Ground-Water and Surface-Water Hydrology of Camp Mabry, Travis County, Texas

Final Report

R. Stephen Fisher, Principal Investigator
Robert E. Mace
Erika Boghici

assisted by
Conrad A. Kuharic and Martina Blüm

prepared for

Adjutant General's Department of Texas
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James F. Resner II
and
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T. James Fries, Project Manager

Bureau of Economic Geology
Noel Tyler, Director
The University of Texas at Austin
Austin, Texas 78713-8924

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EXECUTIVE SUMMARY

Ground-water and surface-water hydrologic investigations of Camp Mabry, Travis County, Texas, were conducted to provide the Texas Army National Guard information needed to plan and conduct training and preparedness activities while preserving environmental quality and resources. Spatial information such as surface geology, watersheds, elevation data, floodplains, well locations, and water levels were converted to digital files and submitted to the Texas Army National Guard Geographic Information System office at Camp Mabry, Austin, Texas, for future use in managing the training facility. Similar investigations were conducted at Camps Barkeley, Bowie, Maxey, and Swift and at Fort Wolters. Results of those studies are presented separately.

Previously published reports and public data files were examined to obtain background information on the camp and surrounding area. These data were used to guide more focused studies on the training facility. Ground-water studies included locating existing wells in and near the camp, installing new wells as needed, testing and sampling selected wells, determining ground-water levels, chemical compositions, and aquifer hydraulic properties, and developing a conceptual model of ground-water flow. Surface-water studies focused on delineating watersheds and mapping floodplains.

Ground-water systems at Camp Mabry are complex because there are several geologic units that have been faulted. Two principal aquifers, the Trinity and Edwards, underlie the camp. The Trinity aquifer contains three hydrostratigraphic units: the lower Trinity, consisting of the Sligo and Hosston Members of the Travis Peak Formation; the middle Trinity, consisting of the lower member of the Glen Rose Formation and the Hensell Sand and Cow Creek Limestone members of the Travis Peak Formation; and the upper Trinity, consisting of the upper member of the Glen Rose Formation and the Paluxy Formation. The Edwards aquifer is exposed at Camp Mabry. Dissolution zones in the Edwards aquifer, principally the Kirschberg solution zone, are the main water-bearing units. Water may also be pumped from shallow (20–30 ft) depths in the weathered zone of strata that crop out at the camp and in low areas that have been filled with gravel and debris.

Water levels in the Edwards aquifer are approximately 120 ft below land surface. Water levels in the recently drilled monitoring well are approximately 95 ft below land surface. Measurements taken during monitor well drilling indicate a strong gradient for downward flow, suggesting that water moves from the shallow weathered zone to the deeper Edwards aquifer. Published analyses of ground water from the Austin Chalk, the Edwards and associated limestones, the Glen Rose Formation, and the Hosston Member (Lower Trinity) are generally

fresh. Waters from the Austin Chalk and Edwards and associated limestones are typically calcium bicarbonate types.

Any conceptual ground-water flow model of Camp Mabry is tentative because both the geology and hydrostratigraphy are complex, and the effect of faults on ground-water flow beneath Camp Mabry is unknown. Results of our investigation suggest that most ground-water flow in Camp Mabry is shallow and unconfined. Rain falls onto formation outcrops, and a small amount percolates into the ground to recharge shallow, unconfined water-bearing units. More recharge moves into the subsurface in the weathered zones of the limestones (Austin Chalk, Edwards Formation, Georgetown Formation, and Buda Limestone) than in the shaley formations (Del Rio Clay and Eagle Ford Formation). This water flows from topographic highs toward topographic lows, where it discharges to local creeks and streams. Some of the water may move deeper into underlying aquifers. Measured water levels suggest a vertical gradient of ground-water flow from the surface into the Kirschburg solution zone deeper into the Edwards Formation. Flow in the Edwards aquifer beneath Camp Mabry is directed toward Town Lake.

Surface water at Camp Mabry flows toward Town Lake and Johnson Branch via unnamed tributaries. Two small ponds on the camp grounds lie along the main drainage that runs through the camp. Paved roads and surfaces and unpaved roads promote rapid runoff into creeks on the camp grounds. No significant 100-yr floodplain exists at Camp Mabry.

INTRODUCTION

This report summarizes ground-water and surface-water studies conducted by the Bureau of Economic Geology (BEG), The University of Texas at Austin, at Camp Mabry, Travis County, Texas, for the Texas Army National Guard. This work was part of a larger study of Texas Army National Guard training facilities that included Camp Barkeley (Taylor County), Camp Bowie (Brown County), Camp Maxey (Lamar County), Camp Swift (Bastrop County), and Fort Wolters (Parker County). These investigations, in conjunction with aquatic and biological surveys conducted by the Texas Parks and Wildlife Department, provide information needed by the Texas Army National Guard to plan and conduct training and preparedness activities in a way that will protect and enhance environmental resources without compromising training needs and national security readiness. Results of similar investigations on the other training facilities are reported separately.

This report contains results of ground-water and surface-water investigations and describes how data files were prepared to provide digital Geographic Information System (GIS) coverages of the camp and surrounding area. The ground-water analyses produced information regarding

hydrostratigraphy, camp and perimeter well surveys, monitor well drilling, ground-water levels, aquifer properties, ground-water chemistry, and a conceptual ground-water flow model. The surface-water analyses produced information regarding streams and drainage basins in and near the camp, watersheds, stream-flow duration, flood frequency, and floodplain analysis. The GIS data preparation section contains descriptions of the original data sets, how they were obtained, and how they were processed to obtain GIS coverages for the camp.

Regional Setting

Camp Mabry, located in Austin, Texas, is bounded by residential areas on the north, south, and west, by Austin State School and by Camp Ray Hubbard of the Texas Department of Transportation on the southeast, and by MoPac Expressway on the east (fig. 1). The physiography of Camp Mabry is defined by the Balcones Escarpment, which separates the Edwards Plateau in western Austin from the Blackland Prairie to the east. Camp Mabry terrain is similar to many areas of the Texas Hill Country (defined as the eastern Edwards Plateau) but has less relief. Slopes on the camp are associated with the Balcones Fault escarpment and are flat to moderately steep.

Soils in the Austin area are from the Brackett, Austin-Eddy, and Bergstrom-Norwood associations (U.S. Department of Agriculture, 1974) and range from shallow, gravelly, calcareous, loamy soils, and moderately deep or shallow, calcareous, clayey and loamy soils, to deep, calcareous, loamy soils. Soils in the Austin area support a juniper-oak-mesquite savanna vegetation in the west, represented by small trees, shrubs, cactus, and large areas of brush and Blackland Prairie vegetation having bunch and short grasses in the east (Kier and others, 1977). Within the Austin city limits, secondary vegetation grown for gardening and landscaping has largely replaced the natural vegetation.

Camp Mabry lies within a transitional zone between a subtropical subhumid climate to the west and a more humid climate to the east (Larkin and Bomar, 1983) within the south-central climatic division (Bomar, 1983). Winds are on average from the south and south-southeast, generally accompanying warm fronts. The average wind speeds range from 8 to 11 mph and are highest in April and lowest in July and October (Bomar, 1983). During the winter months strong winds associated with cold fronts gust from the north, which can cause abrupt weather changes in the Austin area.

Precipitation events in the region are generally caused by humid air from the Gulf of Mexico or the Pacific Ocean rising above cooler Arctic air. Bomar (1983) summarized precipitation and

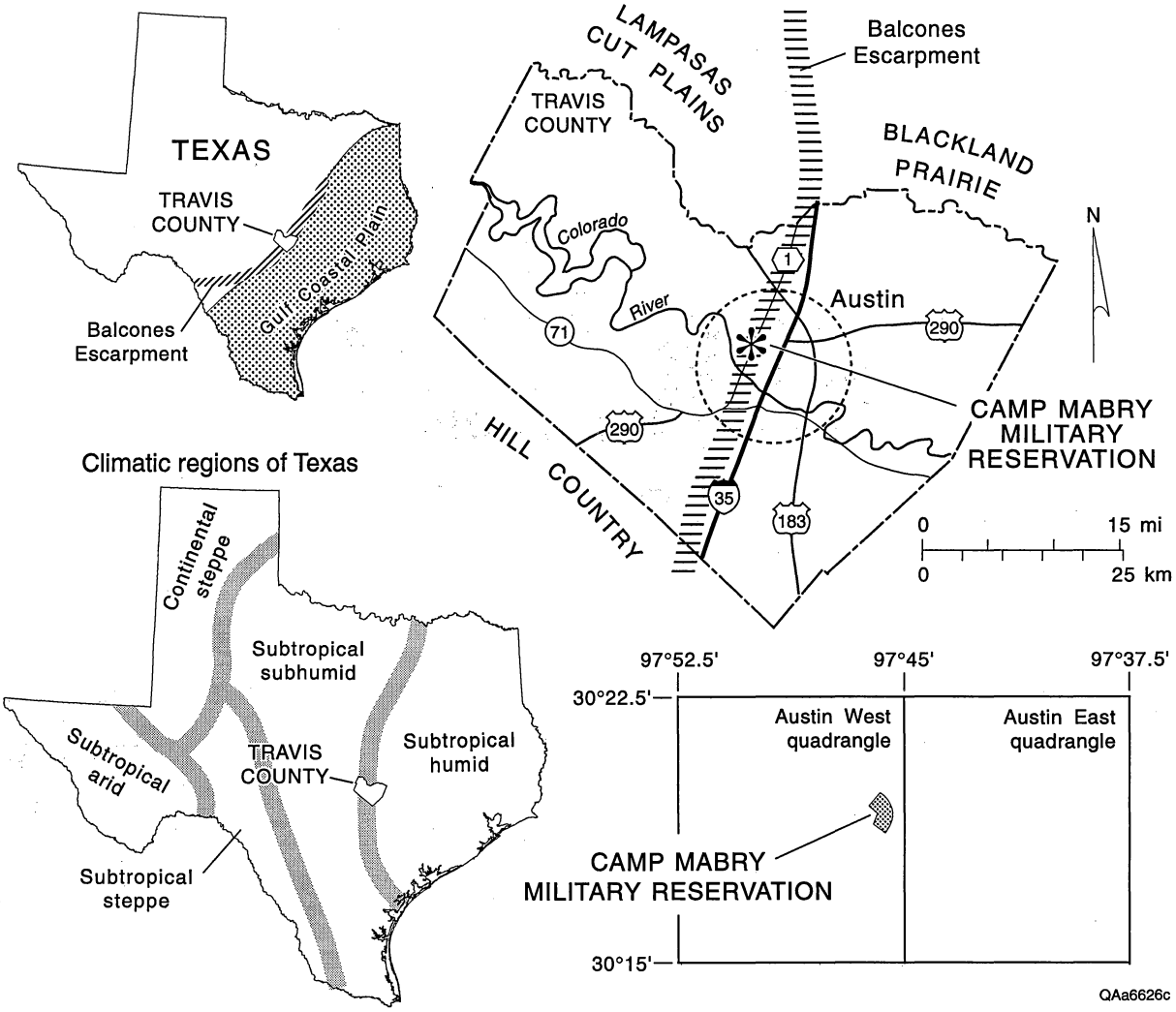

Figure 1. Index map showing locations of Travis County, Texas, major highways, ecological/physiographic provinces, and Camp Mabry (from Wermund and Avakian, 1994) and Brune and Duffin (1983).

temperature data for the Austin area. The average mean precipitation measured in Austin is 31.5 inches, and about two-thirds of the rain falls between May and October. Mean monthly low temperatures range from 39°F in January to 74°F in July, the yearly monthly low averaging 57.5°F. The mean monthly high temperature ranges from 59°F during the coldest month to a high of 95°F in July, the yearly monthly high averaging 79°F.

In Travis County the average monthly gross lake surface evaporation rate ranges from 2.5 inches during January to between 8.75 and 9 inches (from east to west) during July, the annual average being about 63 inches (Larkin and Bomar, 1983).

Geology and Hydrostratigraphy

Camp Mabry is geologically complex, containing several formations and numerous faults (fig. 2). The camp has six formations that crop out within the camp boundaries and crosses several faults associated with the Balcones Fault Zone. Wermund and Avakian (1994) described the geology and physical environment of Camp Mabry in detail. The formations that crop out in Camp Mabry are all Cretaceous and are, oldest to youngest: (1) the upper member of the Edwards Limestone (member 4), (2) the Georgetown Formation, (3) the Del Rio Clay, (4) the Buda Limestone, (5) the Eagle Ford Group, and (6) the Atco Formation of the Austin Group.

The upper member of the Edwards Formation (member 4) is 40 ft thick and consists mostly of gray to tan, micritic, thin- to thick-bedded limestone, dolomitic limestone, and dolomite and does not have a sharp contact with the overlying Georgetown Formation. This member of the Edwards Formation is relatively resistant to weathering, solution, and erosion.

The Georgetown Formation consists of thin interbeds of gray to tan, nodular weathering, hard, fine-grained limestone, marly limestone, and marl. The formation is difficult to excavate, forms a stable foundation, and has a low infiltration capacity. This formation outcrops in the three southwest-flowing stream valleys that cross 35th Street.

The Del Rio Clay is common at Camp Mabry and consists of dark to light brown, gypsiferous, pryritic clays. The Del Rio Clay has a high plasticity index, low-bearing capacity, and high shrink-swell properties. The unit has a low infiltration capacity and behaves as an aquitard.

The Buda Limestone is a gray to tan, hard, fine-grained, glauconitic limestone and is generally strongly jointed. The lower Buda, somewhat less resistant than the upper part, weathers

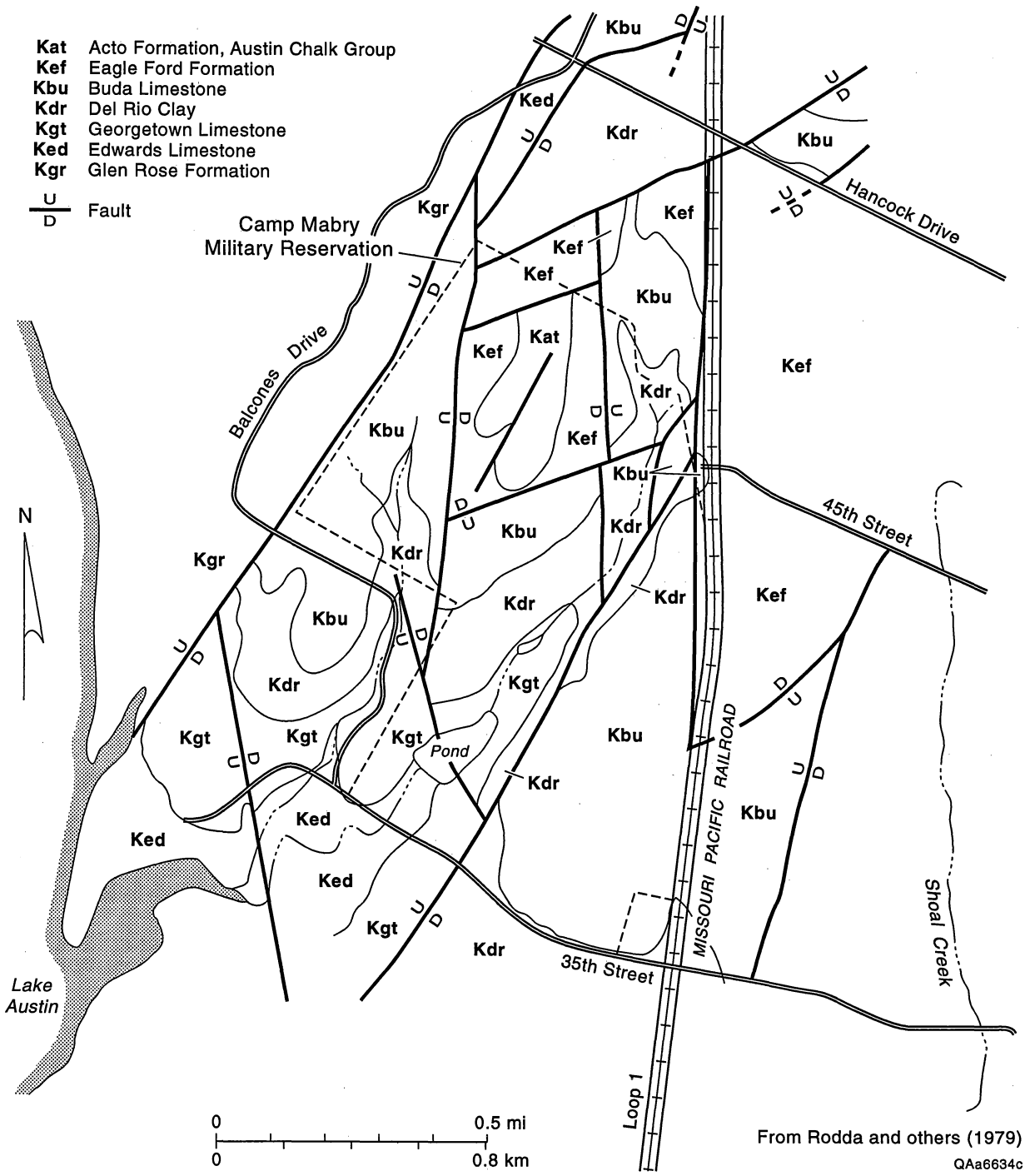

Figure 2. Generalized areal geology of Camp Mabry and stratigraphic column. Faults are shown by bold lines and the U (upthrown) and D (downthrown) symbols (from Wermund and Avakian, 1994).

QUATERNARY	RECENT	Qal	Alluvium	
	PLEISTO-CENE	Qt	Terrace deposits Onion Creek marl High gravel	
CRETACEOUS	GULF	–	Navarro Group	
		–	Taylor Group	
		Kat	Austin Group	
		Kef	Eagle Ford Group	
	COMANCHE	Kbu	Buda Limestone	Washita Group
		Kdr	Del Rio Clay	
		Kgt	Georgetown Formation	
		–	Kiamichi Formation	Fredericksburg Group
		Ked	Edwards Limestone	
		–	Comanche Peak Limestone	
		–	Walnut Formation	
		–	Paluxy Formation	Trinity Group
		–	Glen Rose Formation	
		–	Travis Peak Formation	

After Brune and Duffin (1983) QAb4321c

Figure 2 (cont.)

into nodular structures. In outcrop, fresh surfaces are yellowish to pink. Infiltration capacity of the Buda Limestone is low.

The upper part of the Eagle Ford Formation consists of dark gray clay; the middle part has thin interbeds of sandy and flaggy limestone, chalk, clay, and bentonite; and the lower part contains gray calcareous clay. The bearing capacity of the formation is generally low, local areas have high shrink-swell properties, and infiltration capacity is low to moderate.

The Atco Formation of the Austin Chalk Group (lower unit) is a gray to white, thin- to thick-bedded, massive to slightly nodular, fine-grained limestone, marly limestone, and chalk. Bearing capacity is high. Infiltration capacity is moderate and a function of fracture density.

Two major aquifers underlie Camp Mabry: the Trinity and the Edwards and associated limestones. The Trinity consists of, from oldest to youngest, the Travis Peak Formation, the Glen Rose Formation, and the Paluxy Formation. Brune and Duffin (1983) divided the Trinity into three hydrostratigraphic units: (1) the lower Trinity aquifer, which consists of the Sligo and Hosston members of the Travis Peak Formation; (2) the middle Trinity aquifer, which consists of the lower member of the Glen Rose Formation and the Hensell Sand and Cow Creek Limestone Members of the Travis Peak Formation; and (3) the upper Trinity aquifer, which consists of the upper member of the Glen Rose Formation and the Paluxy Formation. The water-bearing units of the Trinity aquifers are sandstones.

The Trinity aquifers all crop out west of Camp Mabry. The lower Trinity is approximately 1,700 to 2,000 ft beneath Camp Mabry and is about 1,000 ft thick. The lower Trinity yields small to moderate amounts of water and can yield large amounts of water if wells are acidized. The middle Trinity is approximately 1,100 to 1,400 ft beneath Camp Mabry, is about 500 ft thick, and yields small to moderate amounts of water. The upper Trinity is approximately 550 to 800 ft beneath Camp Mabry, is about 610 ft thick, and yields very small to moderate amounts of water.

The Edwards and associated limestones form the only principal aquifer exposed in Camp Mabry (Brune and Duffin, 1983). The Edwards and associated limestones consist of the Comanche Peak Limestone, Edwards Formation, Kiamichi Limestone, and the Georgetown Formation. Dissolution zones in the Edwards Formation, especially the Kirschberg solution zone that lies about halfway down from the top, are the main water-bearing zones. The Edwards Formation and the Georgetown Formation crop out at Camp Mabry, and depth to the Kirschberg solution zone is about 120 to 180 ft.

METHODS

Ground-Water Analysis

General hydrogeologic information about Camp Mabry and surrounding areas was summarized in a Texas Department of Water Resources (TDWR) report about Travis County (Brune and Duffin, 1983) and in Texas Bureau of Economic Geology (BEG) reports on the physical environment of the camp (Wermund and Avakian, 1994) and the northern segment of the Edwards aquifer (Senger and others, 1990). These reports guided our investigation to areas on the camp for which additional hydrogeologic data were needed.

Well Inventory

To develop a ground-water information database we searched State well file records, visited Camp Mabry, spoke with the facility manager, and drove on all roads on the camp grounds and many streets in surrounding neighborhoods to look for evidence of existing wells.

Monitor Well Installation

Installation of a monitor well at Camp Mabry included (1) selecting and staking the appropriate hydrogeologic site for the well, (2) arranging access to the well site and a source of water, (3) drilling the well, (4) purging the well, (5) installing casing, and (6) developing the cased well. The drilling site was chosen at an area that would be best to investigate the hydrogeology of the camp but would still be accessible to a drill rig. Before staking the well site, we contacted camp commanders to ensure that the location would not interfere with camp activities and would not be located near any known buried utilities. We also coordinated our drilling with the camp commander to ensure that our activities would not interfere with training schedules.

We drilled the monitor well with a Central Mine Equipment 75 drilling rig. Depending on the geology, we used hollow-stem augering, solid-stem boring, rotary/wet coring, or a combination thereof to install the well. The monitor well required solid-stem boring or rotary/wet coring because of the presence of hard rock. The drilling mud we used for solid-stem boring and rotary/wet coring was biodegradable Super Mud. Where possible, we collected core and cuttings for inspection at our facilities.

After the well was drilled, we augered or flushed the cuttings from the hole and purged the well with a bailer, usually removing 1 to 2 wellbore volumes of water. After placing surface casing

and drilling the well, we left the hole open for well testing. After well testing, well completion consisted of installing a 2-inch well screen and pipe, placing a sandpack around the screen, placing a bentonite seal above the sandpack, grouting to a few feet below land surface, installing a well guard, and cementing the guard in place with a well pad. We installed 20 ft of 0.010-inch slotted screen in the well. The sandpack consisted of 20/40 sand and straddled the screen. We installed locking above-ground well guards on the well.

Well Testing

We conducted two pumping tests of the well that we drilled in the camp. We conducted one test when the well was partially drilled to determine transmissivity of the upper aquifer and conducted another test when the well had reached the total desired depth but had an open completion. For the tests, an electric submersible pump was installed and the well was allowed to rest unpumped until water levels stabilized. When the pump was started, water levels were measured with an electronic water-level meter and pressure transducers. We measured pump discharge rate using a 12-gal carboy and a stopwatch. Once water-level drawdown reached a quasi-steady-state, the pump was turned off and water-level recovery was measured. Drawdown and recovery data were input onto a spreadsheet, and transmissivity was interpreted using the Theis type curve and Theis recovery method (Theis, 1935) and the Jacob straight-line method (Cooper and Jacob, 1946).

Ground-Water Sampling

Ground-water samples were collected from the monitoring well and from a spring at Camp Mabry. The sample from the monitoring well was collected during the pumping test after the pump and tubing had been thoroughly rinsed and flushed with pumped water. After several wellbore volumes had passed through the pump and tubing, we collected an aliquot for pH and temperature measurement. We then rinsed the filtration equipment with well water and rinsed all sampling bottles with filtered water. Ground-water samples were then filtered (0.45 microns) and collected in bottles for subsequent analysis. To sample the spring we filled a 5-liter beaker with water collected as near to the source as possible. Temperature and pH were measured immediately. Freshly collected water was then used to rinse the filtration equipment, and then all sample containers were rinsed with filtered sample water. Spring-water samples were then filtered and collected in bottles for subsequent analysis. For both well and spring, aliquots intended for cation and trace metal analyses were preserved by adding 6N nitric acid to lower the pH to a value less than 2. Aliquots for all other analyses were filtered but otherwise untreated.

Surface-Water Analysis

Watershed Delineation

We delineated watersheds for Camp Mabry using the hydrologic functions of ArcInfo Grid (ESRI, 1993). This method takes digital elevation data and determines flow directions and points of flow accumulation along hypsography. For each stream link between different order streams, the program determines subwatersheds, or drainage areas, corresponding to that stream link (Maidment, 1995).

Floodplain Analysis

Floodplain analysis involves determining the area adjacent to a river or stream that will flood for a specified return period (for example, a 100-yr flood). The standard procedure is to determine the 100-yr flood at key points in the stream and use backwater computation to determine stages upstream (Linsley and others, 1982, p. 452). If available, the 100-yr flood is usually determined from stream-gage records. However, this type of data is usually unavailable, and regional frequency methods or loss rate and unit hydrograph applied to the 100-yr rainfall can be used (Linsley and others, 1982, p. 452). Because most of the camps lack stream-gauge records, we used the loss rate and unit hydrograph method to estimate the 100-yr floodplain.

Our floodplain analysis consisted of (1) designing 100-yr 24-hr synthetic storms, (2) determining the 100-yr flood hydrographs at strategic points in the watersheds, (3) assessing 100-yr flooding surfaces, and (4) mapping the 100-yr floodplains on 1:2,400 USGS topographic maps.

To design the 100-yr 24-hr synthetic storms, we first used maps published by the U.S. Weather Bureau (Herschfield, 1961, as shown in Chow, 1964, p. 9–56) to determine the 100-yr 24-hr rainfall for the camp. We then used this rainfall rate with the SCS Type II distribution (Bedient and Huber, 1988) to generate the synthetic storms.

To determine the 100-yr flood hydrographs, we used HEC-1 (Hydrologic Engineering Center, 1981) with SCS unit hydrographs (Soil Conservation Service, 1957) and Muskingum routing (McCarthy, 1938). Input to HEC-1 included subbasin drainage area, runoff curve numbers, basin lag, routing storage coefficient, and routing weight factor. Runoff curve numbers are used to define the unit hydrographs and are a function of soil type, vegetation, land use, antecedent moisture, and the hydrologic properties of the catchment surface. Basin lag, also called catchment

lag, is the elapsed time, or response time, between rainfall and runoff occurrence and is partly a function of hydraulic length, catchment gradient, drainage density, and drainage patterns. The routing storage coefficient, or time constant, is a function of the channel reach length and the speed of the flood wave. The routing weight factor is a function of the flow and channel characteristics that affect the dispersion of the flood wave downstream.

We delineated detailed subwatersheds and determined subwatershed drainage areas with ArcInfo (ESRI, 1993). We calculated weighted curve numbers in ArcInfo for each subwatershed using STATSGO (Soil Conservation Service, 1991) digital hydrologic soil data and land use data assuming moderate antecedent moisture conditions (I_a = 0.25 inch). Because most of the watersheds were ungauged, we estimated the basin lag, t_p, using the following equation (Linsley and others, 1982, p. 224):

$$t_p = C_t\left(\frac{LL_c}{\sqrt{s}}\right)^n \qquad (1)$$

where C_t is a constant that varies between 1.8 and 2.2 for units of miles (Snyder, 1938), L is the distance from discharge point to the divide, L_C is the stream length, n is 0.35 for valley drainage areas (Linsley and others, 1982, p. 225), and s is the channel gradient. For this study, we chose a mean C_t value of 2.0. We assigned the routing storage coefficient as 0.20, a typical value for most natural streams (Linsley and others, 1982, p. 219). We measured L, L_C, and s from USGS 1:24,000 topographic sheets. We estimated the routing traveltime constant, K, using the following equation (Linsley and others, 1982, p. 465–541):

$$K = \frac{bL\sqrt{A}}{\sqrt{s}} \qquad (2)$$

where A is the drainage area and b is a constant between 0.04 and 0.08 for L in miles and A in square miles. For this study, we chose a mean b value of 0.06. With the above data input into HEC-1, we modeled 100-yr flood hydrographs for subwatersheds in or just outside the camps and fort. We recorded peak flows for these 100-yr flood hydrographs for assessing flooding depths.

We used HEC-RAS (Hydrologic Engineering Center, 1995) to estimate 100-yr flooding surfaces at the locations where we determined the flood hydrographs. Input to HEC-RAS included topographic cross sections at hydrograph locations, stream lengths between cross sections, Manning's n values, discharge rates, and stream-flow boundary conditions. We measured topographic cross sections from USGS 1:24,000 topographic sheets perpendicular to

the stream path. Using a map roll gauge, we measured stream lengths between cross sections from the topographic sheets. We assumed Manning's *n* values to be 0.06 on the banks (Hydrologic Engineering Center, 1995) and 0.05 in and near the stream channel. HEC-1 supplied the peak 100-yr discharge rates for each hydrograph location. We assigned the stream-flow boundary condition at the output end of the model as a critical depth boundary. In all simulations we assumed subcritical flow. After inputting the above information, HEC-RAS determined the flood surface at each of the chosen locations.

We mapped the 100-yr floodplains by transcribing the 100-yr flood surfaces estimated by HEC-RAS onto USGS 1:24,000 topographic sheets and interpolating between and extrapolating from hydrograph locations. Once mapped, the floodplains were digitized in ArcInfo GIS and the maps were printed.

GIS Data Preparation

Spatial hydrologic and hydrogeologic information was transferred to a GIS for future use by the Texas Army National Guard. Where possible, databases with spatial coordinates were uploaded into the BEG GIS and interpreted data such as contour maps were digitized and attributed. The information was placed into ArcInfo GIS so that data coverages could be overlaid and compared. Care was taken to ensure that proper projections were used when transferring information from digital files downloaded from State computers or when digitizing from USGS topographic sheets. Well postings and hydrologic and hydrogeologic analysis were done on virgin USGS topographic sheets to facilitate data automation and to ensure the best possible data transfer.

A data dictionary was prepared for the coverages for Camp Mabry to ensure that subsequent users will be informed of the method of data automation and the accuracy of the information. All GIS data files were delivered to the Office of the Adjutant General of the Texas Army National Guard at Camp Mabry for inclusion in its GIS program.

GROUND-WATER HYDROLOGY

Well Inventory

We found no preexisting wells at Camp Mabry. Operations Technologies Corporation (1995) reported that a hand-dug well was located at the Old Deison homestead (fig. 3). This

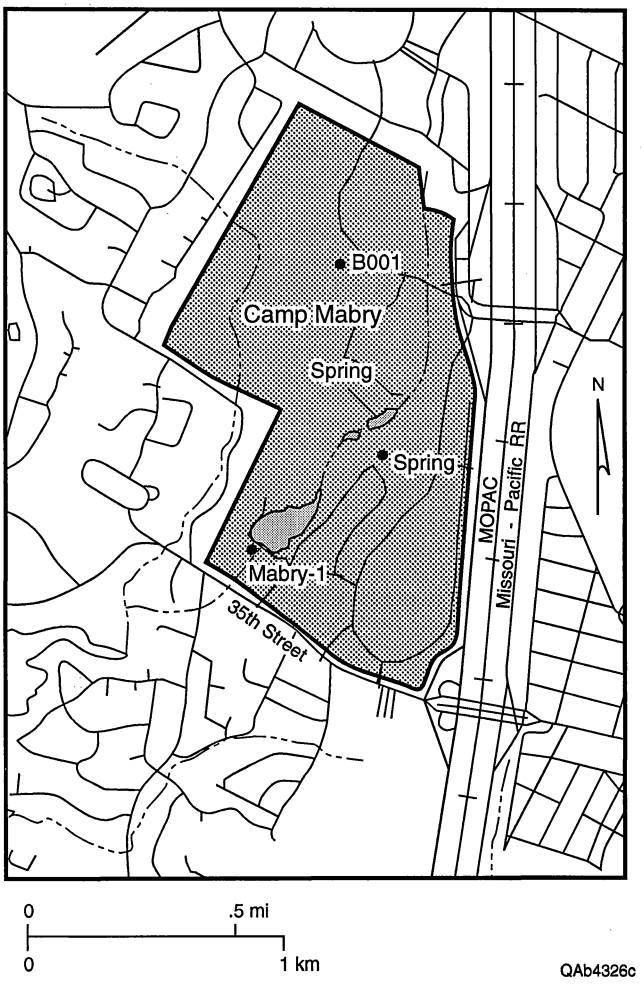

Figure 3. Well and spring locations at Camp Mabry, including a monitor well drilled during this study.

location is now beneath the military parking lot of building 75 and has been filled and paved over. This well probably sourced its water from the weathered Eagle Ford or Austin Groups and is near a small fault. We found a small, diffuse spring in Taylor Creek a few hundred feet up from a small pond near the contact of the Del Rio Clay and the Georgetown Formation. This spring was discharging approximately 2 gpm in November 1995. We also located a small spring up a tributary to Taylor Creek that had a flow estimated at several gallons a minute. The spring is persistent and continued to flow, though at a lower rate, through a dry spell during late 1995 and early 1996. The spring issues from unconsolidated deposits next to a paved road.

Several wells in the camp area were found in State files (app. 1, fig. 4). Most in the immediate vicinity of Camp Mabry are completed in the Edwards aquifer.

Monitoring Well Construction

We drilled one well at Camp Mabry in the Edwards aquifer in the southern part of the camp (fig. 3). This well (MABRY-1) is 151.5 ft deep and is open from 41.4 ft to 151.5 ft. After placing surface casing and drilling to total depth, the well was left open for testing. We used solid-stem boring and rotary/wet coring to drill the well. We had circulation losses and difficult drilling through the ~20 to 30 ft of fill, which included boulders and tree stumps. We conducted a pumping test in this fill zone before sealing it off with cemented casing. Once we set this surface casing, we drilled the hole using a smaller rock bit. Owing to the hardness of the limestone, this bit was worn at a depth of 122 ft. We then drilled the hole using a smaller bit to arrive at the total depth. There was a noticeable loss in drilling fluids below 125 ft and especially at 138 ft. Detailed well schematics and drilling reports are included in appendix 2.

Water Levels

Hydrographs show how water levels vary through time in Travis County. Long-term water-level data were available through TWDB files for the Hosston Member (fig. 5a, b), the Edwards and associated limestones (fig. 5c, d), and the Austin Chalk (fig. 6a, b). Water levels in the Hosston Member have declined about 150 ft since 1950 (fig. 5a, b) probably because of ground-water production from the aquifer. Water levels in the Hosston Member have rebounded since 1986 (fig. 5b). Recharge events appear to affect water levels in the Hosston Formation, as shown by slight increases in water-level elevation. The timing of increases and decreases in water-level elevation agree between the two wells from 1973 to 1989, where data density is greatest (fig. 5a, b).

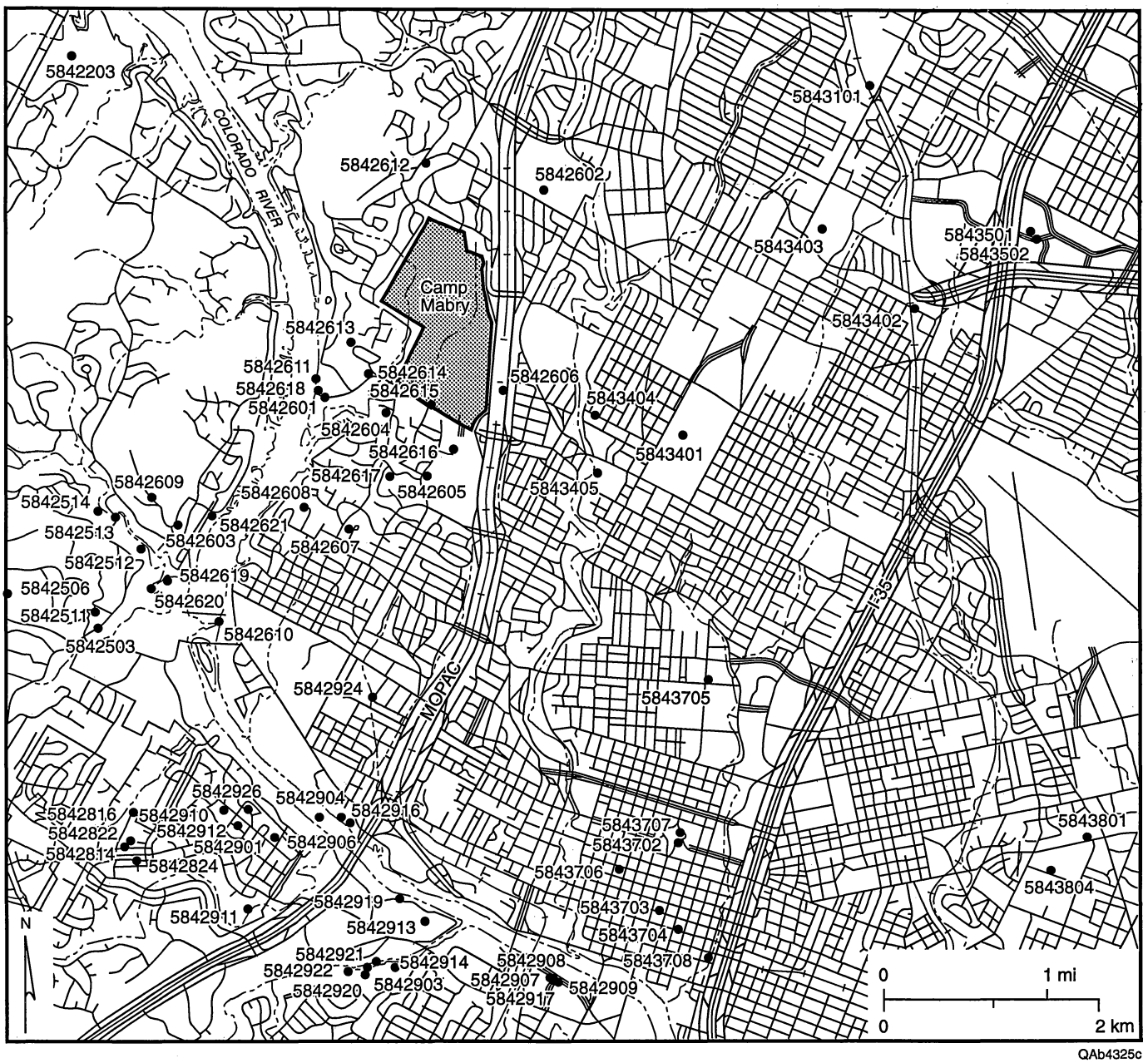

Figure 4. Private wells located near Camp Mabry, based on State well files.

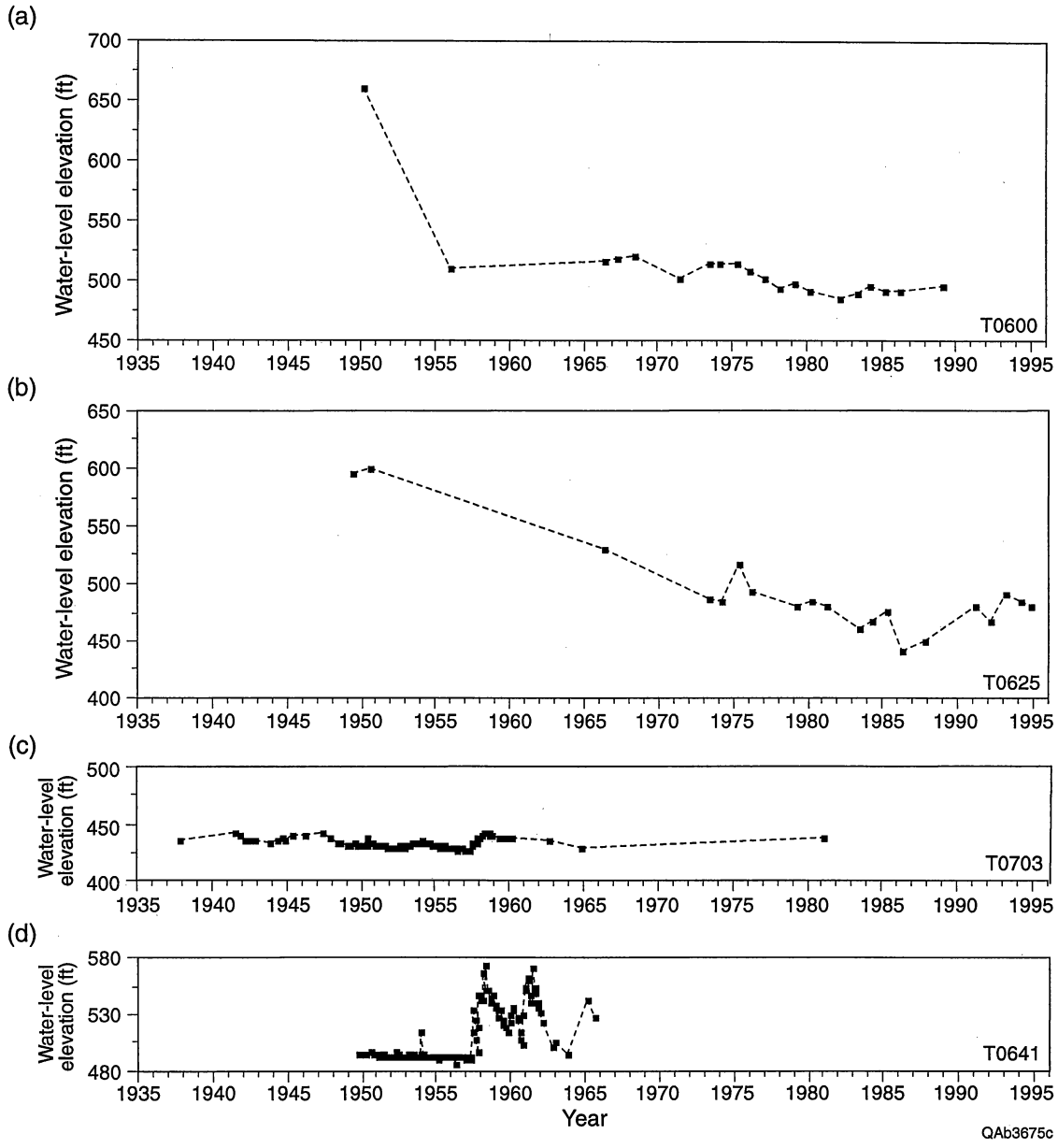

Figure 5. Water levels measured in Travis County in the Hosston Member in (a) well 58-42-302 and (b) well 58-42-502 and in the Edwards Formation and associated limestones in (c) well 58-42-911 and (d) well 58-42-602.

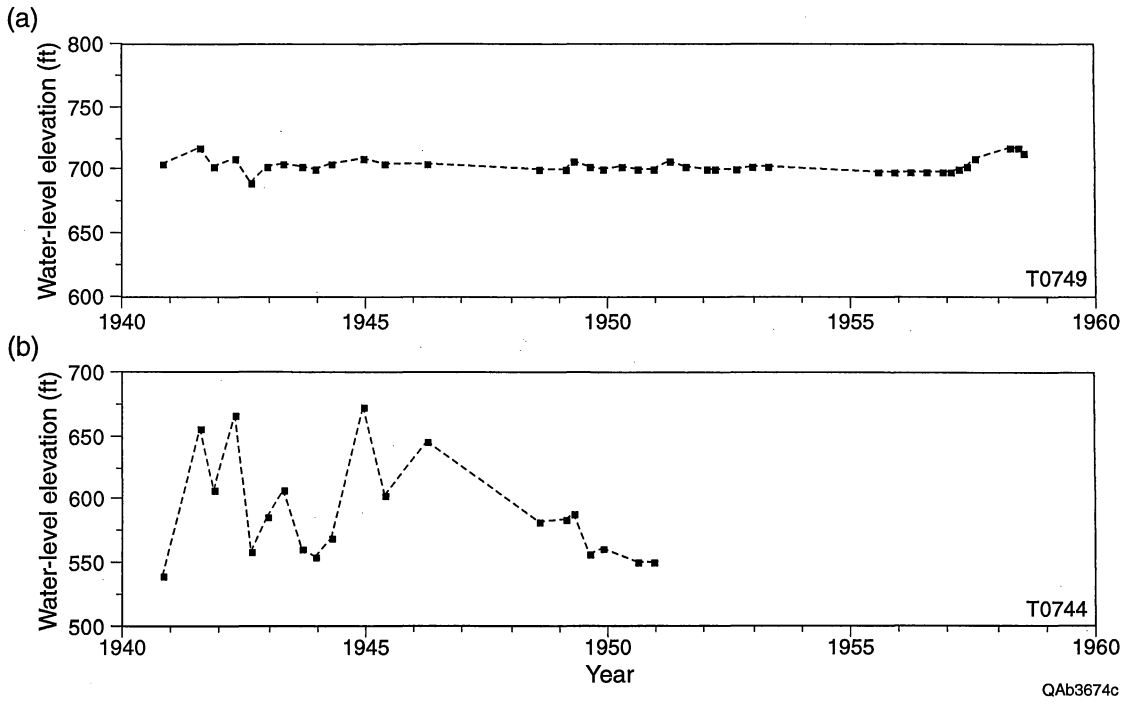

Figure 6. Water levels measured in Travis County in the Austin Chalk in (a) well 58-43-502 and (b) well 58-43-402. Well 58-43-502 is shallow (40 ft deep) and probably completed in weathered chalk, whereas well 58-43-402 is deeper (184 ft deep) and, because of its large variations in water level, probably intersects a fault zone. These two wells are 0.3 mi apart.

The response of water levels in the Edwards Formation to recharge can vary considerably, depending on location of the recharge zone as well as connection into major or minor flow paths. Water levels vary no more than 25 ft in a well (58-42-911) located south of Camp Mabry just south of Town Lake (fig. 5c). Water levels vary about 90 ft in a well (58-42-602) located just northeast of Camp Mabry (fig. 5d). This well has greater water-level fluctuations than well 58-42-911. Therefore, well 58-42-602 may have a better hydraulic connection with the recharge zone than well 58-42-911. Furthermore, large water-level fluctuations suggest that the Edwards Formation in the area connects either to the outcrop west of the fault zone or to the surface by fractures.

Two wells 0.3 miles apart in the chalk have very different water-level response, probably because of the fracturing associated with the Balcones Fault Zone (fig. 6). Well 58-43-402 has much greater fluctuations (fig. 6b) than well 58-43-502 (fig. 6a). The former is probably located in a fault zone and the latter in weathered chalk. Mace and Dutton (1996) observed similar behavior in Austin Chalk in Ellis County south of Dallas.

Water-level elevation in the Edwards beneath Camp Mabry is approximately 440 ft (Brune and Duffin, 1983), which is about 120 ft below land surface (fig. 7). The 150-ft-deep well we drilled into the Edwards at Camp Mabry has a water level 95 ft below land surface but does not tap into the main water-bearing conduits of the Edwards aquifer in this area. Water levels measured in MABRY-1 in the Edwards Formation have not varied more than 1.5 ft between November 1995 and March 1996 and have steadily decreased since the end of November 1995 (table 1).

As we drilled into the Edwards during construction of MABRY-1, we measured water levels at different depths. When the well was 24 ft deep, the water level was 17.2 ft deep; when the well was 132 ft deep, the water level was 36 ft deep; and when the well was 151 ft deep the depth to water was 94.6 ft. These measurements indicate a strong downward component of the ground-water flow gradient (~ 0.76 ft/ft), which means that water is moving from the surficial aquifer deeper into the Edwards Formation. If we assume that the upper Edwards has a hydraulic conductivity of 0.015 ft/day (our measured transmissivity divided by the water column in the well divided by 10 to account for the lower hydraulic conductivity) and an average matrix porosity of 21.7 percent (Hovorka and others, 1993), ground water in the Edwards Formation at this location may be moving downward at a rate of 0.053 ft/day. The flux of water would be 0.011 ft^3/day per square foot of aquifer.

Because of the complex geology of Camp Mabry, predicting water levels in the shallow weathered zone is difficult. We believe that there will be shallow water (<20–30 ft) in weathered zones of the shales and carbonates that crop out at the camp and in the low areas that have been

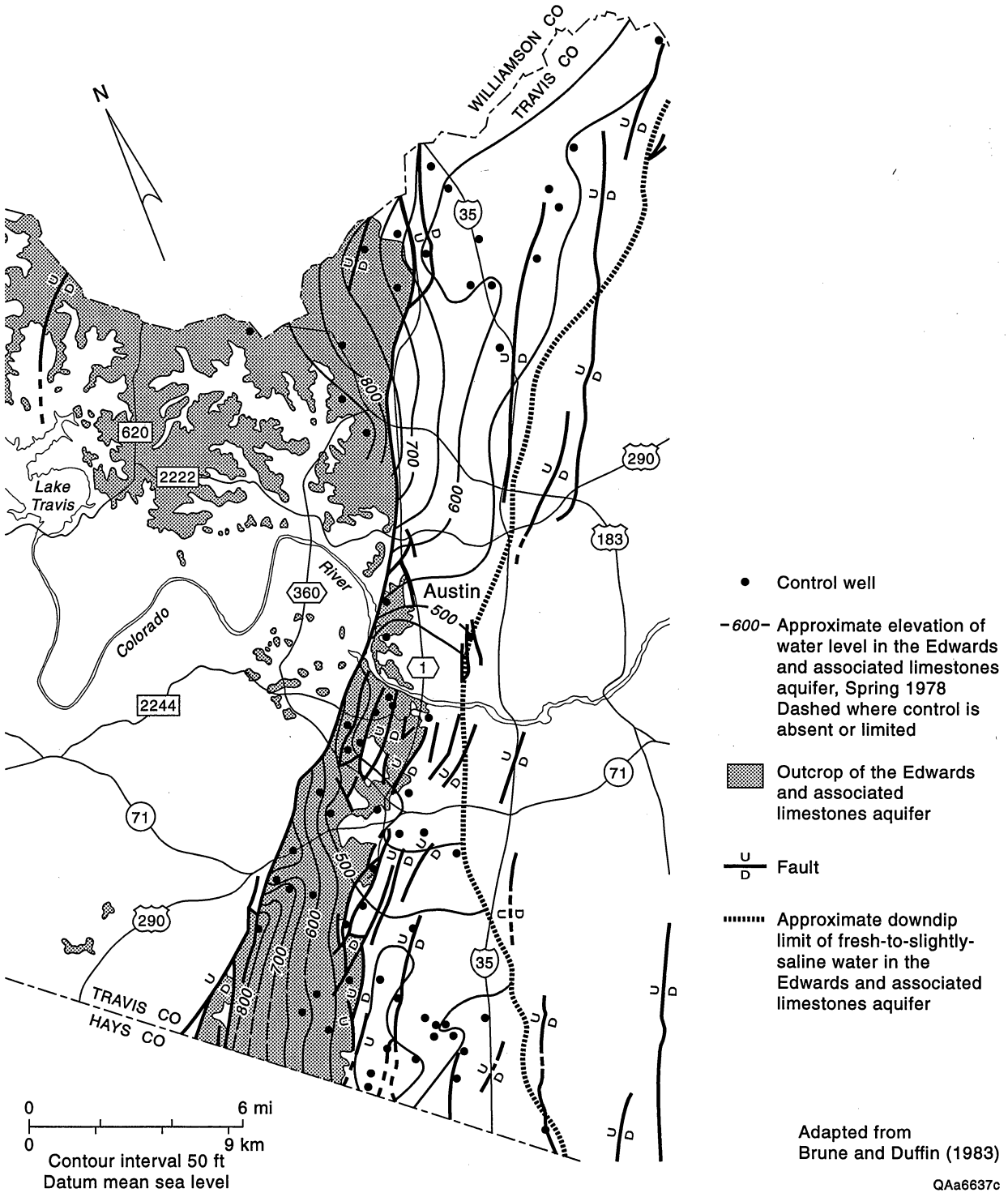

Figure 7. Approximate altitude of water levels in wells completed in the Edwards and associated limestones aquifer, spring 1978, from Brune and Duffin (1983).

Table 1. Water-level measurements in well MABRY-1.

Date	Time	Depth to water (ft)	Water-level elevation (ft)
11/1/95	0955	94.60	467.40
11/21/95	1415	93.82	468.18
12/12/95	1435	94.49	467.51
3/6/96	1045	95.32	466.68

filled in with gravel and debris, such as at MABRY-1. Water levels are probably locally perturbed by increased permeability owing to fracturing associated with faults. It is difficult to predict beforehand which faults will act as conduits and which will act as barriers. However, we expect that major fractures near the surface will act as conduits and serve as local discharge points where they intersect creek bottoms and topographic lows (fig. 8).

Hydraulic Properties

Texas Water Development Board (TWDB) files contain limited information on hydraulic properties of the formations that crop out at and underlie Camp Mabry. Where possible, we include information from studies performed in other areas.

The Trinity Group aquifer has well yields that range from 5 to 800 gpm, the geometric mean being 23 gpm (fig. 9c), and has specific capacities that range from 6.7 to 280 ft^2/day, the geometric mean being 60 ft^2/day (fig. 9d). Using the method of Thomasson and others (1960), this specific capacity corresponds to a transmissivity of 72 ft^2/day. Hydraulic conductivity and transmissivity in the Trinity Group aquifer range from 0.6 to 4.3 ft/day and 0 to 670 ft^2/day, respectively (Brune and Duffin, 1983).

The Edwards and associated limestones have well yields that range from 3 to 1,150 gpm, having a geometric mean of 46 gpm (fig. 9a), as well as specific capacities that range from 30 to 55,000 ft^2/day and have a geometric mean of 660 ft^2/day (fig. 9b). Using the method of Mace (1995), this mean specific capacity corresponds to a transmissivity of 570 ft^2/day. Hydraulic conductivity and transmissivity in the Edwards range from 1.2 to 117 ft/day and 53 to 40,000 ft^2/day, respectively, based on three pump tests in the area (Brune and Duffin, 1983). Transmissivity in the San Antonio segment of the Edwards aquifer ranges from 0.28 to 19,000,000 ft^2/day (Mace, 1995; Hovorka and others, 1995).

The TWDB files contain no information about the hydraulic properties of the Del Rio Clay in Travis County. However, the Del Rio Clay should have a very low hydraulic conductivity ($<10^{-3}$ ft/day). The Del Rio Clay is not known to yield water in Travis County (Brune and Duffin, 1983).

The TWDB files contain no information about the hydraulic properties of the Buda Limestone in Travis County. It is not known to yield water in Travis County (Brune and Duffin, 1983). However, water may move through the weathered zone, where there is a greater frequency of fractures.

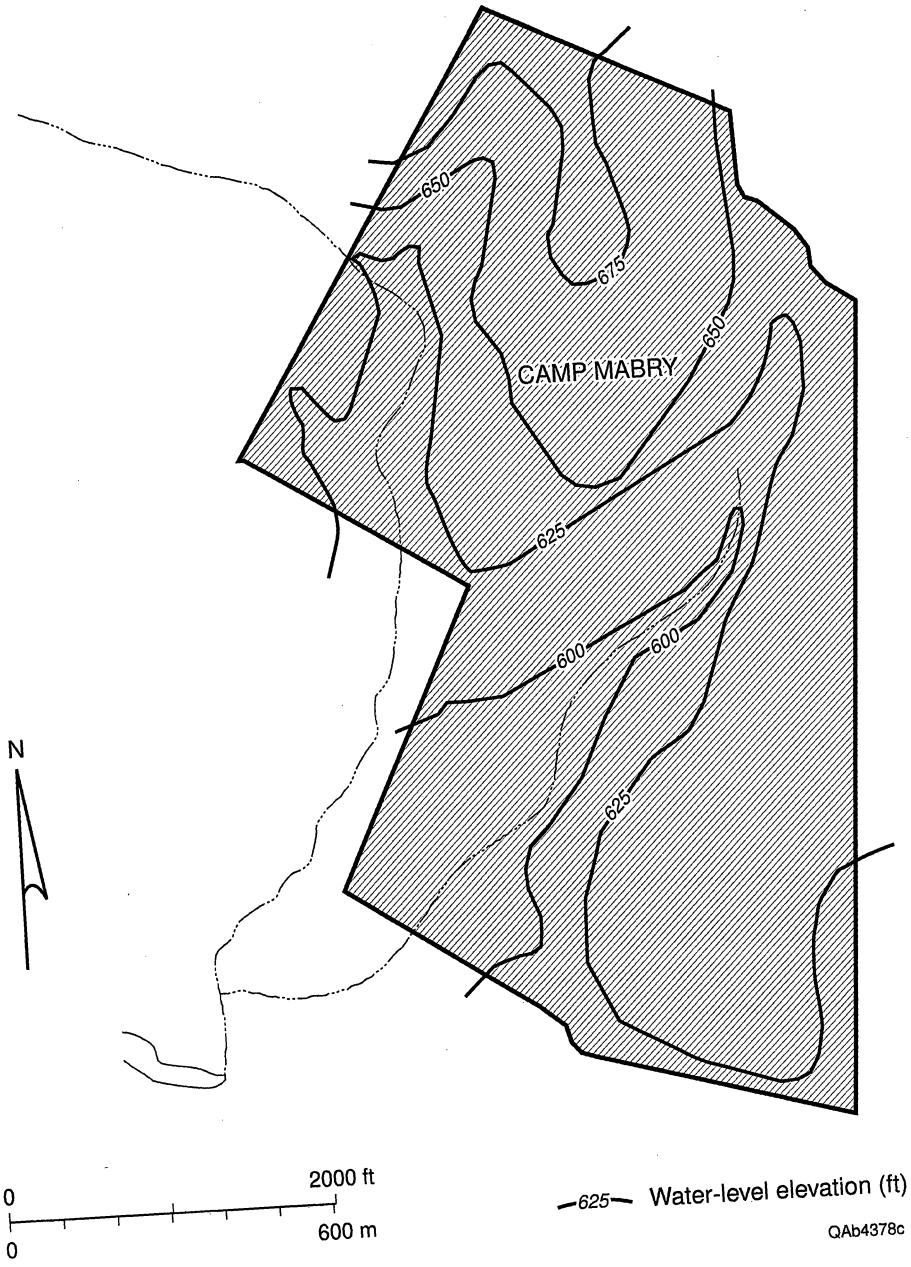

Figure 8. Interpretation of water levels in the weathered zones of Camp Mabry.

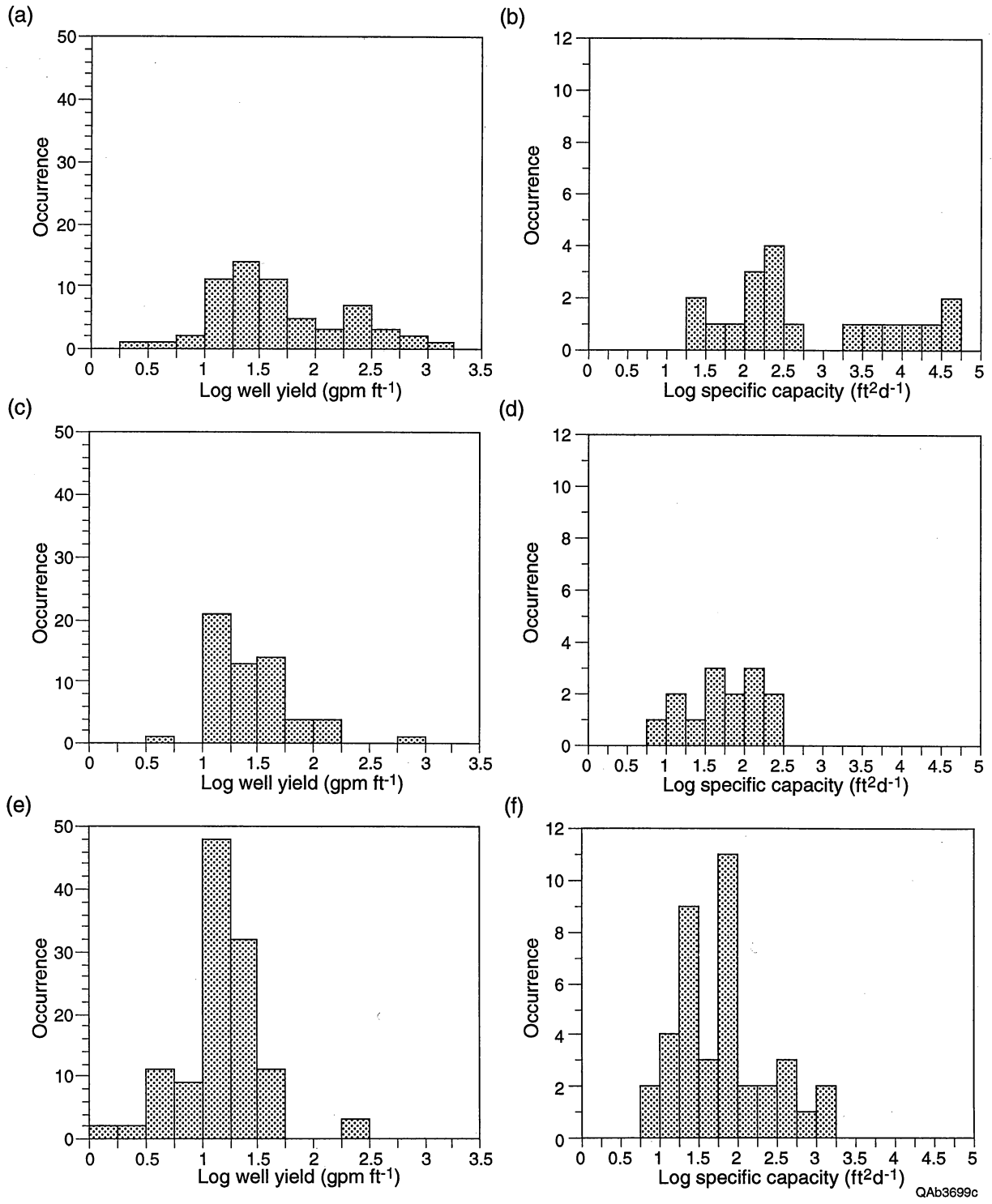

Figure 9. Well yields and specific capacity of the Edwards and associated limestones (a, b), the Lower Trinity (c, d), and the Glen Rose Formation (e, f).

The TWDB files also contain no information about the hydraulic properties of the Eagle Ford Group in Travis County. The Eagle Ford Group is not known to yield water in Travis County (Brune and Duffin, 1983). Bradley (1993) found the hydraulic conductivity of the weathered and unweathered Eagle Ford in the Waco, Texas, area to be 0.5 and 3.7×10^{-5} ft/day, respectively. This large difference in hydraulic conductivity is due to near-surface fracturing owing to unloading and weathering. Dutton and others (1994) reported hydraulic conductivities of 1.7×10^{-3} ft/day in the unweathered Eagle Ford Formation near Waxahachie, Texas.

The Austin Chalk Group has three measured well yields in Travis County, 10, 30, and 250 gpm, and a single measure of specific capacity, 2,880 ft^2/day. The high values of well yield and specific capacity are probably uncommon because the Austin Chalk has low permeability unless fractured because of weathering and unloading or faulting. Hydraulic conductivity measured in 37 hand-dug wells in Austin Chalk outside Waxahachie, Texas, ranged from 10^{-3} to 100 ft/day, values decreasing exponentially with depth (Mace and Dutton, 1994). The Austin Chalk yields small to very small quantities of ground water in Travis County (Brune and Duffin, 1983).

We conducted site-specific aquifer tests in the monitor well (MABRY-1) that we drilled in the Edwards aquifer in Camp Mabry. One test was in the 20 to 30 ft of fill at the surface and another in the completed well in the Edwards aquifer. We experienced large circulation losses in the fill and expected to have a high transmissivity. A pumping test in the fill resulted in a transmissivity between 10 and 25 ft^2/day, depending on the analysis method (fig. 10). A pumping test in the lower part of MABRY-1 in the Edwards Formation resulted in a transmissivity between 2 and 12 ft^2/day (fig. 11). Because this value is low for the Edwards, we can surmise that our well did not intersect any major fractures or conduits.

Ground-Water Chemistry

TWDB files contain substantial water chemistry data for the Austin Chalk, the Edwards and associated limestones, the Glen Rose Formation, and the Hosston Member (Lower Trinity) (table 2) but no data for the Eagle Ford Group, Buda Limestone, or the Del Rio Clay. The Edwards and associated limestones include the Georgetown Formation.

Total dissolved solids (TDS) for the Austin Chalk (20 samples) range from 148 to 798 mg/L, having a geometric mean of 380 mg/L (fig. 12a). All collected water samples were fresh (TDS <1,000 mg/L). TDS for the Edwards and associated limestones (29 samples) range from 118 to 10,195 mg/L, having a geometric mean of 417 mg/L (fig. 12b). Ninety-four percent (27) of

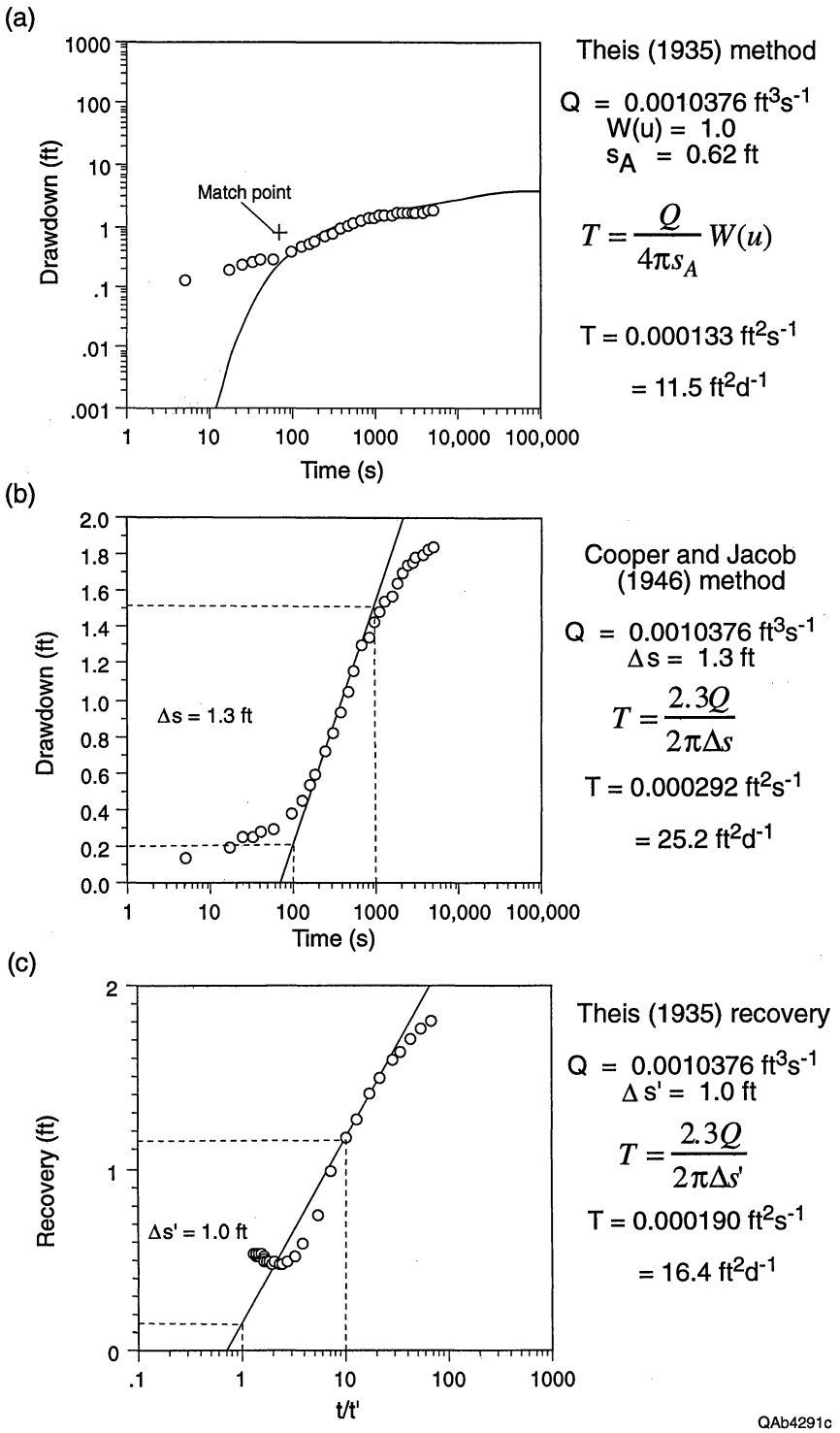

Figure 10. Results of a pumping test in the upper part (fill) of MABRY-1.

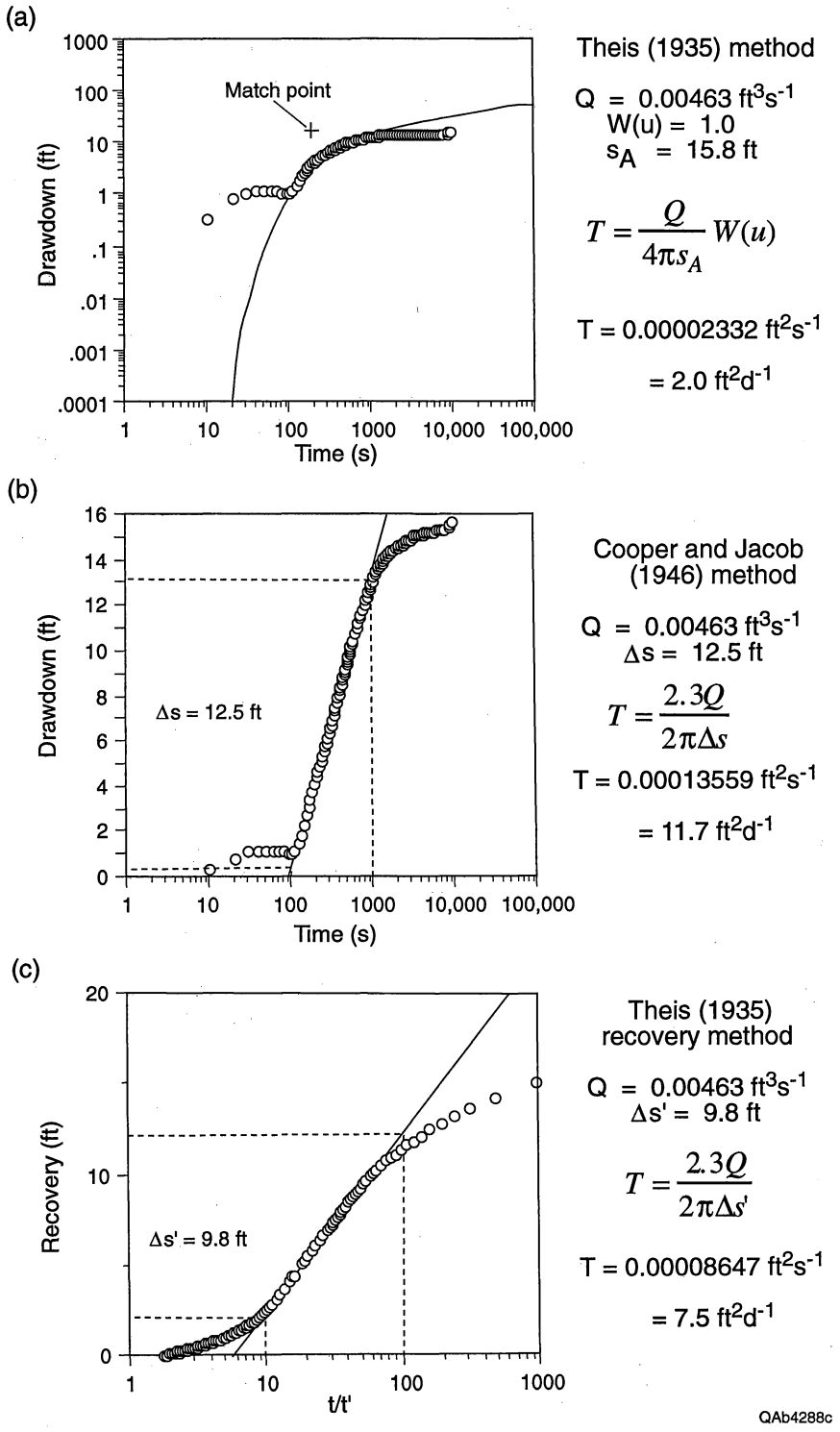

Figure 11. Results of a pumping test in the lower part (Edwards) of MABRY-1.

Table 2. Chemical analyses of selected ground waters from the Austin Chalk for Travis County and from the Edwards and associated limestones, the Glen Rose Formation, and the Hosston Member for the number 42 7 1/2-minute quadrangle of the number 58 1-degree minute quadrangle (in other words, all well numbers starting with 58-42. This area overlies the Camp Mabry area. The TWDB file contains too much information to present here.)

State well number	YR	Temp (C°)	Si (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Sr (mg/L)	HCO_3 (mg/L)	SO_4 (mg/L)	Cl (mg/L)	F (mg/L)	NO_3 (mg/L)	pH	TDS (mg/L)	Total alk (mg/L)	Total hardness (mg/L)	Spec. cond. (μΩ)
Austin Chalk:																		
5835209	1970	-	9	104	5	20	15	-	281.9	68	14	0.3	37	7.7	410	231	280	696
5835605	1972	23	8	119	4	10	-	-	306.3	22	13	0.6	47	7.6	374	251	313	660
5835606	1973	22	7	100	3.04	8.7	-	-	274.6	18	16	0.4	9	7.9	297	225	262	556
5835703	1940	-	-	110	10	15	-	-	336.1	57	11	-	-	-	368	275.41	315	-
5835903	1970	22	9	107.6	5	12.4	-	-	292.9	22	27	0.3	17	7.3	344	240	289	632
5835904	1970	22	9	109	3.5	9.9	-	-	305.1	25	20	0.5	4	7.4	330	250	286	604
5835905	1940	-	-	113	5	19	-	-	275.1	35	32	-	46	-	385	225.41	302	-
5836101	1971	20	8	113.4	3.65	8.74	-	-	318.5	24	17	0.6	2.3	7.3	334	261	298	608
5836103	1971	21	11	142	5	12	-	-	357.6	26	37	0.6	27	7.2	436	293	375	792
5836105	1973	21	10	85	5	13	-	-	195.3	42	32	0.6	10	7.7	293	160	232	540
5836106	1973	21	6	105.8	3.89	15.9	-	-	219.7	49	34	0.8	36	7.6	359	180	280	664
5836203	1980	-	13	123	24	38	-	-	409	63	59	0.3	3.4	8.1	524	335.15	405	1014
5836302	1980	-	20	116	22	41	-	-	375.9	66	60	0.3	3.4	7.9	513	308	380	966
5836601	1980	27	20	58	22	9	-	-	244.1	18	15	0.1	14.3	8.1	276	200	235	507
5836603	1973	22	22	103	7	82	1	-	394.2	65	32	1.5	30	7.8	537	323	285	959
5843502	1940	-	-	25	3	22	-	-	49	15	37	-	22	-	148	40.16	77	-
5850303	1938	-	-	64	26	72	-	-	329	85	46	-	-	-	454	269.67	266	-
5850601	1980	26	20	101	23	39	-	-	331.9	66	58	0.3	3.5	7.9	474	272	346	900
5850901	1972	24	28	98	4	20	-	-	295.3	4	40	0.7	2	7.3	341	242	260	612
5851506	1971	21	20	116	9	35	-	-	284.3	98	22	0.8	4.3	7.4	444	233	326	864
Edwards and associated limestones:																		
5842308	1973	22	7	124	26	24	-	-	339.3	66	71	0.2	19	7.5	504	278	416	980
5842311	1994	20	13	160	20	36	1.2	-	427.1	85	86	0.1	34.97	7	646	350	481	1080
5842602	1940	-	-	87	25	44	-	-	366	54	37	0.2	-	-	427	299.91	319	-
5842604	1950	-	-	-	-	-	-	-	344	70	49	-	-	8.1	-	281.89	-	944
5842605	1938	-	-	158	5	57	-	-	305	55	73	-	157	-	654	249.93	414	-
5842606	1940	-	-	144	8	15	-	-	382	33	34	0.4	35	-	457	313.03	392	-
5842607	1949	-	10	71	39	177	-	-	354	172	180	-	0.04	7.5	823	290.08	337	1440
5842608	1971	19	9	57	21	32	-	-	223.3	33	59	0.3	1.5	7.8	322	183	228	636

Table 2 (cont.)

State well number	YR	Temp (C°)	Si (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Sr (mg/L)	HCO_3 (mg/L)	SO_4 (mg/L)	Cl (mg/L)	F (mg/L)	NO_3 (mg/L)	pH	TDS (mg/L)	Total alk (mg/L)	Total hardness (mg/L)	Spec. cond. (μΩ)
Edwards and associated limestones (cont.):																		
5842610	1896	-	-	-	-	-	-	-	-	-	28	-	0.13	-	298	-	-	-
5842617	1973	22	16	117	8	43	-	-	267.3	72	81	0.3	8	7.7	476	219	324	900
5842618	1973	22	7	122	22	18	-	-	374.7	48	40	0.3	15	7.8	456	307	394	894
5842809	1971	23	8	68	19	6	-	-	270.9	19	12	0.6	3.3	7.5	269	222	247	510
5842810	1949	-	10	72	29	7.3	-	-	294	51	12	-	2	7.4	327	240.92	298	565
5842811	1993	20	15.29	119.7	26.49	18.51	1.78	0.17	325.8	7	32	0.2	7.47	7.5	388	267	407	772
5842813	1994	20	10	88	22	10	1.1	-	305.1	38	22	0.2	5.31	7.1	346	250	310	597
5842814	1989	-	-	68	15	16	1.1	-	305.1	30.8	20.8	0.14	6.64	-	308	250	231	-
5842816	1984	-	-	72	20	8	8	-	285.6	24	16	0.2	4.5	7.8	293	234	261	576
5842820	1982	-	-	67.7	18.9	9.6	-	-	-	32	-	0.1	0.35	6.7	345	-	247	511
5842821	1993	21	8.78	78.9	21.65	12.32	1.38	0.38	219.7	27	21	0.2	1.24	7.5	280	180	286	-
5842901	1949	-	12	84	24	5	-	-	340	12	12	-	6.9	7.6	323	278.61	308	561
5842911	1931	-	-	-	-	-	-	-	-	12	11	-	20	-	-	-	-	-
5842913	1993	20	9.67	110.3	19.27	11.73	1	0.17	291.7	16	24	0.2	7.3	7.3	343	239	354	641
5842914	1995	19	10	81	16	12	1.3	0.58	280.7	30	20	0.2	3.85	7.2	312	230	268	555
5842915	1994	21	9.6	67	21	8.7	1.2	-	268.5	37	15	0.3	3.67	7.3	295	220	253	522
5842916	1972	-	12	73	38	34	-	-	339.3	45	58	0.4	7	7.5	434	278	338	835
5842919	1972	23	7	53	14	30	-	-	179.4	23	57	0.3	0.4	7.1	272	147	189	544
5842921	1973	22	4	82	19	13	-	-	299	25	22	0.2	5	7.8	317	245	282	620
5842922	1973	21	6	77	22	22	-	-	281.9	36	38	0.2	4	7.7	343	231	282	660
5842925	1975	-	9	99	14	8	-	-	322.2	24	15	0.2	7	7.7	334	264	304	630
Glenn Rose Formation:																		
5842304	1970	24	10	374	230	1050	69	-	325	3170	540	5.6	0.4	7.2	5608	266.32	1879	10200
5842304	1973	-	10	379	234	1050	-	-	335.6	3210	550	5.8	0.6	7.2	5604	275	1908	10416
5842307	1971	24	11	363	229	1020	-	-	319.7	3000	550	5.7	0.4	7	5336	262	1847	10000
5842403	1970	-	12	210	166	76	-	-	380.8	970	41	3.2	0.4	7.4	1665	312	1207	3131
5842407	1977	-	10	108	85	17	-	-	299	351	17	4.9	0.4	7.8	743	251	619	1419
5842508	1954	-	-	-	-	-	-	-	409	-	14	-	-	7.5	-	335.15	-	1269
5842621	1970	22	10	550	254	155	-	-	289.2	2300	64	4.7	0.4	7.2	3480	237	2417	6528

Table 2 (cont.)

State well number	YR	Temp (C°)	Si (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Sr (mg/L)	HCO_3 (mg/L)	SO_4 (mg/L)	Cl (mg/L)	F (mg/L)	NO_3 (mg/L)	pH	TDS (mg/L)	Total alk (mg/L)	Total hardness (mg/L)	Spec. cond. (μΩ)
Hosston Member:																		
5842103	1966	-	12	29	17	202	11	-	250.2	338	43	1.6	1.5	8	778	205	142	1408
5842202	1977	-	-	13	4	338	-	-	339.3	313	132	3.3	3.28	8.3	973	278	48	1769
5842202	1965	-	-	25	11	319	-	-	356	295	151	3.3	0.4	7.9	979	291.72	107	1848
5842202	1968	-	-	12	5	328	-	-	329.5	287	114	3.8	2	8.4	919	280	50	1705
5842202	1986	-	12	11	5	344	11	-	344.1	325	144	3.3	3.23	8.3	1027	282	48	1858
5842202	1983	-	-	14	4	342	12	-	335.6	302	136	3.2	2.92	8.4	985	283	51	1840
5842207	1971	26	12	98	51	1580	-	-	450.3	437	2230	2.1	0.4	7.7	4631	369	454	9500
5842301	1949	-	13	52	46	1300	-	-	467	724	1410	-	13	8.2	3787	382.68	318	6070
5842302	1986	23	12	44	23	863	28	-	568.7	681	694	3.9	0.04	8.2	2628	466	204	4929
5842401	1974	-	-	34	14	226	6	-	205	395	38	1.6	3.9	8.4	826	180	142	1490
5842402	1985	-	-	343	176	40	18	-	436.9	1207	32	3.7	0.04	7.9	2034	358	1580	3926
5842405	1977	-	12	69	54	143	9	-	275.8	358	29	2.1	0.4	7.8	812	226	394	1590
5842410	1977	-	16	25	11	230	8	-	217.2	368	39	1	0.4	8.1	805	178	107	1377
5842411	1977	-	14	22	11	221	7	-	217.2	367	33	0.9	0.4	8.1	783	178	100	1368
5842501	1968	-	-	69	19	9	-	-	275.8	21	15	0.3	5	7.8	273	226	250	-
5842502	1986	26	13	13.6	5.83	239	8	-	269.7	291	50	3.5	0.04	8.1	756	221	57	1332
5842503	1955	-	-	-	-	-	-	-	637.2	-	367	-	-	8.1	-	522.13	-	2840
5842504	1955	24	4.4	25	77	65	-	-	312.1	220	26	-	0.04	8.2	570	255.74	379	940
5842505	1950	-	12	22	19	249	-	-	245.1	393	44	-	1.8	7.6	861	200.82	133	1290
5842506	1950	-	-	-	-	-	-	-	206	400	52	-	-	8.3	-	168.8	-	1380
5842507	1955	-	13	28	14	338	-	-	247.1	482	92	1.1	0.04	7.8	1089	202.46	127	1680
5842510	1949	-	8.5	248	208	47	-	-	352.1	1200	28	-	0.04	-	1912	288.52	1474	2330
5842701	1967	23	11	67	53	167	-	-	257.5	477	42	1.8	0.4	7.7	945	211	385	1716
5842702	1972	-	13	204	144	123	-	-	296.5	1020	38	2.4	0.4	7.8	1690	243	1101	3171
5842801	1955	-	17	47	33	365	-	-	287	612	118	2.8	0.3	8.3	1336	235.18	253	1980
5842802	1949	-	15	58	31	319	-	-	291	580	77	1	0.04	7.4	1224	238.46	272	1830
5842806	1971	-	15	38	24	375	-	-	378.3	530	128	1.5	0.4	7.8	1297	310	193	2352

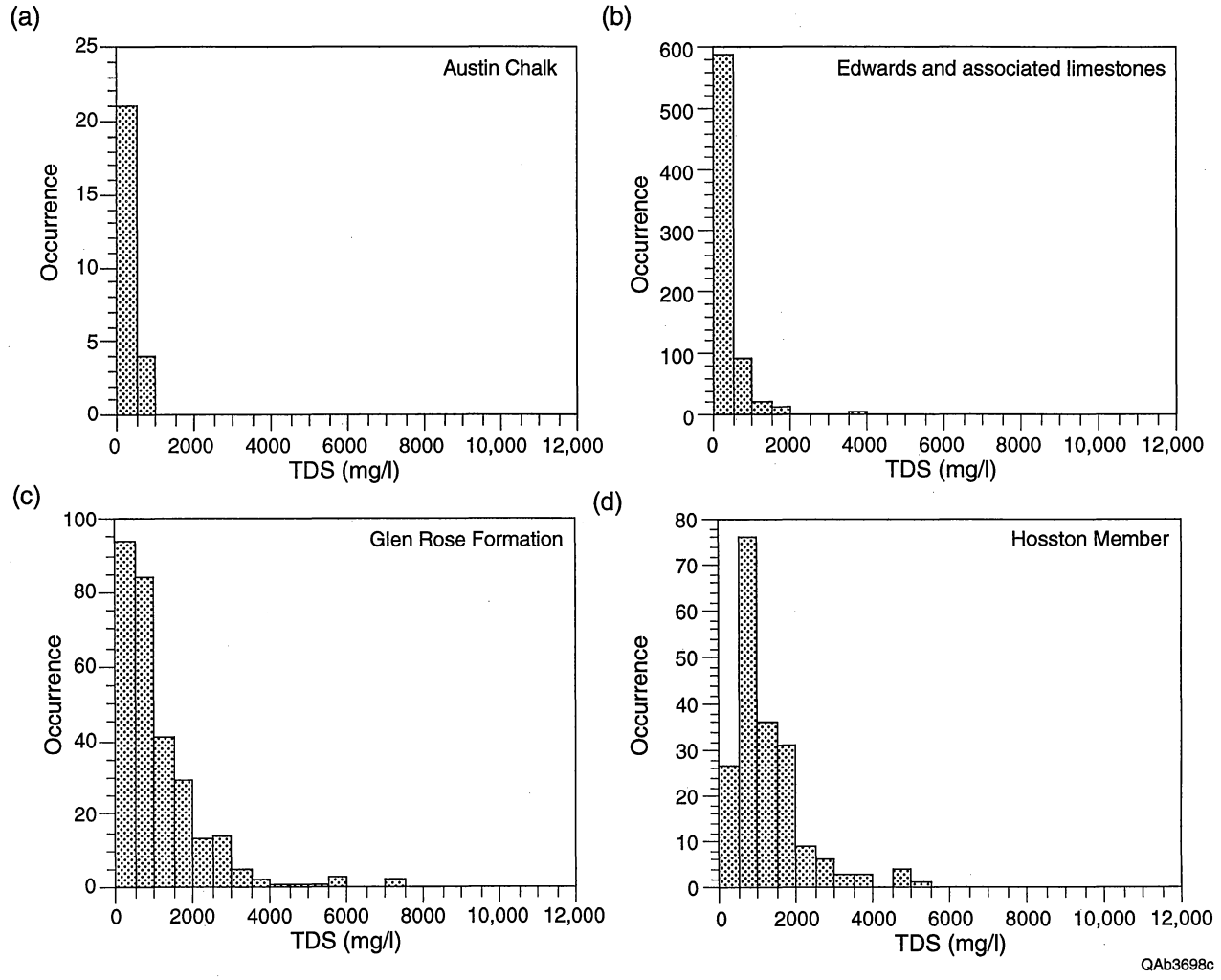

Figure 12. Histograms of total dissolved solids (TDS) in the (a) Austin Chalk, (b) Edwards and associated limestones, (c) Glen Rose Formation, and (d) Hosston Member of the Travis Peak Formation (Lower Trinity) in Travis County.

the collected water samples were fresh, 1 was brackish and 1 was saline. TDS for the Glen Rose Formation (7 samples) range from 179 to 7,211 mg/L, having a geometric mean of 813 mg/L (fig. 12c). Sixty-one percent of the collected water samples were fresh, and the remainder were brackish. TDS for the Hosston Member (Lower Trinity) (27 samples) range from 239 to 5,180 mg/L, having a geometric mean of 1,023 mg/L (fig. 12d). Fifty-three percent of the collected water samples were fresh, and the remainder were brackish.

Waters from the Austin Chalk are calcium bicarbonate in composition (fig. 13a). Waters from the Edwards and associated limestones are also predominantly calcium bicarbonate in composition (fig. 13b), although some waters have a strong presence of sodium and chloride. Waters from the Glen Rose Formation are a mixed calcium bicarbonate and magnesium sulfate type, having some sodium chloride type waters (fig. 14a). As in the Glen Rose Formation, waters from the Hosston Member (Lower Trinity) are a mixed calcium bicarbonate and magnesium sulfate type, having some sodium chloride types (fig. 14b).

Results from the chemical analyses of ground water collected from the Camp Mabry monitor well and the spring are shown in table 3. Water collected from the Camp Mabry monitor well is a mixed cation–bicarbonate type, whereas water from the spring is a calcium bicarbonate type. Water from MABRY-1 has a tritium activity (0±3 TU) that indicates the water is older than about 25 yr.

Conceptual Flow Model

The conceptual flow model of Camp Mabry is tentative owing to the geologic and hydrogeologic complexity of the camp. In particular, it is not known whether the faults are sealed and act as barriers to flow or if they are conductive and behave as preferential flow paths to underlying formations. The continuity of hydraulic head in the Edwards Limestone suggests that at depth faults in this formation act as conduits. However, there is evidence that the faults in Camp Mabry do not transmit water. For example, a pond in the southwest part of the camp overlies a fault in contact with the Edwards. If this fault was highly transmissive, then water would not be able to collect at this location.

Assuming that the faults do not enhance the permeability of the formations and short-circuit water to great depths, we think that most ground-water flow at Camp Mabry is shallow and unconfined. Rain falls onto formation outcrops, and a small percentage percolates into the ground to recharge shallow, unconfined water-bearing units. More recharge moves into the subsurface in the weathered zones of the limestones (Austin Chalk, Edwards Formation, Georgetown Formation, and Buda Limestone) than in the shaley formations (Del Rio Clay and Eagle Ford

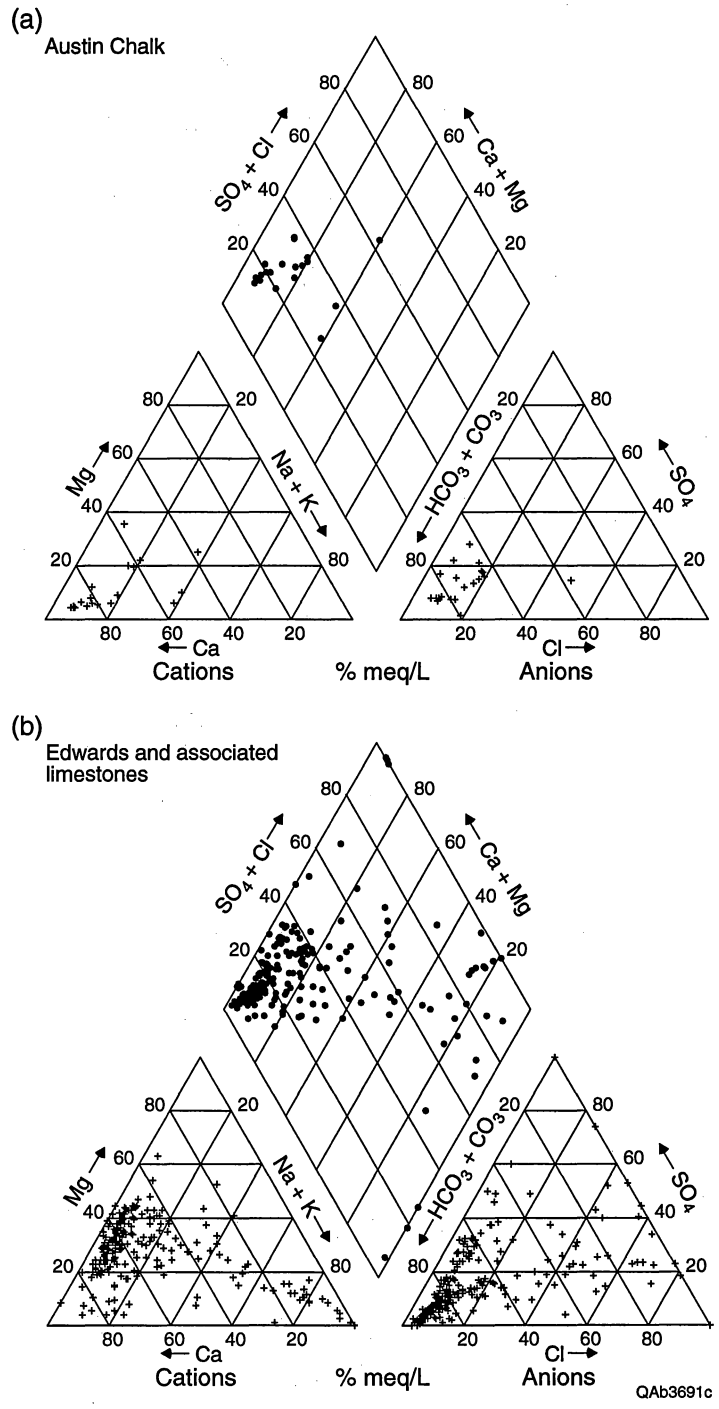

Figure 13. Trilinear diagram showing chemical composition of ground-water samples from the (a) Austin Chalk and (b) Edwards and associated limestones in Travis County.

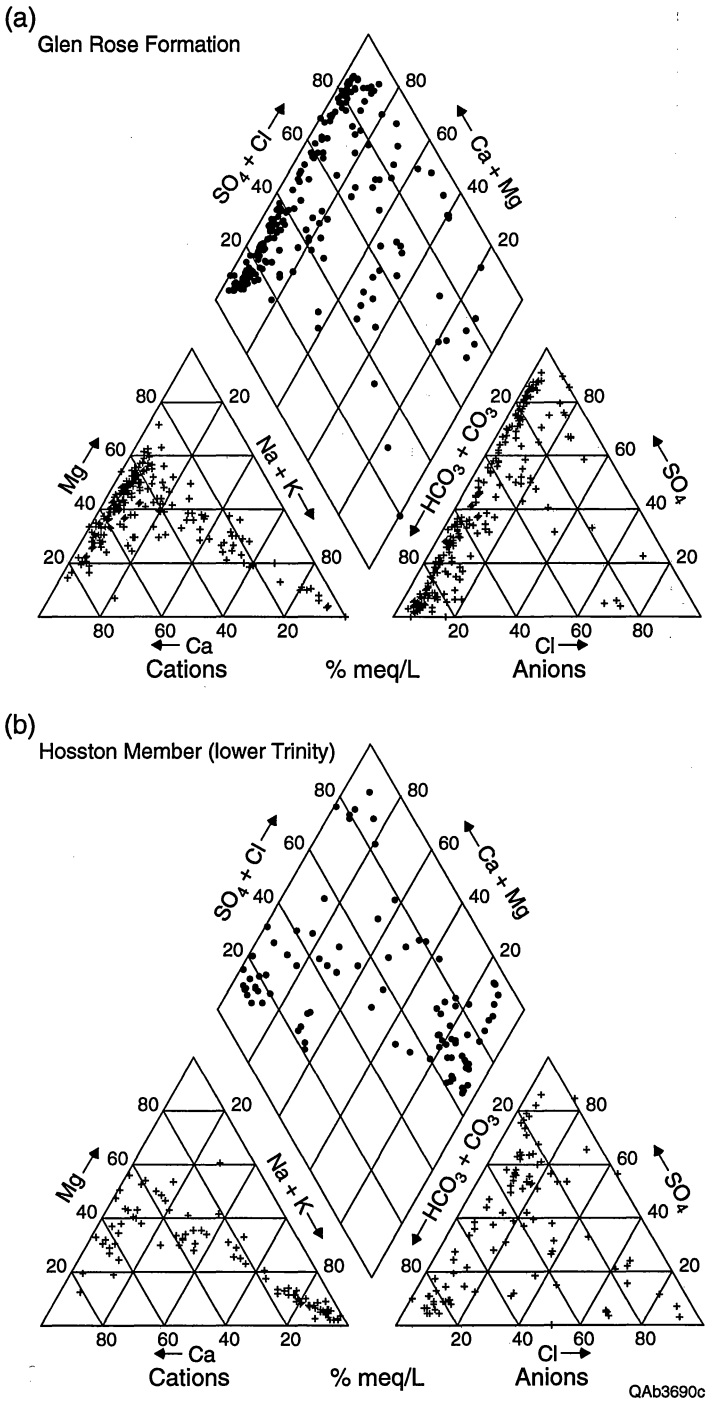

Figure 14. Trilinear diagram showing chemical composition of ground-water samples from the (a) Glen Rose Formation and (b) Hosston Member of the Travis Peak Formation (Lower Trinity) in Travis County.

Table 3. Chemical analysis of Camp Mabry monitor well (Mabry-1) and spring (Mabry-2). Results in mg/L unless otherwise indicated.

	Mabry-1	Mabry-2
pH	7.2	6.4
T (^{o}C)	23.4	21.0
Na	56.4	21.5
K	3.9	0.8
Mg	36.6	4.4
Ca	69.2	139.7
F	2.6	0.8
Cl	60.9	49.0
Br	0.5	0.9
NO_3		4.6
SO_4	62.5	33.0
HCO_3	352.0	360.0
TDS	662	631
Tritium (TU)	0	na

na: Not analyzed.

Formation). This water moves from topographic highs toward topographic lows, where it discharges into local creeks and streams. Surface expressions of faults may lead to greater weathering and therefore higher permeability of the formations at shallow depths. This will create anisotropy that will direct water along the orientation of the faults, at least locally. Some of the water may move further into the subsurface into underlying aquifers, although the expected amount is probably small. Measured water levels suggest a vertical gradient of ground-water flow from the surface into the Kirschburg evaporite deeper into the Edwards Formation. Flow in the Edwards aquifer beneath Camp Mabry is directed toward and discharges through seeps and springs into Town Lake.

SURFACE-WATER HYDROLOGY

Principal Streams and Watersheds

Camp Mabry resides in the Colorado River basin (zone 3) (TDWR, 1983). Surface water at the camp moves into first-order unnamed tributaries to the Colorado River and Johnson Branch. Runoff in the north and west-central areas of the camp feeds into locally intermittent creeks that discharge to Lake Austin (Colorado River) near Laguna Gloria. Surface water in the southwest corner of the camp drains into an unnamed intermittent creek that discharges to Town Lake near Reed Park (fig. 15). There are two small ponds along the main drainage that runs through Camp Mabry. Various roads redirect runoff on the camp into the creeks.

Floodplain Analysis

Camp Mabry does not contain substantial 100-yr floodplains. The only mappable floodplains, which barely extend from the stream beds, are on the small streams that flow south into Lake Austin (fig. 16). Runoffs are slightly greater because of impervious cover and will increase as development continues on the camp. The 100-yr 24-hr rainfall is 10.0 inches, having a maximum SCS Type II distributed rainfall intensity of 4.25 inches/hr (fig. 17a). This 100-yr rainfall results in a maximum flow of 918 cfs in the western stream (fig. 17b for point A in fig. 16) and 2,538 cfs in the eastern stream (fig. 17c for point B in fig. 16).

GIS DATA PREPARATION

Several layers of data and information were automated for inclusion into a geographical information system (GIS). These layers include:

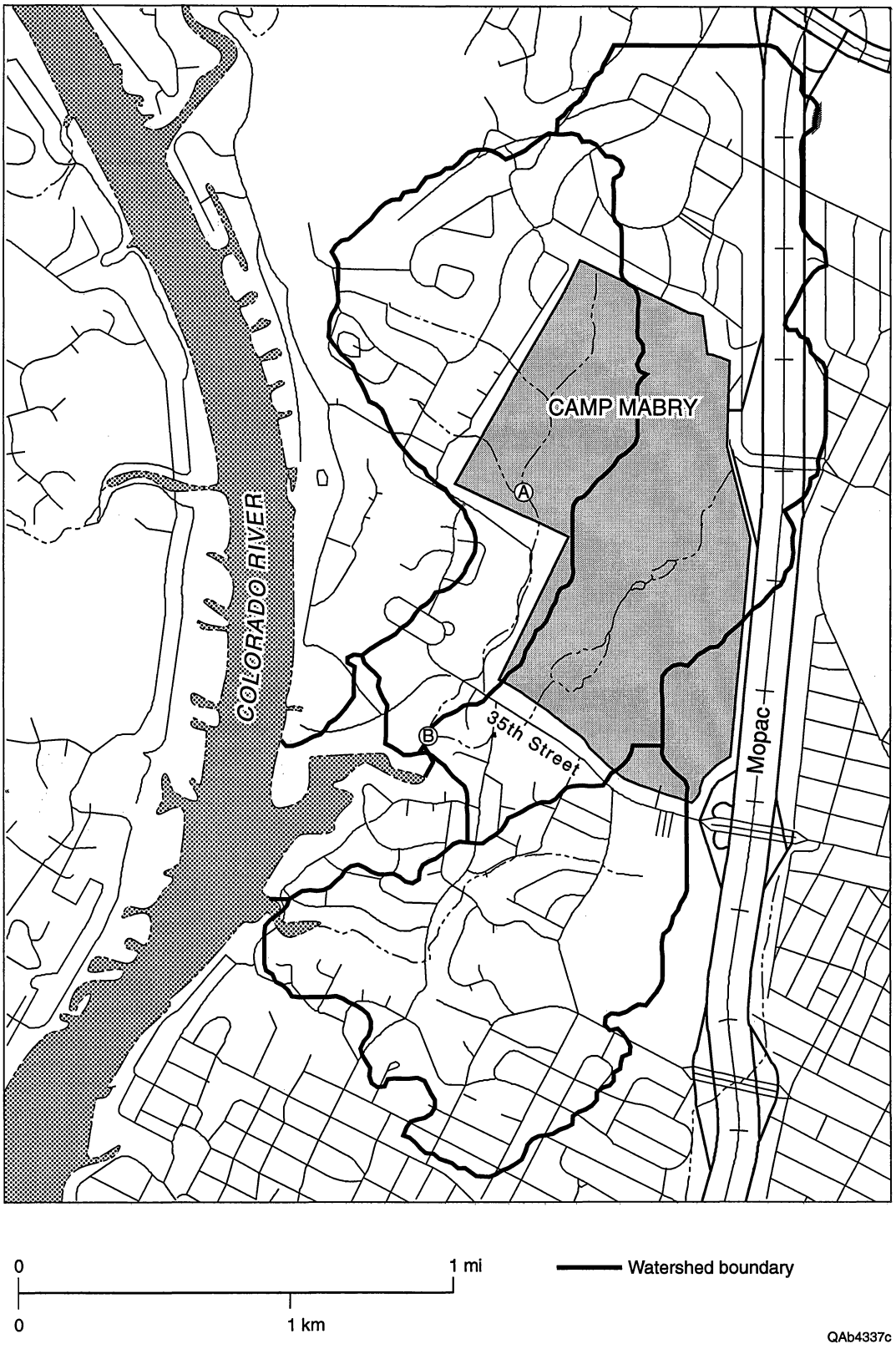

Figure 15. Watershed delineations of Camp Mabry. Points A and B refer to flood hydrographs in figure 17.

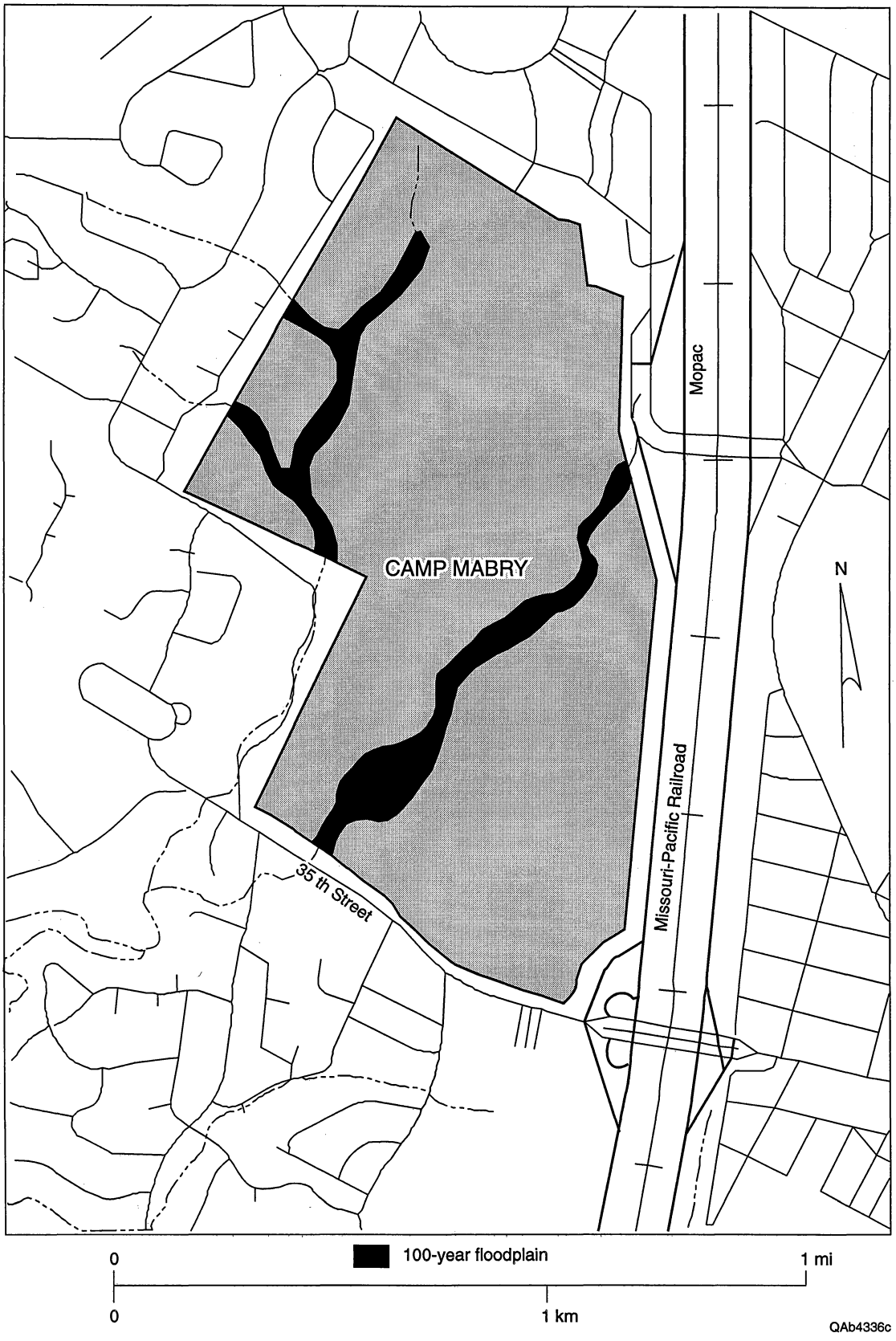

Figure 16. One-hundred-year floodplains of Camp Mabry.

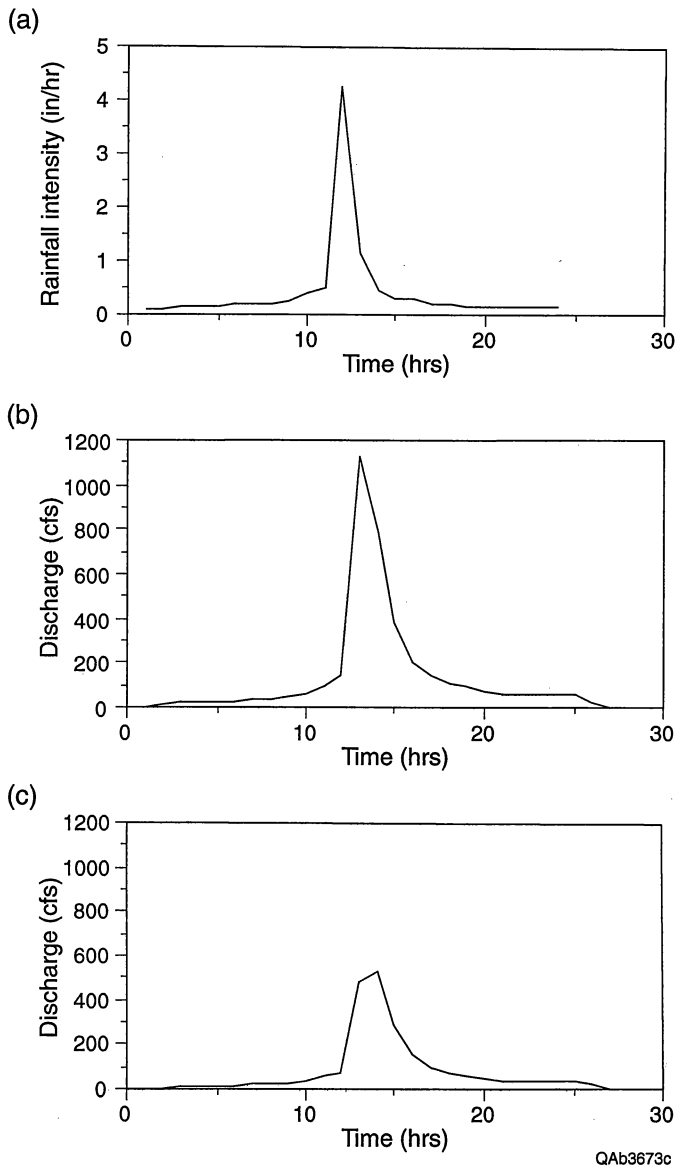

Figure 17. Flood hydrograph analysis of Camp Mabry, including (a) 100-yr 24-hr SCS Type II distributed rainfall intensity and 100-yr flood hydrographs near the camp boundary for the (b) eastern stream (point A, fig. 15) and (c) western stream (point B, fig. 15).

- Roads
- Watersheds
- Digital elevation map (DEM)
- Floodplains
- Soil maps
- Location of off-camp wells
- Location of on-camp wells
- Water-level maps

The data dictionary for these layers is included in appendix 3.

SUMMARY

Camp Mabry occupies a geologically complex urban area. The variety of strata beneath the camp and the presence of numerous faults through the various hydrostratigraphic units result in ground-water systems that are difficult to fully characterize. Ground-water supplies exist in three principal aquifers under the camp: the deep Edwards aquifer, having water levels approximately 120 ft below ground surface; the Kirschberg solution zone, having water levels approximately 95 ft below ground surface; and a weathered zone near land surface that has depths to water of 20 to 30 ft. Water-level measurements indicate a strong downward component of ground-water flow at Camp Mabry. For this reason, the deeper aquifer units are vulnerable to water-quality degradation by surface contamination.

The conceptual ground-water flow model resulting from this study suggests that most ground-water flow at Camp Mabry is shallow and unconfined, and that local recharge occurs as rainfall on formation outcrops. A small amount of this water recharges the shallow, weathered zone aquifer and flows to topographically low regions, where it discharges into creeks or streams. Some may move downward to the deeper aquifers, particularly along faults if they are transmissive.

Runoff from Camp Mabry flows toward Town Lake and Johnson Branch. There are no significant rivers or streams on the camp, nor would a 100-yr storm produce significant flooding in the camp. Because of the urban setting of the camp, as well as the numerous roads, buildings, and paved areas on the camp grounds, storm runoff is likely to be very rapid.

The findings of this study suggest that contamination of deep aquifers is possible because of the downward ground-water flow gradient and the possibility that some faults may

provide rapid transport from surface to deep aquifers. Potentially more significant is the possibility of surface-water contamination resulting from chemicals and debris being rapidly flushed off paved surfaces during heavy rains.

ACKNOWLEDGMENTS

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Appendix 1

Travis County Well Data

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0001	5732201	30.584167	98.056667	218TRNT	-	1089
T0002	5732501	30.569722	98.055000	217HSTN	225	905
T0003	5732502	30.552500	98.043611	218GLRSL	75	850
T0004	5732801	30.509167	98.044444	217HSTN	125	765
T0005	5732802	30.508611	98.044444	218HNSL	28	770
T0006	5732803	30.526667	98.058611	218HNSL	103	860
T0007	5732804	30.505833	98.048889	217HSTN	214	870
T0008	5732805	30.504722	98.076389	218HNSL	-	790
T0009	5732901	30.507222	98.023889	218HNSL	75	720
T0010	5732902	30.508611	98.022778	218HNSL	-	700
T0011	5739905	30.416389	98.131111	217HSTN	176	925
T0012	5740101	30.458611	98.091667	217HSTN	400	772
T0013	5740102	30.458611	98.091389	217HSTN	400	768
T0014	5740201	30.470833	98.066389	217HSTN	159	760
T0015	5740202	30.468056	98.068056	217HSTN	129	725
T0016	5740203	30.473333	98.062222	218GLRSL	-	770
T0017	5740204	30.499722	98.065000	217HSTN	417	980
T0018	5740205	30.471389	98.066389	218TRNT	-	760
T0019	5740206	30.499444	98.055278	217HSTN	401	940
T0020	5740301	30.488333	98.034722	217HSTN	425	970
T0021	5740302	30.473611	98.029444	217HSTN	180	715
T0022	5740303	30.470556	98.030278	217HSTN	210	695
T0023	5740304	30.472500	98.021944	217HSTN	256	720
T0024	5740305	30.465833	98.009167	217HSTN	362	765
T0025	5740306	30.473056	98.029722	218GLRSL	151	780
T0026	5740307	30.481944	98.027500	217HSTN	330	960
T0027	5740308	30.473056	98.029722	217HSTN	192	700
T0028	5740309	30.466111	98.010000	217HSTN	250	765
T0029	5740310	30.466111	98.010000	217HSTN	250	760
T0030	5740311	30.466111	98.010000	217HSTN	370	760
T0031	5740401	30.425278	98.085278	217HSTN	135	700
T0032	5740402	30.426667	98.0925	217HSTN	215	740
T0033	5740403	30.425000	98.084722	217HSTN	136	700
T0034	5740404	30.428889	98.084444	217HSTN	176	720
T0035	5740405	30.424444	98.083889	217HSTN	175	730
T0036	5740406	30.427778	98.107222	218GLRSL	81	840
T0037	5740407	30.458056	98.091944	217HSTN	400	793
T0038	5740408	30.457778	98.091944	217HSTN	400	791
T0039	5740409	30.457778	98.092778	217HSTN	400	786
T0040	5740410	30.437222	98.093611	217HSTN	170	768
T0041	5740411	30.436944	98.093056	217HSTN	205	768
T0042	5740412	30.436389	98.091944	217HSTN	180	768
T0043	5740413	30.425833	98.095000	217HSTN	180	785
T0044	5740414	30.426111	98.095278	217HSTN	222	785
T0045	5740501	30.448611	98.049722	218HNSL	66	760
T0046	5740502	30.423889	98.082778	218GLRSU	123	750
T0047	5740503	30.417222	98.073611	217HSTN	180	740
T0048	5740504	30.417222	98.046944	218GLRSL	100	740
T0049	5740505	30.418889	98.043333	218GLRH	207	720
T0050	5740506	30.428056	98.046389	218GLRS	83	770
T0051	5740507	30.435000	98.082222	217HSTN	106	750
T0052	5740508	30.431944	98.068333	217HSTN	170	720
T0053	5740509	30.427500	98.083056	218HNSL	234	781

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0054	5740510	30.449444	98.060833	217HSTN	160	720
T0055	5740601	30.427778	98.038611	218GLRH	193	700
T0056	5740602	30.450000	98.002778	218GLRSL	-	665
T0057	5740603	30.425556	98.038333	217HSTN	135	720
T0058	5740604	30.449722	98.026944	218GLRSL	120	800
T0059	5740605	30.440556	98.033889	218GLRSL	300	750
T0060	5740701	30.385556	98.085278	218GLRSL	100	790
T0061	5740702	30.394444	98.107222	217HSTN	1158	783
T0062	5740801	30.405278	98.060833	218GLRH	305	820
T0063	5740802	30.407222	98.047500	217HSTN	370	850
T0064	5740803	30.403056	98.064722	218HNSL	130	780
T0065	5740804	30.412500	98.072500	217HSTN	155	720
T0066	5740805	30.379167	98.082500	218GLRSL	100	800
T0067	5740806	30.386389	98.049444	218GLRSL	510	1050
T0068	5740901	30.384444	98.021111	218GLRSL	200	710
T0069	5740902	30.385278	98.019722	218GLRSL	136	705
T0070	5740903	30.385000	98.021389	218GLRSL	200	750
T0071	5740904	30.404444	98.001111	218GLRSL	277	770
T0072	5740905	30.403889	98.000000	218GLRSL	225	768
T0073	5740906	30.383889	98.021667	218GLRT	266	715
T0074	5740907	30.385833	98.021667	218GLRSL	184	750
T0075	5740908	30.386667	98.020833	218GLRSL	120	710
T0076	5740909	30.383333	98.023056	217HSTN	275	720
T0077	5740910	30.383889	98.021667	217HSTN	279	715
T0078	5740911	30.383611	98.023056	218TRNT	330	-
T0079	5747301	30.338611	98.128611	NOT-APPL	1134	800
T0080	5747303	30.350833	98.158889	218HNSL	100	880
T0081	5747304	30.340833	98.143333	218GLRSL	-	805
T0082	5747305	30.336111	98.140556	218SCMR	280	-
T0083	5747306	30.345556	98.139722	218HNSL	-	775
T0084	5747307	30.343889	98.147500	218HNSL	83	860
T0085	5748101	30.366389	98.088333	218GLRSL	192	880
T0086	5748102	30.342500	98.125000	218GLRSL	129	824
T0087	5748103	30.341944	98.123333	218GLRSL	145	928
T0088	5748104	30.352500	98.106667	218GLRSL	124	910
T0089	5748105	30.342778	98.123889	218GLRSL	-	805
T0090	5748201	30.356111	98.070000	218GLRSL	227	970
T0091	5748202	30.369167	98.064167	218CCRK	341	1010
T0092	5748203	30.347778	98.068611	218GLRS	320	1110
T0093	5748204	30.363056	98.045278	217HSTN	434	910
T0094	5748205	30.359444	98.053056	218GLRSL	302	1036
T0095	5748206	30.363889	98.042778	218GLRH	250	870
T0096	5748207	30.354444	98.065000	218GLRSL	330	1088
T0097	5748208	30.354444	98.065000	218GLRSL	330	1090
T0098	5748209	30.352778	98.063889	218GLRSL	350	1090
T0099	5748210	30.365000	98.044167	218GLRS	230	880
T0100	5748301	30.366389	98.036667	218GLRSL	165	710
T0101	5748302	30.366389	98.035000	218GLRSL	175	700
T0102	5748303	30.339167	98.039444	218GLRSL	130	830
T0103	5748304	30.365833	98.020556	218GLRSL	242	770
T0104	5748305	30.358889	98.032222	218GLRSL	271	805
T0105	5748401	30.294167	98.083611	218GLRSL	564	1350
T0106	5748402	30.299722	98.088889	218GLRS	635	1330

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0107	5748403	30.331111	98.086111	218TRNT	-	1050
T0108	5748404	30.321111	98.094444	218GLRSU	-	1080
T0109	5748405	30.304722	98.100000	218TRNT	540	1306
T0110	5748501	30.296667	98.072222	218GLRSL	300	1130
T0111	5748502	30.301389	98.080000	218GLRSU	-	1270
T0112	5748503	30.295556	98.081111	218GLRSU	-	1290
T0113	5748504	30.299167	98.069444	218GLRSL	533	1210
T0114	5748601	30.292500	98.000278	217HSTN	928	1190
T0115	5748602	30.293333	98.000833	217HSTN	904	1165
T0116	5748603	30.293333	98.000833	218GLRSU	300	1160
T0117	5748604	30.297500	98.030000	217HSTN	1130	1173
T0118	5748605	30.296389	98.028611	218GLRSL	750	1190
T0119	5748606	30.296667	98.028611	218GLRSU	150	1188
T0120	5748801	30.275000	98.049444	217HSTN	870	1080
T0121	5748802	30.270278	98.051111	218HNHS	712	1120
T0122	5748803	30.291389	98.075833	218GLRSU	-	1290
T0123	5748804	30.290278	98.071111	218GLRSU	-	1280
T0124	5748805	30.288333	98.053611	218GLRSU	-	1120
T0125	5748806	30.270278	98.051111	218GLRSL	540	1220
T0126	5748807	30.270556	98.051944	218GLRS	590	1223
T0127	5748808	30.273889	98.047778	218GLRS	750	1080
T0128	5748901	30.259444	98.013056	217HSTN	821	1060
T0129	5748902	30.258889	98.012500	217HSTN	728	1056
T0130	5748903	30.255833	98.025556	218GLRS	287	1090
T0131	5748904	30.262778	98.017500	218GLRS	200	1020
T0132	5748905	30.270278	98.028611	218GLRSL	300	1010
T0133	5748906	30.268611	98.028333	218GLRSU	64	1020
T0134	5748907	30.268611	98.027778	218GLRSL	444	1010
T0135	5748908	30.284444	98.019167	218GLRS	300	1150
T0136	5748909	30.270278	98.020833	218GLRS	396	1010
T0137	5756301	30.241667	98.008611	218GLRS	420	940
T0138	5825101	30.586667	97.971944	218GLRS	200	1000
T0139	5825102	30.586111	97.968889	218GLRSU	-	980
T0140	5825103	30.590556	97.975278	218GRHH	940	1045
T0141	5825104	30.595833	97.987500	217HSTN	600	1230
T0142	5825105	30.596389	97.987222	217HSTN	665	1230
T0143	5825201	30.599167	97.936667	218HNSL	520	1095
T0144	5825203	30.608889	97.955556	218HNSL	453	1062
T0145	5825204	30.599167	97.936667	218GRHC	520	1095
T0146	5825401	30.550000	97.960278	218GLRS	375	960
T0147	5825402	30.542500	97.967500	218GLRS	180	1024
T0148	5825403	30.543611	97.964722	218GLRS	425	1000
T0149	5825404	30.546944	97.966667	218GLRSU	-	1030
T0150	5825501	30.554722	97.953611	218GLRS	400	950
T0151	5825502	30.567778	97.941944	218GLRS	448	950
T0152	5825503	30.571944	97.948889	218GLRSL	100	940
T0153	5825504	30.569167	97.950000	218GLRSL	96	920
T0154	5825505	30.554722	97.923056	218GLRSU	-	1000
T0155	5825506	30.579167	97.931111	218HNSL	480	1000
T0156	5825507	30.579722	97.932500	218HNSL	437	1000
T0157	5825508	30.543889	97.942222	218GLRSL	380	860
T0158	5825510	30.571944	97.956667	217HSTN	590	1050
T0159	5825511	30.572778	97.931667	217HSTN	600	1090

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0160	5825512	30.581389	97.932778	218GLRH	440	-
T0161	5825513	30.571944	97.957500	218GLRH	540	1060
T0162	5825601	30.563889	97.911667	218EDRDA	-	1040
T0163	5825602	30.559444	97.908611	218TRNT	-	970
T0164	5825603	30.547222	97.914444	218GLRSU	-	915
T0165	5825604	30.566667	97.901667	217HSTN	700	1040
T0166	5825701	30.536944	97.991667	218EDRDA	-	1260
T0167	5825702	30.535556	97.961389	218GLRSU	-	895
T0168	5825703	30.524722	97.964167	218GLRSU	-	1000
T0169	5825704	30.524444	97.976111	218GLRSU	-	1050
T0170	5825705	30.525833	97.996389	217HSTN	700	1291
T0171	5825706	30.521944	97.958611	217HSTN	650	960
T0172	5825707	30.529444	97.967500	217HSTN	700	1181
T0173	5825708	30.529722	97.967222	217HSTN	755	1183
T0174	5825709	30.521389	97.959167	217HSTN	700	980
T0175	5825710	30.520833	97.959444	217HSTN	700	990
T0176	5825801	30.531667	97.935278	218GLRSL	497	890
T0177	5825802	30.500833	97.918889	218GLRT	600	855
T0178	5825803	30.524444	97.928056	218GLRSL	56	790
T0179	5825804	30.501111	97.922778	217HSTN	615	925
T0180	5825805	30.501389	97.919444	217HSTN	576	860
T0181	5825806	30.524167	97.920278	218HNSL	446	810
T0182	5825901	30.503056	97.914722	218GLRT	643	815
T0183	5825902	30.518333	97.895000	218GLRS	280	810
T0184	5825903	30.516389	97.876389	218GLRS	400	1080
T0185	5825904	30.510833	97.880833	218GLRS	400	1080
T0186	5825905	30.514722	97.875278	218GLRS	387	1060
T0187	5825906	30.514722	97.875556	218GLRS	400	1060
T0188	5825907	30.527500	97.893611	218GLRS	247	775
T0189	5825908	30.515000	97.901944	218GLRS	312	750
T0190	5825909	30.530000	97.889722	218GLRS	560	880
T0191	5825910	30.531944	97.910278	218GLRSL	730	880
T0192	5825911	30.515556	97.878056	218HNHS	945	1080
T0193	5825912	30.513611	97.878889	218LGRLH	775	1080
T0194	5825913	30.504444	97.887500	217HSTN	840	1050
T0195	5825914	30.534722	97.884167	218TRNT	875	862
T0196	5825915	30.536667	97.877222	218TRNT	975	907
T0197	5825916	30.540833	97.879444	218HSCC	940	775
T0198	5825917	30.535278	97.881389	218TRNT	975	860
T0199	5826403	30.546667	97.871944	218GLRSL	888	1110
T0200	5826404	30.546667	97.871667	218GRLH	888	1110
T0201	5826706	30.517222	97.873056	218GLRSU	191	1070
T0202	5826707	30.514722	97.867500	218GLRS	525	1055
T0203	5826708	30.516111	97.874444	218GLRSU	400	1070
T0204	5826709	30.501944	97.874167	218GLRSU	300	880
T0205	5826710	30.505278	97.868889	218GLRSU	100	1040
T0206	5826711	30.522500	97.872222	217HSTN	890	1070
T0207	5833101	30.483056	97.978889	218GLRSL	513	930
T0208	5833102	30.462500	97.976667	218GLRSL	600	1100
T0209	5833103	30.483611	97.971667	218HNHS	926	1220
T0210	5833104	30.484167	97.982778	218GLRSL	455	760
T0211	5833201	30.487222	97.938611	NOT-APPL	3000	855
T0212	5833202	30.478611	97.944444	218GLRS	365	880

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG#	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0213	5833203	30.490833	97.922778	217HSTN	600	780
T0214	5833204	30.476389	97.933889	218GLRSL	620	1110
T0215	5833205	30.496667	97.925833	217HSTN	600	870
T0216	5833206	30.486944	97.940833	218GLRSL	356	855
T0217	5833207	30.468056	97.941944	218GLRS	525	960
T0218	5833208	30.482778	97.941944	218GLRS	630	1050
T0219	5833209	30.499722	97.926389	217HSTN	650	1020
T0220	5833210	30.485278	97.926111	218TRNT	-	980
T0221	5833211	30.490556	97.924722	218GLRS	441	800
T0222	5833212	30.496667	97.929722	218LGRLH	762	1010
T0223	5833213	30.469444	97.951389	218GLRSL	700	1046
T0224	5833214	30.488056	97.929167	218GLRS	418	820
T0225	5833215	30.484444	97.928889	218LGRLH	640	820
T0226	5833216	30.490556	97.941389	218LGRLH	544	930
T0227	5833301	30.495000	97.911667	218LGRLH	545	770
T0228	5833302	30.496111	97.886111	217HSTN	665	880
T0229	5833303	30.498889	97.908889	217HSTN	530	720
T0230	5833304	30.460278	97.915556	218GLRSL	360	740
T0231	5833305	30.476111	97.906389	218GLRSL	345	740
T0232	5833306	30.496111	97.890833	218GLRS	480	940
T0233	5833307	30.495000	97.897778	218GLRS	660	960
T0234	5833308	30.491389	97.910000	217HSTN	740	980
T0235	5833309	30.499167	97.875833	218GLRSU	400	962
T0236	5833310	30.489444	97.911111	217HSTN	874	-
T0237	5833311	30.483611	97.884167	217HSTN	398	1039
T0238	5833401	30.449444	97.979444	218GLRSL	422	970
T0239	5833402	30.442222	97.975278	218GLRS	535	950
T0240	5833403	30.421111	97.960000	217HSTN	462	770
T0241	5833404	30.448611	97.974722	218GLRS	305	1000
T0242	5833405	30.429444	97.991389	218GLRSL	390	910
T0243	5833406	30.433611	97.982222	217HSTN	550	913
T0244	5833501	30.455556	97.920278	218GLRS	422	785
T0245	5833502	30.422500	97.942500	217HSTN	520	715
T0246	5833503	30.432222	97.941944	218GLRSL	68	700
T0247	5833504	30.458056	97.956667	218GLRSU	-	720
T0248	5833505	30.417222	97.918611	218GLRSL	201	710
T0249	5833601	30.437778	97.906111	218GLRS	422	740
T0250	5833602	30.454722	97.897222	218LGRLH	802	1060
T0251	5833603	30.452500	97.912778	218GLRSL	440	830
T0252	5833604	30.433611	97.903056	218GLRSL	390	825
T0253	5833605	30.434444	97.912500	218GLRSL	440	800
T0254	5833606	30.438889	97.905556	218GLRS	404	770
T0255	5833607	30.440278	97.902222	218GLRS	437	780
T0256	5833608	30.441944	97.912222	218GLRSL	370	730
T0257	5833609	30.431389	97.885556	218LGRLH	709	730
T0258	5833610	30.430556	97.885556	218GLRS	215	725
T0259	5833611	30.438333	97.893333	218GLRS	512	840
T0260	5833613	30.445833	97.913333	218GLRS	670	990
T0261	5833614	30.429722	97.886389	218GLRS	407	730
T0262	5833615	30.445278	97.913889	217HSTN	675	720
T0263	5833616	30.438889	97.881389	218GLRS	387	720
T0264	5833617	30.436944	97.887778	218GRLH	620	820
T0265	5833618	30.435556	97.912500	218LGRLH	490	760

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG#	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0266	5833619	30.430556	97.903611	218GLRS	404	760
T0267	5833620	30.435278	97.905278	218GLRS	386	720
T0268	5833621	30.431111	97.886111	218GLRS	263	720
T0269	5833622	30.435278	97.903611	218GLRS	440	780
T0270	5833701	30.381944	97.977222	218GLRS	100	573
T0271	5833702	30.388056	97.965833	218GLRS	230	690
T0272	5833703	30.387222	97.967222	218GLRS	256	740
T0273	5833801	30.396667	97.932778	217HSTN	725	830
T0274	5833802	30.394444	97.935000	217HSTN	641	820
T0275	5833804	30.397778	97.928333	218LGRLH	598	820
T0276	5833805	30.385556	97.928056	218LGRLH	726	770
T0277	5833806	30.404444	97.926389	217HSTN	750	860
T0278	5833807	30.393889	97.933611	218GLRS	417	820
T0279	5833808	30.412222	97.921111	217HSTN	686	750
T0280	5833809	30.413333	97.919444	218GLRS	350	760
T0281	5833810	30.414167	97.922222	218GLRS	385	770
T0282	5833811	30.407500	97.955278	217HSTN	460	740
T0283	5833812	30.375278	97.930556	217HSTN	1150	810
T0284	5833813	30.375556	97.930000	217HSTN	760	810
T0285	5833814	30.384722	97.928333	217HSTN	700	760
T0286	5833901	30.392778	97.888333	217HSTN	687	780
T0287	5833902	30.388056	97.896667	217HSTN	716	750
T0288	5833903	30.390000	97.907222	NOT-APPL	344	538
T0289	5833904	30.389444	97.890833	218GLRSL	500	760
T0290	5833905	30.380000	97.902778	218GLRSL	260	720
T0291	5833906	30.382222	97.911667	218GLRSL	127	550
T0292	5833907	30.414444	97.888333	218GLRS	251	740
T0293	5833908	30.415000	97.888333	218GLRS	383	742
T0294	5834102	30.462778	97.847500	218EBFZA	-	880
T0295	5834103	30.460000	97.850278	218EDRDA	-	850
T0296	5834104	30.458611	97.851389	218EDRDA	-	820
T0297	5834105	30.467222	97.843333	218GLRSU	350	997
T0298	5834401	30.443333	97.860556	217HSTN	821	750
T0299	5834402	30.443611	97.861944	217HSTN	650	730
T0300	5834403	30.433333	97.835556	218GLRSU	470	950
T0301	5834404	30.444167	97.862500	218GLRS	530	720
T0302	5834405	30.451667	97.833611	218GLRSU	274	960
T0303	5834406	30.440833	97.834722	218GLRSU	309	1025
T0304	5834407	30.451944	97.840000	218GLRSU	300	940
T0305	5834408	30.453056	97.838333	218GLRSU	160	920
T0306	5834409	30.453611	97.838611	218GLRSU	290	920
T0307	5834411	30.457778	97.837500	218EDRDA	-	880
T0308	5834412	30.457500	97.840000	218EDRDA	-	850
T0309	5834413	30.446667	97.834167	217HSTN	-	983
T0310	5834414	30.421389	97.835000	218EDRDA	-	855
T0311	5834501	30.457500	97.832778	218EDRDA	-	950
T0312	5834502	30.440556	97.794444	218GLRS	455	900
T0313	5834503	30.423056	97.793889	218GLRSU	206	740
T0314	5834504	30.421667	97.801944	218GLRSL	400	790
T0315	5834505	30.450556	97.830556	218GLRSU	310	1000
T0316	5834506	30.441111	97.832778	218TRNT	320	1018
T0317	5834507	30.441389	97.831944	218TRNT	340	1022
T0318	5834508	30.440278	97.832222	218TRNT	860	1022

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0319	5834509	30.439167	97.808889	218GRLH	840	960
T0320	5834601	30.430556	97.764722	218GLRSU	85	950
T0321	5834603	30.435556	97.787500	217HSTN	1253	925
T0322	5834604	30.436111	97.787222	217HSTN	850	915
T0323	5834606	30.417222	97.751389	218GLRSU	330	880
T0324	5834607	30.423056	97.755278	218GLRSU	250	890
T0325	5834608	30.420556	97.752222	218GLRSU	181	890
T0326	5834609	30.422778	97.783889	218EDRDA	895	895
T0327	5834613	30.432778	97.778611	218EDRDA	175	920
T0328	5834614	30.430833	97.785833	218EDRDA	100	860
T0329	5834615	30.430833	97.785833	218EDRDA	150	865
T0330	5834617	30.430833	97.781944	218EDRDA	-	840
T0331	5834618	30.431944	97.767222	218EDRDA	84	950
T0332	5834619	30.444167	97.791111	218GRHC	900	956
T0333	5834701	30.402500	97.855000	218GLRSU	82	1040
T0334	5834702	30.407500	97.851389	218GLRSU	41	1040
T0335	5834703	30.407778	97.858889	218GLRS	650	1020
T0336	5834704	30.407778	97.859444	218GLRSU	211	1009
T0337	5834705	30.401389	97.851389	218GLRSU	110	1045
T0338	5834706	30.397222	97.848611	218GLRSU	152	1045
T0339	5834707	30.402500	97.854722	218GLRSU	147	1045
T0340	5834708	30.398333	97.846389	218GLRSU	312	1070
T0341	5834709	30.410278	97.845833	218GLRSU	374	1020
T0342	5834710	30.409722	97.844167	218GLRSU	355	1000
T0343	5834711	30.401111	97.854722	218GLRSU	410	1060
T0344	5834712	30.403333	97.853611	218GLRSU	455	1045
T0345	5834713	30.403056	97.853056	218GLRSU	450	1045
T0346	5834714	30.400278	97.852778	218GLRS	770	1059
T0347	5834801	30.412500	97.794722	217HSTN	968	740
T0348	5834802	30.389444	97.826111	217HSTN	950	1000
T0349	5834803	30.390556	97.827500	218GLRSU	400	1000
T0350	5834804	30.415278	97.814722	218EDRDA	-	860
T0351	5834901	30.384167	97.769167	218GLRSU	150	613
T0352	5834902	30.398889	97.750556	218EDRDA	53	902
T0353	5834903	30.405000	97.766944	217HSTN	1222	890
T0354	5834904	30.411667	97.765833	218GLRSL	1122	910
T0355	5834905	30.407222	97.760278	218TRNT	1035	780
T0356	5835104	30.458333	97.714722	218FRGR	375	800
T0357	5835201	30.459167	97.696111	218EDRDA	270	904
T0358	5835206	30.471111	97.674167	218EDRDA	700	820
T0359	5835207	30.461111	97.689444	218EDRDA	330	905
T0360	5835208	30.468611	97.669167	218EDRDA	300	820
T0361	5835209	30.467778	97.671667	211ASTN	20	860
T0362	5835210	30.467500	97.672222	218EDRDA	362	860
T0363	5835211	30.479167	97.672500	218EDRDA	317	838
T0364	5835212	30.477778	97.672222	218EDRDA	320	825
T0365	5835216	30.477778	97.672222	218EBFZA	385	730
T0366	5835217	30.477222	97.672222	218EBFZA	365	820
T0367	5835219	30.458889	97.668056	218EDRDA	379	840
T0368	5835220	30.460833	97.676944	218EBFZA	740	863
T0369	5835221	30.475833	97.673333	218EDRDA	400	815
T0370	5835222	30.466944	97.673889	218EBFZA	460	829
T0371	5835223	30.474444	97.683889	218EDRDA	-	858

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG#	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0372	5835301	30.470278	97.663056	218EDRDA	352	810
T0373	5835302	30.472500	97.641389	218EDRDA	535	820
T0374	5835303	30.471667	97.640833	218EDRDA	552	820
T0375	5835304	30.477500	97.661944	218EDRDA	360	813
T0376	5835308	30.470000	97.666111	218EDRDA	400	839
T0377	5835309	30.463889	97.662222	218EDRDA	515	810
T0378	5835311	30.481111	97.633611	218EDRDA	620	805
T0379	5835312	30.459167	97.665556	218EDRDA	443	839
T0380	5835313	30.471389	97.642778	218EDRDA	611	800
T0381	5835314	30.473333	97.642222	218EDRDA	620	815
T0382	5835315	30.463056	97.625556	218EDRDA	579	765
T0383	5835316	30.462500	97.625278	218EDRDA	633	762
T0384	5835318	30.469444	97.666389	218EBFZA	550	830
T0385	5835319	30.461111	97.651944	218EBFZA	490	760
T0386	5835320	30.461389	97.654167	218EBFZA	462	770
T0387	5835321	30.461667	97.653889	218EBFZA	-	770
T0388	5835322	30.465000	97.664444	218EBFZA	435	805
T0389	5835323	30.458889	97.649444	218EBFZA	520	760
T0390	5835324	30.459722	97.656389	218EBFZA	510	758
T0391	5835401	30.445000	97.711944	218EDRDA	93	811
T0392	5835402	30.454444	97.721111	218EDRDA	85	840
T0393	5835403	30.455278	97.721111	218EDRDA	95	840
T0394	5835405	30.454722	97.721944	218EDRDA	100	845
T0395	5835409	30.451944	97.721667	218EDRDA	200	835
T0396	5835410	30.455278	97.718333	218EDGRU	370	840
T0397	5835411	30.455278	97.717500	218EDRDA	990	830
T0398	5835412	30.451944	97.721667	218FRGR	490	830
T0399	5835413	30.418889	97.745833	218EDRDA	336	855
T0400	5835415	30.446944	97.717222	218EDRDA	112	830
T0401	5835416	30.425556	97.728611	218GLRSU	412	805
T0402	5835417	30.436389	97.710000	218EDRDA	94	775
T0403	5835418	30.435556	97.709167	218EDRDA	88	770
T0404	5835419	30.418889	97.738056	218EDRDA	-	815
T0405	5835420	30.431944	97.710000	218EDRDA	280	767
T0406	5835421	30.455278	97.721111	218FRGR	375	-
T0407	5835422	30.450556	97.720278	218EBFZA	250	820
T0408	5835423	30.445000	97.710556	218EBFZA	380	809
T0409	5835501	30.439722	97.693333	218EDRDA	276	831
T0410	5835502	30.440278	97.700556	218EDRDA	350	772
T0411	5835504	30.449722	97.703056	218EDRDA	210	845
T0412	5835505	30.432778	97.698889	218EDRDA	255	770
T0413	5835506	30.437500	97.667500	218EDRDA	533	533
T0414	5835507	30.429167	97.668611	218EDRDA	525	800
T0415	5835508	30.420278	97.674444	218EDRDA	465	740
T0416	5835509	30.448611	97.668889	218EDRDA	550	853
T0417	5835511	30.448611	97.699444	218EDRDA	200	822
T0418	5835512	30.422778	97.690278	218EDRDA	520	776
T0419	5835513	30.423333	97.691389	218EDRDA	540	760
T0420	5835514	30.454444	97.678333	218EDRDA	420	875
T0421	5835515	30.417778	97.707222	218EBFZA	-	-
T0422	5835516	30.444167	97.706667	-	520	816
T0423	5835517	30.421667	97.687778	218EBFZA	520	760
T0424	5835518	30.427778	97.691667	218EBFZA	510	775

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0425	5835519	30.423611	97.696667	218EBFZA	480	780
T0426	5835601	30.442778	97.653889	218EDRDA	690	848
T0427	5835604	30.419444	97.642778	218EDRDA	565	715
T0428	5835605	30.456667	97.639167	211ASTN	-	725
T0429	5835606	30.425556	97.658056	211ASTN	-	740
T0430	5835607	30.445556	97.630000	218EDRDA	609	750
T0431	5835608	30.444444	97.653333	218EDRDA	584	840
T0432	5835609	30.445556	97.649167	218EBFZA	500	820
T0433	5835610	30.458056	97.649444	218EDRDA	480	706
T0434	5835611	30.420278	97.665000	218EDRDA	459	760
T0435	5835612	30.446944	97.634722	218EDRDA	660	762
T0436	5835613	30.444444	97.653611	218EBFZA	600	850
T0437	5835614	30.457778	97.641389	218EBFZA	500	735
T0438	5835615	30.452778	97.663056	218EBFZA	580	815
T0439	5835616	30.437778	97.665000	218EBFZA	540	795
T0440	5835617	30.445556	97.648333	218EBFZA	580	820
T0441	5835618	30.436944	97.644444	218EBFZA	527	780
T0442	5835619	30.440278	97.643056	218EBFZA	508	809
T0443	5835620	30.421111	97.650833	218EBFZA	440	714
T0444	5835621	30.438889	97.661389	218EDRDA	505	800
T0445	5835622	30.439722	97.661389	218EDRDA	540	798
T0446	5835623	30.457778	97.657778	218EBFZA	560	763
T0447	5835624	30.437222	97.644167	218EDRDA	540	785
T0448	5835625	30.445278	97.641667	218EDRDA	350	790
T0449	5835701	30.387778	97.725833	218EDRDA	610	790
T0450	5835702	30.386389	97.745556	218EDRDA	49	873
T0451	5835703	30.407222	97.713333	211ASTN	22	700
T0452	5835704	30.377222	97.735833	218EDRDA	400	740
T0453	5835705	30.414167	97.709722	218EBFZA	328	720
T0454	5835706	30.402778	97.748611	218GLRSU	126	873
T0455	5835707	30.403611	97.723056	218EDRDA	304	760
T0456	5835708	30.401389	97.730278	218EDRDA	400	801
T0457	5835709	30.383889	97.726389	217HSTN	1833	785
T0458	5835710	30.415833	97.747500	218GLRSU	272	875
T0459	5835711	30.413056	97.746944	218EDRDA	63	870
T0460	5835712	30.401667	97.746389	218FRGR	315	868
T0461	5835713	30.399444	97.744444	218GLRSU	314	880
T0462	5835714	30.376667	97.740278	218EDRDA	65	755
T0463	5835715	30.396944	97.745000	218GLRSU	316	880
T0464	5835716	30.402500	97.712500	218EDRDA	307	725
T0465	5835717	30.383889	97.746944	218FRGR	280	880
T0466	5835718	30.392778	97.733889	218EDRDA	-	785
T0467	5835719	30.386667	97.742778	218EDRDA	-	840
T0468	5835720	30.393611	97.747500	218EBFZA	480	892
T0469	5835721	30.392500	97.726944	218EDDT	1265	791
T0470	5835801	30.393056	97.680000	218EDRDA	300	657
T0471	5835802	30.376944	97.677222	218EDRDA	465	715
T0472	5835803	30.401944	97.682500	218EDDT	1400	660
T0473	5835804	30.383056	97.706389	218EDRDA	416	735
T0474	5835805	30.403889	97.680278	218EDRDA	423	680
T0475	5835806	30.401944	97.677778	218EDRDA	459	690
T0476	5835808	30.390556	97.694167	218EDRDA	460	762
T0477	5835809	30.391111	97.694167	218EDRDA	445	772

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0478	5835810	30.389722	97.679722	218EBFZA	580	665
T0479	5835902	30.391944	97.646111	218EDRDA	725	728
T0480	5835903	30.411944	97.642222	211ASTN	7	710
T0481	5835904	30.403056	97.635000	211ASTN	14	660
T0482	5835905	30.402778	97.651944	211ASTN	20	720
T0483	5835906	30.410556	97.648611	218EDRDA	600	750
T0484	5835907	30.391111	97.645556	218HNSL	1607	720
T0485	5835908	30.390278	97.645556	217HSTN	2140	715
T0486	5835909	30.416667	97.653333	218EBFZA	540	758
T0487	5836101	30.484722	97.584444	211ASTN	12	700
T0488	5836102	30.483889	97.583889	211ASTN	27	700
T0489	5836103	30.483333	97.583611	211ASTN	19	690
T0490	5836104	30.462222	97.597222	218EDRDA	630	722
T0491	5836105	30.494444	97.598333	211ASTN	18	742
T0492	5836106	30.493889	97.596944	211ASTN	29	731
T0493	5836107	30.470000	97.623889	218EBFZA	640	745
T0494	5836201	30.480000	97.552500	211NVTY	20	659
T0495	5836202	30.499167	97.579722	218EDRDA	725	765
T0496	5836203	30.461111	97.575000	211ASTN	13	657
T0497	5836205	30.478889	97.552500	218EDRDA	800	652
T0498	5836206	30.480556	97.580833	218EDRDA	614	692
T0499	5836207	30.496667	97.569167	218EDRDA	780	730
T0500	5836208	30.474444	97.580556	218EBFZA	680	661
T0501	5836302	30.462222	97.503889	211ASTN	17	580
T0502	5836401	30.437222	97.623611	218EDRDA	696	750
T0503	5836402	30.451389	97.605000	218EDRDA	610	755
T0504	5836403	30.437500	97.623333	218EDRDA	692	755
T0505	5836404	30.437500	97.623611	218EDRDA	632	755
T0506	5836405	30.418889	97.621111	218EDRDA	530	690
T0507	5836406	30.438889	97.610833	218EDRDA	619	685
T0508	5836407	30.438333	97.623333	218EBFZA	700	755
T0509	5836501	30.444444	97.569167	110TRRC	12	620
T0510	5836502	30.437778	97.581389	218EBFZA	770	660
T0511	5836503	30.455833	97.570000	218EBFZA	858	647
T0512	5836601	30.445000	97.527778	211ASTN	36	610
T0513	5836602	30.420833	97.533056	211NVTY	30	565
T0514	5836603	30.440556	97.520000	211ASTN	12	550
T0515	5836701	30.405833	97.583889	211NVTY	20	610
T0516	5836702	30.403611	97.585000	211NVTY	16	627
T0517	5836703	30.416111	97.624722	218EBFZA	580	715
T0518	5836801	30.390278	97.551111	211NVTY	26	560
T0519	5836802	30.410833	97.579444	211NVTY	24	603
T0520	5836803	30.411667	97.565556	211NVTY	24	620
T0521	5836901	30.408333	97.511111	211NVTY	18	555
T0522	5837401	30.436944	97.486667	211NVTY	35	490
T0523	5837402	30.419722	97.489444	211NVTY	20	553
T0524	5837501	30.431389	97.418333	NOT-APPL	1217	519
T0525	5837602	30.423333	97.404444	NOT-APPL	1058	530
T0526	5837801	30.403333	97.455000	NOT-APPL	1621	515
T0527	5837901	30.415000	97.385000	NOT-APPL	990	526
T0528	5837902	30.401667	97.398889	NOT-APPL	2102	570
T0529	5833803	30.393333	97.935278	217HSTN	620	830
T0530	5841101	30.341389	97.974167	217HSTN	577	920

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0531	5841102	30.358333	97.966667	217HSTN	680	840
T0532	5841301	30.340833	97.881111	217HSTN	500	640
T0533	5841302	30.342500	97.881111	217HSTN	395	500
T0534	5841303	30.341944	97.882778	218LGRLH	325	510
T0535	5841304	30.358611	97.895000	218GLRSL	-	660
T0536	5841305	30.351389	97.907500	218GLRSL	-	660
T0537	5841306	30.342778	97.888333	218GLRSL	-	480
T0538	5841307	30.343333	97.876667	218GRLH	400	550
T0539	5841308	30.342222	97.881944	218GLRSL	236	510
T0540	5841309	30.339722	97.882222	217HSTN	480	630
T0541	5841310	30.340278	97.881944	217HSTN	560	605
T0542	5841401	30.308889	97.965000	218GLRSU	160	960
T0543	5841402	30.306667	97.983056	218GLRSU	198	1000
T0544	5841403	30.327500	97.975000	218GLRSL	816	1180
T0545	5841404	30.323889	97.987222	218GLRSL	547	1080
T0546	5841405	30.305556	97.982500	218GLRSU	310	990
T0547	5841406	30.307222	97.971944	218HNSL	860	965
T0548	5841501	30.305556	97.936667	218GLRS	440	930
T0549	5841502	30.307778	97.944722	218GLRSL	245	910
T0550	5841503	30.305000	97.937500	218GLRS	608	910
T0551	5841504	30.307500	97.944167	218GLRSU	160	910
T0552	5841505	30.308889	97.945000	218GLRSU	210	920
T0553	5841506	30.296111	97.926944	218GLRSU	65	760
T0554	5841507	30.292778	97.925833	218GLRS	210	760
T0555	5841508	30.296389	97.925278	218GLRSU	120	770
T0556	5841509	30.328889	97.928889	218HNSL	100	520
T0557	5841510	30.332778	97.928056	218GLRSL	180	600
T0558	5841511	30.331389	97.928889	218GLRSL	180	600
T0559	5841512	30.330000	97.929444	218GLRSL	100	530
T0560	5841513	30.331389	97.922500	217HSTN	430	600
T0561	5841514	30.331389	97.922500	217HSTN	430	600
T0562	5841515	30.331389	97.922500	217HSTN	430	600
T0563	5841701	30.270278	97.993333	217HSTN	628	950
T0564	5841801	30.255833	97.936667	218GLRS	407	990
T0565	5841803	30.254444	97.916944	218GLRSL	400	980
T0566	5841804	30.260000	97.922778	218GLRSL	650	1170
T0567	5841805	30.289722	97.925000	218GLRSL	228	820
T0568	5841806	30.255556	97.916667	218GLRSU	-	1000
T0569	5841807	30.282778	97.921111	217HSTN	800	900
T0570	5841901	30.253889	97.886389	218GLRSU	165	980
T0571	5841902	30.256667	97.913333	218GLRS	533	1090
T0572	5841903	30.256667	97.891944	218GLRSU	238	960
T0573	5841904	30.257500	97.911667	218GLRSU	406	1040
T0574	5841905	30.258889	97.913611	218GLRSU	400	1040
T0575	5841906	30.253611	97.916389	218GLRSU	133	1080
T0576	5841907	30.255833	97.901944	218GLRS	640	970
T0577	5841908	30.253056	97.899444	218GLRS	425	960
T0578	5841909	30.274167	97.886389	218GLRSU	-	840
T0579	5841910	30.259722	97.883889	218GLRSU	-	1015
T0580	5841911	30.255833	97.911944	218GLRS	540	1055
T0581	5841912	30.257778	97.912778	218GLRSU	50	1048
T0582	5841913	30.258611	97.910556	218GLRS	507	1035
T0583	5841914	30.256389	97.915000	218GLRS	451	1040

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0584	5842101	30.338889	97.851389	217HSTN	499	520
T0585	5842102	30.340000	97.849444	217HSTN	490	500
T0586	5842103	30.346389	97.869722	217HSTN	466	640
T0587	5842104	30.344167	97.874722	218HNSL	361	530
T0588	5842105	30.341944	97.847222	110TRRC	60	497
T0589	5842201	30.372222	97.805278	218GLRSU	132	630
T0590	5842202	30.340000	97.826111	217HSTN	651	660
T0591	5842203	30.342222	97.798056	217HSTN	920	600
T0592	5842204	30.333889	97.822500	218LGRLH	777	520
T0593	5842205	30.360556	97.807222	218GLRSL	585	940
T0594	5842206	30.348333	97.807222	218HNSL	305	550
T0595	5842207	30.360833	97.808056	217HSTN	1050	930
T0596	5842208	30.345278	97.807222	218GLRSL	430	630
T0597	5842209	30.334444	97.823333	218GRHH	720	610
T0598	5842210	30.336111	97.823611	217HSTN	720	600
T0599	5842301	30.352778	97.788056	217HSTN	852	520
T0600	5842302	30.357222	97.756111	217HSTN	1135	810
T0601	5842303	30.352500	97.753333	217HSTN	1251	790
T0602	5842304	30.362778	97.787500	218GLRS	249	530
T0603	5842306	30.373056	97.788611	218GLRS	431	590
T0604	5842307	30.362778	97.786389	218GLRS	270	550
T0605	5842308	30.361389	97.759722	218EDRDA	-	810
T0606	5842309	30.367222	97.784722	218GLRSU	-	535
T0607	5842310	30.357222	97.756944	218EBFZA	1135	810
T0608	5842311	30.371944	97.763333	218EDRDA	-	790
T0609	5842401	30.295833	97.845833	217HSTN	716	820
T0610	5842402	30.295833	97.843056	217HSTN	930	830
T0611	5842403	30.332778	97.865000	218GLRS	372	620
T0612	5842404	30.309722	97.863889	218GLRSL	375	850
T0613	5842405	30.312222	97.858056	217HSTN	840	880
T0614	5842406	30.308611	97.865556	218LGRLH	712	840
T0615	5842407	30.318056	97.861667	218GLRS	417	843
T0616	5842408	30.317222	97.863056	218GLRSU	207	868
T0617	5842409	30.316667	97.862222	218HNSL	550	860
T0618	5842410	30.311667	97.858889	217HSTN	800	840
T0619	5842411	30.311389	97.858611	217HSTN	800	835
T0620	5842412	30.311389	97.858611	218GLRSU	25	835
T0621	5842413	30.294444	97.871111	217HSTN	850	790
T0622	5842414	30.292222	97.848889	217HSTN	900	760
T0623	5842415	30.292778	97.871667	217HSTN	840	720
T0624	5842501	30.297500	97.823889	217HSTN	941	990
T0625	5842502	30.330833	97.817778	217HSTN	1015	753
T0626	5842503	30.293056	97.796667	217HSTN	987	685
T0627	5842504	30.295278	97.808611	217HSTN	786	740
T0628	5842505	30.300000	97.810000	217HSTN	961	954
T0629	5842506	30.296111	97.805556	217HSTN	938	872
T0630	5842507	30.295556	97.812500	217HSTN	1045	880
T0631	5842508	30.295556	97.825833	218GLRS	495	880
T0632	5842509	30.299722	97.817500	218GLRSL	627	800
T0633	5842510	30.295833	97.821667	217HSTN	994	860
T0634	5842511	30.294444	97.796944	218GLRSL	358	730
T0635	5842512	30.299722	97.792222	218GLRSU	-	510
T0636	5842513	30.302500	97.794722	218GLRSU	-	505

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG#	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0637	5842514	30.303056	97.796389	218GLRSU	-	505
T0638	5842515	30.293056	97.824722	218GLRSU	-	840
T0639	5842516	30.310556	97.824167	218GLRSL	570	865
T0640	5842601	30.312500	97.773889	218GLRSL	140	520
T0641	5842602	30.330000	97.751667	218EDRDA	330	707
T0642	5842603	30.301667	97.788611	218GLRSL	400	680
T0643	5842604	30.311111	97.767778	218EDRDA	143	540
T0644	5842605	30.305556	97.763889	218EDRDA	23	610
T0645	5842606	30.312778	97.756111	218EDRDA	405	540
T0646	5842607	30.301111	97.771667	218EDRDA	300	580
T0647	5842608	30.303056	97.776111	218EDRDA	145	565
T0648	5842609	30.304167	97.791111	218GLRS	443	760
T0649	5842610	30.293333	97.784722	218EDRDA	-	460
T0650	5842611	30.314167	97.774722	218EDRDA	-	490
T0651	5842612	30.332500	97.763333	218GLRSL	598	820
T0652	5842613	30.317222	97.771111	218EDRDA	85	545
T0653	5842614	30.314444	97.769444	218EDRDA	130	547
T0654	5842615	30.311667	97.763333	218EDRDA	130	594
T0655	5842616	30.307778	97.761111	218EDRDA	240	616
T0656	5842617	30.305556	97.767500	218EDRDA	-	540
T0657	5842618	30.313056	97.774444	218EDRDA	-	490
T0658	5842619	30.296944	97.789722	218EDRDA	-	490
T0659	5842620	30.296389	97.791389	218GLRSU	-	503
T0660	5842621	30.302500	97.785278	218GLRS	190	500
T0661	5842701	30.286944	97.873056	217HSTN	900	845
T0662	5842702	30.273889	97.848056	217HSTN	560	620
T0663	5842703	30.276111	97.843611	217HSTN	620	680
T0664	5842704	30.279722	97.844722	217HSTN	740	810
T0665	5842705	30.273611	97.854444	217HSTN	525	630
T0666	5842706	30.277500	97.853611	217HSTN	530	660
T0667	5842707	30.256667	97.846111	218GLRSL	420	840
T0668	5842708	30.258611	97.845556	218GLRSL	485	910
T0669	5842709	30.285278	97.859722	217HSTN	820	860
T0670	5842710	30.286667	97.862778	217HSTN	850	865
T0671	5842801	30.284167	97.806944	217HSTN	846	760
T0672	5842802	30.280000	97.814167	217HSTN	1043	740
T0673	5842803	30.272778	97.814722	218LGRLH	897	760
T0674	5842804	30.271944	97.813611	218GRLH	1035	750
T0675	5842805	30.283611	97.811389	218GLRSL	876	770
T0676	5842806	30.273611	97.813611	217HSTN	1130	800
T0677	5842807	30.282778	97.814722	218GLRSL	420	800
T0678	5842808	30.265278	97.815833	218FRGR	638	720
T0679	5842809	30.265833	97.809722	218EDRDA	340	720
T0680	5842810	30.270556	97.809444	218EDRDA	295	700
T0681	5842811	30.259722	97.823056	218EDRDA	-	570
T0682	5842812	30.264444	97.813333	218EDRDA	375	745
T0683	5842813	30.274167	97.794444	218EDRDA	300	654
T0684	5842814	30.274167	97.794444	218EDRDA	300	653
T0685	5842815	30.252778	97.832222	218EDRDA	516	751
T0686	5842816	30.277222	97.793611	218EDRDA	290	640
T0687	5842817	30.265000	97.816944	218EDRDA	257	762
T0688	5842818	30.270556	97.809444	218EDRDA	300	700
T0689	5842819	30.261111	97.816667	218EDRDA	57	460

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG#	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0690	5842820	30.261111	97.816667	218EDRDA	450	700
T0691	5842821	30.260556	97.810556	218EDRDA	460	712
T0692	5842822	30.274722	97.793889	218EDRDA	300	658
T0693	5842824	30.273056	97.793333	218EDRDA	360	640
T0694	5842901	30.274722	97.779722	218EDRDA	244	525
T0695	5842903	30.262778	97.771111	218EBFZA	45	461
T0696	5842904	30.276389	97.773056	100ALVM	24	450
T0697	5842905	30.276389	97.773056	100ALVM	25	450
T0698	5842906	30.275833	97.772222	100ALVM	26	450
T0699	5842907	30.262222	97.752500	100ALVM	52	446
T0700	5842908	30.262222	97.752778	100ALVM	47	447
T0701	5842909	30.261944	97.751944	100ALVM	51	452
T0702	5842910	30.277222	97.784722	218EDRDA	264	570
T0703	5842911	30.268611	97.782500	218EDRDA	135	517
T0704	5842912	30.277222	97.784722	218EDRDA	245	570
T0705	5842913	30.267222	97.765000	218EDRDA	180	532
T0706	5842914	30.263333	97.770833	218EDRDA	-	435
T0707	5842915	30.250556	97.780000	218EDRDA	295	630
T0708	5842916	30.276389	97.775278	218EDRDA	-	430
T0709	5842917	30.261944	97.752500	100ALVM	55	450
T0710	5842919	30.269167	97.767500	218EDRDA	-	460
T0711	5842920	30.263056	97.772778	218EDRDA	-	470
T0712	5842921	30.263889	97.770000	218EDRDA	-	450
T0713	5842922	30.263333	97.768056	218EDRDA	-	465
T0714	5842924	30.286667	97.769722	218EDRDA	400	600
T0715	5842925	30.277222	97.782222	218EDRDA	180	575
T0716	5842926	30.275833	97.783333	218EDRDA	190	600
T0717	5842927	30.250000	97.753333	218EBFZA	285	495
T0718	5842928	30.255833	97.768611	218EBFZA	303	589
T0719	5842929	30.250278	97.753333	218EBFZA	561	495
T0720	5843101	30.338333	97.719167	218EDRDA	458	721
T0721	5843102	30.365556	97.746111	218GLRSL	909	800
T0722	5843103	30.362778	97.747778	218EDRDA	-	740
T0723	5843104	30.361111	97.716389	218EDRDA	401	750
T0724	5843105	30.347778	97.741944	218EDRDA	-	675
T0725	5843106	30.366111	97.716944	218EDRDA	395	733
T0726	5843107	30.360278	97.749722	218EDRDA	-	740
T0727	5843201	30.347500	97.696111	218EDRDA	409	674
T0728	5843203	30.340556	97.689444	218EDRDA	484	721
T0729	5843204	30.362222	97.669167	218EDRDA	750	694
T0730	5843205	30.342500	97.680833	218EDRDA	563	630
T0731	5843206	30.364722	97.707222	218EDRDA	400	700
T0732	5843207	30.363611	97.695556	218EDRDA	480	-
T0733	5843208	30.372778	97.690556	218EDRDA	469	-
T0734	5843303	30.371389	97.655833	218GLRS	1456	633
T0735	5843304	30.351111	97.646944	211NVTY	41	615
T0736	5843305	30.346111	97.629444	211NVTY	22	640
T0737	5843306	30.350278	97.631667	211NVTY	23	625
T0738	5843307	30.346944	97.642222	211NVTY	23	600
T0739	5843308	30.340556	97.646667	211NVTY	27	560
T0740	5843309	30.334167	97.651667	211NVTY	33	540
T0741	5843310	30.344722	97.666111	218TRNT	1900	-
T0742	5843311	30.346667	97.660000	218EBFZA	720	610

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0743	5843401	30.308611	97.738333	217HSTN	1975	635
T0744	5843402	30.319167	97.715278	211ASTN	184	675
T0745	5843403	30.326111	97.724167	218EDRDA	353	680
T0746	5843404	30.310556	97.747222	110TRRC	27	650
T0747	5843405	30.305556	97.746944	218EDRDA	-	590
T0748	5843501	30.325556	97.703611	218EDRDA	442	718
T0749	5843502	30.325000	97.703056	211ASTN	40	722
T0750	5843601	30.300556	97.654722	211NVTY	26	490
T0751	5843602	30.293889	97.649722	211NVTY	28	512
T0752	5843603	30.308611	97.633333	211NVTY	12	620
T0753	5843604	30.320000	97.626111	211NVTY	16	622
T0754	5843605	30.330556	97.633611	211NVTY	25	630
T0755	5843701	30.255556	97.736389	100ALVM	45	460
T0756	5843702	30.273611	97.739722	218GLRSL	1554	543
T0757	5843703	30.267778	97.741667	217HSTN	2250	495
T0758	5843704	30.266111	97.740000	218LGRLH	2025	485
T0759	5843705	30.287500	97.736389	218EDRDA	445	599
T0760	5843706	30.271389	97.745556	218EDRDA	480	530
T0761	5843707	30.274444	97.739444	218EDRDA	471	545
T0762	5843708	30.263611	97.736944	218TRNT	467	467
T0763	5843801	30.273333	97.699444	218GLRSU	1147	480
T0764	5843802	30.267222	97.668889	110TRRC	11	480
T0765	5843803	30.261944	97.668889	110TRRC	28	440
T0766	5843804	30.270556	97.703056	110TRRC	-	460
T0767	5843901	30.266389	97.644167	110ALVM	59	440
T0768	5843902	30.265833	97.650556	100ALVM	64	440
T0769	5843903	30.265833	97.648889	100ALVM	63	440
T0770	5843904	30.269444	97.644722	100ALVM	61	440
T0771	5843905	30.285556	97.634444	110TRRC	18	545
T0772	5843906	30.276667	97.647778	100ALVM	69	450
T0773	5843907	30.281667	97.647778	100ALVM	45	450
T0774	5843908	30.281111	97.646667	100ALVM	42	460
T0775	5843909	30.271111	97.627222	110TRRC	20	490
T0776	5843910	30.271111	97.627778	110TRRC	14	493
T0777	5843911	30.261111	97.662778	110ALVM	40	440
T0778	5843912	30.261111	97.662778	110ALVM	27	440
T0779	5843913	30.261389	97.664167	100ALVM	33	440
T0780	5843914	30.250833	97.648889	100ALVM	42	430
T0781	5843915	30.277500	97.649722	100ALVM	63	450
T0782	5843916	30.275833	97.650833	100ALVM	64	450
T0783	5843917	30.270000	97.651944	100ALVM	63	440
T0784	5843918	30.268333	97.652778	100ALVM	44	440
T0785	5843919	30.271111	97.651111	100ALVM	44	440
T0786	5843920	30.274444	97.647500	100ALVM	39	445
T0787	5843921	30.265556	97.653889	100ALVM	52	440
T0788	5843922	30.262778	97.661389	100ALVM	-	445
T0789	5843923	30.277778	97.644167	100ALVM	51	448
T0790	5844101	30.349167	97.600278	NOT-APPL	1250	605
T0791	5844102	30.344722	97.620833	211NVTY	22	620
T0792	5844103	30.344444	97.602222	217HSTN	2752	620
T0793	5844201	30.340278	97.558611	217HSTN	3001	535
T0794	5844202	30.340556	97.558333	217HSTN	2560	535
T0795	5844203	30.338333	97.560000	211NVTY	24	523

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0796	5844204	30.341111	97.560833	217HSTN	3086	524
T0797	5844301	30.373333	97.508333	NOT-APPL	1117	510
T0798	5844302	30.349444	97.513333	211NVTY	52	535
T0799	5844303	30.340833	97.528333	211NVTY	16	512
T0800	5844401	30.315556	97.585556	110TRRC	17	640
T0801	5844501	30.325000	97.559722	211NVTY	15	495
T0802	5844502	30.324167	97.561389	100ALVM	19	485
T0803	5844601	30.309444	97.535556	217HSTN	3250	608
T0804	5844602	30.306667	97.518333	110TRRC	-	560
T0805	5844603	30.298889	97.528333	110TRRC	30	596
T0806	5844604	30.305000	97.518889	110TRRC	24	594
T0807	5844605	30.308889	97.512778	110TRRC	21	613
T0808	5844606	30.309444	97.512222	110TRRC	20	613
T0809	5844607	30.294444	97.516389	110TRRC	36	574
T0810	5844608	30.293333	97.519444	110TRRC	30	572
T0811	5844701	30.253333	97.603056	110TRRC	40	445
T0812	5844702	30.266944	97.619444	110TRRC	8	485
T0813	5844703	30.255556	97.615556	110TRRC	42	445
T0814	5844704	30.276389	97.606944	110TRRC	15	545
T0815	5844705	30.264444	97.620556	110TRRC	11	460
T0816	5844706	30.250833	97.599722	110TRRC	55	450
T0817	5844707	30.252222	97.593889	100ALVM	65	453
T0818	5844708	30.255000	97.592222	100ALVM	-	447
T0819	5844709	30.256389	97.590556	100ALVM	-	455
T0820	5844710	30.250556	97.596667	110TRRC	62	453
T0821	5844801	30.252778	97.545833	100ALVM	38	410
T0822	5844802	30.252222	97.546111	100ALVM	42	410
T0823	5844803	30.268056	97.546944	100ALVM	40	440
T0824	5844804	30.258889	97.553611	100ALVM	26	420
T0825	5844805	30.251667	97.558611	100ALVM	33	410
T0826	5844901	30.251389	97.539167	218EDRDA	1690	420
T0827	5844902	30.253333	97.531944	100ALVM	30	415
T0828	5844903	30.255000	97.528056	110TRRC	22	440
T0829	5844904	30.269444	97.501667	110TRRC	550	550
T0830	5844905	30.273056	97.508889	110TRRC	-	545
T0831	5844906	30.270833	97.510278	110TRRC	-	555
T0832	5844907	30.269167	97.510278	110TRRC	-	550
T0833	5844908	30.273333	97.501111	110TRRC	30	570
T0834	5844909	30.278889	97.500833	110TRRC	-	540
T0835	5844910	30.289167	97.522500	110TRRC	30	578
T0836	5845101	30.350278	97.472778	110TRRC	22	495
T0837	5845102	30.335833	97.465278	100ALVM	17	445
T0838	5845202	30.373056	97.432222	110TRRC	22	510
T0839	5845205	30.361667	97.436667	211NVTY	15	485
T0840	5845206	30.357500	97.425000	125MDWY	20	510
T0841	5845207	30.363056	97.445278	NOT-APPL	1895	465
T0842	5845302	30.353889	97.409722	110TRRC	26	497
T0843	5845401	30.299722	97.491944	110TRRC	-	570
T0844	5845403	30.302222	97.471667	110TRRC	-	500
T0845	5845404	30.295556	97.495556	110TRRC	-	565
T0846	5845701	30.279167	97.471667	NOT-APPL	1750	487
T0847	5845702	30.278333	97.459722	NOT-APPL	2030	486
T0848	5845703	30.273333	97.458889	110TRRC	-	440

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0849	5845704	30.250278	97.469722	110TRRC	-	550
T0850	5845705	30.253333	97.476944	110TRRC	28	550
T0851	5845706	30.253611	97.480278	110TRRC	24	550
T0852	5845707	30.256944	97.486944	110TRRC	-	550
T0853	5845708	30.258333	97.486111	110TRRC	15	555
T0854	5845709	30.264722	97.491111	110TRRC	30	570
T0855	5845710	30.266667	97.493889	110TRRC	30	565
T0856	5845711	30.271667	97.487222	110TRRC	35	560
T0857	5845712	30.273333	97.484444	110TRRC	40	565
T0858	5849101	30.209722	97.960556	218GLRS	500	1100
T0859	5849102	30.224167	97.967778	218GLRSU	400	1170
T0860	5849104	30.225556	97.966944	218EDRDA	262	1140
T0861	5849105	30.225000	97.961389	218GLRS	422	1120
T0862	5849106	30.228056	97.962500	218GLRS	530	1140
T0863	5849107	30.228056	97.962500	218GLRSU	350	1140
T0864	5849108	30.234167	97.996111	218GLRSU	395	1105
T0865	5849109	30.231667	97.997778	218GLRSU	339	1140
T0866	5849110	30.209722	97.966667	218GLRS	460	1165
T0867	5849111	30.238611	97.978611	218GLRS	500	1040
T0868	5849112	30.236667	97.982500	218GLRSL	362	1060
T0869	5849115	30.230278	97.996667	218GLRSL	525	1140
T0870	5849116	30.226944	97.961944	218GLRS	594	1130
T0871	5849117	30.211389	97.970000	218GLRS	540	1190
T0872	5849121	30.210556	97.966111	217HSTN	1020	1168
T0873	5849201	30.245833	97.929444	218GLRSU	17	1000
T0874	5849202	30.246111	97.929167	218GLRSL	601	1090
T0875	5849203	30.221389	97.954444	218GLRSU	50	1010
T0876	5849204	30.224167	97.926944	218GLRSU	340	985
T0877	5849205	30.227500	97.938611	218GLRS	485	1090
T0878	5849206	30.216944	97.950833	218GLRS	346	1040
T0879	5849207	30.221667	97.951944	218GLRS	493	1160
T0880	5849208	30.226667	97.940833	218GLRS	375	1050
T0881	5849210	30.219167	97.953333	218GLRS	435	1060
T0882	5849211	30.224167	97.951111	218GLRS	415	1125
T0883	5849212	30.223611	97.951944	218GLRS	500	1125
T0884	5849213	30.218056	97.949722	218GLRSU	349	1050
T0885	5849214	30.226667	97.929722	218GLRS	350	1040
T0886	5849215	30.219167	97.956667	218GLRS	570	1060
T0887	5849216	30.213889	97.952222	218GLRS	585	1025
T0888	5849217	30.221111	97.924722	218GLRSU	330	1000
T0889	5849218	30.219722	97.949167	218GLRSU	351	1090
T0890	5849219	30.240833	97.935278	218GLRS	485	1095
T0891	5849220	30.222222	97.928056	218GLRSU	315	1000
T0892	5849222	30.226111	97.945556	218GLRS	621	1040
T0893	5849223	30.240000	97.941667	218GLRS	600	1130
T0894	5849224	30.230000	97.948333	218GLRS	569	1120
T0895	5849225	30.225278	97.950278	217HSTN	938	1110
T0896	5849226	30.230556	97.954167	218GLRSU	411	1160
T0897	5849227	30.224167	97.951111	218GLRH	500	-
T0898	5849228	30.244722	97.925833	217HSTN	1000	1081
T0899	5849229	30.243333	97.924167	217SLGO	1000	1090
T0900	5849301	30.222778	97.909167	218GLRSL	520	1020
T0901	5849302	30.211944	97.889167	218GLRS	570	940

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0902	5849303	30.239444	97.875000	218GLRSU	115	1040
T0903	5849304	30.211944	97.888333	217HSTN	754	930
T0904	5849305	30.228889	97.910833	218GLRS	505	1070
T0905	5849306	30.228889	97.910000	218GLRSU	390	1080
T0906	5849307	30.228056	97.908056	218GLRS	435	1050
T0907	5849308	30.227222	97.906389	218GLRS	462	1010
T0908	5849309	30.210278	97.883333	218EBFZA	260	975
T0909	5849310	30.234167	97.913056	218GLRSU	395	1100
T0910	5849311	30.226944	97.911111	218GLRSU	380	1040
T0911	5849312	30.223889	97.908889	218GLRS	460	1035
T0912	5849313	30.224167	97.907222	218GLRS	450	1025
T0913	5849314	30.221667	97.875278	218GLRSL	375	850
T0914	5849315	30.222222	97.912222	218GLRS	350	980
T0915	5849316	30.227778	97.883333	218GLRS	340	940
T0916	5849317	30.234444	97.900000	218GLRS	530	1000
T0917	5849318	30.226667	97.908611	218GLRS	461	1030
T0918	5849319	30.227500	97.909167	218GLRS	565	1050
T0919	5849320	30.221667	97.895000	218GLRS	390	970
T0920	5849321	30.222500	97.885556	218GLRS	440	920
T0921	5849322	30.215000	97.895833	218GLRS	480	970
T0922	5849401	30.206944	97.963333	218GLRS	568	1115
T0923	5849502	30.207500	97.951389	218GLRS	425	1100
T0924	5849503	30.188611	97.933889	218GLRS	320	960
T0925	5849504	30.182778	97.924167	218GLRS	-	930
T0926	5849506	30.181944	97.924722	218GLRS	394	960
T0927	5849507	30.184722	97.928611	218GLRS	575	983
T0928	5849508	30.207222	97.953889	218GLRS	462	-
T0929	5849601	30.205000	97.893889	218GLRSL	260	880
T0930	5849602	30.207222	97.895000	218EDRDA	49	890
T0931	5849603	30.207222	97.903333	218GLRSU	92	890
T0932	5849604	30.206667	97.903333	218GLRSL	565	890
T0933	5849605	30.179722	97.875000	218GLRSL	1000	785
T0934	5849606	30.174722	97.900278	218GLRSU	400	881
T0935	5849607	30.184722	97.886944	218GLRS	620	873
T0936	5849608	30.198333	97.876389	218GRHC	1020	830
T0937	5849609	30.179167	97.896389	218GRHC	820	855
T0938	5849610	30.198056	97.885556	218EDGR	-	842
T0939	5849611	30.181944	97.911667	218EDGR	95	902
T0940	5849612	30.180278	97.914167	218EDGR	160	890
T0941	5850101	30.225833	97.869167	218EDRDA	217	810
T0942	5850102	30.221111	97.860278	218EDRDA	250	850
T0943	5850103	30.235833	97.857222	218EDRDA	40	800
T0944	5850104	30.235000	97.843889	218EDRDA	234	760
T0945	5850105	30.233611	97.849444	218EDRDA	325	810
T0946	5850106	30.236944	97.871389	218GLRSU	100	850
T0947	5850107	30.231111	97.855000	218GLRSU	615	790
T0948	5850108	30.210556	97.834167	218EDRDA	235	715
T0949	5850109	30.225556	97.869444	218EDDT	607	800
T0950	5850110	30.214167	97.850556	218EDRDA	217	755
T0951	5850111	30.215556	97.842500	218EDRDA	200	750
T0952	5850112	30.208611	97.842500	218EDRDA	300	760
T0953	5850113	30.241667	97.857222	218GLRS	268	860
T0954	5850114	30.241667	97.856944	218GLRS	387	860

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG#	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T0955	5850115	30.236389	97.860278	218GLRSU	200	810
T0956	5850116	30.237778	97.874444	218GLRSU	125	860
T0957	5850117	30.212778	97.854722	218GLRSU	767	763
T0958	5850118	30.213056	97.855278	218GLRSU	544	760
T0959	5850119	30.233611	97.851389	217HSTN	907	810
T0960	5850120	30.234722	97.872778	217HSTN	855	832
T0961	5850121	30.219167	97.865833	218GLRS	950	801
T0962	5850201	30.220278	97.793333	218EDRDA	290	655
T0963	5850204	30.211944	97.823611	218EDRDA	283	720
T0964	5850205	30.231111	97.805556	218EDRDA	265	685
T0965	5850206	30.236944	97.809722	218EDRDA	257	680
T0966	5850207	30.216944	97.822778	218EDRDA	307	705
T0967	5850208	30.219167	97.824444	218EDRDA	317	705
T0968	5850209	30.236667	97.793889	218EDRDA	330	710
T0969	5850211	30.239722	97.833056	218EDRDA	282	695
T0970	5850212	30.225278	97.806111	218EDRDA	336	672
T0971	5850213	30.217222	97.822222	218EDRDA	300	705
T0972	5850214	30.211111	97.803333	218EDRDA	302	710
T0973	5850215	30.227500	97.810000	218EDRDA	360	675
T0974	5850216	30.231944	97.792500	218EDRDA	582	792
T0975	5850217	30.242500	97.800000	218EDRDA	214	567
T0976	5850218	30.242500	97.800000	218EDRDA	214	567
T0977	5850219	30.239722	97.832778	218EDRDA	252	732
T0978	5850220	30.225556	97.810556	217HSTN	214	669
T0979	5850221	30.225556	97.805833	218EDRDA	360	675
T0980	5850301	30.210833	97.780833	218EDRDA	388	640
T0981	5850302	30.218611	97.766944	110TRRC	18	640
T0982	5850303	30.216389	97.786667	211ASTN	156	630
T0983	5850304	30.228889	97.754722	218EDGR	1200	668
T0984	5850305	30.230833	97.765278	NOT-APPL	780	640
T0985	5850401	30.177222	97.834444	218EDRDA	404	750
T0986	5850402	30.178056	97.847500	218EDRDA	355	750
T0987	5850403	30.174722	97.863056	218EDRDA	264	750
T0988	5850405	30.195000	97.838056	218EDRDA	365	850
T0989	5850406	30.196667	97.843056	218EDRDA	360	820
T0990	5850407	30.175278	97.868333	218EDRDA	320	775
T0991	5850408	30.175278	97.866111	218EDRDA	439	772
T0992	5850409	30.173889	97.874444	218GLRSU	450	796
T0993	5850410	30.178056	97.875000	218EBFZA	-	783
T0994	5850411	30.186389	97.849722	218EDRDA	380	772
T0995	5850412	30.184444	97.867778	218EDRDA	295	809
T0996	5850413	30.175833	97.863611	218EBFZA	475	761
T0997	5850414	30.179444	97.840556	218EDRDA	425	760
T0998	5850415	30.189167	97.873889	218GLRS	700	830
T0999	5850416	30.176111	97.866944	218EBFZA	-	775
T1000	5850501	30.173056	97.830278	218EBFZA	-	726
T1001	5850502	30.186667	97.815000	218EDRDA	300	740
T1002	5850503	30.172778	97.816389	218EDRDA	451	705
T1003	5850504	30.207500	97.832778	218EDRDA	238	720
T1004	5850505	30.175000	97.814167	218EDRDA	390	710
T1005	5850506	30.169722	97.815278	218EDRDA	385	690
T1006	5850507	30.168333	97.826667	218EDRDA	273	690
T1007	5850508	30.197222	97.801111	218EDRDA	120	720

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T1008	5850509	30.196667	97.793889	218EDRDA	425	740
T1009	5850510	30.172778	97.825000	218EDRDA	277	712
T1010	5850511	30.170833	97.825000	218EDRDA	285	700
T1011	5850512	30.171667	97.825000	218EDRDA	295	700
T1012	5850513	30.181944	97.819167	218EDRDA	323	750
T1013	5850514	30.169444	97.829444	218EDRDA	335	711
T1014	5850515	30.171389	97.828611	218EDRDA	-	705
T1015	5850516	30.172500	97.830000	218EDRDA	-	718
T1016	5850517	30.174444	97.817222	218EDRDA	430	695
T1017	5850518	30.200000	97.801111	218EDRDA	431	725
T1018	5850519	30.172222	97.801667	218EDRDA	410	675
T1019	5850520	30.207222	97.801944	218EDRDA	315	715
T1020	5850601	30.198333	97.775833	211ASTN	25	660
T1021	5850602	30.202778	97.789167	218EDRDA	690	690
T1022	5850603	30.168333	97.785833	218EBFZA	799	650
T1023	5850701	30.137222	97.847778	218EDRDA	205	685
T1024	5850702	30.147778	97.873333	218EDRDA	190	765
T1025	5850703	30.138056	97.855000	218EDRDA	455	725
T1026	5850704	30.136944	97.855556	218EDRDA	345	720
T1027	5850705	30.141944	97.841944	218EDRDA	200	660
T1028	5850706	30.136389	97.836111	218EDRDA	305	700
T1029	5850707	30.140278	97.838889	218EDRDA	260	760
T1030	5850708	30.141389	97.834722	218EDRDA	370	705
T1031	5850709	30.163889	97.870000	218EDRDA	334	780
T1032	5850710	30.164444	97.865833	218EDRDA	315	770
T1033	5850711	30.141944	97.841944	218EDRDA	230	660
T1034	5850712	30.141944	97.841944	218EDRDA	227	660
T1035	5850713	30.151111	97.847778	218EDRDA	178	750
T1036	5850714	30.148333	97.845278	218EDRDA	190	710
T1037	5850715	30.133333	97.835833	218EDRDA	351	670
T1038	5850716	30.144722	97.844722	218EDRDA	220	720
T1039	5850717	30.133889	97.837500	218EDRDA	300	660
T1040	5850718	30.136667	97.845000	218EDRDA	312	696
T1041	5850719	30.138611	97.858056	218EDRDA	400	710
T1042	5850720	30.143333	97.861944	218EDRDA	230	660
T1043	5850722	30.151944	97.834167	218EDRDA	380	693
T1044	5850723	30.147500	97.833889	218EDRDA	415	709
T1045	5850724	30.140833	97.837778	218EDRDA	220	692
T1046	5850725	30.137778	97.853611	218EDRDA	500	727
T1047	5850726	30.152778	97.834444	218EDRDA	300	690
T1048	5850727	30.138056	97.856944	218EDRDA	500	720
T1049	5850728	30.141111	97.849444	218EDRDA	400	696
T1050	5850729	30.129722	97.834444	218EDRDA	320	647
T1051	5850730	30.139722	97.837778	218EDRDA	360	685
T1052	5850731	30.149444	97.860278	218EDRDA	438	746
T1053	5850733	30.140278	97.844722	218EDRDA	260	683
T1054	5850734	30.133611	97.850278	218EDRDA	450	714
T1055	5850735	30.134167	97.850278	218EDRDA	300	715
T1056	5850736	30.165278	97.835000	218EDRDA	358	740
T1057	5850737	30.136667	97.833889	218EDRDA	400	685
T1058	5850738	30.134722	97.853056	218EDRDA	325	710
T1059	5850739	30.141389	97.849722	218EDRDA	400	696
T1060	5850740	30.138056	97.855556	218EDRDA	350	720

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T1061	5850801	30.142500	97.810000	218EDRDA	277	662
T1062	5850802	30.140833	97.812222	110TRRC	57	840
T1063	5850803	30.144167	97.815556	218EDRDA	283	686
T1064	5850804	30.161667	97.828889	218EDRDA	390	713
T1065	5850805	30.157222	97.828889	218EDRDA	244	670
T1066	5850806	30.148889	97.795278	110TRRC	32	635
T1067	5850807	30.141944	97.793056	218EDRDA	300	628
T1068	5850808	30.125556	97.799722	218EDRDA	341	708
T1069	5850809	30.139722	97.827222	218EDRDA	281	690
T1070	5850810	30.133611	97.810278	218EDRDA	359	625
T1071	5850811	30.135278	97.832500	218EDRDA	246	683
T1072	5850812	30.140000	97.826667	218EDRDA	300	690
T1073	5850813	30.140278	97.796111	110TRRC	40	630
T1074	5850814	30.140556	97.796944	218EDRDA	399	630
T1075	5850815	30.141389	97.796667	110TRRC	32	630
T1076	5850816	30.141389	97.797778	110TRRC	35	630
T1077	5850817	30.140000	97.832222	218EDRDA	400	700
T1078	5850818	30.140000	97.829444	218EDRDA	268	690
T1079	5850819	30.134167	97.819722	218EDRDA	266	650
T1080	5850820	30.131667	97.820278	218EDRDA	201	650
T1081	5850821	30.133611	97.809722	218EDRDA	327	625
T1082	5850822	30.153056	97.822500	218EDRDA	356	655
T1083	5850823	30.139167	97.803889	110TRRC	80	630
T1084	5850824	30.138611	97.803889	218EDRDA	175	640
T1085	5850825	30.133611	97.810833	218EDRDA	315	630
T1086	5850826	30.145000	97.824722	218EDRDA	308	690
T1087	5850827	30.143889	97.818611	218EDRDA	473	680
T1088	5850828	30.135000	97.825278	218EDRDA	358	665
T1089	5850829	30.156667	97.819722	218EDRDA	420	685
T1090	5850830	30.160278	97.817500	218EDRDA	420	685
T1091	5850832	30.145556	97.824444	218EDRDA	20	680
T1092	5850833	30.143056	97.810278	218EDRDA	400	655
T1093	5850835	30.146111	97.812222	218EDRDA	510	665
T1094	5850836	30.144722	97.812222	218EDRDA	500	660
T1095	5850837	30.146944	97.818889	218EDRDA	475	640
T1096	5850838	30.138889	97.820833	218EDRDA	473	670
T1097	5850839	30.129722	97.821667	218EDRDA	450	625
T1098	5850840	30.129444	97.798333	218EDRDA	498	710
T1099	5850842	30.140000	97.832778	218EDRDA	285	700
T1100	5850843	30.143056	97.824722	218EDRDA	450	692
T1101	5850844	30.143056	97.824722	218EDRDA	450	692
T1102	5850845	30.135833	97.830000	218EDRDA	435	683
T1103	5850846	30.130000	97.821667	218EDRDA	535	625
T1104	5850848	30.129722	97.821667	218EDRDA	450	624
T1105	5850849	30.125833	97.816111	218EDRDA	550	631
T1106	5850850	30.125556	97.815278	218EDRDA	550	629
T1107	5850851	30.125278	97.814722	218EDRDA	550	633
T1108	5850852	30.161389	97.818889	218EDRDA	420	690
T1109	5850853	30.145278	97.812222	218EDRDA	490	660
T1110	5850855	30.145833	97.819167	218EDRDA	500	650
T1111	5850858	30.134722	97.825278	218EDRDA	380	630
T1112	5850859	30.142778	97.822778	218EDRDA	-	688
T1113	5850860	30.153889	97.822500	218EDRDA	500	661

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG #	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T1114	5850861	30.145833	97.830000	218EDRDA	-	704
T1115	5850862	30.138333	97.825833	218EDRDA	250	678
T1116	5850863	30.150278	97.832778	218EDRDA	408	702
T1117	5850901	30.156944	97.771111	211ASTN	-	525
T1118	5850902	30.141389	97.757778	218EDRDA	651	680
T1119	5850903	30.147500	97.790000	218EDRDA	302	631
T1120	5850904	30.140556	97.782500	218EBFZA	300	580
T1121	5851101	30.232500	97.710000	110TRRC	52	470
T1122	5851102	30.239444	97.746667	217HSTN	2246	530
T1123	5851103	30.249444	97.736389	218GLRSL	1595	475
T1124	5851201	30.249722	97.700278	100ALVM	40	450
T1125	5851202	30.241944	97.690556	110TRRC	37	480
T1126	5851203	30.237500	97.700833	100ALVM	30	470
T1127	5851204	30.246111	97.676111	110TRRC	71	460
T1128	5851205	30.246389	97.673056	100ALVM	71	460
T1129	5851301	30.237500	97.654722	110TRRC	35	440
T1130	5851302	30.236667	97.653889	100ALVM	35	440
T1131	5851303	30.232222	97.637222	110TRRC	59	440
T1132	5851304	30.241944	97.652778	100ALVM	35	420
T1133	5851305	30.241667	97.641111	100ALVM	61	420
T1134	5851306	30.239722	97.639167	100ALVM	40	420
T1135	5851307	30.221389	97.660278	110TRRC	63	500
T1136	5851308	30.220278	97.630833	110TRRC	60	430
T1137	5851309	30.218889	97.632222	110TRRC	46	430
T1138	5851310	30.220278	97.626667	110TRRC	38	430
T1139	5851311	30.238611	97.626389	100ALVM	39	435
T1140	5851312	30.220833	97.629444	110TRRC	88	432
T1141	5851313	30.231667	97.645833	111AVCR	50	440
T1142	5851401	30.167222	97.714722	100ALVM	24	560
T1143	5851402	30.174444	97.718056	210CIGR	246	640
T1144	5851403	30.205278	97.742500	110TRRC	25	630
T1145	5851404	30.206944	97.740556	110TRRC	38	630
T1146	5851405	30.173056	97.710278	110TRRC	50	570
T1147	5851406	30.173889	97.712222	210CIGR	152	620
T1148	5851503	30.177222	97.668611	110TRRC	40	470
T1149	5851504	30.173889	97.668611	110TRRC	60	463
T1150	5851505	30.187778	97.686944	110TRRC	34	505
T1151	5851506	30.197500	97.707778	211ASTN	14	580
T1152	5851507	30.173611	97.667500	110TRRC	42	470
T1153	5851508	30.179167	97.668611	100ALVM	70	470
T1154	5851601	30.204722	97.633611	100ALVM	39	450
T1155	5851602	30.169722	97.663889	100ALVM	51	460
T1156	5851604	30.206667	97.644722	110TRRC	79	464
T1157	5851605	30.204444	97.646111	110TRRC	48	450
T1158	5851607	30.198333	97.642222	110TRRC	25	470
T1159	5851608	30.172778	97.652500	110TRRC	33	460
T1160	5851609	30.172778	97.652222	110TRRC	32	460
T1161	5851610	30.170000	97.656111	110TRRC	32	460
T1162	5851611	30.167500	97.662778	110TRRC	36	470
T1163	5851612	30.170556	97.663611	100ALVM	35	460
T1164	5851613	30.167222	97.639444	110TRRC	33	458
T1165	5851614	30.166944	97.640000	110TRRC	32	458
T1166	5851615	30.168611	97.637778	110TRRC	30	460

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG#	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T1167	5851616	30.169722	97.640556	110TRRC	35	455
T1168	5851701	30.164722	97.719167	217HSTN	2425	565
T1169	5851702	30.154167	97.712222	210CIGR	32	580
T1170	5851703	30.157500	97.734167	110TRRC	28	560
T1171	5851704	30.157778	97.745000	110TRRC	17	560
T1172	5851705	30.156111	97.744722	110TRRC	30	560
T1173	5851707	30.133333	97.734722	211NVTY	33	660
T1174	5851708	30.141389	97.725000	110TRRC	66	599
T1175	5851801	30.144722	97.668333	NOT-APPL	3309	540
T1176	5851802	30.149167	97.696944	211NVTY	18	530
T1177	5851803	30.150278	97.703611	210CIGR	19	560
T1178	5851804	30.162222	97.694167	210CIGR	40	560
T1179	5851805	30.161667	97.694444	210CIGR	21	560
T1180	5851806	30.162500	97.695000	210CIGR	60	560
T1181	5851807	30.163056	97.695833	210CIGR	40	550
T1182	5851808	30.163611	97.695278	210CIGR	200	560
T1183	5851809	30.148889	97.706389	211NVTY	35	590
T1184	5851901	30.147778	97.628056	217HSTN	3008	480
T1185	5852102	30.237222	97.591667	110TRRC	10	420
T1186	5852103	30.249722	97.590833	110TRRC	65	450
T1187	5852104	30.248889	97.587500	110TRRC	93	450
T1188	5852105	30.249444	97.588889	110TRRC	52	450
T1189	5852106	30.225556	97.624722	100ALVM	41	435
T1190	5852201	30.241389	97.581389	110TRRC	54	430
T1191	5852202	30.233056	97.569722	110TRRC	37	425
T1192	5852203	30.228056	97.573056	100ALVM	26	410
T1193	5852204	30.214167	97.569722	100ALVM	60	400
T1194	5852205	30.243333	97.563056	110TRRC	27	420
T1195	5852206	30.221944	97.569167	100ALVM	50	410
T1196	5852207	30.227778	97.573611	100ALVM	28	415
T1197	5852208	30.224722	97.575833	100ALVM	39	420
T1198	5852209	30.248333	97.569444	110TRRC	65	430
T1199	5852210	30.233056	97.560556	110TRRC	31	420
T1200	5852211	30.237500	97.558056	100ALVM	30	415
T1201	5852212	30.238056	97.558333	100ALVM	27	415
T1202	5852213	30.226667	97.563333	110TRRC	37	400
T1203	5852214	30.248333	97.570278	110TRRC	42	430
T1204	5852215	30.248333	97.575278	110TRRC	35	430
T1205	5852216	30.247778	97.582778	110TRRC	39	440
T1206	5852217	30.247500	97.546667	100ALVM	55	-
T1207	5852218	30.246667	97.547222	100ALVM	-	-
T1208	5852219	30.246944	97.582500	100ALVM	67	444
T1209	5852302	30.228611	97.515833	100ALVM	60	410
T1210	5852303	30.231944	97.517222	100ALVM	48	415
T1211	5852304	30.218056	97.529444	100ALVM	63	400
T1212	5852305	30.213056	97.511944	110TRRC	39	400
T1213	5852307	30.230556	97.516667	100ALVM	70	400
T1214	5852308	30.246944	97.519722	110TRRC	26	410
T1215	5852309	30.223611	97.508889	110TRRC	40	410
T1216	5852310	30.249722	97.524444	110TRRC	30	420
T1217	5852311	30.249444	97.523889	110TRRC	33	415
T1218	5852312	30.246667	97.522500	110TRRC	27	410
T1219	5852313	30.225833	97.520000	100ALVM	46	402

Appendix 1. Travis County Well Data						
					Well	Elevation of
				Aquifer	depth	land surface
BEG#	State Well #	Latitude	Longitude	code	(ft)	(ft angvd)
T1220	5852314	30.238056	97.536111	100ALVM	61	411
T1221	5852401	30.202500	97.584167	100ALVM	30	410
T1222	5852402	30.184167	97.593611	NOT-APPL	1468	468
T1223	5852501	30.176667	97.581667	NOT-APPL	1630	440
T1224	5852502	30.181389	97.542778	110TRRC	-	420
T1225	5852503	30.194444	97.563333	NOT-APPL	1780	488
T1226	5852504	30.168333	97.558056	NOT-APPL	1544	425
T1227	5852505	30.196389	97.574722	100ALVM	48	405
T1228	5852607	30.178889	97.536389	110TRRC	43	410
T1229	5852608	30.181111	97.540556	110TRRC	35	415
T1230	5852610	30.205556	97.508056	100ALVM	53	400
T1231	5852611	30.194722	97.530833	100ALVM	50	410
T1232	5852612	30.179444	97.535833	110TRRC	47	405
T1233	5852613	30.179167	97.535833	110TRRC	47	405
T1234	5852615	30.193611	97.512778	110TRRC	68	409
T1235	5853104	30.230278	97.494722	110TRRC	30	400
T1236	5858201	30.107778	97.807500	211ASTN	105	700
T1237	5858202	30.124167	97.813056	218EDRDA	405	654
T1238	5858203	30.123056	97.820000	218EDRDA	263	630
T1239	5858204	30.124444	97.824444	218EDRDA	175	630
T1240	5858205	30.101667	97.814722	218EDRDA	-	650
T1241	5858207	30.120278	97.820000	218EDRDA	340	650
T1242	5858208	30.115833	97.819722	218EDRDA	520	680
T1243	5858209	30.118889	97.815833	218EDRDA	400	758
T1244	5858213	30.111944	97.798611	218EBFZA	1009	740
T1245	5858215	30.123333	97.826389	218EDRDA	380	655
T1246	5858216	30.122500	97.814722	218EDRDA	400	670
T1247	5858301	30.091944	97.789167	218EDRDA	703	734
T1248	5858302	30.086389	97.768889	211NVTY	11	670
T1249	5858303	30.101111	97.757778	211NVTY	20	710
T1250	5858304	30.123056	97.751944	218EDRDA	720	660
T1251	5859101	30.086667	97.735278	211NVTY	23	625
T1252	5859102	30.085556	97.735000	211NVTY	16	625
T1253	5859103	30.113056	97.748056	211NVTY	10	675
T1254	5859104	30.111667	97.748889	211NVTY	50	698
T1255	5859105	30.104444	97.738333	218EDRDA	745	655
T1256	5859106	30.085833	97.716944	211NVTY	100	625
T1257	5859301	30.103889	97.641389	NOT-APPL	3770	610
T1258	5859302	30.102778	97.639722	NOT-APPL	1513	600
T1259	5859401	30.074722	97.739722	110TRRC	21	660
T1260	5860105	30.120556	97.617222	NOT-APPL	1495	547
T1261	5860106	30.121667	97.613333	NOT-APPL	836	553
T1262	5860107	30.117500	97.613056	NOT-APPL	813	561
T1263	5860108	30.122222	97.623056	NOT-APPL	676	538
T1264	5740807	30.382778	98.067500	217HSTN	410	860

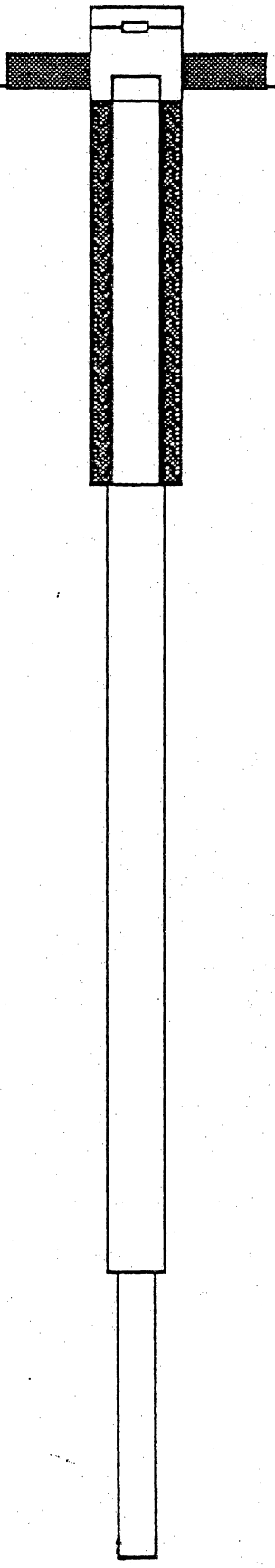
Appendix 2

Detailed Well Schematic and Drilling Report for Monitor Well

WATER MONITOR SCHEMATIC
CAMP MABRY #1
DRILL DATE: 10/11/95
NATIONAL GUARD PROJECT

STICK UP PVC CASING 1.8'
WELL PAD: 4'X4'X4"

HOLE DIAMETER:
7 7/8" SURFACE TO 41.4'
4 3/4" FROM 41.4' TO 122.21'
3 7/8" FROM 122.21' TO 151.65'



STEEL SLEEVE: 2'
BELOW SURFACE

GROUT & PORTLAND
CEMENT MIX: 0.0'- 41.1'

TOTAL DEPTH OF
CORING FROM
SURFACE TO T.D.:
151.65'

LEGEND:

- GROUT & PORTLAND CEMENT MIX
- BACKFILL
- BENTONITE PLUG
- CEMENT
- GRAVEL & SAND
- SAND
- PVC PIPE
- STEEL CASING
- GROUT
- FALL IN

Send original copy by certified mail to: **TNRCC, P.O. Box 13087, Austin, TX 78711-3087** *Please use black ink.*

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

Texas Water Well Drillers Advisory Council
P.O. Box 13087
Austin, Texas 78711-3087
512-239-0530

Camp Mabry #1

1) OWNER Texas National Guard (Name) **ADDRESS** P.O. Box 5218 (Street or RFD) Austin (City) Tx (State) 78763 (Zip)

2) ADDRESS OF WELL: County Travis — Camp Mabry 2210 W. 35th Street (Street, RFD or other) Austin (City) Texas (State) 78703 (Zip) **GRID #** 58-42-6

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☒ Monitor ☐ Environmental Soil Boring ☐ Domestic ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering ☒ Testwell

If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

5) 30° 18' 50" 97° 45' 53" N

6) WELL LOG: Date Drilling: Started 10/11 19 95 Completed ____ 19 __

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
7 7/8	Surface	41.
4 3/4	41.	122.2
3 7/8	122.2	151.45

7) DRILLING METHOD (Check): ☐ Driven ☐ Air Rotary ☒ Mud Rotary ☐ Bored ☐ Air Hammer ☒ Cable Tool ☐ Jetted ☐ Other ____

From (ft.)	To (ft.)	Description and color of formation material
		N/A Rock Bitted

8) Borehole Completion (Check): ☒ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other ____

If Gravel Packed give interval . . . from ____ ft. to ____ ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4"	N	4 1/2" - 4"x10' PVC Riser	1.8' Above Surface	41.4'	

(Use reverse side if necessary)

9) CEMENTING DATA: [Rule 338.44(1)]

Cemented from 4" Above Surface ft. to 2 ft. No. of Sacks Used 4

____ ft. to ____ ft. No. of Sacks Used ____

Method used Hand Poured

Cemented by Drill Crew

Distance to septic system field lines or other concentrated contamination N/A ft.

Method of verification of above distance N/A

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other ____

Depth to pump bowls, cylinder, jet, etc., ____ ft.

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 338.44 (2) (A)]

☒ Specified Steel Sleeve Installed [Rule 338.44 (3)(A)]

☐ Pitless Adapter Used [Rule 338.44 (3)(b)]

☐ Approved Alternative Procedure Used [Rule 338.71]

14) WELL TESTS: Type test: ☐ Pump ☐ Bailer ☐ Jetted

Yield: ____ gpm with ____ ft. drawdown after ____ hrs.

11) WATER LEVEL:

Static level ____ ft. below land surface Date ____

Artesian flow ____ gpm. Date ____

15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No

Type of water? ____ Depth of strata ____

Was a chemical analysis made? ☐ Yes ☐ No

12) PACKERS: Type Depth

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME University of Texas/Bureau of Economic Geology (Type or Print) **WELL DRILLER'S LICENSE NO.** 3187-M

ADDRESS P.O. Box X University Station (Street or RFD) Austin (City) Texas (State) 78701 (Zip)

(Signed) ____ James Doss (Licensed Well Driller) **(Signed)** ____ Jordan Forman (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TNRCC-0199 (Rev. 11-01-94) TNRCC COPY

Appendix 3

Data Dictionary for GIS Coverages

GIS DATA DICTIONARY

Several layers of spatial hydrologic and hydrogeologic data were input to the Bureau of Economic Geology GIS system. Maps were digitized using a Calcomp digitizing table, under the ArcEdit module of GIS ArcInfo, on a Sparc500 Workstation. When possible, the data from the paper originals of the U.S. Geological Survey (USGS) 1:24,000-scale, 7.5-minute topographic maps were either transferred on Mylar or digitized during one session to minimize the distortions related to environmental factors. The digital data base, regardless of the original projection, will be delivered in the Universal Transverse Mercator (UTM) coordinate system, with the following parameters:

Ellipsoid: Clarke 1866
Horizontal Datum: NAD27
Units: meters
Zone 14

The digital data represent the following.

Digital Elevation Models (DEM) were acquired from MicroPath at 1:24,000 scale, where available (View, Buffalo Gap, Paris, Lake Bastrop, Elgin East, McDade, Graford East, Mineral Wells East, Mineral Wells West, and Whitt), or were created from digital elevation contours and streams using the Grid module of ArcInfo (Topogrid). The cell size for DEMs is 30 m, with a horizontal accuracy of ±3 m and a vertical accuracy of ±10 m. The DEMs were used to delineate watersheds of interest.

Watersheds represent polygon coverages encompassing the drainage areas. They were outlined from DEMs for Camp Swift, Camp Mabry, Camp Barkeley, and Fort Wolters or were defined from USGS topographic quads and then transferred to a digital format. Possible inaccuracy might be related to human error and imperfections of the digitizing equipment. Given the USGS-stated positional accuracy of ±40 ft for its 7.5-minute quads, and the inadvertent positional shifts that may have been introduced during the digitizing process, it can be estimated that the positional accuracy of most features will be approximately ±50 ft.

Floodplains are polygon coverages, digitized from USGS topographic quads, with the aforementioned accuracy estimate.

Well locations are point coverages, digitized from USGS topographic quadrangles; they include existing and recently drilled wells, with an internally assigned well name (number) as an item in the Point Attribute Table (PAT). They include wells on and around the camps.

Soil maps are generalized soil maps at 1:250,000 scale compiled by the U.S. Department of Agriculture Soil Conservation Service. They contain polygons describing groups of soil types and attached attribute tables with extensive sets of numerical values, including their

hydrologic properties, which were used to specify the percentage of the map unit occupied by soils in each hydrologic group. The digital data were obtained from the Texas Natural Resources Information System (TNRIS) ftp site.

Water levels represent water-level contours, which, owing to scarcity of control points and the inherent interpolation problems of the software, were hand drawn and then digitized from Mylar overlays.

Cultural features include roads and generalized streams at 1:24,000 scale, at various extents around the camp. They were obtained from the TNRIS ftp site and are the latest version of Texas Department of Transportation (TxDOT) urban maps. These files were originally digitized from USGS 7.5-minute quadrangles. Updates are made periodically using TxDOT highway construction plans, aerial photographs, official city maps, and field inventory. These files contain most of the features found on 7.5-minute quads, except for items such as contour lines, fence lines, jeep trails, electrical transmission lines, oil and gas pipelines, and control data monuments.

The county map files are based on the following map projection system:

TEXAS STATEWIDE MAPPING SYSTEM (NAD27)

Projection: Lambert Conformal Conic

Ellipsoid: Clarke 1866

Datum: North American 1927

Longitude of Origin: 100 degrees west (-100)

Latitude of Origin: 31 degrees 10 minutes north

Standard Parallel #1: 27 degrees 25 minutes north latitude

Standard Parallel #2: 34 degrees 55 minutes north latitude

False Easting: 3,000,000 ft

False Northing: 3,000,000 ft

Unit of Measure: feet (international)

Positional Accuracy: These digital maps were created primarily for the purpose of producing county/urban published maps. Certain features, particularly railroads and streams, have been displaced in congested areas so as to insure map readability at county map scales.

Miscalculation of false northing and easting required reprojection of the DGN digital files, at the correct values (914,400 ft), in order to obtain the perfect overlay with several preexisting county and quadrangle files.

CAMP MABRY

Base maps: the USGS 7.5′ topographic quadrangle, Austin West, is in the State Plane coordinate system, Central Zone (5376), datum NAD27, units in feet.

Coverage name	Coverage type	Initial projection	Final projection	Source	Accuracy	Description
Offcamprdutm	Arc	Texas State Plane	UTM	TXDOT digital county files	±50 ft	Highways and off-camp well locations
Arcamprdutm	Arc	Texas State Plane	UTM	TXDOT digital county files	±50 ft	Highways near the camp
Oncamproads	Arc	Texas State Plane	UTM	Digitized from USGS 7.5′ topographic quads	±40 ft RMS = 0.002	Roads and trails in the camp
Boundutm	Polygon	State Plane Central Zone	UTM	Texas Parks and Wildlife digital files	unknown	Camp boundary
Streamsutm	Arc	State Plane Central Zone	UTM	Delineated from DEM	±40 ft	Streams and rivers delineated from DEM analysis; threshold = 1,000
Wshedutm	Polygon	State Plane Central Zone	UTM	Delineated from DEM	±40 ft	Watersheds corresponding to stream segments
Fplainutm	Polygon	State Plane Central Zone	UTM	Digitized from USGS 7.5′ topographic quads	±40 ft RMS = 0.005	Floodplains
Fpstreamutm	Arc	State Plane Central Zone	UTM	Digitized from USGS 7.5′ topographic quads	±40 ft RMS = 0.004	Stream orders and cross sections used for the HEC-RAS model
Soilsutm	Polygon	Texas State Plane	UTM	STATSGO digital database	Unknown	1:2,500,000-scale distribution of soils in the watersheds
Mbswellsutm	Point	State Plane North Central Zone	UTM	Digitized from USGS 7.5′ topographic quads	±40 ft RMS = 0.004	Location of off-camp wells
Twdbwellsutm	Point	Geographic (lat./long)	UTM	Imported from TWDB files in ASCII format	Unknown; function of TWDB well location accuracy	Location of water wells near the camp
Wlevels	Arc	State Plane Central Zone	UTM	Digitized from USGS 7.5′ topographic quads	±40 ft RMS = 0.005	Digitized water-level contour maps