Estimated Ground-Water Recharge at a Naturally Vegetated, Semiarid Site from a Darcian and a Mass Balance of Chloride Approach

submitted by

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Abstract

Understanding the movement of soil moisture under natural conditions in arid climates is important in managing the region's valuable water resources. Quantifying groundwater recharge has applications in allocating usage and protecting groundwater quality. An important issue in calculating recharge is the role which native plant and root systems have in the direction of soil-water movement.

To gain a better understanding of natural soil-water movement, a naturally vegetated site in west central New Mexico was selected with deep, sandy soils. The area was instrumented with a grid of tensiometers for measuring pressure head and neutron probe access tubes for measuring water contents in situ. The site was divided into computational cells with several near a fourwing saltbush stand and others in less densely vegetated areas. From the pressure head data gradients were calculated and the water contents were used to calculate an unsaturated hydraulic conductivity. From this data the flux through each face of the computational cell was estimated. These fluxes were then analyzed for seasonal patterns. Deep drainage, which is assumed to become groundwater recharge, was then estimated from these fluxes. Chloride profiles from the soil water at the same site were also used to estimate recharge rates. All of these results were then compared to estimates of recharge at the same site from previous work.

Downward movement of soil water was found to dominate at the site. Horizontal flux components were usually small compared to the vertical and often were of the same magnitude as the uncertainty in their calculations. No clear seasonal patterns were evident in the lateral fluxes. Using flux rates through the lower face of the deepest cells yielded an estimated recharge rate of 0.40 cm/year or 2.2% of annual precipitation. No significant difference was noted in flux rates between the cells nearest the vegetation and ones farther away. When the hydraulic gradient was assumed to be unity, the predicted recharge rate was 0.29 cm/year, or 1.5% of annual precipitation. The results of the pressure head method and the assumed unit hydraulic gradient were less than previous estimates made at the site using similar and other methods. The differences can be attributed to the timing of rainfall events and the frequency at which pressure head measurements were taken.

The high concentration of chloride in the soil caused the estimated recharge rates from the chloride mass balance method to be very small, 0.017 cm/year. The location of the site in the floodplain of the Rio Salado and the presence of the halophytic, fourwing saltbushes are believed responsible for the low recharge rates.

Acknowledgements

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INTRODUCTION

In arid climates such as New Mexico's, water is indeed one of the most important resources because its absence limits the development of all other resources. Since surface waters are often already appropriated, groundwater is the most important source of water for new development. A better understanding of how precipitation becomes recharge is vital to the overall managing of water resources in an arid climate.

Recharge is defined as the rate at which precipitation reaches an aquifer. In an arid region many different processes act to prevent water from reaching the water table. Intense but brief rainfall events on hydrophobic soils may cause much of the water to runoff without infiltrating into the soil. Even if the soil is wetted, much of the moisture may be evaporated due to the usually low relative humidity of the atmosphere and intense solar heating. Plants are in competition with one another to remove available water in order that they may survive. These two processes, evaporation and transpiration are difficult to separate and are often lumped together as evapotranspiration. Water which percolates deep enough so that it is beyond the reach of evapotranspiration is assumed to become recharge to an aquifer.

In desert climates precipitation is usually much less than the amount of evaporation from an open body of water. When the effects of plants are considered which have the ability to remove water from an entire section of soil, recharge in desert areas is often assumed to be negligible. This, added to the observation that the depth to the water table in arid areas is large, has lead to proposals that such areas are suitable for hazardous waste storage. But if recharge and solute transport are significant in an arid climate, siting based solely on climate and depth to water table may lead to serious problems. Also if certain areas contribute to recharge of aquifers, protecting these areas from high risk activities would be vital in protecting groundwater resources.

Objectives

1) Characterize soil, plants and rooting habit at a semi-arid site.
2) Analyze seasonal and spatial patterns in the three dimensional fluxes calculated from tensiometric data.
3) Perform a water balance to estimate recharge and evapotranspiration based on flux calculations.
4) Evaluate environmental chloride as a means of estimating recharge and compare to the other methods used.

Review of Relevant Literature

There are several different approaches which may be used to calculate recharge and indirectly evapotranspiration. Three common methods are the Darcian approach, lysimeters in the field, and the use of tracers. The Darcian method is a direct calculation of fluxes based on pressure head measurements and unsaturated hydraulic conductivities. Lysimeters are soil blocks allowed to wet and dry in a similar manner as the conditions investigated. Tracers are either natural or introduced materials used to follow water movement. However, most tracers do not mimic water movement exactly and this limitation must be taken into account when tracers are used to calculate recharge and evapotranspiration.

Darcian Approach. Stephens and Knowlton (1986) used measurements of pressure head and hydraulic conductivity to estimate recharge in sparsely vegetated, sandy soils found at the Sevilleta National Wildlife Refuge. These results are based on a one dimensional form of Darcy's equation. They report up to 20 % of precipitation may become recharge. This despite the fact that potential evaporation exceeds precipitation by a factor of 2 in the winter and a factor of 14 in the summer. These calculations could vary widely depending on the value of unsaturated conductivity used.

The magnitude of the precipitation event along with sandy soils of the site may be responsible for this surprisingly large percentage of recharge. A large rainfall event may wet the soil to a sufficient depth that the moisture will not be evaporated or removed by plants roots. Humid and cloudy conditions after a rain may also allow more of the water to infiltrate past the area of evapotranspiration. The physical properties of the soil also contribute to the amount of recharge which will take place. Sandy soils in the Sevilleta drain quickly after a precipitation event. Since the pore sizes are large in sandy soils, capillary forces holding the water to the soil grains are small. This leads to the dewatering of the large pores due to gravity. Water at the near surface quickly evaporates in the dry air. This forms a dry crust which has a low hydraulic conductivity retarding the liquid flow of water, although vapor transport may be significant under these conditions. All of the above analysis is based on one-dimensional flow.

Another Darcian based approach to examine at moisture flow in sandy soils was done by Kickham (1987) at the Sevilleta site. That study involved an isolated indigo sagebush (<u>Dalea scoparia</u>) growing on a sand dune. Transects of tensiometers extended outward from the center of the bush. Pressure head measurements from these tensiometers were used to create cross sections of total head. These total head cross sections were then contoured and flow lines were drawn. In the winter months downward flow dominated. In the summer months the flow lines were not uniform but converged toward what were interpreted as soil moisture sinks caused by the removal of water by roots of the indigo bush when it was transpiring (Figure 1). These results indicate that the assumption of one dimensional moisture flow in calculating recharge may not be

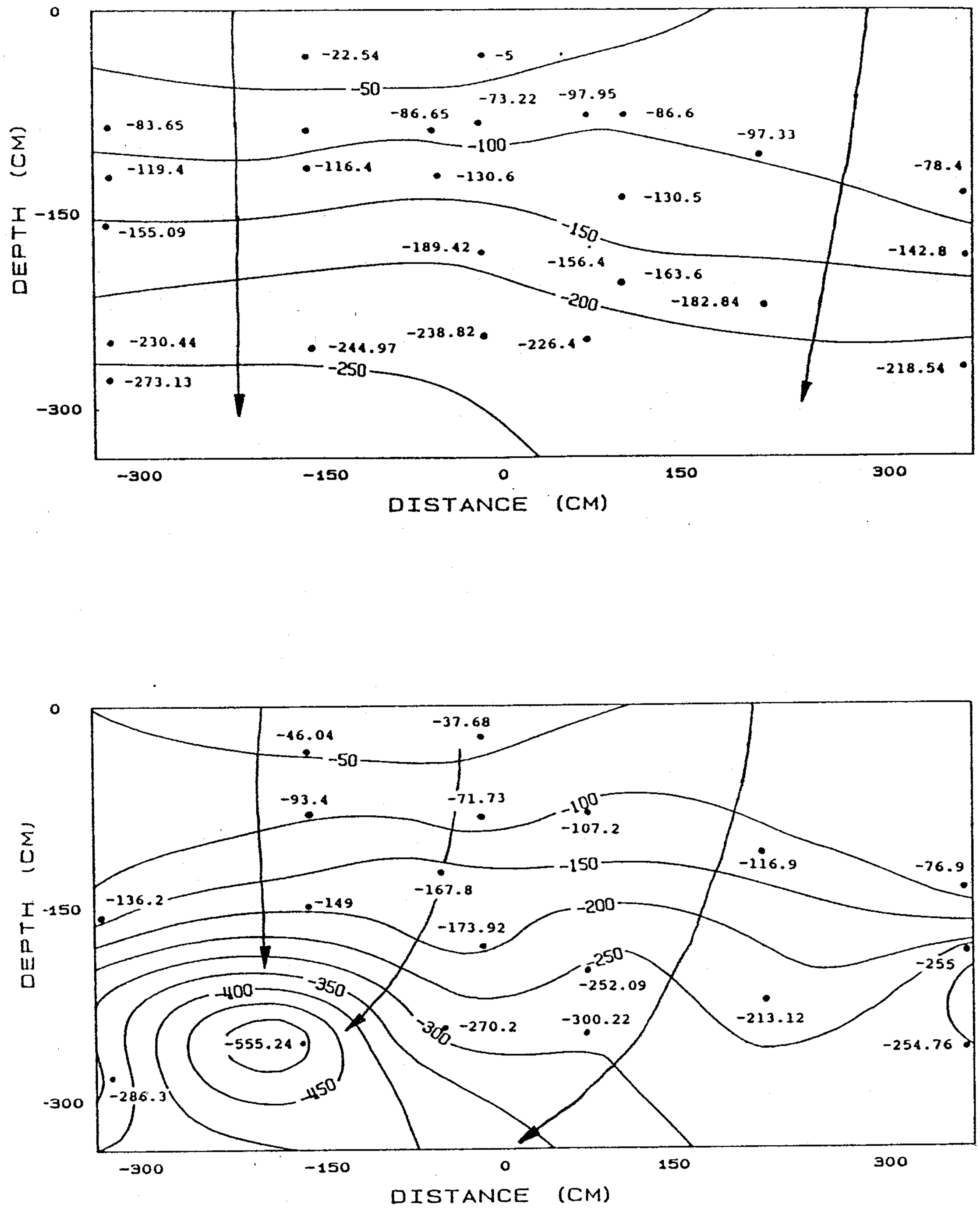

Figure 1. Cross section of total head in cm water under an indigo sagebush in February 1986 (top) and June 1986 (bottom). Plant trunk is located in center of the plot. (Kickham, 1987)

reasonable, at least during the part of the year when the plants are transpiring.

Lysimeters. Another method of calculating evapotranspiration and recharge is the use of lysimeters. A lysimeter is a soil column used to mimic conditions which actually occur in the field. Usually changes in a lysimeter's weight is used to determine how much water has been lost or gained in the soil profile. If the lysimeter is deep enough to extend past the root zone, drainage or recharge can be measured directly. Knowlton (1984) used microlysimeters, 7.5 cm in diameter and 15 cm deep to estimate evaporation in the upper soil layer at the Sevilleta site. Plants were not present in the lysimeters. His results showed evaporation greater than precipitation in many instances. The small diameter PVC pipe creates strong boundary effects because most of the soil is in close proximity to the wall of the lysimeter. The most serious disturbance is the base of the lysimeter, which prevents hydraulic contact with the soil below the 15 cm depth. Temperature gradients cause water vapor transport from areas of high temperature to lower temperature (Hillel 1980). Water vapor transport caused by strong diurnal temperature fluctuations at the surface would be impeded by the bottom of the lysimeter. Consequently microlysimeters tend to overestimate the evaporation losses.

Larger and deeper lysimeters reduce the surface area to soil volume. They may also be deep enough to simulate deep drainage beyond the rooting zone. They lose some accuracy in trying to weigh such a large mass of soil. Evans et al. (1981) used a 3 meter in diameter by a 1 meter deep weighing lysimeter which held 16.3 metric tons of soil. The evaporation and transpiration rate from the lysimeter containing a creosote bush was very similar to the rates determined by a water balance method. The water balance method used soil moisture profiles obtained form neutron probe readings. This method was used on different vegetated and unvegetated sites, but yielded the same results. The effect of vegetation was not noticed. Instead, evapotranspiration depended on precipitation. The greatest evapotranspiration rate occurred after precipitation events. Under extremely dry conditions there was very little loss of water from the soil profile. Gee and Hillel (1989), in there review of methods of estimating recharge, found plants significantly changed the amount of recharge. Gee had used very large lysimeters at the Hanford site in Washington State. Deep rooted plants removed water from the profile and there was less deep drainage past the roots of these plants than in the unvegetated lysimeters. The differences observed by Evans et al and Gee and Hillel may be explained by the larger lysimeters, the cooler climate and the longer time of investigation at the Hanford site.

<u>Soil Moisture Profiles.</u> The amount of water in a soil profile may be measured by using destructive or nondestructive means. Destructive means are usually the least expensive, but

they involve removing samples. This prevents the same profile from being monitored with time. A common nondestructive method of measuring moisture in the profile is the use of neutron attenuation. A source of fast electrons in placed in the soil with a counter of slow neutrons. When fast neutrons strike something of similar mass as their own, they are slowed down. Hydrogen atoms in water are about the same mass of neutrons and cause the neutrons to slow down. The ratio of slow neutrons counted in the field is compared to the slow neutrons counted in the probe is used to arrive at the moisture content. This device must be calibrated for each soil type.

A water balance approach using the water contents determined by the neutron probe can be used to calculate evapotranspiration. Evans et al. (1981) used this method and compared the results to those from a weighing lysimeters. In their approach the total amount of water in the soil profile is measured at certain time intervals. The change of storage of water in the profile is added to precipitation for the same time period. This resulting water loss is then divided by the same time period to arrive at the average water loss per unit time. As mentioned earlier little difference was noted between various vegetation types and unvegetated sites. As Gee and Hillel (1989) point out in their review of methods of estimating recharge in arid climates, a constant soil moisture profile does not necessarily mean no flow. Flow could be occurring in a steady state under a unit gradient caused by gravity. Also the resolution of the moisture content measurements derived from the neutron probe depends on the soil type, water content, and counting time used. Sharp changes in water content are smoothed by the averaging effect of the probe. Evans concluded that evapotranspiration is greatest when soil moisture is available. Under dry conditions there is very little moisture lost from the profile. Evans reports vegetation making little difference in evapotranspiration, but large lysimeters used at Hanford showed a significant difference between vegetated and unvegetated sites.

McCord (1986) used water content profiles to calculate recharge on a sand dune at the Sevilleta site. An interesting observation resulted from these studies. The soil moisture data showed that a depression on the sand dune gained more water than a precipitation event provided. The area continued to gain water even days after the precipitation event. The crest of the dune showed much less water in the profile and the dune slope was intermediate between the two. He concluded that there was lateral flow which converged in the depression, and there, recharge would be greater than elsewhere. These observations were made despite the absence of strong textural layering in the dune soil. McCord also confirmed the lateral flow process with tracers, another method of estimating recharge and evapotranspiration.

Tracers. Tracers are natural or anthropogenic substances in water used to follow the water's movement. The simplest type of tracer is a water soluble dye which can be detected visually. However these dyes often interact with the soil to such a degree that they are not very useful. This problem is worsened by the slow travel times in the vadose zone which allows even more reaction to occur between the dye and the soil. Also in the unsaturated zone sampling usually involves auguring, which becomes increasingly difficult with depth.

Solutes dissolved in water are also used as tracers. But they are subject to diffusion and hydrodynamic dispersion. These processes tend to prevent sharp, piston-like displacement of the solutes. The concentration distribution does not travel as a sharp front but becomes diffuse. Some of the solute will breakthrough earlier while some will travel at a slower rate than the average water velocity. Diffusion caused by concentrations gradients also causes mixing. Diffusion is more important at slower velocities.

Two other processes also affect the behavior of solutes. These two processes are called cation exchange and anion exclusion. They both are caused by the interaction between electrically charged soil particles and the ions in solution. Clays usually have negatively charged surfaces. These charges attract the positively charged cations. Often cations from the soil solution will replace cations which have already been already been attracted to the clay particles. This is known as cation exchange and will slow down the movement of such cations through the soil. Anions, because of their negative charge, will be repelled from the negatively charged clay particles. Anions are restricted to the larger pores and outer regions of water films, away from the charged surface particles. The velocities in these pores are often greater than the mean flow velocity, enabling anions to travel faster than the average water velocity. This is called anion exclusion. Both of these effects must be considered when solutes are used as tracers.

Isotopes of elements may be used to tag substances so that they may be used as tracers. Tritium, an isotope of hydrogen, can be incorporated into a water molecule. This water molecule is heavier than a normal water molecule but it is not subject to the same effects that charged ions are. For this reason tritium is called the ideal tracer. It is often used as the standard to evaluate other tracers. Phillips et al. (1988) used isotopes produced by atmospheric tests of thermonuclear weapons as tracers for studying water movement at the Sevilleta site (Figure 2) and the United States Department of Agriculture Jornado Experimental Range located 40 km northeast of Las Cruces. The advantage of these tracers is that they were input as a pulse during a known time. The tritium peak had penetrated deeper than the chlorine-36 peak. The chlorine can only travel in the liquid phase, whereas the tritium can travel in both liquid and vapor phase. Temperature clear acrylic pipe to serve as a watch glass for the fluid level inside of the tensiometer. The PVC and acrylic pipe were joined by a PVC coupling and PVC cement. At the top of the acrylic pipe a PVC end cap was attached with more PVC cement. The end cap has a 0.80 cm opening into which a number 30 rubber stopper was inserted to seal the tensiometer. See Figure 16 for details of tensiometer construction.

A tensimeter measures the pressure in the air space at the top of the tensiometer. Part of this pressure is due to gravity acting on the column of fluid in the tensiometer. The height of the column can be measured through the sight glass and its contribution to the pressure is then subtracted from the recorded pressure to calculate the actual suction in the soil. All measurements were made from the center of the porous cup. The distance in centimeters from the center of the cup to the stopper was marked on the clear acrylic tubing so the fluid column height may be recorded directly in the field.

Before tensiometers were installed they were tested in the laboratory for any leaks which would prevent them from maintaining a suction in the field. This was done by placing the porous cup of the tensiometer in a water filled container to saturate it while the top of the tensiometer was left unsealed. The tensiometer was removed from the container of water and then filled with de-aired water. The top was sealed with a rubber stopper and then a suction was applied by inserting a hypodermic syringe needle attached to a vacuum

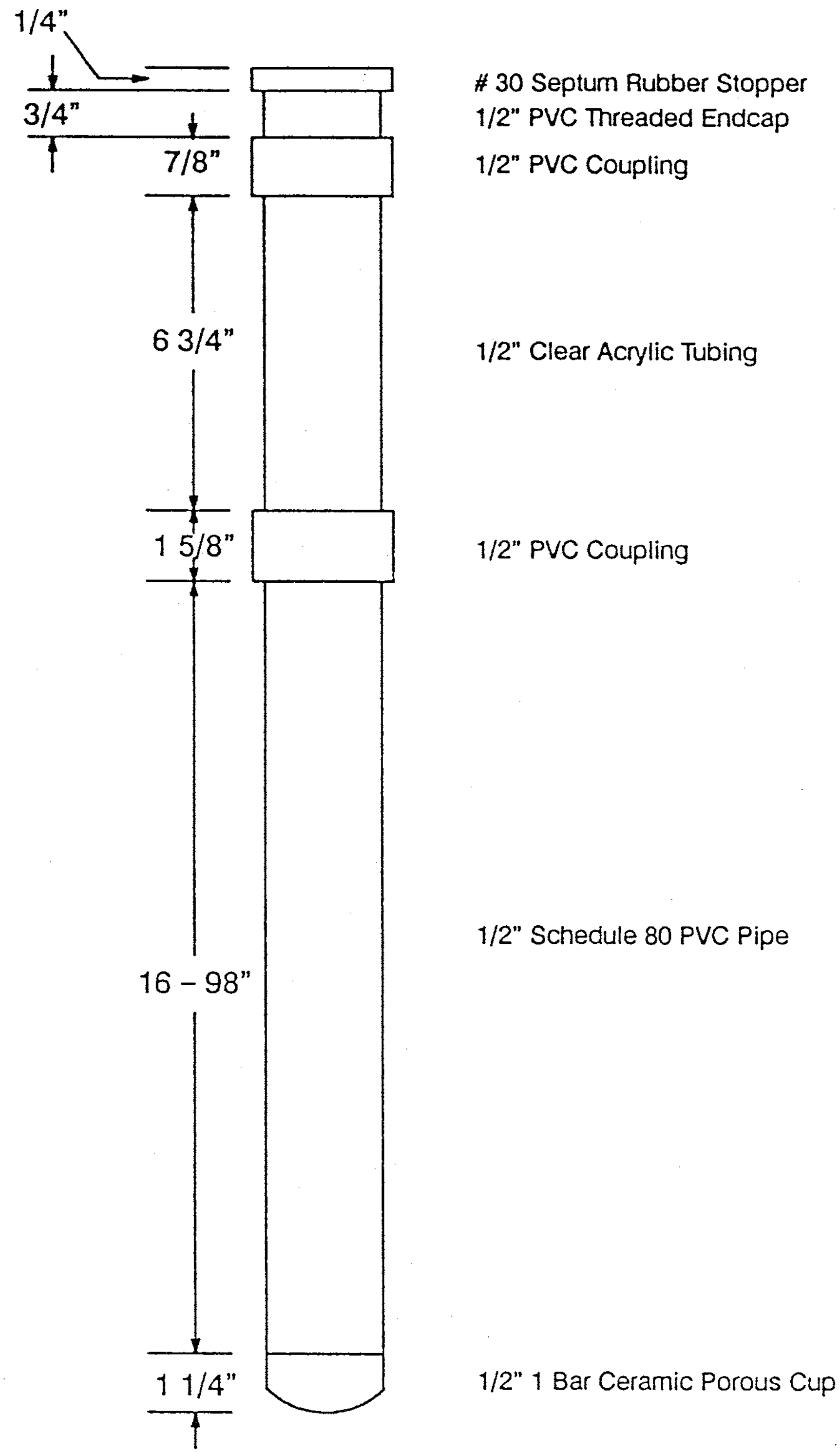

Figure 16. Diagram of tensiometer design used to determine pressure heads.

line through the rubber stopper to withdraw air from above the water column. The tensimeter was used to measure this suction. The suction was measured 24 hours later. If there were any leaks in the tensiometer, the suction would not be maintained very long. Tensiometers which failed this test were checked for loose joints or a cracked porous cup.

The tensiometers were placed in a grid pattern at the field site so that the effects of vegetation, if any, could be detected. It was a square grid pattern with nests of tensiometers placed 1.5 meters from one another. See Figure 14 referenced earlier. There were twenty nests of tensiometers with each nest containing eight tensiometers each. The vertical spacing of the tensiometers was 30 cm. The first tensiometer in each nest was 30 cm below datum and the last was 240 cm below datum. See Figure 17 for a cross section of the instrumentation at the site. A level datum at the field site, surveyed from a nearby township marker, was used because the topography at the site varies. This aided in the calculations because all data points were at regular intervals in vertical space as well as in their x and y direction. The nests of tensiometers were aligned so that the western edge of the grid was parallel to a row of fourwing saltbushes. The northeast and southeast corner of the plot were also located near clumps of fourwing saltbush.

The tensiometers in each nest were offset by 8 cm from the center of the nest in a circle. This was done because past

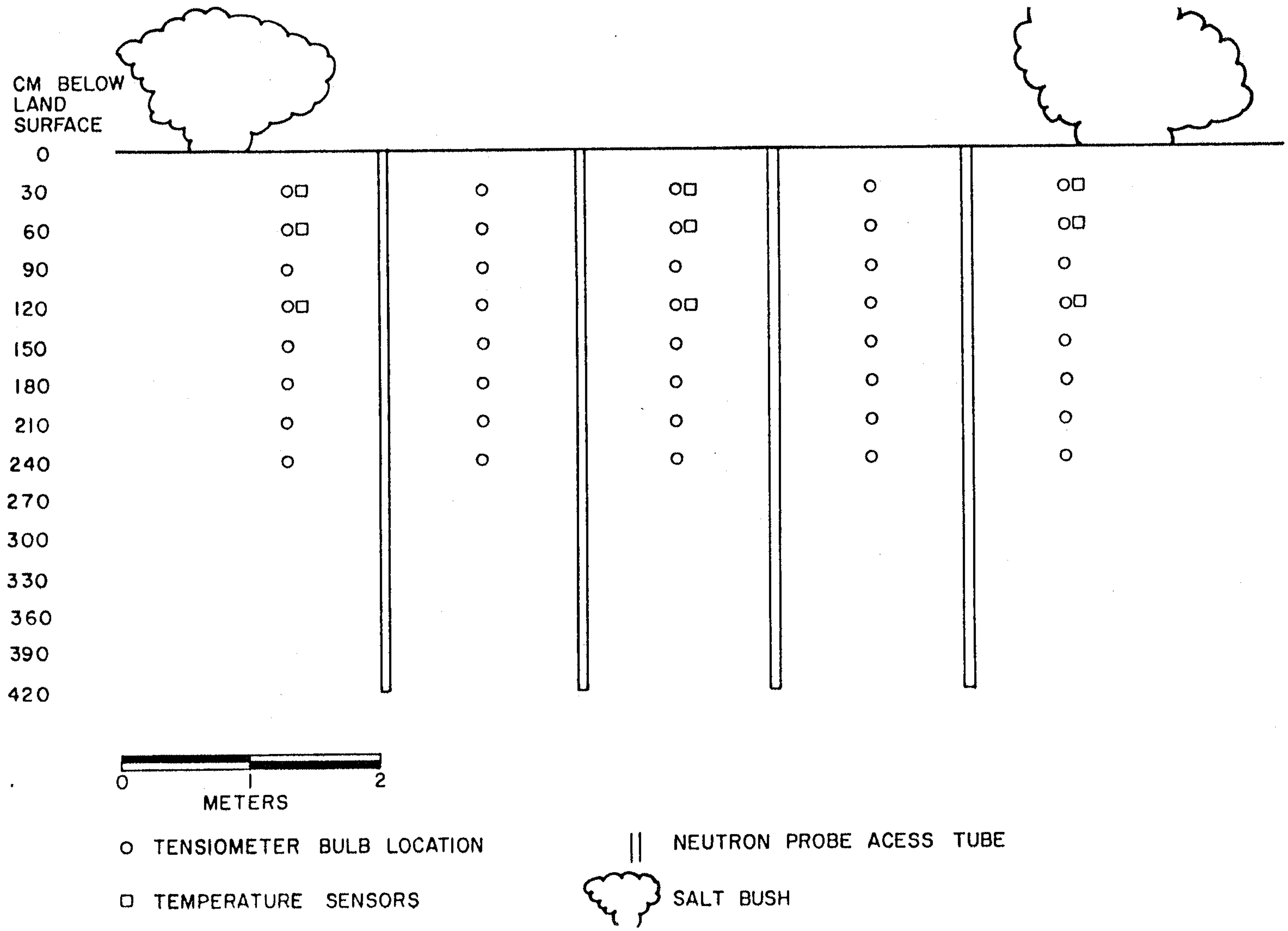

Figure 17. Cross section of field site showing instrumentation.

researchers have found that tensiometers placed in an vertical nest without any offset are very sensitive to the failure of one of the tensiometers above them. The fluid will drain from a failed tensiometer, flowing past the others causing their readings to be unrepresentative of the actual soil conditions.

The tensiometers were installed by hand at the field site because a drill rig would destroy the vegetation we wanted to observe. The sandy soil, almost free of cobbles, made this possible. The center of each tensiometer nest was marked with a stake and the datum marked on the stake. A piece of galvanized conduit slightly larger in diameter than the tensiometers was inserted in the soil to the depth the porous cup was to be placed. This depth was marked on the conduit and the conduit was driven into the ground with a sledgehammer. It was periodically removed so soil inside of the pipe could be removed by tapping the sides of the pipe. This made the conduit easier to drive into the soil. After the approximate depth was reached the tensiometer was placed in the hole. If the hole was too shallow, the insertion tool was used to deepen it. Otherwise the hole was backfilled with dry soil until the depth was correct. The depth was checked by measuring from the tensiometer to the datum marked on the stake with a hand level. As the tensiometer was backfilled it was twisted slightly and moved side to side to make sure the cup of the tensiometer was in contact with the soil.

An antifreeze solution containing ethylene glycol was used in the tensiometers to prevent them from freezing and cracking their barrels. If cracking occurred, the tensiometers would no longer be able to hold a suction, and they would drain. This raises the question whether antifreeze filled tensiometers read the same as water filled ones. In simple laboratory experiments (Knowlton 1986) the effect was found to be negligible at low suctions. Wendt et al. (1978) used a 30% methanol solution in tensiometers and found no major effect on tensiometer readings or plant growth. McKim (1974) investigated different fluids as antifreeze and concluded that as long as the interface between the tensiometer fluid and the soil water occurs in the wall of the cup, the difference in surface tension between the two fluids does not affect the pressure head measured in the soil by the tensiometer.

The exposed portions of the tensiometers were shaded by covers made from 6.25 cm diameter PVC pipe 30 centimeters long. Slots were cut in one end of the pipe and then that end was heated with a hot air gun until the plastic was soft. The flanges were bent inward to close one end of the pipe and held until the PVC became rigid again. These covers prevented the sunlight from bleaching the markings on the tensiometers and protected the PVC and rubber stoppers from ultraviolet light which makes them brittle.

The tensiometers were maintained so that their fluid level was visible in the sight glass. This air gap allowed the tensimeter to measure the pressure in that space. The tensimeter could not measure the pressure of a fluid. When the pressure was recorded the height of the solution in the tensiometer was also recorded. This was so the pressure head at the cup could be calculated. The weight of the fluid column pulling downward on the air gap must be subtracted from the tensimeter reading. During the course of this investigation, it was observed that the pressure inside of tensiometers could be affected by changes in temperature. See Appendix E. It was concluded that the best time to make readings was after a period when the temperature had remained relatively constant so that the pressure inside of the tensiometer was at equilibrium with that of the soil-water. Early morning seemed the most appropriate time to monitor the tensiometers, before the sun would strike them.

<u>Moisture Content.</u> At the research site, the neutron scattering technique was used to indirectly measure water content in the soil. This technique is rapid and nondestructive, allowing for repeated measurements of volumetric water content of the soil.

The neutron probe (503DR, Campbell Pacific Nuclear ,West Pacheco, California) used at the site had a 50 millicurie americium-242/beryllium source of fast neutrons. The probe was calibrated for the Sevilleta soil by McCord (1986). From the calibration a relationship between probe reading and actual moisture content was obtained. The field data was placed in a Lotus spread sheet and an exponential fit was used for the calibration curve (Stein, 1989). The neutron probe measures the water content of the soil in a sphere with a radius of about 15 cm around the radioactive source (Operator's Manual, Campbell Pacific Nuclear). The size of the sphere varies with the soil and moisture content. Under dry soil conditions the sphere of influence is larger than what would be found under moist soil conditions.

To facilitate the use of the neutron scattering technique, thin-walled aluminum access tubes (5 cm in diameter) were installed at locations in the grid shown in Figure 15. The neutron access tubes were installed by hand auguring holes with a 6 cm auger bit. The bottom of each access tube was capped with a rubber stopper and sealed with silicon adhesive to prevent moisture from seeping into the tube and possibly altering the moisture content readings. After inserting the access tubing, the annular space was backfilled with native material to ensure proper contact between the soil and access tubing.

The neutron probe access tubes were installed to a maximum depth of 480 cm. Exceptions occurred whenever hand auguring was stopped earlier by the layer of cobbles in the sand at the base of the plot. Neutron probe readings were taken at 30 cm intervals beginning at a depth of 30 cm below the field datum. The datum was chosen to be the highest point within the research site. Elevations throughout the site were obtained by surveying from the nearby township marker. Readings were taken at a count rate of 16 seconds. It was found that at this count rate, the standard deviation of the readings was 0.1% to 1.3% of the reading itself.

Climatological Data. An automated weather station was located just to the south of the field site. A 21X Micrologger (Campbell Scientific, Logan, Utah) was used to record weather data. Data was stored in internal memory until it was manually down-loaded to a cassette tape recorder. The tape was then taken to the laboratory where a C20 Cassette Interface (Campbell Scientific) allowed the data to be transferred to an Ascii file on an IBM Personal Computer.

The readings taken by the data logger were: precipitation, temperature, relative humidity, wind speed, wind direction, and solar radiation. In the early summer of 1988 soil temperature measurements at 24 locations in the soil profile were added to the other weather data. This was done by using a AM-32 Multiplexer (Campbell Scientific) which allows up to 32 measurements to be made from one input/output channel of the 21X Micrologger. The multiplexer is essentially a series of relays which in a very short time can switch the input/output channel of the 21X through 32 different instruments attached to the multiplexer. The micrologger was programed to store the reading from each instrument attached to the multiplexer separately. All of this data is found in Appendix A.

Precipitation was recorded by a tipping bucket rain gauge (Model RG2501, Sierra-Misco Inc., Berkeley, CA). The mouth of the gauge is 20.3 cm in diameter and funnels water to a tipping bucket. One millimeter of rainfall causes the bucket to tip and sends a pulse recorded by the micrologger. The data logger counts the number of pulses in a 24 hour period. This is the amount of rainfall in millimeters.

Air temperature and relative humidity were recorded by a temperature and relative humidity probe (Model No. 207, Campbell Scientific). The instrument consists of a separate thermistor and relative humidity probe which are read into the datalogger on two separate channels. According to the manufacturer, the accuracy of the temperature measurement is 0.2^{o}C form -33^{o}C to +48^{o}C and that of the relative humidity probe is plus or minus 5% in the range from 12 to 100% relative humidity. Hourly recordings were originally made but later the readings were averaged for a 24 hour day and the average for the day was recorded.

Wind speed was measured with a Met-One Wind Speed Sensor (Model 014A, Met One Inc., Grants Pass, OR). The wind direction was measured with a Met-One Wind Direction Sensor (Model 024A, Met One Inc.). The wind speed was totalized for a 24 hour period. The most frequent wind direction for the day was also recorded. Solar radiation was recorded with a Li-Cor Pyranometer (Model LI-200S, LI-COR, Lincoln, Nebraska).

A manual weather station was located half a kilometer west of the field site along the access road. The meteorological equipment included: a spring powered rain gauge accurate to 0.02 cm, a maximum-minimum thermometer accurate to 0.5^{o}C, a standard Class A evaporation pan with a hook gauge accurate to 0.001 cm, and a totalizing anemometer for reading cumulative wind velocities. All of these instruments were provided by Belfort Instrument Company, Baltimore, MD. The tabulated manual weather station data is found in Stein 1989.

Results of Hydrodynamic Analysis

Several methods were used to analyze the pressure head data from the tensiometers. The Fortran program (Appendix D) mentioned earlier calculated fluxes from Darcy's law of unsaturated flow. Gradients were calculated from tensiometric data and water content from neutron probe logging allowed for the variation of hydraulic conductivity with respect to water content. Actual fluxes were calculated but in doing these calculations the program tends to smooth the data. This happens because the program averages two pressure head readings in order to find the pressure head in the center of the cell. Also several monitoring periods were averaged to minimize the influence of missing field data on the data used in the analysis. Averaging prevented actual instantaneous fluxes from being calculated, but was necessary in order to calculate a long term water balance.

Cross Sections of Total Head. The most convenient way to evaluate the direction of moisture flow is to construct a flow net based on hydraulic head values. Kickham (1987) used this method in her study of the indigo bush at the Sevilleta site. A datum was picked for the site and the pressure head values from the tensiometers were converted to total head values. The total head values in one cross section through the study area were contoured. Flow lines were then drawn perpendicular to the lines of total head. This method of analyzing the data gives the direction of movement of the soil moisture at one instant in time. Pressure head values are not averaged. See Figures 18 and 19 for cross sections of total head from the current study. Most cross sections show a general downward movement of water with little lateral flow. The cross section of October 15 is the only one to show converging flow.

Calculated Fluxes. The computer code described earlier calculated both direction and magnitude of the soil-moisture flux based on pressure head and water content data (Equations 5 and 6). The code can be used to calculate a water balance provided that data are available to calculate a flux through each face of the computational cell. The tensiometers were more reliable in the earlier part of the experiment. Tensiometer failure became more of a problem near the end of the investigation as can be seen in Appendix F. When a reading was missing for a particular tensiometer, the average of the other readings were used. If this was not possible a previous

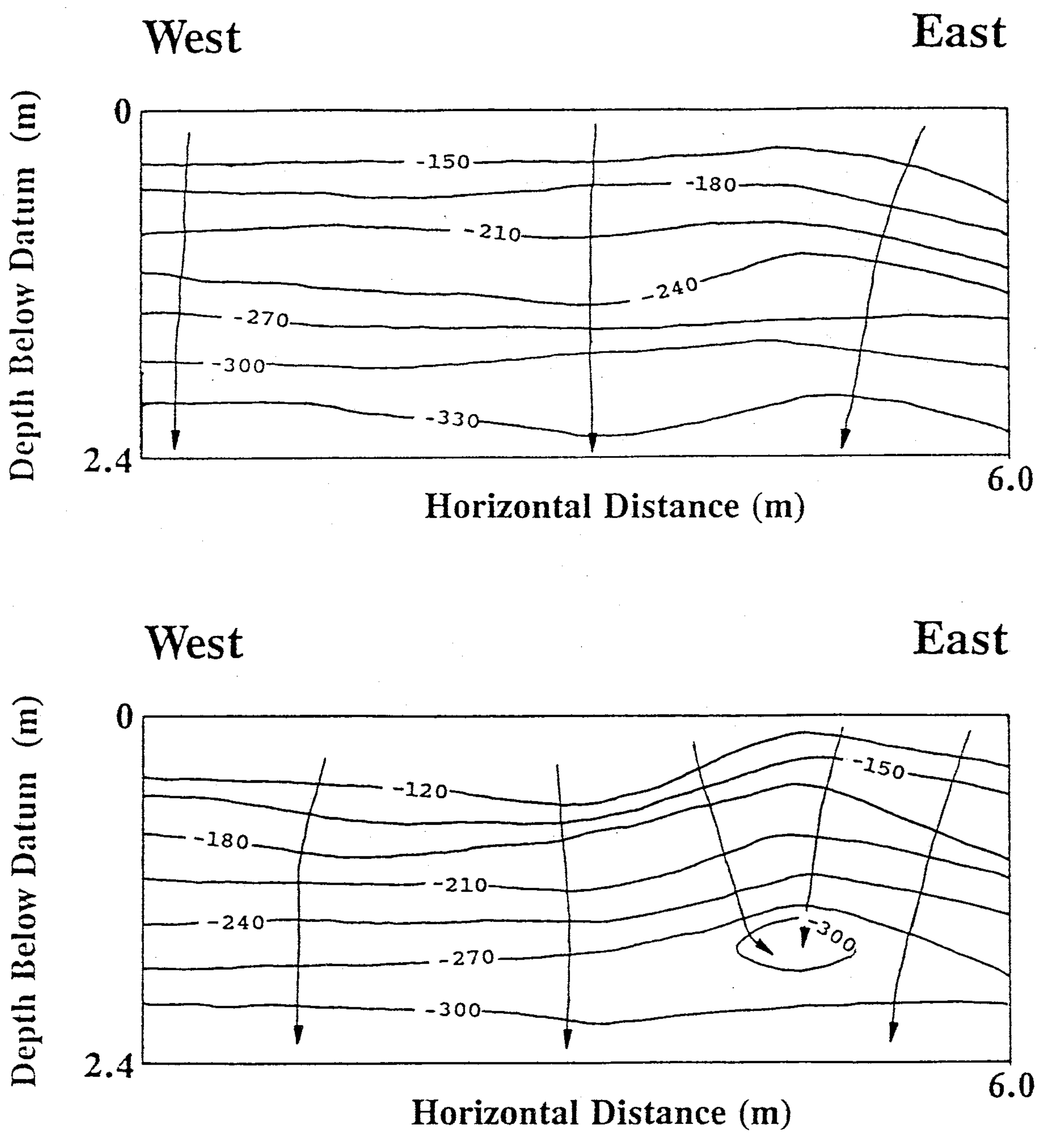

Figure 18. Cross section of total head fields in cm of water from tensiometer nest numbers 4, 5, 12, 13, and 20. Top shows head fields on July 20, 1988 and bottom shows head fields on October 15, 1988.

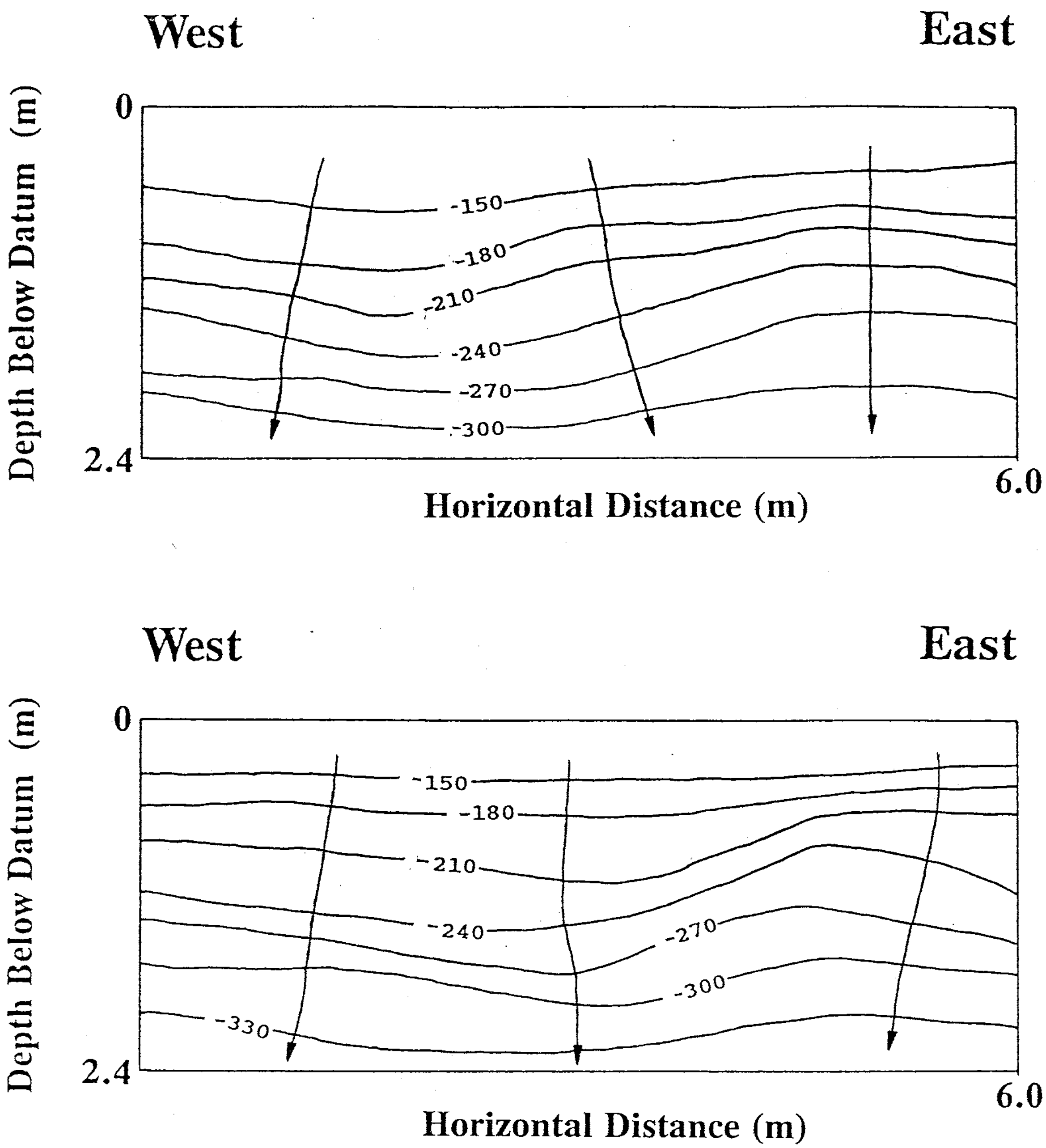

Figure 19. Cross section of total head fields in cm of water from tensiometer nest numbers 4, 5, 12, 13, and 20. Top shows head fields on December 9, 1988 and bottom shows head fields on April 21, 1989.

or later value was used. When no value was available, the position was entered into the input file as a positive value. This was a flag so that the program would spatially average the available data to calculate the hydraulic gradient. Water content data was very reliable and never had to be interpolated. Values were averaged over the same time period as the pressure head data. The area through each computational cell and the time the flux was acting was used to calculate a water balance for that computational cell. There were a total of 30 such cells at the site.

Another way of analyzing the pressure head data is to identify seasonal variations in the magnitude and direction of the horizontal flux components calculated by the program. The input data consisting of pressure head and water content data and the resulting output files are found in Appendix G. The sense of direction is either into or out of the cell. The magnitude of the flux depends upon the pressure head gradient and the hydraulic conductivity of the soil. Plotting the direction and magnitude of the lateral flux with time should reveal any seasonal changes in soil moisture flow. This was done for several different cells and some of the results are shown in Figures 20 through 22 for cell 1 (Figure 15).

Recharge and evapotranspiration were estimated using vertical fluxes calculated from the program assuming that the flux downward below the 210 cm depth was beyond the influence of the plants and becomes recharge. Evapotranspiration is the

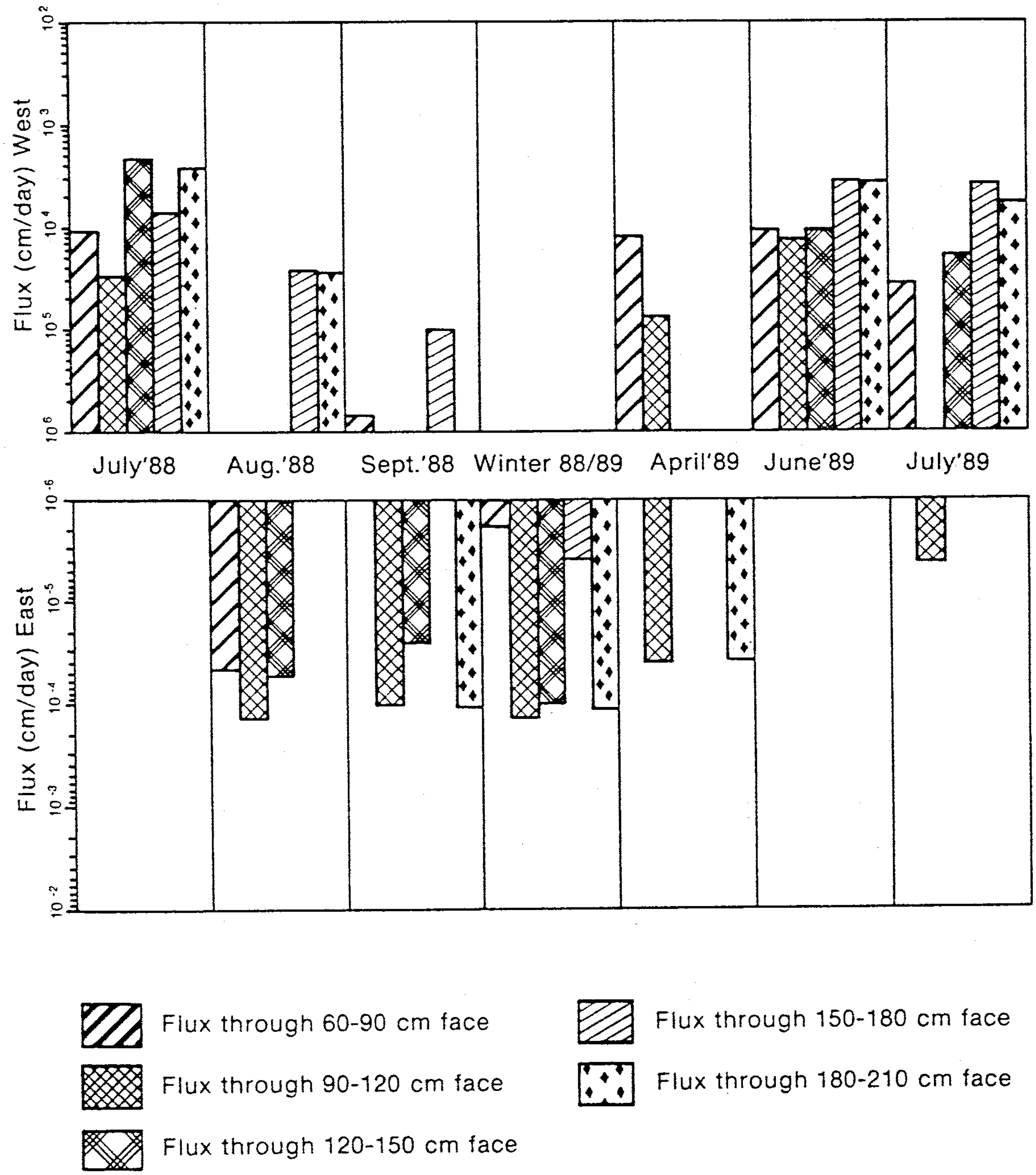

Figure 20. Horizontal flux versus time through the west side of cell number 1. Fourwing saltbushes are to the west of cell number 1.

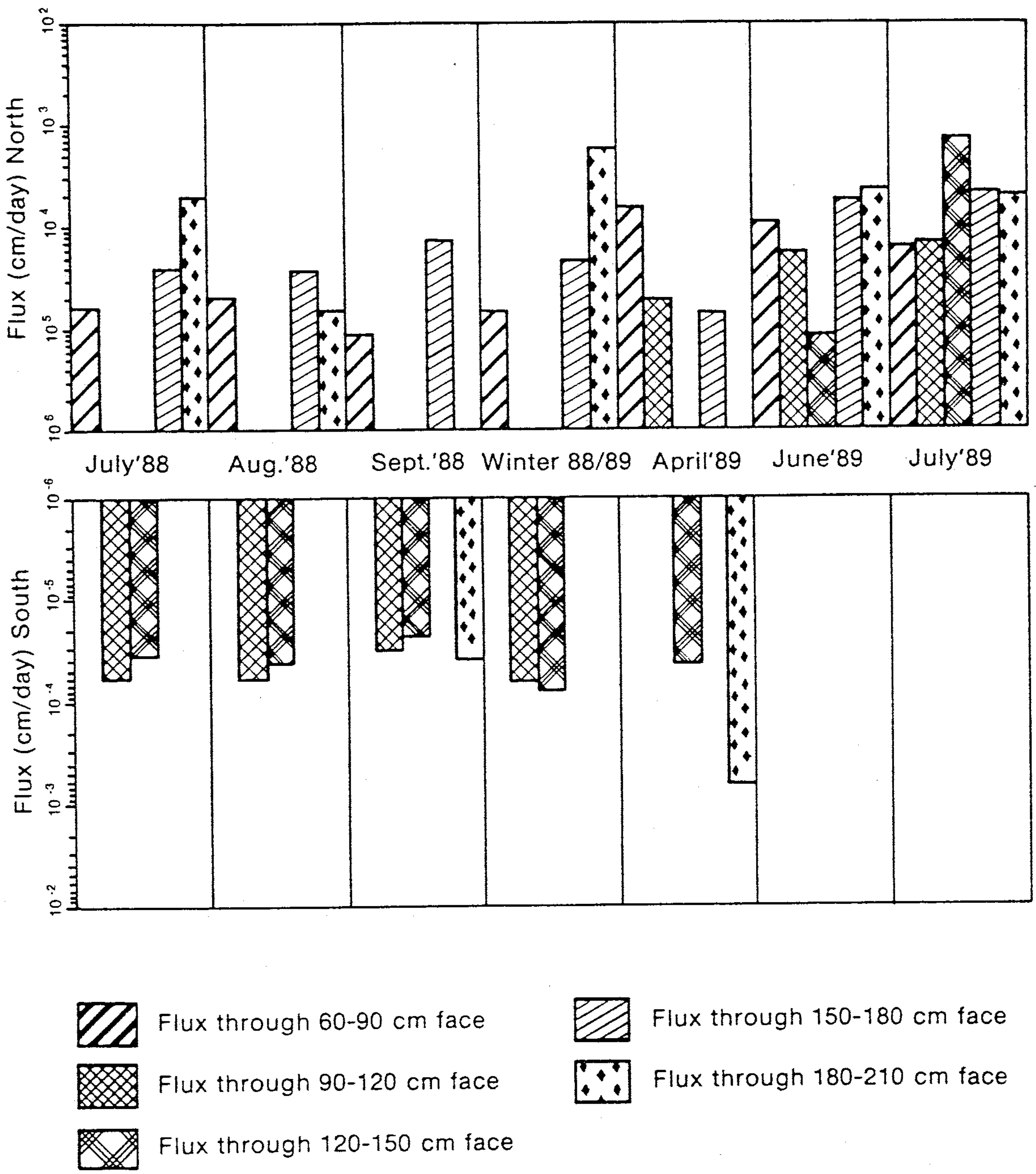

Figure 21. Horizontal flux versus time through the north side of cell number 1.

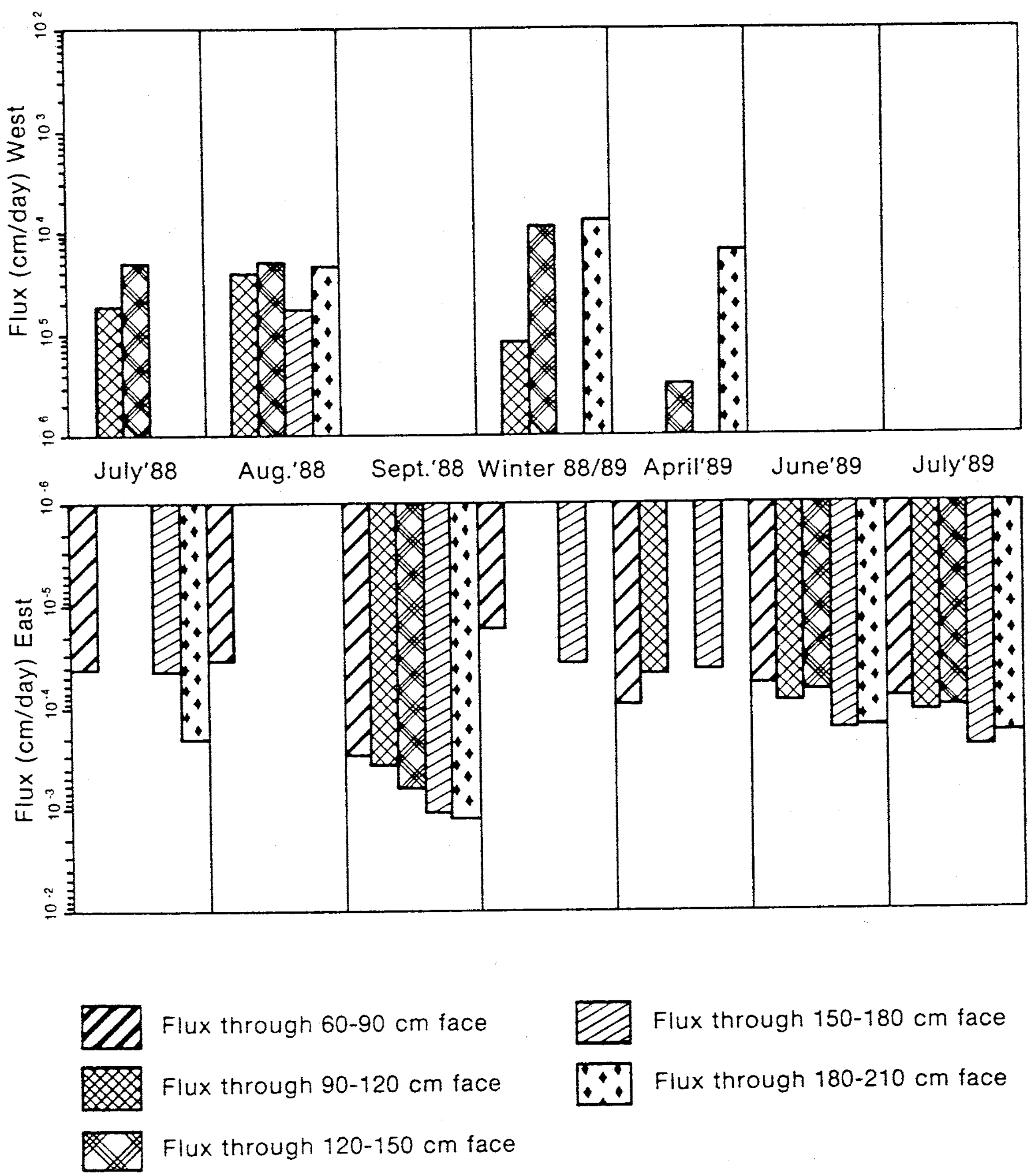

Figure 22. Horizontal flux versus time through the east side of cell number 1.

difference between precipitation and recharge. The flux through the bottom face of each computational cell was calculated for seven different time periods. The length of each time period was multiplied by the flux to determine the amount of water leaving the lower face of the bottom computational cell. The results are shown in Table 3. The average vertical flux was about 7.2 $x10^{-4}$ cm/day or 1.3 % of annual precipitation but ranged from 0.8 to 5.1 % of annual precipitation. The lateral fluxes were usually in the range of 1.0 $x10^{-5}$ cm/day. These lateral fluxes are believed to be of the same magnitude as the error made in their calculations as discussed later. This uncertainty coupled with the signs (flow into and out of the cell) which seem to change erratically, and the results of the cross sections indicating predominantly downward flow justifies neglecting horizontal fluxes in recharge calculatings.

The program was also used to calculate recharge and evapotranspiration based on the assumption of a unit hydraulic gradient. The output from the assumed unit gradient method is also found in Appendix G. This method is often used as a quick estimate because pressure head data is not needed for the calculations. The only driving force of the soil is assumed to be gravity. The water content data used in the previous calculations are the only model input (Equation 6). Pressure head values are all the same so the only gradient is the minus content, 210 cm depth. (Positive values indicate downward flux.) Julian date beginning January 1, 1988.

TIME Julian Days	FLUX (cm/day) CELL 1	CELL 2	CELL 3	CELL 4	CELL 5	CELL 6
182-212	$8.45X10^{-4}$	$6.34X10^{-4}$	$6.56X10^{-4}$	$4.41X10^{-4}$	$2.59X10^{-4}$	$-1.46X10^{-5}$
212-257	$7.61X10^{-4}$	$5.13X10^{-4}$	$9.41X10^{-4}$	$2.63X10^{-4}$	$5.73X10^{-4}$	$-1.22X10^{-4}$
237-288	$5.54X10^{-4}$	$3.50X10^{-4}$	$1.47X10^{-3}$	$4.75X10^{-4}$	$2.45X10^{-4}$	$6.77X10^{-5}$
288-439	$4.82X10^{-3}$	$1.09X10^{-3}$	$3.39X10^{-4}$	$-6.73X10^{-5}$	$7.73X10^{-4}$	$3.54X10^{-3}$
439-500	$3.32X10^{-3}$	$4.33X10^{-4}$	$2.69X10^{-6}$	$2.34X10^{-4}$	$8.41X10^{-4}$	$6.96X10^{-4}$
500-546	$9.24X10^{-4}$	$3.76X10^{-4}$	$9.33X10^{-5}$	$2.62X10^{-3}$	$8.88X10^{-4}$	$2.60X10^{-4}$
546-577	$1.97X10^{-3}$	$3.90X10^{-4}$	$3.05X10^{-4}$	$2.62X10^{-4}$	$8.37X10^{-4}$	$-1.75X10^{-4}$
Recharge cm/yr	1.02	0.234	0.166	0.164	0.249	0.540
Percent of Precip.*	5.67	1.30	0.92	0.91	1.38	3.00

* based on annual precipitation of 18 cm.

one caused by gravity. The results of the unit gradient method of calculating deep fluxes are found in Table 4. There is less spatial variablilty in these vertical fluxes than the ones calculated using actual pressure head measurements and shown in Table 3.

Discussion

Cross section of total head from this investigation do not show the great seasonal variations as reported by Kickham in previous work. There are several differences in the experimental setup which may account for the different observations.

Geometry of Plants and Tensiometers. One difference is the distribution of the vegetation with respect to the tensiometers. In the indigo bush study all of the tensiometers were in one plane and closer together. The current experiment had the tensiometers spaced farther apart and offset one from another. This geometry may tend to obscure small differences in the pressure head field.

The indigo bush study dealt with a very simple plant geometry, that of an isolated bush on a sand dune. The current site was in the midst of irregularly spaced fourwing saltbushes. Trenching of the site after the study was completed did not reveal the expected rooting density pattern. The greatest concentration of roots was not found by the canopy of the bush but farther out. Roots were found in no particular pattern and were widely spaced. Grab samples taken

Table 4. Estimated recharge rates based on assumed unit gradient and water content measurements, 210 cm depth. Julian date beginning January 1, 1988.

TIME Julian Days	FLUX (cm/day) CELL 1	Cell 2	Cell 3	CELL 4	CELL 5	CELL 6
182-212	1.08×10^{-3}	1.04×10^{-3}	9.94×10^{-4}	8.95×10^{-4}	1.01×10^{-3}	8.76×10^{-4}
212-257	9.33×10^{-4}	8.58×10^{-4}	9.14×10^{-4}	6.81×10^{-4}	8.95×10^{-4}	7.26×10^{-4}
237-288	8.95×10^{-4}	8.40×10^{-4}	9.53×10^{-4}	6.96×10^{-4}	8.95×10^{-4}	7.26×10^{-4}
288-439	8.58×10^{-4}	8.23×10^{-4}	8.58×10^{-4}	6.96×10^{-4}	7.73×10^{-4}	6.53×10^{-4}
439-500	7.73×10^{-4}	7.41×10^{-4}	8.06×10^{-4}	6.67×10^{-4}	8.06×10^{-4}	6.96×10^{-4}
500-546	7.26×10^{-4}	6.81×10^{-4}	7.57×10^{-4}	6.53×10^{-4}	7.26×10^{-4}	6.67×10^{-4}
546-577	7.41×10^{-4}	7.41×10^{-4}	7.89×10^{-4}	6.67×10^{-4}	7.26×10^{-4}	6.53×10^{-4}
Recharge cm/yr	0.309	0.295	0.314	0.255	0.296	0.253
Percent of Precip.*	1.72	1.64	1.74	1.42	1.64	1.41

* based on annual precipitation of 18 cm.

while the neutron probe access tubes were being installed also showed large roots at 360 cm, much deeper than expected. But samples taken from an augured hole may be contaminated by material from the surface or side of the hole falling to the bottom. From observations of the roots it is not easy to determine which root is associated with which species or particular plant. One cannot readily identify visually whether a particular root is actively withdrawing water from the soil. The uniformly distributed roots make the designation of vegetated and unvegetated portions of the site less meaningful as far as the soil was concerned. The roots may allow the plants to withdraw moisture from most of the soil even though the surface is not covered by vegetation.

Fluxes calculated by the program do not show large horizontal components. There are some seasonal patterns, but they were not as obvious as expected. Before conclusions can be drawn from the fluxes shown in Figures 20 through 22, the errors associated in their calculations must be considered.

Error in Measurements. These fluxes are based on field data and have the usual errors associated with measuring and installing field instruments. All of the calculations are based on pressure head gradients and conductivity measurements. Unsaturated hydraulic conductivity is a very difficult value to measure in the field. Some authors such as Gee and Hillel (1987) consider one order of magnitude the best one can estimate unsaturated hydraulic conductivity. Using hydraulic conductivity as a function of water content is justified because of proximity of the current soil to the one Knowlton (1984) used to establish the relationship from his instantaneous profile test. Leavitt (1986) found no significant difference in hydraulic properties between floodplain soils mapped as different units at the Sevilleta site. It must be remembered that the calculated fluxes were based upon a hydraulic conductivity water content relationship, which may contain a source of large uncertainty.

The other likely source of uncertainty in calculating fluxes was the error in the pressure head gradients. These errors are from two distinct sources. One is the error in measuring the pressure in the tensiometer, and the other is knowing the actual distance between pressure head measurements used in calculating the gradient.

The first type of error is the one made in measuring the pressure inside of the tensiometer. Manometers which use the height of rise in a column to measure pressure are sometimes used in the field. Mercury is the fluid often used but a small error in the measurement of the column height translates into a large error in the pressure measured because mercury has a higher density. Mercury manometers are difficult to maintain and for this reason a tensimeter (portable pressure transducer) was used at our site. According to the manufacturer, the tensimeter reading is accurate to plus or minus one millibar, which translates to about one centimeter of water.

Tensiometers which are designed to be used with a portable pressure transducer also make the measurement of pressure very sensitive to changes in temperature. This is discussed further in Appendix E. This type of error was difficult to quantify, because it depends on temperature. Measurements of pressure head were taken just before sunrise in order to minimize the temperature effect. About an hour was required to collect all of the pressure head data, and in this time the air temperature would change. Moreover, solar radiation would heat the air inside of the tensiometers. Since field measurements suggested that temperature affects all tensiometers equally, it was only possible to compute pressure head gradients if the measurements were collected at about the same time and under the same temperature conditions. All tensiometers in a nest were measured at nearly the same time. Therefore, the error in calculations made using data from one tensiometer nest should be negligible. Lateral flux calculations which depend on measurements taken from adjoining nests may be separated by enough time that their readings may be off by an estimated 1.7 cm of water. This estimate is based on field observations. See Table 5 for errors associated with pressure gradient calculations in the vertical and horizontal direction.

Table 5. Sources of error in pressure head gradients. Tensimeter error from manufacturer, other errors estimated from field observations.

	X and Y direction	Z Direction
Error in measuring pressure head		
Tensimeter (cm of water)	+/- 1.0	+/- 1.0
Temperature Effects (cm of water)	+/- 3.0	+/- 3.0
Total possible error in pressre head (cm of water)	+/- 4.0	+/- 4.0
Error in calculating spacing of pressure head measurements		
Placement of tensiometers (cm)	+/- 2.0	+/- 0.5

The other possible source of error in pressure head gradients is due to the installation of the tensiometers themselves. The distance between pressure head measurements must be known in order to calculate the gradient. As mentioned in the Instrumentation section of this paper, a level was used to set the tensiometers to a particular depth below a datum. The datum was surveyed from a township marker to a stake which marked the center of each tensiometer nest. For this reason the error in the vertical direction is small, but so is the separation of the tensiometers in a nest, only 30 cm. The horizontal separation of the tensiometers is known with less certainty. It was very difficult to drive the tensiometer insertion tool into the soil while keeping it truly vertical. A small inclination at the top of the rod will cause the tensiometer cup to be progressively farther off true vertical the deeper it is placed. An estimate of plus or minus 2 cm was used for the error associated with the horizontal placement of tensiometer. All of the significant sources of error in pressure head gradients are shown in Table 5.

Finally, the magnitude of the error made in fluxes depends on the water content of the soil. This error is in addition to the uncertainty in the water content measurements as well as uncertainty in the relationship between conductivity and water content. Since flux is the product of the gradient and the hydraulic conductivity (Equation 5 and 6), the error in flux calculations also increases with the water content of the soil. Table 6 shows how the error in pressure head gradient translates into error in calculated fluxes at the water contents frequently found in the field.

Discussion of Lateral Fluxes. The magnitude of error in the flux calculations due to uncertainty in calculating the pressure head gradient varies from 3.91 $x10^{-5}$ cm/day at 0.03 moisture content to 2.1 $x10^{-4}$ cm/day at 0.05 moisture content. The lateral fluxes calculated with the program are usually around 1.0 $x10^{-5}$ cm/day at the same moisture contents. Appendix G contains the lateral and vertical fluxes calculated for each face of the computational cells form July 1988 to July 1989. Many of the lateral fluxes are not larger than the expected error in their calculations and could be the result of experimental error. Some of the fluxes are large enough that there is some confidence in their existence.

For example, Figure 20 shows the fluxes from the west face of cell one which is closest to the line of fourwing saltbush. July 1988 data shows flux west towards the bush at all depths. After the heavy rains of August and September of that year the pattern changes, with most of the fluxes reversing direction to the east, away from the saltbush or becoming smaller. Most of the fluxes the next June and July 1989 are west in the direction of the bushes. Kickham (1987) found the lateral fluxes to be negligible in the winter months based on total head contours. The reversals in flow direction

Table 6. Error in fluxes due to uncertainty in pressure head gradients at 0.03, 0.04 and 0.05 volumetric water content, the most frequently occurring water content during the study. Lateral fluxes and vertical fluxes are shown in (a) and (b) respectively and are based on an average pressure head of a -100 cm water.

a) Lateral Fluxes

Water content (cm^3/cm^3)	Error in gradient (cm/cm)	Conductivity (cm/day)	Magnitude of of flux error (cm/day)
0.03	0.0541	$7.26X10^{-4}$	$3.93X10^{-5}$
0.04	0.0541	$1.67X10^{-3}$	$9.03X10^{-5}$
0.05	0.0541	$3.88X10^{-3}$	$2.10X10^{-4}$

b) Vertical Fluxes

Water content (cm^3/cm^3)	Error in gradient (cm/cm)	Conductivity (cm/day)	Magnitude of of flux error (cm/day)
0.03	0.0690	$7.26X10^{-4}$	$5.01X10^{-5}$
0.04	0.0690	$1.67X10^{-3}$	$1.15X10^{-4}$
0.05	0.0690	$3.88X10^{-3}$	$2.68X10^{-4}$

seen in the current study are difficult to explain. Rainfall would be expected to cause horizontal gradients in the profile to lessen once the wetting front penetrates past moisture depleted areas in the soil. There is no ready explanation for why the fluxes would reverse direction which implies that areas which were once moisture depleted are now sources of water. One explanation might be interception of rainfall by the canopy of the fourwing saltbush. Another mechanism which could be used to explain this observation is not available at this time.

Observed fluxes through the north face of cell number one are shown in Figure 21. There is less of a seasonal pattern noted in the earlier months, but there seems to be a northerly trend during June and July near the end of the study. The beginning pattern or lack of it is expected because the face is perpendicular to the line of saltbushes. The fluxes at the various depths remain fairly constant in their direction through the summer to the winter of the first year. As mentioned earlier variations in fluxes due to water uptake by plants would be expected to diminish during the winter. The magnitude of many of the fluxes are not great enough to say that they are beyond the range of the error in their calculation. This area was excavated at the end of the study and the observed rooting pattern was found to be very complex. Consequently, it was difficult to determine whether a flux was away from or towards the vegetation because the subsurface distribution of roots does not correspond to the canopies of the vegetation observed above ground. Roots of the plants may be able to withdraw water from most areas of the profile and at different times. Changing patterns of water withdrawal would further complicate the interpretation of pressure head data.

Figure 22 shows the fluxes calculated through the eastern face of cell number one. This face is 150 cm farther away from the line of saltbushes on the western edge of the experimental plot. The flow field here is more difficult to interpret because this face is about the same distance from an indigo sagebush as it is from the saltbush, and there might be two competing root systems affecting this face. The July and August data show generally small fluxes. September shows large fluxes at all depths. The Winter and April data is more mixed but June and July data is all towards the East. The magnitudes were not as great as the September data but constant at all depths. The eastern direction is towards the indigo bush.

Overall, the lateral fluxes calculated are not very definitive. Error in their calculation makes for noisy data which is difficult to interpret. The fluxes from the face nearest the saltbushes do seem to reflect the influence of the bushes, in that there is some seasonal changes in the fluxes. However it is difficult to explain the way these fluxes appear to reverse themselves. Towards the center of the plot and away from the large bushes it is more difficult to find any patterns.

Pressure Head and Unit Gradient. Estimated recharge rates based on the pressure head data and an assumed unit gradient are in fairly close agreement. The pressure head method indicates that for most of the year there is a greater than unit gradient downward. A few times it even indicated an upward gradient but the flux upward was overcome later. The rates based on pressure head data range from 0.91 to 5.7 percent of rainfall with an average of 2.2 percent. This means the average pressure head gradient was 1.4. The greatest amount of recharge was calculated in cell number one, which was closest to the bush, and the least amount of recharge was calculated to be near the center of the plot at cells number three and four. This is surprising, unless the bush is intercepting a significant amount of rain and snowfall which leads to greater infiltration by the bush. Evaporation from the bare ground near the center of the plot could be greater because of less shelter from the wind and sun. Also there is no mulch of fallen plant material to slow evaporation. However, cell number two, which is close to the saltbushes had a predicted recharge rate of 1.3 % of precipitation. Significant interception of precipitation by the bushes would also be expected to increase the recharge at this cell if it was the mechanism responsible for the high recharge rate observed in cell one. More likely is the possibility that a failed tensiometer caused errors in the gradient calculations. Most of the estimated recharge in cell number one is from the Winter and April time periods. For this reason the range in recharge rates from cell to cell is believed to be caused by instrument error.

The recharge rates calculated using a unit gradient are slightly less than those calculated from the pressure head data. The highest rate is 1.7 and the lowest is 1.4 percent of precipitation and the average is 1.6 percent. The highest rate is found in the center of the plot, and the lowest rate is in cell number six which has a clump of saltbush near its corner. The differences are not that great so no real inferences can be drawn. These two different methods predict on average that from 2.2 to 1.6 percent of rainfall becomes recharge. The rest is lost to evapotranspiration. Both of these methods compare favorably with one another but not to the chloride mass balance approach discussed next.

CHLORIDE MASS BALANCE ANALYSIS

The use of environmental chloride as a natural tracer has been proposed by many different researchers. The results of many of these researchers are reviewed in the introduction section of this paper. In this study the results of the chloride mass balance approach of estimating recharge are compared to recharge calculated by soil physics methods and moisture content monitoring at the current site and to previous work done there. The advantages of using chloride is that it is generally considered a conservative tracer. Because it is a negatively charged ion, it is not subject to cation exchange. Only in rare cases may anions be adsorbed. Chloride may also be subject to anion exclusion. This refers to the phenomena of negatively charged soil particles repelling negatively charged ions in the soil water. The anions are then restricted to traveling only in the center of the pores, because electrostatic forces repel them from the soil particles. The center of the pore spaces generally have higher velocities. Anion exclusion makes the anions move faster than the average water particle through the soil profile. In general, clay soils have large negatively charged surface areas which increase anion exclusion and cation exchange. Phillips et al., (1987) used soil from an area very close to the current field site in column experiments to determine if there was anion exclusion affecting the transport of chloride ions. They concluded that this was not occurring in the sandy soils at the Sevilleta site.

Theory and Assumptions

Naturally occurring rainfall contains a certain amount of chloride which is believed to come from the aerosol particles trapped when ocean spray evaporates in the air. Chloride concentrations are greatest near the oceans and decrease farther inland. There is also a certain amount of dryfall chloride found in the dust which settles out of the air. This continuous but small input of chloride is the basis of the chloride mass balance method of calculating recharge. If there are no sources or sinks of chloride or water in the soil profile, then the concentration of chloride in the soil water should equal that of the input concentration. But water can be removed from the profile by evaporation and transpiration. Evaporation from the soil surface leaves chloride behind, since chloride can not travel in the vapor phase. Plants are also assumed to be able to extract water from the soil profile without removing the ions in the soil. If there was no deep drainage from the soil profile the concentration of chloride in the soil water would continuously increase. This does not occur if there is drainage from the profile. The drainage or recharge water to the aquifer has a greater concentration of ions than the input water because it has been concentrated by evaporation and transpiration. Recharge can be calculated from the following equation.

$$R = (C_o * P)/CL_{sw} \tag{11}$$

where:

R = recharge rate (L/T)

P = average annual precipitation (L/T)

C_o = chloride concentration in precipitation and dry fall (M/L^3)

CL_{sw} = chloride concentration in soil water (M/L^3)

Equation 11 is valid for only one dimensional flow of soil water and cannot account for the lateral movement of water in the soil. Also the equation assumes that the concentration of chloride in rainfall and dryfall is known and does not change with time and that there is not net increase of chloride in the profile with time. The calculated recharge also depends on the precipitation, P, which is input into the equation.

Methodology

To use Equation 11 the chloride concentration in the soil water has to be determined at different depths. This was done by using grab samples taken from the neutron probe access holes. As the holes were augured, ring samples were taken every 30 centimeters. From these samples volumetric water content, pressure-water content relationships and saturated hydraulic conductivity were determined. Grab samples were also taken and placed in plastic bags. Some of these samples were used in a particle size analysis and others were used to determine the mass of chloride in the soil sample. Using phase relationships, the chloride concentration in the soil sample was calculated at the original water content. This is the CL_{SW} in Equation 11.

Approximately 15 grams of soil from a sample taken at the desired depth was weighed on weighing paper. The soil sample was then placed in a 25 milliliter Oak Ridge type centrifuge tube. The tube had previously been rinsed twice with distilled, deionized water to prevent contamination with chloride from previous samples or tap water. About the same weight of distilled, deionized water was added to the sample in the centrifuge tube. The tube was then sealed and shaken in a sample shaker for at least 10 minutes. The samples were then centrifuged at 3700 rpm for twenty minutes to separate the soil particles from the soil extract. The supernate was then pipetted from the centrifuge tube and titrated for its chloride content.

The procedures for the mercuric nitrate titration are found in Appendix H, and the equations used to calculate the chloride concentration in the soil water are found in Appendix G. The mercuric nitrate solution molality was found by titrating with a standard chloride solution. Once standardized the mercuric nitrate solution was titrated with the soil extract. Diphenylcarbozone and bromophenol blue powder in alcohol were indicators of the titration endpoint. The color changes from a light yellow to pink-violet at the endpoint. Standard burettes to measure the amount of mercuric nitrate solution added to the soil extract were not accurate enough for the small samples prepared. This problem was overcome by using a 100 microliter syringe to measure the titrant.

Results

Chloride concentrations in the soil profile at neutron probe access tube numbers 3, 4, 9 and 10 are shown in Figures 23 through 26 respectively, and their calculated recharge rates are shown in Figure 27 through 30. Chloride concentrations calculated in this study are greater than the profiles used by Phillips et al. (1984) in his study of chlorine-36 and tritium from atmospheric fallout of nuclear weapons testing. Because of the high concentrations of chloride in the soil water, the estimated recharge rates are very small, on the order of tenths of millimeters.

The profiles in general show a peak of chloride near the surface. The concentration in hole number 3 (Figure 23) remains fairly constant until the 240 cm depth where it increases to a peak at the 360 cm depth and then starts to decrease. Access hole number 4 (Figure 24) follows the same pattern, peaking at 360 cm depth again, but it starts the increase at a shallower depth. Hole number 9 (Figure 25) is similar but it has a local peak at the 180 cm depth and then

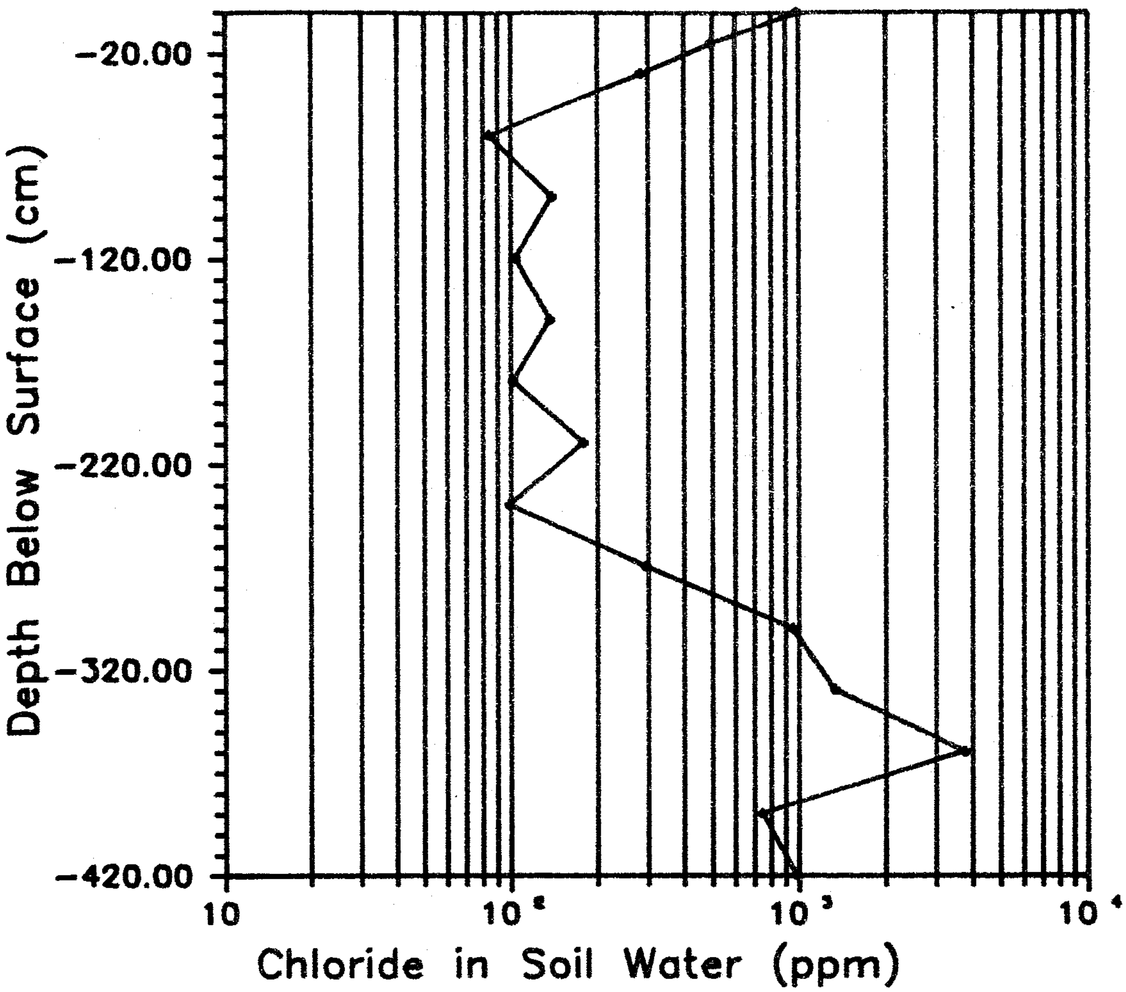

Figure 23. Profile of soil-water chloride concentrations from neutron probe access hole number 3.

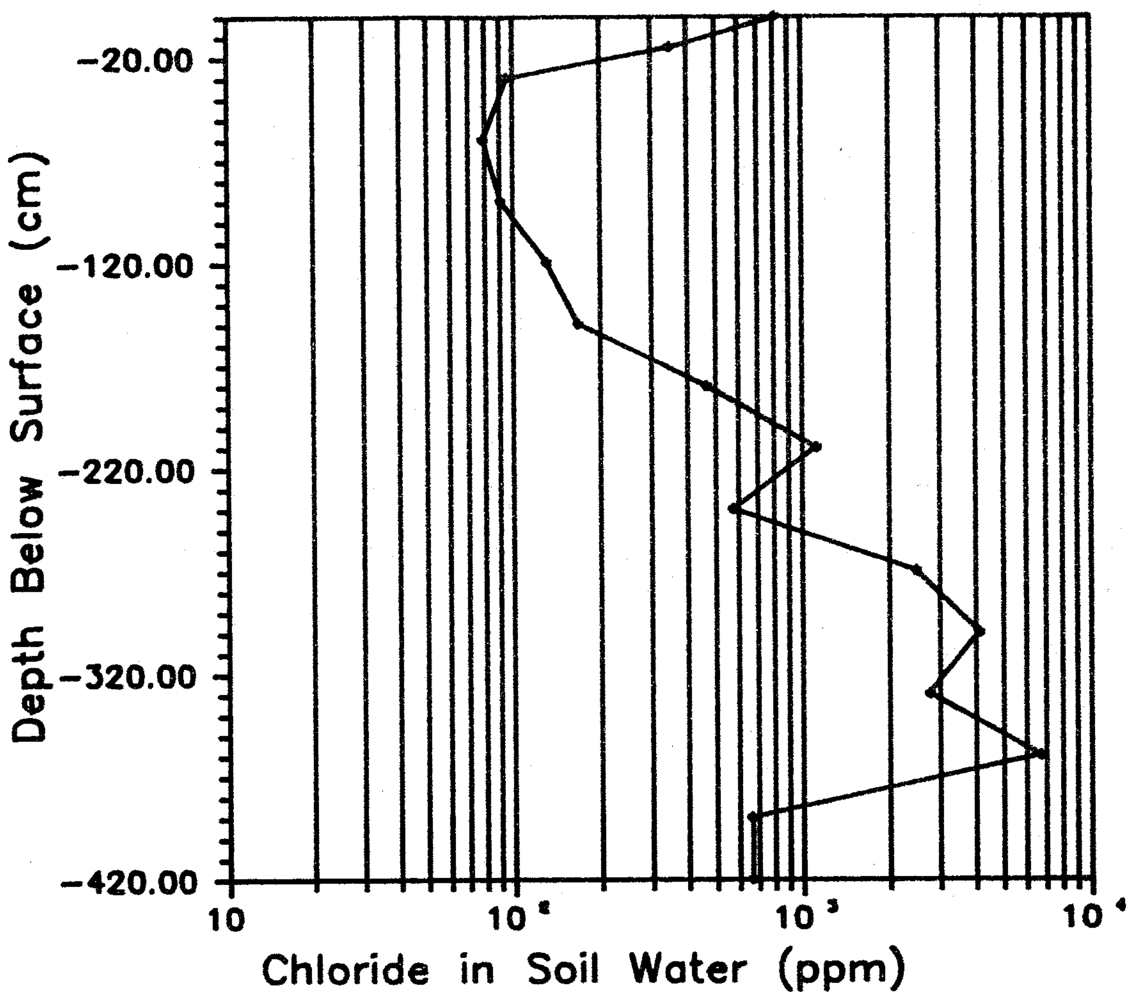

Figure 24. Profile of soil-water chloride concentrations from neutron probe access hole number 4.

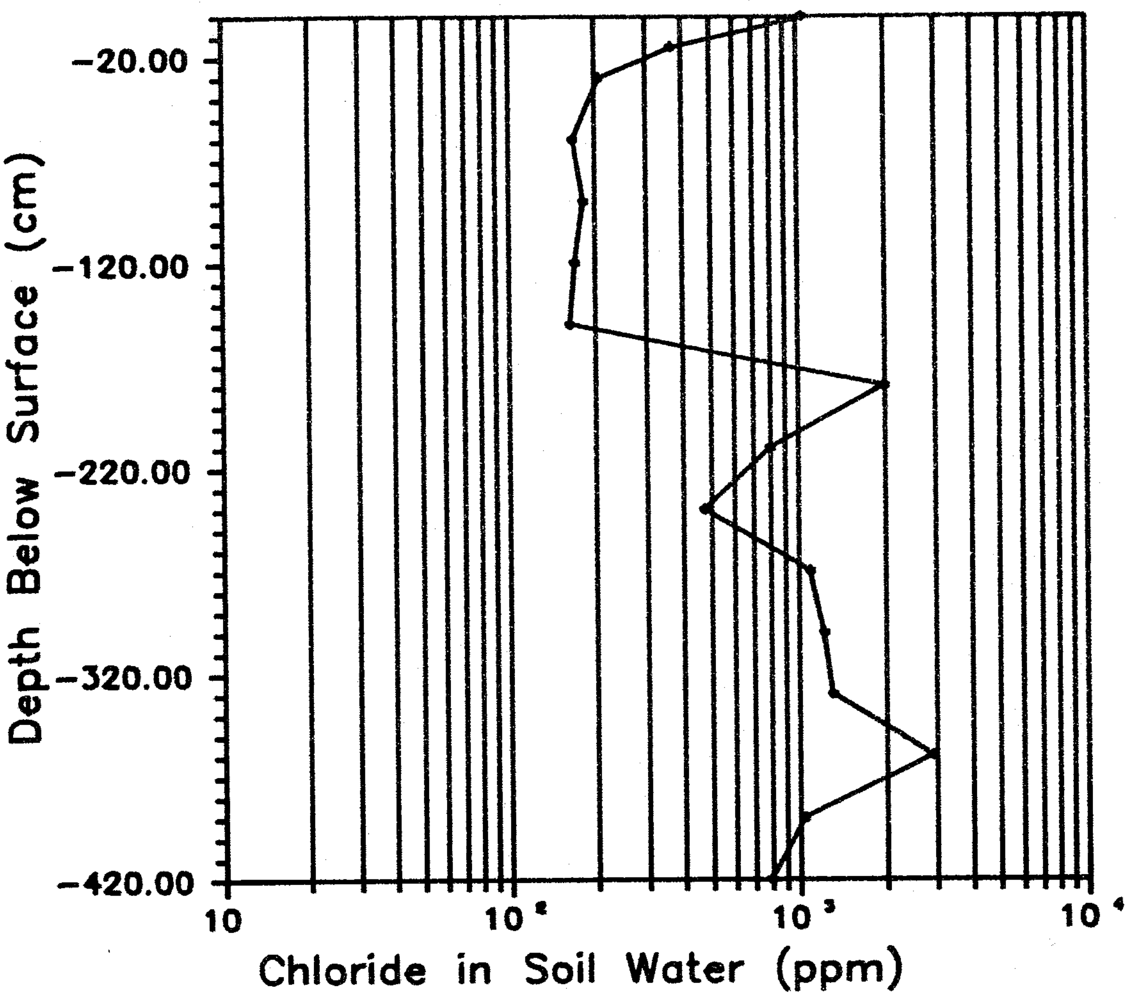

Figure 25. Profile of soil-water chloride concentrations from neutron probe access hole number 9.

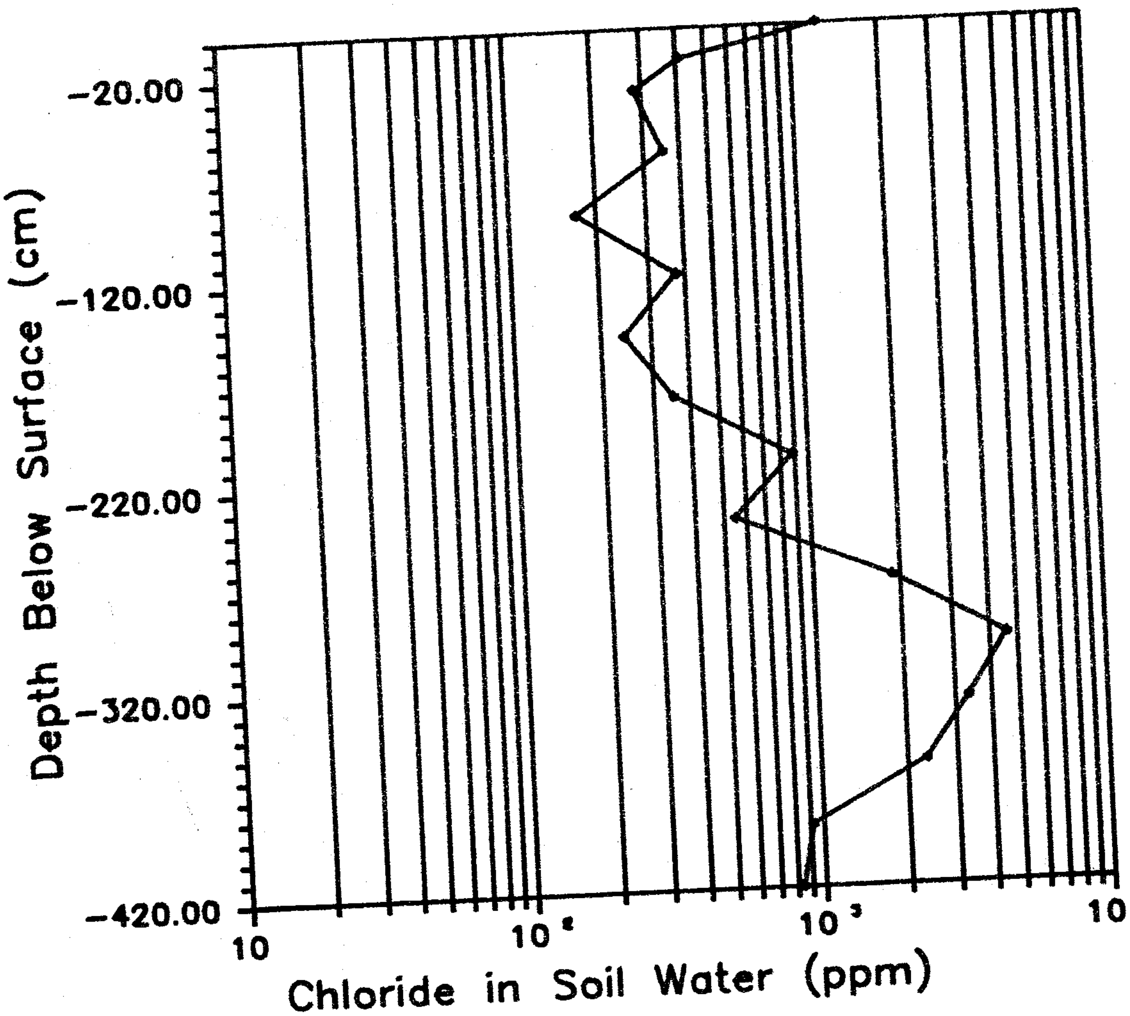

Figure 26. Profile of soil-water chloride concentrat
neutron probe access hole number 10.

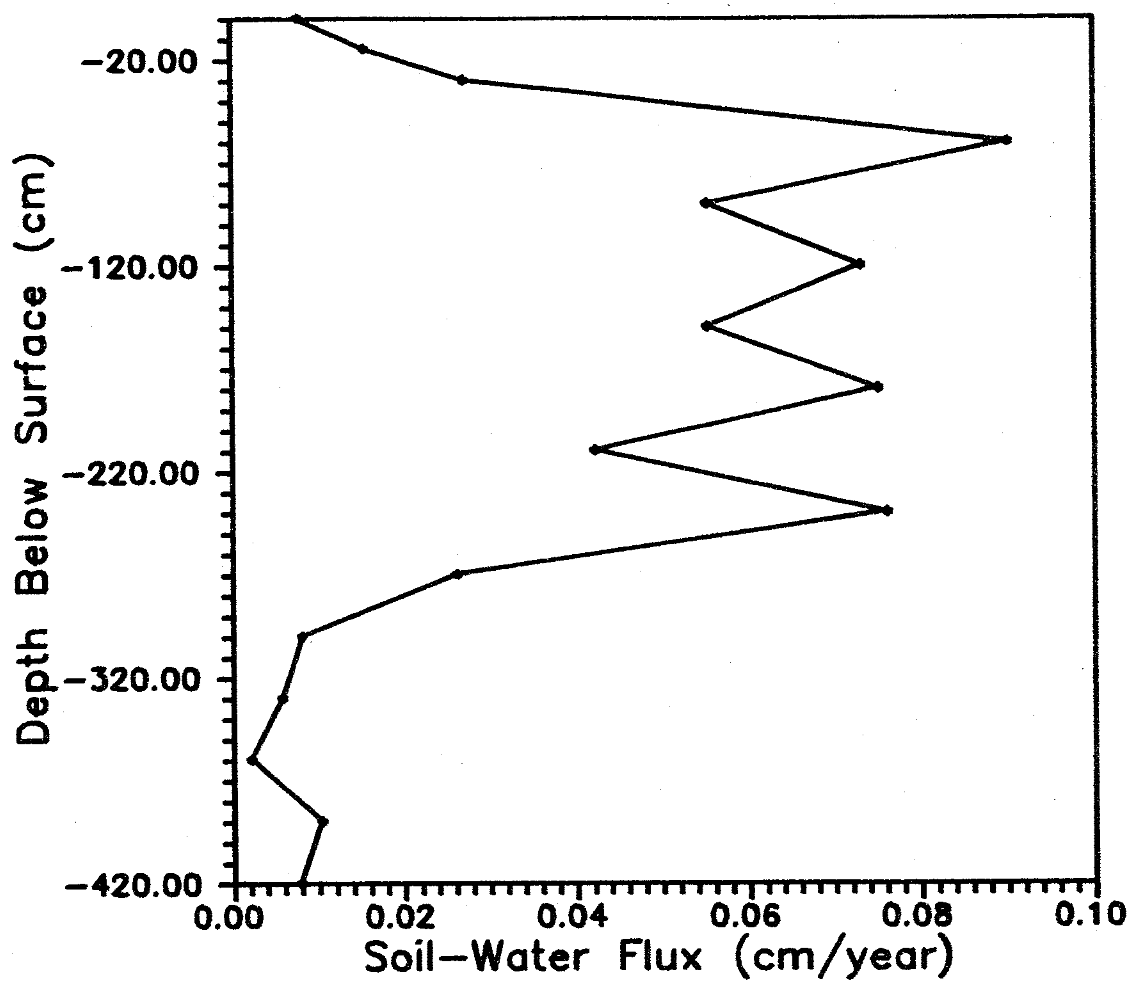

Figure 27. Soil-water fluxes versus depth. Calculated from chloride concentrations in neutron probe access hole number 3.

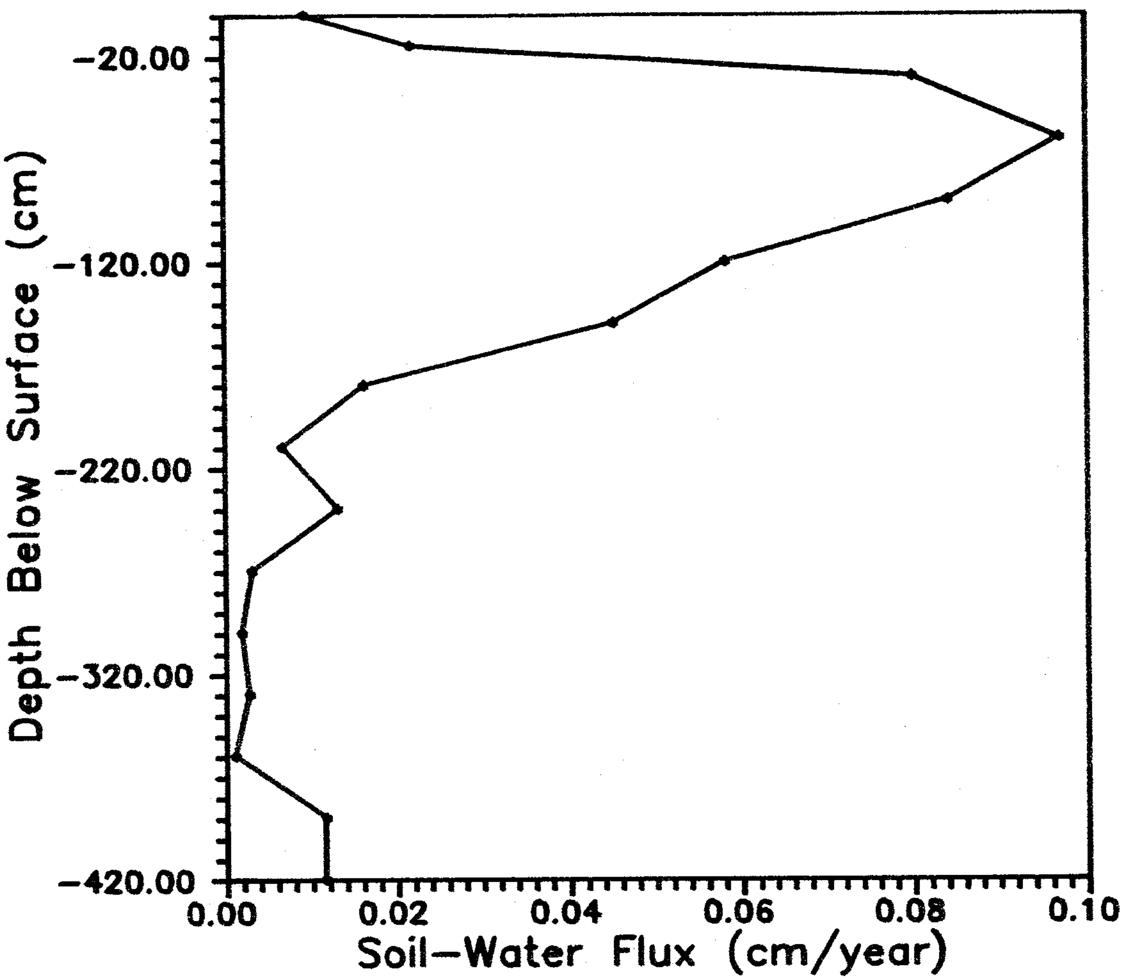

Figure 28. Soil-water fluxes versus depth. Calculated from chloride concentrations in neutron probe access hole number 4.

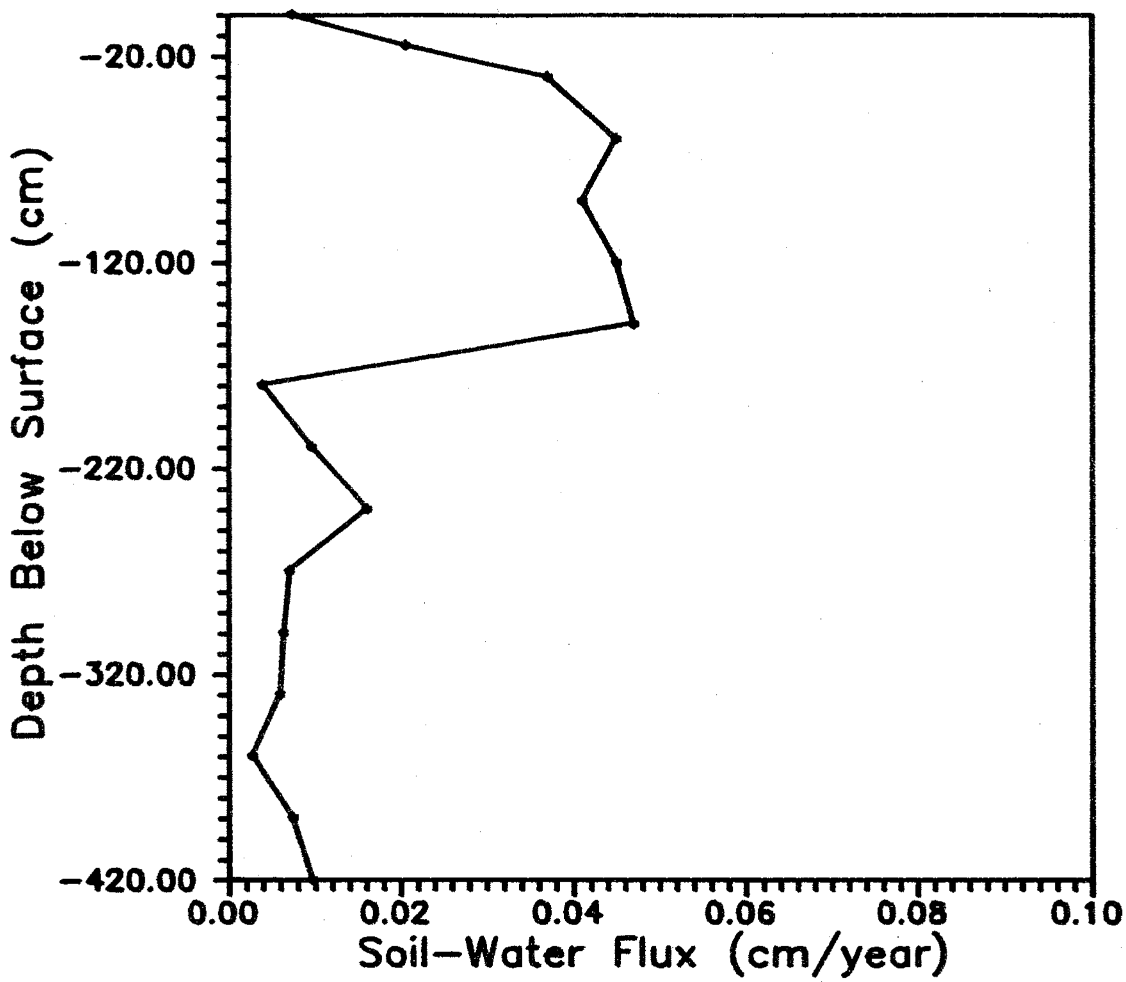

Figure 29. Soil-water fluxes versus depth. Calculated from chloride concentrations in neutron probe access hole number 9.

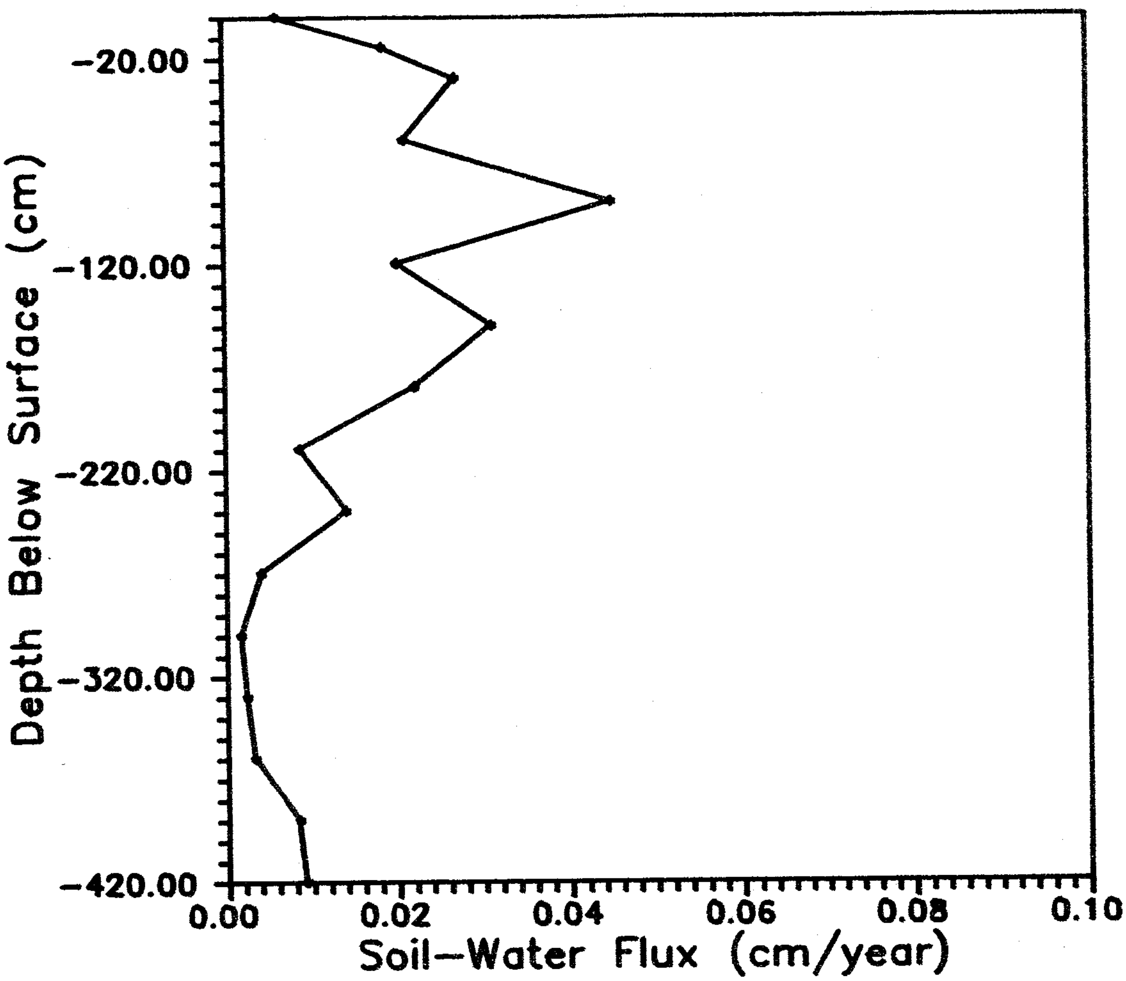

Figure 30. Soil-water fluxes versus depth. Calculated from chloride concentrations in neutron probe access hole number 10.

peaks at the 360 cm depth like its predecessors. The only profile which shows a much different pattern is access hole number 10 (Figure 26). The peak in this profile is found at the 290 cm depth. The small peak of chloride near the surface is probably from evaporation from the near surface. The concentration of chloride reaches a maximum near 360 cm depth in all but access tube number 10. According to the neutron probe logging of water content, the 360 cm depth is in the capillary fringe of the water table during part of the year. When the Rio Salado flows in late summer it recharges the phreatic aquifer beneath the site and causes the water table to rise.

Discussion

The chloride mass balance analysis of estimating recharge is relatively fast and simple. It does not require expensive instrumentation and intensive monitoring as do soil physics methods. Collecting soil samples and the analysis for chloride is not difficult. But, the method does make some restrictive assumptions. Probably not all of these assumptions have been met at this particular site.

All of the chloride profiles show variable chloride concentration with depth. A possible explanation for the variation in the chloride is the sampling method. Very small soil samples were analyzed for their chloride contents. Using larger samples would tend to average the chloride concentration differences and the profiles might have a smoother appearance. There are some general similarities among all of the profiles. There is a peak in chloride concentration near the surface which is probably due to evaporative enrichment. After the concentration has diminished from the peak at the surface, the chloride concentration starts to increase erratically until a peak is reached near the 360 cm depth for all profiles except access hole number 10 (Figure 26). Here the peak is at the 290 cm depth. Below this depth the concentrations are expected to decrease until eventually becoming that of the groundwater. A sample of groundwater taken in March of 1989 was analyzed for chloride and was found to have a concentration of 330 ppm. The sample was taken just to the southeast of the current site from a monitoring well. The sample was taken by a bailer from the well. During March the water table would be at a low stage because the Rio Salado has not flowed since last autumn. The sampling procedure may have mixed the sample so that it is not representative of the groundwater at the fringe of the water table. Ronen et al. (1987) used separated dialysis bags in a monitoring well to sample water at the top of the water table and found the concentration of the ions varied a great deal in a few centimeters. This is believed to be due to entrapped air and density differences in the water due to different ion concentrations. This should be remembered when the high soil-water concentrations are compared to what was measured in the groundwater. The peak in the chloride concentration seems to correspond to the highest rise in the water table in all profiles except that of access tube number 10. See Figure 31 and 32 for a cross-section of volumetric water content from the neutron probe logging.

Gardner (1967) points out that in the ideal case the concentration of chloride in the soil-water would increase steadily with depth until the depth of influence of evaporation and of the roots is passed. See Figure 33 for an idealized chloride concentration profile. This profile assumes an input concentration of 0.375 mg/liter of chloride, conservation of chloride mass, piston displacement of water, and a steadily declining loss of water with depth. This loss of water due to evaporation and plant root uptake was assumed to be 50% in the first 30 cm interval and then a 5% decrease in the amount of water lost to evapotranspiration in each succeeding layer of soil. At the 270 cm depth there is no more loss of water and the concentration becomes stable. Below this depth the concentration of chloride should be that of the water which becomes recharge. Knowing the amount of precipitation allows the chloride profile to be used to calculate soil-water fluxes at various depths. Figure 34 shows the soil-water fluxes calculated from the idealized chloride profile, assuming an annual precipitation rate of 20 cm per year. Below the influence of evapotranspiration, this soil-water flux should become recharge. The function used to generate the idealized profile is probably not accurate near

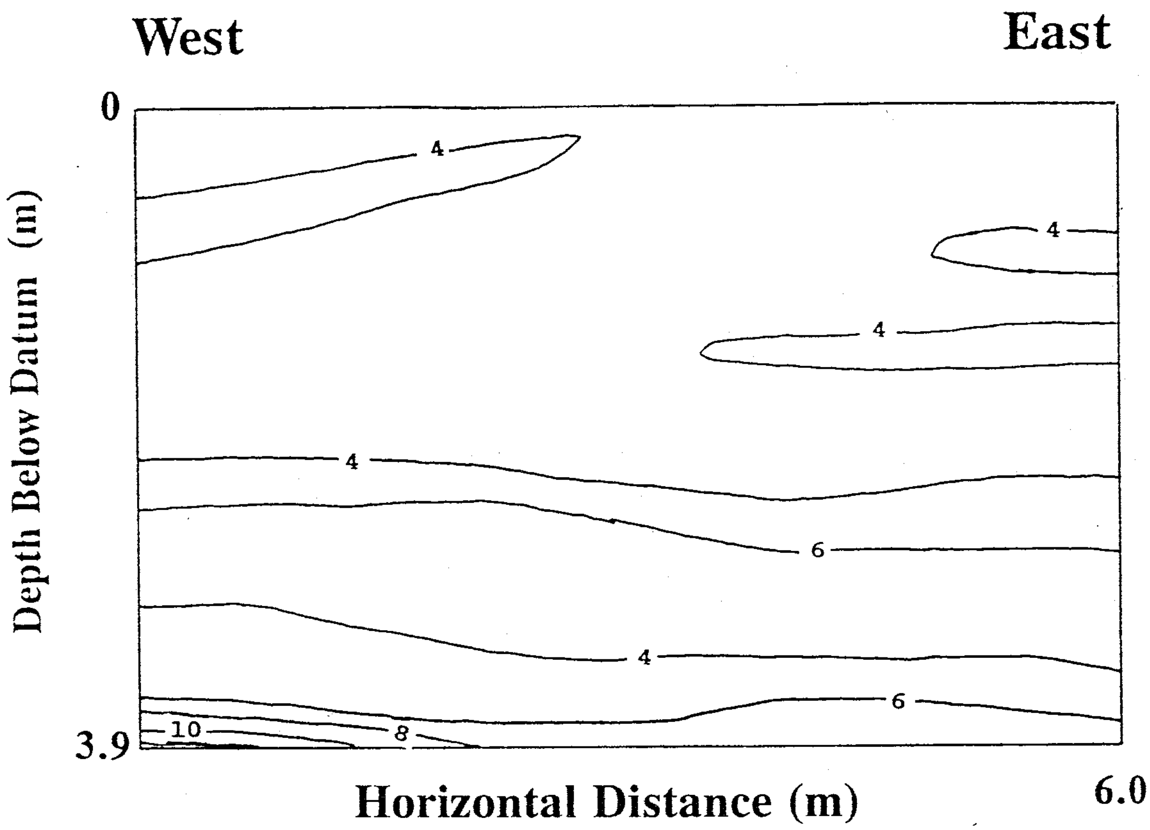

Figure 31. Cross section of volumetric water content from access tube numbers 3, 4, 9 and 10 on August 20, 1988 before flow in the Rio Salado.

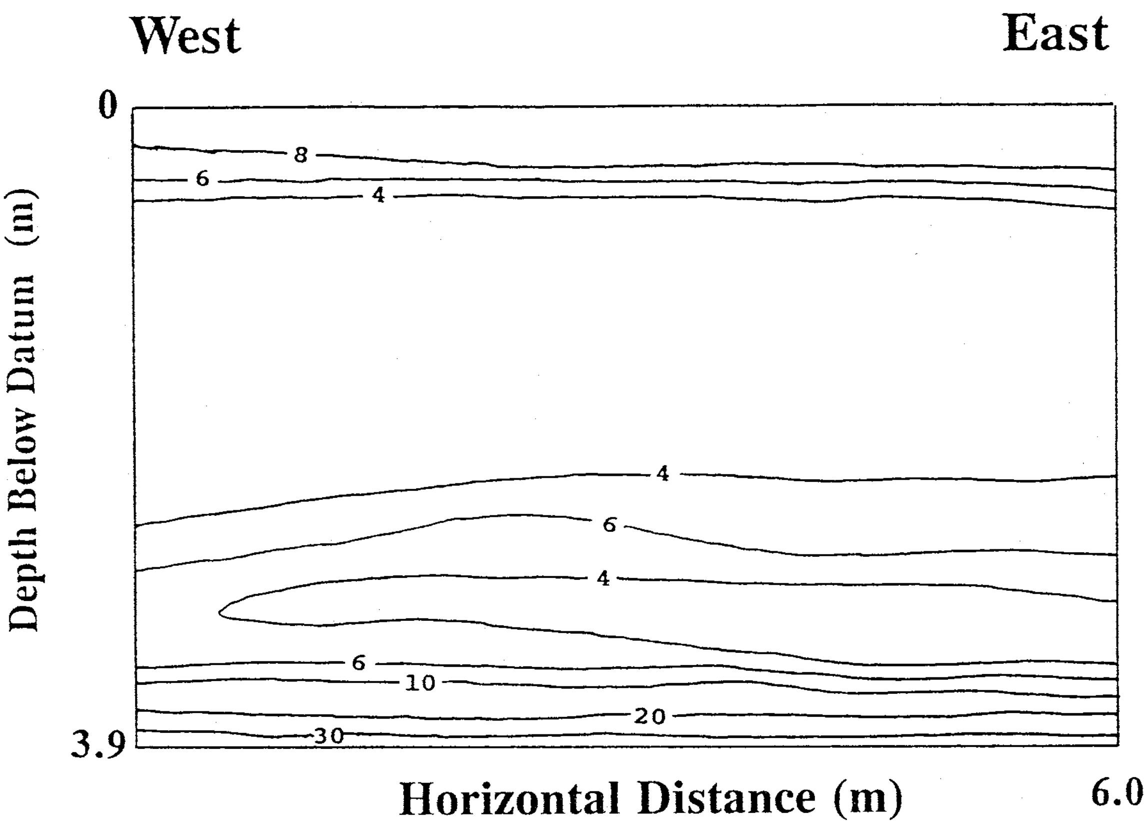

Figure 32. Cross section of volumetric water content from access tube numbers 3, 4, 9, and 10 on September 16, 1988 after flow in the Rio Salado.

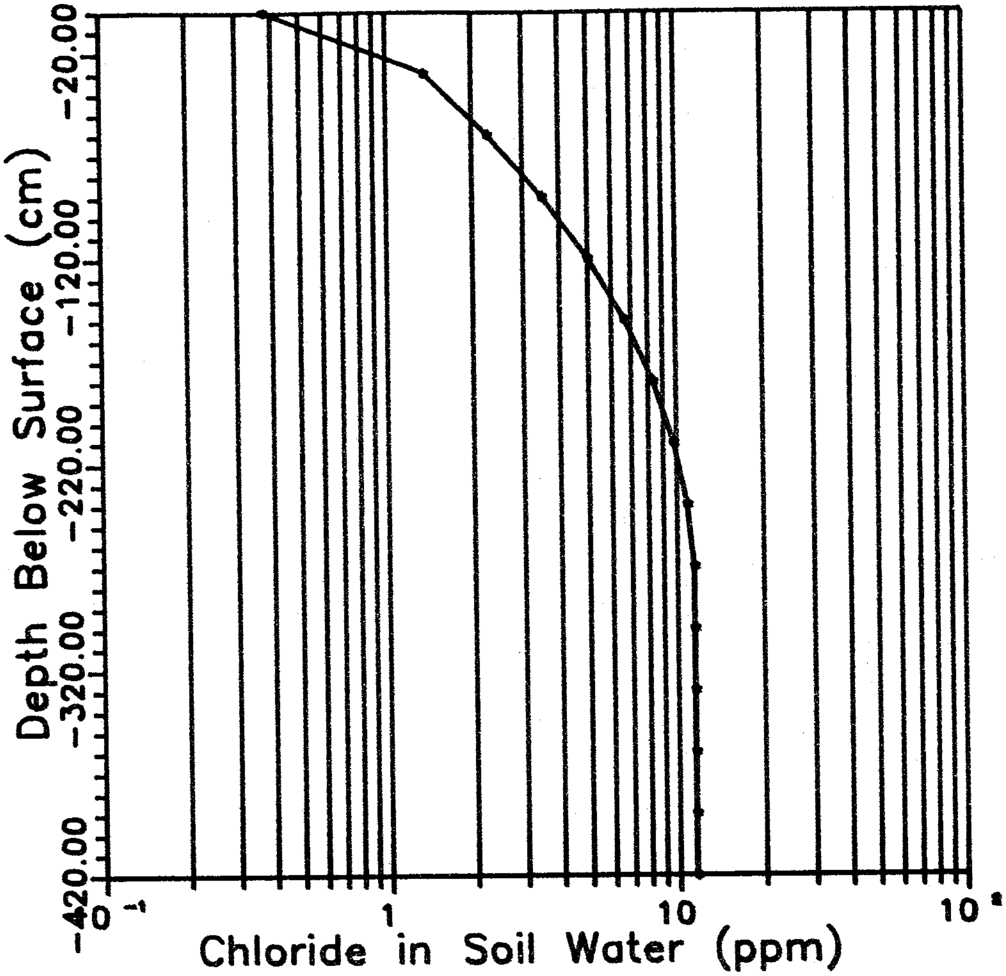

Figure 33. Idealized chloride profile assuming an input concentration of 0.375 mg/liter of chloride, piston displacement, conservation of chloride, and a declining rate of water uptake by plant roots. Concentration become constant once below the root zone.

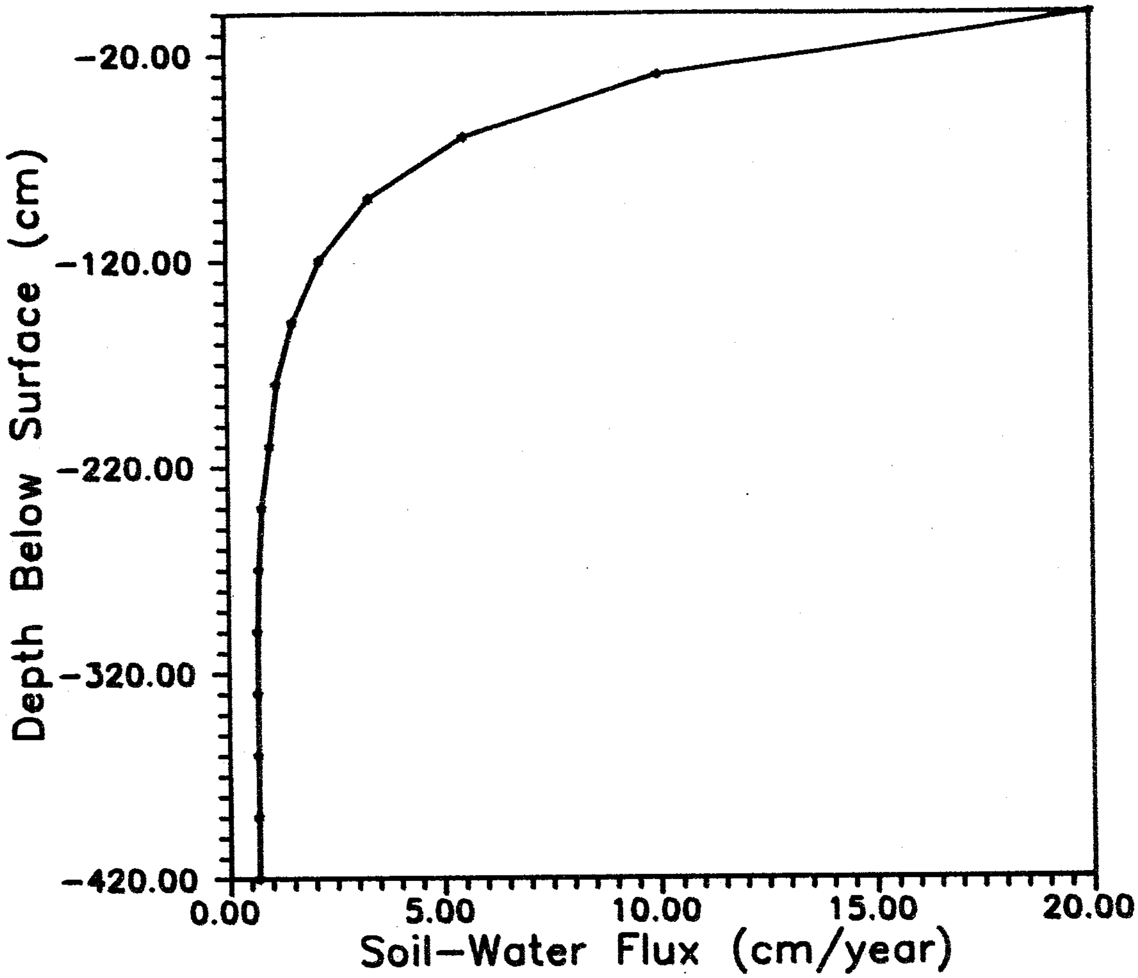

Figure 34. Soil-water flux rates versus depth based on the previous idealized chloride profile and a precipitation rate of 20 cm/year. Flux rate becomes constant once below the root zone.

the surface due to the complexity of evaporation and water uptake by plants. However, there should be some depth below which the roots and evaporation have no effect on the chloride concentration and a steady concentration should be approached if the other assumptions of the model are met.

The four observed profiles do not show the gradual increase of chloride with depth to a constant value. However, the bottom of the observed profile has been truncated by the water table. Since the profile never reaches a constant value, this implies that the roots of the plants may be withdrawing water all the way to the water table, making the estimate of recharge from the 210 cm plane doubtful. The magnitude of recharge may be affected by other factors which are discussed in the next section.

Uncertainty in Inputs. There is always the question of how well the input concentration of chloride is known. The concentration of chloride in precipitation is based on measurements of chlorine-36 to chlorine from soil samples at the Sevilleta site by Phillips et al. (1984). The ratio of chlorine-36 to chlorine is relatively constant because of the very long half life of chlorine-36, about half a million years. The chloride concentration is backed out by measuring the concentration of the isotope, chlorine-36, and solving for the chloride input. This should take into account all sources of chloride and average them over a long period of time. Stone and McGurk (1984) reported much greater concentrations of chloride in eastern New Mexico. This is because that part of the state is closer to the Gulf of Mexico.

Precipitation records have been kept in Socorro for a number of years, but not at the research site where the record goes back only to 1983. The model requires data for average annual precipitation. One of the characteristics of arid climates is the extreme variability in rainfall. In the more humid eastern United States the variation in yearly rainfall approaches only 10 to 15%. In arid regions the variations are often up to 40% of annual precipitation (Bailey 1981). The chloride method produces an estimate of average recharge, and the more accurate the inputs (mean precipitation, mean atmospheric chloride) the more reliable the estimates of recharge will be.

<u>One-Dimensional Flow Assumption.</u> The chloride mass balance method also assumes one dimensional flow of soil water and dissolved ions. The inputs of the system (rainfall and chloride) are assumed to enter the soil as piston flow without being channeled into preferential flow paths. Indeed, calculations of recharge from chloride soil profiles have been used by Johnston (1984b) as evidence that most recharge occurs through preferential flow paths, because not enough recharge would occur otherwise. This conclusion is based on extending the chloride mass balance analysis to the groundwater system. The groundwater concentration of chloride is too dilute to only be receiving soil water of the concentration measured in

the unsaturated zone. If preferential flow paths allow water to become recharged to the aquifer before it is enriched with respect to chloride, the low chloride concentrations can be explained in the groundwater. Preferential flow is also invoked by the same author to explain the great variability of chloride concentrations in the unsaturated zone. Unfortunately the chloride mass balance method can not be extended to the water table at the current site, because of the effects of the nearby Rio Salado. The model assumes that evaporation and removal of soil water by the plants occurs in one dimension. Based on the evidence from pressure head data at the field site, vertical moisture movement dominates. However, the variability of the chloride profiles has lead other researchers such as Sharma and Hughes (1985) to conclude that there is preferential flow in even uniform appearing sands.

Salt Cycling. The chloride mass balance approach for estimating recharge assumes that soil-water becomes enriched with chloride due to evaporation and transpiration. These two processes, according to this model, remove only water and leave the salts in the soil profile. They can only be removed by deep drainage from the profile. If there is no drainage, then the ion concentrations would increase until some mechanism such as precipitation occurs to remove them from the soil water.

It is known that plants do remove ions from the soil to meet their metabolic needs. It is often assumed that plants are able to exclude unneeded ions when they withdraw water from the soil profile. Chloride is needed in small amounts for proper metabolism in plants. Too much salt in the soil has an adverse effect on many plants, because it reduces the potential of the soil water to such a state that the plant is not able to withdraw water from the soil and wilts. Plants which are able to tolerate saline soils are called halophytes.

Halophytes may survive in such saline soils that other plants would die. Halophytes are able to tolerate high level of ions in their tissues without adverse effects. This allows them to lower the potential inside of their tissues so that they are still able to take in saline water (Queen, 1974). According to Caldwell (1974), the Atriplex genus also has salt excreting hairs which prevent too much salt from accumulating in its tissues. The Atriplex genus may excrete so much salt on the surface of its leaves and stems that grazing animals may not be able to forage on the plant until a rain leaches the salt into the soil (Goodin and Mozafar 1971). At the field site soil samples taken underneath the canopy of the fourwing saltbush contained more chloride than the four chloride profiles described previously; and, none of those profiles were under a saltbush canopy. Table 7 shows the chloride content in the soil water at the 30, 60, 90 and 120 cm depth beneath a fourwing saltbush. Compare this to the concentration

Table 7. Chloride concentration in the soil-water under the canopy of the fourwing saltbush just to the west of access tube number 2.

Depth (cm)	Water Content (cm^3/cm^3)	Cl^- in soil extract (ppm)	Cl^- in soil-water (ppm)
30	2.3	29.18	2169.31
60	2.7	9.77	611.12
90	2.9	7.33	429.11
120	3.0	6.20	346.98

found in access hole number 3 which is only 0.75 m from the saltbush. At the 30 cm depth instead of 2169 ppm of chloride in the soil water, it contains only 278 ppm. The 60, 90 and 120 cm depth contain 611, 429 and 347 ppm chloride to the corresponding concentration of 83, 138 and 103 at the same depths in access hole number 3. Tables of the chloride concentration in each hole used in the chloride profiles of Figures 23 through 26 are found in Appendix H.

Fourwing saltbush is the dominate woody plant at the site. The uptake of chloride by plants is not considered a serious problem to the chloride mass balance analysis, if chloride is removed from the soil profile at the same rate it is returned to the soil profile. If the amount of chloride incorporated into the plant tissue is returned when the plant tissue dies, the salt cycling will not have much effect on the chloride profile of the soil. The chloride concentration in the profile should reach a steady state, because the amount of chloride removed equals the amount returned by decay. This is only true if the amount of plant mass does not change with time and the plant matter containing chloride is not removed from the site. The effects of the plants on the total amount of chloride in the profile would be minor if the plants contain small amounts of chloride. Experimental evidence indicates that the chloride contained in the vegetation at the field site is great and may affect the chloride profiles significantly.

Since fourwing saltbush is a halophyte, samples from specimens at the experimental site were analyzed for chloride content. The other major shrub at the site, indigo bush, was also analyzed for chloride content. The results are shown in Table 1. The fourwing saltbush has 1000 times the concentration in its tissue than that of the indigo bush. An extremely important question is where does the saltbush extract its chloride? Auguring the neutron probe access holes revealed large woody roots down to the 4 meter depth in the center of the plot, as far away from any large plant canopy as possible at the site. The only large shrub in the area is the fourwing saltbush. Some of the roots are within the capillary fringe of the water table during or shortly after there has been flow in the Rio Salado. This is also the area of greatest chloride concentration in the soil profile. If the saltbush roots are withdrawing water from this area, they may also be taking up chloride whose origin is the groundwater and not the atmospheric chloride input assumed in the Equation 11. When the saltbush tissue dies, the chloride would be returned to the profile if the plant material is not somehow removed. This could result in an overall enrichment of chloride in the profile which would lead to very small recharge estimates.

Plants are also able to withdraw selectively from different parts of the soil profile. An average salinity in the profile is not a good indication of the stress the plants may be under. Bernstein (1981) reports that plants can survive saline conditions in the lower root zone if there is less saline water in the upper portion of the root zone. This implies that plants may selectively withdraw water from different portions of the soil profile. To understand what role the saltbush may have in redistributing ions in the soil, a greater understanding of transport of ions in plants is needed. The fourwing saltbush extracting chloride from the groundwater may not be the only source of chloride to the system which is not accounted for by the model.

Unaccounted for Sources of Chloride. Periodic flooding from the Rio Salado may be another source of chloride which is not taken into account in the model used to predict recharge. The very characteristics of the site which made it desirable for study using soil physics methods pose problems in the use of the chloride mass balance analysis for estimating recharge. Being along the edge of a ephemeral desert stream provides a sandy, permeable soil. But the location near the river channel makes the site susceptible to flooding from the Rio Salado. The overflow of the sandy, permeable soil by the river water would provide an unknown input of chloride into the soil profile. The pulse of water could also destroy the previous pattern of chloride distribution making interpretations very difficult.

SUMMARY AND CONCLUSIONS

Moisture movement at the field site was examined by using cross sections of total head and calculations of fluxes based on pressure head and water content measurements. Vertical downward flux was dominant according to the total head cross sections. Calculated lateral fluxes were often the same size as the error associated in their calculations. Recharge rates were estimated using measured pressure head gradients and an assumed unit gradient. The average gradient from the pressure head data was greater than unity, but individual measurements varied greatly from one another. Such variations could have been caused by instrument failure. The chloride profiles from the site did not show the distribution necessary to be used in predicting recharge rates. Possible causes were flooding from the river, the shallow depth to water table and the presence of halophytic plants.

Pressure Head and Unit Gradient

Cross sections of total head showed little seasonal changes in the head gradients. There was some lateral flow near the end of the growing season, but the contours of pressure head indicate a general, vertical downward movement of water. As discussed earlier the rooting pattern and placement of the tensiometers with respect to the plants was quite different from previous work done with plants and may be responsible for the more uniform gradients observed.

Calculations of fluxes through computational cell walls also indicate that lateral fluxes were generally small, often of the same magnitude as the possible errors in the calculations. These fluxes have only two senses of direction, into or out of the cell, and they also have a magnitude. The problem of missing data in the time series of measurements was overcome by averaging some pressure head data. Unfortunately, this may obscure rapid changes in flux patterns. All of these flux values depend upon the unsaturated hydraulic conductivity.

No significant pattern was noted in estimated recharge rates between computational cells near the fourwing saltbush canopy and ones farther away. Using changes in moisture storage in the soil profiles, Stein (1989) found a difference in recharge rates between the vegetated and unvegetated cells. More recharge was predicted in the areas farther away from the fourwing saltbushes. The two methods can not be directly compared since the moisture profiles were around the access tubes and the pressure head based calculations used a computational cell anchored at each corner by an access tube. This caused the pressure head computational cells to be 0.75 meters farther away from the saltbush canopy than the moisture content profiles used.

Using a unit gradient as an approximation for the gradient if pressure head measurements are not available has several major limitations. There are many times when such assumptions are not valid. For example near the surface, upward gradients due to evaporation occur. Also, the large gradients caused by an advancing wetting front or lateral flow, if present, would be overlooked when a unit gradient is assumed.

Chloride Mass Balance Analysis

The recharge rates estimated from chloride profiles in the unsaturated zone are small compared to other methods used at the site. There are several possible explanations for this. All of them have to deal with violations of the assumptions the chloride mass balance requires. Unfortunately, a chloride mass balance dealing with both the groundwater and the soil moisture system was not possible at the site. Consequently, evaluating the significance of preferential flow was not possible using the chloride method. The effect of the saltbush on the soil-water chloride profiles is not understood. This type of plant is known to shed salt in their leaves and seeds. This would not upset the chloride balance if the chloride was just being recycled within the profile. However, the roots of the fourwing saltbush extend to at least the capillary fringe during part of the year, and how much chloride they are withdrawing from the groundwater is unknown. Such unaccounted for sources of chloride could be an explanation for the high concentration of chloride found in the soil profiles. Another possibility is that the Rio Salado may have overflowed its banks in the past, introducing chloride from river water and upsetting the previously established chloride concentration distribution in the soil. For all of these reasons the use of the mass balance of chloride at this site to estimate recharge does not seem appropriate.

<u>Comparison of Methods Used in the Current Study</u>

Figure 35 shows yearly recharge rates as percent precipitation from July 1988 to July 1989. The moisture content method predicted the greatest amount of recharge and was also the only method to show a difference between the areas close to the saltbush canopy and locations more distant from the bushes. The pressure head method showed no clear spatial trend in recharge at the site, but this method predicted less recharge than the change in moisture storage method. The unit gradient method predicted less recharge than using pressure heads to calculate actual gradients. This was probably due to pressure head gradients being greater than unity at least part of the time, such as when a wetting front advances. The results from the chloride mass balance method did not compare to any other estimate of recharge rates in either the current study or previous ones. The low recharge rates are believed to be caused by sources of chloride which the method can not take into account, most likely from the fourwing saltbushes which tap the water table.

Figure 36 shows how the calculated recharge rates from the pressure head, unit gradient, and moisture storage methods vary throughout the year. These variations in recharge rates

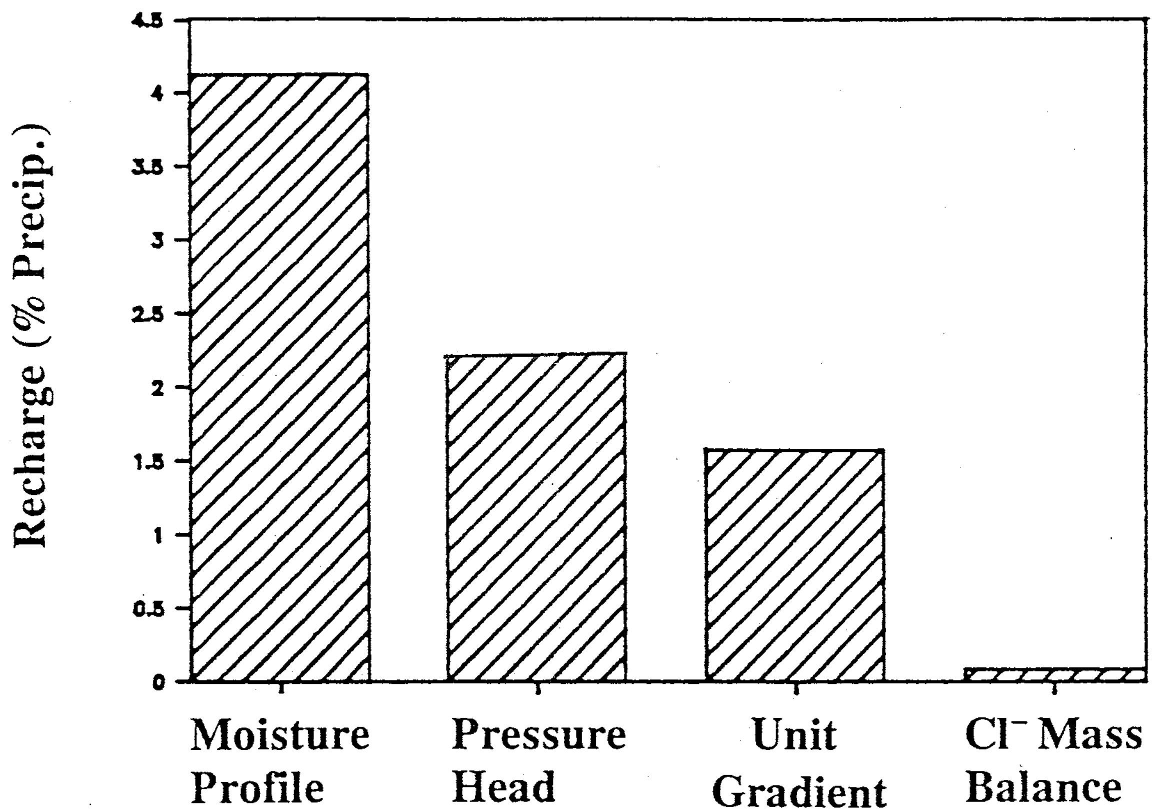

Figure 35. Summary of the current study's estimated recharge rates.

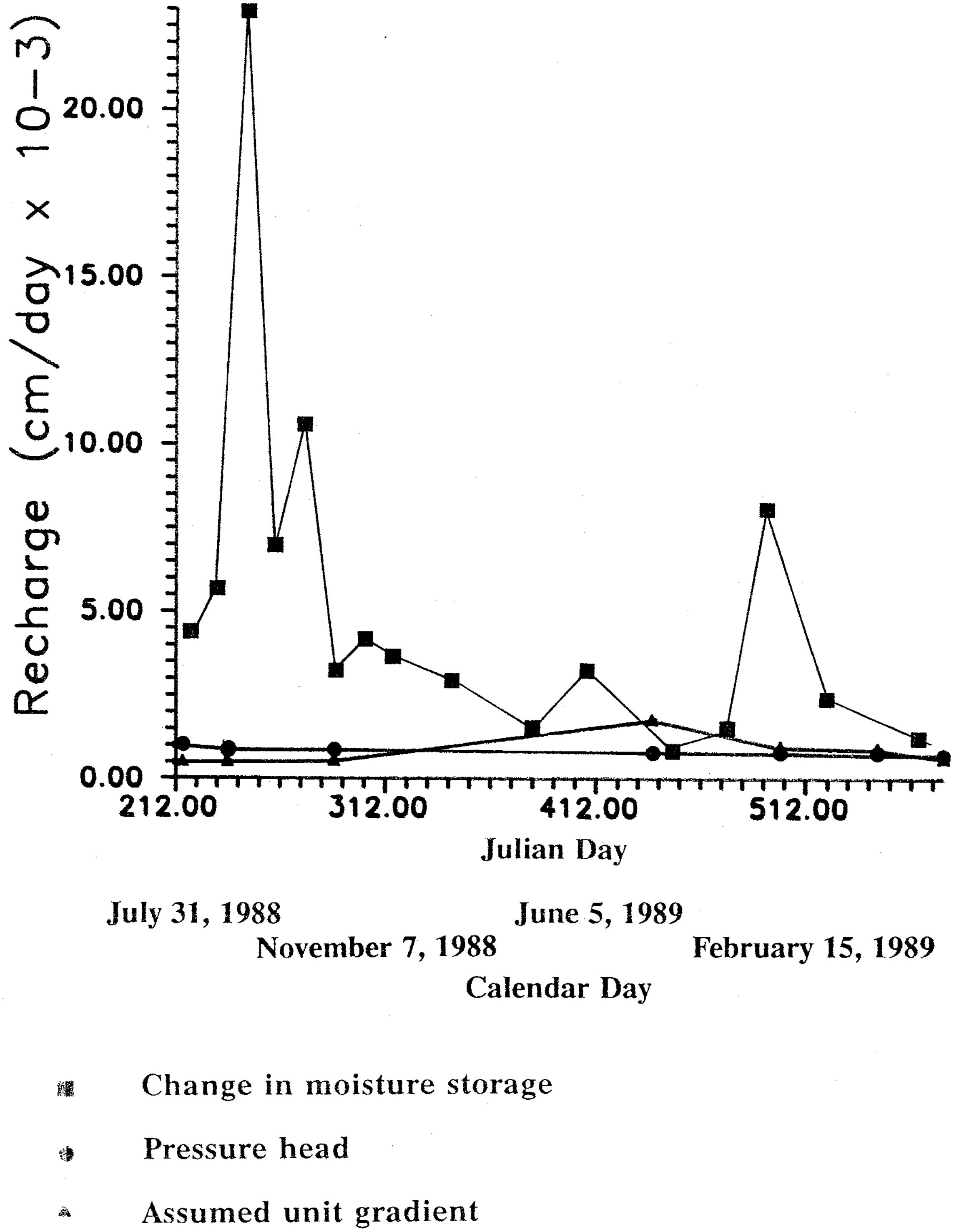

Figure 36. Estimated recharge rates versus time from the current study.

with time help to explain why the yearly rates calculated from the different methods are so great. The moisture storage method predicted the greatest amount of recharge. The recharge rates calculated by this method for late summer and early autumn are greater than the rates estimated by the unit gradient and pressure method for the same time period. These greater short-term rates increased the annual rate estimated by the moisture storage method. The unit gradient method showed very little change from month to month. The only change in the fluxes calculated occurred when the moisture content changed at the plane through which the flux was calculated. This changed the hydraulic conductivity value, but the gradient was always assumed to be unity. The pressure head method calculations on average also predicted nearly uniform recharge rates with time. It was expected that this method would be the most sensitive in responding to changes in conditions after precipitation events and would show the most variation with time. If a wetting front passed through the array of tensiometers between monitoring periods, the gradient which caused its movement might never be detected. The averaging of several monitoring periods to lessen the effects of missing pressure head data would also lessen the affects of transient fluxes through the profile. The moisture profile method detected changes in water content at depth soon after the late summer rains. All recharge rates were quite small, so even a small change in water content in the soil profile translated into a relatively large recharge rate when compared to the other methods. The chloride method of estimating recharge is for a long term average recharge rate and could not be broken down into seasonal rates like the other methods.

Comparison of Current to Previous Studies

Table 8 compares the results from the current study to the results from previous work done at the Sevilleta site (Phillips et al. 1988, Stephens and Knowlton 1986). The methods are in the same general range, except for the current mass balance of chloride which predicted very small recharge rates. Possible reasons are that the current site is closer to the Rio Salado's channel and that the distance to the water table is less than at other locations. Previous work used profiles throughout the Sevilleta site from such places as the dune and on hill slopes. Salt uptake from the capillary fringe by the fourwing saltbush may be responsible for the high chloride content in the current study. A slight increase in elevation above the water table would remove the capillary fringe from the saltbush's root zone, reducing the availability of chloride to the saltbush. Also the rising ground water table in response to flow in the Rio Salado is probably damped quickly with distance from the channel. This could mean that only vegetation close to the channel is affected by the seasonal rise in the water table. Finally, flooding by the Rio Salado may be responsible for the high chloride concentrations observed in the current study. This

Table 8. Comparison of recharge rates calculated from various methods performed at the Sevilleta site.

	RECHARGE (cm/year)	
Method	Current Study	Previous Study
Pressure head	0.40	
Pressure head using unit hydraulic gradient	0.29	
Pressure head using geometric mean of conductivity		3.7
Pressue head using harmonic mean of conductivity		0.70
Tritium peak		0.84
Cl^{36} peak		0.3
Tritium mass balance		0.64
Chloride mass balance	0.017	0.25
Moisture content profile	0.75	

resulted in the smaller estimated recharge rates than previous work in the area with the same method.

The geometric mean method showed the largest recharge rate but this method of calculating the effective hydraulic conductivity is not widely accepted. The tritium and chlorine-36 methods give an average recharge rate based on 25 years of infiltration. The bomb-pulse isotopes used in these tracer studies did not penetrate beyond the reach of the roots, and consequently, recharge might be expected to be less, since the plants are able to withdraw water from this part of the soil profile. Overall, the pressure head method and the change of moisture storage method compared favorably with other methods used by different researchers at the same site in similar soils. The two current methods were based on one year of data. That particular year had less winter precipitation than the amount usually recorded at the Sevilleta. See Figures 5 and 6 and compare the precipitation from July 1988 to July 1989 of the current study to the precipitation recorded in the previous years when the other studies were done. Winter precipitation is more likely to become recharge because evapotranspiration is less when the plants are dormant and the temperatures cooler. Exact comparisons are difficult to make and most recharge rates are likely to be site specific.

RECOMMENDATIONS

The results from the current study suggests several ways to improve future studies to examine the effects of plants on soil-moisture flow. The effect of the vegetation on the chloride distribution in the soil profile would have to be better understood before the chloride mass balance could be used with any confidence at such a site. The suggestions concerning the measurement of pressure head are aimed at minimizing the uncertainty in the calculations and making sure that short-term effects are not missed.

Pressure Head Method. The pressure head method could be improved by making changes in the spacing of the tensiometers, the design of the tensiometers and the frequency at which they are monitored. The first is the spacing of the tensiometers. The grid pattern used in the current study may have been too widely spaced to detect local changes in head. The offset of tensiometers with depth is necessary with current tensiometer design, but this may be to coarse to detect horizontal gradients in the pressure head fields. The horizontal spacing between tensiometers was five times that of the vertical direction, and as a result actually detecting lateral fluxes is more difficult. A closely spaced square grid would seem the best design for this type of study. The reason such a pattern was not used in this study has to do with cost and current design of tensiometers.

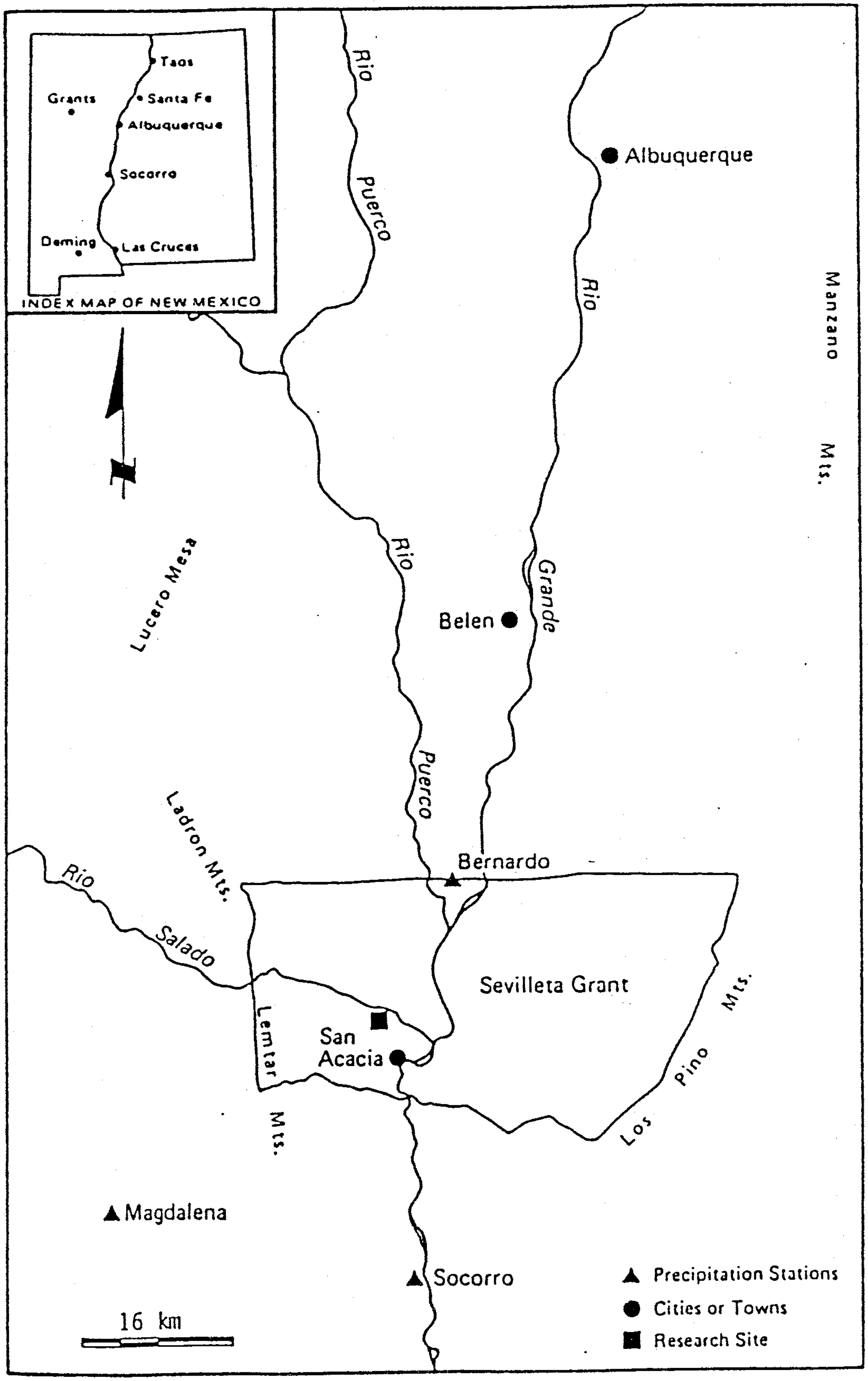

Figure 2. Location of field site in the Sevilleta National Wildlife Refuge.

gradients causing vapor transport of the tritium are believed to be the reason it has gone deeper into the soil profile despite the fact the peak in atmospheric tritium concentration occurred after the chlorine-36 input.

Anions such as bromide have been used as tracers at the sandy soils at the Sevilleta site. Quartz grains do not have surface charges to cause anion exclusion an column experiments done by Phillips et al. (1988) did not find anion exclusion in the Sevilleta soil. McCord (1986) used bromide as tracer in his sand dune investigation. He found lateral movement of the tracer after precipitation events, supporting the results of the water balance based on soil moisture profiles. In terms of trying to estimate long term recharge and evapotranspiration, man introduced tracers have the disadvantage that they are best for short term studies, not long term trends.

Natural environmental tracers that have been introduced into the soil profile for long periods of time may be the best method to estimate average recharge and evapotranspiration. The use of chloride as an environmental tracer has been suggested by many because of the ease in detecting it and its relative inertness.

Chloride has been used in Australia to estimate recharge rates by many different authors. Part of their motivation is to gain a better understanding of how land use changes have caused the salinization of ground and surface waters. Allison et al. (1985) used chloride profiles to calculate the recharge rates beneath naturally vegetated sand dunes, dunes cleared of native vegetation in the 1930's which now support poor pasture, and sinkholes. Annual precipitation is 30 cm. Under the naturally vegetated dunes recharge was about 0.1 mm/yr. In areas where the dunes had been cleared for pasture, the rate of recharge was 14 mm/yr. This is believed to be because the native vegetation removes most of the water before it percolates past the root zone. Recharge beneath secondary sinkholes is much greater because they collect surface runoff. Increasing recharge would seem to be desirable but in much of the Murray River Basin it has lead to increased salinization of surface and groundwaters.

Sharma and Craig (1987) used a chloride mass balance analysis to estimate recharge below differently vegetated deep coastal sands in western Australia. Undisturbed native vegetation, old pine and new pines were studied. Yearly precipitation in the area is 700 to 800 mm. Old pines allowed the least amount of recharge, 4 mm/yr. The young pines allowed the most recharge at 245 mm/yr, but this will decrease as the use of water increases as they mature. Recharge beneath native vegetation was 120 mm/yr, but the mechanism of recharge was different. The concentration of chloride in the groundwater indicates that preferred pathways in the native vegetation may account for fifty percent of the recharge. Similar observations have been reported by other researchers.

Farrington and Bartle (1987) used chloride and a water mass balance approach in the same area that Sharma and Craig studied. The peak of the chloride concentration was found one meter beneath the surface. This is the zone where much of the water is extracted by the roots. The soil is hydrophobic until it has a chance to wet well. This causes water to flow into depressions and may explain why the soil-water content is so variable.

Allison and Hughes (1983) used chloride and tritium profiles to compare recharge beneath native eucalyptus scrub and land now used to grow wheat since 1910. Beneath native forests recharge was calculated to be 0.1 mm, and beneath the wheat it was 3.0 mm. Tritium concentrations were also studied. Some tritium from the bomb peak of 1964 was found at a depth to which it could only reach by preferential flow. These paths are believed to be along the roots of the eucalyptus scrub. Other researchers report stemflow down the roots when a visual dye was used as tracer.

Sharma and Hughes (1985) used chloride, deuterium and oxygen-18 to estimate recharge beneath the Banksia woodland in western Australia. From their chloride profiles they estimated recharge to be 15% of the 775 mm/yr annual precipitation. The chloride profiles show great spatial variation in concentration. The greater concentration of chloride in soil water than in the groundwater suggests that water with a low chloride concentration is entering the top of the water table. Recharge water bypassing much of the soil matrix in the unsaturated zone is their explanation. They note that this interpretation is surprising considering how uniform the sandy soil appears. The stable isotope profiles yielded no reliable recharge estimates.

Johnston (1987a) used chloride profiles as evidence of preferential flow in deeply weathered gneisses and granites in southwestern Western Australia. Two areas were studied, each receiving different amounts of rainfall. The upper layer of the profile is well leached and coarse grained. The clay rich subsoil has very small calculated fluxes due to uptake by the eucalyptus forest. In the basin with 800 mm/yr rainfall the recharge was 0.4 mm/yr and in the forest with 1150 mm/yr of rainfall the recharge was 2 to 5 mm/yr. Johnston is the only author reviewed who considered diffusion of chloride in his calculations. Recharge rates based on chloride in the groundwater are as much as two order of magnitudes greater than the rate using chloride profiles in the unsaturated zone. The difference is explained by attributing most of the recharge to preferential flow through the regolith. This would also account for the widely varying chloride profiles in the unsaturated zone.

Johnston (1987b) studied a smaller area using chloride profiles and piezometers to record the water table's response to rainfall in southwest Western Australia. Most of the chloride profiles estimated a recharge rate between 2.2 to 7.2

mm/yr but in one area it was between 50 to 1000 mm/yr. This rate best matched the apparent rate of recharge to the water table from other means. In this area of greater recharge a groundwater mound would appear after heavy rains. Textural differences in the soil are believed responsible for the area of large recharge.

Mathis et al. (1986) used chloride in irrigated fields at Safford, Arizona to calculate evapotranspiration. The method relies on knowing the concentrations of chloride in all inputs and outputs (deep drainage from the field). Piston displacement by percolating water was assumed in the subsoil. Water lost to evaporation and transpiration was responsible for enriching the subsoil water in chloride. This method compared very well with the Blanely-Criddle method of estimating evapotranspiration.

Several areas in New Mexico have also been studied using chloride profiles. Stone and McGurck (1985) used the method to calculate recharge in the southern High Plains of east central New Mexico. The area was broken into different soil types which have similar hydraulic properties. Recharge was estimated for each type of unit and then multiplied by its areal extent. Recharge was greatest around playas but they cover a small area of the region. The unit with the least recharge per unit area provided the most recharge overall because of its great area of coverage.

Phillips et al. (1987) used chloride profiles at topographically different sites at the Sevilleta Wildlife Refuge to calculate recharge. All predicted recharge rates of about 1 % of annual precipitation. These values are in disagreement with the Darcian and water profile methods of Stephens and Knowlton (1986), Knowlton (1984), and McCord (1986). This may be because the method assumes one-dimensional flow and that water is not transported in the vapor phase. Vapor transport would allow water to move but not the ions in the water. Downward vapor transport of the water would enrich the chloride profiles leading to smaller estimated recharge rates. See the Chloride Mass Balance Analysis section of this paper for further discussion of using soil chloride profiles to estimate recharge rates.

Approach

A plot was selected surrounded by plants, but the middle section was only sparsely vegetated. An extensive set of instruments were emplaced to measure changes in pressure head and water content in the soil profile. Biweekly measurements of water content and pressure head were taken. From this data fluxes were calculated. Fluxes were analyzed for seasonal patterns (magnitude and direction) and relationships to particular precipitation events. After completion of the monitoring phase, part of the site was excavated to examine rooting characteristics. Samples taken while instrumenting the site were used to characterize soil properties at the site.

The suitability of using a chloride mass balance method for estimating recharge was evaluated. Possible violations of the assumptions required by the method were considered, and the results were compared to other methods used at the same site.

SITE DESCRIPTION

The field site chosen for this investigation is located approximately 24 kilometers north of Socorro, New Mexico. The site is within the boundaries of the Sevilleta National Wildlife Refuge. The instrumented site, which is 4.5 by 5.0 meters, is located on the south bank of the Rio Salado approximately 4.8 kilometers west of Interstate Highway 25. See Figure 3 for the location of the site. The Rio Salado is an ephemeral stream with a wide, sandy channel. It flows mainly in response to summer thunderstorms in its drainage basin.

The following were reasons for choosing this particular site:

1. The topography is relatively flat.
2. The soil at the site is relatively uniform and is quite permeable.
3. There is no evidence of surface runoff due to the highly permeable soils and flat topography.
4. The vegetation in the area has been previously identified by Ted Stans, the Sevilleta National Wildlife Refuge manager.
5. The water table is not close enough to the surface to influence pressure heads measured with tensiometers.

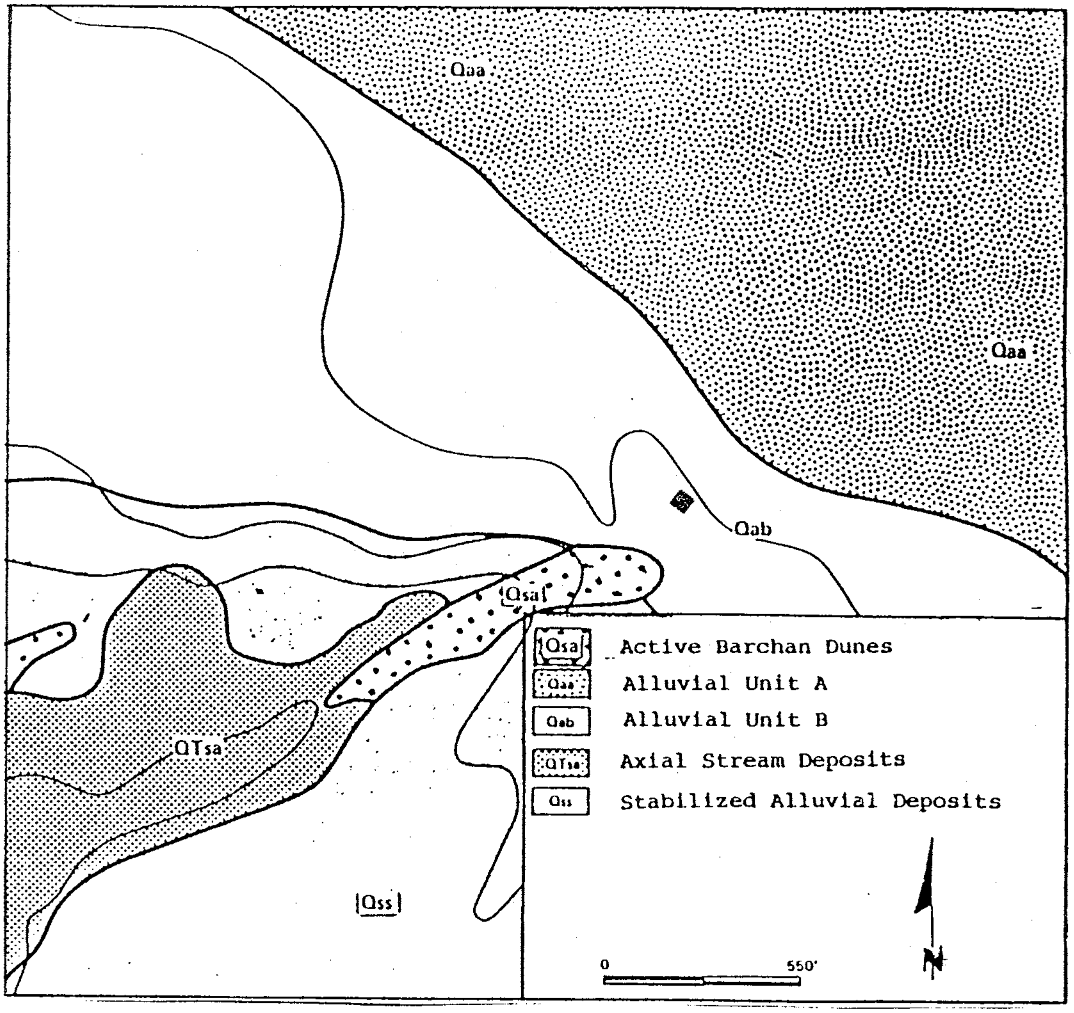

Figure 3. Geologic map of research area. Research site is shown by small rectangle. (Machette, 1978)

6. Detailed meteorological data has been collected in the immediate area since 1983 (Knowlton 1984).

7. The refuge is fenced and patrolled by Department of the Interior, National Fish and Wildlife Service personnel. This reduces the likelihood of theft and vandalism of equipment left in the field.

Climate and Physiographic Region

The field site lies in the northern reaches of the Chihuahuan desert (Figure 4). The Chihuahuan desert is one of four types of deserts recognized in the western United States (Thames and Evans 1981, Petrov 1976). These divisions are useful because aridity is not the only factor which determines an area's flora and fauna. Elevation, time of rainfall, temperatures, and length of growing season are all parts of climate which influence what plant and animal species may live in an area.

The Sonoran desert occurs in Arizona and Sonora, Mexico. There, maximum temperatures in summer can be extremely hot, and minimum temperatures are generally mild because of the low elevation, sea level to 1000 meters. Rainfall ranges from as little as 5 cm to as much as 25 cm in parts of Arizona. Larrea (creosote bush) abounds in upland areas whereas a wide variety of plants are found in drainage channels.

The Great Basin desert lies in the Basin and Range Province of the United States. The desert floors average 1300 meters and surrounding mountain ranges keep these desert

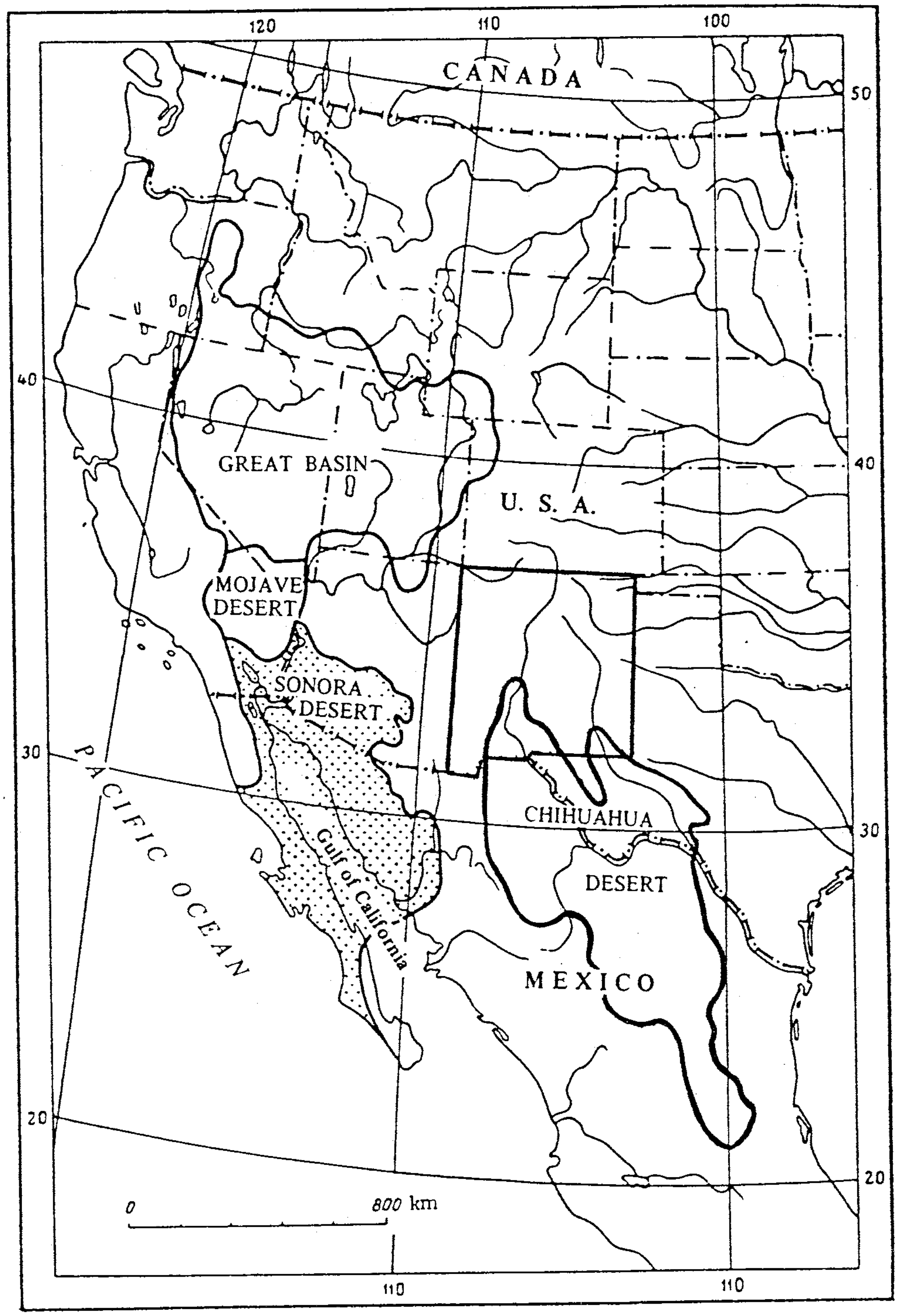

Figure 4. Location of the four major deserts in western North America. (Petrov, 1976)

regions cooler. The frost free growing period is short. Two plant families tend to dominate in this region, Artemis (sagebrush) and Atriplex (saltbush). Their distribution often depends on soil conditions such as salinity. Rainfall typically ranges from 10 to 30 centimeters.

The Mojave desert is lower than the Basin and Range desert. Most of it lies in the state of California. Summers are usually hot and dry and rainfall is 12 cm or less. Distinctive vegetation such as the Joshua tree is found in the higher portions of the desert while creosote bush dominates at lower elevations. Sagebrush is not present.

The Chihuahuan desert is found in western Texas, southern New Mexico, and southward into Mexico. Elevations usually range from 1300 to 2000 meters. Most of the 7 to 30 cm of rain comes in the summer months, although there are some winter snows and rains. Average rainfall at the Sevilleta site is 20 cm. Figure 5 and Figure 6 show precipitation at the Sevilleta site from January 1983 to November 1985, and August 1986 to August 1989, respectively. All of the weather data collected at the site from the current study is found in appendix A. One characteristic of low rainfall regions is the great variation in rainfall from year to year. Summer thunderstorms account for much of the precipitation, which occurs as intense, unevenly distributed rainfall. A single thunderstorm could account for 10 to 15 % of the yearly total rainfall. In summer

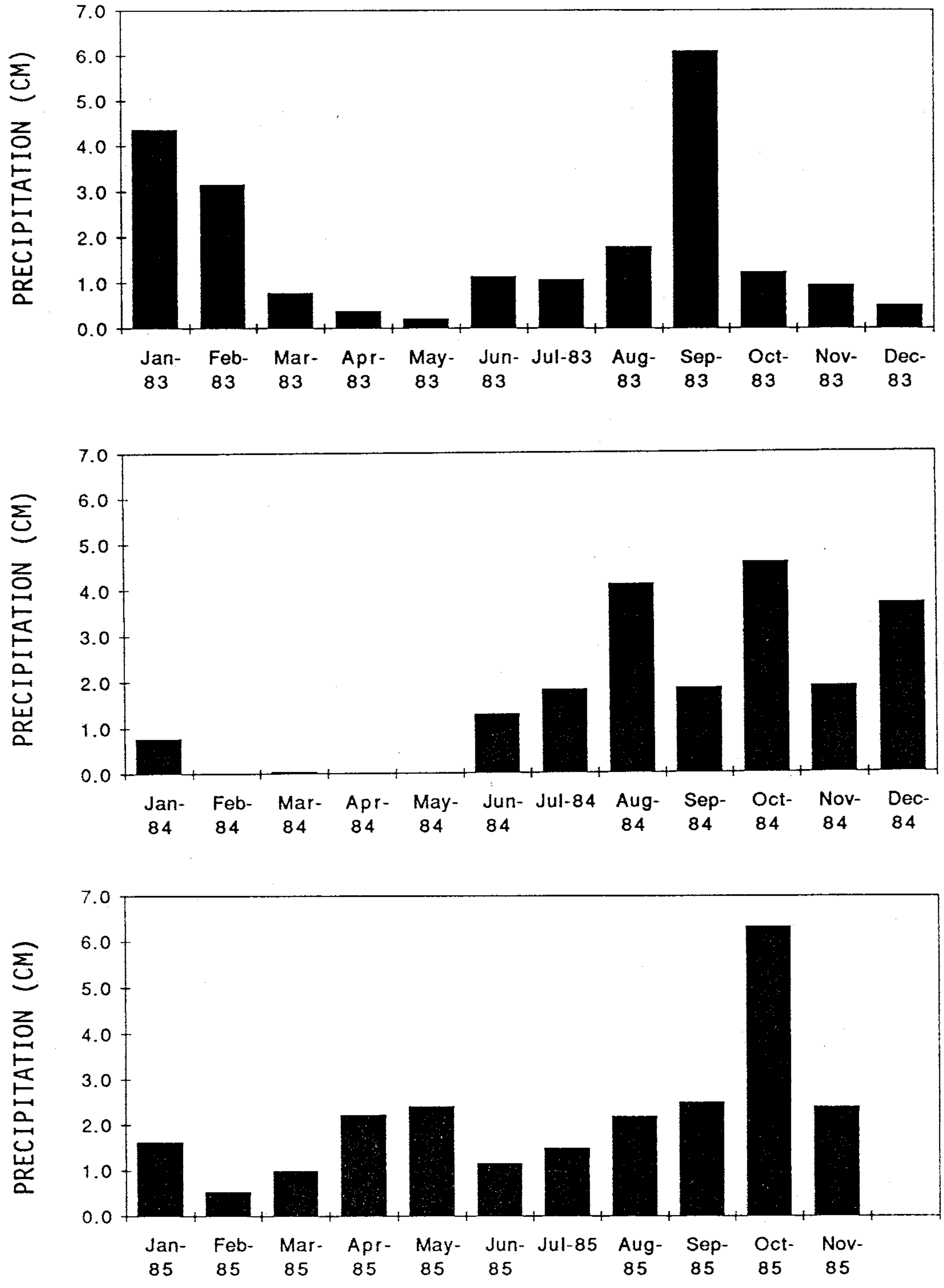

Figure 5. Precipitation from January 1983 to November 1985 as recorded at the field site. (Stephens et al. 1985 and Kickham 1987)

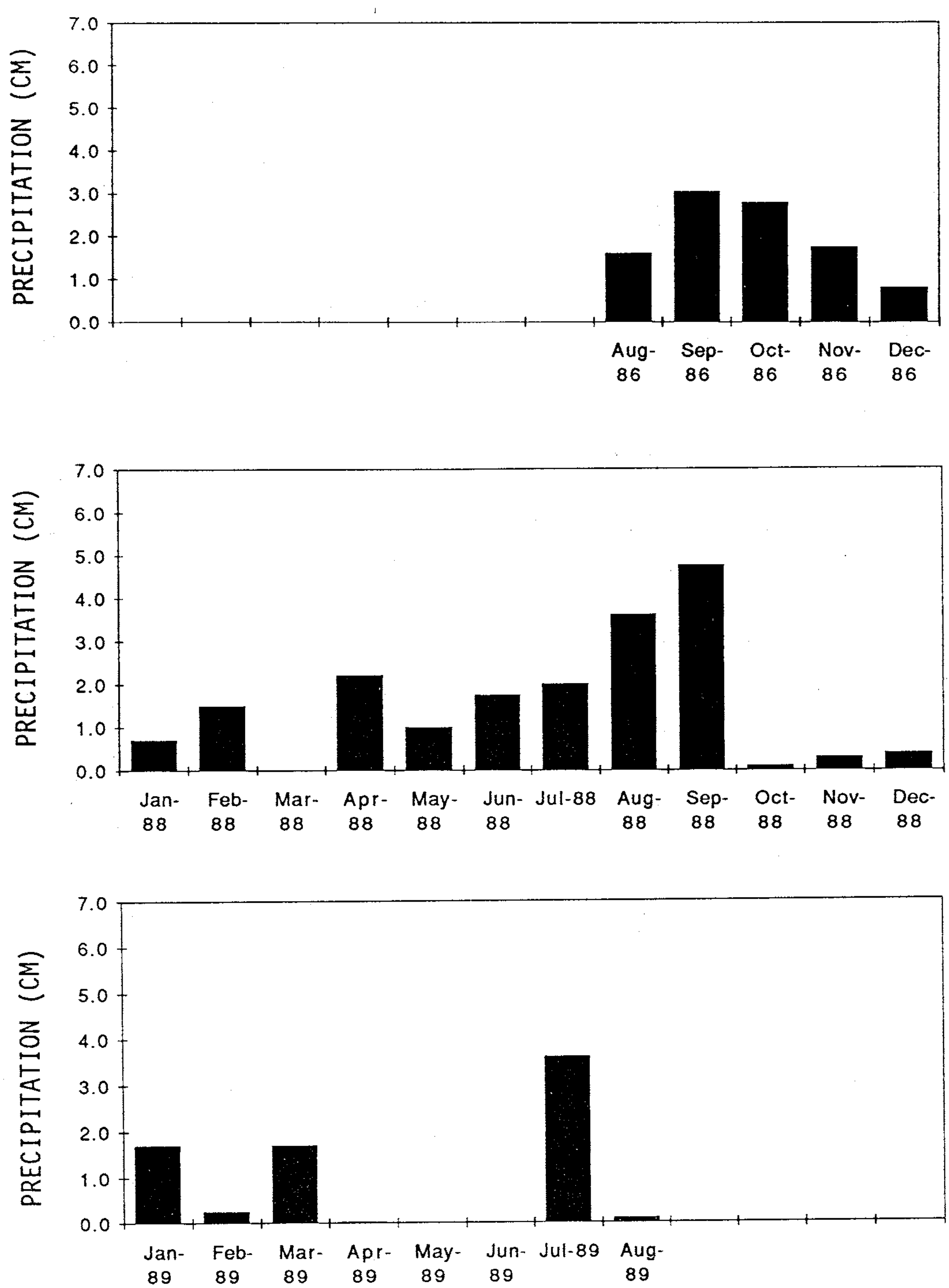

Figure 6. Precipitation from August 1986 to August 1989 as recorded at the field site. (McCord 1989 and current study)

temperatures may exceed 40°C and in winter they may fall to -10°C. Diurnal temperature swings of 30°C are not unusual because of the elevation and the generally low humidities.

Geology and Soils

Machette (1978) mapped the geology of the field site area (Figure 3). It lies on the flood plain of the Rio Salado, a braided ephemeral stream. When the neutron probe access tubes were installed, the cuttings from the holes were geologically logged to produce a south-north cross section and a west-east one through the center of the site (Figure 7). A few silty sand lenses were noted in each cross section. One seemingly continuous layer of silt was noted in the four holes which made up the west-east cross section at the 360 cm depth. A layer of cobbles was found below the 410 cm depth making it impossible to hand auger much deeper. The silty layer and the layer of cobbles were the only distinct layering indicated by grab and ring samples taken from the site during instrumentation. When a trench was excavated to investigate rooting characteristics of the plants, small scale horizontal layering was evident. Grab and ring sampling from the hand augured holes did not reveal these structures. See Figure 8 for a picture of the layering.

Particle size analysis of samples taken from the neutron probe access tubes showed high uniformity from the surface to the 400 cm depth (Stein 1989). At this depth the cobble layer

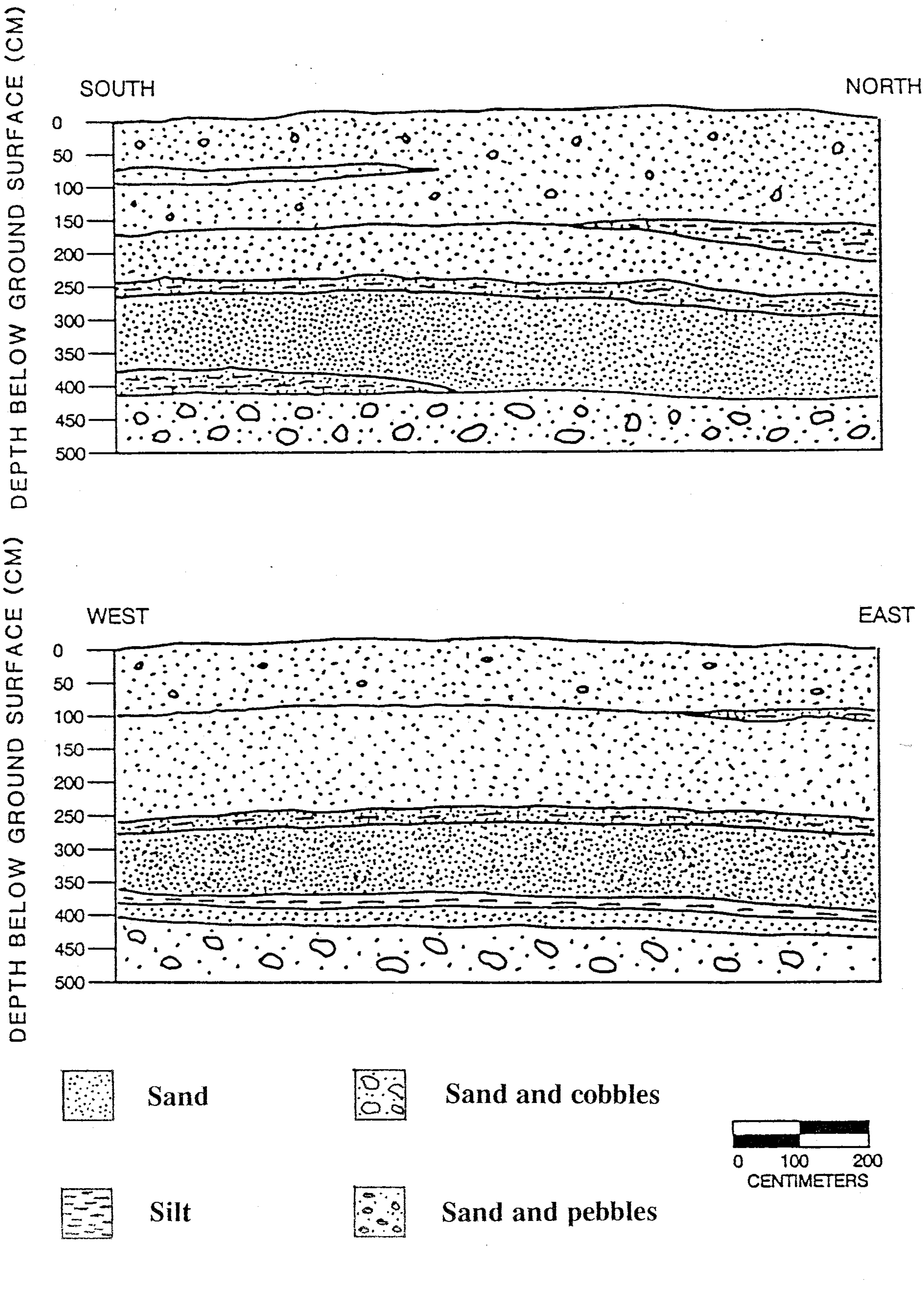

Figure 7. Geologic cross section of site through the center of the plot, south to north (top), and west to east (bottom). (Stein, 1989)

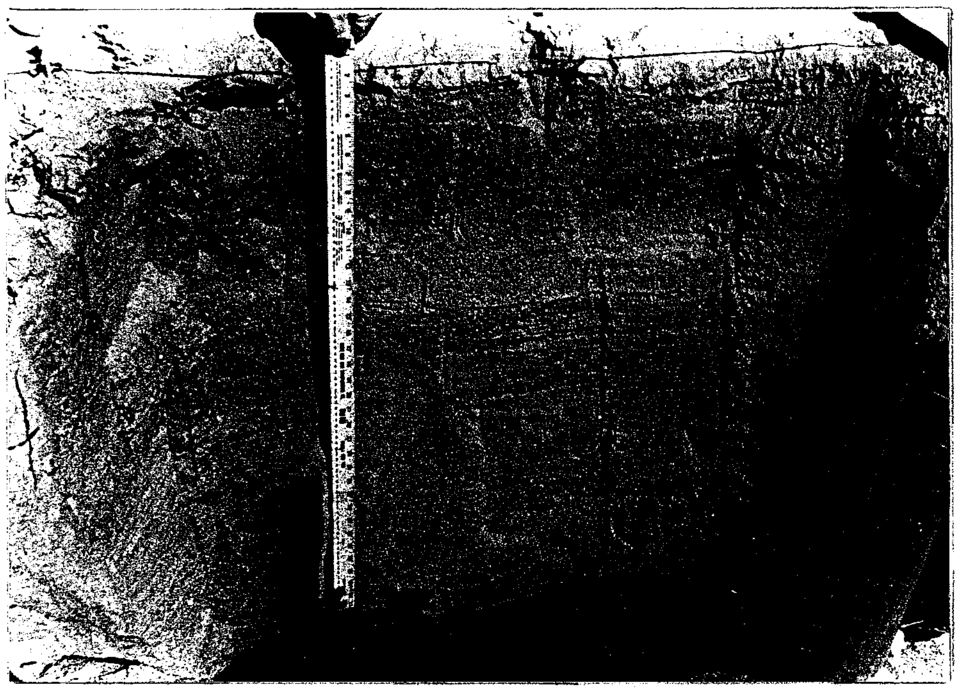

Figure 8. Photograph showing horizontal layering in the field site soil.

causes the greatest variation in particle size distribution. The d_{10} value of grain size was 0.114 mm and its standard deviation was 0.0294, the d_{50} was 0.256 mm and its standard deviation was 0.0484. The C_u (coefficient of uniformity) for these 15 samples was 2.698 with a standard deviation of 0.412. Poorly graded soils such as beach sands usually have C_u values from 2.0 to 3.0.

Vegetation

Current vegetation at the site has already been discussed. It may also be useful to consider the history of the site. The Sevilleta Land Grant, where the current site is located, was grazed by cattle until it became part of the wildlife refuge eight years ago (Stans, personal communication). Since that time there has been no grazing by cattle in the area of the current site. Researchers from New Mexico Tech have noticed an increase in vegetation density since their visits to the area started in the early 1980's (Stephens et al. 1983).

The fourwing saltbush is the dominant plant at the experimental site. According to Phillips (1987), this species of saltbush prefers disturbed soils. Whether overgrazing, blowing sand or flooding from the Rio Salado are responsible is not clear. The field site is on the flood plain of the Rio Salado. There is no development of a topsoil or carbonate layer at the site. The lack of soil development indicates a young age. Besides preferring disturbed soils, saltbushes are known for their ability to tolerate saline soils.

Chloride Concentration in Vegetation. The use of chloride mass balance analysis of soil profiles to estimate recharge rates assumes that there are no sources or sinks of chloride in the soil. The effect of vegetation on chloride concentrations in the soil is not well understood. A first step to gaining a better understanding is to determine how much chloride is actually in the plant tissue.

Samples were taken at the field site from the two plants which dominate the area. They are the fourwing saltbush and the indigo sage. Fourwing saltbush occurs along one edge of the site and at each of the remaining corners. See Figure 9 for the distribution of the plants at the site. Three samples were taken from the fourwing saltbush. One was of stems and leaves, the second was of stems and seeds and the third was of leaf litter, stems and seeds of the fourwing saltbush from underneath the canopy of the bush. Samples of stems and fallen stems from underneath the bush were also taken from the indigo sage bush. No true leaves were noticed on the indigo bush that year. The plant conserves water by carrying out photosynthesis through its stems which contain chlorophyll. Leaves may be produced during wet periods but are later shed to conserve moisture.

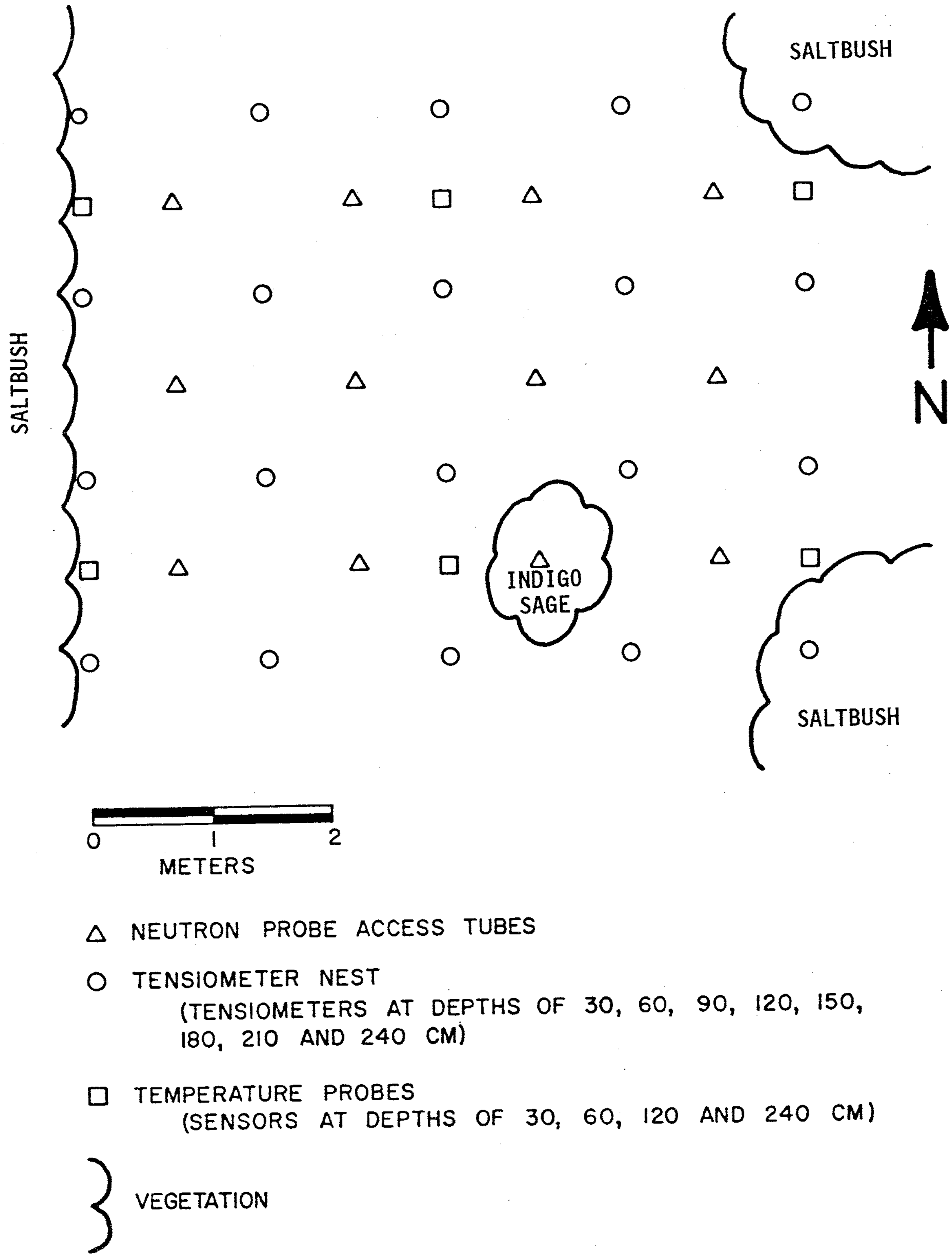

Figure 9. Plan view of site showing instrumentation relative to vegetation.

Samples were oven dried at 100°C so that results could be reported as chloride content per unit weight of dry vegetation. The samples were then heated in a crucible over a bunsen burner to oxidize the organic matter. Little if any ash was lost during the process. The weight of the residue was then recorded. The oven dry weight of the leaf litter samples were corrected by subtracting the weight of the residue from the oven dry weight. This was done because some of these samples contained mineral soil which could not be easily removed from the samples.

Distilled, deionized water was then added to the residue after burning. The water and residue were then shaken in a closed container and allowed to settle overnight. Aliquots were then analyzed for chloride by the mercuric nitrate titration method outlined in Appendix B. Chloride concentration per unit mass of plant material was then calculated and is shown in Table 1.

Site Characterization

In order to calculate the soil-water fluxes at the site, the properties of the site had to be measured. Instrumenting the site allowed samples to be taken which were then analyzed in the laboratory to determine the hydraulic properties of the soil. The rooting pattern and density would have to be determined to see if the vegetation was influencing the

Table 1. Chloride concentration per unit weight of dry plant material.

Sample	dry weight (g)	corrected weight (g)	Cl^- in sample (mg)	Cl^-/plant weight (mg/g)
indigo stems	3.15	3.03	$1.10X10^{-1}$	$3.60X10^{-2}$
fallen indigo stems	3.79	3.71	$1.04X10^{-1}$	$2.80X10^{-2}$
fourwng sb stems and leaves	3.64	3.02	$3.80X10^{+1}$	$1.26X10^{+1}$
fourwng sb stems and seeds	3.76	3.22	$4.65X10^{+1}$	$1.44X10^{+1}$
fourwng sb litter	11.3	4.71	$6.53X10^{0}$	$1.39X10^{0}$

movement of the soil water. The rooting pattern could not be determined until after the study was completed.

Rooting Pattern. In a report by Dwyer and DeGarma (1970), the effect of growing several different native New Mexican desert shrubs under different water regimes was studied. Three of these plants are common at the Sevilleta Wildlife Refuge. They are the creosote bush, the mesquite tree and the fourwing saltbush. Seeds of each species were planted in containers and allowed to germinate and grow under field capacity soil-moisture conditions for about a month. They were thinned until only one plant remained in each pot. The water contents were then varied so that some of each species were grown under the following conditions: field capacity, one half, one third, and one quarter of field capacity. The fourwing saltbush was found to need the least amount of water to produce a gram of plant material. The saltbush was also the only bush which had different rooting patterns under different soil moisture conditions. When water is plentiful it produces coarse roots but under dry conditions very fine roots are produced. Its roots were also the most evenly distributed in the soil profile. Creosote bush had shallow roots while mesquite roots concentrated near the bottom of the container. The fourwing saltbush seems very adaptable. In general its roots are well distributed and vary according to moisture content of the soil.

The rooting pattern of the saltbush at the instrumented site was investigated after the data collection was complete. A trench was excavated from the center of the plot westward to the fourwing saltbush canopy which lines the western edge of the site. Soil samples were taken at four different depths from horizontal faces every 40 cm from the canopy. The samples were oven dried overnight and the roots were separated from the soil by sieving in a number 16 sieve and using forceps to remove any roots which passed through the mesh. The roots were weighed and then compared to the dry weight of the soil (Table 2). The ratio of root to soil is much smaller than those reported by Nimah and Hanks (1973) for alfalfa. The greatest density of roots was expected nearest the canopy. Actually there was no clear root density pattern (Figure 10). Roots were found all the way to the bottom of the excavation, 1.2 meters. When neutron probe access tubes were installed, large roots were found to a depth of 4.0 meters.

The excavation also shows that the roots seek out any disturbance in the soil. The backfill around the aluminum access tubes were filled with roots compared to the surrounding soil. This happened in 1.5 years or less. Two tensiometers were also exposed in the trenching. Both had roots running down their sides, presumably to their cups. Whether these roots were actually concentrated at the porous cups was not possible to determine since removing the soil near the cup destroyed any roots present. These roots grew

Table 2. Root density at field site determined by trenching and seiving of 100cc ring samples.

Distance from canopy (cm)	Depth below surface (cm)	Weight of roots (g)	g roots/g soil ()
160	30	0.01	$6.37X10^{-5}$
160	60	0.00	0.00
160	120	0.01	$6.79X10^{-5}$
120	30	0.05	$3.47X10^{-4}$
120	60	t*	t
120	90	0.03	$2.08X10^{-4}$
120	120	0.01	$6.35X10^{-5}$
80	30	0.01	$6.19X10^{-5}$
80	60	0.00	0.00
80	90	0.01	$6.35X10^{-5}$
80	120	t	t
40	30	0.14	$9.33X10^{-4}$
40	60	0.02	$1.40X10^{-4}$
40	90	0.00	0.00
40	120	t	t
0	30	0.01	$6.48X10^{-5}$
0	60	0.03	$2.03X10^{-4}$
0	90	0.01	$6.80X10^{-5}$
0	120	t	t

* roots found but less than 0.01 grams.

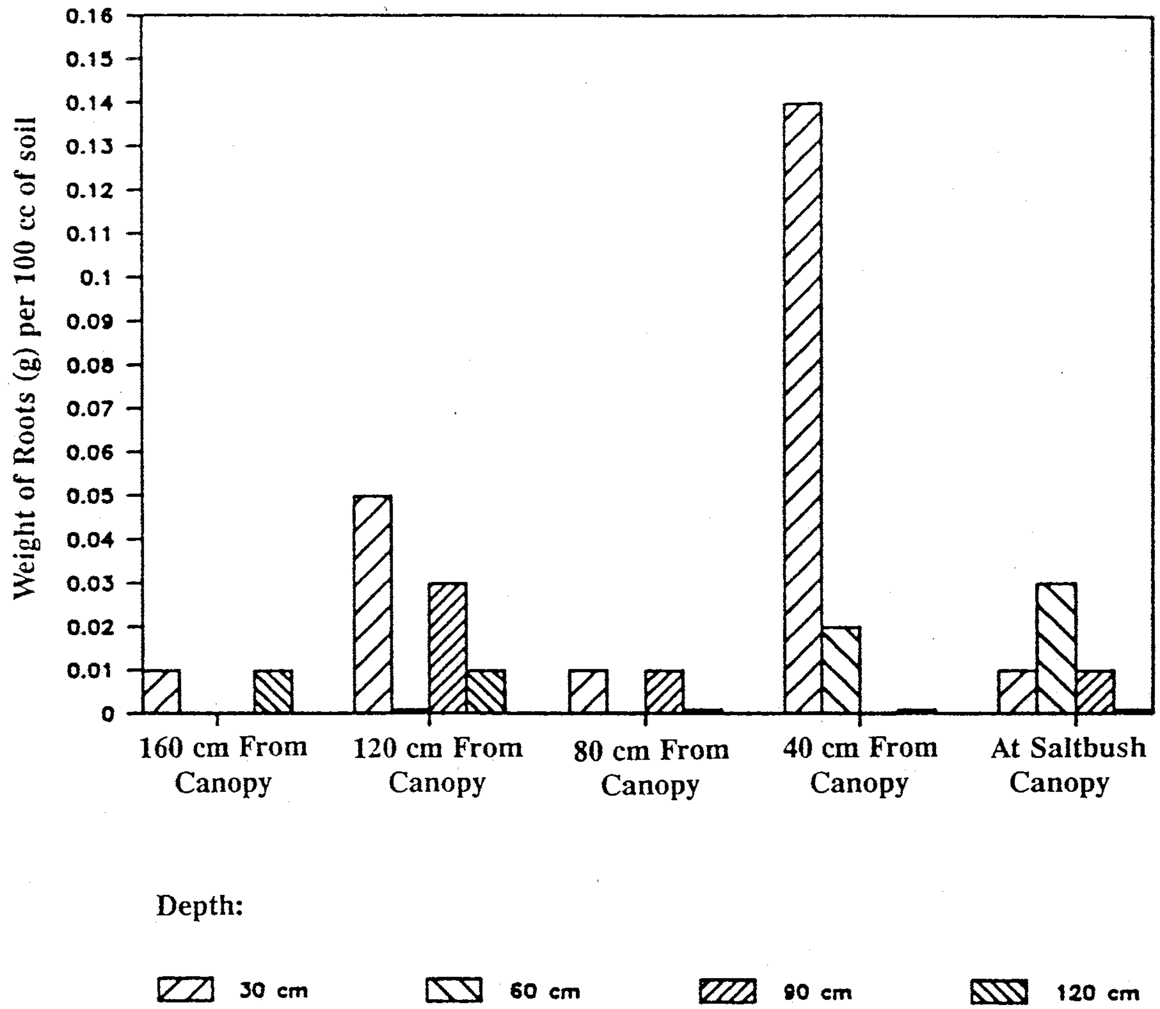

Figure 10. Graph showing root distribution determined by mechanically separating roots from 100 cc samples of soil at different depths and distances from the fourwing saltbush canopy.

there in 1.8 years or less. The backfilled 1.9 cm diameter holes left by sampling for tracers also contained numerous roots. This happened in 7 months or less (Figure 11).

Hydraulic Properties. When the site was being instrumented, soil samples were taken to determine hydraulic characteristics of the site. Installation of the neutron probe access tubes provided an opportunity to take samples while keeping the disturbance of the site to a minimum. The procedure for installing access tubes is found in the Instrumentation section of this report. Hand auguring of the holes was done to minimize disturbance of the soil surface and plant life.

Two type of samples were taken from the site: grab samples from the auger bit, and ring samples from down the hole. Ring samples were used for any characterization of the soil which requires the structure of the soil to remain intact. Grab samples do not retain the soil structure, but they are useful for soil description and grain size analysis, as discussed in the previous section. The undisturbed samples were used in laboratory determinations of initial moisture content, saturated hydraulic conductivity, moisture retention relationships, and residual moisture content. This data, except for the residual moisture content, is tabulated by Stein (1989).

Ring sampling is a means of taking "undisturbed" soil samples. An access hole was hand augured with a 6 cm bit. When

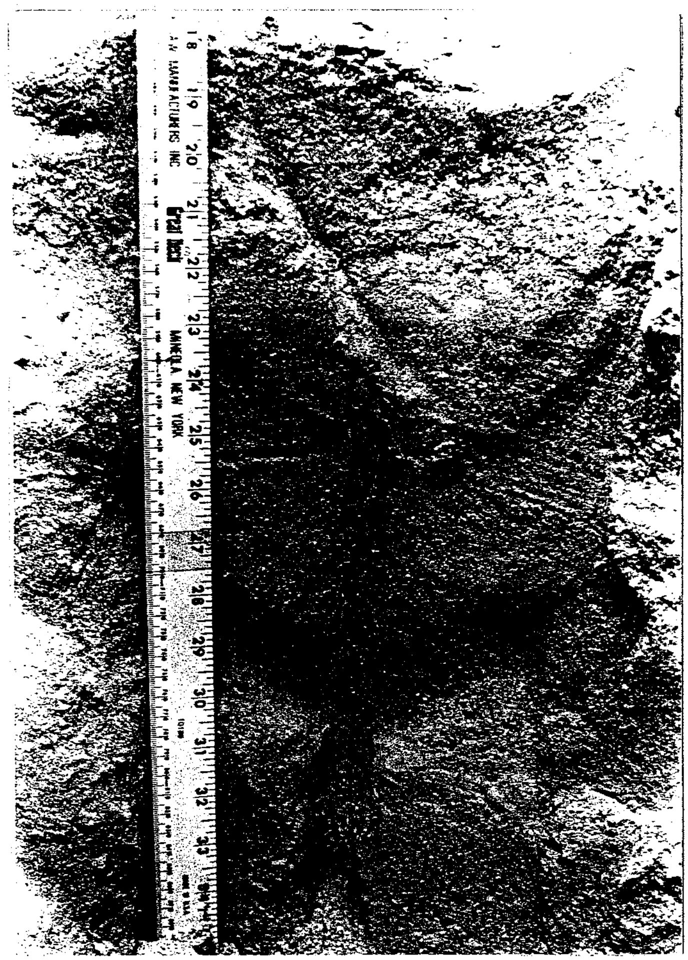

Figure 11. Photograph of roots in backfilled tracer sampling hole. Backfilled December 1988 and photograph taken July 1989.

the desired depth was reached, the auger bit was replaced with an Eijelkamp ring holder. A 100 cc ring was clamped in the holder and forced into the soil. The holder allows soil to pass through the ring so that it is not compacted. The holder was then twisted to break the sample free from the soil. The sample was removed form the hole and the bottom of the ring was capped. The ring was then removed from the holder and the soil trimmed until it is flush with the other end of the ring. That end of the ring was capped and the sample labeled.

The day the ring samples were taken, they were returned to the lab and weighed. After oven drying overnight at 95^{o}C, the samples were reweighed. The loss in weight due to the evaporation of water was used to calculate initial volumetric water content. The samples were then placed in a constant head permeameter to determine saturated hydraulic conductivity. Average values of the first several readings were recorded for each sample. The arithmetic mean saturated hydraulic conductivity from the samples at the site was 9.5 x 10^{-3} cm/sec and the variance of the natural log of saturated hydraulic conductivity was 0.69.

The next property determined was the moisture characteristic curve for each sample. The samples were taken from the constant head tank while still saturated and placed in a Buchner funnel. Underneath the fritted glass plate of the funnel is water which is connected by clear tubing to a burette. The water level in the burette is even with the base of the fritted glass plate in the Buchner funnel. The water level in the burette is recorded. The burette is then lowered, creating a less than atmospheric pressure on the soil sample. Water will leave the sample until an equilibrium is reached between suction applied by the lowered burette and the amount of water held by capillary forces in the soil. The amount of water lost from the sample is recorded by the change of water level in the burette. The process of lowering the burette and waiting for equilibrium to be reached is repeated in steps until a suction of 200 cm of water is reached. Then the burette is raised in steps, allowing the sample to imbibe water. At the end of the experiment the soil sample is weighed and the water content of the sample at each soil suction of both the wetting and drying curve is determined. The wetting and drying curves are not the same because at the same suction the water content of the soil depends on whether it was reached by wetting or drying. A composite wetting and drying curve for the samples is found in Figure 12.

After the wetting and drying curves were determined for the samples in the Buchner funnels, moisture content over the a range of drier conditions was determined using a pressure plate. The pressure plate has a porous plate with a known air entry value. The smaller the pores in the plate the greater the capillary forces holding the water in the pores. For the pores to dewater the air entry pressure must be exceeded.

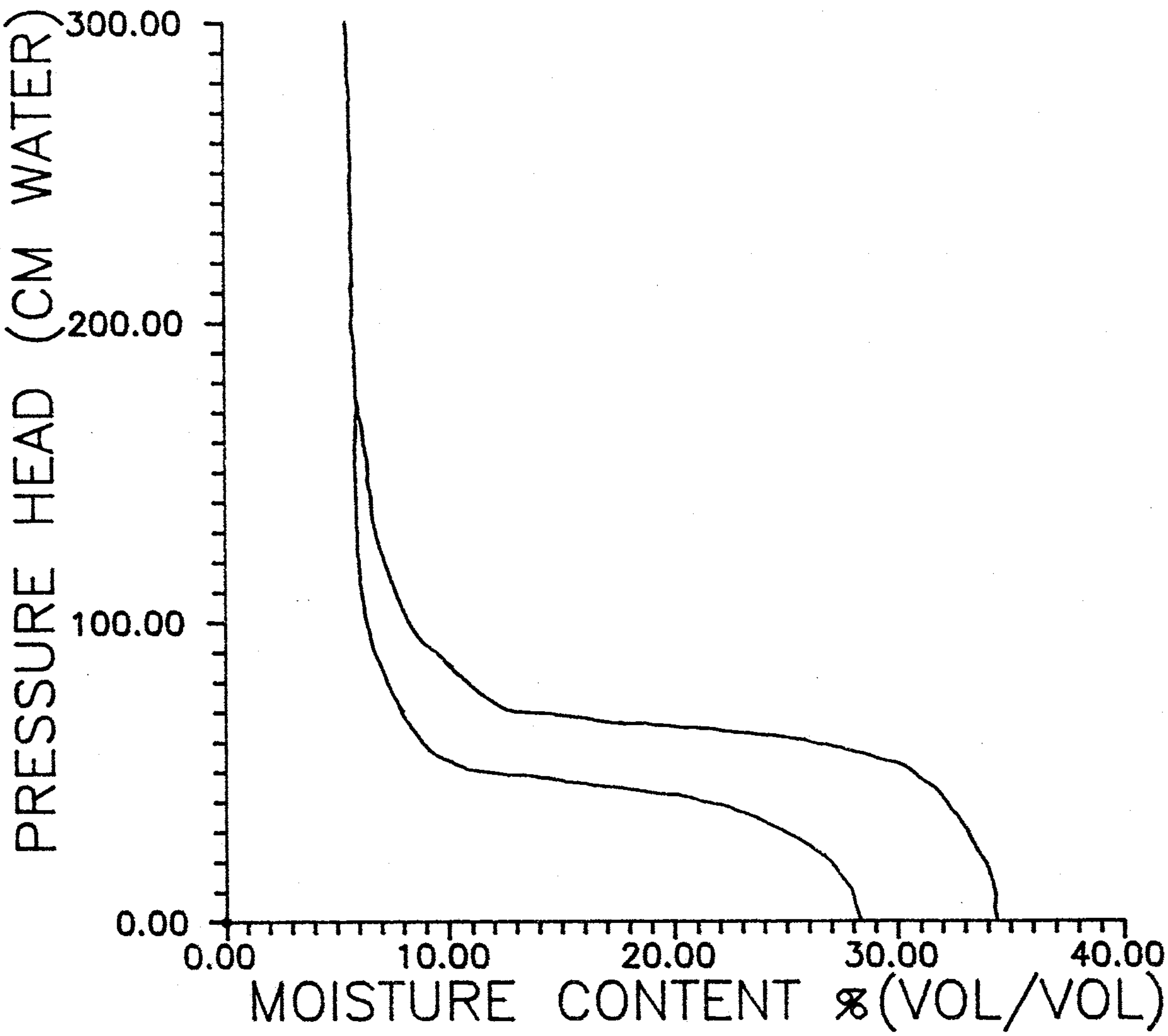

Figure 12. Composite moisture retention curve determined by hanging column studies. Pressure head measured in negative cm of water. (Stein, 1989)

Saturated ring samples are placed on a wetted plate which forms a barrier between the pressure chamber and atmospheric pressure. Nitrogen gas under pressure is introduced into the chamber with the soil samples. The pressure of the gas in the chamber forces water to leave the soil samples until the forces holding the water in the sample are equal to the pressure applied by the gas. At equilibrium, the soil water potential is presumed to be equal to the pressure of the applied gas. The water leaves by means of the porous plate. As long as the gas pressure does not exceed the air-entry pressure of the plate, water can not pass through the plate. In practice, up to 12 ring samples of soil are placed on a wetted plate in the pressure chamber. The pressure was slowly increased until it was near the air entry value. Equilibrium conditions are assumed when no more water is forced out of the samples. The water content of the samples at this pressure was determined by weighing, drying and reweighing the samples. See Appendix C for the pressure plate data. The water content from the pressure plate data was wetter than that found in the field under less suctions. This could be because applied pressure is not analogous to suction in the soil or that the pressure plate experiments were not at equilibrium conditions when they were stopped. There may also be a plate contact effect preventing water from leaving the soil samples causing the greater water contents. Finally the original soil water had been replaced in the soil samples during the constant head permeameter and hanging columns experiments.

HYDRODYNAMIC ANALYSIS

A mass balance approach was used in an attempt to calculate a water balance for the field site. The field site was divided into several computational cells. Pressure head and moisture content data was used to calculate fluxes through each face of the computational cells. Seasonal variations in soil moisture movement were examined by using vertical cross sections of total head and plots of horizontal soil-water flux versus time. In addition fluxes were calculated through the lower most face of each cell using measured pressure head gradients. These calculations were repeated assuming a unit gradient instead of the measured pressure head values and both sets of data were examined for spatial and seasonal patterns.

Conceptual Approach

The principle of mass balance was used to calculate a water balance for the field site. It simply states that the input into a unit volume of soil minus the output is equal to the change in the rate of storage in that unit volume.

$$Q_{in} - Q_{out} = \Delta S/\Delta T \qquad (1)$$

where:

Q = flow rate (L^3/T)

ΔS = change in water storage (L^3)

ΔT = change in time (T)

The unit volume of soil material can be conveniently thought of as a cube with six sides of equal area (Figure 13). Equation 1 may be rewritten as:

$$Q_1 + Q_2 + Q_3 + Q_4 + Q_5 + Q_6 = \Delta S/\Delta T \quad (2)$$

The subscripts identify the face of the cube through which flow occurs. These magnitudes of the flow rate may be either positive or negative. Positive indicates the flow is into the cell and negative indicates a flow out of the cell. Equation 2 may be rewritten in terms of fluxes through a unit surface area:

$$(qA)_{1\text{-}7} + (qA)_{2\text{-}7} + (qA)_{3\text{-}7} + (qA)_{4\text{-}7} + (qA)_{5\text{-}7} + (qA)_{6\text{-}7} = \Delta S/\Delta T \quad (3)$$

where:

q = flux (L/T)

A = surface area of a face (L^2)

The face across which the flux occurs is denoted by subscripts of the nodes which lie on a line orthogonal to that face.

A form of Darcy's Law may now be used to calculate the flux, q, through each face. Darcy's law for saturated flow in an isotropic medium is:

$$q = -K \nabla h \quad (4)$$

where:

q = flux (L/T)

K = hydraulic conductivity (L/T)

∇h = gradient of head ()

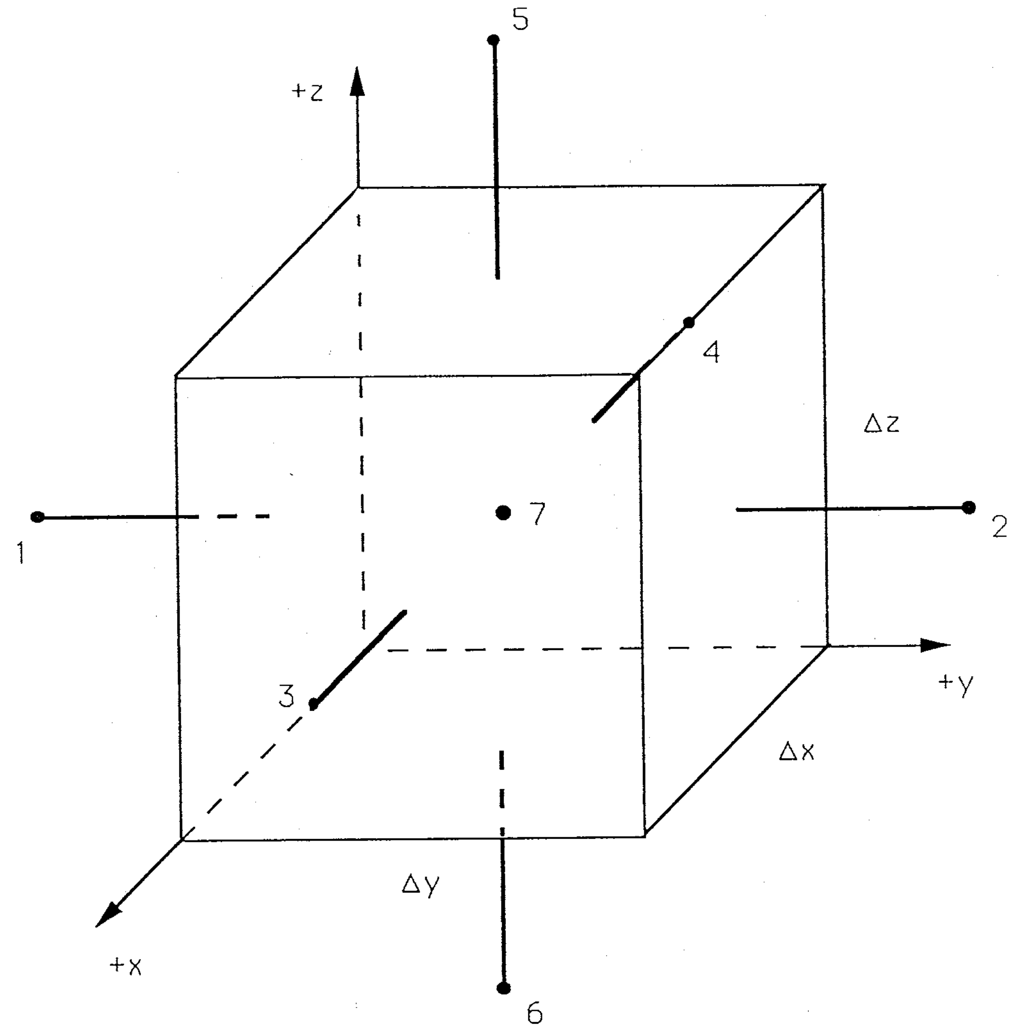

Figure 13. Conceptual cell used to determine fluxes.

In unsaturated flow, equation 4 must be modified to account for the variation in hydraulic conductivity due to variable saturation in the vadose zone. As a soil becomes drier there is less volume for the water to flow through, because not all of the pore space is occupied by water. So it is analogous to reducing the porosity of the soil. Also, as the amount of water in the soil decreases the path the water must take becomes more tortuous. Therefore the hydraulic conductivity in Equation 4 varies with the moisture content of the soil. Hydraulic conductivity may be written as a function of either the water content of the soil or of the pressure head of the soil. There is evidence that the previous history of the soil determines its hydraulic conductivity when it is written in terms of pressure head. This means at the same pressure head the soil may have a different hydraulic conductivity depending on whether it was wetting or drying to reach that water content. The gradient term in Darcy's equation must also be changed in order to apply the equation to unsaturated flow. Water in unsaturated soil is at less than atmospheric pressure because it is being held to the soil particles by capillary forces. The head term in equation 4 is replaced with the pressure head measured in the soil. Gravity which operates only in the vertical direction, is an important component of the hydraulic gradient. Consequently, the equation for flux of water in the unsaturated soils in the horizontal directions is:

$$q_x = -K(\Theta)[d(psi)/dx] \quad \text{or} \quad q_y = -K(\Theta)[d(psi)/dy] \tag{5}$$

and in the vertical direction the flux is:

$$q_z = -K(\Theta)\{[d(psi)/dz-1]\} \tag{6}$$

where:

x or y	= distance in horizontal direction (L)
z	= distance in vertical direction (L)
K	= hydraulic conductivity as a function of water content (L/T)
Θ	= volumetric water content
d(psi)	= change in pressure head (L)
dx or dy or dz	= distance over which the pressure head acts (L)

The minus 1 term is in Equation 6 because of the gradient caused by the force of gravity. It is a plus term when the upper face of the unit volume is considered because gravity is causing water to move downward into the unit volume. When the lower face is considered the term is minus, because gravity tends to cause the water to leave the unit volume. If the unit volume is aligned perpendicular to the three principal axes, the area terms can be written in terms of dx, dy, and dz as follows:

$$A_{1\text{-}7} \text{ and } A_{2\text{-}7} = dxdz \tag{7}$$

$$A_{3\text{-}7} \text{ and } A_{4\text{-}7} = dydz \tag{8}$$

$$A_{5-7} \text{ and } A_{6-7} = dxdy \quad (9)$$

Substituting equations 6 through 9 into equation 3 for the area terms and equations 5 and 6 for the flux terms yields the following:

$$-K(\Theta)[(psi_1-psi_7)/dy]dxdz - K(\Theta)[(psi_2-psi_7)/dy]dxdz - K(\Theta)[(psi_3-psi_7)/dx]dydz - K(\Theta)[(psi_4-psi_7)/dx]dydz - k(\Theta)[(psi_5-psi_7)/dz+1]dxdy - K(\Theta)[(psi_6-psi_7)/dz-1]dxdy = \Delta S/\Delta T \quad (10)$$

where:

Psi = pressure head measured at a point indicated by the subscript.

Θ = the volumetric water content at the face half way between psi_i and psi_j.

Equation 10 is a mass balance expression written for unsaturated flow of water. It is essentially Darcy's law written to account for the variation of hydraulic conductivity with water content and the effect of gravity creating a gradient in the absence of other pressure head gradients. This equation is the basis for the three-dimensional water balance used at the field site.

Computational Approach

The direction and magnitude of water movement at the study area was calculated using tensiometric and water content data. A form of Darcy's law was used which takes into account the unsaturated conditions at the field site. This is Equation 10 mentioned earlier.

The field site was divided into six cells with five different "slices" in each cell. Each of these slices was an actual computational cell. See Figure 14 for a computational cell and Figure 15 for the plan view of the cells at the site. The cell measured 150 centimeters by 150 centimeters and 30 centimeters deep. The corner of each cell was defined by a moisture content reading made with the neutron probe. The four readings at each corner were used to calculate an average water content for that face of the computational cell. This value was used to calculate an unsaturated hydraulic conductivity based on the relationship of water content to hydraulic conductivity. This relationship for the alluvial sand was derived by Knowlton (1984) in an area just to the southeast of the current site. The method used was an instantaneous profile method described by Hillel (1980). This supplied the conductivity used in Equation 10.

The other value needed in the mass balance equation is the pressure gradient. Since the conceptual model calls for the flux through each face, the gradient through that face was computed. See Figure 15 for the computational cell used. In calculating the horizontal gradients, the center pressure head value labeled psi_7 in the conceptual model was found by averaging the pressure head above and below the center of the

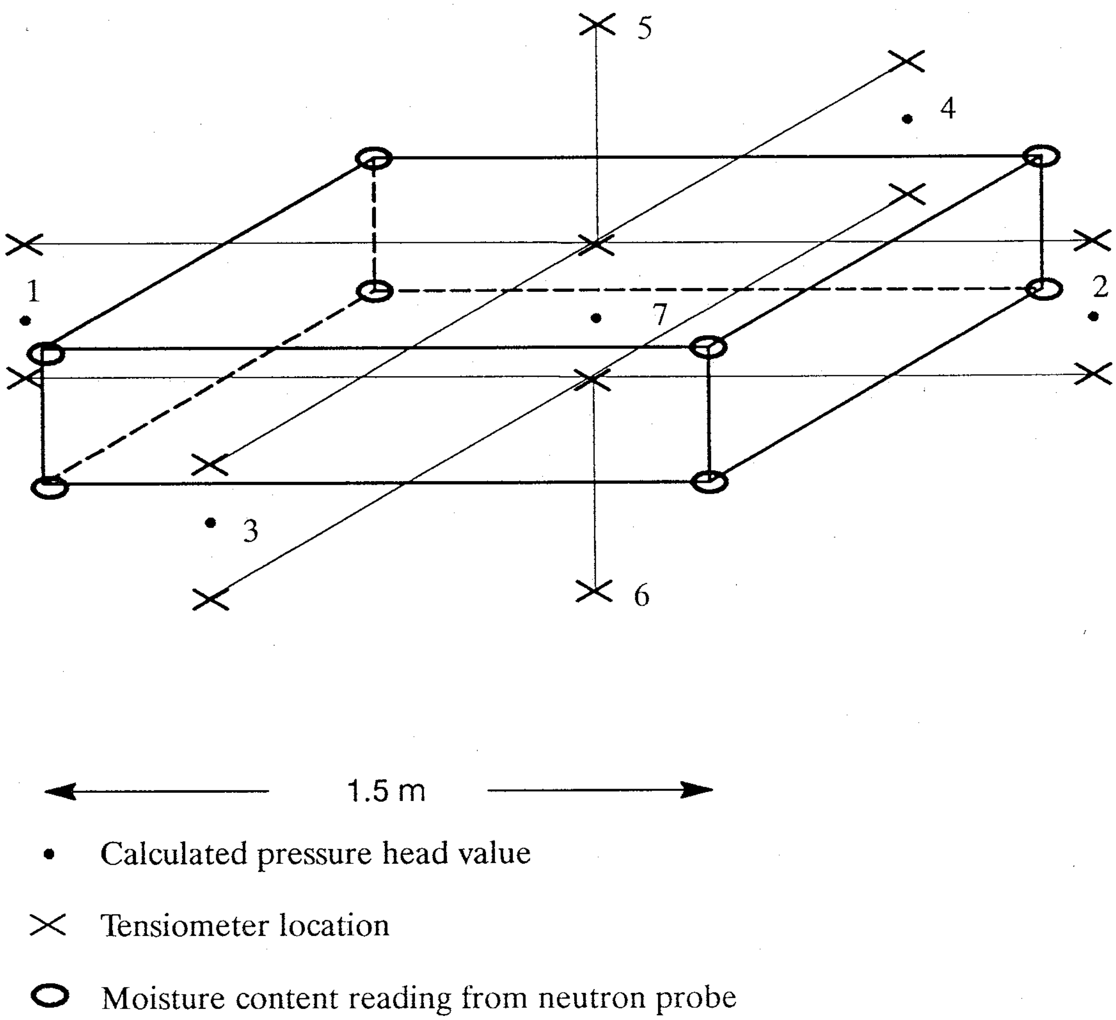

Figure 14. Computational cell showing how pressure head and water content measurements are used to calculate fluxes.

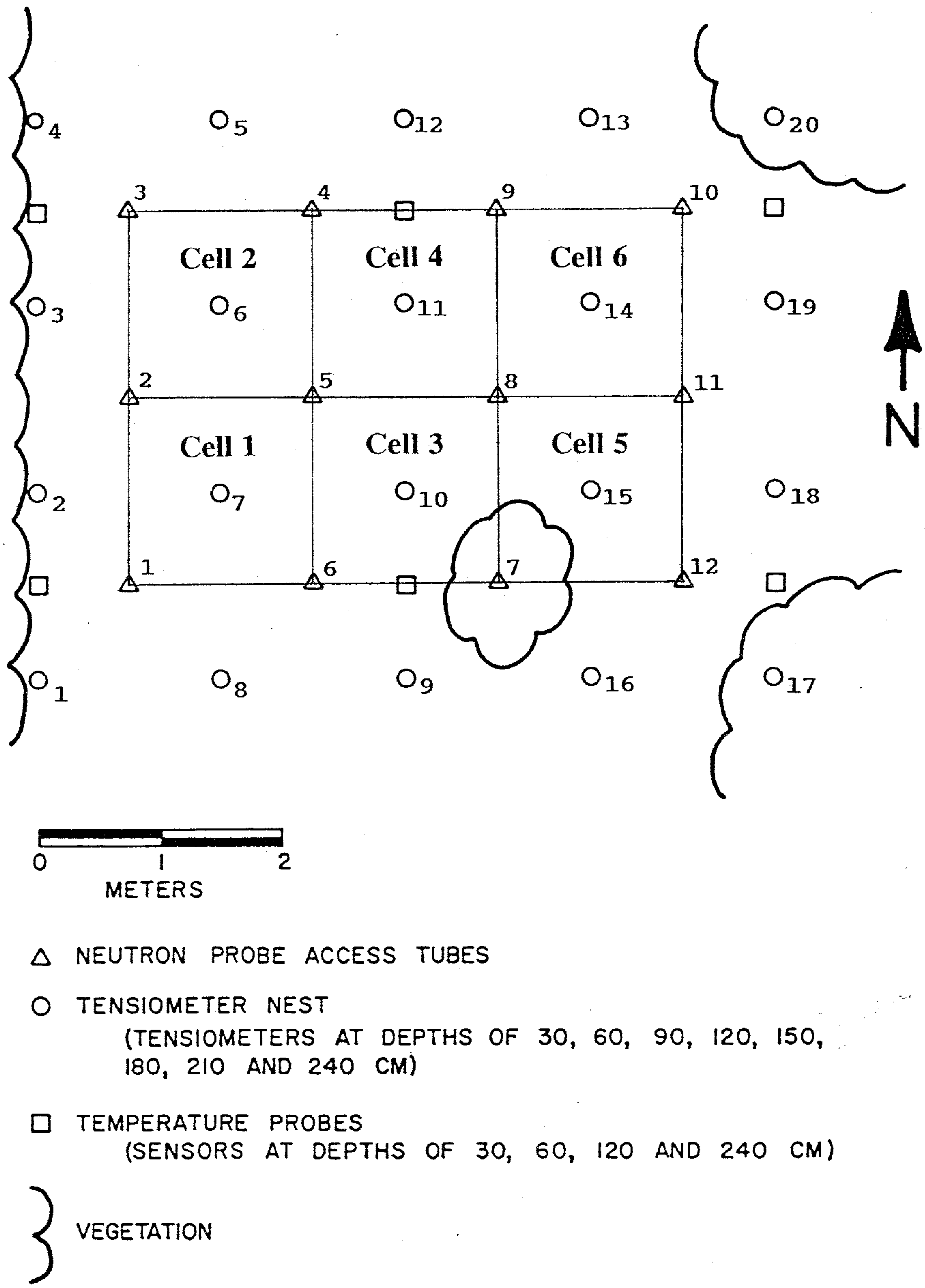

Figure 15. Plan view of computational cells showing their relationship to the vegetation. Tensiometer nests and neutron probe access tubes are also labeled.

cell. If one of the tensiometer readings was not available, the other value was used for psi_7. If both were missing, the calculations could not be made. The pressure head values used outside of the cell (labeled 1, 2, 3, and 4 in Figure 14) were calculated in a similar manner, by averaging two values. The difference in pressure head values between the center of the cell (labeled 7) and the values outside of the cell (labeled 1, 2, 3 and 4) were used to calculate the flux through each of the horizontal faces. The flux through the face was then multiplied by the area of the face, so that a water balance could be calculated.

Calculating flux in the vertical direction required a different approach, since the geometry of the tensiometers was different. The reading at the top face along with the reading 30 centimeters above were averaged together. The gradient was then calculated from that point to the pressure head which was already calculated for the center of the cell labeled psi_7 in Figure 14 of the conceptual model. The gradient from the top face of the cell also had a gravity term because even if there was no pressure gradient, soil moisture would move under the force of gravity. In keeping with the sign convention, this gradient term was positive because it tended to cause water to flow into the cell. The flux through the lower face of the cell was calculated in a similar manner except that the gradient was multiplied by negative one since it causes water to leave the cell.

As discussed in the instrumentation section of this paper the tensiometers which record the pressure head in the soil were not actually aligned vertically in each nest. They were offset so that the failure of one would not affect all of the tensiometer readings below it. Since the geometry of all of the nests was the same, the distance over which the difference in pressure head acts was the same. This simplified the computations made. Appendix D contains the Fortran code used to make the calculations and Appendix G contains the input and output files and a trace through the program. The program stores the water content and pressure head values in arrays. Using this data, the flux through each face is calculated and the results stored in an array. A running total is also kept of the total amount of water which has entered or left each cell for time period specified. This total can either be expressed as a volume of water per time or a volume of water per unit area which reduces to a length per time.

Instrumentation

Tensiometers were installed at the field site to measure pressure head values. They were arranged in a grid pattern with neutron probe access tubes in the center of each square formed by the tensiometer nests. The neutron probe readings provided water content measurements. An automated weather station was set up beside the site. It also recorded soil temperature data. An evaporation pan was maintained a short distance away with a spring powered rain gauge to serve as a backup to the automated station.

Pressure Head. The field site at the Sevilleta National Wildlife Refuge was instrumented with 160 tensiometers in a grid pattern. Each tensiometer is essentially a sealed tube with a porous cup at one end. The tensiometer cup (Soilmoisture Equipment Corp., Santa Barbara, CA) has small pores which, when after wet, will not allow air to pass through. When the tensiometer is filled with water and sealed, the cup is placed in contact with the soil. Under unsaturated conditions the soil water is held by capillary forces which are less than atmospheric pressure. Water will leave or enter the tensiometer until the suction in the inside the tensiometer is equal to that of the water in the soil. The water-wet pores in the porous cup prevent soil air from entering the tensiometer. The pressure inside the tensiometers was measured with a portable pressure transducer instead of a mercury manometer.

The tensiometers were constructed in such a way that a tensimeter (Soil Measurement Systems, Tucson, AZ) was used to measure pressure head. The use of the tensimeter is described by Marthaler et al. (1983). The barrel of the tensiometer consists of schedule 80 PVC pipe. The porous cup was epoxied to one end of the pipe which had been beveled so the cup would fit securely. The other end of the PVC pipe was joined to

Changing the design of the tensiometers could allow for closer spacing of them. The tensiometers used in this project were designed so the tensimeter could be used to measure the pressure inside without using mercury manometers which are difficult to maintain. If and when inexpensive and accurate pressure transducers could be attached to each porous cup, there would no longer be the concern of one tensiometer failing and affecting the other tensiometers as the fluid from inside drains past them.

Field observations show that the current tensiometers are sensitive to changes in temperature. Readings were taken early in the morning to minimize these effects. Pressure transducers buried with the tensiometer cup would isolate the fluid and vapor gap from large diurnal temperature changes which can affect the pressures measured in the tensiometers. The volume of fluid required to fill each tensiometer would be reduced, thus making the failure of one tensiometer less likely to affect nearby ones. Having all of the tensiometers beneath the frost line in the soil would make it unnecessary to use antifreeze solutions which may have a possible effect on the pressure head measurements.

Comparing the calculated recharge rates as they vary with time suggests that the frequency of pressure head measurements may be very important. For this reason it is suggested that any future studies dealing with calculating the effects of plants on soil-moisture movement uses a shorter interval between readings. Individual pressure transducers could be used with an automated data logger to study pressure gradients at shorter time intervals. The tensimeter system is too labor intensive to take many measurements repeatedly in a short time span. This is especially true during rainfall events because tensimeters and personnel do not work well when wet. Knowing when to monitor based on precipitation events is difficult when the researcher is far away from the field site. Automatic data collection would overcome these problems by making more measurements which could be discarded if not needed. All of these suggestions depend upon budget constraints and what aspect of the soil-moisture movement the field investigator is seeking to examine.

Chloride Mass Balance Analysis The chloride mass balance method apparently was not suited for use at the current site. Further investigations would be necessary to determine what causes the high chloride concentrations in the soil profiles at the site. The predicted recharge rates form the chloride profiles do not compare with the eight other methods used at the site.

One obvious solution would be to pick a different site which has a greater depth to the water table. The plants would not be able extract chloride from the groundwater if it is beyond the reach of their roots. Or a site without the halophytic fourwing saltbush might be suitable. Such a site would most likely not have the ideal soil which made the current site so attractive.

If the chloride method is to be used at the current site, a better understanding of the uptake of ions by the vegetation is needed. This would require the cooperation of experts in plant physiology. The most direct way of determining where the fourwing saltbush is getting its chloride may be to use some type of chlorine isotope as a tracer. This could be done in a similar way in which isotopes of carbon were used to trace the pathway of carbon in photosynthesis. If a detectable form of chloride was introduced into a specific area of the root zone, its accumulation could monitored in the plant tissue at the surface. This could identify from which area the plants are extracting chloride. At the current site this could determine if chloride is being extracted from the groundwater. If it is not from the groundwater the likely source of chloride would be from the Rio Salado overflowing its banks.

REFERENCES

American Public Health Association, 1960, Standard Methods for the Examination of Water and Waste-water, 79-81.

Allison, G.B. and M.W. Hughes, 1983, The use of natural tracers as indicators of soil-water movement in a temperate semi-arid region, Journal of Hydrology, 60:151-173.

Allison, G.B., W.J. Stone and M.W. Hughes, 1985, Recharge in karst dune elements of a semi-arid landscape as indicated by natural isotopes and chloride, Journal of Hydrology, 76:1-25.

Bailey, H.P., 1981, Climatic features of deserts, in Water in Desert Ecosystems, ed. by J.L. Thames and D.D. Evans, Dowden, Hutchinsion & Ross Inc., Stroudsburg, PA.

Bernstein, L., 1981, Effects of salinity and soil water regime on crop yields, in Salinity in Irrigation and Water Resources, ed. by D. Yaron, Marcel Dekker Inc., New York.

Caldwell, M.M., 1974, Physiology of desert halophytes, in Ecology of Halophytes, ed. by R.J. Reimold and H. W. Queen, Academic Press, New York.

Dwyer, D.D. and H.C. DeGarmo, 1970, Greenhouse productivity and water-use efficiency of selected desert shrubs and grasses under four soil-moisture levels, New Mexico State University Agricultural Experimental Station Bulletin, 570:1-15.

Evans, D.D., T.W. Sammis, D.R. Cable, 1981, Actual evapotranspiration under desert conditions, in Water in Desert Ecosystems, ed. by J.L. Thames and D.D. Evans, Dowden, Hutchinson & Ross Inc., Stroudsburg, PA.

Farrington, P., and G.A. Bartle, 1987, Water and chloride balance on coastal deep sands of south Western Australia, CSIRO Wembley, WA 6014, Australia, 1-14.

Gardner, W.R., 1967, Water uptake and salt-distribution patterns in saline soils, Symposium Isotope and Radiation Techniques in Soil Physics and Irrigation Studies, Istanbul Int. Atomic Energy Agency, Vienna, 335-340.

Gee, G.W., and D. Hillel, 1988, Groundwater recharge in arid regions: review and critique of estimation methods, Hydrological Processes, vol 2, 255-266.

Goodin, J.R. and A. Mozafar, 1971, Physiology of salinity stress, in Wildland Shrubs-Their Biology and Utilization, An International Symposium, Logan, Utah 255-259.

Hillel, D., 1980, Fundamentals of Soil Physics, Academic Press, New York, 413 pp.

Johnston, C.D., 1987, (a) Distribution of environmental chloride in relation to subsurface hydrology, Journal of Hydrology, 94:67-88.

Johnston, C.D., 1987, (b) Preferred water flow and localised recharge in a variable regolith, Journal of Hydrology, 94:129-142.

Kickham, B.J., 1987, A field study on the water use of a Dalea scoparia plant in the northern Chihuahuan desert, unpublished independent study paper, New Mexico Institute of Mining and Technology, Socorro, New Mexico.

Knowlton, R.G., Jr., 1984, Field study and numerical simulation of natural ground-water recharge, unpublished independent study paper, New Mexico Institute of Mining and Technology, Socorro, New Mexico.

Leavitt, M., 1986, Spatial variability of the hydrologic parameters of soils at the Sevilleta site, unpublished independent study paper, New Mexico Institute of Mining and Technology, Socorro, New Mexico.

Machette, M.C., 1978, Geologic map of the San Acacia Quadrangle, Socorro County, New Mexico, Map GQ-1415, USGS, Washington DC.

Marthaler, H.P., W. Vogelsanger, F. Richard and P.J. Wieranga, 1983, A pressure transducer for the field tensiometers, Soil Science Society of America Journal, vol 47, 624-627.

Mathias, A.D., H.M. Hassan, Y.-Q Hu, J.E. Watson, and A.W.Warrick, 1986, Evapotranspiration estimates derived from subsoil salinity data, Journal of Hydrology, 85:209-223.

McCord, J.T., 1984, Topographic controls on ground-water recharge at a sandy site, unpublished independent study paper, New Mexico Institute of Mining and Technology, Socorro, New Mexico.

McCord, J.T., 1989, Hysteresis and state-dependent anisotropy in variably saturated flow: field, laboratory, and numerical modeling investigation, doctoral dissertation, New Mexico Institute of Mining and Technology, Socorro, New Mexico.

McKim, H.L., R.L. Berg, R.W. McGaw, R.T. Atkins and J. Ingersoll, 1976, Development of a remote reading tensiometer/transducer system for use in subfreezing temperatures, in Proceedings 2nd Conference on Soil-Water Problems in Cold Regions, Edmonton, Alberta, Canada, 31-45.

Nimah, M.N., and R.J. Hanks, 1973, Model for estimating soil water, plant, and atmospheric interrelations: II. field test of model, Soil Science society of America Proceedings, 37:528-532.

Petrov, M.P., Deserts of the World, 1976, Keter Publishing House, Jerusalem, 447 pp.

Phillips, J., 1987, Southwestern Landscaping with Native Plants, Museum of New Mexico Press, Santa Fe, NM, 140 pp.

Phillips, F.M., J.L. Mattick and T.A. Duval, 1987, Quantification of groundwater recharge rates in New Mexico using bomb ^{36}Cl, bomb-^{3}H, and chloride as soil-water tracers, New Mexico Water Resour. Res. Institute, Tech. Completion Report, Proj. No. 1423638 and 14223654, N.M. Water Resour. Res. Inst., Las Cruces, NM, 165 pp.

Phillips, F.M., J.L. Mattick and T.A. Duval, 1988, Chlorine 36 and tritium from nuclear weapons fallout as tracers for long-term liquid and vapor movement in desert soils, Water Resour. Res., 24(11)1877-1891.

Phillips, F.M., K.N. Trotman, H.W. Bentley, and S.N. Davis, 1984, The bomb ^{36}Cl pulse as a tracer for soil-water movement near Socorro, New Mexico, in Proc. Conf. on Water Quality and Pollution in New Mexico, ed. by W.J. Stone, New Mexico Bur. of Min. Resour. Special Publication.

Queen, W.H., 1974, Physiology of coastal halophytes, in Ecology of Halophytes, ed. by R.J. Reimold and W.H. Queen, Academic Press, New York.

Ronen, D., M. Magaritz, H. Gvirtzman and W. Garner, 1987, Microscale chemical heterogeneity in groundwater, Journal of Hydrology, 92:173-178.

Sharma, M.L., and A.B. Craig, 1987, Comparative recharge rates beneath banksia woodland and two pine plantations on the Gnangara Mound, Western Australia, CSIRO, Wembley, WA 6014, Australia, 18 pp.

Sharma, M.L., and M.W. Hughes, 1985, Groundwater recharge estimation using chloride, deuterium and oxygen-18 profiles in the deep coastal sands of Western Australia, Journal of Hydrology, 81:93-109.

Stans, T., 1989, Manager, Sevilleta National Wildlife Refuge, San Acacia, New Mexico, telephone conversation of October 7.

Stein, T.L., 1989, Moisture movement at a desert site, unpublished independent study paper, New Mexico Institute of Mining and Technology, Socorro, New Mexico.

Stephens, D.B., and R.G. Knowlton, Jr., 1986, Soil watermovement and recharge through sand at a semiarid site in New Mexico, Water Resour. Res., 22(6)881-889.

Stephens, D.B., R.G. Knowlton, Jr., J. T. McCord, and W. Cox, 1985, Field Study of Natural Ground-Water Recharge in a Semiarid Lowland, New Mexico Water Resour. Res. Institute, Tech. Completion Report, Proj. No. 1345679, N.M. Water Resour. Res. Inst., Las Cruces, Nm, 91 pp.

Stephens, D.B., S.P. Neuman, S. Tyler, K. Lambert, D.Watson, R. Knowlton, Jr., E. Byers, and S. Yates, 1983, Insitu determination of Hydraulic Conductivity in the Vadose Zone using Borehole Infiltration Tests, Tech. Compl. Rep., Project B-0703-NMEX, N.M. Water Resour. Res. Inst., Las Cruces, NM, 165 pp.

Stone, W.J. and B.E. McGurk, 1985, Groundwater recharge on the southern high plains , east central New Mexico, New Mexico Geological Society Guidebook, 36th Field Conference, Santa Rosa, pp 331-335.

Thames, J.L., and D.D. Evans, 1981, Desert ecosystems: an overview, in Water in Desert Ecosystems, ed. by J.L. Thames and D.D. Evans, Dowden, Hutchinsion & Ross Inc., Stroudsburg, PA.

Wendt, C.W., O.C. Wilke and L.L. New, 1978, Use of methanol-water solutions for freeze protection of tensiometers, Agronomy Journal, vol 70, September-October, 890-891.

Appendices

Appendix A:

Weather Data

Weather Data

October 27, 1987 (Julian day 300) to
December 17, 1987 (Julian day 351)

Measurements taken hourly, ******** denotes a break in the record.

Channel number	Meaning
01	Data logger identification
02	Julian day
03	24 hour time
04	Precipitation (mm)
05	Temperature (^{o}C)
06	Relative humidity (%)
07	Solar radiation (watts/m^2)
08	Wind speed (m/hour)
09	Wind direction (degrees from north, east = 90^{o}).

NOTE: Record starting Julian day 337 has output order as follows:

Channel number	Meaning
01	Data logger identification
02	Temperature (^{o}C)
03	Relative humidity (%)
04	Solar radiation (watts/m^2)
05	Wind speed (m/hr)
06	Wind direction (degrees from north, east = 90^{o}.)
07	Precipitation (mm)

08	Julian day
09	24 hour time.

NOTE:

6999 indicates reading off scale, probably due to sensor failure
0000 indicates instrument not connected
xx???? indicates data transmittal problem

01+0107. 02+0300. 03+1700. 04+0.000 05+20.55 06+19.67 07+0.004 08+0.680
09+316.0
01+0107. 02+0300. 03+1800. 04+0.000 05+19.31 06+20.76 07+0.000 08+1.263
09+273.5
01+0107. 02+0300. 03+1900. 04+0.000 05+17.62 06+24.20 07-0.001 08+1.056
09+284.6
01+0107. 02+0300. 03+2000. 04+0.000 05+17.62 06+25.97 07-0.001 08+1.707
09+288.1
01+0107. 02+0300. 03+2100. 04+0.000 05+18.83 06+24.26 07-0.001 08+2.853
09+297.3
01+0107. 02+0300. 03+2200. 04+0.000 05+17.21 06+26.48 07-0.001 08+1.245
09+164.2
01+0107. 02+0300. 03+2300. 04+0.000 05+15.94 06+30.11 07-0.001 08+1.666
09+248.0

01+0107. 02+0301. 03+0000. 04+0.000 05+14.64 06+32.82 07-0.001 08+1.095
09+221.4
01+0107. 02+0301. 03+0100. 04+0.000 05+13.92 06+34.28 07-0.001 08+1.246
09+242.9
01+0107. 02+0301. 03+0200. 04+0.000 05+11.65 06+40.17 07-0.001 08+0.897
09+265.4
01+0107. 02+0301. 03+0300. 04+0.000 05+09.22 06+46.25 07-0.001 08+1.029
09+257.3
01+0107. 02+0301. 03+0400. 04+0.000 05+09.11 06+49.51 07-0.001 08+1.407
09+287.3
01+0107. 02+0301. 03+0500. 04+0.000 05+08.85 06+50.98 07-0.001 08+1.250
09+262.3
01+0107. 02+0301. 03+0600. 04+0.000 05+07.63 06+62.61 07-0.001 08+1.015
09+236.0
01+0107. 02+0301. 03+0700. 04+0.000 05+08.79 06+60.47 07+0.005 08+1.399
09+245.0
01+0107. 02+0301. 03+0800. 04+0.000 05+10.96 06+54.26 07+0.050 08+0.911
09+139.2
01+0107. 02+0301. 03+0900. 04+0.000 05+14.63 06+43.54 07+0.102 08+1.481
09+141.4
01+0107. 02+0301. 03+1000. 04+0.000 05+17.32 06+33.39 07+0.207 08+1.539
09+140.3
01+0107. 02+0301. 03+1100. 04+0.000 05+20.90 06+21.90 07+0.316 08+1.318
09+149.3
01+0107. 02+0301. 03+1200. 04+0.000 05+22.86 06+18.09 07+0.254 08+1.394
09+192.4
01+0107. 02+0301. 03+1300. 04+0.000 05+21.45 06+20.13 07+0.086 08+2.838
09+245.1
01+0107. 02+0301. 03+1400. 04+0.000 05+19.68 06+33.19 07+0.113 08+4.551
09+320.9
01+0107. 02+0301. 03+1500. 04+0.000 05+19.89 06+35.15 07+0.094 08+3.190
09+212.2
01+0107. 02+0301. 03+1600. 04+0.000 05+19.39 06+36.19 07+0.050 08+3.071
09+104.3
01+0107. 02+0301. 03+1700. 04+0.000 05+18.26 06+39.59 07+0.018 08+1.095
09+137.5
01+0107. 02+0301. 03+1800. 04+0.000 05+16.78 06+43.05 07+0.004 08+1.214
09+220.7
01+0107. 02+0301. 03+1900. 04+0.000 05+13.83 06+52.78 07-0.001 08+0.765
09+175.6

01+0107. 02+0301. 03+2000. 04+0.000 05+11.63 06+072.6 07-0.001 08+0.599
09+228.6
01+0107. 02+0301. 03+2100. 04+0.000 05+10.75 06+082.3 07-0.001 08+1.154
09+281.7
01+0107. 02+0301. 03+2200. 04+0.000 05+11.91 06+084.7 07-0.001 08+1.439
09+287.5
01+0107. 02+0301. 03+2300. 04+0.000 05+12.74 06+084.9 07-0.001 08+1.053
09+213.6

01+0107. 02+0302. 03+0000. 04+0.000 05+16.48 06+085.1 07-0.001 08+1.857
09+275.0
01+0107. 02+0302. 03+0100. 04+0.000 05+18.99 06+083.0 07-0.001 08+2.904
09+315.5
01+0107. 02+0302. 03+0200. 04+0.000 05+20.40 06+083.1 07-0.001 08+1.919
09+190.6
01+0107. 02+0302. 03+0300. 04+0.000 05+22.20 06+083.9 07-0.001 08+0.934
09+211.0
01+0107. 02+0302. 03+0400. 04+0.000 05+25.73 06+083.1 07-0.001 08+1.083
09+224.0
01+0107. 02+0302. 03+0500. 04+2.000 05+37.64 06+078.9 07-0.001 08+1.644
09+268.9
01+0107. 02+0302. 03+0600. 04+0.000 05+39.08 06+077.7 07-0.001 08+0.600
09+209.0
01+0107. 02+0302. 03+0700. 04+0.000 05+40.14 06+077.1 07+0.004 08+0.530
09+220.7
01+0107. 02+0302. 03+0800. 04+0.000 05+53.25 06+072.7 07+0.064 08+0.447
09+240.6
01+0107. 02+0302. 03+0900. 04+0.000 05-6999. 06+6999. 07+0.208 08+0.447
09+186.3
01+0107. 02+0302. 03+1000. 04+0.000 05+33.95 06+68.75 07+0.327 08+0.447
09+142.6
01+0107. 02+0302. 03+1100. 04+0.000 05+18.77 06+63.26 07+0.406 08+0.666
09+148.8
01+0107. 02+0302. 03+1200. 04+0.000 05+20.47 06+51.40 07+0.458 08+1.522
09+185.5
01+0107. 02+0302. 03+1300. 04+0.000 05+22.16 06+42.20 07+0.457 08+2.589
09+216.5
01+0107. 02+0302. 03+1400. 04+0.000 05+23.31 06+33.64 07+0.367 08+3.170
09+251.0
01+0107. 02+0302. 03+1500. 04+0.000 05+23.88 06+22.45 07+0.322 08+4.211
09+298.8
01+0107. 02+0302. 03+1600. 04+0.000 05+23.53 06+13.88 07+0.202 08+5.591
09+323.6
01+0107. 02+0302. 03+1700. 04+0.000 05+22.28 06+14.43 07+0.073 08+4.758
09+330.4
150
09+330.3
01+0107. 02+0302. 03+1900. 04+0.000 05+18.96 06+18.25 07-0.001 08+3.744
09+320.9
01+0107. 02+0302. 03+2000. 04+0.000 05+17.11 06+23.71 07-0.001 08+3.109
09+320.8
01+0107. 02+0302. 03+2100. 04+0.000 05+16.28 06+29.17 07-0.001 08+3.782
09+331.5
01+0107. 02+0302. 03+2200. 04+0.000 05+15.49 06+33.56 07-0.001 08+3.887
09+313.8
01+0107. 02+0302. 03+2300. 04+0.000 05+13.52 06+40.72 07-0.001 08+3.066

09+323.7

01+0107. 02+0303. 03+0000. 04+0.000 05+10.52 06+54.48 07-0.001 08+1.168
09+219.1
01+0107. 02+0303. 03+0100. 04+0.000 05+09.37 06+62.65 07-0.001 08+1.661
09+320.6
01+0107. 02+0303. 03+0200. 04+0.000 05+07.57 06+072.7 07-0.001 08+1.965
09+289.0
01+0107. 02+0303. 03+0300. 04+0.000 05+07.17 06+077.0 07-0.001 08+1.199
09+267.0
01+0107. 02+0303. 03+0400. 04+0.000 05+6.762 06+082.3 07-0.001 08+1.645
09+292.9
01+0107. 02+0303. 03+0500. 04+0.000 05+08.02 06+082.3 07-0.001 08+1.432
09+287.8
01+0107. 02+0303. 03+0600. 04+0.000 05+07.69 06+083.3 07-0.001 08+1.466
09+182.6
01+0107. 02+0303. 03+0700. 04+0.000 05+08.46 06+084.0 07+0.010 08+1.085
09+170.2
01+0107. 02+0303. 03+0800. 04+0.000 05+12.43 06+081.3 07+0.064 08+0.836
09+234.4
01+0107. 02+0303. 03+0900. 04+0.000 05+12.84 06+68.03 07+0.151 08+0.738
09+109.0
01+0107. 02+0303. 03+1000. 04+0.000 05+13.82 06+52.71 07+0.152 08+0.961
09+128.0
01+0107. 02+0303. 03+1100. 04+0.000 05+14.34 06+49.97 07+0.127 08+1.355
09+165.1
01+0107. 02+0303. 03+1200. 04+0.000 05+15.40 06+44.49 07+0.148 08+1.272
09+145.1
01+0107. 02+0303. 03+1300. 04+0.000 05+16.74 06+39.62 07+0.147 08+1.097
09+137.0
01+0107. 02+0303. 03+1400. 04+0.000 05+17.54 06+37.88 07+0.155 08+1.176
09+158.7
01+0107. 02+0303. 03+1500. 04+0.000 05+15.80 06+49.72 07+0.059 08+1.379
09+170.4
01+0107. 02+0303. 03+1600. 04+0.000 05+14.41 06+63.47 07+0.034 08+0.737
09+089.9
01+0107. 02+0303. 03+1700. 04+1.000 05+13.83 06+076.1 07+0.005 08+0.488
09+137.6
01+0107. 02+0303. 03+1800. 04+0.000 05+14.06 06+082.2 07-0.001 08+0.451
09+167.6
200
09+313.6
01+0107. 02+0303. 03+2000. 04+0.000 05+19.49 06+083.3 07-0.001 08+0.940
09+307.1
01+0107. 02+0303. 03+2100. 04+0.000 05+23.76 06+082.6 07-0.001 08+0.949
09+298.5
01+0107. 02+0303. 03+2200. 04+0.000 05+26.55 06+081.5 07-0.001 08+0.599
09+258.2
01+0107. 02+0303. 03+2300. 04+1.000 05+29.04 06+081.2 07-0.001 08+0.569
09+195.3

01+0107. 02+0304. 03+0000. 04+0.000 05+34.89 06+079.2 07-0.001 08+1.813
09+211.5
01+0107. 02+0304. 03+0100. 04+0.000 05+40.31 06+077.3 07-0.001 08+0.769
09+215.9
01+0107. 02+0304. 03+0200. 04+0.000 05+42.74 06+076.3 07-0.001 08+0.522

09+221.5
01+0107. 02+0304. 03+0300. 04+0.000 05+51.01 06+073.2 07-0.001 08+0.568
09+226.7
01+0107. 02+0304. 03+0400. 04+0.000 05+53.48 06+072.1 07-0.001 08+0.614
09+216.5
01+0107. 02+0304. 03+0500. 04+0.000 05+54.34 06+071.6 07-0.001 08+0.592
09+229.8
01+0107. 02+0304. 03+0600. 04+0.000 05+59.53 06+69.54 07-0.001 08+0.525
09+232.8
01+0107. 02+0304. 03+0700. 04+0.000 05+64.21 06+67.71 07+0.000 08+0.505
09+291.7
01+0107. 02+0304. 03+0800. 04+0.000 05-6999. 06+6999. 07+0.029 08+0.755
09+217.0
01+0107. 02+0304. 03+0900. 04+0.000 05-6999. 06+6999. 07+0.087 08+0.966
09+085.2
01+0107. 02+0304. 03+1000. 04+0.000 05-6999. 06+6999. 07+0.176 08+1.514
09+090.4
01+0107. 02+0304. 03+1100. 04+0.000 05-6999. 06+6999. 07+0.168 08+1.458
09+124.1
01+0107. 02+0304. 03+1200. 04+0.000 05+29.79 06+072.4 07+0.281 08+1.176
09+175.8
01+0107. 02+0304. 03+1300. 04+0.000 05+19.16 06+69.20 07+0.331 08+2.570
09+182.7
01+0107. 02+0304. 03+1400. 04+0.000 05+20.07 06+53.45 07+0.368 08+4.257
09+225.5
01+0107. 02+0304. 03+1500. 04+0.000 05+20.47 06+49.79 07+0.289 08+4.907
09+220.5
01+0107. 02+0304. 03+1600. 04+0.000 05+19.32 06+53.61 07+0.088 08+4.321
09+221.1
01+0107. 02+0304. 03+1700. 04+4.000 05+14.65 06+078.2 07+0.001 08+3.878
09+246.3
01+0107. 02+0304. 03+1800. 04+0.000 05+18.10 06+081.6 07+0.000 08+2.036
09+286.9
01+0107. 02+0304. 03+1900. 04+0.000 05+19.74 06+081.6 07-0.001 08+2.014
09+175.5
01+0107. 02+0304. 03+2000. 04+0.000 05+23.90 06+081.5 07-0.001 08+0.945
09+214.2
01+0107. 02+0304. 03+2100. 04+0.000 05+26.56 06+080.8 07-0.001 08+0.997
09+208.1
01+0107. 02+0304. 03+2200. 04+0.000 05+26.98 06+080.7 07-0.001 08+0.934
09+190.3
01+0107. 02+0304. 03+2300. 04+0.000 05+29.63 06+079.7 07-0.001 08+0.739
09+203.5

01+0107. 02+0305. 03+0000. 04+0.000 05+28.46 06+079.8 07-0.001 08+0.611
09+248.0
01+0107. 02+0305. 03+0100. 04+0.000 05+26.83 06+080.2 07-0.001 08+0.812
09+210.0
01+0107. 02+0305. 03+0200. 04+0.000 05+28.81 06+079.4 07-0.001 08+1.216
09+283.3
01+0107. 02+0305. 03+0300. 04+0.000 05+42.11 06+074.9 07-0.001 08+1.473
09+244.9
01+0107. 02+0305. 03+0400. 04+0.000 05+53.87 06+070.5 07-0.001 08+1.696
09+128.6
01+0107. 02+0305. 03+0500. 04+0.000 05+61.18 06+68.00 07-0.001 08+1.115
09+076.0

01+0107. 02+0305. 03+0600. 04+0.000 05+071.6 06+64.37 07-0.001 08+1.207
09+242.6
01+0107. 02+0305. 03+0700. 04+0.000 05-6999. 06+6999. 07+0.003 08+1.833
09+200.9
01+0107. 02+0305. 03+0800. 04+0.000 05-6999. 06+6999. 07+0.036 08+2.182
09+121.1
01+0107. 02+0305. 03+0900. 04+0.000 05-6999. 06+6999. 07+0.100 08+1.196
09+222.6
01+0107. 02+0305. 03+1000. 04+0.000 05-6999. 06+6999. 07+0.145 08+0.945
09+203.1
01+0107. 02+0305. 03+1100. 04+0.000 05-6999. 06+6999. 07+0.256 08+1.236
09+161.3
01+0107. 02+0305. 03+1200. 04+0.000 05-6999. 06+6999. 07+0.435 08+1.782
09+189.3
01+0107. 02+0305. 03+1300. 04+0.000 05-6999. 06+6999. 07+0.402 08+2.296
09+215.1
01+0107. 02+0305. 03+1400. 04+0.000 05+19.07 06+51.23 07+0.379 08+2.817
09+215.1
01+0107. 02+0305. 03+1500. 04+0.000 05+19.26 06+41.87 07+0.291 08+2.332
09+214.5
01+0107. 02+0305. 03+1600. 04+0.000 05+19.40 06+39.87 07+0.178 08+2.110
09+203.5
01+0107. 02+0305. 03+1700. 04+0.000 05+18.46 06+42.11 07+0.053 08+1.149
09+168.1
01+0107. 02+0305. 03+1800. 04+0.000 05+14.55 06+61.82 07+0.000 08+0.667
09+235.3
01+0107. 02+0305. 03+1900. 04+0.000 05+13.65 06+62.19 07-0.002 08+0.959
09+229.2
01+0107. 02+0305. 03+2000. 04+0.000 05+13.14 06+62.57 07-0.001 08+1.146
09+142.9
01+0107. 02+0305. 03+2100. 04+0.000 05+10.81 06+073.8 07-0.001 08+1.229
09+266.5
01+0107. 02+0305. 03+2200. 04+0.000 05+11.10 06+081.3 07-0.001 08+0.836
09+256.8
01+0107. 02+0305. 03+2300. 04+0.000 05+16.29 06+081.4 07-0.001 08+1.411
09+164.6

01+0107. 02+0306. 03+0000. 04+0.000 05+24.07 06+079.2 07-0.001 08+1.626
09+290.7
01+0107. 02+0306. 03+0100. 04+0.000 05+25.30 06+078.9 07-0.001 08+1.836
09+247.0
01+0107. 02+0306. 03+0200. 04+0.000 05+31.38 06+077.1 07-0.001 08+1.689
09+238.8
01+0107. 02+0306. 03+0300. 04+0.000 05+35.03 06+075.8 07-0.001 08+2.276
09+335.4
01+0107. 02+0306. 03+0400. 04+0.000 05+31.44 06+076.6 07-0.001 08+1.564
09+299.7
01+0107. 02+0306. 03+0500. 04+0.000 05+27.00 06+078.4 07-0.001 08+0.912
09+207.5
01+0107. 02+0306. 03+0600. 04+0.000 05+27.75 06+078.5 07-0.001 08+0.605
09+183.9
01+0107. 02+0306. 03+0700. 04+0.000 05+30.30 06+077.7 07+0.006 08+1.178
09+253.2
01+0107. 02+0306. 03+0800. 04+0.000 05+59.10 06+67.80 07+0.098 08+1.862
09+317.8
01+0107. 02+0306. 03+0900. 04+0.000 05+31.04 06+69.29 07+0.194 08+1.842

09+092.4
01+0107. 02+0306. 03+1000. 04+0.000 05+14.06 06+64.35 07+0.250 08+1.173
09+191.7
01+0107. 02+0306. 03+1100. 04+0.000 05+15.14 06+58.73 07+0.267 08+1.402
09+151.6
01+0107. 02+0306. 03+1200. 04+0.000 05+16.87 06+51.29 07+0.368 08+1.767
09+139.0
01+0107. 02+0306. 03+1300. 04+0.000 05+18.68 06+44.26 07+0.361 08+1.804
09+164.6
01+0107. 02+0306. 03+1400. 04+0.000 05+20.11 06+38.01 07+0.301 08+1.537
09+164.3
01+0107. 02+0306. 03+1500. 04+0.000 05+19.95 06+33.99 07+0.172 08+1.498
09+156.2
01+0107. 02+0306. 03+1600. 04+0.000 05+20.09 06+31.68 07+0.146 08+1.191
09+182.2
01+0107. 02+0306. 03+1700. 04+0.000 05+19.99 06+32.62 07+0.069 08+1.168
09+197.2
01+0107. 02+0306. 03+1800. 04+0.000 05+15.45 06+48.81 07+0.000 08+0.880
09+245.9
01+0107. 02+0306. 03+1900. 04+0.000 05+11.84 06+65.72 07-0.002 08+0.665
09+264.9
01+0107. 02+0306. 03+2000. 04+0.000 05+10.81 06+074.3 07-0.001 08+1.034
09+292.4
01+0107. 02+0306. 03+2100. 04+0.000 05+12.45 06+077.9 07-0.001 08+1.642
09+250.8
4
09+276.2
01+0107. 02+0306. 03+2300. 04+0.000 05+11.47 06+075.8 07-0.001 08+2.540
09+340.7

01+0107. 02+0307. 03+0000. 04+0.000 05+11.63 06+076.2 07-0.001 08+2.528
09+331.5
01+0107. 02+0307. 03+0100. 04+0.000 05+10.74 06+078.4 07-0.001 08+1.364
09+266.9
01+0107. 02+0307. 03+0200. 04+0.000 05+11.30 06+081.2 07-0.001 08+0.991
09+292.8
01+0107. 02+0307. 03+0300. 04+0.000 05+12.05 06+082.1 07-0.001 08+0.733
09+278.4
01+0107. 02+0307. 03+0400. 04+0.000 05+16.49 06+081.8 07-0.001 08+1.871
09+327.3
01+0107. 02+0307. 03+0500. 04+0.000 05+20.79 06+080.4 07-0.001 08+2.097
09+339.4
01+0107. 02+0307. 03+0600. 04+0.000 05+22.31 06+079.7 07-0.001 08+2.153
09+337.0
01+0107. 02+0307. 03+0700. 04+0.000 05+23.31 06+079.4 07+0.003 08+2.057
09+315.1
01+0107. 02+0307. 03+0800. 04+0.000 05+27.44 06+076.3 07+0.108 08+0.786
09+160.5
01+0107. 02+0307. 03+0900. 04+0.000 05+17.40 06+65.44 07+0.226 08+1.288
09+134.9
01+0107. 02+0307. 03+1000. 04+0.000 05+15.07 06+52.16 07+0.335 08+1.336
09+130.6
01+0107. 02+0307. 03+1100. 04+0.000 05+18.23 06+41.72 07+0.412 08+1.449
09+134.0
01+0107. 02+0307. 03+1200. 04+0.000 05+19.81 06+34.36 07+0.368 08+2.067
09+125.6

01+0107. 02+0307. 03+1300. 04+0.000 05+20.88 06+30.32 07+0.409 08+2.528
09+114.5
01+0107. 02+0307. 03+1400. 04+0.000 05+22.15 06+21.91 07+0.347 08+2.287
09+123.5
01+0107. 02+0307. 03+1500. 04+0.000 05+22.04 06+19.05 07+0.260 08+1.915
09+128.7
01+0107. 02+0307. 03+1600. 04+0.000 05+21.97 06+18.07 07+0.165 08+1.343
09+158.9
01+0107. 02+0307. 03+1700. 04+0.000 05+20.64 06+18.29 07+0.062 08+1.085
09+144.5
01+0107. 02+0307. 03+1800. 04+0.000 05+16.34 06+30.23 07+0.000 08+0.816
09+256.5
01+0107. 02+0307. 03+1900. 04+0.000 05+11.19 06+50.23 07-0.002 08+0.670
09+291.9
01+0107. 02+0307. 03+2000. 04+0.000 05+10.10 06+59.63 07-0.002 08+1.488
09+313.1
01+0107. 02+0307. 03+2100. 04+0.000 05+10.06 06+58.37 07-0.002 08+1.118
09+188.8
01+0107. 02+0307. 03+2200. 04+0.000 05+09.11 06+63.67 07-0.001 08+2.019
09+315.9
01+0107. 02+0307. 03+2300. 04+0.000 05+09.84 06+61.54 07-0.001 08+2.233
09+310.4

01+0107. 02+0308. 03+0000. 04+0.000 05+09.42 06+62.86 07-0.001 08+2.254
09+239.8
01+0107. 02+0308. 03+0100. 04+0.000 05+09.05 06+63.56 07-0.001 08+2.646
09+327.3
01+0107. 02+0308. 03+0200. 04+0.000 05+09.10 06+62.73 07-0.001 08+2.728
09+329.1
01+0107. 02+0308. 03+0300. 04+0.000 05+09.69 06+60.82 07-0.001 08+1.691
09+263.1
01+0107. 02+0308. 03+0400. 04+0.000 05+08.62 06+68.70 07-0.001 08+1.560
09+174.4
01+0107. 02+0308. 03+0500. 04+0.000 05+09.29 06+075.0 07-0.001 08+1.468
09+240.2
01+0107. 02+0308. 03+0600. 04+0.000 05+10.49 06+077.5 07-0.001 08+0.991
09+214.1
01+0107. 02+0308. 03+0700. 04+0.000 05+10.77 06+080.5 07+0.001 08+0.893
09+232.3
01+0107. 02+0308. 03+0800. 04+0.000 05+15.18 06+078.0 07+0.009 08+1.355
09+248.9
01+0107. 02+0308. 03+0900. 04+1.000 05+14.83 06+079.5 07+0.017 08+0.953
09+167.4
01+0107. 02+0308. 03+1000. 04+0.000 05+23.02 06+081.5 07+0.045 08+0.568
09+121.5
01+0107. 02+0308. 03+1100. 04+0.000 05+33.75 06+077.2 07+0.107 08+0.827
09+280.2
01+0107. 02+0308. 03+1200. 04+0.000 05+31.13 06+69.94 07+0.286 08+1.307
09+179.1
01+0107. 02+0308. 03+1300. 04+0.000 05+16.64 06+67.37 07+0.083 08+2.058
09+243.0
01+0107. 02+0308. 03+1400. 04+0.000 05+16.54 06+071.5 07+0.143 08+1.533
09+239.2
01+0107. 02+0308. 03+1500. 04+0.000 05+17.46 06+67.14 07+0.228 08+1.519
09+189.1
01+0107. 02+0308. 03+1600. 04+0.000 05+17.74 06+63.54 07+0.136 08+1.631

09+201.7
01+0107. 02+0308. 03+1700. 04+0.000 05+16.01 06+66.74 07+0.019 08+1.071
09+208.9
01+0107. 02+0308. 03+1800. 04+0.000 05+14.73 06+073.6 07+0.000 08+0.667
09+229.7
01+0107. 02+0308. 03+1900. 04+0.000 05+14.92 06+079.7 07-0.002 08+0.961
09+257.8
01+0107. 02+0308. 03+2000. 04+0.000 05+19.05 06+080.8 07-0.001 08+0.645
09+202.4
01+0107. 02+0308. 03+2100. 04+0.000 05+23.24 06+079.9 07-0.001 08+1.212
09+268.6
01+0107. 02+0308. 03+2200. 04+0.000 05+21.67 06+074.8 07-0.001 08+2.006
09+220.9
01+0107. 02+0308. 03+2300. 04+0.000 05+17.79 06+077.7 07-0.001 08+3.027
09+223.3
5
09+213.2

01+0107. 02+0309. 03+0100. 04+1.000 05+33.44 06+078.5 07-0.001 08+2.999
09+222.7
01+0107. 02+0309. 03+0200. 04+0.000 05+50.78 06+072.6 07-0.001 08+3.548
09+205.6
01+0107. 02+0309. 03+0300. 04+0.000 05-6999. 06+6999. 07-0.001 08+2.786
09+196.3
01+0107. 02+0309. 03+0400. 04+0.000 05-6999. 06+6999. 07-0.001 08+2.967
09+213.7
01+0107. 02+0309. 03+0500. 04+0.000 05-6999. 06+6999. 07-0.001 08+2.834
09+228.3
01+0107. 02+0309. 03+0600. 04+0.000 05-6999. 06+6999. 07-0.001 08+3.562
09+231.1
01+0107. 02+0309. 03+0700. 04+0.000 05-6999. 06+6999. 07+0.003 08+3.141
09+240.8
01+0107. 02+0309. 03+0800. 04+0.000 05-6999. 06+6999. 07+0.081 08+1.438
09+279.5
01+0107. 02+0309. 03+0900. 04+0.000 05-6999. 06+6999. 07+0.161 08+2.791
09+238.0
01+0107. 02+0309. 03+1000. 04+0.000 05+42.18 06+070.6 07+0.198 08+3.223
09+226.4
01+0107. 02+0309. 03+1100. 04+0.000 05+21.19 06+072.5 07+0.256 08+3.964
09+229.8
01+0107. 02+0309. 03+1200. 04+0.000 05+18.90 06+53.79 07+0.436 08+5.351
09+249.8
01+0107. 02+0309. 03+1300. 04+0.000 05+19.68 06+41.50 07+0.389 08+5.089
09+240.9
01+0107. 02+0309. 03+1400. 04+0.000 05+19.83 06+39.23 07+0.346 08+4.820
09+224.2
01+0107. 02+0309. 03+1500. 04+0.000 05+20.98 06+29.37 07+0.254 08+3.597
09+254.9
01+0107. 02+0309. 03+1600. 04+0.000 05+19.65 06+27.61 07+0.153 08+4.130
09+250.8
01+0107. 02+0309. 03+1700. 04+0.000 05+18.49 06+21.01 07+0.024 08+4.308
09+311.5
01+0107. 02+0309. 03+1800. 04+0.000 05+14.33 06+32.05 07+0.000 08+6.446
09+241.2
01+0107. 02+0309. 03+1900. 04+0.000 05+12.52 06+36.92 07-0.002 08+5.644
09+268.4

01+0107. 02+0309. 03+2000. 04+0.000 05+10.80 06+42.28 07-0.001 08+2.982
09+200.8
01+0107. 02+0309. 03+2100. 04+0.000 05+09.40 06+51.09 07-0.001 08+2.086
09+301.1
01+0107. 02+0309. 03+2200. 04+0.000 05+09.26 06+52.21 07-0.001 08+2.227
09+316.0
01+0107. 02+0309. 03+2300. 04+0.000 05+08.45 06+57.27 07-0.001 08+1.699
09+256.9

01+0107. 02+0310. 03+0000. 04+0.000 05+5.265 06+073.5 07-0.001 08+0.977
09+179.6
01+0107. 02+0310. 03+0100. 04+0.000 05+6.146 06+080.4 07-0.001 08+1.839
09+273.9
01+0107. 02+0310. 03+0200. 04+0.000 05+5.242 06+081.2 07-0.001 08+1.574
09+292.6
01+0107. 02+0310. 03+0300. 04+0.000 05+5.662 06+083.9 07-0.001 08+1.460
09+289.9
01+0107. 02+0310. 03+0400. 04+0.000 05+08.58 06+082.7 07-0.001 08+1.846
09+317.9
01+0107. 02+0310. 03+0500. 04+0.000 05+08.41 06+083.7 07-0.001 08+1.963
09+298.4
01+0107. 02+0310. 03+0600. 04+0.000 05+09.60 06+082.4 07-0.001 08+2.164
09+333.4
01+0107. 02+0310. 03+0700. 04+0.000 05+6.252 06+083.4 07+0.002 08+1.140
09+179.8
01+0107. 02+0310. 03+0800. 04+0.000 05+08.91 06+074.6 07+0.086 08+2.430

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01+0107. 02+0314. 03+1500. 04+0.000 05+17.61 06+15.88 07+0.264 08+2.097
09+146.4
09+114.1
01+0107. 02+0314. 03+1700. 04+0.000 05+13.73 06+17.96 07+0.012 08+1.347
09+140.2
09+237.9
01+0107. 02+0314. 03+1900. 04+0.000 05+11.48 06+21.66 07-0.001 08+2.565
09+239.5
01+0107. 02+0314. 03+2000. 04+0.000 05+11.99 06+21.91 07-0.001 08+2.982
09+254.1
01+0107. 02+0314. 03+2100. 04+0.000 05+08.94 06+28.11 07-0.001 08+1.376
09+245.9
01+0107. 02+0314. 03+2200. 04+0.000 05+5.234 06+41.82 07-0.001 08+1.165
09+260.6
01+0107. 02+0314. 03+2300. 04+0.000 05+3.121 06+49.27 07-0.001 08+0.994
09+150.8

01+0107. 02+0315. 03+0000. 04+0.000 05+1.344 06+56.68 07-0.001 08+1.150
09+158.3
01+0107. 02+0315. 03+0100. 04+0.000 05+1.004 06+61.34 07-0.001 08+1.226
09+181.1
01+0107. 02+0315. 03+0200. 04+0.000 05-0.833 06+070.6 07-0.002 08+1.032
09+184.4
01+0107. 02+0315. 03+0300. 04+0.000 05-1.642 06+075.6 07-0.001 08+1.018
09+235.1
01+0107. 02+0315. 03+0400. 04+0.000 05-2.190 06+080.7 07-0.001 08+1.589
09+247.9

01+0107. 02+0315. 03+0500. 04+0.000 05+0.683 06+077.3 07-0.002 08+1.923
09+241.6
01+0107. 02+0315. 03+0600. 04+0.000 05-0.878 06+075.5 07-0.002 08+1.253
09+165.4
01+0107. 02+0315. 03+0700. 04+0.000 05-2.106 06+082.1 07+0.001 08+1.415
09+199.3
01+0107. 02+0315. 03+0800. 04+0.000 05+2.300 06+074.4 07+0.076 08+1.617
09+253.5
01+0107. 02+0315. 03+0900. 04+0.000 05+6.542 06+49.31 07+0.193 08+1.988
09+258.1
01+0107. 02+0315. 03+1000. 04+0.000 05+10.43 06+38.75 07+0.300 08+1.378
09+191.5
01+0107. 02+0315. 03+1100. 04+0.000 05+12.58 06+30.88 07+0.376 08+1.824
09+108.6
01+0107. 02+0315. 03+1200. 04+0.000 05+14.78 06+24.76 07+0.414 08+1.667
09+130.3
01+0107. 02+0315. 03+1300. 04+0.000 05+16.62 06+19.09 07+0.409 08+1.733
09+180.3
01+0107. 02+0315. 03+1400. 04+0.000 05+17.80 06+16.12 07+0.361 08+1.756
09+214.3
01+0107. 02+0315. 03+1500. 04+0.000 05+17.75 06+15.81 07+0.275 08+1.926
09+144.0
01+0107. 02+0315. 03+1600. 04+0.000 05+17.13 06+15.97 07+0.125 08+1.938
09+134.7
01+0107. 02+0315. 03+1700. 04+0.000 05+15.11 06+16.98 07+0.010 08+1.560
09+119.4
01+0107. 02+0315. 03+1800. 04+0.000 05+09.94 06+21.45 07+0.000 08+1.683
09+179.3
01+0107. 02+0315. 03+1900. 04+0.000 05+5.729 06+29.18 07-0.002 08+1.475
09+243.1
01+0107. 02+0315. 03+2000. 04+0.000 05+4.763 06+35.52 07-0.001 08+2.044
09+242.8
01+0107. 02+0315. 03+2100. 04+0.000 05+4.484 06+36.81 07-0.001 08+1.678
09+245.5
01+0107. 02+0315. 03+2200. 04+0.000 05+1.725 06+45.52 07-0.001 08+1.399
09+202.1
01+0107. 02+0315. 03+2300. 04+0.000 05+1.332 06+47.66 07-0.001 08+1.290
09+182.2

01+0107. 02+0316. 03+0000. 04+0.000 05+0.373 06+50.65 07-0.001 08+0.876
09+175.9
01+0107. 02+0316. 03+0100. 04+0.000 05-0.550 06+51.99 07-0.001 08+1.018
09+136.9
01+0107. 02+0316. 03+0200. 04+0.000 05-0.770 06+51.87 07-0.001 08+1.369
09+191.0
01+0107. 02+0316. 03+0300. 04+0.000 05-2.739 06+57.57 07-0.001 08+0.790
09+150.5
01+0107. 02+0316. 03+0400. 04+0.000 05-0.086 06+51.50 07-0.002 08+2.133
09+238.9
01+0107. 02+0316. 03+0500. 04+0.000 05-0.816 06+48.89 07-0.001 08+1.170
09+137.6
01+0107. 02+0316. 03+0600. 04+0.000 05-3.465 06+57.40 07-0.001 08+0.887
09+167.4
01+0107. 02+0316. 03+0700. 04+0.000 05-4.173 06+61.84 07+0.001 08+0.915
09-6999.
01+0107. 02+0316. 03+0800. 04+0.000 05-3.863 06+68.11 07+0.037 08+1.039

09+173.0
01+0107. 02+0316. 03+0900. 04+0.000 05+4.682 06+45.28 07+0.193 08+0.818
09+139.1
01+0107. 02+0316. 03+1000. 04+0.000 05+11.18 06+24.63 07+0.298 08+1.477
09+100.6
01+0107. 02+0316. 03+1100. 04+0.000 05+13.87 06+19.74 07+0.366 08+1.993
09+66.40
01+0107. 02+0316. 03+1200. 04+0.000 05+15.97 06+17.33 07+0.368 08+1.882
09+099.3
01+0107. 02+0316. 03+1300. 04+0.000 05+17.41 06+15.84 07+0.371 08+1.726
09+108.9
01+0107. 02+0316. 03+1400. 04+0.000 05+18.47 06+14.95 07+0.358 08+1.846
09+103.1
01+0107. 02+0316. 03+1500. 04+0.000 05+18.88 06+14.65 07+0.263 08+2.316
09+117.6
01+0107. 02+0316. 03+1600. 04+0.000 05+16.99 06+15.34 07+0.103 08+2.870
09+122.6
01+0107. 02+0316. 03+1700. 04+0.000 05+15.59 06+15.87 07+0.035 08+2.537
09+112.4
01+0107. 02+0316. 03+1800. 04+0.000 05+12.07 06+17.46 07+0.000 08+1.134
09+132.7
01+0107. 02+0316. 03+1900. 04+0.000 05+08.88 06+19.52 07-0.001 08+1.459
09+216.5
01+0107. 02+0316. 03+2000. 04+0.000 05+07.37 06+21.62 07-0.001 08+1.501
09+235.1
01+0107. 02+0316. 03+2100. 04+0.000 05+6.850 06+22.78 07-0.001 08+1.611
09+243.9
01+0107. 02+0316. 03+2200. 04+0.000 05+6.354 06+23.58 07-0.001 08+1.004
09+189.8
01+0107. 02+0316. 03+2300. 04+0.000 05+07.69 06+22.70 07-0.001 08+1.073
09+107.2

01+0107. 02+0317. 03+0000. 04+0.000 05+10.09 06+20.60 07-0.001 08+1.952
09+177.6
01+0107. 02+0317. 03+0100. 04+0.000 05+09.88 06+20.76 07-0.001 08+2.088
09+183.4
01+0107. 02+0317. 03+0200. 04+0.000 05+09.87 06+20.35 07-0.001 08+1.413
09+189.4
01+0107. 02+0317. 03+0300. 04+0.000 05+08.74 06+21.44 07-0.001 08+1.307
09+166.7
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09+186.5
01+0107. 02+0317. 03+0500. 04+0.000 05+10.39 06+20.14 07-0.001 08+2.455
09+166.3
01+0107. 02+0317. 03+0600. 04+0.000 05+08.24 06+22.58 07-0.001 08+1.698
09+121.9
01+0107. 02+0317. 03+0700. 04+0.000 05+5.776 06+28.54 07+0.000 08+1.031
09+118.4
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09+212.7
01+0107. 02+0317. 03+0900. 04+0.000 05+09.07 06+25.63 07+0.104 08+1.061
09+149.0
01+0107. 02+0317. 03+1000. 04+0.000 05+13.42 06+20.39 07+0.254 08+2.282
09+081.9
01+0107. 02+0317. 03+1100. 04+0.000 05+16.36 06+16.47 07+0.247 08+2.869
09+113.8

01+0107. 02+0317. 03+1200. 04+0.000 05+16.98 06+15.68 07+0.213 08+3.473
09+108.1
01+0107. 02+0317. 03+1300. 04+0.000 05+17.65 06+15.33 07+0.255 08+3.930
09+119.1
01+0107. 02+0317. 03+1400. 04+0.000 05+17.34 06+15.29 07+0.092 08+2.741
09+121.5
01+0107. 02+0317. 03+1500. 04+0.000 05+16.44 06+15.94 07+0.110 08+3.816
09+180.0
01+0107. 02+0317. 03+1600. 04+0.000 05+15.03 06+17.49 07+0.110 08+6.860
09+227.9
01+0107. 02+0317. 03+1700. 04+0.000 05+11.23 06+26.66 07+0.019 08+07.36
09+216.9
01+0107. 02+0317. 03+1800. 04+0.000 05+10.07 06+31.11 07-0.001 08+3.843
09+206.7
01+0107. 02+0317. 03+1900. 04+0.000 05+09.18 06+31.79 07-0.001 08+4.025
09+207.5
01+0107. 02+0317. 03+2000. 04+0.000 05+08.49 06+35.32 07-0.001 08+4.102
09+210.8
01+0107. 02+0317. 03+2100. 04+0.000 05+07.73 06+42.91 07-0.001 08+4.303
09+204.9
01+0107. 02+0317. 03+2200. 04+0.000 05+07.31 06+45.04 07-0.001 08+4.075
09+200.2
01+0107. 02+0317. 03+2300. 04+0.000 05+07.00 06+44.14 07-0.001 08+4.572
09+204.5

01+0107. 02+0318. 03+0000. 04+0.000 05+07.25 06+42.90 07-0.001 08+3.429
09+196.2
01+0107. 02+0318. 03+0100. 04+0.000 05+6.918 06+44.32 07-0.001 08+3.919
09+203.0
01+0107. 02+0318. 03+0200. 04+0.000 05+6.273 06+44.54 07-0.001 08+2.163
09+181.0
01+0107. 02+0318. 03+0300. 04+0.000 05+6.369 06+39.72 07-0.001 08+4.751
09+245.0
01+0107. 02+0318. 03+0400. 04+0.000 05+4.594 06+40.30 07-0.001 08+2.753
09+248.8
01+0107. 02+0318. 03+0500. 04+0.000 05+2.812 06+42.30 07-0.002 08+2.208
09+231.4
01+0107. 02+0318. 03+0600. 04+0.000 05+1.196 06+45.56 07-0.001 08+1.357
09+175.3
01+0107. 02+0318. 03+0700. 04+0.000 05+2.261 06+44.57 07+0.000 08+2.290
09+187.6
01+0107. 02+0318. 03+0800. 04+0.000 05+3.960 06+40.26 07+0.031 08+3.864
09+256.4
01+0107. 02+0318. 03+0900. 04+0.000 05+4.178 06+39.38 07+0.064 08+4.496
09+233.0
01+0107. 02+0318. 03+1000. 04+0.000 05+4.711 06+36.16 07+0.099 08+5.798
09+232.3
01+0107. 02+0318. 03+1100. 04+0.000 05+07.52 06+27.66 07+0.345 08+5.669
09+239.4
01+0107. 02+0318. 03+1200. 04+0.000 05+08.98 06+21.93 07+0.412 08+6.047
09+247.7
01+0107. 02+0318. 03+1300. 04+0.000 05+09.68 06+20.84 07+0.406 08+6.874
09+250.0
01+0107. 02+0318. 03+1400. 04+0.000 05+09.36 06+21.51 07+0.351 08+07.17
09+243.2
01+0107. 02+0318. 03+1500. 04+0.000 05+08.18 06+24.00 07+0.196 08+6.442

09+246.4
01+0107. 02+0318. 03+1600. 04+0.000 05+07.46 06+26.88 07+0.152 08+6.444
09+247.5
01+0107. 02+0318. 03+1700. 04+0.000 05+6.389 06+29.68 07+0.031 08+6.656
09+248.6
01+0107. 02+0318. 03+1800. 04+0.000 05+4.981 06+36.35 07+0.000 08+4.413
09+256.5
01+0107. 02+0318. 03+1900. 04+0.000 05+5.019 06+37.88 07-0.001 08+3.787
09+255.8
01+0107. 02+0318. 03+2000. 04+0.000 05+5.031 06+39.45 07-0.001 08+3.936
09+264.3
01+0107. 02+0318. 03+2100. 04+0.000 05+4.943 06+41.88 07-0.001 08+4.064
09+266.9
01+0107. 02+0318. 03+2200. 04+0.000 05+4.843 06+42.76 07-0.001 08+3.331
09+257.2
01+0107. 02+0318. 03+2300. 04+0.000 05+3.562 06+48.74 07-0.001 08+2.182
09+259.0

01+0107. 02+0319. 03+0000. 04+0.000 05+0.758 06+67.26 07-0.001 08+1.207
09+100.7
01+0107. 02+0319. 03+0100. 04+0.000 05+0.008 06+083.5 07-0.002 08+1.022
09+163.1
01+0107. 02+0319. 03+0200. 04+0.000 05-1.740 06+087.1 07-0.001 08+0.782
09+218.3
01+0107. 02+0319. 03+0300. 04+0.000 05-1.352 06+088.5 07-0.001 08+1.140
09+228.7
01+0107. 02+0319. 03+0400. 04+0.000 05-0.111 06+087.6 07-0.002 08+1.589
09+235.6
01+0107. 02+0319. 03+0500. 04+0.000 05+1.121 06+074.8 07-0.002 08+2.409
09+259.0
01+0107. 02+0319. 03+0600. 04+0.000 05+0.032 06+62.01 07-0.001 08+3.655
09+257.1
01+0107. 02+0319. 03+0700. 04+0.000 05-0.212 06+59.38 07+0.000 08+4.239
09+248.3
01+0107. 02+0319. 03+0800. 04+0.000 05+0.866 06+54.57 07+0.079 08+5.214
09+245.1
01+0107. 02+0319. 03+0900. 04+0.000

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01+0107. 02+0321. 03+0900. 04+0.000 05+2.578 06+25.59 07+0.182 08+0.989
09-6999.
01+0107. 02+0321. 03+1000. 04+0.000 05+5.496 06+21.64 07-6999. 08+2.938
09-6999.
01+0107. 02+0321. 03+1100. 04+0.000 05+07.21 06+19.83 07+0.364 08+3.013
09-6999.
01+0107. 02+0321. 03+1200. 04+0.000 05+08.72 06+18.70 07+0.402 08+3.108
09+241.0
01+0107. 02+0321. 03+1300. 04+0.000 05+09.81 06+18.07 07+0.397 08+3.006
09+261.5
01+0107. 02+0321. 03+1400. 04+0.000 05+10.45 06+17.66 07+0.350 08+3.022
09+301.5
01+0107. 02+0321. 03+1500. 04+0.000 05+10.80 06+17.40 07+0.266 08+2.919
09+232.2
01+0107. 02+0321. 03+1600. 04+0.000 05+10.61 06+17.33 07+0.156 08+2.750
09+287.8

01+0107. 02+0321. 03+1700. 04+0.000 05+08.93 06+17.98 07+0.038 08+2.032
09+196.6
01+0107. 02+0321. 03+1800. 04+0.000 05+3.772 06+19.99 07+0.000 08+1.184
09+161.3
01+0107. 02+0321. 03+1900. 04+0.000 05-1.866 06+22.59 07-0.001 08+1.267
09+243.3
01+0107. 02+0321. 03+2000. 04+0.000 05-4.169 06+24.84 07-0.002 08+1.840
09+247.7
01+0107. 02+0321. 03+2100. 04+0.000 05-0.809 06+23.41 07+0.000 08+2.418
09+237.5
01+0107. 02+0321. 03+2200. 04+0.000 05-1.105 06+23.24 07-0.001 08+2.841
09-6999.
01+0107. 02+0321. 03+2300. 04+0.000 05-3.059 06+24.38 07+0.000 08+1.425
09+216.6

01+0107. 02+0322. 03+0000. 04+0.000 05-3.734 06+25.52 07+0.000 08+2.033
09+227.9
01+0107. 02+0322. 03+0100. 04+0.000 05-6999. 06-6999. 07-6999. 08+2.488
09-6999.
01+0107. 02+0322. 03+0200. 04+0.000 05-4.864 06+26.76 07+0.000 08+2.526
09+237.8
01+0107. 02+0322. 03+0300. 04+0.000 05-5.501 06+27.61 07+0.000 08+2.498
09+239.2
01+0107. 02+0322. 03+0400. 04+0.000 05-5.394 06+27.64 07+0.000 08+2.189
09+228.8
01+0107. 02+0322. 03+0500. 04+0.000 05-6.378 06+28.52 07+0.000 08+2.282
09+242.3
01+0107. 02+0322. 03+0600. 04+0.000 05-08.17 06+32.08 07+0.000 08+1.797
09+245.9
01+0107. 02+0322. 03+0700. 04+0.000 05-07.24 06+32.18 07+0.003 08+2.503
09+241.8
01+0107. 02+0322. 03+0800. 04+0.000 05-5.255 06+29.51 07+0.062 08+2.386
09+242.9
01+0107. 02+0322. 03+0900. 04+0.000 05+0.721 06+22.48 07+0.181 08+2.746
09+265.6
01+0107. 02+0322. 03+1000. 04+0.000 05+5.412 06+19.81 07+0.286 08+2.026
09+263.8
01+0107. 02+0322. 03+1100. 04+0.000 05+08.50 06+18.36 07+0.361 08+2.677
09+219.0
01+0107. 02+0322. 03+1200. 04+0.000 05+10.74 06+17.40 07+0.398 08+3.140
09+262.8
01+0107. 02+0322. 03+1300. 04+0.000 05+12.26 06+16.79 07+0.393 08+3.396
09+217.8
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09+253.9
01+0107. 02+0322. 03+1500. 04+0.000 05+14.99 06+15.75 07+0.263 08+2.501
09+272.0
01+0107. 02+0322. 03+1600. 04+0.000 05+14.86 06+15.80 07+0.150 08+2.427
09+243.5
01+0107. 02+0322. 03+1700. 04+0.000 05+13.14 06+16.42 07+0.009 08+1.483
09+267.7
01+0107. 02+0322. 03+1800. 04+0.000 05+6.617 06+18.80 07+0.000 08+1.298
09+156.8
01+0107. 02+0322. 03+1900. 04+0.000 05+0.151 06+21.43 07-0.001 08+1.473
09+246.8
01+0107. 02+0322. 03+2000. 04+0.000 05-1.088 06+22.37 07-0.002 08+1.962

09+250.5
01+0107. 02+0322. 03+2100. 04+0.000 05+1.407 06+21.29 07-0.001 08+2.653
09+244.3
01+0107. 02+0322. 03+2200. 04+0.000 05+1.336 06+21.15 07-0.001 08+2.979
09+235.9
01+0107. 02+0322. 03+2300. 04+0.000 05+0.243 06+21.62 07-0.001 08+2.698
09+238.9

01+0107. 02+0323. 03+0000. 04+0.000 05-0.353 06+21.93 07-0.001 08+2.352
09+238.0
01+0107. 02+0323. 03+0100. 04+0.000 05-0.877 06+22.16 07-0.001 08+2.645
09+240.1
01+0107. 02+0323. 03+0200. 04+0.000 05-1.877 06+22.70 07-0.001 08+2.393
09+235.4
01+0107. 02+0323. 03+0300. 04+0.000 05-2.593 06+23.29 07-0.001 08+2.178
09+234.2
01+0107. 02+0323. 03+0400. 04+0.000 05-3.870 06+24.40 07-0.001 08+1.649
09+242.2
01+0107. 02+0323. 03+0500. 04+0.000 05-3.572 06+24.74 07-0.001 08+2.348
09+238.9
01+0107. 02+0323. 03+0600. 04+0.000 05-3.439 06+24.56 07-0.001 08+2.355
09+234.0
01+0107. 02+0323. 03+0700. 04+0.000 05-4.210 06+25.16 07+0.000 08+2.268
09+238.7
01+0107. 02+0323. 03+0800. 04+0.000 05-2.686 06+24.66 07+0.056 08+2.070
09+242.0
01+0107. 02+0323. 03+0900. 04+0.000 05+2.888 06+21.34 07+0.175 08+2.168
09+278.2
01+0107. 02+0323. 03+1000. 04+0.000 05+07.16 06+19.47 07+0.281 08+1.803
09+223.7
01+0107. 02+0323. 03+1100. 04+0.000 05+09.70 06+18.41 07+0.357 08+1.857
09+153.9
01+0107. 02+0323. 03+1200. 04+0.000 05+12.60 06+17.10 07+0.395 08+1.525
09+117.0
01+0107. 02+0323. 03+1300. 04+0.000 05+14.65 06+16.14 07+0.390 08+1.517
09+130.2
01+0107. 02+0323. 03+1400. 04+0.000 05+16.50 06+15.33 07+0.343 08+1.684
09+099.5
01+0107. 02+0323. 03+1500. 04+0.000 05+16.66 06+15.19 07+0.259 08+2.477
09+107.1
01+0107. 02+0323. 03+1600. 04+0.000 05+15.86 06+15.44 07+0.058 08+2.845
09+125.9
01+0107. 02+0323. 03+1700. 04+0.000 05+14.01 06+16.11 07+0.009 08+1.388
09+157.3
01+0107. 02+0323. 03+1800. 04+0.000 05+07.57 06+18.43 07+0.000 08+1.486
09+185.0
01+0107. 02+0323. 03+1900. 04+0.000 05+1.828 06+20.63 07-0.001 08+1.337
09+255.0
01+0107. 02+0323. 03+2000. 04+0.000 05-0.342 06+21.57 07-0.002 08+1.794
09+246.7
01+0107. 02+0323. 03+2100. 04+0.000 05+1.213 06+21.12 07-0.001 08+2.075
09+249.0
01+0107. 02+0323. 03+2200. 04+0.000 05+0.430 06+21.46 07-0.001 08+2.775
09+241.8
01+0107. 02+0323. 03+2300. 04+0.000 05+1.280 06+21.10 07-0.001 08+2.521
09+230.7

01+0107. 02+0324. 03+0000. 04+0.000 05-0.686 06+21.93 07-0.001 08+2.225
09+241.7
01+0107. 02+0324. 03+0100. 04+0.000 05-0.746 06+22.44 07-0.001 08+2.621
09+237.6
01+0107. 02+0324. 03+0200. 04+0.000 05-1.149 06+22.73 07-0.001 08+2.469
09+238.5
01+0107. 02+0324. 03+0300. 04+0.000 05-4.232 06+25.30 07-0.001 08+1.509
09+245.9
01+0107. 02+0324. 03+0400. 04+0.000 05-4.658 06+26.28 07-0.001 08+1.323
09+198.0
01+0107. 02+0324. 03+0500. 04+0.000 05-07.79 06+30.38 07-0.001 08+0.640
09+230.8
01+0107. 02+0324. 03+0600. 04+0.000 05-08.70 06+36.22 07+0.000 08+0.877
09-6999.
01+0107. 02+0324. 03+0700. 04+0.000 05-6999. 06-6999. 07-6999. 08+1.244
09-6999.
01+0107. 02+0324. 03+0800. 04+0.000 05-6999. 06-6999. 07-6999. 08+2.013
09-6999.
01+0107. 02+0324. 03+0900. 04+0.000 05+2.179 06+23.86 07+0.175 08+1.772
09-6999.
01+0107. 02+0324. 03+1000. 04+0.000 05+07.62 06+19.25 07+0.280 08+1.156
09-6999.
01+0107. 02+0324. 03+1100. 04+0.000 05+11.19 06+17.44 07+0.356 08+1.623
09-6999.
01+0107. 02+0324. 03+1200. 04+0.000 05+13.53 06+16.43 07+0.346 08+3.681
09+108.5
01+0107. 02+0324. 03+1300. 04+0.000 05+16.28 06+15.53 07+0.369 08+4.960
09+129.1
01+0107. 02+0324. 03+1400. 04+0.000 05+18.09 06+14.91 07+0.334 08+5.472
09+126.7
01+0107. 02+0324. 03+1500. 04+0.000 05+18.95 06+14.56 07+0.250 08+5.183
09+121.1
01+0107. 02+0324. 03+1600. 04+0.000 05+19.42 06+14.27 07+0.146 08+5.227
09+169.9
01+0107. 02+0324. 03+1700. 04+0.000 05+18.50 06+14.56 07+0.033 08+5.164
09+210.9
01+0107. 02+0324. 03+1800. 04+0.000 05+15.64 06+15.64 07+0.000 08+3.515
09+223.6
01+0107. 02+0324. 03+1900. 04+0.000 05+08.88 06+18.45 07-0.002 08+1.424
09+256.1
01+0107. 02+0324. 03+2000. 04+0.000 05+07.14 06+19.60 07-0.001 08+2.013
09+253.8
01+0107. 02+0324. 03+2100. 04+0.000 05+6.444 06+19.85 07-0.001 08+2.221
09+252.7
01+0107. 02+0324. 03+2200. 04+0.000 05+6.273 06+19.88 07-0.002 08+1.513
09+240.0
01+0107. 02+0324. 03+2300. 04+0.000 05+6.969 06+19.54 07-0.002 08+2.054
09+192.1

01+0107. 02+0325. 03+0000. 04+0.000 05+3.349 06+21.72 07-0.002 08+1.493
09+163.2
01+0107. 02+0325. 03+0100. 04+0.000 05+2.198 06+23.01 07-0.001 08+1.667
09+244.7
01+0107. 02+0325. 03+0200. 04+0.000 05+3.220 06+24.85 07-0.001 08+1.498
09+184.9

01+0107. 02+0325. 03+0300. 04+0.000 05-0.451 06+32.71 07-0.001 08+1.214
09+166.3
01+0107. 02+0325. 03+0400. 04+0.000 05-4.353 06+43.45 07-0.001 08+1.075
09+226.1
01+0107. 02+0325. 03+0500. 04+0.000 05-5.051 06+49.66 07-0.001 08+1.024
09+180.3
01+0107. 02+0325. 03+0600. 04+0.000 05-4.950 06+51.88 07-0.001 08+1.470
09+239.2
01+0107. 02+0325. 03+0700. 04+0.000 05-2.618 06+50.61 07+0.001 08+2.151
09+229.1
01+0107. 02+0325. 03+0800. 04+0.000 05+1.382 06+42.74 07+0.053 08+1.741
09+113.1
01+0107. 02+0325. 03+0900. 04+0.000 05+5.015 06+33.28 07+0.167 08+1.339
09+088.0
01+0107. 02+0325. 03+1000. 04+0.000 05+08.90 06+24.58 07+0.273 08+1.437
09+148.8
01+0107. 02+0325. 03+1100. 04+0.000 05+10.84 06+20.75 07+0.347 08+2.123
09+077.9
01+0107. 02+0325. 03+1200. 04+0.000 05+12.95 06+18.47 07+0.384 08+2.084
09+108.4
01+0107. 02+0325. 03+1300. 04+0.000 05+14.88 06+16.80 07+0.379 08+1.824
09+167.1
01+0107. 02+0325. 03+1400. 04+0.000 05+15.51 06+16.29 07+0.332 08+2.154
09+081.3
01+0107. 02+0325. 03+1500. 04+0.000 05+16.09 06+15.90 07+0.251 08+1.982
09+082.2
01+0107. 02+0325. 03+1600. 04+0.000 05+15.84 06+15.93 07+0.143 08+1.860
09+096.4
01+0107. 02+0325. 03+1700. 04+0.000 05+13.59 06+16.80 07+0.033 08+1.823
09+142.2
01+0107. 02+0325. 03+1800. 04+0.000 05+08.54 06+19.11 07+0.000 08+1.644
09+198.6
01+0107. 02+0325. 03+1900. 04+0.000 05+3.240 06+22.44 07-0.001 08+1.190
09+235.6
01+0107. 02+0325. 03+2000. 04+0.000 05+2.757 06+25.62 07-0.002 08+2.215
09+240.1
01+0107. 02+0325. 03+2100. 04+0.000 05+3.732 06+25.07 07-0.002 08+2.517
09+239.1
01+0107. 02+0325. 03+2200. 04+0.000 05+2.289 06+25.97 07-0.002 08+1.085
09+139.6
01+0107. 02+0325. 03+2300. 04+0.000 05+0.142 06+29.82 07-0.001 08+1.430
09+150.8

01+0107. 02+0326. 03+0000. 04+0.000 05-1.892 06+34.21 07-0.001 08+1.323
09+243.7
01+0107. 02+0326. 03+0100. 04+0.000 05+0.519 06+33.97 07-0.001 08+2.264
09+232.4
01+0107. 02+0326. 03+0200. 04+0.000 05-1.257 06+34.44 07-0.001 08+0.709
09+167.8
01+0107. 02+0326. 03+0300. 04+0.000 05-3.286 06+40.12 07-0.001 08+0.721
09+230.0
01+0107. 02+0326. 03+0400. 04+0.000 05-2.954 06+41.78 07-0.001 08+1.349
09+252.2
01+0107. 02+0326. 03+0500. 04+0.000 05-2.426 06+40.76 07+0.000 08+1.916
09+248.0
01+0107. 02+0326. 03+0600. 04+0.000 05-4.295 06+44.67 07+0.000 08+1.037

09+171.1
01+0107. 02+0326. 03+0700. 04+0.000 05-4.950 06+50.66 07+0.001 08+1.324
09-6999.
01+0107. 02+0326. 03+0800. 04+0.000 05-2.554 06+46.53 07+0.052 08+0.778
09-6999.
01+0107. 02+0326. 03+0900. 04+0.000 05+3.748 06+32.80 07+0.127 08+0.842
09-6999.
01+0107. 02+0326. 03+1000. 04+0.000 05+08.15 06+24.09 07+0.241 08+1.031
09+197.7
01+0107. 02+0326. 03+1100. 04+0.000 05+12.00 06+19.37 07+0.313 08+1.253
09+228.6
01+0107. 02+0326. 03+1200. 04+0.000 05+13.54 06+17.78 07+0.348 08+1.715
09+119.5
01+0107. 02+0326. 03+1300. 04+0.000 05+14.51 06+16.94 07+0.272 08+1.949
09+085.4
01+0107. 02+0326. 03+1400. 04+0.000 05+15.06 06+16.51 07+0.244 08+2.890
09+114.8
01+0107. 02+0326. 03+1500. 04+0.000 05+14.76 06+16.61 07+0.181 08+2.927
09+122.1
01+0107. 02+0326. 03+1600. 04+0.000 05+13.99 06+17.05 07+0.087 08+2.759
09+117.4
01+0107. 02+0326. 03+1700. 04+0.000 05+12.71 06+17.79 07+0.022 08+2.287
09+116.8
01+0107. 02+0326. 03+1800. 04+0.000 05+09.68 06+19.72 07-0.001 08+0.989
09+188.1
01+0107. 02+0326. 03+1900. 04+0.000 05+6.373 06+23.12 07-0.001 08+1.411
09+237.0
01+0107. 02+0326. 03+2000. 04+0.000 05+5.258 06+25.10 07-0.002 08+1.226
09+218.1
01+0107. 02+0326. 03+2100. 04+0.000 05+5.777 06+25.74 07-0.002 08+1.387
09+138.4
01+0107. 02+0326. 03+2200. 04+0.000 05+07.76 06+22.23 07-0.002 08+1.348
09+175.7
01+0107. 02+0326. 03+2300. 04+0.000 05+6.921 06+22.83 07-0.001 08+1.953
09+245.5

01+0107. 02+0327. 03+0000. 04+0.000 05+07.64 06+23.12 07-0.001 08+2.969
09+224.9
01+0107. 02+0327. 03+0100. 04+0.000 05+5.507 06+25.79 07-0.002 08+2.165
09+244.8
01+0107. 02+0327. 03+0200. 04+0.000 05+2.961 06+33.74 07-0.002 08+1.274
09+216.4
01+0107. 02+0327. 03+0300. 04+0.000 05+2.728 06+37.00 07-0.001 08+0.822
09+182.3
01+0107. 02+0327. 03+0400. 04+0.000 05+1.435 06+43.04 07-0.001 08+1.364
09+164.8
01+0107. 02+0327. 03+0500. 04+0.000 05+0.753 06+45.15 07-0.001 08+1.367
09+172.5
01+0107. 02+0327. 03+0600. 04+0.000 05+0.176 06+46.42 07-0.001 08+1.364
09+209.5
01+0107. 02+0327. 03+0700. 04+0.000 05-1.627 06+49.54 07+0.000 08+1.646
09+168.2
01+0107. 02+0327. 03+0800. 04+0.000 05-0.473 06+53.47 07+0.046

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01+0107. 02+14.66 03+16.39 04+0.005 05+1.185 06+241.3 07+0.000 08+0337.
09+1700.
01+0107. 02+08.31 03+19.43 04-0.001 05+1.435 06+216.4 07+0.000 08+0337.
09+1800.
01+0107. 02+4.401 03+23.56 04-0.002 05+1.675 06+241.9 07+0.000 08+0337.
09+1900.
01+0107. 02+6.042 03+23.82 04-0.001 05+2.723 06+244.4 07+0.000 08+0337.
09+2000.
01+0107. 02+6.300 03+23.62 04-0.001 05+3.026 06+234.5 07+0.000 08+0337.
09+2100.
01+0107. 02+5.480 03+24.42 04-0.001 05+3.272 06+234.7 07+0.000 08+0337.
09+2200.
01+0107. 02+5.381 03+24.87 04-0.001 05+2.161 06+220.8 07+0.000 08+0337.
09+2300.

01+0107. 02+3.419 03+27.26 04-0.001 05+0.908 06+216.7 07+0.000 08+0338.
09+0000.
01+0107. 02+0.234 03+33.74 04-0.001 05+1.084 06+233.6 07+0.000 08+0338.
09+0100.
01+0107. 02+1.651 03+38.27 04-0.001 05+2.575 06+243.3 07+0.000 08+0338.
09+0200.
01+0107. 02+1.226 03+38.08 04-0.001 05+1.791 06+189.9 07+0.000 08+0338.
09+0300.
01+0107. 02-1.304 03+43.08 04-0.001 05+1.143 06+135.8 07+0.000 08+0338.
09+0400.
01+0107. 02-2.700 03+46.55 04-0.001 05+0.996 06+204.2 07+0.000 08+0338.
09+0500.
01+0107. 02-4.240 03+50.45 04-0.001 05+0.609 06+225.2 07+0.000 08+0338.
09+0600.
01+0107. 02-3.200 03+52.82 04+0.000 05+0.998 06+108.7 07+0.000 08+0338.
09+0700.
01+0107. 02-2.294 03+52.54 04+0.035 05+0.804 06+192.4 07+0.000 08+0338.
09+0800.
01+0107. 02+4.179 03+40.10 04+0.117 05+0.706 06+178.9 07+0.000 08+0338.
09+0900.
01+0107. 02+09.96 03+25.58 04+0.259 05+0.885 06+199.8 07+0.000 08+0338.
09+1000.
01+0107. 02+13.55 03+19.80 04+0.319 05+1.102 06+183.2 07+0.000 08+0338.
09+1100.
01+0107. 02+15.20 03+17.96 04+0.328 05+1.711 06+079.5 07+0.000 08+0338.
09+1200.
01+0107. 02+16.97 03+16.55 04+0.316 05+1.371 06+157.8 07+0.000 08+0338.
09+1300.
01+0107. 02+17.54 03+16.02 04+0.212 05+1.223 06+101.8 07+0.000 08+0338.
09+1400.

01+0107. 02+14.66 03+16.39 04+0.005 05+1.185 06+241.3 07+0.000 08+0337.
09+1700.
01+0107. 02+08.31 03+19.43 04-0.001 05+1.435 06+216.4 07+0.000 08+0337.
09+1800.
01+0107. 02+4.401 03+23.56 04-0.002 05+1.675 06+241.9 07+0.000 08+0337.
09+1900.
01+0107. 02+6.042 03+23.82 04-0.001 05+2.723 06+244.4 07+0.000 08+0337.
09+2000.
01+0107. 02+6.300 03+23.62 04-0.001 05+3.026 06+234.5 07+0.000 08+0337.
09+2100.

01+0107. 02+5.480 03+24.42 04-0.001 05+3.272 06+234.7 07+0.000 08+0337.
09+2200.
01+0107. 02+5.381 03+24.87 04-0.001 05+2.161 06+220.8 07+0.000 08+0337.
09+2300.

01+0107. 02+3.419 03+27.26 04-0.001 05+0.908 06+216.7 07+0.000 08+0338.
09+0000.
01+0107. 02+0.234 03+33.74 04-0.001 05+1.084 06+233.6 07+0.000 08+0338.
09+0100.
01+0107. 02+1.651 03+38.27 04-0.001 05+2.575 06+243.3 07+0.000 08+0338.
09+0200.
01+0107. 02+1.226 03+38.08 04-0.001 05+1.791 06+189.9 07+0.000 08+0338.
09+0300.
01+0107. 02-1.304 03+43.08 04-0.001 05+1.143 06+135.8 07+0.000 08+0338.
09+0400.
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09+0500.
01+0107. 02-4.240 03+50.45 04-0.001 05+0.609 06+225.2 07+0.000 08+0338.
09+0600.
01+0107. 02-3.200 03+52.82 04+0.000 05+0.998 06+108.7 07+0.000 08+0338.
09+0700.
01+0107. 02-2.294 03+52.54 04+0.035 05+0.804 06+192.4 07+0.000 08+0338.
09+0800.
01+0107. 02+4.179 03+40.10 04+0.117 05+0.706 06+178.9 07+0.000 08+0338.
09+0900.
01+0107. 02+09.96 03+25.58 04+0.259 05+0.885 06+199.8 07+0.000 08+0338.
09+1000.
01+0107. 02+13.55 03+19.80 04+0.319 05+1.102 06+183.2 07+0.000 08+0338.
09+1100.
01+0107. 02+15.20 03+17.96 04+0.328 05+1.711 06+079.5 07+0.000 08+0338.
09+1200.
01+0107. 02+16.97 03+16.55 04+0.316 05+1.371 06+157.8 07+0.000 08+0338.
09+1300.
01+0107. 02+17.54 03+16.02 04+0.212 05+1.223 06+101.8 07+0.000 08+0338.
09+1400.
01+0107. 02+18.72 03+15.27 04+0.230 05+2.404 06+123.2 07+0.000 08+0338.
09+1500.
01+0107. 02+17.50 03+15.71 04+0.087 05+2.426 06+127.3 07+0.000 08+0338.
09+1600.
01+0107. 02+15.32 03+16.75 04+0.017 05+1.262 06+126.9 07+0.000 08+0338.
09+1700.
01+0107. 02+11.68 03+18.81 04-0.001 05+0.834 06+234.0 07+0.000 08+0338.
09+1800.
01+0107. 02+09.51 03+20.71 04-0.002 05+1.167 06+243.2 07+0.000 08+0338.
09+1900.
01+0107. 02+09.49 03+21.18 04-0.001 05+1.808 06+254.1 07+0.000 08+0338.
09+2000.
01+0107. 02+09.80 03+21.37 04-0.001 05+1.239 06+219.7 07+0.000 08+0338.
09+2100.
01+0107. 02+08.85 03+22.24 04-0.001 05+1.484 06+247.9 07+0.000 08+0338.
09+2200.
01+0107. 02+09.28 03+22.51 04-0.001 05+1.714 06+161.2 07+0.000 08+0338.
09+2300.

01+0107. 02+11.09 03+21.54 04-0.001 05+1.957 06+203.4 07+0.000 08+0339.
09+0000.

01+0107. 02+09.57 03+23.13 04-0.001 05+1.858 06+125.1 07+0.000 08+0339.
09+0100.
01+0107. 02+08.93 03+27.90 04-0.001 05+1.519 06+153.9 07+0.000 08+0339.
09+0200.
01+0107. 02+09.70 03+28.37 04-0.001 05+1.629 06+179.3 07+0.000 08+0339.
09+0300.
01+0107. 02+08.36 03+32.88 04-0.001 05+1.647 06+182.9 07+0.000 08+0339.
09+0400.
01+0107. 02+5.878 03+35.27 04-0.001 05+1.241 06+173.2 07+0.000 08+0339.
09+0500.
01+0107. 02+4.521 03+42.38 04-0.001 05+1.098 06+223.3 07+0.000 08+0339.
09+0600.
01+0107. 02+2.063 03+47.23 04+0.000 05+1.384 06+177.2 07+0.000 08+0339.
09+0700.
01+0107. 02+3.365 03+52.43 04+0.028 05+1.417 06+223.8 07+0.000 08+0339.
09+0800.
01+0107. 02+5.937 03+48.28 04+0.111 05+1.053 06+212.3 07+0.000 08+0339.
09+0900.
01+0107. 02+11.05 03+34.54 04+0.111 05+1.532 06+153.9 07+0.000 08+0339.
09+1000.
01+0107. 02+14.84 03+24.75 04+0.308 05+1.715 06+145.8 07+0.000 08+0339.
09+1100.
01+0107. 02+15.95 03+19.89 04+0.210 05+2.295 06+63.49 07+0.000 08+0339.
09+1200.
01+0107. 02+15.69 03+19.92 04+0.164 05+1.964 06+65.48 07+0.000 08+0339.
09+1300.
01+0107. 02+17.23 03+18.40 04+0.148 05+1.638 06+108.2 07+0.000 08+0339.
09+1400.
01+0107. 02+13.51 03+25.49 04+0.100 05+07.14 06+221.7 07+0.000 08+0339.
09+1500.
01+0107. 02+11.69 03+30.04 04+0.154 05+6.657 06+252.6 07+0.000 08+0339.
09+1600.
01+0107. 02+09.95 03+32.02 04+0.026 05+6.595 06+253.3 07+0.000 08+0339.
09+1700.
01+0107. 02+08.56 03+36.40 04-0.001 05+5.415 06+239.0 07+0.000 08+0339.
09+1800.
01+0107. 02+07.84 03+39.48 04-0.001 05+5.341 06+244.6 07+0.000 08+0339.
09+1900.
01+0107. 02+07.53 03+40.44 04-0.001 05+6.422 06+253.1 07+0.000 08+0339.
09+2000.
01+0107. 02+07.19 03+41.10 04-0.001 05+07.32 06+252.7 07+0.000 08+0339.
09+2100.
01+0107. 02+07.02 03+42.06 04-0.001 05+6.848 06+252.6 07+0.000 08+0339.
09+2200.
01+0107. 02+07.00 03+42.84 04-0.001 05+5.149 06+253.8 07+0.000 08+0339.
09+2300.

01+0107. 02+6.362 03+45.34 04-0.001 05+2.903 06+248.0 07+0.000 08+0340.
09+0000.
01+0107. 02+3.182 03+54.82 04-0.001 05+0.784 06+189.6 07+0.000 08+0340.
09+0100.
01+0107. 02+0.299 03+072.9 04-0.001 05+0.918 06+197.4 07+0.000 08+0340.
09+0200.
01+0107. 02+0.543 03+082.5 04-0.001 05+1.173 06+218.3 07+0.000 08+0340.
09+0300.
01+0107. 02+4.370 03+084.1 04-0.001 05+1.020 06+225.1 07+0.000 08+0340.

09+0400.
01+0107. 02+08.43 03+083.7 04-0.001 05+0.982 06+129.5 07+0.000 08+0340.
09+0500.
01+0107. 02+10.25 03+083.5 04-0.001 05+1.458 06+138.0 07+0.000 08+0340.
09+0600.
01+0107. 02+10.87 03+084.0 04+0.000 05+0.885 06+222.0 07+0.000 08+0340.
09+0700.
01+0107. 02+18.33 03+083.8 04+0.041 05+1.223 06+118.9 07+0.000 08+0340.
09+0800.
01+0107. 02+42.35 03+64.82 04+0.148 05+1.309 06+166.4 07+0.000 08+0340.
09+0900.
01+0107. 02+10.70 03+47.93 04+0.244 05+3.120 06+256.8 07+0.000 08+0340.
09+1000.
01+0107. 02+12.76 03+39.18 04+0.310 05+1.516 06+217.7 07+0.000 08+0340.
09+1100.
01+0107. 02+13.61 03+34.99 04+0.351 05+2.068 06+146.2 07+0.000 08+0340.
09+1200.
01+0107. 02+14.81 03+31.18 04+0.350 05+2.145 06+195.3 07+0.000 08+0340.
09+1300.
01+0107. 02+15.59 03+28.38 04+0.304 05+1.969 06+184.8 07+0.000 08+0340.
09+1400.
01+0107. 02+15.88 03+26.68 04+0.224 05+1.988 06+124.9 07+0.000 08+0340.
09+1500.
01+0107. 02+15.05 03+27.60 04+0.123 05+1.884 06+65.09 07+0.000 08+0340.
09+1600.
01+0107. 02+12.64 03+31.34 04+0.020 05+1.576 06+096.3 07+0.000 08+0340.
09+1700.
01+0107. 02+07.02 03+41.56 04-0.001 05+1.061 06+210.6 07+0.000 08+0340.
09+1800.
01+0107. 02+2.954 03+53.59 04-0.002 05+0.977 06+231.6 07+0.000 08+0340.
09+1900.
01+0107. 02+1.861 03+59.96 04-0.001 05+1.639 06+248.4 07+0.000 08+0340.
09+2000.
01+0107. 02+5.038 03+63.32 04-0.001 05+2.278 06+244.8 07+0.000 08+0340.
09+2100.
01+0107. 02+4.967 03+60.01 04-0.001 05+2.597 06+240.9 07+0.000 08+0340.
09+2200.
01+0107. 02+4.421 03+60.12 04-0.001 05+2.943 06+232.0 07+0.000 08+0340.
09+2300. xx??????? xx??????? xx??????? xx-0.001 xx??????? xx??????? xx+0.000

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01+0107. 02+17.64 03+17.56 04+0.224 xx??????? xx??????? xx+0.000 xx+0341.
xx+1500. xx??????? xx+16.95 xx+17.65 xx+0.149 xx??????? xx??????? xx???????
xx+0341. xx+1600.
01+0107. 02+14.92 03+19.24 xx??????? xx??????? xx??????? xx??????? xx+0341.
xx+1700.
01+0107. 02+12.40 03+22.13 04-0.001 05+2.556 xx??????? xx+0.000 xx+0341.
xx+1800.
01+0107. 02+07.17 03+29.36 04-0.002 05+1.231 06+226.2 xx??????? xx+0341.
xx+1900.
01+0107. xx??????? xx??????? xx-0.001 xx??????? xx+224.5 xx+0.000 xx+0341.
xx??????? xx??????? xx+0.678 xx+47.72 xx-0.001 xx??????? xx+225.9 xx+0.000
xx+0341. xx???????
01+0107. 02+4.644 xx??????? xx-0.001 xx??????? xx+208.9 xx+0.000 xx+0341.
xx+2200.

01+0107. 02+10.72 03+21.84 04-0.001 05+07.36 06+249.9 07+0.000 08+0341.
09+2300.

01+0107. 02+09.59 xx??????? xx-0.001 xx??????? xx??????? xx+0.000 xx+0342.
xx+0000.
01+0107. 02+08.57 03+30.99 04-0.001 05+07.83 xx??????? xx+0.000 xx???????
xx+0100.
01+0107. 02+07.45 03+29.73 04-0.001 xx??????? xx+255.5 xx+0.000 xx???????
xx+0200.
01+0107. xx??????? xx+31.32 xx-0.001 xx+4401. xx+281.7 xx+0.000 xx???????
xx+0300.
01+0107. xx??????? xx??????? xx-0.001 xx??????? xx+269.3 xx??????? xx+0342.
xx??????? xx??????? xx+4.336 xx??????? xx-0.001 xx??????? xx+255.2 xx+0.000
xx??????? xx??????? xx??????? xx+3.022 xx+25.62 xx-0.001 xx??????? xx+262.3
xx??????? xx+0342. xx???????
01+0107. xx??????? xx??????? xx??????? xx+1.693 xx+212.5 xx+0.000 xx+0342.
xx???????
01+0107. 02+0.373 xx??????? xx+0.046 xx??????? xx+192.1 xx+0.000 xx+0342.
xx+0800.
01+0107. 02+4.785 03+26.91 04+0.165 05+4.273 xx??????? xx+0.000 xx+0342.
xx+0900.
01+0107. 02+07.26 03+22.86 04+0.251 05+4.289 06+247.3 07+0.000 08+0342.
09+1000.
01+0107. 02+09.19 03+19.29 04+0.305 05+3.905 06+262.9 07+0.000 08+0342.
09+1100.
01+0107. 02+10.69 03+17.88 04+0.321 05+2.561 06+272.8 07+0.000 xx???????
xx???????
01+0107. 02+11.53 03+17.37 04+0.298 xx??????? xx+246.4 xx+0.000 xx+0342.
xx+1300.
01+0107. 02+12.19 03+16.92 04+0.240 xx??????? xx+292.8 xx+0.000 xx+0342.
xx+1400.
01+0107. 02+12.29 03+16.83 04+0.157 05+2.748 06+200.1 07+0.000 xx???????
xx+1500.
01+0107. 02+11.28 xx??????? xx??????? xx+2.781 xx+139.4 xx+0.000 xx+0342.
xx+1600.
01+0107. 02+08.83 03+18.16 04+0.008 05+2.040 06+47.03 07+0.000 08+0342.
09+1700.
01+0107. 02+4.146 03+20.05 04-0.001 05+1.289 06+219.3 07+0.000 08+0342.
09+1800.
01+0107. 02-1.072 03+22.52 04-0.001 05+1.157 06+235.7 07+0.000 xx???????
xx+1900.
01+0107. 02-3.720 03+24.62 04-0.001 05+1.679 06+244.5 07+0.000 08+0342.
xx???????
01+0107. xx??????? xx+25.23 xx-0.001 xx??????? xx+252.1 xx+0.000 xx+0342.
xx+2100.
01+0107. 02-1.096 03+24.21 04-0.001 xx??????? xx+239.9 xx+0.000 xx+0342.
xx+2200.
01+0107. 02-0.724 xx??????? xx-0.001 xx+2.607 xx+239.3 xx??????? xx+0342.
xx+2300.

01+0107. 02-0.796 xx??????? xx-0.001 xx+1.970 xx+235.0 xx+0.000 xx+0343.
xx+0000.
01+0107. 02-2.151 03+24.67 04-0.001 05+2.558 06+238.8 07+0.000 08+0343.
09+0100.
01+0107. 02-2.588 03+25.15 04-0.001 xx??????? xx+235.1 xx+0.000 xx+0343.
xx+0200.

01+0107. 02-2.716 03+25.32 04-0.001 05+2.566 06+234.1 07+0.000 08+0343.
09+0300.
01+0107. 02-2.923 03+25.47 04-0.001 05+2.098 06+230.4 07+0.000 08+0343.
xx???????
01+0107. 02-4.487 03+26.87 04-0.001 05+2.236 06+241.2 07+0.000 08+0343.
09+0500.
01+0107. 02-4.456 03+27.37 04-0.001 xx??????? xx+232.7 xx+0.000 xx+0343.
xx???????
01+0107. 02-4.626 03+27.85 04+0.000 xx??????? xx+193.7 xx+0.000 xx+0343.
xx???????
01+0107. 02-4.642 03+28.63 xx??????? xx??????? xx+228.3 xx+0.000 xx+0343.
xx+0800.
01+0107. 02+1.161 03+23.44 04+0.161 05+1.022 06+170.2 07+0.000 08+0343.
09+0900.
01+0107. 02+4.534 03+20.90 04+0.246 05+2.197 06+073.9 07+0.000 08+0343.
09+1000.
01+0107. 02+07.23 03+19.27 04+0.299 05+2.320 06+088.8 07+0.000 08+0343.
09+1100.
01+0107. 02+10.33 03+17.73 04+0.315 05+1.849 06+104.2 07+0.000 08+0343.
09+1200.
01+0107. 02+12.54 03+16.78 04+0.292 05+2.399 06+155.4 07+0.000 08+0343.
09+1300.
01+0107. 02+14.68 03+15.91 04+0.235 05+1.644 06+206.7 07+0.000 08+0343.
09+1400.

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01+0107. 02-1.585 03+53.96 04-0.001 05+0.852 06+236.0 07+0.000 08+0350.
09+1800.
01+0107. 02-1.288 03+60.91 04-0.001 05+0.447 06+243.4 07+0.000 08+0350.
09+1900.
01+0107. 02-0.642 03+074.7 04-0.001 05+0.859 06+206.4 07+0.000 08+0350.
09+2000.
01+0107. 02+1.071 03+074.0 04-0.001 05+0.902 06+222.5 07+0.000 08+0350.
09+2100.
01+0107. 02+2.059 03+077.3 04-0.001 05+0.763 06+217.1 07+0.000 08+0350.
09+2200.
01+0107. 02+3.899 03+077.5 04-0.001 05+1.168 06+244.1 07+0.000 08+0350.
09+2300.

01+0107. 02+6.904 03+079.0 04-0.001 05+1.156 06+236.3 07+0.000 08+0351.
09+0000.
01+0107. 02+08.09 03+078.1 04-0.001 05+1.036 06+252.7 07+0.000 08+0351.
09+0100.
01+0107. 02+10.24 03+078.2 04-0.001 05+0.827 06+219.9 07+0.000 08+0351.
09+0200.
01+0107. 02+11.78 03+078.3 04-0.001 05+1.557 06+241.1 07+0.000 08+0351.
09+0300.
01+0107. 02+13.54 03+078.8 04-0.001 05+1.383 06+230.9 07+0.000 08+0351.
09+0400.
01+0107. 02+12.32 03+079.1 04-0.001 05+0.790 06+139.6 07+0.000 08+0351.
09+0500.
01+0107. 02+12.86 03+081.0 04-0.001 05+1.461 06+224.3 07+0.000 08+0351.
09+0600.
01+0107. 02+19.20 03+079.2 04-0.001 05+1.964 06+236.2 07+0.000 08+0351.
09+0700.

01+0107. 02+18.18 03+077.2 04+0.018 05+2.182 06+229.1 07+0.000 08+0351.
09+0800.
01+0107. 02+18.39 03+68.30 04+0.118 05+2.501 06+253.9 07+0.000 08+0351.
09+0900.
01+0107. 02+5.395 03+55.11 04+0.217 05+2.049 06+256.7 07+0.000 08+0351.
09+1000.
01+0107. 02+5.249 03+43.17 04+0.298 05+1.658 06+223.2 07+0.000 08+0351.
09+1100.
01+0107. 02+07.04 03+36.29 04+0.330 05+1.484 06+207.7 07+2.000 08+0351.
09+1200.
01+0107. 02+6.859 03+36.78 04+0.324 05+2.054 06+231.0 07+2.000 08+0351.
09+1300.
01+0107. 02+5.238 03+41.19 04+0.138 05+1.861 06+257.7 07+2.000 08+0351.
09+1400.

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01+0107. 02-1.585 03+53.96 04-0.001 05+0.852 06+236.0 07+0.000 08+0350.
09+1800.
01+0107. 02-1.288 03+60.91 04-0.001 05+0.447 06+243.4 07+0.000 08+0350.
09+1900.
01+0107. 02-0.642 03+074.7 04-0.001 05+0.859 06+206.4 07+0.000 08+0350.
09+2000.
01+0107. 02+1.071 03+074.0 04-0.001 05+0.902 06+222.5 07+0.000 08+0350.
09+2100.
01+0107. 02+2.059 03+077.3 04-0.001 05+0.763 06+217.1 07+0.000 08+0350.
09+2200.
01+0107. 02+3.899 03+077.5 04-0.001 05+1.168 06+244.1 07+0.000 08+0350.
09+2300.

01+0107. 02+6.904 03+079.0 04-0.001 05+1.156 06+236.3 07+0.000 08+0351.
09+0000.
01+0107. 02+08.09 03+078.1 04-0.001 05+1.036 06+252.7 07+0.000 08+0351.
09+0100.
01+0107. 02+10.24 03+078.2 04-0.001 05+0.827 06+219.9 07+0.000 08+0351.
09+0200.
01+0107. 02+11.78 03+078.3 04-0.001 05+1.557 06+241.1 07+0.000 08+0351.
09+0300.
01+0107. 02+13.54 03+078.8 04-0.001 05+1.383 06+230.9 07+0.000 08+0351.
09+0400.
01+0107. 02+12.32 03+079.1 04-0.001 05+0.790 06+139.6 07+0.000 08+0351.
09+0500.
01+0107. 02+12.86 03+081.0 04-0.001 05+1.461 06+224.3 07+0.000 08+0351.
09+0600.
01+0107. 02+19.20 03+079.2 04-0.001 05+1.964 06+236.2 07+0.000 08+0351.
09+0700.
01+0107. 02+18.18 03+077.2 04+0.018 05+2.182 06+229.1 07+0.000 08+0351.
09+0800.
01+0107. 02+18.39 03+68.30 04+0.118 05+2.501 06+253.9 07+0.000 08+0351.
09+0900.
01+0107. 02+5.395 03+55.11 04+0.217 05+2.049 06+256.7 07+0.000 08+0351.
09+1000.
01+0107. 02+5.249 03+43.17 04+0.298 05+1.658 06+223.2 07+0.000 08+0351.
09+1100.
01+0107. 02+07.04 03+36.29 04+0.330 05+1.484 06+207.7 07+2.000 08+0351.
09+1200.

01+0107. 02+6.859 03+36.78 04+0.324 05+2.054 06+231.0 07+2.000 08+0351.
09+1300.
01+0107. 02+5.238 03+41.19 04+0.138 05+1.861 06+257.7 07+2.000 08+0351.
09+1400.

Weather Data

January 20, 1988 (Julian day 20) to
June 11, 1988 (Julian day 162)

Measurements taken every hour and averaged for the day except rainfall and solar radiation which are totalized. ******** denotes a break in the record.

Channel number	Meaning
01	Data logger identification
02	Julian day
03	Precipitation (mm)
04	Temperature (^{o}C)
05	Relative humidity (%)
06	Solar radiation (watts/m^2)
07	Wind speed (m/hour)
08	Wind direction (degrees from north, east = 90^{o}).

NOTE: Record starting Julian day 146 has the same output order but readings were taken hourly. The time of the reading was not recorded.

6999 indicates reading off scale, probably due to sensor failure
0000 indicates instrument not connected
xx????? indicates data transmittal problem

01+0107.	02+0020.	03+0.000	04+09.35	05+66.45	06+1.138	07+106.0	08+249.8
01+0107.	02+0021.	03+4.000	04+16.77	05+65.48	06+1.584	07+074.8	08+224.2
01+0107.	02+0022.	03+0.000	04-2.811	05+63.11	06+1.011	07+63.43	08+176.3
01+0107.	02+0023.	03+0.000	04-1.137	05+65.94	06+2.423	07+69.35	08+206.0
01+0107.	02+0024.	03+0.000	04+0.497	05+52.63	06+2.396	07+081.8	08+205.1
01+0107.	02+0025.	03+0.000	04-0.173	05+44.38	06+2.537	07+146.1	08+250.3
01+0107.	02+0026.	03+0.000	04-2.894	05+45.00	06+2.559	07+073.4	08+180.9
01+0107.	02+0027.	03+0.000	04+0.603	05+40.55	06+2.574	07+109.6	08+185.0
01+0107.	02+0028.	03+0.000	04+2.465	05+52.61	06+2.496	07+52.31	08+202.6
01+0107.	02+0029.	03+0.000	04+4.566	05+51.80	06+1.935	07+64.48	08+183.1
01+0107.	02+0030.	03+0.000	04+07.34	05+48.87	06+2.620	07+082.5	08+180.0
01+0107.	02+0031.	03+0.000	04+07.31	05+42.95	06+2.536	07+130.7	08+190.6
01+0107.	02+0032.	03+0.000	04+07.01	05+42.72	06+2.497	07+125.3	08+180.6
01+0107.	02+0033.	03+0.000	04-6999.	05+6999.	06+1.229	07+088.4	08+210.3
01+0107.	02+0034.	03+0.000	04-6999.	05+6999.	06+1.642	07+107.2	08+154.1
01+0107.	02+0035.	03+0.000	04+10.30	05+44.10	06+1.687	07+155.3	08+241.6
01+0107.	02+0036.	03+3.000	04-6999.	05+6999.	06+0.757	07+44.97	08+167.1
01+0107.	02+0037.	03+07.00	04-6999.	05+6999.	06+1.623	07+61.06	08+176.1
01+0107.	02+0038.	03+0.000	04+15.93	05+075.9	06+1.412	07+107.2	08+156.9
01+0107.	02+0039.	03+0.000	04-6999.	05+6999.	06+1.678	07+070.7	08+192.2
01+0107.	02+0040.	03+0.000	04-6999.	05+6999.	06+2.903	07+51.27	08+158.2
01+0107.	02+0041.	03+0.000	04+6.439	05+48.02	06+2.939	07+087.2	08+182.0
01+0107.	02+0042.	03+0.000	04+6.318	05+41.00	06+2.776	07+127.9	08+229.4

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01+0107.	02+0044.	03+0.000	04+4.435	05+36.92	06+0.047	07+084.3	08+224.1
01+0107.	02+0045.	03+0.000	04+09.16	05+32.81	06+2.868	07+224.6	08+098.8
01+0107.	02+0046.	03+0.000	04+5.360	05+20.45	06+2.972	07+175.3	08+33.26
01+0107.	02+0047.	03+0.000	04+2.759	05+28.87	06+3.001	07+071.5	08+139.0

01+0107.	02+0048.	03+0.000	04+07.07	05+28.18	06+2.717	07+119.0	08+142.2
01+0107.	02+0049.	03+0.000	04+6.447	05+53.45	06+2.121	07+124.4	08+2.874
01+0107.	02+0050.	03+0.000	04-6999.	05+6999.	06+2.142	07+089.2	08+08.18
01+0107.	02+0051.	03+1.000	04+5.001	05+32.30	06-6999.	07+122.8	08+55.97
01+0107.	02+0052.	03+0.000	04+3.862	05+35.84	06-6999.	07+65.19	08+59.70
01+0107.	02+0053.	03+0.000	04+6.407	05+36.08	06-6999.	07+083.7	08+21.70
01+0107.	02+0054.	03+0.000	04+08.68	05+26.14	06-6999.	07+125.0	08+086.0
01+0107.	02+0055.	03+0.000	04+07.42	05+27.31	06-6999.	07+120.2	08+59.85
01+0107.	02+0056.	03+0.000	04+08.13	05+27.42	06-6999.	07+65.71	08+154.0
01+0107.	02+0057.	03+0.000	04+09.63	05+23.72	06-6999.	07+071.4	08+111.1
01+0107.	02+0058.	03+0.000	04+14.16	05+22.61	06-6999.	07+071.5	08+09.83
01+0107.	02+0059.	03+3.000	04-6999.	05+6999.	06-6999.	07+52.27	08+68.93
01+0107.	02+0060.	03+0.000	04-6999.	05+6999.	06-6999.	07+68.27	08+092.0
01+0107.	02+0061.	03+0.000	04+13.24	05+42.98	06-6999.	07+086.1	08+27.19
01+0107.	02+0062.	03+0.000	04+13.38	05+37.71	06-6999.	07+109.5	08+091.7
01+0107.	02+0063.	03+0.000	04+09.72	05+34.13	06+3.609	07+157.0	08+195.4
01+0107.	02+0064.	03+0.000	04-6999.	05+6999.	06+2.028	07+108.2	08+128.5
01+0107.	02+0065.	03+0.000	04-6999.	05+6999.	06+3.773	07+179.4	08+203.6
01+0107.	02+0066.	03+0.000	04+10.44	05+32.69	06+3.610	07+094.6	08+175.3
01+0107.	02+0067.	03+0.000	04+12.36	05+28.96	06+3.364	07+107.1	08+190.4
01+0107.	02+0068.	03+0.000	04+10.12	05+20.82	06+1.778	07+234.6	08+247.7
01+0107.	02+0069.	03+0.000	04+4.135	05+20.20	06+3.787	07+135.1	08+269.2
01+0107.	02+0070.	03+0.000	04+08.46	05+18.88	06+3.630	07+112.8	08+177.2
01+0107.	02+0071.	03+0.000	04+10.89	05+17.21	06+3.767	07+258.2	08+213.4
01+0107.	02+0072.	03+0.000	04+3.082	05+22.80	06+3.860	07+239.5	08+243.0
01+0107.	02+0073.	03+0.000	04+5.000	05+23.61	06+2.899	07+094.3	08+192.5
01+0107.	02+0074.	03+0.000	04+1.566	05+31.08	06+3.717	07+169.5	08+266.0
01+0107.	02+0075.	03+0.000	04+3.069	05+20.42	06+3.980	07+104.9	08+176.0

01+0107.	02+0076.	03+0.000	04+08.77	05+18.45	06+3.991	07+168.2	08+195.2
01+0107.	02+0077.	03+0.000	04+6.824	05+20.38	06+3.422	07+214.0	08+219.8
01+0107.	02+0078.	03+0.000	04+2.543	05+31.23	06+2.573	07+076.4	08+160.3
01+0107.	02+0079.	03+0.000	04+2.465	05+33.17	06+4.043	07+61.95	08+186.2
01+0107.	02+0080.	03+0.000	04+6.337	05+20.47	06+4.135	07+62.07	08+185.8
01+0107.	02+0081.	03+0.000	04+10.19	05+17.83	06+4.189	07+67.05	08+205.8
01+0107.	02+0082.	03+0.000	04+13.33	05+16.39	06+4.190	07+090.5	08+156.4
01+0107.	02+0083.	03+0.000	04+15.45	05+15.56	06+3.954	07+162.8	08+234.9
01+0107.	02+0084.	03+0.000	04+15.89	05+15.51	06+4.169	07+131.7	08+150.5
01+0107.	02+0085.	03+0.000	04+15.56	05+15.54	06+4.157	07+198.2	08+223.3
01+0107.	02+0086.	03+0.000	04+12.20	05+16.75	06+4.232	07+078.6	08+185.9
01+0107.	02+0087.	03+0.000	04+15.44	05+15.78	06+4.277	07+091.9	08+165.4
01+0107.	02+0088.	03+0.000	04+18.56	05+14.60	06+2.969	07+241.5	08+181.3
01+0107.	02+0089.	03+0.000	04+15.25	05+15.65	06+4.257	07+255.9	08+247.9
01+0107.	02+0090.	03+0.000	04+6.786	05+18.67	06+4.393	07+143.9	08+200.2
01+0107.	02+0091.	03+0.000	04+11.46	05+16.99	06+4.284	07+238.9	08+202.5
01+0107.	02+0092.	03+0.000	04-6999.	05+6999.	06+1.530	07+208.5	08+220.8
01+0107.	02+0093.	03+07.00	04-6999.	05+6999.	06+3.007	07+42.10	08+195.0
01+0107.	02+0094.	03+0.000	04+10.62	05+32.69	06+4.399	07+117.7	08+174.0
01+0107.	02+0095.	03+0.000	04+15.05	05+23.58	06+4.464	07+121.7	08+139.2
01+0107.	02+0096.	03+0.000	04+18.13	05+14.67	06+4.342	07+156.1	08+254.7
01+0107.	02+0097.	03+0.000	04+15.86	05+15.46	06+4.652	07+161.1	08+244.5
01+0107.	02+0098.	03+0.000	04+15.53	05+15.64	06+4.500	07+119.4	08+175.2

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01+0107.	02+0100.	03+0.000	04+17.70	05+14.79	06+0.215	07+169.7	08+240.0
01+0107.	02+0101.	03+0.000	04+12.54	05+20.00	06+4.533	07+131.5	08+095.6
01+0107.	02+0102.	03+0.000	04+09.14	05+21.46	06+4.727	07+088.1	08+167.2
01+0107.	02+0103.	03+0.000	04+12.30	05+17.66	06+4.807	07+070.9	08+203.2

01+0107.	02+0104.	03+0.000	04+15.58	05+15.59	06+4.536	07+088.3	08+163.2
01+0107.	02+0105.	03+0.000	04+18.05	05+14.72	06+3.405	07+094.5	08+154.9
01+0107.	02+0106.	03+0.000	04+14.02	05+39.07	06+1.637	07+133.4	08+198.4
01+0107.	02+0107.	03+0.000	04+20.50	05+42.71	06+3.988	07+086.9	08+144.5
01+0107.	02+0108.	03+13.00	04-6999.	05+6999.	06+1.318	07+109.3	08+180.4
01+0107.	02+0109.	03+0.000	04+08.34	05+53.53	06+2.023	07+222.1	08+228.1
01+0107.	02+0110.	03+0.000	04+13.13	05+34.36	06+5.081	07+198.9	08+242.7
01+0107.	02+0111.	03+0.000	04+16.39	05+28.35	06+4.938	07+192.4	08+240.0
01+0107.	02+0112.	03+0.000	04+17.95	05+22.56	06+4.704	07+123.4	08+172.7

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01+0113.	02+0114.	03+0.000	04+09.75	05+22.98	06+074.1	07+0.910	08+226.5
01+0113.	02+0115.	03+0.000	04+12.25	05+26.39	06+1562.	07+0.754	08+204.2
01+0113.	02+0116.	03+0.000	04+11.53	05+20.02	06+1658.	07+1.181	08+236.0
01+0113.	02+0117.	03+0.000	04+16.30	05+19.82	06+1731.	07+0.931	08+220.1
01+0113.	02+0118.	03+0.000	04+18.06	05+15.08	06+1709.	07+0.803	08+186.5
01+0113.	02+0119.	03+0.000	04+17.28	05+15.51	06+1543.	07+0.642	08+164.5
01+0113.	02+0120.	03+0.000	04+16.61	05+24.58	06+0809.	07+0.780	08+180.5
01+0113.	02+0121.	03+0.000	04+18.39	05+29.76	06+1520.	07+0.959	08+254.8
01+0113.	02+0122.	03+0.000	04+20.75	05+16.00	06+1729.	07+0.925	08+174.6
01+0113.	02+0123.	03+0.000	04+16.33	05+17.56	06+1752.	07+1.394	08+195.9
01+0113.	02+0124.	03+0.000	04+12.38	05+18.01	06+1785.	07+1.222	08+256.9
01+0113.	02+0125.	03+0.000	04+16.13	05+15.43	06+1795.	07+0.739	08+154.2
01+0113.	02+0126.	03+0.000	04+17.23	05+15.50	06+1795.	07+0.946	08+151.5

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01+0107.	02+0146.	03+0.000	04+11.95	05+26.15	06-0.001	07+17.96	08+226.8
01+0107.	02+0146.	03+0.000	04+10.43	05+30.88	06-0.001	07+60.88	08+230.2
01+0107.	02+0146.	03+0.000	04+11.08	05+33.21	06-0.001	07+63.73	08+267.4
01+0107.	02+0146.	03+0.000	04+09.39	05+43.01	06+0.002	07+070.7	08+230.4
01+0107.	02+0146.	03+0.000	04+13.53	05+33.60	06+0.074	07+57.68	08+272.1
01+0107.	02+0146.	03+0.000	04+18.59	05+26.92	06+0.207	07+39.79	08+075.3
01+0107.	02+0146.	03+0.000	04+22.17	05+18.84	06+0.310	07+38.47	08+6.074

01+0107.	02+0146.	03+0.000	04+24.65	05+15.64	06+0.453	07+078.2	08+41.00
01+0107.	02+0146.	03+0.000	04+28.75	05+12.00	06+0.581	07+65.84	08+106.7
01+0107.	02+0146.	03+0.000	04+28.86	05+11.36	06+0.682	07+104.9	08+60.69
01+0107.	02+0146.	03+0.000	04+28.25	05+11.22	06+0.163	07+099.7	08+119.2
01+0107.	02+0146.	03+0.000	04+25.33	05+12.52	06+0.096	07+183.1	08+213.5
01+0107.	02+0146.	03+0.000	04+27.86	05+11.24	06+0.327	07+183.3	08+242.9
01+0107.	02+0146.	03+0.000	04+25.89	05+12.19	06+0.203	07+373.4	08+239.4
01+0107.	02+0146.	03+0.000	04+26.37	05+12.02	06+0.147	07+261.8	08+230.8
01+0107.	02+0146.	03+0.000	04+26.92	05+11.76	06+0.138	07+228.1	08+285.6
01+0107.	02+0146.	03+0.000	04+25.98	05+12.16	06+0.104	07+200.3	08+307.9
01+0107.	02+0146.	03+0.000	04+22.66	05+13.42	06+0.002	07+091.8	08+169.3
01+0107.	02+0146.	03+0.000	04+20.81	05+14.38	06-0.001	07+078.0	08+178.7
01+0107.	02+0146.	03+0.000	04+20.69	05+15.60	06-0.001	07+52.66	08+56.15
01+0107.	02+0146.	03+0.000	04+16.09	05+23.69	06-0.001	07+43.42	08+219.9

01+0107.	02+0147.	03+0.000	04+13.96	05+27.23	06-0.002	07+53.95	08+282.5
01+0107.	02+0147.	03+0.000	04+17.58	05+27.78	06-0.001	07+62.92	08+086.2
01+0107.	02+0147.	03+0.000	04+15.93	05+28.16	06-0.002	07+44.35	08+253.7
01+0107.	02+0147.	03+0.000	04+11.00	05+37.81	06-0.002	07+081.7	08+239.7
01+0107.	02+0147.	03+0.000	04+12.25	05+38.56	06-0.001	07+100.2	08+223.2
01+0107.	02+0147.	03+0.000	04+11.49	05+43.62	06-0.001	07+072.2	08+227.2
01+0107.	02+0147.	03+0.000	04+10.57	05+43.85	06+0.002	07+115.3	08+250.6
01+0107.	02+0147.	03+0.000	04+13.04	05+42.06	06+0.074	07+142.5	08+245.0
01+0107.	02+0147.	03+0.000	04+17.51	05+32.77	06+0.200	07+131.2	08+289.9
01+0107.	02+0147.	03+0.000	04+21.84	05+23.09	06+0.337	07+079.0	08+259.7
01+0107.	02+0147.	03+0.000	04+24.44	05+19.10	06+0.463	07+071.9	08+188.2
01+0107.	02+0147.	03+0.000	04+27.43	05+14.53	06+0.567	07+077.3	08+128.3

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01+0107.	02+0158.	03+0.000	04+29.63	05+13.07	06+0.607	07+65.34	08+221.9
01+0107.	02+0158.	03+0.000	04+31.87	05+10.46	06+0.621	07+107.4	08+151.5
01+0107.	02+0158.	03+0.000	04+33.06	05+09.37	06+0.613	07+157.6	08+082.3
01+0107.	02+0158.	03+0.000	04+33.87	05+09.02	06+0.496	07+339.6	08+118.1
01+0107.	02+0158.	03+0.000	04+32.02	05+09.68	06+0.155	07+304.6	08+164.9
01+0107.	02+0158.	03+0.000	04+32.83	05+09.39	06+0.322	07+308.8	08+140.5
01+0107.	02+0158.	03+0.000	04+30.46	05+10.24	06+0.067	07+276.5	08+081.2
01+0107.	02+0158.	03+0.000	04+29.68	05+10.52	06+0.035	07+225.4	08+116.6
01+0107.	02+0158.	03+0.000	04+27.22	05+11.47	06+0.006	07+125.9	08+146.8
01+0107.	02+0158.	03+0.000	04+26.06	05+11.89	06-0.002	07+55.68	08+136.3
01+0107.	02+0158.	03+0.000	04+22.96	05+13.55	06-0.001	07+48.95	08+138.0
01+0107.	02+0158.	03+0.000	04+24.59	05+12.54	06-0.001	07+127.5	08+216.2

01+0107.	02+0159.	03+0.000	04+22.80	05+13.30	06-0.001	07+118.7	08+199.1
01+0107.	02+0159.	03+0.000	04+22.80	05+13.12	06-0.001	07+230.6	08+216.7
01+0107.	02+0159.	03+0.000	04+18.35	05+15.21	06-0.001	07+107.5	08+204.8
01+0107.	02+0159.	03+0.000	04+19.93	05+14.34	06-0.001	07+51.33	08+165.4
01+0107.	02+0159.	03+0.000	04+16.91	05+15.79	06-0.002	07+60.43	08+234.8
01+0107.	02+0159.	03+0.000	04+15.13	05+16.78	06-0.002	07+130.2	08+242.1
01+0107.	02+0159.	03+0.000	04+13.49	05+18.77	06+0.003	07+092.9	08+232.5
01+0107.	02+0159.	03+0.000	04+18.03	05+15.86	06+0.084	07+11.87	08+6.075
01+0107.	02+0159.	03+0.000	04+22.25	05+13.50	06+0.211	07+097.7	08+219.6
01+0107.	02+0159.	03+0.000	04+26.24	05+11.82	06+0.351	07+171.5	08+264.3
01+0107.	02+0159.	03+0.000	04+28.82	05+10.83	06+0.472	07+099.6	08+07.38

01+0107.	02+0159.	03+0.000	04+30.44	05+10.19	06+0.574	07+093.4	08+50.49
01+0107.	02+0159.	03+0.000	04+32.19	05+09.56	06+0.630	07+089.3	08+15.29
01+0107.	02+0159.	03+0.000	04+34.37	05+08.77	06+0.647	07+107.3	08+151.8
01+0107.	02+0159.	03+0.000	04+34.99	05+08.49	06+0.641	07+110.4	08+079.2
01+0107.	02+0159.	03+0.000	04+35.77	05+08.27	06+0.591	07+127.1	08+118.5
01+0107.	02+0159.	03+0.000	04+35.12	05+08.50	06+0.502	07+160.5	08+47.21
01+0107.	02+0159.	03+0.000	04+34.41	05+08.76	06+0.405	07+186.0	08+101.4
01+0107.	02+0159.	03+0.000	04+31.72	05+09.73	06+0.108	07+156.4	08+164.4
01+0107.	02+0159.	03+0.000	04+29.79	05+10.48	06+0.020	07+138.3	08+122.9
01+0107.	02+0159.	03+0.000	04+27.80	05+11.14	06+0.004	07+104.4	08+204.0
01+0107.	02+0159.	03+0.000	04+24.37	05+12.50	06-0.001	07+077.7	08+150.8
01+0107.	02+0159.	03+0.000	04+23.39	05+12.97	06-0.001	07+67.37	08+183.1
01+0107.	02+0159.	03+0.000	04+25.35	05+12.02	06-0.001	07+172.1	08+213.3

01+0107.	02+0160.	03+0.000	04+23.79	05+12.58	06-0.001	07+272.5	08+246.2
01+0107.	02+0160.	03+0.000	04+23.09	05+12.83	06-0.001	07+325.0	08+273.3
01+0107.	02+0160.	03+0.000	04+21.69	05+13.34	06-0.001	07+337.5	08+221.3
01+0107.	02+0160.	03+0.000	04+19.20	05+14.23	06-0.001	07+158.7	08+201.4
01+0107.	02+0160.	03+0.000	04+19.31	05+14.19	06-0.001	07+178.7	08+219.0
01+0107.	02+0160.	03+0.000	04+18.01	05+14.66	06-0.001	07+163.7	08+315.4
01+0107.	02+0160.	03+0.000	04+17.17	05+14.97	06+0.004	07+118.8	08+276.5
01+0107.	02+0160.	03+0.000	04+18.62	05+14.51	06+0.094	07+63.49	08+201.2
01+0107.	02+0160.	03+0.000	04+22.96	05+12.88	06+0.229	07+162.6	08+242.4
01+0107.	02+0160.	03+0.000	04+25.64	05+11.92	06+0.367	07+217.5	08+195.3
01+0107.	02+0160.	03+0.000	04+27.82	05+11.13	06+0.496	07+176.9	08+231.7
01+0107.	02+0160.	03+0.000	04+29.02	05+10.70	06+0.597	07+241.8	08+270.4
01+0107.	02+0160.	03+0.000	04+30.70	05+10.09	06+0.657	07+186.1	08+248.5
01+0107.	02+0160.	03+0.000	04+31.78	05+09.64	06+0.676	07+195.3	08+263.4
01+0107.	02+0160.	03+0.000	04+32.68	05+09.38	06+0.659	07+185.6	08+321.8
01+0107.	02+0160.	03+0.000	04+33.37	05+09.07	06+0.602	07+172.9	08+268.6
01+0107.	02+0160.	03+0.000	04+35.49	05+08.31	06+0.513	07+107.6	08+323.2
01+0107.	02+0160.	03+0.000	04+34.54	05+08.65	06+0.391	07+124.2	08+347.8
01+0107.	02+0160.	03+0.000	04+33.74	05+08.94	06+0.257	07+143.2	08+269.4
01+0107.	02+0160.	03+0.000	04+32.49	05+09.39	06+0.121	07+179.9	08+280.0
01+0107.	02+0160.	03+0.000	04+29.01	05+10.64	06+0.009	07+072.8	08+348.5
01+0107.	02+0160.	03+0.000	04+22.58	05+13.02	06-0.002	07+1.830	08+200.8
01+0107.	02+0160.	03+0.000	04+17.67	05+14.79	06-0.001	07+30.43	08+251.3
01+0107.	02+0160.	03+0.000	04+15.03	05+15.86	06-0.001	07+57.65	08+245.0

01+0107.	02+0161.	03+0.000	04+17.31	05+14.91	06-0.001	07+081.0	08+214.2
01+0107.	02+0161.	03+0.000	04+16.66	05+15.15	06-0.002	07+103.4	08+235.6
01+0107.	02+0161.	03+0.000	04+13.36	05+16.40	06-0.002	07+41.01	08+4.763
01+0107.	02+0161.	03+0.000	04+14.73	05+15.84	06-0.001	07+081.6	08+220.8
01+0107.	02+0161.	03+0.000	04+15.27	05+15.65	06-0.001	07+108.4	08+174.8
01+0107.	02+0161.	03+0.000	04+19.82	05+14.01	06-0.002	07+218.1	08+242.2
01+0107.	02+0161.	03+0.000	04+17.27	05+14.93	06+0.003	07+140.3	08+102.8
01+0107.	02+0161.	03+0.000	04+18.35	05+14.54	06+0.096	07+30.33	08+12.00
01+0107.	02+0161.	03+0.000	04+22.74	05+12.96	06+0.229	07+14.04	08+09.96
01+0107.	02+0161.	03+0.000	04+24.90	05+12.18	06+0.366	07+085.6	08+07.43
01+0107.	02+0161.	03+0.000	04+27.82	05+11.13	06+0.490	07+100.9	08+37.01
01+0107.	02+0161.	03+0.000	04+30.85	05+10.04	06+0.591	07+127.9	08+316.2
01+0107.	02+0161.	03+0.000	04+33.24	05+09.18	06+0.654	07+127.7	08+11.65
01+0107.	02+0161.	03+0.000	04+36.14	05+08.14	06+0.678	07+133.2	08+15.63
01+0107.	02+0161.	03+0.000	04+38.06	05+07.38	06+0.663	07+123.4	08+65.31

01+0107.	02+0161.	03+0.000	04+37.52	05+07.58	06+0.611	07+159.2	08+202.7
01+0107.	02+0161.	03+0.000	04+38.21	05+07.33	06+0.525	07+176.0	08+141.1
01+0107.	02+0161.	03+0.000	04+36.47	05+07.96	06+0.396	07+185.6	08+102.1
01+0107.	02+0161.	03+0.000	04+35.71	05+08.23	06+0.258	07+196.9	08+138.3
01+0107.	02+0161.	03+0.000	04+34.00	05+08.84	06+0.116	07+175.4	08+141.2
01+0107.	02+0161.	03+0.000	04+30.34	05+10.16	06+0.010	07+137.5	08+131.0
01+0107.	02+0161.	03+0.000	04+27.57	05+11.16	06-0.001	07+095.3	08+164.6
01+0107.	02+0161.	03+0.000	04+22.20	05+13.15	06-0.002	07+57.88	08+246.4
01+0107.	02+0161.	03+0.000	04+18.40	05+14.52	06-0.002	07+55.39	08+092.0

01+0107.	02+0162.	03+0.000	04+21.12	05+13.66	06-0.001	07+071.9	08+50.52
01+0107.	02+0162.	03+0.000	04+19.54	05+17.15	06-0.001	07+32.13	08+242.9
01+0107.	02+0162.	03+0.000	04+20.06	05+24.35	06-0.001	07+25.32	08+57.72
01+0107.	02+0162.	03+0.000	04+19.53	05+29.30	06-0.001	07+56.67	08+133.5
01+0107.	02+0162.	03+0.000	04+20.95	05+24.39	06-0.001	07+101.6	08+61.36
01+0107.	02+0162.	03+0.000	04+18.16	05+28.95	06-0.001	07+092.4	08+092.5
01+0107.	02+0162.	03+0.000	04+16.33	05+38.59	06+0.003	07+18.71	08+304.7
01+0107.	02+0162.	03+0.000	04+18.40	05+38.24	06+0.077	07+24.27	08+255.6
01+0107.	02+0162.	03+0.000	04+22.44	05+30.13	06+0.090	07+53.33	08+089.2
01+0107.	02+0162.	03+0.000	04+23.73	05+26.08	06+0.082	07+157.3	08+071.0
01+0107.	02+0162.	03+0.000	04+25.48	05+21.19	06+0.143	07+140.7	08+46.53

Weather Data

June 12, 1988 (Julian day 163) to
December 17, 1988 (Julian day 351)

Measurements taken every hour and averaged for the day except rainfall, solar radiation and wind speed which are totalized. ******** denotes a break in the record.

Channel number	Meaning
01	Data logger identification
02	Julian day
03	Precipitation (mm)
04	Temperature (^{o}C)
05	Relative humidity (%)
06	Solar radiation (watts/m^2)
07	Wind total (m)
08	Wind direction (degrees from north, east = 90^{o}).
09	soil temperature 30 cm depth station 1
10	soil temperature 60 cm depth station 1
11	soil temperature 120 cm depth station 1
12	soil temperature 240 cm depth station 1
13	soil temperature 30 cm depth station 2
14	soil temperature 60 cm depth station 2
15	soil temperature 120 cm depth station 2
16	soil temperature 240 cm depth station 2
17	soil temperature 30 cm depth station 3
18	soil temperature 60 cm depth station 3
19	soil temperature 120 cm depth station 3
20	soil temperature 240 cm depth station 3

21	soil temperature 30 cm depth station 4
22	soil temperature 60 cm depth station 4
23	soil temperature 120 cm depth station 4
24	soil temperature 240 cm depth station 4
25	soil temperature 30 cm depth station 5
26	soil temperature 60 cm depth station 5
27	soil temperature 120 cm depth station 5
28	soil temperature 240 cm depth station 5
29	soil temperature 30 cm depth station 6
30	soil temperature 60 cm depth station 6
31	soil temperature 120 cm depth station 6
32	soil temperature 240 cm depth station 6

NOTE: Soil temperature nest 1 is between ETT1 and ETT2.
Soil temperature nest 2 is between ETT3 and ETT4.
Soil temperature nest 3 is between ETT12 and ETT11.
Soil temperature nest 4 is between ETT10 and ETT9.
Soil temperature nest 5 is between ETT17 and ETT18.
Soil temperature nest 6 is between ETT19 and ETT20.

6999 indicates reading off scale, probably due to sensor failure
0000 indicates instrument not connected
xx????? indicates data transmittal problem

01+0113. 02+0163. 03-53.40 04-52.08 05-53.37 06-52.77 07+32.05 08+26.43
09+22.91 10+18.65 11+38.94 12+27.56 13+21.49 14+16.75 15+28.46 16-52.52
17+24.74 18+22.77 19+1.000 20+31.83 21+35.40 22+1.121 23+244.3 24+139.7

01+0113. 02+0164. 03-53.15 04-51.54 05-53.09 06-52.32 07+31.45 08+26.93
09+23.12 10+18.85 11+37.78 12+27.88 13+21.81 14+16.93 15+27.70 16-52.03
17+25.14 18+22.59 19+0.000 20-6999. 21+6999. 22+4.353 23+147.7 24+149.6

01+0113. 02+0165. 03-53.47 04-53.46 05-53.48 06-53.48 07+30.97 08+26.55
09+23.01 10+18.65 11+37.86 12+27.39 13+21.94 14+16.73 15+27.50 16-53.41
17+25.22 18+22.17 19+0.000 20+24.94 21+21.62 22+5.478 23+246.1 24+136.0

01+0113. 02+0166. 03-53.48 04-53.48 05-53.49 06-53.49 07+30.93 08+26.55
09+22.95 10+18.75 11+38.16 12+27.52 13+22.15 14+16.82 15+27.70 16-53.41
17+25.39 18+22.27 19+0.000 20+24.29 21+12.49 22+4.678 23+130.6 24+163.5

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01+0113. 02+0169. 03+0.000 04+28.32 05+12.99 06+0.758 07+0877. 08+24.93
09-53.61 10+22.81 11+20.48 12+31.05 13+25.17 14+22.44 15+18.74 16+40.99
17+28.05 18+22.59 19+16.89 20+28.96 21-53.61 22+25.84 23+21.49 24-53.59
25+25.31 26+22.00 27+19.20 28-53.61 29+24.92 30+22.09 31+17.13 32+0.000

01+0113. 02+0170. 03+0.000 04+26.50 05+19.84 06+5.406 07+2583. 08+25.47
09-53.58 10+22.99 11+20.61 12+31.05 13+25.45 14+22.56 15+18.85 16+40.71
17+28.68 18+22.78 19+17.00 20+29.20 21-53.57 22+26.05 23+21.61 24-53.56
25+25.64 26+22.20 27+19.34 28-53.57 29+25.20 30+22.26 31+17.22 32+0.000

01+0113. 02+0171. 03+0.000 04+27.36 05+14.58 06+5.228 07+2416. 08+26.12
09-53.60 10+23.13 11+20.68 12+31.45 13+25.75 14+22.60 15+18.90 16+41.39
17+29.14 18+22.92 19+17.02 20+29.75 21-53.60 22+26.24 23+21.66 24-53.58
25+25.99 26+22.34 27+19.43 28-53.59 29+25.49 30+22.38 31+17.26 32+0.000

01+0113. 02+0172. 03+0.000 04+27.49 05+13.10 06+5.565 07+2452. 08+26.89
09-53.60 10+23.32 11+20.75 12+31.66 13+26.03 14+22.56 15+18.97 16+41.75
17+29.45 18+23.13 19+17.09 20+29.97 21-53.60 22+26.50 23+21.73 24-53.58
25+26.34 26+22.55 27+19.53 28-53.60 29+25.80 30+22.57 31+17.31 32+0.000

01+0113. 02+0173. 03+0.000 04+27.14 05+12.23 06+5.381 07+2793. 08+27.68
09-53.60 10+23.53 11+20.90 12+31.83 13+26.31 14+22.43 15+19.04 16+42.02
17+29.72 18+23.34 19+17.14 20+30.19 21-53.60 22+26.86 23+21.81 24-53.59
25+26.66 26+22.82 27+19.61 28-53.59 29+26.05 30+22.78 31+17.38 32+0.000

01+0113. 02+0174. 03+0.000 04+28.33 05+11.64 06+5.446 07+2464. 08+28.37
09-53.60 10+23.71 11+20.98 12+31.96 13+26.50 14+22.52 15+19.09 16+42.23
17+29.84 18+23.52 19+17.17 20+30.30 21-53.60 22+27.13 23+21.86 24-53.59
25+26.86 26+23.04 27+19.66 28-53.60 29+26.22 30+22.94 31+17.42 32+0.000

01+0113. 02+0175. 03+0.000 04+29.90 05+11.18 06+4.793 07+3937. 08+29.08
09-53.61 10+23.87 11+21.05 12+32.35 13+26.73 14+22.58 15+19.14 16+42.79
17+30.11 18+23.68 19+17.20 20+30.81 21-53.62 22+27.34 23+21.92 24-53.59
25+27.07 26+23.26 27+19.70 28-53.61 29+26.43 30+23.09 31+17.47 32+0.000

01+0113. 02+0176. 03+0.000 04+28.69 05+23.12 06+5.083 07+2126. 08+29.92
09-53.65 10+24.09 11+21.12 12+33.16 13+27.26 14+22.79 15+19.25 16+43.50

17+30.57 18+23.91 19+17.28 20+31.35 21-53.65 22+27.56 23+22.04 24-53.63
25+27.40 26+23.46 27+19.77 28-53.66 29+26.79 30+23.27 31+17.52 32+0.000

01+0113. 02+0177. 03+0.000 04+22.15 05+42.35 06+0.031 07+1202. 08-53.64
09+31.59 10+24.30 11+21.10 12+35.12 13+28.89 14+23.31 15+19.57 16+44.48
17+31.01 18+24.46 19+17.66 20+31.70 21-53.66 22+28.06 23+22.33 24-53.64
25+27.88 26+24.03 27+19.97 28-53.65 29+27.33 30+23.78 31+17.75 32+0.000

01+0113. 02+0178. 03+0.000 04+27.07 05+42.25 06+3.276 07+1974. 08-53.71
09+31.71 10+24.44 11+21.17 12+34.01 13+29.01 14+23.49 15+19.67 16+42.85
17+30.94 18+24.61 19+17.74 20+30.34 21-53.69 22-6999. 23+22.37 24-53.70
25+27.86 26+24.23 27+20.00 28-53.71 29+27.26 30+23.91 31+17.80 32+0.000

01+0113. 02+0179. 03+0.000 04+24.87 05+40.14 06+4.042 07+2138. 08-53.76
09+31.41 10+24.62 11+21.27 12+32.78 13+28.78 14+23.62 15+19.73 16+41.64
17+30.12 18+24.77 19+17.83 20+28.84 21-53.74 22+28.33 23+22.43 24-53.75
25+27.42 26+24.30 27+20.06 28-53.75 29+26.67 30+23.93 31+17.82 32+0.000

01+0113. 02+0180. 03+3.000 04-6999. 05+6999. 06+3.266 07+2056. 08-53.50
09+31.29 10+25.13 11+21.60 12+32.62 13+28.70 14+23.86 15+20.02 16+41.77
17+29.87 18+24.96 19+18.07 20+28.75 21-53.31 22+28.84 23+22.77 24-53.48
25+27.19 26+24.69 27+20.31 28-53.50 29+26.46 30+24.02 31+18.04 32+0.000

01+0113. 02+0181. 03+3.000 04-6999. 05+6999. 06+3.435 07+1562. 08-53.12
09+31.42 10+26.15 11+22.16 12+31.99 13+28.96 14+24.16 15+20.51 16+40.88
17+29.76 18+25.16 19+18.46 20+27.83 21-52.45 22+29.18 23+23.53 24-53.09
25+27.29 26+24.81 27+20.70 28-53.09 29+26.45 30+23.77 31+18.30 32+0.000

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09+29.74 10+25.11 11+22.08 12+31.78 13+27.88 14+24.04 15+20.34 16+40.69
17+28.16 18+24.81 19+18.16 20+26.73 21+25.94 22+28.64 23+22.98 24+26.16
25+25.87 26+24.66 27+20.40 28-53.60 29+25.27 30+23.87 31+18.14 32+0.000

01+0113. 02+0183. 03+0.000 04+29.44 05+43.82 06+4.917 07+2322. 08+26.70
09+29.60 10+25.01 11+22.14 12+31.53 13+27.45 14+23.86 15+20.34 16+40.08
17+28.14 18+24.58 19+17.98 20+26.52 21+25.61 22+28.41 23+23.02 24+25.56
25+25.55 26+24.66 27+20.45 28-53.75 29+24.83 30+23.64 31+18.14 32+0.000

01+0113. 02+0184. 03+0.000 04+26.19 05+33.91 06+5.529 07+2849. 08+27.78
09+29.61 10+24.94 11+22.23 12+32.61 13+26.76 14+23.81 15+20.44 16+41.52
17+28.49 18+24.53 19+18.31 20+27.92 21+25.65 22+28.27 23+23.09 24+26.79
25+25.42 26+24.94 27+20.54 28-53.61 29+24.77 30+23.62 31+18.30 32+0.000

01+0113. 02+0185. 03+0.000 04+27.44 05+29.52 06+5.504 07+2292. 08+28.42
09+30.05 10+24.91 11+22.33 12+33.16 13+27.84 14+23.77 15+20.17 16+42.64
17+29.15 18+24.39 19+18.32 20+29.11 21+26.13 22+28.08 23+23.15 24+27.77
25+25.71 26+24.94 27+20.65 28-53.53 29+25.10 30+23.50 31+18.38 32+0.000

01+0113. 02+0186. 03+0.000 04+25.65 05+28.04 06+4.015 07+2377. 08+29.38
09+30.35 10+24.96 11+22.45 12+34.07 13+28.12 14+23.83 15+20.65 16+43.70
17+29.90 18+24.48 19+18.45 20+30.17 21+26.70 22+28.02 23+23.22 24+28.85
25+26.18 26+25.03 27+20.77 28-53.52 29+25.66 30+23.56 31+18.47 32+0.000

01+0113. 02+0187. 03+0.000 04+27.05 05+24.90 06+3.730 07+2673. 08+29.27
09+30.70 10+25.01 11+22.53 12+33.99 13+28.75 14+23.92 15+20.29 16+43.16

17+30.16 18+24.59 19+18.51 20+29.57 21+27.02 22+28.05 23+23.26 24+28.59
25+26.60 26+25.18 27+20.85 28-53.48 29+25.99 30+23.68 31+18.54 32+0.000

01+0113. 02+0188. 03+3.000 04-6999. 05+6999. 06+4.290 07+2885. 08+29.56
09+30.87 10+25.09 11+22.67 12+34.30 13+28.57 14+24.04 15+21.10 16+43.49
17+30.32 18+24.75 19+18.64 20+29.70 21+27.23 22+28.26 23+23.57 24+28.52
25+26.71 26+25.33 27+21.00 28-53.63 29+26.08 30+23.60 31+18.63 32+0.000

01+0113. 02+0189. 03+0.000 04+25.18 05+44.07 06-0.005 07+0877. 08+29.88
09+31.07 10+25.35 11+22.88 12+34.75 13+29.12 14+24.30 15+21.09 16+44.43
17+30.17 18+25.08 19+18.78 20+30.23 21+27.21 22-6999. 23+23.63 24+29.08
25+26.76 26+26.07 27+20.82 28+28.73 29+26.19 30+24.05 31+18.79 32+0.000

01+0113. 02+0190. 03+0.000 04+30.19 05+38.95 06+3.967 07+3652. 08+29.07
09+31.06 10+25.32 11+22.84 12+33.85 13+29.05 14+24.28 15+21.11 16+43.39
17+30.27 18+25.05 19+18.74 20+29.63 21+27.23 22+29.45 23+23.59 24+28.70
25+26.71 26+26.12 27+20.78 28+28.72 29+26.15 30+24.00 31+18.78 32+0.000

01+0113. 02+0191. 03+4.000 04-6999. 05+6999. 06+4.945 07+3027. 08+29.30
09+31.23 10+25.44 11+22.97 12+33.98 13+28.74 14+24.36 15+21.22 16+43.75
17+30.52 18+25.13 19+18.80 20+30.02 21+27.41 22+30.50 23+23.68 24+29.15
25+26.88 26+26.38 27+21.04 28+29.17 29+26.37 30+24.05 31+18.86 32+0.000

01+0113. 02+0192. 03+1.000 04-6999. 05+6999. 06+3.800 07+2447. 08+29.00
09+31.57 10+25.57 11+23.16 12+33.76 13+29.32 14+24.45 15+21.44 16+43.31
17+30.79 18+25.32 19+19.02 20+29.54 21+27.76 22-6999. 23+23.99 24+28.93
25+27.19 26+26.80 27+21.71 28+28.94 29+26.65 30+24.07 31+19.07 32+0.000

01+0113. 02+0193. 03+0.000 04-6999. 05+6999. 06+3.332 07+2179. 08+27.97
09+31.36 10+25.65 11+23.23 12+32.66 13+23.26 14+24.57 15+21.51 16+42.42
17+30.24 18+25.40 19+19.03 20+28.38 21+27.32 22-6999. 23+23.96 24+27.93
25+26.89 26+27.19 27+21.16 28+27.75 29+26.33 30+24.26 31+19.06 32+0.000

01+0113. 02+0194. 03+1.000 04-6999. 05+6999. 06+5.380 07+2581. 08+28.36
09+31.27 10+26.65 11+23.44 12+33.00 13+26.61 14+24.59 15+21.68 16+43.09
17+30.22 18+25.39 19+19.15 20+28.97 21+27.20 22-6999. 23+24.12 24+28.45
25+26.75 26+27.45 27+21.31 28+28.01 29+26.08 30+24.12 31+19.17 32+0.000

01+0113. 02+0195. 03+0.000 04+27.99 05+21.65 06+3.992 07+3797. 08+29.29
09+31.28 10+26.84 11+23.39 12+33.72 13+26.43 14+24.66 15+20.53 16+44.08
17+30.40 18+25.37 19+19.04 20+29.97 21+27.26 22-6999. 23+24.00 24+29.36
25+26.69 26+27.81 27+21.23 28+28.75 29+26.09 30+24.19 31+19.11 32+0.000

01+0113. 02+0196. 03+0.000 04+33.29 05+10.01 06+2.975 07+30.11 08+31.56
09+25.60 10+23.41 11+34.51 12+28.92 13+24.60 14+21.66 15+44.77 16+30.58
17+25.31 18+18.99 19+30.37 20+27.47 21-6999. 22+24.01 23+29.75 24+26.91
25+28.01 26+21.29 27+28.88 28+26.22 29+24.09 30+19.07 31+39.60 32+35.21

01+0113. 02+0197. 03+0.000 04+28.17 05+23.21 06+4.269 07+30.45 08+32.15
09+25.83 10+23.57 11+34.94 12+29.33 13+24.77 14+21.81 15+45.10 16+31.27
17+25.50 18+19.10 19+31.14 20+28.01 21-6999. 22+24.18 23+30.49 24+27.30
25+28.34 26+21.46 27+29.83 28+26.62 29+24.35 30+19.21 31+35.11 32+32.11

01+0113. 02+0198. 03+0.000 04+29.73 05+36.53 06+3.854 07+29.97 08+32.63
09+25.98 10+23.72 11+34.52 12+21.87 13+24.92 14+19.23 15+44.45 16+31.46
17+25.67 18+19.19 19+30.56 20+28.32 21-6999. 22+24.34 23+30.16 24+27.62

25+28.65 26+21.58 27+29.71 28+26.97 29+24.50 30+19.32 31+31.63 32+29.53

01+0113. 02+0199. 03+0.000 04+27.56 05+25.42 06+3.930 07+29.99 08+32.70
09+26.11 10+23.77 11+34.44 12+23.58 13+25.04 14+21.95 15+44.52 16+31.24
17+25.81 18+19.20 19+30.43 20+28.19 21-6999. 22+24.33 23+30.03 24+27.56
25+28.96 26+21.62 27+29.54 28+26.91 29+24.66 30+19.33 31+34.16 32+32.01

01+0113. 02+0200. 03+0.000 04+28.04 05+22.85 06+4.587 07+30.47 08+33.00
09+26.21 10+23.84 11+34.99 12+29.02 13+25.14 14+21.93 15+44.93 16+31.48
17+25.92 18+19.25 19+30.72 20+28.27 21-6999. 22+24.36 23+30.34 24+27.63
25+29.19 26+21.67 27+29.66 28+26.97 29+24.76 30+19.39 31+34.40 32+32.70

01+0113. 02+0201. 03+0.000 04+28.87 05+37.71 06+5.140 07+30.31 08+33.37
09+26.33 10+23.93 11+35.05 12+28.69 13+25.25 14+22.12 15+44.79 16+31.69
17+26.03 18+19.30 19+30.54 20+28.38 21-6999. 22+24.45 23+30.28 24+27.76
25+29.34 26+21.74 27+29.51 28+27.03 29+24.83 30+19.46 31+34.83 32+31.19

01+0113. 02+0202. 03+0.000 04-6999. 05+6999. 06+3.514 07+29.27 08+33.69
09+26.47 10+24.11 11+34.87 12+28.93 13+25.38 14+22.24 15+45.04 16+31.87
17+26.18 18+19.43 19+30.84 20+28.56 21-6999. 22+24.62 23+30.45 24+27.89
25+29.52 26+21.81 27+29.84 28+27.30 29+24.96 30+19.58 31+31.38 32+28.98

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01+0113. 02+0233. 03+0.000 04+27.63 05+43.02 06+4.480 07+20.15 08+34.67
09+27.75 10+26.59 11+12.71 12+27.69 13+26.91 14+23.92 15+40.85 16+29.84
17+30.74 18+20.60 19+27.79 20+27.69 21-6999. 22+26.55 23+27.71 24+26.33
25+33.64 26+23.72 27+26.90 28+25.85 29+25.06 30+20.84 31+31.13 32+29.93

01+0113. 02+0234. 03+0.000 04+29.59 05+44.05 06+4.419 07+22.83 08+35.02
09+28.24 10+26.68 11+22.11 12+27.97 13+26.97 14+24.35 15+41.44 16+30.22
17+30.93 18+20.69 19+28.55 20+28.05 21-6999. 22+26.69 23+28.45 24+26.56
25+33.72 26+23.88 27+27.63 28+26.10 29+25.07 30+20.99 31+26.98 32+26.90

01+0113. 02+0235. 03+0.000 04+27.38 05+53.75 06+3.338 07+21.86 08+35.25
09+27.65 10+26.62 11+4.587 12+28.17 13+27.01 14+24.41 15+41.89 16+30.48
17+31.13 18+20.71 19+29.16 20+28.33 21-6999. 22+26.66 23+29.53 24+26.72
25+33.70 26+23.87 27+28.20 28+26.30 29+25.05 30+20.99 31+26.39 32+25.53

01+0113. 02+0236. 03+09.00 04-6999. 05+6999. 06+3.639 07+13.71 08+35.43
09+27.61 10+26.65 11-16.65 12+26.88 13+26.98 14+24.51 15+41.10 16+30.54
17+31.30 18+20.74 19+28.53 20+28.44 21-6999. 22+26.70 23+21.68 24+26.86
25+33.62 26+23.89 27+27.68 28+26.39 29+25.01 30+21.01 31+22.20 32+28.92

01+0113. 02+0237. 03+3.000 04-6999. 05+6999. 06+4.303 07-6999. 08+36.52
09+28.22 10+27.21 11+25.89 12+29.20 13+27.16 14+24.24 15+41.31 16+31.42
17+31.77 18+21.35 19+28.79 20+29.37 21-6999. 22+27.48 23+29.27 24+27.58
25+35.26 26+24.47 27+27.78 28+27.00 29+25.08 30+21.58 31+26.10 32+25.11

01+0113. 02+0238. 03+1.000 04-6999. 05+6999. 06+3.686 07+12.42 08+35.72
09+27.65 10+26.86 11+26.02 12+28.54 13+27.20 14+24.04 15+40.95 16+30.65
17+31.91 18+20.83 19+28.63 20+28.62 21-6999. 22+26.83 23+28.56 24+26.99
25+38.82 26+23.95 27+27.62 28+26.40 29+25.01 30+21.10 31+26.38 32+26.71

01+0113. 02+0239. 03+4.000 04+29.08 05+49.53 06+2.805 07+23.69 08+35.65
09+27.73 10+26.71 11+29.62 12+28.02 13+27.29 14+24.21 15+41.49 16+30.68

17+32.27 18+20.73 19+29.28 20+28.63 21-6999. 22+26.74 23+28.07 24+27.01
25+39.16 26+23.88 27+28.28 28+26.38 29+25.05 30+21.03 31+26.94 32+26.28

01+0113. 02+0240. 03+2.000 04-6999. 05+6999. 06+3.203 07-2.653 08+36.25
09+27.95 10+26.88 11+24.37 12+27.12 13+27.43 14+25.14 15+40.35 16+31.23
17+32.85 18+21.10 19+28.45 20+29.30 21-6999. 22+27.27 23+28.57 24+27.55
25+39.35 26+24.21 27+27.95 28+26.94 29+25.08 30+21.37 31+24.48 32+23.08

01+0113. 02+0241. 03+23.00 04-6999. 05+6999. 06+2.936 07-39.87 08+35.84
09+27.97 10+27.05 11+27.14 12+20.33 13+27.52 14+24.28 15+38.39 16+30.62
17+33.29 18+21.05 19+26.60 20+28.79 21-6999. 22+27.23 23+27.02 24+27.21
25+39.45 26+24.17 27+26.40 28+26.55 29+25.18 30+21.35 31+22.74 32+21.75

01+0113. 02+0242. 03+0.000 04-6999. 05+6999. 06+1.367 07-51.63 08+34.91
09+27.62 10+26.98 11+23.82 12+22.34 13+27.62 14+23.58 15+35.38 16+29.20
17+33.72 18+20.95 19+23.56 20+31.35 21-6999. 22+27.10

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01+0113. 02+0247. 03+0.000 04+23.15 05+48.43 06+4.107 07+18.46 08+32.11
09+28.73 10+26.87 11-29.50 12+20.27 13+26.48 14+24.87 15+35.96 16+26.60
17+32.35 18+20.83 19+23.86 20-6999. 21-6999. 22+27.00 23+22.60 24+23.89
25+38.35 26+24.01 27+23.52 28+22.91 29+23.48 30+21.18 31+21.38 32+23.70

01+0113. 02+0248. 03+0.000 04-6999. 05+6999. 06+2.519 07+5.689 08+32.71
09+29.31 10+27.19 11-54.35 12+25.15 13+26.52 14+25.23 15+35.82 16+27.24
17+32.50 18+21.15 19+23.88 20-6999. 21-6999. 22+27.03 23+24.35 24+24.34
25+37.65 26+24.35 27+23.97 28+23.57 29+23.46 30+21.51 31+21.65 32+20.50

01+0113. 02+0249. 03+0.000 04+22.69 05+43.42 06+4.558 07-6999. 08+32.45
09+28.42 10+27.16 11-50.39 12+14.93 13+26.52 14+25.21 15+35.24 16+26.91
17+32.54 18+21.12 19+23.28 20-6999. 21-6999. 22+26.92 23+23.87 24+24.17
25+36.53 26+24.33 27+23.47 28+23.42 29+23.43 30+21.49 31+20.81 32+19.85

01+0113. 02+0250. 03+0.000 04+19.45 05+36.23 06+4.585 07+17.41 08+32.03
09+28.60 10+26.91 11-49.16 12+17.64 13+26.45 14+24.88 15+35.64 16+26.65
17+32.52 18+20.82 19+23.77 20-6999. 21-6999. 22+26.62 23+18.98 24+23.91
25+34.77 26+24.06 27+23.73 28+23.16 29+23.34 30+21.24 31+13.27 32+20.90

01+0113. 02+0251. 03+0.000 04+20.18 05+31.95 06+4.448 07+17.75 08+32.17
09+28.95 10+26.88 11-54.87 12+13.84 13+26.40 14+24.84 15+35.99 16+26.88
17+32.24 18+20.31 19+24.22 20-6999. 21-6999. 22+26.69 23+19.31 24+23.93
25+34.31 26+24.02 27+23.94 28+23.25 29+23.26 30+21.20 31+13.85 32+21.48

01+0113. 02+0252. 03+0.000 04+22.03 05+24.78 06+4.411 07-6999. 08+32.30
09+27.02 10+26.83 11-55.22 12+14.14 13+26.36 14+24.73 15+36.12 16+27.06
17+32.27 18+20.51 19+24.50 20-6999. 21-6999. 22+26.67 23+19.14 24+24.04
25+34.16 26+23.97 27+24.21 28+23.40 29+23.19 30+21.16 31+15.31 32+22.70

01+0113. 02+0253. 03+0.000 04+23.74 05+21.07 06+4.240 07+16.35 08+32.44
09+26.83 10+26.76 11-55.30 12+17.25 13+26.32 14+24.77 15+36.81 16+27.35
17+31.96 18+20.21 19+25.25 20-6999. 21-6999. 22+26.61 23+18.45 24+24.20
25+34.02 26+23.92 27+24.85 28+23.68 29+23.15 30+21.09 31+14.34 32+24.80

01+0113. 02+0254. 03+0.000 04+23.62 05+20.64 06+4.183 07+17.08 08+32.90
09+28.96 10+26.63 11-55.35 12+25.20 13+26.37 14+24.40 15+37.23 16+27.85

17+32.26 18+20.47 19+25.73 20-6999. 21-6999. 22+26.63 23+17.32 24+24.53
25+33.97 26+23.90 27+25.27 28+24.12 29+23.24 30+21.08 31+14.00 32+24.93

01+0113. 02+0255. 03+0.000 04+23.98 05+20.58 06+4.225 07+12.22 08+33.32
09+27.29 10+26.70 11-55.37 12+24.77 13+26.46 14+24.37 15+37.41 16+28.19
17+32.97 18+20.29 19+26.02 20-6999. 21-6999. 22+26.61 23+22.46 24+24.81
25+33.90 26+23.88 27+25.56 28+24.43 29+23.39 30+21.06 31+16.91 32+25.30

01+0113. 02+0256. 03+12.00 04-6999. 05+6999. 06+1.583 07-08.11 08+33.97
09+26.82 10+27.07 11-55.44 12+24.56 13+26.62 14+24.92 15+36.68 16+28.69
17+33.74 18+20.72 19+25.55 20+54.28 21-6999. 22+26.99 23+25.64 24+25.35
25+34.03 26+24.17 27+25.47 28+24.96 29+23.57 30+21.32 31+20.14 32+18.56

01+0113. 02+0257. 03+18.00 04-6999. 05+6999. 06+1.898 07-39.46 08+33.91
09+27.01 10+27.67 11-54.92 12+22.57 13+26.81 14+25.62 15+34.03 16+28.25
17+34.14 18+20.97 19+22.96 20+55.59 21-6999. 22+27.76 23+23.01 24+25.30
25+34.05 26+24.78 27+23.27 28+24.75 29+23.67 30+21.88 31+19.20 32+17.47

01+0113. 02+0258. 03+4.000 04-6999. 05+6999. 06+4.519 07-24.32 08+32.16
09+28.44 10+27.22 11-51.97 12+5.615 13+26.84 14+23.72 15+33.51 16+26.59
17+34.46 18+20.70 19+22.13 20-6999. 21-6999. 22+27.07 23+22.04 24+23.84
25+33.92 26+24.41 27+22.32 28+23.26 29+23.61 30+21.51 31+18.93 32+21.06

01+0113. 02+0259. 03+0.000 04-6999. 05+6999. 06+4.272 07-21.43 08+31.76
09+26.84 10+27.11 11-54.26 12+5.573 13+26.83 14+21.89 15+34.75 16+26.33
17+34.78 18+20.97 19+22.96 20+53.86 21-6999. 22+26.81 23+18.06 24+23.43
25+33.87 26+24.23 27+22.61 28+22.69 29+23.37 30+21.38 31+11.50 32+20.48

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01+0113. 02+0261. 03+0.000 04+23.28 05+26.20 06+4.171 07-08.98 08+31.22
09+26.51 10+26.54 11+24.60 12+08.45 13+26.22 14+22.64 15+34.49 16+25.93
17+33.90 18+20.46 19+22.67 20+56.41 21-6999. 22+26.23 23+11.56 24+23.74
25+32.96 26+23.72 27+22.27 28+22.16 29+22.61 30+20.91 31+08.88 32+25.40

01+0113. 02+0262. 03+0.000 04+21.17 05+36.25 06+3.643 07+0.876 08+31.46
09+27.99 10+26.59 11+24.88 12+14.01 13+26.30 14+23.90 15+34.71 16+26.13
17+34.13 18+20.50 19+23.14 20+59.06 21-6999. 22+26.30 23+16.47 24+23.16
25+32.98 26+23.78 27+22.89 28+22.38 29+22.61 30+20.98 31+10.74 32+22.00

01+0113. 02+0263. 03+0.000 04+23.11 05+35.06 06+4.131 07+2.677 08+31.63
09+27.24 10+26.51 11+25.80 12+15.18 13+26.21 14+22.09 15+35.51 16+26.31
17+34.14 18+20.43 19+23.93 20+62.72 21-6999. 22+26.11 23+17.11 24+23.29
25+32.88 26+23.71 27+23.60 28+22.63 29+22.51 30+20.90 31+12.04 32+23.56

01+0113. 02+0264. 03+0.000 04+19.90 05+19.90 06+4.270 07-6999. 08+32.02
09+28.38 10+26.52 11+25.96 12+07.08 13+26.26 14+23.31 15+35.22 16+26.67
17+34.25 18+20.41 19+23.74 20+62.11 21-6999. 22+26.13 23+15.68 24+23.58
25+32.95 26+23.74 27+23.44 28+22.95 29+22.62 30+20.93 31+08.67 32+21.23

01+0113. 02+0265. 03+1.000 04-6999. 05+6999. 06+1.528 07-16.41 08+32.40
09+25.94 10+26.86 11+24.97 12+5.684 13+26.67 14+24.01 15+34.25 16+26.81
17+35.18 18+20.76 19+22.91 20+56.53 21-6999. 22+26.53 23+23.27 24+23.78
25+33.46 26+24.19 27+23.12 28+23.13 29+22.99 30+21.23 31+15.71 32+16.08

01+0113. 02+0266. 03+6.000 04-6999. 05+6999. 06+0.968 07-37.77 08+31.80

09+34.58 10+27.15 11+22.85 12+5.209 13+27.12 14+24.20 15+32.94 16+26.07
17+36.22 18+21.02 19+21.51 20+48.45 21-6999. 22+27.10 23+21.82 24+23.30
25+34.04 26+24.28 27+22.12 28+22.66 29+23.25 30+21.46 31+16.67 32+14.36

01+0113. 02+0267. 03+5.000 04-6999. 05+6999. 06+2.259 07-07.63 08+30.39
09+26.96 10+26.91 11+21.14 12+5.298 13+26.94 14+22.03 15+31.70 16+24.71
17+36.18 18+20.79 19+20.28 20+45.18 21-6999. 22+26.86 23+20.47 24+22.11
25+33.93 26+24.08 27+20.80 28+21.61 29+22.86 30+21.28 31+14.79 32+14.94

01+0113. 02+0268. 03+0.000 04+16.53 05+48.68 06+4.110 07-33.61 08+29.13
09+26.30 10+26.38 11+20.64 12+5.764 13+26.12 14+18.22 15+30.84 16+23.46
17+35.02 18+20.32 19+19.35 20+42.69 21-6999. 22+26.31 23-1.330 24+20.89
25+33.00 26+23.65 27+19.37 28+20.43 29+21.91 30+20.85 31+6.570 32+16.12

01+0113. 02+0269. 03+0.000 04+17.84 05+40.26 06+4.125 07-17.95 08+29.02
09+25.98 10+26.49 11+21.77 12+4.792 13+25.80 14+19.71 15+31.63 16-6999.
17+34.62 18+20.59 19+19.83 20+41.27 21-6999. 22+26.28 23-14.60 24-6999.
25+32.79 26-6999. 27+19.46 28+19.97 29+21.40 30+21.14 31+2.111 32+18.38

01+0113. 02+0270. 03+0.000 04+19.05 05+36.45 06+4.035 07-19.41 08-6999.
09+24.66 10+26.37 11+22.86 12+07.11 13+25.56 14+20.61 15+32.40 16-6999.
17+34.21 18-6999. 19+20.50 20-6999. 21-6999. 22+24.99 23-14.99 24-6999.
25+31.63 26+22.90 27+18.38 28+19.26 29+21.04 30+17.71 31-1.966 32-6999.

01+0113. 02+0271. 03+0.000 04+20.23 05+33.46 06+3.995 07-09.59 08+30.49
09+28.59 10+26.94 11+23.90 12+6.703 13+25.43 14-6999. 15+33.24 16+23.47
17+33.98 18+19.76 19+21.33 20+33.67 21-6999. 22+22.88 23-15.24 24+19.15
25+31.35 26+20.75 27+20.41 28+20.47 29+20.86 30+16.47 31-4.510 32-6999.

01+0113. 02+0272. 03+0.000 04+20.22 05+28.24 06+4.014 07+0.518 08+30.35
09+25.37 10+26.42 11+25.12 12+12.77 13+25.43 14+22.56 15+34.03 16-6999.
17+34.02 18+20.94 19+22.17 20+33.87 21-6999. 22+26.07 23-12.56 24+21.56
25+32.42 26+23.29 27+21.61 28+20.88 29+20.93 30+20.01 31+3.499 32+21.74

01+0113. 02+0273. 03+0.000 04+20.41 05+15.63 06+4.027 07-6999. 08-6999.
09+24.61 10+23.79 11+25.13 12+08.09 13+25.47 14+18.67 15+33.68 16+21.13
17+34.27 18+16.58 19+21.97 20+27.22 21-6999. 22+20.30 23-16.23 24+17.19
25-6999. 26+18.04 27+18.13 28+18.67 29+21.05 30+14.71 31-3.476 32+17.58

01+0113. 02+0274. 03+0.000 04+13.76 05+33.33 06+3.826 07+10.72 08+30.90
09+24.61 10+26.14 11+24.49 12+6.894 13+25.68 14+23.45 15+33.18 16+25.09
17+34.63 18+19.95 19+21.52 20+31.19 21-6999. 22+25.97 23-5.163 24+22.20
25+32.56 26+23.90 27+21.21 28+21.20 29+21.25 30+20.98 31+5.739 32+15.94

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01+0113. 02+0317. 03+0.000 04+11.99 05+27.00 06+1.310 07-09.84 08+26.11
09+21.25 10+24.39 11+17.55 12-6.928 13+23.55 14+23.10 15+25.36 16+19.05
17+22.48 18+18.37 19+14.35 20+17.39 21+55.51 22+24.22 23+14.14 24+19.21
25+40.70 26+22.01 27+15.22 28+16.17 29+17.32 30+18.96 31+12.69 32+11.90

01+0113. 02+0318. 03+0.000 04+09.02 05+35.43 06+2.675 07-6999. 08+25.67
09+21.18 10+24.36 11+15.49 12-18.48 13+23.46 14+23.09 15+24.72 16+18.59
17+22.39 18+18.36 19+13.71 20+16.93 21-6999. 22+24.22 23+13.61 24+18.79
25+40.28 26+22.03 27+14.65 28+15.77 29+17.15 30+18.95 31+10.75 32+09.91

01+0113.	02+0319.	03+0.000	04+10.24	05+33.88	06+2.641	07-2.016	08+25.23
09+20.94	10+24.29	11+17.11	12-18.04	13+23.27	14+23.02	15+24.42	16+18.12
17+22.14	18+18.31	19+13.31	20+16.50	21-6999.	22+24.16	23+13.18	24+18.16
25+40.18	26+21.96	27+14.14	28+15.28	29+16.84	30+18.89	31+11.98	32+11.42
01+0113.	02+0320.	03+0.000	04+14.01	05+27.46	06+2.434	07-09.87	08+24.90
09+20.64	10+24.17	11+18.58	12-17.28	13+23.00	14+22.92	15+24.69	16+17.84
17+21.63	18+18.04	19+13.47	20+16.29	21-6999.	22+24.06	23+13.23	24+17.37
25+39.94	26+21.87	27+14.17	28+14.94	29+16.47	30+18.78	31+15.74	32+15.22
01+0113.	02+0321.	03+1.000	04+5.569	05+33.67	06+2.687	07-2.050	08+25.07
09+20.56	10+24.23	11+18.88	12-14.90	13+22.98	14+23.05	15+24.82	16+18.01
17+21.51	18+18.08	19+13.57	20+16.45	21-6999.	22+24.16	23+13.40	24+17.62
25+40.11	26+21.95	27+14.26	28+14.99	29+16.34	30+18.84	31+07.98	32+6.781
01+0113.	02+0322.	03+0.000	04+3.425	05+29.50	06+2.698	07+1.157	08+24.56
09+20.39	10+24.15	11+17.32	12-13.88	13+22.86	14+22.96	15+22.78	16+17.31
17+21.49	18+18.17	19+11.59	20+15.71	21+48.68	22+24.10	23+11.63	24+16.63
25+40.12	26+21.92	27+12.54	28+14.38	29+16.12	30+18.80	31+5.898	32+5.457
01+0113.	02+0323.	03+0.000	04+5.951	05+25.66	06+2.294	07+08.11	08+23.72
09+20.22	10+24.05	11+15.69	12-17.41	13+22.62	14+22.91	15+21.64	16+16.32
17+21.06	18+17.99	19+10.42	20+14.90	21+45.19	22+24.02	23+10.47	24+14.52
25+39.99	26+21.86	27+11.49	28+13.51	29+15.68	30+18.72	31+07.57	32+6.619
01+0113.	02+0324.	03+0.000	04+4.470	05+26.56	06+1.968	07+3.121	08+23.08
09+19.86	10+24.01	11+14.48	12-18.41	13+22.35	14+22.84	15+21.57	16+15.52
17+20.80	18+18.09	19+10.26	20+14.46	21+42.49	22+23.94	23+10.34	24+13.94
25+39.83	26+21.83	27+11.39	28+12.96	29+15.21	30+18.66	31+5.844	32+6.080
01+0113.	02+0325.	03+0.000	04+2.971	05+41.68	06+1.154	07-09.35	08+22.66
09+19.53	10+23.92	11+13.76	12-18.05	13+22.07	14+22.80	15+21.02	16+15.08
17+20.43	18+18.02	19+09.72	20+14.02	21+40.84	22+23.89	23+09.83	24+13.51
25+39.59	26+21.78	27+10.78	28+12.50	29+14.80	30+18.59	31+3.739	32+2.831
01+0113.	02+0326.	03+0.000	04+1.467	05+37.14	06+2.557	07-08.97	08+22.01
09-6999.	10+23.83	11+12.43	12-17.78	13+21.80	14+22.69	15+20.06	16+14.08
17+20.07	18+17.97	19+08.75	20+13.47	21+41.21	22+23.81	23+08.86	24+12.83
25+39.36	26+21.74	27+09.34	28+11.92	29+14.39	30+18.52	31+3.582	32+3.115

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01+0113.	02+0343.	03+0.000	04+3.892	05+55.53	06+0.466	07+4.036	08+18.02
09+21.16	10+21.37	11+09.25	12+11.70	13+18.15	14+20.82	15+17.47	16+10.17
17+15.45	18+15.95	19+5.894	20+09.25	21+21.85	22+21.84	23+5.520	24+08.34
25+37.25	26+20.14	27+6.922	28+07.78	29+09.85	30+16.47	31+3.266	32+2.740
01+0113.	02+0344.	03+0.000	04-1.796	05+62.06	06+1.120	07+2.353	08+17.94
09+18.69	10+21.31	11+08.65	12+08.62	13+18.12	14+20.47	15+17.24	16+10.27
17+15.42	18+15.90	19+5.655	20+09.26	21+20.24	22+21.80	23+5.600	24+08.37
25+37.49	26+20.11	27+6.835	28+07.84	29+09.79	30+16.42	31-2.064	32-2.958
01+0113.	02+0345.	03+0.000	04+2.188	05+67.53	06+1.562	07-12.05	08+17.33
09+16.55	10+21.25	11+6.742	12+08.41	13+18.01	14+20.69	15+15.72	16+09.75
17+15.38	18+15.82	19+4.178	20+08.63	21+18.38	22+21.70	23+4.213	24+07.95
25+37.63	26+20.04	27+5.588	28+07.44	29+09.72	30+16.32	31-1.414	32-1.703

01+0113.	02+0346.	03+2.000	04-6999.	05+6999.	06+0.485	07-15.31	08+16.76
09+17.32	10+20.98	11+6.900	12+10.59	13+17.72	14+20.47	15+15.92	16+09.21
17+15.14	18+15.63	19+4.278	20+08.36	21+25.90	22+21.97	23+4.280	24+07.66
25+37.42	26+19.83	27+5.376	28+6.797	29+09.37	30+16.11	31+0.724	32-1.032

01+0113.	02+0347.	03+0.000	04-6999.	05+6999.	06+1.168	07-19.44	08+16.59
09+15.09	10+20.90	11+6.725	12+10.45	13+17.48	14+20.40	15+16.03	16+09.16
17+14.93	18+15.60	19+4.322	20+08.34	21+24.09	22+21.73	23+4.448	24+07.58
25+37.31	26+19.79	27+5.382	28+6.695	29+09.10	30+16.06	31-0.292	32-2.560

01+0113.	02+0348.	03+0.000	04-6999.	05+6999.	06+2.163	07-22.42	08+16.44
09+14.14	10+20.81	11+6.428	12+4.474	13+17.38	14+20.34	15+15.75	16+09.13
17+14.83	18+15.57	19+4.038	20+08.02	21+19.99	22+21.49	23+4.020	24+07.33
25+37.40	26+19.80	27+5.097	28+6.622	29+08.97	30+16.02	31+1.217	32+0.626

01+0113.	02+0349.	03+0.000	04+6.831	05+57.51	06+2.190	07-25.39	08+16.20
09+13.77	10+20.62	11+6.648	12+10.01	13+17.16	14+20.15	15+15.78	16+08.86
17+14.61	18+15.41	19+3.941	20+07.72	21+19.13	22+21.34	23+3.695	24+6.988
25+37.28	26+19.58	27+4.748	28+6.259	29+08.73	30+15.84	31+3.423	32+3.098

01+0113.	02+0350.	03+0.000	04+07.45	05+55.96	06+2.199	07-28.05	08+16.14
09+13.53	10+20.43	11+07.06	12+08.97	13+16.96	14+19.94	15+16.12	16+08.81
17+14.37	18+15.23	19+4.203	20+07.67	21+18.79	22+21.18	23+3.781	24+6.778
25+37.16	26+19.47	27+4.876	28+6.084	29+08.49	30+15.67	31+5.540	32+4.942

01+0113.	02+0351.	03+0.000	04+0.659	05+54.31	06+1.267	07-38.98	08+16.36
09+13.42	10+20.33	11+07.62	12+09.24	13+16.87	14+19.82	15+16.71	16+08.69
17+14.26	18+15.16	19+4.836	20+07.93	21+18.06	22+21.10	23+4.413	24+6.914
25+37.38	26+19.42	27+5.553	28+6.241	29+08.38	30+15.60	31+1.145	32-0.060

Weather Data

January 2, 1989 (Julian day 2) to
July 20, 1989 (Julian day 201)

Measurements taken every hour and averaged for the day except rainfall, solar radiation and wind speed which are totalized. ******** denotes a break in the record.

Channel number	Meaning
01	Data logger identification
02	Julian day
03	Precipitation (mm)
04	Temperature (^{o}C)
05	Relative humidity (%)
06	Solar radiation (watts/m^2)
07	Wind total (m)
08	Wind direction (degrees from north, east = 90^{o}).
09	soil temperature 30 cm depth station 1
10	soil temperature 60 cm depth station 1
11	soil temperature 120 cm depth station 1
12	soil temperature 240 cm depth station 1
13	soil temperature 30 cm depth station 2
14	soil temperature 60 cm depth station 2
15	soil temperature 120 cm depth station 2
16	soil temperature 240 cm depth station 2
17	soil temperature 30 cm depth station 3
18	soil temperature 60 cm depth station 3
19	soil temperature 120 cm depth station 3
20	soil temperature 240 cm depth station 3

21	soil temperature 30 cm depth station 4
22	soil temperature 60 cm depth station 4
23	soil temperature 120 cm depth station 4
24	soil temperature 240 cm depth station 4
25	soil temperature 30 cm depth station 5
26	soil temperature 60 cm depth station 5
27	soil temperature 120 cm depth station 5
28	soil temperature 240 cm depth station 5
29	soil temperature 30 cm depth station 6
30	soil temperature 60 cm depth station 6
31	soil temperature 120 cm depth station 6
32	soil temperature 240 cm depth station 6

NOTE: Soil temperature nest 1 is between ETT1 and ETT2.
Soil temperature nest 2 is between ETT3 and ETT4.
Soil temperature nest 3 is between ETT12 and ETT11.
Soil temperature nest 4 is between ETT10 and ETT9.
Soil temperature nest 5 is between ETT17 and ETT18.
Soil temperature nest 6 is between ETT19 and ETT20.

6999 indicates reading off scale, probably due to sensor failure
0000 indicates instrument not connected
xx????? indicates data transmittal problem

01+0113. 02+0002. 03+0.000 04-0.720 05+37.42 06+2.144 07-12.11 08+13.59
09+11.51 10+18.67 11+3.739 12+3.826 13+15.25 14+15.70 15+12.88 16+6.407
17+12.64 18+13.48 19+0.915 20+4.881 21+12.54 22+19.88 23+0.736 24+3.946
25+36.56 26+18.13 27+1.745 28+3.332 29+6.181 30+14.00 31+0.878 32-0.201

01+0113. 02+0003. 03+0.000 04+1.818 05+33.88 06+1.055 07-10.49 08+13.68
09+11.93 10+18.54 11+4.429 12+07.27 13+15.03 14+16.04 15+13.28 16+6.335
17+12.28 18+13.31 19+1.495 20+4.884 21+12.46 22+19.81 23+1.091 24+4.041
25+36.37 26+18.03 27+2.419 28+3.371 29+5.929 30+13.88 31+2.139 32+1.035

01+0113. 02+0004. 03+0.000 04+2.861 05+39.26 06+0.858 07-3.839 08+13.87
09+11.43 10+18.44 11+4.943 12+07.37 13+14.91 14+12.32 15+14.07 16+6.548
17+12.24 18+13.48 19+2.356 20+5.264 21+12.46 22+19.77 23+1.859 24+4.236
25+36.26 26+17.94 27+3.346 28+3.726 29+5.833 30+13.79 31+2.928 32+2.537

****

01+0113. 02+0019. 03+0.000 04+4.757 05+22.35 06+1.821 07-19.59 08+13.25
09+10.88 10+16.87 11+5.205 12-07.86 13+14.04 14+16.13 15+13.34 16+6.436
17+11.62 18+12.33 19+1.321 20+4.479 21+13.07 22+18.78 23+1.200 24+3.720
25+35.76 26+16.81 27+1.908 28+2.792 29+4.889 30+12.54 31+6.850 32+07.46

01+0113. 02+0020. 03+0.000 04+2.053 05+29.67 06+2.537 07-15.37 08+13.41
09+10.86 10+16.84 11+5.749 12-09.99 13+14.02 14+13.30 15+13.63 16+6.495
17+11.60 18+12.31 19+1.616 20+4.483 21+12.24 22+18.75 23+1.476 24+3.729
25+35.79 26+16.81 27+2.192 28+2.881 29+4.866 30+12.51 31+3.676 32+3.863

01+0113. 02+0021. 03+0.000 04+2.702 05+33.90 06+2.566 07-14.14 08+13.64
09+11.65 10+16.77 11+6.515 12-14.35 13+14.00 14+15.41 15+14.15 16+6.665
17+11.56 18+12.25 19+2.156 20+4.702 21+12.20 22+18.72 23+1.916 24+3.855
25+35.75 26+16.72 27+2.673 28+3.055 29+4.842 30+12.44 31+3.844 32+3.456

01+0113. 02+0022. 03+0.000 04+0.973 05+39.72 06+1.952 07-13.66 08+13.92
09+10.67 10+16.72 11+6.851 12-14.08 13+14.03 14+12.41 15+14.38 16+6.926
17+11.59 18+12.21 19+2.375 20+4.965 21+12.32 22+18.69 23+2.165 24+4.223
25+35.83 26+16.72 27+2.980 28+3.327 29+4.901 30+12.40 31+1.948 32+1.826

01+0113. 02+0023. 03+0.000 04+4.370 05+34.21 06+2.535 07-22.06 08+14.03
09+10.09 10+16.62 11+07.41 12-15.09 13+14.02 14+13.62 15+14.89 16+07.05
17+11.59 18+12.10 19+2.814 20+5.136 21+12.92 22+18.62 23+2.557 24+4.508
25+35.72 26+16.60 27+3.239 28+3.430 29+4.932 30+12.28 31+6.347 32+5.297

****

01+0113. 02+0040. 03+0.000 04-0.925 05+63.87 06+2.042 07-27.37 08+15.22
09+11.29 10+16.12 11+6.356 12-2.634 13+15.44 14+13.93 15+14.85 16+09.32
17+14.74 18+11.72 19+2.941 20+07.25 21+13.71 22+18.54 23+3.008 24+6.438
25+37.72 26+16.10 27+3.445 28+5.085 29+6.817 30+11.71 31-1.189 32-1.952

01+0113. 02+0041. 03+0.000 04+3.476 05+65.06 06+1.840 07-27.70 08+14.69
09+11.08 10+16.04 11+6.261 12-08.58 13+15.21 14+14.06 15+15.32 16+08.81
17+14.54 18+11.66 19+3.230 20+6.843 21+14.62 22+18.51 23+3.236 24+5.998
25+37.51 26+16.03 27+3.296 28+4.405 29+6.420 30+11.65 31+2.431 32+1.355

01+0113. 02+0042. 03+0.000 04+15.56 05+57.82 06+2.643 07-36.08 08+14.80

09+11.38	10+16.04	11+08.00	12-1.961	13+14.97	14+15.21	15+17.03	16+09.05
17+14.28	18+11.63	19+4.858	20+07.09	21+15.53	22+18.52	23+4.700	24+6.884
25+37.22	26+15.97	27+4.362	28+4.398	29+6.083	30+11.59	31+08.63	32+6.938
01+0113.	02+0043.	03+0.000	04-6999.	05+6999.	06+3.100	07-38.18	08+15.69
09+11.06	10+16.10	11+11.06	12+3.768	13+14.91	14+14.93	15+18.95	16+10.04
17+14.17	18+11.70	19+6.697	20+08.10	21+15.95	22+18.64	23+6.571	24+07.90
25+37.12	26+16.04	27+6.018	28+5.188	29+6.025	30+11.65	31+09.99	32+09.60
01+0113.	02+0044.	03+0.000	04+08.42	05+39.69	06+2.807	07-28.80	08+16.40
09+12.05	10+16.03	11+11.90	12+09.62	13+14.99	14+15.21	15+19.51	16+10.75
17+14.21	18+11.64	19+07.25	20+08.82	21+15.67	22+18.57	23+07.20	24+07.54
25+37.21	26+15.98	27+6.758	28+5.881	29+6.234	30+11.58	31+08.78	32+08.82
01+0113.	02+0045.	03+0.000	04+07.41	05+20.16	06+2.510	07-44.65	08+16.75
09+11.03	10+15.91	11+11.75	12+09.96	13+15.12	14+15.13	15+19.12	16+10.92
17+14.36	18+11.56	19+6.836	20+09.03	21+15.66	22+18.51	23+6.809	24+08.96
25+37.23	26+15.89	27+6.341	28+6.170	29+6.499	30+11.49	31+10.93	32+09.32
01+0113.	02+0046.	03+0.000	04+5.229	05+34.37	06+2.064	07-44.34	08+16.93
09+13.21	10+15.97	11+11.05	12+10.01	13+15.30	14+15.16	15+18.54	16+10.98
17+14.58	18+11.60	19+6.542	20+09.07	21+14.95	22+18.53	23+6.439	24+09.53
25+37.46	26+15.94	27+6.412	28+6.262	29+6.700	30+11.54	31+6.627	32+5.554
01+0113.	02+0047.	03+0.000	04+5.551	05+29.73	06+3.338	07-42.29	08+16.91
09+11.38	10+15.93	11+11.52	12+10.00	13+15.39	14+15.12	15+19.21	16+11.00
17+14.76	18+11.58	19+07.16	20+09.16	21+15.60	22+18.52	23+07.05	24+09.61
25+37.46	26+15.91	27+6.952	28+6.389	29+6.801	30+11.50	31+07.44	32+6.937
01+0113.	02+0048.	03+0.000	04+4.843	05+54.78	06+1.540	07-45.66	08+17.17
09+11.48	10+15.99	11+10.78	12+10.03	13+15.54	14+15.17	15+18.56	16+11.25
17+14.99	18+11.64	19+6.665	20+09.40	21+15.13	22+18.58	23+6.568	24+09.78
25+37.74	26+15.97	27+6.737	28+6.651	29+07.01	30+11.55	31+3.409	32+3.003
01+0113.	02+0049.	03+0.000	04+09.33	05+43.61	06+2.340	07-28.02	08+16.78
09+11.44	10+15.85	11+11.48	12+09.89	13+15.49	14+13.21	15+19.43	16+10.88
17+15.04	18+11.53	19+07.45	20+09.18	21+16.74	22+18.51	23+07.14	24+08.61
25+37.50	26+15.83	27+6.755	28+6.399	29+6.978	30+11.42	31+11.89	32+09.18
01+0113.	02+0050.	03+0.000	04-6999.	05+6999.	06+3.228	07-37.11	08+17.39
09+11.79	10+16.14	11+11.99	12+10.30	13+15.67	14+14.03	15+19.93	16+11.61
17+15.26	18+11.80	19+08.05	20+09.92	21+16.34	22+18.80	23+07.83	24+09.23
25+37.85	26+16.10	27+07.83	28+07.06	29+07.20	30+11.67	31+09.68	32+08.89
01+0113.	02+0051.	03+0.000	04-6999.	05+6999.	06+1.200	07-51.38	08+17.75
09+13.43	10+16.19	11+11.81	12+10.52	13+15.78	14+15.36	15+19.87	16+12.01
17+15.40	18+11.83	19+08.08	20+10.32	21+15.64	22+18.82	23+07.97	24+10.62
25+37.96	26+16.13	27+08.21	28+07.55	29+07.43	30+11.70	31+07.01	32+6.534
01+0113.	02+0052.	03+0.000	04+08.14	05+33.98	06+2.655	07-39.81	08+17.45
09+12.49	10+15.92	11+11.56	12+10.22	13+15.75	14+10.31	15+19.52	16+11.69
17+15.39	18+11.59	19+07.66	20+10.05	21+15.84	22+18.56	23+07.66	24+10.49
25+37.75	26+15.89	27+07.82	28+07.38	29+07.51	30+11.46	31+10.10	32+09.67
01+0113.	02+0053.	03+0.000	04+4.385	05+31.54	06+3.481	07-40.56	08+17.64
09+12.49	10+15.89	11+12.06	12+09.78	13+15.85	14+12.51	15+19.53	16+11.77

17+15.54	18+11.62	19+07.55	20+10.08	21+16.26	22+18.59	23+07.64	24+10.54
25+37.91	26+15.92	27+07.44	28+07.36	29+07.64	30+11.49	31+6.223	32+6.067
01+0113.	02+0054.	03+0.000	04+5.555	05+24.02	06+3.460	07-43.70	08+17.70
09+12.87	10+15.88	11+12.22	12+5.547	13+15.91	14+10.59	15+19.53	16+11.73
17+15.60	18+11.61	19+07.54	20+10.02	21+16.48	22+18.60	23+07.62	24+10.54
25+37.90	26+15.89	27+07.26	28+07.22	29+07.68	30+11.47	31+07.70	32+07.37
01+0113.	02+0055.	03+0.000	04+08.30	05+21.86	06+3.514	07-40.65	08+17.83
09+13.56	10+15.84	11+12.77	12+07.29	13+15.95	14+09.73	15+20.20	16+11.86
17+15.62	18+11.61	19+08.21	20+10.17	21+16.74	22+18.60	23+08.22	24+10.70
25+37.86	26+15.85	27+07.81	28+07.31	29+07.67	30+11.45	31+10.46	32+09.36
01+0113.	02+0056.	03+0.000	04+10.23	05+22.50	06+3.182	07-34.29	08+18.12
09+12.85	10+15.81	11+13.51	12+09.06	13+16.01	14+12.83	15+21.02	16+12.24
17+15.64	18+11.60	19+09.11	20+10.60	21+16.85	22+18.62	23+09.01	24+09.95
25+37.81	26+15.87	27+08.70	28+07.71	29+07.74	30+11.43	31+12.05	32+11.43
01+0113.	02+0057.	03+0.000	04+13.54	05+21.93	06+3.506	07-26.77	08+18.58
09+13.01	10+15.83	11+14.57	12+10.59	13+16.09	14+13.59	15+22.17	16+12.81
17+15.70	18+11.59	19+10.26	20+11.24	21+17.29	22+18.62	23+10.10	24+10.18
25+37.80	26+15.86	27+09.71	28+08.28	29+07.92	30+11.41	31+15.62	32+14.61
01+0113.	02+0058.	03+0.000	04+15.65	05+16.37	06+3.508	07-32.28	08+19.25
09+14.67	10+15.79	11+15.93	12+12.66	13+16.23	14+14.31	15+23.41	16+13.59
17+15.85	18+11.59	19+11.52	20+12.12	21+17.08	22+18.63	23+11.28	24+10.91
25+37.88	26+15.85	27+10.83	28+09.01	29+08.21	30+11.40	31+17.25	32+16.52
01+0113.	02+0059.	03+0.000	04+14.59	05+17.33	06+3.665	07-6999.	08+20.04
09+13.48	10+15.86	11+16.99	12+13.48	13+16.48	14+15.10	15+24.44	16+14.45
17+16.15	18+11.61	19+12.64	20+13.10	21+16.90	22+18.68	23+12.32	24+11.81
25+38.03	26+15.88	27+11.91	28+09.82	29+08.62	30+11.42	31+16.72	32+15.85
01+0113.	02+0060.	03+0.000	04+09.86	05+17.63	06+3.114	07-21.76	08+20.59
09+12.90	10+15.95	11+15.99	12+13.72	13+12.04	14+14.04	15+23.45	16+14.84
17+16.60	18+11.67	19+11.81	20+13.49	21+16.66	22+18.72	23+11.61	24+12.15
25+38.29	26+15.95	27+11.36	28+10.31	29+09.13	30+11.48	31+11.38	32+10.67
01+0113.	02+0061.	03+0.000	04+10.85	05+18.04	06+2.463	07-27.35	08+20.54
09+13.24	10+15.97	11+15.32	12+13.54	13+09.61	14+11.15	15+22.93	16+14.64
17+17.01	18+11.68	19+11.26	20+13.33	21+16.35	22+18.75	23+11.14	24+12.21
25+38.46	26+15.95	27+10.88	28+10.25	29+09.45	30+11.50	31+12.09	32+11.13
01+0113.	02+0062.	03+0.000	04+10.87	05+19.24	06+1.126	07-31.99	08+20.52
09+13.43	10+16.01	11+14.77	12+13.38	13+09.65	14+13.02	15+22.59	16+14.61
17+17.29	18+11.71	19+11.02	20+13.32	21+16.38	22+18.78	23+10.93	24+12.30
25+38.63	26+15.99	27+11.04	28+10.27	29+09.66	30+11.53	31+10.75	32+09.99
01+0113.	02+0063.	03+0.000	04+10.26	05+41.44	06+3.538	07-37.90	08+20.42
09+13.60	10+16.07	11+14.91	12+13.26	13+09.90	14+12.65	15+22.68	16+14.52
17+17.39	18+11.78	19+11.00	20+13.26	21+17.19	22+18.87	23+10.96	24+12.32
25+38.78	26+16.04	27+10.96	28+10.26	29+09.82	30+11.57	31+08.95	32+09.83
01+0113.	02+0064.	03+0.000	04+2.125	05+39.08	06+2.052	07-46.85	08+20.50
09+13.76	10+16.19	11+14.58	12+13.52	13+09.88	14+10.29	15+21.70	16+14.47
17+17.42	18+11.88	19+09.95	20+13.11	21+16.57	22+18.96	23+10.15	24+12.17

25+39.01 26+16.16 27+07.15 28+10.13 29+09.98 30+11.68 31+4.499 32+3.961

01+0113. 02+0065. 03+0.000 04+1.621 05+34.06 06+3.651 07-19.61 08+20.08
09+13.84 10+16.05 11+13.92 12+3.250 13+10.03 14+11.96 15+20.99 16+13.91
17+17.27 18+11.90 19+09.25 20+12.51 21+16.24 22+18.98 23+09.37 24+11.67
25+39.04 26+16.19 27+07.62 28+09.52 29+09.94 30+11.71 31+4.300 32+2.915

01+0113. 02+0066. 03+0.000 04+5.127 05+26.96 06+3.801 07-25.14 08+19.62
09+13.84 10+16.19 11+13.42 12+2.946 13+10.17 14+11.90 15+20.79 16+13.50
17+16.95 18+11.91 19+09.10 20+12.11 21+15.65 22+18.98 23+09.13 24+11.28
25+38.96 26+16.20 27+4.080 28+09.10 29+09.75 30+11.71 31+08.08 32+6.675

01+0113. 02+0067. 03+0.000 04+10.98 05+22.94 06+3.784 07-35.74 08+19.51
09+13.75 10+16.16 11+14.28 12-2.248 13+10.03 14+10.93 15+21.94 16+13.55
17+16.50 18+11.90 19+10.22 20+12.17 21+15.29 22+19.00 23+10.14 24+12.04
25+38.77 26+16.16 27-2.889 28+09.10 29+09.56 30+11.69 31+13.76 32+12.57

01+0113. 02+0068. 03+0.000 04+15.05 05+18.35 06+3.890 07-37.13 08+19.94
09+15.21 10+16.10 11+16.00 12+07.62 13+11.29 14+11.99 15+23.95 16+14.21
17+16.09 18+11.89 19+12.21 20+12.91 21+15.72 22+19.00 23+11.93 24+12.96
25+38.59 26+16.14 27-16.37 28+09.67 29+09.53 30+11.66 31+17.37 32+16.21

01+0113. 02+0069. 03+0.000 04+15.92 05+20.65 06+3.946 07-23.18 08+20.76
09+15.03 10+16.18 11+17.10 12+09.89 13+12.58 14+15.42 15+25.24 16+15.22
17+15.80 18+11.94 19+13.61 20+14.01 21+15.78 22+19.05 23+13.31 24+13.18
25+38.67 26+16.20 27-22.02 28+10.63 29+09.79 30+11.71 31+17.95 32+16.96

01+0113. 02+0070. 03+0.000 04+16.04 05+16.20 06+3.942 07-23.93 08+21.46
09+14.67 10+16.17 11+17.89 12+10.71 13+17.63 14+14.47 15+25.98 16+15.99
17+15.72 18+11.97 19+14.47 20+14.85 21+16.71 22+19.08 23+14.14 24+14.09
25+38.84 26+16.23 27-17.34 28+11.45 29+10.18 30+11.74 31+17.77 32+16.95

01+0113. 02+0071. 03+0.000 04+17.56 05+15.20 06+3.796 07-27.77 08+22.06
09+15.18 10+16.23 11+18.57 12+14.47 13+17.86 14+15.49 15+26.53 16+16.61
17+15.77 18+12.00 19+15.10 20+15.52 21+17.43 22+19.10 23+14.78 24+14.84
25+38.98 26+16.26 27-19.13 28+12.13 29+10.64 30+11.76 31+19.00 32+18.22

01+0113. 02+0072. 03+0.000 04+18.87 05+14.44 06+3.913 07-26.23 08+22.59
09+15.06 10+16.23 11+19.00 12+12.80 13+18.12 14+15.51 15+26.94 16+17.13
17+15.82 18+12.02 19+15.57 20+16.11 21+16.98 22+19.11 23+15.30 24+17.33
25+39.16 26+16.28 27-20.62 28+12.71 29+11.08 30+11.78 31+20.25 32+19.58

01+0113. 02+0073. 03+0.000 04+18.61 05+14.56 06+3.063 07-28.16 08+23.17
09+16.14 10+16.33 11+19.76 12+16.42 13+18.40 14+15.57 15+27.62 16+17.69
17+15.97 18+12.05 19+16.32 20+16.70 21+17.21 22+19.15 23+16.02 24+16.71
25+39.35 26+16.33 27+12.36 28+13.29 29+11.51 30+11.82 31+21.08 32+20.30

01+0113. 02+0074. 03+0.000 04+15.21 05+15.68 06+4.015 07-16.48 08+23.74
09+15.27 10+16.29 11+20.16 12+17.25 13+18.72 14+15.65 15+27.72 16+18.18
17+16.17 18+12.12 19+16.45 20+17.20 21+17.57 22+19.23 23+16.18 24+17.07
25+39.62 26+16.41 27+15.62 28+13.82 29+11.98 30+11.90 31+17.32 32+16.86

01+0113. 02+0075. 03+0.000 04+12.65 05+16.63 06+3.694 07-09.26 08+23.99
09+15.78 10+16.45 11+19.60 12+17.46 13+19.03 14+15.73 15+26.84 16+18.22
17+16.33 18+12.20 19+15.60 20+17.27 21+17.68 22+19.29 23+15.41 24+17.13
25+39.92 26+15.81 27-16.58 28+13.88 29+12.39 30+11.98 31+14.88 32+14.21

01+0113. 02+0076. 03+0.000 04+16.03 05+15.57 06+4.199 07-29.22 08+23.88
09+16.00 10+16.50 11+19.39 12+17.10 13+19.21 14+15.76 15+26.75 16+18.02
17+16.34 18+12.21 19+15.52 20+17.08 21+18.46 22+19.30 23+15.36 24+17.21
25+39.98 26+16.33 27-23.36 28+13.71 29+12.56 30+11.99 31+18.27 32+17.05

01+0113. 02+0077. 03+0.000 04+19.09 05+14.28 06+4.287 07-27.41 08+24.02
09+15.99 10+16.62 11+19.88 12+17.46 13+19.33 14+15.79 15+27.46 16+18.22
17+16.27 18+12.24 19+16.19 20+17.25 21+18.54 22+19.33 23+15.95 24+18.70
25+40.01 26+16.53 27-21.68 28+13.88 29+12.68 30+12.01 31+21.32 32+20.46

01+0113. 02+0078. 03+0.000 04+17.22 05+15.01 06+4.271 07-27.98 08+24.44
09+16.33 10+16.64 11+20.41 12+17.90 13+19.51 14+15.88 15+27.86 16+18.64
17+16.31 18+12.32 19+16.66 20+17.71 21+18.55 22+19.40 23+16.42 24+20.16
25+40.19 26+16.61 27-22.05 28+14.27 29+12.91 30+12.09 31+19.86 32+18.43

01+0113. 02+0079. 03+0.000 04+17.11 05+15.01 06+4.275 07-20.73 08+24.67
09+16.47 10+16.70 11+20.63 12+18.04 13+19.69 14+15.93 15+28.21 16+18.93
17+16.39 18+12.38 19+17.10 20+18.18 21+18.80 22+19.46 23+16.82 24+20.70
25+40.29 26+16.69 27-22.67 28+14.62 29+13.16 30+12.16 31+19.30 32+18.89

01+0113. 02+0080. 03+5.000 04-6999. 05+6999. 06+1.929 07-2.805 08+25.12
09+16.75 10+16.97 11+20.30 12+18.72 13+19.98 14+16.15 15+27.36 16+19.29
17+16.60 18+12.58 19+16.32 20+18.62 21+20.42 22+19.83 23+16.26 24+21.34
25+40.66 26+16.85 27-23.67 28+14.99 29+13.52 30+12.36 31+08.51 32+07.41

01+0113. 02+0081. 03+12.00 04-6999. 05+6999. 06+3.664 07-14.89 08+24.31
09+17.01 10+17.11 11+16.59 12+17.92 13+20.22 14+16.28 15+23.04 16+17.92
17+16.69 18+12.67 19+12.09 20+17.35 21+19.92 22+20.01 23+12.45 24+17.71
25+41.00 26+17.07 27-20.93 28+14.09 29+13.72 30+12.50 31+5.073 32+3.019

01+0113. 02+0082. 03+0.000 04-6999. 05+6999. 06+4.249 07-33.61 08+22.87
09+16.96 10+17.16 11+15.68 12+16.39 13+20.07 14+16.33 15+22.91 16+16.55
17+16.60 18+12.81 19+11.66 20+15.90 21+19.52 22+19.98 23+11.80 24+16.17
25+40.88 26+17.07 27-13.00 28+12.70 29+13.31 30+12.56 31+12.28 32+11.63

01+0113. 02+0083. 03+0.000 04+15.52 05+19.74 06+4.319 07-50.15 08+22.48
09+16.65 10+17.12 11+17.41 12+12.26 13+19.76 14+16.29 15+25.05 16+16.52
17+16.15 18+12.79 19+13.59 20+15.89 21+18.80 22+19.94 23+13.69 24+16.69
25+40.47 26-6999. 27-22.44 28+12.36 29+12.82 30+12.50 31+17.50 32+16.91

01+0113. 02+0084. 03+0.000 04+15.75 05+18.96 06+4.465 07-47.21 08+23.14
09+16.53 10+17.21 11+19.18 12+16.73 13+19.64 14+14.88 15+26.63 16+17.34
17+15.89 18+12.87 19+15.18 20+16.79 21+18.88 22+20.03 23+15.26 24+17.54
25+40.26 26-6999. 27-23.26 28+12.98 29+12.70 30+12.58 31+14.47 32+17.67

01+0113. 02+0085. 03+0.000 04+15.46 05+16.82 06+4.491 07-50.61 08+23.73
09+16.52 10+17.30 11+19.83 12+17.39 13+19.69 14+15.66 15+27.24 16+17.98
17+15.86 18+12.95 19+15.91 20+17.49 21+19.19 22+20.11 23+15.96 24+17.97
25+40.22 26+16.24 27-22.81 28+13.62 29+12.84 30+12.66 31+17.99 32+17.28

01+0113. 02+0086. 03+0.000 04+12.49 05+19.27 06+2.445 07-46.85 08+24.14
09+16.68 10+17.41 11+19.22 12+17.81 13+19.87 14+14.00 15+26.83 16+18.42
17+16.02 18+13.05 19+15.70 20+17.94 21+19.28 22+20.20 23+15.79 24+18.62
25+40.41 26+16.73 27-22.87 28+14.16 29+13.13 30+12.78 31+13.76 32+12.87

01+0113. 02+0087. 03+0.000 04+11.55 05+39.09 06+3.278 07-49.95 08+23.95
09+16.82 10+17.50 11+18.71 12+17.01 13+20.01 14+16.19 15+26.56 16+18.21
17+16.21 18+13.13 19+15.30 20+17.77 21+19.82 22+20.29 23+15.39 24+18.83
25+40.58 26+17.35 27-22.44 28+14.10 29+13.34 30+12.85 31+13.92 32+12.61

01+0113. 02+0088. 03+0.000 04+13.01 05+28.23 06+4.568 07-46.53 08+23.89
09+16.91 10+17.55 11+19.04 12+17.26 13+20.06 14+13.38 15+26.60 16+18.24
17+16.34 18+13.18 19+15.33 20+17.74 21+19.30 22+20.34 23+15.45 24+19.93
25+40.71 26+17.40 27-22.17 28+14.09 29+13.44 30+12.90 31+15.68 32+15.71

01+0113. 02+0089. 03+0.000 04+18.41 05+16.94 06+4.554 07-40.07 08+24.13
09+16.88 10+17.54 11+20.33 12+16.64 13+20.02 14+16.52 15+27.76 16+18.46
17+16.34 18+13.17 19+16.51 20+18.02 21+19.15 22+20.34 23+16.46 24+19.40
25+40.59 26+16.14 27-20.97 28+14.16 29+13.42 30+12.89 31+21.18 32+20.27

01+0113. 02+0090. 03+0.000 04+15.78 05+18.98 06+4.621 07-6999. 08+24.86
09+17.04 10+17.65 11+21.42 12+18.61 13+20.17 14+16.57 15+28.76 16+19.23
17+16.48 18+13.25 19+17.48 20+18.72 21+19.09 22+20.44 23+17.42 24+20.10
25+40.78 26+16.81 27-20.73 28+14.80 29+13.63 30+12.98 31+18.42 32+17.68

01+0113. 02+0091. 03+0.000 04+14.04 05+20.10 06+4.586 07-6999. 08+25.29
09+17.35 10+17.71 11+21.20 12+18.99 13+20.38 14+16.63 15+28.52 16+19.57
17+16.67 18+13.27 19+17.30 20+19.09 21+19.23 22+20.51 23+17.29 24+20.38
25+40.95 26+16.07 27-22.96 28+15.13 29+13.92 30+13.06 31+17.15 32+16.06

01+0113. 02+0092. 03+0.000 04+16.38 05+16.92 06+3.541 07-21.81 08+25.40
09+17.45 10+17.75 11+21.11 12+16.11 13+20.54 14+16.68 15+28.44 16+19.69
17+16.89 18+13.35 19+17.27 20+19.18 21+19.69 22+20.54 23+17.34 24+20.94
25+41.00 26+16.68 27-24.58 28+15.31 29+14.12 30+13.09 31+18.46 32+17.31

01+0113. 02+0093. 03+0.000 04+17.16 05+16.03 06+4.694 07-32.94 08+25.49
09+17.65 10+17.78 11+21.41 12+15.87 13+20.67 14+16.74 15+28.57 16+19.71
17+17.10 18+13.41 19+17.32 20+19.20 21+19.92 22+20.58 23+17.31 24+21.21
25+41.01 26+15.73 27-25.30 28+15.35 29+14.28 30+13.14 31+20.03 32+18.67

01+0113. 02+0094. 03+0.000 04+18.38 05+15.17 06+3.785 07-16.11 08+25.85
09+17.78 10+17.82 11+22.03 12+19.71 13+20.79 14+16.77 15+29.37 16+20.11
17+17.25 18+13.44 19+18.22 20+19.68 21+20.29 22+20.62 23+17.93 24+21.97
25+41.11 26+17.00 27-25.24 28+15.62 29+14.41 30+13.18 31+20.42 32+18.75

01+0113. 02+0095. 03+0.000 04+15.92 05+15.66 06+4.704 07-35.45 08+26.16
09+18.05 10+17.91 11+22.08 12+20.01 13+20.99 14+16.83 15+29.49 16+20.44
17+17.47 18+13.49 19+18.39 20+19.95 21+20.24 22+20.70 23+18.11 24+22.23
25+41.28 26+17.60 27-25.34 28+16.00 29+14.67 30+13.27 31+18.92 32+17.64

01+0113. 02+0096. 03+0.000 04+15.08 05+16.21 06+4.775 07-39.73 08+26.37
09+18.22 10+17.98 11+22.24 12+20.24 13+21.17 14+16.83 15+29.74 16+20.65
17+17.70 18+13.59 19+18.65 20+20.20 21+20.07 22+20.75 23+18.45 24+22.60
25+41.35 26+17.82 27-27.70 28+16.23 29+14.91 30+13.33 31+18.03 32+16.13

01+0113. 02+0097. 03+0.000 04+16.90 05+15.34 06+4.671 07-6999. 08+26.47
09+18.39 10+18.04 11+22.23 12+20.35 13+21.29 14+16.85 15+29.77 16+20.80
17+17.88 18+13.63 19+18.76 20+20.38 21+20.93 22+20.78 23+18.53 24+22.97
25+41.39 26+17.65 27-29.11 28+16.46 29+15.10 30+13.38 31+19.62 32+18.45

01+0113. 02+0098. 03+0.000 04+20.71 05+13.75 06+4.784 07-31.07 08+26.64

09+18.51	10+18.04	11+22.90	12+20.50	13+21.36	14+16.97	15+30.42	16+21.00
17+18.03	18+13.65	19+19.43	20+20.67	21+20.83	22+20.79	23+19.10	24+23.64
25+41.35	26+16.78	27-26.42	28+16.64	29+15.28	30+13.40	31+23.13	32+22.07
01+0113.	02+0099.	03+0.000	04+22.34	05+13.10	06+4.977	07-13.97	08+27.18
09+18.67	10+18.13	11+23.79	12+21.00	13+21.50	14+17.05	15+31.32	16+21.54
17+18.21	18+13.70	19+20.36	20+21.30	21+21.63	22+20.84	23+19.97	24+24.84
25+41.44	26+13.38	27-25.02	28+17.08	29+15.51	30+13.45	31+24.71	32+23.47
01+0113.	02+0100.	03+0.000	04+21.26	05+13.58	06+4.936	07-1.792	08+27.86
09+18.91	10+18.22	11+24.46	12+21.33	13+21.72	14+17.10	15+32.38	16+22.26
17+18.46	18+13.77	19+21.42	20+22.03	21+22.43	22+20.91	23+20.95	24+26.59
25+41.60	26+18.05	27-26.83	28+17.69	29+15.82	30+13.53	31+24.41	32+22.76
01+0113.	02+0101.	03+0.000	04+07.99	05+23.01	06+4.735	07-6999.	08+28.57
09+19.40	10+18.40	11+23.88	12+22.23	13+22.19	14+17.24	15+31.36	16+22.75
17+18.93	18+13.98	19+20.49	20+22.46	21+21.96	22+21.14	23+20.17	24+26.38
25+42.21	26+18.30	27-28.05	28+18.26	29+16.37	30+13.77	31+12.71	32+09.88
01+0113.	02+0102.	03+0.000	04+13.85	05+20.88	06+3.653	07-13.65	08+27.85
09+19.59	10+18.42	11+21.82	12+21.53	13+22.31	14+17.18	15+29.64	16+21.98
17+19.10	18+13.99	19+18.89	20+21.77	21+23.14	22+21.12	23+18.71	24+26.20
25+42.19	26+18.30	27-28.54	28+17.84	29+16.54	30+13.79	31+16.94	32+14.29
01+0113.	02+0103.	03+0.000	04+15.20	05+24.72	06+3.724	07-22.17	08+27.31
09+19.70	10+18.53	11+21.97	12+20.97	13+22.34	14+17.23	15+30.11	16+21.56
17+19.19	18+14.05	19+19.06	20+21.57	21+24.94	22+21.20	23+18.95	24+26.53
25+42.22	26+15.13	27-27.85	28+17.53	29+16.55	30+13.83	31+18.05	32+15.83
01+0113.	02+0104.	03+0.000	04+20.15	05+38.02	06+4.866	07-33.99	08+27.39
09+19.77	10+18.72	11+22.33	12+21.09	13+22.38	14+17.39	15+30.58	16+21.72
17+19.29	18+14.21	19+19.16	20+21.67	21+24.50	22+21.39	23+19.13	24+26.07
25+42.36	26+18.26	27-27.82	28+17.52	29+16.61	30+13.97	31+16.61	32+14.16
01+0113.	02+0105.	03+0.000	04+15.66	05+22.07	06+4.919	07-23.08	08+27.26
09+19.74	10+18.74	11+22.31	12+21.01	13+22.32	14+17.45	15+30.66	16+21.66
17+19.24	18+14.22	19+19.29	20+21.48	21+23.54	22+21.35	23+19.18	24+25.71
25+42.23	26+15.61	27-27.14	28+17.42	29+16.57	30+13.99	31+18.97	32+16.80
01+0113.	02+0106.	03+0.000	04+18.27	05+14.82	06+3.882	07-6999.	08+27.32
09+19.75	10+18.82	11+22.54	12+21.09	13+22.32	14+17.56	15+31.00	16+21.82
17+19.23	18+14.26	19+19.72	20+21.78	21+23.15	22+21.35	23+19.53	24+26.35
25+42.18	26+18.57	27-26.50	28+17.56	29+16.59	30+14.05	31+20.48	32+18.34
01+0113.	02+0107.	03+0.000	04+21.47	05+13.49	06+4.868	07-6999.	08+27.49
09+19.98	10+18.91	11+23.43	12+21.20	13+22.32	14+17.65	15+31.81	16+22.08
17+19.23	18+14.29	19+20.47	20+22.09	21+22.48	22+21.37	23+20.25	24+27.70
25+42.07	26+18.19	27-25.95	28+17.82	29+16.64	30+14.09	31+24.36	32+22.67
01+0113.	02+0108.	03+0.000	04+23.11	05+12.85	06+4.737	07-35.88	08+28.02
09+19.81	10+19.00	11+24.55	12+21.75	13+22.38	14+17.74	15+32.97	16+22.69
17+19.30	18+14.34	19+21.56	20+22.75	21+25.30	22+21.41	23+21.26	24+28.59
25+42.06	26+18.67	27-24.30	28+18.26	29+16.79	30+14.14	31+25.41	32+24.28
01+0113.	02+0109.	03+0.000	04+22.23	05+13.39	06+3.761	07-33.19	08+28.39
09+19.93	10+18.99	11+25.25	12+22.43	13+22.58	14+17.85	15+33.69	16+23.41

17+19.50 18+14.43 19+22.33 20+23.69 21+26.10 22+21.46 23+22.03 24+30.08
25+42.21 26+16.93 27-24.40 28+18.88 29+17.08 30+14.23 31+24.25 32+23.30

01+0113. 02+0110. 03+0.000 04+21.27 05+16.96 06+4.653 07-29.34 08+29.17
09+20.25 10+19.18 11+25.61 12+22.96 13+22.84 14+17.98 15+33.91 16+23.81
17+19.80 18+14.52 19+22.48 20+24.08 21+26.86 22+21.54 23+22.22 24+30.01
25+42.41 26+15.87 27-24.23 28+19.30 29+17.41 30+14.32 31+24.19 32+22.07

01+0113. 02+0111. 03+0.000 04+22.87 05+13.57 06+4.220 07-28.45 08+29.53
09+20.48 10+19.22 11+26.23 12+23.47 13+23.06 14+18.08 15+34.50 16+24.21
17+20.06 18+14.58 19+23.03 20+24.59 21+25.51 22+21.56 23+22.77 24+31.43
25+42.52 26+17.35 27-24.23 28+19.63 29+17.69 30+14.38 31+24.85 32+23.13

01+0113. 02+0112. 03+0.000 04+23.36 05+12.79 06+3.008 07-30.50 08+29.84
09+20.75 10+19.43 11+26.11 12+23.54 13+23.28 14+18.15 15+34.49 16+24.54
17+20.32 18+14.65 19+23.02 20+24.93 21+24.47 22+21.60 23+22.82 24+32.84
25+42.65 26+16.69 27-23.23 28+19.97 29+17.97 30+14.45 31+24.76 32+23.83

01+0113. 02+0113. 03+0.000 04+23.89 05+12.60 06+2.400 07-38.21 08+29.98
09+20.89 10+19.55 11+25.99 12+23.86 13+23.49 14+18.24 15+34.30 16+24.67
17+20.54 18+14.72 19+22.85 20+25.12 21+25.20 22+21.66 23+22.67 24+34.22
25+42.76 26+16.52 27-23.70 28+20.18 29+18.23 30+14.52 31+24.58 32+23.65

01+0113. 02+0114. 03+0.000 04+22.22 05+13.12 06+3.834 07-42.72 08+30.00
09+21.09 10+19.61 11+25.84 12+24.06 13+23.69 14+18.35 15+34.20 16+24.74
17+20.78 18+14.81 19+22.79 20+25.18 21+26.46 22+21.73 23+22.57 24+33.47
25+42.85 26+18.53 27-23.38 28+20.35 29+18.47 30+14.62 31+23.76 32+22.17

01+0113. 02+0115. 03+0.000 04+21.52 05+13.38 06+4.933 07-51.39 08+30.17
09+22.07 10+19.67 11+25.91 12+23.86 13+23.84 14+18.47 15+34.40 16+24.83
17+20.96 18+14.84 19+23.00 20+25.24 21+25.44 22+21.80 23+22.83 24+31.94
25+43.00 26+18.71 27-22.62 28+20.51 29+18.68 30+14.71 31+24.12 32+22.88

01+0113. 02+0116. 03+0.000 04+18.55 05+14.49 06+4.260 07-46.84 08+30.33
09+22.66 10+19.81 11+26.08 12+24.35 13+24.00 14+18.60 15+34.29 16+24.99
17+21.16 18+14.96 19+22.98 20+25.38 21+24.85 22+21.89 23+22.93 24+30.46
25+43.20 26+17.12 27-22.92 28+20.71 29+18.91 30+14.84 31+21.46 32+19.51

01+0113. 02+0117. 03+0.000 04+17.08 05+15.09 06+5.168 07-31.84 08+30.26
09+21.92 10+19.96 11+24.18 12+24.30 13+24.13 14+18.72 15+33.58 16+24.83
17+21.16 18+14.89 19+22.39 20+25.21 21+25.40 22+21.97 23+22.50 24+28.79
25+43.07 26+17.48 27-23.73 28+20.70 29+19.09 30+14.94 31+20.37 32+18.36

01+0113. 02+0118. 03+0.000 04+13.44 05+16.29 06+5.256 07-49.28 08+30.06
09+21.98 10+20.13 11+25.21 12+24.12 13+24.26 14+18.85 15+33.18 16+24.59
17+21.35 18+15.09 19+21.90 20+24.92 21+26.11 22+22.08 23+22.26 24+27.92
25+43.34 26+17.03 27-25.14 28+20.55 29+19.21 30+15.07 31+17.28 32+15.95

01+0113. 02+0119. 03+0.000 04+13.84 05+16.13 06+5.272 07-20.18 08+29.72
09+21.93 10+20.25 11+24.84 12+23.92 13+24.31 14+18.95 15+32.41 16+24.18
17+21.34 18+15.32 19+21.05 20+24.40 21+27.05 22+22.15 23+21.46 24+26.07
25+43.40 26+18.03 27-26.11 28+20.16 29+19.20 30+15.16 31+17.65 32+16.31

01+0113. 02+0120. 03+0.000 04+15.33 05+15.69 06+5.062 07-6999. 08+29.31
09+21.78 10+20.35 11+25.19 12+23.69 13+24.29 14+19.04 15+32.44 16+23.83
17+21.20 18+15.39 19+20.99 20+24.02 21+26.41 22+22.20 23+21.38 24+25.09

25+43.35 26+18.42 27-26.17 28+19.73 29+19.07 30+15.23 31+19.08 32+17.10

01+0113. 02+0121. 03+0.000 04+16.09 05+15.39 06+4.008 07-38.95 08+29.06
09+21.62 10+20.46 11+24.85 12+23.61 13+24.29 14+19.13 15+32.81 16+23.84
17+21.07 18+15.47 19+21.31 20+23.96 21+25.10 22+22.27 23+21.67 24+23.70
25+43.32 26+17.30 27-25.76 28+19.66 29+18.95 30+15.31 31+18.79 32+17.86

01+0113. 02+0122. 03+0.000 04+17.29 05+20.91 06+5.001 07-24.66 08+29.00
09+21.61 10+20.56 11+24.82 12+23.54 13+24.28 14+19.22 15+32.63 16+23.78
17+20.97 18+15.56 19+21.13 20+23.79 21+23.96 22+22.37 23+21.50 24+22.48
25+43.32 26+16.86 27-25.81 28+19.67 29+18.92 30+15.39 31+21.17 32+19.12

01+0113. 02+0123. 03+0.000 04+21.99 05+13.26 06+5.215 07-16.62 08+29.04
09+21.67 10+20.61 11+24.41 12+23.54 13+24.21 14+19.26 15+33.41 16+23.83
17+20.78 18+15.59 19+21.83 20+23.76 21+23.91 22+22.37 23+22.12 24+21.69
25+43.21 26+18.53 27-25.86 28+19.69 29+18.84 30+15.42 31+24.87 32+23.79

01+0113. 02+0124. 03+0.000 04+24.51 05+12.32 06+4.467 07-21.31 08+29.40
09+21.70 10+20.66 11+6.570 12+23.86 13+24.25 14+19.33 15+34.35 16+24.26
17+20.67 18+15.64 19+22.75 20+24.07 21+24.06 22+22.40 23+22.89 24+21.19
25+43.17 26+20.12 27-26.39 28+19.98 29+18.86 30+15.47 31+27.30 32+25.96

01+0113. 02+0125. 03+0.000 04+23.37 05+12.73 06+5.115 07-6999. 08+29.60
09+21.46 10+20.78 11+26.09 12+24.38 13+24.39 14+19.43 15+34.90 16+24.75
17+20.75 18+15.72 19+23.32 20+24.49 21+24.42 22+22.48 23+23.40 24+21.20
25+43.31 26+19.07 27-28.50 28+20.42 29+19.02 30+15.57 31+26.03 32+25.52

01+0113. 02+0126. 03+0.000 04+21.26 05+13.58 06+5.266 07-25.65 08+30.25
09+21.74 10+20.87 11+27.82 12+24.90 13+24.59 14+19.51 15+35.17 16+25.13
17+20.88 18+15.81 19+23.63 20+24.69 21+25.18 22+22.56 23+23.72 24+21.35
25+43.46 26+19.94 27-30.63 28+20.72 29+19.23 30+15.66 31+24.53 32+22.91

01+0113. 02+0127. 03+0.000 04+22.06 05+13.18 06+5.107 07-27.81 08+30.44
09+21.85 10+20.89 11+27.54 12+25.03 13+24.76 14+19.55 15+35.45 16+25.36
17+20.99 18+15.86 19+24.04 20+24.90 21+23.98 22+22.58 23+24.12 24+21.44
25+43.54 26+19.13 27-34.18 28+21.00 29+19.39 30+15.72 31+25.01 32+23.05

01+0113. 02+0128. 03+0.000 04+24.42 05+12.33 06+4.946 07-20.47 08+30.65
09+22.04 10+20.84 11+27.57 12+25.13 13+24.90 14+19.59 15+35.80 16+25.56
17+21.09 18+15.89 19+24.39 20+25.08 21+23.92 22+22.61 23+24.46 24+21.59
25+43.60 26+20.11 27-38.75 28+21.34 29+19.56 30+15.77 31+26.88 32+25.80

01+0113. 02+0129. 03+0.000 04+25.87 05+11.79 06+5.352 07-30.15 08+30.82
09+22.22 10+20.90 11+27.87 12+25.35 13+25.00 14+19.63 15+36.23 16+25.81
17+21.21 18+15.94 19+24.77 20+25.30 21+24.49 22+22.62 23+24.84 24+21.84
25+43.63 26+20.43 27-42.90 28+21.64 29+19.75 30+15.82 31+28.56 32+27.32

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01+0113. 02+0159. 03+0.000 04+26.16 05+11.69 06+5.626 07+3.271 08+34.28
09+25.17 10+23.61 11-52.07 12+29.31 13+27.57 14+21.85 15+38.39 16+28.18
17+23.66 18+17.73 19+27.07 20+25.86 21+26.34 22+24.58 23+29.10 24+24.74
25+47.18 26+22.65 27-52.06 28+24.50 29+22.78 30+17.85 31+29.38 32+28.01

01+0113. 02+0160. 03+0.000 04+23.88 05+15.14 06+3.676 07-3.008 08+34.61
09+25.31 10+23.48 11-52.50 12+29.47 13+27.81 14+21.58 15+38.79 16+28.45

17+23.74 18+17.82 19+27.63 20+25.98 21+26.44 22+24.68 23+29.62 24+24.95
25+47.34 26-6999. 27-52.21 28+24.72 29+22.87 30+17.96 31+26.58 32+24.74

01+0113. 02+0161. 03+0.000 04+23.18 05+20.24 06+5.008 07-2.220 08+34.61
09+25.95 10+23.84 11-52.21 12+29.72 13+27.95 14+21.39 15+38.15 16+28.50
17+23.86 18+17.92 19+26.97 20+26.18 21+26.54 22+24.79 23+29.22 24+25.05
25+47.43 26+21.58 27-52.17 28+24.86 29+22.96 30+18.04 31+26.21 32+24.92

01+0113. 02+0162. 03+0.000 04+25.15 05+15.94 06+5.558 07+13.63 08+34.52
09+25.53 10+23.82 11-52.23 12+29.63 13+28.04 14+21.46 15+38.30 16+28.39
17+23.87 18+17.94 19+27.12 20+26.07 21+26.55 22+24.79 23+29.37 24+24.97
25+47.39 26+22.13 27-52.19 28+24.75 29+22.98 30+18.07 31+28.78 32+27.26

01+0113. 02+0163. 03+0.000 04+27.33 05+11.30 06+5.270 07-10.61 08+34.58
09+25.51 10+23.19 11-52.80 12+29.39 13+28.06 14+21.51 15+38.82 16+28.51
17+23.90 18+17.95 19+27.90 20+25.84 21+26.57 22+24.79 23+30.02 24+25.03
25+47.33 26+22.73 27-52.20 28+24.83 29+22.98 30+18.09 31+30.54 32+28.85

01+0113. 02+0164. 03+0.000 04+26.74 05+11.57 06+4.301 07-1.877 08+34.77
09+25.61 10+23.60 11-52.37 12+29.81 13+28.16 14+21.63 15+39.02 16+28.81
17+23.91 18+17.98 19+28.28 20+25.96 21+26.65 22+24.86 23+30.44 24+25.28
25+47.41 26+20.37 27-52.04 28+25.14 29+23.06 30+18.17 31+29.53 32+28.83

01+0113. 02+0165. 03+0.000 04+20.79 05+18.05 06+4.460 07+6.213 08+35.13
09+26.47 10+24.13 11-52.12 12+30.35 13+28.24 14+22.32 15+38.80 16+29.08
17+24.10 18+18.00 19+27.99 20+26.12 21+26.86 22+25.03 23+30.52 24-6999.
25+47.68 26+21.89 27-51.91 28+25.42 29+23.29 30+18.32 31+23.98 32+22.20

01+0113. 02+0166. 03+0.000 04+22.16 05+25.23 06+4.623 07-5.318 08+35.05
09+25.76 10+24.22 11-52.05 12+30.39 13+28.33 14+22.46 15+38.07 16+28.99
17+24.38 18+18.23 19+27.39 20+26.03 21+27.08 22+25.13 23+30.12 24+25.51
25+47.74 26-6999. 27-51.77 28+25.37 29+23.40 30+18.38 31+25.83 32+24.24

01+0113. 02+0167. 03+0.000 04+24.67 05+20.81 06+5.443 07-08.16 08+34.74
09+25.80 10+24.25 11-52.04 12+30.22 13+28.35 14+22.48 15+37.99 16+28.76
17+24.40 18+18.24 19+27.44 20+25.61 21+27.01 22+25.14 23+30.08 24+25.37
25+47.68 26+22.17 27-51.91 28+25.14 29+23.39 30+18.39 31+28.60 32+26.24

01+0113. 02+0168. 03+0.000 04+28.00 05+13.26 06+3.997 07-5.947 08+34.87
09+26.12 10+24.23 11-52.19 12+30.20 13+28.33 14+22.50 15+38.65 16+28.84
17+24.29 18+18.15 19+28.19 20+25.64 21+27.00 22+25.12 23+30.90 24+25.43
25+21.10 26+20.66 27-52.25 28+25.14 29+23.36 30+18.41 31+30.63 32+28.38

01+0113. 02+0169. 03+0.000 04+29.31 05+10.68 06+5.645 07+2.461 08+34.94
09+26.20 10+24.27 11-51.74 12+30.33 13+28.36 14+22.55 15+38.31 16+28.99
17+24.30 18+18.23 19+27.81 20+25.96 21+27.01 22+25.12 23+30.93 24+25.52
25+30.32 26-6999. 27-52.24 28+25.33 29+23.38 30+18.43 31+32.17 32+31.25

01+0113. 02+0170. 03+0.000 04+29.26 05+12.41 06+5.549 07+6.924 08+35.19
09+28.02 10+24.38 11-51.24 12+30.65 13+28.43 14+22.64 15+39.05 16+29.22
17+24.23 18+18.18 19+28.99 20+25.90 21+27.07 22+25.15 23+31.69 24+25.76
25+47.70 26+21.81 27-52.30 28+25.52 29+23.46 30+18.49 31+32.41 32+30.22

01+0113. 02+0171. 03+0.000 04+30.99 05+10.93 06+4.406 07-1.372 08+35.51
09+27.40 10+24.41 11-51.19 12+31.00 13+28.51 14+22.68 15+39.55 16+29.60
17+24.33 18+18.22 19+29.69 20+26.29 21+27.17 22+25.20 23+32.51 24+26.04

25+47.71	26+20.52	27-52.31	28+25.88	29+23.55	30+18.53	31+33.63	32+31.65
01+0113.	02+0172.	03+0.000	04+30.84	05+10.02	06+3.752	07+19.49	08+35.81
09+27.15	10+24.41	11-51.20	12+31.28	13+28.62	14+22.74	15+39.38	16+29.96
17+24.49	18+18.30	19+30.01	20+26.76	21+27.30	22+25.22	23+32.87	24+26.37
25+47.73	26+23.00	27-52.34	28+26.26	29+23.70	30+18.58	31+33.32	32+32.18
01+0113.	02+0173.	03+0.000	04+30.23	05+10.31	06+3.792	07+12.09	08+36.06
09+28.02	10+24.31	11-51.30	12+31.51	13+28.79	14+22.83	15+38.98	16+30.18
17+24.70	18+18.38	19+29.86	20+26.98	21+27.47	22+25.27	23+32.85	24+26.73
25+47.85	26+23.15	27-52.34	28+26.50	29+23.90	30+18.65	31+32.82	32+31.96
01+0113.	02+0174.	03+0.000	04+19.94	05+25.28	06+5.424	07-1.584	08+36.50
09+27.92	10+24.73	11-51.54	12+32.05	13+28.85	14+22.46	15+38.58	16+30.49
17+25.06	18+18.57	19+29.65	20+27.34	21+27.83	22+25.52	23+32.86	24+27.08
25+48.33	26+22.89	27-52.35	28+26.73	29+24.25	30+18.85	31+24.65	32+21.85
01+0113.	02+0175.	03+0.000	04+24.77	05+27.25	06+5.460	07-6999.	08+36.36
09+30.56	10+24.87	11-51.35	12+32.07	13+29.22	14+22.58	15+37.24	16+30.36
17+25.23	18+18.62	19+28.83	20+27.20	21+28.06	22+25.60	23+32.00	24+26.88
25+48.39	26+23.43	27-52.25	28+26.67	29+24.37	30+18.90	31+26.71	32+24.13
01+0113.	02+0176.	03+0.000	04+27.26	05+11.58	06+5.578	07-0.962	08+35.87
09+29.60	10+24.77	11-51.33	12+31.49	13+29.26	14+22.61	15+35.99	16+29.90
17+25.20	18+18.59	19+28.89	20+26.62	21+27.94	22+25.52	23+31.66	24+26.64
25+48.23	26+23.39	27-52.30	28+26.39	29+24.32	30+18.87	31+30.78	32+28.43
01+0113.	02+0177.	03+0.000	04+28.29	05+10.93	06+5.595	07-6999.	08+35.81
09+28.49	10+24.86	11-50.86	12+31.37	13+29.21	14+22.65	15+34.19	16+29.88
17+25.21	18+18.61	19+29.32	20+26.59	21+27.96	22+25.53	23+32.07	24+26.50
25+48.21	26+23.40	27-52.35	28+26.42	29+24.33	30+18.91	31+31.63	32+29.99
01+0113.	02+0178.	03+0.000	04+26.53	05+11.57	06+5.723	07-6999.	08+35.93
09+29.53	10+24.96	11-50.48	12+31.50	13+29.27	14+22.75	15+30.78	16+30.07
17+25.26	18+18.68	19+29.56	20+26.90	21+28.02	22+25.58	23+32.31	24+26.72
25+48.28	26-6999.	27-52.35	28+26.61	29+24.41	30+18.99	31+29.85	32+29.26
01+0113.	02+0179.	03+0.000	04+28.25	05+10.94	06+5.168	07+09.10	08+36.05
09+29.11	10+24.95	11-50.30	12+31.58	13+29.33	14+22.82	15+29.04	16+30.17
17+25.30	18+18.70	19+29.60	20+27.01	21+28.02	22+25.57	23+32.07	24-6999.
25+48.21	26+23.52	27-52.37	28+26.68	29+24.46	30+19.02	31+30.94	32+29.97
01+0113.	02+0180.	03+0.000	04+28.74	05+10.83	06+4.373	07+10.07	08+36.19
09+29.53	10+24.86	11-50.32	12+31.58	13+29.46	14+22.92	15+29.27	16+30.31
17+25.39	18+18.75	19+30.06	20+27.04	21+28.10	22+25.61	23+32.16	24+26.95
25+48.23	26+23.54	27-52.32	28+26.77	29+24.54	30+19.08	31+31.11	32+30.22
01+0113.	02+0181.	03+0.000	04+28.56	05+11.99	06+4.837	07+2.871	08+36.29
09+27.35	10+25.03	11-50.08	12+31.82	13+29.60	14+23.05	15+29.28	16+30.46
17+25.50	18+18.83	19+30.13	20+27.29	21+28.52	22+25.74	23+32.02	24+27.07
25+48.24	26+22.28	27-52.28	28+26.91	29+24.63	30+19.13	31+31.37	32+29.68
01+0113.	02+0182.	03+0.000	04+29.22	05+14.95	06+4.546	07-07.72	08+36.49
09+28.88	10+25.06	11-50.41	12+31.96	13+29.71	14+23.14	15+29.47	16+30.66
17+25.65	18+18.90	19+30.37	20+27.56	21+28.34	22+25.87	23+32.06	24+27.20
25+48.32	26+22.80	27-52.22	28+27.07	29+24.75	30+19.19	31+32.47	32+29.70

01+0113. 02+0183. 03+0.000 04+30.93 05+10.02 06+5.609 07-08.76 08+36.61
09+29.69 10+25.15 11-49.86 12+32.05 13+29.75 14+23.17 15+29.77 16+30.79
17+25.71 18+18.92 19+30.72 20+27.80 21+28.38 22+25.83 23+32.18 24+27.34
25+48.28 26+19.22 27-51.55 28+27.23 29+24.80 30+19.22 31+33.65 32+32.92

01+0113. 02+0184. 03+0.000 04+30.95 05+09.98 06+5.690 07+3.505 08+36.81
09+28.54 10+25.18 11-49.41 12+32.21 13+29.75 14+23.18 15+30.15 16+30.97
17+25.78 18+18.93 19+31.10 20+27.99 21+28.44 22+25.80 23+32.28 24+27.56
25+48.32 26+20.53 27-47.79 28+27.39 29+24.90 30+19.27 31+33.61 32+32.44

01+0113. 02+0185. 03+0.000 04+30.62 05+10.77 06+5.492 07+1.164 08+37.04
09+28.93 10+25.26 11-49.08 12+32.45 13+29.93 14+23.29 15+30.47 16+31.23
17+25.89 18+18.98 19+31.42 20+28.22 21+28.57 22+25.89 23+32.38 24+27.77
25+48.39 26+22.07 27-44.40 28+27.63 29+25.03 30+19.33 31+33.89 32+32.63

01+0113. 02+0186. 03+0.000 04+29.90 05+11.51 06+5.145 07+2.346 08+37.33
09+30.20 10+25.38 11-49.18 12+32.56 13+30.11 14+23.41 15+30.88 16+31.53
17+26.06 18+19.07 19+31.90 20+28.57 21+28.74 22+25.99 23+32.44 24+28.03
25+48.46 26+19.34 27-47.30 28+27.93 29+25.20 30+19.41 31+33.16 32+30.92

01+0113. 02+0187. 03+0.000 04+29.05 05+12.14 06+5.322 07-0.946 08+37.57
09+30.36 10+25.46 11-49.42 12+32.00 13+30.27 14+23.53 15+30.96 16+31.77
17+26.30 18+19.14 19+31.99 20+28.93 21+28.92 22+26.10 23+32.34 24+28.26
25+48.52 26+22.92 27-48.61 28+28.21 29+25.38 30+19.49 31+32.56 32+29.88

01+0113. 02+0188. 03+0.000 04+28.92 05+13.12 06+5.378 07-15.33 08+37.68
09+28.64 10+25.58 11-49.51 12+31.81 13+30.42 14+23.61 15+30.74 16+31.92
17+26.61 18+19.25 19+31.87 20+29.14 21+29.08 22+26.18 23+32.10 24+28.42
25+48.60 26+24.00 27-47.58 28+28.41 29+25.55 30+19.55 31+32.54 32+29.45

01+0113. 02+0189. 03+0.000 04+29.11 05+10.72 06+5.438 07+2.580 08+37.60
09+31.44 10+25.57 11-49.25 12+31.53 13+30.48 14+23.67 15+30.71 16+31.91
17+26.72 18+19.27 19+31.81 20+29.16 21+29.20 22+26.14 23+31.96 24+28.70
25+48.62 26+23.10 27-48.55 28+28.50 29+25.68 30+19.60 31+32.50 32+30.42

01+0113. 02+0190. 03+0.000 04+28.41 05+11.14 06+5.206 07+0.817 08+37.48
09+30.35 10+25.63 11-48.90 12+31.42 13+30.61 14+24.03 15+30.87 16+31.97
17+26.85 18+19.32 19+31.95 20+29.17 21+29.33 22+26.19 23+31.96 24-6999.
25+48.75 26+24.17 27-46.46 28+28.60 29+25.82 30+19.66 31+31.37 32+30.16

01+0113. 02+0191. 03+0.000 04+27.42 05+11.53 06+4.719 07+4.792 08+37.70
09+29.87 10+25.86 11-48.88 12+31.49 13+30.73 14+24.17 15+30.70 16+32.07
17+26.96 18+19.40 19+31.78 20+29.27 21+29.47 22+26.27 23+31.70 24+28.74
25+48.55 26+22.90 27-44.70 28+28.67 29+25.97 30+19.74 31+30.68 32+28.75

01+0113. 02+0192. 03+0.000 04+27.82 05+12.72 06+5.118 07-0.157 08+37.74
09+31.00 10+25.90 11-48.79 12+31.36 13+30.80 14+24.23 15+30.43 16+32.02
17+27.04 18+19.47 19+31.48 20+29.32 21+29.57 22+26.38 23+31.30 24+28.69
25+48.19 26+19.14 27-44.73 28+28.63 29+26.06 30+19.80 31+31.96 32+29.97

01+0113. 02+0193. 03+0.000 04+26.78 05+15.67 06+3.902 07+6.393 08+37.93
09+29.71 10+25.98 11-49.16 12+31.42 13+30.92 14+24.35 15+30.65 16+32.09
17+27.16 18+19.57 19+31.59 20+29.43 21+29.73 22+26.52 23+31.34 24+28.75
25+47.91 26+22.73 27-44.59 28+28.65 29+26.18 30+19.89 31+30.37 32+28.05

01+0113. 02+0194. 03+0.000 04+27.23 05+16.23 06+3.659 07+5.343 08+37.96
09+31.11 10+26.04 11-49.43 12+31.43 13+30.98 14+24.43 15+30.34 16+32.11
17+27.24 18+19.64 19+31.22 20+29.45 21+29.82 22+26.61 23+30.99 24+28.70
25+48.16 26+18.83 27-46.07 28+28.61 29+26.23 30+19.95 31+30.13 32+28.75

01+0113. 02+0195. 03+0.000 04+28.87 05+14.91 06+4.725 07+13.03 08+37.94
09+31.33 10+26.07 11-49.04 12+31.40 13+31.01 14+24.49 15+30.45 16+32.01
17+27.29 18+19.68 19+31.21 20+29.36 21+29.86 22+26.67 23+30.96 24-6999.
25+48.17 26+17.88 27-44.25 28+28.44 29+26.24 30+19.99 31+32.03 32+30.19

01+0113. 02+0196. 03+0.000 04+28.10 05+19.62 06+4.683 07+6.586 08+38.11
09+32.00 10+26.22 11-48.99 12+31.64 13+31.08 14+24.60 15+30.72 16+32.16
17+27.37 18+19.77 19+31.43 20+29.49 21+29.97 22+26.77 23+31.24 24+28.68
25+48.27 26-6999. 27-40.38 28+28.48 29+26.29 30+20.08 31+31.51 32+28.87

01+0113. 02+0197. 03+0.000 04+28.64 05+17.62 06+4.440 07-1.813 08+38.13
09+32.78 10+26.28 11-48.80 12+31.63 13+31.11 14+24.66 15+30.66 16+32.21
17+27.41 18+19.81 19+31.42 20+29.58 21+30.01 22+26.80 23+31.17 24+28.74
25+48.23 26+22.39 27-42.64 28+28.51 29+26.30 30+20.13 31+31.81 32+29.53

01+0113. 02+0198. 03+1.000 04-6999. 05+6999. 06+3.898 07-6999. 08+38.28
09+34.56 10+26.49 11-48.97 12+31.78 13+31.33 14+24.85 15+30.95 16+32.44
17+27.42 18+19.82 19+31.69 20+30.37 21-6999. 22+27.06 23+31.39 24+28.78
25+48.45 26+24.57 27-42.34 28+28.69 29+26.42 30+20.29 31+28.63 32+26.99

01+0113. 02+0199. 03+0.000 04-6999. 05+6999. 06+4.060 07-6999. 08+38.10
09+32.51 10+26.58 11-49.35 12+31.74 13+31.42 14+24.93 15+29.58 16+32.46
17+27.45 18+19.84 19+30.36 20+30.22 21+30.99 22+27.46 23+30.32 24+28.97
25+48.52 26+24.11 27-42.17 28+28.60 29+26.48 30+20.33 31+29.57 32+28.64

01+0113. 02+0200. 03+0.000 04+31.38 05+13.09 06+4.882 07+1.678 08+37.91
09+33.75 10+26.49 11-49.81 12+31.40 13+31.33 14+24.87 15+29.71 16+31.87
17+26.19 18+18.50 19+30.15 20+29.41 21+30.26 22+27.24 23+30.16 24+28.49
25+26.79 26+22.76 27-27.48 28+28.09 29+26.35 30+20.28 31+34.75 32+32.55

01+0113. 02+0201. 03+0.000 04+28.01 05+25.33 06+4.448 07-6999. 08+37.97
09+32.60 10+26.67 11-49.94 12+31.67 13+31.46 14+25.04 15+30.95 16+32.05
17+27.19 18+19.69 19+31.47 20+29.78 21-6999. 22+27.87 23+31.18 24+28.50
25-6.741 26+19.23 27+23.05 28+28.21 29+26.37 30+20.40 31+30.95 32+28.34

Appendix B:

Mercuric Nitrate Titration

Mercuric Nitrate Titration

I. General Discussion

Chloride ion is on of the major anions in water. Chloride can be titrated with mercuric nitrate because of the formation of soluble, slightly dissociated mercuric chloride. In the pH range of 2.3-2.8, diphenylcarbazone indicates the endpoint of this titration by formation of a purple complex with its excess mercuric ions interfere when present in excess of 10 mg/liter.

II. Reagents

Standard Chloride Solution, 0.01411N: dissolve 0.8241 g of pure dry sodium chloride in distilled water and dilute to 1 liter. 1ml = 0.50mg cl.

Standard Mercuric Nitrate Solution, 0.01411N: dissolve approximately 2.3 g anhydrous mercuric nitrate or 2.5 g of the monohydrate in water, and dilute to 1 liter. Standardize against 10 and 20 ml aliquots of standard 0.5 mg/ml cl solution and 10 mg sodium bicarbonate diluted to about 100 ml.

Indicator: dissolve 0.5 g diphenylcarbazone and 50 mg of bromophenol blue indicator powder in alcohol reagent, and dilute to 100 ml with same. Store in glass bottle with dropper.

Nitric acid, 0.05N: dilute 33 ml of concentrated nitric acid to 100 ml. Dilute 10 ml of this solution to 100ml.

III. Procedure

1. Measure 25 ml sample into a 250 ml flask and add 3 drops of indicator.
2. Neutralize the sample with 0.05N nitric acid until blue indicator goes to weak yellow. If the indicator color is not blue, add a drop of NaOH to obtain the blue color. Then add HNO_3 until the weak yellow color is obtained.
3. Titrate slowly to the first permanent pink-violet color with the standardized mercuric nitrate solution.

IV. Calculations

$$\text{Chloride, ppm} = \frac{\text{ml} \times N \times 35.45 \times 1000}{\text{ml of aliquot}}$$

If N is exactly 0.01411 and 25 ml of sample is used:

Chloride, ppm = 20 X ml titrant

V. Bibliography

1. American Public Health Association, Standard Methods for the Examination of Water and waste-water., 1960, 79-81.

Appendix C:

Pressure Plate Data

Table 1. 15 bar pressure plate data for ring samples collected at the field site. Test started 9/23/88.

Sample ID	Access Tube Number and depth (cm below surface)	Wet Weight (g)	Dry Weight (g)	Sample Height* (cm)	Θ_r (cm^3/cm^3)
B 11	12-430	250.23	246.07	5.0	4.24
B 24	5-300	238.29	231.02	5.0	7.41
8 C	5-30	249.94	244.01	5.0	6.04
A 19		242.72	239.04	5.0	3.75
H 14	5-270	258.79	251.32	5.0	7.61
B 21		256.32	252.57	5.0	3.82
A 23	5-430	271.47	268.06	5.0	3.47
A 7	5-210	253.34	249.40	5.0	4.01
B 12	5-180	252.60	247.94	5.0	4.75
22	5-60	240.31	235.30	5.0	5.10
B 6	5-420	257.13	253.77	5.0	3.42
B 17	5-150	245.01	241.44	5.0	3.64
H 4	5-270	252.56	248.96	5.0	3.77

* Assumed to be 5.0 cm.

Table 2. 15 bar pressure plate data for ring samples collected at the field site. Test started 10/24/88.

Sample ID	Access Tube Number and depth (cm below surface)	Wet Weight (g)	Dry Weight (g)	Sample Height (cm)	Θ_r (cm^3/cm^3)
A 13	7-270	251.71	246.11	5.05	5.65
B 10	7-360	250.75	246.97	5.00	3.85
23 C	7-30	258.91	255.02	5.00	3.96
H 23	7-60	249.34	246.24	4.80	3.29
A 5	7-240	249.16	244.66	5.00	4.58
20 C	7-390	245.42	240.88	5.00	4.62
H 7	7-180	248.16	243.61	5.00	4.63
11 C	7-450	266.60	262.45	5.10	4.50
14 C	7-300	252.46	242.71	4.70	10.56
6 C	7-210	241.68	237.79	4.70	4.21
A 8	7-90	245.76	242.10	4.80	3.88
A 4	7-420	244.33	240.60	4.80	3.96
3 C	7-330	250.22	246.88	4.50	3.78

Table 3. 15 bar pressure plate data for ring samples collected at the field site. Test started 12/8/88.

Sample ID	Access Tube Number and depth (cm below surface)	Wet Weight (g)	Dry Weight (g)	Sample Height (cm)	Θ_r (cm^3/cm^3)
H 5	12-90	246.45	241.89	4.70	4.94
A 21	12-180	257.40	252.71	4.90	4.87
H 15	12-300	245.33	236.75	5.00	8.74
A 16	12-120	247.75	243.04	5.00	4.80
B 22	12-150	254.43	250.74	5.00	3.76
A 14	12-420	262.78	258.85	5.05	3.96
H 6	12-210	257.71	253.47	5.00	4.32

Table 4. 15 bar pressure plate data for ring samples collected at the field site. Test started 12/19/88.

Sample ID	Access Tube Number and depth (cm below surface)	Wet Weight (g)	Dry Weight (g)	Sample Height (cm)	Θ_r (cm^3/cm^3)
A 6	2-120	247.65	243.40	4.85	4.46
A 2	7-150	250.76	246.99	5.05	3.80
2 C	12-30	251.69	247.51	5.05	4.22
H 9	5-360	254.00	250.68	5.05	3.36
18 C	5-30	248.84	245.30	5.05	3.57
15	5-330	265.69	260.07	5.10	5.02
A 9	12-270	244.94	237.32	5.00	7.76
H 17	5-330	250.96	246.69	5.00	4.35
B 20	12-390	257.50	251.08	5.05	6.47
B 15	12-330	251.51	247.19	5.00	4.40
A 22	12-360	245.70	240.84	4.80	5.16

Appendix D:

Fortran Code

```
**************************************************************
This program calculates flux through each face of the
computational cells at the field site using Darcy's law.
Required input is water content of the soil and pressure head
measurements. This data is stored in a separate file which the
user specifies during the execution of the code. From pressure
head data hydraulic gradients are calculated. Unsaturated
hydraulic conductivities are derived from a field determined
relationship between volumetric water content and unsaturated
hydraulic conductivity. The time span over which the pressure
head and moisture content values are believed to be
representative must be entered if change in water storage is
to be calculated. The change in storage of water in each cell
is calculated by summing the product of the flux through each
face by that face's surface area and the time that flux
occurred.

**************************************************************

C Declaration of variables

 implicit real*8 (a-h,o-z)
 dimension theta(1:4,1:3,1:8), psi(1:5,1:4,1:8),
/flux(1:6,1:5,1:6), cellstor(1:6,1:5)

 integer depth, cell, i, j, k, l, m, n
 character infil*50,outfil*50
 logical failed

C ******** Variable Dictionary *****************************

* theta   3-d array containing water content data

* psi     3-d array containing pressure head values

* flux    3-d array containing flux through each face of cell

* cellstor 2-d array containing change in storage of water for
*          each cell at site

* depth   Interval of cell ( which slice of cell 1 through
*         6 is being considered ) See Figures 14 and 15 of
*          text.

*          Depth 1  60 to 90 cm interval
*          Depth 2  90 to 120 cm interval
*          Depth 3  120 to 150 cm interval
*          Depth 4  150 to 180 cm interval
*          Depth 5  180 to 210 cm interval

* cell     Counter which records which computational cell is
*          being considered. Ranges from 1 to 6.

* infil    Name of input file name.
```

```
* outfil   Output file name.

* failed   Logical flag for success or failure in calculating
*          change in storage of cell.

* wcav     Average water content in soil plane, determined by
*          averaging 4 water content measurements.

* cd       Unsaturated hydraulic conductivity determined by
*          placing wcav into field derived formula.

* delh     Pressure head gradient, determined from pressure
*          head data.


* i        Index used to denote x direction of pressure head
*          values. (column)

* j        Index used to denote y direction of pressure head
*          values. (row)

*          I and J values are x and y coordinates of the
*          tensiometer nests when seen in plan view. Nest
*          number one has values of (1,1) and tensiometer
*          nest number twenty has values of (5,4).

* k        Index which always indicates depth of pressure
*          head data. K = 1 for 30 cm and k = 8 for 240 cm.

*         Example: Pressure head reading for tensiometer nest
*          2, 60 cm depth is stored in psi(i,j,k)
*          i = 1 ( nest in first column )
*          j = 2 ( nest in 2nd row )
*          k = 2 ( 60 cm depth, k = 2 )

* l        Index used to denote x direction of water content
*          values. (column)

* m        Index used to denote y direction of water content
*          values. (row)

*          L and M values are x and y coordinates of the
*          water content values when seen in plan view.
*          Neutron probe access hole number one has values
*          of (1,1) and access hole number twelve has values
*          of (4,1).

* n        Index which always indicates depth of moisture
*          content reading. L = 1 for 30 cm and l = 8 for 240
*          cm.
************************************************************
************************************************************
```

```
* Ask the user for input and output file names ************

 write(*,*)'Enter the Input File Name'
 read(*,'(a)')infil
 open(unit=99,status='old',file=infil)

 write(*,*)'Enter the Output File Name'
 read(*,'(a)')outfil
 open(unit=98,status='unknown',file=outfil)

* Ask user for time data is valid *************************
 write(*,*)'Enter the Number of Days Flux in Effect'
 read(*,*)days

C Read in moisture content data ****************************
* Must be in following order: 1, 2, 3, 6, 5, 4, 7, 8, 9, 12,
* 11, 10, eight values per line starting with 30 and ending
* with 240 cm.

 do 10 i = 1,4
   do 20 j = 1,3
        read(99,*)(theta(i,j,k), k = 1,8)
 20   continue
 10   continue

C Read in the pressure head values ************************
* Must be in the following order: 1, 2, 3, 4, 8, 7, 6, 5, 9,
* 10, 11, 12, 16, 15, 14, 13, 17, 18, 19, 20 eight values per
* line starting with 30 and ending with 240 cm. Missing
* pressure head data should be indicated in the data files by
* a positive number as a flag for the program, not blanks.


 do 30 i = 1,5
    do 40 j = 1,4
        read(99,*)(psi(i,j,k), k = 1,8)
 40    continue
 30 continue

************************************************************
C Calculations *********************************************

* Start with first cell ***
 cell = 1

* Start x counter for pressure head ***
 do 50 i = 2, 4

*  Initialize x counter for water content ***
   l = i-1

* Start y counter for pressure head ***
   do 60 j = 2, 3
```

```
*     Initialize y counter for water content ***
      m = j-1

*     Start depth counter for pressure head ***
      do 70 k = 2, 6

*       Set depth counter for water content ***
        n = k

*       Set depth of cell counter ***
        depth = k-1

*      Initialize all storage values to zero and failed is not
*       true yet
        cellstor(cell,depth) = 0
        failed = .false.

*************************************************************
C Flux through the western face  ***************************

* Calculate average water content of face *****
 wcav =(theta(l,m,n)+theta(l,m+1,n)+theta(l,m,n+1)+
/theta(l,m+1,n+1))/400.0

* Calculate unsaturated hydraulic conductivity ***
 cd = 5.86656e-5 * exp(83.84*wcav)

* Calculate gradient ****************************************
* Positive delh means flux into the cell ***
 delh =((psi(i-1,j,k)+psi(i-1,j,k+1))/2.0-(psi(i,j,k)+
/psi(i,j,k+1))/2.0)/150.0

* Handle missing pressure head data ************************
* Positive psi values indicate missing data **

* Use k + 1 value if k missing ***
 if (psi(i-1,j,k ) .gt. 0) then
     delh = (psi(i-1,j,k+1)-(psi(i,j,k)+psi(i,j,k+1))/2.0)
/    /150.0
 endif

* Use k value if k + 1 missing ***
 if (psi(i-1,j,k+1) .gt. 0) then
     delh =(psi(i-1,j,k)-(psi(i,j,k)+psi(i,j,k+1))/2.0)
/   /150.0
 endif

* Use k + 1 value if k missing ***
 if ( psi(i,j,k) .gt. 0 ) then
     delh =((psi(i-1,j,k)+psi(i-1,j,k+1))/2.0-psi(i,j,k+1))
/    /150.0
 endif

* use k value if k + 1 missing ***
```

```
 if (psi(i,j,k+1) .gt. 0 ) then
      delh =((psi(i-1,j,k)+psi(i-1,j,k+1))/2.0-psi(i,j,k))
/    /150.0
 endif

* Both k and k + 1 missing, set delh = 0 ***
 if (psi(i-1,j,k).gt.0 .and. psi(i-1,j,k+1).gt.0 ) then
      delh = 0
 endif

* Both k and k + 1 missing, set delh = 0 ***
 if (psi(i,j,k).gt.0 .and. psi(i,j,k+1).gt.0 ) then
      delh = 0
 endif


* Calculate flux by multiplying cd and delh ***
 flux(cell,depth,1) = cd * delh

* Calculate volume per time (flux times area of face)
 temp = flux(cell,depth,1) * 4500.0

* Cumulative volume of water in or out of cell ***
 cellstor(cell,depth) = cellstor(cell,depth) + temp * days

* Set flag if unable to determine delh and consequently unable
* to determine change is storage for this cell ***
 if (abs( delh - 0.0) .lt. 1.0e-24 ) then
      failed = .true.
 endif

************************************************************
C Flux through the eastern face ****************************

* Calculate average water content of face *****
 wcav =(theta(l+1,m,n)+theta(l+1,m+1,n)+theta(l+1,m,n+1)+
/theta(l+1,m+1,n+1))/400.0

* Calculate unsaturated hydraulic conductivity ***
 cd = 5.86656e-5 * exp(83.84*wcav)

* Calculate gradient ****************************************
* Positive delh means flux into the cell ***
delh =((psi(i+1,j,k)+psi(i+1,j,k+1))/2.0-(psi(i,j,k)+
/psi(i,j,k+1))/2.0)/150.0

* Handle missing pressure head data ************************
* Positive psi values indicate missing data ***

* Use k + 1 value if k missing ***
 if (psi(i+1,j,k ) .gt. 0) then
      delh = (psi(i+1,j,k+1)-(psi(i,j,k)+psi(i,j,k+1))/2.0)
/     /150.0
 endif
```

```
* Use k value if k + 1 missing ***
 if (psi(i+1,j,k+1) .gt. 0) then
     delh =(psi(i+1,j,k)-(psi(i,j,k)+psi(i,j,k+1))/2.0)
/    /150.0
 endif

* Use k + 1 value if k missing ***
 if (psi(i,j,k) .gt. 0) then
     delh =((psi(i+1,j,k)+psi(i+1,j,k+1))/2.0-psi(i,j,k+1))
/    /150.0
 endif

* Use k value if k + 1 missing ***
 if (psi(i,j,k+1) .gt. 0) then
     delh =((psi(i+1,j,k)+psi(i+1,j,k+1))/2.0-psi(i,j,k))
/    /150.0
 endif

* Both k and k + 1 missing, set delh = 0 ***
 if (psi(i+1,j,k).gt.0 .and. psi(i+1,j,k+1).gt.0 ) then
     delh = 0
 endif

* Both k and k + 1 missing, set delh = 0 ***
 if (psi(i,j,k).gt.0 .and. psi(i,j,k+1).gt.0 ) then
     delh = 0
 endif

* Calculate flux by multiplying cd and delh ***
 flux(cell,depth,2) = cd * delh

* Calculate volume per time (flux times area of face) ***
 temp = flux(cell,depth,2) * 4500.0

* Cumulative volume of water in or out of cell ***
 cellstor(cell,depth) = cellstor(cell,depth) + temp * days

* Set flag if unable to determine delh and consequently unable
* to determine change is storage for this cell ***
 if (abs( delh - 0.0) .lt. 1.0e-24) then
     failed = .true.
 endif

************************************************************
C Flux through the northern face ***************************

* Calculate average water content of face *****
 wcav =(theta(l,m+1,n)+theta(l,m+1,n+1)+theta(l+1,m+1,n)+
/theta(l+1,m+1,n+1))/400.0

* Calculate unsaturated hydraulic conductivity ***
 cd = 5.86656e-5 * exp(83.84*wcav)
```

```
* Calculate gradient ***************************************
* Positive delh means flux into the cell ***
 delh =((psi(i,j+1,k)+psi(i,j+1,k+1))/2.0-(psi(i,j,k)+
/psi(i,j,k+1))/2.0)/150.0

* Handle missing pressure head data ************************
* Positive psi values indicate missing data ***

* Use k + 1 value if k missing ***
 if (psi(i,j+1,k) .gt. 0) then
     delh = (psi(i,j+1,k+1)-(psi(i,j,k)+psi(i,j,k+1))/2.0)
/    /150.0
      endif

* Use k value if k + 1 missing ***
 if (psi(i,j+1,k+1) .gt. 0) then
     delh =(psi(i,j+1,k)-(psi(i,j,k)+psi(i,j,k+1))/2.0)
/    /150.0
 endif

* Use k + 1 value if k missing ***
 if (psi(i,j,k) .gt. 0) then
     delh =((psi(i,j+1,k)+psi(i,j+1,k+1))/2.0-psi(i,j,k+1))
/   /150.0
 endif

* Use k value if k + 1 missing ***
 if (psi(i,j,k+1) .gt. 0) then
     delh =((psi(i,j+1,k)+psi(i,j+1,k+1))/2.0-psi(i,j,k))
/    /150.0
 endif

* Both k and k + 1 missing, set delh = 0 ***
 if (psi(i,j+1,k).gt.0 .and. psi(i,j+1,k+1).gt.0 ) then
     delh = 0
 endif

* Both k and k + 1 missing, set delh = 0 ***
 if (psi(i,j,k).gt.0 .and. psi(i,j,k+1).gt.0 ) then
     delh = 0
 endif

* Calculate flux by multiplying cd and delh ***
 flux(cell,depth,3) = cd * delh

* Calculate volume per time (flux times area of face) ***
 temp = flux(cell,depth,3) * 4500.0

* Cumulative volume of water in or out of cell ***
 cellstor(cell,depth) = cellstor(cell,depth) + temp * days

* Set flag if unable to determine delh and consequently unable
* to determine change is storage for this cell ***
 if (abs( delh - 0.0) .lt. 1.0e-14) then
```

```
     failed = .true.
 endif

C Flux through the southern face ****************************
 ***********************************************************

* Calculate average water content of face *****
 wcav =(theta(l,m,n)+theta(l,m,n+1)+theta(l+1,m,n)+
/theta(l+1,m,n+1))/400.0

* Calculate unsaturated hydraulic conductivity ***
 cd = 5.86656e-5 * exp(83.84*wcav)

* Calculate gradient ***************************************
* Positive delh means flux into the cell ***
 delh =((psi(i,j-1,k)+psi(i,j-1,k+1))/2.0-(psi(i,j,k)+
/psi(i,j,k+1))/2.0)/150.0

* Handle missing pressure head data ************************
* Positive psi values indicate missing data ***

* Use k + 1 value if k missing ***
 if (psi(i,j-1,k) .gt. 0) then
     delh = (psi(i,j-1,k+1)-(psi(i,j,k)+psi(i,j,k+1))/2.0)
/    /150.0
 endif

* Use k value if k + 1 missing ***
 if (psi(i,j-1,k+1) .gt. 0) then
     delh =(psi(i,j-1,k)-(psi(i,j,k)+psi(i,j,k+1))/2.0)
/    /150.0
 endif

* Use k + 1 value if k missing ***
 if (psi(i,j,k) .gt. 0) then
     delh =((psi(i,j-1,k)+psi(i,j-1,k+1))/2.0-psi(i,j,k+1))
/    /150.0
 endif

* Use k value if k + 1 missing ***
 if (psi(i,j,k+1) .gt. 0) then
     delh =((psi(i,j-1,k)+psi(i,j-1,k+1))/2.0-psi(i,j,k))
/    /150.0
      endif

* Both k and k + 1 missing, set delh = 0 ***
 if (psi(i,j-1,k).gt.0 .and. psi(i,j-1,k+1).gt.0 ) then
     delh = 0
 endif

* Both k and k + 1 missing, set delh = 0 ***
 if (psi(i,j,k).gt.0 .and. psi(i,j,k+1).gt.0 ) then
     delh = 0
 endif
```

```
* Calculate flux by multiplying cd and delh ***
 flux(cell,depth,4) = cd * delh

* Calculate volume per time (flux times area of face) ***
 temp = flux(cell,depth,4) * 4500.0

* Cumulative volume of water in or out of cell ***
 cellstor(cell,depth) = cellstor(cell,depth) + temp * days

* Set flag if unable to determine delh and consequently unable
* to determine change is storage for this cell ***
 if (abs( delh - 0.0) .lt. 1.0e-24) then
     failed = .true.
 endif

C Flux through the upper face ******************************
************************************************************

* Calculate average water content of face *****
 wcav =(theta(l,m,n)+theta(l+1,m,n)+theta(l,m+1,n)+
/theta(l+1,m+1,n))/400.0

* Calculate unsaturated hydraulic conductivity ***
 cd = 5.86656e-5 * exp(83.84*wcav)

* Calculate gradient ***************************************
* Positive delh means flux into the cell ***
 delh =((psi(i,j,k-1)+psi(i,j,k))/2.0-(psi(i,j,k)+
/psi(i,j,k+1))/2.0)/30.0 + 1.0

* Handle missing pressure head data ************************
* Positive psi values indicate missing data ***

* If top psi value not ok but lower is, use only lower value
* in calculation ***
  if ((psi(i,j,k-1) .gt. 0 ) .and. (psi(i,j,k) .lt. 0)) then

* If lower ok then can do calculation else can not ***
     if (psi(i,j,k+1) .lt.0 ) then
         delh =(psi(i,j,k)-(psi(i,j,k)+psi(i,j,k+1))/2.0)
/        /15.0 + 1.0
     else
         delh = 0
* note failure ***
         write(*,*)'delh else = ',delh
     endif
 endif

* If top value ok, but not middle value, use only top value
* in calculation ***
 if ((psi(i,j,k) .gt. 0 ) .and. (psi(i,j,k+1) .lt. 0)) then

* If top value ok then can do calculation else can not **
```

```
     if (psi(i,j,k-1) .lt. 0 ) then
          delh =(psi(i,j,k-1)-(psi(i,j,k+1)+psi(i,j,k-1)
/         )/2.0)/30.0 + 1.0
     else
        delh = 0
* note failure ***
         write(*,*)'delh else = ',delh
 endif


* Calculate flux by multiplying cd and delh ***
 flux(cell,depth,5) = cd * delh

* Calculate volume per time (flux times area of face) ***
 temp = flux(cell,depth,5) * 22500.0

* Cumulative volume of water in or out of cell ***
 cellstor(cell,depth) = cellstor(cell,depth) + (temp * days)

* Set flag if unable to determine delh and consequently unable
* to determine change is storage for this cell ***
 if (abs( delh - 0.0) .lt. 1.0e-24) then
     failed = .true.
 endif


C Flux through the lower face ******************************
************************************************************

* Calculate average water content of face *****
 wcav =(theta(l,m,n+1)+theta(l+1,m,n+1)+theta(l,m+1,n+1)+
/theta(l+1,m+1,n+1))/400.0

* Calculate unsaturated hydraulic conductivity ***
 cd = 5.86656e-5 * exp(83.84*wcav)

* Calculate gradient ***************************************
* Sign of delh corrected right before flux calculation so that
* positive value means flux into the cell ***
 delh =((psi(i,j,k)+psi(i,j,k+1))/2.0-(psi(i,j,k+1)+
/psi(i,j,k+2))/2.0)/30.0 + 1.0

* Handle missing pressure head data ***********************
* Positive psi values indicate missing data ***

* If middle psi value ok but top is not, then use only the
* middle value in the calculation ***
 if ((psi(i,j,k+1) .gt. 0 ) .and. (psi(i,j,k) .lt. 0)) then

* If lower value ok can do calculation else can not ***
     if (psi(i,j,k+2) .lt. 0 ) then
          delh =((psi(i,j,k)+psi(i,j,k+2))/2.0-psi(i,j,k+2)
/         )/30.0 + 1.0
     else
```

```
         delh = 0.0
* note failure ***
     endif
 endif

* If lower value not ok but middle is, use only middle ***
 if ((psi(i,j,k+2) .gt. 0) .and. (psi(i,j,k+1) .lt. 0)) then

* If top value ok, then can do calculation else can not ***
     if (psi(i,j,k) .lt.0 ) then
         delh =((psi(i,j,k)+psi(i,j,k+1))/2.0-psi(i,j,k+1))
/        /15.0 + 1.0
     else
         delh = 0.0
     endif
 endif

* Sign corrected so that positve delh means flux into cell ***
 delh = delh * (-1.0)

* Calculate flux by multiplying cd and delh ***
 flux(cell,depth,6) = cd * delh

* Calculate volume per time (flux times area of face) ***
 temp = flux(cell,depth,6) * 22500.0

* Cumulative volume of water in or out of cell ***
 cellstor(cell,depth) = cellstor(cell,depth) + temp * days

* Set flag if unable to determine delh and consequently unable
* to determine change is storage for this cell ***
 if (abs( delh - 0.0) .lt. 1.0e-24) then
     failed = .true.
 endif

************************************************************
* Set cellstor to zero if delh was not possible to calculate
* for any face, can not calculate change in storage for that
* cell
 if (failed) then
     cellstor(cell,depth) = 0.0
 endif
************************************************************

 70   continue

* Do calculations for next cell ***
 cell = cell + 1

 60   continue

 50   continue

************************************************************
```

```
* Write to output file infil name, and days ***
 write (98,27) ' '
 write (98,27) infil
 write (98,28)'days = ', days

* Write output to file named by user ***
 do 80 i = 1, 6

     write(98,22)'CELL',i
     write(98,27)'    WEST       EAST       NORTH       SOUTH
/    UPPPER    LOWER    DELTA S'

     do 90 j = 1,5
         write(98,23)'DEPTH:',j
         write(98,24)(flux(i,j,k),k = 1,6),cellstor(i,j)

 22      format(/,a,1x,i2)
 23      format(a,1x,i2)
 24      format(7(2x,1PE9.2))
 27      format(/,a)
 28      format(a,F6.1,/////)

 90     continue
 write (98,26)
 26     format(//)
 80     continue

 end
```

Appendix E:

Temperature Effect on Tensiometers

The Effect of Temperature on Tensiometers

During the late spring of 1988 it was noted that the readings from tensiometers at the field site, which were monitored with a Tensimeter, were yielding suctions much less than anticipated. Moisture contents are known from neutron probe logging. Laboratory theta-psi curves indicate that soils with such low water contents should have greater soil suctions. Large daily temperature swings seemed to be a possible cause for the unexpected readings. To see if temperature effects could be the cause, two field experiments were carried out.

PROCEDURE: Several nests of tensiometers were monitored. Each nest contains tensiometers at 30 cm intervals from 30 cm below a datum to 240 cm below that datum. Starting at sunrise and continuing until sunset, the Tensimeter readings were recorded along with the height of the solution in the tensiometer so that pressure head values could be calculated. The temperature from an exposed mercury thermometer at the same elevation as the air gap was also recorded.

Two weeks later the experiment was repeated except that the temperature was measured differently. A thermistor was inserted into a tensiometer constructed exactly like the field ones except the porous cup was replaced with a stopper. One of these was placed close to a saltbush and the other was placed in an open location. The temperature was calculated using a Campbell data logger. When the tensiometers were in the shade, the "dummy" tensiometer temperature was recorded. When they were in the open the more exposed "dummy" tensiometer reading was used to record the temperature.

OBSERVATIONS: Several plots of pressure head versus temperature were made. Figures 1 and 2 contain pressure data versus mercury thermometer measurements of temperature made on July 16, 1988. Figures 3 through 8 contain pressure versus thermistor measurements of temperature made on July 30, 1988. From the thermistor data equations relating pressure head and temperature were made (Table 1). The following observations were made:

1) With increasing temperature there is an increase in pressure head (soil suction becomes less).
2) The depth of the tensiometer did not affect the pressure head versus temperature relationship.
3) The size of the air gap above the solution in the tensiometer did not matter.
4) There is less scatter in the data when the exposed thermometer readings are plotted versus pressure head.

DISCUSSION: The increase of pressure with increasing temperature of a gas is believed to be responsible for the behavior observed. This follows from the gas law:

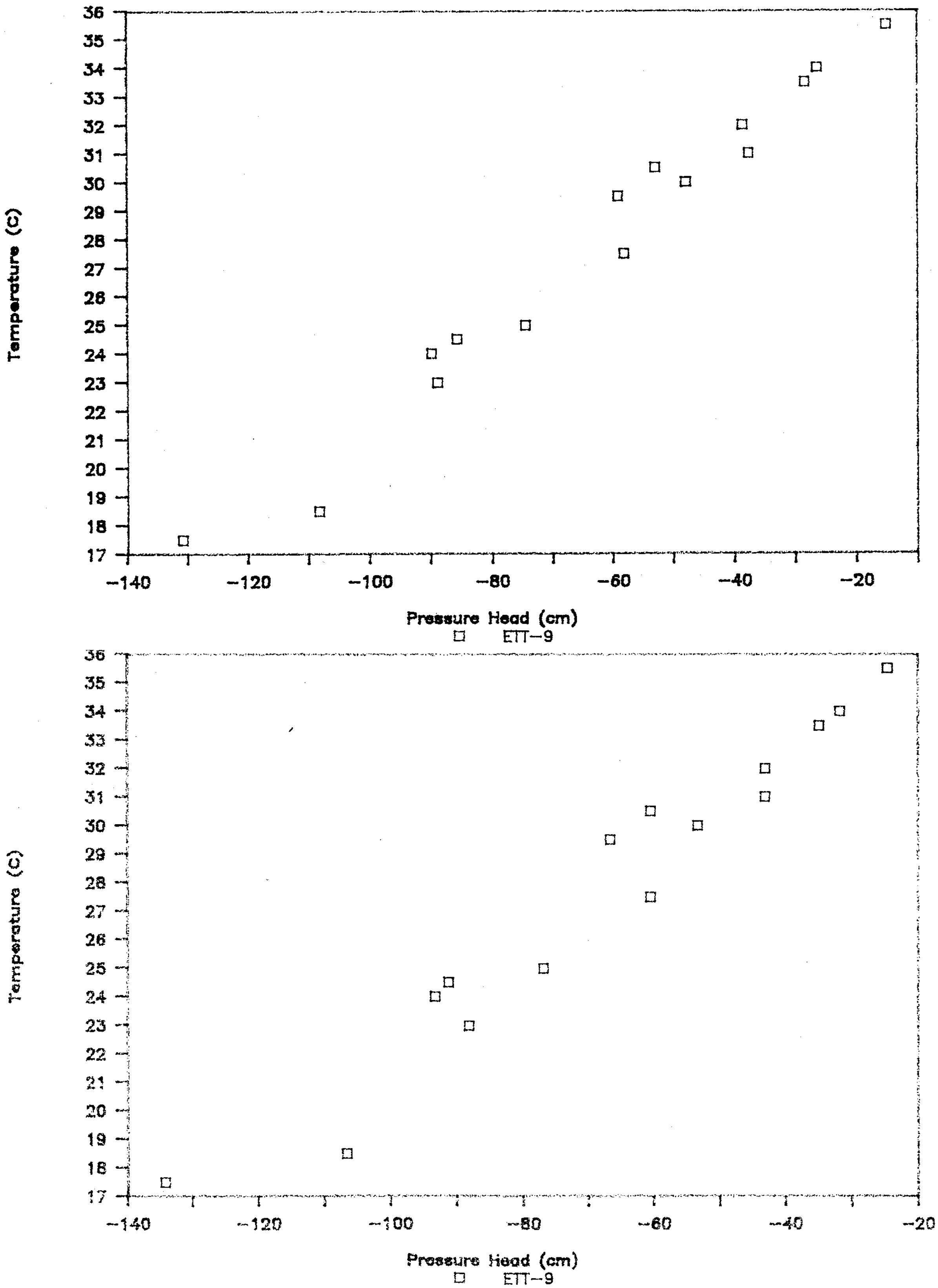
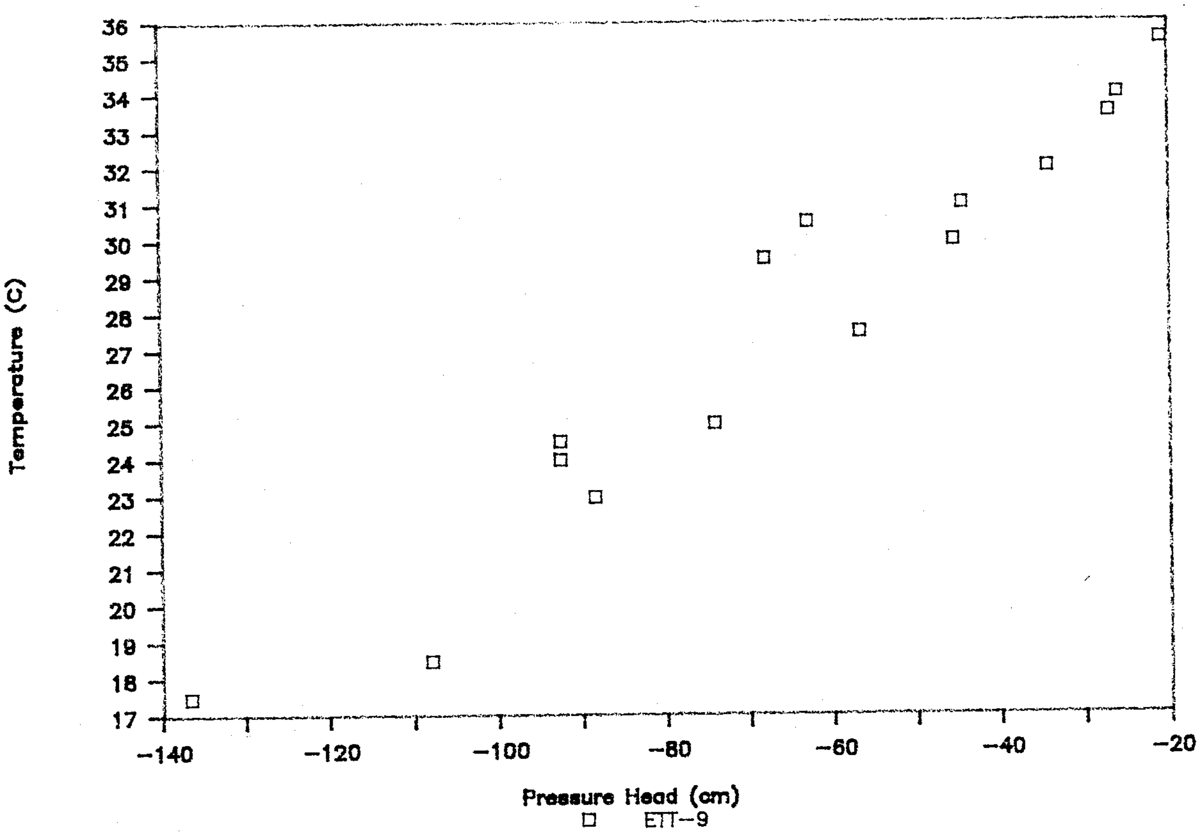


Figure 1. Pressure head versus temperature for ETT9 at 30 cm depth (top) and 60 cm depth (bottom). 7/6/88. Temperature measured with a mercury thermometer.



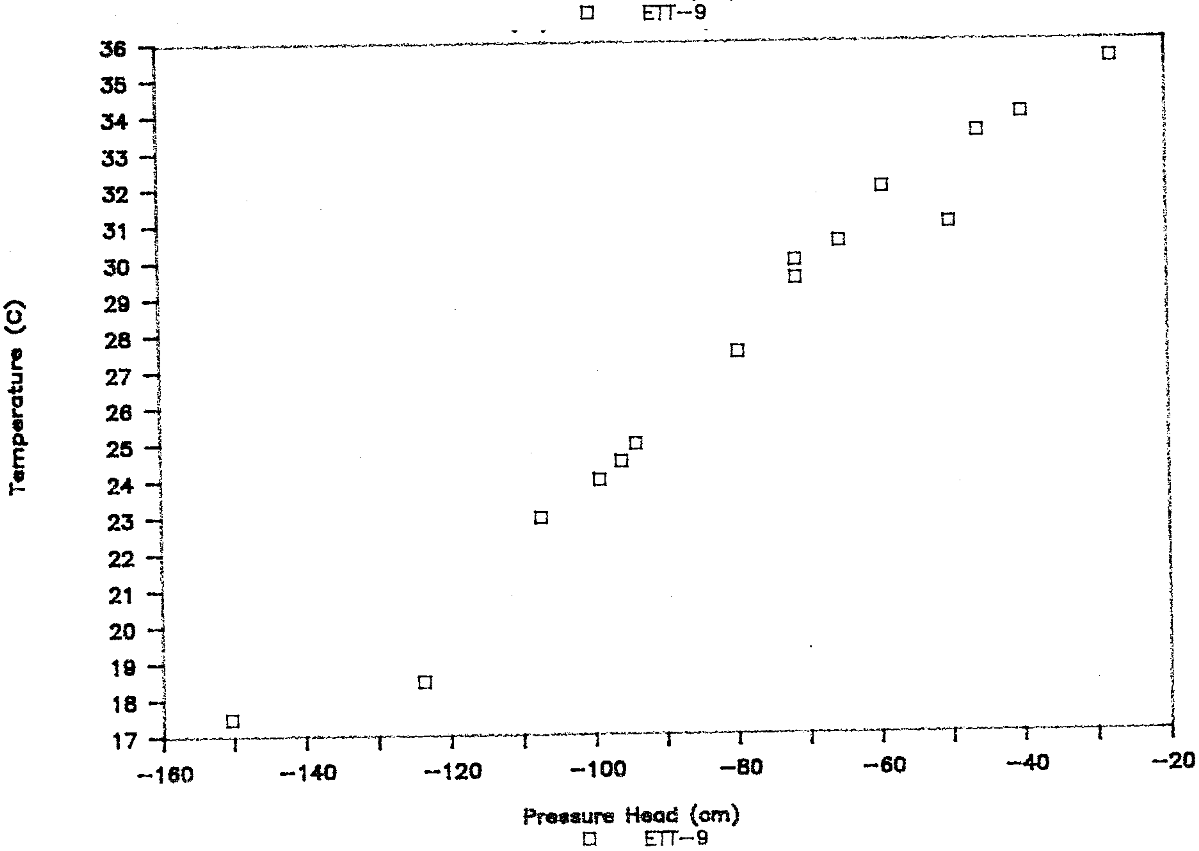


Figure 2. Pressure head versus temperature for ETT9 at 90 cm depth (top) and 120 cm depth (bottom). 7/6/88. Temperature measured with a mercury thermometer.

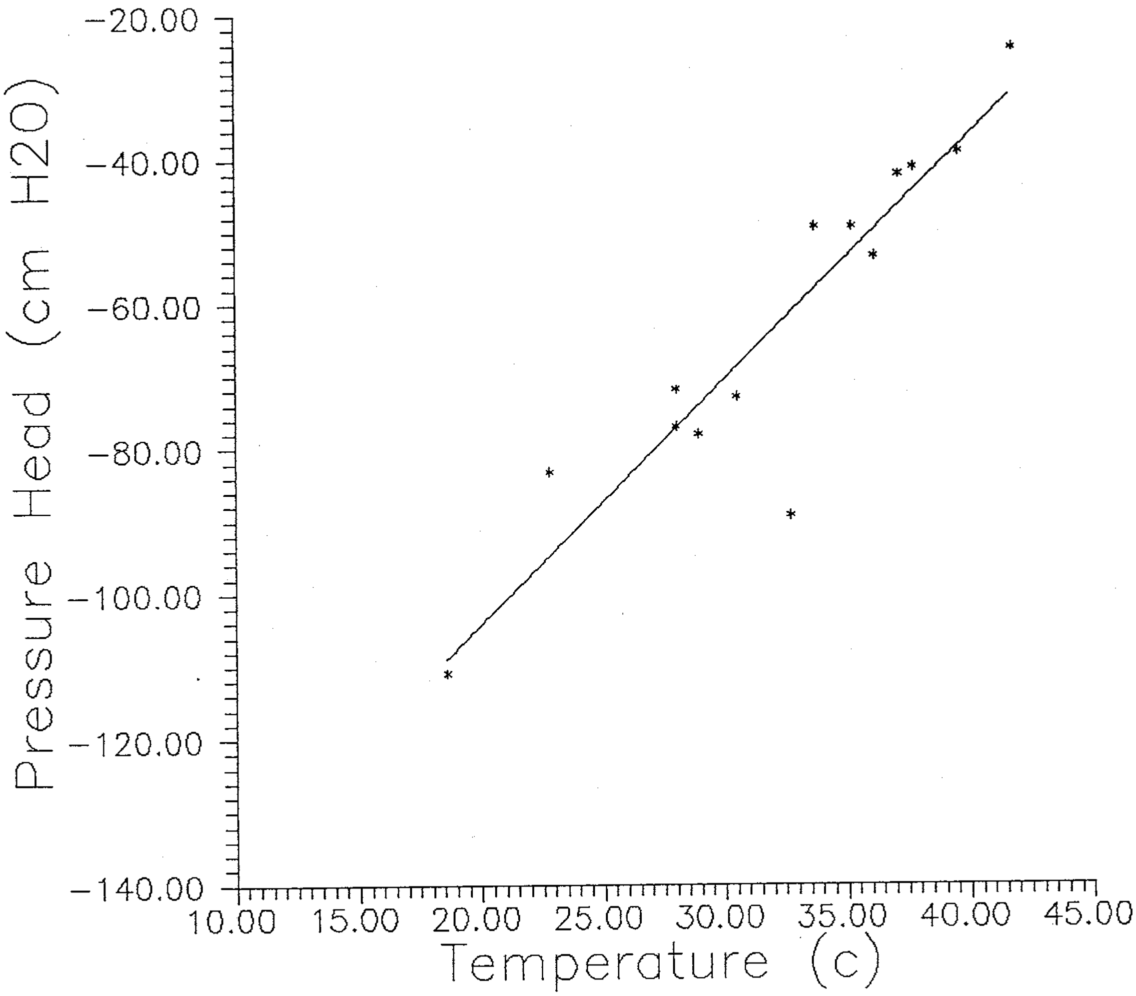


Figure 3. Pressure head versus temperature for ETT8 at 60 cm depth. 7/20/88. Temperature measured with a thermistor.

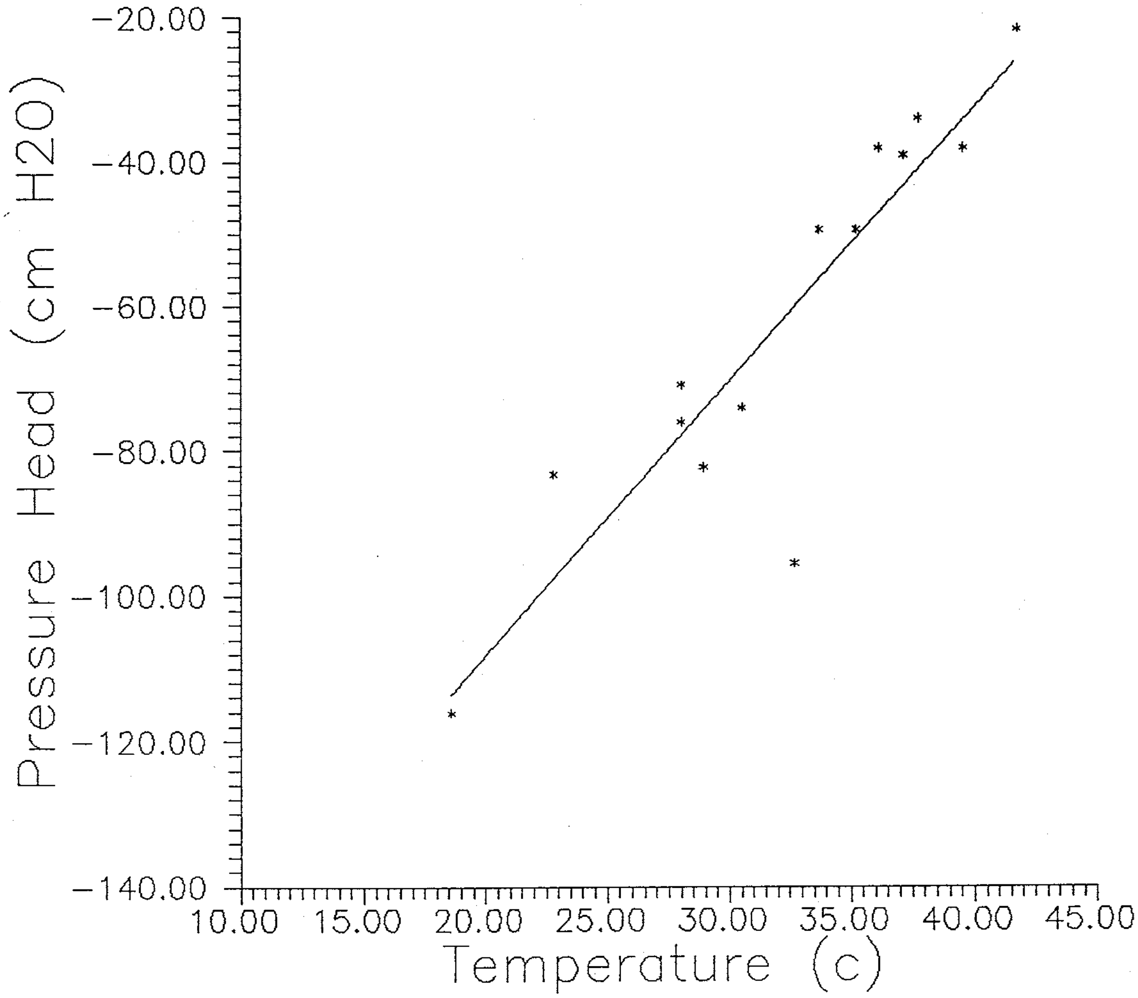


Figure 4. Pressure head versus temperature for ETT8 at 90 cm depth. 7/20/88. Temperature measured with a thermistor.

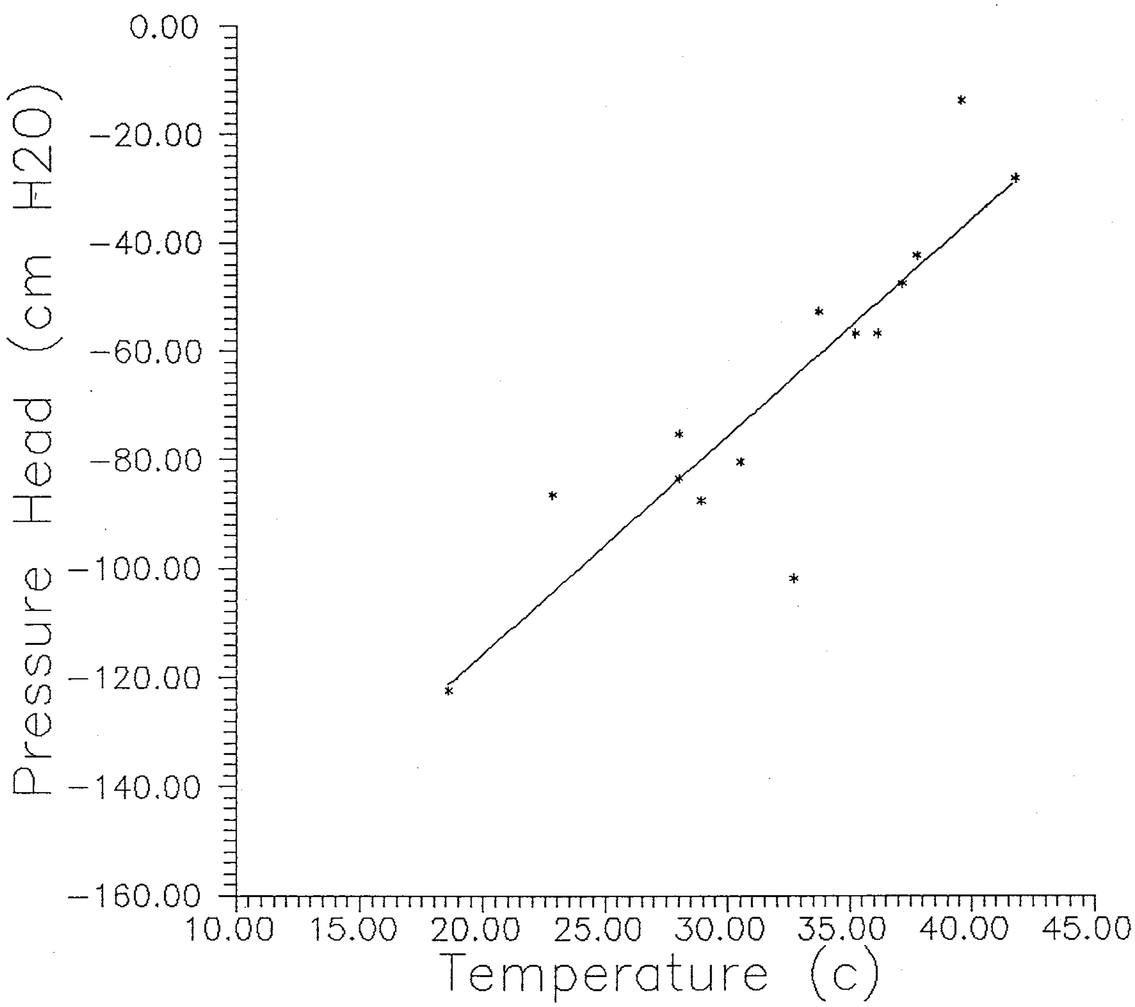


Figure 5. Pressure head versus temperature for ETT8 at 120 cm depth. 7/20/88. Temperature measured with a thermistor.

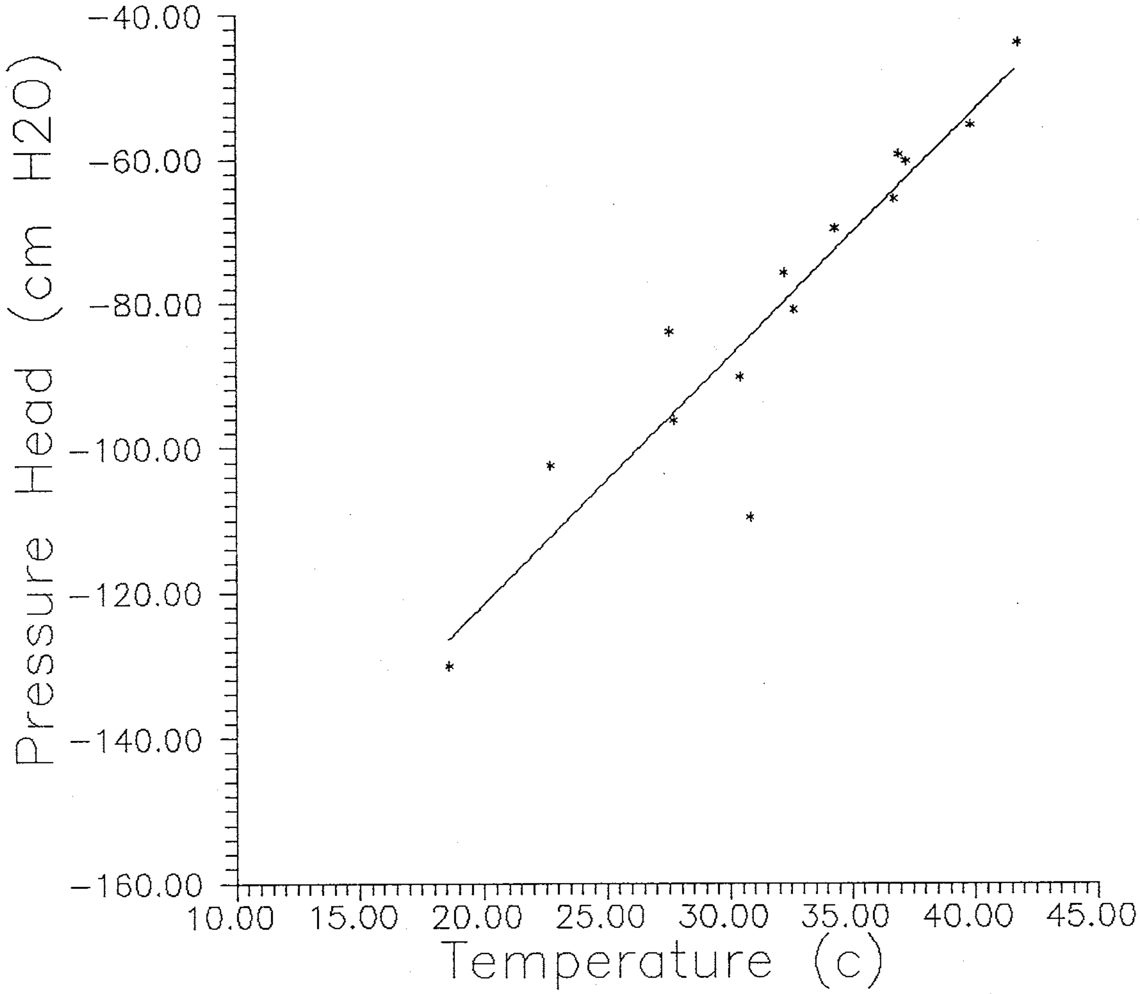


Figure 6. Pressure head versus temperature for ETT9 at 60 cm depth. 7/20/88. Temperature measured with a thermistor.

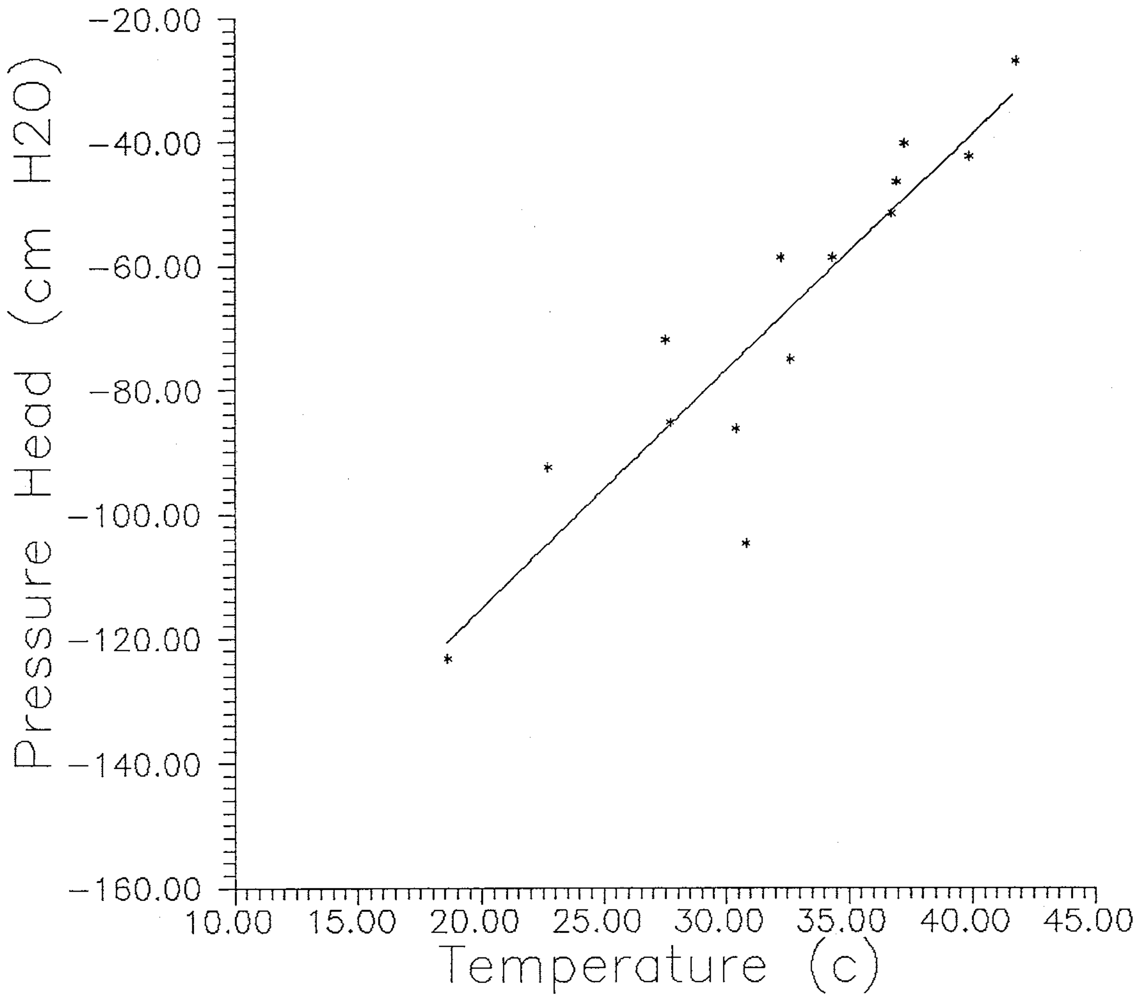


Figure 7. Pressure head versus temperature for ETT9 at 90 cm depth. 7/20/88. Temperature measured with a thermistor.

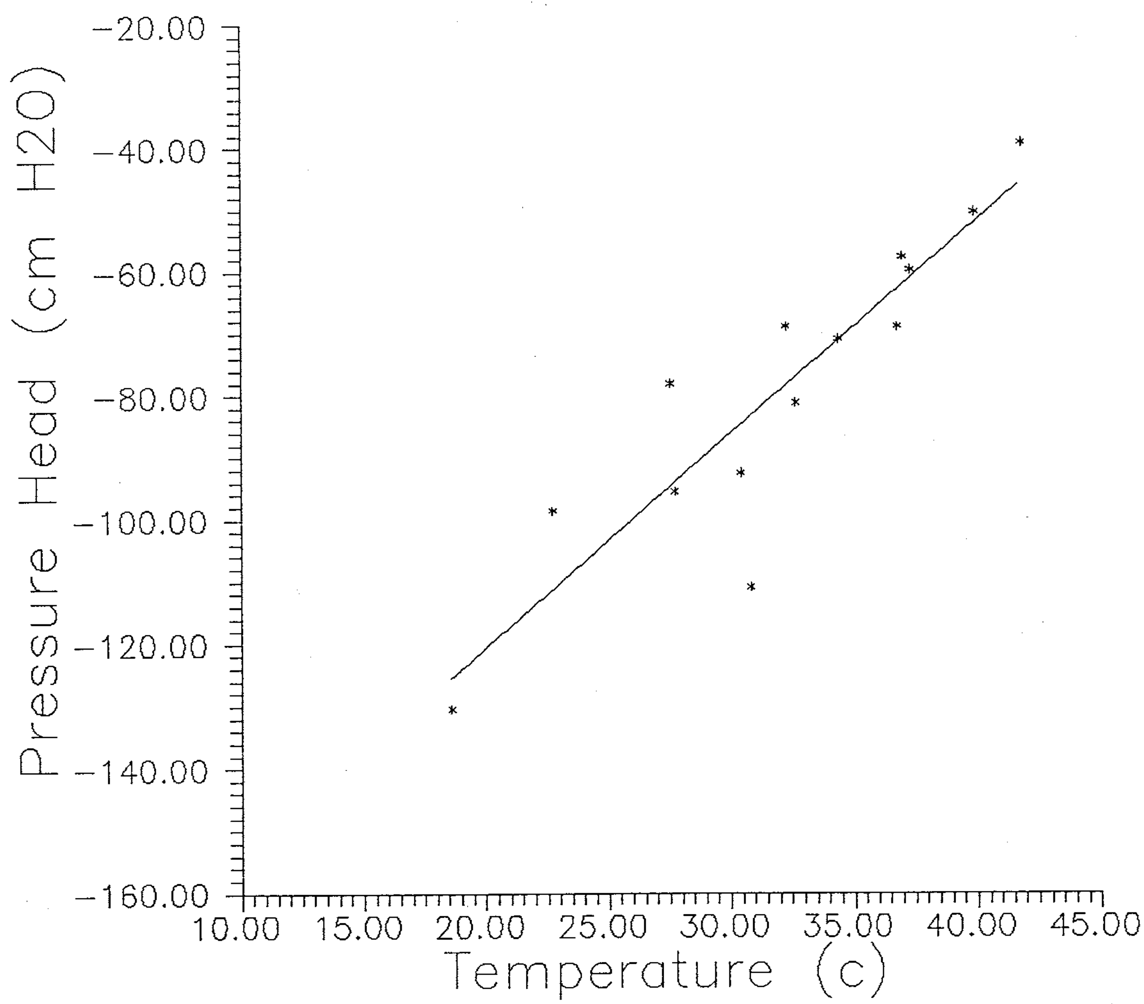


Figure 8. Pressure head versus temperature for ETT9 at 120 cm depth. 7/20/88. Temperature measured with a thermistor.

Table 1. Equations relating pressure head to temperature from July 30, 1988 data using a thermistor to measure temperature.

Tensiometer Nest	Depth (cm)	Equation
ETT8	60	$Y = 3.4X - 171.8$
ETT8	90	$Y = 3.8X - 184.1$
ETT8	120	$Y = 4.0X - 195.9$
ETT9	60	$Y = 3.4X - 190.1$
ETT9	90	$Y = 3.8X - 191.9$
ETT9	120	$Y = 3.5X - 189.9$

Average equation from the experimental data:

$$Y = 3.65X - 187.3$$

where:

X = temp (^{o}C)
Y = pressure (cm H_2O)

or

$$Y = (3.01x10^{-3})X - 9.77x10^{-5}$$

where:

X = temperature (^{o}K)

Y = pressure (atm)

$$\frac{P_1 \; V_1}{n \; R \; T_1} = \frac{P_2 \; V_2}{n \; R \; T_2} \qquad (1)$$

where:

P = pressure of the gas phase

V = volume of the gas phase

n = number of moles in the gas phase

R = gas constant

T = temperature degree K

The subscripts 1 and 2 are time 1 and time 2, respectively. The Tensimeter system uses a pressure transducer to measure the pressure in an air gap above the surface of the fluid in the tensiometer. Actually the air gap contains a mixture of air, water vapor and ethylene glycol whose combined pressure is measured by the pressure transducer.

$$P_{(\text{air gap})} = P_{(\text{column weight down})} + P_{(\text{soil})} + P_{(\text{vapor})} \qquad (2)$$

When the temperature changes, the measured pressure in the air gap changes according to a form of Equation 1. If the top of the tensiometer is considered a closed container, which is reasonable over short time periods because the porous cup at the bottom of the tensiometer does not have time to respond, the volume of gas above the fluid does not have time to change and the amount of gas in the vapor phase changes very little. Field observation indicate no observable change in tensiometer water levels in a one day period. However, measuring methods in the field are not very accurate. Equation 1. reduces to:

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \qquad (3)$$

This equation predicts a linear relationship between pressure and temperature. When the experimental data is plotted, the relationship is linear and very close to that predicted by Equation 3. Figure 9 shows the equation relating temperature to pressure head data derived from field observations and the relationship between temperature and pressure predicted by the ideal gas law. Equation 3 appears to explain the observations made during the course of the two experiments. With increasing temperature the pressure inside the tensiometer increases. The depth of the cup does not matter because the change in pressure is caused by the expansion of the gases in the air gap. The size of the air gap does not matter because its volume does not change. Tensiometers with a large headspace do not have greater increases in pressure than ones with only small headspace. The exposed thermometer yields data with less scatter than the thermistors inside of the dummy tensiometers. The thermistors are sealed in a cable to prevent moisture from damaging them. This reduces their response time and may account for the greater scatter in the data.

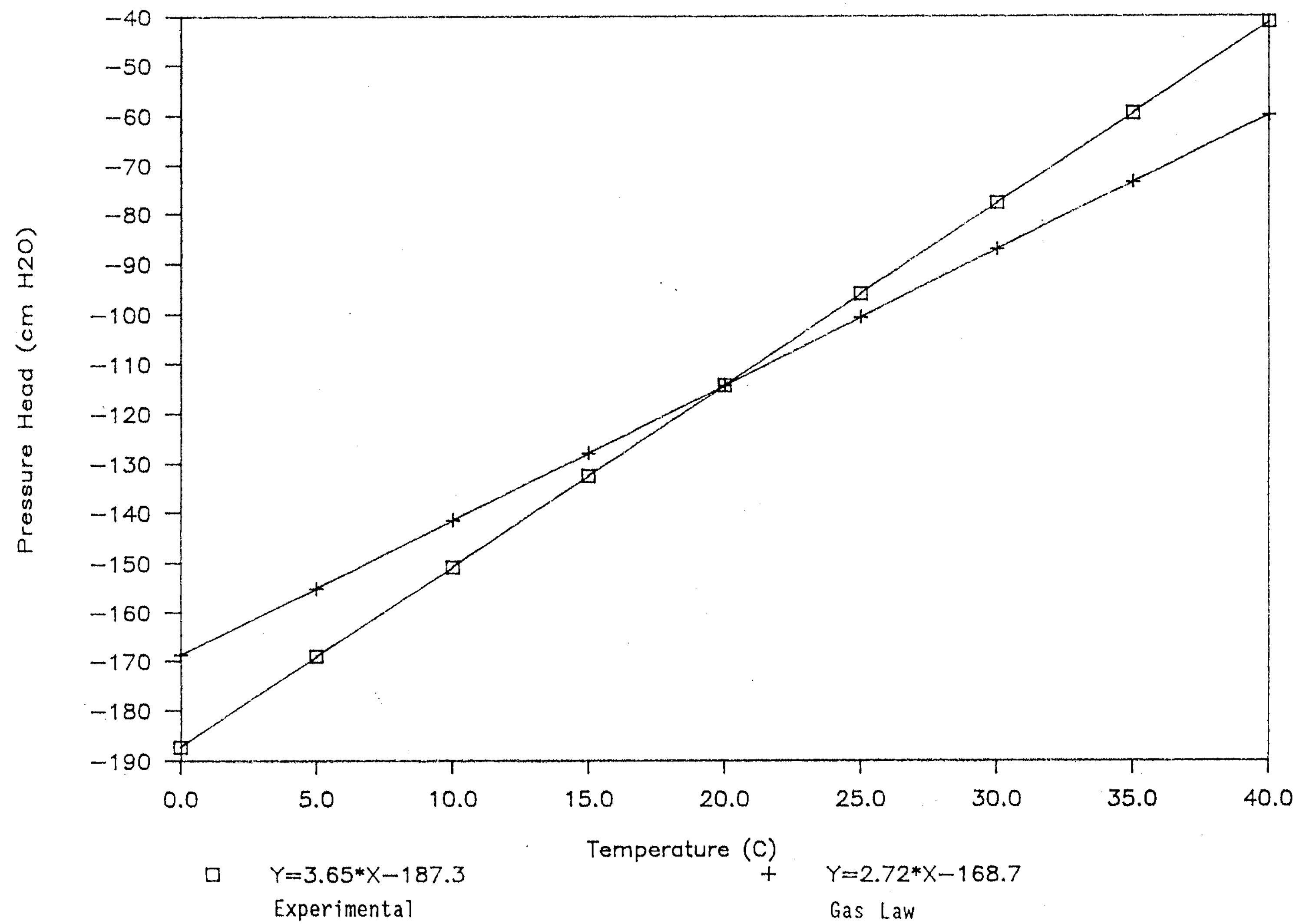


Figure 9. Theoretical (ideal gas law) and experimental relationship between pressure head and temperature.

CONCLUSIONS: The field data closely matches the ideal gas law relating pressure and temperature. The linear plots of the experimental data suggest that the tensiometer cup can not respond to the change of pressure in the tensiometer fast enough in a twelve hour period to cause a nonlinear response in pressure. Possible reasons are that the cup's conductivity is low and fluid can only leave the system very slowly. Also the dry soils in the field have low conductivities which prevent fluid from leaving the tensiometer. Given a long enough time at a constant temperature, the pressure in the tensiometer should reach an equilibrium with that in the soil. However, temperature in the field is seldom steady for any length of time. The difficulty is deciding what the actual pressure in the field is despite the temperature variations. Since the relationship between pressure and temperature is constant, a tensiometer reading at a known temperature may be converted to an equivalent reading at another temperature. This assumes that the tensiometer reaches equilibrium very slowly with the soil, a good approximation given the field data.

This conclusion implies that tensiometer readings may be temperature corrected. For a one day period this is reasonable considering the observed relationship between temperature and pressure. Since tensiometer readings are affected by temperature, comparison between readings taken at different times at different temperatures may be difficult. The results from the two field experiments suggest a method to normalize pressure head readings to a standard temperature. The method was applied to field data and failed.

Attempted Method to Temperature Correct Pressure Head Data

Given an equation for pressure versus temperature (experimental or ideal gas law):

$$Y = (m)X + b \tag{4}$$

where:

Y = pressure

m = slope of line

X = temperature

Consider two tensiometers which are measuring two different soil suctions. For tensiometer one, the pressure-temperature relationship may be written as:

$$Y_1 = (m)X + b_1 \tag{5}$$

and for tensiometer two:

$$Y_2 = (m)X + b_2 \tag{6}$$

Only the intercept of the equations are different. If the temperature is known when the pressure head value was measured, and the slope is constant, the intercept may be calculated. This intercept and slope define a new equation which relates temperature to pressure head at that particular soil-suction. With the equation relating pressure head to temperature, pressure head values may be corrected to an equivalent value at a given temperature.

This method was applied to five different monitoring periods and the results are shown in Figures 10 through 14. Readings were corrected to 20 ^{o}C and the experimentally derived equation shown in Table 1 was used in the calculations. The method did not prove satisfactory. Corrected pressure head values were higher than expected. This occurred particularly during monitoring periods when the temperature was low. See Figure 13 for an example from the January 11, 1989 data. Most of the corrected pressure head values for this time period became positive.

Field data does not suggest any definite reasons for the failure of the method. The previously accepted explanation for the linear relationship observed between pressure and temperature was that the pressure inside of the tensiometer changed faster than equilibrium could be established with the soil water outside of the tensiometer. This may not be true. Other possible explanations for the observed linear behavior exist which may not require the assumption that the headspace volume is constant. The liquid inside of a tensiometer may change volume significantly. The diameter of the tensiometer barrel may change with the temperature, changing the volume occupied by the vapor phase. Finally, the vapor space at the top of the tensiometer may have changed by fluid leaving or

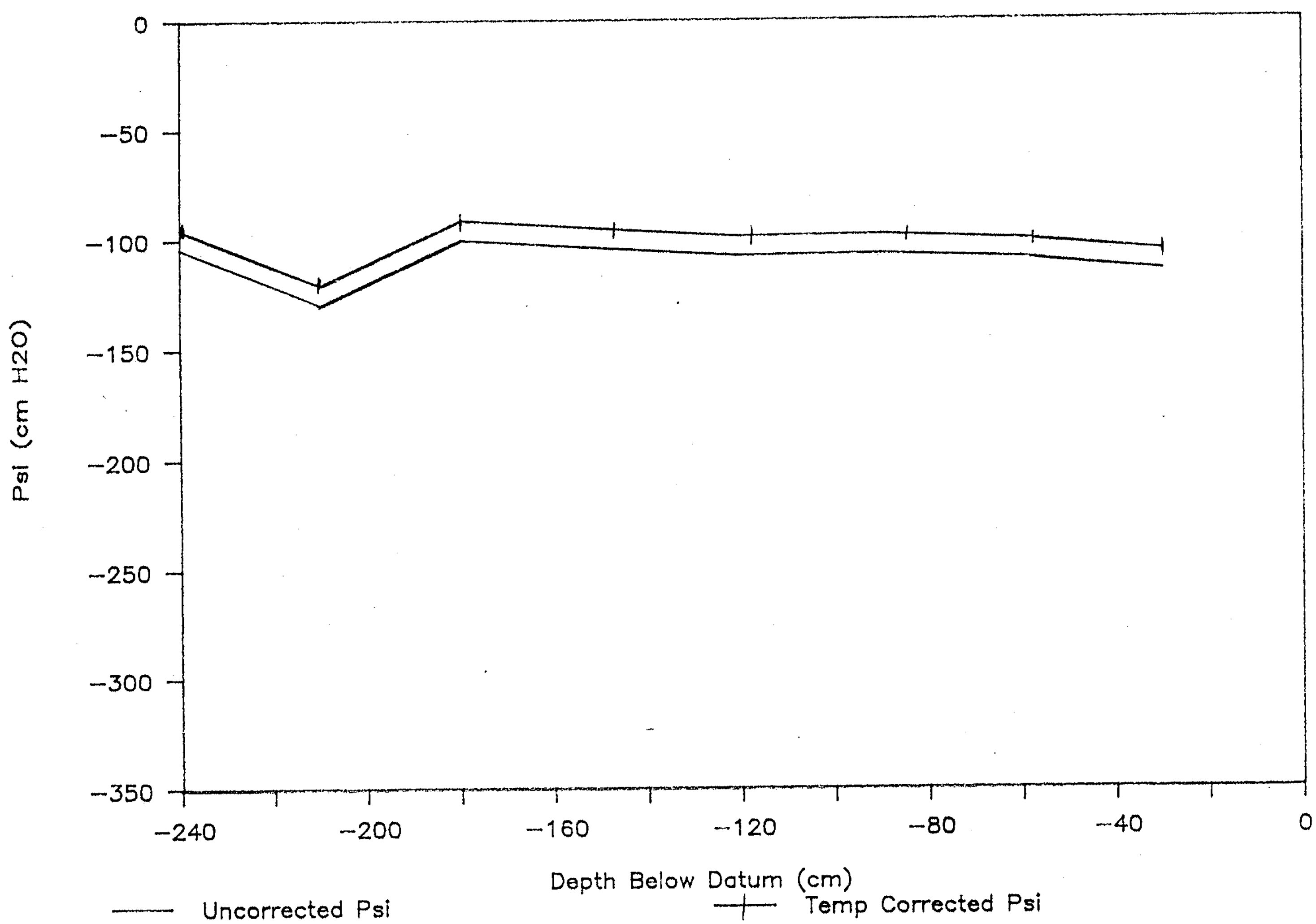


Figure 10. Pressure head with depth and pressure head with depth corrected to 20°C for ETT3, 7/6/88. Actual temperature was 17.5°C.

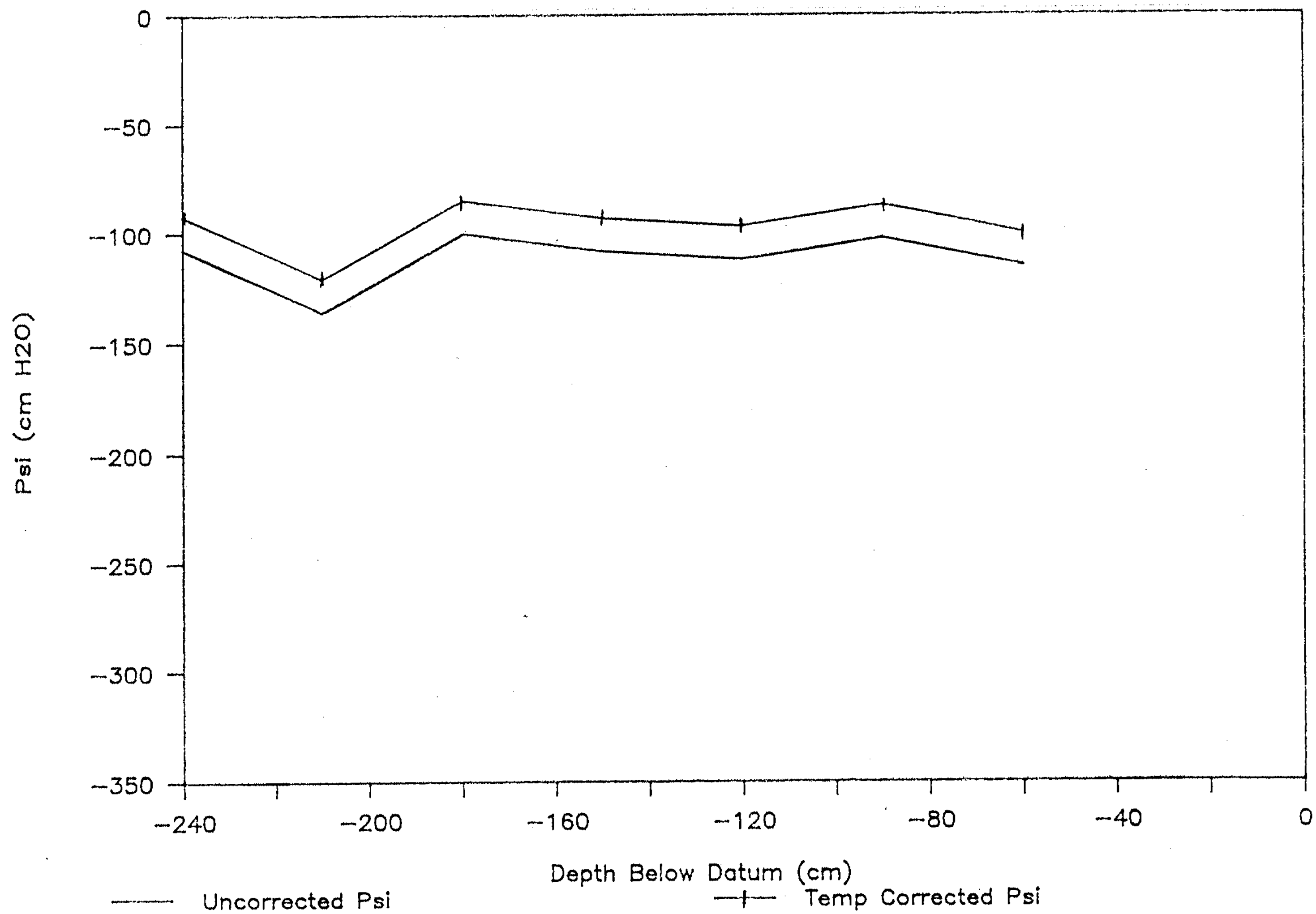


Figure 11. Pressure head with depth and pressure head with depth corrected to 20°C for ETT3, 9/16/88. Actual temperature was 16.0°C.

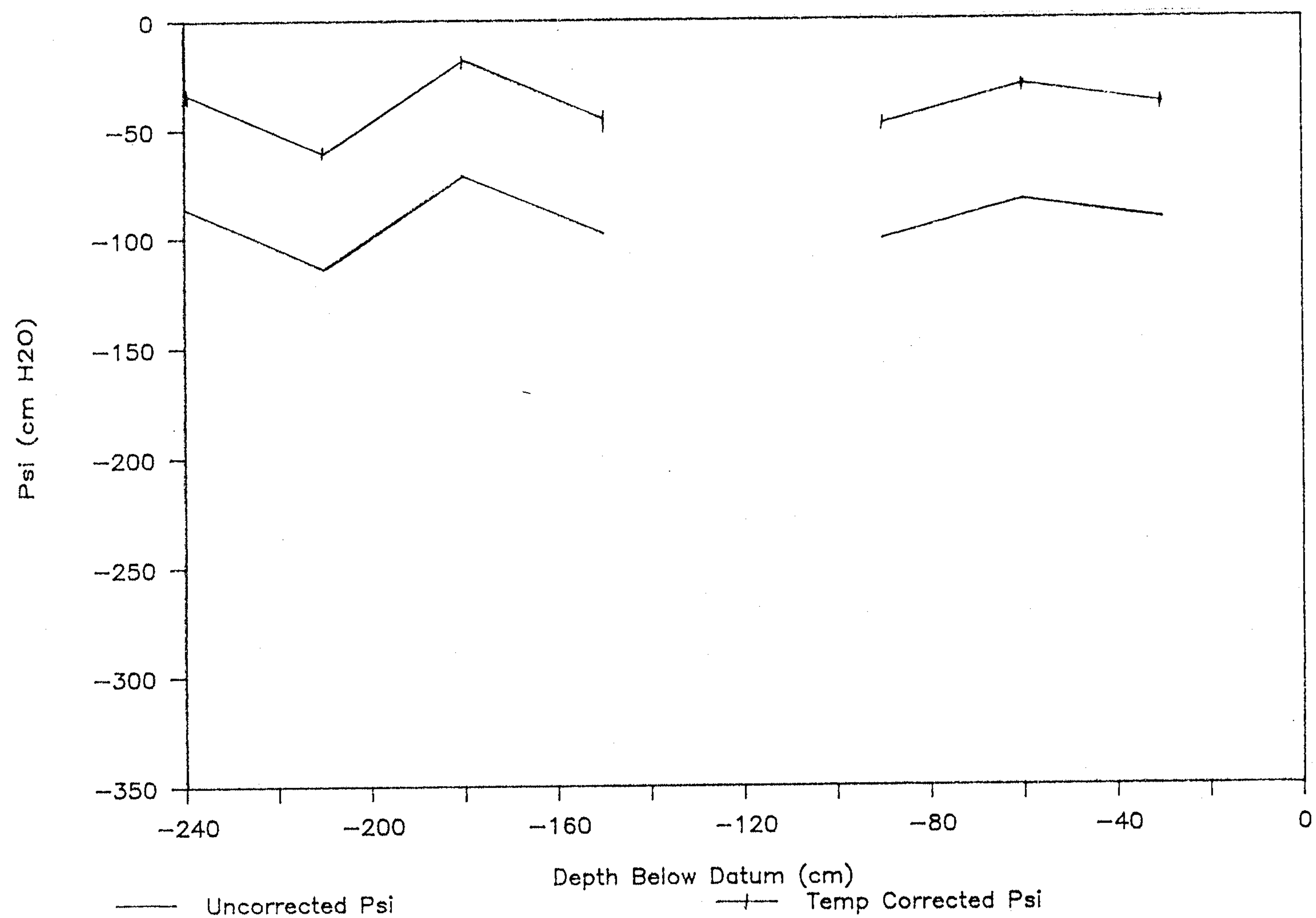


Figure 12. Pressure head with depth and pressure head with depth corrected to 20°C for ETT3, 11/11/88. Actual temperature was 5.5°C.

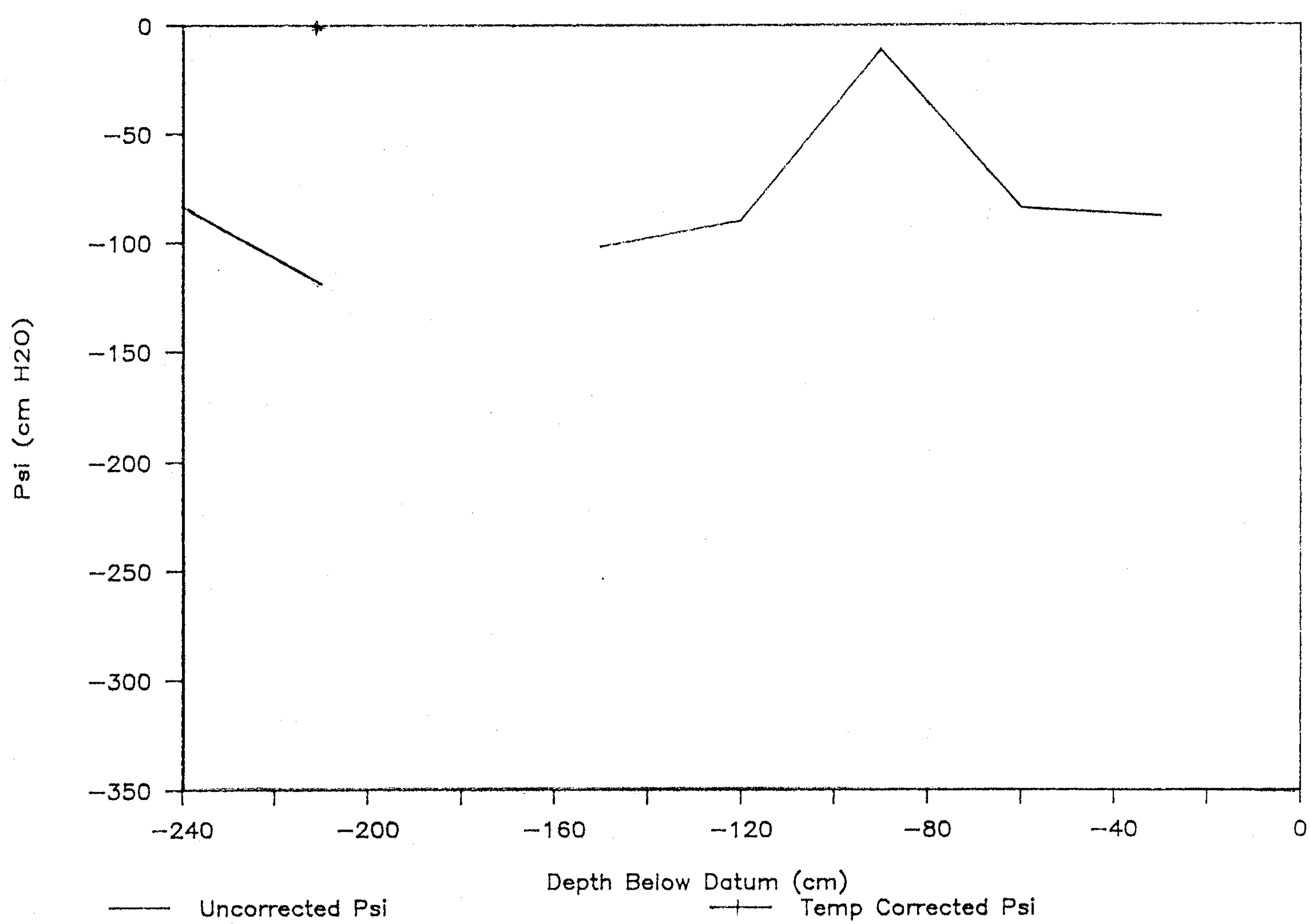


Figure 13. Pressure head with depth and pressure head with depth corrected to 20°C for ETT3, 1/11/89. Actual temperature was -12.0°C.

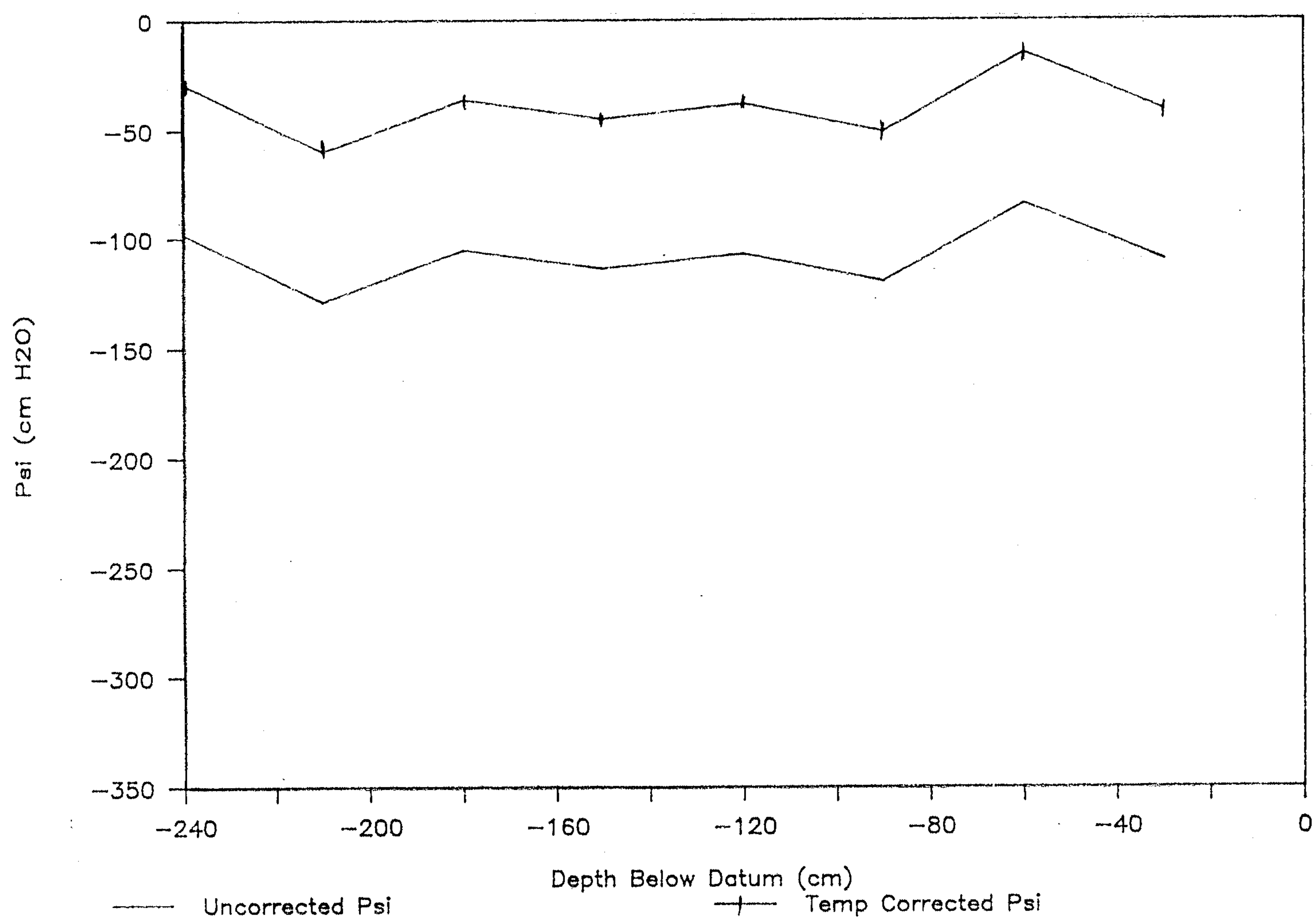


Figure 14. Pressure head with depth and pressure head with depth corrected to 20°C for ETT3, 3/2/89. Actual temperature was 1.0°C.

entering the tensiometer cup even though it is difficult to observe in the field.

One encouraging observation from the two field experiments was that all tensiometers seemed to be affected the same as temperature changed. This implies gradients from tensiometric data collected at the same time may be unaffected by temperature. Actual soil suction values measured with a portable pressure transducer are likely to be affected by temperature.

Appendix F:

Pressure Head Data

TENSIOMETER DATA

		7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
ETT-1	: TIME	630.0	725.0	700.0	700.0	700.0	640.0
NUMBER	:						
	:						
1.0	: READ	188.0	189.0	184.0	198.0	192.0	119.0
	: H2O(CM)	61.5	61.0	61.0	61.0	61.0	61.5
2.0	: READ	207.0	192.0	172.0	183.0	169.0	198.0
	: H2O(CM)	88.0	88.0	87.5	87.5	87.5	87.0
3.0	: READ	250.0	246.0	224.0	232.0	214.0	244.0
	: H2O(CM)	116.0	116.0	116.0	116.0	116.0	116.0
4.0	: READ	181.0	123.0				228.0
	: H2O(CM)	142.0					147.5
5.0	: READ	321.0	320.0	302.0	314.0	287.0	309.0
	: H2O(CM)	174.0	173.5	173.0	173.0	173.0	173.0
6.0	: READ	335.0	332.0	315.0	322.0	307.0	324.0
	: H2O(CM)	201.5	201.0	200.0	199.5	199.5	199.5
7.0	: READ	363.0	343.0	313.0	352.0	340.0	358.0
	: H2O(CM)	234.5	231.0		237.0	236.5	236.5
8.0	: READ	296.0	394.0	373.0	382.0	364.0	385.0
	: H2O(CM)	264.0	263.5	262.5	262.0	262.0	261.5

TENSIOMETER CALCULATIONS

PSI
ETT-1

NO.	DPTH BELOW DATUM(CM)	PSI (CM) 7/6/88 630.0	PSI (CM) 7/20/88 725.0	PSI (CM) 8/6/88 700.0	PSI (CM) 8/19/88 700.0	PSI (CM) 9/2/88 700.0	PSI (CM) 9/16/88 640.0
1	30.00	-126.7	-128.2	-123.1	-137.4	-131.3	-55.9
2	60.00	-117.7	-102.3	-82.4	-93.6	-79.3	-109.5
3	90.00	-131.7	-127.6	-105.1	-113.3	-94.8	-125.6
4	120.00	-33.1					-75.4
5	150.00	-142.3	-141.8	-123.9	-136.2	-108.5	-131.0
6	180.00	-127.1	-124.6	-108.2	-115.9	-100.6	-118.0
7	210.00	-120.4	-103.7		-106.4	-94.7	-113.1
8	240.00	-20.1	-121.1	-100.6	-110.4	-91.9	-114.0

TOTAL HEAD
ETT-1

NO.	DPTH BELOW DATUM(CM)	THEAD (CM) 7/6/88 630.0	THEAD (CM) 7/20/88 725.0	THEAD (CM) 8/6/88 700.0	THEAD (CM) 8/19/88 700.0	THEAD (CM) 9/2/88 700.0	THEAD (CM) 9/16/88 640.0
1	30.00	-156.7	-158.2	-153.1	-167.4	-161.3	-85.9
2	60.00	-177.7	-162.3	-142.4	-153.6	-139.3	-169.5
3	90.00	-221.7	-217.6	-195.1	-203.3	-184.8	-215.6
4	120.00	-153.1					-195.4
5	150.00	-292.3	-291.8	-273.9	-286.2	-258.5	-281.0
6	180.00	-307.1	-304.6	-288.2	-295.9	-280.6	-298.0
7	210.00	-330.4	-313.7		-316.4	-304.7	-323.1
8	240.00	-260.1	-361.1	-340.6	-350.4	-331.9	-354.0

TENSIOMETER DATA

ETT-1	: DATE / : TIME	9/30/88 700.0	10/15/88 700.0	10/29/88 700.0	11/11/88 700.0	12/9/88 744.0	1/18/89 730.0
NUMBER	:						
	:						
1.0	: READ	140.0	146.0	166.0	159.0	186.0	194.0
	: H2O(CM)	61.5	61.5	61.0	61.5	61.5	61.5
2.0	: READ	206.0	176.0	203.0	188.0	206.0	203.0
	: H2O(CM)	87.0	87.0	87.0	87.0	87.5	87.5
3.0	: READ	257.0	214.0	255.0	234.0	237.0	239.0
	: H2O(CM)	115.5	116.0	115.5	115.5	113.0	113.0
4.0	: READ	270.0	240.0	262.0	244.0	246.0	262.0
	: H2O(CM)	146.5	146.5	145.5	145.5	146.5	146.0
5.0	: READ	313.0	283.0	313.0	297.0	300.0	302.0
	: H2O(CM)	172.5	171.0	170.0	170.0	171.0	171.0
6.0	: READ	328.0	300.0	324.0	307.0	311.0	318.0
	: H2O(CM)	199.0	199.0	199.0	199.0	200.0	200.0
7.0	: READ	360.0	320.0	335.0	319.0	344.0	351.0
	: H2O(CM)	236.0	232.0	228.0		243.0	243.0
8.0	: READ	381.0	358.0	385.0	365.0	371.0	374.0
	: H2O(CM)	261.0	261.0	260.0	260.0	261.5	261.0

TENSIOMETER CALCULATIONS

: DATE 9/30/88 10/15/88 10/29/88 11/11/88 12/9/88 1/18/89

PSI : TIME 700.0 700.0 700.0 700.0 747.0 730.0

ETT-1

NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-77.5	-83.6	-104.6	-96.9	-124.6	-132.8
2	60.00	-117.7	-87.0	-114.7	-99.3	-117.2	-114.1
3	90.00	-139.4	-94.8	-137.4	-115.9	-121.6	-123.7
4	120.00	-119.5	-88.8	-112.4	-93.9	-94.9	-111.8
5	150.00	-135.7	-106.5	-138.4	-122.0	-124.0	-126.0
6	180.00	-122.6	-93.9	-118.5	-101.1	-104.1	-111.3
7	210.00	-115.7	-79.0	-98.7		-91.8	-99.0
8	240.00	-110.4	-86.8	-115.6	-95.1	-99.6	-103.2

TOTAL HEAD : DATE 9/30/88 10/15/88 10/29/88 11/11/88 12/9/88 1/18/89

ETT-1 : TIME 700.0 700.0 700.0 700.0 747.0 730.0

NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-107.5	-113.6	-134.6	-126.9	-154.6	-162.8
2	60.00	-177.7	-147.0	-174.7	-159.3	-177.2	-174.1
3	90.00	-229.4	-184.8	-227.4	-205.9	-211.6	-213.7
4	120.00	-239.5	-208.8	-232.4	-213.9	-214.9	-231.8
5	150.00	-285.7	-256.5	-288.4	-272.0	-274.0	-276.0
6	180.00	-302.6	-273.9	-298.5	-281.1	-284.1	-291.3
7	210.00	-325.7	-289.0	-308.7		-301.8	-309.0
8	240.00	-350.4	-326.8	-355.6	-335.1	-339.6	-343.2

TENSIOMETER DATA

	: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
ETT-1	: TIME	730.0	650.0	700.0	714.0	620.0	634.0
NUMBER	:						
	:						
1.0	: READ	175.0	179.0	182.0	160.0	166.0	202.0
	: H20(CM)	61.5	61.0	60.5	60.5	60.5	60.0
2.0	: READ	157.0	174.0	200.0	187.0	195.0	207.0
	: H20(CM)		91.0	90.5	90.0	90.0	89.5
3.0	: READ	206.0	242.0	262.0	253.0	255.0	266.0
	: H20(CM)		124.0	123.0	123.0	123.0	122.0
4.0	: READ	240.0	247.0	268.0	261.0	261.0	280.0
	: H20(CM)	145.5	144.0	143.0	142.0	149.5	145.0
5.0	: READ	268.0	292.0	309.0	297.0	297.0	315.0
	: H20(CM)	166.0	180.0	178.0	177.5	174.0	171.5
6.0	: READ	303.0	301.0	333.0	324.0	329.0	351.0
	: H20(CM)	199.0	202.0	200.5	199.5	206.5	204.5
7.0	: READ	341.0	350.0	365.0	351.0	357.0	371.0
	: H20(CM)	243.0	238.5	237.5	237.0	236.0	234.5
8.0	: READ	358.0	374.0	391.0	380.0	382.0	399.0
	: H20(CM)	260.0	270.5	269.0	268.0	266.5	264.0

TENSIOMETER CALCULATIONS

	: DATE	2/10/89	3/24/69	4/21/89	5/9/89	6/7/89	7/20/89
PSI	: TIME	730.0	650.0	700.0	714.0	620.0	634.0
ETT-1							
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-113.3	-118.0	-121.6	-99.0	-105.2	-142.6
2	60.00		-80.7	-107.8	-95.1	-103.3	-116.1
3	90.00		-114.9	-136.5	-127.3	-129.3	-141.7
4	120.00	-89.8	-98.6	-121.2	-115.1	-107.1	-131.4
5	150.00	-96.5	-106.1	-125.7	-113.9	-117.7	-138.8
6	180.00	-97.0	-91.7	-126.1	-118.0	-115.6	-140.3
7	210.00	-88.7	-102.8	-119.2	-105.4	-112.6	-128.6
8	240.00	-87.9	-93.1	-112.1	-101.9	-105.5	-125.7

TOTAL HEAD	: DATE	2/10/89	3/24/69	4/21/89	5/9/89	6/7/89	7/20/89
ETT-1	: TIME	730.0	650.0	700.0	714.0	714.0	634.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-143.3	-148.0	-151.6	-129.0	-135.2	-172.6
2	60.00		-140.7	-167.8	-155.1	-163.3	-176.1
3	90.00		-204.9	-226.5	-217.3	-219.3	-231.7
4	120.00	-209.8	-218.6	-241.2	-235.1	-227.1	-251.4
5	150.00	-246.5	-256.1	-275.7	-263.9	-267.7	-288.8
6	180.00	-277.0	-271.7	-306.1	-298.0	-295.6	-320.3
7	210.00	-298.7	-312.8	-329.2	-315.4	-322.6	-338.6
8	240.00	-327.9	-333.1	-352.1	-341.9	-345.5	-365.7

ETT-2	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
	: TIME	630.0	725.0	700.0	700.0	700.0	640.0
NUMBER	:						
	:						
1.0	: READ	178.0	167.0	121.0			114.0
	: H20(CM)	60.5	59.5	53.0			60.5
2.0	: READ	204.0	202.0	171.0	189.0	172.0	195.0
	: H20(CM)	87.0	86.5	85.5	85.0	85.0	85.0
3.0	: READ	254.0	251.0	218.0	223.0	211.0	236.0
	: H20(CM)	122.5	122.5	122.0	121.5	121.5	121.5
4.0	: READ	277.0	272.0	227.0	249.0	233.0	257.0
	: H20(CM)	148.0	147.5	142.5	141.0	140.0	139.5
5.0	: READ	306.0	305.0	285.0	299.0	273.0	298.0
	: H20(CM)	175.5	175.0	171.0	170.5	171.0	171.0
6.0	: READ	337.0	336.0	313.0	318.0	296.0	318.0
	: H20(CM)	207.5	207.0	206.0	205.0	205.0	204.5
7.0	: READ	375.0	367.0	346.0	369.0	332.0	346.0
	: H20(CM)	233.0	232.0		236.5	231.0	226.0
8.0	: READ	367.0	316.0				356.0
	: H20(CM)	258.0					268.0

TENSIOMETER CALCULATIONS

PSI ETT-2	: DATE : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 700.0	8/19/88 700.0	9/2/88 700.0	9/16/88 640.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-117.5	-107.3	-67.1			-51.9
2	60.00	-115.7	-114.2	-83.5	-102.5	-85.0	-108.6
3	90.00	-128.9	-125.8	-92.5	-98.2	-85.9	-111.5
4	120.00	-125.1	-120.5	-79.7	-103.9	-88.6	-113.7
5	150.00	-125.3	-124.8	-108.6	-123.5	-96.3	-121.9
6	180.00	-122.7	-122.2	-99.7	-105.9	-83.4	-106.5
7	210.00	-134.3	-127.2		-124.4	-92.4	-112.1
8	240.00	-99.3					-77.3

TOTAL HEAD ETT-2	: DATE : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 700.0	8/19/88 700.0	9/2/88 700.0	9/16/88 640.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-147.5	-137.3	-97.1			-81.9
2	60.00	-175.7	-174.2	-143.5	-162.5	-145.0	-168.6
3	90.00	-218.9	-215.8	-182.5	-188.2	-175.9	-201.5
4	120.00	-245.1	-240.5	-199.7	-223.9	-208.6	-233.7
5	150.00	-275.3	-274.8	-258.6	-273.5	-246.3	-271.9
6	180.00	-302.7	-302.2	-279.7	-285.9	-263.4	-286.5
7	210.00	-344.3	-337.2		-334.4	-302.4	-322.1
8	240.00	-339.3					-317.3

		9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
	: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-2	: TIME	700.0	700.0	700.0	700.0	747.0	730.0
NUMBER	:						
	:						
1.0	: READ	143.0	149.0	165.0	149.0	163.0	172.0
	: H20(CM)	60.0	60.0	60.0	60.0	61.0	61.0
2.0	: READ	193.0	168.0	190.0	168.0	199.0	188.0
	: H20(CM)	85.0	84.5	83.0	82.0	81.5	80.5
3.0	: READ	243.0	224.0	226.0	212.0	195.0	227.0
	: H20(CM)	121.0	121.0	118.5	117.0	114.0	111.0
4.0	: READ	271.0	232.0	251.0	231.0	239.0	252.0
	: H20(CM)	138.0	148.5	146.0	144.0	142.0	140.0
5.0	: READ	309.0	272.0	308.0	283.0	281.0	281.0
	: H20(CM)	171.0	171.0	170.5	171.0	172.0	172.5
6.0	: READ	331.0	300.0	328.0	307.0	315.0	305.0
	: H20(CM)	204.0	204.0	203.5	203.5	204.0	204.5
7.0	: READ	356.0	361.0	382.0	364.0	368.0	373.0
	: H20(CM)		240.0	239.5	239.0	237.0	237.0
8.0	: READ	389.0	368.0	401.0	367.0	390.0	371.0
	: H20(CM)	266.0	265.5	264.5	263.5	262.5	259.0

TENSIOMETER CALCULATIONS

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
PSI ETT-2		: TIME	700.0	700.0	700.0	700.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-82.1	-88.3	-104.7	-88.3	-101.6	-110.8
2	60.00		-106.6	-81.5	-105.6	-84.2	-116.5	-106.3
3	90.00		-119.2	-99.7	-104.4	-91.7	-77.5	-113.5
4	120.00		-129.7	-78.4	-100.6	-82.2	-92.6	-108.0
5	150.00		-133.2	-95.3	-132.7	-106.5	-103.4	-102.9
6	180.00		-120.3	-88.6	-117.8	-96.3	-103.9	-93.1
7	210.00			-112.5	-134.5	-116.6	-122.8	-128.0
8	240.00		-113.3	-92.3	-127.2	-93.4	-118.0	-102.3

TOTAL HEAD		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-2		: TIME	700.0	700.0	700.0	700.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-112.1	-118.3	-134.7	-118.3	-131.6	-140.8
2	60.00		-166.6	-141.5	-165.6	-144.2	-176.5	-166.3
3	90.00		-209.2	-189.7	-194.4	-181.7	-167.5	-203.5
4	120.00		-249.7	-198.4	-220.6	-202.2	-212.6	-228.0
5	150.00		-283.2	-245.3	-282.7	-256.5	-253.4	-252.9
6	180.00		-300.3	-268.6	-297.8	-276.3	-283.9	-273.1
7	210.00			-322.5	-344.5	-326.6	-332.8	-338.0
8	240.00		-353.3	-332.3	-367.2	-333.4	-358.0	-342.3

ETT-2	: DATE : TIME	2/10/89 730.0	3/24/69 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 620.0	7/20/89 634.0
NUMBER	:						
	:						
1.0	: READ	163.0	166.0	186.0	171.0	174.0	178.0
	: H2O(CM)	60.5	60.0	59.5	59.5	59.0	59.0
2.0	: READ	163.0	149.0	142.0	148.0	196.0	203.0
	: H2O(CM)	76.0			92.5	92.0	91.0
3.0	: READ	217.0	224.0	252.0	250.0	267.0	261.0
	: H2O(CM)	110.0	125.0	124.5	124.5	124.0	123.0
4.0	: READ	232.0	235.0	261.0	265.0	266.0	273.0
	: H2O(CM)	139.0	143.0		153.5	152.5	152.0
5.0	: READ	275.0	285.0	308.0	323.0	335.0	332.0
	: H2O(CM)	171.5	170.0	168.0	181.0	179.5	177.5
6.0	: READ	302.0	315.0	327.0	335.0	344.0	353.0
	: H2O(CM)	204.0	202.0	200.0	211.5	210.0	208.0
7.0	: READ	356.0	365.0	377.0	371.0	380.0	306.0
	: H2O(CM)	235.0	238.0	236.0	233.0	231.0	242.0
8.0	: READ	309.0	376.0	397.0	394.0	415.0	420.0
	: H2O(CM)		267.0	265.0	272.0	270.0	268.5

TENSIOMETER CALCULATIONS

PSI ETT-2	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 620.0	7/20/89 634.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-102.1	-105.7	-126.8	-111.4	-115.0	-119.1
2	60.00	-85.5				-102.1	-110.4
3	90.00	-104.3	-95.4	-124.7	-122.6	-140.6	-135.5
4	120.00	-88.6	-87.4		-106.9	-109.0	-116.7
5	150.00	-97.8	-109.7	-135.4	-136.8	-150.7	-149.8
6	180.00	-90.6	-106.1	-120.5	-116.4	-127.2	-138.6
7	210.00	-112.7	-118.7	-133.1	-130.2	-141.6	
8	240.00		-98.9	-122.5	-111.9	-135.6	-142.3

TOTAL HEAD ETT-2	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 620.0	7/20/89 634.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-132.1	-135.7	-156.8	-141.4	-145.0	-149.1
2	60.00	-145.5				-162.1	-170.4
3	90.00	-194.3	-185.4	-214.7	-212.6	-230.6	-225.5
4	120.00	-208.6	-207.4		-226.9	-229.0	-236.7
5	150.00	-247.8	-259.7	-285.4	-286.8	-300.7	-299.8
6	180.00	-270.6	-286.1	-300.5	-296.4	-307.2	-318.6
7	210.00	-322.7	-328.7	-343.1	-340.2	-351.6	
8	240.00		-338.9	-362.5	-351.9	-375.6	-382.3

	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
ETT-3	: TIME	630.0	725.0	700.0	700.0	700.0	640.0
NUMBER	:						
	:						
1.0	: READ	174.0	197.0	175.0	199.0	132.0	128.0
	: H20(CM)	59.0	59.0	59.0	58.5	59.5	60.0
2.0	: READ	201.0	215.0	187.0	197.0	187.0	206.0
	: H20(CM)	90.0	90.0	89.5	89.5	89.5	89.5
3.0	: READ	232.0	240.0	211.0	220.0	210.0	225.0
	: H20(CM)	122.0	122.0	122.0	121.5	121.5	120.0
4.0	: READ	253.0	269.0	243.0	252.0	231.0	257.0
	: H20(CM)	141.0	141.0	141.0	141.0	141.0	141.0
5.0	: READ	286.0	303.0	274.0	281.0	265.0	289.0
	: H20(CM)	176.0	175.5	175.0	175.0	175.0	175.0
6.0	: READ	309.0	333.0	307.0	314.0	286.0	308.0
	: H20(CM)	202.0	201.0	200.5	200.0	201.0	201.0
7.0	: READ	373.0	382.0	363.0	371.0	356.0	377.0
	: H20(CM)	234.5	234.0	233.5	233.0	233.0	233.0
8.0	: READ	376.0	392.0	367.0	375.0	357.0	378.0
	: H20(CM)	262.5	262.0	261.5	261.0	261.5	261.0

TENSIOMETER CALCULATIONS

	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
PSI ETT-3	: TIME	630.0	725.0	700.0	700.0	700.0	640.0
NO. DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1 30.00		-115.0	-138.6	-116.0	-141.2	-71.4	-66.8
2 60.00		-109.4	-123.8	-95.6	-105.8	-95.6	-115.1
3 90.00		-106.8	-115.0	-85.3	-95.1	-84.8	-101.8
4 120.00		-108.0	-124.4	-97.7	-107.0	-85.4	-112.1
5 150.00		-104.3	-122.2	-93.0	-100.2	-83.8	-108.4
6 180.00		-99.9	-125.6	-99.5	-107.2	-77.4	-100.0
7 210.00		-130.7	-140.4	-121.5	-130.2	-114.8	-136.4
8 240.00		-103.7	-120.6	-95.5	-104.3	-85.3	-107.3

TOTAL HEAD	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
ETT-3	: TIME	630.0	725.0	700.0	700.0	700.0	640.0
NO. DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1 30.00		-145.0	-168.6	-146.0	-171.2	-101.4	-96.8
2 60.00		-169.4	-183.8	-155.6	-165.8	-155.6	-175.1
3 90.00		-196.8	-205.0	-175.3	-185.1	-174.8	-191.8
4 120.00		-228.0	-244.4	-217.7	-227.0	-205.4	-232.1
5 150.00		-254.3	-272.2	-243.0	-250.2	-233.8	-258.4
6 180.00		-279.9	-305.6	-279.5	-287.2	-257.4	-280.0
7 210.00		-340.7	-350.4	-331.5	-340.2	-324.8	-346.4
8 240.00		-343.7	-360.6	-335.5	-344.3	-325.3	-347.3

ETT-3	: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
	: TIME	700.0	700.0	700.0	700.0	747.0	730.0
NUMBER	:						
	:						
1.0	: READ	151.0	145.0	160.0	151.0	166.0	148.0
	: H20(CM)	60.0	59.0	59.0	58.5	59.5	59.5
2.0	: READ	162.0	169.0	190.0	174.0	189.0	166.0
	: H20(CM)	90.0	90.0	89.5	89.0	89.5	80.5
3.0	: READ	235.0	185.0	206.0	222.0	228.0	233.0
	: H20(CM)	118.5		118.5	118.0	119.0	119.0
4.0	: READ	267.0	223.0	247.0	227.0	248.0	236.0
	: H20(CM)	141.0	139.0	133.0		155.0	142.0
5.0	: READ	301.0	269.0	303.0	278.0	279.0	283.0
	: H20(CM)	174.5	174.5	174.0	174.0	175.0	175.0
6.0	: READ	318.0	283.0	308.0	286.0	279.0	270.0
	: H20(CM)	200.5		209.0	207.0	198.0	
7.0	: READ	382.0	353.0	394.0	354.0	379.0	360.0
	: H20(CM)	232.5	232.5	232.0	232.0	232.5	233.0
8.0	: READ	382.0	354.0	382.0	357.0	357.0	355.0
	: H20(CM)	261.0	261.0	260.0	260.5	261.5	261.5

TENSIOMETER CALCULATIONS

PSI ETT-3		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
		: TIME	700.0	700.0	700.0	700.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-90.3	-85.3	-100.6	-92.0	-106.3	-87.8
2	60.00		-69.4	-76.6	-98.7	-82.8	-97.6	-83.7
3	90.00		-113.7		-83.9	-100.9	-106.0	-111.1
4	120.00		-122.3	-79.4	-110.4		-87.8	-89.5
5	150.00		-121.2	-88.4	-123.8	-98.2	-98.1	-102.2
6	180.00		-110.8		-91.4	-71.0	-73.5	
7	210.00		-142.0	-112.3	-154.9	-113.9	-139.0	-118.9
8	240.00		-111.4	-82.7	-112.5	-86.4	-85.3	-83.2

TOTAL HEAD ETT-3		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
		: TIME	700.0	700.0	700.0	700.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-120.3	-115.3	-130.6	-122.0	-136.3	-117.8
2	60.00		-129.4	-136.6	-158.7	-142.8	-157.6	-143.7
3	90.00		-203.7		-173.9	-190.9	-196.0	-201.1
4	120.00		-242.3	-199.4	-230.4		-207.8	-209.5
5	150.00		-271.2	-238.4	-273.8	-248.2	-248.1	-252.3
6	180.00		-290.8		-271.4	-251.0	-253.5	-180.0
7	210.00		-352.0	-322.3	-364.9	-323.9	-349.0	-328.9
8	240.00		-351.4	-322.7	-352.5	-326.4	-325.3	-323.2

ETT-3	: DATE / : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 620.0	7/20/89 634.0
NUMBER	:						
	:						
1.0	: READ	127.0	164.0	163.0	157.0	161.0	208.0
	: H20(CM)	56.0	54.5	54.0	54.0	53.5	52.0
2.0	: READ	161.0	178.0	199.0	190.0	194.0	202.0
	: H20(CM)		91.5	91.0	91.0	90.5	90.0
3.0	: READ	225.0	240.0	258.0	250.0	255.0	267.0
	: H20(CM)	118.5	117.5	116.5	116.0	115.0	114.0
4.0	: READ	229.0	262.0	287.0	252.0	284.0	291.0
	: H20(CM)	136.0	151.0	150.0	149.0	148.5	147.0
5.0	: READ	273.0	292.0	306.0	305.0	324.0	333.0
	: H20(CM)	174.5	173.0	171.0	170.0	181.5	180.0
6.0	: READ	251.0	324.0	350.0	342.0	343.0	353.0
	: H20(CM)		212.0	211.0	210.0	209.0	207.0
7.0	: READ	349.0	368.0	378.0	398.0	395.0	404.0
	: H20(CM)	232.5	231.0	229.0	241.5	240.0	238.0
8.0	: READ	352.0	366.0	380.0	405.0	404.0	406.0
	: H20(CM)	260.5	258.5	256.0	272.0	270.5	269.0

TENSIOMETER CALCULATIONS

PSI
ETT-3

NO.	DPTH BELOW DATUM(CM)	: DATE / : TIME	2/10/89 730.0 PSI (CM)	3/24/89 650.0 PSI (CM)	4/21/89 700.0 PSI (CM)	5/9/89 714.0 PSI (CM)	6/7/89 620.0 PSI (CM)	7/20/89 634.0 PSI (CM)
1	30.00		-70.0	-109.6	-109.1	-102.9	-107.6	-157.4
2	60.00			-84.2	-106.3	-97.1	-101.7	-110.4
3	90.00		-103.4	-119.9	-139.4	-131.7	-137.9	-151.3
4	120.00		-88.7	-106.5	-133.2	-98.4	-131.7	-140.5
5	150.00		-92.5	-113.6	-130.1	-130.2	-137.3	-148.1
6	180.00			-104.6	-132.3	-125.2	-127.3	-139.7
7	210.00		-108.2	-129.3	-141.7	-148.8	-147.3	-158.7
8	240.00		-81.2	-97.7	-114.8	-123.2	-123.8	-127.5

TOTAL HEAD
ETT-3

NO.	DPTH BELOW DATUM(CM)	: DATE / : TIME	2/10/89 730.0 THEAD (CM)	3/24/89 650.0 THEAD (CM)	4/21/89 700.0 THEAD (CM)	5/9/89 714.0 THEAD (CM)	6/7/89 620.0 THEAD (CM)	7/20/89 634.0 THEAD (CM)
1	30.00		-100.0	-139.6	-139.1	-132.9	-137.6	-187.4
2	60.00			-144.2	-166.3	-157.1	-161.7	-170.4
3	90.00		-193.4	-209.9	-229.4	-221.7	-227.9	-241.3
4	120.00		-208.7	-226.5	-253.2	-218.4	-251.7	-260.5
5	150.00		-242.5	-263.6	-280.1	-280.2	-287.3	-298.1
6	180.00		-180.0	-284.6	-312.3	-305.2	-307.3	-319.7
7	210.00		-318.2	-339.3	-351.7	-358.8	-357.3	-368.7
8	240.00		-321.2	-337.7	-354.8	-363.2	-363.8	-367.5

ETT-4		: DATE / : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 700.0	8/19/88 700.0	9/2/88 700.0	9/16/88 640.0
NUMBER		:						
		:						
1.0		: READ	87.0					
		: H20(CM)	53.5					
2.0		: READ	201.0	222.0	191.0	201.0	192.0	179.0
		: H20(CM)	88.0	87.5	87.5	87.5	87.5	88.0
3.0		: READ	234.0	247.0	210.0	223.0	212.0	240.0
		: H20(CM)	121.0	120.5	120.5	120.5	120.5	120.0
4.0		: READ	258.0	275.0	246.0	258.0	250.0	276.0
		: H20(CM)	143.5	143.0	143.0	143.0	143.0	143.0
5.0		: READ	280.0	317.0	291.0	300.0	285.0	308.0
		: H20(CM)	174.0	174.0	173.5	173.5	173.5	173.5
6.0		: READ	295.0	331.0	301.0	311.0	292.0	319.0
		: H20(CM)	202.0	201.5	201.5	201.5	202.0	201.5
7.0		: READ	338.0	367.0	347.0	354.0	344.0	365.0
		: H20(CM)	232.5	232.0	231.5	231.0	231.0	231.0
8.0		: READ	352.0	390.0	341.0	372.0	366.0	389.0
		: H20(CM)	264.0	263.5	263.0	263.0	263.0	263.0

TENSIOMETER CALCULATIONS

PSI ETT-4		: DATE / : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 700.0	8/19/88 700.0	9/2/88 700.0	9/16/88 640.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-31.7					
2	60.00		-111.6	-133.6	-101.8	-112.1	-102.9	-89.0
3	90.00		-110.0	-123.8	-85.9	-99.2	-88.0	-117.2
4	120.00		-110.4	-128.4	-98.7	-111.0	-102.8	-129.4
5	150.00		-100.2	-138.2	-112.1	-121.3	-105.9	-129.5
6	180.00		-85.6	-123.0	-92.3	-102.5	-82.5	-110.7
7	210.00		-96.9	-127.2	-107.2	-114.9	-104.7	-126.2
8	240.00		-77.5	-117.0	-67.3	-99.1	-92.9	-116.5

TOTAL HEAD ETT-4		: DATE / : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 700.0	8/19/88 700.0	9/2/88 700.0	9/16/88 640.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-61.7					
2	60.00		-171.6	-193.6	-161.8	-172.1	-162.9	-149.0
3	90.00		-200.0	-213.8	-175.9	-189.2	-178.0	-207.2
4	120.00		-230.4	-248.4	-218.7	-231.0	-222.8	-249.4
5	150.00		-250.2	-288.2	-262.1	-271.3	-255.9	-279.5
6	180.00		-265.6	-303.0	-272.3	-282.5	-262.5	-290.7
7	210.00		-306.9	-337.2	-317.2	-324.9	-314.7	-336.2
8	240.00		-317.5	-357.0	-307.3	-339.1	-332.9	-356.5

ETT-4	: DATE : TIME	9/30/88 700.0	10/15/88 700.0	10/29/88 700.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NUMBER	:						
	:						
1.0	: READ						
	: H2O(CM)						
2.0	: READ	184.0	184.0	209.0	174.0	176.0	190.0
	: H2O(CM)	88.0	87.5	86.5	86.0	86.5	83.0
3.0	: READ	217.0		183.0		209.0	233.0
	: H2O(CM)	120.0		110.0		118.0	118.5
4.0	: READ	282.0	226.0	236.0	182.0		
	: H2O(CM)	142.5	130.5	139.0			
5.0	: READ	325.0	278.0	316.0	291.0	293.0	299.0
	: H2O(CM)	172.5	171.5	170.5	170.5	172.0	172.0
6.0	: READ	297.0	307.0	325.0	299.0	293.0	310.0
	: H2O(CM)		210.0	209.5	209.0	209.5	209.5
7.0	: READ	376.0	345.0	366.0	346.0	356.0	337.0
	: H2O(CM)	230.5	230.5	230.0	230.0	231.0	231.5
8.0	: READ	391.0	356.0	384.0	367.0	275.0	237.0
	: H2O(CM)	262.0	262.0	260.5	260.0		

TENSIOMETER CALCULATIONS

PSI ETT-4	: DATE : TIME	9/30/88 700.0	10/15/88 700.0	10/29/88 700.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00						
2	60.00	-94.1	-94.7	-121.4	-86.0	-87.5	-105.6
3	90.00	-93.6		-69.5		-87.6	-111.6
4	120.00	-136.1	-91.6	-92.7			
5	150.00	-148.0	-100.9	-140.9	-115.3	-115.7	-121.9
6	180.00		-89.3	-108.3	-82.2	-75.5	-92.9
7	210.00	-138.0	-106.2	-128.3	-107.8	-117.0	-97.0
8	240.00	-119.6	-83.7	-114.0	-97.1		

TOTAL HEAD ETT-4	: DATE : TIME	9/30/88 700.0	10/15/88 700.0	10/29/88 700.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00						
2	60.00	-154.1	-154.7	-181.4	-146.0	-147.5	-165.6
3	90.00	-183.6		-159.5		-177.6	-201.6
4	120.00	-256.1	-211.6	-212.7			
5	150.00	-298.0	-250.9	-290.9	-265.3	-265.7	-271.9
6	180.00		-269.3	-288.3	-262.2	-255.5	-272.9
7	210.00	-348.0	-316.2	-338.3	-317.8	-327.0	-307.0
8	240.00	-359.6	-323.7	-354.0	-337.1	ERR	

ETT-4		: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
		: TIME	730.0	650.0	700.0	714.0	620.0	634.0
NUMBER	:							
	:							
1.0	:	READ		113.0	162.0	143.0	151.0	138.0
	:	H20(CM)		62.0	62.0	58.5	54.5	63.5
2.0	:	READ	166.0	165.0	217.0	205.0	222.0	204.0
	:	H20(CM)	77.0	93.5	92.5	92.0	92.0	91.5
3.0	:	READ	227.0	219.0	246.0	203.0	200.0	241.0
	:	H20(CM)	117.5	115.5	114.5	109.0	120.5	119.0
4.0	:	READ		246.0	276.0	266.0	275.0	281.0
	:	H20(CM)		152.0	151.0	151.0	150.0	149.5
5.0	:	READ	287.0	302.0	338.0	321.0	318.0	336.0
	:	H20(CM)	171.5	181.5	180.0	180.0	179.0	177.5
6.0	:	READ	315.0	307.0	334.0	324.0	327.0	340.0
	:	H20(CM)	208.5	207.0	205.5	204.5	203.5	201.5
7.0	:	READ	340.0	351.0	371.0	356.0	360.0	373.0
	:	H20(CM)	230.0	237.5	234.5	233.0	231.5	242.0
8.0	:	READ		335.0	354.0	292.0	315.0	308.0
	:	H20(CM)					268.5	270.0

TENSIOMETER CALCULATIONS

PSI ETT-4		: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
		: TIME	730.0	650.0	700.0	714.0	620.0	634.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00			-49.2	-99.5	-83.8	-96.2	-73.3
2	60.00		-87.5	-68.7	-123.1	-111.4	-128.8	-110.9
3	90.00		-106.5	-100.5	-129.2	-91.1	-75.7	-119.3
4	120.00			-89.0	-120.8	-110.6	-120.9	-127.6
5	150.00		-110.1	-114.8	-153.3	-135.8	-133.8	-153.9
6	180.00		-99.1	-92.5	-121.8	-112.6	-116.8	-132.2
7	210.00		-101.7	-104.9	-128.6	-114.8	-120.6	-122.6
8	240.00							

TOTAL HEAD ETT-4		: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
		: TIME	730.0	650.0	700.0	714.0	620.0	634.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00			-79.2	-129.5	-113.8	-126.2	-103.3
2	60.00		-147.5	-128.7	-183.1	-171.4	-188.8	-170.9
3	90.00		-196.5	-190.5	-219.2	-181.1	-165.7	-209.3
4	120.00			-209.0	-240.8	-230.6	-240.9	-247.6
5	150.00		-260.1	-264.8	-303.3	-285.8	-283.8	-303.9
6	180.00		-279.1	-272.5	-301.8	-292.6	-296.8	-312.2
7	210.00		-311.7	-314.9	-338.6	-324.8	-330.6	-332.6
8	240.00							

	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
ETT-5	: TIME	630.0	725.0	700.0	725.0	700.0	640.0
NUMBER	:						
	:						
1.0	: READ	135.0	171.0	148.0	169.0	120.0	136.0
	: H2O(CM)	58.0	58.5	58.5	58.0	59.0	59.0
2.0	: READ	177.0		168.0	186.0	165.0	155.0
	: H2O(CM)	90.0		84.5	84.5	84.5	
3.0	: READ	225.0	252.0	229.0	233.0	214.0	245.0
	: H2O(CM)	118.0	118.0	118.0	117.5	118.0	117.5
4.0	: READ	241.0	261.0	235.0	242.0	240.0	264.0
	: H2O(CM)	142.0	141.0	139.5	138.5	151.0	149.0
5.0	: READ	285.0	304.0	276.0	289.0	272.0	305.0
	: H2O(CM)	179.0	178.5	178.0	177.0	177.0	177.0
6.0	: READ	326.0	342.0	317.0	310.0	289.0	315.0
	: H2O(CM)	210.0	210.0	209.5	207.5	205.5	203.0
7.0	: READ	341.0	364.0	342.0	351.0	332.0	357.0
	: H2O(CM)	239.0	239.0	238.5	238.0	238.0	238.0
8.0	: READ	364.0	385.0	362.0	365.0	358.0	377.0
	: H2O(CM)	263.5	263.0	263.0	263.0	263.0	262.5

TENSIOMETER CALCULATIONS

		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
PSI		: TIME	630.0	725.0	700.0	725.0	700.0	640.0
ETT-5								
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-76.1	-112.5	-88.9	-110.9	-59.6	-76.0
2	60.00		-84.8		-81.5	-99.9	-78.4	
3	90.00		-104.0	-131.6	-108.1	-112.7	-92.7	-125.0
4	120.00		-94.6	-116.2	-91.1	-99.4	-83.9	-110.7
5	150.00		-100.0	-120.0	-91.9	-106.3	-88.8	-122.7
6	180.00		-108.8	-125.2	-100.1	-95.1	-75.7	-105.0
7	210.00		-93.0	-116.6	-94.6	-104.4	-84.9	-110.5
8	240.00		-90.3	-112.4	-88.8	-91.9	-84.7	-104.7

TOTAL HEAD		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
ETT-5		: TIME	630.0	725.0	700.0	725.0	700.0	640.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-106.1	-142.5	-118.9	-140.9	-89.6	-106.0
2	60.00		-144.8		-141.5	-159.9	-138.4	
3	90.00		-194.0	-221.6	-198.1	-202.7	-182.7	-215.0
4	120.00		-214.6	-236.2	-211.1	-219.4	-203.9	-230.7
5	150.00		-250.0	-270.0	-241.9	-256.3	-238.8	-272.7
6	180.00		-288.8	-305.2	-280.1	-275.1	-255.7	-285.0
7	210.00		-303.0	-326.6	-304.6	-314.4	-294.9	-320.5
8	240.00		-330.3	-352.4	-328.8	-331.9	-324.7	-344.7

ETT-5	: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
	: TIME	700.0	700.0	700.0	700.0	747.0	730.0
NUMBER	:						
	:						
1.0	: READ	142.0	133.0	145.0	129.0	71.0	
	: H2O(CM)	59.5	59.0	59.0	59.0	60.0	60.0
2.0	: READ	152.0			134.0	177.0	214.0
	: H2O(CM)				92.5	92.5	91.5
3.0	: READ	258.0	193.0	214.0	190.0	197.0	196.0
	: H2O(CM)	117.0	110.0	110.0			
4.0	: READ	272.0	247.0	259.0	241.0	248.0	243.0
	: H2O(CM)	148.0	147.0	145.5	144.5	177.5	138.0
5.0	: READ	316.0	283.0	307.0	284.0	284.0	293.0
	: H2O(CM)	176.5	176.5	176.5	176.5	205.0	177.5
6.0	: READ	316.0	273.0	331.0	291.0	333.0	302.0
	: H2O(CM)	199.5		212.5	210.5	238.0	198.0
7.0	: READ	363.0	338.0	361.0	344.0	349.0	344.0
	: H2O(CM)	238.0	237.5	237.0	237.0	263.0	238.0
8.0	: READ	380.0	239.0	356.0	358.0	358.0	375.0
	: H2O(CM)	262.5		265.0	263.5	263.5	261.0

TENSIOMETER CALCULATIONS

PSI ETT-5	: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
	: TIME	700.0	700.0	700.0	700.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-81.7	-73.0	-85.3	-68.9	-8.3	ERR
2	60.00				-38.0	-82.1	-121.1
3	90.00	-138.9	-79.7	-101.3			
4	120.00	-119.9	-95.4	-109.3	-91.9	-63.7	-101.0
5	150.00	-134.5	-100.6	-125.2	-101.7	-71.1	-109.8
6	180.00	-109.8		-111.2	-72.4	-85.9	-97.0
7	210.00	-116.7	-91.6	-115.7	-98.2	-75.5	-97.2
8	240.00	-107.8		-80.5	-84.2	-84.2	-104.3

TOTAL HEAD ETT-5	: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
	: TIME	700.0	700.0	700.0	700.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-111.7	-103.0	-115.3	-98.9	-38.3	
2	60.00				-98.0	-142.1	-181.1
3	90.00	-228.9	-169.7	-191.3			
4	120.00	-239.9	-215.4	-229.3	-211.9	-183.7	-221.0
5	150.00	-284.5	-250.6	-275.2	-251.7	-221.1	-259.8
6	180.00	-289.8		-291.2	-252.4	-265.9	-277.0
7	210.00	-326.7	-301.6	-325.7	-308.2	-285.5	-307.2
8	240.00	-347.8		-320.5	-324.2	-324.2	-344.3

	: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
ETT-5	: TIME	730.0	650.0	700.0	714.0	620.0	634.0
NUMBER	:						
	:						
1.0	: READ	150.0	131.0	151.0	109.0	150.0	258.0
	: H20(CM)	59.0	59.0	52.5	62.5	61.5	56.5
2.0	: READ	194.0	183.0	199.0	205.0	203.0	197.0
	: H20(CM)	90.0	87.0	81.5	93.5	93.0	92.5
3.0	: READ	187.0	205.0	213.0	193.0	212.0	255.0
	: H20(CM)		110.5		118.0	122.5	116.0
4.0	: READ	243.0	216.0	232.0	222.0	244.0	212.0
	: H20(CM)	136.0	141.5		153.0	145.5	154.5
5.0	: READ	286.0	259.0	275.0	313.0	313.0	326.0
	: H20(CM)	177.0			182.0	180.5	179.5
6.0	: READ	289.0	328.0	344.0	332.0	337.0	342.0
	: H20(CM)		209.0	207.5	207.0	205.5	203.0
7.0	: READ	323.0	329.0	341.0	343.0	340.0	354.0
	: H20(CM)	236.0	232.5	230.0	242.5	241.5	240.0
8.0	: READ	362.0	357.0	368.0	368.0	354.0	350.0
	: H20(CM)	260.5	260.0	258.0	271.0	267.0	274.0

TENSIOMETER CALCULATIONS

		: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
PSI		: TIME	730.0	650.0	700.0	714.0	620.0	634.0
ETT-5								
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-90.4	-70.9	-98.4		-87.7	-203.8
2	60.00		-102.2	-94.2	-116.5	-109.7	-108.2	-102.6
3	90.00			-91.5		-71.2	-85.8	-136.9
4	120.00		-103.1	-69.5		-63.3	-93.9	
5	150.00		-103.2			-125.5	-127.1	-141.5
6	180.00			-111.9	-129.9	-118.1	-124.9	-132.7
7	210.00		-77.8	-87.7	-102.7	-91.3	-89.3	-105.3
8	240.00		-91.5	-86.9	-100.3	-86.4	-76.3	

		: DATE	2/10/89	3/24/69	4/21/89	5/9/89	6/7/89	7/20/89
TOTAL HEAD								
ETT-5		: TIME	730.0	650.0	700.0	714.0	620.0	634.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-120.4	-100.9	-128.4		-117.7	-233.8
2	60.00		-162.2	-154.2	-176.5	-169.7	-168.2	-162.6
3	90.00			-181.5		-161.2	-175.8	-226.9
4	120.00		-223.1	-189.5		-183.3	-213.9	
5	150.00		-253.2			-275.5	-277.1	-291.5
6	180.00			-291.9	-309.9	-298.1	-304.9	-312.7
7	210.00		-287.8	-297.7	-312.7	-301.3	-299.3	-315.3
8	240.00		-331.5	-326.9	-340.3	-326.4	-316.3	

		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
ETT-6		: TIME	630.0	725.0	700.0	730.0	745.0	645.0
NUMBER	:							
	:							
1.0	:	READ	158.0	194.0	157.0	170.0	122.0	148.0
	:	H20(CM)	62.0	62.0	62.0	62.0	62.0	62.5
2.0	:	READ	187.0	217.0	190.0	204.0	181.0	166.0
	:	H20(CM)	89.5	89.5	89.5	89.5	90.0	90.0
3.0	:	READ	210.0	246.0	218.0	237.0	218.0	255.0
	:	H20(CM)	116.5	116.5	116.5	116.0	116.5	116.0
4.0	:	READ	246.0	276.0	246.0	263.0	245.0	269.0
	:	H20(CM)	147.5	147.5	147.5	147.5	148.0	147.0
5.0	:	READ	280.0	308.0	282.0	294.0	272.0	299.0
	:	H20(CM)	175.5	175.5	175.0	174.5	175.0	174.5
6.0	:	READ	316.0	345.0	322.0	327.0	327.0	346.0
	:	H20(CM)	206.0	205.5	205.5	205.0	205.5	205.0
7.0	:	READ	340.0	368.0	349.0	355.0	327.0	346.0
	:	H20(CM)	242.0	234.5	234.0	234.0	232.5	229.5
8.0	:	READ	351.0	378.0	358.0	365.0	350.0	371.0
	:	H20(CM)	263.5	263.5	263.0	263.0	263.0	263.0

TENSIOMETER CALCULATIONS

		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
PSI		: TIME	630.0	725.0	700.0	730.0	700.0	640.0
ETT-6								
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-95.4	-132.3	-94.3	-107.7	-58.5	-84.6
2	60.00		-95.6	-126.3	-98.7	-113.0	-88.9	-73.5
3	90.00		-90.2	-127.1	-98.4	-118.4	-98.4	-136.9
4	120.00		-93.8	-124.6	-93.8	-111.3	-92.3	-117.9
5	150.00		-98.6	-127.3	-101.2	-114.1	-91.0	-119.2
6	180.00		-102.8	-133.1	-109.5	-115.2	-114.6	-134.6
7	210.00		-88.8	-125.5	-106.6	-112.7	-85.7	-108.3
8	240.00		-77.0	-104.7	-84.7	-91.9	-76.5	-98.0

		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
TOTAL HEAD								
ETT-6		: TIME	630.0	725.0	700.0	730.0	700.0	640.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-125.4	-162.3	-124.3	-137.7	-88.5	-114.6
2	60.00		-155.6	-186.3	-158.7	-173.0	-148.9	-133.5
3	90.00		-180.2	-217.1	-188.4	-208.4	-188.4	-226.9
4	120.00		-213.8	-244.6	-213.8	-231.3	-212.3	-237.9
5	150.00		-248.6	-277.3	-251.2	-264.1	-241.0	-269.2
6	180.00		-282.8	-313.1	-289.5	-295.2	-294.6	-314.6
7	210.00		-298.8	-335.5	-316.6	-322.7	-295.7	-318.3
8	240.00		-317.0	-344.7	-324.7	-331.9	-316.5	-338.0

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-6		: TIME	713.0	713.0	713.0	713.0	747.0	730.0
NUMBER		:						
		:						
1.0		: READ	159.0	147.0	166.0	150.0	153.0	
		: H20(CM)	62.5	62.0	61.5	61.0	61.5	60.0
2.0		: READ	173.0	138.0	194.0	174.0	179.0	187.0
		: H20(CM)	87.0		94.5	94.5	95.0	95.0
3.0		: READ	262.0	174.0	159.0	199.0	240.0	252.0
		: H20(CM)	115.5			122.0	122.0	122.0
4.0		: READ	277.0	246.0	256.0	231.0	240.0	240.0
		: H20(CM)	146.5	146.5	144.0	142.0	140.0	138.0
5.0		: READ	317.0	279.0	302.0	278.0	283.0	291.0
		: H20(CM)	177.0	173.5	173.0	172.5	173.0	172.5
6.0		: READ	351.0	312.0	340.0	317.0	319.0	324.0
		: H20(CM)	205.0	205.0	204.5	204.5	205.5	205.5
7.0		: READ	290.0	177.0				
		: H20(CM)						
8.0		: READ	373.0	316.0				
		: H20(CM)	262.5					

TENSIOMETER CALCULATIONS

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
PSI		: TIME	713.0	700.0	700.0	713.0	747.0	730.0
ETT-6								
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-95.9	-84.1	-104.1	-88.2	-90.8	ERR
2	60.00		-83.9		-97.4	-76.9	-81.5	-89.7
3	90.00		-144.6			-73.0	-115.0	-127.3
4	120.00		-126.7	-94.9	-107.8	-84.4	-95.7	-97.9
5	150.00		-135.0	-99.8	-123.9	-99.8	-104.4	-113.1
6	180.00		-139.8	-99.8	-129.0	-105.4	-106.4	-111.5
7	210.00							
8	240.00		-100.6					

TOTAL HEAD		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-6		: TIME	713.0	700.0	700.0	713.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-125.9	-114.1	-134.1	-118.2	-120.8	ERR
2	60.00		-143.9		-157.4	-136.9	-141.5	-149.7
3	90.00		-234.6			-163.0	-205.0	-217.3
4	120.00		-246.7	-214.9	-227.8	-204.4	-215.7	-217.9
5	150.00		-285.0	-249.8	-273.9	-249.8	-254.4	-263.1
6	180.00		-319.8	-279.8	-309.0	-285.4	-286.4	-291.5
7	210.00							
8	240.00		-340.6					

ETT-6	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NUMBER	:						
	:						
1.0	: READ	153.0	156.0	187.0	194.0	183.0	193.0
	: H2O(CM)	60.0	59.0	58.0	58.0	58.0	53.5
2.0	: READ	183.0	192.0	216.0	209.0	208.0	212.0
	: H2O(CM)	95.0	95.0	94.0	94.0	94.0	94.0
3.0	: READ	244.0	245.0	274.0	269.0	266.0	269.0
	: H2O(CM)	121.5	120.5	119.5	118.5	118.0	117.5
4.0	: READ	169.0	230.0	262.0	248.0	258.0	292.0
	: H2O(CM)		147.5	139.5	118.5	151.5	150.0
5.0	: READ	277.0	283.0	302.0	150.5	306.0	319.0
	: H2O(CM)	172.0	170.0	168.0	180.0	175.5	173.5
6.0	: READ	316.0	331.0	340.0	339.0	346.0	358.0
	: H2O(CM)	205.0	203.0	202.0	200.5	206.0	204.0
7.0	: READ						
	: H2O(CM)						
8.0	: READ		367.0	382.0	382.0	380.0	391.0
	: H2O(CM)		266.5	265.5	264.0	263.5	262.0

TENSIOMETER CALCULATIONS

PSI ETT-6		: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-92.4	-96.5	-129.4	-136.6	-125.3	-140.4
2	60.00		-85.6	-94.8	-120.5	-113.3	-112.3	-116.4
3	90.00		-119.7	-121.8	-152.6	-148.5	-146.0	-149.6
4	120.00			-77.4	-118.8	-127.0	-101.8	-138.3
5	150.00		-99.3	-107.6	-129.2		-125.3	-140.8
6	180.00		-103.9	-121.4	-131.7	-132.3	-133.6	-148.0
7	210.00							
8	240.00			-90.2	-106.6	-108.2	-106.7	-119.6

TOTAL HEAD ETT-6		: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-122.4	-126.5	-159.4	-166.6	-155.3	-170.4
2	60.00		-145.6	-154.8	-180.5	-173.3	-172.3	-176.4
3	90.00		-209.7	-211.8	-242.6	-238.5	-236.0	-239.6
4	120.00			-197.4	-238.8	-247.0	-221.8	-258.3
5	150.00		-249.3	-257.6	-279.2		-275.3	-290.8
6	180.00		-283.9	-301.4	-311.7	-312.3	-313.6	-328.0
7	210.00							
8	240.00			-330.2	-346.6	-348.2	-346.7	-359.6

		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
ETT-7		: TIME	630.0	725.0	700.0	730.0	745.0	645.0
NUMBER	:							
	:							
1.0	:	READ	153.0	193.0	168.0	198.0	126.0	137.0
	:	H2O(CM)	63.5	63.0	63.0	63.0	63.5	63.5
2.0	:	READ	182.0	208.0	179.0	196.0	180.0	174.0
	:	H2O(CM)	91.5	91.5	91.0	91.0	91.0	91.0
3.0	:	READ	224.0	254.0	228.0	245.0	223.0	256.0
	:	H2O(CM)	123.0	122.5	122.5	122.0	122.5	122.0
4.0	:	READ	257.0	302.0	278.0	278.0	253.0	281.0
	:	H2O(CM)	148.5	148.0	147.5	147.5	148.0	148.0
5.0	:	READ	268.0	299.0	273.0		268.0	308.0
	:	H2O(CM)	171.0	171.0	166.5		182.5	181.0
6.0	:	READ	311.0	338.0	316.0	325.0	300.0	331.0
	:	H2O(CM)	209.0	208.0	206.0	206.0	206.5	206.0
7.0	:	READ	291.0	344.0	297.0	358.0	351.0	378.0
	:	H2O(CM)	225.0			239.5	239.5	239.0
8.0	:	READ	344.0	393.0	301.0	374.0	356.0	376.0
	:	H2O(CM)	263.0	262.5		267.5	267.0	266.0

TENSIOMETER CALCULATIONS

		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
PSI		: TIME	630.0	725.0	700.0	730.0	745.0	645.0
ETT-7								
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-88.6	-130.2	-104.6	-135.3	-61.0	-72.2
2	60.00		-88.3	-115.0	-85.8	-103.2	-86.8	-80.7
3	90.00		-97.6	-128.9	-102.2	-120.2	-97.1	-131.4
4	120.00		-104.0	-150.7	-126.6	-126.6	-100.5	-129.2
5	150.00		-91.2	-122.9	-101.1		-78.8	-121.4
6	180.00		-94.5	-123.2	-102.8	-112.0	-85.9	-118.2
7	210.00		-56.8			-109.9	-102.7	-131.0
8	240.00		-70.4	-121.1		-96.3	-78.4	-99.9

		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
TOTAL HEAD ETT-7		: TIME	630.0	725.0	700.0	730.0	745.0	645.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-118.6	-160.2	-134.6	-165.3	-91.0	-102.2
2	60.00		-148.3	-175.0	-145.8	-163.2	-146.8	-140.7
3	90.00		-187.6	-218.9	-192.2	-210.2	-187.1	-221.4
4	120.00		-224.0	-270.7	-246.6	-246.6	-220.5	-249.2
5	150.00		-241.2	-272.9	-251.1		-228.8	-271.4
6	180.00		-274.5	-303.2	-282.8	-292.0	-265.9	-298.2
7	210.00		-266.8			-319.9	-312.7	-341.0
8	240.00		-310.4	-361.1		-336.3	-318.4	-339.9

		9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
	: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-7	: TIME	713.0	713.0	713.0	713.0	747.0	730.0
NUMBER	:						
	:						
1.0	: READ	156.0	150.0	160.0	128.0	115.0	114.0
	: H2O(CM)	63.5	63.0	63.0	61.0	56.5	
2.0	: READ	174.0	175.0	193.0	177.0	185.0	195.0
	: H2O(CM)	91.0	91.0	90.5	91.0	91.5	91.0
3.0	: READ	263.0	231.0	263.0	237.0	234.0	247.0
	: H2O(CM)	122.0	121.5	121.0	121.5	122.0	121.5
4.0	: READ	313.0	276.0	307.0	277.0	300.0	295.0
	: H2O(CM)	147.5	147.5	147.0	147.0	147.5	148.0
5.0	: READ	306.0	278.0	307.0	283.0	285.0	298.0
	: H2O(CM)	182.5	182.5	182.0	182.0	182.5	182.5
6.0	: READ	344.0	311.0	334.0	308.0	243.0	189.0
	: H2O(CM)	205.5	205.5	205.5	205.0		
7.0	: READ	386.0	361.0	382.0	361.0	377.0	378.0
	: H2O(CM)	238.5	238.5	238.0	237.5	238.0	238.0
8.0	: READ	346.0	259.0	366.0	357.0	370.0	373.0
	: H2O(CM)			271.5	270.0	20.0	269.8

TENSIOMETER CALCULATIONS

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
PSI		: TIME	713.0	713.0	713.0	713.0	747.0	730.0
ETT-7								
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-91.7	-86.1	-96.4	-65.7	-57.2	
2	60.00		-80.7	-81.7	-100.7	-83.7	-91.4	-102.2
3	90.00		-138.6	-106.4	-139.7	-112.5	-108.9	-122.8
4	120.00		-162.5	-124.6	-156.9	-126.1	-149.2	-143.5
5	150.00		-117.8	-89.1	-119.3	-94.7	-96.3	-109.6
6	180.00		-132.0	-98.2	-121.8	-95.7		
7	210.00		-139.7	-114.1	-136.1	-115.1	-131.0	-132.0
8	240.00				-83.8	-76.2	-357.7	-92.8

TOTAL HEAD		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-7		: TIME	713.0	713.0	713.0	713.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-121.7	-116.1	-126.4	-95.7	-87.2	
2	60.00		-140.7	-141.7	-160.7	-143.7	-151.4	-162.2
3	90.00		-228.6	-196.4	-229.7	-202.5	-198.9	-212.8
4	120.00		-282.5	-244.6	-276.9	-246.1	-269.2	-263.5
5	150.00		-267.8	-239.1	-269.3	-244.7	-246.3	-259.6
6	180.00		-312.0	-278.2	-301.8	-275.7		
7	210.00		-349.7	-324.1	-346.1	-325.1	-341.0	-342.0
8	240.00				-323.8	-316.2	-597.7	-332.8

ETT-7		2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
	: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
ETT-7	: TIME	730.0	650.0	700.0	714.0	630.0	640.0
NUMBER	:						
	:						
1.0	: READ		89.0	90.0	147.0	157.0	170.0
	: H20(CM)				63.5	63.0	63.0
2.0	: READ	174.0	169.0	193.0	186.0	186.0	194.0
	: H20(CM)	91.0	90.0	89.5	85.5	85.0	85.0
3.0	: READ	224.0	226.0	248.0	247.0	230.0	247.0
	: H20(CM)	121.5	120.5	119.5	118.5	119.0	117.5
4.0	: READ	267.0	276.0	287.0	276.0	263.0	190.0
	: H20(CM)	147.5	146.5	145.5	144.0	145.0	151.0
5.0	: READ	280.0	280.0	303.0	301.0	294.0	306.0
	: H20(CM)	182.0	181.5	170.0	179.5	179.0	177.5
6.0	: READ		311.0	305.0	349.0	302.0	306.0
	: H20(CM)		207.5		210.0	207.0	212.0
7.0	: READ	363.0	369.0	375.0	372.0	343.0	377.0
	: H20(CM)	237.5	236.0	234.5	233.0	238.5	233.5
8.0	: READ	359.0	358.0	373.0	365.0	339.0	335.0
	: H20(CM)	268.5	266.5	265.0	263.5	268.0	272.5

TENSIOMETER CALCULATIONS

PSI ETT-7		: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
		: TIME	730.0	650.0	700.0	714.0	630.0	640.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00					-82.5	-93.3	-106.6
2	60.00		-80.7	-76.6	-101.7	-98.9	-99.4	-107.6
3	90.00		-99.2	-102.3	-125.9	-126.0	-108.0	-127.0
4	120.00		-115.4	-125.7	-138.0	-128.3	-113.9	
5	150.00		-91.7	-92.2	-128.1	-115.9	-109.2	-123.1
6	180.00			-96.1		-132.3	-87.4	-86.1
7	210.00		-117.2	-124.9	-132.7	-131.2	-95.6	-135.8
8	240.00		-79.8	-80.9	-97.9	-91.3		

TOTAL HEAD ETT-7		: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
		: TIME	730.0	650.0	700.0	714.0	630.0	640.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00					-112.5	-123.3	-136.6
2	60.00		-140.7	-136.6	-161.7	-158.9	-159.4	-167.6
3	90.00		-189.2	-192.3	-215.9	-216.0	-198.0	-217.0
4	120.00		-235.4	-245.7	-258.0	-248.3	-233.9	
5	150.00		-241.7	-242.2	-278.1	-265.9	-259.2	-273.1
6	180.00			-276.1		-312.3	-267.4	-266.1
7	210.00		-327.2	-334.9	-342.7	-341.2	-305.6	-345.8
8	240.00		-319.8	-320.9	-337.9	-331.3		

ETT-8	: DATE : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 700.0	8/19/88 730.0	9/2/88 745.0	9/16/88 645.0
NUMBER	:						
	:						
1.0	: READ			96.0	122.0	121.0	109.0
	: H20(CM)				57.5	57.0	61.5
2.0	: READ	164.0	187.0	172.0	177.0	165.0	192.0
	: H20(CM)	81.0	81.0	81.0	80.5	81.0	81.0
3.0	: READ	203.0	236.0	213.0	224.0	213.0	245.0
	: H20(CM)	122.0	121.5	121.0	121.0	121.0	120.5
4.0	: READ	243.0	273.0	256.0	258.0	246.0	256.0
	: H20(CM)	151.5	151.0	150.5	150.5	150.5	147.5
5.0	: READ	268.0	287.0	261.0	275.0	253.0	282.0
	: H20(CM)	175.0	173.5	171.5	170.0	171.0	169.5
6.0	: READ	310.0	328.0	298.0	330.0	314.0	328.0
	: H20(CM)	202.0	200.0	195.0	206.0	206.0	205.0
7.0	: READ	342.0	345.0	339.0	344.0	317.0	352.0
	: H20(CM)	238.0	236.0	235.0	234.5	232.5	231.0
8.0	: READ	363.0	386.0	369.0	373.0	360.0	386.0
	: H20(CM)	265.5	265.0	264.0	263.5	264.0	263.0

TENSIOMETER CALCULATIONS

PSI ETT-8		: DATE : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 700.0	8/19/88 730.0	9/2/88 745.0	9/16/88 645.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00					-63.3	-62.8	-45.7
2	60.00		-81.1	-104.7	-89.3	-95.0	-82.2	-109.8
3	90.00		-77.1	-111.5	-88.4	-99.7	-88.4	-121.8
4	120.00		-86.5	-117.8	-100.9	-102.9	-90.6	-104.1
5	150.00		-86.9	-108.0	-83.5	-99.4	-75.8	-107.1
6	180.00		-101.0	-121.5	-96.2	-117.2	-100.8	-116.2
7	210.00		-95.1	-100.3	-95.3	-100.9	-75.4	-112.9
8	240.00		-87.1	-111.3	-94.9	-99.5	-85.7	-113.4

TOTAL HEAD ETT-8		: DATE : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 730.0	8/19/88 730.0	9/2/88 745.0	9/16/88 645.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00					-93.3	-92.8	-75.7
2	60.00		-141.1	-164.7	-149.3	-155.0	-142.2	-169.8
3	90.00		-167.1	-201.5	-178.4	-189.7	-178.4	-211.8
4	120.00		-206.5	-237.8	-220.9	-222.9	-210.6	-224.1
5	150.00		-236.9	-258.0	-233.5	-249.4	-225.8	-257.1
6	180.00		-281.0	-301.6	-276.2	-297.2	-280.8	-296.2
7	210.00		-305.1	-310.3	-305.3	-310.9	-285.4	-322.9
8	240.00		-327.1	-351.3	-334.9	-339.5	-325.7	-353.4

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-8		: TIME	713.0	713.0	713.0	713.0	747.0	730.0
NUMBER		:						
		:						
1.0		: READ			121.0	103.0	129.0	160.0
		: H2O(CM)				64.0	64.0	64.0
2.0		: READ	194.0	163.0	192.0	171.0	181.0	183.0
		: H2O(CM)	81.0	81.0	81.0	81.0	82.0	82.5
3.0		: READ	247.0	222.0	242.0	228.0	251.0	240.0
		: H2O(CM)	120.5	120.5	120.5	120.5	120.5	121.0
4.0		: READ	258.0	230.0	252.0	227.0	248.0	257.0
		: H2O(CM)	144.0	141.0	139.0	136.0	149.0	146.5
5.0		: READ	291.0	259.0	278.0	261.0	262.0	272.0
		: H2O(CM)	169.0	168.5	181.5	181.0	180.0	178.0
6.0		: READ	330.0	297.0	311.0	301.0	335.0	335.0
		: H2O(CM)	203.5	200.0		213.0	213.0	212.5
7.0		: READ	362.0	328.0	354.0	309.0	325.0	344.0
		: H2O(CM)	230.5	230.0	230.0	244.5	245.0	245.0
8.0		: READ	386.0	359.0	380.0	362.0	333.0	357.0
		: H2O(CM)	262.0	262.0	261.5	261.5	263.5	263.0

TENSIOMETER CALCULATIONS

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
PSI		: TIME	713.0	713.0	713.0	713.0	747.0	730.0
ETT-8								
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00							
2	60.00		-111.9	-80.1		-88.3	-97.5	-99.0
3	90.00		-123.8	-98.2	-118.7	-104.4	-127.9	-116.1
4	120.00		-109.9	-84.4	-109.1	-86.7	-94.3	-106.2
5	150.00		-116.9	-84.6	-90.2	-73.3	-75.4	-87.8
6	180.00		-119.8	-89.8		-79.9	-114.8	-115.3
7	210.00		-123.7	-89.4		-54.3	-70.2	-89.7
8	240.00		-114.5	-86.8	-108.9	-90.4	-58.5	-83.7

TOTAL HEAD		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-8		: TIME	713.0	713.0	713.0	713.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00							
2	60.00		-171.9	-140.1		-148.3	-157.5	-159.0
3	90.00		-213.8	-188.2	-208.7	-194.4	-217.9	-206.1
4	120.00		-229.9	-204.4	-229.1	-206.7	-214.3	-226.2
5	150.00		-266.9	-234.6	-240.2	-223.3	-225.4	-237.8
6	180.00		-299.8	-269.8		-259.9	-294.8	-295.3
7	210.00		-333.7	-299.4		-264.3	-280.2	-299.7
8	240.00		-354.5	-326.8	-348.9	-330.4	-298.5	-323.7

ETT-8		: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NUMBER		:						
		:						
1.0		: READ	151.0	142.0	155.0	161.0	174.0	186.0
		: H2O(CM)	64.0	59.5	56.0	5.0	54.5	54.5
2.0		: READ	159.0	166.0	183.0	113.0	175.0	199.0
		: H2O(CM)	82.0	80.5	79.0	80.0	89.0	85.0
3.0		: READ	211.0	199.0	207.0	202.0	214.0	235.0
		: H2O(CM)	121.0	120.0	119.5	119.5	119.0	118.0
4.0		: READ	242.0	235.0	251.0	273.0	267.0	276.0
		: H2O(CM)	144.5	139.0		151.0	145.0	155.0
5.0		: READ	262.0	242.0	264.0	219.0	224.0	201.0
		: H2O(CM)	176.0	175.0		171.0	178.5	177.5
6.0		: READ	325.0	330.0	340.0	339.0	339.0	354.0
		: H2O(CM)	212.0	211.0	209.5	208.5	207.5	205.5
7.0		: READ	335.0	338.0	344.0	337.0	347.0	351.0
		: H2O(CM)	245.0	244.0	243.0	242.5	241.5	234.5
8.0		: READ	354.0	360.0	373.0	377.0	383.0	395.0
		: H2O(CM)	262.0	260.5	259.0	261.0	270.0	268.0

TENSIOMETER CALCULATIONS

PSI ETT-8		: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00			-81.7	-98.7	-159.6	-119.8	-132.1
2	60.00		-74.9	-83.7	-102.8	-29.9	-83.8	-112.7
3	90.00		-86.4	-75.2	-83.9	-78.8	-91.6	-114.2
4	120.00		-93.0	-91.7		-117.8	-118.0	-116.5
5	150.00		-79.7	-60.2				
6	180.00		-105.6	-111.8	-123.7	-123.7	-124.8	-142.3
7	210.00		-80.4	-84.6	-91.8	-85.2	-96.5	-108.1
8	240.00		-81.7	-89.4	-104.4	-106.3	-102.8	-117.3

TOTAL HEAD ETT-8		: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/9/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00			-111.7	-128.7	-189.6	-149.8	-162.1
2	60.00		-134.9	-143.7	-162.8	-89.9	-143.8	-172.7
3	90.00		-176.4	-165.2	-173.9	-168.8	-181.6	-204.2
4	120.00		-213.0	-211.7		-237.8	-238.0	-236.5
5	150.00		-229.7	-210.2				
6	180.00		-285.6	-291.8	-303.7	-303.7	-304.8	-322.3
7	210.00		-290.4	-294.6	-301.8	-295.2	-306.5	-318.1
8	240.00		-321.7	-329.4	-344.4	-346.3	-342.8	-357.3

ETT-9	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
	: TIME	630.0	725.0	730.0	800.0	745.0	645.0
NUMBER	:						
	:						
1.0	: READ	161.0	177.0	162.0	171.0	144.0	150.0
	: H20(CM)	61.5	60.0	60.0	60.0	60.0	60.0
2.0	: READ	184.0	210.0	177.0	180.0	169.0	185.0
	: H20(CM)	85.0	85.0	83.0	81.5	80.0	79.0
3.0	: READ	224.0	248.0	229.0	232.0	220.0	253.0
	: H20(CM)	122.0	122.0	122.0	121.5	121.5	121.0
4.0	: READ	266.0	273.0	255.0	248.0	260.0	284.0
	: H20(CM)	145.5	144.0	142.0	140.0	151.0	151.0
5.0	: READ	288.0	305.0	288.0	287.0	267.0	300.0
	: H20(CM)	174.0	174.0	173.5	173.5	173.5	173.0
6.0	: READ	328.0	352.0	331.0	330.0	310.0	313.0
	: H20(CM)	211.0	210.5	210.0	209.5	208.0	207.0
7.0	: READ	368.0	385.0	363.0	368.0	345.0	372.0
	: H20(CM)	239.0	238.0	237.0	236.5	236.5	236.0
8.0	: READ	374.0	390.0	360.0	367.0	350.0	365.0
	: H20(CM)	267.0	266.0	261.0	258.0	264.0	258.0

TENSIOMETER CALCULATIONS

PSI ETT-9	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
	: TIME	630.0	725.0	730.0	730.0	745.0	645.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-99.0	-117.0	-101.6	-110.8	-83.2	-89.3
2	60.00	-97.3	-124.0	-92.3	-97.0	-87.3	-104.8
3	90.00	-98.6	-123.2	-103.8	-107.4	-95.1	-129.4
4	120.00	-116.5	-125.3	-109.0	-103.9	-104.4	-129.0
5	150.00	-108.4	-125.9	-109.0	-108.0	-87.5	-121.8
6	180.00	-109.7	-134.9	-113.9	-113.4	-94.5	-98.7
7	210.00	-120.7	-139.2	-117.7	-123.4	-99.8	-128.0
8	240.00	-96.8	-114.3	-88.9	-99.3	-75.4	-97.2

TOTAL HEAD ETT-9	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
	: TIME	630.0	725.0	730.0	800.0	745.0	645.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-129.0	-147.0	-131.6	-140.8	-113.2	-119.3
2	60.00	-157.3	-184.0	-152.3	-157.0	-147.3	-164.8
3	90.00	-188.6	-213.2	-193.8	-197.4	-185.1	-219.4
4	120.00	-236.5	-245.3	-229.0	-223.9	-224.4	-249.0
5	150.00	-258.4	-275.9	-259.0	-258.0	-237.5	-271.8
6	180.00	-289.7	-314.9	-293.9	-293.4	-274.5	-278.7
7	210.00	-330.7	-349.2	-327.7	-333.4	-309.8	-338.0
8	240.00	-336.8	-354.3	-328.9	-339.3	-315.4	-337.2

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-9		: TIME	713.0	713.0	713.0	713.0	747.0	730.0
NUMBER		:						
		:						
1.0		: READ	147.0	132.0	146.0	127.0	132.0	129.0
		: H2O(CM)	57.5	55.0	53.0	51.0	49.0	
2.0		: READ	183.0	163.0	170.0	158.0	163.0	170.0
		: H2O(CM)	78.0	75.5	92.0	90.0	88.0	84.0
3.0		: READ	253.0	156.0	218.0	219.0	166.0	
		: H2O(CM)	121.0		120.0	117.0		
4.0		: READ	292.0	265.0	279.0	256.0	273.0	247.0
		: H2O(CM)	151.0	151.0	151.0	151.0	151.0	146.5
5.0		: READ	306.0	271.0	299.0	271.0	284.0	262.0
		: H2O(CM)	173.0	172.5	172.0	172.0	173.0	
6.0		: READ	340.0	314.0	335.0	314.0	325.0	330.0
		: H2O(CM)	206.0	206.0	205.5	205.5	206.0	206.0
7.0		: READ	373.0	340.0	364.0	327.0	340.0	340.0
		: H2O(CM)	236.0	236.0	235.5	234.0	232.5	228.0
8.0		: READ	343.0	291.0	261.0			
		: H2O(CM)						

TENSIOMETER CALCULATIONS

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
PSI		: TIME	713.0	713.0	713.0	713.0	747.0	730.0
ETT-9								
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-88.9	-76.2	-92.7	-75.4	-82.7	
2	60.00		-103.8	-86.0	-75.5	-65.3	-72.6	-84.1
3	90.00		-129.4		-94.6	-98.9		
4	120.00		-137.2	-109.6	-123.9	-100.3	-117.8	-95.9
5	150.00		-128.0	-92.6	-121.9	-93.2	-105.4	
6	180.00		-127.4	-100.8	-122.8	-101.3	-112.0	-117.2
7	210.00		-129.0	-95.2	-120.4	-84.0	-99.0	-103.8
8	240.00							

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
TOTAL HEAD								
ETT-9		: TIME	713.0	713.0	713.0	713.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-118.9	-106.2	-122.7	-105.4	-112.7	
2	60.00		-163.8	-146.0	-135.5	-125.3	-132.6	-144.1
3	90.00		-219.4		-184.6	-188.9		
4	120.00		-257.2	-229.6	-243.9	-220.3	-237.8	-215.9
5	150.00		-278.0	-242.6	-271.9	-243.2	-255.4	
6	180.00		-307.4	-280.8	-302.8	-281.3	-292.0	-297.2
7	210.00		-339.0	-305.2	-330.4	-294.0	-309.0	-313.8

ETT-9	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NUMBER	:						
	:						
1.0	: READ	119.0	125.0	151.0	142.0	142.0	171.0
	: H20(CM)		64.0	61.0	61.0	59.5	56.0
2.0	: READ	157.0	149.0	169.0	163.0	172.0	152.0
	: H20(CM)	81.0	94.0	90.5	87.5	84.5	94.0
3.0	: READ		192.0	203.0	208.0	215.0	254.0
	: H20(CM)		116.0		120.0	119.0	111.5
4.0	: READ	228.0	254.0	273.0	271.0	284.0	300.0
	: H20(CM)	139.0	149.0	143.0	140.0	148.5	147.5
5.0	: READ	259.0	288.0	304.0	291.0	241.0	262.0
	: H20(CM)		180.0	176.0	174.0	184.5	184.0
6.0	: READ	314.0	325.0	337.0	319.0	343.0	301.0
	: H20(CM)	206.0	204.5	202.0	210.5	209.5	212.5
7.0	: READ	254.0	356.0	369.0	353.0	356.0	377.0
	: H20(CM)		232.5	231.5	230.5	229.0	241.0
8.0	: READ		352.0	340.0	367.0	371.0	400.0
	: H20(CM)		262.0		272.5	267.5	272.0

TENSIOMETER CALCULATIONS

PSI ETT-9		: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00			-59.4	-89.3	-80.0	-81.7	-115.1
2	60.00		-74.0	-51.8	-76.1	-73.1	-85.6	
3	90.00			-72.3		-84.4	-92.6	-140.7
4	120.00		-84.5	-100.4	-126.3	-127.5	-131.7	-149.2
5	150.00			-102.0	-122.7	-111.5		
6	180.00		-100.8	-113.6	-128.6	-101.1	-126.7	-80.5
7	210.00			-115.4	-129.8	-114.4	-119.1	-127.8
8	240.00			-79.6		-83.7	-93.2	-118.1

TOTAL HEAD ETT-9		: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00			-89.4	-119.3	-110.0	-111.7	-145.1
2	60.00		-134.0	-111.8	-136.1	-133.1	-145.6	
3	90.00			-162.3		-174.4	-182.6	-230.7
4	120.00		-204.5	-220.4	-246.3	-247.5	-251.7	-269.2
5	150.00			-252.0	-272.7	-261.5		
6	180.00		-280.8	-293.6	-308.6	-281.1	-306.7	-260.5
7	210.00			-325.4	-339.8	-324.4	-329.1	-337.8
8	240.00			-319.6		-323.7	-333.2	-358.1

ETT-10	: DATE / : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 730.0	8/19/88 730.0	9/2/88 745.0	9/16/88 645.0
NUMBER	:						
	:						
1.0	: READ						127.0
	: H20(CM)						61.0
2.0	: READ	189.0	212.0	193.0	202.0	185.0	154.0
	: H20(CM)	90.0	90.0	90.0	90.0	90.0	90.5
3.0	: READ	244.0	251.0	236.0	241.0	222.0	257.0
	: H20(CM)	121.5	121.5	121.0	121.0	121.0	121.0
4.0	: READ	255.0	267.0	254.0	261.0	240.0	272.0
	: H20(CM)	147.5	147.5	146.0	146.0	146.5	146.5
5.0	: READ	281.0	295.0	281.0	284.0	270.0	298.0
	: H20(CM)	176.0	176.0	175.0	175.0	175.0	175.0
6.0	: READ	320.0	343.0	332.0	341.0	274.0	357.0
	: H20(CM)	202.0	201.5	201.0	201.0	197.0	211.0
7.0	: READ	336.0	355.0	340.0	348.0	333.0	361.0
	: H20(CM)	235.0	235.0	233.0	233.0	233.0	232.0
8.0	: READ	380.0	390.0	377.0	381.0	364.0	369.0
	: H20(CM)	272.0	271.5	270.0	270.0	270.0	265.5

TENSIOMETER CALCULATIONS

PSI ETT-10 : DATE 7/6/88, 7/20/88, 8/6/88, 8/19/88, 9/2/88, 9/16/88 : TIME 630.0, 725.0, 730.0, 730.0, 745.0, 645.0

NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
	DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
	TIME	630.0	725.0	730.0	730.0	745.0	645.0
1	30.00						-64.7
2	60.00	-97.1	-120.7	-101.2	-110.4	-93.0	-60.7
3	90.00	-119.7	-126.9	-112.0	-117.1	-97.7	-133.5
4	120.00	-103.1	-115.4	-103.6	-110.8	-88.8	-121.6
5	150.00	-99.1	-113.5	-100.2	-103.3	-88.9	-117.6
6	180.00	-111.2	-135.3	-124.6	-133.8	-69.4	-139.5
7	210.00	-92.2	-111.7	-98.4	-106.6	-91.3	-121.0
8	240.00	-97.6	-108.4	-96.7	-100.8	-83.3	-93.3

TOTAL HEAD ETT-10

NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
	: TIME	630.0	725.0	730.0	730.0	745.0	645.0
1	30.00						-94.7
2	60.00	-157.1	-180.7	-161.2	-170.4	-153.0	-120.7
3	90.00	-209.7	-216.9	-202.0	-207.1	-187.7	-223.5
4	120.00	-223.1	-235.4	-223.6	-230.8	-208.8	-241.6
5	150.00	-249.1	-263.5	-250.2	-253.3	-238.9	-267.6
6	180.00	-291.2	-315.3	-304.6	-313.8	-249.4	-319.5
7	210.00	-302.2	-321.7	-308.4	-316.6	-301.3	-331.0
8	240.00	-337.6	-348.4	-336.7	-340.8	-323.3	-333.3

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-10		: TIME	713.0	713.0	713.0	713.0	747.0	730.0
NUMBER		:						
		:						
1.0		: READ	175.0	166.0	175.0	153.0	155.0	181.0
		: H20(CM)	61.0	61.0	61.0	61.0	62.0	62.0
2.0		: READ	175.0	176.0	190.0	174.0	180.0	185.0
		: H20(CM)	90.5	90.0	90.0	90.0	91.0	91.0
3.0		: READ	276.0	240.0	260.0	235.0	248.0	248.0
		: H20(CM)	120.5	120.5	120.5	120.5	121.0	121.0
4.0		: READ	277.0	243.0	261.0	239.0	240.0	220.0
		: H20(CM)	146.0	145.5	145.0	145.0	145.0	
5.0		: READ	310.0	279.0	303.0	271.0	278.0	284.0
		: H20(CM)	175.0	175.0	174.5	174.5	175.5	175.0
6.0		: READ	362.0	331.0	345.0	321.0	334.0	335.0
		: H20(CM)	211.0	211.0	210.5	210.5	210.0	210.0
7.0		: READ	33.0	303.0	360.0	344.0	353.0	356.0
		: H20(CM)			244.0	244.0	244.0	244.0
8.0		: READ	367.0	341.0	358.0	346.0	355.0	357.0
		: H20(CM)	262.5	258.5	270.5	268.0	264.5	261.5

TENSIOMETER CALCULATIONS

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
PSI		: TIME	713.0	713.0	713.0	713.0	747.0	730.0
ETT-10								
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-113.9	-104.6	-113.9	-91.3	-92.3	-118.9
2	60.00		-82.2	-83.8	-98.1	-81.7	-86.8	-91.9
3	90.00		-153.6	-116.7	-137.2	-111.5	-124.3	-124.3
4	120.00		-127.2	-92.9	-111.9	-89.3	-90.4	
5	150.00		-129.9	-98.1	-123.3	-90.5	-96.6	-103.3
6	180.00		-144.6	-112.8	-127.7	-103.1	-117.0	-118.0
7	210.00				-107.1	-90.7	-100.0	-103.0
8	240.00		-94.5	-72.1	-76.7	-67.0	-80.0	-85.3

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
TOTAL HEAD								
ETT-10		: TIME	713.0	713.0	713.0	713.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-143.9	-134.6	-143.9	-121.3	-122.3	-148.9
2	60.00		-142.2	-143.8	-158.1	-141.7	-146.8	-151.9
3	90.00		-243.6	-206.7	-227.2	-201.5	-214.3	-214.3
4	120.00		-247.2	-212.9	-231.9	-209.3	-210.4	
5	150.00		-279.9	-248.1	-273.3	-240.5	-246.6	-253.3
6	180.00		-324.6	-292.8	-307.7	-283.1	-297.0	-298.0
7	210.00				-317.1	-300.7	-310.0	-313.0
8	240.00		-334.5	-312.1	-316.7	-307.0	-320.0	-325.3

ETT-10	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NUMBER	:						
	:						
1.0	: READ	167.0	160.0	178.0	166.0	150.0	159.0
	: H20(CM)	61.5	61.0	60.5	60.3	61.0	61.0
2.0	: READ	169.0	169.0	200.0	181.0	191.0	205.0
	: H20(CM)	90.5	90.0	89.0	89.0	88.5	88.5
3.0	: READ	239.0	241.0	263.0	248.0	253.0	278.0
	: H20(CM)	121.0	120.0	119.0	118.5	118.5	117.0
4.0	: READ	187.0	184.0	135.0	254.0	290.0	305.0
	: H20(CM)				149.0	154.0	152.5
5.0	: READ	260.0	290.0	314.0	301.0	304.0	321.0
	: H20(CM)	171.5	178.0	176.5	176.0	175.5	174.0
6.0	: READ	330.0	337.0	350.0	343.0	343.0	368.0
	: H20(CM)	209.5	208.0	206.5	205.5	205.5	203.5
7.0	: READ	347.0	344.0	358.0	356.0	353.0	373.0
	: H20(CM)	244.0	243.0	242.0	241.0	240.0	238.5
8.0	: READ	344.0	349.0	251.0	345.0	356.0	396.0
	: H20(CM)	259.5	265.5		270.5	267.0	264.5

TENSIOMETER CALCULATIONS

PSI ETT-10	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-105.1	-98.5	-117.5	-105.4	-88.2	-97.5
2	60.00	-76.1	-76.6	-109.5	-90.0	-100.8	-115.1
3	90.00	-115.1	-118.2	-141.8	-127.0	-132.1	-159.4
4	120.00				-100.4	-132.0	-148.9
5	150.00	-82.4	-106.2	-132.4	-119.6	-123.2	-142.3
6	180.00	-113.4	-122.2	-137.1	-131.0	-131.0	-158.8
7	210.00	-93.8	-91.8	-107.2	-106.3	-104.3	-126.4
8	240.00	-74.1	-72.8			-78.4	-122.0

TOTAL HEAD ETT-10	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-135.1	-128.5	-147.5	-135.4	-118.2	-127.5
2	60.00	-136.1	-136.6	-169.5	-150.0	-160.8	-175.1
3	90.00	-205.1	-208.2	-231.8	-217.0	-222.1	-249.4
4	120.00				-220.4	-252.0	-268.9
5	150.00	-232.4	-256.2	-282.4	-269.6	-273.2	-292.3
6	180.00	-293.4	-302.2	-317.1	-311.0	-311.0	-338.8
7	210.00	-303.8	-301.8	-317.2	-316.3	-314.3	-336.4
8	240.00	-314.1	-312.8			-318.4	-362.0

ETT-11	: DATE : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 700.0	8/19/88 725.0	9/2/88 700.0	9/16/88 700.0
NUMBER	:						
	:						
1.0	: READ		92.0	139.0	97.0		120.0
	: H20(CM)				48.0		62.5
2.0	: READ	193.0	213.0	195.0	206.0	189.0	156.0
	: H20(CM)	87.5	87.0	87.0	86.5	87.5	88.5
3.0	: READ	227.0	237.0	223.0	239.0	208.0	246.0
	: H20(CM)	117.0	117.0	117.0	116.5	117.0	116.5
4.0	: READ	238.0	255.0	234.0	248.0	230.0	259.0
	: H20(CM)	145.5	144.5	144.5	144.5	144.5	144.0
5.0	: READ	280.0	299.0	277.0	290.0	271.0	291.0
	: H20(CM)	177.0	177.0	176.5	176.5	176.5	176.5
6.0	: READ	324.0	349.0	334.0	339.0	325.0	353.0
	: H20(CM)	210.0	209.5	209.0	209.0	209.0	208.0
7.0	: READ	344.0	363.0	348.0	355.0	346.0	369.0
	: H20(CM)	232.5	232.5	232.5	232.5	232.5	232.0
8.0	: READ	351.0	371.5	350.0	360.0	346.0	372.0
	: H20(CM)	262.0	261.5	261.0	261.0	260.5	260.0

TENSIOMETER CALCULATIONS

PSI ETT-11	: DATE : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 700.0	8/19/88 725.0	9/2/88 700.0	9/16/88 700.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00				-47.9		-55.9
2	60.00	-103.9	-124.9	-106.5	-118.3	-99.8	-64.9
3	90.00	-107.1	-117.3	-103.0	-119.9	-87.6	-127.1
4	120.00	-87.8	-106.3	-84.8	-99.1	-80.7	-110.9
5	150.00	-97.0	-116.5	-94.5	-107.8	-88.3	-108.8
6	180.00	-106.7	-132.9	-118.0	-123.2	-108.8	-138.6
7	210.00	-103.1	-122.6	-107.2	-114.4	-105.1	-129.2
8	240.00	-78.6	-100.1	-78.6	-88.9	-75.1	-102.3

TOTAL HEAD ETT-11	: DATE : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 700.0	8/19/88 725.0	9/2/88 700.0	9/16/88 700.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00				-77.9		-85.9
2	60.00	-163.9	-184.9	-166.5	-178.3	-159.8	-124.9
3	90.00	-197.1	-207.3	-193.0	-209.9	-177.6	-217.1
4	120.00	-207.8	-226.3	-204.8	-219.1	-200.7	-230.9
5	150.00	-247.0	-266.5	-244.5	-257.8	-238.3	-258.8
6	180.00	-286.7	-312.9	-298.0	-303.2	-288.8	-318.6
7	210.00	-313.1	-332.6	-317.2	-324.4	-315.1	-339.2
8	240.00	-318.6	-340.1	-318.6	-328.9	-315.1	-342.3

ETT-11		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
		: TIME	720.0	720.0	719.0	700.0	747.0	730.0
NUMBER	:							
	:							
1.0	:	READ	183.0	168.0	178.0	161.0	172.0	181.0
	:	H2O(CM)	62.0	61.0	60.5	60.0	60.0	60.0
2.0	:	READ	168.0	178.0	187.0	168.0	171.0	178.0
	:	H2O(CM)	88.0	87.5	87.5	87.5	88.0	88.0
3.0	:	READ	229.0	214.0	223.0	203.0	186.0	210.0
	:	H2O(CM)	117.0	116.5	116.5	116.0	109.5	108.0
4.0	:	READ	267.0	236.0	251.0	224.0	210.0	170.0
	:	H2O(CM)	144.5	144.0	143.5	142.5	136.0	
5.0	:	READ	277.0	245.0	280.0	269.0	279.0	280.0
	:	H2O(CM)	172.5		178.5	178.0	171.0	171.0
6.0	:	READ	305.0	287.0	288.0	272.0	272.0	274.0
	:	H2O(CM)	201.5	195.0	206.5	198.0		
7.0	:	READ	359.0	314.0	328.0	337.0	380.0	383.0
	:	H2O(CM)	230.0		228.5		243.0	243.5
8.0	:	READ	373.0	351.0	354.0	346.0	343.0	361.0
	:	H2O(CM)	260.0	260.0	275.0	275.0	275.0	275.0

TENSIOMETER CALCULATIONS

PSI ETT-11		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
		: TIME	720.0	720.0	719.0	700.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-121.0	-106.7	-117.5	-100.6	-111.9	-121.1
2	60.00		-77.7	-88.5	-97.7	-78.3	-80.8	-88.0
3	90.00		-109.1	-94.3	-103.5	-83.6	-73.1	-99.3
4	120.00		-118.6	-87.3	-103.2	-76.6	-69.3	
5	150.00		-98.8		-95.4	-84.7	-102.4	-103.5
6	180.00		-96.4	-84.9	-73.6	-66.3		
7	210.00		-121.1		-91.0		-128.7	-131.2
8	240.00		-103.3	-80.7	-67.7	-59.5	-56.4	-74.9

TOTAL HEAD ETT-11		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
		: TIME	720.0	720.0	719.0	700.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-151.0	-136.7	-147.5	-130.6	-141.9	-151.1
2	60.00		-137.7	-148.5	-157.7	-138.3	-140.8	-148.0
3	90.00		-199.1	-184.3	-193.5	-173.6	-163.1	-189.3
4	120.00		-238.6	-207.3	-223.2	-196.6	-189.3	
5	150.00		-248.8		-245.4	-234.7	-252.4	-253.5
6	180.00		-276.4	-264.9	-253.6	-246.3		
7	210.00		-331.1		-301.0		-338.7	-341.2
8	240.00		-343.3	-320.7	-307.7	-299.5	-296.5	-314.9

ETT-11	: DATE / : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NUMBER	:						
	:						
1.0	: READ	174.0	167.0	200.0	179.0	180.0	219.0
	: H20(CM)	59.5	59.0	58.0	57.5	57.5	55.0
2.0	: READ	174.0	174.0	210.0	191.0	180.0	221.0
	: H20(CM)	87.5	86.5	85.5	85.5	85.5	85.0
3.0	: READ	201.0	228.0	242.0	228.0	232.0	180.0
	: H20(CM)	107.0	119.5	118.0	117.5	116.0	122.5
4.0	: READ	139.0	173.0	138.0	193.0	208.0	193.0
	: H20(CM)				142.5	149.5	152.0
5.0	: READ	267.0	269.0	287.0	258.0	261.0	305.0
	: H20(CM)	170.5	168.5	166.0	180.0	179.5	177.0
6.0	: READ	250.0	313.0	329.0	304.0	287.0	351.0
	: H20(CM)		203.0	195.0	207.0	210.0	202.5
7.0	: READ	371.0	365.0	380.0	373.0	370.0	307.0
	: H20(CM)	243.0	242.0	240.0	239.0	237.5	241.5
8.0	: READ	363.0	362.0	372.0	362.0	362.0	383.0
	: H20(CM)	274.5	273.5	272.5	271.5	270.5	267.0

TENSIOMETER CALCULATIONS

PSI : DATE / : TIME

ETT-11

NO.	DPTH BELOW DATUM(CM)	2/10/89 730.0 PSI (CM)	3/24/89 650.0 PSI (CM)	4/21/89 700.0 PSI (CM)	5/9/89 714.0 PSI (CM)	6/7/89 630.0 PSI (CM)	7/20/89 640.0 PSI (CM)
1	30.00	-114.5	-107.8	-142.7	-121.7	-122.8	-165.4
2	60.00	-84.4	-85.5	-123.5	-104.0	-92.7	-135.3
3	90.00	-91.2	-105.4	-121.4	-107.6	-113.3	
4	120.00						
5	150.00	-90.7	-94.9	-116.0			-122.7
6	180.00		-103.0	-127.9	-89.4		-142.4
7	210.00	-119.5	-114.4	-131.9	-125.8	-124.4	
8	240.00	-77.5	-77.5	-88.9	-79.7	-80.8	-106.0

TOTAL HEAD : DATE / ETT-11 : TIME

NO.	DPTH BELOW DATUM(CM)	2/10/89 730.0 THEAD (CM)	3/24/89 650.0 THEAD (CM)	4/21/89 700.0 THEAD (CM)	5/9/89 714.0 THEAD (CM)	6/7/89 630.0 THEAD (CM)	7/20/89 640.0 THEAD (CM)
1	30.00	-144.5	-137.8	-172.7	-151.7	-152.8	-195.4
2	60.00	-144.4	-145.5	-183.5	-164.0	-152.7	-195.3
3	90.00	-181.2	-195.4	-211.4	-197.6	-203.3	
4	120.00			-120.0			-120.0
5	150.00	-240.7	-244.9	-266.0			-272.7
6	180.00		-283.0	-307.9	-269.4	-180.0	-322.4
7	210.00	-329.5	-324.4	-341.9	-335.8	-334.4	
8	240.00	-317.5	-317.5	-328.9	-319.7	-320.8	-346.0

ETT-12		7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
ETT-12	: TIME	630.0	725.0	700.0	725.0	700.0	700.0
NUMBER	:						
	:						
1.0	: READ	145.0	168.0	152.0	153.0	134.0	163.0
	: H20(CM)	52.0	52.0	52.0	52.0	53.0	53.0
2.0	: READ	208.0	220.0	205.0	206.0	192.0	147.0
	: H20(CM)	90.0	89.5	89.5	89.5	89.5	90.0
3.0	: READ	215.0	241.0	224.0	229.0	219.0	254.0
	: H20(CM)	117.5	117.5	117.5	117.0	117.0	117.0
4.0	: READ	234.0	249.0	237.0	237.0	231.0	262.0
	: H20(CM)	144.0	144.0	143.5	143.0	143.0	142.5
5.0	: READ	281.0	303.0	288.0	289.0	281.0	312.0
	: H20(CM)	179.0	178.5	178.0	178.0	178.5	177.5
6.0	: READ	324.0	351.0	329.0	331.0	318.0	347.0
	: H20(CM)	212.5	212.5	212.0	212.0	212.0	211.5
7.0	: READ	308.0	333.0	320.0	324.0	318.0	342.0
	: H20(CM)	234.5	234.5	234.0	234.0	234.0	234.0
8.0	: READ	347.0	370.0	357.0	358.0	353.0	377.0
	: H20(CM)	262.5	262.0	262.0	261.5	261.5	261.0

TENSIOMETER CALCULATIONS

PSI ETT-12	: DATE : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 700.0	8/19/88 725.0	9/2/88 700.0	9/16/88 700.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-92.8	-116.4	-100.0	-101.0	-80.4	-110.2
2	60.00	-116.6	-129.4	-114.0	-115.1	-100.7	-54.1
3	90.00	-94.2	-120.9	-103.5	-109.1	-98.9	-134.8
4	120.00	-85.3	-100.7	-88.9	-89.4	-83.3	-115.6
5	150.00	-95.9	-119.0	-104.2	-105.2	-96.4	-129.3
6	180.00	-104.0	-131.7	-109.7	-111.7	-98.4	-128.7
7	210.00	-64.0	-89.7	-76.9	-81.0	-74.8	-99.4
8	240.00	-74.0	-98.1	-84.7	-86.3	-81.2	-106.3

TOTAL HEAD ETT-12	: DATE : TIME	7/6/88 630.0	7/20/88 725.0	8/6/88 700.0	8/19/88 725.0	9/2/88 700.0	9/16/88 700.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-122.8	-146.4	-130.0	-131.0	-110.4	-140.2
2	60.00	-176.6	-189.4	-174.0	-175.1	-160.7	-114.1
3	90.00	-184.2	-210.9	-193.5	-199.1	-188.9	-224.8
4	120.00	-205.3	-220.7	-208.9	-209.4	-203.3	-235.6
5	150.00	-245.9	-269.0	-254.2	-255.2	-246.4	-279.3
6	180.00	-284.0	-311.7	-289.7	-291.7	-278.4	-308.7
7	210.00	-274.0	-299.7	-286.9	-291.0	-284.8	-309.4
8	240.00	-314.0	-338.1	-324.7	-326.3	-321.2	-346.3

		9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
	: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-12	: TIME	720.0	720.0	719.0	700.0	747.0	730.0
NUMBER	:						
	:						
1.0	: READ	166.0	132.0				
	: H20(CM)	51.5	49.0				
2.0	: READ	167.0	134.0	191.0	181.0	183.0	202.0
	: H20(CM)	90.0	89.5	89.5	89.5	90.0	89.5
3.0	: READ	214.0	216.0	228.0	208.0	223.0	231.0
	: H20(CM)	116.5	115.5	115.0	114.5	115.0	115.0
4.0	: READ	266.0	232.0	254.0	226.0	246.0	228.0
	: H20(CM)	142.0	142.0	142.0	141.5	142.0	
5.0	: READ	311.0	281.0	307.0	285.0	159.0	
	: H20(CM)	178.0	178.0	179.5	177.5		
6.0	: READ	352.0	325.0	307.0	294.0	295.0	297.0
	: H20(CM)	211.5	211.5	179.5	233.0	203.0	
7.0	: READ	348.0	326.0	326.0	328.0	259.0	243.0
	: H20(CM)	233.5	233.0	210.0			
8.0	: READ			344.0			
	: H20(CM)			233.0			

TENSIOMETER CALCULATIONS

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
PSI		: TIME	720.0	720.0	719.0	700.0	747.0	730.0
ETT-12								
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-114.8	-82.7				
2	60.00		-74.6	-41.3	-99.7	-89.4	-91.0	-111.0
3	90.00		-94.3	-97.4	-110.3	-90.3	-105.1	-113.3
4	120.00		-120.2	-85.4	-107.9	-79.8	-99.7	
5	150.00		-127.7	-97.0	-122.0	-101.6		
6	180.00		-133.8	-106.1	-122.0	-51.3	-84.5	
7	210.00		-106.1	-84.1	-108.8			
8	240.00				-102.5			

		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
TOTAL HEAD		: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-12		: TIME	720.0	720.0	719.0	700.0	747.0	730.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-144.8	-112.7				
2	60.00		-134.6	-101.3	-159.7	-149.4	-151.0	-171.0
3	90.00		-184.3	-187.4	-200.3	-180.3	-195.1	-203.3
4	120.00		-240.2	-205.4	-227.9	-199.8	-219.7	
5	150.00		-277.7	-247.0	-272.0	-251.6		
6	180.00		-313.8	-286.1	-302.0	-231.3	-264.5	
7	210.00		-316.1	-294.1	-318.8			
8	240.00				-342.5			

ETT-12	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NUMBER	:						
	:						
1.0	: READ		122.0	143.0	155.0	172.0	235.0
	: H20(CM)		52.5		56.0	55.5	54.5
2.0	: READ	196.0	189.0	204.0	200.0	181.0	221.0
	: H20(CM)	88.5	87.5	86.5	86.0	86.0	86.0
3.0	: READ	187.0	198.0	203.0	220.0	226.0	250.0
	: H20(CM)		111.0		115.5	113.0	112.0
4.0	: READ	229.0	238.0	248.0	237.0	228.0	260.0
	: H20(CM)		152.0	151.0	150.0	148.5	146.5
5.0	: READ		263.0	275.0	295.0	297.0	322.0
	: H20(CM)				173.0	172.5	171.5
6.0	: READ	251.0		263.0	281.0	318.0	344.0
	: H20(CM)				206.5	204.5	203.0
7.0	: READ	221.0	330.0	341.0	335.0	336.0	323.0
	: H20(CM)		235.5	233.0	232.0	230.5	244.0
8.0	: READ		344.0	250.0		326.0	351.0
	: H20(CM)		262.5			265.0	272.5

TENSIOMETER CALCULATIONS

PSI ETT-12		: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00			-68.7		-98.7	-116.7	-182.3
2	60.00		-105.9	-99.8	-116.2	-112.7	-93.2	-134.2
3	90.00			-83.8		-101.5	-110.4	-136.0
4	120.00			-80.8	-92.1	-81.9		-109.3
5	150.00					-116.7	-119.3	-146.0
6	180.00					-66.4	-106.5	-134.7
7	210.00			-85.5	-99.5	-94.4	-97.0	
8	240.00			-70.9				

TOTAL HEAD ETT-12		: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00			-98.7		-128.7	-146.7	-212.3
2	60.00		-165.9	-159.8	-176.2	-172.7	-153.2	-194.2
3	90.00			-173.8		-191.5	-200.4	-226.0
4	120.00			-200.8	-212.1	-201.9		-229.3
5	150.00					-266.7	-269.3	-296.0
6	180.00					-246.4	-286.5	-314.7
7	210.00			-295.5	-309.5	-304.4	-307.0	
8	240.00			-310.9				

ETT-13	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
	: TIME	630.0	725.0	700.0	725.0	700.0	700.0
NUMBER	:						
	:						
1.0	: READ	164.0	176.0	154.0	158.0	117.0	152.0
	: H20(CM)	54.5	53.5	53.0	53.0	49.0	
2.0	: READ	235.0	233.0	213.0	213.0	192.0	134.0
	: H20(CM)	90.0	90.0	90.0	90.0	90.0	91.0
3.0	: READ	261.0	270.0	247.0	250.0	228.0	262.0
	: H20(CM)	120.0	120.5	120.5	120.5	120.0	118.5
4.0	: READ	268.0	285.0	268.0	274.0	248.0	282.0
	: H20(CM)	143.5	143.0	143.0	143.0	143.5	143.0
5.0	: READ	302.0	306.0	289.0	292.0	269.0	295.0
	: H20(CM)	174.0	172.0	172.0	171.5	171.0	170.0
6.0	: READ	358.0	376.0	372.0	378.0	379.0	386.0
	: H20(CM)	201.0	201.0	200.0	200.0	200.0	199.5
7.0	: READ	347.0	369.0	359.0	364.0	351.0	371.0
	: H20(CM)	233.5	232.5	232.0	232.0	231.5	231.5
8.0	: READ	377.0	384.0	366.0	369.0	353.0	382.0
	: H20(CM)	261.0	260.5	260.0	260.0	260.0	260.0

TENSIOMETER CALCULATIONS

PSI ETT-13	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
	: TIME	630.0	725.0	700.0	7225.0	700.0	700.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-109.6	-122.9	-100.9	-105.0	-67.3	
2	60.00	-144.3	-142.2	-121.7	-121.7	-100.2	-39.7
3	90.00	-138.7	-147.4	-123.8	-126.9	-104.9	-141.3
4	120.00	-120.7	-138.6	-121.2	-127.4	-100.2	-135.6
5	150.00	-122.8	-129.0	-111.6	-115.2	-92.2	-119.9
6	180.00	-151.2	-169.7	-166.6	-172.8	-173.8	-181.5
7	210.00	-105.1	-128.7	-119.0	-124.1	-111.3	-131.8
8	240.00	-106.3	-114.0	-96.1	-99.2	-82.8	-112.5

TOTAL HEAD ETT-13	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
	: TIME	630.0	725.0	700.0	725.0	700.0	700.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-139.6	-152.9	-130.9	-135.0	-97.3	
2	60.00	-204.3	-202.2	-181.7	-181.7	-160.2	-99.7
3	90.00	-228.7	-237.4	-213.8	-216.9	-194.9	-231.3
4	120.00	-240.7	-258.6	-241.2	-247.4	-220.2	-255.6
5	150.00	-272.8	-279.0	-261.6	-265.2	-242.2	-269.9
6	180.00	-331.2	-349.7	-346.7	-352.8	-353.8	-361.5
7	210.00	-315.1	-338.7	-329.0	-334.1	-321.3	-341.8
8	240.00	-346.3	-354.0	-336.1	-339.2	-322.8	-352.5

ETT-13	: DATE : TIME	9/30/88 720.0	10/15/88 720.0	10/29/88 719.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NUMBER	:						
	:						
1.0	: READ	128.0	92.0	84.0			
	: H20(CM)						
2.0	: READ	165.0	188.0	201.0	184.0	193.0	190.0
	: H20(CM)	90.5	90.0	89.5	89.0	90.0	89.5
3.0	: READ	241.0	221.0	217.0	187.0	260.0	291.0
	: H20(CM)	114.0	110.5	105.0		125.5	124.5
4.0	: READ	289.0	234.0	153.5	273.0	293.0	296.0
	: H20(CM)	143.0	134.0	305.0	153.5	153.5	153.5
5.0	: READ	303.0	282.0	184.0	290.0	309.0	287.0
	: H20(CM)	169.5	169.0	307.0	183.0	182.0	178.5
6.0	: READ	385.0	348.0	207.5	314.0	253.0	228.0
	: H20(CM)	199.5	199.5	360.0	205.5		
7.0	: READ	372.0	335.0	230.0	297.0	230.0	112.0
	: H20(CM)	231.5	231.0	290.0			
8.0	: READ	382.0	338.0				
	: H20(CM)	259.5					

TENSIOMETER CALCULATIONS

PSI ETT-13	: DATE : TIME	9/30/88 720.0	10/15/88 720.0	10/29/88 719.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00						
2	60.00	-72.0	-96.1	-109.9	-93.1	-101.2	-98.7
3	90.00	-124.7	-107.9	-109.7		-131.8	-164.6
4	120.00	-142.7	-96.0	170.0	-115.1	-135.6	-138.6
5	150.00	-128.7	-107.7	140.9	-100.8	-121.4	-102.6
6	180.00	-180.5	-142.6	173.6	-101.3		
7	210.00	-132.9	-95.5	75.5			
8	240.00	-113.1					

TOTAL HEAD ETT-13	: DATE : TIME	9/30/88 720.0	10/15/88 720.0	10/29/88 719.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00						
2	60.00	-132.0	-156.1	-169.9	-153.1	-161.2	-158.7
3	90.00	-214.7	-197.9	-199.7		-221.8	-254.6
4	120.00	-262.7	-216.0	50.0	-235.1	-255.6	-258.6
5	150.00	-278.7	-257.7	-9.1	-250.8	-271.4	-252.6
6	180.00	-360.5	-322.6	-6.4	-281.3		
7	210.00	-342.9	-305.5	-134.5			
8	240.00	-353.1					

ETT-13	: DATE / : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NUMBER	:						
	:						
1.0	: READ		131.0	164.0	143.0	160.0	190.0
	: H2O(CM)		62.0	61.5	61.5	61.5	61.0
2.0	: READ	199.0	204.0	223.0	202.0	198.0	234.0
	: H2O(CM)	89.0	87.5	86.5	86.0	85.5	84.5
3.0	: READ	281.0	283.0	284.0	267.0	263.0	284.0
	: H2O(CM)	125.0	124.5	124.0	123.5	123.5	122.5
4.0	: READ	284.0	289.0	296.0	278.0	276.0	294.0
	: H2O(CM)	153.5	152.5	152.0	151.5	151.0	150.0
5.0	: READ	281.0	320.0	330.0	311.0	308.0	330.0
	: H2O(CM)	169.0	182.0	181.5	181.0	180.5	179.0
6.0	: READ	228.0	182.0	130.0	338.0	337.0	364.0
	: H2O(CM)				205.0	203.5	202.0
7.0	: READ		354.0	366.0	356.0	352.0	373.0
	: H2O(CM)		239.0	236.0	235.0	234.0	232.5
8.0	: READ		335.0	303.0		319.0	335.0
	: H2O(CM)		256.0			264.5	263.0

TENSIOMETER CALCULATIONS

PSI
ETT-13

NO.	DPTH BELOW DATUM(CM)	: DATE 2/10/89 : TIME 730.0 PSI (CM)	3/24/89 650.0 PSI (CM)	4/21/89 700.0 PSI (CM)	5/9/89 714.0 PSI (CM)	6/7/89 630.0 PSI (CM)	7/20/89 640.0 PSI (CM)
1	30.00		-67.7	-102.1	-80.5	-98.0	-129.2
2	60.00	-108.4	-115.2	-135.7	-114.7	-111.2	-149.1
3	90.00	-153.9	-156.4	-158.0	-141.1	-137.0	-159.6
4	120.00	-126.3	-132.5	-140.3	-122.3	-120.8	-140.4
5	150.00	-106.6	-132.7	-143.5	-124.5	-122.0	-146.1
6	180.00				-126.4	-127.0	-156.3
7	210.00		-106.4	-121.9	-112.7	-109.7	-132.8
8	240.00		-68.6				

TOTAL HEAD
ETT-13

NO.	DPTH BELOW DATUM(CM)	: DATE 2/10/89 : TIME 730.0 THEAD (CM)	3/24/89 650.0 THEAD (CM)	4/21/89 700.0 THEAD (CM)	5/9/89 714.0 THEAD (CM)	6/7/89 630.0 THEAD (CM)	7/20/89 640.0 THEAD (CM)
1	30.00		-97.7	-132.1	-110.5	-128.0	-159.2
2	60.00	-168.4	-175.2	-195.7	-174.7	-171.2	-209.1
3	90.00	-243.9	-246.4	-248.0	-231.1	-227.0	-249.6
4	120.00	-246.3	-252.5	-260.3	-242.3	-240.8	-260.4
5	150.00	-256.6	-282.7	-293.5	-274.5	-272.0	-296.1
6	180.00				-306.4	-307.0	-336.3
7	210.00		-316.4	-331.9	-322.7	-319.7	-342.8
8	240.00		-308.6				

		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
ETT-14		: TIME	630.0	730.0	700.0	725.0	700.0	700.0
NUMBER		:						
		:						
1.0		: READ	156.0	173.0	155.0	168.0	129.0	174.0
		: H20(CM)	59.5	59.5	59.5	59.5	60.0	60.0
2.0		: READ	203.0	221.0	202.0	210.0	195.0	175.0
		: H20(CM)	89.5	89.5	89.5	89.5	89.5	90.0
3.0		: READ	235.0	263.0	246.0	255.0	232.0	281.0
		: H20(CM)	116.0	116.0	116.0	116.0	116.0	115.5
4.0		: READ	254.0	273.0	258.0	262.0	241.0	200.0
		: H20(CM)	150.0	150.0	150.0	150.0	150.0	
5.0		: READ	276.0	292.0	276.0	282.0	267.0	295.0
		: H20(CM)	175.0	175.0	175.0	175.0	175.0	174.5
6.0		: READ	351.0	373.0	364.0	369.0	310.0	346.0
		: H20(CM)	202.0	202.0	201.5	201.5	200.5	198.0
7.0		: READ	341.0	371.0	360.0	366.0	359.0	378.0
		: H20(CM)	233.0	232.5	232.5	232.0	232.0	231.5
8.0		: READ	353.0	372.0	355.0	360.0	335.0	350.0
		: H20(CM)	259.5	259.0	258.5	258.0	256.5	265.5

TENSIOMETER CALCULATIONS

		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
PSI		: TIME	630.0	730.0	700.0	725.0	700.0	700.0
ETT-14								
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-96.0	-113.4	-95.0	-108.3	-67.8	-113.9
2	60.00		-112.0	-130.4	-111.0	-119.2	-103.8	-82.8
3	90.00		-116.4	-145.1	-127.6	-136.9	-113.3	-164.0
4	120.00		-99.3	-118.8	-103.4	-107.5	-86.0	
5	150.00		-95.1	-111.5	-95.1	-101.2	-85.8	-115.1
6	180.00		-143.0	-165.5	-156.8	-162.0	-102.6	-142.1
7	210.00		-99.5	-130.8	-119.5	-126.2	-119.0	-139.0
8	240.00		-83.3	-103.3	-86.5	-92.1	-68.1	-73.8

		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
TOTAL HEAD ETT-14		: TIME	630.0	730.0	700.0	725.0	700.0	700.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-126.0	-143.4	-125.0	-138.3	-97.8	-143.9
2	60.00		-172.0	-190.4	-171.0	-179.2	-163.8	-142.8
3	90.00		-206.4	-235.1	-217.6	-226.9	-203.3	-254.0
4	120.00		-219.4	-238.8	-223.5	-227.5	-206.0	
5	150.00		-245.1	-261.5	-245.1	-251.2	-235.9	-265.1
6	180.00		-323.0	-345.5	-336.8	-342.0	-282.6	-322.1
7	210.00		-309.5	-340.8	-329.5	-336.2	-329.0	-349.0
8	240.00		-323.3	-343.3	-326.5	-332.1	-308.1	-313.8

ETT-14	: DATE : TIME	9/30/88 720.0	10/15/88 720.0	10/29/88 719.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NUMBER	:						
	:						
1.0	: READ	168.0	149.0	153.0	88.0	70.0	
	: H2O(CM)	60.0	60.0	58.5	63.5		
2.0	: READ	183.0	182.0	189.0	161.0	171.0	187.0
	: H2O(CM)	90.0	89.5	89.5	89.0	89.0	88.5
3.0	: READ	275.0	238.0	265.0	241.0	260.0	255.0
	: H2O(CM)	115.5	115.5	115.5	115.5	116.0	116.0
4.0	: READ		115.0		231.0	267.0	278.0
	: H2O(CM)				154.5	149.5	145.5
5.0	: READ	300.0	278.0	295.0	255.0	265.0	263.0
	: H2O(CM)	174.5		173.0	170.0	166.0	
6.0	: READ	350.0	313.0	178.0	336.0	415.0	279.0
	: H2O(CM)	196.0			211.0	209.0	
7.0	: READ	352.0	330.0	305.0			
	: H2O(CM)	226.5					
8.0	: READ	360.0	333.0	310.0			
	: H2O(CM)	262.0					

TENSIOMETER CALCULATIONS

PSI ETT-14	: DATE : TIME	9/30/88 720.0	10/15/88 720.0	10/29/88 719.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-107.8	-88.3	-94.0	-22.0		
2	60.00	-91.0	-90.5	-97.6	-69.5	-79.7	-96.7
3	90.00	-157.9	-120.0	-147.6	-123.0	-142.0	-136.9
4	120.00				-70.9	-113.2	-128.8
5	150.00	-120.2		-116.7	-78.9	-93.5	
6	180.00	-148.4			-117.9	-201.1	
7	210.00	-117.7					
8	240.00	-87.8					

TOTAL HEAD ETT-14	: DATE : TIME	9/30/88 720.0	10/15/88 720.0	10/29/88 719.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-137.8	-118.3	-124.0	-52.0		
2	60.00	-151.0	-150.5	-157.6	-129.5	-139.7	-156.7
3	90.00	-247.9	-210.0	-237.6	-213.0	-232.0	-226.9
4	120.00				-190.9	-233.2	-248.8
5	150.00	-270.2		-266.7	-228.9	-243.5	
6	180.00	-328.4			-297.9	-381.1	
7	210.00	-327.7					
8	240.00	-327.8					

ETT-14	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NUMBER	:						
	:						
1.0	: READ		139.0	163.0	160.0	156.0	213.0
	: H2O(CM)		64.0	63.5	63.5	63.5	63.0
2.0	: READ	177.0	182.0			173.0	161.0
	: H2O(CM)	88.0	87.0			93.5	94.5
3.0	: READ	248.0	255.0	267.0	220.0	255.0	283.0
	: H2O(CM)	115.5	114.0	113.0	112.5	112.0	110.0
4.0	: READ	243.0	285.0	271.0	260.0	262.0	289.0
	: H2O(CM)	140.0	154.5	147.5	145.5	141.5	153.0
5.0	: READ	247.0	293.0	308.0	291.0	294.0	309.0
	: H2O(CM)		183.0	182.0	181.5	181.0	179.5
6.0	: READ	257.0	172.0		244.0	335.0	377.0
	: H2O(CM)					212.5	210.0
7.0	: READ		335.0	332.0	368.0	370.0	395.0
	: H2O(CM)		232.0		238.0	237.0	235.5
8.0	: READ		226.0		328.0	348.0	364.0
	: H2O(CM)				261.0	259.0	268.5

TENSIOMETER CALCULATIONS

PSI ETT-14	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-73.8	-98.9	-95.8	-91.7	-150.7
2	60.00	-87.0	-93.1			-76.9	
3	90.00	-130.2	-139.0	-152.4	-104.7	-141.1	-172.0
4	120.00	-98.8	-126.3	-119.5	-110.3	-116.7	-132.0
5	150.00		-103.9	-120.4	-103.5	-107.1	-124.1
6	180.00					-115.3	-161.0
7	210.00		-94.4		-121.8	-124.9	-152.1
8	240.00					-78.7	-84.9

TOTAL HEAD ETT-14	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-103.8	-128.9	-125.8	-121.7	-180.7
2	60.00	-147.0	-153.1			-136.9	
3	90.00	-220.2	-229.0	-242.4	-194.7	-231.1	-262.0
4	120.00	-218.8	-246.3	-239.5	-230.3	-236.7	-252.0
5	150.00		-253.9	-270.4	-253.5	-257.1	-274.1
6	180.00					-295.3	-341.0
7	210.00		-304.4		-331.8	-334.9	-362.1
8	240.00					-318.7	-324.9

ETT-15		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
		: TIME	630.0	730.0	700.0	725.0	700.0	700.0
NUMBER		:						
		:						
1.0		: READ	134.0	158.0	148.0	155.0	130.0	150.0
		: H2O(CM)	60.5	60.5	60.5	60.5	60.5	60.5
2.0		: READ	163.0	191.0	174.0	186.0	175.0	130.0
		: H2O(CM)	93.0	93.0	93.0	93.0	93.0	93.0
3.0		: READ	240.0	252.0	237.0	240.0	227.0	260.0
		: H2O(CM)	127.5	117.5	117.5	117.5	117.5	117.5
4.0		: READ	254.0	273.0	263.0	260.0	251.0	277.0
		: H2O(CM)	146.5	147.0	146.5	146.5	146.5	146.5
5.0		: READ	301.0	317.0	305.0	280.0	266.0	293.0
		: H2O(CM)	179.5	179.5	179.5	175.5	172.0	167.5
6.0		: READ		357.0	340.0	336.0	324.0	354.0
		: H2O(CM)		211.0	211.0	210.5	210.5	200.0
7.0		: READ	340.0	355.0	347.0	351.0	343.0	372.0
		: H2O(CM)	232.0	232.0	231.5	231.5	231.5	231.0
8.0		: READ	354.0	377.0	363.0	374.0	357.0	370.0
		: H2O(CM)	261.0	260.5	260.0	260.0	260.0	259.0

TENSIOMETER CALCULATIONS

PSI ETT-15		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
		: TIME	630.0	730.0	700.0	725.0	700.0	700.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-72.4	-97.0	-86.7	-93.9	-68.3	-88.8
2	60.00		-67.2	-95.9	-78.5	-90.8	-79.5	-33.4
3	90.00		-109.1	-132.2	-116.8	-119.9	-106.5	-140.4
4	120.00		-103.1	-122.0	-112.3	-109.3	-100.0	-126.7
5	150.00		-115.9	-132.3	-120.0	-98.6	-88.0	-120.5
6	180.00			-139.5	-122.0	-118.5	-106.2	-148.2
7	210.00		-99.5	-114.9	-107.2	-111.3	-103.1	-133.4
8	240.00		-82.7	-106.9	-93.0	-104.3	-86.9	-101.3

TOTAL HEAD ETT-15		: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
		: TIME	630.0	730.0	700.0	725.0	700.0	700.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-102.4	-127.0	-116.7	-123.9	-98.3	-118.8
2	60.00		-127.2	-155.9	-138.5	-150.8	-139.5	-93.4
3	90.00		-199.1	-222.2	-206.8	-209.9	-196.5	-230.4
4	120.00		-223.1	-242.0	-232.3	-229.3	-220.0	-246.7
5	150.00		-265.9	-282.3	-270.0	-248.6	-238.0	-270.5
6	180.00			-319.5	-302.0	-298.5	-286.2	-328.2
7	210.00		-309.5	-324.9	-317.2	-321.3	-313.1	-343.4
8	240.00		-322.7	-346.9	-333.0	-344.3	-326.9	-341.3

ETT-15		: DATE / : TIME	9/30/88 720.0	10/15/88 720.0	10/29/88 719.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NUMBER		:						
		:						
1.0		: READ	151.0	141.0	151.0	125.0	114.0	
		: H2O(CM)	61.0	61.0	60.5	60.0	60.0	59.0
2.0		: READ	162.0	158.0	159.0	125.0		
		: H2O(CM)	92.0	90.0	86.5			
3.0		: READ	239.0	206.0	256.0	235.0	244.0	270.0
		: H2O(CM)	112.5		124.0	124.0	125.0	124.5
4.0		: READ	294.0	257.0	280.0	244.0	223.0	200.0
		: H2O(CM)	146.5	146.0	146.0	145.5		
5.0		: READ	295.0	262.0	181.0			
		: H2O(CM)						
6.0		: READ	363.0	275.0	220.0	284.0	336.0	355.0
		: H2O(CM)	210.0			214.0	213.0	212.5
7.0		: READ	368.0	339.0	358.0	335.0	346.0	350.0
		: H2O(CM)	231.0	231.0	231.0	231.0	232.0	231.5
8.0		: READ	359.0	328.0	282.0			
		: H2O(CM)						

TENSIOMETER CALCULATIONS

PSI
ETT-15

NO.	DPTH BELOW DATUM(CM)	: DATE / : TIME	9/30/88 720.0	10/15/88 720.0	10/29/88 720.0	11/11/88 6.3	12/9/88 747.0	1/18/89 730.0
			PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-89.3	-79.0	-89.8	-63.7	-52.4	
2	60.00		-67.3	-65.3	-70.1			
3	90.00		-124.2		-129.3	-107.8	-115.9	-143.1
4	120.00		-144.1	-106.7	-130.3	-93.9		
5	150.00							
6	180.00		-146.7			-61.4	-115.8	-135.8
7	210.00		-129.3	-99.6	-119.0	-95.5	-105.7	-110.3
8	240.00							

TOTAL HEAD
ETT-15

NO.	DPTH BELOW DATUM(CM)	: DATE / : TIME	9/30/88 720.0	10/15/88 720.0	10/29/88 720.0	11/11/88 6.3	12/9/88 747.0	1/18/89 730.0
			THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-119.3	-109.0	-119.8	-93.7	-82.4	
2	60.00		-127.3	-125.3	-130.1			
3	90.00		-214.2		-219.3	-197.8	-205.9	-233.1
4	120.00		-264.1	-226.7	-250.3	-213.9		
5	150.00							
6	180.00		-326.7			-241.4	-295.8	-315.8
7	210.00		-339.3	-309.6	-329.0	-305.5	-315.7	-320.3
8	240.00							

ETT-15	: DATE / TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NUMBER	:						
	:						
1.0	: READ	135.0	123.0	152.0	153.0	150.0	194.0
	: H20(CM)	58.5	50.0		61.5	62.0	62.0
2.0	: READ		118.0			106.0	119.0
	: H20(CM)					88.5	90.0
3.0	: READ	245.0	260.0	270.0	254.0	256.0	280.0
	: H20(CM)	124.5	124.0	121.0	121.0	120.0	118.0
4.0	: READ	171.0	270.0	289.0	270.0	281.0	301.0
	: H20(CM)		150.0	148.0	146.5	145.5	141.5
5.0	: READ		280.0	307.0	302.0	301.0	329.0
	: H20(CM)		180.0	179.0	179.0	178.5	178.0
6.0	: READ	336.0	338.0	340.0	332.0	335.0	345.0
	: H20(CM)	212.0	211.0	210.0	209.0	208.0	206.5
7.0	: READ	339.0	337.0	357.0	365.0	375.0	383.0
	: H20(CM)	231.0	229.0	225.0	241.0	240.0	238.5
8.0	: READ						
	: H20(CM)						

TENSIOMETER CALCULATIONS

PSI
ETT-15

NO.	DPTH BELOW DATUM(CM)	: DATE / TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
			PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-75.6	-72.4		-90.8	-87.2	-132.3
2	60.00							
3	90.00		-117.5	-133.4	-146.9	-130.5	-133.6	-160.3
4	120.00			-115.7	-137.4	-119.5	-131.9	-156.6
5	150.00			-93.8	-122.6	-117.4	-116.9	-146.2
6	180.00		-116.9	-120.0	-123.1	-116.0	-120.1	-132.0
7	210.00		-99.6	-99.7	-124.4	-115.5	-126.8	-136.6
8	240.00							

TOTAL HEAD
ETT-15

NO.	DPTH BELOW DATUM(CM)	: DATE / TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
			THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-105.6	-102.4		-120.8	-117.2	-162.3
2	60.00							
3	90.00		-207.5	-223.4	-236.9	-220.5	-223.6	-250.3
4	120.00			-235.8	-257.4	-239.5	-251.9	-276.6
5	150.00			-243.8	-272.6	-267.4	-266.9	-296.2
6	180.00		-296.9	-300.0	-303.1	-296.0	-300.1	-312.0
7	210.00		-309.6	-309.7	-334.5	-325.5	-336.8	-346.6
8	240.00							

ETT-16	: DATE	7/6/88	7/20/88	8/6/88	8/19/88	9/2/88	9/16/88
	: TIME	630.0	730.0	700.0	725.0	700.0	705.0
NUMBER	:						
	:						
1.0	: READ	137.0	146.0	135.0	142.0	113.0	125.0
	: H2O(CM)	62.0	62.0	62.0	62.0	62.0	62.5
2.0	: READ	155.0	172.0	161.0	166.0	163.0	131.0
	: H2O(CM)	94.0	93.5	93.5	93.5	93.5	94.0
3.0	: READ	250.0	260.0	242.0	237.0	224.0	261.0
	: H2O(CM)	116.0	116.0	116.0	116.0	116.0	115.5
4.0	: READ	269.0	293.0	277.0	277.0	259.0	293.0
	: H2O(CM)	144.0	144.0	143.5	143.5	143.5	143.5
5.0	: READ	306.0	316.0	301.0	299.0	287.0	319.0
	: H2O(CM)	176.0	175.5	175.5	175.0	175.0	175.0
6.0	: READ	325.0	336.0	326.0	325.0	314.0	342.0
	: H2O(CM)	205.0	204.5	204.0	204.0	204.0	203.5
7.0	: READ	362.0	379.0	368.0	368.0	364.0	383.0
	: H2O(CM)	232.5	232.0	231.5	231.0	231.0	230.5
8.0	: READ	364.0	403.0	390.0	392.0	384.0	402.0
	: H2O(CM)	265.0	263.5	263.0	262.0	262.0	261.5

TENSIOMETER CALCULATIONS

PSI : TIME — ETT-16

NO.	DPTH BELOW DATUM(CM)	PSI (CM) 7/6/88 630.0	PSI (CM) 7/20/88 730.0	PSI (CM) 8/6/88 700.0	PSI (CM) 8/19/88 725.0	PSI (CM) 9/2/88 700.0	PSI (CM) 9/16/88 705.0
1	30.00	-73.8	-83.1	-71.8	-79.0	-49.2	-61.0
2	60.00	-58.0	-75.9	-64.6	-69.8	-66.7	-33.4
3	90.00	-131.7	-142.0	-123.5	-118.4	-105.1	-143.5
4	120.00	-121.2	-145.8	-129.9	-129.9	-111.4	-146.3
5	150.00	-124.8	-135.5	-120.2	-118.6	-106.3	-139.1
6	180.00	-113.1	-124.9	-115.2	-114.2	-102.9	-132.1
7	210.00	-121.5	-139.5	-128.8	-129.3	-125.2	-145.2
8	240.00	-88.7	-130.3	-117.5	-120.6	-112.4	-131.4

TOTAL HEAD — ETT-16

NO.	DPTH BELOW DATUM(CM)	THEAD (CM) 7/6/88 630.0	THEAD (CM) 7/20/88 730.0	THEAD (CM) 8/6/88 700.0	THEAD (CM) 8/19/88 725.0	THEAD (CM) 9/2/88 700.0	THEAD (CM) 9/16/88 705.0
1	30.00	-103.8	-113.1	-101.8	-109.0	-79.2	-91.0
2	60.00	-118.0	-135.9	-124.6	-129.8	-126.7	-93.4
3	90.00	-221.7	-232.0	-213.5	-208.4	-195.1	-233.5
4	120.00	-241.2	-265.8	-249.9	-249.9	-231.4	-266.3
5	150.00	-274.8	-285.5	-270.2	-268.7	-256.3	-289.2
6	180.00	-293.1	-304.9	-295.2	-294.2	-282.9	-312.1
7	210.00	-331.5	-349.5	-338.8	-339.3	-335.2	-355.2
8	240.00	-328.7	-370.3	-357.5	-360.6	-352.4	-371.4

ETT-16	: DATE : TIME	9/30/88 727.0	10/15/88 720.0	10/29/88 727.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NUMBER	:						
	:						
1.0	: READ	142.0	133.0	138.0	124.0	116.0	
	: H2O(CM)	62.5	62.5	62.5	63.0	63.5	63.0
2.0	: READ	150.0	147.0	150.0	141.0	151.0	151.0
	: H2O(CM)	94.0	93.5	94.0	93.5	94.0	94.0
3.0	: READ	233.0	218.0	238.0	220.0	239.0	228.0
	: H2O(CM)	115.5	115.0	114.0	114.0	114.5	113.5
4.0	: READ	295.0	260.0	285.0	255.0	268.0	266.0
	: H2O(CM)	143.5	143.5	143.5	143.0	143.0	142.0
5.0	: READ	317.0	286.0	309.0	284.0	297.0	301.0
	: H2O(CM)	175.0	175.0	174.5	174.5	175.5	175.5
6.0	: READ	341.0	311.0	332.0	310.0	327.0	327.0
	: H2O(CM)	204.0	204.0	203.5	203.5	204.5	204.5
7.0	: READ	382.0	351.0	374.0	353.0	374.0	362.0
	: H2O(CM)	230.5	230.5	230.0	230.0	231.0	231.0
8.0	: READ	276.0	228.0	278.0			
	: H2O(CM)						

TENSIOMETER CALCULATIONS

PSI ETT-16	: DATE : TIME	9/30/88 727.0	10/15/88 720.0	10/29/88 727.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-78.4	-69.2	-74.3	-59.5	-50.7	
2	60.00	-52.8	-50.3	-52.8	-44.1	-53.9	-53.9
3	90.00	-114.8	-100.0	-121.6	-103.1	-122.1	-111.9
4	120.00	-148.3	-112.5	-138.1	-107.9	-121.2	-120.2
5	150.00	-137.1	-105.3	-129.4	-103.8	-116.1	-120.2
6	180.00	-130.6	-99.8	-121.9	-99.3	-115.7	-115.7
7	210.00	-144.2	-112.4	-136.5	-115.0	-135.4	-123.1
8	240.00						

TOTAL HEAD ETT-16	: DATE : TIME	9/30/88 727.0	10/15/88 720.0	10/29/88 727.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-108.4	-99.2	-104.3	-89.5	-80.7	
2	60.00	-112.8	-110.3	-112.8	-104.1	-113.9	-113.9
3	90.00	-204.8	-190.0	-211.6	-193.1	-212.1	-201.9
4	120.00	-268.3	-232.5	-258.1	-227.9	-241.2	-240.2
5	150.00	-287.1	-255.3	-279.4	-253.8	-266.1	-270.2
6	180.00	-310.6	-279.8	-301.9	-279.3	-295.7	-295.7
7	210.00	-354.2	-322.4	-346.5	-325.0	-345.4	-333.1
8	240.00						

ETT-16	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NUMBER	:						
	:						
1.0	: READ	142.0	118.0	139.0	129.0	142.0	246.0
	: H2O(CM)	63.0	63.0	63.0	63.0	63.0	62.0
2.0	: READ	137.0	136.0	162.0	137.0	154.0	167.0
	: H2O(CM)	84.5	93.0	90.0	89.0	89.0	88.5
3.0	: READ	206.0	207.0	165.0	213.0	238.0	290.0
	: H2O(CM)	107.5	117.0		114.0	124.5	123.0
4.0	: READ	255.0	255.0	278.0	295.0	290.0	316.0
	: H2O(CM)	141.0	138.5	135.0	150.0	149.0	147.5
5.0	: READ	287.0	290.0	304.0	296.0	298.0	326.0
	: H2O(CM)	175.0	173.0	172.0	171.0	170.5	169.0
6.0	: READ	310.0	320.0	333.0	319.0	332.0	359.0
	: H2O(CM)	204.0	202.5	201.0	200.0	215.0	213.5
7.0	: READ	344.0	348.0	360.0	366.0	370.0	386.0
	: H2O(CM)	231.0	229.0	227.5	235.5	234.0	232.0
8.0	: READ						
	: H2O(CM)						

TENSIOMETER CALCULATIONS

PSI ETT-16	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-77.9	-53.3	-74.8	-64.6	-77.9	-185.6
2	60.00	-49.7	-39.6	-69.4		-62.3	-76.2
3	90.00	-95.8	-86.6		-96.0	-110.3	-165.2
4	120.00	-110.0	-112.7	-140.0	-141.4	-137.3	-165.6
5	150.00	-106.3	-111.6	-127.0	-119.9	-122.5	-152.8
6	180.00	-98.8	-110.7	-125.6	-112.3	-109.6	-138.8
7	210.00	-104.7	-110.9	-124.8	-122.4	-128.1	-146.7
8	240.00						

TOTAL HEAD ETT-16	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-107.9	-83.3	-104.8	-94.6	-107.9	-215.6
2	60.00	-109.7	-99.6	-129.4		-122.3	-136.2
3	90.00	-185.8	-176.6		-186.0	-200.3	-255.2
4	120.00	-230.0	-232.7	-260.0	-261.4	-257.3	-285.6
5	150.00	-256.3	-261.6	-277.0	-269.9	-272.5	-302.8
6	180.00	-278.8	-290.7	-305.6	-292.3	-289.6	-318.8
7	210.00	-314.7	-320.9	-334.8	-332.4	-338.1	-356.7
8	240.00						

ETT-17	: DATE : TIME	7/6/88 630.0	7/20/88 730.0	8/6/88 700.0	8/19/88 725.0	9/2/88 700.0	9/16/88 705.0
NUMBER	:						
	:						
1.0	: READ	144.0	164.0	143.0	151.0	139.0	154.0
	: H20(CM)	60.5	60.5	60.5	60.5	60.5	61.0
2.0	: READ	150.0	167.0	158.0	161.0	164.0	183.0
	: H20(CM)	92.5	92.5	92.5	92.5	92.5	92.0
3.0	: READ	216.0	217.0	216.0	219.0	204.0	226.0
	: H20(CM)	116.5	114.5	113.5	113.5	114.0	112.0
4.0	: READ						241.0
	: H20(CM)						144.5
5.0	: READ	308.0	316.0	300.0	304.0	254.0	
	: H20(CM)	176.0	176.0	175.5	175.5	168.0	
6.0	: READ	353.0	368.0	354.0	353.0	340.0	346.0
	: H20(CM)	200.0	200.0	200.0	200.0	200.0	200.0
7.0	: READ	336.0	349.0	336.0	340.0	334.0	357.0
	: H20(CM)	230.0	230.0	229.4	229.0	230.0	228.5
8.0	: READ	469.0	478.0	451.0	453.0	447.0	445.0
	: H20(CM)	274.5	274.0	273.0	273.0	272.5	272.0

TENSIOMETER CALCULATIONS

PSI ETT-17		: DATE : TIME	7/6/88 630.0	7/20/88 730.0	8/6/88 700.0	8/19/88 730.0	9/2/88 700.0	9/16/88 705.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-82.6	-103.1	-81.6	-89.8	-77.5	-92.3
2	60.00		-54.4	-71.9	-62.6	-65.7	-68.8	-88.8
3	90.00		-96.3	-99.5	-99.6	-102.6	-86.7	-111.4
4	120.00							-91.9
5	150.00		-126.8	-135.0	-119.1	-123.2	-80.0	
6	180.00		-147.2	-162.5	-148.2	-147.2	-133.8	-140.0
7	210.00		-97.6	-110.9	-98.2	-102.7	-95.5	-120.7
8	240.00		-186.1	-195.9	-169.3	-171.3	-165.7	-164.2

TOTAL HEAD ETT-17		: DATE : TIME	7/6/88 630.0	7/20/88 730.0	8/6/88 700.0	8/19/88 6.3	9/2/88 700.0	9/16/88 705.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-112.6	-133.1	-111.6	-119.8	-107.5	-122.3
2	60.00		-114.4	-131.9	-122.6	-125.7	-128.8	-148.8
3	90.00		-186.3	-189.5	-189.6	-192.6	-176.7	-201.4
4	120.00							-211.9
5	150.00		-276.8	-285.0	-269.1	-273.2	-230.0	
6	180.00		-327.2	-342.6	-328.2	-327.2	-313.8	-320.0
7	210.00		-307.6	-320.9	-308.2	-312.7	-305.5	-330.7
8	240.00		-426.1	-435.9	-409.3	-411.3	-405.7	-404.2

ETT-17		9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
	: DATE	9/30/88	10/15/88	10/29/88	11/11/88	12/9/88	1/18/89
ETT-17	: TIME	727.0	720.0	727.0	700.0	747.0	730.0
NUMBER	:						
	:						
1.0	: READ	155.0	136.0	153.0	122.0	113.0	119.0
	: H2O(CM)	59.5	60.0	59.5	57.0	49.5	
2.0	: READ	171.0	162.0	178.0	165.0	183.0	181.0
	: H2O(CM)	92.0	92.0	92.0	91.5	92.0	92.0
3.0	: READ	232.0	200.0				
	: H2O(CM)	111.0	109.0				
4.0	: READ	300.0	277.0	301.0	284.0	302.0	306.0
	: H2O(CM)	144.5	144.5	144.5	144.5	144.5	144.5
5.0	: READ			230.0	233.0	213.0	
	: H2O(CM)			316.0			
6.0	: READ	330.0	298.0	198.0	292.0	328.0	329.0
	: H2O(CM)	199.5	199.0				
7.0	: READ	354.0	320.0		276.0	257.0	231.0
	: H2O(CM)	226.5					
8.0	: READ	285.0	263.0				
	: H2O(CM)						

TENSIOMETER CALCULATIONS

PSI ETT-17		: DATE / : TIME	9/30/88 727.0	10/15/88 730.0	10/29/88 730.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-95.0	-75.0	-92.9	-63.8	-62.7	
2	60.00		-76.5	-67.3	-83.7	-70.9	-88.8	-86.8
3	90.00		-118.6	-88.0				
4	120.00		-152.4	-128.8	-153.4	-136.0	-154.5	-158.6
5	150.00				103.4			
6	180.00		-124.1	-91.9				
7	210.00		-119.8					
8	240.00							

TOTAL HEAD ETT-17		: DATE / : TIME	9/30/88 727.0	10/15/88 730.0	10/29/88 730.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-125.0	-105.0	-122.9	-93.8	-92.7	
2	60.00		-136.5	-127.3	-143.7	-130.9	-148.8	-146.8
3	90.00		-208.6	-178.0				
4	120.00		-272.4	-248.8	-273.4	-256.0	-274.5	-278.6
5	150.00				-46.6			
6	180.00		-304.1	-271.9				
7	210.00		-329.8					
8	240.00							

ETT-17	: DATE / : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NUMBER	:						
	:						
1.0	: READ	101.0	126.0	148.0	129.0	128.0	169.0
	: H20(CM)		55.0		63.0	62.5	62.0
2.0	: READ	143.0	159.0	189.0	161.0	128.0	140.0
	: H20(CM)	82.0	91.0	87.0	78.0	91.5	85.0
3.0	: READ		225.0	245.0	229.0	231.0	258.0
	: H20(CM)		122.5	122.5	121.5	121.5	120.0
4.0	: READ	269.0	264.0	274.0	265.0	276.0	294.0
	: H20(CM)	144.5	143.0	142.0	141.0	140.0	139.5
5.0	: READ		299.0	287.0	229.0	258.0	271.0
	: H20(CM)		180.5		174.5	184.0	181.5
6.0	: READ	302.0	362.0	373.0	367.0	371.0	390.0
	: H20(CM)		208.0	206.5	205.5	204.5	202.5
7.0	: READ	174.0	305.0	310.0	213.0	310.0	329.0
	: H20(CM)		230.0		239.5	241.0	242.0
8.0	: READ		204.0			187.0	269.0
	: H20(CM)						

TENSIOMETER CALCULATIONS

PSI ETT-17	: DATE / : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-70.1		-64.6	-64.1	-106.6
2	60.00	-58.5	-65.3	-100.3	-81.3		
3	90.00		-99.1	-119.6	-104.3	-106.4	-135.6
4	120.00	-120.6	-117.1	-128.4	-120.3	-132.6	-151.6
5	150.00		-112.7				-83.0
6	180.00		-147.8	-160.7	-155.6	-160.8	-182.4
7	210.00		-65.8				-77.5
8	240.00						

TOTAL HEAD ETT-17	: DATE / : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-100.1		-94.6	-94.1	-136.6
2	60.00	-118.5	-125.3	-160.3	-141.3		
3	90.00		-189.1	-209.6	-194.3	-196.4	-225.6
4	120.00	-240.6	-237.1	-248.4	-240.3	-252.6	-271.6
5	150.00		-262.7				-233.0
6	180.00		-327.8	-340.7	-335.6	-340.8	-362.4
7	210.00		-275.8				-287.5
8	240.00						

ETT-18	: DATE : TIME	7/6/88 630.0	7/20/88 730.0	8/6/88 700.0	8/19/88 730.0	9/2/88 700.0	9/16/88 705.0
NUMBER	:						
	:						
1.0	: READ	152.0	173.0	162.0	173.0	125.0	153.0
	: H2O(CM)	59.0	59.0	59.0	59.0	59.5	59.5
2.0	: READ	206.0	220.0	210.0	215.0	209.0	139.0
	: H2O(CM)	90.5	90.5	90.5	90.5	90.5	91.0
3.0	: READ	212.0	235.0	224.0	235.0	209.0	248.0
	: H2O(CM)	110.0	109.5	109.5	109.5	110.0	109.5
4.0	: READ	261.0	279.0	271.0	275.0	258.0	252.0
	: H2O(CM)	147.0	146.5	146.5	146.5	146.5	140.0
5.0	: READ	288.0	305.0	294.0	301.0	290.0	308.0
	: H2O(CM)	177.5	177.5	177.0	177.0	177.0	176.5
6.0	: READ	289.0	306.0	294.0	301.0	281.0	299.0
	: H2O(CM)	208.5	209.0	208.5	208.0	208.0	200.0
7.0	: READ		148.0				
	: H2O(CM)						
8.0	: READ	363.0	382.0	376.0	378.0	368.0	392.0
	: H2O(CM)	267.5	267.0	266.5	266.5	266.5	266.5

TENSIOMETER CALCULATIONS

PSI ETT-18		: DATE : TIME	7/6/88 630.0	7/20/88 730.0	8/6/88 700.0	8/19/88 730.0	9/2/88 700.0	9/16/88 705.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-92.4	-114.0	-102.7	-114.0	-64.2	-92.9
2	60.00		-114.0	-128.3	-118.1	-123.2	-117.1	-44.8
3	90.00		-99.2	-123.3	-112.1	-123.3	-96.1	-136.7
4	120.00		-109.7	-128.7	-120.5	-124.6	-107.2	-108.0
5	150.00		-104.7	-122.1	-111.4	-118.6	-107.3	-126.3
6	180.00		-72.5	-89.3	-77.6	-85.3	-64.8	-91.8
7	210.00							
8	240.00		-85.0	-105.0	-99.4	-101.4	-91.2	-115.8

TOTAL HEAD ETT-18		: DATE : TIME	7/6/88 630.0	7/20/88 730.0	8/6/88 700.0	1/27/87 1615.0	9/2/88 700.0	9/16/88 705.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-122.4	-144.0	-132.7	-144.0	-94.2	-122.9
2	60.00		-174.0	-188.3	-178.1	-183.2	-177.1	-104.8
3	90.00		-189.2	-213.3	-202.1	-213.3	-186.1	-226.7
4	120.00		-229.7	-248.7	-240.5	-244.6	-227.2	-228.0
5	150.00		-254.7	-272.1	-261.4	-268.6	-257.3	-276.3
6	180.00		-252.5	-269.3	-257.6	-265.3	-244.8	-271.8
7	210.00							
8	240.00		-325.0	-345.0	-339.4	-341.4	-331.2	-355.8

ETT-18	: DATE : TIME	9/30/88 727.0	10/15/88 730.0	10/29/88 730.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NUMBER	:						
	:						
1.0	: READ	168.0	148.0	162.0	134.0	144.0	
	: H2O(CM)	59.5	59.5	59.5	59.5	60.0	60.0
2.0	: READ	187.0	194.0	208.0	182.0	198.0	193.0
	: H2O(CM)	91.0	90.5	90.5	90.5	91.5	91.5
3.0	: READ	249.0	213.0	230.0	208.0	220.0	230.0
	: H2O(CM)	109.0	108.0	105.0	105.0	120.0	117.5
4.0	: READ	260.0	230.0	243.0	199.0		
	: H2O(CM)						
5.0	: READ	314.0	283.0	306.0	262.0	242.0	239.0
	: H2O(CM)	176.0	175.5	175.0	175.5		
6.0	: READ	286.0	258.0	227.0	193.0		
	: H2O(CM)						
7.0	: READ						
	: H2O(CM)						
8.0	: READ	384.0	338.0	347.0	329.0	312.0	322.0
	: H2O(CM)	265.5					

TENSIOMETER CALCULATIONS

PSI ETT-18		: DATE : TIME	9/30/88 727.0	10/15/88 730.0	10/29/88 730.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-108.3	-87.8	-102.2	-73.5	-83.2	ERR
2	60.00		-94.0	-101.7	-116.0	-89.4	-104.7	-99.6
3	90.00		-138.2	-102.4	-123.0	-100.5	-96.7	-109.6
4	120.00							
5	150.00		-133.0	-101.7	-125.8	-80.2		
6	180.00							
7	210.00							
8	240.00		-108.7					

TOTAL HEAD ETT-18		: DATE : TIME	9/30/88 727.0	10/15/88 730.0	10/29/88 730.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-138.3	-117.8	-132.2	-103.5	-113.2	
2	60.00		-154.0	-161.7	-176.0	-149.4	-164.7	-159.6
3	90.00		-228.2	-192.4	-213.0	-190.5	-186.7	-199.6
4	120.00							
5	150.00		-283.0	-251.7	-275.8	-230.2		
6	180.00							
7	210.00							
8	240.00		-348.7					

ETT-18	: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/890	7/20/89
	: TIME	730.0	650.0	700.0	714.0	630.0	640.0
NUMBER	:						
	:						
1.0	: READ	143.0	149.0	167.0	152.0	175.0	275.0
	: H20(CM)	60.0	60.0	59.5	59.5	59.0	57.0
2.0	: READ	177.0	183.0	212.0	205.0	197.0	230.0
	: H20(CM)	91.0	90.5	90.0	89.5	89.5	88.5
3.0	: READ	216.0	234.0	262.0	235.0	235.0	262.0
	: H20(CM)	116.5	115.5	114.5	114.0	113.5	110.5
4.0	: READ		267.0	292.0	272.0	280.0	305.0
	: H20(CM)		149.5	148.5	148.0	147.5	145.5
5.0	: READ	187.0	169.0	158.0	292.0	304.0	286.0
	: H20(CM)				172.0	171.0	183.0
6.0	: READ		80.0			200.0	221.0
	: H20(CM)					200.0	206.5
7.0	: READ						
	: H20(CM)						
8.0	: READ	222.0	318.0	292.0	340.0	274.0	384.0
	: H20(CM)				261.5	255.0	267.0

TENSIOMETER CALCULATIONS

PSI ETT-18		: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
		: TIME	730.0	650.0	700.0	714.0	630.0	640.0
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-82.1	-88.3	-107.3	-91.9	-116.0	-220.7
2	60.00		-83.7	-90.4	-120.7	-114.0	-105.8	-140.7
3	90.00		-96.3	-115.9	-145.6	-118.5	-119.0	-149.9
4	120.00			-113.2	-139.9	-119.9	-128.7	-156.5
5	150.00					-114.7	-128.1	-96.7
6	180.00							
7	210.00							
8	240.00							-107.1

TOTAL HEAD ETT-18		: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
		: TIME	730.0	650.0	700.0	714.0	630.0	640.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-112.1	-118.3	-137.3	-121.9	-146.0	-250.7
2	60.00		-143.7	-150.4	-180.7	-174.0	-165.8	-200.7
3	90.00		-186.3	-205.9	-235.6	-208.5	-209.0	-239.9
4	120.00			-233.2	-259.9	-239.9	-248.7	-276.5
5	150.00					-264.7	-278.1	-246.7
6	180.00						-180.0	-180.0
7	210.00							
8	240.00							-347.1

ETT-19	: DATE / : TIME	7/6/88 630.0	7/20/88 730.0	8/6/88 700.0	8/19/88 730.0	9/2/88 700.0	9/16/88 705.0
NUMBER	:						
	:						
1.0	: READ	135.0	141.0	127.0	127.0	118.0	152.0
	: H20(CM)	65.0	65.0	65.0	65.5	65.5	65.5
2.0	: READ	201.0	217.0	203.0	205.0	167.0	
	: H20(CM)	82.0	81.0	82.0	82.0	79.0	
3.0	: READ	248.0	257.0	241.0	239.0	239.0	266.0
	: H20(CM)	123.5	123.5	123.0	123.0	123.0	122.5
4.0	: READ	312.0	316.0	302.0	294.0	290.0	304.0
	: H20(CM)	149.5	149.5	149.0	149.0	149.0	149.0
5.0	: READ	308.0	318.0	312.0	311.0	307.0	336.0
	: H20(CM)	176.0	176.0	175.5	175.5	175.5	175.5
6.0	: READ	345.0	350.0	334.0	337.0	315.0	347.0
	: H20(CM)	201.5	201.0	201.0	201.0	201.5	201.0
7.0	: READ	384.0	400.0	392.0	396.0	392.0	408.0
	: H20(CM)	234.0	233.5	233.0	232.5	232.5	232.5
8.0	: READ	414.0	420.0	410.0	412.0	405.0	426.0
	: H20(CM)	266.5	266.0	265.5	265.0	265.0	264.5

TENSIOMETER CALCULATIONS

PSI

ETT-19

NO.	DPTH BELOW DATUM(CM)	: DATE / : TIME	7/6/88 630.0	7/20/88 730.0	8/6/88 700.0	8/19/88 730.0	9/2/88 700.0	9/16/88 705.0
			PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00		-68.6	-74.7	-60.4	-59.8	-50.6	-85.5
2	60.00		-118.0	-135.5	-120.0	-122.1	-86.4	
3	90.00		-121.6	-130.9	-115.0	-112.9	-112.9	-141.2
4	120.00		-159.3	-163.4	-149.6	-141.4	-137.3	-151.7
5	150.00		-126.8	-137.1	-131.4	-130.4	-126.3	-156.0
6	180.00		-137.4	-143.0	-126.6	-129.7	-106.6	-140.0
7	210.00		-142.5	-159.4	-151.7	-156.4	-152.3	-168.7
8	240.00		-138.3	-145.0	-135.3	-137.9	-130.7	-152.8

TOTAL HEAD

ETT-19

NO.	DPTH BELOW DATUM(CM)	: DATE / : TIME	7/6/88 630.0	7/20/88 730.0	8/6/88 700.0	8/19/88 730.0	9/2/88 700.0	9/16/88 705.0
			THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00		-98.6	-104.7	-90.4	-89.8	-80.6	-115.5
2	60.00		-178.0	-195.5	-180.0	-182.1	-146.4	
3	90.00		-211.6	-220.9	-205.0	-202.9	-202.9	-231.2
4	120.00		-279.3	-283.4	-269.6	-261.4	-257.3	-271.7
5	150.00		-276.8	-287.1	-281.4	-280.4	-276.3	-306.0
6	180.00		-317.4	-323.0	-306.6	-309.7	-286.6	-320.0
7	210.00		-352.5	-369.4	-361.7	-366.4	-362.3	-378.7
8	240.00		-378.3	-385.0	-375.3	-377.9	-370.7	-392.8

ETT-19	: DATE / : TIME	9/30/88 727.0	10/15/88 730.0	10/29/88 730.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NUMBER	:						
	:						
1.0	: READ	151.0	139.0	141.0	121.0	89.0	
	: H20(CM)	65.5	65.5	65.5	65.5	65.5	65.5
2.0	: READ	151.0	182.0				
	: H20(CM)						
3.0	: READ	249.0	229.0	237.0	219.0	237.0	254.0
	: H20(CM)	122.5	122.5	122.5	122.5	122.5	122.5
4.0	: READ	302.0	274.0	291.0			
	: H20(CM)	149.0	149.0	148.5			
5.0	: READ	340.0	307.0	333.0	293.0	295.0	279.0
	: H20(CM)	175.0	175.0	175.0	174.5	172.5	
6.0	: READ	332.0	308.0	340.0	310.0	302.0	304.0
	: H20(CM)	201.5	201.5	200.5	200.5	202.0	202.5
7.0	: READ	363.0	226.0		152.0	242.0	
	: H20(CM)	226.5					
8.0	: READ	413.0	383.0	406.0	381.0	402.0	391.0
	: H20(CM)	264.5	263.5	263.0	262.5	262.5	262.5

TENSIOMETER CALCULATIONS

PSI ETT-19	: DATE / : TIME	9/30/88 727.0	10/15/88 730.0	10/29/88 730.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-84.4	-72.1	-74.2	-53.7	-20.9	
2	60.00						
3	90.00	-123.7	-103.2	-111.4	-93.0	-111.4	-128.9
4	120.00	-149.6	-120.9	-138.9			
5	150.00	-160.7	-126.8	-153.5	-113.0	-117.2	
6	180.00	-124.0	-99.4	-133.3	-102.6	-92.8	-94.3
7	210.00	-129.0					
8	240.00	-139.5	-109.8	-133.9	-108.8	-130.3	-119.1

TOTAL HEAD ETT-19	: DATE / : TIME	9/30/88 727.0	10/15/88 730.0	10/29/88 730.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-114.4	-102.1	-104.2	-83.7	-50.9	
2	60.00						
3	90.00	-213.7	-193.2	-201.4	-183.0	-201.4	-218.9
4	120.00	-269.6	-240.9	-258.9			
5	150.00	-310.7	-276.8	-303.5	-263.0	-267.2	
6	180.00	-304.0	-279.4	-313.3	-282.6	-272.8	-274.3
7	210.00	-339.0					
8	240.00	-379.5	-349.8	-373.9	-348.8	-370.3	-359.1

ETT-19	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NUMBER	:						
	:						
1.0	: READ	144.0	148.0	170.0	166.0	178.0	213.0
	: H20(CM)	66.0	65.5	65.0	64.5	64.0	63.0
2.0	: READ	0.0				174.0	184.0
	: H20(CM)					93.0	92.5
3.0	: READ	244.0	243.0	257.0	251.0	254.0	282.0
	: H20(CM)	122.0	121.5	120.0	120.0	119.5	118.0
4.0	: READ	0.0					
	: H20(CM)						
5.0	: READ	257.0	245.0			237.0	313.0
	: H20(CM)					178.5	170.5
6.0	: READ	315.0	323.0	338.0	334.0	357.0	379.0
	: H20(CM)	201.0	199.5	198.0	194.0	212.0	200.0
7.0	: READ	144.0	128.0	365.0	348.0	333.0	301.0
	: H20(CM)			230.5	224.0	240.0	240.5
8.0	: READ	376.0	383.0	390.0	359.0	375.0	417.0
	: H20(CM)	261.5	259.0	255.0	254.0	273.5	269.5

TENSIOMETER CALCULATIONS

PSI ETT-19	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00	-76.7	-81.4	-104.5	-100.9	-113.7	-150.7
2	60.00					-78.5	-89.3
3	90.00	-119.1	-118.7	-134.6	-128.5	-132.1	-162.4
4	120.00						
5	150.00						-137.8
6	180.00	-107.2	-117.0	-133.9	-134.1	-138.4	-173.8
7	210.00			-126.7	-116.3	-83.8	
8	240.00	-104.8	-114.6	-126.1	-95.4	-90.9	-138.2

TOTAL HEAD ETT-19	: DATE : TIME	2/10/89 730.0	3/24/89 650.0	4/21/89 700.0	5/9/89 714.0	6/7/89 630.0	7/20/89 640.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00	-106.7	-111.4	-134.5	-130.9	-143.7	-180.7
2	60.00					-138.5	-149.3
3	90.00	-209.1	-208.7	-224.6	-218.5	-222.1	-252.4
4	120.00						
5	150.00						-287.8
6	180.00	-287.2	-297.0	-313.9	-314.1	-318.4	-353.8
7	210.00			-336.7	-326.3	-293.8	
8	240.00	-344.8	-354.6	-366.1	-335.4	-330.9	-378.2

ETT-20	: DATE : TIME	7/6/88 630.0	7/20/88 730.0	8/6/88 700.0	8/19/88 730.0	9/2/88 700.0	9/16/88 705.0
NUMBER	:						
	:						
1.0	: READ						
	: H2O(CM)						
2.0	: READ	189.0	176.0				159.0
	: H2O(CM)	92.0	91.5				89.5
3.0	: READ	202.0	223.0	205.0	208.0	213.0	246.0
	: H2O(CM)	121.5	121.5	121.5	121.5	121.5	121.5
4.0	: READ	278.0	267.0	251.0	252.0	243.0	280.0
	: H2O(CM)	147.0	147.0	146.5	146.5	146.5	146.0
5.0	: READ	311.0	306.0	291.0	295.0	292.0	318.0
	: H2O(CM)	176.5	176.0	175.5	175.0	174.5	173.5
6.0	: READ	338.0	336.0	283.0		316.0	343.0
	: H2O(CM)	202.5	201.5			208.0	207.0
7.0	: READ	349.0	346.0	340.0	347.0	347.0	370.0
	: H2O(CM)	237.0	236.5	236.0	236.0	236.0	235.5
8.0	: READ	371.0	357.0	361.0	369.0	360.0	339.0
	: H2O(CM)	258.0		271.0	269.0	269.0	272.5

TENSIOMETER CALCULATIONS

PSI ETT-20	: DATE : TIME	7/6/88 630.0	7/20/88 730.0	8/6/88 700.0	8/19/88 730.0	9/2/88 700.0	9/16/88 705.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00						
2	60.00	-95.0	-82.2				-66.9
3	90.00	-76.6	-98.2	-79.7	-82.8	-87.9	-121.7
4	120.00	-127.2	-115.9	-100.0	-101.1	-91.8	-130.3
5	150.00	-129.3	-124.8	-109.9	-114.5	-112.0	-139.7
6	180.00	-129.1	-128.1			-100.7	-129.4
7	210.00	-103.4	-100.8	-95.2	-102.4	-102.4	-126.5
8	240.00	-103.4		-79.2	-89.5	-80.3	-55.0

TOTAL HEAD ETT-20	: DATE : TIME	7/6/88 630.0	7/20/88 730.0	8/6/88 700.0	8/19/88 730.0	9/2/88 700.0	9/16/88 705.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00						
2	60.00	-155.0	-142.2				-126.9
3	90.00	-166.6	-188.2	-169.7	-172.8	-177.9	-211.7
4	120.00	-247.2	-235.9	-220.0	-221.1	-211.8	-250.3
5	150.00	-279.3	-274.8	-259.9	-264.6	-262.0	-289.7
6	180.00	-309.1	-308.1			-280.7	-309.4
7	210.00	-313.4	-310.8	-305.2	-312.4	-312.4	-336.5
8	240.00	-343.4		-319.2	-329.5	-320.3	-295.0

ETT-20	: DATE : TIME	9/30/88 727.0	10/15/88 730.0	10/29/88 730.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NUMBER	:						
	:						
1.0	: READ						
	: H2O(CM)						
2.0	: READ	196.0	192.0	200.0	186.0	197.0	196.0
	: H2O(CM)	89.0	88.5	88.0	87.5	87.5	84.5
3.0	: READ	245.0	190.0	196.0	167.0		
	: H2O(CM)	121.5	110.5				
4.0	: READ	281.0	257.0	275.0	232.0	191.0	135.0
	: H2O(CM)	145.5	145.0	145.0	143.5		
5.0	: READ	323.0	291.0	308.0	276.0	294.0	295.0
	: H2O(CM)	173.5	173.0	172.5	171.5	171.0	169.5
6.0	: READ	349.0	305.0	313.0	276.0	276.0	291.0
	: H2O(CM)	207.0	203.5	200.5		200.5	
7.0	: READ	372.0	347.0	359.0	340.0	366.0	347.0
	: H2O(CM)	235.5	235.5	235.5	235.0	235.5	236.0
8.0	: READ	376.0	350.0	366.0	335.0	310.0	262.0
	: H2O(CM)	272.5	267.5	265.5	262.5		

TENSIOMETER CALCULATIONS

PSI ETT-20	: DATE : TIME	9/30/88 727.0	10/15/88 730.0	10/29/88 730.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00						
2	60.00	-105.4	-101.8	-110.5	-96.7	-108.0	-110.2
3	90.00	-120.7	-76.1				
4	120.00	-131.9	-107.8	-126.2	-83.8		
5	150.00	-144.9	-112.6	-130.6	-98.8	-117.8	-120.5
6	180.00	-135.6	-94.2	-105.6		-67.7	
7	210.00	-128.6	-102.9	-115.2	-96.3	-122.4	-102.4
8	240.00	-93.0	-71.7	-90.2	-61.7		

TOTAL HEAD ETT-20	: DATE : TIME	9/30/88 727.0	10/15/88 730.0	10/29/88 730.0	11/11/88 700.0	12/9/88 747.0	1/18/89 730.0
NO.	DPTH BELOW DATUM(CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00						
2	60.00	-165.4	-161.8	-170.5	-156.7	-168.0	-170.2
3	90.00	-210.7	-166.1				
4	120.00	-251.9	-227.8	-246.2	-203.8		
5	150.00	-294.9	-262.6	-280.6	-248.8	-267.8	-270.5
6	180.00	-315.6	-274.2	-285.6		-247.7	
7	210.00	-338.6	-312.9	-325.2	-306.3	-332.4	-312.4
8	240.00	-333.0	-311.7	-330.2	-301.7		

ETT-20		2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
	: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
ETT-20	: TIME	730.0	650.0	700.0	714.0	630.0	640.0
NUMBER	:						
	:						
1.0	: READ						
	: H2O(CM)						
2.0	: READ	192.0	199.0	220.0	210.0	183.0	224.0
	: H2O(CM)	83.0	81.0	79.0	78.5	93.0	91.5
3.0	: READ					125.0	128.0
	: H2O(CM)					112.0	114.0
4.0	: READ			273.0	258.0	217.0	217.0
	: H2O(CM)			148.0		151.0	150.0
5.0	: READ	210.0	230.0	295.0	258.0	212.0	197.0
	: H2O(CM)			169.5		179.0	174.0
6.0	: READ	281.0	212.0	316.0	291.0	288.0	341.0
	: H2O(CM)		326.0			212.5	211.5
7.0	: READ	327.0	234.5	336.0	336.0	346.0	337.0
	: H2O(CM)	235.5	159.0	273.5	232.5	231.0	242.0
8.0	: READ	238.0		297.0	273.0	298.0	347.0
	: H2O(CM)					269.0	271.0

TENSIOMETER CALCULATIONS

		: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
PSI		: TIME	730.0	650.0	700.0	714.0	630.0	640.0
ETT-20								
NO.	DPTH BELOW DATUM(CM)		PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)	PSI (CM)
1	30.00							
2	60.00		-107.7	-117.0	-140.7	-131.0	-87.7	-131.4
3	90.00							
4	120.00				-121.0			
5	150.00				-120.5			
6	180.00			132.5				-122.5
7	210.00		-82.4	-69.7	-50.9	-94.9	-106.7	-85.7
8	240.00							

		: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
TOTAL HEAD		: DATE	2/10/89	3/24/89	4/21/89	5/9/89	6/7/89	7/20/89
ETT-20		: TIME	730.0	650.0	700.0	714.0	630.0	640.0
NO.	DPTH BELOW DATUM(CM)		THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)	THEAD (CM)
1	30.00							
2	60.00		-167.7	-177.0	-200.7	-191.0	-147.7	-191.4
3	90.00							
4	120.00				-241.0			
5	150.00				-270.5			
6	180.00			-47.5				-302.5
7	210.00		-292.4	-279.7	-260.9	-304.9	-316.7	-295.7
8	240.00							

Appendix G:

Code Verification
Input files
Output files

Code Verification

The following is a trace of the code used to calculate fluxes at the field site. During the writing of the code, different input files were used to test the logic and the calculations for errors. Intermediate steps were often printed to aid in debugging the program but have not been included in the final version.

Because several three dimensional arrays are used to store data, dummy data files were run to make sure that the data was actually being read in as believed. Pressure head values from tensiometer nests 1, 4, 17, and 20 are never actually used by the program but were included in the data files and program for bookkeeping purposes. For similar reasons water content data from the 30 and 240 cm plane is not actually used because fluxes are not calculated through those planes. In test runs these values were changed to make sure that they did not affect the program.

The best way to check the program is to compare results which were done by hand to the results generated by the code. This also helps others in understanding the code. A few examples of calculations from actual input and output files follow. A listing of all input and output files used in this report are found after the examples.

Check of horizontal flux cell one, North face, depth three, Aug.dat

water content needed:

	Depth: 120	150
ETN-2	3.1	3.1
ETN-5	2.7	3.2

calculate conductivity (cd):

```
wcav = theta(l,m+1,n) + theta(l,m+1,n+1) + theta(l+1,m+1,n)
       + theta(l+1,m+1,n+1)) / 400.0
```

in cell one:

```
   l = 1
   m = 1
   n = 4   (depth 3)
```

wcav = (3.1 + 3.1 + 2.7 + 3.2) / 400.0
wcav = 0.03025

cd = 5.86656 $X10^{-5}$ X exp(83.84*0.03025)
cd = 7.41 $X10^{-4}$ cm/day

Pressure head:

	Depth: 120	150
ETT-6	-102.6	-107.7
ETT-7	-122.6	-101.1

```
delh = ((psi(i,j+1,k) + psi(i,j+1,k+1))/2.0 - ((psi(i,j,k,)
+       psi(i,j,k+1) / 2.0) / 150
```

in cell one

```
   i = 2
   J = 2
   K = 4   (depth 3)
```

delh = ((-102.6 + -107.7) / 2.0 - (-126.6 + -101.1) / 2) / 150

delh = (-105.15 - -113.85) / 150

delh = 0.058

cd * delh = 4.3 $X10^{-5}$ cm/day = flux

Check of flux through the lower face, cell one, depth five, Aug.dat

water content needed:

	Depth: 210
ETN-1	3.4
ETN-2	3.1
ETN-5	3.1
ETN-6	3.6

calculate conductivity (cd):

```
wcav = theta(l,m,n+1) + theta(l+1,m,n+1) + theta(l,m+1,n+1)
       + theta(l+1,m+1,n+1)) / 400.0
```

in cell one:

```
l = 1
m = 1
n = 6    (depth 5)
```

wcav = (3.4 + 3.6 + 3.1 + 3.1) / 400.0
wcav = 0.033

cd = 5.86656 $X10^{-5}$ X exp(83.84*0.033)
cd = 9.33 $X10^{-4}$ cm/day

Pressure head:

	Depth: 180	210	240
ETT-7	-107.4	-109.9	-96.3

```
delh = ((psi(i,j,k) + psi(i,j,k+1))/2.0 - ((psi(i,j,k+1,) +
       psi(i,j,k+2) / 2.0) / 30 + 1.0
```

in cell one

```
i = 2
J = 2
K = 6    (depth 5)
```

delh = ((-107.4 + -109.9) / 2.0 - (-109.9 + -96.3) / 2) /
30 + 1.0

delh = (-108.65 - -103.1) / 30 + 1

delh = 0.815
delh = -1 * delh (in keeping with sign convention)

delh = -0.815
cd * delh = 7.6 $X10^{-4}$ cm/day = flux

Check of flux through the upper face, cell one, depth five, Aug.uda (unit gradient)

water content needed:

	Depth: 180
ETN-1	3.7
ETN-2	3.8
ETN-5	3.1
ETN-6	3.9

calculate conductivity (cd):

wcav = theta(l,m,n) + theta(l+1,m,n) + theta(l,m+1,n) + theta(l+1,m+1,n)) / 400.0

in cell one:
- l = 1
- m = 1
- n = 6 (depth 5)

wcav = (3.7 + 3.9 + 3.8 + 3.1) / 400.0
wcav = 0.03625

cd = 5.86656 $X10^{-5}$ X exp(83.84*0.03625)
cd = 1.23 $X10^{-3}$ cm/day

Pressure head:

	Depth: 150	180	210
ETT-7	-100	-100	-100

delh = ((psi(i,j,k-1) + psi(i,j,k))/2.0 - ((psi(i,j,k) + psi(i,j,k+1) / 2.0) / 30 + 1.0

in cell one
- i = 2
- J = 2
- K = 6 (depth 5)

delh = ((-100 + -100) / 2.0 - (-100 + -100) / 2) / 30 + 1.0

delh = (-100 - -100) / 30 + 1

delh = 1.0

cd * delh = 1.23 $X10^{-3}$ cm/day = flux

july.dat
days = 30.0

CELL 1

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-9.08E-05	-4.25E-05	-1.26E-05	8.47E-05	8.58E-04	-1.31E-03	-1.38E-02
DEPTH: 2	-3.21E-05	1.88E-05	6.00E-05	1.32E-04	1.31E-03	-6.93E-04	1.94E-02
DEPTH: 3	-4.53E-05	4.87E-05	3.52E-05	1.06E-04	6.93E-04	-7.02E-04	5.97E-04
DEPTH: 4	-1.35E-04	-4.60E-05	-3.79E-05	3.07E-05	7.02E-04	-2.07E-04	1.37E-02
DEPTH: 5	-3.65E-04	-2.19E-04	-1.92E-04	-1.92E-04	2.07E-04	-8.45E-04	-2.50E-02

CELL 2

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-2.64E-05	-1.53E-05	4.79E-05	1.26E-05	7.67E-04	-7.82E-04	-3.12E-04
DEPTH: 2	-3.31E-05	1.95E-05	-1.65E-05	-6.00E-05	7.82E-04	-9.79E-04	-6.47E-03
DEPTH: 3	-2.65E-05	5.02E-05	2.40E-05	-3.52E-05	9.79E-04	-1.08E-03	-2.84E-03
DEPTH: 4	5.22E-06	1.72E-06	2.21E-06	3.79E-05	1.08E-03	-1.02E-03	2.04E-03
DEPTH: 5	-1.28E-04	-3.10E-05	5.34E-20	1.92E-04	1.02E-03	-6.34E-04	0.00E+00

CELL 3

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	4.25E-05	8.92E-05	1.44E-05	3.03E-05	1.12E-03	-8.82E-04	8.19E-03
DEPTH: 2	-1.88E-05	-2.00E-06	5.40E-05	2.29E-06	8.82E-04	-4.88E-04	1.20E-02
DEPTH: 3	-4.87E-05	-6.29E-05	3.08E-05	-6.57E-05	4.88E-04	-1.25E-03	-2.38E-02
DEPTH: 4	4.60E-05	-1.25E-04	9.33E-06	-3.96E-05	1.25E-03	-1.02E-03	6.16E-03
DEPTH: 5	2.19E-04	-7.09E-05	-2.03E-05	-1.20E-04	1.02E-03	-6.58E-04	1.11E-02

CELL 4

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	1.53E-05	-7.11E-05	-9.68E-06	-1.44E-05	7.01E-04	-5.27E-04	4.74E-03
DEPTH: 2	-1.95E-05	-8.75E-05	2.44E-05	-5.40E-05	5.27E-04	-7.18E-04	-6.54E-03
DEPTH: 3	-5.02E-05	-2.70E-05	1.13E-05	-3.08E-05	7.18E-04	-1.37E-03	-2.01E-02
DEPTH: 4	-1.72E-06	-1.01E-04	3.58E-06	-9.33E-06	1.37E-03	-9.26E-04	1.27E-02
DEPTH: 5	3.10E-05	-1.12E-04	1.15E-04	2.03E-05	9.26E-04	-4.41E-04	1.49E-02

CELL 5

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-8.92E-05	-9.59E-05	-1.65E-04	-4.58E-06	1.34E-03	-1.54E-03	-7.96E-03
DEPTH: 2	2.00E-06	9.27E-06	-1.97E-05	-1.18E-04	1.54E-03	-8.88E-04	1.88E-02
DEPTH: 3	6.29E-05	1.25E-05	7.10E-05	-8.40E-05	8.88E-04	-1.41E-03	-1.53E-02
DEPTH: 4	1.25E-04	2.20E-04	2.03E-05	4.97E-05	1.41E-03	-7.76E-04	2.15E-02
DEPTH: 5	7.09E-05	3.12E-04	-6.80E-05	-1.14E-05	7.76E-04	-2.59E-04	1.73E-02

CELL 6

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	7.11E-05	-3.64E-06	-9.64E-05	1.65E-04	-2.66E-04	-7.77E-04	-3.05E-02
DEPTH: 2	8.75E-05	-1.40E-04	-9.22E-05	1.97E-05	7.77E-04	-4.19E-04	1.00E-02
DEPTH: 3	2.70E-05	-2.32E-04	-1.34E-04	-7.10E-05	4.19E-04	-1.86E-03	-4.56E-02
DEPTH: 4	1.01E-04	-4.64E-05	-8.77E-05	-2.03E-05	1.86E-03	-1.05E-03	2.38E-02
DEPTH: 5	1.12E-04	-6.08E-05	-2.26E-05	6.80E-05	1.05E-03	1.46E-05	3.25E-02

2.4	3.2	3.5	3.2	3.5	3.8	3.3	4.5	1
2.6	3.3	3.5	3.4	3.5	3.9	3.6	5.0	2
2.8	3.4	3.4	3.6	3.5	3.9	3.8	5.5	3
2.8	3.1	3.3	3.0	3.4	4.0	3.8	5.2	6
2.6	2.9	2.8	2.7	3.2	3.0	3.2	5.4	5
2.8	3.1	2.8	3.4	3.3	3.3	3.1	6.1	4
2.4	3.0	3.4	3.1	3.4	3.6	3.5	4.3	7
2.7	3.2	3.4	2.9	3.6	3.4	3.0	4.7	8
2.7	3.0	3.1	3.4	3.4	3.0	3.7	5.4	9
3.0	3.1	3.3	3.5	3.2	3.5	3.9	4.6	12
3.0	3.4	3.5	3.2	3.2	3.4	3.2	4.2	11
2.8	3.2	3.4	2.8	3.6	3.1	3.0	4.4	10

-127.5	-110	-129.7	100	-142.1	-125.9	-112.1	-121.1	1
-112.4	-115	-127.4	-122.8	-125.1	-122.5	-130.8	-99.3	2
-126.8	-116.6	-110.9	-116.2	-113.2	-112.8	-135.6	-112.2	3
100	-122.6	-116.9	-119.4	-119.2	-104.3	-112.1	-97.3	4
100	-92.9	-94.3	-102.2	-97.5	-111.3	-97.7	-99.2	8
-109.4	-101.7	-113.3	-127.4	-107.1	-108.9	-56.8	-95.8	7
-113.9	-111.0	-108.7	-109.2	-113.0	-114.2	-107.2	-90.9	6
-94.3	-84.8	-117.8	-105.4	-110	-116.6	-104.8	-101.4	5
-108	-110.7	-110.9	-120.9	-117.2	-122.3	-130	-105.6	9
100	-108.9	-123.3	-109.3	-106.3	-123.3	-102	-103	10
100	-114.4	-112.2	-97.1	-106.8	-119.8	-112.9	-89.4	11
-104.6	-123	-107.6	-93	-107.5	-117.9	-76.9	-86.1	12
-78.5	-67	-136.9	-133.5	-130.2	-119	-130.5	-109.5	16
-84.7	-81.6	-120.7	-112.6	-124.1	-139.5	-107.2	-94.8	15
-209.4	-121.2	-130.8	-109.1	-103.3	-154.3	-115.2	-93.3	14
-116.3	-143.3	-143.1	-129.7	-125.9	-160.5	-116.9	-110.2	13
-92.9	-63.2	-97.9	100	-130.9	-154.9	-104.3	-191	17
-103.2	-121.2	-111.3	-119.2	-113.4	-80.9	100	-95	18
-71.7	-126.8	-126.3	-161.4	-132	-140.2	-151	-141.7	19
100	-88.6	-87.4	-121.6	-127.1	-128.6	-102.1	-103.4	20

july.udat
days = 30.0

CELL 1

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.06E-04	-9.14E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.14E-04	-7.73E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-04	-1.01E-03	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-03	-1.28E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.28E-03	-1.08E-03	0.00E+00

CELL 2

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-04	-8.06E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.06E-04	-9.14E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.14E-04	-9.94E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.94E-04	-1.13E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E-03	-1.04E-03	0.00E+00

CELL 3

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.57E-04	-8.76E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.76E-04	-6.81E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.81E-04	-1.01E-03	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-03	-1.10E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-03	-9.94E-04	0.00E+00

CELL 4

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.57E-04	-7.41E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-04	-7.89E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.89E-04	-9.94E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.94E-04	-8.40E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-04	-8.95E-04	0.00E+00

CELL 5

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-04	-1.01E-03	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-03	-8.40E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-04	-9.73E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.73E-04	-1.08E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-03	-1.01E-03	0.00E+00

CELL 6

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.58E-04	-9.73E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.73E-04	-7.73E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-04	-1.06E-03	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-03	-8.76E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.76E-04	-8.76E-04	0.00E+00

2.4	3.2	3.5	3.2	3.5	3.8	3.3	4.5	1
2.6	3.3	3.5	3.4	3.5	3.9	3.6	5.0	2
2.8	3.4	3.4	3.6	3.5	3.9	3.8	5.5	3
2.8	3.1	3.3	3.0	3.4	4.0	3.8	5.2	6
2.6	2.9	2.8	2.7	3.2	3.0	3.2	5.4	5
2.8	3.1	2.8	3.4	3.3	3.3	3.1	6.1	4
2.4	3.0	3.4	3.1	3.4	3.6	3.5	4.3	7
2.7	3.2	3.4	2.9	3.6	3.4	3.0	4.7	8
2.7	3.0	3.1	3.4	3.4	3.0	3.7	5.4	9
3.0	3.1	3.3	3.5	3.2	3.5	3.9	4.6	12
3.0	3.4	3.5	3.2	3.2	3.4	3.2	4.2	11
2.8	3.2	3.4	2.8	3.6	3.1	3.0	4.4	10
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	

aug.dat
days = 25.0

CELL 1

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	4.75E-05	-3.48E-05	-1.99E-05	5.45E-05	6.12E-04	-1.26E-03	-1.60E-02
DEPTH: 2	1.42E-04	3.87E-05	6.09E-05	1.25E-04	1.26E-03	-6.16E-04	1.80E-02
DEPTH: 3	5.55E-05	5.02E-05	4.30E-05	1.05E-04	6.16E-04	-6.21E-04	1.14E-03
DEPTH: 4	-3.64E-05	1.73E-05	-3.61E-05	4.14E-05	6.21E-04	-1.41E-03	-1.97E-02
DEPTH: 5	-3.46E-05	4.56E-05	-1.46E-05	5.21E-05	1.41E-03	-7.61E-04	1.64E-02

CELL 2

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	6.69E-05	-2.14E-05	3.62E-05	1.99E-05	8.68E-04	-7.00E-04	4.70E-03
DEPTH: 2	5.60E-05	1.50E-05	1.45E-05	-6.09E-05	7.00E-04	-7.32E-04	-6.79E-04
DEPTH: 3	3.44E-05	4.14E-05	4.77E-05	-4.30E-05	7.32E-04	-1.04E-03	-7.31E-03
DEPTH: 4	7.55E-05	-4.97E-06	8.25E-05	3.61E-05	1.04E-03	-1.14E-03	-1.54E-03
DEPTH: 5	-2.94E-05	-2.40E-05	8.70E-05	1.46E-05	1.14E-03	-5.13E-04	1.59E-02

CELL 3

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	3.48E-05	5.05E-05	-8.65E-06	5.63E-05	9.38E-04	-8.78E-04	2.17E-03
DEPTH: 2	-3.87E-05	-2.07E-05	4.24E-05	2.83E-05	8.78E-04	-5.59E-04	8.04E-03
DEPTH: 3	-5.02E-05	-3.18E-05	4.16E-05	-1.75E-05	5.59E-04	-8.82E-04	-8.37E-03
DEPTH: 4	-1.73E-05	-8.86E-05	-5.49E-05	-7.21E-05	8.82E-04	-1.07E-03	-5.87E-03
DEPTH: 5	-4.56E-05	-7.93E-05	-7.18E-05	-1.23E-04	1.07E-03	-9.41E-04	1.63E-03

CELL 4

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	2.14E-05	-6.08E-05	6.96E-06	8.65E-06	1.53E-03	-4.59E-04	2.66E-02
DEPTH: 2	-1.50E-05	-8.30E-05	1.67E-05	-4.24E-05	4.59E-04	-5.19E-04	-2.11E-03
DEPTH: 3	-4.14E-05	-3.20E-05	-1.96E-06	-4.16E-05	5.19E-04	-1.56E-03	-2.67E-02
DEPTH: 4	4.97E-06	-1.21E-04	2.12E-05	5.49E-05	1.56E-03	-9.75E-04	1.45E-02
DEPTH: 5	2.40E-05	-1.26E-04	1.01E-04	7.18E-05	9.75E-04	-2.63E-04	1.81E-02

CELL 5

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-5.05E-05	-1.12E-04	-1.41E-04	4.35E-05	1.23E-03	-1.43E-03	-6.10E-03
DEPTH: 2	2.07E-05	-3.53E-05	-2.41E-05	3.44E-04	1.43E-03	-6.84E-04	2.01E-02
DEPTH: 3	3.18E-05	-1.64E-04	4.41E-05	6.70E-04	6.84E-04	-1.06E-03	-6.46E-03
DEPTH: 4	8.86E-05	-2.15E-05	-8.35E-05	-3.25E-05	1.06E-03	-1.04E-03	3.12E-04
DEPTH: 5	7.93E-05	2.21E-04	-1.42E-04	-1.73E-05	1.04E-03	-5.73E-04	1.23E-02

CELL 6

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	6.08E-05	3.94E-05	1.03E-06	1.41E-04	1.24E-03	-7.50E-04	1.35E-02
DEPTH: 2	8.30E-05	-5.47E-05	-2.59E-05	2.41E-05	7.50E-04	-2.65E-04	1.23E-02
DEPTH: 3	3.20E-05	-1.80E-04	-9.52E-05	-4.41E-05	2.65E-04	-2.09E-03	-4.72E-02
DEPTH: 4	1.21E-04	-4.57E-06	-8.81E-05	8.35E-05	2.09E-03	-1.19E-03	2.33E-02
DEPTH: 5	1.26E-04	7.80E-20	-2.27E-05	1.42E-04	1.19E-03	1.22E-04	3.39E-02

2.7	3.1	3.4	3.1	3.4	3.7	3.4	4.4	1
2.5	3.0	3.1	3.1	3.1	3.8	3.1	4.6	2
2.6	3.3	3.4	3.5	3.4	3.8	3.8	5.6	3
2.8	2.9	3.3	3.2	3.4	3.9	3.6	5.0	6
2.6	2.9	2.8	2.7	3.2	3.1	3.1	5.3	5
2.7	3.1	2.8	2.8	3.3	3.3	2.8	6.1	4
2.5	3.1	3.4	3.0	3.3	3.6	3.4	4.2	7
2.6	3.1	3.3	3.0	3.5	3.2	3.0	4.6	8
2.6	3.0	2.9	2.8	3.8	3.1	2.8	4.5	9
2.8	3.1	3.3	3.6	3.2	3.7	3.5	4.3	12
2.7	3.4	3.5	2.9	3.1	3.2	3.1	4.3	11
2.6	3.1	3.3	2.5	3.6	3.2	3.1	4.6	10

-130.3	-88.	-109.2	100.	-130.1	-112.1	-106.4	-105.5	1
-67.1	-93.	-95.4	-91.8	-116.1	-102.3	-124.4	100	2
-128.6	-100.7	-90.2	-102.4	-96.6	-103.4	-125.9	-99.9	3
100	-106.9	-92.6	-104.85	-116.7	-97.4	-111.1	-83.2	4
-63.3	-92.15	-94.1	-101.9	-91.45	-106.7	-98.1	-97.2	8
-119.5	-94.5	-111.2	-126.6	-101.1	-107.4	-109.9	-96.3	7
-101.	-105.9	-108.4	-102.6	-107.7	-112.4	-109.7	-88.3	6
-100.	-90.7	-110.4	-95.2	-99.1	-97.6	-99.3	-90.4	5
-106.2	-94.7	-105.6	-106.5	-108.5	-113.7	-120.6	-94.1	9
100	-105.8	-114.6	-107.2	-101.8	-101.6	-102.5	98.8	10
-47.9	-112.4	-111.5	-92.	-101.2	-120.6	-110.8	-83.8	11
-100.5	-114.6	-106.3	-89.2	-104.7	-110.7	-79.	85.5	12
-75.4	-67.2	-121.	- 129.9	-119.4	-114.7	-129.1	-119.1	16
-90.3	-84.7	-118.4	-110.8	-109.3	-120.3	-109.3	-98.7	15
-101.7	-115.2	-132.3	-105.5	-98.2	-159.4	-122.9	-89.3	14
-103.	-121.7	-125.4	-124.3	-113.4	-169.7	-121.6	-97.7	13
-85.7	-64.2	-67.4	100	-121.2	-147.7	-100.5	-170.3	17
-108.4	-120.7	-117.7	-122.6	-155	-81.5	100	-100.4	18
-60.1	-121.1	-114	-145.5	-130.9	-128.2	-154.1	-136.6	19
100	100	-81.3	-100.6	-112.2	100	-98.8	-84.4	20

aug.udat
days = 25.0

CELL 1

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.11E-04	-8.23E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.23E-04	-7.41E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-04	-9.14E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.14E-04	-1.23E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-03	-9.33E-04	0.00E+00

CELL 2

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-04	-7.41E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-04	-7.41E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-04	-8.95E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-1.10E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-03	-8.58E-04	0.00E+00

CELL 3

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.26E-04	-8.58E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.58E-04	-7.11E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.11E-04	-9.73E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.73E-04	-1.06E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-03	-9.14E-04	0.00E+00

CELL 4

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-04	-6.96E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.96E-04	-6.27E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.27E-04	-1.06E-03	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-03	-8.40E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-04	-6.81E-04	0.00E+00

CELL 5

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-04	-9.94E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.94E-04	-8.06E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.06E-04	-9.14E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.14E-04	-1.04E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-03	-8.95E-04	0.00E+00

CELL 6

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.23E-04	-8.95E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-6.14E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.14E-04	-1.10E-03	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-03	-8.40E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-04	-7.26E-04	0.00E+00

2.7	3.1	3.4	3.1	3.4	3.7	3.4	4.4	1
2.5	3.0	3.1	3.1	3.1	3.8	3.1	4.6	2
2.6	3.3	3.4	3.5	3.4	3.8	3.8	5.6	3
2.8	2.9	3.3	3.2	3.4	3.9	3.6	5.0	6
2.6	2.9	2.8	2.7	3.2	3.1	3.1	5.3	5
2.7	3.1	2.8	2.8	3.3	3.3	2.8	6.1	4
2.5	3.1	3.4	3.0	3.3	3.6	3.4	4.2	7
2.6	3.1	3.3	3.0	3.5	3.2	3.0	4.6	8
2.6	3.0	2.9	2.8	3.8	3.1	2.8	4.5	9
2.8	3.1	3.3	3.6	3.2	3.7	3.5	4.3	12
2.7	3.4	3.5	2.9	3.1	3.2	3.1	4.3	11
2.6	3.1	3.3	2.5	3.6	3.2	3.1	4.6	10
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	

september.dat
days = 51.0

CELL 1

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-1.37E-06	-3.10E-04	-8.71E-06	-2.24E-05	1.44E-03	-1.45E-03	-3.91E-03
DEPTH: 2	1.06E-04	-3.80E-04	3.23E-05	1.17E-04	1.45E-03	-5.38E-04	4.52E-02
DEPTH: 3	2.65E-05	-6.37E-04	2.30E-05	1.05E-04	5.38E-04	-6.16E-04	-8.88E-03
DEPTH: 4	-9.59E-06	-1.09E-03	-7.25E-05	2.28E-05	6.16E-04	-1.60E-03	-6.20E-02
DEPTH: 5	1.13E-04	-1.25E-03	3.90E-05	8.08E-05	1.60E-03	-5.54E-04	4.31E-02

CELL 2

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	4.63E-05	5.35E-05	3.86E-05	8.71E-06	1.85E-03	-1.07E-03	4.12E-02
DEPTH: 2	9.21E-05	5.41E-05	3.83E-05	-3.23E-05	1.07E-03	-5.74E-04	2.67E-02
DEPTH: 3	4.96E-05	5.89E-05	2.17E-05	-2.30E-05	5.74E-04	-1.11E-03	-2.62E-02
DEPTH: 4	1.61E-04	7.84E-05	1.05E-04	7.25E-05	1.11E-03	-7.55E-04	2.24E-02
DEPTH: 5	-1.43E-05	-2.32E-05	7.59E-05	-3.90E-05	7.55E-04	-3.50E-04	2.06E-02

CELL 3

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	3.10E-04	5.81E-04	3.84E-04	4.09E-04	2.45E-03	-2.16E-03	3.23E-02
DEPTH: 2	3.80E-04	4.75E-04	4.77E-04	4.92E-04	2.16E-03	-1.60E-03	4.71E-02
DEPTH: 3	6.37E-04	7.63E-04	7.23E-04	7.40E-04	1.60E-03	-1.91E-03	1.33E-02
DEPTH: 4	1.09E-03	1.01E-03	9.71E-04	1.23E-03	1.91E-03	-1.89E-03	4.47E-02
DEPTH: 5	1.25E-03	1.13E-03	1.02E-03	1.52E-03	1.89E-03	-1.47E-03	7.16E-02

CELL 4

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-5.35E-05	-1.62E-04	9.33E-06	-3.84E-04	1.56E-03	-9.37E-04	2.55E-02
DEPTH: 2	-5.41E-05	-4.69E-05	-8.81E-06	-4.77E-04	9.37E-04	-5.19E-04	1.54E-02
DEPTH: 3	-5.89E-05	2.66E-05	-6.09E-05	-7.23E-04	5.19E-04	-1.18E-03	-4.20E-02
DEPTH: 4	-7.84E-05	-8.01E-05	-7.91E-05	-9.71E-04	1.18E-03	-1.07E-03	-6.92E-03
DEPTH: 5	2.32E-05	-5.83E-05	4.50E-05	-1.02E-03	1.07E-03	-4.75E-04	2.01E-02

CELL 5

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-5.81E-04	-1.41E-04	-3.01E-04	4.88E-05	3.50E-03	-2.09E-03	6.23E-02
DEPTH: 2	-4.75E-04	5.05E-05	4.63E-05	-2.83E-05	2.09E-03	-5.34E-04	7.51E-02
DEPTH: 3	-7.63E-04	-5.49E-06	9.02E-05	-1.06E-04	5.34E-04	-1.11E-03	-3.71E-02
DEPTH: 4	-1.01E-03	1.24E-04	1.22E-05	-2.35E-05	1.11E-03	-1.23E-03	-1.56E-02
DEPTH: 5	-1.13E-03	3.07E-04	9.33E-06	-1.73E-06	1.23E-03	-2.45E-04	4.21E-02

CELL 6

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	1.62E-04	1.78E-04	1.81E-04	3.01E-04	4.25E-03	-7.98E-04	1.84E-01
DEPTH: 2	4.69E-05	-1.08E-04	-4.07E-05	-4.63E-05	7.98E-04	-2.28E-04	2.76E-02
DEPTH: 3	-2.66E-05	-2.55E-04	-1.34E-04	-9.02E-05	2.28E-04	-1.85E-03	-8.80E-02
DEPTH: 4	8.01E-05	-9.93E-05	-1.76E-04	-1.22E-05	1.85E-03	-1.07E-03	3.76E-02
DEPTH: 5	5.83E-05	-4.55E-05	-1.15E-04	-9.33E-06	1.07E-03	-6.77E-05	5.02E-02

4.2	3.2	3.4	3.2	3.4	3.7	3.3	4.5	1
4.4	3.0	3.0	3.2	3.2	3.9	3.1	4.8	2
5.8	3.8	3.3	3.3	3.4	3.8	3.7	5.5	3
6.0	3.1	3.3	3.0	3.4	3.9	3.5	4.9	6
6.2	3.2	2.8	2.7	3.0	3.0	3.1	5.3	5
6.9	3.7	2.8	2.7	3.4	3.2	2.8	6.0	4
4.7	4.5	3.3	3.1	3.3	3.3	3.6	4.6	7
6.6	3.5	3.3	3.0	3.4	3.3	3.1	4.6	8
6.9	3.9	2.8	2.8	3.7	3.0	2.8	4.7	9
5.6	3.5	3.3	3.5	3.2	3.5	3.3	4.3	12
7.4	5.5	3.7	2.8	3.1	3.2	3.0	4.2	11
6.7	4.7	3.2	2.7	3.6	3.1	3.1	4.6	10

-88.2	-102.2	-119.9	-97.5	-125.1	-113.7	-107.8	-105.4	1
-67.	-100.1	-105.5	-110.7	-117.1	-103.4	-102.3	-95.3	2
-76.2	-93.4	-100.1	-106.6	-104.5	-96.1	-131.1	-101.3	3
100	-96	-99.8	-108.6	-123.8	-113.7	-123.	-109.7	4
-54.3	-101.3	-111.3	-101.6	-100	-112.3	-104.	-104.5	8
-75.0	-82.7	-122.4	-130.7	-106.	-112.0	-124.5	-89.15	7
-79.7	-82.1	-126.6	-112.3	-115.1	-126.7	-97.	-91.7	6
-72.4	-78.4	-118.9	-104.5	-115.3	-96.8	-104.0	-99.1	5
-87.1	-98.6	-118.0	-123.5	-112.4	-106.9	-118.9	-86.3	9
-119.3	-138.6	-184.5	-232.5	-262.1	-297.8	-316.2	-330.4	10
-88.5	-80.9	-107.9	-103.4	-98.6	-114.6	-118.5	-95.6	11
-101.8	-76.5	-109.3	-106.4	-117.8	-120.3	-93.4	-93.8	12
-62.9	-51.	-121.1	-135.3	-127.5	-121.9	-138.2	-121.9	16
-82.1	-60.1	-123.7	-123.6	-104.3	-137.7	-121.9	-94.1	15
-96.5	-92.5	-145.1	-86.	-106.9	-131.0	-125.2	-76.6	14
-67.3	-70.6	-123.6	-126.2	-113.6	-178.6	-125.3	-102.8	13
-88.3	-78.0	-105.6	-122.2	-80.0	-132.6	-112.0	-165.0	17
-88.5	-85.3	-123.7	-107.7	-122.2	-78.3	100.0	-105.2	18
-73.5	-86.4	-125.9	-146.2	-147.7	-123.5	-150.	-141	19
-66.9	-105.	-114.3	-127.9	-132.2	-121.9	-119.2	-76.1	20

september.udat
days = 51.0

CELL 1

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.06E-04	-8.06E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.06E-04	-7.41E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-04	-8.95E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-1.23E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-03	-8.95E-04	0.00E+00

CELL 2

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-03	-7.11E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.11E-04	-7.11E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.11E-04	-8.95E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-1.08E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E-03	-8.40E-04	0.00E+00

CELL 3

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-03	-8.40E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-04	-6.96E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.96E-04	-9.14E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.14E-04	-9.94E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.94E-04	-9.53E-04	0.00E+00

CELL 4

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-03	-6.81E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.81E-04	-6.14E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.14E-04	-9.94E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.94E-04	-8.06E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.06E-04	-6.96E-04	0.00E+00

CELL 5

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.07E-03	-1.01E-03	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-03	-7.89E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.89E-04	-8.95E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-9.53E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.53E-04	-8.95E-04	0.00E+00

CELL 6

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.35E-03	-8.95E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-6.27E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.27E-04	-1.06E-03	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-03	-8.23E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.23E-04	-7.26E-04	0.00E+00

4.2	3.2	3.4	3.2	3.4	3.7	3.3	4.5	1
4.4	3.0	3.0	3.2	3.2	3.9	3.1	4.8	2
5.8	3.8	3.3	3.3	3.4	3.8	3.7	5.5	3
6.0	3.1	3.3	3.0	3.4	3.9	3.5	4.9	6
6.2	3.2	2.8	2.7	3.0	3.0	3.1	5.3	5
6.9	3.7	2.8	2.7	3.4	3.2	2.8	6.0	4
4.7	4.5	3.3	3.1	3.3	3.3	3.6	4.6	7
6.6	3.5	3.3	3.0	3.4	3.3	3.1	4.6	8
6.9	3.9	2.8	2.8	3.7	3.0	2.8	4.7	9
5.6	3.5	3.3	3.5	3.2	3.5	3.3	4.3	12
7.4	5.5	3.7	2.8	3.1	3.2	3.0	4.2	11
6.7	4.7	3.2	2.7	3.6	3.1	3.1	4.6	10
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	

decjf.dat
days = 151.0

CELL 1

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	1.87E-06	-1.69E-05	-1.46E-05	4.13E-06	2.37E-03	-1.43E-03	1.40E-01
DEPTH: 2	1.44E-04	8.49E-06	6.54E-05	1.03E-04	1.43E-03	-5.44E-04	1.44E-01
DEPTH: 3	1.05E-04	1.14E-04	8.10E-05	1.55E-04	5.44E-04	2.07E-04	1.27E-01
DEPTH: 4	3.96E-06	-3.83E-05	-4.51E-05	2.07E-05	-2.68E-03	-1.68E-03	-6.60E-01
DEPTH: 5	1.18E-04	1.30E-04	7.34E-04	2.26E-04	1.68E-03	-4.82E-03	-4.37E-01

CELL 2

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	3.52E-05	8.17E-05	1.30E-05	1.46E-05	2.89E-03	-8.43E-04	3.13E-01
DEPTH: 2	6.03E-05	3.69E-05	8.84E-05	-6.54E-05	8.43E-04	-4.89E-04	5.71E-02
DEPTH: 3	4.70E-05	-3.83E-05	4.84E-05	-8.10E-05	4.89E-04	-1.05E-03	-8.57E-02
DEPTH: 4	1.60E-04	-7.71E-05	8.84E-05	4.51E-05	1.05E-03	-1.09E-03	-2.67E-05
DEPTH: 5	7.03E-05	3.01E-05	1.26E-04	5.60E-04	-2.51E-03	0.00E+00	0.00E+00

CELL 3

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	1.69E-05	-3.98E-04	8.27E-05	4.54E-04	3.73E-03	-2.29E-03	2.23E-01
DEPTH: 2	-8.49E-06	7.49E-04	9.90E-05	8.22E-04	-2.16E-03	-3.58E-04	-3.30E-01
DEPTH: 3	-1.14E-04	0.00E+00	-7.60E-05	5.29E-04	3.58E-04	-4.29E-03	0.00E+00
DEPTH: 4	3.83E-05	-1.30E-04	-8.80E-05	-2.21E-06	1.62E-03	-1.07E-03	7.67E-02
DEPTH: 5	-1.30E-04	-1.01E-04	3.18E-05	-1.44E-06	1.07E-03	-3.39E-04	1.05E-01

CELL 4

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-8.17E-05	-1.77E-04	-6.04E-04	-8.27E-05	2.94E-03	-8.28E-04	2.91E-01
DEPTH: 2	-3.69E-05	-1.20E-04	-2.36E-04	-9.90E-05	8.28E-04	-7.85E-04	-8.32E-03
DEPTH: 3	3.83E-05	3.46E-05	5.10E-05	7.60E-05	7.85E-04	-1.30E-03	-7.21E-02
DEPTH: 4	7.71E-05	-1.61E-04	2.12E-04	8.80E-05	1.30E-03	-2.74E-04	1.62E-01
DEPTH: 5	-3.01E-05	-4.62E-04	7.70E-05	-3.18E-05	2.74E-04	6.73E-05	3.81E-02

CELL 5

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	3.98E-04	4.51E-04	1.89E-04	-4.03E-03	9.90E-03	0.00E+00	0.00E+00
DEPTH: 2	7.94E-04	8.46E-04	3.58E-06	9.40E-05	0.00E+00	0.00E+00	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.13E-03	-4.00E-03	0.00E+00
DEPTH: 4	1.30E-04	0.00E+00	-1.22E-04	8.13E-05	0.00E+00	0.00E+00	0.00E+00
DEPTH: 5	1.01E-04	0.00E+00	3.86E-04	6.03E-05	0.00E+00	0.00E+00	0.00E+00

CELL 6

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	1.77E-04	-2.01E-04	-2.40E-04	-1.89E-04	1.18E-02	-1.68E-03	1.51E+00
DEPTH: 2	1.20E-04	3.38E-05	-8.71E-05	-3.58E-06	1.68E-03	-1.69E-04	2.30E-01
DEPTH: 3	-3.46E-05	-6.36E-05	-9.65E-05	0.00E+00	1.69E-04	-2.39E-03	0.00E+00
DEPTH: 4	1.61E-04	2.18E-04	2.21E-04	1.22E-04	2.39E-03	-3.54E-03	-1.52E-01
DEPTH: 5	4.62E-04	9.77E-04	0.00E+00	9.70E-04	-1.72E-03	0.00E+00	0.00E+00

4.6	3.4	3.4	3.0	3.3	3.5	3.1	4.5	1
3.9	3.2	3.2	3.1	3.3	3.8	3.0	4.6	2
4.7	4.8	3.2	3.1	3.4	3.7	3.5	5.5	3
5.7	4.1	3.2	2.9	3.4	3.9	3.5	4.8	6
5.5	4.1	2.8	2.6	3.1	3.0	3.2	5.3	5
4.9	4.6	2.7	2.7	3.2	3.2	2.9	6.0	4
4.4	6.4	4.4	3.1	3.3	3.4	3.1	4.3	7
5.1	4.1	3.3	2.9	3.4	3.2	3.0	4.7	8
5.0	4.7	2.9	2.7	3.6	2.9	2.7	4.5	9
4.6	4.9	3.3	3.5	3.1	3.3	3.3	4.3	12
4.7	5.7	4.0	2.8	2.9	3.2	2.9	4.1	11
5.0	6.2	4.1	2.6	3.5	3.0	2.9	4.7	10

-123.6 -115.7 -122.7 -98.8 -115.5 -104.1 -93.2 -96.9 1
-104.8 -102.7 -98.4 -96.4 -101.4 -95.9 -121.2 -110.2 2
-88.0 -90.7 -106.8 -88.7 -97.6 -73.5 -122. -83.2 3
100 -93.5 -68.6 100 -115.9 -89.2 -105.2 100 4
100 -90.5 -110.1 -97.8 -81. -111.9 -80.1 -74.6 8
-61.5 -91.4 -110.3 -136.0 -99.2 100 -126.7 -176.8 7
-91.6 -85.6 -120.7 -96.8 -105.6 -107.3 100 100 6
-49.4 -101.8 100 -89.3 -94.7 -91.5 -83.5 -93.3 5
-82.7 -76.9 100 -99.4 100 -105.4 -110. -101.4 9
-105.4 -84.9 -121.2 100 -94.1 -116.1 -98.9 -79.8 10
-85.2 -83. -102. -95.9 -123.7 -117.9 -85. 11
100 -102.6 -218.4 -99.7 100 -84.5 100 100 12
-64.3 -525.5 -109.9 -117.1 -114.2 -110.1 -121.1 100 16
-64. 100 -125.5 100 100 -125.5 100 100 -122.8 -105.2 15
100 -87.8 -136.3 -113.5 -93.5 -201.1 100 100 14
100 -102.8 -150.1 -133.5 -110.2 100 100 100 13
-62.7 -78. 100 -144.6 100 100 100 100 17
-82.7 -96. -100.9 100 100 100 100 100 18
-48.8 100 -119.8 100 -117.2 -98.1 100 -118.1 19
100 -108.6 100 100 -119.2 -67.7 -102.4 100 20

decjf.udat
days = 151.0

CELL 1

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-03	-8.23E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.23E-04	-6.67E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.67E-04	-9.14E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.14E-04	-1.15E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-03	-8.58E-04	0.00E+00

CELL 2

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-03	-7.11E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.11E-04	-6.53E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.53E-04	-8.95E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-1.04E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-03	-8.23E-04	0.00E+00

CELL 3

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.96E-03	-1.04E-03	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-03	-6.53E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.53E-04	-9.33E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.33E-04	-9.94E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.94E-04	-8.58E-04	0.00E+00

CELL 4

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.30E-03	-6.81E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.81E-04	-5.76E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.76E-04	-9.53E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.53E-04	-7.73E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-04	-6.96E-04	0.00E+00

CELL 5

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.89E-03	-1.36E-03	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-03	-7.73E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-04	-8.40E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-04	-9.14E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.14E-04	-7.73E-04	0.00E+00

CELL 6

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.49E-03	-1.18E-03	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-03	-5.88E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.88E-04	-9.73E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.73E-04	-7.73E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-04	-6.53E-04	0.00E+00

4.6	3.4	3.4	3.0	3.3	3.5	3.1	4.5	1
3.9	3.2	3.2	3.1	3.3	3.8	3.0	4.6	2
4.7	4.8	3.2	3.1	3.4	3.7	3.5	5.5	3
5.7	4.1	3.2	2.9	3.4	3.9	3.5	4.8	6
5.5	4.1	2.8	2.6	3.1	3.0	3.2	5.3	5
4.9	4.6	2.7	2.7	3.2	3.2	2.9	6.0	4
4.4	6.4	4.4	3.1	3.3	3.4	3.1	4.3	7
5.1	4.1	3.3	2.9	3.4	3.2	3.0	4.7	8
5.0	4.7	2.9	2.7	3.6	2.9	2.7	4.5	9
4.6	4.9	3.3	3.5	3.1	3.3	3.3	4.3	12
4.7	5.7	4.0	2.8	2.9	3.2	2.9	4.1	11
5.0	6.2	4.1	2.6	3.5	3.0	2.9	4.7	10
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	

apr.dat
days = 61.0

CELL 1

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-7.53E-05	-9.68E-05	-1.51E-04	1.74E-04	2.56E-03	-1.44E-03	6.70E-02
DEPTH: 2	4.15E-05	-4.77E-05	-1.85E-05	2.69E-04	1.44E-03	-7.21E-04	4.66E-02
DEPTH: 3	-1.24E-05	3.28E-06	4.47E-05	0.00E+00	7.21E-04	-5.75E-04	0.00E+00
DEPTH: 4	1.08E-06	-4.31E-05	-1.43E-05	8.92E-04	-2.55E-03	-1.32E-03	-2.26E-01
DEPTH: 5	3.99E-05	6.56E-05	6.68E-04	1.84E-04	1.32E-03	-3.32E-03	-1.10E-01

CELL 2

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	9.87E-05	1.02E-04	1.57E-04	1.51E-04	2.14E-03	-7.35E-04	9.19E-02
DEPTH: 2	-3.58E-06	5.73E-05	0.00E+00	1.85E-05	7.35E-04	-4.33E-04	0.00E+00
DEPTH: 3	-4.38E-05	3.71E-05	0.00E+00	-4.47E-05	4.33E-04	-1.02E-03	0.00E+00
DEPTH: 4	-5.52E-06	4.86E-05	3.80E-06	1.43E-05	1.02E-03	-1.22E-03	-1.14E-02
DEPTH: 5	-3.90E-05	9.08E-06	9.99E-05	6.60E-04	-3.18E-03	-4.33E-04	-2.11E-01

CELL 3

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	9.68E-05	-3.40E-04	2.51E-05	8.26E-04	3.59E-03	-2.39E-03	8.04E-02
DEPTH: 2	4.77E-05	-2.63E-06	6.21E-04	9.87E-04	-2.87E-03	-5.99E-04	-1.91E-01
DEPTH: 3	-3.28E-06	1.46E-05	6.54E-04	4.62E-05	5.99E-04	-4.82E-03	-2.49E-01
DEPTH: 4	4.31E-05	8.22E-05	7.48E-05	6.98E-05	1.13E-03	-6.01E-04	3.53E-02
DEPTH: 5	-6.56E-05	-9.55E-06	-3.83E-05	-5.30E-05	6.01E-04	-2.69E-06	3.45E-02

CELL 4

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-1.02E-04	-2.35E-04	4.50E-05	-2.51E-05	1.13E-03	-6.75E-04	2.38E-02
DEPTH: 2	-5.73E-05	-7.34E-05	5.35E-04	4.76E-04	-1.98E-03	-5.70E-04	-1.45E-01
DEPTH: 3	-3.71E-05	-2.41E-05	6.44E-04	5.25E-04	5.70E-04	-4.87E-03	-2.49E-01
DEPTH: 4	-4.86E-05	1.03E-05	0.00E+00	-7.48E-05	1.42E-03	-1.06E-03	0.00E+00
DEPTH: 5	-9.08E-06	0.00E+00	1.53E-04	3.83E-05	1.06E-03	-2.34E-04	0.00E+00

CELL 5

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	3.40E-04	1.54E-04	1.27E-03	2.76E-03	0.00E+00	-7.18E-03	0.00E+00
DEPTH: 2	2.63E-06	-4.06E-06	3.70E-05	1.83E-05	9.90E-04	-4.70E-04	3.24E-02
DEPTH: 3	-1.46E-05	-5.10E-05	5.18E-05	-2.13E-05	4.70E-04	-6.82E-04	-1.34E-02
DEPTH: 4	-8.22E-05	0.00E+00	1.46E-05	-2.29E-05	6.82E-04	-1.02E-03	0.00E+00
DEPTH: 5	9.55E-06	0.00E+00	0.00E+00	-1.00E-05	1.02E-03	-8.41E-04	0.00E+00

CELL 6

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	2.35E-04	1.98E-03	6.08E-05	1.35E-03	4.26E-03	-5.36E-03	-2.30E-02
DEPTH: 2	7.34E-05	8.40E-06	-6.94E-05	-3.70E-05	-1.11E-04	-2.86E-04	-2.46E-02
DEPTH: 3	2.41E-05	0.00E+00	-1.20E-04	-5.18E-05	2.86E-04	-1.07E-03	0.00E+00
DEPTH: 4	-1.03E-05	5.92E-04	6.27E-04	-1.46E-05	-2.75E-03	0.00E+00	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.20E-03	-6.96E-04	0.00E+00

3.3	3.7	3.5	2.8	3.3	3.6	3.1	4.4	1
3.7	3.3	3.2	3.3	3.0	4.0	2.9	4.6	2
3.8	4.1	3.3	3.2	3.3	3.7	3.4	5.6	3
4.6	4.1	3.4	3.0	3.4	3.9	3.4	4.8	6
4.5	4.1	2.9	2.7	3.1	3.0	2.9	5.4	5
4.2	4.1	2.8	2.7	3.3	3.4	2.9	6.0	4
3.8	5.8	4.6	3.2	3.3	3.6	3.2	4.2	7
4.5	4.0	3.3	3.0	3.6	3.2	3.0	4.7	8
4.4	4.0	3.0	2.9	3.6	3.1	2.8	4.6	9
3.9	4.2	3.4	3.5	3.1	3.5	3.4	3.4	12
3.9	4.4	4.0	2.7	3.0	3.2	2.9	4.1	11
4.4	5.0	3.9	2.6	3.5	3.1	3.1	4.6	10

-121.6	-107.8	-136.5	-121.2	-125.7	-126.1	-119.2	-112.1	1
-126.8	100	-124.7	100	-135.4	-120.5	-133.1	-122.5	2
-109.1	-106.3	-139.4	-133.2	-130.1	-132.3	-141.7	-114.8	3
-99.5	-123.1	-129.2	-120.8	-153.3	-121.8	-128.6	100	4
-98.7	-102.8	-83.9	100	100	-123.7	-91.8	-104.4	8
100	-101.7	-125.9	-138.0	-128.1	100	-132.7	-97.9	7
-129.4	-120.5	-152.6	-118.8	-129.2	-131.7	100	-106.8	6
-98.4	-116.5	100	100	100	-129.9	-102.7	-100.3	5
-89.3	-76.1	100	-126.3	-122.7	-128.6	-129.8	100	9
-117.5	-109.5	-141.8	100	-132.4	-137.1	-107.2	100	10
-142.7	-123.5	-121.4	100	-116.0	-127.9	-131.9	-88.9	11
100	-116.2	100	-92.1	100	100	-99.5	100	12
-74.8	-69.4	100	-140.0	-127.0	-125.6	-124.8	100	16
100	100	-146.9	-137.4	-122.6	-123.1	-124.4	100	15
-98.9	100	-152.4	-119.5	-120.4	100	100	100	14
-102.1	-135.7	-158.0	-140.3	-143.5	100	-121.9	100	13
100	-100.3	-119.6	-128.4	100	-160.7	100	100	17
-107.3	-120.7	-145.6	-139.9	100	100	100	100	18
-104.5	100	-134.6	100	100	-133.9	-126.7	-126.1	19
100	-140.7	100	-121.0	-120.5	100	100	100	20

apr.udat
days =   61.0

CELL 1

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.42E-03	-8.95E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-6.96E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.96E-04	-8.58E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.58E-04	-1.23E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-03	-7.73E-04	0.00E+00

CELL 2

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.54E-03	-7.57E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.57E-04	-7.11E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.11E-04	-8.40E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-04	-1.13E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E-03	-7.41E-04	0.00E+00

CELL 3

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.55E-03	-1.15E-03	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-03	-7.11E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.11E-04	-9.73E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.73E-04	-1.04E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-03	-8.06E-04	0.00E+00

CELL 4

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E-03	-7.26E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.26E-04	-6.27E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.27E-04	-1.01E-03	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-03	-8.40E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-04	-6.67E-04	0.00E+00

CELL 5

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.78E-03	-1.45E-03	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E-03	-7.89E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.89E-04	-8.95E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-9.94E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.94E-04	-8.06E-04	0.00E+00

CELL 6

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.25E-03	-1.15E-03	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-03	-6.14E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.14E-04	-1.04E-03	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-03	-8.23E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.23E-04	-6.96E-04	0.00E+00

3.3	3.7	3.5	2.8	3.3	3.6	3.1	4.4	1
3.7	3.3	3.2	3.3	3.0	4.0	2.9	4.6	2
3.8	4.1	3.3	3.2	3.3	3.7	3.4	5.6	3
4.6	4.1	3.4	3.0	3.4	3.9	3.4	4.8	6
4.5	4.1	2.9	2.7	3.1	3.0	2.9	5.4	5
4.2	4.1	2.8	2.7	3.3	3.4	2.9	6.0	4
3.8	5.8	4.6	3.2	3.3	3.6	3.2	4.2	7
4.5	4.0	3.3	3.0	3.6	3.2	3.0	4.7	8
4.4	4.0	3.0	2.9	3.6	3.1	2.8	4.6	9
3.9	4.2	3.4	3.5	3.1	3.5	3.4	3.4	12
3.9	4.4	4.0	2.7	3.0	3.2	2.9	4.1	11
4.4	5.0	3.9	2.6	3.5	3.1	3.1	4.6	10
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	

2july.dat
days = 31.0

CELL 1

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-2.57E-05	-8.33E-05	-6.29E-05	1.82E-05	7.88E-04	-1.19E-03	-1.36E-02
DEPTH: 2	4.35E-06	-1.16E-04	-6.93E-05	5.88E-05	-1.79E-03	-5.98E-04	-7.46E-02
DEPTH: 3	-4.91E-05	-1.02E-04	-7.32E-05	5.67E-04	5.98E-04	-3.17E-03	-7.76E-02
DEPTH: 4	-2.46E-04	-2.63E-04	-2.14E-04	-2.50E-04	-1.80E-04	-1.26E-03	-5.05E-02
DEPTH: 5	-1.62E-04	-1.85E-04	-1.99E-04	-9.05E-05	1.26E-03	-1.97E-03	-2.60E-02

CELL 2

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	9.97E-06	-9.02E-06	6.02E-05	6.29E-05	7.23E-04	-8.92E-04	-4.48E-03
DEPTH: 2	-9.63E-06	0.00E+00	3.07E-05	6.93E-05	8.92E-04	-5.24E-04	0.00E+00
DEPTH: 3	-2.25E-05	7.34E-05	-9.05E-06	7.32E-05	5.24E-04	-8.79E-04	-1.03E-02
DEPTH: 4	3.05E-06	6.37E-05	4.45E-05	2.14E-04	8.79E-04	-1.21E-03	-8.14E-03
DEPTH: 5	-7.62E-06	6.40E-04	1.73E-04	1.99E-04	-2.93E-03	-3.90E-04	-9.68E-02

CELL 3

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	8.33E-05	-1.24E-04	9.05E-06	-1.67E-05	1.30E-03	-1.23E-03	1.76E-03
DEPTH: 2	1.16E-04	-2.12E-05	0.00E+00	4.54E-05	1.23E-03	-4.30E-04	0.00E+00
DEPTH: 3	1.02E-04	-2.93E-05	1.06E-04	-1.78E-05	4.30E-04	-1.00E-03	-1.67E-02
DEPTH: 4	2.63E-04	7.12E-05	9.67E-05	4.64E-04	1.00E-03	-6.86E-04	1.53E-02
DEPTH: 5	1.85E-04	4.65E-05	9.88E-07	2.55E-04	6.86E-04	-3.05E-04	1.48E-02

CELL 4

WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1						
9.02E-06	4.80E-04	8.18E-07	-9.05E-06	-2.24E-03	0.00E+00	0.00E+00
DEPTH: 2						
0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.91E-03	-2.60E-03	0.00E+00
DEPTH: 3						
-7.34E-05	-2.87E-05	-2.50E-05	-1.06E-04	0.00E+00	-4.80E-03	0.00E+00
DEPTH: 4						
-6.37E-05	-6.09E-05	-4.75E-05	-9.67E-05	1.58E-03	-1.28E-03	7.59E-03
DEPTH: 5						
5.97E-04	-6.43E-05	5.80E-04	-9.88E-07	-2.10E-03	-2.62E-04	-6.62E-02

CELL 5

WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1						
1.24E-04	8.23E-05	6.68E-04	2.17E-04	1.09E-03	-4.72E-03	-1.06E-01
DEPTH: 2						
2.12E-05	2.88E-05	3.19E-05	-3.81E-05	7.84E-04	-5.21E-04	8.43E-03
DEPTH: 3						
2.93E-05	1.17E-04	1.06E-04	-4.10E-05	5.21E-04	-4.66E-04	3.04E-03
DEPTH: 4						
-7.12E-05	2.09E-04	-1.85E-05	-3.83E-05	4.66E-04	-7.36E-04	-7.88E-03
DEPTH: 5						
-4.65E-05	0.00E+00	-1.10E-04	-4.83E-05	7.36E-04	-8.37E-04	0.00E+00

CELL 6

WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1						
7.47E-04	2.59E-04	8.90E-05	7.62E-04	9.83E-04	-4.09E-03	-8.48E-02
DEPTH: 2						
0.00E+00	-4.82E-05	8.35E-06	-3.19E-05	-2.80E-04	-1.11E-04	0.00E+00
DEPTH: 3						
2.87E-05	-4.34E-05	-8.00E-05	-1.06E-04	1.11E-04	-1.44E-03	-4.25E-02
DEPTH: 4						
6.09E-05	-6.97E-05	-5.16E-05	1.85E-05	1.44E-03	-1.09E-03	1.08E-02
DEPTH: 5						
6.43E-05	-8.17E-05	5.23E-05	1.10E-04	1.09E-03	1.75E-04	4.00E-02

2.4	2.9	3.2	2.9	3.1	3.5	2.9	4.2	1
2.3	2.7	2.9	3.0	3.0	3.6	2.9	4.5	2
2.4	3.0	3.2	3.0	2.9	3.6	3.2	5.4	3
2.5	2.6	3.2	2.9	3.2	3.7	3.2	4.6	6
2.2	2.8	2.7	2.6	3.0	2.9	3.1	5.1	5
2.2	2.8	2.7	2.6	3.3	3.3	2.9	6.1	4
2.2	3.0	3.2	2.8	3.2	3.4	3.2	4.2	7
2.2	3.0	3.3	2.8	3.4	3.2	2.9	4.6	8
2.4	2.9	2.8	2.7	3.6	2.9	2.7	4.5	9
2.6	3.2	3.2	3.4	3.0	3.2	3.0	4.3	12
2.5	2.9	3.3	2.7	2.8	3.1	2.9	4.2	11
2.3	3.2	3.3	2.5	3.6	2.9	3.0	4.6	10

-142.6	-116.1	-141.7	-131.4	-138.8	-140.3	-128.6	-125.6	1
-119.1	-110.4	-135.5	-116.7	-149.8	-138.6	100	-142.3	2
-157.4	-110.4	-151.3	-140.5	-148.1	-139.7	-158.7	-127.5	3
-73.3	-110.9	-119.3	-127.6	-153.9	-132.2	-122.6	100	4
-132.1	-112.7	-114.2	-116.5	100	-142.3	-108.1	-117.3	8
-106.6	-107.6	-127.0	100	-123.1	-86.1	-135.8	100	7
-140.4	-116.4	-149.6	-138.3	-140.8	-148.0	100	-119.6	6
-203.8	-102.6	-136.9	100	-141.5	-132.7	-105.3	100	5
-115.1	100	-140.7	-149.2	100	-80.5	-127.8	-118.1	9
-97.5	-115.1	-159.4	-148.9	-142.3	-158.8	-126.4	-122.0	10
-165.4	-135.3	100	100	-122.7	-142.4	100	-106.0	11
-182.3	-134.2	-136.0	-109.3	-146.0	-134.7	100	100	12
-185.6	-76.2	-165.2	-165.6	-152.8	-138.8	-146.7	100	16
-132.3	100	-160.3	-156.6	-146.2	-132.0	-136.6	100	15
-150.7	100	-172.0	-132.0	-124.1	-161.0	-152.1	-84.9	14
-129.3	-149.1	-159.6	-140.4	-146.1	-156.3	-132.8	100	13
-106.6	100	-135.6	-151.6	-83.0	-182.4	-77.5	100	17
-220.7	-140.7	-149.9	-156.5	-96.7	100	100	-107.1	18
-150.7	-89.3	-162.4	100	-137.8	-173.8	100	-138.2	19
100	-131.4	100	100	100	-122.5	-85.7	100	20

2july.udat
days =   31.0

CELL 1

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.88E-04	-7.26E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.26E-04	-6.40E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.40E-04	-7.73E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-04	-1.04E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.04E-03	-7.41E-04	0.00E+00

CELL 2

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.27E-04	-6.53E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.53E-04	-6.14E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.14E-04	-7.57E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.57E-04	-9.73E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.73E-04	-7.41E-04	0.00E+00

CELL 3

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.40E-04	-7.89E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.89E-04	-6.01E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.01E-04	-8.58E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.58E-04	-9.33E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.33E-04	-7.89E-04	0.00E+00

CELL 4

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.53E-04	-6.53E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.53E-04	-5.53E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.53E-04	-9.53E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.53E-04	-7.73E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-04	-6.67E-04	0.00E+00

CELL 5

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-04	-8.95E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-6.81E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.81E-04	-7.89E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.89E-04	-8.76E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.76E-04	-7.26E-04	0.00E+00

CELL 6

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.26E-04	-8.40E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.40E-04	-5.53E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.53E-04	-9.73E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.73E-04	-7.41E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-04	-6.53E-04	0.00E+00

2.4	2.9	3.2	2.9	3.1	3.5	2.9	4.2	1
2.3	2.7	2.9	3.0	3.0	3.6	2.9	4.5	2
2.4	3.0	3.2	3.0	2.9	3.6	3.2	5.4	3
2.5	2.6	3.2	2.9	3.2	3.7	3.2	4.6	6
2.2	2.8	2.7	2.6	3.0	2.9	3.1	5.1	5
2.2	2.8	2.7	2.6	3.3	3.3	2.9	6.1	4
2.2	3.0	3.2	2.8	3.2	3.4	3.2	4.2	7
2.2	3.0	3.3	2.8	3.4	3.2	2.9	4.6	8
2.4	2.9	2.8	2.7	3.6	2.9	2.7	4.5	9
2.6	3.2	3.2	3.4	3.0	3.2	3.0	4.3	12
2.5	2.9	3.3	2.7	2.8	3.1	2.9	4.2	11
2.3	3.2	3.3	2.5	3.6	2.9	3.0	4.6	10
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	

june.dat
days = 46.0

CELL 1

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-8.90E-05	-6.04E-05	-1.11E-04	8.78E-05	8.85E-04	-9.40E-04	-4.11E-03
DEPTH: 2	-7.13E-05	-9.19E-05	-5.41E-05	3.30E-05	9.40E-04	-6.81E-04	1.02E-02
DEPTH: 3	-9.23E-05	-7.14E-05	-8.53E-06	-3.39E-05	6.81E-04	-4.22E-04	9.98E-03
DEPTH: 4	-2.69E-04	-1.68E-04	-1.75E-04	-1.83E-04	4.22E-04	-8.90E-04	-2.88E-02
DEPTH: 5	-2.56E-04	-1.63E-04	-2.31E-04	-1.30E-04	8.90E-04	-9.24E-04	-8.73E-03

CELL 2

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	3.93E-05	1.12E-04	1.32E-04	1.11E-04	7.91E-04	-5.62E-04	1.42E-02
DEPTH: 2	-5.62E-05	3.82E-05	1.51E-04	5.41E-05	5.62E-04	-4.02E-04	9.10E-03
DEPTH: 3	-1.01E-04	1.58E-04	1.41E-05	8.53E-06	4.02E-04	-1.11E-03	-3.19E-02
DEPTH: 4	-1.81E-05	2.93E-04	2.10E-05	1.75E-04	1.11E-03	-1.35E-03	-6.75E-03
DEPTH: 5	-2.40E-05	6.00E-04	1.55E-04	2.31E-04	-2.92E-03	-3.76E-04	-1.43E-01

CELL 3

DEPTH	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	6.04E-05	-1.07E-04	6.79E-05	1.60E-04	1.34E-03	-1.30E-03	3.22E-03
DEPTH: 2	9.19E-05	-4.09E-06	8.34E-05	1.14E-04	1.30E-03	-5.68E-04	3.65E-02
DEPTH: 3	7.14E-05	1.76E-05	2.44E-04	-2.16E-05	5.68E-04	-8.09E-04	-8.21E-03
DEPTH: 4	1.68E-04	5.24E-05	2.80E-04	2.65E-06	8.09E-04	-6.67E-04	1.12E-02
DEPTH: 5	1.63E-04	-3.05E-05	-3.41E-05	-3.41E-05	6.67E-04	-9.33E-05	2.70E-02

CELL 4

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	-1.12E-04	-3.16E-05	5.34E-06	-6.79E-05	6.37E-04	-1.13E-03	-2.44E-02
DEPTH: 2	-3.82E-05	-7.39E-05	8.05E-05	-8.34E-05	-1.48E-03	-2.07E-04	-7.85E-02
DEPTH: 3	-1.58E-04	-2.07E-04	-1.08E-04	-2.44E-04	2.07E-04	0.00E+00	0.00E+00
DEPTH: 4	-2.93E-04	-2.17E-04	-2.27E-04	-2.80E-04	0.00E+00	-1.47E-03	0.00E+00
DEPTH: 5	5.32E-04	2.04E-05	1.05E-04	3.41E-05	1.47E-03	-2.62E-03	-4.66E-02

CELL 5

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	1.07E-04	1.35E-04	1.47E-04	3.13E-04	1.55E-03	-4.94E-03	-1.49E-01
DEPTH: 2	4.09E-06	5.09E-05	1.98E-05	5.81E-05	9.57E-04	-5.35E-04	2.07E-02
DEPTH: 3	-1.76E-05	-1.94E-05	5.92E-05	-3.08E-05	5.35E-04	-6.47E-04	-5.26E-03
DEPTH: 4	-5.24E-05	-5.05E-05	4.00E-05	1.43E-05	6.47E-04	-1.04E-03	-1.86E-02
DEPTH: 5	3.05E-05	0.00E+00	1.65E-05	2.69E-05	1.04E-03	-8.88E-04	0.00E+00

CELL 6

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	3.16E-05	2.61E-05	-9.39E-05	-1.47E-04	1.70E-03	-1.49E-03	8.12E-03
DEPTH: 2	7.39E-05	-1.65E-05	0.00E+00	-1.98E-05	1.49E-03	-2.66E-04	0.00E+00
DEPTH: 3	2.07E-04	0.00E+00	-5.10E-05	-5.92E-05	2.66E-04	-9.11E-04	0.00E+00
DEPTH: 4	2.17E-04	-1.43E-04	-7.61E-05	-4.00E-05	9.11E-04	-9.81E-04	-3.60E-03
DEPTH: 5	-2.04E-05	4.26E-05	7.95E-06	-1.65E-05	9.81E-04	-2.60E-04	3.33E-02

2.6	3.1	3.3	3.0	3.3	3.5	3.0	4.2	1
2.3	2.8	3.0	3.0	2.9	3.8	2.7	4.6	2
2.5	2.3	3.2	3.1	3.0	3.6	3.3	5.4	3
2.6	3.0	3.2	3.0	3.1	3.8	3.3	4.7	6
2.6	3.0	2.7	2.6	2.9	3.1	3.0	5.5	5
2.6	2.9	2.8	2.5	3.2	3.3	2.7	6.0	4
2.4	3.1	3.6	3.0	3.3	3.3	3.0	4.0	7
2.5	3.2	3.3	3.0	3.3	3.2	2.9	4.5	8
2.8	3.1	2.8	2.8	3.6	2.9	2.9	4.5	9
3.0	3.4	3.4	3.4	3.0	3.3	3.3	4.2	12
2.8	3.2	3.3	2.7	2.9	3.2	2.8	4.1	11
2.9	3.7	3.6	2.7	3.4	2.9	3.0	4.7	10

-105.2	-103.3	-129.3	-107.1	-117.7	-115.6	-112.6	-105.5	1
-115.0	-102.1	-140.6	-109.0	-150.7	-127.2	-141.6	-135.6	2
-107.6	-101.6	-137.9	-131.7	-137.3	-127.3	-147.3	-123.8	3
-96.20	-128.8	-75.70	-120.9	-133.8	-116.8	-120.6	100	4
-119.8	-83.80	-91.60	-118.0	100	-124.8	-96.50	-102.8	8
-93.30	-99.4	-108.0	-113.9	-109.2	-87.4	-95.6	100	7
-125.3	-112.3	-146.0	-101.8	-125.3	-133.6	100	-106.7	6
-87.7	-108.2	-85.8	-93.9	-127.1	-124.9	-89.3	-76.3	5
-81.7	-85.6	-92.6	-131.7	100	-126.7	-119.1	-93.2	9
-88.2	-100.8	-132.1	-132.0	-123.2	-131.0	-104.3	-78.4	10
-122.8	-92.7	-113.3	100	-74.9	100	-124.4	-80.8	11
-116.7	-93.2	-110.4	-74.3	-119.3	-106.5	-97.0	100	12
-77.9	-62.3	-110.3	-137.3	-122.5	-109.6	-128.1	100	16
-87.2	100	-133.6	-131.9	-116.9	-120.1	-126.8	100	15
-91.7	-76.9	-141.1	-116.7	-107.1	-115.3	-124.9	-78.7	14
-98.0	-111.2	-137.0	-120.8	-122.0	-127.0	-109.7	100	13
100	100	-106.4	-132.6	100	-160.8	100	100	17
-116.0	-105.8	-119.0	-128.7	-128.1	100	100	100	18
-113.7	-78.5	-132.1	100	100	-138.4	-83.8	-90.9	19
-87.7	100	100	100	100	-106.7	100	100	20

june.udat
days =   46.0

CELL 1

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.11E-04	-7.57E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.57E-04	-6.67E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.67E-04	-7.57E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.57E-04	-1.15E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-03	-7.26E-04	0.00E+00

CELL 2

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.88E-04	-6.81E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.81E-04	-6.14E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.14E-04	-7.26E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.26E-04	-1.06E-03	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-03	-6.81E-04	0.00E+00

CELL 3

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-04	-8.58E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.58E-04	-6.67E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.67E-04	-8.23E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.23E-04	-9.73E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.73E-04	-7.57E-04	0.00E+00

CELL 4

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.57E-04	-6.67E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.67E-04	-5.76E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.76E-04	-8.95E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-8.06E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.06E-04	-6.53E-04	0.00E+00

CELL 5

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.76E-04	-1.01E-03	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.01E-03	-7.41E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-04	-8.06E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.06E-04	-8.95E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-7.26E-04	0.00E+00

CELL 6

	WEST	EAST	NORTH	SOUTH	UPPPER	LOWER	DELTA S
DEPTH: 1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.33E-04	-8.95E-04	0.00E+00
DEPTH: 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.95E-04	-6.14E-04	0.00E+00
DEPTH: 3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.14E-04	-9.33E-04	0.00E+00
DEPTH: 4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.33E-04	-7.57E-04	0.00E+00
DEPTH: 5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.57E-04	-6.67E-04	0.00E+00

2.6	3.1	3.3	3.0	3.3	3.5	3.0	4.2	1
2.3	2.8	3.0	3.0	2.9	3.8	2.7	4.6	2
2.5	2.3	3.2	3.1	3.0	3.6	3.3	5.4	3
2.6	3.0	3.2	3.0	3.1	3.8	3.3	4.7	6
2.6	3.0	2.7	2.6	2.9	3.1	3.0	5.5	5
2.6	2.9	2.8	2.5	3.2	3.3	2.7	6.0	4
2.4	3.1	3.6	3.0	3.3	3.3	3.0	4.0	7
2.5	3.2	3.3	3.0	3.3	3.2	2.9	4.5	8
2.8	3.1	2.8	2.8	3.6	2.9	2.9	4.5	9
3.0	3.4	3.4	3.4	3.0	3.3	3.3	4.2	12
2.8	3.2	3.3	2.7	2.9	3.2	2.8	4.1	11
2.9	3.7	3.6	2.7	3.4	2.9	3.0	4.7	10
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	
-100	-100	-100	-100	-100	-100	-100	-100	

Appendix H:

Chloride Data
Chloride Calculations

Table 1. Chloride concentration in the soil-water from access tube number 3. Concentration determined by titration.

Depth (cm)	Water Content (volumetric)	Cl^- in soil extract (ppm)	Cl^- in soil-water (ppm)
0	1.0	5.65	977.33
15	2.1	5.93	488.13
30	3.3	5.41	278.69
60	3.7	1.79	83.37
90	3.4	2.76	137.55
120	3.7	2.26	103.43
150	3.7	2.98	136.47
180	4.6	2.71	100.49
210	4.2	4.40	177.98
240	6.0	3.49	98.30
270	6.7	11.67	293.01
300	3.5	19.57	949.90
330	4.7	36.95	1330.36
360	5.9	130.65	3754.60
390	11.7	50.77	734.76
420	9.3	53.51	973.63

Table 2. Chloride concentration in the soil-water from access tube number 4. Concentration determined by titration.

Depth (cm)	Water Content (volumetric)	Cl^- in soil extract (ppm)	Cl^- in soil-water (ppm)
0	1.0	4.78	806.63
15	2.1	4.07	344.38
30	3.2	1.78	93.64
60	3.2	1.48	77.65
90	3.0	1.57	89.60
120	2.8	2.15	129.85
150	3.3	3.26	167.28
180	3.2	8.75	463.62
210	3.0	20.45	1151.30
240	6.1	20.53	567.28
270	6.5	94.98	2467.80
300	3.3	79.99	4109.71
330	3.9	62.76	2733.79
360	5.0	185.59	6681.24
390	8.3	32.45	652.55
420	6.7	26.26	658.03

Table 3. Chloride concentration in the soil-water from access tube number 9. Concentration determined by titration.

Depth (cm)	Water Content (volumetric)	Cl^- in soil extract (ppm)	Cl^- in soil-water (ppm)
0	1.0	6.11	1040.47
15	2.1	4.38	363.44
30	3.2	3.88	204.10
60	3.1	3.05	165.84
90	3.2	3.42	181.33
120	2.9	2.88	167.83
150	3.6	3.43	160.60
180	3.0	35.25	1983.10
210	2.7	12.66	791.37
240	4.6	12.65	465.66
270	6.0	38.54	1091.20
300	3.1	22.16	1217.60
330	3.3	25.52	1301.78
360	6.0	103.31	2902.24
390	7.2	43.26	1026.76
420	5.6	25.94	781.80

Table 4. Chloride concentration in the soil-water from access tube number 10. Concentration determined by titration.

Depth (cm)	Water Content (volumetric)	Cl^- in soil extract (ppm)	Cl^- in soil-water (ppm)
0	1.0	7.16	1218.60
15	2.1	4.86	403.44
30	2.9	4.2	278.46
60	3.2	5.80	349.72
90	3.6	3.13	168.19
120	2.9	5.57	372.45
135	3.2	4.01	238.85
180	3.1	5.66	348.93
210	2.9	13.14	880.53
240	4.4	12.5	541.54
270	5.9	57.19	1872.30
300	3.3	78.46	4584.10
330	3.2	54.26	3316.80
360	5.3	64.41	2314.90
390	7.1	38.19	907.83
420	5.6	27.33	826.38

Table 5. Soil-water fluxes with depth calculated from chloride concentrations determined at access tube numbers 3, 4, 9 and 10.

	FLUX (cm/year)			
Depth (cm)	ETN-3	ETN-4	ETN-9	ETN-10
0	0.0077	0.0093	0.0072	0.0062
15	0.0154	0.0022	0.0206	0.0186
30	0.0269	0.0800	0.0367	0.0270
60	0.0900	0.0966	0.0452	0.0214
90	0.0545	0.0837	0.0414	0.0446
120	0.0725	0.0578	0.0447	0.0201
150	0.0550	0.0448	0.0467	0.0314
180	0.0746	0.0162	0.0038	0.0215
210	0.0420	0.0065	0.0095	0.0085
240	0.0763	0.0132	0.0161	0.0138
270	0.0256	0.0030	0.0069	0.0040
300	0.0079	0.0018	0.0062	0.0016
330	0.0056	0.0027	0.0576	0.0023
360	0.0020	0.0011	0.0258	0.0032
390	0.0102	0.0115	0.0073	0.0083
420	0.0077	0.0114	0.0096	0.0091

Formulas Used in Chloride Mass Balance Analysis

Calculation of chloride content in soil-water extract (see Appendix B).

Cl^- (ppm) = [ml $Hg(NO_3)_2$ solution added x Normality $Hg(NO_3)_2$ solution x gfw chlorine x 1000 mg/g] / (ml of sample)

Calculation of chloride content in soil water.

$$Cl_{sw} \text{ (ppm)} = [(A \times E + B) \times C / 1000] / [(A - \{A \times E\}) / (F \times 1000) \times (D / 100)]$$

where:

A = weight of soil (g)

B = volume of DI water added to make soil extract (ml)

C = chloride concentration in soil extract (ppm)

D = water content of soil when sampled (volumetric %)

E = water content of soil sample just before extract made (gravimetric %)

F = dry bulk density of soil (g/cm^3)

Assumptions:

Gravimetric water content of samples was determined by oven drying the first two sets of samples. Values were always near 1 %. Since samples had been stored under the same conditions in lab, it was not deemed necessary to experimentally determine this value for every sample. 1 % used for all calculations.

Dry bulk density of soil = 1.65 g/cm^3.

Initial water content of soil determined by neutron probe readings.

Calculations of Soil-Water Flux

$$\text{Flux (cm/year)} = (C_o/Cl_{sw}) \times P$$

where:

Flux = soil-water flux (cm/year)

C_o = atmospheric concentration in precipitation (mg/liter)

Cl_{sw} = chloride concentration in soil water (mg/liter)

P = average annual precipitation

Assumptions:

Cl_{sw} calculated from concentration in soil-water extract

C_o = 0.375 mg/liter

P = 20 cm/year