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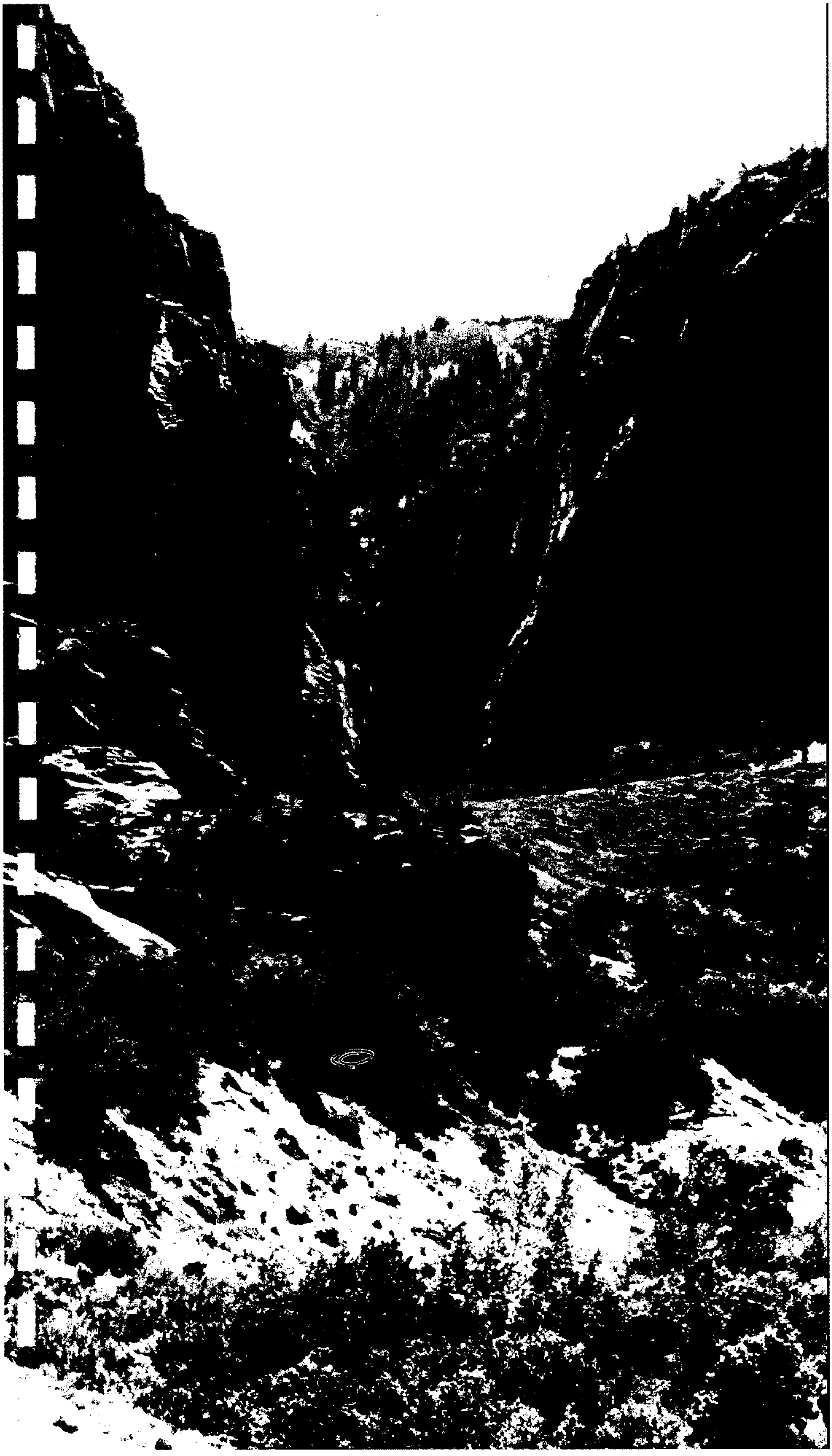
Groundwater Resources of the Virgin River Basin in Utah

Calvin G. Clyde



Groundwater
Resources of the

VIRGIN RIVER BASIN

in Utah

by Calvin G. Clyde,
Utah Water Research
Laboratory

UTAH
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Water Resources
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GROUNDWATER RESOURCES OF THE VIRGIN RIVER BASIN IN UTAH

by

Calvin G. Clyde

Utah Water Research Laboratory
Utah State University
Logan, Utah

September 1987

for

Utah Division of Water Resources

ABSTRACT

The Division of Water Resources is conducting a study of further water development in the Virgin River Basin. This report examines the effects of groundwater development as a part of the overall study. The study area includes about 1000 square miles in the Central Virgin River Basin west of the Hurricane Fault and 1300 square miles in the Upper Virgin River Basin east of the Hurricane Fault.

The deeply incised Virgin River has cut a youthful drainage network with deep canyons and steep escarpments and drains out of southwest Utah across Arizona to Lake Mead in Nevada. A basin-wide geologic map emphasizing groundwater features has been prepared from available reports. Outcrops of the principal sedimentary formations are shown as well as alluvial deposits, lava flows, and other features.

Groundwater in usable quantities occurs in both consolidated and unconsolidated rock formations. The principal consolidated aquifer is the Navajo Sandstone. Its water quality is usually excellent and large recoverable reserves are present. In recent years many wells in the Navajo Sandstone aquifer have been developed for public water supply. Groundwater resources in unconsolidated alluvial aquifers also are extensive, but in some areas may be of poor quality.

Wells in alluvial aquifers have long been a major source of water especially for irrigation. Springs are natural indicators of groundwater availability while wells show where groundwater resources have been artificially developed. Maps show the locations of the 800 springs in the basin and the 700 wells. Other maps show the use (public water supply, irrigation, and other) and the growth of each kind of use.

Recorded water level data are reported in two ways. Hydrographs of 29 wells have been plotted to show changes over time and a groundwater contour map of parts of the basin has been prepared to show the general pattern of groundwater movement. The annual withdrawal by wells for various uses, the total annual groundwater recharge, and groundwater discharge are summarized. Groundwater quality from typical wells and springs in the Virgin River Basin is presented by table and map.

The opportunities for additional groundwater development occur mainly by the following means: Reduce evapotranspiration of groundwater by lowering water tables, reduce seepage to gaining streams and reduce flows to springs and seeps by lowering water tables (this may require transfer of surface water rights and spring rights to the groundwater), and artificially increase the recharge to the groundwater from melting snow and rain.

Principal recommendations are:

Selectively increase monitoring of groundwater levels, withdrawals, and water quality from wells.

Extend groundwater contour maps to cover more of the basin.

Study future aquifer yields under proposed development levels and aquifer management options.

Continue the cautious development of the Navajo Sandstone aquifer especially for public water supply uses.

Initiate programs to protect the recharge (outcrop) zones of the Navajo Sandstone aquifer from pollution.

Encourage groundwater use from alluvial aquifers for irrigation particularly where the water quality is marginal for other uses.

Where groundwater is the only economic supply available and amounts are small, careful development for domestic use should continue.

Water development plans should consider both surface and groundwater supplies and pick the best mix.

ACKNOWLEDGMENTS

The writer appreciates the opportunity to work with and for the Division of Water Resources on this study. Paul Summers and Eugene Bigler directed the project. Especially helpful were Mimi Short, Richard Tullis, Lloyd Austin, Steve Richardson, Ben Everitt, and David Pitcher of the Division. The help of Jerry Olds and Gerald Stoker of the Division of Water Rights is appreciated. G. W. Sandberg of the U.S. Geological Survey supplied well data and made many positive suggestions. Phillip Solomon, Utilities Engineer of St. George and Oscar Bluth of Washington provided data on city wells. The help and suggestions of many others representing other federal, state, and county organizations is acknowledged. Special thanks are due consultant S. Bryce Montgomery for his help and suggestions.

Although many contributed much through their help and suggestions, the writer accepts full responsibility for the interpretations and conclusions herein.

Calvin G. Clyde

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INTRODUCTION

Need for the Study

The Division of Water Resources, in cooperation with the Washington County Water Conservancy District and other local agencies, is conducting a study of the feasibility of further water development in the Virgin River Basin. Groundwater is recognized as an important part of the total water supply in the basin. This study of the groundwater resources and the effects of further groundwater development in the Virgin River Basin was authorized as part of the overall water study.

Due mainly to the emerging status of the St. George area as a center for recreation, retirement and refuge from winter weather, demand for water and land has increased significantly in recent years. The population of Washington County is expected to more than double in the next 20 years. Such rapid growth will severely strain the organizations that provide services to the public. Water of good quality is a resource already in short supply which will thus become even more in demand in the future. Since much of the groundwater in the basin is of excellent chemical quality, public water supply agencies frequently drill wells to meet their water needs. To make wise use of available groundwater resources requires that studies be done beforehand and that good plans be made and followed as growth and development of the area continue.

Scope of the Study

While the time and resources available for this study provided for some data collection, mostly the study has had to rely on information from past studies and data gathered by others. Consideration was given area by area in the basin to the description, geology, occurrence, movement, storage, use, recharge and quality of the groundwater. The study includes appraisal of the potential for further development of groundwater and examines the limiting factors on groundwater development.

Previous Studies

Much information is available on the geology of the Virgin River Basin. Most reports cover specific parts of the area but they collectively give a complete picture of the geology of the basin and adjacent areas. These will be discussed further in a later section on geology.

Several reports have been published describing various hydrologic aspects and the availability of water supplies of the Virgin River Basin. Since this study deals mostly with the groundwater conditions in the area, only the most significant groundwater studies are specifically cited. Other important groundwater and surface water reports are included in the list of references for convenience to the reader. Brief descriptions of some of the past groundwater studies follow:

Cordova et al. (1972) described the groundwater conditions in the Central Virgin River Basin. Their report did not include any of the Virgin River

Basin east of the Hurricane Fault or in Beaver Dam Wash to the west. The rest of the Virgin River Basin in Utah is included. The report includes descriptions of geology, physiography, climate, groundwater occurrence, storage, movement, recharge, groundwater use and groundwater quality. Both unconsolidated and consolidated rock aquifers are included, but the emphasis is on the consolidated formations.

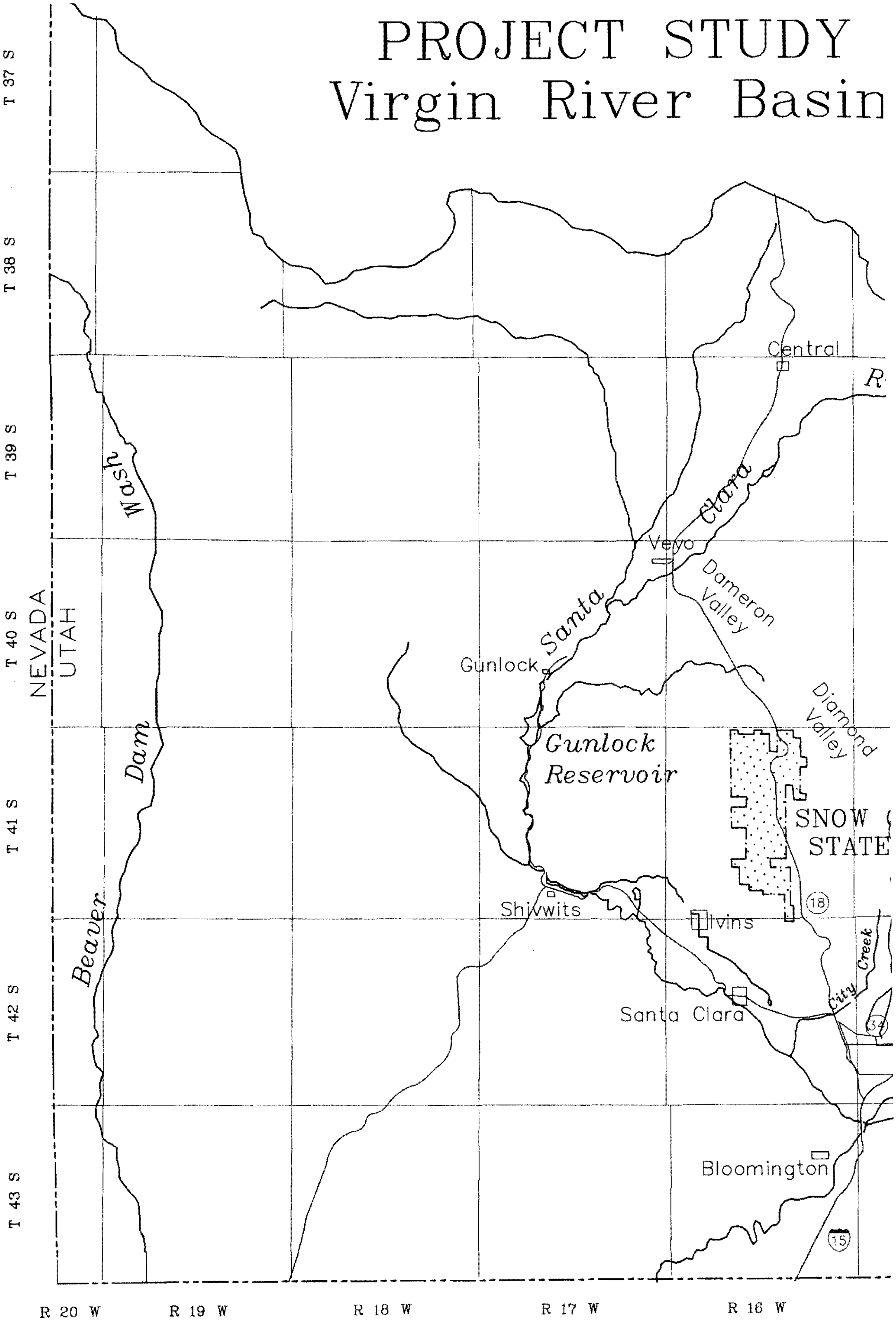
Cordova (1978) investigated the groundwater conditions in the Navajo sandstone in the Central Virgin River Basin, Utah. The area covered is the same as the earlier study by Cordova et al. (1972), but the study considered only the Navajo sandstone aquifer. The geology, occurrence, storage, movement, recharge, use and quality and the potential for development are described.

Cordova (1981) studied the groundwater conditions in the Upper Virgin River and Kanab Creek Basins, which includes all the Virgin River Basin east of the Hurricane Faults plus other adjacent areas in the Kanab Basin. The geology, physiography, climate and the groundwater occurrence, storage, movement, use and quality are described. Emphasis is on the Navajo sandstone, but information is also given on other consolidated formations and the unconsolidated aquifers.

Goode (1964 and 1966) made two reconnaissance studies of the Water Resources in Western Kane County. While most of the area described is outside the Virgin River Basin, the East Fork of the Virgin River above Parunuweap Canyon is included. Emphasis is on the springs feeding this part of the East Fork and on diversions from the river. Information on the geology of the area is included.

Together the five reports summarized above give a rather complete picture of groundwater conditions in the Virgin River Basin, Utah. This report makes use of much of the information from the above documents, other reports, and new data acquired by the writer.

PROJECT STUDY
Virgin River Basin



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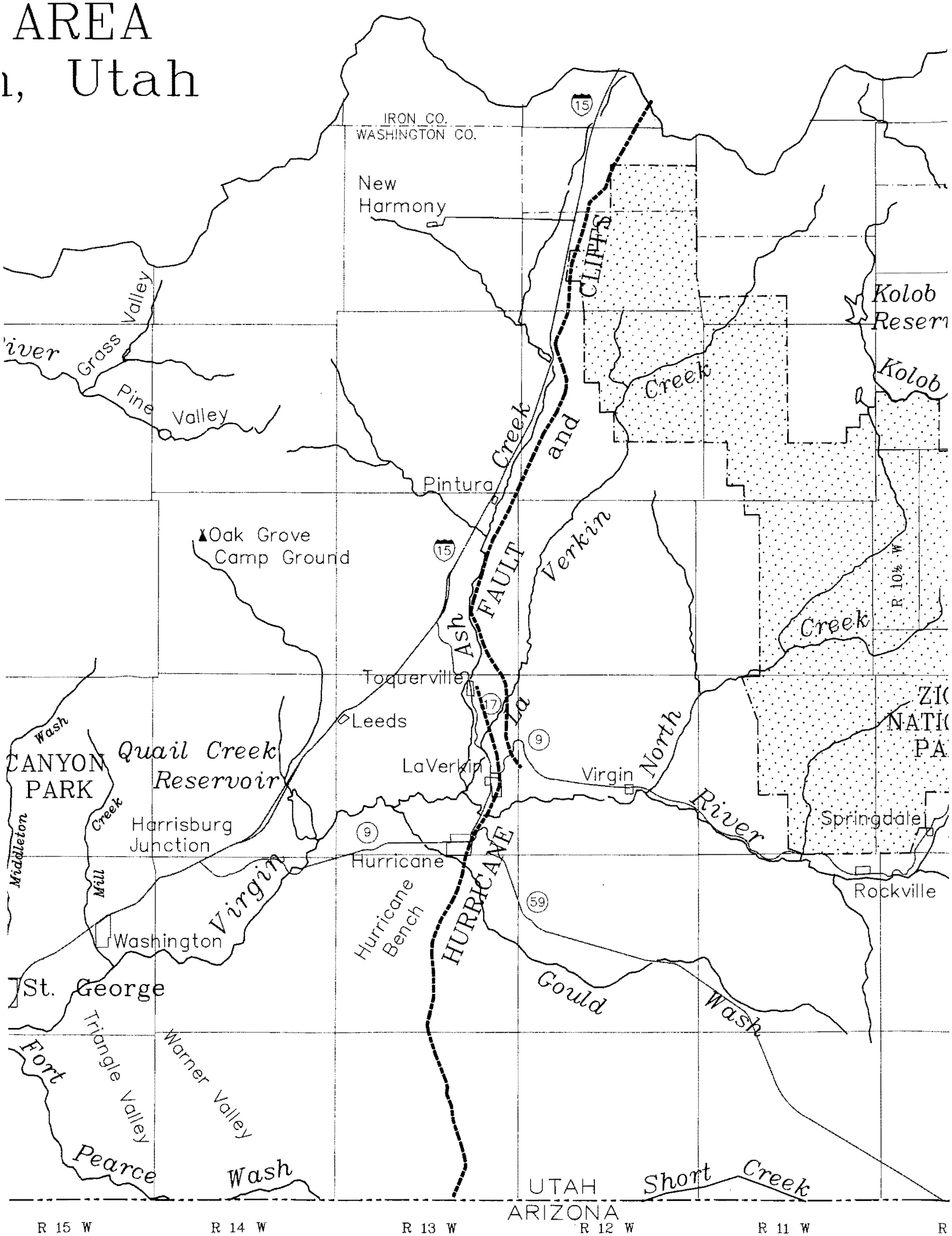
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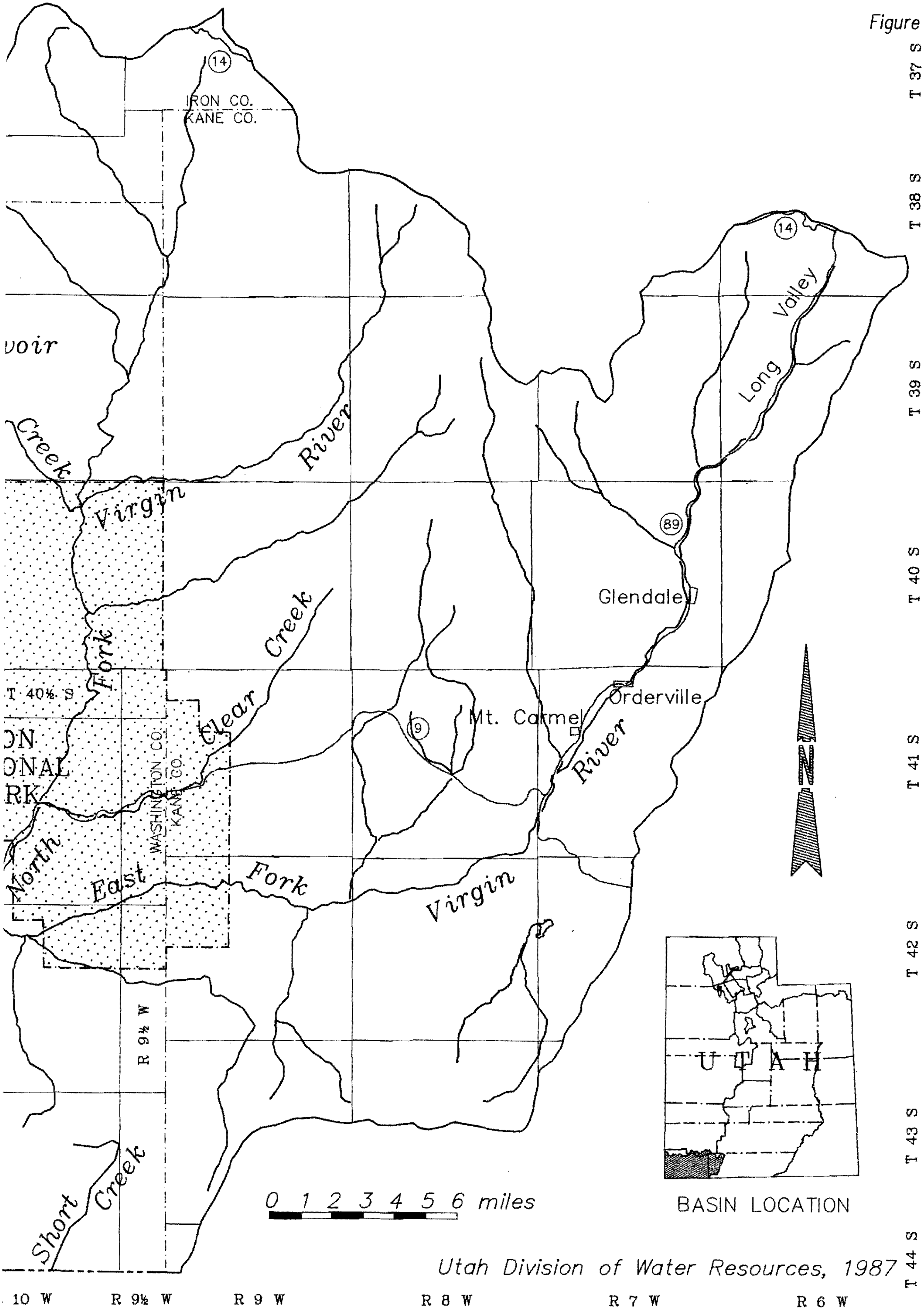
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Utah Division of Water Resources, 1987
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Figure 1

LOCATION AND DESCRIPTION OF THE STUDY AREA

Location

The study area of this report includes parts of Washington, Iron and Kane Counties in Southwestern Utah. About 1000 square miles are in the Central Virgin River Basin drainage area west of the Hurricane Fault and about 1300 square miles are in the Upper Virgin River Basin east of the Hurricane Fault in Figure 1. Not included is the area tributary to the Beaver Dam Wash on the west along the Utah-Nevada border. While well and spring locations and precipitation are reported for this western area, it is omitted from other parts of the study.

The area is not divided into detailed sub-areas for this report. When necessary to identify a region when referring to aquifers, wells and springs approximate locations are identified by drainages or nearby place names as follows:

Central Virgin River

Ash Creek Valley
Bloomington
Diamond Valley - Snow Canyon
Fort Pearce Wash
Gunlock
Hurricane Bench
Leeds - Quail Creek - Harrisburg
Mill Creek - Middleton Wash - City Creek
New Harmony Valley
Pine Valley - Grass Valley
St. George Valley
Santa Clara - Ivins
Triangle Valley - Warner Valley
Virgin River Valley
Washington Valley

Upper Virgin River

Gould Wash - Short Creek
Kolob Creek - North Fork - Clear Creek
LaVerkin Creek - North Creek
Mt. Carmel - Orderville - Glendale
Springdale

Physiography

The Central Virgin River Basin is characterized by gently dipping sedimentary formations capped in the north by igneous intrusions and other volcanics that were subsequently unroofed and eroded leaving the Bull Valley mountains to the northwest and the Pine Valley mountains to the north. Lava flows, cinder cones, and faulting have modified the area and erosion has carved a youthful drainage network with deep canyons, steep escarpments, and high mountains. Altitudes range from 2,400 ft where the Virgin River crosses into Arizona to more than 10,300 ft in the Pine Valley mountains. West of St. George the sedimentary formations are steeply upturned approaching the Beaver Dam mountains which are a strongly faulted and folded range.

The Upper Virgin Basin is characterized by broad sedimentary plateaus and mesas that have been deeply dissected by the Virgin River. Altitudes range from about 3,100 ft where the river flows through the Hurricane cliffs to more than 10,000 ft in the headwaters of the North Fork near Navajo Lake. Local relief is often steep and rugged with 1,000 ft cliffs and escarpments.

Drainage

From headwaters in southern Utah the Virgin River drains out of Utah across the northwest corner of Arizona into the Colorado River at Lake Mead in Nevada. The river and its larger tributaries are perennial, but smaller tributaries, especially to the south are intermittent or ephemeral. Variability of flows in the basin is often extreme. In some areas, especially to the south, occasional floods have cut deeply into the alluvial valley deposits to form impressive washes.

Climate

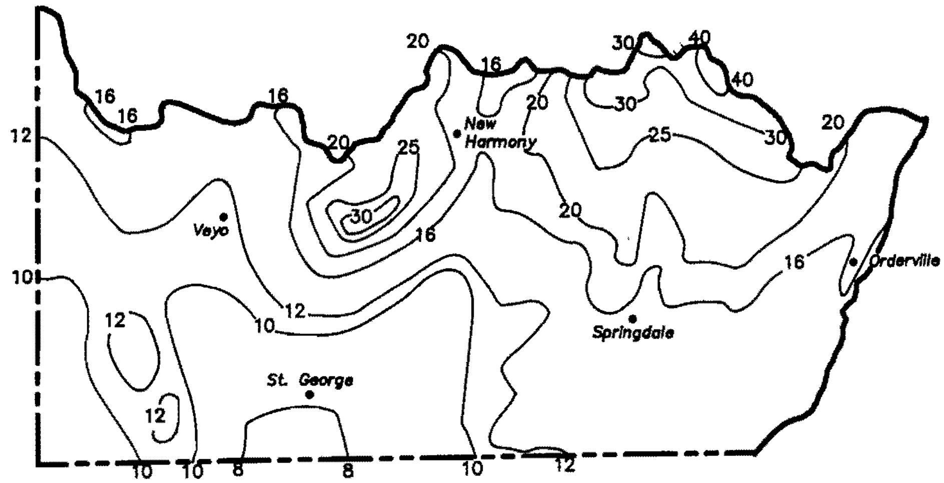
The climate of the study area varies from semiarid in the lower elevations in the south to subhumid in the higher country to the north and east. Summers are typically hot and dry with high evaporation rates and winters are mild in the lower elevations. Winter precipitation comes mostly as snow at higher elevations and as rain at lower altitudes. The snow accumulates during the winter, melts when temperatures rise and normally runs off slowly. While most of the precipitation falls in the winter months, substantial amounts can occur in late summer from torrential storms. The water runs off rapidly and may cause significant erosion. Because of the pattern of precipitation, the wintertime precipitation is the most effective in recharging the groundwater. The annual distributions of winter and summer rainfall are shown in Figures 2a,b,c.

Normal annual precipitation varies from 8 inches south of St. George to 40 inches near Navajo Lake. Wintertime precipitation is 6 to 30 inches and summertime precipitation from 3 to 10 inches.

The mean monthly temperature in the winter is mild and is usually above freezing at low elevations. Summers are hot with mean monthly temperatures above 80°F in July and August. Maximum daily temperatures are often over 100°F. At higher elevations the winters can be cold, but summers are comfortably cool.

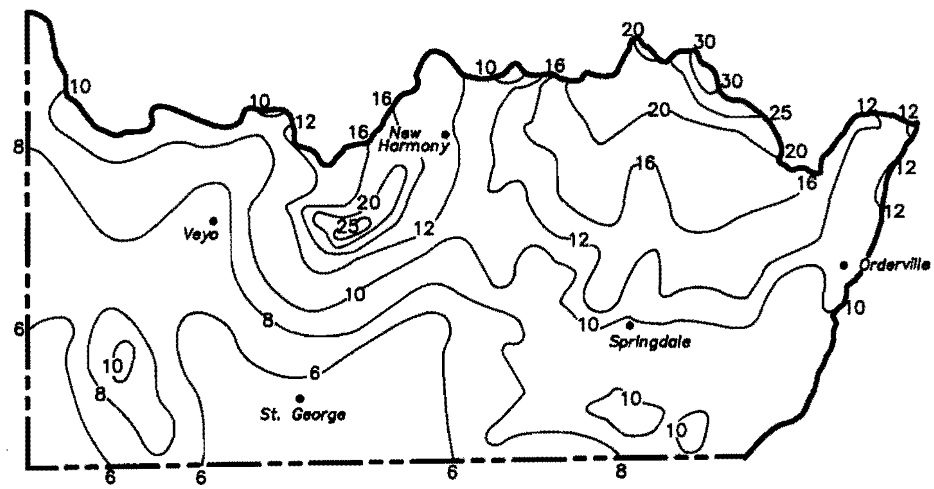
Culture and Economy

Mormon pioneers first settled the region beginning in 1852 at New Harmony. Most of the present communities were settled by 1905. Initially irrigated agriculture provided the economic base, but in recent years tourism, recreation and retirement activities have become important. Many towns have expanded substantially. New planned developments have appeared and many summer and winter home sites in remote areas are being built.



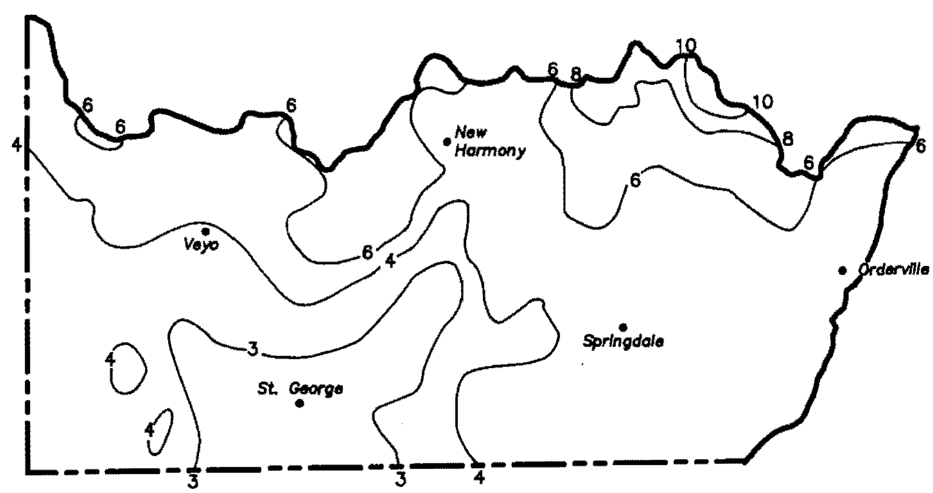
From Utah Natural Resources and Energy, 1983, p.30

Figure 2a. Normal Annual precipitation.



From Utah Natural Resources and Energy, 1983, p.31

Figure 2b. Normal precipitation for October through April.



From Utah Natural Resources and Energy, 1983, p.32

Figure 2c. Normal precipitation for May through September.

GROUNDWATER GEOLOGY

Cook (1957, 1960) has described the geology of Washington County and the Pine Valley mountains in great detail. Cordova (1978, 1981) has summarized the geology of the Central Virgin River and the Upper Virgin River. Their findings are summarized in Table 1 and the written description given here is more in layman's terms than the above reports and is intended to give an overall visual impression of the geology of the area rather than a detailed technical description. Geologic features related to groundwater are emphasized. Major rock units are identified in Table 1 and their thickness, type of material, water yield and water quality are described. The surface contours, drainage network and other important features appear on the geologic map (Figure 3).

Similar to much of the earth's crust, the Virgin River Basin is formed from layered deposits of sedimentary rocks. The oldest (Cambrian) rocks exposed in the study area are in the Beaver Dam mountains. The youngest are recent (Quaternary) alluvial deposits along the Virgin River. Over 19,000 feet of sediment have been identified representing some 500 million years of the earth's history between the oldest and the youngest rocks.

Much of the rock material has been eroded into the spectacular scenery of the area. The deposits have also been broken and displaced along faults and bent and folded at other locations. Finally, igneous rocks have been extruded on the surface (lava flows and cinder cones) or intruded underground.

The major fault systems in the area run north and south and divide the area into distinct zones on Figure 3. On the west is the Gunlock Fault and its southern extension the Cedar Pocket Canyon Fault. In the middle is the Hurricane Fault with its 2000 ft high cliffs separating the Central and Upper Basins. On the east is the Sevier Fault along or near the basin boundary.

An important geologic and hydrologic feature in the area is the Navajo sandstone. This rock layer is up to 2200 feet thick and consists of red and white sandstone. This colorful formation forms the scenic vistas of Zion National Park and because of its water bearing properties is also an important aquifer unit. The Navajo sandstone is exposed in or underlies about three-fourths of the area of the basin.

An effective way to portray aspects of the geology of an area is to draw lines representing the locations of the outcrop of the various layers. The outcrop areas are then colored to clearly show the exposed areas of the rock units as in Figure 3. Besides the <u>pink</u> Navajo sandstone outcrop, one readily sees the <u>purple</u> igneous rocks (recent lava flows and older intrusive rock), the <u>yellow</u> alluvial deposits and dunes, the <u>orange</u> Claron formation and the Wasatch formation, the <u>green</u> sandstone formations above the Navajo and the <u>blue</u> Shinarump conglomerate below. In addition there are other uncolored formations. The fault lines, both major and minor, are also shown on the map as is the surface topography.

Cook (1957, 1960) presents cross-sections running both east and west through the study area. The cross sections illustrate graphically the geology

Table 1. Generalized geology, yields of wells and springs, and chemical quality of groundwater in the Central Virgin River Basin [Geology modified from Cook (1960)].

Yields of wells and springs and chemical quality of water: Small yield is 10 gpm (gallons per minute) or less; moderate yields is more than 10 gpm to 100 gpm; large yield is more than 100 gpm to 1,000 gpm; very large yield is more than 1,000 gpm. Fresh water has a dissolved-solids concentration of less than 1,000 mg/l (milligrams per liter), slightly saline water 1,000 to 3,000 mg/l, and moderately saline water 3,000 to 10,000 mg/l.

Color on Figure 3	Unit	Approximate Maximum Thickness (ft)	Type of Material	Yields of Wells and Springs and Chemical Quality of Water
Purple	Basalt, some pyroclastics	900	Dark flow rock, cinder cones	Yield from basalt locally is large to very large, water is fresh. Yield from pyroclastics is probably small and water probably is fresh
Yellow	Alluvial fans and terraces, channel-fill deposits, and dunes, landslides, talus, and mudflows	Generally less than 200; but in places more than 500	Unconsolidated sedimentary materials from clay to boulders in size	Moderate to very large yields to irrigation wells from alluvial-fan and channel-fill deposits. Small yield from some other deposits locally. Water is fresh to moderately saline.
Orange (partly white)	Undifferentiated sedimentary and igneous rocks confined mainly to Harmony, Bull Valley, and Pine Valley Mountains; includes Claron Formation	9,000	Light to dark intrusive and extrusive igneous rocks, with some limestone, sandstone, siltstone, and conglomerate	Yield is small to large. Water is generally fresh.
Green	Undifferentiated: Includes Kaiparowits Formation, Straight Cliffs Sandstone, Wahweap Sandstone, Tropic Formation, and Dakota (?) Sandstone	4,100	Sandstone, shale, coal, and conglomerate	No well or spring data are available. Yield probably is small to moderate, and water probably is fresh to slightly saline
White	Entrada Sandstone and Carmel Formation undifferentiated	310	Limestone, sandstone, shale, and gypsum	Yield is small to moderate. Water is fresh.
Pink	Navajo Sandstone	2,200	Red and white crossbedded sandstone	Yields moderate to very large quantities of fresh to slightly saline water.
White	Kayenta Formation	740	Red silty sandstone	Yields small quantities of fresh to moderately saline water.
White	Moenave Formation, Chinle Formation (including Shinarump Member), and Moenkopi Formation	3,200	Mainly shale and siltstone; some mudstone and sandstone	Yield small to moderate. Water is fresh to moderately saline.
White	Kaibab Limestome	1,100	Mainly limestone	Few well or spring data are available. Yield probably is small to large. Water probably is fresh, but springs close to the east and southwestern boundaries of the project area yield moderately saline water.
White	Undifferentiated: Includes Toroweap Formation, Supai Formation, Coconimo Sandstone, Callville Limestone, Redwall Limestone, Devonian to Cambrian limestone and dolomite, Pioche Shale, and Prospect Mountain Quartzite	7,400	Mainly limestone, dolomite, and sandstone; some shale and quartzite	No well or spring data are available. Yield probably is small and water probably is fresh.

From Cordova et al. (1972, p. 9).

EXPLANATION

Igneous and Metamorphic Rocks

	Quaternary basalt.
	Tertiary volcanic rocks, undifferentiated.
	Late Tertiary rhyolite–dacite–quartz latite flows.
	Late Tertiary rhyolite–dacite–quartz latite ignimbrites.
	Tertiary porphyritic intrusive rocks.
	Page Ranch Formation *Includes equivalents in the Bull Valley district.*
	Rencher Formation *Mostly rhyolitic ignimbrites.*
	Quichapa Formation *Mostly rhyolitic ignimbrites.*
PЄi	*Precambrian intrusive rock, chiefly granite and pegmatite.*
PЄcr	*Undifferentiated crystalline rocks: schist, gneiss, and granitoid rocks. Vishnu–type terrain. Middle? Precambrian.*

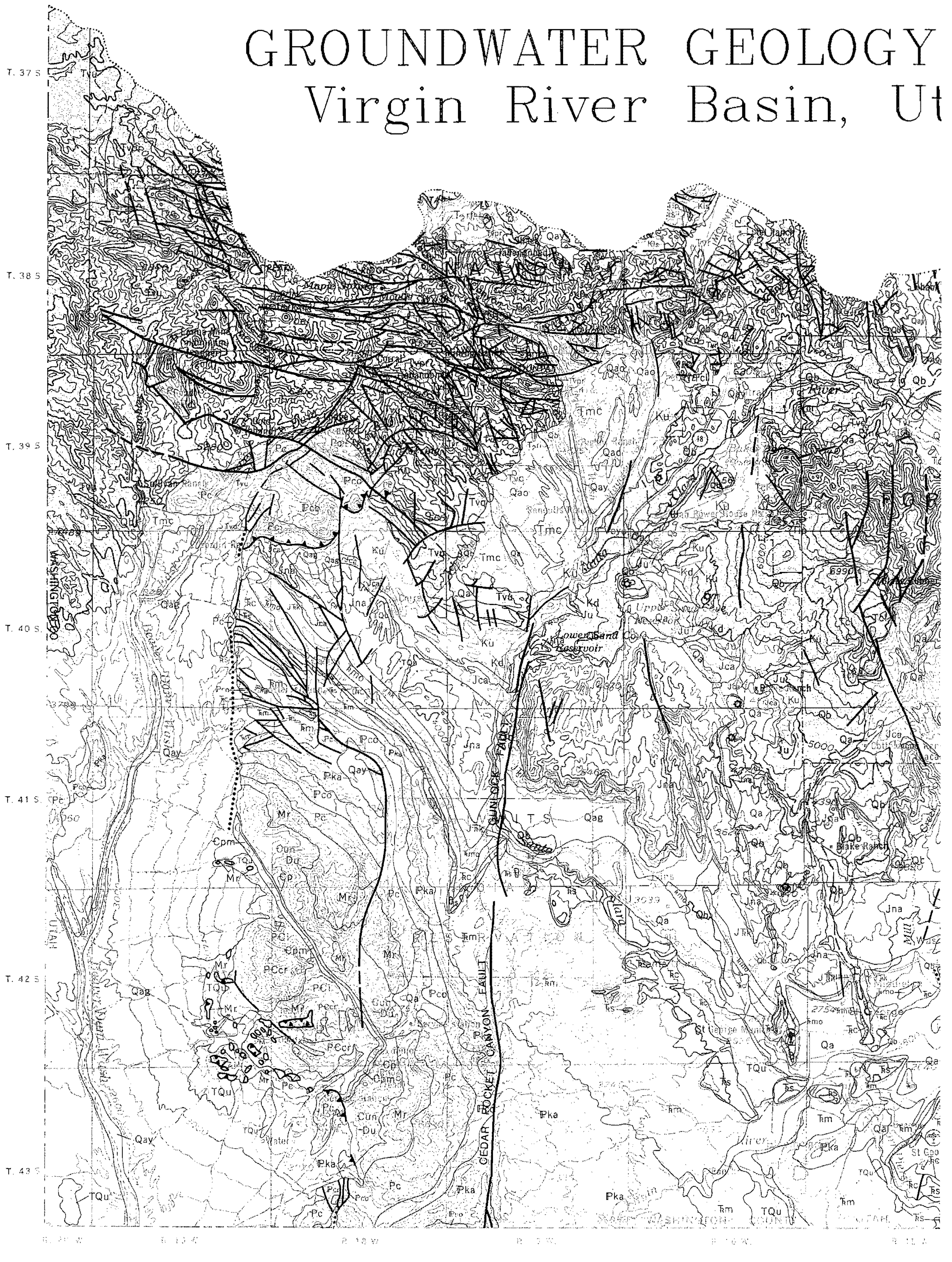
Sedimentary Rocks

QUATERNARY	Qay	*Relatively younger alluvial deposits; chiefly along active streams.*
QUATERNARY	Qao	*Relatively older alluvial deposits; on terraces above active streams.*
QUATERNARY	Qas	*Alluvial surfaces; mostly sloping and well drained with soil profile suitable for crops. Mostly not stony.*
QUATERNARY	Qa	*Undifferentiated alluvium.*
QUATERNARY	Qco	*Miscellaneous covering deposits; including wind blown material, thin soil, and alluvium.*
QUATERNARY	Qag	*Colluvium and alluvium; mostly stony and unfit for agricultural crops.*
QUATERNARY	Qgs	*Gravel surfaces; mainly terraces and pediments undergoing erosion: may not be associated with active streams.*
QUATERNARY	Qls	*Landslides and other surficial masses displaced by gravity.*
QUATERNARY	Qds	*Dunes; siliceous.*
TERTIARY	TQu	*Tertiary and Quaternary deposits and surfaces of uncertain age.*
TERTIARY	Tmc	Muddy Creek Formation *Vari–colored clay, silt, and sand; some evaporites. Miocene?*
TERTIARY		Claron Formation *White and pink limestone, some coarse clastics. "Wasatch" equivalent.*
TERTIARY		Wasatch Formation or Group *Variegated continental sediments ranging from limestone to coarse conglomerate. Paleocene and Eocene.*
CRETACEOUS	Ku	Cretaceous undivided *Sandstone and sandy shale.*
CRETACEOUS		Kaiparowits Formation *Sandstone and sandy shale.*
CRETACEOUS		Wahweap and Straight Cliffs Sandstones undivided
CRETACEOUS		Wahweap Sandstone *Yellowish–gray massive sandstone, minor shale.*
CRETACEOUS		Straight Cliffs Sandstone *Chiefly massive sandstone, coal bearing.*
CRETACEOUS	Ktr	Tropic Shale *Gray marine shale and sandstone with coal.*
CRETACEOUS	Kis	Iron Springs Formation *Coarse sandstone, grit, and conglomerate in very lenticular beds. Local in Iron Springs district and vicinity.*
CRETACEOUS	Kdt	Dakota and Tropic Formations undivided
CRETACEOUS	Kd	Dakota Sandstone *Thin beds of conglomerate, sandstone, shale, and coal.*
JURASSIC	Ju	Jurassic undivided *Includes "Entrada" sandstone of southwest Utah and other Jurassic rocks of uncertain assignment, mostly San Rafael Group equivalents.*
JURASSIC	Jw	Winsor Formation *Gray to red continental sandstone and siltstone.*
JURASSIC	Jca	Carmel Formation *Marine gypsum, limestone, shale, and sandstone. Middle and Upper Jurassic.*
JURASSIC	Jna	Navajo Sandstone *Cross–bedded, eolian sandstone.*
JURASSIC	JŦk	Kayenta Formation *Reddish fluvial and eolian sandstone.*
TRIASSIC	Ŧmo	Moenave Formation *Sandstone, siltstone, and shale; consists of the cliff–forming Springdale Sandstone Member, above, and the Dinosaur Canyon Member, below.*
TRIASSIC	Ŧc	Chinle Formation or Group *Variegated continental shale, silt and sandstone.*
TRIASSIC	Ŧs	Shinarump Conglomerate *Conglomerate, grit and sandstone, cliff–former. Middle and Upper Triassic.*
TRIASSIC	Ŧm	Moenkopi Formation or Group *Siltstone and sandstone, usually red. Lower Triassic.*
PALEOZOIC	Pko	Kaibab Limestone *Light–colored, cherty limestone, dolomite and evaporites. Includes Toroweap in Beaver Dam Mountains and Hurricane Cliffs.*
PALEOZOIC	Pco	Coconino Sandstone *Light–colored, cross–bedded, non–marine sandstone. May include Supai equivalents, (Queantoweap).*
PALEOZOIC	Pc	Callville Limestone *Thick–bedded, cliff–forming limestone with silty limestone near base. Includes Pakoon locally. Pennsylvanian.*
PALEOZOIC	Mr	Redwall Limestone *Gray limestone with brown to red bedded chert. Lower Mississippian.*
PALEOZOIC	Єun	Cambrian undivided *Chiefly limestone. Includes thin Ordovician? and Devonian in Beaver Dam Range.*
PALEOZOIC	Єp	Pioche Formation *Interbedded green and brown phyllitic shale and quartzite.*
PALEOZOIC	Єpm	Prospect Mountain Quartzite *Mostly brownish–red quartzite.*

Note: The principal water–bearing formations (aquifers) are shown in color.

Adapted from Hintze, 1963

GROUNDWATER GEOLOGY
Virgin River Basin, Ut



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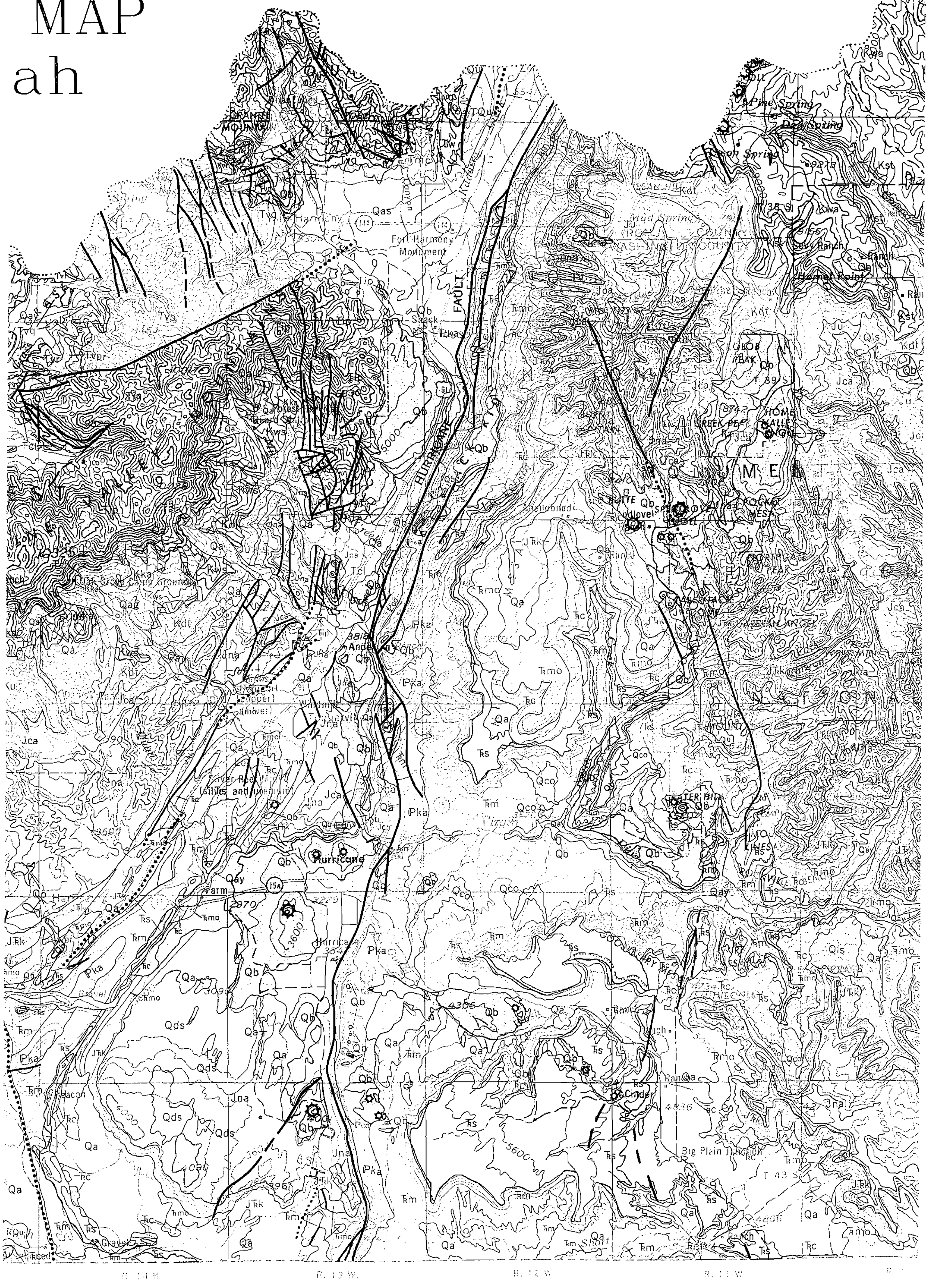
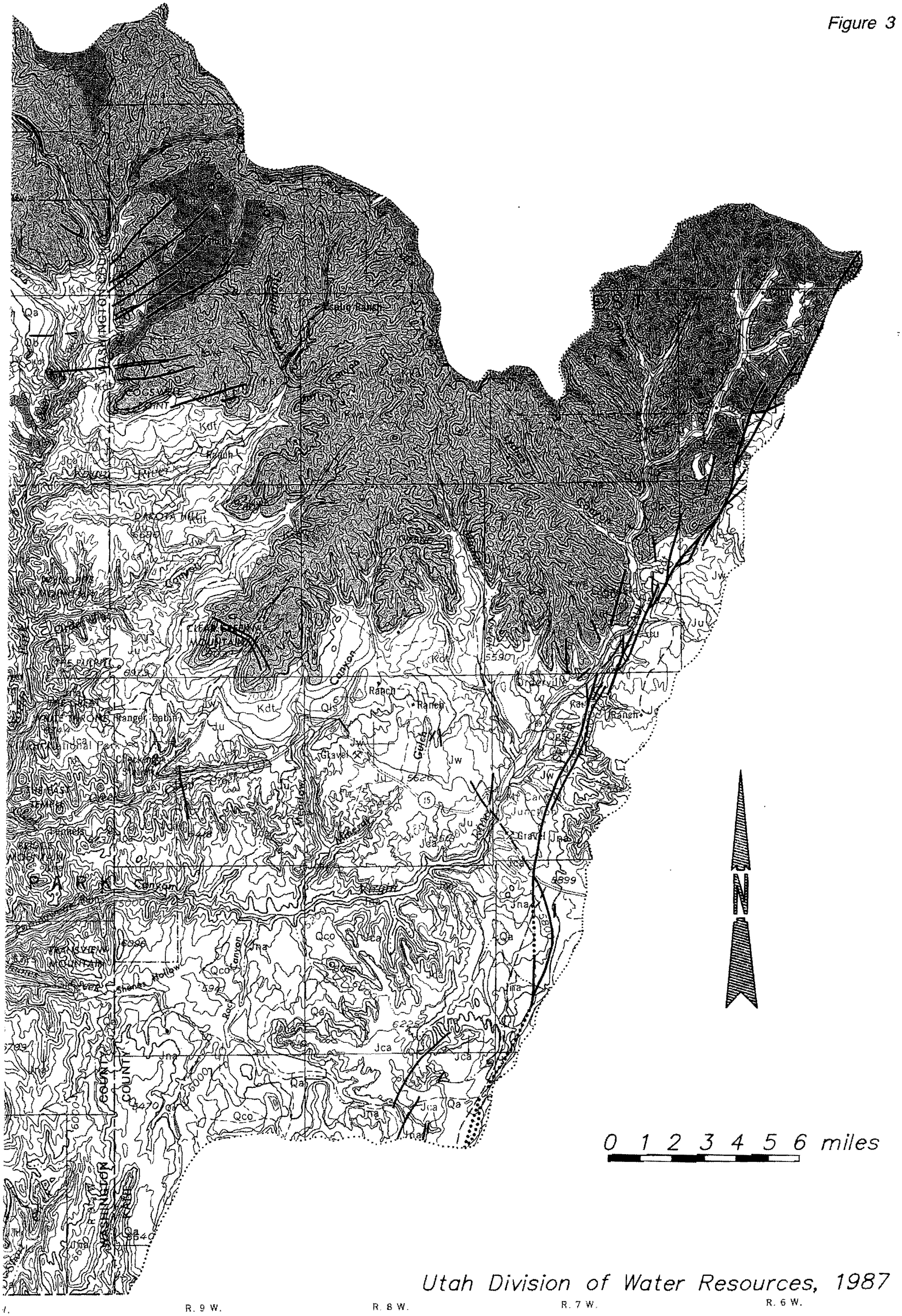


Fort Harmony Monument
HURRICANE FAULT
Hurricane
Mud Spring
Pine Spring
Kolob Peak
Big Plain Junction
R. 14 W.
R. 13 W.
R. 12 W.
R. 11 W.
T 43 S

Figure 3



Utah Division of Water Resources, 1987

and the groundwater aquifers. The Navajo sandstone and other sedimentary units have a distinctive saucer shape in the Central Virgin River Basin. The main part of the saucer is horizontal and is deeply buried beneath the volcanics of the Pine Valley mountains to the north and west. The edge of the aquifer saucer is exposed along an arc from Pintura to Washington to St. George to Ivins to Shivwits. The lip of the saucer is at 4400 ft, 2850 ft, 2900 ft, 3770 ft and 3400 ft at the locations above. The Chinle and other shale beds form less permeable floors to the sandstone aquifers. Because the Kayenta formation beneath the Navajo aquifer unit is less pervious, the natural escape for water in the aquifer is by flow over the lip into springs and seeps or underground flow. If the water level near the outcrop drops below the lip of the saucer, the water cannot escape as it could if the aquifer were horizontal and flat.

Overlying the Navajo sandstone is the Carmel formation (not colored on Figure 3) and other sedimentary units. The intrusive igneous rock which forms the Pine Valley mountains was implaced against the top of the Claron formation. Later erosion removed the covering of the intrusive rock and sculpted the mountains visible today.

In recent geologic times, lava flows (purple on Figure 3) covered large areas from Pine Valley and Central downhill as far as St. George. Cinder cones such as those near Veyo and Diamond Valley appeared at that time.

Along Ash Creek and the Virgin River downstream from Hurricane the Navajo sandstone has been eroded away, but southeast of Washington the rock bedding dips downward after arching over the Virgin anticline and the Navajo sandstone outcrops again in a large area.

East of the Hurricane Fault the Navajo sandstone structure is more flat than saucer shaped. It is also raised up rather than buried and has been subjected to erosion in the Zion National Park area. South of the Virgin River the sandstone tilts upwards at a low angle as it goes south towards Arizona.

Extensive unconsolidated alluvial deposits (yellow on Figure 3) have accumulated in some areas of the basin such as New Harmony Valley, Pine Valley, Gould Wash, Santa Clara Valley, the Virgin River Valley and the area southeast of St. George. These unconsolidated materials form the largest producing aquifer of the basin although it has less water in storage than the Navajo aquifer system. The alluvial aquifers produce water that is fresh to moderately saline while the Navajo sandstone is fresh to slightly saline.

GROUNDWATER RESOURCES

General Occurrence of Groundwater

Groundwater in usable quantities occurs in the Virgin River Basin in both consolidated and unconsolidated rock formations. The unconsolidated aquifers are composed of alluvial deposits in many locations in the basin. Consolidated rock formations underlie the unconsolidated material. Depending on the local conditions, water can move either from the consolidated rock into the alluvium or from the alluvium into the rock. Perched groundwater aquifers also occur in places where impervious underlying strata retain the groundwater above. The water may later flow over the edge of the perching layer and find its way down to other lower aquifers.

Water in the consolidated aquifers is present in the intergranular space of the rock (primary porosity) such as sandstone, in cracks, and in solution channels and tubes in soluble rock such as limestone. Aquifers may be either confined or unconfined. Confined aquifers occur where impervious layers overlie aquifers. Confined aquifers can occur either in consolidated rock or unconsolidated material. In either case the piezometric or pressure surface of the water may be well above the aquifer top. Confining layers may be quite tight or may be semi-pervious and leaky.

Consolidated Rock Aquifers

The Navajo sandstone usually contains large amounts of groundwater. Other consolidated formations which are sufficiently permeable and contain water in recoverable quantities are the Claron (Wasatch) formation, the Straight Cliffs and Wahweap sandstones, the Carmel, Kayenta, Moenave, Chinle, and Moenkopi formations and the Kaibab limestone, see Tables 2 and A-1.

Where streams are deeply incised into water bearing rock, the groundwater flows out either directly into the stream or into alluvial material along the watercourse and thence into the stream. Such streams are "gaining" streams and are found in many parts of the Virgin River Basin. Local outflow into the drainage system may also be affected by impervious layers in the rock and fractures that divert the flow. Zion National Park is typical of these areas.

At other locations the drainage network may not have cut so deeply into a rock aquifer. If the groundwater level in such an outcrop zone is below the stream bed, then water percolates into the aquifer from the "losing" stream. The Mill Creek drainage above Washington typifies such areas of the Navajo sandstone aquifer.

Alluvial Aquifers

Alluvial aquifers occur along all the major drainages where streams have deposited loose unconsolidated material to depths from near zero to over 200 ft. Where these narrow valley fill (watercourse) aquifers occur along gaining streams, the water table is usually high and groundwater is easily recovered through shallow wells. Surface water in such streams is closely connected to the groundwater and wells pumped near the stream will first reduce natural

Table 2. Typical reported aquifer properties in the Virgin River Basin.

Aquifer, Location and Comments	Porosity η (percent)	Transmis-sivity T (ft^2/day) [From Pump Tests]	Conductivity K (ft/day) [Horizontal, from Labora-tory Tests]	Conductivity K (ft/day) [From Pump Test]	Storage Coefficient S (dimensionless) a : confined y : unconfined t : aquifer test
Central Basin					
Unconsolidated					
Anderson Jct.					0.25 y
Fort Pearce Wash				270	0.20 y
Leeds				45	0.25 y
New Harmony No.				200	0.0004 a, 0.30 y
New Harmony So.				35	0.0001 a, 0.30 y
Pine Valley					0.30 y
Santa Clara R. Valley				200	0.001 a, 0.20 y
Washington Fields				240	0.20 y
Consolidated					
Gunlock (Navajo)				20	0.003 a, 0.30 y
Hurricane (Navajo)				15	0.003 a, 0.30 y
St. George (Kayenta)				1	0.006 a
Triangle Valley (Chinle)				3	0.006 a
Triangle Valley (Chinle)				25	0.006 a
Washington Fields (Shinarump Member)				100	0.003 a
Navajo (Neutron Logs)	32				
Navajo (Rock Samples)	17		2.1 (Average)		
Navajo (Aquifer Tests)					
Gunlock		5,300		6.1	0.04 t
Mill Creek T.1		5,000		5.0	-
Mill Creek T.2		2,400		3.4	-
Mill Creek T.3		5,000		5.0	0.04 t
Hurricane Bench		2,700		5.2	0.04 t
Leeds					0.04 t
Upper Basin					
Navajo (Rock Samples)	24			5.0	
Kanab Basin					
Navajo (Aquifer Tests)		7,300			0.0016 t

Data are from Cordova (1972, 1978, 1981).

seepage and then may reverse the natural gradient and induce recharge from the river to the groundwater reservoir. These aquifers are found as follows: in the upper Virgin River Basin along the East Fork north of Mt. Carmel Junction, along the North Fork near Springdale, along Clear Creek above Zion National Park, and the Virgin River from Rockville to Virgin; in the Central Virgin River Basin along Ash Creek, the Virgin River Valley from LaVerkin to below Bloomington, and all the Santa Clara River below Gunlock.

In addition to the narrow valley fill aquifers there are more extensive and deeper (up to 500 ft) alluvial aquifers in the basin such as: Kolob Creek near Kolob Reservoir, Gould Wash, Short Creek, Fort Pearce Wash, New Harmony Valley, Oak Grove Basin, Hurricane Bench, Washington Valley, Triangle Valley, St. George Fields, Pine Valley and Grass Valley, the area near Central, Diamond Valley and Dameron Valley, and the Santa Clara Bench. Groundwater resources in some of the deposits are extensive but may be of lower quality in some localities. Streams in these more extensive alluvial aquifers can also be either gaining or losing streams depending on whether the water table is above or below the stream bed.

Aquifer Properties

Besides information about the location, areal extent, and thickness of aquifers, a knowledge of particular properties of aquifers is useful in understanding the storage, movement and release of water. The hydraulic properties of interest are porosity, hydraulic conductivity, transmissivity and storage coefficient.

Porosity (η) is the volume of voids divided by the total sample volume, often expressed as a percent. Porosity may be due to primary void space between particles or secondary void space in joints and cracks.

The hydraulic conductivity (K) is the volume of water that will move through a unit cross-section of the material in unit time under a unit hydraulic gradient. Thus the units are cubic feet per day per square foot or simply feet per day. It is not a true velocity of travel but rather a flux or Darcy velocity through a unit area. However, if this flux is divided by the porosity, the resulting velocity is a mean seepage velocity through the formation.

The transmissivity (T) is the product of hydraulic conductivity and aquifer thickness and has units of feet squared per day.

The storage coefficient (S) of an aquifer is the volume of water released from (or taken into) storage per unit surface area per unit change of head. S is usually small (0.001 to 0.00001) for confined conditions and large (0.05 to 0.30) for unconfined conditions. When water is pumped from an unconfined aquifer with a large storage coefficient, the aquifer is dewatered and large amounts may have to be pumped to greatly affect water levels. With a confined aquifer, however, since the storage coefficient is small, a little pumping may have a large effect on the piezometric surface. This is so because the aquifer is not actually dewatered. The stored water comes from expansion of the water as it flows up and out of the well and from compression of the aquifer structure as the pressure is decreased by pumping.

Typical aquifer properties reported by Cordova (1972, 1978, and 1981) and by others are given in Table 2. The values of storage coefficient, S=0.04, reported for the Navajo aquifer by Cordova (1978) were obtained from unconfined pumping tests of 4 to 28 days duration. This may be too short a time for all the stored water to drain out of the drawdown cone of the well. If this is the case, then the storage coefficient could actually be larger than the reported values and closer to the reported porosity values.

Wells in the Virgin River Basin

The best indicators of the extent, location and amount of groundwater development are the existing wells in the basin. The map of Figure 4 shows the wells in the Virgin River Basin in Utah. It was prepared from data furnished by the Division of Water Rights from their computerized files on wells. The procedure to prepare Figure 4 is as follows:

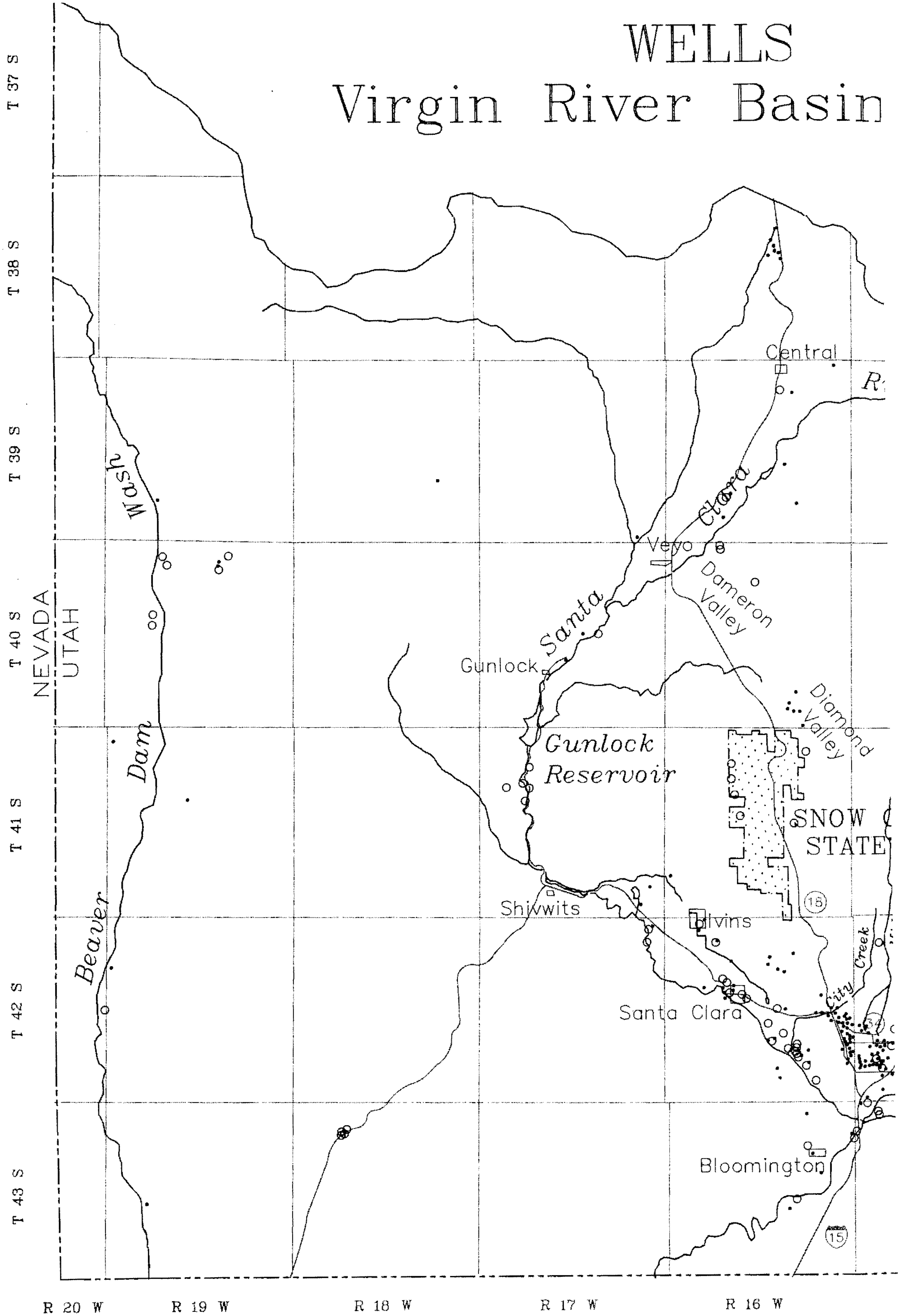
The Water Rights files are organized according to Water Rights (WR) numbers by geographical areas and the current status of each application is recorded, from the time the application is filed for a well, through approval, to proof of diversion, to the issuance of a certificate for the water right. Each file shows the pertinent data on the water right including location, size, discharge rate, owner, priority date, etc. Unfortunately the files do not contain current information on whether wells have been abandoned or destroyed.

A list (with over 950 files) was first created by WR number of all wells with either a valid certificate or an approved application which grants the applicant permission to drill a well. This was believed to give the most accurate listing of current wells even though it is realized that some wells with certificates may have been abandoned and some approved wells may not yet be constructed. Especially in areas previously farmed that are now covered by housing near Washington, St. George and Santa Clara, many wells have been abandonded. Other wells may be used infrequently or are pumped at a rate smaller than that shown in the water right.

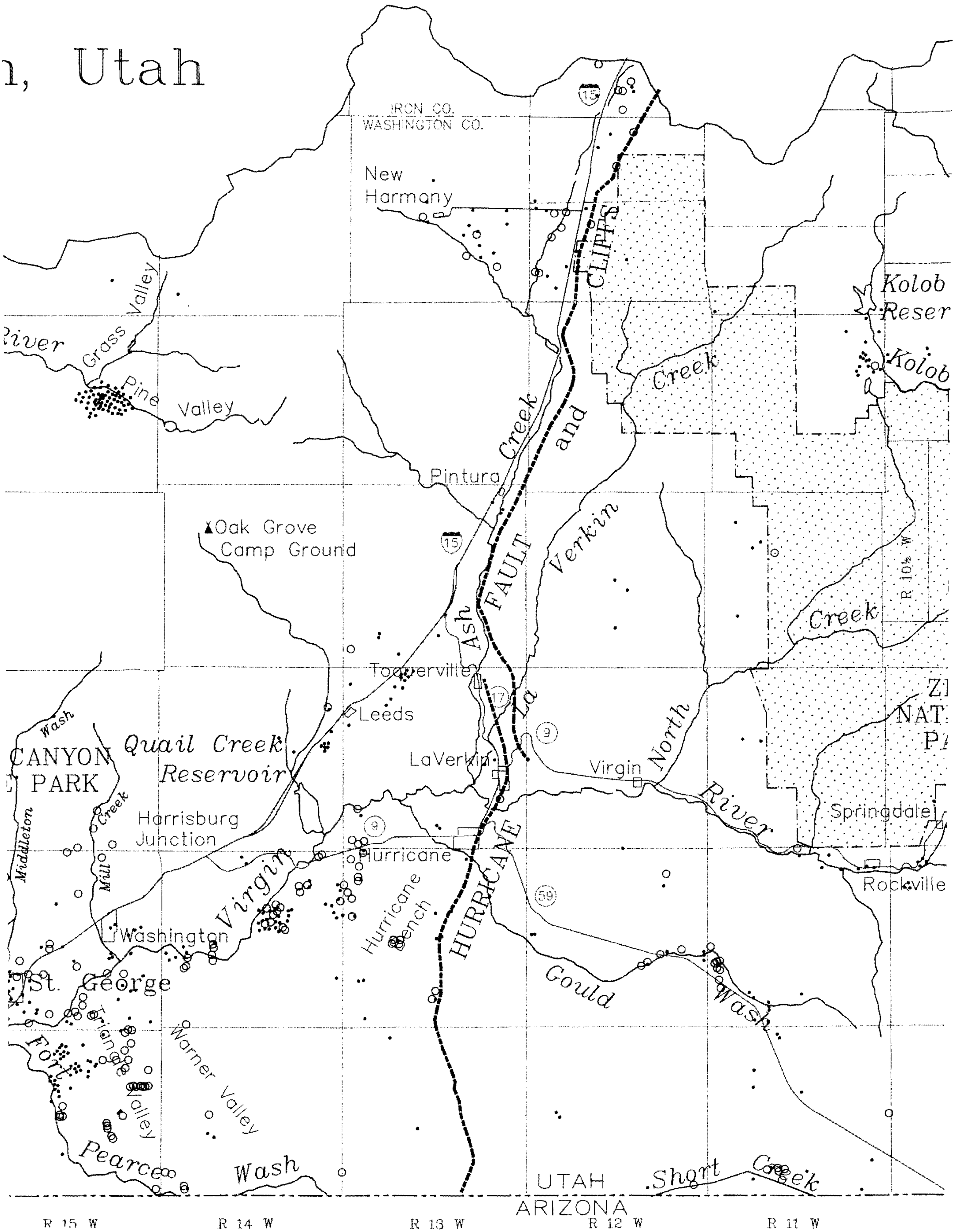
A program was written to compute from the listed location data the USGS well location number for each well (see Figure A-30 for explanation of the numbering system). It was observed that a well might have several appurtenant WR numbers or a WR might cover more than one more well. The entire list was then examined and entries were combined on the basis of wells, that is, all WR's in the same well were combined together and the flow in WR's with multiple well locations were divided among the wells.

The above procedure yielded a list of almost 700 wells with water rights in the basin whose locations were unique. This list was then sorted by size, i.e., wells with discharge rates equal to or greater than 0.5 cfs and less than 0.5 cfs. These data were then plotted by machine according to the location in each township. This gave the map of Figure 4.

The location and amount of groundwater development are quickly recognized from this figure and clearly show where man is causing a noticeable impact on the groundwater resource by withdrawal of water from wells. Many of the previously mentioned groundwater aquifers are recognized in the pattern of well locations. Since most wells are constructed as near as possible to the

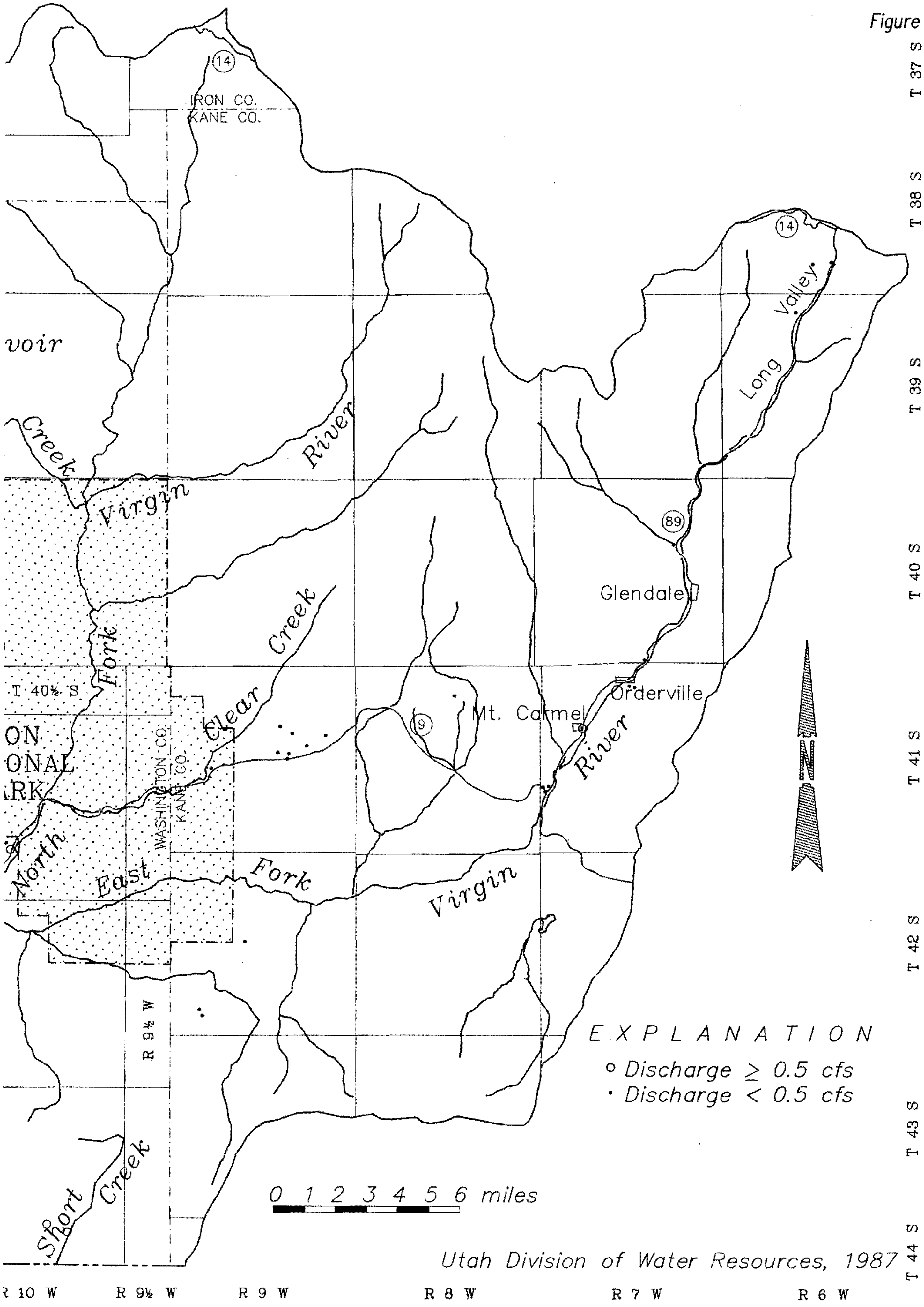

WELLS
Virgin River Basin
T 37 S
T 38 S
T 39 S
T 40 S
T 41 S
T 42 S
T 43 S
NEVADA
UTAH
Beaver Dam Wash
Central
Santa Clara
Veyo
Dameron Valley
Gunlock
Gunlock Reservoir
Diamond Valley
Shivwits
Ivins
City Creek
Santa Clara
Bloomington
15
R 20 W
R 19 W
R 18 W
R 17 W
R 16 W

, Utah



IRON CO.
WASHINGTON CO.
15
New Harmony
CLIFFS
and
FAULT
HURRICANE
Kolob Reser
Kolob
Creek
River
Grass Valley
Pine Valley
Pintura
Ash Creek
Oak Grove Camp Ground
Verkin
La
R 10½ W
Toquerville
Leeds
17
9
Quail Creek Reservoir
CANYON PARK
Wash
Middleton
Mill Creek
Harrisburg Junction
LaVerkin
Virgin
North
River
Springdale
Rockville
Hurricane
Hurricane Bench
59
Virgin
Washington
St. George
Gould
Wash
Fort
Pearce
Wash
Warner Valley
Valley
UTAH
ARIZONA
Short Creek
R 15 W
R 14 W
R 13 W
R 12 W
R 11 W

Figure 4



14
IRON CO.
KANE CO.
voir
Creek
River
Virgin
Fork
Clear
Creek
T 40½ S
ON
ONAL
ARK
WASHINGTON CO.
KANE CO.
North
East
Fork
Virgin
9
Mt. Carmel
River
Orderville
Glendale
89
Long
Valley
14
N
EXPLANATION
o Discharge ≥ 0.5 cfs
• Discharge < 0.5 cfs
0 1 2 3 4 5 6 miles
R 9½ W
Short
Creek
Utah Division of Water Resources, 1987
T 37 S
T 38 S
T 39 S
T 40 S
T 41 S
T 42 S
T 43 S
T 44 S
R 10 W
R 9½ W
R 9 W
R 8 W
R 7 W
R 6 W

point of use, Figure 4 indicates where groundwater from wells is used in the basin. The exception to this is the municipal wells whose water is often transported some distance for use.

Springs in the Virgin River Basin

Other natural indicators of groundwater resources are the locations of springs in the basin. Springs occur when some hydrogeologic phenomena forces the water in the ground to the surface. Springs are classified by Fetter (1980) according to their causes as depression springs, contact springs, fault springs, sinkhole springs, joint springs, and fracture springs. A further description of the types of springs found in the Virgin River Basin is given by Goode (1964, 1966). Springs may vary from a barely perceptible flow to hundreds of cubic feet per second (cfs).

Toquerville Springs

In the Virgin River Basin the largest spring is Toquerville spring. The upper Toquerville spring flow has been measured over 21.7 cfs. With the lower springs added, flows have exceeded 30 cfs at times, but base flow is somewhat less. The water quality of Toquerville Springs is excellent. The total dissolved solids (TDS) are typically about 460 mg/l.

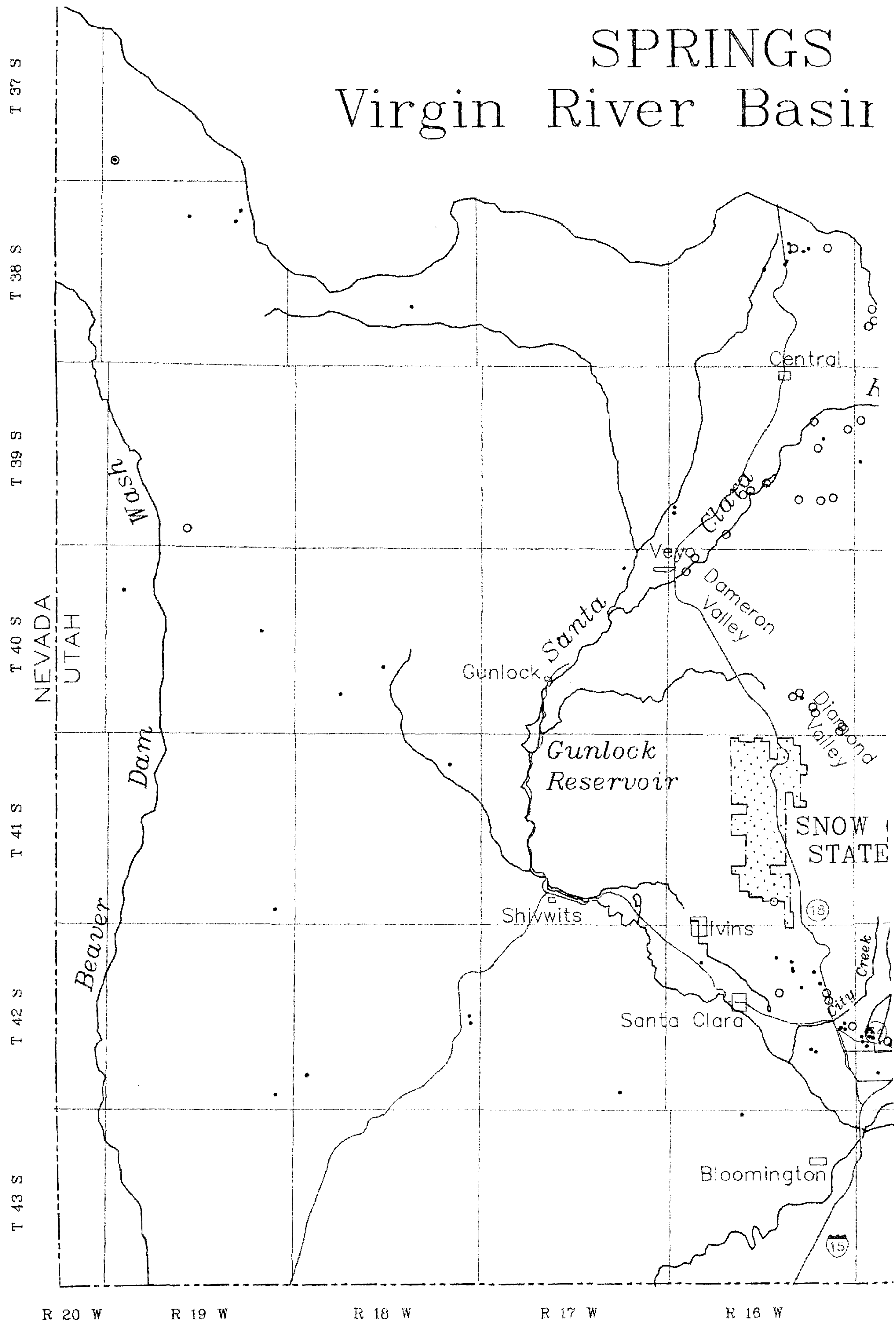
Several studies have been made on the relationship between seepage from Ash Creek Reservoir and flow from Toquerville Springs. Mower (1982) provides a summary of the hydrogeology of the area and the past dye studies. He reports that there is no conclusive evidence that dye from any of the five injection tests reached any of the monitoring stations. Nevertheless, Mower concluded from hydrologic studies that some of the seepage losses from Ash Creek Reservoir reappear in Toquerville Springs. He estimates that during 1972-81 the average increase in the discharge rate of Toquerville Springs attributable to seepage from Ash Creek Reservoir exceeded 5 cubic feet per second.

LaVerkin Springs

LaVerkin Hot Springs are also noteworthy because of the large amount of dissolved salts they release into the Virgin River. These springs in the bed of the Virgin River just east of the Hurricane Fault discharge more than 11 cfs with TDS exceeding 9,000 mg/l. In connection with early studies of the proposed Dixie Project, the U.S. Bureau of Reclamation studied the hydrology of the LaVerkin Springs. A decade of studies concentrated on various options for removing the contaminating effects of the springs. The Bureau proposed to collect the mineral rich water by pumping and transporting it out of the area for evaporation or desaltation. During the studies, it was determined that a large network of wells would be required and it would be very costly (U.S. Bureau of Reclamation 1974). Specific results of these studies are briefly summarized by the Utah Division of Water Resources (1986).

Spring Locations

By using the files of the Division of Water Rights and a procedure similar to that already described for the wells, Figure 5 was prepared to show the location of the 800 large and small springs in the basin.



SPRINGS
Virgin River Basi
T 37 S
T 38 S
T 39 S
T 40 S
T 41 S
T 42 S
T 43 S
NEVADA
UTAH
Beaver Dam Wash
Central
Santa Clara
Veyo
Dameron Valley
Gunlock
Diamond Valley
Gunlock Reservoir
SNOW
STATE
Shivwits
Ivins
18
City Creek
Santa Clara
Bloomington
15
R 20 W
R 19 W
R 18 W
R 17 W
R 16 W

ı, Utah

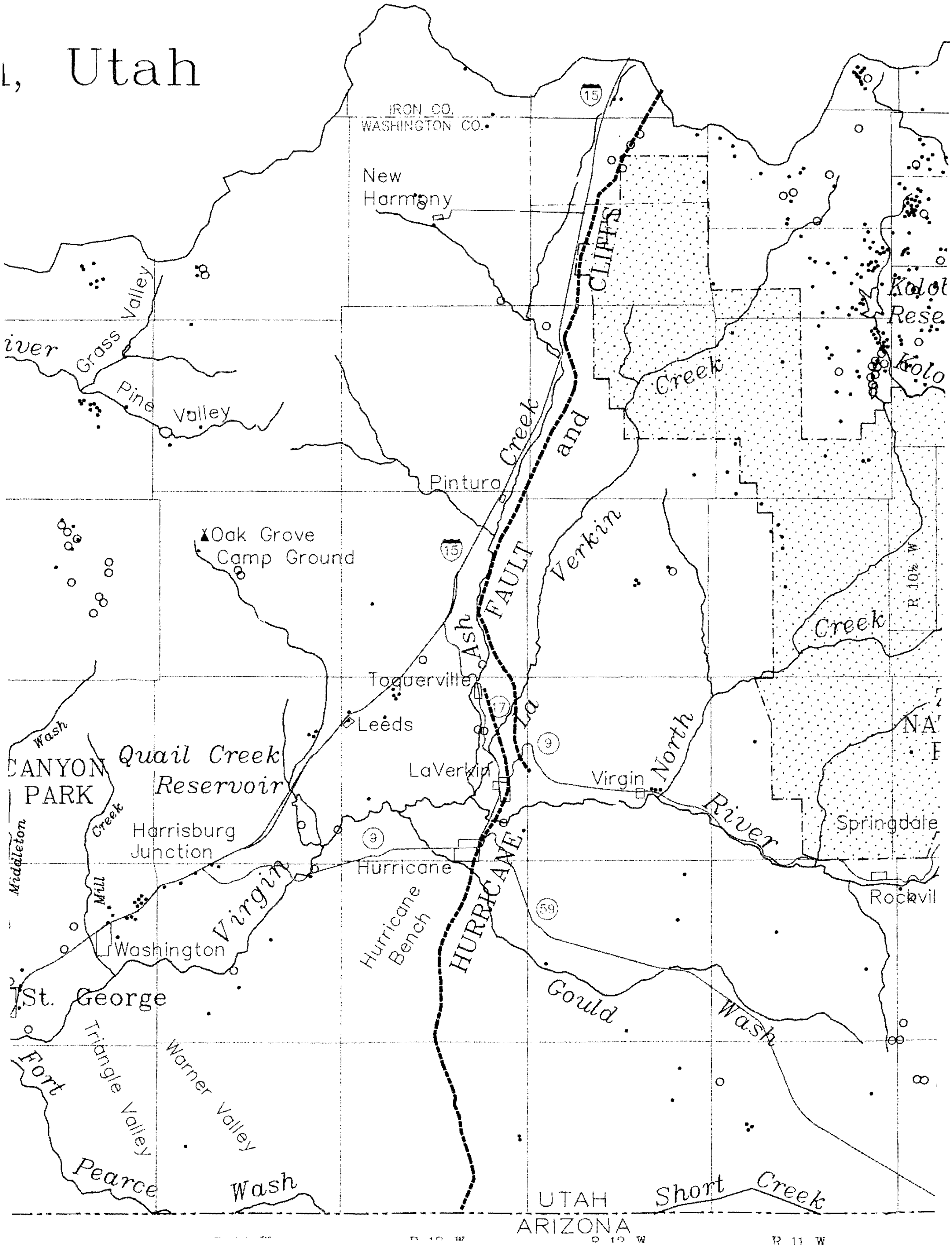
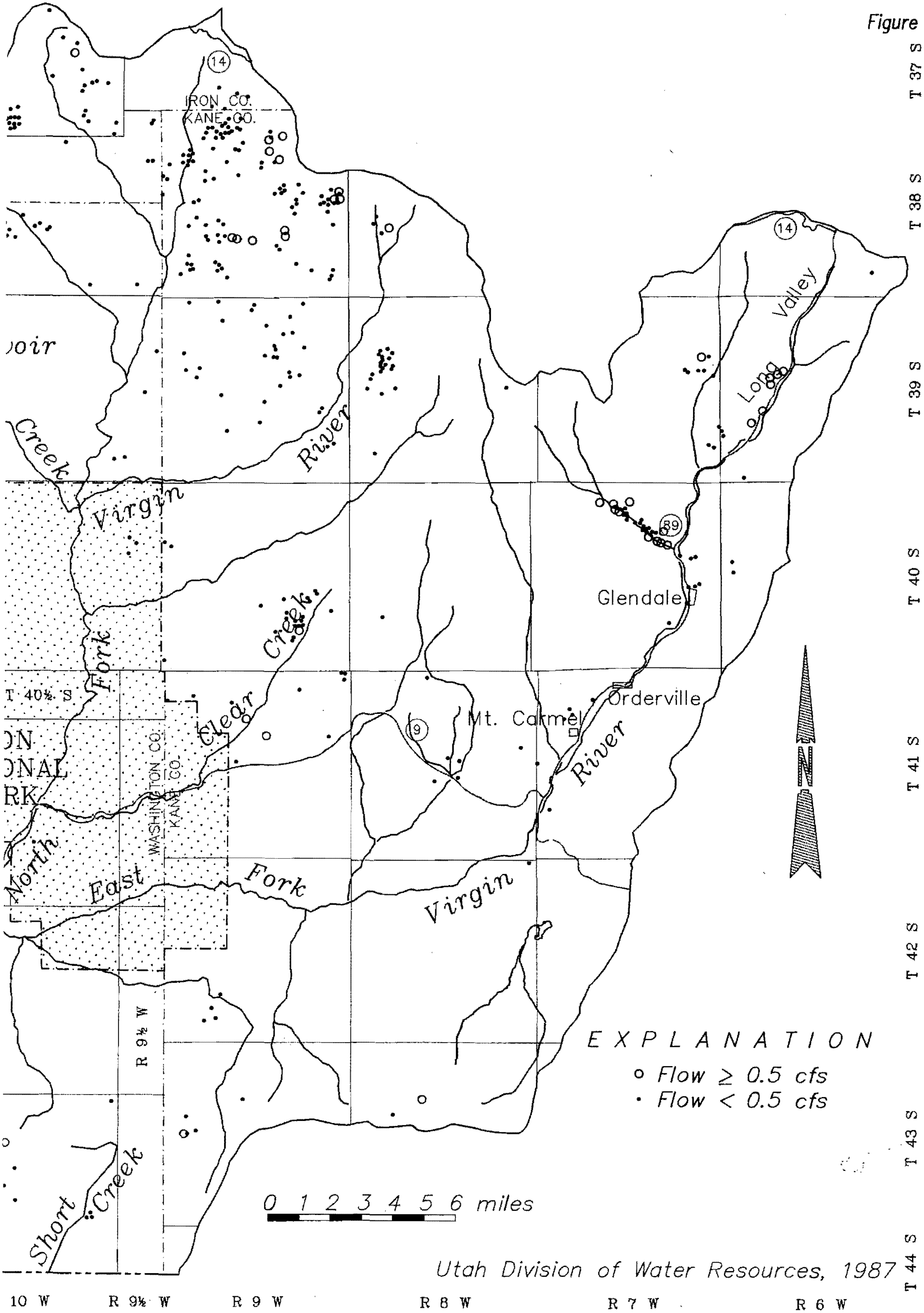

IRON CO.
WASHINGTON CO.
15
New Harmony
CLIFFS
and
Creek
Kolob Reservoir
Kolob
Grass Valley
River
Pine Valley
Ash Creek
Pintura
Oak Grove Camp Ground
15
FAULT
La Verkin
R. 10½ W.
Creek
Toquerville
17
Leeds
La
9
Wash
CANYON PARK
Quail Creek Reservoir
LaVerkin
Virgin
North
River
Creek
Harrisburg Junction
9
HURRICANE
Springdale
Middleton
Hurricane
Mill
Virgin
Hurricane Bench
59
Rockvil
Washington
HURRICANE
St. George
Gould
Wash
Fort
Triangle Valley
Warner Valley
Pearce
Wash
UTAH
Short
Creek
ARIZONA
R. 12 W.
R. 11 W.

Figure 5



Utah Division of Water Resources, 1987

The difference in the location of wells and springs in the basin is easily seen from Figures 4 and 5. While the wells show where groundwater is available by pumping, the springs show where groundwater flows to the surface naturally. Most wells are at lower elevations near settled areas and farmland where good aquifers are found. Most springs are located at higher elevations in steeper terrain and are often remote from extensive farmland. Many springs are fed by perched aquifers which have not been exploited by wells. In some areas the wells and springs are found together and clearly draw from the same source, for example, the springs and wells near the edge or lip of the Navajo sandstone near St. George and also in Pine Valley.

Groundwater Levels

An important indicator of changes occurring in aquifers are measurements of the water levels in wells. Those wells perforated in an unconfined zone show the elevation of the water table. If the water in a well penetrating a confined aquifer rises higher than the top of the aquifer, then the aquifer is under pressure and the water level indicates the height of the piezometric head or pressure surface. Water levels in confined aquifers can also be below the top of the aquifer and this shows the aquifer is not under pressure, is partly de-watered, and behaves like an unconfined aquifer.

The U.S. Geological Survey regularly measures water levels in many wells in the Virgin River Basin. Most wells are measured twice a year but some are done more frequently. These data are stored for later use and some records are published in annual groundwater conditions reports. A few other government entities (such as towns and cities, counties, other state and federal agencies) businesses, consultants and individuals also collect groundwater level data from time to time, but these data are harder to find and access.

Water level data are especially useful in three ways: the preparation of well hydrographs (water level at one location plotted vs. time) and water level contour maps (water levels at one time used to plot lines of equal water level elevation) and as indicators of hydraulic conditions at wells.

Well Hydrographs

Well hydrographs (see Figures A1-A29) have been plotted from USGS data for all wells with two or more measurements. These 29 wells are located in the Santa Clara Valley below Gunlock, the Virgin River Valley below Hurricane, in Fort Pierce Wash, and the New Harmony Valley. Data are not available for well hydrographs at other needed locations, especially in the Upper Virgin River Basin and in the Navajo sandstone aquifers near the large municipal wells in Snow Canyon and Mill Creek where occasional measurements show some downward movement of water levels.

The available well hydrographs give an interesting picture. Most wells do not show any long term rise or fall in the water levels. Two, however, do show long term declines in response to increased pumping. These are well (C-41-17)7ada-1 in the Navajo aquifer near Gunlock (down 22 ft since 1971) and well (C-43-15)25ddd-1 completed in the unconsolidated rock in Fort Pearce Wash near the Arizona border (down 90 ft since 1961). Two wells show trends upward. These are well (C-37-12)34abb-1 near Kanarraville (up 35 ft since

1960) and well (C-38-12)9abb-1 southwest of Kanarraville (up 8 ft since 1973). If data on production from nearby wells were available, correlation with water levels would be possible.

Thus from the available data there appears to be no widespread downward trend that would indicate widespread overdraft of groundwater in the basin. The decline at Gunlock and the lack of data in Snow Canyon, Mill Creek and the upper Virgin River should motivate effort to collect additional water level and pumpage data in these areas.

Groundwater Contour Maps

Groundwater contour maps for parts of the Virgin River Basin have appeared in past publications. Cordova et al. (1972) showed a groundwater contour map of the alluvial aquifers for New Harmony Valley and for the area near St. George and southward towards Arizona. Cordova (1978) shows a generalized map for the Navajo sandstone aquifer (mostly unconfined) from Gunlock eastward past Snow Canyon, City Creek and Mill Creek to the Hurricane Fault and southward including the Hurricane Bench. Montgomery (1980) prepared a generalized map of the piezometric surface of the Navajo sandstone aquifer east of the Hurricane Fault. All these maps have been used to prepare the composite map in Figure 6. Map areas east of the Hurricane Fault show the pressure surface in the confined Navajo aquifer. Areas west of the Hurricane Fault show water levels in the mostly unconfined Navajo aquifer and in alluvial fill.

Measurements made since the published maps were prepared were used in a few areas to update the map. For example, contours north of St. George were moved northward to agree with recent measurements that indicated more declines. In Gould Wash near Big Plain Junction, contours were moved northward because of the higher levels indicated by recent measurements. The contours were also changed near Gunlock and Triangle Valley.

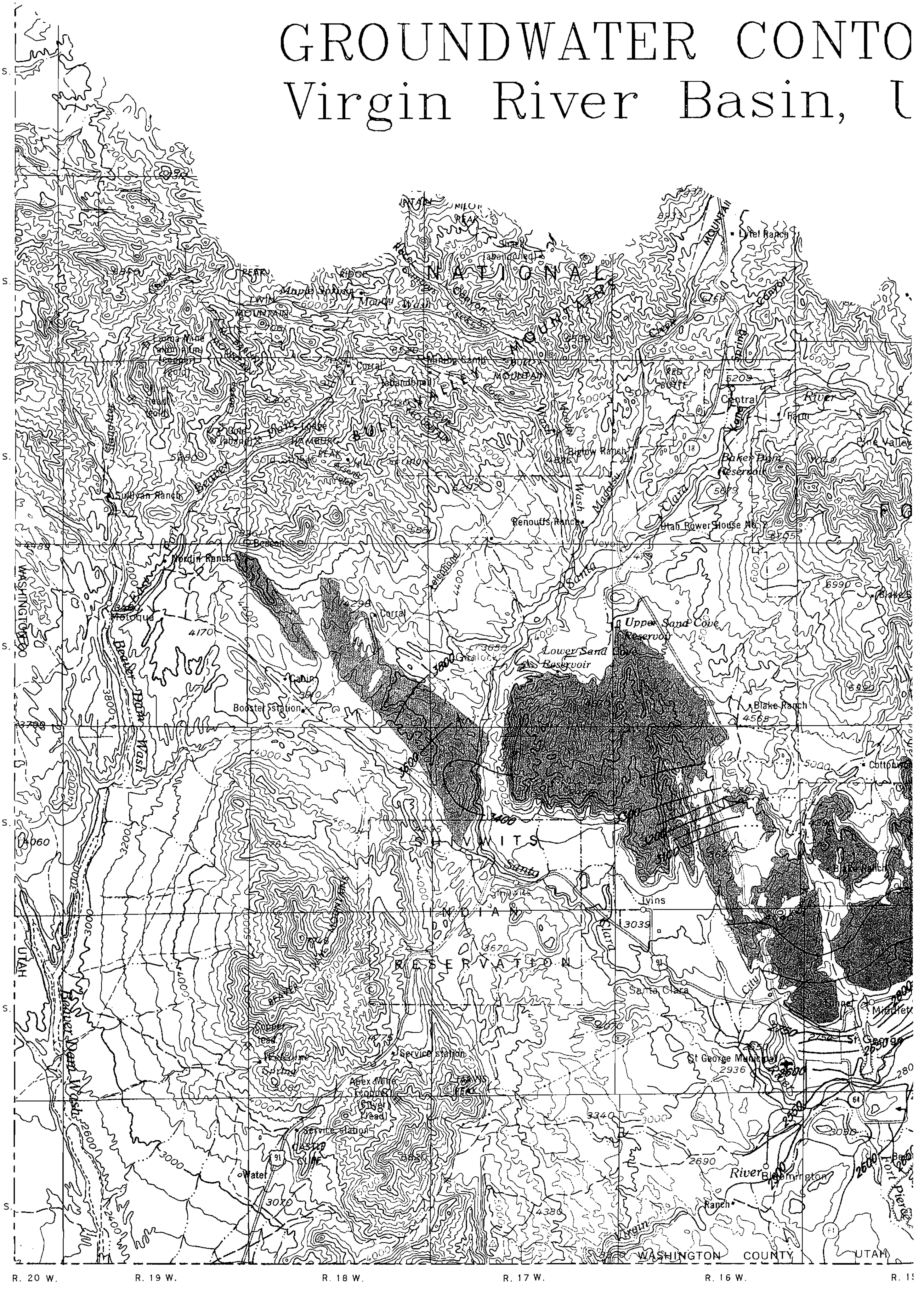
The blank areas on the contour map point out the need for additional well water level data so that a more complete map can be prepared.

Groundwater Movement

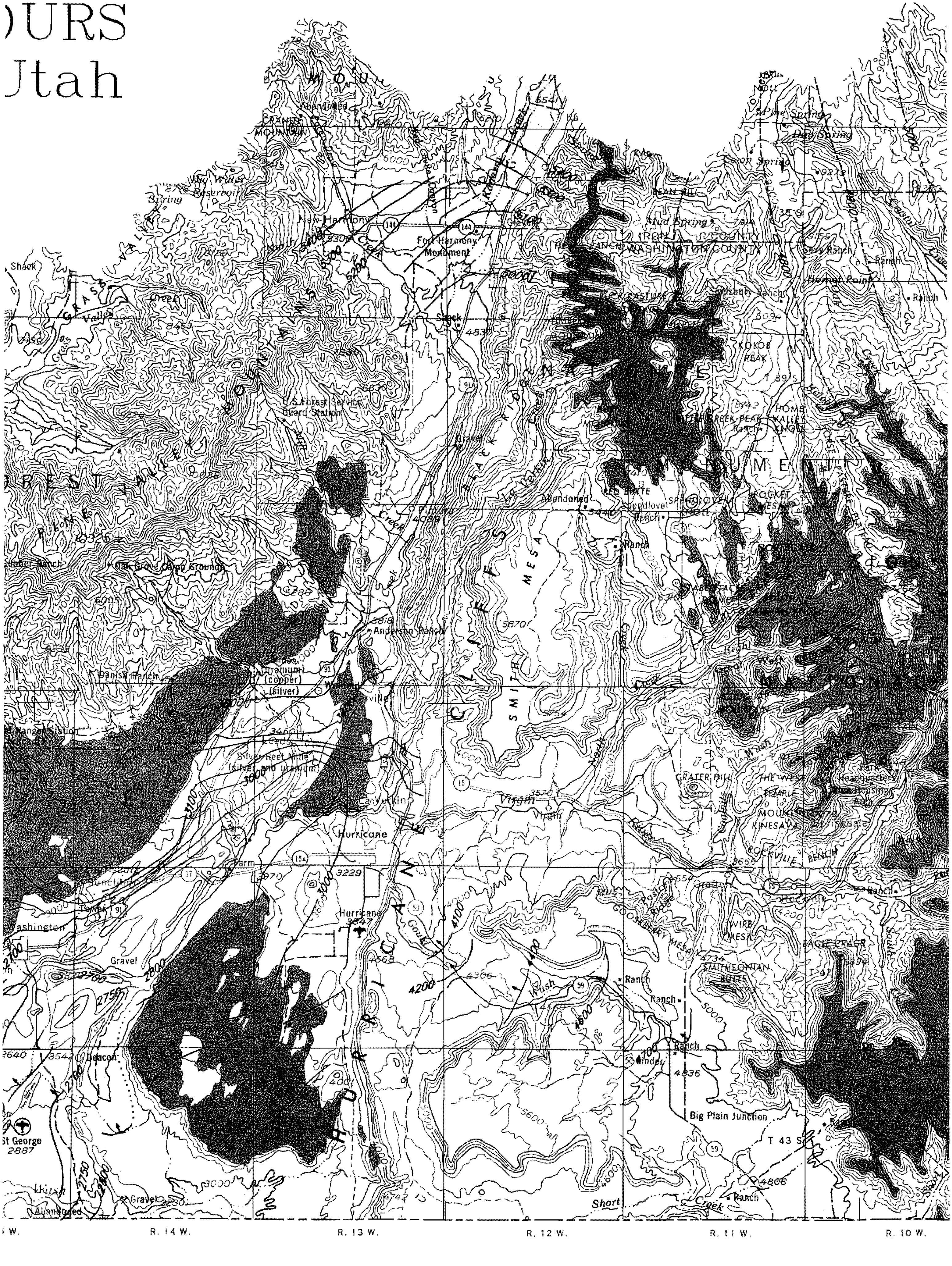
Since lines of flow are perpendicular to the groundwater contour lines, the contour map shows the direction of groundwater movement. The general pattern of flow is usually similar to the surface flows, downward from the higher country towards the drainage network of the Virgin River and its tributaries. In many areas of the basin the contours indicate flow from the aquifers into the "gaining" streams. However, in some areas groundwater levels are below the stream bed and "losing" streams recharge the groundwater.

The groundwater movement may be extremely complex and occurs simultaneously at several levels. Topmost is the soil mantle where infiltration occurs. The groundwater then moves downward until it hits less pervious layers. Some of the groundwater may move slowly through the semi-pervious layers to recharge lower formations. Other flow moves horizontally until it surfaces at a spring or seep or cascades steeply down through the soil at the edge of the impervious layer. Thus the groundwater moves on through the system to lower layers or lower elevations coming temporarily or

GROUNDWATER CONTO
Virgin River Basin, U

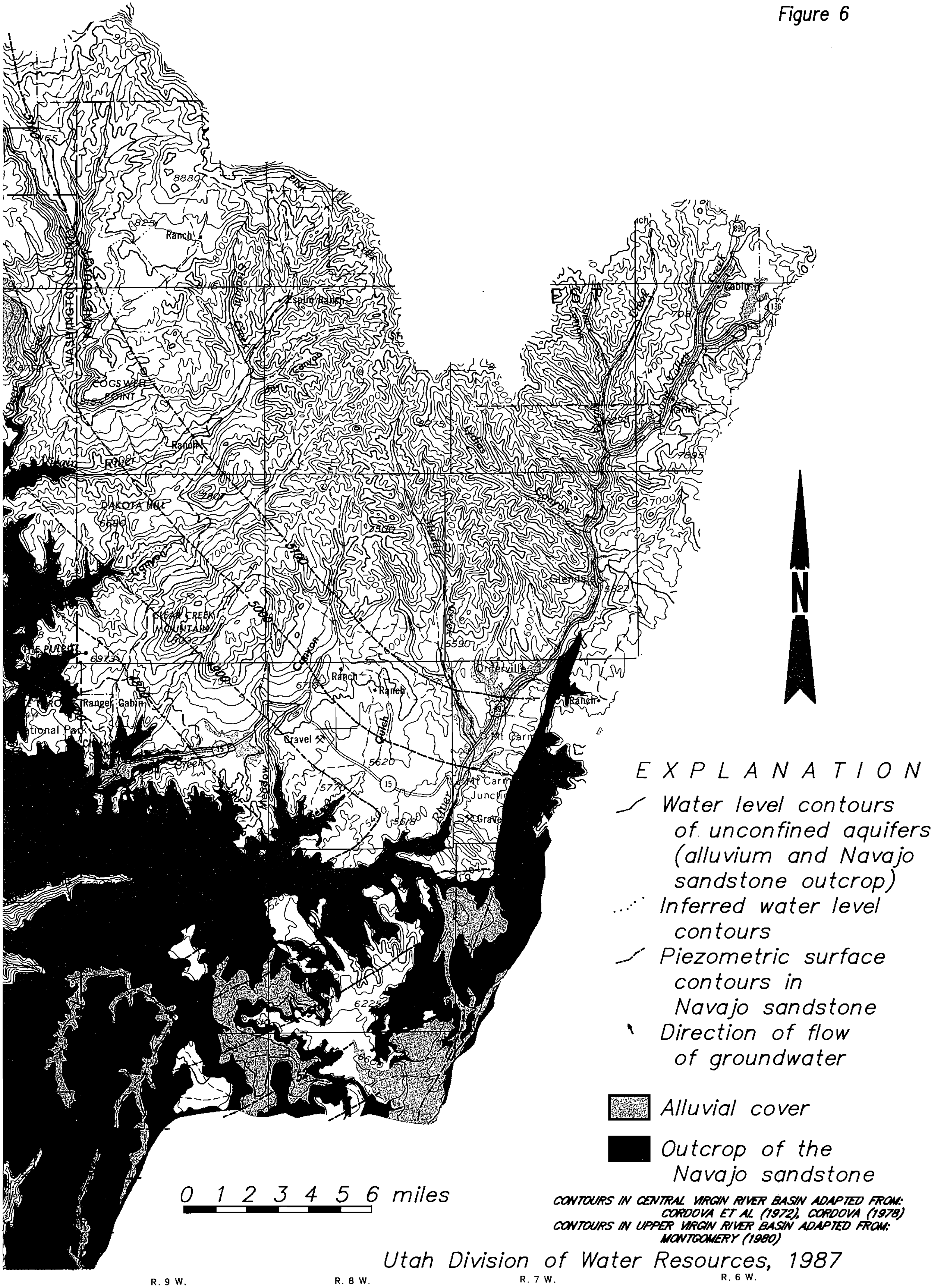


OURS
Utah



New Harmony
Fort Harmony Monument
Pine Valley
Grass Valley
Oak Grove Camp Ground
Danish Ranch
Anderson Ranch
U.S. Forest Service Guard Station
Silver Reef Mine (silver and uranium)
Leeds
Toquerville
La Verkin
Hurricane
Virgin
Washington
St George
2887
Beacon
Gravel
Abandoned
Smith Mesa
Hurricane Cliffs
Black Ridge
Kolob Peak
Home Valley Knoll
Red Butte
Crater Hill
The West Temple
Mount Kinesava
Rockville Bench
Rockville
Grafton
Gooseberry Mesa
Wire Mesa
Smithsonian Butte
Eagle Crags
Big Plain Junction
Short Creek
Ranch
Shack
Iron County
Washington County
Mud Spring
Pine Spring
Dry Spring
Hornet Point
Virgin River
T 43 S
R. 14 W.
R. 13 W.
R. 12 W.
R. 11 W.
R. 10 W.

Figure 6


EXPLANATION
Water level contours of unconfined aquifers (alluvium and Navajo sandstone outcrop)
Inferred water level contours
Piezometric surface contours in Navajo sandstone
Direction of flow of groundwater
Alluvial cover
Outcrop of the Navajo sandstone
0 1 2 3 4 5 6 miles
N
CONTOURS IN CENTRAL VIRGIN RIVER BASIN ADAPTED FROM: CORDOVA ET AL (1972), CORDOVA (1978)
CONTOURS IN UPPER VIRGIN RIVER BASIN ADAPTED FROM: MONTGOMERY (1980)
Utah Division of Water Resources, 1987
R. 9 W.
R. 8 W.
R. 7 W.
R. 6 W.
COGSWELL POINT
DAKOTA HILL
CLEAR CREEK MOUNTAIN
Orderville
Ranger Cabin
Gravel
Ranch

permanently to the surface at springs or into stream beds. Complicating this picture may be faults where movement of the earth's crust has displaced the layers relative to one another. These impervious layers may block the flow through aquifers at the fault line or the water may move along the fractured zone to another aquifer.

Faults in the Virgin River Basin frequently inhibit or block groundwater flow. However, according to Cordova (1981), groundwater contours and geohydrologic data show a general movement of groundwater across the Hurricane fault from east to west, but the amount of flow is probably small.

Groundwater Storage

Once the aquifer storage coefficients (Table 2) and the volume of aquifer materials are known, the volume of groundwater in storage can be estimated. Some estimates of storage are reported by Cordova (1972, 1978, 1981) and are given in Table 3. Some estimates of the groundwater available to wells have been modified by the writer.

The Central Virgin River basin has estimated recoverable groundwater reserves of 7.2 million acre feet. Over 6 million of this is in the Navajo sandstone. In the Upper Virgin River Basin the groundwater in the Navajo aquifer is 30 million acre feet. Since the thicknesses and areas of the aquifers are similar in the two basins, the larger difference in recoverable groundwater must be explained by other aquifer characteristics. "Recoverable" means that it could likely be removed economically using current technology.

The explanation lies in the different shape and depth of the aquifer east and west of the Hurricane Fault. West of the fault the Navajo aquifer has a distinctive saucer shape with the lip or high edge of the saucer corresponding to the southern and eastern edges of the aquifer outcrop. The bottom of the aquifer plunges deeper to near sea level or below as it goes northward under the Pine Valley mountains as shown by cross-sections given by Cook (1957) and Cook (1960) and by Figure 7. Thus it is deeply buried northward from the outcrop and could be reached only by very expensive wells. Economic recovery of groundwater is feasible only within or near the outcrop area. East of the Hurricane Fault the Navajo aquifer is more nearly horizontal, especially to the north of the Virgin River, and is exposed or not so deeply buried. Recovery of the groundwater is probably more feasible than in the deeply buried Navajo sandstone west of the fault, but little development has taken place.

The amount of groundwater in storage responds to both recharge and discharge. Wetter than average years bring water levels in wells up. Increased draft lowers the water levels. Dry years cause lower levels both because of less recharge and because draft tends to be high in dry years.

Groundwater Use

Groundwater in the Virgin River Basin is used for public water supply, irrigation, domestic supply, for stock watering. Spring flows have been diverted for all these purposes since the first settlers arrived in the area. Groundwater from wells was developed much later (after 1900). Figure 8 shows all the wells in the basin according to their use. It is no surprise that

Table 3. Estimates of groundwater storage.

Note: Most of these data were taken from Cordova (1972, 1978, 1981) with some revisions of estimates done by the writer.	Area (acres) 1	Estimated Average Thickness of Saturated Zone (ft) 2	Estimated Effective Porosity 3	Estimated Effective Storage Coefficient 4	Groundwater in Storage (acre feet) 5[b]	Maximum Ground-water Available to wells 6[c]
Central Basin Unconsolidated Aquifers						
New Harmony Valley	23,700	300	0.30	0.15	2,100,000	1,050,000
Fort Pearce Wash	1,500	100	0.20	0.10	30,000	15,000
Santa Clara River Valley	1,300	50	0.20	0.10	10,000	5,000
Pine Valley	1,000	75	0.30	0.15	20,000	10,000
Anderson Junction	100	100	0.25	0.125	3,000	1,500
Leeds	300	30	0.25	0.125	2,000	1,000
Totals (rounded)					2,170,000	1,080,000
Central Basin Navajo Aquifer						
In Outcrop Area[a]						
Gunlock	9,300	620	0.17	0.085	980,000	490,000
St. George	49,600	700	0.17	0.085	5,900,000	2,950,000
Leeds	30,000	360	0.17	0.085	1,800,000	900,000
Hurricane Bench	40,500	430	0.17	0.085	3,000,000	1,500,000
In Burried Area	230,000	2,200	0.17	0.085	86,000,000	1,360,000
Totals (rounded)					97,700,000	7,200,000
Upper Basin Unconsolidated Aquifers					Small Amount	Small Amount
Upper Basin Navajo Aquifer						
In Outcrop Area	190,000	300	0.15	0.075	9,000,000	4,500,000
In Buried Area	380,000	2,000	0.15	0.075	100,000,000	25,000,000
Totals (rounded)					109,000,000	30,000,000 (est.)
All Basin, Other Rock Aquifers					Millions	Millions

(a) Gunlock area is west of Gunlock Fault; St. George area is between Gunlock and Washington Faults; Leeds area is between Washington and Leeds Faults; Hurricane Bench area is generally south of the Leeds Fault.
(b) Column 5 = Column 1 x Column 2 x Column 3.
(c) Computation for outcrop area assumes lowering water level to base of aquifer. Computation for buried area assumes aquifer water level can be lowered to the base of the aquifer under the top edge of the outcrop. Saucer shape of aquifer limits availability.

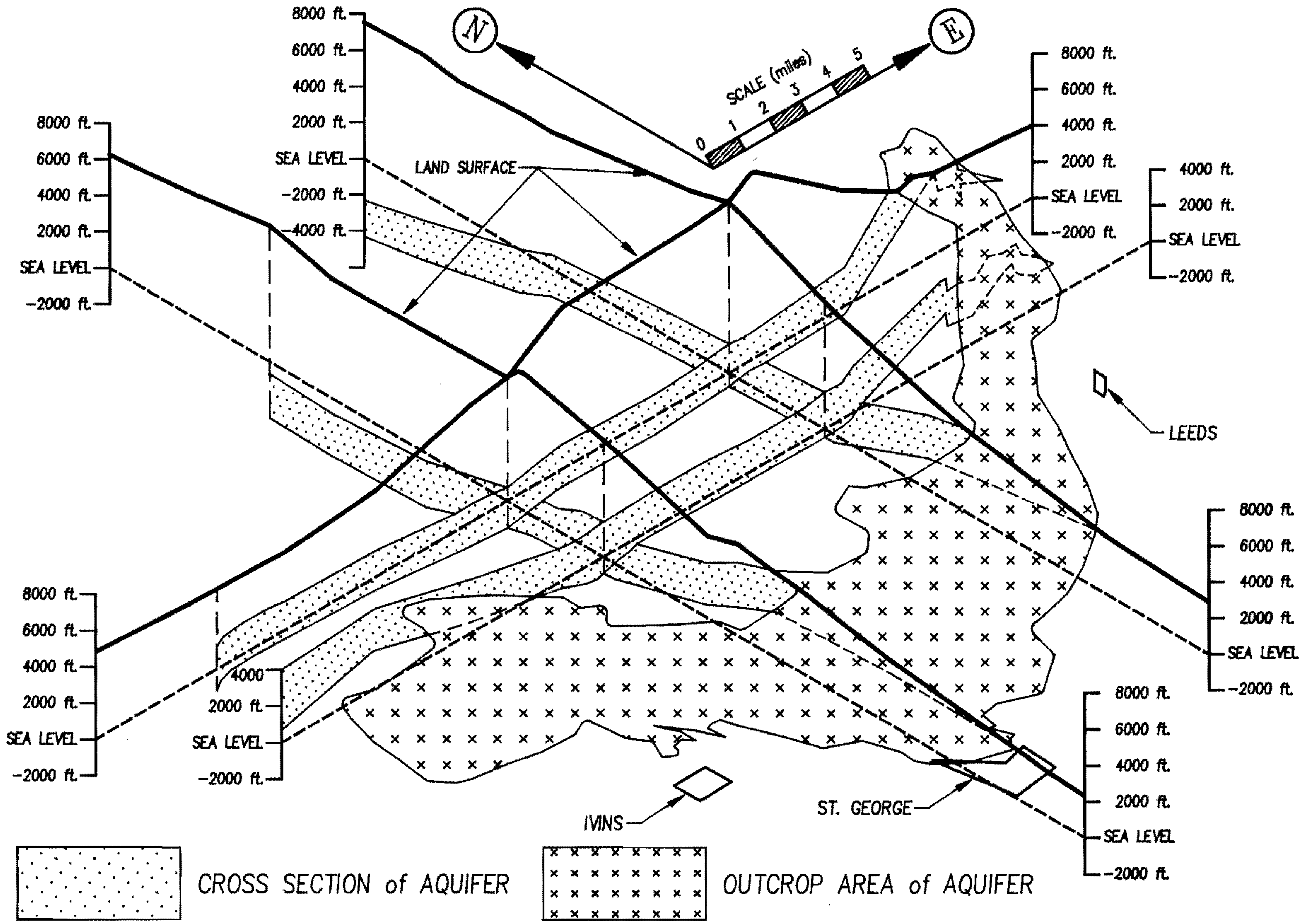


Figure 7. The Navajo sandstone aquifer. Cross section information taken from Cook (1957, 1960, 1960a).

USE OF GROUNDWATER F
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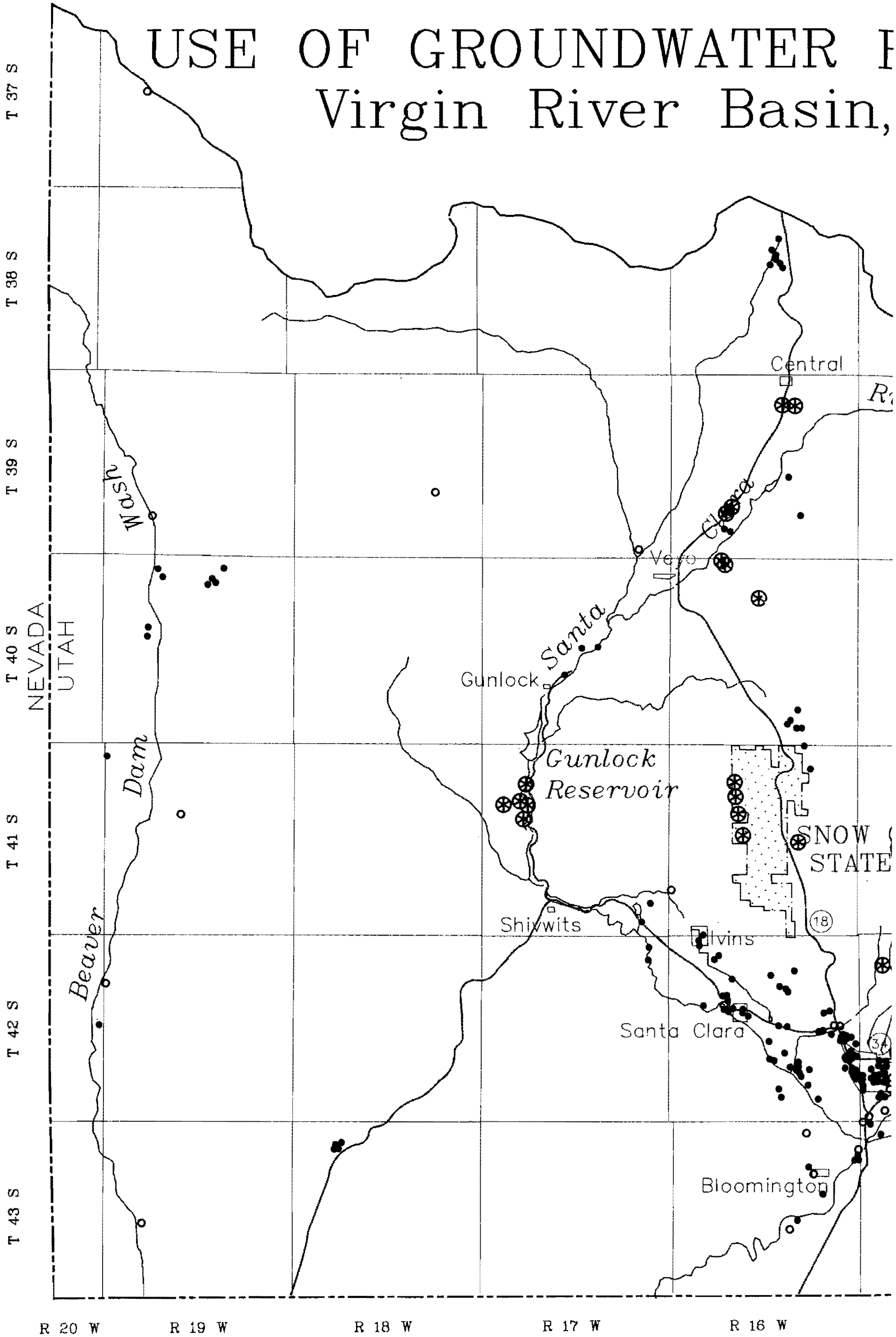


FROM WELLS
Utah

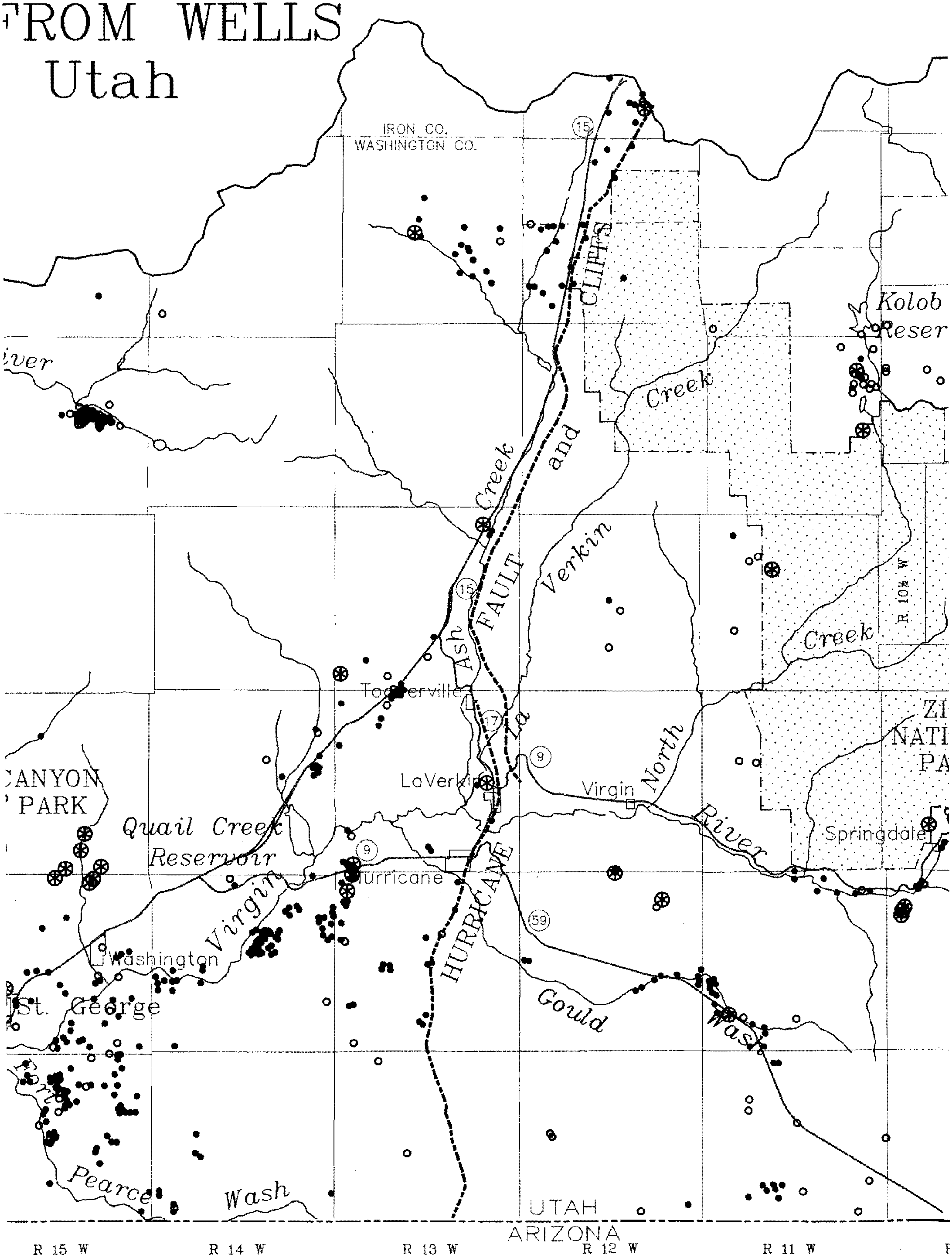
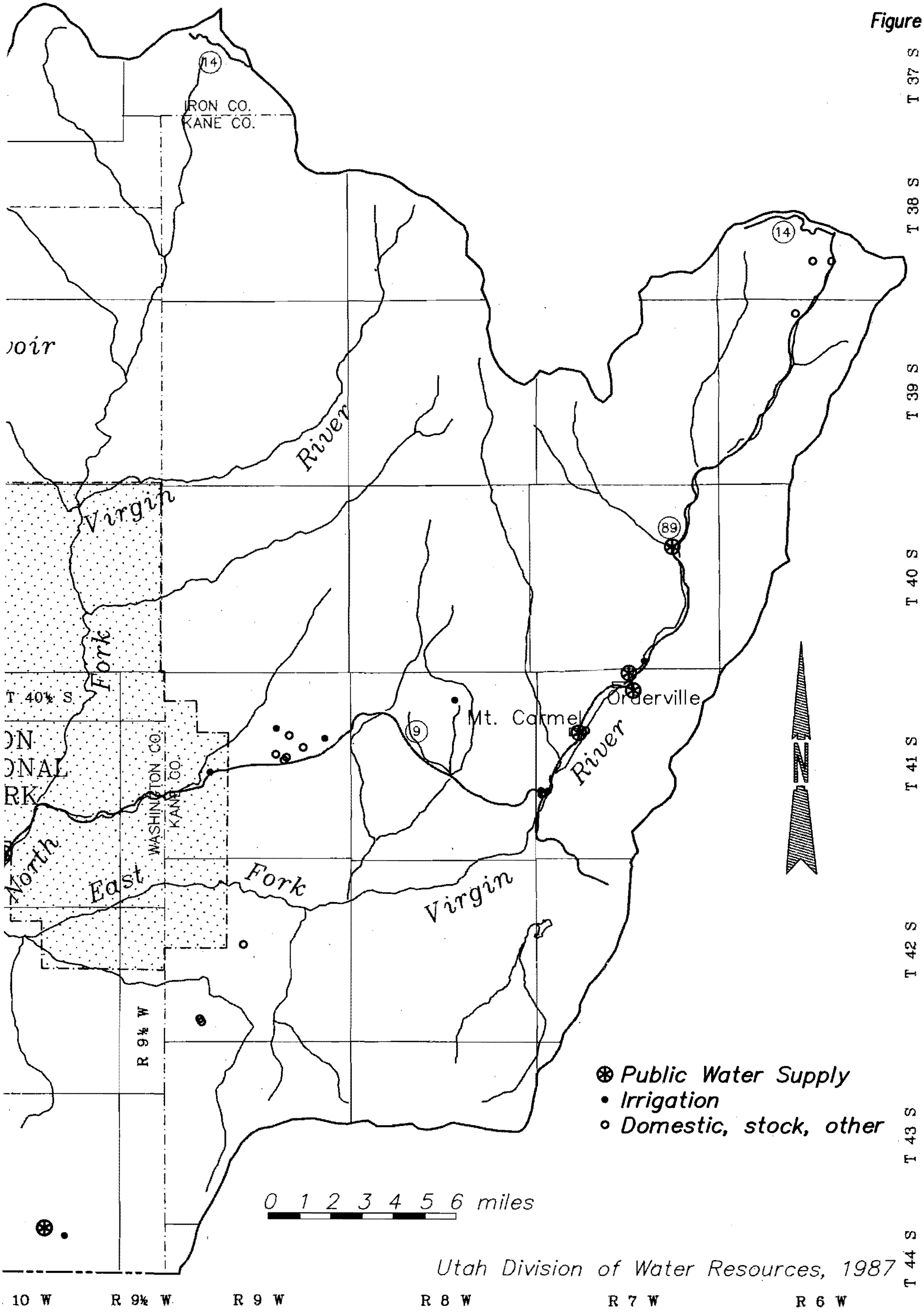


Figure 8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Utah Division of Water Resources, 1987
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irrigation and domestic and stock wells are scattered over the basin while public water supply wells are clustered near cities. In fact, most of the big public water supply wells are found at Gunlock, Snow Canyon and Mill Creek Canyon, but other public water supply wells are scattered throughout the basin near towns and residential areas.

The number of irrigation wells increased slowly until 1950. Figure 9 shows the locations of high yield irrigation wells in 1950, 1960, 1970 and 1986 and points out the rapid growth after 1950. A similar history of increasing numbers of municipal wells after 1960 is shown in Figure 10.

The U.S. Geological Survey annually estimates the groundwater withdrawals from wells in major basins in Utah and releases the data in an annual report on groundwater conditions including the Central Virgin River basin. The withdrawals are taken partly from reported groundwater withdrawals and estimated partly from records of energy used for pumping. Table 4 summarizes the annual withdrawals as reported by Mason et al. (1986).

Table 4. Annual withdrawal by wells in Central Virgin River Basin in thousands of acre feet.

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Draft	13	17	18	20	20	20	22	27	16	19	21

The mean withdrawal for 1975-85 is 19,400 acre feet

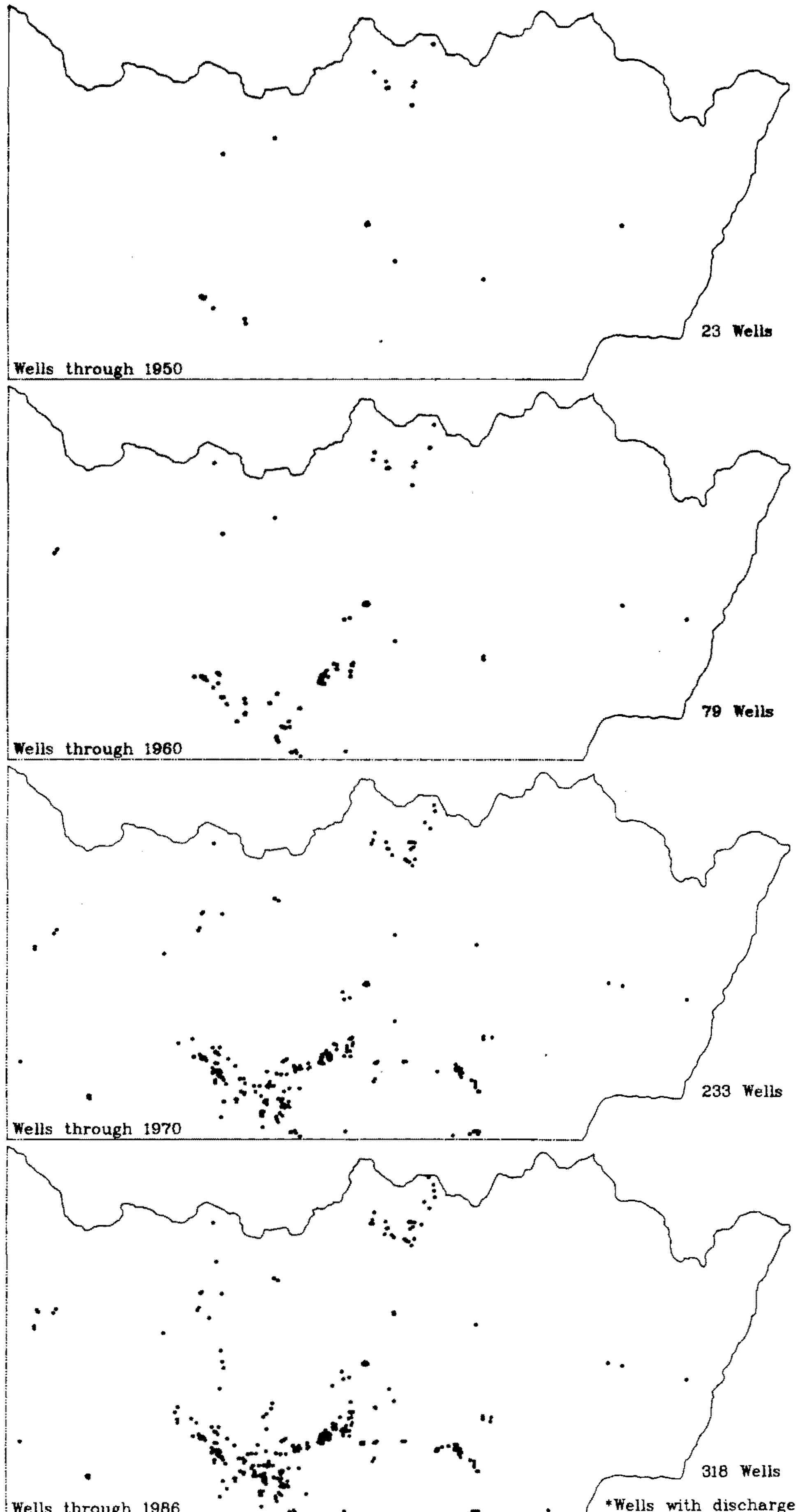
The division of the 1984 and 1985 withdrawals among various uses are reported by Seiler et al. (1985) and Mason et al. (1986) in Table 5.

Table 5. Withdrawal by wells, for various uses, in 1984 and 1985 in the Central Virgin River area.

Use	Amount (acre feet) 1984	1985
Irrigation	11,000	10,400
Industry	unknown	1,500
Public Water Supply	7,600	8,500
Domestic and Stock	250	250
Total (rounded)	19,000	21,000

Figure 9

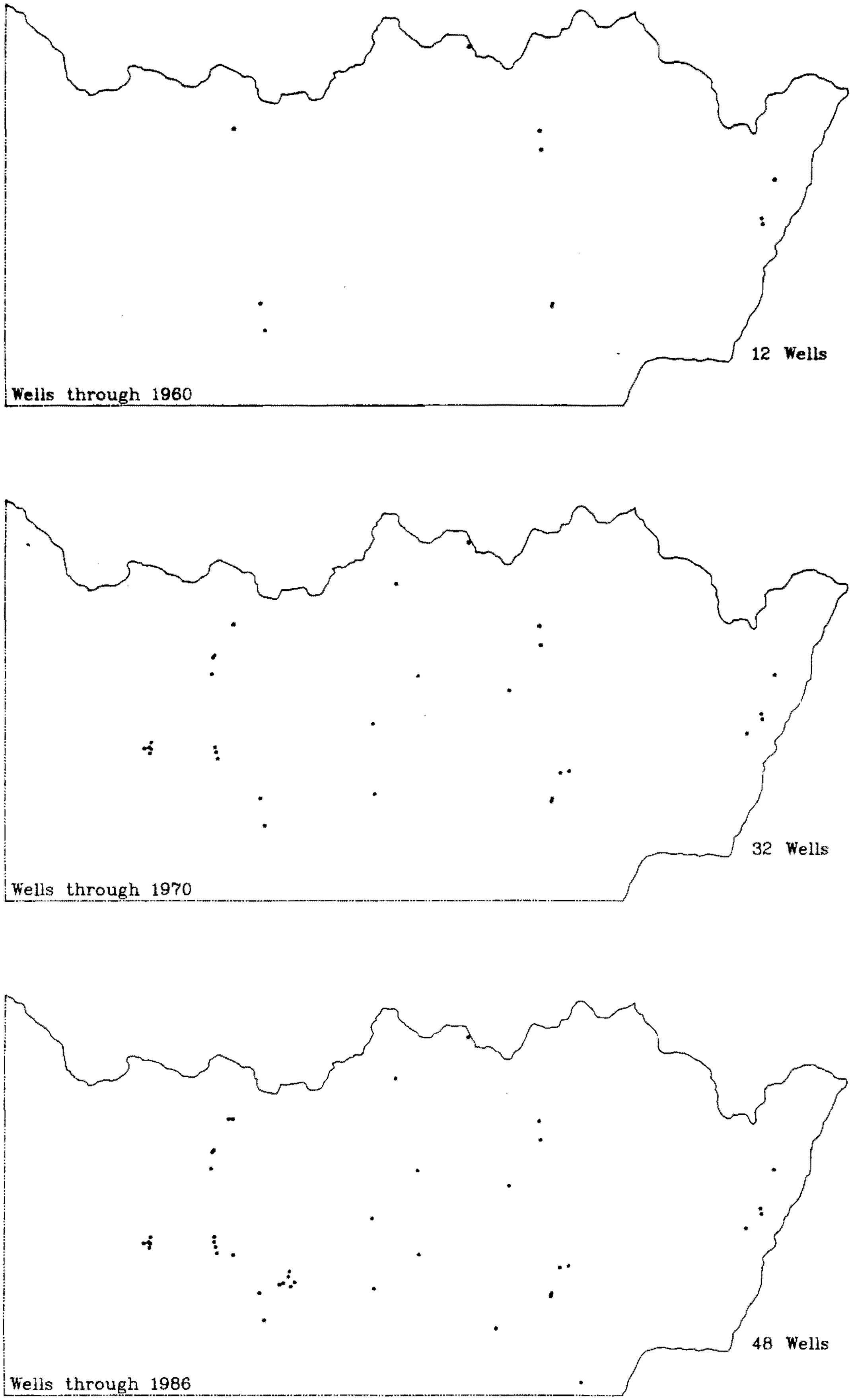
IRRIGATION GROWTH*
Virgin River Basin, Utah



*Wells with discharge right ≥ 0.1 cfs

Figure 10

PUBLIC WATER SUPPLY GROWTH
Virgin River Basin, Utah



G. W. Sandberg, who made the estimates in the above mentioned annual reports comments on the 1984 uses as follows (see Seiler et al. 1986, p. 68):

> The 1984 withdrawal for public supply was more than double the 1983 withdrawal. Withdrawal for irrigation decreased. This is attributed to greater use of surface water for irrigation and conversion of land from agricultural to urban use. The increased demand for public supply is attributed to less water available from springs and increased demand because of less precipitation.

His comments for the 1985 year are similar, "Withdrawal for irrigation decreased slightly whereas withdrawal for public water supply increased. This can be attributed to the conversion of land from agricultural to urban use."

Sandberg's comments agree with opinions expressed to the writer by other water experts in the area. Another reason for the decline in irrigation withdrawals in recent years may be the high cost of energy for pumping and the decline in prices for agricultural commodities. Land is lying fallow now that was farmed in earlier years. However, these recent decreases in pumping for irrigation may change if farm prices recover and a series of dry years occur.

Most municipalities report their public water use to various divisions of state government. The Department of Natural Resources, Division of Water Rights has published these data in Utah Water-Use Reports Nos. 1, 2, 3, 4 and 5. Only the years 1979-83 are summarized in detail in Table 6. Estimates of total use are included for 1960, 1970, and 1975.

Groundwater Discharge

Besides the manmade discharge through wells the natural discharge processes are springs, drains, seepage into streams, evapotranspiration by plants and subsurface outflow. Table 7 summarizes the discharge of groundwater as reported by past studies. Since the Virgin River is the natural drain for the region, most of the groundwater not pumped or used by evapotranspiration must eventually come out as streamflow.

Geologic and geophysical data indicate that the unknown subsurface outflow from the Upper Virgin River Basin moves westward across the Hurricane Fault. According to Cordova (1981) the amount is probably small.

Groundwater Recharge

Natural recharge to the groundwater in the Upper Virgin River Basin is mostly by infiltration of precipitation (some directly and some from melting snow) as well as seepage from streams passing over recharge areas of the aquifer outcrops. Much of the recharge takes place at higher elevations in the Pine Valley mountains and the Kolob Plateau where the precipitation is large. Cordova (1981) has estimated the amounts of recharge as shown in Table 8. An unknown but significant amount of recharge enters the area by underground flow from the Upper Sevier Basin to the north. Most of this comes from Navajo Lake through solution channels in the Wasatch formation and comes to the surface a short distance away in Cascade Springs in the cliffs south of the lake. While flows from Cascade Spring have been measured intermittently,

Table 6. Reported diversions of groundwater for public water supply in the Virgin River Basin (acre feet).

	Central Virgin River Area				Upper Virgin River Area			
	Surface	Groundwater		Total	Surface	Groundwater		Total
Year	Water	Springs	Wells	Water	Water	Springs	Wells	Water
1960 (est.)				1,600				230 *
1970 (est.)				3,270				260 *
1975 (est.)				4,600				400 *
1979	463	5,460	2,220	8,140	-	163	269	432 *
1980	449	6,260	2,960	9,670	-	205	109	314 *
1981	463	4,790	5,720	10,970	225	734	179	1,140
1982	46	5,890	4,550	10,490	154	808	96	1,060
1983	46	7,410	4,500	11,960	211	621	134	970

* Do not include Zion National Park uses.

Table 7. Annual discharge of groundwater.

Type of Groundwater Discharge	Central Virgin River Basin Average for 1968 and 1970 (acre feet)(1)	Upper Virgin River Basin 1977 (acre feet)(2)
Seepage into Streams	23,500	42,000
Flow from Springs and Drains	36,000	1,900
Withdrawal from Wells	7,600	1,300
Evapotranspiration	13,000	4,000
Subsurface Outflow	2,000	Unknown
Totals	82,100	49,200
Total for Virgin River Basin	131,300	

(1) From Cordova et al. (1972).
(2) From Cordova (1981).

Table 8. Natural recharge of groundwater in the Virgin River Basin

Item	Estimated Average Annual Recharge	
	Central Virgin River Area (acre feet)	Upper Virgin River Area (acre feet)
Infiltration of precipitation	70,000	55,000
Infiltration of streamflow	15,000	
Subsurface inflow	20,000	Unknown
Total (rounded)	100,000	55,000

the total groundwater inflow from the Upper Sevier Basin has not been estimated.

In the Central Virgin River Basin the processes are similar except that some recharge also occurs from subsurface inflow. This inflow comes mostly from east of the Hurricane Cliffs. Some of this inflow may appear in Toquerville Springs and in other minor springs and seeps, while most of it remains underground. The details of this recharge are not well known at this time.

Recharge to the Navajo sandstone, which is more deeply buried except at the outcrop, is even more complex. Most of the recharge is by infiltration of precipitation and streamflow in the outcrop area and where highly permeable basalt is found in outcrop areas. Some recharge to the Navajo sandstone also occurs from the overlying Carmel formation. Cordova et al. (1972) has estimated the amount of recharge and it is included in Table 8. Cordova (1978) gives a detailed discussion of recharge to the Navajo sandstone.

Annual recharge and discharge from a groundwater basin should be the same if the basin is in equilibrium. In the Central Virgin River Basin the reported average annual recharge (100,000 ac ft/yr) is greater than the discharge (82,000 ac ft/yr) for 1968-1970. Similarly the average annual recharge in the Upper Virgin River Basin (55,000 ac ft/yr) is greater than the discharge (49,000 ac ft/yr) in 1977. Thus estimates of average annual recharge are compared to discharge estimates for specific years. One should not expect these to balance unless the estimates are for the same years or series of years. These differences do not invalidate the estimates but simply show that the methods used (estimates not for the same years) and/or the unknown items create uncertainties in the comparison.

Groundwater Quality

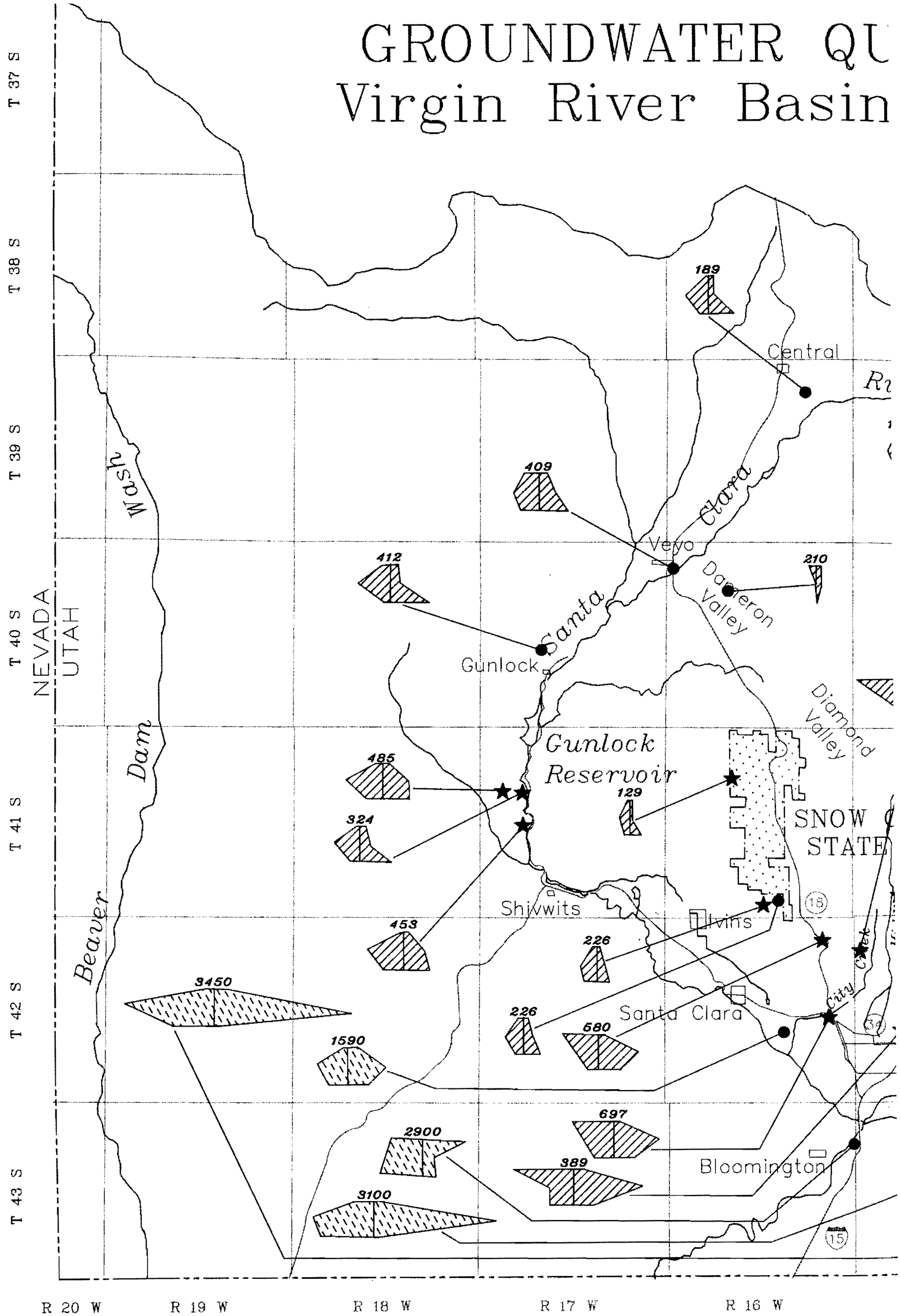
Water quality, which is defined as the salts dissolved in the water and organisms or material carried by the water, determines its suitability for various uses. Standards that drinking water must meet have been established and agreed upon by federal and state agencies and the World Health Organization. Criteria for judging the suitability of waters for irrigation are well recognized. Other criteria for special industrial uses are also available. As new information related to water quality become available, the standards and criteria are continuously revised. Recent textbooks on groundwater hydrology such as Todd (1980) and state and federal documents list the standards.

The quality of water is established by analyzing a sample in a chemical laboratory. The concentration of each constituent is then reported, usually in milligrams per liter (mg/l) or micrograms per liter (µg/l). Such items as temperature, taste, odor, pH, hardness, organic compounds and total dissolved solids (TDS) may also be reported. Sample analyses will usually report on the major ions (sodium, potassium, calcium, magnesium, chloride, sulphate, nitrate and carbonate and bicarbonate) and may also include many trace elements as well.

Water quality data may be presented in many ways; bar diagrams, pie diagrams, trilinear diagrams, and other methods described by Hem (1970). Stiff (1951) diagrams are used in Figure 11 and are further explained there. The diagrams plot the principal ions on three horizontal axes. The shape of diagram reflects the chemical makeup of the water and the size shows the concentration.

Figure 11 shows typical samples from around the basin in both the unconsolidated and the consolidated rock aquifers.

In general both surface and groundwater quality are better higher in the tributaries than lower down, but good and bad quality may be found in many areas. Water in the Navajo sandstone is generally very good, but in some locations it may be poor. Other rock aquifers tend to contain poorer quality water, but there are many exceptions. Unconsolidated aquifers may contain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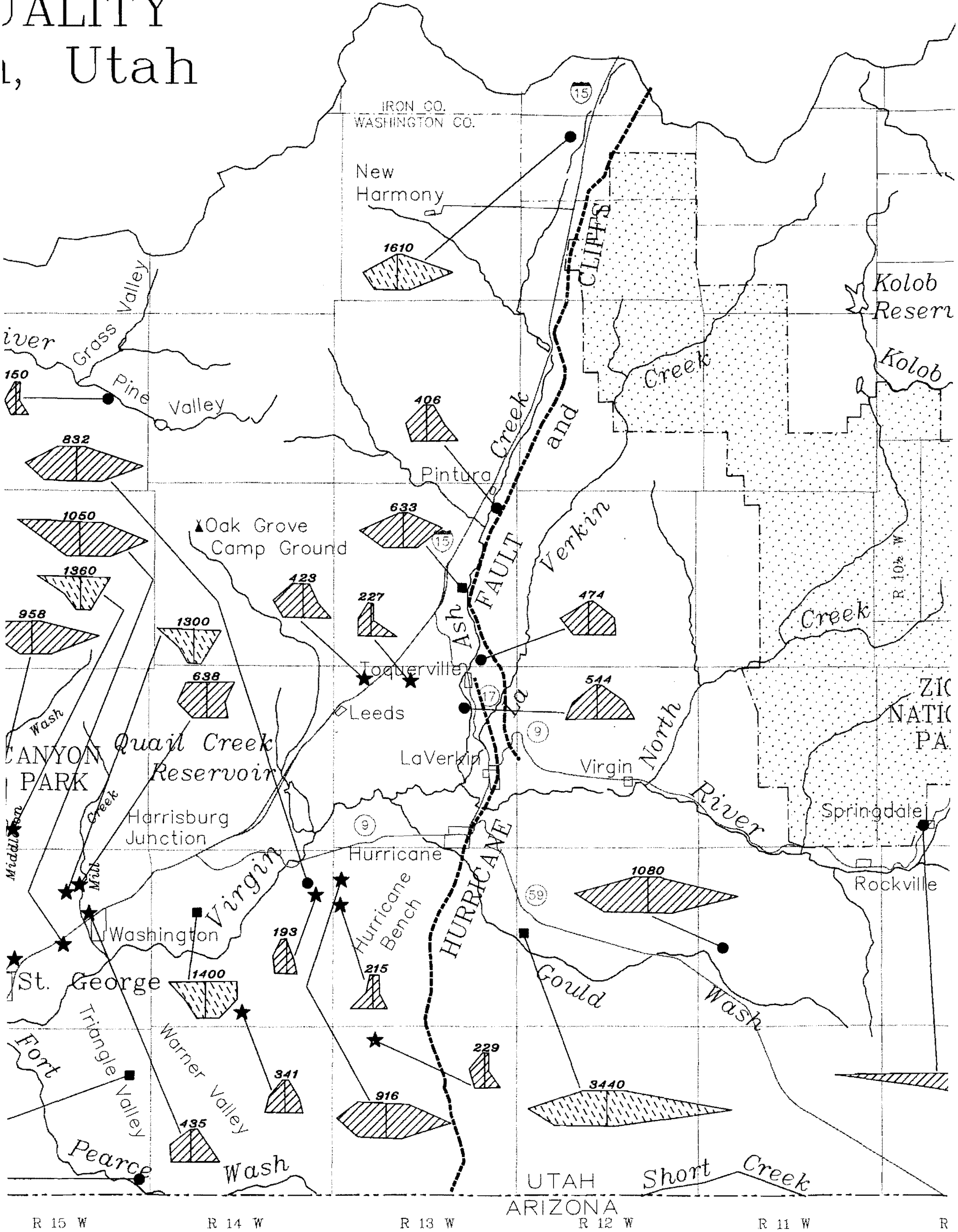
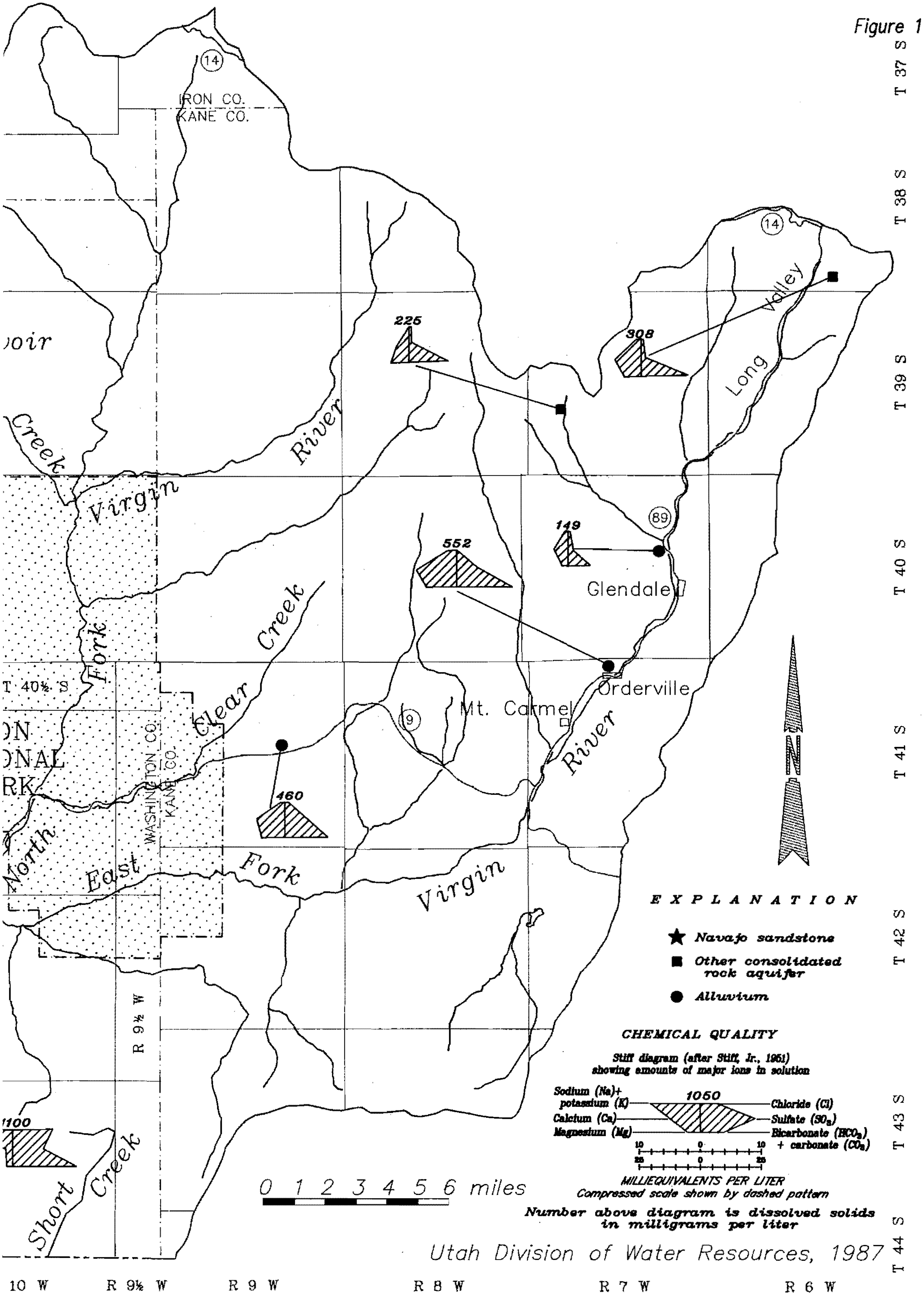


Figure 11



Utah Division of Water Resources, 1987

good water high in the tributaries, but most have poor water downstream due to discharge from some geological formations that contain soluble material. A few mineralized springs are found in the basin such as the LaVerkin Springs which contain over 9,000 mg/l.

To give a quick picture of the water quality in the Virgin River Basin ranges of the total dissolved solids content (TDS) of typical water samples are given in Table 9. The data in Table 9 and Figure 11 are taken from reported chemical analyses in Cordova (1972, 1978, 1981) and from both published and unpublished files of the U.S. Geological Survey.

Since the water quality varies from excellent to unusable for drinking or irrigation, it is clear that water quality will be a major constraint on the future development of groundwater.

Table 9. Typical ranges of TDS in groundwater samples (wells and springs) in the Virgin River Basin.

	Total Dissolved Solids, TDS, in mg/l			
		Wells in		
Area	Springs	Alluvial Aquifers	Navajo Aquifer	Other Rock Aquifers
Central Virgin River				
Ash Creek Valley		410		630
Snow Canyon			110, 130	
Diamond Valley - Dameron Valley				210
Fort Pearce Wash		3300		
Gunlock			290, 470	
Hurricane Bench	1300	830		
Leeds - Harrisburg Junction		1000	230	
Mill Creek - City Creek	330		380, 660, 960	1300
New Harmony Valley	240	410, 1610		
Pine Valley		150		
St. George Valley			820	902, 1400, 4000
Santa Clara - Ivins Bench		230		470, 2450, 4070
Triangle Valley - Warner Valley				3100, 3400
Virgin River Valley		1180, 2900, 6860		1400
Washington Valley	435			
Santa Clara Valley		190, 412, 900, 1590, 2620		
Upper Virgin River				
Gould Wash		1080, 3440		
Clear Creek - North Fork	230	870		
Glendale	150	320		
Orderville		550		
Rockville		400, 2000		
Springdale		1100		
Near Long Valley Junction		290, 310		
LaVerkin Creek	620			
Virgin River (LaVerkin Springs)	9400			

POTENTIAL FOR ADDITIONAL GROUNDWATER DEVELOPMENT

If discharge already approximately equals recharge to the groundwater in the basin, how can there be any additional groundwater development potential?

One possibility is that the reported estimates of recharge and discharge are incorrect. The fallacy of comparing average values of recharge with estimates of discharge for a particular year has already been suggested. If better, more comparable estimates could be made, a more precise picture of the recharge and discharge would be in hand. While new water would not be found by this process, the uncertainty regarding amounts would be less. In any event nature will balance the equation, and the difference between inflow and outflow will come from or go to storage.

A second possibility to provide water for additional groundwater development is to control portions of the recharge and/or discharge of the groundwater. If for example seepage to gaining streams and/or flow from springs were reduced, additional water could be pumped from wells. The added well discharge could come from the streams (surface water) or springs (groundwater) and both kinds of rights could be affected.

Another option might be to reduce the evapotranspiration of the groundwater. This could be done by lowering water tables so that plants could not easily reach the groundwater. Any water so "salvaged" would be water otherwise not beneficially used and no water rights would be affected. However, wetlands habitat might be changed.

Artificially increasing recharge to the groundwater reservoir from melting snow and during periods of heavy precipitation may be another productive means for increasing available groundwater. While this may be a viable option wherever part of the surface runoff escapes from the basin, downstream users might object if their irrigation supply is adversely affected.

Central Virgin River Basin

Evapotranspiration directly from groundwater accounts for 16 percent of the groundwater discharge in the Central Basin. Lowering water levels in selected alluvial aquifer areas by additional pumping could salvage some water not now being used. This is a net gain in total water available.

Seepage into streams and flow from springs and drains accounted for 72 percent of the discharge in 1970. Where gaining streams occur in alluvial aquifers there may be some opportunity for reducing seepage by additional pumping. Pumping can also induce recharge into the aquifers from the stream and from adjacent bedrock aquifers. This kind of management represents a change from surface to groundwater use. There may be another benefit from inducing recharge from the river to the aquifer. This is sometimes done to "filter" the river water and reduce the expense for treating the water for culinary use. Here the river bed sands and gravels are used as a sand filter. Chlorination may still be needed and the water quality be marginal due to the dissolved salts in the water. Dilution with other better quality water may be necessary if the "filtered" river water is to be used for drinking.

Lowering water levels in the Navajo sandstone aquifer will reduce flow from springs along the outcrop near St. George. Unseen groundwater outflow will also be reduced. Reduction of spring outflow impacts the spring water rights and may be a transfer of spring flow to well flow. However, this may be desirable in some respects because the well flows are more convenient as they are available when needed rather than only when nature provides the spring flows. Reducing subsurface outflow is likely a net increase in available water, depending on if and where the groundwater outflow appears at the surface. Additional costs may be incurred when pumping this water if the old spring rights must be purchased.

The groundwater storage reservoir is a valuable asset in a water supply system and allows the flexibility of drawing from the storage when needed. However, if the reservoir is drawn down in dry years it must also be allowed to build up in wet years or the water level will show a long term decline. In some cases deliberate mining of water may be done temporarily while other sources are being developed.

Artificial recharge may be a viable option in the Central Virgin River, especially for the Navajo sandstone aquifer. Many streams cross the outcrop area. A few flow continuously, but most are ephemeral. To make more water available, recharge should be increased by building check dams, ponds, and spreading facilities in the stream courses to capture more of the unused flood waters through infiltration. An effort should be made to estimate the maximum perennial yield of groundwater that could be available in the Virgin River Basin if all measures of conservation, salvage, and recharge were implemented.

The Navajo sandstone aquifer and its priceless supply of high quality water in the Central Virgin River Basin are especially vulnerable to pollution by the activities of people. This is because so much of the aquifer outcrop area has highly pervious sandy soil or lava flows and is located close to the populated area in and near St. George. In this uncovered, potential recharge area the aquifer is exposed to whatever contaminants are in the precipitation and the streamflow or to whatever is left in or on the land by people. Use of the outcrop areas must be controlled if the good quality of the Navajo aquifer water is to be preserved. Some areas such as Snow Canyon State Park are already protected. Other areas such as City Creek, Middleton Wash and Mill Creek are vulnerable.

Many of the alluvial aquifers are also vulnerable to pollution. In some areas these aquifers naturally contain poor quality water. Elsewhere the groundwater has already been adversely affected by the activities of man, while in other locations the shallow alluvial aquifers still contain good quality water. Especially where these aquifers supply drinking water to residents, appropriate regulations need to be in place to protect the groundwater resources.

Upper Virgin River Basin

In the Upper Virgin River Basin 85 percent of the groundwater discharge is by seepage into streams. Additional groundwater development will reduce this seepage and will effectively transfer surface water to the groundwater. As in the Central Basin, this may be good as a means of obtaining a protected, filtered good quality supply. Again storage can be used to augment flows in dry years.

Evapotranspiration accounts for 8 percent of discharge and some of this could be salvaged by lowering water levels. Subsurface outflow is unknown and probably small.

Legal Implications

Further groundwater development raises many legal issues related to water rights. A few have been suggested above. Further groundwater development also may adversely affect water quality in the area and downstream. The Virgin River is an interstate stream thus raising other legal issues about the affects of groundwater development. These questions have not been discussed in depth here, but they need and deserve further attention in continuing studies.

CONCLUSIONS AND RECOMMENDATIONS

1. More data on water levels in wells are needed throughout the basin, but especially in those areas where no regular monitoring is being done or where large volumes are being pumped. More monitoring in major pumping centers such as Gunlock, Snow Canyon and Mill Creek Canyon is urgently needed. A task force should be set up composed of interested water leaders from the area assisted by the Divisions of Water Resources, Water Rights and Environmental Health and representatives of the USGS, BLM, Forest Service, cities, counties and conservancy districts. Such a group should select the additional observation wells that are needed and find ways to support the effort financially.

2. As more water level data are collected, the groundwater hydrographs and contour maps should be extended to areas not now covered. An effort should especially be made (by collecting all available data on piezometric levels in the Navajo sandstone) to extend the Navajo aquifer contour map in the Central Basin area northward. This will give a better picture of the sources of recharge, the direction of movement, and the discharge of the aquifer.

3. As more data on water levels and discharge are collected around the major pumping centers, continuing analysis should go forward to help understand what is happening to the aquifers in those areas. Where the production and drawdown are greatest is where problems will first appear. Understanding those problems can guide further development.

4. More data are needed on the amount of groundwater being pumped for irrigation from different aquifers. Ways should be found to give more support to this effort so that more extensive and detailed estimates of irrigation draft by use and by aquifer can be made. This will give a clearer picture through the years of what is happening to the water pumped from wells for irrigation.

5. The storage coefficients under unconfined conditions (specific yields) in the Navajo sandstone and other consolidated rock aquifers need better definition. Some <u>long term</u> pumping tests need to be made under conditions such that there is time for all the delayed drainage to occur. The estimates of S_y from such tests would give a better picture of available storage in the outcrop areas of the aquifers.

6. Some questions are still unanswered about the nature and amount of underflow across the Hurricane Fault. As more groundwater levels data are collected, it may be possible to learn more about this question. This is a complex problem and considerable effort may be needed to look at tributary areas both east and west of the Hurricane Fault.

7. Many qualitative comments have been made in this report concerning the yield of aquifers, but no numerical amounts could be given from past studies. An effort should be made in the future to determine the perennial yields possible from the various aquifers under different assumed levels of development and aquifer management options. First

should come an estimate of the yield assuming minimal efforts of aquifer management to reduce some losses and salvage evapotranspiration. This perennial yield estimate would indicate the initial opportunity for added development. Later efforts could include estimates based on aggressive programs of loss reduction, reduction of spring flows as well as implementation of artificial recharge projects where feasible. This maximum perennial yield would give the ultimate yield possible from the groundwater.

8. Since there is no present clear indication of widespread groundwater overdraft in the Navajo aquifer, cautious development of the groundwater resources, especially for higher level (municipal) uses should continue. As pumping increases, its effects should be monitored and additional development allowed only if serious problems do not occur. The good quality water present in so much of the sandstone is an important resource for the future of the area. Its use and conservation should go forward.

9. Because the Navajo sandstone aquifer is so vulnerable to pollution in its outcrop zone, plans should be formulated and programs begun to protect this important drinking water aquifer. Access and use must be strictly controlled in the outcrop zone and other areas where infiltrating water can move quickly into the aquifer. Conditions may warrant requesting classification by EPA of the Navajo sandstone aquifer as a sole source aquifer. Some other aquifers also may need protection.

10. Available data show a decrease of irrigation pumpage from the alluvial aquifers of the basin. Groundwater levels in some areas have recovered noticeably in recent years. Further use of groundwater for irrigation in the alluvial aquifers could be allowed and perhaps should be encouraged. To use the poorer quality waters for a purpose they can well serve, makes hydrologic and economic sense. In those areas where excellent quality water is available in the alluvial aquifers groundwater development for higher order (municipal) uses should be allowed. Where pumping clearly affects streamflows, it may be necessary to allow pumping only if surface water rights can be purchased and transferred to the groundwater source.

11. Where groundwater is the only economic supply available and amounts are small, development of groundwater for domestic use should continue carefully.

12. Legal issues related to groundwater development need further definition in continuing studies.

In some areas surface waters are available and should be utilized. In other areas groundwater has a clear advantage. Water development plans should consider both sources and pick the mix that optimizes the system design. Such conjunctive use of surface and ground waters will ultimately lead to the best plan.

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APPENDIX A: FIGURES AND TABLES

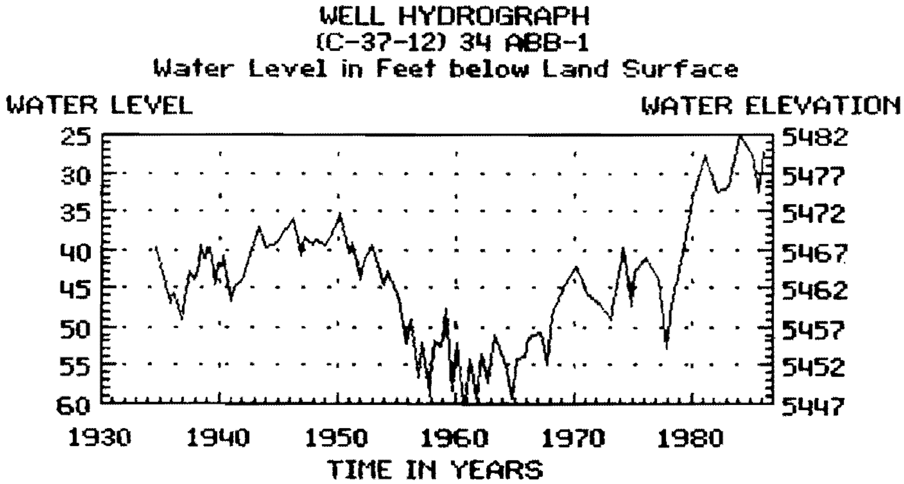


Figure A-1. Kanarraville.

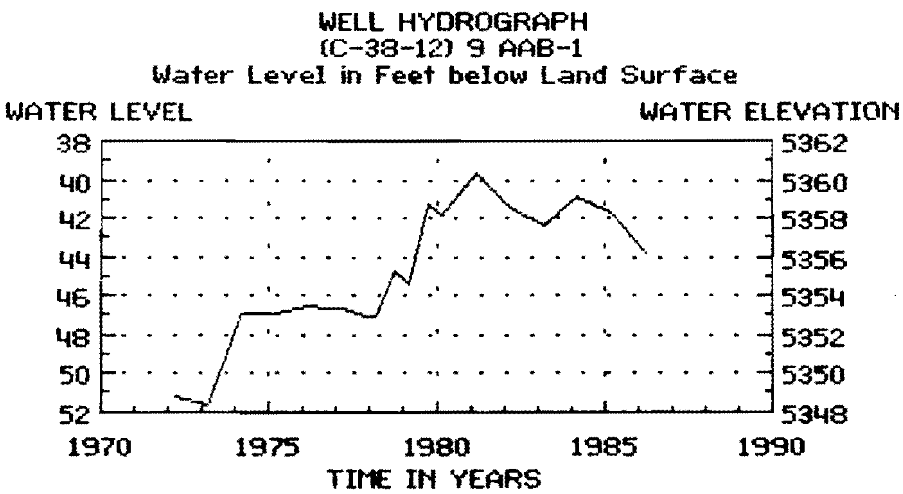


Figure A-2. South of Kanarraville.

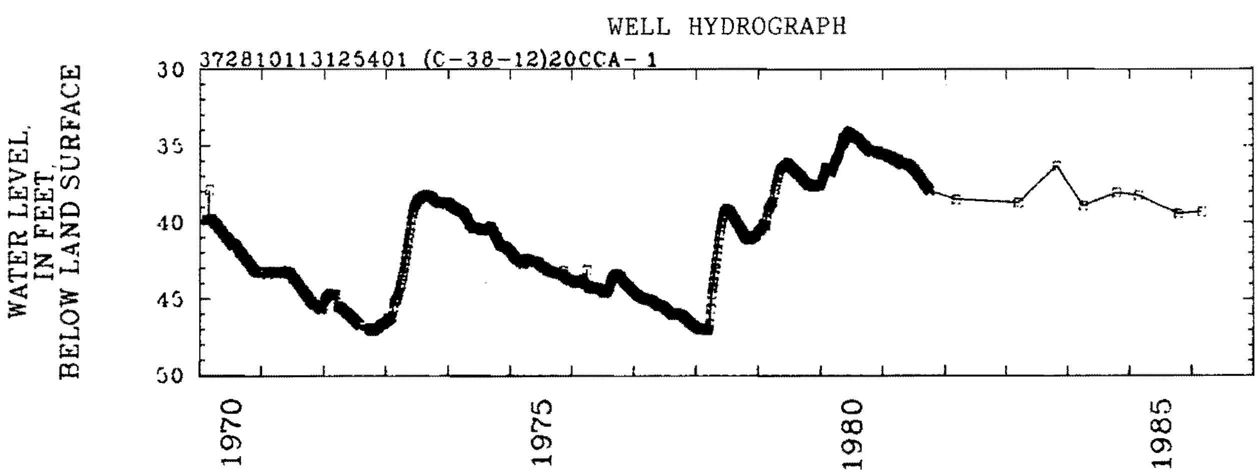
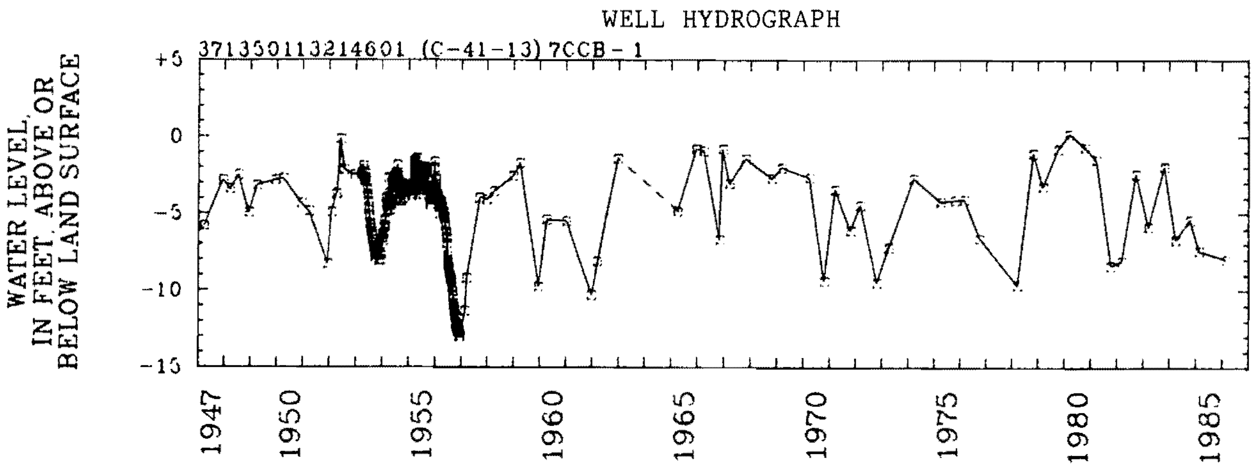


Figure A-3. Southwest of Kanarraville.



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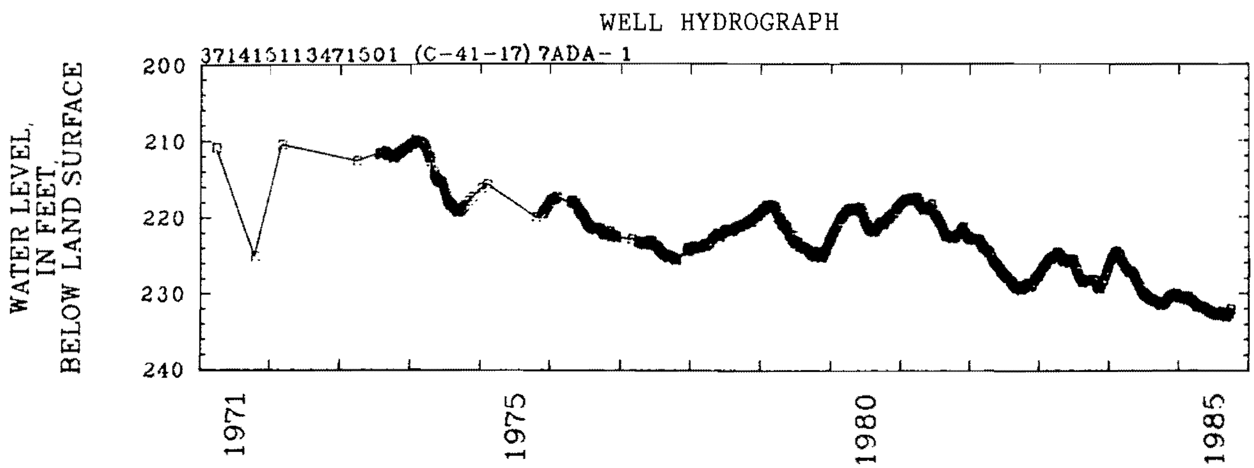


Figure A-5. Gunlock.

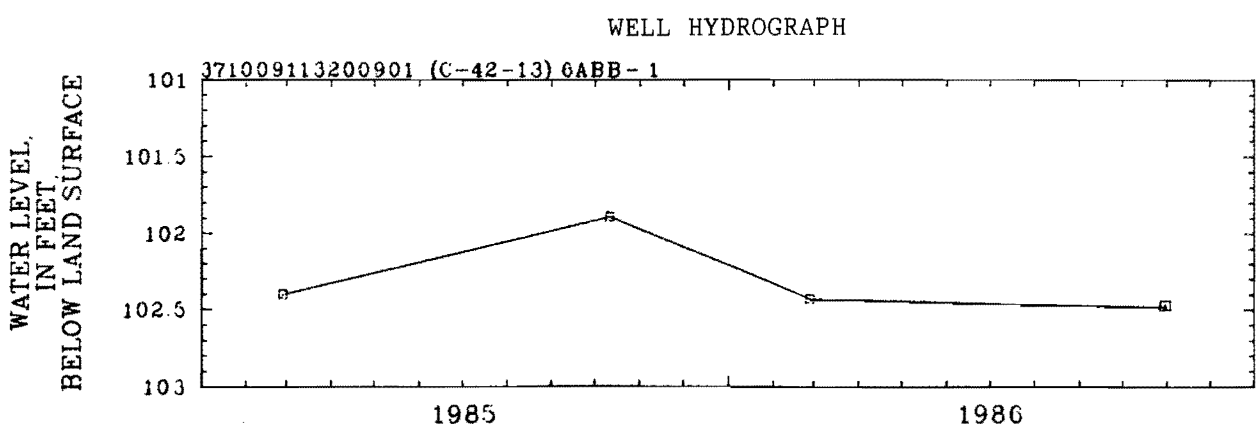
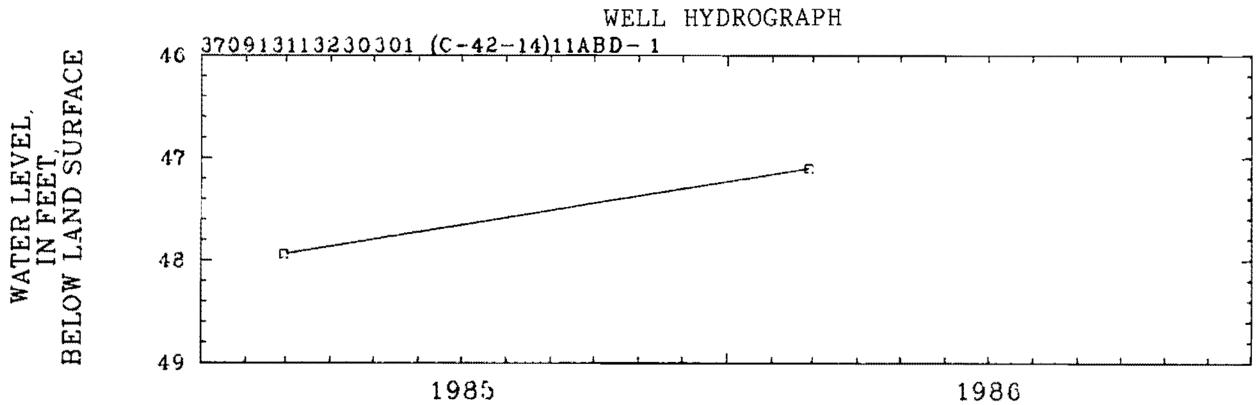


Figure A-6. Hurricane Bench.



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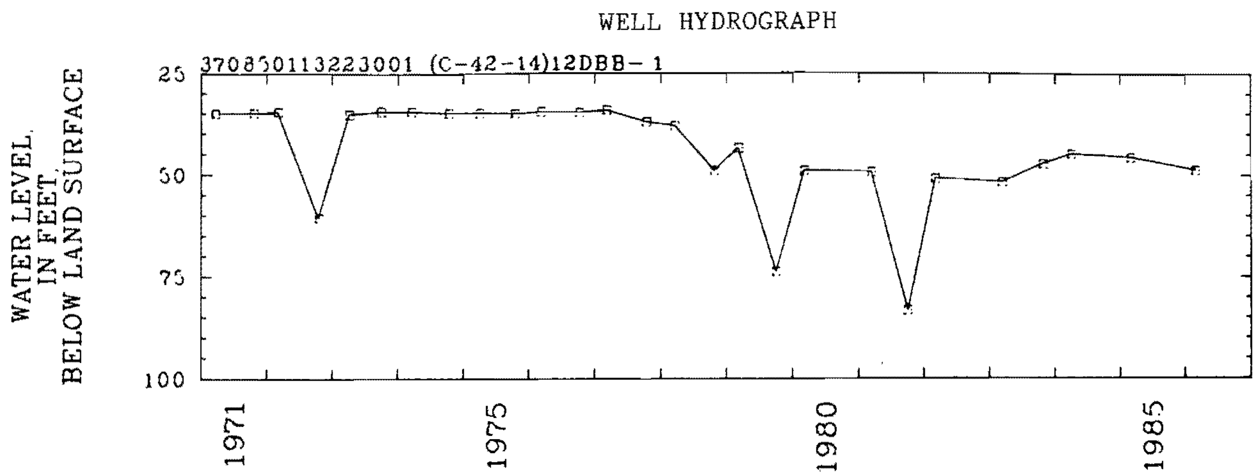


Figure A-8. Hurricane Bench.

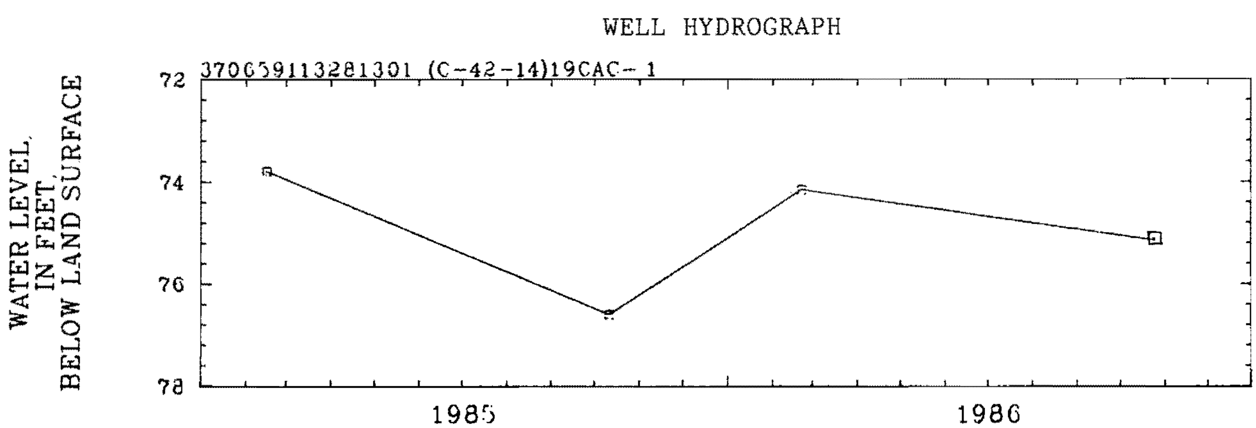
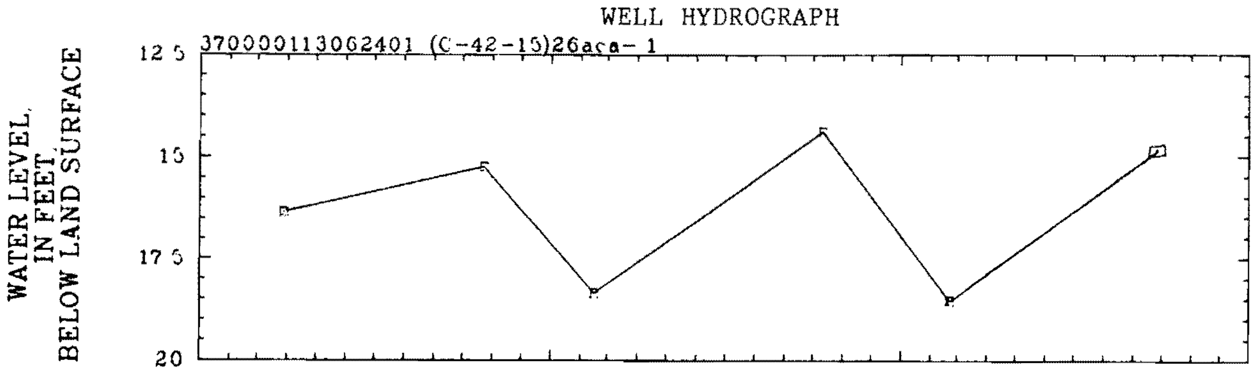


Figure A-9. East of Washington.



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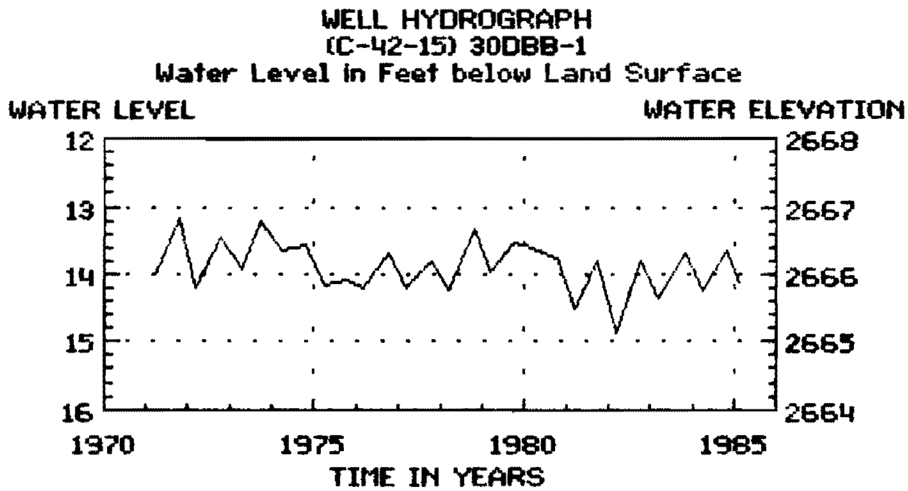


Figure A-11. St. George City.

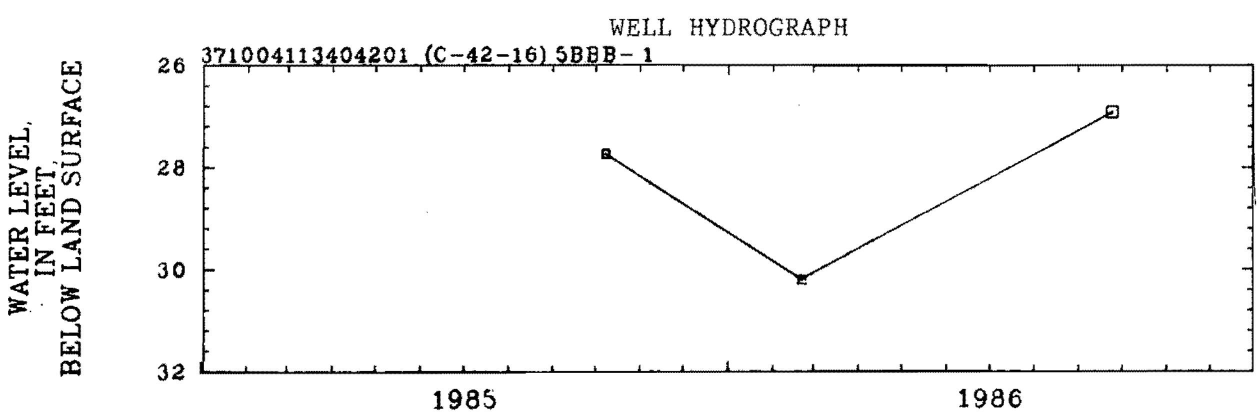


Figure A-12. Ivins.

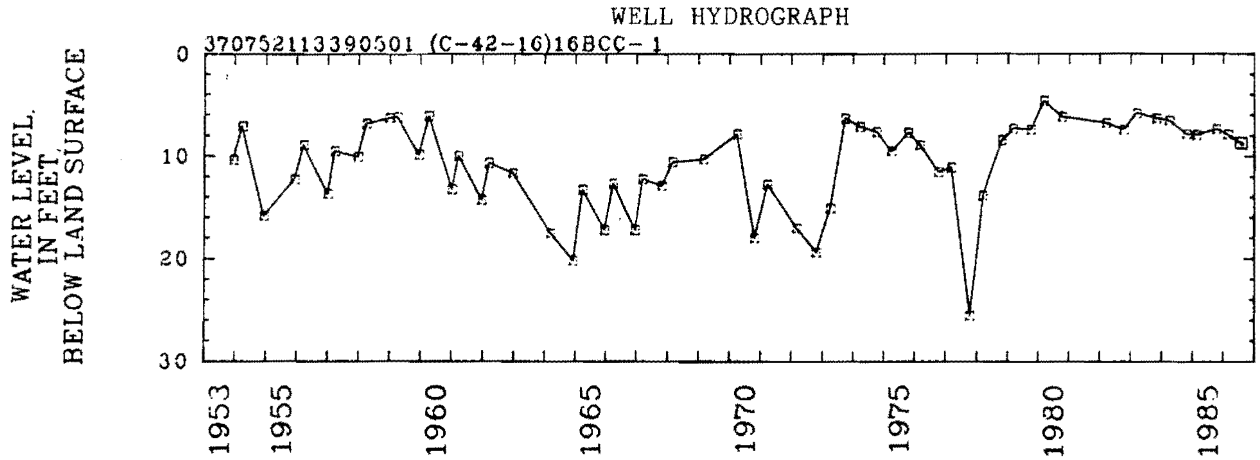
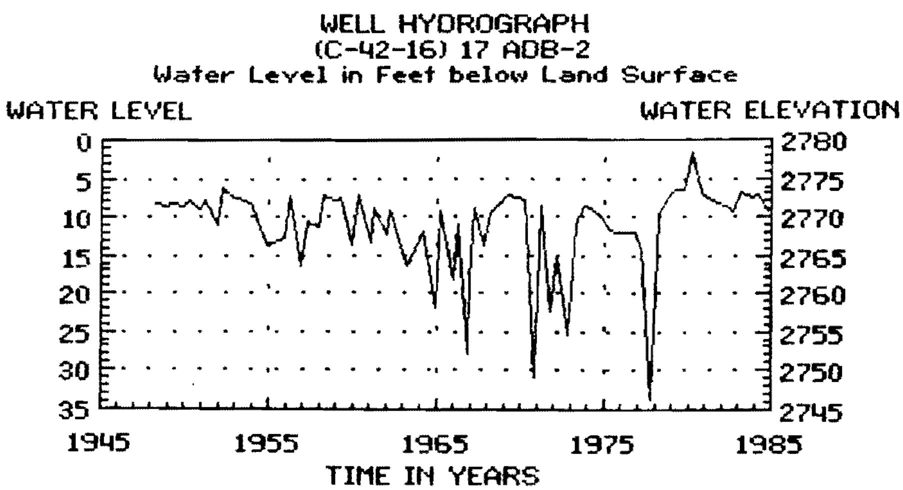


Figure A-13. Santa Clara.



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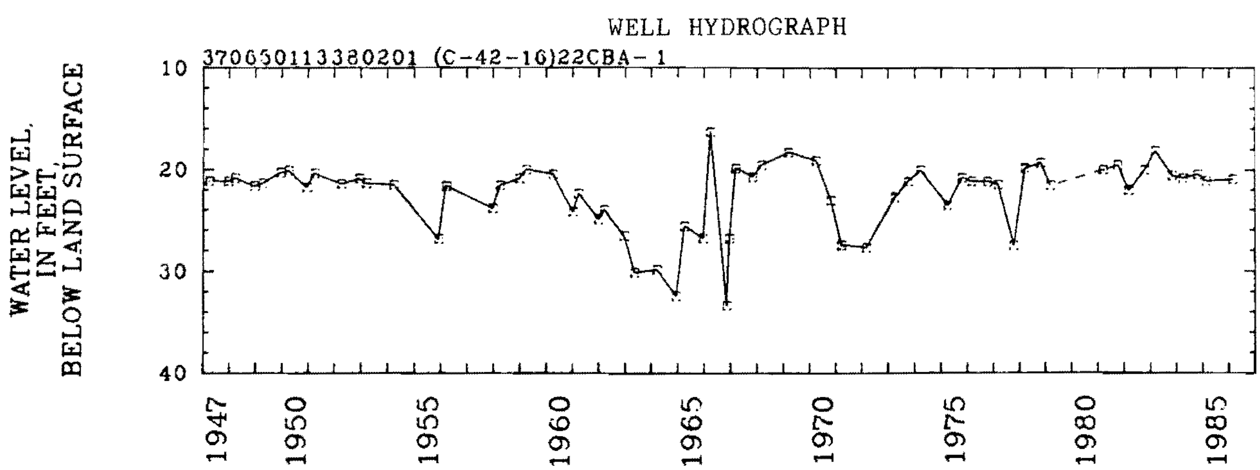
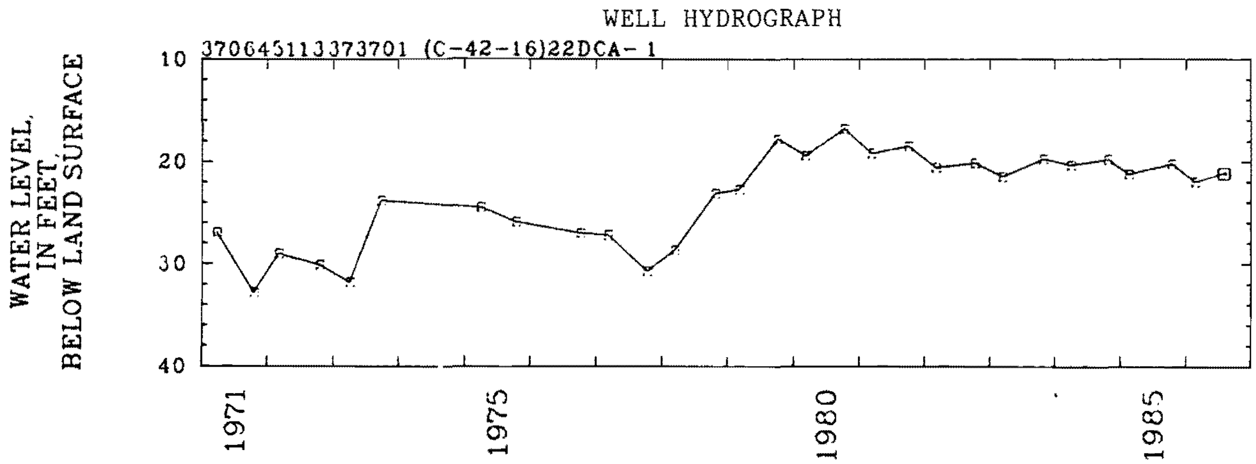


Figure A-15. Santa Clara Valley.



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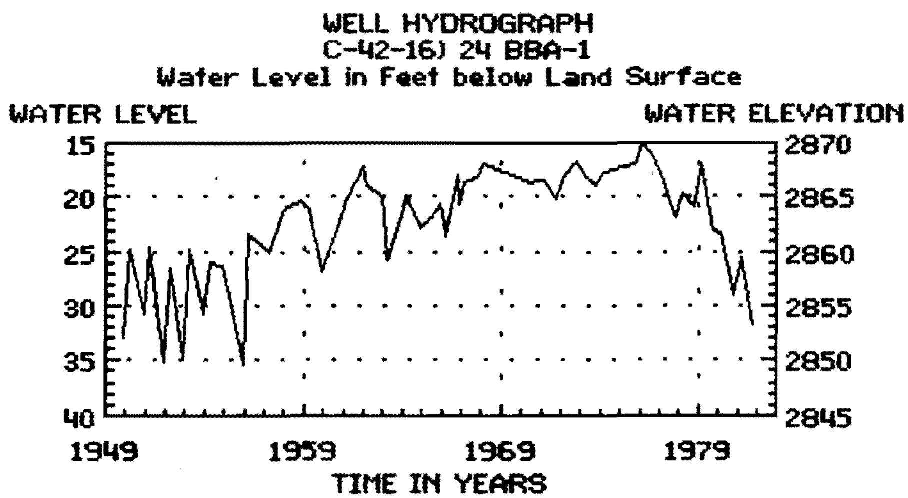


Figure A-17. Northwest St. George.

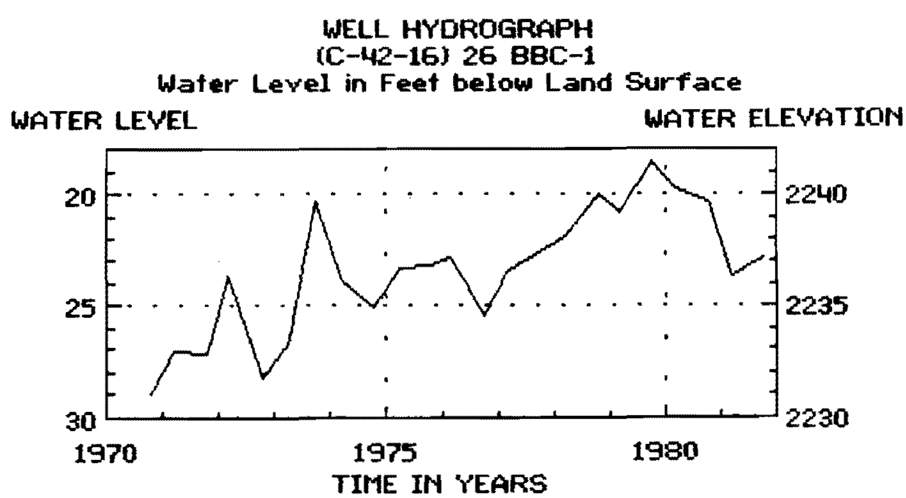
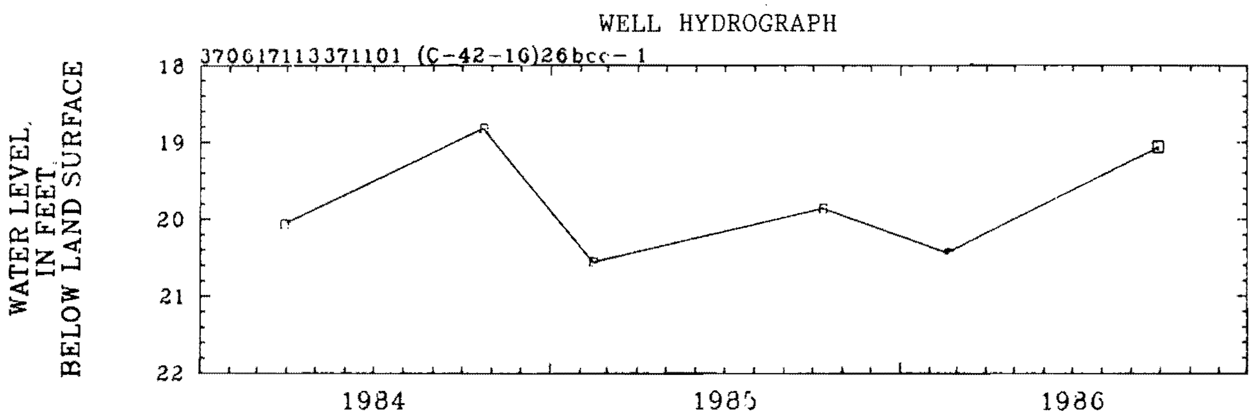


Figure A-18. South Santa Clara Valley.



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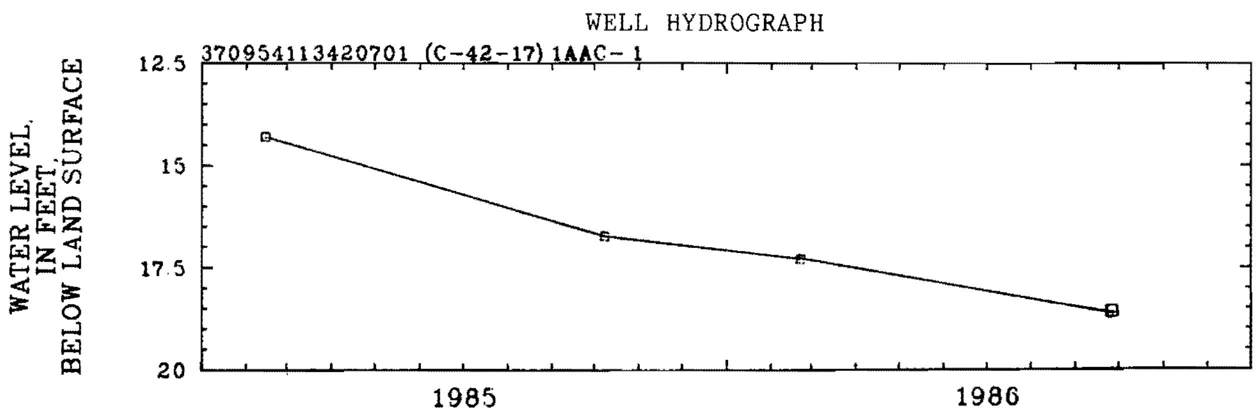


Figure A-20. West of Ivins.

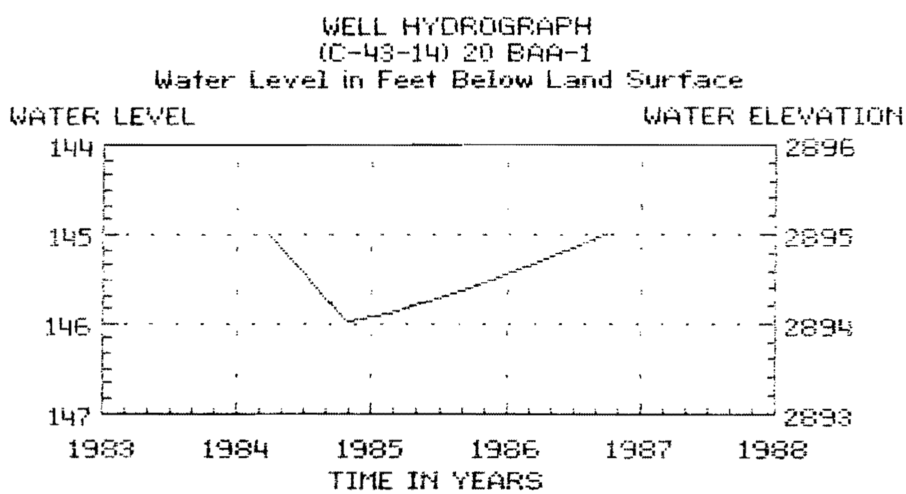
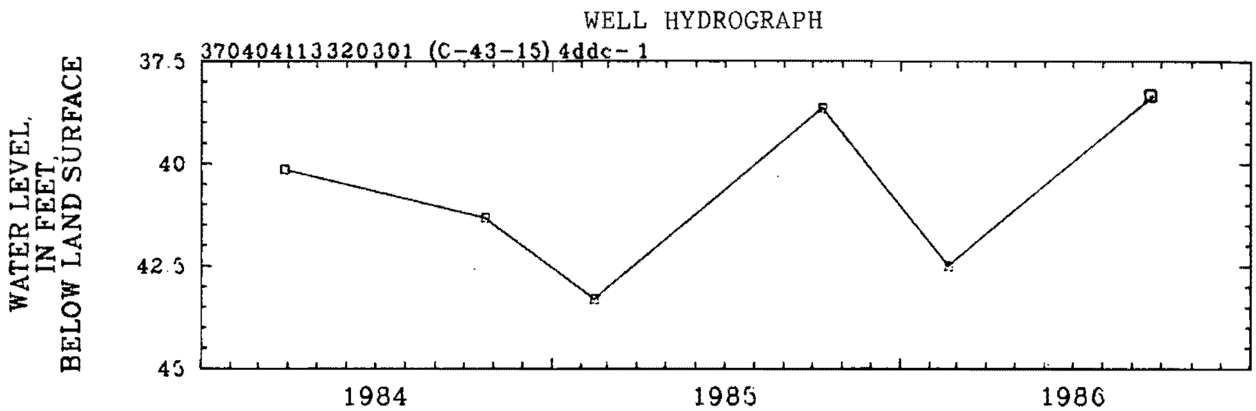


Figure A-21. Warner Valley.



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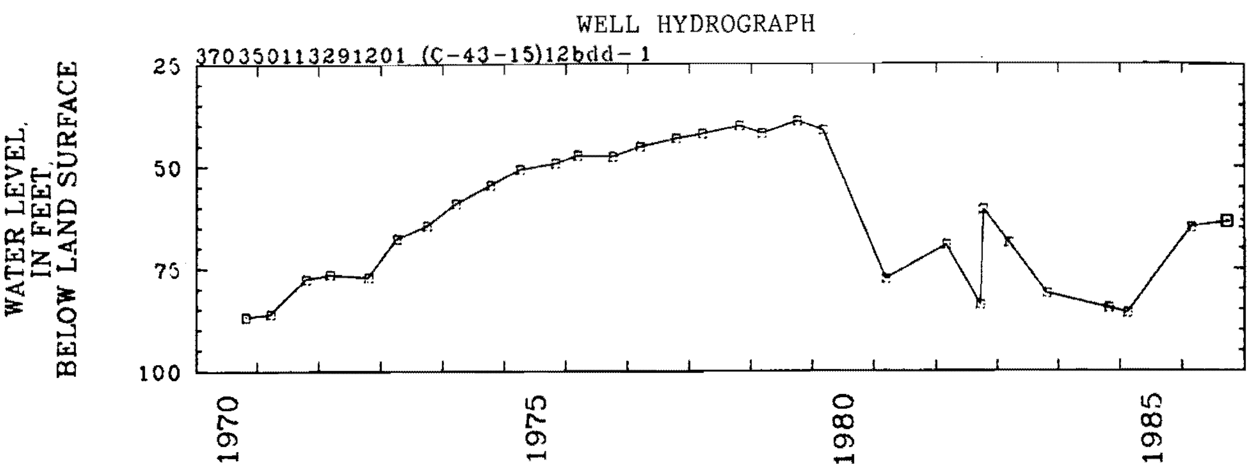


Figure A-23. Triangle Valley.

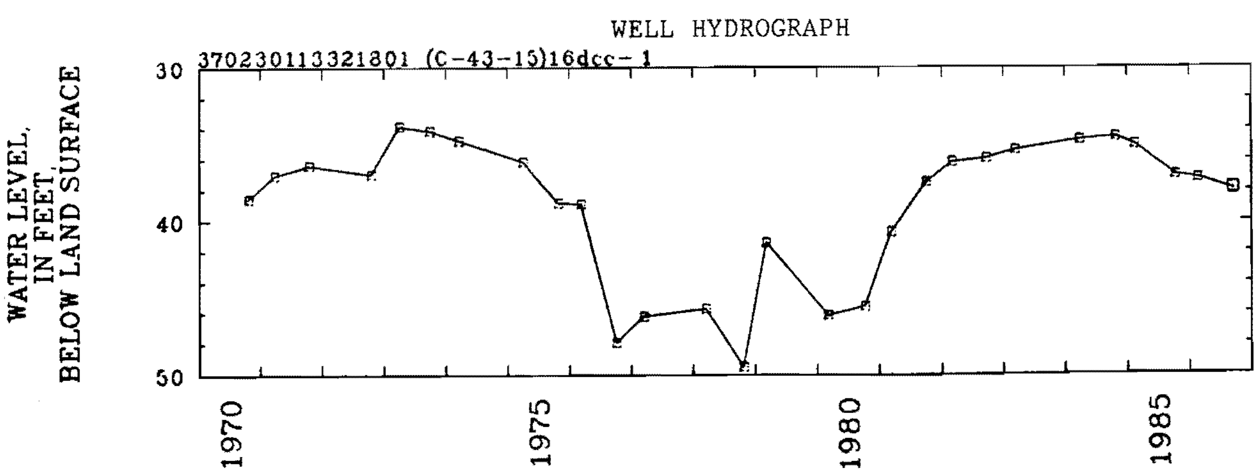
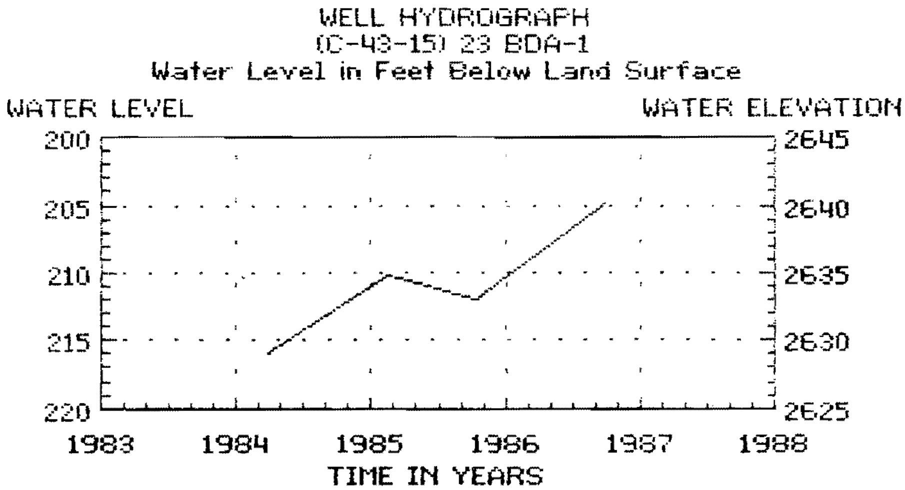


Figure A-24. Fort Pierce Wash (Little Valley).



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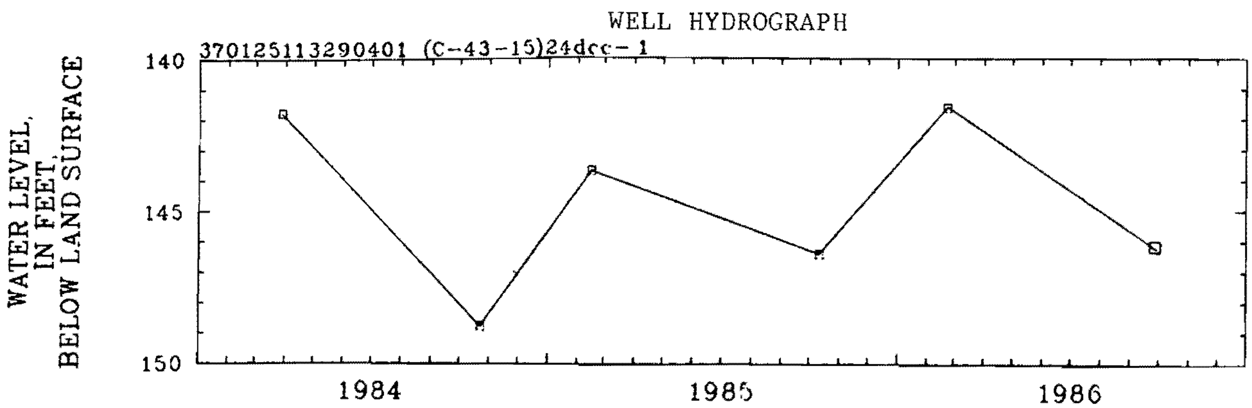

Figure A-26. Fort Pierce Wash.

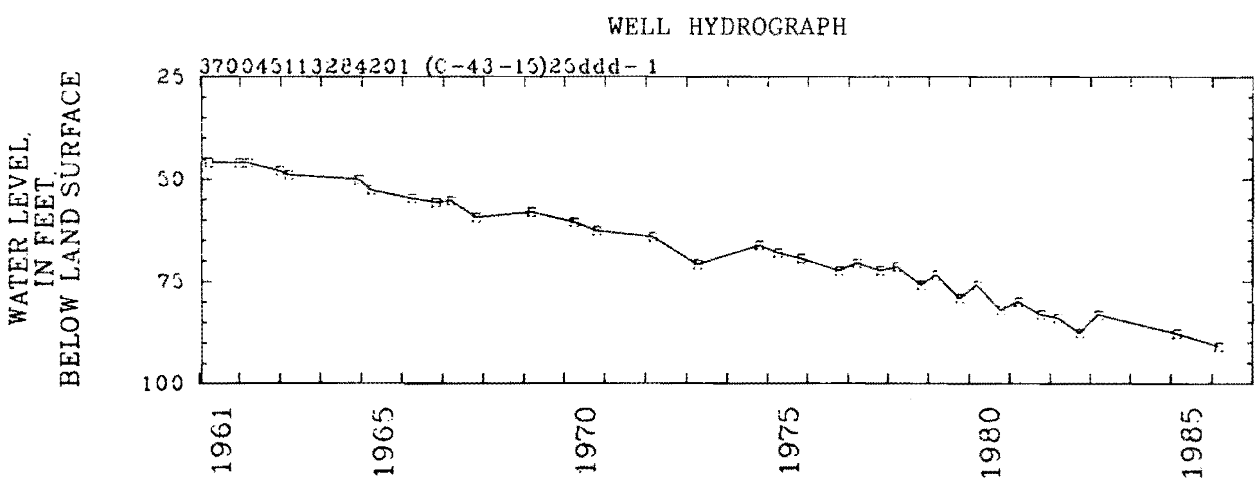

Figure A-27. Ft. Pierce Wash near Arizona.

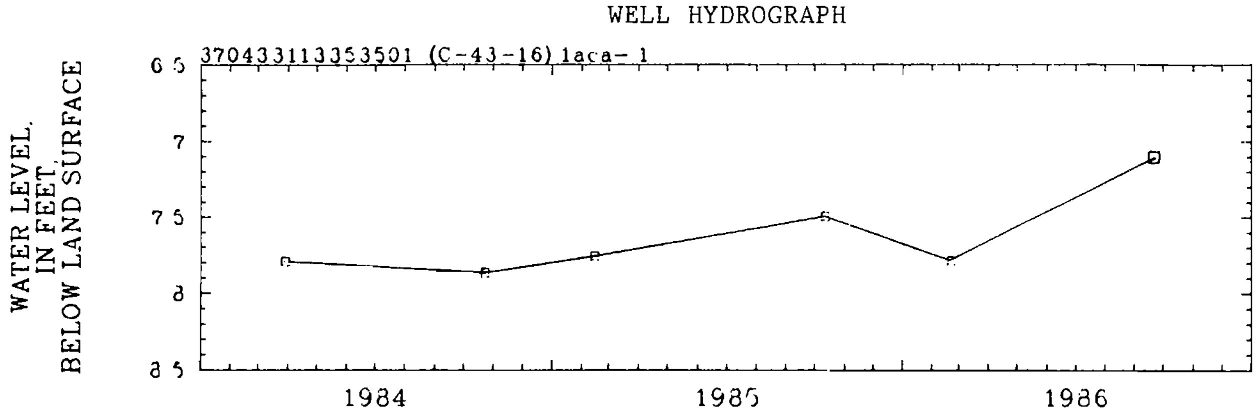

Figure A-28. South of St. George.

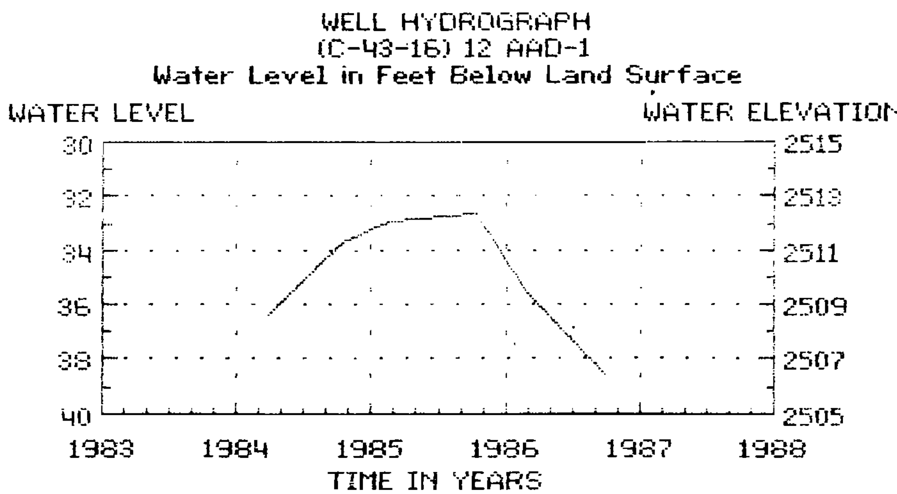

Figure A-29. East Bloomington.

Well- and spring-numbering system

The system of numbering wells and springs in Utah is based on the cadastral land-survey system of the U. S. Government. The number, in addition to designating the well or spring, describes its position in the land net. By the land-survey system, the State is divided into four quadrants by the Salt Lake base line and meridian, and these quadrants are designated by the uppercase letters A, B, C, and D, indicating the northeast, northwest, southwest, and southeast quadrants, respectively. Numbers designating the township and range (in that order) follow the quadrant letter, and all three are enclosed in parentheses. The number after the parentheses indicates the section, and is followed by three letters indicating the quarter section, the quarter-quarter section, and the quarter-quarter-quarter section (generally 10 acres[1]); the letters a, b, c, and d indicate, respectively, the northeast, northwest, southwest, and southeast quarters of each subdivision. The number after the letters is the serial number of the well or spring within the 10-acre tract; the letter "S" preceding the serial number denotes a spring. If a well or spring cannot be located within a 10-acre tract, one or two location letters are used and the serial number is omitted. Thus (C-42-16)22dca-1 designates the first well constructed or visited in the NE¼SW¼SE¼ sec. 22, T. 42 S., R. 16 W., and (C-42-16)22b-S designates a spring known only to be in the northwest quarter of the same section. Other sites where hydrologic data were collected are numbered in the same manner, but three letters are used after the section number and no serial number is used. The numbering system is illustrated in figure A-30.

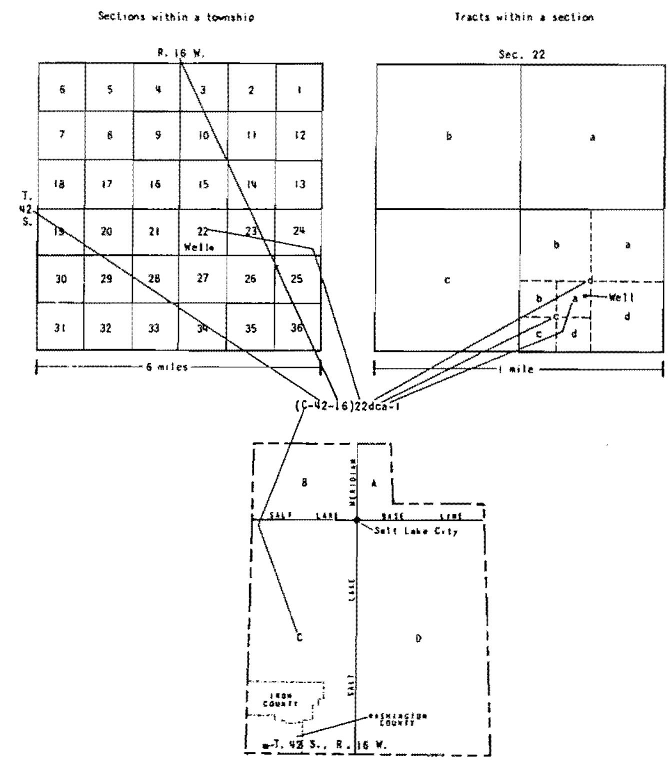

Figure A-30. Well-and spring-numbering system used in Utah.

1 Although the basic land unit, the section, is theoretically a 1-mile square, many sections are irregular. Such sections are subdivided into 10-acre tracts, generally beginning at the southeast corner, and the surplus or shortage is taken up in the tracts along the north and west sides of the section.

Table A-1. Records of selected wells.

Location	Owner or designation	Year constructed	Depth of well (feet)	Casing: Diameter (inches)	Casing: Depth (feet)	Well finish	Principal aquifer	Depth to top of Navajo Sandstone	Land surface altitude (feet above MSL)	Well water level: Above (+) or below land-surface datum (feet)	Well water level: Date	Well yield: Rate (gal/min)	Well yield: Date	Use of water	Remarks and other data available
							Ash Creek Valley								
(C-39-13)33ccd-1	Sun Oil Co.	1951	5,496	17 1/2	-	-		0	5,240			-	-	U	Destroyed
(C-40-13)2daa-1	Town of Pintura	1934	345	6	-	-	-		4,100	297	10-68	-		P	C
23aba-1	McCulloch G. W. No. 1	1964	7,315	-	-	-	Kaibab Limestone		3,800	765	9-64	-		U	C
27bdb-2	Anderson Ranch	1958	300	6	-	-	Uncons. Rock		3,840	245	5-58	21		S	C
(C-41-13)12cbb-1	Town of La Verkin	1957	165	8	16	-	Shinarump Cong.		3,200	35	5-57	-		U	C
23bca-1	Ash Creek well	1969	1,835	14	140	X	Dakota Sandstone, Carmel Formation, Navajo Sandstone	1700FC	3,040	+15		96F	2-5-75	S	Drilled into alluvium, C
23bcd-1	W. Wilson	1969	1,835	12	140	X	Shinarump Cong.		3,040	15	-	100		S	-
							Bloomington								
(C-43-16)12aaa-1	W. Hackwell	1965	50	14	18	P	Uncons. Rock		2,540	8	10-65	-		C	C
12adb-1	Bloomington	1969	107	-	-	-	Gravel, sand		2,520	30	-	2,700		I	C,Q
12ccb-1	Johnson Land Development	1956	105	14	60	O	Shinarump Cong.		2,725	47	10-68	450		I	-
14bbb-1	Johnson Land Development	-	-	10	-	-	Moenkopi		2,560	58	11-68	-		U	-
22dab-1	E. Jones	1966	45	8	36	X	Uncons. Terrace		2,490	30	1-66	10		U	C
							Diamond Valley - Snow Canyon								
(C-40-16)34cad-1	L. Stabeli	1974	280	8	-	-		14S	4,565			-	-	U	Water table not reached; destroyed
35dcc-1	E. Blake	1966	40	16	20	O	Carmel Formation		4,500	1	11-66	50		U	C
(C-41-15)30abc-1	F. Holland and M. Gubler	1956	215	16	0	-	Navajo Sandstone	0	3,840			-	-	U	Water table not reached; destroyed
(C-41-16)1ccc-1	H. O. Moore	-	385	16	60	X	Uncons. Rock		4,800	91	10-68	-		U	-
3dbc-1	State of Utah	1969	900	8	-	-	Navajo Sandstone	15C	4,600			-	-	U	Water table not reached; destroyed
9cba-1	Snow Canyon 2	1974	425	16	-	-	Navajo Sandstone	0	3,550	287		-	-	T	C,L
16cdb-1	Snow Canyon 1	1974	685	8	-	X	Navajo Sandstone	0	3,440	186		965	8-13-74	T	C,L,W
28bca-1	D. Snow	1963	300	6	28	-	Kayenta Formation		3,200	128		-	-	U	-
							Fort Pierce Wash								
(C-43-13)21caa-1	W. Spendlove	1962	185	6	50	X	Kayenta, Navajo	55A	3,300	160R		25	-	S	W. T. in Kayenta
(C-43-14)31ddd-1	G. Seegmiller	1962	14	14	14	P	Uncons. Rock		2,820	12	10-68	-		U	-
(C-43-15)5dbd-1	J. Holt	1967	153	14	25	X	Uncons. Rock		2,580	10	11-67	-		U	-
9ada-1	K. Bentley	1969	145	18	-	X	Uncons. Rock		2,660	21	11-69	-		S	-
9cba-1	Hanning and others	1967	125	14	20	P	Uncons. Rock		2,615	40	8-67	-		U	-
16aad-1	K. Bentley	1970	195	10	-	-	Moenkopi Form.		2,680	53	2-70	-		U	-
16cab-1	City of St. George	1962	264	16	-	-	-		2,660	73	10-68	-		U	-
16dbc-1	K. Bentley	1966	105	16	40	P	Uncons. Rock		2,655	42	3-66	-		U	-
16dcc-1	W. Seegmiller	-	160	16	30	P	Gravel, sand		2,660	31	10-68	1,570		I	C,Q
25ddd-1	G. Seegmiller	1960	144	16	50	P	Uncons. Rock		2,795	45	11-60	1,572		I	C,D,Q
							Gunlock								
(C-40-17)21ddb-1	Town of Gunlock	1961	127	6	52	P	Uncons. Rock		4,000	33	-	30		P	C
(C-41-17)7ada-1	City of St. George	1966	244H	16	346	P	Navajo Sandstone	0	3,600	203	2-66	-		P	-
7ddb-1	Gunlock 2	1965	500	16	446	F	Navajo Sandstone	17S	3,580	196	-	822	7-1-74	P	C,W
7dca-1	City of St. George	1965	500	16	176	F	Navajo Sandstone	0	3,580	178	3-65	1,200		P	C
8cac-1	Gunlock 1	1965	500	16	283	F	Navajo Sandstone	3S	3,480	101		630	10-28-74	P	C,W
8cca-1	City of St. George	1964	500	16	100	F	Navajo Sandstone	0	3,480	100	7-68	700		P	C
8cda-1	Gunlock 4b	1970	500	14	-	-	Navajo Sandstone	0	3,460	67		2,000	1-22-74	P	C,W
8cdc-1	City of St. George	1970	500	14	-	X	Navajo Sandstone	0	3,460	71	6-70	-		U	-
17bdb-1	Gunlock 3	1965	626	16	626	F	Navajo Sandstone	0	3,460	83		1,620	9-26-74	P	C,W
17cba-1	City of St. George	1965	626	16	9	F	Navajo Sandstone	0	3,480	76	10-65	1,600		P	C
							Hurricane Bench								
(C-41-13)31acd-1	F. Judd	1973	259	5	259	O	Navajo Sandstone	161AL	3,080	181		200R		T	C,L,W
(C-42-13)6bac-1	W. Wilson	1962	180	8	-	-	Navajo Sandstone	22A	3,035	130		-	-	U	
6bac-2	W. Wilson	1974	417	12	100	X	Navajo Sandstone	22A	3,035	127		-	-	U	W
7bba-1	W. Wilson	1958	185	8	18	X	Navajo Sandstone	8S	2,960	47		725R	-	U	C,L,W
7bba-2	W. Wilson	1962	127	16	-	X	Navajo Sandstone	11SL	2,960	48		400R	-	U	C
7bba-3	W. Wilson	1965	705	16	50	X	Navajo Sandstone	15S	2,960	51		1,800R	-	U	
7cbb-1	Hydro-Tech Co.	1964	129	16	15	X	Navajo Sandstone	14S	2,950	32		368	10-10-74	I	C
7ccb-1	W. Wilson	1974	400	-	-	-	Navajo Sandstone	14S	2,950	49		-	-	I	W
7ccc-1	Royal Garden Farms	1964	129	16	15	X	Navajo Sandstone	0	2,960	34	10-64	-		I	C,Q
17dcd-1	W. Wilson	1970	230H	12	-	-	Valley fill		3,300	225		-	-	U	
18bcb-1	W. John	1958	258	8	18	X	Navajo Sandstone	4S	2,980	60		-	-	U	L,W
18bcb-2	W. John	1959	194	14	17	X	Navajo Sandstone	15S	2,980	50		850R	-	U	L
18ccb-1	W. Wilson	1958	258	8	18	-	Navajo Sandstone		2,980	60	1-58	-		U	-
18ccb-2	W. Wilson	1959	194	14	17	X	Navajo Sandstone		2,980	60	1-59	-		I	-
21aab-1	E. Graff	1952	365	14	-	-	Uncons. Rock		3,320	300	1-52	-		U	-
22bbb-1	W. Wilson	1973	500	12	428	O	Valley fill		3,360	297		-	-	U	
33ada-1	E. Graff	1969	473	10	448	O	-		3,380	434	9-69	500		U	-
33ada-2	E. Graff	1970	480	10	357	O	-		3,380	444	1-70	-		U	-
(C-42-14)1add-1	W. Wilson	1969	300	14	145	X	Navajo Sandstone	161AL	2,960	102		-	-	U	
1bac-1	L. Jones	1973	400	16	-	-	Moenave Formation		2,880	40		530	5-10-74	I	
11abd-1	E. Stringham	1956	67	10	44	P	Uncons. Terrace		2,850	44	3-56	-		I	C,Q
11dcc-1	Washington City	1972	600	8	100	X	Kayenta Formation		2,930	130		60R		P	
12ada-1	W. Wilson	1974	300	12	101	X	Navajo Sandstone	36S	2,916	24		420	10-23-74	I	C
12dbb-1	Dixie Springs Farm	1964	140	16	23	X	Navajo Sandstone	6S	2,925	34		156	8-4-70	I	C
12dcc-1	Dixie Springs Farm	1964	140	16	23	X	Navajo Sandstone		2,940	32	1-64	101		I	C,Q
12dda-1	W. Wilson	1974	425	12	40	X	Navajo Sandstone	41S	2,940	36		400	10-23-74	I	C,W
15aba-1	E. Stratton	1961	175	10	175	O	Kayenta Formation		2,820	-	-	-		U	-
15baa-1	H. Fawcett	1960	140	14	-	P	Valley fill		2,800	114		-	-	U	
15cba-1	H. Fawcett	1961	320	14	75	X	Moenave		2,820	78	5-61	110		I	C,Q
15cda-1	E. Willard	1971	272	14	-	X	Navajo Sandstone	0	2,875	75		50R		H	
15dab-1	R. Graff	1974	200	14	12	X	Navajo Sandstone	35V	2,910	89		200R		I	
25abb-1	Terracor 3	1970	720	8	4	X	Navajo Sandstone		3,010	74		375	-	T	C,L,W
25adc-2	G. Woodbury	1959	165	10	5	X	Navajo Sandstone	4S	3,030	99		-	-	S	
26bbb-1	Terracor 2	1970	645	8	5	X	Navajo Sandstone	4S	3,035	88		250R		T	L,W
34cad-1	Terracor 1	1970	735	8	11	X	Navajo Sandstone	10S	3,515	435R		-	-	T	C
(C-43-13)5bdd-1	Spillsbury Co.	1956	530	6	46	X	Navajo Sandstone	46S	3,420	500	2-56	-		S	C
							Leeds Creek - Quail Creek - Harrisburg								
(C-40-14)35aab-1	Leeds Creek well	1973	405	16	-	-	Navajo Sandstone	16C	4,360			-	-	U	Water table not reached; destroyed
(C-41-13)4bab-1	W. Scheuber	1966	115	10	-	-	Navajo Sandstone	0	3,680	14		-	-	H	C,W
4bbc-1	H. Ludwig	1970	100	8	100	F	Navajo Sandstone	0	3,670	-		-	-	H	C
5aaa-1	E. Wooten	1960	60	14	11	X	Navajo Sandstone	3S	3,675	26		106	10-30-74	H	C,W
5adb-1	L. Howard	1969	54	14	17	X	Navajo Sandstone	3S	3,650	18		85R		I	
5adb-2	A. Howard	1974	97	8	83	X	Navajo Sandstone	25GS	3,650	21		-	-	I	
5bbc-1	Coddard and Savage	1972	310	8	40	X	Navajo Sandstone	26E	3,660	72		550	10-10-74	I	C,W
5dbb-1	A. Howard	1953	48	12	8	X	Navajo Sandstone	-	3,600	15	11-53	-		H	C
6aac-1	Coddard and Savage	1972	260	11	31	X	Navajo Sandstone	27F	3,700	84		50R		T	C,L,W
7ccb-1	L. Sullivan	1946	98	12	12	P	Uncons. Rock		3,400	5	3-47	117		I	C,Q
16bcd-1	Utah State Land Board	1969	1,128	7	-	-	-		3,240	+1	5-70	94F		S	C
(C-41-14)15ada-1	U.S. Bureau of Land Management	1963	65	6	47	F	Navajo Sandstone	0	3,220	30R	6-63	20R2		P	-
28dab-1	U.S. Bureau of Land Management	1966	151H	6	19	P	Kayenta Formation		3,280	88		-	-	U	

*From Cordova et al. (1972) and Cordova (1978, 1981)

Table A-1. Continued.

Location	Owner or designation	Year constructed	Depth of well (feet)	Casing: Diameter (inches)	Casing: Depth (feet)	Well finish	Principal aquifer	Depth to top of Navajo Sandstone	Land surface altitude (feet above MSL)	Well water level: Above (+) or below land-surface datum (feet)	Well water level: Date	Well yield: Rate (gal/min)	Well yield: Date	Use of water	Remarks and other data available
							Hill Creek - Middleton Wash - City Creek								
(C-40-15)27dba-1	City of St. George	1957	507	6	-	-	-	0	-	130	-	-		U	-
(C-41-15)32aca-1	Terracor	1974	600	14	550	0			3,530	478		-	-	T	C,L
(C-42-15)6dcc-1	City Creek No. 1	1973	700	16	30	X			3,296			1,320	7-28-73	T	C,L,W
6dcd-1	City Creek No. 2	1974	900	24	50	X			3,308			470	1-29-75	T	C,L
10bcd-1	Washington City	1972	650	16	20	X			3,020			1,000	5-18-74	T	C,L,W
15abb-1	F. Sullivan	1970	231H	5	30	X			2,900			250R		U	L
(C-42-16)1ccd-1	Twist Hollow	1974	365	12	4	X	Kayenta, Navajo	0	3,240	252	-	-	-	T	C,L, W.T. in Kayenta
							New Harmony Valley								
(C-37-12)11aab-1	G. Vandenburghe	1953	365	14	-	-	Gravel, sand		5,490	38	3-70	855		I	-
14abc-1	A. Graff	1950	264	14	-	-	Gravel, sand		5,485	31	3-70	639		I	-
23aca-1	J. Prestwich	1954	276	16	83	P	Gravel, sand		5,525	-	-	-		I	Q
23acb-1	J. Prestwich	1940	300	16	96	P	Gravel, sand		5,520	-	-	575		I	Q
23cbd-2	W. Williams	1968	561	14	230	F	Gravel, sand		5,500	50	3-70	1,100		I	C,D,Q
27dad-1	L. Heywood	1953	216	16	112	P	Gravel, sand		5,520	67	-	-		I	-
34aba-1	L. Prestwich	1953	220	16	-	P	Gravel, sand		5,522	62	-	-		I	Q
34abb-1	Kanarraville Irrigation Co.	1934	190	12	-	-	Gravel, sand		5,508	43	3-70	800		I	Q
34dbd-1	L. Prestwich	1965	342	16	70	P	Gravel, sand		5,520	64	-	-		I	-
35bbc-1	Town of Kanarraville	1952	190	12	120	P	Gravel, sand		-	-	-	160		P	-
(C-38-12)3bcb-2	L. Davis and others	1953	227	16	75	P	Gravel, sand		5,483	71	3-70	-		U	H
4cdc-1	Utah State Road Comm.	1965	404	8	262	P	Gravel, sand		5,482	75	10-69	-		P	-
9aab-1	R. Williams	1967	300	12	100	F	Gravel, sand		5,397	58	4-70	-		U	-
9bba-1	R. Williams	1936	135	12	11	P	-		5,320	11	-	20		U	-
19aab-1	E. Graff	1969	200	14	-	P	Gravel, sand		5,120	75	11-69	-		I	Q
20bba-1	E. Graff	1946	220	16	62	P	Gravel, sand		5,125	41	12-47	210		I	C,Q
20bcc-1	E. Graff	1949	216	16	40	P	Gravel, sand		5,084	49	12-68	277		I	C,Q
20cca-1	E. Graff	1967	290	14	80	P	Gravel, sand		5,050	39	11-69	-		U	-
32bbc-1	E. Graff	1949	216	16	-	-	-		4,980	2	10-68	-		I	C
(C-38-13)9dcd-1	J. Prince	1952	154	10	28	P	-		5,500	31	10-68	193		I	D
16cad-1	J. Prince	1952	156	14	16	P	Uncons. Rock		5,400	6	10-68	211		I	Q
22cbd-1	E. Wood	1947	190	14	-	P	Gravel, sand		5,240	2	10-68	700		U	-
23cca-1	L. Iverson	1946	130	12	36	P	Gravel, sand		5,200	36	10-68	75		I	-
							Pine Valley - Grass Valley								
(C-39-15)14cbc-1	Pine Valley Irrigation Co.	1968	97	6	40	P	Gravel, sand		6,500	20	7-68	-		H	D
14ccb-1	B. Snow	-	20	36	20	O	Uncons. Rock		6,500	11	10-68	-		H	C
14dad-1	P. McDermott	-	9	36	9	O	Uncons. Rock		6,500	3	10-68	-		H	C
14dcc-2	E. Jacobsen	-	21	36	21	O	Uncons. Rock		6,500	12	10-68	-		H	C
14dcd-1	N. Berkstrom	1967	100	6	38	P	Uncons. Rock		6,500	25	4-67	25		H	C
15daa-1	L. Paxman	-	15	40	15	O	Uncons. Rock		6,500	8	10-68	-		H	C
(C-38-14)31bda-1	E. Gardner	1963	200	16	42	P	-		6,960	37	10-68	-		U	D
							St. George Valley								
(C-42-15)19cac-1	R. Prince	1960	100	8	11	X	Kayenta Formation		3,040	40	8-60	-		I	C
20cdb-1	St. George City	1955	100	12	26	X	Navajo Sandstone	0	2,920			584R		U	L
29bbd-1	S. Priabrey	1964	105	8	20	X	Kayenta Formation		2,760	34	7-64	-		I	-
29cac-1	A. Iverson	1951	25	96	25	O	Gravel, sand		2,680	20	10-68	-		H	-
29ddc-1	F. Formaster	1966	300	16	200	P	Chinle Formation		2,640	50	11-66	-		U	-
30ada-1	W. Oliphant	1960	90	8	29	X	Kayenta Formation		2,740	10	6-60	-		I	C
30adc-1	E. McArthur	1966	95	6	40	X	Kayenta Formation		2,695	30	9-66	20		H	L
30bdb-1	W. Milne	1960	88	8	33	X	Kayenta Formation		2,700	12	-	-		I	-
30caa-2	E. Blackburn	1959	36	10	23	X	Kayenta Formation		2,680	6	6-59	-		I	C
30cbd-1	E. Stringham	1957	30	10	11	X	Moenave		2,660	8	9-57	-		I	C
30dac-3	S. Stucki	1959	60	10	12	X	Chinle Formation		2,670	13	6-59	-		I	-
30dbb-1	E. Spendlove	1965	80	8	47	X	Chinle Formation		2,675	13	8-68	-		U	-
30dcd-2	K. Empey	1961	25	8	20	O	Chinle Formation		2,645	7	10-68	-		I	C
31ccd-1	H. Hafen	-	100	6	-	-	Chinle Formation		2,560	7	10-68	-		S	-
32abc-1	R. Hazen	1958	53	10	17	P	Chinle Formation		2,630	4	10-68	-		U	-
32dba-1	R. McArthur	1969	145	8	23	P	Uncons. Rock		2,600	20	8-69	-		S	-
32dcc-2	C. Cox	1966	72	10	20	P	-		2,580	6	2-68	-		C	D
33cab-1	P. Formaster	1964	259	16	27	X	Shinarump Cong.		2,630	8	9-64	-		I	-
(C-42-16)24aca-1	E. Earl	1965	134	8	20	X	Kayenta Formation		2,870	40	10-65	-		I	C
24dbd-1	J. Callahan	1965	90	8	57	X	Kayenta Formation		2,800	14	1-65	-		U	-
24ddd-1	C. Dean	1964	84	8	46	-	Kayenta Formation		2,760	6	10-68	-		I	C
25aab-1	G. Johnson	1960	56	8	18	P	Uncons. Rock		2,755	8	1-60	-		I	C
25dab-1	B. Leavitt	1958	50	12	25	P	Uncons. Rock		2,700	8	9-58	-		I	C
(C-43-16)1ada-1	C. Blake	1956	53	16	28	P	Uncons. Rock		2,580	9	8-68	240		U	H
1add-1	C. Blake	1956	53	16	34	P	Uncons. Rock		2,560	8	8-68	440		U	-
							Santa Clara - Ivins								
(C-42-16)5bbb-1	W. Hafen	1963	110	16	36	X	Chinle Formation		3,060	28	5-67	55		I	C,D
5bbb-2	D. Hafen	1957	172	8	40	P	Chinle Formation		3,080	-	-	-		H	-
6ada-1	C. Mannering	1970	100	6	22	P	Moenave		3,040	9	2-70	7		H	-
13ccd-1	J and J Hill and Lumber Co.	1965	68	10	20	P	Uncons. Rock		2,920	21	1-65	15		N	-
14daa-1	City of St. George	1964	500	8	27	X	Kayenta Formation		2,915	78	1964	-		I	C,Q
22baa-1	R. Hafen	1963	100	16	62	P	Uncons. Rock		2,760	55	2-63	465		I	Q
23aad-2	W. Thompson	1969	140	14	30	X	Kayenta Formation		2,860	33		-		H	
23abd-1	R. Hammer	1965	105	8	30	X	Kayenta Formation		2,840	45	12-66	20		S	-
24bba-1	B. Thornton	1949	185	5	-	-	-		2,880	18	5-70	-		H	-
16acc-1	Town of Santa Clara	1968	415	14	-	-	-		2,790	53	3-68	3		U	D
16bcc-1	St. George-Clara Field Canal Co.	1953	63	16	33	P	Uncons. Rock		2,780	17	10-68	-		I	C,Q
16cab-1	St. George-Clara Field Canal Co.	1953	63	16	30	P	Uncons. Rock		2,760	8	6-53	-		I	Q
16dcb-1	St. George-Clara Field Canal Co.	1959	63	14	14	P	Uncons. Rock		2,760	5	7-59	300		I	C,Q
17aac-1	New Santa Clara Field Canal Co.	1934	60	12	-	-	-		2,800	12	9-34	-		I	Q
17aba-1	New Santa Clara Field Canal Co.	1964	90	14	60	P	Uncons. Rock		2,800	42	5-64	-		I	Q
17adb-2	Cates Service Station	1939	60	6	60	O	Uncons. Rock		2,800	26	10-68	30		U	-
22cba-1	S. Frei	1946	92	16	18	P	Uncons. Rock		2,730	23	7-46	-		I	Q
22dca-1	L. Frei	1966	88	14	30	P	Uncons. Rock		2,700	28	3-66	-		I	C,Q
26bbc-1	Mathis Market Supply Co.	1966	70	14	32	P	Uncons. Rock		2,655	28	3-66	-		U	-
26bcb-1	Mathis Market Supply Co.	1963	72	14	28	P	Uncons. Rock		2,660	25	5-63	-		I	Q
26bcc-1	W. Snow	1961	75	14	37	P	Uncons. Rock		2,640	21	9-61	-		I	Q
26bcc-2	W. Snow	1961	78	14	35	P	Uncons. Rock		2,660	21	9-61	-		I	Q
26cdd-1	R. Snow	1966	70	14	33	P	Uncons. Rock		2,615	15	7-66	-		I	D,Q
27adb-1	Mathis Market Supply Co.	1964	75	14	28	F	Uncons. Rock		2,680	20	3-64	-		I	Q
35adb-1	O. Gubler	1959	61	14	28	P	Uncons. Rock		2,600	21	7-59	-		I	Q
35add-1	R. Barrett	1967	47	8	32	P	Uncons. Rock		2,625	25	5-67	-		I	C
(C-43-16)1aca-1	C. Blake	1956	52	16	27	P	Uncons. Rock		2,585	13	10-68	360		I	Q
1baa-1	C. Blake	1956	140	16	27	P	Uncons. Rock		2,600	4	5-56	240		I	C,Q
							Triangle Valley - Warner Valley								
(C-43-15)12bdd-1	K. Stucki	1965	497	16	95	P	Uncons. Rock		2,770	78	10-65	200		U	D
12ccc-1	S. Stucki	1968	407	16	265	O	Chinle Formation		2,800	239	10-68	-		I	Q
12ccd-2	S. Stucki	1964	172	16	91	X	Chinle Formation		2,780	89	9-64	1,100		I	C,Q
(C-43-14)20abb-1	G. Thomas	1968	260	10	170	X	-		3,050	-	7-68	-		U	D

Table A-1. Continued.

Location	Owner or designation	Year constructed	Depth of well (feet)	Casing		Well finish	Principal aquifer	Depth to top of Navajo Sandstone	Land surface altitude (feet above MSL)	Well water level		Well yield		Use of water	Remarks and other data available
				Diameter (inches)	Depth (feet)					Above (+) or below land-surface datum (feet)	Date	Rate (gal/min)	Date		
							Virgin River Valley								
(C-42-14)4dbb-1	W. Post	1955	200	6	160	P	Moenave		3,140	123	9-68	-		H	-
19add-1	N. Sullivan	1965	200	16	193	O	Uncons. Rock		2,680	185	9-65	-		U	D
20abc-1	S. Sorensen	1963	205	6	165	-	Moenkapi Form.		2,720	115	8-63	4		S	C
20cac-1	L. Atkin	1967	253	6	30	P	-		2,720	31	1-67	-		U	-
20dbc-1	D. Iverson	1970	71	16	10	F	Uncons. Rock		2,700	7	7-70	-		I	Q
21bad-1	C. Helm	1965	200	8	38	X	Kayenta Formation		2,860	20		20R		U	D
21ccb-1	St. George-Washington Canal Co.	1963	80	16	35	-	Uncons. Rock		2,760	16	7-63	-		U	C
							Washington Valley								
(C-42-15)14dad-1	D. Nisson	1958	352	10	234	P	Chinle Formation		2,840	125	3-58	115		I	C,Q
21abd-1	F. Hawkes	1965	200	8	40	X	Kayenta Formation		2,840	12	9-65	-		S	-
21bad-1	C. Holm	1965	200	8	38	X	Kayenta Formation		2,860	21	9-65	20		U	-
22ccb-1	D. Bundy	1964	125	8	46	X	Moenave		2,720	19	9-64	-		H	C
33ddb-1	R. Shurtliff	1961	70	8	10	X	Moenkapi Form.		2,600	30	8-61	-		S	C
33ddd-1	Schmutz Bros.	1963	45	3	0	X	Shinarump Cong.		2,600	40	1963	-		S	C
34dba-1	St. George East Stake	1968	194	6	88	X	Alluvium, Chinle Formation		2,620	19	7-68	-		S	C
34dba-2	St. George East Stake	1968	265	16	21	X	Shinarump Cong.		2,620	18	8-68	-		I	H,D,Q
35baa-1	C. Prisbrey	1967	45	5	18	F	Uncons. Rock		2,640	18	1967	-		H	C
35dad-1	W. Stahelf	1965	160	6	55	F	Uncons. Rock		2,675	45	10-65	50		S	C
(C-43-15)2aaa-1	I. Andrus	1965	160	16	105	P	Uncons. Rock		2,685	53	2-65	-		-	C,D,Q
4dac-1	Milne and others	1966	190	8	45	X	Moenkapi Form.		2,730	98	3-66	40		U	C
10aca-1	St. George-Washington Canal Co.	1963	300	16	0	X	Moenkapi Form.		2,660	22	10-68	-		U	-
10acc-1	W. Seegmiller	1965	100	8	40	O	Moenkapi Form.		2,670	28	10-68	60		H	C
							UPPER VIRGIN RIVER BASIN								
(C-38-6)22dbc-1	D. Christensen	1977	452	4	452	F	Wasatch Formation		7,520	317.18	10- 7-77	9.5	9-29-77	H	C
28acd-1	D. Christensen	1977	272M	4	272	P	Wasatch Formation		7,440	228.02	10- 7-77	-	-	S	
(C-39-6)4cad-1	K. Bowers	1970	170	6	115	X	Wasatch Formation		7,080	61.20	10- 1-77	40R	8- 6-70	U	D,Z
(C-39-11)12ddb-1	L. Glazier	1976	168	6	100	X	Basalt		7,910	85.5	12-10-77	7.6	3-13-77	H	D
(C-40-7)14bad-1	Glendale Town	1976	120	8	100	X	Wahweap Sandstone		5,880	40R	6-28-76	214	6- 2-77	P	Flowing well; reported flow 700 gal/min; C,D
(C-40-11)8dcd-1	E. Lee	1965	641	4	641	P	Navajo Sandstone		5,900	335R	8-30-65	-	-	S	Originally drilled to 823 feet; D
29bbd-1	C. Wright	1966	320	6	20	X	Chinle Formation		5,325	282.83	12-10-77	10R	11-29-66	S	Z
(C-41-7)4aaa-1	Orderville Town	1969	75	8	75	P	Unconsol. rocks		5,480	24R	8-12-69	240	7- 1-77	P	C,D,Z
17baa-1	Mt. Carmel Town	1961	60	14	52	P	Unconsol. rocks		5,280	7R	3- -61	-	-	P	
19cdc-2	Golden Hand Motel	1966	295	8	59	X	Navajo Sandstone		5,200	242R	11-25-66	-	-	C	D
30bba-1	Thunderbird Motel	1967	310	8	250	X	Navajo Sandstone		5,190	232.71	6-29-77	35R	6-29-77	C	D,Z
(C-41-9)10cdd-1	H. Drews	1966	186	6	186	P	Jurassic rock above Navajo Sandstone		6,235	123R	3-26-66	-	-	H	C
15aad-1	H. Drews	1966	147	6	147	P	Jurassic rock above Navajo Sandstone		6,120	104R	4- 6-66	13	11-12-77	H	C
15dcd-1	H. Drews	1966	245	6	119	X	Navajo Sandstone		5,970	192.96	11-12-77	-	-	S	O
15ddb-1	T. Baca	1961	231	6	73	X	Navajo Sandstone		5,980	193R	12- 1-61	3	11-12-77	S	C,Z
20bdb-1	U.S. National Park Service	1962	924.5	8	924.5	P	Navajo Sandstone		5,690	865R	7-31-62	9.4R	7-31-62	H	
(C-41-10)28bca-1	J. Voyles	1963	555	6	500	X	Shinarump Member		4,050	170R	8-12-63	-	-	H	C
28bdb-1	Springdale Town	1971	100	16	100	P	Unconsol. rocks, Chinle Formation		3,930	21.36	12- 7-77	-	-	P	D
(C-42-10)7acb-1	Rockville Pipeline Co.	1971	90	8	3	X	Shinarump Member		4,100	34R	6-10-71	-	-	P	Z
7bdd-1	Rockville Pipeline Co.	1975	110	8	94	P,X	Shinarump Member		4,150	8R	12-31-75	75R	12-31-75	P	C,Z
(C-42-11)1dcb-1	C. Steed	1968	92	8	70	P,X	Unconsol. rocks, Moenkopi Formation		3,700	17.31	12- 9-77	-	-	I	C,D
1ddc-1	W. Sweeten	1968	118	8,6	110	P,X	Moenkopi Formation		3,725	71.06	12- 9-77	-	-	U	
3aad-1	A. Cox	1968	154	10	53	X	Moenkopi Formation		3,750	78.26	12- 9-77	-	-	I	O
3ac-1	Grafton Town	1934	62	6,4	62	P	Unconsol. rocks		3,650	18.17	12-21-57	30R	11-12-34	U	Abandoned town
(C-42-11)4aaa-1	C. Stout	1961	38	14	38	P	Unconsol. rocks		3,640	4.69	12- 9-77	-	-	I	Z
4aaa-2	C. Stout	1972	86	14	50	P	Unconsol. rocks		3,640	3.45	12- 9-77	-	-	U	
18ddd-1	C. Hale, Jr.	1965	332	8	142	X	Moenkopi Formation		4,960	168R	6-19-65	-	-	U	
19cca-1	K. Hall No. 3	1968	270	16	270	P	Unconsol. rocks		4,725	106.67	11-15-77	260	6-20-78	I	C,W
19ccc-1	K. Hall No. 1	1971	285	14	250	P	Unconsol. rocks, Moenkopi Formation		4,700	94.58	11-15-77	-	-	I	D,W
19ccc-2	K. Hall No. 2	1975	390	12	285	P	Unconsol. rocks, Moenkopi Formation		4,710	103.85	11-17-77	660	11-18-77	I	C,W,Z
19ccc-3	K. Hall	1976	267M	10,8	335	P	Unconsol. rocks, Moenkopi Formation		4,700	92.64	11-15-77	40R	7-30-76	U	Original depth 375 feet; L,W,Z
29ccd-1	E. DeMille	1974	168	8	160	P,X	Unconsol. rocks		4,760	153.05	11-15-77	-	-	S	
30bad-1	E. Graff	1973	237	10	205	P,X	Unconsol. rocks, Moenkopi Formation		4,720	102R	3-11-76	275R	3-11-76	I	Z
30bca-1	E. Graff	1969	170	10	143	X	Unconsol. rocks, volcanics		4,720	88R	3-10-69	-	-	I	
30bcd-1	E. Graff	1969	238	10	238	P	Unconsol. rocks,		4,720	86R	3-24-69	-	-	I	
32abb-1	E. Graff	1971	200	6	185	X	Shinarump Member		4,800	158.22	11-15-77	-	-	S	
32ada-1	E. Graff	1973	250	6	196	X	Shinarump Member		4,845	174.80	11-15-77	-	-	S	D
32dcc-1	E. Graff	1969	130	6	30	X	Shinarump Member		4,820	70.88	11-15-77	-	-	S	
34bbb-1	H. Hirschi	1963	455	6	425	X	Shinarump Member		4,960	420R	9-14-63	1.5R	9-14-63	S	D
(C-42-12)2dcd-1	Virgin Town	1977	610	6	400	X	Shinarump Member		5,000	-	-	300R	4-27-77	P	Horizontal well; Perched aquifer; C
11aac-1	Virgin Town	1977	178	8	-	-	Shinarump Member		5,080	115.68	11-17-77	400R	1977	U	Perched aquifer; Z
11adb-1	E. Lee	1960	170	6	20	X	Shinarump Member		5,080	128.22	11-17-77	0.9R	4-22-60	S	Perched aquifer; D
18ccd-1	E. Branham	1962	75	6	75	P	Unconsol. rocks, Moenkopi Formation		4,240	36R	7- 7-62	45R	9-21-63	H	D
18ccd-2	E. Branham	1964	98	14	35	X	Unconsol. rocks, Moenkopi Formation		4,245	46R	11-18-64	94R	4-18-75	I	C
23daa-1	D. Ballard	1974	123	12	123	F	Unconsol. rocks, volcanics		4,640	31.69	11-16-77	94	6-20-78	I	C,Z
23daa-2	D. Ballard	1977	236M	10	169	X	Unconsol. rocks, volcanics		4,640	59.23	12- 7-77	-	-	U	Original depth 245 feet; D
23dab-1	D. Ballard	1977	280	10	-	P	Unconsol. rocks		4,640	88.40	6-20-78	600R	1977	I	Z
24cbb-1	D. Ballard	1977	190	10	170	F	Unconsol. rocks		4,645	37R	3-18-77	-	-	U	
24ddb-1	E. Graff	1971	252	10	252	P	Unconsol. rocks		4,680	63	3-17-71	-	-	I	
(C-43-10)23ddd-1	Colorado City Area Development Co.	1968	84	8	84	G	Unconsol. rocks		5,120	13.5R	3-27-68	200R	6-24-68	I	Z
34add-1	United Effort Plan	1968	90	8	60	G,X	Unconsol. rocks		5,050	15R	2- 3-68	190R	2- 3-68	I	Supplies Hildale; D,Z
34dbd-1	United Effort Plan	1968	-	-	-	-	Unconsol. rocks		5,035	30R	1978	200	1978	P	Supplies Hildale
(C-43-11)5aad-1	E. Graff	1972	205	10	133	X	Shinarump Member		4,850	182.28	11-15-77	-	-	S	
15ccb-1	Colorado City Area Development Co.	1969	167	8,6	6	X	Shinarump Member		4,840	135.73	11-15-77	-	-	S	D

Location: See explanation of well-and spring-numbering system in text.
Depth of well: Reported; M, measured by U.S. Geological Survey. Datum is land surface.
Well finish: F, perforated and gravel packed; G, gravel and screen; O, open end; P, perforated; X, open hole.
Altitude: Above mean sea level; interpolated from U.S. Geological Survey topographic maps.
Water level: Measured by U.S. Geological Survey; R, reported.
Yield: Measured by U.S. Geological Survey; E, estimated; R, reported; F, flowing
Use of water: C, commercial; H, domestic; I, irrigation; P, public supply; S, stock; U, unused, unknown, or destroyed; T, test.
Remarks and other data available: A, aquifer test results in Table 8, Cordova (1981); C, water quality data in Table 23 of Cordova (1981), Table 7 of Cordova (1978) and Table 18 of Cordova (1972); H, water-level hydrograph in Cordova (1972); D, drillers logs in Table 20 of Cordova (1981) and Table 17 of Cordova (1972); L, geophysical data in Table 7 of Cordova (1981) or files of USGS; Q, annual discharge data in Table 10 of Cordova (1972); W, water-level measurements in Table 18 of Cordova (1981) and Table 8 of Cordova (1978).

Table A-2. Recent well water level measurements.

Well No.	Owner or Location	Date	Depth to Water (ft)	Measured by
(C-42-12)18ccc	Bud Branham (Gould (Wash)	9/27/86	40	C. G. Clyde
(C-42-11)30ddb	Apple Valley (Gould Wash)	9/27/86	125	C. G. Clyde
(C-42-12)24dac	Apple Valley (Gould Wash)	9/27/86	86	C. G. Clyde
(C-42-11)30baa	Apple Valley (Gould Wash)	9/27/86	102.7	C. G. Clyde
(C-42-11)32add	Big Plain Junction	9/27/86	154	C. G. Clyde
(C-42-11)32dcc	Near Big Plain Junction	9/27/86	65.4	C. G. Clyde
(C-43-11)15ccb	Near Big Plain Junction	9/27/86	133	C. G. Clyde
(C-42-13)28ddd	Sky Ranch Dev.	9/26/86	453.3	C. G. Clyde
(C-42-13)33aad	Sky Ranch Dev.	9/26/86	450.6	C. G. Clyde
(C-41-15)34aca	St. George, Mill Creek #1	8/1/86	240	St. George City
(C-41-15)34aca	St. George, Mill Creek #1	9/1/86	210	St. George City
(C-41-15)27dad	St. George, Mill Creek #2	8/1/86	310 *	St. George City
(C-41-15)27dad	St. George, Mill Creek #2	9/1/86	325 *	St. George City
(C-42-15)6ddc	St. George, City Creek	9/1/86	330 *	St. George City
(C-42-15)6ddc	St. George, City Creek	9/15/86	285 +	St. George City
(C-41-16)9cbb	St. George, Snow Canyon #2	9/4/86	315 *	St. George City
(C-41-16)9cbb	St. George, Snow Canyon #2	10/2/86	132 †	St. George City
(C-40-16)9abd	Dameron Valley Corp.	6/25/85	381	UGMS
(C-41-17)8dcb	St. George, Gunlock #4	10/3/86	85	St. George City

All are static water levels except as noted.
* Pumping water level.
+ Well shut off 3 days.
† Well shut off 20 hours.

Table A-3 Virgin River Area Wells By WR Number

WR Number*	USGS Number
44	(C-40-13) 1CCA-
106	(C-42-10) 7ABC-
106	(C-42-10) 7BDD-
106	(C-42-10) 7BDD-
118	(C-42- 9)32BCC-
118	(C-42- 9)32BCC-
166	(C-40-13)32DBA-
186	(C-38-13)23CCA-
192	(C-38-12)20BBA-
197	(C-42-16)24BAA-
203	(C-42-16)16BCC-
203	(C-42-16)16BDC-
208	(C-42-15)30DDB-
209	(C-42-16)22CBA-
211	(C-39-16) 3DDD-
212	(C-38-13) 9DCD-
214	(C-38-12)29CCD-
217	(C-42-15)31DAC-
226	(C-37-12)34AAA-
228	(C-37-12)34ABA-
235	(C-37-12)35BBC-
236	(C-37-12)27DAD-
241	(C-42-10) 6DAA-
243	(C-38-13)24BCD-
244	(C-38-12)31DAC-
245	(C-38-12)20CBB-
248	(C-42-15)30DBD-
256	(C-41- 7)19CCD-
261	(C-42-14) 4ACB-
263	(C-42-15)29ACC-
267	(C-38-16)15BDA-
267	(C-38-16)15BDD-
267	(C-38-16)15DBB-
269	(C-43-16)12ADA-
270	(C-39-15)14CCB-
271	(C-43-15) 6BBB-
272	(C-38-16)15CBA-
273	(C-41-15)20CBA-
275	(C-38-13)16CAD-
281	(C-42-14)11ABD-
284	(C-42-15)31CDC-
286	(C-42-16)25ABB-
287	(C-41- 7)19CCD-
293	(C-42-15)20CCA-
294	(C-39-15)14DCD-
296	(C-42-16)23ABD-
298	(C-42-16)25ABA-
302	(C-43-15)23BCB-
303	(C-42-15)30DDC-
308	(C-42-15)30CDA-
310	(C-42-14) 4DBA-
311	(C-42-14)25ADC-
313	(C-42-15)14CAA-
314	(C-43-13) 5BDD-
319	(C-42-15) 6DDC-
320	(C-42-16)35ACA-
321	(C-42-16)26CBA-
322	(C-42-16)26BCC-
323	(C-42-16)16DBC-
324	(C-38-12) 9ADD-
325	(C-42-15)32BBC-
327	(C-40-11) 8DAD-
333	(C-42- 7)24ADD-
336	(C-42-16)25ADC-
340	(C-42-15)30ADB-
341	(C-42-13)18BCD-
343	(C-42-15)30ACA-
346	(C-42-16)25ADC-
347	(C-42-15)30CDB-
348	(C-42-15)30DCC-
349	(C-41-10)32AAD-
352	(C-42-15)30CAA-
354	(C-42-15)30CBC-
358	(C-42-16)25DAB-
359	(C-43-19)20BDC-
361	(C-42-15)29CDC-
362	(C-40-17)15CCD-
366	(C-42-13) 7BAA-
368	(C-42-13) 7BAB-
369	(C-40-19) 3ADC-
369	(C-40-19) 3DCB-
370	(C-40-19) 3CDA-
370	(C-40-19) 3CDC-
371	(C-42-13)18BCA-
372	(C-42-13) 7BAB-
372	(C-42-13) 7CBD-
373	(C-42-14)15BAA-
373	(C-42-14)15BDD-
373	(C-42-14)15CAB-
374	(C-41- 7)30BBA-
375	(C-42-12) 3BBA-
376	(C-42-15)30ABC-
377	(C-42-16)23AAD-
378	(C-42-15)32ABC-
379	(C-42-15)34BDB-
381	(C-42-15)30DAD-
382	(C-39-15)14CCB-
383	(C-39-15)14CCB-

*Area 81- Virgin River Basin

Table A-3 Virgin River Area Wells By WR Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
384	(C-42-14)15ABA-	452	(C-41- 7)17BAA-
386	(C-43-15)10ABB-	453	(C-43-11)25CAD-
390	(C-42-15)30DDB-	454	(C-43-11)36CCC-
395	(C-42-10) 7ABC-	458	(C-42-15)33DDB-
395	(C-42-10) 7BDD-	460	(C-42-14)20ACA-
395	(C-42-10) 7BDD-	461	(C-42-16)13CCD-
399	(C-42-11) 1DCB-	462	(C-42-11) 4AAA-
401	(C-42-16)25ADB-	463	(C-41-13) 7CCC-
402	(C-42-16)25AAB-	465	(C-38-12)19AAA-
403	(C-42-16)25ACB-	465	(C-38-12)19AAB-
404	(C-42-15)30DCD-	465	(C-38-12)19DCA-
406	(C-41-13) 5AAA-	465	(C-38-12)20BBA-
407	(C-42-10) 5CBA-	466	(C-42-15)30ADB-
409	(C-42-16)24DDC-	467	(C-38-13)21BAA-
411	(C-43-14)30CCD-	469	(C-42-16)24BCB-
411	(C-43-15)25DDD-	471	(C-42-16)24BCB-
412	(C-40-19) 5ACD-	472	(C-42-11)34BBB-
412	(C-40-19) 5DAC-	473	(C-43-11)15BCC-
413	(C-42-16)24ACD-	474	(C-40- 7)34CDD-
418	(C-42-12)11ACB-	475	(C-42-16)22BAA-
420	(C-42-15)19CAC-	477	(C-38-16)10DBC-
421	(C-40-17)21DCA-	480	(C-39-16)29ADC-
423	(C-42-15)26BBD-	481	(C-42-16)14DAA-
424	(C-42-11) 1CAC-	482	(C-38-13)26CAB-
426	(C-41-13) 5AAC-	484	(C-43-15)11BAA-
428	(C-42-15)30BDB-	485	(C-43-15)14DCD-
429	(C-42-16)25ADD-	487	(C-42-15)34DBA-
430	(C-43-15)36DDC-	487	(C-42-15)34DBA-
431	(C-43-14)25DDD-	488	(C-43-15)10AAA-
431	(C-43-14)31BAB-	491	(C-41- 9)15DDB-
431	(C-43-14)31DCD-	492	(C-41- 9)15DDC-
432	(C-42-15)30AAB-	493	(C-41- 9)14CAB-
433	(C-41-14)13ABA-	496	(C-43-15) 6BAB-
440	(C-43-15)12CDC-	497	(C-42-16)27ADB-
441	(C-43-15) 6ACD-	498	(C-42-16)26BCC-
442	(C-43-13)21CAA-	506	(C-43-15) 2AAA-
443	(C-42-14)20DBC-	510	(C-42-15)13CBC-
443	(C-42-15)25BAD-	510	(C-42-15)14DDD-
445	(C-43-14)31DCD-	511	(C-42-13) 6ABC-
446	(C-42-15)30DCD-	512	(C-42-16)24BDD-
447	(C-43-15)16DCC-	514	(C-41- 9)20BDB-
450	(C-42-10) 7ABC-	518	(C-42-16)24ACD-
450	(C-42-10) 7BDD-	527	(C-42-12)18CCD-
450	(C-42-10) 7BDD-	528	(C-42-15) 6DDC-
451	(C-41-17) 7DDB-	529	(C-39-16) 3DCC-
451	(C-41-17) 8BAD-	534	(C-42-16)26CBA-
451	(C-41-17) 8CAC-	535	(C-42-15)21ACA-
451	(C-41-17) 8DCB-	536	(C-43-15)11AAB-
451	(C-41-17)17BDA-	536	(C-43-15)11ACD-

* Area 81- Virgin River Basin

Table A-3 Virgin River Area Wells By WR Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
536	(C-43-15)11DDD-	622	(C-42-16)22DCA-
536	(C-43-15)12CDC-	623	(C-42-15)30ADC-
536	(C-43-15)12CDD-	625	(C-37-12)34DBD-
537	(C-42-12)18CCC-	626	(C-42-15)33CAB-
545	(C-42-16)24DAA-	627	(C-42-15)28BBC-
548	(C-42-15) 6DDC-	627	(C-42-15)29ABC-
554	(C-42-15)27CDC-	627	(C-42-15)29BCA-
555	(C-42-15)33DDD-	628	(C-41-17) 7DDB-
556	(C-42-14)12DBA-	628	(C-41-17) 8CAC-
556	(C-42-14)12DBB-	629	(C-39-15)15CAD-
556	(C-42-14)12DBC-	630	(C-39-15)14CDC-
561	(C-42-16)24ADC-	631	(C-39-11)12DDB-
562	(C-42-16)17ABA-	634	(C-39-15)14CDB-
563	(C-42-15)30DCD-	635	(C-41-17)17BDA-
564	(C-40-13) 1CCA-	637	(C-40-11) 8DCB-
565	(C-41-14)15ADA-	638	(C-39-15)14CDD-
566	(C-42-16) 5BBB-	639	(C-42-15)22CCB-
567	(C-43-11)34BBA-	640	(C-42-15)32DCC-
568	(C-42-15)30ABB-	642	(C-42-15)30DCC-
571	(C-42-16)24BDA-	643	(C-42-15)30CCB-
572	(C-42-16)24ACC-	644	(C-42-11) 3ADA-
573	(C-42-14)20ACA-	645	(C-42-15)10CBA-
574	(C-42-17) 1CDB-	646	(C-42-15)13CAC-
575	(C-41-10)28BBD-	650	(C-41-13)30CDD-
577	(C-41-15)27DAD-	651	(C-41- 9)15AAD-
577	(C-41-15)34ACA-	652	(C-38-12) 4CDC-
577	(C-41-15)34CCD-	653	(C-40- 7)34CDD-
577	(C-42-15) 4AAB-	655	(C-39-15)14CDD-
583	(C-39-10)19BBB-	658	(C-39-15)14CDD-
584	(C-39-11) 1DBA-	659	(C-43-16)11CAB-
585	(C-41-10)28BDB-	660	(C-43-16)11DBC-
588	(C-39-11)12BDD-	662	(C-38-12)27CBD-
589	(C-38-14)31BDA-	662	(C-38-12)29ACB-
590	(C-42-15)19CCB-	662	(C-38-12)29DCC-
593	(C-42-16)24DBB-	663	(C-42-15)30DBB-
595	(C-42-16)24ADC-	665	(C-43-16)12AAA-
596	(C-42-16)16CAB-	668	(C-42-15)32BDC-
597	(C-42-15)30DCD-	669	(C-43-16)22DAB-
599	(C-42-16)25DAA-	670	(C-43-16)23BBC-
600	(C-42-10) 5BCC-	671	(C-42-16)17DAA-
601	(C-41-13) 4BBA-	674	(C-43-16) 2BDC-
603	(C-43-15)16DCC-	675	(C-41-14)12BDA-
606	(C-42-16)24ACB-	676	(C-39-15)14CDD-
607	(C-42-16)24DDD-	704	(C-37-12)33ADB-
609	(C-42-15)19CDB-	705	(C-37-12)33ADB-
610	(C-42-15)29BBD-	747	(C-41- 9)13BBC-
612	(C-42-16)26BBC-	767	(C-41- 9)15CDA-
612	(C-42-16)26BCB-	774	(C-39-15)15DDA-
613	(C-42-20)24AAA-	775	(C-43-15) 4DCD-

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Table A-3 Virgin River Area Wells By WR Number(cont)

WR Number*	USGS Number
775	(C-43-15) 4DDB-
775	(C-43-15) 4DDB-
775	(C-43-15) 4DDC-
775	(C-43-15) 4DDC-
775	(C-43-15) 4DDD-
775	(C-43-15) 4DDD-
775	(C-43-15) 4DDD-
776	(C-37-12)34ABB-
778	(C-39-15)14CDD-
779	(C-43-12)20BBB-
780	(C-39-15)14CDD-
781	(C-41- 9)10CDD-
782	(C-41-16) 9CBB-
782	(C-41-16)16BBD-
782	(C-41-16)16CDB-
787	(C-40-13)31BCD-
789	(C-39-15)14CCB-
790	(C-41-11)17DBA-
791	(C-37-12)34ABB-
792	(C-40-13)27BDB-
793	(C-42-16)17AAC-
794	(C-40-13) 2ADD-
795	(C-39-10)19BBB-
796	(C-39-11)12CCB-
797	(C-39-15)14CCB-
798	(C-42-15)35DAD-
799	(C-40-12)21AAA-
800	(C-40-12)21AAA-
802	(C-42-13) 6BAD-
802	(C-42-13) 6BCD-
804	(C-42-13) 6BAD-
804	(C-42-13) 6BCD-
808	(C-41-14)15ADA-
809	(C-42-15)19CBB-
813	(C-40-13)27CCC-
814	(C-41-13) 4BBC-
814	(C-41-13) 5AAD-
815	(C-41-13)25BCC-
817	(C-42-15)31ADB-
818	(C-41-11)17BCD-
819	(C-42-15)30DBD-
820	(C-43-15)16DCC-
820	(C-43-15)16DCC-
820	(C-43-15)16DCD-
821	(C-38-11)31CCD-
823	(C-42-16)24ACC-
824	(C-40-12)22BDC-
826	(C-39-19)29DBC-
827	(C-43-15) 9ADA-
828	(C-40-11)29BBC-
834	(C-42-15)19CBD-
836	(C-39-15)15DDA-
839	(C-39-15)14CCB-
840	(C-42-14)19DAC-
843	(C-40-17)15DCD-
844	(C-39-15)15DDA-
845	(C-41-16) 9BBB-
845	(C-41-16) 9CBB-
845	(C-41-16)16BBD-
845	(C-41-16)16CDB-
846	(C-39-15)15DDC-
852	(C-39-15)14DCC-
853	(C-39-15)14CDB-
854	(C-39-15)15DDC-
860	(C-39-15)15DBC-
861	(C-40-12)28DAD-
878	(C-39-15)15DDC-
880	(C-39-15)15DDC-
881	(C-39-15)14CCB-
882	(C-39-15)14DCD-
884	(C-43-11)28CCA-
884	(C-43-11)28CDC-
884	(C-43-11)28DCB-
884	(C-43-11)29DDA-
884	(C-43-11)33BAD-
884	(C-43-12)36ACB-
890	(C-39-11)12DCB-
894	(C-39-15)15DDC-
900	(C-42-13)33AAB-
901	(C-42-11)30BAB-
901	(C-42-11)30BAC-
901	(C-42-11)30BDC-
901	(C-42-11)30CDA-
902	(C-43-15) 2ABB-
903	(C-42-15)30DBB-
906	(C-40-19)17BDA-
906	(C-40-19)17CAD-
916	(C-42-16)25ABD-
919	(C-39-15)15DDC-
923	(C-39-15)14DCC-
924	(C-39-15)15DDB-
925	(C-43-11)28CCA-
925	(C-43-11)28CDC-
925	(C-43-11)28DCB-
925	(C-43-11)29DDA-
925	(C-43-11)32BAD-
925	(C-43-12)36ACB-
926	(C-42-13) 2BCC-

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Table A-3 Virgin River Area Wells By WR Number(cont)

WR Number*	USGS Number
927	(C-42-14)13ADB-
930	(C-38-11)36DDC-
934	(C-39-15)14CCB-
936	(C-39-15)15DBA-
937	(C-43-15)16DBD-
937	(C-43-15)16DBD-
938	(C-43-15)16DBC-
938	(C-43-15)16DBD-
938	(C-43-15)28ACD-
940	(C-39-15)15DDD-
943	(C-39-15)14CDB-
944	(C-39-15)15DDB-
945	(C-39-15)15DDB-
946	(C-39-15)14CCB-
948	(C-39-15)14CDD-
949	(C-39-15)14CDC-
953	(C-42-15)35BAA-
963	(C-41- 9)10CDD-
971	(C-42-15)32ADC-
973	(C-41-16) 9CBB-
973	(C-41-16)16BBD-
973	(C-41-16)16CDB-
975	(C-42-13) 6CAD-
976	(C-39-10) 7CBB-
983	(C-42-14)12ADA-
983	(C-42-14)12DDB-
984	(C-43-15) 9DAA-
987	(C-43-15)10CBC-
987	(C-43-15)10CBD-
987	(C-43-15)10CCA-
995	(C-39-15)14ACD-
996	(C-41-16) 9CBB-
996	(C-41-16)16BBD-
996	(C-41-16)16CDB-
998	(C-43-15) 5ADB-
1000	(C-41-13) 6CBB-
1004	(C-42-14)14BBB-
1004	(C-42-14)14BBC-
1004	(C-42-14)15AAB-
1004	(C-42-14)15AAB-
1004	(C-42-14)15DAB-
1004	(C-42-14)15DAD-
1014	(C-39-11)24BAC-
1024	(C-39-15)14CBC-
1025	(C-43-15)10AAC-
1034	(C-42-15)26ABD-
1039	(C-42-13)22BBB-
1039	(C-42-13)22BBB-
1040	(C-42-13) 6CAD-

WR Number*	USGS Number
1045	(C-40-16) 5ABA-
1045	(C-40-16) 5ABD-
1046	(C-43-15) 2DAA-
1046	(C-43-15) 2DDB-
1047	(C-42-16) 6ADD-
1048	(C-42-16)27BBA-
1049	(C-42-15)30CCC-
1051	(C-42-12)27AAB-
1052	(C-42-11)19CCD-
1052	(C-42-11)19CCD-
1052	(C-42-11)19CDB-
1053	(C-42-15)31AAA-
1055	(C-39-15)14DCD-
1056	(C-42-16)17ACA-
1057	(C-42-16)17BCA-
1058	(C-42-16)10DCA-
1060	(C-39-11)12CBC-
1062	(C-43- 8)34BAB-
1068	(C-41-16)30CBC-
1075	(C-39-15)14CDD-
1076	(C-39-15)14CDC-
1077	(C-42-16) 6ADA-
1079	(C-39-15)14CCB-
1080	(C-39-15)15DAA-
1083	(C-40-16)34AAD-
1083	(C-40-16)34ADA-
1088	(C-42-15)34BCC-
1088	(C-42-15)34CBD-
1096	(C-41- 7) 3CBC-
1096	(C-41- 7) 4AAD-
1097	(C-41- 7) 3CBC-
1097	(C-41- 7) 4AAD-
1098	(C-41- 7) 3CBC-
1098	(C-41- 7) 4AAD-
1102	(C-42-14)12DAA-
1104	(C-39-16)26CBA-
1107	(C-42-14)20ACA-
1108	(C-42-13)31DCB-
1111	(C-41- 7) 3CBC-
1111	(C-41- 7) 4AAD-
1113	(C-39-16)32AAB-
1115	(C-39-15)14CDB-
1117	(C-42-11) 3BCB-
1119	(C-43-14)20BAA-
1125	(C-43-18) 5CDD-
1125	(C-43-18) 5DCC-
1125	(C-43-18) 8ABB-
1125	(C-43-18) 8BAA-
1170	(C-39- 6) 4CAA-

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Table A-3 Virgin River Area Wells By WR Number(cont)

WR Number*	USGS Number
1173	(C-37-12)28AAC-
1179	(C-39-16)32AAB-
1179	(C-39-16)32AAB-
1181	(C-42-11)32ABC-
1181	(C-42-11)32ADA-
1181	(C-42-11)32ADD-
1181	(C-42-11)32DAA-
1181	(C-42-11)32DCC-
1181	(C-42-11)32DDD-
1183	(C-42-12)24DAB-
1183	(C-42-12)24DAD-
1183	(C-42-12)24DDA-
1201	(C-42-13) 6CAD-
1202	(C-41-13)31CBD-
1202	(C-41-13)31CDB-
1209	(C-42-12)24BCD-
1210	(C-42-12)22DDD-
1213	(C-39-16) 1BAB-
1218	(C-42-14) 1BBD-
1234	(C-41-13)31DCB-
1234	(C-42-13) 6CAD-
1236	(C-43-12)19AAA-
1237	(C-39-18)23DCC-
1245	(C-42-15)22CCD-
1248	(C-42-14)15CAB-
1252	(C-39-16)29ADA-
1252	(C-39-16)29ADC-
1253	(C-40-16)26CCB-
1253	(C-40-16)35BCC-
1255	(C-42-12)23DBA-
1256	(C-42-13)20AAC-
1256	(C-42-13)20ABC-
1256	(C-42-13)20ACB-
1256	(C-42-13)20ADB-
1259	(C-38-12) 4CDC-
1260	(C-40-13)31BCD-
1261	(C-42-15)33DAB-
1262	(C-41-13) 5DBA-
1263	(C-43-15) 2AAA-
1263	(C-43-15) 2AAB-
1267	(C-42-15)23DAA-
1268	(C-41-13)34BCB-
1269	(C-43-16)14ADC-
1276	(C-42-14)15ABA-
1276	(C-42-14)15ABC-
1278	(C-42-11) 3DAC-
1279	(C-42-13) 6CAD-
1281	(C-42-14)11ACB-
1281	(C-42-14)11ACC-

WR Number*	USGS Number
1282	(C-42-15)30CCC-
1288	(C-43-15)11DDD-
1288	(C-43-15)12BDD-
1288	(C-43-15)12CCC-
1288	(C-43-15)12CDD-
1299	(C-43-15) 2BBC-
1300	(C-42-14)15CAD-
1301	(C-42-14)15CAD-
1303	(C-42-17) 1BDD-
1308	(C-43-15)10BCB-
1315	(C-42-14)20ACA-
1315	(C-42-14)20ACA-
1316	(C-42-14)15BDD-
1317	(C-42-14)15CAA-
1318	(C-42-14)15CBD-
1319	(C-43-11) 8CAD-
1319	(C-43-11)17BAA-
1322	(C-42-16)10AAD-
1322	(C-42-16)10BCA-
1324	(C-42-16)22ABA-
1326	(C-41-10)29CAA-
1328	(C-43-15)10BCC-
1331	(C-43-15) 9DDD-
1332	(C-42-14)15CAB-
1332	(C-42-14)15CAC-
1333	(C-39-15)15DDA-
1334	(C-42-15)26DBD-
1336	(C-42-17) 1BDD-
1338	(C-42-13)15BAD-
1340	(C-42-15)26DDA-
1344	(C-42-14)12DCC-
1345	(C-43-15)10DBC-
1351	(C-42-14)19DAC-
1352	(C-38-12)30CCD-
1356	(C-43-14)20DBD-
1360	(C-42-13)16AAD-
1369	(C-42-11) 1CCB-
1370	(C-42-11)29CDC-
1373	(C-40-11)16BAB-
1374	(C-42-15)31AAB-
1376	(C-39-15)14CCA-
1377	(C-39-15)23BAD-
1380	(C-41-13)23ABC-
1389	(C-43-15)16ACB-
1397	(C-42-14)31DCD-
1398	(C-39-11)12BCA-
1399	(C-39-11)12CAD-
1400	(C-39-11)12BCD-
1402	(C-39-11)12DBD-

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Table A-3 Virgin River Area Wells By WR Number(cont)

WR Number*	USGS Number
1405	(C-42-14)20ACA-
1427	(C-41-16) 9CBB-
1427	(C-41-16)16BBD-
1427	(C-41-16)16CDB-
1428	(C-42-16)26CDD-
1429	(C-42-14)11ADB-
1438	(C-38-13)21BAA-
1439	(C-41-13)30CAC-
1440	(C-39-11)12BDB-
1441	(C-39-11)12BBD-
1451	(C-43-11)13DDD-
1467	(C-41-13) 5ADB-
1468	(C-42-14)15BAA-
1468	(C-42-14)15BDD-
1468	(C-42-14)15CAB-
1470	(C-38-13)23CCA-
1471	(C-39-16)22ADB-
1473	(C-38-12)19ABB-
1474	(C-43-15)23BCA-
1474	(C-43-15)23CAC-
1475	(C-42-13)33AAD-
1484	(C-43-14)31DCD-
1487	(C-40-16) 9ADB-
1490	(C-42-12)22DDD-
1492	(C-42-16)26BDD-
1493	(C-42-16) 5CDA-
1494	(C-42-16) 5CDA-
1496	(C-42-16)10BCA-
1497	(C-41-17)36CBD-
1499	(C-42-16)10BCA-
1500	(C-42-16)34ACB-
1500	(C-42-16)34BAA-
1502	(C-41-16)23BBA-
1506	(C-39-11) 1CDB-
1508	(C-43-15)16BDC-
1509	(C-42-14)12ADD-
1514	(C-43-15) 4DCD-
1517	(C-43-15)16BAA-
1518	(C-41-14)14CDA-
1520	(C-43-15) 9ADA-
1521	(C-43-15)16DCC-
1521	(C-43-15)16DCC-
1521	(C-43-15)16DCD-
1522	(C-41-13) 8BAA-
1522	(C-41-13) 8BAD-
1523	(C-41-13) 5AAA-
1525	(C-39-16)29ADA-
1525	(C-39-16)29ADC-
1546	(C-39-15)15DAD-
1547	(C-39-16)29ADA-
1547	(C-39-16)29ADC-
1549	(C-39-16)29ADC-
1550	(C-41-16)23BBA-
1551	(C-41-16)23BBA-
1553	(C-39-15)14CDA-
1555	(C-43-15)10BCB-
1557	(C-40-13) 1CCA-
1559	(C-42-17) 1BDD-
1560	(C-39-11)12CCC-
1563	(C-42-16)10BCA-
1567	(C-39-10)17CDD-
1567	(C-39-10)20ADB-
1568	(C-39-16)29ADA-
1568	(C-39-16)29ADC-
1569	(C-42-16)10BCA-
1570	(C-41-14)12BDA-
1574	(C-41-16)23BBA-
1575	(C-41-16)23BBA-
1576	(C-42-16) 5CDA-
1577	(C-42-16)10BCA-
1578	(C-42-16)24DDC-
1579	(C-42-12)27AAB-
1581	(C-41-13) 4BBB-
1588	(C-42-13) 6CAD-
1589	(C-42-14)19CBB-
1589	(C-42-14)19CCA-
1589	(C-42-14)19CCD-
1591	(C-37-19)17DCC-
1592	(C-42-14)15BDD-
1593	(C-39-15)15CCA-
1594	(C-42-16)17BCA-
1598	(C-42-14)13ADB-
1599	(C-42-14)14BBB-
1599	(C-42-14)14BBC-
1599	(C-42-14)15AAB-
1599	(C-42-14)15AAB-
1599	(C-42-14)15DAB-
1599	(C-42-14)15DAD-
1601	(C-42- 9)21BAA-
1603	(C-42-12)23CAD-
1604	(C-42-14)19CBB-
1605	(C-40- 7)14BAD-
1609	(C-41-13)31DCB-
1610	(C-42-14)19ACB-
1611	(C-42-14)19ACB-
1614	(C-40-13) 1CCA-
1617	(C-42-16)17ADC-
1623	(C-41-10)32ADA-

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Table A-3 Virgin River Area Wells By WR Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
1625	(C-41-13)30CAC-	1717	(C-42-14)19DBD-
1626	(C-41-17)36CBD-	1718	(C-39-11)12BDC-
1628	(C-42-13)28DDA-	1719	(C-41-15)35CDA-
1630	(C-42-14)19CAC-	1721	(C-42-13) 6CAD-
1631	(C-42-15)32ADC-	1722	(C-42-13) 6CAD-
1632	(C-42-16)24DCA-	1723	(C-42-13) 6CAD-
1633	(C-42-14)13ADB-	1726	(C-42-14)19CCA-
1635	(C-38-12)19AAA-	1727	(C-42-14)19CCA-
1635	(C-38-12)19AAB-	1731	(C-43-15) 4DCC-
1635	(C-38-12)19DCA-	1732	(C-42-17) 1BDD-
1635	(C-38-12)20BBA-	1733	(C-43-14)20CAA-
1635	(C-38-12)21BCC-	1734	(C-43-15) 9ADA-
1636	(C-39-11) 2ACD-	1734	(C-43-15) 9ADA-
1637	(C-42-16)26CDD-	1734	(C-43-15)10BCB-
1639	(C-42-15)36DCB-	1734	(C-43-15)14CDA-
1642	(C-42-14)13ADA-	1734	(C-43-15)14DDC-
1647	(C-42-15)34DDA-	1735	(C-43-15)10BCC-
1648	(C-42-15)36DCB-	1736	(C-43-15) 9CDD-
1649	(C-41-16)23BBA-	1747	(C-42-15)23CAB-
1651	(C-42-15)30DCC-	1748	(C-42-16)27BAB-
1652	(C-42-15)36DCB-	1752	(C-42-14)11ABD-
1660	(C-42-16)10CAD-	1755	(C-41-19) 6BCB-
1661	(C-42-16) 9BCC-	1759	(C-38-12) 3ACB-
1662	(C-42-16) 9BCC-	1760	(C-38-12) 4ACD-
1663	(C-41-17)36CBD-	1762	(C-42-11) 2CDA-
1664	(C-42-16) 9BCC-	1763	(C-42-13)10ADA-
1665	(C-41-17)36CBD-	1764	(C-43-15) 4DCD-
1666	(C-41-17)36CBD-	1764	(C-43-15) 4DDB-
1667	(C-38-12)17DDD-	1764	(C-43-15) 4DDB-
1668	(C-38-13)26ACD-	1764	(C-43-15) 4DDC-
1669	(C-42-17) 1CDB-	1764	(C-43-15) 4DDC-
1670	(C-42-16)10CAD-	1764	(C-43-15) 4DDD-
1671	(C-42-17) 1CDB-	1764	(C-43-15) 4DDD-
1674	(C-42-15) 2BCB-	1764	(C-43-15) 4DDD-
1677	(C-42-16)10CAD-	1774	(C-42-16)10BCA-
1678	(C-42-14)20ACA-	1777	(C-42-15)23CBD-
1679	(C-38-12)31ABC-	1779	(C-39-16)29ADC-
1680	(C-43-12)34DDD-	1783	(C-42-12)22DDD-
1681	(C-42-14)20ACA-	1785	(C-38-13)22DAA-
1682	(C-42-16)10DCA-	1798	(C-43-11) 4BDC-
1682	(C-42-16)10DCA-	1798	(C-43-11) 4BDD-
1684	(C-43-16)12AAA-	1799	(C-42-11)30BAB-
1684	(C-43-16)12AAA-	2086	(C-38-16)15BAB-
1686	(C-38-13)23BBB-	2099	(C-38-12)31BAB-
1697	(C-38-16)15DBC-	2112	(C-41-17)36CBD-
1706	(C-42-13) 6CAD-	2113	(C-41-17)36CBD-
1708	(C-41-19)16BDA-	2118	(C-43-16)12AAA-
1714	(C-42-15)23CAB-	2118	(C-43-16)12AAA-
1716	(C-41-14)12BDA-	2150	(C-39-15)14CDA-

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Table A-3 Virgin River Area Wells By WR Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
2157	(C-41- 8) 3CCD-	2238	(C-41-10)32ADA-
2158	(C-42-13)33AAD-	2239	(C-38-13)26ACD-
2159	(C-39-17)36CCB-	2242	(C-41- 9)15AAD-
2161	(C-38-13)27ADD-	2243	(C-39-15)14CBC-
2167	(C-40-16) 9ADB-	2244	(C-39-15)14CCB-
2170	(C-42-11)19BCB-	2245	(C-39-15)24BBB-
2171	(C-42-11)19BCB-	2246	(C-39-15)15DAC-
2176	(C-37-12)35BBC-	2255	(C-39-16) 3DDD-
2178	(C-42-16)34ACB-	2258	(C-42-15) 9CDA-
2178	(C-42-16)34BAA-	2260	(C-40-11) 5CCC-
2179	(C-42-16)26CDD-	2261	(C-41-14)13ACC-
2183	(C-38-13)22DCA-	2261	(C-41-14)13CAA-
2184	(C-41-13) 8BAA-	2261	(C-41-14)13CAA-
2185	(C-40-13)32BBB-	2261	(C-41-14)13CAD-
2187	(C-42-14)13ABC-	2261	(C-41-14)13DBB-
2189	(C-42-16)27BAB-	2261	(C-41-14)13DBB-
2190	(C-38-13)26BAB-	2266	(C-42-15)21BBD-
2190	(C-38-13)26CAB-	2271	(C-42-16)10CAD-
2195	(C-41-14)12ACB-	2272	(C-42-16)10CAD-
2196	(C-41- 7)17BAA-	2274	(C-41-13) 6CBB-
2198	(C-40-13)33CCD-	2275	(C-38-13)24BBA-
2202	(C-42-16)34ACB-	2276	(C-40-16) 9ADB-
2202	(C-42-16)34BAA-	2280	(C-39-15)15DAD-
2206	(C-38-13)21ACB-	2281	(C-42-16)10BCA-
2207	(C-42-16)34ACB-	2287	(C-41-13)23AAA-
2207	(C-42-16)34BAA-	2289	(C-42-16)26CDD-
2208	(C-42-16)34ACB-	2290	(C-42-16)10BCA-
2208	(C-42-16)34BAA-	2292	(C-39-15)14CDC-
2210	(C-41-16) 2BAB-	2315	(C-42-19) 7CBC-
2213	(C-38-12)18CCD-	2319	(C-42-16)34ACB-
2214	(C-42-16) 5CDA-	2322	(C-38- 6)27DCC-
2215	(C-41-13)34BCB-	2323	(C-38- 6)28DDD-
2217	(C-38-13)26DDA-	2328	(C-42-16)34ACB-
2219	(C-42-11) 3ADA-	2328	(C-42-16)34BAA-
2221	(C-42-16)34ACB-	2362	(C-42-16)34ACB-
2221	(C-42-16)34BAA-	2363	(C-42-16)34ACB-
2223	(C-42-14)19DCD-	2364	(C-42-16)34ACB-
2224	(C-42-13)30ACC-	2409	(C-40-16)26CCB-
2224	(C-42-13)30CAA-	2411	(C-42-16)34ACB-
2225	(C-40-16)35BCD-	2411	(C-42-16)34BAA-
2226	(C-39-15)15DAD-	2412	(C-42-15) 2BCB-
2227	(C-42-16)34ACB-	2413	(C-41-10)28BDB-
2227	(C-42-16)34BAA-	2415	(C-42-15)20ADA-
2228	(C-41-15) 9CAA-	2417	(C-43-11)28CCC-
2229	(C-42-16)34ACB-	2419	(C-42-16)34BAA-
2229	(C-42-16)34BAA-	2421	(C-43-15) 3CAB-
2230	(C-41-17)36BAA-	2423	(C-43-10)26CCA-
2232	(C-39-11) 1BAB-	2424	(C-42-13)20AAC-
2234	(C-42-10) 6DAD-	2424	(C-42-13)20ABC-

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Table A-3 Virgin River Area Wells By WR Number(cont)

WR Number*	USGS Number
2424	(C-42-13)20ACB-
2424	(C-42-13)20ADB-
2427	(C-41-14)13ABA-
2432	(C-42-14)12ADA-
2432	(C-42-14)12DDB-
2433	(C-42-15)36DCB-
2436	(C-41-16) 2DBC-
2440	(C-39-16)29ADA-
2440	(C-39-16)29ADC-
2441	(C-39-16)29ADA-
2441	(C-39-16)29ADC-
2442	(C-39-16)29ADA-
2442	(C-39-16)29ADC-
2443	(C-39-16)29ADA-
2443	(C-39-16)29ADC-
2444	(C-39-16)29ADA-
2444	(C-39-16)29ADC-
2445	(C-39-16)29ADA-
2445	(C-39-16)29ADC-
2446	(C-39-16)29ADA-
2446	(C-39-16)29ADC-
2447	(C-39-16)29ADA-
2447	(C-39-16)29ADC-
2448	(C-39-16)29ADA-
2448	(C-39-16)29ADC-
2449	(C-39-16)29ADC-
2450	(C-39-16)29ADC-
2451	(C-39-16)29ADC-
2452	(C-39-16)29ADC-
2453	(C-39-16)29ADC-
2454	(C-42-16)26CDD-
2455	(C-42-16)26CDD-
2456	(C-42-16)26CDD-
2457	(C-42-16)26CDD-
2458	(C-42-16)26CDD-
2459	(C-42-16)26CDD-
2460	(C-42-16)26CDD-
2461	(C-42-16)26CDD-
2462	(C-42-16)34BAA-
2463	(C-42-16)34BAA-
2464	(C-42-16)34BAA-
2465	(C-42-16) 5CDA-
2466	(C-42-16) 5CDA-
2467	(C-42-14)12ADA-
2467	(C-42-14)12DDB-
2496	(C-38-12) 9ADD-
2500	(C-38-15)26CDB-
2546	(C-42-15)36DCB-
2549	(C-38-13)26ACD-
2555	(C-43-11)28CCA-
2555	(C-43-11)28CDC-
2555	(C-43-11)28DCB-
2555	(C-43-11)29DDA-
2555	(C-43-11)32BAD-
2555	(C-43-12)36ACB-
2556	(C-43-11)28CCA-
2556	(C-43-11)28CDC-
2556	(C-43-11)28DCB-
2556	(C-43-11)29DDA-
2556	(C-43-11)32BAD-
2556	(C-43-12)36ACB-
2557	(C-43-11)28CCA-
2557	(C-43-11)28CDC-
2557	(C-43-11)28DCB-
2557	(C-43-11)29DDA-
2557	(C-43-11)32BAD-
2557	(C-43-12)36ACB-
2712	(C-42-17) 1BDD-
2713	(C-42-17) 1BDD-
2716	(C-38-16)15BAB-
2759	(C-43-14)20BAA-
2760	(C-43-14)20BAA-
2761	(C-40-11) 8DCB-
NEW	(C-42-11)30DDB-
NEW	(C-42-12) 2DCD-
NEW	(C-43-10)27DBB-

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Table A-4 Virgin River Area Wells By USGS Number

WR Number*	USGS Number	WR Number*	USGS Number
236	(C-37-12)27DAD-	1785	(C-38-13)22DAA-
1173	(C-37-12)28AAC-	2183	(C-38-13)22DCA-
705	(C-37-12)33ADB-	1686	(C-38-13)23BBB-
704	(C-37-12)33ADB-	1470	(C-38-13)23CCA-
226	(C-37-12)34AAA-	186	(C-38-13)23CCA-
228	(C-37-12)34ABA-	2275	(C-38-13)24BBA-
791	(C-37-12)34ABB-	243	(C-38-13)24BCD-
776	(C-37-12)34ABB-	2549	(C-38-13)26ACD-
625	(C-37-12)34DBD-	2239	(C-38-13)26ACD-
2176	(C-37-12)35BBC-	1668	(C-38-13)26ACD-
235	(C-37-12)35BBC-	2190	(C-38-13)26BAB-
1591	(C-37-19)17DCC-	2190	(C-38-13)26CAB-
2322	(C-38- 6)27DCC-	482	(C-38-13)26CAB-
2323	(C-38- 6)28DDD-	2217	(C-38-13)26DDA-
821	(C-38-11)31CCD-	2161	(C-38-13)27ADD-
930	(C-38-11)36DDC-	589	(C-38-14)31BDA-
1759	(C-38-12) 3ACB-	2500	(C-38-15)26CDB-
1760	(C-38-12) 4ACD-	477	(C-38-16)10DBC-
1259	(C-38-12) 4CDC-	2086	(C-38-16)15BAB-
652	(C-38-12) 4CDC-	2716	(C-38-16)15BAB-
324	(C-38-12) 9ADD-	267	(C-38-16)15BDA-
2496	(C-38-12) 9ADD-	267	(C-38-16)15BDD-
1667	(C-38-12)17DDD-	272	(C-38-16)15CBA-
2213	(C-38-12)18CCD-	267	(C-38-16)15DBB-
465	(C-38-12)19AAA-	1697	(C-38-16)15DBC-
1635	(C-38-12)19AAA-	1170	(C-39- 6) 4CAA-
465	(C-38-12)19AAB-	976	(C-39-10) 7CBB-
1635	(C-38-12)19AAB-	1567	(C-39-10)17CDD-
1473	(C-38-12)19ABB-	795	(C-39-10)19BBB-
1635	(C-38-12)19DCA-	583	(C-39-10)19BBB-
465	(C-38-12)19DCA-	1567	(C-39-10)20ADB-
1635	(C-38-12)20BBA-	2232	(C-39-11) 1BAB-
465	(C-38-12)20BBA-	1506	(C-39-11) 1CDB-
192	(C-38-12)20BBA-	584	(C-39-11) 1DBA-
245	(C-38-12)20CBB-	1636	(C-39-11) 2ACD-
1635	(C-38-12)21BCC-	1441	(C-39-11)12BBD-
662	(C-38-12)27CBD-	1398	(C-39-11)12BCA-
662	(C-38-12)29ACB-	1400	(C-39-11)12BCD-
214	(C-38-12)29CCD-	1440	(C-39-11)12BDB-
662	(C-38-12)29DCC-	1718	(C-39-11)12BDC-
1352	(C-38-12)30CCD-	588	(C-39-11)12BDD-
1679	(C-38-12)31ABC-	1399	(C-39-11)12CAD-
2099	(C-38-12)31BAB-	1060	(C-39-11)12CBC-
244	(C-38-12)31DAC-	796	(C-39-11)12CCB-
212	(C-38-13) 9DCD-	1560	(C-39-11)12CCC-
275	(C-38-13)16CAD-	1402	(C-39-11)12DBD-
2206	(C-38-13)21ACB-	890	(C-39-11)12DCB-
467	(C-38-13)21BAA-	631	(C-39-11)12DDB-
1438	(C-38-13)21BAA-	1014	(C-39-11)24BAC-

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Table A-4 Virgin River Area Wells By USGS Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
995	(C-39-15)14ACD-	1333	(C-39-15)15DDA-
2243	(C-39-15)14CBC-	844	(C-39-15)15DDA-
1024	(C-39-15)14CBC-	924	(C-39-15)15DDB-
1376	(C-39-15)14CCA-	945	(C-39-15)15DDB-
383	(C-39-15)14CCB-	944	(C-39-15)15DDB-
270	(C-39-15)14CCB-	919	(C-39-15)15DDC-
797	(C-39-15)14CCB-	880	(C-39-15)15DDC-
881	(C-39-15)14CCB-	846	(C-39-15)15DDC-
789	(C-39-15)14CCB-	878	(C-39-15)15DDC-
2244	(C-39-15)14CCB-	854	(C-39-15)15DDC-
946	(C-39-15)14CCB-	894	(C-39-15)15DDC-
934	(C-39-15)14CCB-	940	(C-39-15)15DDD-
382	(C-39-15)14CCB-	1377	(C-39-15)23BAD-
839	(C-39-15)14CCB-	2245	(C-39-15)24BBB-
1079	(C-39-15)14CCB-	1213	(C-39-16) 1BAB-
2150	(C-39-15)14CDA-	529	(C-39-16) 3DCC-
1553	(C-39-15)14CDA-	211	(C-39-16) 3DDD-
634	(C-39-15)14CDB-	2255	(C-39-16) 3DDD-
853	(C-39-15)14CDB-	1471	(C-39-16)22ADB-
943	(C-39-15)14CDB-	1104	(C-39-16)26CBA-
1115	(C-39-15)14CDB-	2442	(C-39-16)29ADA-
1076	(C-39-15)14CDC-	2444	(C-39-16)29ADA-
2292	(C-39-15)14CDC-	1525	(C-39-16)29ADA-
949	(C-39-15)14CDC-	2443	(C-39-16)29ADA-
630	(C-39-15)14CDC-	2440	(C-39-16)29ADA-
1075	(C-39-15)14CDD-	1252	(C-39-16)29ADA-
658	(C-39-15)14CDD-	1547	(C-39-16)29ADA-
655	(C-39-15)14CDD-	2441	(C-39-16)29ADA-
948	(C-39-15)14CDD-	2446	(C-39-16)29ADA-
676	(C-39-15)14CDD-	2445	(C-39-16)29ADA-
778	(C-39-15)14CDD-	2447	(C-39-16)29ADA-
780	(C-39-15)14CDD-	2448	(C-39-16)29ADA-
638	(C-39-15)14CDD-	1568	(C-39-16)29ADA-
852	(C-39-15)14DCC-	2446	(C-39-16)29ADC-
923	(C-39-15)14DCC-	2447	(C-39-16)29ADC-
882	(C-39-15)14DCD-	1779	(C-39-16)29ADC-
294	(C-39-15)14DCD-	1547	(C-39-16)29ADC-
1055	(C-39-15)14DCD-	2444	(C-39-16)29ADC-
629	(C-39-15)15CAD-	2443	(C-39-16)29ADC-
1593	(C-39-15)15CCA-	2441	(C-39-16)29ADC-
1080	(C-39-15)15DAA-	1525	(C-39-16)29ADC-
2246	(C-39-15)15DAC-	2440	(C-39-16)29ADC-
2226	(C-39-15)15DAD-	2448	(C-39-16)29ADC-
2280	(C-39-15)15DAD-	2449	(C-39-16)29ADC-
1546	(C-39-15)15DAD-	480	(C-39-16)29ADC-
936	(C-39-15)15DBA-	1252	(C-39-16)29ADC-
860	(C-39-15)15DBC-	2442	(C-39-16)29ADC-
774	(C-39-15)15DDA-	2450	(C-39-16)29ADC-
836	(C-39-15)15DDA-	2445	(C-39-16)29ADC-

*Area 81- Virgin River Basin

Table A-4 Virgin River Area Wells By USGS Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
2451	(C-39-16)29ADC-	421	(C-40-17)21DCA-
2452	(C-39-16)29ADC-	369	(C-40-19) 3ADC-
1568	(C-39-16)29ADC-	370	(C-40-19) 3CDA-
1549	(C-39-16)29ADC-	370	(C-40-19) 3CDC-
2453	(C-39-16)29ADC-	369	(C-40-19) 3DCB-
1179	(C-39-16)32AAB-	412	(C-40-19) 5ACD-
1179	(C-39-16)32AAB-	412	(C-40-19) 5DAC-
1113	(C-39-16)32AAB-	906	(C-40-19)17BDA-
2159	(C-39-17)36CCB-	906	(C-40-19)17CAD-
1237	(C-39-18)23DCC-	1111	(C-41- 7) 3CBC-
826	(C-39-19)29DBC-	1098	(C-41- 7) 3CBC-
1605	(C-40- 7)14BAD-	1097	(C-41- 7) 3CBC-
653	(C-40- 7)34CDD-	1096	(C-41- 7) 3CBC-
474	(C-40- 7)34CDD-	1096	(C-41- 7) 4AAD-
2260	(C-40-11) 5CCC-	1111	(C-41- 7) 4AAD-
327	(C-40-11) 8DAD-	1098	(C-41- 7) 4AAD-
637	(C-40-11) 8DCB-	1097	(C-41- 7) 4AAD-
2761	(C-40-11) 8DCB-	2196	(C-41- 7)17BAA-
1373	(C-40-11)16BAB-	452	(C-41- 7)17BAA-
828	(C-40-11)29BBC-	287	(C-41- 7)19CCD-
799	(C-40-12)21AAA-	256	(C-41- 7)19CCD-
800	(C-40-12)21AAA-	374	(C-41- 7)30BBA-
824	(C-40-12)22BDC-	2157	(C-41- 8) 3CCD-
861	(C-40-12)28DAD-	781	(C-41- 9)10CDD-
564	(C-40-13) 1CCA-	963	(C-41- 9)10CDD-
44	(C-40-13) 1CCA-	747	(C-41- 9)13BBC-
1557	(C-40-13) 1CCA-	493	(C-41- 9)14CAB-
1614	(C-40-13) 1CCA-	2242	(C-41- 9)15AAD-
794	(C-40-13) 2ADD-	651	(C-41- 9)15AAD-
792	(C-40-13)27BDB-	767	(C-41- 9)15CDA-
813	(C-40-13)27CCC-	491	(C-41- 9)15DDB-
787	(C-40-13)31BCD-	492	(C-41- 9)15DDC-
1260	(C-40-13)31BCD-	514	(C-41- 9)20BDB-
2185	(C-40-13)32BBB-	575	(C-41-10)28BBD-
166	(C-40-13)32DBA-	2413	(C-41-10)28BDB-
2198	(C-40-13)33CCD-	585	(C-41-10)28BDB-
1045	(C-40-16) 5ABA-	1326	(C-41-10)29CAA-
1045	(C-40-16) 5ABD-	349	(C-41-10)32AAD-
2276	(C-40-16) 9ADB-	2238	(C-41-10)32ADA-
2167	(C-40-16) 9ADB-	1623	(C-41-10)32ADA-
1487	(C-40-16) 9ADB-	818	(C-41-11)17BCD-
2409	(C-40-16)26CCB-	790	(C-41-11)17DBA-
1253	(C-40-16)26CCB-	601	(C-41-13) 4BBA-
1083	(C-40-16)34AAD-	1581	(C-41-13) 4BBB-
1083	(C-40-16)34ADA-	814	(C-41-13) 4BBC-
1253	(C-40-16)35BCC-	406	(C-41-13) 5AAA-
2225	(C-40-16)35BCD-	1523	(C-41-13) 5AAA-
362	(C-40-17)15CCD-	426	(C-41-13) 5AAC-
843	(C-40-17)15DCD-	814	(C-41-13) 5AAD-

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Table A-4 Virgin River Area Wells By USGS Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
1467	(C-41-13) 5ADB-	996	(C-41-16)16BBD-
1262	(C-41-13) 5DBA-	782	(C-41-16)16BBD-
2274	(C-41-13) 6CBB-	845	(C-41-16)16BBD-
1000	(C-41-13) 6CBB-	1427	(C-41-16)16BBD-
463	(C-41-13) 7CCC-	973	(C-41-16)16BBD-
2184	(C-41-13) 8BAA-	782	(C-41-16)16CDB-
1522	(C-41-13) 8BAA-	973	(C-41-16)16CDB-
1522	(C-41-13) 8BAD-	845	(C-41-16)16CDB-
2287	(C-41-13)23AAA-	1427	(C-41-16)16CDB-
1380	(C-41-13)23ABC-	996	(C-41-16)16CDB-
815	(C-41-13)25BCC-	1575	(C-41-16)23BBA-
1625	(C-41-13)30CAC-	1502	(C-41-16)23BBA-
1439	(C-41-13)30CAC-	1551	(C-41-16)23BBA-
650	(C-41-13)30CDD-	1550	(C-41-16)23BBA-
1202	(C-41-13)31CBD-	1649	(C-41-16)23BBA-
1202	(C-41-13)31CDB-	1574	(C-41-16)23BBA-
1609	(C-41-13)31DCB-	1068	(C-41-16)30CBC-
1234	(C-41-13)31DCB-	451	(C-41-17) 7DDB-
2215	(C-41-13)34BCB-	628	(C-41-17) 7DDB-
1268	(C-41-13)34BCB-	451	(C-41-17) 8BAD-
2195	(C-41-14)12ACB-	451	(C-41-17) 8CAC-
675	(C-41-14)12BDA-	628	(C-41-17) 8CAC-
1570	(C-41-14)12BDA-	451	(C-41-17) 8DCB-
1716	(C-41-14)12BDA-	451	(C-41-17)17BDA-
433	(C-41-14)13ABA-	635	(C-41-17)17BDA-
2427	(C-41-14)13ABA-	2230	(C-41-17)36BAA-
2261	(C-41-14)13ACC-	1665	(C-41-17)36CBD-
2261	(C-41-14)13CAA-	2113	(C-41-17)36CBD-
2261	(C-41-14)13CAA-	1663	(C-41-17)36CBD-
2261	(C-41-14)13CAD-	1626	(C-41-17)36CBD-
2261	(C-41-14)13DBB-	1497	(C-41-17)36CBD-
2261	(C-41-14)13DBB-	2112	(C-41-17)36CBD-
1518	(C-41-14)14CDA-	1666	(C-41-17)36CBD-
808	(C-41-14)15ADA-	1755	(C-41-19) 6BCB-
565	(C-41-14)15ADA-	1708	(C-41-19)16BDA-
2228	(C-41-15) 9CAA-	333	(C-42- 7)24ADD-
273	(C-41-15)20CBA-	1601	(C-42- 9)21BAA-
577	(C-41-15)27DAD-	118	(C-42- 9)32BCC-
577	(C-41-15)34ACA-	118	(C-42- 9)32BCC-
577	(C-41-15)34CCD-	600	(C-42-10) 5BCC-
1719	(C-41-15)35CDA-	407	(C-42-10) 5CBA-
2210	(C-41-16) 2BAB-	241	(C-42-10) 6DAA-
2436	(C-41-16) 2DBC-	2234	(C-42-10) 6DAD-
845	(C-41-16) 9BBB-	450	(C-42-10) 7ABC-
1427	(C-41-16) 9CBB-	395	(C-42-10) 7ABC-
845	(C-41-16) 9CBB-	106	(C-42-10) 7ABC-
782	(C-41-16) 9CBB-	106	(C-42-10) 7BDD-
973	(C-41-16) 9CBB-	106	(C-42-10) 7BDD-
996	(C-41-16) 9CBB-	395	(C-42-10) 7BDD-

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Table A-4 Virgin River Area Wells By USGS Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
395	(C-42-10) 7BDD-	802	(C-42-13) 6BAD-
450	(C-42-10) 7BDD-	804	(C-42-13) 6BAD-
450	(C-42-10) 7BDD-	804	(C-42-13) 6BCD-
424	(C-42-11) 1CAC-	802	(C-42-13) 6BCD-
1369	(C-42-11) 1CCB-	1201	(C-42-13) 6CAD-
399	(C-42-11) 1DCB-	1040	(C-42-13) 6CAD-
1762	(C-42-11) 2CDA-	1234	(C-42-13) 6CAD-
644	(C-42-11) 3ADA-	1721	(C-42-13) 6CAD-
2219	(C-42-11) 3ADA-	1279	(C-42-13) 6CAD-
1117	(C-42-11) 3BCB-	1722	(C-42-13) 6CAD-
1278	(C-42-11) 3DAC-	1706	(C-42-13) 6CAD-
462	(C-42-11) 4AAA-	1723	(C-42-13) 6CAD-
2170	(C-42-11)19BCB-	975	(C-42-13) 6CAD-
2171	(C-42-11)19BCB-	1588	(C-42-13) 6CAD-
1052	(C-42-11)19CCD-	366	(C-42-13) 7BAA-
1052	(C-42-11)19CCD-	372	(C-42-13) 7BAB-
1052	(C-42-11)19CDB-	368	(C-42-13) 7BAB-
1370	(C-42-11)29CDC-	372	(C-42-13) 7CBD-
901	(C-42-11)30BAB-	1763	(C-42-13)10ADA-
1799	(C-42-11)30BAB-	1338	(C-42-13)15BAD-
901	(C-42-11)30BAC-	1360	(C-42-13)16AAD-
901	(C-42-11)30BDC-	371	(C-42-13)18BCA-
901	(C-42-11)30CDA-	341	(C-42-13)18BCD-
NEW	(C-42-11)30DDB-	1256	(C-42-13)20AAC-
1181	(C-42-11)32ABC-	2424	(C-42-13)20AAC-
1181	(C-42-11)32ADA-	2424	(C-42-13)20ABC-
1181	(C-42-11)32ADD-	1256	(C-42-13)20ABC-
1181	(C-42-11)32DAA-	1256	(C-42-13)20ACB-
1181	(C-42-11)32DCC-	2424	(C-42-13)20ACB-
1181	(C-42-11)32DDD-	1256	(C-42-13)20ADB-
472	(C-42-11)34BBB-	2424	(C-42-13)20ADB-
NEW	(C-42-12) 2DCD-	1039	(C-42-13)22BBB-
375	(C-42-12) 3BBA-	1039	(C-42-13)22BBB-
418	(C-42-12)11ACB-	1628	(C-42-13)28DDA-
537	(C-42-12)18CCC-	2224	(C-42-13)30ACC-
527	(C-42-12)18CCD-	2224	(C-42-13)30CAA-
1490	(C-42-12)22DDD-	1108	(C-42-13)31DCB-
1210	(C-42-12)22DDD-	900	(C-42-13)33AAB-
1783	(C-42-12)22DDD-	2158	(C-42-13)33AAD-
1603	(C-42-12)23CAD-	1475	(C-42-13)33AAD-
1255	(C-42-12)23DBA-	1218	(C-42-14) 1BBD-
1209	(C-42-12)24BCD-	261	(C-42-14) 4ACB-
1183	(C-42-12)24DAB-	310	(C-42-14) 4DBA-
1183	(C-42-12)24DAD-	1752	(C-42-14)11ABD-
1183	(C-42-12)24DDA-	281	(C-42-14)11ABD-
1051	(C-42-12)27AAB-	1281	(C-42-14)11ACB-
1579	(C-42-12)27AAB-	1281	(C-42-14)11ACC-
926	(C-42-13) 2BCC-	1429	(C-42-14)11ADB-
511	(C-42-13) 6ABC-	2432	(C-42-14)12ADA-

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Table A-4 Virgin River Area Wells By USGS Number(cont)

WR Number*	USGS Number
2467	(C-42-14)12ADA-
983	(C-42-14)12ADA-
1509	(C-42-14)12ADD-
1102	(C-42-14)12DAA-
556	(C-42-14)12DBA-
556	(C-42-14)12DBB-
556	(C-42-14)12DBC-
1344	(C-42-14)12DCC-
983	(C-42-14)12DDB-
2467	(C-42-14)12DDB-
2432	(C-42-14)12DDB-
2187	(C-42-14)13ABC-
1642	(C-42-14)13ADA-
927	(C-42-14)13ADB-
1598	(C-42-14)13ADB-
1633	(C-42-14)13ADB-
1599	(C-42-14)14BBB-
1004	(C-42-14)14BBB-
1004	(C-42-14)14BBC-
1599	(C-42-14)14BBC-
1004	(C-42-14)15AAB-
1004	(C-42-14)15AAB-
1599	(C-42-14)15AAB-
1599	(C-42-14)15AAB-
384	(C-42-14)15ABA-
1276	(C-42-14)15ABA-
1276	(C-42-14)15ABC-
1468	(C-42-14)15BAA-
373	(C-42-14)15BAA-
373	(C-42-14)15BDD-
1468	(C-42-14)15BDD-
1316	(C-42-14)15BDD-
1592	(C-42-14)15BDD-
1317	(C-42-14)15CAA-
1248	(C-42-14)15CAB-
1332	(C-42-14)15CAB-
1468	(C-42-14)15CAB-
373	(C-42-14)15CAB-
1332	(C-42-14)15CAC-
1301	(C-42-14)15CAD-
1300	(C-42-14)15CAD-
1318	(C-42-14)15CBD-
1599	(C-42-14)15DAB-
1004	(C-42-14)15DAB-
1004	(C-42-14)15DAD-
1599	(C-42-14)15DAD-
1611	(C-42-14)19ACB-
1610	(C-42-14)19ACB-
1630	(C-42-14)19CAC-
1589	(C-42-14)19CBB-
1604	(C-42-14)19CBB-
1589	(C-42-14)19CCA-
1727	(C-42-14)19CCA-
1726	(C-42-14)19CCA-
1589	(C-42-14)19CCD-
1351	(C-42-14)19DAC-
840	(C-42-14)19DAC-
1717	(C-42-14)19DBD-
2223	(C-42-14)19DCD-
1315	(C-42-14)20ACA-
460	(C-42-14)20ACA-
1107	(C-42-14)20ACA-
1315	(C-42-14)20ACA-
1681	(C-42-14)20ACA-
573	(C-42-14)20ACA-
1405	(C-42-14)20ACA-
1678	(C-42-14)20ACA-
443	(C-42-14)20DBC-
311	(C-42-14)25ADC-
1397	(C-42-14)31DCD-
2412	(C-42-15) 2BCB-
1674	(C-42-15) 2BCB-
577	(C-42-15) 4AAB-
528	(C-42-15) 6DDC-
548	(C-42-15) 6DDC-
319	(C-42-15) 6DDC-
2258	(C-42-15) 9CDA-
645	(C-42-15)10CBA-
646	(C-42-15)13CAC-
510	(C-42-15)13CBC-
313	(C-42-15)14CAA-
510	(C-42-15)14DDD-
420	(C-42-15)19CAC-
809	(C-42-15)19CBB-
834	(C-42-15)19CBD-
590	(C-42-15)19CCB-
609	(C-42-15)19CDB-
2415	(C-42-15)20ADA-
293	(C-42-15)20CCA-
535	(C-42-15)21ACA-
2266	(C-42-15)21BBD-
639	(C-42-15)22CCB-
1245	(C-42-15)22CCD-
1714	(C-42-15)23CAB-
1747	(C-42-15)23CAB-
1777	(C-42-15)23CBD-
1267	(C-42-15)23DAA-
443	(C-42-15)25BAD-

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Table A-4 Virgin River Area Wells By USGS Number(cont)

WR Number*	USGS Number
1034	(C-42-15)26ABD-
423	(C-42-15)26BBD-
1334	(C-42-15)26DBD-
1340	(C-42-15)26DDA-
554	(C-42-15)27CDC-
627	(C-42-15)28BBC-
627	(C-42-15)29ABC-
263	(C-42-15)29ACC-
610	(C-42-15)29BBD-
627	(C-42-15)29BCA-
361	(C-42-15)29CDC-
432	(C-42-15)30AAB-
568	(C-42-15)30ABB-
376	(C-42-15)30ABC-
343	(C-42-15)30ACA-
466	(C-42-15)30ADB-
340	(C-42-15)30ADB-
623	(C-42-15)30ADC-
428	(C-42-15)30BDB-
352	(C-42-15)30CAA-
354	(C-42-15)30CBC-
643	(C-42-15)30CCB-
1049	(C-42-15)30CCC-
1282	(C-42-15)30CCC-
308	(C-42-15)30CDA-
347	(C-42-15)30CDB-
381	(C-42-15)30DAD-
663	(C-42-15)30DBB-
903	(C-42-15)30DBB-
819	(C-42-15)30DBD-
248	(C-42-15)30DBD-
348	(C-42-15)30DCC-
642	(C-42-15)30DCC-
1651	(C-42-15)30DCC-
446	(C-42-15)30DCD-
597	(C-42-15)30DCD-
404	(C-42-15)30DCD-
563	(C-42-15)30DCD-
208	(C-42-15)30DDB-
390	(C-42-15)30DDB-
303	(C-42-15)30DDC-
1053	(C-42-15)31AAA-
1374	(C-42-15)31AAB-
817	(C-42-15)31ADB-
284	(C-42-15)31CDC-
217	(C-42-15)31DAC-
378	(C-42-15)32ABC-
1631	(C-42-15)32ADC-
971	(C-42-15)32ADC-
325	(C-42-15)32BBC-
668	(C-42-15)32BDC-
640	(C-42-15)32DCC-
626	(C-42-15)33CAB-
1261	(C-42-15)33DAB-
458	(C-42-15)33DDB-
555	(C-42-15)33DDD-
1088	(C-42-15)34BCC-
379	(C-42-15)34BDB-
1088	(C-42-15)34CBD-
487	(C-42-15)34DBA-
487	(C-42-15)34DBA-
1647	(C-42-15)34DDA-
953	(C-42-15)35BAA-
798	(C-42-15)35DAD-
1648	(C-42-15)36DCB-
2546	(C-42-15)36DCB-
2433	(C-42-15)36DCB-
1639	(C-42-15)36DCB-
1652	(C-42-15)36DCB-
566	(C-42-16) 5BBB-
2465	(C-42-16) 5CDA-
1576	(C-42-16) 5CDA-
2466	(C-42-16) 5CDA-
1493	(C-42-16) 5CDA-
2214	(C-42-16) 5CDA-
1494	(C-42-16) 5CDA-
1077	(C-42-16) 6ADA-
1047	(C-42-16) 6ADD-
1662	(C-42-16) 9BCC-
1661	(C-42-16) 9BCC-
1664	(C-42-16) 9BCC-
1322	(C-42-16)10AAD-
1496	(C-42-16)10BCA-
1499	(C-42-16)10BCA-
1569	(C-42-16)10BCA-
1563	(C-42-16)10BCA-
1577	(C-42-16)10BCA-
1322	(C-42-16)10BCA-
1774	(C-42-16)10BCA-
2281	(C-42-16)10BCA-
2290	(C-42-16)10BCA-
1670	(C-42-16)10CAD-
1677	(C-42-16)10CAD-
2271	(C-42-16)10CAD-
1660	(C-42-16)10CAD-
2272	(C-42-16)10CAD-
1058	(C-42-16)10DCA-
1682	(C-42-16)10DCA-

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Table A-4 Virgin River Area Wells By USGS Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
4682	(C-42-16)10DCA-	612	(C-42-16)26BBC-
461	(C-42-16)13CCD-	612	(C-42-16)26BCB-
481	(C-42-16)14DAA-	498	(C-42-16)26BCC-
203	(C-42-16)16BCC-	322	(C-42-16)26BCC-
203	(C-42-16)16BDC-	1492	(C-42-16)26BDD-
596	(C-42-16)16CAB-	321	(C-42-16)26CBA-
323	(C-42-16)16DBC-	534	(C-42-16)26CBA-
793	(C-42-16)17AAC-	1637	(C-42-16)26CDD-
562	(C-42-16)17ABA-	2461	(C-42-16)26CDD-
1056	(C-42-16)17ACA-	2179	(C-42-16)26CDD-
1617	(C-42-16)17ADC-	1428	(C-42-16)26CDD-
1594	(C-42-16)17BCA-	2459	(C-42-16)26CDD-
1057	(C-42-16)17BCA-	2454	(C-42-16)26CDD-
671	(C-42-16)17DAA-	2455	(C-42-16)26CDD-
1324	(C-42-16)22ABA-	2456	(C-42-16)26CDD-
475	(C-42-16)22BAA-	2460	(C-42-16)26CDD-
209	(C-42-16)22CBA-	2458	(C-42-16)26CDD-
622	(C-42-16)22DCA-	2457	(C-42-16)26CDD-
377	(C-42-16)23AAD-	2289	(C-42-16)26CDD-
296	(C-42-16)23ABD-	497	(C-42-16)27ADB-
606	(C-42-16)24ACB-	1748	(C-42-16)27BAB-
572	(C-42-16)24ACC-	2189	(C-42-16)27BAB-
823	(C-42-16)24ACC-	1048	(C-42-16)27BBA-
518	(C-42-16)24ACD-	2328	(C-42-16)34ACB-
413	(C-42-16)24ACD-	2363	(C-42-16)34ACB-
561	(C-42-16)24ADC-	2319	(C-42-16)34ACB-
595	(C-42-16)24ADC-	2364	(C-42-16)34ACB-
197	(C-42-16)24BAA-	2411	(C-42-16)34ACB-
471	(C-42-16)24BCB-	2362	(C-42-16)34ACB-
469	(C-42-16)24BCB-	2229	(C-42-16)34ACB-
571	(C-42-16)24BDA-	1500	(C-42-16)34ACB-
512	(C-42-16)24BDD-	2178	(C-42-16)34ACB-
545	(C-42-16)24DAA-	2227	(C-42-16)34ACB-
593	(C-42-16)24DBB-	2221	(C-42-16)34ACB-
1632	(C-42-16)24DCA-	2202	(C-42-16)34ACB-
1578	(C-42-16)24DDC-	2207	(C-42-16)34ACB-
409	(C-42-16)24DDC-	2208	(C-42-16)34ACB-
607	(C-42-16)24DDD-	2227	(C-42-16)34BAA-
402	(C-42-16)25AAB-	2221	(C-42-16)34BAA-
298	(C-42-16)25ABA-	2229	(C-42-16)34BAA-
286	(C-42-16)25ABB-	2208	(C-42-16)34BAA-
916	(C-42-16)25ABD-	2207	(C-42-16)34BAA-
403	(C-42-16)25ACB-	1500	(C-42-16)34BAA-
401	(C-42-16)25ADB-	2462	(C-42-16)34BAA-
346	(C-42-16)25ADC-	2328	(C-42-16)34BAA-
336	(C-42-16)25ADC-	2419	(C-42-16)34BAA-
429	(C-42-16)25ADD-	2202	(C-42-16)34BAA-
599	(C-42-16)25DAA-	2411	(C-42-16)34BAA-
358	(C-42-16)25DAB-	2463	(C-42-16)34BAA-

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Table A-4 Virgin River Area Wells By USGS Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
2464	(C-42-16)34BAA-	884	(C-43-11)33BAD-
2178	(C-42-16)34BAA-	567	(C-43-11)34BBA-
320	(C-42-16)35ACA-	454	(C-43-11)36CCC-
2712	(C-42-17) 1BDD-	1236	(C-43-12)19AAA-
1303	(C-42-17) 1BDD-	779	(C-43-12)20BBB-
1732	(C-42-17) 1BDD-	1680	(C-43-12)34DDD-
2713	(C-42-17) 1BDD-	884	(C-43-12)36ACB-
1336	(C-42-17) 1BDD-	2555	(C-43-12)36ACB-
1559	(C-42-17) 1BDD-	2556	(C-43-12)36ACB-
1671	(C-42-17) 1CDB-	925	(C-43-12)36ACB-
574	(C-42-17) 1CDB-	2557	(C-43-12)36ACB-
1669	(C-42-17) 1CDB-	314	(C-43-13) 5BDD-
2315	(C-42-19) 7CBC-	442	(C-43-13)21CAA-
613	(C-42-20)24AAA-	1119	(C-43-14)20BAA-
1062	(C-43- 8)34BAB-	2760	(C-43-14)20BAA-
2423	(C-43-10)26CCA-	2759	(C-43-14)20BAA-
NEW	(C-43-10)27DBB-	1733	(C-43-14)20CAA-
1798	(C-43-11) 4BDC-	1356	(C-43-14)20DBD-
1798	(C-43-11) 4BDD-	431	(C-43-14)25DDD-
1319	(C-43-11) 8CAD-	411	(C-43-14)30CCD-
1451	(C-43-11)13DDD-	431	(C-43-14)31BAB-
473	(C-43-11)15BCC-	431	(C-43-14)31DCD-
1319	(C-43-11)17BAA-	445	(C-43-14)31DCD-
453	(C-43-11)25CAD-	1484	(C-43-14)31DCD-
2555	(C-43-11)28CCA-	1263	(C-43-15) 2AAA-
925	(C-43-11)28CCA-	506	(C-43-15) 2AAA-
2556	(C-43-11)28CCA-	1263	(C-43-15) 2AAB-
2557	(C-43-11)28CCA-	902	(C-43-15) 2ABB-
884	(C-43-11)28CCA-	1299	(C-43-15) 2BBC-
2417	(C-43-11)28CCC-	1046	(C-43-15) 2DAA-
2555	(C-43-11)28CDC-	1046	(C-43-15) 2DDB-
2556	(C-43-11)28CDC-	2421	(C-43-15) 3CAB-
925	(C-43-11)28CDC-	1731	(C-43-15) 4DCC-
2557	(C-43-11)28CDC-	1764	(C-43-15) 4DCD-
884	(C-43-11)28CDC-	1514	(C-43-15) 4DCD-
2555	(C-43-11)28DCB-	775	(C-43-15) 4DCD-
925	(C-43-11)28DCB-	1764	(C-43-15) 4DDB-
2557	(C-43-11)28DCB-	1764	(C-43-15) 4DDB-
2556	(C-43-11)28DCB-	775	(C-43-15) 4DDB-
884	(C-43-11)28DCB-	775	(C-43-15) 4DDB-
2556	(C-43-11)29DDA-	1764	(C-43-15) 4DDC-
2557	(C-43-11)29DDA-	775	(C-43-15) 4DDC-
2555	(C-43-11)29DDA-	775	(C-43-15) 4DDC-
884	(C-43-11)29DDA-	1764	(C-43-15) 4DDC-
925	(C-43-11)29DDA-	1764	(C-43-15) 4DDD-
2556	(C-43-11)32BAD-	1764	(C-43-15) 4DDD-
2557	(C-43-11)32BAD-	1764	(C-43-15) 4DDD-
2555	(C-43-11)32BAD-	775	(C-43-15) 4DDD-
925	(C-43-11)32BAD-	775	(C-43-15) 4DDD-

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Table A-4 Virgin River Area Wells By USGS Number(cont)

WR Number*	USGS Number
775	(C-43-15) 4DDD-
998	(C-43-15) 5ADB-
441	(C-43-15) 6ACD-
496	(C-43-15) 6BAB-
271	(C-43-15) 6BBB-
1734	(C-43-15) 9ADA-
1520	(C-43-15) 9ADA-
827	(C-43-15) 9ADA-
1734	(C-43-15) 9ADA-
1736	(C-43-15) 9CDD-
984	(C-43-15) 9DAA-
1331	(C-43-15) 9DDD-
488	(C-43-15)10AAA-
1025	(C-43-15)10AAC-
386	(C-43-15)10ABB-
1555	(C-43-15)10BCB-
1308	(C-43-15)10BCB-
1734	(C-43-15)10BCB-
1328	(C-43-15)10BCC-
1735	(C-43-15)10BCC-
987	(C-43-15)10CBC-
987	(C-43-15)10CBD-
987	(C-43-15)10CCA-
1345	(C-43-15)10DBC-
536	(C-43-15)11AAB-
536	(C-43-15)11ACD-
484	(C-43-15)11BAA-
1288	(C-43-15)11DDD-
536	(C-43-15)11DDD-
1288	(C-43-15)12BDD-
1288	(C-43-15)12CCC-
536	(C-43-15)12CDC-
440	(C-43-15)12CDC-
1288	(C-43-15)12CDD-
536	(C-43-15)12CDD-
1734	(C-43-15)14CDA-
485	(C-43-15)14DCD-
1734	(C-43-15)14DDC-
1389	(C-43-15)16ACB-
1517	(C-43-15)16BAA-
1508	(C-43-15)16BDC-
938	(C-43-15)16DBC-
937	(C-43-15)16DBD-
937	(C-43-15)16DBD-
938	(C-43-15)16DBD-
1521	(C-43-15)16DCC-
1521	(C-43-15)16DCC-
603	(C-43-15)16DCC-
447	(C-43-15)16DCC-

WR Number*	USGS Number
820	(C-43-15)16DCC-
820	(C-43-15)16DCC-
1521	(C-43-15)16DCD-
820	(C-43-15)16DCD-
1474	(C-43-15)23BCA-
302	(C-43-15)23BCB-
1474	(C-43-15)23CAC-
411	(C-43-15)25DDD-
938	(C-43-15)28ACD-
430	(C-43-15)36DDC-
674	(C-43-16) 2BDC-
659	(C-43-16)11CAB-
660	(C-43-16)11DBC-
2118	(C-43-16)12AAA-
665	(C-43-16)12AAA-
1684	(C-43-16)12AAA-
2118	(C-43-16)12AAA-
1684	(C-43-16)12AAA-
269	(C-43-16)12ADA-
1269	(C-43-16)14ADC-
669	(C-43-16)22DAB-
670	(C-43-16)23BBC-
1125	(C-43-18) 5CDD-
1125	(C-43-18) 5DCC-
1125	(C-43-18) 8ABB-
1125	(C-43-18) 8BAA-
359	(C-43-19)20BDC-

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Table A-5 Virgin River Area Springs by WR Number

WR Number*	USGS Number
17	(C-38-13)36CCC-
20	(C-40- 9) 7CCA-
21	(C-40- 9)18BAA-
22	(C-40-10)13BBC-
23	(C-40-10)12CBC-
23	(C-40-10)12CDC-
24	(C-39-12) 6BDD-
28	(C-42- 8) 1AAC-
45	(C-37-13)27ADA-
46	(C-38-13) 2ABC-
48	(C-41-13)25CDB-
52	(C-43- 8)17CAA-
53	(C-43- 9)18DDC-
54	(C-43- 9)20BBB-
59	(C-43-10)21BAC-
67	(C-43- 9)34CAA-
69	(C-41-14)26DCA-
70	(C-42-16)15ACB-
78	(C-43-14)19DDB-
79	(C-42-14) 5BCD-
81	(C-41- 7)19BBB-
82	(C-41- 8)13ACC-
86	(C-41-16)34BDA-
87	(C-40-16) 6DBC-
100	(C-42-15)14BAB-
102	(C-40-16) 6ADB-
104	(C-38-12) 3ACD-
104	(C-38-12) 3CAC-
104	(C-38-12) 9ABD-
104	(C-38-12)10CBB-
105	(C-41-10)22CDD-
106	(C-42-10) 7BDD-
108	(C-37-13)35DDB-
111	(C-39-11) 9BDD-
112	(C-42- 8) 1AAC-
113	(C-40-11) 5AAC-
114	(C-43-11)12CCD-
116	(C-39- 7)13BAA-
119	(C-43- 9)18DDC-
120	(C-43- 9)18DAB-
127	(C-43-10) 1AAD-
129	(C-38-15)30ABC-
129	(C-38-15)30ACC-
129	(C-38-15)30CAA-
138	(C-42-10)31CAB-
138	(C-43-10) 6BBB-
138	(C-43-11) 1AAA-
139	(C-38-18)27AAB-
140	(C-40-14) 8CCD-
145	(C-39-14)20BCC-
146	(C-39-14)30BDD-
149	(C-42-16)14BAB-
151	(C-42-12)14AAA-
155	(C-43-13)24ADC-
160	(C-42-14)32ABB-
165	(C-42-11)16CBA-
167	(C-43-11)20BBC-
176	(C-42-15)29CDA-
177	(C-38-19) 2CDD-
178	(C-38-19)11BCA-
184	(C-42-14)21CAD-
188	(C-39-15) 7CCA-
195	(C-41- 7)30DBB-
200	(C-42-14) 5ABA-
201	(C-42-12)19DBB-
204	(C-41- 9)13BAC-
207	(C-42-15)11CAA-
213	(C-42-15)30DCB-
215	(C-42-12) 1CBA-
216	(C-41-10)32AAC-
218	(C-42-15)19CAD-
220	(C-41-10)18DBA-
222	(C-42-15)11CDA-
233	(C-37-10)30DBD-
237	(C-37-11)33DBB-
238	(C-37-11)33DCC-
246	(C-42-15)32DBA-
252	(C-40-15) 4DDB-
252	(C-40-15)10BBB-
252	(C-40-15)10BDC-
252	(C-40-15)10CBA-
252	(C-40-15)14BAD-
252	(C-40-15)14BDD-
252	(C-40-15)15CCA-
252	(C-40-15)22DDA-
252	(C-40-15)23BCB-
252	(C-40-15)23BCD-
254	(C-42-15)19CAC-
255	(C-41-14)12CCA-
255	(C-41-14)12CCC-
255	(C-41-14)12CCC-
262	(C-37- 9)34BCA-
268	(C-41- 9) 2CAB-
274	(C-41-10)17DAB-
277	(C-39-16)28ABB-
283	(C-38-11)16ACB-
283	(C-38-11)16ADB-
288	(C-42-15)12BCA-

*Area 81- Virgin River Basin

Table A-5 Virgin River Area Springs by WR Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
289	(C-42-15)12BDB-	697	(C-38-11)35CAC-
290	(C-42-15)12BDD-	699	(C-38-11)35DAC-
291	(C-42-14) 6CCC-	700	(C-38-11)35DDB-
292	(C-42-15)12ACB-	701	(C-38-11)36CBB-
295	(C-43-10)21DBD-	703	(C-43-12)11AAA-
315	(C-39-14) 5BBA-	706	(C-37-12)33ACD-
316	(C-39-11)30AAC-	708	(C-42-18)24ABB-
317	(C-42-15)19CAB-	708	(C-42-18)24ACB-
331	(C-42-14)15DBD-	712	(C-40-19)14DAD-
332	(C-42-14) 2DAA-	714	(C-42-15)15BBD-
380	(C-42-14)28ACB-	718	(C-39-15)15DDA-
394	(C-41- 9)16CDC-	719	(C-39-15)15DDA-
395	(C-42-10) 7BDD-	720	(C-39-15)15DDA-
405	(C-40-16)35ABD-	721	(C-39-15)14CCC-
425	(C-39-11) 1BAA-	722	(C-39-15)23BBC-
450	(C-42-10) 7BDD-	723	(C-39-15)14CCC-
468	(C-38-16)14BAD-	724	(C-39-15)23CBB-
478	(C-38- 9) 5ACC-	725	(C-39-15)13CCC-
483	(C-39- 9) 7DBD-	726	(C-39-15)15DDD-
501	(C-40- 7)11CBC-	728	(C-40-11) 9BBA-
502	(C-40- 7)10DAD-	729	(C-40-11) 4CDC-
504	(C-40-11) 9ACB-	730	(C-40-11) 9DBB-
505	(C-40-11)16DCC-	731	(C-38- 9)27ADB-
508	(C-39-11)12AAA-	732	(C-38- 9)27AAA-
509	(C-39-11)12DDB-	735	(C-39-10) 6DDC-
515	(C-38-11)24DAC-	736	(C-38-10)32DAA-
515	(C-38-11)24DDA-	737	(C-38-10)32ACD-
519	(C-40- 7)10ACB-	739	(C-39-10) 6DBD-
519	(C-40- 7)10ACB-	740	(C-38-10)31DCC-
520	(C-40- 7)10DAB-	741	(C-42-16)10ADA-
521	(C-40- 7) 3CCC-	741	(C-42-16)10DAA-
523	(C-40- 7)10BBB-	741	(C-42-16)10DAA-
524	(C-40- 7)10BBB-	741	(C-42-16)11DBA-
525	(C-40- 7)10BBC-	742	(C-42-16)10ADA-
526	(C-40- 7)10BDA-	742	(C-42-16)10DAA-
544	(C-42-15)19DDD-	742	(C-42-16)10DAA-
570	(C-42-16) 8BCB-	742	(C-42-16)11DBA-
591	(C-42-15)16DDD-	748	(C-40- 7)24BCD-
604	(C-41- 9) 1AAB-	750	(C-37-11)26DAC-
604	(C-41- 9) 1AAB-	751	(C-37-11)26DCA-
604	(C-41- 9) 1ADB-	752	(C-37-11)26DCA-
621	(C-42-15)20CAA-	753	(C-37-11)35AAB-
664	(C-43- 8)17DCA-	754	(C-37-11)35AAD-
680	(C-43- 8)16BAB-	755	(C-37-11)35AAD-
681	(C-43- 9)16ABB-	756	(C-37-11)26DDC-
682	(C-42-15)19CBC-	757	(C-37-11)26DDC-
683	(C-42-15)19DDD-	758	(C-37-11)26DDC-
693	(C-40- 7)25ADA-	759	(C-39- 7)13BCC-
696	(C-42-18)30CDC-	761	(C-43- 8)11DDC-

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Table A-5 Virgin River Area Springs by WR Number(cont)

WR Number*	USGS Number
762	(C-38- 9)14CDD-
762	(C-38- 9)14CDD-
763	(C-38- 9)14BCC-
763	(C-38- 9)15ADD-
763	(C-38- 9)15ADD-
763	(C-38- 9)15DAA-
764	(C-38- 9)14DBD-
766	(C-41- 9) 9DBA-
767	(C-41- 9) 9BBA-
768	(C-41-14)36AAA-
770	(C-42-15)29BAD-
770	(C-42-15)29BAD-
784	(C-38- 9)24BDA-
785	(C-38- 9)14BDA-
806	(C-39- 7)14ADD-
822	(C-42-16)24BDD-
825	(C-40-12)15DCA-
825	(C-40-12)15DCA-
825	(C-40-12)15DCA-
829	(C-41-19)36CAC-
832	(C-38-11)10BBC-
833	(C-38-11)10BBA-
835	(C-42-10) 7BBC-
841	(C-39-15)15DCB-
842	(C-39-15)15DCB-
862	(C-38-11)36DDC-
865	(C-38-10)31CAA-
865	(C-38-10)31CAA-
865	(C-38-10)31CAA-
867	(C-38-10)31DDC-
868	(C-39-10) 6ACC-
869	(C-39-10) 6BBC-
869	(C-39-10) 6BCA-
870	(C-39-11) 1DAB-
871	(C-39-10) 5CAA-
871	(C-39-10) 5CAA-
873	(C-39-10) 8DCA-
874	(C-39-10) 8CDC-
875	(C-39-10) 9CCC-
876	(C-38-11)30CCB-
885	(C-40- 7)10DAB-
885	(C-40- 7)10DBA-
885	(C-40- 7)10DBA-
886	(C-38- 9)13DCB-
888	(C-38-11)24DAC-
888	(C-38-11)24DDA-
891	(C-39-11)11CDB-
896	(C-40- 7)10ACD-
904	(C-42-16)26ABC-
908	(C-39- 7)13ACC-
908	(C-39- 7)13BDD-
912	(C-39- 7)13ACC-
912	(C-39- 7)13BDD-
918	(C-37-19)31BAC-
922	(C-40-16)36DCC-
922	(C-40-16)36DCD-
931	(C-39-10)19DAC-
942	(C-42-14) 5BCC-
942	(C-42-14) 6DBD-
951	(C-43-10)16DBD-
954	(C-38-10)18DAB-
955	(C-38-10)19AAB-
955	(C-38-10)19AAC-
957	(C-38-10)18DCA-
958	(C-38-10)19ABD-
958	(C-38-10)19ABD-
958	(C-38-10)19ABD-
958	(C-38-10)19ACA-
959	(C-38-10)19BDD-
960	(C-38-10)19ACA-
960	(C-38-10)19ACA-
960	(C-38-10)19ACB-
960	(C-38-10)19ACB-
960	(C-38-10)19ACB-
961	(C-38-10)17CBB-
964	(C-40-12)14ADC-
966	(C-42-14) 5BCC-
966	(C-42-14) 6DBD-
979	(C-42-16)24ADD-
980	(C-42-16)24ADD-
986	(C-38- 9)13DCB-
990	(C-39-11)12DBA-
991	(C-39-11)12DBB-
992	(C-39-11)12BDD-
993	(C-39-11)12BDD-
994	(C-39-11)12ABD-
1003	(C-39- 6)31DDC-
1005	(C-39-11) 1DBC-
1006	(C-39-11) 1DCA-
1007	(C-39-11) 1DBB-
1008	(C-38- 9) 7ADA-
1008	(C-38- 9) 7ADA-
1009	(C-38- 9) 7DAA-
1010	(C-38- 9) 7DAA-
1010	(C-38- 9) 7DAD-
1016	(C-39-11)12AAB-
1016	(C-39-11)12AAB-
1019	(C-42-15)19CAC-

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Table A-5 Virgin River Area Springs by WR Number(cont)

WR Number*	USGS Number
1026	(C-38-10)19CCC-
1027	(C-39-11) 1BDD-
1028	(C-39-11)12AAB-
1029	(C-39-11)12AAB-
1030	(C-38-11)22ABC-
1031	(C-39-10) 6CCB-
1033	(C-41-13) 7BCB-
1043	(C-42-16)24ACA-
1043	(C-42-16)24ACB-
1061	(C-42-16)11DDC-
1063	(C-40- 9)22DDA-
1064	(C-40- 9)26BBC-
1065	(C-40- 9)26BCB-
1066	(C-40- 9)27DAC-
1067	(C-40-12)14ACD-
1070	(C-43-10)25BBA-
1070	(C-43-10)25BBC-
1070	(C-43-10)25BBD-
1073	(C-41-13)11CDA-
1082	(C-40- 9)22CDC-
1090	(C-37-10)35ADB-
1091	(C-37-10)35ADD-
1092	(C-38-10) 2BBA-
1104	(C-39-16)25BCA-
1104	(C-39-16)26ADB-
1104	(C-39-16)26BCA-
1109	(C-40- 9)22CDC-
1110	(C-38- 6)36BBC-
1121	(C-40-14)16DBB-
1132	(C-40-15)14BAD-
1132	(C-40-15)14BDD-
1132	(C-40-15)15CCA-
1132	(C-40-15)22DDA-
1132	(C-40-15)23BCB-
1132	(C-40-15)23BCD-
1133	(C-41- 7) 8AAA-
1134	(C-40-14)16DBB-
1136	(C-40-13)19DAA-
1144	(C-41-13)11CDA-
1145	(C-41-13)11CDA-
1158	(C-39- 6)30BCA-
1158	(C-39- 6)30BCA-
1158	(C-39- 6)30BCB-
1160	(C-39- 7)13DAC-
1161	(C-42-15)12CCA-
1161	(C-42-15)12CCC-
1161	(C-42-15)12CDC-
1162	(C-39-16)25BCA-
1164	(C-42-15)19CAB-

WR Number*	USGS Number
1164	(C-42-15)19CBA-
1165	(C-39-16)13ABA-
1166	(C-42-15)19CAB-
1169	(C-40- 7)24BDA-
1169	(C-40- 7)24BDC-
1172	(C-40- 7)10ACB-
1172	(C-40- 7)10ACB-
1180	(C-42-16)13BCC-
1180	(C-42-16)13CBA-
1191	(C-39-10)19ABD-
1192	(C-39-10)19BDA-
1193	(C-38- 9)13DCC-
1194	(C-38- 9)13DCB-
1195	(C-38- 9)13DDB-
1196	(C-38- 9)13DCD-
1197	(C-38- 9)24DBC-
1198	(C-38- 9)24DBC-
1199	(C-38- 9)27ADC-
1200	(C-42-15)14DBA-
1207	(C-42-11)24CCB-
1218	(C-42-14) 1BBC-
1219	(C-37-10)33CAA-
1220	(C-37-10)33CAA-
1221	(C-37-10)33DBC-
1222	(C-37-10)33CAD-
1223	(C-37-10)33DBB-
1224	(C-37-10)33BDC-
1225	(C-37-10)33BDD-
1226	(C-37-10)33BDD-
1227	(C-37-10)33ABA-
1228	(C-37-10)33BAB-
1229	(C-37-10)33BAB-
1230	(C-37-10)33BBA-
1232	(C-43-11) 7CAC-
1238	(C-39-10)20AAD-
1239	(C-39-10)21CBC-
1240	(C-39-11)11CDB-
1244	(C-39- 8)31AAC-
1250	(C-39-10)20BAC-
1251	(C-39-10)20CCB-
1254	(C-40-16)26CCA-
1258	(C-37-12)33ADA-
1266	(C-40-13)33DBB-
1270	(C-39- 6)17DCD-
1271	(C-39- 6)20CAD-
1272	(C-39- 6)29BBC-
1275	(C-38-10)15BCC-
1280	(C-39-11) 1ACC-
1284	(C-37-10)14CCB-

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Table A-5 Virgin River Area Springs by WR Number(cont)

WR Number*	USGS Number
1290	(C-37-10)23ABC-
1292	(C-39-16)28ABB-
1293	(C-39-10) 8BBD-
1294	(C-38- 9)23BDB-
1295	(C-38- 9)23BAB-
1296	(C-39- 9)20AAA-
1297	(C-38- 8)20CDA-
1298	(C-38- 8)20CCD-
1304	(C-42-16)24ADD-
1305	(C-42-16)24ADD-
1327	(C-41-13) 5DBA-
1327	(C-41-13) 5DBA-
1327	(C-41-13) 5DBA-
1327	(C-41-13) 5DBA-
1329	(C-38- 8)19ADA-
1330	(C-38- 8)19DAA-
1337	(C-38- 9)26BBB-
1339	(C-39- 7)25DDD-
1350	(C-38-10)19DCC-
1363	(C-38-10) 8CAB-
1364	(C-38-10) 8BBB-
1365	(C-37-10)31DDC-
1366	(C-38-10) 8BCC-
1401	(C-39-11)12CDA-
1403	(C-42-12)34CCA-
1406	(C-39-11)12BBC-
1407	(C-39-11)11DDD-
1408	(C-38-10) 8CDB-
1409	(C-38-10) 8BDA-
1412	(C-39- 9) 5AAB-
1413	(C-38- 9)31AAA-
1414	(C-39- 9) 6AAA-
1415	(C-38- 9)32AAA-
1416	(C-38- 9)32AAA-
1422	(C-39-12)36BDB-
1423	(C-38-13)16CAD-
1426	(C-41- 9) 1AAB-
1426	(C-41- 9) 1AAB-
1426	(C-41- 9) 1ADB-
1430	(C-40-16)26CCA-
1436	(C-41- 7) 8BCA-
1436	(C-41- 7) 8CBC-
1437	(C-41- 7) 8CAB-
1444	(C-38- 9)28AAD-
1445	(C-38- 9)28BAB-
1446	(C-38- 9)28BBB-
1447	(C-39-10) 9CBA-
1448	(C-36-10) 9CBA-
1449	(C-39-10) 9CCC-

WR Number*	USGS Number
1454	(C-41-13) 8BDB-
1455	(C-38- 9) 5DAC-
1455	(C-38- 9) 5DAD-
1455	(C-38- 9) 5DDA-
1455	(C-38- 9) 5DDB-
1456	(C-38- 9) 5DAC-
1457	(C-37- 9)33DDA-
1457	(C-38- 9) 5ABB-
1457	(C-38- 9) 5ABC-
1458	(C-38- 9) 4BCA-
1459	(C-38- 9) 4BCC-
1460	(C-38- 9) 4BDD-
1461	(C-38- 9) 4BCD-
1461	(C-38- 9) 4CBA-
1461	(C-38- 9) 4CBA-
1461	(C-38- 9) 4CBA-
1462	(C-38- 9) 4BBD-
1465	(C-40- 7) 3CAC-
1465	(C-40- 7) 4CAC-
1465	(C-40- 7) 4DCA-
1465	(C-40- 7) 4DDC-
1465	(C-40- 7) 4DDC-
1465	(C-40- 7)10DDB-
1465	(C-40- 7)11CAC-
1465	(C-40- 7)11CCD-
1465	(C-40- 7)11CDC-
1466	(C-39-10)18BDC-
1477	(C-38-10)18DAA-
1480	(C-38-10)17CDB-
1481	(C-38-10) 8DCD-
1482	(C-38-10) 9BBB-
1483	(C-38-10)17ABC-
1485	(C-43-13)24ADC-
1486	(C-43-11)20BBC-
1495	(C-43-12)14ABD-
1501	(C-42-17)35BDD-
1505	(C-39-11) 1DBB-
1505	(C-39-11) 1DBC-
1510	(C-39-11)13BAB-
1511	(C-39-11)13BAC-
1512	(C-39-11)13BAA-
1513	(C-39-11)13BAA-
1515	(C-43-11)20BBB-
1526	(C-43-10) 7DAA-
1526	(C-43-10) 7DBA-
1526	(C-43-10) 8CDD-
1526	(C-43-10) 8DCC-
1526	(C-43-10) 9CDA-
1526	(C-43-10)17ABB-

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Table A-5 Virgin River Area Springs by WR Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
1526	(C-43-10)17DBC-	1728	(C-38-11) 8ABD-
1527	(C-38- 9)20DAA-	1729	(C-39-11) 6DAB-
1528	(C-38- 9)29AAD-	1740	(C-40-18)29CAC-
1529	(C-38- 9)20DDC-	1741	(C-40-18)21DCA-
1530	(C-38- 9)29ABB-	1746	(C-38-12)12DDD-
1531	(C-38- 9)21CBB-	1750	(C-41- 8) 4BDA-
1532	(C-38- 9)20CAD-	1751	(C-39-16)28ABB-
1533	(C-39- 9)10DCA-	1753	(C-38-10)32DCA-
1534	(C-39- 9)10DCA-	1756	(C-38-11) 6BAA-
1535	(C-39- 9)10CDB-	1757	(C-37-12)36DCD-
1537	(C-39- 9)10ACD-	1758	(C-38-12) 1ABC-
1537	(C-39- 9)10DBA-	1761	(C-41-13)36AAA-
1538	(C-39- 9)15DAC-	1769	(C-38-11)18BBB-
1539	(C-39- 9)14BCB-	1770	(C-38-11)18BDD-
1540	(C-39- 9)22BDB-	1778	(C-38-11) 9ACA-
1540	(C-39- 9)22CCD-	1791	(C-38-10)16CAB-
1542	(C-39- 9)24CBA-	1792	(C-38-10)16CAC-
1542	(C-39- 9)24CBC-	1793	(C-38-10)16CAD-
1543	(C-39- 9)14BDD-	1794	(C-38-10)16CDA-
1545	(C-39- 9)14BCD-	1795	(C-38-10)16DCD-
1552	(C-38-10)29BBD-	1796	(C-38-10)21ABC-
1565	(C-38-14)29ACC-	1797	(C-38-10)21AAC-
1571	(C-38-15)26CAC-	1833	(C-39-14)20DCC-
1571	(C-38-15)26CBC-	1877	(C-39-15)19BBB-
1571	(C-38-15)26CCC-	1880	(C-40-15) 4DAC-
1571	(C-38-15)27AAD-	1881	(C-40-15)10BBB-
1571	(C-38-15)27ABD-	1882	(C-40-15)10BDC-
1571	(C-38-15)27ACA-	1883	(C-40-15)10CBD-
1571	(C-38-15)27DDA-	1913	(C-39-16)25BCA-
1573	(C-39-19)33ACB-	1914	(C-39-16)25BCA-
1583	(C-42-15)19CCD-	1956	(C-40-17) 2CAA-
1586	(C-42-15)19CCB-	1957	(C-40-17)16CDC-
1595	(C-38-10)15DDC-	2087	(C-38-11)26DAA-
1595	(C-38-10)15DDD-	2088	(C-38-11)27AAD-
1596	(C-38-10)15CDA-	2089	(C-38-11)16DCC-
1596	(C-38-10)15DBC-	2090	(C-38-11)26CBA-
1613	(C-37-11)25CCB-	2091	(C-38-11)27BAB-
1615	(C-38-13)21ADC-	2092	(C-38-11)26DCD-
1618	(C-41- 9) 6DDA-	2093	(C-38-11)27ABC-
1619	(C-40- 9)31CBD-	2094	(C-38-11)16DCB-
1640	(C-38-16)14BDB-	2095	(C-38-11)16ABD-
1656	(C-37-10)35DCC-	2096	(C-38-11)22BCB-
1659	(C-38-11) 1BBB-	2097	(C-38-11)26ABB-
1675	(C-38- 9) 4DCD-	2100	(C-37-11)25BAB-
1683	(C-39-16)28ABB-	2101	(C-38-11)25BAD-
1698	(C-41- 9) 6CCD-	2102	(C-38-11)25ABC-
1710	(C-40- 7)14BAA-	2103	(C-38-11)25ACB-
1713	(C-40- 7)26CAA-	2104	(C-38-11)25ACB-
1718	(C-39-11)12BDD-	2105	(C-38-11)25BDC-

*Area 81- Virgin River Basin

Table A-5 Virgin River Area Springs by WR Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
2106	(C-38-11)25BDD-	2168	(C-39- 6)17DAA-
2107	(C-38-11)25CBC-	2169	(C-39- 6)17DBD-
2108	(C-39-11)14BCD-	2177	(C-42-15)20CCC-
2109	(C-39-11)14DBA-	2182	(C-43- 8)21ABC-
2110	(C-39-11)23BDD-	2192	(C-38- 9) 9BAD-
2111	(C-39-11)27DAA-	2193	(C-38- 9) 9ABC-
2114	(C-38-11)11CBC-	2194	(C-38- 9) 8ABD-
2115	(C-38-11)11CBD-	2197	(C-38- 9) 5CAD-
2119	(C-38-11)24CAC-	2197	(C-38- 9) 5CDA-
2120	(C-38-11)24CAA-	2199	(C-38-10) 8ADC-
2121	(C-38-11)24BAC-	2201	(C-38- 9) 9ABC-
2123	(C-38-11)24DDB-	2205	(C-41-13)30AAB-
2124	(C-38-11)13CCD-	2209	(C-39- 7)13ABA-
2125	(C-38-11)24BCA-	2210	(C-40-16)35ABD-
2126	(C-38-11)24DCB-	2211	(C-40- 6)18DCC-
2128	(C-38-10)19ABA-	2212	(C-40- 6)18DBC-
2129	(C-38-10)20CAB-	2220	(C-40-14)16DBB-
2130	(C-38-10)18DDB-	2235	(C-37-11)26DAC-
2131	(C-38-10)18DAC-	2236	(C-41-11)17BAD-
2132	(C-38-10)18BDD-	2237	(C-41-13) 7BBB-
2133	(C-38-10)18BDB-	2240	(C-41-12)23CAC-
2134	(C-38-10)20BCD-	2240	(C-41-12)23CBC-
2135	(C-38-10)18DCB-	2240	(C-41-12)23CBD-
2136	(C-38-10) 7DCB-	2241	(C-39-11)11CDB-
2137	(C-38-10) 7DDA-	2248	(C-41- 8)21DAB-
2138	(C-38-10)19ADC-	2250	(C-41- 8)22DBB-
2139	(C-38-11)35DCC-	2251	(C-39-11)12CDC-
2140	(C-38-11)34DCA-	2254	(C-39-16)22CCB-
2141	(C-39-11) 3ACA-	2254	(C-39-16)28ABB-
2142	(C-39-11)10AAA-	2254	(C-39-16)32ADC-
2143	(C-39-11)11BCB-	2262	(C-39-16)11DCA-
2144	(C-38-11)27CDD-	2270	(C-39-16)30CBB-
2145	(C-38-11)35CAC-	2270	(C-39-16)30CBC-
2146	(C-38-11)36BCC-	2277	(C-41- 8)15CCA-
2149	(C-41- 9)15BAC-	2278	(C-41- 8)15DCC-
2151	(C-38-11)25DCD-	2285	(C-38-16)15ADA-
2152	(C-39-11)31DDD-	2286	(C-38-16)15AAA-
2153	(C-39-11)31ABD-	2287	(C-40-13)35DBB-
2154	(C-38-12) 1ABC-	2293	(C-38- 9) 4ACC-
2155	(C-37-12)36DCD-	2299	(C-40-17)16CDC-
2156	(C-38-11) 6BAA-	2300	(C-41-18) 2DDD-
2160	(C-40- 7)13BCD-	2301	(C-42-19)36CAC-
2160	(C-40- 7)13BDC-	2302	(C-39-16)19DAB-
2160	(C-40- 7)14ADC-	2303	(C-38-16)15DAB-
2162	(C-40- 8)29BCA-	2304	(C-38-16)13BBC-
2163	(C-38-11) 6BAA-	2305	(C-38-16)15AAD-
2164	(C-38-11) 6ADB-	2306	(C-38-16)15DAC-
2165	(C-38-11) 6DAD-	2310	(C-38-16)15CCB-
2168	(C-39- 6)17DAA-	2311	(C-39-16)14ADB-

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Table A-5 Virgin River Area Springs by WR Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
2311	(C-39-16)14ADD-	2500	(C-38-15)27DDA-
2312	(C-39-16)14DAC-	2502	(C-38- 9) 7BBC-
2314	(C-39-15)23CBB-	2503	(C-38-10) 1ADC-
2316	(C-38-14)29CAB-	2503	(C-38-10) 1ADC-
2317	(C-38-14)29BDD-	2507	(C-38- 9)30DAA-
2324	(C-40-15)16ACA-	2508	(C-38- 9)30DDD-
2325	(C-38-19) 9AAC-	2509	(C-38- 9)30DDD-
2341	(C-40-19) 7ACC-	2510	(C-38- 9)31ABD-
2354	(C-43-16) 4BBD-	2513	(C-39-10) 8BAB-
2403	(C-38- 9)29ABB-	2514	(C-39-10)17BAA-
2416	(C-39- 8) 8CCB-	2515	(C-39-10) 6DDB-
2416	(C-39- 8) 8CCC-	2516	(C-39-10)18DAA-
2416	(C-39- 8) 8CCC-	2517	(C-39-10)18DDC-
2416	(C-39- 8) 8CDA-	2518	(C-39-10)18BDC-
2416	(C-39- 8) 8CDB-	2519	(C-39-10)18BBD-
2416	(C-39- 8)17BAB-	2520	(C-39-11)12ACC-
2416	(C-39- 8)17BAD-	2521	(C-39-10)17BBA-
2416	(C-39- 8)17BBA-	2522	(C-39-10)18AAA-
2416	(C-39- 8)17BBC-	2523	(C-39-10)17CDC-
2416	(C-39- 8)17BBC-	2524	(C-39-11)25CCA-
2416	(C-39- 8)17BBD-	2525	(C-39-11)25CDB-
2416	(C-39- 8)17BCB-	2528	(C-40- 9)23DAC-
2416	(C-39- 8)17BCB-	2529	(C-40- 9)23DDB-
2416	(C-39- 8)17BDA-	2530	(C-40- 9)24CBB-
2416	(C-39- 8)17DCC-	2531	(C-40- 9)24CBB-
2416	(C-39- 8)18DAB-	2534	(C-40- 9)26CDA-
2416	(C-39- 8)18DBD-	2535	(C-40- 9)26CDC-
2416	(C-39- 8)19ABB-	2536	(C-40- 9)35BAB-
2416	(C-39- 8)20BBC-	2537	(C-40- 9)26CAA-
2434	(C-42-16)26ABC-	2538	(C-40- 9)26CAA-
2438	(C-40-16)26CBD-	2539	(C-40- 9)26DBB-
2439	(C-42-16)10BAD-	2540	(C-40- 9)26ACC-
2473	(C-38- 9)29DDC-	2541	(C-40- 9)26ACB-
2474	(C-38- 9)29DDD-	2542	(C-40- 9)25BAA-
2480	(C-38- 9)19DAD-	2561	(C-38-13)16BCA-
2485	(C-38- 9) 7CAC-	2563	(C-38-13)16BDC-
2488	(C-39- 9)17BAC-	2565	(C-39- 9) 3CDA-
2489	(C-39- 9)17BCD-	2566	(C-39- 9) 4AAD-
2490	(C-39- 9)18ADB-	2567	(C-39- 9)10AAA-
2497	(C-42- 9)29DAB-	2568	(C-38- 9)20BCD-
2498	(C-42- 9)32BDD-	2569	(C-38- 9)17CDC-
2499	(C-42- 9)29DCC-	2570	(C-38- 9)17AAC-
2499	(C-42- 9)32ACA-	2571	(C-38- 9)17BAD-
2500	(C-38-15)26CAC-	2573	(C-38- 9)17CCD-
2500	(C-38-15)26CBC-	2575	(C-38- 9) 8CDD-
2500	(C-38-15)26CCC-	2577	(C-37-10)36DCD-
2500	(C-38-15)27AAD-	2578	(C-37-10)27AAB-
2500	(C-38-15)27ABD-	2580	(C-37-10)10DCC-
2500	(C-38-15)27ACA-	2581	(C-37-10)14DCC-

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Table A-5 Virgin River Area Springs by WR Number(cont)

WR Number*	USGS Number
2586	(C-37-10)23DCA-
2588	(C-37-10)26ADB-
2589	(C-37-10)26ACD-
2590	(C-37-10)25BBC-
2591	(C-37-10)36DAB-
2592	(C-38-10)12DAC-
2593	(C-39- 9)11BBA-
2594	(C-38- 9)33BCA-
2595	(C-39- 9) 4ADA-
2596	(C-39- 9) 4CBC-
2597	(C-38- 9) 9CBD-
2598	(C-38- 9)16ABB-
2601	(C-38- 9) 3DDA-
2602	(C-38- 9) 3DCB-
2603	(C-38- 9) 3DCC-
2604	(C-38- 9)10DAB-
2605	(C-38- 9)10DBD-
2606	(C-38- 9)10ACB-
2607	(C-38- 9)10CAC-
2608	(C-39- 9) 2ABC-
2609	(C-39- 9) 2CBA-
2610	(C-39- 9)11DBB-
2611	(C-39- 9)25DBC-
2612	(C-39- 9)25CDA-
2615	(C-42-10)10BDD-
2616	(C-42-10) 5DBC-
2617	(C-42-10) 5DAC-
2621	(C-38- 9)28BBB-
2622	(C-39- 9)28BCB-
2623	(C-38- 9)28BAB-
2627	(C-39-10)35AAD-
2628	(C-39-10)35ACB-
2639	(C-41- 8)22DBB-
2648	(C-38- 9)35AAA-
2649	(C-38- 9)13DDB-
2650	(C-38- 9)13CDA-
2672	(C-37- 9)34CDC-
2673	(C-37- 9)34DAD-
2674	(C-37- 9)34DBA-
2676	(C-38-14)29BDD-
2677	(C-38- 9)13CDD-
2678	(C-38- 9)13CDC-
2679	(C-38- 9)13CDD-
2680	(C-38- 9)13CDA-
2681	(C-38- 9)26CDD-
2682	(C-38- 9)36ABC-
2683	(C-38- 9)36ACB-
2684	(C-38- 9)36ACB-
2685	(C-38- 9) 5ACD-
2686	(C-38- 9) 5ACD-
2687	(C-38- 9) 4ACB-
2688	(C-38- 9) 4ABD-
2722	(C-39- 7)25DDD-
2727	(C-39- 8)13CCC-
2747	(C-37-10)25BBC-
2748	(C-37-10)25ABC-
2749	(C-37-10)24BCA-
2750	(C-37-10)24ACB-
2751	(C-37-10)24BAA-
2752	(C-37-10)24AAB-
2753	(C-37-10)24AAB-
2754	(C-37-10)24AAB-
2755	(C-38- 9)18BBA-
2756	(C-38- 9)18CBC-
2757	(C-38- 9)18BAC-
2758	(C-38-10)36CAC-
2770	(C-39-10)12DDA-
2771	(C-39-10)24ABC-

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Table A-6 Virgin River Area Springs By USGS Number

WR Number*	USGS Number
1448	(C-36-10) 9CBA-
1457	(C-37- 9)33DDA-
262	(C-37- 9)34BCA-
2672	(C-37- 9)34CDC-
2673	(C-37- 9)34DAD-
2674	(C-37- 9)34DBA-
2580	(C-37-10)10DCC-
1284	(C-37-10)14CCB-
2581	(C-37-10)14DCC-
1290	(C-37-10)23ABC-
2586	(C-37-10)23DCA-
2754	(C-37-10)24AAB-
2752	(C-37-10)24AAB-
2753	(C-37-10)24AAB-
2750	(C-37-10)24ACB-
2751	(C-37-10)24BAA-
2749	(C-37-10)24BCA-
2748	(C-37-10)25ABC-
2590	(C-37-10)25BBC-
2747	(C-37-10)25BBC-
2589	(C-37-10)26ACD-
2588	(C-37-10)26ADB-
2578	(C-37-10)27AAB-
233	(C-37-10)30DBD-
1365	(C-37-10)31DDC-
1227	(C-37-10)33ABA-
1228	(C-37-10)33BAB-
1229	(C-37-10)33BAB-
1230	(C-37-10)33BBA-
1224	(C-37-10)33BDC-
1225	(C-37-10)33BDD-
1226	(C-37-10)33BDD-
1219	(C-37-10)33CAA-
1220	(C-37-10)33CAA-
1222	(C-37-10)33CAD-
1223	(C-37-10)33DBB-
1221	(C-37-10)33DBC-
1090	(C-37-10)35ADB-
1091	(C-37-10)35ADD-
1656	(C-37-10)35DCC-
2591	(C-37-10)36DAB-
2577	(C-37-10)36DCD-
2100	(C-37-11)25BAB-
1613	(C-37-11)25CCB-
2235	(C-37-11)26DAC-
750	(C-37-11)26DAC-
751	(C-37-11)26DCA-
752	(C-37-11)26DCA-
758	(C-37-11)26DDC-
756	(C-37-11)26DDC-
757	(C-37-11)26DDC-
237	(C-37-11)33DBB-
238	(C-37-11)33DCC-
753	(C-37-11)35AAB-
754	(C-37-11)35AAD-
755	(C-37-11)35AAD-
706	(C-37-12)33ACD-
1258	(C-37-12)33ADA-
1757	(C-37-12)36DCD-
2155	(C-37-12)36DCD-
45	(C-37-13)27ADA-
108	(C-37-13)35DDB-
918	(C-37-19)31BAC-
1110	(C-38- 6)36BBC-
1329	(C-38- 8)19ADA-
1330	(C-38- 8)19DAA-
1298	(C-38- 8)20CCD-
1297	(C-38- 8)20CDA-
2602	(C-38- 9) 3DCB-
2603	(C-38- 9) 3DCC-
2601	(C-38- 9) 3DDA-
2688	(C-38- 9) 4ABD-
2687	(C-38- 9) 4ACB-
2293	(C-38- 9) 4ACC-
1462	(C-38- 9) 4BBD-
1458	(C-38- 9) 4BCA-
1459	(C-38- 9) 4BCC-
1461	(C-38- 9) 4BCD-
1460	(C-38- 9) 4BDD-
1461	(C-38- 9) 4CBA-
1461	(C-38- 9) 4CBA-
1461	(C-38- 9) 4CBA-
1675	(C-38- 9) 4DCD-
1457	(C-38- 9) 5ABB-
1457	(C-38- 9) 5ABC-
478	(C-38- 9) 5ACC-
2686	(C-38- 9) 5ACD-
2685	(C-38- 9) 5ACD-
2197	(C-38- 9) 5CAD-
2197	(C-38- 9) 5CDA-
1455	(C-38- 9) 5DAC-
1456	(C-38- 9) 5DAC-
1455	(C-38- 9) 5DAD-
1455	(C-38- 9) 5DDA-
1455	(C-38- 9) 5DDB-
1008	(C-38- 9) 7ADA-
1008	(C-38- 9) 7ADA-
2502	(C-38- 9) 7BBC-

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Table A-6 Virgin River Area Springs By USGS Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
2485	(C-38- 9) 7CAC-	1294	(C-38- 9)23BDB-
1009	(C-38- 9) 7DAA-	784	(C-38- 9)24BDA-
1010	(C-38- 9) 7DAA-	1198	(C-38- 9)24DBC-
1010	(C-38- 9) 7DAD-	1197	(C-38- 9)24DBC-
2194	(C-38- 9) 8ABD-	1337	(C-38- 9)26BBB-
2575	(C-38- 9) 8CDD-	2681	(C-38- 9)26CDD-
2193	(C-38- 9) 9ABC-	732	(C-38- 9)27AAA-
2201	(C-38- 9) 9ABC-	731	(C-38- 9)27ADB-
2192	(C-38- 9) 9BAD-	1199	(C-38- 9)27ADC-
2597	(C-38- 9) 9CBD-	1444	(C-38- 9)28AAD-
2606	(C-38- 9)10ACB-	2623	(C-38- 9)28BAB-
2607	(C-38- 9)10CAC-	1445	(C-38- 9)28BAB-
2604	(C-38- 9)10DAB-	2621	(C-38- 9)28BBB-
2605	(C-38- 9)10DBD-	1446	(C-38- 9)28BBB-
2650	(C-38- 9)13CDA-	1528	(C-38- 9)29AAD-
2680	(C-38- 9)13CDA-	2403	(C-38- 9)29ABB-
2678	(C-38- 9)13CDC-	1530	(C-38- 9)29ABB-
2679	(C-38- 9)13CDD-	2473	(C-38- 9)29DDC-
2677	(C-38- 9)13CDD-	2474	(C-38- 9)29DDD-
886	(C-38- 9)13DCB-	2507	(C-38- 9)30DAA-
986	(C-38- 9)13DCB-	2509	(C-38- 9)30DDD-
1194	(C-38- 9)13DCB-	2508	(C-38- 9)30DDD-
1193	(C-38- 9)13DCC-	1413	(C-38- 9)31AAA-
1196	(C-38- 9)13DCD-	2510	(C-38- 9)31ABD-
2649	(C-38- 9)13DDB-	1415	(C-38- 9)32AAA-
1195	(C-38- 9)13DDB-	1416	(C-38- 9)32AAA-
763	(C-38- 9)14BCC-	2594	(C-38- 9)33BCA-
785	(C-38- 9)14BDA-	2648	(C-38- 9)35AAA-
762	(C-38- 9)14CDD-	2682	(C-38- 9)36ABC-
762	(C-38- 9)14CDD-	2684	(C-38- 9)36ACB-
764	(C-38- 9)14DBD-	2683	(C-38- 9)36ACB-
763	(C-38- 9)15ADD-	2503	(C-38-10) 1ADC-
763	(C-38- 9)15ADD-	2503	(C-38-10) 1ADC-
763	(C-38- 9)15DAA-	1092	(C-38-10) 2BBA-
2598	(C-38- 9)16ABB-	2136	(C-38-10) 7DCB-
2570	(C-38- 9)17AAC-	2137	(C-38-10) 7DDA-
2571	(C-38- 9)17BAD-	2199	(C-38-10) 8ADC-
2573	(C-38- 9)17CCD-	1364	(C-38-10) 8BBB-
2569	(C-38- 9)17CDC-	1366	(C-38-10) 8BCC-
2757	(C-38- 9)18BAC-	1409	(C-38-10) 8BDA-
2755	(C-38- 9)18BBA-	1363	(C-38-10) 8CAB-
2756	(C-38- 9)18CBC-	1408	(C-38-10) 8CDB-
2480	(C-38- 9)19DAD-	1481	(C-38-10) 8DCD-
2568	(C-38- 9)20BCD-	1482	(C-38-10) 9BBB-
1532	(C-38- 9)20CAD-	2592	(C-38-10)12DAC-
1527	(C-38- 9)20DAA-	1275	(C-38-10)15BCC-
1529	(C-38- 9)20DDC-	1596	(C-38-10)15CDA-
1531	(C-38- 9)21CBB-	1596	(C-38-10)15DBC-
1295	(C-38- 9)23BAB-	1595	(C-38-10)15DDC-

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Table A-6 Virgin River Area Springs By USGS Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
1595	(C-38-10)15DDD-	1756	(C-38-11) 6BAA-
1791	(C-38-10)16CAB-	2156	(C-38-11) 6BAA-
1792	(C-38-10)16CAC-	2163	(C-38-11) 6BAA-
1793	(C-38-10)16CAD-	2165	(C-38-11) 6DAD-
1794	(C-38-10)16CDA-	1728	(C-38-11) 8ABD-
1795	(C-38-10)16DCD-	1778	(C-38-11) 9ACA-
1483	(C-38-10)17ABC-	833	(C-38-11)10BBA-
961	(C-38-10)17CBB-	832	(C-38-11)10BBC-
1480	(C-38-10)17CDB-	2114	(C-38-11)11CBC-
2133	(C-38-10)18BDB-	2115	(C-38-11)11CBD-
2132	(C-38-10)18BDD-	2124	(C-38-11)13CCD-
1477	(C-38-10)18DAA-	2095	(C-38-11)16ABD-
954	(C-38-10)18DAB-	283	(C-38-11)16ACB-
2131	(C-38-10)18DAC-	283	(C-38-11)16ADB-
957	(C-38-10)18DCA-	2094	(C-38-11)16DCB-
2135	(C-38-10)18DCB-	2089	(C-38-11)16DCC-
2130	(C-38-10)18DDB-	1769	(C-38-11)18BBB-
955	(C-38-10)19AAB-	1770	(C-38-11)18BDD-
955	(C-38-10)19AAC-	1030	(C-38-11)22ABC-
2128	(C-38-10)19ABA-	2096	(C-38-11)22BCB-
958	(C-38-10)19ABD-	2121	(C-38-11)24BAC-
958	(C-38-10)19ABD-	2125	(C-38-11)24BCA-
958	(C-38-10)19ABD-	2120	(C-38-11)24CAA-
960	(C-38-10)19ACA-	2119	(C-38-11)24CAC-
960	(C-38-10)19ACA-	888	(C-38-11)24DAC-
958	(C-38-10)19ACA-	515	(C-38-11)24DAC-
960	(C-38-10)19ACB-	2126	(C-38-11)24DCB-
960	(C-38-10)19ACB-	515	(C-38-11)24DDA-
960	(C-38-10)19ACB-	888	(C-38-11)24DDA-
2138	(C-38-10)19ADC-	2123	(C-38-11)24DDB-
959	(C-38-10)19BDD-	2102	(C-38-11)25ABC-
1026	(C-38-10)19CCC-	2104	(C-38-11)25ACB-
1350	(C-38-10)19DCC-	2103	(C-38-11)25ACB-
2134	(C-38-10)20BCD-	2101	(C-38-11)25BAD-
2129	(C-38-10)20CAB-	2105	(C-38-11)25BDC-
1797	(C-38-10)21AAC-	2106	(C-38-11)25BDD-
1796	(C-38-10)21ABC-	2107	(C-38-11)25CBC-
1552	(C-38-10)29BBD-	2151	(C-38-11)25DCD-
865	(C-38-10)31CAA-	2097	(C-38-11)26ABB-
865	(C-38-10)31CAA-	2090	(C-38-11)26CBA-
865	(C-38-10)31CAA-	2087	(C-38-11)26DAA-
740	(C-38-10)31DCC-	2092	(C-38-11)26DCD-
867	(C-38-10)31DDC-	2088	(C-38-11)27AAD-
737	(C-38-10)32ACD-	2093	(C-38-11)27ABC-
736	(C-38-10)32DAA-	2091	(C-38-11)27BAB-
1753	(C-38-10)32DCA-	2144	(C-38-11)27CDD-
2758	(C-38-10)36CAC-	876	(C-38-11)30CCB-
1659	(C-38-11) 1BBB-	2140	(C-38-11)34DCA-
2164	(C-38-11) 6ADB-	697	(C-38-11)35CAC-

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Table A-6 Virgin River Area Springs By USGS Number(cont)

WR Number*	USGS Number
2145	(C-38-11)35CAC-
699	(C-38-11)35DAC-
2139	(C-38-11)35DCC-
700	(C-38-11)35DDB-
2146	(C-38-11)36BCC-
701	(C-38-11)36CBB-
862	(C-38-11)36DDC-
1758	(C-38-12) 1ABC-
2154	(C-38-12) 1ABC-
104	(C-38-12) 3ACD-
104	(C-38-12) 3CAC-
104	(C-38-12) 9ABD-
104	(C-38-12)10CBB-
1746	(C-38-12)12DDD-
46	(C-38-13) 2ABC-
2561	(C-38-13)16BCA-
2563	(C-38-13)16BDC-
1423	(C-38-13)16CAD-
1615	(C-38-13)21ADC-
17	(C-38-13)36CCC-
1565	(C-38-14)29ACC-
2317	(C-38-14)29BDD-
2676	(C-38-14)29BDD-
2316	(C-38-14)29CAB-
1571	(C-38-15)26CAC-
2500	(C-38-15)26CAC-
2500	(C-38-15)26CBC-
1571	(C-38-15)26CBC-
1571	(C-38-15)26CCC-
2500	(C-38-15)26CCC-
1571	(C-38-15)27AAD-
2500	(C-38-15)27AAD-
2500	(C-38-15)27ABD-
1571	(C-38-15)27ABD-
2500	(C-38-15)27ACA-
1571	(C-38-15)27ACA-
1571	(C-38-15)27DDA-
2500	(C-38-15)27DDA-
129	(C-38-15)30ABC-
129	(C-38-15)30ACC-
129	(C-38-15)30CAA-
2304	(C-38-16)13BBC-
468	(C-38-16)14BAD-
1640	(C-38-16)14BDB-
2286	(C-38-16)15AAA-
2305	(C-38-16)15AAD-
2285	(C-38-16)15ADA-
2310	(C-38-16)15CCB-
2303	(C-38-16)15DAB-
2306	(C-38-16)15DAC-
139	(C-38-18)27AAB-
177	(C-38-19) 2CDD-
2325	(C-38-19) 9AAC-
178	(C-38-19)11BCA-
2168	(C-39- 6)17DAA-
2168	(C-39- 6)17DAA-
2169	(C-39- 6)17DBD-
1270	(C-39- 6)17DCD-
1271	(C-39- 6)20CAD-
1272	(C-39- 6)29BBC-
1158	(C-39- 6)30BCA-
1158	(C-39- 6)30BCA-
1158	(C-39- 6)30BCB-
1003	(C-39- 6)31DDC-
2209	(C-39- 7)13ABA-
908	(C-39- 7)13ACC-
912	(C-39- 7)13ACC-
116	(C-39- 7)13BAA-
759	(C-39- 7)13BCC-
908	(C-39- 7)13BDD-
912	(C-39- 7)13BDD-
1160	(C-39- 7)13DAC-
806	(C-39- 7)14ADD-
1339	(C-39- 7)25DDD-
2722	(C-39- 7)25DDD-
2416	(C-39- 8) 8CCB-
2416	(C-39- 8) 8CCC-
2416	(C-39- 8) 8CCC-
2416	(C-39- 8) 8CDA-
2416	(C-39- 8) 8CDB-
2727	(C-39- 8)13CCC-
2416	(C-39- 8)17BAB-
2416	(C-39- 8)17BAD-
2416	(C-39- 8)17BBA-
2416	(C-39- 8)17BBC-
2416	(C-39- 8)17BBC-
2416	(C-39- 8)17BBD-
2416	(C-39- 8)17BCB-
2416	(C-39- 8)17BCB-
2416	(C-39- 8)17BDA-
2416	(C-39- 8)17DCC-
2416	(C-39- 8)18DAB-
2416	(C-39- 8)18DBD-
2416	(C-39- 8)19ABB-
2416	(C-39- 8)20BBC-
1244	(C-39- 8)31AAC-
2608	(C-39- 9) 2ABC-
2609	(C-39- 9) 2CBA-

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Table A-6 Virgin River Area Springs By USGS Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
2565	(C-39- 9) 3CDA-	2523	(C-39-10)17CDC-
2566	(C-39- 9) 4AAD-	2522	(C-39-10)18AAA-
2595	(C-39- 9) 4ADA-	2519	(C-39-10)18BBD-
2596	(C-39- 9) 4CBC-	2518	(C-39-10)18BDC-
1412	(C-39- 9) 5AAB-	1466	(C-39-10)18BDC-
1414	(C-39- 9) 6AAA-	2516	(C-39-10)18DAA-
483	(C-39- 9) 7DBD-	2517	(C-39-10)18DDC-
2567	(C-39- 9)10AAA-	1191	(C-39-10)19ABD-
1537	(C-39- 9)10ACD-	1192	(C-39-10)19BDA-
1535	(C-39- 9)10CDB-	931	(C-39-10)19DAC-
1537	(C-39- 9)10DBA-	1238	(C-39-10)20AAD-
1534	(C-39- 9)10DCA-	1250	(C-39-10)20BAC-
1533	(C-39- 9)10DCA-	1251	(C-39-10)20CCB-
2593	(C-39- 9)11BBA-	1239	(C-39-10)21CBC-
2610	(C-39- 9)11DBB-	2771	(C-39-10)24ABC-
1539	(C-39- 9)14BCB-	2627	(C-39-10)35AAD-
1545	(C-39- 9)14BCD-	2628	(C-39-10)35ACB-
1543	(C-39- 9)14BDD-	1280	(C-39-11) 1ACC-
1538	(C-39- 9)15DAC-	425	(C-39-11) 1BAA-
2488	(C-39- 9)17BAC-	1027	(C-39-11) 1BDD-
2489	(C-39- 9)17BCD-	870	(C-39-11) 1DAB-
2490	(C-39- 9)18ADB-	1007	(C-39-11) 1DBB-
1296	(C-39- 9)20AAA-	1505	(C-39-11) 1DBB-
1540	(C-39- 9)22BDB-	1005	(C-39-11) 1DBC-
1540	(C-39- 9)22CCD-	1505	(C-39-11) 1DBC-
1542	(C-39- 9)24CBA-	1006	(C-39-11) 1DCA-
1542	(C-39- 9)24CBC-	2141	(C-39-11) 3ACA-
2612	(C-39- 9)25CDA-	1729	(C-39-11) 6DAB-
2611	(C-39- 9)25DBC-	111	(C-39-11) 9BDD-
2622	(C-39- 9)28BCB-	2142	(C-39-11)10AAA-
871	(C-39-10) 5CAA-	2143	(C-39-11)11BCB-
871	(C-39-10) 5CAA-	2241	(C-39-11)11CDB-
868	(C-39-10) 6ACC-	891	(C-39-11)11CDB-
869	(C-39-10) 6BBC-	1240	(C-39-11)11CDB-
869	(C-39-10) 6BCA-	1407	(C-39-11)11DDD-
1031	(C-39-10) 6CCB-	1508	(C-39-11)12AAA-
739	(C-39-10) 6DBD-	1029	(C-39-11)12AAB-
2515	(C-39-10) 6DDB-	1016	(C-39-11)12AAB-
735	(C-39-10) 6DDC-	1016	(C-39-11)12AAB-
2513	(C-39-10) 8BAB-	1028	(C-39-11)12AAB-
1293	(C-39-10) 8BBD-	994	(C-39-11)12ABD-
874	(C-39-10) 8CDC-	2520	(C-39-11)12ACC-
873	(C-39-10) 8DCA-	1406	(C-39-11)12BBC-
1447	(C-39-10) 9CBA-	1718	(C-39-11)12BDD-
1449	(C-39-10) 9CCC-	992	(C-39-11)12BDD-
875	(C-39-10) 9CCC-	993	(C-39-11)12BDD-
2770	(C-39-10)12DDA-	1401	(C-39-11)12CDA-
2514	(C-39-10)17BAA-	2251	(C-39-11)12CDC-
2521	(C-39-10)17BBA-	990	(C-39-11)12DBA-

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Table A-6 Virgin River Area Springs By USGS Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
991	(C-39-11)12DBB-	2254	(C-39-16)28ABB-
509	(C-39-11)12DDB-	1683	(C-39-16)28ABB-
1512	(C-39-11)13BAA-	1292	(C-39-16)28ABB-
1513	(C-39-11)13BAA-	277	(C-39-16)28ABB-
1510	(C-39-11)13BAB-	2270	(C-39-16)30CBB-
1511	(C-39-11)13BAC-	2270	(C-39-16)30CBC-
2108	(C-39-11)14BCD-	2254	(C-39-16)32ADC-
2109	(C-39-11)14DBA-	1573	(C-39-19)33ACB-
2110	(C-39-11)23BDD-	2212	(C-40- 6)18DBC-
2524	(C-39-11)25CCA-	2211	(C-40- 6)18DCC-
2525	(C-39-11)25CDB-	1465	(C-40- 7) 3CAC-
2111	(C-39-11)27DAA-	521	(C-40- 7) 3CCC-
316	(C-39-11)30AAC-	1465	(C-40- 7) 4CAC-
2153	(C-39-11)31ABD-	1465	(C-40- 7) 4DCA-
2152	(C-39-11)31DDD-	1465	(C-40- 7) 4DDC-
24	(C-39-12) 6BDD-	1465	(C-40- 7) 4DDC-
1422	(C-39-12)36BDB-	519	(C-40- 7)10ACB-
315	(C-39-14) 5BBA-	519	(C-40- 7)10ACB-
145	(C-39-14)20BCC-	1172	(C-40- 7)10ACB-
1833	(C-39-14)20DCC-	1172	(C-40- 7)10ACB-
146	(C-39-14)30BDD-	896	(C-40- 7)10ACD-
188	(C-39-15) 7CCA-	523	(C-40- 7)10BBB-
725	(C-39-15)13CCC-	524	(C-40- 7)10BBB-
721	(C-39-15)14CCC-	525	(C-40- 7)10BBC-
723	(C-39-15)14CCC-	526	(C-40- 7)10BDA-
842	(C-39-15)15DCB-	885	(C-40- 7)10DAB-
841	(C-39-15)15DCB-	520	(C-40- 7)10DAB-
719	(C-39-15)15DDA-	502	(C-40- 7)10DAD-
720	(C-39-15)15DDA-	885	(C-40- 7)10DBA-
718	(C-39-15)15DDA-	885	(C-40- 7)10DBA-
726	(C-39-15)15DDD-	1465	(C-40- 7)10DDB-
1877	(C-39-15)19BBB-	1465	(C-40- 7)11CAC-
722	(C-39-15)23BBC-	501	(C-40- 7)11CBC-
724	(C-39-15)23CBB-	1465	(C-40- 7)11CCD-
2314	(C-39-15)23CBB-	1465	(C-40- 7)11CDC-
2262	(C-39-16)11DCA-	2160	(C-40- 7)13BCD-
1165	(C-39-16)13ABA-	2160	(C-40- 7)13BDC-
2311	(C-39-16)14ADB-	2160	(C-40- 7)14ADC-
2311	(C-39-16)14ADD-	1710	(C-40- 7)14BAA-
2312	(C-39-16)14DAC-	748	(C-40- 7)24BCD-
2302	(C-39-16)19DAB-	1169	(C-40- 7)24BDA-
2254	(C-39-16)22CCB-	1169	(C-40- 7)24BDC-
1162	(C-39-16)25BCA-	693	(C-40- 7)25ADA-
1913	(C-39-16)25BCA-	1713	(C-40- 7)26CAA-
1914	(C-39-16)25BCA-	2162	(C-40- 8)29BCA-
1104	(C-39-16)25BCA-	20	(C-40- 9) 7CCA-
1104	(C-39-16)26ADB-	21	(C-40- 9)18BAA-
1104	(C-39-16)26BCA-	1082	(C-40- 9)22CDC-
1751	(C-39-16)28ABB-	1109	(C-40- 9)22CDC-

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Table A-6 Virgin River Area Springs By USGS Number(cont)

WR Number*	USGS Number	WR Number*	USGS Number
1063	(C-40- 9)22DDA-	1132	(C-40-15)14BDD-
2528	(C-40- 9)23DAC-	252	(C-40-15)14BDD-
2529	(C-40- 9)23DDB-	1132	(C-40-15)15CCA-
2530	(C-40- 9)24CBB-	252	(C-40-15)15CCA-
2531	(C-40- 9)24CBB-	2324	(C-40-15)16ACA-
2542	(C-40- 9)25BAA-	1132	(C-40-15)22DDA-
2541	(C-40- 9)26ACB-	252	(C-40-15)22DDA-
2540	(C-40- 9)26ACC-	1132	(C-40-15)23BCB-
1064	(C-40- 9)26BBC-	252	(C-40-15)23BCB-
1065	(C-40- 9)26BCB-	1132	(C-40-15)23BCD-
2538	(C-40- 9)26CAA-	252	(C-40-15)23BCD-
2537	(C-40- 9)26CAA-	102	(C-40-16) 6ADB-
2534	(C-40- 9)26CDA-	87	(C-40-16) 6DBC-
2535	(C-40- 9)26CDC-	2438	(C-40-16)26CBD-
2539	(C-40- 9)26DBB-	1430	(C-40-16)26CCA-
1066	(C-40- 9)27DAC-	1254	(C-40-16)26CCA-
1619	(C-40- 9)31CBD-	2210	(C-40-16)35ABD-
2536	(C-40- 9)35BAB-	405	(C-40-16)35ABD-
23	(C-40-10)12CBC-	922	(C-40-16)36DCC-
23	(C-40-10)12CDC-	922	(C-40-16)36DCD-
22	(C-40-10)13BBC-	1956	(C-40-17) 2CAA-
729	(C-40-11) 4CDC-	1957	(C-40-17)16CDC-
113	(C-40-11) 5AAC-	2299	(C-40-17)16CDC-
504	(C-40-11) 9ACB-	1741	(C-40-18)21DCA-
728	(C-40-11) 9BBA-	1740	(C-40-18)29CAC-
730	(C-40-11) 9DBB-	2341	(C-40-19) 7ACC-
505	(C-40-11)16DCC-	712	(C-40-19)14DAD-
1067	(C-40-12)14ACD-	1133	(C-41- 7) 8AAA-
964	(C-40-12)14ADC-	1436	(C-41- 7) 8BCA-
825	(C-40-12)15DCA-	1437	(C-41- 7) 8CAB-
825	(C-40-12)15DCA-	1436	(C-41- 7) 8CBC-
825	(C-40-12)15DCA-	81	(C-41- 7)19BBB-
1136	(C-40-13)19DAA-	195	(C-41- 7)30DBB-
1266	(C-40-13)33DBB-	1750	(C-41- 8) 4BDA-
2287	(C-40-13)35DBB-	82	(C-41- 8)13ACC-
140	(C-40-14) 8CCD-	2277	(C-41- 8)15CCA-
1134	(C-40-14)16DBB-	2278	(C-41- 8)15DCC-
1121	(C-40-14)16DBB-	2248	(C-41- 8)21DAB-
2220	(C-40-14)16DBB-	2250	(C-41- 8)22DBB-
1880	(C-40-15) 4DAC-	2639	(C-41- 8)22DBB-
252	(C-40-15) 4DDB-	1426	(C-41- 9) 1AAB-
1881	(C-40-15)10BBB-	604	(C-41- 9) 1AAB-
252	(C-40-15)10BBB-	604	(C-41- 9) 1AAB-
252	(C-40-15)10BDC-	1426	(C-41- 9) 1AAB-
1882	(C-40-15)10BDC-	604	(C-41- 9) 1ADB-
252	(C-40-15)10CBA-	1426	(C-41- 9) 1ADB-
1883	(C-40-15)10CBD-	268	(C-41- 9) 2CAB-
252	(C-40-15)14BAD-	1698	(C-41- 9) 6CCD-
1132	(C-40-15)14BAD-	1618	(C-41- 9) 6DDA-

*Area 81- Virgin River Basin

Table A-6 Virgin River Area Springs By USGS Number(cont)

WR Number*	USGS Number
767	(C-41- 9) 9BBA-
766	(C-41- 9) 9DBA-
204	(C-41- 9)13BAC-
2149	(C-41- 9)15BAC-
394	(C-41- 9)16CDC-
274	(C-41-10)17DAB-
220	(C-41-10)18DBA-
105	(C-41-10)22CDD-
216	(C-41-10)32AAC-
2236	(C-41-11)17BAD-
2240	(C-41-12)23CAC-
2240	(C-41-12)23CBC-
2240	(C-41-12)23CBD-
1327	(C-41-13) 5DBA-
1327	(C-41-13) 5DBA-
1327	(C-41-13) 5DBA-
1327	(C-41-13) 5DBA-
2237	(C-41-13) 7BBB-
1033	(C-41-13) 7BCB-
1454	(C-41-13) 8BDB-
1073	(C-41-13)11CDA-
1145	(C-41-13)11CDA-
1144	(C-41-13)11CDA-
48	(C-41-13)25CDB-
2205	(C-41-13)30AAB-
1761	(C-41-13)36AAA-
255	(C-41-14)12CCA-
255	(C-41-14)12CCC-
255	(C-41-14)12CCC-
69	(C-41-14)26DCA-
768	(C-41-14)36AAA-
86	(C-41-16)34BDA-
2300	(C-41-18) 2DDD-
829	(C-41-19)36CAC-
28	(C-42- 8) 1AAC-
112	(C-42- 8) 1AAC-
2497	(C-42- 9)29DAB-
2499	(C-42- 9)29DCC-
2499	(C-42- 9)32ACA-
2498	(C-42- 9)32BDD-
2617	(C-42-10) 5DAC-
2616	(C-42-10) 5DBC-
835	(C-42-10) 7BBC-
106	(C-42-10) 7BDD-
395	(C-42-10) 7BDD-
450	(C-42-10) 7BDD-
2615	(C-42-10)10BDD-
138	(C-42-10)31CAB-
165	(C-42-11)16CBA-

WR Number*	USGS Number
1207	(C-42-11)24CCB-
215	(C-42-12) 1CBA-
151	(C-42-12)14AAA-
201	(C-42-12)19DBB-
1403	(C-42-12)34CCA-
1218	(C-42-14) 1BBC-
332	(C-42-14) 2DAA-
200	(C-42-14) 5ABA-
966	(C-42-14) 5BCC-
942	(C-42-14) 5BCC-
79	(C-42-14) 5BCD-
291	(C-42-14) 6CCC-
966	(C-42-14) 6DBD-
942	(C-42-14) 6DBD-
331	(C-42-14)15DBD-
184	(C-42-14)21CAD-
380	(C-42-14)28ACB-
160	(C-42-14)32ABB-
207	(C-42-15)11CAA-
222	(C-42-15)11CDA-
292	(C-42-15)12ACB-
288	(C-42-15)12BCA-
289	(C-42-15)12BDB-
290	(C-42-15)12BDD-
1161	(C-42-15)12CCA-
1161	(C-42-15)12CCC-
1161	(C-42-15)12CDC-
100	(C-42-15)14BAB-
1200	(C-42-15)14DBA-
714	(C-42-15)15BBD-
591	(C-42-15)16DDD-
317	(C-42-15)19CAB-
1164	(C-42-15)19CAB-
1166	(C-42-15)19CAB-
254	(C-42-15)19CAC-
1019	(C-42-15)19CAC-
218	(C-42-15)19CAD-
1164	(C-42-15)19CBA-
682	(C-42-15)19CBC-
1586	(C-42-15)19CCB-
1583	(C-42-15)19CCD-
683	(C-42-15)19DDD-
544	(C-42-15)19DDD-
621	(C-42-15)20CAA-
2177	(C-42-15)20CCC-
770	(C-42-15)29BAD-
770	(C-42-15)29BAD-
176	(C-42-15)29CDA-
213	(C-42-15)30DCB-

*Area 81- Virgin River Basin

Table A-6 Virgin River Area Springs By USGS Number(cont)

WR Number*	USGS Number
246	(C-42-15)32DBA-
570	(C-42-16) 8BCB-
741	(C-42-16)10ADA-
742	(C-42-16)10ADA-
2439	(C-42-16)10BAD-
741	(C-42-16)10DAA-
741	(C-42-16)10DAA-
742	(C-42-16)10DAA-
742	(C-42-16)10DAA-
741	(C-42-16)11DBA-
742	(C-42-16)11DBA-
1061	(C-42-16)11DDC-
1180	(C-42-16)13BCC-
1180	(C-42-16)13CBA-
149	(C-42-16)14BAB-
70	(C-42-16)15ACB-
1043	(C-42-16)24ACA-
1043	(C-42-16)24ACB-
1304	(C-42-16)24ADD-
979	(C-42-16)24ADD-
1305	(C-42-16)24ADD-
980	(C-42-16)24ADD-
822	(C-42-16)24BDD-
2434	(C-42-16)26ABC-
904	(C-42-16)26ABC-
1501	(C-42-17)35BDD-
708	(C-42-18)24ABB-
708	(C-42-18)24ACB-
696	(C-42-18)30CDC-
2301	(C-42-19)36CAC-
761	(C-43- 8)11DDC-
680	(C-43- 8)16BAB-
52	(C-43- 8)17CAA-
664	(C-43- 8)17DCA-
2182	(C-43- 8)21ABC-
681	(C-43- 9)16ABB-
120	(C-43- 9)18DAB-
119	(C-43- 9)18DDC-
53	(C-43- 9)18DDC-
54	(C-43- 9)20BBB-
67	(C-43- 9)34CAA-
127	(C-43-10) 1AAD-
138	(C-43-10) 6BBB-
1526	(C-43-10) 7DAA-
1526	(C-43-10) 7DBA-
1526	(C-43-10) 8CDD-
1526	(C-43-10) 8DCC-
1526	(C-43-10) 9CDA-
951	(C-43-10)16DBD-

WR Number*	USGS Number
1526	(C-43-10)17ABB-
1526	(C-43-10)17DBC-
59	(C-43-10)21BAC-
295	(C-43-10)21DBD-
1070	(C-43-10)25BBA-
1070	(C-43-10)25BBC-
1070	(C-43-10)25BBD-
138	(C-43-11) 1AAA-
1232	(C-43-11) 7CAC-
114	(C-43-11)12CCD-
1515	(C-43-11)20BBB-
167	(C-43-11)20BBC-
1486	(C-43-11)20BBC-
703	(C-43-12)11AAA-
1495	(C-43-12)14ABD-
155	(C-43-13)24ADC-
1485	(C-43-13)24ADC-
78	(C-43-14)19DDB-
2354	(C-43-16) 4BBD-

*Area 81- Virgin River Basin

APPENDIX B: COMMENTS ON THE MAY 1987 DRAFT

APPENDIX B: Comments on the May 1987 Draft

A draft report was sent by the Utah Division of Water Resources to agencies currently participating in the cooperative Upper Virgin River Basin Study in Utah and was addressed to the contact person involved in that ongoing study. The draft report also was sent to other persons who contributed data or information to the groundwater study. The following people were sent a draft report for their review and comment.

Ron Thompson - Washington County Water Conservancy District
Dennis Curtis - Bureau of Land Management
Martin Urka - U.S. Bureau of Indian Affairs
Jim Brady - National Park Service
Jim Probst - Dixie National Forest
Jim Conley - U.S. Army Corps of Engineers
Clayton Ramsey - U.S. Soil Conservation Service
John Marstella - U.S. Soil Conservation Service
G. W. Sandberg - U.S. Geological Survey
Ralph Seiler - U.S. Geological Survey
Kidd Waddell - U.S. Geological Survey
Martin Einert - U.S. Bureau of Reclamation
Jerry Olds - Utah Division of Water Rights
Gerald Stoker - Utah Division of Water Rights
Jim Christensen - Utah Department of Agriculture
Bill Lund - Utah Geological and Mineral Survey
Jim Harvey - Utah Division of Comprehensive Emergency Management
Wes Shields - Utah Division of Wildlife Resources
Mike Reichert - Utah Bureau of Water Pollution Control
Mack Croft - Utah Bureau of Water Pollution Control
Dan Blake - Utah Bureau of Drinking Water/Sanitation
Ken Alkema - Utah Division of Environmental Health
Jim Dykman - Utah Division of State History
Dennis Burns - Utah Division of Parks & Recreation
Phillip Solomon - City of St. George
Oscar Bluth - City of Washington
John Willie - Washington County
Ken Sizemore - Five County Association of Governments
Roy Urie - Utah Board of Water Resources
Del Smith - Southern Utah Wilderness Alliance
Bryce Montgomery - CEJA Corporation
Brooks Pace - The Dameron Corporation
Bud Braham - Hurricane
Ted Gubler - St. George

The review of the draft report and the comments received are appreciated. Comments were received by the Division of Water Resources from the following:

Phillip Solomon - City of St. George
Jim Probst, Hugh C. Thompson - Dixie National Forest
Bryce Montgomery - CEJA Corporation
Robert H. Klauk - Utah Geological and Mineral Survey
Joseph Gates - U. S. Geological Survey
Jim Brady, Harold Grafe - National Park Service
Mack Croft - Utah Bureau of Water Pollution Control
Bud Branham - Hurricane

The entire comments received are not reproduced in this Appendix. Some comments, after review by the Division of Water Resources and the author, were able to be incorporated into the text or figures in the final report. Comments that were not incorporated into the text are addressed below. Some comments require no response but are included for additional information and reference for future studies.

City of St. George

Comment - The Water and Power Department staff of the City of St. George "would have liked to had some information included regarding Beaver Dam Wash area. ... The City is interested in the water development of this area and needs any information available that would help in the development plans."

Response - This area was omitted from the report as mentioned in the text.

Comment - In regards to recommendation #1, page 38, "the City of St. George is currently monitoring all of the well field areas for static levels and water quantity. In the initial stages of the study, the City did not have monitors on all of its well fields but recently has installed air tubes and meters to do so. The City is willing to share any information or data gathered recently."

Dixie National Forest

Comment - "Springs in the Cottonwood and Wide Canyon areas of the Dixie National Forest have been developed by the City of St. George for culinary purposes. ... Protection of the quantity and quality of these waters is an important management objective for this area of the forest. Since spring sources are also an important contributor to municipal culinary supplies, we suggest they be identified and mapped" as in Figure 8, on page 24.

Response - Since the identified municipal uses in Figure 8 on page 24 are limited to well withdrawals, these springs are not identified in the figure. The discussion in the text and Figures 8, 9, and 10 are limited to well withdrawals and development. Time and resources did not permit springs to be discussed in a similiar manner.

Comment - "Recommendation number 7 on pages 38-39 proposes studying the feasibility of increasing groundwater storage by reducing surface flows. Such a program could have obvious impacts on riparian and wetlands ecosystems. The extent of the impacts should be addressed in the proposed study."

Bryce Montgomery

Comment - "I recommend that further detail and emphasis be placed on the need for specific plans and action to create artificial recharge to the aquifers as is mentioned in the 3rd paragraph of page 36. In particular, the valuable Navajo Sandstone aquifer needs to be replenished so far as possible as the draft by wells from its stored water increases over the coming years. But in developing artificial recharge, special care must be taken to prevent pollution of the aquifers with the type of water used for the artificial recharging. Calvin has emphasized in paragraphs 4 and 5 on page 36 and paragraph 9, page 39, the need to protect aquifer recharge areas."

Utah Geological and Mineral Survey

Comment - No reference is made of UGMS Special Studies 67 entitled, 'Low-Temperature Geothermal Assessment of the Santa Clara and Virgin River Valleys, Washington County, Utah' ... chemical analyses were made for 55 water samples from springs and wells in the basin. These samples were collected and analyzed in 1986, and therefore, provide a more recent account of water quality in the area."

Response - The groundwater study report was prepared in 1986 and Special Studies 67 was not available to the author in time to be considered in the report. The report is referenced for possible use in future related studies.

Comment - "... Dr. Clyde does not discuss low temperature geothermal resources of the basin. Although low temperature geothermal is an energy resource, it is transported by water, and therefore, the UGMS thinks it should be included to some extent, with discussion of water resources for the area."

Response - Time and resources were not available to allow for discussion of low temperature geothermal resources.

Comment - "Recommendation No. 1 should include the UGMS as a provider of geological support to the task force. Furthermore, the USU Water Lab should be considered as a member of the task force."

Response - Excellent suggestion.

U.S. Geological Survey

Comment - "... more discussion would have been useful on the option of managing the groundwater reservoir by drawing it down during dry years, and allowing it to recover partly or completely during wet years; and by mining groundwater. In most arid areas of the Nation such as this one, some degree of groundwater mining eventually occurs, and all the pros and cons should be addressed here."

Response - A detailed study would be required to address all the pros and cons of groundwater mining and was beyond the scope of this study.

Comment - " ... it is good to point out that the Navajo Sandstone Aquifer is vulnerable to pollution, because this certainly could be a problem. However, much of the Navajo outcrop, ..., is in an area of 8-12 inches of precipitation, and probably does not receive natural recharge, except from streams that cross the outcrop. ... we do not really know if surface pollution on most of the outcrop would be transmitted down to the water table. Probably more work needs to be done on this problem before activities are prohibited over the outcrop area."

Response - The author agrees that more work needs to be done concerning this problem (see recommendation #9). Regardless of the amount of precipitation or natural recharge, access and use must still be carefully evaluated and controlled in the outcrop zone and other areas because of the potential for artificially inducing pollution into an important aquifer.

National Park Service

Comment - "... we are concerned that the study's conclusions and recommendations could lead a reader to expect that groundwater development, or loss reduction, could be achieved with little environmental consequences. ... the concept of environmental assessment, which is overlooked in the report, is important because protection of environmental values may limit the extent to which groundwater development may occur."

Response - Time and resources available for this study limited the scope and allowed only brief mention of environmental values as such. Any groundwater development would certainly have to give careful consideration to all potential environmental impacts.

Comment - "The report, if it is to deal with water rights at all, should discuss the potential for conflict with the Federal Reserve Water Rights of the three land management agencies administering federal lands within the basin."

Response - Considerable more time and effort would be required to deal with the water right issues related to groundwater development, as mentioned on page 37. These need further definition in future studies but are beyond the scope of this study.