FINITE DIFFERENCE MODELLING
OF THE
ADANA (TURKEY) PLAIN GROUNDWATER BASIN

A MASTER'S THESIS

in

Geological Engineering

Middle East Technical University

Ankara - Turkey

by

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February 1989

5454

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ABSTRACT

FINITE DIFFERENCE MODELLING

OF

THE ADANA (TURKEY)PLAIN GROUNDWATER BASIN

KURTTAŞ, Türker
M.Sc. in Geological Engineering

Supervisor : Assoc. Prof. Dr. Nurkan KARAHANOĞLU
February 1989, 130 pages

In this research, a modular three-dimensional finite difference groundwater model is applied to the Adana Plain groundwater basin.

The governing equations used in the program were originally derived from the continuity equation and modified for confined aquifer condition by utilizing transient flow conditions. The objective of transient simulation is to predict head patterns at successive times when given the initial head distribution and the boundary conditions. Recharge/discharge rates, rivers, drains, evapotranspiration and boundaries affecting the head change can also be simulated within the model.

The three dimensional groundwater model is applied to a portion of the confined aquifer in the Adana Plain using finite difference techniques. The hydrogeological properties of the aquifers are determined and all the available data are compiled to apply the model.

Simulation studies cover, the calibration of the heads for the period September 1980 through November 1981 and investigation of the effects of variable pumping rates on the groundwater storage.

Calibration of the heads for November-1981 is accomplished by adjusting the stress rates and aquifer parameters. Then simulation is accomplished by means of observed head distribution for the period between September 1980 and November-1981. The simulation has shown a very good fit between the calculated and the observed head values.

Key words : Finite difference, Modelling, Groundwater, Confined aquifer, Numerical methods, Adana Plain.

ÖZET

ADANA (TÜRKİYE) OVASI YERALTISUYU HAVZASININ SONLU FARKLAR MODELİ

KURTTAŞ, Türker
Yüksek Mühendislik Tezi, Jeoloji Mühendisliği Bölümü

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Şubat 1989, 130 sayfa

Bu araştırmada üç boyutlu, modüler, sonlu farklar yeraltı suyu modeli Adana ovası yeraltısuyu havzasına uygulanmıştır.

Programda esas alınan akım eşitlikleri süreklilik denkleminden türetilmiş, zamana bağlı akım koşulları kullanılarak basınçlı akifer koşullarına uyarlanmıştır. Zamana bağlı benzeştirmede asıl amaç, ilksel yük dağılımı ve sınır koşulları verildiğinde belirli bir süre sonundaki yük dağılımını sağlamaktır. Model içinde kuyuların, beslenim/boşalım değerlerinin, nehirlerin, drenlerin, buharlaşma-terlemenin ve sınır koşullarının yük değişimine etkileri benzeştirilebilir.

Üç boyutlu yeraltısuyu modeli, sonlu farklar tekniği kullanılarak Adana Ovasındaki basınçlı akiferin bir kesimine uygulanmıştır. Akiferin hidrojeolojik özellikleri belirlenmiş ve elde edilebilen veriler model sahasına uygulamak amacı ile derlenmiştir.

Model çalışmaları, Eylül-1980-Kasım 1981 dönemine ait kalibrasyonun yapılması ve yeraltısuyu depolaması üzerinde kuyu boşalımının etkisinin incelenmesi çalışmalarını kapsamaktadır.

Kasım-1981 ayına ait yüklerin kalibrasyonu, beslenme ve boşalım miktarlarının düzeltilmesi ve akifer parametrelerinin dağılımının belirlenmesi ile yapılmıştır.

Benzeştirme sonucunda gözlenen ve hesaplanan yük değerleri arasında oldukça iyi bir uyumluluk elde edilmiştir.

Anahtar Kelimeler :Sonlu farklar, Modelleme, Yeraltısuyu, Basınçlı akifer, Nümerik yöntemler, Adana Ovası

ACKNOWLEDGEMENTS

I gratefully thank my supervisor Assoc. Prof. Dr. Nurkan Karahanoğlu for his support and suggestions throughout the study. I wish to acknowledge my co-supervisor, Assoc. Prof. Dr. Alparslan Arıkan for his guidance and helpful advice during this work.

Particularly, I wish to thank Prof. Dr. Gültekin Günay for his kind encouragement and support during my study.

I also gratefully thank Prof. Dr. Vedat Doyuran and Assoc. Prof. Dr. Ayhan Erler for their helpful comments and suggestions.

Special thanks are due to all the staff members of the Geological Engineering Department at the Middle East Technical University; and to C. Serdar Bayarı , Can Denizman, Aylan Kuruç and all staff members of the Hydrogeological Engineering Department at the Hacettepe University, and to Şafak Saner for his help in drawing the maps.

I am very grateful to State Hydraulic Works (DSi), in Ankara and in Adana, especially to Dr. Erol Tuncer and Atilla Taylan for their great help during field work and all phases at this study.

I wish to thank Levent Tezcan and his family for their friendship and help in the completion of this research.

Finally, I am very happy to express my sincere thanks to my family, for their encouragement..

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NOMENCLATURE

Q	discharge rate (L^3T^{-1})
q	Specific discharge (L^3/T^{-1}))
A	cross-sectional area (L^2)
L	length of flow (L)
h	Hydraulic head (L)
x,y, and z	spatial coordinate indicator
dV	elemental volume of the aquifer / cell (L^3)
dM	mass of water within dV (M)
Ss, SS	specific storage (L^{-1})
K	hydraulic conductivity (LT^{-1})
KC, KC, KV	hydraulic conductivity along Rows, Columns, and layers (LT^{-1})
C	conductance (L^2T^{-1})
CR, CC, CV	conductance along Rows, Columns, and layers (L^2T^{-1})
t	time (T)
p, q	constant (dimensionless)
a	flow from the nth external source (L^3T^{-1})
QS	combined flow from the external sources (L^3T^{-1})
QRIV	leakage through the reach of the riverbed (L^3T^{-1})
CRIV	conductance of the reach of the riverbed (L^2T^{-1})
QRCH	recharge from precipitation (L^3T^{-1})
I	infiltration rate (LT^{-1})
DELR,DELC,DELV	is the cell width along rows, columns and layers (L)
QD	drain discharge rate (L^3T^{-1})
CD	conductance between aquifer and drain (L^2T^{-1})

d	head in the drain (L)
SURF	evapotranspiration surface elevation (L)
EXDP	extinction depth (L)
EXEL	extinction elevation (L)
EVTR	maximum evaporation rate (L^3T^{-1})
HCOF	determined by the formula (L^2T^{-1})
RHS	determined by the formula (L^3T^{-1})
SC1	determined by the formula (L^{-1})
m,n	time step
W	Iteration Parameters
l	Index for Iteration Parameters
SEED	Constant

1.INTRODUCTION

1.1. Purpose and Scope

Groundwater modeling is a tool that can help in analyzing many groundwater problems. Models are useful for reconnaissance studies after field investigations, for interpretive studies following the field program, and for predictive studies to estimate future field behavior. In addition to these applications, models are useful for studying various types of flow behavior by examining hypothetical aquifer problems. Before attempting such studies, however, one must be familiar with groundwater modeling concepts, model usage, and modeling limitations.

A conceptual understanding of the physical problems of aquifer can be translated into mathematical terms that are shown in the familiar groundwater equation and transport equations through this porous unit. The main objectives in designing the three-dimensional finite-difference groundwater flow model is to produce a program that can be readily modified, simple to use, can be executed on a variety of computers with minimal changes, and is relatively efficient with respect to computer memory and execution time.

Before the behavior of an aquifer can be examined using a mathematical model, a great deal of information must be specified. Though there may be considerable difficulty in obtaining reliable data, yet the problem must be completely formulated with estimates made of all the relevant parameters.

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The deficiencies in the data are highlighted and it quickly becomes apparent what further information is required.

Because of these reasons the model described in this research is applied to simulate the hydrological and hydrogeological conditions of the ADANA-Çukurova plain in the south of the Central Anatolia, Turkey.

1.2. Previous Investigations

Seyhan River drainage area, which includes Adana Plain, had been the subject of various geological and hydrogeological investigations. Some of the studies carried out in the plain can be summarized as follows; Report and Engineering Study, Water Supply of Adana by IGIP (1965,b), Sewerage of Adana by IGIP (1965,a), Rezistivity investigations report by Senay (1965), Report on development plan for irrigation and drainage of the Adana Plain by TAMS (1966), Seyhan project feasibility report by TAHAL-ECI (1966), Groundwater investigations in the Adana Plain by Mandel, et.al. (1968), , Adana sewerage and drainage project by Holfelder (1976), Master plan for lower Seyhan Plain by Verbund- Plan GMBH-Consult Instutul Roman de Consulting-Temelsu Mühendislik Inc. (1980), and Drinking Water Supply, investigation and Feasibility Report for Adana by NAVA (1984).

The hydrogeological investigation of the Adana Plain was carried out by D.S.I. during the period of 1980 to 1982. The hydrogeological report was prepared in 1983. Many of the data

used in this study are taken from this unpublished report prepared by Taylan(1983). The geologic map, transmissivity, coefficient of hydraulic conductivity, potentiometric level contour maps of the plain are included in that report. Information about the surface and groundwater resources, hydrology and groundwater budget of the plain are also given in that report.

1.3. Location and Accessibility

The Adana Plain is situated in southern Turkey (Figure 1.1). It is bounded by Seyhan Dam and Mediterranean Sea along N-S direction and Berdan and Ceyhan Rivers along W-E direction, respectively. The study area lies between the latitudes 36°32'N - 37°08'N and longitudes 34°56'E - 35°38'E.

Adana Plain is 52 km long along N-S direction and 56 km wide in the east-west direction. The city of Adana is situated at the Northern edge of the Adana Plain. Adana is the fourth largest city in Turkey. It has good access facilities with Ankara (481 km) and with ports of Iskenderun (150 km) and Mersin (70 km) by highway and by railway in all seasons of the year. The industries are concentrated and settled along these roads. It has its own airfield with regular flights to Ankara and Middle-East.

1.4. Physiography

The area covered by the town is fairly flat at about 20 to 25 m. above mean sea level, except for a rise in one of the oldest districts, to a height of around 38 m. To the north of the city two big irrigation canals form roughly the boundary between the flat, fertile plain and the steeper, less fertile foothills of the Taurus Mountains.

The Seyhan Dam was constructed in 1956 and has a lake area of about 7200 ha, 5 km to the North of Adana.

The Adana Plain is bounded by the Taurus Mountains at the north, and by Mediterranean sea at the south. On the east and west the plain is bordered by Ceyhan and Berdan Rivers, respectively. On the southwest there are continuous sand dunes along the Mediterranean sea. The height of these sand dunes seldom exceeds 10 m. Several shallow lakes or lagoons are found along the north face of the dunes, the largest of which is Akyatan (IGIP,1965).

Seyhan river divides the plain into two parts and reaches to the Mediterranean Sea at the south. Northern part of the Adana City is covered by the Seyhan Dam Reservoir. On the south of the Seyhan Dam there is a diversion dam, related to two main canals and Seyhan River bed.

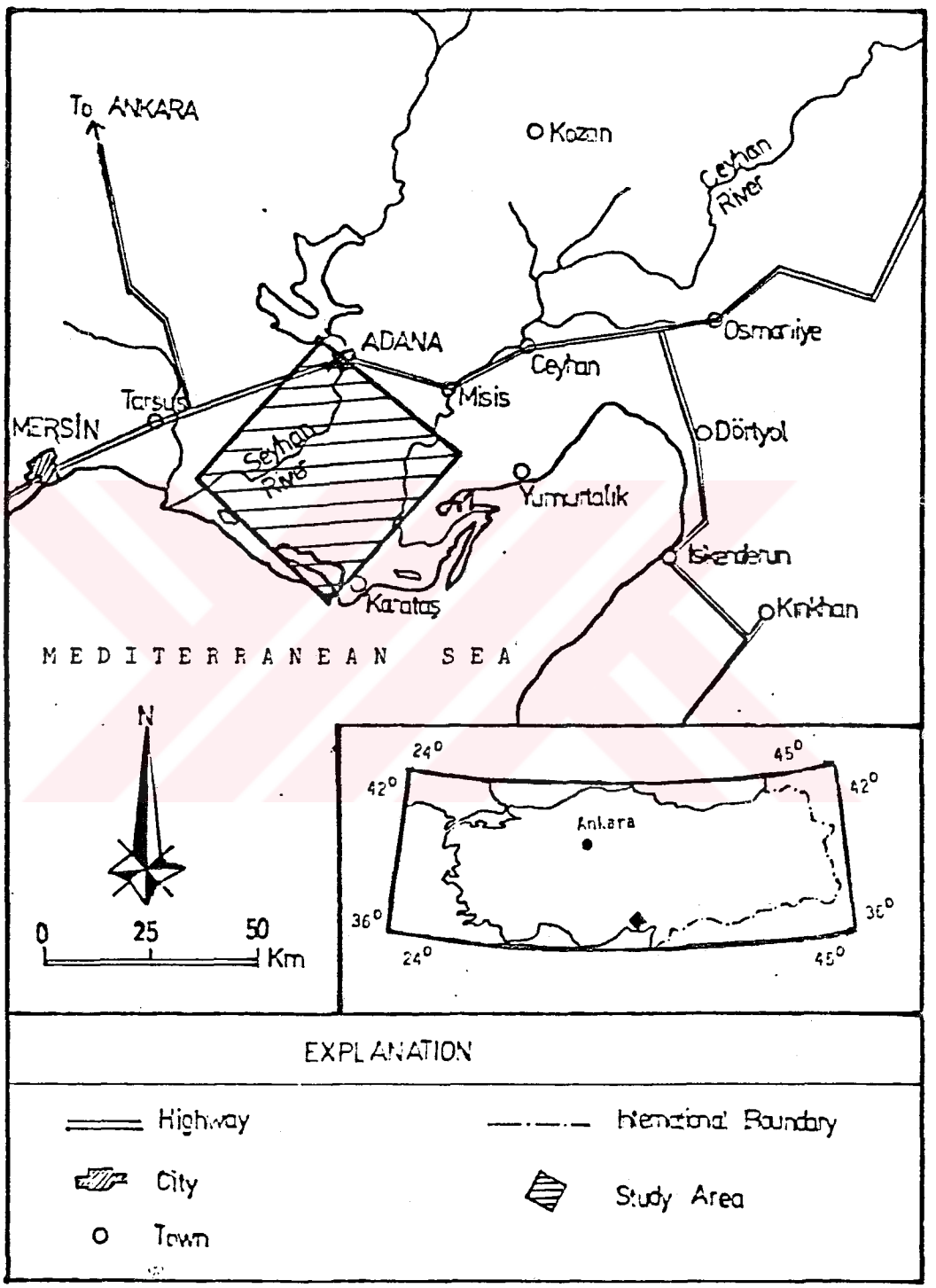


Figure 1.1. Location Map of the Adana Plain Groundwater Basin

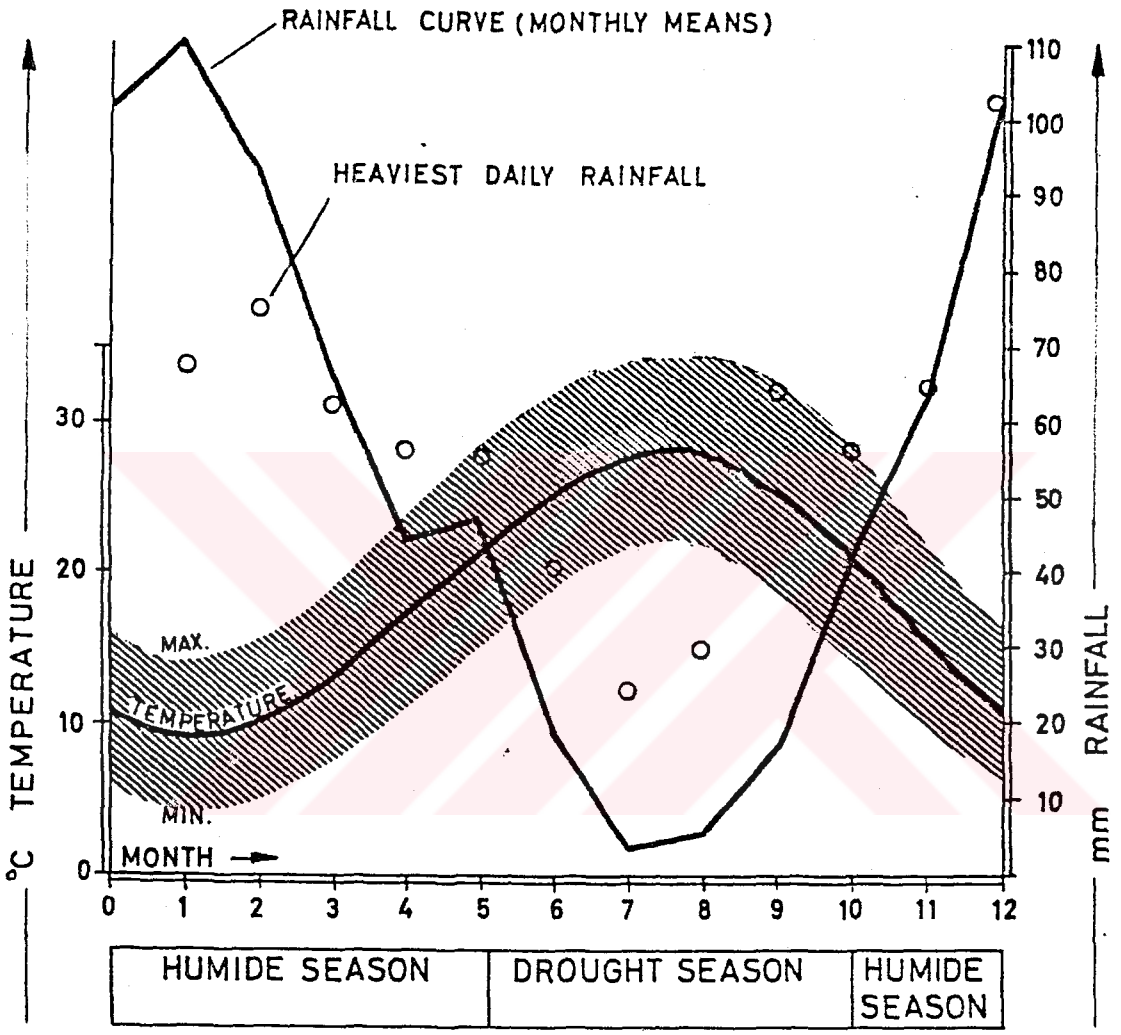
1.5. Climate

Information regarding to the climate characteristics of the basin is provided by IGIP (1965,a)

Adana Plain lies within a zone having a typical Mediterranean Climate; the summers are generally hot and dry, whereas the winters are warm and rainy. Adana plain belongs to one of the hottest part of the Mediterranean Region. Adana lies in the area of influence of the advancing cyclones, which bring the greatest part of the annual rainfalls during winter. The winter season time is relatively mild for an area in this latitude, and especially the protective mountain range of the Taurus in the north keeps back almost always the polar cold air masses from Eastern Europe. However, a few days of frost can occur in winter time due to these cold air masses. On the other hand, the warm air masses from the southern desert areas influence the weather as a result of blowing over the sea. The variations in the weather situation cause relatively large temperature differences. Thus the two extreme values -7.1°C (January),+45.6°C (August) are recorded at the meteorological station at Adana during the period 1929-1983 (see Figure 1.2.).

The rainfalls are coming principally in winter and the average value is 640.9 mm. The least annual rainfall is 319.4 mm for 1972 and the maximum annual rainfall is 1264 mm for the year of 1968. Because of its protected position, Adana receives almost exclusively rain as precipitation.

Latitude N	:	36° 59' N
Longitude E	:	35° 18' E
Elevation Above Sea Level	:	20 m
Years of Observation	:	1931-1983



Temperature	:	Max : 45,6 °C	Min	: -7.1°C
		Maximum Daily Difference		: 26.9°C
		Mean Annual Temperature		: 15.0°C

Precipitation	:	Maximum Daily Rainfall	102.05 mm
		Maximum Annual Rainfall	1264.00 mm
		Minimum Annual Rainfall	319.40 mm
		Mean Annual Rainfall	640.90 mm

Figure 1.2. The Climate of Adana (Modified after IGIP, 1965)

The curve of average monthly humidity values is relatively constant over the whole year with a value of 64 %. However, maximum values over 90% can occur in the summer.

Prevailing wind directions between south and west. The direction reverses itself frequently, especially in winter, when local fall-wind can be observed; but those northerly winds have less effect, as they are on the average less strong than SW winds. The strongest winds are the SW winds prevailing mainly in August; they have an average velocity of 2.10 m/s, measured at a height of 2m above ground level.

2.HYDROGEOLOGY

2.1. Geology

Geology controls the occurrence, distribution and quality of the groundwater in the Adana Plain. The groundwater occurs under confined aquifer conditions within the Quaternary rocks. Geological map of the area is shown in Figure 2.1.

2.1.1. Rocks of Eocene Age

Karataş Formation

Karataş Formation does not crop out in the study area but observed in a limited area covering the township Karatas south of Adana and to the east of Yalnızca and Sirkenli villages situated by the Ceyhan River where it covers hilly terrains.

It consists of claystones alternating with sandstone and marls. Claystone crops out along the shore and to the south of Karataş hills (mountain). It is highly folded, fractured and jointed. Beds dip approximately 60°-70° N along the shore. Sandstone cemented with calcite is encountered around Bahçeköy. It is not considered significant as far as groundwater potential is concerned (Taylan, 1983).

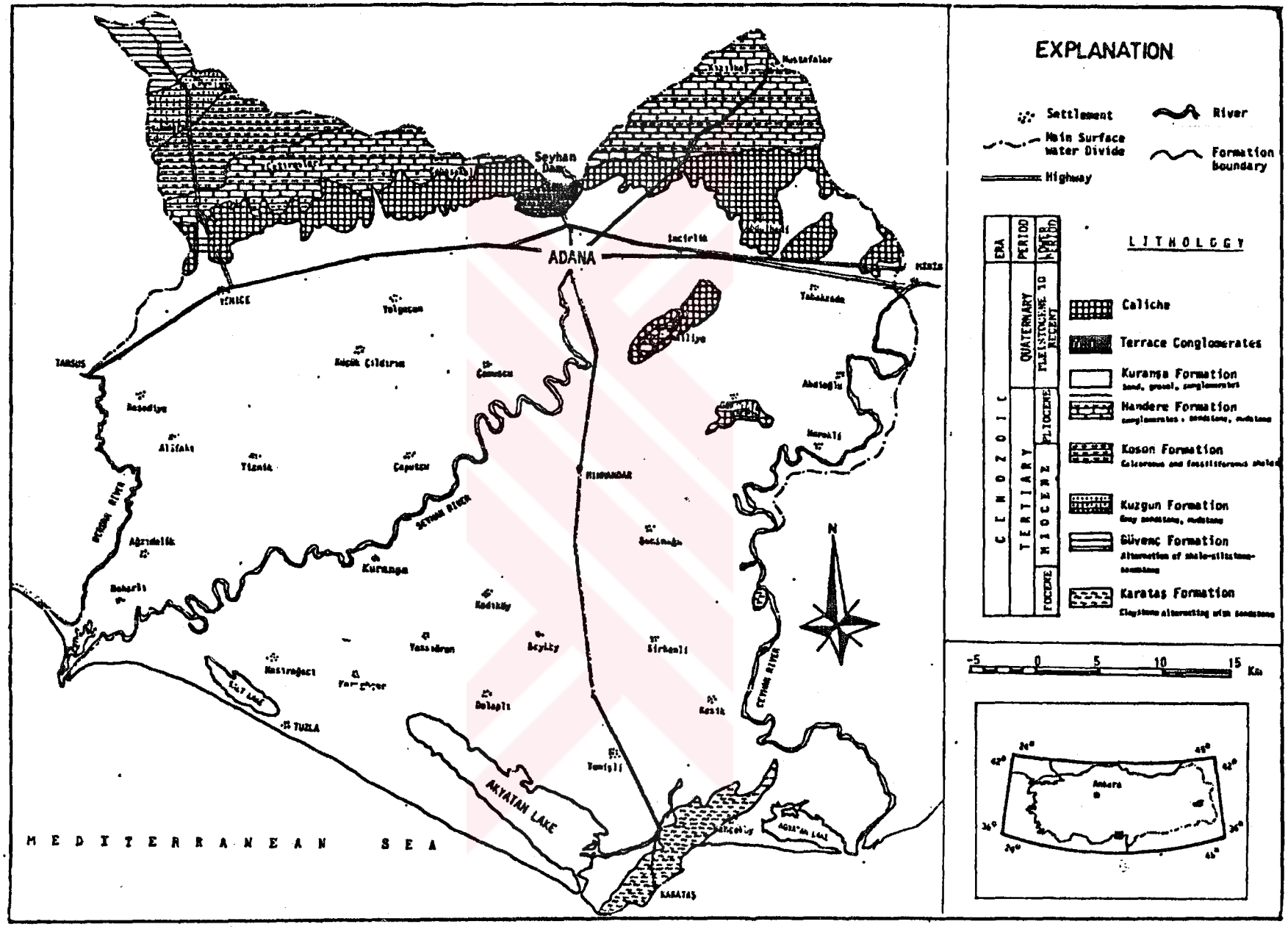


Figure 2.1. Geological Map of the Adana Plain Groundwater Basin
(Modified after Taylan, 1983)

2.1.2. Rocks of Miocene Age

Güvenç Formation

It is composed of an alternating sequence of shale, siltstone,sandstone and limestone. It is named as Güvenç Shale since more than 70-80 % of the formation consists of shales. It contains microfauna in great amounts and its age is given as Langhien-Serravalien (Middle Miocene) (Nazik,1983)

Kuzgun Formation

The Kuzgun formation conformably overlies Guvenc formation and starts with a conglomerate. It is 1.5-2 m thick and followed by alternating layers of yellowish gray sandstones, red-brown, and greenish-gray mudstones. The thickness of this unit increases from west to east and the maximum measured thickness is 450 meters (Yetiş et.al,1986).

Conglomerate contains coarse gravels, and has a red-brown matrix. It displays lateral and vertical lithological variations. It is insignificant with regard to the groundwater occurrence and its age is Tortonian (Upper Miocene) (Gökçen and Gürbüz, 1985).

Koson Formation

Koson Formation covers an area where Kıllıcami and Gökkuyu villages are situated NW of Yenice township. Its thickness is measured as 600 m (Taylan, 1983). It comprises very fine layers of calcareous and fossiliferous shales

including fragments ranging in size from blocks and silts. This formation does not contain significant groundwater. It's age is Upper Miocene (Mandel and Michaeli, 1968).

2.1.3. Rocks of Pliocene Age

Handere Formation

Handere Formation of Miocene age crops out to the north of Adana and around the Ismailiye village . It displays a flysch-like character with alternating claystone and sandstone in many locations. According to Gökçen and Gürbüz (1985), Handere Formation is characterized by fluvial cross-bedded polygenic continental conglomerates, sandstones and mudstones. Its age is estimated as Pliocene based on the Ostracods and Foraminifera fossils it contains.

Lenses and layers of gypsum, anhydrite and rocksalt encountered in Handere Formation are rather typical. Thus. saline groundwater may be expected between Adana and Tarsus. To the south of the E-5 highway, Handere Formation dips southward beneath the plain along a line extending E-W.

About 20 km. SE of the city center, all units constituting Handere Formation can readily be observed with limestone horizon at the top, whose apparent thickness is about 10 m. Below that, bedded soft gray marls and thin layers of sandstone-siltstone are observed. At the bottom, bedded blue-green claystone crops out (IGIP, 1965,a).

Handere formation extends 10-15 m below the caliche from the south of İncirlik village to Ceyhan River. Groundwater potential of this unit is negligibly small (Taylan, 1983).

2.1.4. Rocks of Quaternary Age

Kuranşa Formation

It covers the entire study area. Alluvium comprises lithological units of various ages thus displaying variations in characteristics at different sites. Since its typical features are apparent at Kuranşa, it is named as Kuranşa Formation (Taylan, 1983). Kuranşa Formation bears groundwater in great amounts around Berdan, Adana and Yüreğir Plain to the south.

Alluvium is observed in the south of the Seyhan Diversion Dam. It is made up of coarşe sand and gravel near the Seyhan River and clay, sand, gravel and conglomerate bands in the area between the Seyhan River and İncirlik Village. However, at the city center it comprises layers of sand, clay and gravel. On the other hand pebbles, sand, gravel and clay layers form tha major comstituents between Adana and Tarsus. The thickness of alluvium can not be determined in the south of Adana, however it is more than 1250m in Kuranşa. where the formation comprises clay, sand, gravel and pebbles. In Yemişli Village, alluvium is made of sand, clay, gravel and loose

conglomerate layers and is more than 365m thick. Its thickness decreases towards Ceyhan River while the ratio of clay increases. Groundwater recharge to alluvium takes place from caliche and alluvial cones. Also recharge from Seyhan and Berdan Rivers may be important in winter seasons (Taylan,1983).

Terrace Conglomerates

They are situated at the Seyhan River bed down stream from the dam. They are composed of gravels transported by Seyhan River(Ternek,1958). Their thickness approaches 100m to the N of Adana city center. They are made up of carbonate cemented conglomerates whose gravels comprise limestone, quartzite and serpantinite. To the north of Adana, 80m thick conglomerates are drilled on the road to Kurttepe around Tellidere. Domestic water is also supplied from these conglomerates in the city center (Taylan, 1983).

Caliche

It crops out at the north of the Adana Plain, along a belt extending E-W between the Neogene Formations and the alluvium. Occurrence of caliche has taken place at the contact of Handere Formation and Alluvium. Partially, it covers the Pliocene and Miocene series, it also crops out around the Cement Factory and, Çotlu and Karataş Hills in the study area (Taylan, 1983).

Deposition of caliche is originated by the emergence of

the groundwater of high bi-carbonate concentrations through faults, fractures and joints.

The caliche is highly calcareous and is composed of alluvium cemented by carbonates . Locally, they comprise gravels and clay; and are fed by surface flow. They are usually underlain by siltstone and their color varies from white or yellow to light pink with a massive or stratified structure (TAMS, 1961).

Generally, the caliches are underlain by pebbles or by masses of conglomerate-like consolidated pebbles and marls. Caliche is a continental formation and covers the Pleistocene terraces. Its thickness ranges between 3-60m. In some places of the area the caliche forms cuestas (Ternek,1958).

2.2. Hydrology

2.2.1. Streams

Three major streams namely Seyhan, Berdan and Ceyhan drains the central , western and eastern parts of the plain, respectively (Figure 2.2).

Seyhan River

Seyhan River flows through the city center of Adana in the NS direction and than it turns towards SW. It then gets closer to Berdan River and reaches the Mediterranean sea after

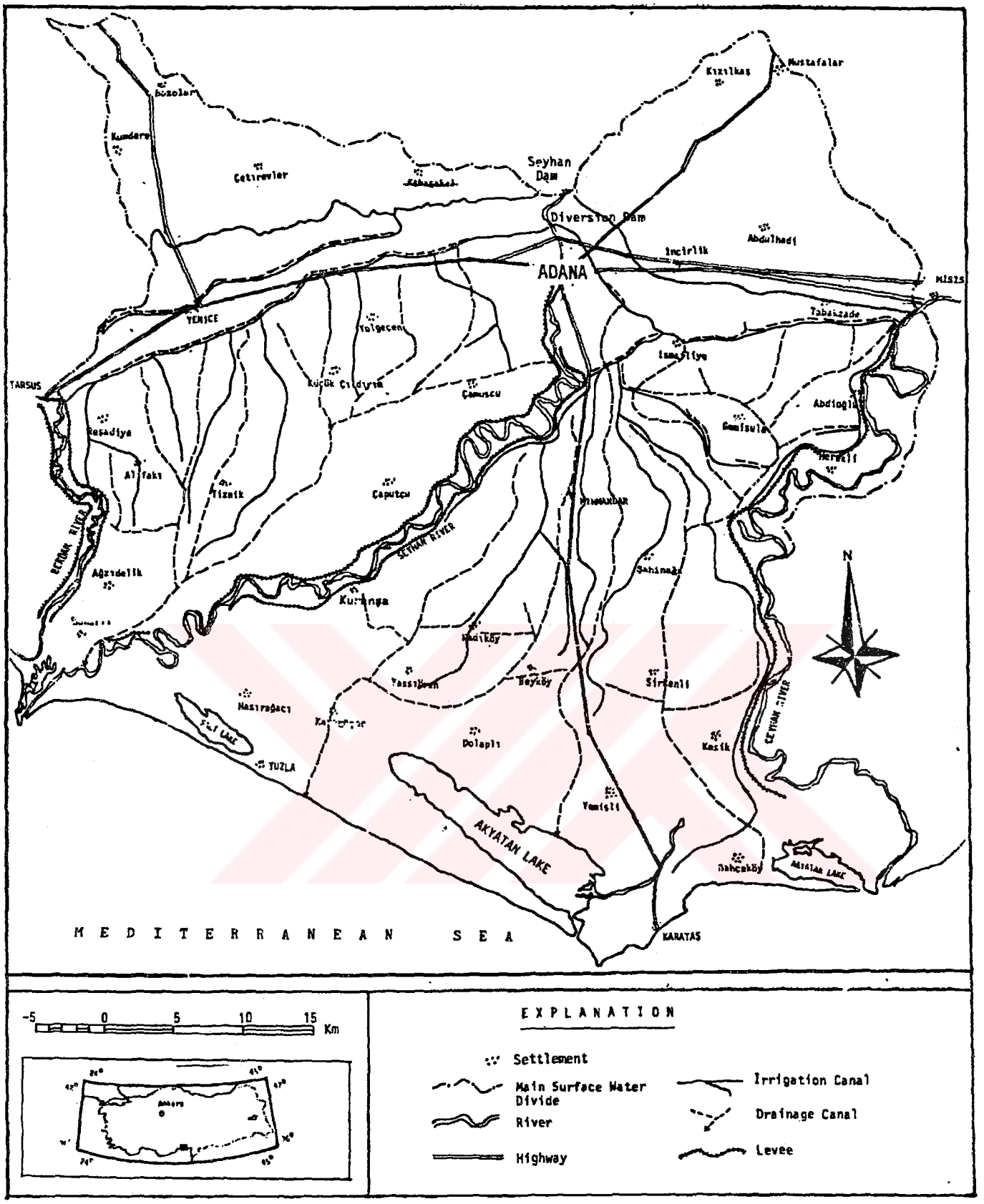


Figure 2.2. Hydrology of the Adana Plain Groundwater Basin (Modified after Taylan, 1983)

passing through Baharlı village. To the north of Adana, Seyhan Dam containing three hydraulic turbines with a total capacity of 60 Megawatt is located on the Seyhan River. The dam with a reservoir volume of 1 million m^3 also serves for irrigation purposes. Seyhan diversion dam is situated to the south of the dam.

Based on the measurements made by DSI in 1980, the maximum discharge-recharge capacity was determined in April whereas the minimum was in October. There is no direct connection between Seyhan Lake and city center aquifers, that is, the recharge area of the aquifers north of the city is; the part of the river downstream of Seyhan Dam.

Berdan River

Berdan River flows through Tarsus township and constitutes the western border of the plain. It flows southward until its discharge to the Mediterranean sea. Berdan Dam was constructed on Berdan River for flood protection, irrigation and domestic water supply purposes.

There is also a diversion dam on the Berdan River. Due to the clayey formations on the southern part of the river bed , there is no recharge to Adana Plain.

Ceyhan River

It flows southward through Ceyhan Township, forms the eastern border of the plain and than discharges into the Mediterranean Sea. Irrigation is possible by means of

Cevdetiye Diversion Dam. Arslantaş Dam, which is producing a power of 138 megawatt electricity was constructed on the Ceyhan River.

2.2.2. Springs

There is no any significant spring in the Adana Plain, but some water leakage takes place in some districts at the northern part of the plain.

2.2.3. Lakes

Several shallow lakes or lagoons are found along the north face of the sand dunes along the Mediterranean sea in the south part of the Adana Plain. Three lakes can be named in the Adana Plain ;

Akyatan Lake

Being quite a large lake, it extends in the E-W direction along the Mediterranean Sea between Karataş and İnnepli Tumulus. One of the main drainage canal discharges to this lake. Akyatan lake discharges its water to the Mediterranean Sea by a natural outlet channel.

Ağyatan Lake

Ağyatan Lake is situated to the northeast of Karataş and to the east of Bahçeköy, extending in the E-W direction, parallel to the Mediterranean Sea. Ağyatan Lake also

discharges its water to the Mediterranean Sea by a natural outlet channel.

Salt Lake

It extends in the NW-SE direction, parallel to the Mediterranean shoreline . Its water is significantly saline.

2.2.4. Swamps

Only in winter time a rather large swamp forms between Yemişli and Karataş villages. It gets dry in late spring.

2.2.5. Canals

There are four main drainage canals discharging water directly to the Mediterranean Sea. Apart from those some water is discharged to the Berdan River and subsequently to the Mediterranean Sea by two drainage canals.

A large area between Mediterranean Sea and hypotethic dashed lines drawn connecting the Ceyhan River in the east and the villages namely Helvacı-Oymaklı-Yüzbaşı-Dolaplı-Baharlı-Karagöcer-Hasırağacı-Ganime-Tabaklar has not been drained yet. Secondary and tertiary drainage channels do not exist in this part of the area. Drainage of this area in on planning stage (Taylan, 1983).

There are 32 industrial companies on the right and left banks of the Seyhan River. Each of which discharging water of 30-40 l/s to the drains.

2.3. Hydrogeology

2.3.1. Water Bearing Formations

In the Adana plain the groundwater occur within the Kuransa formation (sand, gravel, conglomerates). As it is shown on the Figure 2.3., aquifer properties within the Kuransa Formation can be analyzed in the 6 main subareas (Mandel et. al., 1968).

Conglomerates are abundant both to the north and south of the E-5 Highway, just south of the Adana on both sides of the Seyhan River, and behaves as unconfined aquifer (Figure 2.3.,A). It has the form of lens of compact conglomerates whose thickness changes 10m to 100m. The thickest part of this aquifer zone is situated near the Seyhan River. The drinking water supply of the Adana City is supplied by boreholes in this part of the aquifer. So, at least part of this water comes from the Seyhan riverbed by infiltration.

The confined aquifer (B) is situated further south. It is composed of sand and sandy gravels with a maximum thickness of 30m. The amount of clay and silt fraction increases towards the Seyhan River. Even the aquifer seems to be divided into two parts both on the right and left sides of river, there is a sand layer with a minimun thickness of 2 m extending beneath the river bed. This sand layer connects the parts of confined aquifer located at left and right banks of the river.

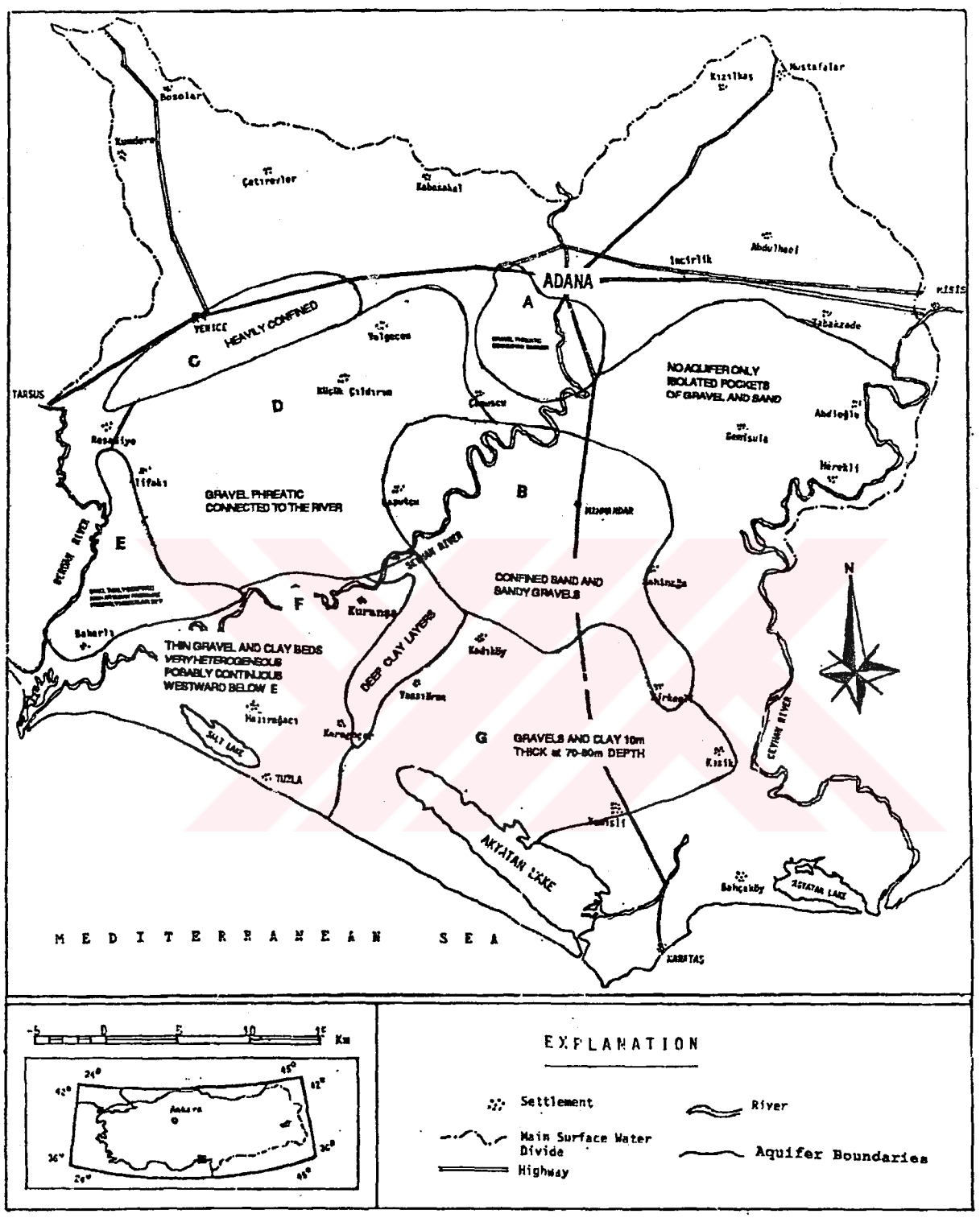


Figure 2.3. Hypothetical Aquifer Boundaries within the Kuransa Formation (After Mandel et. al., 1968).

Aquifer (C), is heavily confined, permeable strata occur at depths of about 100m only. Lithology and thickness of the aquifer is unknown.

In the south of (C), there is vertically superimposed aquifer (D). Near to the aquifer (C), (D) is consists of gravels 5-10m thick and overlain by 70-80m of impermeable layers. The aquifer is found at a depth of about 35m, further east and south of (C), only shallow boreholes can be exploited for drinking water supply and irrigation.

In the triangular area between the Seyhan and Berdan Rivers, aquifer (E) occurs. It is composed of sand probably of Marine origin, confined under comparatively thin impervious layers, and contains water under artesian pressure and salty in Chemical composition. Below the sands there probably occurs a gravel aquifer containing water under still higher artesian pressure which may be connected with (D) and which may drain, partly (C).

Aquifer (F) to the east of the Seyhan River is characterized by its extreme heterogeneity. It is composed of thin layers of sand interbedded with thick clay.

Aquifer (G) is situated in the southern end of the plain, connecting with the Akyatan Lake. It is composed of sand and clay. Aquifer (G) is probably connected to the sea only by isolated <fingers> of more permeable material, so that outflow into the sea is negligibly small, prevailing high groundwater potentials up to the sea cost.

In the north of the plain between Adana and Misis, there is no good aquifer apart from the small gravel lens. Conglomerate outcrops appear along the E-5 Highway from Incirlik to Tarsus in layers of varying thicknesses interbedded with clay, sand and gravel. They are generally fissured and fractured thus acquiring aquifer characteristics. The degree of fissuring decreases towards the northern parts of Adana, close to the Seyhan Dam.

In short, there is only one unconfined aquifer found in the plain near Adana. It is recharged by the Seyhan riverbed, and by precipitation. All the other aquifers are confined and recharged partly by precipitation and by subsurface inflow from the Taurus mountains. Aquifers consist of interconnected lenses of gravel, clayey sand and sand. Aquifers are not connected with the rivers except near Adana City, because of impermeable layers. Drainage into the sea is negligibly small, because of the poor aquifer condition near the sea.

The depth to the water table increases toward north due to an increase in the topographic elevation and to the presence of thick clay layers. The water yield from the wells reaches its minimum at 50 m. contour line. Above this elevation, the yield of the wells, if water is encountered, is very low.

The transmissivity values range between 500 to 2000 m^3/day/m in the study area. At the northern part of the plain

where the conglomerates takes place, has the highest transmissivity values. On the other hand the lowest transmissivity values are encountered in the southern part of the plain. Hydraulic conductivity values range between 10 and 150 m/day. The maximum values are in the region bounded by Seyhan River on the east and E-5 Road on the north.

The storage coefficient in the plain ranges between 0.0001 and 0.25. The highest values are encountered in the northern part of the plain on both sides of Seyhan River. In this area storage coefficient values close nearly specific yield, which suggests that the aquifer behaves as an unconfined aquifer. It also supports the possibilities of aquifer recharge by the Seyhan River in this area (Taylan, 1983).

The wells drilled close to Seyhan River in Adana also suggest that the groundwater of the Adana Plain is being recharged by the Seyhan river because no seasonal variation in their production rates or in their water level are encountered.

2.3.2. Wells

There are presently 67 municipal wells with depths ranging from 25 m to 125 m,with an average depth of about 50 m. Wells have been drilled in the Adana Plain, especially in the city center. The distributions of wells in the Adana Plain is shown in Figure 2.4. The water is pumped directly to the

distribution network serving residential and commercial areas of the city. There are a few small industries that supply their water requirements from this distribution network. The specific capacities and the average discharge rates of these wells range between 1 - 40 l/s/m and 10-80 l/s, respectively.

In addition to the municipal wells, there are 408 private wells supplying water to industrial and commercial users plus an undetermined number of private wells for domestic supply. Municipal wells are in constant use, except during breakdowns, power failures and routine maintenance. On the basis of data made available by the Municipality, it would appear that 97 percent of available pump hours are utilized. Water from the wells is directly discharged into the distribution network but it is not possible to assess the actual production rates because of lack of flow meters or accurate pressure gauges on the discharge headers of the wells.

There are numerous shallow wells most of which have been abandoned. A great number of these wells are used for drinking and potable water supply. Quite a few number of these wells are used for irrigation.

The total yield of the existing municipal wells is 3621 l/s . Municipality officials estimate the total present supply from the municipal wells at about 2200 l/s. The private wells

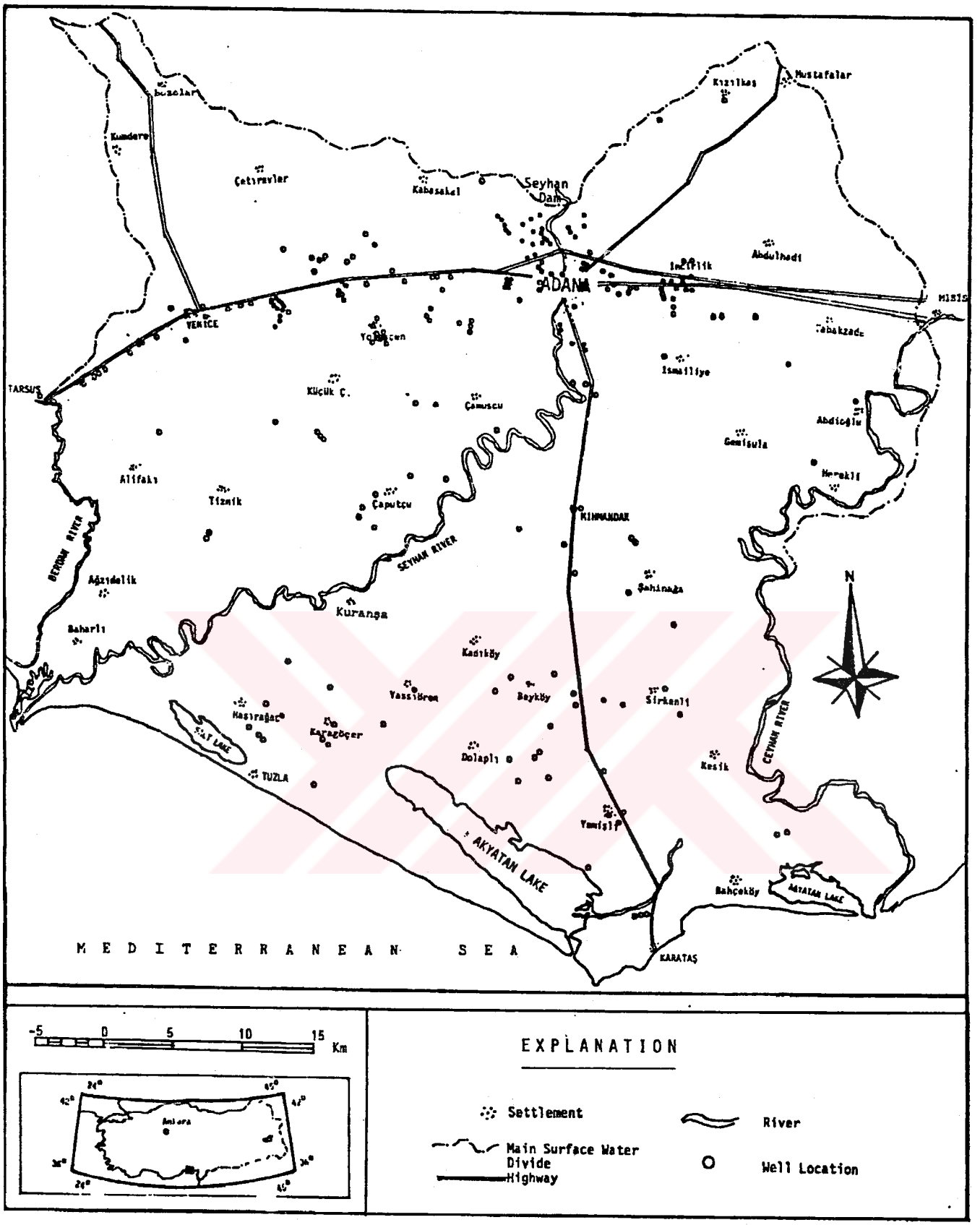


Figure 2.4. Distributions of Wells in the Adana Plain Groundwater Basin (Modified after Taylan, 1983)

have a total yield capacity of 2100 l/s but no information is available with regard to their actual production (Taylan, 1983).

3. GROUNDWATER MODELING TECHNIQUES

Groundwater modeling techniques are mainly related with the quantative description of the hydrogeologic properties of the water bearing formation and its response to development and management practices. The effective application of groundwater flow models involves several interrelated areas, such as; model selection, computer program use, sensitivity analysis, system conceptualization, data collection design, calibration, and prediction (Mercer and Faust, 1980).

The hydrogeologic characteristics and dimensions of the water bearing formations and their boundaries are studied by means of analytical and computer techniques by cause-and-effect relationships (Walton,1970). But it is rarely be made because of the incompleteness of basic data need. Approximate solutions based on existing data, when properly qualified according to the quality and quantity of data, thus, will be of great importance.

3.1. Analytical and Numerical Methods

Analytical and numerical methods are powerful tools for aiding hydrogeologists in evaluating groundwater resources. These methods for groundwater flow, consist of a partial differential equation together with appropriate boundary and initial conditions that express conservation of mass and that describe continuous variables ,for example, over the region of interest (Mercer and Faust,1980).

In the Analytical Methods (or Idealized Aquifers and Mathematical Models) groundwater system parameters are averaged, boundary configurations are simplified, and the response of the system to pumping is determined by application of a standard closed formed solution of simplified groundwater flow equation. Therefore, one of the primary goals should be the prediction of hydraulic-head drawdowns in aquifers under proposed pumping schemes.

One of the greatest advantages of analytical methods is that; they require only paper and pencil, a map scale, a calculator, and tables of well functions to accomplish a simulation, and no scale factors or manipulations of laboratory equipment are needed. It can be done in a very short time interval and at a very nominal costs.

Disadvantages of analytical methods is that; for the prediction of drawdown in multiple-well systems this methods are not sophisticated enough to handle the heterogeneous aquifers of irregular shape that are often encountered in the field.

Numerical modeling techniques are used to solve large set of simultaneous equations which describes the physical processes active in the aquifer.

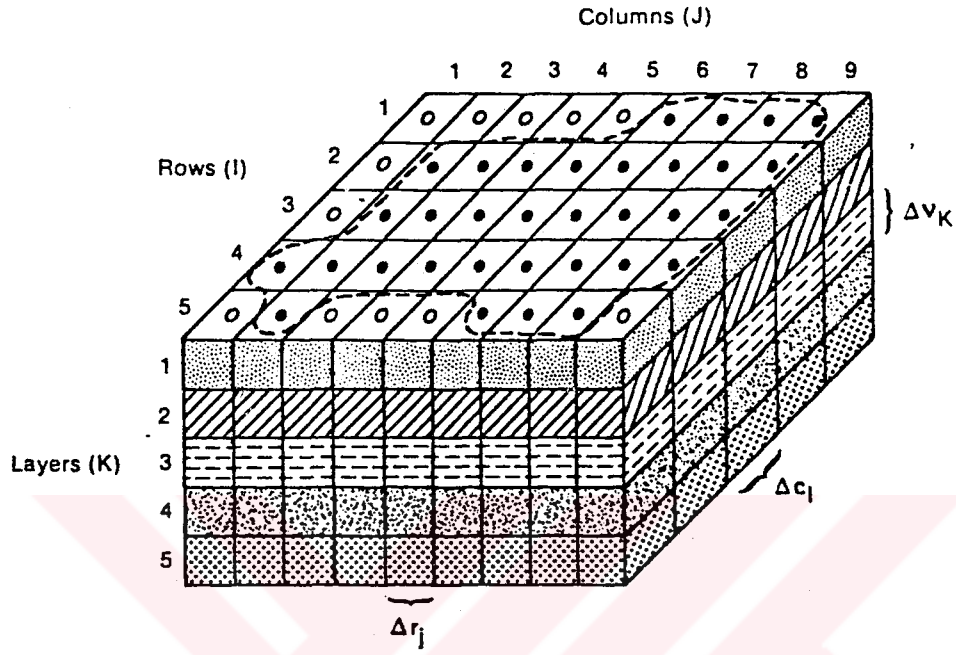
Numerical methods are the approximate solution procedures based on discretization of the continuum that makes up the region of flow. In the discretization procedure, the study

area is divided into a finite number of blocks, each with its own hydrogeologic properties, and each having a node at the center at which the hydraulic head is defined for the entire block, and equations for each node is written. Then by using different solution scheme this set of equations are solved for each time step. There are two types of Numerical methods used in groundwater applications as Finite Element and Finite Difference Methods.

3.1.2. Finite Difference Method

Finite difference (FD) method is a numerical approach which has been successfully applied to groundwater flow equations. This procedure ,once, needs the boundaries of the aquifer to be determined. Boundaries may be physical (variable head, constant head, impermeable or no-flow boundary) or convenient (small subregion of a large aquifer). In the FD method it is necessary to dicretize the region, that is , a grid is established throughout the region. Figure 3.1. shows spatial discretization of an aquifer system into mesh of points termed nodes, forming rows, columns, and layers. To conform with computer array conventions, an i,j,k coordinate system is used.

Generally irregular and rectangular grids with variable width, length, and thickness (r , c and k, respectively) used to describe the aquifer, using smaller spacing for areas where more details is required(as near a well field) depending on the program to be used. There are two types of grids; point-



Explanation

----	Aquifer Boundary
•	Active Cell
0	Inactive Cell
Δr_J	Dimension of Cell Along the Row Direction. Subscript (J) Indicates the Number of the Column
Δc_I	Dimension of Cell Along the Column Direction. Subscript (I) Indicates the Number of the Row
Δv_K	Dimension of the Cell Along the Vertical Direction. Subscript (K) Indicates the Number of the Layer

Figure 3.1. Spatial Discretization of an Aquifer System in to FD Grids (After McDonald and Harbaugh, 1984)

centered and block centered grids (Figure 3.2). Node point represents the position at which the solution of unknown values is obtained (for example, head). Both systems start by dividing the aquifer with two sets of parallel lines perpendicular to each other. In the block- centered formulation, the blocks formed by the sets of parallel lines are the cells; the nodes are at the center of the cells, whereas in the point-centered formulation , the nodes are at the intersection points of the sets of parallel lines, and cells are drawn around the nodes with faces halfway between nodes. In spite of the minor difference between two types of grids, point-centered grid is convenient for problems where values of head are specified on the boundary, whereas the block-centered grid has an advantage in problems where the flux is specified across the boundary.

After the grid is designed, it is necessary to specify aquifer parameters and initial data for each node. An algebraic equation for each node in the grid system is obtained by considering the continuity equation: the sum of all flows into and out of the finite-difference block must be equal to the rate of change in storage within the cell.

For the rectangular grid the form of a typical equation for the node and six adjacent cells is;

$$B_{i,j,k}{}^{n}h_{i,j-1,k}{}^{+}\ C_{i,j,k}{}^{n}h_{i,j+1,k}{}^{+}\ D_{i,j,k}{}^{n}h_{i+1,j,k}{}^{+}\ E_{i,j,k}{}^{n}h_{i-1,j,k}{}^{+}$$

$$F_{i,j,k}{}^{n}h_{i,j,k+1}{}^{+}\ G_{i,j,k}{}^{n}h_{i,j,k-1}{}^{+}\ A_{i,j,k}{}^{n}h_{i,j,k} = Q_{i,j,k}{}^{n-1} \qquad (1)$$

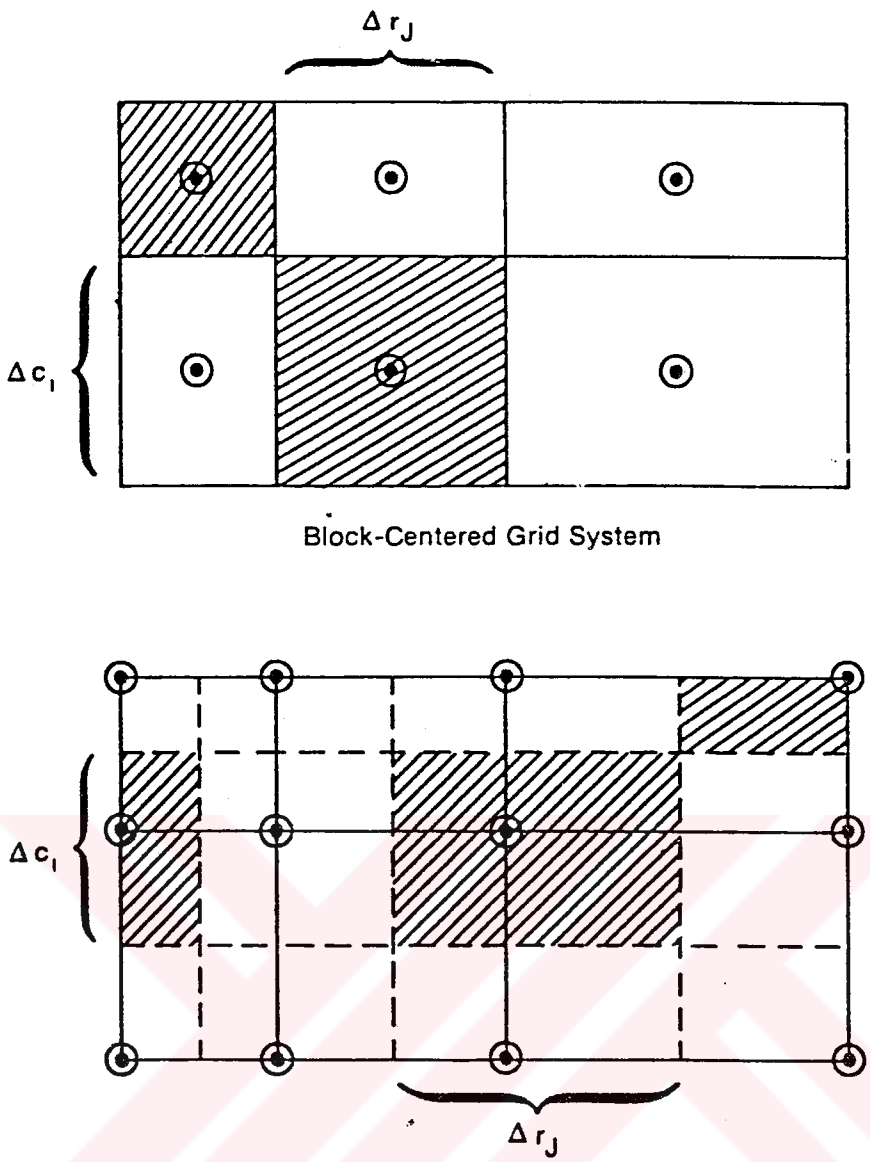


Figure 3.2. Grids Showing the Difference Between Block-Centered and Point-Centered Grids (After McDonald and Harbaugh, 1984)

The notation in Equation 1 refers to the nodal locations shown in Figure 3.3. where h is the head at the designated node; the explicit definitions of the coefficients Bi,j,k , Ci,j,k, Di,j,k, Ei,j,k, Fi,j,k, Gi,j,k, Hi,j,k, Aj,j,k are not given here, but it is explained in the following sections. n represents the present time level and the unknown head values are evaluated at this time level with the known n-1 quantity, Qi,j,k, which is computed from the information at the old time level (n-1). Writing an equation similar to Equation 1 for each node results N equations with N unknown head values to be determined, where N represents the total number of the nodes. The general form of these equations can be written in the matrix form as ;

$$Ah=d \qquad (2)$$

Where A is a matrix containing coefficients related to grid spacing and to aquifer properties, such as transmissivity; h is a vector containing the dependent variables to be determined, for example head values at each node; and d is a vector containing all known information, for example specified pumpage and boundary condition information.

This matrix equation is solved numerically by one of two basic ways: direct and iterative methods. Direct methods sequence of operation is performed to provide exact solution, except machine round-off error. Iterative methods involve making an initial guess by some iterative process until an error criterion is attained. Iterative methods will be explained in the following sections.

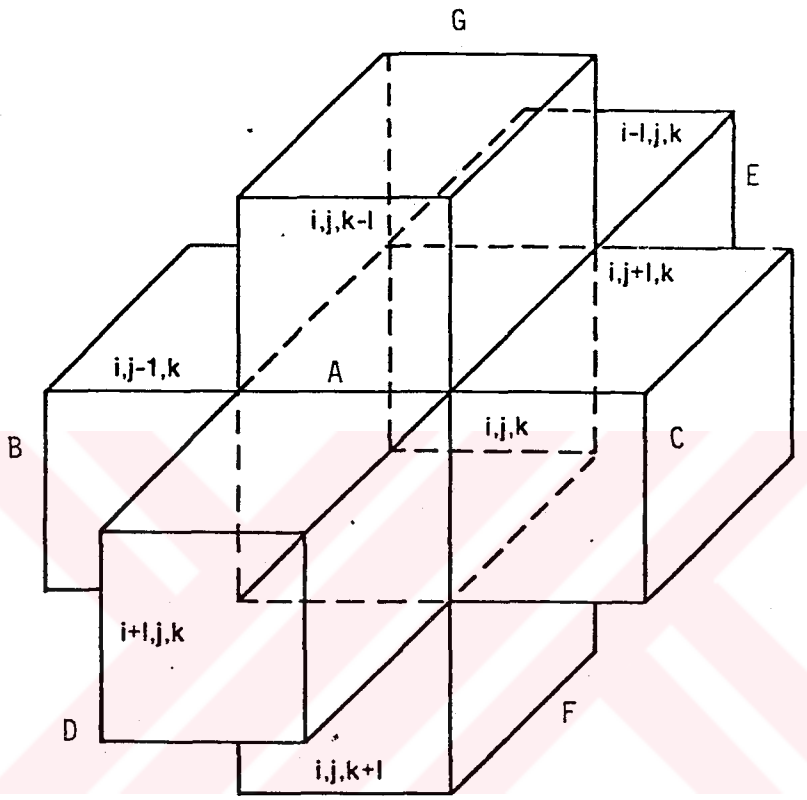


Figure 3.3. Cell i,j,k and the six adjacent cells (Modified after McDonald and Harbaugh, 1984)

3.2. Flow Equations

The derivations of equations used in groundwater applications are based on the conservation principles dealing with mass, momentum, and energy (Figure 3.4).

These principles required that the net quantity (mass,momentum, or energy) leaving or entering a specified volume of an aquifer during a given time interval is equal to the change in the amount of that quantity stored in the volume. The derivation of the particular conservation equation involves representing the balance in terms of mathematical expressions.

3.2.1. Derivation of the Finite Difference Equation

Derivation of finite difference equation of groundwater flow is based upon the application of continuity equation; the difference of all flows into and out of the cell must be equal to the rate of change in storage within the cell. The continuity equation expressing the balance of flow for a cell is (McDonald and Harbaugh, 1984),

$$Qi = Ss\ dv\left(\frac{dh}{dt}\right) \qquad (3)$$

where Qi is the flow rate into the cell (L^3/T)

Ss is the specific storage (1/L)

dV is the volume of the cell (L^3)

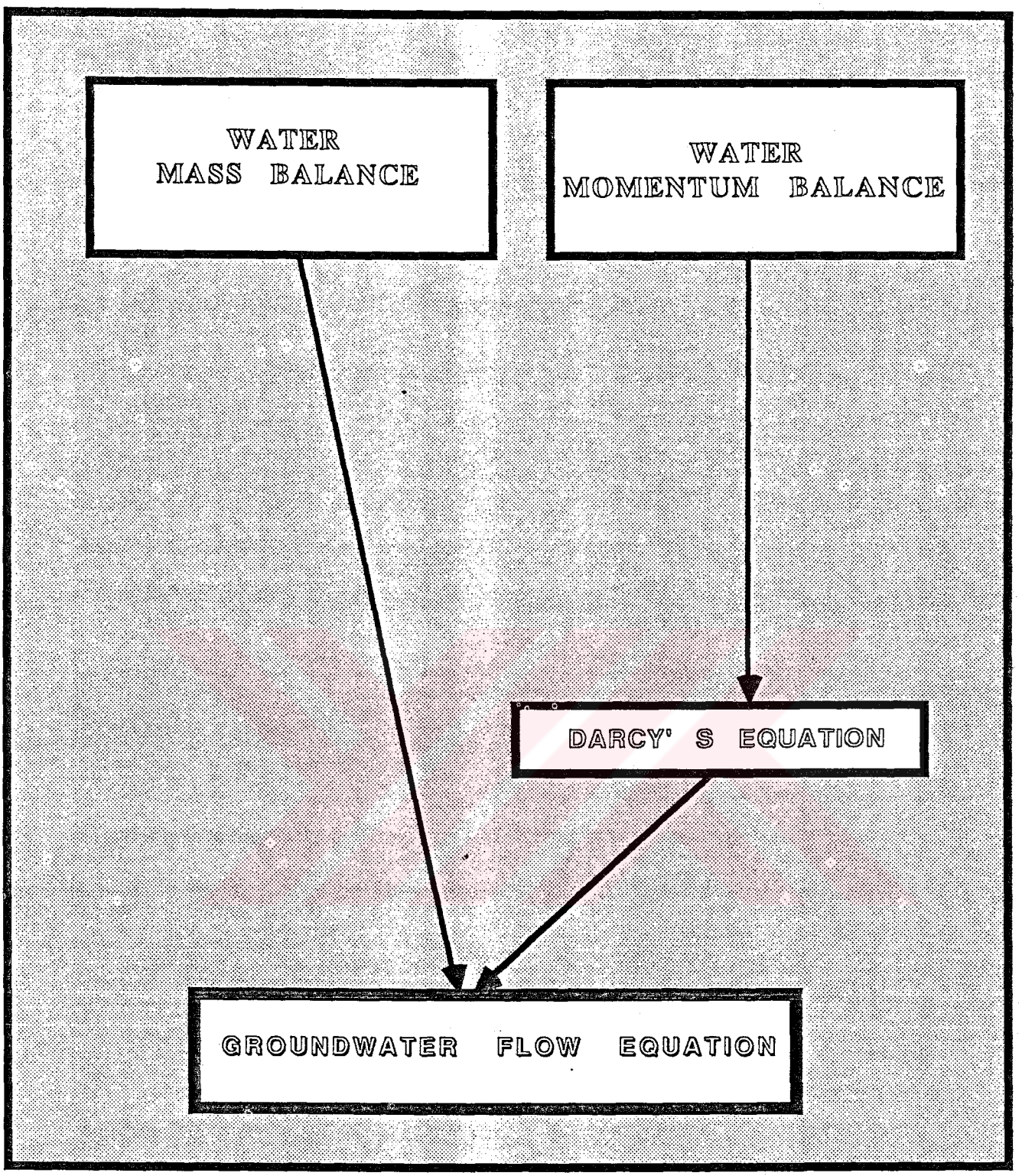


Figure 3.4 Diagram of the Major Components of the Groundwater Flow Equation (After Mercer and Faust,1981)

The right side of the equation represents the volume of water taken into storage over a time interval dt given a head change dh. The above equation is stated in terms of inflow and storage gain. Outflow and loss are represented by defining outflow as negative inflow and loss as negative gain.

Flow into cell (i,j,k) from surrounding cells (Figure 3.3), according to Darçy's law are given by;

$$q_{i,j-1/2,k} = KR_{i,j-1/2,k} dc_i dv_k (h_{i,j-1,k} - h_{i,j,k})/dr_{j-1/2}$$

$$q_{i,j+1/2,k} = KR_{i,j+1/2,k} dc_i dv_k (h_{i,j+1,k} - h_{i,j,k})/dr_{j+1/2}$$

$$q_{i+1/2,j,k} = KC_{i+1/2,j,k} dr_j dv_k (h_{i+1,j,k} - h_{i,j,k})/dc_{i+1/2} \qquad (4)$$

$$q_{i-1/2,j,k} = KC_{i-1/2,j,k} dr_j dv_k (h_{i-1,j,k} - h_{i,j,k})/dc_{i-1/2}$$

$$q_{i,j,k+1/2} = KV_{i,j,k+1/2} dc_i dv_k (h_{i,j,k+1} - h_{i,j,k})/dv_{k+1/2}$$

$$q_{i,j,k-1/2} = KV_{i,j,k-1/2} dc_i dv_k (h_{i,j,k-1} - h_{i,j,k})/dv_{k-1/2}$$

In the above equations KR,KC,KV represent the hydraulic conductivities between the cell (i,j,k) and related cells along rows, columns and layers, respectively. dr_j,dc_i,dv_k are the dimensions of cell (i,j,k) along row, column and layer directions, respectively. The index (j-1/2) is used to indicate the space between the nodes, and it does not indicate a mid-point between the nodes. So $dr_{j-1/2}$ is the distance between nodes (i,j,k) and (i,j-1,k). q represents the volumetric fluid discharge through the face between the node (i,j,k) and the surrounding nodes.

The above equations describe the flow through the faces of cell (i,j,k) in terms of heads, grid dimensions and hydraulic conductivities remain constant throughout the simulation, therefore the notation can be simplified by combining the constants as a single constant called conductance, for example,

$$CR_{i,j-1/2,k} = KR_{i,j-1/2,k} dc_i dv_k / dr_{j-1/2} \qquad (5)$$

where $CR_{i,j-1/2,k}$ is the conductance in ith. row and kth. layer between nodes (i,j,k) and (i,j-1,k) (L^2/T). So conductance may be defined as the product of hydraulic conductivity and cross sectional area of flow divided by the length of flow path. Substituting these expression into Equation 4 yields,

$$\begin{aligned}
q_{i,j-1/2,k} &= CR_{i,j-1/2,k} (h_{i,j-1,k} - h_{i,j,k}) \\
q_{i,j+1/2,k} &= CR_{i,j+1/2,k} (h_{i,j+1,k} - h_{i,j,k}) \\
q_{i+1/2,j,k} &= CC_{i+1/2,j,k} (h_{i+1,j,k} - h_{i,j,k}) \\
q_{i-1/2,j,k} &= CC_{i-1/2,j,k} (h_{i-1,j,k} - h_{i,j,k}) \\
q_{i,j,k+1/2} &= CV_{i,j,k+1/2} (h_{i,j,k+1} - h_{i,j,k}) \\
q_{i,j,k-1/2} &= CV_{i,j,k-1/2} (h_{i,j,k-1} - h_{i,j,k})
\end{aligned} \qquad (6)$$

These equations express the flow into cell (i,j,k) from the six adjacent cells. To account for flows into the cell from outside the aquifer, such as seepage through streambeds, drains, evapotranspiration, areal recharge and wells, additional terms are required. These flows may be expressed by the following expression,

$$a_{(i,j,k,n)} = p_{(i,j,k,n)}h_{(i,j,k)} + q_{(i,j,k,n)} \qquad (7)$$

in which, $a_{i,j,k,n}$ represents flow from the n th external source into cell (i,j,k) (L3/T) and $p_{i,j,k,n}$ and $q_{i,j,k,n}$ are constants. For external sources entirely independent of head in the receiving cell e.g. a well, the constant p will be zero. If there are N external sources affecting the cell (i,j,k), the combined flow is expressed as

$$QS_{i,j,k} = a_{i,j,k,n} = p_{i,j,k,n}h_{i,j,k} + q_{i,j,k,n} \qquad (8)$$

and it can be rewritten as

$$QS_{i,j,k} = P_{i,j,k}h_{i,j,k} + Q_{i,j,k} \qquad (9)$$

External sources can be drains, rivers, wells, areal recharge and evapotranspiration. Rivers may contribute water to the aquifer or drain water from the aquifer depending on the head gradient between the river and the aquifer. To simulate the effect of river leakage, the river is divided into reaches, each of which is completely contained in a single cell. River/aquifer leakage is defined between each river reach and the model cell contains the reach. Leakage through a reach of riverbed is approximated by Darcy's law as

$$QRIV = CRIV\ (HRIV-HAQ) \quad (10)$$

where QRIV is the leakage through the reach of the riverbed (L^3/T), CRIV is the conductance of the reach of the riverbed (L^2/T).

Infiltration from precipitation generally occurs evenly over a large area and called areally distributed recharge. The rate of the flow is the infiltration rate times the horizontal area of the cell,

$$QRCH_{i,j,k} = I_{i,j,k}*DELR_j*DELC_i \quad (11)$$

where $I_{i,j,k}$ is the infiltration rate (L/T).

The rate at which water seeps into a drain in the saturated zone of an aquifer is approximated in the model using the equation,

$$QD_{i,j,k}=CD_{i,j,k}(h_{i,j,k} - d_{i,j,k}) \quad (12)$$

where $d_{i,j,k}$ is the head in the drain, CD is the conductance of the interface between the aquifer and the drain. CD is affected by size and frequency of openings in a drain tile, chemical precipitation around a tile, difference in permeability between the aquifer material and the backfill around a tile, and a low permeability bed in an open drain or the converging area of flow as the drain is approached. The head in the drain is assumed to be the elevation of the drain.

Evapotranspiration rate depends on the position of the aquifer head relative to ET surface and Et extinction elevation;

$$Q = 0 \text{ when } h<EXEL$$

$$Q = EVTR\ (h - EXEL)/EXDP \text{ when } surf>=h>=EXEL \qquad (13)$$

$$Q = EVTR \text{ when } h>SURF$$

where Q is the ET rate (L^3/T), EXEL is the extinction elevation, SURF is the ET surface elevation, EXDP is the extinction depth and EVTR is the maximum ET rate.

The continuity equation including the flow rates between node (i,j,k),six adjacent cells and external flow rates (Qs) yields;

$$q_{i,j-1/2,k}+ q_{i,j+1/2,k}+ q_{i+1/2,j,k}+ q_{i-1/2,j,k}+ q_{i,j,k+1/2}+$$

$$q_{i,j,k-1/2}+ QS_{i,j,k} = SS_{i,j,k}\ (dh_{i,j,k}/dt)dr_j dc_i dv_k \qquad (14)$$

where $dh_{i,j,k}/dt$ is a finite difference approximation for head change with respect to time (L/T), $SS_{i,j,k}$ is the specific storage of the cell (i,j,k) (1/L) and $dr_j dc_i dv_k$ is the volume of the cell (i,j,k). In finite difference approximation for large system of equations backward difference form is preferred since it is numerical stable that is errors introduced at any time of simulation diminish progressively at succeeding times. The above equation can be rewritten in backward difference form specifying flow terms at tm, the end of time interval and approximating the time derivative of head over the interval tm-1 to tm, that is,

$$CV_{(i,j,k-1/2)}\ h^{m}_{(i,j,k-1)} + CC_{(i-1/2,j,k)}\ h^{m}_{(i-1,j,k)} +$$

$$CR_{(i,j-1/2,k)}\ h^{m}_{(i,j-1,k)} + [-CV_{(i,j,k-1/2)} - CC_{(i-1/2,j,k)} -$$

$$+CR_{(i,j-1/2,k)} - CV_{(i,j,k+1/2)} - CC_{(i+1/2,j,k)} - CR_{(i,j+1/2,k)}$$

$$HCOF_{(i,j,k)}]\ h^{m}_{(i,j,k)} + CV_{(i,j,k+1/2)}\ h^{m}_{(i,j,k+1)} + CC_{(i+1/2,j,k)}$$

$$h^{m}_{(i+1,j,k)} + CR_{(i,j+1/2,k)}\ h^{m}_{(i,j+1,k)} = RHS_{(i,j,k)} \qquad (15)$$

where,

$$HCOF_{(i,j,k)} = P_{(i,j,k)} - SC1_{(i,j,k)} / (t_m - t_{m-1}) \qquad (16)$$

$$RHS_{(i,j,k)} = -Q_{(i,j,k)} - SC1_{(i,j,k)} h^{m-1}_{(i,j,k)} / (t_m - t_{m-1}) \qquad (17)$$

$$SC1_{(i,j,k)} = SS_{(i,j,k)} dr_j dc_i dv_k \qquad (18)$$

In this equation, head at the beginning of the time step $h^{m}_{(i,j,k)}$ and all conductances and coefficients to the node (i,j,k) are known. The seven heads at time tm are unknown. The equations of this type can be written for each node in the system and a system of n equations with n unknown can be obtained. This system can be solved iteratively. In this program Strongly Implicit Procedure and Slice-Successive Overrelaxation methods are used.

3.2.2. Solution Approaches for F.D. Equations

The following sections explain the computational algorithms for three numerical methods which can be used for

solving the simultaneous equations and describe the results of numerical experiments using these techniques. But only two numerical techniques available in the model: Strongly Implicit Procedure (SIP) and Slice Successive OverRelaxation Procedure (SSOP).

3.2.2.1. Alternating-Direction Implicit Procedure (ADI)

In the ADI technique, two sets of matrix equations are solved for rows in which head values along rows are computed. implicitly and those along columns are obtained from the previous column computations.

Briefly, the ADI Method involves first, for a given time increment, reducing a large set of simultaneous equations down to a number of small sets. This is done by solving the node equations by Gauss elimination of an individual column of the model while all terms related to the nodes in adjacent columns are held constant.

After all column equations have been processed column by column, attention is focused on solving the node equations again by Gauss elimination of an individual row while all terms related to adjacent rows are held constant. Finally, after all equations have been solved row by row, an "iteration" has been completed. The above process is repeated a sufficient number of times to achieve convergence, and this completes the calculations for the given time increment. The calculated heads are then used as initial conditions for the

next time increment. This total process is repeated for successive time increments (Prickett and Lonnquist,1971).

For many field problems ADI Method is convergent and competitive, in terms of the computational work required. However, it may be difficult to obtain a solution for steady-state simulations involving extremely variable coefficients. This method is not suitable regardless of the size of the time increment.

3.2.2.2. Slice-Successive Overrelaxation Method (SSOR)

This is also a technique for iteratively solving a system of linear equations. In this method FD equations associated with the cells in the FD grid are solved. Since there is an equation for each cell -there are too many equations- in the grid, it is difficult to solve the system of equations.

Implementation of SSOR involves processing the rows one at a time, first reformulating the equations for each row, and then solving the resulting equations to get the approximate head changes for each cell in the row. Finally, the head chances must be multiplied by the relaxation factor and added to the head at the previous iteration to get the new head value.

SSOR method reduces the number of equations by simultaneously solving only those equations representing cells in a single slice and slice is identified by its row number. The head in row 2, can be approximated only while heads in row

1 are being calculated (the head calculated at the previous iteration). Terms in equations for slice say P, which involve heads in slice P+1 use heads from the preceeding iteration. Solution of those equations gives approximate head changes for the current iteration. The approximate head changes are multiplied by the relation factor (generally between 1 and 2) to get the final head changes for the iteration.

3.2.2.3. Strongly Implicit Procedure (SIP)

In the SIP Method (Technique), large system of simultaneous linear equations are solved for the node and adjacent six nodes. Since the head at any node appears in the equation for that node and in the equation for the adjoining cells.

All heads are accepted as unknown at the present time level(t) and the time derivatives are approximated by the difference between the unknown heads at the present time level (t) and the known values of heads at the previous time level (t-1).

Coefficients of the heads in these equations form a symmetric matrix which form a computational standpoint. Then coefficient matrix is decomposed in to lower and upper triangular matrices. In the lower triangular matrices all of the nonzero elements are on or below the main diagonal; and in upper triangular matrices all of the nonzero elements are above the main diagonal. After decomposition of the

coefficient matrix, simultaneous equations can be solved using a method called "Backward Substution".

Since the lower and upper triangular matrices are not sparse, a lot of computer memory and time is needed to calculate all of the nonzero elements. Furthermore, round of errors may become unacceptably large.

4. APPLICATION OF THE MODEL TO ADANA PLAIN

4.1. Computer Program

In this work a modular three-dimensional Finite Difference Groundwater Model prepared by McDonald and Harbaugh (1984) is used. The program originally was written in FORTRAN 66. It is revised and modified to FORTRAN '77 by Arıkan and Tezcan (1988) at the Hacettepe University, Division of the Hydrogeological Engineering.

By using this model any kind of aquifer (i.e. multi-layered, heterogeneous, anisotropic, leaky) can be simulated.

The program of the three-dimensional finite-difference model, has been divided into a main program and a series of highly independent subroutines called modules. The main program simply organizes and controls these modules and serves as a switching system for information. The modules, in turn, have been grouped into "Packages". A package is a group of modules that deals with a single aspect of the simulation. All modules are associated with a particular task such as river simulation, effect of wells, recharge, rivers, drains, evapotranspiration, and general head boundaries, solution method etc.

4.2. Data Input

Computer program used in this study simulates the response of the groundwater level to the changing recharge and

discharge conditions within the aquifers. The basic input data, as it is mentioned in the previous sections, needed for the model include initial water levels (or piezometric heads), Transmissivity (T), Storage Coefficient (S), Hydraulic Conductivity (K), discharge and recharge rates at each node. Simulation time periods and dimensions of the FD mesh are also need to be given.

Detailed information on how the input data is choosen and prepared for the model is explained in detail in the following sub-chapters. Computer printouts, including information about the model parameters are given in Appendix A.

4.2.1. Discretization of Finite Difference Mesh

Adana Plain has a total area of about 2692 sq.kms. However, in this study NW and SE extensions of the plain is excluded, since the SE part of the aquifer only includes sand and gravel as isolated bands and shows poor aquifer characteristics, and insuficiency of the data about lithology and thickness of the Kuransa Formation at the NW part of the plain. By this exclusion, dimensions of the mesh and hence, coefficient matrix components are reduced to save computer time and memory.

As a result of above mentioned reduction, the model area covers 1890 sq.kms of the Adana Plain and it is discretized into 1170 grids formed by 30 columns and 39 rows (Figure 4.1).

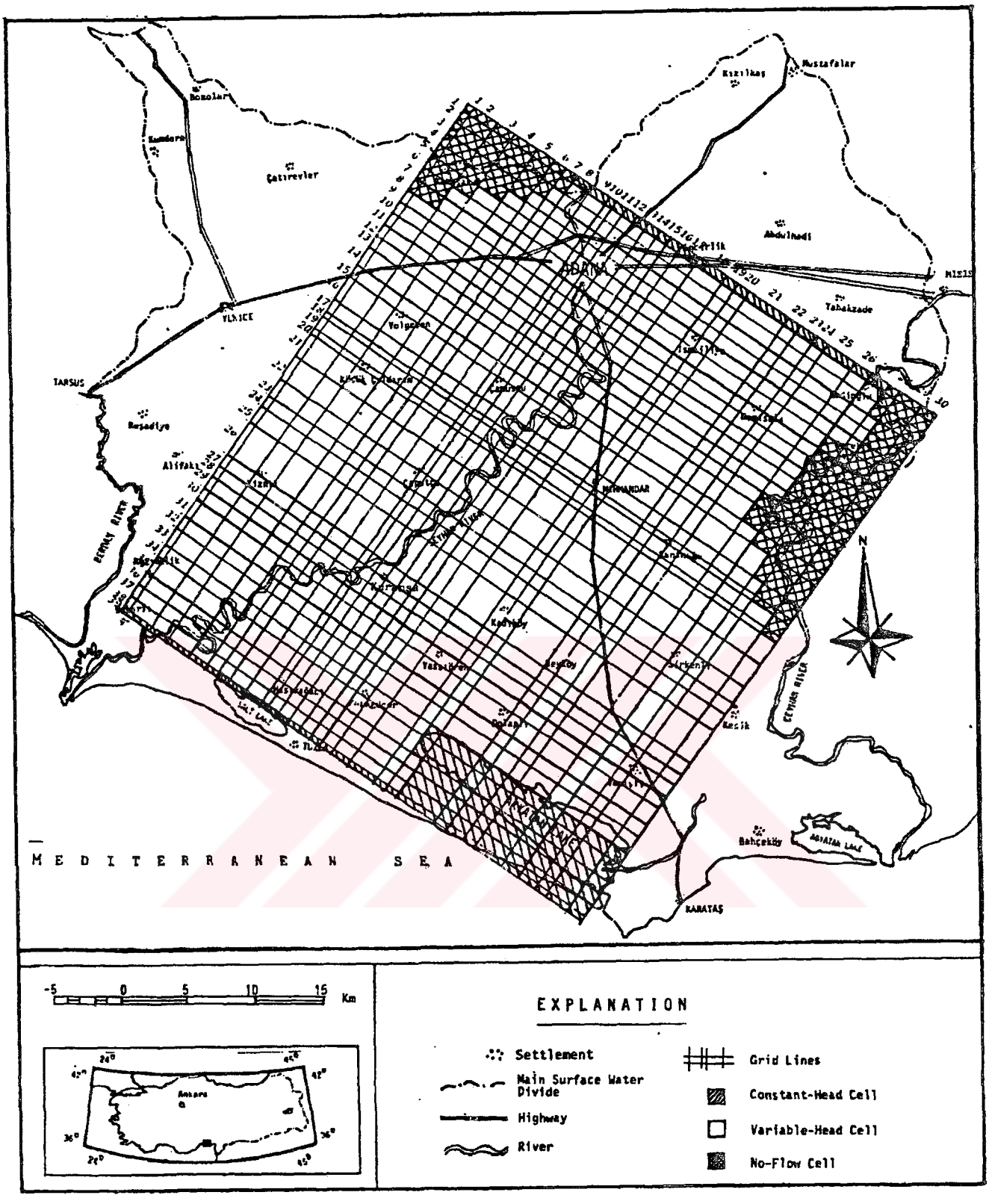


Figure 4.1. Finite Difference Mesh of the Study Area

FD mesh consist of non-uniform grids. The grid lines are close where wells are concentrated and rivers and canals existed. While constructing FD mesh. Transmissivity is also affects the shape and dimension and density of FD mesh. Row and column axis are constructed nearly parallel to the transmissivity contours and perpendicular to the equal potentiometric contours. Column and row size of the FD mesh increase especially near the city center and through southwest of the plain along the Seyhan River, and decrease towards east and southeast of the plain, where the limited data are available.

Approximately 118.5 km^2 of the model area includes constant-head cells in 100 nodes and, 148 km^2 includes no-flow condition cells in 99 nodes. The area underlain by aquifers is about 1615 km^2 including 971 nodes. Only 101 nodes include pumping wells each has an average discharge rate of 2500 m^3/day. Nodes include wells and their discharhe rates are given in Appendix A. It should be noted that some wells works for the period of irrigation season which continues between May and October, while the others work for whole year period.

4.2.2. Physical Parameters of the Adana Plain

In this section point transmissivity and storage values for the study area will be explained; Transmissivity is defined as the rate at which water of the prevailing kinematic viscosity is transmitted through a unit width of the aquifer

under a unit hydraulic gradient. It is equal to an integration of the hydraulic conductivities across the saturated part of the aquifer perpendicular to the flow paths (Lohman, 1972). Most reliable way of determining transmissivity is through pumping test.

The transmissivity values used as input data for the calibration phase were derived from the transmissivity contour map of The Adana Plain which was prepared by Taylan (1983), and from the pumping test data provided by DSI for each well. The transmissivity of each cell is determined by superimposing the finite difference mesh over transmissivity contour map (Figure 4.2). The point transmissivity values range between 500 m^2/day to 2500 m^2/day in the model area. Transmissivity values are considerably higher at the locations A, B, and, D in Figure 2.3. It reaches its maximum values at the city center where the unconfined aquifer takes place. Outside these parts of the plain, transmissivity values tend to decrease towards south and southeast of the plain, related to the materials that Kuransa Formation contains. As it is shown in Figure 2.3., locations at F,G and Eastern part of the aquifer has comparatively small values of transmissivity which is about 500 m^2/day. Transmissivity values for the nodes used in the model are given in Appendix B.

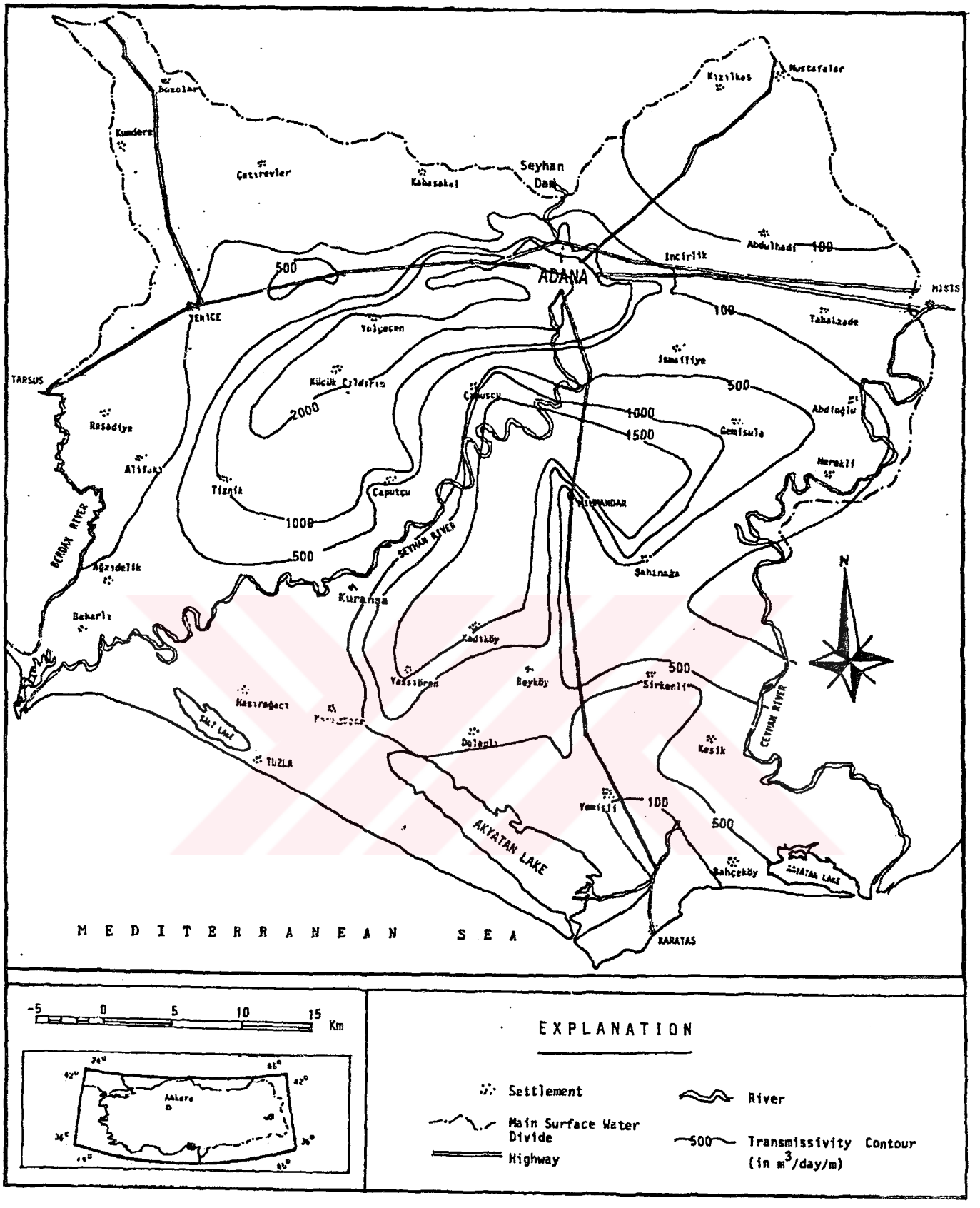


Figure 4.2. Distribution of Transmissivity in the Adana Plain (Modified after Taylan, 1983)

Storage coefficient of an aquifer is defined as the volume of water in aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head.

In a confined water body the water derived from storage with decline in head comes from the trend of water to expand and trend of the aquifer skeleton to subside. The water added to storage with rise in head is accommodated partly by compression of the water body. The amount of water derived from or added to the aquifer by these processes generally is negligible compared to that involved in gravity drainage or filling of pores; hence, in an unconfined water body the storage coefficient is virtually equal to the specific yield (Lohman, 1972).

Although rigid limits cannot be established, the storage coefficient of confined aquifers may range from about 0.00001 to 0.001, whereas it may range from about 0.05 to 0.30 for the unconfined aquifers (Ferris et. al., 1962).

The storage coefficients used as input data for the calibration phase were derived from data given by DSI for each well. Storage coefficient map of the plain was constructed by using these data(Figure 4.3). The storage coefficient of each cell was determined by linear interpolation between the wells and the values to be assigned for each node were chosen by considering the nearest two equal storage coefficient lines. The storage coefficient values range between 0.0001 - 0.25 in the model area. Values of storage coefficient nearly 0.005 in

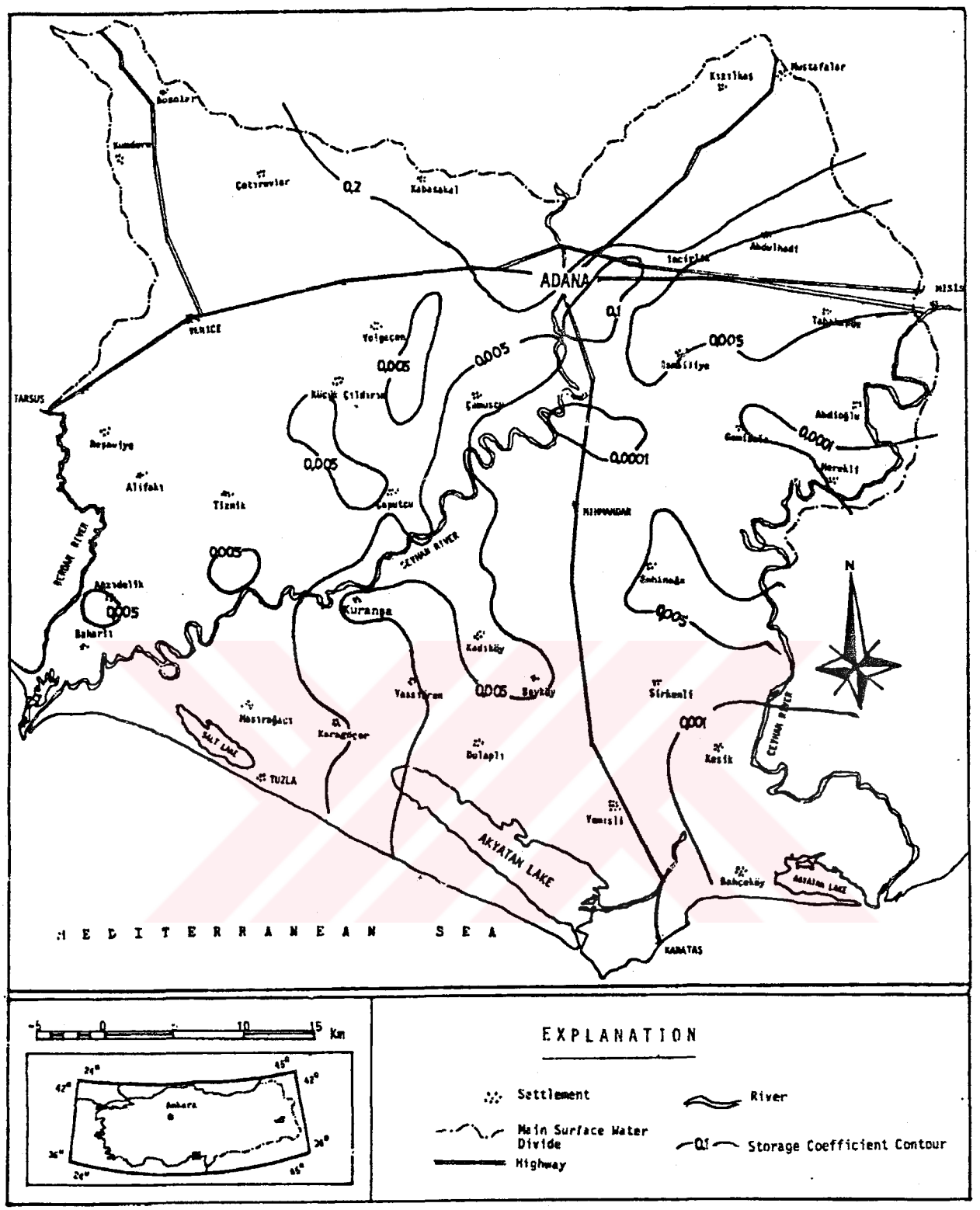


Figure 4.3. Distribution of Storage Coefficient in the Adana Plain

the study area, except the areas where the clay composition of the Kuransa Formation. In this part of the area where it covers the eastern and southeastern part of the plain and the area between Seyhan and Berdan towards west, storage coefficients change between 0.0001 to 0.005. Storage coefficients for the nodes are given in Appendix B.

4.2.3. Recharge/Discharge Rates

Groundwater recharge in the Adana Plain chiefly is supplied by infiltration from precipitation, irrigation and Seyhan River.

Infiltration from Precipitation

Annual precipitation in the plain is 640.9 mm. Due to the extremely high evapotranspiration, generally no excess water is available after the first three months of the year. Thus, infiltration from precipitation occurs only in the early months of the year. For evaluating the recharge from precipitation a Thornwaite water budget (see Table 4.1.) has been constituted by using evapotranspiration and precipitation data of the Doğankent Meteorological station for 1980 and 1981. This station is believed to be most representative one as, it is located in the middle of the model area.

Infiltration from precipitation is calculated through equation (11) in the model. So, infiltration rate and dimensions of the cells is required to calculate the infiltration from precipitation.

(a)

WATER BUDGET CALCULATION RESULTS (1980) *													
	JAN.	FEB.	MAR.	APR.	MAY.	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	ANNUAL
PRECIPITATION	195.0	102.6	114.3	74.4	47.5	0.0	0.0	0.0	1.0	75.4	64.1	94.4	768.7
EVAPOTRANSPIRATION	40.0	70.8	82.9	126.0	154.2	229.5	237.0	239.8	201.0	110.9	67.4	53.8	1613.3
PRECIPITATION-ETP	155.0	31.8	31.4	-51.6	-106.7	-229.5	-237.0	-239.8	-200.0	-35.5	-3.3	40.6	-844.6
RESERVED WATER	100.0	100.0	100.0	48.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.6	
ACTUAL ETP	0.0	70.8	82.9	126.0	95.9	0.0	0.0	0.0	1.0	75.4	64.1	53.8	569.9
DEFICIT WATER	0.0	0.0	0.0	0.0	58.3	229.5	237.0	239.8	200.0	35.5	3.3	0.0	1003.4
EXCESS WATER	155.0	31.8	31.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	218.2
GROUNDWATER INFLOW	77.5	38.7	19.4	9.7	4.8	2.4	1.2	0.6	0.3	0.2	0.1	0.0	154.9
RESERVE CAPACITY OF SOIL : 100 mm : ALL THE VALUES ARE IN mm													

(b)

WATER BUDGET CALCULATION RESULTS (1981) *													
	JAN.	FEB.	MAR.	APR.	MAY.	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	ANNUAL
PRECIPITATION	340.1	87.0	39.3	25.2	83.0	23.5	0.0	0.0	3.0	54.0	72.7	200.5	928.3
EVAPOTRANSPIRATION	44.8	50.8	83.9	171.4	169.0	228.0	254.0	234.0	198.5	189.9	81.5	43.0	1748.8
PRECIPITATION-ETP	295.3	36.2	-44.6	-146.2	-86.0	-204.5	-254.0	-234.0	-195.5	-135.9	-8.8	157.5	-820.5
RESERVED WATER	100.0	100.0	55.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
ACTUAL ETP	44.8	50.8	83.9	80.6	83.0	23.5	0.0	0.0	3.0	54.0	72.7	43.0	539.3
DEFICIT WATER	0.0	0.0	0.0	90.8	86.0	204.5	254.0	234.0	195.5	135.9	8.8	0.0	1209.5
EXCESS WATER	295.3	36.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.5	389.0
GROUNDWATER INFLOW	162.0	99.1	49.6	24.8	12.4	6.2	3.1	1.5	0.8	0.4	0.2	0.1	360.2
RESERVE CAPACITY OF SOIL : 100 mm : ALL THE VALUES ARE IN mm													

Table 4.1. Water Budget Calculation Results of the Adana Plain for the years of (a) 1980 and (b) 1981

*(Budget design and calculation is modified after Günay et.al.,1987)

From the beginning of the simulation period (September 1980) to the end of December 1980, no excess water was available. Thus, any recharge from precipitation has not occurred during that period. However, as can be inferred from the budget, recharge from precipitation takes place in January and February 1981. In January 1981, there is an excess water of 295.3 mm which was caused mainly by a heavy storm of 340.1 mm/day occurred in the plain.

Considering the surface area of the impermeable strata covering almost all of the plain and which has not been determined accurately so far, infiltration ratio for the whole plain has been taken as %40. When the large areal extend of impermeable layer over the plain, this amount of infiltration is in acceptable order. Hence, recharge from precipitation for January and February 1981 has been evaluated to be 9.84×10^{-4} m/day and 1.2×10^{-4} m/day respectively.

Due to the absence of excess water, no recharge from precipitation has occured in the plain during the simulation period extending from the beginning of March to the end of October 1981.

Recharge from Infiltration

The amount of recharge from infiltration has been evaluated based on the amount of water released from the Seyhan Dam and on the measurements carried out by DSI in the irrigation and drainage canals between 1980-1981.

In 1980, 1.53×10^9 m^3 water has been released from the Seyhan Dam regulator to the irrigation canals of both right and left banks. An amount of 6.12×10^8 m^3 of this water is drained through drainage canals whereas, 60% of the water used for irrigation infiltrates into the soil. Total irrigated areas on the right and left banks are 718×10^6 m^2 and 1095×10^6 m^2 respectively, amounting to 1813 km^2 in total.

The part of the aquifer which can be recharged by infiltration from irrigation and precipitation covers an area of 600km in the plain (Taylan, 1983). Considering the evaporation from canal surface during the irrigation season , about 40% of the water released for the irrigation is assumed to contribute to the aquifer.

Thus, recharge from irrigation is evaluated as follows;

$$R = \left[\left(\frac{Q_{left}}{A_{left}} \right) + \left(\frac{Q_{right}}{A_{right}} \right) \right] * \left(\frac{0.4 * 600}{30 * A_{MODEL}} \right) \text{ m/day}$$

where,

Q_{left} = The amount of water released from the left bank (m^3/months)

Q_{right} = The amount of water released from the right bank (m^3/months

A_{left} = Irrigated area on the left bank (1095×10^6 m^2)

A_{right} = Irrigated area on the right bank (718×10^6 m^2)

A_{MODEL} = Modeled area of the aquifer (1615 km^2)

The amounts of water released from the Seyhan Dam and of the calculated infiltration rates are given in Table 4.2. for both banks.

On the other hand, recharge from precipitation has been evaluated by using the water budget. As can be seen from this budget given in Table 4.1. excess water takes place only in January and February 1981. Considering the infiltration ratio from precipitation is %10, recharge from precipitation has been evaluated to be 9.84×10^{-4} m/day for January 1981, and 1.20×10^{-4} for February 1981.

Recharge from Rivers

Recharge from the Seyhan River is of special importance around the city center where conglomerates are predominant. Very little drawdown has been observed in the wells drilled in that region. At the downstream of the Seyhan Dam, there is no gauging station to measure the flows of Seyhan River within the area covered by the model. Therefore, recharge from the Seyhan River has been evaluated, assuming that the water level is 3 meters above the river bed. Recharge from streams is determined through equation 10, depending on the head differences between the groundwater level and the stream level.

Discharge from the aquifer is brought about by evapotranspiration losses, withdrawal from the wells and by discharge through streams. As it is explained in Section 3., river aquifer relation is determined through equation (10) related to the heads both in the river reach and aquifer for the nodes. If the potentiometric head in the cell is greater than head in the sorrounding cells, flow will be through

sorrounding cells. On the contrary, flow will be through cell contains river reach. Computer program used in this study controls and checks the heads both in the cells includes river reach and sorrounding cells. Conductance for the riverbed, length of the river reach and head in the river should be given as input data. The properties of the river reach ,used in the model, are given in Appendix A.

Evaporation Losses

Owing to the rather shallow groundwater table, evapotranspiration losses which have been evaluated based on the deficit water values of the water budget are significant in the plain. Extinction depth has been considered to be 2 m with the relevant infiltration ratio from deficit water of 40%. The subsequent evaluated values are given in Table 4.2. Evaporation rates are calculated according to the potentiometric head with respect to the extinction depth using equation (13) in the program. If potentiometric head is smaller than extinction elevation, there will not be evapotranspiration. If potentiometric head is greater than extinction elevation, evapotranspiration will reach its maximum value and be equal to maximum ET rate. If potentiometric head is between surface elevation and extinction depth, evapotranspiration is calculated by the relation;

$$\text{Max. Evapotranspiration} * \frac{\text{(Potentiometric head-Extinction elevation)}}{\text{Extinction Depth}}$$

MONTHS (1980-1981)	IRRIGATION WATER (m^3) LEFT BANK	RIGHT BANK	INFILTRATION FROM IRRIGATION(m^3/day)	INFILTRATION FROM PRECIPITATION(m^3/day)	EVAPOTRANSPIRATION RATES (m^3/day)
SEPTEMBER	187889760	88591840	$1.461*10^{-3}$	———	$2.66x10^{-3}$
OCTOBER	193887480	31795520	$1.096*10^{-3}$	———	$4.73x10^{-4}$
NOVEMBER	———	———	———	———	———
DECEMBER	———	———	———	———	———
JANUARY	———	———	———	$9.84x10^{-4}$	———
FEBRUARY	———	———	———	$1.20x10^{-4}$	———
MARCH	———	———	———	———	———
APRIL	———	3576009	$2.467*10^{-5}$	———	$1.21x10^{-4}$
MAY	57497312	———	$2.597*10^{-4}$	———	$1.14x10^{-3}$
JUN	41893113	———	$4.064*10^{-4}$	———	$2.72x10^{-3}$
JULY	140373560	———	$1.440*10^{-4}$	———	$3.38x10^{-3}$
AUGUST	163493387	———	$8.290*10^{-4}$	———	$3.12x10^{-3}$
SEPTEMBER	87256902	———	$1.020*10^{-4}$	———	$2.60x10^{-3}$
OCTOBER	40376569	———	$4.216*10^{-4}$	———	$1.81x10^{-3}$
NOVEMBER	———	———	———	———	

Table 4.2 Infiltration and Evapotranspiration Values Used in the Model

The extinction depth is taken as 2m for the model area. Evapotranspiration surface elevations, in other words topografic elevations of the cells are given in Appendix C.

Discharge to Sea

Discharge to the sea takes place through lakes and outlet canals. Because of the occurance of the clayey formation, through south of the plain, there is no direct discharge to the sea which positively effects the groundwater storage.

Discharge to Seyhan River

Discharge to Seyhan River occurs in the southern part of the plain where the potentiometric level is below the river level and it is calculated by equation (10). As it is explained in the previous sections computer program calculates discharge to river by compairing the head in the cell contains reach of river and sorrounding cells.

The average abstraction from groundwater storage by means of wells is 2500m^3/day. The municipal and public wells are operated throughout the year whereas pumping is carried out from the wells drilled for irrigation purposes only during irrigation periods of the year.

4.2.4. Initial Heads And Boundary Conditions

The initial values of potentiometric heads that are used as input data for the calibration phase are derived from the potentiometric contour map given in Figure 4.4. prepared by

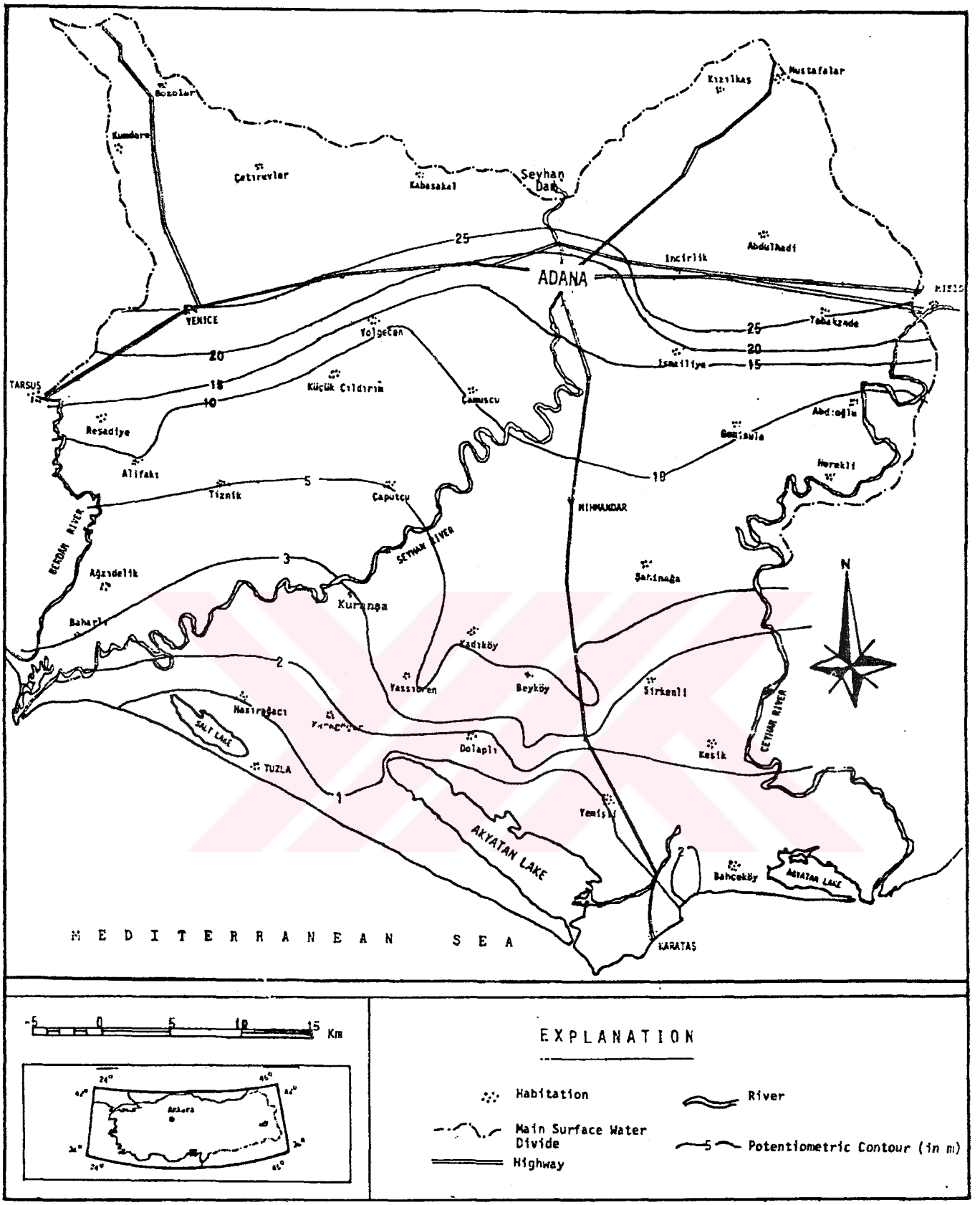


Figure 4.4. Potentiometric Contour Map of the Study Area (September, 1980) (After Taylan, 1983)

Taylan (1983), and observation data taken from the wells by DSI. In the determination of the potentiometric head of each cell, the same approach applied for transmissivity was used and the value for each cell was determined by superimposing the finite difference mesh over potentiometric contour map (Figure 4.4.). Values used as initial head for the model are also given in Appendix.C.

According to the boundary types, the model area can simply be divided into three parts. These are (1) constant-head cell, (2) no-flow cell, and (3) variable-head cell boundaries.

No-flow cell is placed at the left and right uppermost corner of the finite difference mesh. Left corner of the mesh is covered by the caliche. This part of the aquifer is connected with the caliche in vertical dimension but recharge from caliche is negligible (Taylan,1983). Right corner of the FD mesh is bounded by the Ceyhan River. Through this part of the aquifer, clay composition of the Kuransa formation increases, thus natural no-flow condition occurs by itself. No flow cell is modeled by assigning zero transmissivity values outside the boundaries.

Constant head cell is placed at the northern and southern boundary of the finite difference mesh. In southern parts of the FD mesh, there are two lakes, Akyatan Lake at the southeast, and Salt Lake. Discharge to the sea is simulated by a zero level of constant head together with lakes. This type

of cell is assumed as a boundary along which there is no drawdown or change in water level. In order to simulate the effects of the inflow from the northern part of the aquifer outside the model area, the first row is also taken as constant head boundary. Constant head cells are those in which head is constant throughout the simulation. Finite difference equations for constant head cells and no-flow cells are not formulated.

All the other cells are variable-head cells. Variable head cells are those in which the head can be expected to vary with time, a finite difference equation is formulated for each one.

4.3. Calibration

The calibration of a groundwater model is to arrange the values of parameters in a logical manner so that the head values produced by the model match the observed values.

Historical matching is widely affected from the uncertainties of input data of abstractions, boundary conditions, outflows and recharge. In many cases the estimation of recharge constitutes one of the largest errors introduced in the model.

In this study, calibration is accomplished for the period of September 1980 through November 1981. Recharge and discharge from evaporation are estimated by using water balance. A question arises regarding the water balance

approach in the groundwater resource assessment, particularly in short-term groundwater exploitation strategies. The water balance approach may, however, be significant on a long term basis to control the steady but continuous decline of the groundwater level (Balek, 1987).

In the calibration study, firstly, the filtration and evapotranspiration ratios are adjusted. According to Taylan (1983) the infiltration from precipitation is 40% of the excess water. However since the area of the aquifer in which the infiltration occurs is limited to about 1/3 of total model area, the ratio of infiltration to be used by the model for whole area was taken roughly as 10%.

The well discharge occurs by means of public wells for municipal use. Discharge rates of the public wells are not recorded well. The reported rates are thought to be 1/3 of the actual rates (SPO,1985).

Matching the observed and calculated heads is achieved by changing the transmissivity and storage coefficients. The spatial distribution of transmissivity and storage coefficient cannot be determined very well, because of the insufficiency of the available data. However, the aquifer parameters have been changed by paying special attention to avoid any significant influence on the hydraulic structure of the aquifer. The transmissivity values were increased at the northwest and decreased at the east of the area.

The storage coefficient also affects the drawdown values. The increase in storage coefficients decreases the drawdown during the irrigation season. In the northwestern part, conglomerate units behave as an unconfined aquifer, thus, the storage coefficient was increased up to 0.25 while in the east storage coefficient needs to be set to 0.001. Changing storage coefficient 50 times brings about the same effects on the head distribution by changing the transmissivity 2 times.

Another important factor affecting the convergence to the observed values is the iteration parameters of the SIP solution method. As stated in Tresscott et.al. (1980) SIP is more powerful iterative technique for solving large systems of linear equations. However selection of iteration parameters are an important part of SIP, and selecting them is not well understood. Selection of the parameters does not alter the value of the solution (conclusion), only the efficiency of the method (McDonald and Harbaugh, 1984). In the Model Program, the iteration parameters are calculated by using the equation,

$$W(1) = 1 - SEED^{(1-1)/L-1)}$$

where, W(1) is the 1th iteration parameters , L is the number of iteration, and 1 is an index range from 1 to L. This equation needs only the value of parameter SEED to be specified by user. The optimum value of SEED can be determined by trial and error method (Weinstein, et.al., 1969). The optimum value of SEED gives efficient convergence. Optimum

convergence occurs when the convergence criterion is met with the least number of iterations. Convergence deviates from optimum if the absolute value of head change each iteration is consistently either too small or too large. By observing the rate of convergence for several different SEEDs, an optimal SEED is determined. Hence, the SEED value was taken as 0.0009 by using trial and error method.

The good fit between observed and simulated heads is obtained at the end of the calibration period. The observed heads, simulated heads and differences between them are presented in Table 4.3. and Figure 4.4. Vertical axis in Figure 4.4. shows the head values at the end of April and November 1981 and represents the beginning and ending of the irrigation season. Node description for the wells are given in Table 4.3. It can be seen both from Table 4.3 and Figure 4.4.that the good fit is obtained. At the northern side of the model area where the hydrogeologic data are relatively abundant differences between observed and simulated heads are insignificant. At the southern part of the plain, where the data are scarce, deviations from observed values increased. Along the western border of the model, the maximum deviation cropped out, since the inflow from the aquifer outside the model area was not taken into account.

WELL NO	NODE (Row, Column)		HEADS (m) (1) Observed APRIL (1)	(2) Calculated APRIL (2)	DIF.	(1) Observed NOVEMBER (1)	(2) Calculated NOVEMBER (2)	DIF.
1	4	26	9.84	9.81	0.03	9.39	9.80	-0.41
2	7	24	12.10	11.30	0.80	11.40	11.40	0.00
3	9	22	11.80	13.00	-1.20	11.20	13.30	-2.10
4	15	12	10.72	12.90	-2.18	12.72	12.00	0.72
5	15	25	9.65	9.60	0.05	9.25	9.10	0.15
6	18	24	8.19	9.70	-1.51	7.19	8.00	-0.81
7	20	18	9.86	9.50	0.36	9.56	9.20	0.36
8	24	23	5.81	6.10	-0.29	5.26	4.90	0.36
9	25	3	7.37	8.10	-0.73	7.77	7.40	0.37
10	26	3	5.28	5.60	-0.32	5.18	4.50	0.68
11	26	19	6.13	5.70	0.43	5.76	4.10	1.66
12	26	22	4.45	5.30	-0.85	4.20	3.90	0.30
13	26	25	3.90	3.10	0.80	3.00	2.50	0.50
14	27	21	4.10	4.30	-0.20	3.55	2.90	0.65
15	27	25	2.80	2.80	0.00	2.80	2.50	0.30
16	28	19	4.12	4.00	0.12	3.47	3.00	0.47
17	28	22	3.60	3.60	0.00	2.80	3.00	-0.20
18	28	25	2.40	2.30	0.10	1.75	2.10	-0.35
19	29	25	3.30	2.10	1.20	2.85	2.20	0.65
20	29	26	1.90	1.80	0.10	1.10	1.70	-0.60
21	29	28	1.25	1.40	-0.15	0.95	1.30	-0.35
22	30	4	4.40	3.90	0.50	4.10	2.50	1.60
23	34	17	2.80	1.70	1.10	1.95	1.10	0.85
24	36	11	0.65	0.70	-0.05	-0.55	0.70	-1.25
25	37	17	-0.47	0.30	-0.77	-0.32	0.40	-0.72
26	38	17	0.00	0.20	-0.20	-1.10	-0.20	-0.90

Table 4.3. Comparison of the Observed and Simulated Heads. (April and November 1981)

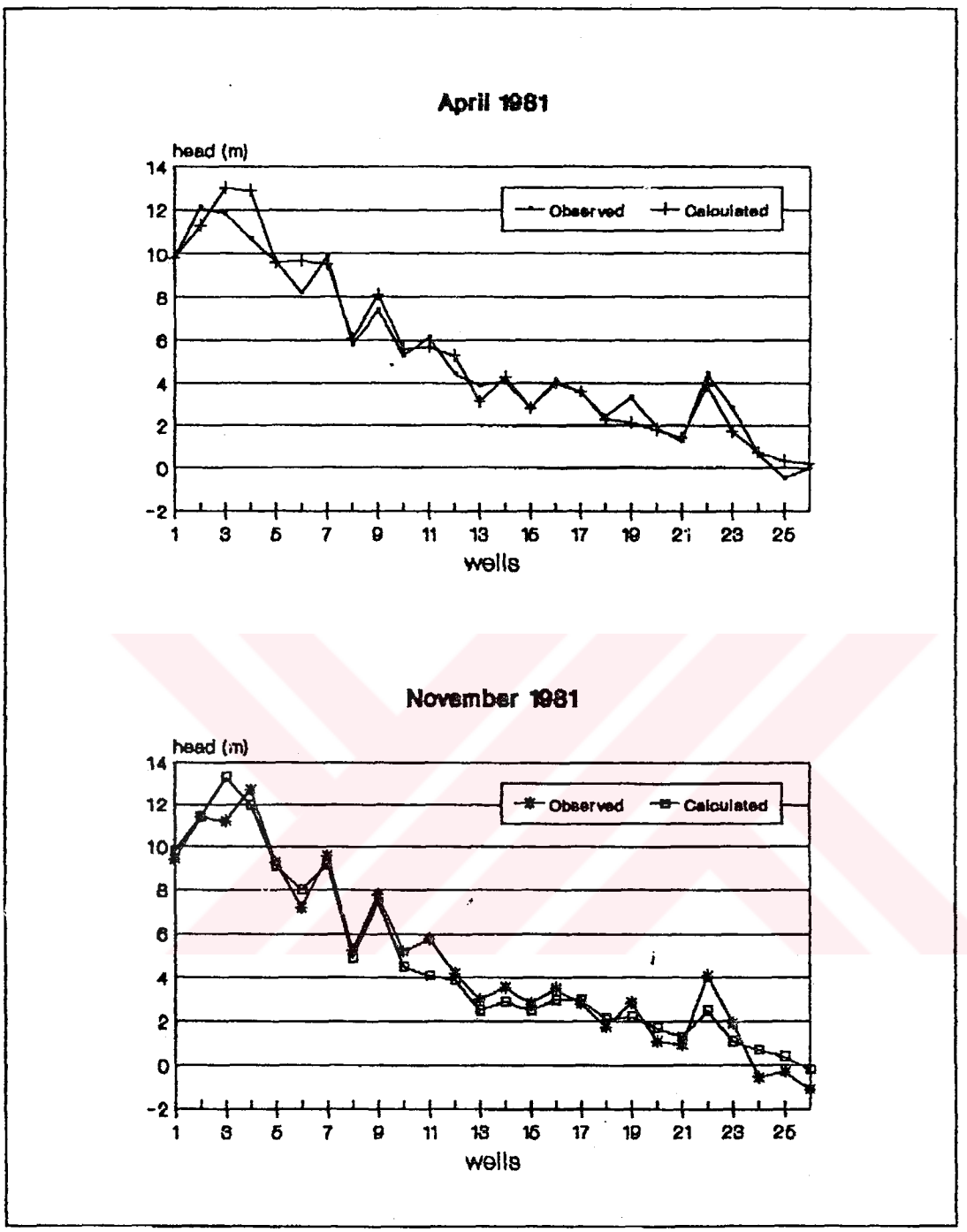


Figure 4.5. Comparison of the Observed and Simulated Heads.
(April and November 1981)

Computed heads through simulation period are given in Figure 4.6. Horizontal axis represents time steps while vertical axis shows the head in that node. As it is seen in these graphs groundwater levels at each node increase along the first month of the simulation period. It may be the irrigation effect on the groundwater storage.

For the following three months, groundwater levels does not change. It indicates the continuity of the irrigation effect since there is no recharge from precipitation in these months.

Groundwater level suddenly rise with a steep slope at the beginning of the 5th time step, corresponding to January 1981, where recharge from precipitation takes place. During the following three months precipitation continues, and recharge and discharge is balanced according to the pumping effects in the system. Thus, groundwater levels remains constant through 7th time step which is actualy April 1981.

From the beginning of the 8th time step irrigation and well discharge begin and recharge from pecipitation does not take place. Thus, groundwater levels begin to drop until it reaches nearly constant values during these months. It can be concluded that water released from groundwater storage is supplied by infiltration from irrigation and recharge from Seyhan River.

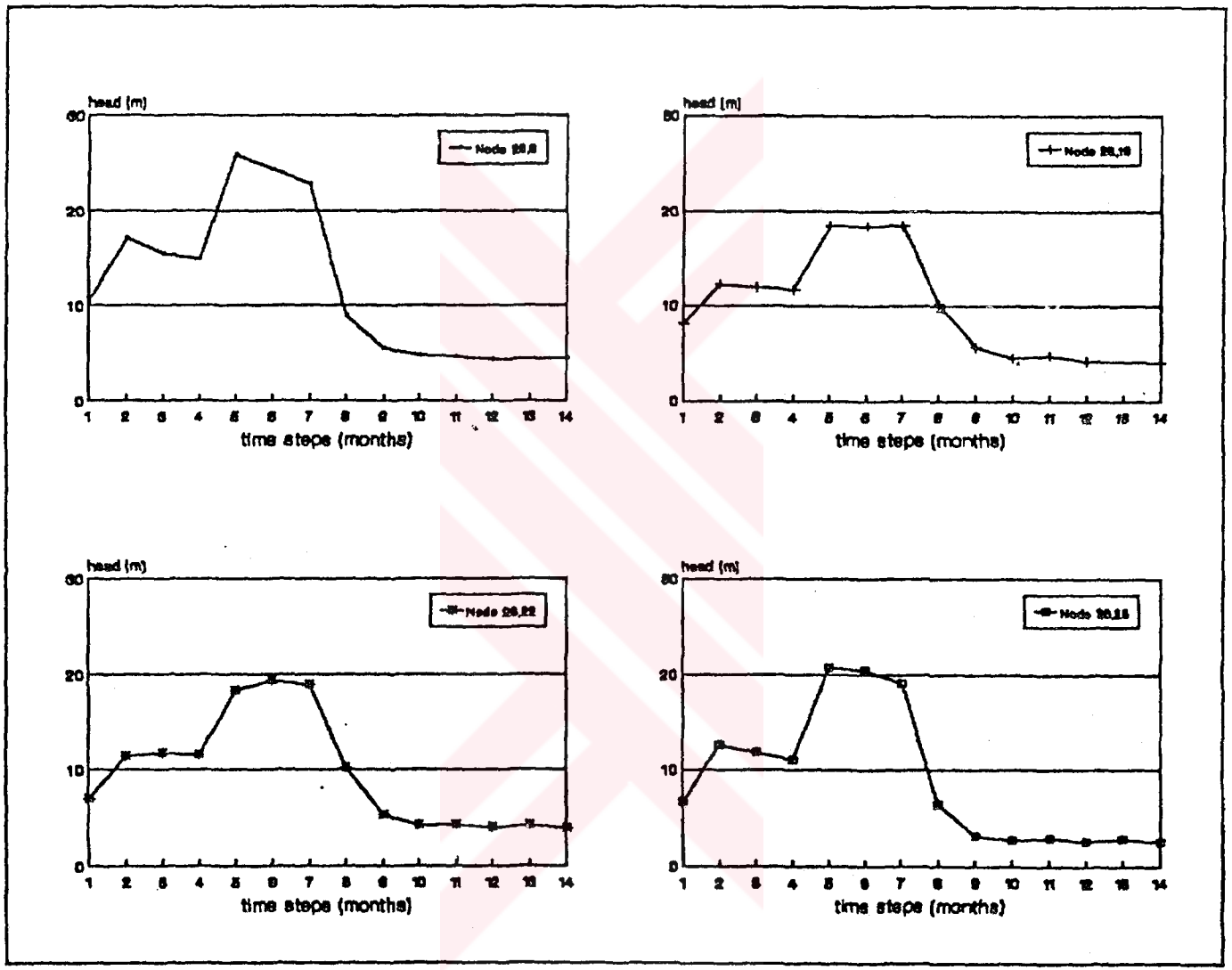


Figure 4.6. Time-Head Distribution Throughout the Simulation
(for the nodes 26-03, 26-19, 26-22, 26-25)

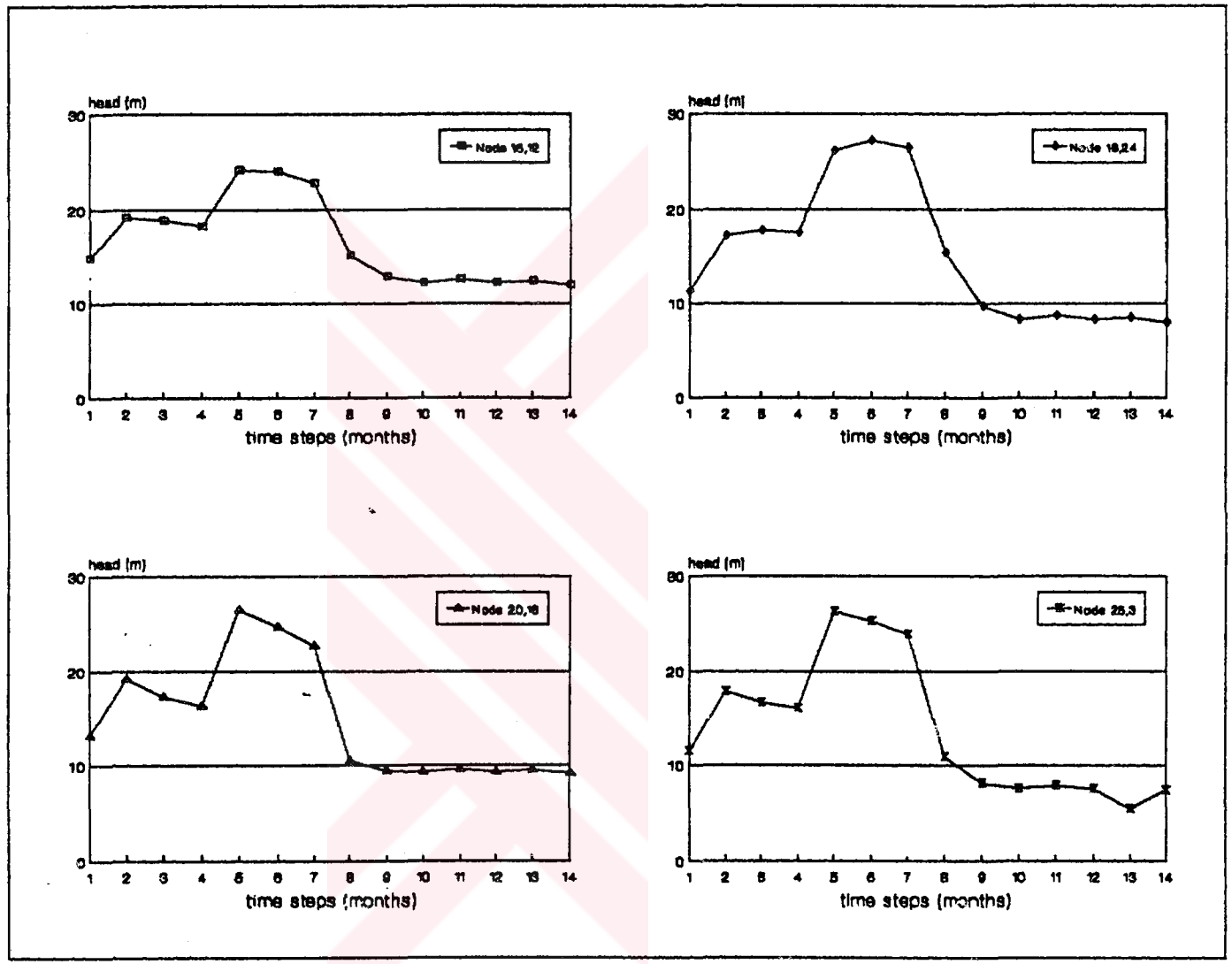


Figure 4.6. (Continue) Time-Head Distribution Throughout the Simulation (for the nodes 15-12, 18-24, 20-18, 25-03)

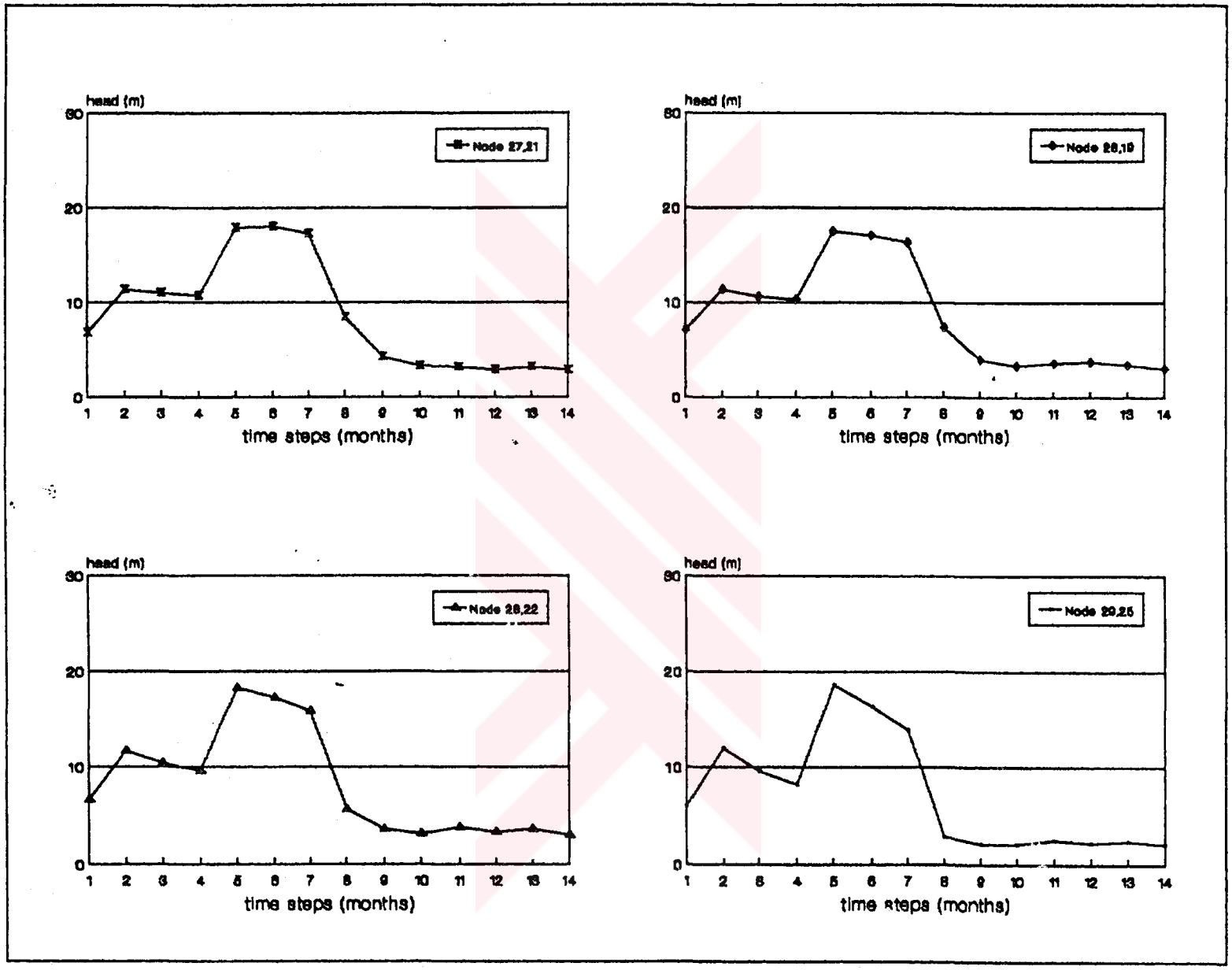


Figure 4.6. (Continue) Time-Head Distribution Throughout the Simulation (for the nodes 27,21, 28-19, 28-22, 29-25)

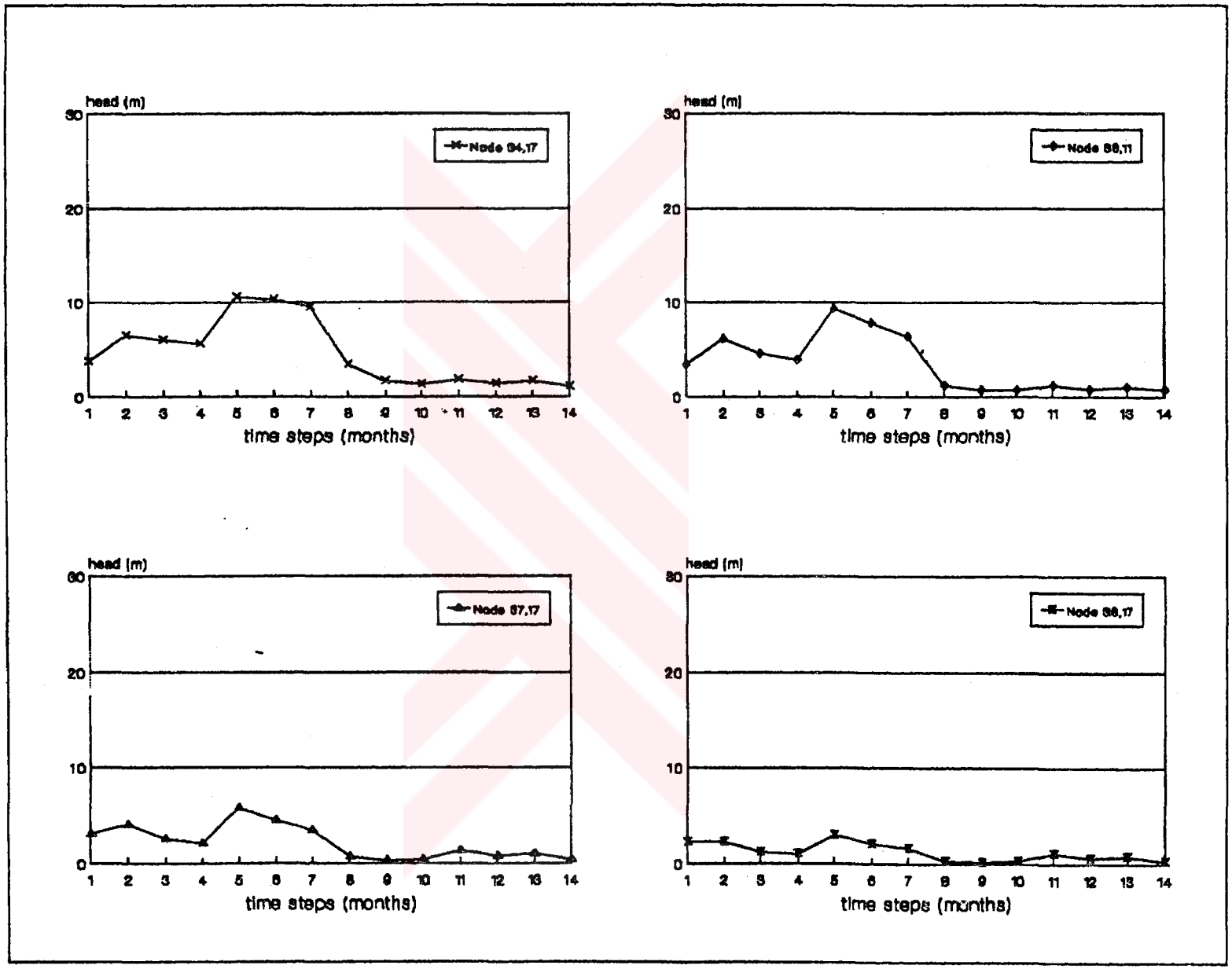


Figure 4.6. (Continue) Time-Head Distribution Throughout the Simulation (For the nodes 34-17, 36-11, 37-17, 38-17)

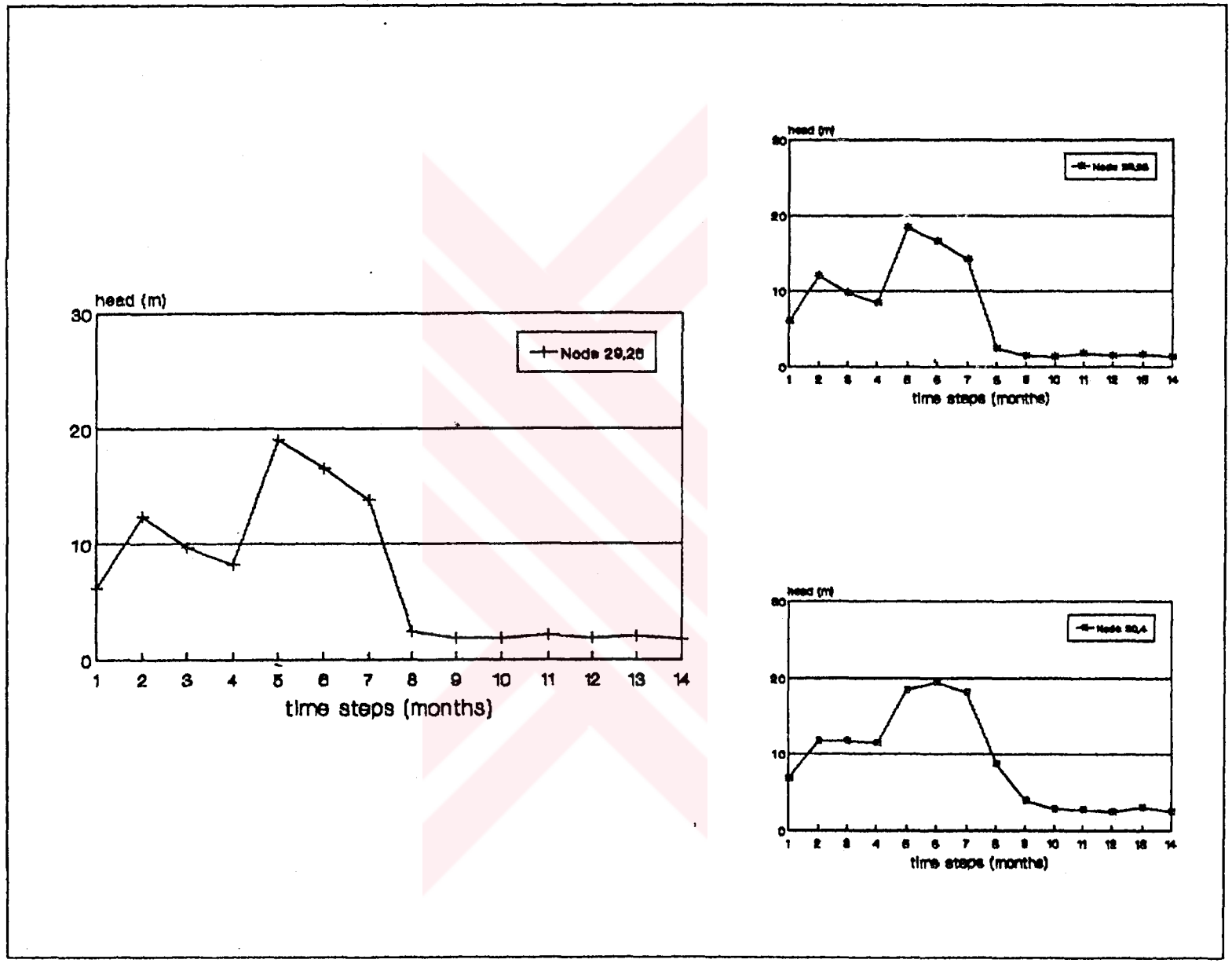


Figure 4.6. (Continue) Time-Head Distribution Throughout the Simulation (for the nodes 26-26, 29-28, 30-04)

4.4. Effect of Discharge Rates on the Groundwater System

The model has been re-executed by increasing the number and discharge rates of the wells to observe the influence of pumping on groundwater storage. The new pumping locations have been chosen arbitrarily, and different well distributions have been used.

An example of the pumping effects to the head distributions is given in Figure 4.7. In this scheme, the discharge rates of the existing wells have been doubled whereas for the new twenty wells are taken as pumpage rates of 30 l/s. Comparing the consequent head distribution with the calibrated distribution, any important deviation has not appeared.

It is concluded from different pumping schemes, the influence of the well discharge on the groundwater storage is not significant. Main reason cause the water level stability may be the recharge from irrigation water and Seyhan River in the drought season and recharge from precipitation in the wet season.

As it is explained in the previous section, interpretation of Figure 4.6. gives the same results with the above conclusions. Groundwater level never changes suddenly except for the 5th and 8th time steps. But this is because of the daily storm effect happened in January 1981. Because of this daily storm (340mm), groundwater level rise suddenly and return to its previous situation after three months.

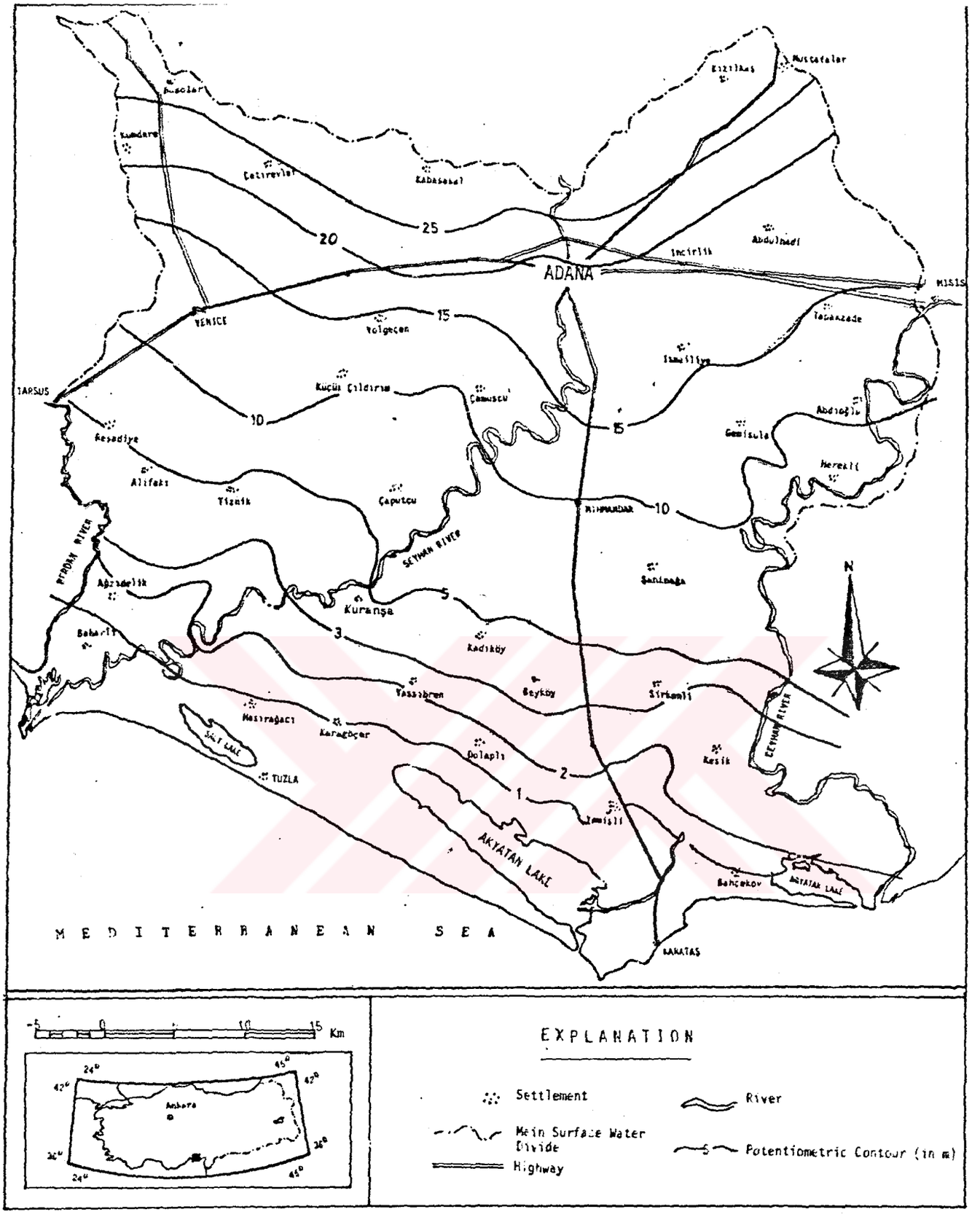


Figure 4.7. Potentiometric Contour Map Showing Pumping Effects on the Groundwater Storage (November 1981)

5. CONCLUSIONS AND RECOMMENDATIONS

The computer program used in this study has been created to determine the head distribution throughout the confined aquifers of the Adana Plain. The physical parameters, initial heads and boundary conditions of the basin are defined on the basis of available field data.

In groundwater model studies, the precise determination of the stress rates and of the aquifer's hydraulic structure increases the accuracy of the results. However, estimation of the recharge and discharge rates by using water balance approach is not satisfactory. During the calibration phase of this study, the recharge and discharge rates given in the previous studies came out to be far from accurate. The infiltration and evapotranspiration ratios have been adjusted in order to match the observed and simulated heads.

Describing the spatial distribution of the aquifer parameters is another important factor affecting the accuracy of the study. Insufficiency and scarcity of the available transmissivity and storage coefficient values complicate the calibration process. In the southern and western part of the study area, constant aquifer parameters were used. The deviations of the simulated head values from the observed values are considerably high in this part of the study area and any idea for the salt water enrichment from Mediterranean Sea could not be evidenced.

The annual change of the groundwater storage is very little. The difference between inflow and outflow through the model area is nearly zero. It can be concluded that, present exploitation does not exceed the safe yield. Accordingly, a detailed analysis of the pumping effects on the groundwater storage reveals that the present discharge rates can be increased.

A high correlation was achieved between the simulated and observed heads. Indeed, on some well locations, calculated and simulated heads are nearly same value. Because of the lack of long term measurements of groundwater level, the future heads could not be predicted. However, with updated level measurements, the prediction studies can be done.

Groundwater is mainly recharged by the precipitation, and Seyhan River. This effect is especially observed during the storm occur in January 1981 which cause the water level rise as soon as storm occurred. River recharge in this month also cause the water level rise. On the contrary, groundwater also recharges the surface water at the southern part of the plain. These effects are also observed from the volumetric budget given in appendix E. Recharge from constant heads increases up to seven times in comparison with the other months. Recharge from river is also cause the water level rise in this month.

Groundwater explotation can be increased, but this may cause changes in the groundwater chemical quality, since some

industries discharge their wastewater to the river by drainage canals. Thus, monitoring the groundwater quality is of special importance as to the groundwater pollution in the area.

It is recommended that water level measurements to be taken continuously and the aquifer characteristics to be estimated by means of pumping tests where the data are insufficient.

The Quaternary geology of the Adana plain is highly complex. The distribution of various lithological units throughout the basin, specifically the permeable and impermeable deposits, normally requires detailed geological field studies. Based on the result of the studies the hydrogeological characteristics of the basin must be re-evaluated.

In this study the aquifer is assumed to be confined. However, the possibility of semi-confined and/or unconfined aquifer conditions may also be considered.

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APPENDICES

APPENDIX A

GENERAL INFORMATION ABOUT THE MODEL AREA

********** FINITE DIFFERENCE MODEL OF THE ADANA PLAIN **********

1 Layers 39 Rows 30 Columns

14 Stress Period(s) in Simulation

Model Time Unit is Days

TRANSIENT SIMULATION

LAYER	AQUIFER TYPE
1	CONFINED-T & S constant

Maximum of101 Wells
Recharge to the top layer
Evapotranspiration from top layer
Maximum of 100 River nodes
Maximum of 100 Iterations allowed for closure
6 Iteration Parameters

CELL WIDTH ALONG ROW, DELR (m)

500.00	2000.00	1500.00	2000.00	1500.00	1000.00
1000.00	1500.00	1500.00	500.00	1000.00	1000.00
1000.00	1000.00	1000.00	1000.00	1500.00	2500.00
1000.00	1000.00	3500.00	1000.00	1500.00	1000.00
2500.00	1500.00	1500.00	1000.00	2000.00	1500.00

CELL WIDTH ALONG COLUMN, DELC(m)

500.00	1000.00	1000.00	1000.00	1000.00	1000.00
1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
1000.00	1500.00	1000.00	2000.00	1000.00	500.00
1000.00	500.00	2000.00	2000.00	1500.00	1000.00
1500.00	3000.00	1000.00	1000.00	1000.00	1000.00
1500.00	1000.00	1500.00	1000.00	1500.00	1000.00
1000.00	1000.00	500.00			

Solution by the Strongly Implicit Procedure

Maximum iterations allowed for closure = 100
Acceleration parameter = .70000
Head change criterion for closure = .10000E+00
SIP head change printout interval = 5
6 Iteration Parameters calculated from specified WSEED = .00090000 :
.0000000E+00 .7540491E+00 .9395081E+00
.9851220E+00 .9963408E+00 .9991000E+00

BOUNDARY ARRAYS

	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
1	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	0	0	0	0
2	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	0	0	0	0
3	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	0	0	0	0
4	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	0	0	0
5	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	0	0	0
6	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	0	0	0
7	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	0	0	0	0
8	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	0	0	0	0
9	1	1	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
10	1	1	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
11	1	1	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
12	1	1	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
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22	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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31	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
32	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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35	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
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37	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
38	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
39	-1	-1	-1	-1	-1	-1	-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) NO-FLOW NODES (1) ACTIVE NODES (-1) CONSTANT-HEAD NODES

80 RIVER REACHES

VER REACH	ROW	COL	STAGE	CONDUCTANCE	BOTTOM ELEV.	RIVER REACH	ROW	COL	STAGE	CONDUCTANCE	BOTTOM ELEV.
1	1	8	49.00	89.40	46.00	41	22	15	21.00	21.60	18.00
2	1	9	49.00	43.20	46.00	42	23	14	7.730	86.40	4.730
3	2	9	49.00	59.40	46.00	43	24	13	7.090	48.60	4.090
4	3	9	29.00	97.20	26.00	44	24	14	7.180	54.00	4.180
5	4	9	40.30	97.20	37.00	45	25	13	6.630	108.0	3.630
6	4	10	28.00	21.60	25.00	46	26	12	5.850	70.20	2.850
7	5	11	24.00	70.20	21.00	47	26	13	5.610	102.6	2.610
8	6	12	22.33	59.40	19.33	48	27	11	4.420	43.02	1.420
9	7	12	21.29	59.40	18.29	49	27	12	5.050	54.00	2.050
10	8	13	20.99	54.00	17.99	50	27	13	4.570	18.80	1.570
11	9	13	19.82	70.20	16.82	51	28	10	4.190	16.20	1.190
12	9	14	19.12	21.60	16.12	52	28	11	4.000	59.40	1.000
13	10	14	18.10	5.400	15.10	53	29	8	3.820	10.80	.8200
14	11	14	117.1	37.80	14.09	54	29	9	3.890	59.40	.8900
15	11	15	17.03	43.02	14.03	55	29	10	3.850	37.80	.8500
16	12	15	16.29	32.40	13.29	56	29	11	4.000	86.40	1.000
17	12	16	16.58	59.40	13.58	57	30	8	3.000	27.00	.0000
18	12	17	17.61	108.0	14.61	58	30	9	3.560	48.60	.5600
19	13	16	15.52	48.60	12.52	59	30	11	3.710	21.60	.7100
20	13	17	16.70	54.00	13.70	60	31	6	3.200	75.60	.2000
21	14	16	14.50	86.40	11.50	61	31	7	3.210	54.00	.2100
22	14	17	15.51	91.80	12.51	62	31	8	3.000	124.2	.0000
23	15	16	12.88	54.00	9.880	63	32	6	3.200	64.80	.2000
24	15	17	14.42	81.00	11.42	64	33	5	2.730	27.00	.0000
25	16	15	11.50	108.0	8.500	65	33	6	2.990	59.40	.0000
26	16	16	11.50	54.00	8.500	66	34	4	3.000	10.80	.0000
27	16	17	13.05	97.20	10.05	67	34	5	2.500	81.00	.0000
28	17	13	10.74	48.60	7.740	68	34	6	2.750	43.20	.0000
29	17	14	11.04	81.00	8.040	69	35	4	3.000	54.00	.0000
30	17	15	11.25	97.20	8.250	70	35	5	2.270	140.4	.0000
31	18	14	10.68	27.00	7.680	71	35	6	2.650	54.00	.0000
32	18	15	10.89	37.80	7.890	72	36	4	3.000	70.20	.0000
33	19	13	10.10	75.60	7.100	73	36	5	2.060	102.6	.0000
34	19	14	10.36	59.40	7.360	74	37	3	3.000	21.60	.0000
35	19	15	10.53	75.60	7.530	75	37	4	3.000	183.6	.0000
36	20	13	9.760	48.60	6.760	76	37	5	3.000	10.80	.0000
37	21	14	9.450	113.4	6.450	77	38	3	3.000	54.00	.0000
38	21	15	9.560	118.8	6.560	78	38	4	3.000	81.00	.0000
39	22	13	8.410	64.80	5.410	79	38	5	3.000	5.400	.0000
40	22	14	8.540	78.02	5.540	80	39	3	3.000	54.00	.0000

APPENDIX B

TRANSMISSIVITY AND STORAGE COEFFICIENT DISTRIBUTION

TRANSMISSIVITY DISTRIBUTION

	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
1	0.	0.	0.	0.	0.	0.	0.	1000.	1000.	1000.	1000.	1000.	1000.	1000.	1000.	1000.	1000.	1000.	1000.	1000.	800.	800.	600.	900.	600.	600.	500.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	2500.	2500.	2500.	2500.	2000.	2000.	2000.	2000.	2000.	2000.	1800.	1500.	1500.	1200.	1000.	800.	600.	600.	600.	500.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	2500.	2500.	2500.	2000.	2500.	2000.	2000.	2000.	2000.	2000.	2000.	1800.	1700.	1500.	1200.	1000.	700.	600.	500.	500.	500.	0.	0.	0.
4	0.	0.	0.	0.	0.	2900.	2500.	2500.	2000.	2000.	2500.	2000.	2000.	2000.	2000.	2000.	2000.	1800.	1700.	1600.	1300.	1000.	900.	800.	700.	500.	500.	500.	0.	0.
5	0.	0.	0.	0.	2000.	2000.	2000.	2000.	2000.	2000.	2500.	2000.	2000.	2000.	2000.	2000.	1800.	1950.	1500.	1500.	1450.	1200.	900.	700.	600.	500.	500.	600.	0.	0.
6	0.	0.	0.	2100.	2000.	2000.	2000.	2000.	2000.	3150.	2500.	2000.	2000.	1900.	1800.	1500.	1500.	1500.	1500.	1750.	1450.	1300.	900.	700.	600.	650.	550.	550.	0.	0.
7	0.	0.	950.	950.	2850.	2750.	2750.	2850.	2500.	2500.	2500.	2000.	2000.	1900.	1800.	1700.	1750.	1650.	1500.	1350.	1400.	1300.	900.	950.	650.	650.	0.	0.	0.	0.
8	0.	0.	950.	950.	2850.	2750.	2200.	2000.	2000.	2500.	2000.	2000.	2000.	2000.	1800.	1600.	1600.	1600.	1500.	1300.	1400.	1500.	900.	700.	550.	350.	0.	0.	0.	0.
9	950.	950.	950.	950.	2850.	1000.	1500.	2000.	2000.	2900.	2000.	2000.	2000.	2000.	1700.	1550.	1450.	1600.	1500.	1400.	1400.	1500.	900.	600.	550.	400.	0.	0.	0.	0.
10	950.	950.	950.	1750.	1800.	1500.	2000.	2000.	2000.	2000.	2000.	2000.	2000.	1760.	1600.	1500.	1300.	1250.	1200.	1200.	1300.	1000.	1000.	1000.	1000.	700.	0.	0.	0.	0.
11	1000.	1600.	1200.	1200.	1200.	1500.	1500.	1500.	1500.	1500.	1500.	1500.	1500.	1400.	1400.	1375.	1425.	1300.	1000.	1000.	1000.	1000.	1000.	1000.	1000.	600.	0.	0.	0.	0.
12	1600.	1500.	1500.	1500.	1500.	2000.	2000.	2000.	2000.	2000.	1800.	1500.	1000.	950.	900.	750.	950.	800.	1000.	1200.	1300.	1000.	1000.	1000.	1000.	500.	0.	0.	0.	0.
13	1600.	1250.	1250.	1550.	1000.	2000.	2000.	2000.	2000.	1500.	1400.	800.	950.	950.	950.	950.	800.	1000.	1300.	1500.	1500.	1000.	1000.	1000.	1000.	0.	0.	0.	0.	0.
14	1600.	1500.	1500.	1350.	1200.	2000.	2000.	2000.	1500.	900.	950.	800.	1000.	1000.	1000.	1000.	1200.	1500.	1500.	1500.	1000.	1000.	1000.	1100.	1100.	0.	0.	0.	0.	0.
15	1400.	1500.	1250.	1250.	1500.	1500.	1500.	1000.	800.	950.	950.	1000.	1200.	1500.	1500.	1500.	1500.	1500.	1500.	1500.	1000.	1000.	1000.	1200.	1100.	1000.	0.	0.	0.	0.
16	1400.	1500.	1750.	1500.	1500.	1500.	1300.	1200.	800.	950.	950.	800.	1200.	1500.	1500.	1500.	1500.	1500.	1500.	1500.	1000.	1000.	1000.	1000.	1000.	1000.	900.	0.	0.	0.
17	1850.	1500.	1750.	2000.	2000.	2000.	1900.	1000.	700.	950.	950.	950.	1100.	1500.	1500.	1500.	1500.	1500.	1500.	1000.	1000.	700.	1000.	1000.	1000.	1000.	900.	900.	900.	0.	0.
18	1000.	1500.	2000.	2000.	2000.	2000.	1600.	1000.	850.	650.	650.	650.	650.	1000.	1500.	1500.	1500.	1500.	1500.	1000.	650.	500.	700.	900.	900.	550.	550.	900.	900.	0.	0.
19	1000.	1500.	2000.	2000.	2000.	2000.	1700.	1100.	900.	650.	650.	650.	900.	1500.	1500.	1500.	1500.	1500.	1500.	1000.	650.	600.	600.	650.	650.	900.	900.	250.	150.	50.	0.
20	1900.	1500.	2000.	2000.	2000.	1900.	1600.	1300.	900.	700.	650.	650.	650.	1000.	1500.	1500.	1500.	1500.	1500.	1500.	650.	600.	670.	650.	650.	900.	650.	650.	650.	600.	0.
21	1900.	1200.	2000.	1600.	2000.	1800.	1400.	1300.	1200.	1000.	800.	650.	650.	800.	1500.	1500.	1500.	1500.	1500.	1500.	1000.	550.	650.	650.	650.	600.	600.	600.	600.	600.	600.
22	1900.	1500.	1600.	1400.	1900.	1700.	1500.	1400.	1300.	1100.	1000.	650.	650.	650.	800.	1300.	1500.	1500.	1500.	1000.	600.	650.	650.	600.	600.	600.	650.	650.	650.	650.
23	1900.	1500.	1400.	1200.	1300.	1600.	1500.	1500.	1300.	900.	650.	600.	600.	650.	800.	1100.	1500.	1500.	1500.	1200.	1000.	650.	650.	600.	600.	600.	600.	650.	650.	650.
24	1500.	1500.	1300.	1100.	1230.	1650.	1400.	1200.	1000.	800.	650.	650.	600.	650.	800.	1200.	1500.	1500.	1500.	1500.	1500.	650.	650.	650.	600.	600.	600.	650.	650.	650.
25	1200.	1200.	1100.	1000.	1300.	1450.	1400.	1300.	1000.	900.	700.	650.	650.	650.	1000.	1300.	1500.	1500.	1500.	1500.	1400.	1000.	650.	650.	650.	650.	650.	650.	650.	650.
26	1100.	1000.	900.	1000.	1000.	1400.	1300.	1000.	800.	650.	650.	650.	650.	800.	1200.	1600.	1800.	1900.	2000.	2000.	1600.	850.	550.	650.	500.	500.	500.	650.	650.	650.
27	1000.	700.	800.	900.	900.	850.	800.	700.	650.	650.	650.	650.	650.	800.	1100.	1500.	1500.	1500.	1500.	1000.	900.	800.	700.	550.	450.	350.	300.	350.	300.	400.
28	1000.	650.	700.	800.	800.	800.	700.	650.	650.	650.	650.	650.	650.	800.	1100.	1500.	1500.	1500.	1250.	900.	850.	650.	650.	550.	650.	650.	650.	600.	600.	600.
29	650.	650.	600.	700.	700.	700.	650.	650.	650.	650.	650.	650.	650.	800.	1100.	1400.	1500.	1500.	1000.	900.	850.	600.	550.	650.	650.	650.	650.	600.	650.	650.
30	650.	650.	600.	800.	600.	650.	650.	650.	650.	650.	650.	650.	650.	800.	1000.	1200.	1500.	1500.	1000.	900.	850.	550.	550.	650.	650.	650.	650.	650.	650.	650.
31	650.	650.	650.	650.	650.	650.	650.	650.	650.	650.	650.	650.	650.	800.	1000.	1200.	1400.	1000.	900.	700.	650.	650.	650.	650.	650.	600.	600.	650.	650.	650.
32	650.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	1000.	1250.	1000.	900.	600.	700.	700.	700.	700.	600.	600.	600.	600.	600.
33	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	700.	1000.	800.	700.	700.	700.	700.	700.	600.	600.	600.	600.	600.	600.
34	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.
35	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.
36	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	650.	650.	650.	650.	650.	650.	650.	650.	650.	650.	650.
37	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.
38	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.
39	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.	600.

PRIMARY STORAGE COEFFICIENT

	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
1	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
2	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.2583	.2572	.2529	.2529	.2534	.1829	.1705	.1905	.2288	.2183	.0050	.0050	.0050	.0050	.0050	.0010	.0010	.0010	.0010	.0010	.0000	.0000	.0000
3	.0000	.0000	.0000	.0000	.0000	.0000	.2569	.2576	.2572	.2529	.2524	.2538	.1524	.1707	.2032	.2405	.2591	.0050	.0050	.0050	.0050	.0040	.0010	.0010	.0010	.0010	.0010	.0000	.0000	.0000
4	.0000	.0000	.0000	.0000	.0000	.2529	.2529	.2575	.2572	.2534	.2524	.2581	.1321	.1524	.1905	.2286	.2591	.0050	.0050	.0050	.0050	.0010	.0010	.0010	.0010	.0010	.0010	.0010	.0100	.0000	.0000
5	.0000	.0000	.0000	.0000	.2529	.2529	.2529	.2580	.2576	.2598	.2585	.2514	.1219	.1524	.1524	.2286	.0247	.0050	.0050	.0050	.0050	.0010	.0010	.0010	.0010	.0010	.0010	.0010	.0010	.0000	.0000
6	.0000	.0000	.0000	.1201	.2529	.2529	.2529	.2510	.2581	.2546	.2546	.2576	.1524	.0610	.1067	.2032	.2405	.0050	.0020	.0010	.0010	.0010	.0000	.0005	.0000	.0001	.0001	.0001	.0000	.0000
7	.0000	.0000	.3048	.1021	.2597	.2582	.2253	.2588	.2586	.2546	.2587	.2592	.1158	.0792	.0116	.0120	.0015	.0050	.0050	.0010	.0010	.0010	.0010	.0005	.0010	.0010	.0000	.0000	.0000	.0000
8	.0000	.0000	.1048	.1021	.2586	.2580	.2319	.2534	.2581	.2565	.2567	.2568	.0100	.0122	.0152	.0152	.0065	.0050	.0050	.0013	.0011	.0010	.0013	.0008	.0013	.0010	.0000	.0000	.0000	.0000
9	.0039	.0048	.1048	.1021	.2533	.2581	.2438	.2525	.2518	.2516	.2516	.2516	.0054	.0055	.0018	.0015	.0010	.0012	.0050	.0021	.0011	.0007	.0010	.0038	.0017	.0018	.0008	.0000	.0000	.0000
10	.0020	.0028	.0038	.0010	.0032	.0046	.0050	.0046	.0036	.0032	.0042	.0032	.0054	.0056	.0011	.0010	.0012	.0012	.0021	.0021	.0011	.0012	.0015	.0024	.0019	.0011	.0000	.0000	.0000	.0000
11	.0018	.0012	.0010	.0053	.0040	.0046	.0040	.0034	.0032	.0032	.0042	.0038	.0060	.0051	.0001	.0010	.0010	.0011	.0010	.0011	.0011	.0024	.0023	.0021	.0015	.0019	.0000	.0000	.0000	.0000
12	.0019	.0018	.0028	.0041	.0038	.0029	.0032	.0042	.0032	.0038	.0033	.0061	.0061	.0055	.0046	.0020	.0010	.0002	.0011	.0002	.0011	.0022	.0021	.0020	.0019	.0019	.0000	.0000	.0000	.0000
13	.0016	.0016	.0026	.0036	.0021	.0008	.0030	.0044	.0032	.0036	.0072	.0061	.0061	.0061	.0012	.0020	.0010	.0000	.0010	.0009	.0010	.0017	.0020	.0020	.0020	.0000	.0000	.0000	.0000	.0000
14	.0013	.0011	.0011	.0026	.0046	.0067	.0038	.0046	.0038	.0050	.0079	.0061	.0061	.0061	.0010	.0015	.0009	.0000	.0000	.0000	.0027	.0025	.0025	.0017	.0019	.0000	.0000	.0000	.0000	.0000
15	.0016	.0013	.0011	.0016	.0016	.0040	.0050	.0049	.0066	.0073	.0073	.0068	.0020	.0020	.0030	.0030	.0010	.0010	.0010	.0010	.0026	.0032	.0017	.0021	.0030	.0029	.0000	.0000	.0000	.0000
16	.0046	.0012	.0011	.0021	.0017	.0052	.0051	.0049	.0049	.0056	.0073	.0021	.0033	.0037	.0036	.0033	.0025	.0010	.0010	.0014	.0019	.0060	.0058	.0029	.0020	.0012	.0004	.0000	.0000	.0000
17	.0046	.0010	.0048	.0044	.0030	.0045	.0061	.0061	.0011	.0010	.0007	.0025	.0031	.0033	.0032	.0033	.0020	.0010	.0010	.0037	.0012	.0043	.0051	.0050	.0045	.0034	.0024	.0015	.0000	.0000
18	.0042	.0041	.0037	.0042	.0039	.0043	.0061	.0061	.0010	.0010	.0069	.0079	.0023	.0025	.0026	.0026	.0014	.0016	.0010	.0010	.0046	.0050	.0036	.0030	.0051	.0066	.0068	.0065	.0000	.0000
19	.0040	.0037	.0037	.0038	.0043	.0043	.0021	.0061	.0000	.0012	.0012	.0001	.0014	.0016	.0019	.0021	.0013	.0013	.0010	.0010	.0027	.0034	.0028	.0046	.0056	.0060	.0070	.0080	.0090	.0000
20	.0037	.0037	.0037	.0037	.0044	.0030	.0032	.0061	.0039	.0029	.0010	.0076	.0050	.0010	.0013	.0070	.0012	.0005	.0016	.0015	.0014	.0023	.0040	.0056	.0056	.0070	.0070	.0086	.0094	.0000
21	.0037	.0037	.0037	.0037	.0039	.0044	.0044	.0046	.0024	.0013	.0011	.0067	.0046	.0051	.0055	.0070	.0050	.0010	.0045	.0045	.0010	.0011	.0051	.0060	.0052	.0030	.0020	.0040	.0040	.0030
22	.0037	.0037	.0037	.0053	.0029	.0022	.0040	.0040	.0034	.0013	.0013	.0023	.0090	.0062	.0081	.0070	.0084	.0011	.0013	.0011	.0011	.0018	.0049	.0051	.0039	.0017	.0010	.0017	.0062	.0000
23	.0037	.0037	.0037	.0065	.0070	.0069	.0066	.0063	.0057	.0030	.0013	.0033	.0053	.0043	.0043	.0060	.0061	.0012	.0050	.0030	.0049	.0030	.0030	.0030	.0016	.0020	.0010	.0012	.0011	.0030
24	.0017	.0020	.0017	.0020	.0032	.0047	.0032	.0067	.0057	.0043	.0087	.0040	.0041	.0040	.0050	.0060	.0072	.0072	.0080	.0070	.0043	.0015	.0050	.0045	.0021	.0021	.0014	.0013	.0011	.0070
25	.0017	.0017	.0020	.0015	.0027	.0042	.0035	.0040	.0039	.0014	.0046	.0058	.0077	.0087	.0090	.0090	.0090	.0075	.0056	.0027	.0026	.0010	.0015	.0030	.0027	.0060	.0016	.0012	.0010	.0070
26	.0017	.0012	.0012	.0012	.0035	.0047	.0049	.0032	.0025	.0020	.0010	.0017	.0070	.0076	.0081	.0084	.0020	.0023	.0024	.0096	.0077	.0055	.0051	.0050	.0030	.0005	.0037	.0016	.0013	.0060
27	.0045	.0069	.0020	.0037	.0042	.0043	.0045	.0031	.0022	.0024	.0023	.0022	.0022	.0029	.0033	.0036	.0036	.0021	.0019	.0008	.0060	.0054	.0062	.0030	.0043	.0003	.0063	.0010	.0015	.0012
28	.0037	.0058	.0020	.0038	.0040	.0043	.0039	.0033	.0026	.0021	.0024	.0031	.0035	.0039	.0042	.0060	.0067	.0032	.0010	.0016	.0010	.0010	.0022	.0026	.0010	.0010	.0020	.0021	.0011	.0016
29	.0037	.0069	.0020	.0037	.0042	.0042	.0042	.0035	.0028	.0024	.0038	.0041	.0045	.0049	.0060	.0060	.0067	.0039	.0028	.0016	.0013	.0016	.0015	.0019	.0019	.0013	.0021	.0011	.0061	.0010
30	.0037	.0037	.0041	.0054	.0052	.0042	.0042	.0041	.0036	.0057	.0051	.0054	.0065	.0065	.0069	.0060	.0067	.0066	.0038	.0030	.0012	.0017	.0019	.0024	.0029	.0016	.0017	.0017	.0034	.0022
31	.0037	.0037	.0042	.0051	.0051	.0041	.0040	.0040	.0034	.0040	.0050	.0053	.0065	.0066	.0069	.0069	.0067	.0066	.0050	.0043	.0014	.0010	.0020	.0021	.0013	.0015	.0031	.0036	.0034	.0024
32	.0037	.0037	.0037	.0040	.0039	.0039	.0039	.0032	.0030	.0037	.0046	.0051	.0065	.0060	.0060	.0069	.0067	.0065	.0065	.0053	.0045	.0010	.0019	.0010	.0015	.0021	.0031	.0035	.0035	.0023
33	.0037	.0037	.0012	.0024	.0038	.0038	.0035	.0033	.0030	.0036	.0037	.0038	.0063	.0060	.0070	.0066	.0067	.0065	.0062	.0061	.0048	.0010	.0010	.0010	.0016	.0022	.0035	.0035	.0035	.0035
34	.0037	.0048	.0013	.0026	.0034	.0036	.0036	.0034	.0029	.0034	.0034	.0036	.0042	.0061	.0059	.0051	.0049	.0062	.0061	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
35	.0045	.0059	.0014	.0028	.0035	.0037	.0036	.0034	.0030	.0033	.0031	.0025	.0052	.0047	.0042	.0040	.0043	.0055	.0058	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
36	.0067	.0086	.0016	.0028	.0035	.0037	.0037	.0037	.0032	.0032	.0032	.0033	.0032	.0034	.0033	.0037	.0044	.0051	.0055	.0056	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
37	.0089	.0011	.0018	.0027	.0033	.0037	.0037	.0037	.0033	.0033	.0034	.0038	.0019	.0023	.0027	.0032	.0034	.0050	.0053	.0054	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
38	.0011	.0013	.0019	.0026	.0037	.0037	.0037	.0037	.0031	.0032	.0033	.0032	.0026	.0025	.0024	.0029	.0032	.0050	.0052	.0053	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
39	.0012	.0015	.0020	.0026	.0037	.0037	.0000	.0000	.0000	.0000	.0000	.0000	.0027	.0026	.0026	.0028	.0031	.0032	.0052	.0053	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

APPENDIX C

EVAPOTRANSPIRATION SURFACE ELEVATION AND INITIAL HEAD DISTRIBUTION

ET SURFACE ELEVATION (m)

	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
1	.00	.00	.00	.00	.00	.00	.00	50.00	50.00	50.00	46.50	50.00	50.00	50.00	50.00	50.00	50.00	50.00	45.00	45.00	40.00	25.00	18.23	17.24	15.85	12.50	11.86	.00	.00	.00
2	.00	.00	.00	.00	.00	.00	.00	50.00	50.00	33.00	40.00	33.00	34.00	34.00	40.00	40.00	40.00	45.00	35.00	50.00	40.00	21.32	16.67	13.00	13.00	12.65	11.64	.00	.00	.00
3	.00	.00	.00	.00	.00	.00	60.00	50.00	38.00	32.00	32.00	30.20	30.24	34.70	31.96	33.00	40.00	35.00	30.00	50.00	25.00	17.97	13.00	12.39	12.03	11.83	11.30	.00	.00	.00
4	.00	.00	.00	.00	.00	70.00	60.00	50.00	41.35	29.00	25.00	25.00	25.00	26.34	27.61	29.20	30.00	30.00	30.00	50.00	25.00	12.45	12.26	11.00	11.79	11.49	11.00	11.00	.00	.00
5	.00	.00	.00	.00	60.00	50.00	50.00	36.11	29.41	25.00	25.00	24.37	23.00	24.19	24.40	25.00	25.00	25.00	30.00	25.44	20.00	12.14	11.81	11.45	10.93	10.43	10.66	9.70	.00	.00
6	.00	.00	.00	70.00	50.00	46.32	36.76	25.00	24.16	23.86	23.62	23.33	22.95	23.17	23.54	23.94	24.09	24.25	50.00	50.00	12.50	12.00	11.70	11.53	11.19	10.82	10.36	9.50	.00	.00
7	.00	.00	70.00	60.00	50.00	35.94	25.00	23.99	22.50	22.44	22.50	22.29	21.97	22.15	22.50	22.00	23.17	24.50	50.00	50.00	14.00	12.50	13.00	13.00	11.97	10.49	.00	.00	.00	.00
8	.00	.00	70.00	50.00	38.16	25.00	23.70	22.17	20.65	21.02	21.10	21.25	21.99	21.14	21.46	21.02	22.26	25.00	50.00	50.00	12.50	24.00	23.00	50.00	40.00	10.16	.00	.00	.00	.00
9	70.00	70.00	60.00	50.00	36.90	25.00	21.55	19.00	19.17	19.60	19.87	20.21	20.02	20.12	20.42	20.76	21.35	22.96	35.00	24.26	21.03	14.00	15.00	50.00	11.47	8.53	.00	.00	.00	.00
10	70.00	60.00	50.00	41.07	30.77	23.75	21.36	18.53	17.56	18.32	18.55	19.17	19.04	19.10	19.37	19.70	17.33	20.04	25.00	24.09	20.40	16.79	15.06	13.10	10.69	7.68	.00	.00	.00	.00
11	60.00	50.00	42.00	32.14	25.00	22.20	19.72	16.59	15.03	16.76	17.24	18.13	18.02	18.09	18.33	18.64	19.52	19.77	22.45	21.20	18.00	16.39	14.99	13.69	11.00	9.15	.00	.00	.00	.00
12	50.00	39.73	33.33	25.00	23.61	20.42	19.00	15.20	14.17	15.34	15.92	17.00	17.04	17.07	17.29	17.50	18.61	18.70	19.89	17.47	14.75	13.00	12.50	12.35	12.14	8.02	.00	.00	.00	.00
13	50.00	40.10	36.00	22.16	20.83	19.16	16.25	13.61	12.50	13.92	14.60	16.04	16.11	16.06	16.25	16.52	17.70	17.63	17.35	13.50	12.50	12.02	12.03	11.85	11.70	.00	.00	.00	.00	.00
14	31.50	32.69	25.00	13.69	17.36	17.90	14.72	12.50	12.04	12.50	12.89	14.79	14.04	14.04	15.00	15.15	16.51	16.35	14.20	12.50	12.75	11.55	11.47	11.25	11.13	.00	.00	.00	.00	.00
15	31.25	25.00	22.06	14.63	15.27	13.30	14.69	12.50	11.50	11.90	12.50	14.52	13.67	13.52	13.70	13.00	15.42	14.95	12.17	11.91	11.25	11.05	10.92	10.65	10.65	10.39	.00	.00	.00	.00
16	25.00	39.00	19.61	14.72	12.02	12.50	12.50	12.11	11.09	11.37	11.95	12.22	12.24	12.50	12.50	12.50	14.05	13.35	13.47	11.19	10.63	10.43	10.17	9.90	9.93	9.40	9.33	.00	.00	.00
17	23.22	17.92	14.95	15.10	11.29	12.11	12.20	11.34	11.00	10.85	11.35	11.65	11.74	12.04	12.25	12.50	12.50	12.21	11.30	11.20	8.89	8.17	9.52	11.00	9.27	8.35	7.76	7.26	.00	.00
18	21.44	17.00	13.00	13.50	10.93	11.66	11.76	10.93	10.20	10.47	11.06	11.37	11.42	11.60	11.09	12.10	12.12	11.70	10.40	10.00	9.69	9.54	9.17	10.19	8.93	7.86	8.61	7.42	.00	.00
19	20.50	14.34	12.50	12.50	10.56	11.27	11.32	10.51	10.04	10.29	11.00	11.00	11.10	11.36	11.53	11.72	11.61	11.35	10.00	9.00	9.37	9.23	8.82	11.04	8.60	7.36	7.09	7.63	7.34	.00
20	20.90	14.67	12.00	9.60	10.20	10.02	22.00	10.00	9.75	9.99	10.42	10.77	10.76	11.00	11.17	11.21	11.16	10.56	9.70	9.54	9.00	8.93	8.47	8.00	7.34	6.90	8.12	7.01	5.00	.00
21	19.64	15.62	12.00	11.06	9.60	10.15	10.14	10.41	9.33	9.50	9.91	10.24	12.31	10.45	10.56	10.37	10.40	10.19	9.19	8.97	10.27	8.43	7.93	7.40	7.62	6.05	7.11	6.52	4.79	5.00
22	16.13	16.07	12.50	9.76	7.24	9.03	7.00	8.31	8.63	8.79	9.20	9.47	9.41	9.54	9.30	9.14	9.13	9.04	8.21	9.00	7.71	7.66	6.91	6.40	6.70	4.45	4.45	4.76	4.39	5.44
23	12.50	12.50	11.67	8.72	7.01	8.02	7.95	7.32	9.55	8.07	6.26	8.71	8.64	8.73	5.30	10.20	8.05	8.06	8.00	14.00	6.52	6.09	7.16	10.00	6.07	5.30	4.35	4.46	4.04	7.50
24	11.46	11.50	11.46	7.00	7.10	7.35	6.30	6.65	7.57	7.63	7.79	8.22	8.09	8.10	10.21	7.20	7.10	10.21	7.42	7.27	6.46	6.39	7.90	5.00	5.50	5.50	4.09	4.25	3.77	4.57
25	10.10	10.66	8.74	8.90	6.55	6.62	6.40	5.99	7.11	7.21	7.29	7.70	7.63	7.64	8.14	6.60	9.00	6.50	6.44	6.36	5.92	5.09	5.00	5.00	6.00	4.93	4.79	4.03	3.51	7.41
26	7.01	9.53	4.00	5.77	6.47	5.39	5.41	5.00	6.41	6.31	6.23	6.05	6.61	6.59	6.45	5.00	14.61	5.40	6.01	5.14	5.00	5.02	5.00	6.20	3.90	4.76	3.35	3.60	3.06	7.33
27	5.63	7.17	5.00	6.43	4.17	4.00	4.79	4.23	5.60	5.56	5.42	6.05	5.57	5.60	5.40	4.05	4.41	4.54	4.53	4.49	4.20	4.70	4.67	3.94	4.20	4.14	2.93	3.34	2.65	2.77
28	5.00	6.69	5.00	6.00	3.10	3.10	4.64	4.91	5.20	5.19	5.00	5.64	9.42	5.23	5.00	4.71	4.12	4.23	5.67	4.20	4.00	5.90	4.30	3.66	3.50	3.72	2.72	3.16	2.44	2.53
29	4.74	5.00	4.13	5.20	4.51	4.53	4.51	4.02	4.09	4.05	5.00	5.24	5.00	4.02	4.71	4.36	3.02	3.93	3.90	3.07	3.70	4.03	3.96	3.40	4.00	3.36	2.49	3.00	2.24	2.32
30	4.56	5.94	4.66	3.40	4.35	4.30	4.37	4.57	4.56	4.53	4.71	4.00	4.59	4.46	4.30	4.01	3.53	4.30	3.59	3.57	3.40	3.70	3.20	2.90	2.96	3.00	2.26	3.50	2.04	2.13
31	4.30	7.32	5.44	3.20	4.03	4.20	4.21	4.00	4.13	4.09	4.35	4.41	4.12	4.02	3.93	3.50	3.36	3.22	3.21	3.12	2.43	2.64	3.20	2.71	2.40	2.54	1.90	5.74	1.30	7.30
32	4.05	6.91	2.60	3.15	3.94	3.99	4.03	3.52	3.69	3.62	4.00	4.74	3.60	3.57	3.43	3.19	2.79	2.05	2.01	2.79	2.10	2.29	2.70	2.37	2.00	2.33	1.69	5.32	1.53	.77
33	3.79	5.60	2.20	3.03	3.75	3.04	3.05	3.00	3.22	3.15	4.00	3.44	3.20	3.12	3.00	2.79	2.43	2.45	2.42	3.42	1.04	1.97	2.36	2.00	2.05	1.92	1.41	1.30	1.26	1.39
34	3.35	4.34	5.00	2.90	3.50	3.75	3.70	2.62	2.79	2.72	4.66	2.93	2.76	2.60	2.61	2.37	3.60	2.00	2.03	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
35	3.29	3.29	2.95	2.76	3.27	3.65	3.61	3.06	2.56	2.25	4.06	2.46	2.32	2.23	2.14	1.94	1.02	2.50	1.66	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
36	3.05	2.77	2.02	2.63	3.06	3.21	3.54	1.71	1.00	1.05	2.50	1.99	1.07	1.79	1.70	1.55	1.29	1.32	1.25	1.26	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
37	2.05	2.35	2.40	2.50	2.00	3.13	2.01	1.30	1.52	1.40	1.40	1.60	1.51	1.43	1.34	1.22	3.55	1.01	.94	.97	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
38	2.65	1.93	1.90	2.30	2.71	3.05	2.23	.93	1.16	1.09	1.11	1.21	1.14	7.02	1.00	.09	3.43	.70	.62	.64	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
39	2.50	1.65	1.50	2.32	2.50	2.99	.00	.00	.00	.00	.00	.00	.00	.71	.66	.51	.40	.39	.39	.43	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

EVAPOTRANSPIRATION RATE = .0026400

EXTINCTION DEPTH = 2.0000000

INITIAL HEADS (m)

	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
1	.00	.00	.00	.00	.00	.00	.00	27.00	26.00	25.00	25.00	24.00	22.00	21.00	20.00	19.00	18.00	18.00	16.00	16.00	16.00	13.00	12.00	12.00	11.00	10.00	.00	.00	.00	.00
2	.00	.00	.00	.00	.00	.00	.00	26.76	25.93	24.86	24.11	23.24	21.94	20.41	18.63	18.39	18.00	17.39	16.27	15.98	15.54	13.51	12.66	12.31	11.44	10.64	10.92	.00	.00	.00
3	.00	.00	.00	.00	.00	.00	26.42	26.01	24.96	24.00	23.38	22.51	21.12	19.61	18.14	17.93	16.90	16.06	16.16	15.84	15.22	13.79	13.10	12.65	11.85	11.23	11.10	.00	.00	.00
4	.00	.00	.00	.00	.00	26.44	26.24	25.65	24.10	23.15	22.39	21.55	20.50	19.35	10.11	16.92	16.55	16.40	15.96	15.65	14.90	13.91	13.35	12.97	12.20	11.57	11.44	11.41	.00	.00
5	.00	.00	.00	.00	26.30	25.99	25.52	24.54	22.52	21.42	20.79	20.14	19.62	19.00	17.60	16.03	16.52	16.21	15.73	15.43	14.77	13.95	13.47	13.10	12.45	11.07	11.55	11.45	.00	.00
6	.00	.00	.00	25.92	25.07	25.21	24.34	22.95	20.63	19.70	19.36	10.94	10.63	10.26	17.51	16.04	16.70	15.90	15.47	14.20	14.13	13.09	13.50	12.06	12.00	12.00	11.64	11.40	.00	.00
7	.00	.00	25.96	25.76	25.24	24.11	22.90	21.03	19.07	10.40	10.14	17.03	17.72	17.53	17.09	16.73	16.51	15.71	15.22	14.24	14.10	13.76	13.43	12.00	12.00	12.10	.00	.00	.00	.00
8	.00	.00	25.75	25.10	24.29	23.03	21.42	19.30	17.71	17.25	17.02	16.07	16.95	16.04	16.63	16.40	16.09	15.30	14.91	14.64	14.03	13.57	13.31	12.99	12.45	12.00	.00	.00	.00	.00
9	24.67	25.25	24.62	23.61	22.96	21.36	19.45	17.03	16.64	16.35	16.17	16.12	16.29	16.27	16.12	15.91	15.62	15.01	14.56	14.30	12.71	11.70	13.10	12.79	12.24	11.93	.00	.00	.00	.00
10	21.64	22.10	21.56	21.11	20.92	19.50	10.42	17.34	16.42	16.12	15.94	15.04	15.03	15.77	15.63	15.44	15.14	14.50	14.15	13.00	12.34	12.07	12.67	12.10	11.91	11.75	.00	.00	.00	.00
11	10.99	19.19	19.05	19.24	10.97	17.99	17.34	16.59	15.93	15.69	15.54	15.43	15.36	15.27	15.14	14.92	14.62	14.09	13.60	13.31	12.02	12.52	12.00	11.96	11.50	11.59	.00	.00	.00	.00
12	17.35	17.12	17.15	17.25	17.24	16.61	16.21	15.74	15.35	15.10	15.06	14.92	14.74	14.54	14.34	14.15	13.07	13.30	12.00	12.65	12.27	12.01	11.77	11.50	11.27	11.40	.00	.00	.00	.00
13	15.93	15.69	15.61	15.70	15.73	15.37	15.22	14.95	14.79	14.67	14.52	14.22	13.07	13.50	13.35	13.10	12.92	12.54	12.24	12.10	11.04	11.62	11.39	11.15	10.06	.00	.00	.00	.00	.00
14	14.36	14.07	13.07	13.25	13.09	13.00	13.09	13.04	13.99	13.77	13.50	13.11	12.79	12.54	12.36	12.19	12.02	11.79	11.60	11.49	11.17	10.90	10.65	10.40	10.16	.00	.00	.00	.00	.00
15	13.17	13.13	12.00	11.03	11.06	11.13	11.17	11.20	13.07	12.75	12.40	12.19	11.94	11.72	11.57	11.45	11.33	11.10	11.00	10.00	10.43	10.03	9.73	9.50	9.29	0.59	.00	.00	.00	.00
16	12.20	12.22	12.14	11.07	11.09	11.00	11.07	11.05	11.01	11.57	11.39	11.23	11.06	10.93	10.02	10.72	10.61	10.45	10.31	10.17	9.75	9.20	0.93	0.64	7.99	7.34	6.71	.00	.00	.00
17	11.57	11.54	11.41	11.26	11.16	11.10	11.05	10.99	10.76	10.59	10.46	10.36	10.20	10.10	10.00	10.00	10.00	10.00	10.00	9.55	9.21	0.50	0.11	7.60	6.64	5.94	5.47	4.79	.00	.00
18	11.25	11.20	11.04	10.91	10.70	10.70	10.64	10.47	10.23	10.14	10.04	9.94	9.92	9.03	9.72	9.63	9.53	9.39	10.10	9.19	0.92	0.37	7.69	7.20	6.24	5.52	4.76	4.33	.00	.00
19	10.00	10.06	10.69	10.54	10.40	10.31	10.22	10.01	9.70	9.70	9.62	9.52	9.51	9.46	9.36	9.27	9.10	9.03	0.05	0.76	0.52	7.04	7.39	6.90	5.90	5.10	4.40	4.01	3.43	.00
20	10.52	10.51	10.32	10.17	10.02	9.93	9.03	9.60	9.30	9.27	9.21	9.12	9.10	9.11	0.99	0.91	0.02	0.67	0.42	0.34	0.13	7.52	7.09	6.53	5.60	4.02	4.19	3.01	3.42	.00
21	9.06	9.04	9.70	9.56	0.39	0.26	0.13	7.95	0.76	0.67	0.59	0.40	0.43	0.41	0.30	0.31	0.22	0.09	7.90	7.79	7.52	6.92	6.53	6.00	4.60	4.45	3.97	3.65	3.34	3.10
22	0.90	0.07	0.77	0.61	7.41	6.26	5.00	6.02	6.07	7.70	7.71	7.61	7.40	7.43	7.43	7.39	7.33	7.23	7.00	6.97	6.62	6.10	5.79	5.39	4.69	3.96	3.65	3.30	3.15	3.04
23	0.10	0.16	0.04	7.06	7.65	6.19	6.15	6.26	6.10	7.02	6.94	6.04	6.76	6.70	6.67	6.65	6.62	6.55	6.40	6.30	5.91	5.56	5.27	4.09	4.34	3.79	3.47	3.25	3.03	3.00
24	7.70	7.70	7.57	7.30	6.15	4.99	4.15	4.73	6.54	6.42	6.33	6.24	6.10	6.15	6.13	6.13	6.14	6.09	5.97	5.07	5.50	5.23	4.94	4.59	4.12	3.62	3.31	3.11	2.91	2.95
25	7.24	7.23	7.10	6.91	6.66	6.49	4.30	4.24	6.06	5.94	5.03	5.71	5.64	5.62	5.63	5.66	5.60	5.66	5.56	5.49	5.29	4.93	4.66	4.33	3.10	3.42	3.14	2.95	2.76	2.62
26	6.30	5.60	4.63	6.05	5.00	5.65	4.54	4.40	5.22	5.11	5.03	4.94	4.07	4.05	4.07	4.90	4.92	4.93	5.00	4.04	4.65	4.00	4.06	5.30	3.30	3.00	2.76	2.61	2.45	2.33
27	5.74	5.60	4.62	4.42	5.10	5.02	4.09	4.70	4.52	4.43	4.37	4.32	4.29	4.29	4.32	4.33	4.35	4.34	4.31	4.27	4.20	3.69	3.44	3.19	2.00	1.00	1.34	1.23	2.11	2.03
28	5.37	5.20	4.21	3.53	3.50	3.61	3.47	4.31	4.16	4.09	4.04	4.00	3.99	4.01	4.04	4.06	4.07	4.05	4.07	3.92	3.65	3.10	3.11	2.03	1.90	1.20	1.12	1.02	1.90	1.03
29	5.00	4.92	4.03	4.65	3.41	3.23	3.09	3.95	3.03	3.76	3.72	3.69	3.69	3.72	3.76	3.00	3.00	3.75	3.67	3.56	3.20	2.96	2.71	2.46	1.23	1.02	1.09	1.70	1.67	1.62
30	4.64	4.59	4.46	4.20	3.44	3.00	3.77	3.63	3.51	3.45	3.41	3.39	3.39	3.44	3.50	3.53	3.53	3.30	3.33	3.21	2.09	2.51	2.20	2.12	1.92	1.75	1.65	1.55	1.46	1.42
31	4.24	4.22	4.09	3.90	3.60	3.53	3.41	3.20	3.16	3.09	3.06	3.03	3.04	3.00	3.14	3.10	3.19	3.11	2.92	2.77	2.35	1.96	1.70	1.67	1.52	1.39	1.30	1.23	1.50	1.14
32	3.93	3.94	3.01	3.62	3.39	3.22	3.10	2.96	2.03	2.77	2.73	2.70	2.70	2.73	2.70	2.03	2.05	2.75	2.40	2.20	1.69	1.30	1.25	1.17	1.00	.90	.90	.06	.03	.00
33	3.70	3.60	3.55	3.35	3.11	2.93	2.79	2.64	2.50	2.44	2.40	2.37	2.37	2.39	2.42	2.44	2.45	2.34	1.96	1.65	.93	.73	.65	.60	.55	.49	.46	.44	.42	.23
34	3.53	3.51	3.34	3.12	2.05	2.64	2.40	2.31	2.16	2.10	2.07	2.05	2.06	2.07	2.09	2.10	2.10	1.93	1.34	.07	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
35	3.30	3.36	3.14	2.91	2.59	2.34	2.15	1.95	1.79	1.74	1.72	1.72	1.74	1.77	1.00	1.00	1.76	1.53	.77	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
36	3.22	3.10	2.92	2.71	2.33	2.00	1.74	1.50	1.34	1.31	1.30	1.33	1.41	1.49	1.54	1.56	1.53	1.32	.70	.41	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
37	3.09	3.03	2.79	2.57	2.12	1.69	1.33	1.06	.92	.90	.91	.90	1.13	1.20	1.37	1.41	.95	.97	.79	.52	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
38	2.90	2.92	2.71	2.40	1.95	1.35	.75	.51	.42	.41	.43	.53	.06	1.11	1.25	1.32	.90	.91	.00	.56	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
39	.50	.50	.50	.50	.30	.50	.00	.00	.00	.00	.00	.00	.50	.50	.50	.50	.50	.50	.50	.50	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

APPENDIX D

HEAD AND DRAWDOWN DISTRIBUTION FOR 1. STRESS PERIOD (SEPTEMBER - 1980)
HEAD AND DRAWDOWN DISTRIBUTION FOR 2. STRESS PERIOD (OCTOBER - 1980)
HEAD AND DRAWDOWN DISTRIBUTION FOR 3. STRESS PERIOD (NOVEMBER - 1980)
HEAD AND DRAWDOWN DISTRIBUTION FOR 4. STRESS PERIOD (DECEMBER - 1980)
HEAD AND DRAWDOWN DISTRIBUTION FOR 5. STRESS PERIOD (JANUARY - 1981)
HEAD AND DRAWDOWN DISTRIBUTION FOR 6. STRESS PERIOD (FEBRUARY - 1981)
HEAD AND DRAWDOWN DISTRIBUTION FOR 7. STRESS PERIOD (MARCH - 1981)
HEAD AND DRAWDOWN DISTRIBUTION FOR 8. STRESS PERIOD (APRIL - 1981)
HEAD AND DRAWDOWN DISTRIBUTION FOR 9. STRESS PERIOD (MAY - 1981)
HEAD AND DRAWDOWN DISTRIBUTION FOR 10. STRESS PERIOD (JUNE - 1981)
HEAD AND DRAWDOWN DISTRIBUTION FOR 11. STRESS PERIOD (JULY - 1981)
HEAD AND DRAWDOWN DISTRIBUTION FOR 12. STRESS PERIOD (SEPTEMBER - 1981)
HEAD AND DRAWDOWN DISTRIBUTION FOR 13. STRESS PERIOD (OCTOBER - 1981)
HEAD AND DRAWDOWN DISTRIBUTION FOR 14. STRESS PERIOD (NOVEMBER - 1981)

HEAD DISTRIBUTIONS AT END OF TIME STEP 1 STRES PERIOD 1 (SEPTEMBER 1988)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	18.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.9	26.0	25.0	24.4	23.5	22.1	20.8	19.4	18.6	18.4	20.0	19.7	17.7	19.7	17.1	15.7	14.5	13.2	13.0	15.7	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	26.6	26.3	25.2	24.2	23.5	22.6	21.5	20.2	18.9	18.3	17.7	21.3	22.1	22.3	22.2	19.3	18.1	17.2	16.1	15.7	16.6	.0	.0	.0
4	.0	.0	.0	.0	.0	26.6	26.4	25.0	24.3	23.3	22.5	21.0	21.0	19.9	18.6	17.5	17.5	22.3	23.5	23.7	23.5	21.0	19.9	19.2	18.3	17.7	17.5	16.4	.0	.0
5	.0	.0	.0	.0	26.6	26.2	25.5	24.7	22.0	21.7	21.2	20.5	20.0	19.4	18.4	17.5	18.5	22.9	24.3	24.3	23.5	22.0	21.2	20.6	19.9	19.2	18.6	18.0	.0	.0
6	.0	.0	.0	26.5	26.1	25.4	24.5	23.2	20.9	20.0	19.7	19.2	18.9	19.1	18.6	17.8	17.8	23.0	24.9	25.2	23.5	22.6	22.1	21.9	21.3	20.4	19.4	19.0	.0	.0
7	.0	.0	26.3	26.4	25.4	24.3	23.2	21.4	19.5	18.9	18.6	18.4	18.7	18.8	19.4	19.3	18.9	23.2	24.9	25.4	23.4	22.9	22.7	23.0	22.6	21.0	.0	.0	.0	.0
8	.0	.0	26.6	25.9	24.5	23.3	21.0	19.7	18.0	17.7	17.6	17.6	18.9	19.4	19.7	19.9	20.6	23.3	24.7	25.0	23.1	23.0	22.9	24.3	24.2	21.4	.0	.0	.0	.0
9	37.0	35.7	27.1	25.4	23.7	21.9	20.1	18.4	17.3	16.9	16.9	17.1	18.7	19.3	19.7	19.5	20.0	22.7	24.1	23.9	22.5	22.3	22.1	23.1	21.9	20.7	.0	.0	.0	.0
10	37.1	36.3	30.9	27.4	24.4	22.3	20.5	18.0	17.0	17.7	17.7	18.1	18.6	19.1	19.4	19.7	20.4	22.0	23.4	23.1	21.0	21.3	20.9	20.7	20.3	20.0	.0	.0	.0	.0
11	36.6	35.9	32.0	27.4	23.9	21.4	20.0	18.7	17.9	17.7	17.7	18.0	18.4	19.2	19.9	19.3	19.9	21.0	21.9	21.7	20.0	20.0	19.7	19.5	19.2	19.3	.0	.0	.0	.0
12	35.3	34.9	31.1	25.0	22.0	20.4	19.3	18.2	17.6	17.5	17.4	17.5	17.6	18.0	18.2	18.6	19.2	20.2	20.4	20.3	19.7	19.0	18.6	18.3	18.1	18.0	.0	.0	.0	.0
13	33.0	33.4	29.5	24.6	21.4	19.1	18.5	17.6	17.1	17.0	16.9	16.0	16.0	17.0	17.4	17.7	18.3	19.0	19.2	19.2	18.0	18.0	17.5	17.2	16.9	.0	.0	.0	.0	.0
14	31.0	30.7	26.7	22.7	19.5	18.1	17.5	16.9	16.6	16.2	15.9	15.0	15.0	15.9	16.3	16.6	17.1	17.0	18.0	17.9	17.4	16.5	16.1	15.9	15.5	.0	.0	.0	.0	.0
15	28.3	27.3	24.2	20.0	18.2	17.1	16.5	16.0	15.5	15.2	15.0	14.9	15.0	15.1	15.3	15.6	16.0	16.7	16.0	16.0	16.2	15.1	14.0	14.5	14.0	12.5	.0	.0	.0	.0
16	24.6	24.9	21.6	18.0	16.5	15.7	15.2	14.0	14.2	14.0	14.0	14.1	14.1	14.1	14.3	14.6	15.0	15.5	15.6	15.6	15.1	13.5	13.0	12.9	12.5	11.0	11.4	.0	.0	.0
17	21.5	21.1	18.0	16.9	15.5	14.0	14.3	13.0	13.2	13.1	13.1	13.2	13.3	13.4	13.5	13.7	14.1	14.6	14.6	14.2	14.1	12.4	12.0	11.6	10.9	10.3	9.0	9.3	.0	.0
18	20.2	19.5	17.7	16.2	15.0	14.3	13.9	13.3	12.0	12.3	12.7	12.0	13.0	13.0	13.1	13.3	13.6	14.1	14.0	13.9	13.4	12.0	11.6	11.3	10.2	9.4	9.1	0.0	.0	.0
19	19.1	10.3	16.0	15.5	14.4	13.9	13.5	12.9	12.4	12.4	12.5	12.3	12.6	12.7	12.7	12.9	13.2	13.6	13.5	13.4	12.9	11.7	11.2	10.9	9.5	0.0	0.0	7.5	6.0	.0
20	10.3	17.5	16.1	15.0	13.9	13.5	13.3	12.5	12.1	12.1	12.1	11.9	12.1	12.3	12.3	12.3	12.6	13.1	12.9	12.0	12.6	11.3	10.6	10.1	9.1	0.4	7.0	7.3	6.3	.0
21	17.1	16.1	14.9	13.9	12.9	12.5	12.1	11.7	11.6	11.6	11.6	11.4	11.6	11.3	11.3	11.4	11.6	12.2	12.0	12.0	12.0	10.7	9.7	9.1	0.3	0.2	7.0	7.2	6.5	6.5
22	15.3	15.1	13.6	12.4	11.5	11.1	10.7	10.4	10.3	10.3	10.2	10.2	9.0	9.0	10.0	10.2	10.4	11.2	11.4	11.4	10.9	9.9	9.1	0.7	0.3	0.3	0.0	7.5	6.5	6.3
23	13.4	13.3	12.4	11.4	10.5	9.9	9.5	9.3	9.3	9.4	9.5	9.4	9.2	9.3	9.5	9.7	9.7	10.4	10.5	11.1	9.4	9.2	9.0	9.3	0.5	0.1	7.7	7.7	7.5	7.2
24	12.7	12.6	12.0	11.1	10.1	9.5	9.1	0.7	0.4	0.6	0.6	0.7	0.6	0.0	9.3	9.1	9.2	9.6	9.4	9.4	0.0	0.7	0.4	0.3	0.0	7.7	7.7	7.5	7.6	6.7
25	12.1	12.0	11.5	10.0	9.0	9.2	0.0	0.4	0.1	0.2	0.1	0.1	7.9	0.0	0.3	0.5	0.9	0.9	0.7	0.7	0.3	0.2	0.1	7.7	7.4	7.2	7.6	7.6	7.6	6.0
26	10.7	10.7	10.4	9.9	9.0	0.5	0.3	0.2	0.2	0.2	0.2	7.9	7.5	7.6	7.9	0.5	9.0	0.7	0.1	7.6	7.0	6.9	6.6	6.5	6.6	7.4	7.0	7.3	7.4	6.9
27	9.1	0.9	9.0	0.4	0.0	7.0	7.7	7.7	7.7	7.6	7.5	7.5	7.6	7.4	7.4	7.5	7.0	7.7	7.5	7.2	6.0	6.5	6.2	6.3	6.2	6.9	5.9	6.5	6.9	7.0
28	0.4	0.2	0.4	7.7	7.4	7.2	7.2	7.2	7.2	7.1	7.1	7.3	7.9	7.1	6.9	6.9	7.0	7.0	7.1	7.0	6.9	6.6	6.3	6.2	6.3	6.5	6.1	6.2	6.4	6.7
29	7.9	7.7	7.0	7.1	6.9	6.0	6.7	6.0	6.7	6.6	6.5	6.6	6.7	6.4	6.3	6.3	6.3	6.4	6.5	6.6	6.7	6.4	6.2	6.0	6.0	6.1	6.0	6.0	5.7	6.4
30	7.6	7.5	7.3	6.0	6.5	6.4	6.4	6.3	6.3	6.1	6.0	6.0	5.9	5.0	5.0	5.0	5.0	5.7	5.9	6.0	6.3	6.0	5.7	5.3	5.6	5.7	5.7	5.7	5.4	6.2
31	7.2	7.2	6.9	6.5	6.2	6.0	5.9	5.9	5.9	5.7	5.6	5.4	5.3	5.2	5.1	5.2	5.2	5.1	5.1	5.2	5.4	5.1	5.0	4.9	5.1	5.1	5.0	5.3	5.0	6.4
32	6.0	6.9	6.7	6.3	6.0	5.7	5.7	5.7	5.7	5.6	5.4	5.1	4.9	4.7	4.6	4.6	4.6	4.5	4.4	4.3	3.9	3.9	3.0	3.9	4.1	3.9	3.9	4.4	3.7	4.3
33	6.4	6.4	6.6	6.2	5.7	5.5	5.5	5.5	5.4	5.4	5.5	5.0	4.5	4.2	3.9	4.0	4.1	3.0	3.6	3.3	2.3	2.4	2.4	2.4	2.7	2.4	2.2	2.2	1.9	2.2
34	5.9	5.9	6.2	5.0	5.2	5.1	5.1	5.0	5.0	5.0	4.9	4.5	4.2	3.9	3.7	3.6	3.7	3.4	2.6	2.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	5.2	5.2	5.5	5.2	4.7	4.6	4.5	4.4	4.4	4.4	4.5	3.9	3.5	3.5	3.2	2.6	3.2	2.9	1.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	4.4	4.3	4.6	4.4	4.0	3.9	3.7	3.6	3.5	3.4	3.4	3.2	3.0	3.2	3.1	3.0	3.1	2.6	1.7	1.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	3.5	3.5	3.6	3.5	3.3	3.2	2.9	2.7	2.6	2.5	2.4	2.1	2.1	2.0	2.0	2.7	3.1	2.2	1.6	1.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	2.3	2.1	2.1	2.2	2.3	2.3	1.0	1.4	1.3	1.3	1.2	1.3	1.7	2.0	2.0	1.9	2.3	1.5	1.2	.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 2 (OCTOBER 1980)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	18.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.0	25.9	25.0	24.3	23.4	22.1	20.9	19.6	18.7	18.4	19.3	19.0	19.0	19.1	17.1	16.2	15.7	14.9	15.5	20.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	26.4	26.3	25.2	24.1	23.5	22.6	21.5	20.4	19.2	18.4	18.1	20.4	21.2	21.5	22.0	20.7	20.3	20.2	19.0	20.3	22.5	.0	.0	.0
4	.0	.0	.0	.0	.0	26.5	26.3	25.7	24.2	23.2	22.5	21.0	21.0	20.0	18.9	17.9	18.1	21.6	22.0	23.3	24.0	23.6	23.4	23.4	23.4	23.7	24.3	23.4	.0	.0
5	.0	.0	.0	.0	26.6	26.1	25.3	24.7	22.9	21.0	21.3	20.6	20.0	19.6	18.0	18.0	18.9	22.4	24.0	24.6	25.4	25.5	25.5	25.6	25.0	26.2	26.1	25.0	.0	.0
6	.0	.0	.0	26.7	26.1	25.4	24.5	23.2	21.0	20.2	19.9	19.3	19.0	19.3	19.0	18.4	18.6	23.1	25.0	25.6	26.5	26.0	27.0	27.4	27.7	27.9	27.3	27.0	.0	.0
7	.0	.0	26.5	26.6	25.4	24.3	23.3	21.6	19.6	19.1	18.0	18.7	19.0	19.2	19.7	19.0	20.1	23.0	25.7	26.4	27.2	27.6	28.0	28.4	28.9	28.7	.0	.0	.0	.0
8	.0	.0	27.0	26.2	24.6	23.4	22.0	19.9	18.2	18.0	17.9	18.1	19.2	19.0	20.3	20.6	21.6	24.4	26.1	26.0	27.7	28.1	28.4	29.0	29.6	29.3	.0	.0	.0	.0
9	34.0	34.1	28.1	26.1	24.0	22.3	20.7	19.0	17.0	17.4	17.5	17.9	19.4	20.2	20.7	20.7	22.4	24.9	26.3	26.9	27.0	28.2	28.4	28.7	29.0	29.1	.0	.0	.0	.0
10	34.6	34.0	30.2	27.3	24.6	22.9	21.5	20.1	19.1	18.0	18.0	19.2	20.0	20.0	21.3	21.0	23.1	25.1	26.4	27.0	27.0	27.9	27.9	28.0	28.2	28.7	.0	.0	.0	.0
11	34.0	33.6	31.0	27.9	24.7	22.9	21.9	20.7	19.9	19.7	19.7	20.0	20.6	21.0	21.7	22.3	23.3	25.1	26.3	26.0	27.4	27.3	27.2	27.2	27.4	28.1	.0	.0	.0	.0
12	33.4	33.1	30.0	27.6	24.0	22.9	22.0	20.9	20.3	20.1	20.1	20.2	20.6	21.2	21.7	22.3	23.3	25.2	26.1	26.5	26.0	26.5	24.4	26.3	24.4	27.7	.0	.0	.0	.0
13	32.5	32.2	30.1	27.3	24.5	22.4	21.0	20.9	20.3	20.2	20.0	20.1	20.4	20.9	21.6	22.1	23.1	24.0	25.6	25.0	26.2	25.6	25.4	25.2	25.1	.0	.0	.0	.0	.0
14	31.0	30.7	28.9	26.5	23.0	22.2	21.6	20.9	20.3	19.9	19.6	19.7	19.9	20.3	21.0	21.6	22.5	24.1	24.7	24.9	24.9	24.2	23.9	23.7	23.5	.0	.0	.0	.0	.0
15	29.4	29.0	27.4	25.3	23.0	21.0	21.1	20.4	19.6	19.2	19.1	19.2	19.6	19.0	20.2	20.7	21.6	23.2	23.7	23.9	23.0	22.5	22.2	22.0	21.6	19.0	.0	.0	.0	.0
16	27.3	27.3	25.7	23.9	21.7	20.0	20.2	19.5	18.6	18.4	18.4	18.7	18.9	18.9	19.3	19.0	20.7	22.1	22.6	22.7	22.6	20.4	19.0	19.0	19.6	19.0	18.7	.0	.0	.0
17	25.1	25.1	23.7	22.2	20.0	20.0	19.4	18.6	18.1	17.0	17.6	17.0	18.0	18.1	18.4	19.0	19.0	21.0	21.4	21.2	21.5	19.0	18.4	18.0	17.4	16.9	16.4	15.7	.0	.0
18	24.2	24.0	22.0	21.6	20.4	19.6	19.0	18.2	17.7	17.1	17.3	17.3	17.6	17.7	18.0	18.5	19.3	20.4	20.7	20.0	20.6	18.6	17.9	17.3	16.3	15.6	15.4	15.0	.0	.0
19	23.3	23.1	22.1	21.0	19.9	19.2	18.6	17.0	17.2	17.3	17.2	16.0	17.0	17.3	17.5	18.0	18.0	19.9	20.0	20.1	20.1	18.2	17.3	16.4	15.3	14.7	13.7	12.5	9.6	.0
20	22.5	22.4	21.5	20.5	19.4	18.0	18.3	17.5	17.1	17.0	16.9	16.3	16.3	16.0	17.0	17.3	18.1	19.2	19.2	19.3	19.7	17.0	16.6	15.6	14.0	14.3	13.3	12.2	10.9	.0
21	21.3	21.1	20.4	19.5	18.5	18.0	17.5	17.0	16.0	16.7	16.5	15.7	15.4	15.5	15.0	16.1	16.0	18.1	18.1	18.2	19.0	17.1	15.4	14.6	14.0	14.2	13.0	12.0	11.7	11.7
22	19.0	19.7	19.0	17.9	17.1	16.7	16.2	15.0	15.5	15.4	15.2	14.7	15.0	13.7	14.1	14.5	15.0	16.6	16.9	17.0	17.2	15.9	14.0	14.3	14.2	14.0	14.6	13.7	12.0	11.0
23	19.1	18.9	18.2	17.0	15.9	15.4	15.0	14.5	14.1	14.2	14.2	13.0	13.3	13.1	13.4	13.6	14.0	15.0	15.0	15.1	14.7	14.0	14.5	14.4	14.7	14.0	14.6	14.3	13.4	12.3
24	18.0	18.7	18.2	17.1	15.0	15.1	14.7	14.0	13.2	13.2	13.0	12.9	12.5	12.4	12.7	12.9	13.2	13.0	13.0	13.0	13.0	14.1	13.0	13.0	14.2	14.4	14.6	14.3	13.9	11.0
25	18.5	18.5	17.9	17.0	15.6	14.0	14.4	13.0	13.1	13.0	12.6	12.2	11.6	11.6	11.9	12.2	12.6	13.0	13.1	13.1	13.1	13.5	13.5	13.3	13.4	13.5	14.4	14.5	14.0	11.6
26	17.5	17.5	17.1	16.3	14.0	14.1	13.0	13.6	13.5	13.3	13.0	12.4	11.5	11.4	11.5	11.9	12.6	12.6	12.2	11.0	11.3	11.4	11.3	11.5	12.6	14.3	13.0	14.1	14.0	12.1
27	14.9	14.7	15.1	14.4	13.5	13.2	13.0	12.9	12.7	12.3	12.0	11.7	11.5	11.3	11.2	11.2	11.5	11.0	11.0	11.5	11.4	11.3	11.1	11.7	12.3	13.7	12.4	13.3	13.5	13.1
28	13.9	13.6	14.2	13.4	12.0	12.5	12.4	12.3	12.0	11.6	11.3	11.2	11.1	10.0	10.7	10.6	10.7	11.1	11.4	11.5	11.0	11.7	11.6	11.9	12.5	13.1	12.6	12.7	12.6	12.7
29	13.1	12.0	13.3	12.4	12.1	11.0	11.7	11.5	11.2	10.0	10.5	10.6	10.4	10.2	10.0	10.0	10.0	10.3	10.0	11.1	11.6	11.6	11.6	11.6	12.0	12.4	12.2	12.0	11.4	12.0
30	12.6	12.5	12.4	11.7	11.3	11.1	11.0	10.0	10.6	10.3	10.1	9.9	9.7	9.5	9.4	9.4	9.4	9.5	10.0	10.3	11.1	11.0	10.9	10.7	11.2	11.5	11.3	11.1	10.6	11.1
31	12.0	12.0	11.7	11.2	10.6	10.3	10.2	10.1	10.3	9.9	9.7	9.3	8.9	8.7	8.6	8.6	8.6	8.6	8.0	9.0	9.7	9.6	9.6	9.6	10.0	10.0	9.6	9.4	9.2	9.6
32	11.5	11.5	11.4	10.9	10.3	9.9	10.0	10.0	10.0	9.7	9.4	8.9	8.4	8.1	7.9	7.0	7.9	7.7	7.6	7.5	7.2	7.3	7.4	7.5	7.0	7.6	7.3	7.1	6.9	7.3
33	10.0	10.9	11.2	10.7	9.0	9.5	9.7	9.7	9.7	9.4	9.1	8.6	8.0	7.5	7.0	7.1	7.1	6.7	6.2	5.7	4.3	4.4	4.5	4.6	4.7	4.5	4.3	4.1	3.0	4.2
34	9.9	9.9	10.5	9.9	0.9	0.0	9.0	9.1	9.0	0.0	0.5	0.1	7.5	7.0	6.7	6.5	6.5	6.0	4.7	3.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	0.5	0.5	9.2	0.7	7.9	7.9	0.0	0.1	0.0	7.0	7.6	7.1	6.5	6.4	6.0	5.2	5.0	5.2	2.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	6.0	6.0	7.4	7.0	6.5	6.5	6.5	6.5	6.4	6.3	6.1	5.0	5.5	5.5	5.4	5.1	5.1	4.5	2.9	1.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	5.1	5.3	5.5	5.2	5.0	5.0	4.9	4.0	4.7	4.6	4.4	4.1	3.9	4.3	4.3	4.2	4.1	3.6	2.6	1.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	2.9	3.0	3.0	2.9	2.0	2.0	2.5	2.4	2.4	2.3	2.3	2.2	2.4	2.7	2.6	2.5	2.3	2.2	1.7	1.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 3 (NOVEMBER 1988)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	18.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.6	25.7	24.0	24.2	23.3	22.0	20.0	19.7	18.7	18.3	18.2	17.5	17.4	17.2	15.3	14.2	13.0	12.9	13.1	16.4	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	26.4	26.1	25.1	24.0	23.3	22.4	21.3	20.4	19.3	18.5	18.2	18.7	18.7	18.7	18.6	17.4	16.7	16.3	15.8	16.1	17.8	.0	.0	.0
4	.0	.0	.0	.0	.0	26.3	26.1	25.5	24.0	23.1	22.4	21.7	20.0	19.9	19.0	18.0	18.2	19.3	19.6	19.7	19.6	18.9	18.6	18.3	18.1	18.4	19.5	21.2	.0	.0
5	.0	.0	.0	.0	26.4	26.0	25.1	24.5	22.0	21.0	21.3	20.6	19.0	19.5	18.0	18.2	18.6	19.9	20.3	20.5	20.4	20.2	20.0	19.9	19.8	20.1	20.4	21.0	.0	.0
6	.0	.0	.0	26.6	26.0	25.2	24.3	23.1	21.0	20.1	19.9	19.3	18.9	19.1	18.9	18.6	18.0	20.4	20.0	20.9	21.1	21.1	21.1	21.1	21.2	21.2	20.0	20.9	.0	.0
7	.0	.0	26.3	26.4	25.3	24.2	23.2	21.6	19.7	19.1	18.9	18.0	18.9	18.0	19.1	19.2	19.7	20.0	21.4	21.5	21.7	21.0	22.0	22.1	22.4	22.2	.0	.0	.0	.0
8	.0	.0	27.0	26.2	24.6	23.4	22.1	20.0	18.3	18.2	18.1	18.3	18.0	19.1	19.3	19.4	20.0	21.1	21.7	21.9	22.1	22.4	22.7	22.9	23.3	23.2	.0	.0	.0	.0
9	28.5	28.5	27.6	25.9	24.0	22.4	20.9	19.3	18.1	17.6	17.0	18.2	18.9	19.2	19.2	18.0	19.9	21.1	21.9	22.1	22.4	22.0	25.1	23.6	23.9	24.1	.0	.0	.0	.0
10	27.9	27.7	26.0	25.3	23.5	22.1	20.9	19.0	18.0	18.5	18.5	18.0	19.3	19.7	19.6	19.6	20.1	21.0	21.9	22.2	22.6	23.1	23.4	23.7	24.0	24.3	.0	.0	.0	.0
11	27.1	27.0	26.2	25.0	23.0	21.7	20.9	20.0	19.3	19.1	19.1	19.3	19.7	20.6	20.1	19.9	20.1	20.0	21.7	22.0	22.6	23.2	23.4	23.6	23.0	24.4	.0	.0	.0	.0
12	26.4	26.4	25.7	24.5	22.0	21.5	20.9	20.1	19.5	19.4	19.4	19.5	19.0	20.1	20.0	19.9	20.0	20.0	21.5	21.9	22.5	23.0	23.2	23.3	23.4	24.4	.0	.0	.0	.0
13	25.7	25.6	25.0	24.1	22.5	21.2	20.0	20.1	19.6	19.5	19.5	19.5	19.7	19.0	19.7	19.7	19.9	20.6	21.3	21.6	22.4	22.6	22.7	22.7	22.0	.0	.0	.0	.0	.0
14	24.7	24.2	24.0	23.4	22.1	21.2	20.7	20.2	19.7	19.5	19.4	19.3	19.3	19.3	19.3	19.3	19.6	20.3	20.9	21.2	22.1	22.1	22.0	21.9	21.7	.0	.0	.0	.0	.0
15	23.9	23.6	23.2	22.5	21.3	20.0	20.4	20.0	19.4	19.1	19.0	18.9	18.0	18.7	18.7	18.0	19.1	20.0	20.5	20.0	21.3	21.3	21.1	20.9	20.5	19.1	.0	.0	.0	.0
16	23.1	22.9	22.3	21.6	20.3	20.1	19.0	19.4	18.6	18.4	18.3	18.2	18.0	17.9	18.0	18.3	18.6	19.4	19.9	20.1	20.7	20.2	19.9	19.6	19.1	18.1	17.4	.0	.0	.0
17	22.2	22.1	21.6	20.9	20.0	19.6	19.3	18.0	18.0	17.7	17.6	17.4	17.2	17.1	17.2	17.6	18.0	18.6	19.0	19.1	19.0	19.0	18.7	18.4	17.0	17.0	16.4	15.0	.0	.0
18	21.0	21.7	21.2	20.5	19.7	19.3	19.0	18.4	17.7	16.9	17.2	17.1	16.0	16.0	16.9	17.3	17.7	19.2	18.6	18.0	19.3	18.5	18.2	17.0	17.1	16.3	15.9	15.5	.0	.0
19	21.4	21.3	20.0	20.2	19.4	19.0	18.6	18.0	17.4	17.0	16.0	16.6	16.3	16.4	16.5	16.9	17.3	17.0	18.1	18.2	18.6	17.9	17.5	17.0	16.3	15.6	14.7	13.7	10.3	.0
20	21.0	20.9	20.4	19.0	19.1	18.6	18.3	17.7	17.0	16.7	16.5	16.2	15.9	16.1	16.2	16.5	16.9	17.3	17.5	17.6	18.0	17.3	16.9	16.4	15.0	15.1	14.0	13.1	11.0	.0
21	20.2	20.2	19.7	19.2	18.4	18.0	17.6	17.1	16.5	16.2	15.9	15.6	15.2	15.3	15.5	15.9	16.2	16.6	16.0	16.9	16.0	16.3	15.9	15.4	14.9	14.4	13.7	13.0	12.1	11.9
22	19.1	19.0	18.7	18.0	17.2	16.9	16.5	16.0	15.5	15.1	14.7	14.5	14.1	14.1	14.5	14.0	15.0	15.3	15.5	15.5	15.4	15.1	14.9	14.6	14.3	13.0	13.3	12.0	12.2	11.7
23	10.3	10.2	17.0	17.2	16.4	15.9	15.6	15.2	14.7	14.4	14.1	13.7	13.4	13.2	13.5	13.0	14.0	14.3	14.4	14.4	14.2	14.2	14.1	14.0	13.0	13.4	12.7	12.6	12.3	12.0
24	17.7	17.7	17.3	16.7	15.9	15.4	15.1	14.6	14.0	13.7	13.4	13.0	12.6	12.6	12.9	13.1	13.3	13.6	13.7	13.6	13.5	13.5	13.5	13.5	13.4	13.2	12.0	12.4	12.3	11.9
25	17.1	17.1	16.7	16.1	15.4	15.0	14.6	14.1	13.3	13.1	12.9	12.4	12.0	12.1	12.3	12.5	12.7	12.9	13.0	12.9	12.9	12.9	12.9	12.9	13.0	13.0	12.0	12.6	12.3	11.6
26	15.9	15.0	15.5	15.0	14.5	14.1	13.0	13.4	12.9	12.5	12.1	11.7	11.4	11.5	11.6	11.7	11.0	12.0	11.9	11.9	11.0	11.7	11.5	11.4	11.0	12.2	12.5	12.4	12.2	11.9
27	14.6	14.6	14.3	13.9	13.4	13.1	12.9	12.5	11.0	11.3	11.0	10.0	10.0	10.9	10.9	11.0	11.0	11.1	11.2	11.2	11.0	10.9	10.0	10.0	11.0	11.1	11.5	11.4	11.4	11.2
28	13.9	13.0	13.6	13.1	12.0	12.5	12.2	11.0	11.2	10.7	10.4	10.5	10.5	10.5	10.5	10.5	10.5	10.6	10.6	10.6	10.4	10.4	10.3	10.3	10.3	10.4	10.6	10.6	10.6	10.5
29	13.2	13.0	12.0	12.2	12.1	11.7	11.5	11.0	10.4	10.1	9.9	10.0	10.1	10.0	10.0	10.0	10.0	10.0	9.9	9.7	9.6	9.6	9.5	9.6	9.7	9.0	9.0	9.9	9.9	9.0
30	12.5	12.4	12.1	11.7	11.3	11.0	10.7	10.3	9.9	9.0	9.7	9.7	9.6	9.6	9.5	9.5	9.5	9.4	9.3	9.2	0.9	0.6	0.6	0.6	0.7	0.7	0.9	0.9	9.0	0.9
31	11.6	11.6	11.3	11.0	10.4	9.9	9.7	9.4	9.5	9.4	9.3	9.2	9.0	0.9	0.0	0.0	0.7	0.5	0.3	0.1	7.5	7.1	7.0	7.0	7.1	7.3	7.4	7.5	7.5	7.5
32	10.0	10.0	10.5	10.2	9.6	9.2	9.2	9.1	9.0	0.9	0.0	0.6	0.4	0.2	0.1	0.0	7.9	7.7	7.2	6.0	5.7	5.1	5.0	5.0	5.1	5.3	5.4	5.4	5.4	5.4
33	10.0	9.9	9.6	9.3	0.0	0.5	0.6	0.6	0.5	0.3	0.2	0.0	7.7	7.5	7.3	7.1	7.0	6.7	5.0	5.1	3.2	2.9	2.0	2.0	2.0	2.0	2.9	2.9	2.9	2.9
34	0.9	0.7	0.5	0.2	7.6	7.5	7.7	7.7	7.6	7.5	7.3	7.1	6.9	6.6	6.4	6.1	6.0	5.6	4.0	2.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	7.5	7.5	7.1	6.0	6.3	6.4	6.5	6.5	6.4	6.3	6.2	6.0	5.0	5.5	5.2	4.7	4.9	4.4	2.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	5.0	5.7	5.4	5.1	4.0	4.9	5.0	4.9	4.0	4.7	4.6	4.5	4.4	4.2	4.1	3.9	3.0	3.3	2.0	1.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	4.1	3.9	3.7	3.6	3.5	3.5	3.4	3.4	3.3	3.2	3.2	3.1	3.0	3.0	2.9	2.0	2.6	2.4	1.6	1.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	2.0	2.0	2.0	1.9	1.9	1.0	1.6	1.5	1.5	1.4	1.4	1.4	1.6	1.6	1.6	1.5	1.2	1.4	1.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

T. C.
Yükseköğretim Kurulu
Dokümantasyon Merkezi

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 4 (DECEMBER 1980)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	18.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.5	25.5	24.7	24.1	23.2	21.9	20.0	19.7	18.7	18.2	17.9	17.0	16.0	16.5	14.5	13.6	13.1	12.2	12.2	14.5	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	26.3	26.0	24.9	23.8	23.1	22.2	21.2	20.3	19.4	18.6	18.2	18.0	17.7	17.5	17.2	16.0	15.2	14.6	14.2	14.3	15.5	.0	.0	.0
4	.0	.0	.0	.0	.0	26.1	25.9	25.3	23.9	22.9	22.2	21.6	20.7	19.9	19.0	18.2	18.3	18.4	18.2	18.1	17.7	17.0	16.6	16.2	15.8	16.0	16.9	18.5	.0	.0
5	.0	.0	.0	.0	26.3	25.8	24.9	24.3	22.7	21.7	21.2	20.5	19.7	19.4	18.6	18.3	18.5	18.7	18.6	18.6	18.3	17.8	17.5	17.3	17.1	17.2	17.5	18.1	.0	.0
6	.0	.0	.0	26.4	25.9	25.1	24.2	23.0	21.0	20.1	19.9	19.3	18.7	18.9	18.6	18.6	18.8	19.0	18.9	18.9	18.7	18.5	18.4	18.3	18.2	18.1	17.8	18.0	.0	.0
7	.0	.0	26.5	26.3	25.2	24.1	23.2	21.6	19.7	19.2	19.0	18.0	18.7	18.6	18.7	18.8	19.2	19.2	19.3	19.2	19.1	19.1	19.0	19.0	19.1	18.0	.0	.0	.0	.0
8	.0	.0	26.0	26.0	24.5	23.4	22.1	20.1	18.4	18.3	18.3	18.4	18.6	18.7	18.7	18.6	19.0	19.3	19.5	19.4	19.4	19.5	19.6	19.7	19.9	19.0	.0	.0	.0	.0
9	25.6	25.0	25.9	25.5	23.9	22.5	21.0	19.5	18.2	17.0	18.0	18.3	18.6	18.7	18.5	17.9	18.7	19.2	19.5	19.6	19.7	19.9	20.1	20.4	20.6	20.7	.0	.0	.0	.0
10	25.0	25.1	25.3	24.4	23.0	21.7	20.0	19.7	18.7	18.5	18.5	18.6	18.9	19.1	18.6	18.5	18.7	19.1	19.5	19.7	19.9	20.2	20.4	20.7	20.9	21.1	.0	.0	.0	.0
11	24.3	24.3	24.2	23.6	22.2	21.1	20.5	19.7	19.0	18.9	18.0	18.9	19.2	19.0	19.1	18.0	18.7	18.9	19.4	19.6	20.0	20.4	20.6	20.0	21.0	21.3	.0	.0	.0	.0
12	23.6	23.7	23.4	22.0	21.7	20.7	20.2	19.6	19.1	19.0	19.0	19.0	19.1	19.3	19.0	18.7	18.6	18.9	19.3	19.5	20.0	20.4	20.6	20.7	20.9	21.5	.0	.0	.0	.0
13	23.0	22.9	22.7	22.3	21.3	20.3	20.0	19.5	19.1	19.1	19.0	19.0	19.0	18.9	18.7	18.5	18.4	18.7	19.2	19.4	20.0	20.3	20.5	20.5	20.6	.0	.0	.0	.0	.0
14	22.1	21.9	21.0	21.6	20.0	20.2	19.9	19.5	19.2	19.0	18.9	18.0	18.6	18.4	18.2	18.1	18.1	18.5	18.9	19.2	19.9	20.1	20.2	20.1	20.1	.0	.0	.0	.0	.0
15	21.4	21.2	21.2	20.9	20.1	19.9	19.7	19.4	19.9	18.7	18.5	18.3	18.0	17.0	17.7	17.7	17.0	18.3	18.7	18.9	19.6	19.7	19.7	19.6	19.3	18.4	.0	.0	.0	.0
16	21.0	20.0	20.6	20.1	19.3	19.3	19.2	18.9	18.2	18.1	17.9	17.6	17.3	17.1	17.1	17.2	17.4	17.0	18.2	18.4	19.1	19.1	19.1	18.9	18.5	17.7	17.2	.0	.0	.0
17	20.5	20.4	20.1	19.7	19.1	18.9	18.7	18.4	17.7	17.3	17.2	17.0	16.6	16.4	16.4	16.7	16.9	17.3	17.6	17.6	18.4	18.2	18.2	18.0	17.6	17.0	16.5	16.0	.0	.0
18	20.2	20.2	19.9	19.5	19.0	18.7	18.5	18.1	17.4	16.6	16.9	16.6	16.3	16.1	16.1	16.4	16.6	17.0	17.2	17.4	18.0	17.9	17.0	17.6	17.1	16.4	16.1	15.0	.0	.0
19	20.0	19.9	19.6	19.2	18.7	18.5	18.2	17.0	17.2	16.7	16.6	16.3	15.9	15.0	15.9	15.1	16.3	16.6	16.0	17.0	17.5	17.4	17.3	17.0	16.5	15.9	15.2	14.3	11.0	.0
20	19.7	19.7	19.4	19.0	19.5	18.2	17.9	17.5	16.9	16.5	16.2	15.9	15.5	15.6	15.6	15.0	16.0	16.3	16.4	16.5	16.9	16.0	16.7	16.5	16.1	15.4	14.4	13.5	12.3	.0
21	19.2	19.1	10.9	10.5	10.0	17.7	17.4	16.9	16.4	16.0	15.0	15.4	15.0	15.0	15.1	15.4	15.5	15.7	15.0	15.9	15.0	15.9	15.0	15.6	15.2	14.5	13.0	13.2	12.4	12.2
22	10.3	10.3	10.0	17.6	17.0	16.7	16.4	16.0	15.5	15.1	14.7	14.5	14.1	14.1	14.4	14.6	14.7	14.0	14.0	14.0	14.7	14.0	14.7	14.5	14.2	13.6	13.0	12.7	12.3	12.0
23	17.6	17.5	17.2	16.9	16.3	15.9	15.7	15.3	14.0	14.5	14.2	13.0	13.4	13.2	13.5	13.7	13.0	13.9	13.9	13.9	13.7	13.0	13.0	13.7	13.4	12.9	12.2	12.1	12.0	11.9
24	17.0	17.0	16.7	16.3	15.0	15.4	15.1	14.7	14.1	13.0	13.5	13.1	12.7	12.6	12.9	13.0	13.2	13.3	13.3	13.3	13.2	13.2	13.2	13.1	12.9	12.6	12.1	11.7	11.0	11.6
25	16.4	16.4	16.1	15.7	15.2	14.9	14.6	14.1	13.3	13.1	12.9	12.5	12.1	12.2	12.3	12.5	12.6	12.7	12.7	12.7	12.6	12.6	12.6	12.5	12.4	12.3	12.0	11.7	11.6	11.2
26	15.2	15.2	14.9	14.6	14.2	13.9	13.6	13.2	12.6	12.2	11.9	11.5	11.3	11.5	11.5	11.6	11.6	11.7	11.7	11.7	11.7	11.5	11.3	11.0	11.0	11.2	11.4	11.3	11.3	11.3
27	14.2	14.2	13.0	13.5	13.1	12.9	12.6	12.2	11.5	11.0	10.6	10.5	10.6	10.7	10.7	10.0	10.0	10.0	10.9	10.9	10.7	10.4	10.2	10.0	9.0	9.0	10.2	10.1	10.1	10.0
28	13.6	13.5	13.2	12.0	12.5	12.2	11.9	11.4	10.7	10.3	10.0	10.1	10.2	10.3	10.3	10.3	10.3	10.3	10.3	10.2	9.9	9.6	9.4	9.2	9.0	0.9	9.1	9.2	9.2	9.2
29	13.0	12.0	12.5	11.9	11.0	11.4	11.1	10.6	10.0	9.7	9.5	9.7	9.0	9.9	9.9	9.9	9.0	9.7	9.6	9.4	9.0	0.7	0.5	0.3	0.2	0.2	0.3	0.4	0.5	0.4
30	12.2	12.1	11.0	11.4	11.0	10.6	10.3	9.0	9.5	9.4	9.3	9.4	9.4	9.4	9.4	9.4	9.3	9.1	0.0	0.6	0.1	7.6	7.3	7.3	7.2	7.2	7.4	7.4	7.5	7.5
31	11.2	11.1	10.0	10.5	10.0	9.4	9.2	0.9	0.9	0.9	0.9	0.0	0.0	0.0	0.7	0.7	0.6	0.3	7.9	7.6	6.7	6.0	5.0	5.0	5.7	5.0	6.0	6.1	6.2	6.1
32	10.1	10.1	9.9	9.5	9.0	0.5	0.5	0.4	0.3	0.3	0.2	0.2	0.1	0.0	0.0	7.9	7.0	7.4	6.0	6.3	4.9	4.2	4.1	4.0	4.0	4.1	4.2	4.3	4.4	4.3
33	9.2	9.2	0.0	0.5	0.0	7.7	7.7	7.7	7.6	7.6	7.5	7.4	7.3	7.2	7.1	6.9	6.0	6.4	5.4	4.6	2.7	2.3	2.2	2.1	2.1	2.2	2.2	2.3	2.3	2.3
34	0.0	0.0	7.6	7.2	6.7	6.6	6.7	6.7	6.7	6.6	6.5	6.4	6.3	6.2	6.0	5.0	5.6	5.2	3.7	2.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	6.7	6.6	6.2	5.0	5.4	5.4	5.5	5.5	5.4	5.4	5.3	5.2	5.1	4.9	4.7	4.2	4.3	3.0	1.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	5.0	5.0	4.6	4.3	4.0	4.0	4.1	4.0	4.0	3.9	3.9	3.0	3.7	3.6	3.5	3.3	3.1	2.0	1.5	.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	3.4	3.4	3.2	3.0	2.0	2.0	2.7	2.7	2.6	2.6	2.6	2.5	2.5	2.5	2.4	2.3	2.1	1.9	1.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	1.0	1.7	1.7	1.6	1.5	1.5	1.3	1.2	1.1	1.1	1.1	1.2	1.3	1.3	1.3	1.2	1.0	1.1	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 5 (JANUARY 1981)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	18.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.5	25.5	24.7	24.1	23.2	21.9	20.8	19.0	18.8	18.4	19.0	18.5	18.5	18.8	17.3	16.9	16.7	16.2	17.3	24.6	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	26.2	26.0	24.9	23.8	23.1	22.2	21.3	20.5	19.5	18.8	18.5	19.9	20.5	20.8	21.8	21.5	21.9	22.3	22.5	23.6	26.9	.0	.0	.0
4	.0	.0	.0	.0	.0	26.1	25.8	25.3	23.9	22.9	22.2	21.6	20.8	20.0	19.2	18.4	18.6	21.0	22.0	22.7	24.5	25.2	25.8	26.3	27.0	28.1	29.3	28.3	.0	.0
5	.0	.0	.0	.0	26.2	25.7	24.8	24.3	22.7	21.8	21.3	20.6	19.8	19.6	19.1	18.6	19.3	21.9	23.4	24.4	26.6	27.0	28.5	29.1	30.1	31.3	31.8	31.4	.0	.0
6	.0	.0	.0	26.6	25.9	25.1	24.2	23.8	21.1	20.2	20.0	19.4	18.9	19.3	19.3	19.1	19.4	22.9	24.8	25.9	28.3	29.6	30.5	31.4	32.4	33.5	33.4	33.2	.0	.0
7	.0	.0	26.7	26.5	25.3	24.2	23.2	21.7	19.9	19.4	19.2	19.1	19.2	19.3	20.0	20.3	20.6	24.0	25.9	27.2	29.7	31.0	31.9	32.8	33.8	34.4	.0	.0	.0	.0
8	.0	.0	27.1	26.2	24.6	23.5	22.3	20.3	18.7	18.6	18.6	18.8	19.8	20.4	20.9	21.4	22.5	25.2	27.0	28.3	30.8	32.0	32.7	33.4	34.4	35.1	.0	.0	.0	.0
9	31.1	30.6	27.6	26.2	24.3	22.9	21.6	20.1	18.8	18.4	18.6	19.1	20.6	21.5	22.0	22.2	24.1	26.6	28.1	29.3	31.6	32.6	33.2	33.5	34.5	35.2	.0	.0	.0	.0
10	31.4	31.1	29.0	27.2	25.2	24.0	22.9	21.7	20.0	20.5	20.6	21.0	21.0	22.6	23.3	24.0	25.5	27.0	29.3	30.2	32.2	33.0	33.4	33.6	34.4	35.3	.0	.0	.0	.0
11	31.5	31.3	29.0	27.0	25.0	24.6	23.9	23.0	22.3	22.1	22.1	22.3	22.9	24.1	24.2	25.1	26.4	28.7	30.4	31.2	32.6	32.9	33.2	33.5	34.2	35.0	.0	.0	.0	.0
12	31.4	31.3	30.0	28.2	26.4	25.2	24.6	23.0	23.3	23.1	23.0	23.1	23.6	24.3	24.0	25.7	27.0	29.0	31.2	31.0	32.7	32.0	32.9	33.2	33.7	34.0	.0	.0	.0	.0
13	31.4	31.2	30.0	28.5	26.0	25.2	24.9	24.3	23.0	23.6	23.5	23.6	24.0	24.6	25.6	26.2	27.6	30.2	31.4	31.0	32.5	32.4	32.5	32.6	32.9	.0	.0	.0	.0	.0
14	31.1	30.9	30.1	28.0	27.0	25.0	25.4	24.0	24.4	24.1	23.9	24.0	24.4	24.9	25.0	26.4	27.0	30.1	31.1	31.4	31.7	31.5	31.5	31.7	31.0	.0	.0	.0	.0	.0
15	30.6	30.4	29.9	28.0	27.2	26.1	25.5	25.0	24.4	24.0	23.9	24.2	24.6	24.9	25.4	26.0	27.1	29.4	30.4	30.7	31.0	30.3	30.3	30.4	30.3	29.3	.0	.0	.0	.0
16	29.0	30.0	29.4	28.3	26.7	26.0	25.5	25.0	24.3	24.0	23.9	24.3	24.4	24.4	24.7	25.4	26.6	28.7	29.6	30.0	30.4	28.5	28.2	28.5	28.0	28.0	28.0	.0	.0	.0
17	28.9	29.1	28.2	27.4	26.5	25.0	25.4	24.0	24.7	24.1	23.6	23.7	23.6	23.6	24.0	24.9	26.1	27.9	28.6	28.6	29.7	27.5	27.0	26.0	26.6	26.4	26.2	25.3	.0	.0
18	28.5	28.5	27.0	27.1	26.3	25.7	25.3	24.6	24.4	23.6	23.5	23.2	23.3	23.3	23.7	24.6	25.0	27.5	28.1	28.4	28.9	27.1	26.6	26.2	25.4	25.0	24.9	24.4	.0	.0
19	28.1	28.0	27.5	26.0	26.1	25.6	25.2	24.5	24.0	24.0	23.0	22.0	22.7	23.0	23.4	24.2	25.4	27.1	27.5	27.9	28.5	26.9	26.1	25.3	24.4	23.9	22.0	21.2	15.0	.0
20	27.7	27.7	27.2	26.6	25.0	25.4	25.1	24.4	24.1	24.0	23.7	22.5	22.1	22.6	22.9	23.4	24.7	26.5	26.7	27.1	28.4	26.6	25.4	24.5	23.9	23.4	22.3	20.0	18.9	.0
21	27.2	27.1	26.7	26.1	25.4	25.0	24.6	24.2	24.1	23.9	23.5	22.2	21.4	21.2	21.6	22.2	23.3	25.5	25.5	25.0	27.0	26.1	24.4	23.4	23.1	23.6	23.1	21.7	20.2	20.3
22	26.6	26.5	26.0	25.1	24.5	24.2	23.0	23.4	23.1	22.9	22.5	21.6	19.9	19.5	20.1	20.7	21.4	23.7	24.3	24.6	25.7	24.6	23.3	23.0	23.3	24.4	24.3	22.9	20.4	19.0
23	26.5	26.4	25.0	24.6	23.6	23.1	22.7	22.3	21.9	21.9	21.7	20.7	19.6	19.0	19.4	19.7	20.2	21.0	21.9	22.1	22.2	22.0	22.0	22.0	23.0	24.0	24.3	24.3	23.0	22.6	20.5
24	26.0	26.7	26.2	25.1	23.0	23.0	22.6	21.9	21.3	20.9	20.2	19.6	18.6	18.2	18.5	18.7	19.1	20.1	20.4	20.6	21.1	22.0	21.9	22.2	23.3	23.6	24.1	23.6	22.9	19.6
25	26.9	26.0	26.3	25.4	23.0	22.0	22.3	21.7	20.9	20.6	19.9	18.0	17.4	17.3	17.5	17.0	18.3	19.0	19.5	19.0	20.3	21.2	21.6	21.7	22.4	22.3	23.5	23.6	22.9	19.2
26	26.2	26.2	25.9	24.0	22.9	22.0	21.6	21.4	21.0	20.6	20.0	18.7	17.3	16.9	17.0	17.3	18.1	18.7	18.5	18.1	18.0	18.3	18.6	18.9	20.7	23.1	22.1	22.6	22.3	19.4
27	22.9	22.6	23.4	22.4	21.3	20.7	20.4	20.2	19.7	18.9	18.2	17.6	17.3	17.0	16.0	16.0	17.1	17.0	17.9	17.6	17.9	17.9	17.7	18.7	19.5	21.7	19.7	20.9	21.1	20.3
28	21.6	21.2	22.1	21.1	20.3	19.0	19.5	19.1	18.5	17.7	17.1	17.0	16.0	16.5	16.2	16.1	16.3	17.0	17.5	17.7	18.3	18.3	18.3	18.7	19.5	20.4	19.6	19.6	19.5	19.5
29	20.5	20.1	20.0	19.7	19.1	18.7	18.4	17.9	17.2	16.5	16.0	16.1	15.9	15.7	15.5	15.4	15.5	16.0	16.7	17.1	17.9	18.0	18.0	18.1	18.6	19.1	18.6	18.4	17.3	18.1
30	19.7	19.5	19.4	18.5	17.9	17.5	17.2	16.7	16.3	15.8	15.5	15.3	15.0	14.9	14.7	14.7	14.7	14.9	15.5	15.9	17.0	16.9	14.0	16.0	17.1	17.5	17.1	16.7	15.9	16.5
31	18.6	18.6	18.2	17.4	16.6	15.9	15.7	15.4	15.7	15.3	15.0	14.6	14.2	13.9	13.0	13.7	13.7	13.7	13.0	14.0	14.0	14.6	14.5	14.6	15.1	15.9	14.3	13.9	13.6	14.0
32	17.5	17.5	17.4	16.7	15.7	15.0	15.1	15.2	15.3	14.9	14.5	14.0	13.5	13.1	12.9	12.0	12.7	12.4	12.0	11.7	10.0	11.0	11.1	11.2	11.6	11.3	10.7	10.4	10.3	10.6
33	16.2	16.3	16.9	16.0	14.7	14.2	14.4	14.6	14.6	14.3	14.0	13.5	12.0	12.3	12.0	11.0	11.6	11.1	9.9	0.9	6.4	6.6	6.7	6.0	7.0	6.6	6.3	6.1	6.1	6.1
34	14.5	14.5	15.4	14.5	13.0	12.9	13.2	13.5	13.5	13.3	13.1	12.6	12.0	11.4	11.1	10.0	10.6	9.6	7.3	5.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	12.2	12.1	13.2	12.3	11.1	11.2	11.5	11.0	11.9	11.0	11.6	11.4	10.0	10.4	10.0	9.4	9.2	7.9	4.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	9.4	9.4	10.4	9.6	8.9	9.1	9.2	9.3	9.4	9.4	9.3	9.2	9.0	8.7	8.4	8.0	7.6	6.3	4.2	2.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	7.0	7.4	7.6	7.0	6.0	6.0	6.0	6.0	6.9	6.9	6.0	6.0	6.0	6.7	6.5	6.2	5.0	5.0	3.6	2.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	4.0	4.1	4.1	3.0	3.7	3.7	3.5	3.4	3.5	3.5	3.5	3.5	3.7	3.7	3.6	3.4	3.0	2.9	2.3	1.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 6 (FEBRUARY 1981)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	18.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.4	25.4	24.6	24.0	23.1	21.9	20.0	19.0	18.0	18.4	18.5	17.0	17.7	17.0	16.0	15.2	14.7	14.1	14.7	19.9	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	26.0	25.0	24.0	23.7	23.0	22.1	21.2	20.4	19.6	18.0	18.6	19.1	19.3	19.5	19.0	19.0	18.6	18.6	18.4	19.2	21.0	.0	.0	.0
4	.0	.0	.0	.0	.0	25.9	25.7	25.1	23.7	22.0	22.2	21.5	20.7	20.0	19.5	18.5	18.0	20.0	20.6	20.9	21.5	21.4	21.4	21.5	21.0	22.7	24.3	26.4	.0	.0
5	.0	.0	.0	.0	26.1	25.6	24.7	24.2	22.6	21.7	21.2	20.6	19.0	19.6	19.2	18.7	19.3	20.9	21.7	22.2	23.0	23.4	23.6	23.0	24.4	25.2	25.0	26.5	.0	.0
6	.0	.0	.0	26.5	25.0	25.0	24.1	23.0	21.0	20.3	20.1	19.4	19.0	19.3	19.4	19.3	19.6	21.7	22.7	23.2	24.2	24.9	25.3	25.0	26.5	26.9	26.4	26.6	.0	.0
7	.0	.0	26.7	26.4	25.2	24.2	23.2	21.7	19.9	19.5	19.3	19.2	19.3	19.3	19.9	20.2	20.7	22.6	23.7	24.2	25.4	26.3	26.0	27.4	28.2	28.3	.0	.0	.0	.0
8	.0	.0	27.0	26.2	24.6	23.5	22.4	20.5	18.9	18.0	18.0	19.0	19.7	20.1	20.5	20.0	21.6	23.4	24.6	25.2	26.4	27.4	28.1	28.6	29.7	29.9	.0	.0	.0	.0
9	28.9	28.0	27.5	26.2	24.4	23.0	21.0	20.4	19.1	18.7	18.9	19.4	20.3	20.0	21.0	20.0	22.2	24.0	25.4	26.0	27.3	28.3	29.1	29.9	30.0	31.2	.0	.0	.0	.0
10	28.0	28.7	27.6	26.3	24.6	23.5	22.5	21.4	20.5	20.2	20.3	20.6	21.2	21.0	21.9	22.1	23.0	24.6	26.0	26.7	28.0	29.1	29.9	30.6	31.4	31.9	.0	.0	.0	.0
11	28.6	28.5	27.7	26.5	24.0	23.0	23.2	22.3	21.7	21.5	21.5	21.7	22.2	23.2	22.9	23.0	23.5	25.0	26.5	27.3	28.7	29.0	30.4	30.9	31.6	32.2	.0	.0	.0	.0
12	28.5	28.4	27.7	26.7	25.3	24.3	23.7	23.0	22.5	22.4	22.4	22.5	22.9	23.4	23.4	23.5	24.0	25.6	27.1	27.0	29.1	30.1	30.6	31.0	31.5	32.3	.0	.0	.0	.0
13	28.3	28.2	27.7	26.9	25.6	24.5	24.1	23.6	23.1	23.0	23.0	23.2	23.5	23.0	23.9	23.9	24.5	26.2	27.4	28.0	29.3	30.1	30.6	30.0	31.2	.0	.0	.0	.0	.0
14	28.0	27.9	27.5	27.0	25.9	25.1	24.7	24.3	23.0	23.0	23.7	23.0	23.9	24.1	24.2	24.2	24.0	26.4	27.5	28.1	29.5	30.1	30.3	30.4	30.6	.0	.0	.0	.0	.0
15	27.9	27.7	27.5	27.0	26.0	25.5	25.1	24.7	24.2	24.1	24.0	24.0	24.0	24.0	24.1	24.2	24.0	26.4	27.5	28.0	29.3	29.6	29.7	29.0	29.7	28.0	.0	.0	.0	.0
16	27.9	27.0	27.5	26.9	25.0	25.6	25.4	25.0	24.5	24.1	24.0	23.9	23.7	23.5	23.6	24.1	24.0	26.3	27.2	27.7	28.9	28.9	28.0	28.0	28.7	28.1	27.6	.0	.0	.0
17	27.0	27.7	27.3	26.0	26.1	25.7	25.5	25.0	24.4	23.9	23.7	23.4	23.0	22.0	23.0	23.7	24.5	25.0	26.6	27.0	28.4	27.9	27.9	27.7	27.4	26.9	26.4	25.9	.0	.0
18	27.6	27.6	27.2	26.7	26.1	25.7	25.4	25.0	24.3	23.4	23.6	23.2	22.7	22.6	22.0	23.5	24.3	25.5	26.2	26.7	28.0	27.6	27.5	27.2	26.7	26.1	25.9	25.4	.0	.0
19	27.5	27.5	27.1	26.6	26.0	25.7	25.4	24.9	24.3	23.0	23.5	22.9	22.2	22.3	22.6	23.3	24.0	25.1	25.0	26.3	27.5	27.2	26.9	26.5	26.0	25.4	24.5	23.2	17.6	.0
20	27.4	27.3	26.9	26.5	25.9	25.5	25.2	24.0	24.2	23.7	23.3	22.7	21.9	22.1	22.4	23.0	23.7	24.7	25.3	25.0	27.0	26.6	26.3	25.9	25.5	24.9	23.0	22.5	20.7	.0
21	27.1	27.0	26.7	26.2	25.6	25.3	25.0	24.5	23.9	23.5	23.1	22.4	21.7	21.4	21.0	22.4	23.1	24.1	24.6	25.0	25.0	25.7	25.3	24.9	24.6	24.3	23.6	22.6	21.4	21.2
22	26.7	26.6	26.2	25.6	24.9	24.6	24.3	23.0	23.2	22.7	22.2	21.6	20.7	20.4	20.9	21.4	21.9	22.0	23.3	23.5	24.2	24.3	24.2	24.1	24.1	23.9	23.3	22.6	21.6	20.7
23	26.3	26.3	25.0	25.2	24.4	24.0	23.6	23.1	22.6	22.1	21.7	20.9	20.1	19.5	20.0	20.4	20.0	21.6	21.9	22.1	22.4	23.0	23.2	23.4	23.6	23.5	22.0	22.5	21.9	21.2
24	26.1	26.0	25.6	25.0	24.2	23.6	23.3	22.7	22.0	21.4	20.9	20.1	19.1	19.0	19.3	19.6	20.0	20.6	21.0	21.1	21.5	22.0	22.4	22.7	23.1	23.1	22.7	22.2	21.0	20.0
25	25.0	25.7	25.3	24.7	25.0	23.3	22.9	22.3	21.3	20.0	20.3	19.3	18.2	18.3	18.6	18.9	19.2	19.0	20.1	20.3	20.6	21.1	21.5	21.0	22.4	22.6	22.5	22.2	21.6	20.3
26	24.0	24.7	24.4	23.0	23.0	22.4	22.0	21.5	20.7	19.9	19.3	18.3	17.7	17.7	17.9	18.0	18.3	18.7	18.9	18.9	19.0	19.3	19.5	19.6	20.3	21.4	21.6	21.3	21.1	20.3
27	23.1	23.1	22.0	22.2	21.6	21.1	20.7	20.1	19.0	18.1	17.4	17.0	17.0	17.1	17.1	17.2	17.3	17.6	17.0	17.9	18.0	18.1	18.1	18.4	18.0	19.2	19.3	19.3	19.4	19.0
28	22.2	22.0	21.9	21.3	20.7	20.2	19.7	19.0	17.9	17.1	16.3	16.6	16.6	16.6	16.6	16.6	16.7	16.9	17.1	17.2	17.2	17.3	17.4	17.5	17.7	17.0	17.9	18.0	17.9	17.0
29	21.2	21.0	20.0	20.0	19.6	19.0	18.5	17.0	16.7	16.0	15.7	16.1	16.1	16.1	16.0	16.0	16.0	16.1	16.2	16.2	16.2	16.2	16.2	16.2	16.4	16.6	16.7	16.6	16.6	16.5
30	20.1	20.0	19.7	19.0	18.4	17.7	17.2	16.6	16.0	15.7	15.5	15.6	15.5	15.4	15.4	15.3	15.3	15.2	15.2	15.1	14.9	14.6	14.5	14.7	14.0	14.9	15.0	15.0	14.9	14.9
31	10.0	10.7	10.3	17.0	16.0	15.0	15.5	15.1	15.4	15.2	15.1	14.9	14.7	14.6	14.5	14.4	14.3	14.0	13.7	13.4	12.7	12.1	12.0	12.1	12.2	12.4	12.5	12.5	12.4	12.4
32	17.3	17.3	17.0	16.4	15.4	14.6	14.7	14.6	14.6	14.5	14.4	14.1	13.0	13.6	13.5	13.3	13.2	12.7	11.9	11.3	9.5	0.0	0.7	0.7	0.9	9.0	9.0	9.0	9.0	9.0
33	15.0	15.0	15.5	14.9	14.0	13.5	13.7	13.0	13.0	13.6	13.5	13.2	12.9	12.6	12.3	12.1	11.9	11.2	9.7	0.5	5.4	5.0	4.0	4.0	4.9	4.9	4.9	4.9	4.9	4.9
34	14.0	14.0	13.6	13.0	11.9	11.9	12.2	12.4	12.4	12.3	12.2	11.9	11.6	11.3	11.0	10.7	10.3	9.5	6.0	4.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	11.6	11.6	11.2	10.6	9.0	10.0	10.3	10.5	10.5	10.4	10.3	10.2	9.9	9.6	9.2	0.6	0.5	7.3	3.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	0.0	0.7	0.4	7.0	7.4	7.7	7.0	7.9	0.0	7.9	7.0	7.7	7.6	7.4	7.1	6.0	6.5	5.5	3.2	1.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	6.1	6.0	5.0	5.4	5.3	5.4	5.4	5.5	5.5	5.4	5.4	5.4	5.3	5.2	5.0	4.0	4.5	4.0	2.6	1.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	3.0	3.0	2.9	2.0	2.7	2.7	2.6	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.4	2.1	2.1	1.5	1.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 7 (MARCH 1981)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	19.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.3	25.3	24.5	23.9	23.0	21.0	20.0	19.0	18.0	18.4	18.1	17.3	17.2	17.0	15.1	14.2	13.7	12.9	13.2	16.7	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	25.9	25.7	24.7	23.6	22.9	22.0	21.1	20.4	19.6	18.9	18.6	18.5	18.4	18.3	18.2	17.2	16.6	16.3	15.8	16.3	18.1	.0	.0	.0
4	.0	.0	.0	.0	.0	25.7	25.5	25.0	23.6	22.7	22.1	21.4	20.6	20.0	19.3	18.6	18.0	19.2	19.3	19.3	19.3	18.0	18.6	18.4	18.3	18.0	20.1	22.6	.0	.0
5	.0	.0	.0	.0	26.0	25.4	24.5	24.1	22.5	21.6	21.2	20.5	19.0	19.6	19.2	18.0	19.2	19.0	20.0	20.2	20.3	20.2	20.1	20.1	20.2	20.7	21.2	22.0	.0	.0
6	.0	.0	.0	26.4	25.7	24.0	24.0	22.9	21.0	20.3	20.1	19.5	18.9	19.3	19.4	19.3	19.7	20.4	20.7	20.9	21.2	21.4	21.5	21.7	21.9	22.0	21.6	21.9	.0	.0
7	.0	.0	26.7	26.3	25.1	24.1	23.2	21.7	20.0	19.6	19.4	19.3	19.2	19.2	19.6	19.0	20.4	21.0	21.5	21.6	22.1	22.5	22.0	23.0	23.4	23.4	.0	.0	.0	.0
8	.0	.0	26.9	26.1	24.6	23.6	22.5	20.6	19.0	19.0	19.0	19.2	19.5	19.7	19.9	20.0	20.6	21.5	22.1	22.3	22.9	23.5	23.9	24.3	24.9	24.9	.0	.0	.0	.0
9	27.0	27.0	27.1	26.0	24.4	23.1	21.9	20.6	19.3	18.9	19.1	19.5	20.0	20.2	20.1	19.6	20.0	21.0	22.4	22.9	23.6	24.3	24.9	25.6	26.3	26.4	.0	.0	.0	.0
10	26.7	26.7	26.4	25.5	24.1	23.0	22.2	21.2	20.3	20.0	20.1	20.3	20.6	20.9	20.0	20.7	21.1	22.1	23.0	23.4	24.3	25.1	25.0	26.5	27.1	27.3	.0	.0	.0	.0
11	26.4	26.4	26.0	25.3	23.9	23.0	22.5	21.7	21.1	20.9	20.9	21.0	21.4	22.1	21.5	21.3	21.4	22.3	23.3	23.9	24.9	25.9	26.5	27.0	27.6	27.9	.0	.0	.0	.0
12	26.1	26.1	25.0	25.1	24.0	23.2	22.0	22.2	21.7	21.6	21.6	21.6	21.9	22.1	21.0	21.6	21.7	22.7	23.0	24.3	25.4	26.4	27.0	27.4	27.0	28.2	.0	.0	.0	.0
13	25.9	25.0	25.6	25.1	24.2	23.3	23.1	22.6	22.2	22.1	22.1	22.2	22.3	22.3	22.1	21.9	22.1	23.2	24.2	24.6	25.0	26.2	27.3	27.6	20.0	.0	.0	.0	.0	.0
14	25.6	25.5	25.3	25.1	24.4	23.0	23.5	23.2	22.0	22.0	22.0	22.7	22.6	22.5	22.3	22.1	22.4	23.5	24.3	24.0	26.2	27.1	27.5	27.7	27.9	.0	.0	.0	.0	.0
15	25.5	25.3	25.4	25.1	24.4	24.1	23.9	23.6	23.2	23.1	23.0	22.0	22.5	22.3	22.2	22.2	22.5	23.6	24.4	24.9	26.4	27.2	27.5	27.6	27.7	27.3	.0	.0	.0	.0
16	25.0	25.6	25.5	25.1	24.3	24.3	24.2	23.9	23.4	23.2	23.0	22.6	22.2	21.9	21.9	22.1	22.5	23.6	24.4	24.0	26.3	27.1	27.4	27.4	27.2	26.0	26.5	.0	.0	.0
17	25.9	25.0	25.6	25.3	24.0	24.6	24.4	24.1	23.4	22.9	22.0	22.3	21.7	21.4	21.5	22.0	22.5	23.3	24.0	24.4	26.0	26.5	26.0	26.0	26.7	26.3	25.9	25.5	.0	.0
18	25.9	25.9	25.6	25.3	24.0	24.6	24.4	24.1	23.4	22.5	22.6	22.2	21.5	21.2	21.3	21.9	22.4	23.2	23.0	24.3	25.0	26.3	26.5	26.5	26.3	25.0	25.6	25.2	.0	.0
19	25.9	25.9	25.6	25.3	24.9	24.6	24.4	24.1	23.4	22.9	22.5	22.0	21.1	21.0	21.2	21.7	22.2	23.0	23.6	24.0	25.4	25.9	26.1	26.0	25.0	25.4	24.7	23.7	10.0	.0
20	25.9	25.0	25.6	25.3	24.0	24.6	24.3	24.0	23.3	22.0	22.4	21.9	21.0	21.0	21.2	21.6	22.1	22.7	23.3	23.7	24.0	25.4	25.6	25.6	25.4	24.9	23.9	22.0	21.5	.0
21	25.0	25.7	25.5	25.2	24.7	24.4	24.1	23.7	23.1	22.6	22.2	21.7	21.0	20.7	20.9	21.4	21.9	22.4	22.9	23.2	23.0	24.6	24.0	24.0	24.6	24.0	23.3	22.5	21.6	21.4
22	25.4	25.4	25.2	24.0	24.1	23.9	23.6	23.2	22.5	22.0	21.4	21.0	20.3	20.2	20.6	21.0	21.3	21.6	21.9	22.1	22.6	23.3	23.6	23.7	23.6	23.0	22.4	22.0	21.5	21.1
23	25.0	25.0	24.7	24.4	23.0	23.4	23.1	22.7	22.1	21.6	21.1	20.4	19.0	19.3	19.0	20.1	20.4	20.0	21.1	21.2	21.5	22.1	22.4	22.6	22.6	22.2	21.4	21.3	21.1	20.9
24	24.7	24.6	24.4	24.0	23.4	23.0	22.7	22.2	21.5	21.0	20.5	19.7	19.0	19.7	19.2	19.5	19.0	20.1	20.4	20.5	20.0	21.2	21.6	21.0	21.9	21.7	21.2	20.0	20.7	20.5
25	24.2	24.2	23.9	23.5	22.9	22.5	22.2	21.7	20.7	20.2	19.0	19.0	19.1	19.4	19.6	19.9	19.1	19.4	19.7	19.0	20.1	20.4	20.7	20.9	21.2	21.3	20.9	20.6	20.3	19.9
26	23.2	23.1	22.0	22.4	21.9	21.5	21.2	20.6	19.7	19.0	19.4	17.7	17.4	17.6	17.0	17.9	18.0	18.3	18.5	18.6	18.0	18.9	18.9	19.0	19.1	19.5	19.0	19.6	19.5	19.5
27	22.1	22.1	21.6	21.1	20.7	20.3	19.9	19.1	18.0	17.1	16.5	16.2	16.4	16.7	16.0	16.9	17.0	17.1	17.2	17.4	17.3	17.2	17.0	16.9	16.9	16.0	17.5	17.3	17.3	17.1
28	21.4	21.3	20.0	20.3	19.0	19.3	18.0	18.0	16.9	16.1	15.6	15.0	16.0	16.2	16.3	16.3	16.3	16.3	16.4	16.3	16.1	15.9	15.0	15.6	15.3	15.3	15.5	15.4	15.6	15.6
29	20.5	20.3	19.0	19.1	18.0	18.2	17.6	16.0	15.7	15.1	14.9	15.3	15.5	15.7	15.7	15.7	15.7	15.5	15.4	15.2	14.7	14.4	14.2	14.0	13.9	13.9	14.1	14.2	14.4	14.2
30	19.4	19.2	18.0	18.2	17.6	16.9	16.3	15.6	14.9	14.0	14.7	14.9	15.0	15.1	15.1	15.1	15.0	14.7	14.3	14.0	13.2	12.6	12.3	12.3	12.3	12.3	12.5	12.6	12.7	12.6
31	17.0	17.7	17.4	16.0	15.9	14.9	14.5	14.1	14.2	14.2	14.2	14.2	14.3	14.2	14.2	14.1	14.0	13.5	12.9	12.4	11.0	10.1	9.0	9.7	9.7	9.9	10.2	10.3	10.4	10.3
32	16.1	16.1	15.7	15.2	14.3	13.4	13.4	13.3	13.4	13.4	13.3	13.3	13.3	13.2	13.1	13.0	12.0	12.2	11.1	10.4	0.1	7.1	6.0	6.0	6.9	7.0	7.2	7.3	7.3	7.3
33	14.5	14.5	14.0	13.4	12.6	12.1	12.2	12.3	12.3	12.3	12.3	12.2	12.1	12.0	11.0	11.6	11.3	10.6	9.0	7.7	4.5	3.9	3.7	3.6	3.6	3.7	3.0	3.0	3.0	3.0
34	12.7	12.6	11.9	11.3	10.4	10.4	10.6	10.0	10.0	10.0	10.7	10.7	10.6	10.4	10.1	9.0	9.5	0.7	6.1	4.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	10.4	10.3	9.6	0.9	0.2	0.4	0.7	0.0	0.0	0.0	0.0	0.7	0.6	0.4	0.1	7.5	7.4	6.4	3.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	7.6	7.6	6.9	6.4	6.0	6.2	6.4	6.4	6.4	6.4	6.4	6.3	6.3	6.1	5.9	5.6	5.3	4.5	2.5	1.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	5.2	5.0	4.7	4.3	4.2	4.3	4.3	4.3	4.3	4.2	4.2	4.2	4.2	4.1	4.0	3.0	3.5	3.1	1.9	1.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	2.5	2.4	2.3	2.2	2.1	2.1	1.9	1.9	1.9	1.9	1.9	1.9	2.1	2.1	2.0	1.9	1.6	1.6	1.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 8 (APRIL 1981)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	18.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.2	25.2	24.4	23.9	23.0	21.7	20.7	19.0	18.0	18.3	17.0	16.0	16.4	15.0	13.4	12.2	11.5	10.7	10.2	10.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	25.7	25.6	24.5	23.5	22.0	21.9	21.1	20.4	19.6	18.9	18.6	17.0	17.2	16.7	15.6	13.4	11.0	11.1	10.4	10.1	10.0	.0	.0	.0
4	.0	.0	.0	.0	.0	25.6	25.3	24.0	23.5	22.6	22.0	21.3	20.6	20.0	19.3	10.7	10.0	10.1	17.4	16.9	15.1	12.6	11.4	10.6	10.2	9.9	10.0	12.2	.0	.0
5	.0	.0	.0	.0	25.0	25.3	24.4	23.9	22.5	21.6	21.1	20.5	19.7	19.5	19.2	10.0	19.0	10.4	17.5	16.0	14.7	12.3	11.3	10.6	10.0	9.5	9.5	9.7	.0	.0
6	.0	.0	.0	26.2	25.6	24.7	23.9	22.0	21.0	20.3	20.1	19.5	10.9	19.2	19.2	19.2	19.5	10.5	17.4	16.6	14.1	12.4	11.5	10.9	10.1	9.3	9.0	0.7	.0	.0
7	.0	.0	26.7	26.2	25.1	24.0	23.2	21.7	20.0	19.6	19.5	19.3	19.1	10.0	19.0	19.1	19.5	10.5	17.5	16.6	14.0	12.0	12.4	11.0	10.5	9.4	.0	.0	.0	.0
8	.0	.0	26.0	26.0	24.6	23.5	22.4	20.6	19.1	19.0	19.1	19.1	19.0	10.0	10.7	10.6	10.7	10.3	17.5	16.6	14.2	13.5	13.3	12.7	11.4	9.6	.0	.0	.0	.0
9	24.7	24.9	26.5	25.5	24.1	22.9	21.6	20.3	19.0	10.6	10.9	19.1	10.7	10.5	10.1	17.2	17.0	17.0	17.3	16.5	14.7	13.0	13.7	13.4	11.3	9.9	.0	.0	.0	.0
10	24.1	24.1	24.6	24.0	22.0	21.4	20.3	19.1	10.2	10.0	10.0	10.2	10.2	10.1	17.0	17.3	17.1	17.2	16.0	16.2	14.0	14.2	13.7	13.0	11.5	10.2	.0	.0	.0	.0
11	23.2	23.3	23.3	22.0	21.4	20.1	19.2	10.1	17.4	17.3	17.3	17.5	17.7	10.2	17.5	17.1	16.7	16.5	16.1	15.6	14.5	14.2	13.7	12.9	11.6	10.7	.0	.0	.0	.0
12	22.5	22.5	22.2	21.5	20.4	19.1	10.3	17.3	16.0	16.0	16.0	16.9	17.0	17.0	16.7	16.4	16.3	15.9	15.2	14.6	13.7	13.5	13.2	12.7	11.9	11.0	.0	.0	.0	.0
13	21.6	21.6	21.1	20.4	19.2	10.2	17.6	16.9	16.4	16.4	16.6	16.5	16.3	16.1	15.6	15.5	15.6	15.1	14.3	13.7	13.2	13.2	13.1	12.7	12.3	.0	.0	.0	.0	.0
14	20.5	20.3	19.7	10.5	17.0	17.5	17.0	16.6	16.2	16.2	16.3	15.9	15.5	15.1	14.5	14.4	14.6	14.3	13.4	13.0	13.0	13.3	13.3	13.0	12.7	.0	.0	.0	.0	.0
15	19.6	19.3	10.7	17.1	16.5	16.7	16.6	16.4	16.1	16.0	15.0	15.2	14.3	13.9	13.7	13.6	13.0	13.5	12.0	12.5	12.0	13.9	13.9	13.7	13.4	13.3	.0	.0	.0	.0
16	10.9	10.6	17.7	16.3	15.4	16.0	16.1	16.0	15.3	15.2	15.0	14.0	13.4	13.0	12.9	12.9	13.0	12.6	12.2	12.0	12.3	14.9	15.4	14.7	13.9	12.9	12.0	.0	.0	.0
17	10.1	17.5	17.0	16.3	15.7	15.0	15.9	15.7	14.0	14.0	14.3	13.5	12.0	12.4	12.3	12.3	12.1	11.6	11.4	11.3	11.0	14.5	15.4	15.5	15.3	14.5	14.0	14.3	.0	.0
10	17.0	17.3	16.7	16.2	15.7	15.7	15.6	15.5	14.1	13.2	13.0	13.6	12.6	12.2	12.1	12.0	11.7	11.2	11.0	11.0	11.9	14.4	15.1	15.5	15.0	15.4	14.9	15.0	.0	.0
19	17.5	17.0	16.5	16.0	15.7	15.5	15.3	15.3	14.4	13.4	13.1	13.5	12.3	12.0	11.9	11.9	11.5	10.0	10.7	10.7	11.4	13.7	14.0	15.6	16.1	15.0	15.0	16.1	14.7	.0
20	17.2	16.7	16.3	15.9	15.5	15.3	15.3	15.0	13.9	13.1	12.7	13.3	12.5	12.1	12.1	12.2	11.6	10.5	10.6	10.6	10.6	13.0	14.5	15.5	15.9	15.3	14.6	14.6	14.1	.0
21	16.7	16.3	15.9	15.6	15.2	15.1	14.9	14.4	13.2	12.6	12.3	13.0	12.7	12.6	12.7	12.7	12.1	10.3	10.7	10.0	9.6	11.9	14.1	15.1	15.1	13.2	12.2	12.6	12.0	12.2
22	15.4	15.4	15.1	15.2	14.5	14.3	14.2	13.0	12.0	12.0	11.5	12.0	13.1	13.4	13.5	13.3	12.0	10.5	10.2	9.9	9.0	11.0	12.7	13.1	12.2	9.7	0.0	9.5	11.0	13.1
23	13.0	13.0	13.0	14.5	14.0	14.3	14.1	13.7	12.0	12.1	11.0	11.7	12.1	12.2	12.0	12.0	12.5	11.1	11.3	11.5	10.9	10.7	11.0	10.0	9.1	7.7	0.2	0.7	0.0	10.4
24	12.3	12.3	12.3	12.7	13.2	13.3	13.2	13.1	12.1	11.9	12.0	11.0	11.0	11.9	12.4	12.0	12.0	11.0	11.7	11.5	10.0	10.0	10.4	9.9	0.3	7.4	5.9	5.7	0.7	10.3
25	10.9	10.9	10.9	11.1	12.0	12.3	12.2	11.9	10.9	10.7	10.0	11.2	11.0	12.3	12.0	12.0	12.4	11.7	11.3	11.0	10.5	9.4	9.0	0.0	7.0	0.0	5.9	5.3	5.9	9.7
26	9.4	9.3	0.9	9.2	10.0	11.0	10.9	10.1	0.9	0.4	0.2	0.7	10.1	11.1	11.4	11.4	11.1	10.0	10.2	10.7	10.0	10.2	9.4	0.3	0.4	4.5	5.7	4.0	5.0	0.7
27	11.0	11.2	9.3	9.5	10.1	10.1	9.0	0.7	7.4	7.0	0.9	7.3	0.2	9.0	9.5	9.7	9.0	0.0	0.5	9.0	0.4	7.0	7.0	0.2	5.0	3.3	5.2	3.5	2.9	3.7
20	11.0	11.3	9.2	9.4	9.0	9.4	0.9	7.9	0.7	0.5	0.5	7.2	0.2	0.0	9.0	9.3	9.1	0.0	7.4	7.0	5.0	5.0	5.2	4.4	3.3	2.0	3.0	2.0	2.4	2.4
29	10.0	10.0	9.0	0.9	9.0	0.0	0.1	7.1	0.2	0.2	0.5	7.2	7.9	0.4	0.0	0.9	0.7	7.0	0.0	5.7	4.1	3.0	3.0	3.1	2.9	2.4	2.3	2.4	3.0	2.1
30	9.5	9.5	0.7	0.7	0.4	7.7	7.1	0.4	5.9	0.3	0.0	7.2	7.0	0.3	0.5	0.5	0.2	7.2	0.0	5.0	3.0	2.0	2.0	2.2	2.3	2.0	1.9	2.3	2.3	1.9
31	0.0	0.0	7.0	7.0	7.1	0.2	5.0	5.3	5.2	5.0	0.2	0.7	7.3	7.7	7.0	7.0	7.5	0.0	5.3	4.4	2.0	1.0	1.9	1.7	1.4	1.4	1.0	2.4	1.7	2.1
32	0.0	0.0	5.9	5.7	5.4	4.9	4.0	4.3	4.3	4.0	5.3	5.0	0.3	0.0	0.7	4.7	0.5	5.7	4.0	3.7	1.7	1.2	1.3	1.1	.9	1.0	1.0	1.5	.9	.0
33	5.3	5.4	4.0	3.0	4.0	3.0	3.7	3.4	3.4	4.0	4.0	4.0	5.1	5.3	5.2	5.2	5.1	4.4	3.3	2.7	.9	.0	.0	.5	.7	.4	.3	.3	.1	.2
34	4.3	4.4	3.4	2.0	3.1	3.2	3.1	2.7	2.0	3.0	3.5	3.3	3.4	3.7	3.0	3.3	3.4	3.1	1.0	.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	3.3	3.4	2.2	2.1	2.4	2.0	2.0	2.2	1.9	2.1	2.5	1.9	1.9	2.0	1.7	1.1	1.0	1.0	.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	2.0	2.5	1.0	1.0	1.9	2.0	1.9	1.2	1.1	1.1	1.2	1.0	.9	.9	.0	.7	.0	.7	.2	-.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	1.0	1.3	1.1	1.2	1.4	1.4	1.2	.5	.4	.4	.4	.2	.0	.3	.3	.3	.7	.2	-.1	-.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	.9	.0	.0	.0	.9	.9	.5	.0	.0	.0	.0	.0	.1	.3	.1	.1	.3	.0	-.1	-.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 9 (MAY 1981)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	19.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.1	25.2	24.4	23.0	22.9	21.7	20.0	19.0	18.0	18.3	17.0	16.0	16.4	15.7	13.4	12.3	11.6	10.0	10.3	10.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	25.6	25.5	24.5	23.4	22.7	21.9	21.0	20.4	19.6	18.9	18.6	17.8	17.1	16.6	15.4	13.2	11.9	11.1	10.5	10.1	9.8	.0	.0	.0
4	.0	.0	.0	.0	.0	25.4	25.2	24.7	23.4	22.6	21.9	21.3	20.5	20.0	19.4	18.7	18.7	18.0	17.2	16.6	15.0	12.5	11.4	10.6	10.2	9.8	9.6	9.8	.0	.0
5	.0	.0	.0	.0	25.7	25.2	24.3	23.9	22.4	21.6	21.1	20.5	19.7	19.5	19.2	18.9	18.9	18.1	17.2	16.0	14.5	12.2	11.2	10.6	9.9	9.3	9.2	8.9	.0	.0
6	.0	.0	.0	26.2	25.5	24.7	23.0	22.0	21.0	20.3	20.1	19.5	18.9	19.1	19.1	19.2	19.3	18.2	17.0	16.2	13.0	12.1	11.3	10.7	9.9	9.2	9.0	8.6	.0	.0
7	.0	.0	26.7	26.1	25.0	24.0	23.1	21.7	20.1	19.7	19.5	19.3	19.0	18.7	18.0	18.9	19.0	18.0	16.9	16.1	13.7	12.4	11.9	11.3	10.0	9.0	.0	.0	.0	.0
8	.0	.0	26.6	25.0	24.5	23.5	22.4	20.6	19.1	19.1	19.1	19.1	18.0	18.6	18.4	18.2	17.0	18.3	17.7	16.7	15.9	13.6	12.0	12.4	11.7	10.3	8.0	.0	.0	.0
9	24.1	24.3	25.9	25.1	23.9	22.7	21.4	20.0	18.0	18.4	18.7	18.0	18.4	18.2	17.0	17.0	17.5	17.3	16.4	15.7	13.9	13.0	12.5	11.0	10.1	8.2	.0	.0	.0	.0
10	23.4	23.5	24.0	23.4	22.3	20.9	19.0	18.6	17.7	17.6	17.7	17.0	17.0	17.0	17.5	17.1	16.0	16.7	16.0	15.4	13.9	13.0	12.4	11.5	9.9	8.0	.0	.0	.0	.0
11	22.5	22.5	22.5	22.0	20.6	19.2	18.4	17.1	16.4	16.4	16.6	16.9	17.1	17.7	17.1	16.0	16.5	16.1	15.3	14.0	13.5	12.6	12.1	11.4	10.2	8.4	.0	.0	.0	.0
12	21.5	21.5	21.2	20.4	19.2	17.9	17.0	15.0	15.3	15.4	15.5	15.9	16.1	16.2	16.1	16.0	16.0	15.4	14.4	13.9	12.0	11.9	11.4	11.0	10.3	8.4	.0	.0	.0	.0
13	20.5	20.4	19.0	18.9	17.0	16.5	15.0	14.9	14.4	14.5	14.7	15.0	15.0	15.0	15.0	15.0	15.1	14.5	13.5	12.9	12.0	11.3	10.9	10.6	10.2	.0	.0	.0	.0	.0
14	19.0	10.0	10.1	16.7	15.9	15.3	14.7	14.0	13.5	13.5	13.6	13.0	13.0	13.7	13.7	13.0	14.0	13.6	12.6	12.1	11.3	10.7	10.4	10.2	9.9	.0	.0	.0	.0	.0
15	17.0	17.5	16.7	15.0	14.2	13.9	13.7	13.2	12.7	12.6	12.7	12.9	12.6	12.5	12.6	12.7	13.0	12.0	11.7	11.3	10.5	10.3	10.1	9.9	9.6	9.2	.0	.0	.0	.0
16	16.6	16.3	15.3	13.0	12.3	12.3	12.3	11.9	11.2	11.4	11.5	11.5	11.4	11.4	11.6	11.7	12.0	11.7	11.1	10.5	9.6	10.0	9.9	9.6	9.2	0.6	8.3	.0	.0	.0
17	15.4	15.2	14.1	13.1	11.0	11.6	11.5	10.2	10.2	10.4	10.0	10.0	10.0	10.9	11.0	11.0	11.0	10.7	10.1	9.6	0.7	9.2	9.5	9.0	9.3	0.0	0.4	0.4	.0	.0
18	15.0	14.7	13.4	12.6	11.5	11.3	11.2	10.0	10.0	9.6	10.3	10.6	10.5	10.6	10.6	10.7	10.6	10.3	9.6	9.2	0.6	9.0	9.2	9.7	9.4	9.0	0.0	0.0	.0	.0
19	14.5	14.0	12.9	12.1	11.2	10.9	10.7	10.5	9.9	9.7	9.9	10.3	10.2	10.3	10.3	10.4	10.2	9.0	9.2	0.9	0.4	0.7	0.0	9.0	9.4	9.1	9.3	9.0	10.0	.0
20	14.1	13.0	12.5	11.7	10.9	10.6	10.5	10.1	9.5	9.4	9.5	10.1	10.1	10.1	10.1	10.1	9.9	9.4	0.0	0.6	0.2	0.3	0.6	9.3	9.2	0.6	0.3	0.3	0.2	.0
21	13.6	13.4	11.9	11.0	10.2	10.0	9.0	9.6	9.0	0.9	9.0	9.6	9.9	9.0	9.0	9.7	9.5	0.0	0.4	0.3	0.1	7.7	0.0	0.5	0.3	6.9	6.5	6.6	6.7	6.1
22	12.5	12.4	11.4	10.2	9.2	0.9	0.0	0.5	0.3	0.1	0.1	0.5	9.2	9.4	9.4	9.2	0.9	0.1	7.7	7.0	6.7	6.0	7.0	7.1	6.4	6.5	6.1	6.5	5.9	7.1
23	11.2	11.1	10.4	9.4	0.9	0.5	0.3	0.2	0.1	7.0	7.6	7.9	0.2	0.4	0.6	0.0	0.4	7.7	7.5	7.4	6.3	6.2	6.4	6.4	5.2	4.2	3.2	3.4	3.9	6.0
24	10.2	10.1	9.4	0.3	7.7	7.6	7.5	7.4	7.1	7.3	7.5	7.6	7.7	0.0	0.5	0.4	0.3	7.9	7.2	6.9	6.0	5.7	6.1	5.4	4.6	4.1	3.2	3.0	3.3	5.6
25	9.0	9.0	0.1	7.4	6.0	6.7	6.6	6.5	6.3	6.5	6.7	7.2	7.5	7.9	0.1	0.1	0.1	7.2	6.6	6.3	5.6	5.2	4.0	4.6	4.3	4.1	3.3	2.9	3.0	5.6
26	7.2	7.3	5.6	5.3	5.6	5.5	5.4	5.1	5.3	5.3	5.4	5.0	6.3	6.7	6.9	6.0	6.6	5.6	5.7	5.9	5.6	5.3	4.7	4.5	3.1	3.1	2.6	2.5	2.5	5.4
27	6.4	6.7	5.0	5.2	4.0	4.7	4.6	4.3	4.5	4.5	4.6	4.9	5.0	5.2	5.3	5.3	5.1	4.5	4.5	4.7	4.3	4.2	4.0	3.3	2.0	2.5	2.2	1.9	1.6	2.1
28	6.0	6.2	4.7	4.9	4.4	4.3	4.2	4.1	4.1	4.2	4.2	4.6	5.0	4.0	4.0	4.0	4.7	4.0	4.0	3.7	3.3	3.6	3.2	2.7	2.3	2.1	1.6	1.6	1.2	1.4
29	5.6	5.7	4.3	4.3	4.2	4.0	4.0	3.9	3.0	3.9	4.0	4.3	4.5	4.5	4.5	4.5	4.2	3.7	3.4	3.1	2.6	2.7	2.5	2.1	2.1	1.0	1.3	1.4	1.2	1.1
30	5.1	5.3	4.3	3.9	3.9	3.7	3.6	3.6	3.5	3.7	3.9	4.1	4.2	4.2	4.2	4.1	3.9	3.4	2.9	2.7	2.1	2.1	1.9	1.4	1.6	1.4	1.1	1.3	.0	.9
31	4.7	5.3	4.2	3.3	3.4	3.3	3.2	3.1	3.1	3.3	3.5	3.7	3.7	3.0	3.7	3.6	3.3	3.0	2.5	2.2	1.4	1.4	1.5	1.2	1.1	1.0	.0	1.0	.5	.0
32	4.0	4.5	3.0	2.6	2.9	2.9	2.0	2.5	2.6	2.0	3.0	3.3	3.2	3.2	3.1	3.0	2.0	2.4	2.1	1.0	.9	.9	1.0	.9	.0	.7	.5	.6	.2	.0
33	3.4	3.0	2.2	2.1	2.5	2.5	2.4	2.1	2.1	2.4	2.7	2.5	2.5	2.5	2.2	2.2	2.1	1.0	1.5	1.4	.5	.5	.6	.5	.7	.4	.1	.0	-.2	-.1
34	2.0	3.0	2.3	1.0	2.1	2.2	2.1	1.7	1.6	1.0	2.1	1.0	1.7	1.7	1.6	1.4	1.7	1.3	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	2.2	2.2	1.7	1.5	1.0	2.0	1.9	1.5	1.2	1.2	1.4	1.1	.9	.9	.7	.1	.6	.9	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	1.7	1.6	1.3	1.3	1.5	1.6	1.4	.7	.6	.6	.7	.5	.4	.4	.3	.2	.2	.2	.0	-.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	1.2	1.0	1.0	1.1	1.3	1.3	1.0	.3	.2	.2	.2	-.1	-.3	.1	.1	.1	.3	-.1	-.2	-.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	.0	.7	.7	.0	.9	.9	.5	.0	.0	-.1	-.1	-.1	.1	.3	.1	.1	.2	.0	-.1	-.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 10 (JUNE 1981)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	18.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.1	25.2	24.4	23.8	22.9	21.7	20.8	19.8	18.8	18.4	17.9	16.9	16.6	15.9	13.5	12.4	11.7	11.0	10.4	10.1	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	25.5	25.4	24.4	23.3	22.7	21.9	21.0	20.4	19.7	19.0	18.6	18.0	17.3	16.8	15.6	13.3	11.9	11.2	10.6	10.2	9.9	.0	.0	.0
4	.0	.0	.0	.0	.0	25.3	25.1	24.7	23.4	22.5	21.9	21.3	20.6	20.0	19.4	18.9	18.8	18.2	17.4	16.9	15.2	12.5	11.4	10.6	10.3	9.9	9.6	9.4	.0	.0
5	.0	.0	.0	.0	25.7	25.1	24.2	23.0	22.4	21.6	21.1	20.5	19.7	19.6	19.2	18.9	18.9	18.4	17.4	16.7	14.7	12.1	11.1	10.5	9.9	9.4	9.2	8.9	.0	.0
6	.0	.0	.0	26.2	25.4	24.6	23.8	22.8	21.8	20.3	20.1	19.5	18.9	19.1	19.1	19.1	19.2	18.4	17.2	16.5	13.9	12.0	11.3	10.7	9.9	9.3	9.0	8.5	.0	.0
7	.0	.0	26.7	26.1	25.0	24.0	23.1	21.8	20.1	19.7	19.6	19.3	19.0	18.6	18.0	18.0	18.9	18.2	17.2	16.3	13.7	12.4	12.0	11.4	10.0	9.0	.0	.0	.0	.0
8	.0	.0	26.5	25.7	24.4	23.4	22.3	20.6	19.1	19.1	19.1	19.0	18.8	18.6	18.4	18.2	18.3	18.0	17.0	16.2	13.6	12.9	12.5	11.9	10.4	8.8	.0	.0	.0	.0
9	24.2	24.3	25.6	24.0	23.7	22.5	21.2	19.7	18.5	18.2	18.5	18.6	18.4	18.2	17.9	17.1	17.7	17.6	16.7	16.0	14.1	13.2	12.7	11.9	10.1	7.9	.0	.0	.0	.0
10	23.6	23.6	23.9	23.3	22.2	20.7	19.6	18.2	17.3	17.3	17.4	17.6	17.7	17.8	17.5	17.2	17.8	17.2	16.4	15.7	14.1	13.1	12.5	11.5	9.8	7.7	.0	.0	.0	.0
11	22.7	22.6	22.5	21.8	20.4	18.9	18.0	16.5	15.8	16.0	16.2	16.7	17.0	17.6	17.1	16.9	16.7	16.6	15.8	15.1	13.7	12.7	12.1	11.3	10.1	8.1	.0	.0	.0	.0
12	21.6	21.7	21.1	20.1	18.9	17.4	16.5	15.1	14.5	14.8	15.1	15.6	15.9	16.1	16.0	16.1	16.3	15.9	14.8	14.1	12.9	11.9	11.3	10.9	10.2	8.1	.0	.0	.0	.0
13	20.5	20.5	19.7	18.6	17.4	15.9	15.2	13.9	13.4	13.7	14.0	14.5	14.7	14.8	14.9	15.1	15.4	15.0	13.8	13.0	11.9	11.1	10.7	10.4	10.1	.0	.0	.0	.0	.0
14	19.0	18.8	17.9	16.2	15.5	14.6	13.9	12.9	12.3	12.4	12.6	13.2	13.4	13.5	13.6	13.8	14.2	13.9	12.7	12.0	11.2	10.4	10.1	9.9	9.7	.0	.0	.0	.0	.0
15	17.7	17.3	16.4	14.4	13.6	13.1	12.8	12.1	11.4	11.5	11.7	12.2	12.3	12.3	12.4	12.7	13.1	13.0	11.7	11.2	10.2	9.8	9.6	9.4	9.2	8.7	.0	.0	.0	.0
16	16.2	16.0	14.9	13.3	11.5	11.5	11.4	11.0	10.2	10.5	10.7	11.0	11.1	11.2	11.4	11.6	12.0	11.8	11.0	10.4	9.3	9.1	8.9	8.8	8.5	8.0	7.8	.0	.0	.0
17	14.8	14.7	13.4	12.3	10.9	10.7	10.6	10.2	9.5	9.7	10.0	10.3	10.5	10.6	10.8	10.9	11.0	10.7	10.0	9.4	8.3	8.0	8.3	8.6	8.1	7.4	7.0	6.6	.0	.0
18	14.3	14.0	12.6	11.7	10.5	10.3	10.2	9.8	9.2	9.0	9.7	10.0	10.2	10.3	10.4	10.5	10.5	10.2	9.5	9.1	8.2	8.0	8.1	8.3	7.8	7.1	7.1	6.7	.0	.0
19	13.7	13.4	12.0	11.2	10.1	9.9	9.7	9.4	9.0	9.1	9.4	9.7	9.9	10.0	10.1	10.1	10.1	9.8	9.0	8.7	8.0	7.8	7.7	8.0	7.4	6.7	6.9	6.9	7.1	.0
20	13.3	13.0	11.6	10.7	9.7	9.6	9.5	9.1	8.7	8.8	9.0	9.4	9.6	9.7	9.8	9.8	9.7	9.3	8.6	8.3	7.9	7.5	7.3	7.3	7.0	6.3	6.4	6.1	4.9	.0
21	12.7	12.5	11.1	10.0	9.0	8.9	8.8	8.7	8.3	8.3	8.5	8.9	9.2	9.2	9.2	9.1	9.0	8.6	8.1	7.9	7.9	7.0	6.7	6.6	6.4	5.2	5.4	5.1	4.2	4.0
22	11.0	11.6	10.5	8.9	7.5	7.6	7.4	7.3	7.4	7.5	7.5	7.9	8.2	8.3	8.2	8.1	8.0	7.6	7.3	7.3	6.4	6.2	5.9	5.6	5.4	3.7	3.5	3.6	3.7	5.0
23	10.7	10.6	9.6	8.0	7.1	6.9	6.7	6.6	6.9	6.9	7.0	7.2	7.4	7.4	7.1	7.4	7.1	6.9	6.7	6.6	5.5	5.5	5.6	5.5	4.7	3.0	2.9	3.0	3.1	4.6
24	9.0	9.7	8.0	7.2	6.4	6.2	5.9	5.9	6.0	6.3	6.5	6.0	6.9	6.9	7.0	6.7	6.6	6.6	6.1	5.9	5.1	5.0	5.1	4.4	4.2	3.0	2.9	2.7	2.7	3.9
25	8.0	8.0	7.6	6.0	5.7	5.5	5.4	5.2	5.4	5.7	5.9	6.3	6.4	6.5	6.6	6.3	6.4	5.7	5.4	5.2	4.7	4.5	4.1	3.9	3.9	3.6	3.1	2.7	2.5	4.1
26	6.7	6.0	4.0	4.7	4.0	4.4	4.3	4.2	4.0	4.9	5.0	5.3	5.4	5.4	5.3	5.0	5.1	4.5	4.6	4.4	4.1	4.2	3.7	3.6	2.7	3.0	2.2	2.2	2.1	4.1
27	5.3	5.6	4.3	4.5	3.6	3.6	3.6	3.5	4.1-	4.2	4.2	4.5	4.4	4.4	4.2	4.0	3.0	3.6	3.6	3.6	3.3	3.4	3.2	2.0	2.6	2.5	1.7	1.0	1.4	1.0
28	4.6	5.0	3.9	4.1	3.0	3.0	3.3	3.5	3.0	3.0	3.9	4.1	4.2	4.0	3.0	3.6	3.4	3.2	3.3	3.1	2.0	3.1	2.0	2.4	2.2	2.1	1.5	1.5	1.1	1.2
29	4.1	4.3	3.5	3.4	3.1	3.1	3.2	3.4	3.5	3.5	3.6	3.0	3.7	3.6	3.5	3.3	3.0	2.0	2.7	2.6	2.4	2.5	2.4	2.0	2.1	1.0	1.3	1.3	.9	1.0
30	3.9	4.3	3.4	2.0	3.0	3.0	3.0	3.1	3.2	3.3	3.3	3.4	3.4	3.3	3.1	2.9	2.7	2.5	2.3	2.2	2.0	2.0	1.0	1.4	1.6	1.4	1.0	1.2	.7	.0
31	3.0	4.4	3.5	2.4	2.7	2.0	2.0	2.7	2.0	2.0	3.0	3.0	2.9	2.0	2.7	2.5	2.3	2.1	1.9	1.0	1.3	1.4	1.5	1.3	1.1	1.0	.7	1.0	.3	.0
32	3.4	3.9	2.3	2.0	2.5	2.6	2.5	2.3	2.3	2.4	2.6	2.7	2.5	2.3	2.2	2.0	1.0	1.7	1.5	1.4	.0	.9	1.1	.9	.0	.0	.4	.6	.1	-.1
33	3.0	3.4	1.0	1.0	2.2	2.3	2.3	1.9	1.9	2.1	2.3	2.1	1.9	1.0	1.5	1.5	1.4	1.1	1.1	1.1	.5	.5	.7	.6	.9	.4	.1	.0	-.2	-.1
34	2.5	2.0	2.2	1.7	2.0	2.2	2.1	1.6	1.5	1.6	1.9	1.6	1.4	1.3	1.1	1.0	1.3	.9	.5	-.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	1.9	2.0	1.6	1.5	1.0	2.0	1.9	1.4	1.1	1.2	1.4	1.0	.7	.7	.5	.0	.5	.7	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	1.5	1.4	1.3	1.3	1.6	1.6	1.5	.7	.6	.6	.7	.5	.3	.3	.3	.1	.2	.1	-.1	-.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	1.2	1.0	1.0	1.2	1.3	1.3	1.0	.3	.2	.2	.2	.0	-.2	.1	.1	.1	.4	-.1	-.2	-.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	.0	.7	.7	.9	1.0	1.0	.5	.0	.0	-.1	-.1	-.1	.1	.4	.1	.1	.3	-.1	-.2	-.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 11 (JULY 1981)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	18.0	18.0	18.0	18.0	18.0	18.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.1	25.2	24.4	23.9	23.0	21.9	20.9	20.0	19.0	18.6	18.9	18.1	17.8	17.2	14.5	13.1	11.9	11.4	10.9	10.5	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	25.5	25.4	24.5	23.4	22.0	22.0	21.2	20.6	19.9	19.2	18.9	19.7	19.3	19.0	17.7	14.5	12.2	11.3	10.9	10.6	10.2	.0	.0	.0
4	.0	.0	.0	.0	.0	25.4	25.1	24.7	23.4	22.6	22.0	21.4	20.0	20.3	19.7	19.0	19.1	20.4	20.0	19.5	17.6	13.1	11.5	10.6	10.5	10.2	9.9	9.7	.0	.0
5	.0	.0	.0	.0	25.7	25.1	24.3	23.9	22.5	21.7	21.2	20.6	20.0	19.0	19.5	19.1	19.6	20.0	20.3	19.5	16.7	12.5	11.2	10.6	10.0	9.5	9.5	8.9	.0	.0
6	.0	.0	.0	26.4	25.5	24.7	23.9	22.9	21.2	20.5	20.3	19.7	19.1	19.5	19.5	19.4	19.5	21.0	20.3	19.4	15.1	12.3	11.4	10.9	10.1	9.6	9.2	8.6	.0	.0
7	.0	.0	26.0	26.3	25.0	24.1	23.2	21.9	20.3	19.9	19.7	19.5	19.3	19.1	19.6	19.7	19.7	21.1	20.3	19.3	14.7	13.0	12.7	12.3	10.4	9.3	.0	.0	.0	.0
8	.0	.0	26.0	26.0	24.5	23.5	22.3	20.6	19.1	19.1	19.2	19.2	19.3	19.3	19.4	19.5	20.0	20.9	20.2	19.3	15.1	14.3	14.2	13.6	11.6	9.1	.0	.0	.0	.0
9	29.0	29.3	26.5	25.4	23.9	22.6	21.0	19.5	18.4	18.1	18.4	18.6	18.7	18.0	18.0	18.4	19.5	20.5	20.0	19.3	16.5	14.5	14.3	13.5	10.5	7.0	.0	.0	.0	.0
10	29.6	29.2	27.2	25.3	23.4	21.5	19.9	18.0	17.0	17.2	17.4	17.0	17.9	18.1	18.2	18.2	18.2	19.5	19.6	19.0	14.0	14.9	13.0	12.3	10.0	7.4	.0	.0	.0	.0
11	29.9	29.6	26.9	24.6	22.2	20.0	18.4	16.3	15.4	15.0	16.2	16.0	17.1	17.7	17.4	17.6	17.9	18.5	18.6	18.0	15.9	14.3	13.2	12.1	10.5	8.1	.0	.0	.0	.0
12	27.9	27.0	25.0	23.0	20.9	18.6	17.0	14.0	13.9	14.5	14.9	15.7	16.0	16.2	16.3	16.6	17.2	17.4	17.0	15.9	13.0	12.4	11.0	11.3	10.6	0.1	.0	.0	.0	.0
13	26.0	26.5	24.2	20.9	19.1	16.0	15.4	13.5	12.7	13.3	13.0	14.6	14.9	15.0	15.2	15.5	16.2	16.2	15.2	13.0	12.3	11.3	11.0	10.7	10.4	.0	.0	.0	.0	.0
14	25.0	24.5	22.2	17.7	16.2	15.2	13.9	12.4	11.7	11.9	12.3	13.3	13.6	13.7	13.9	14.2	15.0	14.0	13.3	12.3	11.5	10.6	10.3	10.1	10.0	.0	.0	.0	.0	.0
15	22.9	22.4	20.1	15.4	14.0	13.2	12.9	11.0	10.9	11.2	11.6	12.6	12.5	12.5	12.7	13.0	13.0	13.6	12.0	11.3	10.3	9.9	9.0	9.6	9.4	9.0	.0	.0	.0	.0
16	20.2	19.9	17.6	14.0	11.6	11.5	11.4	11.0	10.1	10.4	10.0	11.1	11.2	11.3	11.5	11.0	12.5	12.2	11.6	10.6	9.5	9.2	9.0	0.9	0.0	0.3	0.0	.0	.0	.0
17	17.2	16.7	14.4	12.9	10.9	10.0	10.7	10.2	9.7	9.0	10.1	10.5	10.6	10.0	11.0	11.2	11.3	11.0	10.3	9.7	0.3	7.0	0.4	9.0	0.1	7.3	7.0	6.4	.0	.0
18	16.1	15.4	13.1	12.1	10.4	10.4	10.3	9.0	9.3	9.1	9.0	10.2	10.4	10.5	10.7	10.0	10.9	10.6	9.7	9.2	0.4	0.1	0.1	0.7	7.0	6.9	7.0	6.5	.0	.0
19	15.1	14.1	12.3	11.3	10.0	10.0	9.9	9.5	9.0	9.2	9.6	9.9	10.1	10.2	10.3	10.4	10.4	10.1	9.2	0.0	0.2	0.0	7.0	0.4	7.3	6.4	6.7	6.5	6.2	.0
20	14.7	13.0	11.0	10.6	9.6	9.6	9.7	9.2	0.7	0.9	9.2	9.6	9.0	9.9	10.0	10.0	9.9	9.6	0.0	0.5	0.2	7.7	7.4	7.3	6.0	6.0	6.5	6.0	4.2	.0
21	14.3	13.0	11.3	10.0	0.0	0.9	0.9	0.9	0.4	0.5	0.7	9.1	9.9	9.4	9.4	9.3	9.2	0.9	0.2	0.1	0.7	7.3	6.7	6.4	6.4	5.1	5.7	5.2	3.0	3.9
22	13.3	13.1	11.1	0.0	7.1	7.5	7.2	7.3	7.5	7.7	7.0	0.2	0.3	0.3	0.2	0.1	0.0	7.9	7.5	0.0	6.7	6.4	5.9	5.5	5.5	3.7	3.5	3.6	3.5	5.0
23	11.4	11.2	10.1	7.9	6.0	6.0	6.6	6.5	7.3	7.1	7.2	7.3	7.5	7.4	6.7	7.5	7.1	7.1	6.9	7.1	5.6	5.7	6.0	6.3	4.9	4.1	3.2	3.3	3.1	5.6
24	10.3	10.3	9.5	7.2	6.3	6.1	5.0	5.0	6.2	6.5	6.6	6.9	7.0	7.0	7.2	6.6	6.5	6.0	6.3	6.1	5.3	5.3	5.0	4.6	4.5	4.1	3.1	2.9	2.0	4.0
25	9.2	9.3	7.9	7.2	5.7	5.5	5.3	5.1	5.7	5.9	6.1	6.5	6.5	6.5	6.5	6.1	6.6	5.7	5.4	5.3	4.0	4.7	4.2	4.1	4.4	3.0	3.4	2.9	2.6	5.1
26	7.2	7.7	4.7	4.0	5.0	4.5	4.3	4.2	5.1	5.1	5.2	5.5	5.5	5.4	5.2	4.0	3.5	4.5	4.0	4.4	3.9	4.3	3.9	4.3	2.9	3.4	2.4	2.5	2.3	5.1
27	5.2	5.9	4.2	4.0	3.5	3.6	3.7	3.5	4.3	4.4	4.4	4.7	4.6	4.5	4.3	3.9	3.7	3.6	3.7	3.6	3.2	3.6	3.4	3.0	2.9	2.9	1.9	2.1	1.6	2.0
28	4.5	5.2	4.0	4.5	2.0	2.0	3.4	3.7	4.0	4.0	4.0	4.4	4.0	4.1	3.0	3.6	3.2	3.2	3.6	3.2	3.0	3.0	3.1	2.6	2.5	2.4	1.7	1.0	1.3	1.4
29	4.0	4.2	3.4	3.7	3.2	3.2	3.3	3.6	3.7	3.7	3.0	4.0	3.9	3.7	3.5	3.2	2.9	2.9	2.9	2.0	2.6	2.9	2.7	2.3	2.5	2.1	1.5	1.7	1.1	1.2
30	3.9	4.6	3.6	2.7	3.1	3.2	3.2	3.3	3.4	3.4	3.5	3.6	3.5	3.3	3.1	2.9	2.6	2.7	2.5	2.4	2.2	2.4	2.1	1.7	1.9	1.0	1.3	1.9	1.0	1.2
31	3.9	5.4	3.9	2.3	2.0	3.0	3.0	2.9	3.0	3.0	3.2	3.2	3.0	2.9	2.7	2.5	2.2	2.1	2.1	2.0	1.4	1.6	1.9	1.6	1.4	1.4	1.0	2.1	.6	2.1
32	3.6	5.0	2.2	2.1	2.7	2.0	2.0	2.5	2.5	2.7	2.9	3.1	2.6	2.4	2.2	2.0	1.0	1.7	1.7	1.6	1.0	1.2	1.5	1.2	1.0	1.1	.7	1.6	.4	.2
33	3.2	4.1	1.0	1.9	2.5	2.6	2.6	2.1	2.1	2.4	3.1	2.5	2.1	1.9	1.7	1.6	1.4	1.3	1.3	1.6	.7	.0	1.0	.9	1.3	.7	.3	.3	.0	.2
34	2.7	3.2	3.0	1.9	2.3	2.5	2.4	1.7	1.7	2.0	2.0	1.9	1.6	1.5	1.4	1.3	1.0	1.0	.7	-.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	2.2	2.2	1.9	1.7	2.1	2.3	2.3	1.0	1.4	1.6	2.3	1.4	1.1	1.0	.9	.4	.0	1.1	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	1.0	1.6	1.6	1.5	1.9	2.0	2.0	.0	.0	.9	1.2	.0	.7	.6	.5	.4	.5	.3	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	1.5	1.2	1.3	1.4	1.6	1.0	1.4	.4	.4	.4	.4	.3	.1	.4	.3	.3	1.4	.0	-.1	-.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	1.1	.0	.9	1.1	1.3	1.4	.0	.0	.1	.1	.1	.1	.2	.9	.2	.2	1.1	-.1	-.2	-.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 12 (AUGUST 1981)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	19.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.1	25.2	24.4	23.9	23.1	21.9	21.0	20.1	19.1	18.6	18.7	17.7	17.4	16.6	13.9	12.6	11.7	11.1	10.7	10.2	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	25.5	25.4	24.5	23.4	22.0	22.0	21.3	20.7	20.0	19.3	19.0	19.2	18.7	18.3	16.0	13.0	11.9	11.0	10.6	10.3	9.9	.0	.0	.0
4	.0	.0	.0	.0	.0	25.3	25.1	24.7	23.4	22.6	22.0	21.5	20.9	20.4	19.0	19.1	19.2	19.9	19.2	18.6	16.3	12.3	11.1	10.3	10.2	9.9	9.5	9.4	.0	.0
5	.0	.0	.0	.0	25.7	25.1	24.2	23.9	22.5	21.7	21.3	20.7	20.1	19.9	19.6	19.3	19.7	20.2	19.4	18.5	13.4	11.0	10.0	10.3	9.7	9.2	9.2	8.6	.0	.0
6	.0	.0	.0	26.4	25.5	24.7	23.9	22.9	21.2	20.5	20.4	19.7	19.2	19.6	19.6	19.5	19.7	20.4	19.3	18.3	14.0	11.7	11.0	10.6	9.0	9.3	8.9	8.3	.0	.0
7	.0	.0	26.9	26.4	25.1	24.1	23.2	21.9	20.3	19.9	19.8	19.6	19.4	19.2	19.6	19.7	19.9	20.4	19.4	18.1	13.0	12.2	12.2	11.0	10.0	9.0	.0	.0	.0	.0
8	.0	.0	26.9	26.1	24.5	23.4	22.3	20.5	19.1	19.1	19.2	19.2	19.2	19.2	19.3	19.3	19.7	20.2	19.2	18.1	13.0	13.4	13.2	12.6	10.0	8.7	.0	.0	.0	.0
9	28.9	28.6	26.7	25.5	23.9	22.5	20.9	19.2	18.2	18.0	18.3	18.5	18.5	18.6	18.5	19.0	18.9	19.0	19.0	18.0	15.0	13.7	13.6	12.7	10.1	7.5	.0	.0	.0	.0
10	28.4	28.1	26.5	24.0	22.9	21.1	19.6	17.0	16.0	17.0	17.2	17.6	17.7	17.9	17.9	17.0	17.7	19.0	18.5	17.7	15.3	14.0	13.2	11.9	9.7	7.1	.0	.0	.0	.0
11	27.3	27.1	25.7	23.0	21.6	19.5	18.1	16.0	15.2	15.6	15.9	16.5	16.9	17.5	17.2	17.2	17.5	18.0	17.5	16.7	14.7	13.4	12.7	11.7	10.2	7.0	.0	.0	.0	.0
12	26.2	26.1	24.5	22.2	20.2	18.0	16.6	14.5	13.7	14.2	14.7	15.4	15.7	15.9	16.0	16.3	16.9	17.0	16.1	15.1	13.2	12.0	11.4	11.0	10.3	7.0	.0	.0	.0	.0
13	25.0	24.7	22.9	20.3	18.5	16.3	15.0	13.2	12.4	13.0	13.5	14.4	14.6	14.7	14.9	15.2	15.9	15.0	14.5	13.2	11.9	11.0	10.7	10.4	10.1	.0	.0	.0	.0	.0
14	23.0	22.6	20.6	16.0	15.0	14.7	13.6	12.1	11.4	11.6	12.0	13.0	13.3	13.4	13.6	13.9	14.7	14.5	12.9	11.9	11.2	10.3	10.0	9.0	9.7	.0	.0	.0	.0	.0
15	21.1	20.6	18.6	14.6	13.6	12.0	12.6	11.5	10.7	10.9	11.3	12.2	12.2	12.2	12.4	12.7	13.5	13.3	11.6	11.0	10.1	9.6	9.5	9.3	9.2	8.7	.0	.0	.0	.0
16	18.0	18.4	16.4	13.5	11.3	11.2	11.1	10.7	9.9	10.2	10.5	10.0	11.0	11.1	11.3	11.5	12.2	11.9	11.1	10.2	9.2	0.9	0.0	0.6	0.5	0.0	7.7	.0	.0	.0
17	16.5	16.1	13.0	12.4	10.5	10.5	10.4	10.0	9.4	9.5	9.9	10.2	10.4	10.6	10.7	10.9	11.0	10.7	10.0	9.4	0.0	7.6	0.1	0.5	7.0	7.0	6.7	6.1	.0	.0
18	15.5	14.9	12.7	11.7	10.1	10.1	10.0	9.6	9.0	0.0	9.6	9.9	10.1	10.3	10.4	10.5	10.6	10.3	9.4	0.9	0.1	7.0	7.0	0.3	7.5	6.6	6.7	6.2	.0	.0
19	14.6	13.0	11.9	11.0	9.7	9.7	9.6	9.2	0.0	0.9	9.3	9.6	9.0	10.0	10.1	10.1	10.1	9.0	0.9	0.5	0.0	7.7	7.5	7.0	7.0	6.1	6.4	6.2	5.0	.0
20	14.1	13.4	11.4	10.3	9.3	9.3	9.3	0.9	0.5	0.6	0.9	9.3	9.5	9.7	9.7	9.7	9.6	9.3	0.5	0.2	7.9	7.4	7.1	6.9	6.5	5.7	6.2	5.6	3.9	.0
21	13.6	13.2	11.0	9.7	0.5	0.6	0.6	0.6	0.1	0.2	0.4	0.0	9.3	9.1	9.1	9.0	0.9	0.6	0.0	7.0	0.4	7.0	6.5	6.1	6.1	4.0	5.4	4.9	3.5	3.6
22	12.6	12.3	10.7	0.5	6.0	7.2	6.9	7.0	7.2	7.4	7.5	7.9	0.0	0.0	7.9	7.0	7.7	7.5	7.2	7.5	6.3	6.1	5.6	5.2	5.2	3.4	3.2	3.3	3.2	4.7
23	11.0	10.9	9.0	7.6	6.5	6.5	6.3	6.2	6.0	6.0	6.9	7.2	7.2	7.0	6.1	6.9	6.7	6.7	6.6	6.6	5.3	5.4	5.6	5.6	4.6	3.0	2.9	2.9	2.0	4.0
24	10.0	9.9	9.0	6.9	6.0	5.0	5.5	5.5	5.9	6.2	6.4	6.7	6.7	6.7	6.6	6.2	6.2	6.3	5.9	5.7	5.0	4.9	5.2	4.2	4.2	3.0	2.0	2.6	2.5	3.6
25	0.0	0.9	7.5	6.0	5.4	5.2	5.0	4.9	5.4	5.6	5.0	6.2	6.2	6.2	6.2	5.7	6.0	5.3	5.1	4.9	4.5	4.4	3.9	3.0	4.1	3.5	3.1	2.6	2.3	4.3
26	6.0	7.1	4.4	4.5	4.7	4.2	4.0	3.9	4.0	4.0	4.9	5.2	5.2	5.1	4.0	4.4	4.0	4.2	4.3	4.0	3.6	4.0	3.6	3.9	2.6	3.1	2.1	2.2	1.9	4.7
27	4.9	5.6	3.9	4.5	3.2	3.3	3.4	3.2	4.0	4.1	4.1	4.4	4.3	4.2	3.9	3.6	3.4	3.3	3.4	3.2	2.9	3.3	3.1	2.7	2.6	2.5	1.6	1.0	1.3	1.7
28	4.2	4.9	3.7	4.2	2.5	2.5	3.1	3.4	3.0	3.0	3.0	4.1	4.3	3.0	3.5	3.3	2.9	2.9	3.2	2.9	2.7	3.3	2.0	2.3	2.2	2.1	1.4	1.5	1.0	1.1
29	3.7	4.0	3.1	3.4	2.9	2.9	3.1	3.3	3.4	3.5	3.6	3.7	3.6	3.4	3.2	2.9	2.6	2.6	2.6	2.5	2.3	2.6	2.4	2.0	2.2	1.0	1.2	1.4	.9	.9
30	3.6	4.3	3.3	2.4	2.0	2.9	2.9	3.1	3.1	3.2	3.3	3.3	3.2	3.0	2.9	2.6	2.3	2.4	2.2	2.1	1.9	2.1	1.0	1.4	1.6	1.5	1.0	1.5	.7	.0
31	3.6	4.9	3.5	2.0	2.6	2.7	2.7	2.6	2.7	2.7	2.9	2.9	2.7	2.6	2.4	2.2	2.0	1.9	1.0	1.7	1.1	1.3	1.6	1.3	1.1	1.1	.7	1.4	.3	1.3
32	3.3	4.4	1.9	1.0	2.4	2.5	2.5	2.2	2.3	2.4	2.6	2.0	2.3	2.1	2.0	1.0	1.5	1.5	1.4	1.4	.0	.9	1.2	.9	.0	.0	.4	1.0	.1	-.2
33	2.9	3.0	1.5	1.7	2.2	2.3	2.3	1.0	1.0	2.1	2.6	2.1	1.0	1.7	1.4	1.3	1.2	1.0	1.0	1.2	.4	.5	.0	.6	1.0	.5	.1	.0	-.2	-.1
34	2.4	2.9	2.4	1.6	2.0	2.2	2.1	1.4	1.4	1.7	2.2	1.6	1.4	1.2	1.1	1.0	1.4	.0	.5	-.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	1.9	1.9	1.6	1.4	1.0	2.1	2.0	1.5	1.1	1.2	1.7	1.1	.0	.0	.6	.1	.5	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	1.5	1.4	1.3	1.3	1.6	1.7	1.7	.6	.5	.6	.0	.5	.4	.3	.3	.1	.2	.0	-.1	-.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	1.2	1.0	1.0	1.1	1.4	1.5	1.2	.1	.1	.1	.1	.0	-.2	.1	.0	.0	.0	-.3	-.4	-.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	.9	.6	.7	.9	1.1	1.2	.6	-.2	-.1	-.2	-.1	-.1	.0	.5	.0	.0	.6	-.3	-.4	-.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 13 (SEPTEMBER 1981)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	18.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.1	25.2	24.5	23.9	23.1	22.0	21.1	20.1	19.1	18.7	18.0	17.9	17.5	16.0	14.2	12.0	11.9	11.3	10.0	10.4	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	25.5	25.4	24.5	23.5	22.9	22.1	21.4	20.0	20.1	19.4	19.1	19.5	19.0	18.6	17.2	14.2	12.2	11.3	10.0	10.5	10.1	.0	.0	.0
4	.0	.0	.0	.0	.0	25.3	25.1	24.7	23.5	22.7	22.1	21.5	21.0	20.5	19.9	19.3	19.4	20.2	19.6	19.1	17.0	13.1	11.5	10.6	10.5	10.2	9.0	9.6	.0	.0
5	.0	.0	.0	.0	25.7	25.1	24.3	23.9	22.6	21.0	21.4	20.0	20.2	20.1	19.0	19.4	19.9	20.6	19.9	19.1	16.3	12.6	11.2	10.6	10.0	9.5	9.4	8.0	.0	.0
6	.0	.0	.0	26.5	25.6	24.7	23.9	22.9	21.3	20.6	20.4	19.0	19.4	19.7	19.0	19.7	19.9	20.0	19.9	10.9	15.0	12.4	11.4	10.9	10.1	9.5	9.2	8.6	.0	.0
7	.0	.0	27.0	26.5	25.1	24.1	23.2	21.9	20.4	20.0	19.9	19.7	19.5	19.4	19.0	19.9	20.1	20.9	19.9	10.0	14.6	13.0	12.6	12.1	10.3	9.3	.0	.0	.0	.0
8	.0	.0	27.1	26.2	24.6	23.4	22.3	20.5	19.1	19.1	19.2	19.3	19.3	19.3	19.5	19.6	20.0	20.7	19.0	10.0	14.9	14.1	13.0	13.1	11.2	9.0	.0	.0	.0	.0
9	29.6	29.3	27.1	25.7	24.0	22.5	20.0	19.1	10.1	10.0	10.3	10.5	10.6	10.7	10.0	10.4	19.4	20.2	19.6	10.7	15.9	14.3	14.0	13.1	10.4	7.9	.0	.0	.0	.0
10	29.1	20.0	27.1	25.2	23.2	21.3	19.7	17.9	17.0	17.1	17.3	17.7	17.9	10.1	10.1	10.1	10.2	19.3	19.0	10.3	16.1	14.6	13.6	12.2	10.0	7.5	.0	.0	.0	.0
11	20.2	27.9	26.4	24.3	21.9	19.0	10.3	16.3	15.4	15.0	16.1	16.7	17.1	17.7	17.4	17.5	17.0	10.3	10.1	17.3	15.3	13.9	13.1	12.0	10.4	0.1	.0	.0	.0	.0
12	27.0	26.9	25.2	22.7	20.5	10.3	16.9	14.0	14.0	14.5	14.9	15.6	15.9	16.2	16.3	16.5	17.1	17.3	16.5	15.6	13.6	12.3	11.7	11.2	10.5	0.1	.0	.0	.0	.0
13	25.0	25.5	23.6	20.0	10.9	16.6	15.3	13.5	12.0	13.3	13.7	14.6	14.0	14.9	15.1	15.4	16.1	16.0	14.9	13.7	12.3	11.3	11.0	10.7	10.4	.0	.0	.0	.0	.0
14	23.9	23.5	21.4	17.7	16.1	15.0	13.9	12.4	11.7	11.9	12.3	13.2	13.5	13.6	13.0	14.1	14.0	14.7	13.2	12.3	11.4	10.5	10.3	10.1	9.9	.0	.0	.0	.0	.0
15	21.9	21.4	19.3	15.4	14.0	13.2	12.0	11.0	10.9	11.2	11.5	12.4	12.4	12.4	12.6	12.9	13.7	13.5	12.0	11.3	10.3	9,9	9.7	9.5	9.4	0.9	.0	.0	.0	.0
16	19.4	19.1	17.0	13.9	11.6	11.5	11.3	10.9	10.1	10.4	10.7	11.0	11.2	11.3	11.5	11.0	12.4	12.1	11.4	10.6	9.4	9.1	9.0	0.0	0.7	0.2	7.9	.0	.0	.0
17	16.0	16.4	16.2	12.7	10.0	10.7	10.6	10.2	9.6	9.0	10.1	10.4	10.6	10.0	10.9	11.1	11.2	11.0	10.2	9.6	0.3	7.0	0.3	0.7	0.0	7.3	6.9	6.4	.0	.0
18	15.0	15.2	13.1	12.0	10.4	10.3	10.2	9.0	9.2	9.0	9.0	10.1	10.3	10.5	10.6	10.7	10.0	10.5	9.6	9.2	0.3	0.0	0.1	0.5	7.7	6.0	6.9	6.4	.0	.0
19	14.9	14.1	12.3	11.3	10.0	9.9	9.0	9.4	9.0	9.1	9.5	9.0	10.0	10.2	10.3	10.3	10.3	10.0	9.2	0.0	0.2	7.9	7.7	0.1	7.2	6.3	6.6	6.3	6.0	.0
20	14.5	13.0	11.0	10.6	9.5	9.5	9.5	9.1	0.7	0.9	9.2	9.5	9.7	9.9	9.9	9.9	9.9	9.5	0.7	0.4	0.1	7.6	7.3	7.2	6.7	5.9	6.3	5.0	4.1	.0
21	14.0	13.6	11.3	9.9	0.0	0.0	0.0	0.7	0.3	0.4	0.7	9.0	9.6	9.3	9.3	9.2	9.1	0.0	0.2	0.0	0.6	7.2	6.7	6.3	6.3	5.1	5.6	5.0	3.0	3.9
22	12.9	12.7	10.9	0.7	7.1	7.4	7.2	7.2	7.5	7.6	7.7	0.1	0.2	0.2	0.1	0.0	7.9	7.0	7.5	7.0	6.6	6.3	5.0	5.5	5.4	3.7	3.5	3.6	3.4	4.0
23	11.2	11.1	10.0	7.0	6.0	6.7	6.5	6.4	7.0	7.0	7.1	7.4	7.4	7.3	6.6	7.2	7.0	6.9	6.0	6.9	5.5	5.7	5.0	5.9	4.9	4.0	3.1	3.2	3.1	5.1
24	10.2	10.2	9.3	7.2	6.2	6.0	5.7	5.7	6.1	6.3	6.5	6.0	6.9	6.9	6.9	6.4	6.4	6.6	6.1	5.9	5.2	5.2	5.5	4.5	4.4	4.0	3.1	2.9	2.0	3.9
25	9.1	9.2	7.0	7.1	5.7	5.4	5.3	5.1	5.5	5.0	6.0	6.3	6.4	6.3	6.4	5.9	6.2	5.5	5.3	5.2	4.7	4.6	4.2	4.0	4.3	3.7	3.3	2.9	2.6	4.3
26	7.1	7.6	4.7	4.0	4.9	4.4	4.3	4.1	5.0	5.1	5.1	5.4	5.4	5.2	5.0	4.7	5.1	4.4	4.6	4.2	3.0	4.2	3.0	4.1	2.0	3.3	2.3	2.4	2.2	4.9
27	5.2	5.0	4.2	4.7	3.4	3.5	3.6	3.5	4.3	4.3	4.3	4.7	4.5	4.4	4.2	3.0	3.7	3.5	3.6	3.5	3.2	3.5	3.3	2.9	2.0	2.0	1.0	2.0	1.5	1.9
20	4.5	5.1	4.0	4.3	2.0	2.0	3.3	3.6	4.0	4.0	4.0	4.3	4.5	4.0	3.7	3.5	3.2	3.1	3.4	3.1	2.9	3.6	3.0	2.6	2.4	2.3	1.6	1.0	1.3	1.4
29	4.0	4.2	3.4	3.6	3.1	3.1	3.3	3.5	3.6	3.7	3.0	3.9	3.0	3.6	3.4	3.1	2.0	2.0	2.0	2.7	2.6	2.0	2.6	2.2	2.4	2.0	1.4	1.6	1.1	1.2
30	3.9	4.5	3.5	2.7	3.0	3.1	3.1	3.3	3.3	3.4	3.5	3.5	3.4	3.2	3.0	2.0	2.5	2.6	2.4	2.3	2.2	2.3	2.1	1.7	1.0	1.7	1.3	1.7	.9	1.1
31	3.9	5.2	3.7	2.3	2.0	2.9	2.9	2.0	2.9	3.0	3.1	3.1	2.9	2.0	2.6	2.4	2.2	2.1	2.0	1.9	1.4	1.5	1.0	1.5	1.3	1.3	1.0	1.7	.5	1.7
32	3.6	4.7	2.3	2.1	2.6	2.7	2.7	2.4	2.5	2.6	2.0	3.0	2.5	2.3	2.1	2.0	1.7	1.6	1.6	1.6	1.0	1.1	1.4	1.2	1.0	1.0	.7	1.3	.3	.1
33	3.2	4.0	1.9	1.9	2.4	2.5	2.5	2.0	2.1	2.3	2.9	2.4	2.0	1.9	1.6	1.5	1.4	1.2	1.2	1.5	.6	.7	.9	.0	1.2	.6	.3	.2	.0	.1
34	2.7	3.1	2.7	1.0	2.2	2.4	2.3	1.7	1.7	2.0	2.6	1.9	1.6	1.4	1.3	1.2	1.7	1.0	.7	-.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	2.1	2.1	1.9	1.6	2.0	2.3	2.2	1.7	1.4	1.5	2.0	1.3	1.0	.9	.0	.3	.7	1.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	1.7	1.6	1.5	1.5	1.0	1.9	1.0	.0	.7	.0	1.0	.0	.6	.6	.5	.3	.4	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	1.4	1.2	1.2	1.3	1.6	1.7	1.3	.4	.3	.3	.3	.2	.0	.3	.2	.3	1.0	.0	-.2	-.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	1.1	.0	.0	1.0	1.2	1.3	.0	.0	.0	.0	.0	.1	.2	.7	.2	.2	.0	-.1	-.2	-.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

HEAD DISTRIBUTIONS AT THE END OF TIME STEP 1 STRESS PERIOD 14 (OCTOBER 1981)

	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
1	.0	.0	.0	.0	.0	.0	.0	27.0	26.0	25.0	25.0	24.0	22.0	21.0	20.0	18.0	18.0	18.0	16.0	16.0	16.0	13.0	12.0	12.0	11.0	10.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	26.1	25.2	24.4	23.9	23.1	21.9	21.0	20.1	19.1	18.7	18.3	17.3	16.9	16.1	13.6	12.4	11.6	10.9	10.4	10.1	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	25.4	25.4	24.5	23.4	22.8	22.1	21.4	20.8	20.1	19.5	19.2	18.7	18.0	17.5	16.1	13.4	11.8	11.1	10.5	10.2	9.8	.0	.0	.0
4	.0	.0	.0	.0	.0	25.2	25.0	24.6	23.4	22.7	22.1	21.5	21.0	20.5	20.0	19.3	19.4	19.1	18.3	17.7	15.6	12.4	11.3	10.4	10.2	9.8	9.5	9.3	.0	.0
5	.0	.0	.0	.0	25.6	25.0	24.2	23.8	22.5	21.8	21.4	20.8	20.2	20.1	19.0	19.5	19.7	19.4	18.4	17.6	14.9	12.0	11.0	10.4	9.8	9.3	9.1	8.6	.0	.0
6	.0	.0	.0	26.5	25.5	24.6	23.9	22.9	21.3	20.6	20.5	19.9	19.3	19.7	19.0	19.7	19.9	19.5	18.3	17.3	14.0	11.9	11.1	10.6	9.8	9.2	8.9	8.4	.0	.0
7	.0	.0	27.0	26.5	25.1	24.0	23.2	21.9	20.3	20.0	19.9	19.7	19.4	19.2	19.5	19.6	19.0	19.4	18.2	17.1	13.0	12.3	12.0	11.4	9.9	8.9	.0	.0	.0	.0
8	.0	.0	27.0	26.1	24.5	23.4	22.2	20.4	19.0	19.1	19.2	19.2	19.1	19.0	19.0	19.0	19.2	19.1	18.0	17.0	13.0	13.0	12.6	11.9	10.4	8.7	.0	.0	.0	.0
9	26.0	26.0	26.0	25.4	23.0	22.4	20.7	19.1	18.1	17.9	18.2	18.5	18.4	18.4	18.3	17.6	18.4	18.6	17.7	16.0	14.3	13.3	12.9	12.0	10.0	7.7	.0	.0	.0	.0
10	25.0	25.9	25.4	24.0	22.4	20.7	19.4	17.0	16.9	17.0	17.2	17.5	17.7	17.0	17.7	17.5	17.4	18.0	17.2	16.4	14.4	13.3	12.6	11.6	9.7	7.4	.0	.0	.0	.0
11	24.0	24.7	24.0	22.0	20.0	19.0	17.0	16.2	15.4	15.7	16.0	16.5	16.9	17.6	17.1	17.1	17.1	17.3	16.4	15.6	13.9	12.0	12.2	11.4	10.0	7.9	.0	.0	.0	.0
12	23.7	23.6	22.6	21.1	19.3	17.5	16.3	14.7	14.0	14.4	14.0	15.4	15.7	16.0	16.0	16.2	16.6	16.4	15.2	14.4	12.9	11.0	11.3	10.9	10.2	7.9	.0	.0	.0	.0
13	22.4	22.2	21.1	19.4	17.7	15.9	14.9	13.5	12.0	13.2	13.6	14.3	14.6	14.7	14.9	15.1	15.6	15.3	14.0	13.1	11.9	11.0	10.7	10.4	10.0	.0	.0	.0	.0	.0
14	20.6	20.2	18.9	16.6	15.5	14.5	13.6	12.4	11.7	11.9	12.2	13.0	13.3	13.4	13.5	13.0	14.3	14.1	12.0	12.0	11.1	10.3	10.0	9.0	9.6	.0	.0	.0	.0	.0
15	18.9	18.5	17.2	14.5	13.6	12.9	12.5	11.7	10.9	11.1	11.4	12.0	12.1	12.2	12.4	12.6	13.2	13.0	11.7	11.1	10.1	9.6	9.4	9.2	9.1	8.6	.0	.0	.0	.0
16	17.1	16.0	15.3	13.3	11.4	11.3	11.1	10.7	9.9	10.2	10.5	10.0	10.9	11.0	11.3	11.5	12.0	11.7	11.0	10.3	9.2	0.9	8.7	8.6	8.4	7.9	7.6	.0	.0	.0
17	15.3	15.0	13.5	12.2	10.6	10.5	10.3	9.9	9.3	9.5	9.0	10.1	10.3	10.5	10.7	10.0	10.9	10.7	9.9	9.4	0.1	7.7	0.0	0.2	7.0	7.0	6.7	6.2	.0	.0
18	14.6	14.2	12.6	11.6	10.2	10.1	9.9	9.5	9.0	0.0	9.5	9.9	10.1	10.2	10.3	10.4	10.5	10.2	9.4	0.9	0.1	7.7	7.0	0.0	7.4	6.6	6.7	6.2	.0	.0
19	13.9	13.4	11.9	11.0	9.0	9.7	9.5	9.1	0.0	0.9	9.2	9.5	9.7	9.9	10.0	10.0	10.0	9.7	0.9	0.5	7.9	7.6	7.4	7.5	6.9	6.2	6.3	6.0	5.7	.0
20	13.4	13.1	11.5	10.4	9.4	9.3	9.2	0.0	0.5	0.6	0.9	9.2	9.4	9.6	9.6	9.6	9.6	9.2	0.5	0.2	7.0	7.3	7.0	6.9	6.5	5.7	5.9	5.3	3.9	.0
21	12.0	12.5	10.9	9.7	0.6	0.6	0.5	0.4	0.0	0.2	0.4	0.7	9.0	9.0	9.0	0.9	0.0	0.5	7.9	7.0	7.9	6.9	6.4	6.1	6.0	4.9	5.2	4.7	3.6	3.6
22	11.7	11.6	10.4	0.5	7.0	7.2	7.0	7.0	7.2	7.3	7.4	7.0	7.9	0.0	7.0	7.7	7.7	7.5	7.1	7.2	6.3	6.0	5.6	5.2	5.1	3.5	3.3	3.3	3.2	4.5
23	10.7	10.5	9.4	7.6	6.6	6.4	6.3	6.2	6.5	6.6	6.0	7.1	7.1	7.0	6.3	6.0	6.7	6.6	6.4	6.3	5.3	5.4	5.4	5.2	4.5	3.7	2.0	2.9	2.0	4.2
24	9.0	9.7	0.6	6.9	6.0	5.0	5.5	5.5	5.7	6.0	6.3	6.5	6.6	6.6	6.9	6.1	6.1	6.1	5.0	5.6	4.9	4.0	4.9	4.2	4.1	3.7	2.0	2.6	2.5	3.4
25	0.7	0.7	7.4	6.5	5.5	5.2	5.0	4.9	5.2	5.5	5.7	6.1	6.1	6.1	6.0	5.6	5.7	5.2	5.0	4.9	4.4	4.3	3.9	3.7	3.0	3.4	3.0	2.6	2.3	3.5
26	6.5	6.6	4.5	4.5	4.6	4.2	4.1	3.9	4.6	4.0	4.0	5.1	5.1	5.0	4.7	4.4	4.6	4.1	4.1	3.9	3.6	3.9	3.5	3.4	2.5	2.9	2.1	2.1	1.9	3.0
27	5.0	5.4	4.0	4.2	3.3	3.3	3.4	3.3	4.0	4.0	4.1	4.3	4.2	4.1	3.9	3.6	3.4	3.3	3.3	3.2	2.9	3.2	3.0	2.7	2.5	2.4	1.6	1.7	1.3	1.6
28	4.3	4.0	3.7	3.9	2.7	2.7	3.1	3.3	3.7	3.7	3.7	4.0	4.0	3.7	3.5	3.2	3.0	2.9	3.0	2.0	2.6	3.0	2.7	2.3	2.1	2.0	1.4	1.4	1.0	1.1
29	3.0	4.0	3.2	3.2	2.9	2.9	3.0	3.2	3.4	3.4	3.5	3.6	3.5	3.3	3.1	2.9	2.6	2.6	2.5	2.4	2.3	2.4	2.3	1.9	2.1	1.7	1.2	1.3	.0	.9
30	3.6	4.1	3.2	2.5	2.0	2.0	2.9	3.0	3.1	3.1	3.2	3.3	3.1	3.0	2.0	2.6	2.3	2.3	2.2	2.1	1.9	2.0	1.0	1.4	1.5	1.4	1.0	1.2	.6	.7
31	3.5	4.2	3.2	2.1	2.5	2.7	2.7	2.6	2.6	2.7	2.0	2.0	2.7	2.5	2.4	2.2	2.0	1.0	1.7	1.6	1.1	1.3	1.5	1.2	1.0	1.0	.7	1.0	.2	.0
32	3.2	3.0	2.0	1.0	2.3	2.5	2.4	2.2	2.2	2.3	2.5	2.6	2.3	2.1	1.9	1.7	1.5	1.4	1.3	1.3	.0	.9	1.1	.9	.7	.7	.4	.6	.1	-.1
33	2.0	3.3	1.6	1.7	2.2	2.3	2.2	1.0	1.0	2.0	2.3	2.0	1.0	1.6	1.3	1.3	1.1	.9	1.0	1.0	.4	.5	.7	.6	.9	.4	.1	.0	-.3	-.1
34	2.4	2.7	2.1	1.6	2.0	2.1	2.0	1.5	1.4	1.6	1.9	1.5	1.3	1.2	1.0	.9	1.1	.7	.4	-.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	1.9	1.9	1.6	1.4	1.0	2.0	1.9	1.4	1.1	1.1	1.4	.9	.7	.7	.5	-.1	.4	.7	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36	1.5	1.3	1.3	1.2	1.5	1.6	1.5	.6	.5	.5	.7	.5	.3	.3	.2	.1	.1	.0	-.1	-.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
37	1.2	.9	1.0	1.1	1.3	1.3	1.0	.2	.1	.1	.1	-.1	-.3	.0	.0	.0	.4	-.2	-.3	-.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38	.0	.6	.7	.0	1.0	1.0	.5	-.1	-.1	-.1	-.1	-.1	.0	.4	.0	.0	.3	-.2	-.3	-.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
39	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.5	.5	.5	.5	.5	.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

APPENDIX E

VOLUMETRIC BUDGET AND DESCRIPTION OF THE 1. STRESS PERIOD (SEPTEMBER - 1980)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 2. STRESS PERIOD (OCTOBER   - 1980)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 3. STRESS PERIOD (NOVEMBER - 1980)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 4. STRESS PERIOD (DECEMBER - 1980)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 5. STRESS PERIOD (JANUARY   - 1981)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 6. STRESS PERIOD (FEBRUARY - 1981)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 7. STRESS PERIOD (MARCH   - 1981)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 8. STRESS PERIOD (APRIL   - 1981)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 9. STRESS PERIOD (MAY   - 1981)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 10. STRESS PERIOD (JUNE   - 1981)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 11. STRESS PERIOD (JULY   - 1981)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 12. STRESS PERIOD (SEPTEMBER - 1981)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 13. STRESS PERIOD (OCTOBER   - 1981)
VOLUMETRIC BUDGET AND DESCRIPTION OF THE 14. STRESS PERIOD (NOVEMBER - 1981)

STRESS PERIOD NO. 1, LENGTH = 30.00000

NUMBER OF TIME STEPS = 1
MULTIPLIER FOR DELT = 1.000
INITIAL TIME STEP SIZE = 30.00000

100 WELLS ACTIVE IN THIS STRESS PERIOD

WELL NO.	ROW	COL	STRESS RATE	WELL NO.	ROW	COL	STRESS RATE	WELL NO.	ROW	COL	STRESS RATE
1	2	9	-763.20	35	9	10	-2304.0	69	23	9	-432.00
2	2	11	-537.70	36	9	16	-4435.2	70	23	27	-864.00
3	2	17	-432.00	37	10	5	-518.40	71	24	9	-1152.0
4	2	18	-696.10	38	11	5	-864.00	72	24	28	-432.00
5	2	25	-720.00	39	11	6	-864.00	73	25	9	-1152.0
6	3	8	-42.623	40	11	17	-403.20	74	25	11	-432.00
7	3	10	-1296.0	41	11	18	-864.00	75	25	25	-1036.8
8	3	11	-1440.0	42	12	4	-576.00	76	25	30	-720.00
9	3	12	-1728.0	43	12	8	-720.00	77	26	21	-1010.9
10	3	13	-1152.0	44	12	9	-82.067	78	26	23	-576.00
11	3	18	-1814.4	45	13	3	-172.80	79	26	24	-864.00
12	4	8	-432.00	46	13	6	-1526.4	80	26	25	-864.00
13	4	9	-2390.4	47	13	8	-720.00	81	27	21	-2.8800
14	4	11	-1440.0	48	13	9	-720.00	82	27	24	-2.8800
15	4	16	-2066.1	49	14	2	-950.40	83	28	26	-2.8800
16	5	7	-3254.4	50	14	3	-460.80	84	29	4	-734.40
17	5	13	-1440.0	51	15	2	-1286.2	85	29	24	-2.8800
18	5	15	-288.00	52	15	4	-576.00	86	29	29	-2.8800
19	5	16	-1213.1	53	16	5	-2882.0	87	30	18	-720.00
20	6	9	-2160.0	54	16	9	-864.00	88	30	24	-576.00
21	6	10	-1699.2	55	16	14	-1008.0	89	30	25	-2.8800
22	6	11	-374.40	56	17	9	-720.00	90	30	29	-97.920
23	6	12	-2160.0	57	17	20	-794.88	91	31	24	-2.8800
24	6	13	-4032.0	58	17	22	-357.98	92	33	15	-720.00
25	6	19	-288.00	59	18	10	-864.00	93	33	18	-1008.0
26	7	9	-1152.0	60	19	7	-576.00	94	33	29	-921.60
27	7	10	-518.40	61	21	13	-576.00	95	35	12	-230.40
28	7	11	-230.40	62	21	18	-518.40	96	35	13	-576.00
29	7	14	-2304.0	63	21	21	-864.00	97	35	16	-2073.6
30	7	26	-345.60	64	21	23	-432.00	98	37	12	-432.00
31	8	8	-2793.6	65	21	25	-115.20	99	37	13	-1008.0
32	8	9	-4282.6	66	22	5	-1114.7	100	38	17	-720.00
33	9	6	-576.00	67	22	11	-1008.0				
34	9	9	-576.00	68	23	3	-288.00				

9 ITERATIONS FOR TIME STEP 1 IN STRESS PERIOD 1
MAXIMUM HEAD CHANGE FOR EACH ITERATION

ROW	COL	HEAD CHANGE
16	27	7.911942
14	2	6.277380
11	1	4.934161
12	26	2.344975
13	1	1.225882
6	27	.499810
6	27	.134408
6	27	.120991
5	28	.071808

VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP 1 IN STRESS PERIOD 1

CUMULATIVE VOLUMES L**3		RATES FOR SEPTEMBER 1980 L**3/T	
IN:		IN:	
STORAGE =	10067.	STORAGE =	335.56
CONSTANT HEAD =	.14343E+06	CONSTANT HEAD =	4781.1
WELLS =	.00000	WELLS =	.00000
RECHARGE =	.14639E+09	RECHARGE =	.48796E+07
ET =	.00000	ET =	.00000
RIVER LEAKAGE =	.16255E+06	RIVER LEAKAGE =	5418.4
TOTAL IN =	.14670E+09	TOTAL IN =	.48901E+07
OUT:		OUT:	
STORAGE =	.29074E+08	STORAGE =	.96912E+06
CONSTANT HEAD =	.34786E+07	CONSTANT HEAD =	.11595E+06
WELLS =	.29112E+07	WELLS =	97039.
RECHARGE =	.00000	RECHARGE =	.00000
ET =	.11096E+09	ET =	.36985E+07
RIVER LEAKAGE =	.24917E+06	RIVER LEAKAGE =	8305.7
TOTAL OUT =	.14667E+09	TOTAL OUT =	.48890E+07
IN - OUT =	34096.	IN - OUT =	[illegible]
PERCENT DISCREPANCY =	.02	PERCENT [illegible] =	[illegible]

TIME SUMMARY AT END OF TIME STEP 1 IN STRESS PERIOD 1

TIME STEP LENGTH =	30.0000
STRESS PERIOD TIME =	30.0000
TOTAL SIMULATION TIME =	30.0000

```
STRESS PERIOD NO     P  LENGTH =    31.00000
   ----------------------------------------
NUMBER OF TIME STEPS    =      1
MULTIPLIER FOR DELT     =      1.000
INITIAL TIME STEP SIZE =    31.00000
REUSING WELLS FROM LAST STRESS PERIOD
                RECHARGE =        .0010960 FOR LAYER  1
REUSING SURF FROM LAST STRESS PERIOD
 EVAPOTRANSPIRATION RATE =        .0004730 FOR LAYER  1
REUSING EXDP FROM LAST STRESS PERIOD
REUSING RIVER REACHES FROM LAST STRESS PERIOD

   9 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD  2
MAXIMUM HEAD CHANGE FOR EACH ITERATION
-------------------------------------
LAYER   ROW   COL    HEAD CHANGE
-----  ----- -----   -----------
  1      26      27       2.515213
  1      11      26       2.482313
  1      15      26       2.454272
  1      12      26       2.015409
  1      15      26        .943055
  1      12      26        .471981
  1      15      26        .230413
  1       6      27        .117384
  1      16      27        .097145


VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD  2
-------------------------------------------------------------------------------
  CUMULATIVE VOLUMES  L**3                RATES FOR THIS TIME STEP  L**3/T
  -----------------------                ---------------------------------
     IN:                                     IN:
     ---                                     ---
                STORAGE =    .49141E+06            STORAGE =    15527.
           CONSTANT HEAD =    .29331E+06      CONSTANT HEAD =    4834.6
                  WELLS =    .00000                 WELLS =    .00000
               RECHARGE =    .20128E+09           RECHARGE =    .17709E+07
                     ET =    .00000                    ET =    .00000
           RIVER LEAKAGE =    .32225E+06      RIVER LEAKAGE =    5151.6
               TOTAL IN =    .20239E+09           TOTAL IN =    .17964E+07
      OUT:                                    OUT:
      ----                                    ----
                STORAGE =    .55399E+08            STORAGE =    .84921E+06
           CONSTANT HEAD =    .81209E+07      CONSTANT HEAD =    .14975E+06
                  WELLS =    .59194E+07              WELLS =    97039.
               RECHARGE =    .00000               RECHARGE =    .00000
                     ET =    .13185E+09                 ET =    .67383E+06
           RIVER LEAKAGE =    .10097E+07      RIVER LEAKAGE =    24535.
              TOTAL OUT =    .20229E+09          TOTAL OUT =    .17944E+07
               IN - OUT =    96576.               IN - OUT =    2015.5
     PERCENT DISCREPANCY =     .05      PERCENT DISCREPANCY =     .11
```

STRESS PERIOD NO. 3, LENGTH = 30.00000

NUMBER OF TIME STEPS = 1
MULTIPLIER FOR DELT = 1.000
INITIAL TIME STEP SIZE = 30.00000

79 WELLS

WELL NO.	ROW	COL	STRESS RATE	WELL NO.	ROW	COL	STRESS RATE
1	2	9	-763.20	41	12	4	-576.00
2	2	11	-537.70	42	12	8	-720.00
3	2	17	-432.00	43	12	9	-82.067
4	2	18	-696.10	44	13	3	-172.80
5	2	25	-720.00	45	13	6	-1526.4
6	3	8	-42.630	46	13	8	-720.00
7	3	10	-1296.0	47	13	9	-720.00
8	3	11	-1440.0	48	14	2	-950.40
9	3	12	-1728.0	49	14	3	-460.80
10	3	13	-1152.0	50	15	2	-1286.2
11	3	18	-1238.4	51	16	5	-2882.0
12	4	8	-432.00	52	16	9	-864.00
13	4	9	-2390.4	53	16	14	-1008.0
14	4	11	-1440.0	54	17	20	-794.88
15	4	16	-2066.1	55	17	22	-357.98
16	5	7	-3254.4	56	18	10	-864.00
17	5	13	-1440.0	57	21	13	-576.00
18	5	15	-288.00	58	21	21	-864.00
19	5	16	-1213.1	59	21	25	-115.20
20	6	9	-2160.0	60	22	5	-1114.7
21	6	10	-1699.2	61	22	11	-1008.0
22	6	11	-374.40	62	23	3	-288.00
23	6	12	-2160.0	63	23	27	-664.00
24	6	13	-4032.0	64	24	28	-432.00
25	6	19	-288.00	65	25	9	-1152.0
26	7	9	-1152.0	66	25	30	-720.00
27	7	10	-518.40	67	26	24	-864.00
28	7	11	-230.40	68	26	25	-864.00
29	7	14	-2304.0	69	27	21	-2.8800
30	7	26	-345.60	70	27	24	-2.8800
31	8	8	-2793.6	71	28	26	-2.8800
32	8	9	-4282.6	72	29	4	-734.40
33	9	9	-576.00	73	29	24	-2.8800
34	9	10	-2304.0	74	29	29	-2.8800
35	9	16	-4435.2	75	30	25	-2.8800
36	10	5	-518.40	76	30	29	-97.920
37	11	5	-864.00	77	31	24	-2.8800
38	11	6	-864.00	78	35	16	-864.00
39	11	17	-403.20	79	38	17	-720.00
40	11	18	-864.00				

```
                RECHARGE =       .0000000 FOR LAYER  1
REUSING SURF FROM LAST STRESS PERIOD
 EVAPOTRANSPIRATION RATE =       .0000000 FOR LAYER  1
REUSING EXDP FROM LAST STRESS PERIOD
REUSING RIVER REACHES FROM LAST STRESS PERIOD


   8 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD  3
MAXIMUM HEAD CHANGE FOR EACH ITERATION
-------------------------------------
  ROW   COL    HEAD CHANGE
 ----- -----   -----------
   9       1    -2.165717
   6      26    -1.924731
  11       1    -2.217484
   8      23    -1.495109
  13       1     -.511056
   6      27     -.362868
   6      27     -.108730
   6      27     -.093675


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

     IN:                                     IN:
     ---                                     ---
               STORAGE =     .71518E+07              STORAGE =     .22201E+06
        CONSTANT HEAD =     .49694E+06       CONSTANT HEAD =     6787.7
                WELLS =     .00000                   WELLS =     .00000
             RECHARGE =     .20128E+09            RECHARGE =     .00000
                   ET =     .00000                      ET =     .00000
        RIVER LEAKAGE =     .48329E+06       RIVER LEAKAGE =     5367.9
            TOTAL IN =     .20942E+09           TOTAL IN =     .23417E+06
     OUT:                                    OUT:
     ----                                    ----
               STORAGE =     .56921E+08              STORAGE =     50717.
        CONSTANT HEAD =     .10631E+08       CONSTANT HEAD =     83674.
                WELLS =     .83500E+07               WELLS =     81023.
             RECHARGE =     .00000                RECHARGE =     .00000
                   ET =     .13185E+09                  ET =     .00000
        RIVER LEAKAGE =     .16113E+07       RIVER LEAKAGE =     20051.
            TOTAL OUT =     .20936E+09           TOTAL OUT =     .23546E+06
             IN - OUT =     57648.                IN - OUT =    -1297.0
    PERCENT DISCREPANCY =      .03       PERCENT DISCREPANCY =     -.55
```

```
STRESS PERIOD NO.    4, LENGTH =    31.00000
-----------------------------------------------
NUMBER OF TIME STEPS    =      1
MULTIPLIER FOR DELT     =      1.000
INITIAL TIME STEP SIZE =    31.00000
REUSING WELLS FROM LAST STRESS PERIOD
                RECHARGE =        .0000000 FOR LAYER  1
REUSING SURF FROM LAST STRESS PERIOD
 EVAPOTRANSPIRATION RATE =        .0000000 FOR LAYER  1
REUSING EXDP FROM LAST STRESS PERIOD
REUSING RIVER REACHES FROM LAST STRESS PERIOD


   7 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD  4
MAXIMUM HEAD CHANGE FOR EACH ITERATION
--------------------------------------
 ROW   COL    HEAD CHANGE
----- -----   -----------
   9     1      -1.031958
   7    26       -.989833
  11     1       -.960974
   9    23       -.765733
  13     1       -.241872
   6    27       -.196318
  12    26       -.059297

VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD  4
-------------------------------------------------------------------------------
  CUMULATIVE VOLUMES  L**3                RATES FOR THIS TIME STEP  L**3/T
  -----------------------                ------------------------------

     IN:                                      IN:
     ---                                      ---
              STORAGE =    .12337E+08              STORAGE =    .16727E+06
        CONSTANT HEAD =    .78058E+06        CONSTANT HEAD =    9149.8
                WELLS =    .00000                    WELLS =    .00000
             RECHARGE =    .20128E+09             RECHARGE =    .00000
                   ET =    .00000                       ET =    .00000
        RIVER LEAKAGE =    .65293E+06        RIVER LEAKAGE =    5472.5
             TOTAL IN =    .21505E+09             TOTAL IN =    .18189E+06
      OUT:                                     OUT:
      ----                                     ----
              STORAGE =    .57674E+08              STORAGE =    24298.
        CONSTANT HEAD =    .12503E+08        CONSTANT HEAD =    60390.
                WELLS =    .10862E+08                WELLS =    81023.
             RECHARGE =    .00000                 RECHARGE =    .00000
                   ET =    .13185E+09                   ET =    .00000
        RIVER LEAKAGE =    .21513E+07        RIVER LEAKAGE =    17420.
            TOTAL OUT =    .21504E+09            TOTAL OUT =    .18313E+06
             IN - OUT =    19216.                 IN - OUT =   -1239.8
   PERCENT DISCREPANCY =     .01       PERCENT DISCREPANCY =    -.68
```

```
 STRESS PERIOD NO.    5, LENGTH =    31.00000
-----------------------------------------------

 NUMBER OF TIME STEPS    =      1
 MULTIPLIER FOR DELT     =      1.000
 INITIAL TIME STEP SIZE =    31.00000
 REUSING WELLS FROM LAST STRESS PERIOD
                 RECHARGE =       .0009840 FOR LAYER  1
 REUSING SURF FROM LAST STRESS PERIOD
  EVAPOTRANSPIRATION RATE =       .0000000 FOR LAYER  1
 REUSING EXDP FROM LAST STRESS PERIOD
 REUSING RIVER REACHES FROM LAST STRESS PERIOD


   11 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD  5
 MAXIMUM HEAD CHANGE FOR EACH ITERATION
----------------------------------------

    ROW   COL     HEAD CHANGE
   -----  -----   -----------
     26    26       4.463799
      7    26       4.453907
      9    23       3.672798
      9    23       3.506750
     15    26       1.450346
      6    27        .912189
     15    26        .348110
      6    27        .232328
     16    27        .147489
      6    27        .116010
     15    26        .051719

 VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD  5
 ------------------------------------------------------------------------------

   CUMULATIVE VOLUMES  L**3                RATES FOR THIS TIME STEP  L**3/T
   -----------------------                 ---------------------------------

      IN:                                     IN:
      ---                                     ---
                  STORAGE =     .12527E+08              STORAGE =     6134.1
            CONSTANT HEAD =     .10342E+07        CONSTANT HEAD =     8182.8
                    WELLS =     .00000                    WELLS =     .00000
                RECHARGE =      .25057E+09            RECHARGE =      .15899E+07
                      ET =      .00000                      ET =      .00000
            RIVER LEAKAGE =     .80638E+06        RIVER LEAKAGE =     4949.8
                TOTAL IN =      .26494E+09            TOTAL IN =      .16092E+07
       OUT:                                    OUT:
       ----                                    ----
                  STORAGE =     .97688E+08              STORAGE =     .12908E+07
            CONSTANT HEAD =     .18470E+08        CONSTANT HEAD =     .19249E+06
                    WELLS =     .13373E+08                WELLS =     81023.
                RECHARGE =      .00000                RECHARGE =      .00000
                      ET =      .13185E+09                  ET =      .00000
            RIVER LEAKAGE =     .35245E+07        RIVER LEAKAGE =     44297.
                TOTAL OUT =     .26490E+09            TOTAL OUT =     .16086E+07
                 IN - OUT =     36704.                 IN - OUT =     563.75
      PERCENT DISCREPANCY =       .01          PERCENT DISCREPANCY =       .04
```

```
 STRESS PERIOD NO.    6. LENGTH =    29.00000
-------------------------------------------------
 NUMBER OF TIME STEPS    =      1
 MULTIPLIER FOR DELT     =      1.000
 INITIAL TIME STEP SIZE =    29.00000
 REUSING WELLS FROM LAST STRESS PERIOD
                 RECHARGE =        .0001200 FOR LAYER  1
 REUSING SURF FROM LAST STRESS PERIOD
  EVAPOTRANSPIRATION RATE =        .0000000 FOR LAYER  1
 REUSING EXDP FROM LAST STRESS PERIOD
 REUSING RIVER REACHES FROM LAST STRESS PERIOD

    8 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD  6
 MAXIMUM HEAD CHANGE FOR EACH ITERATION
----------------------------------------
    ROW   COL     HEAD CHANGE
   ----- -----    -----------
      6    27      -1.927269
      6    26      -1.894668
      6    28      -1.429388
      8    23      -1.246239
      5    28       -.413308
      6    27       -.333523
      6    27       -.104817
      6    27       -.087483


 VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD  6
 ---------------------------------------------------------------------------
   CUMULATIVE VOLUMES  L**3                RATES FOR THIS TIME STEP  L**3/T
   -----------------------                 ------------------------------

      IN:                                     IN:
      ---                                     ---
                  STORAGE =     .16730E+08              STORAGE =     .14493E+06
            CONSTANT HEAD =     .13092E+07        CONSTANT HEAD =     9480.1
                    WELLS =     .00000                    WELLS =     .00000
                RECHARGE =      .25619E+09            RECHARGE =     .19389E+06
                       ET =     .00000                       ET =     .00000
            RIVER LEAKAGE =     .95118E+06        RIVER LEAKAGE =     4993.1
                 TOTAL IN =     .27518E+09             TOTAL IN =     .35330E+06
       OUT:                                    OUT:
       ----                                    ----
                  STORAGE =     .10050E+09              STORAGE =     96814.
            CONSTANT HEAD =     .22403E+08        CONSTANT HEAD =     .13561E+06
                    WELLS =     .15723E+08                WELLS =     81023.
                RECHARGE =      .00000                RECHARGE =     .00000
                       ET =     .13185E+09                   ET =     .00000
            RIVER LEAKAGE =     .47051E+07        RIVER LEAKAGE =     40711.
                TOTAL OUT =     .27517E+09            TOTAL OUT =     .35416E+06
                 IN - OUT =     11680.                 IN - OUT =     -862.50
      PERCENT DISCREPANCY =      .00          PERCENT DISCREPANCY =     -.24
```

```
 STRESS PERIOD NO.   7, LENGTH =   31.00000
-----------------------------------------------
 NUMBER OF TIME STEPS    =     1
 MULTIPLIER FOR DELT     =     1.000
 INITIAL TIME STEP SIZE =   31.00000
 REUSING WELLS FROM LAST STRESS PERIOD
                 RECHARGE =       .0000000 FOR LAYER  1
 REUSING SURF FROM LAST STRESS PERIOD
  EVAPOTRANSPIRATION RATE =       .0000000 FOR LAYER  1
 REUSING EXDP FROM LAST STRESS PERIOD
 REUSING RIVER REACHES FROM LAST STRESS PERIOD


    7 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD  7
 MAXIMUM HEAD CHANGE FOR EACH ITERATION
----------------------------------------
   ROW   COL    HEAD CHANGE
  ----- -----   -----------
    9     26     -1.185785
    7     26     -1.490237
    8     23     -1.170743
    7     26     -1.107508
    5     28      -.314199
    6     27      -.295402
   12     26      -.083553


 VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD  7
-------------------------------------------------------------------------------
   CUMULATIVE VOLUMES  L**3                RATES FOR THIS TIME STEP  L**3/T
   ----------------------                  --------------------------------

      IN:                                     IN:
      ---                                     ---
                 STORAGE =    .23629E+08              STORAGE =    .22254E+06
          CONSTANT HEAD =    .16462E+07       CONSTANT HEAD =    10873.
                   WELLS =    .00000                   WELLS =    .00000
               RECHARGE =    .25619E+09           RECHARGE =    .00000
                      ET =    .00000                     ET =    .00000
          RIVER LEAKAGE =    .11101E+07       RIVER LEAKAGE =    5127.6
               TOTAL IN =    .28258E+09           TOTAL IN =    .23854E+06
       OUT:                                    OUT:
       ----                                    ----
                 STORAGE =    .10127E+09              STORAGE =    25000.
          CONSTANT HEAD =    .25466E+08       CONSTANT HEAD =    98805.
                   WELLS =    .18235E+08               WELLS =    81023.
               RECHARGE =    .00000               RECHARGE =    .00000
                      ET =    .13185E+09                 ET =    .00000
          RIVER LEAKAGE =    .58125E+07       RIVER LEAKAGE =    35722.
              TOTAL OUT =    .28263E+09           TOTAL OUT =    .24055E+06
                 IN - OUT =   -50656.                IN - OUT =   -2011.3
      PERCENT DISCREPANCY =     -.02        PERCENT DISCREPANCY =     -.84
```

STRESS PERIOD NO. 8, LENGTH = 30.00000

NUMBER OF TIME STEPS = 1
MULTIPLIER FOR DELT = 1.000
INITIAL TIME STEP SIZE = 30.00000

100 WELLS

WELL NO.	ROW	COL	STRESS RATE	WELL NO.	ROW	COL	STRESS RATE	WELL NO.	ROW	COL	STRESS RAT
1	2	9	-763.20	47	13	8	-720.00	93	33	18	-1008.0
2	2	11	-537.70	48	13	9	-720.00	94	33	29	-921.60
3	2	17	-432.00	49	14	2	-950.40	95	35	12	-230.40
4	2	18	-696.10	50	14	3	-460.80	96	35	13	-576.00
5	2	25	-720.00	51	15	2	-1286.2	97	35	16	-2073.6
6	3	8	-42.623	52	15	4	-576.00	98	37	12	-432.00
7	3	10	-1296.0	53	16	5	-2882.0	99	37	13	-1008.0
8	3	11	-1440.0	54	16	9	-864.00	100	38	17	-720.00
9	3	12	-1728.0	55	16	14	-1008.0				
10	3	13	-1152.0	56	17	9	-720.00				
11	3	18	-1814.4	57	17	20	-794.88				
12	4	8	-432.00	58	17	22	-357.98				
13	4	9	-2390.4	59	18	10	-864.00				
14	4	11	-1440.0	60	19	7	-576.00				
15	4	16	-2066.1	61	21	13	-576.00				
16	5	7	-3254.4	62	21	18	-518.40				
17	5	13	-1440.0	63	21	21	-864.00				
18	5	15	-288.00	64	21	23	-432.00				
19	5	16	-1213.1	65	21	25	-115.20				
20	6	9	-2160.0	66	22	5	-1114.7				
21	6	10	-1699.2	67	22	11	-1008.0				
22	6	11	-374.40	68	23	3	-288.00				
23	6	12	-2160.0	69	23	9	-432.00				
24	6	13	-4032.0	70	23	27	-864.00				
25	6	19	-288.00	71	24	9	-1152.0				
26	7	9	-1152.0	72	24	28	-432.00				
27	7	10	-518.40	73	25	9	-1152.0				
28	7	11	-230.40	74	25	11	-432.00				
29	7	14	-2304.0	75	25	25	-1036.8				
30	7	26	-345.60	76	25	30	-720.00				
31	8	8	-2793.6	77	26	21	-1010.9				
32	8	9	-4262.6	78	26	23	-576.00				
33	9	6	-576.00	79	26	24	-864.00				
34	9	9	-576.00	80	26	25	-864.00				
35	9	10	-2304.0	81	27	21	-2.8800				
36	9	16	-4435.2	82	27	24	-2.8800				
37	10	5	-518.40	83	28	26	-2.8800				
38	11	5	-864.00	84	29	4	-734.40				
39	11	6	-864.00	85	29	24	-2.8800				
40	11	17	-403.20	86	29	29	-2.8800				
41	11	18	-864.00	87	30	18	-720.00				
42	12	4	-576.00	88	30	24	-576.00				
43	12	8	-720.00	89	30	25	-2.8800				
44	12	9	-82.867	90	30	29	-97.920				
45	13	3	-172.80	91	31	24	-2.8800				
46	13	6	-1526.4	92	33	15	-720.00				

```
                RECHARGE =       .0000247 FOR LAYER  1
 REUSING SURF FROM LAST STRESS PERIOD
  EVAPOTRANSPIRATION RATE =       .0012100 FOR LAYER  1
 REUSING EXDP FROM LAST STRESS PERIOD
 REUSING RIVER REACHES FROM LAST STRESS PERIOD


   10 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD  8
 MAXIMUM HEAD CHANGE FOR EACH ITERATION
 ----------------------------------------
   ROW   COL    HEAD CHANGE
  ----- -----   -----------
    26    26      -6.175743
     7    26      -6.254819
    15    26      -4.672276
    12    26      -3.216381
    15    26      -1.566838
    12    26       -.505330
    15    26       -.387428
    17    26       -.121808
    16    27       -.153103
    17    26       -.040251


 VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD  8
 ----------------------------------------------------------------------------
   CUMULATIVE VOLUMES  L**3                 RATES FOR THIS TIME STEP  L**3/T
   -----------------------                  ---------------------------------

      IN:                                      IN:
      ---                                      ---
                  STORAGE =    .67739E+08              STORAGE =    .14703E+07
            CONSTANT HEAD =    .22012E+07        CONSTANT HEAD =    18499.
                    WELLS =    .00000                    WELLS =    .00000
                RECHARGE =    .25739E+09            RECHARGE =    39861.
                      ET =    .00000                      ET =    .00000
            RIVER LEAKAGE =    .13063E+07        RIVER LEAKAGE =    6538.3
                TOTAL IN =    .32864E+09            TOTAL IN =    .15352E+07
       OUT:                                     OUT:
       ----                                     ----
                  STORAGE =    .10139E+09              STORAGE =    4032.2
            CONSTANT HEAD =    .25871E+08        CONSTANT HEAD =    13511.
                    WELLS =    .21146E+08                WELLS =    97039.
                RECHARGE =    .00000                RECHARGE =    .00000
                      ET =    .17428E+09                  ET =    .14146E+07
            RIVER LEAKAGE =    .60160E+07        RIVER LEAKAGE =    6783.7
               TOTAL OUT =    .32871E+09           TOTAL OUT =    .15360E+07
                IN - OUT =   -72672.                 IN - OUT =   -733.75
      PERCENT DISCREPANCY =     -.02       PERCENT DISCREPANCY =     -.05
```

```
 STRESS PERIOD NO.   9, LENGTH =   31.00000
-----------------------------------------------
 NUMBER OF TIME STEPS    =     1
 MULTIPLIER FOR DELT     =     1.000
 INITIAL TIME STEP SIZE =   31.00000
 REUSING WELLS FROM LAST STRESS PERIOD
                 RECHARGE =       .0002597 FOR LAYER  1
 REUSING SURF FROM LAST STRESS PERIOD
  EVAPOTRANSPIRATION RATE =       .0011400 FOR LAYER  1
 REUSING EXDP FROM LAST STRESS PERIOD
 REUSING RIVER REACHES FROM LAST STRESS PERIOD


    7 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD  9
 MAXIMUM HEAD CHANGE FOR EACH ITERATION
-----------------------------------------
  ROW   COL     HEAD CHANGE
 ----- -----    -----------
   26    30       -4.157785
   18    24       -2.483400
   20     6       -1.720302
   20     6        -.834852
   17    28        -.285160
   17    28        -.110690
   17    28        -.052595


 VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD  9
-------------------------------------------------------------------------------
   CUMULATIVE VOLUMES  L**3                RATES FOR THIS TIME STEP  L**3/T
   ----------------------                  --------------------------------

      IN:                                     IN:
      ---                                     ---
                  STORAGE =     .84836E+08              STORAGE =     .55153E+06
            CONSTANT HEAD =     .28053E+07        CONSTANT HEAD =     19488.
                    WELLS =     .00000                    WELLS =     .00000
                RECHARGE =      .27040E+09            RECHARGE =     .41961E+06
                       ET =     .00000                       ET =     .00000
            RIVER LEAKAGE =     .15349E+07        RIVER LEAKAGE =     7376.3
                TOTAL IN =      .35957E+09            TOTAL IN =     .99800E+06
       OUT:                                    OUT:
       ----                                    ----
                  STORAGE =     .10154E+09              STORAGE =     4724.7
            CONSTANT HEAD =     .26233E+08        CONSTANT HEAD =     11661.
                    WELLS =     .24154E+08                WELLS =     97039.
                RECHARGE =      .00000                RECHARGE =     .00000
                       ET =     .20171E+09                   ET =     .88476E+06
            RIVER LEAKAGE =     .60346E+07        RIVER LEAKAGE =     600.59
                TOTAL OUT =     .35967E+09            TOTAL OUT =     .99879E+06
                 IN - OUT =    -97056.                  IN - OUT =    -786.25
      PERCENT DISCREPANCY =      -.03          PERCENT DISCREPANCY =      -.08
```

```
 STRESS PERIOD NO.  10, LENGTH =   30.00000
-----------------------------------------------
 NUMBER OF TIME STEPS    =     1
 MULTIPLIER FOR DELT     =     1.000
 INITIAL TIME STEP SIZE =   30.00000
 REUSING WELLS FROM LAST STRESS PERIOD
                 RECHARGE =       .0004064 FOR LAYER  1
 REUSING SURF FROM LAST STRESS PERIOD
  EVAPOTRANSPIRATION RATE =       .0014800 FOR LAYER  1
 REUSING EXDP FROM LAST STRESS PERIOD
 REUSING RIVER REACHES FROM LAST STRESS PERIOD


    6 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD 10
 MAXIMUM HEAD CHANGE FOR EACH ITERATION
----------------------------------------
   ROW   COL     HEAD CHANGE
  ----- -----    -----------
    21    30       -3.243855
    21    30        2.155662
    21    30       -1.710153
    21    30         .487515
    21    30         .157479
    21    30         .049397

 VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD 10
-------------------------------------------------------------------------------
   CUMULATIVE VOLUMES  L**3              RATES FOR THIS TIME STEP  L**3/T
   ----------------------                ---------------------------------

      IN:                                IN:
      ---                                ---
                  STORAGE =    .89771E+08          STORAGE =    .16447E+06
            CONSTANT HEAD =    .33497E+07    CONSTANT HEAD =    18147.
                    WELLS =    .00000              WELLS =    .00000
                RECHARGE =    .29010E+09        RECHARGE =    .65664E+06
                       ET =    .00000               ET =    .00000
            RIVER LEAKAGE =    .17733E+07    RIVER LEAKAGE =    7945.3
                TOTAL IN =    .38499E+09        TOTAL IN =    .84721E+06
       OUT:                                OUT:
       ----                                ----
                  STORAGE =    .10181E+09          STORAGE =    8970.7
            CONSTANT HEAD =    .26626E+08    CONSTANT HEAD =    13117.
                    WELLS =    .27065E+08              WELLS =    97039.
                RECHARGE =    .00000            RECHARGE =    .00000
                       ET =    .22357E+09               ET =    .72855E+06
            RIVER LEAKAGE =    .60349E+07    RIVER LEAKAGE =    9.1554
               TOTAL OUT =    .38510E+09        TOTAL OUT =    .84768E+06
                IN - OUT =   -.11123E+06         IN - OUT =   -474.63
      PERCENT DISCREPANCY =     -.03      PERCENT DISCREPANCY =     -.06
```

```
 STRESS PERIOD NO.  11, LENGTH =   31.00000
-----------------------------------------------
 NUMBER OF TIME STEPS    =      1
 MULTIPLIER FOR DELT     =      1.000
 INITIAL TIME STEP SIZE =   31.00000
 REUSING WELLS FROM LAST STRESS PERIOD
                RECHARGE =       .0014400 FOR LAYER  1
 REUSING SURF FROM LAST STRESS PERIOD
  EVAPOTRANSPIRATION RATE =       .0033870 FOR LAYER  1
 REUSING EXDP FROM LAST STRESS PERIOD
 REUSING RIVER REACHES FROM LAST STRESS PERIOD


    6 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD 11
 MAXIMUM HEAD CHANGE FOR EACH ITERATION
---------------------------------------
   ROW   COL     HEAD CHANGE
  ----- -----   ------------
     9     1        1.867925
    13     1        1.909108
    11     1        1.947351
    12     1         .702545
    13     1         .356954
    12     1         .053578


 VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD 11
-------------------------------------------------------------------------------
   CUMULATIVE VOLUMES  L**3                 RATES FOR THIS TIME STEP  L**3/T
   -----------------------                  --------------------------------

      IN:                                      IN:
      ---                                      ---
                  STORAGE =     .90168E+08             STORAGE =     12831.
            CONSTANT HEAD =     .37835E+07       CONSTANT HEAD =     13993.
                    WELLS =     .00000                   WELLS =     .00000
                RECHARGE =     .36222E+09           RECHARGE =     .23267E+07
                       ET =     .00000                     ET =     .00000
            RIVER LEAKAGE =     .19841E+07       RIVER LEAKAGE =     6798.3
                TOTAL IN =     .45816E+09           TOTAL IN =     .23603E+07
       OUT:                                     OUT:
       ----                                     ----
                  STORAGE =     .10705E+09             STORAGE =     .16900E+06
            CONSTANT HEAD =     .27783E+08       CONSTANT HEAD =     37298.
                    WELLS =     .30074E+08               WELLS =     97039.
                RECHARGE =     .00000               RECHARGE =     .00000
                       ET =     .28732E+09                 ET =     .20565E+07
            RIVER LEAKAGE =     .60367E+07       RIVER LEAKAGE =     58.177
                TOTAL OUT =     .45826E+09           TOTAL OUT =     .23599E+07
                 IN - OUT =    -97280.                IN - OUT =     450.50
      PERCENT DISCREPANCY =      -.02         PERCENT DISCREPANCY =      .02
```

```
 STRESS PERIOD NO.  12, LENGTH =   30.00000
-----------------------------------------------

 NUMBER OF TIME STEPS    =      1
 MULTIPLIER FOR DELT     =      1.000
 INITIAL TIME STEP SIZE =   30.00000
 REUSING WELLS FROM LAST STRESS PERIOD
                 RECHARGE =       .0008290 FOR LAYER  1
 REUSING SURF FROM LAST STRESS PERIOD
  EVAPOTRANSPIRATION RATE =       .0031200 FOR LAYER  1
 REUSING EXDP FROM LAST STRESS PERIOD
 REUSING RIVER REACHES FROM LAST STRESS PERIOD


    5 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD 12
 MAXIMUM HEAD CHANGE FOR EACH ITERATION
----------------------------------------

   ROW   COL     HEAD CHANGE
  ----- -----    -----------
    10    21        -.737867
    14     1        -.596099
    13     1        -.538366
    13     1        -.221878
    13     1        -.092284

 VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD 12
-----------------------------------------------------------------------------

   CUMULATIVE VOLUMES  L**3                RATES FOR THIS TIME STEP  L**3/T
   -----------------------                 ---------------------------------

      IN:                                     IN:
      ---                                     ---
                  STORAGE =     .92428E+08              STORAGE =     75310.
            CONSTANT HEAD =     .42799E+07        CONSTANT HEAD =     16547.
                    WELLS =     .00000                    WELLS =     .00000
                RECHARGE =      .40241E+09            RECHARGE =     .13395E+07
                       ET =     .00000                       ET =     .00000
            RIVER LEAKAGE =     .22219E+07        RIVER LEAKAGE =     7928.7
                TOTAL IN =      .50134E+09            TOTAL IN =     .14392E+07
       OUT:                                    OUT:
       ----                                    ----
                  STORAGE =     .10801E+09              STORAGE =     32015.
            CONSTANT HEAD =     .28544E+08        CONSTANT HEAD =     25381.
                    WELLS =     .32985E+08                WELLS =     97039.
                RECHARGE =      .00000                RECHARGE =     .00000
                       ET =     .32593E+09                   ET =     .12871E+07
            RIVER LEAKAGE =     .60369E+07        RIVER LEAKAGE =     8.3227
                TOTAL OUT =     .50150E+09            TOTAL OUT =     .14416E+07
                IN - OUT =     -.16659E+06            IN - OUT =     -2310.1
      PERCENT DISCREPANCY =      -.03          PERCENT DISCREPANCY =     -.16
```

```
 STRESS PERIOD NO.  13, LENGTH =   31.00000
-----------------------------------------------
 NUMBER OF TIME STEPS    =      1
 MULTIPLIER FOR DELT     =      1.000
 INITIAL TIME STEP SIZE =   31.00000
 REUSING WELLS FROM LAST STRESS PERIOD
                 RECHARGE =       .0010200 FOR LAYER  1
 REUSING SURF FROM LAST STRESS PERIOD
  EVAPOTRANSPIRATION RATE =       .0026000 FOR LAYER  1
 REUSING EXDP FROM LAST STRESS PERIOD
 REUSING RIVER REACHES FROM LAST STRESS PERIOD


    5 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD 13
 MAXIMUM HEAD CHANGE FOR EACH ITERATION
---------------------------------------
   ROW   COL     HEAD CHANGE
  ----- -----    -----------
     8    21       .526819
    15     4       .306781
    13     1       .291868
    13     1       .111874
    13     1       .054863

 VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD 13
-------------------------------------------------------------------------------
   CUMULATIVE VOLUMES  L**3              RATES FOR THIS TIME STEP  L**3/T
   ------------------------              ---------------------------------

      IN:                                   IN:
      ---                                   ---
                 STORAGE =    .92521E+08          STORAGE =    3015.1
           CONSTANT HEAD =    .46998E+07    CONSTANT HEAD =    13544.
                   WELLS =    .00000              WELLS =    .00000
                RECHARGE =    .45350E+09         RECHARGE =    .16481E+07
                      ET =    .00000               ET =    .00000
           RIVER LEAKAGE =    .24410E+07    RIVER LEAKAGE =    7068.8
                TOTAL IN =    .55316E+09         TOTAL IN =    .16717E+07
       OUT:                                  OUT:
       ----                                  ----
                 STORAGE =    .11080E+09          STORAGE =    90064.
           CONSTANT HEAD =    .29556E+08    CONSTANT HEAD =    32649.
                   WELLS =    .35993E+08          WELLS =    97039.
                RECHARGE =    .00000         RECHARGE =    .00000
                      ET =    .37089E+09               ET =    .14502E+07
           RIVER LEAKAGE =    .60382E+07    RIVER LEAKAGE =    39.766
               TOTAL OUT =    .55327E+09        TOTAL OUT =    .16699E+07
                IN - OUT =   -.11238E+06         IN - OUT =    1748.5
      PERCENT DISCREPANCY =    -.02      PERCENT DISCREPANCY =     .10
```

```
 STRESS PERIOD NO.  14, LENGTH =   30.00000
-------------------------------------------------
 NUMBER OF TIME STEPS    =      1
 MULTIPLIER FOR DELT     =      1.000
 INITIAL TIME STEP SIZE =   30.00000
 REUSING WELLS FROM LAST STRESS PERIOD
                 RECHARGE =       .0004216 FOR LAYER  1
 REUSING SURF FROM LAST STRESS PERIOD
  EVAPOTRANSPIRATION RATE =       .0018100 FOR LAYER  1
 REUSING EXDP FROM LAST STRESS PERIOD
 REUSING RIVER REACHES FROM LAST STRESS PERIOD

    6 ITERATIONS FOR TIME STEP   1 IN STRESS PERIOD 14
 MAXIMUM HEAD CHANGE FOR EACH ITERATION
----------------------------------------
   ROW   COL     HEAD CHANGE
  ----- -----    -----------
     9     1       -.931029
    13     1       -.980681
    11     1      -1.054486
    13     1       -.432655
    13     1       -.197717
    12    18       -.039230


 VOLUMETRIC BUDGET FOR ENTIRE MODEL AT END OF TIME STEP  1 IN STRESS PERIOD 14
-------------------------------------------------------------------------------
   CUMULATIVE VOLUMES  L**3              RATES FOR THIS TIME STEP  L**3/T
   -----------------------               ---------------------------------

      IN:                                   IN:
      ---                                   ---
                STORAGE =     .95596E+08            STORAGE =     .10250E+06
         CONSTANT HEAD =     .51942E+07     CONSTANT HEAD =     16482.
                 WELLS =     .00000                 WELLS =     .00000
              RECHARGE =     .47393E+09          RECHARGE =     .68120E+06
                    ET =     .00000                    ET =     .00000
         RIVER LEAKAGE =     .26889E+07     RIVER LEAKAGE =     8262.1
             TOTAL IN =     .57741E+09         TOTAL IN =     .80845E+06
       OUT:                                  OUT:
       ----                                  ----
                STORAGE =     .11088E+09            STORAGE =     2642.2
         CONSTANT HEAD =     .30099E+08     CONSTANT HEAD =     18086.
                 WELLS =     .38904E+08             WELLS =     97039.
              RECHARGE =     .00000          RECHARGE =     .00000
                    ET =     .39163E+09                ET =     .69132E+06
         RIVER LEAKAGE =     .60383E+07     RIVER LEAKAGE =     4.5500
             TOTAL OUT =     .57754E+09         TOTAL OUT =     .80910E+06
              IN - OUT =    -.13184E+06          IN - OUT =    -649.06
    PERCENT DISCREPANCY =     -.02       PERCENT DISCREPANCY =     -.08
```


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