# Ground Water in the Corvallis-Albany Area, Central Willamette Valley, Oregon

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 2032

*Prepared in cooperation with the Oregon State Engineer*

# Ground Water in the Corvallis-Albany Area, Central Willamette Valley, Oregon

*By* F. J. FRANK

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 2032

*Prepared in cooperation with the Oregon State Engineer*

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1974

UNITED STATES DEPARTMENT OF THE INTERIOR

ROGERS C. B. MORTON, *Secretary*

GEOLOGICAL SURVEY

V. E. McKelvey, *Director*

Library of Congress catalog-card No. 74-600008

---

**For sale by the Superintendent of Documents, U. S. Government Printing Office**
**Washington, D. C. 20402 - Price $1.95 (paper cover)**
Stock Number 2401-02487

# CONTENTS

# ILLUSTRATIONS



# TABLES

# GROUND WATER IN THE CORVALLIS-ALBANY AREA, CENTRAL WILLAMETTE VALLEY, OREGON

By F. J. Frank

ABSTRACT

The Corvallis-Albany area is part of the alluvial plain that lies between the Cascade and Coast Ranges in the central Willamette Valley in northwestern Oregon. As used in this report, the Corvallis-Albany area consists of approximately 210 square miles and includes a part of the lower foothills of the Coast and Cascade Ranges. Volcanic and marine sedimentary units exposed in the foothills range in age from Eocene to Oligocene or Miocene. The volcanic rocks are primarily pillow lavas and basalt flows, which yield only small quantities of water generally adequate for domestic and stock use. Marine-deposited sandstone, siltstone, and shale of the older sedimentary units are fine grained, poorly permeable, and generally yield small volumes of water to wells. In the valley plain the older units are overlain by Pleistocene and Holocene alluvial deposits. The alluvial deposits (sand and gravel) of the valley plain contain the most productive aquifers in the area and are considered to be the only units feasible for large-scale development of ground-water supplies.

Aquifers in the area are recharged principally by direct infiltration of precipitation. Most of the precipitation (about 38 in. per yr avg) occurs during late autumn and winter. Ground water is discharged naturally from the area by seepage and spring flow to streams, by evapotranspiration, by underflow, and artificially through wells.

During 1971 the seasonal decline of water levels from winter to late summer averaged about 10 feet for the alluvial deposits. The seasonal change of storage in that year was estimated to be about 130,000 acre-feet. Of this volume, about 14,000 acre-feet was pumped from wells; the rest (about 116,000 acre-feet) was discharged through seeps and springs by evapotranspiration. The difference between pumpage and natural discharge indicates that a great quantity of additional water is available for development. The storage capacity of the alluvial aquifers in the area is estimated to be about 750,000 acre-feet between depths of 10 and 100 feet.

Ground water from the alluvial deposits is chemically suitable for all uses, as is most of the water from perched-water bodies in the older sedimentary and volcanic rocks. However, the mineral content of water from the older sedimentary rocks, particularly from deeper producing zones in the valley plain, is greater than that from the alluvial deposits. Locally, some of the water from the older rocks is too saline for general use. Analysis of water samples for coliform bacteria indicates that ground-water pollution exists in parts of the Corvallis-Albany area. Further study is necessary to document fully the nature and extent of pollution.

## INTRODUCTION

The water supply for most municipal and industrial uses in the Corvallis-Albany area is presently obtained from surface-water sources. Although surface water is abundant, some parts of the area lack facilities for its distribution, and small- to moderate-sized industries and suburban developments are using readily and more economically obtainable ground water. Additional ground-water supplies will be needed in this part of the Willamette River valley for maximum utilization of the irrigable land.

The purpose of this report is to provide sufficient geologic and hydrologic data to aid in future development of ground-water supplies. Objectives of the investigation were to (1) delineate the extent, thickness, and water-bearing characteristics of the principal geologic units, (2) determine sources, occurrence, availability, and direction of ground-water movement, (3) determine chemical quality of the ground water, and (4) estimate the quantity of ground water used and the quantity available from the alluvial aquifers of the valley plain.

The ground-water resources of the area are described in a report by Piper (1942). Also, a brief description of ground-water conditions and availability is included in a report by Frank and Johnson (1972) that presents many of the ground-water data collected during this investigation. Ground-water-level records for a number of wells in the study area have been collected by the Oregon State Engineer, and some of these records are published in the State Engineer's ground-water report series (Sceva and DeBow, 1965, 1966; Bartholomew and DeBow, 1967, 1970).

This investigation is part of a continuing cooperative program between the Oregon State Engineer and the U.S. Geological Survey to evaluate the ground-water resources of Oregon. The study was made under the immediate supervision of D. D. Harris, and under the general supervision of Stanley F. Kapustka, district chief in charge of U.S. Geological Survey water-resources investigations in Oregon. At various times the author was assisted in the collection and compilation of field data by E. A. Oster, S. W. Anderson, W. L. Lewis, and C. A. Collins. D. A. Curtiss, chemist, U.S. Geological Survey, made the coliform analyses. Many of the data for this investigation were supplied by well owners, operators, and drillers. The helpful cooperation of these people and of the well owners who permitted access to their wells to collect ground-water data is gratefully acknowledged. Special thanks are extended to officials of the Pacific Power & Light Co., who provided data needed to estimate the volume of ground water pumped for irrigation in the area.

## WELL-NUMBERING SYSTEM

Designations of wells discussed in this report are based on the official system for rectangular subdivision of public lands. The number indicates the location of the well or test hole by township, range, and section, and its position within the section. A graphic illustration of this method of well numbering is shown in figure 1. The first numeral indicates the township; the second, the range; and the third, the section in which the well is located. The letters following the section number locate the well within the section. The first letter denotes the quarter section (160 acres); the second, the quarter-quarter section (40 acres); and the third, the quarter-quarter-quarter section (10 acres). For example, well 11S/3W–16dcb is in NW¼SW¼SE¼ sec. 16, T. 11 S., R. 3 W. Where two or more wells are located in the same 10-acre subdivision, serial numbers are added after the third letter.

## GEOGRAPHIC FEATURES

The area covered by this investigation consists of approximately 210 square miles and lies between long 123°25′ on the west and 122°55′30″ on the east and lat 44°41′ on the north and 44°28′30″ on the south (fig. 2). It includes that part of the central Willamette Valley adjacent to the lower Santiam basin.

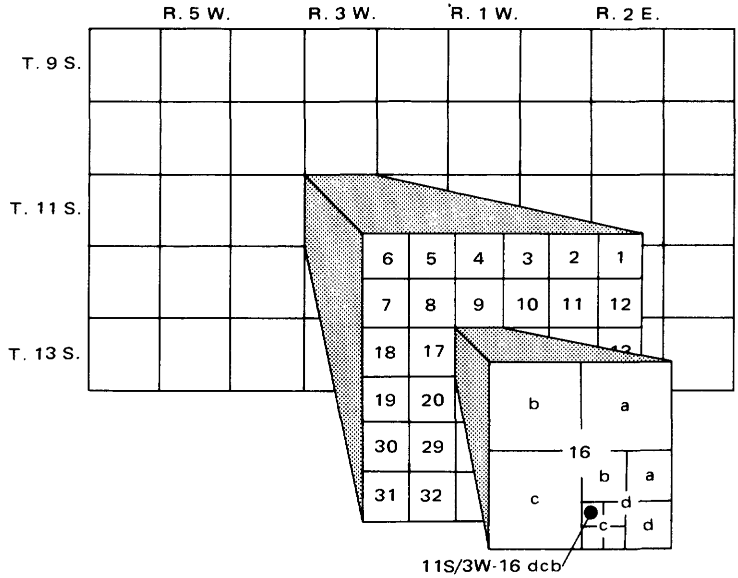



FIGURE 1.—Well-numbering system.

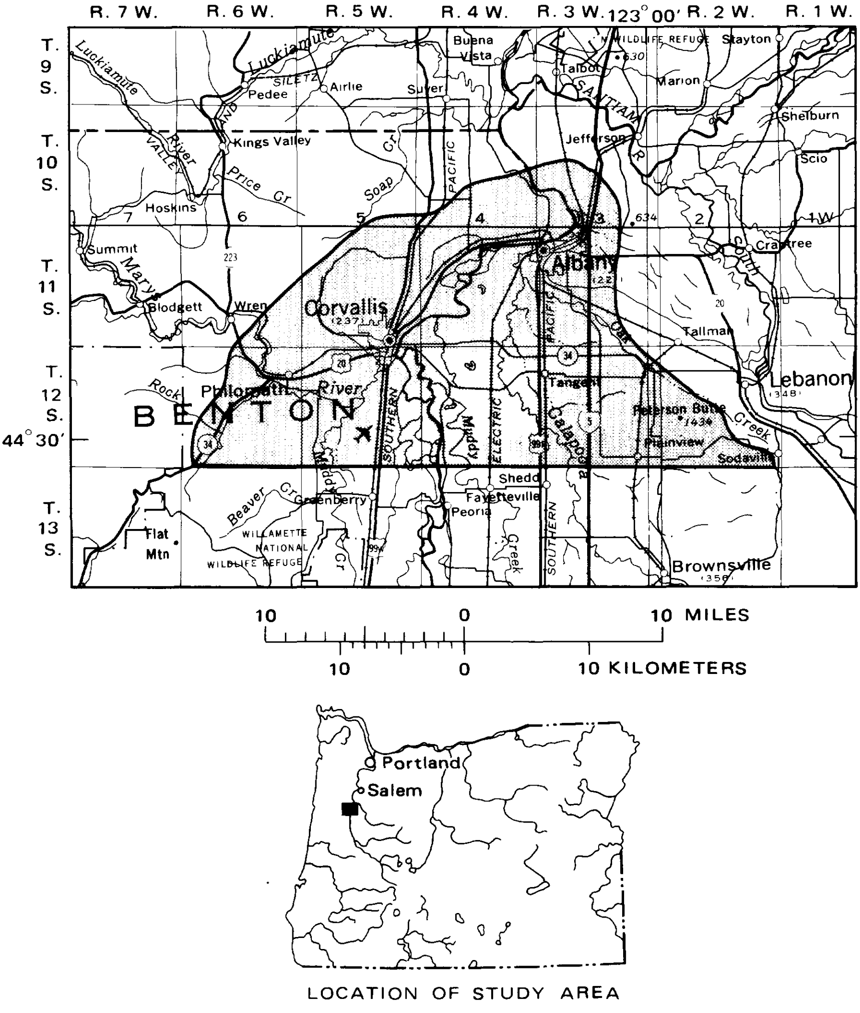



FIGURE 2.—Location and general features of the Corvallis-Albany area.

The largest cities within the study area are Corvallis (population 36,726), Albany (population 19,300), and Philomath (population 1,800) (Oregon Population Research and Census figures for 1971). North Albany has an estimated population of about 2,500. In addition, about 7,400 people live in the suburbs of Corvallis and the uplands near Philomath and Corvallis. An estimated 9,600 people live in the valley plain, which includes the suburbs south of Corvallis and Albany.

The major industries in the area are related to forest products and range from lumber production to the manufacture of wood products.

Agriculture is an important industry; the area surrounding Albany is one of the Nation's largest producers of grass seed—ryegrass, bluegrass, alta fescue, and orchard grass seed. Other agricultural crops are grains, tree fruits, nuts, and vegetables. Other industries related to agriculture are food- and meat-processing plants. Albany has become an important center for the production of zirconium, titanium, and related metals and the melting and casting of reactive and refractory metals.

## CLIMATE

The area has a temperate marine climate characterized by wet winters and dry summers. Topography, nearness to the Pacific Ocean, and exposure to middle-latitude westerly winds are the principal climatic controls.

The normal annual precipitation in the Corvallis-Albany area is about 38 inches, most of which occurs as rain. (See fig. 3). The wettest months are November through January. In July and August, normal precipitation is less than half an inch, and occasionally in midsummer no rain occurs for periods of 30–60 days. Figure 4 shows minimum, mean, and maximum monthly precipitation for the period of record.

According to National Weather Service records, the average annual temperature at the Corvallis station is 53°F. January is generally the coldest month, with an average temperature of 39.4°F and a minimum averaging about 30°F. The lowest temperature recorded at Corvallis was —14° on December 12, 1919. July is usually the warmest month, with an average temperature of 66.6°F and a maximum averaging about 82°F. The highest recorded temperature was 107°F on July 20, 1946. The area has a growing season of about 200 days.

## TOPOGRAPHY AND DRAINAGE

The Corvallis-Albany area is part of a broad alluvial plain which lies between the Cascade and Coast Ranges in the central Willamette Valley of northwestern Oregon. The lowland part of the area is an alluviated valley plain, with an elevation of about 200–300 feet above mean sea level, and irregular bottom lands along the streams, which are 5–30 feet below the valley-plain terrace. The upland parts of the area consist of (1) hills and ridges of the Coast Range which form the northwestern part of the area at elevations of 500–1,500 feet above mean sea level and (2) isolated hills in the southeastern part of the area which project above the valley plain and rise to elevations of 300–1,400 feet above mean sea level.

The area is drained primarily by the Willamette, Marys, and

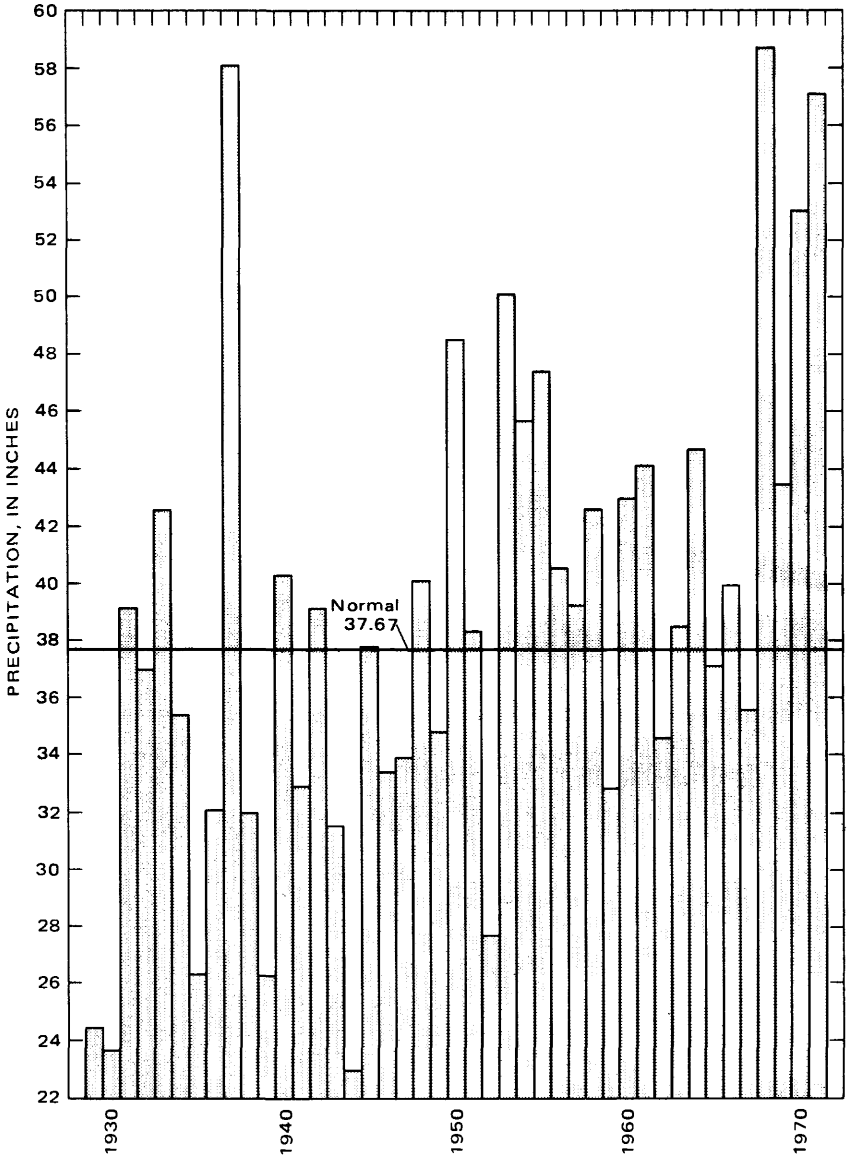



FIGURE 3.—Annual precipitation at Corvallis, 1929–71.

Calapooia Rivers. The Willamette River, which is the master stream, enters the area from the south and flows generally northward east of the Coast Range foothills. The Marys River enters the area from the west and drains into the Willamette River near Corvallis. The Calapooia River drains much of the eastern part of the area and is tributary to the Willamette River at Albany.

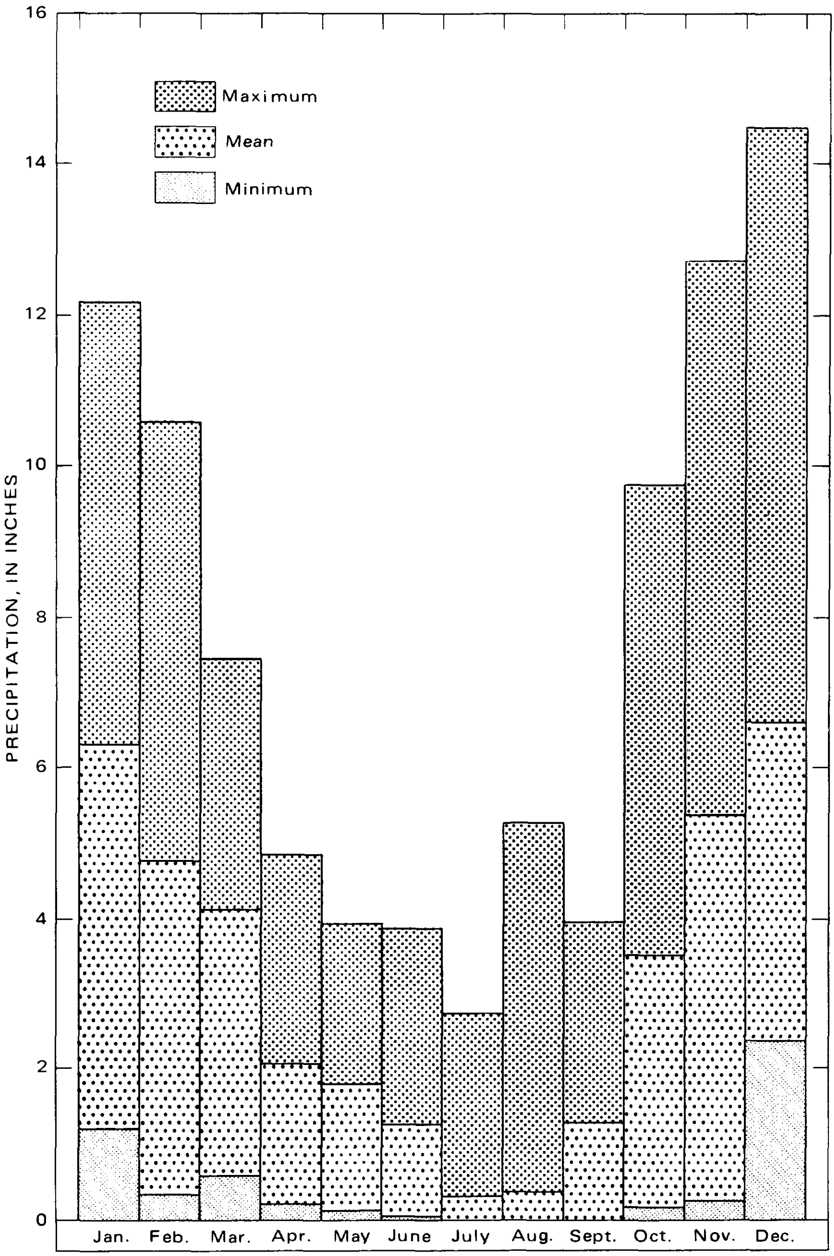



FIGURE 4.—Monthly precipitation at Corvallis.

## STREAM DISCHARGE

Streamflow data in the study area consist of continuous records at gaging stations maintained on the Willamette, Marys, and Calapooia

Rivers and of periodic and miscellaneous measurements at other sites. Records of daily flow and results of miscellaneous measurements have been published by the Geological Survey in annual reports of water-resources data for Oregon.

The average annual runoff from an area of about 4,840 square miles, measured at Willamette River at Albany, was about 10,100,000 acre-feet during 1929–70 (fig. 5). The total runoff varies considerably from year to year; less than 6,000,000 acre-feet in 1931 and 1941 and about 17,500,000 acre-feet in 1956. The average monthly flow of the river (fig. 6) was about 1,700,000 acre-feet for January and about 200,000 acre-feet for August.

During the 30-year period 1941–70, the average annual runoff of Marys River near Philomath, drainage area 159 square miles, was 338,000 acre-feet. The average annual runoff of Calapooia River at Albany, drainage area 372 square miles, was 663,000 acre-feet for the 30-year period.

Two of the principal streams in the area are both named Muddy Creek—one in Benton County west of the Willamette River and the other in Linn County east of the Willamette River. In this report they are referred to as Muddy Creek (west) and Muddy Creek (east). Muddy Creek (west) drains much of the west side of the area and is tributary to the Marys River about 3 miles south of Corvallis. Muddy Creek (east) flows between the Willamette and Calapooia Rivers and is tributary to the east channel of the Willamette River. Many other small streams drain the foothills of the Coast Range and are tributary to the larger streams of the area.

## GEOLOGIC FORMATIONS AND THEIR WATER-BEARING PROPERTIES

The rate at which water is recharged to and discharged from an aquifer is dependent on the character and distribution of the geologic units and on the climate and physiography of the area.

General geologic features of this area were known from previous studies. Distribution of the rock units that make up the main elements of the geology, as compiled from the work of Vokes, Myers, and Hoover (1954), Allison (1953), and Piper (1942), is shown on plate 1, along with geologic sections from drillers' log data.

For simplicity, the geologic units in the area are divided into two main divisions: (1) The older and generally consolidated rocks that form the higher parts of the area and occur at depth below the valley plain and (2) the unconsolidated materials, mainly sand and gravel of Pleistocene and Holocene age, that compose the valley fill. A summary of the geologic formations exposed in the area and their water-bearing properties is shown in table 1.

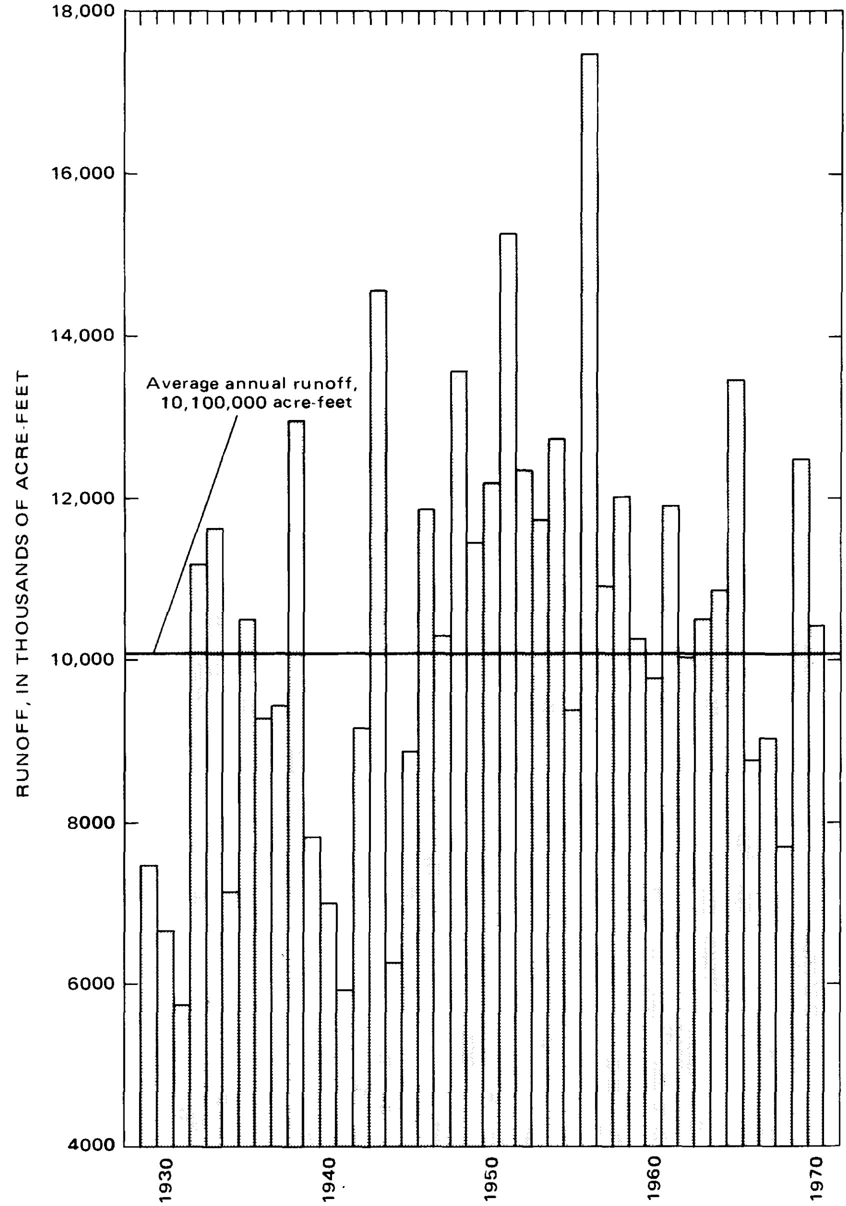



FIGURE 5.—Annual runoff of Willamette River at Albany, 1929–70.

## CONSOLIDATED ROCKS

The older and generally consolidated rocks in the area consist of the Siletz River Volcanics, the marine Tyee and Spencer Formations, and intrusive igneous rocks. Also, the Eugene Formation and the

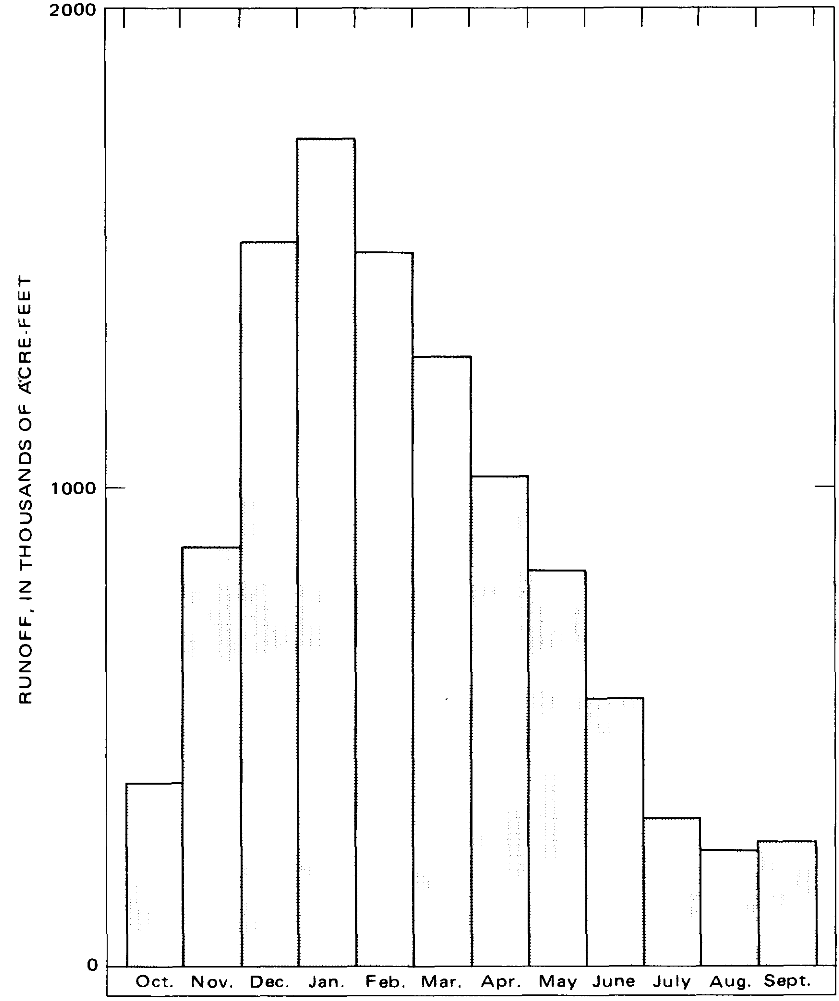



FIGURE 6.—Average monthly runoff of Willamette River at Albany, 1929–70.

Little Butte Volcanic Series are exposed in the extreme southeastern part of the area.

The oldest rocks exposed within the area are the Siletz River Volcanics which include the Coffin Butte Volcanics as mapped by Allison (1953). The volcanic rocks appear to be moderately permeable, allowing the infiltration of sufficient precipitation so that much of the sequence contains zones of saturation high above the levels of nearby stream channels. These rocks usually yield water adequate for domestic uses but inadequate for municipal or irrigation uses.

The marine sedimentary rocks of the Tyee and Spencer Formations are generally fine-grained sandstone, siltstone, and shale and are so poorly permeable that they usually yield only small quantities of water to wells. In the upland and foothill parts of the area, wells produce small to moderate quantities of good-quality water adequate for domestic use. In places beneath the valley plain, however, wells drilled into marine sandstone may produce poor-quality water. (See section on "Ground Water.")

At most places intrusive igneous rocks yield little water; however, locally they yield adequate quantities of water for domestic uses.

## UNCONSOLIDATED DEPOSITS

The unconsolidated deposits consist of isolated terrace deposits, older alluvium which underlies the valley plain, and younger alluvium which is coextensive with the present flood plain of the Willamette River.

The terrace deposits are dissected deposits of gravel, silt, clay, and sand which generally rest on a bedrock shelf. Therefore, in many places these deposits, having limited thickness, are well drained and contain little ground water. However, where the deposits are sufficiently thick to hold and store water, they yield small to moderate quantities of water to wells.

The older alluvium, together with the younger alluvium, forms the principal aquifer in the area. Included in the older alluvium is the Willamette Silt as mapped by Allison (1953) and thin, younger alluvial deposits of fine sand and silt along the minor streams. Below a thickness of 5–15 feet of Willamette Silt, the deposit is composed of interconnected lenses of coarse sand and gravel derived from volcanic rocks and interspersed with fine sand and silt; this section yields large quantities of water to wells. Below a depth of about 50 feet, the coarser alluvial deposits tend to grade into and interfinger with lenses of sand, silt, clay, and pebbles.

In most places the younger alluvium is capable of yielding ample water of good quality for irrigation or municipal supplies. The deposits are composed of cobbles, coarse gravel, sand, and a small proportion of silt and have an average thickness of about 35 feet. In a few places (probably less than 10 percent of the total outcrop area) the deposits contain so many fine particles interspersed with the sand and gravel that water is yielded slowly to wells. Although not extensive, these fine-grained deposits may locally impede the infiltration of water from the river. Such infiltration is necessary for some of the wells to sustain large withdrawals.

TABLE 1.—*Principal rock units and their water-bearing properties*

| System | Series | | Unit designation | Approximate thickness (ft) | Physical character | Occurrence | Water-bearing properties |
|---|---|---|---|---|---|---|---|
| QUATERNARY | Holocene | Unconsolidated deposits | Younger alluvium | 35 (avg) | Largely coarse gravel, ranging in size from small pebbles to cobbles as much as 6 in. in diameter. Pebbles are generally well rounded and are mainly of basaltic and andesitic composition. Contains some sandy zones and a small proportion of silt. | Forms the present flood plain of the Willamette River. | In most places, generally yields large quantities of water to wells, especially where pumping induces recharge from the river. |
| QUATERNARY | Pleistocene and Holocene | Unconsolidated deposits | Older alluvium | 20–200 | Sand and gravel interspersed with mixtures of sand, silt, and clay. Forms lenticular bodies of gravel and sand that appear to be interconnected, allowing free movement of ground water. Deposit tends to be of finer materials than is the younger alluvium. Upper part consists of about 5–15 ft of Willamette Silt. | Forms and lies beneath the valley plain. Includes some younger alluvial deposits along the smaller tributaries, such as Muddy Creek (west) and Calapooia and Marys Rivers. | Yields moderate to large quantities of water to wells in the valley plain. The younger alluvial deposits (included with this unit) along the tributaries of the Willamette are thin, are composed of fine-grained materials, and yield water slowly to wells. |
| QUATERNARY | Pleistocene and Holocene | Unconsolidated deposits | Terrace deposits | 10–150 | Poorly sorted gravel, sand, and clay. Unit deeply weathered, particularly in upper part. | Occur as dissected benches that rest on bedrock shelves higher than the valley plain. Deposits are found near Philomath and in southeastern part of area. | Yield small quantities of water to wells from weathered upper part of unit. Unweathered parts of the deposits at depth transmit water freely and may yield moderate quantities of water. |
| | Oligocene and Miocene | | Little Butte Volcanic Series | 5,000–10,000 | Consists of a sequence of volcanic rocks, predominantly dacitic and andesitic flows and tuffs, and olivine basalt flows with some scoriaceous material. | Composes the upland parts of the southeast corner of area. | Has limited areal extent and is unimportant as an aquifer. Where present, generally yields small quantities of water to wells. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Consolidated rocks | Oligocene | TERTIARY | Eugene Formation | 1,500 | Marine sediments of tuffaceous sandstone, siltstone, and shale. | Exposed in foothills and underlies parts of the valley plain in the southeastern part of area. | Do. |
| | Oligocene(?) | | Intrusive igneous rocks | .............. | Dikes and sill-like intrusive bodies of gabbro and basalt which cut the sedimentary beds of the Tyee and Spencer Formations. In general, these rocks are fine to medium grained. Porphyritic and diabasic textures are common. Locally consists of dikes and pipes. | Form ridges south of Philomath and in the southeast corner of the area. | Generally yield small quantities of water to wells. Locally may contain confined water and, where in contact with the Tyee and Spencer Formations, may yield moderate quantities of water. Yields no water in the southeastern part of area. |
| | Eocene | | Spencer Formation | 4,500 | Upper part of formation is of fine- to medium-grained arkosic and micaceous sandstone. Lower part consists of basaltic and arkosic sandstone. Usually contains a few thin beds of sand and shaly siltstone and, locally, has a few thin lenses of tuffaceous materials. Sediments are of marine origin. | Forms part of the foothills near Corvallis and north of Albany and extends beneath much of the valley plain. | Generally yields small to moderate quantities of water to wells. Water from wells drilled into this unit beneath the valley plain may be of poor quality and locally may be too saline for most uses. |
| | | | Tyee Formation | 4,000 | A marine sequence of tuffaceous sandstone, siltstone, and shale. In fresh exposures the sandstone is firmly compacted and gray to blue gray. In places includes well-indurated conglomerate beds which contain subangular basalt pebbles. | Forms part of the foothills near Corvallis and Philomath. Extends beneath much of the valley plain. | Generally yields small to moderate quantities of water to wells. Water may be of poor chemical quality locally. Some water is obtained from small saturated zones perched above the regional water table. |
| | | | Siletz River Volcanics | 3,000 | Consists of a thick sequence of zeolitic pillow lava and basalt flows with interbedded tuffaceous siltstone, shale, and fine tuff. Along their southeast margin, the volcanic rocks are faulted against younger strata, and faults occur within the series. | Underlies about 25 square miles of the area. Composes the uplands near Philomath and Corvallis. | Important aquifer; supplies water for many new homes and subdivisions. Yields small to moderate quantities of water, usually adequate for domestic use. Most of the water is obtained from small saturated zones perched above the regional water table. |

# GROUND WATER

The source of ground water in the area is precipitation. Most of the precipitation evaporates; some is transpired to the atmosphere by vegetation, some runs off, and some infiltrates into the ground. Part of the water that infiltrates is retained as soil moisture; the remainder percolates downward to the zone of saturation. The water in a saturated zone moves by force of gravity downgradient to points of discharge, such as springs, seeps along stream channels, or wells. Saturated permeable rock materials that yield usable quantities of water to wells and springs are called aquifers.

The upper surface of a zone of saturation is the water table, and the water in a zone of saturation is ground water. The water table is regionwide, but other water tables of minor extent (perched water tables) may occur where ground water collects above poorly permeable materials that are above the main water table. Perched-water bodies in the Corvallis-Albany area generally yield only small quantities of water to wells because the rate of recharge and volume of water in storage are usually small.

Confined ground water is water held in the zone of saturation by an overlying bed or layer of material through which it cannot pass readily. In a well that penetrates such a body of confined ground water, the water will rise above the bottom of the confining bed. Water will flow naturally from a well that penetrates a body of confined ground water where the hydrostatic head raises the water level above land surface. Perched ground water may also be confined if the perched water body is overlain by rather impermeable rocks.

## OCCURRENCE AND AVAILABILITY

### CONSOLIDATED ROCKS

In parts of the area where the consolidated rocks are the principal aquifers, ground water occurs under perched, confined, and unconfined conditions. Most of the wells that penetrate the consolidated rocks draw water from aquifers perched above the regional water table. A few of these wells produce water from the main saturated zone or from confined water bodies. Table 2 gives the depths, yields, and specific capacities of wells tapping consolidated-rock aquifers.

#### SILETZ RIVER VOLCANICS

The Siletz River Volcanics is the second most important aquifer in the area. It yields water supplies for an increasing number of people who are or who will be living in the uplands and foothills near Philomath and Corvallis. Because the volcanic rocks underlie upland and foothill areas, many of the wells drilled into them penetrate

TABLE 2.—*Yields and specific capacities of representative wells in the consolidated deposits*

| Township and range | Number of wells | Geologic unit | Depth: Range (ft) | Depth: Average (ft) | Yield: Range (gpm) | Yield: Average (gpm) | Specific capacity: Range (gpm per ft) | Specific capacity: Average (gpm per ft) |
|---|---|---|---|---|---|---|---|---|
| 11S/5W | 22 | Siletz River Volcanics | 53–498 | 196 | 4–55 | 17 | 0.03–3.75 | 0.55 |
| 11S/6W | 7 | do | 50–370 | 175 | 3–27 | 14 | .08–5.50 | .39 |
| 10S/4W | [1]5 | Tyee and Spencer Formations | 70–300 | 156 | 6–40 | 16 | .07–1.0 | .25 |
| 11S/4W | 5 | do | 74–250 | 232 | 4–45 | 16 | .02–1.1 | .57 |
| 12S/5W | 6 | do | 92–220 | 142 | 3–16 | 10 | .02–0.47 | .14 |
| 12S/6W | 8 | do | 38–360 | 182 | 2–30 | 9 | .01–3.7 | .55 |
| 12S/6W | 4 | Intrusive and related rocks | 107–501 | 276 | 5–30 | 21 | .02–2 | .59 |

[1]One well reported to yield 460 gpm with 38 feet of drawdown.

isolated ground-water bodies perched above the regional water table. Locally, where the perched ground water occurs under semiconfined or confined conditions, wells may flow from 3 to 10 gpm (gallons per minute); however, they usually cease flowing in late summer. (See table 7, well 11S/5W–15dbb.) In the volcanic rocks at lower elevations in the foothills, ground water occurs under water-table conditions. In general, wells in the Siletz River Volcanics have a considerable range in depth and yield (table 2).

At places where the volcanic rocks intersect the land surface, springs, which generally discharge at the heads of small ravines, contribute water to the flow of small streams that drain the area. Most of the springs and seeps that emanate from the volcanic rocks cease to flow during the dry summer months, but a few flow 5–10 gpm throughout the year.

Some of the wells that tap the volcanic rocks produce inadequate volumes of water for domestic uses, and consequently a few of these wells have been abandoned. Generally, however, water is readily obtainable from these rocks in volumes sufficient for most domestic uses. Occasionally a well must be deepened to obtain additional water from a lower perched zone; at higher elevations, several perched zones sometimes must be tapped to obtain adequate domestic supplies.

As residential developments increase in parts of the area underlain by the volcanic rocks, many small discontinuous perched-water bodies may supply water for two or more families. As more wells are drilled into these water bodies, wells may become too closely spaced, resulting in mutual interference between pumping wells and local overdraft of the perched-water bodies. Although there is little evidence of interference between pumping wells at present, mutual interference could become a problem as demands for water from these aquifers increase.

### TYEE, SPENCER, AND EUGENE FORMATIONS

The Tyee, Spencer, and Eugene Formations are composed of marine-deposited rocks. Because of similarities in occurrence and water-bearing properties, they will be discussed together here. These rocks yield small to moderate quantities of water to wells which are a source of stock and domestic water in a large part of the uplands and foothills. In the foothills and uplands, most wells drilled into these deposits produce several to about 15 gpm (table 2). A few of the wells drilled in the foothills are reported to have high yields. For example, well 11S/4W–2bad is reported to yield 460 gpm with 38 feet of drawdown (table 7).

Because the regional water table at high altitudes in the uplands and foothills is generally more than 200 feet below land surface, some wells must be drilled to considerable depths to obtain water for domestic use. However, at higher elevations much of the water from these rocks is obtained from small saturated zones perched above the regional water table and at relatively shallow depths of from 40 to 150 feet. Many of the wells in the southeast corner of T. 12 S., R. 6 W., south of Philomath and in T. 10 S., R. 4 W., in the foothills north of Albany produce moderate quantities of water from perched-water zones. At higher elevations, the perched-water zones in the sandstone generally yield only small quantities of water to wells. However, water from these perched zones is usually of good quality because saline water has been removed through local recharge from precipitation. Conversely, some of the wells drilled into the sandstone beneath the valley plain produce poor-quality water because entrapped salt water has not everywhere been displaced by circulating ground water. This is illustrated by wells 11S/5W–13acb and 12S/4W–29bdb, which yield water of poor quality (tables 5, 7). Water from these wells occurs under confined conditions. Well 11S/5W–13acb flows about 7 gpm, and well 12S/4W–29bdb about 5 gpm.

### INTRUSIVE IGNEOUS ROCKS

The intrusive igneous rocks, which form a southwest-trending ridge in T. 12 S., R. 6 W., south of Philomath and the slopes and ridges of Peterson Butte in the southeastern part of the area, are of limited areal extent and of minor importance as aquifers in the Corvallis-Albany area. Because the intrusive dikes and sills cut the sedimentary rocks of the Tyee and Spencer Formations, it is difficult to determine their lateral extent by the interpretation of drillers' logs. Wells that penetrate the intrusive section, as outlined on plate 1, usually produce water in quantities adequate for domestic uses. Yields of these wells range from 5 to 30 gpm (table 2). Water may occur under either perched or confined conditions. Many small springs issue from the intrusive rocks at the heads of ravines and at the contact with related sedimentary rocks. Some of the springs flow 10–15 gpm throughout the year, and a few are being utilized as water supplies for stock and domestic uses.

### UNCONSOLIDATED DEPOSITS

Unconsolidated deposits of older and younger alluvium underlie the valley plain. They are the most productive aquifers in the Corvallis-Albany area and are considered to be the only ones feasible for large-scale development of ground water. Table 3 gives depths, yields, and specific capacities of wells that tap unconsolidated deposits.

Nearly all the alluvial deposits are below the water table, and most of the ground water in the alluvium is unconfined. However, confined ground water occurs seasonally at a few places in these deposits. Many of the fine-sand strata lie between clay and silt layers in the alluvium and contain water under a small confining pressure. In late winter and early spring, pressure builds to the point where water rises above land surface in some wells, such as in well 12S/3W–7bcc2 (table 7). During dry seasons these wells do not flow, and during much of the year water levels in all the wells are those typical of a water-table system.

TABLE 3.—*Yields and specific capacities of representative wells in the unconsolidated deposits*

| Township and range | Number of wells | Geologic unit | Depth | | Yield | | Specific capacity | |
|---|---|---|---|---|---|---|---|---|
| | | | Range (ft) | Average (ft) | Range (gpm) | Average (gpm) | Range (gpm per ft) | Average (gpm per ft) |
| 10S/3W | 3 | Younger alluvium | 30– 45 | 38 | 60–90 | 73 | 7– 15 | 11 |
| 10S/4W | 2 | do | 30– 33 | 32 | 600 | 600 | 33– 40 | 37 |
| 11S/4W | 9 | do | 32– 38 | 34 | 40–500 | 307 | 6–310 | 82 |
| 11S/5W | 5 | do | 33– 41 | 37 | 300–750 | 450 | 38–375 | 142 |
| 12S/4W | 6 | do | 28– 43 | 34 | 265–800 | 535 | 28–200 | 75 |
| 12S/5W | 3 | do | 31– 45 | 36 | 100–150 | 100 | 3– 12 | 9 |
| 12S/3W | 13 | Older alluvium | 35– 93 | 68 | 20–365 | 103 | 1.7– 7.8 | 3.7 |
| 12S/4W | 10 | do | 45–146 | 71 | 20–175 | 66 | 1.7– 25 | 6.9 |
| 12S/5W | 7 | do | 37–114 | 66 | 10–220 | 76 | 1.2– 15 | 4.2 |

### TERRACE DEPOSITS

Many of the terrace deposits are thin and rest on bedrock benches above the valley plain. Therefore, they are well drained and contain little ground water. However, some of the terrace deposits in parts of the area, as in T. 12 S., R. 5 W., and T. 12 S., R. 6 W., extend to depths of 170 to more than 200 feet. The upper part of these deposits has decomposed to clay of low permeability and has little capacity for the infiltration and transmission of water; however, the yield of 75 gpm for well 12S/6W–12dcd indicates that these deposits are not greatly weathered at depth and can transmit water rather freely. Wells, such as 12S/5W–8dcb and 12S/5W–30bda (table 6), that extend below the valley plain into the regional body of ground water produce adequate water supplies for most domestic uses. Water from well 12S/6W–12dcd contains excessive chloride and other minerals (table 5), which may be caused by upward migration of water from underlying, older marine deposits that contain more highly mineralized water. Generally, however, most of the ground water obtained from these deposits is of good chemical quality.

### OLDER ALLUVIUM

Yields of wells that penetrate the older alluvium depend on the thickness and character of the materials that make up the deposits. The older alluvium was deposited over an eroded bedrock surface and, as shown by the section on plate 1 and logs of wells in table 6, the thickness and lithology of these deposits vary considerably within small areas.

In the vicinity of Corvallis and Philomath, older alluvial deposits lie on an irregular bedrock surface and have a thickness ranging from several feet to about 25 feet. In this part of the area, the alluvial deposits consist of the clays and silts of the upper part of the unit and yield little or no water to wells. Along Marys River the alluvium is thin, varying from 10 to 30 feet; it thickens toward the south, exceeding a thickness of 100 feet along Muddy Creek (west), as shown by logs of wells 12S/5W–20acd and 12S/5W–32ccb (table 6). In alluvial deposits penetrated by these wells, beds of clay separate permeable beds of sand and gravel. The wells are used for irrigation and yield more than 200 gpm. From Muddy Creek (west) eastward toward the Willamette River, the alluvial deposits are thinner, and thickness rarely exceeds 50 feet. At well 12S/5W–22dca2 (table 6), the sediments consist of sand and gravel from a depth of 24 to 44 feet. This well has a yield of about 110 gpm.

From the Willamette River eastward through the center of the southern part of T. 11 S., R. 3 W., and southward through the center of T. 12 S., R. 3 W., the older alluvial deposits thicken from about 180 to more than 200 feet. (See section *D–D′* on plate 1 and logs of wells 11S/3W–33caa and 11S/3W–19baa in table 6.) The deposits tend to thin out toward the foothills of the southeastern part of the area, as shown by the log of well 12S/3W–35adc2 (table 6). The average depth of wells in this part of the area is about 60 feet, and the wells usually penetrate permeable sand and gravel at a depth of about 25 feet. The wells are mostly used for domestic purposes. In this part of the area, the sediments tend to be finer at depth but contain permeable sand and fine gravel, capable of yielding 500 gpm of good-quality water (well 11S/3W–19baa, tables 6, 7). Well 11S/3W–19baa pumps some sand, as do many of the shallower wells that draw water from the upper and coarser parts of the alluvium. Refinements in present well construction by the use of fabricated well screens and (or) a gravel pack around the screen or perforated parts of the casing would solve sand problems and increase the yields of wells in these alluvial aquifers. Well-construction methods are described in a report on another part of the Willamette Valley (Price, 1967, p. 75, 76), in a publication by Edward E. Johnson, Inc. (1966), and in many other publications.

As shown on plate 1, the older alluvial deposits have a thickness of about 50 feet near the Willamette River and adjacent to the younger alluvial deposits. Below a depth of 40–60 feet, as shown by log of well 12S/4W–16cac (table 6), are deposits of clay (Spencer? Formation), which contain water of inferior quality.

### YOUNGER ALLUVIUM

The highest yielding wells in the area are in the shallow gravel and sand aquifers that make up the younger alluvium of the present flood plain of the Willamette River. Most of the wells yield several hundred gallons per minute; some have been reported to yield more than 700 gpm of good-quality water. (See table 7, wells 10S/4W–25dddl and 11S/5W–36cdb.) The reported pumping yields of wells in the younger alluvial deposits ranged from about 40 to 800 gpm. The specific capacities of these wells ranged from about 6 gpm per foot of drawdown to as much as 375.

Because of the irregularities of the underlying surface, the thickness of these deposits varies from place to place. The thickness ranges from 20 to 45 feet and averages about 35 feet. The younger alluvial deposits generally overlie the older alluvial materials, but in some places (as shown by logs of wells 11S/4W–1aac2, 12S/5W–2cd, and 10S/3W–31dbdl, table 6) they lie directly on Tertiary bedrock.

From strategically placed wells, a considerable volume of water could be developed by inducing infiltration from the Willamette River to the younger alluvial deposits. Such infiltration would be at the expense of streamflow and would be successful only where highly permeable materials in the younger alluvium are in direct contact with the stream channel.

## RECHARGE AND MOVEMENT

The aquifers of the Corvallis-Albany area are recharged mostly during late autumn and winter, which are the seasons of greatest precipitation (fig. 4). The first autumn rains restore the soil moisture, but little water percolates to the ground-water bodies. When the soil has become saturated (generally by November), nearly all the precipitation that is not lost by overland runoff or evapotranspiration saturates permeable rock materials and begins to infiltrate to the ground-water reservoir. As the reservoir fills, ground-water gradients steepen, and the rate of discharge through seeps and springs increases.

The shape and slope of the water table are shown on plate 2 by contours connecting points on the water table that have the same altitudes. Water-level contours show the configuration of the water surface, just as topographic contours show the shape of the land surface. In general, the direction of movement of the ground water is at right angles to the contours in the direction of gradient toward the nearest stream or other point of discharge. In the study area, the general movement of ground water is from the outer margins of the valley plain toward the Willamette River and in a general downstream direction. Where the incised streams that flow through the valley plain have intersected the water table, the principal component of flow is toward those streams.

The more widely spaced contours on the map indicate a more gentle slope of the water-table surface, probably owing to a greater transmissivity of the materials through which the water is moving. The more widely spaced intervals occur in unconsolidated alluvial deposits that are highly permeable and afford large yields of water to wells. Conversely, the more closely spaced contours indicate less permeability or a thinner section of saturated material. Closely spaced contours appear predominantly in the western part of the area, where permeabilities are low and consequently yields of water to wells are small.

The unconsolidated alluvial deposits that underlie the valley plain are recharged directly by precipitation, and the reservoir is filled to near capacity by January or February. With the filling of the reservoir, the hydraulic gradient of the water table steepens, and water moves toward the nearest surface drainage. The steepened gradient of the water table may induce discharge until it equals the rate of recharge and the water table will rise no higher. If the rate of recharge exceeds the rate of discharge, the water table may rise to the land surface. This creates a waterlogged condition, and during late winter additional precipitation stands rejected on much of the flatter parts of the valley plain. When the water table is low, the alluvial aquifers probably receive some recharge from streams in the flood-plain areas of the Willamette River. However, the generalized water-table contour map of the area (pl. 2) indicates that adjacent to most stream courses the water table is at a higher altitude than is the stream surface. Therefore, most streams in the area usually gain water from, rather than lose water to, adjacent alluvial aquifers. Other sources of recharge to the alluvial aquifers are (1) undetermined volumes of water that enter from upstream underflow of the Willamette River and some minor streams and (2) infiltration from irrigation water and fluid-waste disposal.

The consolidated volcanic rocks and sedimentary rocks that make up the foothill and upland parts of the area are recharged directly by precipitation where they are near or form the land surface. They are also recharged indirectly by water percolating downward through soils and overlying unconsolidated deposits. Because these rocks are rather impermeable, a large volume of the precipitation runs off the foothills and uplands. At higher elevations the water levels in the unconsolidated rocks, as shown by hydrographs of wells 11S/5W–2acd and 11S/5W–20dcc (fig. 7), generally conform to the seasonal recharge pattern. However, because of their lower permeabilities and also because of some downward percolation of water to underlying zones, these perched aquifers, which may be multiple, continue to recharge slowly throughout and beyond the entire period of high precipitation. This is in contrast to the recharge pattern of the unconsolidated deposits, which reject recharge after they are filled to near capacity during the months of January and February. (See fig. 8.)

## DISCHARGE

Ground water is discharged naturally from aquifers in the area at seeps and springs, by evapotranspiration, and artificially through wells. In the valley plain, ground water is discharged from the unconsolidated alluvial deposits mainly by seeps and springs adjacent to or in stream channels, by evapotranspiration in areas where the water table is near the surface, and by pumping from wells. During the dry summer months the rate of ground-water discharge exceeds the rate of recharge, and the upper part of the ground-water reservoir becomes dewatered. Discharge through springs and seeps helps to sustain the flow of the Willamette River and other streams that flow through the area. An indication of the magnitude of natural

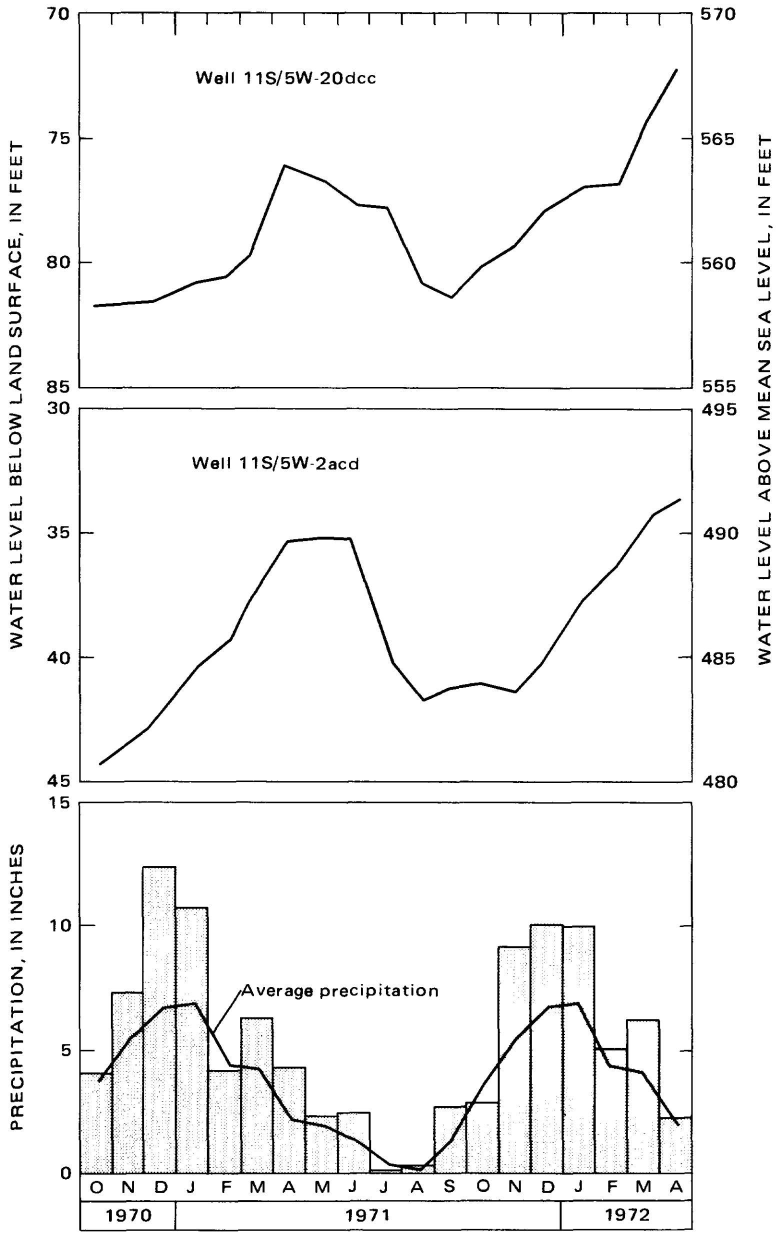



FIGURE 7.—Relation between monthly precipitation at Corvallis and changes of water levels in wells 11S/5W–2acd and 11S/5W–20dcc.

discharge from the alluvial deposits may be obtained from the numerical difference between estimated total pumpage and depletion of storage in 1971. This difference indicates that about 116,000 acre-feet of water per year may be discharged naturally from the alluvial deposits.

Discharge from the consolidated rocks of the upland and foothill parts of the area is mainly by evapotranspiration or seepage from springs and seeps that issue from shallow perched-water bodies and by pumpage from wells. The springs and seeps supply base flow to streams draining this area.

## WATER-LEVEL FLUCTUATIONS AND GROUND-WATER STORAGE

Ground water in storage is water that fills the openings in rocks in the zone of saturation. Because some water will be retained in the deposits by capillary, molecular, and other forces, not all the ground water stored in the pores of the saturated material is available for use. Water levels in wells indicate the height of the water table and fluctuate largely in response to changes in ground-water storage caused by pumping, natural discharge, and recharge.

### FLUCTUATIONS OF WATER LEVEL

Water-level fluctuations in wells indicate changes in the volume of ground water in storage. Because these fluctuations occur mostly in response to changes in the rates of recharge or discharge of ground water, the volume of ground water in storage varies seasonally and annually. Increases in the volume of ground water in storage result in rises in ground-water levels; decreases in the volume of ground water in storage result in lowering of ground-water levels. Records of water levels in wells show that ground-water levels start to rise as precipitation and infiltration increase starting about November, continue at a high level during the rainy winter months, and decline as rainfall diminishes and as pumping, evaporation, and transpiration increase during spring and summer. (See fig. 8.) Ground-water levels in wells are generally at their lowest in September and October of each year.

In general, ground-water levels in the unconsolidated alluvial deposits fluctuate about 10–12 feet during the year. The hydrographs in figure 9 generally show no net change in water levels of wells from 1962 to 1972. The recovery of water levels each winter to approximately the same level indicates that there was no overdraft in the area during the period of measurement. Comparison of water-level data for 1962–72 with those of Piper (1942) indicates that seasonal fluctuations of the water table in the alluvial deposits have been in the same range for more than 30 years.

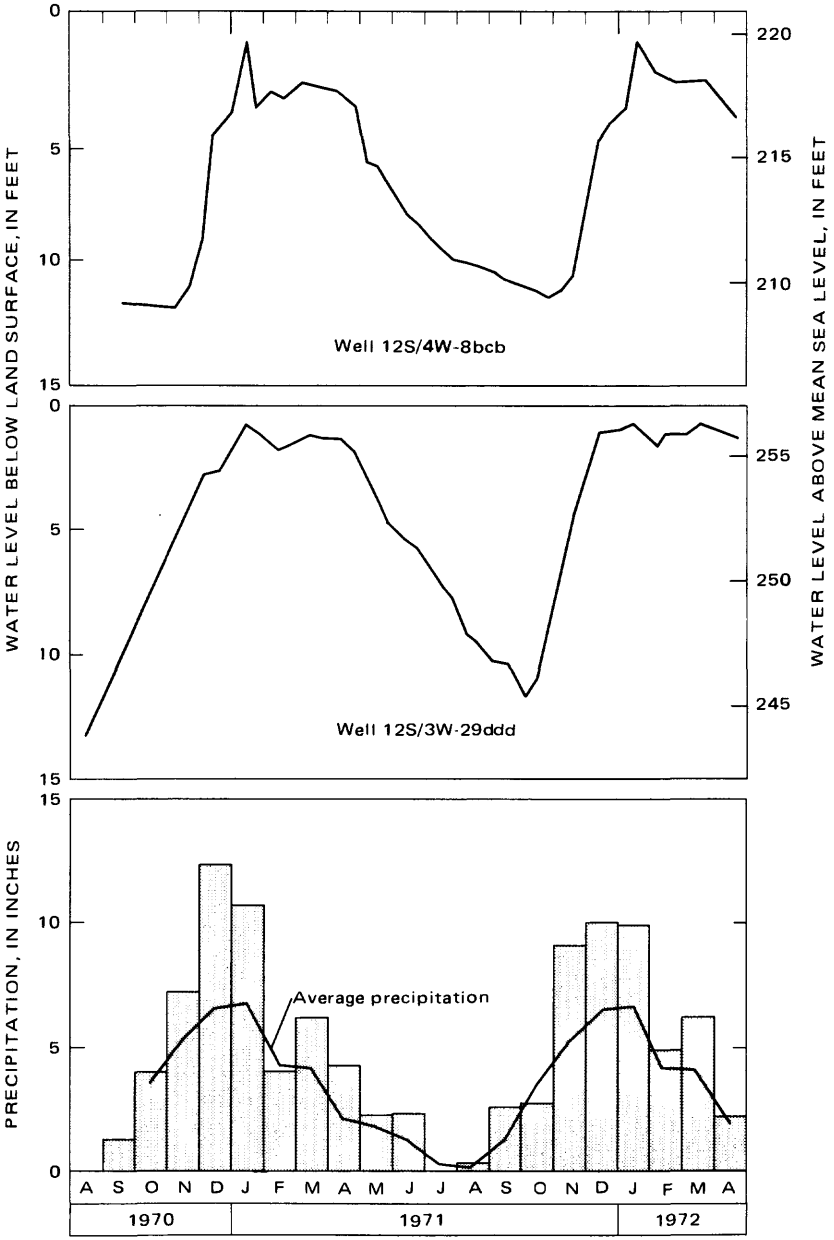



FIGURE 8.—Relation between monthly precipitation at Corvallis and changes of water levels in wells 12S/3W–29ddd and 12S/4W–8bcb.

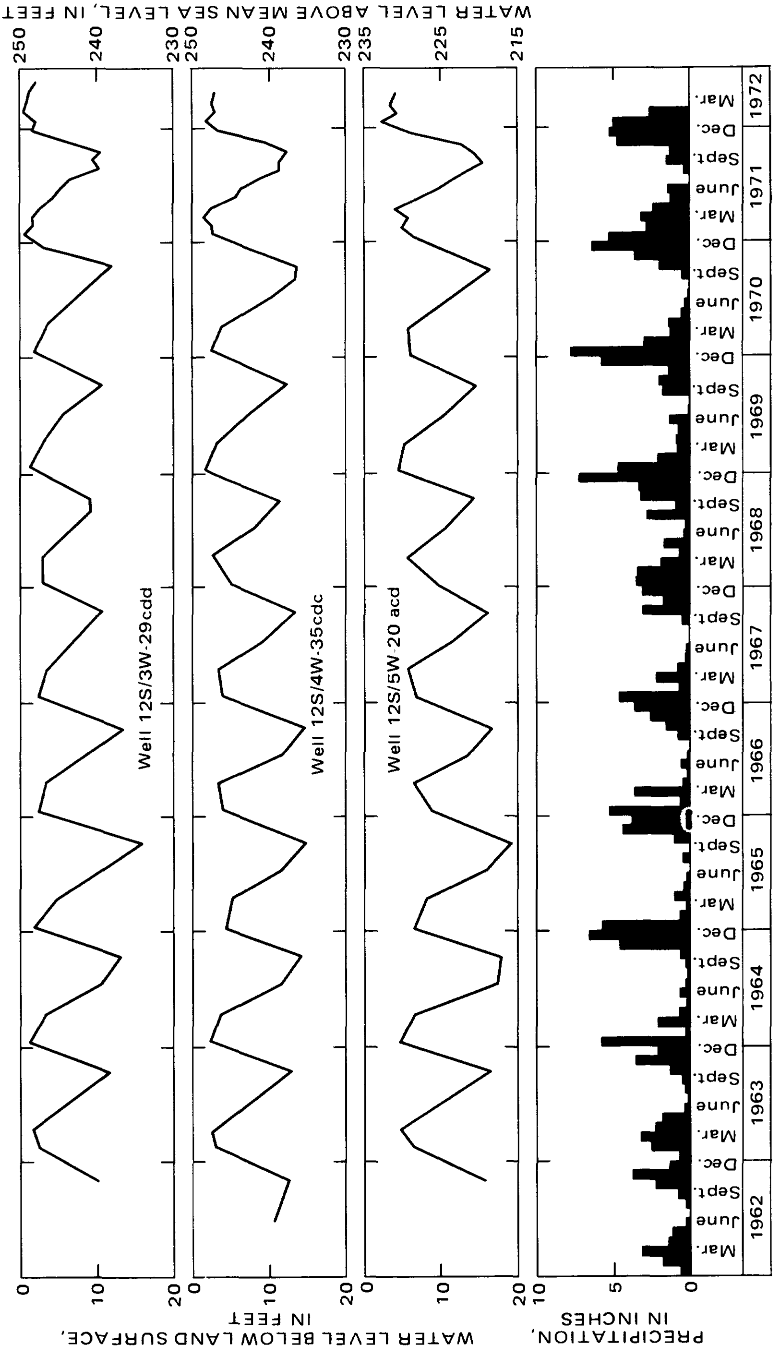



FIGURE 9.—Relation between monthly precipitation at Corvallis and changes of water levels in selected wells, 1962–72.

## STORAGE VOLUME

The volume of ground water stored in selected depth intervals was determined for the aquifers beneath the valley plain by the following equation: Volume stored (acre-feet) = area (acres) × thickness of interval (feet) × specific yield.

Specific yield is defined as the ratio of the volume of water that will drain by gravity from a saturated rock to the total volume of rock, expressed as a percentage.

The specific yield was estimated for the younger and older alluvial deposits which constitute the two major aquifers of the valley plain. To estimate these values, specific yields were assigned to five lithologic types in representative wells. (See table 4.) These values were adopted with slight modification from figures used in estimating the ground-water storage volume of similar deposits, as compiled by Johnson (1967).

TABLE 4.—*Specific yields of materials described in drillers' logs*

| *Lithologic type* | *Specific yield (percent)* |
|---|---|
| Gravel, sand and gravel, and related coarse gravelly deposits | 25 |
| Sand, medium- to coarse-grained, loose | 25 |
| Sand, fine; tight sand; sand lenses; sand with clay lenses | 15 |
| Clay and gravel; gravel with clay binder; conglomerate; cemented gravel; clay with gravel lenses | 10 |
| Clay, silt, and related fine-grained deposits | 3 |

Average specific yield, based on total thickness of respective lithologic units reported in drillers' logs, was computed for each township and parts thereof that lie within the boundaries of the alluvial aquifers, as shown on plate 1. The average specific yield of the younger alluvial deposits was estimated for the depth interval of 10–35 feet. The specific yield of the older alluvial deposits was estimated for two selected depth intervals: (1) 10–50 feet and (2) 50–100 feet.

The volume of saturated rocks in each depth zone was then multiplied by the computed average specific yield to obtain the volume of recoverable ground water in each township. No storage estimates were made for alluvial areas where the older alluvial sediments were of limited thickness (less than 50 ft). These areas are immediately adjacent to the Willamette River and parts of the area near Corvallis and south of Philomath.

The average specific yield of the materials in the 10–35-foot interval of the younger alluvium ranged from about 18 percent in T. 10 S., Rs. 3 and 4 W., to 21 percent in T. 11 S., Rs. 4 and 5 W. The overall average specific yield of materials in the younger alluvium was about 19 percent.

The average specific yield of the older alluvial deposits in the 10–50-foot-depth interval ranged from about 11 percent in T. 12 S., R. 5 W., to 16 percent in T. 10 S., R. 3 W.; the average specific yield of the materials in the 50–100-foot-depth interval of the older alluvial deposits ranged from about 17 percent in T. 12 S., R. 3 W., to about 7 percent in T. 12 S., R. 5 W. The overall average specific yield of the materials in the upper depth interval was about 14 percent, and the overall average specific yield of the materials in the 50–100-foot-depth interval was about 11 percent.

Ground-water storage for a 25,000-acre area covered by younger alluvium was computed to be 120,000 acre-feet. For the older alluvium, ground-water storage was computed separately for the 10–50-foot- and 50–100-foot-depth intervals. The shallower zone extends over an area of 60,000 acres and contains 320,000 acre-feet of ground water; the deeper zone covers an area of 47,000 acres and contains 310,000 acre-feet of ground water. The total volume of water in storage in the alluvial deposits to a depth of 100 feet was estimated to be 750,000 acre-feet.

There is additional good-quality ground water available below the 100-foot-depth zone, particularly east of the Willamette River. (See tables 5, 6, wells 11S/3W–19baa and 11S/3W–33caa.) However, there are insufficient well logs for aquifers below the 100-foot-depth level on which to base quantitative estimates.

### SEASONAL CHANGE OF STORAGE

The seasonal change of ground-water storage is the volume of water that drains from saturated rock materials when the water table declines from its annual high position in winter to its annual low point in late summer. (See figs. 8, 9.) By applying the specific-yield value to the change in saturated volume of the deposits, determined by the average water-level change multiplied by the area, a quantitative figure for change of ground water in storage was obtained.

During 1971 the seasonal decline of water level from winter to late summer averaged about 10 feet for the alluvial deposits. With a calculated specific yield of 19 percent and an area of about 25,000 acres of younger alluvial deposits, the seasonal depletion of ground water in storage in these deposits was about 47,000 acre-feet. Similarly, with a specific yield of about 14 percent and an area of 60,000 acres, the seasonal depletion of ground water in storage for the older alluvial deposits was about 84,000 acre-feet. Total depletion of storage in the alluvial deposits was about 130,000 acre-feet.

## CHEMICAL QUALITY OF THE GROUND WATER

Because water is a solvent for practically all minerals, all ground water contains certain chemical elements in solution. In the small concentrations in which they generally occur, most of these dissolved solids are harmless and include many substances that are necessary for proper nutrition of plants and animals. Some materials dissolved in water can be harmful if concentrations are only slightly higher than needed. Important features of the chemical quality of the ground water are summarized in the following paragraphs.

### EXPLANATION OF DATA

Dissolved solids refers to the substances dissolved in water. In this report, concentrations of dissolved mineral constituents are reported in milligrams per liter. For example, at common levels of concentration, 1 mg/l (milligram per liter) is equivalent to 1 pound of substance per million pounds of water, or about 8.33 pounds per million gallons of water. The U.S. Public Health Service (1962) recommends that the dissolved solids in drinking water should not exceed 500 mg/l.

Specific conductance is a measure of the ability of water to conduct electrical current and is expressed in micromhos at 25°C. The specific conductance of water is approximately proportional to the concentration of dissolved solids present. Numerically, the dissolved-solids content of water in milligrams per liter is usually 55–75 percent of the specific conductance value.

Hardness of water is caused principally by dissolved calcium and magnesium and is expressed in milligrams per liter of calcium carbonate. In this report, the following numerical ranges and terms are used to classify hardness of water:

| *Hardness range (mg/l of* $CaCO_3$*)* | *Description* |
|---|---|
| 0– 60 | Soft |
| 61–120 | Moderately hard |
| 121–180 | Hard |
| >180 | Very hard |

The observed hardness values for ground water in the Corvallis-Albany area ranged from 4 to 1,500 mg/l. The water ranges from soft to very hard and averages moderately hard.

### VARIATIONS

Dissolved-solids content, and consequently chemical quality of the ground water, varies considerably from place to place in the Corvallis-Albany area. Table 5 contains 27 well-water analyses, 21 of which were made by the U.S. Geological Survey and the rest by commercial or State laboratories.

Most ground water from the alluvial deposits beneath the valley plain contains relatively small concentrations of dissolved minerals, principally bicarbonate, silica, and calcium. The dissolved-solids content of water sampled from the alluvial deposits ranged from 114 to 405 mg/l.

In places beneath the valley plain, the marine sedimentary rocks contain more highly mineralized water, particularly greater concentrations of sodium, chloride, and sulfate, than do most other aquifers in the area. (See table 5, analyses of water from wells 11S/5W–13acb and 12S/4W–29bdb.) Although the log for well 12S/6W–12dcd (table 6) shows that it taps terrace and associated alluvial aquifers, water pumped from it is highly mineralized. This suggests that some of the water may be derived from underlying marine rocks.

### SUITABILITY FOR USE

The concentrations of certain constituents of ground water determine the suitability of the water for various uses. For example, calcium and magnesium cause hardness in water, and excessive hardness in water is objectionable for domestic and industrial uses. Minute concentrations of some chemical ions such as arsenic and manganese can make water unsuitable for some uses. Suitability of water for drinking can be evaluated on the basis of the recommended limits established by the U.S. Public Health Service (1962) for the more common mineral constituents.

The coliform bacteria count also determines suitability of the water for various uses. During this study, water samples from nine domestic wells and one creek were analyzed for coliform bacteria, which are commonly used as indicators of pollution. Although these organisms are not necessarily harmful in themselves, their presence may indicate pollution from fecal wastes.

The membrane filter technique was used to examine water samples for coliform bacteria. According to the U.S. Public Health Service (1962, p. 6), coliform colonies per standard sample shall not exceed 4 per 100-milliliter sample, using this method.

Coliform colonies per 100-milliliter sample were as follows:

| *Location* | *Count* | *Number of samples* |
|---|---|---|
| North Albany area | 0 | 4 |
| T. 11 S., R. 3 W., sec. 17 | 880 | 1 |
| T. 11 S., R. 4 W., sec. 13 | 420 | 1 |
| T. 11 S., R. 4 W., sec. 32 | 0 | 1 |
| T. 11 S., R. 5 W., sec. 12 | 2 | 1 |
| T. 11 S., R. 5 W., sec. 20 | 0 | 1 |
| Oak Creek | 3,100 | 1 |

TABLE 5.—*Chemical analyses, in milligrams per liter, of water*

| Location of well | Water-bearing material | Date of collection | Silica ($SiO_2$) | Iron (Fe), dissolved | Manganese (Mn), dissolved | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Nitrite+ Nitrate (as N) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10S/3W-31dcd | Gravel | 1-26-71 | 43 | 0.03 | 0.03 | 30 | 18 | 13 | 0.8 | ...... | ...... | 11 | 28 | 0.1 | ...... | 4.5 |
| 10S/3W-31ddc | Sand and gravel | 1-26-71 | 53 | [2].03 | .03 | 32 | 20 | 11 | .3 | ...... | ...... | 25 | 27 | .1 | ...... | 16 |
| 10S/3W-32cbc | do | 1-26-71 | 54 | [2].03 | .03 | 34 | 20 | 12 | 1.0 | ...... | ...... | 26 | 27 | .2 | ...... | 9.2 |
| 10S/4W-25ddd1 | Gravel and sand | 8-26-71 | 47 | .02 | ...... | 60 | 25 | 31 | 2.0 | 106 | ...... | 23 | 140 | .5 | ...... | 5.3 |
| 11S/3W-4acb | Sand and gravel | 5-24-66 | 42 | [2].08 | ...... | 7.4 | 4.6 | 17 | 1.2 | 84 | ...... | 1 | 2.5 | .1 | 0.8 | ...... |
| 11S/3W-17bda | do | 6-17-66 | 33 | .37 | ...... | 33 | 17 | 14 | 1.0 | 213 | 0 | 1.4 | 4.5 | .3 | .2 | ...... |
| 11S/3W-17bdb | do | 8-26-71 | 31 | .10 | ...... | 22 | 12 | 27 | 1.4 | 191 | 0 | 0 | 6.0 | .5 | 0 | ...... |
| 11S/3W-19baa | do | 5-24-71 | 30 | .16 | .14 | 16 | 7.9 | 40 | 1.2 | 165 | 0 | .8 | 13 | 0 | ...... | ...... |
| 11S/3W-33caa | Gravel and sand | 5-24-71 | 36 | .04 | .05 | 22 | 11 | 16 | 1.1 | 143 | 0 | 0 | 8.5 | .1 | ...... | .46 |
| 11S/4W-19cbd | Sand and gravel | 10- 8-66 | 44 | [2].03 | ...... | 14 | ...... | 7.6 | 1.4 | 80 | 0 | 5.6 | 5.0 | .2 | 7.4 | ...... |
| 11S/4W-32bdc | Clay, sand, and gravel | 8-11-69 | 61 | [2]13.4 | 0 | 14 | 9.3 | 10 | .8 | 69 | 0 | 15 | 6.6 | .6 | 1.2 | ...... |
| 11S/4W-32cbd | Gravel | ...... | ...... | .24 | ...... | ...... | ...... | ...... | ...... | 80 | 10 | ...... | 24.5 | ...... | ...... | ...... |
| 11S/5W-13acb | Claystone | 5-25-71 | 11 | .11 | .12 | 600 | 3.9 | 1,400 | 2.7 | 23 | 0 | 500 | 3,100 | .8 | ...... | .02 |
| 11S/5W-20bbc1 | Broken basalt | 10-23-66 | 32 | [2].05 | ...... | 33 | 9.8 | 9.2 | .2 | 166 | 0 | .2 | 4.0 | .1 | .2 | ...... |
| 11S/5W-20bbc2 | do | 2-21-66 | 32 | [2].08 | ...... | 32 | ...... | 8.5 | .3 | 162 | 0 | 1.0 | 6.0 | .1 | .3 | ...... |
| 11S/5W-21bcd | do | 6-22-65 | 17 | [2].06 | ...... | 1.2 | .2 | 38 | .1 | 67 | 16 | 1.2 | 4.2 | .1 | 0 | ...... |
| 11S/5W-29caa | Lava rock | 6-22-65 | 57 | [2].02 | ...... | 16 | 5.7 | 8.4 | .1 | 93 | 0 | 1.2 | 2.8 | 0 | 0 | ...... |
| 11S/5W-36dcd | Gravel | 12-14-64 | 33 | [2].02 | 0 | 13 | 8.0 | 5.9 | 1.1 | 68 | 0 | 9.0 | 7.5 | .1 | 3.3 | ...... |
| 12S/3W-35adc2 | Clay and shale | 5-25-71 | 47 | .14 | .24 | 110 | 43 | 82 | .4 | 228 | 0 | 52 | 200 | .2 | ...... | 2.4 |
| 12S/4W-6baa | Sand and gravel | 8-26-71 | 61 | .01 | ...... | 18 | 10 | 9.0 | .8 | 124 | 0 | 7.3 | 5.0 | .1 | 2.8 | ...... |
| 12S/4W-6cdb | Gravel | 7-23-71 | 42 | .03 | 0 | 21 | 11 | 11 | .6 | 87 | 0 | 15 | 12 | 0 | ...... | 5.8 |
| 12S/4W-29bdb | Sand | 5-25-71 | 28 | 1.5 | .18 | 61 | 11 | 280 | 2.7 | 325 | 0 | 4.3 | 360 | 0 | ...... | 1.5 |
| 12S/5W-22dca2 | Gravel and sand | 5-26-71 | 46 | .30 | 1.10 | 62 | 24 | 22 | 2.8 | 324 | 0 | 16 | 16 | .3 | ...... | .35 |
| 12S/5W-30dac | Sand | 5-26-71 | 20 | .03 | .25 | 47 | 10 | 38 | 1.0 | 193 | 0 | .3 | 56 | 0 | ...... | .02 |
| 12S/6W-12dcd | Gravel and sand | 5-27-71 | 32 | .04 | .09 | 220 | 15 | 140 | 1.2 | 111 | 0 | 2.5 | 590 | 0 | ...... | .03 |
| 12S/6W-14dcc | Sandstone | 8-25-71 | 48 | 1.4 | .03 | 15 | 1.1 | 29 | .5 | 117 | 0 | 8.5 | 5 | .5 | ...... | .00 |
| 12S/6W-15aac | Sandstone | 6-18-71 | 30 | .01 | .05 | 33 | .3 | 100 | .3 | 39 | 0 | 1.9 | 200 | .2 | ...... | .01 |

| | | | Phosphate, ortho as P | Boron (B) | Arsenic (As) | Dissolved solids, calculated from determined constituents | Hardness (Ca, Mg) | Noncarbonate hardness | Sodium-adsorption-ratio (SAR) | Specific conductance (micromhos at 25°C) | pH | Temperature °C | Temperature °F | Laboratory[1] | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10S/3W-31dcd | Gravel | 1-26-71 | 0.15 | | 0.005 | 250 | 130 | | 0.6 | 290 | 6.7 | | | OSHD | |
| 10S/3W-31ddc | Sand and gravel | 1-26-71 | .11 | | .005 | 310 | 150 | | 1.2 | 360 | 6.9 | | | OSHD | |
| 10S/3W-32cbc | do | 1-26-71 | .21 | | .005 | 295 | 142 | | .4 | | 6.7 | | | OSHD | |
| 10S/4W-25dddl | Gravel and sand | 8-26-71 | .08 | 0.32 | .030 | 405 | 250 | 170 | .8 | 736 | 6.6 | 12 | 53 | USGS | (3) |
| 11S/3W-4acb | Sand and gravel | 5-24-66 | .55 | .02 | 0 | 119 | 38 | 0 | .2 | 143 | 7.5 | 14 | 57 | USGS | |
| 11S/3W-17bda | do | 6-17-66 | .26 | .11 | 0 | 210 | 152 | 0 | .5 | 330 | 7.8 | 13 | 56 | USGS | |
| 11S/3W-17bdb | do | 8-26-71 | .34 | .41 | 0 | 196 | 100 | 0 | 1.2 | 305 | 7.7 | 14.5 | 58 | USGS | (4) |
| 11S/3W-19baa | do | 5-24-71 | .70 | .05 | | 195 | 72 | 0 | 2 | 301 | 7.6 | 13 | 55 | USGS | |
| 11S/3W-33caa | Gravel and sand | 5-24-71 | .10 | .04 | | 168 | 100 | 0 | .7 | 252 | 7.6 | 13 | 55 | USGS | |
| 11S/4W-19cbd | Sand and gravel | 10- 8-66 | .14 | | | 132 | 68 | 2 | | 167 | 6.8 | | | OSHD | |
| 11S/4W-32bdc | Clay, sand, and gravel | 8-11-69 | | | .001 | 340 | 72 | | .5 | | 6.5 | | | CL | |
| 11S/4W-32cbd | Gravel | | | | | 210 | 102 | | | | | | | CL | |
| 11S/5W-13acb | Claystone | 5-25-71 | .01 | 1.70 | | 5,630 | 1,500 | 1,500 | 16 | 9,360 | 7.6 | 14 | 80 | USGS | |
| 11S/5W-20bbcl | Broken basalt | 10-23-66 | | | | 171 | 123 | 0 | .7 | 262 | 7.6 | | | USGS | |
| 11S/5W-20bbc2 | do | 2-21-66 | | | | 170 | 121 | 0 | | 259 | 7.5 | 10 | 50 | USGS | |
| 11S/5W-21bcd | do | 6-22-65 | .02 | .05 | 0 | 111 | 4 | 0 | 8.7 | 170 | 9.3 | 14 | 58 | USGS | |
| 11S/5W-29caa | Lava rock | 6-22-65 | .03 | 0 | 0 | 137 | 64 | 0 | .5 | 157 | 7.3 | 13 | 55 | USGS | |
| 11S/5W-36dcd | Gravel | 12-14-64 | .05 | | 0 | 114 | 66 | 10 | .3 | 159 | 6.6 | 11 | 52 | USGS | |
| 12S/3W-35adc2 | Clay and shale | 5-25-71 | .03 | .04 | | 753 | 450 | 260 | 1.7 | 1,270 | 7.4 | 13 | 55 | USGS | |
| 12S/4W-6baa | Sand and gravel | 8-26-71 | .12 | 0 | .020 | 185 | 86 | 0 | .4 | 217 | 6.3 | 13 | 55 | USGS | (5) |
| 12S/4W-6cdb | Gravel | 7-23-71 | .02 | .06 | .003 | 181 | 72 | 26 | .5 | 246 | 7.2 | 14 | 58 | USGS | |
| 12S/4W-29bdb | Sand | 5-25-71 | .10 | .52 | | 916 | 200 | 0 | 8.7 | 1,640 | 7.5 | 14 | 58 | USGS | |
| 12S/5W-22dca2 | Gravel and sand | 5-26-71 | .50 | .04 | | 353 | 250 | 0 | .6 | 606 | 7.7 | 13 | 55 | USGS | |
| 12S/5W-30dac | Sand | 5-26-71 | .22 | .11 | | 268 | 160 | 0 | 1.3 | 541 | 7.3 | 13 | 55 | USGS | |
| 12S/6W-12dcd | Gravel and sand | 5-27-71 | .03 | .16 | | 1,060 | 610 | 520 | 2.5 | 2,050 | 7.6 | 13 | 55 | USGS | |
| 12S/6W-14dcc | Sandstone | 8-25-71 | .02 | .42 | .030 | 167 | 42 | 0 | 1.9 | 206 | 7.7 | 14 | 58 | USGS | |
| 12S/6W-15aac | Sandstone | 6-18-71 | .01 | .43 | | 385 | 84 | 52 | 4.8 | 709 | 8.3 | 14 | 58 | USGS | |

[1]Laboratory: CL, Charlton Laboratories; OSHD, Oregon State Health Division Laboratory; USGS, U.S. Geological Survey.
[2]Total iron in solution when sample collected.
[3]Analyzed for nitrogen total as N, 5.6 mg/l.
[4]Analyzed for nitrogen total as N, 0.29 mg/l.
[5]Analyzed for nitrogen total as N, 3.0 mg/l.

The preceding analyses of water for coliform bacteria indicate that ground-water pollution does exist in parts of the Corvallis-Albany area. Further study is required to document fully the nature and extent of pollution.

All analyses of water from the alluvial deposits indicate that the water has a low SAR (sodium-adsorption-ratio) and is therefore suitable for irrigation. The SAR indicates the effect that an irrigation water will have on soil-drainage characteristics. Water with a high SAR value lowers the permeability of soils and eventually causes clogging, which makes them unsuitable for cultivation. An SAR of about four is the limit for crops that are sensitive to the effects of soil clogging (Federal Water Pollution Control Administration, 1968, p. 115–117). SAR values are presented with the analytical data in table 5.

## USE OF GROUND WATER

Ground water in the area is used for irrigation, public, domestic, and industrial supplies. As used in this report, irrigation supplies include water used for irrigation of crops and pastures; domestic supplies include water used for household requirements, watering of stock, and irrigation of lawns and small gardens; public supplies include water supplies to water districts serving suburban residential areas and school and recreational facilities; and industrial supplies include water used in dairy operations, in processing of meat and poultry, in lumber-related industries, and in various processing operations related to mineral industries.

Most of the ground water is obtained from the alluvial deposits; total pumpage from this source during 1971 was estimated to be 14,000 acre-feet. The volumes withdrawn from the alluvial deposits are shown in the following table and are discussed subsequently:

| *Type of supply* | *Estimated 1971 withdrawals (acre-ft)* |
|---|---|
| Irrigation | 10,500 |
| Industrial | 2,300 |
| Domestic | 900 |
| Public | 300 |
| Total | 14,000 |

In addition, about 600 acre-feet of ground water was pumped from the consolidated deposits in 1971, mainly for domestic uses.

### IRRIGATION

Most of the ground water pumped for irrigation is from wells in the Holocene alluvial deposits of the present Willamette River flood plain. Because most of the land in the valley plain is planted to various grasses and other grains requiring no irrigation, the ground-water potential of the older alluvial deposits for irrigation purposes is largely undeveloped.

Most of the ground water used for irrigation is pumped by electric power and applied to the land with sprinkler systems. Electric-power data (in kilowatthours) for irrigation wells were obtained from records of Pacific Power & Light Co.

The quantity of water pumped for irrigation was calculated by dividing total kilowatthours of power consumed by a factor for kilowatthours per acre-feet of water pumped, as determined from an assumed overall efficiency rating of 60 percent, and adjusted for total pumping lift. According to those calculations, a total of approximately 10,500 acre-feet of ground water was pumped from the alluvial deposits to irrigate 9,000 acres in 1971.

### DOMESTIC

Most of the wells in the area, particularly in rural and suburban areas, are used for domestic supplies, and most of these wells also supply water for livestock and for irrigation of lawns and gardens. The volume of ground water used for domestic supplies was estimated on the basis of population and a per capita use of 75 gallons per day for all uses. Estimated ground-water use for domestic purposes totals 900 acre-feet.

### PUBLIC

Corvallis, Albany, and Philomath, the three largest municipalities in the Corvallis-Albany area, obtain their municipal supplies from surface-water sources. Corvallis obtains its water mainly from Rock Creek; auxiliary supplies are from the Willamette River. Philomath also obtains its water from Rock Creek. The source of water for the city of Albany is the South Santiam River.

Few records are kept of the volume of ground water pumped for public supplies in the area. Total pumpage was estimated by the number of connections reported by water districts serving suburban residential areas and on the basis of population.

It was estimated that about 300 acre-feet of ground water was pumped for public supplies during 1971. Most of this water was used by the suburban community of North Albany.

In the writer's opinion, additional ground water from the younger alluvial deposits of the present flood plain of the Willamette River could be developed economically and with a minimum of storage and purification facilities. This is particularly true in growing parts of the area such as Corvallis, where increasingly heavy demands are being made on present municipal water systems.

### INDUSTRIAL

Many industries in the area use surface water. Industries that utilize ground water include food processing, dairy, lumber, and metallurgical operations. It is estimated that about 2,300 acre-feet of water was pumped by these industries in 1971.

## POTENTIAL FOR DEVELOPMENT OF GROUND WATER FROM THE ALLUVIAL DEPOSITS

As previously discussed, the seasonal change in the volume of ground-water storage for the alluvial deposits was estimated to be about 130,000 acre-feet. This total is much larger than the estimated total pumpage of 14,000 acre-feet in 1971. The difference of about 116,000 acre-feet between the volume of estimated seasonal depletion and depletion attributed to pumpage is probably a conservative indication of the volume of unused ground water discharged from the aquifer each year.

The total change in storage of 130,000 acre-feet represents the amount of net recharge by the infiltration of precipitation that would be necessary to replenish the aquifer and would be equal to about 18 inches of the average annual precipitation of 38 inches. Because the volume of water pumped for all uses was only about 14,000 acre-feet, or the equivalent of 2 inches of the net recharge, additional ground water could be withdrawn for irrigation and other uses by salvaging part of the natural discharge. If all the natural discharge could be salvaged, it would amount to about 116,000 acre-feet of water throughout the valley plain. The salvage of additional ground water would be at the expense of streamflow; however, data in the section on "Stream Discharge" indicate that any water that could be salvaged would have a negligible effect on the total streamflow of the area. Any lowering of the water table by pumping might have the additional benefit of diverting late winter and early spring runoff to become additional ground-water recharge. A further benefit would be the drainage of waterlogged parts of the area.

# OUTLOOK FOR THE FUTURE

At present, water supplies for the larger cities of Corvallis and Albany are obtained from surface-water sources. Because of the rapid economic growth of these cities, it is expected that additional volumes of water will be needed in the future. Most of this additional water will be obtained from the expansion of existing surface-water facilities; some supplemental water may be obtained from the alluvial aquifers. Although an increase in the volume of ground water used for domestic and industrial purposes can be expected, future development of ground water will be mainly for irrigation of crops. Most of this increased development will be from the alluvial aquifers of the valley plain.

The foregoing sections indicate that the quantity of ground water available for use on a sustained annual basis from aquifers beneath the valley plain far exceeds the quantity pumped. In the Corvallis-Albany area, alluvial aquifers beneath the valley plain retain a large volume of water in storage throughout the year. The aquifers accept large volumes of water as recharge, which is discharged through seeps and springs, by evapotranspiration, and by wells. During this study, recharge was more than nine times the annual pumpage, which would indicate the potential for a sizable increase in water withdrawn for irrigation.

Wells tapping perched ground-water bodies in the consolidated rocks generally will remain capable of producing adequate quantities of water for most domestic uses. Increased ground-water development in the upland and foothill areas where these consolidated rocks provide domestic water supplies may cause mutual interference between discharging wells and local overdraft from perched-water bodies. At some future time, wells in these areas may have to be spaced so as to minimize these hazards.

Additional ground water is available from the alluvial aquifers; however, unless wells are properly spaced, increased withdrawals may be accompanied by local interference between pumping wells. To obtain maximum quantities of water efficiently and to minimize excessive well interference that could occur if all the wells were drilled in the upper and coarser parts of the alluvial aquifers, some wells will have to be drilled to produce water from the deeper zones of the older alluvial aquifers. The older alluvial deposits, at depth, contain materials in the sand- and silt-sized ranges. Wells producing water from these finer materials may pump troublesome amounts of sand, which could cause excessive wear to pumps and irrigation equipment or lower the efficiency of wells. These problems can be alleviated by the construction of wells using properly designed screens and (or) gravel packs. Future development of ground water from these fine-grained aquifers for irrigation and other uses that require large yields from a single well will, of necessity, require the use of gravel-envelope and screened wells.

As ground-water development from the alluvial aquifers proceeds, records of ground-water pumpage should be kept. Water levels of representative wells in the area should be measured on a continuing basis to provide data for relating water-level changes to pumpage. Periodically, water-level maps should be revised to reflect seasonal and long-term water-level trends and changes in ground-water storage.

Increasing development of water supplies from the alluvial aquifer, particularly for domestic and industrial uses, may be accompanied by some pollution of these aquifers. During this study, several instances of ground-water contamination were found. However, additional information is needed to determine areas of potential ground-water pollution. A monitoring program of periodic sampling and analysis would aid in identifying and tracing the extent of contamination and in developing methods for controlling pollution.

## SUMMARY AND CONCLUSIONS

The principal conclusions resulting from this study are as follows:

1. Ground water is generally available for domestic use throughout the Corvallis-Albany area. However, the volumes of water that can be developed from the consolidated sedimentary and volcanic rocks are generally small and vary considerably from place to place. The unconsolidated alluvial deposits that underlie the valley plain are the most productive aquifers and the only ones feasible for large-scale development of ground water for irrigation, municipal, and industrial uses in the area.
2. The Siletz River Volcanics yields water supplies for an increasing number of people in the upland parts of the area near Philomath and Corvallis. Many of the wells drilled into these rocks penetrate isolated ground-water bodies perched above the regional water table. Consequently, many of these small discontinuous bodies of water may supply water for several families. This may, with increasing use, result in mutual interference between pumping wells and cause an overdraft of these perched-water bodies locally.
3. The unconsolidated alluvial materials were deposited over an irregular bedrock surface, and the thickness and lithology of these deposits vary considerably within small areas. The older alluvial deposits tend to be of finer materials at depth but locally contain permeable sand and fine gravel capable of yielding 500 gpm of good-quality water to wells. However, many of the wells pump objectionable amounts of sand from both the shallow and deep parts of these aquifers. Proper well construction by development and use of fabricated well screens and (or) a gravel pack around the screens or perforated parts of the casing would solve sand problems and increase the yields of wells in the older alluvial aquifers.
4. Ground-water levels in the unconsolidated alluvial deposits fluctuate about 10–12 feet during the year. Available data indicate that seasonal fluctuations of the water table have been in the same range for more than 30 years.
5. The seasonal change of storage for the alluvial deposits is estimated to be about 130,000 acre-feet of water, which is more

than nine times the 1971 pumpage of 14,000 acre-feet. By salvaging part of this natural discharge, a sizable quantity of ground water could be withdrawn for irrigation or other uses.

6. Storage capacity of the alluvial aquifers in the area is estimated to be about 750,000 acre-feet of water between the depths of 10 and 100 feet.
7. Chemical quality of water from the alluvial deposits is generally satisfactory for most uses, as is most of the water obtained from perched-water bodies in the older sedimentary and volcanic rocks. Water from the alluvial deposits has a low sodium-adsorption-ratio and is suitable for irrigation. Water from the older marine sedimentary rocks, particularly from deeper producing zones beneath the valley plain, is more highly mineralized and has greater concentrations of chloride than does most other ground water in the area. Locally, some of the water from the older rocks is too saline for most uses.
8. Analysis of water samples from wells for coliform bacteria indicate that ground-water pollution exists in parts of the area. Further study is necessary to document fully the nature and extent of pollution.

## REFERENCES

Allison, I. S., 1953, Geology of the Albany quadrangle, Oregon: Oregon Dept. Geology and Mineral Industries Bull. 37, 18 p.

Bartholomew, W. S., and DeBow, Robert, 1967, Ground-water levels, 1966: Oregon State Engineer Ground Water Rept. 12, 122 p.

———1970, Ground-water levels, 1967-68: Oregon State Engineer Rept. 15, 122 p.

Federal Water Pollution Control Administration, 1968, Water quality criteria: Federal Water Pollution Control Adm., 234 p.

Frank, F. J., and Johnson, N. A., 1972, Selected ground-water data in the Corvallis-Albany area, central Willamette Valley, Oregon: Oregon State Engineer Ground Water Rept. 17, 46 p.

Johnson, A. I., 1967, Specific yield—Compilation of specific yields for various materials: U.S. Geol. Survey Water-Supply Paper 1662–D, 74 p.

Johnson, Edward E., Inc., 1966, Ground water and wells: St. Paul, Minn., Edward E. Johnson, Inc., 440 p.

Piper, A. M., 1942, Ground-water resources in the Willamette Valley, Oregon: U.S. Geol. Survey Water-Supply Paper 890, 194 p.

Price, Don, 1967, Geology and water resources in the French Prairie area, northern Willamette Valley, Oregon: U.S. Geol. Survey Water-Supply Paper 1833, 97 p.

Sceva, J. E., and DeBow, Robert, 1965, Ground-water levels, 1964: Oregon State Engineer Ground Water Rept. 5, 109 p.

———1966, Ground-water levels, 1965: Oregon State Engineer Ground Water Rept. 9, 111 p.

U.S. Public Health Service, 1962, Drinking water standards, 1962: Public Health Service Pub. 956, 61 p.

Vokes, H. E., Myers, D. A., and Hoover, Linn, 1954, Geology of the west coastal border area of the Willamette Valley, Oregon: U.S. Geol. Survey Oil and Gas Inv. Map OM–150.

# BASIC GROUND-WATER DATA

## BASIC GROUND-WATER DATA

Table 6 contains lithologic logs of representative wells drilled in the study area. Nearly all the logs were obtained from drillers' reports submitted to the Oregon State Engineer. The reports were edited for consistency of terminology and for conformance with the stratigraphic units described in the text, but are otherwise unchanged.

Data summarized in table 7 are representative of ground-water data collected in the study area during this investigation. Well records shown in table 7 were obtained from reports compiled by well drillers and from well owners and operators.

The locations of wells in the tables are shown on plate 1. Most of the data collected in the study area have been published by the Oregon State Engineer (Frank and Johnson, 1972). Additional unpublished ground-water data, including well reports and ground-water-level records, are on file in the offices of the Oregon State Engineer, Salem, Oreg., and the U.S. Geological Survey, Portland, Oreg.

TABLE 6.—*Drillers' logs of representative wells*

| Materials | Thickness (ft) | Depth (ft) |
|---|---|---|
| **10S/3W-31dbd1** | | |
| [Country Village Water System. Alt 190 ft. Drilled by Valley Well Drillers, 1967. Casing: 12-in. diam to 29 ft; perforated 21–26 ft] | | |
| Soil | 2 | 2 |
| Younger alluvium: | | |
| Clay, brown | 5 | 7 |
| Gravel | 17 | 24 |
| Sand and gravel | 3 | 27 |
| Spencer Formation: | | |
| Shale, dark-blue | 48 | 75 |
| **11S/3W-19baa** | | |
| [Oregon Metallurgical Corp. Alt 225 ft. Drilled by Merle Warren Well Drilling, 1970. Casing: 12-in. diam to 192 ft; perforated 177–192 ft] | | |
| Soil | 2 | 2 |
| Older alluvium: | | |
| Clay, brown | 11 | 13 |
| Clay, blue | 4 | 17 |
| Gravel, dirty | 12 | 29 |
| Clay, brown | 2 | 31 |
| Gravel, dirty | 5 | 36 |
| Clay, brown, and gravel | 13 | 49 |
| Clay, blue, and gravel | 3 | 52 |
| Clay, black, sandy | 5 | 57 |
| Clay, black, sandy, and gravel | 12 | 69 |
| Wood log | 2½ | 71½ |
| Clay, blue, and gravel | 2½ | 74 |
| Clay, black, sandy, and gravel | 5 | 79 |
| Clay, blue | 4 | 83 |
| Clay, blue, sandy | 6 | 89 |
| Clay, black, sandy | 6 | 95 |

TABLE 6.—*Drillers' logs of representative wells—Continued*

| Materials | Thickness (ft) | Depth (ft) |
|---|---|---|
| **11S/3W–19baa—Continued** | | |
| Older alluvium—Continued: | | |
| Clay, brown | 5 | 100 |
| Clay, black, sandy | 10½ | 110½ |
| Sand, black, and gravel | 14½ | 125 |
| Clay, blue, and gravel | 8 | 133 |
| Sand, black, and gravel | 4 | 137 |
| Clay, black, sandy, and gravel | 9 | 146 |
| Sand, black, and gravel | 4 | 150 |
| Clay, blue | 6 | 156 |
| Clay, brown | 5 | 161 |
| Clay, blue | 4 | 165 |
| Clay, black | 10 | 175 |
| Sand, black, and pea-sized gravel | 7 | 182 |
| Clay, dark-brown, and wood | 3 | 185 |
| Clay, black | 5 | 190 |
| Clay, brown | 7 | 197 |
| Clay, brown, sandy | 3 | 200 |
| **11S/3W–33caa** [Rem Metals Corp. Alt 259 ft. Drilled by E. J. Studebaker, 1968. Casing: 12-in. diam to 182 ft; perforated 33–175 ft] | | |
| Soil | 4 | 4 |
| Older alluvium: | | |
| Clay | 19 | 23 |
| Sand and gravel, loose | 2 | 25 |
| Gravel, cemented | 8 | 33 |
| Sand and gravel | 4 | 37 |
| Gravel, cemented | 7 | 44 |
| Gravel and silt | 9 | 53 |
| Gravel, cemented | 4 | 57 |
| Gravel | 16 | 73 |
| Sand, coarse | 9 | 82 |
| Clay, blue | 13 | 95 |
| Sand, coarse, and small-sized gravel, tight | 27 | 122 |
| Gravel, small-sized, with blue clay | 56 | 178 |
| Spencer(?) Formation: | | |
| Shale, blue, hard | 7 | 185 |
| Shale, blue, sticky | 18 | 203 |
| **11S/4W–1aac2** [Gibson Hill Water Improvement Dist. Alt 205 ft. Drilled by Merle Warren Well Drilling, 1970. Casing: 8-in. diam to 35 ft; perforated 24–33 ft] | | |
| Younger alluvium: | | |
| Soil and sandy loam | 21 | 21 |
| Gravel | 8 | 29 |
| Gravel, water-bearing | 4½ | 33½ |
| Spencer Formation: | | |
| Sandstone | 13½ | 47 |
| **11S/5W–13acb** [Northgate Lumber Co. Alt 240 ft. Drilled by Schoen Electric & Pump, 1970. Casing: 6-in. diam to 255 ft; unperforated] | | |
| Soil | 2 | 2 |
| Older alluvium: | | |
| Clay, brown | 19 | 21 |
| Clay, blue | 8 | 29 |
| Spencer Formation: | | |
| Claystone, blue-gray | 186 | 215 |
| Claystone, brown | 40 | 255 |

TABLE 6.—*Drillers' logs of representative wells—Continued*

| Materials | Thickness (ft) | Depth (ft) |
|---|---|---|
| **12S/3W-35adc2** | | |
| [Simplot Soil Builders. Alt 278 ft. Drilled by Merle Warren Well Drilling, 1963. Casing: 6-in. diam to 93 ft; perforated 84-92 ft] | | |
| Soil | 3 | 3 |
| Older alluvium: | | |
| Clay, yellow | 62 | 65 |
| Clay, blue | 25 | 90 |
| Eugene Formation: | | |
| Shale | 20 | 110 |
| **12S/4W-16cac** | | |
| [Oak Village Trailer Court. Alt 240 ft. Drilled by Merle Warren Well Drilling, 1970. Casing: 6-in. diam to 299 ft; perforated 33-43 ft] | | |
| Soil | 3 | 3 |
| Older alluvium: | | |
| Clay, brown | 17 | 20 |
| Clay and gravel | 7 | 27 |
| Sand, brown, and gravel | 5 | 32 |
| Clay and gravel | 3 | 35 |
| Sand, brown, and gravel | 7 | 42 |
| Spencer Formation: | | |
| Clay, blue | 27 | 69 |
| Clay, gray, sandy | 16 | 85 |
| Clay, blue, firm | 28 | 113 |
| Clay, green | 11 | 124 |
| Clay, blue | 8 | 132 |
| Clay, green | 7 | 139 |
| Clay, brown | 5 | 144 |
| Clay, green | 9 | 153 |
| Clay, gray | 8 | 161 |
| Clay, green | 16 | 177 |
| Clay, blue | 30 | 207 |
| Clay, light-blue | 18 | 225 |
| Clay, blue | 40 | 265 |
| Clay, gray-green | 15 | 280 |
| Clay, gray | 20 | 300 |
| **12S/4W-29bdb** | | |
| [Anne Dunlap. Alt 243 ft. Drilled by Merle Warren Well Drilling, 1970. Casing: 6-in. diam to 221 ft; perforated 211-221 ft] | | |
| Soil | 2 | 2 |
| Older alluvium: | | |
| Clay, brown | 16 | 18 |
| Clay, brown, and some gravel | 2 | 20 |
| Clay, brown | 2½ | 22½ |
| Gravel | 5½ | 28 |
| Clay, yellow | 8 | 36 |
| Clay, blue | 4 | 40 |
| Clay, blue, and gravel | 6 | 46 |
| Clay, blue | 3 | 49 |
| Clay, blue, and gravel | 4 | 53 |
| Spencer Formation: | | |
| Clay, light-blue | 37 | 90 |
| Clay, dark-blue, hard | 4 | 94 |
| Clay, light-blue | 31 | 125 |
| Clay, dark-blue | 15 | 140 |
| Clay, brown | 13 | 153 |
| Clay, light-blue | 9 | 162 |
| Clay, brown | 14 | 176 |
| Clay, gray | 10 | 186 |

TABLE 6.—*Drillers' logs of representative wells*—*Continued*

| Materials | Thickness (ft) | Depth (ft) |
|---|---|---|
| **12S/4W-29bdb—Continued** | | |
| Spencer Formation—Continued: | | |
| Clay, dark-blue | 7 | 193 |
| Sand, blue, packed | 14 | 207 |
| Sand, black | 11 | 218 |
| Gravel | 1½ | 219½ |
| Clay, blue | 1½ | 221 |
| **12S/5W-2cd** [Willamette Petroleum Syndicate. Alt 220 ft. Drilled to depth of 2,150 ft; date drilled and driller unknown. Log to 1,880-ft depth on file in office of U.S. Geological Survey, Portland, Oreg.] | | |
| Younger alluvium: | | |
| Soil and clay | 15 | 15 |
| Sand and gravel, water-bearing | 20 | 35 |
| Spencer Formation: | | |
| Shale, light-blue | 85 | 120 |
| Sand, salt-water bearing (gas) | 5 | 125 |
| Shale, brown | 47 | 172 |
| Shale, brown and gray, sandy | 88 | 260 |
| Shells, limy | 6 | 266 |
| Shale, brown | 34 | 300 |
| **12S/5W-8dcb** [Harold Johnson. Alt 275 ft. Drilled by Raymond C. Gellatly, 1970. Casing: 6-in. diam to 195 ft; unperforated] | | |
| Soil | 3 | 3 |
| Terrace deposits: | | |
| Clay, brown, tough | 14 | 17 |
| Clay, gray | 9 | 26 |
| Gravel and sand, cemented | 12 | 38 |
| Clay, blue | 28 | 66 |
| Clay, dark-brown | 5 | 71 |
| Clay, blue | 24 | 95 |
| Clay and wood, dark-brown | 9 | 104 |
| Clay, light-gray | 21 | 125 |
| Clay, dark-gray | 41 | 166 |
| Clay, red | 20 | 186 |
| Clay, brown, with streaks of sand and gravel | 19 | 205 |
| **12S/5W-20acd** [Joseph Lachek. Alt 235 ft. Drilled by Raymond C. Gellatly, 1959. Casing: 10-in. diam to 92 ft; perforated 56–92 ft] | | |
| Soil | 4 | 4 |
| Older alluvium: | | |
| Clay, light-gray | 11 | 15 |
| Clay, gray, tough | 5 | 20 |
| Clay, blue | 5 | 25 |
| Gravel and clay | 11 | 36 |
| Clay, gray | 18 | 54 |
| Sand and gravel, gray | 8 | 62 |
| Clay, gray | 13 | 75 |
| Sand, gray, and gravel | 19 | 94 |
| Clay, tough | 6 | 100 |
| **12S/5W-22dca2** [City of Corvallis. Alt. 240 ft. Drilled by Bill Howell Well Drilling, 1965. Casing: 8-in. diam. to 44 ft; perforated 33–43 ft] | | |
| Older alluvium: | | |
| Clay, brown | 19 | 19 |
| Clay mud, blue | 5 | 24 |

TABLE 6.—*Drillers' logs of representative wells*—*Continued*

| Materials | Thickness (ft) | Depth (ft) |
|---|---|---|
| **12S/5W-22dca2—Continued** | | |
| Older alluvium—Continued: | | |
| Sand and clay, blue | 8 | 32 |
| Gravel and sand, brown, fine | 7 | 39 |
| Gravel, coarse | 3 | 42 |
| Gravel and sand, fine | 2 | 44 |
| Clay, blue | 6 | 50 |
| **12S/5W-30bda** [Wayne Anderson. Alt 315 ft. Drilled by L. W. Mutschler Well Drilling, 1969. Casing: 6-in. diam to 100 ft; unperforated] | | |
| Soil | 3 | 3 |
| Terrace deposits: | | |
| Clay, yellow | 29 | 32 |
| Clay, blue, with sand | 6 | 38 |
| Clay, yellow | 40 | 78 |
| Claystone, gray | 16 | 94 |
| Sand, coarse, with fine gravel, water-bearing | 6 | 100 |
| **12S/5W-32ccb** [Leighton Davis. Alt 245 ft. Drilled by Raymond C. Gellatly, 1966. Casing: 8-in. diam to 114 ft; perforated 34-41 ft, 65-80 ft, and 90-102 ft] | | |
| Soil | 2 | 2 |
| Older alluvium: | | |
| Loam, brown | 13 | 15 |
| Clay, gray | 6 | 21 |
| Gravel, cemented, and sand and clay | 13 | 34 |
| Sand, coarse, and gravel | 10 | 44 |
| Clay, gray, tough | 12 | 56 |
| Clay, dark-gray, sandy | 9 | 65 |
| Sand, gray, and fine gravel, with rotten wood | 10 | 75 |
| Clay, gray | 23 | 98 |
| Sand, gray, and gravel | 7 | 105 |
| Clay, gray, sandy | 9 | 114 |
| **12S/6W-12dcd** [Hobin Lumber Co. Alt 275 ft. Drilled by Raymond C. Gellatly & Ronald S. Witham Well Drilling, 1970. Casing: 8-in. diam to 169 ft; perforated 158-168 ft] | | |
| Rock and gravel fill | 2 | 2 |
| Terrace deposits: | | |
| Clay, brown | 9 | 11 |
| Clay, brown, and gravel | 19 | 30 |
| Clay, gray | 9 | 39 |
| Sand and gravel, gray | 9 | 48 |
| Clay and wood, blue | 22 | 70 |
| Gravel and sand | 5 | 75 |
| Clay, brown | 12 | 87 |
| Clay, gray | 48 | 135 |
| Clay and sand, brown, and fine gravel | 10 | 145 |
| Gravel and sand | 10 | 155 |
| Gravel and sand, cemented | 12 | 167 |
| Clay, gray | 2 | 169 |

## TABLE 7.—*Records of wells*

Well number: See section "well-numbering system."
Type of well: All drilled.
Finish: B, open bottom (not perforated or screened); P, perforated.
Altitude: Altitude of land surface at well, in feet above mean sea level, interpolated from topographic maps.
Water level: Depths to water given in feet and decimals were measured by the U.S. Geological Survey; those in whole feet were reported by others or estimated.
Specific conductance of water: Field determination, in micromhos at 25°C.
Type of pump: C, centrifugal; J, jet; S, submersible; T, turbine; N, none.
Well performance: Yield in gallons per minute, and drawdown in feet below nondischarging water level, reported by owner, operator, driller, or pump company.
Use: D, domestic; PS, public supply; Ir, irrigation; In, industrial; F, fire; N, none.
Remarks: Ca, chemical analysis of water in table 5; H, hydrograph in fig. 7, 8, or 9; L, driller's log of well in table 6; P or B, pumped or bailed, for the indicated number of hours, when drawdown was measured. Remarks on adequacy, dependability, and general quality are reported by owners, tenants, drillers, or others.

| Well | Owner | Year completed | Depth of well (ft) | Diameter of well (in.) | Depth of casing (ft) | Finish | Water-bearing zone(s): Depth to top (ft) | Water-bearing zone(s): Thickness (ft) | Water-bearing zone(s): Character of material | Altitude (ft) | Water level: Feet below datum | Water level: Date | Specific conductance of water | Type of pump and horsepower | Well performance: Yield (gpm) | Well performance: Drawdown (ft) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **T. 10 S., R. 3 W.** | | | | | | | | | | | | | | | | | | |
| 31dbd1 | Country Village Water System. | 1967 | 75 | 12 | 29 | P, 21–26 | 17<br>24 | 7<br>3 | Gravel<br>Sand and gravel | 190 | 7.42 | 3-30-71 | ....... | S | 90 | 1 | PS | P 2 hr, L. This well and two other 12-in. wells about 30 ft in depth serve as water supply for 30 homes. |
| 31ddc | Rolling Greenacres Water System. | ....... | 35 | 10 | 35 | P | ...... | ...... | ........ do ........ | 195 | ...... | ...... | 415 | S, 10 | ...... | ...... | PS | Ca. Water supply for 39 homes. |
| **T. 10 S., R. 4 W.** | | | | | | | | | | | | | | | | | | |
| 25ddd1 | Parker–Oak Grove Water Improvement Dist. | 1959 | 30 | 12 | 30 | P, 23–30 | 16 | 14 | Sand and gravel.. | 190 | 9.00 | 3-29-71 | 750 | T, 50 | 750 | 6 | PS | P 3 hr, Ca. Water supply for 307 homes. Another 30-ft well nearby used for auxiliary supply. |
| **T 11 S., R. 3 W.** | | | | | | | | | | | | | | | | | | |
| 16dcb | Grand Prairie School.. | 1959 | 86 | 8 | 80 | P | 25 | 30 | Sand and gravel.. | 240 | 22 | 9-11-59 | ....... | J, 2 | 85 | ...... | PS | |
| 19baa | Oregon Metallurgical Corp. ........ | 1970 | 200 | 12 | 192 | P, 177–192 | 29<br>175 | 90<br>7 | Sand, clay, and gravel ........<br>........ do ........ | 225 | 12 | 5-28-70 | 301 | S, 25 | 500 | 100 | In | P 3 hr, L, Ca. Well reported to pump some sand. |
| 33caa | Rem Metals Corp......... | 1968 | 203 | 12 | 182 | P, 33–175 | 23 | 155 | Gravel and sand.. | 259 | 12 | 7-11-68 | 252 | T, 40 | 75 | 30 | In | B 1 hr, L, Ca. |

TABLE 7.—*Records of wells—Continued*

| Well | Owner | Year completed | Depth of well (ft) | Diameter of well (in.) | Depth of casing (ft) | Finish | Water-bearing zone(s): Depth to top (ft) | Thickness (ft) | Character of material | Altitude (ft) | Water level: Feet below datum | Date | Specific conductance of water | Type of pump and horsepower | Well performance: Yield (gpm) | Drawdown (ft) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **T. 11 S., R. 4 W.** | | | | | | | | | |
| 2bad | Ed Bennett | 1962 | 281 | 8 | 19 | B | ...... | ...... | Sandstone and shale. | 425 | 198 | 3-17-62 | ....... | T, 20 | 460 | 38 | Ir | P 2 hr. Used to irrigate 7½-acre golf course. |
| 32cbd | Wes Linn Water Co., Inc. | 1969 | 35 | 10 | 34 | P, 26- 34 | 23 | 11 | Gravel | 218 | 9 | 3-27-63 | 300 | T, 15 | 325 | 17 | PS | P 8 hr, Ca. Water supply for 50 homes. |
| | | | | | | | | | **T. 11 S., R. 5 W.** | | | | | | | | | |
| 2acd | Orano Grindahl | 1962 | 108 | 6 | 80 | B | 98 | 10 | Lava rock | 525 | 44.33 | 10-26-70 | ....... | S, ¾ | 40 | 40 | D | B 1 hr, H. |
| 2cab | Bohdan Maksynuick | 1965 | 453 | 6 | 20 | B | ...... | ...... | do | 750 | 125 | 9- 7-65 | ....... | S, 1 | 5 | 155 | D | B 6 hr. Water supply from this well reported to be barely adequate during summer. |
| 11bcd1 | Vineyard Mt., Inc. | 1969 | 183 | 8 | 46 | B | 76<br>140<br>172 | 10<br>14<br>11 | do<br>do<br>do | 375 | 8 | 2-26-69 | ....... | S, 15 | 55 | 167 | PS | P 12 hr. One of several wells used as water supply for housing development. |
| 13acb | Northgate Lumber Co. | 1970 | 255 | 6 | 255 | B | ...... | ...... | Claystone | 240 | Flowed 7 gpm | 7- 2-70 | 7,500 | S, 3 | 30 | 140 | F | B 2 hr, L, Ca. Reported to have tapped connate water at 79-ft depth. |
| 15dbb | Harold Nelson | 1962 | 36 | 6 | 35 | B | 20 | 14 | Lava rock | 580 | .66 | 10-28-70 | ....... | S, ½ | 10 | ...... | D | B. Well flows 2-3 gpm during winter. Ceases to flow during summer. |
| 20dcc | Rick Ross | 1970 | 152 | 6 | ....... | B | ...... | ...... | do | 640 | 81.75 | 10- 5-70 | 210 | S, ½ | 11 | 90 | D | B, H. |
| 29caa | R. E. Milleman | 1963 | 245 | 6 | 94 | B | 235 | 7 | do | 740 | 112 | 10-10-63 | 157 | S, ¾ | 4½ | 133 | D | P 4 hr, Ca. |
| 36cdb | Oregon State Univ. | 1957 | 41½ | 8 | 41½ | P, 31- 41 | 17<br>20<br>30 | 3<br>10<br>11 | Sand<br>Sand and gravel<br>Gravel | 215 | 20.24 | 10-14-70 | ....... | C, 5 | 750 | 2 | Ir | P 2 hr. |
| | | | | | | | | | **T 12 S., R. 2 W.** | | | | | | | | | |
| 19ccb | Scott Wheeler | 1966 | 47½ | 6 | 18 | B | ...... | ...... | Sandstone | 325 | 2.3 above surface | 9-17-70 | 455 | S, 5 | 100-200 | ...... | Ir | Water reported to contain methane gas. |
| 30bcd | Crossan Farms | 1967 | 140 | 8 | 33 | B | ...... | ...... | Shale | 320 | 21.00 | 9-25-70 | ....... | S, 3 | 300 | 58 | D | P 3 hr, L. |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **T. 12 S., R. 3 W.** | | | | | | | | | | | | | | | | | | |
| 7bcc2 | Don Stockton | 1970 | 55 | 6 | ....... | ..................... | ...... | ...... | Sand and gravel | 240 | Flows 2–3 gpm | 3–11–71 | ........ | S, ½ | ...... | ...... | D | Flows during wet months only. Water level was 10–12 ft below land surface Sept. 22, 1971. |
| 29ddd | Ed Herrling | 1967 | 56 | 8 | 56 | P, 42– 54 | 25<br>45 | 9<br>11 | Gravel<br>Sand and gravel | 257 | 13.02 | 9–15–70 | ........ | N | 110 | 13½ | N | B 1 hr. H. |
| 35adc2 | Simplot Soil Builders. | 1963 | 110 | 6 | 93 | P, 84– 92 | 85 | 10 | Clay and shale | 278 | 15 | 10–20–63 | 1,225 | S, ½ | 14 | 82 | In | B 1 hr, L, Ca. Water has bad taste. |
| **T. 12 S., R. 4 W.** | | | | | | | | | | | | | | | | | | |
| 6cdb | Willard Hamlin | 1961 | 35 | 10 | 35 | P, 26– 35 | 20 | 15 | Gravel | 220 | 16.94 | 9–18–70 | 246 | C, 30 | 600 | 3 | Ir | P 4 hr, Ca. Irrigates 50 acres. |
| 8bcb | R. G. Gates | 1956 | 33 | 10 | 32 | P, 18– 32 | 15 | 17 | do | 221 | 11.67 | 9–23–70 | ........ | N | 265 | 10 | N | P 4 hr, H. Formerly used for irrigation. |
| 16cac | Oak Village Trailer Court. | 1970 | 300 | 6 | 299 | P, 33– 43 | 30 | 17 | Sand and gravel | 240 | 19.08 | 9–16–70 | 2,000 | S, 1½ | 48 | 12 | D | B 1½ hr, L. When pumped heavily, water from older sediment below the alluvium enters well. Water has unpleasant taste and is of poor quality. |
| 29bdb | Anne Dunlap | 1970 | 221 | 6 | 221 | P, 211–221 | 210 | 10 | Sand | 243 | Flows | 9–11–70 | 1,490 | S | 72 | 9 | D | B 1 hr, Ca, L. |
| **T 12 S., R. 5 W.** | | | | | | | | | | | | | | | | | | |
| 2cd | Willamette Petroleum Syndicate. | ... .... | 2,150 | 5 | ....... | ..................... | 15 | 20 | Sand and gravel | 220 | ........ | ................ | ........ | N | ...... | ...... | N | L. Well drilled for oil; abandoned. |
| 8dcb | Harold Johnson | 1970 | 205 | 6 | 195 | B | ...... | .... . | Sand, clay, and gravel. | 275 | 27 | 4– 4–70 | 380 | S, ½ | 15 | 158 | D | B 3 hr, L. |
| 20acd | Joseph Lachek | 1959 | 100 | 10 | 92 | P, 56– 92 | 25<br>54<br>75 | 11<br>8<br>19 | Gravel and clay<br>Sand and gravel<br>do | 235 | 5.05 | 2–11–71 | ........ | T, 15 | 200 | 58 | N | L, H. Well formerly used for irrigation. |
| 22dca2 | City of Corvallis | 1965 | 50 | 8 | 44 | P, 33– 43 | 32 | 12 | Gravel and sand | 240 | 25.50 | 11– 4–70 | 353 | T, 5 | 110 | 18 | PS | P 4 hr, Ca. |
| 30bda | Wayne Anderson | 1969 | 100 | 6 | 100 | B | 94 | 6 | Sand and gravel | 315 | 67 | 7– 3–69 | 215 | S, ½ | 25 | 15 | D | B 1 hr, L. |
| 30dac | William Furtick | 1970 | 180 | 6 | 180 | B | ...... | ...... | Sand, clay, and gravel. | 320 | 90 | 3–22–70 | 253 | S | 55 | 70 | D | Air test 2 hr, Ca. |
| 32ccb | Leighton Davis | 1966 | 114 | 8 | 114 | P, 34– 41, 65– 80, 90–102 | 34<br>65<br>98 | 7<br>10<br>4 | Sand and gravel<br>do<br>do | 245 | 17.80 | 11– 3–70 | ........ | S | 220 | 66 | Ir | P 4 hr, L. Water from bottom part of formation penetrated by well reported to be of poorer quality than that from upper part. |

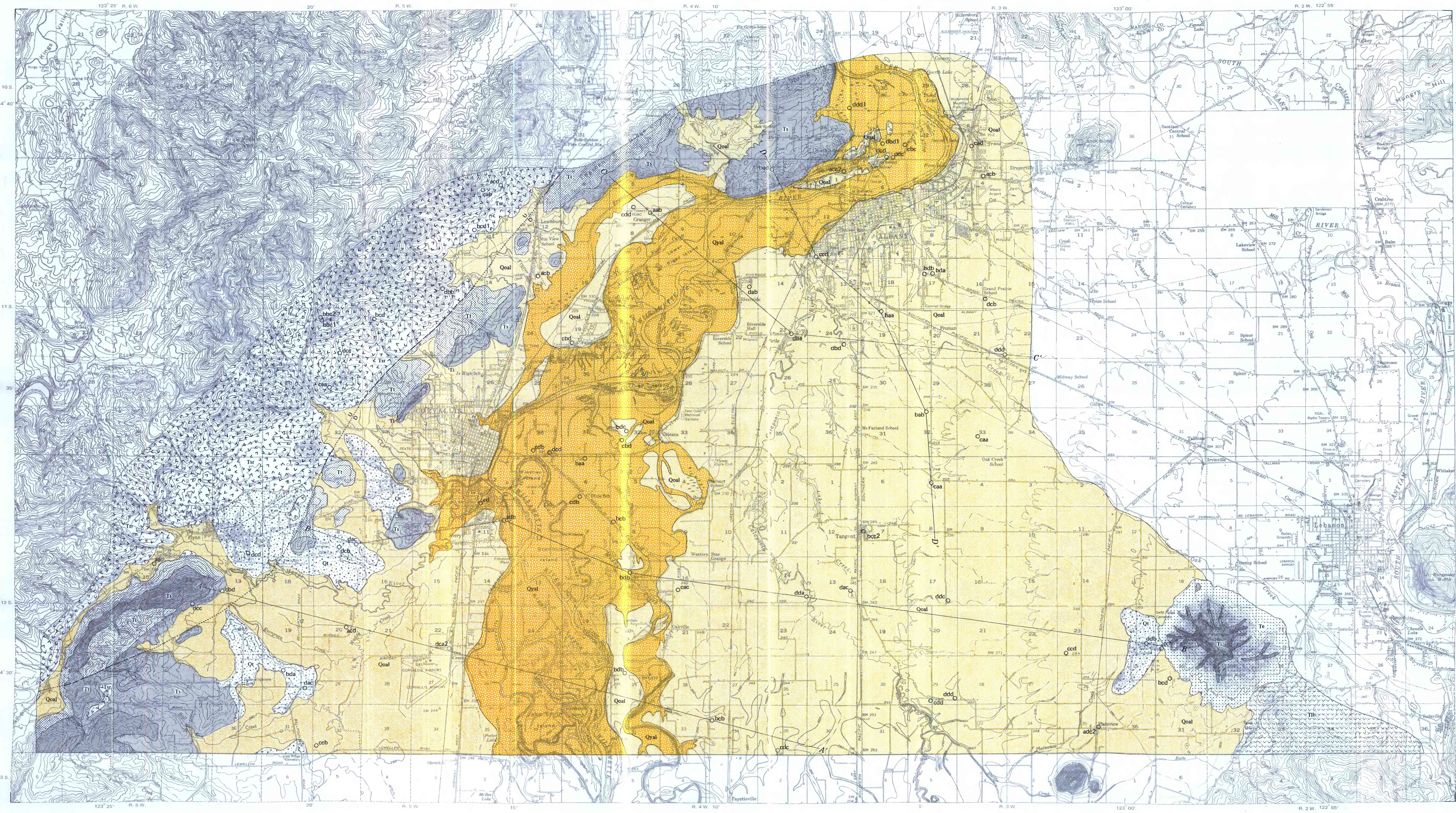
TABLE 7.—*Records of wells—Continued*

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T. 12 S., R. 6 W. | | | | | | | | | | | | | | | | | | | |
| 12dcd | Hobin Lumber Co. | 1970 | 169 | 8 | 169 | P, 158–168 | 155 | 12 | Gravel and sand | 275 | 17 | 6–22–70 | 1,400 | S, 7½ | 75 | 128 | In | P 3 hr, L, Ca. |
| 14dcc | Frank Nordyke | 1968 | 501 | 6 | 25 | B | 497 | 4 | Sandstone | 350 | Flows | 8–25–71 | 270 | C, ¾ | 30 | 150 | D | B 4 hr, Ca. Flows about 10 gpm. |
| 15aac | V. A. Cone | 1971 | 605 | 10 | 18 | B | ..... | ..... | do | 339 | 9.26 | 5–19–71 | 700 | S | 150 | 595 | D | Air test 2 hr, L, Ca. |

☆ U.S. GOVERNMENT PRINTING OFFICE: 1974 O—543–586/96

PREPARED IN COOPERATION WITH THE
OREGON STATE ENGINEER





Base from U.S. Geological Survey; Corvallis, 1956; Albany, Monroe, Halsey, Lebanon, 1957; and Brownsville, 1950

Geology from Vokes, Myers, and Hoover (1954); Allison (1953); and Piper (1942)

SCALE 1:62 500

CONTOUR INTERVAL 10, 25, 40, AND 50 FEET
DATUM IS MEAN SEA LEVEL

## EXPLANATION

### UNCONSOLIDATED DEPOSITS

QUATERNARY

*Holocene*

**Qyal** — Younger alluvium
*Assorted coarse gravel and sand. Yields moderate to large quantities of water to wells*

*Pleistocene and Holocene*

**Qoal** — Older alluvium
*Largely sand and gravel, with mixture of sand, silt, and clay. Is somewhat finer and less assorted than the younger alluvium. Tends to be of finer materials below depths of 50-100 feet. Yields moderate to large quantities of water to properly constructed wells. Includes some younger alluvial deposits along minor streams, and "Willamette Silt," as mapped by Allison*

**Qt** — Terrace deposits
*Poorly sorted gravel, sand, and clay, weathered in upper part. Yield small to moderate quantities of water to wells from saturated coarser grained beds*

### CONSOLIDATED ROCKS

TERTIARY

*Oligocene and Miocene*

**Tlb** — Little Butte Volcanic Series
*Volcanic rocks, predominantly dacitic and andesitic flows and tuffs. Has limited areal extent. Where present, yields small quantities of water to wells*

*Oligocene*

**Te** — Eugene Formation
*Marine-deposited coarse- to fine-grained sandstone with intercalated shale. Yields water slowly to wells*

*Oligocene(?)*

**Ti** — Intrusive igneous rocks
*Dikes and sills of gabbro and basalt. Generally yield small quantities of water to wells*

*Eocene*

**Ts** — Spencer Formation
*Marine-deposited sequences of tuffaceous sandstone, shale, and mudstone. Yields water slowly to wells. Contains saline water locally*

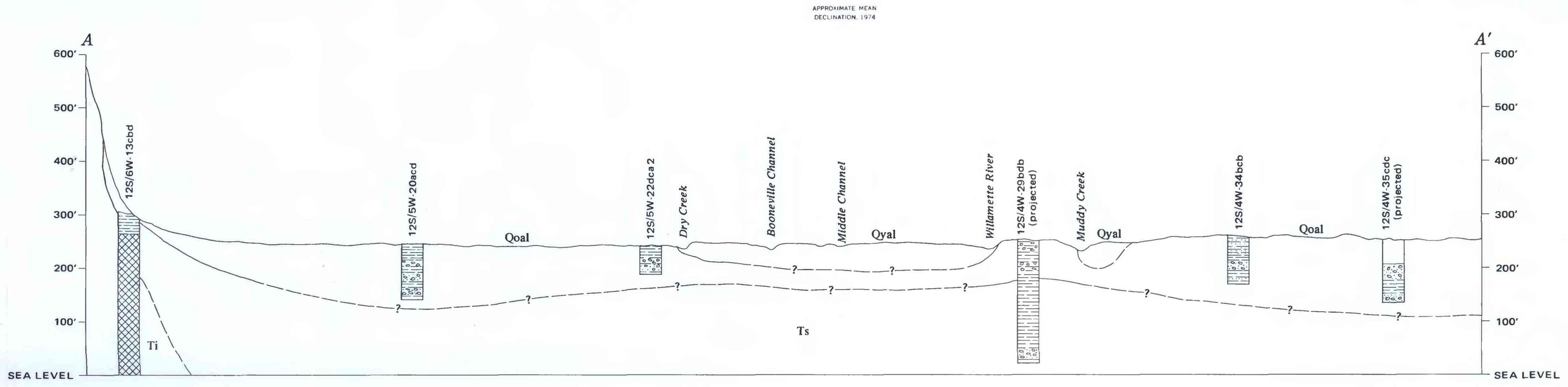
**Tt** — Tyee Formation
*Marine-deposited tuffaceous sandstone, siltstone, and shale. Yields water slowly to wells*

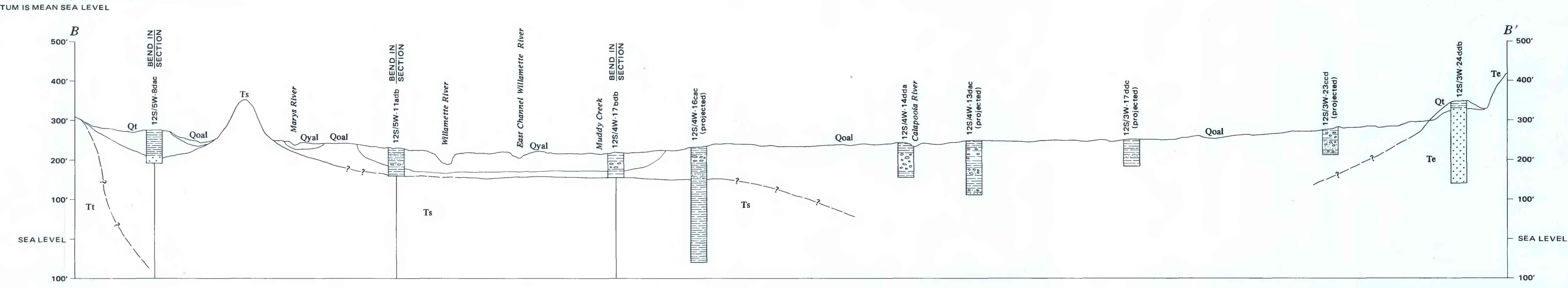
**Tsr** — Siletz River Volcanics
*Zeolite pillow lava and basalt flows with interbedded tuffaceous siltstone, shale, and fine tuff. Yield small to moderate quantities of water to wells, usually adequate for domestic use*

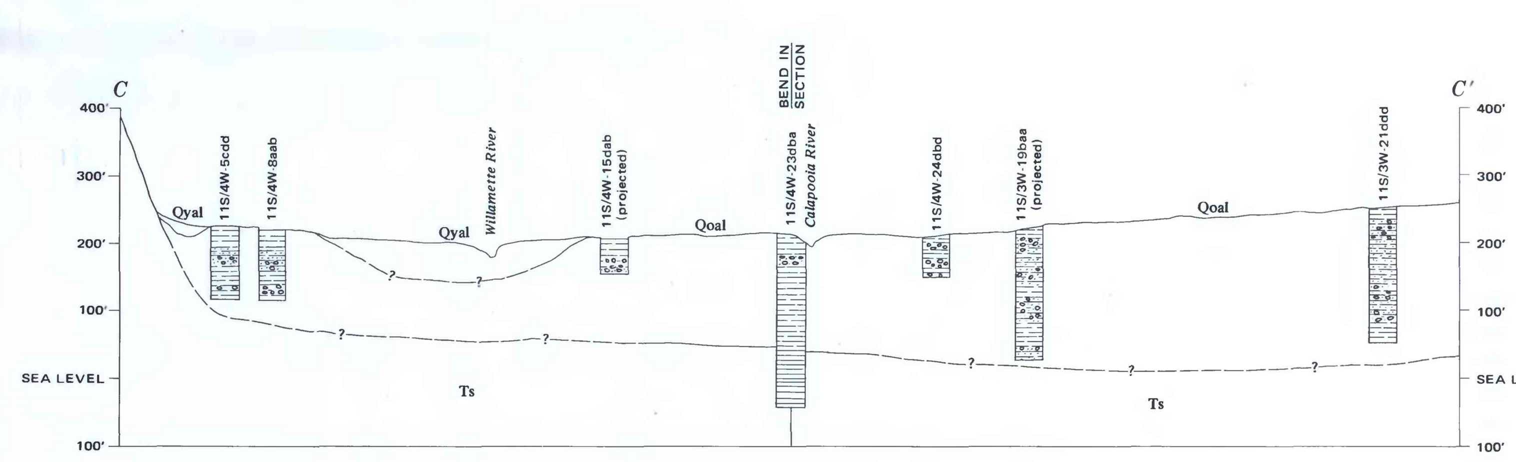
Contact

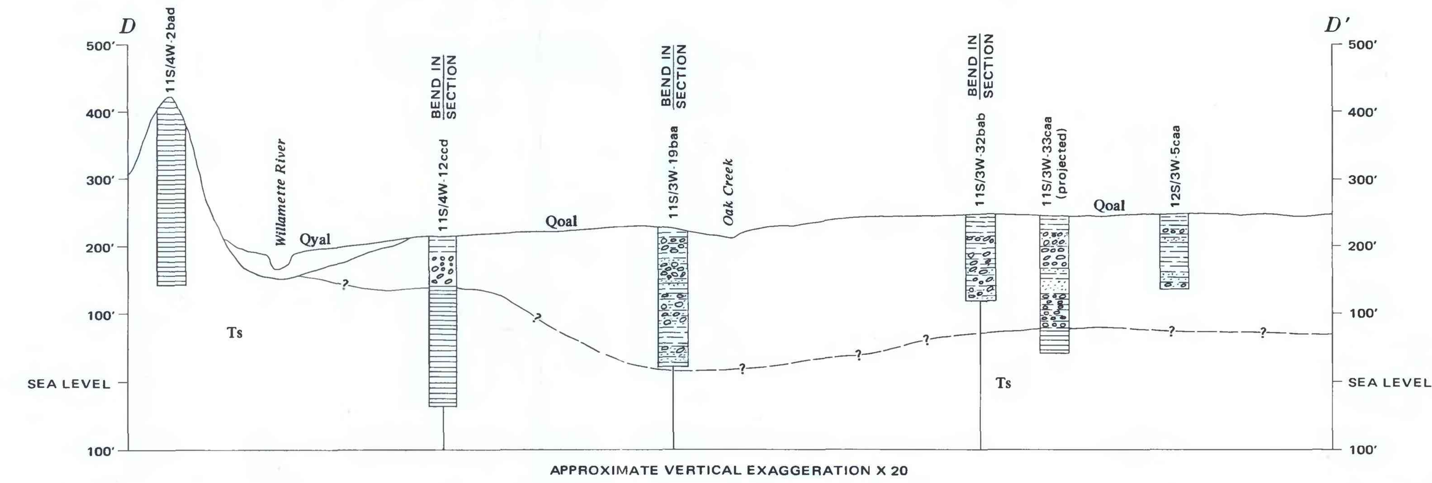
Fault
*Dashed where approximately located; dotted where concealed. U, upthrown side; D, downthrown side*

Well and number









EXPLANATION

Clay — Sand, clay, and gravel — Sand and clay — Clay and gravel — Sand — Shale — Gravel — Sandstone — Sand and gravel — Volcanic rock

APPROXIMATE VERTICAL EXAGGERATION X 20

# GEOLOGIC MAP AND SECTIONS OF THE CORVALLIS-ALBANY AREA, OREGON

U.S. GOVERNMENT PRINTING OFFICE: 1974 O—543-586/86


Base from U.S. Geological Survey; Corvallis, 1956; Albany, Monroe, Halsey, Lebanon, 1957; and Brownsville, 1950

APPROXIMATE MEAN DECLINATION, 1974

SCALE 1:62 500

1 ½ 0 1 2 3 4 5 MILES

1 .5 0 1 2 3 4 5 6 7 KILOMETERS

CONTOUR INTERVAL 10, 25, 40, AND 50 FEET

# WATER-LEVEL MAP, SEPTEMBER 1971, CORVALLIS–ALBANY AREA, OREGON

* U.S. GOVERNMENT PRINTING OFFICE: 1974 O—543–586/96