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INTEGRATED HYDROGEOLOGICAL MODELING OF THE GENERAL SEPARATIONS AREA

Volume 2

Groundwater Flow Model (U)

G. P. Flach and M. K. Harris

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Abstract

The 15 mi^2 General Separations Area (GSA) contains more than 35 RCRA and CERCLA waste units, and is the focus of numerous ongoing and anticipated contaminant migration and remedial alternatives studies. To meet the analysis needs of GSA remediation programs, a groundwater flow model of the area based on the FACT code was developed. The model is consistent with detailed characterization and monitoring data through 1996. Model preprocessing has been automated so that future updates and modifications can be performed quickly and efficiently. Most remedial action scenarios can be explicitly simulated, including vertical recirculation wells, vertical barriers, surface caps, pumping wells at arbitrary locations, specified drawdown within well casings (instead of flowrate), and wetland impacts of remedial actions. The model has a fine scale vertical mesh and heterogeneous conductivity field, and includes the vadose zone. Therefore, the model is well suited to support subsequent contaminant transport simulations. The model can provide a common framework for analyzing groundwater flow, contaminant migration, and remedial alternatives across Environmental Restoration programs within the GSA.

Model summary

The present GSA model simulates groundwater flow within the area bounded by Fourmile Branch on the south, Upper Three Runs on the north, F-area on the west, and McQueen Branch on the east, from ground surface to the bottom of the Gordon aquifer. Groundwater from the Upper Three Runs (UTR) aquifer unit is assumed to discharge equally from each side of Upper Three Runs, Fourmile Branch and McQueen Branch. Therefore, these streams provide natural, no-flow boundary conditions for most of the UTR aquifer unit. On the west side of the unit, hydraulic head values from a contour map of measured water elevations are prescribed. The Gordon aquifer is assumed to discharge equally from both sides of Upper Three Runs and so a no-flow boundary condition is specified over the north face of the model. Lacking natural boundary conditions, hydraulic heads are specified over the west, south and east faces of the model within the Gordon aquifer. Areas of groundwater recharge and discharge consistent with computed hydraulic head at ground surface are computed as part of the model solution using a combined recharge/drain boundary condition applied over the entire top surface of the model. Groundwater discharges to surface water in regions where the computed head is above ground elevation.

The areal resolution of the model is 200 ft square except in peripheral areas. There are 108 elements along the east-west axis, and 77 elements along the north-south axis. The vertical resolution varies depending on hydrogeologic unit and terrain/hydrostratigraphic surface variations. Each hydrostratigraphic surface is defined by numerous "picks" ranging in number from approximately 70 to 375 depending on the surface. The "upper" aquifer zone of UTR aquifer unit is represented with 9 finite-elements in the vertical direction. The vadose zone is included in the model. The "lower" aquifer zone contains 5 finite-elements while the "tan clay" confining zone separating the aquifer zones is modeled with 2 vertical elements. The Gordon confining and aquifer units each contain 2 elements, for a total of 20 vertical elements from ground surface to the bottom of the Gordon aquifer. The 3D mesh size is therefore $108 \times 77 \times 20 = 166{,}320$ elements or $109 \times 78 \times 21 = 178{,}542$ nodes. The relatively fine vertical resolution of the model is designed to support subsequent contaminant transport analyses.

Hydraulic conductivity values in the model are based directly on a large characterization database comprised of approximately 85 pumping and 481 slug test data points, 258 laboratory permeability measurements, and nearly 37,500 lithology data records. The conductivity field is heterogeneous within hydrogeologic units and reflects variations present in the characterization data. The average horizontal conductivities in the saturated "upper" UTR aquifer zone, "lower" UTR aquifer zone, and Gordon aquifer unit are 7.5, 7.1, and 38 ft/d. The average vertical conductivities for the "tan clay" confining zone and the Gordon confining unit are 6×10^{-3} and 1×10^{-4} ft/d.

Model calibration targets include hydraulic head, groundwater recharge and stream baseflow measurements. The overall root-mean-square difference between simulated head and approximately 665 time-averaged measurements is 3.2 ft. The r.m.s. residuals within the "upper", "lower", and Gordon aquifer zones/units are 2.8, 4.4, and 2.0 ft. The average natural recharge over the entire model domain is 14.8 in/yr compared to approximately 15 in/yr from prior groundwater budget studies. Various man-made features (e.g. basins) provide additional recharge in localized areas. The estimated discharge rates to Upper Three Runs, Fourmile Branch, McQueen Branch, and Crouch Branch within the model domain are 18.2, 2.6, 1.5, and 1.8 ft^3/s. The simulated discharge rates are 10.1, 2.9, 3.5, and 1.3 ft^3/s. Predicted seepage faces are consistent with field observations. Simulated hydraulic heads, vertically-averaged over the entire thickness of the "upper" UTR, "lower" UTR, and Gordon aquifer zones, agree well with potentiometric maps based on measured heads. Simulated flow directions vertically-averaged over the entire thickness of the aquifer zones agree with conceptual models of groundwater flow.

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Introduction

The 15 mi^2 General Separations Area (GSA) contains more than 35 RCRA and CERCLA waste units, and is the focus of numerous ongoing and anticipated contaminant migration and remedial alternatives studies (Figure 1). To meet the analysis needs of GSA remediation programs, development of a groundwater flow model of the area was initiated. Specific objectives for updating GSA groundwater flow simulation capability include (Lewis, 1996):

- incorporate field data collected since the previous GSA flow model was last updated (GeoTrans, 1992; GeoTrans, 1993; Sadler, 1995).
- automate model development to enable efficient updates from site databases and modifications to investigate remedial actions of interest.
- significantly increase vertical discretization to enable better simulation of aquifer heterogeneities and minimize numerical dispersion in subsequent contaminant transport studies.
- improve utilization of characterization data to better define aquifer heterogeneities, especially for subsequent contaminant transport studies.
- provide combined vadose and saturated zone modeling capability.
- enable simulation of vertical recirculation wells, vertical barriers, surface caps, pumping wells at arbitrary locations, specified drawdown within well casings (instead of flowrate), and wetland impacts of remedial actions.
- provide a common framework for analyzing groundwater flow, contaminant migration, and remedial alternatives within the GSA across ER programs.

The amount of characterization data from the GSA has approximately doubled since 1991 when the GeoTrans (1992) model was first developed. GeoTrans (1993) and Sadler (1995) performed limited updates subsequently. Overall the GeoTrans model is based on data of pre-1992 vintage, however. Therefore nearly half of the present characterization database is not reflected in the latest FTWORK model of the GSA. Part of the reason that groundwater models have not been kept current with available characterization data is the considerable effort required to process raw data into formats directly usable by groundwater codes through input. With automated code input data processing, frequent model updates become feasible. Annual or more frequent updates are envisioned for the present model of the GSA based on the FACT code (Hamm and others, 1997).

Conventional groundwater flow models discretize aquifer zones with a single grid block/element, and consequently assign a single hydraulic conductivity value to the entire vertical extent of the zone at a given areal location. While this approach may be adequate for large-scale groundwater flow simulation, it is usually inadequate for contaminant transport simulation for two reasons. First, contamination is numerically smeared uniformly over the entire vertical extent of aquifer zones (diluted), corresponding to an aphysical amount of vertical dispersion. Second, small-scale heterogeneities in hydraulic conductivity have a significant effect on contaminant migration. These features can not be captured with a vertically-coarse mesh. To remedy these shortcomings with respect to subsequent transport simulation, the present FACT model of the GSA incorporates multiple mesh layers within each aquifer zone that reflect heterogeneities indicated by characterization data. Because most groundwater contaminants originate above the water table, the present model also includes the vadose zone.

The remedial actions in the above list of objectives cannot be readily simulated using the GeoTrans model based on the FTWORK code. The FACT code contains a variably-saturated formulation and certain boundary condition options that remedy this shortcoming. A FACT-based GSA model is expected to be capable of simulating nearly all remedial actions. Because FACT is an in-house developed code, the software can be modified as needed to handle unforeseen technologies. As such, a FACT-based GSA model can provide a common framework across ER programs for analyzing groundwater flow and contaminant transport.

The remainder of this report summarizes the hydrogeologic framework and data of the study area, describes the model development process, and presents model results and conclusions.

Hydrogeologic framework and data

The hydrogeologic framework behind the GSA model is summarized in this section. The hydrogeologic and hydrologic data used to develop and/or calibrate the GSA model are also identified and described. For more detailed discussion, the reader is referred to Volume 1 of this report.

Geology of the study area

The SRS is underlain by sediment of the Atlantic Coastal Plain. The Atlantic Coastal Plain consists of a southeast-dipping wedge of unconsolidated and semi-consolidated sediment that extends from its contact with the Piedmont province at the Fall Line to the edge of the continental shelf. The sediment ranges from Late Cretaceous to Miocene in age and comprises layers of sand, muddy sand, and mud with subordinate calcareous sediment. The sediment rests unconformably on crystalline and sedimentary basement rock.

The mapping done for this study analyzes units that are Tertiary in age (Figure 2). These include, in ascending order, the Lang Syne Formation, Snapp Formation, Fourmile

Branch Formation, Congaree Formation, Warley Hill Formation, Santee Formation, Clinchfield Formation, Dry Branch Formation, Tobacco Road Sand, and "upland" unit. A brief discussion of the hydrostratigraphic units and their relationship with the lithostratigraphy is presented in the following section. Detailed descriptions of the geology of the SRS and GSA can be found in several recent reports (Colquhoun and others, 1983; Fallaw and others, 1990; Aadland and others, 1991; Dennehy and others, 1989; Logan and Euler, 1989; Fallaw and Price, 1995). In addition, Volume 1 of this report (Smits and others, 1997) provides detailed subsurface mapping of the hydrostratigraphic and lithostratigraphic units within the study area.

Hydrostratigraphy of the study area

The hydrostratigraphy of the SRS has been subject to several different classifications. This report incorporates the hydrostratigraphic nomenclature currently established for the SRS vicinity by Aadland and others (1995). The nomenclature is correlated with the local lithostratigraphy in Figure 2. A thorough description and review of the hydrostratigraphy of the SRS region is available in Aadland and others (1995). In the study area, the Meyers Branch confining system defines the base of the Floridan aquifer system, which is the focus of this modeling effort. In the GSA, the top of the Meyers Branch confining system is delineated by the laterally continuous, dense, gray to black, clay and sandy clay of the Lang Syne Formation of the Black Mingo Group (Aadland and others, 1991, 1995).

Gordon aquifer

The Gordon aquifer constitutes the basal unit of the Floridan aquifer system in this part of the SRS region. Beneath the GSA, the Gordon aquifer is made up of the loose sand and clayey sand of the Congaree Formation and, where present, the sandy parts of the underlying Fishburne and Williamsburg Formations (Harris and others, 1990; Aadland and others, 1991, 1995). The sand within the Gordon aquifer is yellowish to grayish orange in color and is sub- to well-rounded, moderately to poorly sorted, and medium to coarse-grained. Pebbly layers and zones of iron and silica cement are common. Layers of light tan to gray clay up to three feet in thickness are rare, and thin (<6 in thick) layers of clay are often found near the base of this unit. Small amounts of calcareous sediment occur sporadically within the Gordon aquifer in the study area.

Gordon confining unit

The Gordon aquifer is separated from the Upper Three Runs aquifer by the Gordon confining unit. The unit is commonly referred to as the "green clay" in previous SRS literature and includes sediment of the Warley Hill Formation. The unit comprises layers of interbedded silty and clayey sand, sandy clay and clay. The clay is stiff to hard and is often fissile. Glauconite is a common constituent and imparts a distinctive greenish cast to the sediment, hence the informal name "green clay" for this unit. Zones of silica-cemented sand and clay are noted in some cores taken from the GSA. In the vicinity of the GSA, the Gordon confining unit includes some calcareous sediment and limestone, primarily calcarenaceous sand and clayey sand with subordinate calcarenaceous and micritic clay, and sandy micrite and limestone.

Upper Three Runs aquifer (Water Table aquifer)

The Upper Three Runs aquifer (Aadland and others, 1995) is termed the Water Table aquifer in Volume 1 of this report (Smits and others, 1997). These terms are used interchangeably in this volume. The Water Table aquifer includes all sediment from the ground surface to the top of the Gordon confining unit. In the vicinity of the GSA, the Water Table aquifer incorporates the "upland" unit, the Tobacco Road Sand, Dry Branch Formation, Clinchfield Formation, and Santee Limestone. The Water Table aquifer is locally divided into informal "lower" and "upper" aquifer zones separated by the "tan clay" confining zone.

The "lower" aquifer zone consists of the dominantly fine-grained, well-sorted sand and clayey sand of the Santee Limestone and parts of the Dry Branch Formation beneath the "tan clay" confining zone. The bulk of the carbonate sediment present beneath the GSA is included in the "lower" aquifer zone. Descriptions of drill core indicate that the carbonate sediment in this vicinity has a dominant siliciclastic component, and consists of calcarenaceous sand, micritic sand, shelly sand and some sandy calcarenite and shelly limestone.

The "tan clay" confining zone is equivalent to the "tan clay" zone referred to in previous SRS reports. The "tan clay" confining zone includes sediment of the Dry Branch Formation. The zone contains light-yellowish tan to orange clay and sandy clay interbedded with clayey sand and sand. The lithology of the clay is similar to that of the Twiggs Clay Member, but is dispersed vertically and horizontally and is not continuous over long distances (Harris and others, 1990; Aadland and others, 1991).

The "upper" aquifer zone consists of all sediment from the ground surface to the top of the "tan clay" confining zone. The "upper" aquifer zone includes the "upland" unit, Tobacco Road Sand, and part of the Dry Branch Formation. This unit is characterized by sand and clayey sand with minor intercalated clay layers. The sediment within the "upland" unit is commonly very dense and clayey and contains some gravelly sand.

Hydrostratigraphic surfaces

Smits and others (1997) have established boundaries for hydrostratigraphic units of the Floridan aquifer system beneath the GSA. These "picks" are tabulated in Appendix A. The number of picks per unit boundary ranges from 68 for the bottom of the Gordon aquifer to 377 for the top of the "tan clay" confining zone. Smits and others (1997) generated altitude contour and isopach maps for units of the Floridan aquifer system using EarthVision®; the altitude contour maps from Volume 1 are reproduced here for convenience (Figures 3 through 7). In this study, hydrostratigraphic surfaces are represented with linear triangular functions that strictly interpolate the scattered picks. Strict interpolation is needed subsequently in the model development process. USGS Digital Elevation Model (DEM) data, supplemented with surveyed data as needed, can be used to define the topographic surface (Figure 8). Figure 9 illustrates the hydrostratigraphic model constructed in Volume 1. Upper Three Runs is seen to completely incise the Upper Three Runs aquifer unit, whereas Fourmile Branch generally lies slightly above the "tan clay" confining zone in the study area.

Hydraulic properties

The steady-state hydraulic head and Darcy velocity fields are affected only by horizontal and vertical hydraulic conductivity in the saturated zone. Soil characteristic curves (capillary suction and relative permeability as a function of water saturation) also affect the flow solution in unsaturated regions. Effective porosity affects groundwater "particle" tracing results which rely on the pore velocity field. Specific storage affects transient flow only. GSA characterization data available for defining these hydraulic properties in the model are identified below.

Horizontal and vertical conductivities

The primary focus of this model development effort is steady-state groundwater flow simulation. As such, conductivity is by far the most important of the hydraulic properties. Approximately 481 slug tests, 85 single and multiple well pumping tests, and 258 laboratory permeability measurements are available for defining horizontal and vertical conductivity. In addition, nearly 37,500 lithology data records corresponding to one foot core intervals provide indirect or "soft" conductivity information. All of these data are maintained in a Paradox® version 7.0 relational database constructed by Smits and others (1997). Appendix B lists the slug test, single and multiple well pumping test, and laboratory permeability data extracted from the database and used in this investigation. The lithology data are too numerous to list. Smits and others (1997) describe fully the content and format of lithology data set. Of main interest to this study, the lithologic core descriptions contain a mud fraction estimate that can be used to infer conductivity.

Soil characteristic curves

Relative permeability and capillary suction head as a function of water saturation are referred to as soil characteristic curves. These relationships are difficult to measure accurately, and testing is expensive. Very little data are available for SRS unconsolidated sediments. A small set of water retention (capillary suction versus saturation) data were obtained by O'Brien & Gere (1991) for M-area sediment samples. The data have been plotted by Flach and others (1996, Figures 11 and 12). Yu and others (1993) obtained both relative permeability and water retention data for remolded GSA sediments to be used for Environmental Restoration construction projects. Recently, Mark Amidon obtained water retention data from 3 undisturbed soil samples collected from the vadose zone around the Burial Grounds Complex. Given the lack of data and a specific need for accurate vadose zone modeling, a simplified approach for defining soil characteristic curves is taken as shown in Figure 10. These "pseudo-soil characteristic curves" are adequate for transporting water and contaminants through the vadose zone to the water table, provided detailed, accurate information about the unsaturated zone is not needed.

Effective porosity

Aadland and others (1995, Tables 3 and 7) estimate the average porosity of the Upper Three Runs and Gordon aquifers to be about 35%. Regions of relatively immobile water, ranging from grain-sized "dead-end" pores to macro-scale clay intervals, do not effectively participate in contaminant transport. Therefore an "effective" porosity value, smaller than the total porosity, is commonly used for transport simulations and particle tracing related to contaminant migration. An effective porosity value of 25% is assumed uniformly in the GSA model for the purpose of computing a pore velocity field that may be used later for particle tracing. The assumed porosity value is consistent with the general recommendation of Looney and others (1987, p. 39). However, the value does not affect the head and Darcy velocity solutions, or set a precedence for subsequent transport simulations.

Specific storage

Specific storage is relevant only to transient flow simulations, and therefore has no effect on the steady-state results presented in later sections. However, specific storage is required input to the FACT code used in this study, and would affect transient flow simulations anticipated in the future. Therefore some estimate is needed for this parameter. Specific storage is defined by (Freeze and Cherry, 1979, p. 59)

$$S_s = \rho g(\alpha + \eta\beta) \quad (1)$$

where

$S_s \equiv$ specific storage

$\rho \equiv$ density of water (~1000 kg/m^3)

$g \equiv$ gravitational acceleration (9.8 m/s^2)

$\alpha \equiv$ compressibility of porous medium

$\eta \equiv$ total porosity

$\beta \equiv$ compressibility of water (4.4×10^{-10} m^2/N)

Compressibility ranges from 10^{-6} to 10^{-8} m^2/N for clay and from 10^{-7} to 10^{-9} m^2/N for sand (Freeze and Cherry, 1979, Table 2.5). Assuming a nominal compressibility value of 5×10^{-8} m^2/N and a total porosity of 0.4 yields 1.5×10^{-4} ft^{-1} for specific storage. A nominal value of 10^{-4} ft^{-1} is input to the FACT code.

Groundwater sources and sinks

Estimates of groundwater recharge and discharge rates are critical to boundary condition specification and/or model calibration. Fortunately, reliable data and estimates are available for defining surface recharge and stream baseflow.

Surface recharge

At least three independent investigations of surface groundwater recharge have been performed in or near the GSA. Parizek and Root (1986) conducted a detailed hydrologic budget study of the McQueen Branch basin, half of which is contained in the GSA. They estimated recharge to average 15.6 in/yr for the basin. This value was computed by dividing the total volumetric rate of recharge by the total basin area. Therefore the average recharge excluding seepage/wetland areas would be somewhat larger. Hubbard (1984, 1985) conducted a multi-year lysimeter study at the SRS burial grounds in the GSA and measured an average recharge of about 16 in/yr. Parizek and Root (1986) and Looney and others (1987) report that Cahill (1982) estimated recharge to be about 15 in/yr at the Low Level Radioactive Solid Waste Burial Site near Barnwell, South Carolina (the authors did not locate a copy of Cahill (1982)). From these studies, the average recharge over the GSA, based on total surface area, is estimated in this study to be about 15 in/yr. The average rate excluding groundwater discharge areas would be somewhat higher.

In addition to natural recharge from rainfall, production facilities and basins are an additional source of groundwater recharge. In general, there is little or no information on the volumetric flowrates from these artificial (man-made) features.

Stream baseflow

The four largest streams within or bordering the GSA are Upper Three Runs, McQueen Branch, Crouch Branch, and Fourmile Branch (Figure 1). The U. S. Geological Survey records stream flowrate at stations along Upper Three Runs and Fourmile Branch near the GSA that can be used to estimate baseflow for these reaches. The measurements include the contributions from both baseflow and runoff, and produce an upper bound estimate for baseflow. Parizek and Root (1986), WSRC (1992) and WSRC (1994) provide additional hydrologic data pertinent to McQueen Branch, Crouch Branch and Upper Three Runs.

The average flowrate in Upper Three Runs at Road C for Water Years (WY) 1974-95-was 211 ft^3/s. At Road A the average over the same time period was 245 ft^3/s (Cooney and others, 1996). The distance between these stations is approximately 24,000 ft, yielding a linear rate of 1.42×10^{-3} ft^2/s. Based on measurements of Upper Three Runs flow between Road F and Road C and tributaries along this reach, Parizek and Root (1986) estimated baseflow to be 15 to 30 ft^3/s. Assuming an average baseflow gain of 22.5 ft^3/s along the 16,000 ft between Roads F and C yields a linear rate of 1.41×10^{-3} ft^2/s. This value is essentially that computed from the USGS data between Roads C and A, and suggests a baseflow gain of 1.4×10^{-3} $ft^3/s/ft$ near the GSA. As shown in Table 1, the estimated baseflow contribution from the GSA model domain is 18.2 ft^3/s assuming a 50% contribution from each side of the stream.

From USGS water resources data spanning WY 73-92, Flach and others (1996) estimate that Fourmile Branch gains 0.92 ft^3/s, or 2.04×10^{-3} $ft^3/s/ft$, over the 4500 ft between Stations 3 and 4 (between Road 4 and Road C). Over the same reach, GeoTrans (1992) estimated baseflow at 1.0 ft^3/s, and Parizek and Root (1986) estimated 1.1 ft^3/s. All three values are close and suggest a baseflow contribution from the GSA model domain of 2.6 ft^3/s, again assuming a 50% contribution from each side of Fourmile Branch (Table 1).

As part of their hydrologic budget study, Parizek and Root (1986) measured flowrates in McQueen Branch and estimated a baseflow gain of 2.5 to 3.5 ft^3/s with 1/3 to 1/2 coming from the GSA side. An average value for this range would be around 1.5 ft^3/s (Table 1).

WSRC (1992) and WSRC (1994) report measured flowrates in Crouch Branch near its confluence with Upper Three Runs. The two measurements of 1.78 and 1.9 ft^3/s are consistent and suggest a nominal value of 1.8 ft^3/s (Table 1).

Potentiometric surfaces

Hydraulic head data and potentiometric maps are used as model calibration targets and to define prescribed head boundary conditions. Because steady-state groundwater flow is the focus of this effort, time-averaged head data and maps are of most interest.

The primary source of hydraulic head data is water level measurements from GSA monitoring wells archived in the site database maintained by the Environmental Protection Department (EPD). These data are published in periodic well inventory and monitoring reports; see Environmental Protection Department and Exploration Resources, Inc. (1996a, b) for example. Head data from as early as 1986 through second quarter 1996 were extracted from the database maintained on the IBM mainframe.

Additional HAA well series data were extracted from the SHRINE version of the database. Finally, water level data collected in Fourmile Branch wetland areas by Dixon (1996) were also considered. Stream elevation data from surveys, and digitized from site topographic map series 3302, and the USGS-prepared site map dated 1987, are used to define hydraulic heads near groundwater discharge areas.

The EPD database is known to contain a few erroneous entries. These errors and other outliers were screened by deleting entries that differed by more than 20 ft from the mean. In addition, any averaged head values with a $2\sigma_m$ uncertainty greater than 3 ft were deleted. The reasoning is that model calibration targets should be known at least as well as the desired root-mean-square (r.m.s.) residual level desired between the data and model. The goal for the present model is a 3 ft r.m.s. residual overall. Appendix C lists the 667 well water elevation values used as targets in this study. There are 79 wells in the Gordon aquifer, 173 in the "lower" zone of UTR aquifer, and 415 in the "upper" zone.

Data from the Gordon aquifer were fit using the kriging algorithm in Tecplot® version 7 and contoured as shown in Figure 11. The aquifer discharges to Upper Three Runs. Figure 12 illustrates hydraulic head in the aquifer unit or zone containing the water table. The "control" data depicted in Figure 12 are pseudo-data added to guide machine contouring in areas lacking well data. At groundwater divides and towards Fourmile Branch the water table lies in the "upper" zone of Upper Three Runs aquifer. Towards Upper Three Runs stream, the water table descends into the "lower" aquifer zone. At Upper Three Runs, the Gordon confining unit crops out exposing the Gordon aquifer.

Conceptual model of groundwater flow and contaminant transport

Figure 13 illustrates the conceptual model of groundwater flow along a schematic north-south cross-section running through the center of the study area. From Figures 12 and 13, groundwater flow in the Upper Three Runs aquifer is seen to be driven by recharge, with nearby streams intercepting flow from higher elevations. The underlying Gordon aquifer is strongly influenced by Upper Three Runs, which appears to completely drain the aquifer and function as a no-flow line (Figures 9 and 11). Except for process water outfalls and man-made basins, surface water bodies gain from groundwater discharge. Aadland and others (1995, Plate 17) give the leakance of the Crouch Branch confining unit (of the Meyers Branch confining system) as roughly 3×10^{-6} day^{-1}, which corresponds to 0.13 in/yr for every 10 ft of head difference. The head difference across the Crouch Branch confining unit ranges from 0 to 20 ft, causing an upward flow averaging 0.13 in/yr (Aadland and others, 1995, Figure 30). Flow across the unit is therefore a small fraction of total recharge, and could probably be neglected. A representative leakance coefficient for the Gordon confining unit in the study area appears to be roughly 10^{-5} day^{-1} (Aadland and others, 1995, Plate 13). The head difference across the Gordon confining unit is highly variable due to large variation in the water table. Supposing a head difference of 50 ft for example, the Darcy velocity through the unit would be 2.2 in/yr or 15% of surface recharge. Therefore, groundwater flow in the

Gordon aquifer appears to be influenced significantly by recharge from the overlying UTR aquifer, and lateral flow into the model domain.

Solute groundwater contamination originating in the GSA is expected to be confined to the Upper Three Runs and Gordon aquifers. Most surface recharge discharges to the nearest stream, with the balance entering the Gordon aquifer. As groundwater in the Gordon aquifer flows toward Upper Three Runs, the gradient between the Crouch Branch and Gordon aquifers becomes upward ensuring ultimate discharge to Upper Three Runs. Contamination is not expected to enter the Crouch Branch aquifer.

Groundwater flow model development

The process used to develop the GSA flow model is described in this section.

FACT code description

FACT (Subsurface Flow And Contaminant Transport) is a variably-saturated 3D finite-element groundwater flow and solute contaminant transport code developed by the Savannah River Technology Center (Hamm and others, 1997). FACT version 1.0 is an outgrowth of the SAFT3D code developed jointly by HydroGeoLogic, Inc. and SRTC (Huyakorn and others, 1991). Distinguishing features of FACT include efficient memory management and numerical algorithms that make large grids feasible, and user-friendly boundary conditions. For example, the combination recharge/drain boundary condition automatically determines whether a surface node should receive recharge or be discharging groundwater, based on the head solution. The software has been extensively verification and validation (V&V) tested (Hamm and others, 1997).

Model configuration and mesh

Groundwater recharge over the General Separations Area travels as deep as the Gordon aquifer before discharging to Upper Three Runs, Fourmile Branch, McQueen Branch, or tributary. Therefore contamination originating from GSA facilities is expected to be confined to the Upper Three Runs and Gordon aquifer units between Upper Three Runs on the north, Fourmile Branch on the south, McQueen Branch on the east, and a line west of F-area. As shown in Figures 14 and 15, these are the boundaries chosen for the GSA model. The streams bordering the GSA also provide natural no-flow boundary conditions, and further motivation for choosing model boundaries as shown in Figures 14 and 15.

The areal resolution of the model is 200 ft square except in peripheral areas (Figure 14), similar to the earlier GeoTrans (1992) model. There are 108 elements along the east-west axis, and 77 elements along the north-south axis. The vertical resolution varies depending on hydrogeologic unit and terrain/hydrostratigraphic surface variations (Figure

15). The top surface of the mesh conforms to the ground surface. The bottom surface of the mesh coincides with the bottom of the Gordon aquifer unit. Interior node layers conform to the other stratigraphic surfaces. The "upper" aquifer zone of UTR aquifer unit is represented with 9 finite-elements in the vertical direction. The vadose zone is included in the model. The "lower" aquifer zone contains 5 finite-elements while the "tan clay" confining zone separating the aquifer zones is modeled with 2 vertical elements. The Gordon confining and aquifer units each contain 2 elements, for a total of 20 vertical elements from ground surface to the bottom of the Gordon aquifer. The three-dimensional mesh size is therefore $108\times77\times20=166,320$ elements or $109\times78\times21=178,542$ nodes. The relatively fine vertical resolution of the model, particularly in the "upper" UTR aquifer zone, is designed to support subsequent contaminant transport analyses.

Boundary conditions

The entire top surface of the mesh is assigned a combination recharge/drain boundary condition (Hamm and others, 1997) with a maximum local recharge rate of 18 in/yr, and drain leakance coefficient of 1.0 d^{-1} (Figures 14 and 16). With this FACT code boundary condition, recharge automatically occurs at nodes with an elevation higher than computed head. Discharge automatically occurs at nodes where the head is higher than the node elevation. Accounting for seepage areas, model results indicate that a 18 in/yr local maximum corresponds to 14.8 in/yr over the total model area. The selected drain coefficient is sufficiently large to ensure that computed head will be only slightly greater than ground elevation in discharge areas.

The entire bottom surface of the mesh is assigned a general head boundary condition to account for flow into the model domain across the Crouch Branch confining unit (Figures 14 and 16). A leakance coefficient of 3×10^{-6} d^{-1} is assumed based on Aadland and others (1995, plate 17). This value is supported by a scoping SRTC regional flow model developed by Bob Hiergesell for which model calibration indicates the leakance should be about 5×10^{-6} d^{-1}. Head distribution in the Crouch Branch aquifer is also taken from Aadland and others (1995, plate 45) as shown in Figure 17.

Boundary nodes between the top and bottom surfaces of the mesh are assigned either a no-flow or prescribed head boundary condition (Figures 14 and 16). No flow is assumed to occur beneath streams and in the unsaturated zone (Figure 16). Along prescribed head boundaries, head is specified only in the saturated zone. The UTR aquifer is assumed to discharge completely to Fourmile Branch and McQueen Branch, and symmetrically from each side. Also, a groundwater divide is assumed to exist along a line running north-south crossing the gap between the head waters of McQueen Branch and Fourmile Branch. A no flow condition is therefore specified for this unit over the south and east faces of the active model mesh. Because Upper Three Runs incises the Gordon confining unit, no boundary conditions are needed along the north face for the UTR aquifer. Nodal layers within the UTR aquifer in the center of the mesh enter the Gordon aquifer unit at northern outcrops, and are assigned no flow boundary conditions along Upper Three Runs. That is, along Upper Three Runs these layers receive Gordon aquifer boundary conditions, in the same manner as deeper nodal layers residing totally within the Gordon aquifer. Along the west face, head is prescribed for the UTR aquifer. The Gordon aquifer is assumed to discharge completely and symmetrically to Upper Three Runs and adjoining wetlands. A no flow condition is therefore specified for the Gordon aquifer over the north face of the active model mesh. Prescribed head boundary conditions are assigned elsewhere for this unit.

Recharge/discharge areas

Naturally occurring recharge from rainfall, as well as aquifer discharge to ground surface, are handled automatically by the combination recharge/drain boundary condition discussed above. The distribution and rate of recharge/discharge are part of the computed solution and presented in the results section.

Man-made basins, and various process (clean), domestic, storm and waste water systems, contribute additional recharge to the UTR aquifer unit. Figure 18 identifies the artificial sources of recharge considered in the GSA model. These features are modeled with a general head boundary condition using a specified head value just below ground elevation and a leakance coefficient defined through model calibration. Simulated recharge rates are shown in the results section. Most areas of artificial recharge correspond to active (not capped) basins (Figure 18). The exception is a large polygonal area within and southwest of the H-area tank farm. The source(s) of recharge for this area is not easily identified or certain, but anecdotal evidence and the model calibration process point to significant artificial recharge from H-area, as will be further discussed in the results section.

Material properties

This section describes the process for developing initial estimates of the horizontal and vertical conductivity fields. The other hydraulic property data/estimates require no further processing. The initial conductivity distributions are subsequently adjusted during model calibration. The overall process for generating initial elemental conductivity values is

1) Adjust raw slug and pumping test data to remove inferred biases

2) Correlate mud fraction to horizontal and vertical conductivity

3) Transform mud fraction data into conductivities

4) Segregate the scattered data according to element layer and vertically average data on a finer scale than the layer height

5) For each element layer, fit the scattered conductivity data in 2D

6) Stack the 2D elemental conductivity fields to form the 3D K_h and K_v fields.

These steps are illustrated in Figure 19 and discussed in more detail below.

Adjustments to slug/pumping test data

A limitation of the project characterization database is that multiple slug and pumping test values are recorded for a given well, corresponding to multiple tests and/or multiple analyses of the same test(s). Lacking a single recommended value or analysis type for each well, all values are used equally in a developing the model conductivity fields.

Early model calibration indicated that model K_h values larger than initially predicted were needed to reproduce both measured well head data and estimated discharge rates to streams. Horizontal conductivity in aquifer zones is defined mainly by slug and single well pumping test data, directly and indirectly through their influence on a mud fraction/K_h correlation. The geometric average of all slug, single well, and multiple well pumping test data is summarized in Table 2. Ideally these data would be segregated by formation and then averaged. Unfortunately, the multiple well pumping test data are too few to yield a meaningful average for each formation. Note that the average slug test value is significantly lower than the mean single-well pumping test result, and that both are much lower than the multiple well pumping test average. Model calibration indicates that horizontal conductivity should be on the order of 10 ft/d in aquifer zones, in agreement with the multiple well pumping test data. Sadler (1995, page 2) makes similar observations and offers the following explanation:

> "Most of the slug and single well tests were performed on water quality monitoring wells which were drilled with the mud rotary technique and on which well development was limited to physical means; no chemical additive was used to help breakup the mud cake on the wall of the borehole. Well development was not a priority because the wells were planned to be used for water quality monitoring only. This practice produces hydraulically inefficient wells. The problem with slug tests and single well pumping tests is that they depend only upon the water level in the stressed well, not in observation wells. When an inefficient well is stressed, changes in the well are much different than in the aquifer just outside the borehole. Therefore, there is a possibility that the hydraulic conductivity values from slug and single well pumping tests in the vicinity of the F- and H-Area Seepage Basins are systematically low due to the effects of clay on the borehole walls. Some single well tests in the area have been analyzed accounting for well inefficiency. However, these analyses used well efficiency values of around 90 percent, when well efficiencies are probably much lower."

The bias due to well inefficiency would be towards low estimates for slug and single well pumping tests. Also, the bias would be greater for slug tests than single well pumping tests because the zone of influence is smaller for a slug test. The data in Table 2 follow these trends and supports Sadler's (1995) explanation. Aadland and others (1995, p. 58) also conclude that short-duration, single-well pumping tests and slug tests tend to be biased low.

Sadler (1995) ignored slug and single well pumping test data, in favor of multiple well pumping test data. In this investigation, slug and single well pumping test data are "corrected" in an attempt to remove the apparent bias from these data sets. The correction scheme is based on the assumption that the lower the K_h value and/or mud content (formation damage more likely), the more likely the K_h value is biased low. A bilinear function of mud fraction and original K_h value is chosen to quantify the correction factor:

$$\begin{aligned} z = {} & \frac{(y - y_m)}{(y_p - y_m)}\frac{(x - x_m)}{(x_p - x_m)} z_{pp} \\ & + \frac{(y - y_m)}{(y_p - y_m)}\frac{(x_p - x)}{(x_p - x_m)} z_{mp} \\ & + \frac{(y_p - y)}{(y_p - y_m)}\frac{(x - x_m)}{(x_p - x_m)} z_{pm} \\ & + \frac{(y_p - y)}{(y_p - y_m)}\frac{(x_p - x)}{(x_p - x_m)} z_{mm} \end{aligned} \quad (2)$$

where

$z = \log_{10}$ (correction factor)

x = mud fraction

$y = \log_{10}(K_h)$, K_h in ft/d

x_m = 0, lower bound on x

x_p = 0.3, upper bound on x

$y_m = \log_{10}$ (0.1 ft/d), lower bound on y

$y_p = \log_{10}$ (40 ft/d), upper bound on y

$z_{pp} = \log_{10}$ (1.0), z value at (x_p, y_p)

$z_{mp} = \log_{10}$ (1.0), z value at (x_m, y_p)

z_{pm} = $\log_{10}(7.5)$, z value at (x_p, y_m)

z_{mm} = $\log_{10}(37.5)$, z value at (x_m, y_m)

The correction factor 10^z, where z is defined by equation (2), is plotted in Figure 20. The z function is termed bilinear because cross-sectional slices parallel to the x- or y-axis produce straight (linear) lines. For example, a slice at $x=x_0$ produces a linear variation in in z with y. The functional form can be derived by first considering a linear variation in z with y

$$z = \frac{(y - y_m)}{(y_p - y_m)} z_p + \frac{(y - y_m)}{(y_p - y_m)} z_m$$

and then allowing the endpoints z_p and z_m to vary linearly with x:

$$z_p = \frac{(x - x_m)}{(x_p - x_m)} z_{pp} + \frac{(x - x_m)}{(x_p - x_m)} z_{mp}$$

$$z_m = \frac{(x - x_m)}{(x_p - x_m)} z_{pm} + \frac{(x - x_m)}{(x_p - x_m)} z_{mm}$$

The correlation is defined within the box defined by x_m, x_p, y_m and y_p, specifically, $0 \leq x$, mud fraction ≤ 0.3 and 0.1 ft/d $\leq y$, $K_h \leq 40$ ft/d. Values outside these ranges are clipped to the nearest bound when computing the correction factor, z. The four corners of the correlation are defined by z_{pp}, z_{mp}, z_{pm} and z_{mm}. The parameter values were determined through model calibration, and are specific to this model and characterization data. Note that the correction factor is 1 for K_h values above 40 ft/d (i.e. no correction). The maximum correction is a factor of 37.5, and is applied to K_h less than or equal to 0.1 ft/d with 0% mud.

The single well pumping data are adjusted by multiplying the original K_h estimate by the factor defined by equation (2):

$$K_{h,corr} = K_{h,orig} \times 10^z \qquad (3)$$

The slug test data are adjusted by multiplying the original K_h value by 1.74 to bring the slug test average in line with the single well pumping test data, followed by the factor defined by equation (2):

$$K_{h,corr} = K_{h,corr} \times 1.74 \times 10^z \qquad (4)$$

From Table 2, note that 2.2/1.3 equals 1.74 (prior to rounding). Appendix D lists the modified slug and pumping test data.

Conductivity inferred from lithology

Figure 21 illustrates horizontal conductivity data as a function of mud fraction. The modified slug and single well pumping test data (Appendix D) are shown in this figure as opposed to the original estimates (Appendix B). The data exhibit large scatter, spanning orders of magnitude in K_h (ft/d) for a given mud content. Nevertheless the data show a definite trend of decreasing horizontal conductivity with increasing mud fraction as expected, and can be used in lieu of direct conductivity data to define K_h based on lithology. A piecewise linear relationship, determined using a least squares technique, was chosen to define the correlation between conductivity and lithology (Figure 21).

Laboratory permeability data for vertical conductivity are plotted in Figure 22. These data likewise exhibit large scatter indicating a weak correlation between conductivity and mud content alone. Also shown in Figure 22 is a piecewise linear least squares fit of the data. The least squares fit appears reasonable in the high mud fraction region, but unrealistically low for small mud fractions. The reason may be that the laboratory data are primarily for samples recovered from confining zones, and therefore biased low with respect to average sandy sediment. To remedy this situation, the anisotropy ratio, K_h/K_v, was computed from the laboratory permeability database where both measurements were taken from the same core sample. The geometric average of the resulting 89 anisotropy ratios is 3.6. Dividing the correlation for K_h by 3.6 yields the second correlation line shown in Figure 22. This second correlation essentially agrees with the least squares fit line for high mud fractions, but produces much larger, more realistic K_v estimates for sandy sediment, and is more consistent with the K_h correlation. The second correlation is chosen for inferring K_v from mud content.

Laboratory permeability measurements are viewed as significantly more reliable than conductivity values inferred from lithology through the correlations just discussed. The lithology-based estimates are ignored at locations where both data types are available.

Vertical averaging and assignment to element layers

Laboratory permeability data and conductivity values inferred from foot-by-foot core lithology descriptions have a vertical resolution of one foot or less. Vertical element layers are typically several feet in thickness, and contain several of these smaller scale conductivity values stacked vertically at each borehole location. Data with a smaller scale than that of the vertical mesh resolution are vertically averaged to generate values representative of the element layer as a whole at the various areal locations (Figure 23). Arithmetic averaging is used for horizontal conductivity, and the harmonic mean is computed for vertical conductivity:

$$\overline{K_h}^a \equiv \frac{\sum_{i=1}^{N} \Delta z_i K_{h,i}}{\sum_{i=1}^{N} \Delta z_i} \tag{5}$$

$$\frac{1}{\overline{K_v}^h} \equiv \frac{\sum_{i=1}^{N} \Delta z_i \frac{1}{K_{v,i}}}{\sum_{i=1}^{N} \Delta z_i} \tag{6}$$

Slug and pumping tests measure average horizontal conductivity over the well screen length, typically 10-20 feet. These data are on the same scale as the element vertical mesh resolution, and no averaging is required. The data are assigned to one or more element layers for which the overlap between screen zone and element thickness is 50% or more of either the screen height or element thickness (Figure 23).

Horizontal fitting

With all data having been segregated by element layer, the scattered data for each layer are fit using a bicubic spline algorithm. Figure 24 shows the result for a typical element layer (K=14). A two-step process is used to approximate the element layer data, in a manner similar to the proprietary gridding algorithm contained in EarthVision® software. First, pseudo-data are created in regions lacking actual data using an inverse distance weighting technique. Then, the combined data set is approximated using a bicubic spline functional form and least squares optimization. During optimization, single well pumping test data are given twice the weight of slug test, laboratory permeability, and conductivity values inferred from lithology, which are all equally weighted. Multiple well pumping test data are given sufficient weight to effectively override all other data types. The various weights are based on engineering judgement and model calibration. The combined data are fit at an 800 ft grid resolution. Element conductivity values are computed by evaluating the appropriate two-dimensional fit at the element centroid location.

Modifications for thin element layers

Most of the conductivity characterization data are located in central portions of the GSA where element thicknesses are relatively large. In these areas, the anisotropy ratio, K_h/K_v, is typically one or more orders of magnitude, because harmonic averaging of K_v over several feet yields very low values. Element thicknesses are smaller near streams, frequently less than one foot. Where there is no data present, the horizontal fitting process extrapolates low K_v values found in the center of the GSA into these peripheral areas. The result is unrealistically large anisotropy ratios for element layers that are very thin. To remedy this algorithmic deficiency, K_V is increased such that the anisotropy ratio satisfies the constraints listed in Table 3. The maximum element thickness in the upper aquifer zone is on the order of 10 ft, and no restriction on K_V is imposed at this endpoint. In the limit as element thickness goes to zero, vertical conductivity should coincide with horizontal conductivity. This endpoint is assumed to occur at a thickness of 0.5 ft. In between, log10 of the anisotropy ratio is assumed to vary approximately linearly.

Horizontal and vertical conductivity fields

The complete three-dimensional horizontal conductivity fields are created by simply stacking the two-dimensional fields for element layers.

Automated preprocessing

Processing raw data into FACT code input formats as discussed above requires an enormous amount of data manipulation and calculation. Fortunately, code preprocessing has been fully automated so that future upgrades and modifications to the GSA model can be performed efficiently compared to more conventional, manual data processing. The **make** language on a **UNIX** workstation is used as the main driver for preprocessing. **Make** calls other lower tier commands such as other **make** commands, **FORTRAN**, **C**, and **UNIX korn** shell commands and scripts. The ability of **make** to incorporate any other executable software program results in a very flexible and efficient preprocessing environment. Preprocessor inputs are specified in a mesh invariant manner so that the mesh can be changed without invalidating other input. For example, the regions of inactive elements are specified by areal clipping polygons and bounding stratigraphic surfaces defined in site coordinates and elevation above mean sea level, as opposed to element indices or numbers. All flowchart dependencies are automatically tracked by **make** such that only those parts affected by a change are executed. A more detailed description of pre- and post-processing software is provided by Flach (1999).

Model calibration process

Groundwater recharge and discharge estimates, monitoring well head data, multiple well pumping tests, and a general knowledge of groundwater flow directions and timing were used as targets for calibrating the GSA model. The horizontal and vertical hydraulic conductivity fields are viewed as having the most uncertainty and corresponding leeway for making model changes, followed by rates of artificial recharge. Artificial recharge rates are adjusted through the leakance value associated with a general head boundary condition. Plausible infiltration rates for basins are assumed to be no more than roughly 5 times the natural rate of 15 in/yr.

As required to achieve model calibration, the initial horizontal and vertical conductivity fields generated through the process described earlier are adjusted through multipliers, minimum and maximum value clipping parameters, and a type of affine correction (Isaaks and Srivastava, 1989, p. 471) used to reduce variability about either the arithmetic or geometric mean. Vertical conductivity is further adjusted with an additional maximum K_h/K_v ratio parameter, used to increase K_v while holding K_h fixed. Global adjustments are made to each of the 5 hydrostratigraphic units in the model, followed by local modifications. Multiplicative factors are used to rescale the selected conductivity field. The clipping parameters are used to eliminate values that are judged to be extreme. Compared to smaller scale conductivity data, the upscaled model conductivity field should exhibit a lower variance (Isaaks and Srivastava, 1989, chapter 19). The affine corrections are used to make the conductivity field less variable, reflecting upscaling, while preserving either the arithmetic or geometric mean. The chosen algorithms are merely calibration tools, and not rigorous.

The affine correction chosen for horizontal conductivity, K_h, preserves the arithmetic mean and involves the following steps:

1) Compute the arithmetic, $\overline{K}_h^a$, and geometric mean, $\overline{K}_h^g$, for the specified volume:

$$\overline{K}_h^a = \frac{1}{n}\sum_{i=1}^{n} K_{h,i} \tag{7}$$

$$\log_{10}\left(\overline{K}_h^g\right) = \frac{1}{n}\sum_{i=1}^{n}\log_{10}\left(K_{h,i}\right) \tag{8}$$

2) At each point in the specified volume, reduce the difference between the $\log_{10}(K_h)$ and $\log_{10}\left(\overline{K}_h^g\right)$ by a specified "smoothing" factor, δ:

$$\log_{10}\left(K_h^i\right) = \log_{10}\left(\overline{K}_h^g\right) + \delta\left[\log_{10}\left(K_h\right) - \log_{10}\left(\overline{K}_h^g\right)\right] \tag{9}$$

The smoothed, intermediate conductivity field, K_h^i, has the same geometric mean as the original field, K_h.

3) Restore the original arithmetic mean by multiplying each intermediate value by the ratio of arithmetic mean to geometric mean for the original population:

$$K_h^f = K_h^i \times \frac{\overline{K}_h^a}{\overline{K}_h^g} \tag{10}$$

where K_h^f is the final, smoothed, horizontal conductivity field.

The affine correction for vertical conductivity, K_v, is similar, omitting the last step, and therefore preserves the geometric mean:

1) Compute the geometric mean, $\overline{K}_v^g$, for the specified volume:

$$\log_{10}\left(\overline{K}_v^g\right) = \frac{1}{n}\sum_{i=1}^{n}\log_{10}\left(K_{v,i}\right) \tag{11}$$

2) At each point in the specified volume, reduce the difference between the $\log10(K_v)$ and $\log_{10}\left(\overline{K}_v^g\right)$ by a specified "smoothing" factor, δ:

$$\log_{10}\left(K_v^f\right) = \log_{10}\left(\overline{K}_v^g\right) + \delta\left[\log_{10}\left(K_v\right) - \log_{10}\left(\overline{K}_v^g\right)\right] \tag{12}$$

The final, smoothed, vertical conductivity field, K_v^f, has the same geometric mean as the original field, K_v.

The smoothing parameter, δ, in the affine corrections ranges from 0 to 1. For δ=0, the field is uniformly set to the mean value, arithmetic for K_h and geometric for K_v. That is, δ=0 produces maximum smoothing. For δ=1, the field is unchanged.

The goal of the calibration process is to achieve as good of agreement with prior targets as possible, without resorting to unjustifiable variation in conductivity or other parameters. A lower estimate for the calibration goal is the uncertainty level in the target data. That is, one should not expect to match calibration targets better than the "noise" level in the data. Head targets have a maximum uncertainty of 3 ft, as discussed previously. The average uncertainty is much less. The previous model of the GSA achieved a root-mean-square head residual of around 3 ft (GeoTrans, 1992). A calibration goal of 3 ft for the root-mean-square residual is chosen for the current model. A reasonable calibration goal for the largest head residual is sometimes defined as 5-10% of the total head variation in the modeled system. For the Gordon aquifer, the total variation is about 80 ft (Figure 11) suggesting a calibration goal of 4 to 8 ft for the maximum residual. For the Upper Three Runs aquifer, the total variation is about 160 ft (Figure 12) for a calibration goal of 8 to 16 ft. The uncertainty of the recharge and stream base flow targets was not quantitatively estimated. Engineering judgement suggests an uncertainty of roughly ±25%.

Groundwater flow model results

The outcome of the calibration process is summarized in this section. Simulated groundwater flow results are then presented, followed by an assessment of the model.

Calibration results

The model calibration process revealed that a much smaller than expected hydraulic conductivity near H-area, or much larger than expected recharge rate over H-area, or a combination of both, is needed in order to reproduce measured water elevations of 275 ft that sharply decline away from the area. The latter approach, consisting of a modest reduction in conductivity and modest increase in recharge, was chosen for two reasons. First, the resulting hydraulic conductivity field and recharge rate are still reasonably consistent with the rest of the GSA, whereas very large deviations are required if conductivity or recharge alone is modified. Secondly, anecdotal evidence suggests that underground leaks in domestic, process, and storm sewer water lines can account for significant artificial recharge, on the order of magnitude of 100 gal/min. Jeff Pike of the F/H Tank Farm Systems Engineering group identified the following water leaks in the H-area tank farm:

- suspected leak in process/well (domestic) water system near the Tanks 21-24 cluster
- leaky storm sewer system near Tanks 9-12 cluster (currently being fitted with a sleeve to stop leaks
- steam condensate flows continuously to leaky storm sewers in general
- underground pipes associated with a tank cooling system near Tanks 9-16 has a measurable and noticeable leak.

There are undoubtedly additional unknown leaks. The recharge rates from the artificial sources were defined through model calibration. Calibration results for artificial recharge zones are listed in Table 4. The infiltration rate for the polygon representing H-area tank farm sources averages nearly 15 in/yr. The total volumetric flowrate from H-area due to artificial groundwater sources is about 95 gal/min. This flowrate may be excessive, especially considering that no additional recharge was added at other facilities (e.g. F-area). Infiltration rates for basins are reasonable, varying from 0.9 to 5.7 times the natural recharge rate of about 15 in/yr. Figure 25 illustrates the distribution and rate of artificial recharge. The computed groundwater infiltration rate from the Crouch Branch aquifer is also listed in Table 4.

Several adjustments to the horizontal and vertical conductivity fields are required to achieve adequate agreement with calibration targets, and simulate known features not already captured in the original fields (e.g. capped areas). These modifications are specified in Table 5 and accompanying Figure 26. First, the entire conductivity field for each hydrostratigraphic unit or zone is adjusted (lines 1-5, Table 5). Following global adjustment, local changes are made to achieve even better agreement with head data (lines 6-12, Table 5). Then, vertical conductivities near Upper Three Runs, Fourmile Branch and McQueen Branch are increased to account for known incisement and backfilling of these channels with permeable sediment (lines 13-15, Table 5). Finally, appropriate surface conductivities are set to low to simulate capped areas (lines 16-22, Table 5).

The initial heterogeneous conductivity field for the Gordon aquifer appeared to exhibit variations that were inconsistent with measured hydraulic heads. The raw conductivity data and mud fraction/conductivity correlations contain large errors that create artificial variations in conductivity in addition to natural (real) heterogeneity. In addition, there are few cores that fully penetrate the Gordon aquifer, and provide unbiased information with respect to the entire thickness. Finally, there are large areal regions containing no data that are strongly influenced by a few distant boreholes. To remedy this situation, the simplified approach of assigning the Gordon aquifer a uniform horizontal conductivity of 38 ft/d was taken (line 1, Table 5). The chosen value is consistent with multiple well pumping test data (e.g. Aadland and others, 1995, Table 8) and past GSA models (e.g. GeoTrans, 1992, 1993).

The initial conductivity field of the Gordon confining unit significantly overpredicted leakance. In order to reproduce the large head difference across the unit, the Gordon confining unit was assigned a uniform vertical conductivity of 10^{-4} ft/d (line 2, Table 5). Multiple well aquifer tests and estimates based on laboratory permeability measurements suggest the vertical conductivity for the unit is around 4×10^{-4} ft/d (e.g. Aadland and others, 1995, Table 8). GeoTrans (1992) assumed a value of approximately 1.5×10^{-4} ft/d. More recently, GeoTrans (1993) lowered the Gordon confining unit vertical conductivity to 1.25×10^{-5} ft/d to prevent excessive tritium migration into the Gordon aquifer from H-area seepage basins. Sadler (1995) assumed an even smaller value of 10^{-6} ft/d. The value chosen for the present model, 10^{-4} ft/d, is a compromise between field measurements and recent models which suggest that a lower value is appropriate.

Horizontal conductivity in the “upper” and “lower” aquifer zones was increased by 10% from the initial estimates (lines 3 and 5, Table 5). Vertical conductivity was limited to be no smaller than 0.05 ft/d. Harmonic averaging implies that clay intervals are continuous across large regions, which is not correct for confining zones. A value of 0.05 ft/d corresponds to an anisotropy ratio of 200 (10/0.05) which is typical of an aquifer zone.

Initial estimates of “tan clay” confining zone leakance varied over several of magnitude. In many locations, the predicted leakance did not appear to be consistent with head data. Model calibration improved when the conductivity field was smoothed using a factor of 0.5 (line 4, Table 5). This setting represents a compromise between uniform properties and the initial, highly heterogeneous conductivity field. Harmonic averaging also apparently overestimates the confining ability of the “tan clay” zone. Clay intervals in the “tan clay” confining zone are assumed to be more continuous than those in aquifer zones, and a lower bound on K_v of 0.005 ft/d is assumed based on model calibration (line 4, Table 5).

Local changes to conductivity focus on H-area, the “tan clay” confining zone throughout the GSA, backfilled stream channels, and capped areas (lines 6-22, Table 8 and Figure 26). Based on model calibration, “lower” aquifer zone K_h was increased east of H-area and decreased beneath H-area (lines 6 and 7). In three locations the “tan clay” confining zone K_v was assumed to be more competent than the default setting (lines 8-10). “Upper” aquifer zone K_h was decreased west of the F-area seepage basins and around H-area (lines 11 and 12). The vertical conductivity near Upper Three Runs, Fourmile Branch and McQueen Branch is assumed to be relatively high due to past downcutting and backfilling, and so the K_h/K_v limit was set to a low value (lines 13-15). Several capped areas are simulated by setting surface conductivity to very low values (lines 16-22).

Figures 27 through 31 illustrate vertically averaged K_h for the three aquifer zones and vertically averaged K_v for the two confining zones. In these figures, horizontal conductivities are arithmetically averaged and vertical conductivities are harmonically averaged. The arithmetic average horizontal conductivities in the Gordon aquifer unit, “lower” UTR aquifer zone, and “upper” UTR aquifer zone, are 38, 7.1 and 7.5 ft/d, respectively. The average vertical conductivities for the Gordon confining unit and the “tan clay” confining zone are 10^{-4} and 6×10^{-3} ft/d, respectively. The "tan clay" value is a geometric average. Several aspects of the “upper” zone conductivity field agree with variations in K_h known from prior characterization and modeling investigations. First, conductivity is higher than average in the west around F-area, and lower in the east near H-area. A zone of high conductivity occurs naturally between H-area seepage basin 4 and the Fourmile Branch seepline. Conductivity is low beneath the east end of the Old Radioactive Waste Burial Ground. Table 6 compares multiple well pumping test data to average horizontal conductivity in the GSA model. Because multiple well pumping test data are heavily weighted during development of the initial conductivity field, the agreement is good.

Table 7 and Figure 32 summarize the agreement between simulated and measured heads, and Figures 33 through 35 illustrate the distribution of residuals in the three aquifer zones. The overall root-mean-square difference between simulated head and approximately time-averaged measurements is 3.2 ft. The r.m.s. residuals within the Gordon, “lower”, and “upper” aquifer zones are 2.0, 4.4 and 2.8 ft. Not surprisingly, agreement is excellent in the Gordon aquifer (Figure 33), which exhibits a simple head variation (Figure 11). For the “lower” aquifer zone, a few large residuals occur where the water table drops sharply to Upper Three Runs (Figure 34). Considering the steep gradients, large residuals are not surprising. There are unexpected large residuals east of H-area. The reason is uncertain. Otherwise the agreement is good. The agreement is excellent in the “upper” aquifer zone (Figure 35). A detailed listing of individual head residuals is provided in Appendix E. Simulated and measured head match best in the central and western GSA. Larger residuals are found in and east of H-area, and west and north of F-area.

Table 8 compares stream baseflow estimates to simulated values from the GSA model. The estimates have a large uncertainty, perhaps in the range of ±20-50%. Considering this uncertainty, the agreement between measured and simulated baseflow is acceptable. The average recharge rate over the total model area is 14.8 in/yr from natural sources. Away from discharge areas, the local recharge rate is 18 in/yr. Artificial sources provide a small amount of additional recharge from an overall perspective. Artificial recharge is large at H-area, however, as previously discussed. Figure 36 illustrates the rate of natural groundwater recharge/discharge for the GSA model.

Simulated GSA groundwater flow

Figures 37 through 39 illustrate simulated hydraulic head arithmetically averaged over the entire thickness of the Gordon, "lower" UTR and "upper" UTR aquifer zones, respectively. Simulated head in the aquifer zone containing the water table is shown in Figure 40, and Figure 41 illustrates simulated water table elevation. The measured head in the Gordon aquifer is shown in Figure 11, for comparison to Figure 37. Measured head in the aquifer unit containing the water table is shown in Figure 12, for comparison to Figures 38 through 41. Figures 42 through 44 illustrate vertically-averaged flow direction over the entire thickness of the three aquifer zones, based on arithmetic averaging. Figure 45 shows simulated seepage faces. A mass balance summary is given in Figure 46 (Flach, 1999). Note that 36% of recharge to the Upper Three Runs aquifer is simulated to leak through the Gordon confining unit.

Model assessment

The process used herein to generate model conductivity produces aquifer heterogeneity directly from the characterization data. Conventional model development typically involves starting with uniform properties for each hydrostratigraphic unit, and then adding variation on the tail end through a subjective model calibration process. In this respect, the present GSA conductivity fields can be viewed as being relatively objective and defensible. However, errors in the raw characterization data and mud fraction versus conductivity correlations produce artificial variations that are hard to distinguish from real heterogeneity. Therefore, smoothing the initial conductivity fields is probably prudent. The continuity of confining units is apparently overpredicted using the methods discussed above. The initial vertical conductivities have large uncertainty and must be modified. Calibration can be done mostly through global adjustments to the conductivity field for each hydrostratigraphic unit. A few local adjustments are still necessary. Calibration differs somewhat from conventional models, but is still a tedious and uncertain process.

While the conductivity fields depicted in Figures 27-31 are probably more accurate than can be achieved with conventional methods, especially with respect to capturing field-scale heterogeneity, a dramatic improvement in r.m.s. head residuals was not observed. The reason is that only large-scale variations in average $K_{h/v}$ affect overall head distribution and stream baseflows. Therefore, the additional resolution in $K_{h/v}$ heterogeneity achieved here does not affect the overall head distribution. Likewise, increased vertical mesh resolution within aquifer zones does not appear to significantly improve agreement between measured and simulated heads. However, small-scale heterogeneity and increased mesh resolution have a significant effect on smaller scale groundwater flow paths and contaminant dispersion. Thus, the present GSA model should be better suited for simulating contaminant migration than more conventional models.

Additional work is needed to better define the artificial recharge and conductivity field around H-area. The artificial recharge rates assumed in the present model may be excessive, and suggest that additional alterations to the conductivity field may needed in the area. Additional work is needed to define the uncertainty associated with predictions from the present model.

Because the model development process has been automated using the **`make`** software, changes to the baseline model can be performed very quickly. For example, a new mesh configuration can be processed and flow results generated in less than an hour, most of which is computer processing time. The present baseline GSA model can be efficiently updated or modified to simulate remedial actions.

Summary and conclusions

Important attributes of the baseline GSA model are listed below:

- the present baseline model is current with GSA characterization data, incorporating all of the field data compiled by Smits and others (1997)
- detailed characterization data are utilized to define a heterogeneous model conductivity field
- aquifer zones are sub-divided by several vertical mesh layers
- model preprocessing has been fully automated using the **`make`** software language
- both the vadose and saturated zones are simulated in the model
- groundwater flow beneath the entire GSA down to the Meyers Branch Confining System is simulated

- the model is based on the FACT code.

Implications are that:

- model results are well suited to support subsequent, finer-scale transport simulations
- most remedial actions can be explicitly simulated, including vertical recirculation wells, vertical barriers, surface caps, pumping wells at arbitrary locations, specified drawdown within well casings (instead of flowrate), and wetland impacts of remedial actions
- the model can be quickly updated and modified to stay current with data and satisfy future needs
- the model provides a common framework for analyzing groundwater flow, contaminant migration, and remedial alternatives across ER programs.

Additional work is needed to:

- define model uncertainties
- validate or improve recharge and conductivity assumptions near H-area.

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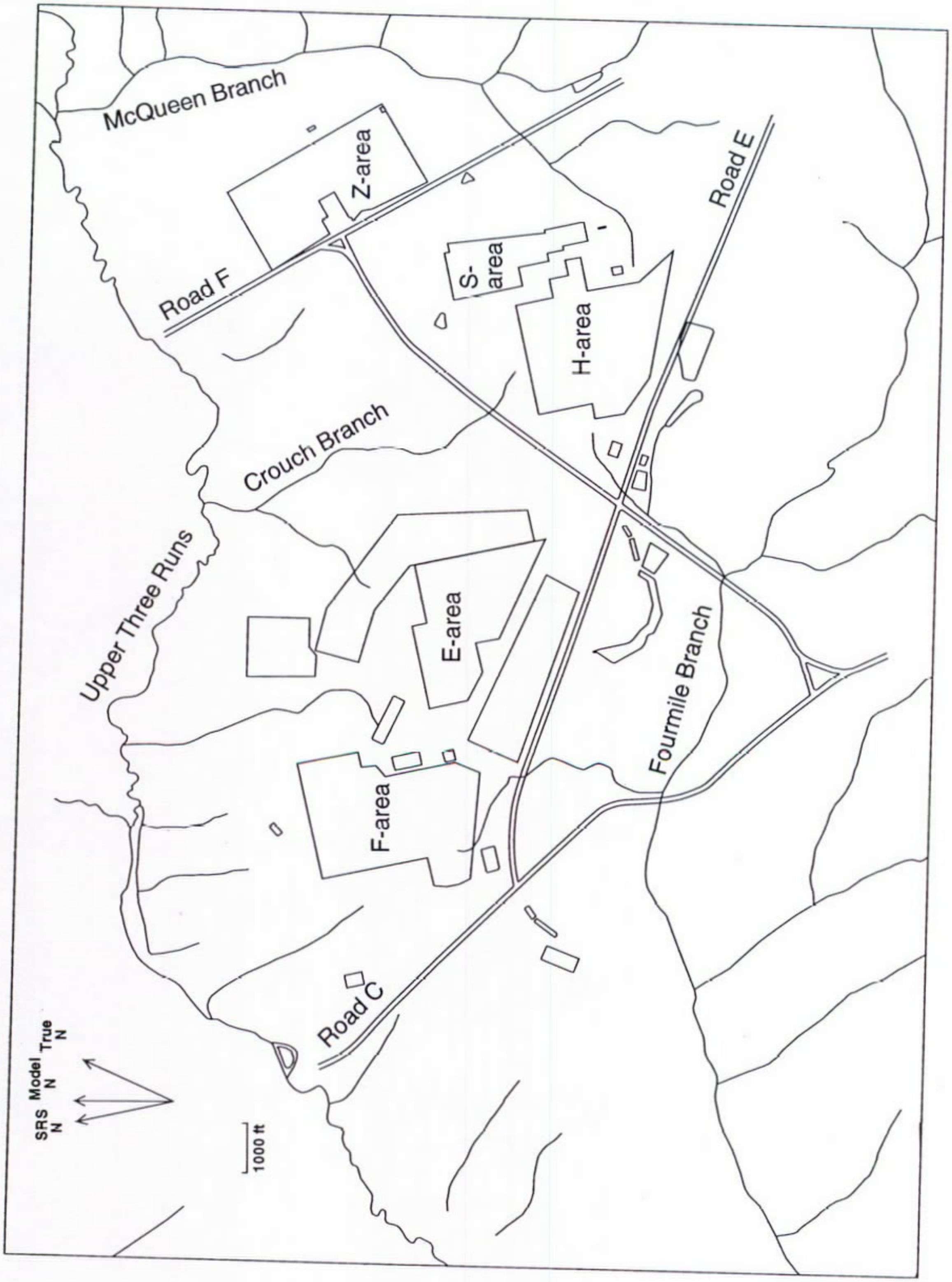


Figure 1. General Separations Area (GSA) of the Savannah River Site.

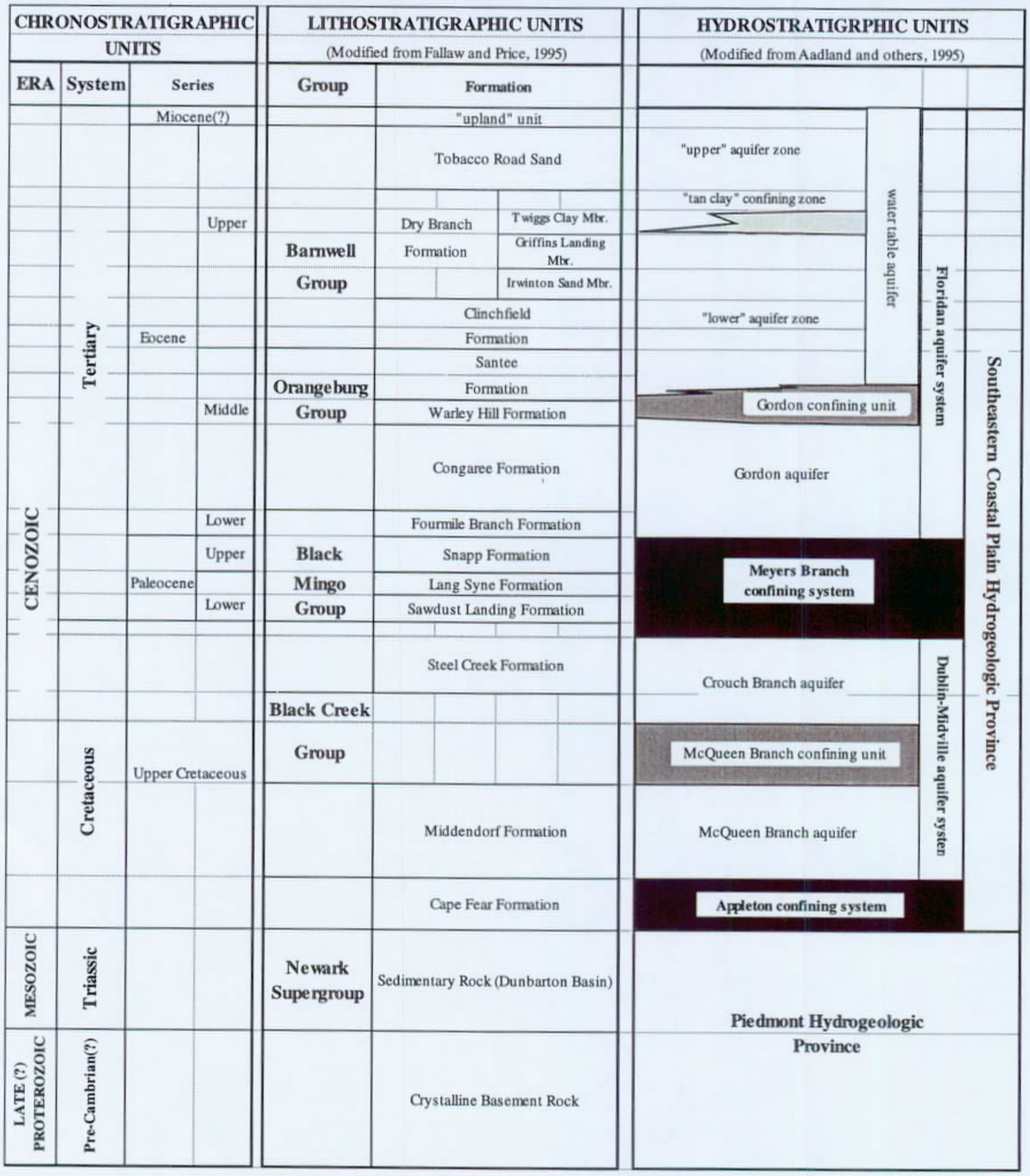


Figure 2. Comparison of lithostratigraphic and hydrostratigraphic units at SRS.

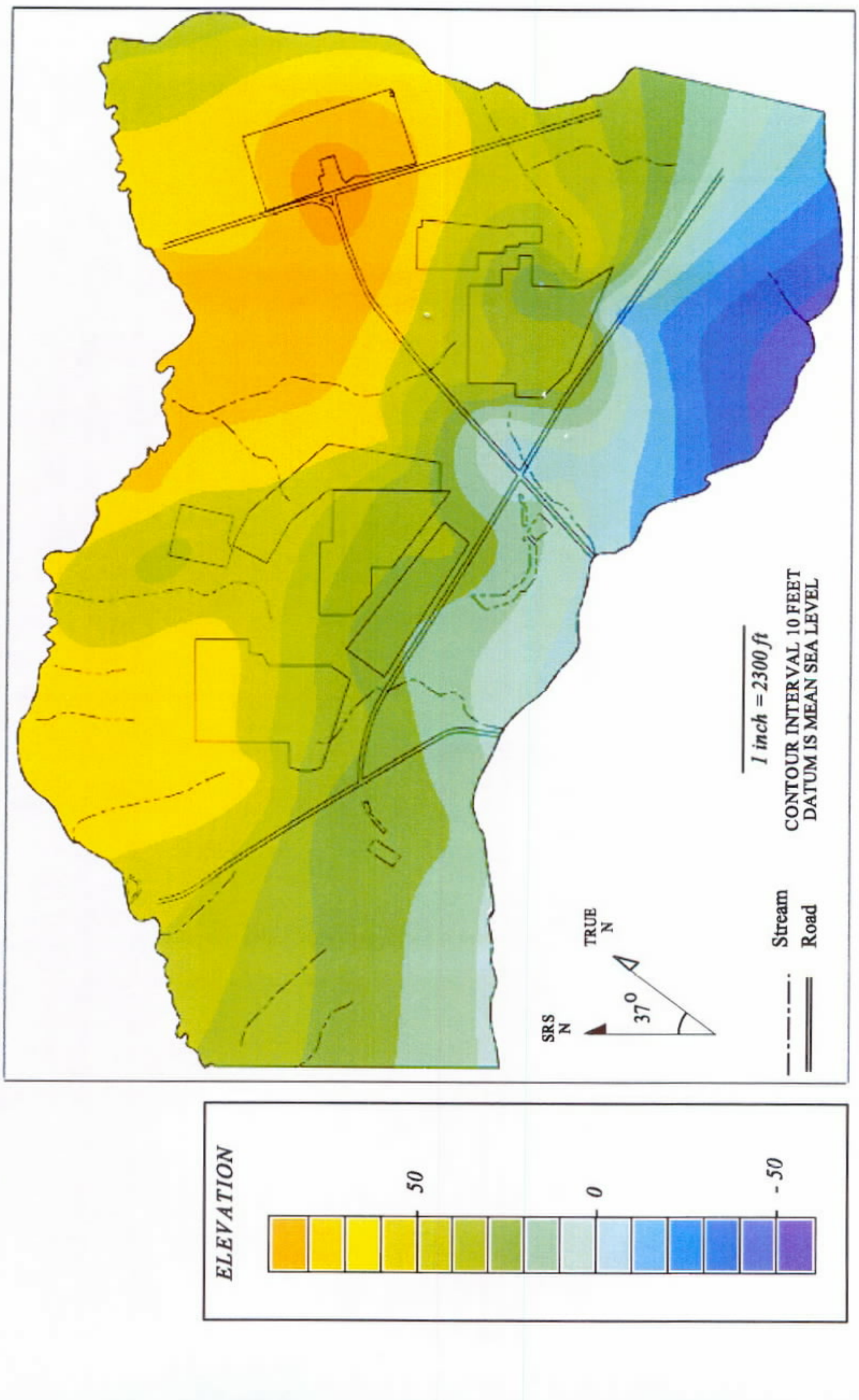


Figure 3. Altitude-contour map of the top of the Meyers Branch confining system.

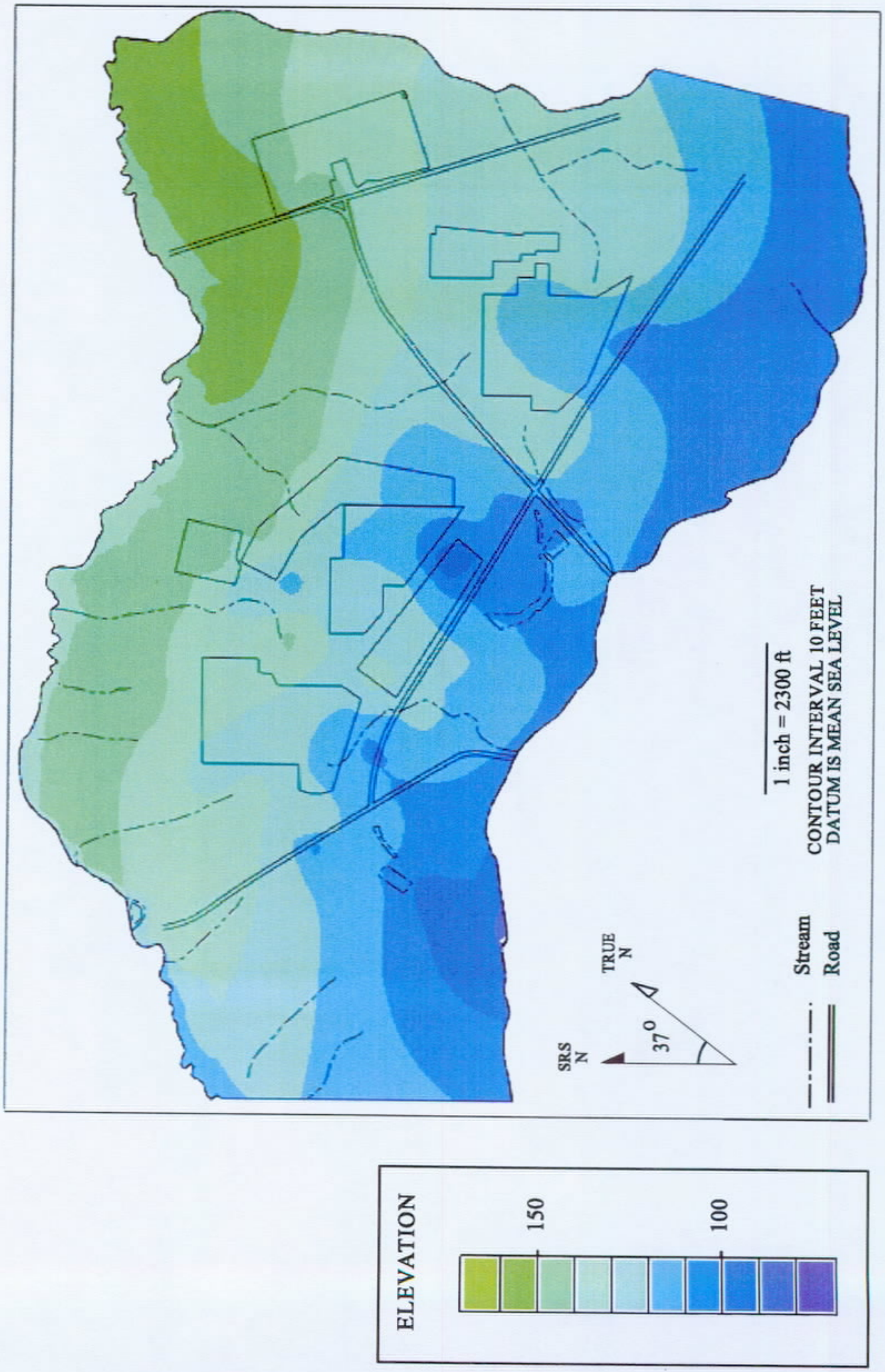


Figure 4. Altitude-contour map of the top of the Gordon aquifer unit.

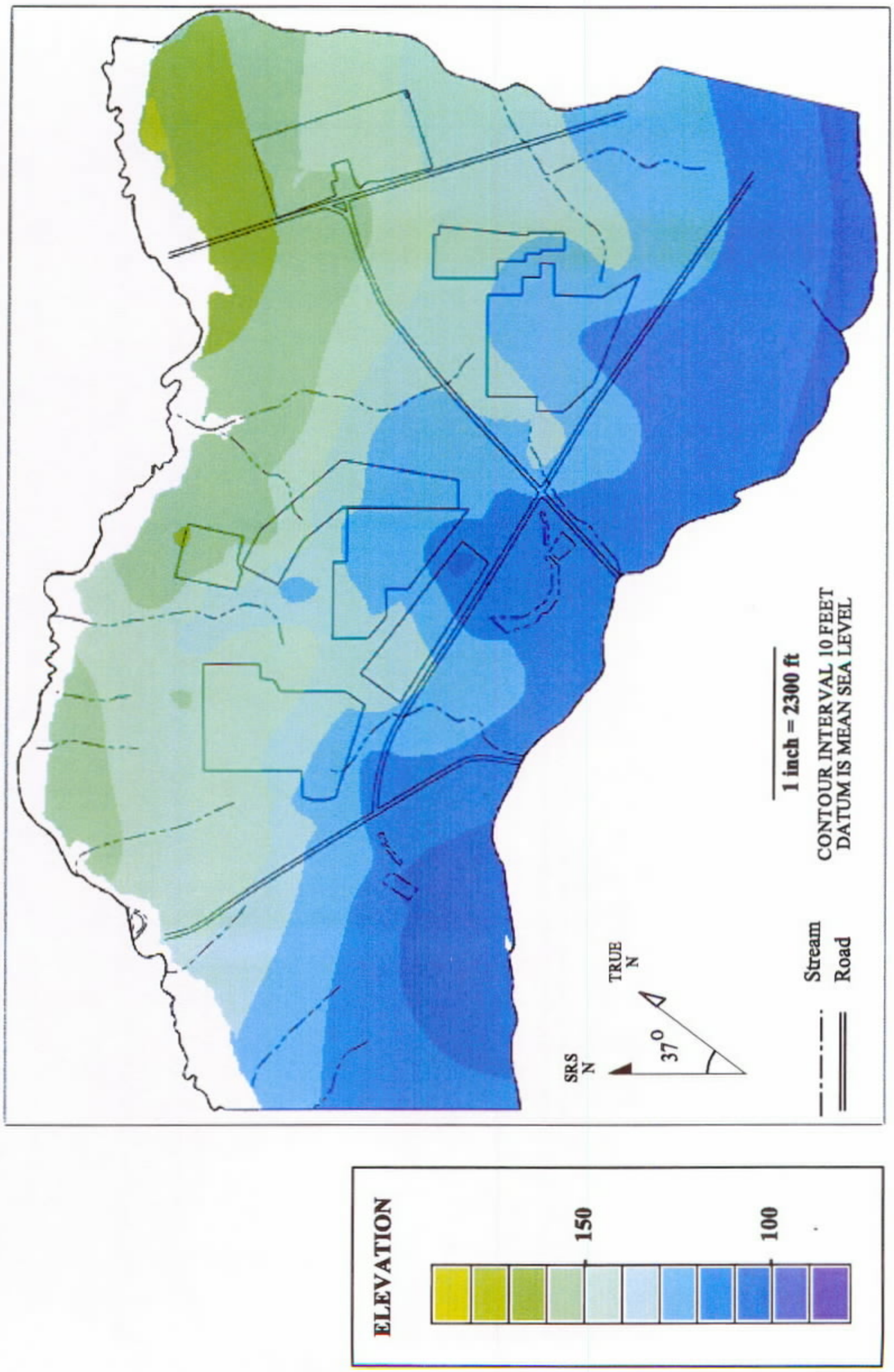


Figure 5. Altitude-contour map of the top of the Gordon confining unit.

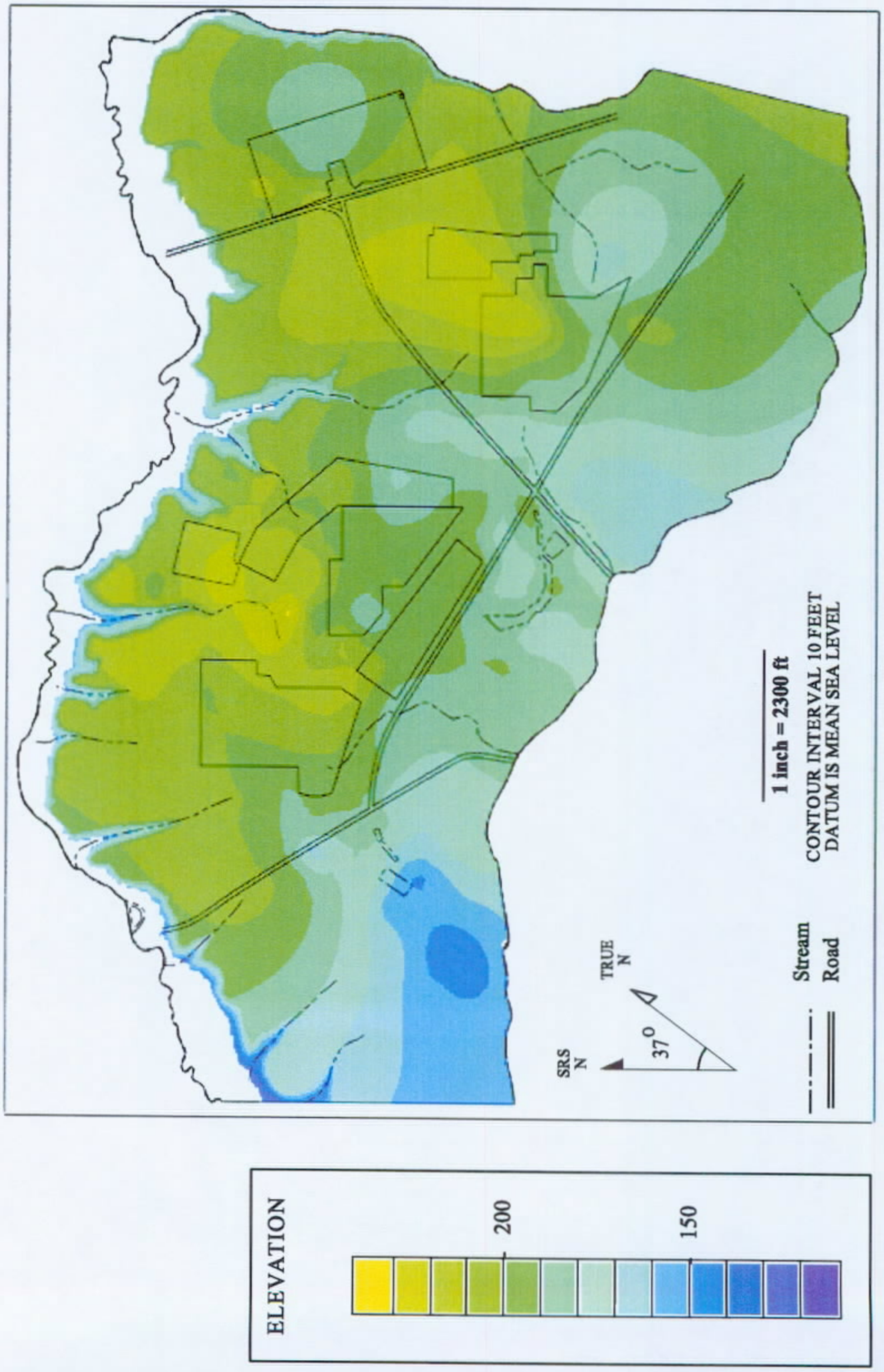


Figure 6. Altitude-contour map of the top of the "lower" aquifer zone within Upper Three Runs aquifer.

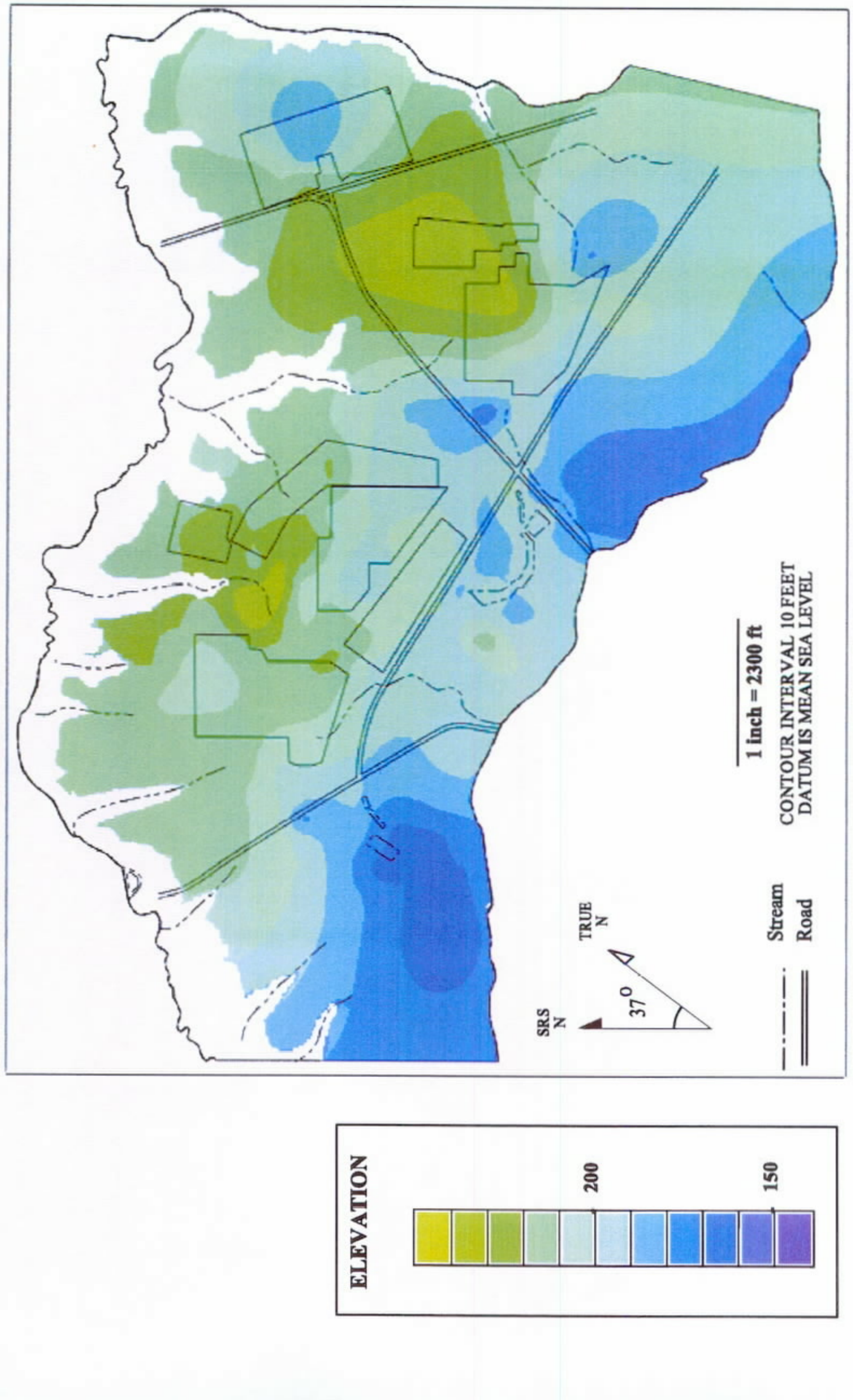


Figure 7. Altitude-contour map of the top of the “tan clay” confining zone withinn the Upper Three Runs aquifer.

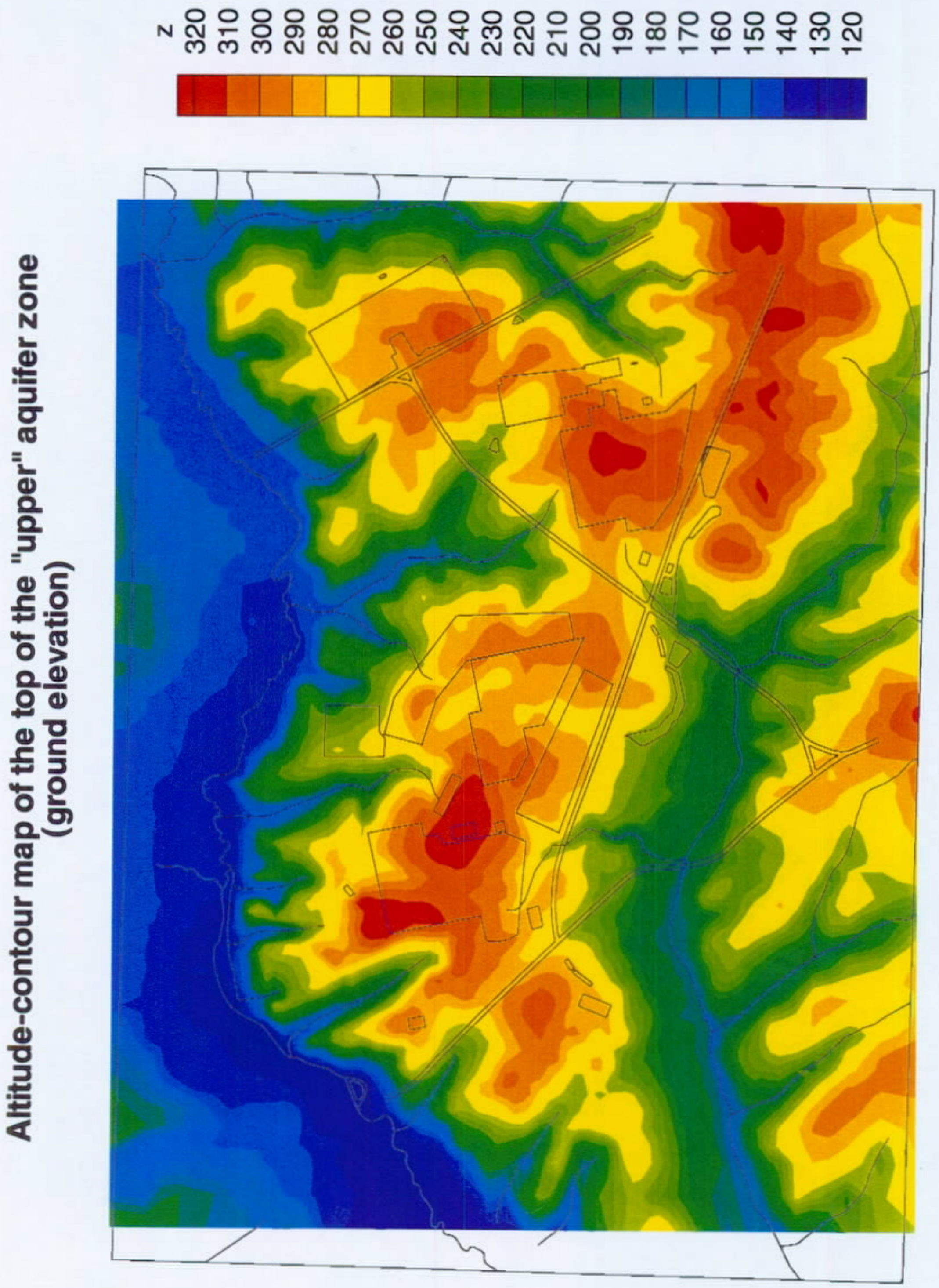


Figure 8. Altitude-contour map of the top of the "upper" aquifer zone within Upper Three Runs aquifer.

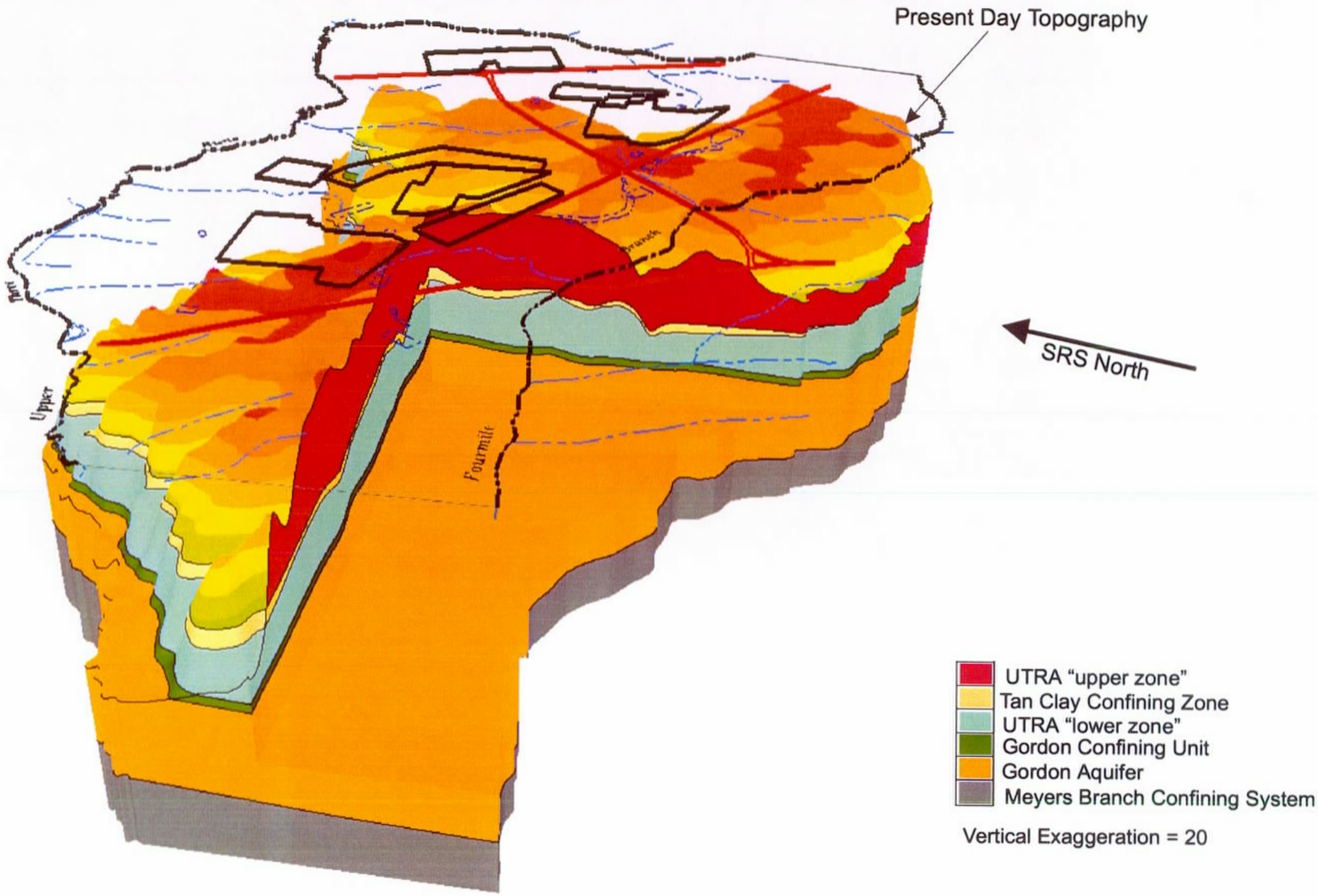


Figure 9. Three-dimensional chair cut view of the hydrostratigraphic model.

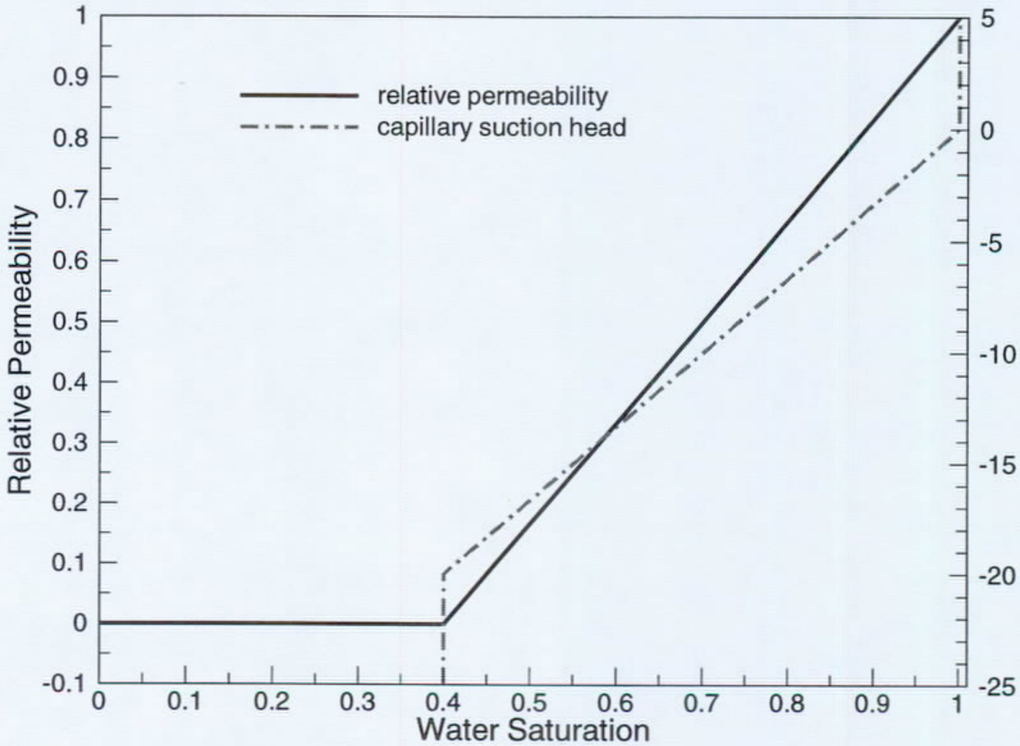


Figure 10. Relative permeability and capillary suction head as a function of water saturation in GSA flow model.

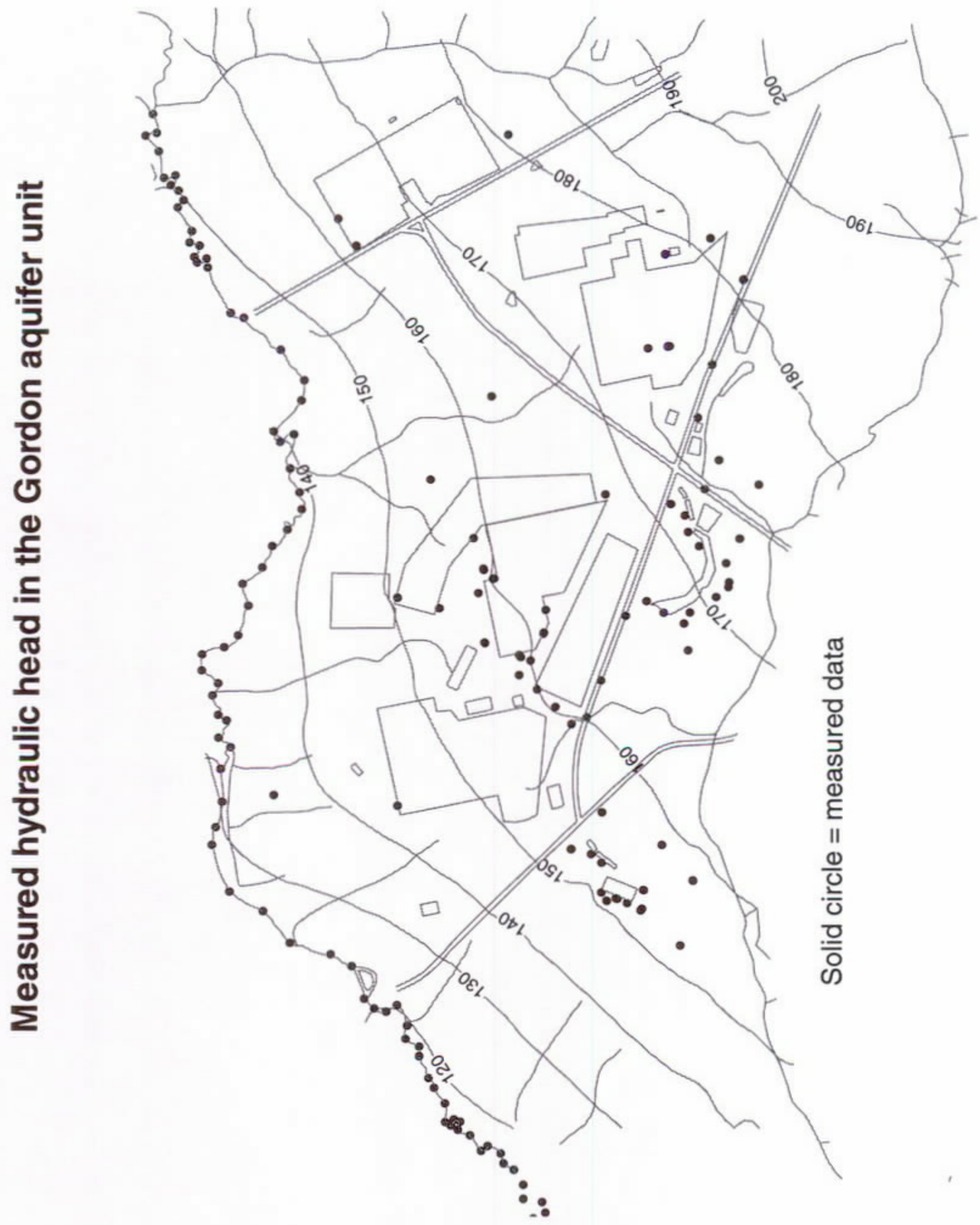


Figure 11. Measured hydraulic head in the Gordon aquifer unit (ft).

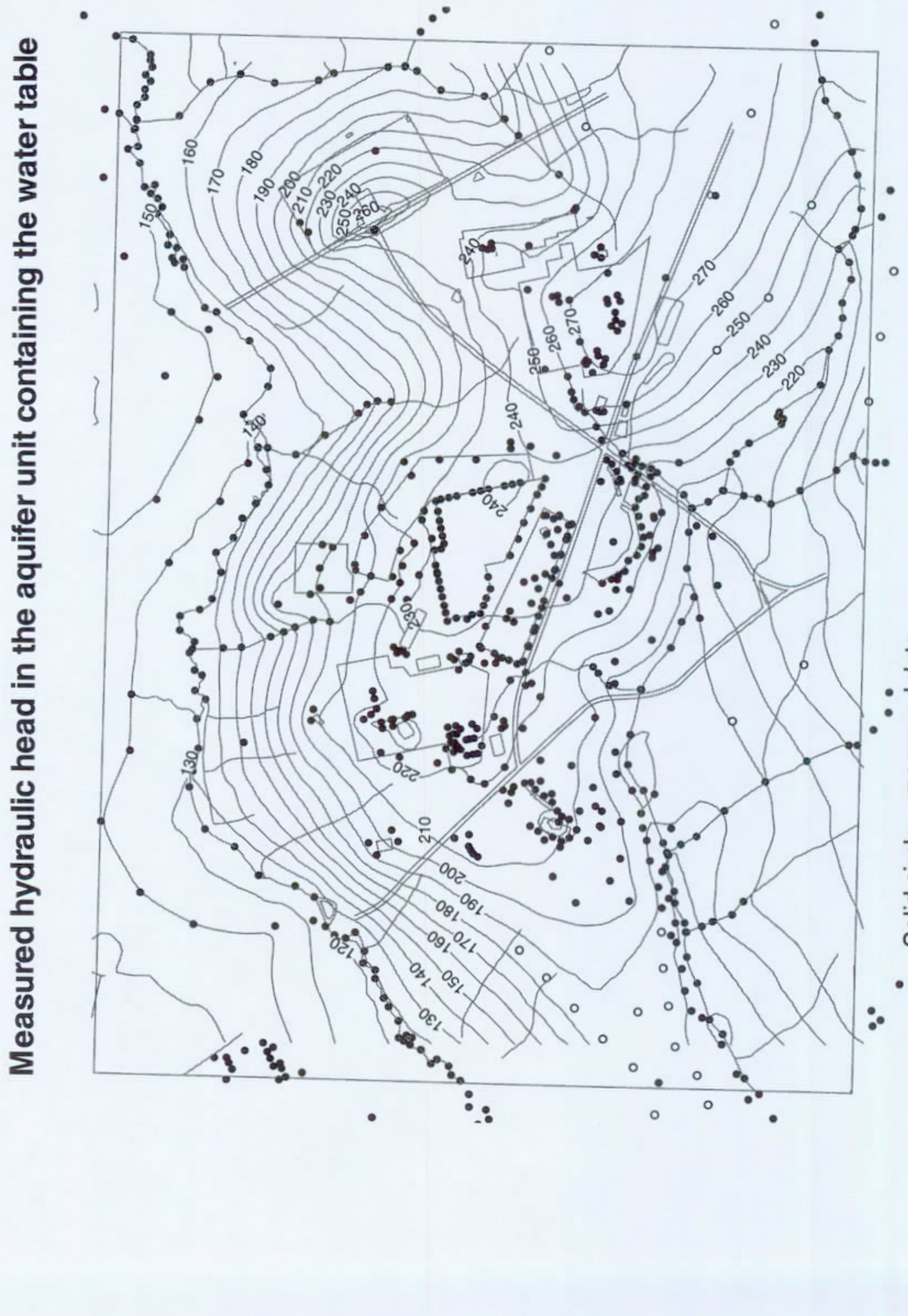


Figure 12. Measured hydraulic head in the aquifer zone containing the water table (ft).

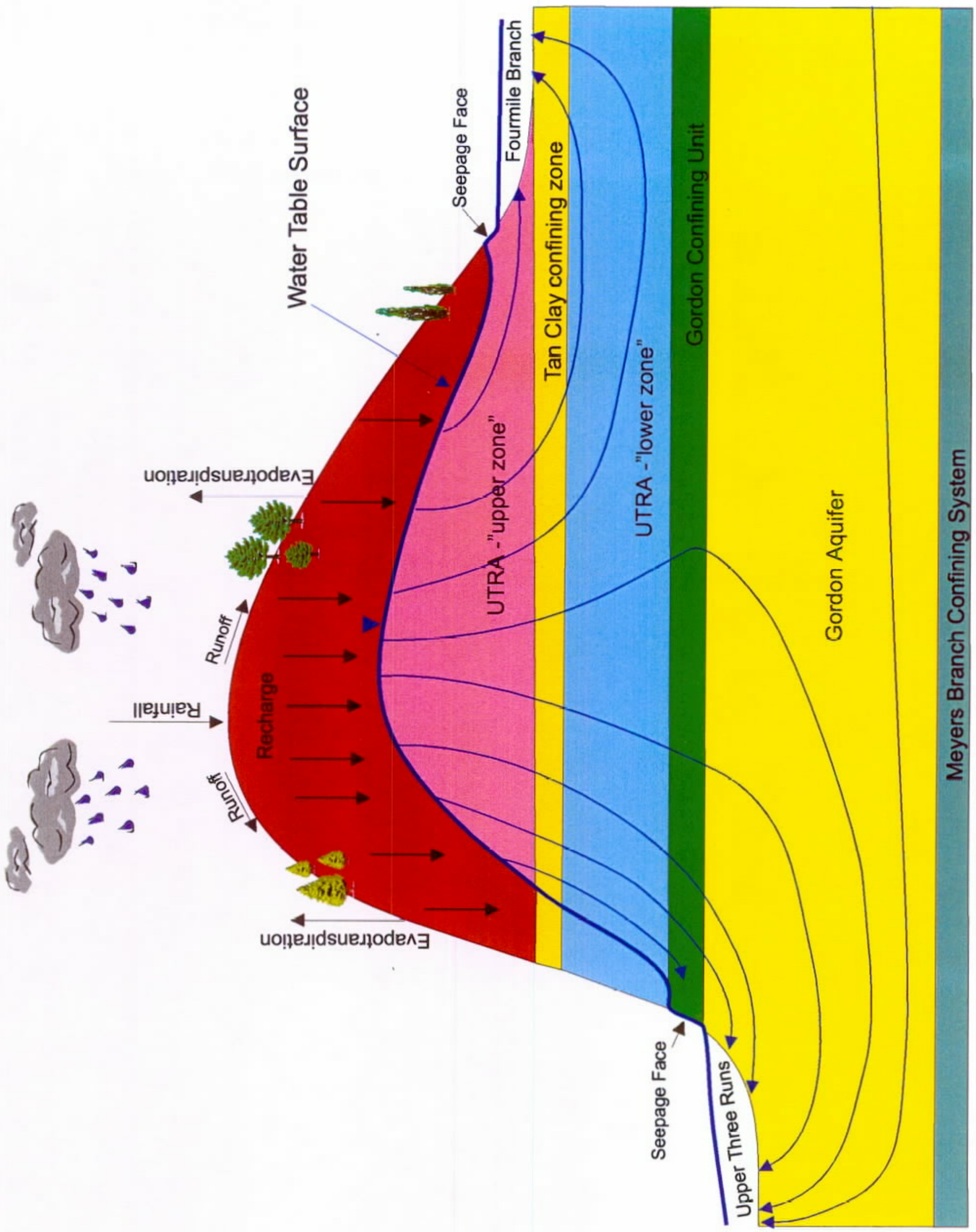


Figure 13. Conceptual model of groundwater flow in the GSA.

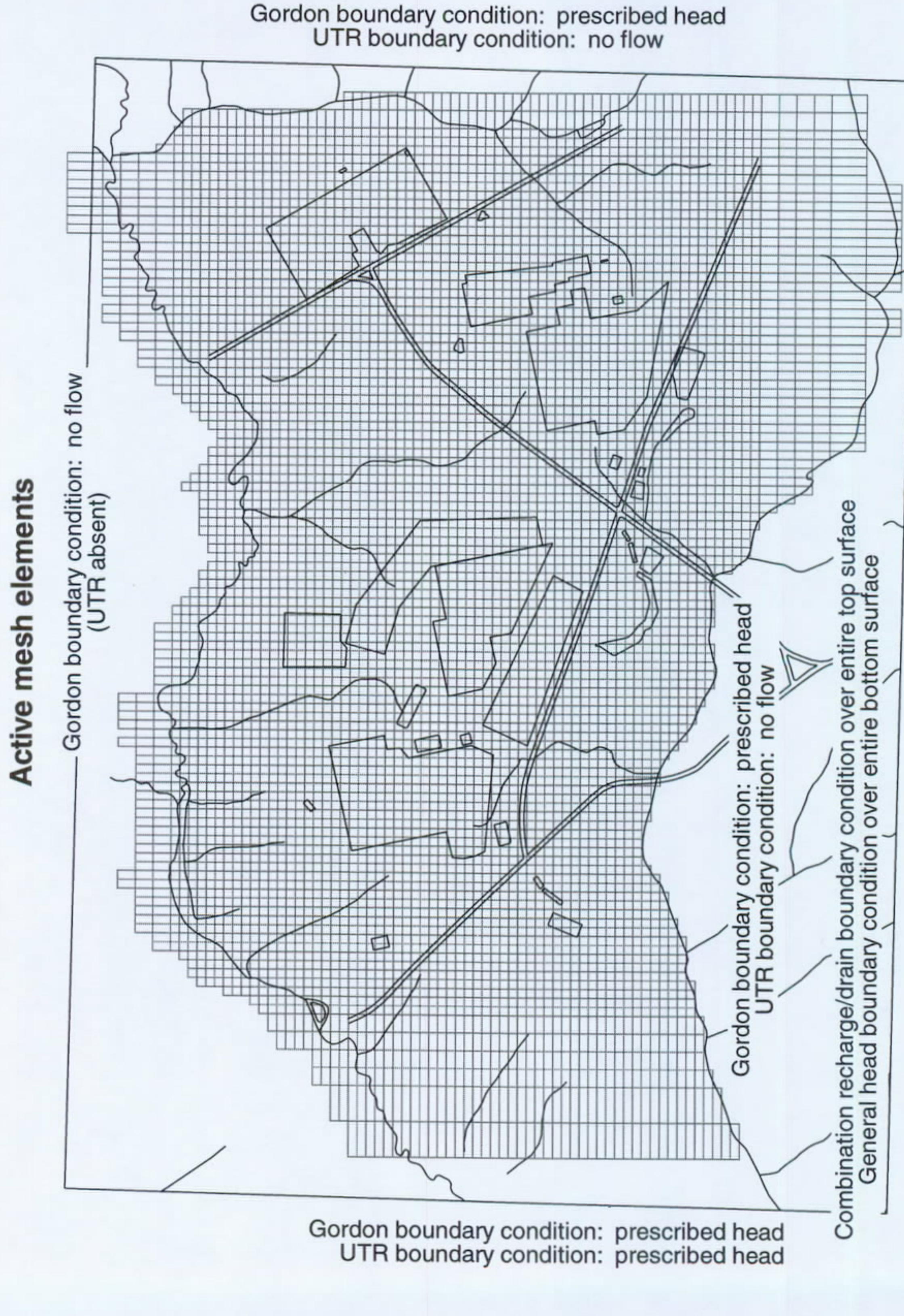


Figure 14. Plan view of active GSA model mesh indicating boundary conditions.

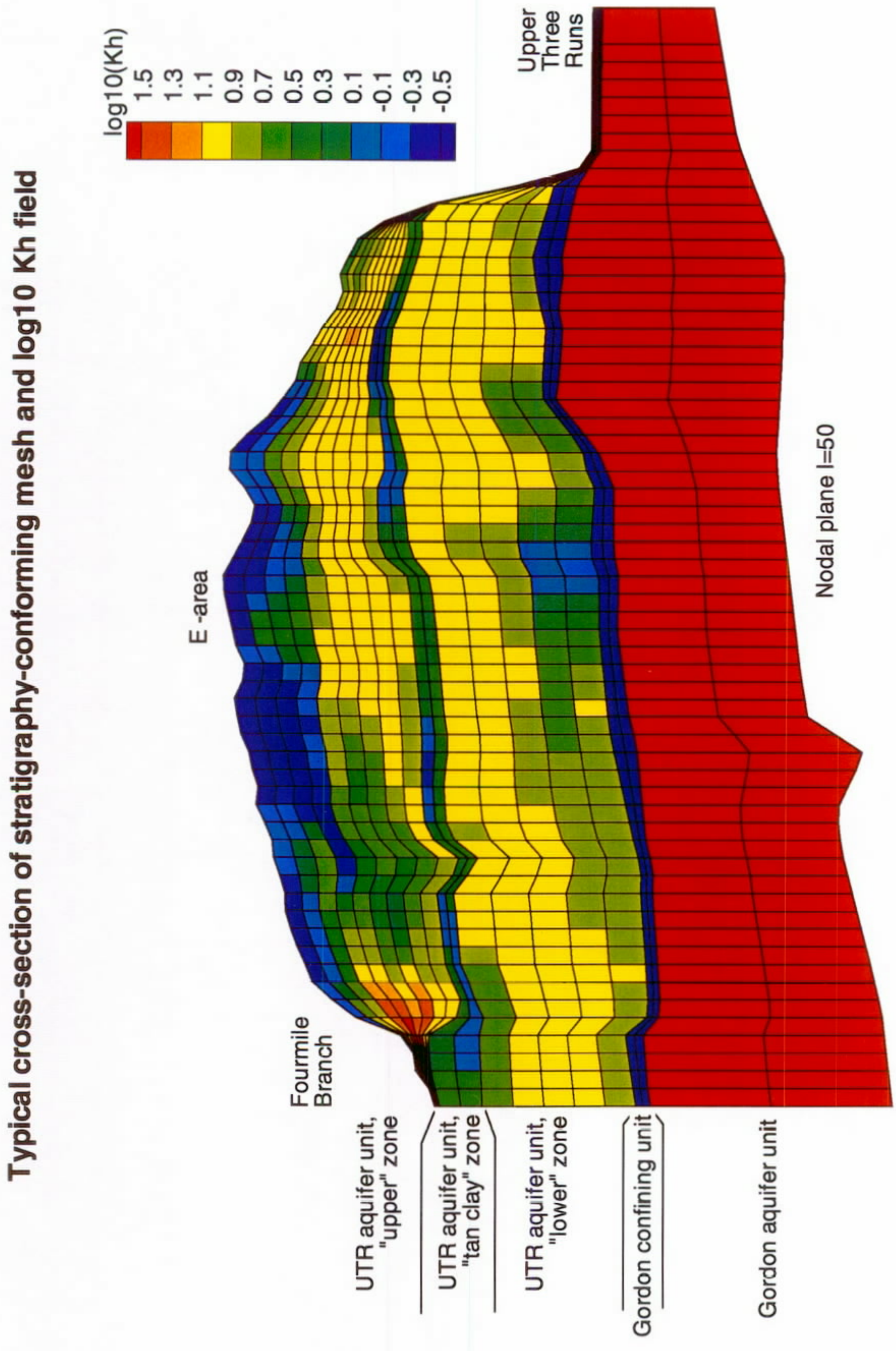


Figure 15. Typical cross-sectional view of GSA model mesh showing hydrostratigraphy.

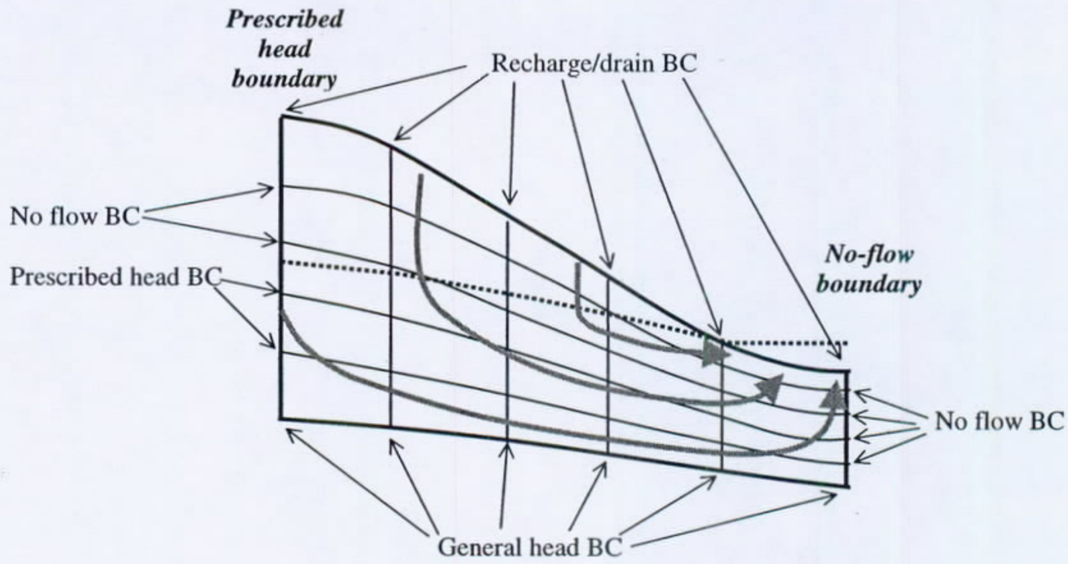


Figure 16. Schematic diagram of no-flow and prescribed head boundary condition specification.

Hydraulic head in the Crouch Branch aquifer unit

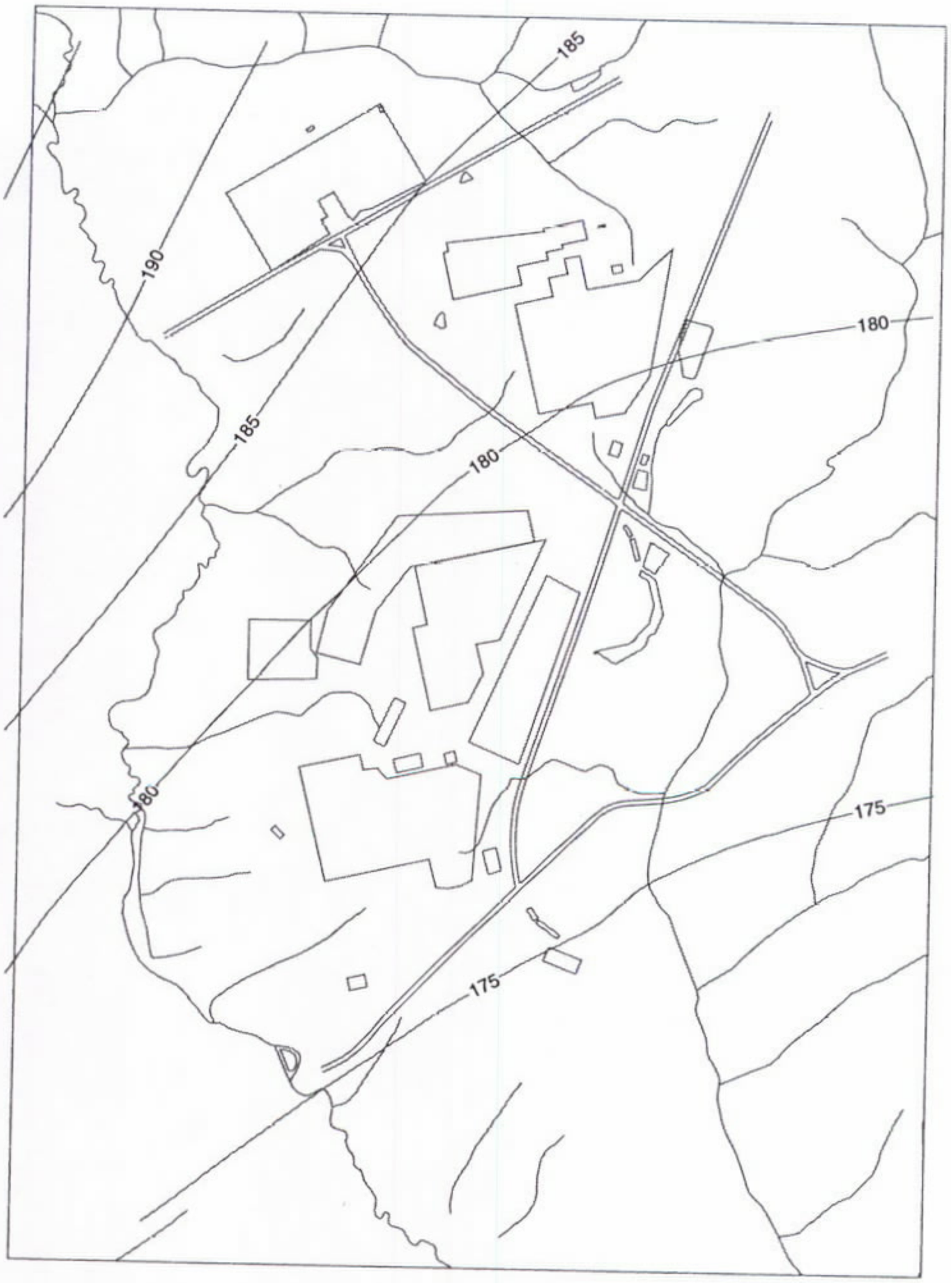


Figure 17. Hydraulic head in the Crouch Branch aquifer unit (ft).

Sources of artificial recharge

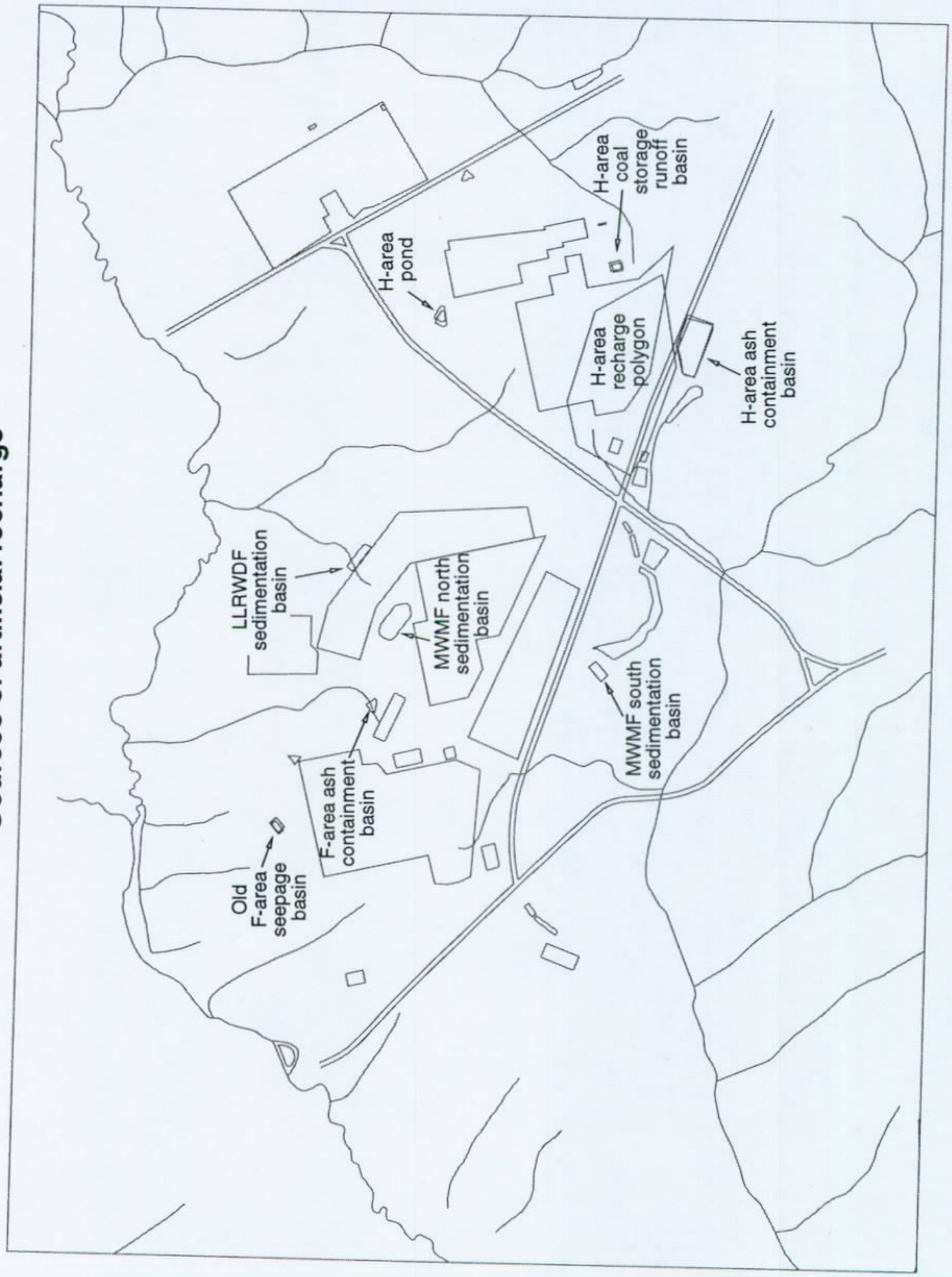


Figure 18. Locations of artificial (man-made) sources of groundwater recharge.

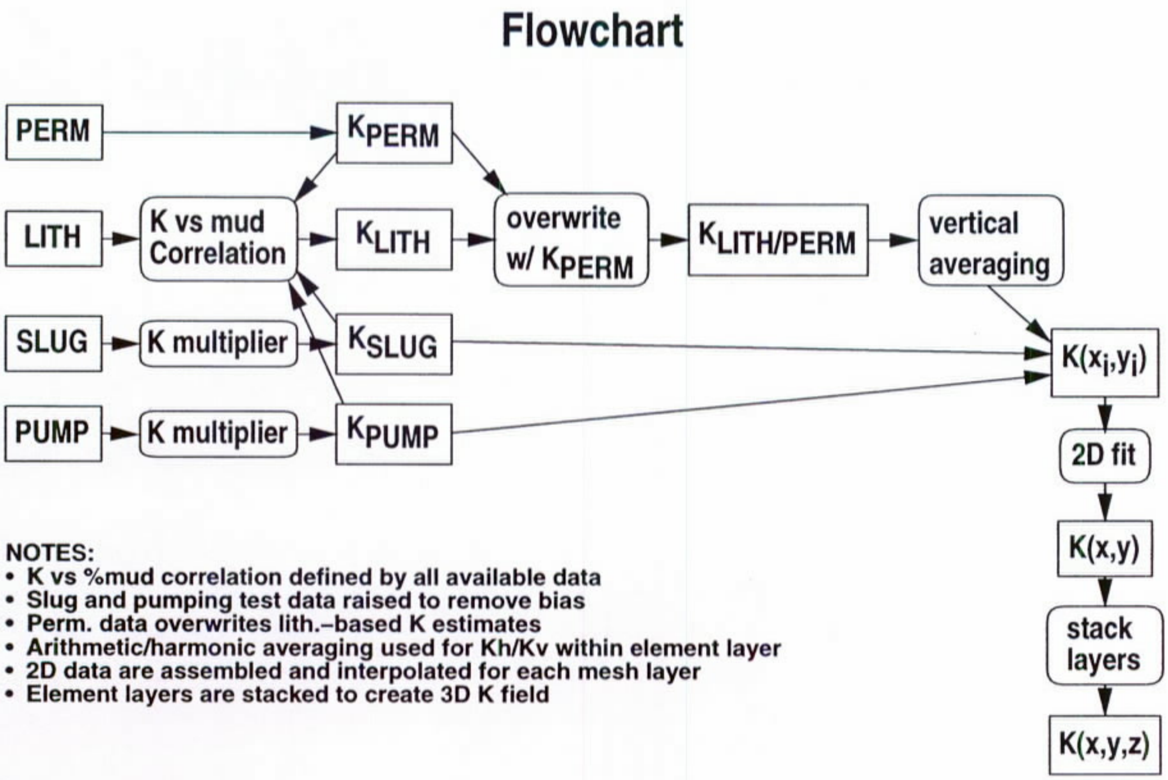


Figure 19. Flowchart of hydraulic conductivity field development.

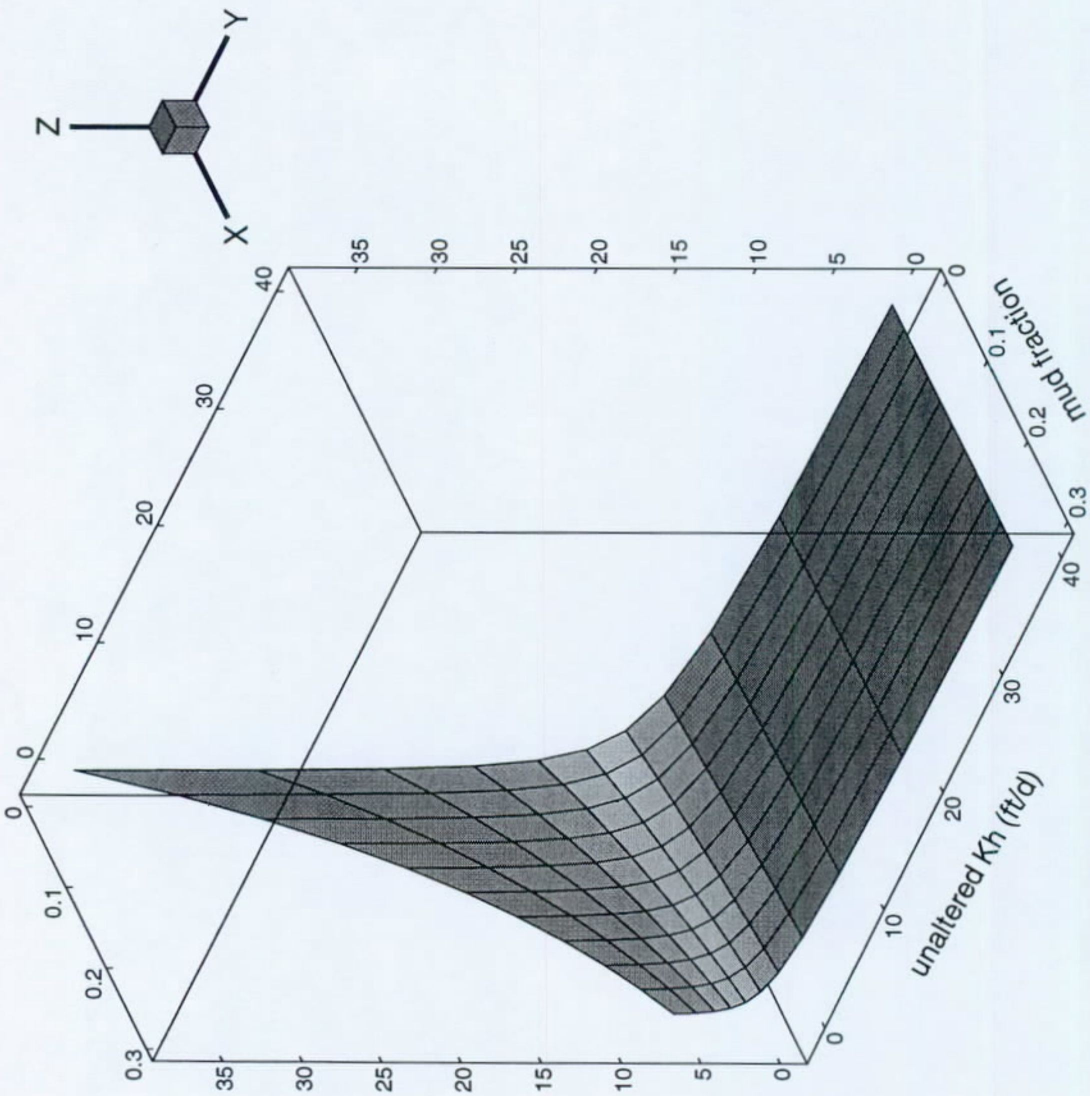


Figure 20. Correction factor applied to slug and single well pumping test data.

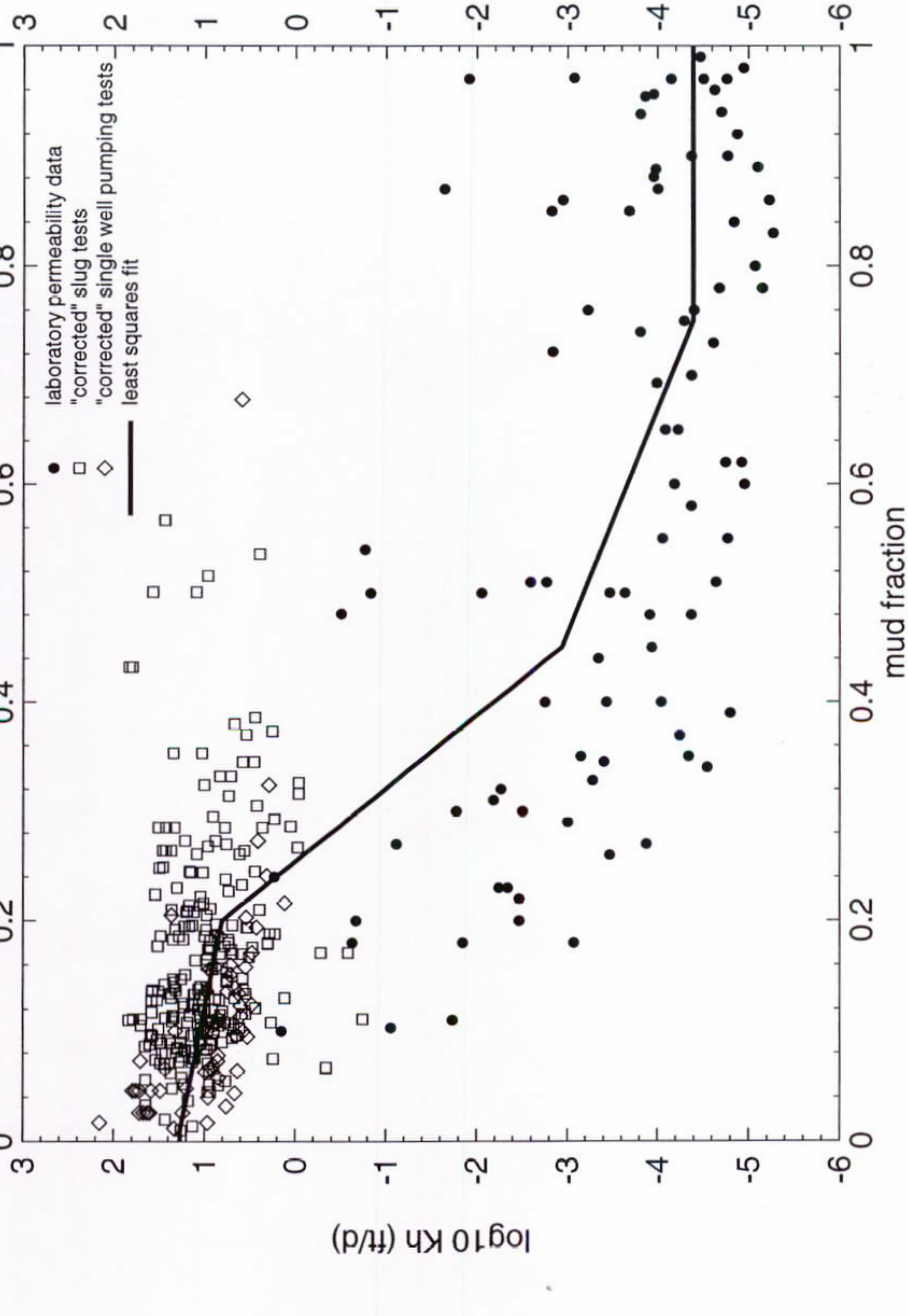


Figure 21. Horizontal conductivity as a function of mud fraction.

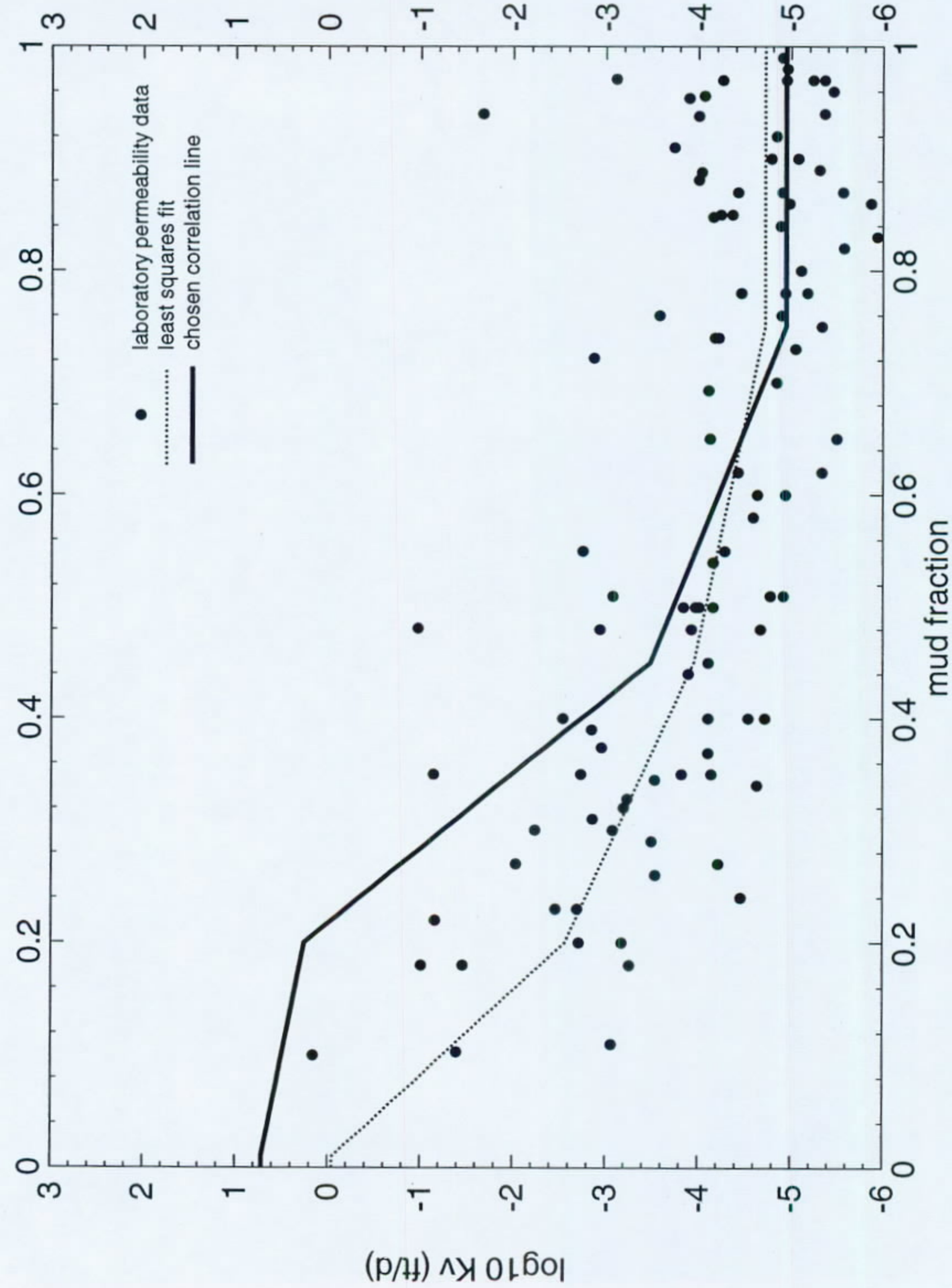


Figure 22. Vertical conductivity as a function of mud fraction.

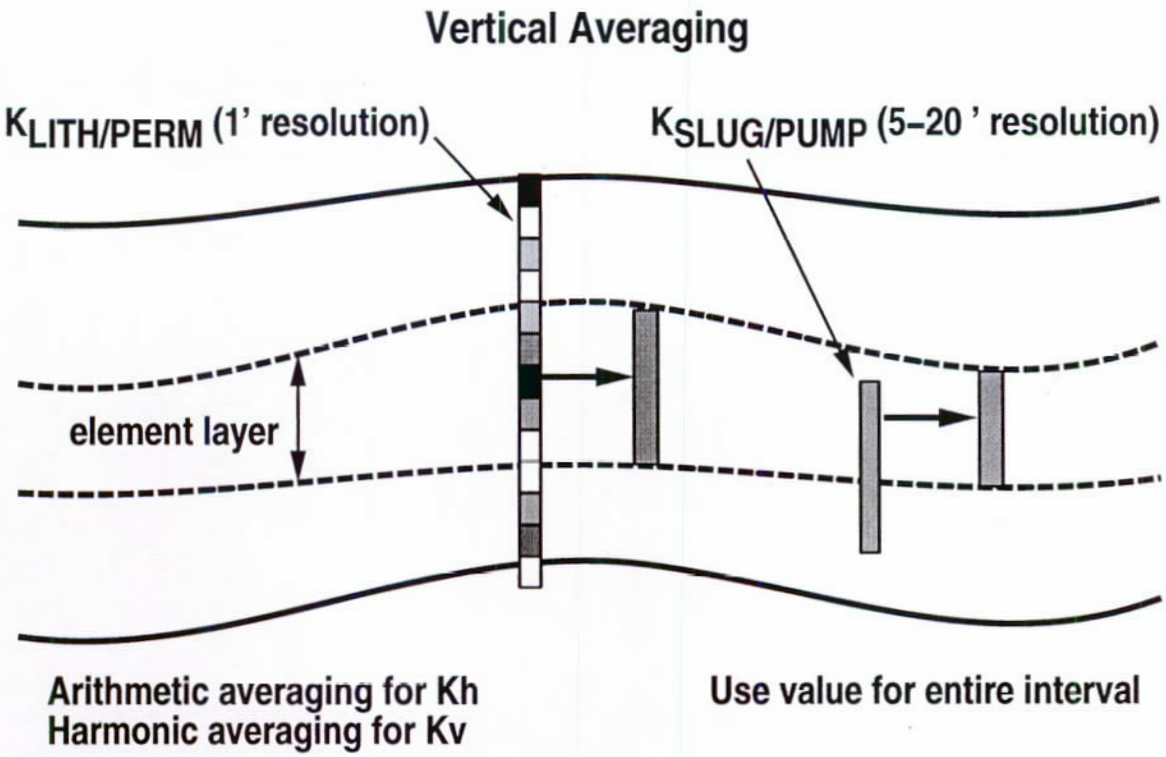


Figure 23. Vertical averaging and assignment to element layers.

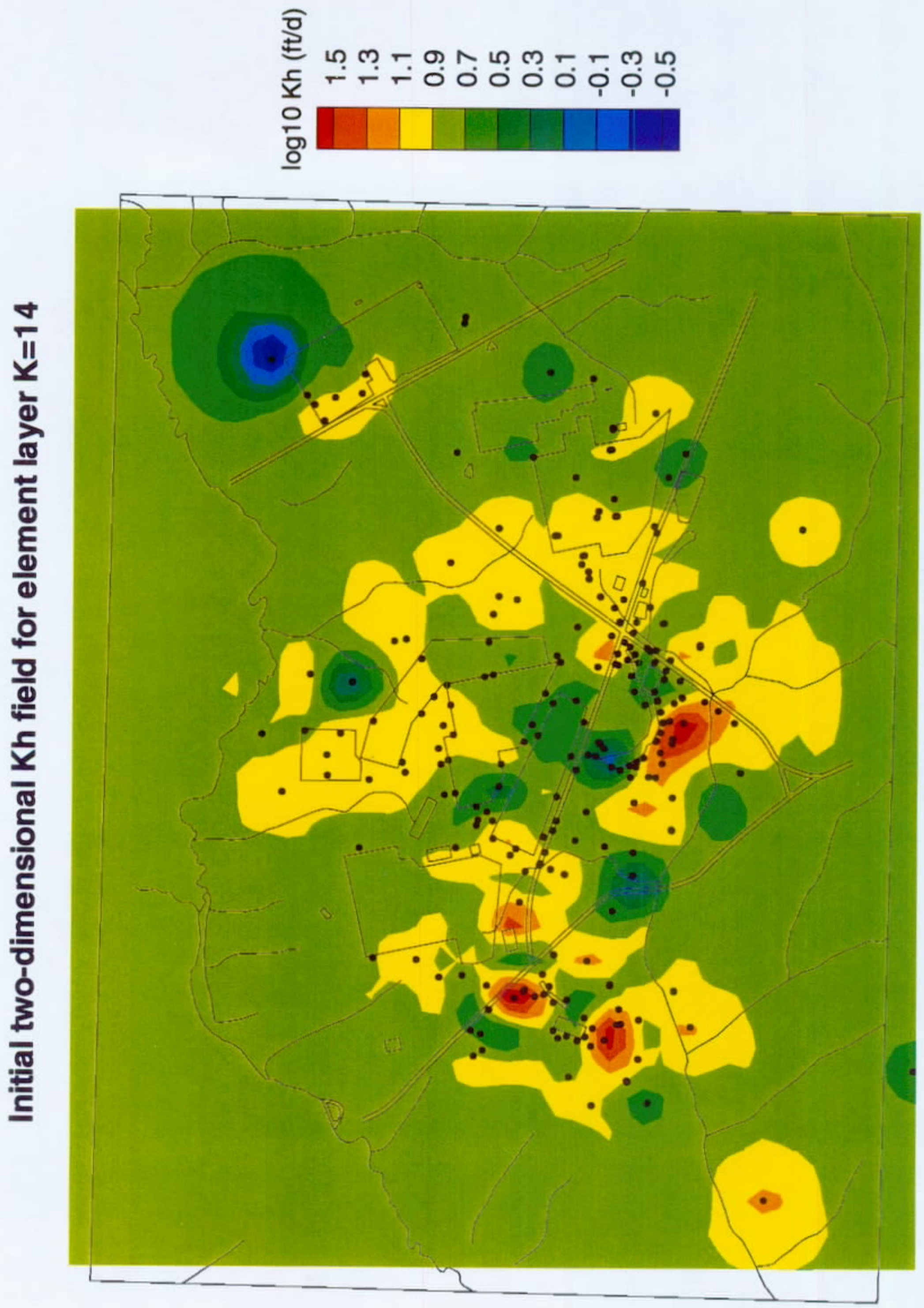


Figure 24. Typical two-dimensional fit of element layer conductivity data; Kh for layer K=14 in "upper" aquifer zone is shown.

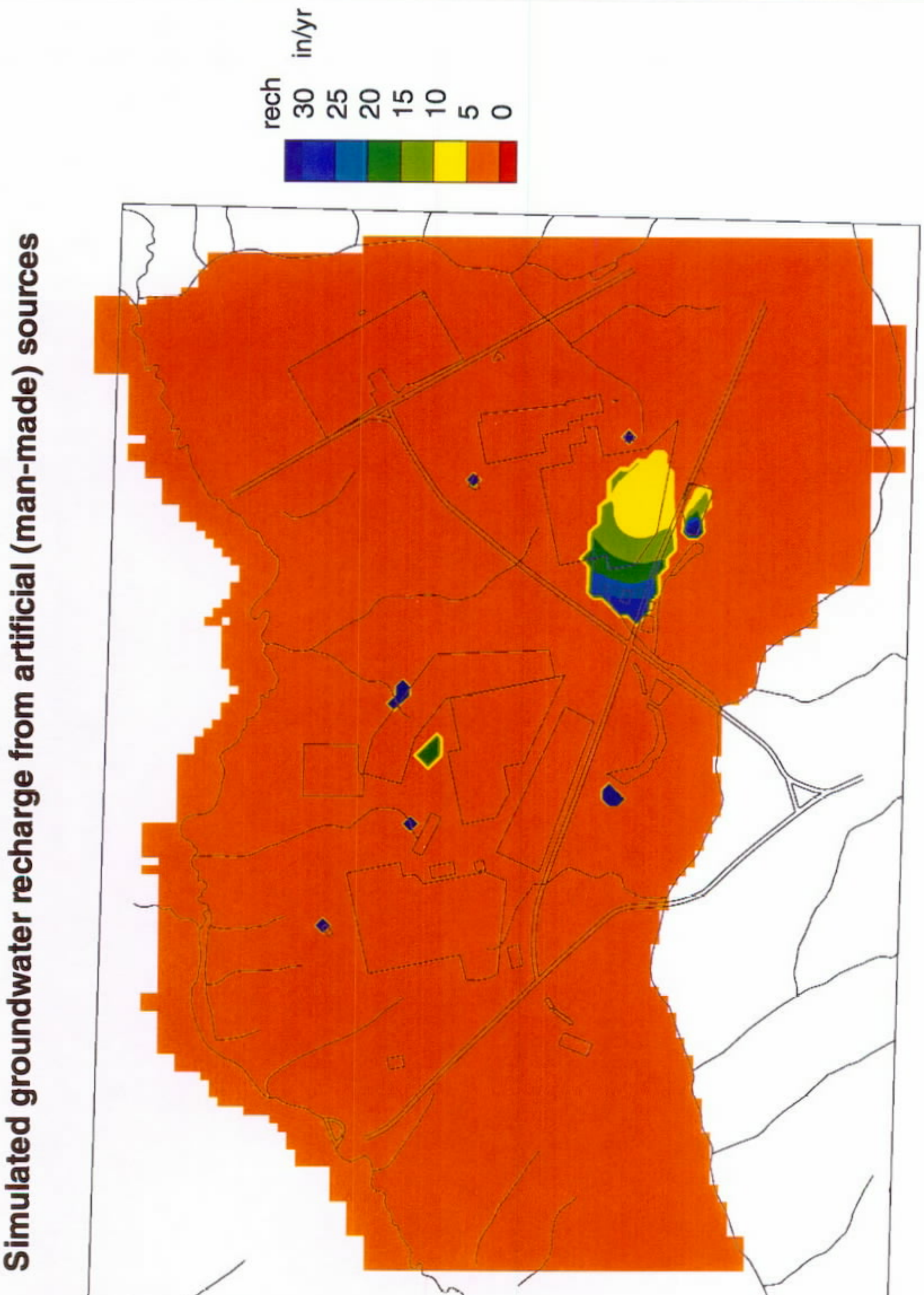


Figure 25. Distribution and rates of artificial recharge.

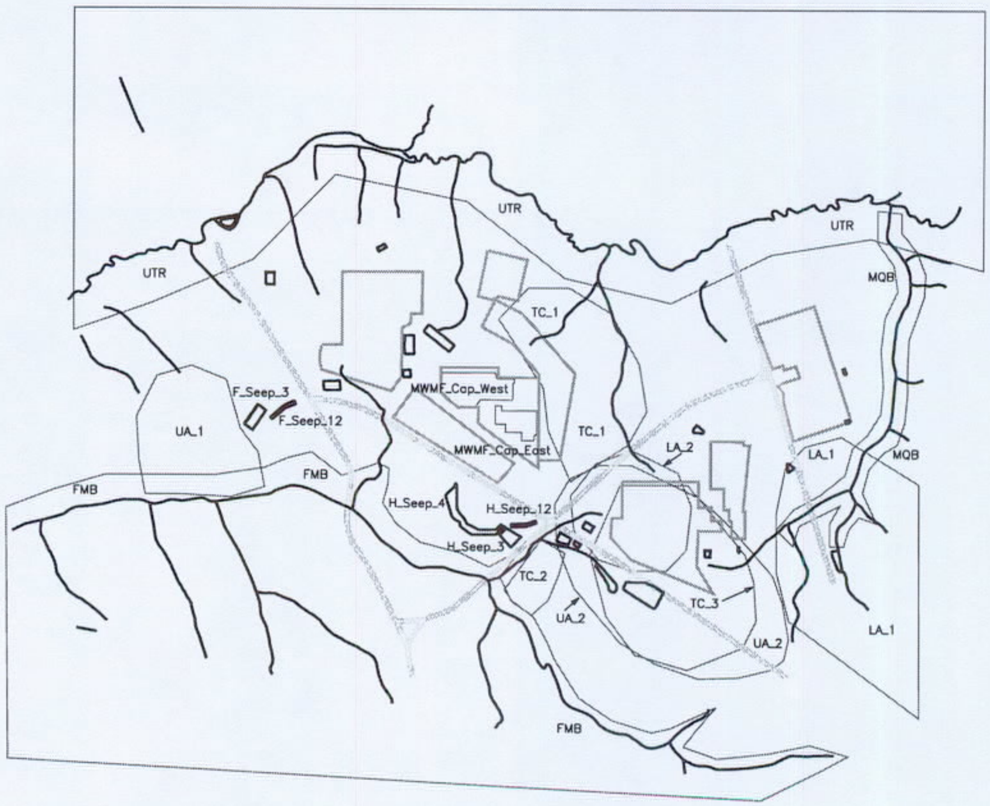


Figure 26. Polygons used to select volumes for modifying model conductivity fields.

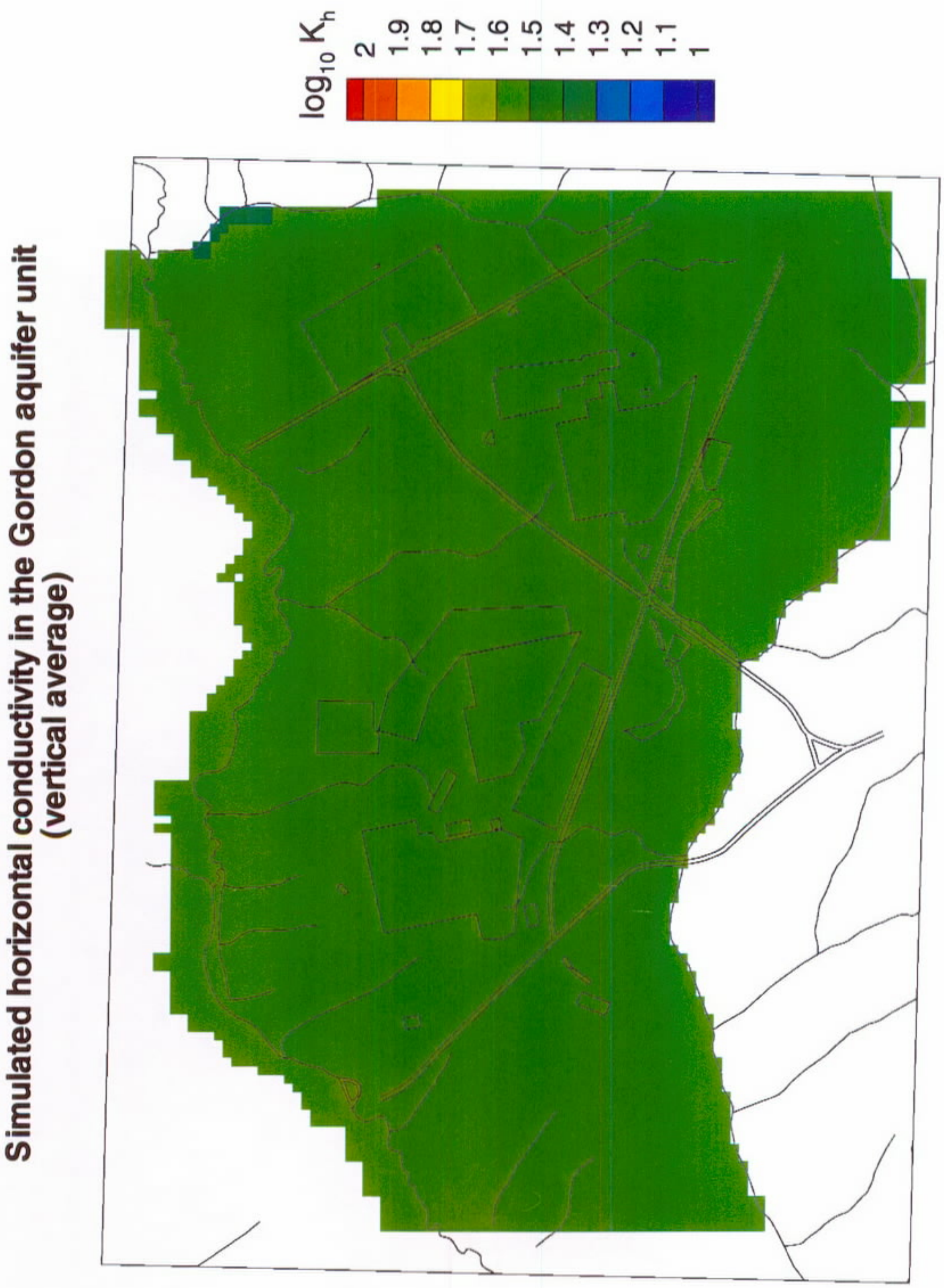


Figure 27. Vertically averaged horizontal conductivity in the Gordon aquifer unit.

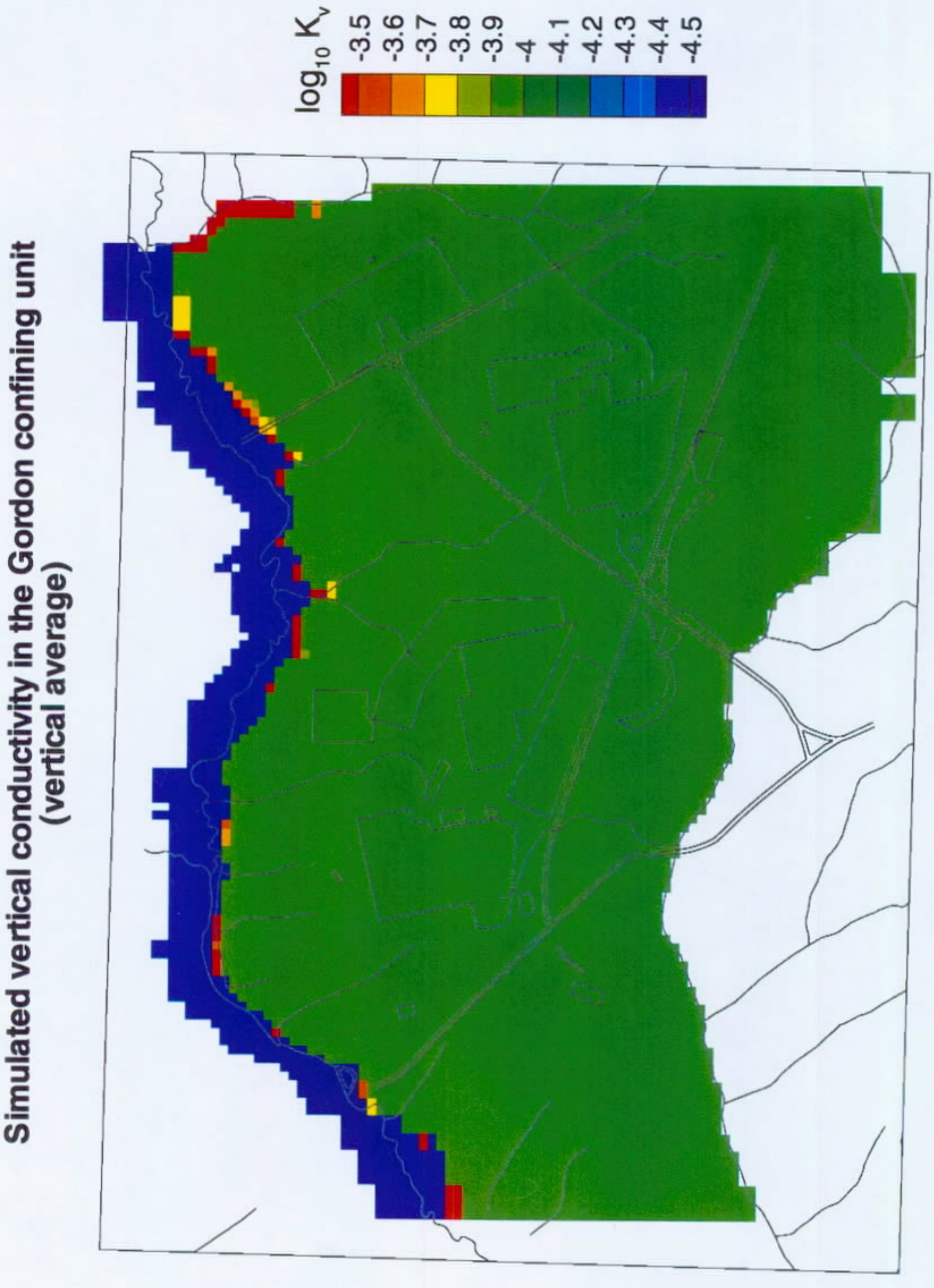


Figure 28. Vertically averaged vertical conductivity in the Gordon confining unit.

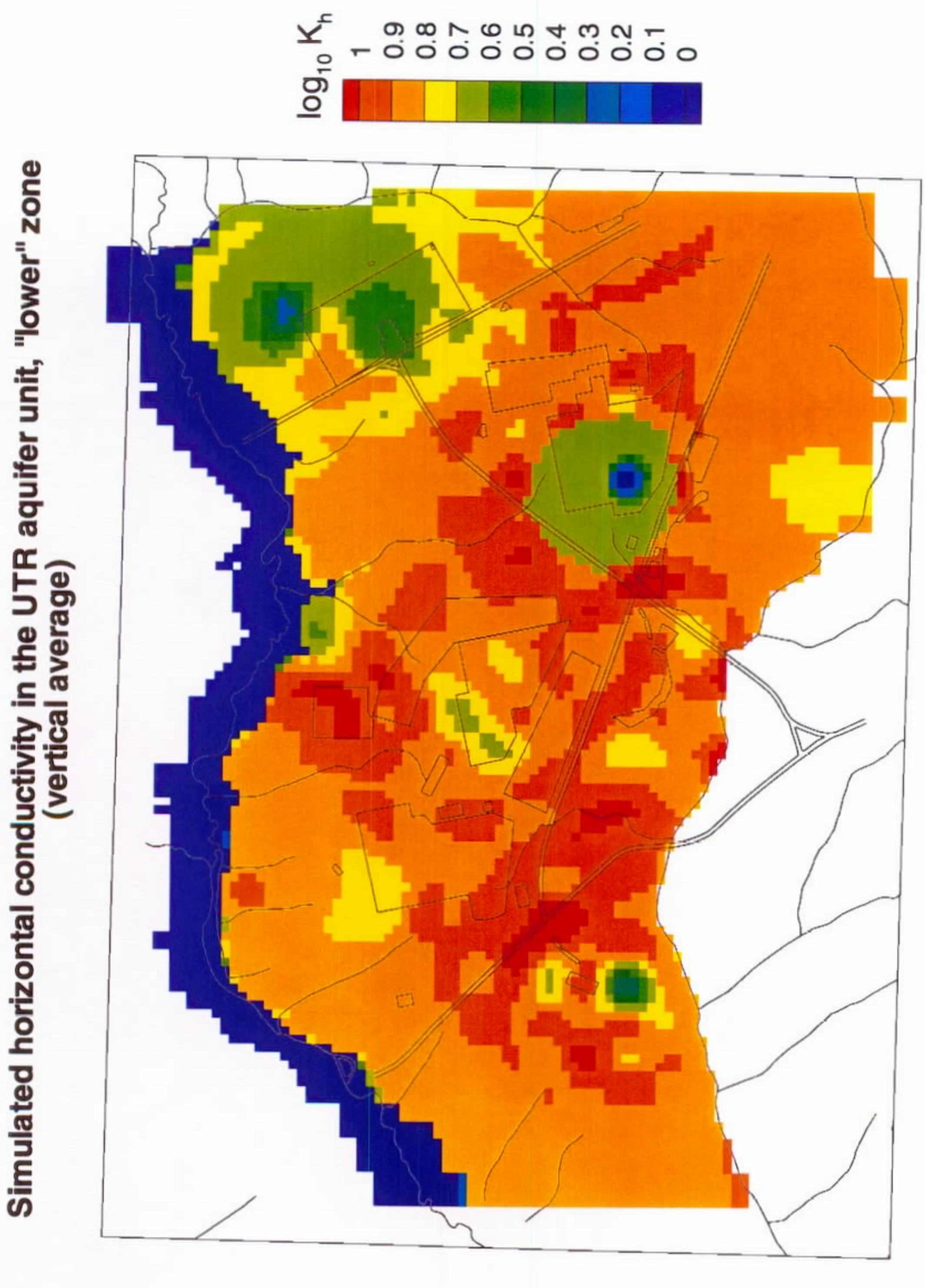


Figure 29. Vertically averaged horizontal conductivity in the "lower" aquifer zone.

Simulated vertical conductivity in the UTR aquifer unit, "tan clay" confining zone (vertical average)

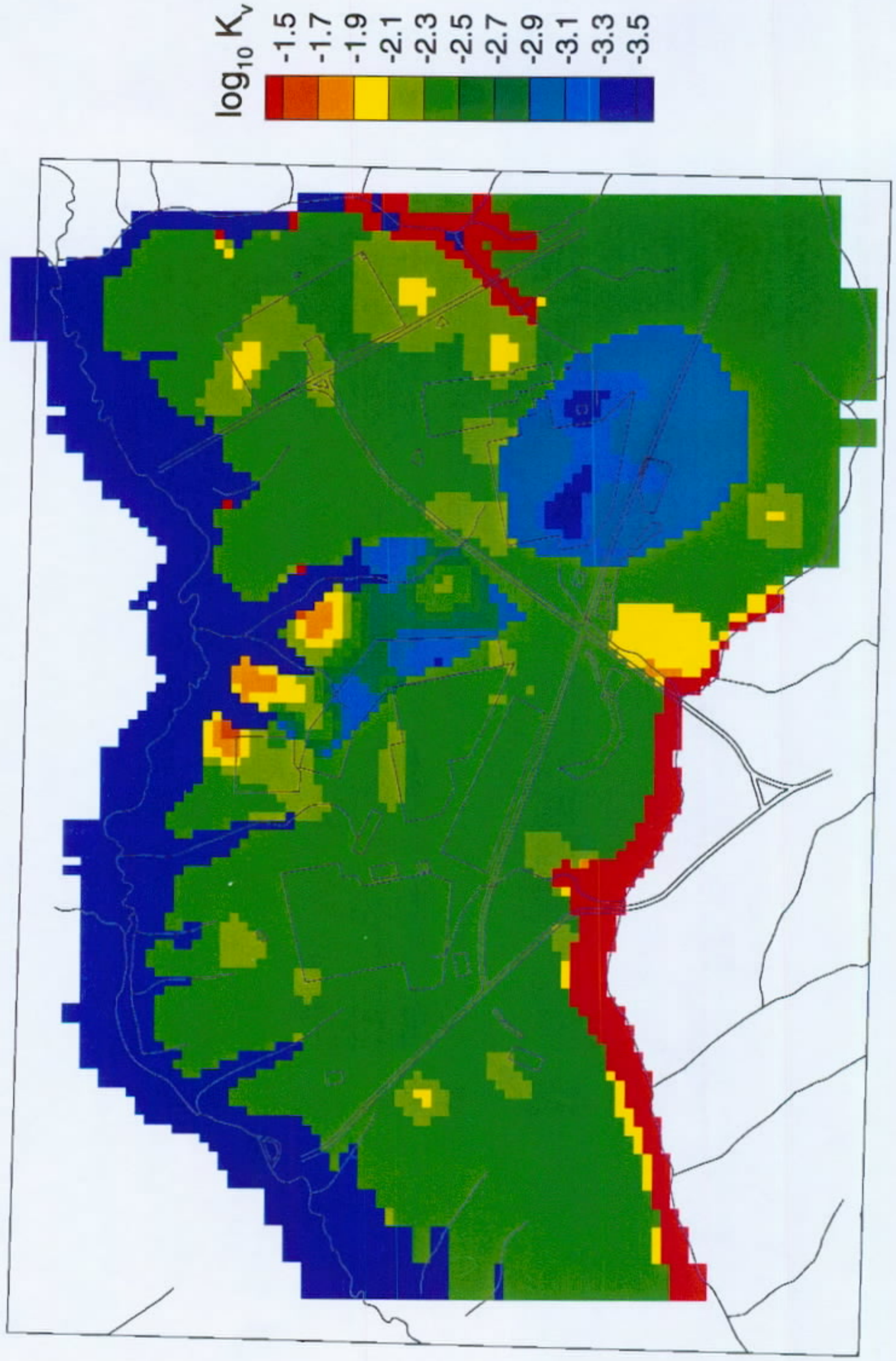


Figure 30. Vertically averaged vertical conductivity in the "tan clay" confining zone.

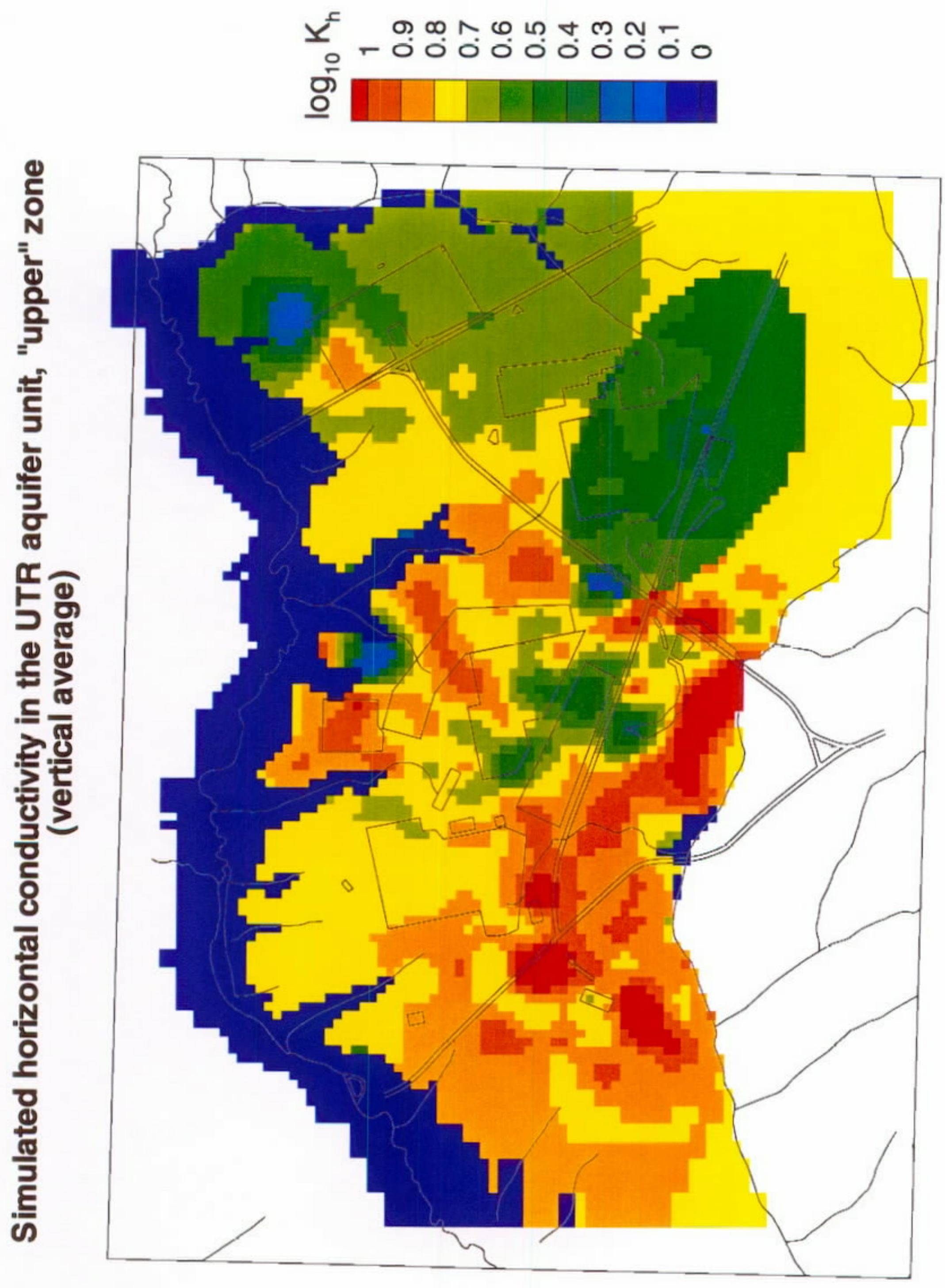


Figure 31. Vertically averaged horizontal conductivity in the "upper" aquifer zone.

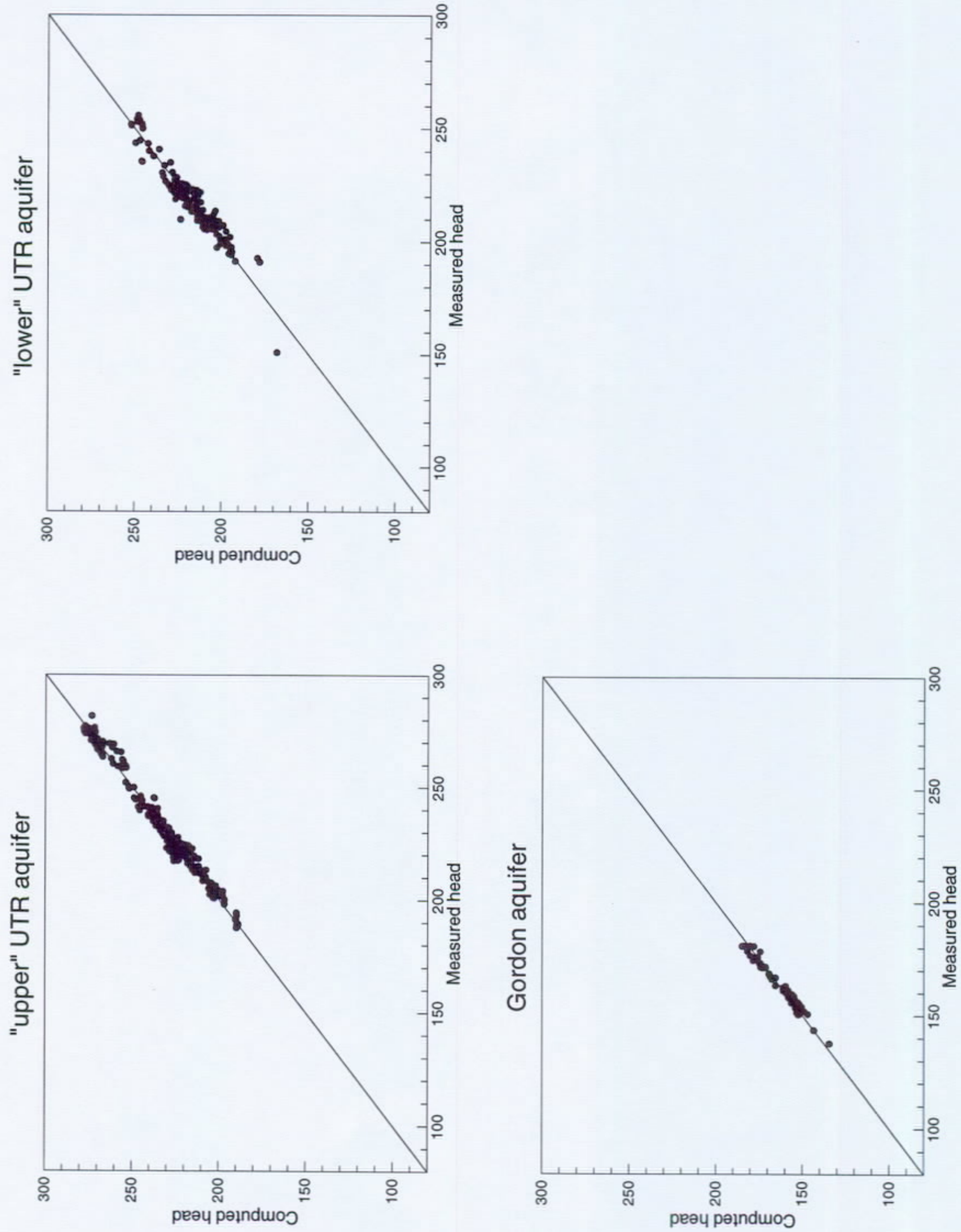


Figure 32. Comparison of predicted and measured hydraulic head (ft).

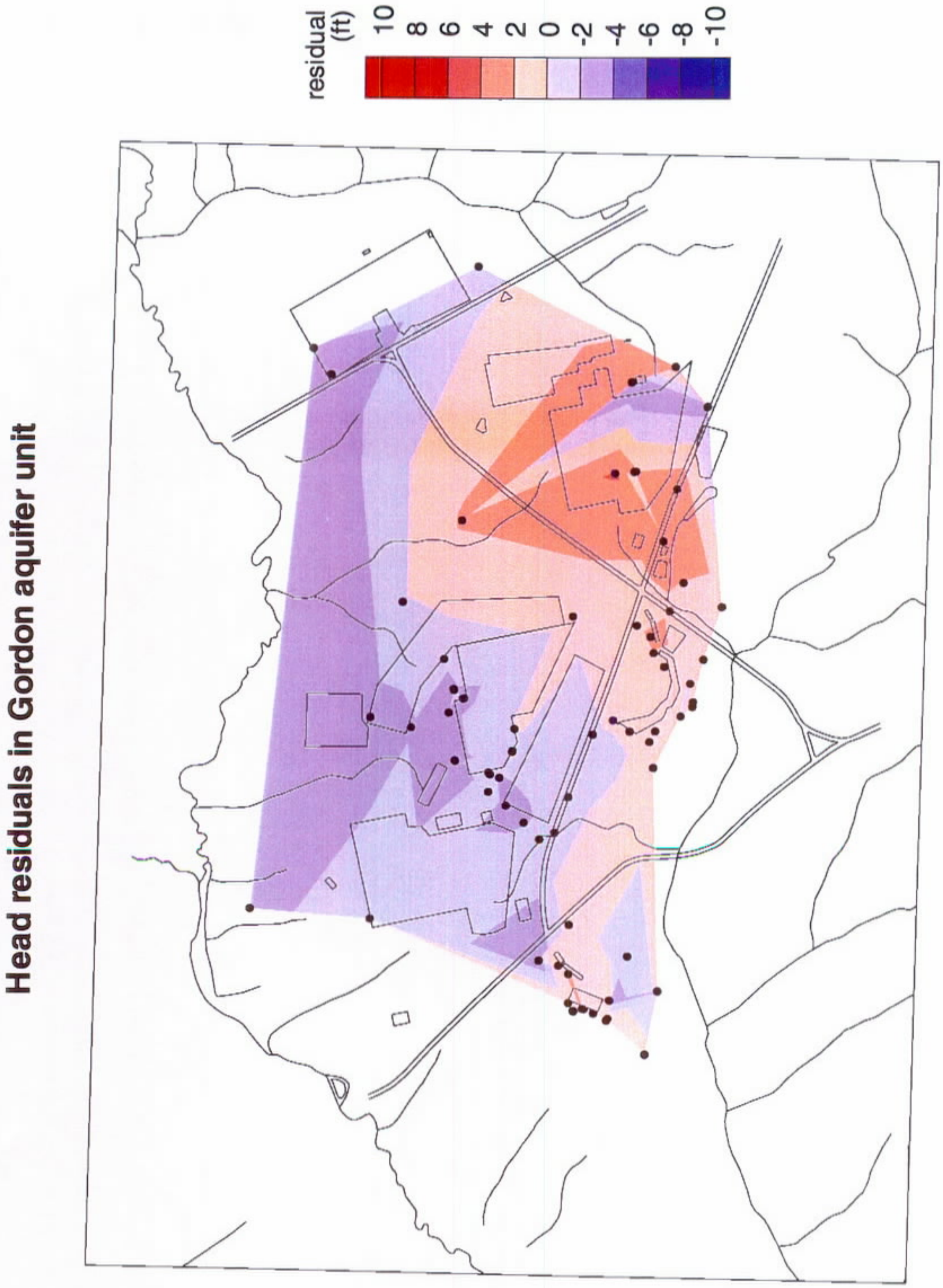


Figure 33. Head residual distribution in the Gordon aquifer unit (ft).

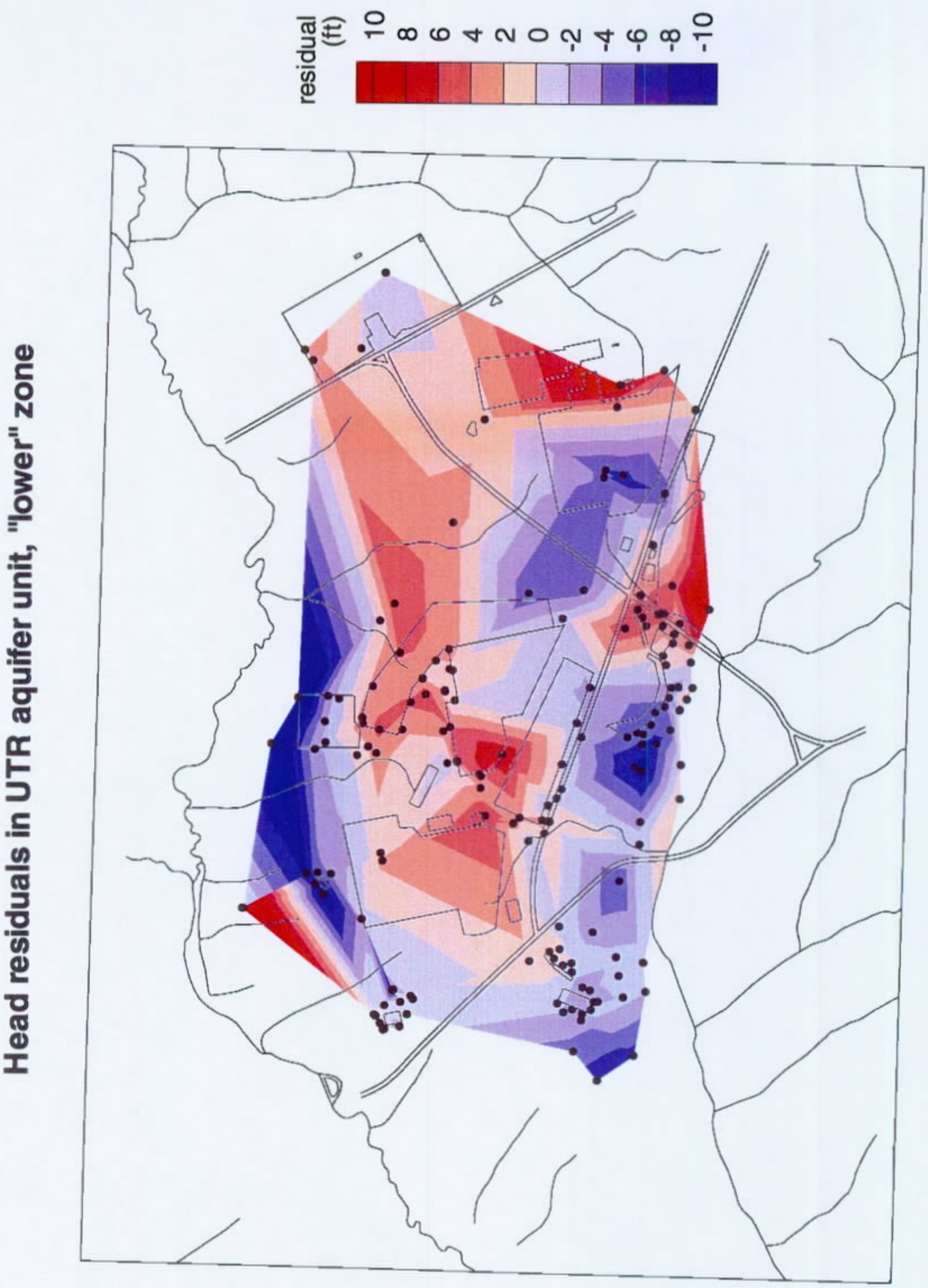


Figure 34. Head residual distribution in the "lower" aquifer zone (ft).

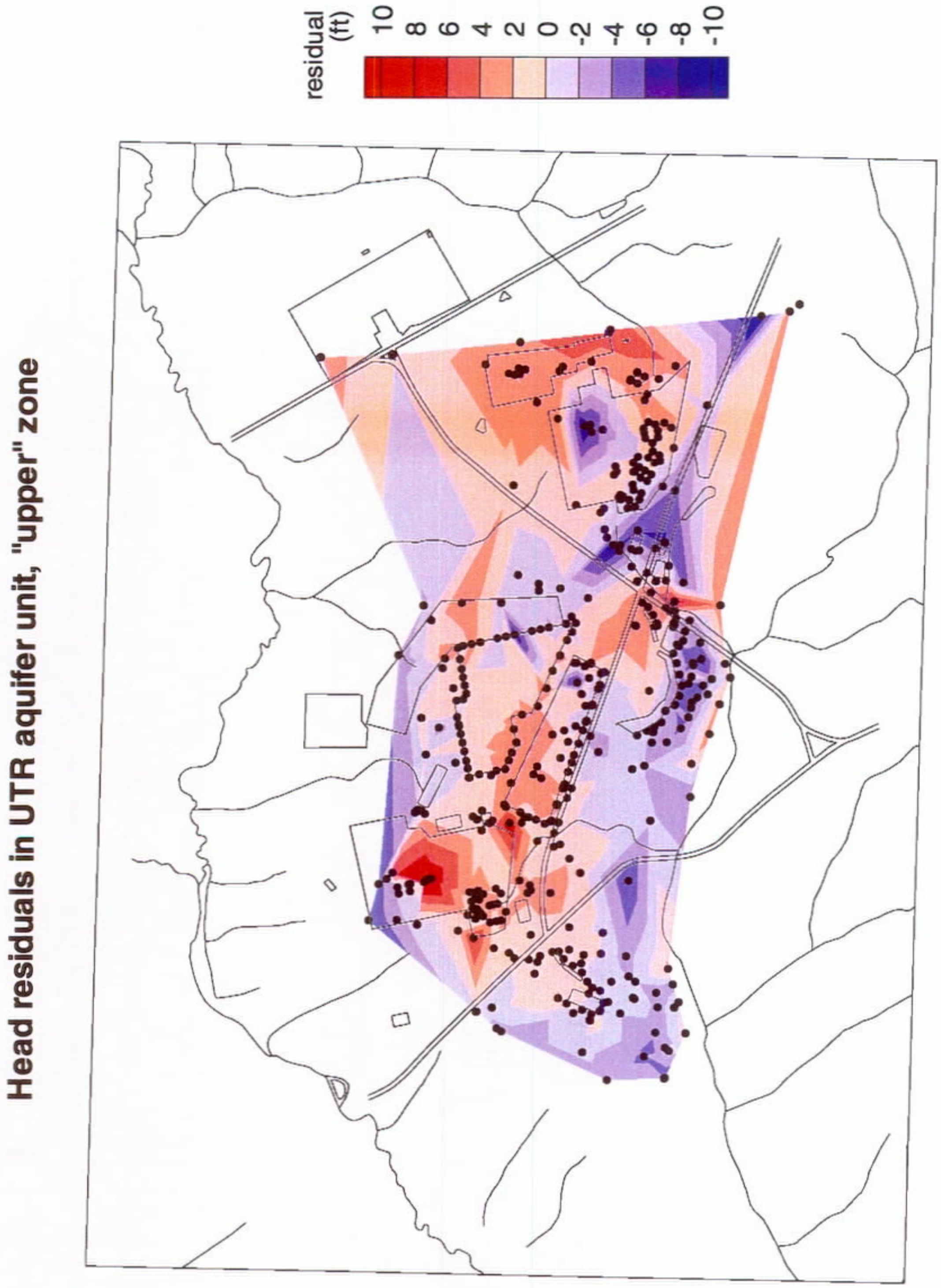


Figure 35. Head residual distribution in the "upper" aquifer zone (ft).

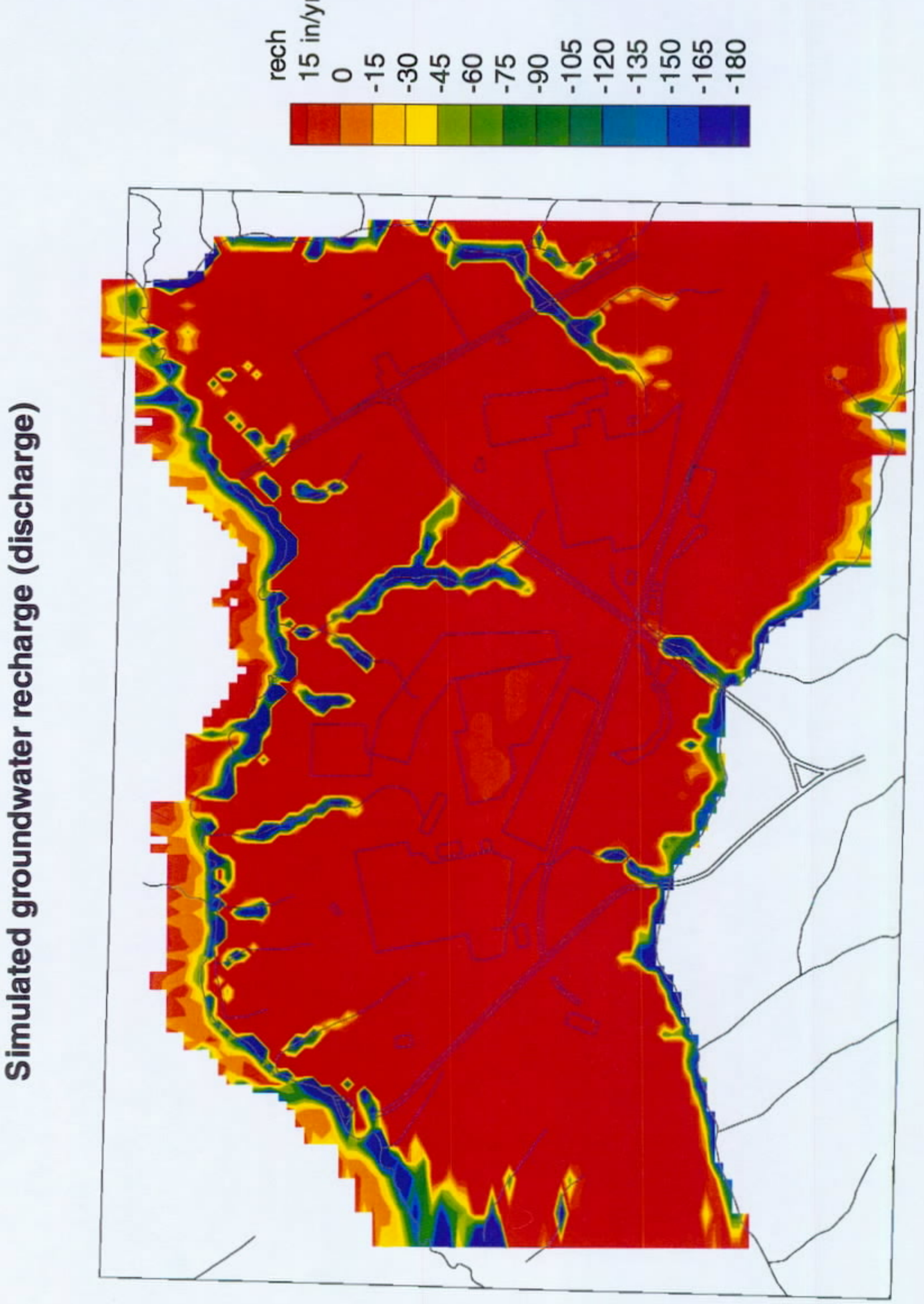


Figure 36. Simulated natural surface recharge and discharge rates.

Simulated hydraulic head in Gordon aquifer unit

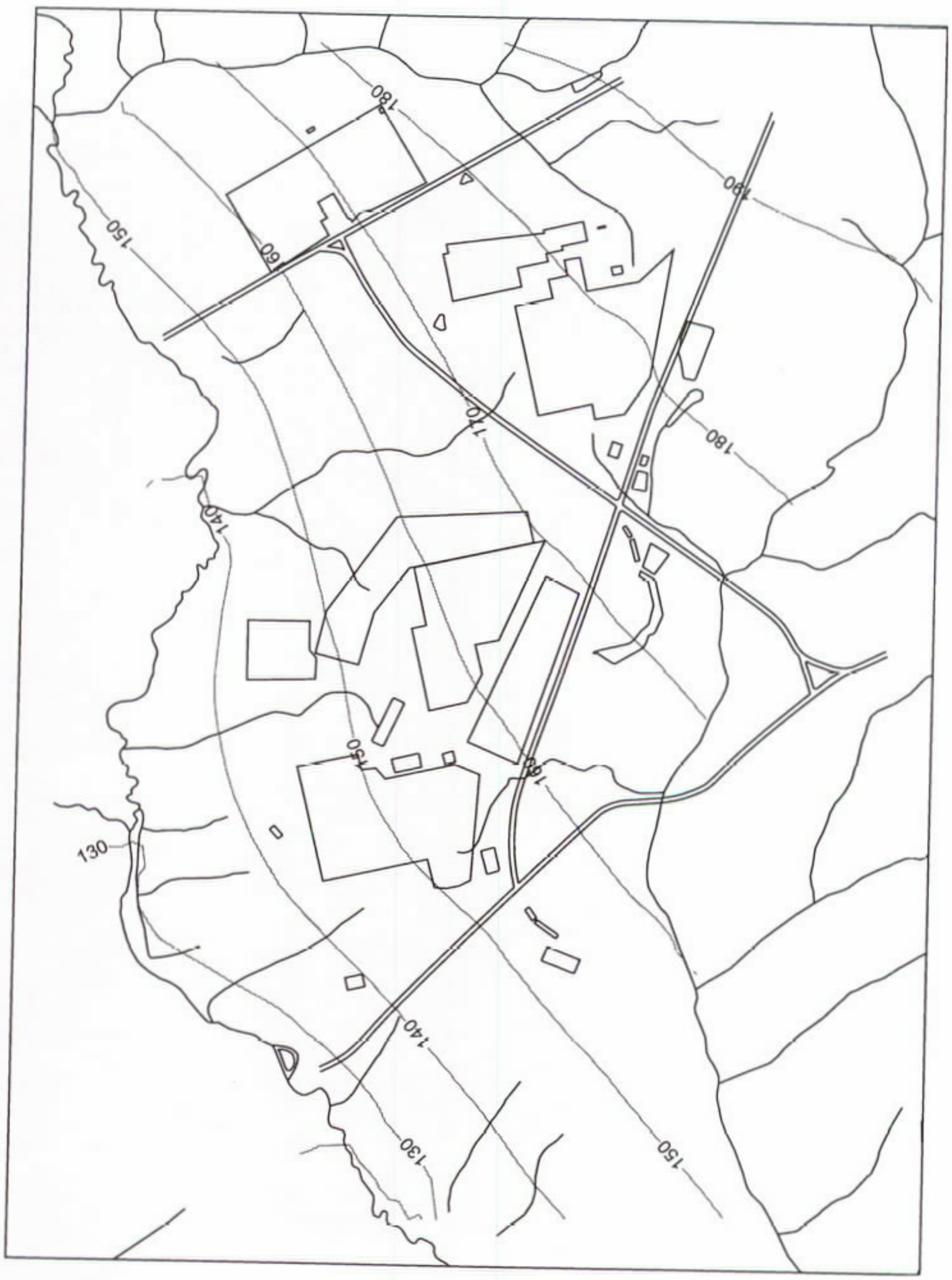


Figure 37. Simulated hydraulic head in the Gordon aquifer unit, averaged over the aquifer thickness (ft).

Simulated hydraulic head in Upper Three Runs aquifer unit, "lower" zone

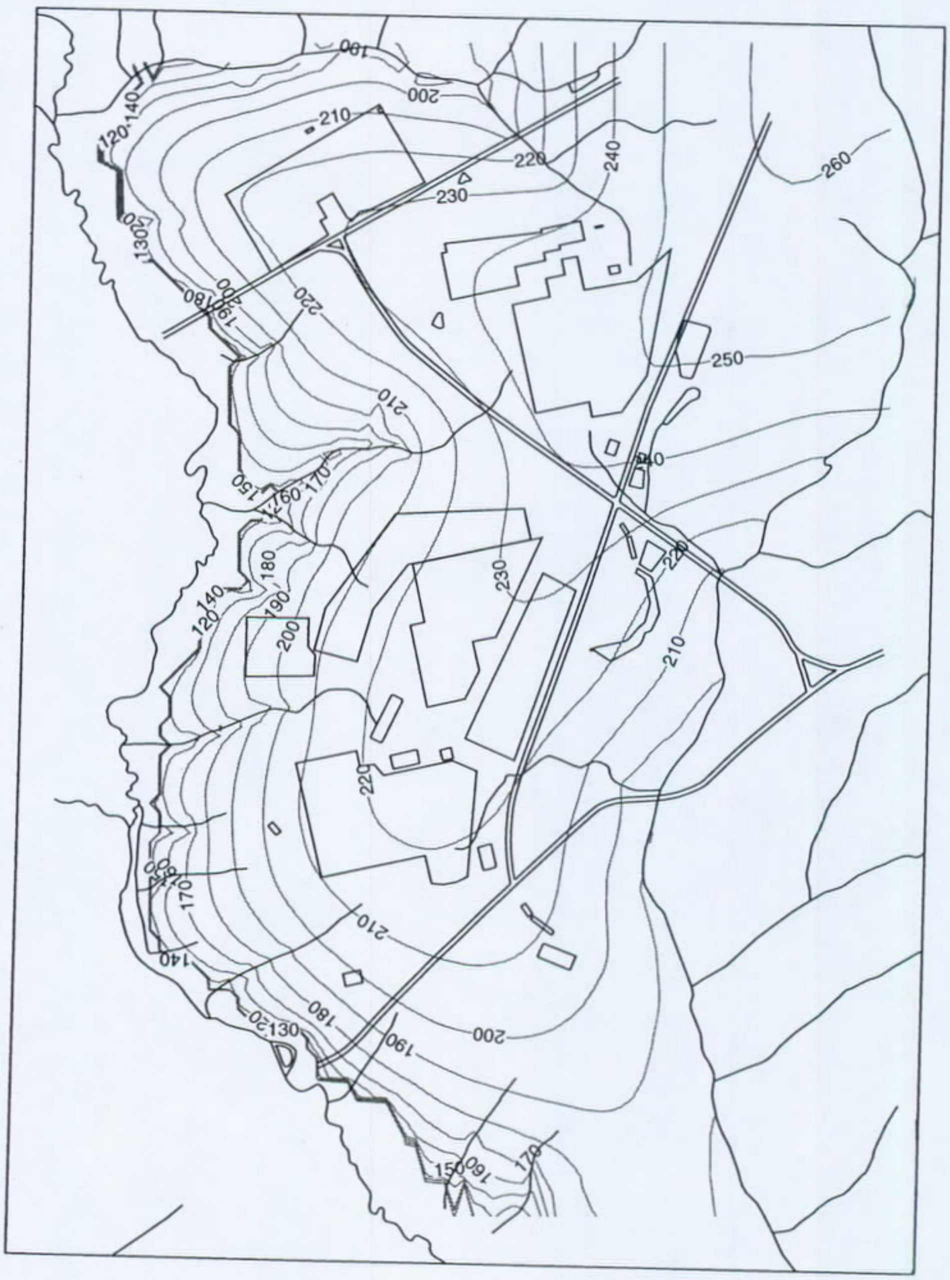


Figure 38. Simulated hydraulic head in the "lower" aquifer zone, averaged over the aquifer thickness (ft).

Simulated hydraulic head in Upper Three Runs aquifer unit, "upper" zone

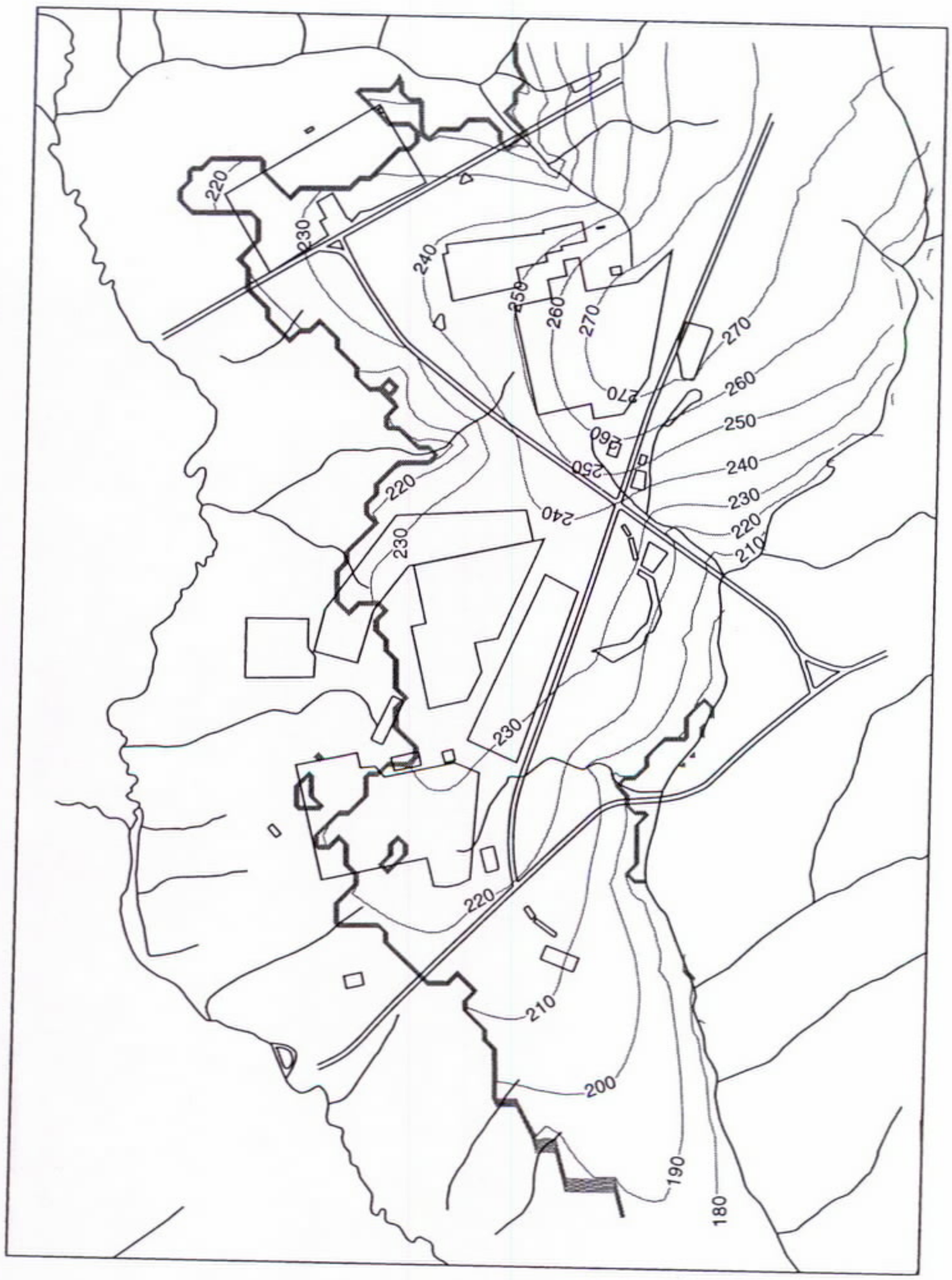


Figure 39. Simulated hydraulic head in the "upper" aquifer zone, averaged over the aquifer thickness (ft).

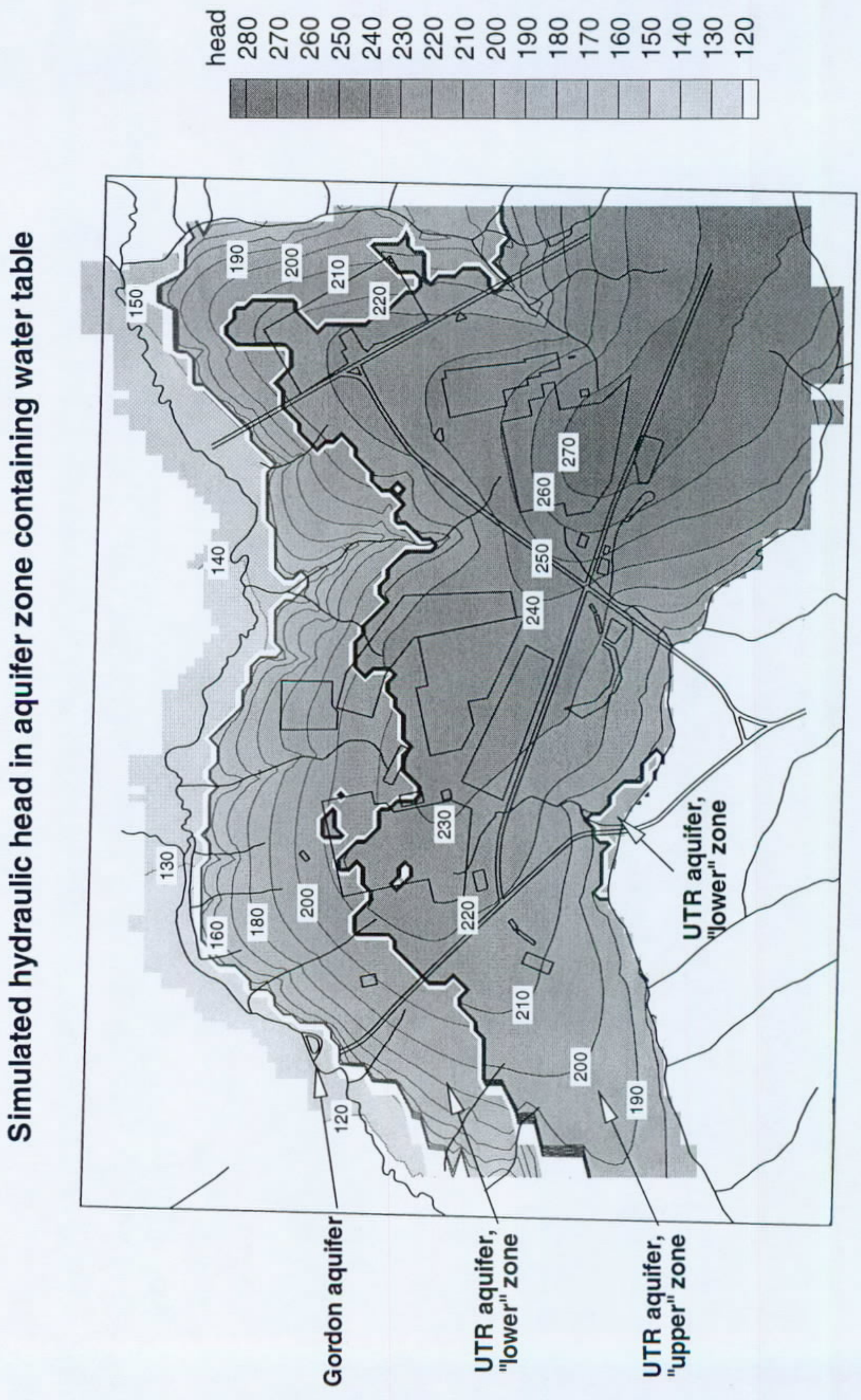


Figure 40. Simualted head in the aquifer zone containing the water table (ft).

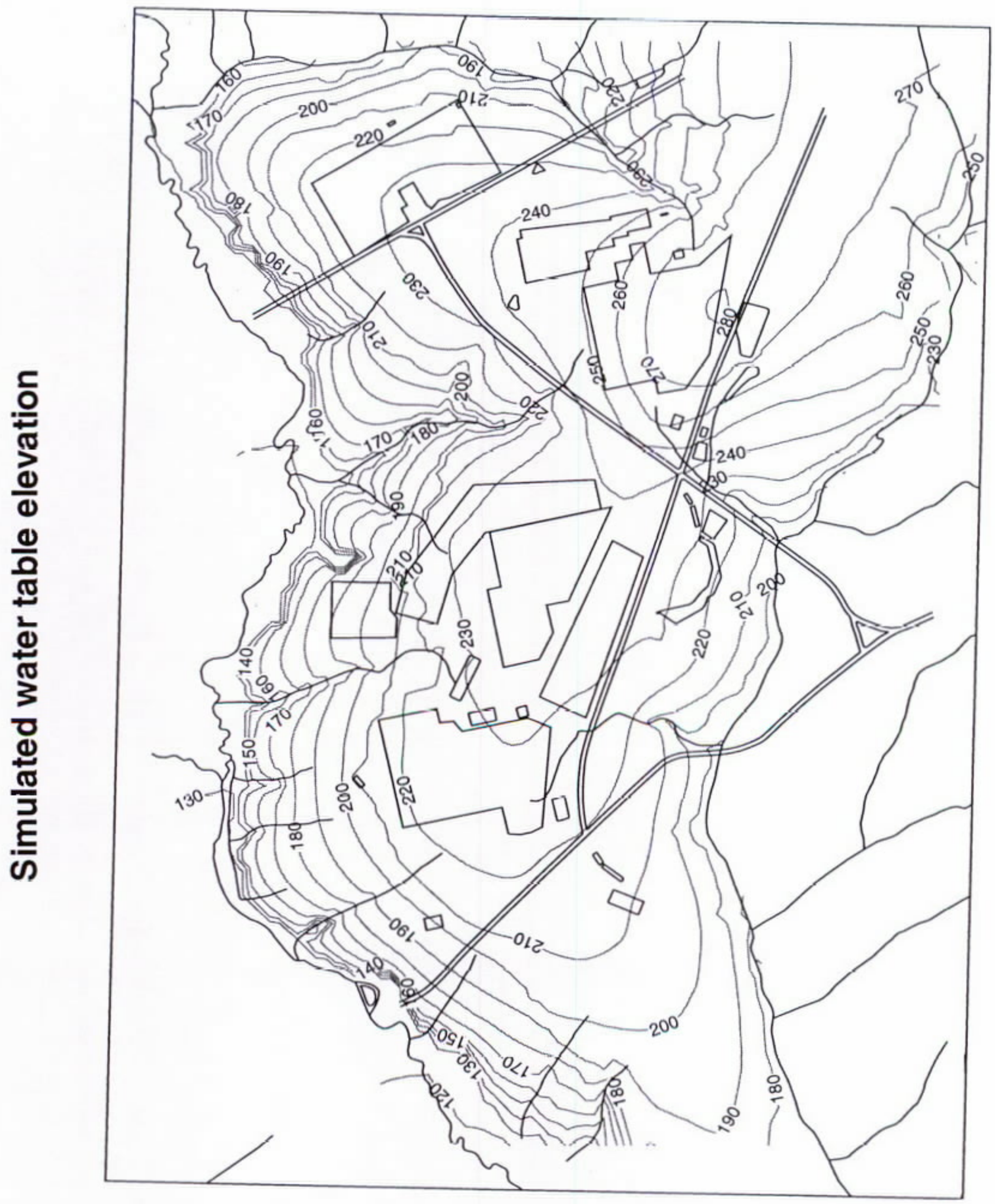


Figure 41. Simulated water table elevation (ft).

Groundwater flow directions in Gordon aquifer unit

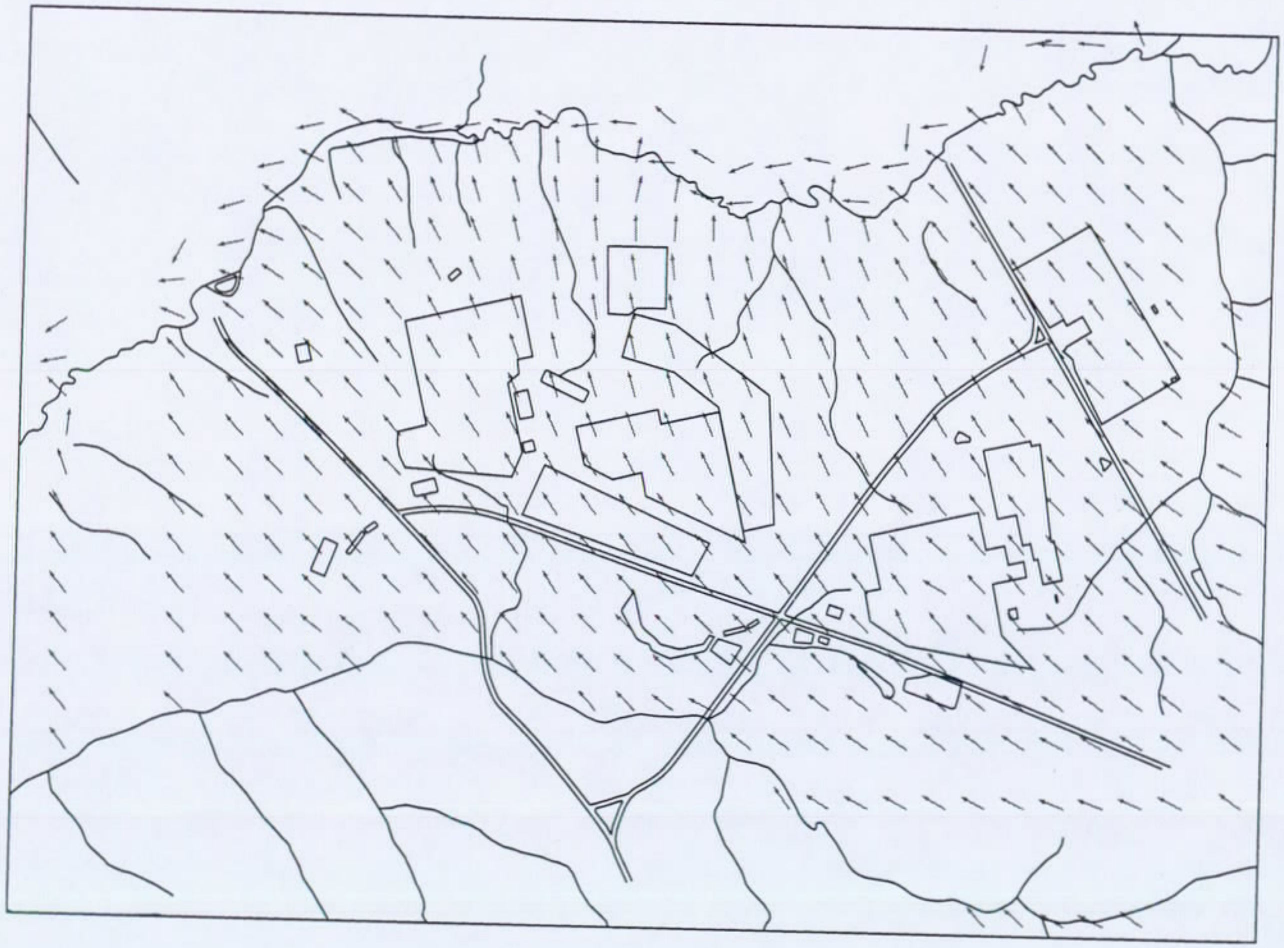


Figure 42. Simulated flow direction in the Gordon aquifer unit, averaged over the aquifer thickness.

Groundwater flow directions in Upper Three Runs aquifer unit, "lower" zone

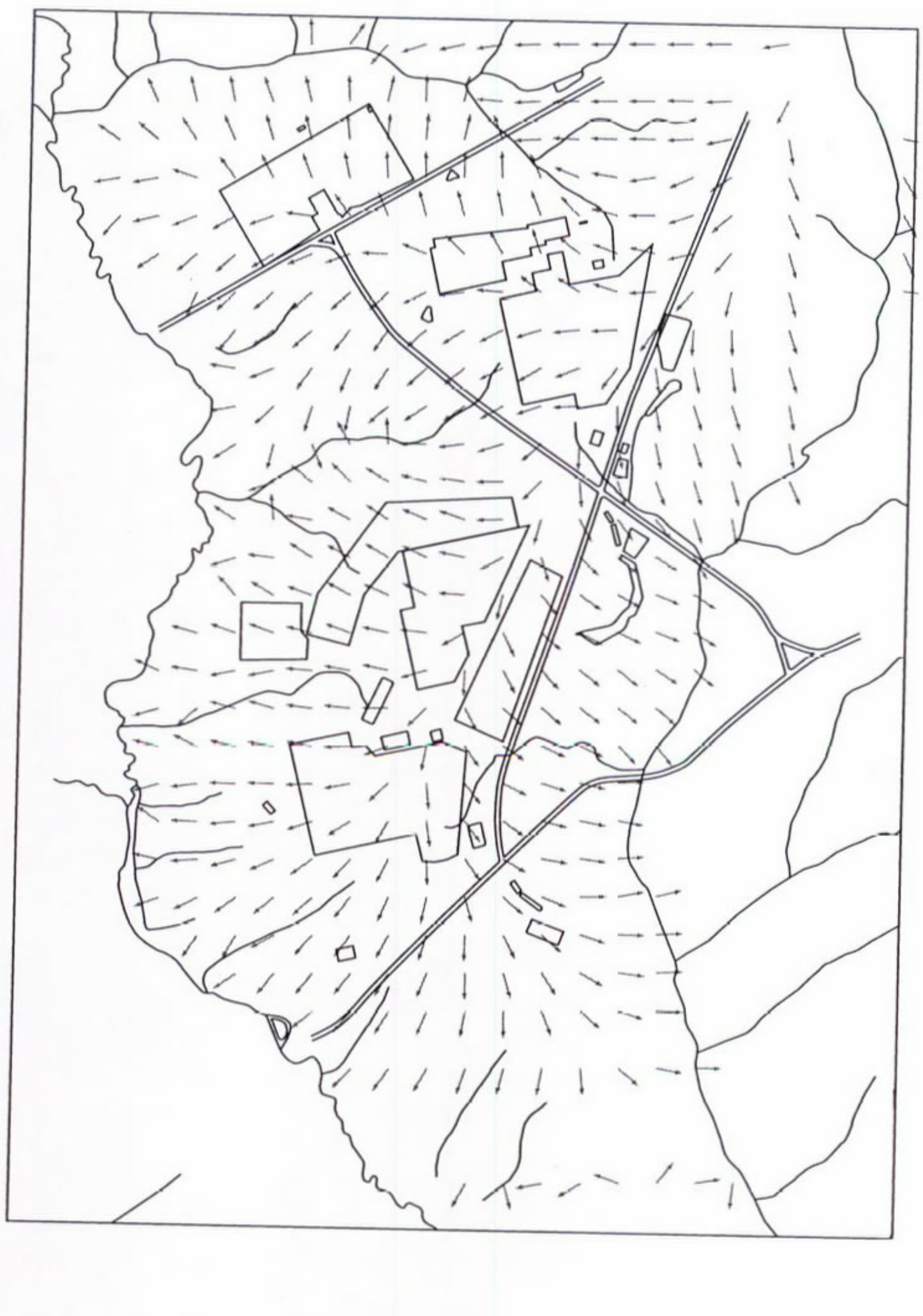


Figure 43. Simulated flow direction in the "lower" aquifer zone, averaged over the aquifer thickness.

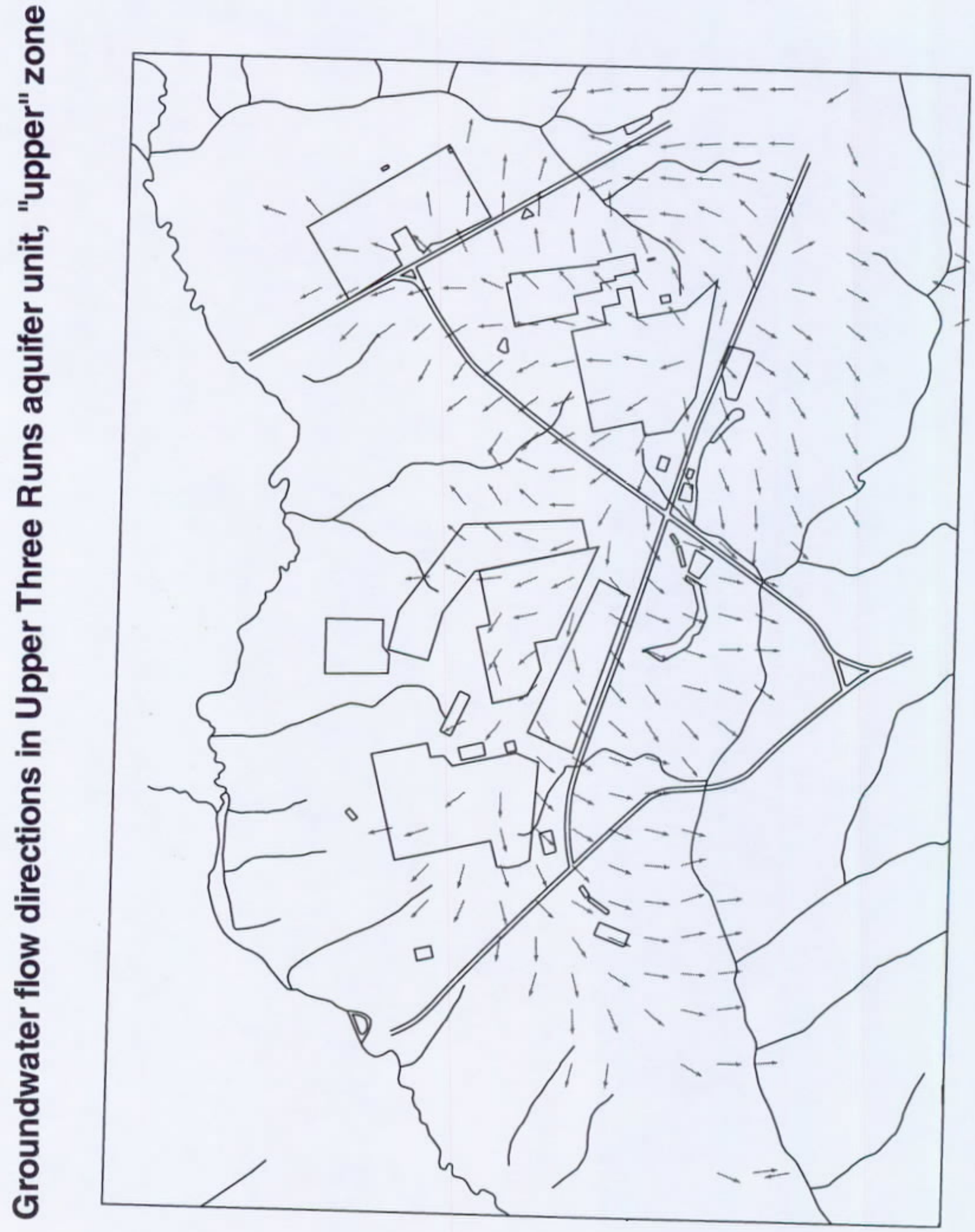


Figure 44. Simulated flow direction in the "upper" aquifer zone, averaged over the aquifer thickness.

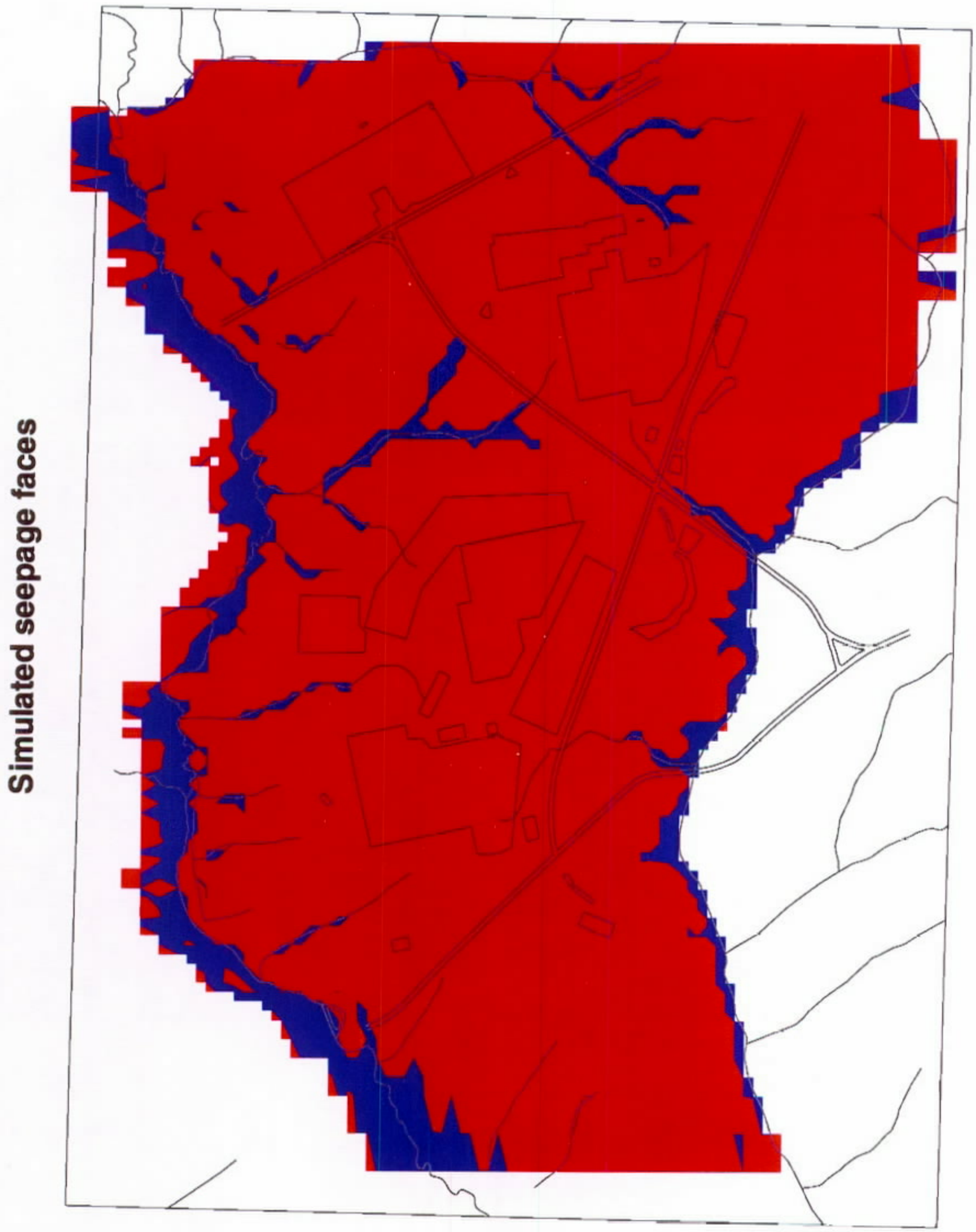
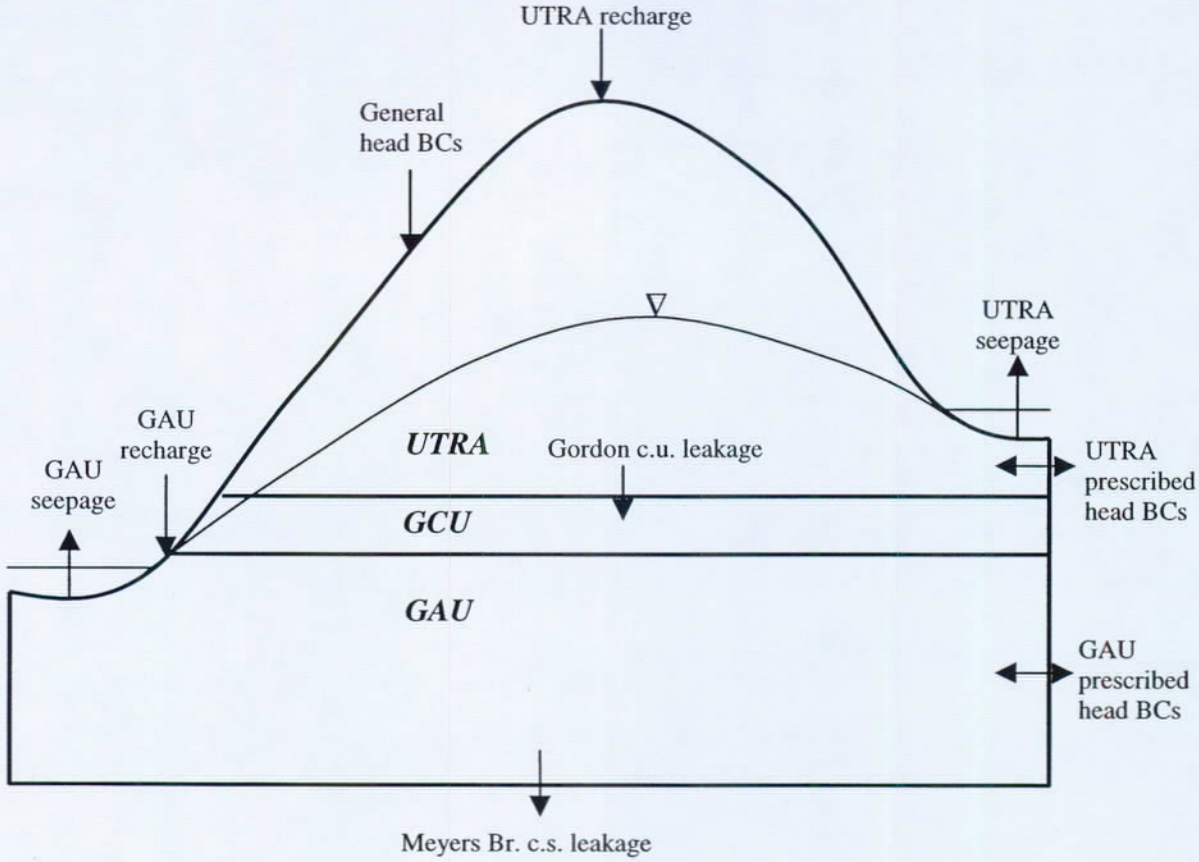


Figure 45. Simulated seepage faces.



Flow component (ft^3/s)	**Entire model**	**UTR aquifer**	**Gordon aquifer**
Recharge	+12.4322	+11.8425	+0.5897
Seepage	-16.4716	-7.6729	-8.7987
Prescribed head BCs	+3.4385	-0.1743	+3.6128
General head BCs	+0.3203	+0.3203	n/a
Gordon c.u. leakage	n/a	-4.3156	+4.3156
Meyers Br. c.s. leakage	+0.2805	n/a	+0.2805
Net total flow	-0.0001	0.0000	-0.0001

Figure 46. Mass balance summary.

Table 1. Estimated baseflow contributions from GSA model domain.

Stream	Rate/ length (ft^2/s)	Length (ft)	Rate (ft^3/s)	Split (%)	Baseflow rate (ft^3/s)
Upper Three Runs	1.4×10^{-3}	26,000	36.4	50	18.2
Fourmile Branch	0.204×10^{-3}	26,000	5.3	50	2.6
McQueen Branch	–	–	3.0	50	1.5
Crouch Branch	–	–	1.8	100	1.8

Table 2. Geometric averages of all slug, single well, and multiple well pumping test data.

Test	Number of data	Geometric average of K_h (ft/d)
Slug	481	1.3
Single well pumping	76	2.2
Multiple well pumping	11	11

Table 3. Anisotropy constraints based on element thickness.

Element thickness (ft)	Maximum K_h/K_v ratio
4.5	100
3.5	30
2.5	10
1.5	3
0.5	1

Table 4. Summary of general head boundary condition parameters for artificial recharge and Crouch Branch aquifer sources.

Source	Leakance coefficient (d^{-1})	Head (ft)	Volumetric flowrate (gpm)	Darcy velocity (in/yr)	Darcy velocity/ 15 in/yr
Old F-area seepage basin	0.001	276	4.1	86	5.7
F-area ash containment basin	0.002	261	4.0	83	5.6
MWMF south sedimentation basin	0.002	253	10	72	4.8
MWMF north sedimentation basin	0.0001	275	5.5	16	1.1
LLRWDF sedimentation basin	0.001	249	8.6	60	4.0
H-area pond	1	251	2.7	56	3.8
H-area coal storage runoff basin	0.0025	281	3.0	63	4.2
H-area ash containment basin	1	280	11	15	1.0
H-area recharge polygon	0.001	280	95	14	0.9
Crouch Branch aquifer	3×10^{-6}	Figure 15	125	0.33	0.02

Table 5. Summary of modifications to initial conductivity fields.

Region hydrostratigraphic zone / clipping polygon (if appl.)	Smoothing parameter δ	K_h multiplier (if different from 1)	K_h lower bound (ft/d)	K_h upper bound (ft/d)	K_v multiplier (if different from 1)	K_v lower bound (ft/d)	K_v upper bound (ft/d)	K_h/K_v limit
1 Gordon aquifer	–	–	38	38	–	–	–	–
2 Gordon confining unit	–	–	10^{-2}	10^{-2}	–	10^{-4}	10^{-4}	–
3 "lower" aquifer zone	–	1.1	–	–	–	0.05	–	–
4 "tan clay" confining zone	0.5	–	–	–	–	0.005	–	–
5 "upper" aquifer zone	–	1.1	–	–	–	0.05	–	–
6 "lower" zone / LA_1	–	1.25	–	–	–	0.05	–	–
7 "lower" zone / LA_2	–	–	–	5	–	0.05	–	–
8 "tan clay" / TC_1	–	–	–	–	–	0.0005	–	–
9 "tan clay" / TC_2	–	–	–	–	–	0.01	–	–
10 "tan clay" / TC_3	–	–	–	–	–	0.0001	0.001	–
11 "upper" zone / UA_1	–	0.9	–	–	–	0.05	–	–
12 "upper" zone / UA_2	–	–	–	4	–	0.05	–	–
13 topo – 35' / FMB	–	–	1	25	–	–	–	10
14 topo – 35' / MQB	–	–	1	25	–	–	–	10
15 Gordon aquifer / UTR	–	–	38	38	–	–	–	10
16 topo–10'/MWMF_Cap_East	–	–	10^{-3}	10^{-3}	–	10^{-5}	10^{-5}	–
17 topo–10'/MWMF_Cap_West	–	–	10^{-3}	10^{-3}	–	10^{-5}	10^{-5}	–
18 topo – 10' / F_Seep_12	–	–	10^{-3}	10^{-3}	–	10^{-5}	10^{-5}	–
19 topo – 10' / F_Seep_3	–	–	10^{-3}	10^{-3}	–	10^{-5}	10^{-5}	–
20 topo – 10' / H_Seep_12	–	–	10^{-3}	10^{-3}	–	10^{-5}	10^{-5}	–
21 topo – 10' / H_Seep_3	–	–	10^{-3}	10^{-3}	–	10^{-5}	10^{-5}	–
22 topo – 10' / H_Seep_4	–	–	10^{-3}	10^{-3}	–	10^{-5}	10^{-5}	–

Table 6. Comparison between multiple well pumping test data and the calibrated model conductivity fields.

Aquifer	Pumped well	Estimated K_h (ft/d)	Average K_h in GSA model (ft/d)
Gordon	HSB084A	33*	38
Gordon	HPT001A	38*	38
"lower"	FIW002IC	8	8.5
"lower"	FSB000PC	2	2.6
"lower"	FSB088C	12	13
"lower"	HC001C	1	2.2
"lower"	HC002H	1	1.4
"upper"	FIW001ID	51	55
"upper"	FSB000PD	38	26
"upper"	HSB000PD	38	27
"upper"	HIW001ID	12	13

* from Aadland and others (1995, Table 8)

Table 7. Summary comparison of measured and simulated hydraulic head.

```
          Overall rms hydraulic head difference:      3.22

Gordon aquifer: rms of (FACT-data) differences:       2.04
                avg of (FACT-data) differences:      -0.13
                avg of |FACT-data| differences:       1.69
                max of {FACT-data} differences:       4.14

"lower" zone:   rms of (FACT-data) differences:       4.38
                avg of (FACT-data) differences:      -0.28
                avg of |FACT-data| differences:       3.32
                max of {FACT-data} differences:      17.03

"upper" zone:   rms of (FACT-data) differences:       2.80
                avg of (FACT-data) differences:       0.07
                avg of |FACT-data| differences:       2.18
                max of {FACT-data} differences:       9.04
```

Table 8. Comparison of measured and simulated stream baseflow.

Stream	Estimated baseflow contribution from GSA (ft^3/s)	Simulated baseflow contribution from GSA (ft^3/s)
Upper Three Runs and tributaries excluding McQueen Branch	18.2	10.1
Fourmile Branch and tributaries	2.6	2.9
McQueen Branch	1.5	3.5
Crouch Branch	1.8	1.3

Appendix A - Hydrostratigraphic unit boundary picks

Unit tops (ft m.s.l.) where:

TCCZ = "tan clay" confining zone
LAZ = "lower" aquifer zone
GCU = Gordon confining unit
GAU = Gordon aquifer unit
MBCS = Meyers Branch confining system

Easting	Northing	Grnd. Surf.	Well ID	TCCZ	LAZ	GCU	GAU	MBCS
57196	73511	281.8	BGC-1A	199.3	183.5	110.6	107.8	
55887	74350	273.6	BGC-2A	200.3	192.3	125.8	118.5	
56990.54	76997.88	298.8	BGO-10AA	218.8	206.8	129.8	125.8	
56250.68	76804.63	311.4	BGO-12A	199.4	186.4	137.4	132.4	
55838.32	76377.54	300.2	BGO-14A	220.2	212.2	133.2	127.2	
56194.15	75756.95	302.8	BGO-16A	195.8	182.8	130.8	125.8	
56699.67	75599.89	292.9	BGO-18A	204.9	198.9	130.9	125.9	
57114.81	74953.76	280.88	BGO-20AA	205.88	193.88	124.88	113.88	42.88
55668.08	76158.5	294.7	BGO-25A	211.7	200.7	137.7	127.7	
55014.2	76144.6	285.1	BGO-26A	219.1	205.1	133.1	129.1	
54671.4	75666.3	273.9	BGO-27C	198.9	191.9			
54103.5	75560	262.1	BGO-29A	196.1	185.1	124.1	113.1	
54816.2	74978	271.1	BGO-31C	198.1	188.1			
55681.4	74479.7	277.4	BGO-33C	200.4	191.4			
56545.7	73953.9	271.4	BGO-35C	204.4	197.4			
57279.2	73498.2	284.3	BGO-37C	199.3	191.3			
57821.93	73572.52	293.7	BGO-39A	203.7	201.7	112.7	101.7	28.7
55403.69	76469.52	298.3	BGO-41A	217.3	208.3	138.3	131.3	
55522.27	76404.71	295.9	BGO-42C	215.9	208.9			
56268.64	77066.01	312.2	BGO-43AA	195.2	187.2	135.2	127.2	
57880.51	76757.02	283.3	BGO-44AA	222.3	199.3	131.3	120.3	
54550.14	75830.03	276.9	BGO-45A	206.9	200.9	133.9	129.9	
54444.65	75012.1	263.4	BGO-46B	199.4	193.4	128.4	126.4	
54914.04	74728.83	264.8	BGO-47A	197.8	189.8	130.8	124.8	
55124.38	74599.64	274.7	BGO-48C	197.7	191.7			
56205.08	73902.78	269.1	BGO-49A	201.1	192.1	119.1	115.1	
54179.77	75201.16	253.5	BGO-50A	193.5	183.5	132.5	128.5	
57201.6	74617.3	281.6	BGO-52AA	206.6	196.6	124.6	115.6	17.6
55429.22	76068.96	288.9	BGO-53AA	222.9	215.9	137.9	131.9	28.9
58794.5	76476.9	294.2	BGO-5C	218.2	201.2			
58316.8	76487.2	283.8	BGO-6A	209.8	194.8	120.8	119.8	

57618.3	76569	281.3	BGO-8A	213.3	199.3	130.3	120.3	
57371.94	76975.69	282.8	BGO-9AA	223.8	210.8	134.8	124.8	
59697.7	79566.9	222.5	BGT-11			150.5	145.5	67.5
58416.5	79965.3	216.5	BGT-18			161.5	146.5	54.5
58549.6	80956.4	159.5	BGT-20			150.5	139.5	69.5
56970.3	77860.3	281	BGT-22	231	216	126	114	53
57108.1	80777.2	258.3	BGT-28	216.3	194.3	156.3	150.3	48.3
60045.9	77197.6	275.7	BGT-3	211.7	197.7	142.7	140.7	64.7
54986.57	77051.85	317.32	BGT-47	214.32	210.32	137.32	128.32	
60924.1	77677.6	225.7	BGT-5	213.7	205.7	153.7	145.7	71.7
53422.04	75837.68	278.25	BGT-53	200.25	191.25	120.25	109.25	32.25
58490.09	72911.77	284.3	BGT-61	184.3	178.3	108.3	101.3	
60426.74	74443.06	242.3	BGT-67	185.8	173.8	135.3	127.8	27.3
59316.7	78642.3	226	BGT-9	210	205	149	141	64
59581.4	75300.7	273.8	BGX-11D	192.8	176.8	125.8	116.8	
58590.35	76831.89	289.1	BGX-1A	211.1	198.1	132.1	127.1	
58256.5	77203.4	289.2	BGX-2B	216.2	198.2	140.2	127.2	
57215.6	77879.2	288.8	BGX-4A	224.8	212.8	129.8	123.8	
58312.8	78349.3	277.1	BGX-7D	225.1	220.1	157.1	144.1	
59522.1	76936	277.4	BGX-9D	207.4	202.4	139.4	131.4	
42023.04	86417.06	281.5	BPC-1	193	185.5	155	150.5	36.5
50588.2	77365.2	293.8	BRR-1D	194.8				
50203.5	77398.3	289.5	BRR-3D	207.5	193.5			
51100	77054.6	293.9	BRR-6B	178.4	166.4	122.9	108.4	
50707.5	77575.4	289.6	BRR-7B	201.6	189.6	134.6	122.1	
50116.5	77634.7	276.7	BRR-8B	204.7	199.7	130.7	126.2	
47183.78	66855.77	285.1	CPC-1	165.6	156.1	95.6	86.6	-8.4
53115.1	79664.5	316.7	FC-1A	215	209	149	138	
55423.8	79243.6	288.1	FC-2A	209	202	148	138	
57620	78726.6	269.5	FC-3A	226	224	156	154	
53896.5	82242.5	239	FC-4A	231	227	129	128	
54671.7	87988.1	204.4	FC-5A			161.4	156.4	
52843.11	79488.82	316.8	FCH-1	213.8	201.8	141.8	125.8	66.8
52599.59	78500	288.7	FCH-2	212.7	196.7	141.7	129.7	57.7
52087.22	78059.22	307.2	FCH-3	207.2	196.2	140.2	131.2	59.2
52021.03	77514.56	297.5	FCH-4	196.5	186.5	127.5	120.5	41.5
51667.65	76992.12	284.2	FCH-5	196.2	191.2	129.2	128.2	36.2
51245.7	76410.33	291.5	FCH-6	188.5	181.5	123.5	120.5	24.5
51354.4	76165.3	293.3	FIW-1MC	190.3	185.3	121.3		
51184.5	75930.8	290.5	FIW-2MA	188.5	179.5	120.5	116.5	
54288.8	80154.5	282.4	FNB-1A	208.4	202.4	151.4	137.9	
54116.6	80557.2	282.2	FNB-3A	211.2	207.7	146.2	140.2	
50958.4	75534.4	283.8	FSB-100A	184.8	182.8	117.8	113.8	
51191.3	75719	282.9	FSB-101A	190.9	182.9	118.9	115.9	
48809.1	74231.4	227	FSB-112A	164	144	103	98	
51068.1	74167.5	221.3	FSB-113A	178.3	171.3	109.3	104.3	22.3

52046.6	75297.4	250	FSB-114A	178	173	114	110	
49736	72515.5	205.8	FSB-115C	180.8	164.8	100.8	85.8	5.8
50645.9	72725.5	200.5	FSB-116C	175.5	170.5			
49175.7	75538.9	278	FSB-120A	181	165	112	110	
48413.1	75155.7	254.4	FSB-121C	173.4	162.4			
48195	73881.8	216	FSB-122C	164	148	104		
51750.5	74566.7	236.3	FSB-123C	183.3	172.3			
51658.3	75649.1	275.4	FSB-1TA	191.4	187.4	117.4	115.4	24.4
51391.6	76131.9	291.5	FSB-76A			120.5	116.5	
50172.8	74757.7	270.5	FSB-78A	162.5	146.5	104.5	99.5	
50149.6	73664.5	216.1	FSB-79A	173.1	164.1	103.1	100.1	18.1
50115.8	75601.7	285.6	FSB-87A	175.6	172.6	114.6	108.6	
51345.2	75553.2	279.1	FSB-89C	186.1	180.1			
50953.5	75213.3	277	FSB-91C	168	161			
50458.3	74897.3	274	FSB-93C	166	151			
50016.7	74971.7	281.8	FSB-95C	173.8	157.8			
49778.7	74882.2	277.7	FSB-96A	166.7	153.7	108.7	100.7	
49965.7	75171.2	283.8	FSB-97A	162.8	151.8	110.8	106.8	
50121.6	75389.8	280.7	FSB-98A	171.7	159.7	108.7	106.7	
50314.8	75675.6	285.3	FSB-99A	178.3	173.3	115.3	112.3	
50140	74090.2	230.8	FSB-PC	160.8	157.3			
62953.3	69892.2	290.2	HAA-1TA	207.7	204.2	117.2	109.7	-12.3
61285.1	70925.4	291.4	HAA-2AA	189.9	185.9	124.9	118.9	29.9
60201.9	71488	274.5	HAA-3AA	190.5	179	128	122.5	10
61929.6	72223.2	299.2	HAA-4AA	202.2	193.7	124.7	118.7	
63860.2	71441	279.8	HAA-6AA	209.8	183.3	125.3	120.3	23.3
61593.4	75806.7	228	HC-10A	201	194	126	122	
62147	74519	263.8	HC-11A	190.8	179	136	133	
59504	73187	287.3	HC-12A	195.3	190.3			
63610	73394	291.3	HC-13A	202	200	125.3	122.3	
60658	67560	268.5	HC-14A	195.5	183	116.5	111.5	
61450	70950	294	HC-15A	182	180			
65462	72596	262.6	HC-16A	199	197	131	125.6	
61700	73200	294	HC-17A	193	187	128	126	
63409	71560	293	HC-18A	176	167	114	111	
61867	71755	299.5	HC-1A	204.5	194	123	121	
61866	71794	298.7	HC-2A	208.7	191	126.7	118.7	
58548	71918	253.8	HC-35D	196.8	184	116	106	
62266	71742	300.6	HC-3A	201.6	186.6	119.6	110.6	
63409	71606	293	HC-4A	183	161			
61710	73265	294	HC-5A	196	187			
62060	72150	300.2	HC-6A	211.2	192.2			
66992	74352	277	HC-7A	207	204	142	140	
60058.5	77481.8	262.3	HC-8A	222.3	220	153	150	
64084	75135	269.3	HC-9A	213.3	206.3	134	129.3	
62942.5	72513.7	308.6	HCA-4AA	233.6	230.1	124.1	116.6	

60923.42	72796.39	284	HCH-1	202	187	135	126	18
60091.79	72519.61	270.9	HCH-2	195.9	179.9	130.9	122.9	-0.1
59917.33	71998.82	264	HCH-3	197	179	130	123	
59139.93	72449.59	269.9	HCH-4	192.9	182.9	122.9	113.9	
59331.53	71810.36	255	HCH-5	192	180	123	119	-10
58342.2	72564.6	275.8	HIW-1BD	204.8				
58471.8	72500	272.3	HIW-1MC	186.8	179.8			
56753	73249.7	276.3	HIW-2A	201.8	195.3	116.3	110.3	
56698.4	73226.4	269	HIW-2MC	199	193.5			
56570.1	73160.1	263.4	HIW-4MC	197.4	190.4	112.4		
56498.9	73557.9	266.1	HIW-5MC	184.1	178.1			
56973.3	78731.7	262.7	HMD-1C	228.7	225.7	138.7	126.7	
57269.7	79665.8	259.3	HMD-2C	222.3	216.3	143.3	138.3	
57745.2	79578.7	257.5	HMD-3C	223.5	218.5	154.5	149.5	
58188.5	79160.4	248.5	HMD-4C	223.5	219.5	152.5	140.5	
62493.6	70395.4	293.5	HPC-1	194.5	187.5	115.5	109.5	27.5
60587	74847.1	232.9	HPT-1A			118.9	114.9	52.9
60200.5	75061.8	257.8	HPT-2A			120.8	117.8	56.8
58604.4	72001.9	256.3	HSB-101C	195.3	189.3			
58323.6	71593.9	245.2	HSB-103C	195.2	181.2			
58082.6	71376.8	245.5	HSB-104C	193.5	184.5			
57883.8	71447.3	247.2	HSB-105C	190.2	183.2			
57651.5	71720.9	250.7	HSB-106C	191.7	183.7			
57432	71698.5	259.3	HSB-107C	199.3	191.3			
56895.6	71684.8	259.4	HSB-109C	203.4	189.4			
56680.7	71779.3	253.4	HSB-110C	192.4	188.4			
56501.9	71919.4	253.7	HSB-111C	187.7	171.7			
56417.4	72156.4	252.6	HSB-112C	190.6	185.6			
56160.4	72312.3	258.7	HSB-113C	187.7	173.7			
56043.2	72653.2	266.8	HSB-115C	208.8	196.8			
55170.1	72733.6	234.8	HSB-117A	215.8	191.8	122.8	116.8	
55775.6	72696.4	245	HSB-118A	183	173	119	114	
56100.2	73082.5	254.8	HSB-119A	212.8	194.8	114.8	110.8	
56431.9	73395.1	266	HSB-120A	203	196	112	110	
57389.6	72024.8	272.3	HSB-121A	197.3	184.3	113.3	109.3	
57747.4	72195.9	269.4	HSB-122A	188.4	177.4	110.4	108.4	
58124.8	72189.8	263.6	HSB-123A	195.6	185.6	113.6	107.6	
58514.6	72199.6	263.9	HSB-124A			118.4		
58787.7	71472.4	238.3	HSB-132C	163.3	158.3			
57365.4	71127.4	231.5	HSB-139A	189.5	178.5	118.5	114.5	
56535.4	70050.3	234	HSB-140A	194	181	111	105	
59168.7	71213.6	252.6	HSB-141A	180.6	166.6	118.6	112.6	
52773.2	73738.2	220.1	HSB-143C	198.1	179.1			
56200.5	71892.1	233.6	HSB-144A	185.6	178.6	108.6	103.6	
57769	71098.9	233.7	HSB-145C	183.7	174.7			
58454	70478.9	249.5	HSB-146A	173.5	162.5	118.5	111.5	

55344.2	70151.5	248.9	HSB-148C	186.9	174.9			
54014.9	72997.9	211.6	HSB-151C	192.6	182.6			
54346.7	72012	212.1	HSB-152C	198.1	186.1			
58436	72436.2	270.7	HSB-65A	203.7	198.7	118.7	112.7	
56892.1	71526.9	247.4	HSB-68A	198.4	193.4	116.4	110.4	
56465.1	71549.4	234.1	HSB-69A	187.1	181.1	115.1	112.1	
58606.1	71648.6	234.9	HSB-83A	194.9	187.9	113.9	103.9	11.9
56359.1	71586.2	226.7	HSB-84A	204.7	180.7	118.7	110.7	
58943.4	73791.9	292.1	HSB-85A	204.1	200.1	126.1	119.1	
55985.9	72520.2	260	HSB-86A	185	178	112	109	
55650.03	72119.31	227.8	HSB-PC	187.8	177.8			
58696.1	72394	267.1	HSB-TB	207.1	199.1	110.1	106.1	9.1
60555.7	72692.6	274.6	HSL-6AA	174.1	169.1	125.6	121.1	8.6
61113.8	72729.4	286.7	HSL-8AA	193.2	185.7	136.7	129.2	45.7
75391.13	77284.38	301.79	IDB-2A	244.79	227.79	141.79	137.79	-13.71
37781.1	85104.3	282.2	IDP-3A	190.2	182.2	161.2	140.2	36.2
45406.62	71658.83	238.2	LWR-9SB	179.2	161.2	110.2	108.2	
75121.9	69592.8	327.5	MWD-1A	217.5	210.5	132.5	129.5	21.5
70856.6	66632.1	335.9	NPN-1A	234.9	224.4	110.4	104.9	1.9
54032.6	74967.5	261.6	OFS-1SB	194.6	188.6	127.6	125.6	
53848	74671	257.5	OFS-2SB	192.5	181.5	125.5	120.5	
54579	74270	258.1	OFS-3SB	195.1	185.1	125.1	120.1	
55188	73874	258.7	OFS-4SB	195.7	190.7	126.7	121.7	
54298	73623	228.7	OFS-5SB	187.7	178.7	121.7	114.7	
76439.6	72444.9	294.4	P-14TA	213.4	202.9	139.4	131.4	25.9
47652.7	67578.5	296.9	P-18TA	174.9	166.9	90.9	85.9	-17.1
64022.9	70382	274.1	P-27TA	180.1	169.1	129.1	127.1	49.1
55441.1	79284.3	285.6	P-28TA	214.6	210.6	140.6	132.6	63.6
40532.31	70517.63	178.7	SSW-3	138.7	133.7	88.7	83.7	
65438.93	78039.9	268.9	YSC-1A	209.9	198.9	158.9	153.9	68.9
65855.46	78186.24	272.5	YSC-1C	214.5	212.5	163.5	156.5	
66100.08	78311.53	281.7	YSC-2A	219.7	214.7	161.7	150.7	
65920	77680	277	YSC-3SB	211	205	149	140	
65883.5	77050.08	287.5	YSC-4A	222.5	213.5	159.5	144.5	86.5
67134.9	74295.9	273	YSC-5A	221	209	136	128	

Appendix B – Original hydraulic conductivity data

Transmissivity data from multiple well pumping tests (Smits and others, 1997)

Extract. Well ID	Observ. Well ID	Extraction Well SRS Easting	Extraction Well SRS Northing	Observation Well SRS Easting	Observation Well SRS Northing	Screen Mid Point	Screen Length (ft)	Transmissivity (1/d)	Transmissivity Analysis Method
FSB000PC	FSB025PC	50140.00	74090.20	50115.90	74084.60	130.75	49.90	48.00	Aqetsolv (Hantush leaky)
FSB000PC	FSB025PC	50140.00	74090.20	50115.90	74084.60	130.75	49.90	37.00	Hantush-Jacob
FSB000PC	FSB025PC	50140.00	74090.20	50115.90	74084.60	130.75	49.90	56.00	Jacob
FSB000PC	FSB050PC	50140.00	74090.20	50140.10	74040.20	130.75	49.90	65.00	Aqetsolv (Hantush leaky)
FSB000PC	FSB050PC	50140.00	74090.20	50140.10	74040.20	130.75	49.90	49.00	Hantush-Jacob
FSB000PC	FSB050PC	50140.00	74090.20	50140.10	74040.20	130.75	49.90	80.00	Jacob
FSB000PC	FSB079C	50140.00	74090.20	50171.30	73668.00	130.75	49.90	173.00	Aqetsolv (Hantush leaky)
FSB000PC	FSB079C	50140.00	74090.20	50171.30	73668.00	130.75	49.90	91.00	Hantush-Jacob
FSB000PC	FSB079C	50140.00	74090.20	50171.30	73668.00	130.75	49.90	480.00	Jacob
FSB000PC	FSB100PC	50140.00	74090.20	50240.40	74089.90	130.75	49.90	138.00	Aqetsolv (Hantush leaky)
FSB000PC	FSB100PC	50140.00	74090.20	50240.40	74089.90	130.75	49.90	104.00	Hantush-Jacob
FSB000PC	FSB100PC	50140.00	74090.20	50240.40	74089.90	130.75	49.90	140.00	Jacob
FSB000PC	FSB103C	50140.00	74090.20	49651.30	74210.00	130.75	49.90	168.00	Aqetsolv (Hantush leaky)
FSB000PC	FSB103C	50140.00	74090.20	49651.30	74210.00	130.75	49.90	104.00	Hantush-Jacob
FSB000PC	FSB103C	50140.00	74090.20	49651.30	74210.00	130.75	49.90	480.00	Jacob
FSB000PC	FSB106C	50140.00	74090.20	50651.30	74190.10	130.75	49.90	220.00	Aqetsolv (Hantush leaky)
FSB000PC	FSB106C	50140.00	74090.20	50651.30	74190.10	130.75	49.90	122.00	Hantush-Jacob
FSB000PC	FSB106C	50140.00	74090.20	50651.30	74190.10	130.75	49.90	840.00	Jacob
FSB000PC	FSB110C	50140.00	74090.20	50150.60	74190.70	130.75	49.90	61.00	Aqetsolv (Hantush leaky)
FSB000PC	FSB110C	50140.00	74090.20	50150.60	74190.70	130.75	49.90	37.00	Hantush-Jacob
FSB000PC	FSB110C	50140.00	74090.20	50150.60	74190.70	130.75	49.90	86.00	Jacob
FSB000PC	FSB150PC	50140.00	74090.20	49990.10	74090.00	130.75	49.90	77.00	Aqetsolv (Hantush leaky)
FSB000PC	FSB150PC	50140.00	74090.20	49990.10	74090.00	130.75	49.90	73.00	Hantush-Jacob
FSB000PC	FSB150PC	50140.00	74090.20	49990.10	74090.00	130.75	49.90	70.00	Jacob
FSB000PD	FSB025PD	49849.81	74549.20	49831.60	74534.00	193.45	43.70	1620.00	Aqetsolv (Neuman method)
FSB000PD	FSB025PD	49849.81	74549.20	49831.60	74534.00	193.45	43.70	1989.00	Jacob
FSB000PD	FSB025PD	49849.81	74549.20	49831.60	74534.00	193.45	43.70	1295.00	Neuman-Walton
FSB000PD	FSB050PD	49849.81	74549.20	49874.60	74600.90	193.45	43.70	1938.00	Aqetsolv (Neuman method)
FSB000PD	FSB050PD	49849.81	74549.20	49874.60	74600.90	193.45	43.70	2106.00	Jacob
FSB000PD	FSB050PD	49849.81	74549.20	49874.60	74600.90	193.45	43.70	1554.00	Neuman-Walton
FSB000PD	FSB100PD	49849.81	74549.20	49921.10	74512.50	193.45	43.70	1521.00	Aqetsolv (Neuman method)
FSB000PD	FSB100PD	49849.81	74549.20	49921.10	74512.50	193.45	43.70	1989.00	Jacob
FSB000PD	FSB100PD	49849.81	74549.20	49921.10	74512.50	193.45	43.70	1554.00	Neuman-Walton
FSB000PD	FSB150PD	49849.81	74549.20	49717.90	74615.80	193.45	43.70	1502.00	Aqetsolv (Neuman method)
FSB000PD	FSB150PD	49849.81	74549.20	49717.90	74615.80	193.45	43.70	1556.00	Jacob
FSB000PD	FSB150PD	49849.81	74549.20	49717.90	74615.80	193.45	43.70	1195.00	Neuman-Walton
HSB000PD	HSB025PD	56429.20	71518.00	56412.40	71536.30	208.80	29.80	955.90	Jacob straight-line method

HSB000PD	HSB025PD	56429.20	71518.00	56412.40	71536.30	208.80	29.80	884.60	Neuman curve fitting
HSB000PD	HSB050PD	56429.20	71518.00	56459.40	71484.90	208.80	29.80	865.70	Jacob straight-line method
HSB000PD	HSB050PD	56429.20	71518.00	56459.40	71484.90	208.80	29.80	705.70	Neuman curve fitting
HSB000PD	HSB100PD	56429.20	71518.00	56379.50	71445.30	208.80	29.80	951.60	Neuman curve fitting
HPT001A	HC010A	60587.00	74847.10	61593.40	75806.70	93.50	51.00	1280.00	Hantush-Jacob
HPT001A	HPT002A	60587.00	74847.10	60200.50	75061.80	93.50	51.00	2290.00	Hantush-Jacob
FSB088C	FSB089C	51518.00	75619.40	51345.20	75553.20	163.40	10.00	768.00	Aqetsolv (Theis-recovery)
FSB088C	FSB089C	51518.00	75619.40	51345.20	75553.20	163.40	10.00	640.00	Theis (Hand Plot)
FSB088C	FSB089C	51518.00	75619.40	51345.20	75553.20	163.40	10.00	666.00	Theis Non-Equilibrium Eq.
FSB088C	FSB090C	51518.00	75619.40	51148.60	75382.90	163.40	10.00	779.00	Aqetsolv (Theis-recovery)
FSB088C	FSB090C	51518.00	75619.40	51148.60	75382.90	163.40	10.00	640.00	Theis
FSB088C	FSB090C	51518.00	75619.40	51148.60	75382.90	163.40	10.00	631.00	Theis Non-Equilibrium Eq.
FSB088C	FSB111C	51518.00	75619.40	51526.30	75383.30	163.40	10.00	789.00	Aqetsolv (Theis-recovery)
FSB088C	FSB111C	51518.00	75619.40	51526.30	75383.30	163.40	10.00	696.00	Theis Non-Equilibrium Eq.
HC001C	HC006A	61872.00	71745.00	62060.00	72150.00	186.00	5.00	63.00	-
HC002H	HC006A	61862.00	71804.00	62060.00	72150.00	159.70	10.00	54.00	Cooper (1963), hand plot
FIW001ID	FSB076	51362.50	76171.60	51388.80	76141.60	204.00	20.00	1406.70	Aqetsolv (Neuman Method)
FIW002IC	FIW002MC	51202.60	75924.50	51263.50	75757.90	150.25	49.90	492.20	Aqetsolv (Hantush leaky)
HIW001ID	HIW001MD	58480.00	72506.90	58486.00	72546.30	220.50	15.00	536.30	Aqetsolv (Neuman Method)
HSB084A	HSB068A	56359.10	71586.20	56892.10	71526.90	70.30	11.20	2035.00	Aqtesolv (Non-Leaky Theis)
HSB084A	HSB068A	56359.10	71586.20	56892.10	71526.90	70.30	11.20	2000.00	Cooper Jacob (Hand Plot)
HSB084A	HSB068A	56359.10	71586.20	56892.10	71526.90	70.30	11.20	2009.00	Theis (Hand Plot)
HSB084A	HSB068A	56359.10	71586.20	56892.10	71526.90	70.30	11.20	2125.00	Aqtesolv (Non-Leaky Theis)
HSB084A	HSB068A	56359.10	71586.20	56892.10	71526.90	70.30	11.20	2300.00	Aqtesolv (Theis-Recovery)
HSB084A	HSB068A	56359.10	71586.20	56892.10	71526.90	70.30	11.20	2257.00	Cooper Jacob (Hand Plot)
HSB084A	HSB069A	56359.10	71586.20	56465.10	71549.40	70.30	11.20	1281.00	Aqtesolv (Hantush Leaky)
HSB084A	HSB069A	56359.10	71586.20	56465.10	71549.40	70.30	11.20	1535.00	Cooper Jacob (Hand Plot)
HSB084A	HSB069A	56359.10	71586.20	56465.10	71549.40	70.30	11.20	1292.00	Hantush Jacob Leaky (Hand Plot)
HSB084A	HSB069A	56359.10	71586.20	56465.10	71549.40	70.30	11.20	1247.00	Aqtesolv (Hantush Leaky)
HSB084A	HSB069A	56359.10	71586.20	56465.10	71549.40	70.30	11.20	1124.00	Aqtesolv (Non-Leaky Theis)
HSB084A	HSB069A	56359.10	71586.20	56465.10	71549.40	70.30	11.20	1548.00	Aqtesolv (Theis-Recovery)
HSB084A	HSB069A	56359.10	71586.20	56465.10	71549.40	70.30	11.20	1581.00	Cooper Jacob (Hand Plot)
HSB084A	HSB083A	56359.10	71586.20	58606.10	71648.60	70.30	11.20	3816.00	Cooper Jacob (Hand Plot)
HSB084A	HSB083A	56359.10	71586.20	58606.10	71648.60	70.30	11.20	2253.00	Theis (Hand Plot)
HSB084A	HSB083A	56359.10	71586.20	58606.10	71648.60	70.30	11.20	2562.00	Aqtesolv (Non-Leaky Theis)
HSB084A	HSB083A	56359.10	71586.20	58606.10	71648.60	70.30	11.20	2714.00	Aqtesolv (Theis-Recovery)
HSB084A	HSB083A	56359.10	71586.20	58606.10	71648.60	70.30	11.20	3720.00	Cooper Jacob (Hand Plot)
HSB084A	HSB086A	56359.10	71586.20	55985.90	72520.20	70.30	11.20	2039.00	Aqtesolv (Non-Leaky Theis)
HSB084A	HSB086A	56359.10	71586.20	55985.90	72520.20	70.30	11.20	2212.00	Cooper Jacob (Hand Plot)
HSB084A	HSB086A	56359.10	71586.20	55985.90	72520.20	70.30	11.20	2055.00	Theis (Hand Plot)

HSB084A	HSB086A	56359.10	71586.20	55985.90	72520.20	70.30	11.20	2226.00	Aqtesolv (Non-Leaky Theis)
HSB084A	HSB086A	56359.10	71586.20	55985.90	72520.20	70.30	11.20	2183.00	Aqtesolv (Theis-Recovery)
HSB084A	HSB086A	56359.10	71586.20	55985.90	72520.20	70.30	11.20	2575.00	Cooper Jacob (Hand Plot)
HSB084A	HSB118A	56359.10	71586.20	55775.60	72696.40	70.30	11.20	2490.00	Cooper Jacob (Hand Plot)
HSB084A	HSB118A	56359.10	71586.20	55775.60	72696.40	70.30	11.20	2102.00	Theis (Hand Plot)
HSB084A	HSB118A	56359.10	71586.20	55775.60	72696.40	70.30	11.20	2543.00	Aqtesolv (Non-Leaky Theis)
HSB084A	HSB118A	56359.10	71586.20	55775.60	72696.40	70.30	11.20	2369.00	Aqtesolv (Theis-Recovery)
HSB084A	HSB118A	56359.10	71586.20	55775.60	72696.40	70.30	11.20	2790.00	Cooper Jacob (Hand Plot)
HSB084A	HSB139A	56359.10	71586.20	57365.40	71127.40	70.30	11.20	1943.00	Cooper Jacob (Hand Plot)
HSB084A	HSB139A	56359.10	71586.20	57365.40	71127.40	70.30	11.20	1644.00	Theis (Hand Plot)
HSB084A	HSB139A	56359.10	71586.20	57365.40	71127.40	70.30	11.20	1812.00	Aqtesolv (Non-Leaky Theis)
HSB084A	HSB139A	56359.10	71586.20	57365.40	71127.40	70.30	11.20	1873.00	Aqtesolv (Theis-Recovery)
HSB084A	HSB139A	56359.10	71586.20	57365.40	71127.40	70.30	11.20	2231.00	Cooper Jacob (Hand Plot)

Conductivity data from single well pumping tests (Smits and others, 1997)

Well ID	SRS Easting	SRS Northing	Screen Midpoint	Screen Length	Conductivity (ft/d)		Analysis Method
FSB079A	50149.60	73664.50	29.20	10.40	1.43E+02	SS	-
FSB078A	50172.80	74757.70	32.25	10.50	8.20E-01	SS	-
FSB087A	50115.80	75601.70	38.35	10.50	5.10E+01	SS	-
FSB076A	51391.60	76131.90	42.15	10.50	1.29E+00	SS	-
FC002A	55423.80	79243.60	55.10	4.00	1.20E+00	SS	Recovery
HSB068A	56892.10	71526.90	52.75	10.50	1.13E+00	SS	-
HC003A	62266.00	71742.00	68.10	5.00	2.60E+00	SS	Recovery
HSB085A	58943.40	73791.90	66.10	10.00	8.72E+00	SS	-
HSB065A	58436.00	72436.20	67.85	10.70	1.74E+00	SS	-
HSB086A	55985.90	72520.20	68.50	10.80	5.46E+00	SS	-
HSB083A	58606.10	71648.60	70.60	10.80	1.05E+01	SS	-
FC002B	55424.00	79251.40	81.30	5.00	1.20E-01	SS	-
FSB078B	50178.80	74765.90	87.60	10.40	4.87E+00	SS	-
FSB087B	50104.90	75597.00	95.25	10.50	4.10E-01	SS	-
HSB086B	55976.90	72519.00	118.90	10.20	3.00E-01	SS	-
YSC004A	65883.50	77050.08	126.00	10.00	5.20E+01	-	Recovery
YSC004A	65883.50	77050.08	126.00	10.00	4.00E+01	-	Theis Non-Eq.
YSC004A	65883.50	77050.08	126.00	10.00	4.70E+01	-	WHIP(Recovery)
YSC004A	65883.50	77050.08	126.00	10.00	4.30E+01	-	WHIP(Theis)
HSB083B	58594.90	71639.60	126.65	10.90	3.80E-01	SS	-
HSB084B	56352.40	71603.30	127.35	11.10	2.90E-01	SS	-
HSB065B	58439.40	72445.60	128.30	10.00	3.40E-01	SS	-
HSB068B	56882.10	71525.50	129.00	11.00	2.80E-01	SS	-
YSC001A	65438.93	78039.90	106.85	60.10	6.20E+01	-	Cooper-Jacob
YSC001A	65438.93	78039.90	106.85	60.10	3.70E+01	-	Recovery
YSC001A	65438.93	78039.90	106.85	60.10	2.20E+01	-	Theis
YSC001A	65438.93	78039.90	106.85	60.10	5.20E+01	-	WHIP(Recovery)
YSC001A	65438.93	78039.90	106.85	60.10	5.70E+01	-	WHIP(Theis)
HC008B	60058.40	77487.50	135.00	5.00	1.20E+00	SS	Recovery

HSB085B	58953.30	73789.30	138.20	10.00	5.80E-01	SS	-
FSB078C	50170.20	74772.50	146.50	9.80	5.50E-01	SS	-
HC004A	63409.00	71606.00	152.50	5.00	3.50E-01	SS	Recovery
FC001B	53115.00	79672.40	154.30	5.00	5.00E-02	SS	-
FSB087C	50093.40	75591.90	154.05	10.50	9.60E-01	SS	-
HC006A	62060.00	72150.00	158.70	5.00	2.40E-01	SS	Recovery
FSB076C	51396.40	76112.40	160.05	10.50	1.72E+01	SS	-
FSB111C	51526.30	75383.30	164.00	10.00	6.21E+00	SS	Hantush-Jacob
FSB111C	51526.30	75383.30	164.00	10.00	5.47E+00	SS	Hantush-Jacob
FSB111C	51526.30	75383.30	164.00	10.00	4.50E+00	SS	Hantush-Jacob
HSB130C	54643.60	70762.40	164.90	10.00	9.45E+01	SS	Hantush-Jacob
HSB083C	58614.80	71636.90	165.70	11.00	1.34E+00	SS	-
HSB101C	58604.40	72001.90	171.30	10.00	1.68E+00	SS	Hantush-Jacob
HSB068C	56872.70	71524.10	173.95	11.10	4.10E-01	SS	-
HSB084C	56360.10	71597.10	176.35	10.90	3.10E-01	SS	-
BGO008C	57618.70	76579.20	179.30	10.00	4.10E-01	SS	Hantush-Jacob
HC001C	61872.00	71745.00	186.00	5.00	9.50E-01	SS	Recovery
HC008C	60065.10	77484.40	189.80	5.00	5.00E-01	SS	Recovery
HC013B	63610.00	73894.00	195.80	5.00	9.00E-02	SS	-
HSB086C	55984.60	72529.70	194.40	10.00	2.27E+00	SS	-
HSB130D	54651.70	70757.20	192.10	20.00	2.60E-01	SS	Hantush-Jacob
BGO014C	55839.00	76367.70	197.10	10.00	8.90E-01	SS	Hantush-Jacob
HC004B	63408.00	71596.00	202.50	5.00	2.30E-01	SS	Recovery
HSB131D	56891.10	70365.00	200.70	10.00	1.91E+00	SS	Hantush-Jacob
HSB131D	56891.10	70365.00	200.70	10.00	1.30E+02	SS	Hantush-Jacob
HC002E	61861.00	71784.00	208.20	5.00	6.20E-01	SS	Recovery
HC006B	62070.00	72150.00	212.70	5.00	4.20E-01	SS	Recovery
SBG004	65010.20	72399.80	200.60	30.00	5.40E-01	SS	Hantush-Jacob
FSB087D	50081.10	75586.30	202.10	29.40	4.30E-01	SS	-
HSB065C	58447.10	72439.60	213.20	10.80	2.44E+00	SS	-
HSB065C	58447.10	72439.60	213.20	10.80	8.80E-01	SS	Hantush-Jacob
SBG005	64499.00	72208.30	209.40	20.00	1.80E-01	SS	Hantush-Jacob
HSB084D	56349.90	71583.90	209.50	20.00	1.56E+01	SS	-
FET003D	53025.70	75961.00	213.00	20.00	1.84E+01	SS	Hantush-Jacob
HSB085C	58947.40	73802.30	219.20	10.00	2.09E+00	SS	-
HSB085C	58947.40	73802.30	219.20	10.00	1.84E+00	SS	Hantush-Jacob
HSB066	56928.30	72429.20	213.10	30.00	1.71E+00	SS	Hantush-Jacob
HSB083D	58601.70	71628.10	213.70	30.00	8.60E-01	SS	-
FET002D	52981.20	76045.80	219.50	20.00	4.04E+01	SS	Hantush-Jacob
HR8014	59612.10	71431.40	217.10	29.60	4.50E+00	SS	Hantush-Jacob
BGO011D	56651.30	76805.10	226.30	20.00	1.89E+00	SS	Hantush-Jacob
HSB086D	55996.50	72522.10	221.60	30.00	2.36E+00	SS	-
SBG006	63860.00	73599.30	223.10	30.00	1.01E+00	SS	Hantush-Jacob
ZW004	56556.90	77667.40	234.45	10.50	2.39E+00	SS	-
BGO008D	57617.80	76588.80	230.60	20.00	1.25E+00	SS	Hantush-Jacob
ZDT001	65114.80	71644.40	237.00	20.00	1.55E+00	-	-
HC002F	61861.00	71780.00	253.20	5.00	1.80E+00	SS	-

Conductivity data from slug tests (Smits and others, 1997)

Well ID	SRS Easting	SRS Northing	Screen Midpoint	Screen Length	Conductivity (ft/d)		Analysis Method
HAA003AA	60201.90	71488.00	11.50	10.00	5.00E-01	FL	-
HAA003AA	60201.90	71488.00	11.50	10.00	3.20E-01	RS	-
HAA001AA	62960.40	69885.70	18.60	10.00	9.97E+00	FL	-
HAA001AA	62960.40	69885.70	18.60	10.00	9.81E+00	RS	-
HSL006AA	60555.70	72692.60	23.60	10.00	4.21E+00	FL	-
HSL006AA	60555.70	72692.60	23.60	10.00	6.76E+00	RS	-
HAA006AA	63860.20	71441.00	30.80	10.00	2.60E-01	FL	-
HAA006AA	63860.20	71441.00	30.80	10.00	2.20E-01	RS	-
BGO051AA	57867.00	74113.10	34.20	10.00	1.19E+00	FL	Bouwer-Rice
BGO051AA	57867.00	74113.10	34.20	10.00	7.80E-01	RS	Bouwer-Rice
HAA002AA	61285.10	70925.40	34.40	10.00	3.06E+01	FL	-
HAA002AA	61285.10	70925.40	34.40	10.00	1.99E+01	RS	-
FC005B	54657.60	87997.70	37.10	5.00	4.00E-02	-	-
HCA004AA	62942.50	72513.70	38.60	10.00	1.38E+01	FL	-
HCA004AA	62942.50	72513.70	38.60	10.00	1.40E+01	RS	-
BGO052AA	57201.60	74617.30	41.60	10.00	8.15E+00	FL	Bouwer-Rice
BGO052AA	57201.60	74617.30	41.60	10.00	9.00E-01	RS	Bouwer-Rice
BGO053AA	55429.22	76068.96	43.80	10.00	1.12E+00	FL	Bouwer-Rice
FC002A	55423.80	79243.60	55.10	4.00	8.39E+00	-	-
FC003B	57629.90	78727.70	63.70	5.00	1.19E+01	-	-
HC003A	62266.00	71742.00	68.10	5.00	1.25E+01	-	-
BGO044AA	57880.51	76757.02	66.25	10.10	4.37E+00	FL	Mod. Bouwer-Rice
BGO043AA	56268.64	77066.01	67.20	10.00	8.60E-01	FL	Mod. Bouwer-Rice
FC005C	54646.30	88007.50	72.50	5.00	1.10E-03	-	-
HC002A	61866.00	71794.00	74.70	5.00	2.83E+00	-	-
SDS007A	67681.00	76515.00	77.50	5.00	4.00E-02	-	-
SDS007A	67681.00	76515.00	77.50	5.00	8.00E-02	-	-
FC004B	53901.30	82249.00	78.60	5.00	8.03E+00	-	-
FC002B	55424.00	79251.40	81.30	5.00	5.90E-01	-	-
BGO049A	56205.08	73902.78	80.10	10.00	4.80E-01	FL	Mod. Bouwer-Rice
BGO051A	57841.80	74133.00	80.10	10.00	1.05E+01	-	-
BGO051A	57841.80	74133.00	80.10	10.00	1.08E+01	FL	Bouwer-Rice
BGO051A	57841.80	74133.00	80.10	10.00	1.02E+01	RS	Bouwer-Rice
BGO053A	55420.61	76075.27	83.60	10.00	3.80E-01	FL	Bouwer-Rice
BGO053A	55420.61	76075.27	83.60	10.00	3.30E-01	RS	Bouwer-Rice
HSB144A	56200.50	71892.10	83.60	10.00	2.20E-01	RS	Bouwer-Rice
HSB141A	59168.70	71213.60	85.60	10.00	1.90E+00	RS	Bouwer-Rice
HC002B	61876.00	71785.00	88.20	5.00	1.17E+00	-	-
BGO010AA	56990.54	76997.88	85.80	10.00	4.30E-01	FL	Mod. Bouwer-Rice
FSB112A	48809.10	74231.40	86.00	10.00	1.70E+00	RS	Bouwer-Rice
HSB140A	56535.40	70050.30	86.00	10.00	1.20E+01	RS	Bouwer-Rice
FSB113A	51068.10	74167.50	86.15	10.30	6.20E-01	RS	Bouwer-Rice
BGO052A	57195.87	74622.57	86.70	10.00	4.14E+00	FL	Bouwer-Rice

BGO052A	57195.87	74622.57	86.70	10.00	4.17E+00	RS	Bouwer-Rice
HC035D	58548.00	71918.00	90.30	5.00	1.90E-01	-	-
HSB069A	56465.10	71549.40	88.10	10.00	8.79E+00	-	-
HC001A	61867.00	71755.00	92.00	5.00	5.60E-01	-	-
HSB117A	55170.10	72733.60	89.80	10.00	1.60E-01	-	-
HSB122A	57747.40	72195.90	90.40	10.00	6.80E+00	-	Hvorslev
HSB146A	58454.00	70478.90	90.50	10.00	9.40E+00	RS	Bouwer-Rice
FSB097A	49965.70	75171.20	90.80	10.00	8.50E-01	-	-
BGO047A	54914.04	74728.83	91.80	10.00	3.06E+00	FL	Mod. Bouwer-Rice
HSB139A	57365.40	71127.40	92.60	10.00	3.82E+00	-	Hvorslev
BGO050A	54179.77	75201.16	95.50	10.00	4.00E-01	FL	Mod. Bouwer-Rice
HSB118A	55775.60	72696.40	96.00	10.00	1.20E+01	-	-
FC001A	53115.10	79664.50	99.20	5.00	1.47E+00	-	-
FSB101A	51191.30	75719.00	97.90	10.00	3.30E-01	-	-
BGO008AR	57617.50	76598.80	99.60	10.00	1.60E-01	-	-
BGO008AR	57617.50	76598.80	99.60	10.00	1.65E+00	FL	Mod. Bouwer-Rice
HAA001A	62967.90	69879.10	99.90	10.00	5.34E+00	RS	-
FSB114A	52046.60	75297.40	100.10	9.80	4.40E-01	RS	Bouwer-Rice
HAA006A	63870.00	71440.90	100.60	10.00	1.45E+00	FL	-
HAA006A	63870.00	71440.90	100.60	10.00	1.38E+00	RS	-
FSB100A	50958.40	75534.40	100.80	10.00	3.70E-01	-	-
BGO010AR	57063.80	76806.00	101.50	10.00	8.50E-01	FL	Mod. Bouwer-Rice
BGO014AR	55788.90	76351.80	101.80	10.00	1.65E+00	FL	Mod. Bouwer-Rice
HAA003A	60190.40	71470.90	101.80	10.00	8.00E-01	FL	-
HAA003A	60190.40	71470.90	101.80	10.00	4.90E-01	RS	-
BGO044A	57851.20	76755.20	103.00	10.00	4.03E+00	FL	Mod. Bouwer-Rice
FSB120A	49175.70	75538.90	104.00	10.00	6.50E-01	RS	Bouwer-Rice
HC003B	62253.00	71738.00	106.60	5.00	1.20E+01	-	-
BGO012AR	56259.90	76803.80	104.30	10.00	9.80E-01	FL	Mod. Bouwer-Rice
BGO018A	56699.67	75599.89	104.50	10.00	1.20E+01	-	-
HAA005A	62657.40	70601.10	105.70	10.00	1.09E+01	FL	-
HAA005A	62657.40	70601.10	105.70	10.00	6.49E+00	RS	-
BGC001A	57196.00	73511.00	110.00	4.00	4.60E-01	-	-
BGO016A	56194.15	75756.95	107.50	10.00	1.50E-01	-	-
BGO041A	55403.69	76469.52	108.30	10.00	1.30E-01	FL	Mod. Bouwer-Rice
BGO003A	58806.84	75561.71	108.70	10.00	5.19E+00	FL	Bouwer-Rice
BGO003A	58806.84	75561.71	108.70	10.00	3.25E+00	RS	Bouwer-Rice
HCA004A	62929.90	72515.50	108.70	10.00	8.46E+00	FL	-
HCA004A	62929.90	72515.50	108.70	10.00	8.60E+00	RS	-
BGO025A	55668.08	76158.50	109.10	10.00	5.00E-01	-	-
HSL006A	60549.50	72684.50	109.70	10.00	5.19E+00	FL	-
HSL006A	60549.50	72684.50	109.70	10.00	6.32E+00	RS	-
BGO008A	57618.30	76569.00	110.30	10.00	2.10E-01	-	-
BGO012A	56250.68	76804.63	111.40	10.00	5.00E-03	-	-
BGX004A	57215.60	77879.20	111.80	10.00	1.83E+00	FL	Mod. Bouwer-Rice
BGO006A	58316.80	76487.20	112.50	10.00	7.70E-01	-	-
BGO014A	55838.32	76377.54	114.60	10.00	4.00E-02	-	-
YSC005A	67134.90	74295.90	118.50	5.00	7.10E-01	-	Bouwer-Rice

BGO010A	57050.92	76805.18	116.10	10.00	1.60E-01	-	-
BGC002A	55887.00	74350.00	119.60	4.00	2.00E-02	-	-
BGX001A	58590.35	76831.89	119.10	10.00	1.00E-02	FL	Mod. Bouwer-Rice
FC003C	57639.00	78728.00	123.50	5.00	1.66E+00	-	-
BGO045A	54550.14	75830.03	121.90	10.00	2.45E+00	FL	Mod. Bouwer-Rice
BGO051B	57848.30	74127.70	122.10	10.00	4.70E-01	FL	Bouwer-Rice
BGO051B	57848.30	74127.70	122.10	10.00	1.03E+01	RS	Bouwer-Rice
HAA001B	62976.00	69872.20	124.30	10.00	7.50E-01	FL	-
HAA001B	62976.00	69872.20	124.30	10.00	7.60E-01	RS	-
BGC003A	54697.00	75081.00	133.60	4.00	1.59E+01	-	-
HAA003B	60178.40	71453.20	130.90	10.00	3.50E-01	FL	-
HAA003B	60178.40	71453.20	130.90	10.00	3.10E-01	RS	-
HCA004B	62942.30	72532.90	131.60	10.00	2.00E-01	FL	-
HCA004B	62942.30	72532.90	131.60	10.00	1.90E-01	RS	-
BGO052B	57189.90	74627.88	131.70	10.00	9.40E-01	FL	Bouwer-Rice
BGO052B	57189.90	74627.88	131.70	10.00	1.30E-01	RS	Bouwer-Rice
HC008B	60058.40	77487.50	135.00	5.00	5.99E+00	-	-
HSL006B	60543.60	72676.30	132.90	10.00	2.00E-01	FL	-
HSL006B	60543.60	72676.30	132.90	10.00	2.00E-01	RS	-
HC001B	61877.00	71745.00	136.00	5.00	1.28E+00	-	-
FSB112C	48794.80	74227.50	134.10	10.00	1.60E-01	RS	Bouwer-Rice
HC002C	61872.00	71784.00	138.20	5.00	3.40E-01	-	-
BGO020B	57119.82	74951.51	136.00	10.00	5.60E-01	FL	Bouwer-Rice
BGO020B	57119.82	74951.51	136.00	10.00	2.10E-01	RS	Bouwer-Rice
HAA006B	63879.80	71440.40	136.35	10.10	8.00E-02	FL	-
HAA006B	63879.80	71440.40	136.35	10.10	7.00E-02	RS	-
FC005D	54635.70	88011.90	138.90	5.00	1.30E+01	-	-
SDS012A	66610.00	77742.00	138.90	5.00	1.21E+00	-	-
BGO045B	54563.60	75840.30	142.00	10.00	1.20E-01	FL	Mod. Bouwer-Rice
BGX002B	58256.50	77203.40	142.20	10.00	2.10E-01	FL	Mod. Bouwer-Rice
BGO010B	56978.80	76982.10	144.00	10.00	3.10E-01	FL	Mod. Bouwer-Rice
BGO046B	54444.65	75012.10	145.40	10.00	2.33E+00	FL	Mod. Bouwer-Rice
HSB112C	56417.40	72156.40	145.60	10.00	4.17E+00	-	-
HSB111C	56501.90	71919.40	145.70	10.00	1.65E+00	-	-
FSB105C	49828.00	75234.20	146.50	10.00	3.84E+00	FL	Hvorslev
FSB093C	50458.30	74897.30	147.00	10.00	5.27E+00	-	-
BGO053B	55411.96	76081.70	148.40	10.00	1.20E-01	FL	Bouwer-Rice
BGO053B	55411.96	76081.70	148.40	10.00	1.00E-01	RS	Bouwer-Rice
FSB097C	49970.60	75179.60	148.80	10.00	2.60E-01	-	-
BGO012CR	56215.20	76806.00	149.00	10.00	1.60E-01	FL	Mod. Bouwer-Rice
HC004A	63409.00	71606.00	152.50	5.00	1.54E+00	-	-
HSB125C	58592.80	71503.60	150.60	10.00	7.70E-01	-	Hvorslev
HSB125C	58592.80	71503.60	150.60	10.00	9.40E-01	FL	-
FSB102C	50834.80	73582.90	150.90	10.00	5.51E+00	FL	Hvorslev
FC001B	53115.00	79672.40	154.30	5.00	7.00E-02	-	-
FSB103C	49651.30	74210.00	152.10	10.00	3.90E-01	FL	Hvorslev
HSB135C	56560.80	71390.20	152.30	10.00	3.69E+01	-	Hvorslev
HSB135C	56560.80	71390.20	152.30	10.00	3.12E+00	RS	-

HAA001C	62983.00	69866.20	152.40	10.00	5.50E-01	FL	-
HAA001C	62983.00	69866.20	152.40	10.00	5.90E-01	RS	-
FSB092C	50564.00	75053.20	152.60	10.00	5.00E-01	-	-
HSB129C	55110.00	71830.40	152.80	10.00	6.50E-01	-	Hvorslev
HSB129C	55110.00	71830.40	152.80	10.00	4.50E-01	RS	-
BGO044B	57865.80	76756.00	153.10	10.00	6.00E-02	FL	Mod. Bouwer-Rice
FSB098C	50116.50	75381.20	153.40	10.00	1.55E+00	-	-
FSB121C	48413.10	75155.70	153.40	10.00	1.10E+01	RS	Bouwer-Rice
HSB127C	56792.10	71210.10	153.40	10.00	8.20E-01	RS	-
HSB131C	56894.90	70374.70	153.50	10.00	1.36E+02	-	Hvorslev
FSB091C	50953.50	75213.30	154.10	10.00	1.40E-01	-	-
HSB134C	58289.90	71210.30	154.10	10.00	1.31E+00	-	Hvorslev
FSB104C	49248.60	73872.60	155.70	10.00	1.67E+00	FL	Hvorslev
FSB120C	49171.10	75549.80	155.70	10.00	1.70E+00	RS	Bouwer-Rice
FSB107C	51158.10	75184.00	155.80	10.00	8.90E-01	FL	Hvorslev
HC006A	62060.00	72150.00	158.70	5.00	1.55E+00	-	-
HC005A	61710.00	73265.00	159.00	5.00	4.20E-01	-	-
HSB113C	56160.40	72312.30	156.70	10.00	9.90E-01	-	-
HSB105C	57883.80	71447.30	157.20	10.00	4.28E+00	-	-
HSB146C	58473.10	70471.60	157.30	10.00	6.80E-01	RS	Bouwer-Rice
HSB100C	58806.50	72077.20	158.00	10.00	1.39E+00	-	-
BGO012C	56241.10	76805.20	158.60	10.00	4.00E-02	-	-
BGO012C	56241.10	76805.20	158.60	10.00	1.11E+00	-	-
HCA004C	62931.80	72532.80	158.80	10.00	1.88E+00	FL	-
HCA004C	62931.80	72532.80	158.80	10.00	1.30E+00	RS	-
FSB113C	51084.20	74160.70	159.00	10.00	1.60E-01	RS	Bouwer-Rice
FC002D	55423.00	79267.20	161.70	5.00	2.73E+00	-	Hvorslev
HC002H	61862.00	71804.00	159.70	10.00	8.50E-01	-	-
HSB141C	59170.20	71196.70	159.70	10.00	9.00E+00	RS	Bouwer-Rice
FSB123C	51750.50	74566.70	160.30	10.00	6.70E+00	RS	Bouwer-Rice
FSB106C	50651.30	74190.10	161.00	10.00	2.40E+01	FL	Hvorslev
FSB089C	51345.20	75553.20	161.10	10.00	5.20E-01	-	-
FSB099C	50320.60	75683.70	162.20	10.00	3.03E+00	-	-
BGO010C	57041.10	76805.20	162.30	10.00	7.00E-02	-	-
HSL006C	60537.60	72667.50	162.60	10.00	4.46E+00	FL	-
HSL006C	60537.60	72667.50	162.60	10.00	4.84E+00	RS	-
BGO006C	58307.00	76487.10	163.00	10.00	1.51E+00	-	-
FSB114C	52033.80	75288.50	163.00	10.00	4.20E-01	RS	Bouwer-Rice
HC015B	61444.80	70960.90	165.50	5.00	4.09E+00	-	-
FSB090C	51148.60	75382.90	163.10	10.00	1.08E+00	-	-
FSB088C	51518.00	75619.40	163.40	10.00	4.50E+00	-	-
HSB106C	57651.50	71720.90	163.70	10.00	2.44E+01	-	-
HSB148C	55344.20	70151.50	163.90	10.00	1.80E+00	RS	Bouwer-Rice
FSB111C	51526.30	75383.30	164.00	10.00	1.04E+01	FL	Hvorslev
HSB103C	58323.60	71593.90	164.20	10.00	3.15E+00	-	-
HSB107C	57432.00	71698.50	164.30	10.00	9.80E-01	-	-
HC010B	61600.10	75801.30	167.30	5.00	9.10E-01	-	-
HSB130C	54643.60	70762.40	164.90	10.00	7.37E+01	-	Hvorslev

HSB130C	54643.60	70762.40	164.90	10.00	6.80E+01	RS	-
FSB122C	48195.00	73881.80	165.00	10.00	2.60E+00	RS	Bouwer-Rice
FSB116C	50645.90	72725.50	165.50	10.00	6.90E-01	RS	Bouwer-Rice
HSB136C	55949.60	71900.30	165.50	10.00	6.10E-01	-	Hvorslev
FC003D	57647.90	78728.40	168.40	5.00	1.50E-01	-	Hvorslev
HAA006C	63889.80	71440.60	166.10	10.00	2.31E+01	FL	-
HAA006C	63889.80	71440.60	166.10	10.00	2.29E+01	RS	-
HSB140C	56551.80	70049.20	166.60	10.00	6.10E-01	RS	Bouwer-Rice
HSB142C	53505.30	73119.00	166.60	10.00	6.00E-01	RS	Bouwer-Rice
BGO050C	54197.00	75190.40	167.50	10.00	3.30E-01	FL	Mod. Bouwer-Rice
HAA003C	60167.40	71436.90	168.30	10.00	1.60E-01	FL	-
HAA003C	60167.40	71436.90	168.30	10.00	9.00E-02	RS	-
HSB104C	58082.60	71376.80	168.50	10.00	6.40E-01	-	-
FSB115C	49736.00	72515.50	168.80	10.00	3.60E-01	RS	Bouwer-Rice
HSB145C	57769.00	71098.90	169.70	10.00	3.80E-01	RS	Bouwer-Rice
HSB070C	55757.10	72597.30	169.90	10.00	3.10E-01	FL	Hvorslev
HSB070C	55757.10	72597.30	169.90	10.00	2.00E-01	RS	-
HSB117C	55162.90	72740.70	170.10	10.00	5.70E-01	FL	-
BGO049C	56202.20	73917.20	171.00	10.00	8.80E-01	FL	Mod. Bouwer-Rice
HSB101C	58604.40	72001.90	171.30	10.00	4.00E+00	-	-
HSB102C	58399.70	71960.10	171.70	10.00	2.00E+00	-	-
HSB109C	56895.60	71684.80	173.40	10.00	9.50E-01	-	-
HSB132C	58787.70	71472.40	173.60	10.00	2.80E-01	-	Hvorslev
HSB143C	52773.20	73738.20	174.10	10.00	2.40E+00	RS	Bouwer-Rice
HSB151C	54014.90	72997.90	175.60	10.00	8.00E-01	RS	Bouwer-Rice
BGX004C	57202.20	77886.20	175.70	10.00	1.16E+00	-	-
BGX004C	57202.20	77886.20	175.70	10.00	1.16E+00	FL	Mod. Bouwer-Rice
HSB126C	57178.20	70627.70	178.80	5.00	5.67E+01	RS	-
HSB110C	56680.70	71779.30	176.40	10.00	7.10E-01	-	-
FC004E	53915.30	82268.90	178.90	5.00	4.79E+00	-	Hvorslev
HSB071C	55281.50	72866.60	176.90	10.00	2.70E-01	-	Hvorslev
HSB071C	55281.50	72866.60	176.90	10.00	1.70E-01	RS	-
HC012B	59488.40	73186.90	179.80	5.00	5.09E+00	-	-
HSB152C	54346.70	72012.00	178.10	10.00	8.00E-01	RS	Bouwer-Rice
HC002D	61866.00	71784.00	180.70	5.00	3.59E+00	-	-
BGO020C	57106.02	74937.64	179.00	10.00	8.90E-01	FL	Bouwer-Rice
BGO020C	57106.02	74937.64	179.00	10.00	1.00E+00	RS	Bouwer-Rice
BGX012C	59675.30	74427.90	179.10	10.00	1.11E+00	FL	Mod. Bouwer-Rice
BGO008C	57618.70	76579.20	179.30	10.00	1.39E+00	-	-
BGO051C	57854.40	74123.10	180.10	10.00	1.47E+00	FL	Bouwer-Rice
BGO051C	57854.40	74123.10	180.10	10.00	1.56E+00	RS	Bouwer-Rice
BGX001C	58599.80	76820.00	181.00	10.00	3.60E-01	FL	Mod. Bouwer-Rice
BGO048C	55124.38	74599.64	181.70	10.00	2.15E+00	FL	Mod. Bouwer-Rice
BGO029C	54099.10	75577.80	181.80	10.00	2.90E-01	FL	Mod. Bouwer-Rice
HAA005C	62667.60	70600.80	182.70	10.00	2.92E+00	FL	-
HAA005C	62667.60	70600.80	182.70	10.00	3.68E+00	RS	-
BGO046C	54433.90	75022.20	183.00	10.00	1.40E-01	FL	Mod. Bouwer-Rice
HC001C	61872.00	71745.00	186.00	5.00	4.28E+00	-	-

BGO047C	54933.40	74752.00	183.60	10.00	4.60E-01	FL	Mod. Bouwer-Rice
BGO003C	58806.39	75550.42	183.70	10.00	2.00E-02	FL	Bouwer-Rice
BGO003C	58806.39	75550.42	183.70	10.00	1.00E-02	RS	Bouwer-Rice
BGO052C	57184.00	74633.04	183.70	10.00	2.27E+00	FL	Bouwer-Rice
BGO052C	57184.00	74633.04	183.70	10.00	3.11E+00	RS	Bouwer-Rice
FC001C	53115.10	79680.10	186.40	5.00	4.20E-03	-	-
HSB116C	55989.10	72888.10	185.50	10.00	4.36E+00	-	Hvorslev
FC003E	57655.50	78728.80	188.20	5.00	1.39E+00	-	Hvorslev
BGX002D	58265.60	77192.40	186.10	10.00	3.40E-01	RS	Mod. Bouwer-Rice
SDS012B	66610.70	77749.90	189.20	5.00	8.00E-02	-	-
HC008C	60065.10	77484.40	189.80	5.00	4.73E+00	-	-
FSB115D	49728.30	72504.30	187.50	10.00	3.80E+00	RS	Bouwer-Rice
HSB115C	56043.20	72653.20	187.80	10.00	4.60E-01	-	-
BGO053C	55403.34	76088.07	188.10	10.00	2.30E+00	FL	Bouwer-Rice
BGO005C	58794.50	76476.90	188.20	10.00	1.30E-01	-	-
FC002E	55423.70	79275.60	191.40	5.00	6.01E+00	-	Hvorslev
HSB145D	57753.90	71088.00	189.20	10.00	3.30E-01	RS	Bouwer-Rice
HSB114C	56107.00	72464.60	190.60	10.00	2.86E+00	-	-
HC011C	62131.40	74496.40	193.30	5.00	1.01E+00	-	-
BGO042C	55522.27	76404.71	190.90	10.00	4.50E-01	FL	Mod. Bouwer-Rice
HSB108C	57155.50	71688.70	191.00	10.00	9.80E-01	-	-
FSB116D	50629.70	72727.40	191.40	10.00	1.10E+00	RS	Bouwer-Rice
HC013B	63610.00	73894.00	195.80	5.00	4.50E-01	-	-
HSB142D	53493.10	73113.00	194.70	10.00	6.80E-01	RS	Bouwer-Rice
BGO014CR	55789.00	76337.80	195.10	10.00	4.00E-01	FL	Mod. Bouwer-Rice
BGO045C	54577.40	75835.00	195.50	10.00	1.22E+00	FL	Mod. Bouwer-Rice
HSB126D	57169.60	70633.40	195.50	10.00	2.30E+00	RS	Hvorslev
HSB126D	57169.60	70633.40	195.50	10.00	2.90E-01	-	-
BGO044C	57894.90	76757.80	195.60	10.00	8.00E-02	FL	Mod. Bouwer-Rice
HSB130D	54651.70	70757.20	192.10	20.00	2.10E-01	-	Bouwer-Rice
HSB130D	54651.70	70757.20	192.10	20.00	2.60E-01	RS	-
HSB130D	54651.70	70757.20	192.10	20.00	8.80E-01	-	-
BGO014C	55839.00	76367.70	197.10	10.00	9.80E-01	-	-
HC005B	61705.00	73266.00	200.50	5.00	4.73E+00	-	-
HC004B	63408.00	71596.00	202.50	5.00	1.01E+00	-	-
HSB129D	55103.40	71837.10	195.20	20.00	3.40E+00	FL	Hvorslev
HSB129D	55103.40	71837.10	195.20	20.00	2.30E+00	RS	Hvorslev
HSB129D	55103.40	71837.10	195.20	20.00	2.65E+00	-	-
SDS004	63723.00	75817.00	195.40	20.00	3.87E+00	-	-
HSB131D	56891.10	70365.00	200.70	10.00	6.77E+00	-	-
YSC004C	65901.90	77059.70	200.90	10.00	1.26E+00	-	Bouwer-Rice
FSB122D	48201.70	73865.50	196.60	20.00	1.60E+00	RS	Bouwer-Rice
HSB152D	54362.10	72011.70	202.00	10.00	1.10E+00	RS	Bouwer-Rice
HC003E	62251.00	71753.00	204.60	5.00	2.45E+00	-	-
YSC001C	65855.46	78186.24	202.50	10.00	2.40E+00	-	Bouwer-Rice
HSB151D	54026.40	72997.80	202.60	10.00	2.30E+00	RS	Bouwer-Rice
HMD003D	57745.20	79578.70	197.70	20.00	2.60E-01	-	-
FSB112D	48780.00	74223.70	198.90	20.00	4.80E+00	RS	Bouwer-Rice

FSB113D	51098.40	74154.80	199.60	20.00	5.10E+00	RS	Bouwer-Rice
FSB117D	50486.80	74070.40	199.70	20.00	2.50E+00	RS	Bouwer-Rice
FSB104D	49255.40	73865.20	200.40	20.00	2.31E+01	RS	Bouwer-Rice
HC002E	61861.00	71784.00	208.20	5.00	2.16E+00	-	-
HMD002D	57269.70	79665.80	200.80	20.00	4.14E+00	-	-
BGX006D	57524.90	78740.10	201.00	20.00	3.57E+00	RS	Mod. Bouwer-Rice
FSB110D	50141.60	74193.30	201.10	20.00	2.30E+00	RS	Bouwer-Rice
FSB118D	51276.30	74697.90	201.30	20.00	1.10E+00	RS	Bouwer-Rice
FSB121DR	48429.70	75151.90	201.30	20.00	2.70E-01	RS	Bouwer-Rice
HC001D	61867.00	71746.00	209.00	5.00	1.17E+00	-	-
BGO048D	55121.00	74586.40	207.00	10.00	1.10E+01	RS	Mod. Bouwer-Rice
BGO046D	54420.00	75033.80	207.10	10.00	1.15E+01	RS	Mod. Bouwer-Rice
FC002F	55423.00	79283.40	209.80	5.00	1.90E+00	-	-
FSB119D	50600.60	74599.70	203.10	20.00	6.00E-01	RS	Bouwer-Rice
BGO047D	54922.90	74739.70	208.40	10.00	1.59E+01	FL	Mod. Bouwer-Rice
BGX007D	58312.80	78349.30	204.10	20.00	2.04E+01	RS	Mod. Bouwer-Rice
FSB123D	51734.80	74562.70	204.10	20.00	3.90E+00	RS	Bouwer-Rice
HSB140D	56560.60	70036.00	204.10	20.00	4.00E+00	RS	Bouwer-Rice
BGX005D	57308.60	78402.00	205.00	20.00	1.45E+00	RS	Mod. Bouwer-Rice
HC006B	62070.00	72150.00	212.70	5.00	2.17E+00	-	-
FSB120D	49163.70	75568.70	206.50	20.00	3.40E+00	RS	Bouwer-Rice
SDS017	67354.00	74421.00	206.60	20.00	3.31E+00	-	-
BGO019D	56997.30	75350.00	206.80	20.00	4.50E-01	-	-
FSB097D	49975.50	75188.90	206.90	20.00	8.00E-02	-	-
HSB143D	52774.50	73754.00	206.90	20.00	9.50E+00	RS	Bouwer-Rice
FSB114D	52018.60	75278.60	207.75	20.10	3.50E+00	RS	Bouwer-Rice
HSB127D	56788.00	71218.90	207.80	20.00	1.40E+01	FL	Hvorslev
HSB127D	56788.00	71218.90	207.80	20.00	1.33E+01	RS	Hvorslev
HSB127D	56788.00	71218.90	207.80	20.00	1.36E+01	-	-
FSB093D	50452.40	74888.50	207.90	20.00	1.78E+00	-	-
FSB093D	50452.40	74888.50	207.90	20.00	2.85E+00	-	Bouwer-Rice
YSC002D	66130.70	78320.40	207.95	20.10	1.19E+00	-	Bouwer-Rice
FSB099D	50326.90	75691.70	208.10	20.00	1.80E+00	-	Bouwer-Rice
FSB099D	50326.90	75691.70	208.10	20.00	2.97E+00	-	-
HSB148D	55355.70	70160.90	208.10	20.00	4.20E-01	RS	Bouwer-Rice
HSB125D	58584.10	71498.20	209.40	20.00	7.09E+00	FL	Hvorslev
HSB125D	58584.10	71498.20	209.40	20.00	4.25E+00	RS	Hvorslev
HSB125D	58584.10	71498.20	209.40	20.00	5.67E+00	-	-
FSL007D	51485.60	76327.80	209.55	20.10	6.80E-01	FL	Bouwer-Rice
FSL007D	51485.60	76327.80	209.55	20.10	5.00E-01	RS	Bouwer-Rice
HSB136D	55941.70	71906.00	210.20	20.00	1.86E+01	-	Bouwer-Rice
HSB136D	55941.70	71906.00	210.20	20.00	3.30E-01	RS	-
HSB136D	55941.70	71906.00	210.20	20.00	7.58E+00	RS	Hvorslev
HSB136D	55941.70	71906.00	210.20	20.00	9.69E+00	-	-
FSB098D	50111.60	75371.90	210.30	20.00	5.00E-02	-	-
HSB117D	55155.60	72747.60	210.30	20.00	9.14E+00	-	Bouwer-Rice
HSB117D	55155.60	72747.60	210.30	20.00	9.10E-01	RS	-
HSB117D	55155.60	72747.60	210.30	20.00	6.55E+00	RS	Bouwer-Rice

HSB117D	55155.60	72747.60	210.30	20.00	1.22E+01	-	-
BGO013DR	55840.40	76824.70	215.30	10.00	2.80E-01	FL	Mod. Bouwer-Rice
FSB091D	50946.60	75207.60	210.90	20.00	3.09E+00	-	-
FSB091D	50946.60	75207.60	210.90	20.00	4.56E+00	-	Bouwer-Rice
FSB107D	51149.80	75177.20	210.90	20.00	1.38E+00	RS	Bouwer-Rice
FSL009D	51543.90	75768.40	211.45	20.10	2.10E-01	FL	Bouwer-Rice
FSL009D	51543.90	75768.40	211.45	20.10	9.00E-01	RS	Bouwer-Rice
BGX003D	57780.10	77577.00	211.60	20.00	1.85E+00	RS	Mod. Bouwer-Rice
FSB092D	50557.60	75045.80	211.70	20.00	2.40E-01	-	-
FSB092D	50557.60	75045.80	211.70	20.00	6.91E+00	-	Bouwer-Rice
FSB111D	51515.90	75382.90	211.70	20.00	1.25E+00	RS	Bouwer-Rice
FSB089D	51335.80	75548.30	211.90	20.00	2.60E+00	-	-
FSB089D	51335.80	75548.30	211.90	20.00	3.25E+00	-	Bouwer-Rice
FSB088D	51527.00	75621.80	212.10	20.00	1.10E-01	-	Bouwer-Rice
FSB088D	51527.00	75621.80	212.10	20.00	1.19E+00	-	-
FSL006D	51727.90	76733.10	212.10	20.00	6.50E-01	FL	Bouwer-Rice
FSL006D	51727.90	76733.10	212.10	20.00	1.14E+00	RS	Bouwer-Rice
FSL008D	51513.50	76054.70	212.75	20.10	4.00E-02	FL	Bouwer-Rice
FSL008D	51513.50	76054.70	212.75	20.10	7.80E-01	RS	Bouwer-Rice
FSL005D	51903.30	77047.70	213.60	20.20	4.66E+00	FL	Bouwer-Rice
FSL005D	51903.30	77047.70	213.60	20.20	1.38E+00	RS	Bouwer-Rice
FSB105D	49833.01	75243.34	213.70	20.00	6.20E-01	RS	Bouwer-Rice
BGX004D	57186.20	77893.90	213.80	20.00	2.89E+00	RS	Mod. Bouwer-Rice
FSB108D	51142.30	76260.70	213.80	20.00	4.80E-01	-	-
BGO017D	56399.40	75599.60	214.00	20.00	1.28E+00	-	-
FSL004D	52230.40	77452.40	214.05	20.10	1.39E+00	FL	Bouwer-Rice
FSL004D	52230.40	77452.40	214.05	20.10	1.90E-01	RS	Bouwer-Rice
HSB146D	58493.00	70469.70	214.05	20.10	1.60E+00	RS	Bouwer-Rice
FSB090D	51140.70	75376.90	215.10	20.00	2.70E-01	-	Bouwer-Rice
FSB090D	51140.70	75376.90	215.10	20.00	4.20E-01	-	-
HSB137D	55696.10	72278.90	215.30	20.00	2.10E+00	-	Bouwer-Rice
HSB137D	55696.10	72278.90	215.30	20.00	4.60E-01	RS	-
HSB137D	55696.10	72278.90	215.30	20.00	1.48E+00	RS	Bouwer-Rice
HSB137D	55696.10	72278.90	215.30	20.00	4.25E+00	-	-
HSB134D	58296.50	71217.30	215.80	20.00	1.60E+00	-	Bouwer-Rice
HSB134D	58296.50	71217.30	215.80	20.00	2.32E+00	RS	-
HSB134D	58296.50	71217.30	215.80	20.00	2.92E+00	RS	Bouwer-Rice
HSB134D	58296.50	71217.30	215.80	20.00	2.12E+01	-	-
FSL003D	52465.20	77765.20	215.95	20.10	8.80E-01	FL	Bouwer-Rice
FSL003D	52465.20	77765.20	215.95	20.10	8.80E-01	RS	Bouwer-Rice
HSB132D	58799.30	71469.50	216.50	20.00	5.00E+00	-	Bouwer-Rice
HSB132D	58799.30	71469.50	216.50	20.00	4.60E-01	RS	-
HSB132D	58799.30	71469.50	216.50	20.00	7.26E+00	RS	Bouwer-Rice
HSB132D	58799.30	71469.50	216.50	20.00	1.25E+01	-	-
HSB139D	57384.40	71133.20	216.70	20.00	8.80E+00	-	Bouwer-Rice
HSB139D	57384.40	71133.20	216.70	20.00	3.70E-01	RS	-
HSB139D	57384.40	71133.20	216.70	20.00	7.05E+00	RS	Bouwer-Rice
HSB139D	57384.40	71133.20	216.70	20.00	9.86E+00	-	-

HSB150D	58692.80	71692.60	216.90	20.00	1.20E+00	RS	Bouwer-Rice
HSB149D	57286.30	71338.80	217.00	20.00	2.90E+00	RS	Bouwer-Rice
M037A	57230.00	72860.00	226.00	2.00	2.40E-01	-	-
BGO050D	54209.10	75181.30	218.00	20.00	1.61E+00	RS	Mod. Bouwer-Rice
BGO029D	54099.40	75592.50	218.50	20.00	1.58E+00	RS	Mod. Bouwer-Rice
HSB133D	59102.30	71943.50	218.50	20.00	8.00E-02	-	-
FSL001D	52992.50	79063.10	218.55	20.10	8.50E-01	FL	Bouwer-Rice
FSL001D	52992.50	79063.10	218.55	20.10	3.00E-01	RS	Bouwer-Rice
FSL002D	52790.50	78636.50	218.75	20.10	1.70E-01	FL	Bouwer-Rice
FSL002D	52790.50	78636.50	218.75	20.10	3.30E-01	RS	Bouwer-Rice
BGO009D	57478.90	76811.60	219.20	20.00	1.00E-01	-	-
BGO045D	54585.50	75854.30	219.60	20.00	6.07E+00	RS	Mod. Bouwer-Rice
SDS003A	64711.00	75643.00	220.50	20.00	2.75E+00	-	-
HSB104D	58075.80	71370.20	220.60	20.00	2.18E+01	-	Bouwer-Rice
HSB104D	58075.80	71370.20	220.60	20.00	2.75E+01	-	-
HSB106D	57644.80	71727.80	220.70	20.00	8.20E+00	-	Bouwer-Rice
HSB106D	57644.80	71727.80	220.70	20.00	1.82E+01	-	-
HSB110D	56672.10	71785.20	221.40	20.00	2.33E+00	-	Bouwer-Rice
HSB110D	56672.10	71785.20	221.40	20.00	4.54E+01	-	-
HSB111E	56487.20	71932.80	221.70	20.00	3.82E+01	-	Bouwer-Rice
HSB105D	57877.40	71454.80	221.80	20.00	3.40E+01	-	Bouwer-Rice
HSB105D	57877.40	71454.80	221.80	20.00	3.83E+01	-	-
HSB108D	57145.60	71688.00	222.00	20.00	1.27E+00	-	Bouwer-Rice
HSB108D	57145.60	71688.00	222.00	20.00	1.33E+01	-	-
BGX009D	59522.10	76936.00	222.40	20.00	3.60E-01	RS	Mod. Bouwer-Rice
HSB114D	56104.60	72474.20	222.80	20.00	5.20E-01	-	Bouwer-Rice
HSB114D	56104.60	72474.20	222.80	20.00	6.40E+00	-	-
HSB109D	56885.50	71685.60	223.00	20.00	1.26E+00	-	Bouwer-Rice
HSB109D	56885.50	71685.60	223.00	20.00	9.20E+00	-	-
BGO044D	57910.00	76759.50	228.40	10.00	1.30E+01	RS	Mod. Bouwer-Rice
HSB103D	58315.60	71588.10	223.70	20.00	1.21E+00	-	Bouwer-Rice
HSB103D	58315.60	71588.10	223.70	20.00	4.82E+00	-	-
HSB115D	56039.80	72662.30	223.90	20.00	4.40E-01	-	Bouwer-Rice
HSB115D	56039.80	72662.30	223.90	20.00	2.50E+00	-	-
HSB116D	55988.20	72898.10	224.50	20.00	7.10E-01	-	Bouwer-Rice
HSB116D	55988.20	72898.10	224.50	20.00	2.70E+00	-	-
BGX001D	58608.60	76809.50	224.70	20.00	1.65E+00	RS	Mod. Bouwer-Rice
HSB107D	57412.20	71696.60	225.10	20.00	2.96E+00	-	Bouwer-Rice
HSB107D	57412.20	71696.60	225.10	20.00	1.56E+01	-	-
HSB147D	55804.40	73827.90	225.20	20.00	6.70E-01	RS	Bouwer-Rice
HSB101D	58594.80	71997.50	226.10	20.00	1.24E+00	-	Bouwer-Rice
HSB101D	58594.80	71997.50	226.10	20.00	4.17E+00	-	-
BGX010D	59765.50	76183.30	226.20	20.00	5.20E-01	RS	Mod. Bouwer-Rice
HSB113D	56164.30	72302.70	226.20	20.00	2.37E+00	-	Bouwer-Rice
HSB113D	56164.30	72302.70	226.20	20.00	7.10E+00	-	-
BGO011D	56651.30	76805.10	226.30	20.00	2.54E+00	-	-
HSB102D	58393.40	71952.40	226.30	20.00	2.00E-01	-	Bouwer-Rice
HSB102D	58393.40	71952.40	226.30	20.00	4.20E-01	-	-

HSB100D	58796.90	72073.80	226.90	20.00	1.01E+00	-	Bouwer-Rice
HSB100D	58796.90	72073.80	226.90	20.00	2.54E+00	-	-
BGO006D	58297.10	76487.30	227.20	20.00	3.80E-01	-	-
BGO016D	56202.10	75751.40	227.30	20.00	7.00E-02	-	-
BGO021D	57470.66	74688.53	227.70	20.00	7.90E-01	-	-
BGO012D	56231.10	76805.20	227.80	20.00	1.20E-01	-	-
HSB141D	59170.90	71184.40	227.80	20.00	5.90E-01	RS	Bouwer-Rice
BGO014DR	55789.40	76322.10	228.10	20.00	2.15E+00	RS	Mod. Bouwer-Rice
BGO010DR	57073.70	76804.80	228.30	20.00	1.16E+00	RS	Mod. Bouwer-Rice
BGO049D	56198.80	73931.50	228.50	20.00	7.30E-01	RS	Mod. Bouwer-Rice
BGO015D	55859.10	75973.50	228.70	20.00	1.11E+00	-	-
BGO002D	58809.70	74552.90	228.90	20.00	6.20E-01	-	-
BGO005D	58784.80	76477.50	229.30	20.00	7.30E-01	-	-
BGO052D	57177.91	74638.32	229.40	20.00	5.00E-02	FL	Bouwer-Rice
BGO052D	57177.91	74638.32	229.40	20.00	1.70E-01	RS	Bouwer-Rice
BGO018D	56711.20	75600.00	229.60	20.00	1.26E+01	-	-
HSL001D	58925.00	72179.60	229.80	20.00	3.25E+00	FL	Bouwer-Rice
HSL001D	58925.00	72179.60	229.80	20.00	7.76E+00	RS	Bouwer-Rice
BGO051D	57860.60	74118.00	230.05	20.10	8.00E-02	FL	Bouwer-Rice
BGO051D	57860.60	74118.00	230.05	20.10	4.00E-01	RS	Bouwer-Rice
BGO007D	57917.20	76494.50	230.20	20.00	1.51E+01	-	-
BGO004D	58803.70	76150.10	230.60	20.00	6.90E-01	-	-
BGO008D	57617.80	76588.80	230.60	20.00	1.87E+00	-	-
BGO024D	58438.80	74012.40	231.00	20.00	3.60E-01	-	-
BGO023D	58132.96	74238.09	232.00	20.00	1.11E+00	-	-
BGX012D	59674.30	74410.90	233.70	20.00	3.60E-01	RS	Mod. Bouwer-Rice
BGO001D	58779.30	73737.90	235.00	20.00	3.10E-01	-	-
BGO053D	55396.42	76092.84	235.20	20.00	1.94E+00	RS	Bouwer-Rice
HSL002D	59423.50	72190.80	235.25	20.10	9.10E-01	FL	Bouwer-Rice
HSL002D	59423.50	72190.80	235.25	20.10	1.96E+00	RS	Bouwer-Rice
HC003F	62253.00	71758.00	243.10	5.00	1.46E+01	-	-
BGO003D	58809.20	75351.30	237.60	20.00	1.40E-01	-	-
BGO013D	55840.00	76805.30	238.50	20.00	1.40E-01	-	-
BGO014D	55839.60	76357.50	239.60	20.00	5.60E-01	-	-
BGO010D	57030.60	76805.10	240.50	20.00	3.30E-01	-	-
HSL003D	59770.60	72251.50	243.75	20.10	5.70E-01	FL	Bouwer-Rice
HSL003D	59770.60	72251.50	243.75	20.10	4.70E-01	RS	Bouwer-Rice
HC002F	61861.00	71780.00	253.20	5.00	1.23E+01	-	-
HC001E	61864.00	71746.00	254.00	5.00	1.23E+01	-	-
HSL007D	60723.00	72674.40	252.35	20.10	2.34E+00	FL	Bouwer-Rice
HSL007D	60723.00	72674.40	252.35	20.10	1.33E+00	RS	Bouwer-Rice
HSL006D	60531.10	72659.70	253.95	20.10	1.75E+00	FL	Bouwer-Rice
HSL006D	60531.10	72659.70	253.95	20.10	8.80E-01	RS	Bouwer-Rice
HSL004D	60171.90	72453.70	255.05	20.10	9.10E-01	FL	Bouwer-Rice
HSL004D	60171.90	72453.70	255.05	20.10	1.46E+00	RS	Bouwer-Rice
HAA006D	63900.20	71440.30	257.15	20.10	2.42E+00	FL	-
HAA006D	63900.20	71440.30	257.15	20.10	1.50E-01	RS	-
HSL005D	60339.40	72562.20	257.75	19.90	7.60E-01	FL	Bouwer-Rice

HSL005D	60339.40	72562.20	257.75	19.90	1.04E+00	RS	Bouwer-Rice
HSL008D	61117.10	72688.10	258.40	20.00	8.30E-01	FL	Bouwer-Rice
HSL008D	61117.10	72688.10	258.40	20.00	3.03E+00	RS	Bouwer-Rice
HAA002D	61250.60	70945.40	270.35	20.10	1.00E-02	FL	-
HAA001D	62991.00	69859.10	271.80	20.00	1.04E+00	FL	-
HAA001D	62991.00	69859.10	271.80	20.00	1.66E+00	RS	-

Appendix C - Hydraulic head data

Well ID	SRS Easting	SRS Northing	Screen Bottom	Screen Top	Head (ft)	Aquifer
Gordon aquifer wells (79):						
'BGO 8A '	57618.30	76569.00	105.3	115.3	161.0	1
'BGO 8AR'	57617.50	76598.80	94.6	104.6	161.1	1
'BGO 9AA'	57371.90	76975.70	73.8	83.8	157.9	1
'BGO 14A '	55838.30	76377.50	109.6	119.6	157.8	1
'BGO 14AR'	55788.90	76351.80	96.8	106.8	158.9	1
'BGO 16A '	56194.20	75757.00	102.5	112.5	160.7	1
'BGO 16AR'	56217.10	75743.20	103.7	113.7	161.0	1
'BGO 18A '	56699.70	75599.90	99.5	109.5	161.0	1
'BGO 25A '	55668.10	76158.50	104.1	114.1	160.6	1
'BGO 26A '	55014.20	76144.60	81.0	91.0	160.1	1
'BGO 29A '	54103.50	75560.00	102.5	112.5	159.5	1
'BGO 41A '	55403.70	76469.50	103.3	113.3	158.2	1
'BGO 43A '	56253.40	77061.40	105.9	115.9	159.4	1
'BGO 43AA'	56268.60	77066.00	62.2	72.2	156.7	1
'BGO 44A '	57851.20	76755.20	98.0	108.0	158.4	1
'BGO 44AA'	57880.50	76757.00	61.2	71.3	158.5	1
'BGO 45A '	54550.10	75830.00	116.9	126.9	160.7	1
'BGO 47A '	54914.00	74728.80	86.8	96.8	162.4	1
'BGO 49A '	56205.10	73902.80	75.1	85.1	166.8	1
'BGO 50A '	54179.80	75201.20	90.5	100.5	160.0	1
'BGX 1A '	58590.40	76831.90	114.1	124.1	159.1	1
'BGX 4A '	57215.60	77879.20	106.8	116.8	155.1	1
'FC 1A '	53115.10	79664.50	96.7	101.7	143.5	1
'FC 3B '	57629.90	78727.70	61.2	66.2	150.6	1
'FC 3C '	57639.00	78728.00	121.0	126.0	151.8	1
'FC 4C '	53905.90	82255.40	116.3	121.3	137.6	1
'FSB 76A '	51391.60	76131.90	36.9	47.4	155.0	1
'FSB 76B '	51394.00	76122.40	99.2	109.7	151.5	1
'FSB 78A '	50172.80	74757.70	27.0	37.5	155.9	1
'FSB 78B '	50178.80	74765.90	82.4	92.8	154.3	1
'FSB 79A '	50149.60	73664.50	24.0	34.4	158.0	1
'FSB 79B '	50159.20	73666.10	80.7	91.2	158.0	1
'FSB 87A '	50115.80	75601.70	33.1	43.6	153.8	1
'FSB 87B '	50104.90	75597.00	90.0	100.5	150.6	1
'FSB 96A '	49778.70	74882.20	85.7	95.7	152.1	1
'FSB 96AR'	49746.60	74914.90	79.0	89.0	153.3	1
'FSB 97A '	49965.70	75171.20	85.8	95.8	152.1	1
'FSB 98A '	50121.60	75389.80	84.7	94.7	150.4	1
'FSB 98AR'	50105.80	75362.00	82.1	92.1	151.8	1
'FSB 99A '	50314.80	75675.60	92.9	102.9	150.5	1
'FSB100A '	50958.40	75534.40	95.8	105.8	151.3	1
'FSB101A '	51191.30	75719.00	92.9	102.9	151.6	1
'FSB112A '	48809.10	74231.40	81.0	91.0	153.5	1
'FSB113A '	51068.10	74167.50	81.0	91.3	158.9	1
'FSB114A '	52046.60	75297.40	95.2	105.0	155.6	1
'HAA 1A '	62967.90	69879.10	94.9	104.9	180.8	1
'HAA 1AA'	62960.40	69885.70	13.6	23.6	180.7	1
'HAA 2A '	61276.00	70930.40	107.3	117.3	176.6	1
'HAA 3A '	60190.40	71470.90	96.8	106.8	175.4	1
'HAA 4A '	61920.00	72223.00	105.4	115.3	174.4	1
'HAA 6A '	63870.00	71440.90	95.6	105.6	178.6	1
'HAA 6AA'	63860.20	71441.00	25.8	35.8	178.3	1
'HC 1A '	61867.00	71755.00	89.5	94.5	175.8	1
'HC 2A '	61866.00	71794.00	72.2	77.2	175.8	1

'HC 2B '	61876.00	71785.00	85.7	90.7	175.0	1
'HC 8B '	60058.40	77487.50	132.5	137.5	155.5	1
'HC 10A '	61593.40	75806.70	114.0	117.0	163.3	1
'HSB 65A '	58436.00	72436.20	62.5	73.2	171.2	1
'HSB 68A '	56892.10	71526.90	47.5	58.0	171.6	1
'HSB 69A '	56465.10	71549.40	83.1	93.1	171.5	1
'HSB 83A '	58606.10	71648.60	65.2	76.0	173.0	1
'HSB 84A '	56359.10	71586.20	64.7	75.9	171.7	1
'HSB 85A '	58943.40	73791.90	61.1	71.1	168.6	1
'HSB 86A '	55985.90	72520.20	63.1	73.9	168.4	1
'HSB117A '	55170.10	72733.60	84.8	94.8	166.5	1
'HSB118A '	55775.60	72696.40	91.0	101.0	167.4	1
'HSB119A '	56100.20	73082.50	93.3	103.3	166.8	1
'HSB120A '	56431.90	73395.10	91.0	101.0	166.1	1
'HSB121A '	57389.60	72024.80	88.3	98.3	171.4	1
'HSB122A '	57747.40	72195.90	85.4	95.4	171.2	1
'HSB123A '	58124.80	72189.80	93.6	103.6	171.5	1
'HSB139A '	57365.40	71127.40	87.6	97.6	173.3	1
'HSB141A '	59168.70	71213.60	80.6	90.6	174.8	1
'HSB144A '	56200.50	71892.10	78.6	88.6	171.3	1
'HSB146A '	58454.00	70478.90	85.5	95.5	176.0	1
'P 27B '	64000.30	70405.90	74.8	94.8	180.9	1
'YSC 1A '	65438.90	78039.90	76.8	136.9	163.1	1
'YSC 2A '	66100.10	78311.50	134.7	144.7	162.6	1
'YSC 5A '	67134.90	74295.90	116.0	121.0	180.9	1

"lower" aquifer zone wells (173):

'BG 92 '	56828.00	79019.60	197.2	227.2	208.8	2
'BG 93 '	57160.80	79930.80	180.5	210.5	199.0	2
'BG 94 '	57494.00	80867.20	152.8	182.8	191.0	2
'BG 95 '	58407.00	80059.90	152.5	182.5	192.7	2
'BG 96 '	58297.80	79396.30	177.2	207.2	197.6	2
'BG 103 '	59752.10	77883.60	169.5	199.5	199.9	2
'BG 115 '	57884.50	77207.20	198.9	218.9	215.8	2
'BG 122 '	56789.70	78581.10	189.9	209.9	211.1	2
'BGO 5C '	58794.50	76476.90	183.2	193.2	216.2	2
'BGO 6B '	58346.50	76553.20	139.7	149.7	219.2	2
'BGO 6C '	58307.00	76487.10	158.0	168.0	220.2	2
'BGO 8C '	57618.70	76579.20	174.3	184.3	224.6	2
'BGO 10B '	56978.80	76982.10	139.0	149.0	220.3	2
'BGO 10C '	57041.10	76805.20	157.3	167.3	220.5	2
'BGO 12C '	56241.10	76805.20	153.6	163.6	220.1	2
'BGO 12CR'	56215.20	76806.00	144.0	154.0	221.8	2
'BGO 14C '	55839.00	76367.70	192.1	202.1	221.2	2
'BGO 14CR'	55789.00	76337.80	190.1	200.1	224.1	2
'BGO 16B '	56183.80	75767.50	136.0	146.0	218.8	2
'BGO 27C '	54671.40	75666.30	154.9	163.9	221.0	2
'BGO 29C '	54099.10	75577.80	176.8	186.8	223.4	2
'BGO 30C '	54512.30	75181.00	178.4	188.4	219.1	2
'BGO 31C '	54816.20	74978.00	176.4	186.4	225.7	2
'BGO 33C '	55681.40	74479.70	177.8	187.8	225.3	2
'BGO 35C '	56545.70	73953.90	161.9	171.9	228.7	2
'BGO 37C '	57279.20	73498.20	168.8	178.8	230.7	2
'BGO 42C '	55522.30	76404.70	185.9	195.9	223.8	2
'BGO 43CR'	56237.20	77035.20	178.4	188.4	225.8	2
'BGO 44B '	57865.80	76756.00	148.1	158.1	220.8	2
'BGO 44C '	57894.90	76757.80	190.6	200.6	220.7	2
'BGO 45B '	54563.60	75840.30	137.0	147.0	219.5	2
'BGO 45C '	54577.40	75835.00	190.5	200.5	223.2	2
'BGO 46B '	54444.70	75012.10	140.4	150.4	218.3	2
'BGO 46C '	54433.90	75022.20	178.0	188.0	220.1	2
'BGO 47C '	54933.40	74752.00	178.6	188.6	223.2	2
'BGO 48C '	55124.40	74599.60	176.7	186.7	223.8	2
'BGO 49C '	56202.20	73917.20	166.0	176.0	228.4	2
'BGO 50C '	54197.00	75190.40	162.5	172.5	218.9	2

'BGX 1C '	58599.80	76820.00	176.0	186.0	216.2	2
'BGX 2B '	58256.50	77203.40	137.2	147.2	213.0	2
'BGX 2D '	58265.60	77192.40	181.1	191.1	215.7	2
'BGX 3D '	57780.10	77577.00	201.6	221.6	215.3	2
'BGX 4C '	57202.20	77886.20	170.7	180.7	215.0	2
'BGX 5D '	57308.60	78402.00	195.0	215.0	209.4	2
'BGX 6D '	57524.90	78740.10	191.0	211.0	206.2	2
'BGX 7D '	58312.80	78349.30	194.1	214.1	206.0	2
'BGX 8DR'	58942.50	77589.60	183.1	203.1	205.7	2
'BGX 12C '	59675.30	74427.90	174.1	184.1	235.0	2
'FBP 1A '	51080.70	78893.00	161.8	191.8	206.6	2
'FBP 2A '	50534.10	79711.40	137.1	167.1	191.4	2
'FBP 3A '	50913.40	79838.90	141.0	171.0	194.2	2
'FBP 4 '	51368.20	79320.00	165.2	195.2	212.3	2
'FBP 5D '	51073.90	79193.80	192.6	212.6	205.5	2
'FBP 6D '	50547.10	79672.90	178.3	198.3	195.5	2
'FBP 7D '	50878.90	79805.70	183.2	203.2	194.7	2
'FBP 8D '	51386.40	79291.80	172.8	192.8	207.4	2
'FBP 9D '	51074.00	79565.10	177.9	197.9	200.6	2
'FBP 10D '	50535.80	79329.70	180.8	200.8	201.2	2
'FBP 11D '	50767.90	79099.30	192.0	212.1	203.4	2
'FBP 12D '	51165.70	78932.30	182.1	202.1	208.5	2
'FBP 13D '	50694.10	79748.90	172.7	192.7	195.0	2
'FC 1B '	53115.00	79672.40	151.8	156.8	210.8	2
'FC 1C '	53115.10	79680.10	183.9	188.9	214.0	2
'FC 3D '	57647.90	78728.40	165.9	170.9	206.4	2
'FC 3E '	57655.50	78728.80	185.7	190.7	205.3	2
'FC 3F '	57663.20	78729.10	205.1	210.1	206.2	2
'FC 4D '	53910.70	82262.20	146.4	151.4	151.0	2
'FC 4E '	53915.30	82268.90	176.4	181.4	185.2	2
'FCB 3 '	54874.40	76427.80	195.3	225.3	221.7	2
'FNB 1 '	54271.60	80151.50	177.2	207.2	210.8	2
'FNB 2 '	54362.10	80442.30	180.8	210.8	206.8	2
'FNB 3 '	54105.80	80553.10	182.1	212.1	209.1	2
'FNB 4 '	53843.50	80409.80	179.6	209.6	213.6	2
'FSB 76C '	51396.40	76112.40	154.8	165.3	212.9	2
'FSB 78C '	50170.20	74772.50	141.6	151.4	208.0	2
'FSB 79C '	50171.30	73668.00	149.8	159.6	196.7	2
'FSB 87C '	50093.40	75591.90	148.8	159.3	208.8	2
'FSB 88C '	51518.00	75619.40	158.4	168.4	212.7	2
'FSB 89C '	51345.20	75553.20	156.1	166.1	211.9	2
'FSB 90C '	51148.60	75382.90	158.1	168.1	210.8	2
'FSB 91C '	50953.50	75213.30	149.1	159.1	210.8	2
'FSB 92C '	50564.00	75053.20	147.6	157.6	210.1	2
'FSB 93C '	50458.30	74897.30	142.0	152.0	208.7	2
'FSB 94C '	50180.00	74869.00	139.8	149.8	207.7	2
'FSB 95C '	50016.70	74971.70	145.8	155.8	205.6	2
'FSB 97C '	49970.60	75179.60	143.8	153.8	208.2	2
'FSB 98C '	50116.50	75381.20	148.4	158.4	209.3	2
'FSB 99C '	50320.60	75683.70	157.2	167.2	209.7	2
'FSB102C '	50834.80	73582.90	145.9	155.9	195.2	2
'FSB105C '	49828.00	75234.20	141.5	151.5	207.6	2
'FSB106C '	50651.30	74190.10	156.0	166.0	201.3	2
'FSB107C '	51158.10	75184.00	150.8	160.8	210.0	2
'FSB110C '	50150.60	74190.70	137.2	147.2	201.0	2
'FSB111C '	51526.30	75383.30	159.0	169.0	212.1	2
'FSB112C '	48794.80	74227.50	129.1	139.1	202.1	2
'FSB113C '	51084.20	74160.70	154.0	164.0	202.6	2
'FSB114C '	52033.80	75288.50	158.0	168.0	213.7	2
'FSB120C '	49171.10	75549.80	150.7	160.7	206.4	2
'FSB121C '	48413.10	75155.70	148.4	158.4	204.6	2
'FSB123C '	51750.50	74566.70	155.3	165.3	210.6	2
'HAA 1B '	62976.00	69872.20	119.3	129.3	251.4	2
'HAA 1C '	62983.00	69866.20	147.4	157.4	251.9	2
'HAA 2B '	61267.50	70935.40	127.2	137.2	252.9	2

'HAA 2C '	61258.90	70940.40	171.9	181.9	254.1	2
'HAA 3B '	60178.40	71453.20	125.9	135.9	240.1	2
'HAA 3C '	60167.40	71436.90	163.3	173.3	243.3	2
'HAA 4B '	61909.90	72222.90	124.5	135.0	250.0	2
'HAA 4C '	61899.90	72223.10	158.3	168.3	251.3	2
'HAA 6B '	63879.80	71440.40	131.3	141.4	235.4	2
'HAA 6C '	63889.90	71440.60	161.1	171.1	235.6	2
'HC 2C '	61872.00	71784.00	135.7	140.7	253.7	2
'HC 2D '	61866.00	71784.00	178.2	183.2	255.8	2
'HC 4A '	63409.00	71606.00	150.0	155.0	244.7	2
'HC 6A '	62060.00	72150.00	156.2	161.2	252.2	2
'HC 8C '	60065.10	77484.40	187.3	192.3	197.5	2
'HC 10B '	61600.10	75801.30	164.8	169.8	208.9	2
'HC 12B '	59488.40	73186.90	177.3	182.3	240.8	2
'HMD 1D '	56973.30	78731.70	199.7	219.7	209.9	2
'HMD 2D '	57269.70	79665.80	190.8	210.8	201.0	2
'HMD 3D '	57745.20	79578.70	187.7	207.7	200.5	2
'HMD 4D '	58188.50	79160.40	188.9	208.9	199.9	2
'HSB 65B '	58439.40	72445.60	123.3	133.3	224.4	2
'HSB 68B '	56882.10	71525.50	123.5	134.5	216.8	2
'HSB 68C '	56872.70	71524.10	168.4	179.5	217.9	2
'HSB 70C '	55757.10	72597.30	164.9	174.9	223.2	2
'HSB 71C '	55281.50	72866.60	171.9	181.9	222.8	2
'HSB 83B '	58594.90	71639.60	121.2	132.1	222.8	2
'HSB 83C '	58614.80	71636.90	160.2	171.2	224.7	2
'HSB 84B '	56352.40	71603.30	121.8	132.9	210.8	2
'HSB 84C '	56360.10	71597.10	170.9	181.8	213.8	2
'HSB 85B '	58953.30	73789.30	133.2	143.2	233.7	2
'HSB 86B '	55976.90	72519.00	113.8	124.0	221.7	2
'HSB100C '	58806.50	72077.20	153.0	163.0	226.7	2
'HSB101C '	58604.40	72001.90	166.3	176.3	225.4	2
'HSB102C '	58399.70	71960.10	166.7	176.7	224.6	2
'HSB103C '	58323.60	71593.90	159.2	169.2	223.4	2
'HSB104C '	58082.60	71376.80	163.5	173.5	220.7	2
'HSB105C '	57883.80	71447.30	152.2	162.2	219.6	2
'HSB106C '	57651.50	71720.90	158.7	168.7	221.7	2
'HSB107C '	57432.00	71698.50	159.3	169.3	219.3	2
'HSB109C '	56895.60	71684.80	168.4	178.4	218.9	2
'HSB110C '	56680.70	71779.30	171.4	181.4	219.2	2
'HSB111C '	56501.90	71919.40	140.7	150.7	220.4	2
'HSB112C '	56417.40	72156.40	140.6	150.6	221.7	2
'HSB113C '	56160.40	72312.30	151.7	161.7	222.1	2
'HSB115C '	56043.20	72653.20	182.8	192.8	224.4	2
'HSB116C '	55989.10	72888.10	180.5	190.5	225.3	2
'HSB117C '	55162.90	72740.70	165.1	175.1	221.8	2
'HSB125C '	58592.80	71503.60	145.6	155.6	223.3	2
'HSB127C '	56792.10	71210.10	148.4	158.4	210.2	2
'HSB129C '	55110.00	71830.40	147.8	157.8	205.6	2
'HSB133C '	59110.30	71949.50	173.3	183.3	230.5	2
'HSB134C '	58289.90	71210.30	149.1	159.1	220.8	2
'HSB135C '	56560.80	71390.20	147.3	157.3	206.6	2
'HSB136C '	55949.60	71900.30	160.5	170.5	217.4	2
'HSB137C '	55700.20	72269.90	163.8	173.8	220.3	2
'HSB139C '	57374.50	71129.80	148.5	158.5	214.4	2
'HSB141C '	59170.20	71196.70	154.7	164.7	228.9	2
'HSB142C '	53505.30	73119.00	161.6	171.6	198.2	2
'HSB143C '	52773.20	73738.20	169.1	179.1	209.4	2
'HSB145C '	57769.00	71098.90	164.7	174.7	213.3	2
'HSB146C '	58473.10	70471.60	152.3	162.3	209.9	2
'HSB151C '	54014.90	72997.90	170.6	180.6	207.8	2
'HSB152C '	54346.70	72012.00	173.1	183.1	198.9	2
'NBG 4 '	54329.20	78942.10	196.1	227.5	217.0	2
'NBG 5 '	54515.60	78943.40	194.9	226.4	217.7	2
'P 27C '	64004.90	70391.70	139.6	144.6	243.6	2
'SBG 1 '	63749.10	74619.40	190.7	220.7	237.8	2

'YSC 1C '	65855.50	78186.20	197.5	207.5	217.1	2
'YSC 2D '	66130.70	78320.40	197.9	218.0	216.5	2
'YSC 4C '	65901.90	77059.70	195.9	205.9	227.4	2
'ZBG 2 '	67472.90	76170.50	210.9	230.9	221.7	2
'ZW 2 '	54388.70	80701.50	194.8	204.8	207.3	2

"upper" aquifer zone wells (415):

'BG 26 '	58809.70	73958.40	210.7	230.7	239.3	3
'BG 27 '	58810.00	74356.70	234.4	254.4	240.9	3
'BG 28 '	58810.20	74752.00	239.7	259.7	247.1	3
'BG 29 '	58809.90	75151.60	231.6	251.6	245.0	3
'BG 30 '	58809.10	75550.10	231.7	251.7	237.6	3
'BG 31 '	58803.70	75949.90	223.3	243.3	233.7	3
'BG 32 '	58803.50	76349.90	226.9	246.9	233.4	3
'BG 33 '	58526.00	76479.90	221.2	241.2	232.9	3
'BG 34 '	58107.40	76493.60	217.4	237.4	232.8	3
'BG 35 '	57726.40	76495.30	228.0	248.0	232.9	3
'BG 36 '	57620.30	76747.60	223.3	243.3	232.5	3
'BG 37 '	57251.00	76804.90	227.8	247.8	232.8	3
'BG 38 '	56851.10	76805.00	225.9	245.9	232.3	3
'BG 39 '	56451.30	76804.90	226.0	246.0	231.7	3
'BG 40 '	56051.00	76805.10	221.9	241.9	231.4	3
'BG 41 '	55868.80	76576.30	221.0	241.0	230.8	3
'BG 42 '	55869.50	76178.80	217.1	237.1	230.7	3
'BG 43 '	56039.40	75852.50	222.9	242.9	230.5	3
'BG 51 '	58599.30	73864.30	221.2	241.2	240.7	3
'BG 52 '	55524.30	75910.40	223.8	243.8	229.3	3
'BG 53 '	55073.90	76157.30	214.7	234.7	228.0	3
'BG 54 '	54830.30	75837.90	215.2	235.2	228.6	3
'BG 55 '	54590.50	75525.30	214.9	234.9	226.6	3
'BG 56 '	54481.90	75206.50	210.9	230.9	225.1	3
'BG 57 '	54820.00	75000.40	214.6	234.6	225.3	3
'BG 58 '	55162.30	74790.90	218.2	238.2	226.8	3
'BG 59 '	55508.30	74593.40	217.7	237.7	229.8	3
'BG 60 '	55850.30	74386.30	215.5	235.5	230.8	3
'BG 61 '	56360.80	74075.40	225.0	245.0	232.8	3
'BG 62 '	56530.90	73971.60	222.5	242.5	233.4	3
'BG 63 '	56870.50	73754.50	224.2	244.2	235.2	3
'BG 64 '	57212.40	73547.20	227.3	247.3	238.1	3
'BG 65 '	57552.70	73340.60	230.9	250.9	235.7	3
'BG 66 '	57805.00	73585.00	231.0	251.0	235.2	3
'BG 67 '	57902.60	73954.10	224.7	244.7	236.5	3
'BG 98 '	57398.70	77597.90	212.5	242.5	224.5	3
'BG 99 '	58404.10	76904.60	215.9	245.9	232.5	3
'BG 100 '	58899.10	77815.60	203.3	233.3	224.8	3
'BG 104 '	59888.00	77038.80	215.8	245.8	224.6	3
'BG 107 '	60120.10	74803.60	208.3	228.3	235.2	3
'BG 108 '	59827.90	74383.00	217.3	247.3	238.8	3
'BG 109 '	59626.10	73926.20	228.4	258.4	240.2	3
'BG 110 '	59277.20	73354.70	224.3	254.3	241.3	3
'BG 124 '	57095.00	77254.00	214.8	234.8	231.8	3
'BGO 1D '	58779.30	73737.90	225.0	245.0	238.0	3
'BGO 2D '	58809.70	74552.90	218.9	238.9	238.4	3
'BGO 3D '	58809.20	75351.30	227.6	247.6	235.6	3
'BGO 4D '	58803.70	76150.10	220.6	240.6	232.1	3
'BGO 5D '	58784.80	76477.50	219.3	239.3	231.1	3
'BGO 6D '	58297.10	76487.30	217.2	237.2	231.5	3
'BGO 7D '	57917.20	76494.50	220.2	240.2	233.1	3
'BGO 8D '	57617.80	76588.80	220.6	240.6	233.4	3
'BGO 10D '	57030.60	76805.10	230.5	250.5	231.9	3
'BGO 10DR'	57073.70	76804.80	218.3	238.3	232.2	3
'BGO 11D '	56651.30	76805.10	216.3	236.3	230.7	3
'BGO 12D '	56231.10	76805.20	217.8	237.8	231.2	3
'BGO 13D '	55840.00	76805.30	228.5	248.5	231.1	3
'BGO 13DR'	55840.40	76824.70	210.3	220.3	231.4	3

'BGO 14DR'	55789.40	76322.10	218.1	238.1	231.2	3
'BGO 15D '	55859.10	75973.50	218.7	238.7	230.2	3
'BGO 16D '	56202.10	75751.40	217.3	237.3	231.1	3
'BGO 17D '	56399.40	75599.60	204.0	224.0	230.8	3
'BGO 17DR'	56407.20	75604.00	216.9	236.9	232.2	3
'BGO 18D '	56711.20	75600.00	219.6	239.6	232.1	3
'BGO 19D '	56997.30	75350.00	196.8	216.8	231.1	3
'BGO 20D '	57113.80	74962.20	216.3	236.3	234.5	3
'BGO 21D '	57470.70	74688.50	217.7	237.7	235.2	3
'BGO 22DR'	57831.50	74471.50	219.2	239.2	236.2	3
'BGO 23D '	58133.00	74238.10	222.0	242.0	236.1	3
'BGO 24D '	58438.80	74012.40	221.0	241.0	237.1	3
'BGO 26D '	55015.20	76128.00	213.4	233.5	228.1	3
'BGO 27D '	54680.20	75677.30	209.3	229.3	227.7	3
'BGO 28D '	54457.90	75348.30	210.1	230.1	226.3	3
'BGO 29D '	54099.40	75592.50	208.5	228.5	226.9	3
'BGO 30D '	54499.20	75187.70	207.8	227.8	225.9	3
'BGO 31D '	54841.70	74985.30	211.1	231.1	226.8	3
'BGO 32D '	55250.20	74727.00	214.5	234.5	227.9	3
'BGO 33D '	55695.40	74468.70	213.1	233.1	230.4	3
'BGO 34D '	56082.60	74228.80	212.7	232.7	233.2	3
'BGO 35D '	56556.50	73946.00	219.4	239.4	235.1	3
'BGO 36D '	56888.10	73743.80	223.3	243.3	237.3	3
'BGO 37D '	57292.90	73490.80	226.1	246.1	238.5	3
'BGO 38D '	57557.50	73329.30	222.3	242.3	235.7	3
'BGO 39D '	57831.00	73583.50	224.7	244.7	235.4	3
'BGO 40D '	54638.60	76125.80	216.6	226.5	222.9	3
'BGO 43D '	56238.80	77056.70	198.2	208.2	231.8	3
'BGO 44D '	57910.00	76759.50	223.4	233.4	232.6	3
'BGO 45D '	54585.60	75854.30	209.6	229.6	228.3	3
'BGO 46D '	54420.00	75033.80	202.1	212.1	225.7	3
'BGO 47D '	54922.90	74739.70	203.4	213.4	226.7	3
'BGO 48D '	55121.00	74586.40	202.0	212.0	227.1	3
'BGO 49D '	56198.80	73931.50	218.5	238.5	234.9	3
'BGO 50D '	54209.10	75181.30	208.0	228.0	225.6	3
'BGX 1D '	58608.60	76809.50	214.7	234.7	229.8	3
'BGX 9D '	59522.10	76936.00	212.4	232.4	226.8	3
'BGX 10D '	59765.50	76183.30	216.2	236.2	226.0	3
'BGX 11D '	59581.40	75300.70	216.7	236.7	235.7	3
'BGX 12D '	59674.30	74410.90	223.7	243.7	239.2	3
'BRR 1D '	50588.20	77365.20	200.4	220.4	216.8	3
'BRR 4D '	50104.50	77360.50	198.7	218.7	214.9	3
'BRR 5D '	50009.00	77266.70	202.1	222.1	214.9	3
'F 10 '	50444.30	75155.30	266.5	276.5	270.4	3
'F 18A '	50108.00	74170.20	194.4	204.4	203.8	3
'FAC 3 '	55322.70	78018.30	224.8	254.8	229.1	3
'FAC 5 '	55241.30	77960.30	214.0	234.0	224.9	3
'FAC 5P '	55314.80	78175.70	225.7	235.7	229.7	3
'FAC 6 '	55335.50	78129.00	216.2	236.2	220.8	3
'FAC 7 '	55356.20	78123.40	215.7	235.7	223.2	3
'FAC 8 '	55366.00	78090.90	216.0	236.0	227.2	3
'FAL 1 '	53756.40	78115.90	207.0	238.5	218.9	3
'FAL 2 '	53757.40	78231.90	206.6	238.0	217.1	3
'FC 1D '	53114.50	79688.30	217.2	222.2	223.6	3
'FCA 2D '	53715.20	78295.80	219.0	239.0	225.1	3
'FCA 9D '	53733.10	78600.50	221.9	241.9	225.3	3
'FCA 10A '	53571.90	78640.40	221.0	241.0	225.3	3
'FCA 10D '	53732.00	78640.00	219.5	239.5	226.3	3
'FCA 16A '	53568.80	78899.50	215.1	235.1	225.2	3
'FCA 16D '	53719.50	78898.50	221.1	241.1	225.0	3
'FCA 19D '	53719.10	78271.90	209.7	229.7	217.1	3
'FCB 1 '	54871.80	76835.40	205.6	235.6	229.9	3
'FCB 2 '	55046.70	76679.70	205.2	235.2	228.9	3
'FCB 4 '	54605.90	76780.40	204.5	234.5	227.9	3
'FCB 5 '	54773.00	76492.60	217.1	237.1	228.6	3

'FCB 6 '	54733.40	76582.10	215.1	235.1	228.9	3
'FCB 7 '	54957.10	76913.90	218.3	238.3	230.8	3
'FET 1D '	53299.90	76165.60	206.9	226.9	223.6	3
'FET 2D '	52981.20	76045.80	209.5	229.5	222.3	3
'FET 3D '	53025.70	75961.00	203.0	223.0	222.3	3
'FET 4D '	53149.00	75959.30	205.1	225.1	222.8	3
'FSB 0PD'	49849.80	74549.20	171.6	215.3	207.4	3
'FSB 76 '	51388.80	76141.60	197.0	227.0	218.1	3
'FSB 77 '	50713.10	75129.40	186.4	216.4	212.2	3
'FSB 78 '	50164.70	74764.00	187.7	217.7	208.7	3
'FSB 79 '	50139.70	73663.10	174.1	204.1	201.9	3
'FSB 87D '	50081.10	75586.30	187.4	216.8	213.6	3
'FSB 88D '	51527.00	75621.80	202.1	222.1	216.1	3
'FSB 89D '	51335.80	75548.30	201.9	221.9	215.5	3
'FSB 90D '	51140.70	75376.90	205.1	225.1	215.0	3
'FSB 91D '	50946.60	75207.60	200.9	220.9	213.7	3
'FSB 92D '	50557.60	75045.80	201.7	221.7	211.9	3
'FSB 93D '	50452.40	74888.50	197.9	217.9	210.8	3
'FSB 94DR'	50162.90	74869.10	183.3	203.4	210.1	3
'FSB 95D '	50008.90	74977.50	207.8	227.8	208.8	3
'FSB 95DR'	49996.00	74991.70	187.0	207.0	210.3	3
'FSB 97D '	49975.50	75188.90	196.9	216.9	210.7	3
'FSB 98D '	50111.60	75371.90	200.3	220.3	212.4	3
'FSB 99D '	50326.90	75691.70	198.1	218.1	211.9	3
'FSB104D '	49255.40	73865.20	190.4	210.4	204.2	3
'FSB105D '	49833.30	75244.30	203.7	223.7	208.3	3
'FSB105DR'	49841.00	75258.10	188.5	208.6	211.1	3
'FSB106D '	50636.80	74193.00	202.9	222.9	206.8	3
'FSB107D '	51149.80	75177.20	200.9	220.9	213.8	3
'FSB108D '	51142.30	76260.70	203.8	223.8	217.6	3
'FSB109D '	50488.60	75855.90	205.8	225.8	213.3	3
'FSB110D '	50141.60	74193.30	191.1	211.1	205.4	3
'FSB111D '	51515.90	75382.90	201.7	221.7	215.0	3
'FSB112D '	48780.00	74223.70	188.9	208.9	206.2	3
'FSB113D '	51098.40	74154.80	189.6	209.6	207.6	3
'FSB114D '	52018.60	75278.60	197.7	217.8	217.3	3
'FSB117D '	50486.80	74070.40	189.7	209.7	205.2	3
'FSB118D '	51276.30	74697.90	191.3	211.3	211.7	3
'FSB119D '	50600.60	74599.70	193.1	213.1	208.4	3
'FSB120D '	49163.70	75568.70	196.5	216.5	209.6	3
'FSB121DR'	48429.70	75151.90	191.3	211.3	207.4	3
'FSB122C '	48195.00	73881.80	160.0	170.0	200.0	3
'FSB122D '	48201.70	73865.50	186.6	206.6	203.8	3
'FSB123D '	51734.80	74562.70	194.1	214.1	212.3	3
'FSL 1D '	52992.50	79063.10	208.5	228.6	224.4	3
'FSL 2D '	52790.60	78636.50	208.7	228.8	224.9	3
'FSL 3D '	52465.20	77765.20	205.9	226.0	223.0	3
'FSL 4D '	52230.40	77452.40	204.0	224.1	217.2	3
'FSL 5D '	51903.30	77047.70	203.5	223.7	220.8	3
'FSL 6D '	51727.90	76733.10	202.1	222.1	220.0	3
'FSL 7D '	51485.60	76327.80	199.5	219.6	219.0	3
'FSL 8D '	51513.50	76054.70	202.7	222.8	218.0	3
'FSL 9D '	51543.90	75768.40	201.4	221.5	216.0	3
'FSS 1D '	53897.60	75257.60	209.9	229.9	223.7	3
'FSS 2D '	53918.90	75103.50	204.4	224.4	223.1	3
'FSS 3D '	53548.00	74960.50	205.8	225.8	220.8	3
'FSS 4D '	52876.10	75537.80	202.6	222.6	218.9	3
'FTF 2 '	53275.10	77336.00	219.4	239.4	225.0	3
'FTF 3 '	53244.80	77235.30	218.2	221.2	224.0	3
'FTF 4 '	53268.20	77132.90	216.6	236.6	224.4	3
'FTF 5 '	53168.30	77035.60	215.3	235.3	224.8	3
'FTF 6 '	53062.00	77151.40	216.9	236.9	224.3	3
'FTF 7 '	53089.70	77235.90	222.1	226.1	223.6	3
'FTF 8 '	53059.90	77336.20	219.6	239.6	226.7	3
'FTF 9 '	52769.50	77482.80	216.4	236.4	224.0	3

'FTF 10 '	52905.00	77336.00	215.1	235.1	224.2	3
'FTF 11 '	52748.80	77180.70	215.8	235.8	224.8	3
'FTF 12 '	52648.50	77321.40	215.0	235.0	226.7	3
'FTF 13 '	53098.40	76637.80	216.1	236.1	225.6	3
'FTF 15 '	53230.00	76732.00	197.5	227.5	225.1	3
'FTF 16 '	52879.80	76758.60	203.8	233.8	223.3	3
'FTF 17 '	52884.00	76872.00	200.6	230.6	223.1	3
'FTF 18 '	52879.20	76955.80	202.3	232.3	223.4	3
'FTF 19 '	52670.40	77139.10	198.3	228.3	222.5	3
'FTF 20 '	52500.00	77015.00	198.3	228.3	221.9	3
'FTF 21 '	52498.60	76866.70	198.7	228.7	223.2	3
'FTF 22 '	52494.70	76751.30	212.6	242.6	221.8	3
'FTF 23 '	52660.30	76611.80	201.2	231.2	222.3	3
'FTF 24A '	52780.80	77256.60	212.7	232.7	221.9	3
'FTF 25A '	52868.70	77308.40	212.8	232.8	223.3	3
'FTF 26 '	52875.40	77250.00	206.3	226.3	223.3	3
'FTF 27 '	52823.50	77227.20	213.5	243.5	223.4	3
'H 6 '	58335.40	72009.10	225.2	235.2	231.0	3
'H 7 '	58336.10	71949.20	224.9	234.9	229.0	3
'H 8 '	58233.90	71615.40	218.4	228.4	227.0	3
'H 9 '	58275.30	71572.60	207.4	217.4	226.8	3
'H 10 '	57822.80	71607.20	222.5	232.5	227.3	3
'H 11 '	57779.40	71565.90	212.0	222.0	227.7	3
'H 18A '	57337.70	71339.60	217.5	227.5	224.1	3
'H 19 '	57041.70	71434.20	219.6	221.1	223.8	3
'HAA 1D '	62991.00	69859.10	261.8	281.8	276.2	3
'HAA 2D '	61250.60	70945.40	260.3	280.4	276.4	3
'HAA 3D '	60154.30	71418.40	246.7	266.7	262.1	3
'HAA 4D '	61890.00	72223.30	255.7	275.7	269.8	3
'HAA 6D '	63900.20	71440.30	247.1	267.2	264.8	3
'HAC 1 '	61415.20	72171.00	258.8	278.8	269.2	3
'HAC 2 '	61366.90	72220.20	258.8	278.8	268.8	3
'HAC 3 '	61313.60	72183.40	255.0	275.0	268.9	3
'HAC 4 '	61372.00	72120.30	254.1	274.1	269.4	3
'HAP 1 '	63398.80	71209.80	256.3	276.3	270.7	3
'HAP 2 '	63519.80	71122.90	243.8	263.8	270.3	3
'HC 1D '	61867.00	71746.00	206.5	211.5	268.9	3
'HC 1E '	61864.00	71746.00	251.5	256.5	275.0	3
'HC 2E '	61861.00	71784.00	205.7	210.7	269.5	3
'HC 2F '	61861.00	71780.00	250.7	255.7	274.3	3
'HC 6B '	62070.00	72150.00	210.2	215.2	268.9	3
'HC 11C '	62131.40	74496.40	190.8	195.8	236.6	3
'HCA 1 '	63109.00	72521.70	253.7	273.7	269.2	3
'HCA 2 '	62943.30	72265.90	242.0	273.4	270.2	3
'HCA 3 '	63108.70	72651.70	253.8	273.8	269.0	3
'HCA 4 '	62942.90	72523.70	241.9	273.3	269.3	3
'HCB 1 '	63921.50	71426.80	222.6	252.6	263.4	3
'HCB 2 '	63797.90	71289.70	239.9	269.9	267.9	3
'HCB 3 '	63919.90	71098.80	233.6	263.6	266.4	3
'HCB 4 '	64054.50	71244.20	235.9	265.9	264.4	3
'HET 1D '	60546.00	71948.30	240.3	260.3	267.5	3
'HET 2D '	60094.40	72006.00	239.7	259.7	258.3	3
'HET 3D '	60110.50	72093.90	239.9	259.9	258.7	3
'HET 4D '	60166.50	72178.10	239.5	259.6	259.1	3
'HR3 11 '	60146.50	71402.80	200.4	230.0	259.4	3
'HR3 13 '	60065.50	71649.40	205.1	234.8	258.5	3
'HR8 11 '	59559.80	71945.70	207.9	237.6	245.9	3
'HR8 12 '	59330.10	71780.10	206.3	235.9	239.4	3
'HR8 13 '	59300.20	71559.60	201.7	231.4	237.7	3
'HR8 14 '	59612.10	71431.40	202.3	231.9	244.0	3
'HSB 65 '	58432.00	72425.60	212.4	242.4	232.7	3
'HSB 65C '	58447.10	72439.60	207.8	218.6	232.7	3
'HSB 66 '	56928.30	72429.20	198.1	228.1	225.4	3
'HSB 67 '	58424.30	71505.00	200.7	230.7	223.8	3
'HSB 68 '	56901.00	71528.00	213.3	243.3	221.9	3

'HSB 69	'	56475.10	71546.90	199.0	229.0	219.5	3
'HSB 70	'	55758.90	72606.90	205.7	235.7	224.5	3
'HSB 71	'	55279.20	72875.90	204.8	234.8	224.1	3
'HSB 83D	'	58601.70	71628.10	198.7	228.7	224.8	3
'HSB 84D	'	56349.90	71583.90	199.5	219.5	218.9	3
'HSB 85C	'	58947.40	73802.30	214.2	224.2	238.9	3
'HSB 86C	'	55984.60	72529.70	189.4	199.4	223.8	3
'HSB 86D	'	55996.50	72522.10	206.6	236.6	223.7	3
'HSB100D	'	58796.90	72073.80	216.9	236.9	233.4	3
'HSB101D	'	58594.80	71997.50	216.1	236.1	230.7	3
'HSB102D	'	58393.40	71952.40	216.3	236.3	228.2	3
'HSB103D	'	58315.60	71588.10	213.7	233.7	225.6	3
'HSB104D	'	58075.80	71370.20	210.6	230.6	224.9	3
'HSB105D	'	57877.40	71454.80	211.8	231.8	225.3	3
'HSB106D	'	57644.80	71727.80	210.7	230.7	225.9	3
'HSB107D	'	57412.20	71696.60	215.1	235.1	224.7	3
'HSB108D	'	57145.60	71688.00	212.0	232.0	223.6	3
'HSB109D	'	56885.50	71685.60	213.0	233.0	222.9	3
'HSB110D	'	56672.10	71785.20	211.4	231.4	222.2	3
'HSB111D	'	56494.50	71926.20	185.7	195.7	222.1	3
'HSB111E	'	56487.20	71932.80	211.7	231.7	222.2	3
'HSB112D	'	56408.10	72161.60	188.3	198.3	222.9	3
'HSB112E	'	56399.50	72166.60	211.7	231.7	222.8	3
'HSB113D	'	56164.30	72302.70	216.2	236.2	222.9	3
'HSB114D	'	56104.60	72474.20	212.8	232.8	223.6	3
'HSB115D	'	56039.80	72662.30	213.9	233.9	224.3	3
'HSB116D	'	55988.20	72898.10	214.5	234.5	226.3	3
'HSB125D	'	58584.10	71498.20	199.4	219.4	221.1	3
'HSB126D	'	57169.60	70633.40	190.5	200.5	204.9	3
'HSB127D	'	56788.00	71218.90	197.8	217.8	218.2	3
'HSB129D	'	55103.40	71837.10	185.2	205.2	208.3	3
'HSB132C	'	58787.70	71472.40	168.6	178.6	221.5	3
'HSB132D	'	58799.30	71469.50	206.5	226.5	221.1	3
'HSB133D	'	59102.30	71943.50	208.5	228.5	235.0	3
'HSB134D	'	58296.50	71217.30	205.8	225.8	222.1	3
'HSB135D	'	56552.80	71396.70	199.9	219.9	218.3	3
'HSB136D	'	55941.70	71906.00	200.2	220.2	220.9	3
'HSB137D	'	55696.10	72278.90	205.3	225.3	222.3	3
'HSB138D	'	55260.70	73160.20	208.1	228.1	224.1	3
'HSB139D	'	57384.40	71133.20	206.7	226.7	222.7	3
'HSB141D	'	59170.90	71184.40	217.8	237.8	240.5	3
'HSB143D	'	52774.50	73754.00	196.9	216.9	213.2	3
'HSB145D	'	57753.90	71088.00	184.2	194.2	220.7	3
'HSB146D	'	58493.00	70469.70	204.0	224.1	222.0	3
'HSB147D	'	55804.40	73827.90	215.2	235.2	232.2	3
'HSB149D	'	57286.30	71338.80	207.0	227.0	222.3	3
'HSB150D	'	58692.80	71692.60	206.9	226.9	226.8	3
'HSB151D	'	54026.40	72997.80	197.6	207.6	207.2	3
'HSB152D	'	54362.10	72011.70	197.0	207.0	205.7	3
'HSL 1D	'	58925.00	72179.60	219.8	239.8	234.8	3
'HSL 2D	'	59423.50	72190.80	225.2	245.3	241.2	3
'HSL 3D	'	59770.60	72251.50	233.7	253.8	249.8	3
'HSL 4D	'	60171.90	72453.70	245.0	265.1	261.3	3
'HSL 5D	'	60339.40	72562.20	247.8	267.7	265.5	3
'HSL 6D	'	60531.10	72659.70	243.9	264.0	259.2	3
'HSL 7D	'	60723.00	72674.40	242.3	262.4	259.1	3
'HSL 8D	'	61117.10	72688.10	248.4	268.4	260.3	3
'HSS 1D	'	64675.60	67610.30	236.5	256.5	268.6	3
'HSS 2D	'	64785.90	67355.90	234.5	254.5	267.7	3
'HSS 3D	'	64709.50	68257.50	262.6	282.6	281.6	3
'HTF 1	'	62067.00	71745.00	236.9	256.9	272.8	3
'HTF 2	'	62175.00	71610.00	237.0	257.0	274.1	3
'HTF 4	'	61942.00	71630.00	235.2	255.2	274.2	3
'HTF 5	'	62110.00	71390.00	264.3	284.3	277.1	3
'HTF 6	'	62228.00	71259.00	263.6	283.6	275.9	3

'HTF	7	'	62112.00	71130.00	263.5	283.5	275.9	3
'HTF	8	'	61965.00	71270.00	263.6	283.6	273.7	3
'HTF	9	'	61698.00	71652.00	245.8	265.8	273.5	3
'HTF	10	'	61838.00	71520.00	245.2	265.2	273.2	3
'HTF	11	'	61722.00	71398.00	238.9	258.9	273.9	3
'HTF	12	'	61593.00	71520.00	242.9	262.9	273.4	3
'HTF	13	'	61586.00	71856.00	262.6	282.6	274.2	3
'HTF	14	'	61462.00	71858.00	261.9	281.9	273.5	3
'HTF	15	'	61353.00	71700.00	260.7	280.7	273.5	3
'HTF	16	'	61950.00	72150.00	248.3	268.3	269.7	3
'HTF	17	'	61188.00	72600.00	238.4	258.4	262.5	3
'HTF	18	'	61223.30	71771.80	251.7	271.7	271.5	3
'HTF	19	'	61079.20	71902.50	245.7	265.7	269.1	3
'HTF	20	'	61086.40	72073.30	251.9	271.9	267.9	3
'HTF	21	'	61261.00	71998.20	242.6	262.6	269.5	3
'HTF	22	'	62553.60	71363.40	251.4	271.4	275.4	3
'HTF	23	'	62670.30	71363.10	256.8	276.8	274.8	3
'HTF	24	'	62775.60	71362.60	257.8	277.8	274.2	3
'HTF	25	'	62902.00	71224.30	252.5	272.5	274.6	3
'HTF	26	'	62815.70	71090.70	255.5	275.5	275.4	3
'HTF	27	'	62660.30	71057.90	259.1	279.1	276.1	3
'HTF	28	'	62515.70	71080.10	251.9	271.9	275.9	3
'HTF	29	'	62414.90	71229.90	259.9	289.9	275.6	3
'HTF	31	'	62662.50	70747.00	246.7	266.7	275.7	3
'HTF	32	'	62807.90	70880.60	251.1	271.1	274.7	3
'HTF	34	'	61978.50	71144.10	251.7	271.7	275.8	3
'MGA	36	'	57891.50	73904.00	234.2	254.2	237.3	3
'MGC	9	'	55610.70	75372.10	217.3	237.3	229.6	3
'MGC	11	'	55770.70	75252.30	219.2	239.2	231.1	3
'MGC	19	'	56408.70	74770.10	230.6	234.6	232.2	3
'MGC	32	'	57448.80	73982.10	232.0	252.0	245.2	3
'MGC	36	'	57776.00	73738.90	234.4	254.4	236.1	3
'MGE	9	'	55489.40	75215.10	218.1	238.1	229.2	3
'MGE	21	'	56446.20	74487.80	227.9	247.9	234.2	3
'MGE	30	'	57175.40	73935.80	229.3	249.3	236.1	3
'MGE	34	'	57495.10	73695.00	237.2	257.2	238.6	3
'MGG	15	'	55851.50	74699.00	223.3	243.3	232.6	3
'MGG	19	'	56174.30	74456.00	226.0	246.0	232.7	3
'MGG	23	'	56491.80	74214.00	227.1	247.1	235.2	3
'MGG	28	'	56895.40	73905.00	230.3	250.3	235.7	3
'MGG	36	'	57541.70	73413.00	232.5	252.5	237.9	3
'NBG	1	'	53879.30	79300.40	200.9	232.3	224.4	3
'NBG	2	'	53958.40	79099.80	203.6	233.6	224.8	3
'NBG	3	'	54068.10	78939.60	202.1	233.5	217.6	3
'P	27D	'	64008.90	70376.90	199.5	219.5	266.6	3
'SBG	2	'	64939.60	74570.20	205.9	235.9	237.7	3
'SBG	3	'	65265.60	73699.90	206.6	236.6	237.0	3
'SBG	5	'	64499.00	72208.30	199.4	219.4	249.3	3
'SBG	6	'	63860.00	73599.30	208.1	238.1	244.3	3
'SCA	2	'	64697.10	73850.60	215.9	245.9	242.2	3
'SCA	3	'	64571.20	73959.30	220.3	240.3	241.4	3
'SCA	3A	'	64571.20	73965.00	267.1	277.1	270.8	3
'SCA	4	'	64563.50	73856.50	220.4	240.4	241.7	3
'SCA	4A	'	64567.20	73855.20	265.3	275.3	268.8	3
'SCA	5	'	64630.80	74092.90	223.7	243.7	241.4	3
'SCA	6	'	64637.50	73706.20	221.3	241.1	242.1	3
'SLP	1	'	64449.10	72958.40	228.0	248.0	245.2	3
'SLP	2	'	64529.70	72863.40	217.7	237.7	244.7	3
'YSC	1D	'	65859.10	78170.70	216.8	236.8	221.1	3
'Z	2	'	53181.60	74785.30	214.0	214.5	219.4	3
'Z	3	'	51328.30	75086.20	206.6	207.1	212.6	3
'Z	8	'	51584.90	76640.50	213.6	214.1	219.3	3
'Z	9	'	50570.50	77732.00	209.9	210.4	215.0	3
'Z	9	'	50570.50	77732.00	207.5	227.5	215.0	3
'Z	12	'	61400.90	71198.90	251.3	251.8	274.3	3

'Z 13 '	62203.60	70785.80	256.6	257.1	276.1	3
'ZBG 1 '	65584.10	76584.20	220.0	240.1	233.8	3
'ZBG 1A '	65598.80	76588.50	276.0	281.0	278.5	3
'ZDT 1 '	65114.80	71644.40	227.0	247.0	239.7	3
'ZDT 2 '	65059.90	71696.50	225.1	245.1	241.2	3
'ZW 4 '	56556.90	77667.40	229.2	239.7	232.3	3
'ZW 5 '	54708.60	75767.40	221.0	231.0	227.4	3
'ZW 6 '	52030.80	76166.00	216.7	227.2	220.3	3
'ZW 7 '	60300.70	72399.50	254.5	264.8	265.8	3
'ZW 8 '	63801.50	70800.80	254.1	264.1	270.9	3
'ZW 9 '	61400.30	73198.40	242.4	252.4	252.0	3
'ZW 10 '	63401.00	73212.40	242.2	252.2	249.7	3
'FPZ001A '	48783.93	73654.07	182.01	184.51	197.98	3
'FPZ002A '	48871.17	73720.82	189.35	191.85	201.54	3
'FPZ003A '	49095.87	73206.81	172.47	187.47	188.81	3
'FPZ004A '	49810.69	73696.74	191.96	194.46	201.48	3
'FPZ005A '	49723.21	73336.24	176.60	179.10	191.18	3
'FPZ005B '	49723.21	73336.24	183.95	188.95	191.21	3
'FPZ006A '	49824.88	73211.48	175.52	178.02	189.17	3
'FPZ006B '	49824.88	73211.48	181.70	186.70	188.80	3
'FPZ007A '	50246.41	73257.64	184.25	186.75	192.99	3
'FPZ007B '	50246.41	73257.64	189.10	194.10	194.15	3
'FPZ008A '	50617.12	73291.57	170.86	173.36	187.64	3
'FPZ008B '	50617.12	73291.57	176.90	184.40	187.57	3
'HPZ001A '	55676.72	71299.53	189.95	194.95	202.28	3
'HPZ002A '	56151.46	71690.83	207.15	212.15	218.40	3
'HPZ003A '	56295.18	70938.29	183.20	185.70	200.77	3
'HPZ003B '	56295.18	70938.29	192.97	197.97	200.72	3
'HPZ004A '	56572.29	71154.36	197.03	199.53	210.09	3
'HPZ005A '	56891.87	70995.50	204.33	206.83	212.61	3
'HPZ005B '	56891.87	70995.50	207.59	212.59	212.90	3
'HPZ006A '	56838.23	70582.95	192.71	197.71	201.78	3

Appendix D – Modified hydraulic conductivity data

Single well pumping test data

Well ID	Kh Original	Correction Factor	Kh Modified
FSB079A	143.00	1.00	143.00
FSB078A	0.82	8.58	7.04
FSB087A	51.00	1.00	51.00
FSB076A	1.29	7.06	9.11
FC002A	1.20	3.25	3.90
HSB068A	1.13	8.19	9.25
HC003A	2.60	4.21	10.95
HSB085A	8.72	2.47	21.54
HSB065A	1.74	5.58	9.71
HSB086A	5.46	3.18	17.36
HSB083A	10.50	1.99	20.90
FC002B	0.12	10.92	1.31
FSB078B	4.87	3.27	15.92
FSB087B	0.41	14.02	5.75
HSB086B	0.30	12.45	3.74
YSC004A	52.00	1.00	52.00
YSC004A	40.00	1.00	40.00
YSC004A	47.00	1.00	47.00
YSC004A	43.00	1.00	43.00
HSB083B	0.38	10.41	3.96
HSB084B	0.29	14.87	4.31
HSB065B	0.34	7.83	2.66
HSB068B	0.28	16.51	4.62
YSC001A	62.00	1.00	62.00
YSC001A	37.00	1.04	38.48
YSC001A	22.00	1.40	30.80
YSC001A	52.00	1.00	52.00
YSC001A	57.00	1.00	57.00
HC008B	1.20	5.87	7.04
HSB085B	0.58	5.99	3.47
FSB078C	0.55	4.69	2.58
HC004A	0.35	8.51	2.98
FC001B	0.05	7.50	0.38
FSB087C	0.96	7.35	7.06
HC006A	0.24	12.51	3.00
FSB076C	17.20	1.59	27.35
FSB111C	6.21	1.87	11.61
FSB111C	5.47	1.95	10.67
FSB111C	4.50	2.08	9.36
HSB130C	94.50	1.00	94.50
HSB083C	1.34	6.36	8.52
HSB101C	1.68	4.01	6.74
HSB068C	0.41	9.65	3.96
HSB084C	0.31	6.63	2.06
BG0008C	0.41	10.77	4.42
HC001C	0.95	7.52	7.14
HC008C	0.50	8.37	4.18
HC013B	0.09	7.50	0.68
HSB086C	2.27	4.35	9.87
HSB130D	0.26	5.44	1.41
BG0014C	0.89	5.79	5.15
HC004B	0.23	14.61	3.36
HSB131D	1.91	2.78	5.31

HSB131D	130.00	1.00	130.00
HC002E	0.62	7.40	4.59
HC006B	0.42	4.63	1.94
SBG004	0.54	4.25	2.30
FSB087D	0.43	8.17	3.51
HSB065C	2.44	3.86	9.42
HSB065C	0.88	6.31	5.55
SBG005	0.18	6.15	1.11
HSB084D	15.60	1.49	23.24
FET003D	18.40	1.30	23.92
HSB085C	2.09	4.47	9.34
HSB085C	1.84	4.77	8.78
HSB066	1.71	2.89	4.94
HSB083D	0.86	6.06	5.21
FET002D	40.40	1.00	40.40
HR8014	4.50	2.08	9.36
BGO011D	1.89	2.79	5.27
HSB086D	2.36	3.73	8.80
SBG006	1.01	3.45	3.48
ZW004	2.39	2.58	6.17
BGO008D	1.25	5.81	7.26
ZDT001	1.55	2.98	4.62
HC002F	1.80	4.21	7.58

Slug test data

Well ID	Kh Original	Correction Factor	Kh Modified
HAA003AA	0.50	7.61	3.81
HAA003AA	0.32	8.85	2.83
HAA001AA	9.97	2.78	27.72
HAA001AA	9.81	2.80	27.47
HSL006AA	4.21	5.69	23.95
HSL006AA	6.76	4.44	30.01
HAA006AA	0.26	22.54	5.86
HAA006AA	0.22	24.54	5.40
BGO051AA	1.19	5.69	6.77
BGO051AA	0.78	6.55	5.11
HAA002AA	30.60	2.00	61.20
HAA002AA	19.90	2.48	49.35
FC005B	0.04	13.08	0.52
HCA004AA	13.80	3.22	44.44
HCA004AA	14.00	3.19	44.66
BGO052AA	8.15	3.95	32.19
BGO052AA	0.90	12.24	11.02
BGO053AA	1.12	13.47	15.09
FC002A	8.39	2.95	24.75
FC003B	11.90	2.62	31.18
HC003A	12.50	3.22	40.25
BGO044AA	4.37	5.00	21.85
BGO043AA	0.86	11.00	9.46
FC005C	0.00	13.08	0.01
HC002A	2.83	7.07	20.01
SDS007A	0.04	13.08	0.52
SDS007A	0.08	13.08	1.05
FC004B	8.03	2.99	24.01
FC002B	0.59	7.20	4.25
BGO049A	0.48	19.09	9.16
BGO051A	10.50	2.73	28.67
BGO051A	10.80	2.71	29.27
BGO051A	10.20	2.76	28.15
BGO053A	0.38	24.16	9.18
BGO053A	0.33	26.17	8.64

HSB144A	0.22	32.01	7.04
HSB141A	1.90	9.40	17.86
HC002B	1.17	11.76	13.76
BGO010AA	0.43	8.01	3.44
FSB112A	1.70	7.41	12.60
HSB140A	12.00	3.25	39.00
FSB113A	0.62	14.93	9.26
BGO052A	4.14	5.51	22.81
BGO052A	4.17	5.49	22.89
HC035D	0.19	26.69	5.07
HSB069A	8.79	3.94	34.63
HC001A	0.56	16.73	9.37
HSB117A	0.16	30.92	4.95
HSB122A	6.80	4.07	27.68
HSB146A	9.40	3.55	33.37
FSB097A	0.85	13.09	11.13
BGO047A	3.06	7.39	22.61
HSB139A	3.82	5.41	20.67
BGO050A	0.40	18.11	7.24
HSB118A	12.00	3.12	37.44
FC001A	1.47	5.30	7.79
FSB101A	0.33	23.92	7.89
BGO008AR	0.16	11.17	1.79
BGO008AR	1.65	5.09	8.40
HAA001A	5.34	5.20	27.77
FSB114A	0.44	17.89	7.87
HAA006A	1.45	12.59	18.26
HAA006A	1.38	12.97	17.90
FSB100A	0.37	23.83	8.82
BGO010AR	0.85	11.85	10.07
BGO014AR	1.65	5.09	8.40
HAA003A	0.80	13.66	10.93
HAA003A	0.49	17.68	8.66
BGO044A	4.03	3.77	15.19
FSB120A	0.65	15.52	10.09
HC003B	12.00	3.19	38.28
BGO012AR	0.98	11.30	11.07
BGO018A	12.00	3.26	39.12
HAA005A	10.90	2.70	29.43
HAA005A	6.49	3.21	20.83
BGC001A	0.46	7.83	3.60
BGO016A	0.15	38.86	5.83
BGO041A	0.13	34.10	4.43
BGO003A	5.19	4.29	22.27
BGO003A	3.25	5.28	17.16
HCA004A	8.46	3.93	33.25
HCA004A	8.60	3.89	33.45
BGO025A	0.50	16.22	8.11
HSL006A	5.19	5.18	26.88
HSL006A	6.32	4.67	29.51
BGO008A	0.21	13.20	2.77
BGO012A	0.00	36.05	0.18
BGX004A	1.83	8.95	16.38
BGO006A	0.77	13.40	10.32
BGO014A	0.04	32.56	1.30
YSC005A	0.71	19.00	13.49
BGO010A	0.16	29.72	4.76
BGC002A	0.02	13.08	0.26
BGX001A	0.01	45.65	0.46
FC003C	1.66	5.08	8.43
BGO045A	2.45	7.56	18.52
BGO051B	0.47	12.67	5.95
BGO051B	10.30	3.19	32.86
HAA001B	0.75	6.64	4.98
HAA001B	0.76	6.61	5.02

BGC003A	15.90	2.38	37.84
HAA003B	0.35	8.58	3.00
HAA003B	0.31	8.94	2.77
HCA004B	0.20	17.16	3.43
HCA004B	0.19	17.55	3.33
BGO052B	0.94	9.34	8.78
BGO052B	0.13	22.63	2.94
HC008B	5.99	4.55	27.25
HSL006B	0.20	23.21	4.64
HSL006B	0.20	23.21	4.64
HC001B	1.28	9.14	11.70
FSB112C	0.16	11.17	1.79
HC002C	0.34	14.84	5.05
BGO020B	0.56	12.05	6.75
BGO020B	0.21	18.79	3.95
HAA006B	0.08	23.86	1.91
HAA006B	0.07	23.86	1.67
FC005D	13.00	2.54	33.02
SDS012A	1.21	11.21	13.56
BGO045B	0.12	34.27	4.11
BGX002B	0.21	10.94	2.30
BGO010B	0.31	8.94	2.77
BGO046B	2.33	7.14	16.64
HSB112C	4.17	3.73	15.55
HSB111C	1.65	5.58	9.21
FSB105C	3.84	3.84	14.75
FSB093C	5.27	4.66	24.56
BGO053B	0.12	32.03	3.84
BGO053B	0.10	35.10	3.51
FSB097C	0.26	9.48	2.46
BGO012CR	0.16	11.17	1.79
HC004A	1.54	6.66	10.26
HSB125C	0.77	6.58	5.07
HSB125C	0.94	6.16	5.79
FSB102C	5.51	3.40	18.73
FC001B	0.07	13.08	0.92
FSB103C	0.39	8.28	3.23
HSB135C	36.90	1.79	66.05
HSB135C	3.12	4.11	12.82
HAA001C	0.55	7.37	4.05
HAA001C	0.59	7.20	4.25
FSB092C	0.50	7.61	3.81
HSB129C	0.65	6.97	4.53
HSB129C	0.45	7.89	3.55
BGO044B	0.06	15.65	0.94
FSB098C	1.55	10.71	16.60
FSB121C	11.00	3.41	37.51
HSB127C	0.82	6.45	5.29
HSB131C	136.00	1.74	236.64
FSB091C	0.14	22.94	3.21
HSB134C	1.31	5.51	7.22
FSB104C	1.67	5.07	8.47
FSB120C	1.70	8.54	14.52
FSB107C	0.89	6.27	5.58
HC006A	1.55	8.68	13.45
HC005A	0.42	12.99	5.46
HSB113C	0.99	9.46	9.37
HSB105C	4.28	5.09	21.79
HSB146C	0.68	8.61	5.85
HSB100C	1.39	5.40	7.51
BGO012C	0.04	43.73	1.75
BGO012C	1.11	11.99	13.31
HCA004C	1.88	8.86	16.66
HCA004C	1.30	10.78	14.01
FSB113C	0.16	23.68	3.79

FC002D	2.73	7.23	19.74
HC002H	0.85	6.37	5.41
HSB141C	9.00	3.59	32.31
FSB123C	6.70	4.59	30.75
FSB106C	24.00	2.07	49.68
FSB089C	0.52	14.61	7.60
FSB099C	3.03	5.12	15.51
BGO010C	0.07	13.08	0.92
HSL006C	4.46	3.65	16.28
HSL006C	4.84	3.55	17.18
BGO006C	1.51	5.33	8.05
FSB114C	0.42	21.14	8.88
HC015B	4.09	6.65	27.20
FSB090C	1.08	5.88	6.35
FSB088C	4.50	3.64	16.38
HSB106C	24.40	2.06	50.26
HSB148C	1.80	6.14	11.05
FSB111C	10.40	2.74	28.50
HSB103C	3.15	4.65	14.65
HSB107C	0.98	11.87	11.63
HC010B	0.91	12.01	10.93
HSB130C	73.70	1.74	128.24
HSB130C	68.00	1.74	118.32
FSB122C	2.60	6.30	16.38
FSB116C	0.69	10.34	7.13
HSB136C	0.61	7.12	4.34
FC003D	0.15	11.41	1.71
HAA006C	23.10	2.10	48.51
HAA006C	22.90	2.10	48.09
HSB140C	0.61	14.84	9.05
HSB142C	0.60	14.96	8.98
BGO050C	0.33	11.67	3.85
HAA003C	0.16	11.17	1.79
HAA003C	0.09	13.08	1.18
HSB104C	0.64	7.01	4.49
FSB115C	0.36	19.35	6.97
HSB145C	0.38	12.88	4.89
HSB070C	0.31	8.94	2.77
HSB070C	0.20	10.36	2.07
HSB117C	0.57	14.45	8.24
BGO049C	0.88	12.95	11.40
HSB101C	4.00	4.79	19.16
HSB102C	2.00	4.78	9.56
HSB109C	0.95	9.11	8.65
HSB132C	0.28	9.25	2.59
HSB143C	2.40	7.97	19.13
HSB151C	0.80	12.30	9.84
BGX004C	1.16	9.89	11.47
BGX004C	1.16	9.89	11.47
HSB126C	56.70	1.74	98.66
HSB110C	0.71	6.77	4.81
FC004E	4.79	3.56	17.05
HSB071C	0.27	9.37	2.53
HSB071C	0.17	10.94	1.86
HC012B	5.09	3.97	20.21
HSB152C	0.80	9.32	7.46
HC002D	3.59	6.56	23.55
BGO020C	0.89	9.63	8.57
BGO020C	1.00	9.14	9.14
BGX012C	1.11	5.82	6.46
BGO008C	1.39	9.97	13.86
BGO051C	1.47	8.68	12.76
BGO051C	1.56	8.43	13.15
BGX001C	0.36	15.80	5.69
BGO048C	2.15	8.36	17.97

BGO029C	0.29	9.14	2.65
HAA005C	2.92	4.21	12.29
HAA005C	3.68	3.89	14.32
BGO046C	0.14	26.66	3.73
HC001C	4.28	5.61	24.01
BGO047C	0.46	7.83	3.60
BGO003C	0.02	26.14	0.52
BGO003C	0.01	26.14	0.26
BGO052C	2.27	5.80	13.17
BGO052C	3.11	5.08	15.80
FC001C	0.00	13.08	0.05
HSB116C	4.36	3.67	16.00
FC003E	1.39	5.40	7.51
BGX002D	0.34	16.80	5.71
SDS012B	0.08	34.21	2.74
HC008C	4.73	4.91	23.22
FSB115D	3.80	5.72	21.74
HSB115C	0.46	13.87	6.38
BGO053C	2.30	4.56	10.49
BGO005C	0.13	19.00	2.47
FC002E	6.01	3.84	23.08
HSB145D	0.33	19.12	6.31
HSB114C	2.86	4.23	12.10
HC011C	1.01	6.01	6.07
BGO042C	0.45	18.19	8.19
HSB108C	0.98	6.07	5.95
FSB116D	1.10	10.42	11.46
HC013B	0.45	7.89	3.55
HSB142D	0.68	6.86	4.66
BGO014CR	0.40	8.21	3.28
BGO045C	1.22	5.64	6.88
HSB126D	2.30	4.56	10.49
HSB126D	0.29	9.14	2.65
BGO044C	0.08	25.03	2.00
HSB130D	0.21	10.19	2.14
HSB130D	0.26	9.48	2.46
HSB130D	0.88	6.29	5.54
BGO014C	0.98	9.66	9.47
HC005B	4.73	4.95	23.41
HC004B	1.01	12.57	12.70
HSB129D	3.40	4.00	13.60
HSB129D	2.30	4.56	10.49
HSB129D	2.65	4.34	11.50
SDS004	3.87	3.83	14.82
HSB131D	6.77	3.17	21.46
YSC004C	1.26	7.49	9.44
FSB122D	1.60	8.54	13.66
HSB152D	1.10	9.99	10.99
HC003E	2.45	6.91	16.93
YSC001C	2.40	7.62	18.29
HSB151D	2.30	5.94	13.66
HMD003D	0.26	24.50	6.37
FSB112D	4.80	3.56	17.09
FSB113D	5.10	3.49	17.80
FSB117D	2.50	4.43	11.07
FSB104D	23.10	2.10	48.51
HC002E	2.16	7.89	17.04
HMD002D	4.14	5.46	22.60
BGX006D	3.57	3.93	14.03
FSB110D	2.30	4.56	10.49
FSB118D	1.10	5.84	6.42
FSB121DR	0.27	22.16	5.98
HC001D	1.17	9.49	11.10
BGO048D	11.00	2.86	31.46
BGO046D	11.50	2.65	30.48

FC002F	1.90	4.86	9.23
FSB119D	0.60	7.16	4.30
BGO047D	15.90	2.84	45.16
BGX007D	20.40	2.46	50.18
FSB123D	3.90	6.16	24.02
HSB140D	4.00	3.78	15.12
BGX005D	1.45	5.32	7.71
HC006B	2.17	4.65	10.09
FSB120D	3.40	4.00	13.60
SDS017	3.31	4.03	13.34
BGO019D	0.45	7.89	3.55
FSB097D	0.08	14.06	1.12
HSB143D	9.50	3.02	28.69
FSB114D	3.50	3.96	13.86
HSB127D	14.00	2.48	34.72
HSB127D	13.30	2.53	33.65
HSB127D	13.60	2.51	34.14
FSB093D	1.78	6.30	11.21
FSB093D	2.85	5.19	14.79
YSC002D	1.19	5.69	6.77
FSB099D	1.80	5.78	10.40
FSB099D	2.97	4.76	14.14
HSB148D	0.42	16.32	6.85
HSB125D	7.09	3.12	22.12
HSB125D	4.25	3.71	15.77
HSB125D	5.67	3.36	19.05
FSL007D	0.68	6.86	4.66
FSL007D	0.50	7.61	3.81
HSB136D	18.60	2.26	42.04
HSB136D	0.33	8.75	2.89
HSB136D	7.58	3.05	23.12
HSB136D	9.69	2.81	27.23
FSB098D	0.05	36.74	1.84
HSB117D	9.14	2.92	26.69
HSB117D	0.91	6.54	5.95
HSB117D	6.55	3.28	21.48
HSB117D	12.20	2.64	32.21
BGO013DR	0.28	9.25	2.59
FSB091D	3.09	5.85	18.08
FSB091D	4.56	4.87	22.21
FSB107D	1.38	5.41	7.47
FSL009D	0.21	10.19	2.14
FSL009D	0.90	6.25	5.62
BGX003D	1.85	4.90	9.07
FSB092D	0.24	9.74	2.34
FSB092D	6.91	3.15	21.77
FSB111D	1.25	5.59	6.99
FSB089D	2.60	5.65	14.69
FSB089D	3.25	5.13	16.67
FSB088D	0.11	12.67	1.39
FSB088D	1.19	5.69	6.77
FSL006D	0.65	6.97	4.53
FSL006D	1.14	5.77	6.58
FSL008D	0.04	13.08	0.52
FSL008D	0.78	6.55	5.11
FSL005D	4.66	3.59	16.73
FSL005D	1.38	5.41	7.47
FSB105D	0.62	7.08	4.39
BGX004D	2.89	4.22	12.20
FSB108D	0.48	7.72	3.71
BGO017D	1.28	5.55	7.10
FSL004D	1.39	5.40	7.51
FSL004D	0.19	10.54	2.00
HSB146D	1.60	5.15	8.24
FSB090D	0.27	9.37	2.53

FSB090D	0.42	8.07	3.39
HSB137D	2.10	4.70	9.87
HSB137D	0.46	7.83	3.60
HSB137D	1.48	5.28	7.81
HSB137D	4.25	3.71	15.77
HSB134D	1.60	5.15	8.24
HSB134D	2.32	4.54	10.53
HSB134D	2.92	4.21	12.29
HSB134D	21.20	2.16	45.79
FSL003D	0.88	6.29	5.54
FSL003D	0.88	6.29	5.54
HSB132D	5.00	3.51	17.55
HSB132D	0.46	7.83	3.60
HSB132D	7.26	3.10	22.51
HSB132D	12.50	2.58	32.25
HSB139D	8.80	3.05	26.84
HSB139D	0.37	9.80	3.63
HSB139D	7.05	3.31	23.34
HSB139D	9.86	2.92	28.79
HSB150D	1.20	5.67	6.80
HSB149D	2.90	4.21	12.21
M037A	0.24	9.74	2.34
BGO050D	1.61	5.14	8.28
BGO029D	1.58	5.17	8.17
HSB133D	0.08	13.08	1.05
FSL001D	0.85	6.37	5.41
FSL001D	0.30	9.04	2.71
FSL002D	0.17	10.94	1.86
FSL002D	0.33	8.75	2.89
BGO009D	0.10	13.08	1.31
BGO045D	6.07	3.29	19.97
SDS003A	2.75	4.29	11.80
HSB104D	21.80	2.14	46.65
HSB104D	27.50	1.98	54.45
HSB106D	8.20	2.97	24.35
HSB106D	18.20	2.27	41.31
HSB110D	2.33	4.54	10.58
HSB110D	45.40	1.74	79.00
HSB111E	38.20	1.79	68.38
HSB105D	34.00	1.84	62.56
HSB105D	38.30	1.77	67.79
HSB108D	1.27	5.56	7.06
HSB108D	13.30	2.53	33.65
BGX009D	0.36	18.55	6.68
HSB114D	0.52	7.51	3.91
HSB114D	6.40	3.23	20.67
HSB109D	1.26	7.94	10.00
HSB109D	9.20	3.32	30.54
BGO044D	13.00	2.54	33.02
HSB103D	1.21	7.93	9.60
HSB103D	4.82	4.36	21.02
HSB115D	0.44	9.30	4.09
HSB115D	2.50	4.88	12.20
HSB116D	0.71	6.77	4.81
HSB116D	2.70	4.32	11.66
BGX001D	1.65	5.09	8.40
HSB107D	2.96	4.19	12.40
HSB107D	15.60	2.39	37.28
HSB147D	0.67	6.90	4.62
HSB101D	1.24	6.10	7.56
HSB101D	4.17	3.94	16.43
BGX010D	0.52	7.51	3.91
HSB113D	2.37	4.51	10.69
HSB113D	7.10	3.12	22.15
BGO011D	2.54	4.41	11.20

HSB102D	0.20	10.36	2.07
HSB102D	0.42	8.07	3.39
HSB100D	1.01	6.01	6.07
HSB100D	2.54	4.41	11.20
BGO006D	0.38	18.40	6.99
BGO016D	0.07	13.08	0.92
BGO021D	0.79	7.25	5.73
BGO012D	0.12	29.17	3.50
HSB141D	0.59	7.20	4.25
BGO014DR	2.15	4.66	10.02
BGO010DR	1.16	10.15	11.77
BGO049D	0.73	6.70	4.89
BGO015D	1.11	5.82	6.46
BGO002D	0.62	7.08	4.39
BGO005D	0.73	11.25	8.21
BGO052D	0.05	13.08	0.65
BGO052D	0.17	10.94	1.86
BGO018D	12.60	2.78	35.03
HSL001D	3.25	4.06	13.19
HSL001D	7.76	3.03	23.51
BGO051D	0.08	24.90	1.99
BGO051D	0.40	13.46	5.38
BGO007D	15.10	2.42	36.54
BGO004D	0.69	6.83	4.71
BGO008D	1.87	8.26	15.45
BGO024D	0.36	8.50	3.06
BGO023D	1.11	7.75	8.60
BGX012D	0.36	8.50	3.06
BGO001D	0.31	15.74	4.88
BGO053D	1.94	4.82	9.35
HSL002D	0.91	6.22	5.66
HSL002D	1.96	4.81	9.43
HC003F	14.60	3.05	44.53
BGO003D	0.14	12.13	1.70
BGO013D	0.14	11.68	1.64
BGO014D	0.56	9.69	5.43
BGO010D	0.33	17.00	5.61
HSL003D	0.57	7.28	4.15
HSL003D	0.47	7.77	3.65
HC002F	12.30	3.11	38.25
HC001E	12.30	3.08	37.88
HSL007D	2.34	4.53	10.60
HSL007D	1.33	5.48	7.29
HSL006D	1.75	5.00	8.75
HSL006D	0.88	6.29	5.54
HSL004D	0.91	6.22	5.66
HSL004D	1.46	5.31	7.75
HAA006D	2.42	4.48	10.84
HAA006D	0.15	11.41	1.71
HSL005D	0.76	6.61	5.02
HSL005D	1.04	5.95	6.19
HSL008D	0.83	6.42	5.33
HSL008D	3.03	4.15	12.57
HAA002D	0.01	13.08	0.13
HAA001D	1.04	5.95	6.19
HAA001D	1.66	5.08	8.43

Appendix E – Residuals between measured and simulated head

Overall rms hydraulic head difference: 3.22

Gordon aquifer rms of (FACT-data) differences: 2.04
avg of (FACT-data) differences: -0.13
avg of |FACT-data| differences: 1.69
max of (FACT-data) differences: 4.14

Well ID	SRS Easting	SRS Northing	Screen Bottom	Screen Top	Measured Head	Simulated Head	Residual
"BGO 8A "	12138.28	10318.17	105.3	115.3	161.0	158.5	-2.5
"BGO 8AR"	12131.30	10347.15	94.6	104.6	161.1	158.2	-2.9
"BGO 9AA"	11812.71	10664.75	73.8	83.8	157.9	155.4	-2.5
"BGO 14A "	10437.00	9760.77	109.6	119.6	157.8	157.9	0.1
"BGO 14AR"	10394.02	9725.36	96.8	106.8	158.9	157.8	-1.1
"BGO 16A "	10914.13	9227.82	102.5	112.5	160.7	160.1	-0.6
"BGO 16AR"	10939.40	9219.09	103.7	113.7	161.0	160.2	-0.8
"BGO 18A "	11441.24	9179.26	99.5	109.5	161.0	161.2	0.2
"BGO 25A "	10316.05	9511.17	104.1	114.1	160.6	158.4	-2.2
"BGO 26A "	9679.33	9361.62	81.0	91.0	160.1	157.6	-2.5
"BGO 29A "	8910.07	8600.45	102.5	112.5	159.5	158.7	-0.8
"BGO 41A "	9992.76	9760.40	103.3	113.3	158.2	157.2	-1.0
"BGO 43A "	10700.83	10516.03	105.9	115.9	159.4	155.9	-3.5
"BGO 43AA"	10714.74	10523.69	62.2	72.2	156.7	154.1	-2.6
"BGO 44A "	12327.38	10548.72	98.0	108.0	158.4	157.7	-0.7
"BGO 44AA"	12355.67	10556.57	61.2	71.3	158.5	154.9	-3.6
"BGO 45A "	9290.78	8957.40	116.9	126.9	160.7	158.5	-2.2
"BGO 47A "	9875.68	7955.92	86.8	96.8	162.4	161.2	-1.2
"BGO 49A "	11310.30	7416.41	75.1	85.1	166.8	165.5	-1.3
"BGO 50A "	9059.30	8265.35	90.5	100.5	160.0	159.5	-0.5
"BGX 1A "	13034.48	10777.43	114.1	124.1	159.1	158.1	-1.0
"BGX 4A "	11471.98	11516.01	106.8	116.8	155.1	152.9	-2.2
"FC 1A "	7089.90	12409.76	96.7	101.7	143.5	143.4	-0.1
"FC 3B "	11700.81	12432.11	61.2	66.2	150.6	147.0	-3.6
"FC 3C "	11709.65	12434.29	121.0	126.0	151.8	149.0	-2.8
"FC 4C "	7324.74	15108.45	116.3	121.3	137.6	134.5	-3.1
"FSB 76A "	6138.53	8596.02	36.9	47.4	155.0	151.7	-3.3
"FSB 76B "	6142.85	8587.22	99.2	109.7	151.5	152.8	1.3
"FSB 78A "	5232.08	6998.44	27.0	37.5	155.9	152.7	-3.2
"FSB 78B "	5236.24	7007.71	82.4	92.8	154.3	154.4	0.1
"FSB 79A "	5436.67	5924.31	24.0	34.4	158.0	155.8	-2.2
"FSB 79B "	5445.73	5927.87	80.7	91.2	158.0	158.2	0.2
"FSB 87A "	5000.84	7812.15	33.1	43.6	153.8	150.5	-3.3
"FSB 87B "	4991.16	7805.28	90.0	100.5	150.6	151.8	1.2
"FSB 96A "	4820.70	7038.28	85.7	95.7	152.1	153.4	1.3
"FSB 96AR"	4782.51	7063.60	79.0	89.0	153.3	153.2	-0.1
"FSB 97A "	4943.53	7359.85	85.8	95.8	152.1	152.8	0.7
"FSB 98A "	5050.57	7606.08	84.7	94.7	150.4	152.5	2.1
"FSB 98AR"	5040.90	7575.61	82.1	92.1	151.8	152.5	0.7
"FSB 99A "	5180.13	7925.81	92.9	102.9	150.5	151.9	1.4
"FSB100A "	5839.02	7921.51	95.8	105.8	151.3	153.4	2.1
"FSB101A "	6028.45	8150.49	92.9	102.9	151.6	153.3	1.7
"FSB112A "	4007.60	6200.00	81.0	91.0	153.5	154.2	0.7
"FSB113A "	6230.52	6607.28	81.0	91.3	158.9	158.0	-0.9
"FSB114A "	6952.72	7915.93	95.2	105.0	155.6	156.4	0.8
"HAA 1A "	18761.89	4886.70	94.9	104.9	180.8	184.8	4.0
"HAA 1AA"	18753.18	4891.60	13.6	23.6	180.7	178.0	-2.7
"HAA 2A "	16888.38	5563.26	107.3	117.3	176.6	180.2	3.6
"HAA 3A "	15714.13	5866.24	96.8	106.8	175.4	177.8	2.4
"HAA 4A "	17249.56	6961.51	105.4	115.3	174.4	178.5	4.1
"HAA 6A "	19319.56	6601.93	95.6	105.6	178.6	181.8	3.2
"HAA 6AA"	19309.95	6600.00	25.8	35.8	178.3	174.4	-3.9
"HC 1A "	17295.03	6492.72	89.5	94.5	175.8	177.8	2.0
"HC 2A "	17285.94	6530.66	72.2	77.2	175.8	175.8	0.0

"HC 2B "	17297.59	6523.94	85.7	90.7	175.0	177.3	2.3
"HC 8B "	14334.09	11723.92	132.5	137.5	155.5	155.3	-0.2
"HC 10A "	16185.01	10399.00	114.0	117.0	163.3	165.5	2.2
"HSB 65A "	13797.37	6445.69	62.5	73.2	171.2	172.6	1.4
"HSB 68A "	12476.26	5235.26	47.5	58.0	171.6	171.4	-0.2
"HSB 69A "	12053.92	5168.49	83.1	93.1	171.5	172.3	0.8
"HSB 83A "	14127.51	5710.67	65.2	76.0	173.0	174.8	1.8
"HSB 84A "	11942.58	5182.45	64.7	75.9	171.7	172.0	0.3
"HSB 85A "	14011.82	7877.26	61.1	71.1	168.6	169.2	0.6
"HSB 86A "	11383.35	6018.45	63.1	73.9	168.4	169.2	0.8
"HSB117A "	10541.01	6057.57	84.8	94.8	166.5	167.4	0.9
"HSB118A "	11141.01	6147.07	91.0	101.0	167.4	168.5	1.1
"HSB119A "	11378.24	6592.23	93.3	103.3	166.8	167.8	1.0
"HSB120A "	11637.70	6966.96	91.0	101.0	166.1	167.5	1.4
"HSB121A "	12859.37	5825.72	88.3	98.3	171.4	172.9	1.5
"HSB122A "	13173.78	6067.47	85.4	95.4	171.2	173.1	1.9
"HSB123A "	13544.20	6139.97	93.6	103.6	171.5	174.0	2.5
"HSB139A "	13022.28	4942.90	87.6	97.6	173.3	174.3	1.0
"HSB141A "	14768.25	5402.14	80.6	90.6	174.8	176.8	2.0
"HSB144A "	11723.85	5448.69	78.6	88.6	171.3	171.2	-0.1
"HSB146A "	14221.92	4534.90	85.5	95.5	176.0	177.3	1.3
"P 27B "	19662.20	5616.64	74.8	94.8	180.9	183.9	3.0
"YSC 1A "	19482.17	13382.92	76.8	136.9	163.1	159.7	-3.4
"YSC 2A "	20072.45	13786.06	134.7	144.7	162.6	160.4	-2.2
"YSC 5A "	21919.53	10073.35	116.0	121.0	180.9	180.3	-0.6

"lower" zone

rms of (FACT-data) differences:	**4.38**
avg of (FACT-data) differences:	**-0.28**
avg of |FACT-data| differences:	**3.32**
max of (FACT-data) differences:	**17.03**

Well ID	SRS Easting	SRS Northing	Screen Bottom	Screen Top	Measured Head	Simulated Head	Residual
"BG 92 "	10855.74	12550.90	197.2	227.2	208.8	209.1	0.3
"BG 93 "	10991.82	13511.38	180.5	210.5	199.0	196.4	-2.6
"BG 94 "	11123.05	14496.60	152.8	182.8	191.0	178.0	-13.0
"BG 95 "	12183.95	13896.76	152.5	182.5	192.7	179.3	-13.4
"BG 96 "	12215.11	13224.96	177.2	207.2	197.6	194.4	-3.2
"BG 103 "	13952.13	12047.68	169.5	199.5	199.9	200.4	0.5
"BG 115 "	12265.98	10997.77	198.9	218.9	215.8	221.1	5.3
"BG 122 "	10909.45	12114.02	189.9	209.9	211.1	213.9	2.8
"BGO 5C "	13307.93	10472.63	183.2	193.2	216.2	219.3	3.1
"BGO 6B "	12853.86	10454.11	139.7	149.7	219.2	220.5	1.3
"BGO 6C "	12828.96	10381.25	158.0	168.0	220.2	221.5	1.3
"BGO 8C "	12136.55	10328.23	174.3	184.3	224.6	224.3	-0.3
"BGO 10B "	11426.87	10589.28	139.0	149.0	220.3	223.0	2.7
"BGO 10C "	11524.59	10429.20	157.3	167.3	220.5	224.4	3.9
"BGO 12C "	10742.07	10262.87	153.6	163.6	220.1	224.9	4.8
"BGO 12CR"	10716.57	10258.27	144.0	154.0	221.8	224.8	3.0
"BGO 14C "	10439.72	9751.33	192.1	202.1	221.2	226.8	5.6
"BGO 14CR"	10397.03	9711.69	190.1	200.1	224.1	226.7	2.6
"BGO 16B "	10901.77	9235.93	136.0	146.0	218.8	226.6	7.8
"BGO 27C "	9443.46	8822.50	154.9	163.9	221.0	223.3	2.3
"BGO 29C "	8902.07	8616.94	176.8	186.8	223.4	221.8	-1.6
"BGO 30C "	9388.74	8314.73	178.4	188.4	219.1	222.1	3.0
"BGO 31C "	9728.20	8179.35	176.4	186.4	225.7	222.7	-3.0
"BGO 33C "	10678.10	7871.82	177.8	187.8	225.3	225.3	0.0
"BGO 35C "	11632.83	7537.21	161.9	171.9	228.7	226.9	-1.8
"BGO 37C "	12445.05	7243.97	168.8	178.8	230.7	228.4	-2.3
"BGO 42C "	10122.25	9721.68	185.9	195.9	223.8	226.2	2.4
"BGO 43CR"	10690.43	10487.03	178.4	188.4	225.8	224.8	-1.0
"BGO 44B "	12341.49	10552.54	148.1	158.1	220.8	222.0	1.2
"BGO 44C "	12369.58	10560.35	190.6	200.6	220.7	222.7	2.0
"BGO 45B "	9301.84	8970.28	137.0	147.0	219.5	223.0	3.5
"BGO 45C "	9316.44	8967.97	190.5	200.5	223.2	224.8	1.6
"BGO 46B "	9357.73	8135.46	140.4	150.4	218.3	220.3	2.0
"BGO 46C "	9345.07	8143.09	178.0	188.0	220.1	221.0	0.9
"BGO 47C "	9889.83	7982.65	178.6	188.6	223.2	222.6	-0.6
"BGO 48C "	10108.34	7873.29	176.7	186.7	223.8	223.1	-0.7
"BGO 49C "	11304.47	7429.89	166.0	176.0	228.4	225.7	-2.7

"BGO 50C "	9078.37	8258.37	162.5	172.5	218.9	220.5	1.6
"BGX 1C "	13046.15	10767.75	176.0	186.0	216.2	218.1	1.9
"BGX 2B "	12630.64	11071.39	137.2	147.2	213.0	215.1	2.1
"BGX 2D "	12641.83	11062.53	181.1	191.1	215.7	217.4	1.7
"BGX 3D "	12086.97	11337.78	201.6	221.6	215.3	219.6	4.3
"BGX 4C "	11457.41	11520.07	170.7	180.7	215.0	217.5	2.5
"BGX 5D "	11454.25	12046.72	195.0	215.0	209.4	214.0	4.6
"BGX 6D "	11595.53	12422.40	191.0	211.0	206.2	209.3	3.1
"BGX 7D "	12447.46	12203.96	194.1	214.1	206.0	208.4	2.4
"BGX 8DR"	13221.35	11591.78	183.1	203.1	205.7	210.0	4.3
"BGX 12C "	14595.49	8651.53	174.1	184.1	235.0	229.5	-5.5
"FBP 1A "	5260.36	11232.14	161.8	191.8	206.6	205.8	-0.8
"FBP 2A "	4555.55	11919.01	137.1	167.1	191.4	192.1	0.7
"FBP 3A "	4900.05	12122.59	141.0	171.0	194.2	194.4	0.2
"FBP 4 "	5452.80	11709.58	165.2	195.2	212.3	204.5	-7.8
"FBP 5D "	5191.17	11524.95	192.6	212.6	205.5	204.7	-0.8
"FBP 6D "	4576.27	11884.05	178.3	198.3	195.5	194.1	-1.4
"FBP 7D "	4873.21	12082.94	183.2	203.2	194.7	195.8	1.1
"FBP 8D "	5476.46	11685.78	172.8	192.8	207.4	205.0	-2.4
"FBP 9D "	5114.07	11888.16	177.9	197.9	200.6	200.3	-0.3
"FBP 10D "	4636.57	11546.01	180.8	200.8	201.2	198.2	-3.0
"FBP 11D "	4911.50	11368.90	192.0	212.1	203.4	202.9	-0.5
"FBP 12D "	5335.33	11288.25	182.1	202.1	208.5	206.6	-1.9
"FBP 13D "	4704.25	11988.96	172.7	192.7	195.0	194.5	-0.5
"FC 1B "	7088.16	12417.46	151.8	156.8	210.8	210.2	-0.6
"FC 1C "	7086.65	12425.01	183.9	188.9	214.0	210.8	-3.2
"FC 3D "	11718.27	12436.53	165.9	170.9	206.4	208.2	1.8
"FC 3E "	11725.62	12438.51	185.7	190.7	205.3	208.5	3.2
"FC 3F "	11733.09	12440.40	205.1	210.1	206.2	208.7	2.5
"FC 4D "	7328.02	15116.10	146.4	151.4	151.0	168.0	17.0
"FC 4E "	7331.13	15123.61	176.4	181.4	185.2	0.0	-185.2
"FCB 3 "	9483.70	9609.56	195.3	225.3	221.7	227.4	5.7
"FNB 1 "	8119.87	13126.56	177.2	207.2	210.8	206.9	-3.9
"FNB 2 "	8147.93	13429.82	180.8	210.8	206.8	202.4	-4.4
"FNB 3 "	7874.20	13484.92	182.1	212.1	209.1	201.6	-7.5
"FNB 4 "	7647.42	13290.21	179.6	209.6	213.6	203.7	-9.9
"FSB 76C "	6147.28	8577.94	154.8	165.3	212.9	214.2	1.3
"FSB 78C "	5226.46	7012.38	141.6	151.4	208.0	204.4	-3.6
"FSB 79C "	5457.17	5932.24	149.8	159.6	196.7	194.7	-2.0
"FSB 87C "	4980.97	7797.90	148.8	159.3	208.8	206.7	-2.1
"FSB 88C "	6368.72	8120.99	158.4	168.4	212.7	213.3	0.6
"FSB 89C "	6213.46	8020.31	156.1	166.1	211.9	212.6	0.7
"FSB 90C "	6056.57	7812.86	158.1	168.1	210.8	211.2	0.4
"FSB 91C "	5900.99	7606.40	149.1	159.1	210.8	209.4	-1.4
"FSB 92C "	5553.29	7368.82	147.6	157.6	210.1	207.0	-3.1
"FSB 93C "	5482.31	7194.35	142.0	152.0	208.7	205.8	-2.9
"FSB 94C "	5215.98	7108.81	139.8	149.8	207.7	204.7	-3.0
"FSB 95C "	5034.89	7175.31	145.8	155.8	205.6	204.5	-1.1
"FSB 97C "	4946.58	7369.08	143.8	153.8	208.2	205.0	-3.2
"FSB 98C "	5047.37	7596.61	148.4	158.4	209.3	206.4	-2.9
"FSB 99C "	5184.12	7934.94	157.2	167.2	209.7	208.4	-1.3
"FSB102C "	6123.86	5986.95	145.9	155.9	195.2	194.4	-0.8
"FSB105C "	4795.74	7392.84	141.5	151.5	207.6	204.4	-3.2
"FSB106C "	5818.13	6542.73	156.0	166.0	201.3	201.0	-0.3
"FSB107C "	6107.21	7620.28	150.8	160.8	210.0	210.0	0.0
"FSB110C "	5328.25	6439.22	137.2	147.2	201.0	199.7	-1.3
"FSB111C "	6425.93	7891.78	159.0	169.0	212.1	212.4	0.3
"FSB112C "	3994.42	6193.33	129.1	139.1	202.1	195.2	-6.9
"FSB113C "	6247.68	6603.98	154.0	164.0	202.6	201.3	-1.3
"FSB114C "	6942.05	7904.57	158.0	168.0	213.7	213.3	-0.4
"FSB120C "	4087.58	7564.97	150.7	160.7	206.4	201.4	-5.0
"FSB121C "	3428.08	7021.88	148.4	158.4	204.6	197.5	-7.1
"FSB123C "	6815.01	7139.64	155.3	165.3	210.6	207.4	-3.2
"HAA 1B "	18771.25	4881.64	119.3	129.3	251.4	251.9	0.5
"HAA 1C "	18779.34	4877.22	147.4	157.4	251.9	252.1	0.2
"HAA 2B "	16879.03	5566.39	127.2	137.2	252.9	248.3	-4.6
"HAA 2C "	16869.58	5569.49	171.9	181.9	254.1	248.8	-5.3
"HAA 3B "	15706.07	5846.43	125.9	135.9	240.1	241.8	1.7
"HAA 3C "	15698.70	5828.20	163.3	173.3	243.3	242.4	-0.9
"HAA 4B "	17239.71	6959.31	124.5	135.0	250.0	245.5	-4.5
"HAA 4C "	17229.88	6957.43	158.3	168.3	251.3	245.8	-5.5
"HAA 6B "	19329.25	6603.48	131.3	141.4	235.4	245.8	10.4

"HAA 6C "	19339.09	6605.77	161.1	171.1	235.6	246.1	10.5
"HC 2C "	17293.89	6522.13	135.7	140.7	253.7	247.2	-6.5
"HC 2D "	17288.02	6520.88	178.2	183.2	255.8	248.0	-7.8
"HC 4A "	18834.31	6667.58	150.0	155.0	244.7	247.0	2.3
"HC 6A "	17401.68	6919.21	156.2	161.2	252.2	246.1	-6.1
"HC 8C "	14341.29	11722.28	187.3	192.3	197.5	202.7	5.2
"HC 10B "	16192.68	10395.11	164.8	169.8	208.9	211.7	2.8
"HC 12B "	14670.69	7398.79	177.3	182.3	240.8	236.0	-4.8
"HMD 1D "	11057.73	12299.50	199.7	219.7	209.9	211.8	1.9
"HMD 2D "	11153.44	13274.82	190.8	210.8	201.0	199.7	-1.3
"HMD 3D "	11636.66	13288.48	187.7	207.7	200.5	198.0	-2.5
"HMD 4D "	12157.24	12971.49	188.9	208.9	199.9	199.1	-0.8
"HSB 65B "	13798.74	6455.59	123.3	133.3	224.4	230.0	5.6
"HSB 68B "	12466.77	5231.82	123.5	134.5	216.8	213.8	-3.0
"HSB 68C "	12457.87	5228.49	168.4	179.5	217.9	214.4	-3.5
"HSB 70C "	11143.52	6046.29	164.9	174.9	223.2	216.7	-6.5
"HSB 71C "	10622.32	6210.83	171.9	181.9	222.8	214.4	-8.4
"HSB 83B "	14118.42	5699.53	121.2	132.1	222.8	229.0	6.2
"HSB 83C "	14138.45	5701.03	160.2	171.2	224.7	229.3	4.6
"HSB 84B "	11932.47	5197.78	121.8	132.9	210.8	211.6	0.8
"HSB 84C "	11941.29	5193.32	170.9	181.8	213.8	211.8	-2.0
"HSB 85B "	14022.04	7876.77	133.2	143.2	233.7	232.9	-0.8
"HSB 86B "	11374.79	6015.40	113.8	124.0	221.7	216.4	-5.3
"HSB100C "	14234.42	6171.56	153.0	163.0	226.7	232.3	5.6
"HSB101C "	14052.39	6055.89	166.3	176.3	225.4	230.7	5.3
"HSB102C "	13860.85	5972.45	166.7	176.7	224.6	229.0	4.4
"HSB103C "	13862.55	5598.43	159.2	169.2	223.4	226.3	2.9
"HSB104C "	13671.96	5335.96	163.5	173.5	220.7	222.7	2.0
"HSB105C "	13462.84	5363.59	152.2	162.2	219.6	221.7	2.1
"HSB106C "	13178.73	5582.91	158.7	168.7	221.7	221.9	0.2
"HSB107C "	12968.69	5515.37	159.3	169.3	219.3	220.1	0.8
"HSB109C "	12446.86	5390.44	168.4	178.4	218.9	216.2	-2.7
"HSB110C "	12217.01	5438.20	171.4	181.4	219.2	215.7	-3.5
"HSB111C "	12012.99	5538.06	140.7	150.7	220.4	215.3	-5.1
"HSB112C "	11881.06	5752.31	140.6	150.6	221.7	216.6	-5.1
"HSB113C "	11597.26	5851.37	151.7	161.7	222.1	216.8	-5.3
"HSB115C "	11411.74	6160.46	182.8	192.8	224.4	219.5	-4.9
"HSB116C "	11309.99	6378.97	180.5	190.5	225.3	220.6	-4.7
"HSB117C "	10532.49	6063.02	165.1	175.1	221.8	212.3	-9.5
"HSB125C "	14144.64	5566.07	145.6	155.6	223.3	228.4	5.1
"HSB127C "	12444.32	4904.60	148.4	158.4	210.2	210.5	0.3
"HSB129C "	10670.01	5161.61	147.8	157.8	205.6	205.6	0.0
"HSB133C "	14558.13	6109.82	173.3	183.3	230.5	234.2	3.7
"HSB134C "	13909.34	5216.20	149.1	159.1	220.8	223.6	2.8
"HSB135C "	12180.62	5032.67	147.3	157.3	206.6	210.9	4.3
"HSB136C "	11476.73	5404.55	160.5	170.5	217.4	212.1	-5.3
"HSB137C "	11155.93	5714.22	163.8	173.8	220.3	213.6	-6.7
"HSB139C "	13030.68	4947.14	148.5	158.5	214.4	214.1	-0.3
"HSB141C "	14773.23	5385.92	154.7	164.7	228.9	233.6	4.7
"HSB142C "	8832.46	6088.42	161.6	171.6	198.2	197.5	-0.7
"HSB143C "	7987.62	6541.87	169.1	179.1	209.4	203.6	-5.8
"HSB145C "	13422.99	4998.93	164.7	174.7	213.3	217.4	4.1
"HSB146C "	14242.12	4531.73	152.3	162.3	209.9	223.6	13.7
"HSB151C "	9356.10	6075.92	170.6	180.6	207.8	204.8	-3.0
"HSB152C "	9885.63	5180.55	173.1	183.1	198.9	200.9	2.0
"NBG 4 "	8427.66	11955.57	196.1	227.5	217.0	219.4	2.4
"NBG 5 "	8609.72	11995.59	194.9	226.4	217.7	218.7	1.0
"P 27C "	19669.65	5603.71	139.6	144.6	243.6	249.6	6.0
"SBG 1 "	18540.45	9685.84	190.7	220.7	237.8	239.2	1.4
"YSC 1C "	19859.25	13612.64	197.5	207.5	217.1	219.5	2.4
"YSC 2D "	20100.53	13801.12	197.9	218.0	216.5	219.9	3.4
"YSC 4C "	20138.84	12520.40	195.9	205.9	227.4	227.2	-0.2
"ZBG 2 "	21860.39	11977.26	210.9	230.9	221.7	220.1	-1.6
"ZW 2 "	8120.06	13688.89	194.8	204.8	207.3	199.1	-8.2

"upper" zone **rms of (FACT-data) differences: 2.80**
avg of (FACT-data) differences: 0.07
avg of |FACT-data| differences: 2.18
max of (FACT-data) differences: 9.04

Well ID SRS SRS Screen Screen Measured Simulated Residual

	Easting	Northing	Bottom	Top	Head	Head	
"BG 26 "	13846.42	8012.32	210.7	230.7	239.3	238.6	-0.7
"BG 27 "	13763.90	8401.98	234.4	254.4	240.9	238.6	-2.3
"BG 28 "	13681.91	8788.68	239.7	259.7	247.1	0.0	-247.1
"BG 29 "	13598.54	9179.49	231.6	251.6	245.0	237.2	-7.8
"BG 30 "	13514.90	9569.11	231.7	251.7	237.6	236.2	-1.4
"BG 31 "	13426.50	9959.05	223.3	243.3	233.7	235.2	1.5
"BG 32 "	13343.14	10350.27	226.9	246.9	233.4	234.1	0.7
"BG 33 "	13044.67	10419.74	221.2	241.2	232.9	233.8	0.9
"BG 34 "	12632.37	10346.10	217.4	237.4	232.8	233.8	1.0
"BG 35 "	12259.34	10268.55	228.0	248.0	232.9	233.6	0.7
"BG 36 "	12103.11	10493.28	223.3	243.3	232.5	233.1	0.6
"BG 37 "	11729.96	10472.55	227.8	247.8	232.8	232.5	-0.3
"BG 38 "	11338.78	10389.50	225.9	245.9	232.3	232.1	-0.2
"BG 39 "	10947.74	10306.28	226.0	246.0	231.7	232.2	0.5
"BG 40 "	10556.14	10223.25	221.9	241.9	231.4	232.3	0.9
"BG 41 "	10425.50	9961.57	221.0	241.0	230.8	232.5	1.7
"BG 42 "	10508.83	9572.90	217.1	237.1	230.7	232.8	2.1
"BG 43 "	10742.85	9289.05	222.9	242.9	230.5	233.6	3.1
"BG 51 "	13660.18	7876.53	221.2	241.2	240.7	238.6	-2.1
"BG 52 "	10226.97	9238.59	223.8	243.8	229.3	232.6	3.3
"BG 53 "	9735.08	9386.45	214.7	234.7	228.0	231.0	3.0
"BG 54 "	9563.21	9023.39	215.2	235.2	228.6	230.3	1.7
"BG 55 "	9393.65	8667.76	214.9	234.9	226.6	228.7	2.1
"BG 56 "	9353.70	8333.35	210.9	230.9	225.1	227.2	2.1
"BG 57 "	9727.26	8202.05	214.6	234.6	225.3	228.2	2.9
"BG 58 "	10105.64	8068.29	218.2	238.2	226.8	229.4	2.6
"BG 59 "	10485.14	7947.05	217.7	237.7	229.8	230.4	0.6
"BG 60 "	10862.73	7815.58	215.5	235.5	230.8	231.4	0.6
"BG 61 "	11426.71	7617.61	225.0	245.0	232.8	233.2	0.4
"BG 62 "	11614.68	7551.44	222.5	242.5	233.4	233.9	0.5
"BG 63 "	11991.99	7409.69	224.2	244.2	235.2	235.2	0.0
"BG 64 "	12369.52	7278.01	227.3	247.3	238.1	235.7	-2.4
"BG 65 "	12745.34	7146.68	230.9	250.9	235.7	236.1	0.4
"BG 66 "	12941.31	7438.19	231.0	251.0	235.2	237.6	2.4
"BG 67 "	12960.04	7819.52	224.7	244.7	236.5	238.1	1.6
"BG 98 "	11709.56	11278.93	212.5	242.5	224.5	225.3	0.8
"BG 99 "	12837.14	10809.81	215.9	245.9	232.5	232.7	0.2
"BG 100 "	13131.91	11803.82	203.3	233.3	224.8	221.2	-3.6
"BG 104 "	14260.71	11249.60	215.8	245.8	224.6	222.4	-2.2
"BG 107 "	14952.46	9111.50	208.3	228.3	235.2	233.4	-1.8
"BG 108 "	14754.09	8639.34	217.3	247.3	238.8	237.7	-1.1
"BG 109 "	14651.68	8150.56	228.4	258.4	240.2	239.9	-0.3
"BG 110 "	14429.22	7519.01	224.3	254.3	241.3	241.0	-0.3
"BG 124 "	11484.00	10879.40	214.8	234.8	231.8	228.8	-3.0
"BGO 1D "	13862.53	7790.32	225.0	245.0	238.0	238.9	0.9
"BGO 2D "	13722.82	8593.83	218.9	238.9	238.4	238.1	-0.3
"BGO 3D "	13556.33	9374.68	227.6	247.6	235.6	236.7	1.1
"BGO 4D "	13384.87	10154.88	220.6	240.6	232.1	234.7	2.6
"BGO 5D "	13298.32	10471.20	219.3	239.3	231.1	233.4	2.3
"BGO 6D "	12819.24	10379.38	217.2	237.2	231.5	233.9	2.4
"BGO 7D "	12446.14	10307.44	220.2	240.2	233.1	233.7	0.6
"BGO 8D "	12133.68	10337.43	220.6	240.6	233.4	233.3	-0.1
"BGO 10D "	11514.34	10426.92	230.5	250.5	231.9	232.2	0.3
"BGO 10DR"	11556.56	10435.59	218.3	238.3	232.2	232.2	0.0
"BGO 11D "	11143.33	10348.06	216.3	236.3	230.7	232.1	1.4
"BGO 12D "	10732.29	10260.79	217.8	237.8	231.2	232.2	1.0
"BGO 13D "	10349.71	10179.57	228.5	248.5	231.1	232.3	1.2
"BGO 13DR"	10346.07	10198.63	210.3	220.3	231.4	232.1	0.7
"BGO 14DR"	10400.68	9696.41	218.1	238.1	231.2	232.7	1.5
"BGO 15D "	10541.34	9369.92	218.7	238.7	230.2	233.1	2.9
"BGO 16D "	10923.02	9223.99	217.3	237.3	231.1	233.8	2.7
"BGO 17D "	11147.57	9116.53	204.0	224.0	230.8	233.6	2.8
"BGO 17DR"	11154.28	9122.45	216.9	236.9	232.2	234.1	1.9
"BGO 18D "	11452.47	9181.75	219.6	239.6	232.1	234.5	2.4
"BGO 19D "	11784.30	8996.69	196.8	216.8	231.1	233.3	2.2
"BGO 20D "	11978.88	8641.59	216.3	236.3	234.5	236.4	1.9
"BGO 21D "	12384.89	8448.07	217.7	237.7	235.2	237.5	2.3
"BGO 22DR"	12782.92	8310.83	219.2	239.2	236.2	238.0	1.8
"BGO 23D "	13126.36	8145.22	222.0	242.0	236.1	238.3	2.2
"BGO 24D "	13472.40	7988.03	221.0	241.0	237.1	238.5	1.4

"BGO 26D "	9683.76	9345.59	213.4	233.5	228.1	230.7	2.6
"BGO 27D "	9449.78	8835.09	209.3	229.3	227.7	229.4	1.7
"BGO 28D "	9300.74	8467.06	210.1	230.1	226.3	227.6	1.3
"BGO 29D "	8899.31	8631.39	208.5	228.5	226.9	227.1	0.2
"BGO 30D "	9374.53	8318.56	207.8	227.8	225.9	227.2	1.3
"BGO 31D "	9751.63	8191.79	211.1	231.1	226.8	228.2	1.4
"BGO 32D "	10204.90	8024.06	214.5	234.5	227.9	229.5	1.6
"BGO 33D "	10694.08	7863.97	213.1	233.1	230.4	230.8	0.4
"BGO 34D "	11122.70	7709.82	212.7	232.7	233.2	232.1	-1.1
"BGO 35D "	11645.04	7531.73	219.4	239.4	235.1	233.9	-1.2
"BGO 36D "	12011.43	7402.89	223.3	243.3	237.3	235.2	-2.1
"BGO 37D "	12459.99	7239.58	226.1	246.1	238.5	235.7	-2.8
"BGO 38D "	12752.38	7136.62	222.3	242.3	235.7	236.0	0.3
"BGO 39D "	12967.06	7442.13	224.7	244.7	235.4	237.5	2.1
"BGO 40D "	9315.84	9265.14	216.6	226.5	222.9	230.2	7.3
"BGO 43D "	10687.53	10508.40	198.2	208.2	231.8	230.2	-1.6
"BGO 44D "	12384.00	10565.15	223.4	233.4	232.6	233.3	0.7
"BGO 45D "	9320.45	8988.55	209.6	229.6	228.3	229.5	1.2
"BGO 46D "	9329.06	8151.55	202.1	212.1	225.7	226.0	0.3
"BGO 47D "	9882.12	7968.44	203.4	213.4	226.7	227.1	0.4
"BGO 48D "	10107.76	7859.67	202.0	212.0	227.1	227.5	0.4
"BGO 49D "	11298.17	7443.17	218.5	238.5	234.9	232.0	-2.9
"BGO 50D "	9092.10	8251.98	208.0	228.0	225.6	225.9	0.3
"BGX 1D "	13056.94	10759.31	214.7	234.7	229.8	232.7	2.9
"BGX 9D "	13924.18	11072.97	212.4	232.4	226.8	227.2	0.4
"BGX 10D "	14318.75	10387.32	216.2	236.2	226.0	230.0	4.0
"BGX 11D "	14322.18	9485.73	216.7	236.7	235.7	234.6	-1.1
"BGX 12D "	14598.05	8634.69	223.7	243.7	239.2	238.0	-1.2
"BRR 1D "	5096.27	9635.33	200.4	220.4	216.8	216.0	-0.8
"BRR 4D "	4624.12	9530.16	198.7	218.7	214.9	211.7	-3.2
"BRR 5D "	4550.20	9418.56	202.1	222.1	214.9	212.0	-2.9
"F 10 "	5414.98	7443.80	266.5	276.5	270.4	0.0	-270.4
"F 18A "	5290.84	6410.31	194.4	204.4	203.8	204.1	0.3
"FAC 3 "	9591.52	11258.51	224.8	254.8	229.1	228.0	-1.1
"FAC 5 "	9523.96	11184.86	214.0	234.0	224.9	226.3	1.4
"FAC 5P "	9551.07	11410.83	225.7	235.7	229.7	227.2	-2.5
"FAC 6 "	9581.03	11369.46	216.2	236.2	220.8	225.1	4.3
"FAC 7 "	9602.44	11368.28	215.7	235.7	223.2	224.9	1.7
"FAC 8 "	9618.78	11338.53	216.0	236.0	227.2	225.2	-2.0
"FAL 1 "	8039.16	11028.33	207.0	238.5	218.9	226.4	7.5
"FAL 2 "	8016.02	11142.00	206.6	238.0	217.1	225.9	8.8
"FC 1D "	7084.36	12432.91	217.2	222.2	223.6	217.3	-6.3
"FCA 2D "	7961.45	11195.73	219.0	239.0	225.1	226.3	1.2
"FCA 9D "	7915.61	11497.50	221.9	241.9	225.3	225.1	-0.2
"FCA 10A "	7749.64	11503.01	221.0	241.0	225.3	224.8	-0.5
"FCA 10D "	7906.32	11535.90	219.5	239.5	226.3	224.9	-1.4
"FCA 16A "	7692.74	11755.80	215.1	235.1	225.2	223.5	-1.7
"FCA 16D "	7840.35	11786.16	221.1	241.1	225.0	223.7	-1.3
"FCA 19D "	7970.24	11173.17	209.7	229.7	217.1	226.1	9.0
"FCB 1 "	9396.41	10007.72	205.6	235.6	229.9	229.2	-0.7
"FCB 2 "	9600.00	9891.78	205.2	235.2	228.9	229.9	1.0
"FCB 4 "	9147.76	9898.63	204.5	234.5	227.9	228.6	0.7
"FCB 5 "	9371.04	9651.87	217.1	237.1	228.6	230.7	2.1
"FCB 6 "	9313.70	9731.18	215.1	235.1	228.9	230.4	1.5
"FCB 7 "	9463.53	10102.24	218.3	238.3	230.8	231.1	0.3
"FET 1D "	7998.12	9025.74	206.9	226.9	223.6	225.9	2.3
"FET 2D "	7711.29	8842.29	209.5	229.5	222.3	224.8	2.5
"FET 3D "	7772.45	8768.60	203.0	223.0	222.3	224.6	2.3
"FET 4D "	7893.41	8792.57	205.1	225.1	222.8	225.0	2.2
"FSB 0PD"	4959.48	6727.34	171.6	215.3	207.4	205.5	-1.9
"FSB 76 "	6133.77	8604.92	197.0	227.0	218.1	218.5	0.4
"FSB 77 "	5683.29	7474.35	186.4	216.4	212.2	212.0	-0.2
"FSB 78 "	5222.84	7002.92	187.7	217.7	208.7	207.1	-1.6
"FSB 79 "	5427.28	5920.88	174.1	204.1	201.9	197.9	-4.0
"FSB 87D "	4970.10	7789.87	187.4	216.8	213.6	212.0	-1.6
"FSB 88D "	6377.03	8125.21	202.1	222.1	216.1	217.6	1.5
"FSB 89D "	6205.29	8013.57	201.9	221.9	215.5	216.8	1.3
"FSB 90D "	6050.09	7805.35	205.1	225.1	215.0	215.4	0.4
"FSB 91D "	5895.43	7599.39	200.9	220.9	213.7	213.6	-0.1
"FSB 92D "	5548.57	7360.25	201.7	221.7	211.9	210.7	-1.2
"FSB 93D "	5478.37	7184.52	197.9	217.9	210.8	208.9	-1.9
"FSB 94DR"	5199.23	7105.35	183.3	203.4	210.1	207.7	-2.4

"FSB 95D "	5026.06	7179.36	207.8	227.8	208.8	208.0	-0.8
"FSB 95DR"	5010.49	7190.57	187.0	207.0	210.3	208.0	-2.3
"FSB 97D "	4949.44	7379.20	196.9	216.9	210.7	209.3	-1.4
"FSB 98D "	5044.51	7586.50	200.3	220.3	212.4	211.1	-1.3
"FSB 99D "	5188.62	7944.07	198.1	218.1	211.9	213.9	2.0
"FSB104D "	4520.28	5934.71	190.4	210.4	204.2	200.3	-3.9
"FSB105D "	4798.82	7403.82	203.7	223.7	208.3	209.4	1.1
"FSB105DR"	4803.49	7418.92	188.5	208.6	211.1	209.4	-1.7
"FSB106D "	5803.34	6542.55	202.9	222.9	206.8	204.7	-2.1
"FSB107D "	6100.51	7611.91	200.9	220.9	213.8	214.2	0.4
"FSB108D "	5867.90	8670.17	203.8	223.8	217.6	218.3	0.7
"FSB109D "	5312.65	8138.30	205.8	225.8	213.3	215.4	2.1
"FSB110D "	5318.90	6439.89	191.1	211.1	205.4	204.3	-1.1
"FSB111D "	6415.84	7889.23	201.7	221.7	215.0	216.6	1.6
"FSB112D "	3980.74	6186.53	188.9	208.9	206.2	201.8	-4.4
"FSB113D "	6262.80	6601.16	189.6	209.6	207.6	204.7	-2.9
"FSB114D "	6929.24	7891.72	197.7	217.8	217.3	217.8	0.5
"FSB117D "	5682.11	6391.45	189.7	209.7	205.2	203.5	-1.7
"FSB118D "	6323.89	7169.38	191.3	211.3	211.7	211.3	-0.4
"FSB119D "	5683.38	6932.84	193.1	213.1	208.4	207.6	-0.8
"FSB120D "	4076.41	7581.92	196.5	216.5	209.6	208.2	-1.4
"FSB121DR"	3445.11	7021.62	191.3	211.3	207.4	204.3	-3.1
"FSB122C "	3479.60	5730.48	160.0	170.0	200.0	196.8	-3.2
"FSB122D "	3489.55	5715.92	186.6	206.6	203.8	197.7	-6.1
"FSB123D "	6800.48	7132.46	194.1	214.1	212.3	212.0	-0.3
"FSL 1D "	7095.02	11796.01	208.5	228.6	224.4	221.7	-2.7
"FSL 2D "	6986.22	11336.75	208.7	228.8	224.9	223.6	-1.3
"FSL 3D "	6849.09	10416.84	205.9	226.0	223.0	224.4	1.4
"FSL 4D "	6684.45	10062.06	204.0	224.1	217.2	223.7	6.5
"FSL 5D "	6448.64	9598.19	203.5	223.7	220.8	221.6	0.8
"FSL 6D "	6342.48	9254.00	202.1	222.1	220.0	220.1	0.1
"FSL 7D "	6189.75	8807.18	199.5	219.6	219.0	218.9	-0.1
"FSL 8D "	6273.82	8545.85	202.7	222.8	218.0	218.6	0.6
"FSL 9D "	6363.08	8272.12	201.4	221.5	216.0	218.1	2.1
"FSS 1D "	8771.54	8261.85	209.9	229.9	223.7	225.0	1.3
"FSS 2D "	8824.42	8115.54	204.4	224.4	223.1	224.4	1.3
"FSS 3D "	8491.35	7898.55	205.8	225.8	220.8	222.4	1.6
"FSS 4D "	7714.11	8323.54	202.6	222.6	218.9	222.8	3.9
"FTF 2 "	7730.52	10165.40	219.4	239.4	225.0	227.4	2.4
"FTF 3 "	7721.82	10060.61	218.2	221.2	224.0	227.2	3.2
"FTF 4 "	7766.00	9965.31	216.6	236.6	224.4	227.3	2.9
"FTF 5 "	7688.51	9849.36	215.3	235.3	224.8	226.9	2.1
"FTF 6 "	7560.46	9940.53	216.9	236.9	224.3	226.7	2.4
"FTF 7 "	7569.99	10028.95	222.1	226.1	223.6	226.8	3.2
"FTF 8 "	7519.99	10120.86	219.6	239.6	226.7	226.7	0.0
"FTF 9 "	7205.45	10203.88	216.4	236.4	224.0	225.7	1.7
"FTF 10 "	7368.51	10088.46	215.1	235.1	224.2	226.2	2.0
"FTF 11 "	7248.01	9904.07	215.8	235.8	224.8	225.6	0.8
"FTF 12 "	7120.65	10020.85	215.0	235.0	226.7	225.3	-1.4
"FTF 13 "	7702.85	9445.72	216.1	236.1	225.6	226.3	0.7
"FTF 15 "	7811.99	9565.23	197.5	227.5	225.1	226.7	1.6
"FTF 16 "	7463.91	9518.43	203.8	233.8	223.3	225.7	2.4
"FTF 17 "	7444.44	9630.23	200.6	230.6	223.1	225.8	2.7
"FTF 18 "	7422.32	9711.20	202.3	232.3	223.4	225.9	2.5
"FTF 19 "	7179.98	9847.08	198.3	228.3	222.5	224.8	2.3
"FTF 20 "	7039.10	9690.27	198.3	228.3	221.9	224.1	2.2
"FTF 21 "	7068.57	9544.92	198.7	228.7	223.2	224.1	0.9
"FTF 22 "	7088.74	9431.23	212.6	242.6	221.8	224.3	2.5
"FTF 23 "	7279.73	9329.21	201.2	231.2	222.3	224.7	2.4
"FTF 24A "	7263.53	9984.97	212.7	232.7	221.9	225.7	3.8
"FTF 25A "	7338.74	10053.91	212.8	232.8	223.3	226.0	2.7
"FTF 26 "	7357.44	9998.18	206.3	226.3	223.3	225.9	2.6
"FTF 27 "	7311.41	9965.09	213.5	243.5	223.4	225.9	2.5
"H 6 "	13787.77	6007.01	225.2	235.2	231.0	232.3	1.3
"H 7 "	13800.91	5948.56	224.9	234.9	229.0	231.3	2.3
"H 8 "	13770.34	5600.81	218.4	228.4	227.0	225.1	-1.9
"H 9 "	13819.74	5567.55	207.4	217.4	226.8	224.4	-2.4
"H 10 "	13369.93	5507.31	222.5	232.5	227.3	224.6	-2.7
"H 11 "	13336.07	5457.89	212.0	222.0	227.7	223.6	-4.1
"H 18A "	12951.07	5144.70	217.5	227.5	224.1	217.8	-6.3
"H 19 "	12641.87	5175.69	219.6	221.1	223.8	0.0	-223.8
"HAA 1D "	18788.64	4871.94	261.8	281.8	276.2	275.4	-0.8

"HAA 2D "	16860.42	5572.65	260.3	280.4	276.4	271.8	-4.6
"HAA 3D "	15689.74	5807.38	246.7	266.7	262.1	255.8	-6.3
"HAA 4D "	17220.16	6955.57	255.7	275.7	269.8	270.8	1.0
"HAA 6D "	19349.23	6607.62	247.1	267.2	264.8	268.1	3.3
"HAC 1 "	16766.61	6805.69	258.8	278.8	269.2	269.7	0.5
"HAC 2 "	16709.13	6843.78	258.8	278.8	268.8	269.0	0.2
"HAC 3 "	16664.65	6796.70	255.0	275.0	268.9	268.7	-0.2
"HAC 4 "	16734.89	6747.12	254.1	274.1	269.4	269.5	0.1
"HAP 1 "	18906.71	6277.91	256.3	276.3	270.7	273.8	3.1
"HAP 2 "	19043.13	6218.07	243.8	263.8	270.3	272.6	2.3
"HC 1D "	17296.90	6483.92	206.5	211.5	268.9	271.5	2.6
"HC 1E "	17293.96	6483.29	251.5	256.5	275.0	273.4	-1.6
"HC 2E "	17283.13	6519.84	205.7	210.7	269.5	271.3	1.8
"HC 2F "	17283.96	6515.93	250.7	255.7	274.3	273.1	-1.2
"HC 6B "	17411.46	6921.29	210.2	215.2	268.9	269.3	0.4
"HC 11C "	16983.68	9229.19	190.8	195.8	236.6	238.1	1.5
"HCA 1 "	18350.48	7500.89	253.7	273.7	269.2	262.8	-6.4
"HCA 2 "	18241.58	7216.23	242.0	273.4	270.2	267.0	-3.2
"HCA 3 "	18323.16	7627.99	253.8	273.8	269.0	260.8	-8.2
"HCA 4 "	18187.59	7468.31	241.9	273.3	269.3	263.4	-5.9
"HCB 1 "	19372.87	6598.85	222.6	252.6	263.4	267.1	3.7
"HCB 2 "	19280.47	6439.04	239.9	269.9	267.9	270.0	2.1
"HCB 3 "	19439.50	6277.68	233.6	263.6	266.4	269.3	2.9
"HCB 4 "	19540.92	6447.89	235.9	265.9	264.4	267.3	2.9
"HET 1D "	15962.70	6407.14	240.3	260.3	267.5	261.6	-5.9
"HET 2D "	15508.98	6369.69	239.7	259.7	258.3	255.6	-2.7
"HET 3D "	15506.45	6459.02	239.9	259.9	258.7	255.9	-2.8
"HET 4D "	15543.72	6553.02	239.5	259.6	259.1	256.7	-2.4
"HR3 11 "	15685.35	5790.50	200.4	230.0	259.4	253.8	-5.6
"HR3 13 "	15554.85	6014.87	205.1	234.8	258.5	253.5	-5.0
"HR8 11 "	14998.59	6199.56	207.9	237.6	245.9	245.1	-0.8
"HR8 12 "	14808.34	5989.82	206.3	235.9	239.4	239.8	0.4
"HR8 13 "	14824.94	5767.92	201.7	231.4	237.7	238.4	0.7
"HR8 14 "	15156.68	5707.37	202.3	231.9	244.0	244.2	0.2
"HSB 65 "	13795.66	6434.49	212.4	242.4	232.7	236.3	3.6
"HSB 65C "	13807.52	6451.32	207.8	218.6	232.7	236.4	3.7
"HSB 66 "	12324.07	6125.37	198.1	228.1	225.4	226.7	1.3
"HSB 67 "	13979.53	5532.41	200.7	224.2	223.8	222.6	-1.2
"HSB 68 "	12484.74	5238.19	213.3	241.8	221.9	216.3	-5.6
"HSB 69 "	12064.22	5168.13	199.0	229.0	219.5	214.4	-5.1
"HSB 70 "	11143.28	6056.06	205.7	235.7	224.5	221.8	-2.7
"HSB 71 "	10618.14	6219.44	204.8	234.8	224.1	222.0	-2.1
"HSB 83D "	14127.46	5689.70	198.7	228.7	224.8	226.9	2.1
"HSB 84D "	11934.06	5178.29	199.5	219.5	218.9	214.1	-4.8
"HSB 85C "	14013.57	7888.26	214.2	224.2	238.9	238.9	0.0
"HSB 86C "	11380.10	6027.47	189.4	199.4	223.8	221.3	-2.5
"HSB 86D "	11393.32	6022.51	206.6	236.6	223.7	221.7	-2.0
"HSB100D "	14225.73	6166.24	216.9	236.9	233.4	236.4	3.0
"HSB101D "	14043.91	6049.59	216.1	236.1	230.7	233.9	3.2
"HSB102D "	13856.29	5963.60	216.3	236.3	228.2	231.7	3.5
"HSB103D "	13855.93	5591.09	213.7	233.7	225.6	224.5	-1.1
"HSB104D "	13666.68	5328.09	210.6	230.6	224.9	221.6	-3.3
"HSB105D "	13455.02	5369.60	211.8	231.8	225.3	222.5	-2.8
"HSB106D "	13170.75	5588.27	210.7	230.7	225.9	225.0	-0.9
"HSB107D "	12949.72	5509.39	215.1	235.1	224.7	222.8	-1.9
"HSB108D "	12690.73	5445.55	212.0	232.0	223.6	220.1	-3.5
"HSB109D "	12436.81	5389.12	213.0	233.0	222.9	218.0	-4.9
"HSB110D "	12207.37	5442.18	211.4	231.4	222.2	217.7	-4.5
"HSB111D "	12004.33	5543.17	185.7	195.7	222.1	218.1	-4.0
"HSB111E "	11995.82	5548.11	211.7	231.7	222.2	218.4	-3.8
"HSB112D "	11870.88	5755.47	188.3	198.3	222.9	220.1	-2.8
"HSB112E "	11861.43	5758.57	211.7	231.7	222.8	220.3	-2.5
"HSB113D "	11603.07	5842.79	216.2	236.2	222.9	220.5	-2.4
"HSB114D "	11509.02	5998.13	212.8	232.8	223.6	221.7	-1.9
"HSB115D "	11406.53	6168.65	213.9	233.9	224.3	223.1	-1.2
"HSB116D "	11307.03	6388.57	214.5	234.5	226.3	225.6	-0.7
"HSB125D "	14137.26	5558.98	199.4	219.4	221.1	224.0	2.9
"HSB126D "	12933.47	4418.98	190.5	200.5	204.9	206.0	1.1
"HSB127D "	12438.48	4912.35	197.8	217.8	218.2	211.8	-6.4
"HSB129D "	10662.16	5166.79	185.2	205.2	208.3	209.4	1.1
"HSB132C "	14341.77	5576.07	168.6	178.6	221.5	228.6	7.1
"HSB132D "	14353.72	5575.65	206.5	226.5	221.1	227.8	6.7

"HSB133D "	14551.55	6102.29	208.5	228.5	235.0	238.0	3.0
"HSB134D "	13914.34	5224.42	205.8	223.2	222.1	219.2	-2.9
"HSB135D "	12171.45	5037.36	199.9	219.9	218.3	213.0	-5.3
"HSB136D "	11467.81	5408.48	200.2	220.2	220.9	216.5	-4.4
"HSB137D "	11150.05	5722.17	205.3	225.3	222.3	218.7	-3.6
"HSB138D "	10540.93	6493.69	208.1	228.1	224.1	223.4	-0.7
"HSB139D "	13039.66	4952.52	206.7	226.4	222.7	215.3	-7.4
"HSB141D "	14776.48	5374.04	217.8	237.8	240.5	235.3	-5.2
"HSB143D "	7985.60	6557.60	196.9	216.9	213.2	207.4	-5.8
"HSB145D "	13410.48	4985.13	184.2	194.2	220.7	216.9	-3.8
"HSB146D "	14261.98	4534.01	204.0	224.1	222.0	225.4	3.4
"HSB147D "	10933.93	7259.84	215.2	235.2	232.2	229.7	-2.5
"HSB149D "	12900.96	5133.23	207.0	227.0	222.3	217.2	-5.1
"HSB150D "	14203.16	5771.73	206.9	226.9	226.8	229.4	2.6
"HSB151D "	9367.37	6078.21	197.6	207.6	207.2	205.5	-1.7
"HSB152D "	9900.75	5183.45	197.0	207.0	205.7	201.8	-3.9
"HSL 1D "	14329.04	6296.36	219.8	239.8	234.8	238.0	3.2
"HSL 2D "	14814.31	6410.96	225.2	245.3	241.2	242.4	1.2
"HSL 3D "	15141.21	6542.50	233.7	253.8	249.8	249.2	-0.6
"HSL 4D "	15491.70	6823.72	245.0	265.1	261.3	255.2	-6.1
"HSL 5D "	15632.98	6964.67	247.8	267.7	265.5	256.6	-8.9
"HSL 6D "	15800.22	7099.90	243.9	264.0	259.2	257.4	-1.8
"HSL 7D "	15984.87	7154.18	242.3	262.4	259.1	258.3	-0.8
"HSL 8D "	16367.51	7249.52	248.4	268.4	260.3	261.1	0.8
"HSS 1D "	20903.98	3022.53	236.5	256.5	268.6	270.8	2.2
"HSS 2D "	21064.76	2796.62	234.5	254.5	267.7	270.4	2.7
"HSS 3D "	20802.58	3662.64	262.6	282.6	281.6	273.4	-8.2
"HTF 1 "	17492.73	6524.52	236.9	256.9	272.8	273.3	0.5
"HTF 2 "	17626.44	6414.92	237.0	257.0	274.1	274.1	0.0
"HTF 4 "	17394.38	6386.04	235.2	255.2	274.2	273.5	-0.7
"HTF 5 "	17608.60	6186.22	264.3	284.3	277.1	277.1	0.0
"HTF 6 "	17751.26	6082.61	263.6	283.6	275.9	277.5	1.6
"HTF 7 "	17664.62	5932.32	263.5	283.5	275.9	277.6	1.7
"HTF 8 "	17491.72	6038.69	263.6	283.6	273.7	277.0	3.3
"HTF 9 "	17151.13	6356.83	245.8	265.8	273.5	273.3	-0.2
"HTF 10 "	17315.52	6256.83	245.2	265.2	273.2	274.4	1.2
"HTF 11 "	17227.42	6113.37	238.9	258.9	273.9	273.4	-0.5
"HTF 12 "	17075.87	6205.89	242.9	262.9	273.4	272.9	-0.5
"HTF 13 "	16999.17	6533.09	262.6	282.6	274.2	273.4	-0.8
"HTF 14 "	16877.46	6509.26	261.9	281.9	273.5	272.4	-1.1
"HTF 15 "	16803.69	6332.05	260.7	280.7	273.5	272.2	-1.3
"HTF 16 "	17294.09	6896.34	248.3	268.3	269.7	271.0	1.3
"HTF 17 "	16455.18	7178.08	238.4	258.4	262.5	262.1	-0.4
"HTF 18 "	16661.90	6375.32	251.7	271.7	271.5	270.1	-1.4
"HTF 19 "	16493.77	6473.20	245.7	265.7	269.1	267.5	-1.6
"HTF 20 "	16465.31	6641.77	251.9	271.9	267.9	267.3	-0.6
"HTF 21 "	16651.70	6604.61	242.6	262.6	269.5	268.4	-1.1
"HTF 22 "	18048.04	6252.43	251.4	271.4	275.4	276.0	0.6
"HTF 23 "	18162.25	6276.40	256.8	276.8	274.8	276.2	1.4
"HTF 24 "	18265.35	6297.80	257.8	277.8	274.2	275.9	1.7
"HTF 25 "	18417.75	6188.81	252.5	272.5	274.6	275.7	1.1
"HTF 26 "	18361.11	6040.18	255.5	275.5	275.4	277.1	1.7
"HTF 27 "	18215.93	5975.79	259.1	279.1	276.1	278.0	1.9
"HTF 28 "	18069.87	5967.44	251.9	271.9	275.9	277.3	1.4
"HTF 29 "	17940.13	6093.01	259.9	289.9	275.6	277.5	1.9
"HTF 31 "	18282.72	5672.14	246.7	266.7	275.7	277.8	2.1
"HTF 32 "	18397.16	5833.05	251.1	271.1	274.7	277.7	3.0
"HTF 34 "	17531.10	5918.35	251.7	271.7	275.8	276.1	0.3
"MGA 36 "	12959.60	7768.21	234.2	254.2	237.3	238.3	1.0
"MGC 9 "	10423.40	8730.02	217.3	237.3	229.6	232.6	3.0
"MGC 11 "	10604.81	8646.10	219.2	239.2	231.1	233.0	1.9
"MGC 19 "	11329.13	8307.09	230.6	234.6	232.2	234.8	2.6
"MGC 32 "	12510.33	7752.56	232.0	252.0	245.2	237.6	-7.6
"MGC 36 "	12880.95	7582.70	234.4	254.4	236.1	237.9	1.8
"MGE 9 "	10337.40	8551.23	218.1	238.1	229.2	232.0	2.8
"MGE 21 "	11424.50	8038.75	227.9	247.9	234.2	234.5	0.3
"MGE 30 "	12252.53	7650.43	229.3	249.3	236.1	236.8	0.7
"MGE 34 "	12615.31	7481.36	237.2	257.2	238.6	0.0	-238.6
"MGG 15 "	10798.89	8121.69	223.3	243.3	232.6	232.2	-0.4
"MGG 19 "	11165.16	7951.12	226.0	246.0	232.7	233.1	0.4
"MGG 23 "	11526.03	7780.42	227.1	247.1	235.2	234.2	-1.0
"MGG 28 "	11985.06	7562.08	230.3	250.3	235.7	235.8	0.1

"MGG 36 "	12719.53	7215.21	232.5	252.5	237.9	236.3	-1.6
"NBG 1 "	7913.10	12212.50	200.9	232.3	224.4	219.4	-5.0
"NBG 2 "	8032.18	12032.73	203.6	233.6	224.8	221.4	-3.4
"NBG 3 "	8172.79	11898.84	202.1	233.5	217.6	223.0	5.4
"P 27D "	19676.64	5590.06	199.5	219.5	266.6	270.1	3.5
"SBG 2 "	19715.17	9885.23	205.9	235.9	237.7	240.9	3.2
"SBG 3 "	20214.99	9101.73	206.6	236.6	237.0	240.7	3.7
"SBG 5 "	19775.26	7483.34	199.4	219.4	249.3	251.7	2.4
"SBG 6 "	18861.02	8711.09	208.1	238.1	244.3	248.0	3.7
"SCA 2 "	19627.58	9130.94	215.9	245.9	242.2	244.2	2.0
"SCA 3 "	19481.83	9211.09	220.3	240.3	241.4	244.5	3.1
"SCA 3A "	19480.65	9216.66	267.1	271.6	270.8	0.0	-270.8
"SCA 4 "	19495.67	9108.93	220.4	240.4	241.7	244.8	3.1
"SCA 4A "	19499.56	9108.43	265.3	272.8	268.8	0.0	-268.8
"SCA 5 "	19512.35	9354.16	223.7	243.7	241.4	244.1	2.7
"SCA 6 "	19599.31	8977.30	221.3	241.1	242.1	244.9	2.8
"SLP 1 "	19570.50	8206.67	228.0	248.0	245.2	248.9	3.7
"SLP 2 "	19669.09	8130.50	217.7	237.7	244.7	248.3	3.6
"YSC 1D "	19865.99	13598.23	216.8	236.8	221.1	224.2	3.1
"Z 2 "	8169.39	7651.00	214.0	214.5	219.4	220.1	0.7
"Z 3 "	6294.03	7560.01	206.6	207.1	212.6	214.3	1.7
"Z 8 "	6221.86	9133.69	213.6	214.1	219.3	219.5	0.2
"Z 9 "	5002.69	9990.43	209.9	210.4	215.0	214.8	-0.2
"Z 9 "	5002.69	9990.43	207.5	227.5	215.0	214.8	-0.2
"Z 12 "	16954.73	5851.86	251.3	251.8	274.3	271.3	-3.0
"Z 13 "	17825.78	5614.68	256.6	257.1	276.1	277.1	1.0
"ZBG 1 "	19926.85	11989.22	220.0	240.1	233.8	233.9	0.1
"ZBG 1A "	19940.34	11996.48	276.0	281.0	278.5	0.0	-278.5
"ZDT 1 "	20494.85	7059.79	227.0	247.0	239.7	245.7	6.0
"ZDT 2 "	20430.32	7099.34	225.1	245.1	241.2	246.6	5.4
"ZW 4 "	10871.71	11171.89	229.2	239.7	232.3	0.0	-232.3
"ZW 5 "	9458.83	8929.12	221.0	231.0	227.4	229.7	2.3
"ZW 6 "	6756.67	8762.27	216.7	227.2	220.3	220.7	0.4
"ZW 7 "	15628.95	6797.48	254.5	264.8	265.8	259.0	-6.8
"ZW 8 "	19385.64	5961.58	254.1	264.1	270.9	271.2	0.3
"ZW 9 "	16538.42	7807.55	242.4	252.4	252.0	253.8	1.8
"ZW 10 "	18492.49	8237.21	242.2	252.2	249.7	252.0	2.3
"FPZ001A "	4103.01	5630.17	182.0	184.5	198.0	196.9	-1.1
"FPZ002A "	4174.47	5713.60	189.3	191.8	201.5	197.9	-3.6
"FPZ003A "	4501.13	5257.54	172.5	187.5	188.8	189.7	0.9
"FPZ004A "	5098.46	5885.38	192.0	194.5	201.5	198.5	-2.9
"FPZ005A "	5087.85	5514.57	176.6	179.1	191.2	190.4	-0.7
"FPZ005B "	5087.85	5514.57	183.9	188.9	191.2	190.2	-1.0
"FPZ006A "	5213.24	5413.67	175.5	178.0	189.2	188.9	-0.3
"FPZ006B "	5213.24	5413.67	181.7	186.7	188.8	189.0	0.2
"FPZ007A "	5615.96	5546.47	184.2	186.8	193.0	189.8	-3.1
"FPZ007B "	5615.96	5546.47	189.1	194.1	194.2	189.9	-4.3
"FPZ008A "	5971.51	5656.73	170.9	173.4	187.6	189.8	2.2
"FPZ008B "	5971.51	5656.73	176.9	184.4	187.6	189.9	2.4
"HPZ001A "	11334.72	4760.17	189.9	194.9	202.3	205.4	3.1
"HPZ002A "	11717.73	5241.62	207.2	212.2	218.4	214.6	-3.8
"HPZ003A "	12014.77	4535.41	183.2	185.7	200.8	203.4	2.6
"HPZ003B "	12014.77	4535.41	193.0	198.0	200.7	202.7	2.0
"HPZ004A "	12240.90	4804.37	197.0	199.5	210.1	209.3	-0.8
"HPZ005A "	12586.52	4715.43	204.3	206.8	212.6	209.6	-3.0
"HPZ005B "	12586.52	4715.43	207.6	212.4	212.9	209.6	-3.3
"HPZ006A "	12619.83	4300.74	192.7	197.7	201.8	202.0	0.2