results in extensive storage of fresh water underground. Except for glacial ice, groundwater is the greatest source of fresh water on earth, equaling about 25 times the volume of fresh water lakes, reservoirs, and rivers.

Groundwater is water that has percolated below the soil moisture zone to the zone of saturation. The upper surface of the zone of saturation is the water table. Water-table, or unconfined, aquifers contain groundwater at atmospheric pressure. The configuration of the water table is often a subdued representation of the topography of the land surface. Groundwater moves down gradient from areas of recharge to areas of discharge at relatively lower elevation. As it moves preferentially in the more permeable materials, the groundwater may become confined below less permeable overlying materials. Groundwater in these confined, or artesian, aquifers is under sufficient pressure head to rise above the bottom of overlying confining beds in wells that penetrate such aquifers. The potentiometric surface represents the total head in a confined aquifer and is analogous to the water table in an unconfined aquifer.

Recharge

Groundwater recharge on Parrett Mountain originates naturally from precipitation that falls in the area. Precipitation infiltrates directly into the subsurface whenever unsaturated, permeable materials are at the land surface. This water percolates downward under the force of gravity until it reaches the zone of saturation where it becomes groundwater. Some precipitation infiltrates indirectly into the subsurface when swollen streams lose water to adjacent unsaturated materials.
Recharge varies from year to year, depending on the amount and seasonal distribution of precipitation, soil/rock permeability, and other factors. Most of the precipitation in the Parrett Mountain study area does not become groundwater, but either runs off to local creeks or becomes transpired/ evaporated in the area where it falls. Quantitative estimates of recharge to basalt aquifers are presented in a subsequent section of this report.

Water levels in wells have shown that groundwater recharge comes from precipitation (Appendix B). This study monitored 37 wells on a monthly basis and found that recharge correlated to precipitation in each. Initial recharge responses displayed a lag of up to several months from the beginning of winter rains.

There may be a very limited amount of natural recharge through subsurface inflow into the Parrett Mountain area from the northwest. Otherwise, stratigraphic and topographic conditions appear to preclude such recharge.

Recharge on Parrett Mountain also appears to occur artificially in three ways. Wells which develop water from more than one aquifer can allow recharge from one aquifer to another by virtue of movement in open borehole sections. Secondly, since much if not most of the water pumped from wells passes through the accompanying septic system, some fraction of such waste water moves downward from drainfields and becomes groundwater again. A third mechanism is recharge induced by pumping of wells which tap aquifers which are hydraulically connected to nearby creeks. Prior to development, such recharge would not occur.

Discharge

Natural discharge of groundwater in the Parrett Mountain area occurs principally as subsurface outflow from the area and as springflow and seepage to surface water bodies within the area. Subsurface outflow probably occurs largely toward the Willamette River on the south. Small springs are reported all over Parrett Mountain, primarily in steeper areas. Seepage to surface water bodies would be hidden like subsurface outflow but would occur notably to creeks.

Groundwater discharge on Parrett Mountain also appears to occur artificially in a couple of ways. There are about 1000 basalt wells on Parrett Mountain which pump water for domestic, stockwatering, irrigation and other purposes. Estimates of pumping are given elsewhere in this report. Wells which develop water from more than one aquifer can allow discharge from one aquifer to pass to another by virtue of movement in open sections of boreholes. If all basalt aquifers are viewed as a whole, there is no net recharge or discharge from this effect, only an internal shifting.

Continuity Equation

The continuity equation is a basic mathematical formula which expresses the conservation of mass for a system. In groundwater studies, the system is a reservoir, aquifer or geographic area. The groundwater components of the hydrologic cycle are summarized in the equation:

$$R - D = \Delta S \qquad (1)$$

Where:

R = recharge to the system
D = discharge from the system, and
ΔS = change in storage in the system.

Over a sufficiently long period of time under solely natural conditions, groundwater systems approximate a state of dynamic equilibrium. That means that the average recharge equals the average discharge and storage change is zero. This condition is termed steady state. These conditions occur when climatic and geologic conditions, which influence the system, are stable.

This basic assumption is expressed in the equation:

$$R_o = D_o \qquad (2)$$

Where:

R_o = average recharge to the system under natural conditions, and
D_o = average discharge from the system under natural conditions.

Natural groundwater recharge can be highly variable on an annual basis. This variability may be roughly proportional to variations in precipitation. For the local area, it is estimated that recharge from precipitation can vary from 60% to 135% of average.

The link between groundwater recharge and discharge is storage. Groundwater storage accumulates over eons in response to climatic and geologic changes and can be many hundreds of times the average annual recharge. In large groundwater systems, discharge is strongly influenced by total storage. Such storage results largely from long-term recharge conditions. This means that under natural conditions, natural groundwater discharge routinely occurs near the long-term average recharge rate as expressed in equation 2.

As development occurs, pumpage by wells becomes a discharge superimposed upon a previously stable system. A new balance may come about by an increase in recharge, or a decrease in natural discharge, or loss of storage, or some combination of these. This expansion of the basic continuity equation gives:

$$(R_o + \Delta R_o) - (D_o - \Delta D_o) - P - \Delta S = 0 \qquad (3)$$

Where:

ΔR_o = a change in average recharge (induced recharge)
ΔD_o = a change in the average natural discharge, and
P = pumping discharge.

Early in the development of a large groundwater system, most of the pumping discharge is derived from the loss of storage, if inducing additional recharge is difficult. The characteristics of the basalt rock in the Parrett Mountain area may not allow for inducing additional recharge easily. The decline of water levels in the system reflects this reduction in storage and may continue for many years. The precise response of the system depends on many factors but significant early development will be dominated by the following equation when natural recharge and discharge are little changed:

$$P = -\Delta S \qquad (4)$$

As system development continues, discharge conditions will evolve. Pumpage will become more closely linked to discharge reductions and, as possible, recharge additions. Reductions in storage will be supplanted by these new sources of water for pumpage. Combining equations 2 and 3 shows this as:

$$\Delta R_o + \Delta D_o - P - \Delta S = 0 \qquad (5)$$

A new equilibrium occurs in a groundwater system when ΔS becomes zero. On the average, all discharge is again equal to all recharge. The general trend of water levels is flat but at deeper levels than prior to development, the deeper levels being necessary to increase recharge and reduce natural discharge. The decrease in natural discharge plus the increase in recharge is termed capture. The following equation describes a system where sufficient capture has occurred to result in new steady state conditions:

$$\Delta R_o + \Delta D_o - P = 0 \qquad (6)$$

The time necessary for the re-establishment of steady state conditions can be great. The size of the system and the location of development within it are important factors. It is conceivable that a new equilibrium in large systems could easily require decades to establish.

Theoretically, there is some critical rate of pumpage from a system such that pumping at a greater rate will not permit the restoration of steady state conditions. Although reduction of natural discharge should occur, the ability to stimulate additional recharge may be the limiting factor. In such a situation, pumpage would eventually decrease as storage becomes depleted.

Basalt Aquifers

The principal aquifers in the Parrett Mountain area are those of the Columbia River Basalt Group. Other aquifers are found in the Troutdale Formation and the alluvium which overlie the basalt rocks. These groundwater sources are fairly minor sources of groundwater in the area.

Role of Stratigraphic Units

Groundwater can occur and flow within the porous and permeable portions of Columbia River Basalt Group rocks. Such portions are usually limited to permeable zones at flowtops and bottoms. In combination, they are called interflow zones. Favorable groundwater conditions occur when cooling fractures, flow breccia and/or weathering form interconnected spaces. Interflow zones serve to provide horizontal permeability. Basalt flow centers are generally solid, but commonly contain joints in the massive rock which were created by shrinkage as the lava cooled. These joints may provide some additional porosity and a limited level of vertical permeability. The slab nature of basalt lava flows, the general occurrence of water between flows, and the low relative permeability across flows tend to isolate interflow zones into separate distinguishable aquifers.

Principal aquifer identification at study wells is based on a correlation of the principal water-bearing zone in a well to the stratigraphic unit as portrayed on structure contour maps. If no water-bearing zones are identified on the well report, the principal aquifer identification methodology assumes that the aquifer is at the bottom of the well. This overall approach is subject to the errors on the maps as well as those on the water well reports. This methodology identified seven basalt aquifers, ranging stratigraphically from the Wapshilla Ridge unit to the Winter Water unit. The three boundaries (interflow zones) of the four units within this range were also identified as aquifers. At 26 wells, the principal aquifer could not be uniquely determined. In those cases, dual principal aquifers were assigned. The wells located by this study with principal basalt aquifer identification are summarized on Table 2 and displayed on Plates 1 and 3.

If geologic mapping had been at the flow level rather than at the unit level, it is likely that more aquifers could be identified. For example, the Ortley/Grouse Creek consists of three flows so that aquifer identification in that unit may actually be two interflows between the three flows. This makes more sense than the actual flow interior being the aquifer.

Even though the Wapshilla Ridge unit is a single flow, its interior is an aquifer. Perhaps, this could occur from the fact that the flow is very thick (up to 300') and may result not as one layer from a single lava effluence but as a composite formed by several related, separately arriving effluences. This multiple layer of a single flow takes on the form of several flows with associated interflow zones.

The identification of seven aquifers does not mean that all are present and valuable at any given location. In fact, there appears to be just one (Wapshilla Ridge) at many places. In some wells, several aquifers are present.

Table 2. Principal Aquifer(s) of Study Wells

Principal Aquifer	Number of Wells: Single Aquifer	Number of Wells: Two Aquifers*	Flows in Unit
Winter Water	4		2
		} 0	
Boundary Winter Water/Umtanum	32		-
		} 4	
Umtanum	14		2
		} 0	
Boundary Umtanum/OGC	41		-
		} 6	
Ortley/Grouse Creek (OGC)	24		3
		} 5	
Boundary OGC/Wapshilla Ridge	52		-
		} 11	
Wapshilla Ridge	110		1

* number aligned between named units indicates the number of wells that apparently draw water from both units.

The aquifers in this report were identified on the basis of stratigraphy. This is the simplest approach in this complex environment. Using other information, such as heads in the aquifer, would show that some portions of the stratigraphic aquifers are integrated and act as a single aquifer. This feature is found in several places and is readily seen on Plate 3 in which similar heads occur in adjacent wells with different principal aquifers.

Role of Faults

Conceptually, there is a close relationship between faults and the occurrence of groundwater in basalt aquifers. Depending on the setting, faults can act in a variety of ways such as to increase recharge, increase discharge, and impede groundwater movement.

Faults can increase the surface exposure of the aquifers. This makes the aquifers readily accessible to infiltration from precipitation and water courses which flow over them. Without this exposure, the entry of water into the basalt would be limited to infiltration across flows and exposures due to erosion or original aquifer edges.

Faults can cause an inclination of the aquifers which increases the gradient on any water which enters them. This allows water to move downward more easily. It also enhances the opportunity for any available water at the point of infiltration to become recharge.

Faults can act to impede groundwater movement. The lateral movement of water is interrupted when offset of layers occurs. Water moving down gradient in an aquifer which is truncated against less permeable rock would backup and move more slowly through the fault barrier.

Faults can act to improve groundwater transmission, recharge, and discharge. Potentially, water moving down gradient in an aquifer could encounter more permeable rock in the fault zone, allowing water to move more freely both vertically and horizontally. If a permeable fault zone extends to the surface, that zone could serve as a recharge area much like the aquifer outcrop does. Conversely, that same situation could set up a discharge area if aquifer pressures at the fault zone are sufficient to move water to the surface.

Role of Drainages

Drainages often occur along faults (Plates 1 and 2). Typically, erosion creates these drainages along fault zones by removing weakened fault material and exposing bedrock to small steep streams. Most of these creeks are seasonal but larger ones like Corral Creek are perennial.

These drainages truncate and incise aquifers. On scarp slopes, the exposed aquifers in drainages create ideal recharge areas. Seasonal streams running over these aquifers provide a steady supply of recharge. Conversely, on dip slopes, the exposed aquifers in drainages discharge groundwater to streams, springs, and seeps.

Conceptually, the drainages should result in shallow aquifers being particularly sensitive to reduced natural discharge and increased recharge when they are developed. The relatively short distance from recharge point to discharge point is quite important in this matter. Although the study did not focus on streams, springs and seeps, anecdotal information from local residents reports reduced rates of all three in recent years. In part this must be attributed to lower precipitation but well interception of natural discharge should also play a part. Head lowering in such aquifers should induce additional recharge.

Groundwater Flow Directions

Groundwater flows under the influence of gravity. Water infiltrates the ground at an initial entry point at a given elevation. It becomes groundwater at that elevation or a lower one, depending on where the zone of saturation occurs. It travels along a flow path and ultimately discharges at an elevation which is lower than the point of infiltration and recharge. With some minor exceptions which are not germane to the Parrett Mountain setting, the elevation drop from the point of recharge to the point of discharge provides the sole driving force to move groundwater.

On a permeability basis, groundwater should generally move in the dip direction of the interflow zones. These inclined zones provide a preferential direction for groundwater movement. This pattern is generally apparent in the head data for the several aquifers.

In the Parrett Mountain study area, the nominal direction of groundwater flow is southeast. This reflects the common directions of aquifer dip, land surface slope and head lowering in basalt wells. A notable exception to this general pattern occurs on the west side of Parrett Mountain. Several fault blocks there display rock dips and surface slopes to the west. Combined with head data in basalt wells, it appears that basalt groundwater on the west side of Parrett Mountain flows generally to the west or southwest. Quite possibly, smaller areas of Parrett Mountain display yet other groundwater flow directions.

Well Yields

Basalt wells in the study area display a range of well yields according to water well reports and other information (Appendix A). Yields depend on a variety of well factors, including the height of the water column in the well, the number of water-bearing zones encountered, and the thickness and permeability of water-bearing zones. Reported yields also depend on a number of factors, including the method of testing the well yield, the test rate, and the testing duration. For example, using pressurized air to lift water from the well (air test method) commonly results in a lower measured yield than do other methods.

Well yields range from less than 1 gpm to 880 gpm for wells in the Parrett Mountain study area. The large wells at Dammasch State Hospital and the City of Sherwood all yielded 300 gpm or more. Irrigation wells display yields of 40 to 300 gpm. Domestic wells range from nominally "dry" to 100 gpm. Tested domestic well yields average roughly 20 gpm.

Water Levels

The water level in a well is typically a measure of the depth to the water surface from land surface. A negative water level is a water level which is above land surface. Using the land surface reference is useful for comparing data from a single well. In order to compare data from a number of wells, a sea level datum is often used. The "head" of the water surface in a well is the land surface elevation minus the water level.

Water levels measured in a well at various times are displayed on charts called well hydrographs. These graphs are among the most diagnostic sources of hydrogeologic information. Over many years, these records assist in providing good information on the yield capacity of a groundwater source and aid in the determination of recharge rates. Over a few hours, they can give information on the hydraulic properties of the aquifer(s) through controlled testing.

There are a number of monitoring wells which this study relied upon for water level information. These wells display water level records of different durations and intensities. The most intense data come from the recorder well at 3S/1W-17aac. The apparatus at this well would record water levels several times per day. Thirty-seven wells were monitored monthly during the investigation. A number of wells have been monitored over more than 40 years. Monitoring wells are listed in Table 3 and shown on Plate 1.

Basic Influences

Most causes of static water level fluctuations (as opposed to pumping water levels) in wells can be classified into four basic types:

1. Changes in groundwater storage,
2. Deformation of aquifers,
3. Changes in atmospheric pressure,
4. Disturbances within wells.

In the Parrett Mountain study area, the most important cause of static water level fluctuations is changes in groundwater storage. This cause takes several forms: general aquifer storage changes (recharge and discharge), multiaquifer effect, well drilling effect, and pumping effect. These items are discussed later in this section.

Another cause of static water level fluctuations of special interest is aquifer deformation. Fluctuations due to the Scotts Mills earthquake of March 25, 1993 resulted in identifiable water level changes at several wells. This earthquake was the first in many years which was consistently experienced in the Willamette Valley without instrumentation. Although dramatic and interesting, the earthquake influence on water levels is probably a minor factor in the scheme of things on Parrett Mountain. Frequent water level collection at monitoring wells during this study appeared to reveal an earthquake-caused water level change at only a quarter of the wells as noted in Table 4. Temporary water level changes, which did not appear on consecutive monthly measurements, can give the appearance of error and are so noted.

Table 3. Water Level Monitoring Wells on Parrett Mountain.

Well Location	Well ID	Well Location	Well ID
2S/1W-32bda	WASH 1823	3S/1W- 4bdb	CLAC 7859
3S/1W- 5cad	CLAC 7781	3S/1W- 5bdb	CLAC 18432
3S/1W- 5bca	CLAC 7824	3S/1W- 5caa	CLAC 7864
3S/1W- 6dbd	WASH 1360	3S/1W- 7cab	WASH 1937
3S/1W- 7aad	WASH 1949	3S/1W- 7dbb	WASH 1942
3S/1W- 8abc	CLAC 7918	3S/1W- 8bba	CLAC 7908
3S/1W- 8cdc	CLAC 787	3S/1W- 9bad	CLAC 7968
3S/1W- 9adc	CLAC 7966	3S/1W- 9acc	CLAC 7963
3S/1W-10adc	CLAC 8009	3S/1W-10caa	CLAC 18836
3S/1W-15cac	CLAC 8184	3S/1W-16caa	CLAC 18057
3S/1W-16ddd	CLAC 8231	3S/1W-17aca	CLAC 18317
3S/1W-17aac	CLAC 17780	3S/1W-18aac	CLAC 8341
3S/1W-19add	CLAC 8379	3S/1W-20acc	CLAC 8409
3S/1W-30dbc	CLAC 8697	3S/1W-30bbd	CLAC 18406
3S/1W-31bdb	CLAC 8741	3S/2W-11ddc	WASH 2003
3S/2W-12dda	WASH 1910	3S/2W-13ccd	YAMH 2549
3S/2W-14bcb	YAMH 2345	3S/2W-15aac	YAMH 2379
3S/2W-23dca	YAMH 2532	3S/2W-23bba	YAMH 168
3S/2W-24bad	YAMH 2544	3S/2W-25cbc	YAMH 2574
3S/2W-26daa	YAMH 2596	3S/2W-26bda	YAMH 2599
3S/2W-36aba	YAMH 2703		

Table 4. Water Level Response to Scotts Mills Earthquake of March 25, 1993.

Well Location	Well ID	Change	Comments
3S/1W-17bda	CLAC 18317	-3'	permanent decline (?)
3S/1W-20acc	CLAC 8409	-3'	permanent decline (?)
3S/2W-13ccd	YAMH 2549	+7'	permanent rise (?)
3S/1W- 7dbb	WASH 1942	-2'	temporary decline or possibly measurement error
3S/1W- 5bca	CLAC 7824	-5'	temporary decline or possibly measurement error
3S/1W-16caa	CLAC 18057	+3'	temporary rise or possibly measurement error
3S/1W- 9adc	CLAC 7966	+4'	temporary rise or possibly measurement error
3S/1W-17aac	CLAC 17780	-3'	recorder well, temporary decline

Multiaquifer Effect

Ideally, the water level in a well serves only to monitor one thing, the water level in a single aquifer. Such a well would not allow the vertical movement of water since an aquifer contains only one head/water level at a point at any given time. The water level in a multiaquifer well is a composite of the separate aquifer water levels encountered by the well bore. This feature is displayed in figure 5 in which a multiaquifer well serves as a conduit for flow between aquifers. The head difference between aquifers dictates the vertical flow direction in the well. Whenever there is vertical movement in a well, the composite water level will be somewhere between those of the aquifers separately since water movement requires some head drop as a driving force.

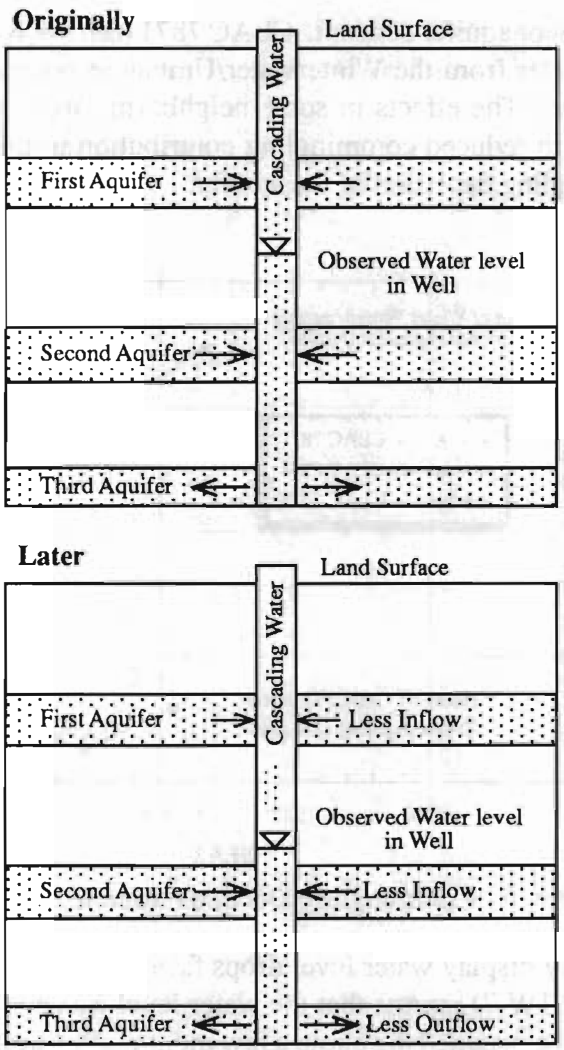

Figure 5. Internal Flow in a Multiaquifer Well

The composite water level of a multiaquifer well is probably not stable over time. Conceptually, a donor aquifer(s) and receiver aquifer(s) within a well are not going to be perfectly matched, particularly following initial well construction. At that time, the donor aquifer will be its most capable of supplying water. Conversely, the receiver aquifer will be its most capable of taking in new water. The continual vertical movement of water in a well should be greatest at first and then diminish to a more steady flow later. This means that new multiaquifer wells will usually have shallower water levels than they will some time later. The Parrett Mountain study data seem to support the view that over time water levels in multiaquifer wells more commonly display donor aquifer depletion (water level decline) than receiver aquifer accretion (water level rise). The water level of the most transmissive aquifer will cast the greatest influence on the water level in a multiaquifer well.

Figure 6 demonstrates the donor aquifer concept. CLAC 7871 (3S/1W-8) shows a large water level drop over a few years as water from the Winterwater/Umtanum boundary aquifer moves to the Ortley-Grouse Creek aquifer. The effects in some neighboring wells are apparently those of a decline in CLAC 8243 due to reduced commingling contribution to the aquifer and a decline in CLAC 7873 due to commingling depletion of the aquifer.

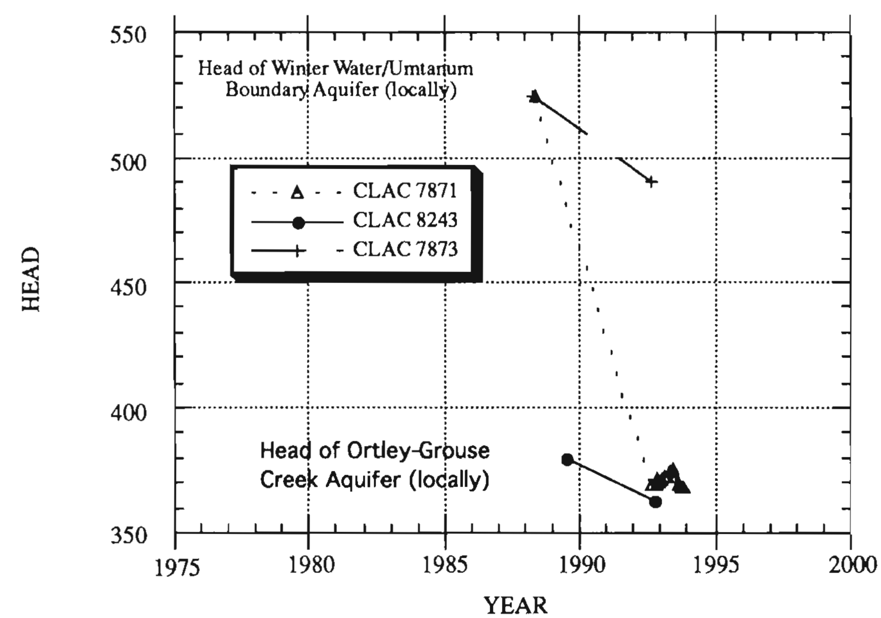

Figure 6. Commingling Decline Example, Section 8.

Some multiaquifer wells may display water level drops fairly soon after construction. The pump installer at WASH 1924 (3S/1W-7) reports that the water level was about 50 feet deeper than the well report level entry when he installed the pump a few months after well construction. The owner of CLAC 7887 (3S/1W-5) also reported that the pump installer found a 50 feet lower water level there when that pump was installed a couple of months after construction. Reductions in commingling over time are reasonable explanations as donor aquifers lose water.

A number of wells in 3S/1W-7 and -8 display a receiver aquifer water level rise (figure 7). Several wells near WASH 1947 have risen since they were constructed. These wells obtain their principal water from an integrated set of aquifers ranging from the Wapshilla Ridge up through the boundary of the Ortley-Grouse Creek/Umtanum.

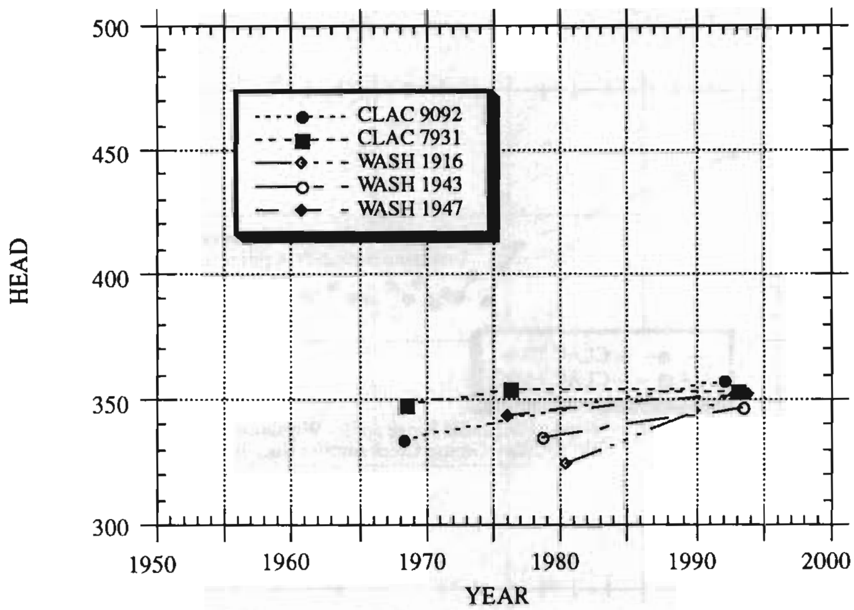

Figure 7. Commingling Rise Example, Sections 7/8

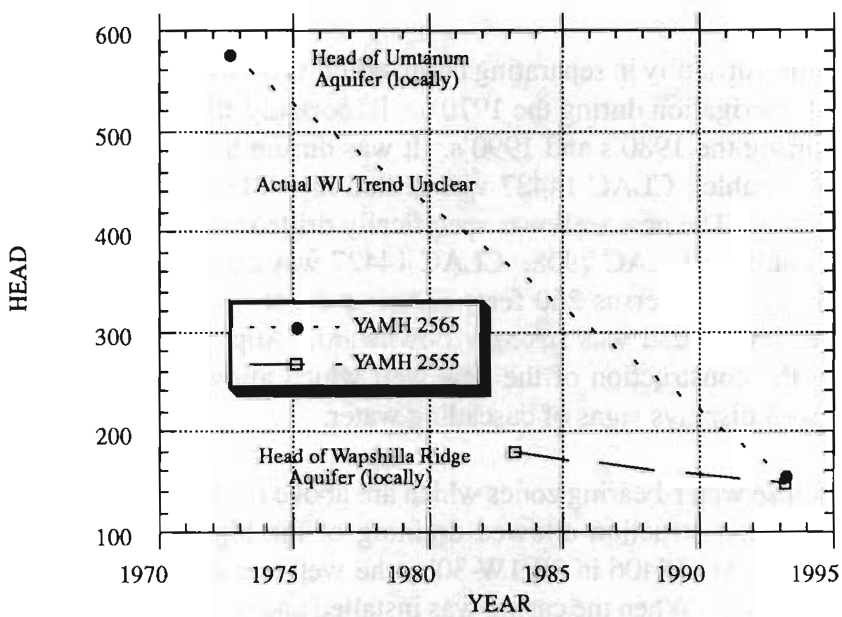

Figure 8. Commingling Decline Example, Section 36.

Figure 8 shows a huge water level decline. The decline of over 400 feet appears real based on the well report, the owner's experience and study measurements. YAMH 2565 (3S/2W-36) produced domestic water for years but the yield dropped off. The owner installed a large storage tank and timer system to harvest the available supply. That proved inadequate eventually so a deeper, replacement well was drilled (YAMH 2555). The result appears to be that slow commingling drainage produced a steadily lower head and water column in the older well.

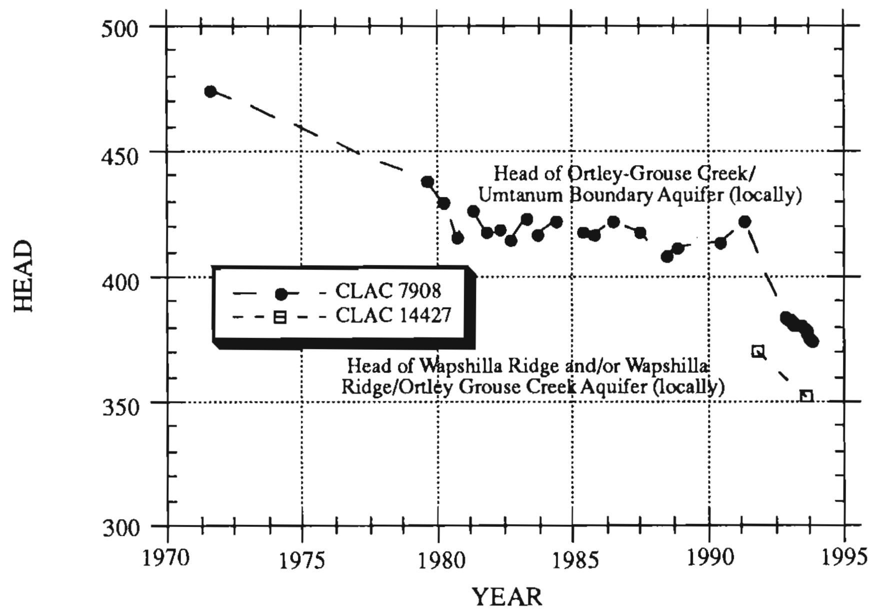

Figure 9. Commingling Decline Example, Section 8.

Figure 9 demonstrates the difficulty in separating basalt aquifers by well construction. CLAC 7908 in 3S/1W-8 was used for irrigation during the 1970's. Reportedly, the yield dropped and the well was used much less during the 1980's and 1990's. It was during that period of reduced use that water levels were fairly stable. CLAC 14427 was drilled in 1991 to replace CLAC 7908 and is located about 20 feet away. The new well was specifically drilled with the intent of not obtaining water from the same source as CLAC 7908. CLAC 14427 was cased and sealed below the total depth of CLAC 7908 (279 feet versus 260 feet). During the study, CLAC 7908 was measured monthly and the water level trend was strongly downward. Apparently, there is some avenue which was created by the construction of the new well which allows water to move downward more easily. Neither well displays signs of cascading water.

Many well reports disclose water-bearing zones which are above the reported static water level. In most cases the final well construction allowed draining of the higher zones. During the well construction process of CLAC 18406 in 3S/1W-30b , the well had a water level of about 14 feet before it was cased and sealed. When the casing was installed and sealed into place, the water level dropped to 190 feet below land surface. When the upper aquifer was excluded, a large head difference with the lower Wapshilla Ridge aquifer became apparent.

A multiaquifer presence in water wells on Parrett Mountain is widespread. Cascading water in wells is the most readily noted form as water drops down a well to the static water level. Detecting water movement in the submerged portion of a well requires special instruments. According to local pump installer, Jerry Phillips (oral communication, 1992), cascading water occurs in about half of the basalt wells on Parrett Mountain. This agrees well with the study data. The study discovered cascading which was usually nominal and less than one would expect from an examination of aquifer production from well reports. The average cascading rate at wells was unclear using the available tools but seemed to be less than 1 gpm. Whether this represents a constant rate, or reflects a greatly diminished rate after the upper aquifer is largely drained, is unknown.

The multiaquifer wells on Parrett Mountain usually display lower aquifer head with depth. This conclusion is drawn from the stratified, upland character of local aquifers, the presence of cascading water in wells, the lack of flowing well conditions, and the reports of well construction/alteration. At greater depth, particularly in the lowland discharge areas, the heads of basalt aquifers should increase with depth.

Well Drilling Effect

The construction of a well can have influences on the water level in the well. Over the last 25 years, air rotary drilling equipment has been the most commonly used well drilling equipment in the area. This machinery sends compressed air down a rotating drill stem to cool the bit and clean the hole. When water is encountered, this air also brings that to the surface and acts to draw water from the aquifer(s) during the drilling operation. The drilling operation can extract thousands of gallons of water over a period which is commonly a few days. Not all of the water which is forced out of the aquifer leaves the hole. Drillers report that in uncased portions of basalt wells above the water level, some of the air-blown water can accumulate in unsaturated rock and that this water later falls back down to the water level.

Some local drillers report that they have observed that water levels can rise or drop several feet during the day following well completion. The time that the water level in the completed well ultimately needs to recover from these drilling-related factors must vary with site specific conditions. The water level which well drillers cite on their well reports may reflect the influence of either change. In most cases, the water level should be deeper immediately following well construction since water is always removed during the drilling process.

The data for WASH 1362 (3S/1W-7) in Appendix B shows an extreme influence of well drilling on water levels. The construction of this 560 feet deep well began on March 11, 1992 and ended on March 12, 1992. The water level on the driller's report appears depressed due to the pumping action of construction but seems reliable. The water level trend displays long-term recovery of over 100 feet in 19 months with half occurring within the first three days. In this case, the construction pumping apparently combined with aquifer boundaries to require a very lengthy recovery period. The well has never been in use.

Pumping Effect

Pumping a well lowers the water level in that well in order to induce groundwater flow into it. The influence of pumping lingers after pumping ceases as water levels in the aquifer adjust to the withdrawal stress. Pumping can also lower the water level in nearby wells. Pumping, its residual effects, and interference last a time which varies depending on a number of factors.

Pumping and slow recovery effects play a large role in the water levels at CLAC 7918 in 3S/1W-8. This nursery and domestic use well is depicted on a hydrograph in Appendix B. The seasonal fluctuation is about 70 feet which is far more than any other well measured monthly in the study. If this well were only used for domestic use, the seasonal changes would certainly be less severe. Although some of the water levels appeared to be rising slowly during the measurements, some did not. The seasonal pumping and its residual effects at this well may be intensified by aquifer boundaries which cause slow recovery.

The hydrograph of WASH 2003 in 3S/2W-11d is displayed in Appendix B. This well is unused and has no pump. The water levels in the well have been very stable for many years. Several of the monthly water levels during the study were depressed, due apparently to interference effects from nearby pumping for nursery use. The interference caused a water level lowering of about 12 feet at the observation well.

Human Error Effect

Water level data are subject to certain human errors. These errors can take the form of mistakes in measurements, readings, data entry, and calculations. Mechanical errors may occur from marking errors on measurement tapes, measuring point changes, and tape calibration. In some cases, data errors are easy to infer from other information. Unfortunately, water level data are time-dependent and cannot be recreated.

Water level reliability, particularly of historic data, becomes an important judgment call. The basic question of reliability asks "Was the measured water level reasonable given the prevailing conditions." The quality control on the water level data measured during the study was high and there are probably few errors. When odd measurements occurred, the wells were remeasured. Accurate measurement was a high priority. The reliability of historic water level data, principally from water well reports, becomes very difficult to judge critically for a variety of reasons. Unless there were reasons to seriously question a measurement, it was deemed reliable by default. This judging of historic data is quite important in the assessment of water level changes over time. Figure 10 shows a situation in which the water level (head) on the deepening report was completely unbelievable and rejected as unreliable. Figure 11 shows a situation in which neighboring wells in the same aquifer display divergent trends and rejection of the questionable data becomes extremely tempting. It is quite possible that both well report levels for the large rise and decline wells were unreliable. However, neither was rejected.

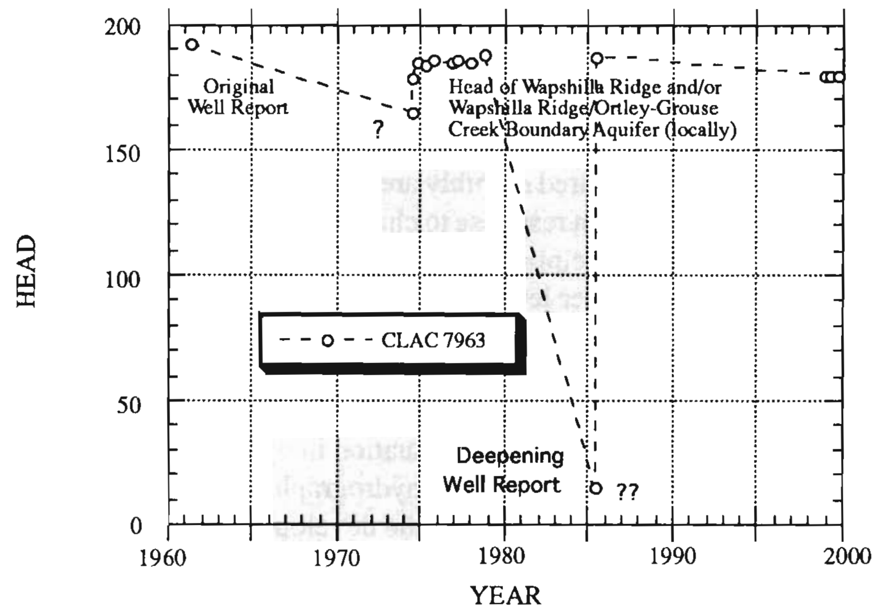

Figure 10. Data Reliability Example, Section 9.

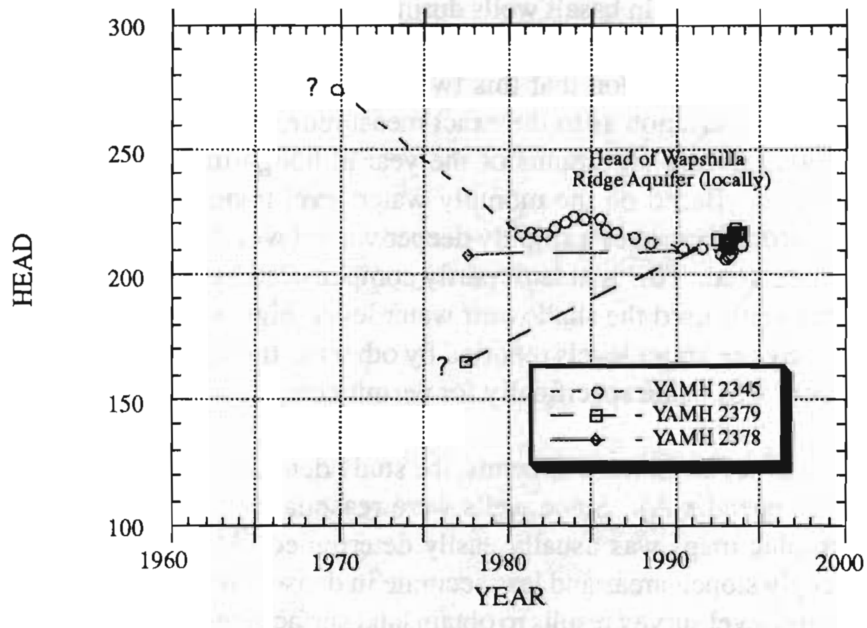

Figure 11. Data Reliability Example, Sections 14/15.

Area Water Level Analysis

Monthly Monitoring Wells

The hydrographs of select wells measured monthly are displayed in Appendix B. All of these wells showed seasonal water level changes in response to changes in the recharge/discharge balance. The timing of the recharge response to precipitation is generally quick in shallow wells and delayed in deep wells. For example, annual water level fluctuations in some deep wells did not bottom out until February and did not top out until September. These wells display a delay in water level response to precipitation of at least four months.

The hydrographs depict an average water level fluctuation in wells of about six feet per year. With the exception of CLAC 7918 in 3S/1W-8, all well hydrographs display annual fluctuations of two to 16 feet. The average fluctuation is important in the development of basalt recharge estimates in a subsequent section of this report.

Synoptic Heads

This study looked at water levels in basalt wells during the period of 1992-1993 as an approximate instantaneous picture of the resource (Plate 3). The hydrographs (Appendix B) of select wells measured monthly support the notion that this two-year window provides a synoptic look at all basalt wells with minimal variation as to the exact measurement dates. Water levels for synoptic purposes were measured during all months of the year although most were collected during the period October to March. Based on the monthly water level trends in Appendix B, this time of measurement feature probably causes a slightly deeper water level (lower head) than average to the data set of all wells measured. This is at least partly compensated by the fact that the synoptic head for monthly measured wells used the shallowest water level (highest head) for the period. In only a few wells did the study use water levels reported by others as the synoptic measurement. In those cases, the measurement was made specifically for permit compliance.

In order to convert water levels in wells to heads, the study determined the land surface elevation at the measured wells (Appendix A). Since wells were reasonably precisely field located, the land surface from topographic maps was usually easily determined. However, topographic maps are difficult to use in steeply sloped areas and less accurate in densely forested areas. In such areas, the study used altimeter and level survey results to obtain land surface elevations. Errors due to elevation determinations should be minimal.

A significant feature of Plate 3 is the variety of heads in basalt wells over short distances. This variety is particularly evident in the upland portions of the study area. For example, there are neighboring wells in 3S/2W-14 with over 300 feet of head difference. YAMH 761 has a head of 215 feet and develops water from the Wapshilla Ridge aquifer. YAMH 2340 has a head of 457 feet and also develops water from the Wapshilla Ridge aquifer. Although commingling may play a role in the large head difference, a better explanation is that there are actually multiple aquifers within the Wapshilla Ridge unit.

Ideally, there should be clear relationships between the heads and the principal aquifers of wells in an area. In a general way, relationships of that kind are evident on Plate 3. Heads common to an aquifer are persistent over distances which are usually less than a mile. Head similarities of neighboring wells also suggest that several aquifers may be hydraulically integrated in certain areas. After much examination of the data, contouring the aquifer heads over Parrett Mountain does not seem to make great sense. The data seems to contain considerable noise possibly due to commingling and problems of principal aquifer identification.

It is reasonable that each fault block should be a discrete unit for contouring heads in the several aquifers. Within each fault block, the flows should be continuous and aquifer heads in each aquifer or integrated aquifer should display clear distribution patterns. This investigation did not discover these idealizations. The paucity of data in some blocks and noise in some of the existing data merge in that analysis. These things show that the basalt hydrogeology of Parrett Mountain is complex.

Historic Changes

Historic water level changes are shown on Plate 4. These changes compare the oldest reliable water level for the well as currently constructed with the synoptic water level. Not all wells that the study visited display changes. This is due to the fact that either no synoptic measurement was possible or no reliable historic measurement was available. The time interval for these changes varies from less than one year to more than 40 years.

Factors which influence data accuracy for a water level rise or decline are shown in Table 5.

Table 5. Principal Water Level Change Factors

FACTOR	DECLINE	RISE
- Human Errors/Factors	√	√
- Unidentified/Unreported Well Construction Changes	√	√
- Commingling	√	√
- Earthquake	√	√
- Original water level raised by initially strong cascading water or fluff	√	
- Original water level depressed by pumping of drilling process		√
- Comparing measurements from different seasons of the year	√	√
- Synoptic water level depressed by pumping	√	
- Original water level measured cascading water zone or drilling foam	√	
- Methodology to select shallowest synoptic water level		√
- Aquifer depletion due to drought/use	√	
- Aquifer accretion due to climate		√

In all, the study presents "current-construction" water level changes at 260 wells in the Parrett Mountain study area (figure 12). The range of water level changes for the wells was -418 feet to +104 feet. In these wells, water levels have changed a mean average (arithmetic average) of -13.7 feet over a mean average of 14.0 years. Perhaps of more interest are the median averages of -6.5 feet over 14.5 years. The median splits the data and indicates that half of the data are greater and half are less than the value.

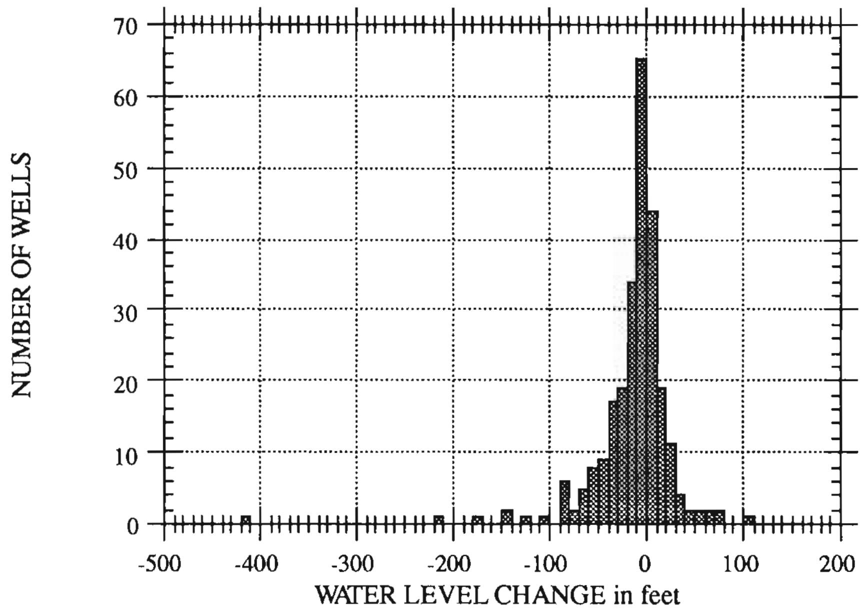

Figure 12. Water Level Changes at Wells as Currently Constructed

There are a few wells that display extreme declines which carry considerable weight in the statistics. Combined, the changes of the 7 wells with more than -100 feet of change are -1342 feet. This value contributes -5 feet of change per well in the mean average water level change of -13.7 feet at the 260 wells. All 7 wells were or are domestic wells in rural residential environments which are generally distant from high capacity wells. Their declines stand out on Plate 4 and do not reflect an area-wide pattern of that much decline. It is highly questionable if use represents any more than a nominal portion of the decline at these 7 wells since the large capacity basalt wells of Sherwood, Dammasch and Wilsonville have a mean average change of about -33 feet. Commingling is the more reasonable cause.

On a strictly natural basis without pumping and other effects, the water level trends in wells should appear similar to the precipitation cumulative departures on figure 3. This assumes that recharge is basically proportional to precipitation. Precipitation on Parrett Mountain has been below average in recent years. During the life of the average study well, the precipitation deficiency has been on the order of 20 inches or one-half of the average annual quantity. From the preceding, it is reasonable that the average well has experienced a water level change of about -4 feet over the last 14 years due to the precipitation deficiency. According to the available record, the precipitation deficiency from average has been the greatest since 1984. On that basis, wells constructed in 1984 should display the greatest decline from precipitation deficiency. That would be on the order of -10 feet.

The study also compared synoptic water levels at basalt wells with the oldest reliable water level for the wells as "previously" constructed. The previous construction usually meant prior to the deepening of the well to its current depth. Altering a well by deepening can easily produce a new and very different well since additional aquifers are usually encountered. In all, the study presents "previous-construction" water level changes at 25 wells in the study area (figure 13). In these wells, water levels have changed a mean average of -127 feet over a mean average of 23 years. Figure 14 is a composite hydrograph of some of these wells. Data from these 25 wells after alterations

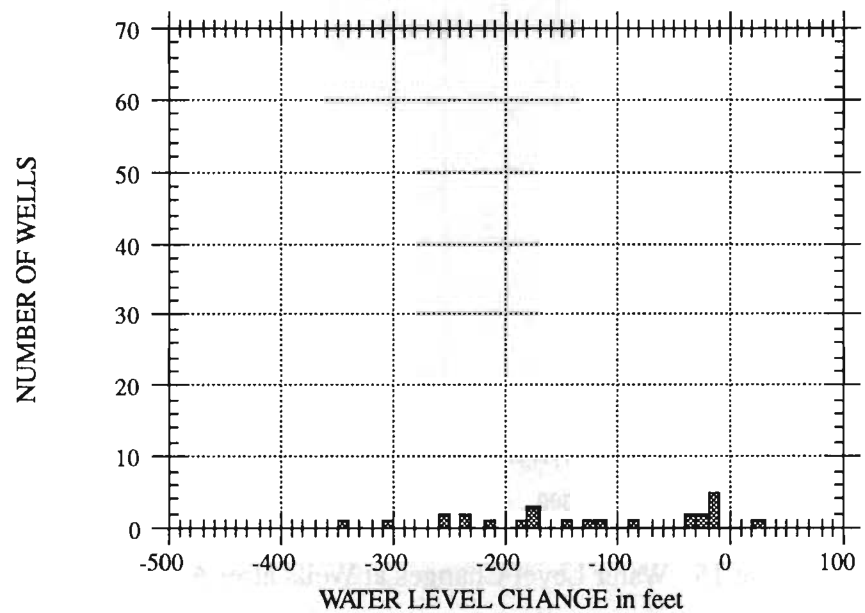

Figure 13. Water Level Changes at Wells Spanning Alterations.

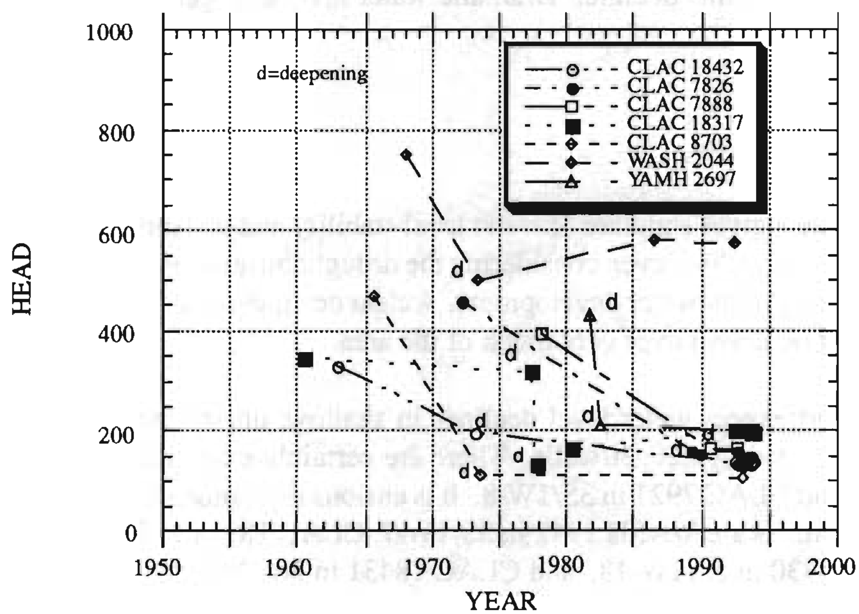

Figure 14. Hydrographs of Selected Altered Wells.

(figure 15) show much less water level decline. These wells declined an average three feet in 10 years. This shows that these water levels have stabilized, apparently at the level of deeper aquifers in many cases, as would be expected given the upland, layered character of the basalt aquifers in the Parrett Mountain study area.

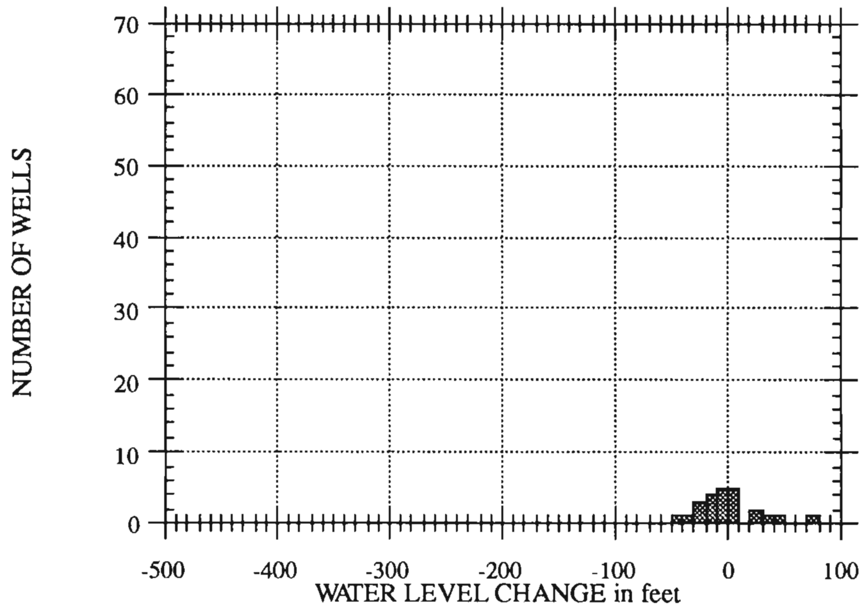

Figure 15. Water Level Changes at Wells after Alterations.

Taken as a whole, Parrett Mountain wells are fairly stable in their current constructions. The central tendency of water level changes shows only a small decline. Precipitation deficiencies in recent years account for some of this decline. Dramatic water level changes in some wells are usually linked to well alterations.

Areas of Instability

In a general way, Plate 4 gives a picture of water level stability and instability in wells. Some areas display little water level decline, even considering the drought influences. These would suggest the potential for additional groundwater development. A clear designation of either water level stability or instability cannot be drawn over very much of the area.

As a type, one would expect water level declines in shallow, upland wells as their aquifers are commingled and depleted by deeper wells. There are certainly examples of this such as YAMH 2697 in 3S/2W-36 and CLAC 7921 in 3S/1W-8. It is curious that some shallower, upland wells are stable. Notable examples are WASH 1942 in 3S/1W-7, CLAC 18118 in 3S/1W-8, CLAC 8702 in 3S/1W-30, CLAC 8330 in 3S/1W-18, and CLAC 18431 in 3S/1W-8.

While there are many individual wells that display gradual water level declines or abrupt drops, there are few identifiable areas which display a chronic decline pattern. In part, this may be due to the fact that not all wells in the area were incorporated into the study. Perhaps a more significant explanation is the lack of intermediate water level data between the time of well construction and the synoptic period. In any case, the study identifies only a few areas of water level decline.

To identify an area as having a chronic decline pattern, wells must display several factors. These are proximity, head similarities, water level/head decline trend similarities, continuing water level/ head declines, and common aquifer linkage. Absence of some of these factors may result in some decline areas being overlooked on the basis of inadequate or inconclusive information.

The reasons for a chronic water level decline pattern in wells appear limited to pumping, commingling, or both. In areas of seemingly high groundwater pumping, the reason is more easily linked to pumping but in actuality may not be. Conversely, in areas of seemingly low groundwater pumping the reason is more easily linked to commingling. In any particular case, a unique reason may be very difficult to demonstrate clearly.

Portion of Section 5

Some wells in the northwest quarter of section 5 of 3S/1W display a continuing water level decline of about 30 feet over a period of 20 years. Figure 16 is a well hydrograph of several wells in this area. Several of the wells have cascading water and deeper, open-borehole wells are nearby. This declining resource with a current head of about 230 to 250 feet appears to be both a donor and receiver aquifer. This is based on commingling in some of these wells as well as deeper nearby wells which commingle and have a head of about 130 to 150 feet. Some wells in the area with a

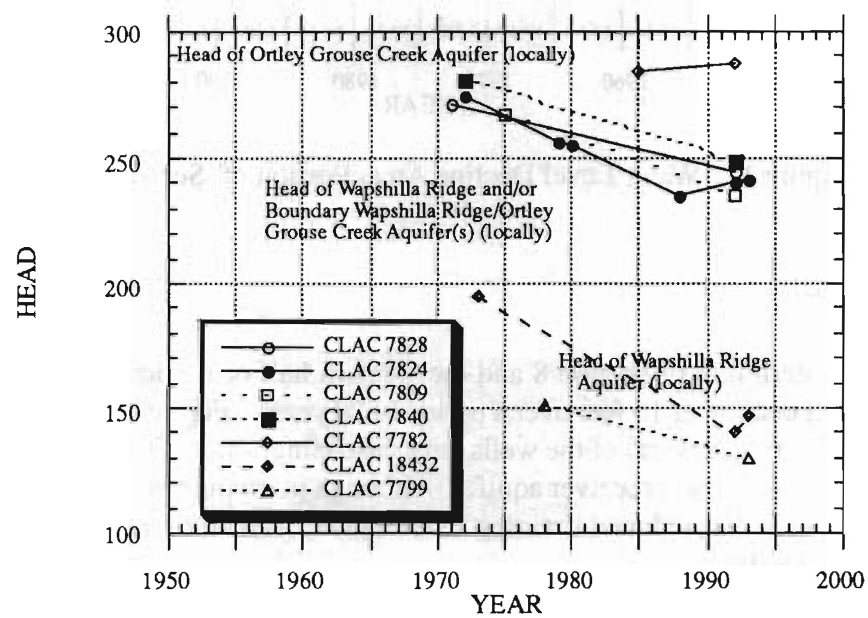

Figure 16. Water Level Decline Area, Portion of Section 5

head above 250 feet display a stable water level. Although pumping may play a role in the water level declines, it is more likely that draining due to commingling is the greater source of decline.

Portion of Section 8

Some wells in the northwest quarter of section 8 of 3S/1W display a continuing water level decline of 60+ feet over a period of 20 years. Figure 17 is a well hydrograph of several wells in this area. Several of the wells have cascading water. This declining resource appears to be a receiver aquifer from which large amounts of irrigation water were drawn during the 70's and 80's. Although reduced cascading may play a role in the water level declines, it is more likely that pumping has been a greater decline cause.

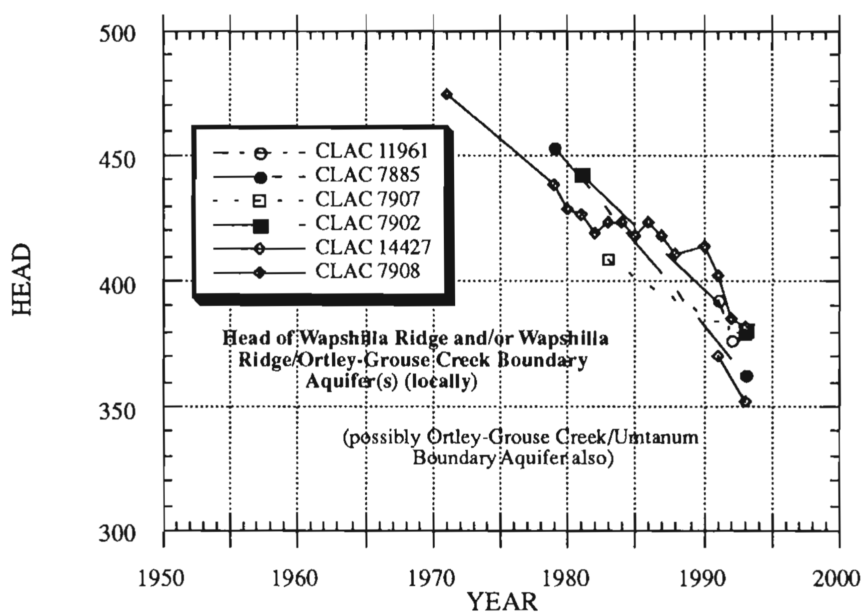

Figure 17. Water Level Decline Area, Portion of Section 8.

Portions of Sections 8/9

Some wells in the eastern half of section 8 and the western half of section 9 of 3S/1W display a continuing water level decline of 15 feet over a period of 20 years. Figure 18 is a well hydrograph of several wells in this area. Several of the wells have cascading water. Over most of the area, this declining resource appears to be a receiver aquifer. Although pumping may play a role in the water level declines, it is likely that reduced draining from higher head aquifers through commingling wells is an important decline cause.

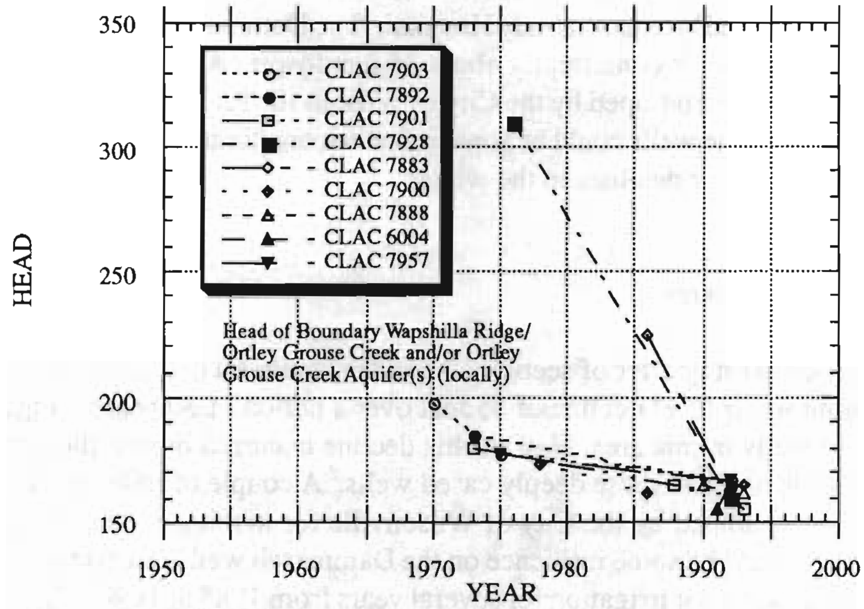

Figure 18. Water Level Decline Area, Portions of Sections 8/9.

Portions of Sections 10/15/16

Some wells in the southwest quarter of section 10 and adjacent portions of sections 15 and 16 of 3S/ 1W display a continuing water level decline of about 35 feet over a period of 40 years. Half of this decline occurred during the period 1985-1993. Figure 19 is a well hydrograph of several wells in this area. None of the wells have displayed cascading water. Water levels of CLAC 8009 in

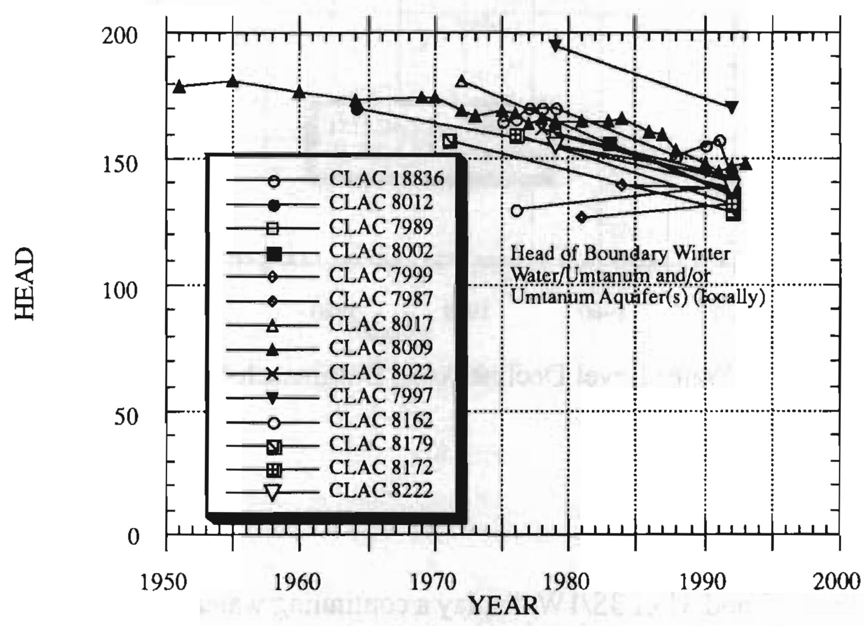

Figure 19. Water Level Decline Area, Portions of Sections 10/15/16.

Appendix B probably tracks the long-term trend of the area in detail. There is some irrigation in the area and institutional use at Dammasch State Hospital. The Dammasch wells display a very similar trend but have a head which is consistently about 35 feet lower. A couple of miles to the east are several large wells which are pumped by the City of Wilsonville for municipal use. Based on heads and declines, the Wilsonville wells could be some influence on this area. Use by Dammasch appears to be the best explanation for declines in the wells.

Dammasch State Hospital Area

Two wells in the southwest quarter of section 15 and the southeast quarter of section 16 of 3S/1W display a continuing water level decline of 35 feet over a period of 30 years. Figure 20 is a well hydrograph of two wells in this area. Half of this decline occurred during the period 1985-1993. No cascading water is noted in these deeply cased wells. A couple of miles to the east are several large wells which are pumped by the City of Wilsonville for municipal use. Based on heads and declines, these wells could be some influence on the Dammasch wells. Reportedly, the Dammasch wells were pumped heavily for irrigation for several years from 1985 to 1990. This report correlates well with the declines in the wells during the period. Use by Dammasch appears to be the best explanation for declines in the Dammasch wells.

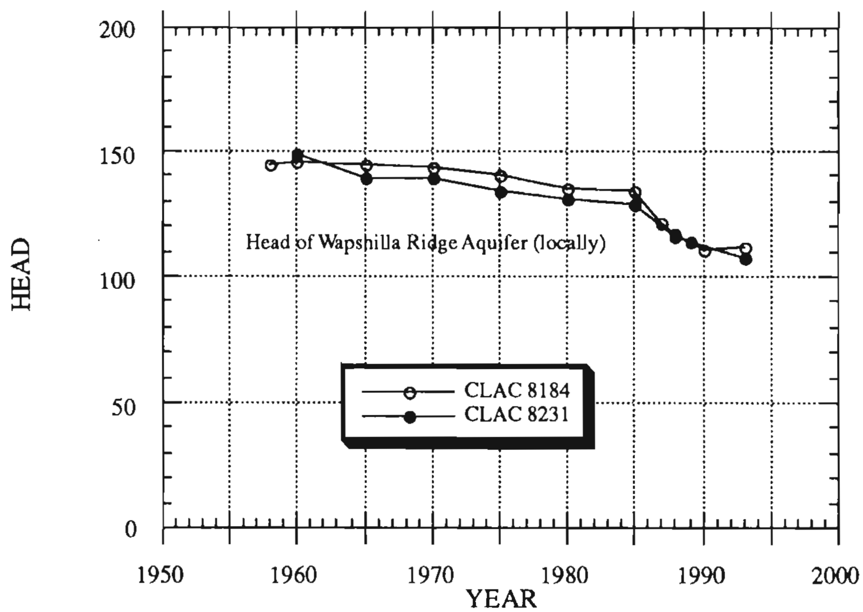

Figure 20. Water Level Decline Area, Dammasch State Hospital.

Portions of Sections 30/31

Some wells in sections 30 and 31 of 3S/1W display a continuing water level decline of 40 feet over a period of 20 years. There are data which suggest that declines may be up to 60 feet in 33 years based on the current trend and oldest historic data. Figure 21 is a well hydrograph of several wells in this area. Several of the wells have cascading water. On that basis and the fact that the heads are low, this declining resource appears to be a receiver aquifer. The cause for the decline is difficult to judge. By appearance, use in the area is minimal. Potentially, the resource is being bled off to shallower zones through wells. This could occur in lowlying areas near the Willamette River where the head in the aquifer comes closer to land surface. However, the study has identified no well or wells which act in this way.

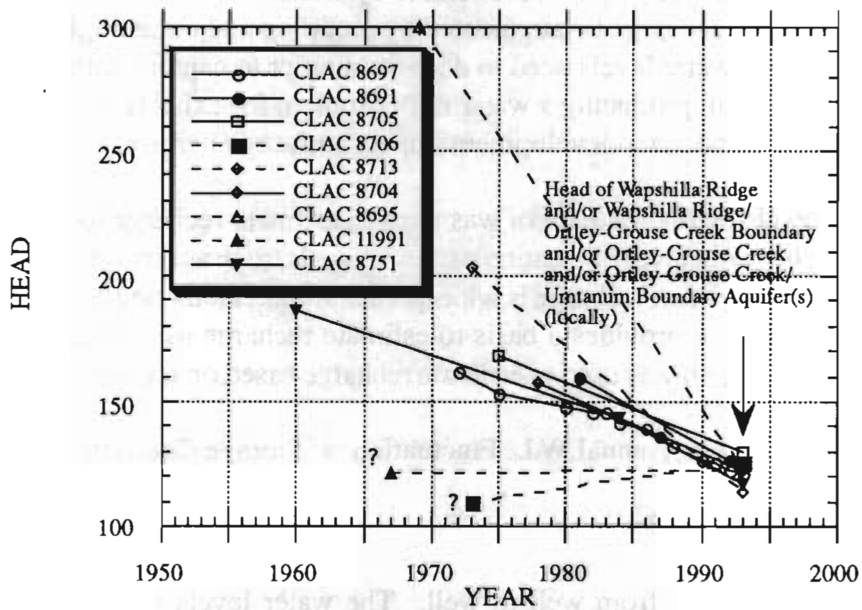

Figure 21. Water Level Decline Area, Portions of Sections 30/31.

Basalt Recharge Estimates

Estimating basalt groundwater recharge is a difficult process. The complexities of basalt terrains like Parrett Mountain and the nature of the current database in the area afford little more than a general estimate of recharge. Any estimate of recharge leads to other difficult questions such as:

1. How much of the recharge is recoverable by wells?
2. How much can recharge be augmented by pumping and commingling?
3. How much do water levels need to decline in order to capture natural and augmented recharge without producing a water right problem for existing users?
4. How will groundwater development impact surface water users?

The annual water level fluctuation pattern was used to estimate recharge to the basalt aquifers of Parrett Mountain. The water level fluctuation pattern in wells, such as those identified at the monthly monitoring wells, indicates that recharge is widespread. If this fluctuation is considered the natural recharge/discharge effect, it provides a basis to estimate recharge as a layer(s) of water over the area. The following equation was used to estimate recharge based on the annual fluctuation pattern:

Annual Recharge = Area x Annual W.L. Fluctuation x Storage Coefficient x No. of Aquifers

The area is about 28 square miles.

Water level fluctuations vary from well to well. The water levels in many of the wells in the monthly well monitoring network approximate a sine wave. The amplitude of these waves averages about six feet annually. This amplitude suggests that a groundwater level rise of at least six feet occurs in the basalt aquifer each year. Six feet is considered a minimum because the water-level sine wave results from the simultaneous dynamics of recharge and discharge. This concurrence eclipses some of the recharge during the period when recharge continues but discharge is greater. The fluctuations are the net effects of recharge and discharge not the gross effects. For example, on the rising limb of the annual hydrograph, recharge is clearly greater than discharge but what discharge there is subdues the rise. On the descending limb, recharge is less than discharge but there is still some recharge component. One could contend that the annual recharge water response is actually twice the measured amplitude if the canceling effect of discharge were eliminated. A six feet recharge response is a conservative figure while a twelve feet response is a liberal one.

The storage coefficient is a very difficult factor to properly estimate. Estimates of recharge based on the water level fluctuation method are highly leveraged by the storage coefficient that one applies. The connected pore space in the basalt is on the order of one percent of the entire rock mass. That suggests that the amount of recharged water is very much less than the annual water level fluctuation. Past investigators have used various storage coefficients for basalt aquifers and .005 is something of a middle ground (Davies-Smith et al, 1988). A storage coefficient of one-tenth of a percent (.001) is a conservatively low figure while one percent (.01) appears to be a liberal one.

The number of aquifers is very important if one assumes that the water level fluctuation is indicative of each aquifer on the mountain. The number of unique aquifers at any given well is at least one. In some cases, well reports detail up to four aquifers in a well. The number of aquifers to apply the fluctuation to is a very difficult factor to judge. An average of one to two aquifers is probably a realistic estimate.

Considering all of the major variables, a seemingly conservative estimate of recharge is:

Annual Recharge = Area x Annual W.L. Fluctuation x Storage Coefficient x No. of Aquifers
= 28 x 6 x .001 x 1
= 35 Million Gallons per Year (mgy)

Considering all of the major variables, a liberal estimate of recharge is:

Annual Recharge = 28 x 12 x .01 x 2
= 1,400 Million Gallons per Year (mgy)

The two calculations act as end members to bracket the likely rate of recharge. Table 6 displays the array of recharge values for different variables

Table 6. Estimates of Basalt Groundwater Recharge to Parrett Mountain

Storage Coefficient (Dimensionless)	No. of Aquifers (#)	Recharge* (mgy)	Recharge** (mgy)
.001	1	35	70
.005	1	175	350
.010	1	350	700
.001	2	70	140
.005	2	350	700
.010	2	700	1400

* (based on <u>6 feet</u> of annual water level recharge response)
** (based on <u>12 feet</u> of annual water level recharge response)

The seemingly "reasonable" bounds on recharge are 35 to 1400 mgy under current conditions. A more comfortable fit for recharge is a range of 350 to 700 mgy considering the water balance calculations in the next section. Recharge is a dynamic feature which results from a multitude of factors. Under pristine conditions with other factors being equal, recharge will be at a minimal level. The seasonal water level fluctuation pattern would be at a minimal level in that state. The current situation is not pristine and recharge should be greater than under pristine conditions.

Water Balance

Water balance calculations serve to tie together much of the previous discussion. The attempt to portray at what rates recharge, discharge, and changes in storage occur (Table 7). This kind of accounting is based on a given time since these variables change with time due to weather and development. For purposes of this report, the year period from October 1992 to October 1993 is ideal since the monthly water level monitoring at wells was in place then and precipitation was close to the long-term average.

Recharge conditions for the year appear to be close to the long-term conditions. Precipitation at the Rex 1S station was almost that of the long-term average of 42 inches. The monthly amounts of precipitation were clearly below average in January and February and above average in March and April. Cooler weather in the early summer was balanced by warmer weather in the late summer and fall. To the extent that any year can be an average recharge year, this period seems close.

Pumping discharge conditions are assumed to be no more than the rate of 558 mgy as estimated in the groundwater development section. The cool and wet early summer probably reduced the portion for irrigation somewhat and there was no irrigation from the Dammasch State Hospital wells. Illegal uses for irrigation and other uses creates an undetermined discharge. Natural discharge amounts cannot be determined through any direct set of calculations.

Perhaps, the most powerful check on recharge is the result of water level changes during the study. At the 37 monthly monitoring wells, there was an average rise of about one-half foot. This cross-section of wells is believed to be representative of the response in the basalt aquifers.

Table 7. Estimated Water Balance for October 1992 to October 1993

Inflow in mgy		Outflow in mgy	
Recharge:	580+	Pumping Discharge:	~560
		Natural Discharge within area:	?
		Addition to Storage:	~20
Subsurface Inflow:	?	Subsurface Outflow:	?
	580+		580+

Natural discharge within the study area remains an unknown quantity. Observations by some local residents cite reduced spring flows and creek flows in summer compared to decades earlier. This raises the possibility that commingling wells may be causing these reductions in natural discharge by ushering shallow groundwater to lower aquifers.

The water level rise reflected a storage addition. Inflow to the system exceeded outflow. From this fact, a minimum recharge rate was derived from pumping discharge estimates and the assumption that recharge within the area should dominate inflow. The minimum recharge of 580 mgy is in the range noted in the previous recharge calculations.

Quality

Water Chemistry

The study did little to investigate the chemistry of basalt groundwaters on Parrett Mountain. The study effort was directed at water quantity not water quality. However, the study used the numerous site visits to measure specific conductance at many of the wells. Such work was done because it was usually easy and convenient to perform at those times. Conversations with well owners commonly revealed some noticeable water hardness and/or iron. Frank and Collins (1978) detailed chemical analyses on several wells.

Specific conductance is a proxy of the total dissolved solids content of a water. Water will allow the passage of an electric current with less resistance as its mineralization increases. Other factors that affect conductance include the temperature of the sample and the kinds of minerals (ions) which are in the water. Given the general consistency of the geologic terrain and temperatures of the waters, the variability of the measurements due to these factors is probably small.

The analysis of the specific conductance data is cursory. The values ranged from 35 to 900 micromhos/cm with most between 100 to 200. These ranges correspond to the dissolved solids equivalents of approximately 22 to 575 and 64 to 128 milligrams per liter, respectively. The correlation over small areas indicates that the specific conductance usually increases with depth. This relationship displays much variability perhaps due to the commingling nature of many basalt wells. Analysis did not find that aquifers were distinct based upon specific conductance. This may be due to the commingling nature of wells or the similarities of rock chemistry for the aquifers.

Water Temperature

Water temperatures were measured at many of the wells. In most cases a water's temperature was influenced by its storage in the pressure tank and the heating or cooling that it experienced there. No attempts were made to deplete the storage tank in order to obtain an aquifer water temperature. Some systems allowed direct flow from the well and no time in a storage tank was involved. Temperatures from such wells are typically 50 to 54 degrees Fahrenheit. Appendix A lists water temperatures, reporting the seemingly best available one from the water well report or the study. Temperatures ranged from 48 to 61 degrees Fahrenheit. Air rotary drilling of wells introduces hot compressed air into the well and probably accounts for the temperatures in the high 50's and low 60's on some water well reports.

Tritium

Tritium is the heaviest isotope of hydrogen and occurs naturally in minute quantities. Tritium is radioactive and has a half-life of 12.3 years. This half-life means that half of a quantity of tritium will undergo radioactive decay to stable hydrogen isotopes in 12.3 years. Being hydrogen, tritium becomes part of a water molecule and can serve as a tracer for water movement.

Since the onset of thermonuclear testing in the atmosphere in 1952, the tritium concentration in precipitation has increased greatly. It has been estimated that prior to testing, the natural tritium content of precipitation globally was in the range of 5-20 tritium units. A tritium unit is the equivalent of 1 tritium atom in 10^{18} atoms of hydrogen. Globally, groundwater that was recharged prior to 1952 is now expected to have tritium concentrations below about 1-2 tritium units due to radioactive decay. With the cessation of atmospheric testing, the U.S. Geological Survey data reveal that tritium levels in precipitation at Portland, Oregon have decreased to an annual range of 3-9 tritium units in 1990 from an annual range of 500-4000 in 1963. The ranges reflect multiple samples collected during the year. Typically, precipitation during the rainy winter months is in the lower portion of the range. The 1990 range should better reflect the pre-1952 tritium level in precipitation in the Parrett Mountain area than does the global estimate. If so, groundwater that was recharged locally prior to 1952 should be expected to now have tritium concentrations below 1 tritium unit.

In 1990 and 1991, the City of Sherwood obtained tritium analyses at several wells in the study area. Those analyses are shown on Table 8. Considering the natural mixing effect of groundwater and commingling influences, the reported tritium levels suggest that at least some of the groundwater was probably recharged after 1952.

Table 8. Tritium Analyses of Parrett Mountain Groundwaters

Well Location	Well ID	Tritium Units	Comments
2S/1W-32cbc	WASH 717	5.6 (+/-1.3)	municipal well
3S/1W- 5bcd	CLAC 7830	5.9 (+/-0.6)	domestic well
3S/1W- 7dbb	WASH 1942	10.0 (+/-0.6)	domestic well
3S/1W- 8bxx	source unclear	1.8 (+/-0.7)	irrigation/domestic well(s) CLAC 7908, CLAC 7907 or CLAC 7902 in some combination

SUMMARY/CONCLUSIONS

The groundwater hydrology of Parrett Mountain is dominated by lava flows of two formations of the Columbia River Basalt Group. There are 11 flows with a maximum thickness of 900 feet in the area. The lower Grande Ronde formation is represented by 10 flows within six units and the upper Wanapum formation has one flow. The flows commonly dip to the southeast at about 5 degrees or less but other dip directions are south, southwest, and west. The inferred direction of basalt groundwater flow is in the down dip direction.

Faulting is widespread and occurs in several trends. Displacements along the faults range from a few feet to about 1000 feet with documented faults creating 19 separate fault blocks. Faulting has greatly influenced the drainage system and many water courses run along faults. Faulting facilitates recharge and natural discharge by exposing porous and permeable rock layers at the surface to precipitation and streams, causing a dip in the basalt layers for increased movement of water, and possibly enhancing vertical permeability across dense flows.

Eleven basalt aquifers are identified although only one to five are known in any given well. These basalt aquifers are linked to stratigraphic units. Additional basalt aquifers are probable in the area, particularly as they may occur between individual flows within identified units. On a local basis, multiple water-bearing zones are sometimes naturally integrated and act as one aquifer.

Basalt aquifers are the principal source of groundwater on Parrett Mountain, providing water for about 1000 active basalt wells in the area. Pumpage from basalt aquifers in 1993 was about 558 million gallons for municipal, irrigation, rural residential, and other uses. Over most of Parrett Mountain, basalt aquifers are the only usable sources of groundwater.

Recharge to the basalt aquifers is widespread and occurs from local precipitation. The general water level stability during the study at the monthly observation wells supports a conclusion that total recharge was nearly balanced by total discharge. Average precipitation recharged more than 558 million gallons per year. This stability in spite of high pumpage demonstrates the potential for increasing recharge as pumpage increases after water levels have declined. The limits on this dynamic for the basalt aquifers are problematical.

Long-term water level changes in wells occur principally from pumping, natural recharge, natural discharge and commingling within wells. Individual wells often encounter more than one aquifer, resulting in water levels that are a composite of the levels in the aquifers as water moves between aquifers in the borehole. Commingling effects can produce water level rises or declines. Both the rates of subsurface discharge from and subsurface recharge to Parrett Mountain are undetermined.

Water level changes in basalt wells display a wide range when comparing historic levels to those collected by the study. In 260 wells, water levels have declined as much as 418 feet and risen as much as 104 feet. The mean of the water level changes of these wells was a decline of 14 feet. The median was a decline of 6.5 feet. The strong central tendency of the data reflect a general stability in the area. However, the dispersion of the data reflects a number of factors, including depletion of groundwater in storage. Below average precipitation in the area resulted in below average recharge during the years preceding the study. This produced water level declines which averaged about 4 feet per well.

For 25 of the 260 wells, the water level change across a well alteration displayed an average decline of 127 feet over an average 23 years. This rate differs greatly from the general well population. Well alteration often results in truly different wells since the combination of aquifers in the restructured boreholes can change heads considerably in this setting in which aquifer heads usually decrease with depth. Comparisons of water levels before and after well deepening were the primary reason for the large water level drops which became highlighted in 1992.

The cascading water form of commingling occurs in at least half of the basalt wells on Parrett Mountain. This provides a source of recharge to deeper aquifers. The average rate of cascading is probably less than one gallon per minute.

The general water level stability does not preclude areas of local instability. There are six areas noted within the Parrett Mountain study area which display water level decline patterns which are basically the result of pumpage and/or commingling. These subareas show total declines of 15 to 60 feet. Combined, they total about 3 square miles in area.

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APPENDIX A

RECORDS OF WELLS

EXPLANATION AND KEY TO ABBREVIATIONS

LOCATION: See figure 1 for description of well location system.

WELL ID: A unique set of characters and numbers which will be assigned to all well log reports in the state. The first four characters represent the first four letters of the county. For example, Washington county is referred to as WASH. Following the county designation will be a number. Each well log report within a county will have its own unique number. The combination of the four characters and the number makes the OWRD well ID. If a well has been deepened or reconditioned, then more than one well ID will be associated with the well. Additional well ID's are noted in the comments, but this report will use the original well ID in reference to any well. If a well log could not be located for a given well, four characters, PMTN, and a number were assigned to the well. Those wells without a well log on file with OWRD are identified with this temporary well ID (PMTN#) which is used only in this report.

YEAR DRILLED: The year in which the well was drilled. If the well was deepened, then the year of deepening is recorded on the same line as the other well information given at the time of deepening.

CASING DEPTH: The casing depth (in feet). If a second value is given (##/###), then the well has a liner to that depth.

FINISH: X = open hole below casing; P = perforated, with interval noted in feet.

DEPTH TO WATER-BEARING ZONE: Depth from land surface to the top of each water-bearing zone called out on the well log reports from the drillers.

ELEVATION: Elevation of land surface at the well, in feet above mean sea level, as indicated on or interpolated from 1:24,000 scale topographic maps (+/- 5 feet), or from an altimeter reading taken by Jim Luzier or OWRD, or from leveling.

WATER LEVEL DEPTH: Depth to water below land surface in feet. Minus sign (-) indicates water level is above land surface (flowing).

A: Synoptic water level; An "x" denotes the highest water level elevation recorded.

B: An "x" denoted the oldest reliable water level recorded under current construction.

C: An "x" denotes the oldest reliable water level recorded under original construction.

WATER LEVEL COMMENTS: # next to driller refers to the driller's Water Well Constructor's License No.; OWRD refers to Oregon Water Resources Department; USGS refers to U.S. Geological Survey; various other measurements are referenced by the person's last name, as a pump test, or from a report; ppg = pumping; ppd = pumped; ccw = cascading water; wl = water level; swl = static water level. UNIDATA refers to the OWRD Starlog Data Logging System.

TEST TYPE: U = unknown test method; A, B, or P: air-tested, bailed, or pumped for indicated time, in hours, when drawdown / stem depth and yield were measured. Yield is in gallons per minute, drawdown is in feet below static (nonpumping) level at end of testing period, and stem depth is in feet, as reported by driller, owner, operator, or pump company. Stem depth reported for air-tested wells is generally not a reliable drawdown measurement.

CONDUCTIVITY: OWRD conductivity (specific conductance) measurements were made with the Chemtrix type 700 portable conductivity meter which measures total ionized substances in solution. Other conductivity measurements were made by the USGS and by Jim Luzier. Conductivity units are in micromhos / centimeter.

TEMPERATURE: Measurements are recorded in degrees Fahrenheit. Temperature measurements were taken by OWRD personnel or by the drillers.

USE OF WATER: D = domestic; I = irrigation; P = public supply; S = stock; N = industrial; DS = domestic and stock; DI = domestic and irrigation.

COMMENTS: If original well has been altered or reconditioned then the second well ID is noted here. Any other comments on the well are also noted here, including any water use permit #'s.

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
2S/1W-31 aba	WASH	3447	SHERWOOD #4	MEINECKE RD	1969	458	14	94	X		203	44.00		x		4/28/69	driller	P	414	249	4			P	Permit G-4500
												68.00				11/1/89	SHERWOOD								
												67.00				12/1/89	SHERWOOD								
												64.60				1/1/90	SHERWOOD								
												64.00				2/1/90	SHERWOOD								
												64.00				3/1/90	SHERWOOD								
												65.00				4/1/90	SHERWOOD								
												66.00				5/1/90	SHERWOOD								
												65.00				6/1/90	SHERWOOD								
												72.60				7/1/90	SHERWOOD								
												72.00				8/1/90	SHERWOOD								
												74.00				9/1/90	SHERWOOD								
												70.00				10/1/90	SHERWOOD								
												62.00				4/1/91	SHERWOOD								
												65.00				5/1/91	SHERWOOD								
												67.00				6/1/91	SHERWOOD								
												70.00				7/1/91	SHERWOOD								
												70.00				8/1/91	SHERWOOD								
												75.00				9/1/91	SHERWOOD								
												74.00				10/1/91	SHERWOOD								
												73.00				11/1/91	SHERWOOD								
												69.56				11/8/91	OWRD, off several days								
												72.00				12/1/91	SHERWOOD								
												70.00				1/20/92	SHERWOOD								
												70.00				3/2/92	SHERWOOD								
												73.00				3/20/92	SHERWOOD								
												72.50				4/17/92	SHERWOOD								
												70.50				5/18/92	SHERWOOD								
												76.50				6/9/92	SHERWOOD								
												78.00				6/25/92	SHERWOOD								
												75.00				7/17/92	SHERWOOD								
												76.00				8/14/92	SHERWOOD								
												68.00				2/12/93	SHERWOOD								
												67.50				3/12/93	SHERWOOD								
												65.00				3/30/93	SHERWOOD								
												64.00	x			4/15/93	SHERWOOD								
												64.00				5/14/93	SHERWOOD								
												65.00				6/15/93	SHERWOOD								
												65.00				7/15/93	SHERWOOD								
												68.00				8/19/93	SHERWOOD								
												70.21				10/21/93	OWRD, off overnight								
2S/1W-31 dbd	WASH	3448	KENNERLY	SUNSET BLVD	1952	215	6	119	X		210	30.00		x		9/25/52	driller	U	100	35				U	was REYNOLDS
												41.00				3/5/63	OWRD								
												38.00				5/13/63	OWRD								
												33.80				5/13/63	OWRD								
												39.36				8/13/63	OWRD								
												39.69				11/13/63	OWRD								
												34.61				2/7/64	OWRD								
												34.65				5/1/64	OWRD								
												39.15				7/29/64	OWRD								
												41.58				10/28/64	OWRD								
												34.62				2/1/65	OWRD								
												33.86				4/28/65	OWRD								
												40.40				8/5/65	OWRD								
												41.69				11/1/65	OWRD								
												35.88				1/26/66	OWRD								
												34.38				4/26/66	OWRD								
												39.98				7/26/66	OWRD								
												42.08				10/25/66	OWRD								
												35.58				2/1/67	OWRD								
												35.48				4/25/67	OWRD								
												41.86				7/18/67	OWRD								
												44.52				10/18/67	OWRD								
												38.34				1/16/68	OWRD								
												35.22				4/16/68	OWRD								
												38.19				7/17/68	OWRD								
												41.98				10/15/68	OWRD								
												34.36				1/21/69	OWRD								
												34.85				4/15/69	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												37.70				7/15/69	OWRD								
												42.50				10/15/69	OWRD								
												37.00				1/15/70	OWRD								
												34.50				4/14/70	OWRD								
												43.50				7/21/70	OWRD								
												44.50				10/20/70	OWRD								
												38.00				1/25/71	OWRD								
												36.50				4/20/71	OWRD								
												41.50				7/21/71	OWRD								
												44.00				10/14/71	OWRD								
												39.00				1/18/72	OWRD								
												37.00				3/28/72	OWRD								
												41.00				7/27/72	OWRD								
												42.00				9/27/72	OWRD								
												40.00				1/2/73	OWRD								
												40.00				4/19/73	OWRD								
												43.00				7/12/73	OWRD								
												44.00				10/4/73	OWRD								
												40.00				7/5/74	OWRD								
												47.00				9/30/74	OWRD								
												39.00				1/13/75	OWRD								
												51.00				3/31/75	OWRD								
												45.00				6/30/75	OWRD								
												46.00				10/6/75	OWRD								
												43.00				1/5/76	OWRD								
												40.00				4/5/76	OWRD								
												33.00				4/1/76	USGS								
												43.00				7/9/76	OWRD								
												43.00				9/27/76	OWRD								
												43.00				1/3/77	OWRD								
												39.00				3/22/77	OWRD								
												42.00				4/4/77	OWRD								
												49.00				7/6/77	OWRD								
												45.00				9/26/77	OWRD								
												39.00				1/9/78	OWRD								
												38.00				4/3/78	OWRD								
												39.50				9/23/79	OWRD								
												40.00				4/2/80	OWRD								
												37.00				4/3/80	OWRD								
												43.00				9/22/80	OWRD								
												33.40				4/16/81	OWRD								
												41.00				10/8/81	OWRD								
												38.70				5/9/82	OWRD								
												44.57				9/22/83	OWRD								
												39.82				5/9/84	OWRD								
												44.09				6/5/85	OWRD								
												50.43				10/3/85	OWRD								
												48.92				6/4/86	OWRD								
												52.75				10/9/86	OWRD								
												49.88				6/16/87	OWRD								
												45.09				6/13/88	OWRD								
												55.58				10/27/88	OWRD								
												48.82				5/23/90	OWRD								
												47.91				5/15/91	OWRD								
												55.80				11/8/91	OWRD								
												47.71	x			6/18/93	OWRD								
2S/1W-32 cbc	WASH	717	SHERWOOD #5	SUNSET BLVD	1984	800	16	200	X	252, 283	190	48.00		x		10/25/84	driller	P	700	309	24			P	sealed to 200'
												53.00				11/1/89	SHERWOOD								
												57.00				12/1/89	SHERWOOD								
												55.00				1/1/90	SHERWOOD								
												55.00				2/1/90	SHERWOOD								
												52.00				3/1/90	SHERWOOD								
												52.00				4/1/90	SHERWOOD								
												52.00				5/1/90	SHERWOOD								
												52.00				6/1/90	SHERWOOD								
												52.00				7/1/90	SHERWOOD								
												67.00				8/1/90	SHERWOOD								
												63.00				9/1/90	SHERWOOD								
												65.00				10/1/90	SHERWOOD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												58.60				11/1/90	SHERWOOD								
												58.60				12/1/90	SHERWOOD								
												58.60				1/1/91	SHERWOOD								
												58.00				2/1/91	SHERWOOD								
												58.00				3/1/91	SHERWOOD								
												55.00				4/1/91	SHERWOOD								
												54.00				5/1/91	SHERWOOD								
												55.00				6/1/91	SHERWOOD								
												58.00				7/1/91	SHERWOOD								
												60.00				8/1/91	SHERWOOD								
												62.50				9/1/91	SHERWOOD								
												62.50				10/1/91	SHERWOOD								
												61.00				11/1/91	SHERWOOD								
												58.50				12/1/91	SHERWOOD								
												54.91				1/10/92	OWRD								
												62.50				1/20/92	SHERWOOD								
												56.00				3/2/92	SHERWOOD								
												60.00				3/20/92	SHERWOOD								
												60.00				4/17/92	SHERWOOD								
												57.50				5/18/92	SHERWOOD								
												64.50				6/9/92	SHERWOOD								
												62.00				7/17/92	SHERWOOD								
												63.00				8/14/92	SHERWOOD								
												55.00				11/1/92	SHERWOOD								
												55.00				12/1/92	SHERWOOD								
												60.00				1/18/93	SHERWOOD								
												55.00				2/12/93	SHERWOOD								
												55.00				3/12/93	SHERWOOD								
												52.00				3/30/93	SHERWOOD								
												52.00				4/15/93	SHERWOOD								
												51.00	x			5/14/93	SHERWOOD								
												52.00				6/15/93	SHERWOOD								
												52.00				7/15/93	SHERWOOD								
												57.00				8/19/93	SHERWOOD								
												57.54				10/21/93	OWRD								
2S/1W-32 bda	WASH	1823	SHERWOOD #3	FIRST ST.	1946	339	16	36	X	137	190	26.00		x		1/1/46	driller	U	510	42				P	12" casing
												32.00				3/5/63	OWRD, ppg								from
												19.50				5/15/63	OWRD								35' - 122'
												20.00				7/1/63	OWRD								
												22.00				7/27/63	OWRD								
												27.00				8/14/63	OWRD								
												38.00				8/23/63	OWRD, ppg								
												40.00				9/7/63	OWRD, ppg								
												26.00				10/7/63	OWRD								
												25.00				11/4/63	OWRD								
												38.00				12/16/63	OWRD, ppg								
												31.00				1/7/64	OWRD, ppg								
												22.00				2/3/64	OWRD								
												26.00				3/3/64	OWRD								
												24.00				6/2/64	OWRD								
												24.00				7/5/64	OWRD								
												26.00				8/2/64	OWRD								
												28.00				11/1/64	OWRD								
												23.00				12/1/64	OWRD								
												23.00				1/1/65	OWRD								
												24.00				2/2/65	OWRD								
												22.00				3/2/65	OWRD								
												19.00				4/28/65	OWRD								
												24.00				5/8/65	OWRD								
												26.00				6/6/65	OWRD								
												26.00				7/8/65	OWRD								
												40.00				8/4/65	OWRD, ppg								
												38.00				11/1/65	OWRD, ppg								
												25.00				1/26/66	OWRD								
												25.00				3/2/66	OWRD								
												25.00				4/5/66	OWRD								
												22.00				4/26/66	OWRD								
												25.00				5/3/66	OWRD								
												25.00				6/1/66	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												25.00				7/5/66	OWRD								
												36.00				7/27/66	OWRD								
												25.00				8/3/66	OWRD								
												25.00				9/4/66	OWRD								
												66.00				10/4/66	OWRD								
												40.00				10/25/66	OWRD, ppg								
												25.00				11/1/66	OWRD								
												25.00				12/6/66	OWRD								
												34.00				2/1/67	OWRD, ppg								
												24.00				4/25/67	OWRD								
												41.00				7/18/67	OWRD								
												44.00				10/18/67	OWRD, ppg								
												42.00				11/1/67	OWRD, ppg								
												38.00				12/5/67	OWRD, ppg								
												38.00				1/3/67	OWRD								
												28.00				1/16/68	OWRD								
												27.00				2/6/68	OWRD								
												26.50				4/16/68	OWRD								
												37.00				7/17/68	OWRD, ppg								
												33.00				8/28/68	OWRD								
												40.50				10/15/68	OWRD, ppg								
												27.00				11/29/68	OWRD								
												35.00				1/21/69	OWRD, ppg								
												35.00				2/3/69	OWRD, ppg								
												25.00				3/4/69	OWRD								
												26.00				4/4/69	OWRD								
												41.50				7/15/69	OWRD								
												48.00				10/15/69	OWRD								
												59.50				1/15/70	OWRD, ppg								
												44.00				1/19/70	OWRD								
												43.00				2/2/70	OWRD								
												39.00				3/12/70	OWRD								
												39.50				4/14/70	OWRD								
												46.00				6/23/70	OWRD								
												54.00				7/21/70	OWRD								
												54.00				8/4/70	OWRD								
												52.50				10/20/70	OWRD								
												47.00				12/29/70	OWRD								
												46.00				1/25/71	OWRD								
												45.00				2/18/71	OWRD								
												44.00				4/20/71	OWRD								
												45.00				7/19/71	OWRD								
												54.00				9/2/71	OWRD								
												52.00				10/14/71	OWRD								
												43.00				12/20/71	OWRD								
												44.00				2/21/72	OWRD								
												42.00				3/6/72	OWRD								
												39.00				4/11/72	OWRD								
												53.00				5/19/72	OWRD								
												57.00				7/5/72	OWRD								
												67.00				8/7/72	OWRD								
												63.00				2/14/73	OWRD								
												59.00				4/13/73	OWRD								
												46.00				7/12/73	OWRD								
												52.00				7/31/52	OWRD								
												47.00				10/4/73	OWRD								
												45.00				12/7/73	OWRD								
												43.00				1/3/74	OWRD								
												40.00				3/4/74	OWRD								
												37.00				4/19/74	OWRD								
												46.00				9/30/74	OWRD								
												42.00				1/13/75	OWRD								
												38.00				3/31/75	OWRD								
												40.00				6/30/75	OWRD								
												63.00				10/6/75	OWRD, ppg								
												42.00				1/5/76	OWRD								
												39.00				4/5/76	OWRD								
												40.00				7/9/76	OWRD								
												63.00				7/8/77	OWRD, ppg								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												46.00				9/26/77	OWRD								
												61.00				1/9/78	OWRD								
												39.00				4/3/78	OWRD								
												23.00				4/23/79	OWRD								
												61.50				4/15/80	OWRD, ppg								
												50.00				10/1/80	OWRD								
												51.49				10/2/80	OWRD								
												46.81				4/16/81	OWRD								
												51.50				10/23/81	OWRD								
												65.35				10/1/82	OWRD								
												67.70				10/13/82	OWRD, ppg								
												42.80				3/8/83	OWRD								
												47.00				10/20/83	OWRD								
												43.98				5/21/84	OWRD								
												68.82				10/17/84	OWRD, ppg								
												51.49				4/5/85	OWRD, ppg								
												51.49				4/25/85	OWRD, ppg								
												58.42				10/24/85	OWRD, ppg								
												71.70				4/28/86	OWRD, ppg								
												51.70				4/13/88	OWRD								
												57.70				7/22/88	OWRD								
												56.00				11/1/89	SHERWOOD								
												60.00				12/1/89	SHERWOOD								
												52.00				1/1/90	SHERWOOD								
												52.00				2/1/90	SHERWOOD								
												55.00				3/1/90	SHERWOOD								
												68.00				4/1/90	SHERWOOD								
												50.00				5/1/90	SHERWOOD								
												55.00				6/1/90	SHERWOOD								
												52.00				7/1/90	SHERWOOD								
												56.00				8/1/90	SHERWOOD								
												52.00				9/1/90	SHERWOOD								
												50.00				10/1/90	SHERWOOD								
												65.00				11/1/90	SHERWOOD								
												65.00				12/1/90	SHERWOOD								
												65.00				1/1/91	SHERWOOD								
												65.00				2/1/91	SHERWOOD								
												65.00				3/1/91	SHERWOOD								
												64.00				3/4/91	SHERWOOD								
												63.00				3/15/91	SHERWOOD								
												62.00				3/22/91	SHERWOOD								
												62.00				4/1/91	SHERWOOD								
												62.00				4/2/91	SHERWOOD								
												63.00				5/1/91	SHERWOOD								
												63.00				5/20/91	SHERWOOD								
												63.00				6/1/91	SHERWOOD								
												62.00				6/4/91	SHERWOOD								
												63.00				6/24/91	SHERWOOD								
												66.00				7/1/91	SHERWOOD								
												66.00				7/3/91	SHERWOOD								
												66.00				7/10/91	SHERWOOD								
												67.00				7/23/91	SHERWOOD								
												68.00				8/1/91	SHERWOOD								
												68.00				8/6/91	SHERWOOD								
												68.00				8/15/91	SHERWOOD								
												70.00				9/1/91	SHERWOOD								
												70.00				9/5/91	SHERWOOD								
												70.00				9/16/91	SHERWOOD								
												70.00				10/1/91	SHERWOOD								
												70.00				10/8/91	SHERWOOD								
												72.60				10/17/91	SHERWOOD								
												72.00				10/23/91	SHERWOOD								
												70.00				10/30/91	SHERWOOD								
												68.00				11/4/91	SHERWOOD								
												66.00				6/9/92	SHERWOOD								
												71.00				6/25/92	SHERWOOD								
												67.00				7/17/92	SHERWOOD								
												68.00				8/14/92	SHERWOOD								
												62.00				11/1/92	SHERWOOD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												62.00				12/1/92	SHERWOOD								
												63.00				1/18/93	SHERWOOD								
												60.00				2/12/93	SHERWOOD								
												60.00				3/12/93	SHERWOOD								
												57.50				3/30/93	SHERWOOD								
												57.00	x			4/15/93	SHERWOOD								
												57.00				5/14/93	SHERWOOD								
												57.00				6/15/93	SHERWOOD								
												57.00				7/15/93	SHERWOOD								
												57.00				8/19/93	SHERWOOD								
												63.20				10/21/93	OWRD								
2S/1W-33 dda	WASH	1847	TRI-COUNTY GUN CLUB	TONQUIN RD	1959	109	6	20	X		230	66.00			x	10/12/59	NEW WELL 109'	B	5.5	20	2			P	
					1973	230				218		63.00		x		2/9/73	DEEP. 230'	P	52	167	2		52		WASH 1842
												66.42				12/12/75	GW RPT #27								
												63.80				4/1/80	OWRD								
												75.55				9/17/80	OWRD								
												75.35				10/8/81	OWRD								
												64.97				4/15/82	OWRD								
												76.05				9/29/82	OWRD								
												63.45				4/29/83	OWRD								
												73.60				9/27/83	OWRD								
												65.89				5/9/84	OWRD								
												71.71				6/5/85	OWRD								
												83.08				10/3/85	OWRD								
												69.79				6/4/86	OWRD								
												74.18				6/16/87	OWRD								
												73.50				6/13/88	OWRD								
												81.75				5/23/90	OWRD								
												91.26	x			6/18/93	OWRD								
3S/1W-1cda	WASH	3561	WILSONVILLE	STAFFORD RD	1970	783	12	783	P:535, 600	149	345	112.00		x		7/25/70	driller-109	P	510	210	24		57	P	
									720			159.36				4/15/88	OWRD, off 6 hrs								
												168.17				5/31/89	OWRD, off 6 months								
												174.40				6/1/90	OWRD, off 3 days								
												176.53				5/24/91	OWRD, off 3 days								
												204.74	x			12/30/93	OWRD, off 7 days								
3S/1W-4 bdb	CLAC	7859	NIELSEN	24362 BAKER	1989	180	6	19	X	102, 163, 172	275	45.00		x		3/21/89	driller	A	15	160	1	175		D	
												45.63				7/8/92	OWRD								
												41.46				10/27/92	OWRD								
												40.70				11/23/92	OWRD								
												33.76				12/21/92	OWRD								
												33.43				1/27/93	OWRD								
												36.73				2/25/93	OWRD								
												34.13				3/29/93	OWRD								
												33.27	x			4/28/93	OWRD								
												36.20				5/27/93	OWRD								
												37.61				6/28/93	OWRD								
												38.48				7/27/93	OWRD								
												41.22				8/25/93	OWRD								
												41.23				9/30/93	OWRD								
												40.68				10/26/93	OWRD								
3S/1W-4 bdb	CLAC	7723	AXELSON	24386 BAKER	1992	200	6	30	X	116, 156, 187	270	90.00		x		7/13/92	driller-715	A	20	180	1	173	56	DS	OWRD temp.
												71.59	x			10/22/92	OWRD								
3S/1W-4 add	CLAC	7766	DORSETT	12570 MORGAN	1971	125	6	22	X	106	145	3.00				12/3/71	driller-404	P	30	122	2		52	D	
3S/1W-4 aca	CLAC	7764	ERWERT	13015 MORGAN	1970	155	6	25	X	142	170	-9.24		x		5/19/70	driller-404, flowing	P	80	135	2		52	D	OWRD temp.
												15.21	x			11/6/92	OWRD, not flowing								
3S/1W-4 bcc	CLAC	7725	HESS	24949 BAKER	1987	145	6	100	X	120	295	45.00		x		9/24/87	driller-645	A	23	145	1	118	56	D	
												36.10	x			10/22/92	OWRD								
3S/1W-4 ddd	CLAC	7731	NEEMISH	25900 MEADOW	1986	145	6	20	X		240	65.00		x		9/9/86	driller-645	A	33	145	1	125	54	D	
												77.12	x			10/9/92	OWRD								
3S/1W-4 bca	CLAC	7722	PIHL	24354 BAKER	1988	205	6	39	P:145-175	70, 175, 195	275	80.00		x		10/11/88	driller-645	A	25	205	1		56	D	
												63.07	x			11/12/92	OWRD								
3S/1W-4 dab	CLAC	17819	SHEEHAN	12950 MORGAN	1992	145	6	41	P:85-145	120	180	21.00		x		3/9/92	driller-156	A	30+	140	1		56	D	
												22.32	x			11/12/92	OWRD								
3S/1W-4 dba	CLAC	7743	STEVENS	13360 MORGAN	1980	185	6	84	X	94	250	83.00		x		1/4/80	driller-79						54	D	
												86.55	x			11/6/92	OWRD								
3S/1W-4 bca	CLAC	18840	KAPLAN	24342 BAKER	1988	150	6	33	X	89, 115, 134	285	90.00		x		11/17/88	driller-715	A	30	130	1	142	50	D	
												20.79	x			12/11/92	OWRD								
3S/1W-4 bcd	CLAC	7760	FERRY	13925 MORGAN	1963	175	6	76	X		270	20.00		x		12/20/63	driller-117	P	40	90	1			I	
												29.67	x			10/21/93	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
3S/1W-5 ccb	CLAC	7822	BANCROFT	25672 LADD	1972	155	6	58	X	142	610	101.00			x	7/15/72	driller-404	P	10	54	2		53	D	
					1979	360				306		210.00				8/13/79	driller-404	A	20	130	2	105	52		CLAC 7794
												254.00		x		8/18/79	Phillips Pump								
												280.00				2/10/92	pump inst.								
												281.77				6/18/92	OWRD								
												277.19	x			9/10/92	OWRD, no ccw								
3S/1W-5 cad	CLAC	7781	COE	15717 OBERST	1986	245	6	63/245	P:185-225	110, 185	440	140.00		x		6/4/86	driller	A	25	225	1	138	54	D	
												115.90				5/20/92	OWRD								
												117.41				10/27/92	OWRD								
												117.44				11/23/92	OWRD								
												115.94				12/21/92	OWRD								
												113.35				1/27/93	OWRD								
												112.94				2/25/93	OWRD								
												111.32				3/29/93	OWRD								
												109.93				4/28/93	OWRD								
												108.94	x			5/27/93	OWRD								
												109.50				6/28/93	OWRD								
												109.95				7/27/93	OWRD								
												111.48				8/25/93	OWRD								
												112.36				9/30/93	OWRD								
												113.28				10/26/93	OWRD								
3S/1W-5 bdb	CLAC	18432	EPPICH	24616 LADD	1962	168	6	56	X	155	405	75.00			x	12/12/62	driller-1	B	11	93	2		52	D	
					1973	320				292		210.00		x		4/20/73	driller-404	P	15	52	2	150	54		CLAC 7816
												265.14				5/19/92	OWRD								
												272.41				8/14/92	OWRD, ccw								
												270.16				10/27/92	OWRD								
												268.79				11/23/92	OWRD								
												267.31				12/21/92	OWRD								
												264.73				1/27/93	OWRD								
												262.64				2/25/93	OWRD								
												261.19				3/29/93	OWRD								
												259.96				4/29/93	OWRD								
												259.41				5/27/93	OWRD								
												257.95	x			6/28/93	OWRD, rising slowly								
												258.35				7/27/93	OWRD								
												264.87				8/25/93	OWRD								
												271.48				9/29/93	OWRD, rising								
												268.41				10/26/93	OWRD								
3S/1W-5 bca	CLAC	7824	GARSTKA	24575 LADD	1972	245	6	68	X	226	395	120.00		x		4/4/72	driller	P	30	125	2	130	52	D	
												139.00				7/23/79	owner								
												140.00				4/7/80	owner								
												141.00				6/27/80	owner								
												160.00				9/9/88	owner								
												169.00				8/12/90	owner								
												158.60				8/18/90	owner								
												156.00				2/26/92	owner								
												155.05				5/26/92	OWRD								
												161.45				10/27/92	OWRD, ccw								
												162.12				11/24/92	OWRD, no ccw								
												161.56				12/21/92	OWRD								
												159.87				1/27/93	OWRD								
												159.03				2/25/93	OWRD								
												162.60				3/29/93	OWRD, seems too deep								
												155.39				4/28/93	OWRD								
												153.21				5/27/93	OWRD								
												153.11	x			6/28/93	OWRD								
												153.76				7/27/93	OWRD								
												155.28				8/25/93	OWRD								
												157.58				9/29/93	OWRD								
												168.52				10/26/93	OWRD								
3S/1W-5 bac	CLAC	7799	FICKEN/CAIRNS	24600 LADD	1978	410	6	27	X	382	405	254.00		x		3/11/78	driller-404	A	50	136	2		52	D	
												283.00				9/2/92	pump installer								
												275.46	x			10/19/93	OWRD, ccw								
3S/1W-5 cad	CLAC	7808	HOLST	15761 OBERST	1975	140	6	116	X	126	440	84.00		x		4/2/75	driller-404	P	40	36	2	110		D	
												114.85	x			5/26/92	OWRD								
3S/1W-5 bcd	CLAC	7830	OWENS	25025 LADD	1971	200	6	70	X	178	425	145.00			x	5/3/71	driller-404	P	40	55	2		52	D	
					1990	324		324	P:?	218, 300		185.00		x		8/16/90	driller-553	A	42	324	1	113	55		CLAC 194
												185.06	x			7/14/92	OWRD								
3S/1W-5 cba	CLAC	7797	VANDLAC	24948 LADD	1978	320	6	25	X	246	440	184.00		x		10/7/78	driller-404	A	20	74	2	106	52	D	

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												196.00				5/7/83	Phillips Pump								
												196.33				1/24/86	Phillips Pump								
												188.00	x			5/19/92	OWRD								
3S/1W-5 bcd	CLAC	7828	GARSTKA	24801 LADD	1971	260	6	90	X	224	415	112.00		x		5/15/71	driller-404	P	35	148	2	100	52	D	
												215.55				5/27/92	OWRD, questionable								
												170.22	x			8/13/92	OWRD, ccw								
3S/1W-5 bdb	CLAC	7840	PITNEY	24700 LADD	1966	114	6	43	X	101	413	80.00			x	8/31/66	driller-277	P	10	26	4			D	
					1972	230				218		132.00		x		7/29/72	driller-404	P	30	98	2	121	53		CLAC 7821
												150.80				8/15/75	USGS								
												164.06	x			6/24/92	OWRD								
												165.82				9/15/92	OWRD, ccw								
3S/1W-5 ccc	CLAC	7826	RADKE	25780 LADD	1972	245	6	60	X	194	600	140.00			x	4/6/72	driller-404	P	20	105	2		52	D	
					1989	585				470, 545		440.00		x		4/9/89	driller-645	A	20	585	1	145	52		CLAC 7777
												445.00				11/14/89	Phillips Pump								
												442.23	x			9/10/92	OWRD								
3S/1W-5 daa	CLAC	7841	SMITH	25152 MCCON.	1965	165	6	125	X	125, 155	310	40.00		x		5/17/65	driller-94	B	30	60	3	132	57	D	
												51.40				8/15/75	USGS								
												60.96	x			8/13/92	OWRD								
3S/1W-5 caa	CLAC	7864	SKEETERS #1	15771 OBERST	1961	138	8	97	P:72-81	74, 126	410	90.00			x	4/1/61	driller-106	B	60	35	1		49	I	
					1967	315						105.00		x		3/16/67	driller-68	B	50	10	1		52		CLAC 7849
												113.02				10/11/76	OWRD								
												114.34				1/18/77	OWRD								
												113.02				4/18/77	OWRD								
												115.80				7/19/77	OWRD								
												115.26				10/10/77	OWRD								
												107.81				1/27/78	OWRD								
												109.58				4/11/78	OWRD								
												116.07				10/9/78	OWRD								
												110.46				4/19/79	OWRD								
												108.15				4/2/80	OWRD, ccw								
												114.45				9/16/80	OWRD								
												114.20				10/7/81	OWRD								
												106.40				4/15/82	OWRD								
												112.60				9/29/82	OWRD								
												105.50				4/29/83	OWRD, ccw								
												111.68				9/22/83	OWRD, ccw								
												107.08				5/17/84	OWRD, ccw								
												108.89				6/5/85	OWRD, ccw								
												113.67				10/3/85	OWRD, ccw								
												111.90				6/4/86	OWRD								
												115.30				6/16/87	OWRD								
												111.37				6/13/88	OWRD								
												111.26				5/15/91	OWRD								
												115.66	x			8/13/92	OWRD								
3S/1W-5 caa	CLAC	12324	SKEETERS #2	15771 OBERST	1991	323	6	98/323	P:307-323	210, 278	425	119.00		x		9/5/91	driller-553	A	37	305	1		54	D	
												123.07	x			8/13/92	OWRD								
3S/1W-5 bdc	CLAC	7782	FIFIELD	24840 LADD	1985	144	6	43/120	P:82-118	52, 106	370	86.00		x		11/27/85	driller-553	A	30	114	1	80		D	
												82.81	x			7/10/92	OWRD								
3S/1W-5 bcd	CLAC	7809	MOORE	25001 LADD	1975	260	6	32	X	248	445	178.00		x		2/21/75	driller-404	P	10	48	2	115	52	D	
												209.57	x			6/30/92	OWRD								
3S/1W-5 ada	CLAC	7842	BASEL	24515 BAKER	1964	122	6	39	X		310	42.00		x		6/25/64	driller-111	B	20	20	1	129		D	
												52.38	x			7/14/92	OWRD								
3S/1W-5 aab	CLAC	7807	EDY	24245 BAKER	1975	170	6	40	X	152	345	57.00		x		10/17/75	driller-404	P	60	92	2	128	52	D	
												79.14	x			10/1/92	OWRD								
3S/1W-5 aba	CLAC	7790	WIRFS-BROCK	24003 BAKER	1979	185	6	30	X	168	390	118.00		x		1/9/79	driller-404	P	30	47	2	144	58	D	water sample
												108.10	x			10/1/92	OWRD								from tank
3S/1W-5 aba	PMTN	2	SCHMEER	24005 BAKER		?	6				390	120.04	x			11/6/92	OWRD								no log
3S/1W-5 ccd	CLAC	7887	WOODCOCK	25960 LADD	1979	570	6	93	X	556	610	370.00		x		5/22/79	driller-404	A	20	180	2	140	52	D	
												370.00				7/25/79	Phillips Pump, repeating log entry?, owner says level was about 50 feet deeper than log								
												449.50				10/1/92	OWRD, no ccw, tape mark error?								
												453.69	x			10/19/93	OWRD, tape wet								
3S/1W-5 ccb	CLAC	7817	RICHARDS	25675 LADD	1973	215	6	70	P:52-70	70, 200	595	170.00				4/5/73	driller-111	B	16	45	1			D	
					1979	320				292		233.00				12/17/79	driller-404, deepening	A	25	300	2		52		CLAC 7792
					1981	600		341	X	542		380.00				11/12/81	driller-404, deepening	A	30	580	2		52		CLAC 7785
3S/1W-6 dbd	WASH	1904	TROUDT	17191 SQUIRREL	1970	230	6	82	X	206	340	166.00			x	8/6/70	driller-404	P	20	64	2		53	D	
					1990	290	4	285	P:265-285	230		180.00		x		11/7/90	driller-573	A	30	270	1	165	53		WASH 174
												179.38	x			7/10/92	OWRD								
3S/1W-6 dbd	WASH	1360	HANSEN	17140 SQUIRREL	1992	345	6	79/345	P:325-345	300	427	233.00		x		3/7/92	driller	A	50	340	1		53	D	
												235.24				7/10/92	OWRD								

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												238.81				10/27/92	OWRD								
												238.62				11/24/92	OWRD								
												237.38				12/21/92	OWRD								
												235.05				1/27/93	OWRD								
												233.94				2/25/93	OWRD								
												232.14				3/29/93	OWRD								
												229.77				4/29/93	OWRD								
												227.67				5/27/93	OWRD								
												227.61	x			6/29/93	OWRD								
												227.92				7/27/93	OWRD								
												232.91				8/25/93	OWRD								
												231.96				9/29/93	OWRD								
												233.78				10/26/93	OWRD								
3S/1W-6 dbc	WASH	1894	MUELLER	17270 SQUIR.	1972	230	6	42	X	218	340	119.00		x		10/10/72	driller-404	P	75	111	2	190		D	
												131.94	x			10/19/93	driller-404								
3S/1W-6 bbd	WASH	1881	ULRICH	24400 MIDDLE.	1967	110	6	56	X	16, 47, 57, 75	190	6.00		x		7/11/67	driller-111	B	13	88	1	210	54	D	
												19.30	x			3/11/93	OWRD								
3S/1W-6 bbd	WASH	1855	SADLER	18127 BROOK.	1988	165	6	59/165	P:?	95, 130	205	35.00		x		8/17/88	driller-645	A	40	165	1		56	DS	
												22.79	x			4/8/93	OWRD								
3S/1W-6 abb	WASH	864	SCOTT	17433 BROOK.	1976	200	6	49	X	186	210	32.00		x		6/5/76	driller-404	P	25	148	2		52	D	
												57.12	x			10/19/93	OWRD, off 25 minutes, rising very slowly								
3S/1W-7 aad	WASH	868	BRIGGS	16550 PARRETT	1983	715	6	74	X	240	730	430.00				6/17/83	driller-645	A	7.5	715	1	156	54	D	
												430.00				10/18/83	Phillips Pump								
3S/1W-7 bac	WASH	1361	MANKE #1	PARRETT	1992	760	6	205/622	P:440-600	450	708	418.00		x		3/12/92	driller-723	A	4	4	1		59	U	
												384.02				6/7/92	Luzier								
												384.22				6/26/92	Luzier								
												384.18				7/6/92	Luzier								
												364.20				4/22/93	OWRD, corrected from mismarked tape								
												358.21	x			10/21/93	OWRD								
3S/1W-7 bad	WASH	1363	MANKE #2	PARRETT	1992	622	6	230	P:450-510	461, 480	572	370.00		x		3/12/92	driller-723	A	8	622	1		56	U	liner length unclear
												385.99				6/7/92	Luzier								
												386.56				7/7/92	Luzier								
												386.61				7/8/92	Luzier								
												386.52				7/9/92	Luzier								
												386.50				7/11/92	Luzier								
												386.54				7/12/92	Luzier								
												392.70				9/15/92	OWRD								
												382.86	x			4/22/93	OWRD								
												385.57				10/21/93	OWRD								
3S/1W-7 bba	WASH	1366	MANKE #3	PARRETT	1992	573	6	219/573	P:420-573	405, 454, 490	506	322.00		x		3/9/92	driller-723	A	50	570	1	138	52	U	
												321.55				6/7/92	Luzier								
												323.74				7/7/92	Luzier								
												323.99				7/10/92	Luzier								
												323.67				7/11/92	Luzier								
												323.78				7/12/92	Luzier								
												326.96				9/15/92	OWRD								
												318.95	x			4/22/93	OWRD								
												322.23				10/21/93	OWRD								
3S/1W-7 bbc	WASH	1364	MANKE #4	PARRETT	1992	650	6	400	X	348, 558, 597	659	346.00				3/12/92	driller-723, wl bad	A	22	650	1		61	U	
												474.50		x		3/14/92	driller-723, corrected								WASH 1554
												469.88				3/15/92	Luzier								
												472.17				6/7/92	Luzier								
												474.30				6/29/92	OWRD								
												479.34				9/25/92	OWRD								
												470.24	x			4/22/93	OWRD								
												473.20				10/21/93	OWRD								
3S/1W-7 bac	WASH	1362	MANKE #6	PARRETT	1992	562	6	406/560	P:?	93, 530	659	396.00		x		3/12/92	driller-723	A	35	560	1		58	U	
												344.90				3/15/92	Luzier								
												318.35				6/7/92	Luzier								
												315.78				7/8/92	Luzier								
												315.52				7/9/92	Luzier								
												315.02				7/11/92	Luzier								
												314.90				7/12/92	Luzier								
												314.99				7/13/92	Luzier								
												296.91				4/22/93	OWRD								
												291.75	x			10/21/93	OWRD								
3S/1W-7 cbd	WASH	1948	MOZEICO	18484 PARRETT	1986	735	6	60/725	P:665-725	370, 440, 475	1020	460.00				4/18/86	driller-645	A	15	735	1	173	54	DS	
3S/1W-7 cdc	WASH	1915	MILLER	27940 HEATER	1972	436	6	64	X	425	880	375.00		x		3/9/72	driller-111	B	12	30	1	200			
												379.60				8/12/75	USGS								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												376.11	x			8/13/92	OWRD								
3S/1W-7 cab	WASH	1937	KIMBALL	18040 PARRETT	1964	640	6		X	600	985	475.00		x		5/27/64	driller-58, deepened	B	10	100	2	145		D	no original log
												535.37				6/19/92	OWRD								
												531.80				9/15/92	OWRD								
												536.20				10/27/92	OWRD								
												537.24				12/21/92	OWRD								
												536.80				1/28/93	OWRD								
												537.06				2/25/93	OWRD								
												536.43				3/30/93	OWRD								
												535.66				4/29/93	OWRD								
												534.44				5/28/93	OWRD								
												532.53				6/29/93	OWRD								
												531.92	x			7/28/93	OWRD								
												533.85				8/26/93	OWRD, idle for a week								
												534.12				9/30/93	OWRD								
												534.87				10/26/93	OWRD								
3S/1W-7 ccd	WASH	1912	SMITH	27795 HEATER	1961	475	6	75	X	460	910	300.00				12/4/61	driller-58	B	15	10	1	171		D	
3S/1W-7 aad	WASH	1924	WEIDENWEBER	16810 PARRETT	1984	445	6	75/445	P:365-445	220, 320	795	300.00		x		5/18/84	driller- 645	A	15	445	1	114	56	D	
												350.00				7/1/84	Phillips pump, approx. date								
												366.45				5/21/92	OWRD								
												372.08				9/10/92	OWRD								
												361.31	x			3/11/93	OWRD								
3S/1W-7 daa	WASH	1938	PUDERBAUGH	16860 PARRETT	1965	531	6	96	X	441, 482, 501	790	455.00			x	5/8/65	driller-68	B	13	20	1		54	D	
												420.00				12/11/80	Phillips Pump								
					1991	665				565		455.00		x		11/15/91	driller-645	A	8.5	625	1	160	53		WASH 1256
												432.01	x			6/30/92	OWRD								
												440.61				9/10/92	OWRD								
												448.00				12/29/93	K+C Pump								
3S/1W-7 aad	WASH	3458	BITZENBURGER	16675 PARRETT	1970	712	6	103	X	694	775	509.00				11/19/70	driller-79	A	9	700	2		64	D	
												590.00				5/13/93	Phillips Pump								
3S/1W-7 adc	WASH	1923	BUTLER	16900 PARRETT	1989	605	6	67	X	115, 155, 585	825	370.00		x		5/22/89	driller-645	A	15	605	1	162	56	D	
												294.21				7/8/92	OWRD,accurate?,ccw								
												413.71	x			10/19/93	OWRD								
3S/1W-7 aac	WASH	1946	NIXON	16785 PARRETT	1987	515	6	87	X	440, 460, 495	780	355.00		x		11/9/87	driller-645	A	6	515	1	140	54	D	
												340.00				12/4/89	Phillips Pump								
												350.00				5/28/92	Phillips Pump								
												335.34	x			6/30/92	OWRD								
												339.63				9/15/92	OWRD								
												336.86				11/12/92	OWRD								
												339.01				12/11/92	OWRD								
												335.74				4/22/93	OWRD								
3S/1W-7 aaa	WASH	3150	BURTON/BROOKS	26005 LADD	1971	260	6	69	X	210	720	195.00		x		8/3/71	driller-1	B	12	65	2	95	53	D	
												211.80				8/17/78	OWRD								
												197.00				7/21/86	Phillips pump								
												198.28	x			5/19/92	OWRD								
3S/1W-7 cab	WASH	1807	HUSBAND	27110 HEATER	1975	710	6	35	X	676	962	478.00				8/8/75	driller-404	P	10	212	2	170	52	D	
												480.35		x		8/12/75	USGS								
												483.09				8/14/92	OWRD								
												481.72	x			11/19/92	OWRD								
3S/1W-7 daa	WASH	1158	IMBRIE	27005 LADD	1991	505	6	36/505	P:440-505	460	700	380.00		x		5/3/91	driller-353	A	10	500	1	152	54	D	
												352.60	x			7/16/92	OWRD								
3S/1W-7 aad	WASH	1949	JOHNSON	16785 PARRETT	1987	805	6	105	X	705	760	580.00		x		4/14/87	driller-645	A	5.5	705	1	170	54	D	
												586.30				6/16/92	OWRD, ccw								
												593.42				10/27/92	OWRD, no ccw								
												591.68				12/21/92	OWRD								
												588.52	x			3/2/93	OWRD								
												590.49				3/30/93	OWRD								
												591.56				4/29/93	OWRD								
3S/1W-7 cbc	WASH	1359	WHIPPLE	PARRETT	1992	630	6	149/630	P:610-630	610	1020	442.00		x		3/7/92	driller-1266	A	15	625	1		55	D	
												460.93				6/30/92	OWRD								
												452.58				7/10/92	OWRD								
												457.15	x			7/14/92	OWRD								
												457.04				9/10/92	OWRD								
												460.59				1/11/93	OWRD								
3S/1W-7 dbc	WASH	1929	AUEL	17410 PARRETT	1986	485	6	40	X	115, 415	820	335.00		x		11/11/86	driller-645	A	30	485	1	155	55	D	
												330.00				8/3/87	Phillips Pump								
												330.67	x			9/10/92	OWRD, ccw								
3S/1W-7 dbb	WASH	1942	BACH	17440 PARRETT	1978	200	6	60/200	P:160-120	178	880	158.00		x		4/28/78	driller-404	A	10	200	2	105	52	D	
												125.00				5/11/78	Phillips Pump								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												144.04				8/25/92	OWRD								
												146.93				10/27/92	OWRD								
												146.48				11/24/92	OWRD								
												148.47				12/21/92	OWRD								
												142.86				1/28/93	OWRD								
												139.66				2/25/93	OWRD								
												141.49				3/30/93	OWRD								
												134.11				4/29/93	OWRD								
												131.95	x			5/28/93	OWRD								
												133.47				6/29/93	OWRD, rising slowly								
												134.65				7/28/93	OWRD								
												137.85				8/26/93	OWRD								
												142.60				9/30/93	OWRD								
												144.66				10/26/93	OWRD								
3S/1W-7 dab	WASH	1930	BARRON #1	27015 LADD	1986	110	6	46/110	P:90-110	67	780	50.00				6/1/86	driller-604	B	4	35	2			S	
3S/1W-7 dab	WASH	1939	BARRON #2	27015 LADD	1986	492	6	38/492	P:472-492	458	750	400.00				7/7/86	driller-604	B	15	10	2			D	
3S/1W-7 adb	WASH	1920	BENNETT	16840 PARRETT	1975	410	8	90	X	399	805	335.00		x		2/13/75	driller	B	80	5	2	66	62	D	
												348.28	x			10/9/92	OWRD, ccw								
3S/1W-7 cdd	WASH	1806	BULLOCH	28189 HEATER	1974	430	8	27	X	92, 230, 360, 395	825	338.00				6/25/74	driller-79	A	25	62	2		52	D	
												208.00				3/31/88	Phillips Pump								
3S/1W-7 dac	WASH	1947	ENGELS	27055 LADD	1975	530	6	32	X	494	735	391.00		x		12/13/75	driller-404	P	15	120	2	240	54	D	
												383.25	x			10/23/92	OWRD								
												383.32				1/12/93	OWRD								
3S/1W-7 aaa	WASH	1945	HIX	26045 LADD	1987	685	6	80	X	220, 555, 665, 670	710	550.00				8/10/87	driller-645	A	12	685	1		52	D	
3S/1W-7 dac	WASH	1943	HOFTIEZER	27025 LADD	1978	570	6	49/570	P:530-570	525	755	420.00		x		3/8/78	driller-79	A	30	570	2		52	D	
												407.80	x			11/19/92	OWRD								
3S/1W-7 dda	PMTN	8	LANDIS	27675 LADD		8	8	550			685	486.70				10/15/92	OWRD, owner reported depth						141	D	no log
												492.30	x			10/19/93	OWRD								
3S/1W-7 cbd	WASH	865	MONTAGUE	18470 PARRETT	1984	705	6	40	X	325	1010	435.00		x		8/10/84	driller-645	A	18	705	1		48	D	
												444.59	x			10/23/92	OWRD								
3S/1W-7 cdb	WASH	1926	PAULSON	27700 HEATER	1986	615	6	66	X	455	905	410.00		x		7/18/86	driller-645	A	28	615	1	168	56	D	
												410.00				7/21/86	Phillips Pump								
												400.65	x			10/23/92	OWRD								
3S/1W-7 aaa	WASH	1913	RIEGER	26035 LADD	1974	520	6	67	X	513	710	405.00		x		9/26/74	driller-1	B	15	65	1	131	53	D	
												382.27	x			10/22/92	OWRD, ccw								
3S/1W-7 ddb	WASH	1941	ROBERG	27865 LADD	1983	480	6	67/480	P:440-475	455	740	400.00		x		9/30/83	driller	A	30	460	1	109	52	D	
												400.00				8/19/86	Phillips Pump, approx. date								
												390.21				10/15/92	OWRD, ccw								
												386.58	x			12/11/92	OWRD								
3S/1W-7 adc	WASH	1927	SOUTHWELL	16850 PARRETT	1985	615	6	72/615	P:555-615	80, 446, 466, 584	805	348.00		x		5/28/85	driller-296	A	15	614	1	160	56	D	
												362.07	x			10/9/92	OWRD								
3S/1W-7 dca	WASH	1906	THEUS	27605 170th	1984	560	6	75/560	P:515-560	515, 550, 555	775	430.00				9/29/84	driller	A	15	540	1	137	52	D	
3S/1W-7 dad	WASH	1933	WALKER	27115 LADD	1982	460	6	60	X	431	710	415.00		x		3/28/82	driller-404	A	25	45	1	240	52	D	
												357.15	x			10/9/92	OWRD								
3S/1W-7 dad	WASH	1916	WENTZ	27085 LADD	1979	700	6	19/700	P:690-700	440, 540, 660	725	400.00		x		5/17/79	driller-79	A	40	280	2		60	D	
												372.99	x			11/12/92	OWRD								
3S/1W-7 dab	WASH	1921	WAHL	16980 PARRETT	1978	565	6	47	X	60, 275	800	340.00		x		7/19/78	driller-645	A	12	566	1		52	D	
												375.00				7/1/85	owner, 1985 pump work								
												427.00				7/30/86	Phillips Pump, approx. date								
												380.91	x			11/19/92	OWRD, ccw								
3S/1W-7 ddd	PMTN	9	HALL	27815 LADD	?	200	6				685	54.34	x			4/8/93	OWRD, owner reported depth							D	no log
3S/1W-8 abd	CLAC	7927	SMEED	26464 MCCON.	?	358	6	70			525	280.00		x		10/7/57	driller-79, deepened					357	54	D	no original log
												277.57	x			6/16/92	OWRD, ccw								
3S/1W-8 daa	CLAC	7888	GILMORE	27264 147th	1978	405	6	40	X	120	505	110.00			x	3/17/78	driller-645	A	15	405	1		58	D	
					1990	445	4	445	P:425-445	440		340.00		x		9/4/90	driller-573	A	15	430	1		56		CLAC 208
												342.44	x			9/10/92	OWRD								
3S/1W-8 abd	CLAC	7901	CRECRAFT	26328 MCCON.	1973	470	6	75	X	456	495	315.00		x		9/18/73	driller-404	P	35	62	2	160	54	D	
												330.00				8/5/88	Phillips Pump								
												334.91	x			5/20/92	OWRD								
												336.73				9/15/92	OWRD								
												339.97				3/11/93	OWRD								
												339.78				4/15/93	OWRD								
3S/1W-8 abc	CLAC	7911	SMITH	26363 MCCON.	1977	470	6	60	X	424	525	212.00				9/27/77	driller-404	A	12	238	2	150	52	D	
												359.00				9/2/88	Phillips Pump								
3S/1W-8 abc	CLAC	7918	ROGERS	15425 PLEAS.	1975	455	6	75	X	406	565	212.00		x		8/14/75	driller	P	36	223	2	197	52	DI	
												212.00				12/19/79	PGE								
												244.00				8/15/86	Phillips Pump								
												293.80				5/27/92	OWRD								
												285.55				8/13/92	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												273.99				10/27/92	OWRD								
												262.56				11/23/92	OWRD								
												250.98				12/21/92	OWRD								
												238.88				1/27/93	OWRD								
												233.51				2/25/93	OWRD								
												226.55				3/29/93	OWRD								
												223.37	x			4/28/93	OWRD								
												226.69				5/27/93	OWRD								
												229.97				6/28/93	OWRD								
												237.82				7/27/93	OWRD								
												253.94				8/26/93	OWRD, off overnight, heavy use this month, ccw above wl								
												269.93				9/29/93	OWRD								
												277.82				10/26/93	OWRD								
3S/1W-8 dad	CLAC	7903	ROSE	27345 145th	1970	375	6	76	X	358	493	295.00		x		4/28/70	driller-1	B	24	30	1	130	54	D	
												314.20				8/14/75	USGS								
												325.40	x			9/10/92	OWRD								
3S/1W-8 bba	CLAC	7908	WILLIAMS	16031 PLEAS.	1971	260	6	82	X	243	620	146.00		x		7/31/71	driller	P	50	114	2		53	U	
												181.85				8/17/79	OWRD								
												190.60				4/2/80	OWRD								
												203.51				9/16/80	OWRD								
												192.93				4/23/81	OWRD, ppg								
												202.33				10/7/81	OWRD								
												200.53				5/15/82	OWRD								
												205.10				9/29/82	OWRD								
												196.85				4/29/83	OWRD								
												202.60				9/22/83	OWRD								
												197.34				5/17/84	OWRD								
												201.79				6/5/85	OWRD								
												202.65				10/3/85	OWRD								
												197.41				6/4/86	OWRD								
												201.55				6/16/87	OWRD								
												211.60				6/17/88	OWRD								
												208.55				10/27/88	OWRD								
												205.68				5/30/90	OWRD								
												197.79				5/15/91	OWRD								
												235.48	x			10/27/92	OWRD								
												237.20				11/30/92	OWRD								
												237.44				12/21/92	OWRD								
												238.31				1/27/93	OWRD								
												238.96				3/2/93	OWRD								
												239.43				3/29/93	OWRD								
												239.24				4/28/93	OWRD								
												238.98				5/27/93	OWRD								
												239.96				6/28/93	OWRD								
												240.72				7/27/93	OWRD								
												242.24				8/25/93	OWRD								
												243.95				9/30/93	OWRD								
												245.25				10/26/93	OWRD								
3S/1W-8 ccd	CLAC	7873	UGORETZ	16293 BELL	1988	225	6	60/225	P:180-225	180, 200	620	100.00		x		4/18/88	driller-616	A	20	220	4	85		D	
												134.98	x			8/13/92	OWRD								
3S/1W-8 ccb	CLAC	7874	SUMNER	27400 LADD	1988	595	6	46	X	80, 150, 330	675	480.00				3/2/88	Phillips Pump	A	8	595	1	120	56	D	
												480.00				10/27/88	driller-645, added to report, originally omitted								
3S/1W-8 bbc	CLAC	11961	LANGSTON	26300 LADD	1991	568	6	132	X	100, 365, 498, 541	685	292.00		x		7/25/91	driller-573	A	60	565	1	115	55	D	
												307.21	x			7/10/92	OWRD								
												308.35				9/15/92	OWRD, ccw								
3S/1W-8 dba	CLAC	7875	BAKER	27227 XANTHUS	1988	305	6	59	X	115, 240, 265	560	180.00		x		2/23/88	driller-645	A	15	305	1	123	57	D	
												180.00				3/3/88	Phillips Pump								
												191.86	x			8/25/92	OWRD, ccw								
3S/1W-8 bad	CLAC	18431	BARNETT	15751 PLEAS.	1959	200	6	99	X	193	575	155.00		x		5/8/59	driller-1	B	25	10	2	73	66	D	
												165.00				6/30/87	Phillips Pump								
												161.85	x			7/16/92	OWRD								
3S/1W-8 aba	CLAC	6004	FEVES	26300 MCCON.	1991	415	6	59	X	340, 365	470	315.00		x		4/24/91	driller-645	A	20	415	1		55	D	
												304.61	x			7/16/92	OWRD								
3S/1W-8 dba	CLAC	7928	GROSS	14900 TOOZE	1976	405	6	78	X	187	510	200.00		x		6/14/76	driller-500	P	10	200	1			D	
												350.08	x			8/14/92	OWRD, ccw								
					1992	436		/436	P:416-436			318.00				9/17/92	driller-1492	A	10	436	1	130	53		CLAC 18081
3S/1W-8 cbb	CLAC	7931	KIDD	27270 LADD	1968	470	6	60	X	334, 457	660	312.00		x		3/7/68	driller-404	P	15	158	1	167	52	D	
												305.65				8/14/75	USGS								
												307.15	x			8/13/92	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
3S/1W-8 cbd	CLAC	17756	KIEFEL	LADD	1992	330	6	42/330	P:310-330	306	636	272.00		x		3/10/92	driller-1266	A	22	330	1			U	
												266.95	x			7/10/92	OWRD								
3S/1W-8 cdc	CLAC	7871	PHILPOT	16203 BELL	1988	305	6	79/302	P:245-275	90, 110, 260	620	85.00		x		5/23/88	driller-645	A	33	305	1		56	D	
												241.17				8/14/92	OWRD, ccw								
												239.21				10/27/92	OWRD, ccw								
												240.38				11/23/92	OWRD, ccw								
												239.90				12/22/92	OWRD								
												238.96				1/28/93	OWRD								
												238.12				3/2/93	OWRD, ccw								
												237.11				3/30/93	OWRD								
												235.64				4/29/93	OWRD								
												234.26	x			5/28/93	OWRD								
												235.54				6/29/93	OWRD								
												237.20				7/28/93	OWRD								
												240.76				8/26/93	OWRD								
												241.98				9/29/93	OWRD								
												242.22				10/27/93	OWRD								
3S/1W-8 aca	CLAC	7895	TIDBALL	26700 MCCON.	1976	508	6	63	X	272	540	400.00				6/23/76	driller-511	P	12	100	2	143	58	DS	
3S/1W-8 bbc	CLAC	7904	ALLEN	16351 PLEAS.	1969	282	6	58	X	256	665	165.00		x		8/7/69	driller-404	P	20	117	2	103	54	D	
												224.51	x			10/8/92	OWRD								
3S/1W-8 dda	CLAC	7892	BEACH	27626 147th	1973	333	6	25	X	95	460	275.00		x		6/15/73	driller-511	P	20	50	2	125	52	D	
												225.00				7/1/89	pump installer for 1989, accurate?								
												295.39	x			10/15/92	OWRD								
3S/1W-8 dba	CLAC	7879	COWGILL/GRONER	27080 XANTHUS	1987	405	6	51/405	P:345-375	15, 150, 305, 355, 39	560	110.00		x		7/9/87	driller-645	A	16	405	1	96	56	D	
												117.00				9/21/87	Phillips Pump								
												195.40	x			10/1/92	OWRD								
3S/1W-8 bca	CLAC	7893	DAY	16110 PLEAS.	1973	315	6	53	X	305	640	240.00				6/27/73	driller-511	P	40	70	2		52	D	
3S/1W-8 cdb	CLAC	8243	GIFFORD	16245 BELL	1989	330	6	118/330	P:310-330	257, 302, 315	590	210.00		x		7/10/89	driller-1266	A	22	325	1.5	158	58	D	
												226.76	x			10/1/92	OWRD								
3S/1W-8 bda	CLAC	7932	HOFFMAN	15730 PLEAS.	1967	155	6	78	X	136	555	74.00		x		10/24/67	driller-404	P	36	81	1	92	52	D	
												100.00				7/28/85	Phillips Pump								
												77.00				7/1/87	owner's recollection in year								
												100.00				9/1/91	owner's recollection								
												100.00				2/18/92	owner's recollection								
												104.71	x			10/1/92	OWRD, ccw								
3S/1W-8 bda	CLAC	18118	KELLY	15560 PLEAS.	1980	200	6	59/200	P:181-196	54, 112	560	55.00		x		6/24/80	driller-703	A	13.5	200	1.5	121	52	D	
												54.85	x			10/9/92	OWRD								
3S/1W-8 cbc	CLAC	9092	MOOERS	27373 LADD	1967	192	6	28	X	62, 146	695	81.00			x	9/8/67	driller-404	P	6	111	1		53	D	
					1967	470				448		361.00		x		11/16/67	driller 404	P	12	110	1	115	52		CLAC 9093
												245.00				10/19/89	Phillips Pump, accurate?								
												337.78	x			10/1/92	OWRD								
3S/1W-8 daa	CLAC	7883	THEIM	14560 TOOZE	1986	465	6	60	X		505	280.00		x		5/2/86	driller-645	A	18	465	1	110	53	D	
												341.79	x			10/23/92	OWRD, ccw								
3S/1W-8 dbb	PMTN	10	THOMSEN	27101 XANTHUS	?	200	6				565	101.00		x		2/23/87	Phillips Pump, depth info from Phillips					68	52	D	no log
												120.00	x			11/5/92	OWRD								
3S/1W-8 abb	CLAC	7900	COVEY/HART	26189 MCCON.	1978	365	6	60	X	344	465	292.00		x		2/6/78	driller-404	A	12	53	2		52	D	
												290.00				4/10/78	Phillips Pump								
												303.00				10/31/86	Phillips Pump								
												299.85	x			1/11/93	OWRD								
3S/1W-8 bac	CLAC	7885	LANGSTON	15995 PLEAS.	1979	540	8	85	X	510	595	142.00		x		11/21/79	driller-404	A	200+	520	2	102	52	D	
												250.00				6/25/80	Phillips Pump, accurate?								
												231.75	x			3/18/93	OWRD								
3S/1W-8 bac	CLAC	7921	LANGSTON	15995 PLEAS.	1966	155	6	55	X		595	14.00		x		3/17/66	driller-247	B	20	40	1			U	
												144.11	x			3/18/93	OWRD, puddle on bottom								
3S/1W-8 bbd	CLAC	7907	WILLIAMS	16031 PLEAS.	1971	340	6	60	X	290	650	93.00			x	7/30/71	driller	P	15	247	2		53	D	
												179.00				8/17/78	OWRD, off 5 days								
												195.00				8/17/79	OWRD, ppg								
					1983	450	8	80	X	424		241.00		x		5/6/83	driller, deepening	A	200+	450	1		52		CLAC 7926
												244.50				9/22/83	OWRD								
												271.31	x			4/8/93	OWRD								
3S/1W-8 bbd	CLAC	7902	WILLIAMS	16031 PLEAS.	1981	436	8	60	X	418	655	212.00		x		7/3/81	driller	A	200	400	2		52	D	
												273.94	x			4/8/93	OWRD								
3S/1W-8 bba	CLAC	14427	WILLIAMS	16031 PLEAS.	1991	590	8	279		320, 465, 565	620	250.00		x		10/29/91	driller-573	A	100	270	2			D	
												268.00	x			7/27/93	OWRD								
3S/1W-8 abc	PMTN	3	SMITH	26363 MCCON.	?	?	6				525	148.46	x			5/20/92	OWRD, owner said yield dropped								no log
3S/1W-9 bad	CLAC	7968	GOLDBECK	26281 BAKER	1964	200	6	77	X	165	400	105.00		x		7/2/64	driller-82	B	36	55	1	100	54	D	
												94.30				8/14/75	OWRD, questionable								
												119.27				7/19/76	OWRD								
												119.97				10/10/76	OWRD								

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												119.23				10/11/76	OWRD								
												119.54				1/18/77	OWRD								
												118.72				4/18/77	OWRD								
												112.84				1/27/78	OWRD								
												113.66				4/11/78	OWRD								
												119.30				10/9/78	OWRD								
												115.82				4/19/79	OWRD								
												118.53	x			10/8/92	OWRD								
3S/1W-9 bcd	CLAC	7957	WARD	14235 TOOZE	1975	395	6	65	X	372	485	307.00		x		4/23/75	driller-404	P	25	68	2	357	52	D	
												320.00				9/24/85	owner's pump work info								
												316.00				9/24/85	Phillips Pump								
												316.00				7/13/89	owner's pump work info								
												318.47	x			5/26/92	OWRD								
3S/1W-9 dac	CLAC	7960	BURDA	12350 TOOZE	1971	230	6	65	X	198	330	156.00			x	4/27/71	driller-404	P	20	74	2		52	D	
												162.80				8/14/75	USGS								
					1981	315				302		162.00		x		7/7/81	driller-404, deepening	A	45	315	2		52		CLAC 7940
												178.80	x			10/21/93	OWRD								
3S/1W-9 adc	CLAC	7966	RISBURG	12901 TOOZE	1973	335	6	43	X	314	385	224.00		x		6/22/73	driller	P	24	14	2	100	54	D	
												233.67				6/29/76	OWRD, ppg								
												220.07				10/11/76	OWRD								
												218.87				1/18/77	OWRD								
												226.71				4/18/77	OWRD								
												235.28				7/19/77	OWRD, ppg								
												221.61				10/10/77	OWRD								
												220.52				1/24/78	OWRD								
												218.67				4/3/78	OWRD								
												220.48				10/9/78	OWRD								
												218.51				4/19/79	OWRD								
												219.00				4/2/80	OWRD								
												222.38				9/17/80	OWRD								
												219.40				4/16/81	OWRD								
												223.30				10/7/81	OWRD								
												219.40				4/15/82	OWRD								
												223.85				9/30/82	OWRD								
												220.00				4/29/83	Phillips Pump								
												217.96				5/4/83	OWRD								
												221.35				9/23/83	OWRD								
												219.08				5/17/84	OWRD								
												220.50				6/5/84	OWRD								
												226.50				10/3/85	OWRD								
												221.55				6/4/86	OWRD								
												225.02				6/16/87	OWRD								
												224.82				6/17/88	OWRD								
												231.66				10/13/88	OWRD								
												228.14				5/30/90	OWRD								
												238.50				10/28/92	OWRD								
												238.57				11/23/92	OWRD								
												237.47				12/21/92	OWRD								
												237.19				1/27/93	OWRD								
												235.82				2/25/93	OWRD								
												235.24				3/29/93	OWRD								
												230.43				4/28/93	OWRD, questionable								
												234.87	x			5/27/93	OWRD								
												235.35				6/28/93	OWRD								
												237.15				7/27/93	OWRD								
												239.64				8/25/93	OWRD								
												241.59				9/29/93	OWRD								
												242.36				10/26/93	OWRD								
3S/1W-9 dbc	CLAC	7965	BACON	27464 BAKER	1974	335	6	51/200	X	302	415	165.00		x		6/15/74	driller-404	P	12	150	2	120	56	D	
												242.45	x			10/15/92	OWRD, ccw								
3S/1W-9 aab	CLAC	9128	BIRKELAND	26010 BAKER	1959	140	6	45	X	125	290	52.00		x		8/11/59	driller-117	B	12	120	1	113	54	DS	
												109.46	x			10/8/92	OWRD								
3S/1W-9 abd	CLAC	7944	BROWN	26400 BAKER	1977	132	6	56	X	125	360	67.00		x		5/26/77	driller-533	B	20	33	1.5		54	D	
												65.00				11/7/91	PUMP SHOP	P	5.5	25	4				Pump Shop
												67.76	x			11/12/92	OWRD								
3S/1W-9 dcc	CLAC	7943	HANSEN	27972 BAKER	1980	445	6	47/160	X	270	380	240.00		x		2/12/80	driller-722	A	30	305	1	167	54	D	
												208.19	x			11/5/92	OWRD								
3S/1W-9 dac	CLAC	7941	LUNDY	12300 TOOZE	1981	340	6	40	X	314	330	150.00		x		7/7/81	driller-404	A	35	340	2	169	52	D	
												180.03	x			10/9/92	OWRD								

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3S/1W-9 abc	CLAC	7952	MARTINSON	26280 BAKER	1977	400	6	60	X	384	405	206.00		x		5/11/77	driller-404	A	40	174	2	120	52	D	
												241.29	x			10/22/92	OWRD								
3S/1W-9 cac	CLAC	7958	MEYER	27525 BAKER	1978	425	6	60	X	320	465	280.00				8/10/78	driller-645	A	75	425	1		55	DS	
3S/1W-9 cad	CLAC	7949	MEYER	27525 BAKER	1969	480	6	80	X	432	465	281.00		x		7/10/69	driller-117	A	12	480	1			D	
												304.36	x			10/22/92	OWRD								
3S/1W-9 cda	CLAC	7948	MEYER	27731 BAKER	1969	425	6	44	X		425	240.00		x		11/26/69	driller-117	A	37		1	104	54	D	
												260.99	x			10/22/92	OWRD, ccw								
3S/1W-9 baa	CLAC	7946	MILLER	26065 BAKER	1971	235	6	48	X	70	375	136.00		x		5/20/71	driller-117	A	10	235	1	110	52	D	
												140.00				6/30/87	Phillips Pump								
												140.80	x			10/15/92	OWRD, ccw								
3S/1W-9 dbc	CLAC	7951	REITZ	27196 BAKER	1963	245	6	80	X		395	134.00		x		4/28/63	driller-99	B	13	35	2.5		53	D	
												133.09	x			11/19/92	OWRD								
3S/1W-9 cbc	CLAC	7959	SMITH	27360 145th	1979	335	6	45	X	305	470	178.00		x		3/21/79	driller-404	A	20	137	2	93	52	D	
												178.00				9/28/79	Phillips Pump								
												199.57	x			10/5/92	OWRD								
3S/1W-9 acc	CLAC	7963	TAYLOR	26770 BAKER	1968	435	6	80	X	330, 412	455	262.00			x	3/2/68	driller-404	P	15	173	1		52	D	
												290.50				6/29/76	OWRD								
												276.00				7/19/76	OWRD								
												270.00				10/10/76	OWRD								
												270.00				10/11/76	OWRD								
												271.00				1/18/77	OWRD								
												269.00				4/18/77	OWRD								
												270.00				1/27/78	OWRD								
												269.00				4/11/78	OWRD								
												270.00				10/9/78	OWRD								
												267.00				4/19/79	OWRD								
					1983	540				506		440.00				6/27/83	driller-404, mmt ??	A	40	540	1		52		CLAC 7937
												268.00		x		6/28/83	Phillips Pump, approx date, just deepened								
												275.00				1/4/92	Phillips Pump								
												275.00				4/4/92	owner's record of pump work								
												274.75	x			7/8/92	OWRD								
3S/1W-9 dba	CLAC	1435	STEVENSON	13100 TOOZE	1990	405	6	57.5	X	290, 395	376	220.00		x		10/17/90	driller-645	A	30	405	1	190	57	D	
												221.84	x			1/12/93	OWRD								
3S/1W-10 dcc	CLAC	8014	BISCHOF	11650 TOOZE	1970	230	6	70	X	166	185	39.00				6/2/70	driller-404	P	60	191	2		52	D	
												41.73				1/18/77	OWRD								
												41.61				4/18/77	OWRD								
												39.10				1/27/78	OWRD								
												40.09				4/11/78	OWRD								
												41.81				10/9/78	OWRD								
												45.92				11/12/91	pump test submittal	P	35	34	4				
3S/1W-10 ccd	CLAC	8009	SOROKOVSKY	12041 TOOZE	?	115	6				250	70.02			x	7/11/51	USGS								
												70.52				7/17/51	USGS								
												70.95				8/15/51	USGS								
												71.91				9/27/51	USGS								
												72.97				10/24/51	USGS								
												72.66				11/26/51	USGS								
												72.24				12/19/51	USGS								
												71.98				1/15/52	USGS								
												70.84				2/20/52	USGS								
												70.08				3/19/52	USGS								
												70.04				4/28/52	USGS								
												71.07				7/1/52	USGS								
												71.70				8/1/52	USGS								
												72.03				8/22/52	USGS								
												72.94				9/27/52	USGS								
												73.61				10/30/52	USGS								
												74.06				11/28/52	USGS								
												74.90				12/23/52	USGS								
												74.08				2/4/53	USGS								
												72.97				3/2/53	USGS								
												71.73				5/5/53	USGS								
												72.06				6/2/53	USGS								
												72.04				7/1/53	USGS								
												73.41				9/1/53	USGS								
												73.74				10/5/53	USGS								
												74.56				12/7/53	USGS								
												72.56				2/4/54	USGS								
												70.55				4/20/54	USGS								
												71.05				7/15/54	USGS								

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												72.67				9/29/54	USGS								
												71.94				3/22/55	USGS								
												70.91				5/29/55	USGS								
												72.11				8/3/55	USGS								
												72.80				9/6/55	USGS								
												73.41				11/25/55	USGS								
												72.27				12/20/55	USGS								
												69.46				2/18/56	USGS								
												68.42				5/12/56	USGS								
												70.65				8/20/56	USGS								
												72.87				12/23/56	USGS								
												71.11				6/25/57	USGS								
												73.69				9/25/57	USGS								
												73.94				10/11/57	USGS								
												74.18				12/16/57	USGS								
												74.30				1/9/58	USGS								
												71.29				4/2/58	USGS								
												71.89				4/21/58	USGS								
												71.41				5/1/58	USGS								
												71.60				5/29/58	USGS								
												71.97				5/30/58	USGS								
												72.14				7/8/58	USGS								
												73.27				8/7/58	USGS								
												76.25				9/3/58	USGS, ppg								
												74.58				9/29/58	USGS								
												74.95				9/30/58	USGS								
												75.26				10/28/58	USGS								
												75.82				11/26/58	USGS								
												75.25				12/22/58	USGS								
												75.22				1/13/59	USGS								
												75.04				1/14/59	USGS								
												74.55				1/30/59	USGS								
												73.06				3/10/59	USGS								
												72.40				4/7/59	USGS								
												71.94				4/20/59	USGS								
												71.94				4/22/59	USGS								
												71.98				5/7/59	USGS								
												71.82				6/2/59	USGS								
												71.80				6/23/59	USGS								
												74.55				6/30/59	USGS								
												72.30				7/23/59	USGS								
												73.68				8/25/59	USGS								
												73.38				9/4/59	USGS								
												74.41				10/6/59	USGS								
												75.56				11/24/59	USGS								
												75.62				12/27/59	USGS								
												75.79				1/5/60	USGS								
												75.12				1/26/60	USGS								
												73.56				3/23/60	USGS								
												73.15				4/6/60	USGS								
												72.72				7/12/60	USGS								
												76.00				10/12/60	USGS								
												75.35				10/18/60	USGS								
												74.67				1/17/61	USGS								
												73.82				2/20/61	USGS								
												70.52				5/6/61	USGS								
												70.77				5/23/61	USGS								
												73.20				7/27/61	USGS								
												71.59				9/19/61	USGS								
												75.75				10/13/61	USGS								
												75.95				1/15/62	USGS								
												75.50				2/26/62	USGS								
												74.74				3/30/62	USGS								
												76.25				8/1/62	USGS								
												77.19				11/19/62	USGS								
												74.59				2/19/63	USGS								
												73.38				4/23/63	USGS								
												74.88				8/1/63	USGS								
												76.40				11/13/63	USGS								

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												74.09				2/10/64	USGS								
												72.35				4/30/64	USGS								
												75.20				7/29/64	USGS								
												77.46				10/27/64	USGS								
												76.28				1/22/65	USGS								
												74.06				4/28/65	USGS								
												76.75				7/23/65	USGS								
												78.67				11/1/65	USGS								
												77.44				1/26/66	USGS								
												75.44				4/26/66	USGS								
												79.28				7/27/66	USGS								
												80.35				10/25/66	USGS								
												78.68				1/31/67	USGS								
												76.32				4/25/67	USGS								
												79.45				7/18/67	USGS								
												81.15				10/18/67	USGS								
												80.42				1/16/68	USGS								
												77.75				4/16/68	USGS								
												79.21				7/17/68	USGS								
												80.46				10/15/68	USGS								
												76.26				1/21/69	USGS								
												74.62				4/15/69	USGS								
												76.55				7/15/69	USGS								
												80.36				10/15/69	USGS								
												79.10				1/27/70	USGS								
												75.65				4/14/70	USGS								
												80.45				7/21/70	USGS								
												82.46				10/20/70	USGS								
												81.25				1/25/71	USGS								
												77.42				4/20/71	USGS								
												78.83				7/21/71	USGS								
												82.30				10/14/71	USGS								
												80.55				1/18/72	USGS								
												80.98				9/8/72	USGS								
												83.33				1/18/73	USGS								
												83.14				6/4/73	USGS								
												81.36				7/16/74	USGS								
												91.26				10/17/74	USGS								
												85.07				1/21/75	USGS								
												81.36				4/14/75	USGS								
												84.29				7/14/75	USGS								
												88.48				10/21/75	USGS								
												85.59				1/19/76	USGS								
												82.21				4/20/76	USGS								
												85.85				7/26/76	USGS								
												88.07				10/11/76	USGS								
												87.52				1/18/77	USGS								
												87.18				3/17/77	USGS								
												85.95				4/18/77	OWRD								
												89.13				7/19/77	OWRD								
												90.25				10/10/77	OWRD								
												87.23				1/27/78	OWRD								
												84.05				4/13/78	OWRD								
												88.82				10/9/78	OWRD								
												85.17				4/19/79	OWRD								
												90.26				7/12/79	OWRD								
												85.35				3/28/80	OWRD								
												92.64				10/5/80	OWRD								
												92.64				10/5/80	OWRD								
												85.10				4/16/81	OWRD								
												92.42				10/19/81	OWRD								
												84.93				4/15/82	OWRD								
												93.60				10/1/82	OWRD								
												92.95				10/13/82	OWRD								
												87.37				3/8/83	OWRD								
												85.05				4/29/83	OWRD								
												90.20				9/23/83	OWRD								
												89.84				10/20/83	OWRD								
												84.51				5/17/84	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												84.11				5/21/84	OWRD								
												91.21				10/17/84	OWRD								
												87.10				4/25/85	OWRD								
												94.45				10/24/85	OWRD								
												88.90				4/25/86	OWRD								
												90.47				4/23/87	OWRD								
												101.06				10/1/87	OWRD								
												96.76				4/13/88	OWRD								
												99.28				7/25/88	OWRD								
												100.23				7/30/88	OWRD								
												101.42				8/10/88	OWRD								
												102.60				8/18/88	OWRD								
					1988	244						106.00		x		9/7/88	driller-649	A	20	244	1		55	D	CLAC 7979
												104.53				10/10/88	OWRD								
												96.79				4/20/89	OWRD								
												102.06				4/11/90	OWRD								
												104.66				2/15/91	OWRD								
												110.17				9/20/91	OWRD								
												104.13				2/19/92	OWRD								
												103.40				4/1/92	OWRD								
												110.03				7/22/92	OWRD								
												111.53				10/21/92	OWRD								
												111.08				10/28/92	OWRD								
												111.10				11/23/92	OWRD								
												109.58				12/21/92	OWRD								
												109.91				1/22/93	OWRD								
												108.22				1/29/93	OWRD								
												107.32				2/25/93	OWRD								
												105.78				3/29/93	OWRD								
												105.13				4/5/93	OWRD								
												103.61				4/28/93	OWRD								
												101.96				5/27/93	OWRD								
												101.52	x			6/28/93	OWRD								
												103.30				7/26/93	OWRD								
												111.95				10/14/93	OWRD, ppg								
												111.54				10/26/93	OWRD								
3S/1W-10 cbc	CLAC	8016	AMATO	12335 TOOZE	1972	170	6	46	X	156	285	120.00				10/24/72	driller-404	P	12	50	2		53	D	
3S/1W-10 cdc	CLAC	8012	HOUGH	27818 GRAHAMS	1964	212	6	79.6	X	200	235	65.00		x		1/24/64	driller--4	B	20	20	1.5	118	54	D	
												91.50	x			10/5/92	OWRD								
3S/1W-10 cab	CLAC	7989	JACOBSON	12505 TOOZE	1979	200	6	19	X	90	195	35.00		x		10/9/79	driller-636	A	100	200	1		52	D	
												55.24	x			11/19/92	OWRD								
3S/1W-10 cda	CLAC	8002	KARVIA	11849 MALLOY	1983	266	6	80/266	P:129-131	94, 129, 249, 262	210	64.00		x		1/8/83	driller-637	P	50	27	2	134	58	D	
												83.99	x			10/22/92	OWRD								
3S/1W-10 cac	CLAC	7987	POTTS	12111 MALLOY	1981	205	6	80	X	140, 196	250	123.00		x		1/20/81	driller-637	P	35	6	2	124	54	D	
												118.45	x			10/8/92	OWRD								
3S/1W-10 ccb	CLAC	8017	SALZER	12251 TOOZE	1972	155	6	58	X	138	255	74.00		x		6/21/72	driller-404	P	40	81	2	145	52	D	
												119.96	x			10/8/92	OWRD								
3S/1W-10 cbd	CLAC	7997	WRIGHT	12055 MALLOY	1979	220	6	64	X	200	255	60.00		x		2/25/79	driller-472	B	60	100	2	115	53	D	
												85.46	x			10/23/92	OWRD								
3S/1W-10 cad	CLAC	7999	MCKAY	27374 GRAHAMS	1984	120	6	33/120	P:60-120	102	180	41.00		x		9/5/84	driller	A	40	110	2	120		D	
												42.11	x			10/15/92	OWRD								
3S/1W-10 cdc	CLAC	8022	THOMSON	11797 TOOZE	1978	205	6	88/42	X	74, 196	235	73.00		x		9/20/78	driller-647	B	33	38	1	138	54	D	liner from
												92.37	x			10/8/92	OWRD								163 to 205'
3S/1W-10 abd	PMTN	14	ROCKWELL	26300 GRAHAMS	?						150	4.95				11/5/92	OWRD, basalt source?							D	no log
						59						9.00				9/11/93	Phillips Pump:swl + depth info								
3S/1W-10 bdd	CLAC	8007	MILLER	26909 GRAHAMS	?	110	6				170	31.55				5/29/76	OWRD	U	15					D	
												33.16				7/26/76	OWRD								
												28.77				1/18/77	OWRD								
												29.46				4/18/77	OWRD								
3S/1W-10 caa	CLAC	18836	CHICK-A-DEE NURSERY		1969	182	10	40	X	118, 136, 170	185	30.00			x	1/14/69	driller-58	P	200	150	2		48	I	
					1975	226				182, 219		19.50		x		12/1/75	DEEP. 182-226'	A	300	200	2				CLAC 8030
												19.10				6/29/76	OWRD								
												18.85				10/11/76	OWRD								
												16.61				1/18/77	OWRD								
												14.89				4/18/77	OWRD								
												23.66				7/19/77	OWRD								
												21.09				10/10/77	OWRD								
												14.60				1/27/78	OWRD								
												16.26				4/11/78	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												19.93				10/9/78	OWRD								
												14.93				4/19/79	OWRD								
												34.00				10/13/88	OWRD								
												30.01				5/30/90	OWRD								
												28.17				5/13/91	OWRD								
												42.24	x			10/1/92	OWRD								
3S/1W-11ada	CLAC	8034	WILSONVILLE	PARKWAY AVE.	1980	435	12	124	X	114	230	56.00		x		10/20/80	driller-10	P	1115	142	24			P	
												63.75				4/18/88	OWRD, off 48+ hours								
												63.00				4/20/88	OWRD, off 17+ hrs								
												81.66				5/29/90	OWRD, off 1 week								
												85.06				5/21/91	OWRD, off several days								
												119.6				12/17/93	OWRD, off 48+ hrs								
												115.9	x			12/22/93	OWRD, off 7 days								
3S/1W-11bac	CLAC	8043	BONN. POWER	PETERS RD	1968	325	10	134/19€	P:250-278	135	225	48.00		x		5/21/68	driller-58	P	141	62	8			N	
												67.43				3/25/76	USGS								
												72.80				4/1/80	OWRD								
												80.90				9/17/80	OWRD								
												72.38				4/17/81	OWRD								
												84.25				9/11/81	OWRD								
												75.62				4/15/82	OWRD								
												87.15				9/27/82	OWRD								
												76.20				4/29/83	OWRD								
												84.13				9/23/83	OWRD								
												77.69				5/7/84	OWRD								
												85.40				10/2/84	OWRD								
												83.85				6/3/85	OWRD								
												88.31				10/14/85	OWRD								
												81.28				5/29/86	OWRD								
												86.83				10/7/86	OWRD								
												82.50				4/29/87	OWRD								
												94.55				9/29/87	OWRD								
												84.22				4/15/88	OWRD								
												95.76				10/13/88	OWRD								
												86.73				5/26/89	OWRD								
												90.52				5/22/90	OWRD								
												89.96				5/13/91	OWRD								
												103.29				10/1/92	OWRD								
												95.64	x			6/18/93	OWRD								
3S/1W-12cdc	CLAC	4488	WILSONVILLE	BOECKMAN RD	1991	880	14	366	X		230	117.00		x		3/22/91	driller-649	P	1000	300	1		62	P	
												119.44				5/21/91	OWRD, no pump								
												118.69	x			6/16/93	OWRD								
3S/1W-13acd	CLAC	8086	WILSONVILLE	WILSONVILLE RD	1984	665	14	376/303	P:355-658	377	205	58.00		x		2/21/84	driller	P	1000	234	24		58	P	
												63.68				6/4/86	OWRD, off 2 hrs								
												84.48				10/9/86	OWRD, off 1/2 hr								
												90.90				6/17/87	OWRD, off 10 min.								
												91.15				9/30/87	OWRD, off 6 hrs								
												75.29				4/18/88	OWRD								
												83.70				10/13/88	OWRD, off 7.5 hrs								
												97.75				5/31/89	OWRD								
												80.16				6/8/90	OWRD, off 4 days								
												83.56				5/24/91	OWRD, off 3 days								
												84.32	x			12/8/93	OWRD, off 2 months								
3S/1W-15 cac	CLAC	8184	DAMMASCH #1		1958	920	14	251	X		215	70.00		x		7/2/58	driller-79	P	300	102	2		62.5	P	
												65.83				4/22/59	OWRD								
												65.54				5/7/59	OWRD								
												65.67				6/2/59	OWRD								
												66.40				7/23/59	OWRD								
												67.46				10/6/59	OWRD								
												69.18				10/18/60	OWRD								
												66.60				2/20/61	OWRD								
												67.52				5/23/61	OWRD								
												68.98				1/17/62	OWRD								
												67.92				4/9/62	OWRD								
												72.75				8/1/62	OWRD								
												70.37				11/19/62	OWRD								
												69.08				2/19/63	OWRD								
												70.79				4/23/63	OWRD								
												71.73				8/1/63	OWRD								
												70.37				11/13/63	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												68.62				4/30/64	OWRD								
												71.18				10/27/64	OWRD								
												69.75				1/22/65	OWRD								
												69.74				4/28/65	OWRD								
												73.04				11/1/65	OWRD								
												71.45				1/26/66	OWRD								
												70.60				4/26/66	OWRD								
												74.91				10/25/66	OWRD								
												71.90				2/1/67	OWRD								
												71.94				4/25/67	OWRD								
												77.80				7/19/67	OWRD								
												68.10				10/19/67	OWRD								
												74.45				1/16/68	OWRD								
												72.75				4/16/68	OWRD								
												71.95				1/21/69	OWRD								
												71.28				4/15/69	OWRD								
												74.29				10/22/69	OWRD								
												72.60				1/27/70	OWRD								
												71.46				4/14/70	OWRD								
												76.68				10/20/70	OWRD								
												73.13				1/25/71	OWRD								
												72.56				4/20/71	OWRD								
												74.93				1/18/72	OWRD								
												73.79				1/18/73	OWRD								
												77.38				1/21/75	OWRD								
												74.84				4/14/75	OWRD								
												79.79				10/21/75	OWRD								
												75.70				4/20/76	OWRD								
												79.99				10/11/76	OWRD								
												77.45				1/18/77	OWRD								
												76.33				4/18/77	OWRD								
												82.25				7/19/77	OWRD								
												81.97				10/10/77	OWRD								
												78.36				1/24/78	OWRD								
												81.39				10/9/78	OWRD								
												77.60				4/19/79	OWRD								
												87.47				7/12/79	OWRD								
												79.19				3/28/80	OWRD								
												90.21				10/2/80	OWRD								
												79.82				4/16/81	OWRD								
												80.58				4/15/82	OWRD								
												89.90				10/1/82	OWRD								
												81.87				3/7/83	OWRD								
												80.45				4/29/83	OWRD								
												84.97				9/27/83	OWRD								
												82.38				11/15/83	OWRD								
												88.39				10/17/84	OWRD								
												81.42				4/25/85	OWRD								
												91.38				10/24/85	OWRD								
												99.50				10/16/86	OWRD								
												94.28				5/7/87	OWRD								
												97.95				4/13/88	OWRD								
												292.27				7/22/88	OWRD, ppg								
												107.02				10/10/88	OWRD, recently ppd								
												98.88				4/20/89	OWRD								
												108.46				1/18/90	OWRD								
												104.15				4/11/90	OWRD								
												120.00				10/10/90	OWRD								
												103.84				2/15/91	OWRD, recovering								
												105.17				6/6/91	OWRD, ppg								
												123.72				9/20/91	OWRD								
												103.57				2/19/92	OWRD								
												102.51				4/1/92	OWRD								
												116.70				7/29/92	OWRD								
												117.81				10/21/92	OWRD								
												116.53				10/28/92	OWRD								
												115.65				11/23/92	OWRD								
												113.40				12/21/92	OWRD								
												111.70				1/22/93	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM ⊖ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												111.61				1/29/93	OWRD								
												111.05				2/25/93	OWRD								
												106.30				3/29/93	OWRD								
												105.72				4/5/93	OWRD								
												104.64				4/28/93	OWRD								
												103.28	x			5/27/93	OWRD								
												103.33				6/28/93	OWRD								
												108.57				7/27/93	OWRD								
												108.25				7/28/93	OWRD								
												112.51				8/25/93	OWRD								
												114.12				9/29/93	OWRD								
												237.60				10/14/93	OWRD, ppg								
												113.88				10/26/93	OWRD								
3S/1W-15 bab	CLAC	8162	RUMPF	29100 GRAHAMS	1976	180	6	90	X	140	240	110.00		x		4/12/76	driller, owner's log copy	P	30	70	1	85	58	DS	
												101.04	x			10/22/92	OWRD								
3S/1W-15 bab	CLAC	8179	TABOR	11800 TOOZE	1971	245	6	154	X	218	230	73.00		x		8/5/71	driller-404	P	60	172	2		53	D	
												100.65	x			11/6/92	OWRD								
3S/1W-15ccb	CLAC	8189	GIBSON	29559 GRAHAMS	1967	210	6	147	X		193	40.00		x		8/25/67	driller-117	B	14	150	1.5	155	53	D	
												43.92	x			10/9/92	OWRD								
3S/1W-16 bad	CLAC	8229	DUGAN	28303 BAKER	1965	173	6	35	X		315	138.00			x	12/14/65	driller-1	B	18	35	1		53	DS	yield dropped
												143.72				8/13/75	USGS								
					1990	295				215, 258, 280		158.00		x		8/22/90	driller-417	A	35	295	1	200			CLAC 189
												152.54	x			9/15/92	OWRD								
3S/1W-16 caa	PMTN	16	JONES #1	29029 BAKER	?	113	6				235	94.85	x			6/19/92	OWRD, plumbed depth					187	56	U	no log
3S/1W-16 caa	CLAC	18057	JONES #2	29029 BAKER	1992	198	6	178	X	179	235	72.00				7/25/92	driller-573	A	32	198	1		53	D	
												100.48		x		10/28/92	OWRD								
												99.60				11/23/92	OWRD								
												97.87				12/21/92	OWRD								
												96.31				1/27/93	OWRD								
												96.05				2/25/93	OWRD								
												95.36				3/29/93	OWRD								
												90.58				4/28/93	OWRD, water level seems a little too shallow								
												93.73				5/27/93	OWRD								
												93.58	x			6/28/93	OWRD								
												94.15				7/27/93	OWRD								
												95.58				8/25/93	OWRD								
												98.00				9/29/93	OWRD								
												98.59				10/26/93	OWRD								
3S/1W-16 aca	CLAC	8240	ALEXANDER	28528 BAKER	1971	290	6	32	X	262	320	162.00				8/25/71	driller-404	P	40	128	2		53	D	
3S/1W-16 aca	CLAC	8222	BOLSTAD	12950 WESTFALL	1979	205	6	28.5/19(	P:140-190	150	295	140.00		x		8/14/79	driller-645	A	15	185	1		53	D	
												156.89	x			11/5/92	OWRD								
3S/1W-16 aaa	CLAC	8172	CLEEK	12604 WESTFALL	1978	150	6	41	X	135	250	90.00		x		2/14/78	driller-79	A	15	45	2	120		D	
												118.30	x			10/8/92	OWRD								
3S/1W-16 dcc	PMTN	18	CALKINS	13235 BELL	?	?					180	90.90				10/22/92	OWRD, basalt source?					260	54	D	no log
3S/1W-16 dbb	CLAC	8209	MASON	29450 BAKER	1977	300	6	165	X	150	220	70.00		x		8/27/77	driller-670	P	50	230	1	200	55	D	
												68.75	x			10/15/92	OWRD								
3S/1W-16 dba	CLAC	8214	MCGEE	29397 BAKER	1977	245	6	90	X	230	210	70.00		x		6/16/77	driller-404	P	40	155	2	220	52	D	
												72.28	x			10/5/92	OWRD								
3S/1W-16 cda	CLAC	8230	GARRETT	29600 BAKER	1962	105	6	83.5	X	90	150	30.00				9/1/62	driller-35,sand/gravel	B	20	100	1	210		D	
												41.63				8/13/75	USGS, sand/gravel								
												34.45				11/5/92	OWRD, sand/gravel								
3S/1W-16 ddd	CLAC	8231	DAMMASCH #2		1961	1000				971	185	36.00		x		4/12/60	driller							I	chemistry
												50.00				9/19/61	OWRD								done
												50.00				10/5/61	OWRD								
												50.00				10/17/61	OWRD								
												50.00				10/19/61	OWRD								
												50.00				10/31/61	OWRD								
												55.00				11/15/61	OWRD, ppg								
												50.00				11/30/61	OWRD								
												45.00				1/17/62	OWRD								
												43.50				3/30/62	OWRD								
												48.00				8/1/62	OWRD								
												46.00				11/19/62	OWRD								
												44.50				2/19/63	OWRD								
												44.50				4/23/63	OWRD								
												47.50				8/1/63	OWRD								
												46.50				11/13/63	OWRD								
												45.00				2/10/64	OWRD								
												45.00				4/30/64	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												48.50				7/29/64	OWRD								
												47.50				10/27/64	OWRD								
												45.50				1/22/65	OWRD								
												45.50				4/28/65	OWRD								
												50.50				7/23/65	OWRD								
												49.00				11/1/65	OWRD								
												47.50				1/26/66	OWRD								
												46.50				4/26/66	OWRD								
												54.00				7/27/66	OWRD								
												50.50				10/25/66	OWRD								
												47.50				2/1/67	OWRD								
												47.50				3/16/67	OWRD								
												47.00				4/25/67	OWRD								
												47.50				5/11/67	OWRD								
												50.50				6/27/67	OWRD								
												53.50				7/18/67	OWRD								
												55.00				8/15/67	OWRD								
												55.00				9/6/67	OWRD								
												53.00				10/18/67	OWRD								
												51.50				11/16/67	OWRD								
												50.50				12/13/67	OWRD								
												49.50				1/16/68	OWRD								
												48.00				4/16/68	OWRD								
												47.50				6/11/68	OWRD								
												51.50				7/17/68	OWRD								
												52.50				8/5/68	OWRD								
												50.50				9/18/68	OWRD								
												49.50				10/15/68	OWRD								
												49.50				11/25/68	OWRD								
												47.00				1/21/69	OWRD								
												46.50				4/15/69	OWRD								
												46.50				5/5/69	OWRD								
												46.50				6/2/69	OWRD								
												49.50				7/17/69	OWRD								
												51.50				8/4/69	OWRD								
												53.50				9/11/69	OWRD								
												50.50				10/15/69	OWRD								
												50.50				11/25/69	OWRD								
												47.50				1/27/70	OWRD								
												47.50				3/9/70	OWRD								
												47.50				4/14/70	OWRD								
												46.00				5/7/70	OWRD								
												49.50				6/11/70	OWRD								
												58.50				7/21/70	OWRD								
												55.50				8/20/70	OWRD								
												54.50				9/10/70	OWRD								
												52.50				10/20/70	OWRD								
												52.50				11/10/70	OWRD								
												52.50				12/20/70	OWRD								
												48.50				1/25/71	OWRD								
												48.50				4/20/71	OWRD								
												56.50				7/21/71	OWRD								
												52.00				10/14/71	OWRD								
												48.50				1/18/72	OWRD								
												56.50				9/8/72	OWRD								
												49.50				1/18/73	OWRD								
												51.50				6/4/73	OWRD								
												52.50				7/16/74	OWRD								
												60.50				10/17/74	OWRD								
												52.50				1/21/75	OWRD								
												50.50				4/14/75	OWRD								
												54.00				7/14/75	OWRD								
												60.50				10/21/75	OWRD								
												57.00				1/19/76	OWRD								
												54.00				2/18/76	OWRD								
												53.00				3/16/76	OWRD								
												53.00				4/15/76	OWRD								
												58.50				4/20/76	OWRD								
												54.00				5/17/76	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												56.50				7/26/76	OWRD								
												56.50				10/11/76	OWRD								
												54.00				1/18/77	OWRD								
												53.50				4/18/77	OWRD								
												60.00				7/19/77	OWRD								
												68.50				10/10/77	OWRD								
												55.00				1/24/78	OWRD								
												53.50				4/13/78	OWRD								
												58.50				10/9/78	OWRD								
												55.00				4/19/79	OWRD								
												53.50				3/28/80	OWRD								
												64.00				10/5/80	OWRD								
												52.40				4/16/81	OWRD								
												62.25				10/1/81	OWRD								
												54.75				4/15/82	OWRD								
												64.25				10/1/82	OWRD								
												56.17				3/7/83	OWRD								
												56.17				4/29/83	OWRD								
												61.94				9/23/83	OWRD								
												62.25				10/20/83	OWRD								
												54.17				5/21/84	OWRD								
												64.56				10/17/84	OWRD								
												56.48				4/25/85	OWRD								
												66.41				10/24/85	OWRD								
												59.94				4/24/86	OWRD								
												86.50				10/1/87	OWRD								
												68.90				4/13/88	OWRD								
												80.73				10/10/88	OWRD								
												70.90				4/20/89	OWRD								
												85.30				1/18/90	OWRD								
												85.30				4/11/90	OWRD								
												99.00				8/1/90	OWRD								
												73.80				2/15/91	OWRD								
												96.90				9/20/91	OWRD								
												73.80				2/19/92	OWRD								
												73.80	x			4/1/92	OWRD								
												87.66				7/29/92	OWRD, recently ppd								
												96.90				10/21/92	OWRD								
												96.90				1/22/93	OWRD								
												78.42				4/4/93	OWRD								
												77.25				4/16/93	pump test submittal	P	880	4	4			I	
												79.57				7/28/93	OWRD								
												85.35				10/14/93	OWRD								
3S/1W-17 aca	CLAC	18317	COGGER	15190 BELL	1960	140	6	33	X	115	445	100.00			x	7/29/60	driller-1	B	12	40	1		54	D	
					1977	240						125.00				4/25/77	driller-647								CLAC 8306
					1977	380				352		310.00				10/24/77	driller-404, accurate?	A	40	380	2	275	52		CLAC 8288
												280.00		x		6/10/80	Phillips Pump, approx, date								
												242.18				6/30/92	OWRD								
												243.22				10/28/92	OWRD, ccw								
												243.89				11/23/92	OWRD								
												243.24				12/22/92	OWRD								
												242.53				1/28/93	OWRD								
												242.02	x			3/2/93	OWRD								
												242.49				3/30/93	OWRD								
												244.41				4/29/93	OWRD								
												244.24				5/28/93	OWRD								
												244.83				6/30/93	OWRD, ccw								
												245.16				7/28/93	OWRD								
												246.54				8/25/93	OWRD								
												247.07				9/29/93	OWRD								
												248.34				10/27/93	OWRD								
3S/1W-17 aac	CLAC	8283	ADAMS#1	14987 BELL	1986	285	6	60	X	190, 265	350	175.00		x		10/2/86	driller-645	A	27	285	1		54	D	
												179.00				7/5/90	Phillips Pump								
												162.32	x			11/6/92	OWRD								
3S/1W-17 aac	CLAC	17780	ADAMS #2	BELL	1982	184	6	21/184	P:165-183	145	280	95.00		x		3/6/92	driller-553	A	10.5	154	1		57	U	
												95.65				11/12/92	OWRD								OWRD
												96.50				11/23/92	OWRD, unidata								UNIDATA
												96.50				11/25/92	OWRD, unidata								RECORDER
												96.00				12/2/92	OWRD, unidata								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												96.30				12/9/92	OWRD, unidata								
												95.80				12/16/92	OWRD, unidata								
												96.30				12/23/92	OWRD, unidata								
												95.80				12/30/92	OWRD, unidata								
												95.50				1/6/93	OWRD, unidata								
												95.00				1/13/93	OWRD, unidata								
												95.00				1/20/93	OWRD, unidata								
												95.20				1/27/93	OWRD, unidata								
												95.20				2/3/93	OWRD, unidata								
												95.00				2/10/93	OWRD, unidata								
												95.00				2/17/93	OWRD, unidata								
												94.20	x			2/19/93	OWRD, unidata								
												95.00				2/24/93	OWRD, unidata								
												95.20				3/3/93	OWRD, unidata								
												95.80				3/9/93	OWRD, unidata								
												96.00				3/16/93	OWRD, unidata								
												96.30				3/23/93	OWRD, unidata								
												97.80				3/30/93	OWRD, unidata								
												98.80				4/6/93	OWRD, unidata								
												99.90				4/13/93	OWRD, unidata								
												100.60				4/20/93	OWRD, unidata								
												101.20				4/27/93	OWRD, unidata								
												100.90				5/2/93	OWRD, unidata								
												99.10				5/9/93	OWRD, unidata								
												99.40				5/16/93	OWRD, unidata								
												99.90				5/23/93	OWRD, unidata								
												100.10				5/30/93	OWRD, unidata								
												100.40				6/6/93	OWRD, unidata								
												100.90				6/13/93	OWRD, unidata								
												100.90				6/20/93	OWRD, unidata								
												100.90				6/27/93	OWRD, unidata								
												101.40				7/4/93	OWRD, unidata								
												102.20				7/11/93	OWRD, unidata								
												101.90				7/18/93	OWRD, unidata								
												101.90				7/25/93	OWRD, unidata								
												101.90				8/1/93	OWRD, unidata								
												101.90				8/8/93	OWRD, unidata								
												102.20				8/15/93	OWRD, unidata								
												102.20				8/22/93	OWRD, unidata								
												102.70				8/29/93	OWRD, unidata								
												102.70				9/5/93	OWRD, unidata								
												102.40				9/12/93	OWRD, unidata								
												102.20				9/19/93	OWRD, unidata								
												102.20				9/26/93	OWRD, unidata								
												101.90				10/3/93	OWRD, unidata								
												101.70				10/10/93	OWRD, unidata								
												101.40				10/17/93	OWRD, unidata								
												101.20				10/24/93	OWRD, unidata								
												100.60				11/7/93	OWRD, unidata								
												100.90				11/14/93	OWRD, unidata								
												100.10				11/21/93	OWRD, unidata								
												100.40				11/28/93	OWRD, unidata								
												101.13				11/30/93	OWRD								
3S/1W-17 bcd	CLAC	8303	BILES	28800 LADD	1976	380	6	20	X	150	510	260.00		x		9/30/76	driller-511	P	15	124	2		54	D	
												298.13	x			11/19/92	OWRD, ccw								
3S/1W-17 aaa	CLAC	8282	HILL	14819 BELL	1987	268	6	19/266	P:246-256	121, 236	335	151.00		x		3/31/87	driller-296	A	42	266	1		54	D	
												165.11	x			11/12/92	OWRD								
3S/1W-17 cac	CLAC	73	LEWIS	29459 LADD	1990	216	6	39/216	P:176-216	195	280	72.00		x		6/12/90	driller-417	A	25	216	1		58	D	
												77.34	x			11/5/92	OWRD								
3S/1W-17 aad	CLAC	1486	MARSHALL	14813 BELL	1991	163	6	46/163	P:105-141	101	250	62.00		x		1/14/91	driller-553	A	25	160	1		54	D	
												64.25	x			11/6/92	OWRD								
3S/1W-17 adc	CLAC	8310	NUMRICH	14930 BELL	1972	152	6	43	X	70, 103, 129	385	66.00		x		10/18/72	driller-111	B	20	70	1	103	54	D	
												71.73				8/8/75	USGS								
												109.51	x			10/23/92	OWRD								
												106.33				10/12/93	Schneider Pump								
3S/1W-17 adc	CLAC	17722	NUMRICH	BELL	1992	168	6	22/168	P:149-167	92	365	85.00		x		2/25/92	driller-553	A	17	108	1		57	U	
												135.84	x			10/23/92	OWRD								
												136.00				10/12/93	Schneider Pump								
						283	6	195		236		172.00				11/22/93	driller-649	A	35	283	1		55		CLAC 18936

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
3S/1W-17 dcb	CLAC	8255	PASCOE	15444 BRK. FIR	1981	240	6	21	X	204	310	116.00		x		5/7/81	driller-404	A	50	104	2	200	52	D	
												120.00				9/5/86	Phillips Pump								
												104.60	x			10/8/92	OWRD								
3S/1W-17 aaa	CLAC	8256	PIERSON	14817 BELL	1981	285	6	22/285	P:185-285	125	295	130.00		x		5/12/81	driller-645	A	35	285	1	150	54	D	
												127.98	x			10/5/92	OWRD								
3S/1W-17 acd	CLAC	8252	RANKIN	15050 BELL	1982	240	6	25	X	75	375	165.00		x		10/1/82	driller-645	A	30	240	1	210	55	D	
												163.00				3/13/87	Phillips Pump								
												152.09	x			10/5/92	OWRD, ccw								
3S/1W-17 abb	CLAC	9345	ROGOWICZ	15495 BELL	1978	395	6	58	X	22, 130, 372, 382	565	295.00		x		8/30/78	driller-497	A	15	395	1	121	54	D	
												306.34	x			10/9/92	OWRD, ccw								
3S/1W-17 ddb	CLAC	8260	RUNNELS	15000 BRK. FIR	1978	110	6	40	X	84, 98	195	6.00		x		11/8/78	driller-404	A	60	74	2	310	52	D	
												0.00				11/1/91	owner, well flowing								
												0.38	x			10/15/92	OWRD								
3S/1W-17 bdb	CLAC	8289	ZURSTADT	15510 BELL	1977	470	6	60	X	428	485	301.00		x		3/3/77	driller-404	P	10	72	2	154	52	D	
												285.75	x			10/9/92	OWRD								
3S/1W-17 dcc	CLAC	8301	MILLER	29888 LADD	1977	175	6	103	X	76	235	70.00		x		7/3/77	driller-487	P	15	105	1		54	D	
												80.38	x			11/5/92	OWRD								
3S/1W-17 add	PMTN	19	LANGER	14795 BELL	?	?					265	91.77	x			11/12/92	OWRD								no log
3S/1W-17 cdc	CLAC	8402	HANDY	29950 LADD	1975	95	6	85	P:15-85	50	170	12.00		x		6/12/75	driller-511	A	35	50	1.5	117	54	D	
												15.43	x			12/11/92	OWRD								
3S/1W-17 cab	CLAC	8270	FULLMER	29206 LADD	1978	305	6	19	X	262	400	199.00		x		4/3/78	driller-637	P	25	35	2	210	54	D	
												204.80	x			12/30/92	OWRD								
3S/1W-17 ddc	CLAC	17781	BISENIUS	14508 BELL	1992	123	6	99/123	P:104-122	98	200	67.00		x		3/6/92	driller-553	A	15	120	1			D	
												68.83	x			1/11/93	OWRD								
3S/1W-17 baa	CLAC	8280	LEITH	15825 BELL	1988	405	6	59	X	155, 300, 375	570	280.00		x		11/15/88	driller-645	A	18	405	1	157	54	D	
												329.68	x			1/11/93	OWRD								
3S/1W-17 ddb	CLAC	8262	STOLLEY	14520 BELL	1976	145	6	41	X	50, 118, 135	210	15.00		x		5/1/76	driller-79	A	75	85	2	200		D	
												7.64	x			1/11/93	OWRD								
3S/1W-17 bad	CLAC	17743	MINARD	15775 BELL	1992	495	6	64	X	370, 445,495	575	345.00		x		3/3/92	driller-645	A	27	495	1	133	55	D	
												354.14	x			1/11/93	OWRD, ccw								
3S/1W-17 bbd	CLAC	8269	BETHUNE	16010 BELL	1978	525	6	38	X	397, 518	565	340.00		x		3/29/78	driller-637	P	18	30	2	116	54	D	
												346.00				6/26/89	Phillips Pump								
												347.47	x			3/11/93	OWRD								
3S/1W-17 bbd	CLAC	8297	BARROWS	16020 BELL	1971	440	6	40	X	420	560	310.00				2/11/71	driller-462	B	9	440	1.5	173	56	D	
												345.00				9/27/79	Phillips Pump								
3S/1W-17 bad	CLAC	8253	ARKLESS	15830 BELL	1982	505	6	40	X	115, 375	530	325.00		x		6/17/82	driller-645	A	22	505	1		58	D	
												322.87				5/18/84	OWRD								
												325.82	x			10/19/93	OWRD								
3S/1W-17 bba	CLAC	8298	BENSON	16150 BELL	1973	545	6	37	X	495	610	416.00		x		9/10/73	driller-117	A	15	545	1		53	D	
												412.25	x			10/19/93	OWRD, slight ccw								
3S/1W-18 aac	CLAC	8341	POMPE	28233 LADD	1976	453	6	30	X	390	630	320.00		x		5/7/76	driller-511	P	20	105	1	115	54	D	
												293.69				5/19/92	OWRD								
												297.10				10/28/92	OWRD								
												297.46				11/23/92	OWRD								
												297.17				12/22/92	OWRD								
												298.00				1/28/93	OWRD								
												296.40				3/2/93	OWRD								
												296.27				3/30/93	OWRD								
												294.98				4/29/93	OWRD								
												293.72				5/28/93	OWRD								
												293.04				6/30/93	OWRD								
												292.58	x			7/28/93	OWRD								
												293.86				8/26/93	OWRD, rising slowly								
												294.12				9/30/93	OWRD								
												294.50				10/27/93	OWRD								
3S/1W-18 cdb	CLAC	18316	COX	29696 HEATER	1974	200	6	61	X	45, ?	660	85.00		x		8/21/74	driller-247	A	12	95	1			D	
												78.73				8/7/75	USGS								
												88.31	x			6/24/92	OWRD								
3S/1W-18 aba	CLAC	8330	MARTINGALE	28111 LADD	1981	260	6	60	X	244	660	89.00		x		4/23/81	driller-404	A	16	150	2		52	D	
												90.00				5/1/92	pumpman								
												90.98	x			12/30/92	OWRD								
3S/1W-18 cbd	CLAC	8333	CARY	29455 HEATER	1978	365	6	40/365	P:265-365	315	760	245.00		x		10/13/78	driller-645	A	18	365	1	166	53	D	
												248.22	x			1/12/93	OWRD								
3S/1W-18 cca	CLAC	8321	HEALD	29575 HEATER	1981	405	6	38/326	P:200-326	325	750	320.00				4/17/81	driller-645	A	3	400	1	156	48	D	
												250.00				11/18/81	Phillips Pump								
												240.00				8/15/89	Phillips Pump, well now 277' deep								
					1989	405	4	45-350	P:325-350			240.00				11/28/89	driller-1266, recond	A	6	305	1				CLAC 8315
3S/1W-18 aab	CLAC	8342	CLARK	28101 LADD	1975	435	6	20	X	160	655	230.00		x		10/3/75	driller-511	P	30	150	2			D	
												320.43	x			2/4/93	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
3S/2W-18 aba	PMIN	41	BECKHAM	28085 LADD	?	30	6				600	10.00				2/4/93	owner, basalt source?							D	no log, hand dug
3S/1W-19 add	CLAC	8379	BISCHOFF	30656 LADD	1972	200	6	76	X	180	320	143.00		x		6/3/72	driller-404	P	30	57	2	180	52	D	
												148.96				5/1/75	OWRD								
												148.86				8/1/75	USGS								
												143.80				4/2/80	OWRD								
												145.12				9/16/80	OWRD								
												142.88				4/23/81	OWRD								
												145.15				10/6/81	OWRD								
												142.89				4/15/82	OWRD								
												145.10				9/29/82	OWRD								
												141.80				5/4/83	OWRD								
												144.97				9/27/83	OWRD								
												143.57				6/5/85	OWRD								
												145.18				6/16/87	OWRD								
												144.34				6/17/88	OWRD								
												147.89				10/28/92	OWRD								
												148.36				11/25/92	OWRD, recent ppg								
												147.62				12/22/92	OWRD								
												147.15				1/28/93	OWRD								
												147.06				3/2/93	OWRD								
												146.66				3/30/93	OWRD								
												146.38				4/29/93	OWRD								
												146.26	x			5/26/93	OWRD								
												147.04				7/28/93	OWRD								
												148.34				9/30/93	OWRD								
												148.09				10/27/93	OWRD								
3S/1W-19 bac	CLAC	8375	BUCKNER	30320 HEATER	1980	325	6	40	X	295	670	265.00		x		12/16/80	driller-645	A	12	325	1	133	56	D	
												254.20	x			7/8/92	OWRD								
3S/1W-19 bac	CLAC	8387	PARKIN	30350 HEATER	1976	545	6	24	X	15	655	290.00		x		6/25/76	driller-247	A	13	245	1	154	52	D	
												330.97	x			6/24/92	OWRD, ccw								
3S/1W-19 aad	CLAC	8378	DIXON/CASEY	30438 LADD	1972	185	6	42	X	166	280	101.00		x		8/18/72	driller-404	P	58	84	2	210	52	D	
												99.95				8/1/75	USGS								
												103.00				4/28/87	Phillips Pump								
												104.00				5/13/92	pump test	P	17.8	1	4				Schueler
												104.67	x			12/30/92	OWRD								
3S/1W-19 bcb	CLAC	59	STEEN	18400 SMITH	1990	315	6	38/315	P:?	280	660	212.00		x		5/14/90	driller-417	A	20	315	1	130	64	D	
												214.00				6/1/90	Phillips Pump								
												214.00	x			12/30/92	OWRD								
3S/1W-19 bdb	CLAC	8360	ABE	30625 HEATER	1986	505	6	60	X	265	610	345.00		x		10/8/86	driller-645	A	17	505	1	165	58	D	
												340.00				3/30/87	pump test	P	11	23	4				Phillips
												352.21	x			1/19/93	OWRD								
3S/1W-20 acc	CLAC	8409	BOLE III	15510 ROBERTS	1966	330	6	38	X	287, 319	405	212.00		x		7/15/66	driller-10	B	12	54	1			U	
												213.79				11/3/92	OWRD								
												213.38				11/25/92	OWRD								
												212.59				12/22/92	OWRD								
												212.27	x			1/28/93	OWRD, heavy ccw								
												212.52				3/2/93	OWRD, no ccw								
												216.26				3/30/93	OWRD								
												216.05				4/29/93	OWRD								
												216.06				4/29/93	OWRD								
												210.33				5/26/93	OWRD, questionable								
												215.63				6/30/93	OWRD								
												215.54				7/28/93	OWRD								
												216.37				8/26/93	OWRD								
												216.65				9/30/93	OWRD								
												216.82				10/27/93	OWRD								
3S/1W-20 bbb	CLAC	5340	WISTHOFF	30181 LADD	1991	151	6	47/151	P:132-151	135	197	70.00		x		4/13/91	driller-1266	A	24	150	1	177	56	D	
												67.25	x			1/12/93	OWRD								
3S/1W-20 ccd	CLAC	8679	GRANT	16111 EDMINSTON	1975	425	6	30	X	300	430	244.00		x		9/20/75	driller-117	A	22	425	1	150	53	D	
												253.00				5/22/91	Phillips Pump								
												254.33	x			1/12/93	OWRD								
3S/1W-21 dbd	CLAC	8418	JENSEN	30803 GRAHAMS	1962	135	6	120	X		180	65.00				9/4/62	driller, non-basalt aquifer	B	14	30	2.5		53	DI	
												79.93				11/3/92	OWRD, non-basalt aquifer								
												78.12				11/23/92	OWRD, non-basalt aquifer								
												78.24				12/21/92	OWRD, non-basalt aquifer								
												75.18				1/27/92	OWRD, non-basalt aquifer								
												75.94				2/25/93	OWRD, non-basalt aquifer								
												75.00				3/29/93	OWRD, non-basalt aquifer								
												75.85				4/28/93	OWRD, non-basalt aquifer								

					YEAR	WELL	CASING	CASING		DEPTH TO		WATER				LEVEL	WATER LEVEL	TEST		STEM @ or				USE	
LOCATION	WELL	ID	OWNER	ADDRESS	DRILLED	DEPTH	DIA.	DEPTH	FINISH	WBZ's	ELEV.	DEPTH				DATE	REMARKS	TYPE	YIELD	DRAWDOWN	TIME	COND	TEMP	OF	COMMENTS
						(feet)	(in.)	(feet)		(feet)	(feet)	(feet)	A	B	C					(feet)				WATER	
												75.93				5/27/93	OWRD, non-basalt aquifer								
3S/1W-21 bba	CLAC	8235	SMITH	14200 BELL	1970	245	6	30	X	221	290	166.00		x		5/25/70	driller-404	P	25	79	2	900?		D	
												171.04	x			1/12/93	OWRD								
3S/1W-21 cac	CLAC	8413	TIPPET	31603 GRAHAMS	1972	204	12	138	X	138	170	67.00		x		6/22/72	driller-277	P	75	108	2			D	
												63.39	x			1/12/93	OWRD								
3S/1W-21 aba	PMTN	22	HAZEL	13031 BELL	?	60	6				150						owner's depth info					280		D	no log
3S/1W-21 dcb	CLAC	8411	FARLEY	13200 WILSONV.	1988	384	6	279	X		175	80.00		x		9/2/88	driller-649	A	30	324	1			D	
												72.17	x			5/13/92	pump test submittal	P	25	139	1				
3S/1W-24baa	CLAC	8491	WILSONVILLE	WILSONVILLE RD	1984	620	14	394	X	410	100	-27.72		x		10/24/84	driller	P	913	379	26			P	
												-21.44				4/15/88	OWRD								
												-14.74	x			6/17/93	OWRD								
3S/1W-28 bca	PMTN	23	TIPPET	31603 GRAHAM	?	?	6				130	68.44				1/12/93	OWRD							D	no log
3S/1W-28 acb	PMTN	24	GETLIN	13550 WILSONV.	?	89+	6				135	56.00				9/26/89	pump test, basalt well?	P	11	33	4	430	52	D	no log
												49.55				1/19/93	OWRD								
3S/1W-29 bbd	CLAC	8678	EICHMAN	16373 EDMINS.	1956	230	6	29	X		395	224.00			x	3/15/56	driller-99	B	10	2	1	134	55	D	
												217.05				7/31/75	USGS, ppg 1 sprinkler								
												216.15				7/31/75	USGS, pump off 45 minutes								
					1988	340				225		225.00		x		10/1/88	driller-649	P	18	15	1				CLAC 8683
												228.00				1/12/93	owner's hydrogeologist								
												228.50	x			1/19/93	OWRD								
3S/1W-29 bda	CLAC	8674	BECK	15701 EDMINS.	1974	277	6	22	X	135	210	100.00		x		7/6/74	driller-511	A	15	177	1			D	
												88.33	x			1/19/93	OWRD								
3S/1W-29 bba	CLAC	17738	NUMRICH	EDMINSTON	1992	283	6	23/283	P:264-282	262	383	190.00		x		3/5/92	driller-553	A	20	280	1			U	
												196.00				9/16/92	Phillips Pump								
												194.32	x			1/21/93	OWRD								
3S/1W-30 dbc	CLAC	8697	CONRAD	33140 LADD	1972	460	6	19	X	400, 435	490	328.00		x		6/16/72	driller-117	A	19	460	1	138	55	D	
												337.05				7/30/75	USGS								
												341.95				4/2/80	OWRD								
												343.74				9/16/80	OWRD								
												343.99				4/15/82	OWRD								
												346.75				9/30/82	OWRD								
												344.20				5/4/83	OWRD, rising								
												346.75				9/22/83	OWRD								
												347.70				5/17/84	OWRD								
												350.90				6/4/86	OWRD								
												354.45				6/16/87	OWRD								
												358.31				6/17/88	OWRD								
												361.91				10/27/88	OWRD, rising								
												362.82				5/23/90	OWRD, rising								
												363.60				5/15/91	OWRD								
												368.40	x			10/28/92	OWRD								
												369.27				12/22/92	OWRD								
												370.15				1/29/93	OWRD								
												370.00				3/2/93	OWRD								
												369.59				3/30/93	OWRD								
												369.16				4/30/93	OWRD								
												368.98				5/26/93	OWRD								
												369.26				6/30/93	OWRD								
												369.29				7/28/93	OWRD								
												370.17				8/26/93	OWRD								
												371.28				9/30/93	OWRD								
												371.32				10/27/93	OWRD								
3S/1W-30 ddb	CLAC	8691	REGER	34094 LADD	1981	285	6	24/285	P:145-285	65	300	140.00		x		10/19/81	driller-645	A	15	285	1	150	54	D	
												172.64	x			7/9/92	OWRD								
3S/1W-30 bbd	CLAC	18406	SALZMAN	NE CORRAL	1992	385	6	152	X	37, 190?	405	190.00		x		10/16/92	driller	A	30	385	1		55	U	SPECIAL AREA
												191.05				12/11/92	OWRD								WELL
												190.78				12/22/92	OWRD								CONSTRUCTION
												190.89				1/28/93	OWRD								STANDARDS
												189.87				3/2/93	OWRD								
												190.66				3/30/93	OWRD								
												190.27				4/29/93	OWRD								
												189.33	x			5/26/93	OWRD								
												189.46				6/30/93	OWRD								
3S/1W-30 ada	CLAC	124	BETTS	16510 EDMINS.	1990	425	6	19	X	265, 390	430	205.00		x		6/27/90	driller-645	A	15	425	1	140	52	D	
												201.07	x			1/21/93	OWRD								
3S/1W-30 cac	CLAC	8705	BORDNER	33575 LADD	1975	460	6	24	X	442	480	312.00		x		4/12/75	driller-404	P	30	108	2	165	52	D	
												350.33	x			1/29/93	OWRD								
3S/1W-30 aaa	CLAC	8690	SCHOENING	16800 EDMINS.	1983	365	6	40/365	P:265-365	65, 120, 238	515	235.00		x		7/20/83	driller-645	A	14	365	1	132	54	DS	
												235.00				7/25/83	Phillips Pump								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												241.89	x			2/4/93	OWRD								
3S/1W-30 aab	CLAC	8689	BARTELL	32150 LADD	1983	303	6	70	X	235	505	227.00		x		9/12/83	driller-404	A	10	300	1	116	52	DS	
												228.69	x			2/4/93	OWRD								
3S/1W-30 bdd	CLAC	8706	JOHNSEN	33003 LADD	1965	176	6	24	X		575	108.00			x	8/16/65	driller-99	B	9	20	2		54	D	
					1973	558				485		465.00				8/14/73	driller-184, accurate?	B	9	93	2	178			CLAC 18453
												470.00				2/11/93	OWRD, rec. ppd., ccw								
												448.71	x			4/15/93	OWRD, ccw								
3S/1W-30 bcc	CLAC	8702	BARTELL	32803 LADD	1965	290	6	20	X		620	226.00		x		12/8/65	driller-207	B	16	0	3	200	54	D	
												224.65				5/22/90	OWRD								
												224.46	x			3/18/93	OWRD								
3S/1W-30 acb	CLAC	8713	HEINZ	32698 LADD	1973	515	6	34	X	494	580	372.00		x		9/3/73	driller-404	P	12	120	2	124	54	D	
												460.75	x			3/25/93	OWRD								
3S/1W-30 caa	CLAC	8704	CREW	32833 LADD	1978	585	6	19/585	P:545-565	164, 545	570	412.00		x		7/27/78	driller-637	P	10	91	2	170	52	DS	
												447.67	x			3/25/93	OWRD, ccw								
3S/1W-30 bda	CLAC	8695	BRYANT	32727 LADD	1969	545	6	21	X	492	605	305.00		x		6/7/69	driller-117	A	7	545	1			D	
												480.68	x			4/15/93	OWRD, ccw								
3S/1W-31 bdb	CLAC	8741	SMITH	34621 RANCH	1977	365	6	20.5	X	305, 345	270	195.00		x		9/23/77	driller-645	A	18	365	1	107	58	D	
												213.57				8/14/92	OWRD, rising?								
												191.83				10/29/92	OWRD, rising slowly								
												193.49				11/25/92	OWRD, rising slowly								
												189.56				12/22/92	OWRD								
												189.84				1/29/93	OWRD								
												188.85				3/2/93	OWRD								
												190.12				3/30/93	OWRD, rising slowly								
												184.14	x			4/30/93	OWRD								
												184.75				5/26/93	OWRD								
												189.69				6/30/93	OWRD, rising								
												201.78				8/25/93	OWRD, rising slowly								
												203.29				9/30/93	OWRD								
												191.11				10/27/93	OWRD								
3S/1W-31 dda	PMTN	26	OUELETTE	16920 WILSONV.	1946?	293	6				110	40.00				7/1/46	owner depth + wl info w/in year					107		D	no log
												45.32				1/12/93	OWRD								basalt well?
3S/1W-31 acd	CLAC	8740	DAWSON	34797 LADD	1963	167	6	156	X	151	170	70.00		x		6/5/63	driller-4	B	20	0	1	144		D	
												64.88	x			1/21/93	OWRD								
3S/1W-31 bbb	CLAC	8720	HANN	18450 KRAMIEN	1985	438	6	34/438	P:358-418	305	485	320.00		x		4/30/85	driller-746	A	12	435	2	136	49	D	
												299.32	x			2/4/93	OWRD								
3S/1W-31 ddc	PMTN	27	FRYE	16964 WILSONV.	?	150	6				110	50.04				2/11/93	OWRD, owner's depth info, poor water quality					190		D	no log, basalt?
3S/1W-31 aad	CLAC	8748	ELLISON	34530 LADD	1977	185	6	48	X	94	185	88.00		x		6/24/77	driller-637	P	18	45	2	290	52	D	
												88.82	x			2/11/93	OWRD								
3S/1W-31 adb	CLAC	8744	ELLISON	34536 LADD	1962	152	6	47	X	131	185	66.00		x		6/10/62	driller-117	B	18	68	1	290	52	D	
												73.68	x			2/11/93	OWRD								
3S/1W-31 bad	CLAC	8746	NEAL	34438 S. RANCH	1978	300	6	19/300	P:280-300	65, 210, 240, 283, 28	285	140.00		x		9/29/78	driller-79	A	60	160	2	168	54		
												141.44	x			3/11/93	OWRD								
3S/1W-31 abc	CLAC	11991	CONNER	34223 LADD	1967	500	6	24	X	460	275	154.00		x		8/2/67	driller-404	P	18	346	1	131	54	D	
												152.13	x			3/11/93	OWRD								
3S/1W-31 abb	CLAC	8751	JOHNSON	34025 LADD	1943	170	6	?	?	?	315	?							4					D	no orig. log
					1960	315	6	17	X	308		129.00		x		5/27/60	driller-1	B	25	51	1	177	54	D	dpng. log gives
												171.00				2/2/84	Phillips Pump, approx. date								some original
												197.98	x			3/11/93	OWRD								well info
3S/1W-32 cbc	PMTN	29	MCKAY	16700 WILSONV.	?	400+	6				105	4.00				historic	owner's depth + wl info					190		DI	no log
												22.33	x			1/12/93	OWRD								
3S/2W-1 adb	WASH	1960	BARON	24670 OLD 99W	1979	200	6	102	X	184	250	28.00		x		12/29/79	driller	A	20	152	2	168	52	D	
												34.08				5/20/92	OWRD								
												42.49				10/28/92	OWRD								
												39.42				11/24/92	OWRD								
												35.43				12/21/92	OWRD								
												32.75				1/27/93	OWRD								
												34.30				2/25/93	OWRD								
												33.08				3/29/93	OWRD								
												30.86	x			4/29/93	OWRD								
												34.51				5/27/93	OWRD								
												35.51				6/29/93	OWRD								
												37.96				7/27/93	OWRD								
												41.86				9/29/93	OWRD								
												39.61				10/26/93	OWRD								
3S/2W-1 dba	WASH	1979	ROYBAL	MIDDLETON	?	260				196	260	60.00				2/22/74	DEEP. 150-260'	P	10	40	2		53	D	
												61.43				7/10/75	GW RPT #27								
												62.10				4/2/80	OWRD								
												65.17				9/16/80	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												65.10				9/11/81	OWRD								
												61.10				5/12/82	OWRD								
												63.70				9/30/82	OWRD								
												60.60				5/4/83	OWRD								
												61.00				9/22/83	OWRD								
												59.40				5/17/84	OWRD								
												60.97				6/5/85	OWRD								
												62.15				4/18/86	OWRD								
												67.47				6/16/87	OWRD								
												66.70				6/13/88	OWRD								
												64.62				5/23/90	OWRD								
3S/2W-11 ddc	WASH	2003	WILL. PAC. #3		1978	502	8	115	X	180	368	69.00		x		9/29/78	driller	P	450	413	1		49	U	
												65.02				12/13/83	P. Hughes, aquifer test	P	423	28	24				
												65.88				4/16/86	OWRD								
												65.84				6/18/87	OWRD								
												67.03				6/17/88	OWRD								
												69.04				10/27/88	OWRD								
												68.97				5/23/90	OWRD								
												69.92				5/15/91	OWRD								
												71.82				10/28/92	OWRD								
												72.31				11/24/92	OWRD								
												72.19				12/21/92	OWRD								
												72.04				1/29/93	OWRD								
												71.45				2/25/93	OWRD								
												80.05				3/29/93	OWRD, interference?								
												81.28				4/2/93	OWRD, interference?								
												68.48				4/29/93	OWRD								
												78.80				5/27/93	OWRD, interference?								
												65.84				6/29/93	OWRD								
												65.43	x			7/27/93	OWRD								
												78.94				8/25/93	OWRD, interference?								
												78.74				9/29/93	OWRD, interference?								
												76.58				10/26/93	OWRD, interference?								
												79.27				10/26/93	OWRD, rising?								
3S/2W-12 dda	WASH	1931	VOLLUM	18560 PARRETT	1964	422	6	422	X	350	1030	315.00		x		11/6/64	driller-1	B	12	107	2	176	51	D	
												328.37	x			7/8/92	OWRD								
3S/2W-12 ddc	WASH	2033	WILLIS	18850 PARRETT	1976	540	6	75	X		1090	dry				6/16/76	driller-79							D	no water
					1976	670				557, 590, 630, 650		515.00		x		7/22/76	driller-79	A	12	155	2	135	51		WASH 2034
												476.00				9/14/76	USDOE, questionable								
												516.85				2/27/92	OWRD								
												516.79	x			5/21/92	OWRD								
3S/2W-12 dcd	WASH	2044	KNUDSEN	19145 PARRETT	1968	388	6	137	X	363, 383	1100	350.00			x	1/16/68	driller-1	B	18	0	2		54	D	
					1973	765				730		600.00		x		5/29/73	driller-117	A	10	765	1	157	54		WASH 2038
												520.00				8/9/86	Phillips Pump, approx. date								
												527.85	x			5/21/92	OWRD								
3S/2W-12 dbc	WASH	1365	MANKE #5	PARRETT MTN	1992	647	6	450	P:547-647	347, 552	680	389.00		x		3/12/92	driller-723	A	60	640	1	387	57	U	Luzier's conductivity
												380.05				3/15/92	Luzier								
												374.07				6/7/92	Luzier								
												375.48				6/29/92	OWRD								
												375.39				7/8/92	Luzier								
												372.40				7/9/92	OWRD								
												375.47				7/9/92	Luzier								
												375.35				7/11/92	Luzier								
												374.12				10/1/92	OWRD								
												361.86	x			4/22/93	OWRD, ccw								
												374.34				10/21/93	OWRD								
3S/2W-12 dda	WASH	1910	PENTZ	18750 PARRETT	1966	380	6	90/360	P:320-360	341	1050	350.00		x		4/4/66	driller-111	B	12	10	0.8	184		D	
												354.73				5/20/92	OWRD								
												360.12				11/3/92	OWRD								
												360.05				11/25/92	OWRD								
												360.15				12/22/92	OWRD								
												359.90				1/27/93	OWRD								
												359.92				3/2/93	OWRD								
												359.56				3/29/93	OWRD								
												359.22				4/29/93	OWRD								
												358.38				5/27/93	OWRD								
												358.16				6/30/93	OWRD								
												358.00	x			7/28/93	OWRD								
												358.30				8/25/93	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												358.54				9/29/93	OWRD								
												358.70				10/26/93	OWRD								
3S/2W-12 acb	WASH	2037	PANNIER	26300 REIN	1973	365	6	48.5	X	320	445	190.00		x		9/27/73	driller-117	A	12	365	1	160	51	D	USGS
												181.85				7/17/75	USGS								Conductivity
												198.12	x			11/12/92	OWRD								
3S/2W-12 dcd	WASH	2042	BACH	19000 PARRETT	1966	260	8	20	X	240	1100	220.00				8/1/66	driller-35	B	10	20	2			D	
					1977	620	6	265	X	605		448.00				5/6/77	driller-404	A	10	600	2				WASH 2026
3S/2W-13 bda	YAMH	2308	GREGG	13305 PARRETT	1970	570	6	69	X	162, 379	1110	287.00				9/8/70	driller	P	10	115	24			D	
												315.35				9/26/75	USGS								
												339.87				7/8/77	OWRD								
												343.68				10/10/77	OWRD								
												291.18				1/27/78	OWRD, Questionable								
												336.56				4/11/78	OWRD								
												483.48				10/9/78	OWRD, ppg								
3S/2W-13 abb	YAMH	2322	CLAY	13825 PARRETT	1985	885	6	85/844	P:764-844	165	1100	520.00				5/10/85	driller-645	A	14	885	1	130		D	
												510.00				6/7/85	Phillips Pump								
3S/2W-13 bdd	YAMH	2309	AU	13380 PARRETT	1974	885	8	105	X	730	1145	577.00				1/24/74	driller-10	B	12	0	1.5	168		D	G-6160
3S/2W-13 ccd	YAMH	2549	RILEE	12075 PARRETT	1962	500	6	70	X		1090	425.00		x		11/5/62	driller-111	B	4	500	0.5	99	58	U	
												437.89				5/21/92	OWRD								
												439.15				10/29/92	OWRD								
												438.74				11/25/92	OWRD, ccw								
												439.93				12/21/92	OWRD								
												438.93				1/28/93	OWRD, ccw								
												438.49				2/25/93	OWRD, ccw								
												431.06				4/2/93	OWRD, ccw								
												430.73				4/29/93	OWRD								
												430.57	x			5/27/93	OWRD, ccw								
												431.96				6/29/93	OWRD, ccw								
												433.02				7/27/93	OWRD								
												435.14				8/25/93	OWRD								
												436.62				9/30/93	OWRD								
												437.36				10/26/93	OWRD								
3S/2W-13 cba	YAMH	2313	AUSTIN	12755 PARRETT	1970	920	6	103	X		1245	385.00				5/19/70	driller-117	A	12	920	1			D	
												660.00				8/15/92	owner, date approx.								
3S/2W-13 cab	YAMH	2324	GORDON	12800 PARRETT	1988	924	6	94.5	X	520	1180	519.00				6/24/88	driller-649	A	20	900	4			D	ccw@280'
3S/2W-13 cab	YAMH	2314	BANE	13000 PARRETT	1974	780	6	101	X	520	1180	520.00		x		10/2/74	driller-511	A	15	760	1	157		D	
												621.19	x			1/21/93	OWRD								
3S/2W-13 abd	YAMH	107	JUZA	35600 WILDHORSE	1990	815	6	59	X	540, 790, 810	1085	520.00		x		8/22/90	driller-645	A	6.5	815	1	100	51	D	
												509.16	x			1/21/93	OWRD								
3S/2W-13 aad	PMTN	42	ABNEY	35720 WILDHORSE	?	30					1035						owner's depth info								no log
3S/2W-13 aad	PMTN	43	ABNEY	35720 WILDHORSE	?	36					1000						owner's depth info								no log
3S/2W-13 adc	YAMH	114	LEMELSON	29001 HEATER	1990	495	6	20	X	485, 515	970	435.00		x		8/30/90	driller-645	A	15	615	1		59	D	
												435.00				9/xx/90	The Pump Shop								
												421.39	x			10/21/93	OWRD								
3S/2W-14 bcb	YAMH	2345	CRAMER	32255 PARRETT	1969	445	6	41	X		515	240.00		x		8/18/69	driller-117	A	12		1	163	48	D	
												301.20				4/2/80	OWRD								
												298.95				9/15/80	OWRD								
												298.09				4/23/81	OWRD								
												299.50				10/7/81	OWRD								
												298.74				4/15/82	OWRD								
												296.05				9/29/82	OWRD								
												293.40				5/4/83	OWRD								
												291.65				9/27/83	OWRD								
												292.33				5/17/84	OWRD								
												293.15				6/5/85	OWRD								
												296.45				10/3/85	OWRD								
												298.00				4/15/86	OWRD								
												300.18				6/16/87	OWRD								
												302.17				6/17/88	OWRD								
												304.69				5/23/90	OWRD								
												304.67				5/15/91	OWRD								
												306.60				6/30/92	OWRD								
												307.53				10/29/92	OWRD								
												308.37				11/24/92	OWRD								
												308.04				12/21/92	OWRD								
												308.01				1/27/93	OWRD								
												307.61				2/25/93	OWRD								
												306.25				3/29/93	OWRD								
												304.21				4/30/93	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												302.44				5/27/93	OWRD								
												301.79				6/29/93	OWRD								
												301.21	x			7/27/93	OWRD								
												302.03				8/25/93	OWRD								
												302.58				9/29/93	OWRD								
												303.58				10/26/93	OWRD								
3S/2W-14 bdb	YAMH	292	WISSUSIK	32315 OLD PAR	1974	560	6	158	X	78, 375	680	140.00			x	11/18/74	driller-247	A	12	400	1	160	57	D	
								559	P:?			405.00		x		9/24/89	pump test	P	10	45	4				liner noted
												398.93	x			12/30/92	OWRD								
3S/2W-14 aad	YAMH	680	WALSH	33841 HAUGEN	1991	495	6	18/495	P:455-495	410, 485	835	357.00		x		2/26/91	driller-417	A	20	495	1		51	D	
												350.05	x			1/12/93	OWRD								
3S/2W-14 ccd	PMTN	34	DORMER	33303 OLD PAR	?	470	6				850						owner 's info	U	22					D	no log
3S/2W-14 bbb	YAMH	2346	LEWIS	32255 99W	1978	200	6	20	X	138	430	88.00		x		1/31/78	driller-560	A	15	178	4			D	
												152.73	x			1/19/93	OWRD								
3S/2W-14 caa	YAMH	885	ROLFS	33260 HAUGEN	1991	436	6	83/436	P:396-436	415	835	378.00		x		10/29/91	driller-417	A	12	436	1	145	54	D	
												378.71	x			1/19/93	OWRD								
3S/2W-14 caa	YAMH	886	ROLFS	33260 HAUGEN	1991	800	6	90	X	456	815	456.00				10/15/91	driller	A	1.5	800	1		55	U	little water
3S/2W-14 caa	YAMH	2340	TOWN	33280 HAUGEN	1990	482	6	70/482	P:441-480	103, 196, 455	830	366.00		x		1/2/90	driller-553	A	18	480	1	145	56	D	
												372.56	x			2/4/93	OWRD	P	19						pump test
3S/2W-14 ccb	PMTN	35	GARVEY	32855 OLD PAR		293	6				695	215.00				1/17/79	on pumphouse wall					162			no log
												225.00				?	on pumphouse wall								
3S/2W-14 cbb	YAMH	2336	LAKOVICS	32555 OLD PAR	1973	575	6	120	X	85	690	350.00			x	9/10/73	driller-254	A	12	555	1	146	56	D	
								460	P:535-575			350.00				10/24/75	driller-254, liner added								liner added
												449.00		x		7/29/82	Phillips Pump								
												462.28	x			3/11/93	OWRD								
3S/2W-14 ccc	YAMH	2331	STANG	33025 OLD PAR	1976	310	6	140	X	190	730	230.00		x		5/11/76	driller-184	B	15	30	1	144	46	D	
												181.30	x			3/11/93	OWRD								
3S/2W-14 bdd	YAMH	761	POEHLER	33300 HAUGEN	1991	780	6	738	P:?	68, 525, 690	805	580.00		x		5/31/91	driller-645	A	25	740	1	163	52	D	
												589.89	x			3/18/93	OWRD								
3S/2W-14 cdb	YAMH	2350	ALEXANDER	33405 OLD PAR	1973	680	6	20	X	664	1010	602.00		x		10/23/73	driller-404	P	12	78	2		53	D	
												540.00				7/1/77	owner, pump work 1977								
												564.86	x			4/2/93	OWRD								
3S/2W-14 cdc	YAMH	2327	ALEXANDER	33399 OLD PAR	1988	625	6	35/625	P:535-625	516	965	516.00		x		3/15/88	driller-649	P	7.5	15	9		55	D	
												525.14	x			4/2/93	OWRD								
3S/2W-15 dda	YAMH	2380	ZAUNER	32750 OLD PAR	1978	255	6	68	X	177	600	164.00		x		8/15/78	driller-703	B	18	69	2		53	D	
												176.78	x			4/15/93	OWRD								
3S/2W-15 aac	YAMH	2379	SCHAAD	31600 SCHAAD	1977	530	6	20/530	P:470-530	506	495	330.00		x		5/27/77	driller-404	A	40	510	2	109	52	D	
												281.18				6/16/92	OWRD								
												282.48				10/29/92	OWRD								
												283.28				11/24/92	OWRD								
												283.09				12/21/92	OWRD								
												282.70				1/27/93	OWRD								
												284.00				2/1/93	Phillips Pump								
												282.53				2/25/93	OWRD								
												281.07				3/29/93	OWRD								
												279.22				4/30/93	OWRD								
												277.54				5/27/93	OWRD								
												276.95				6/29/93	OWRD								
												276.46	x			7/27/93	OWRD								
												277.44				8/25/93	OWRD, rising slowly								
												277.97				9/29/93	OWRD								
												278.81				10/26/93	OWRD								
3S/2W-15 ada	YAMH	2378	SCHAAD	32300 OLD PAR	1977	485	6	60/485	P:425-485	448	510	302.00		x		8/15/77	driller-404	A	40	465	2	128	52	D	
												300.28	x			3/25/93	OWRD								
3S/2W-15 dbb	YAMH	2381	HERMANSON	31187 CORRAL	1942	140	6	140	P:100-140		210	60.00		x		8/1/42	driller	P	20	100?	1			D	
												54.79	x			4/8/93	OWRD								
3S/2W-15 dad	YAMH	2412	MUELLER	32700 OLD PAR	1984	348	6	212/348	P:310-347	265	615	194.00		x		9/10/84	driller	A	14	348	1			D	
												200.00				7/1/88	owner from pump work in 1988								
												203.35	x			4/22/93	OWRD								
3S/2W-15 dbb	YAMH	2371	SCHOLZ	31139 CORRAL	1967	103	6	100	P:25-100	91	230	21.00		x		4/6/67	driller-111	B	20	60	1		57	D	
												27.37	x			4/15/93	OWRD								
3S/2W-22 cad	YAMH	2501	SIEFKEN	30800 SIEFKEN	1974	145	6	80/140	P:105-145	105	222	31.00		x		9/21/74	driller-117	A	100	145	1	180	52	I	
												31.54				7/23/75	USGS								
												28.45				4/2/80	OWRD								
												31.48				9/15/80	OWRD								
												28.29				4/23/81	OWRD								
												31.10				10/7/81	OWRD								
												27.72				4/15/82	OWRD								
												31.30				9/30/82	OWRD								

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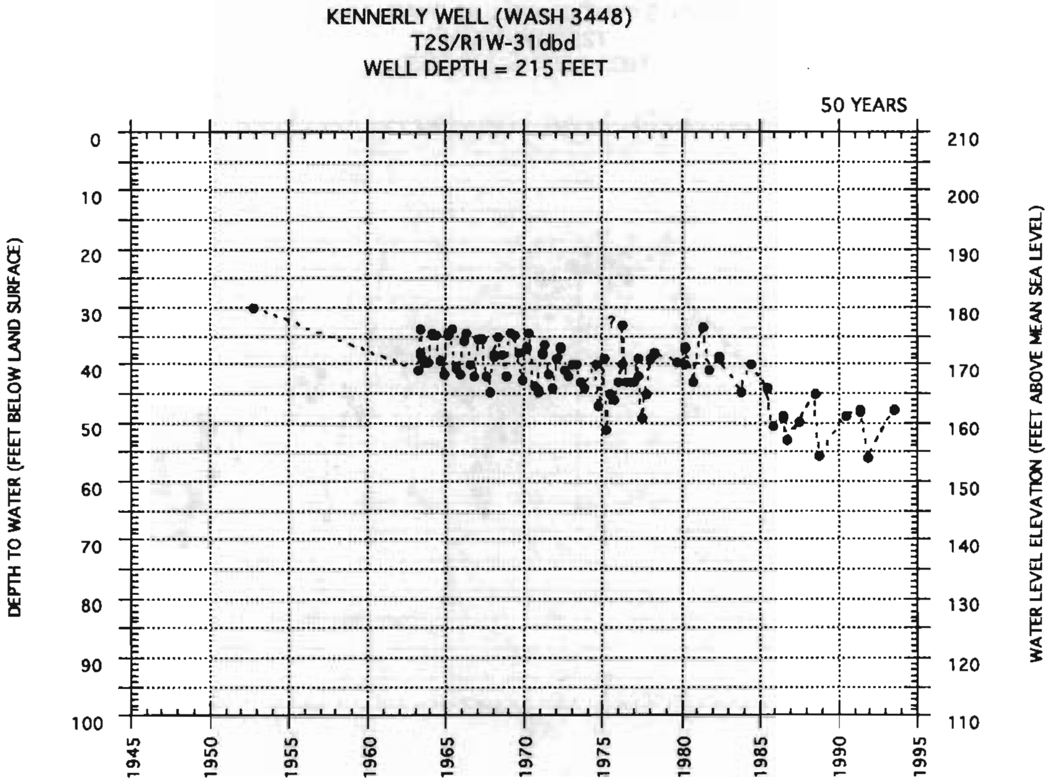
												27.45				5/4/83	OWRD								
												30.72				9/23/83	OWRD								
												27.62				5/17/84	OWRD								
												29.04				6/5/85	OWRD								
												31.88				6/16/87	OWRD								
												29.06				6/17/88	OWRD								
												28.95				5/15/91	OWRD								
												30.86				10/29/92	OWRD								
												30.93				11/24/92	OWRD								
												30.28				12/22/92	OWRD								
												29.50				1/28/93	OWRD								
												29.40				3/2/93	OWRD								
												29.02				3/30/93	OWRD								
												28.33				4/30/93	OWRD								
												28.14	x			5/26/93	OWRD								
												28.81				6/30/93	OWRD								
												29.62				8/3/93	OWRD								
												31.25				8/25/93	OWRD, recently ppd.								
												30.82				9/30/93	OWRD								
												30.39				10/27/93	OWRD								
3S/2W-22 aca	YAMH	2518	FRIEDMAN/SEITZ	31909 CORRAL	1961	97	6	86	P:46-86	52	330	35.00		x		11/22/61	driller-111	B	14	45	1	121	54	D	
												37.00				5/27/88	pump test	P	14	7	4				
												37.61	x			3/18/93	OWRD								
3S/2W-22 aaa	YAMH	2522	DARBY	11900 ANNA	1971	165	6	147	P:40-140	100	555	71.00		x		8/3/71	driller-117	A	13	165	1		56	D	
												86.62	x			4/2/93	OWRD								
3S/2W-22 acb	PMTN	38	CRAFT	32005 CORRAL	?	38	6				305	9.00				Aug-92	owner's wl +depth info, basalt well?							D	no log
												6.90				4/8/93	OWRD								
3S/2W-22 ddc	YAMH	2509	RENNE	10050 RENNE	1979	165	6	147	X	112	280	70.00		x		2/13/79	driller-715	A	30	145	1			D	
												55.31	x			4/15/93	OWRD								
3S/2W-22 aab	YAMH	2512	HENDREN	31600 SCHAAD	1968	245	6	20/245	P:205-245		505	78.00		x		8/10/68	driller-117	A	37			116	56	D	
												112.13				3/18/93	OWRD, rising								
												109.01	x			4/22/93	OWRD								
3S/2W-23 dca	YAMH	2532	BAUER	33505 CORRAL	1975	403	6	33	X	154	665	238.00		x		6/21/75	driller-511	A	12	120	1			D	
												228.25				7/23/75	USGS								
												226.25				4/2/80	OWRD								
												232.85				9/23/80	OWRD								
												221.65				4/23/81	OWRD								
												227.30				10/7/81	OWRD								
												227.10				4/15/82	OWRD, ccw								
												231.70				9/30/82	OWRD, no ccw								
												218.70				4/5/83	OWRD								
												228.72				9/23/83	OWRD								
												219.05				5/18/84	OWRD								
												229.60				6/16/87	OWRD								
												237.67				6/17/88	OWRD, rising slowly								
												247.00				9/12/88	Phillips Pump								
												222.04				5/15/91	OWRD								
												221.19	x			4/15/93	OWRD, ccw								
3S/2W-23 cac	YAMH	2535	FERRIS	32680 CORRAL	1969	581	6	581	P:412-581		705	375.00				8/14/69	driller-430	B	1	200	4	160	52	D	
3S/2W-23 bac	YAMH	2539	STREED	CORRAL CREEK	1980	500	6	60/500	P:400-500	390	765	350.00				5/7/80	driller-645	A	5	500	1		60	D	
												360.00				7/1/92	The Pump Shop								
3S/2W-23 bac	YAMH	2339	STREED	CORRAL CREEK	1981	360	6	?		322	660	190.00		x		9/11/81	driller-404, deepened	A	15	360	2	158	52	D	no original log
												210.00				11/xx/89	The Pump Shop								
												214.55	x			7/16/92	OWRD								
3S/2W-23 bba	YAMH	168	PAR. MTN. EST. #1	33100 OLD PAR	1990	600	6	300/450	P:300-450	367, 475	760	286.00		x		5/29/90	driller-1281, accurate?	A	7.5	600	1		60	P	G-11220
												170.00				11/13/90	pump test, questionable								
												312.04				4/27/91	owner's permit report								
												312.50				3/30/92	owner's permit report								
												311.30				10/29/92	OWRD								
												315.48				11/24/92	OWRD								
												312.80				12/21/92	OWRD								
												311.37				1/27/93	OWRD								
												310.24				2/25/93	OWRD								
												309.25				3/27/93	owner's permit report								
												309.04	x			3/29/93	OWRD								
												317.70				4/28/93	OWRD								
												322.42				5/27/93	OWRD								
												446.62				6/29/93	OWRD, pumping								
												314.04				8/25/93	OWRD								

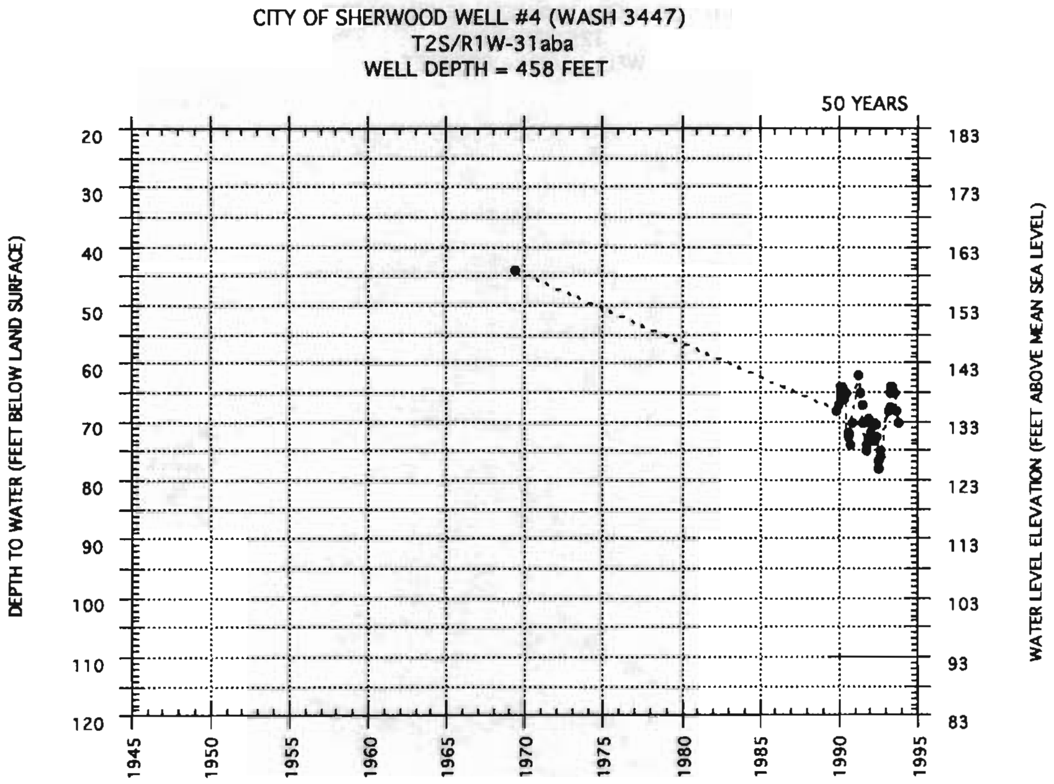
LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												312.39				9/29/93	OWRD								
												309.08				10/26/93	OWRD								
3S/2W-23 dcc	YAMH	2536	BAUER	33030 CORRAL	1972	586	6	20	X	549	830	460.00		x		9/2/72	driller-560	A	10	?	1	159		D	
												-507.82				6/30/92	OWRD, recently ppd.								
												512.34	x			10/22/93	OWRD								
3S/2W-23 bbb	YAMH	167	PAR. MTN. EST. #2	33100 OLD PAR	1990	285	6	247	P:237-247	230, 245	691	176.00		x		6/5/90	driller-1281, accurate?	A	150+	280	1		60	P	G-11220
												202.09				4/27/91	owner's permit report								
												239.00				3/30/92	owner's permit report, off 2 days								
												226.92				4/13/93	owner's permit report								
												224.00				4/17/93	owner, ccw								
												220.67				4/21/93	owner, ccw								
												216.25				4/26/93	owner, ccw								
												210.75				5/2/93	owner, ccw								
												213.47				5/2/93	owner, ccw								
												208.42				5/9/93	owner, ccw								
												201.75				5/19/93	owner, ccw								
												199.75				5/30/93	owner								
												198.08	x			6/7/93	owner, ccw???								
												199.50				8/4/93	owner, ppd on 8/3/93								
												230.83				12/1/93	owner, off ~12 days								
												236.92				12/12/93	owner, off ~ 30 days								
3S/2W-24 dbd	PMTN	39	RILEE	10500 PARRETT	?	400	6				750	303.68	x			5/21/92	OWRD, owner's depth info					163	54	D	no log
3S/2W-24 bad	YAMH	2544	MILLS	11755 PARRETT	1974	380	6	28	X	265	1000	265.00			x	6/16/74	driller-511	A	4	115	2	140	55	D	
					1974	625						475.00		x		10/8/74	driller-511	P	10	125	4				YAMH 2543
												484.53				5/21/92	OWRD								
												486.04				11/3/92	OWRD								
												485.61				11/25/92	OWRD								
												485.96				12/21/92	OWRD								
												486.05				1/28/93	OWRD								
												486.06				2/25/93	OWRD								
												485.48				3/29/93	OWRD								
												484.64				4/29/93	OWRD								
												483.47				5/27/93	OWRD								
												482.68				6/29/93	OWRD								
												482.42	x			7/27/93	OWRD								
												483.37				8/25/93	OWRD								
												483.38				9/29/93	OWRD								
												484.76				10/26/93	OWRD								
3S/2W-24 bdc	YAMH	2550	FULMER	11055 PARRETT	1969	620	6	36	X	586	920	260.00		x		9/15/69	driller-404	P	25	360	2	113	52	D	
												480.03				3/18/93	OWRD, heavy ccw below 200'								
												478.08	x			4/15/93	OWRD, heavy ccw								
3S/2W-24 bdb	YAMH	2548	DUGAN	11375 PARRETT	1968	625	6	40	X		960	447.00		x		3/8/68	driller-117	A	12				53	D	
												446.52	x			4/22/93	OWRD								
3S/2W-25 aaa	PMTN	40	RILEE	9900 PARRETT	?	267	6				615	211.12	x			6/2/92	OWRD, ccw, owner's depth info								no log
3S/2W-25 cbc	YAMH	2574	MOFFITT	34125 KRAMIEN	1970	680	6	20	X		850	575.00		x		3/21/70	driller-117	A	7.5	680	1	128	55	D	
												580.05				6/30/92	OWRD								
												590.33				10/29/92	OWRD								
												590.67				11/25/92	OWRD								
												592.73				12/22/92	OWRD								
												591.45				3/3/93	OWRD								
												589.00	x			3/30/93	OWRD								
3S/2W-25 bad	YAMH	2559	WOOTON	34750 CORRAL	1978	125	6	20/125	P:25-125	35	495	25.00		x		10/9/78	driller-645	A	10	125	1	138	52	D	
												26.00				10/27/89	Phillips Pump								
												22.87	x			3/25/93	OWRD								
3S/2W-25 aca	YAMH	2566	HORROCKS	35500 CORRAL	1970	135	6	21	X	75	470	61.00		x		8/25/70	driller-117	A	45	?	1		55	DS	
												64.27	x			4/2/93	OWRD								
3S/2W-26 daa	YAMH	2596	PORTER	33925 KRAMIEN	1976	720	6	20/720	P:500-720	670	855	535.00		x		12/13/76	driller-645	A	9.5	720	1		51	D	
												595.07				4/2/93	OWRD								
												591.69				5/26/93	OWRD								
												590.25				6/30/93	OWRD								
												592.69				8/3/93	OWRD								
												588.25				8/26/93	OWRD								
												587.98	x			9/30/93	OWRD								
												588.61				10/27/93	OWRD								
3S/2W-26 bda	YAMH	2599	CLEMENT	9220 BLACKCAP	1974	465	6	60/300	X	448	640	352.00		x		5/29/74	driller-404	P	25	83	2	100	54	D	
												342.54				10/29/92	OWRD								
												343.05				11/24/92	OWRD								
												342.84				12/22/92	OWRD								
												343.11				1/28/93	OWRD								

LOCATION	WELL	ID	OWNER	ADDRESS	YEAR DRILLED	WELL DEPTH (feet)	CASING DIA. (in.)	CASING DEPTH (feet)	FINISH	DEPTH TO WBZ's (feet)	ELEV. (feet)	WATER DEPTH (feet)	A	B	C	LEVEL DATE	WATER LEVEL REMARKS	TEST TYPE	YIELD	STEM @ or DRAWDOWN (feet)	TIME	COND	TEMP	USE OF WATER	COMMENTS
												343.29				3/2/93	OWRD								
												342.51				3/30/93	OWRD								
												340.44				4/29/93	OWRD								
												338.56				5/26/93	OWRD								
												337.72				6/30/93	OWRD								
												337.44				8/3/93	OWRD								
												337.37				8/26/93	OWRD								
												337.12	x			9/30/93	OWRD								
												337.50				10/27/93	OWRD								
3S/2W-26 bab	YAMH	2563	DOMBEK	10055 BLACKCAP	1972	560	6	90	X	497	700	150.00				7/19/72	driller-560, questionable	A	20	520	1			D	
						460	5	340				410.00		x		7/1/74	Pump Shop, date approx.	P	14	30	2				cave in?
												414.68	x			2/11/93	OWRD								
3S/2W-26 bba	YAMH	2592	KLINGELE	9775 BLACKCAP	1974	480	6	47/474	P:414-474	460	655	350.00		x		7/20/74	driller-533	A	22	457	1	135	54	D	
												361.99	x			3/18/93	OWRD	A	20	480	2				YAMH 2593
3S/2W-26 abb	YAMH	316	SNOW	32901 KRAMIEN	1985	775	6	20/775	P:715-775	550, 605	830	550.00		x		9/13/85	driller-645	A	12	755	1	160	58	DS	
												523.51	x			3/25/93	OWRD								
3S/2W-26 bdb	YAMH	2609	KLOSTER	9449 BLACKCAP	1987	466	8	40/460	P:?	410, 440	610	310.00		x		4/15/87	driller-645	A	30	460	1	163	54	D	
												327.57	x			3/25/93	OWRD								
3S/2W-26 aab	YAMH	2528	BOYLES	33720 CORRAL	1967	245	6	47	X		625	202.00		x		12/15/67	driller-117	B	20	22	1		54	DS	
												186.05	x			4/2/93	OWRD								
3S/2W-35 bbd	YAMH	2683	BRYSON	700 STAR MOOR.	1980	586	6	20/260	P:241-258	238	265	132.00		x		4/18/80	driller-703	A	60	?	1		52	D	
												135.21	x			10/22/93	OWRD								
3S/2W-36 abb	YAMH	2714	KROGER	35097 KRAMIEN	1962	285	8	26	X	280	610	230.00		x		8/10/62	driller-382	B	7	12	2	147		D	
												253.47	x			3/25/93	OWRD								
												260.00				10/xx/93	The Pump Shop								
3S/2W-36 aca	YAMH	2685	MCCAFFREY	7425 EARLWOOD	1983	545	6	40/545	P:445-545	126	500	320.00		x		6/29/83	driller	A	5	545	1	145		D	
												363.88	x			6/16/92	OWRD, ccw								
3S/2W-36 aad	YAMH	2709	DICKENSEN	35780 KRAMIEN	1977	207	6	19	X	180	490	125.00			x	1/19/77	driller-553	A	13	200	1	195	56	D	
					1988	450				343, 426		295.00		x		5/6/88	driller-553	A	11	435	1				YAMH 2689
												246.02	x			5/27/92	OWRD								
3S/2W-36 aba	YAMH	2703	COX	35505 KRAMIEN	1976	280	6	22	X	245, 250	560	212.00		x		8/30/76	driller-79	A	14	275	2	183	54	D	
												211.72				6/19/92	OWRD								
												211.85				10/29/92	OWRD								
												212.15				11/25/92	OWRD								
												212.11				12/22/92	OWRD								
												212.14				1/29/93	OWRD								
												211.53				3/2/93	OWRD								
												211.49				3/30/93	OWRD								
												211.16				4/30/93	OWRD, rising slowly								
												208.62				5/26/93	OWRD								
												207.35				6/30/93	OWRD								
												206.29				8/3/93	OWRD								
												206.03				8/26/93	OWRD								
												205.59	x			9/30/93	OWRD								
												205.71				10/27/93	OWRD								
3S/2W-36 aca	YAMH	2697	BROWN	7505 EARLWOOD	1981	350	6	?		130	520	90.00			x	10/20/81	driller-79, deepening	P	8	40	2			D	was 100', no log
					1982	430				403		308.00		x		6/15/82	driller-79, deepening	P	15	92	2	125	58		YAMH 2698
												325.06	x			8/25/92	OWRD, ccw								
3S/2W-36 dab	YAMH	2687	WHITAKER	6885 EARLWOOD	1989	505	6	19	X	430	390	190.00		x		9/18/89	driller-645	A	5	505	1	195	56	D	
												269.15	x			1/21/93	OWRD, ccw								
3S/2W-36 aca	YAMH	2706	WOOD	7250 EARLWOOD	1971	155	6	20	X	122	500	32.00		x		5/8/71	driller-404	P	15	123	2	172	52	D	
												38.28				7/24/74	USGS								
												80.14	x			2/11/93	OWRD								
3S/2W-36 acc	YAMH	2700	WOOD	35155 ROCKY	1984	545	6	20/545	P:465-545	140, 460	520	400.00		x		7/24/84	driller-645	A	9	545	1	140	54	D	
												398.00				3/11/85	Phillips Pump								
												406.05	x			2/11/93	OWRD								
3S/2W-36 acc	YAMH	2716	COLE	7049 EARLWOOD	1971	493	6	26		480	515	400.00		x		9/24/71	driller-10	B	14	6	0.5	148	52	D	
												418.43	x			2/11/93	OWRD								
3S/2W-36 acd	YAMH	2686	ACOTT	7085 EARLWOOD	1990	545	6	18	X	505	445	412.00		x		2/26/90	driller-1281	A	30	545	1		59	D	
												340.74	x			4/2/93	OWRD								
3S/2W-36 abb	YAMH	2555	WISE	35100 KRAMIEN	1983	743	6	30/743	P:658-743	335	650	470.00		x		4/1/83	driller-645	A	5	743	1		53	I	
												503.29	x			4/8/93	OWRD								
3S/2W-36 abb	YAMH	2565	WISE	35100 KRAMIEN	1972	550	6	20	X	53	625	50.00		x		8/9/72	driller-511	P	5	500	2		54	D	
												468.39	x			4/8/93	OWRD, ccw								
3S/2W-36 acd	PMTN	1	ACOTT	7085 EARLWOOD	?	147	6				445	138.90				4/2/93	Puddle on bottom, owner's depth info							U	no log, "dry"
3S/2W-36 aad	YAMH	2708	STERRETT	KRAMIEN	1977	260	6	19	X	250	520	150.00		x		1/18/77	driller-553	A	12	255	1			U	no house
												146.92	x			12/22/93	OWRD								
4S/1W-6 bac	YAMH	812	BISHOP	36550 WILSONV	1991	390	6	228	X	377	120	36.00		x		8/23/91	driller-126	A	90	385	1		56	D	
												30.90	x			10/22/93	OWRD								

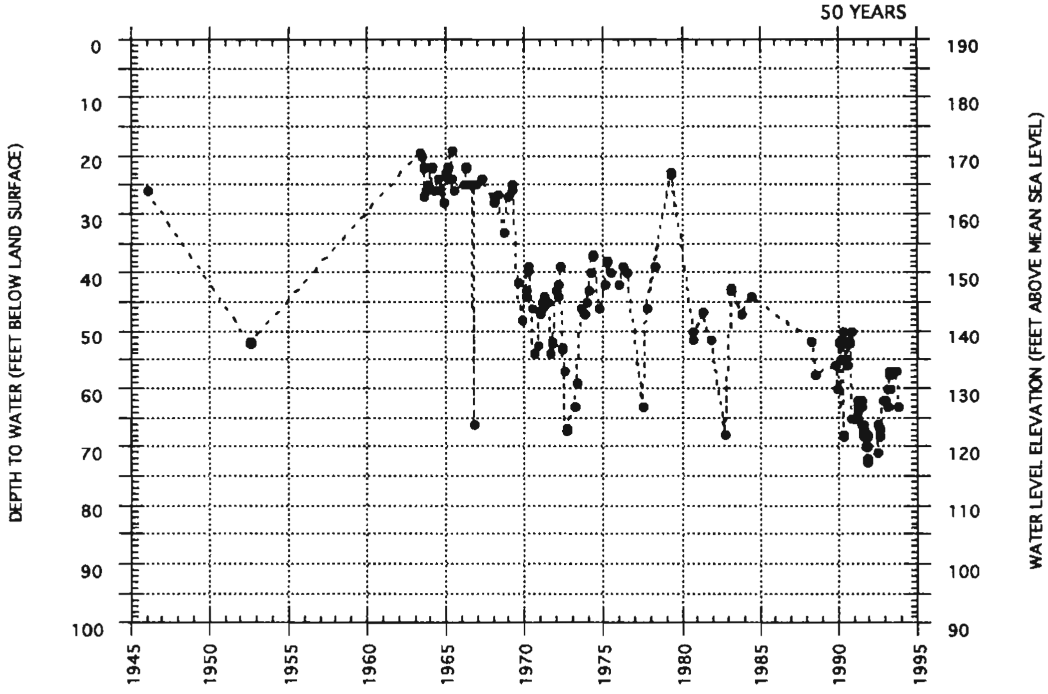
APPENDIX B

HYDROGRAPHS OF MONITORING WELLS

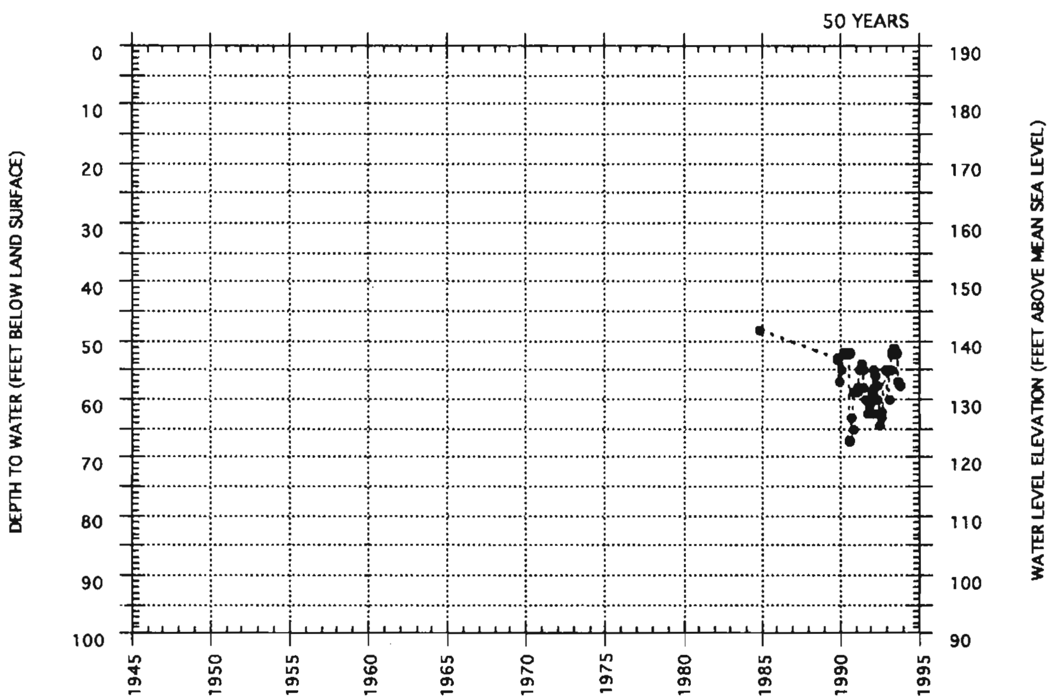

KENNERLY WELL (WASH 3448)
T2S/R1W-31dbd
WELL DEPTH = 215 FEET
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
0
10
20
30
40
50
60
70
80
90
100
210
200
190
180
170
160
150
140
130
120
110
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995


CITY OF SHERWOOD WELL #4 (WASH 3447)
T2S/R1W-31aba
WELL DEPTH = 458 FEET
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
20
30
40
50
60
70
80
90
100
110
120
183
173
163
153
143
133
123
113
103
93
83
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995

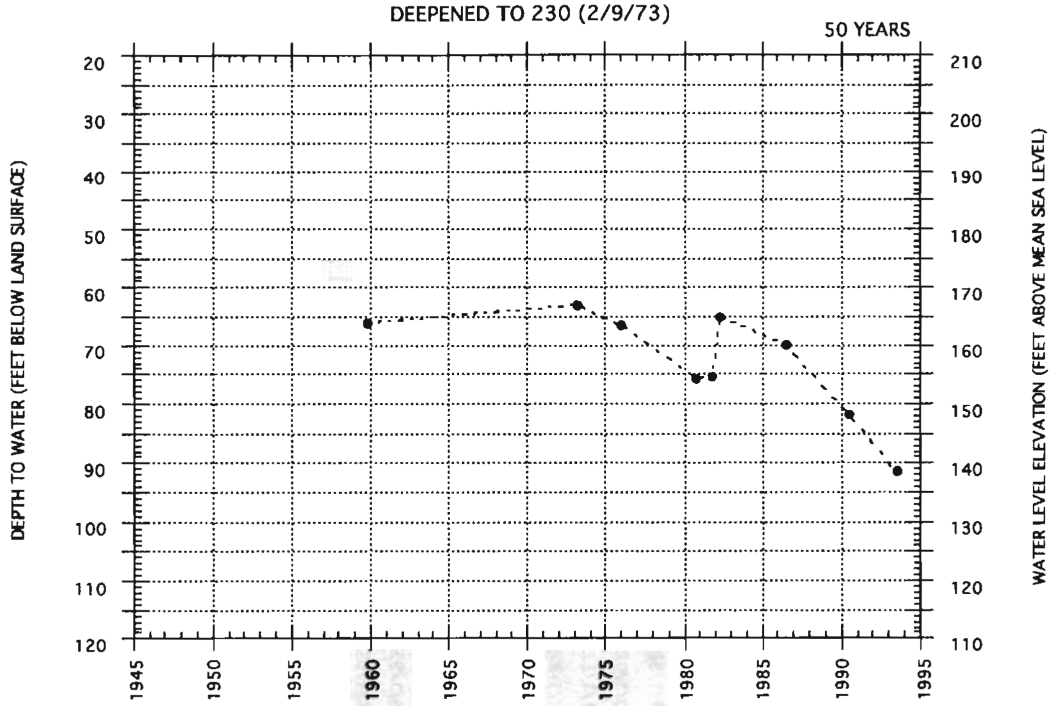
CITY OF SHERWOOD WELL #3 (WASH 1823)
T2S/R1W-32bdd
WELL DEPTH = 339 FEET



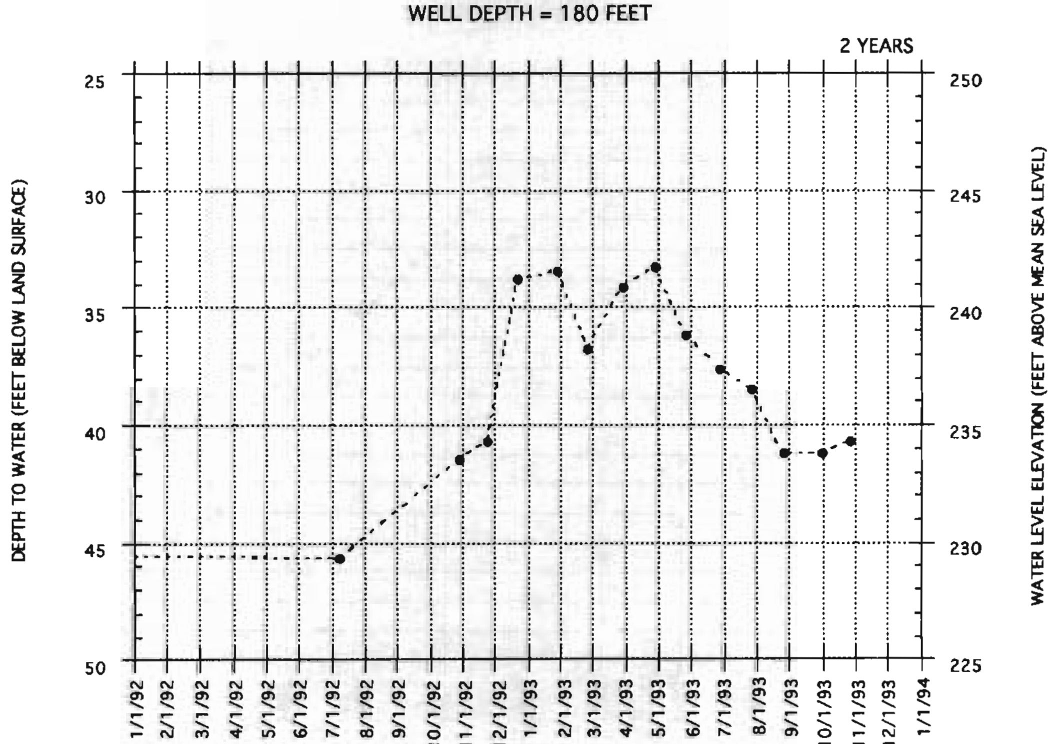
CITY OF SHERWOOD WELL #5 (WASH 717)
T2S/R1W-32cbc
WELL DEPTH = 800 FEET



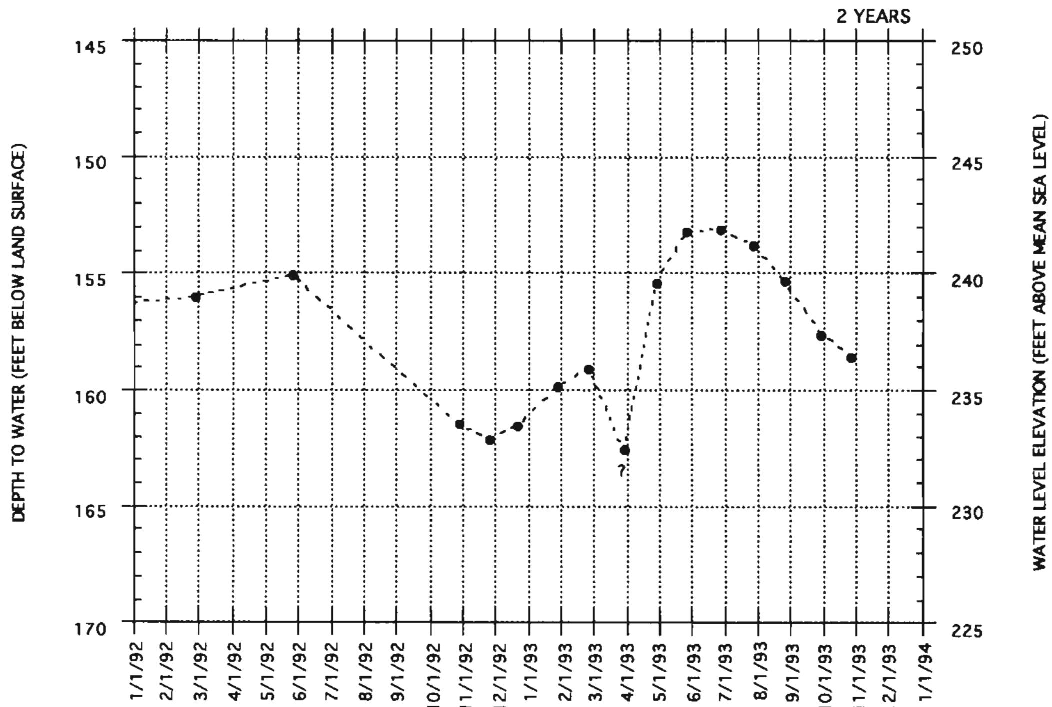
TRI-COUNTY GUN CLUB WELL (WASH 1847)
T2S/R1W-33dda
ORIGINAL WELL DEPTH = 109 FEET
DEEPENED TO 230 (2/9/73)



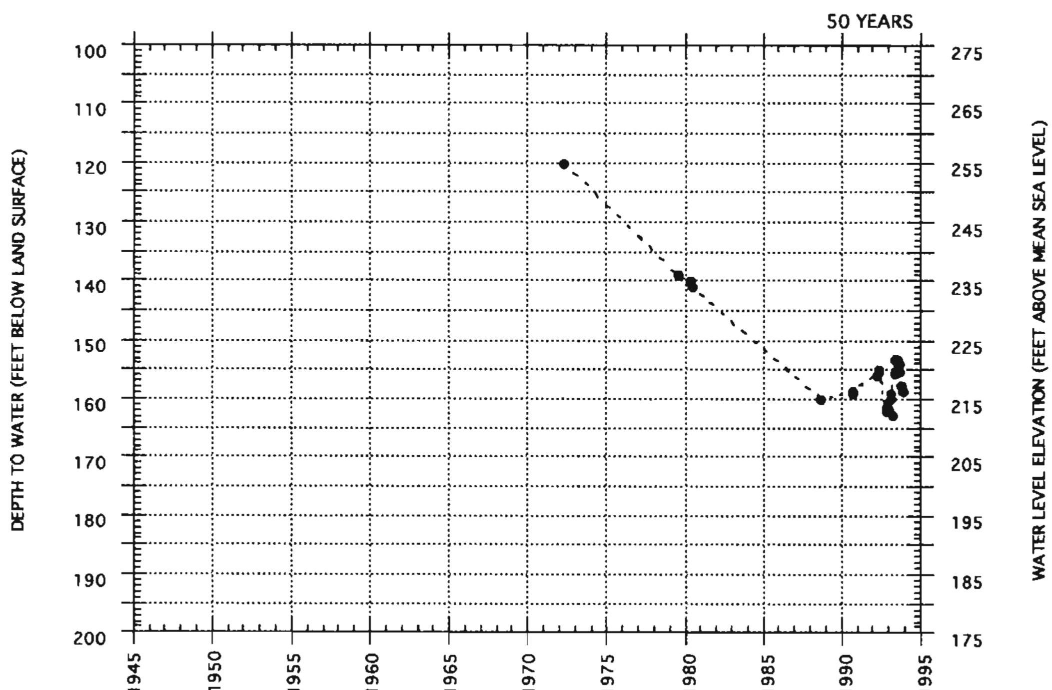
NIELSEN WELL (CLAC 7859)
T3S/R1W-4bdb
WELL DEPTH = 180 FEET



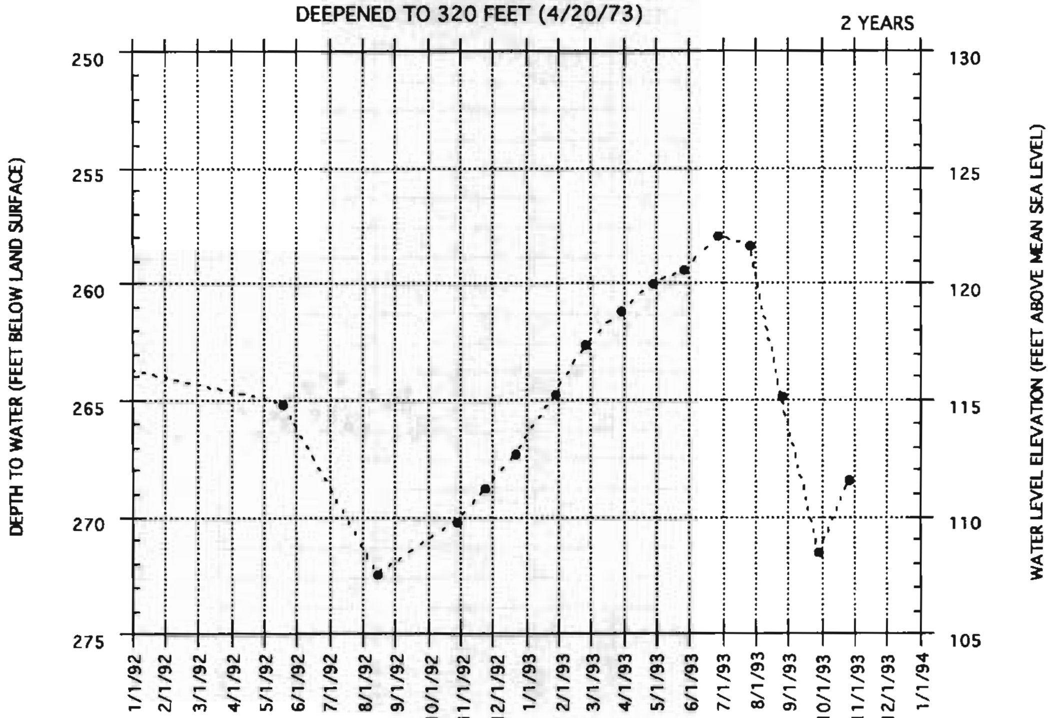
GARSTKA WELL (CLAC 7824)
T3S/R1W-5bca
WELL DEPTH = 245 FEET



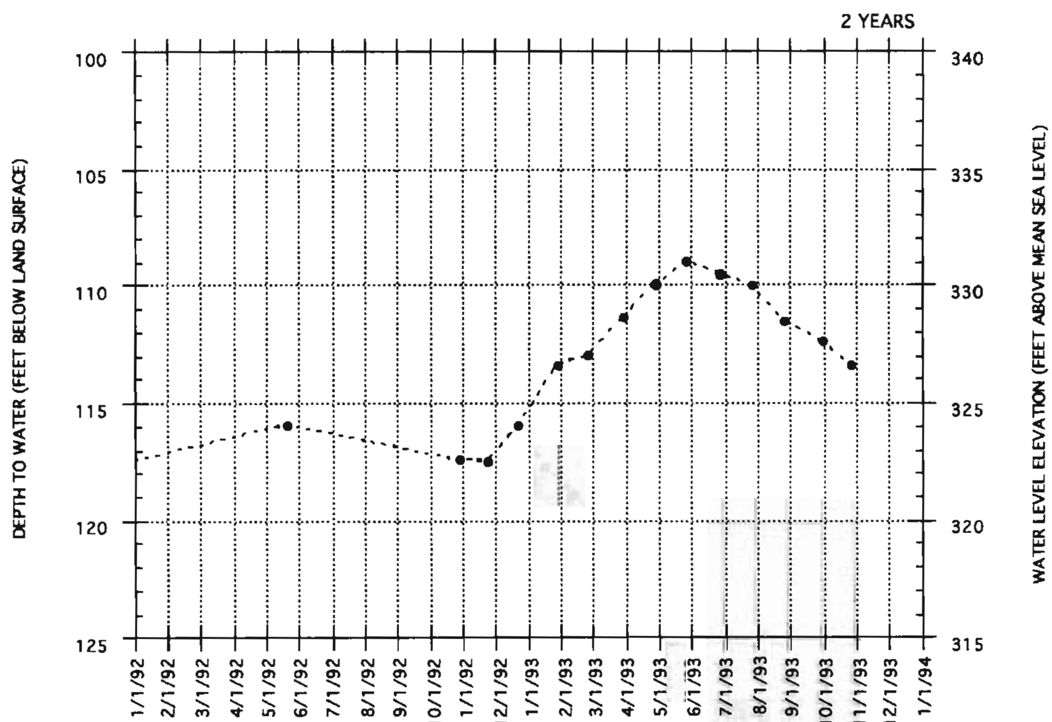
GARSTKA WELL (CLAC 7824)
T3S/R1W-5bca
WELL DEPTH = 245 FEET



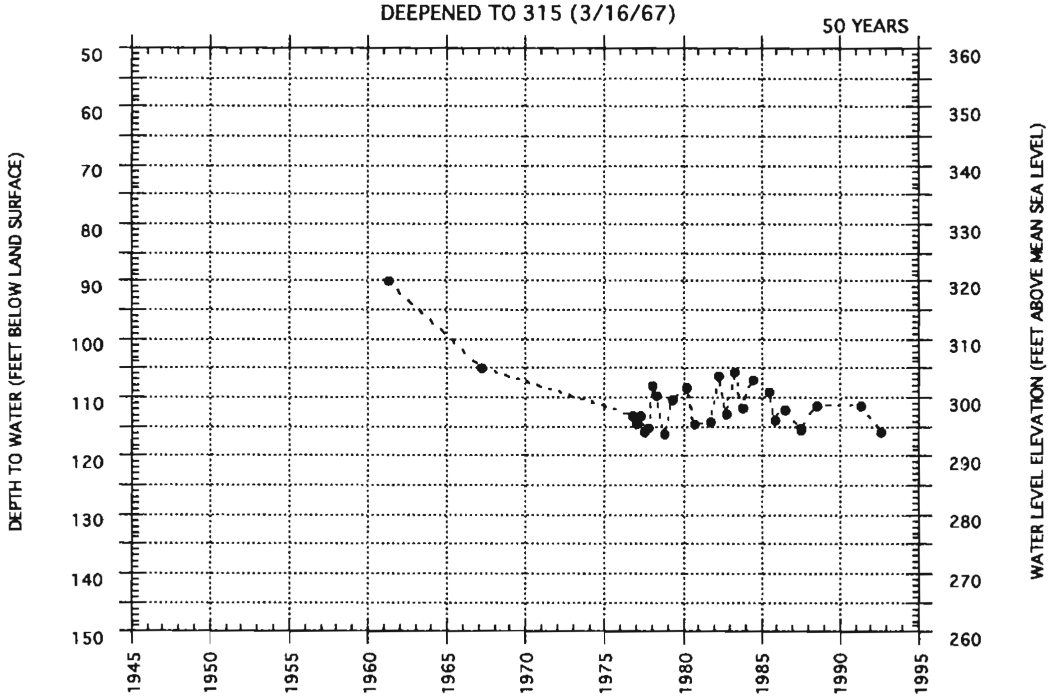
EPPICH WELL (CLAC 18432)
T3S/R1W-5bdb
ORIGINAL WELL DEPTH = 168 FEET
DEEPENED TO 320 FEET (4/20/73)



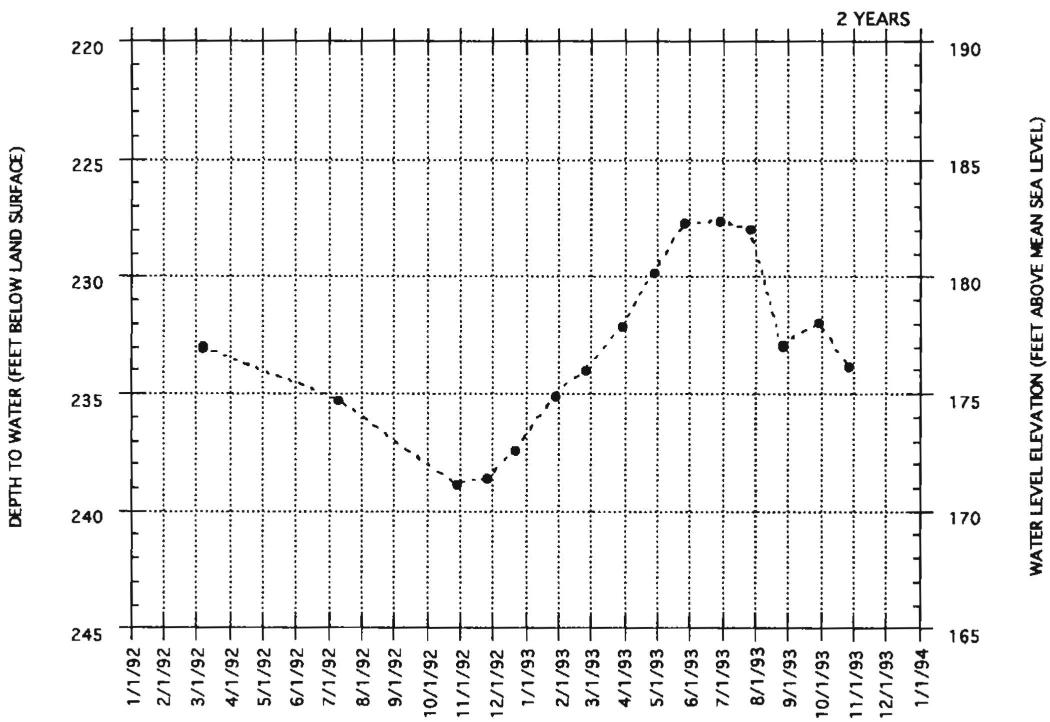
COE WELL (CLAC 7781)
T3S/R1W-5cad
WELL DEPTH = 245 FEET

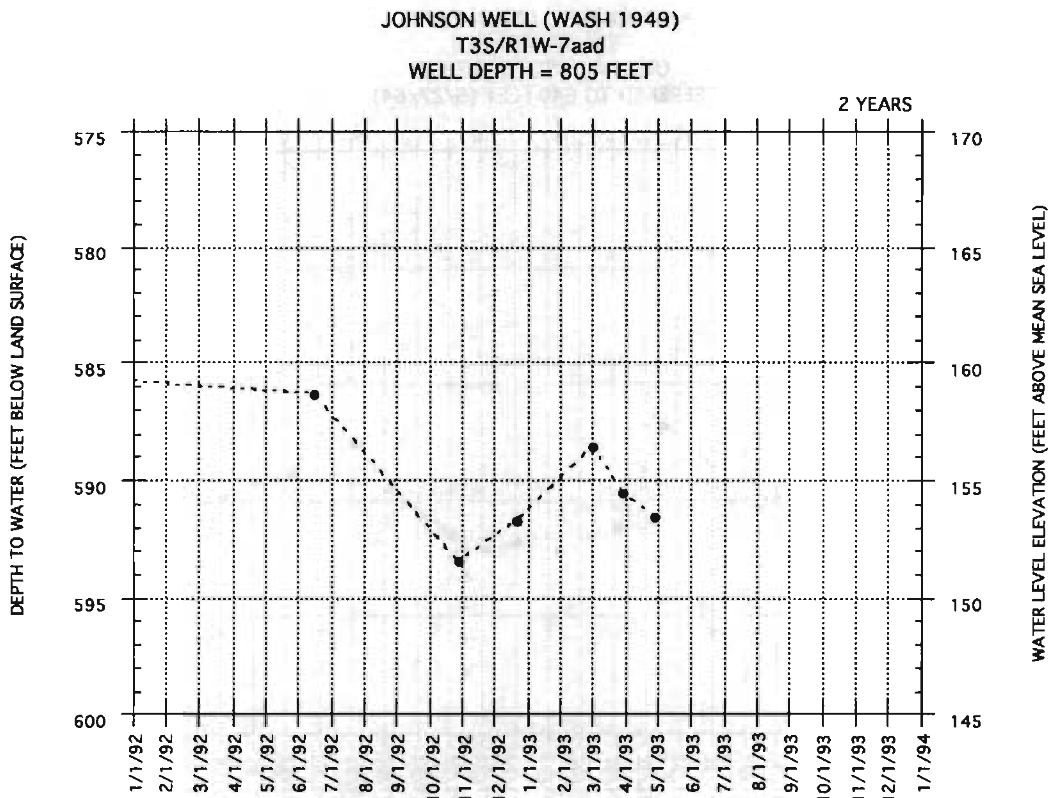


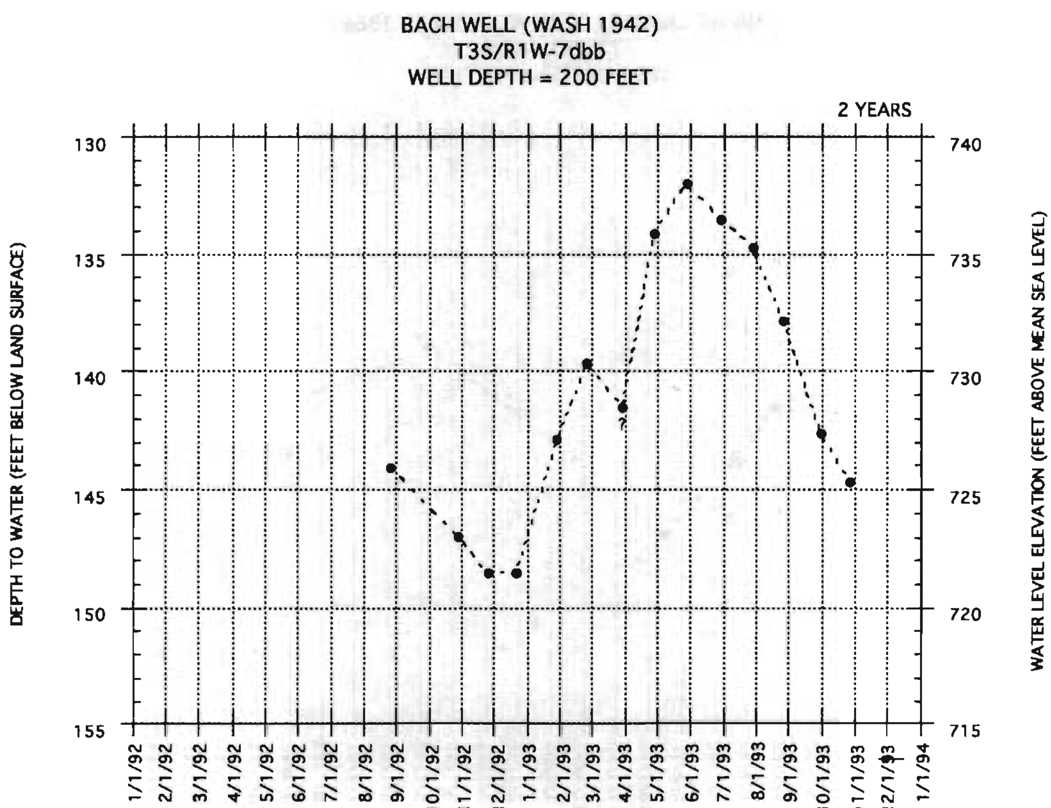
SKEETERS WELL (CLAC 7864)
T3S/R1W-5cca
ORIGINAL WELL DEPTH = 138 FEET
DEEPENED TO 315 (3/16/67)



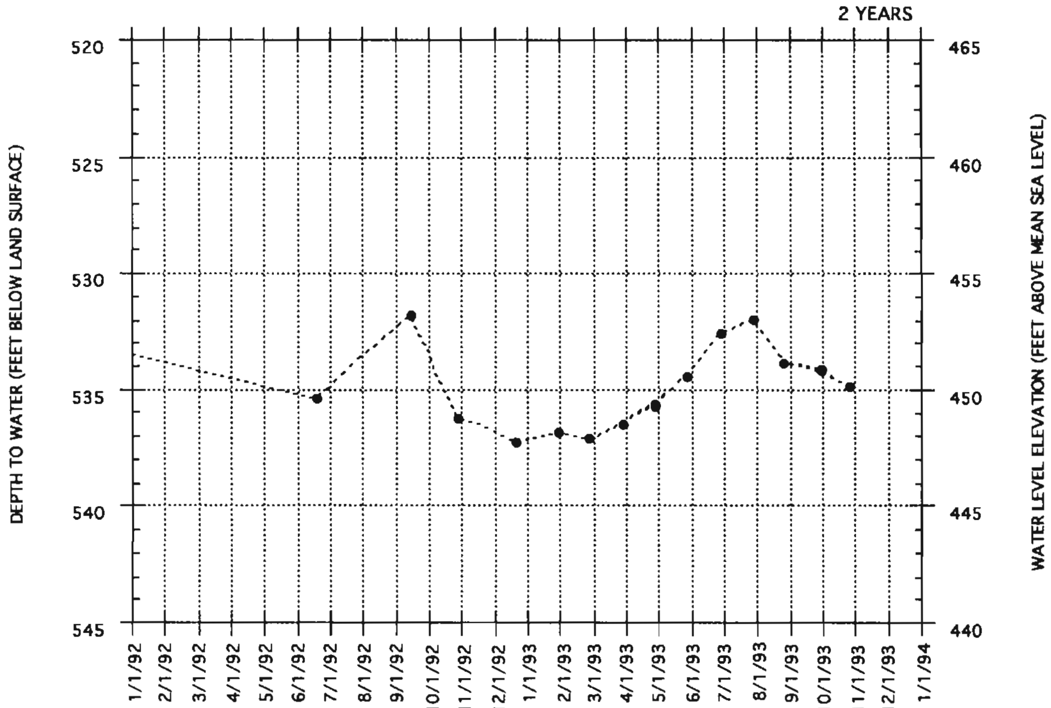
HANSEN WELL (WASH 1360)
T3S/R1W-6dbd
WELL DEPTH = 345 FEET



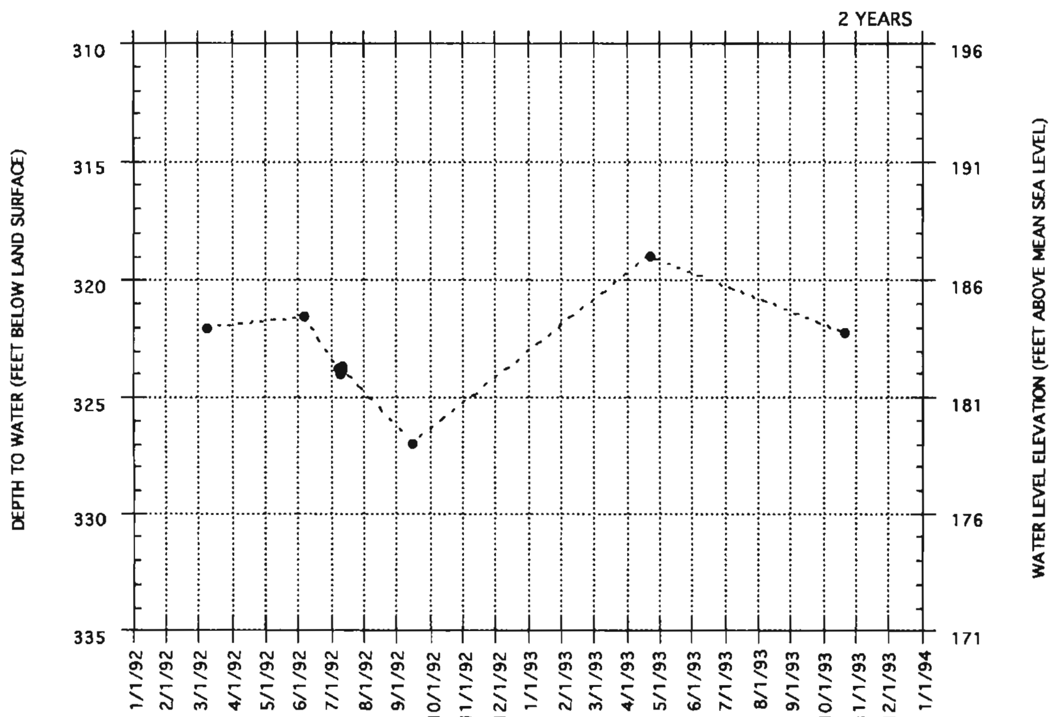

JOHNSON WELL (WASH 1949)
T3S/R1W-7aad
WELL DEPTH = 805 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
575
580
585
590
595
600
170
165
160
155
150
145
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
6/1/93
7/1/93
8/1/93
9/1/93
10/1/93
11/1/93
12/1/93
1/1/94

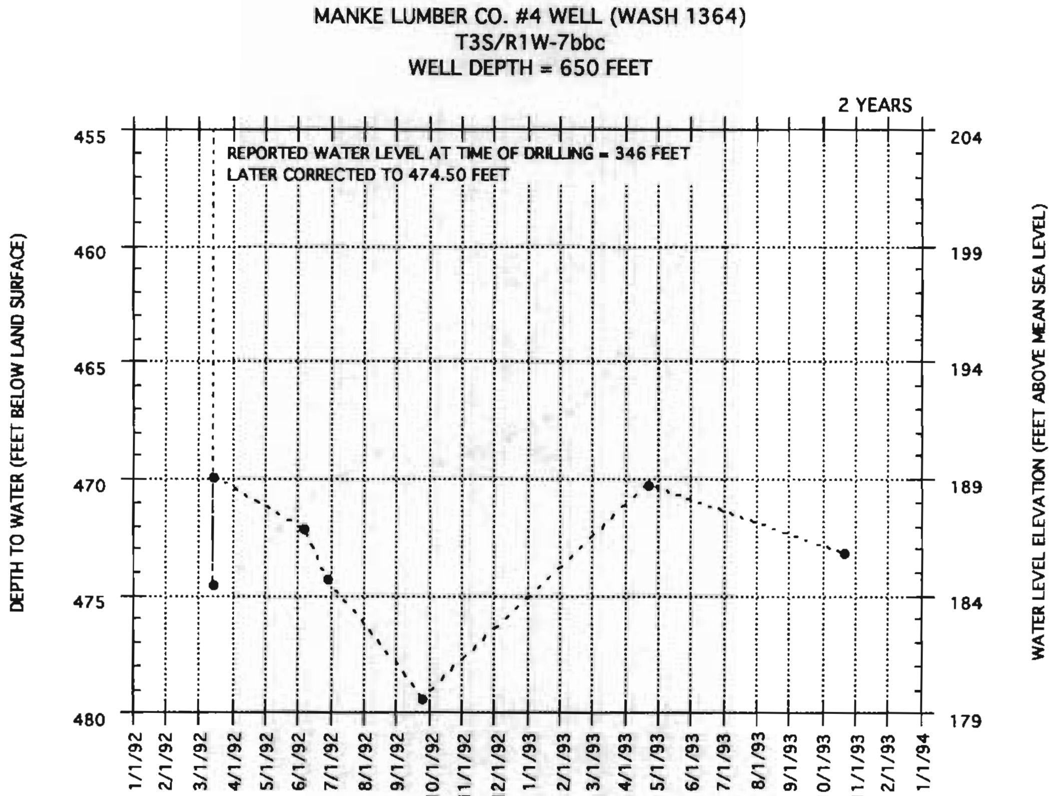

BACH WELL (WASH 1942)
T3S/R1W-7dbb
WELL DEPTH = 200 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
130
135
140
145
150
155
740
735
730
725
720
715
?
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
6/1/93
7/1/93
8/1/93
9/1/93
10/1/93
11/1/93
12/1/93
1/1/94

KIMBALL WELL (WASH 1937)
T3S/R1W-7cab
ORIGINAL WELL 575 FEET
DEEPENED TO 640 FEET (5/27/64)



MANKE LUMBER CO. #3 WELL (WASH 1366)
T3S/R1W-7bba
WELL DEPTH = 573 FEET




MANKE LUMBER CO. #4 WELL (WASH 1364)
T3S/R1W-7bbc
WELL DEPTH = 650 FEET
2 YEARS
REPORTED WATER LEVEL AT TIME OF DRILLING = 346 FEET
LATER CORRECTED TO 474.50 FEET
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
455
460
465
470
475
480
204
199
194
189
184
179
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
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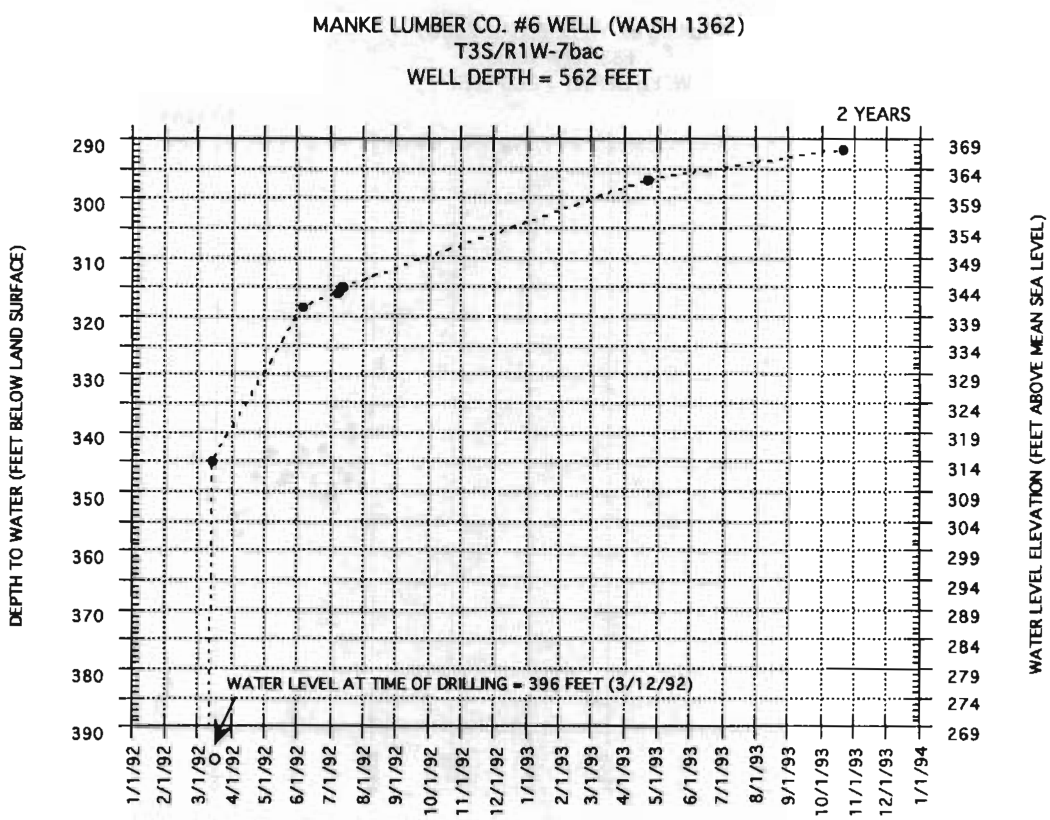
12/1/93
1/1/94


MANKE LUMBER CO. #6 WELL (WASH 1362)
T3S/R1W-7bac
WELL DEPTH = 562 FEET
2 YEARS
WATER LEVEL AT TIME OF DRILLING = 396 FEET (3/12/92)
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
290
300
310
320
330
340
350
360
370
380
390
369
364
359
354
349
344
339
334
329
324
319
314
309
304
299
294
289
284
279
274
269
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
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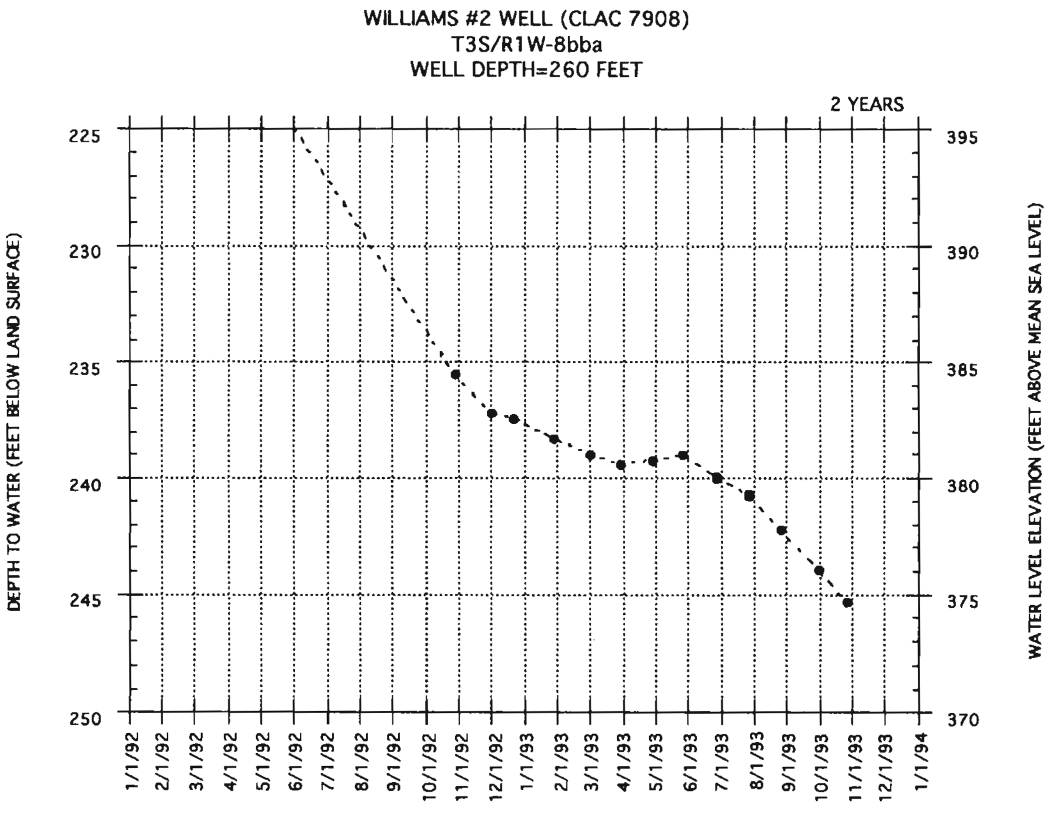
12/1/93
1/1/94



WILLIAMS #2 WELL (CLAC 7908)
T3S/R1W-8bba
WELL DEPTH=260 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
225
230
235
240
245
250
395
390
385
380
375
370
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
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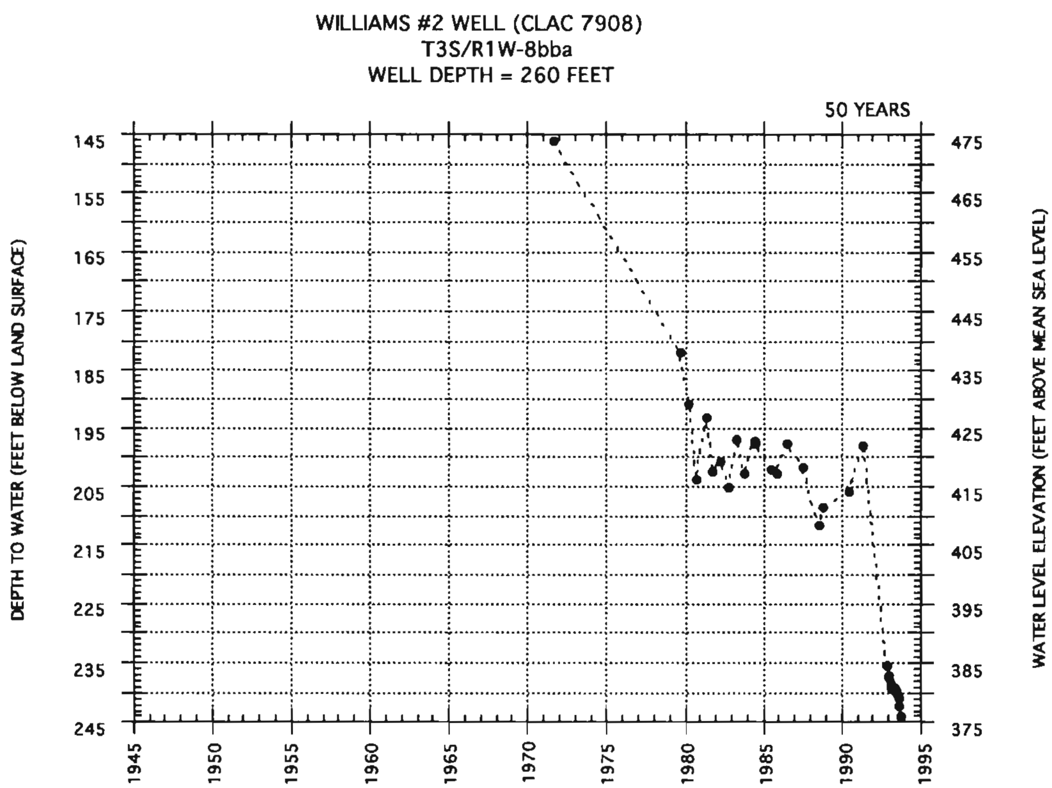
12/1/93
1/1/94



WILLIAMS #2 WELL (CLAC 7908)
T3S/R1W-8bba
WELL DEPTH = 260 FEET
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
145
155
165
175
185
195
205
215
225
235
245
475
465
455
445
435
425
415
405
395
385
375
1945
1950
1955
1960
1965
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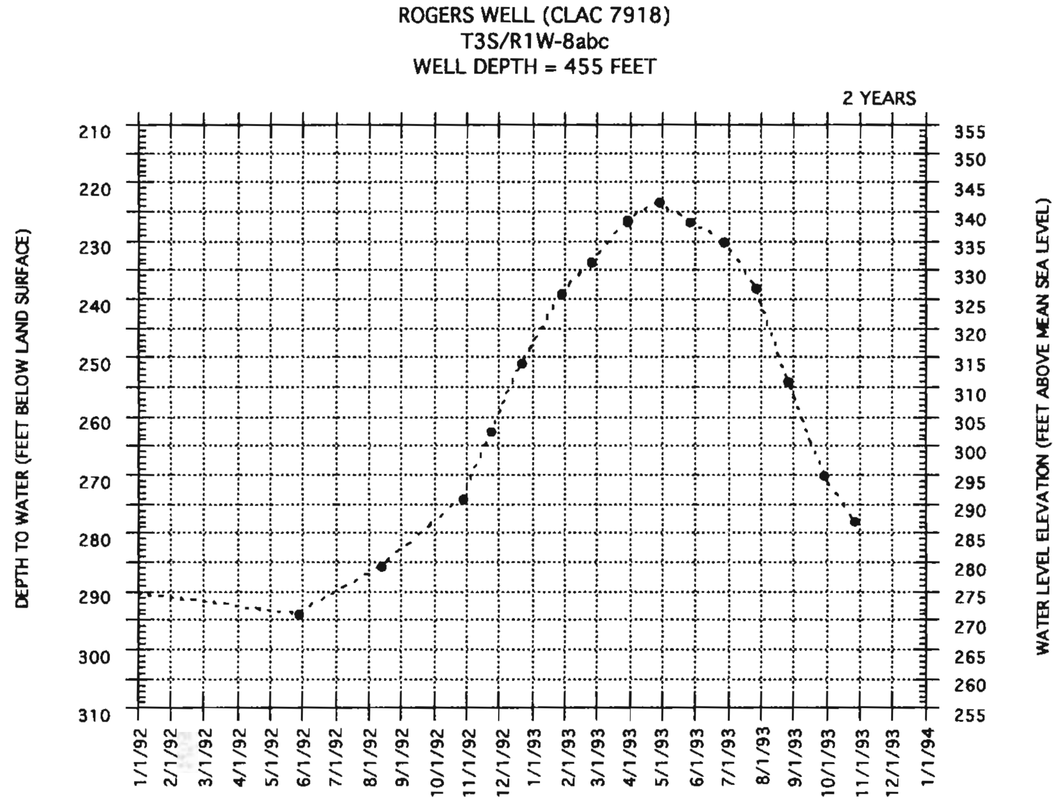
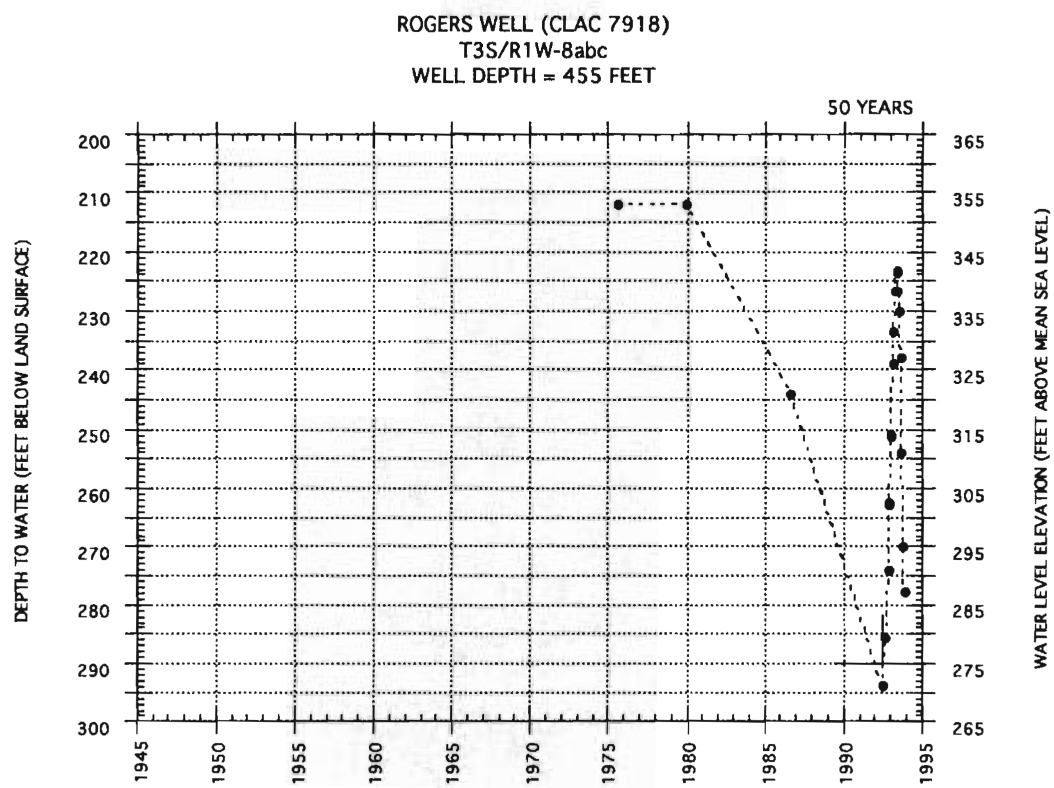
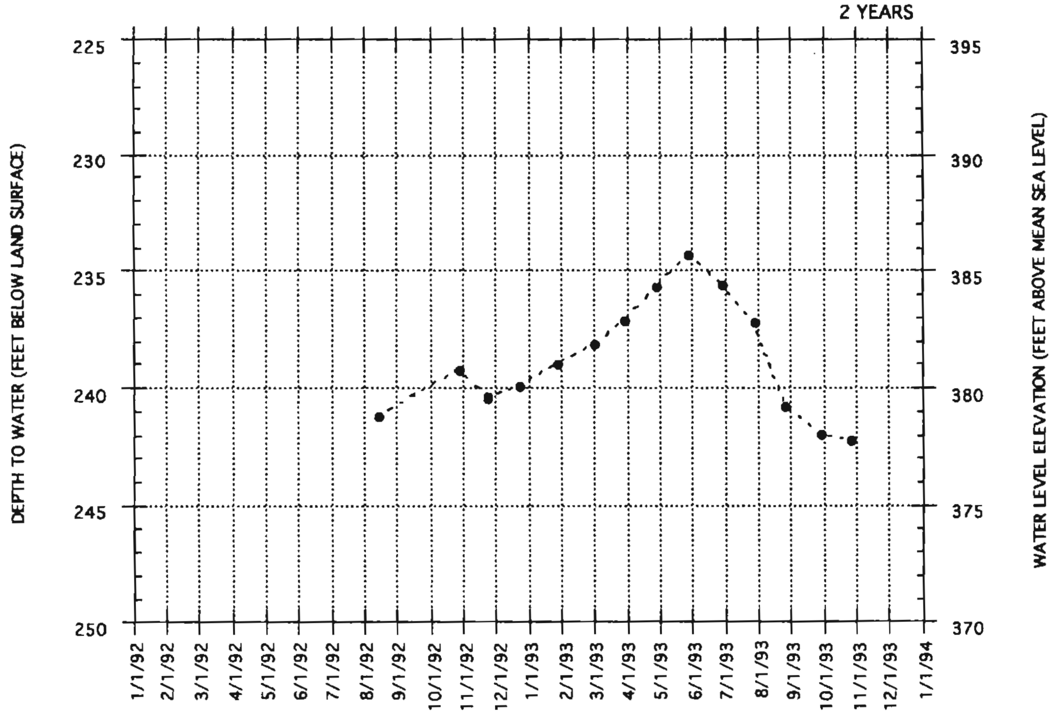
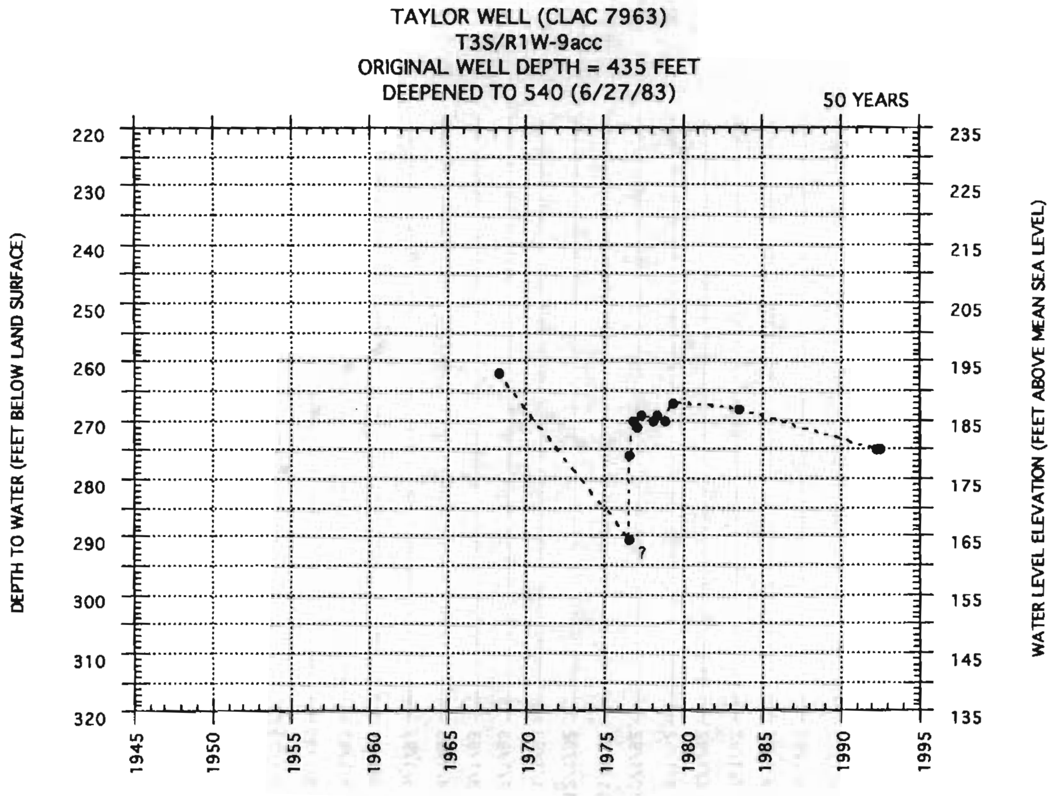
1975
1980
1985
1990
1995

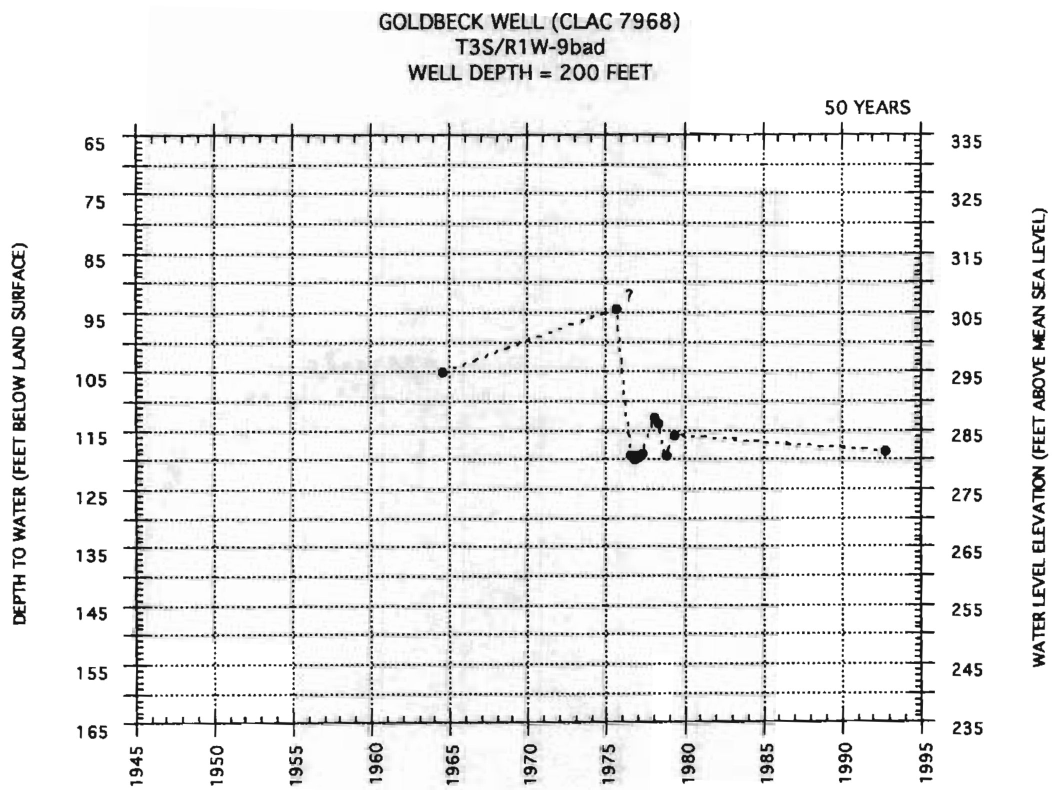

ROGERS WELL (CLAC 7918)
T3S/R1W-8abc
WELL DEPTH = 455 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)

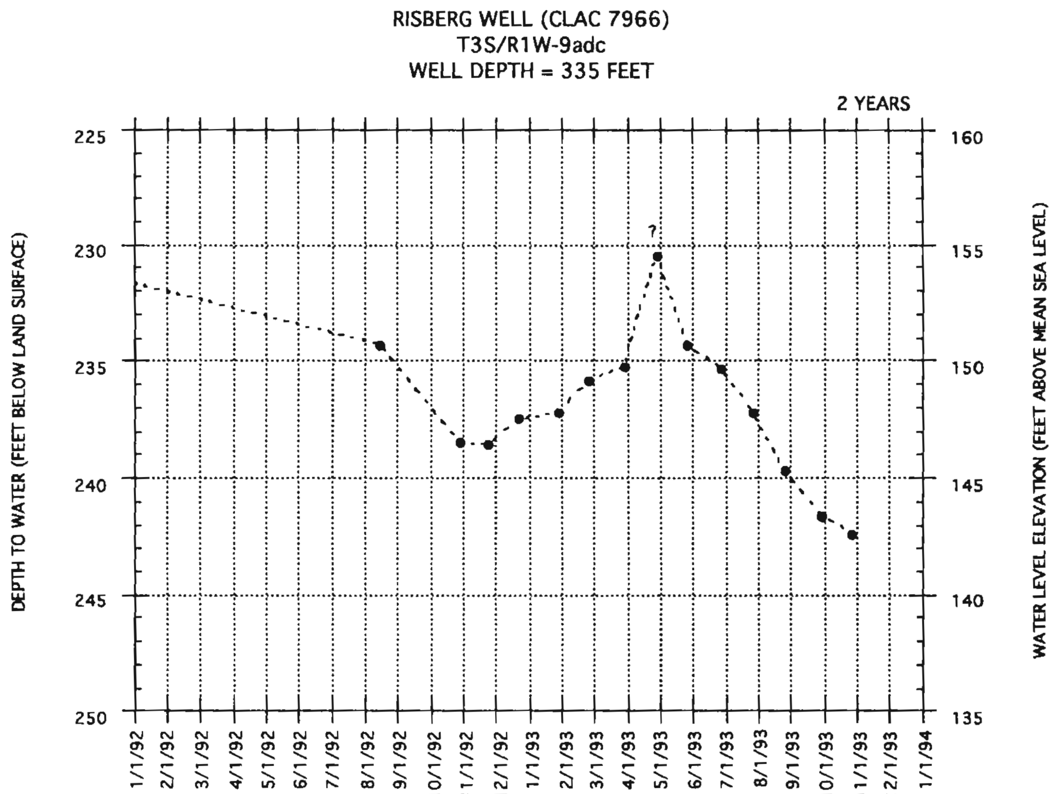

ROGERS WELL (CLAC 7918)
T3S/R1W-8abc
WELL DEPTH = 455 FEET
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)

PHILPOT WELL (CLAC 7871)
T3S/R1W-8cdc
WELL DEPTH = 305 FEET




TAYLOR WELL (CLAC 7963)
T3S/R1W-9acc
ORIGINAL WELL DEPTH = 435 FEET
DEEPENED TO 540 (6/27/83)
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
220
230
240
250
260
270
280
290
300
310
320
235
225
215
205
195
185
175
165
155
145
135
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
?


GOLDBECK WELL (CLAC 7968)
T3S/R1W-9bad
WELL DEPTH = 200 FEET
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
65
75
85
95
105
115
125
135
145
155
165
335
325
315
305
295
285
275
265
255
245
235
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
?



RISBERG WELL (CLAC 7966)
T3S/R1W-9adc
WELL DEPTH = 335 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
225
230
235
240
245
250
160
155
150
145
140
135
?
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
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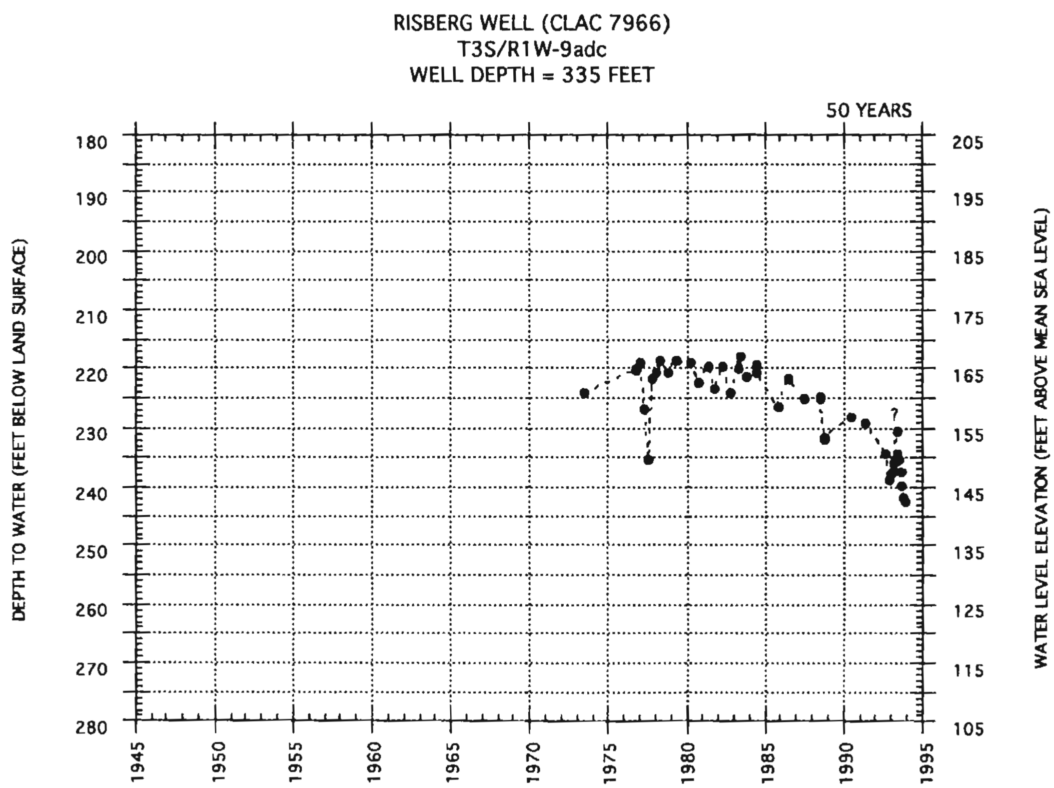
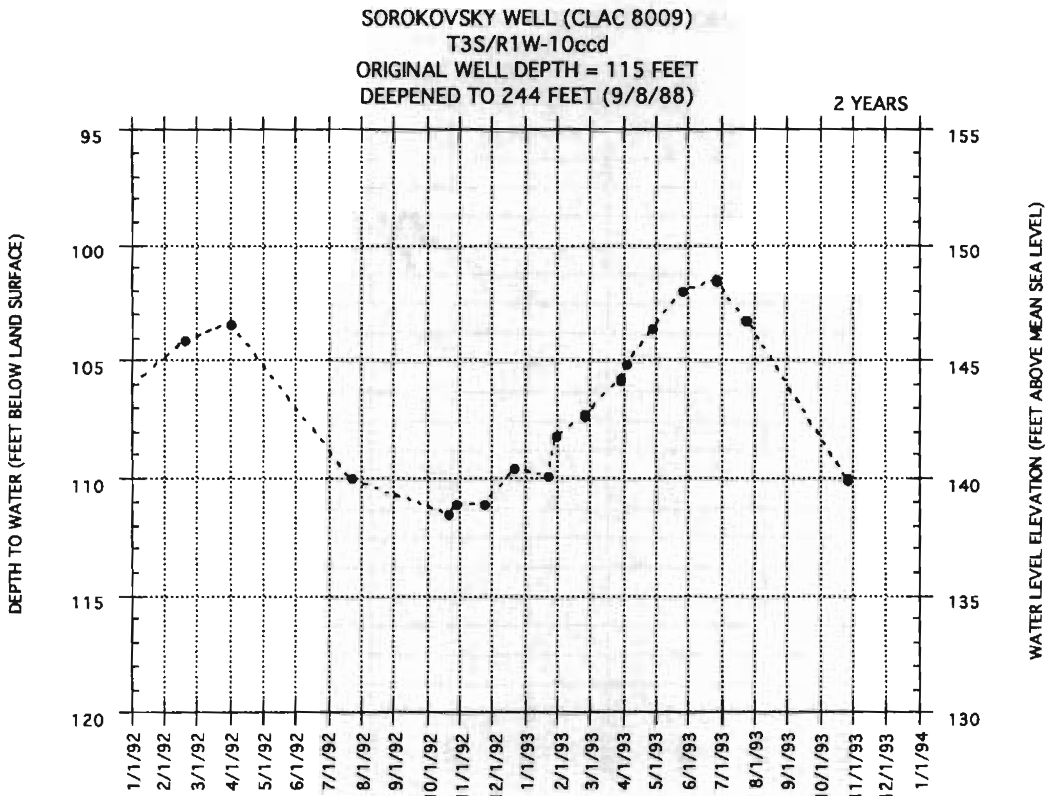
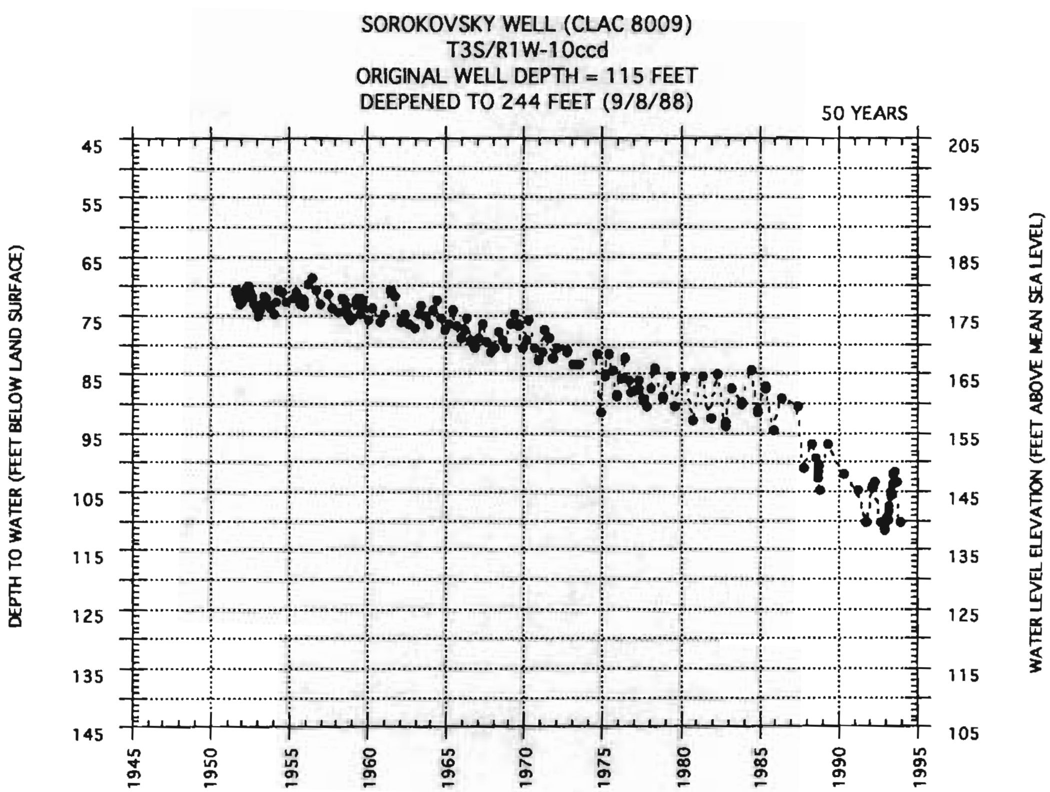
12/1/93
1/1/94

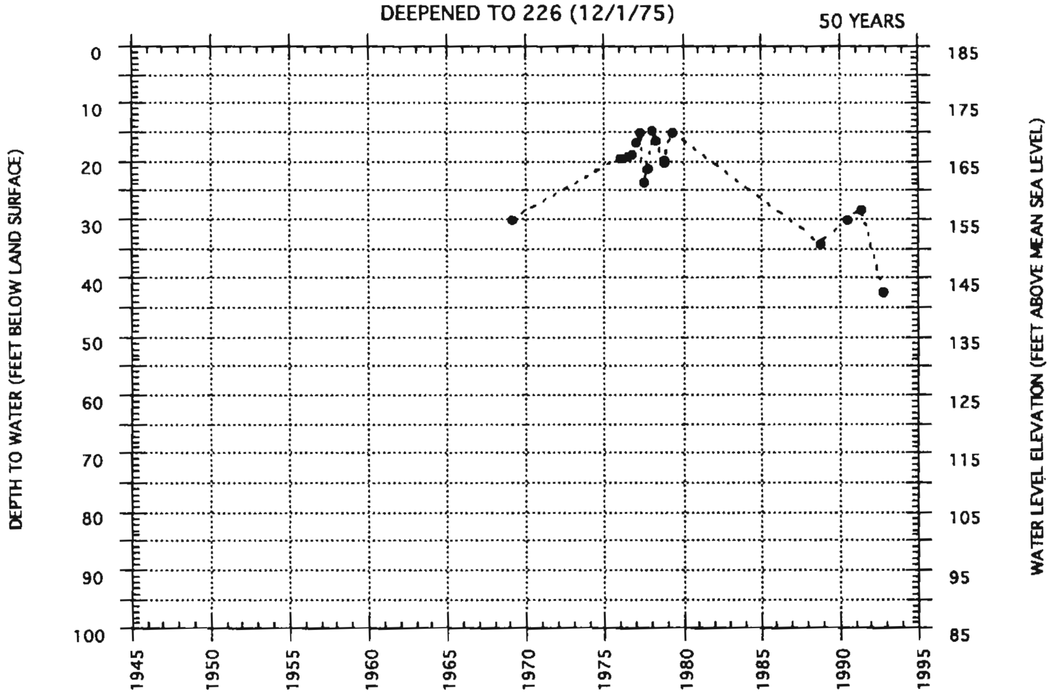


RISBERG WELL (CLAC 7966)
T3S/R1W-9adc
WELL DEPTH = 335 FEET
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
180
190
200
210
220
230
240
250
260
270
280
205
195
185
175
165
155
145
135
125
115
105
?
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995

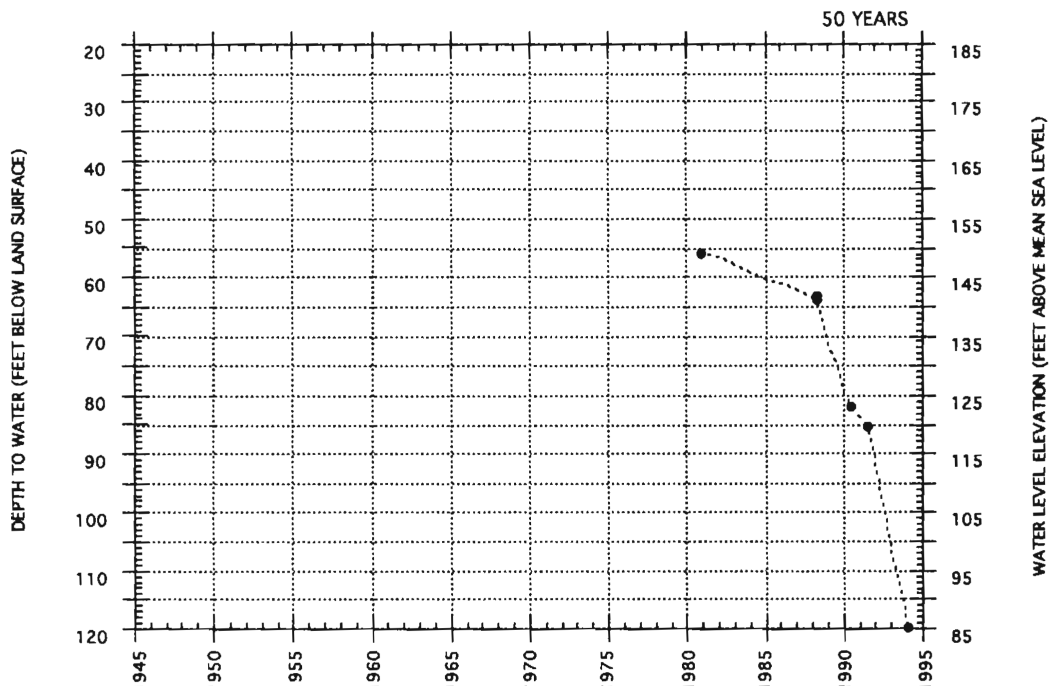

SOROKOVSKY WELL (CLAC 8009)
T3S/R1W-10ccd
ORIGINAL WELL DEPTH = 115 FEET
DEEPENED TO 244 FEET (9/8/88)
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
95
100
105
110
115
120
155
150
145
140
135
130
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
6/1/93
7/1/93
8/1/93
9/1/93
10/1/93
11/1/93
12/1/93
1/1/94


SOROKOVSKY WELL (CLAC 8009)
T3S/R1W-10ccd
ORIGINAL WELL DEPTH = 115 FEET
DEEPENED TO 244 FEET (9/8/88)
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
45
55
65
75
85
95
105
115
125
135
145
205
195
185
175
165
155
145
135
125
115
105
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995

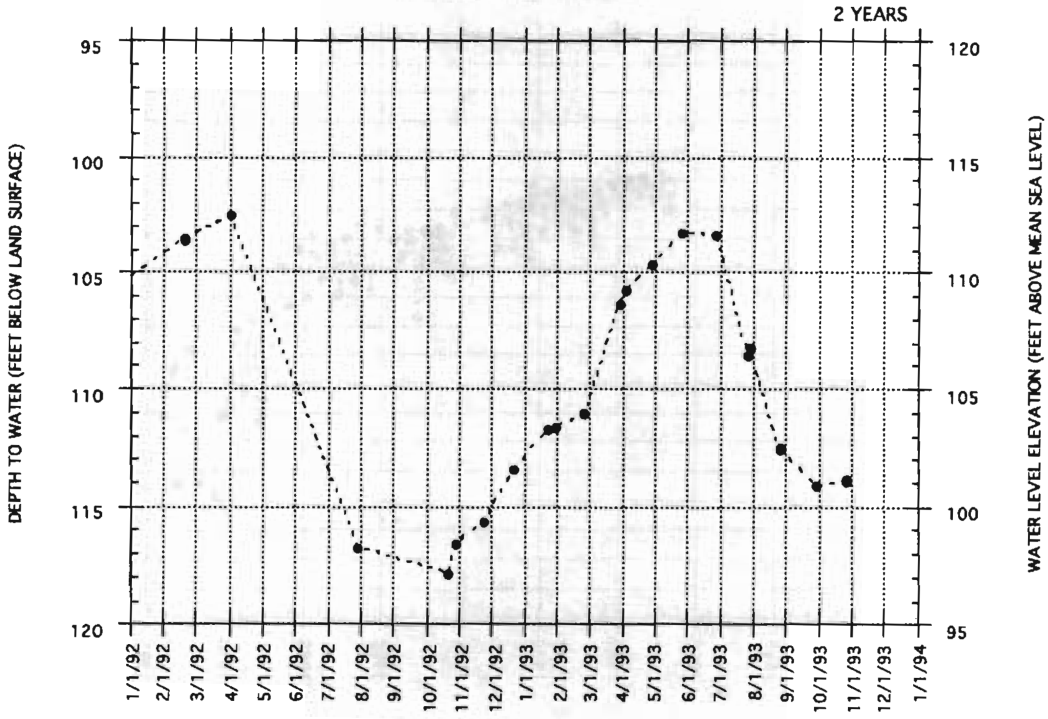
CHICK-A-DEE NURSERY WELL (CLAC 18836)
T3S/R1W-10caa
ORIGINAL WELL DEPTH = 182 FEET
DEEPENED TO 226 (12/1/75)



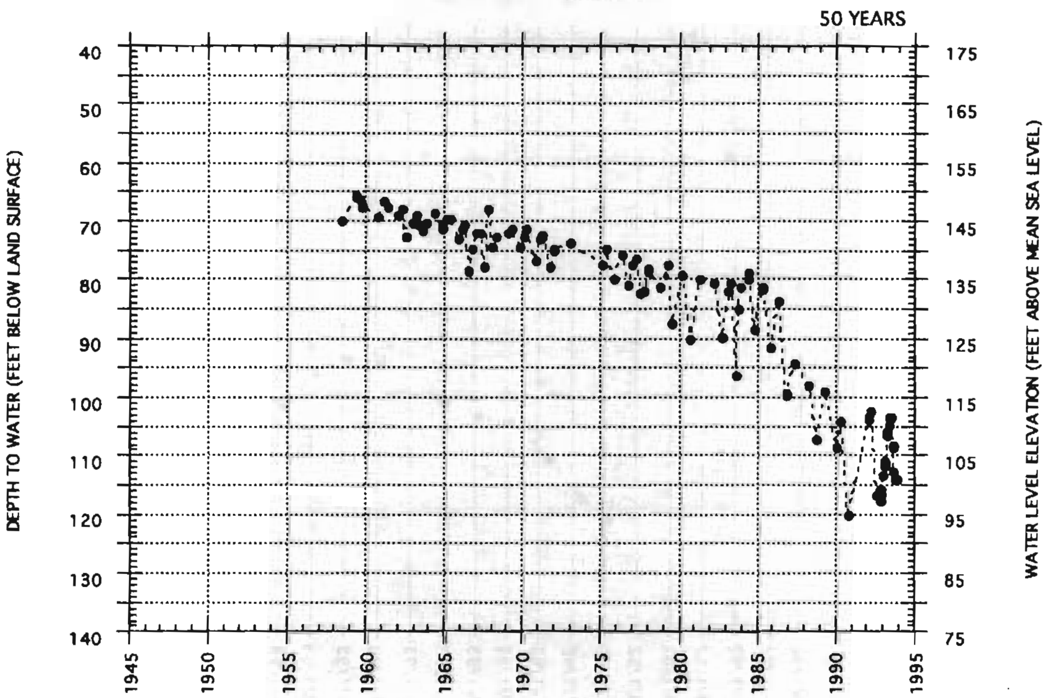
WIEDEMAN WELL (CLAC 8034)
T3S/R1W-11ada
WELL DEPTH = 435 FEET

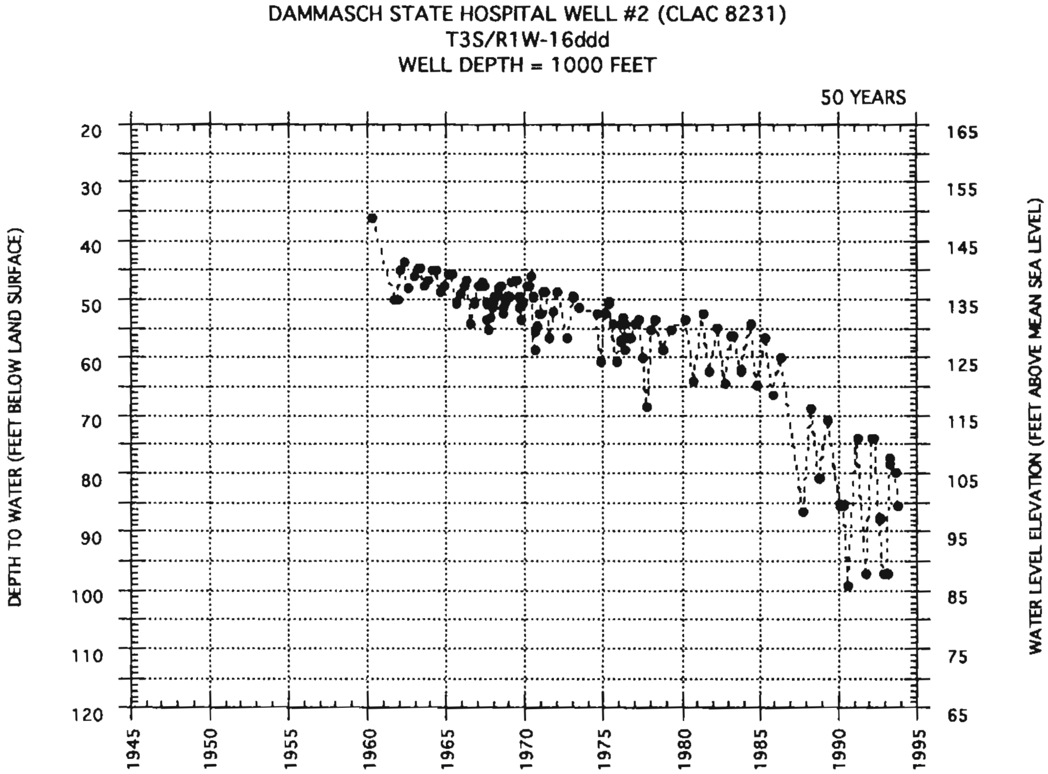


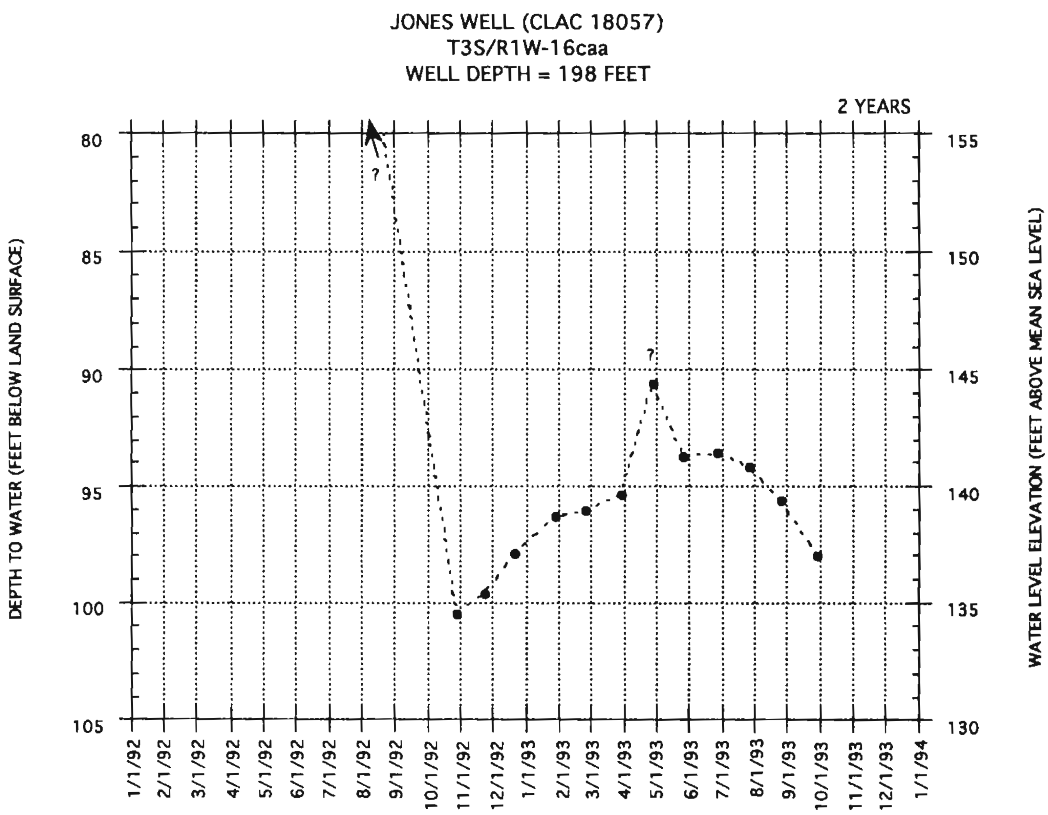
DAMMASCH STATE HOSPITAL WELL #1 (CLAC 8184)
T3S/R1W-15cac
WELL DEPTH = 920 FEET



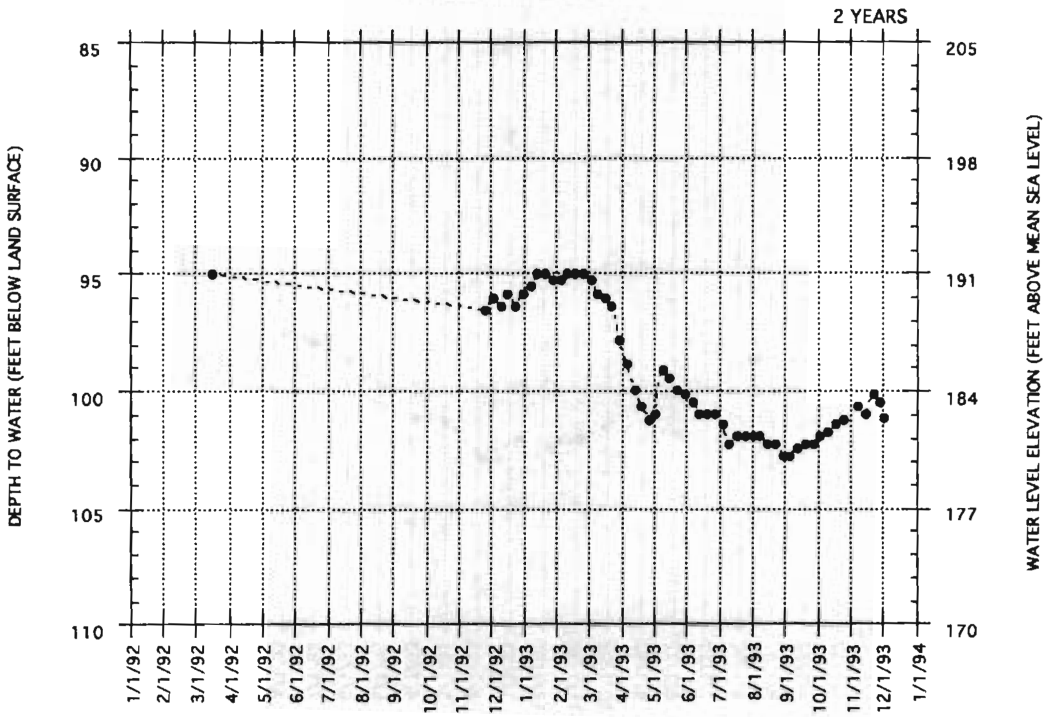
DAMMASCH STATE HOSPITAL WELL #1 (CLAC 8184)
T3S/R1W-15cac
WELL DEPTH = 920 FEET



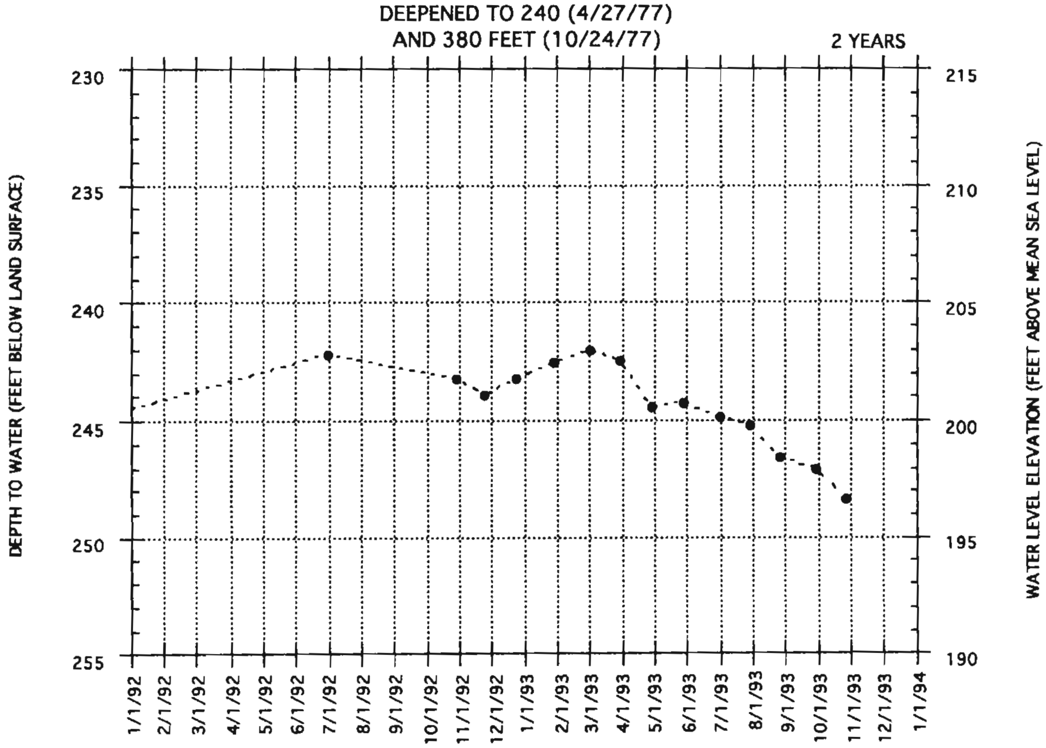

DAMMASCH STATE HOSPITAL WELL #2 (CLAC 8231)
T3S/R1W-16ddd
WELL DEPTH = 1000 FEET
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
20
30
40
50
60
70
80
90
100
110
120
165
155
145
135
125
115
105
95
85
75
65
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995

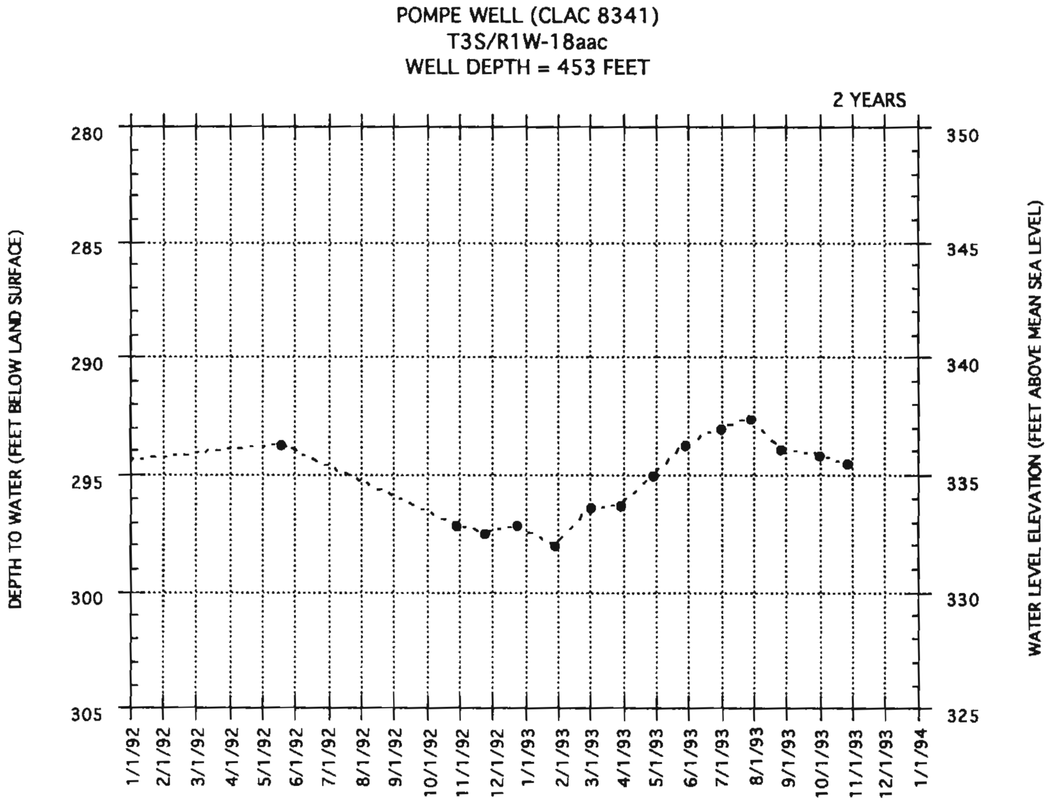

JONES WELL (CLAC 18057)
T3S/R1W-16caa
WELL DEPTH = 198 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
?
?
80
85
90
95
100
105
155
150
145
140
135
130
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
6/1/93
7/1/93
8/1/93
9/1/93
10/1/93
11/1/93
12/1/93
1/1/94

ADAMS RECORDER WELL (CLAC 17780)
T3S/R1W-17aac
WELL DEPTH = 184 FEET



COGGER WELL (CLAC 18317)
T3S/R1W-17bda
ORIGINAL WELL DEPTH = 140 FEET
DEEPENED TO 240 (4/27/77)
AND 380 FEET (10/24/77)




POMPE WELL (CLAC 8341)
T3S/R1W-18aac
WELL DEPTH = 453 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
280
285
290
295
300
305
350
345
340
335
330
325
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
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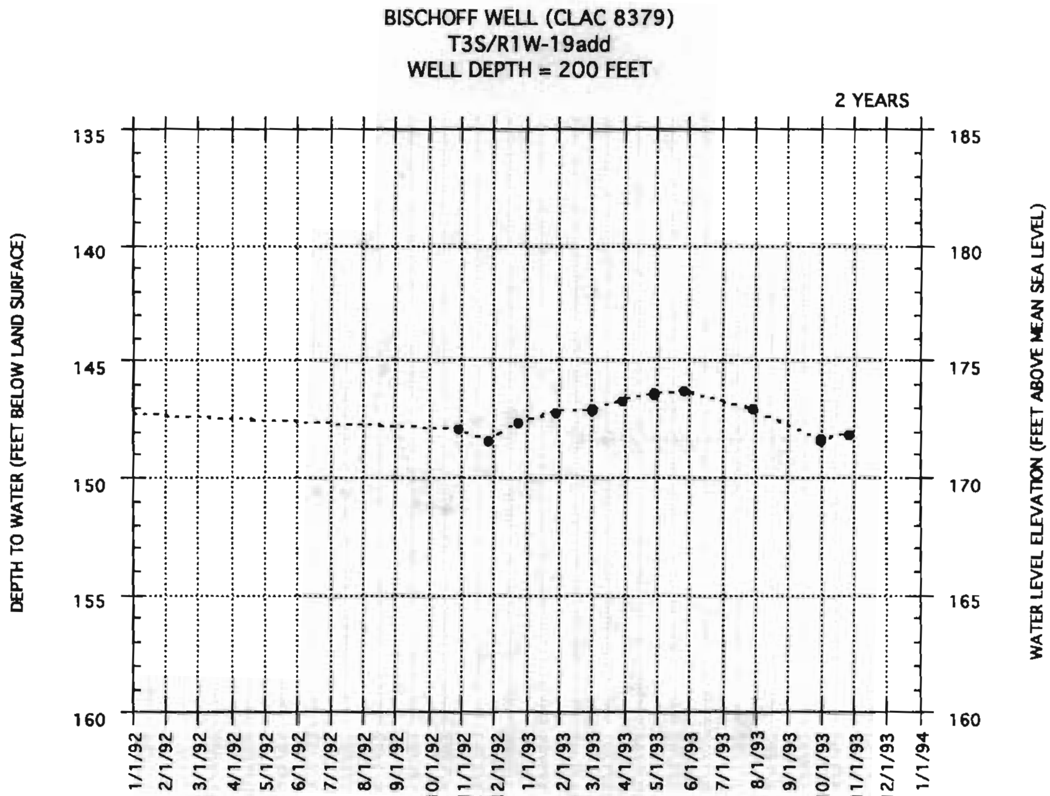
12/1/93
1/1/94


BISCHOFF WELL (CLAC 8379)
T3S/R1W-19add
WELL DEPTH = 200 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
135
140
145
150
155
160
185
180
175
170
165
160
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
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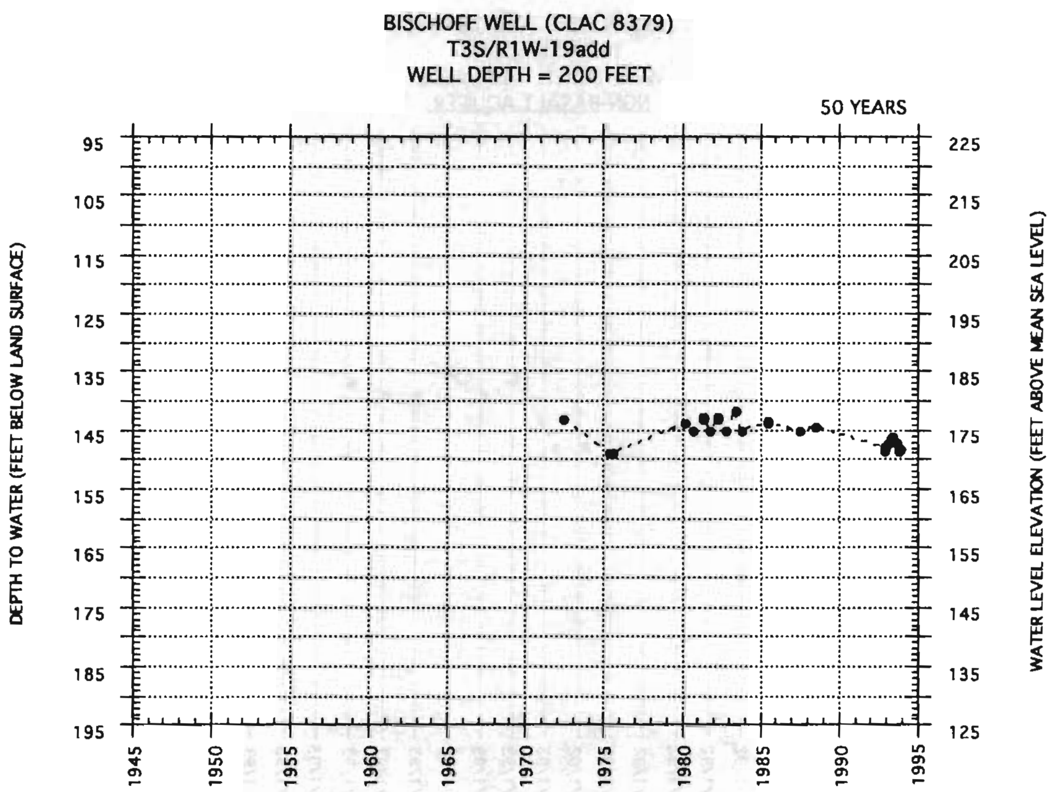
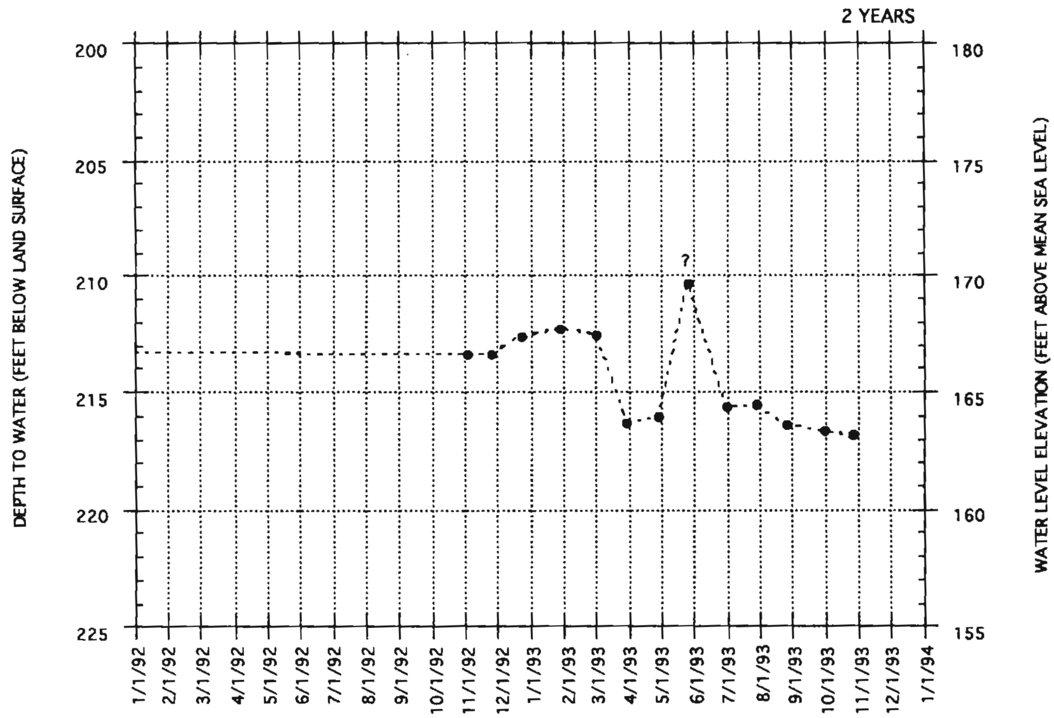
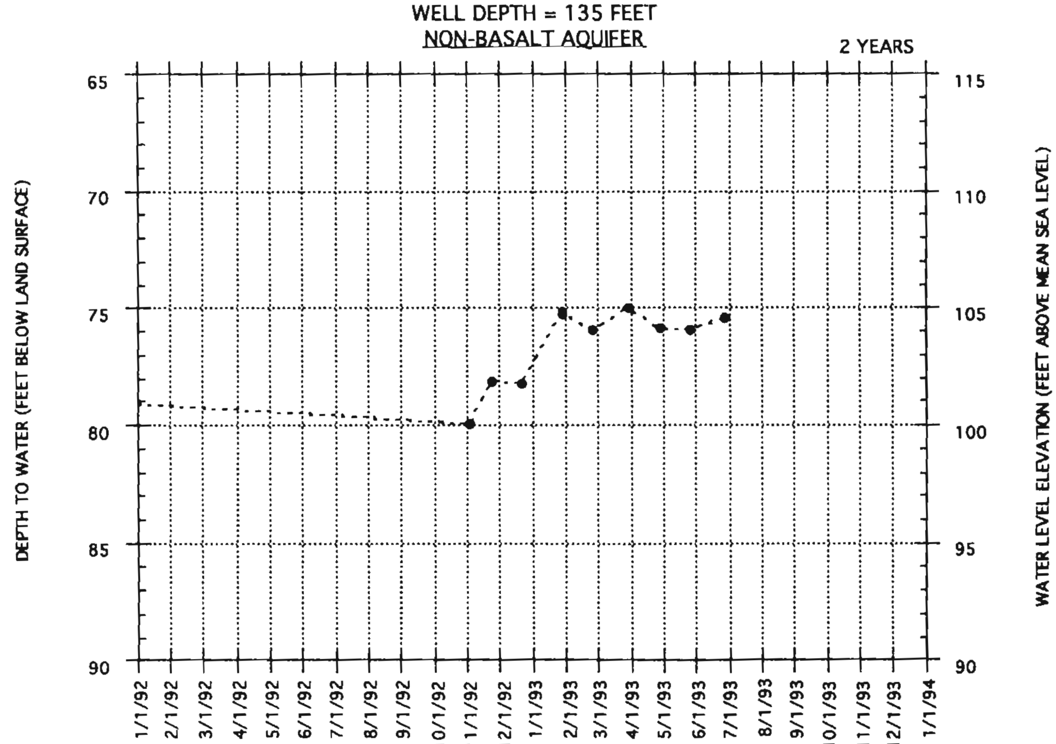
12/1/93
1/1/94


BISCHOFF WELL (CLAC 8379)
T3S/R1W-19add
WELL DEPTH = 200 FEET
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
95
105
115
125
135
145
155
165
175
185
195
225
215
205
195
185
175
165
155
145
135
125
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995

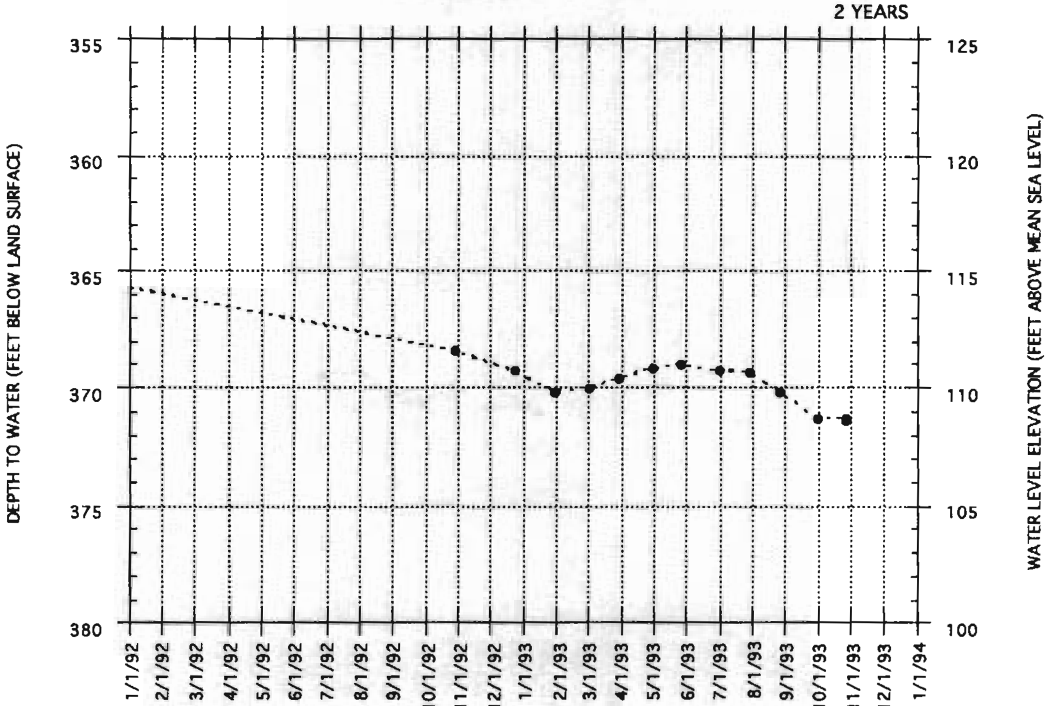
BOLE WELL (CLAC 8409)
T3S/R1W-20acc
WELL DEPTH = 330 FEET



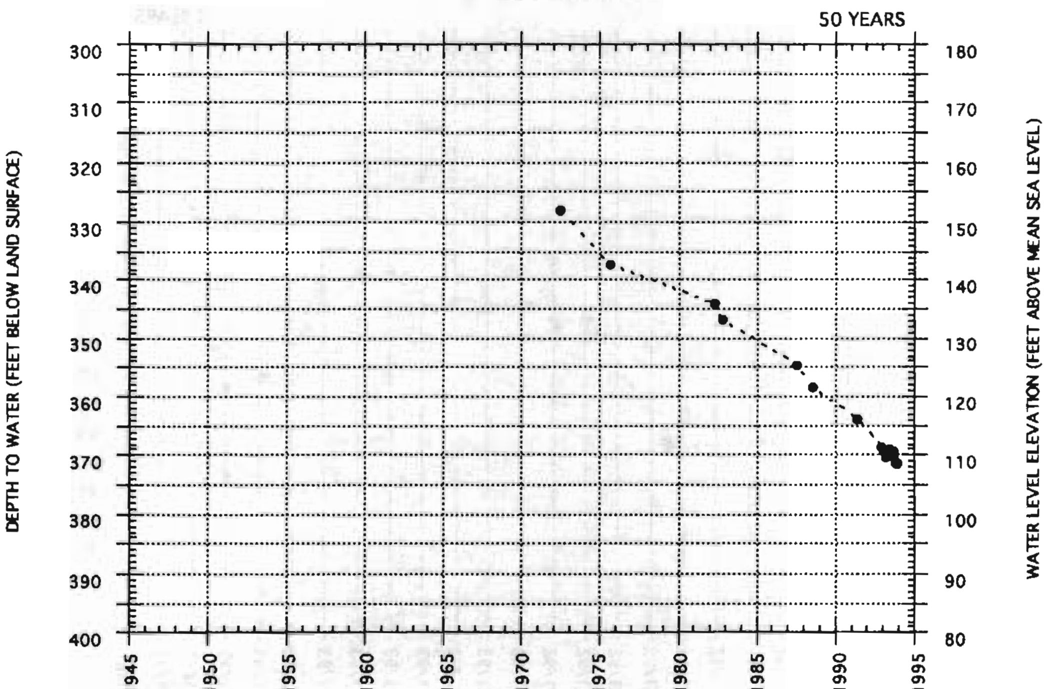
JENSEN WELL (CLAC 8418)
T3S/R1W-21dbd
WELL DEPTH = 135 FEET
NON-BASALT AQUIFER



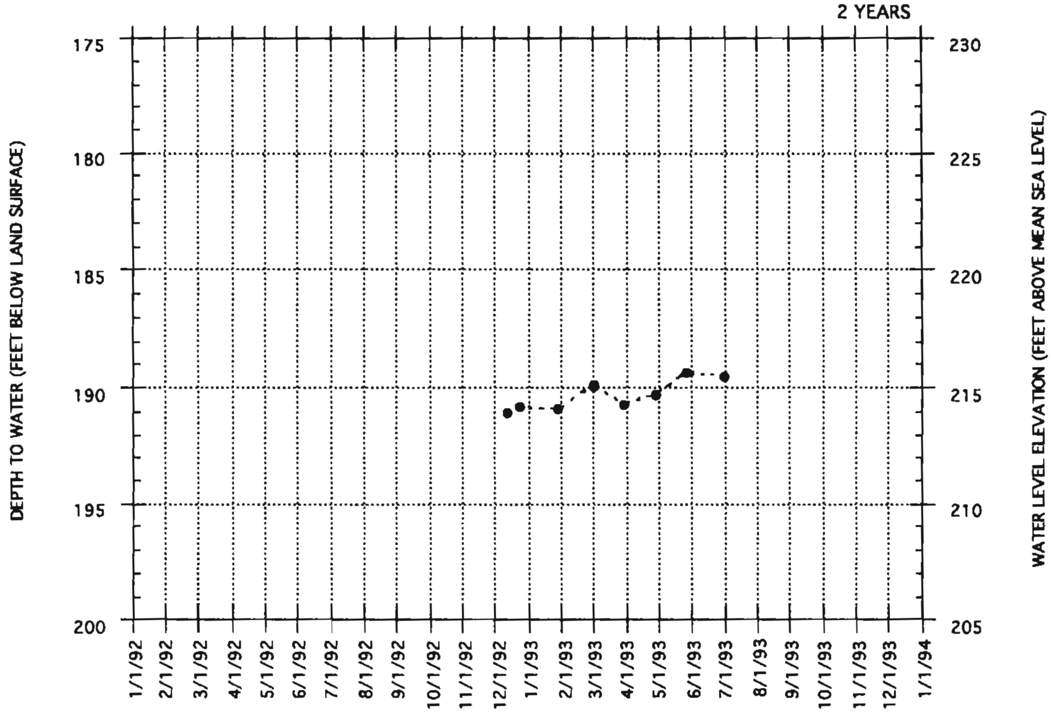
CONRAD WELL (CLAC 8697)
T3S/R1W-30dbc
WELL DEPTH = 460 FEET



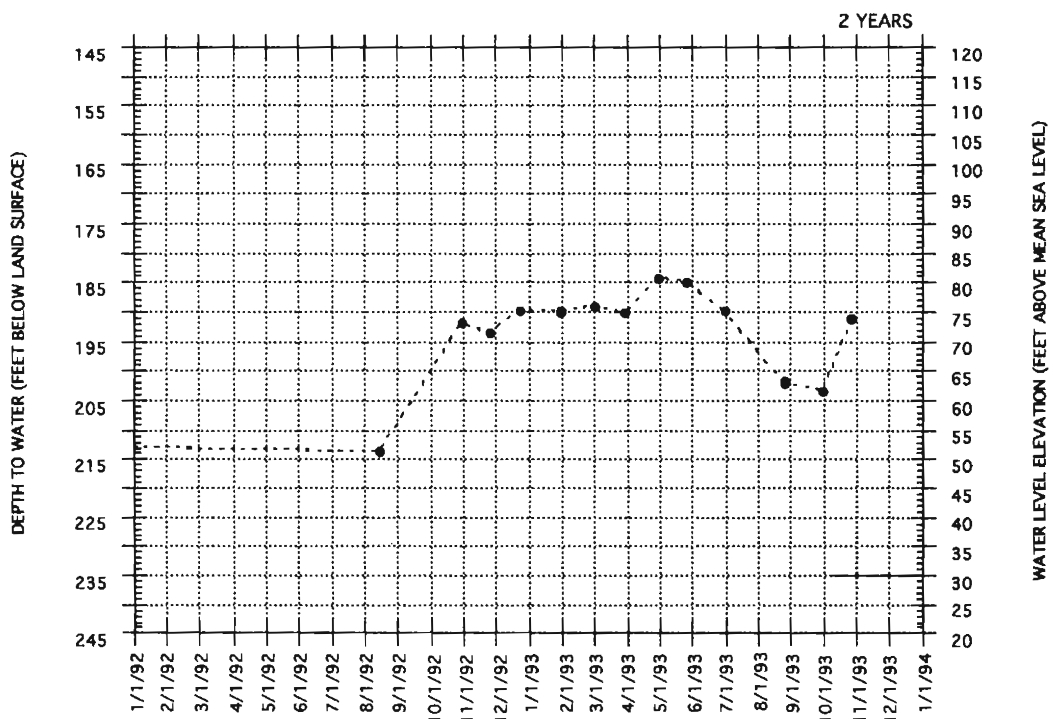
CONRAD WELL (CLAC 8697)
T3S/R1W-30dbc
WELL DEPTH = 460 FEET



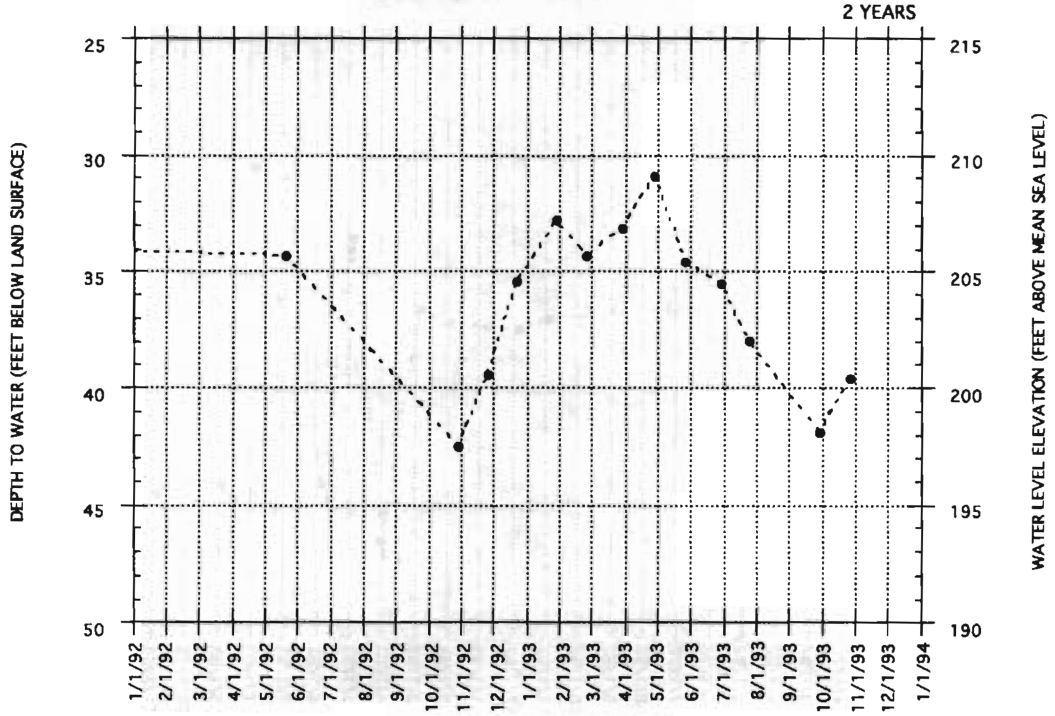
SALZMAN WELL (CLAC 18406)
T3S/R1W-30bbd
WELL DEPTH = 385 FEET



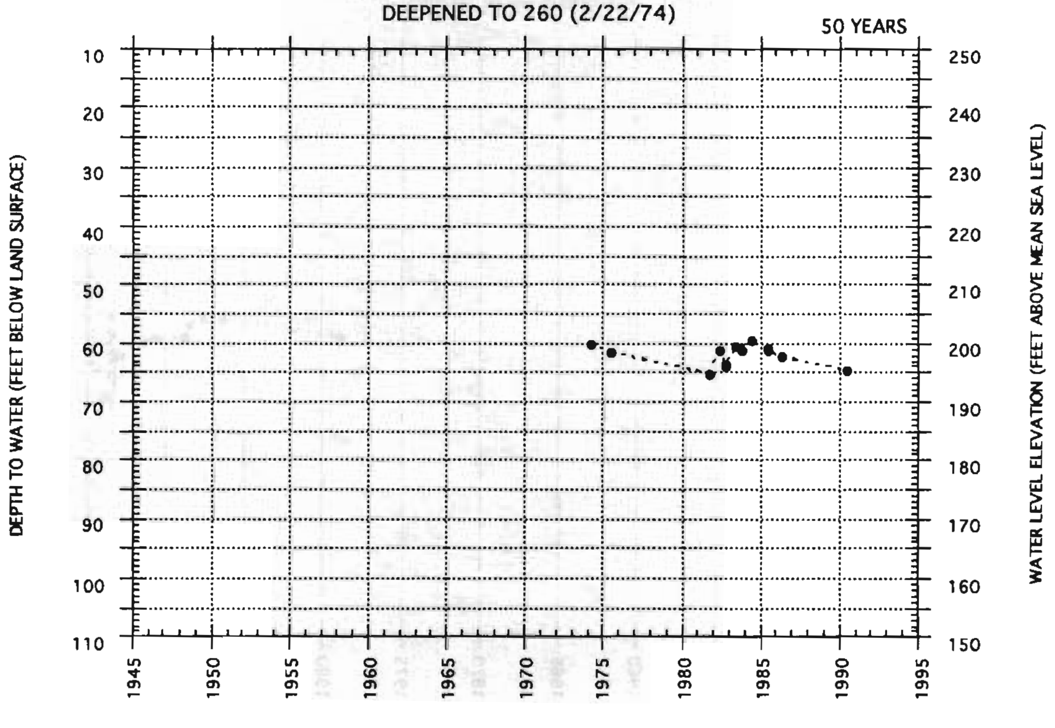
SMITH WELL (CLAC 8741)
T3S/R1W-31bdb
WELL DEPTH = 365 FEET

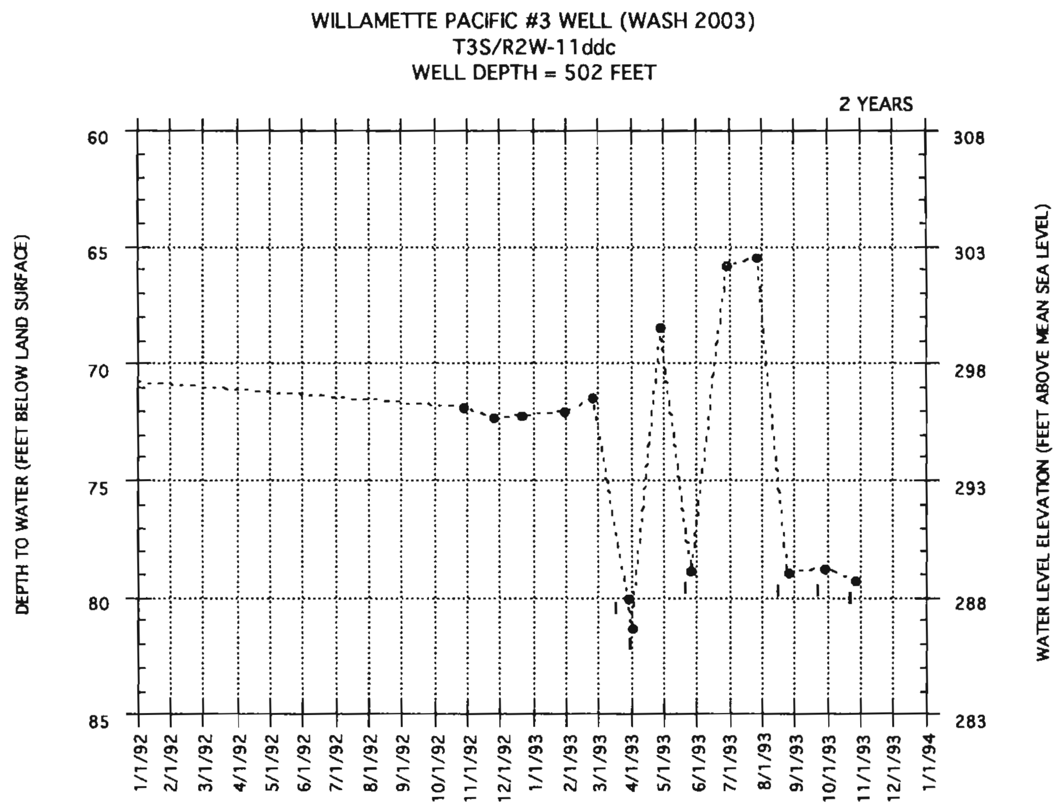


BARON WELL (WASH 1960)
T3S/R2W-1adb
WELL DEPTH = 200 FEET



ROYBAL WELL (WASH 1979)
T3S/R2W-1dba
ORIGINAL WELL DEPTH = 150 FEET
DEEPENED TO 260 (2/22/74)




WILLAMETTE PACIFIC #3 WELL (WASH 2003)
T3S/R2W-11ddc
WELL DEPTH = 502 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
60
65
70
75
80
85
308
303
298
293
288
283
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
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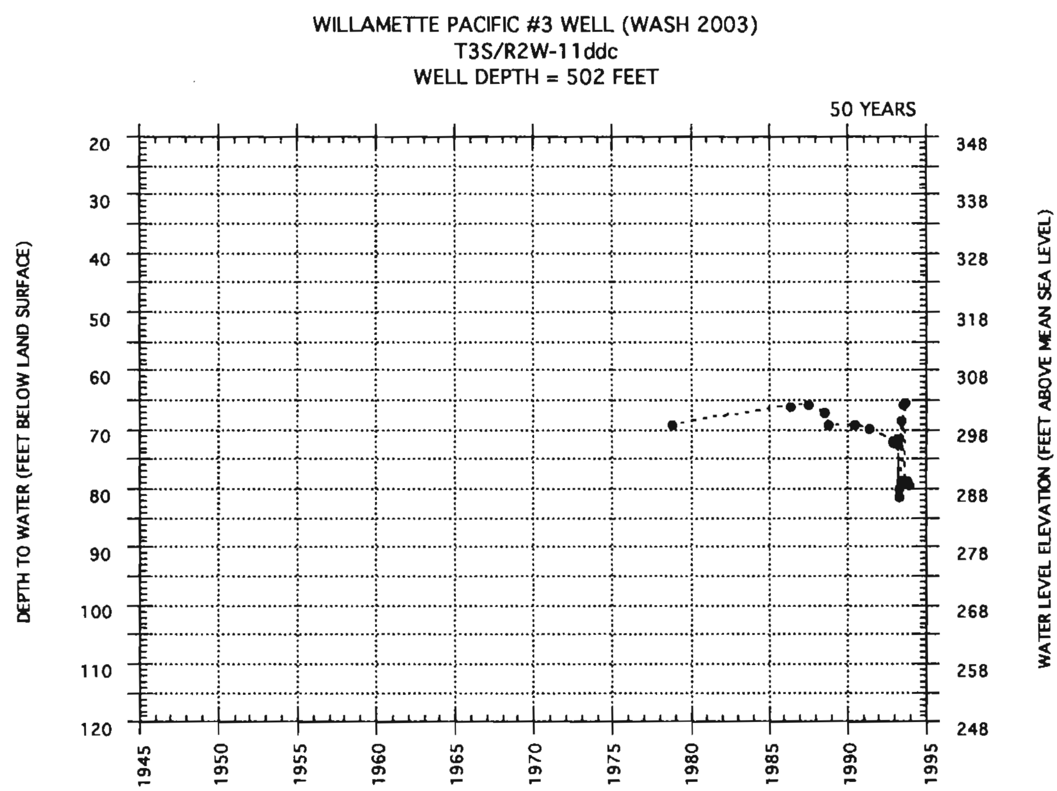
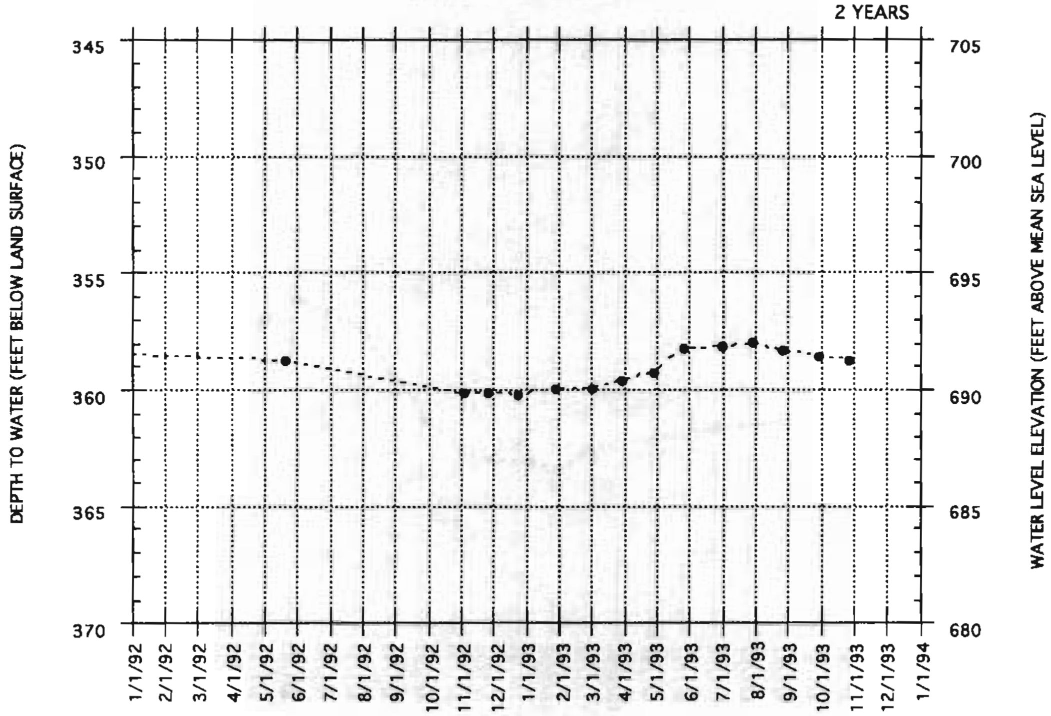
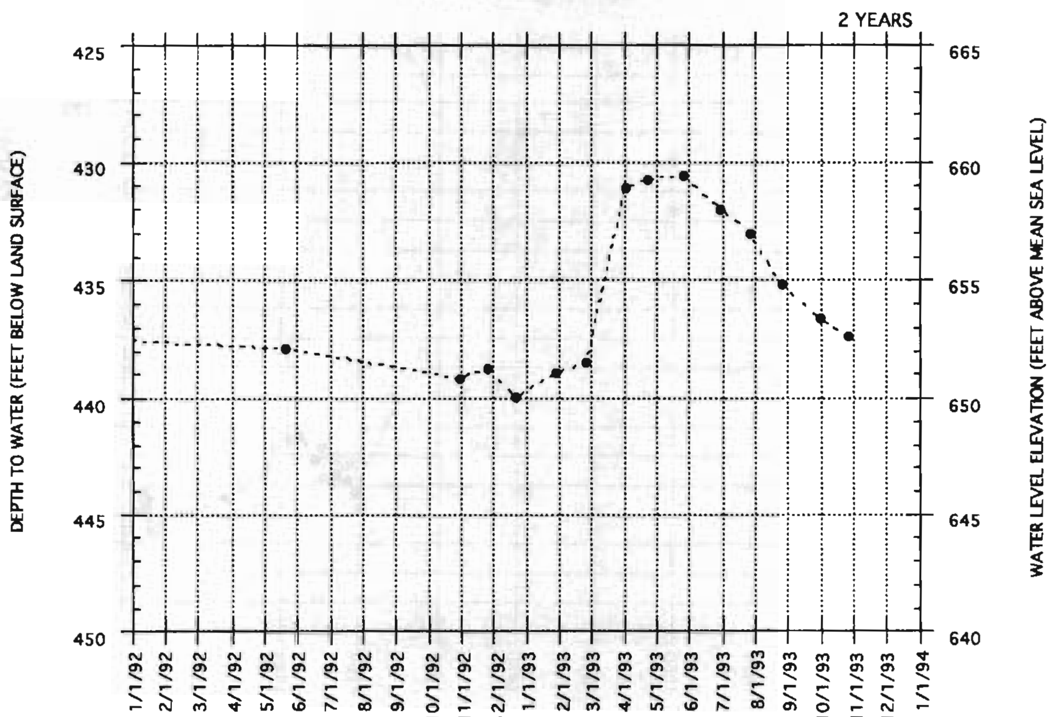
9/1/93
10/1/93
11/1/93
12/1/93
1/1/94


WILLAMETTE PACIFIC #3 WELL (WASH 2003)
T3S/R2W-11ddc
WELL DEPTH = 502 FEET
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
20
30
40
50
60
70
80
90
100
110
120
348
338
328
318
308
298
288
278
268
258
248
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995

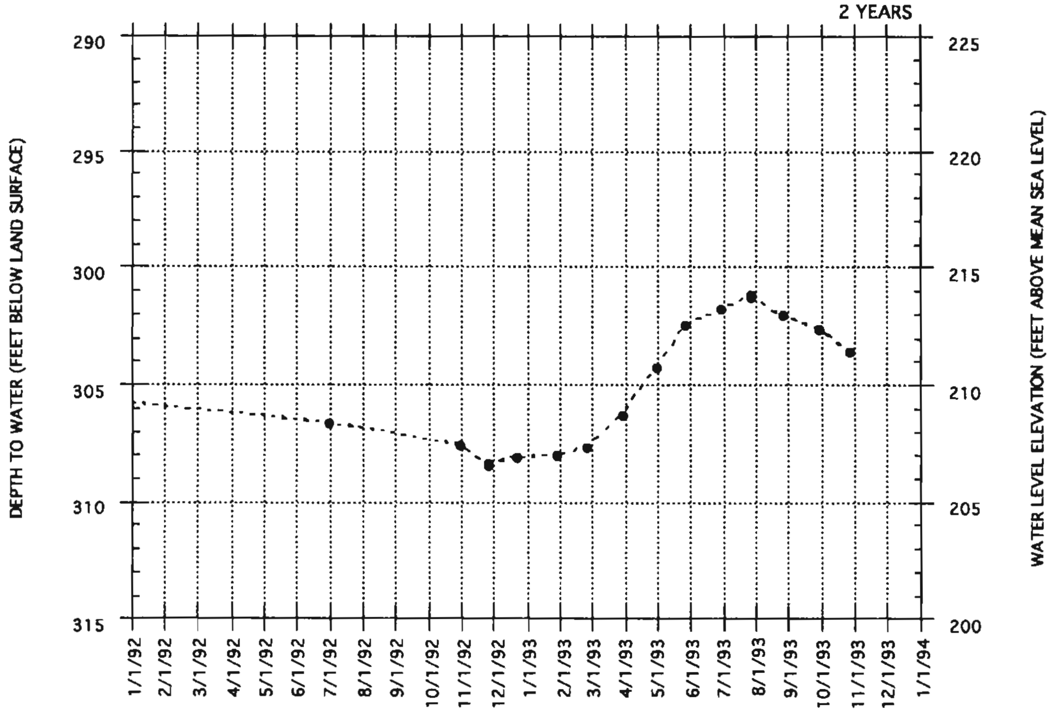
PENTZ WELL (WASH 1910)
T3S/R2W-12ddc
WELL DEPTH = 380 FEET



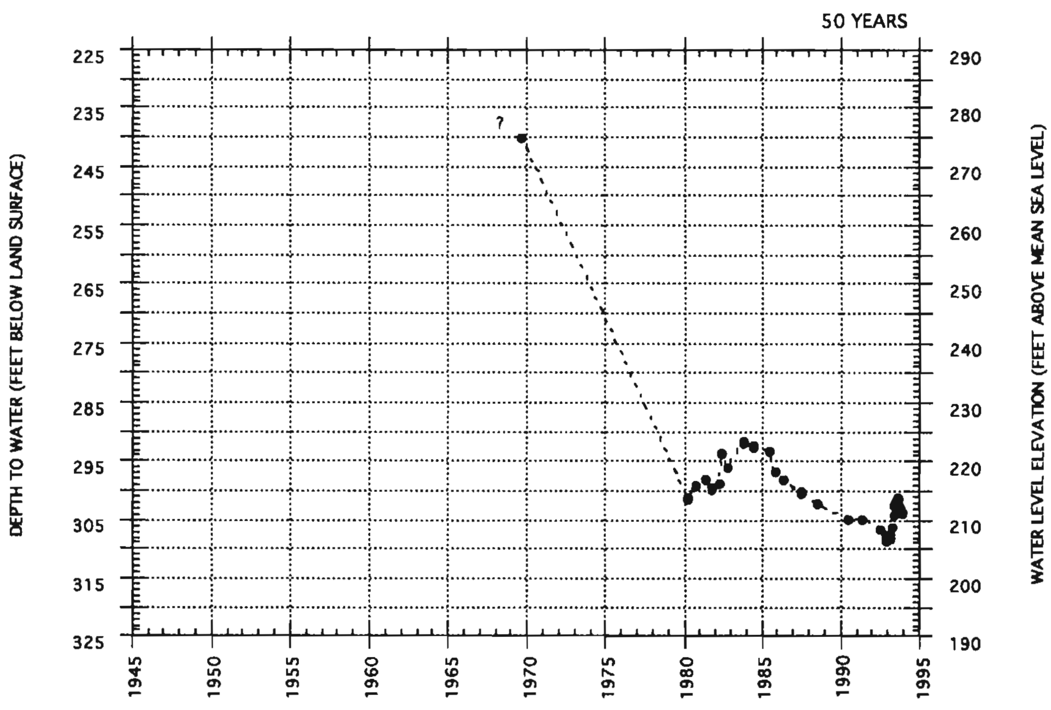
RILEE SCHOOL HOUSE WELL (YAMH 2549)
T3S/R2W-13ccd
WELL DEPTH = 500 FEET

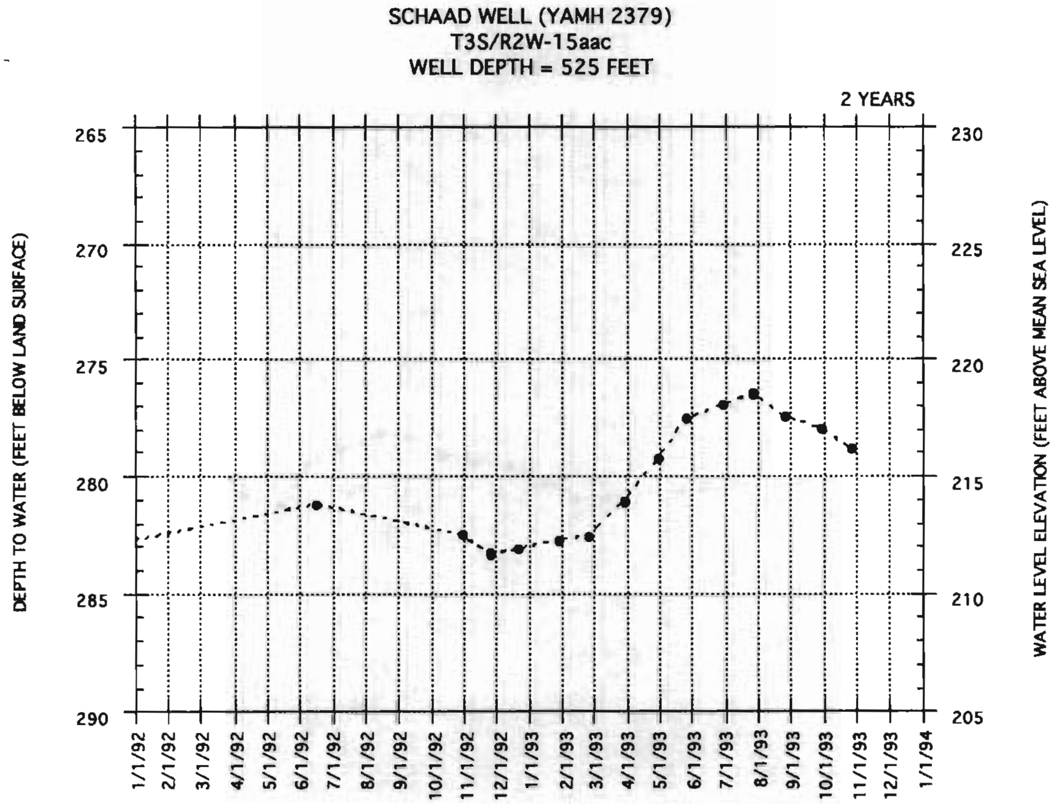


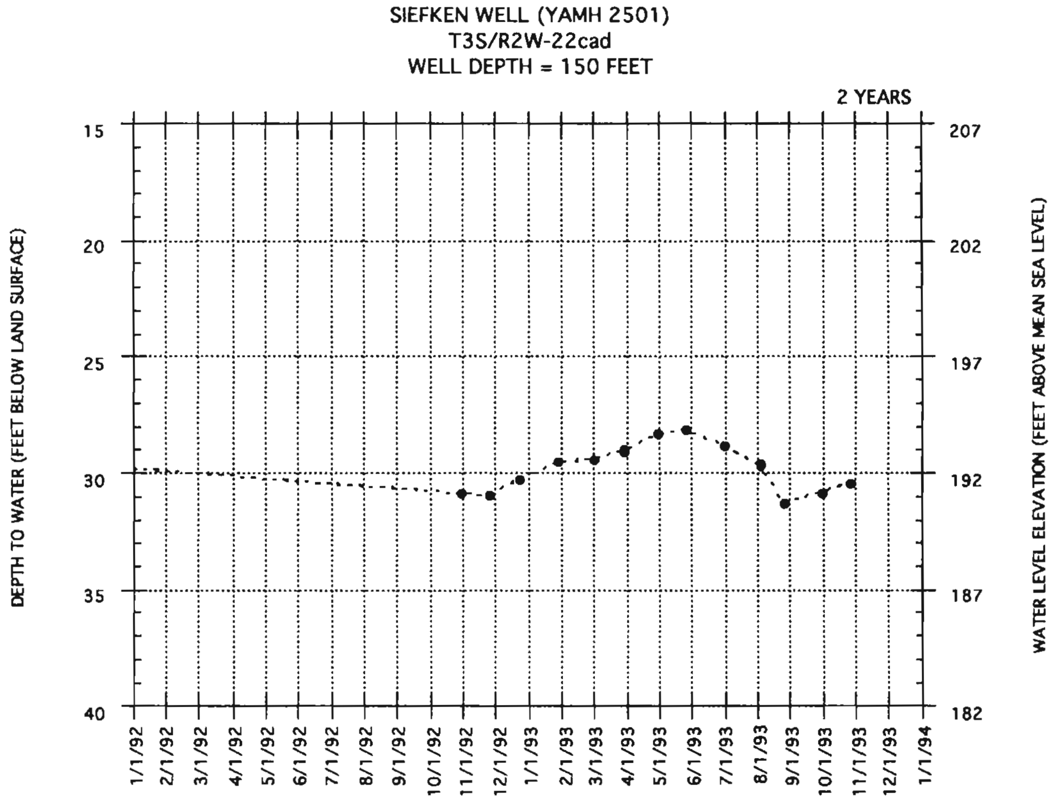
CRAMER WELL (YAMH 2345)
T3S/R2W-14bcb
WELL DEPTH = 445 FEET



CRAMER WELL (YAMH 2345)
T3S/R2W-14bcb
WELL DEPTH = 445 FEET




SCHAAD WELL (YAMH 2379)
T3S/R2W-15aac
WELL DEPTH = 525 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
265
270
275
280
285
290
230
225
220
215
210
205
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
6/1/93
7/1/93
8/1/93
9/1/93
10/1/93
11/1/93
12/1/93
1/1/94



SIEFKEN WELL (YAMH 2501)
T3S/R2W-22cad
WELL DEPTH = 150 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
15
20
25
30
35
40
207
202
197
192
187
182
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
6/1/93
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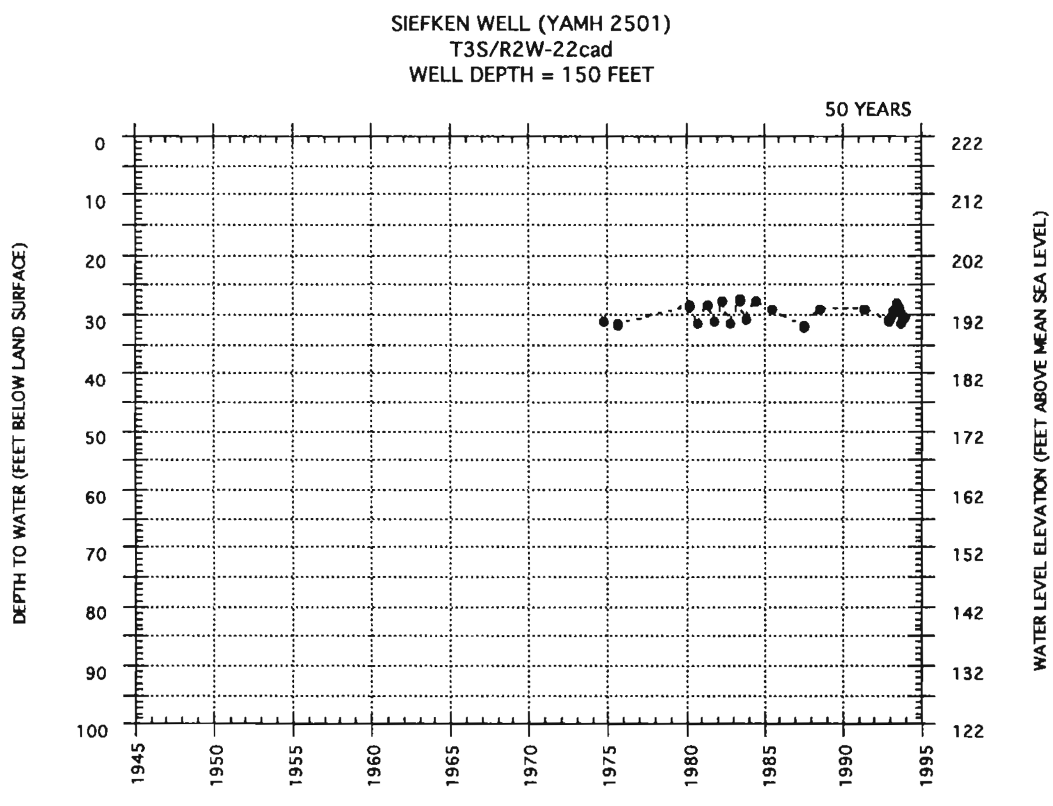
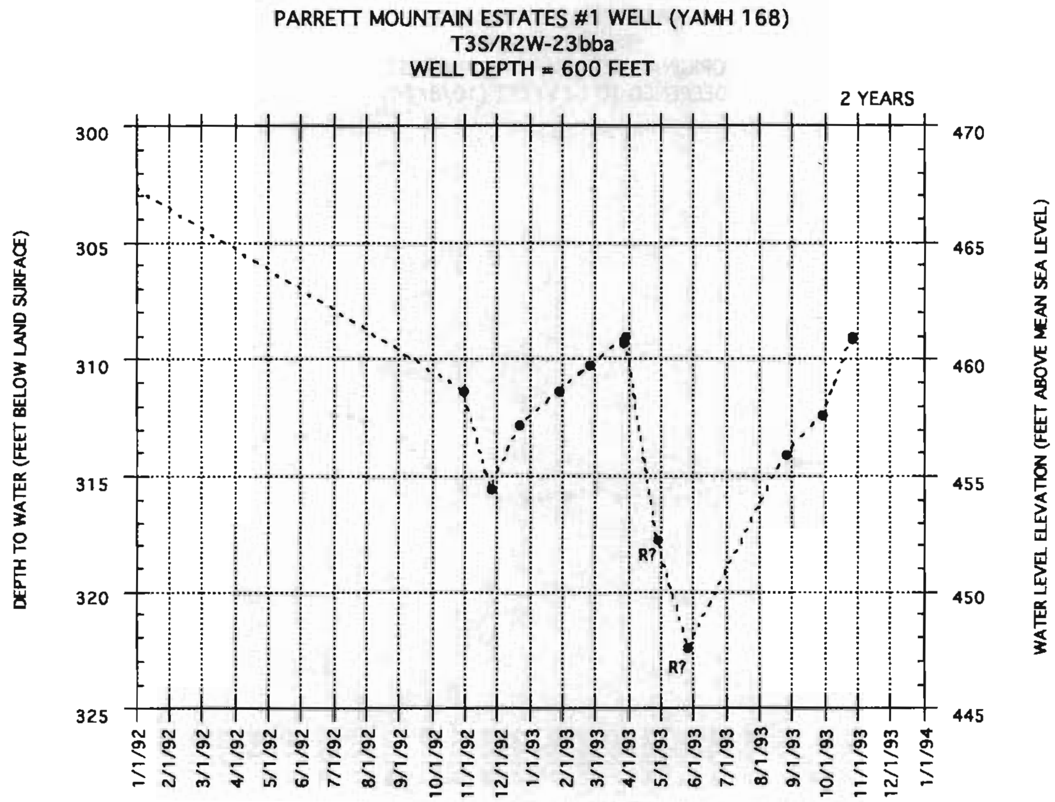
8/1/93
9/1/93
10/1/93
11/1/93
12/1/93
1/1/94



SIEFKEN WELL (YAMH 2501)
T3S/R2W-22cad
WELL DEPTH = 150 FEET
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
0
10
20
30
40
50
60
70
80
90
100
222
212
202
192
182
172
162
152
142
132
122
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995


PARRETT MOUNTAIN ESTATES #1 WELL (YAMH 168)
T3S/R2W-23bba
WELL DEPTH = 600 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
300
305
310
315
320
325
470
465
460
455
450
445
R?
R?
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
6/1/93
7/1/93
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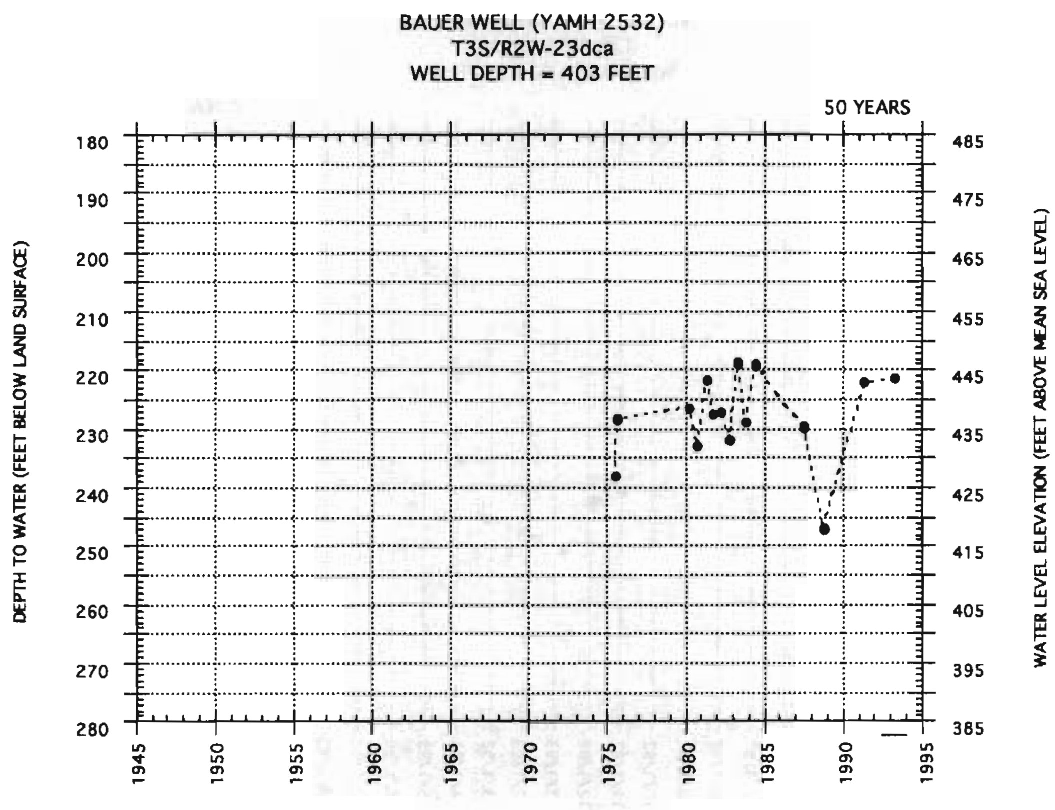
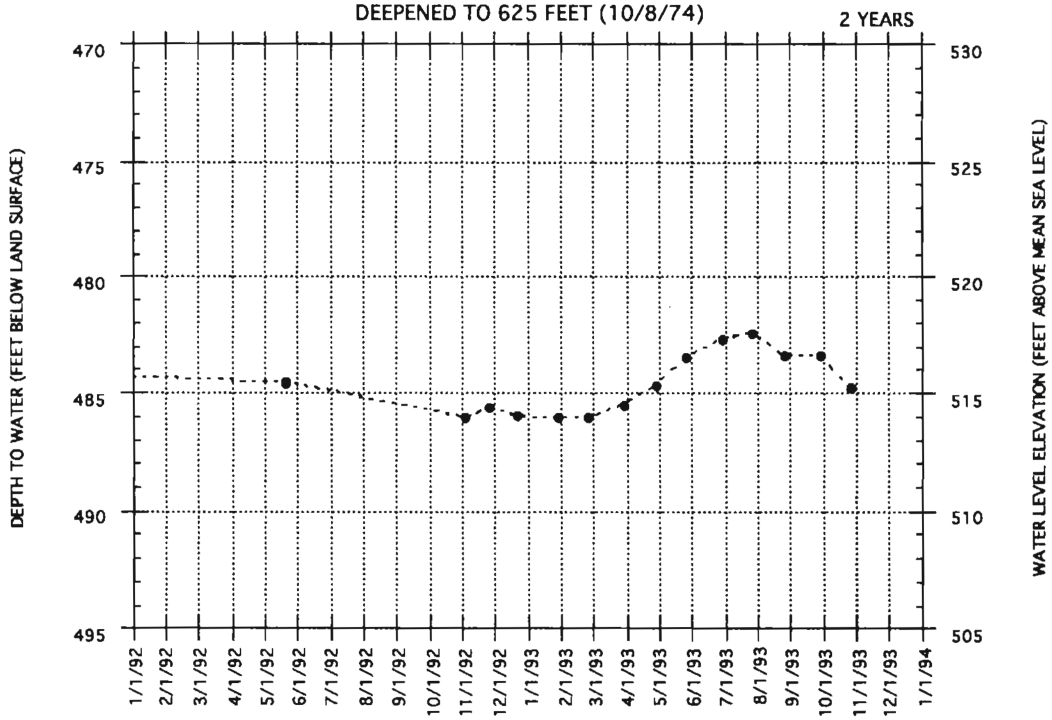
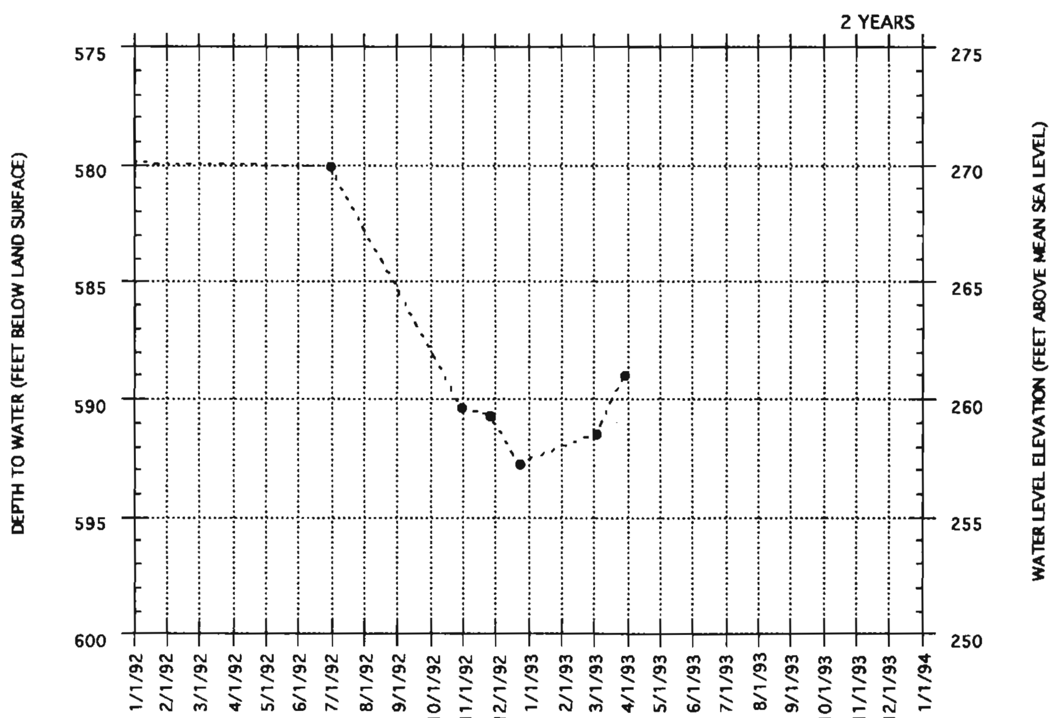
9/1/93
10/1/93
11/1/93
12/1/93
1/1/94

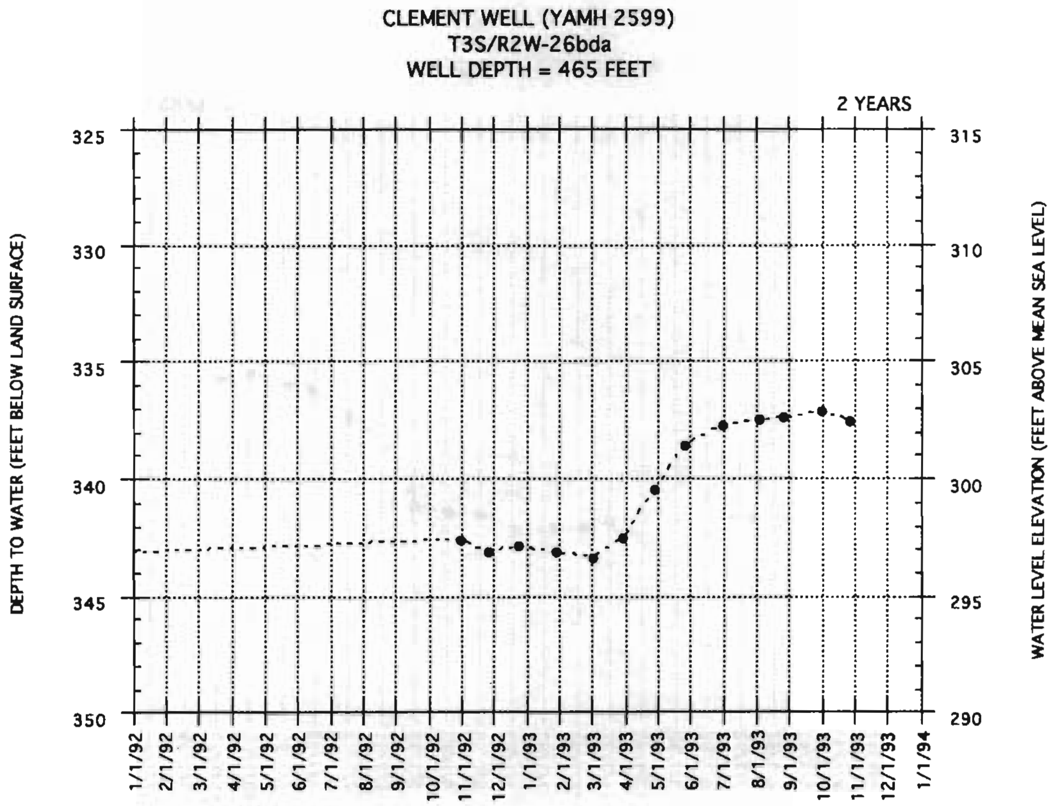

BAUER WELL (YAMH 2532)
T3S/R2W-23dca
WELL DEPTH = 403 FEET
50 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
180
190
200
210
220
230
240
250
260
270
280
485
475
465
455
445
435
425
415
405
395
385
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995

MILLS WELL (YAMH 2544)
T3S/R2W-24bad
ORIGINAL WELL DEPTH = 380 FEET
DEEPENED TO 625 FEET (10/8/74)



MOFFITT WELL (YAMH 2574)
T3S/R2W-25cbc
WELL DEPTH = 735 FEET




CLEMENT WELL (YAMH 2599)
T3S/R2W-26bda
WELL DEPTH = 465 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
325
330
335
340
345
350
315
310
305
300
295
290
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
6/1/93
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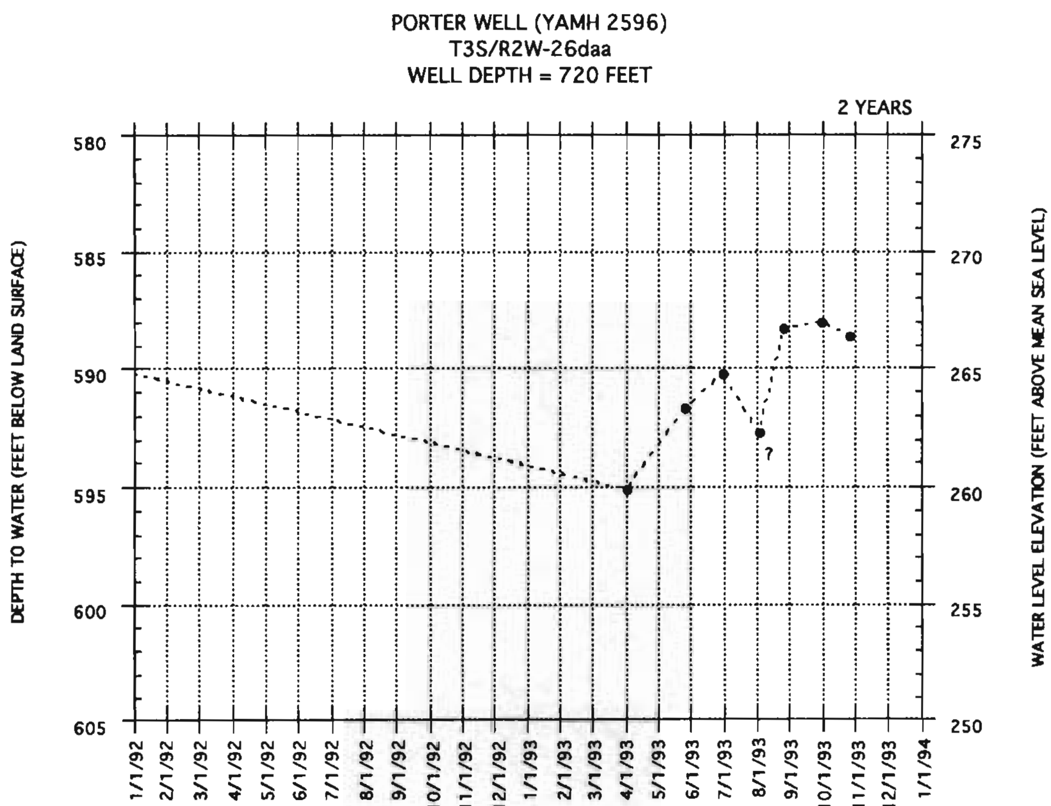
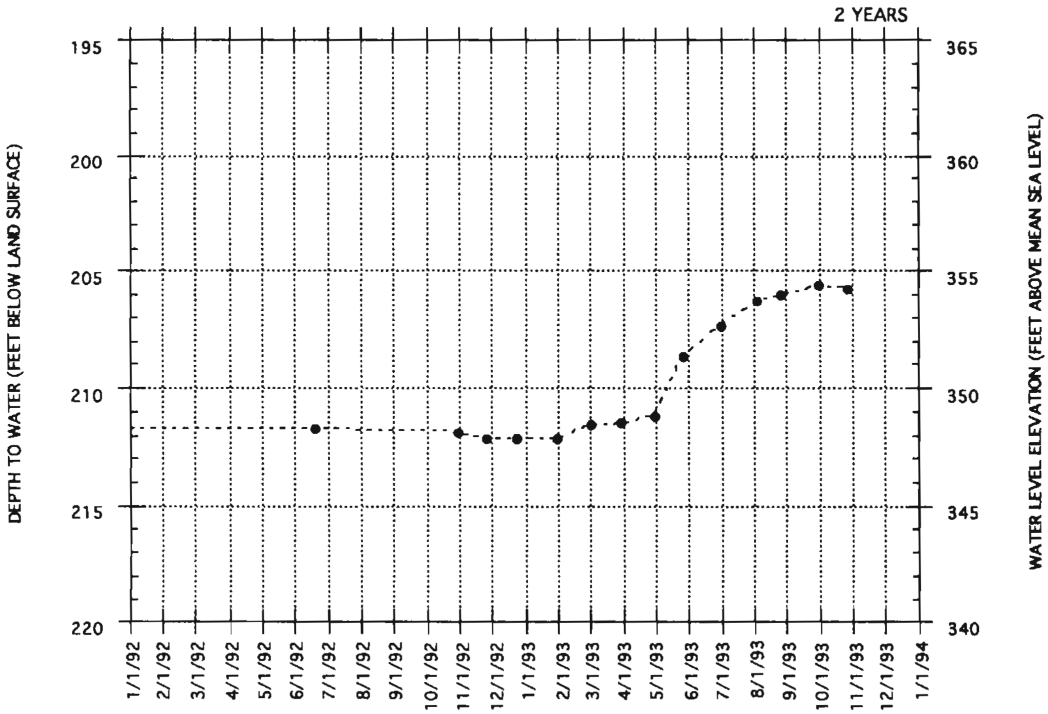
8/1/93
9/1/93
10/1/93
11/1/93
12/1/93
1/1/94


PORTER WELL (YAMH 2596)
T3S/R2W-26daa
WELL DEPTH = 720 FEET
2 YEARS
DEPTH TO WATER (FEET BELOW LAND SURFACE)
WATER LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
580
585
590
595
600
605
275
270
265
260
255
250
?
1/1/92
2/1/92
3/1/92
4/1/92
5/1/92
6/1/92
7/1/92
8/1/92
9/1/92
10/1/92
11/1/92
12/1/92
1/1/93
2/1/93
3/1/93
4/1/93
5/1/93
6/1/93
7/1/93
8/1/93
9/1/93
10/1/93
11/1/93
12/1/93
1/1/94

COX WELL (YAMH 2703)
T3S/R2W-36aba
WELL DEPTH = 280 FEET



APPENDIX C

PRECIPITATION AT REX 1S

Precipitation in Inches at Rex 1S

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	ANNUAL
1993	*3.91*	1.13	4.62	7.00	4.11	2.24	1.90	0.23	0.00	1.70	1.95	7.22	*36.01*
1992	5.33	4.83	1.03	5.08	0.06	0.59	0.68	0.60	1.88	4.28	*5.29*	*5.99*	*35.64*
1991	3.41	5.04	4.53	5.43	3.38	2.59	0.24	1.83	0.16	2.83	7.67	5.26	42.37
1990	9.07	4.28	2.66	1.73	1.97	2.09	0.39	1.46	0.72	4.44	4.58	3.11	36.50
1989	4.24	3.29	7.58	0.87	2.13	1.26	0.30	0.98	1.06	1.80	4.21	3.85	31.57
1988	7.53	1.29	3.72	4.13	3.43	2.14	0.12	0.09	1.42	0.14	9.69	*3.14*	*36.84*
1987	8.40	4.55	6.11	1.83	1.39	0.20	1.50	0.27	0.37	0.34	2.75	10.77	38.48
1986	6.73	6.81	3.06	1.78	2.76	0.48	1.15	0.00	3.39	3.06	6.81	4.34	40.37
1985	0.25	*2.60*	4.38	1.14	0.82	2.42	0.54	0.44	1.72	3.54	4.66	2.52	*25.03*
1984	2.84	4.88	4.63	4.17	4.61	4.67	0.03	0.16	1.89	5.62	12.87	3.40	49.77
1983	7.26	10.49	7.66	2.60	1.94	2.05	2.82	2.29	0.23	2.06	10.47	6.10	55.97
1982	6.85	7.88	3.51	5.12	0.86	1.56	0.42	0.72	3.51	3.81	5.11	9.26	48.61
1981	1.97	4.00	3.65	2.18	2.35	3.74	0.16	0.02	2.61	4.48	5.61	11.01	41.78
1980	11.16	4.46	3.87	4.18	1.57	3.08	0.20	0.32	1.80	2.14	6.81	11.60	51.19
1979	*2.99*	6.87	2.65	2.55	2.25	0.57	0.14	1.03	2.70	5.99	3.92	8.09	*39.75*
1978	6.32	3.73	1.65	3.72	4.09	0.79	1.28	2.49	3.50	0.37	4.63	*3.10*	*35.67*
1977	1.03	2.86	3.41	0.62	4.03	1.24	0.94	3.03	3.22	2.95	6.75	12.30	42.38
1976	6.19	7.30	3.21	1.89	2.15	0.46	0.98	2.93	1.30	1.45	1.09	1.33	30.28
1975	7.09	4.88	4.69	2.19	1.81	1.52	0.52	2.66	0.00	6.09	*5.41*	6.17	*43.03*
1974	9.13	5.35	6.63	1.97	2.21	0.70	2.16	0.03	0.20	1.90	7.24	7.18	44.70
1973	5.03	1.55	3.75	1.56	1.44	1.27	0.04	0.80	2.70	3.85	14.27	10.85	47.11
1972	**10.20**	**5.73**	**6.59**	3.63	2.35	0.60	0.27	0.27	3.46	0.88	4.24	8.93	47.15
1971	8.92	3.81	6.13	3.44	1.36	2.62	0.21	0.90	2.99	3.90	7.05	8.74	50.07
1970	12.08	4.38	2.33	2.53	1.18	0.55	0.10	0.00	1.75	3.74	*6.46*	9.60	*44.70*
1969	6.73	3.01	1.24	2.84	1.66	3.35	0.06	0.04	3.64	4.51	2.97	8.98	39.03
1968	5.20	7.96	3.55	2.18	3.57	2.41	0.49	3.76	2.36	6.16	7.11	10.33	55.08
1967	7.85	1.83	3.99	2.29	1.42	0.80	0.00	0.20	0.83	5.21	2.70	4.83	31.95
1966	*7.22*	1.95	5.47	1.08	1.20	1.35	1.40	0.29	1.71	2.72	5.24	7.82	*37.45*
1965	8.60	1.54	0.94	3.08	1.30	0.99	0.33	0.98	0.00	2.14	6.74	6.98	33.62
1964	12.32	0.72	3.47	1.37	0.77	1.49	0.88	0.70	1.45	0.87	8.87	12.58	45.49
1963	1.84	4.83	6.06	3.87	3.71	1.26	0.97	0.80	1.24	3.18	6.57	4.35	38.68
1962	*1.75*	3.40	4.91	3.59	2.03	0.76	0.01	1.65	2.06	4.18	12.02	2.96	*39.32*
1961	5.56	9.74	7.05	3.46	3.12	0.51	0.54	0.63	0.91	3.85	5.33	6.40	47.10
1960	4.00	4.52	5.83	4.37	4.38	0.46	0.00	0.71	0.72	3.70	10.23	3.43	42.35
1959	10.20	4.91	4.86	1.26	2.78	2.40	0.88	0.09	2.83	3.14	3.17	3.31	39.83
1958	7.93	7.18	2.34	4.24	0.68	3.30	0.00	0.04	0.97	2.21	8.00	5.64	42.53
1957	2.35	4.66	7.56	1.66	3.58	1.30	0.09	0.96	0.71	3.27	3.36	8.85	38.35
1956	12.87	3.87	5.99	0.63	1.35	1.37	0.02	1.82	1.26	6.76	1.60	4.29	41.83
1955	2.71	3.11	3.98	4.55	1.21	1.24	1.16	0.00	3.51	7.48	9.48	11.72	50.15
1954	10.19	5.79	2.71	3.57	1.21	3.00	0.53	1.29	1.71	4.32	5.56	5.88	45.76
1953	14.91	3.99	4.58	2.23	2.69	1.99	0.00	1.78	1.13	3.26	6.84	7.88	51.28
1952	**6.09**	**4.34**	**2.91**	**1.73**	**0.49**	3.51	0.00	0.20	0.33	1.05	0.97	7.15	28.77
1951	8.80	5.11	4.66	1.27	1.69	0.05	0.24	0.42	2.94	**7.24**	**7.63**	**9.22**	49.27
1950	9.30	6.10	5.52	1.61	0.63	2.47	0.53	0.58	1.80	9.24	9.77	6.20	53.75
1949	1.04	11.58	2.60	0.85	1.94	0.51	0.57	0.17	0.94	2.90	6.42	5.11	34.63
1948	6.81	5.95	4.35	3.50	4.87	0.64	0.59	0.74	2.96	2.08	7.14	9.33	48.96

BOLD values shows McMinnville data since Rex 1S is not reported

ITALICS values show data for months with some days missing (less than 9)

APPENDIX D

ADMINISTRATIVE ACTION

ADMINISTRATIVE ACTION

At its January 1992 meeting, the Oregon Water Resources Commission adopted the Willamette Basin rules that classified eight groundwater areas for exempt uses only, including two for basalt aquifers that make up the Parrett Mountain area. The Commission also approved the Willamette Basin plan which directs staff to work with local parties and schedule a groundwater study, as needed, on Parrett Mountain. The plan indicates that the Department will consider creating a Serious Water Management Problem Area which would allow the Department to require reporting on water use (and possibly groundwater levels) from existing and new wells in the area.

During consideration of the Willamette Basin Rules and Plan at the Commission's January, 1992 meeting, staff described a possible Parrett Mountain groundwater study. The study would take 18 months and a staff commitment of two person-years. The staff report also described the delays that such a study would place on previously contemplated activities. Karl Anuta, attorney for a local group of residents (Friends of Parrett Mountain), appealed to the Commission for administrative controls on new uses of groundwater on Parrett Mountain during the study period. The Commission directed staff to hold a hearing and generate the record on a proposal to withdraw the unappropriated groundwater of Parrett Mountain from further appropriation for two years. Staff was instructed to return to the Commission at its March 13, 1992 meeting with a staff report on the proposal. The hearing on the proposal took place on February 28, 1992.

At its March 13, 1992 meeting, the Commission took several administrative actions. It withdrew basalt groundwater in a three square-mile area of "Northern Parrett Mountain". This action occurred because it appeared that the potential risk to the resource and existing users from additional development of exempt uses may be substantial. Due to the odd statutory language in ORS 536.410 concerning the withdrawal process and upon the advice of the Attorney General, the withdrawal took the form of an order (expiring 3/13/94) and a temporary rule (expiring 9/13/92). The Commission also adopted temporary special area well construction standards (rules) for Parrett Mountain in order to prevent the commingling of dissimilar waters within wells. Such commingling was identified as an important factor in the water level decline situation for some area basalt wells. These standards were also set to expire on 9/13/92.

The several Commission actions came under appeal. In March 1992, Manke Lumber Company filed an intent to appeal with the Land Use Board of Appeals (LUBA). Filing the Intent to appeal held that option open. In May 1992, Michael Morey and Leslie MacKenzie filed an appeal to the order in Washington County Circuit Court and to the rules in the Court of Appeals. On June 5, 1992, the Commission lifted the stays to those instruments which the appeals automatically produced. In July, 1992, the same plaintiffs sought an injunction against the Department's holding of additional Parrett Mountain rulemaking hearings. The Washington County Circuit Court denied that request.

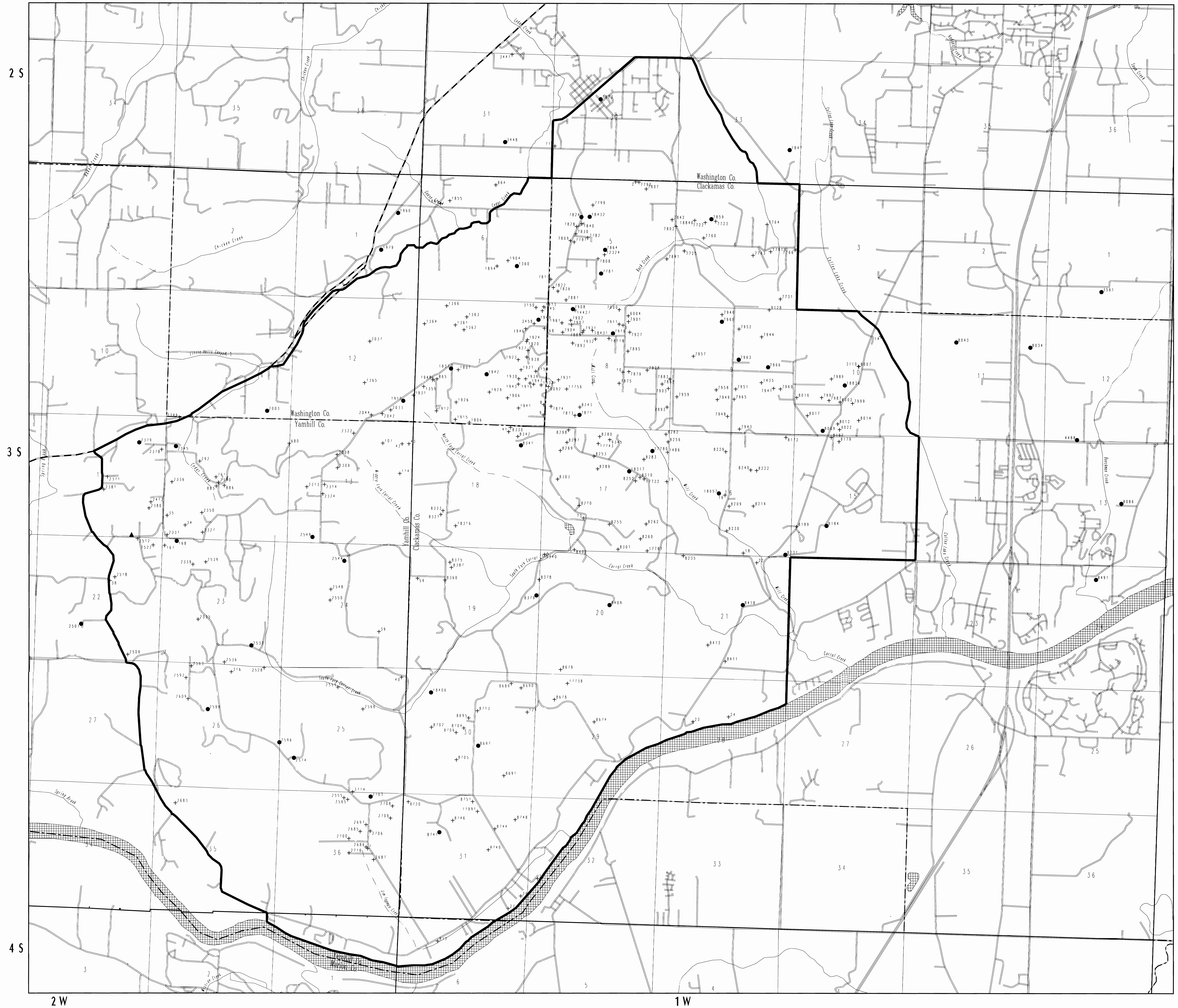
Since the temporary rules could not last for more than 180 days, the Commission held hearings on July 15, 1992 on the matters of continuing the withdrawal and the special area well construction standards until March 13, 1994. The continuation would help insure that the administrative withdrawal would be adequately covered by both order and rule in the event that judicial review determined that one of the instruments was improper.

At the August 1992 meeting, the Commission adopted permanent, time-dated rules regarding Parrett Mountain. Amendments to the Willamette Basin rules withdrew shallow basalt groundwater on Northern Parrett Mountain from further appropriation but slightly expanded the classification for that area's deep basalt groundwater, allowing domestic and rural residential fire protection. The special area well construction standards were continued in a much more flexible form. Both adopted rules were set for expiration on March 13, 1994. The prior rules and order from the March action were removed, mooting the legal challenges.

At the November 1993 meeting, the Commission endorsed a tentative public involvement process, authorized a rulemaking hearing, selected a Commission subcommittee for draft rule assistance, and selected a Commissioner to hold the Basin amendment hearing. The subcommittee was given the authority to modify the process to seek extension of the current rules if the results of the public involvement process were not adequate. Responding to input at the Department's public information meeting on November 23, 1993, the subcommittee decided to modify the process. Public comments suggested that the proposed schedule provided neither enough time for public review of the technical information nor enough time for citizen advisory committee formulation of proposed rules.

The Commission's reason for proposing to extend the rules was based on providing more time for public involvement in the development of any final rules without allowing the automatic expiration of the current rules. This provision carried with it more time for agency staff to complete the study report and more time for a public rules advisory committee to consider the report information during formulation of any proposed final rules. The Commission conducted a hearing on January 21, 1994, concerning extending the rules. The proposed extension date, November 13, 1994, appeared adequate to allow sufficient time for any challenges or other delays. At the February 25, 1994 meeting, the Commission adopted amendments to allow extension of the rules as proposed.

PARRETT MOUNTAIN AREA LOCATIONS MAP



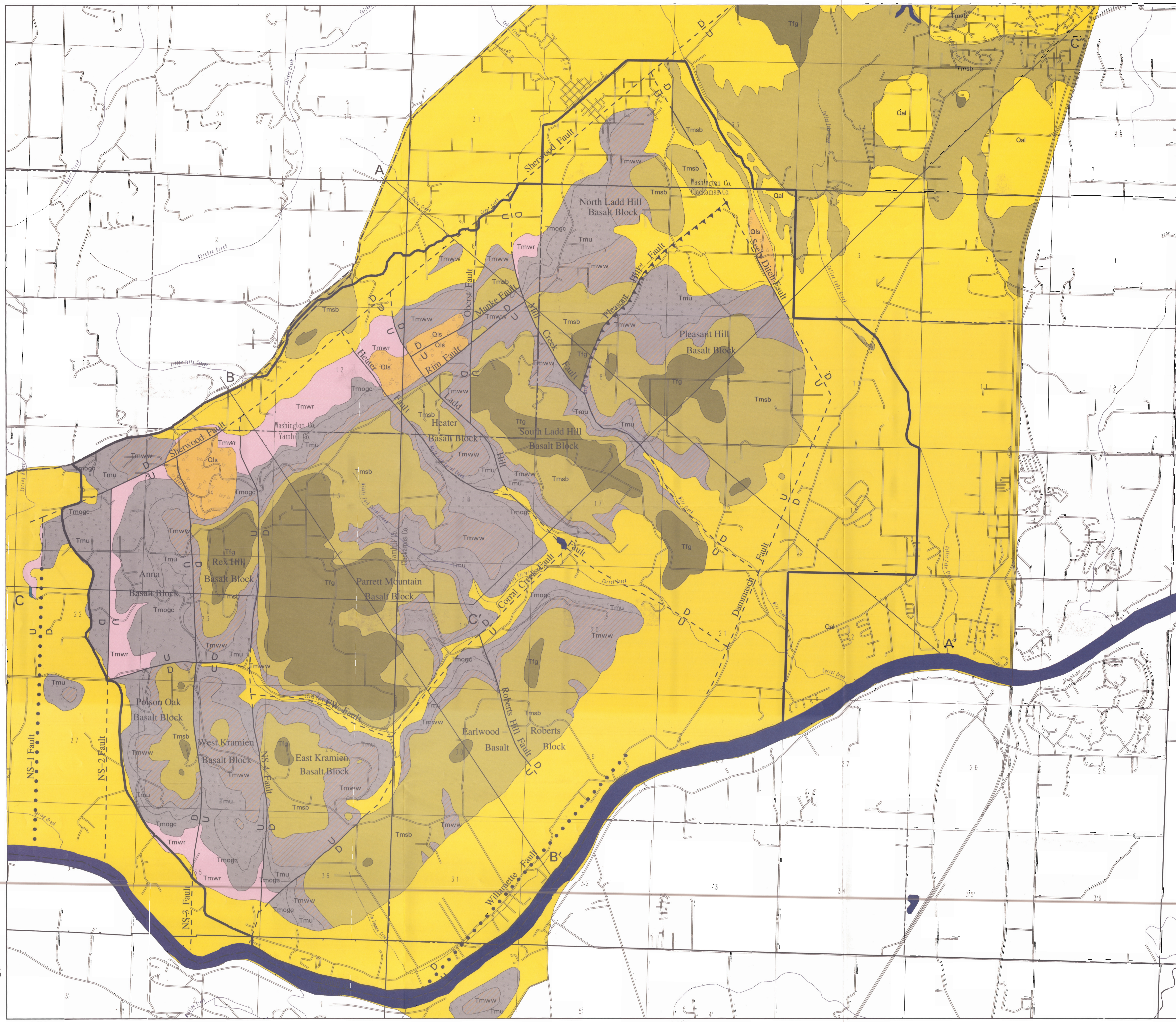
Legend

- Groundwater Study Area boundary
- + Located well with Well Number. The Well Number preceeded by the 4-letter County or PMTN code form a unique Well-ID in this report.
- ● Located well with monthly, long-term, or recorder monitoring by OWRD.
- ▲ Precipitation gaging station

Contour interval 100 feet

Scale 1:24,000

0 .25 .5 .75 1 MILES



GEOLOGIC MAP OF THE PARRETT MOUNTAIN AREA

Legend

- Qal - Alluvium/colluvium unit
- Qls - Landslide
- Tfg - Ginko Flow of the Frenchmen Springs member, Wanapum formation, Columbia River Basalt Group
- Tmsb - Sentinel Bluffs unit, Grande Ronde Basalt formation, Columbia River Basalt Group
- Tmww - Winter Water unit, Grande Ronde Basalt formation, Columbia River Basalt Group
- Tmu - Umtanum unit, Grande Ronde Basalt formation, Columbia River Basalt Group
- Tmogc - Ortley-Grouse Creek unit, Grande Ronde Basalt formation, Columbia River Basalt Group
- Tmwr - Wapshilla Ridge unit, Grande Ronde Basalt formation, Columbia River Basalt Group
- Tos - Oligocene-Miocene sediments

Faults

- Fault U - upthrown side D - downthrown side
- Approximate location
- Inferred location concealed beneath mapped units
- Thrust fault w/teeth on the hanging wall

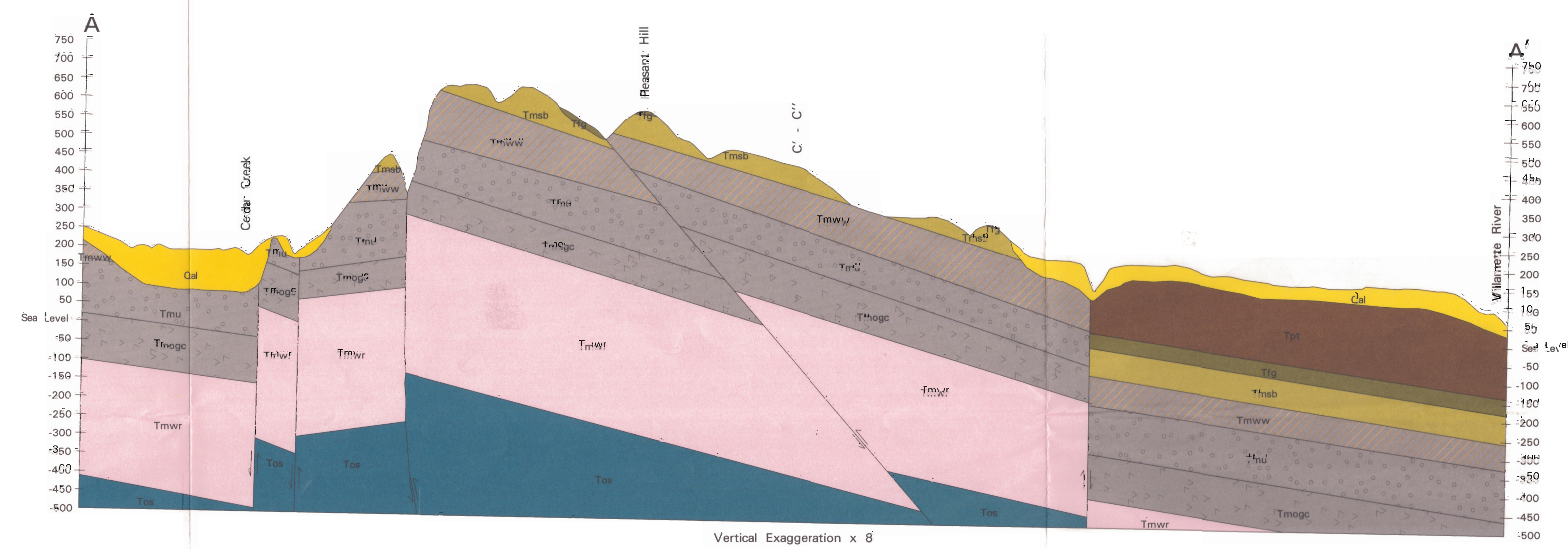
Scale 1:24,000

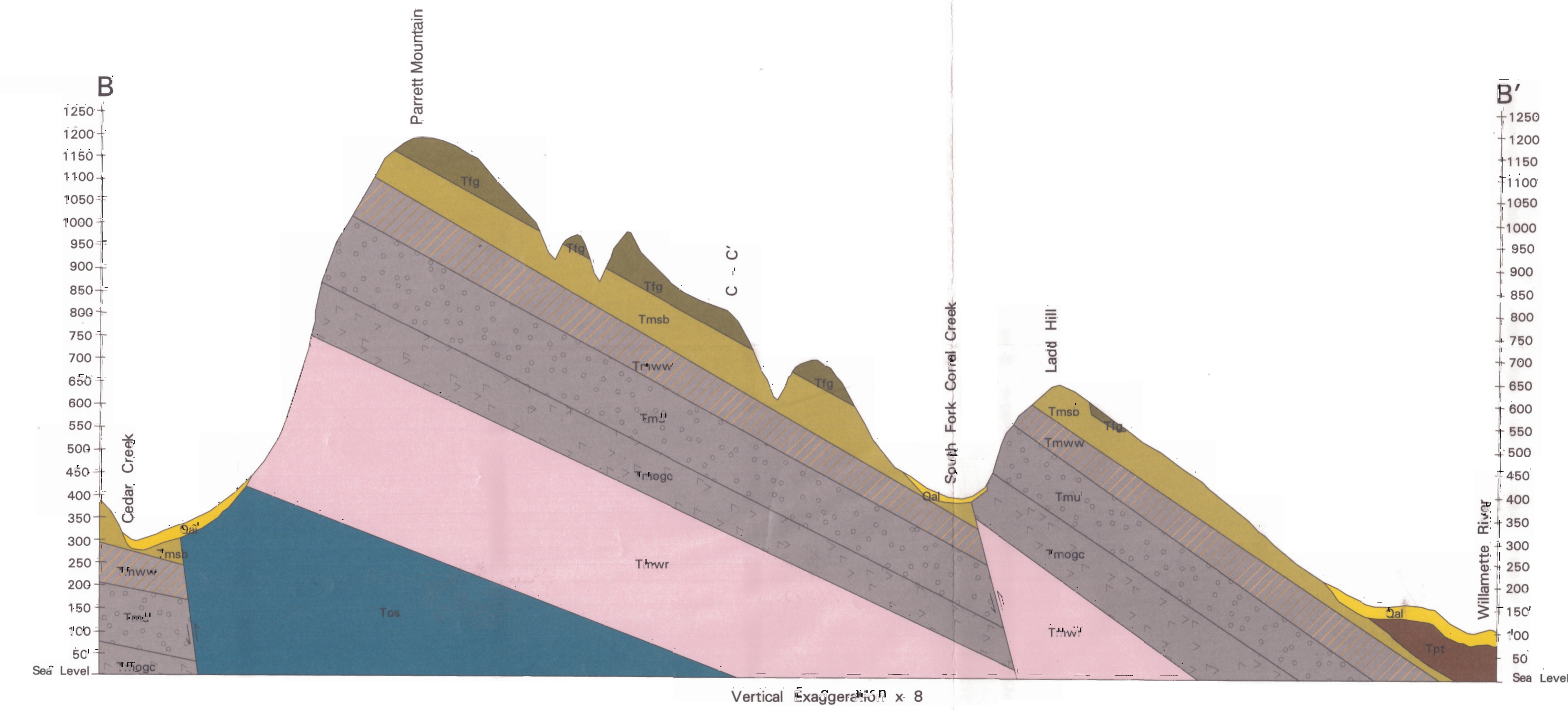
GEOLOGIC CROSS-SECTIONS OF THE PARRETT MOUNTAIN AREA

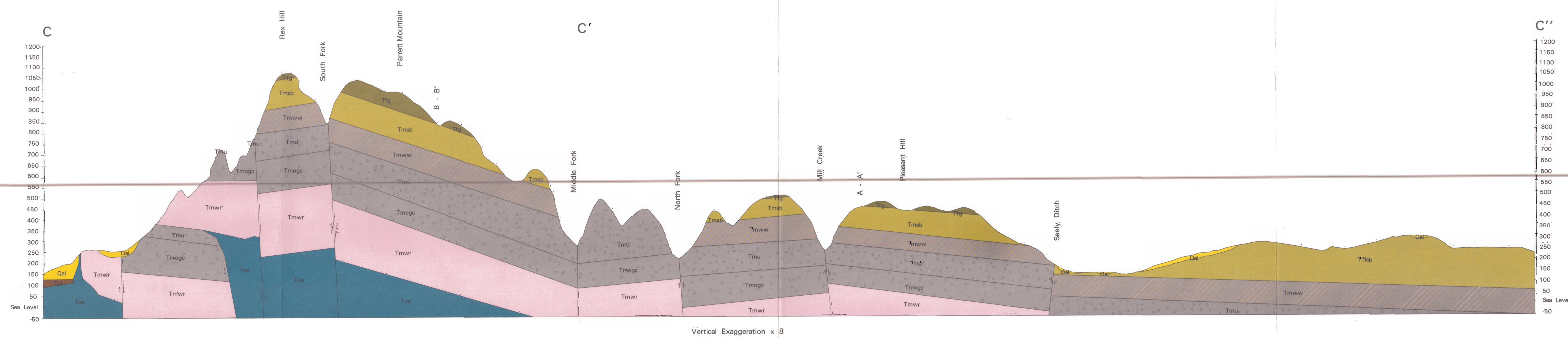
Legend

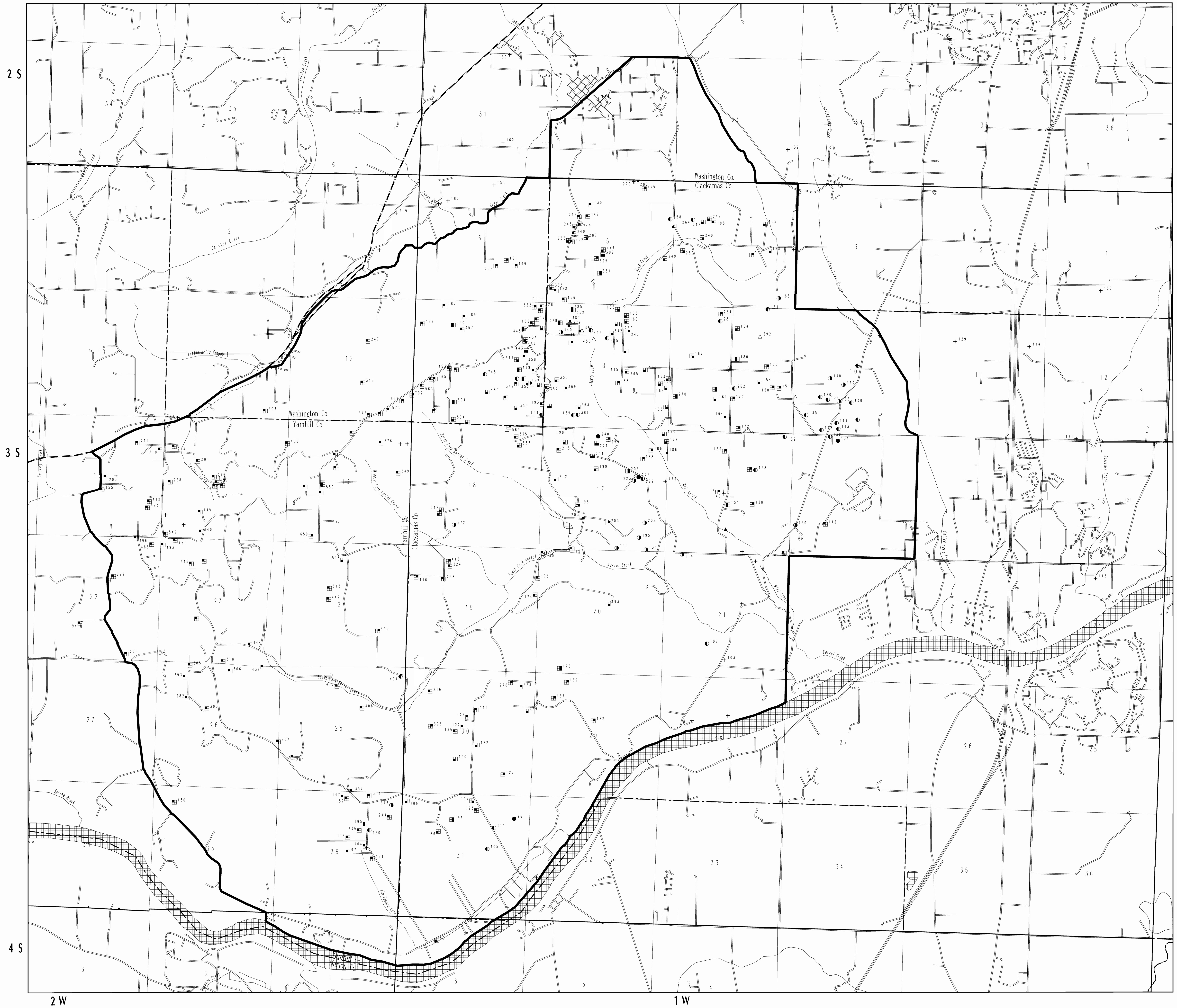
- Qal - Alluvium/Colluvium unit
- Tpt - Troutdale formation
- Tfg - Ginko Flow of the Frenchmen Springs member Wanapum formation, Columbia River Basalt Group
- Tmsb - Sentinel Bluffs unit Grande Ronde Basalt formation, Columbia River Basalt Group
- Tmww - Winter Water unit Grande Ronde Basalt formation, Columbia River Basalt Group
- Tmu - Umtanum unit Grande Ronde Basalt formation, Columbia River Basalt Group
- Tmogc - Ortley-Grouse Creek unit Grande Ronde Basalt formation, Columbia River Basalt Group
- Tmwr - Wapshilla Ridge unit Grande Ronde Basalt formation, Columbia River Basalt Group
- Tos - Oligocene-Miocene sediments

Scale 1:24,000









HEADS AT BASALT WELLS 1992-1993

Legend

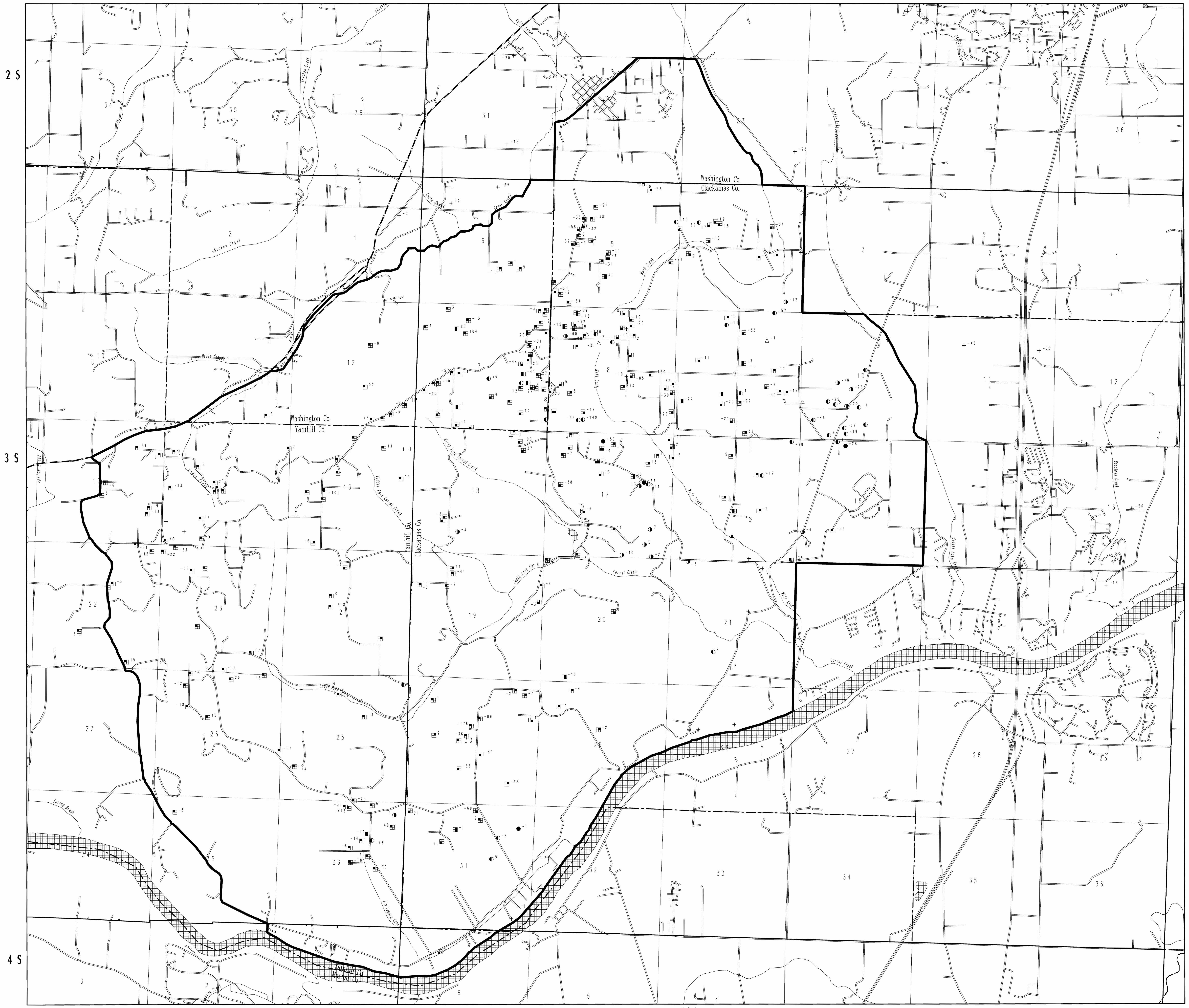
350 Head at basalt well. Static water level in well is expressed in feet above mean sea level.

Principal aquifer developed by study well. Based on well reports and geologic investigation the well principally develops water from this unit or units. Symbol may be a combination of individual symbols.

- + Not determined (due to lack of geologic mapping and/or well report)
- ▲ Alluvium
- △ Winter Water
- ◐ Boundary Winter Water/Umtanum
- ◑ Umtanum
- Boundary Umtanum/Ortley-Grouse Creek
- Ortley-Grouse Creek
- Boundary Wapshilla Ridge/Ortley-Grouse Creek
- Wapshilla Ridge

Scale 1:24,000

0 .25 .5 .75 1 MILES



HEAD CHANGES AT BASALT WELLS IN THEIR CURRENT CONSTRUCTION

Legend

-35 Head change at basalt well. A difference at wells in static water level measured between the shallowest and most reliable level measured during the 1992-1993 investigation and the oldest reliable water level for the well in its present construction. In most cases the latter level is the well report. This methodology allows a judgement for reliability. It does NOT allow well construction changes to influence the head change.

Principal aquifer developed by study well. Based on well report and geologic investigation the well principally develops water from this unit or units. Symbol may be a combination of individual symbols.

- + Not determined (due to lack of geologic mapping and/or well report)
- ▲ Alluvium
- △ Winter Water
- ◐ Boundary Winter Water/Umtanum
- ◑ Umtanum
- Boundary Umtanum/Ortley-Grouse Creek
- Ortley-Grouse Creek
- Boundary Wapshilla Ridge/Ortley-Grouse Creek
- Wapshilla Ridge

Scale 1:24,000

0 .25 .5 .75 1 MILES