STEADY-STATE SIMULATION OF GROUND-WATER FLOW IN THE RUSH SPRINGS AQUIFER, COBB CREEK BASIN, CADDO COUNTY, OKLAHOMA

By

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Bachelor of Science

Oklahoma State University

Stillwater, Oklahoma

1994

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
May, 1999

OKLAHOMA STATE UNIVERSITY

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ACKNOWLEDGMENTS

Giacometti said, "The more I work, the more I see things differently, that is, everything gains in grandeur every day, becomes more and more unknown, more and more beautiful. The closer I come, the grander it is, the more remote it is."

This endeavor would not have been possible without the support and assistance of many fine individuals.

My warmest thanks go to Andrew Stirling, whose love and understanding buoyed my spirits throughout my work on this thesis.

I would like to extend my sincerest thanks to my committee members, Dr. Arthur Hounslow, Dr. Gary Stewart, Dr. William Focht and Noel Osborn of the Oklahoma Water Resources Board. Their patience, guidance, and sense of humor made the development of this thesis a positive learning experience.

I would also like to thank my colleagues at the Oklahoma Water Resources Board: Bob Fabian, Ed Eckenstein, Mark Belden, Saji Varghese, and Ray Hardy. They are among the finest people I know and are a joy to work with.

I am grateful for the technical (and moral) support provided by James Leewright, Michael Sughru, Kevin Koon, Jim Summers, Andy Scurlock and Lenora Guiles of the Oklahoma Water Resources Board. Chris Maeder and Ben Brush of BOSS International responded swiftly to my late-night calls for software support. Mark Becker, Carol Becker, and Richard Luckey of the USGS provided data and invaluable guidance at key points during this thesis.

I extend my thanks to the people at the Oklahoma State University School of Geology who, by simply doing their jobs well, contributed to the successful completion of this thesis. They are Dr. Zuhair Al-Shaieb, Sandy Earls, Nancy Dryden, and Catherine Yates.

My most heartfelt thanks goes to my parents and my brother: Linda, Raymond, and Matthew. Their unflagging faith in me has been my source of strength throughout my entire life.

Financial support for this thesis was provided by the Oklahoma Water Resources Board through the Carl Albert Public Internship Program, in the form of an Executive Fellowship.

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CHAPTER I

INTRODUCTION

Models of a real hydrogeologic system are relied upon for two fundamental purposes: (1) to understand why a flow system is behaving in a particular observed manner and (2) to predict how a flow system will behave. In addition, models can be used to analyze hypothetical flow situations in order to gain a generic understanding of that type of flow system (Anderson and Woessner, 1992).

The term "model" refers to any representation of a real system (Fetter, 1994). Physical models of groundwater systems, such as laboratory sand tanks, simulate groundwater flow directly. A mathematical model simulates groundwater flow indirectly by means of a governing equation, along with equations that describe heads or flows along the boundaries of the model (Anderson and Woessner, 1992).

Two opinions about mathematical models are prevalent (Anderson and Woessner, 1992):

1. "Models are worthless because they require too many data and therefore are too expensive to assemble and run. Furthermore, they can never be proved (sic) to be correct and suffer from a lack of scientific certainty."

2. "Models are essential in performing complex analyses and in making informed

decisions."

Each of these opinions is true to some extent. Development of a groundwater flow model requires extensive field information for input and for calibration. Results will be influenced by uncertainty and nonunique solutions will result (Anderson and Woessner, 1992). Models provide a framework for organizing field information and for testing ideas about how the system works. Models can alert scientists to phenomena not considered and can identify areas where more field information is required. Construction of ground-water models is time-consuming, but it is also true that use of a groundwater flow model is the best way to make an informed analysis of or prediction about the consequences of actions (Anderson and Woessner, 1992).

Objectives

The primary objectives of this study were to develop a ground-water flow model of the Rush Springs aquifer in the Cobb Creek basin that could be used in planning and management of the basin and to use the model to estimate the effects of various pumping scenarios and climatic conditions on the amounts of water stored in the aquifer. The secondary, but not lesser, objective was to develop a fundamental understanding of the science and art ground-water flow modeling.

Background

The Rush Springs Formation is a source of large quantities of fresh ground-water, especially in northwestern Caddo County. Figure 1 shows the extent of the aquifer in Oklahoma. The entire aquifer encompasses about 2,400 square miles and includes most of Caddo and Custer Counties, a portion of Dewey County, the southwestern corners of Blaine and Canadian Counties, western Washita County, the extreme northeast corners of Kiowa and Comanche Counties, northern Stephens County and southwestern Grady County.

The Rush Springs aquifer supplies water for households, livestock, and irrigation, for rural water districts and for the municipalities of Anadarko, Binger, Carnegie, Cement, Cyril, Eakly, Fletcher, Fort Cobb, Gracemont, Hinton, Hydro, Rush Springs and Weatherford (Roles, 1976). Minor amounts of water are used for oil and gas drilling operations and other industrial purposes.

Approximately one-half, or about 950 square miles, of the area covered by the Rush Springs aquifer is in Caddo County, Oklahoma. About 325,000 acre-feet per year of ground-water is allocated for withdrawal from the Rush Springs aquifer, nearly 60 percent of which is allocated in Caddo County. Ground-water irrigation is highly developed over portions of the Rush Springs aquifer in this County, and is concentrated in an area north of the Washita River (Figure 2), within the Cobb Creek drainage basin. The location of the Cobb Creek drainage basin within the boundary of the Rush Springs aquifer is shown in Figure 3.

Prior to 1949, only farm and a few public supply wells extracted water from the

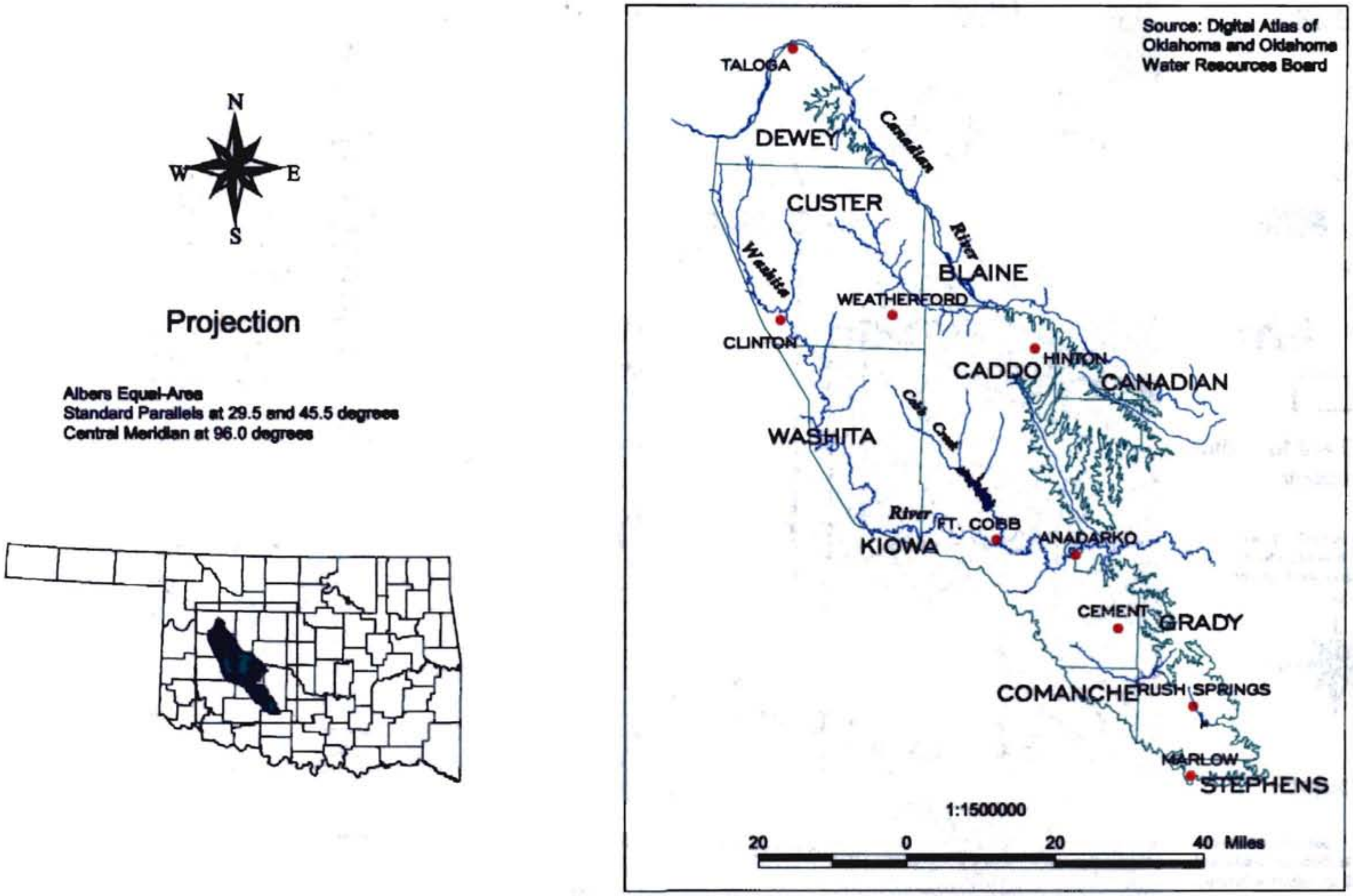


Figure 1. Location of the Rush Springs aquifer in Oklahoma and geographic features in the area.

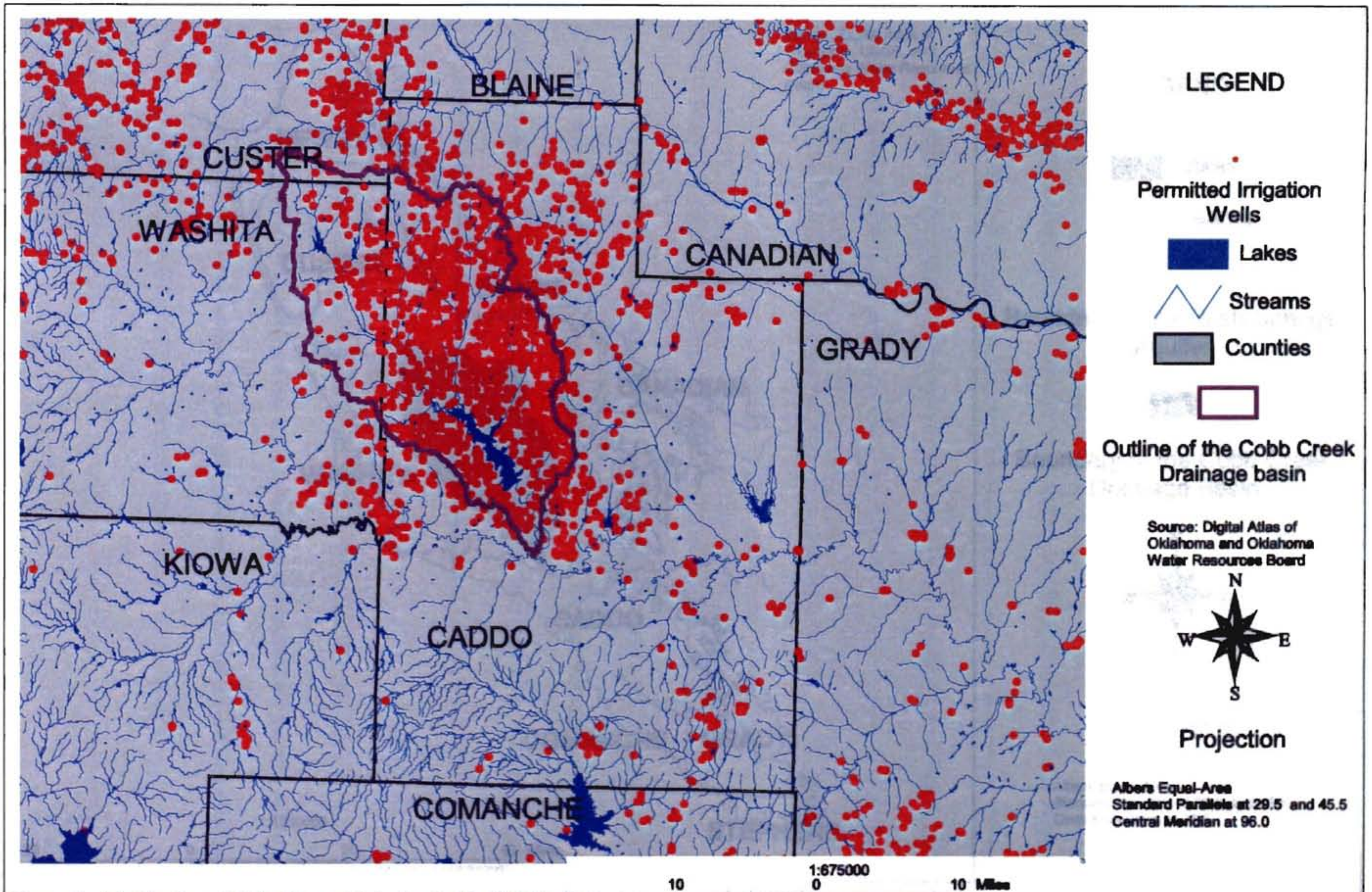


Figure 2. Distribution of irrigation wells in the Caddo County area.

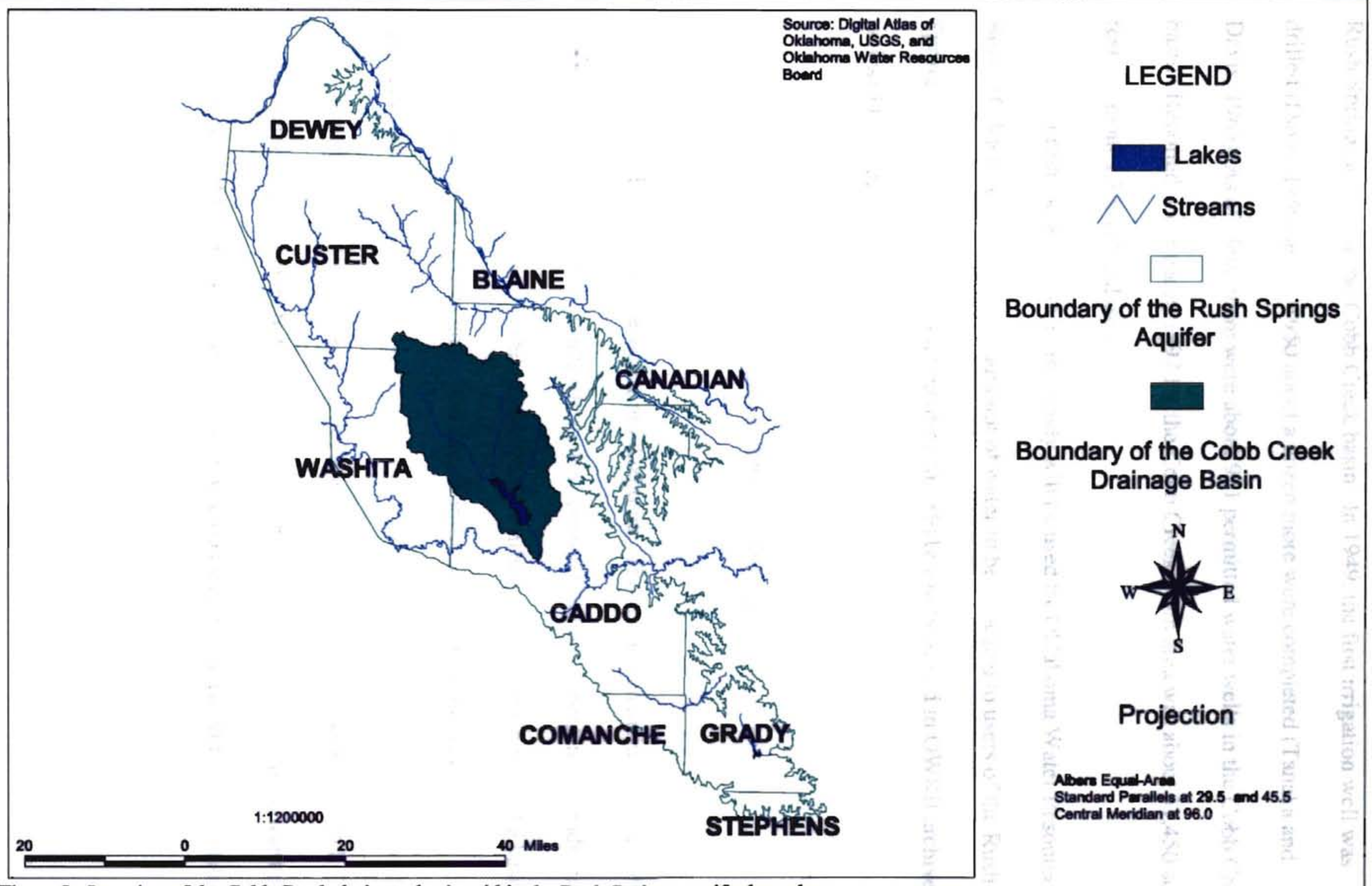


Figure 3. Location of the Cobb Creek drainage basin within the Rush Springs aquifer boundary.

Rush Springs aquifer in the Cobb Creek basin. In 1949, the first irrigation well was drilled (Davis, 1950) and in 1950 about a dozen more were completed (Tanaka and Davis, 1963). As of 1998, there were about 951 permitted water wells in the Cobb Creek basin. Reported water use in 1997 for the Cobb Creek basin area was about 37,450 acre-feet, or about 1.2 x 10^{10} gallons.

Information gained from this study will be used by Oklahoma Water Resources Board (OWRB) to determine the amount of water to be allocated to users of the Rush Springs aquifer. All information regarding this study will be stored in OWRB archives and will be available to the public.

Location of the Study Area

The study area is in west-central Oklahoma. The study area includes the Cobb Creek drainage basin and is principally in west-central Caddo County, and extends short distances into northeastern Washita County and southeastern Custer County. The basin is roughly oval in shape, covers about 320 square miles and is underlain by the Rush Springs Formation.

The product of this study is a ground-water flow model. The area covered by the ground-water flow model includes the study area, but its boundaries extend outward from the boundaries of the study area to hydrogeologic boundaries that could be realistically simulated. This area will be referred to as the model area in this paper.

Methods

The geology, physiography, and hydrogeology have been studied and documented in previous works. These previous works provide the necessary background information for this investigation.

A steady-state model of the Rush Springs aquifer in the Cobb Creek basin was developed using the computer program MODFLOW. MODFLOW is a finite-difference modular model code written by McDonald and Harbaugh of the United States Geological Survey (1988). MODFLOW was used in combination with Groundwater Modeling System (GMS). GMS is a pre- and post-processor that was developed by Engineering Computer Graphics Laboratory of Brigham Young University in partnership with the U.S. Army Corps of Engineers Waterways Experiment Station.

Post-processing, presentation mapping, and generation of datasets was accomplished using ArcView and ARC/INFO (ESRI, 1997). ArcView and ARC/INFO are Geographic Information Systems (GIS) developed by Environmental Systems Research Institute, Inc.

Water-well permit data and information from well drillers' logs were acquired from the Oklahoma Water Resources Board (OWRB) Water Rights Database. Other well data were acquired directly from water well drillers' logs on file at OWRB. Calculation of hydrologic parameters specific to the Rush Springs aquifer in the Cobb Creek basin was accomplished using the Ground-Water Utilities application. The Groundwater Utilities application is a computer program developed by James Summers and Robert Fabian of the OWRB.

CHAPTER II

PREVIOUS WORK

Stratigraphy and Geology

The Rush Springs Formation and the Marlow Formation are included in the Whitehorse Group. In his master's thesis, Becker (1993) described stratigraphic, lithologic, and mineral resources studies conducted on the rocks of the Whitehorse Group. This section closely follows Becker's discussion of previous works.

Several researchers have described the stratigraphy and lithology of the Whitehorse Group. The earliest reference to the Whitehorse Group was made by Cragin (1896). He recognized and correlated the rocks of the what is now referred to as the Whitehorse Group with sections in Kansas, dividing it into three members: the Dog Creek Shale, the Red Bluff Sandstone, and the Day Creek Dolomite.

Gould (1905) found that the name Red Bluff was preoccupied in Oklahoma and substituted the name Whitehorse Sandstone Member, after Whitehorse Springs in northwestern Woods County. Gould placed the Whitehorse Sandstone Member in the Woodward Formation, which he described as "300 feet of rocks consisting chiefly of shales, sandstones, and dolomites" overlying the Blaine Formation and underlying the rocks of the Greer Formation.

Adopting the nomenclature proposed by Gould, Reeves (1921) correlated rocks in the Cement area of Caddo County, Oklahoma, and noted a 2-foot gypsum layer marking the base of the Whitehorse sandstone member.

In 1924, Gould and Sawyer, in separate papers, elevated the Whitehorse to formation rank. They both placed the Dog Creek Shale below the Whitehorse Formation, but disagreed on the placement of the Dog Creek contact. Sawyer named the lower part of the Whitehorse Formation the Marlow Member, after the town of Marlow in Grady County, Oklahoma.

Reed and Meland (1924) described a fossiliferous, conglomeratic sandstone in the Marlow Member and called it Verden, after the town of Verden located in Grady County, Oklahoma. Bass (1939) later interpreted the localized sandstone as a nearshore strandline deposit.

In his report on oil and gas in Oklahoma, Becker (1927) described the geology of Grady and Caddo counties. Becker placed the base of the Whitehorse Formation at the top of the Verden and the Cloud Chief above the Whitehorse.

In 1929, Sawyer divided the Whitehorse Formation into the lower Marlow Member and the overlying Rush Springs Sandstone. The Rush Springs Sandstone is named after the town of Rush Springs in Grady County, Oklahoma. Sawyer recognized the Rush Springs Sandstone to be the same interval of rocks described as the Whitehorse sandstone by Reeves (1921). Sawyer also described the contact between the Rush Springs Sandstone and the Marlow Member as being the same as the Greenfield Limestone, dolomites that capped the hills immediately west of the town of Greenfield, Oklahoma. The Greenfield Limestone was described by Stephenson in 1925. Sawyer determined the upper contact of the Rush Springs Sandstone to be the Cloud Chief, which was previously described by Gould in 1924. Sawyer also described a bed located 40 feet below the top of the Rush Springs Sandstone, and named it Weatherford. Weatherford, in Custer County, Oklahoma, is the type locality of the Weatherford Bed.

Evans (1931) found that the name Greenfield was preoccupied and substituted the name Relay Creek dolomite for the marker beds between the Rush Springs and Marlow. Evans positioned the Marlow between the Dog Creek and the base of the Relay Creek dolomite. Evans also suggested that the Cloud Chief be incorporated into the Whitehorse Formation, and like Sawyer (1929), positioned the Cloud Chief above the Rush Springs. At the time of Evans' study, Buckstaff suggested to Evans that the Whitehorse be raised to group status (Evans, 1931).

Green raised the Marlow to formation status in 1936. He also suggested that a wavy boundary about 10 feet above the Relay Creek marked the contact between the Marlow Formation and the Rush Springs Sandstone, and that the two units were unconformable. This interpretation was not adopted by the local geologic community. Green also raised the Rush Springs to formation rank. He assigned the beds above the Rush Springs to the Quartermaster Formation. These beds included the Cloud Chief, Doxey Shale, and Elk City Sandstone, but later, Green (1937) altered this sequence and included the Cloud Chief as the uppermost member of the Whitehorse Group.

Schweer (1937) published a correlation chart that shows the Whitehorse Group composed of the Marlow Formation and the Rush Springs Sandstone, with the contact between the two being the top of the Relay Creek dolomite.

King (1942) published a correlation chart of the Guadelupian Series of north-central Texas that shows unconformities at the top and base of the Whitehorse Group, and includes the Cloud Chief Formation as part of the Whitehorse Group.

The stratigraphic nomenclature and placement of the Whitehorse Group was adopted in 1954 by Miser for the Oklahoma Geological Survey: the Whitehorse Group overlies the El Reno Group and underlies the Cloud Chief Formation, and that the Whitehorse Group contains the Marlow Formation and the Rush Springs Sandstone.

For his thesis, Becker (1993) adopted the stratigraphy as interpreted by Fay (1962) and Fay and Hart (1978). Fay called the upper Relay Creek dolomite the Emmanuel Bed and the lower Relay Creek dolomite the Relay Creek Bed. The Weatherford Bed was positioned in the upper portion of the Rush Springs Sandstone. Fay placed the contact between the Cloud Chief and the Rush Springs at the base of a series of gypsum and dolomite beds at the base of the Cloud Chief, and referred to it as the Moccasin Creek Bed.

A lithologic study of the rocks of the Whitehorse group was made by Freie in 1930. He described the grains in the Whitehorse Group as coarsening upward from the top of the Dog Creek to the top of the Rush Springs. Al-Shaieb (1977) and Allen (1980) made uranium minerals surveys in the area; descriptions of the gypsum found in the Cloud Chief Formation were made Ham and Curtis (1958); and Ham, Mankin, and Schleicher (1961) described the borate minerals found in the Cloud Chief Formation.

In a 1963 master's thesis, O'Brien reported on the geology of east-central Caddo County.

Hydrology

Davis (1950) conducted the first hydrologic investigation of the Whitehorse Group in the Pond (Cobb) Creek watershed in Caddo County, in which he investigated irrigation and groundwater quality in the Pond (Cobb) Creek watershed.

In 1955, Davis studied groundwater availability, aquifer-test data, hydrologic characteristics, and water quality of the Whitehorse Group in Grady and northern Stephens Counties. Tanaka and Davis (1963) described the hydrogeology of the Whitehorse Group. They studied the water quality, the hydraulic characteristics, recharge, discharge and water availability in the Caddo County area.

In 1966, OWRB published a report entitled "Ground water in the Rush Springs Sandstone, Caddo County area." The report quantifies the pumpage and recharge in the Caddo County area and presents historical water-level data from 1956 to 1966. In 1976, OWRB published "Basic data report on groundwater levels in the Rush Springs Sandstone area of southwestern Oklahoma." This report includes water level records in the Rush Springs Sandstone for the period 1956 to 1976 and includes measurements for 118 wells. Accompanying the data is an OWRB publication by Roles (1976) consisting of three sheets and entitled "Ground water resources of the Rush Springs Sandstone of southwestern Oklahoma." This publication summarizes the data found in the 1976 data report.

Levings (M.S. Thesis, 1971) made a general groundwater reconnaissance study of the upper Sugar Creek watershed in Caddo County, Oklahoma.

In 1985, Harlin and Wijeyawickrema, reported on the danger of overdevelopment of irrigation in Rush Springs aquifer in Caddo County.

Kalinina (OWRB, 1992) delineated a Wellhead Protection Area for the City of Weatherford, Custer County, Oklahoma. This report included information and data on geology and aquifer characteristics of the Rush Springs aquifer in the Weatherford municipal well field and the surrounding area.

In 1990, Johnson, Runkle and Becker described the hydrogeologic characteristics of the Rush Springs aquifer as an example of an aquifer in a large sedimentary basin.

The geochemistry of the Rush Springs aquifer described in terms of water-rock interactions was reported by Becker in 1993 (M.S. Thesis).

In 1998, Becker and Runkle described the hydrogeology, water quality, and geochemistry of the Rush Springs aquifer. Their findings were applied to the development and construction of a regional groundwater flow model of the Rush Springs aquifer by Becker in 1998. This model will be used by OWRB to determine the amount of water to be allocated to users of the Rush Springs aquifer.

Modeling

A text that proved invaluable to the author is titled "Applied Groundwater Modeling: Simulation of Flow and Advective Transport," by Mary Anderson and William Woessner. It clearly explains concepts of ground-water flow modeling in terms of several commonly used modeling codes.

CHAPTER III

GEOGRAPHY

Physiography

The study area is located in the Gypsum Hills region west of the Red Bed Plains physiographic province (Gould, 1905 and Fenneman,1938). The gypsum hills are formed by resistant beds composed of sandstone, dolomite, limestone, and gypsum interbedded with silt and clay (Fenneman, 1938). The interbedded resistant and erodible material create escarpments and smooth plains (Fenneman, 1938). The discontinuous gypsum is the chief scarp-former in the area (Fenneman, 1938). Where it is present, small cuestas, pronounced ledges overlooking river valleys and small, steep-sided canyons incising the softer sandstone beneath result (Gould, 1905).

Topography

The study area is located in the Cobb Creek watershed. A watershed is the highest point of land that divides the area drained by one stream from that of another stream. The term watershed is often used interchangeably with the term drainage basin.

In this report, the study area will be referred to as the Cobb Creek basin. Cobb Creek was known as Pond Creek. The U.S. Board on Geographic Names has since accepted the name Cobb Creek. Figure 4 shows the geographic features in the Cobb Creek basin area.

Davis (1950) described the topography of the Cobb Creek basin in his report on the ground-water availability in the basin. The area is drained by Cobb Creek and its two main tributaries, Willow Creek and Spring Creek. These are perennial streams whose base flow is maintained by seepage from the Rush Springs Formation. Vegetation along these streams includes willow, sycamore, cottonwood and oak trees, along with underbrush. The uplands and valley slopes are well-drained, and most have been cleared for cultivation (Davis, 1950).

Maximum relief in the area is about 580 feet. The altitude of the land surface ranges from about 1,240 feet, where Cobb Creek joins the Washita River, to about 1,820 feet at the northwest end of the basin (Davis, 1950).

The surface is a moderately rolling plain, except along larger streams where local relief reaches 100 feet or more. In the western part of the basin, many cuestas with steep eastward facing escarpments and gentle back slopes are present. Most of the cuestas have less than 75 feet of relief and mark the eastern limit of the main outcrop of the Cloud Chief Formation (Davis, 1950). The Cloud Chief Formation crops out elsewhere in the basin as thin outliers, capping buttes an acre or less in area (Davis, 1950).

The Cobb Creek basin lies within the larger drainage basin of the Washita River, along with Sugar Creek. Sugar Creek is a perennial stream whose flow is maintained by seepage from the Rush Springs Formation. The area drained by Sugar Creek is dissected

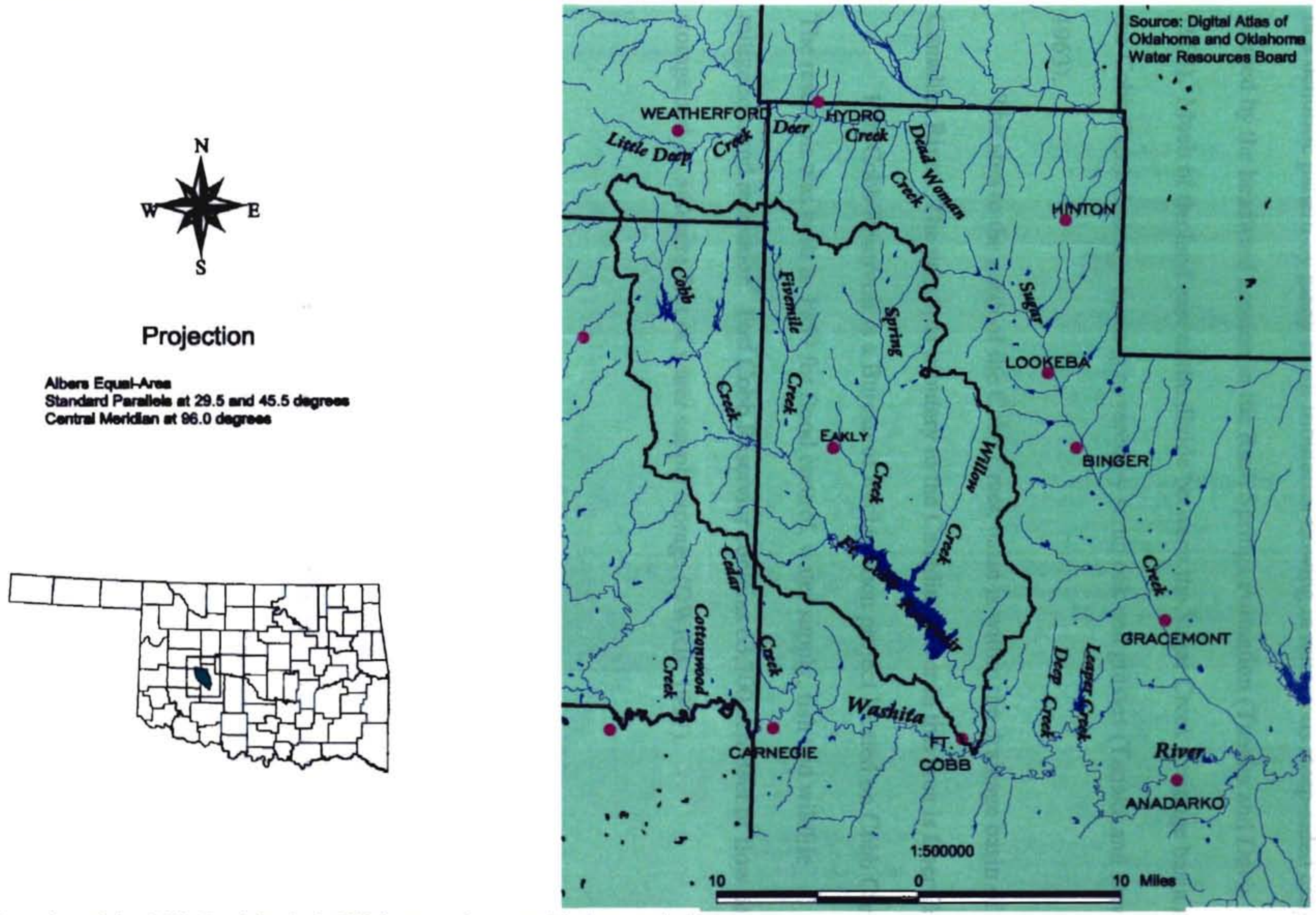


Figure 4. Location of the Cobb Creek basin in Oklahoma and geographic features in the area.

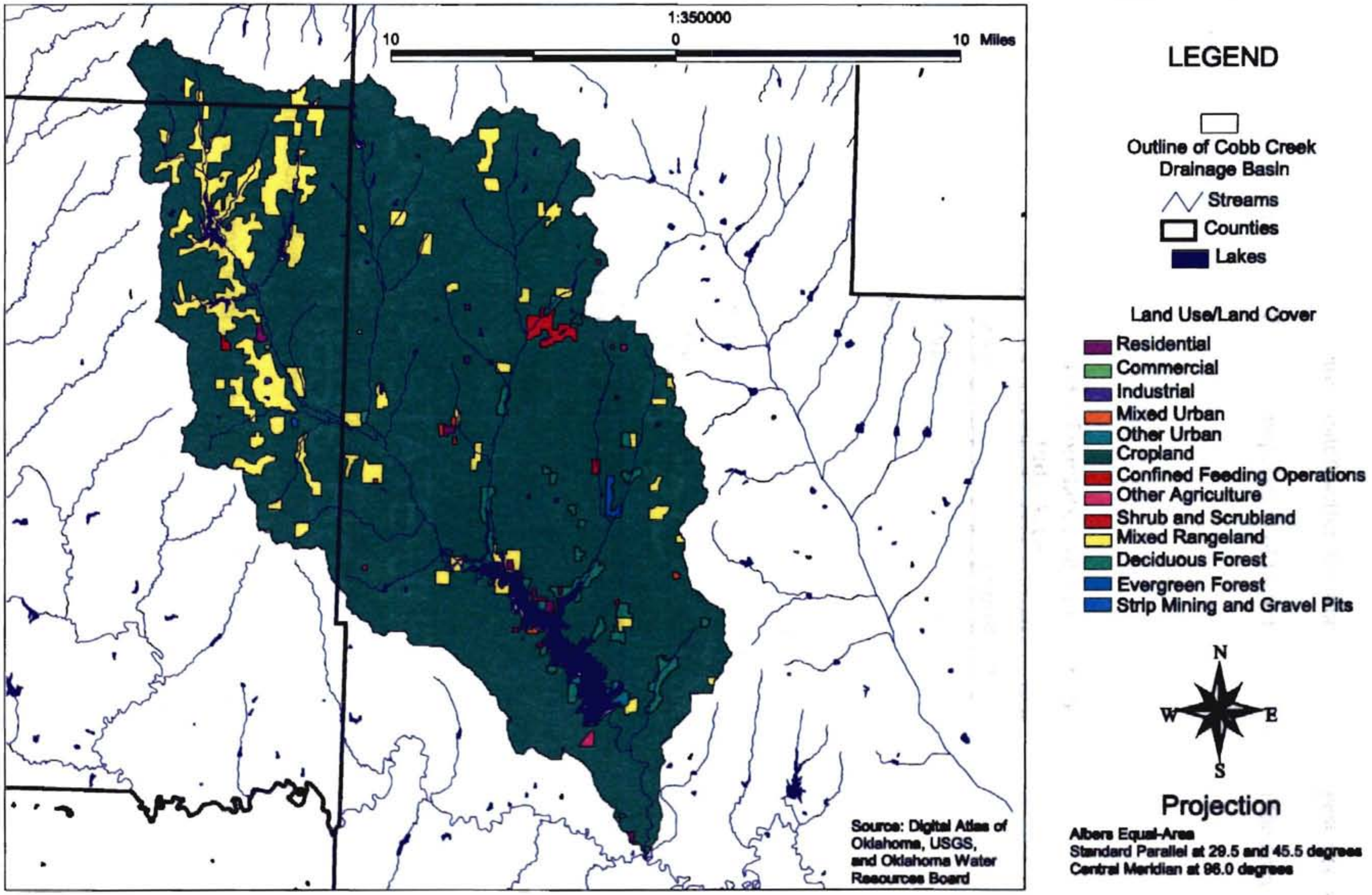
in a dendritic pattern by many small tributaries flowing in numerous steep-sided canyons formed by the headward erosion in the Rush Springs Formation (Tanaka and Davis, 1963). Much of the land east of the divide between the Sugar Creek drainage basin and the Cobb Creek drainage basin is covered by scrub oak and grasses (Tanaka and Davis, 1963).

The area to the north of the Cobb Creek basin is within the drainage basin of the Canadian River. The principal tributary to the Canadian River in this area is Deer Creek.

Fort Cobb Reservoir is a Bureau of Reclamation project located on Cobb Creek. The reservoir was built in 1959 for flood control, water supply, fish and wildlife mitigation, and recreation. Fort Cobb Reservior contains 63,700 acre-feet of flow control storage and 78,340 acre-feet of water supply storage (OWRB, 1997).

Land Use

The primary land use in the study area is agriculture. Of the 808,320 acres that comprise Caddo County, 90 percent are farmed (Census of Agriculture, 1997). The land use/land cover in the Cobb Creek basin is shown in Figure 5 (Anderson and others, 1976). The principal crops grown are sorghum, wheat, cotton, soybeans, peanuts, and alfalfa (Census of Agriculture, 1997). More than 91 percent of the water allocated for agricultural purposes in Caddo County is derived from ground-water (OWRB, 1997); the estimated use for irrigation was 34.3 million gallons per day in 1990 (Lurry and Tortorelli, 1995). Irrigation exceeds the second largest water use, public water supply, by thirty times (Lurrry and Tortorelli, 1995). In June 1998, 111,809 acres in Caddo County



Source: Digital Atlas of Oklahoma, USGS, and Oklahoma Water Resources Board

Figure 5. Land use / land cover in the Cobb Creek basin.

were permitted for irrigation.

Several towns and cities are located within the study area. The largest city is Anadarko, the county seat. The 1990 population of the cities and towns in the area are presented in Table 1.

Table 1. 1990 Population of Towns in the Study Area

City/Town	Population
Anadarko	6,586
Binger	724
Eakly	277
Fort Cobb	663
Gracemont	339
Lookeba	141

Oklahoma Department of Commerce, 1999.

Climate

Caddo County has a warm, temperate, continental climate. The area receives the warmer, moisture-laden air from the Gulf of Mexico, which is regularly penetrated by the cooler drier air moving down from the Arctic or approaching from the Pacific. When these two air systems meet, significant changes in temperature, precipitation and velocity often occur (Soil Conservation Service, 1979).

The seasonal characteristics of the climate vary in intensity from year to year, but changes between seasons are gradual. Winters are mostly moderate and sunny. Temperatures are fairly low and some snow falls, but the cold periods generally last only a few days. The heaviest seasonal rainfall occurs in the spring and fall; rains late in the spring and early in the summer are generally accompanied by the greatest number of severe local storms (Soil Conservation Survey, 1979). Summers are long and hot.

The average annual precipitation for Caddo County is 29.8 inches (Oklahoma Climatological Survey, 1999). Most rainfall is localized and intense, resulting in flash floods and rapid runoff (Tanaka and Davis, 1963). More than 80 percent of the annual precipitation is received from March through October (OCS, 1999).

The maximum mean annual temperature in Caddo County is 61.2°F. The highest temperatures are in the summer, when the maximum monthly mean in July is 83.1°F. The lowest temperatures are in January, with a minimum monthly mean of 37.1°F (Oklahoma Climatological Survey, 1999).

The winds are predominantly from the south, except during the winter and early spring when winds alternate from the north and the south.

Soils

Soils are a reflection of the surrounding geologic material and the topographic setting upon which they were formed (Becker, 1993). Soil associations are distinguished by texture, permeability, color, and topographic setting. Seven soil associations occur in the study area and are described below (Soil Conservation Service, 1973):

1. Port-Gracemont-Pulaski-- consists of deep, nearly level soils on flood plains,

poorly to well-drained, moderate to rapid permeability, sandy and loamy, reddish-brown, available water capacity high, intake rate moderate, calcareous, slightly acid to medium acid in Pulaski. Gracemont soils have a water table at a depth of less than 40 inches.

2. Pond Creek-Minco-- nearly level to steep soils on uplands, moderately slow to moderate permeability, dark grayish-brown to brown, available water capacity high, intake rate moderate, alkaline in Pond Creek, slightly acid in Minco. Only a small acreage is moderately steep or steep and is cut by drainageways.

3. Pond Creek-Cobb-- deep and moderately deep, loamy, nearly level to sloping soils on uplands, moderately slow to moderate permeability, dark grayish-brown to reddish brown, alkaline, available water capacity high, intake rate moderate.

4. Grant-Pond Creek-Lucien-- deep and shallow, loamy, nearly level to steep soils on uplands, moderately slow to moderate to moderately rapid permeability, dark grayish-brown to brown to reddish-brown, alkaline, available water capacity high, except in Lucien where it is low, intake rate moderate. Lucien is susceptible to erosion.

5. Dougherty-Eufaula-- consists of deep, sandy, very gently sloping to rolling soils on uplands, moderate to rapid permeability, grayish- to pale-brown, available water capacity low, intake rate high, slightly acid.

6. Noble-Darnell-- consists of deep and shallow, loamy, very gently sloping to hilly soils on wooded uplands, moderately rapid permeability, reddish-brown to brown, available water content high, intake rate moderate, slightly acid.

CHAPTER IV

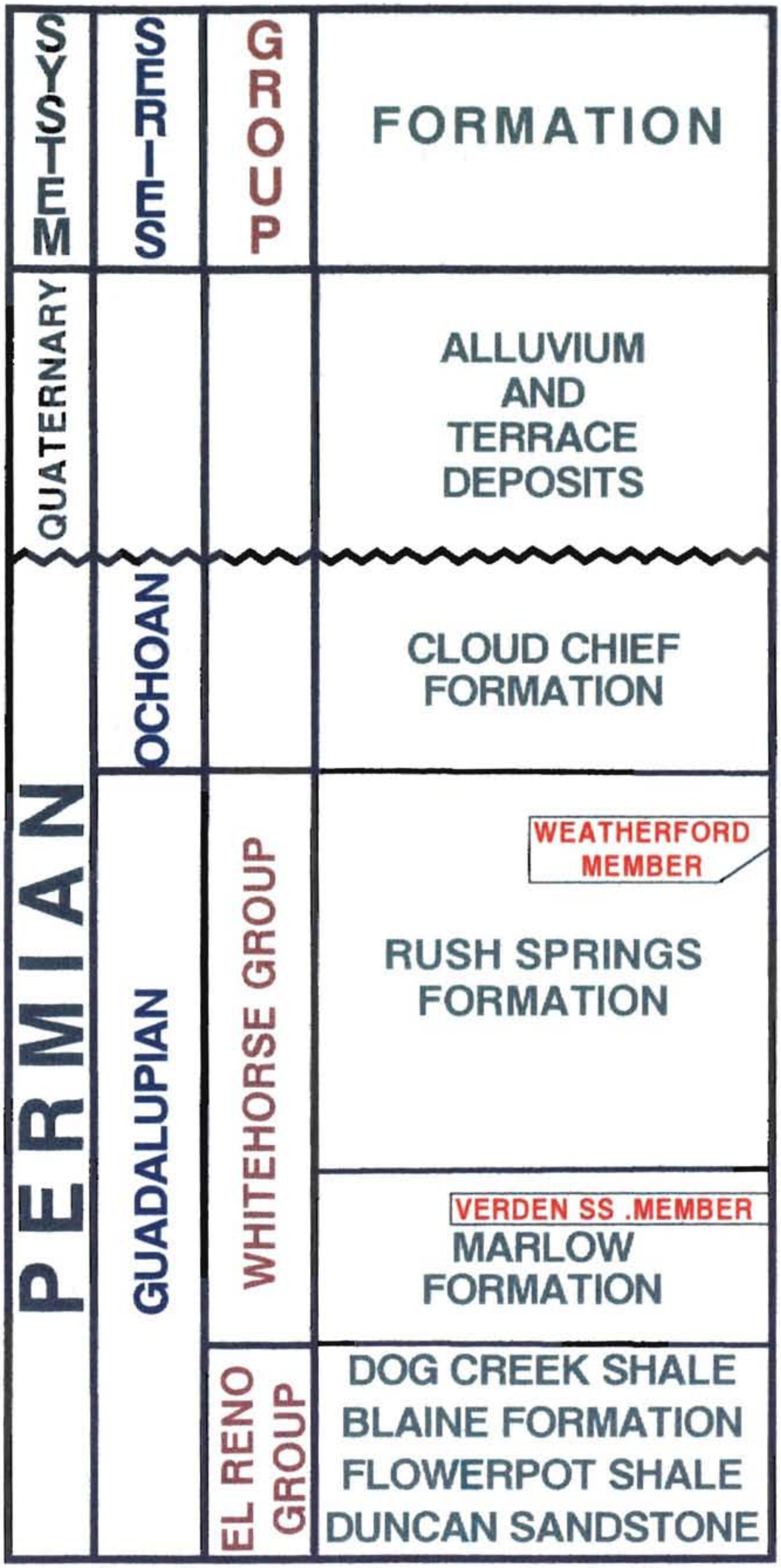
GEOLOGY

Structural Setting

The study area is within the southeastern Anadarko basin, which extends from south-central Oklahoma and west-northwest into Texas (Becker and Runkle, 1998). The Rush Springs aquifer, in rocks of Permian age, is located in the upper portion of the basin's Paleozoic sedimentary deposits (Johnson, Runkle, and Becker, 1990). These formations dip southwestward toward the axis of the Anadarko structural trough at a rate of 20 to 40 feet per mile (Davis, 1950). The axis of this trough extends northwestward across the south edge of the Cobb Creek basin (Davis, 1950).

Stratigraphy

The discussion of rocks in the study area will be limited to the units shown in Figure 6. Although the focus of this paper is the Rush Springs Formation and in the Marlow Formation of Permian age, other Permian rocks underlying and overlying these units are also discussed briefly because of their relationship to the formations of interest.



SYSTEM	SERIES	GROUP	FORMATION
QUATERNARY			ALLUVIUM AND TERRACE DEPOSITS
PERMIAN	OCHOAN		CLOUD CHIEF FORMATION
	GUADALUPIAN	WHITEHORSE GROUP	WEATHERFORD MEMBER RUSH SPRINGS FORMATION
			VERDEN SS .MEMBER MARLOW FORMATION
		EL RENO GROUP	DOG CREEK SHALE
			BLAINE FORMATION
			FLOWERPOT SHALE
			DUNCAN SANDSTONE

Figure 6. Generalized stratigraphic nomenclature of subject rocks.

The surficial geology in the Cobb Creek drainage basin area is shown in Figure 7.

El Reno Group

The El Reno Group includes the strata from the base of the Duncan Sandstone to the base of the Marlow Formation (Davis, 1955). The El Reno Group consists of several hundred feet of shale, siltstone, sandstone, dolomite, anhydrite, and gypsum of Permian age (Tanaka and Davis, 1963). The formations composing the El Reno Group in Caddo County, in ascending order, are the Duncan Sandstone, the Flowerpot Shale, the Blaine Formation and the Dog Creek Shale. The thickness of the El Reno Group ranges from about 660 feet in eastern Caddo County to about 460 feet in eastern Washita County (Tanaka and Davis, 1963).

Whitehorse Group

The Whitehorse Group in Oklahoma consists of the Permian strata that lie above the El Reno Group and below the Cloud Chief Formation (Davis, 1955). The age and correlation of the Whitehorse Group was the source of much dispute, but has been resolved in recent years (Becker, 1993). The Whitehorse Group is recognized as early Permian, Guadelupian in age (Fay and Hart, 1978).

The upper part of the Whitehorse Group is the Rush Springs Formation and the lower part is the Marlow Formation. In central Caddo County and westward, the Whitehorse Group is conformable with the underlying Dog Creek Shale of the El Reno

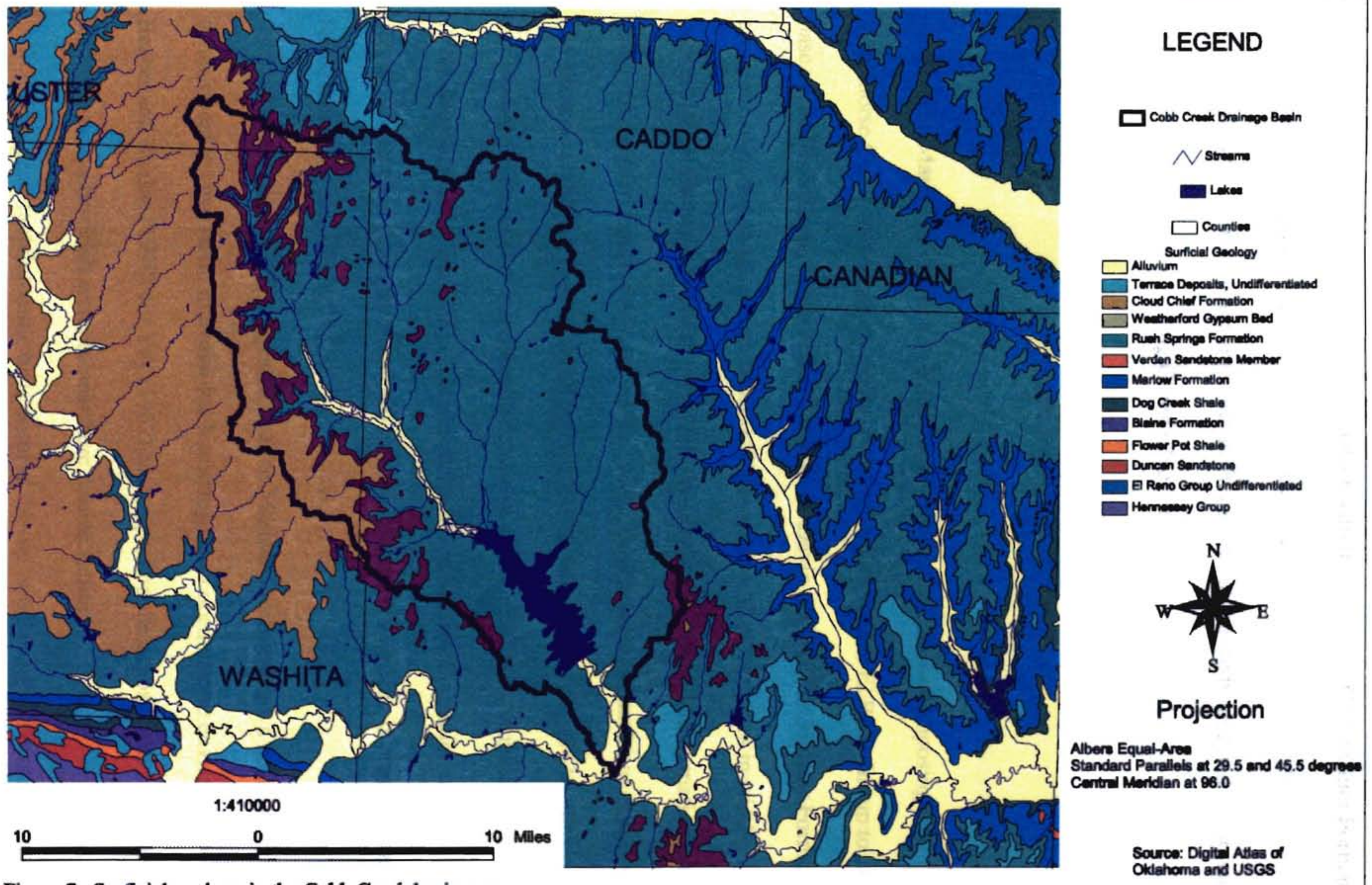


Figure 7. Surficial geology in the Cobb Creek basin area.

Group (Tanaka and Davis, 1963). The contact with the overlying Cloud Chief Formation is locally unconformable in eastern Washita County (Tanaka and Davis, 1963).

The Whitehorse Group crops out in 90 percent of the study area and is concealed in the remainder by the overlying Cloud Chief Formation.

Marlow Formation

The Marlow Formation is the lower of the two formations composing the Whitehorse Group and occupies the interval from the top of the El Reno Group to the base of the Rush Springs Formation (Tanaka and Davis, 1963). The Marlow Formation crops out as a band ranging from about 0.5 mile to more than five miles in width encircling the southeast end of the Anadarko basin (Davis, 1955). The formation consists mostly of even- to massively bedded, brick-red, fine-grained silty sandstone, sandy shale, and siltstone (Johnson, Runkle and Becker, 1990; Tanaka and Davis, 1963). Siltstones and sandstones are well-cemented with calcite or gypsum (Johnson, Runkle and Becker, 1990; Tanaka and Davis, 1963). The thickness of the Marlow Formation ranges from zero to 120 feet and averages about 100 feet where the entire section is present (Johnson, Runkle, and Becker, 1990).

MacLachlan (1967) suggested that the Marlow was formed in a nearshore marine depositional environment, in a tidal flat bordering on an open marine environment. Becker and Runkle (1998) cite Fay (1962) as interpreting the depositional environment of the Marlow as a brackish-water to nearshore marine setting.

Two persistant dolomitic beds occur at the top of the Marlow Formation; these are designated the Upper Relay Creek and the Lower Relay Creek dolomites (Davis, 1955). They are separated by about 25 feet of red sandstone and shale (Davis, 1955). Where present, the dolomites' maximum thickness is about 4 inches (Davis, 1955).

Rush Springs Formation

The Rush Springs Formation is the uppermost formation of the Whitehorse Group. It overlies the Marlow Formation and underlies the Cloud Chief Formation (Davis, 1955; Tanaka and Davis, 1963). The Rush Springs Formation is commonly referred to as the Rush Springs Sandstone. Following the United States Geological Survey (USGS) convention, the unit is herein referred to as the Rush Springs Formation.

The Rush Springs Formation is a even- to highly cross-bedded sandstone with some interbedded dolomite or gypsum (Becker, 1993; Becker and Runkle, 1998). Locally the sandstone is silty or argillaceous, and contains some layers of red-brown shale (Johnson, Runkle, and Becker, 1990). The sand is poorly cemented with dolomite/calcite in places, but the principal cement found in the subsurface is gypsum; most of the formation has little or no cement (Johnson, Runkle, and Becker, 1990). Tanaka and Davis (1963) stated that the sand grains composing the Rush Springs in Caddo County are subround to subangular and are "remarkably homogeneous in lithologic character." The sand grains are dominated by very fine to fine-grained quartz and are moderately to poorly sorted (Tanaka and Davis, 1963; Becker, 1993). Where the entire section is present, the Rush Springs Formation is more than 300 feet thick (Becker and Runkle, 1998).

Johnson, Runkle and Becker (1990) concluded that the Rush Springs Formation was deposited in alternating shallow-marine, eolian-dune, and coastal-sabkha environments on the east side of a shallow sea. In the west and northwest, the formation contains more silt, clay, and evaporites, which indicates a shallow, more restricted marine environment (Johnson, Runkle, and Becker, 1990).

The Weatherford gypsum bed is located about 30 to 60 feet below the top of the Rush Springs Formation (Carr and Bergman, 1976). In the area just southeast of the Cobb Creek basin, the Weatherford gypsum bed is a nine-inch, well-indurated zone of dark brown, wavy-bedded sandy dolomite (O'Brien, 1963). At no place is this bed thicker than 16 inches (O'Brien, 1963). The Weatherford gypsum member is a dolomite at most places in Caddo County, at some places it is a dolomitic shale and at others, anhydrite or gypsum (Tanaka and Davis, 1963).

The Weatherford in the Caddo County area was deposited in a near-shore environment and the variations from gypsum-anhydrite to dolomite are related to the Permian sea on the west and to the landmass on the east (Tanaka and Davis, 1963).

The Weatherford is placed as part of the Cloud Chief Formation in some earlier studies, and as part of the Rush Springs Formation in more recent reports. For the purposes of this study, the Weatherford gypsum bed is considered to be part of the Rush Springs Formation.

Cloud Chief Formation

The Cloud Chief Formation overlies the Rush Springs Formation and conceals that formation in the western part of the study area. It is also found as erosional remnants capping small hills elsewhere in the study area (Davis, 1955). The Cloud Chief formation is characterized by massive gypsum units interbedded with reddish-brown shales and siltstones, with some sandstone (Tanaka and Davis, 1963). The sandstones and shales are in some places similar to the underlying Rush Springs Formation, but they can be distinguished most readily by their darker color, greater hardness, and resistance to erosion (Davis, 1955). A mature karst topography is developed locally on the Cloud Chief in the main outcrop area west of the study area and in the larger outliers to the south and east (Tanaka and Davis, 1963). These areas are characterized by sinkholes.

Alluvium and Terrace Deposits

Overlying the Cloud Chief and Rush Springs Formations are narrow bands of alluvium and terrace deposits of Quaternary age.

The alluvium consists of fine-grained sandy silt and clay eroded from the Rush Springs Formation mixed with gypsum eroded from the Cloud Chief Formation (Davis, 1950). The alluvium occurs in the lower part of Cobb Creek and its tributaries, Sugar Creek and along the Washita River. The maximum thickness of the alluvium in Cobb Creek is about 30 feet (Davis, 1950). Along Sugar Creek, the maximum thickness of the alluvium is 108 feet. The thickness of the alluvium in the Washita River floodplain ranges from zero to 120 feet, and averages about 64 feet (Hart, 1965).

Terrace deposits, like the alluvium, were deposited by streams. They are lithologically similar to the alluvium but contain significantly more gravel-sized sediment

(Davis, 1950). The terrace deposits are older and topographically higher (Hart, 1965), and represent deposits of streams that flowed at much higher levels than the present streams. Most of the terrace deposits in the area are very thin (Davis, 1950). The largest terrace deposit in the area covers about 20 acres and has a maximum thickness of 25 feet (Davis, 1950). Fossil bones and teeth were collected from this gravel and identified as those of a horse and an elephant of Pleistocene age (Davis, 1950).

CHAPTER V

HYDROGEOLOGY

The term "Rush Springs aquifer" is commonly used by the local and professional community when referring to the Rush Springs Formation in the context of an aquifer. (Becker, 1993). In some reports (Johnson and others, 1990), the term Rush Springs aquifer is expanded to include parts of the Marlow Formation.

Aquifer Characteristics

The Marlow Formation is not a good aquifer in eastern Caddo County (Tanaka and Davis, 1963). Tanaka and Davis (1963) found that wells in the Marlow had maximum yields of only one or two gallons per minute (gpm). The water from the Marlow is very hard and is high in calcium, magnesium and sodium sulfate (Davis, 1955).

The Marlow Formation is well-cemented and contains abundant silt and clay. This causes reduced overall permeability (Johnson, Runkle, and Becker, 1990). The USGS took several core samples of the Marlow that were found to be dry immediately following excavation, indicating little or no ground-water flow in these sections (Becker, 1998).

In the outcrop area of the Marlow along Sugar Creek are zones of increased permeability and porosity (Becker, 1998). Becker (1998) included the Marlow in these areas as part of the Rush Springs aquifer for modeling purposes. Throughout the rest of Becker's study area, and throughout the Cobb Creek basin study area, the Marlow acts as a lower confining layer to the Rush Springs aquifer.

In this study, the base of the Rush Springs aquifer occurs at the base of the Rush Springs Formation.. The Rush Springs-Marlow contact is characterized by an increase in cement, clay, and silt-sized material (Becker, 1992, OWRB meeting notes). However, in some areas, the base of the aquifer is quite difficult to identify.

The Rush Springs aquifer is the principal aquifer in both the study and model areas. Yields from wells drilled in the Rush Springs Formation vary, but the most productive irrigation wells are reported to yield more than 1,000 gpm. Within the model area, reported irrigation well (from drillers' logs) yields range from 95 to 1,500 gpm. The amount of water that a well will yield depends on the permeability of the aquifer, the thickness of the zone of saturation, and in the Rush Springs aquifer, the presence or absence of loosely cemented beds of sand in the formation (Tanaka and Davis, 1963).

Specific capacity of a well is its yield per unit of drawdown (Driscoll, 1986). In general, the higher the specific capacity, the higher the aquifer transmissivity (Kalinina, 1992). Specific capacities calculated from information found on drillers' logs for 153 irrigation wells in the model area range from 0.8 to 14 gpm per foot of drawdown. Becker and Runkle (1998) reported that specific capacities for 89 wells located throughout the Rush Springs aquifer ranged from 0.7 to 15 gpm per foot of drawdown. Tanaka and Davis (1963) found that wells encountering loose sands during drilling or wells that pump a mixture of silt, sand and water during initial test pumping generally have specific capacities ranging from 6 to 10 gpm per foot of drawdown. Wells that encounter little or no loose sand during drilling and that pump little silt or sand generally have specific capacities ranging from 1 to 3 gpm per foot of drawdown. This is because the removal of fine-grained sand and silt from the aquifer during the development of the well causes a gradual increase in the effective radius of the well, resulting in an increase in the specific capacity (Tanaka and Davis, 1963).

Aquifer transmissivity is the rate at which water is transmitted through a unit width of the aquifer under a unit hydraulic gradient (Driscoll, 1986). Tanaka and Davis (1963) calculated transmissivities from four aquifer tests conducted in the Caddo County area. These transmissivity values ranged from 670 to 1,740 feet squared per day (Tanaka and Davis, 1963). Davis (1955) reported transmissivities ranging from 670 to 1,870 feet squared per day. Transmissivities were also calculated for this study from short duration pumping tests found on drillers' logs for 153 irrigation wells located within the study area. These transmissivity values ranged from about 198 to 2,558 feet squared per day.

Hydraulic conductivity is the capacity of the rock to transmit water. Hydraulic conductivity is the rate of flow through a unit cross-sectional area under a unit gradient at the prevailing temperature (Driscoll, 1986). It is expressed in units of feet per day in this report. Becker and Runkle (1998) reported that hydraulic conductivities estimated from slug tests conducted by the 3M Company near Weatherford, Oklahoma ranged from 1.05 to 5.62 feet per day. Other aquifer tests, run by USGS, were also used to estimate hydraulic conductivity in the Rush Springs aquifer. These tests showed that the hydraulic conductivity of the Rush Springs aquifer ranged from 3.84 to 4.41 feet per day (Becker and Runkle, 1998). Using the OWRB Groundwater Utilities Program, estimates of hydraulic conductivity were calculated using short-duration pump test data from drillers' logs. Hydraulic conductivity estimated from these tests ranged from 0.5 to almost 19 feet per day; the mean was about 4 feet per day. A summary of the OWRB Groundwater Utilities Program is found in Appendix A. A table summarizing the input parameters and the results is found in Appendix B.

The specific yield is the ratio of the volume of water that the rock or soil, after being saturated, will yield by gravity, to its own volume (Fetter, 1994). The specific yield is expressed as a percentage in this report. Tanaka and Davis (1963) conducted laboratory analyses of 27 samples from the Rush Springs. Specific yield in these samples ranges from 13 to 38 percent and averages about 25 percent (Tanaka and Davis, 1963).

The potentiometric surface is the level to which water will rise in a tightly cased well (AGI, 1984). Over much of the model area, this term is generally synonymous with the term water-table. Water-table is the surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere (AGI, 1984).

A water-table map of the study area was created by Tanaka and Davis (1963), and is shown on Plate 1. This contour map reflects the position of the water-table in the Cobb Creek basin in June 1956 and includes the locations of the points used to interpret the contours. Ground-water in the Rush Springs aquifer is under water-table conditions (unconfined) and depth to water below land surface ranges from zero to 155 feet, determined by the author from drillers' logs.

The water-table of the Rush Springs aquifer in the Cobb Creek basin is more than 1650 feet above sea level in the northwest part of the model area and is less than 1250 feet above sea level along parts of the southern boundary of the model area.

Ground-water flow in the Rush Springs aquifer is generally from the northwest to the southeast (Tanaka and Davis, 1963; Johnson, Runkle and Becker, 1990; Becker and Runkle, 1998; and Becker, 1998). Within the model area, movement is locally toward Cobb and Sugar Creeks and their main tributaries.

The June 1956 saturated thickness of the Rush Springs aquifer in the Cobb Creek basin model area is shown in Figure 8. The saturated thickness map was constructed by subtracting the base-of-aquifer map from the June 1956 water-table map. The saturated thickness was greatest in the western one-third of the model area where it exceeded 370 feet. The saturated thickness was less than 50 feet on the eastern edge of the model area, corresponding to the erosional extent of the Rush Springs Formation. The map does not show the saturated thickness approaching zero here because there were not many base-of-aquifer points in this area.

Becker (1993, 1998) evaluated the quality of the water from the Rush Springs aquifer. Water from the Rush Springs is very hard (greater than 180 mg/L of $CaCO_3$, Hem, 1985). Selected inorganic constituents concentrations were less than the Oklahoma drinking water standard maximum allowable and recommended maximum levels. The maximum concentration for sulfate was 840 milligrams per liter; this exceeds the recommended maximum level of 250 milligrams per liter. Nitrate concentrations are also high; the mean concentration for nitrate in the waters of the Rush Springs was 14.3 milligrams per liter. This concentration exceeds the maximum allowable level of 10 milligrams per liter. The most common types of water found in the Rush Springs aquifer are calcium-magnesium bicarbonate and calcium-sulfate.

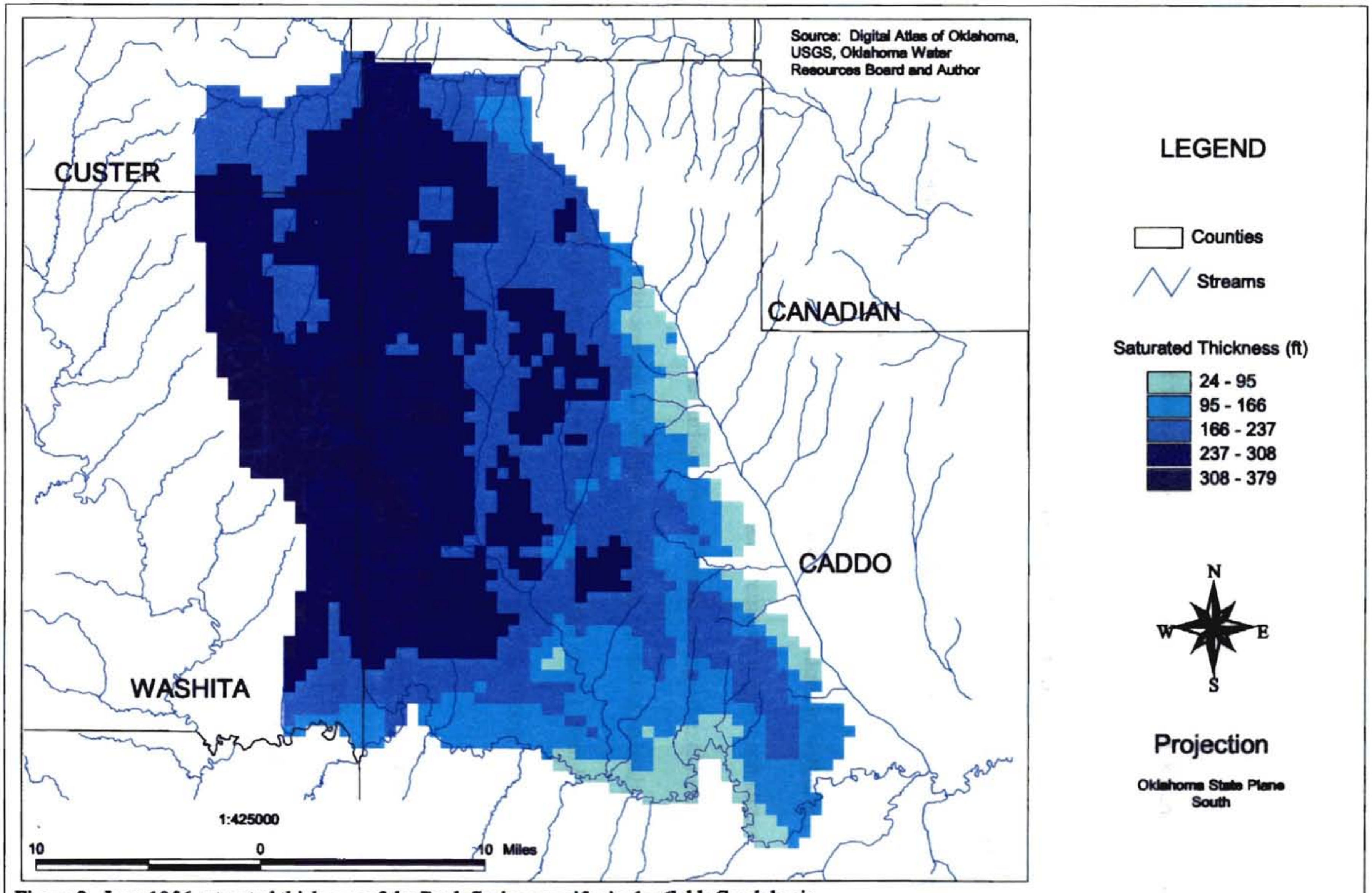


Figure 8. June 1956 saturated thickness of the Rush Springs aquifer in the Cobb Creek basin.

Recharge and Discharge

Recharge is the addition of water to the zone of saturation. (Tanaka and Davis, 1963). Recharge to the Rush Springs aquifer occurs primarily through precipitation and is extremely variable in both time and space. The amount of recharge by precipitation is governed not only by the total amount of precipitation but also by its intensity and distribution (Tanaka and Davis, 1963). Topography, land cover and soil type can also affect the amount of recharge by precipitation.

Becker (1998) estimated recharge to the Rush Springs aquifer within his study area to be about 2 inches per year, based on (1) measurements within each stream basin normalized by drainage area; (2) the surface area of the the study area; (3) the mean annual rainfall for the study area of 29 inches, and (4) the estimated annual ground water withdrawal for the study area. Becker varied recharge in the model from less than 1 inch per year to over 2 inches per year based on variations in rainfall, topography, and model responses to calibration (Becker, 1998).

Tanaka and Davis (1963) developed a quantitative estimate of recharge in the Cobb Creek basin by analyzing the effect of precipitation on ground-water levels in the basin. The estimated annual average recharge in the Cobb Creek basin ranged from 1.5 inches to 3.5 inches for the time period 1953 to 1956. The average rate of recharge for the 4-year period was 2.4 inches. Tanaka and Davis stated that because 1954 and 1956 were unusually dry years, they believed that a recharge rate of 2.8 inches would be about average over a long period, approximately 10 percent of the annual precipitation of 28.1

inches.

Natural discharge from the Rush Springs aquifer in the Cobb Creek basin occurs as evapotranspiration where the depth to water is shallow and as flow to streams, seeps and springs (Tanaka and Davis, 1963). Evaporation is the process by which water passes from the liquid state to the vapor state (Fetter, 1994). Transpiration is the process by which plants give off water vapor through their leaves (Fetter, 1994). Under field conditions it is not possible to separate evaporation from transpiration totally, so the two are often considered together. The majority of water loss due to evapotranspiration takes place during the summer months, with little or no loss during the winter. Evapotranspiration is the major use of water in all but extremely humid, cool climates (Fetter, 1998).

Discharge by transpiration and evaporation from the zone of saturation is negligible over most of the study area because the average depth to water is more than 50 feet. Only where the water-table is close to the land surface, such as along the major drainage systems, does discharge through evapotranspiration become significant (Tanaka and Davis, 1963).

Hillside seeps at the Rush Springs Formation and Marlow Formation contact occur along Spring Creek and Sugar Creek (Becker, 1998). The author observed springs and seeps south of Hinton, in Red Rock Canyon State Park (Figure 9).

A simplified estimate was made of the volume of ground-water discharged (base flow) to Cobb Creek by examining historical stream flow data. The Cobb Creek basin is located within the Upper Washita watershed, USGS Cataloging Unit 11130302. Information about the Cobb Creek basin can be found at the URL

Figure 9. Seep from the Rush Springs aquifer in Red Rock Canyon State Park, south of Hinton, Oklahoma.

http://www.epa.gov/surf2/hucs/1130302/, along with links to real-time and historical water data at the USGS URL http://www.usgs.gov/lookup/getwatershed?11130302. Mean daily discharge measurements for Cobb Creek at the Fort Cobb gaging station were downloaded from this site for for the years 1939 through 1949. The base flow for each year was determined by examining the data recorded from December through February, so that the effects of evapotranspiration and irrigation pumping on stream base flow would be minimal. It was estimated that the amount of ground-water discharge to Cobb Creek could range from 10 to 34 cubic feet per second (864,000 to 2,937,000 cubic feet per day). Becker (1998) reported base flow in Cobb Creek for 1989 and 1991. The average measured base flow for these years was 25.5 cubic feet per second (about 2,200,000 cubic feet per day).

The Rush Springs aquifer extends beyond the other streams bounding the study area and it would have been impossible to estimate the discharge that comes from only the model area. However, simplified estimates of discharge to some of these streams were used as a guide for model calibration purposes. The estimate of baseflow in the Washita River was about 12 cubic feet per second for October through December 1963.

Mean daily streamflow measurements were not available for the time period of interest for Deer Creek or Sugar Creek. Becker (1998) reported base flows for these streams as being 35.7 cubic feet per second and 17.0 cubic feet per second, respectively, averaged for the years 1989 and 1991.

Artificial discharge from the Rush Springs aquifer occurs as discharge to wells. Prior to large-scale development of the aquifer for irrigation, this discharge was small and the aquifer was in a relative state of dynamic equilibrium. Information regarding pumpage was collected in anticipation of a development period simulation for the study area.

Tanaka and Davis (1963) estimated that the pumpage in the Caddo County area totaled approximately 30,600 acre-feet (1,332,936,000 cubic feet) per year. This included discharge by irrigation, public supply, industrial, and rural wells in the following amounts (Table 2, from Tanaka and Davis, 1963):

Table 2. Estimated Pumpage in the Caddo County area, 1956.

Use	Pumpage (Acre-Feet)
Irrigation	24,000
Public Supply	2,800
Industrial	1,800
Rural	2,000

Irrigation pumpage was based on an average from 1956 to 1959. The remaining pumpage is based on estimates for 1960 (Tanaka and Davis, 1963).

Public supply use included municipalities located outside the model area. These values were itemized on page 40 of Tanaka and Davis (1963). Subtracting these values from the public supply total left 834 acre-feet as the pumpage for the public supply category. The irrigation value was derived from crop requirement estimates and crop acreage for all of Caddo County. This value is probably too high for the model area.

In 1997, reported irrigation water use in the model area was 34,171 acre-feet. Public supply use in the model area was 3,224.1 acre-feet for 1997. Reported industrial use was 55.1 acre-feet. These values were derived from the OWRB water rights database and could be underestimated because not all users report. Domestic users are not required by state law to report their use.

CHAPTER VI

NUMERICAL MODELING SOFTWARE

MODFLOW

MODFLOW is a three-dimensional, cell-centered, finite difference, saturated flow model developed by the USGS. The code is public domain and may be downloaded via the Internet at http://water.usgs.gov/software/ground_water.html. MODFLOW can perform both steady-state and transient simulations and has a wide variety of boundary conditions and input options.

The ground-water flow equation used in MODFLOW is based on Darcy's Law, which states that flow through porous media is directly proportional to water-level change over the flow path and is inversely proportional to the length of the path (Fetter, 1994). The flow equation is developed from Darcy's Law by applying the principals of conservation of energy and mass and is generally expressed as a partial differential equation (McDonald and Harbaugh, 1988). An approximate equation is substituted for the partial-differential equation. In MODFLOW, a finite-difference equation is substituted. This finite-difference equation treats time and space as discrete units, rather than as continuums (McDonald and Harbaugh, 1988).

The finite-difference technique subdivides the aquifer into a grid of blocks called cells. Aquifer parameters are assumed to be constant within a cell but may vary from cell to cell. The flow of water into and out of each cell from various sources must be calculated (Luckey and Becker, 1999). The technique used in this study places a node at the center of a cell. Water-levels are calculated at this node. Figure 10 illustrates a typical model cell. All the flows shown in this figure are not likely to occur at every cell.

All models are based on a set of simplifying assumptions. The basic assumptions of this model are (USGS Fact Sheet 121-97, 1997):

1. Saturated flow conditions exist;
2. Flow in the aquifer obeys Darcy's Law.;
3. The density of water is constant over time and space;
4. Flow is two-dimensional; and
5. The principal directions of horizontal hydraulic conductivity do not vary within the system.

A steady-state simulation is one in which the system being modeled is assumed to be in dynamic equilibrium; that is, recharge is equal to discharge and there is no change in head with time. Head is the elevation to which water rises at a given point as a result of reservoir pressure (AGI, 1984). In this study, the term head is used interchangeably with the words "water-level elevation". During a transient simulation, water is released from or taken into storage within the aquifer. Heads change with time as a result of this transfer of water (Anderson and Woessner, 1992).

Boundary conditions are mathematical statements specifiying the head or the flux at the boundaries of the problem domain (Anderson and Woessner, 1992).

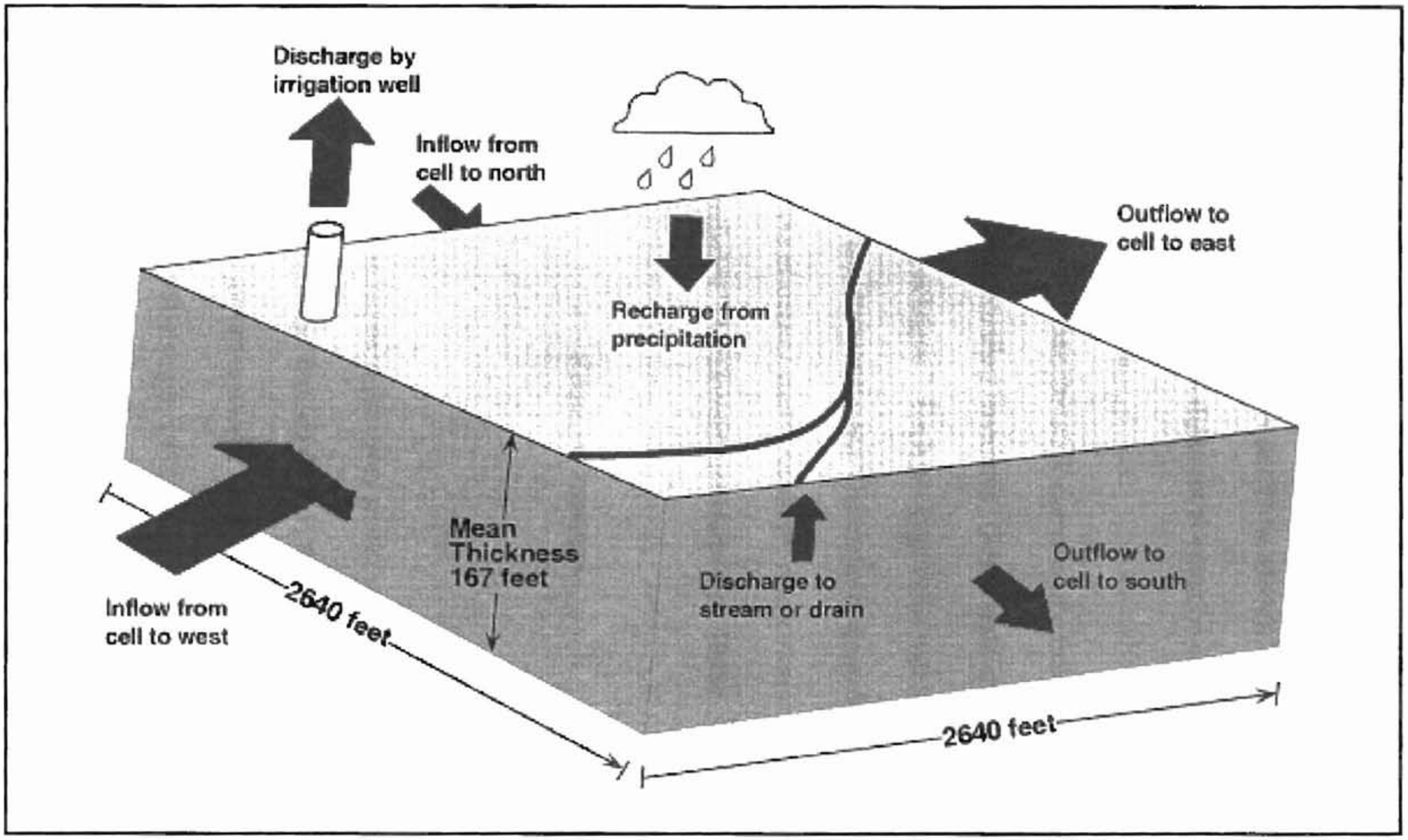


Figure 10. Model Cell with typical inflows and outflows, after Luckey and Becker, 1999.

The finite-difference model and its associated modular computer program is presented by McDonald and Harbaugh (1988) in the Techniques of Water-Resources Investigations of the United States Geological Survey paper entitled "A Modular Three-Dimensional Finite-Difference Ground-Water Flow Model." The derivation of the finite-difference approximation of the partial differential equation central to the code is described clearly in this same report.

The modular structure of MODFLOW consists of a main program and a series of highly independent subroutines called "modules" (McDonald and Harbaugh, 1988). The modules are grouped into "packages." Each package deals with a specific feature of the hydrologic system which is to be simulated. The major options that are available include procedures to simulate the effects of wells, recharge, rivers, drains, evapotranspiration, and "general-head boundaries" (McDonald and Harbaugh, 1988).

Required Packages

Basic Package

The Basic Package is required for every model constructed. It handles administrative tasks for the model. It reads data on the number of rows, columns, layers, and stress periods, on the major options to be used, and on the location of input data for those options (McDonald and Harbaugh, 1988).

The Basic Package is used to specify initial conditions, particularly the initial head distribution within the model. In a steady-state simulation, the initial head distribution is either the same magnitude of a few measured values in the area to be modeled or is interpolated from good distribution of measured points in the area to be modeled. A transient simulation typically begins with a steady-state distribution of heads.

The Basic Package is also used to specify the length of time for which the simulation will be run. Simulation time is divided into stress periods, which are time intervals during which all external stresses are constant, and which are in turn divided into time steps (McDonald and Harbaugh, 1988). The length of the stress period, the number of time steps into which it is to be divided, and the time step multiplier (the ratio of the length of each time step to that of the preceding time step) are all specified by the user. Using these terms, the length of each time step in the stress period is calculated by the program (McDonald and Harbaugh, 1988). Specification of stress periods is required for transient simulations, but not for steady-state simulations.

The primary output of a MODFLOW simulation is head distribution. The Basic Package can be used to control the frequency at which heads are printed or saved by invoking the Output Control option (McDonald and Harbaugh, 1988). Other output items include drawdowns and volumetric budget terms.

Block-Centered Flow Package

The Block-Centered Flow Package computes the conductance components of the finite-difference equation which determine flow between adjacent cells (McDonald and Harbaugh, 1988). It also computes the terms that determine the rate of movement of water to and from storage (McDonald and Harbaugh, 1988) in a transient simulation.

The Block-Centered Flow Package input includes the fundamental variables which control cell-to-cell flow and storage in the model. The variables to be input are dependent on the layer type chosen for each layer in the model. The variables may include transmissivity, hydraulic conductivity, specific yield, confined storage coefficient, vertical leakance, aquifer bottom elevation and aquifer top elevation (McDonald and Harbaugh, 1988).

Other parameters required for the Block-Centered Flow Package include the cell dimensions and a flag indicating whether the simulation is steady-state or transient.

Strongly Implicit Procedure Package

Several methods for solving finite-difference equations are available to MODFLOW. They include the Slice-Successive Over-Relaxation technique, the Preconditioned Conjugate-Gradient method, and the Strongly Implicit Procedure (SIP) method. The SIP was used to solve the finite-difference equations created from the input parameters of the Cobb Creek basin model. SIP is a method for solving a large system of simultaneous linear equations by iteration. A detailed description of this method is given by McDonald and Harbaugh, 1988, p. 12-1.

Local Sources/Sinks

River Package

The purpose of the River Package is to simulate the effects of flow between surface-water features and ground-water systems (McDonald and Harbaugh, 1988). Rivers and streams either contribute water to the ground-water system or drain water from the system, depending on the head gradient between the stream and the ground-water regime (McDonald and Harbaugh, 1988).

Each model cell crossed by a reach of a river requires six input parameters: layer, row, column, stage, conductance and river bottom elevation.

Flow between the stream and the ground-water system is given by McDonald and Harbaugh, 1988:

$$QRIV = CRIV(HRIV - h_{i,j,k})$$

where:

QRIV is the flow between the stream and the aquifer, taken as positive if it is directed into the aquifer;

CRIV is the hydraulic conductance of the stream-aquifer interconnection (KLW/M);

HRIV is the head in the stream; and

$h_{i,j,k}$ is the head at the node in the cell underlying the stream reach.

Figure 11 illustrates the manner in which a river cell simulates the stream/aquifer interaction. Flow between the river and the aquifer (QRIV) is parallel to the y-axis and increasing head in the aquifer (h) is parallel to the x-axis. When the head elevation in the aquifer cell is less than the elevation of the river bottom, the flow of water is into the aquifer, that is, the stream is losing over that particular reach. When the head elevation in the cell equals the river stage (HRIV), flow from the aquifer to the stream and vice versa estimated by the formula from McDonald and Harbaugh (1988) would equal zero. When the head elevation in the cell surrounding the river exceeds the stage of the river, the flow of water is from the aquifer to the stream; the aquifer discharges to the stream, and the stream is gaining on that particular reach.

The River package uses the streambed conductance to account for the length and width of the river channel in a cell and the thickness and vertical hydraulic conductivity

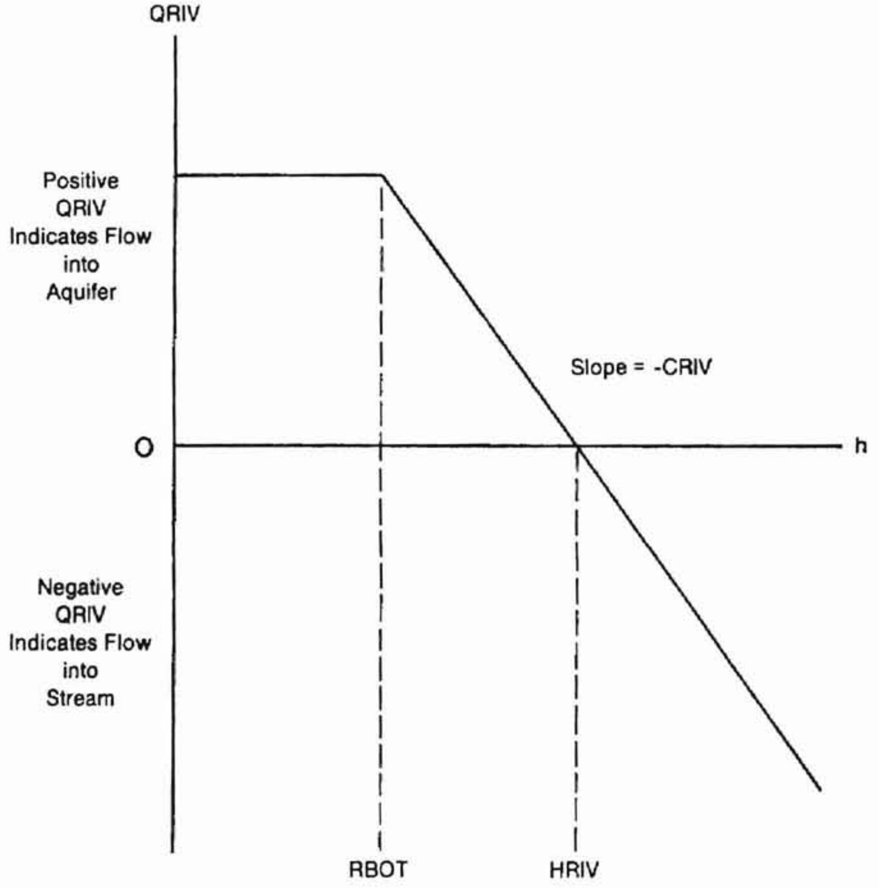


Figure 11. Plot of flow, QRIV, from a stream into a cell as a function of head, h, in the cell where RBOT is the elevation of the bottom of the streambed and HRIV is the head in the stream. From McDonald and Harbaugh, 1988.

of the river bed sediments. Conductance describes the degree to which the stream bed and the aquifer are interconnected and is

$$\mathrm{CRIV} = \frac{K\,L\,W}{M}$$

where:

CRIV hydraulic conductance of the stream aquifer interconnection;

K is the hydraulic conductivity of the riverbed material;

L is the length of the river reach in a cell;

M is the thickness of the river bed; and

W is the width of the river reach.

The above riverbed conductance formula can be generalized to estimate the required conductance term for all head-dependent boundaries as:

$$C = \frac{K\,L\,W}{M}$$

This was demonstrated by Morgan and McFarland (1996) in their simulation of a ground-water flow system in the Portland Basin of Oregon and Washington.

Drain Package (DRN)

The Drain Package is designed to simulate the effects of features such as agricultural drains, which remove water from the aquifer at a rate proportional to the difference between the head in the aquifer and some fixed head or elevation (McDonald and Harbaugh, 1988)

Drains behave in much the same manner as river cells. When the head in the cell surrounding the drain is greater than the drain elevation, water is discharged to the drain.

However, unlike the river cell, flow in a drain is never to the aquifer. Figure 12 illustrates the manner in which the drain package simulates flow in perennial streams and springs. The drain function is described by the equation pair (McDonald and Harbaugh, 1988):

$$QD_{i,j,k} = CD_{i,j,k}(h_{i,j,k}-d_{i,j,k}) \qquad \text{for } h_{i,j,k} > d_{i,j,k}$$

$$QD_{i,j,k} = 0 \qquad \text{for } h_{i,j,k} <= d_{i,j,k}$$

Input requirements for the Drain Package include the location of each drain (layer, row, and column), drain elevation and hydraulic conductance of the interface between the aquifer and the drain (McDonald and Harbaugh, 1988).

Well Package

The Well Package is designed to simulate features such as wells which withdraw water from the aquifer (or add water to it) at a specified rate, where the rate is independent of both the cell area and the head in the cell (McDonald and Harbaugh, 1988).

Well discharge is handled in the Well Package by specifying the volumetric rate, Q, at which each individual well removes water from the aquifer. Negative values of Q are used to indicate well discharge (McDonald and Harbaugh, 1988).

Input requirements for the well package include the row, column, and layer number of the cell in which the cell is located, and the discharge rate of that well during that stress period.

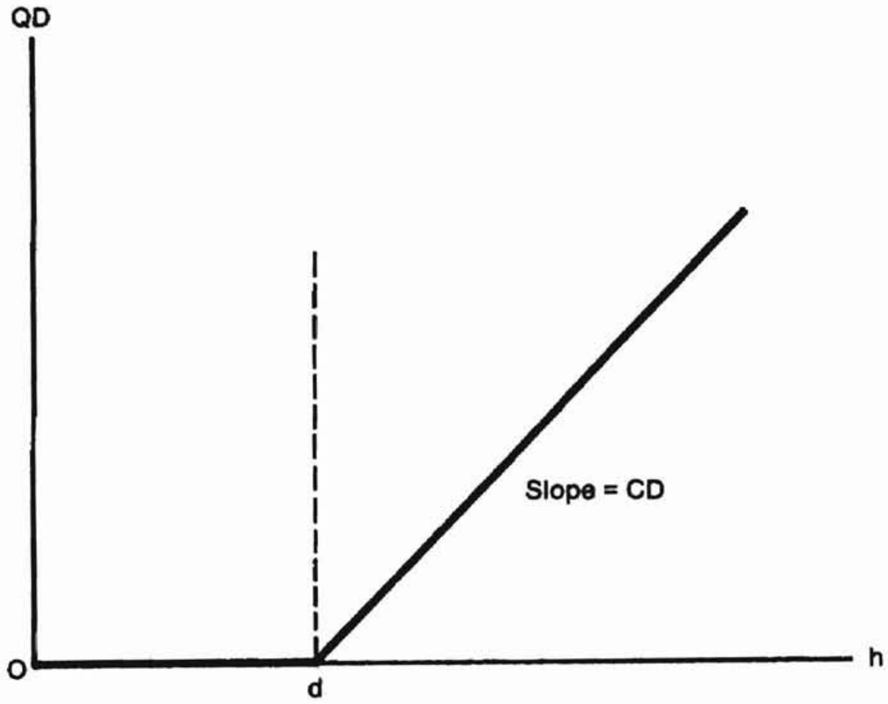


Figure 12. Plot of flow, QD, into a drain cell as a function of head, h, in a cell where the elevation of the drain is d and the conductance is CD. From McDonald and Harbaugh, 1988.

Areal Sources/Sinks

Recharge Package

The Recharge Package is designed to simulate areally distributed recharge to the ground-water system. Recharge is the addition of water to the zone of saturation (Driscoll, 1986). Most commonly, areal recharge occurs as a result of precipitation that percolates to the ground-water system (McDonald and Harbaugh, 1988).

Recharge applied to the model is defined as (McDonald and Harbaugh, 1988):

$$Q_{Ri,\,j} = I_{i,j} * DELR_j * DELC_i$$

where $Q_{Ri,\,j}$ is the recharge flow rate applied to the model at horizontal cell location (i,j) expressed as fluid volume per unit time; and $I_{i,j}$ is the recharge flux (in units of length per unit time) applicable to the map area of a cell ($DELR_j * DELC_i$). The recharge flow rate is applied to a single cell with the vertical column of cells located at (i,j).

Input requirements for the Recharge Package include the array of recharge flux and a flag indicating the layer in each vertical column where recharge is applied.

GMS

The pre- and post-processor used for constructing the model is called Ground-Water Modeling System (GMS). GMS was developed by Dr. Norm Jones under the direction of the U.S. Army Corps of Engineers and involved support from the U.S. Department of Defense, Department of Energy and Environmental Protection Agency.

GMS provides an easy-to-use graphical user interface (GUI) for MODFLOW input and enables easy visualization of the MODFLOW output. The required data for MODFLOW are input by the user and then converted by GMS to MODFLOW format files. These files are then read by MODFLOW when MODFLOW is executed. MODFLOW can be executed with a GMS menu command.

A useful feature in GMS is the Map module, which provides a suite of tools for defining conceptual models in GIS format using feature objects. Feature objects (points, arcs, and polygons), can be grouped together in layers. A set of layers can be constructed to represent a conceptual model of a ground-water modeling problem.

The Map module was used to construct the Cobb Creek basin model. A base map image of the Cobb Creek basin showing surficial geology, streams and wells was generated by ArcView and imported into GMS. This base map was digitized to create the model boundaries, a stream coverage and a well coverage. These coverages, along with areal attributes such as recharge and hydraulic conductivity, were quickly converted to MODFLOW grid format by executing a series of simple commands.

The Map module also provides time-saving tools to aid in model calibration and sensitivity analysis. Using observed water-levels, a set of calibration points and targets can be created. GMS automatically calculates the residual at each point, which is displayed visually and can be exported into a spreadsheet. GMS can also generate an error summary for each simulation, plot the observed values versus the simulated values, and plot the error versus simulation. All of these tools were used in the calibration and sensitivity analysis of the Cobb Creek basin model.

CHAPTER VII

MODEL DESIGN

Four general categories of information are needed for model design: (1) boundary conditions; (2) aquifer geometry, which includes the vertical and areal limits of the system; (3) aquifer parameters, including hydraulic conductivity, specific yield, streambed and drain conductance; and (4) aquifer stresses, which includes any additions or withdrawals of water that are not accounted for by the boundary conditions (Luckey and Becker, 1999).

Boundary Conditions

This model was constructed to understand the flow system of the Rush Springs aquifer in the Cobb Creek Basin. Model boundaries extended to geologic and hydrologic boundaries that could be realistically simulated. The eastern boundary of the model corresponds to the erosional extent of the Rush Springs Formation. This boundary was treated as a combination of both drain and zero-flow cells. A zero-flow cell is one in which no flow takes place and no water-level elevation is calculated; an inactive cell. It is at this boundary that the Rush Springs-Marlow contact is near land surface, and any downward flow of water is redirected to springs and seeps that contribute water to Sugar Creek. Approximately 4 miles of the eastern boundary which did not correspond with an actual stream was also simulated using drain cells. The aquifer continues east of this area and, in the real system, water probably crosses this boundary. North of this portion of the eastern boundary is Dead Woman Creek, which was simulated in the model using drains.

The northern boundary consists of the Little Deep and Deer Creeks. The flow in these streams is probably maintained by discharge from the Rush Springs aquifer and was simulated in the model using drains. The southern boundary is formed by the Washita River and was simulated using river cells.

Most of the western boundary was simulated as zero-flow. This portion coincides with an apparent ground-water divide indicated by the water-table map developed in 1956 by Tanaka and Davis (1963). This ground-water divide is also present in a regional potentiometric surface map of the Rush Springs aquifer constructed by Becker and Runkle (1998), and Becker (1998). Tanaka and Davis (1963) speculated that subsurface flow of water into the area north of the Washita River was limited by this ground-water divide and that the amount of inflow from the topographically higher areas to the north and west was small. About 3 miles of the western boundary corresponds to Cottonwood Creek, a tributary to the Washita River, and was simulated using drains.

The lower boundary of the model was the base of the Rush Springs Formation, which was treated as a zero-flow boundary. This boundary condition was probably appropriate for the western three-fourths of the model. In the eastern part of the model area, the saturated thickness in the Rush Springs aquifer is thin and the Marlow Formation is probably functioning as an aquifer rather than as a lower confining layer

(Becker, 1998).

The upper boundary of the model was the water-table. Recharge from precipitation moved downward across this boundary, and discharge to streams and rivers moved upward across this boundary. This boundary condition was probably appropriate for the eastern three-fourths of the model. In the extreme western part of the model area, the Rush Springs Formation is overlain by the Cloud Chief Formation. It is possible that the Rush Springs aquifer is under confined conditions in this area. In his regional model of the Rush Springs aquifer, Becker (1998) modeled the Cloud Chief Formation as a separate, confining layer to the Rush Springs. This layer was active in only 31 (3.5 km^2) cells on the western edge of the Becker's model area. It represented the Cloud Chief Formation where the thickness exceeded 50 feet and included about 10 feet of mudstone within the interval (Becker, 1998, personal communication). This area of significant Cloud Chief thickness was to the west of the Cobb Creek Basin model area. The Cobb Creek basin model may be less accurate in this area, but model results did not indicate any major problems due to this assumption.

Aquifer Geometry

The model area was gridded using 77 rows, 65 columns and one layer for a total of 5,005 cells. The rows were oriented in the east-west direction and the columns were oriented in the north-south direction. Each cell was 2,640 feet wide in both the north-south and east-west directions and covered an area of approximately one-quarter of a square mile. The cell covered the full vertical extent of the aquifer; the mean vertical thickness was 215 feet. A cell was termed active if a water-level was calculated at its node: the model had 2,483 active cells and 2,522 inactive cells (Figure 13).

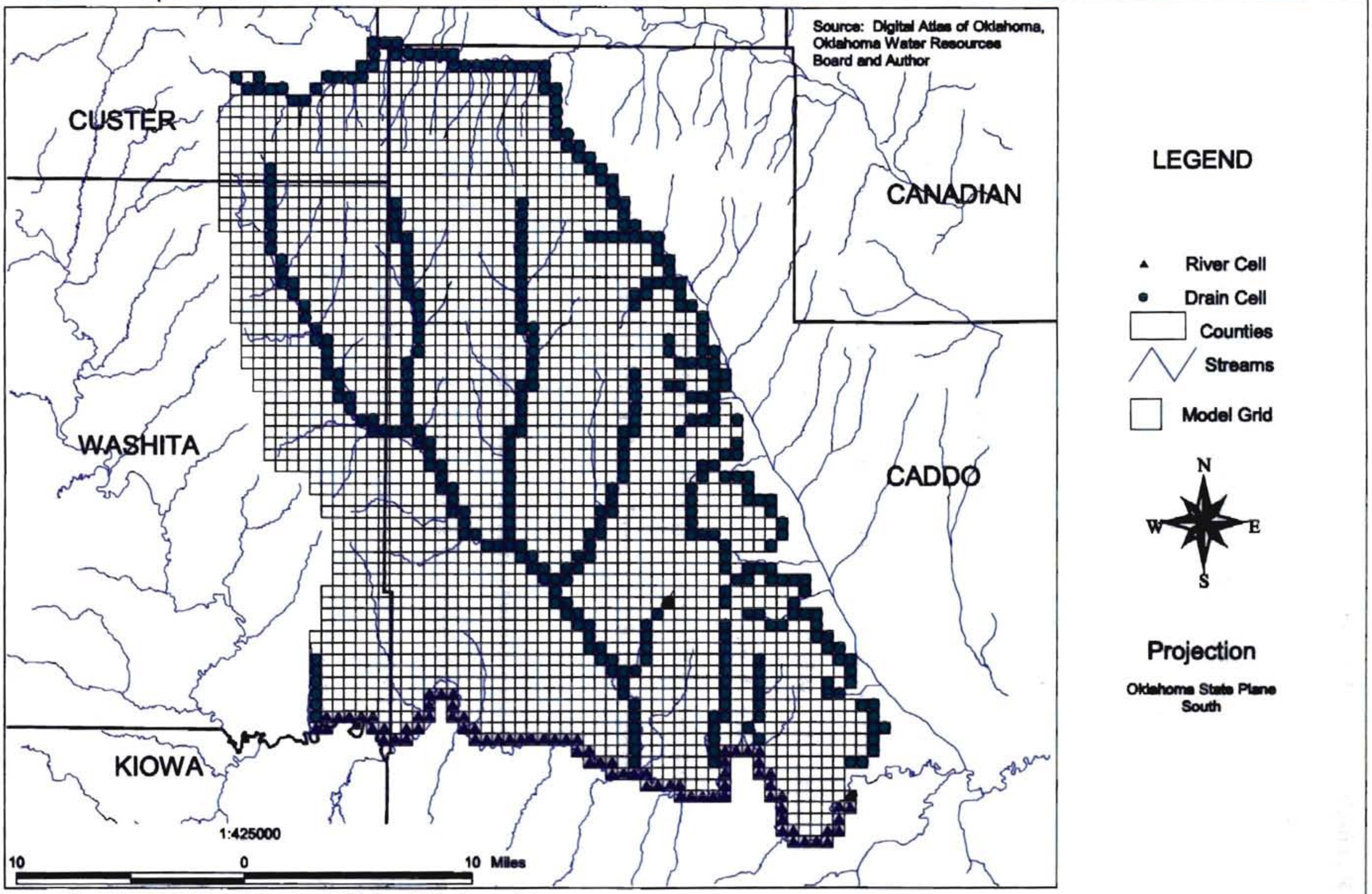
The model was used to simulate a steady-state system, representing the predevelopment period. The predevelopment period is the time period prior to major development of the aquifer for irrigation. For the Rush Springs aquifer in the Cobb Creek basin, the predevelopment period was before 1950. After this study is concluded, the model is intended to be used in a transient simulation to represent the period during and after major development of the aquifer (development period).

Aquifer Parameters

River Conductance

The Washita River was simulated in the model using the River Package of MODFLOW (McDonald and Harbaugh, 1988). River bottom elevation was determined using the 1:100,000 Oklahoma Digital Elevation Model (DEM) (Cederstrand and Rea, 1996). River stage was set at 3 feet greater than river bottom elevation for all reaches of the Washita River in the model area. This simple convention was employed by Becker (Becker, personal communication, 1998) in his regional model of the Rush Springs aquifer.

A range of riverbed conductance values for the Washita River was estimated using the general conductance formula given on page 56 of this paper. Freeze and Cherry (1979) gave a range of typical hydraulic conductivity values for consolidated and unconsolidated aquifer materials. The range of horizontal hydraulic conductivity given



Source: Digital Atlas of Oklahoma, Oklahoma Water Resources Board and Author

Figure 13. MODFLOW grid for the Cobb Creek basin model.

for silty sand to gravel was 1×10^{-7} to 1 m/s (0.028 to 283,392 ft/day). The Washita River alluvial deposits between Clinton and Anadarko range in thickness from 0 to 120 feet and average about 64 feet (Hart, 1965). Based on this range of hydraulic conductivity and the average thickness of the alluvial deposits, in combination with the dimensions of each river cell in the Cobb Creek basin model, an acceptable range of riverbed conductance values was estimated to be from 3005 to 3×10^{10} ft^2/day. The initial riverbed conductance value for all river cells in the Cobb Creek model was 5000 ft^2/day.

Drain Conductance

Drain nodes were used in the model to simulate a number of small streams, seeps and springs that originate near the eastern aquifer boundary and also the internal stream system of Cobb Creek. Several drain nodes were used to simulate streams draining the aquifer along the northern and southern boundaries. These stream elevations were estimated using a 1:100,000 Oklahoma Digital Elevation Model (DEM) (Cederstrand and Rea, 1996).

A range of drain conductance values was estimated using the general conductance formula on page 56 of this report. The range of hydraulic conductivity for fine-grained sandy silt given by Freeze and Cherry (1979) was 2.8×10^{-4} to 283 ft/day. The alluvial deposits in the lower part of Cobb Creek reach a maximum thickness of 30 feet (Davis, 1950). Using these values along with the area of each cell crossed by a reach of the stream, the estimated range of drain conductance values was 65 to 6.5×10^{7} ft^2/day. Drain conductance values were initially set at 2000 ft^2/day.

The range of conductance values for the drains used to simulate cross-boundary flow over the 4-mile portion of eastern boundary was also estimated using the general conductance formula on page 56 of this paper. The average thickness of the Rush Springs Formation in these cells was 198 feet, and the range of hydraulic conductivity for friable sandstone given by Driscoll (1986) was 1 to 1000 ft/day. The estimated range of conductance values for the these drain cells was 35,000 to $3.5\text{x}10^8$ ft^2/day. These conductance values were initially set at 35,000 ft^2/day. The elevations of these drains were set to the elevation of the water-table.

Estimates of conductance for other drains in the model were not made. Other drains in the model corresponded to Cottonwood, Leaper, Deep, Little Deep, Deer, Dead Woman Creeks, and other tributaries to Cobb and Sugar Creeks.

Base of Aquifer

A base-of-aquifer array for the Cobb Creek basin model was prepared using drillers' logs on file with OWRB. Drillers' logs generally gave a good description of the strata encountered during the drilling process. Only those wells drilled for irrigation purposes were used to estimate the base-of-aquifer elevation of the Rush Springs. It was assumed that a high-capacity irrigation well was drilled through the entire thickness of the Rush Springs in order to take advantage of the full saturated thickness of the aquifer. The Marlow Formation was identified by the drillers in several ways, including the designation "Marlow," "Red Clay, or "Red Bed," and "Marlow Clay" and the depth below land surface that it was encountered was recorded.

A point coverage with associated base-of-aquifer elevations was created from the drillers' logs using the digitizing tools in ArcView, the Oklahoma DEM (Cederstrand and Rea, 1996) and an Arc/Info command called LATTICESPOT. First, each well spot was digitized and attributed with the depth of the Marlow recorded on the driller's log. Then, the resulting point coverage was imported to Arc/Info along with the Oklahoma DEM. In Arc/Info, each well point was matched to a surface elevation on the Oklahoma DEM using the Arc/Info command LATTICESPOT. The LATTICESPOT command interpolated the surface elevation for each point in the coverage and added this value as a new attribute to the attribute table of the well point coverage. The elevation of the top of the Marlow was then calculated by subtracting the depth to the top of the Marlow from the surface elevation derived from the DEM, giving the elevation of the base of the Rush Springs aquifer at each point. The resulting point coverage was imported into GMS and interpolated to the existing MODFLOW finite-difference grid to create the base-of-aquifer array. The point coverage was initially hand-contoured; the computer interpolation technique, known as the natural neighbor technique, most closely matched the hand-drawn contours. Figure 14 shows the distribution of the points used to create the base-of-aquifer array and the resulting contour map.

Areas where lack of data may have affected the base-of-aquifer interpolation are along the edges of the model and in the extreme southwest and southeast corners. Errors in the base-of-aquifer array could result from misinterpretation of the lithology encountered and recorded by the driller and from misinterpretation of the drillers' logs when picking the top of the Marlow. Errors were likely generated when the elevations for each point were interpolated from the Oklahoma DEM and compounded when the point coverage was interpolated to the MODFLOW grid. However, the base-of-the-aquifer map appears reasonable within the study area and is suitable for modeling purposes.

Water-Table

A June 1956 water-table map of the study area was created by Tanaka and Davis

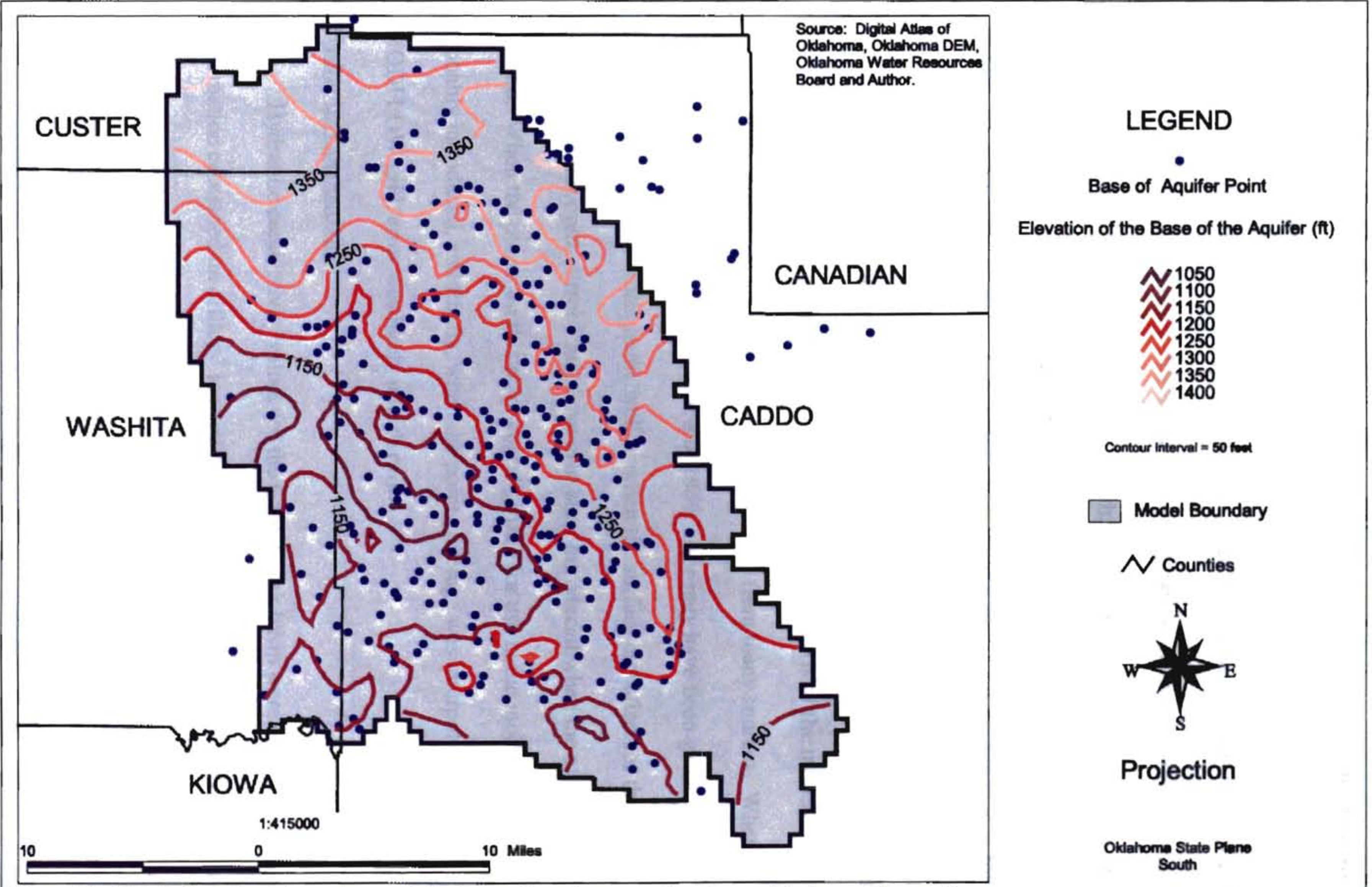

Source: Digital Atlas of Oklahoma, Oklahoma DEM, Oklahoma Water Resources Board and Author.

Figure 14. Distribution of points used to create the base-of-aquifer map and contours of the base of the aquifer.

(1963). This map was scanned, registered and the points digitized using the digitizing tools in ArcView. The point coverage was supplemented with stream elevations derived from the Oklahoma DEM and imported to GMS. The point coverage was interpolated to the existing MODFLOW finite-difference grid using the natural neighbor technique. This interpolation technique produced an array which, when contoured, most closely matched Tanaka and Davis' contours. Figure 15 shows the distribution of points used to create the water table map and the resulting contours. The Tanaka and Davis source map is found on Plate 1.

The model may be less accurate in areas where there was a lack of data points. Such areas occur in the northern and extreme southwestern parts of the model. Uncertainty in the potentiometric surface array arrives from many sources. When the water-level measurments were collected in 1956, error may have been generated in measuring the depth to water in the well or when the surface elevations of the wells were estimated or surveyed. Error could have also been introduced when the map itself was created. When the points on this map were digitized for use in the model, error was probably introduced, and finally, when the point coverage was interpolated to the MODFLOW grid, error was likely introduced.

Hydraulic Conductivity

Hydraulic conductivity values for the Cobb Creek basin were estimated using information contained on drillers' logs on file with the OWRB to establish an acceptable range for use in calibrating the model. The range of hydraulic conductivity estimated from data found on the drillers' logs was 0.5 to 19 feet per day. A hydraulic conductivity of 19 feet per day was estimated in only one well, the remaining estimates were within

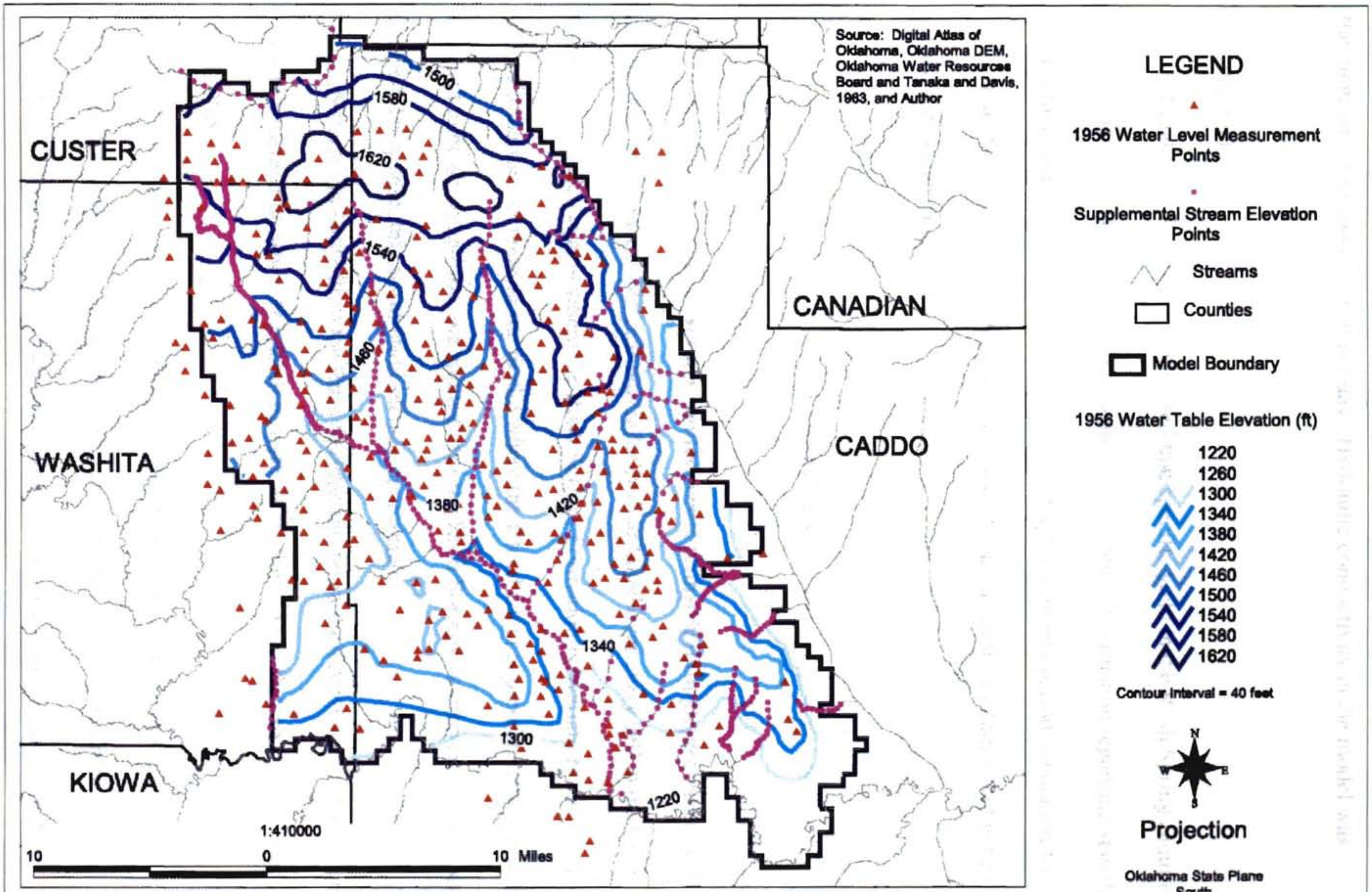


Figure 15. Distribution of points used to create the water table map and contours of the elevation of the water table.

the range of 0.5 to about 11 feet per day. Hydraulic conductivity in the model was initially set to 5 feet per day.

Specific Yield

Tanaka and Davis (1963) reported that specific yield in the Rush Springs aquifer ranged from 13 to 34 percent, with a mean of 25 percent. Information regarding specific yield is included in this section in anticipation of a development period simulation for the study area. Specific yield is a required parameter for a transient simulation, but not a steady-state simulation.

Aquifer Stresses

Recharge to the Rush Springs aquifer occurs primarily through precipitation. The average rate of 2.8 inches per year was initially distributed over every cell in the Cobb Creek basin model, except where the Rush Springs Formation is overlain by the Cloud Chief Formation. In areas of the model where the Cloud Chief is present, recharge was assumed to be about half the rate applied over the Rush Springs outcrop area. Based on the model response, this assumption seemed appropriate.

Natural discharge from the Rush Springs aquifer in the Cobb Creek basin occurs as evapotranspiration where the depth to water is shallow and as flow to streams, seeps and springs.

The literature does not quantify the volume of water lost to evapotranspiration, and no attempt to explicitly model this loss was attempted in the Cobb Creek basin model. An estimate of discharge due to evapotranspiration was made during model calibration and is described in Chapter VIII of this paper.

CHAPTER VIII

MODEL CALIBRATION, RESULTS, AND SENSITIVITY ANALYSIS

Model Calibration

Calibration of a flow model refers to a demonstration that the model is capable of producing field-measured heads and flows, which are the calibration values. Calibration is accomplished by finding a set of parameters, boundary conditions, and stresses that produce simulated heads and fluxes that match field-measured values within a preestablished range of error (Anderson and Woessner, 1992).

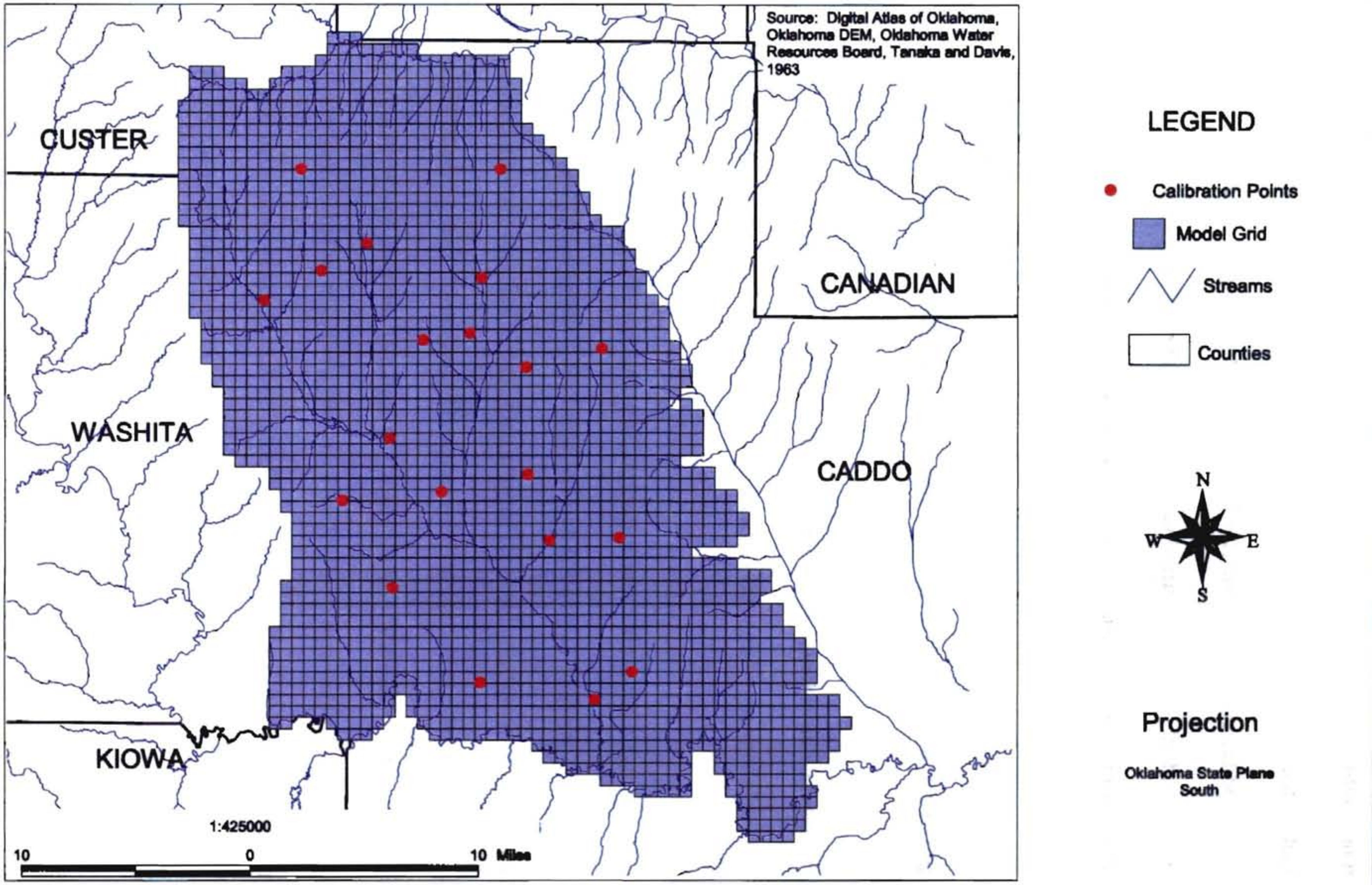
Estimates of flow as calibration values, in addition to heads, are essential to increase the likelihood of achieving a unique calibration (Anderson and Woessner, 1992). For example, when calibrating a model, an increase in hydraulic conductivity creates the same effect as a decrease in recharge, making it possible to calibrate the model to heads by adjusting either hydraulic conductivity or recharge. Calibration to flow gives an independent check on hydraulic conductivity values (Anderson and Woessner, 1992).

Calibration of the predevelopment period Cobb Creek basin model was based on two reasonable assumptions: (1) that the pre-1950 water-level elevations exceeded the June 1956 water-level elevations; and that (2) ground-water discharge is primarily to streams and that the elevation of the streams is a close approximation of the water-table elevation. The predevelopment period model integrated data on the elevation of the base of the aquifer, hydraulic conductivity, streambed conductance, and recharge from precipitation and then calculated the elevation of the water-table, discharge to rivers and streams, and discharge across the artificial boundary on the western edge of the model.

Water-level measurements were extremely sparse for the time period before 1950. Water-level measurements that did exist were not viewed with confidence because information regarding well construction and completion were not available. Twenty points were selected to serve as calibration points. A map showing the location of the calibration points is shown as Figure 16. Six calibration points were located on reaches of Cobb Creek. The elevation of the land surface is assumed to be equal to the elevation of the water-table at these points. The stream elevations were estimated from the Oklahoma DEM. The model was considered, in part, to be calibrated if the calculated water-level was with 15 feet of the estimated values at these points. Fourteen calibration points corresponded with water-level measuring points from the 1956 water-table map of the Caddo County irrigation area constructed by Tanaka and Davis (1963). If the calculated water-level at these points was greater than the measured value, the model was considered, in part, to be calibrated.

Ground-water discharge to Cobb Creek was also used as a calibration value. Cobb Creek is the only stream deriving its total flow from within the model area. Flow in Cobb Creek was estimated to be between 860,000 and 3,000,000 cubic feet per day (approximately 10 and 35 cubic feet per second, respectively).

As model heads rose and discharge to Cobb Creek approached the upper end of the range of estimated values, the model was periodically evaluated for closeness-of-fit to



Source: Digital Atlas of Oklahoma, Oklahoma DEM, Oklahoma Water Resources Board, Tanaka and Davis, 1963

Figure 16. Location of calibration points for the Cobb Creek basin model

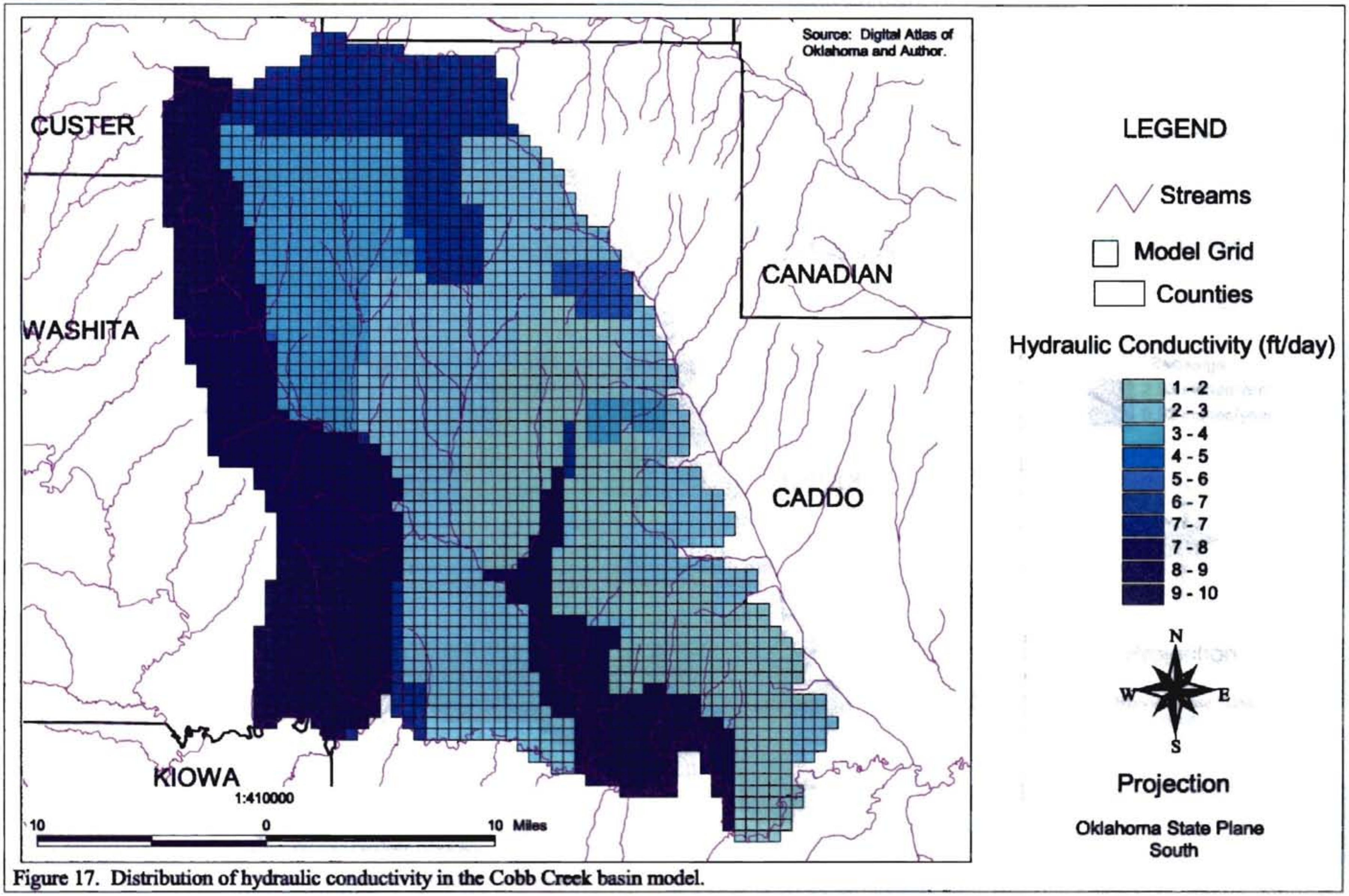
the 1956 water-table map by activating the Well Package and making a simulation run with pumping stress applied. Once drawdown from pumping did not exceed 70 feet in within the study area, the predevelopment model was considered to be calibrated.

The model was calibrated using the trial-and-error technique. In this type of calibration technique, parameter values are adjusted in sequential model runs to match simulated heads and flow to the calibration targets. Hydraulic conductivity, recharge, and streambed conductance were varied during the calibration process. Changes in areal parameters were made over large areas and were not made cell-by-cell simply to improve the fit of the model.

Hydraulic conductivity was adjusted throughout the model within a range of 0.5 to 10 feet per day. Distribution of hydraulic conductivity throughout the modeled area is shown in Figure 17.

The net recharge rate was adjusted uniformly until a reasonable agreement between measured and simulated discharge to Cobb Creek was achieved. The model area was divided into two recharge zones. One zone of recharge corresponded to the outcrop area of the Rush Springs Formation. The other zone occured where the overlying Cloud Chief Formation was present. The final recharge values for the calibrated predevelopment model were 2.83 in/year over the Rush Springs outcrop area, and 0.92 inches/year over areas where the Cloud Chief was present. The distribution of recharge values over the model is shown in Figure 18.

Streambed conductances were altered during calibration and the following ranges of values were used in the calibrated model (Table 3):



Source: Digital Atlas of Oklahoma and Author.

Figure 17. Distribution of hydraulic conductivity in the Cobb Creek basin model.

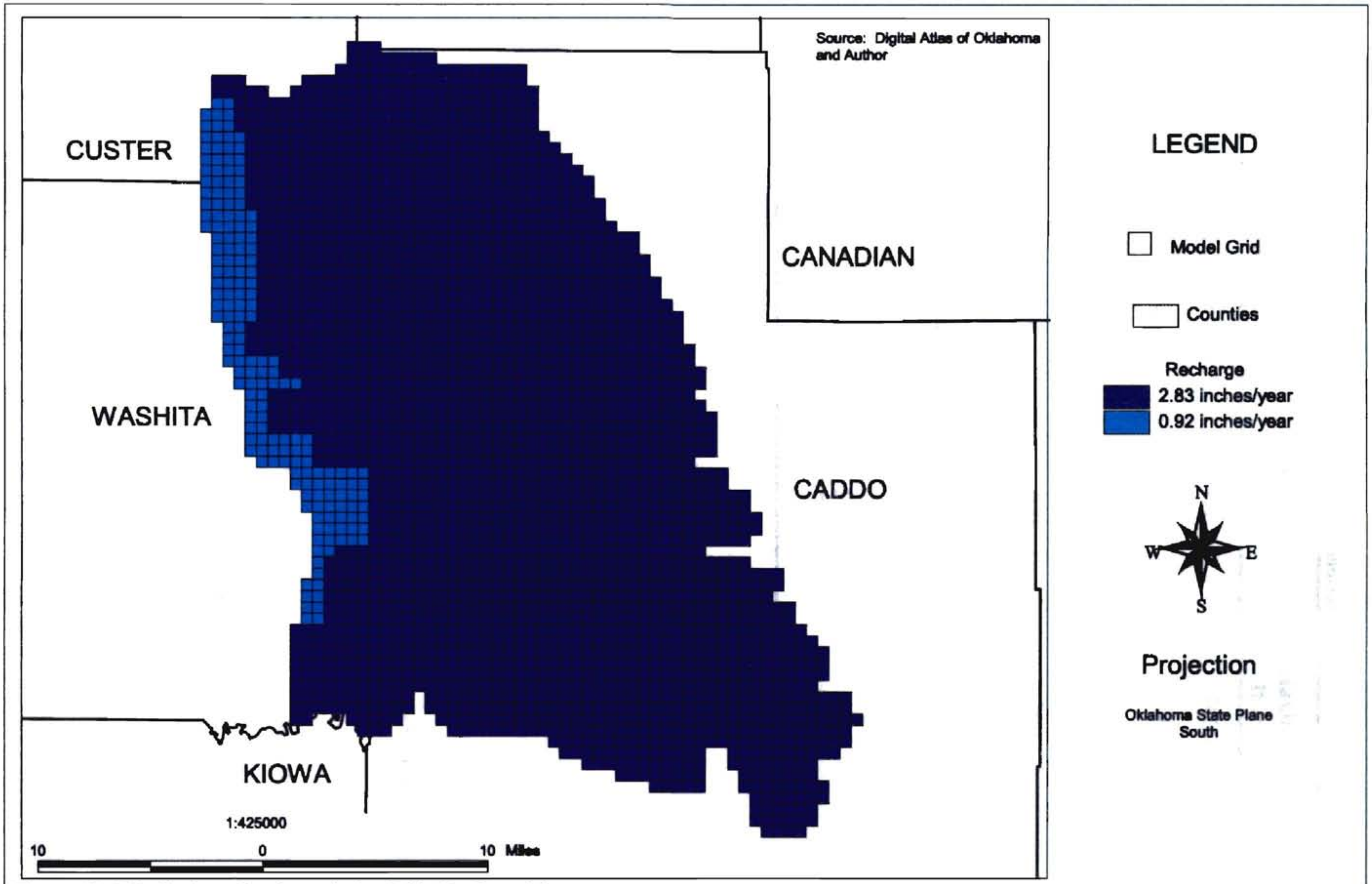


Figure 18. Distribution of recharge in the Cobb Creek model area.

Table 3. Ranges of Streambed Conductances Used.

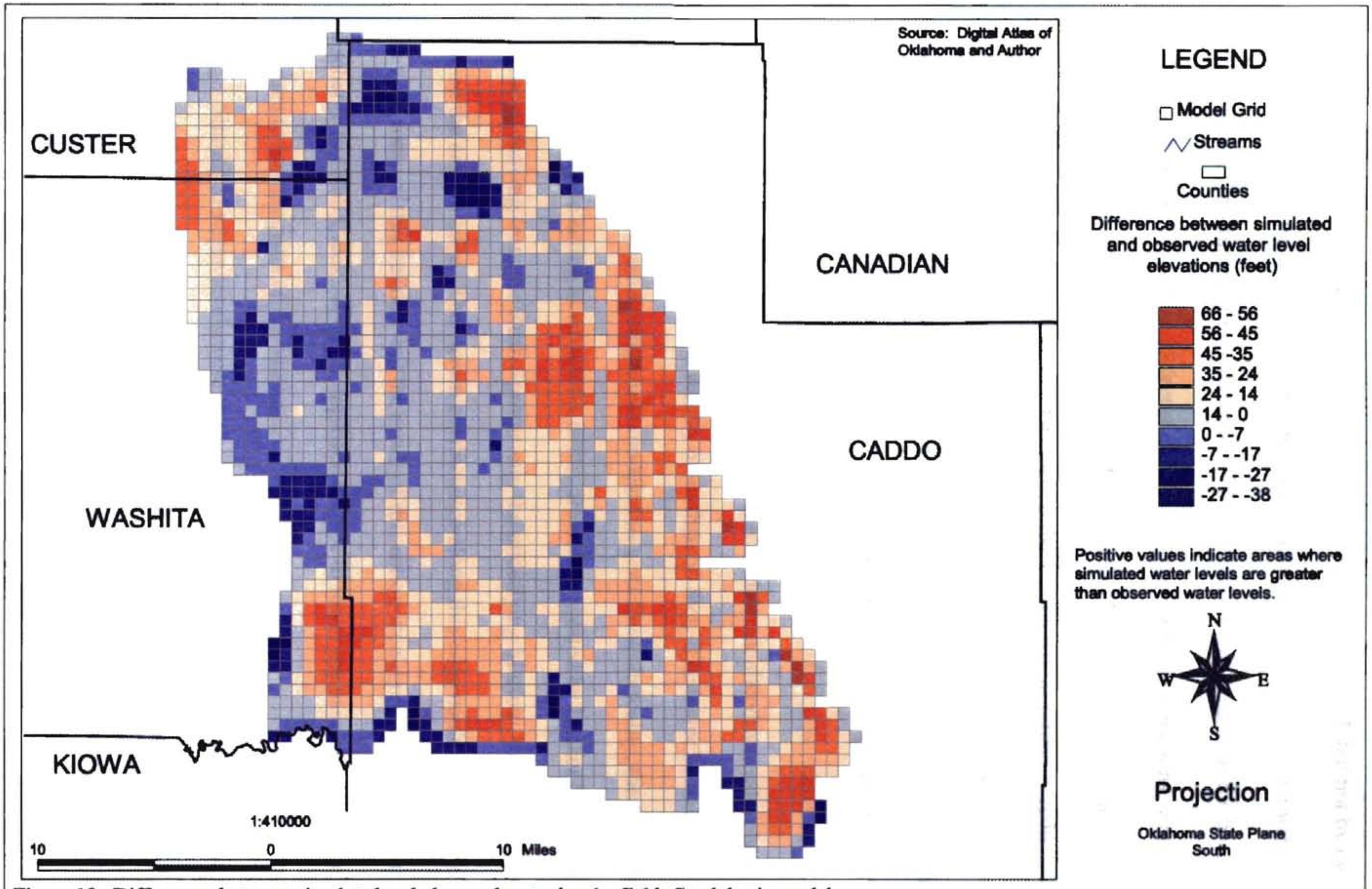
Stream	Minimum (ft^2/day)	Maximum (ft^2/day)
Sugar Creek tributaries	100	1000
Cobb Creek and tributaries	200	8000
Little Deep/Deer Creek	400	2000
Cottonwood Creek	200	200
Dead Woman Creek	300	1000
Washita River	275	5000
Deep Creek	50	500
Leaper Creek	100	1000

Model Results

Differences between simulated and 1956 water-levels or estimated discharges to streams remained after the calibration process ended. In this section, these differences will be discussed and the potential causes for the differences will be examined for the benefit of future investigators.

A map of the differences between the simulated water-levels and the observed 1956 water-levels is shown in Figure 19. This map was created by subtracting the predevelopment water-level map from 1956 water-level map.

Water-levels throughout most of the model were greater than the 1956 water-levels ("observed water-levels"). Most of the simulated water-levels on Cobb Creek were



Source: Digital Atlas of Oklahoma and Author

Positive values indicate areas where simulated water levels are greater than observed water levels.

Figure 19. Differences between simulated and observed water levels, Cobb Creek basin model.

greater than the stream elevation estimated from the Oklahoma DEM, but not by more than 15 feet. Two isolated areas on Cobb Creek had water-levels that were notably greater than the estimated stream elevation. Water-levels in one area, near the head of Cobb Creek, were as much as 35 feet above the estimated stream elevations; water-levels in the other area, near the confluence of Willow and Cobb Creek, were as much as 30 feet above. Increasing the streambed conductance in these cells would probably reduce the water-level to within 15 feet of the stream elevation. This adjustment would cause more discharge to the stream and may have an affect on the water-levels around the stream. With the previous two exceptions, the model was considered to simulate heads along the reaches of Cobb Creek well.

In some areas along the eastern edge of the model, calculated water-levels were greater than the observed water-levels by more than 50 feet. The lower boundary in this area, the base of the Rush Springs, was modeled as zero-flow. In reality, the Marlow Formation may be acting as an aquifer in this area, as suggested by Becker (1998). Thus, instead of moving from the Rush Springs into the underlying Marlow, the water builds up against the eastern edge. The stream conductance along this edge could be increased to alleviate some of this buildup, but the result of this action would probably increase the discharge to Cobb Creek. A better approach may be to lower the base of the aquifer in this area to include parts of the Marlow.

Simulated water-levels were as much as 65 feet greater than observed levels in the extreme northeastern corner of the model. Due to the sparse distribution of water-level data, the source of the problem could not be identified. This model region was therefore considered less reliable.

In the southeastern corner of the model, water-levels were as much as 46 feet greater than observed levels. Data on water-levels were sparse in this area and again, the model was considered to be less reliable. This part of the model could probably be simulated more effectively by moving the western boundary in this area to follow Cedar Creek.

In parts of the model, simulated water-levels were below the observed levels. In an area along the western boundary, the simulated water-levels were as much as 20 feet below observed water-levels. Those differences may have been partially due to treating the western boundary as zero-flow, but more likely were due to recharge on this part of the Cloud Chief outcrop being underestimated. Further south along the western border, water-levels in a few cells were as much as 50 feet below the 1956 observations. Due to the sparse data distribution it was difficult to attribute the problem to any specific cause.

At the head of Spring Creek is an area where calculated water-levels are as much as 29 feet below observed water-levels. Water-level data is sparse in the area, so the reason for this difference in water-levels is very difficult to ascertain. A similar situation occurs just to the north of this area. In these areas, the model may not be very reliable.

East of the area at the head of Spring Creek are small regions that have calculated water-levels that are as much as 18 feet below observed water-levels. The drawdown, while not severe, may result from underestimation of recharge in this area. Decreasing hydraulic conductivity in this area did not cause notable improvement of these differences.

Simulated predevelopment water-levels were compared to observed water-levels at 20 points. A graph of the differences between simulated and observed predevelopment water-levels is shown in Figure 20. Statistics for the differences are as follows:

Mean difference:	11.55 feet
Mean absolute difference:	14.93 feet
Root mean square difference:	18.52 feet
Calibration points within 10 feet:	45 percent
Calibration points within 25 feet:	85 percent
Calibration points within 50 feet:	100 percent

Agreement between estimated and simulated predevelopment discharge to Cobb Creek was examined. The estimated discharge to Cobb Creek was between 10 and 35 cubic feet per second. At the end of the calibration process, simulated discharge to Cobb Creek was about 65 cubic feet per second. The discharge is about 30 cubic feet per second more than the upper limit of estimated discharge. The reason for this difference can be attributed to loss due to evapotranspiration. Evapotranspiration can have a significant impact where the water-table is close to the land surface, such as near Cobb Creek. Another way to simulate this loss would be to use the evapotranspiration package available in MODFLOW.

Another way to check of the residual error in the solution is to compare the total simulated inflows and outflows, as computed by MODFLOW, in the water budget. The difference between inflow and outflow is divided by either inflow or outflow to yield error in the water balance (Anderson and Woessener, 1992). The MODFLOW water balance for the predevelopment model is:

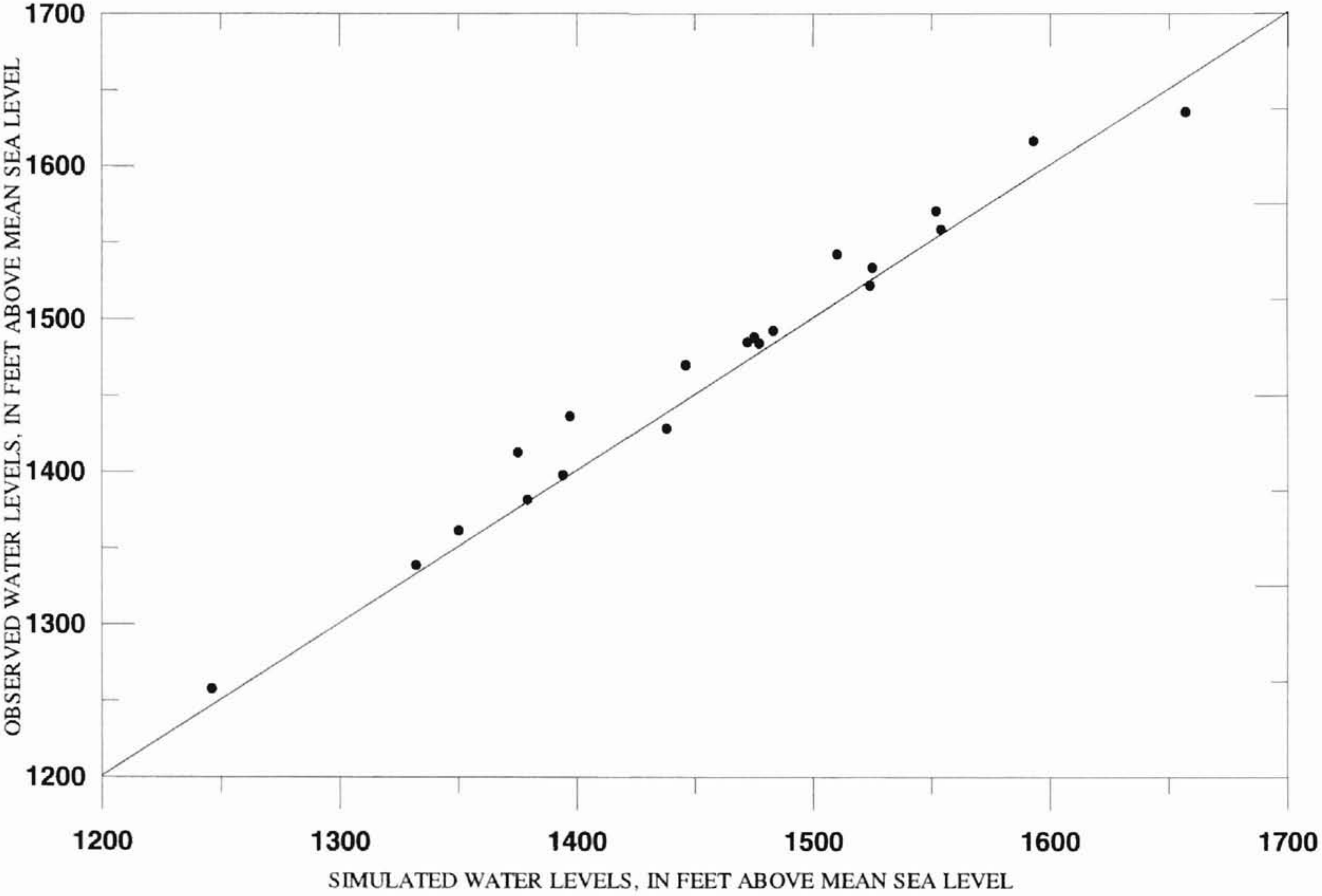


Figure 20. Comparison of observed and simulated water levels in calibration points for the predevelopment period model.

IN:

Recharge = 10,640,000 cubic feet per day

OUT:

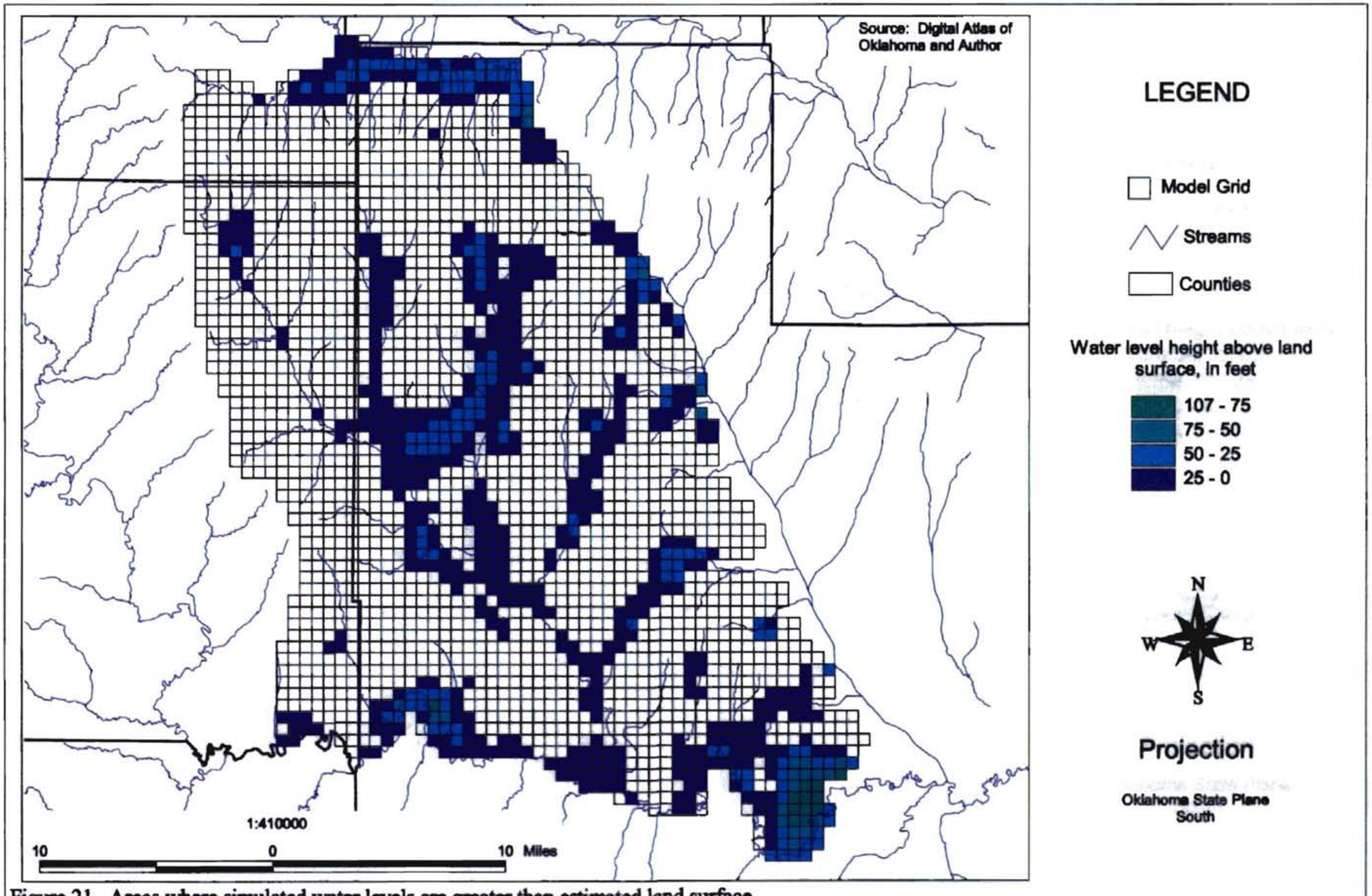
Drains = 8,885,600 cubic feet per day
River Leakage = 1,755,400 cubic feet per day

Total In - Total Out = -1000 cubic feet per day

Percent Discrepancy = -0.01

To ensure that the resulting head distribution was reasonable, it was compared to a map of the elevation of the land surface in the model area. Subtracting the predevelopment map from the land surface map results in a depth-to-water map. There were areas in which the predevelopment water-levels were greater than the land surface (Figure 21). While this was of concern, it was not surprising. For comparison, the 1956 water-table map was subtracted from the land surface map. The resulting depth-to-water map derived from this calculation showed similar areas where the 1956 water-level was above land surface (Figure 22).

The predevelopment period model generally simulated water-levels greater than 1956 water-levels in much of the model area. The water-levels calculated at the stream nodes were within 15 feet of the estimated stream elevation. The model was considered to be reliable with respect to water-levels in these areas. The simulated discharge to Cobb Creek was greater than the estimated discharge. This excess can be reasonably explained as the loss that would probably have occured due to evapotranspiration, and so the discharge to Cobb Creek was considered to be reasonable.



Source: Digital Atlas of Oklahoma and Author

Figure 21. Areas where simulated water levels are greater than estimated land surface.

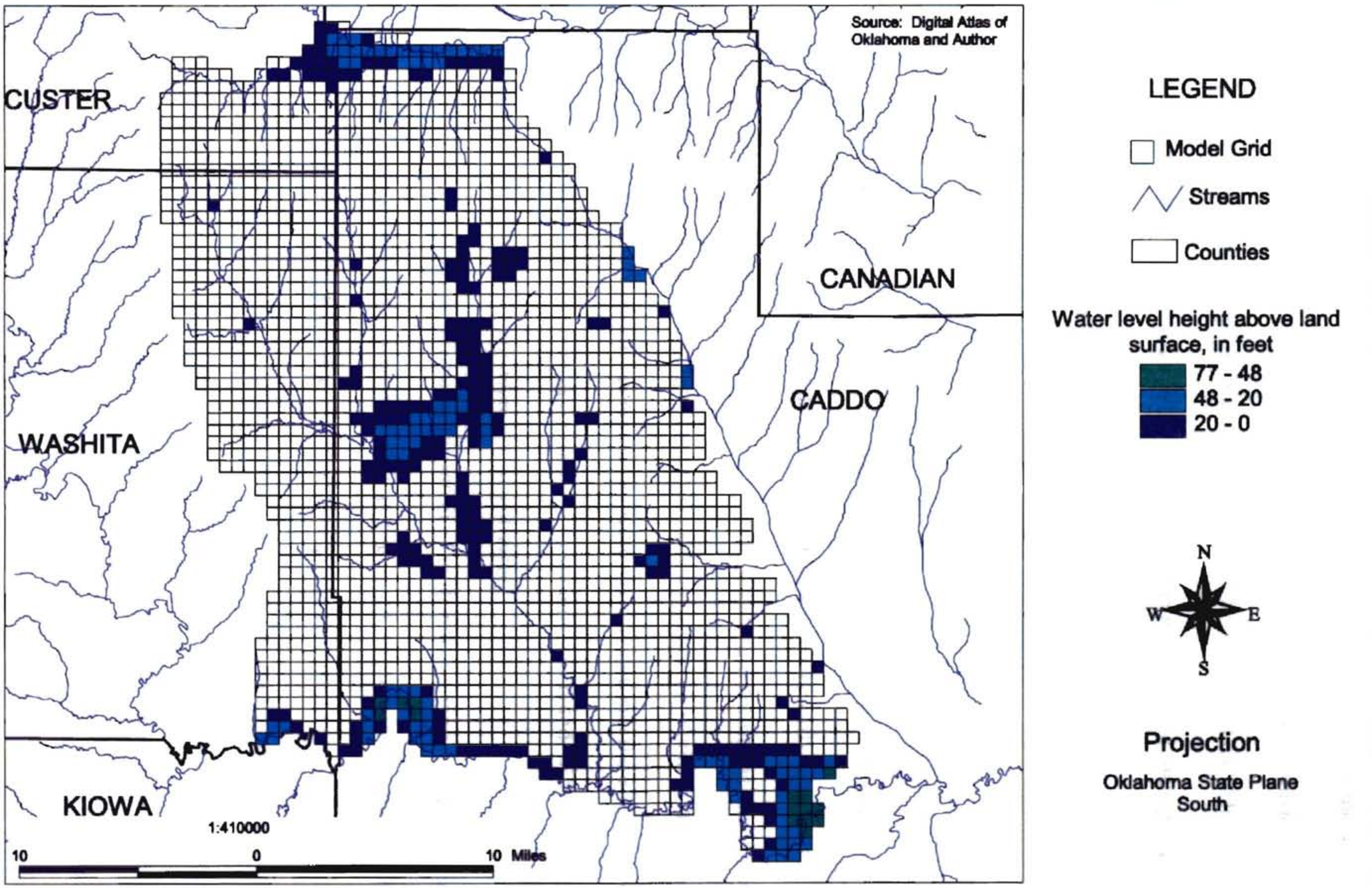


Figure 22. Area where 1956 water levels are greater than estimated land surface.

In the areas where head differences were greater than ± 25 feet, the model should be considered less reliable with respect to water-levels. This model was considered to adequate for its intended purpose; that is, to understand flow within the Cobb Creek basin and to provide a tool with which OWRB could use in the planning and management of the basin.

Model Sensitivity Analysis

A sensitivity analysis was performed on the predevelopment period model to determine its response to change in model inputs. The sensitivity analysis consisted of uniformly increasing or decreasing one or two model inputs and noting the change in simulated water-levels and discharge to streams. For the predevelopment period model, changes in recharge and hydraulic conductivity were investigated and the effect of these changes on simulated water-levels and discharge to streams was noted. Changes in the areal distribution of model inputs were not investigated.

For the predevelopment model, the effect of uniformly varying recharge while keeping all other model inputs fixed is shown in Figure 23. Recharge was changed by up to 75 percent of the calibrated value. Discharge response to changes in recharge was linear. Decreasing recharge by 25 percent would result in the smallest error between simulated and observed water-levels. Increasing recharge by 50 percent caused simulated water-levels at the calibration points to be as much as 80 feet greater than the observed water-levels. Decreasing recharge by 50 percent caused the simulated water-levels at the calibration points to be as much as 69 feet below observed water-levels. Stream cells

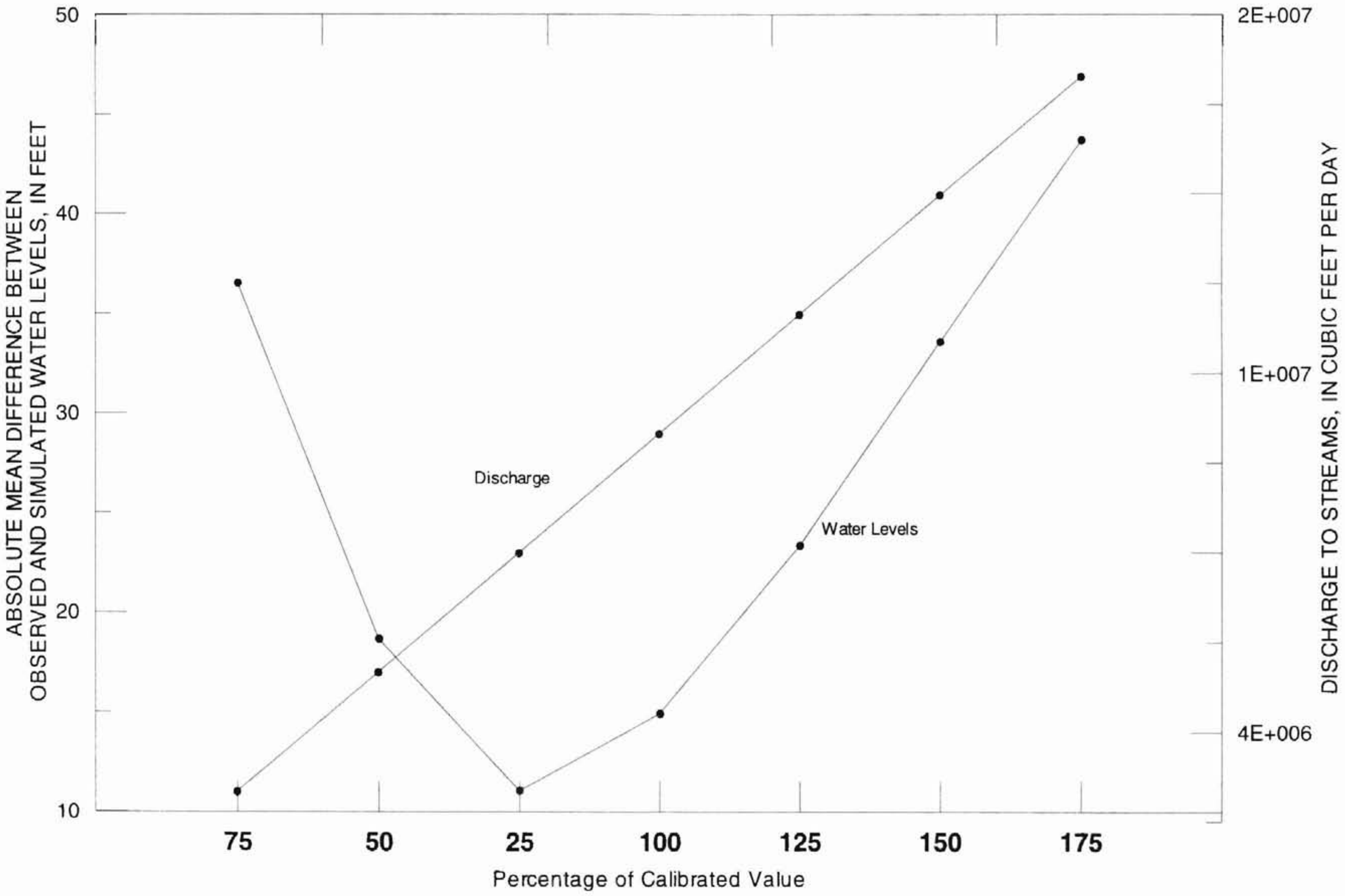


Figure 23. Predevelopment period sensitivity analysis of recharge.

moderated simulated water-levels as recharge was increased.

The effect of uniformly varying hydraulic conductivity while keeping all other model inputs was examined for the predevelopment model (Figure 24). Hydraulic conductivity was changed up to 75 percent of the calibrated value. Changing hydraulic conductivity had almost no effect on discharge to streams. Simulated discharge to streams was 123.160 cubic feet per second when hydraulic conductivity was decreased by 75 percent and was 123.164 cubic feet per second when hydraulic conductivity was increased by 75 percent. Changing hydraulic conductivity caused a substantial change in simulated water-levels. Decreasing hydraulic conductivity by 50 percent caused simulated water-levels at the calibration points to be as much as 109 feet greater than the observed water-levels. Increasing hydraulic conductivity by 50 percent caused simulated water-levels at the calibration points to be less than observed water-levels by as much as 48 feet. Stream cells moderated simulated water-levels as hydraulic conductivity was increased.

During the calibration process, it was apparent that simulated water-levels could be made to match observed water-levels by either changing recharge or hydraulic conductivity. If simulated water-levels were below observed water-levels, either recharge could be increased or hydraulic conductivity could be decreased; and conversely, if simulated water-levels were too far above observed water-levels, either recharge could be decreased or hydraulic conductivity could be increased. The effect of simultaneous changing hydraulic conductivity and recharge on the model is shown in figure 25. As both recharge and hydraulic conductivity were decreased by 50 percent, the simulated water-levels slowly declined towards observed water-levels. The mean difference

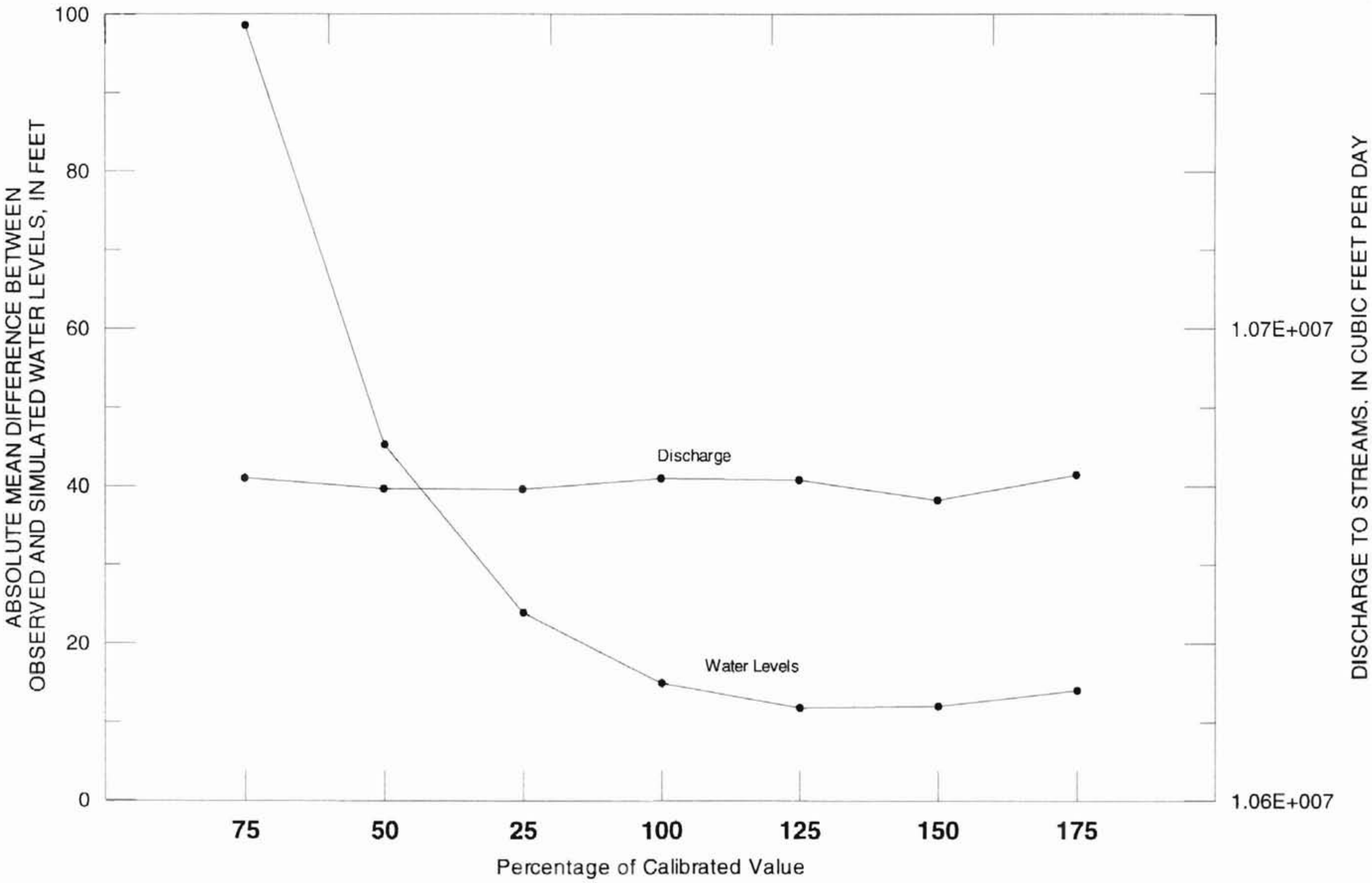


Figure 24. Predevelopment period sensitivity analysis of hydraulic conductivity.

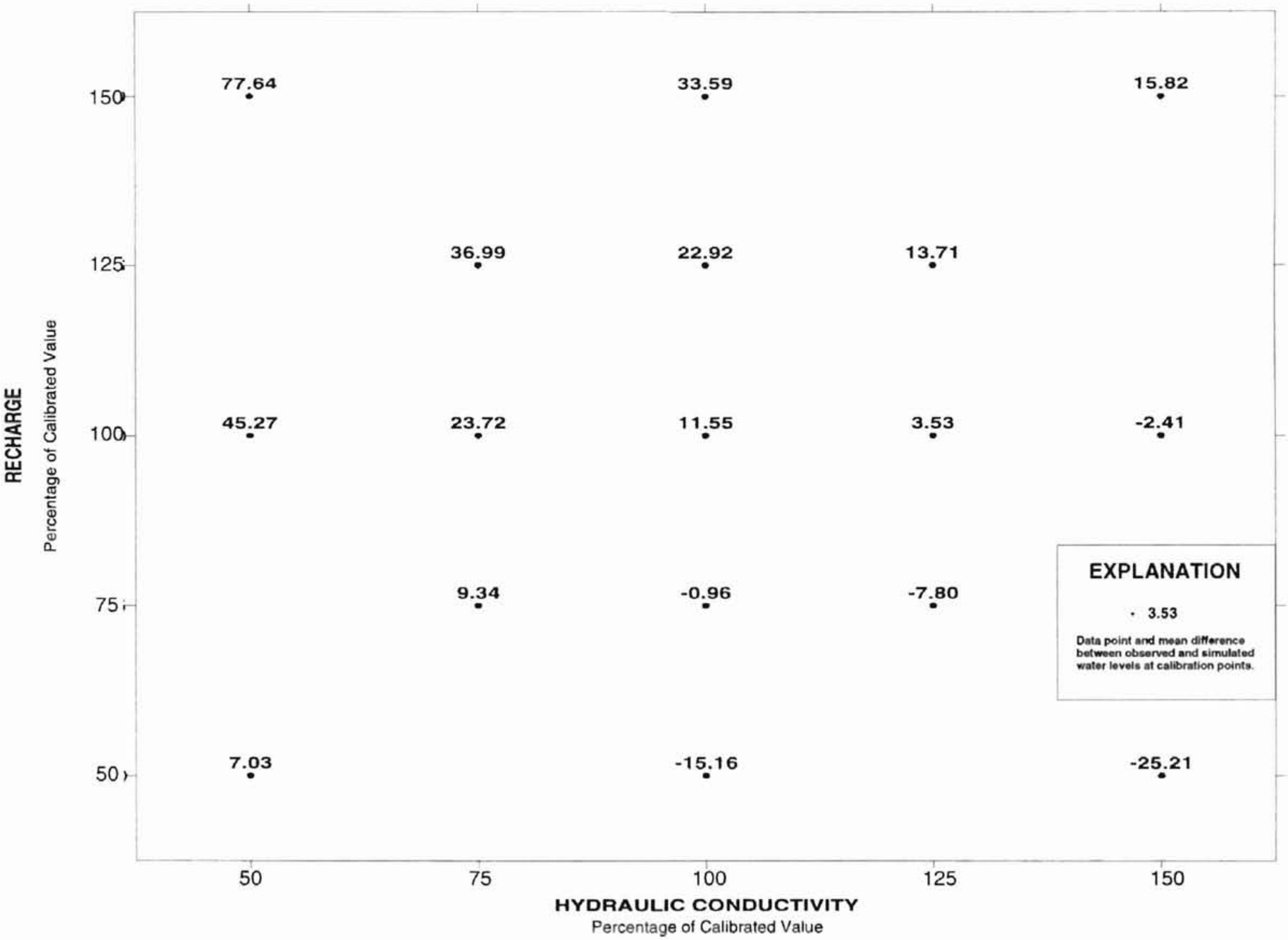


Figure 25. Predevelopment period sensitivity analysis of recharge and hydraulic conductivity.

between observed and simulated water-levels was reduced to about 7 feet. Likewise, as both recharge and hydraulic conductivity were increased by 50 percent, the simulated water-levels slowly rose further above observed water-levels, and the mean difference was increased to 15.82 feet. If either recharge or hydraulic conductivity were increased while the other was decreased, the difference between observed and simulated water-levels changed rapidly. If hydraulic conductivity was increased by 25 percent while recharged was reduced by 25 percent, the mean difference between simulated water-levels fell below observed water-levels. The mean difference at this point is -7.8 feet. If hydraulic conductivity was decreased by 25 percent and recharge was increased by 25 percent, simulated water-levels rose and the mean difference between simulated and observed water-levels was almost 37 feet. If recharge was increased by 50 percent while hydraulic conductivity was decreased by 50 percent, observed and simulated water-levels differed by more than 75 feet.

Recharge and hydraulic conductivity were closely related with respect to simulated water-levels, but not to simulated discharge to streams. Changing recharge caused a nearly equal change in simulated discharge to streams, but changing simulated hydraulic conductivity caused almost no change in simulated discharge to streams. The mean difference between observed and simulated water-levels were reduced to about 7 feet when both hydraulic conductivity were reduced by 50 percent, but simulated discharge decreased by about 62 cubic feet per second. Similarly, when both recharge and hydraulic conductivity were increased by 50 percent, the mean difference between observed and simulated water-levels was increased to almost 16 feet, but simulated discharge increased by about 62 feet per second.

Because discharge to Cobb Creek was used as a criterion for calibration, the amount of recharge necessary for the basin could be determined separately from the effects of hydraulic conductivity; because of this, hydraulic conductivity within the basin could also be known.

CHAPTER IX

CONCLUSIONS

The intentions of this study were:

1. to develop a ground-water flow model of the Rush Springs aquifer in the Cobb Creek basin that can be used in planning and management of the basin;
2. to use the model to determine the effects of various pumping scenarios and climatic conditions on the amount of water stored in the aquifer; and
3. to develop a fundamental understanding of the science and art of ground-water flow modeling.

These goals were accomplished partially at the conclusion of this study. A conceptual and numerical ground-water flow model of the Rush Springs aquifer in the Cobb Creek basin was developed and calibrated to predevelopment conditions. The calibration was dependent on two reasonable assumptions:

1. the predevelopment ground-water elevations exceeded the June 1956 ground-water elevations.
2. the ground-water discharge in the predevelopment period in the Cobb Creek basin primarily was to streams and that the elevations of the streams were a close

approximation of the water-table elevation.

The ground-water flow model of the Cobb Creek basin reasonably simulated ground-water elevations that were greater than the June 1956 heads. The model also reasonably simulated discharge to Cobb Creek and ground-water elevations at the streams. Uncertainty in the model was addressed, suggestions to improve the model were made, and a sensitivity analysis was conducted in order to increase the level of confidence in the model.

Before the model can be used for prediction (Objective 2), it should be calibrated to development period conditions. This will require the addition of pumpage and storage parameters for the basin, and calibration would be based on the model's ability to simulate the 1956 ground-waters. Then confidence in the model could be increased by a development period sensitivity analysis, in which the model's sensitivity to changes in storage parameters would be tested. Next, verification would establish greater confidence in the model. Model verification is a process in which the set of calibrated parameter values and stresses are used to reproduce another set of field data. In this case, the field data would be 1998 ground-water measurements taken in the area as part of OWRB Mass Water-Level Measurement Program.

Finally, the model could be used for prediction. Several problems could be investigated, for example:

1. Using current (1998) pumpage, what amount of water would be in storage at a point in time 20, 40, and 60 years from now?

2. Using current (1998) pumpage, what amount of water would be in storage if a severe (10 year) drought occurred?

3. What would be the effect on the Cobb Creek basin of using the amount of water allocated by OWRB to users of the Rush Springs aquifer on a localized area, such as the Cobb Creek basin? At this allocated pumpage, what would the amount of water in storage at a point in time 20, 40, and 60 years from now?

Another important issue to be addressed for the development period model and subsequent prediction analysis is the effect of Fort Cobb Reservoir on ground-water flow in the basin. Discussions with other modelers have revealed a myriad of methods that can be used to simulate an overlying source reservoir. Because the reservoir is lying directly on the Rush Springs outcrop, the aquifer and the reservoir are are almost certainly in hydraulic communication. The most logical way to simulate this condition, to this author, would be to use the River Package in MODFLOW. The River Package would allow flow from the aquifer to the reservoir and vice versa, and would limit this flow based on the head in the aquifer relative to the reservoir bottom. The dynamics of interaction between surface water and ground water has been the cause of much research, and additional MODFLOW packages have been developed by users to simulate these types of systems effectively.

The last intention of this study was to develop a fundamental understanding of the art and science of ground-water flow modeling. The entire experience was a successful learning process.

Throughout this study, mistakes were made and lessons were learned. One of the most significant facts learned in this study is that ground-water flow modeling requires significant amounts of time. At a ground-water flow modeling class attended by the author, the assertion was made that construction and calibration of a ground-water flow model takes 90 percent of the time spent on the project, and three times as long as one plans. This statement accurately describes the author's experience with this model.

All models require the experience of a skilled model user to design hydrogeologically valid boundary conditions and to select meaningful values for model parameters. While experience is an asset to the modeling process, not even the most experienced modeler would say that he or she has mastered the art and science of ground-water flow modeling.

This study will continue after completion of research for this thesis. The completed model will be used by OWRB in planning and management of the Rush Springs aquifer in the Cobb Creek basin. The completed model will be available to the public at OWRB.

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APPENDIX A

SUMMARY OF GROUNDWATER UTILITIES PROGRAM

SUMMARY OF GROUNDWATER UTILITIES PROGRAM

Taken from Fabian and others, 1992.

Estimating Transmissivity

Areas under consideration may not have had a hydrogeologic investigation performed, therefore no aquifer parameters may be available in any published reports. In these circumstances, the groundwater investigator must rely on unpublished reports, aquifer tests conducted by a public water supplier, or on short duration well acceptance tests from the well driller's well completion logs.

If wells within or adjacent to the area of interest have had an aquifer test completed by the public water supplier, then transmissivity may be calculated or determined graphically. However, if the well has had only a short-duration well acceptance test conducted, then transmissivity may be estimated from its specific capacity or by using the Theis non-equilibrium equations:

$$u = \frac{r^2 s}{4\pi T t} \qquad (1)$$

Where:

r is the effective radius of the well (ft);

S is the storage coefficient (confined aquifer) or specific capacity (unconfined aquifer) and is unitless;

T is the regional transmissivity of the aquifer (ft^2/day) as determined from a hydrogeologic investigation or text; and

t is the length of time (days) of the pumping period preceding the determination of the of the specific capacity of the well.

$$T = \frac{[W(u)]\,(Q)}{4d} \qquad (2)$$

Where:

$W(u)$ is the well function of u;

Q is the pumping rate of the well (ft^3/day);

d is the drawdown of the well (ft).

T is the transmissivity (ft^2/day) and is representative of the well site or well field.

Hydraulic conductivity of the well site is then determined from the transmissivity using the equation:

$$K = T/b \qquad (3)$$

Where:

T is the transmissivity from equation 2; and

b is the length (ft) of the well's penetration into the saturated portion of the aquifer, open hole interval or saturated thickness of the aquifer.

K is the hydraulic conductivity in ft/day.

The Theis equation used above to determine the transmissivity also assumes a confined, homogenous, isotropic aquifer of infinite lateral extent. The transmissivity for the open hole or screened interval will give the hydraulic conductivity for the producing horizon. This hydraulic conductivity value may be larger than the true conductivity of the aquifer.

The estimation of the transmissivity using the Theis equation is appropriate for confined aquifers where there is not dewatering or in thick, unconfined aquifers where the drawdown is small compared to the aquifer thickness. In thin, unconfined aquifers, where drawdown is an appreciable proportion of the aquifer thickness, Jacob's correction for drawdown should be applied. Jacob's correction for drawdown estimates what the observed drawdown would have been had there been no reduction in the saturated thickness, as in a confined aquifer.

Jacob's correction for drawdown is calculated by the equation:

$$d' = d - (d^2 / 2b) \tag{4}$$

Where:

d is the measured drawdown (ft) during the well acceptance test; and

b is the saturated thickness (ft) of the aquifer.

d' is the corrected drawdown, in feet.

UTILITY menu options

Often after a well is drilled it will be pumped for a short time to determine whether the well is capable of producing an adequate supply of water and to test the pump. The pump capacity, duration of test, and amount of drawdown are used in the calculations to estimate the transmissivity of the well site.

When deciding whether to select the confined or unconfined option for estimating transmissivity, the aquifer type and amount of drawdown in relation to the saturated thickness of the aquifer must be considered. If the aquifer is a relatively thin, unconfined aquiferwhere the drawdown is greater than 10 percent of the the saturated thickness, then the unconfined option should be selected. The unconfined estimation uses Jacob's correction (equation 4) in calculating transmissivity. In all other instances, the confined option for calculating transmissivity should be used.

Data input requirements are as follows:

r = the effective well radius, the radius of the well bore or the distance the observation well is from the pumping well (feet);

S = the aquifer storage coefficient or specific yield (unitless);

T = the regional aquifer transmissivity (ft^2/day);

t = length of time (days) of well acceptance or drawdown test;

Q = pumping rate for well (gallons per minute)

d = drawdown measured in observation or production well, at the end of the pump test;

b = the saturated thickness of the aquifer or the screened interval and that part of the aquifer above the screen to the top of the aquifer. This value is used in the unconfined aquifer option for correcting drawdown.

Utility output is as follows:

T' = the calculated transmissivity for the site (ft^2/day).

d' = the corrected drawdown (ft) using the Jacob's correction for the unconfined option;

K = the calculated hydraulic conductivity for the site (ft/day). Estimated transmissivity is divided by the saturated thickness (b) used in the equation to provide an estimated hydraulic conductivity for the well site.

APPENDIX B

RESULTS OF ANALYSIS OF WELL SITE PARAMETERS USING THE GROUNDWATER UTILITIES PROGRAM

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	Use Class	Radius (feet)	Average Storage	T-initial (ft2/day)	Time (days)	Drawdown (ft)	Discharge (gpm)	Total depth (feet)	First Water Zone (ft)
1	4101	Irrigation	0.67	0.25	9000	0.83	140	300	300	60
2	4102	Irrigation	0.67	0.25	9000	0.42	150	395	293	74
3	4109	Irrigation	0.67	0.25	9000	1.25	230	425	370	80
4	4112	Irrigation	0.67	0.25	9000	1.25	187	550	314	50
5	4120	Irrigation	0.75	0.25	9000	1.25	50	600	365	70
6	4123	Irrigation	0.58	0.25	9000	1.25	270	600	400	86
7	4129	Irrigation	0.67	0.25	9000	0.17	170	450	330	50
8	4130	Irrigation	0.67	0.25	9000	1.50	160	450	354	65
9	4132	Irrigation	0.67	0.25	9000	1.25	150	500	312	50
10	4144	Irrigation	0.67	0.25	9000	1.00	155	570	372	80
11	4156	Irrigation	0.67	0.25	9000	1.25	190	600	302	15
12	4157	Irrigation	0.67	0.25	9000	1.25	180	800	340	30
13	4161	Irrigation	0.75	0.25	9000	1.25	220	1000	240	80
14	4162	Irrigation	0.67	0.25	9000	1.25	100	600	350	35
15	4163	Irrigation	0.67	0.25	9000	1.25	200	710	365	45
16	4172	Irrigation	0.67	0.25	9000	1.25	140	740	270	55
17	4173	Irrigation	0.67	0.25	9000	1.25	223	675	275	10
18	4178	Irrigation	0.67	0.25	9000	1.25	176	240	308	32
19	4183	Irrigation	0.67	0.25	9000	1.25	150	700	375	40
20	33890	Irrigation	0.67	0.25	9000	1.25	235	650	372	290
21	4187	Irrigation	0.67	0.25	9000	1.25	224	375	325	85
22	4188	Irrigation	0.67	0.25	9000	1.25	180	700	317	28

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	Use Class	Radius (feet)	Average Storage	T-initial (ft2/day)	Time (days)	Drawdown (ft)	Discharge (gpm)	Total depth (feet)	First Water Zone (ft)
23	4191	Irrigation	0.67	0.25	9000	1.25	192	300	335	20
24	4194	Irrigation	0.67	0.25	9000	0.63	190	480	300	20
25	4195	Irrigation	0.67	0.25	9000	1.50	148	680	360	42
26	4199	Irrigation	0.67	0.25	9000	1.25	185	810	347	95
27	3569	Irrigation	0.67	0.25	9000	1.00	25	330	165	50
28	3573	Irrigation	0.67	0.25	9000	1.50	110	250	184	70
29	3574	Irrigation	0.67	0.25	9000	1.25	80	275	163	40
30	3578	Irrigation	0.67	0.25	9000	1.25	127	955	250	45
31	3580	Irrigation	0.67	0.25	9000	1.00	130	425	256	30
32	3579	Irrigation	0.83	0.25	9000	1.50	64	900	235	90
33	3585	Public	0.67	0.25	9000	3.17	145	318	235	75
34	3586	Public	0.67	0.25	9000	1.25	164	220	243	71
35	3587	Public	0.67	0.25	9000	5.00	135	500	248	90
36	3595	Irrigation	0.58	0.25	9000	1.25	97	350	247	85
37	3606	Irrigation	0.67	0.25	9000	1.25	70	240	206	65
38	3616	Irrigation	0.67	0.25	9000	1.25	110	200	278	80
39	3620	Irrigation	0.67	0.25	9000	1.25	144	750	260	56
40	3621	Irrigation	0.67	0.25	9000	1.25	85	900	255	16
41	3627	Irrigation	0.58	0.25	9000	0.58	185	225	273	35
42	3626	Irrigation	0.67	0.25	9000	0.33	174	412	260	31
43	3631	Irrigation	0.67	0.25	9000	1.25	128	600	212	65
44	3633	Irrigation	0.58	0.25	9000	1.25	114	300	202	70

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	Use Class	Radius (feet)	Average Storage	T-initial (ft2/day)	Time (days)	Drawdown (ft)	Discharge (gpm)	Total depth (feet)	First Water Zone (ft)
45	3638	Irrigation	0.67	0.25	9000	1.25	169	225	270	38
46	3642	Irrigation	0.58	0.25	9000	1.88	145	275	232	40
47	3646	Irrigation	0.67	0.25	9000	1.25	150	450	240	50
48	3653	Irrigation	0.67	0.25	9000	1.50	127	218	180	18
49	3655	Irrigation	0.67	0.25	9000	1.67	155	220	245	65
50	3658	Irrigation	0.67	0.25	9000	1.33	155	220	245	42
51	3660	Irrigation	0.67	0.25	9000	1.25	102	158	238	68
52	3661	Irrigation	0.67	0.25	9000	1.25	181	325	232	34
53	3664	Irrigation	0.67	0.25	9000	1.25	115	380	268	55
54	3674	Irrigation	0.67	0.25	9000	1.00	88	140	170	42
55	3678	Irrigation	0.67	0.25	9000	1.67	275	400	333	25
56	33858	Irrigation	0.67	0.25	9000	1.00	137	700	331	180
57	3680	Irrigation	0.67	0.25	9000	1.50	250	200	312	40
58	3687	Irrigation	0.67	0.25	9000	1.25	190	500	300	60
59	3698	Irrigation	0.67	0.25	9000	1.25	125	400	245	55
60	3708	Irrigation	0.67	0.25	9000	0.25	150	770	308	55
61	3711	Irrigation	0.67	0.25	9000	1.00	114	820	196	68
62	3712	Irrigation	0.67	0.25	9000	1.67	118	106	210	72
63	4117	Irrigation	0.67	0.25	9000	1.25	197	230	276	38
64	3678	Irrigation	0.67	0.25	9000	1.67	275	400	333	25
65	33858	Irrigation	0.67	0.25	9000	1.00	180	700	331	180
66	3680	Irrigation	0.67	0.25	9000	1.50	250	200	312	40

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	Use Class	Radius (feet)	Average Storage	T-initial (ft2/day)	Time (days)	Drawdown (ft)	Discharge (gpm)	Total depth (feet)	First Water Zone (ft)
67	3681	Irrigation	0.67	0.25	9000	2.92	230	650	318	40
68	3693	Irrigation	0.67	0.25	9000	0.42	160	250	320	140
69	3685	Irrigation	0.67	0.25	9000	1.25	213	200	327	47
70	3686	Irrigation	0.67	0.25	9000	1.25	155	620	313	60
71	3687	Irrigation	0.67	0.25	9000	1.25	190	500	300	60
72	3696	Irrigation	0.58	0.25	9000	1.25	280	400	455	120
73	3699	Irrigation	0.67	0.25	9000	1.25	140	400	265	60
74	3708	Irrigation	0.67	0.25	9000	0.25	150	770	308	55
75	3739	Irrigation	0.67	0.25	9000	1.25	197	600	296	53
76	3740	Irrigation	0.67	0.25	9000	1.75	150	450	234	70
77	3741	Irrigation	0.67	0.25	9000	0.42	165	490	249	65
78	4293	Irrigation	0.67	0.25	9000	0.08	131	595	266	43
79	3742	Irrigation	0.58	0.25	9000	0.42	160	750	282	40
80	3766	Irrigation	0.67	0.25	9000	1.00	120	800	258	55
81	3767	Irrigation	0.67	0.25	9000	1.67	150	900	224	35
82	3773	Irrigation	0.67	0.25	9000	1.25	200	700	311	50
83	3775	Irrigation	0.67	0.25	9000	0.63	200	473	300	70
84	3779	Irrigation	0.67	0.25	9000	1.25	185	600	310	65
85	3786	Irrigation	0.67	0.25	9000	0.83	130	550	319	45
86	3787	Irrigation	0.50	0.25	9000	1.25	200	600	307	70
87	3795	Irrigation	0.58	0.25	9000	0.92	170	750	310	75
88	3796	Irrigation	0.67	0.25	9000	1.50	157	335	259	43

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	Use Class	Radius (feet)	Average Storage	T-initial (ft2/day)	Time (days)	Drawdown (ft)	Discharge (gpm)	Total depth (feet)	First Water Zone (ft)
89	3807	Irrigation	0.67	0.25	9000	1.50	162	520	284	50
90	3810	Irrigation	0.75	0.25	9000	1.25	153	700	294	70
91	3811	Irrigation	0.67	0.25	9000	1.25	96	478	268	74
92	3814	Irrigation	0.58	0.25	9000	0.83	165	650	320	80
93	3832	Irrigation	0.67	0.25	9000	1.25	147	450	288	100
94	3841	Irrigation	0.67	0.25	9000	1.00	160	600	282	50
95	3845	Irrigation	0.67	0.25	9000	1.25	200	550	287	70
96	3849	Irrigation	0.67	0.25	9000	1.00	220	325	305	40
97	3855	Irrigation	0.67	0.25	9000	0.17	174	575	249	50
98	40877	Irrigation	0.75	0.25	9000	1.25	160	500	238	0
99	3858	Irrigation	0.67	0.25	9000	1.00	35	500	310	65
100	3863	Irrigation	0.67	0.25	9000	0.83	140	170	244	52
101	3864	Irrigation	0.58	0.25	9000	1.25	142	510	280	68
102	3867	Irrigation	0.67	0.25	9000	0.21	158	870	290	42
103	3894	Irrigation	0.67	0.25	9000	0.42	130	580	300	60
104	3900	Irrigation	0.67	0.25	9000	2.00	170	750	305	60
105	3901	Irrigation	0.67	0.25	9000	1.25	182	690	285	48
106	3924	Irrigation	0.67	0.25	9000	1.25	197	440	304	53
107	3920	Irrigation	0.67	0.25	9000	1.25	140	700	300	80
108	3927	Irrigation	0.67	0.25	9000	1.25	180	800	287	50
109	3933	Irrigation	0.75	0.25	9000	1.00	150	650	300	42
110	3937	Irrigation	0.67	0.25	9000	1.00	145	500	350	155

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	Use Class	Radius (feet)	Average Storage	T-initial (ft2/day)	Time (days)	Drawdown (ft)	Discharge (gpm)	Total depth (feet)	First Water Zone (ft)
111	3938	Irrigation	0.67	0.25	9000	1.25	203	750	325	37
112	3943	Irrigation	0.67	0.25	9000	1.25	120	732	297	35
113	4007	Irrigation	0.67	0.25	9000	0.42	81	715	340	80
114	4011	Irrigation	0.67	0.25	9000	1.25	150	1000	250	60
115	4015	Irrigation	0.67	0.25	9000	1.25	115	300	282	75
116	4017	Irrigation	0.67	0.25	9000	0.17	160	420	340	80
117	4019	Irrigation	0.67	0.25	9000	1.08	120	530	339	90
118	4023	Irrigation	0.67	0.25	9000	0.25	116	760	350	60
119	4031	Irrigation	0.67	0.25	9000	0.17	175	650	342	65
120	4043	Irrigation	0.67	0.25	9000	0.17	140	425	310	75
121	4049	Irrigation	0.67	0.25	9000	0.17	159	900	300	66
122	4050	Irrigation	0.67	0.25	9000	1.00	152	700	330	60
123	4066	Irrigation	0.67	0.25	9000	1.00	135	840	282	80
124	4084	Industrial	0.67	0.25	9000	1.25	178	656	304	72
125	4085	Irrigation	0.67	0.25	9000	1.25	205	285	307	40
126	4088	Irrigation	0.75	0.25	9000	1.46	160	800	270	70
127	33882	Irrigation	0.75	0.25	9000	1.25	160	800	230	200
128	4096	Irrigation	0.67	0.25	9000	0.42	161	550	267	54
129	4487	Irrigation	0.50	0.25	9000	0.50	90	700	320	70
130	34656	Irrigation	0.63	0.25	9000	0.42	217	300	304	70
131	4489	Irrigation	0.58	0.25	9000	1.25	163	350	345	77
132	4494	Irrigation	0.67	0.25	9000	1.25	210	400	315	90

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	Use Class	Radius (feet)	Average Storage	T-initial (ft2/day)	Time (days)	Drawdown (ft)	Discharge (gpm)	Total depth (feet)	First Water Zone (ft)
133	30000	Irrigation	0.63	0.25	9000	0.42	231	480	312	60
134	4503	Irrigation	0.67	0.25	9000	1.04	165	550	300	103
135	33587	Irrigation	0.67	0.25	9000	1.25	179	500	284	41
136	4510	Irrigation	0.67	0.25	9000	0.42	240	500	291	18
137	4519	Irrigation	0.67	0.25	9000	1.17	174	440	319	70
138	4424	Irrigation	0.67	0.25	9000	1.25	165	600	337	80
139	4425	Irrigation	0.67	0.25	9000	1.79	165	440	313	85
140	4426	Irrigation	0.63	0.25	9000	0.42	148	800	270	72
141	4430	Irrigation	0.67	0.25	9000	1.25	130	488	275	55
142	4449	Irrigation	0.67	0.25	9000	0.58	185	675	330	85
143	4457	Irrigation	0.67	0.25	9000	0.67	130	510	358	70
144	4462	Irrigation	0.67	0.25	9000	1.25	104	666	350	85
145	4468	Irrigation	0.67	0.25	9000	1.25	178	658	345	75
146	4469	Irrigation	0.67	0.25	9000	1.25	197	500	288	66
147	4472	Irrigation	0.67	0.25	9000	0.63	192	640	338	65
148	24299	Irrigation	0.67	0.25	9000	1.25	278	520	0	47
149	24314	Irrigation	0.67	0.25	9000	1.25	100	550	365	60
150	24319	Irrigation	0.67	0.25	9000	1.25	192	420	360	48
151	24320	Irrigation	0.67	0.25	9000	0.42	280	300	350	50
152	24332	Irrigation	0.67	0.25	9000	1.25	190	700	390	608

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	Approximate Yield (gpm)	Hydraulic Conductivity Estimated (ft/day)	Transmissivity Calculated (ft2/day)	Hydraulic Conductivity (ft/day)	Latitude	Longitude
1	4101	300	2.17	384.3	2.02	35.37097	-98.53192
2	4102	430	2.45	474.1	2.29	35.37277	-98.54075
3	4109	425	1.24	365.1	1.27	35.3729	-98.56716
4	4112	550	2.20	552.1	1.97	35.36755	-98.57381
5	4120	1500	8.31	1843.6	6.63	35.36207	-98.61128
6	4123	600	1.43	517.4	1.72	35.36555	-98.54961
7	4129	450	1.85	330.5	1.2	35.36018	-98.5474
8	4130	450	1.87	490	1.7	35.36018	-98.5474
9	4132	500	2.41	584.5	2.2	35.36018	-98.52305
10	4144	339	2.59	635.6	2.33	35.34225	-98.57365
11	4156	600	2.12	595.7	2.08	35.32235	-98.60913
12	4157	800	2.73	816.3	2.6	35.32235	-98.62241
13	4161	1000	3.00	945	3.24	35.32414	-98.57378
14	4162	600	3.74	955.1	3.09	35.32414	-98.58485
15	4163	710	2.20	670.9	2.16	35.32226	-98.56706
16	4172	750	4.63	1045.1	4.75	35.31685	-98.52979
17	4173	675	2.51	756.8	3.26	35.31143	-98.52979
18	4178	240	0.99	227.5	0.86	35.31516	-98.55599
19	4183	700	2.72	788	2.39	35.31517	-98.57828
20	33890	0	1.71	556.3	1.79	35.31517	-98.57164
21	4187	375	1.31	364.7	1.48	35.31503	-98.618
22	4188	750	2.60	731.6	2.54	35.3078	-98.62021

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	Approximate Yield (gpm)	Hydraulic Conductivity Estimated (ft/day)	Transmissivity Calculated (ft2/day)	Hydraulic Conductivity (ft/day)	Latitude	Longitude
23	4191	300	1.07	260.9	0.87	35.3008	-98.60494
24	4194	480	1.91	447.8	1.76	35.30435	-98.5828
25	4195	680	2.73	794.3	2.45	35.30071	-98.56504
26	4199	810	3.01	862.1	3.08	35.29346	-98.54972
27	3569	330	22.10	2160.2	18.78	35.15796	-98.29223
28	3573	250	3.87	673	5.96	35.13448	-98.29002
29	3574	275	5.52	781.1	6.51	35.12719	-98.28354
30	3578	955	7.20	1806	8.99	35.17611	-98.39309
31	3580	425	2.76	665.9	2.92	35.17791	-98.40414
32	3579	900	20.06	665.9	4.7	35.17972	-98.40414
33	3585	318	2.51	626.3	3.73	35.1688	-98.36039
34	3586	220	1.44	343.9	1.92	35.17241	-98.36924
35	3587	500	4.35	1122.1	6.84	35.16338	-98.35818
36	3595	350	4.29	803.6	4.96	35.15801	-98.39977
37	3606	250	4.96	696.7	5.24	35.14358	-98.39314
38	3616	205	1.84	357	1.88	35.19771	-98.42813
39	3620	750	5.04	1190.5	5.98	35.1959	-98.45458
40	3621	900	8.53	2150.7	9	35.19246	-98.49882
41	3627	250	1.00	254.2	1.08	35.17795	-98.49004
42	3626	412	2.02	475.4	2.1	35.17795	-98.48783
43	3631	600	6.18	1332.6	9.13	35.17429	-98.41281
44	3633	300	3.84	714.4	5.41	35.16164	-98.43693

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	Approximate Yield (gpm)	Hydraulic Conductivity Estimated (ft/day)	Transmissivity Calculated (ft2/day)	Hydraulic Conductivity (ft/day)	Latitude	Longitude
45	3638	225	1.15	293.4	1.32	35.16173	-98.50114
46	3642	275	2.02	489.3	2.7	35.15804	-98.47456
47	3646	450	3.11	759.4	4.08	35.15081	-98.47456
48	3653	218	2.26	442.2	3.03	35.13459	-98.4458
49	3655	220	1.56	367.6	2.1	35.14363	-98.46353
50	3658	220	1.42	331.6	1.73	35.14363	-98.47015
51	3660	158	1.82	308.6	1.88	35.1346	-98.46353
52	3661	325	1.81	492.9	2.58	35.1364	-98.47015
53	3664	380	3.07	683.8	3.3	35.14374	-98.51212
54	3674	140	2.47	332.9	2.68	35.12176	-98.43701
55	3678	400	0.93	387.5	1.28	35.20162	-98.53339
56	33858	700	3.54	1033	3.72	35.19981	-98.54224
57	3680	200	0.57	198.6	0.74	35.19435	-98.55117
58	3687	500	2.07	637.8	2.6	35.17076	-98.5136
59	3698	0	3.52	751.1	4.29	35.14916	-98.52465
60	3708	770	4.71	1048.8	4.99	35.12886	-98.61532
61	3711	0	10.82	2118	16.5	35.12344	-98.6109
62	3712	0	1.25	213.3	1.55	35.11802	-98.6109
63	4117	230	0.97	274.9	1.18	35.20154	-98.5179
64	3678	400	0.93	387.6	1.25	35.20162	-98.53339
65	33858	700	2.69	860	3.09	35.19981	-98.54224
66	3680	200	0.57	198.6	0.47	35.19435	-98.55117

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ID	Well ID	Approximate Yield (gpm)	Hydraulic Conductivity Estimated (ft/day)	Transmissivity Calculated (ft2/day)	Hydraulic Conductivity (ft/day)	Latitude	Longitude
67	3681	650	2.00	786.6	2.89	35.19616	-98.54896
68	3693	250	1.75	358.5	2.08	35.16172	-98.57757
69	3685	200	0.67	202.9	0.75	35.18699	-98.58863
70	3686	620	3.09	891.5	3.58	35.17989	-98.51802
71	3687	500	2.07	637.8	2.6	35.17076	-98.5136
72	3696	400	0.85	360.8	1.11	35.15693	-98.57757
73	3699	200	2.75	653.9	3.27	35.14916	-98.52244
74	3708	770	4.71	1048.8	4.99	35.12886	-98.61532
75	3739	600	2.43	780.2	3.24	35.23732	-98.30975
76	3740	450	3.54	880.6	5.4	35.23208	-98.38216
77	3741	490	3.12	721.5	3.94	35.23027	-98.39322
78	4293	595	4.03	705.1	3.25	35.23027	-98.40005
79	3742	750	3.73	997.9	4.12	35.23027	-98.4089
80	3766	800	6.52	1516.9	7.7	35.28635	-98.45283
81	3767	900	6.92	1841	11.02	35.27912	-98.4484
82	3773	700	2.62	878.2	3.42	35.28444	-98.47928
83	3775	473	2.07	592.4	2.69	35.28082	-98.47043
84	3779	600	2.55	790.3	3.23	35.28636	-98.49922
85	3786	550	3.02	812.9	3.01	35.27905	-98.50351
86	3787	700	2.47	846.3	3.62	35.27905	-98.51236
87	3795	750	3.61	1076.6	4.58	35.27373	-98.49479
88	3796	335	1.94	499.6	2.36	35.27188	-98.47043

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ID	Well ID	Approximate Yield (gpm)	Hydraulic Conductivity Estimated (ft/day)	Transmissivity Calculated (ft2/day)	Hydraulic Conductivity (ft/day)	Latitude	Longitude
89	3807	520	2.69	762.6	3.32	35.25739	-98.43304
90	3810	700	4.00	1071.3	4.87	35.24836	-98.43304
91	3811	478	8.71	1419	12.9	35.25912	-98.45948
92	3814	650	3.19	915.4	3.85	35.25912	-98.47718
93	3832	450	3.24	777.5	4.27	35.23949	-98.49714
94	3841	600	3.11	855.5	3.69	35.23577	-98.45284
95	3845	750	2.52	796.9	3.79	35.24291	-98.4221
96	3849	325	1.09	347.4	1.34	35.22856	-98.43302
97	3855	575	3.26	711.4	3.65	35.22317	-98.46173
98	40877	0	3.04	774.9	3.91	35.22227	-98.4694
99	3858	0	11.27	2558.4	10.49	35.2269	-98.49049
100	3863	170	1.22	244.3	1.28	35.2069	-98.46832
101	3864	510	3.29	851.5	4.05	35.20507	-98.45512
102	3867	870	4.42	763	3.18	35.20867	-98.43081
103	3894	670	3.58	829.4	3.46	35.26476	-98.56739
104	3900	750	3.63	1139.6	4.87	35.27553	-98.52096
105	3901	690	3.08	950.8	4.01	35.27373	-98.52096
106	3924	450	1.73	538.8	2.16	35.2448	-98.53215
107	3920	600	4.22	1134.2	4.97	35.23763	-98.62058
108	3927	800	3.64	1132.1	4.82	35.22686	-98.53875
109	3933	650	3.26	898.6	3.51	35.22861	-98.57418
110	3937	500	3.40	1052.7	7.26	35.2069	-98.5852

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ID	Well ID	Approximate Yield (gpm)	Hydraulic Conductivity Estimated (ft/day)	Transmissivity Calculated (ft2/day)	Hydraulic Conductivity (ft/day)	Latitude	Longitude
111	3938	750	2.50	879.7	3.09	35.21414	-98.55861
112	3943	732	4.66	1272.7	5.05	35.2124	-98.52545
113	4007	715	6.59	1516.1	5.88	35.37281	-98.4685
114	4011	1000	6.76	1810.4	9.53	35.36028	-98.48837
115	4015	300	2.51	533.2	2.67	35.36209	-98.4928
116	4017	420	1.97	423.8	1.65	35.35221	-98.46082
117	4019	530	3.56	892.4	3.73	35.36046	-98.44404
118	4023	0	4.67	1102.4	4.08	35.33891	-98.42639
119	4031	650	2.58	637.7	2.3	35.33859	-98.45299
120	4043	425	2.54	495.7	2.16	35.33317	-98.49496
121	4049	900	4.66	1075.6	4.6	35.33141	-98.45292
122	4050	700	3.55	1005.3	4.02	35.33141	-98.46178
123	4066	840	5.99	1482.9	7.41	35.30969	-98.4507
124	4084	0	3.24	960.1	4.38	35.30068	-98.50597
125	4085	285	1.02	313.2	1.19	35.29346	-98.50597
126	4088	800	4.86	1328.9	6.71	35.29534	-98.45293
127	33882	800	5.12	1361.3	7.24	35.29538	-98.44409
128	4096	550	3.15	743.9	3.56	35.30267	-98.41552
129	4487	700	5.99	1480.4	5.92	35.44707	-98.54736
130	34656	320	1.19	331.1	1.48	35.44527	-98.54736
131	4489	350	1.57	458.8	1.74	35.44346	-98.52542
132	4494	400	1.50	481.8	1.97	35.4327	-98.5584

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	Approximate Yield (gpm)	Hydraulic Conductivity Estimated (ft/day)	Transmissivity Calculated (ft2/day)	Hydraulic Conductivity (ft/day)	Latitude	Longitude
133	30000	550	1.61	503.5	2.02	35.40912	-98.60056
134	4503	550	3.03	815	3.84	35.41803	-98.53837
135	33587	95	2.23	661.9	2.75	35.40367	-98.52529
136	4510	550	1.38	447	1.54	35.40193	-98.61165
137	4519	440	1.96	566.9	2.29	35.38922	-98.54967
138	4424	600	2.57	791.8	2.91	35.43058	-98.49957
139	4425	440	2.44	808.7	3.85	35.42516	-98.49957
140	4426	800	5.39	1262.2	6.54	35.43076	-98.51482
141	4430	488	3.53	838.7	4.09	35.40891	-98.49526
142	4449	675	2.88	826.6	1.98	35.40364	-98.45075
143	4457	510	3.16	762.5	3.19	35.39456	-98.46851
144	4462	666	4.87	1282.3	5.07	35.39461	-98.50369
145	4468	658	2.62	838.3	3.08	35.38733	-98.48399
146	4469	500	2.19	678.9	3.04	35.38914	-98.49729
147	4472	640	2.42	731	2.76	35.38192	-98.47294
148	24299	520	1.17	490.9	1.59	35.3692	-98.63123
149	24314	550	3.53	1027.5	3.43	35.35852	-98.65749
150	24319	420	1.45	469.9	1.62	35.36027	-98.62677
151	24320	300	0.69	233.3	0.78	35.35123	-98.63785
152	24332	700	2.18	789.5	2.43	35.29899	-98.62896

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	X-coord (feet)	Y-coord (feet)
1	4101	1809907.13	741989.75
2	4102	1807278.88	742660.5
3	4109	1799404.38	742749.563
4	4112	1797412.13	740813.938
5	4120	1786226.25	738885.563
6	4123	1804621.38	740044.813
7	4129	1805272.75	738088.875
8	4130	1805272.75	738088.875
9	4132	1812530	738050.438
10	4144	1797405.25	731604.75
11	4156	1786782.88	724422.75
12	4157	1782818	724446.875
13	4161	1797331.38	725010.75
14	4162	1794026.63	725029.75
15	4163	1799330.38	724317.688
16	4172	1810438.38	722286.938
17	4173	1810428	720313.813
18	4178	1802620.88	721712.438
19	4183	1795967.5	721754
20	33890	1797950.13	721742.688
21	4187	1784119.5	721775.625
22	4188	1783443.25	719148.375

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	X-coord (feet)	Y-coord (feet)
23	4191	1787983.13	716571.375
24	4194	1794599.63	717826.625
25	4195	1799889.63	716467.688
26	4199	1804449	713805.625
27	3569	1881144.75	664165.313
28	3573	1881781.5	655617.375
29	3574	1883710.88	652955.75
30	3578	1851023.63	670871.25
31	3580	1847722.5	671542.438
32	3579	1847725.13	672200.563
33	3585	1860786.5	668174.438
34	3586	1858148.5	669500.25
35	3587	1861438.5	666199.063
36	3595	1849000.25	664293.563
37	3606	1850961.5	659031.813
38	3616	1840586.88	678775.438
39	3620	1832678.75	678151.875
40	3621	1819456	676964.625
41	3627	1822051.88	671670
42	3626	1822713.13	671666.813
43	3631	1845127	670233.875
44	3633	1837899.63	665660

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	X-coord (feet)	Y-coord (feet)
45	3638	1818705.13	665781.125
46	3642	1826646.25	664400.125
47	3646	1826633.88	661768.938
48	3653	1835203.88	655826.063
49	3655	1829919.75	659140.563
50	3658	1827937.63	659149.688
51	3660	1829904.75	655851.313
52	3661	1827925.38	656518.563
53	3664	1815392.63	659252.438
54	3674	1837811.63	651143.813
55	3678	1809142.38	680351.188
56	33858	1806497.13	679707.125
57	3680	1803817.13	677733.313
58	3687	1814997.88	669087.75
59	3698	1811655.25	661241.875
60	3708	1784505.38	654007
61	3711	1785814.38	652026
62	3712	1785802.38	650051.625
63	4117	1813771.63	680297.938
64	3678	1809142.38	680351.188
65	33858	1806497.13	679707.125
66	3680	1803817.13	677733.313

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	X-coord (feet)	Y-coord (feet)
67	3681	1804479.5	678387.813
68	3693	1795861.88	665899.063
69	3685	1792611.13	675115.313
70	3686	1813694.75	672417.125
71	3687	1814997.88	669087.75
72	3696	1795852	664157.938
73	3699	1812316.75	661238.438
74	3708	1784505.38	654007
75	3739	1875999.5	693064.375
76	3740	1854368.13	691232.063
77	3741	1851061.63	690586.625
78	4293	1849022.38	690594.625
79	3742	1846379.25	690605.188
80	3766	1833350.75	711073.813
81	3767	1834659.75	708436.625
82	3773	1825450.75	710413.188
83	3775	1828088.25	709085.813
84	3779	1819506.5	711143.25
85	3786	1818213.5	708486.438
86	3787	1815569.63	708499.688
87	3795	1820806.88	706539.313
88	3796	1828073.13	705829.75

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	X-coord (feet)	Y-coord (feet)
89	3807	1839209.88	700507.563
90	3810	1839195.75	697218.188
91	3811	1831320.13	701171.5
92	3814	1826035.63	701196
93	3832	1820041.75	694079.5
94	3841	1833263.63	692663.438
95	3845	1842456.5	695221.563
96	3849	1839171.63	690011.813
97	3855	1830588.25	688089.25
98	40877	1828296.63	687770.75
99	3858	1822006.25	689487.688
100	3863	1828591.88	682173.625
101	3864	1832534.25	681491.875
102	3867	1839801.63	682769.375
103	3894	1799114.88	703386.188
104	3900	1812994.38	707234
105	3901	1812990.88	706575.875
106	3924	1809596.75	696064.188
107	3920	1783174.63	693604.625
108	3927	1807591.38	689547.313
109	3933	1797012.88	690243
110	3937	1793674.5	682358.625

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	X-coord (feet)	Y-coord (feet)
111	3938	1801634.38	684947.563
112	3943	1811537.88	684261.188
113	4007	1828819.75	742566.688
114	4011	1822874.5	738033.313
115	4015	1821556	738697.938
116	4017	1831073.88	735059.25
117	4019	1836092.5	738037.5
118	4023	1841321.5	730172.188
119	4031	1833388.25	730087.375
120	4043	1820858.38	728175.813
121	4049	1833397	727476.75
122	4050	1830754.88	727488.75
123	4066	1834021.75	719567.438
124	4084	1817517.38	716367.188
125	4085	1817504.25	713735.938
126	4088	1833333.5	714345.313
127	33882	1835972.38	714350.25
128	4096	1844507.63	716966.063
129	4487	1805453.38	769718.125
130	34656	1805449.88	769059.938
131	4489	1811982.5	768367
132	4494	1802138.38	764505.25

Appendix B. Results of analysis of well site parameters using data from drillers' logs on file at OWRB. All data were analyzed using the Groundwater Utilities Program (Fabian and others, 1992).

ID	Well ID	X-coord (feet)	Y-coord (feet)
133	30000	1789524.5	755991.688
134	4503	1808076.38	759132.25
135	33587	1811945.88	753883.688
136	4510	1786202.75	753396.813
137	4519	1804652.38	748662.375
138	4424	1819661.5	763638.563
139	4425	1819651.75	761665.375
140	4426	1815118	763726.625
141	4430	1820904.88	755745
142	4449	1834160.75	753763.75
143	4457	1828852	750484.438
144	4462	1818366.5	750551.563
145	4468	1824227.63	747874.813
146	4469	1820266.88	748552.25
147	4472	1827509.25	745888.813
148	24299	1780293.63	741516
149	24314	1772438.63	737678.063
150	24319	1781604.13	738255.75
151	24320	1778280.13	734988.313
152	24332	1780812.25	715954.25

APPENDIX C

MODFLOW OUTPUT FOR THE COBB CREEK BASIN MODEL

```
C:\RushSprings\LocalModel\tryone.out                          has been opened on unit 26
C:\RushSprings\LocalModel\tryone.bas                          has been opened on unit  1
C:\RushSprings\LocalModel\tryone.bcf                          has been opened on unit 11
C:\RushSprings\LocalModel\tryone.oc                           has been opened on unit 10
C:\RushSprings\LocalModel\tryone.hed                          has been opened on unit 30
C:\RushSprings\LocalModel\tryone.drw                          has been opened on unit 35
C:\RushSprings\LocalModel\tryone40.ccf                        has been opened on unit 40
C:\RushSprings\LocalModel\tryone.sip                          has been opened on unit 12
C:\RushSprings\LocalModel\tryone.riv                          has been opened on unit 15
C:\RushSprings\LocalModel\tryone.drn                          has been opened on unit 14
C:\RushSprings\LocalModel\tryone.rch                          has been opened on unit 20
1              U.S. GEOLOGICAL SURVEY MODULAR FINITE-DIFFERENCE GROUND-WATER MODEL
0Cobb Creek Basin Model:  3-9-99                             Created by Lisa Penderson; Oklahoma State Plane
  1 LAYERS        77 ROWS        65 COLUMNS
  1 STRESS PERIOD(S) IN SIMULATION
 MODEL TIME UNIT IS DAYS
0I/O UNITS:
 ELEMENT OF IUNIT:  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
         I/O UNIT:  0  0 14 15  0  0  0 20 12  0  0 10  0  0  0  0  0  0  0  0  0  0 11  0
0BAS1 -- BASIC MODEL PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT  1
 ARRAYS RHS AND BUFF WILL SHARE MEMORY.
 START HEAD WILL BE SAVED
   45191 ELEMENTS IN X ARRAY ARE USED BY BAS
   45191 ELEMENTS OF X ARRAY USED OUT OF 3000000
0BCF2 -- BLOCK-CENTERED FLOW PACKAGE, VERSION 2, 7/1/91 INPUT READ FROM UNIT 11
 STEADY-STATE SIMULATION
 CELL-BY-CELL FLOWS WILL BE RECORDED ON UNIT 40
 HEAD AT CELLS THAT CONVERT TO DRY=  -888.00
 WETTING CAPABILITY IS NOT ACTIVE
      LAYER  AQUIFER TYPE
      -------------------
        1        1
   10011 ELEMENTS IN X ARRAY ARE USED BY BCF
   55202 ELEMENTS OF X ARRAY USED OUT OF 3000000
```

```
0DRN1 -- DRAIN PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT 14
 MAXIMUM OF  364 DRAINS
 CELL-BY-CELL FLOWS WILL BE RECORDED ON UNIT 40
    1820 ELEMENTS IN X ARRAY ARE USED FOR DRAINS
   57022 ELEMENTS OF X ARRAY USED OUT OF 3000000
0RCH1 -- RECHARGE PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT 20
 OPTION 3 -- RECHARGE TO HIGHEST ACTIVE NODE IN EACH VERTICAL COLUMN
 CELL-BY-CELL FLOW TERMS WILL BE RECORDED ON UNIT 40
    5005 ELEMENTS OF X ARRAY USED FOR RECHARGE
   62027 ELEMENTS OF X ARRAY USED OUT OF 3000000
0RIV1 -- RIVER PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT 15
 MAXIMUM OF   80 RIVER NODES
 CELL-BY-CELL FLOWS WILL BE RECORDED ON UNIT 40
     480 ELEMENTS IN X ARRAY ARE USED FOR RIVERS
   62507 ELEMENTS OF X ARRAY USED OUT OF 3000000
0SIP1 -- STRONGLY IMPLICIT PROCEDURE SOLUTION PACKAGE, VERSION 1, 9/1/87 INPUT READ FROM UNIT 12
 MAXIMUM OF  50 ITERATIONS ALLOWED FOR CLOSURE
  5 ITERATION PARAMETERS
   20225 ELEMENTS IN X ARRAY ARE USED BY SIP
   82732 ELEMENTS OF X ARRAY USED OUT OF 3000000
1Cobb Creek Basin Model:  3-9-99                      Created by Lisa Penderson; Oklahoma State Plane
          0


BOUNDARY ARRAY FOR LAYER  1 WILL BE READ ON UNIT  1 USING FORMAT:          (65I3)
                    ------------------------------------------------------------------------------------------

        1      2      3      4      5      6      7      8      9     10
       11     12     13     14     15     16     17     18     19     20
       21     22     23     24     25     26     27     28     29     30
       31     32     33     34     35     36     37     38     39     40
       41     42     43     44     45     46     47     48     49     50
       51     52     53     54     55     56     57     58     59     60
       61     62     63     64     65
```

```
..............................................................................
0 1    0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0
0 2    0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0
0 3    0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0
0 4    0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    1    1    1    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0
0 5    0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    1    1    1    1
      1    1    1    1    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
```

```
        0   0   0   0   0   0   0   0   0   0
        0   0   0   0   0
0 6      0   0   0   0   0   0   0   0   0   0
        0   0   0   0   0   1   1   1   1   1
        1   1   1   1   1   1   1   1   1   1
        1   1   0   0   0   0   0   0   0   0
        0   0   0   0   0   0   0   0   0   0
        0   0   0   0   0   0   0   0   0   0
        0   0   0   0   0
0 7      0   0   0   0   1   1   1   0   0   0
        0   0   1   1   1   1   1   1   1   1
        1   1   1   1   1   1   1   1   1   1
        1   1   0   0   0   0   0   0   0   0
        0   0   0   0   0   0   0   0   0   0
        0   0   0   0   0   0   0   0   0   0
        0   0   0   0   0
0 8      0   0   0   0   1   1   1   1   1   0
        0   1   1   1   1   1   1   1   1   1
        1   1   1   1   1   1   1   1   1   1
        1   1   1   0   0   0   0   0   0   0
        0   0   0   0   0   0   0   0   0   0
        0   0   0   0   0   0   0   0   0   0
        0   0   0   0   0
0 9      0   0   0   0   1   1   1   1   1   1
        1   1   1   1   1   1   1   1   1   1
        1   1   1   1   1   1   1   1   1   1
        1   1   1   0   0   0   0   0   0   0
        0   0   0   0   0   0   0   0   0   0
        0   0   0   0   0   0   0   0   0   0
        0   0   0   0   0
0 10      0   0   0   1   1   1   1   1   1   1
        1   1   1   1   1   1   1   1   1   1
        1   1   1   1   1   1   1   1   1   1
        1   1   1   0   0   0   0   0   0   0
```

```
         0    0    0    0    0    0    0    0    0    0
         0    0    0    0    0    0    0    0    0    0
         0    0    0    0    0
0 11       0    0    0    1    1    1    1    1    1    1
         1    1    1    1    1    1    1    1    1    1
         1    1    1    1    1    1    1    1    1    1
         1    1    1    0    0    0    0    0    0    0
         0    0    0    0    0    0    0    0    0    0
         0    0    0    0    0    0    0    0    0    0
         0    0    0    0    0
0 12       0    0    0    1    1    1    1    1    1    1
         1    1    1    1    1    1    1    1    1    1
         1    1    1    1    1    1    1    1    1    1
         1    1    1    1    0    0    0    0    0    0
         0    0    0    0    0    0    0    0    0    0
         0    0    0    0    0    0    0    0    0    0
         0    0    0    0    0
0 13       0    0    0    1    1    1    1    1    1    1
         1    1    1    1    1    1    1    1    1    1
         1    1    1    1    1    1    1    1    1    1
         1    1    1    1    1    0    0    0    0    0
         0    0    0    0    0    0    0    0    0    0
         0    0    0    0    0    0    0    0    0    0
         0    0    0    0    0
0 14       0    0    0    1    1    1    1    1    1    1
         1    1    1    1    1    1    1    1    1    1
         1    1    1    1    1    1    1    1    1    1
         1    1    1    1    1    1    0    0    0    0
         0    0    0    0    0    0    0    0    0    0
         0    0    0    0    0    0    0    0    0    0
         0    0    0    0    0
0 15       0    0    0    1    1    1    1    1    1    1
         1    1    1    1    1    1    1    1    1    1
         1    1    1    1    1    1    1    1    1    1
```

```
        1     1     1     1     1     1     1     0     0     0
        0     0     0     0     0     0     0     0     0     0
        0     0     0     0     0     0     0     0     0     0
        0     0     0     0     0
0.16      0     0     0     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     0     0
        0     0     0     0     0     0     0     0     0     0
        0     0     0     0     0     0     0     0     0     0
        0     0     0     0     0
0.17      0     0     0     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     0     0
        0     0     0     0     0     0     0     0     0     0
        0     0     0     0     0     0     0     0     0     0
        0     0     0     0     0
0.18      0     0     0     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     0
        0     0     0     0     0     0     0     0     0     0
        0     0     0     0     0     0     0     0     0     0
        0     0     0     0     0
0.19      0     0     0     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     0
        0     0     0     0     0     0     0     0     0     0
        0     0     0     0     0     0     0     0     0     0
        0     0     0     0     0
0.20      0     0     0     1     1     1     1     1     1     1
        1     1     1     1     1     1     1     1     1     1
```

```
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 21      0    0    0    0    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    0    0    0    0    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 22      0    0    0    0    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    0    0    0    0    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 23      0    0    0    0    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    0    0    0    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 24      0    0    0    0    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    0    0    0    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 25      0    0    0    0    1    1    1    1    1    1
```

```
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    0    0    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 26      0    0    0    0    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    0    0    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 27      0    0    0    0    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    0    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 28      0    0    0    0    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 29      0    0    0    0    0    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    0    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
```

```
0 30     0    0    0    0    0    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    0    0    0    0
       0    0    0    0    0    0    0    0    0    0
       0    0    0    0    0
0 31     0    0    0    0    0    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    0    0    0
       0    0    0    0    0    0    0    0    0    0
       0    0    0    0    0
0 32     0    0    0    0    0    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    0    0    0
       0    0    0    0    0    0    0    0    0    0
       0    0    0    0    0
0 33     0    0    0    0    0    0    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    1    0    0
       0    0    0    0    0    0    0    0    0    0
       0    0    0    0    0
0 34     0    0    0    0    0    0    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    1    1    1
       1    1    1    1    1    1    1    1    0    0
       0    0    0    0    0    0    0    0    0    0
```

```
        0    0    0    0    0
0 35     0    0    0    0    0    0    0    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    0    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 36     0    0    0    0    0    0    0    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 37     0    0    0    0    0    0    0    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 38     0    0    0    0    0    0    0    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 39     0    0    0    0    0    0    0    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    0
```

```
          0     0     0     0     0     0     0     0     0     0
          0     0     0     0     0
 0 40       0     0     0     0     0     0     0     1     1     1
          1     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     0
          0     0     0     0     0     0     0     0     0     0
          0     0     0     0     0
 0 41       0     0     0     0     0     0     0     0     1     1
          1     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     0     0     0
          0     0     0     0     0     0     0     0     0     0
          0     0     0     0     0
 0 42       0     0     0     0     0     0     0     0     0     0
          0     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     1
          0     0     0     0     0     0     0     0     0     0
          0     0     0     0     0
 0 43       0     0     0     0     0     0     0     0     0     0
          0     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     1
          0     0     0     0     0     0     0     0     0     0
          0     0     0     0     0
 0 44       0     0     0     0     0     0     0     0     0     0
          0     0     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     1
          1     1     1     1     1     1     1     1     1     1
```

```
        1    1    1    1    1    1    1    1    1    1
        1    1    0    0    0    0    0    0    0    0
        0    0    0    0    0
0.45     0    0    0    0    0    0    0    0    0    0
        0    0    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    0    0    0    0    0    0    0    0
        0    0    0    0    0
0.46     0    0    0    0    0    0    0    0    0    0
        0    0    0    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    0    0    0    0    0    0    0
        0    0    0    0    0
0.47     0    0    0    0    0    0    0    0    0    0
        0    0    0    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    0    0    0    0    0    0    0
        0    0    0    0    0
0.48     0    0    0    0    0    0    0    0    0    0
        0    0    0    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    0    0    0    0    0    0    0    0
        0    0    0    0    0
0.49     0    0    0    0    0    0    0    0    0    0
        0    0    0    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
```

```
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    0    0
        0    0    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 50      0    0    0    0    0    0    0    0    0    0
        0    0    0    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    0    0    0    0    0    0    0    0
        0    0    0    0    0
0 51      0    0    0    0    0    0    0    0    0    0
        0    0    0    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    0    0    0    0    0
        0    0    0    0    0
0 52      0    0    0    0    0    0    0    0    0    0
        0    0    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    0    0    0    0    0
        0    0    0    0    0
0 53      0    0    0    0    0    0    0    0    0    0
        0    0    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    1    1    1    1    1    1
        1    1    1    1    0    0    0    0    0    0
        0    0    0    0    0
0 54      0    0    0    0    0    0    0    0    0    0
        0    0    1    1    1    1    1    1    1    1
```

```
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     0     0     0     0
           0     0     0     0     0
0 55         0     0     0     0     0     0     0     0     0     0
           0     0     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     0     0     0     0
           0     0     0     0     0
0 56         0     0     0     0     0     0     0     0     0     0
           0     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     0     0     0
           0     0     0     0     0
0 57         0     0     0     0     0     0     0     0     0     0
           0     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     0     0
           0     0     0     0     0
0 58         0     0     0     0     0     0     0     0     0     0
           0     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     1
           1     1     1     1     1     1     1     1     1     0
           0     0     0     0     0
0 59         0     0     0     0     0     0     0     0     0     0
```

```
           0    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    0
           0    0    0    0    0
0 60         0    0    0    0    0    0    0    0    0    0
           0    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    0
           0    0    0    0    0
0 61         0    0    0    0    0    0    0    0    0    0
           0    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    0    0
           0    0    0    0    0
0 62         0    0    0    0    0    0    0    0    0    0
           0    1    1    1    1    1    1    1    1    1
           1    1    0    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    0    0    0    0
0 63         0    0    0    0    0    0    0    0    0    0
           0    1    1    1    1    1    1    1    1    1
           1    1    0    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    1    1    1    1    1    1    1    1    1
           1    0    0    0    0
```

```
0.64     0     0     0     0     0     0     0     0     0     0
       0     1     1     0     0     0     1     1     1     1
       1     0     0     0     1     1     1     1     1     1
       1     1     1     1     1     1     1     1     1     1
       1     1     1     1     1     1     1     1     1     1
       1     1     1     1     1     1     1     1     1     1
       1     1     0     0     0
0.65     0     0     0     0     0     0     0     0     0     0
       0     0     0     0     0     0     0     1     1     1
       0     0     0     0     0     1     1     1     1     1
       1     1     1     1     1     1     1     1     1     1
       1     1     1     1     1     1     1     1     1     1
       1     1     1     1     1     1     1     1     1     1
       1     0     0     0     0
0.66     0     0     0     0     0     0     0     0     0     0
       0     0     0     0     0     0     0     0     0     0
       0     0     0     0     0     0     0     0     0     0
       0     0     0     0     1     1     1     1     1     1
       1     1     1     1     1     1     1     1     1     1
       1     1     1     1     1     1     1     1     1     1
       1     0     0     0     0
0.67     0     0     0     0     0     0     0     0     0     0
       0     0     0     0     0     0     0     0     0     0
       0     0     0     0     0     0     0     0     0     0
       0     0     0     0     0     1     1     1     1     1
       1     1     1     1     1     1     1     1     0     0
       1     1     1     1     1     1     1     1     1     1
       0     0     0     0     0
0.68     0     0     0     0     0     0     0     0     0     0
       0     0     0     0     0     0     0     0     0     0
       0     0     0     0     0     0     0     0     0     0
       0     0     0     0     0     0     0     1     1     1
       1     1     1     1     1     1     1     1     0     0
       1     1     1     1     1     1     1     1     0     0
```

```
      0    0    0    0    0
0 69    0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      1    1    1    1    1    1    1    1    0    0
      0    1    1    1    1    1    1    1    0    0
      0    0    0    0    0
0 70    0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    1    1    1    1    1    0    0
      0    1    1    1    1    1    1    1    1    0
      0    0    0    0    0
0 71    0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    1    1    1    1    1    1    1    0
      0    0    0    0    0
0 72    0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    1    1    1    1    1    1    0    0
      0    0    0    0    0
0 73    0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
      0    0    0    0    0    0    0    0    0    0
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         0       0       1       1       1       1       1       1       0       0
         0       0       0       0       0
0 74       0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       1       1       1       1       0       0       0
         0       0       0       0       0
0 75       0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0
0 76       0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0
0 77       0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0       0       0       0       0       0
         0       0       0       0       0
0AQUIFER HEAD WILL BE SET TO -999.00    AT ALL NO-FLOW NODES (IBOUND=0).
          0
```

```
INITIAL HEAD FOR LAYER  1 WILL BE READ ON UNIT  1 USING FORMAT:       (10G15.6)
                    ------------------------------------------------------------------------------------

           1       2       3       4       5       6       7       8       9      10
          11      12      13      14      15      16      17      18      19      20
          21      22      23      24      25      26      27      28      29      30
          31      32      33      34      35      36      37      38      39      40
          41      42      43      44      45      46      47      48      49      50
          51      52      53      54      55      56      57      58      59      60
          61      62      63      64      65
 ..............................................................................................
 0 1   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
 0 2   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
 0 3   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
 0 4   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   1499.   1499.   1499.   0.000
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     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000
0 5   0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    1505.    1507.    1506.    1504.
     1501.    1499.    1498.    1497.    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000
0 6   0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    1514.    1512.    1517.    1521.    1520.
     1516.    1510.    1503.    1496.    1492.    1489.    1488.    1486.    1485.    1484.
     1483.    1483.    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000
0 7   0.000    0.000    0.000    0.000    1634.    1633.    1629.    0.000    0.000    0.000
     0.000    1542.    1552.    1535.    1531.    1528.    1522.    1527.    1540.    1544.
     1542.    1535.    1524.    1513.    1503.    1494.    1487.    1483.    1480.    1479.
     1478.    1478.    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000
0 8   0.000    0.000    0.000    0.000    1633.    1629.    1615.    1607.    1601.    1561.
     1557.    1569.    1557.    1551.    1536.    1534.    1540.    1544.    1557.    1568.
     1570.    1565.    1554.    1540.    1526.    1513.    1501.    1492.    1485.    1481.
     1478.    1477.    1478.    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
     0.000    0.000    0.000    0.000    0.000
0 9   0.000    0.000    0.000    0.000    1624.    1619.    1609.    1607.    1597.    1598.
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       1590.   1571    1561.   1560.   1551.   1546.   1565.   1579.   1576.   1585.
       1590.   1589.   1581.   1569.   1555.   1540.   1525.   1511.   1500.   1492.
       1485.   1480.   1481.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 10   0.000   0.000   0.000   1624.   1614.   1614.   1607.   1601.   1611.   1601.
       1588.   1577.   1578.   1573.   1567.   1574.   1588.   1598.   1601.   1598.
       1599.   1599.   1595.   1588.   1578.   1566.   1552.   1538.   1524.   1512.
       1505.   1493.   1483.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 11   0.000   0.000   0.000   1611.   1609.   1611.   1610.   1610.   1603.   1600.
       1597.   1586.   1595.   1601.   1602.   1602.   1603.   1606.   1607.   1607.
       1605.   1600.   1599.   1596.   1590.   1584.   1575.   1565.   1556.   1546.
       1527.   1503.   1499.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 12   0.000   0.000   0.000   1599.   1606.   1608.   1610.   1613.   1612.   1599.
       1587.   1589.   1600.   1616.   1626.   1625.   1617.   1607.   1604.   1604.
       1604.   1603.   1598.   1594.   1593.   1592.   1588.   1583.   1577.   1565.
       1545.   1522.   1525.   1553.   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 13   0.000   0.000   0.000   1590.   1597.   1605.   1609.   1611.   1611.   1604.
       1592.   1587.   1596.   1618.   1634.   1635.   1625.   1612.   1613.   1611.
       1609.   1613.   1611.   1596.   1590.   1590.   1589.   1587.   1582.   1574.
       1565.   1553.   1550.   1557.   1570.   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
```

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0 14  0.000   0.000   0.000   1585.   1589.   1609.   1615.   1612.   1608.   1604.
     1594.   1587.   1597.   1617.   1633.   1633.   1630.   1625.   1625.   1624.
     1620.   1615.   1611.   1597.   1596.   1595.   1596.   1596.   1594.   1589.
     1584.   1583.   1580.   1576.   1575.   1599.   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 15  0.000   0.000   0.000   1582.   1583.   1600.   1612.   1618.   1609.   1604.
     1601.   1601.   1626.   1651.   1650.   1636.   1628.   1626.   1625.   1630.
     1633.   1628.   1619.   1614.   1610.   1610.   1614.   1617.   1616.   1607.
     1598.   1595.   1592.   1585.   1589.   1633.   1601.   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 16  0.000   0.000   0.000   1577.   1579.   1590.   1602.   1616.   1601.   1600.
     1600.   1610.   1637.   1654.   1652.   1641.   1626.   1618.   1618.   1630.
     1638.   1635.   1621.   1609.   1610.   1617.   1626.   1632.   1633.   1625.
     1605.   1592.   1590.   1589.   1602.   1629.   1601.   1604.   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 17  0.000   0.000   0.000   1573.   1574.   1577.   1608.   1618.   1602.   1598.
     1601.   1603.   1635.   1643.   1637.   1628.   1615.   1608.   1611.   1622.
     1625.   1624.   1617.   1609.   1609.   1615.   1626.   1635.   1630.   1630.
     1623.   1594.   1590.   1590.   1594.   1600.   1603.   1585.   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 18  0.000   0.000   0.000   1567.   1569.   1571.   1584.   1612.   1597.   1593.
     1592.   1590.   1635.   1629.   1621.   1610.   1598.   1594.   1598.   1600.
     1602.   1606.   1609.   1609.   1607.   1609.   1616.   1625.   1622.   1633.
     1618.   1594.   1589.   1586.   1586.   1587.   1575.   1551.   1541.   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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      0.000    0.000    0.000    0.000    0.000
0 19   0.000    0.000    0.000    1562.    1562.    1566.    1564.    1584.    1584.    1584.
      1582.    1582.    1600.    1612.    1608.    1599.    1591.    1582.    1571.    1580.
      1582.    1583.    1591.    1602.    1602.    1601.    1601.    1603.    1600.    1605.
      1594.    1585.    1583.    1588.    1594.    1585.    1558.    1534.    1513.    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 20   0.000    0.000    0.000    1556.    1556.    1560.    1557.    1553.    1573.    1575.
      1574.    1584.    1596.    1599.    1597.    1590.    1585.    1571.    1554.    1565.
      1567.    1561.    1559.    1573.    1592.    1589.    1582.    1574.    1561.    1572.
      1570.    1564.    1565.    1583.    1589.    1583.    1541.    1524.    1501.    1486.
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 21   0.000    0.000    0.000    0.000    1549.    1553.    1552.    1541.    1554.    1561.
      1579.    1588.    1587.    1586.    1585.    1586.    1575.    1550.    1539.    1543.
      1547.    1546.    1543.    1544.    1573.    1573.    1562.    1546.    1533.    1549.
      1552.    1553.    1553.    1565.    1581.    1537.    1530.    1511.    1494.    1478.
      1436.    1425.    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 22   0.000    0.000    0.000    0.000    1542.    1545.    1546.    1535.    1542.    1543.
      1581.    1578.    1572.    1570.    1570.    1570.    1558.    1533.    1524.    1526.
      1531.    1540.    1542.    1545.    1572.    1569.    1550.    1529.    1516.    1523.
      1536.    1549.    1555.    1558.    1561.    1563.    1542.    1530.    1511.    1493.
      1454.    1423.    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 23   0.000    0.000    0.000    0.000    1535.    1538.    1538.    1529.    1534.    1537.
      1552.    1555.    1549.    1553.    1559.    1559.    1544.    1533.    1521.    1511.
      1521.    1535.    1541.    1548.    1567.    1562.    1554.    1527.    1504.    1501.
      1526.    1551.    1561.    1561.    1566.    1564.    1552.    1537.    1514.    1503.
      1475.    1427.    1423.    0.000    0.000    0.000    0.000    0.000    0.000    0.000
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      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 24   0.000   0.000   0.000   0.000   1529.   1530.   1531.   1523.   1524.   1528.
      1531.   1529.   1530.   1540.   1553.   1557.   1537.   1527.   1513.   1498.
      1505.   1519.   1531.   1543.   1551.   1569.   1558.   1530.   1502.   1488.
      1515.   1545.   1557.   1559.   1564.   1559.   1554.   1551    1535.   1493.
      1470.   1430.   1420.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 25   0.000   0.000   0.000   0.000   1522.   1523.   1524.   1517.   1517.   1517.
      1518.   1517.   1521.   1532.   1546.   1548.   1532.   1520.   1504.   1487.
      1485.   1489.   1515.   1533.   1553.   1567.   1555.   1525.   1502.   1476.
      1495.   1533.   1553.   1559.   1561.   1560.   1553.   1548.   1539.   1492.
      1457.   1442.   1422.   1412.   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 26   0.000   0.000   0.000   0.000   1515.   1516.   1517.   1511.   1513.   1494.
      1495.   1506.   1513.   1521.   1530.   1532.   1523.   1514.   1497.   1475.
      1476.   1484.   1516.   1535.   1547.   1555.   1538.   1506.   1496.   1473.
      1481.   1513.   1541.   1552.   1557.   1560.   1553.   1545.   1532.   1496.
      1475.   1440.   1421.   1405.   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 27   0.000   0.000   0.000   0.000   1509.   1510.   1511.   1506.   1511.   1503.
      1473.   1495.   1506.   1507.   1513.   1518.   1516.   1514.   1497.   1472.
      1467.   1499.   1530.   1537.   1537.   1536.   1520.   1511.   1485.   1463.
      1469.   1497.   1529.   1546.   1552.   1555.   1550.   1541.   1536.   1516.
      1487.   1437.   1419.   1402.   1389.   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 28   0.000   0.000   0.000   0.000   1503.   1504.   1505.   1501.   1509.   1501.
      1468.   1485.   1498.   1497.   1506.   1511.   1509.   1510.   1490.   1466.
      1461.   1500.   1527.   1530.   1527.   1525.   1524.   1517.   1486.   1460.
      1462.   1489.   1521.   1539.   1544.   1554.   1551.   1538.   1537.   1524.
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       1494.   1453.   1430.   1409.   1381.   1380.   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 29  0.000   0.000   0.000   0.000   0.000   1498.   1499.   1497    1507.   1501
       1490.   1460.   1483.   1493.   1501.   1502.   1501.   1501.   1487.   1461.
       1453.   1475.   1511.   1525.   1524.   1520.   1523.   1522.   1494.   1458.
       1460.   1491.   1519.   1528.   1528.   1546.   1549.   1556.   1557.   1554.
       1518.   1477.   1450.   1412.   1376.   1374.   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 30  0.000   0.000   0.000   0.000   0.000   1492.   1494.   1494.   1503.   1501.
       1486.   1452.   1476.   1491.   1490.   1491.   1494.   1494.   1478.   1449.
       1448.   1470.   1500.   1517.   1520.   1515.   1516.   1514.   1485.   1455.
       1451.   1486.   1511.   1519.   1519.   1538.   1554.   1559.   1567.   1561.
       1540.   1496.   1465.   1418.   1380.   1369.   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 31  0.000   0.000   0.000   0.000   0.000   1487.   1489.   1490.   1499.   1499.
       1470.   1458.   1449.   1478.   1480.   1485.   1487.   1486.   1474.   1445.
       1449.   1480.   1495.   1502.   1518.   1507.   1499.   1486.   1471.   1454.
       1437.   1462.   1494.   1514.   1520.   1549.   1558.   1553.   1562.   1558.
       1549.   1510.   1442.   1422.   1377.   1365.   1372.   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 32  0.000   0.000   0.000   0.000   0.000   1482.   1485.   1487.   1494.   1484.
       1462.   1459.   1439.   1459.   1466.   1477.   1475.   1468.   1457.   1435.
       1442.   1473.   1487.   1489.   1495.   1493.   1478.   1470.   1459.   1455.
       1447.   1444.   1476.   1510.   1516.   1547.   1554.   1553.   1557.   1552.
       1537.   1498.   1439.   1411.   1393.   1365.   1370.   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 33  0.000   0.000   0.000   0.000   0.000   0.000   1480.   1483.   1488.   1475.
       1460.   1457.   1438.   1449.   1453.   1463.   1461.   1453.   1447.   1428.
       1429.   1440.   1469.   1484.   1486.   1484.   1472.   1450.   1443.   1432.
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        1435.   1451.   1491.   1510.   1519.   1546.   1549.   1546.   1553.   1556.
        1519.   1493.   1455.   1421.   1392.   1372.   1367.   1376.   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
0 34    0.000   0.000   0.000   0.000   0.000   0.000   1476.   1480.   1481.   1472.
        1465.   1460.   1438.   1436.   1442.   1446.   1445.   1443.   1439.   1421.
        1422.   1435.   1465.   1481.   1478.   1474.   1466.   1452.   1440.   1423.
        1446.   1466.   1496.   1508.   1527.   1547.   1547.   1539.   1532.   1519.
        1506.   1487.   1463.   1417.   1389.   1370.   1365.   1374.   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
0 35    0.000   0.000   0.000   0.000   0.000   0.000   0.000   1476.   1476.   1469.
        1467.   1461.   1440.   1435.   1430.   1437.   1436.   1429.   1423.   1409.
        1416.   1442.   1466.   1474.   1473.   1472.   1463.   1448.   1441.   1415.
        1455.   1464.   1497.   1513.   1525.   1540.   1539.   1526.   1512.   1508.
        1494.   1470.   1455.   1417.   1385.   1370.   1363.   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
0 36    0.000   0.000   0.000   0.000   0.000   0.000   0.000   1473.   1472.   1465.
        1463.   1458.   1445.   1425.   1412.   1424.   1422.   1416.   1415.   1403.
        1412.   1437.   1455.   1462.   1465.   1469.   1460.   1444.   1427.   1402.
        1447.   1473.   1501.   1507.   1510.   1522.   1523.   1511.   1498.   1478.
        1473.   1447.   1437.   1433.   1395.   1370.   1361.   1370.   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
0 37    0.000   0.000   0.000   0.000   0.000   0.000   0.000   1469.   1469.   1467.
        1458.   1454.   1444.   1433.   1412.   1408.   1405.   1404.   1405.   1407.
        1410.   1430.   1440.   1447.   1453.   1453.   1447.   1441.   1414.   1398.
        1442.   1475.   1492.   1499.   1501.   1506.   1509.   1502.   1473.   1471.
        1469.   1451    1443.   1441.   1404.   1382.   1374.   1370.   1363.   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
0 38    0.000   0.000   0.000   0.000   0.000   0.000   0.000   1466.   1468.   1467.
        1460.   1449.   1440.   1437.   1423.   1411.   1403.   1393.   1399.   1394.
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      1400.    1421.    1430.    1437.    1444.    1440.    1437.    1427.    1388.    1399.
      1448.    1466.    1478.    1490.    1496.    1496.    1494.    1489.    1459.    1462.
      1473.    1469.    1473.    1478.    1442.    1408.    1403.    1371.    1358.    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 39   0.000    0.000    0.000    0.000    0.000    0.000    0.000    1462.    1466.    1466.
      1463.    1458.    1443.    1432.    1431.    1424.    1416.    1404.    1399.    1382.
      1375.    1395.    1415.    1427.    1431.    1426.    1422.    1400.    1377.    1409.
      1452.    1458.    1465.    1479.    1489.    1487     1480.    1473.    1443.    1459.
      1470.    1475.    1476.    1482.    1449.    1412.    1407.    1374.    1353.    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 40   0.000    0.000    0.000    0.000    0.000    0.000    0.000    1458.    1463.    1463.
      1463.    1460.    1447.    1435.    1431.    1425.    1422.    1418.    1405.    1391.
      1379.    1383.    1406.    1420.    1419.    1416.    1412.    1397.    1381.    1403.
      1444.    1451.    1457.    1469.    1478.    1475.    1463.    1455.    1433.    1460.
      1467.    1481.    1476.    1468.    1432.    1401.    1400.    1377.    1350.    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 41   0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    1460.    1461.
      1460.    1457.    1451.    1446.    1443.    1438.    1424.    1417.    1415.    1405.
      1389.    1376.    1387.    1403.    1407.    1410.    1400.    1377.    1373.    1415.
      1431.    1447.    1451.    1458.    1463.    1460.    1451.    1445.    1430.    1456.
      1470.    1478.    1473.    1461.    1423.    1394.    1375.    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 42   0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    1455.    1455.    1451.    1448.    1448.    1436.    1422.    1417.    1416.
      1404.    1387.    1377.    1392.    1395.    1398.    1390.    1369.    1365.    1393.
      1430.    1443.    1447.    1449.    1450.    1449.    1436.    1423.    1414.    1452.
      1477.    1477.    1476.    1468.    1448.    1415.    1383.    1345.    1351.    1321.
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 43   0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
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        0.000   1454.   1453.   1451.   1450.   1446.   1440.   1432.   1422.   1416.
        1398.   1389.   1366.   1376.   1384.   1385.   1382.   1373.   1363.   1385.
        1417.   1426.   1439.   1442.   1440.   1436.   1418.   1402.   1420.   1432.
        1476.   1483.   1471.   1469.   1431.   1429.   1377.   1348.   1356.   1319.
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
 0 44     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   1452.   1449.   1451.   1442.   1437.   1437.   1427.   1413.
        1397.   1382.   1366.   1359.   1369.   1377.   1376.   1356.   1358.   1391.
        1406.   1413.   1425.   1429.   1423.   1410.   1390.   1397.   1420.   1440.
        1482.   1484.   1466.   1460.   1455.   1432.   1389.   1356.   1358.   1323.
        1292.   1281.   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
 0 45     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   1452.   1453.   1451.   1441.   1437.   1437.   1432.   1420.
        1404.   1386.   1368.   1354.   1354.   1366.   1364.   1351.   1347.   1383.
        1396.   1410.   1413.   1413.   1406.   1397.   1375.   1396.   1432.   1451.
        1478.   1479.   1462.   1446.   1439.   1430.   1399.   1365.   1363.   1334.
        1290.   1276.   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
 0 46     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   1457.   1450.   1439.   1439.   1436.   1432.   1425.
        1415.   1401.   1380.   1358.   1348.   1358.   1354.   1348.   1343.   1369.
        1391.   1404.   1405.   1399.   1396.   1390.   1368.   1409.   1437.   1450.
        1475.   1475.   1461.   1442.   1422.   1414.   1392.   1370.   1365.   1356.
        1293.   1273.   1272.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
 0 47     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   1452.   1449.   1438.   1439.   1441.   1429.   1425.
        1421.   1412.   1393.   1367.   1346.   1344.   1344.   1344.   1337.   1350.
        1375.   1385.   1386.   1390.   1381.   1362.   1372.   1416.   1428.   1449.
        1473.   1473.   1462.   1454.   1415.   1378.   1364.   1360.   1363.   1367.
        1307.   1271.   1267.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
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0 48   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   1444.   1446.   1445.   1440.   1436.   1424.   1423.
     1423.   1418.   1404.   1385.   1359.   1342.   1342.   1335.   1336.   1338.
     1352.   1358.   1364.   1369.   1359.   1351.   1369.   1409.   1427.   1452.
     1469.   1476.   1468.   1453.   1418.   1390.   1353.   1338.   1352.   1361.
     1339.   1272.   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 49   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   1438.   1444.   1447.   1438.   1433.   1425.   1418.
     1420.   1418.   1414.   1408.   1395.   1396.   1377.   1351.   1342.   1335.
     1334.   1346.   1348.   1347.   1345.   1352.   1390.   1418.   1430.   1452.
     1463.   1464.   1461.   1456.   1443.   1414.   1358.   1331.   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 50   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   1438.   1438.   1430.   1432.   1432.   1421.   1412.
     1413.   1416.   1420.   1424.   1413.   1410.   1397.   1372.   1359.   1355.
     1332.   1331.   1334.   1338.   1346.   1355.   1391    1419.   1425.   1441.
     1451.   1455.   1450.   1447.   1444.   1425.   1376.   1341.   1336.   1316.
     1292.   1288.   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 51   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   1428.   1426.   1423.   1420.   1417.   1412.   1409.
     1408.   1408.   1413.   1422.   1418.   1414.   1407.   1383.   1366.   1360.
     1337.   1328.   1329.   1335.   1340.   1350.   1378.   1407.   1416.   1423.
     1434.   1444.   1441.   1443.   1442.   1430.   1406.   1375.   1350.   1332.
     1309.   1282.   1267.   1263.   1274.   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 52   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   1434.   1421.   1407.   1406.   1407.   1407.   1407.   1405.
     1400.   1398.   1403.   1414.   1420.   1419.   1415.   1401.   1388.   1375.
     1358.   1336.   1327.   1330.   1334.   1344.   1368.   1388.   1399.   1412.
     1418.   1428.   1436.   1436.   1432.   1422.   1411.   1410.   1391.   1370.
     1346.   1299.   1269.   1262.   1271.   0.000   0.000   0.000   0.000   0.000
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       0.000   0.000   0.000   0.000   0.000
0 53   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   1439.   1417.   1397.   1392.   1397.   1401.   1401.   1397.
       1394.   1395.   1399.   1412.   1422.   1421.   1416.   1410.   1403.   1386.
       1356.   1343.   1331.   1326.   1326.   1334.   1353.   1368.   1378.   1399.
       1409.   1396.   1405.   1425.   1421.   1416.   1411.   1409.   1410.   1403.
       1379.   1340.   1286.   1268.   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 54   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   1442.   1415.   1394.   1388.   1388.   1390.   1390.   1390.
       1390.   1394.   1402.   1414.   1422.   1418.   1417.   1411.   1410.   1404.
       1381.   1367.   1355.   1324.   1321.   1319.   1334.   1357.   1362.   1378.
       1377.   1379.   1391.   1411.   1414.   1415.   1418.   1414.   1408.   1415.
       1381.   1355.   1311.   1291.   1269.   1278.   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 55   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   1440.   1413.   1395.   1387.   1384.   1382.   1381.   1383.
       1387.   1395.   1406.   1417.   1424.   1419.   1415.   1409.   1409.   1401.
       1383.   1374.   1358.   1343.   1324.   1319.   1328.   1344.   1345.   1346.
       1345.   1371.   1387.   1408.   1410.   1414.   1428.   1426.   1398.   1407.
       1400.   1346.   1335.   1333.   1291.   1277.   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 56   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   1453.   1437.   1413.   1394.   1384.   1378.   1376.   1377.   1380.
       1386.   1393.   1406.   1416.   1424.   1414.   1406.   1408.   1408.   1401.
       1392.   1389.   1368.   1343.   1329.   1320.   1318.   1322.   1330.   1335.
       1342.   1362.   1376.   1411.   1410.   1406.   1407.   1431.   1399.   1406.
       1408.   1392.   1370.   1375.   1352.   1277.   1281.   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 57   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   1440.   1428.   1408.   1389.   1377.   1370.   1369.   1371.   1377.
       1383.   1384.   1392.   1400.   1402.   1402.   1401.   1404.   1404.   1400.
       1396.   1399.   1378.   1348.   1334.   1314.   1314.   1302.   1302.   1324.
       1330.   1348.   1371.   1410.   1413.   1415.   1386.   1380.   1387.   1401.
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      1401.    1406.    1389.    1390.    1386.    1294.    1279.    1283.    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 58  0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    1419.    1413.    1395.    1377.    1365.    1360.    1358.    1360.    1365.
      1366.    1362.    1367.    1373.    1376.    1380.    1385.    1391.    1394.    1394.
      1394.    1398.    1400.    1357.    1340.    1303.    1300.    1298.    1296.    1311.
      1318.    1335.    1356.    1385.    1408.    1392.    1374.    1334.    1343.    1366.
      1357.    1387.    1389.    1389.    1387.    1348.    1276.    1278.    1283.    0.000
      0.000    0.000    0.000    0.000    0.000
 0 59  0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    1387.    1394.    1378.    1364.    1354.    1349.    1348.    1350.    1353.
      1354.    1355.    1358.    1361.    1363.    1367.    1371.    1376.    1381.    1384.
      1388.    1398.    1400.    1363.    1343.    1333.    1304.    1278.    1284.    1298.
      1307.    1329.    1339.    1351.    1377.    1368.    1359.    1358.    1341.    1329.
      1329.    1356.    1375.    1380.    1380.    1371.    1281.    1274.    1278.    0.000
      0.000    0.000    0.000    0.000    0.000
 0 60  0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    1386.    1369.    1362.    1354.    1345.    1340.    1340.    1341.    1343.
      1344.    1346.    1347.    1350.    1353.    1358.    1363.    1368.    1373.    1377.
      1384.    1399.    1391.    1361.    1353.    1338.    1316.    1275.    1275.    1282.
      1290.    1317.    1329.    1338.    1347.    1329.    1336.    1340.    1328.    1300.
      1296.    1357.    1358.    1362.    1365.    1355.    1309.    1269.    1273.    0.000
      0.000    0.000    0.000    0.000    0.000
 0 61  0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    1363.    1357.    1356.    1349.    1339.    1334.    1334.    1332.    1331.
      1332.    1334.    1336.    1338.    1341.    1346.    1352.    1359.    1366.    1373.
      1371.    1372.    1368.    1352.    1352.    1346.    1306.    1276.    1265.    1261.
      1267.    1295.    1316.    1328.    1328.    1317.    1322.    1327.    1308.    1284.
      1277.    1350.    1346.    1349.    1354.    1351.    1304.    1271.    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 62  0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    1338.    1340.    1338.    1332.    1326.    1321.    1322.    1320.    1320.
      1321.    1322.    0.000    1323.    1323.    1324.    1327.    1333.    1341.    1348.
      1352.    1340.    1341.    1341.    1345.    1340.    1307.    1283.    1262.    1246.
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       1253.    1274.    1299.    1312.    1310.    1307.    1312.    1307.    1279.    1270.
       1269.    1314.    1333.    1344.    1352.    1352.    1336.    1281.    1265.    1267.
       1270.    0.000    0.000    0.000    0.000
0 63   0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    1323.    1321.    1318.    1316.    1313.    1312.    1313.    1313.    1314.
       1314.    1313.    0.000    1310.    1308.    1305.    1302.    1300.    1300.    1303.
       1305.    1308.    1314.    1310.    1314.    1315.    1306.    1295.    1261.    1243.
       1247.    1255.    1275.    1287.    1298.    1298.    1296.    1276.    1256.    1262.
       1257.    1267.    1293.    1322.    1345.    1356.    1348.    1305.    1265.    1264.
       1265.    0.000    0.000    0.000    0.000
0 64   0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    1317.    1314.    0.000    0.000    0.000    1307.    1307.    1307.    1307.
       1306.    0.000    0.000    0.000    1301.    1298.    1295.    1291.    1287.    1283.
       1280.    1277.    1278.    1280.    1286.    1295.    1300.    1290.    1270.    1249.
       1246.    1248.    1260.    1267.    1278.    1276.    1268.    1257.    1241.    1239.
       1233.    1249.    1284.    1316.    1338.    1347.    1335.    1305.    1272.    1261.
       1262.    1263.    0.000    0.000    0.000
0 65   0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    0.000    0.000    0.000    1300.    1300.    1299.
       0.000    0.000    0.000    0.000    0.000    1292.    1289.    1285.    1281.    1276.
       1272.    1269.    1267.    1265.    1264.    1268.    1274.    1271.    1273.    1250.
       1241.    1243.    1245.    1250.    1255.    1256.    1240.    1237.    1234.    1227.
       1239.    1264.    1291.    1314.    1331.    1335.    1324.    1301.    1276.    1260.
       1259.    0.000    0.000    0.000    0.000
0 66   0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    1253.    1248.    1244.    1250.    1253.    1245.
       1243.    1241.    1239.    1240.    1242.    1243.    1233.    1229.    1228.    1233.
       1243.    1260.    1281.    1301.    1316.    1319.    1312.    1296.    1277.    1260.
       1256.    0.000    0.000    0.000    0.000
0 67   0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
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     0.000   0.000   0.000   0.000   0.000   1241.   1239.   1236.   1236.   1238.
     1237.   1235.   1233.   1231.   1228.   1226.   1225.   1225.   0.000   0.000
     1236.   1247.   1263.   1282.   1295.   1300.   1298.   1289.   1275.   1261.
     0.000   0.000   0.000   0.000   0.000
0 68   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   1231.   1230.   1230.
     1229.   1228.   1226.   1225.   1223.   1221.   1220.   1219.   0.000   0.000
     1230.   1239.   1251.   1265.   1274.   1279.   1281.   1278.   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 69   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     1222.   1221.   1220.   1219.   1218.   1217.   1216.   1216.   0.000   0.000
     0.000   1231.   1241.   1253.   1260.   1264.   1267.   1266.   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 70   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   1214.   1213.   1212.   1212.   1212.   0.000   0.000
     0.000   1223.   1231.   1240.   1247.   1252.   1255.   1256.   1255.   0.000
     0.000   0.000   0.000   0.000   0.000
0 71   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   1221.   1228.   1235.   1240.   1244.   1247.   1248.   0.000
     0.000   0.000   0.000   0.000   0.000
0 72   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   1212.   1217.   1224.   1229.   1234.   1238.   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 73 0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   1208.   1211.   1215.   1220.   1225.   1230.   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 74 0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   1209.   1211.   1214.   1217.   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000
0 75 0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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     0.000   0.000   0.000   0.000   0.000
0 76 0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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0 77 0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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       0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
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       0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    0.000
0HEAD PRINT FORMAT IS FORMAT NUMBER   0    DRAWDOWN PRINT FORMAT IS FORMAT NUMBER   0
0HEADS WILL BE SAVED ON UNIT 30    DRAWDOWNS WILL BE SAVED ON UNIT 35
0OUTPUT CONTROL IS SPECIFIED EVERY TIME STEP
0                              COLUMN TO ROW ANISOTROPY =  1.000000
0                                         DELR =  2640.000
0                                         DELC =  2640.000
          0


HYD. COND. ALONG ROWS FOR LAYER  1 WILL BE READ ON UNIT 11 USING FORMAT:          (10G15.6)
             ------------------------------------------------------------------------------


        1      2      3      4      5      6      7      8      9     10
       11     12     13     14     15     16     17     18     19     20
       21     22     23     24     25     26     27     28     29     30
       31     32     33     34     35     36     37     38     39     40
       41     42     43     44     45     46     47     48     49     50
       51     52     53     54     55     56     57     58     59     60
       61     62     63     64     65
 ..................................................................................
0 1    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
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       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
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0 2    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
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     3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
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 0 4   3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
     3.500    3.500    3.500    3.500    3.500    3.500    7.000    7.000    7.000    3.500
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 0 5   3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
     3.500    3.500    3.500    3.500    3.500    3.500    7.000    7.000    7.000    7.000
     7.000    7.000    7.000    7.000    3.500    3.500    3.500    3.500    3.500    3.500
     3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
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     3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
     3.500    3.500    3.500    3.500    3.500
 0 6   3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
     3.500    3.500    3.500    3.500    3.500    7.000    7.000    7.000    7.000    7.000
     7.000    7.000    7.000    7.000    7.000    7.000    7.000    7.000    7.000    7.000
     7.000    7.000    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
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     3.500    3.500    3.500    3.500    3.500
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0 7   3.500   3.500   3.500   3.500   10.15   10.15   10.15   3.500   3.500   3.500
     3.500   3.500   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000
     7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000
     7.000   7.000   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500
0 8   3.500   3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   3.500
     3.500   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000
     7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000
     7.000   7.000   7.000   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500
0 9   3.500   3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   7.000
     7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000
     7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000
     7.000   7.000   7.000   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500
0 10  3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15   7.000
     7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000
     7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000
     7.000   7.000   7.000   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500
0 11  3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   7.000   7.000
     7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000
     7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000   7.000
     7.000   7.000   7.000   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
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       3.500    3.500    3.500    3.500    3.500
0 12   3.500    3.500    3.500    10.15    10.15    10.15    10.15    10.15    4.200    4.200
       4.200    7.000    7.000    7.000    7.000    7.000    7.000    7.000    7.000    7.000
       7.000    7.000    7.000    7.000    7.000    7.000    7.000    7.000    7.000    7.000
       7.000    7.000    7.000    7.000    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500
0 13   3.500    3.500    3.500    10.15    10.15    10.15    10.15    10.15    4.200    4.200
       4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200
       4.200    4.200    4.200    4.200    7.000    7.000    7.000    7.000    7.000    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500
0 14   3.500    3.500    3.500    10.15    10.15    10.15    10.15    10.15    4.200    4.200
       4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200
       4.200    4.200    4.200    4.200    7.000    7.000    7.000    7.000    7.000    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500
0 15   3.500    3.500    3.500    10.15    10.15    10.15    10.15    10.15    4.200    4.200
       4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200
       4.200    4.200    4.200    4.200    7.000    7.000    7.000    7.000    7.000    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500
0 16   3.500    3.500    3.500    10.15    10.15    10.15    10.15    10.15    10.15    4.200
       4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200
       4.200    4.200    4.200    4.200    7.000    7.000    7.000    7.000    7.000    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
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      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
 0 17  3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200
      4.200   4.200   4.200   4.200   7.000   7.000   7.000   7.000   7.000   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
 0 18  3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200
      4.200   4.200   4.200   4.200   7.000   7.000   7.000   7.000   7.000   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
 0 19  3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200
      4.200   4.200   4.200   4.200   7.000   7.000   7.000   7.000   7.000   7.000
      7.000   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
 0 20  3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200
      4.200   4.200   4.200   4.200   7.000   7.000   7.000   7.000   7.000   7.000
      7.000   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
 0 21  3.500   3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15
      8.400   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200
      4.200   4.200   4.200   4.200   4.900   4.900   7.000   7.000   7.000   7.000
      7.000   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
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      3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
      3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
      3.500    3.500    3.500    3.500    3.500
0 22   3.500    3.500    3.500    3.500    10.15    10.15    10.15    10.15    10.15    10.15
      8.400    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200
      4.200    4.200    4.200    4.200    4.200    4.900    7.000    7.000    7.000    7.000
      7.000    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
      3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
      3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
      3.500    3.500    3.500    3.500    3.500
0 23   3.500    3.500    3.500    3.500    10.15    10.15    10.15    10.15    10.15    10.15
      8.400    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200
      4.200    4.200    4.200    4.200    4.200    4.900    7.000    7.000    7.000    7.000
      7.000    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
      3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
      3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
      3.500    3.500    3.500    3.500    3.500
0 24   3.500    3.500    3.500    3.500    10.15    10.15    10.15    10.15    10.15    10.15
      8.400    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200
      4.200    4.200    4.200    4.200    4.200    4.900    7.000    7.000    7.000    7.000
      7.000    3.500    3.500    3.500    3.500    3.500    3.500    5.600    5.600    5.600
      5.600    5.600    5.600    3.500    3.500    3.500    3.500    3.500    3.500    3.500
      3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
      3.500    3.500    3.500    3.500    3.500
0 25   3.500    3.500    3.500    3.500    10.15    10.15    10.15    10.15    10.15    10.15
      8.400    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200
      4.200    2.800    2.800    2.800    2.800    2.800    7.000    7.000    7.000    7.000
      7.000    3.500    3.500    3.500    3.500    3.500    3.500    5.600    5.600    5.600
      5.600    5.600    5.600    5.600    3.500    3.500    3.500    3.500    3.500    3.500
      3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
      3.500    3.500    3.500    3.500    3.500
0 26   3.500    3.500    3.500    3.500    10.15    10.15    10.15    10.15    10.15    10.15
      8.400    8.400    4.200    4.200    4.200    4.200    4.200    4.200    4.200    4.200
      4.200    2.800    2.800    2.800    2.800    2.800    2.800    2.800    2.800    3.500
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      3.500   3.500   3.500   3.500   3.500   3.500   3.500   5.600   5.600   5.600
      5.600   5.600   5.600   5.600   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 27    3.500   3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15
      8.400   8.400   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200
      4.200   2.800   2.800   2.800   2.800   2.800   2.800   2.800   2.800   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   1.050   1.050   1.050   5.600
      5.600   5.600   5.600   5.600   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 28    3.500   3.500   3.500   3.500   8.400   10.15   10.15   8.400   8.400   8.400
      8.400   8.400   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200
      4.200   2.800   2.800   2.800   2.800   2.800   2.800   2.800   2.800   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   1.050   1.050   1.050   5.600
      5.600   5.600   5.600   5.600   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 29    3.500   3.500   3.500   3.500   3.500   8.400   8.400   8.400   8.400   8.400
      8.400   8.400   4.200   4.200   4.200   4.200   4.200   4.200   4.200   4.200
      4.200   2.800   2.800   2.800   2.800   2.800   2.800   2.800   2.800   2.800
      2.800   3.500   3.500   3.500   1.050   1.050   1.050   1.050   1.050   1.050
      1.050   1.050   1.050   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 30    3.500   3.500   3.500   3.500   3.500   8.400   8.400   8.400   8.400   8.400
      8.400   8.400   5.600   4.200   4.200   4.200   4.200   4.200   4.200   4.200
      4.200   2.800   2.800   2.800   2.800   2.800   2.800   2.800   2.800   2.800
      3.500   3.500   3.500   3.500   2.450   1.050   1.050   1.050   1.050   1.050
      1.050   1.050   1.050   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 31    3.500   3.500   3.500   3.500   3.500   8.400   8.400   8.400   8.400   8.400
      8.400   8.400   8.400   4.200   4.200   4.200   4.200   4.200   4.200   4.200
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       4.200    2.800    2.800    2.800    2.800    2.800    2.800    2.800    2.800    2.800
       3.500    3.500    3.500    3.500    2.450    1.050    1.050    1.050    1.050    1.050
       1.050    1.050    1.050    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500
0 32   3.500    3.500    3.500    3.500    3.500    8.400    8.400    8.400    8.400    8.400
       8.400    8.400    8.400    4.200    4.200    4.200    4.200    4.200    4.200    4.200
       4.200    2.800    2.800    2.800    2.800    2.800    2.800    2.800    2.800    2.800
       3.500    3.500    3.500    3.500    2.450    1.050    1.050    1.050    1.050    1.050
       1.050    1.050    1.050    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500
0 33   3.500    3.500    3.500    3.500    3.500    3.500    8.400    8.400    8.400    8.400
       8.400    8.400    8.400    4.200    4.200    4.200    4.200    4.200    4.200    4.200
       3.500    2.800    2.800    2.800    2.800    2.800    2.800    2.800    2.800    2.800
       3.500    3.500    2.450    1.050    1.050    1.050    1.050    1.050    1.050    1.050
       1.050    1.050    1.050    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500
0 34   3.500    3.500    3.500    3.500    3.500    3.500    8.400    8.400    8.400    8.400
       8.400    8.400    8.400    4.200    4.200    4.200    4.200    4.200    4.200    4.200
       3.500    2.800    2.800    2.800    2.800    2.800    2.800    2.800    2.800    2.800
       2.800    2.800    1.050    1.050    1.050    1.050    1.050    1.050    1.050    1.050
       1.050    1.050    1.050    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500
0 35   3.500    3.500    3.500    3.500    3.500    3.500    3.500    8.400    8.400    8.400
       8.400    8.400    8.400    4.200    4.200    4.200    4.200    4.200    4.200    4.200
       3.500    2.800    2.800    2.800    2.800    2.800    2.800    2.800    2.800    2.800
       2.800    2.800    1.050    1.050    1.050    1.050    1.050    1.050    1.050    1.050
       1.050    1.050    1.050    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500    3.500
       3.500    3.500    3.500    3.500    3.500
0 36   3.500    3.500    3.500    3.500    3.500    3.500    3.500    8.400    8.400    8.400
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     8.400  8.400  8.400  4.200  4.200  4.200  4.200  4.200  4.200  4.200
     3.500  2.800  2.800  2.800  2.800  2.800  2.800  2.800  2.800  2.800
     2.800  2.800  1.050  1.050  1.050  1.050  1.050  1.050  1.050  1.050
     4.200  4.200  4.200  4.200  4.200  4.200  4.200  3.500  3.500  3.500
     3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500
     3.500  3.500  3.500  3.500  3.500
0 37  3.500  3.500  3.500  3.500  3.500  3.500  3.500  8.400  8.400  8.400
     8.400  8.400  8.400  8.400  4.200  4.200  4.200  4.200  4.200  4.200
     3.500  2.800  2.800  2.800  2.800  2.800  2.800  2.800  2.800  2.800
     2.800  2.800  1.050  1.050  1.050  1.050  1.050  1.050  1.050  1.050
     4.200  4.200  4.200  4.200  4.200  4.200  4.200  3.500  3.500  3.500
     3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500
     3.500  3.500  3.500  3.500  3.500
0 38  3.500  3.500  3.500  3.500  3.500  3.500  3.500  8.400  8.400  8.400
     8.400  8.400  8.400  8.400  8.400  8.400  8.400  4.200  4.200  4.200
     3.500  2.800  2.800  2.800  2.800  2.800  2.800  2.800  2.800  2.800
     2.800  2.800  2.450  2.450  2.450  2.450  2.450  1.400  7.000  1.400
     4.200  4.200  4.200  3.150  4.200  4.200  4.200  3.500  3.500  3.500
     3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500
     3.500  3.500  3.500  3.500  3.500
0 39  3.500  3.500  3.500  3.500  3.500  3.500  3.500  8.400  8.400  8.400
     8.400  8.400  8.400  8.400  8.400  8.400  8.400  8.400  8.400  8.400
     7.000  2.800  2.800  2.800  2.800  2.800  2.800  2.800  2.800  2.450
     2.450  2.450  2.450  2.450  2.450  2.450  2.450  1.400  7.000  1.400
     4.200  4.200  4.200  1.400  1.400  3.500  3.500  3.500  3.500  3.500
     3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500
     3.500  3.500  3.500  3.500  3.500
0 40  3.500  3.500  3.500  3.500  3.500  3.500  3.500  8.400  8.400  8.400
     8.400  8.400  8.400  8.400  8.400  8.400  8.400  8.400  8.400  8.400
     8.400  8.400  2.800  2.800  2.800  2.800  2.800  2.800  2.800  2.450
     2.450  2.450  2.450  2.450  2.450  2.450  2.450  1.400  7.000  1.400
     1.400  1.400  1.400  1.400  1.400  3.500  3.500  3.500  3.500  3.500
     3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500  3.500
     3.500  3.500  3.500  3.500  3.500
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0 41  3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   8.400   8.400
     8.400   8.400   8.400   8.400   8.400   8.400   8.400   8.400   8.400   8.400
     8.400   8.400   8.400   2.800   2.800   2.800   2.800   2.800   2.800   2.450
     2.450   2.450   2.450   2.450   2.450   2.450   2.450   1.400   7.000   1.400
     1.400   1.400   1.400   1.400   1.400   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500
0 42  3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   8.400   8.400   8.400   8.400   8.400   8.400   8.400   8.400   8.400
     8.400   8.400   8.400   2.800   2.800   2.800   2.800   2.800   2.800   2.450
     2.450   2.450   2.450   2.450   2.450   2.450   2.450   10.15   7.000   1.400
     1.400   1.400   1.400   1.400   1.400   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500
0 43  3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   8.400   8.400   8.400   8.400   8.400   8.400   8.400   8.400   8.400
     8.400   8.400   8.400   8.400   2.800   2.800   2.800   2.800   2.800   2.450
     2.450   2.450   2.450   2.450   2.450   2.450   2.450   10.15   1.400   1.400
     1.400   1.400   1.400   1.400   1.400   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500
0 44  3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   8.400   8.400   8.400   8.400   8.400   8.400   8.400   8.400
     8.400   8.400   8.400   8.400   2.800   2.800   2.800   2.800   2.800   2.450
     2.450   2.450   2.450   2.450   2.450   2.450   10.15   10.15   1.400   1.400
     1.400   1.400   1.400   1.400   1.400   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500
0 45  3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
     3.500   3.500   8.400   8.400   8.400   8.400   8.400   8.400   8.400   8.400
     8.400   8.400   8.400   2.800   2.800   2.800   2.800   2.800   2.800   2.450
     2.450   2.450   2.450   2.450   2.450   2.450   10.15   10.15   1.400   1.400
     1.400   1.400   1.400   1.400   1.400   1.400   1.400   3.500   3.500   3.500
     3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
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      3.500   3.500   3.500   3.500   3.500
0 46  3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   8.400   8.400   8.400   8.400   8.400   8.400   8.400
      8.400   8.400   8.400   8.400   2.800   2.800   2.800   2.800   2.800   2.450
      2.450   2.450   2.450   2.450   2.450   2.450   10.15   10.15   3.150   1.400
      1.400   1.400   1.400   1.400   1.400   1.400   1.400   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 47  3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   8.400   8.400   8.400   8.400   8.400   8.400   8.400
      8.400   8.400   8.400   8.400   2.800   2.800   2.800   2.800   2.450   2.450
      2.450   2.450   2.450   2.450   2.450   2.450   10.15   10.15   3.150   1.400
      1.400   1.400   1.400   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 48  3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   8.400   8.400   8.400   8.400   8.400   8.400   8.400
      8.400   8.400   8.400   8.400   2.800   2.800   2.800   2.800   2.800   2.800
      2.450   2.450   2.450   2.450   2.450   10.15   10.15   10.15   3.150   1.400
      1.400   1.400   1.400   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 49  3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   8.400   8.400   8.400   8.400   8.400   8.400   8.400
      10.15   10.15   10.15   10.15   2.800   2.800   2.800   2.800   2.800   2.800
      2.800   2.450   2.450   2.450   2.450   10.15   10.15   3.500   1.400   1.400
      1.400   1.400   1.400   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 50  3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      10.15   10.15   8.400   8.400   2.800   2.800   2.800   2.800   2.800   2.800
      2.800   2.450   2.450   2.450   8.400   10.15   8.400   1.400   1.400   1.400
      1.400   1.400   1.400   3.500   3.500   3.500   3.500   3.500   3.500   3.500
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      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 51   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      10.15   10.15   8.400   8.400   2.800   2.800   2.800   2.800   2.800   2.800
      2.800   8.400   8.400   8.400   8.400   10.15   10.15   1.400   1.400   1.400
      1.400   1.400   1.400   3.500   3.500   3.500   3.500   3.500   3.500   1.400
      1.400   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 52   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      10.15   10.15   10.15   7.000   2.800   2.800   2.800   2.800   2.800   2.800
      2.800   2.800   2.800   10.15   10.15   10.15   10.15   1.400   1.400   1.400
      1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400
      1.400   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 53   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      10.15   10.15   10.15   7.000   2.800   2.800   2.800   2.800   2.800   2.800
      2.800   2.800   2.800   10.15   10.15   10.15   10.15   1.400   1.400   1.400
      1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400
      1.400   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 54   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      10.15   10.15   10.15   7.000   2.800   2.800   2.800   2.800   2.800   2.800
      2.800   2.800   2.800   2.800   2.800   10.15   10.15   1.400   1.400   1.400
      1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400
      1.400   3.500   1.750   1.400   1.400   1.400   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 55   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      10.15   10.15   10.15   7.000   2.800   2.800   2.800   2.800   2.800   2.800
      2.800   2.800   2.800   2.800   2.800   10.15   10.15   10.15   10.15   10.15
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       3.500   3.500   3.500   3.500   1.400   1.400   1.400   1.400   1.400   1.400
       1.400   1.400   1.400   1.400   1.400   1.400   3.500   3.500   3.500   3.500
       3.500   3.500   3.500   3.500   3.500
 0 56   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
       3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
       10.15   10.15   10.15   7.000   2.800   2.800   2.800   2.800   2.800   2.800
       2.800   2.800   2.800   2.800   2.800   10.15   10.15   10.15   10.15   10.15
       10.15   10.15   10.15   3.500   1.400   1.400   1.400   1.400   1.400   1.400
       1.400   1.400   1.400   1.400   1.400   1.400   1.400   3.500   3.500   3.500
       3.500   3.500   3.500   3.500   3.500
 0 57   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
       3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
       10.15   10.15   10.15   7.000   2.800   2.800   2.800   2.800   2.800   2.800
       2.800   2.800   2.800   2.800   2.800   10.15   10.15   10.15   10.15   10.15
       10.15   10.15   10.15   1.400   1.400   1.400   1.400   1.400   1.400   1.400
       1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   3.500   3.500
       3.500   3.500   3.500   3.500   3.500
 0 58   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
       3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
       10.15   10.15   10.15   7.000   2.800   2.800   2.800   2.800   2.800   2.800
       2.800   2.800   2.800   2.800   2.800   10.15   10.15   10.15   10.15   10.15
       10.15   10.15   1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400
       1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   3.500
       3.500   3.500   3.500   3.500   3.500
 0 59   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
       3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
       10.15   10.15   10.15   7.000   2.800   2.800   2.800   2.800   2.800   2.800
       2.800   2.800   2.800   2.800   2.800   10.15   10.15   10.15   10.15   10.15
       10.15   10.15   1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400
       1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   3.500
       3.500   3.500   3.500   3.500   3.500
 0 60   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
       3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
       10.15   10.15   10.15   7.000   2.800   2.800   2.800   2.800   2.800   2.800
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      2.800   2.800   2.800   2.800   2.800   2.800   10.15   10.15   10.15   10.15
      10.15   10.15   1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400
      1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   3.500
      3.500   3.500   3.500   3.500   3.500
0 61    3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      10.15   10.15   10.15   7.000   7.000   7.000   2.800   2.800   2.800   2.800
      2.800   2.800   2.800   2.800   2.800   2.800   10.15   10.15   10.15   10.15
      10.15   10.15   1.400   1.400   1.400   10.15   10.15   3.500   1.400   1.400
      1.400   1.400   1.400   1.400   1.400   1.400   1.400   1.400   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 62    3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      10.15   10.15   3.500   7.000   7.000   7.000   2.800   2.800   2.800   2.800
      2.800   2.800   2.800   2.800   2.800   2.800   10.15   10.15   10.15   10.15
      10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      1.750   1.750   1.750   1.750   1.750   1.750   1.750   1.750   1.750   1.750
      3.500   3.500   3.500   3.500   3.500
0 63    3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      10.15   10.15   3.500   7.000   7.000   7.000   2.800   2.800   2.800   2.800
      2.800   2.800   2.800   2.800   2.800   2.800   2.800   10.15   10.15   10.15
      10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      3.500   3.500   1.750   1.750   1.750   1.750   1.750   1.750   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 64    3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   10.15   10.15   3.500   3.500   3.500   10.15   10.15   10.15   10.15
      10.15   3.500   3.500   3.500   7.000   7.000   2.800   2.800   2.800   2.800
      2.800   2.800   2.800   2.800   2.800   2.800   2.800   2.800   2.800   10.15
      10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
      10.15   10.15   3.500   1.750   1.750   1.750   1.750   1.750   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 65    3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   10.15   10.15   7.000
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        3.500   3.500   3.500   3.500   3.500   7.000   2.800   2.800   2.800   2.800
        2.800   2.800   2.800   2.800   2.800   2.800   2.800   2.800   2.800   10.15
        10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
        10.15   10.15   10.15   1.750   1.750   1.750   1.750   1.750   3.500   3.500
        3.500   3.500   3.500   3.500   3.500
0 66    3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        3.500   3.500   3.500   3.500   2.800   2.800   2.800   2.800   2.800   10.15
        10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15
        10.15   10.15   10.15   1.750   1.750   1.750   1.750   1.750   3.500   3.500
        3.500   3.500   3.500   3.500   3.500
0 67    3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        3.500   3.500   3.500   3.500   3.500   2.800   2.800   2.800   2.800   10.15
        10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   3.500   3.500
        10.15   10.15   10.15   1.750   1.750   1.750   1.750   1.750   3.500   3.500
        3.500   3.500   3.500   3.500   3.500
0 68    3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        3.500   3.500   3.500   3.500   3.500   3.500   3.500   2.800   2.800   10.15
        10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   3.500   3.500
        10.15   10.15   10.15   1.750   1.750   1.750   1.750   1.750   3.500   3.500
        3.500   3.500   3.500   3.500   3.500
0 69    3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
        10.15   10.15   10.15   10.15   10.15   10.15   10.15   10.15   3.500   3.500
        3.500   10.15   10.15   1.750   1.750   1.750   1.750   1.750   3.500   3.500
        3.500   3.500   3.500   3.500   3.500
0 70    3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
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      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   10.15   10.15   10.15   10.15   10.15   3.500   3.500
      3.500   10.15   10.15   1.750   1.750   1.750   1.750   1.750   1.750   3.500
      3.500   3.500   3.500   3.500   3.500
0 71   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   10.15   1.750   1.750   1.750   1.750   1.750   1.750   3.500
      3.500   3.500   3.500   3.500   3.500
0 72   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   10.15   1.750   1.750   1.750   1.750   1.750   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 73   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   10.15   1.750   1.750   1.750   1.750   1.750   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
0 74   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500   3.500
      3.500   3.500   3.500   1.750   1.750   1.750   1.750   3.500   3.500   3.500
      3.500   3.500   3.500   3.500   3.500
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0 75   3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
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     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500
0 76   3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500
0 77   3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500     3.500
     3.500     3.500     3.500     3.500     3.500
          0


BOTTOM FOR LAYER  1 WILL BE READ ON UNIT 11 USING FORMAT:          (10G15.6)
                 ----------------------------------------------------------------------------------------

       1       2       3       4       5       6       7       8       9      10
      11      12      13      14      15      16      17      18      19      20
      21      22      23      24      25      26      27      28      29      30
      31      32      33      34      35      36      37      38      39      40
      41      42      43      44      45      46      47      48      49      50
      51      52      53      54      55      56      57      58      59      60
      61      62      63      64      65
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0 1  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000
0 2  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000
0 3  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000
0 4  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   1273.   1264.   1255.   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000
0 5  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   1283.   1275.   1264.   1254.
    1253.   1251.   1251.   1253.   0.000   0.000   0.000   0.000   1260.   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
 0 6  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   1301.   1294.   1287.   1277.   1265.
      1260.   1264.   1262.   1264.   1268.   1273.   1277.   1279.   1280.   1282.
      1284.   1286.   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
 0 7  0.000   0.000   0.000   0.000   1407.   1405.   1401.   0.000   0.000   0.000
      0.000   1351.   1339.   1329.   1319.   1312.   1306.   1301.   1292.   1279.
      1271.   1277.   1282.   1281.   1283.   1289.   1296.   1302.   1305.   1307.
      1308.   1310.   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
 0 8  0.000   0.000   0.000   0.000   1403.   1403.   1401.   1396.   1390.   1381.
      1370.   1359.   1348.   1338.   1329.   1323.   1318.   1314.   1308.   1295.
      1286.   1288.   1300.   1305.   1305.   1307.   1314.   1323.   1330.   1333.
      1335.   1336.   1337.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
 0 9  0.000   0.000   0.000   0.000   1399.   1400.   1399.   1396.   1392.   1385.
      1375.   1365.   1355.   1346.   1338.   1332.   1329.   1327.   1323.   1311.
      1304.   1304.   1311.   1322.   1328.   1328.   1331.   1338.   1347.   1355.
      1359.   1359.   1360.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
 0 10  0.000   0.000   0.000   1388.   1392.   1395.   1396.   1394.   1391.   1386.
      1379.   1370.   1361.   1353.   1346.   1341.   1338.   1337.   1336.   1327.
      1322.   1320.   1324.   1331.   1339.   1343.   1342.   1344.   1351.   1361.
      1370.   1375.   1375.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
0 11    0.000   0.000   0.000   1379.   1385.   1389.   1391.   1391.   1390.   1386.
        1380.   1373.   1366.   1358.   1352.   1348.   1345.   1345.   1345.   1339.
        1336.   1334.   1336.   1339.   1342.   1344.   1344.   1342.   1344.   1352.
        1362.   1372.   1379.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
0 12    0.000   0.000   0.000   1370.   1375.   1381.   1385.   1387.   1386.   1384.
        1380.   1374.   1368.   1362.   1356.   1352.   1350.   1349.   1349.   1346.
        1344.   1342.   1341.   1341.   1340.   1339.   1331.   1332.   1337.   1343.
        1351.   1361.   1369.   1374.   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
0 13    0.000   0.000   0.000   1360.   1365.   1371.   1377.   1381    1382.   1381.
        1378.   1374.   1369.   1363.   1358.   1354.   1352.   1350.   1350.   1347.
        1345.   1342.   1340.   1337.   1335.   1333.   1331.   1332.   1339.   1348.
        1358.   1369.   1377.   1378.   1364.   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
0 14    0.000   0.000   0.000   1351.   1353.   1361.   1368.   1373.   1376.   1377.
        1375.   1372.   1368.   1363.   1359.   1355.   1351.   1348.   1345.   1342.
        1340.   1338.   1336.   1341.   1342.   1341.   1339.   1341.   1348.   1361.
        1375.   1386.   1392.   1389.   1371.   1378.   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
0 15    0.000   0.000   0.000   1342.   1341.   1349.   1357.   1364.   1369.   1372.
        1371.   1369.   1365.   1361.   1357.   1353.   1349.   1345.   1340.   1333.
        1328.   1332.   1361.   1370.   1364.   1361.   1358.   1358.   1363.   1375.
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         1388.   1397.   1399.   1396.   1394.   1379.   1412.   0.000   0.000   0.000
         0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
         0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
         0.000   0.000   0.000   0.000   0.000
  0 16   0.000   0.000   0.000   1333.   1330.   1336.   1346.   1354.   1361.   1365.
         1366.   1365.   1362.   1359.   1355.   1351.   1347.   1343.   1336.   1328.
         1322.   1335.   1368.   1377.   1379.   1381.   1380.   1380.   1380.   1385.
         1394.   1398.   1398.   1395.   1393.   1392.   1393.   1400.   0.000   0.000
         0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
         0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
         0.000   0.000   0.000   0.000   0.000
  0 17   0.000   0.000   0.000   1324.   1319.   1322.   1333.   1343.   1352.   1358.
         1360.   1360.   1358.   1355.   1352.   1348.   1344.   1340.   1333.   1327.
         1325.   1345.   1369.   1378.   1380.   1383.   1387.   1388.   1389.   1389.
         1394.   1393.   1390.   1386.   1378.   1363.   1360.   1367.   0.000   0.000
         0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
         0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
         0.000   0.000   0.000   0.000   0.000
  0 18   0.000   0.000   0.000   1315.   1308.   1308.   1319.   1331.   1342.   1350.
         1354.   1355.   1353.   1351.   1348.   1345.   1342.   1337.   1329.   1324.
         1327.   1350.   1369.   1372.   1373.   1374.   1377.   1378.   1363.   1368.
         1388.   1382.   1378.   1375.   1362.   1339.   1333.   1339.   1350.   0.000
         0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
         0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
         0.000   0.000   0.000   0.000   0.000
  0 19   0.000   0.000   0.000   1306.   1298.   1295.   1305.   1318.   1331.   1341.
         1347.   1349.   1348.   1347.   1345.   1342.   1339.   1332.   1323.   1318.
         1323.   1343.   1360.   1361.   1361.   1359.   1354.   1331.   1290.   1309.
         1365.   1370.   1366.   1366.   1357.   1327.   1320.   1323.   1332.   0.000
         0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
         0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
         0.000   0.000   0.000   0.000   0.000
  0 20   0.000   0.000   0.000   1297.   1287.   1283.   1290.   1304.   1319.   1332.
         1340.   1343.   1343.   1342.   1341.   1339.   1333.   1323.   1311.   1305.
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      1308.   1321    1341.   1348.   1348.   1344.   1335.   1310.   1290.   1318.
      1350.   1358.   1360.   1359.   1358.   1330.   1315.   1314.   1318.   1327.
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 21   0.000   0.000   0.000   0.000   1277.   1271.   1275.   1290.   1307.   1321.
      1332.   1337.   1338.   1337.   1336.   1332.   1323.   1309.   1294.   1285.
      1284.   1293.   1313.   1327.   1334.   1334.   1327.   1316.   1326.   1343.
      1343.   1355.   1372.   1371.   1364.   1351.   1323.   1309.   1306.   1309.
      1314.   1321.   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 22   0.000   0.000   0.000   0.000   1267.   1259.   1260.   1275.   1293.   1311.
      1324.   1331.   1332.   1332.   1329.   1322.   1309.   1290.   1272.   1261.
      1259.   1264.   1281.   1300.   1314.   1320.   1326.   1328.   1330.   1335.
      1339.   1350.   1383.   1384.   1366.   1358.   1348.   1315.   1297.   1296.
      1302.   1311.   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 23   0.000   0.000   0.000   0.000   1257.   1248.   1246.   1260.   1280.   1299.
      1315.   1324.   1326.   1325.   1319.   1307.   1289.   1267.   1248.   1239.
      1239.   1241.   1254.   1273.   1286.   1292.   1318.   1320.   1316.   1315.
      1327.   1341.   1367.   1380.   1363.   1352.   1365.   1355.   1300.   1288.
      1295.   1307.   1323.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 24   0.000   0.000   0.000   0.000   1247.   1237.   1232.   1244.   1265.   1287.
      1305.   1317.   1320.   1318.   1310.   1294.   1272.   1245.   1224.   1222.
      1229.   1234.   1246.   1259.   1262.   1276.   1310.   1310.   1300.   1289.
      1291.   1319.   1332.   1349.   1348.   1342.   1352.   1377.   1323.   1288.
      1298.   1311.   1327.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 25   0.000   0.000   0.000   0.000   1237.   1226.   1220.   1228.   1250.   1273.
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      1293.    1306.    1312.    1311.    1304.    1288.    1261.    1231.    1208.    1206.
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      1253.    1262.    1300.    1318.    1323.    1334.    1341.    1360.    1320.    1300.
      1308.    1322.    1337.    1350.    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 26   0.000    0.000    0.000    0.000    1227.    1215.    1207.    1212.    1232.    1255.
      1276.    1292.    1299.    1301.    1297.    1285.    1262.    1231.    1207.    1200.
      1206.    1221.    1240.    1253.    1258.    1288.    1284.    1269.    1259.    1248.
      1236.    1229.    1263.    1304.    1313.    1331.    1341.    1346.    1327.    1316.
      1325.    1338.    1350.    1359.    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 27   0.000    0.000    0.000    0.000    1218.    1204.    1195.    1195.    1213.    1235.
      1257.    1274.    1281.    1284.    1283.    1274.    1256.    1231.    1207.    1197.
      1200.    1215.    1238.    1254.    1260.    1232.    1225.    1226.    1242.    1244.
      1247.    1256.    1283.    1292.    1296.    1312.    1333.    1340.    1330.    1330.
      1342.    1355.    1364.    1368.    1365.    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 28   0.000    0.000    0.000    0.000    1208.    1194.    1183.    1179.    1194.    1215.
      1237.    1252.    1259.    1263.    1263.    1256.    1240.    1219.    1205.    1194.
      1199.    1219.    1244.    1256.    1253.    1250.    1230.    1223.    1241.    1245.
      1257.    1260.    1264.    1283.    1291.    1300.    1315.    1334.    1330.    1337.
      1351.    1364.    1371.    1372.    1320.    1317.    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 29   0.000    0.000    0.000    0.000    0.000    1184.    1172.    1166.    1176.    1196.
      1216.    1227.    1233.    1237.    1239.    1234.    1221.    1202.    1190.    1192.
      1207.    1239.    1264.    1261.    1259.    1280.    1295.    1283.    1241.    1240.
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      1347.    1356.    1361.    1358.    1328.    1276.    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
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0 30   0.000    0.000    0.000    0.000    0.000    1175.    1162.    1154.    1160.    1177.
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       1213.    1254.    1271.    1273.    1269.    1274.    1281.    1272.    1247.    1237.
       1244.    1246.    1243.    1280.    1286.    1286.    1309.    1323.    1328.    1332.
       1333.    1334.    1327.    1308.    1299.    1296.    0.000    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    0.000
0 31   0.000    0.000    0.000    0.000    0.000    1166.    1153.    1144.    1146.    1160.
       1172.    1172.    1175.    1179.    1184.    1187.    1185.    1176.    1159.    1154.
       1190.    1228.    1253.    1257.    1255.    1255.    1259.    1253.    1239.    1231.
       1236.    1238.    1245.    1278.    1279.    1280.    1307.    1310.    1318.    1324.
       1318.    1310.    1302.    1297.    1296.    1299.    1302.    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    0.000
0 32   0.000    0.000    0.000    0.000    0.000    1157.    1144.    1135.    1133.    1144.
       1147.    1146.    1148.    1152.    1159.    1166.    1171.    1170.    1161.    1162.
       1175.    1199.    1227.    1234.    1232.    1231.    1236.    1236.    1228.    1222.
       1226.    1234.    1251.    1268.    1274.    1325.    1303.    1311.    1317.    1311.
       1307.    1303.    1300.    1296.    1296.    1303.    1314.    0.000    0.000    0.000
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       0.000    0.000    0.000    0.000    0.000
0 33   0.000    0.000    0.000    0.000    0.000    0.000    1136.    1126.    1122.    1128.
       1126.    1124.    1126.    1131.    1138.    1148.    1158.    1167.    1175.    1171.
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       1302.    1311.    1304.    1298.    1299.    1307.    1322.    1340.    0.000    0.000
       0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    0.000    0.000    0.000    0.000
0 34   0.000    0.000    0.000    0.000    0.000    0.000    1129.    1119.    1113.    1113.
       1109.    1108.    1110.    1115.    1123.    1134.    1145.    1163.    1181.    1164.
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       1230.    1243.    1243.    1250.    1275.    1283.    1289.    1293.    1293.    1261.
       1306.    1327.    1311.    1301.    1302.    1311.    1326.    1343.    0.000    0.000
       0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
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      0.000    0.000    0.000    0.000    0.000
 0 35   0.000    0.000    0.000    0.000    0.000    0.000    0.000    1112.    1106.    1102.
      1099.    1098.    1099.    1104.    1111.    1120.    1129.    1137.    1164.    1146.
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      1328.    1335.    1315.    1303.    1303.    1311.    1324.    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 36   0.000    0.000    0.000    0.000    0.000    0.000    0.000    1107.    1100.    1096.
      1093.    1092.    1093.    1097.    1103.    1109.    1110.    1098.    1120.    1135.
      1138.    1145.    1136.    1149.    1155.    1158.    1182.    1207.    1208.    1209.
      1212.    1220.    1255.    1256.    1261.    1264.    1288.    1291.    1286.    1298.
      1328.    1334.    1315.    1303.    1301.    1308.    1319.    1332.    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 37   0.000    0.000    0.000    0.000    0.000    0.000    0.000    1101.    1095.    1093.
      1090.    1090.    1091.    1095.    1100.    1103.    1101.    1095.    1102.    1121.
      1131.    1156.    1137.    1139.    1153.    1159.    1161.    1180.    1192.    1203.
      1208.    1220.    1248.    1252.    1253.    1271.    1280.    1271.    1276.    1288.
      1296.    1330.    1311.    1299.    1297.    1301.    1310.    1321.    1334.    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 38   0.000    0.000    0.000    0.000    0.000    0.000    0.000    1097.    1091.    1091.
      1092.    1092.    1094.    1098.    1102.    1103.    1098.    1090.    1087.    1106.
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      1289.    1310.    1308.    1294.    1291.    1293.    1299.    1308.    1319.    0.000
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      0.000    0.000    0.000    0.000    0.000
 0 39   0.000    0.000    0.000    0.000    0.000    0.000    0.000    1092.    1087.    1089.
      1094.    1098.    1101.    1105.    1108.    1106.    1100.    1089.    1081.    1097.
      1105.    1153.    1167.    1163.    1161.    1153.    1147.    1163.    1177.    1176.
      1212.    1225.    1230.    1257.    1267.    1260.    1243.    1237.    1263.    1290.
      1286.    1279.    1305.    1290.    1285.    1284.    1286.    1293.    1302.    0.000
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        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
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        1095.   1104.   1111.   1116.   1118.   1116.   1107.   1095.   1083.   1084.
        1097.   1121.   1126.   1140.   1149.   1147.   1141.   1150.   1167.   1172.
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        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
 0.41   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1081.   1086.
        1096.   1109.   1122.   1129.   1133.   1131.   1122.   1108.   1092.   1080.
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        0.000   0.000   0.000   0.000   0.000
 0.42   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   1113.   1129.   1143.   1149.   1149.   1140.   1124.   1102.   1080.
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        1293.   1286.   1277.   1269.   1258.   1248.   1243.   1242.   1244.   1241.
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
 0.43   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   1113.   1135.   1152.   1163.   1165.   1159.   1141.   1112.   1080.
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        1166.   1153.   1191.   1208.   1229.   1227.   1233.   1239.   1246.   1253.
        1281.   1279.   1277.   1264.   1247.   1235.   1228.   1227.   1228.   1226.
        0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   0.000   0.000   0.000
 0.44   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
        0.000   0.000   1136.   1159.   1173.   1178.   1173.   1156.   1122.   1087.
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      0.000   0.000   0.000   0.000   0.000
0 45  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   1134.   1159.   1179.   1186.   1184.   1167.   1133.   1107.
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      0.000   0.000   0.000   0.000   0.000
0 46  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   1157.   1179.   1190.   1188.   1169.   1141.   1130.
      1101.   1076.   1069.   1075.   1074.   1077.   1075.   1108.   1112.   1130.
      1132.   1125.   1122.   1136.   1149.   1204.   1211.   1211.   1212.   1234.
      1246.   1293.   1287.   1272.   1247.   1219.   1202.   1198.   1199.   1204.
      1215.   1228.   1243.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 47  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   1154.   1175.   1189.   1187.   1165.   1125.   1132.
      1152.   1135.   1101.   1084.   1076.   1079.   1089.   1107.   1106.   1112.
      1112.   1126.   1131.   1140.   1185.   1237.   1233.   1207.   1210.   1226.
      1232.   1259.   1278.   1273.   1257.   1230.   1205.   1195.   1195.   1201.
      1212.   1225.   1238.   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 48  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   1151.   1170.   1184.   1187.   1173.   1123.   1099.
      1157.   1149.   1123.   1102.   1099.   1106.   1112.   1102.   1093.   1110.
      1119.   1119.   1130.   1139.   1203.   1234.   1205.   1165.   1193.   1200.
      1217.   1228.   1251.   1262.   1268.   1265.   1222.   1198.   1192.   1200.
      1210.   1222.   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 49  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   1147.   1165.   1177.   1180.   1174.   1152.   1131.
      1150.   1138.   1117.   1111.   1119.   1131.   1124.   1084.   1094.   1110.
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       1113.   1105.   1087.   1099.   1160.   1200.   1173.   1155.   1180.   1183.
       1197.   1224.   1241.   1248.   1288.   1299.   1241.   1200.   0.000   0.000
       0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 50   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   1145.   1160.   1170.   1171.   1166.   1156.   1149.
       1147.   1130.   1115.   1111.   1115.   1131.   1131.   1115.   1108.   1110.
       1116.   1103.   1088.   1098.   1135.   1170.   1179.   1176.   1177.   1182.
       1197.   1221.   1228.   1238.   1261.   1274.   1244.   1199.   1192.   1199.
       1207.   1216.   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 51   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   1143.   1156.   1164.   1163.   1153.   1148.   1147.
       1142.   1122.   1114.   1115.   1114.   1116.   1123.   1121.   1115.   1125.
       1125.   1111.   1103.   1118.   1138.   1146.   1155.   1169.   1177.   1183.
       1196.   1203.   1222.   1230.   1244.   1262.   1249.   1198.   1192.   1198.
       1205.   1213.   1222.   1232.   1217.   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 52   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   1126.   1142.   1153.   1159.   1156.   1142.   1136.   1139.
       1140.   1121.   1116.   1117.   1118.   1124.   1123.   1116.   1115.   1126.
       1125.   1119.   1120.   1131.   1137.   1136.   1143.   1149.   1174.   1178.
       1190.   1197.   1218.   1224.   1233.   1259.   1254.   1199.   1193.   1197.
       1203.   1210.   1218.   1226.   1235.   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 53   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   1128.   1141.   1151.   1155.   1151.   1134.   1123.   1128.
       1137.   1133.   1131.   1134.   1138.   1142.   1138.   1125.   1118.   1123.
       1123.   1118.   1119.   1127.   1137.   1150.   1160.   1158.   1168.   1171.
       1176.   1197.   1217.   1222.   1230.   1259.   1261.   1200.   1194.   1196.
       1200.   1206.   1212.   1220.   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   0.000   0.000   0.000
0 54   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
       0.000   0.000   1130.   1142.   1150.   1152.   1147.   1129.   1114.   1118.
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      1135.    1144.    1142.    1144.    1146.    1146.    1144.    1141.    1136.    1132.
      1125.    1116.    1119.    1133.    1149.    1158.    1159.    1159.    1172.    1176.
      1179.    1204.    1216.    1223.    1234.    1259.    1267.    1202.    1194.    1194.
      1197.    1202.    1207.    1213.    1220.    1225.    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 55  0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    1133.    1143.    1149.    1150.    1144.    1127.    1110.    1113.
      1136.    1146.    1145.    1147.    1149.    1148.    1146.    1144.    1142.    1137.
      1135.    1141.    1136.    1144.    1154.    1161.    1163.    1165.    1179.    1189.
      1190.    1211.    1215.    1222.    1236.    1252.    1269.    1202.    1192.    1192.
      1194.    1197.    1202.    1207.    1212.    1216.    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 56  0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    1125.    1136.    1145.    1149.    1149.    1143.    1127.    1109.    1116.
      1142.    1149.    1151.    1152.    1152.    1150.    1148.    1147.    1146.    1144.
      1180.    1207.    1156.    1153.    1172.    1183.    1183.    1179.    1181.    1187.
      1197.    1203.    1234.    1215.    1229.    1231.    1253.    1199.    1190.    1190.
      1191.    1193.    1196.    1200.    1204.    1208.    1211.    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 57  0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    1130.    1140.    1147.    1150.    1150.    1143.    1130.    1113.    1122.
      1144.    1151.    1156.    1158.    1157.    1152.    1153.    1158.    1160.    1156.
      1160.    1204.    1178.    1197.    1220.    1222.    1207.    1188.    1177.    1177.
      1192.    1197.    1206.    1221.    1224.    1228.    1229.    1195.    1187.    1187.
      1187.    1188.    1191.    1193.    1196.    1199.    1201.    1203.    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
 0 58  0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    1135.    1143.    1150.    1152.    1151.    1145.    1135.    1120.    1124.
      1142.    1143.    1146.    1161.    1174.    1177.    1180.    1186.    1186.    1173.
      1169.    1177.    1194.    1243.    1260.    1241.    1204.    1179.    1169.    1169.
      1183.    1200.    1201.    1217.    1221.    1227.    1238.    1185.    1184.    1184.
      1183.    1184.    1185.    1187.    1188.    1190.    1191.    1193.    1193.    0.000
      0.000    0.000    0.000    0.000    0.000
 0 59  0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
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       0.000    1139.    1147.    1152.    1154.    1153.    1148.    1140.    1130.    1135.
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       1176.    1177.    1190.    1219.    1240.    1191.    1157.    1160.    1165.    1166.
       1179.    1196.    1204.    1204.    1210.    1215.    1222.    1182.    1181.    1181.
       1180.    1180.    1180.    1180.    1181.    1182.    1182.    1183.    1183.    0.000
       0.000    0.000    0.000    0.000    0.000
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       1152.    1143.    1139.    1143.    1156.    1174.    1190.    1201.    1211.    1201.
       1177.    1180.    1186.    1190.    1182.    1121.    1128.    1157.    1163.    1165.
       1175.    1185.    1190.    1194.    1195.    1197.    1193.    1179.    1178.    1177.
       1177.    1176.    1175.    1175.    1174.    1174.    1174.    1173.    1173.    0.000
       0.000    0.000    0.000    0.000    0.000
0 61    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    1148.    1153.    1156.    1157.    1156.    1155.    1153.    1150.    1158.
       1154.    1144.    1143.    1151.    1165.    1180.    1191.    1197.    1199.    1197.
       1193.    1188.    1187.    1184.    1175.    1158.    1147.    1161.    1161.    1162.
       1168.    1172.    1169.    1179.    1188.    1193.    1188.    1177.    1175.    1174.
       1173.    1172.    1171.    1169.    1168.    1167.    1166.    1164.    0.000    0.000
       0.000    0.000    0.000    0.000    0.000
0 62    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    1151.    1155.    1157.    1157.    1157.    1156.    1157.    1159.    1164.
       1152.    1143.    0.000    1158.    1168.    1174.    1180.    1186.    1190.    1192.
       1191.    1189.    1187.    1184.    1173.    1163.    1159.    1158.    1149.    1143.
       1151.    1160.    1164.    1175.    1187.    1188.    1183.    1175.    1173.    1172.
       1170.    1169.    1167.    1164.    1162.    1160.    1158.    1156.    1155.    1153.
       1152.    0.000    0.000    0.000    0.000
0 63    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
       0.000    1154.    1157.    1157.    1157.    1156.    1156.    1157.    1163.    1164.
       1142.    1141.    0.000    1147.    1150.    1155.    1160.    1166.    1171.    1176.
       1179.    1180.    1180.    1178.    1172.    1160.    1135.    1105.    1104.    1104.
       1119.    1139.    1161.    1177.    1184.    1182.    1178.    1173.    1171.    1169.
       1168.    1166.    1163.    1160.    1157.    1154.    1151.    1149.    1147.    1145.
       1143.    0.000    0.000    0.000    0.000
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0 64  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   1156.   1157.   0.000   0.000   0.000   1153.   1152.   1155.   1143.
      1134.   0.000   0.000   0.000   1138.   1141.   1145.   1148.   1153.   1157.
      1160.   1164.   1166.   1167.   1165.   1160.   1149.   1128.   1099.   1085.
      1093.   1116.   1146.   1176.   1178.   1175.   1174.   1172.   1169.   1167.
      1165.   1163.   1160.   1156.   1153.   1149.   1145.   1142.   1139.   1137.
      1135.   1133.   0.000   0.000   0.000
0 65  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   1144.   1141.   1134.
      0.000   0.000   0.000   0.000   0.000   1140.   1143.   1146.   1148.   1151.
      1154.   1156.   1157.   1158.   1158.   1157.   1154.   1146.   1133.   1114.
      1094.   1104.   1124.   1148.   1170.   1165.   1168.   1170.   1169.   1166.
      1164.   1161.   1157.   1153.   1149.   1145.   1140.   1136.   1133.   1130.
      1127.   0.000   0.000   0.000   0.000
0 66  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   1156.   1156.   1154.   1152.   1148.   1142.
      1133.   1119.   1122.   1120.   1153.   1155.   1161.   1168.   1168.   1165.
      1162.   1159.   1155.   1150.   1146.   1141.   1136.   1131.   1127.   1123.
      1120.   0.000   0.000   0.000   0.000
0 67  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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      0.000   0.000   0.000   0.000   0.000   1154.   1153.   1151.   1149.   1147.
      1144.   1141.   1135.   1130.   1143.   1146.   1154.   1164.   0.000   0.000
      1161.   1158.   1153.   1148.   1143.   1137.   1132.   1127.   1122.   1118.
      0.000   0.000   0.000   0.000   0.000
0 68  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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      1161.   1157.   1152.   1147.   1141.   1135.   1129.   1123.   1117.   0.000
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      0.000   0.000   0.000   0.000   0.000
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      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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      0.000   1156.   1151.   1145.   1139.   1133.   1126.   1120.   1114.   0.000
      0.000   0.000   0.000   0.000   0.000
0 70  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   1141.   1141.   1142.   1146.   1152.   0.000   0.000
      0.000   1156.   1150.   1144.   1138.   1131.   1124.   1117.   1111.   0.000
      0.000   0.000   0.000   0.000   0.000
0 71  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   1150.   1144.   1137.   1130.   1123.   1116.   1109.   0.000
      0.000   0.000   0.000   0.000   0.000
0 72  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   1145.   1142.   1137.   1129.   1122.   1114.   0.000   0.000
      0.000   0.000   0.000   0.000   0.000
0 73  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
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      0.000    0.000    1136.    1135.    1132.    1128.    1122.    1114.    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 74    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
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      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    1126.    1124.    1122.    1118.    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 75    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 76    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
0 77    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
      0.000    0.000    0.000    0.000    0.000
          0
```

SOLUTION BY THE STRONGLY IMPLICIT PROCEDURE

```
                                     -------------------------------------------
0                                 MAXIMUM ITERATIONS ALLOWED FOR CLOSURE =      50
                                          ACCELERATION PARAMETER =     1.0000
                                    HEAD CHANGE CRITERION FOR CLOSURE =   0.10000E+00
                                    SIP HEAD CHANGE PRINTOUT INTERVAL =     999
0                                    CALCULATE ITERATION PARAMETERS FROM MODEL CALCULATED WSEED
1                                   STRESS PERIOD NO.   1, LENGTH =   1.000000
                                   ---------------------------------------------

                                   NUMBER OF TIME STEPS =     1

                                    MULTIPLIER FOR DELT =     1.000

                                  INITIAL TIME STEP SIZE =   1.000000
          0

  364 DRAINS
0         LAYER    ROW    COL  ELEVATION   CONDUCTANCE   DRAIN NO.
          ------------------------------------------------------------
            1     49     48   1330.        2000.         1
            1     18     39   1540.       0.3500E+05      2
            1     18     38   1551.       0.3500E+05      3
            1     17     38   1584.       0.3500E+05      4
            1     16     38   1603.       0.3500E+05      5
            1     16     37   1600.       0.3500E+05      6
            1     15     37   1600.       0.3500E+05      7
            1     14     36   1599.       0.3500E+05      8
            1     29     39   1579.        50.00         9
            1     58     48   1333.        500.0        10
            1     55     41   1345.        200.0        11
            1     59     40   1297.        3000.        12
            1     58     41   1317.        3000.        13
            1     57     41   1329.        3000.        14
            1     56     41   1341.        500.0        15
```

1	54	42	1379.	200.0	16
1	53	43	1405.	200.0	17
1	39	29	1376.	5000.	18
1	32	31	1447.	5000.	19
1	25	30	1475.	7000.	20
1	13	35	1598.	1000.	21
1	24	43	1420.	1000.	22
1	27	45	1387.	1000.	23
1	34	47	1365.	1000.	24
1	33	47	1367.	1000.	25
1	18	30	1632.	5000.	26
1	31	47	1371.	1000.	27
1	31	46	1364.	1000.	28
1	30	46	1368.	1000.	29
1	29	46	1372.	1000.	30
1	28	46	1378.	1000.	31
1	32	44	1411.	100.0	32
1	4	17	1507.	2000.	33
1	5	17	1506.	2000.	34
1	6	17	1513.	2000.	35
1	6	16	1506.	2000.	36
1	7	16	1511.	2000.	37
1	7	13	1538.	2000.	38
1	8	12	1559.	2000.	39
1	9	10	1583.	1000.	40
1	8	9	1587.	1000.	41
1	8	8	1606.	700.0	42
1	8	7	1614.	700.0	43
1	8	32	1477.	400.0	44
1	9	33	1481.	400.0	45
1	10	33	1482.	400.0	46
1	12	33	1525.	400.0	47
1	12	34	1552.	400.0	48
1	13	34	1557.	300.0	49

1	14	35	1575.	1000.	50
1	21	42	1425.	1000.	51
1	21	41	1436.	1000.	52
1	21	40	1477.	1000.	53
1	21	39	1493.	500.0	54
1	21	38	1511.	500.0	55
1	21	37	1530.	500.0	56
1	21	36	1536.	500.0	57
1	26	40	1495.	100.0	58
1	27	40	1516.	200.0	59
1	67	40	1238.	6000.	60
1	66	40	1245.	6000.	61
1	65	40	1250.	6000.	62
1	64	40	1248.	6000.	63
1	63	40	1242.	6000.	64
1	62	40	1246.	6000.	65
1	61	39	1264.	6000.	66
1	60	39	1274.	6000.	67
1	59	39	1284.	6000.	68
1	59	38	1277.	5000.	69
1	58	38	1298.	5000.	70
1	58	37	1300.	5000.	71
1	57	37	1314.	5000.	72
1	57	36	1314.	5000.	73
1	56	36	1320.	5000.	74
1	55	36	1318.	5000.	75
1	55	35	1323.	5000.	76
1	54	35	1321.	5000.	77
1	54	34	1323.	5000.	78
1	53	34	1325.	5000.	79
1	53	33	1330.	5000.	80
1	51	34	1334.	5000.	81
1	49	35	1397.	6000.	82
1	47	37	1397.	8000.	83

1	45	37	1397.	8000.	84
1	45	38	1397.	6000.	85
1	40	39	1433.	3000.	86
1	38	39	1459.	3000.	87
1	52	33	1327.	5000.	88
1	50	32	1330.	4000.	89
1	50	31	1331.	4000.	90
1	49	31	1333.	4000.	91
1	49	30	1335.	4000.	92
1	48	30	1338.	4000.	93
1	43	23	1365.	4000.	94
1	43	24	1375.	4000.	95
1	44	24	1358.	4000.	96
1	45	24	1354.	4000.	97
1	45	25	1354.	4000.	98
1	46	25	1348.	4000.	99
1	47	25	1346.	4000.	100
1	47	26	1344.	4000.	101
1	48	27	1341.	4000.	102
1	48	28	1334.	4000.	103
1	48	29	1335.	4000.	104
1	40	29	1380.	5000.	105
1	38	29	1387.	5000.	106
1	38	30	1399.	5000.	107
1	37	30	1398.	5000.	108
1	36	30	1402.	5000.	109
1	35	30	1414.	5000.	110
1	34	30	1422.	5000.	111
1	34	31	1445.	5000.	112
1	33	31	1435.	5000.	113
1	31	31	1437.	5000.	114
1	30	31	1451.	5000.	115
1	29	31	1460.	5000.	116
1	29	30	1457.	5000.	117

1	28	30	1459.	5000.	118
1	27	30	1462.	7000.	119
1	26	30	1472.	7000.	120
1	24	30	1488.	7000.	121
1	23	30	1500.	7000.	122
1	22	30	1522.	5000.	123
1	21	30	1549.	5000.	124
1	20	30	1572.	5000.	125
1	19	30	1604.	5000.	126
1	42	23	1377.	4000.	127
1	41	23	1386.	4000.	128
1	41	22	1376.	4000.	129
1	40	22	1383.	4000.	130
1	39	22	1394.	4000.	131
1	39	21	1374.	5000.	132
1	39	20	1381.	5000.	133
1	38	20	1393.	5000.	134
1	37	20	1406.	5000.	135
1	36	20	1403.	5000.	136
1	35	20	1408.	5000.	137
1	34	20	1420.	5000.	138
1	33	20	1427.	5000.	139
1	32	20	1435.	5000.	140
1	31	21	1449.	5000.	141
1	30	21	1448.	5000.	142
1	29	21	1452.	5000.	143
1	28	21	1460.	5000.	144
1	27	21	1466.	5000.	145
1	26	21	1475.	5000.	146
1	26	20	1475.	5000.	147
1	25	20	1487.	5000.	148
1	24	20	1498.	5000.	149
1	23	20	1510.	5000.	150
1	22	20	1525.	5000.	151

1	21	20	1543.	5000.	152
1	21	19	1538.	5000.	153
1	20	19	1553.	5000.	154
1	19	19	1571.	5000.	155
1	38	19	1399.	5000.	156
1	38	18	1393.	5000.	157
1	38	17	1402.	5000.	158
1	37	17	1405.	5000.	159
1	37	16	1407.	5000.	160
1	37	15	1411.	5000.	161
1	36	15	1411.	5000.	162
1	35	15	1429.	5000.	163
1	35	14	1434.	5000.	164
1	34	14	1435.	5000.	165
1	33	14	1448.	5000.	166
1	33	13	1438.	5000.	167
1	32	13	1439.	5000.	168
1	31	13	1448.	5000.	169
1	30	12	1451.	5000.	170
1	29	12	1460.	7000.	171
1	28	11	1467	7000.	172
1	27	11	1472.	7000.	173
1	26	10	1494.	5000.	174
1	25	9	1517.	5000.	175
1	24	9	1523.	5000.	176
1	23	9	1533.	5000.	177
1	22	8	1618.	5000.	178
1	21	8	1618.	5000.	179
1	20	8	1618.	5000.	180
1	19	8	1618.	5000.	181
1	5	19	1480.	2000.	182
1	6	24	1465.	2000.	183
1	6	25	1463.	2000.	184
1	6	26	1457.	2000.	185

1	6	27	1456.	2000.	186
1	6	28	1454.	2000.	187
1	6	29	1445.	1000.	188
1	6	30	1444.	1000.	189
1	6	31	1441.	1000.	190
1	6	32	1438.	1000.	191
1	59	12	1412.	200.0	192
1	60	12	1389.	200.0	193
1	61	12	1372.	200.0	194
1	62	12	1345.	200.0	195
1	63	12	1326.	200.0	196
1	4	18	1485.	2000.	197
1	4	19	1482.	2000.	198
1	5	20	1476.	2000.	199
1	5	21	1474.	2000.	200
1	5	22	1471.	2000.	201
1	5	24	1467.	2000.	202
1	20	40	1484.	500.0	203
1	22	42	1423.	1000.	204
1	25	41	1455.	1000.	205
1	25	42	1441.	1000.	206
1	30	43	1465.	100.0	207
1	34	43	1462.	100.0	208
1	35	45	1384.	500.0	209
1	35	46	1369	500.0	210
1	36	47	1358.	500.0	211
1	37	45	1402.	500.0	212
1	43	45	1461.	500.0	213
1	41	46	1393.	500.0	214
1	41	47	1375.	500.0	215
1	44	45	1467.	500.0	216
1	46	45	1421.	500.0	217
1	47	46	1377.	1000.	218
1	47	47	1362.	1000.	219

1	48	48	1337.	500.0	220
1	51	49	1349.	1000.	221
1	50	50	1316.	1000.	222
1	50	51	1293.	1000.	223
1	50	52	1278.	1000.	224
1	54	51	1381.	100.0	225
1	55	52	1345.	100.0	226
1	55	53	1335.	100.0	227
1	60	57	1308.	1000.	228
1	61	57	1303.	1000.	229
1	59	51	1328.	1000.	230
1	60	51	1293.	1000.	231
1	61	51	1276.	1000.	232
1	62	51	1266.	1000.	233
1	63	51	1258.	1000.	234
1	64	50	1239.	1000.	235
1	65	51	1215.	1000.	236
1	57	48	1380.	500.0	237
1	59	48	1357.	500.0	238
1	60	48	1340.	500.0	239
1	61	48	1327.	500.0	240
1	62	48	1307.	500.0	241
1	64	47	1268.	500.0	242
1	65	47	1240.	500.0	243
1	66	47	1234.	500.0	244
1	67	47	1224.	500.0	245
1	37	40	1471.	3000.	246
1	38	40	1462.	3000.	247
1	39	39	1442.	3000.	248
1	41	39	1430.	3000.	249
1	42	39	1414.	3000.	250
1	43	38	1401.	3000.	251
1	44	38	1397.	3000.	252
1	46	37	1397.	8000.	253

1	49	36	1397.	8000.	254
1	50	35	1345.	6000.	255
1	50	34	1338.	5000.	256
1	37	49	1363.	500.0	257
1	33	40	1556.	5000.	258
1	34	40	1519.	5000.	259
1	35	40	1508.	5000.	260
1	36	40	1477.	5000.	261
1	51	52	1283.	1000.	262
1	25	44	1411.	1000.	263
1	26	44	1404.	1000.	264
1	27	44	1401.	1000.	265
1	34	44	1416.	100.0	266
1	63	47	1296.	500.0	267
1	18	19	1598.	5000.	268
1	8	6	1628.	400.0	269
1	50	48	1341.	500.0	270
1	58	12	1444.	200.0	271
1	9	11	1570.	1000.	272
1	5	23	1469.	2000.	273
1	41	29	1372.	5000.	274
1	42	29	1364.	5000.	275
1	43	29	1362.	5000.	276
1	44	29	1357.	4000.	277
1	45	29	1347.	4000.	278
1	46	29	1342.	4000.	279
1	47	29	1336.	4000.	280
1	51	32	1327.	4000.	281
1	51	33	1329.	4000.	282
1	15	8	1618.	5000.	283
1	16	8	1618.	5000.	284
1	17	8	1618.	5000.	285
1	18	8	1618.	5000.	286
1	25	10	1517.	5000.	287

1	55	48	1425.	50.00	288
1	56	48	1430.	50.00	289
1	63	48	1275.	500.0	290
1	67	59	1274.	1000.	291
1	67	60	1261.	1000.	292
1	66	61	1255.	1000.	293
1	65	61	1258.	1000.	294
1	64	61	1261.	1000.	295
1	64	62	1263.	1000.	296
1	63	61	1265.	1000.	297
1	62	61	1269.	1000.	298
1	62	60	1267.	1000.	299
1	61	58	1270.	1000.	300
1	60	59	1272.	1000.	301
1	59	59	1277.	1000.	302
1	58	59	1282.	500.0	303
1	58	58	1278.	500.0	304
1	57	58	1282.	500.0	305
1	57	57	1278.	500.0	306
1	56	57	1281.	500.0	307
1	56	56	1276.	500.0	308
1	55	56	1277.	500.0	309
1	54	56	1278.	1000.	310
1	54	55	1269.	1000.	311
1	54	54	1290.	1000.	312
1	53	54	1267.	1000.	313
1	52	55	1271.	1000.	314
1	51	55	1274.	1000.	315
1	51	54	1263.	1000.	316
1	51	53	1266.	1000.	317
1	54	50	1414.	100.0	318
1	53	48	1408.	500.0	319
1	52	48	1409.	500.0	320
1	51	50	1332.	1000.	321

1	47	45	1414.	1000.	322
1	48	52	1272.	1000.	323
1	47	53	1267.	1000.	324
1	46	53	1271.	1000.	325
1	45	52	1276.	1000.	326
1	44	52	1280.	1000.	327
1	44	51	1291.	1000.	328
1	44	50	1322.	1000.	329
1	43	50	1319.	1000.	330
1	42	50	1320.	1000.	331
1	42	49	1351.	1000.	332
1	42	48	1345.	1000.	333
1	42	46	1414.	500.0	334
1	45	45	1439.	500.0	335
1	39	49	1352.	500.0	336
1	37	47	1373.	500.0	337
1	37	46	1381.	500.0	338
1	35	47	1362.	1000.	339
1	34	48	1373.	1000.	340
1	33	48	1375.	1000.	341
1	32	47	1369.	1000.	342
1	32	46	1365.	1000.	343
1	32	45	1392.	1000.	344
1	31	43	1442.	100.0	345
1	25	43	1421.	1000.	346
1	26	41	1475.	1000.	347
1	28	39	1536.	200.0	348
1	23	43	1423.	1000.	349
1	11	33	1498.	400.0	350
1	8	33	1477.	400.0	351
1	7	32	1477.	400.0	352
1	7	14	1534.	2000.	353
1	7	15	1530.	2000.	354
1	7	7	1647.	400.0	355

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             1     7     5  1669.       400.0       356
             1    19    39   1513.       500.0       357
             1    30    13   1475.       5000.       358
             1    38    44   1477.       50.00       359
             1    58    51   1357.       1000.       360
             1    40    49   1349.       1000.       361
             1    40    48   1376.       1000.       362
             1    15    36   1632.       5000.       363
             1    48    36   1350.       8000.       364
             0


 RECHARGE WILL BE READ ON UNIT 20 USING FORMAT:          (10G15.6)
                 ------------------------------------------------------------------------------

          1       2       3       4       5       6       7       8       9      10
         11      12      13      14      15      16      17      18      19      20
         21      22      23      24      25      26      27      28      29      30
         31      32      33      34      35      36      37      38      39      40
         41      42      43      44      45      46      47      48      49      50
         51      52      53      54      55      56      57      58      59      60
         61      62      63      64      65
 ..............................................................................................
 0 1  6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
     6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
     6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
     6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
     6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
     6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
     6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
 0 2  6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
     6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
     6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
     6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
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         6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
         6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
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     6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
0 71  6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
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0 75  6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
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     6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04 6.4600E-04
         0

  80 RIVER REACHES
LAYER   ROW   COL   STAGE   CONDUCTANCE  BOTTOM ELEVATION  RIVER REACH
        ----------------------------------------------------------------
           1    69    44   1228.      5000.        1225.        1
           1    64    12   1294.      2000.        1291.        2
           1    64    13   1288.      2000.        1285.        3
           1    63    13   1288.      2000.        1285.        4
           1    63    14   1288.      2000.        1285.        5
           1    63    15   1287.      2000.        1284.        6
           1    63    16   1287.      2000.        1284.        7
           1    63    17   1287.      2000.        1284.        8
           1    64    17   1286.      2000.        1283.        9
           1    64    18   1286.      2000.        1283.       10
           1    65    18   1286.      2000.        1284.       11
```

1	65	19	1286.	2000.	1283.	12
1	65	20	1286.	2000.	1283.	13
1	64	20	1286.	2000.	1283.	14
1	64	21	1286.	2000.	1283.	15
1	63	21	1283.	2000.	1280.	16
1	63	22	1278.	1000.	1275.	17
1	62	22	1272.	1000.	1269.	18
1	61	22	1272.	1000.	1269.	19
1	61	23	1271.	1000.	1268.	20
1	61	24	1271.	1000.	1268.	21
1	62	24	1270.	1000.	1267.	22
1	63	24	1270.	1000.	1267.	23
1	63	25	1269.	1000.	1266.	24
1	64	25	1269.	1000.	1266.	25
1	64	26	1268.	1000.	1265.	26
1	65	26	1267.	1000.	1264.	27
1	65	27	1266.	3000.	1263.	28
1	65	28	1264.	3000.	1261.	29
1	65	29	1264.	3000.	1262.	30
1	65	30	1264.	3000.	1261.	31
1	65	31	1255.	2000.	1252.	32
1	65	32	1255.	2000.	1252.	33
1	65	33	1252.	2000.	1249.	34
1	65	34	1250.	2000.	1247.	35
1	65	35	1247.	3000.	1244.	36
1	66	35	1244.	3000.	1241.	37
1	66	36	1242.	3000.	1239.	38
1	67	36	1240.	3000.	1237.	39
1	67	37	1238.	3000.	1235.	40
1	67	38	1238.	5000.	1235.	41
1	68	38	1237.	5000.	1234.	42
1	68	39	1236.	5000.	1233.	43
1	68	40	1235.	5000.	1232.	44
1	68	41	1235.	5000.	1232.	45

1	69	41	1233.	5000.	1230.	46
1	69	42	1232.	5000.	1229.	47
1	69	43	1230.	5000.	1227.	48
1	70	44	1227.	5000.	1224.	49
1	70	45	1225.	5000.	1222.	50
1	70	46	1223.	5000.	1220.	51
1	70	47	1221.	5000.	1218.	52
1	70	48	1213.	5000.	1210.	53
1	69	48	1211.	5000.	1208.	54
1	68	48	1209.	3000.	1206.	55
1	67	48	1209.	3000.	1206.	56
1	66	48	1209.	3000.	1206.	57
1	66	49	1209.	3000.	1206.	58
1	66	50	1208.	1000.	1205.	59
1	66	51	1207.	1000.	1204.	60
1	67	51	1207.	1000.	1204.	61
1	68	51	1206.	1000.	1203.	62
1	68	52	1203.	1000.	1200.	63
1	69	52	1202.	1000.	1199.	64
1	70	52	1201.	1000.	1198.	65
1	70	53	1200.	1000.	1197.	66
1	71	53	1199.	1000.	1196.	67
1	72	53	1198.	1000.	1195.	68
1	73	53	1197.	275.0	1194.	69
1	73	54	1196.	275.0	1193.	70
1	74	54	1194.	275.0	1191.	71
1	74	55	1192.	275.0	1189.	72
1	74	56	1192.	275.0	1189.	73
1	74	57	1188.	275.0	1185.	74
1	73	57	1187.	275.0	1184.	75
1	73	58	1186.	275.0	1183.	76
1	72	58	1185.	275.0	1182.	77
1	71	58	1184.	275.0	1181.	78
1	71	59	1183.	275.0	1180.	79

```
          1    70    59   1182.       275.0          1179.        80
0AVERAGE SEED = 0.00039089
 MINIMUM SEED = 0.00016172
          0
   5 ITERATION PARAMETERS CALCULATED FROM AVERAGE SEED:

       0.0000000E+00  0.8593912E+00  0.9802291E+00  0.9972200E+00  0.9996091E+00
          0
   18 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD  1
0MAXIMUM HEAD CHANGE FOR EACH ITERATION:
 HEAD CHANGE LAYER,ROW,COL
 ------------------------------------------------------------------------------------------------------------
   85.47    ( 1, 68, 38)  -78.40    ( 1, 68, 38)  17.56    ( 1, 56, 18)  14.68    ( 1, 15,  4)  13.87    ( 1, 49, 16)
  -2.033    ( 1, 16, 31)  -3.083    ( 1, 46, 14)  -2.957   ( 1, 49, 14)  -8.047   ( 1, 49, 17)  3.521    ( 1, 40,  8)
  0.6411    ( 1, 49, 26)  0.6745    ( 1, 45, 13)  1.452    ( 1, 45, 15)  0.7047   ( 1, 53, 13)  0.4497   ( 1, 53, 19)
  0.1234    ( 1, 50, 28)  0.1683    ( 1, 52, 30) -0.8413E-01 ( 1, 56, 24)
          0
0HEAD/DRAWDOWN PRINTOUT FLAG = 1    TOTAL BUDGET PRINTOUT FLAG = 1    CELL-BY-CELL FLOW TERM FLAG = 1
0OUTPUT FLAGS FOR ALL LAYERS ARE THE SAME:
  HEAD   DRAWDOWN  HEAD  DRAWDOWN
 PRINTOUT  PRINTOUT  SAVE    SAVE
 ----------------------------------
    1       1      1      1
 "  CONSTANT HEAD" BUDGET VALUES WILL BE SAVED ON UNIT 40 AT END OF TIME STEP  1, STRESS PERIOD  1
 "FLOW RIGHT FACE " BUDGET VALUES WILL BE SAVED ON UNIT 40 AT END OF TIME STEP  1, STRESS PERIOD  1
 "FLOW FRONT FACE " BUDGET VALUES WILL BE SAVED ON UNIT 40 AT END OF TIME STEP  1, STRESS PERIOD  1
 "         DRAINS" BUDGET VALUES WILL BE SAVED ON UNIT 40 AT END OF TIME STEP  1, STRESS PERIOD  1
 "       RECHARGE" BUDGET VALUES WILL BE SAVED ON UNIT 40 AT END OF TIME STEP  1, STRESS PERIOD  1
 "  RIVER LEAKAGE" BUDGET VALUES WILL BE SAVED ON UNIT 40 AT END OF TIME STEP  1, STRESS PERIOD  1
1               HEAD IN LAYER  1 AT END OF TIME STEP  1 IN STRESS PERIOD  1
        ----------------------------------------------------------------------

         1       2       3       4       5       6       7       8       9       10
        11      12      13      14      15      16      17      18      19      20
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    21      22      23      24      25      26      27      28      29      30
    31      32      33      34      35      36      37      38      39      40
    41      42      43      44      45      46      47      48      49      50
    51      52      53      54      55      56      57      58      59      60
    61      62      63      64      65
..............................................................................
0 1  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0
0 2  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
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    -999.0  -999.0  -999.0  -999.0  -999.0
0 3  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
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    -999.0  -999.0  -999.0  -999.0  -999.0
0 4  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0   1507.   1499.   1494.  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
    -999.0  -999.0  -999.0  -999.0  -999.0
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0 5  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
    -999.0   -999.0   -999.0   -999.0   -999.0   -999.0    1512.    1510.    1501.    1498.
     1495.    1491.    1486.    1481.   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
    -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
    -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
    -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
    -999.0   -999.0   -999.0   -999.0   -999.0
0 6  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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0 19  -999.0   -999.0   -999.0    1600.    1598.    1597.    1598.    1599.    1601.    1604.
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     -999.0   -999.0   -999.0   -999.0   -999.0
0 33  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0    1485.    1482.    1478.    1473.
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     -999.0   -999.0   -999.0   -999.0   -999.0
0 34  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0    1482.    1478.    1475.    1470.
```

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       1535.   1525.   1492.   1459.   1439.   1415.   1378.   1378.  -999.0  -999.0
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      -999.0  -999.0  -999.0  -999.0  -999.0
0 35  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0   1473.   1471.   1468.
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       1518.   1513.   1491.   1462.   1429.   1405.   1377.  -999.0  -999.0  -999.0
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      -999.0  -999.0  -999.0  -999.0  -999.0
0 36  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0   1470.   1468.   1466.
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       1447.   1473.   1505.   1535.   1553.   1561.   1560.   1549.   1526.   1482.
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0 37  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0   1467.   1466.   1464.
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0 38  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0   1465.   1464.   1462.
       1459.   1454.   1448.   1441.   1431.   1422.   1411.   1403.   1402.   1398.
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```
0 39  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0    1463.    1462.    1460.
       1457.    1453.    1448.    1442.    1435.    1427.    1419.    1412.    1405.    1393.
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0 45  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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     -999.0   1392.   1392.   1392.   1392.   1392.   1392.   1392.   1390.   1389.
      1386.   1384.   1383.   1385.   1393.   1403.   1413.   1420.   1423.   1422.
      1418.   1411.   1400.   1383.   1353.   1322.   1306.   1288.   1290.   1303.
      1316.   1328.   1355.   1382.   1394.   1394.   1387.   1371.   1379.   1373.
      1348.   1382.   1397.   1400.   1393.   1375.   1346.   1320.   1287.  -999.0
     -999.0  -999.0  -999.0  -999.0  -999.0
0 60  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
     -999.0   1379.   1379.   1379.   1379.   1378.   1378.   1378.   1376.   1373.
      1368.   1362.   1361.   1361.   1368.   1380.   1396.   1406.   1411.   1412.
      1410.   1403.   1393.   1377.   1353.   1325.   1306.   1293.   1280.   1294.
      1306.   1315.   1339.   1360.   1368.   1361.   1355.   1350.   1356.   1348.
      1317.   1365.   1386.   1393.   1387.   1368.   1324.   1312.   1282.  -999.0
     -999.0  -999.0  -999.0  -999.0  -999.0
0 61  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
     -999.0   1363.   1363.   1362.   1362.   1361.   1361.   1361.   1359.   1355.
      1347.   1332.   1331.   1326.   1341.   1354.   1373.   1388.   1395.   1398.
      1397.   1392.   1383.   1369.   1350.   1325.   1304.   1291.   1272.   1281.
      1293.   1303.   1317.   1331.   1335.   1328.   1326.   1325.   1327.   1320.
      1297.   1347.   1371.   1382.   1380.   1364.   1321.   1292.  -999.0  -999.0
     -999.0  -999.0  -999.0  -999.0  -999.0
0 62  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
     -999.0   1344.   1342.   1341.   1340.   1340.   1340.   1342.   1341.   1336.
      1326.   1314.  -999.0   1304.   1321.   1334.   1352.   1367.   1375.   1379.
      1379.   1375.   1368.   1357.   1342.   1321.   1302.   1289.   1274.   1258.
      1280.   1292.   1299.   1306.   1311.   1314.   1313.   1307.   1302.   1297.
      1284.   1326.   1353.   1368.   1372.   1366.   1348.   1331.   1318.   1284.
      1277.  -999.0  -999.0  -999.0  -999.0
0 63  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
     -999.0   1323.   1314.   1313.   1313.   1312.   1312.   1320.   1322.   1316.
```

```
    1305.    1303.   -999.0    1292.    1297.    1312.    1328.    1342.    1350.    1354.
    1354.    1352.    1346.    1338.    1328.    1315.    1299.    1284.    1271.    1253.
    1271.    1283.    1292.    1298.    1301.    1302.    1299.    1293.    1290.    1285.
    1277.    1302.    1329.    1353.    1364.    1364.    1354.    1338.    1320.    1300.
    1279.   -999.0   -999.0   -999.0   -999.0
0 64 -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
   -999.0    1306.    1302.   -999.0   -999.0   -999.0    1299.    1301.    1305.    1300.
    1297.   -999.0   -999.0   -999.0    1287.    1290.    1303.    1313.    1318.    1321.
    1320.    1318.    1315.    1310.    1304.    1301.    1294.    1284.    1269.    1254.
    1267.    1277.    1284.    1289.    1291.    1289.    1283.    1279.    1275.    1266.
    1271.    1285.    1304.    1335.    1354.    1359.    1354.    1339.    1320.    1301.
    1276.    1270.   -999.0   -999.0   -999.0
0 65 -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0    1294.    1295.    1293.
   -999.0   -999.0   -999.0   -999.0   -999.0    1279.    1273.    1271.    1272.    1271.
    1268.    1266.    1263.    1260.    1255.    1277.    1282.    1278.    1266.    1254.
    1264.    1271.    1276.    1279.    1280.    1275.    1265.    1260.    1256.    1253.
    1251.    1274.    1288.    1318.    1344.    1353.    1350.    1335.    1316.    1298.
    1275.   -999.0   -999.0   -999.0   -999.0
0 66 -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
   -999.0   -999.0   -999.0   -999.0    1246.    1247.    1264.    1265.    1259.    1248.
    1258.    1265.    1269.    1270.    1269.    1263.    1249.    1223.    1221.    1230.
    1236.    1262.    1278.    1307.    1335.    1346.    1344.    1329.    1308.    1292.
    1272.   -999.0   -999.0   -999.0   -999.0
0 67 -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
   -999.0   -999.0   -999.0   -999.0   -999.0    1242.    1241.    1240.    1248.    1241.
    1250.    1257.    1260.    1261.    1259.    1253.    1239.    1216.   -999.0   -999.0
    1229.    1250.    1267.    1297.    1327.    1339.    1338.    1323.    1293.    1280.
   -999.0   -999.0   -999.0   -999.0   -999.0
0 68 -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
```

```
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  1238.   1237.   1237.
       1239.   1246.   1249.   1250.   1249.   1245.   1235.   1215.  -999.0  -999.0
       1222.   1231.   1253.   1286.   1317.   1331.   1332.   1328.  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0
0 69  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
       1235.   1235.   1234.   1233.   1238.   1236.   1229.   1214.  -999.0  -999.0
      -999.0   1222.   1241.   1275.   1307.   1320.   1321.   1315.  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0
0 70  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0   1228.   1227.   1226.   1222.   1215.  -999.0  -999.0
      -999.0   1215.   1223.   1263.   1295.   1305.   1300.   1280.   1233.  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0
0 71  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0   1217.   1253.   1282.   1288.   1278.   1242.   1222.  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0
0 72  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0  -999.0
      -999.0  -999.0   1214.   1243.   1267.   1271.   1258.   1228.  -999.0  -999.0
      -999.0  -999.0  -999.0  -999.0  -999.0
```

```
0 73  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   1216.    1225.    1248.    1249.    1227.    1217.   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0 74  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   1218.    1223.    1223.    1216.   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0 75  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0 76  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0 77  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
```

```
      -999.0    -999.0    -999.0    -999.0    -999.0
 0HEAD WILL BE SAVED ON UNIT 30 AT END OF TIME STEP  1, STRESS PERIOD  1
 1            DRAWDOWN IN LAYER  1 AT END OF TIME STEP  1 IN STRESS PERIOD  1
        ----------------------------------------------------------------------

         1        2        3        4        5        6        7        8        9       10
        11       12       13       14       15       16       17       18       19       20
        21       22       23       24       25       26       27       28       29       30
        31       32       33       34       35       36       37       38       39       40
        41       42       43       44       45       46       47       48       49       50
        51       52       53       54       55       56       57       58       59       60
        61       62       63       64       65
 ..........................................................................................
 0 1  -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0
 0 2  -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0
 0 3  -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0
```

```
0 4  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -7.520   0.3129   4.950    -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0 5  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -6.258   -3.301   5.708    6.544
      6.404    7.748   11.24    15.90    -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0 6  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -7.625   -10.51   -8.510   -2.302   -0.4608
     -1.244   -2.593   -2.453    5.094    4.774    6.769    7.441    7.651    4.752    5.101
      7.364    9.941   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0 7  -999.0   -999.0   -999.0   -999.0   0.9822   0.5670   -2.115   -999.0   -999.0   -999.0
     -999.0   -999.0   -1.578   -15.52   -15.02   -7.884   -20.55   -16.93   -2.882    3.581
      4.439    1.703   -3.242   -7.376   -12.97   -17.94   -22.01   -24.51   -25.44   -24.26
     -21.27   -16.79   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0 8  -999.0   -999.0   -999.0   -999.0    1.056   -1.903   -12.05   -13.89   -14.03   -999.0
     -999.0   -5.946   -16.64   -19.01   -30.97   -28.60   -22.59   -18.42   -3.001   10.11
     14.99    13.47     6.168   -3.077   -12.92   -22.93   -32.36   -39.26   -43.27   -44.11
     -41.76   -35.90   -36.33   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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      -999.0   -999.0   -999.0   -999.0   -999.0
0 9   -999.0   -999.0   -999.0   -999.0   -7.193   -10.57   -19.39   -17.48   -21.54   -10.24
      -9.576   -23.37   -29.75   -27.30   -33.51   -35.72   -15.31   0.2617  -0.3328    10.88
       18.63    20.21    14.91    5.934   -4.437   -16.71   -29.75   -40.78   -48.88   -53.35
      -54.09   -51.98   -42.80   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0
0 10  -999.0   -999.0   -999.0   -5.354   -15.49   -15.97   -22.01   -25.63   -11.95   -17.19
      -24.29   -30.90   -26.35   -28.80   -32.27   -22.83   -6.607    5.624    11.17    9.590
       13.23    16.13    14.58    9.436    2.050   -8.356   -20.08   -32.09   -42.72   -50.09
      -52.16   -55.91   -54.23   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0
0 11  -999.0   -999.0   -999.0   -18.06   -19.82   -18.52   -19.47   -18.78   -23.45   -24.05
      -23.95   -32.30   -20.74   -11.64   -8.054   -6.473   -2.812    1.932    5.488    7.086
       7.461    4.794    5.175    4.068   0.3577   -4.384   -10.88   -18.40   -24.69   -31.02
      -44.29   -60.36   -53.79   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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      -999.0   -999.0   -999.0   -999.0   -999.0
0 12  -999.0   -999.0   -999.0   -28.19   -21.45   -19.42   -18.39   -16.29   -18.10   -30.28
      -40.41   -35.77   -23.41   -5.509    6.743    8.541    2.484   -5.118   -6.407   -4.645
      -2.572   -1.392   -5.046   -7.500   -7.210   -7.625   -9.255   -11.84   -15.68   -22.47
      -38.05   -55.15   -44.25   -21.61   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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      -999.0   -999.0   -999.0   -999.0   -999.0
0 13  -999.0   -999.0   -999.0   -35.57   -28.71   -20.59   -18.03   -17.69   -19.88   -28.16
      -40.80   -44.21   -34.52   -10.75    7.063    10.14    2.192   -8.908   -5.851   -5.532
      -6.395  -0.9147  -0.6853   -13.74   -18.77   -17.78   -16.62   -16.91   -19.68   -24.64
      -30.59   -38.32   -37.81   -29.25   -23.24   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
```

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      -999.0    -999.0    -999.0    -999.0    -999.0
0 14  -999.0     -999.0    -999.0    -37.20    -33.80    -14.48    -8.772    -13.87    -20.96    -28.91
      -40.37    -47.95    -38.48    -17.24   -0.1313    2.038    0.8247    -1.692   -3.9185E-02 0.6704
      -2.173    -5.596    -7.683    -20.17    -18.92    -18.20    -15.80    -14.00    -15.19    -19.66
      -23.23    -21.91    -22.85    -23.51    -19.23    6.2744E-02 -999.0   -999.0    -999.0    -999.0
      -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
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      -999.0    -999.0    -999.0    -999.0    -999.0
0 15  -999.0     -999.0    -999.0    -37.33    -36.11    -19.98    -8.833    -2.894    -16.75    -26.16
      -33.18    -35.20    -10.39    14.28     14.51     3.039    -3.299    -3.276    -1.694    4.496
       8.673    4.082    -3.995    -6.927    -8.873    -6.652    -1.815    2.793     2.016    -7.137
      -16.75    -18.42    -19.67    -24.17    -16.01    29.07     0.7617    -999.0    -999.0    -999.0
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      -999.0    -999.0    -999.0    -999.0    -999.0
0 16  -999.0     -999.0    -999.0    -37.39    -36.35    -25.52    -14.76    -2.681    -19.81    -24.70
      -29.78    -23.10    2.045     18.33     17.11     8.471    -4.049    -8.854    -5.773    6.777
       14.94    11.94    -2.372    -12.54    -9.523   -0.5164    9.161     16.53     18.57     9.033
      -11.14    -24.76    -24.83    -23.93    -6.646    24.40     2.501     11.36    -999.0    -999.0
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0 17  -999.0     -999.0    -999.0    -37.40    -36.00    -33.81    -3.093    4.664    -13.44    -20.42
      -23.63    -25.50    3.371     10.94     6.528    -0.1007    -9.787    -11.77    -5.552    5.063
       7.372    4.567    -3.472    -10.23    -9.161   -0.8706    11.57     22.49     18.35     17.96
       9.552    -20.16    -24.35    -21.69    -13.30    0.1924    12.36     4.355    -999.0    -999.0
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      -999.0    -999.0    -999.0    -999.0    -999.0
0 18  -999.0     -999.0    -999.0    -37.43    -35.95    -33.25    -21.09    4.526    -12.13    -19.46
      -25.75    -32.94    9.639     2.487    -3.536    -11.07    -17.96    -15.32    -2.286    -4.498
      -6.578    -6.006    -5.296    -6.286    -6.008    -2.527    6.472     18.50     17.75     29.25
       13.45    -13.87    -20.12    -21.72    -16.19    -6.571    -4.265    -1.146    0.2064    -999.0
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     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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0 19  -999.0    -999.0    -999.0    -37.80    -35.68    -30.96    -33.37    -15.48    -17.04    -20.29
     -27.36   -32.91   -17.26   -6.646   -9.395   -13.56   -14.70   -12.20   -7.385   -8.565
     -14.93   -19.10   -14.87   -6.077   -4.829   -4.028   -1.171    5.057    5.638    13.66
     0.5953   -14.25   -19.16   -13.81   -2.454   -1.495   -15.22   -21.14   -25.97   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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     -999.0   -999.0   -999.0   -999.0   -999.0
0 20  -999.0    -999.0    -999.0    -39.55    -34.69    -28.58    -32.03    -36.34    -18.14    -19.28
     -23.27   -20.15   -12.70   -10.72   -10.73   -12.62   -8.638   -9.237   -7.521   -6.179
     -15.30   -28.54   -36.99   -25.93   -8.313   -9.247   -11.03   -14.82   -22.41   -3.994
     -10.77   -24.20   -28.25   -10.92  -0.1272    4.328   -25.61   -26.31   -31.01   -22.70
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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0 21  -999.0    -999.0    -999.0    -999.0    -30.47    -25.60    -26.46    -37.45    -25.45    -20.92
     -6.410   -4.586   -10.10   -12.94   -12.29   -5.784   -7.420   -18.35   -7.955   -5.960
     -18.28   -30.63   -41.39   -45.88   -18.05   -15.44   -21.05   -30.89   -35.21   -6.938
     -12.82   -22.91   -30.88   -22.37   -1.846   -31.96   -25.96   -29.18   -28.09   -18.42
     -26.12   -17.22   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0 22  -999.0    -999.0    -999.0    -999.0    -26.63    -22.71    -21.35    -31.16    -23.73    -25.38
      7.619   -1.838   -13.48   -17.64   -15.76   -10.62   -13.65   -26.67   -20.14   -7.579
     -20.12   -24.85   -31.61   -33.75   -8.649   -9.699   -22.41   -35.63   -35.81   -10.47
     -12.07   -13.10   -19.38   -21.67   -17.95   -8.078   -18.56   -15.57   -17.38   -14.47
     -28.66   -27.23   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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     -999.0   -999.0   -999.0   -999.0   -999.0
0 23  -999.0    -999.0    -999.0    -999.0    -23.07    -19.76    -17.13    -23.11    -11.83    -16.29
     -6.585   -11.33   -23.39   -22.57   -15.40   -10.22   -17.23   -16.85   -14.15   -9.046
     -17.68   -17.86   -21.91   -21.70   -4.246   -6.984   -8.220   -24.80   -31.56   -10.59
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      -4.849    2.549   -3.712   -12.49   -9.098   -7.798   -10.30   -12.04   -18.89   -11.33
      -17.45   -41.17   -18.20   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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      -999.0   -999.0   -999.0   -999.0   -999.0
0 24  -999.0   -999.0   -999.0   -999.0   -20.05   -17.12   -13.68   -16.63   -8.599   -9.535
      -12.54   -21.64   -27.69   -21.58   -8.853  -0.7222   -13.55   -12.58   -12.30   -9.096
      -20.07   -22.33   -22.51   -18.57   -12.39    8.349    5.027   -10.93   -21.86   -10.54
      -3.297    7.559    1.560   -8.207   -7.960   -10.93   -8.304    1.756    1.214   -23.25
      -24.05   -41.50   -23.46   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0
0 25  -999.0   -999.0   -999.0   -999.0   -17.86   -15.14   -11.16   -12.88   -5.732   -4.095
      -8.546   -14.95   -21.17   -15.53   -3.418    1.016   -7.536   -9.121   -10.70   -8.570
      -23.60   -38.30   -27.80   -19.42   -3.082    13.19    9.460   -8.330   -12.87   -12.49
      -15.49    2.634    3.447   -2.712   -8.148   -9.896   -10.36   -3.455    3.015   -25.18
      -30.99   -24.91   -21.92   -12.87   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0
0 26  -999.0   -999.0   -999.0   -999.0   -16.76   -13.96   -9.534   -10.87   -2.577   -11.34
      -13.41   -8.277   -12.17   -12.63   -6.917   -2.754   -6.110   -5.407   -8.516   -9.168
      -8.312   -27.33   -14.80   -8.034   -1.764    7.443   -2.339   -22.18   -11.64   -6.374
      -25.09   -14.40   -3.617   -6.698   -10.36   -10.24   -12.78   -9.517   -7.551   -25.47
      -22.10   -42.90   -40.69   -20.96   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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0 27  -999.0   -999.0   -999.0   -999.0   -17.04   -13.53   -8.880   -9.305    2.106    3.977
      -12.22   -2.541   -3.471   -11.37   -10.64   -4.934   -3.280    2.293   -3.485   -14.60
      -8.406   -1.034    8.172    1.917   -4.276   -4.353   -13.86   -10.81   -15.44   -7.430
      -30.36   -24.70   -11.31   -10.31   -15.35   -17.86   -25.29   -26.20   -12.37   -11.37
      -26.94   -60.39   -54.79   -27.05   -12.83   -999.0   -999.0   -999.0   -999.0   -999.0
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0 28  -999.0   -999.0   -999.0   -999.0   -19.06   -13.36   -8.552   -7.561    6.790    7.792
      -9.250   0.8446    2.800   -8.011   -4.716  -0.6780   0.2622    6.903   -4.112   -16.44
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     -7.815    7.538    13.54    2.501   -7.031   -9.907   -4.622   0.7087   -9.588   -8.081
     -28.33   -26.55   -14.15   -13.34   -22.43   -21.90   -33.93   -43.05   -22.86   -13.11
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0 29  -999.0   -999.0   -999.0   -999.0   -999.0   -11.27   -7.369   -5.551    9.328    11.92
      11.33   -8.154    2.898    1.109    3.137    1.665    2.017    6.923    1.179   -14.49
     -8.291   -10.50    4.059    4.113   -3.932   -8.840  -0.8613    10.28    1.367   -6.352
     -7.549   -14.22   -10.65   -18.61   -37.24   -36.38   -44.63   -38.58   -26.75   -10.38
     -29.87   -50.38   -45.67   -46.95   -53.80   -17.40   -999.0   -999.0   -999.0   -999.0
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0 30  -999.0   -999.0   -999.0   -999.0   -999.0   -10.11   -6.244   -3.654    11.10    16.31
      10.58   -10.78    7.200    12.56    3.711    2.188    5.342    8.996   0.2627   -19.62
     -7.823   -10.42  -0.9901    2.126   -1.670   -7.909   -1.918    5.860   -7.413   -18.09
     -8.583   -11.17   -12.99   -25.22   -42.64   -45.37   -44.38   -43.84   -29.93   -22.34
     -26.24   -44.55   -30.44   -41.13   -50.91   -19.66   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0 31  -999.0   -999.0   -999.0   -999.0   -999.0   -10.28   -5.692   -1.997    11.86    17.46
     -3.058   -6.255   -7.979    11.05    5.287    6.099    8.212    11.41    5.661   -14.77
     -5.802    4.185  -0.1663   -5.238    4.046   -8.541   -12.75   -16.81   -17.52   -17.31
     -12.43   -28.91   -25.24   -27.95   -40.81   -34.23   -42.92   -52.22   -38.26   -30.04
     -20.99   -32.54   -52.15   -35.30   -51.28   -18.87   -4.846   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0 32  -999.0   -999.0   -999.0   -999.0   -999.0   -12.01   -5.416  -0.2939    11.85    6.754
     -8.179   -2.111   -11.25   0.7937   0.7771    9.196    6.798    3.634  -0.2506   -8.560
     -13.73   0.6099   -1.577   -11.28   -10.71   -13.79   -25.85   -25.19   -24.03   -12.48
     -6.888   -43.68   -40.67   -30.82   -44.78   -37.29   -45.84   -49.55   -38.09   -28.36
     -29.49   -43.52   -59.86   -43.30   -24.07   -20.44   -6.925   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0 33  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -4.288    1.058    9.859    1.194
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    -7.415   -2.217   -9.828   -1.150   -2.119    4.512    2.710   -2.002  -0.2689   -6.582
    -22.11   -26.86   -12.30   -8.111   -11.37   -14.44   -23.22   -36.18   -29.48   -24.05
    -9.806   -30.63   -20.10   -32.30   -48.32   -40.84   -47.09   -48.75   -29.16   -1.337
    -34.70   -42.37   -43.55   -38.97   -43.94   -39.18   -11.58   -3.386   -999.0   -999.0
    -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
    -999.0   -999.0   -999.0   -999.0   -999.0
0 34  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -5.209    1.831    6.118    1.926
   -0.5889    1.339   -13.17   -6.168   -3.310   -2.006   -2.900  -0.9305    1.013   -5.507
    -22.23   -25.63   -8.788   -2.947   -10.31   -15.51   -19.43   -23.86   -18.86   -8.194
    -1.674   -11.77   -15.92   -36.87   -41.55   -36.44   -41.77   -43.71   -31.02   -4.605
    -29.35   -38.31   -29.27   -42.93   -49.47   -45.14   -13.14   -4.241   -999.0   -999.0
    -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
    -999.0   -999.0   -999.0   -999.0   -999.0
0 35  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0    3.325    4.890    1.279
     3.438    2.585   -11.34   -4.282   -2.694    1.284  -0.7533   -5.233   -4.862   -7.786
    -19.00   -10.19   0.6782   -1.035   -6.697   -7.555   -12.16   -16.71   -7.010   -6.703
     5.070   -11.92   -12.57   -29.91   -37.93   -35.25   -38.04   -42.67   -35.86   -2.399
    -23.94   -42.35   -35.19   -44.90   -44.90   -34.97   -14.67   -999.0   -999.0   -999.0
    -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
    -999.0   -999.0   -999.0   -999.0   -999.0
0 36  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0    3.206    3.662   -1.036
    0.6156    1.365   -5.349   -14.75   -9.109   -1.111   -2.327   -6.921   -4.362   -6.966
    -15.56   -6.077   -1.835   -3.437   -4.320  -0.1884   -3.485   -8.885   -8.085   -8.849
   -0.1387  -0.1193   -4.004   -28.67   -42.65   -39.53   -37.70   -37.69   -27.66   -3.955
    -27.84   -51.77   -50.66   -36.12   -49.57   -51.58   -34.98   -40.78   -999.0   -999.0
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    -8.970   -3.363   -6.617   -8.099   -5.946   -4.876   -4.700    1.685   -7.447   -7.384
    -2.471    4.852   -6.120   -23.48   -35.58   -35.42   -28.21   -21.43   -24.41   -4.748
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      -4.778     2.974    -3.456    -6.093    -3.701    -6.124    -2.300     2.479    -7.268    -5.284
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      -20.95    -27.79    -19.19   -0.3120    -15.74    -31.97    -22.77    -44.59    -44.63    -999.0
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       5.498     4.583    -4.618    -9.897    -3.932    -3.142    -2.226    -8.431    -5.738    -10.76
      -12.58    -3.012    -1.885    -1.577    -3.998    -8.843    -6.306    -13.48    -8.125    -5.093
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       6.488     8.421    -1.126    -8.164    -5.971    -5.588    -2.042    0.7170    -4.932    -11.13
      -17.04    -7.399     4.146     5.462    -3.122    -7.555    -5.606    -8.443    -5.201    -11.80
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       5.019     6.710     4.336     2.302     4.135     5.538    -2.496    -3.260    0.5354    -1.908
      -10.44    -12.59    -3.184     1.584    -2.850    -2.726    -8.642    -20.73    -6.254     4.948
      -5.600    -10.28    -21.72    -23.83    -22.38    -22.38    -21.15    -6.301    -6.633    -9.023
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0 42  -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
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      0.7273    -7.011    -8.226     1.561    -3.351    -3.747    -8.717    -20.26    -7.488    -10.95
     -1.5869E-02 -6.595    -15.65    -20.79    -20.89    -15.53    -12.44    -5.900    -12.62    -10.56
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     -6.385    -14.40    -13.01    -15.47    -16.31    -11.51    -10.89    -12.14    -15.89    -37.39
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     -8.556    -17.06    -15.35    -15.88    -18.74    -19.63    -21.98    -10.38    -15.66    -29.58
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     -999.0    -999.0     8.612     11.21     10.63     2.596     1.811     6.505     4.808   -0.9355
     -10.28    -18.97    -26.71    -15.26    -7.454    -5.361    -9.333    -17.43    -7.587    0.1802
     -8.116    -9.161    -14.53    -18.39    -22.43    -20.56    -26.67    -6.622    0.7943    -14.66
     -10.44    -20.34    -35.07    -34.72    -13.82    -8.312    -20.18    -34.11    -20.46    -27.75
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0 47  -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
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     -4.107    -7.570    -13.91    -13.77    -20.34    -30.89    -25.25     9.397     4.343    -5.224
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     -9.664   -16.87   -18.80   -15.95   -20.34   -10.69   -18.73    6.363    4.771   -1.029
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     -30.18   -28.59   -32.50   -25.92   -19.24   -17.20   -17.99   -21.74   -21.25   -15.05
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0 54  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   12.43    -15.96   -38.56   -44.90   -44.78   -43.49   -42.66   -43.08
      -42.41   -38.83   -31.65   -20.83   -16.00   -21.61   -20.50   -23.04   -16.91   -12.34
      -21.32   -16.56   -4.602   -6.664   -5.648   -20.96   -12.29   -2.803   -13.57   -10.31
      -24.26   -32.00   -36.40   -32.22   -43.24   -47.23   -39.80   -32.20   -29.63   -9.840
      -23.89   -29.25   -54.01   -18.11   -14.50   -5.565   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0
0 55  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   15.60    -12.38   -32.30   -41.19   -44.31   -46.49   -46.76   -44.76
      -40.80   -33.19   -22.76   -14.53   -11.82   -20.24   -24.42   -28.22   -22.31   -22.87
      -28.41   -21.56   -18.86   -11.02   -3.919   -7.922   -10.48   0.2371   -6.440   -13.07
      -24.27   -15.54   -16.74   -14.40   -33.71   -41.61   -27.57   -21.26   -43.58   -24.92
      -18.80   -52.37   -48.37   -33.50   -53.27   -22.10   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0
0 56  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   37.79    18.45    -6.528   -26.29   -37.68   -43.05   -45.27   -44.70   -41.10
      -35.08   -28.39   -16.55   -8.932   -6.939   -21.69   -31.56   -29.09   -26.01   -27.07
      -26.91   -16.29   -20.92   -25.36   -14.34   -4.471   -12.85   -14.01   -12.12   -13.41
      -13.58   -8.064   -10.04   3.260    -21.35   -39.06   -37.73   -6.543   -36.04   -24.50
      -13.87   -20.42   -33.37   -15.25   -14.72   -35.54   -15.58   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0
0 57  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   29.76    16.76    -4.506   -24.01   -36.85   -43.19   -44.79   -42.39   -35.81
      -28.93   -28.28   -20.46   -15.26   -20.19   -27.54   -32.42   -31.69   -29.51   -29.83
```

```
     -26.70    -13.31    -18.89    -29.74    -15.54    -4.967    -3.284    -20.61    -27.12    -11.03
     -9.429    -10.22    -4.270     8.621    -10.79    -17.55    -40.97    -28.12    -31.83    -16.55
     -10.15    -5.791    -19.64    -11.08     1.781    -60.07    -29.87    -13.45    -999.0    -999.0
     -999.0    -999.0    -999.0    -999.0    -999.0
0 58  -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
     -999.0     16.12     9.721    -8.199    -26.34    -38.49    -44.19    -45.18    -42.21    -37.03
     -34.05    -37.75    -33.10    -29.73    -34.14    -39.25    -40.56    -39.15    -36.37    -33.49
     -28.05    -15.02    -1.636    -26.60    -13.43    -18.68    -5.469    -5.043    -15.86    -9.060
     -8.115    -5.977    -12.27    -10.34    -4.306    -24.50    -33.15    -45.29    -54.01    -29.77
     -19.19    -11.50    -17.05    -14.62    -5.374    -23.80    -65.38    -23.94    -9.605    -999.0
     -999.0    -999.0    -999.0    -999.0    -999.0
0 59  -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
     -999.0    -4.855     1.501    -13.91    -28.25    -38.46    -43.39    -43.62    -40.64    -35.85
     -31.87    -28.30    -25.38    -24.26    -29.56    -36.92    -42.43    -44.30    -42.17    -37.76
     -29.96    -12.19    0.1008    -19.39    -10.05     10.90    -2.039    -10.49    -5.822    -5.395
     -9.226    0.4987    -16.70    -30.57    -16.66    -26.74    -27.56    -13.78    -37.83    -44.08
     -19.23    -26.23    -22.01    -19.89    -12.58    -4.086    -65.89    -46.12    -9.343    -999.0
     -999.0    -999.0    -999.0    -999.0    -999.0
0 60  -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
     -999.0     6.769    -10.06    -16.38    -25.00    -33.53    -37.75    -37.61    -34.63    -30.46
     -23.99    -16.56    -13.48    -11.14    -14.33    -22.04    -32.38    -37.62    -38.56    -35.24
     -25.18    -4.237    -1.812    -16.57   -0.5123     12.51     10.19    -17.60    -5.738    -11.83
     -15.96     1.659    -9.862    -22.56    -21.46    -32.18    -19.52    -9.967    -28.92    -48.32
     -21.30    -7.652    -27.28    -30.45    -22.41    -13.25    -15.87    -42.30    -9.524    -999.0
     -999.0    -999.0    -999.0    -999.0    -999.0
0 61  -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
     -999.0   -0.5758    -5.356    -6.013    -12.72    -22.19    -27.20    -26.85    -27.36    -24.38
     -14.61     1.973     4.780     12.44    0.3802    -8.089    -21.43    -29.24    -29.30    -25.19
     -26.29    -19.86    -15.23    -17.40     2.118     21.09     2.118    -14.64    -7.107    -19.04
     -25.86    -7.643    -1.296    -3.125    -6.765    -10.89    -4.327     1.884    -19.35    -35.72
     -19.73     3.548    -24.80    -32.60    -26.50    -12.80    -16.83    -21.76    -999.0    -999.0
     -999.0    -999.0    -999.0    -999.0    -999.0
0 62  -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0    -999.0
     -999.0    -6.052    -1.474    -2.479    -7.878    -14.18    -19.35    -19.81    -21.29    -15.69
```

```
     -4.903    8.487   -999.0    18.65    2.159   -9.919   -24.15   -33.88   -34.55   -30.62
     -26.98   -35.25   -27.14   -16.62    3.486    19.20    4.605   -5.518   -11.59   -11.67
     -26.07   -18.31  -0.3256    5.649  -0.7750   -6.912  -0.7823  -0.5592   -22.26   -26.44
     -15.60   -11.61   -20.28   -23.99   -20.03   -13.09   -11.94   -49.82   -53.47   -16.50
     -6.756   -999.0   -999.0   -999.0   -999.0
0 63 -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0  -0.3263    7.171    4.895    2.818   0.9792   0.7478   -7.753   -8.762   -2.935
      8.748    9.908   -999.0    18.27    10.43   -7.146   -26.13   -42.21   -49.59   -50.82
     -49.19   -43.76   -32.16   -28.48   -13.57   0.3474    6.581    10.45   -10.59   -10.35
     -24.10   -27.87   -16.38   -11.43   -3.273   -3.364   -2.082   -17.49   -33.82   -22.40
     -20.06   -35.47   -36.81   -30.92   -19.47   -7.872   -6.576   -33.27   -54.64   -36.48
     -13.13   -999.0   -999.0   -999.0   -999.0
0 64 -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0    10.30    12.18   -999.0   -999.0   -999.0    7.864    6.060    1.695    7.042
      9.354   -999.0   -999.0   -999.0    14.26    8.250   -8.267   -21.77   -31.19   -37.50
     -40.73   -41.28   -36.66   -29.28   -17.43   -6.465    6.000    6.262   0.6927   -5.259
     -21.25   -28.27   -24.06   -21.62   -12.57   -12.90   -14.63   -22.24   -33.83   -26.78
     -37.43   -36.26   -20.33   -19.31   -16.77   -11.97   -18.68   -33.99   -47.48   -39.94
     -14.57   -7.284   -999.0   -999.0   -999.0
0 65 -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0    6.132    4.871    5.804
     -999.0   -999.0   -999.0   -999.0   -999.0    12.72    16.16    13.71    9.194    4.968
      4.629    2.298    3.323    5.228    9.177   -9.148   -8.309   -6.118    6.940   -3.323
     -22.55   -27.76   -30.94   -29.27   -24.04   -19.20   -25.18   -22.75   -22.31   -26.39
     -11.86   -9.886    2.389   -4.791   -13.19   -18.36   -25.91   -34.07   -40.16   -38.70
     -16.29   -999.0   -999.0   -999.0   -999.0
0 66 -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0    6.281   0.3268   -19.82   -15.11   -6.213   -3.496
     -15.36   -23.82   -30.36   -30.53   -27.26   -19.76   -15.47    5.805    7.344    2.963
      7.092   -2.031    2.894   -6.322   -19.10   -27.09   -32.11   -33.38   -31.57   -31.82
     -16.31   -999.0   -999.0   -999.0   -999.0
0 67 -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
```

```
       -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
       -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
       -999.0   -999.0   -999.0   -999.0   -999.0   -0.4913  -2.400   -3.896   -12.31   -3.257
       -13.79   -22.31   -27.37   -30.39   -31.07   -26.86   -13.80   8.095    -999.0   -999.0
       6.875    -2.907   -3.405   -15.60   -31.81   -38.98   -40.30   -34.96   -18.36   -18.88
       -999.0   -999.0   -999.0   -999.0   -999.0
0 68   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
       -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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       -9.913   -18.71   -22.71   -25.01   -26.42   -23.79   -14.67   4.417    -999.0   -999.0
       8.290    8.221    -2.165   -21.19   -43.10   -51.26   -51.70   -50.08   -999.0   -999.0
       -999.0   -999.0   -999.0   -999.0   -999.0
0 69   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
       -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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       -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
       -12.82   -13.61   -13.53   -13.60   -19.69   -18.93   -13.06   1.556    -999.0   -999.0
       -999.0   8.874    0.3926   -22.74   -46.97   -55.12   -53.98   -49.01   -999.0   -999.0
       -999.0   -999.0   -999.0   -999.0   -999.0
0 70   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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       -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
       -999.0   -999.0   -999.0   -14.73   -14.72   -13.44   -10.73   -3.356   -999.0   -999.0
       -999.0   7.627    8.099    -22.50   -47.56   -53.01   -45.49   -24.34   22.64    -999.0
       -999.0   -999.0   -999.0   -999.0   -999.0
0 71   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
       -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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       -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
       -999.0   -999.0   3.921    -24.83   -46.80   -48.18   -33.59   5.083    25.79    -999.0
       -999.0   -999.0   -999.0   -999.0   -999.0
```

```
0 72  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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      -999.0   -999.0   -999.0   -999.0   -999.0
0 73  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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0 74  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -8.558   -11.52   -8.982    1.300   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0
0 75  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
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      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0
0 76  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
      -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
```

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     -999.0   -999.0   -999.0   -999.0   -999.0
0 77  -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0   -999.0
     -999.0   -999.0   -999.0   -999.0   -999.0
0DRAWDOWN WILL BE SAVED ON UNIT 35 AT END OF TIME STEP  1, STRESS PERIOD  1
          0


                VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD  1
                -----------------------------------------------------------------------------
0           CUMULATIVE VOLUMES      L**3                       RATES FOR THIS TIME STEP      L**3/T
            ------------------                     ------------------------


              IN:                                    IN:
              ---                                    ---
               STORAGE =    0.0000                              STORAGE =    0.0000
             CONSTANT HEAD =    0.0000                           CONSTANT HEAD =    0.0000
                DRAINS =    0.0000                            DRAINS =    0.0000
               RECHARGE =   0.10640E+08                            RECHARGE =   0.10640E+08
             RIVER LEAKAGE =    0.0000                          RIVER LEAKAGE =    0.0000
0               TOTAL IN =   0.10640E+08                          TOTAL IN =   0.10640E+08
0             OUT:                                    OUT:
              ----                                   ----
               STORAGE =    0.0000                              STORAGE =    0.0000
             CONSTANT HEAD =    0.0000                           CONSTANT HEAD =    0.0000
                DRAINS =   0.88856E+07                          DRAINS =   0.88856E+07
               RECHARGE =    0.0000                            RECHARGE =    0.0000
             RIVER LEAKAGE =   0.17554E+07                         RIVER LEAKAGE =   0.17554E+07
0               TOTAL OUT =   0.10641E+08                          TOTAL OUT =   0.10641E+08
0               IN - OUT =   -786.00                          IN - OUT =   -786.00
```
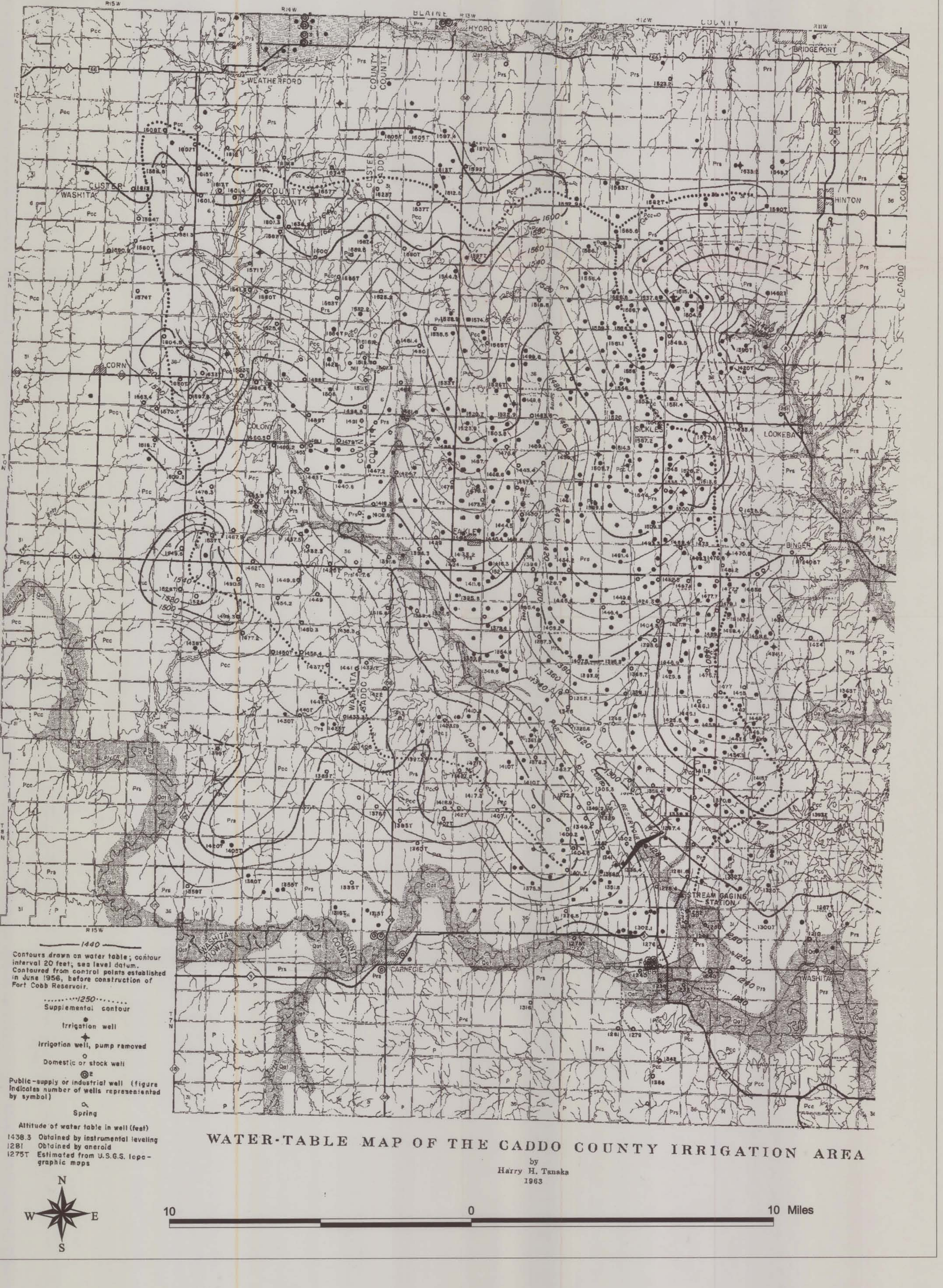

```
0          PERCENT DISCREPANCY =          -0.01                    PERCENT DISCREPANCY =          -0.01



           0


        TIME SUMMARY AT END OF TIME STEP  1 IN STRESS PERIOD  1
                      SECONDS      MINUTES      HOURS       DAYS        YEARS
                 -----------------------------------------------------------
       TIME STEP LENGTH      86400.0     1440.00     24.0000     1.00000    0.273785E-02
      STRESS PERIOD TIME      86400.0     1440.00     24.0000     1.00000    0.273785E-02
    TOTAL SIMULATION TIME      86400.0     1440.00     24.0000     1.00000    0.273785E-02
           1
```

PLATE 1.

Source: Tanaka and Davis, 1963



1440
Contours drawn on water table; contour interval 20 feet; sea level datum. Contoured from control points established in June 1956, before construction of Fort Cobb Reservoir.

1250
Supplemental contour

● Irrigation well

✦ Irrigation well, pump removed

○ Domestic or stock well

◎2 Public-supply or industrial well (figure indicates number of wells represented by symbol)

Spring

Altitude of water table in well (feet)

1438.3	Obtained by instrumental leveling
1281	Obtained by aneroid
1275T	Estimated from U.S.G.S. topographic maps

WATER-TABLE MAP OF THE CADDO COUNTY IRRIGATION AREA

by
Harry H. Tanaka
1963

2

VITA

Lisa Renee Penderson

Candidate for the Degree of

Master of Science

Thesis: STEADY-STATE SIMULATION OF GROUND-WATER FLOW IN THE RUSH SPRINGS AQUIFER, COBB CREEK BASIN, CADDO COUNTY, OKLAHOMA.

Major Field: Geology

Biographical:

Personal Data: Born in El Paso, Texas on January 8, 1972, the daughter of Raymond and Linda Penderson.

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Experience: Teaching assistant at Oklahoma State University from 1995 to 1997. Geologist for Southern Environmental and Management Specialties, Inc., summer 1996. Geologist for MDK Consultants from 1997 to 1998. Participating in the Carl Albert Public Internship Program as a Water Resources Geologist at the Oklahoma Water Resources Board, June 1998 to June 2000.

Professional Memberships: American Association of Petroleum Geologists, AAPG Division of Environmental Geoscientists, Oklahoma City Geological Society.