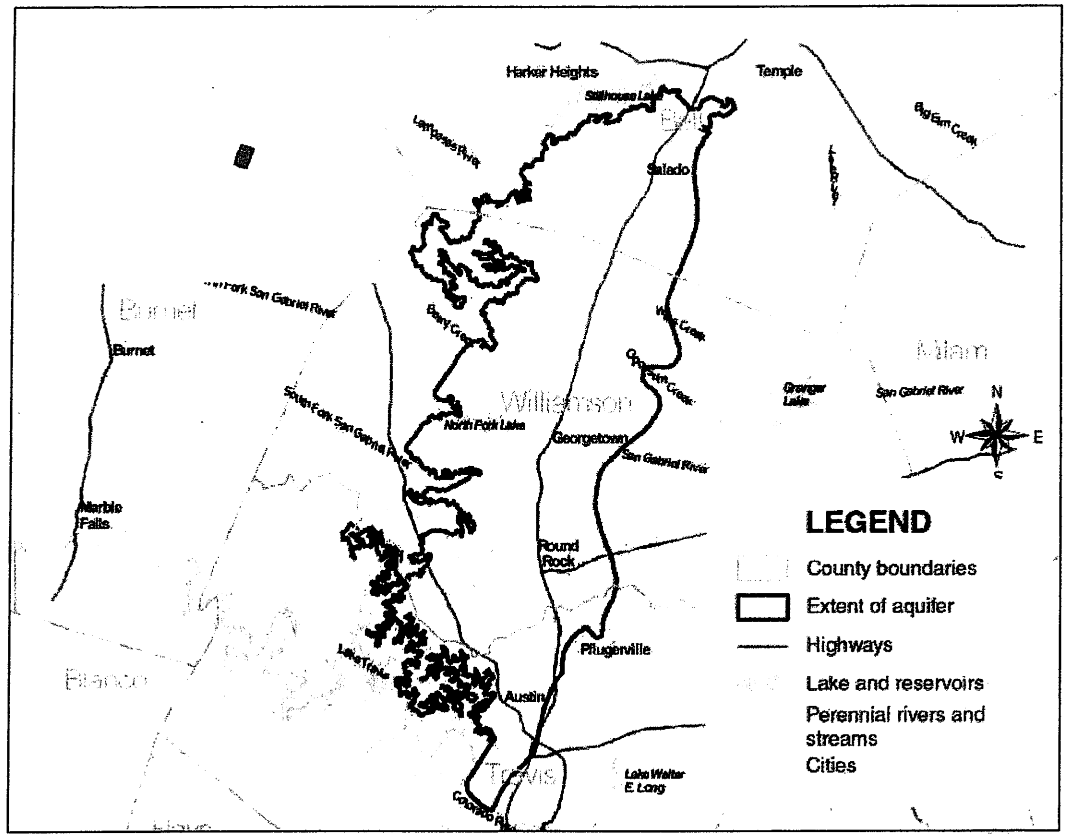
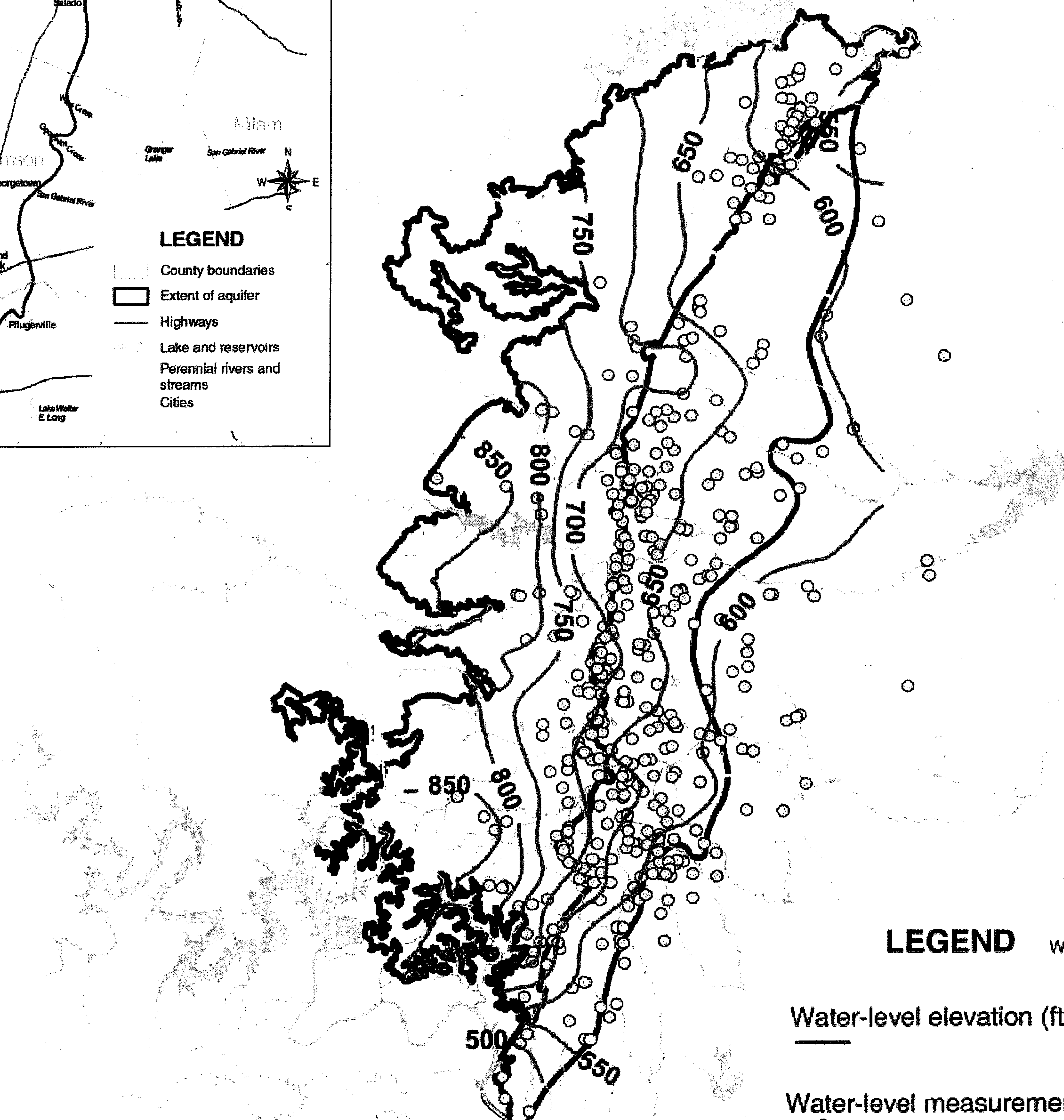
RESPONSE 54

NOTE(S)
1. WATER-LEVEL ELEVATIONS REPRESENT WATER LEVEL MEASUREMENTS MADE DURING THE MONTH OF JANUARY DURING THE YEARS 1990 THROUGH 1999 (JONES, 2003).





LEGEND

Water-level elevation (ft)

Water-level measurements

INTENDED FOR PERMITTING PURPOSES ONLY

GOLDER ASSOCIATES INC.
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Jones, Ian C. 2003. Groundwater Availability Modeling: Northern Segment of the Edwards Aquifer, Texas. Texas Water Development Board Numbered Report 358, pp. 3 and 22

Path: \\houston\drafting_2014\...ple\PRODUCTION_A - PERMIT AMMENDMENT APPLICATION\ | File Name: 1400336A038.dwg

REV.	YYYY-MM-DD	DESCRIPTION	PREPARED	REVIEWED	APPROVED
1	2016-12	RESPONSE TO 1ST NOD KRK	TNB	MX	CGD
1	2016-12	RESPONSE TO 1ST NOD MX	TNB	KRK	CMH

DESIGNED

CLIENT
CITY OF TEMPLE

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PROJECT
PERMIT AMENDMENT APPLICATION MSW 692B
TEMPLE RECYCLING AND DISPOSAL FACILITY
BELL COUNTY, TEXAS

TITLE
EDWARDS AQUIFER POTENTIOMETRIC MAP

PROJECT NO. 1400336

APPLICATION SECTION
III Attachment 4

REV. ----

FIGURE
III-4-9.3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

4.0 HYDROGEOLOGY

The most significant regional aquifers in the vicinity of the site are, in the order of their importance, the Cretaceous Edwards Limestone, the Cretaceous Trinity Group, and Quaternary alluvial deposits (Brune and Duffin 1983). In accordance with 30 TAC 330.63(e)(3), the following discussion provides a description of these aforementioned regional aquifers based upon available published and open-file sources. The stratigraphy of the Temple area and water-bearing characteristics are summarized on Table III-4-1. Chemical characteristics of the aquifer units are summarized in Table III-4-2.

4.1 Regional Hydrogeology

The regional subsurface aquifers have been disrupted by faulting within the BFZ, which is located 2 miles northwest of the S~~s~~ite. Flow rates vary laterally within each aquifer, especially in areas where the aquifer is displaced by faults. This displacement has resulted in restriction of groundwater flow, particularly in the Edwards and Trinity aquifers, which has resulted in high concentrations of dissolved solids (Brune and Duffin 1983). Although the displacement has restricted groundwater flow in the individual aquifers, this may allow interconnection between aquifers regionally. The faults from the BFZ affect the groundwater movement, particularly in the Edwards and associated limestones in which the faults have formed natural paths for solution channels and also have formed underground barriers (Brune and Duffin 1983). The three units of the middle Trinity aquifer are hydraulically connected to some extent due to the fault system (Brune and Duffin 1983). Regionally aquifers may be interconnected to some extent, but shown on Figure III-4-6 there are no faults within two miles of the Site.

The following is a discussion of the significant regional aquifers.

4.1.1 Edwards and Associated Limestones

The Edwards aquifer pinches out southwest of the site and extends to the Lampasas River in Southern Bell County, but is included here as part of the regional aquifer discussion. The Edwards aquifer is located within the BFZ in the south-central portion of Bell County, southwest of Temple. Figure III-4-9.3 present the water level elevations of the northern segment of the Edwards aquifer. The water levels in this segment of the Edwards aquifer range from 550 to 750 feet-mean sea level. The potentiometric surface slopes east-northeast in this region. The source of recharge for the Edwards aquifer is from precipitation in the drainage areas west of the BFZ. Precipitation infiltrates the subsurface through numerous scattered dissolution features and faults, which act as conduits for recharging the limestone aquifers. ~~Areas of aquifer recharge are illustrated in Figure III-4-8, which shows where the Edwards aquifer outcrops.~~ In the BFZ, the entire aquifer is usually saturated and water may occur under artesian conditions (Duffin and Musick 1991). The groundwater in the Edwards aquifer is not recommended for drinking near its downdip limit of fresh to slightly saline water, where higher concentrations of dissolved minerals occur (Duffin and Musick 1991). As shown in Figure III-4-5, the Edwards Formation is overlain by Navarro and Taylor Group, Austin Chalk, Eagle Ford Group, and Woodbine Group, all of which yield very small quantities of water (see Table III-4-1). The thickness and low permeability characteristics of this aquifer's overlying strata indicate that it is highly unlikely that groundwater could infiltrate through the site and into any aquifers underlying the site that may be used for human consumption.

Due to its karst and faulted nature, hydraulic properties of the Edwards aquifer vary both laterally and vertically. Permeability in the Edwards is high and water moves rapidly through the aquifer. Because the porosity within the Edwards is not evenly distributed, permeabilities and transmissivities vary significantly. Permeabilities vary from 8.7 to 877 gallons/day/square foot, or 350 to 34,700 liters/day/square meter (Brune and Duffin 1983). Because of the large range in permeability and variability in thickness, transmissivity values range from 0.5 to 4 x 10^6 ft^2/day (calculated from specific capacity data) (Jones 2003). Hydraulic conductivity values range from 0.01 to 30,000 ft/day (mean of 9 ft/day) (Jones 2003). In the subsurface, the Edwards consists of 200 to 360 feet (61 to 107 meters) of brittle, thick-bedded to massive limestone, commonly dolomitic, containing minor beds of shale, clay, and siliceous limestone. The total thickness of the Edwards and associated limestone aquifers, where fresh to slightly saline, ranges from 250 to 450 feet (76 to 137 meters). Since groundwater in the Edwards and associated limestone moves in underground channels, it moves relatively fast. The direction of movement is generally to the east-southeast in Bell County. In some areas of north-central Texas, faulting has placed the relatively impervious Del Rio Clay, Buda Limestone, and Eagle Ford Group opposite the aquifer. This faulting has resulted in a series of underground barriers that restrict the lateral movement of the groundwater in the confined portion of the aquifer (Brune and Duffin 1983).

4.1.2 Trinity Group Aquifers

The Trinity Group aquifer is the next significant aquifer in the area at a depth of approximately 1,500 feet below the site. The source of recharge for Trinity is from precipitation in the drainage areas west of the BFZ. The Trinity outcrops extensively west of the site and thus receives most of its recharge through precipitation on outcrops and seepage, underflow, and leakage from lakes and streams. Areas of recharge are illustrated in Figure III-4-8, which shows where the Edwards and Trinity aquifers outcrop.

The Trinity Group is subdivided into upper, middle, and lower units. Figures III-4-9.1 and III-4-9.2 present the elevations of the Trinity subdivisions. As shown in Table III-4-1 and on Figure III-4-5, the lower Trinity aquifer consists of the Hosston and Sligo members of the Travis Peak Formation. These units are generally of low permeability and groundwater pumpage has caused declines in this aquifer. The hydraulic conductivity for the entire Trinity aquifer ranges from about 1 to 31 feet per day according to the USGS (Ryder 1996). According to Brune and Duffin (1983), water from this unit is usually slightly to moderately saline (Total Dissolved Solids [TDS] = 549 to 1,042 mg/l). The total thickness of the lower Trinity aquifer increases towards the eastern portion of Bell County up to nearly 1,000 feet in the downdip