Document No. 050017
PBS&J Job No. 710013

GUADALUPE-BLANCO RIVER AUTHORITY
REGIONAL WASTEWATER FACILITY
PLANNING STUDY
EASTERN HAYS COUNTY, TEXAS

Prepared for:

Guadalupe-Blanco River Authority
933 E. Court Street
Seguin, Texas 78155

Prepared by:

PBS&J
6504 Bridge Point Parkway
Suite 200
Austin, Texas 78730-5091

August 2005

Printed on recycled paper

Contents

Appendices

Figures

Tables

Page

Acronyms and Abbreviations

CAMPO	Capital Area Metropolitan Planning Organization
CCN	Certificate of Convenience and Necessity
cfs	cubic feet per second
DO	dissolved oxygen
ERDC	Environmental Research and Development Center
GBRA	Guadalupe-Blanco River Authority
GIS	Geographic Information System
gpd	gallons per day
HCISD	Hays Consolidated Independent School District
IH	Interstate Highway
LUE	Living Unit Equivalent
mg/L	milligram per liter
MGD	million gallons per day
NRCS	Natural Resource Conservation Service,
OSSFs	Onsite Sewer Facilities
SWCD	Soil and Water Conservation District
TCEQ	Texas Commission on Environmental Quality
TP	total phosphorus
TSDC	Texas State Data Center
TSZ	Traffic Serial Zone
TWDB	Texas Water Development Board
USACE	U.S. Army Corps of Engineers
USBOC	U.S. Census Bureau's
USGS	U.S. Geological Survey
WES	Waterways Experiment Station
WWTP	wastewater treatment plant

Executive Summary

The Guadalupe-Blanco River Authority (GBRA) retained PBS&J to investigate the opportunities for regionalization of wastewater treatment facilities in the eastern portion of Hays County, Texas. This investigation is in relation to a sharp increase in growth in Eastern Hays County, particularly near the cities of Buda, Mountain City, Kyle, Neiderwald, and Uhland. The increase in growth will cause greater environmental stress on the watersheds of the area due, in part, to an expected increase in septic systems (OSSF) and small, individual wastewater treatment plants with their discharges into the associated watersheds.

This investigation of the planning area also analyzed where regional facilities might be located in order to minimize adverse effects to water quality, make the most economic sense, and to maximize reuse of the treated wastewater, both to reduce discharge to the receiving streams and to reduce demand on the water supply.

Six tasks were developed to accomplish these goals:

1) Development of Baseline Information
2) Public Participation
3) Population Analysis and WWTP Planning
4) Analyze Effects of Conceptual Development Options
5) Regional Water Quality Protection Plan
6) Recommendation for Watershed Management Practice

Projections from two agencies were used for population growth: the Capital Area Metropolitan Planning Organization (CAMPO), and the Hays Consolidated Independent School District (Hays CISD). Projections were divided into two periods: 2005–2017 and 2017–2030, and analyzed by Traffic Serial Zones (TSZ). From this analysis it was determined that the highest overall potential growth occurred more or less along the IH 35 corridor on both the east and west sides. The greatest population change is shown to be in the Kyle and Mountain City, city limit boundaries and, to some extent, just east of the city of Buda city limits.

Once key areas of growth had been determined multiple wastewater collection, treatment and disposal methods were evaluated for their suitability and cost-effectiveness to manage the anticipated increase in population in the planning area.

Three separate alternatives were considered: No Action, Sub-regional Plants, and Smaller Multiple Plants. Each of these three models was evaluated to determine collection volume, possible reuse, environmental effects, and overall cost to serve the projected population growth throughout each of the planning area's TSZs.

No Action was a model in which there is no governmental effort supporting regionalization and wastewater treatment is left up to each individual development. This alternative would have the most use of OSSFs and little wastewater reuse.

The **Regional Plants** alternative considered two plants, one located in Kyle and the other at Winfield, to serve the entire study area with wastewater collection and reuse.

Multiple Plants is a five-plant model, with each plant serving a smaller portion of the planning area with wastewater collection and reuse.

Analysis determined that the Multiple Plant scenario should have greater reuse potential due to each plant's proximity to the reuse demands; reuse is shown to reduce water demands on an annual average basis by nearly a million gallons per day (See Table 4-4). This is significant to water conservation and will affect water treatment costs and water rights impacts. City representatives and GBRA could have significant impact on the management of water and will more likely encourage private development to provide organized wastewater treatment and the reuse infrastructure. The multiple plant model proved to have the lowest anticipated cost per LUE.

To implement the recommended plan, an agreement or "Wastewater Compact" could be created. The Compact would be the basis for guiding development of wastewater facilities in the study area, while still relying on the private sector to assume the profit potential and risk for new development. The Compact would allow for members to take different roles, depending on the location of new development and specific conditions. The Compact could also be the vehicle for coordination on rate studies, and to solicit participation/stakeholder meetings with citizens, governments and developers in order to begin initiating treatment facilities.

1.0 INTRODUCTION

The Guadalupe-Blanco River Authority (GBRA) retained PBS&J to investigate the opportunities for regionalization of wastewater treatment facilities in the eastern portion of Hays County, Texas. This regional wastewater facility planning study is being partially funded by a Texas Water Development Board (TWDB) Regional Facility Planning Fund Grant. Figure 1-1 shows an overall map of the planning area.

Eastern Hays County is experiencing a sharp increase in growth, particularly near the cities of Buda, Mountain City, Kyle, Niederwald, and Uhland. The increase in growth will cause greater environmental stress on the watersheds of the area due, in part, to an expected increase in both on-site sewage facilities (OSSFs) along with small, individual wastewater treatment plants (WWTPs) and their respective discharges into the associated watersheds. The individual watersheds included in the study area are Elm Creek, Upper Brushy Creek, Brushy Creek, Porter Creek, Bunton Branch, and Plum Creek. Figure 1-2 shows the limits of the various watersheds. All of the individual watersheds eventually converge into Plum Creek, which converges with the San Marcos River, which joins with the Guadalupe River.

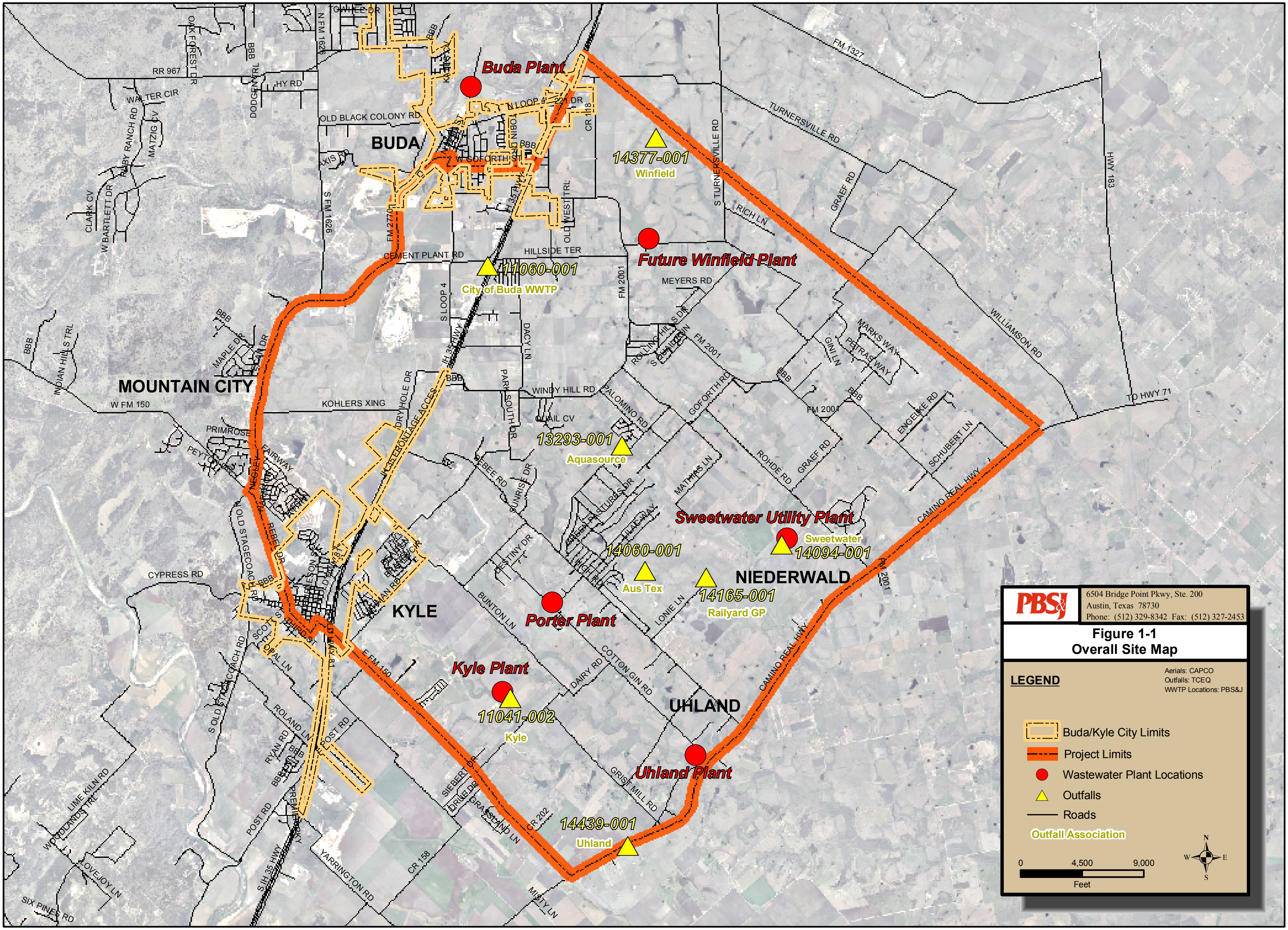
GBRA, together with the TWDB and interested communities, is motivated to evaluate all existing and proposed facilities and developments within the planning area to analyze where wastewater facilities may be located in order to have the greatest benefit to water quality, and make the most economic sense. Another goal is to provide for the most practical reuse of the treated effluent in an effort to facilitate reduced discharge to the receiving streams and to reduce the impact of development on the water supply resources.

In order to achieve the objectives of this analysis, the following tasks were performed:

A. Planning Area Description (Section 2)

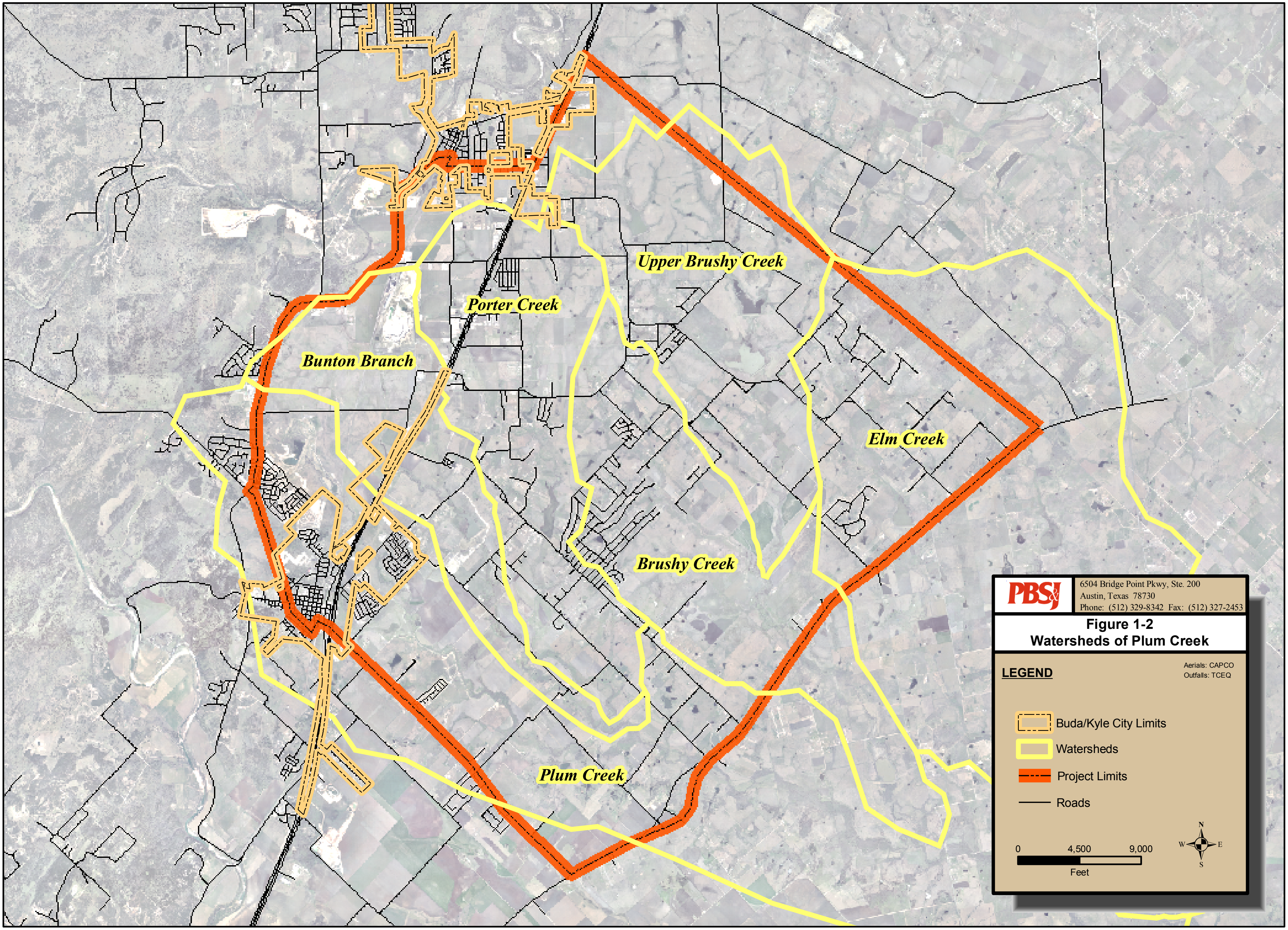
This task relied heavily upon the Geographic Information System (GIS) to identify several parameters for each subwatershed, and locate them on a variety of maps. The parameters include:

1. Locate all existing WWTPs and outfall locations in the service area. Table 4.1 lists all of the existing wastewater plants.
2. Include all topographic features, soil types, and vegetation.
3. Provide the boundaries of city corporate limits, subdivisions, water and wastewater Certificate of Convenience and Necessity (CCNs), and land use types.
4. Include all infrastructures, including roads, power lines, county boundaries, reservoirs, and creeks, etc.



File:N:\710013\esri\Report_maps\figure_1_1

2/22/2005


Upper Brushy Creek
Porter Creek
Bunton Branch
Elm Creek
Brushy Creek
Plum Creek
PBSJ
6504 Bridge Point Pkwy, Ste. 200
Austin, Texas 78730
Phone: (512) 329-8342 Fax: (512) 327-2453
Figure 1-2
Watersheds of Plum Creek
LEGEND
Aerials: CAPCO
Outfalls: TCEQ
Buda/Kyle City Limits
Watersheds
Project Limits
Roads
0
4,500
9,000
Feet
N
E
S
W

B. Public Participation (Appendix B)

PBS&J, along with GBRA, is to conduct three public meetings with the stakeholders associated with the study area. The initial meeting presented the study baseline information and the broad objective of the study to the public/stakeholders. The second meeting included a presentation of current water quality conditions and sought input on water quality goals and direction to formulate and obtain consensus on a more specific set of project objectives from the public/stakeholders. These objectives related to development in the immediate watersheds, including analysis of purely regulatory options, the effects of no-action, and a general analysis of regional wastewater planning options. The final meeting will be a presentation of water quality protection alternatives, considering the water quality effects and the fiscal implications of the alternatives, and an opportunity for input on the final report. The minutes of the stakeholder meeting are included in the Appendix B of this report.

C. Population and Wastewater Analysis (Section 3)

Population growth projections were compiled from two sources: The Capital Area Metropolitan Planning Organization (CAMPO) Traffic Serial Zone (TSZ) Data, 2003, and the Hays Consolidated Independent School District (HCISD). Population was compared to the U.S. Census Bureau (USBOC) Decennial Census Estimates for 2000. The population projections were then distributed appropriately within the study area and added to the study area GIS maps.

The analysis then considered three alternatives for wastewater service based on population projections, city corporate boundaries, CCNs, watershed boundaries, effluent reuse demands, and population growth expectations. These alternatives considered different levels of planning and government action.

D. Water Quality Analysis (Section 4)

Each alternative developed in Task C was analyzed regarding its effects on water quality. The BATHTUB model was used to simulate water quality of ponds that would receive WWTP effluent. This model was used because it is well suited to the system of ponds with little calibration data. With the level of wastewater treatment assumed for all alternatives, there would not be an issue with meeting water quality criteria in the creeks and the QUAL-TX model normally used for this purpose would be of limited value. The development of input data for the BATHTUB model and the results of analysis are presented.

E. Regional Water Quality Protection Plan (Section 5)

Economic, socioeconomic, and environmental factors were used to analyze the alternatives for wastewater and reuse management. This section details the alternatives, summarizes the pros and cons for each, and describes the preferred alternative.

F. Implementation Plan (Section 6)

This section describes the process recommended to implement the selected alternative. It includes specific steps that should be taken by governmental units to provide the most cost-effective and environmentally responsive approach to wastewater service.

2.0 PLANNING AREA DESCRIPTION

GBRA selected the boundaries of the planning area to be considered for regional management of water and wastewater resources. The area selected has several components which make it vital to GBRA and the management of their watersheds. These components include the following:

- The planning area contains a number of small, intermittent flowing creeks which converge into Plum Creek, which then converges with the San Marcos River, which, in turn, converges with the Guadalupe River. These creeks include Elm, Upper Brushy, Brushy, Porter, Bunton Branch, and Plum Creeks.

- The eastern section of Hays County has seen, and is expected to continue experiencing rapid growth. As Austin expands, additional development pressures will focus growth outside of the corporate limits. A number of developments are shown proposed in and around the cities of Kyle, Buda, Niederwald, and Uhland. With increase in growth comes the need for water supply and wastewater management.

- Because the anticipated growth is occurring outside corporate limits, there is less control that governing entities have in order to protect the environment. With decisions of wastewater management, reuse opportunities and water quality issues in the hands of individual developers, rather than from regional coordination, there is a greater likelihood that water quality protection and conservation will be neglected.

- It is anticipated that, without regional management of the sewer treatment systems, there is more likelihood that there will be Onsite Sanitary Sewerage Facilities (OSSFs). This Planning Area has soil characteristics which are high in impermeable clays. These types of soils are not ideal for OSSFs, increasing the chance for water quality related issues downstream.

2.1 DEVELOPMENT OF BASELINE INFORMATION

For this study PBS&J developed a series of maps that incorporate pertinent data accumulated to facilitate analyzing the region from a development and water quality perspective. The base line information became the initial tool of accumulated data collection from which to build. This was the foundation for the overall planning study. The following is a brief discussion of some of the parameters which went into the baseline mapping.

2.2 LAND USE AND TOPOGRAPHY

2.2.1 Planning Area

The planning area to be included in this study is the eastern portion of Hays County which includes the communities of Niederwald, Uhland, and portions of Buda, Mountain City, and Kyle. The eastern portion of Hays County can be broken down into six main watersheds: Plum Creek, Burton Branch, Porter Creek, Elm Creek, Brushy Creek, and Upper Brushy Creek. The boundaries of each can be seen in Figure 1-2. All of these watersheds converge into Plum Creek, which eventually merges with the San Marcos River, and discharges into the Guadalupe River.

Hays County is located southeast of the Central Texas Hill Country on the borders of the southern Black Prairie Region and Edwards Plateau. The county encompasses an area approximately 440,000 acres or 694 square miles, with its center located at 98°00′ west longitude and 30°00′ north latitude and 23 miles southwest of the City of Austin. The elevation rises from east to west, varying from 600 to over 1,400 feet. The southeastern portions of the county are predominately agricultural plains. In the southeast quarter, multiple streams and some hilly areas can be found throughout the central to northern areas. Present urban growth in the study area is predominantly located adjacent to the Interstate Highway 35 (IH 35) corridor.

The average maximum temperature in July is 96 °F, with an average minimum temperature of 40 °F in January. Hays County has a growing season of 254 days and a mean annual rainfall is 33.75 inches.

2.2.2 Vegetation

The Hays County region is home to an abundant mixture of vegetation. The primary natural grasses found in this area are indiangrass and big bluestem; however, little bluestem, sand lovegrass, meadow dropseed, sand dropseed, Hall’s panicum, tall grama, three-awn and yellow indiangrass also can be found within the study area.

The trees commonly associated with this region typically fall into two groupings: those which grow taller than 15 feet, these include pecan, deciduous and live oak, shagbark hickory, sycamore, cedar elm, and mature juniper ash (mountain cedar). The other group, trees which are less than 15 feet, is comprised of species such as young juniper ash, Texas persimmon, mesquite, deciduous yaupon, small live oak, and small juniper.

The remaining flora commonly seen throughout the region is agarita, prickly pear, twist-leaf yucca, beargrass, and thin leaf yucca.

2.2.3 Soils

The soil in the study area varies from thin limestone to black, waxy, chocolate, and gray loam. Presently there are eight main soils found in this study area[1]:

1. Austin
2. Brackett

[1] Soil data as reported from Hays County Soil and Water Conservation District (SWCD) #351 Fact Sheet.

3. Branyon
4. Heiden
5. Krum
6. Lewisville
7. Rumple
8. Sunev clay loam

Austin soil consists of moderately deep, Fine-Silty, Carbonatic, Thermic , and clayey soils on uplands. These soils formed in chalk.

Brackett soil complexes are shallow, loamy and occasionally clayey soils mixed together with limestone bedrock outcroppings. They are fairly alkaline (pH 7.9–8.4) but one of two common variations contains a high proportion of calcium. Throughout the county these soils typically range from 11–17 inches in depth. Brackett soils are well drained, have a moderately slow permeability with very low available water capacity and a shallow rooting zone. Runoff of these soils is rapid and water erosion is a severe hazard. A distinctive feature of these soils is a “benched” or “stair-stepped” appearance due to the bands of rock outcrop.

Branyon soils consist of very deep, moderately well drained, very slowly permeable soils that formed in calcareous clayey sediments. These soils are on nearly level to very gently sloping Pleistocene terraces. Slopes range from 0 to 3 percent. A moderately well drained soil, permeability is very slow. Water enters the soil rapidly when it is dry and cracked and very slowly when it is moist.

Heiden soils consist of deep, clayey soils on uplands. These soils formed in clayey marine sediment and range.

Krum soils consist of very deep, well drained, moderately slowly permeable soils that formed in calcareous clayey sediments. These soils are on nearly level to moderately sloping terraces and lower slopes of valleys. Slopes range from 0 to 8 percent. The Krum soils consisted of 4.16 percent of the Edwards Aquifer Watershed.

Lewisville soils are typically nearly level alluvial soil with silty clay, slow drainage, usually cultivated.

Sunev clay loam is a well drained, deep, gently sloping soil found in valleys and foot slopes. The soil is moderately alkaline and contains high levels of calcium carbonate (lime) on average. Water runoff is medium to rapid, permeability is moderate and available water capacity is moderate. The rooting zone in Sunev clay is deep and water erosion is only a moderate hazard. This soil is well suited for cropland, pastures, and rangeland. This soil is classified in the Clay Loam range site.

2.2.4 Land Use

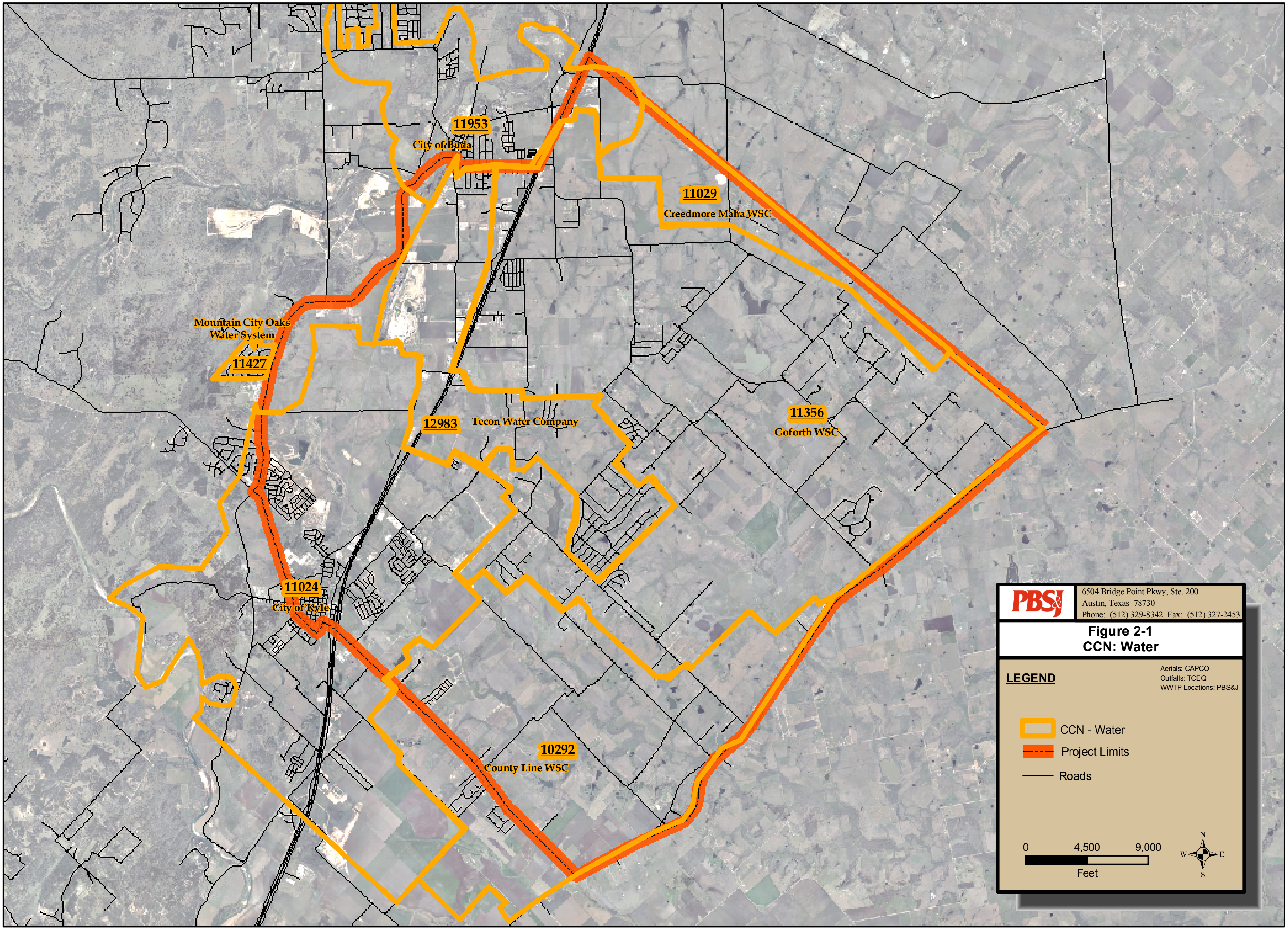
Eastern Hays County features a diversity of land use types. The four main categories of land use common to this area are:

1. Urban areas
2. Agricultural areas
3. Natural vegetation areas
4. Water and barren areas

These four land use types are also found throughout the study area. Due to overall limited development and therefore limited impervious cover within the study area runoff is currently minimal. Due to many of the drainage basins being associated with in-stream ponds, the ability to retain small fluctuations in run off in these ponds aids in controlling runoff. However as development increases in and around each watershed the amount of permeable cover will decrease thus increasing typical flows seen through each drainage basin. All other maps identifying current public infrastructure, CCN boundaries, and all maps used for presentations during public meetings can be viewed in the Appendix B.

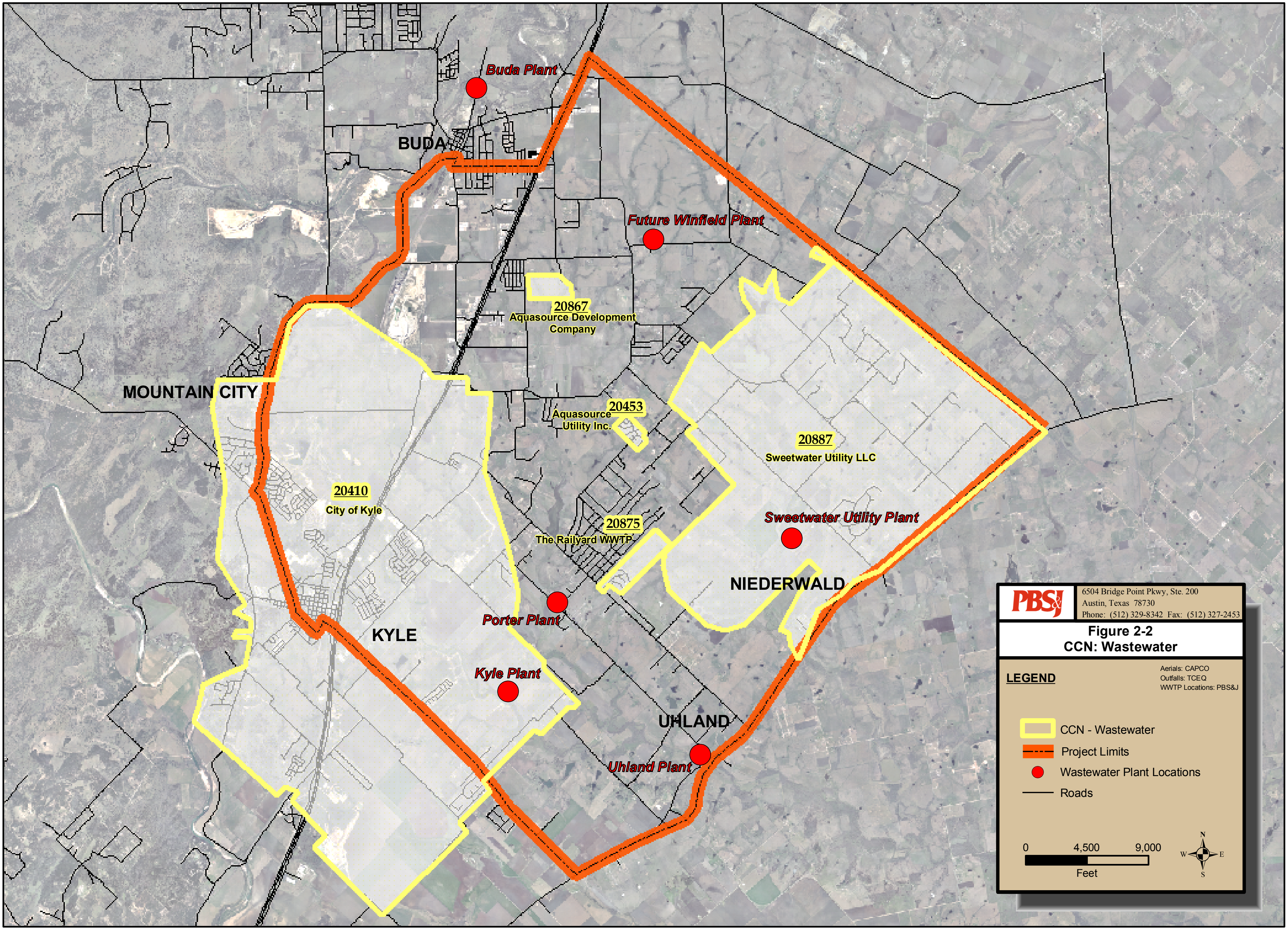
2.2.5 Mapping

In order to facilitate analyzing the population growth over the study area, PBS&J produced a series of GIS maps which were used as the basis of existing conditions. These maps included land use and topographical features, soil types, water and sewer CCN boundaries, power lines, subdivision boundaries, WWTP and outfalls. Figures 2-1, 2-2, and 2-3 provide this information. These figures were provided as a basis for consideration for anticipated population growth, which is further discussed in Section 3.0: Population and Wastewater Analysis. These figures were also used as discussion items in the stakeholder meeting presented by GBRA and PBS&J, where the study objectives were discussed and formulated to obtain a general consensus from the stakeholders.



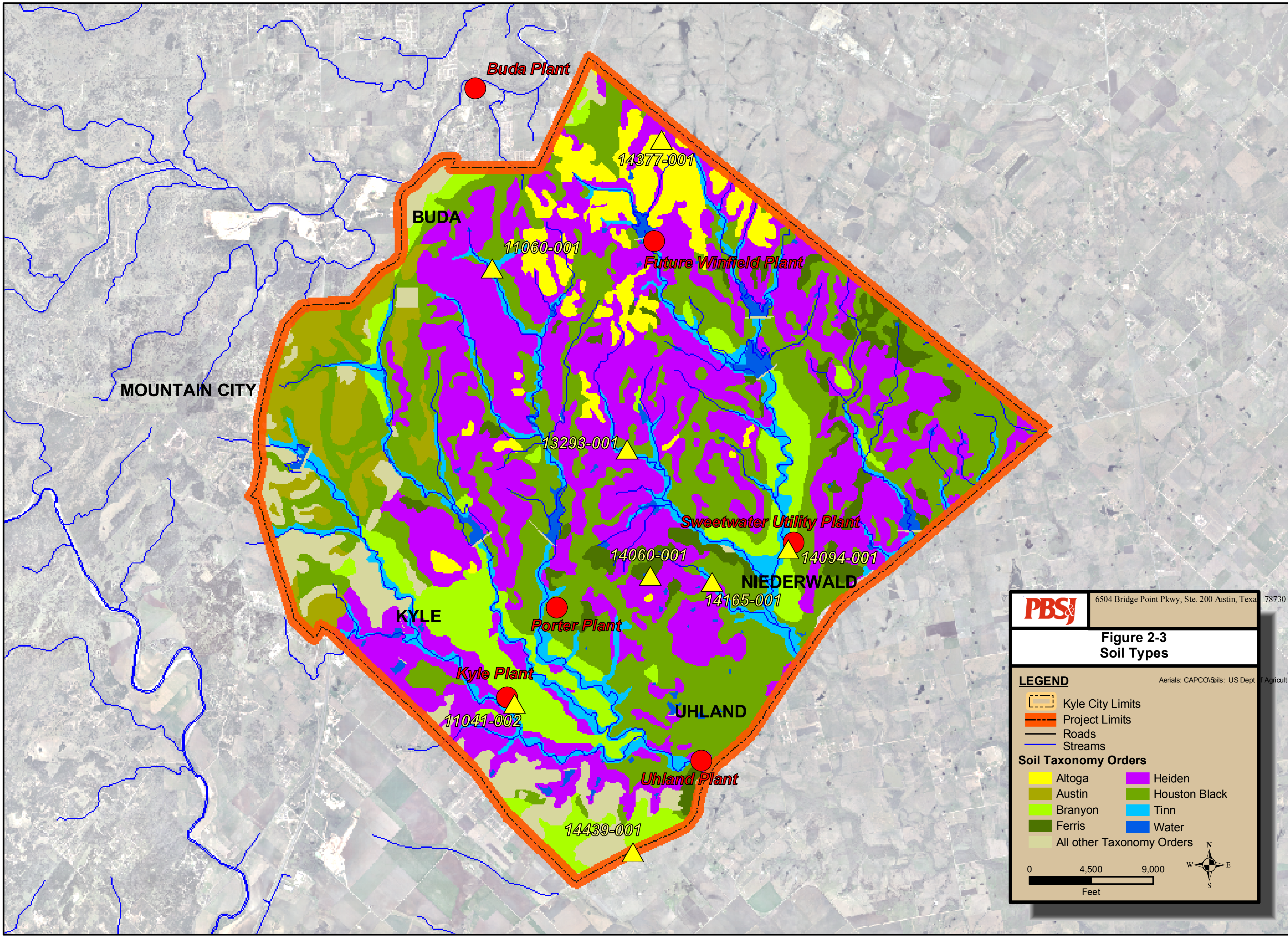
File:N:\710013\esri\Report_maps\figure_2_1

2/22/2005



File:N:\710013\esri\Report_maps\figure_2_2

2/22/2005



File:N:\710013\esri\Report_maps\figure_2_3

2/22/2005

3.0 POPULATION AND WASTEWATER ANALYSIS

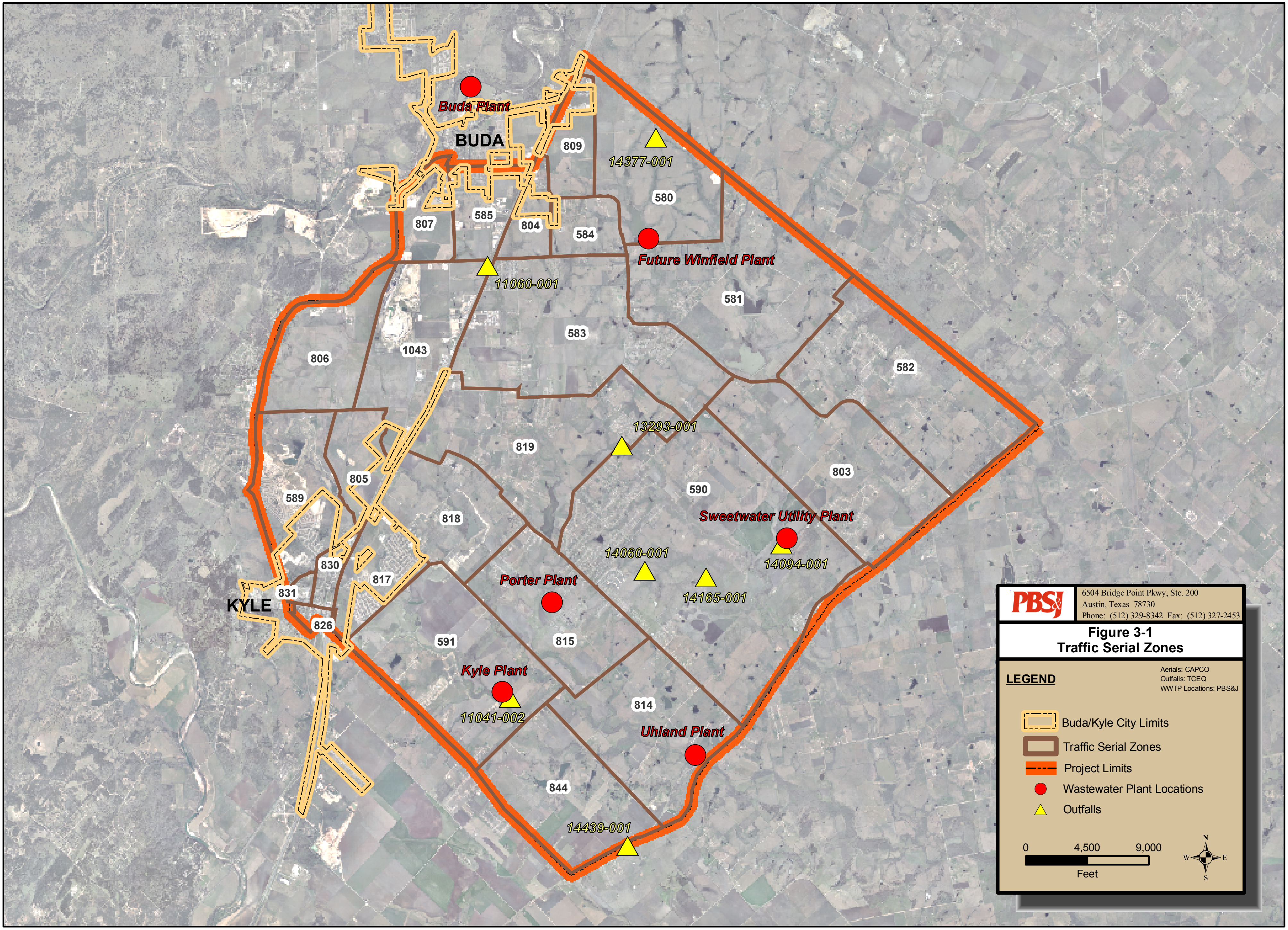
In order to develop a regional wastewater and water conservation plan, PBS&J assessed the impact of increased growth within the planning area which contributes to the Guadalupe River. As growth from the Austin metro area continues to spillover into unincorporated areas of Hays County, where government land use controls are less stringent. The effect from these individual developments has a greater potential for negative environmental impact. Individual or private development typically will not be designed with water conservation and treated wastewater quality as it primary objectives. These developments are usually cost driven. Individualized discharges or OSSF area a concern mostly due to clayey soils found within the study area. These flows along with small developer package plants tend to be less manageable and, therefore, run a greater risk of creating more pollutants within each watershed since they would be less likely motivated to provide wastewater reuse.

To assess the increase in population growth within the planning area, PBS&J analyzed population and housing forecast data published by two agencies: CAMPO, and HCISD. First we collected CAMPO TSZ data for Hays County (CAMPO, 2003). This data provides baseline (year 2000) population data as well as population projections for the years 2017 and 2030 divided into TSZs within the county. The baseline population data is based on the results of the USBOC's 2000 Decennial Census, and the population for the County has been apportioned by CAMPO into TSZs based on 2000 census tract data and land use analysis. The population projections (which are part of the same CAMPO data-set), are also organized by TSZ, and were developed from the population projections for Hays County prepared by the Texas State Data Center (TSDC) for the years 2017 and 2030. The population projections were then apportioned by CAMPO into TSZs based on their land use and development forecasting methods. We then compared this data with projected population and housing data from the HCISD Demographic Update Report (HCISD, 2003). The HCISD report provided forecasting for students in Hays County for a 5-year period.

3.1 CAMPO TRAFFIC SERIAL ZONE ANALYSIS

As described above, PBS&J used the TSZ data prepared by CAMPO for years 2017 and 2030. This data was organized by using a GIS to identify those TSZs that were within the planning area boundaries, and to eliminate those TSZs that are outside the boundary or that only had a small portion of their area located within the planning area boundary. Of these TSZs that were partially located within the planning area boundary, most had only small portions within the boundary, and, therefore, could easily be eliminated without skewing the results of the population analysis. Figure 3-1 shows the boundaries of each TSZ within the planning area.

The percent change was determined for the years 2000, 2017, and 2030 based on compiled CAMPO historical and projected population data for each of the TSZs. Next, the TSZs were arranged in descending order in terms of numeric change in population between the years 2000 to 2017, 2017 to 2030, and 2000 to 2030. The TSZs were organized into the following four categories (hereafter numeric



File:N:\710013\esri\Report_maps\figure_3_1

2/22/2005

population change tables): highest, high, moderate, and lowest for each time period. The numeric population change tables are organized as follows: Table 3.1 shows numeric population change for 2000 to 2017, Table 3.2 shows 2017 to 2030, and Table 3.3 shows 2000 to 2030.

Maps were then created which graphically depict the numeric change in population for each of the CAMPO study year increments (2000 to 2017, 2017 to 2030, and 2000 to 2030) for use in public meetings with the stakeholders. These maps are done by color code, showing highest to lowest numeric population change for each study year increment (Figures 3-2, 3-3, and 3-4). We also depicted the addition of population for each CAMPO study year (2000, 2017, and 2030) within the planning area by a dot density depiction, with each dot representing 50 people living within a particular TSZ (Figures 3-5, 3-6, and 3-7).

3.2 ANALYSIS OF POPULATION DATA

The CAMPO TSZ results show a significant increase in population within the planning area between 2000 to 2030. The percentages of population growth within the planning area is shown in the table below.

Year	Total Population	% Change
2000	14,467	–
2017	40,354	179
2030	60,650	50

The overall change in the study area population between 2000 and 2030 is more than a four-fold increase. This increase is worthy of the consideration for water quality and water availability.

The results of our study using the CAMPO TSZ method show that the highest overall potential growth occurred more or less along the IH 35 corridor on both the east and west sides. And, the single greatest growth over the 2000 to 2030 study period was TSZ No. 591, with an increase of 6,516 people, and starting with only 200 people living within the TSZ in 2000.

The greatest population change is shown to be in the Kyle and Mountain City city limit boundaries and, to some extent, just east of the City of Buda city limits.

By watersheds, the greatest growth occurs within Upper Brushy Creek, Porter Creek, Bunton Branch, and Plum Creek, with less development occurring in Elm Creek and Brushy Creek. The greatest numeric change in population relative to existing WWTPs is shown to occur within the City of Kyle (Outfall Permit No. 11041-002) and the Winfield Wastewater Treatment Plant (Outfall Permit No. 14377-001).

TABLE 3.1
NUMERIC POPULATION CHANGE BY TRAFFIC SERIAL ZONE
2000 TO 2017

TSZ #	Population in Year 2000*	Population in Year 2017	Numeric Change (2000 to 2017) - Sorted in Descending Order	Population Growth Category
591	200	5,260	5,060	Highest
589	746	4,999	4,253	Highest
806	3	3,800	3,797	Highest
580	0	2,400	2,400	High
1043	23	2,027	2,004	High
803	384	1,804	1,420	High
818	242	1,650	1,408	High
805	17	1,216	1,199	High
583	1,981	3,024	1,043	High
819	1,646	2,617	971	Moderate
844	85	802	717	Moderate
807	2	660	658	Moderate
814	260	694	434	Moderate
815	947	1,251	304	Moderate
581	392	576	184	Moderate
590	3,018	3,188	170	Moderate
585	1,034	1,125	91	Lowest
804	82	137	55	Lowest
582	917	955	38	Lowest
817	1,417	1,431	14	Lowest
809	25	22	-3	Lowest
584	198	179	-19	Lowest
831	304	160	-144	Lowest
830	544	377	-167	Lowest
Total	14,467	40,354	25,887	

Source: Capital Area Metropolitan Organization (CAMPO), Traffic Serial Zone Data, 2003.
*Population estimates for the year 2000 were derived from the U.S. Bureau of Census Decennial Census, and were apportioned into the TSZ by CAMPO.

Range of Numeric Changes (2000 to 2017) = -167 to 5060

Lowest Growth = Less than 100
Moderate Growth = 100 to 999
High Growth = 1000 to 2499
Highest Growth = 2500 and above

TABLE 3.2
NUMERIC POPULATION CHANGE BY TRAFFIC SERIAL ZONE
2017 TO 2030

TSZ #	Population in Year 2017	Population in Year 2030	Numeric Change (2017 to 2030) - Sorted in Descending Order	Population Growth Category
581	576	2,480	1,904	High
815	1,251	3,043	1,792	High
583	3,024	4,648	1,624	High
584	179	1,691	1,512	High
591	5,260	6,716	1,456	High
805	1,216	2,560	1,344	High
806	3,800	5,032	1,232	High
580	2,400	3,632	1,232	High
819	2,617	3,793	1,176	High
818	1,650	2,658	1,008	High
582	955	1,963	1,008	High
589	4,999	5,811	812	Moderate
807	660	1,444	784	Moderate
809	22	806	784	Moderate
814	694	1,366	672	Moderate
590	3,188	3,748	560	Moderate
1043	2,027	2,527	500	Moderate
803	1,804	2,196	392	Moderate
844	802	1,138	336	Moderate
804	137	305	168	Moderate
585	1,125	1,125	0	Lowest
817	1,431	1,431	0	Lowest
831	160	160	0	Lowest
830	377	377	0	Lowest
Total	40,354	60,650	20,296	

Source: Capital Area Metropolitan Organization (CAMPO), Traffic Serial Zone Data, 2003.

Range of Numeric Changes (2017 to 2030) = 0 to 1,904

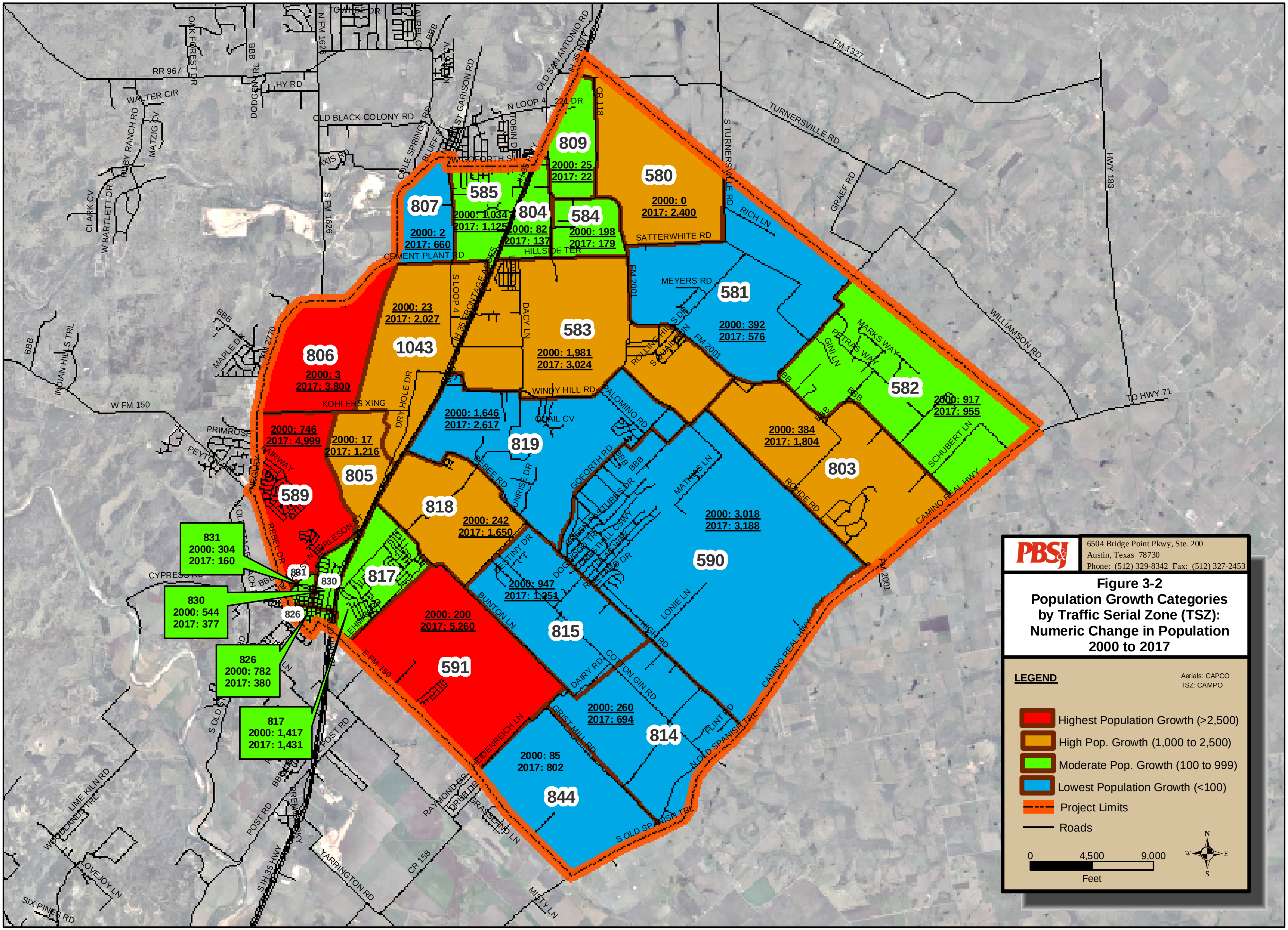
Lowest Growth = less than 100
Moderate Growth = 100 to 999
High Growth = 1,000 to 2,499

TABLE 3.3
NUMERIC POPULATION CHANGE BY TRAFFIC SERIAL ZONE
2000 TO 2030

TSZ #	Population in Year 2000*	Population in Year 2030	Numeric Change (2000 to 2030) - Sorted in Descending Order	Population Growth Category
591	200	6,716	6,516	Highest
589	746	5,811	5,065	Highest
806	3	5,032	5,029	Highest
580	0	3,632	3,632	Highest
583	1,981	4,648	2,667	Highest
805	17	2,560	2,543	Highest
1043	23	2,527	2,504	Highest
818	242	2,658	2,416	High
819	1,646	3,793	2,147	High
815	947	3,043	2,096	High
581	392	2,480	2,088	High
803	384	2,196	1,812	High
584	198	1,691	1,493	Moderate
807	2	1,444	1,442	Moderate
814	260	1,366	1,106	Moderate
844	85	1,138	1,053	Moderate
582	917	1,963	1,046	Moderate
809	25	806	781	Moderate
590	3,018	3,748	730	Moderate
804	82	305	223	Moderate
585	1,034	1,125	91	Lowest
817	1,417	1,431	14	Lowest
831	304	160	-144	Lowest
830	544	377	-167	Lowest
Totals	14,467	60,650	46,183	

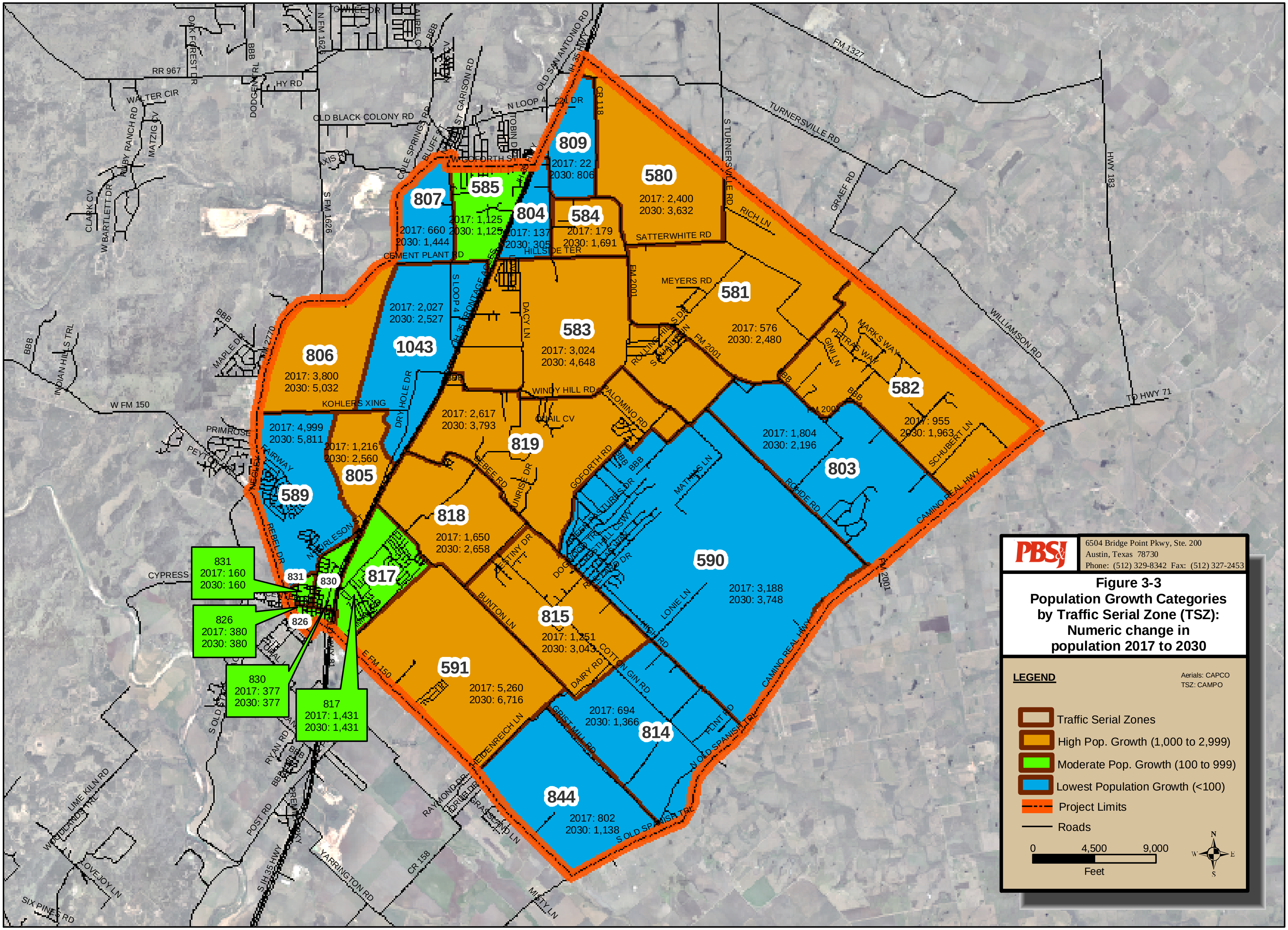
Range of Numeric Changes
(2000 to 2030) = -167 to 6,516
Lowest Growth = Less than 100
Moderate Growth = 100 to 1,499
High Growth = 1,500 to 2,499
Highest Growth = 2500 and above

Source: Capital Area Metropolitan Organization (CAMPO), Traffic Serial Zone Data, 2003.
*Population estimates for the year 2000 were derived from the U.S. Bureau of Census Decennial Census, and were apportioned into the TSZ by CAMPO.



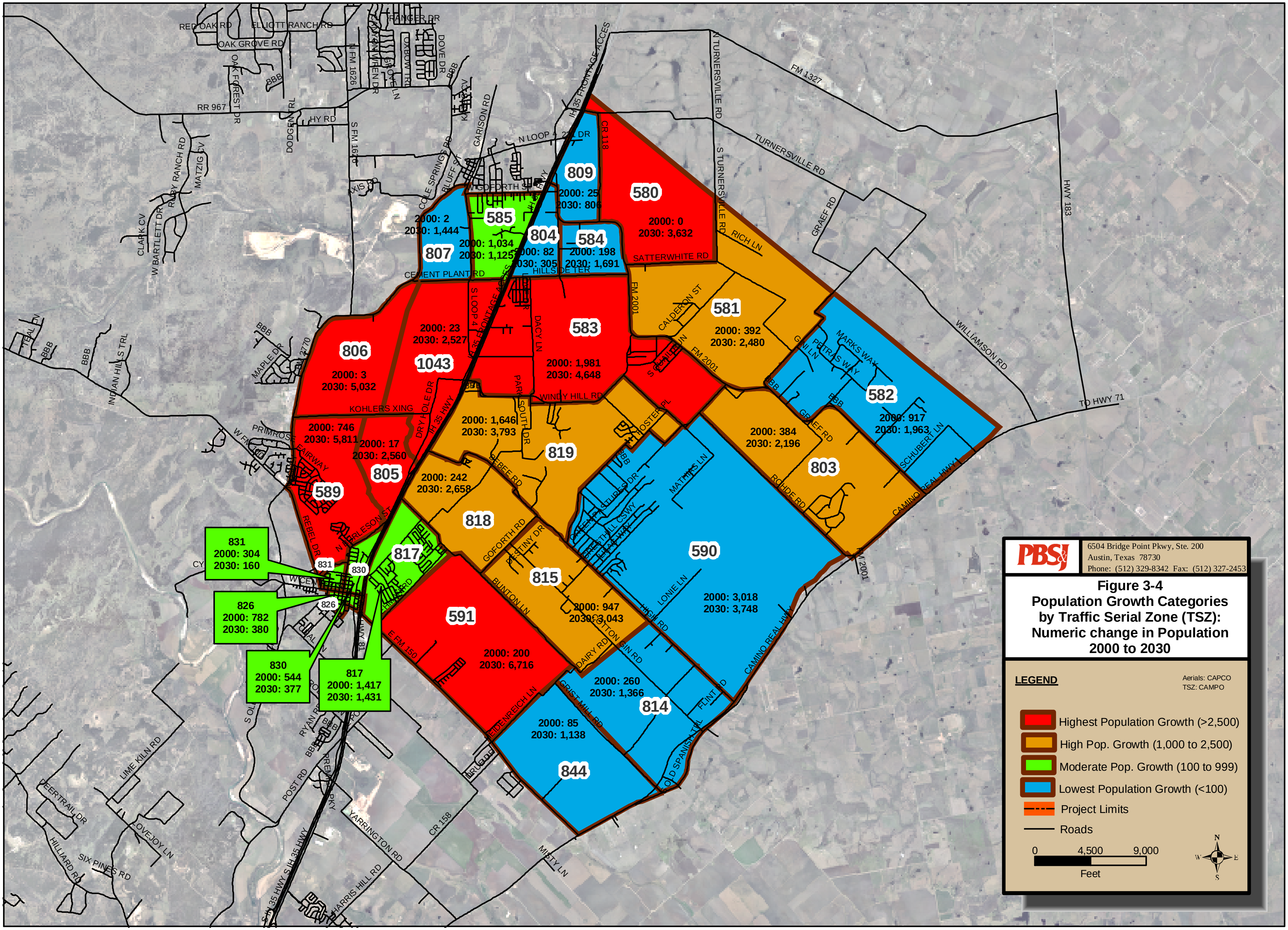
File:N:\710013\esri\Report_maps\figure_3_2

2/22/2005



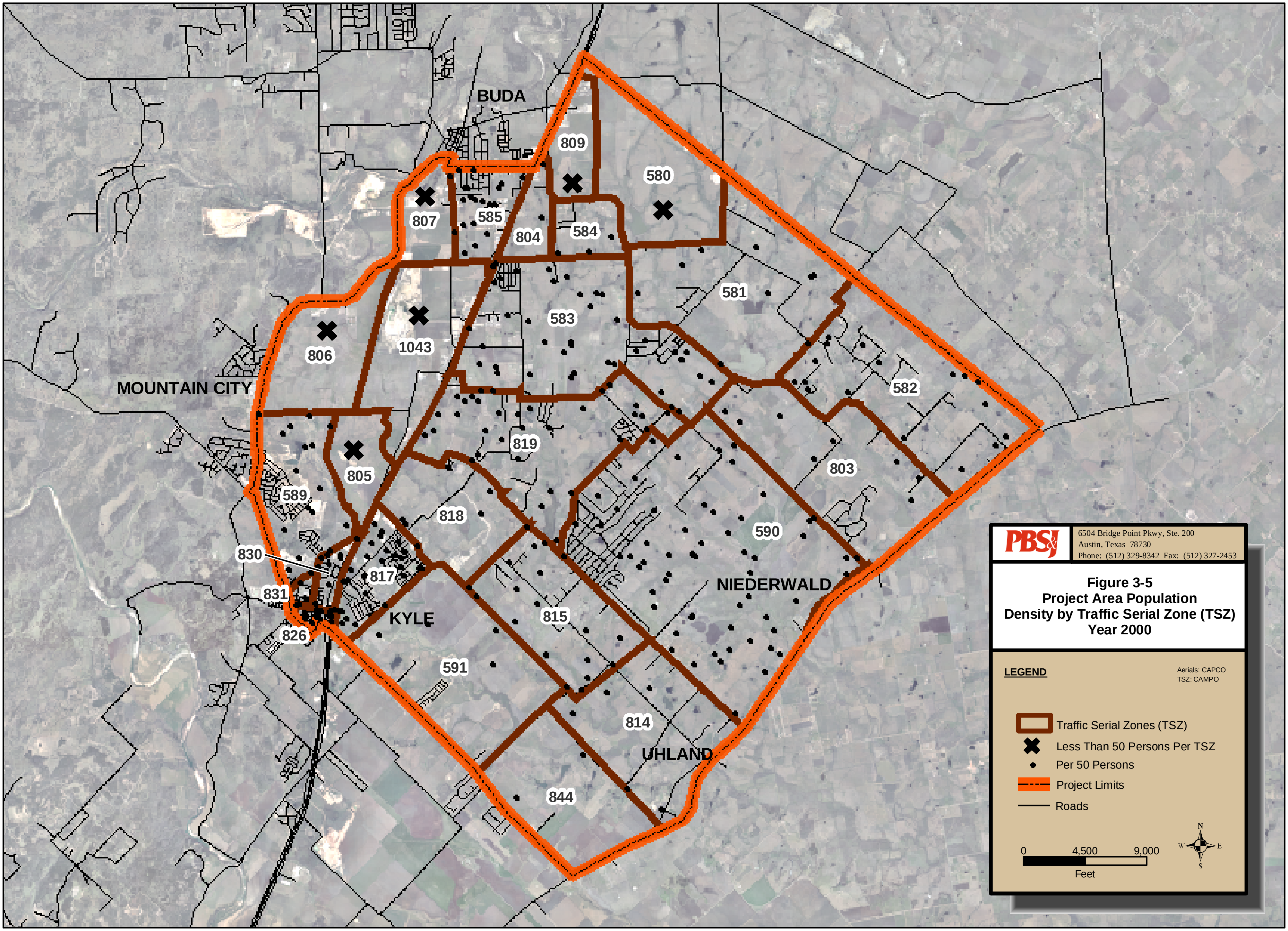
File:N:\710013\esri\Report_maps\figure_3_3

2/22/2005



File:N:\710013\esri\Report_maps\figure_3_4

2/22/2005



File:N:\710013\esri\Report_maps\figure_3_5

2/22/2005

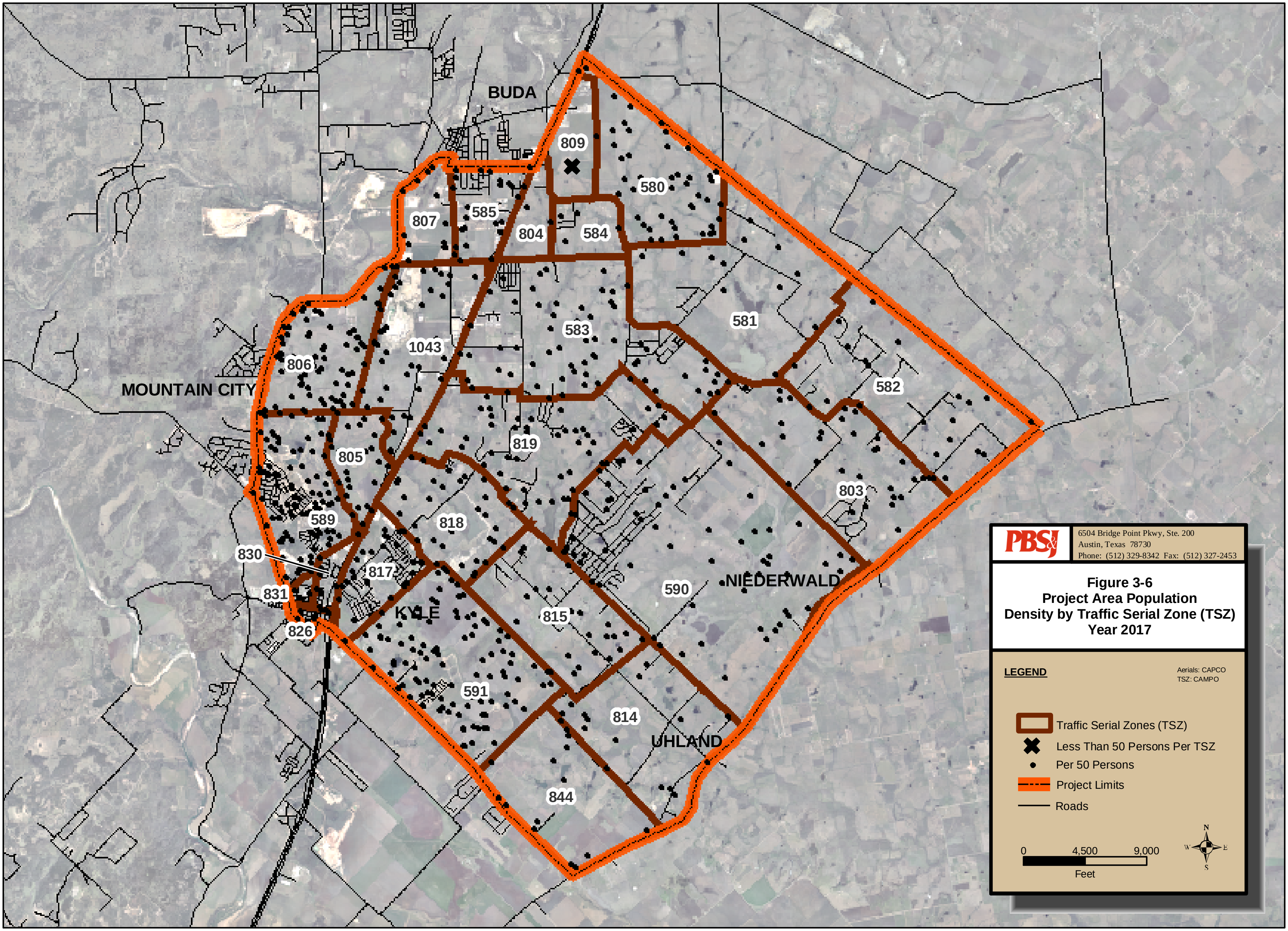
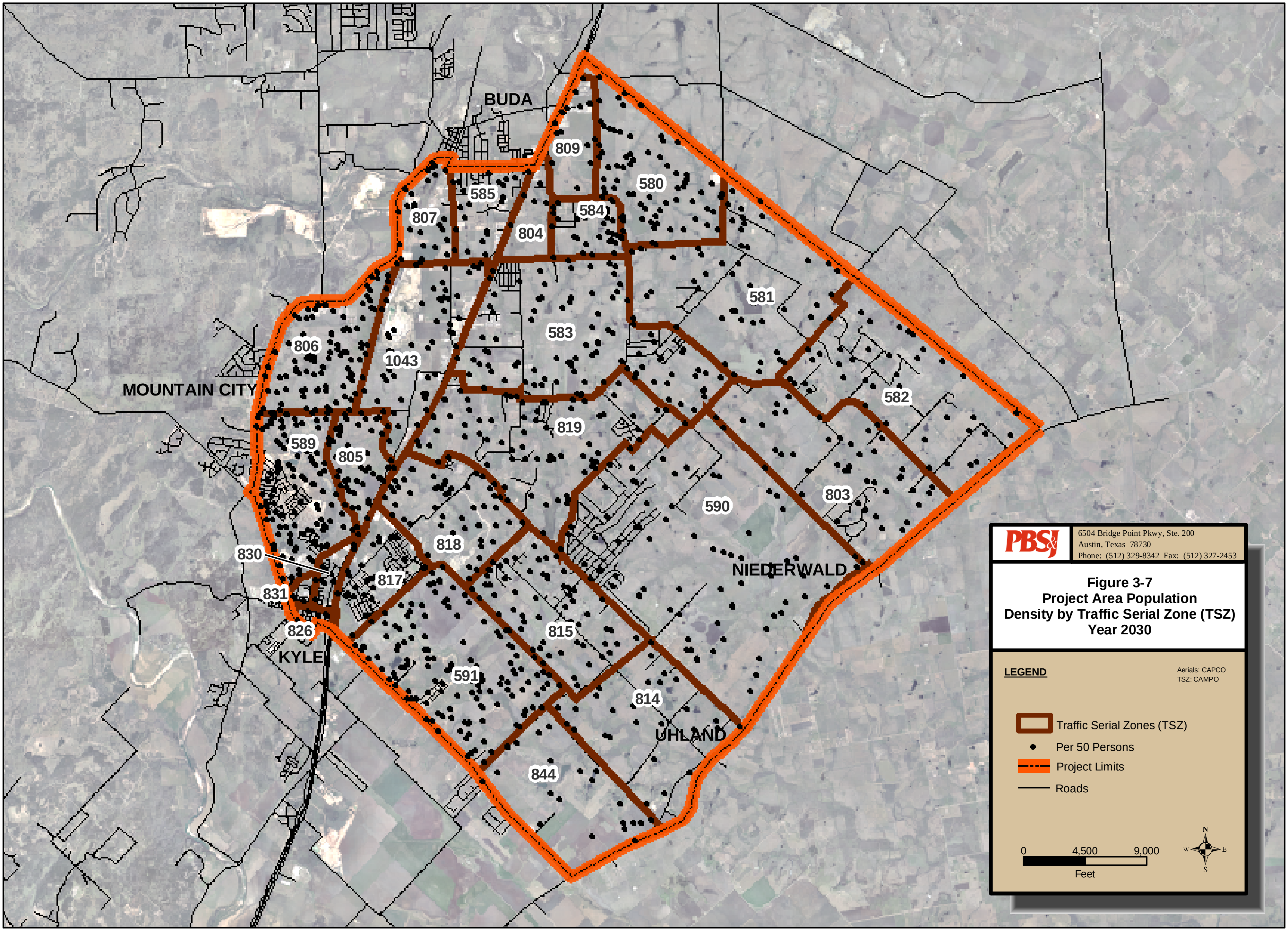


Figure 3-6
Project Area Population
Density by Traffic Serial Zone (TSZ)
Year 2017

File:N:\710013\esri\Report_maps\figure_3_6

2/22/2005



PBSJ
6504 Bridge Point Pkwy, Ste. 200
Austin, Texas 78730
Phone: (512) 329-8342 Fax: (512) 327-2453

Figure 3-7
Project Area Population Density by Traffic Serial Zone (TSZ) Year 2030

LEGEND

Aerials: CAPCO
TSZ: CAMPO

Traffic Serial Zones (TSZ)
Per 50 Persons
Project Limits
Roads

0 4,500 9,000
Feet

File:N:\710013\esri\Report_maps\figure_3_7

2/22/2005

3.3 HAYS CONSOLIDATED INDEPENDENT SCHOOL DISTRICT ANALYSIS

PBS&J considered population projections provided by the HCISD Demographic Update Report, April, 2003 (HCISD, 2003), and compared them with those results from CAMPO's TSZ projections.

Relating the two separate data sources was challenging. There are several factors discovered in the comparative analysis which should be discussed:

1. The HCISD report was developed for the purpose of determining expected students, not overall population. PBS&J related the student population to overall population based on a person per household unit multiplier of 2.69.
2. The HCISD report data may not be capturing all of the future housing units for each planning unit since the study only is counting subdivisions that are known to be coming online for years 2003 and 2008. So, projected changes in housing units shown between 2008 to 2030 are likely to be inaccurate and incomplete, and do not provide a year-to-year comparison with the CAMPO data.
3. The HCISD report has housing units that do not have the same boundaries as the TSZ. We were able to massage the housing unit boundaries to more-or-less co-relate with the TSZ boundaries. But, in many instances, the co-relation requires gross assumptions about population density within the TSZ.
4. Of the 20 or so TSZ areas found in the CAMPO study for the proposed planning area, the HCISD study data only provides numeric data for eight of these TSZ areas. Therefore, the HCISD study only focuses on a narrow area of the overall planning area.

Considering all of the above-mentioned unavoidable flaws in the comparative analysis between the HCISD study and the CAMPO TSZ study, we concluded that the comparison was grossly inaccurate and invalid. However, interestingly enough, after we made our comparison of the HCISD planning units that more-or-less co-related with ten of the TSZ, in part or whole, we discovered that the difference in the two study methods had population results within 2.5 percent of each other for the year 2017. Certain areas within the planning area were greater and certain areas were lower. More importantly, the assumptions leading up to the results, and the difficulty in comparing the two separate methods have led us to conclude that the CAMPO TSZ data is more comprehensive for our entire planning area, has longer future projections (to year 2030) and has its primary objective more in line with the purpose of the GBRA study.

3.4 REGIONAL WASTEWATER PLANNING

The objective of the Regional Wastewater Planning is to identify and evaluate multiple alternative wastewater collection, treatment and disposal methods for their suitability and cost effectiveness to manage the anticipated increase in population in the planning area.

Three separate alternatives were considered: 1) No-Action, 2) Regional Plants, and 3) Small Multiple Plants. The Regional Plants alternative consists of two regional plants with reuse. The No-Action alternative is where there is no wastewater treatment regionalization, and treatment is left up to each individual development. The Small Multiple Plants alternative consists of five Multiple Small Plants, with each plant serving a portion of the planning area with wastewater collection and reuse. Each of these three models was used to determine collection volume, possible reuse, overall cost, and captured population growth throughout each of the planning area's TSZs.

The capacity of each plant was determined by the use of average flow from all TSZs served at a predetermined capture rate of generated flow for that area. An average flow of 80 gallons per day (gpd)/capita was assumed for calculating average daily flows for each TSZ, with wet and dry weather flow being calculated using a 1.3 and 0.8 multiplier, respectively. Capture rates were determined based on current and anticipated collection rates and OSSF usage within each TSZ. OSSF usage is more common in rural and less developed areas. Therefore, anticipated wastewater collection rates encountered will be lower in more rural areas. Development densities also tend to be less in rural areas, which also leads to wastewater collection in rural areas being more cost prohibitive. For the study collection rates in the models, rural TSZs are calculated to have between 30–50 percent, as compared with 70–95 percent as seen with TSZs bordering the IH 35 corridor. All flow not collected for each TSZ is assumed to be OSSF flow. Each of the three wastewater collection models calculated flows by TSZ can be viewed in each treatment model's flow table.

Wastewater collection calculations for each model utilized a common method throughout the study. A collection main was assumed to originate from the center of each TSZ and flow via gravity main to either the next adjacent TSZ or that region's treatment facility. For areas in a TSZ where a gravity main would not likely work, a force main would be used, and the additional cost of a lift station would be added to the collection cost of the overall model. Costs for lift stations were determined to be $500,000 per lift station for all models. Calculated pipe sizes and lengths per TSZ can be viewed in each model's cost table. Pipe cost was determined using a cost per linear foot of pipe with labor and material costs included.

Reuse of wastewater effluent was considered for each model. Reuse will serve two primary purposes: 1) it will supplement water supply for irrigation, and, 2) it will reduce discharge to the outfall receiving stream. Reuse was an important component to the Regional Plant alternative. In a regional plant, because the collection distances are much greater than where smaller, more frequent plant scenarios are found, there tends to be fewer Living Unit Equivalents (LUEs) connected to the system, thus decreasing the available amount of treated effluent from the plant for reuse. Also, due to the distance from the regional plants to areas of key reuse (more densely populated TSZs), piping and pumping costs become an issue, making the reuse from a regional plant more difficult, unless specific industrial uses can be identified that can utilize the reuse and justify the cost of conveyance. Such uses might include power plants, cement plants, or agricultural purposes. For distant customers, reuse piping cost would outweigh any cost benefit that would allow a facility to provide distant customers with service.

Maximum demand for reuse water was determined by using turf grass water demand and subtracting average annual rainfall, while assuming limited application due to extended distribution distances. The remaining water needs not met by ambient rainfall were calculated to be the maximum reuse that could be utilized. The maximum demand or amount of potential reuse was calculated to occur in July, with a demand of 4625 gallon/day/acre. Using this as a basis for maximum usage, it was determined that the average annual reuse was 31 percent; calculated monthly usage can be seen in the table below.

Calculated Monthly Reuse

Month	Max demand gpd/acre	Reuse (%)
January	199	4
February	534	12
March	1,539	33
April	1,910	41
May	45	1
June	2,326	50
July	4,625	100
August	3,648	79
September	2,344	51
October	100	2
November	0	0
December	0	0
	Average	31

Reuse calculations for each applicable treatment model used a similar method as those described above for collection. The main difference being only one distribution main for reuse per service area is used, verses one distribution main serving each TSZ. For each plant's service area all reuse water would be directed to the center of the most populated TSZ, This was done to minimize the cost due to the limited reuse flows generated by each plant, and maximize the benefit of residence able to be served with reuse water.

Density of development tends to be much lower overall in eastern Hays County, as compared with similar parts of the nearby Austin area. This may be due to a variety of factors, including, but not limited to, environmental impacts to receiving streams controls, real estate preferences, and any determined natural preserve areas. Traditionally, as development density is reduced, the costs for providing centralized collection and treatment tend to increase. Thus, the need to consider either individual (OSSF) or cluster-type onsite treatment and disposal systems becomes evident. However, it must also be noted that individual OSSF systems typically range from four to eight thousand dollars, with some units ranging as high as $20,000 or more dollars depending on treatment quality, site conditions, and other environmental constraints.

3.4.1 No-Action

No-Action is a model in which there is no regionalization, and treatment is left up to each individual development. A greater number of TSZs will be served by OSSFs. PBS&J selected plants each serving an area generating no more than 266,000 gpd. A total of 17 plants are used in this model, with plant capacities ranging from 275,000 gpd to 75,000 gpd being the smallest. All plants within this model are 275,000 gallons or smaller to better represent those built by individual communities. TSZs served by each plant can be seen in Figure 3-8.

The capacity of each plant was determined by using a 80 gpd/capita multiplier as described in Section 3.0. Capture rates, as discussed below, were determined based on current and anticipated collection rates and

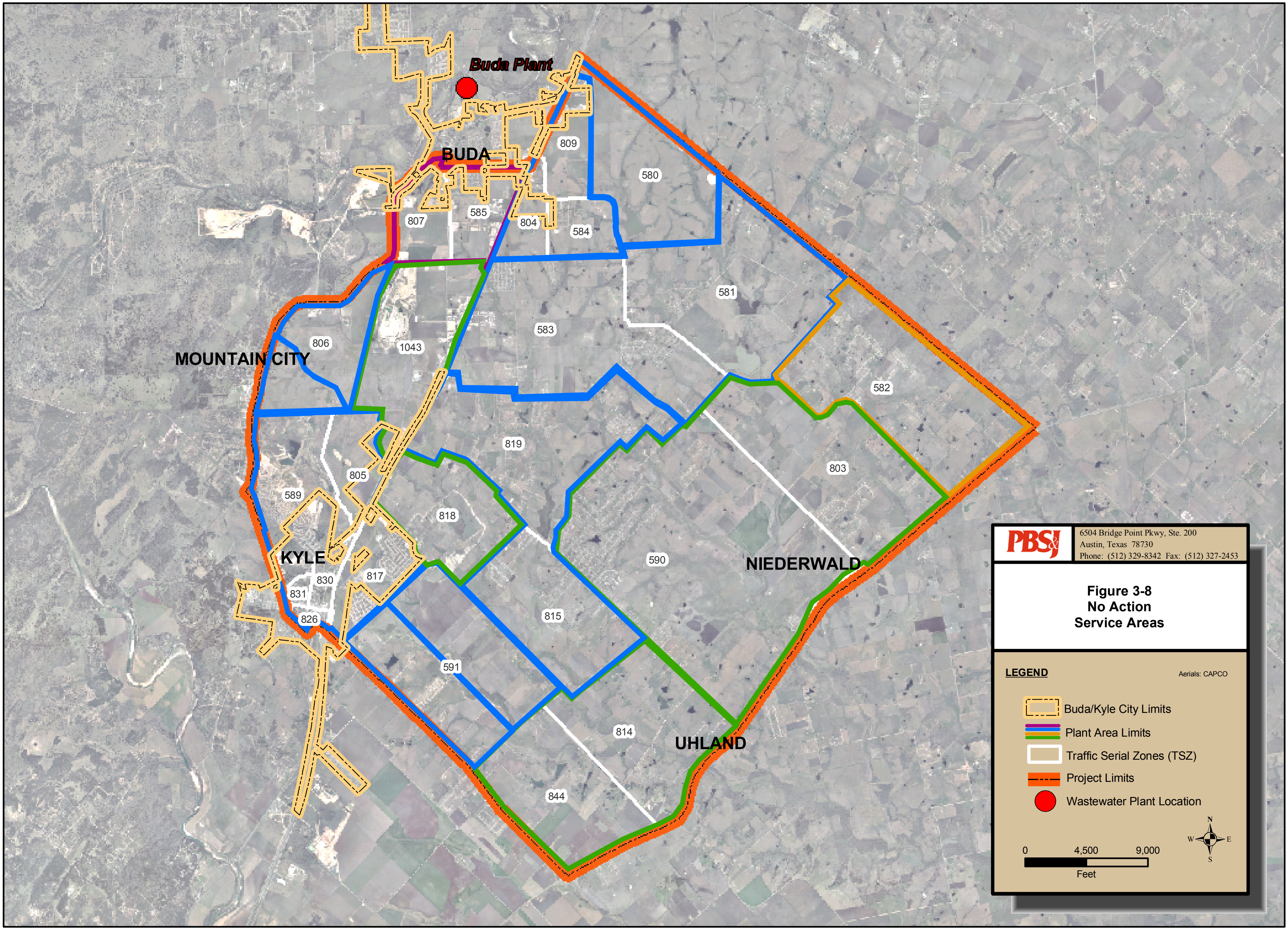


Figure 3-8
No Action
Service Areas

TABLE 3.4
FLOW ANALYSIS
NO-ACTION

Plant Size (X1000 gal)	TSZ #	% Area	% Captured	Population 2000 [1]	Population 2030 [2]	Numeric Change (2000 to 2030)	Flow Avg (gpd)	OSSF (gpd)	% Captured Avg (gpd)	Discharge Avg (gpd)
300	580	100%	70%	0	3,632	3,632	290,560	87,168	203,392	203,392
	total			***0***	***3,632***	***3,632***	***290,560***	***87,168***	***203,392***	203,392
275	581	100%	50%	392	2,480	2,088	167,040	83,520	83,520	83,520
	583	100%	50%	1,981	4,648	2,667	213,360	106,680	106,680	106,680
	total			***2,373***	***7,128***	***4,755***	***380,400***	***190,200***	***190,200***	190,200
250	591	100%	70%	200	6,716	6,516	521,280	156,384	364,896	364,896
2 plants	***total***			***200***	***6,716***	***6,516***	***521,280***	***156,384***	***364,896***	364,896
	each			*100*	*3,358*	*3,258*	*260,640*	*78,192*	*182,448*	182,448
250	819	100%	50%	1,646	3,793	2,147	171,760	85,880	85,880	85,880
	815	6%	70%	947	3,043	2,096	10,061	3,018	7,043	7,043
	815	94%	50%	947	3,043	2,096	157,619	78,810	78,810	78,810
	total			***3,540***	***6,836***	***4,243***	***339,440***	***167,708***	***171,732***	171,732
200	589	100%	70%	746	5,811	5,065	405,200	121,560	283,640	283,640
	831	100%	70%	304	160	-144	0	0	0	0
	830	100%	70%	544	377	-167	0	0	0	0
	826	100%	70%	782	380	-402	0	0	0	0
	817	100%	70%	1,417	1,431	14	1,120	336	784	784
	805	100%	70%	17	2,560	2,543	203,440	61,032	142,408	142,408
	total			***3,810***	***10,719***	***6,909***	***609,760***	***182,928***	***426,832***	***426,832***
200	804	100%	70%	82	305	223	17,840	5,352	12,488	12,488
	809	100%	70%	25	806	781	62,480	18,744	43,736	43,736
	584	100%	70%	198	1,691	1,493	119,440	35,832	83,608	83,608
	total			***305***	***2,802***	***2,497***	***199,760***	***59,928***	***139,832***	139,832
200	806	20%	50%	3	5,032	5,029	80,464	40,232	40,232	40,232
2 plants	806	80%	70%	3	5,032	5,029	321,856	96,557	225,299	225,299
	total			***6***	***5,032***	***5,029***	***402,320***	***136,789***	***265,531***	265,531
	each			*3*	*2,516*	*2,515*	*201,160*	68,394	*132,766*	132,766
150	803	100%	50%	384	2,196	1,812	144,960	72,480	72,480	72,480
	590	100%	30%	3,018	3,748	730	58,400	40,880	17,520	17,520
	total			***3,402***	***5,944***	***2,542***	***203,360***	***113,360***	***90,000***	90,000
150	1043	88%	70%	23	2,527	2,504	176,282	52,884	123,397	123,397
	1043	12%	70%	23	2,527	2,504	24,038	7,212	16,827	16,827
	total			***46***	***2,527***	***2,504***	***200,320***	***60,096***	***140,224***	140,224
175	818	50%	70%	242	2,658	2,416	96,640	28,992	67,648	67,648
	818	50%	50%	242	2,658	2,416	96,640	48,320	48,320	48,320
	total			***484***	***2,658***	***2,416***	***193,280***	***77,312***	***115,968***	115,968
125	814	100%	50%	260	1,366	1,106	88,480	44,240	44,240	44,240
	844	100%	50%	85	1,138	1,053	84,240	42,120	42,120	42,120
	total			***345***	***2,504***	***2,159***	***172,720***	***86,360***	***86,360***	86,360
75	582	100%	50%	917	1,963	1,046	83,680	41,840	41,840	41,840
	total			***917***	***1,963***	***1,046***	***83,680***	***41,840***	***41,840***	41,840
Buda	585	100%	100%	1,034	1,125	91	7,280	0	7,280	7,280
	807	100%	100%	2	1,444	1,442	115,360	0	115,360	115,360
	total			***1,036***	***2,569***	***1,533***	***122,640***	***0***	***122,640***	***122,640***
	Total	91%	63%	15,249	61,030	45,781	3,719,520	1,360,073	2,236,807	2,236,807

[1]U.S. Census Bureau - Decennial Census Estimates 2000.

[2]Population Projections by TSZ developed by CAMPO using Texas State Data Center (TSDC) Population Projections Developed for Hays County.

Table 3.5
Cost Analysis
No Action

Plant Size (X1000 gal)	TSZ #	Ave Flow (gpd)	Ave Flow (gpd)X5	Cost per gal	Plant Cost	Type	Design Line	Line Length (ft)	Line Cost	Collection Cost
225	580	203,392	1016960							
	total	203,392	1,331,400	$4.50	$1,012,500.00	G	12	13200	$35.00	$462,000.00
200	581	83,520	417600							
	583	106,680	533400							
	total	190,200	951,000	$4.50	$900,000.00	G	10	17160	$32.00	$549,120.00
250	591	364,896	1824480							
2 plants	total	364,896	1,824,480		$2,250,000.00					
	each	182,448	912,240	$4.50	$1,125,000.00	G	10	11550	$32.00	$369,600.00
175	819	85,880	429400							
	815	7,043	35212.8							
	815	78,810	394048							
	total	171,732	858,661	$4.50	$787,500.00	G	10	16830	$32.00	$538,560.00
450	589	283,640	1418200							
	831	0	0							
	830	0	0							
	817	0	0							
	805	784	3920							
	826	142,408	712040							
	total	426,832	2,134,160	$4.50	$1,920,744.00	G	14	16830	$32.00	$538,560.00
150	804	12,488	62440							
	809	43,736	218680							
	584	83,608	418040							
	total	139,832	699,160	$4.50	$675,000.00	G	8	16830	$28.00	$471,240.00
150	806	40,232	201160							
2 plants	806	225,299	1126496							
	total	265,531	1,327,656		$1,350,000.00					
	each	132,766	663,828	$4.50	$675,000.00	G	8	13200	$28.00	$369,600.00
125	803	72,480	362400							
	590	17,520	87600							
	total	90,000	450,000	$4.50	$562,500.00	G	8	17820	$28.00	$498,960.00
150	1043	123,397	616985.6							
	1043	16,827	84134.4							
	total	140,224	701,120	$4.50	$675,000.00	G	8	13860	$28.00	$388,080.00
125	818	67,648	338240							
	818	48,320	241600							
	total	115,968	579,840	$4.50	$562,500.00	G	8	8580	$28.00	$240,240.00
100	814	44,240	221200							
	844	42,120	210600							
	total	86,360	431,800	$4.50	$450,000.00	G	6	19800	$28.00	$554,400.00
50	582	41,840	209200							
	total	41,840	209,200	$4.50	$225,000.00	G	4	14190	$28.00	$397,320.00
Buda[1]	585	7,280								
	807	115,360								
	total	122,640		N/A				0		
	Total	2,236,807	11,498,477		$11,370,744.00					$4,839,120.00

[1] Cost analysis was not conducted on the Buda plant expansion

OSSF usage within each TSZ. For the No-Action plant model, these flow calculations can been seen in Table 3.4.

Due to the lack of regional wastewater collection management and high rates of OSSF use associated with this model, regulation of effluent and receiving stream water quality control would be greatly diminished. Unregulated development creates the possibility of a great amount of flow entering a single watershed verses limiting the flow to two watersheds, as seen in the regional model, or selected streams, as seen by the multiple plant model.

For the No-Action model, the term "No-Action" refers to no central planning for wastewater collection being in place. In this model, all wastewater collection would be determined by the developer(s) on a case-by-case basis. Many of the new developments would utilize OSSF due to lower development costs associated with alternative treatments. TSZs are expected to bear wastewater collection rates of 30–70%, with the remaining wastewater being treated by OSSF. TSZs located along the IH 35 corridor would posses the higher collection values, whereas the more rural zones would rely more upon OSSFs. Using the growth estimates and typical small plant sizes of 275,000 gpd and less, a total of 17 plants would be developed to accommodate the 2.4 MGD production within the TSZs.

No reuse was assumed for this model due to no incentive for reuse. This assumption is based upon the construction cost of running additional lines for reuse distribution lines would be less attractive to individual developers. Because no reuse is assumed, all 2.4 MGD, which is treated by the model's wastewater plants, would be discharged into the six main watersheds. Depending on the outfall locations of the 17 assumed plants, eutrophic conditions could arise in receiving steams and ponds during periods of low stream flow and high evaporation. Table 3.5 shows a cost analysis of the No-Action model. The calculated cost per LUE served was calculated to be $1,566, making this No-Action alternative the second most expensive of the three alternatives.

3.4.2 Regional Plants

In our model, PBS&J considered two plants, each serving a portion of the study area with collection and reuse. The two plant models utilized the future Winfield Plant and the existing Kyle Plant for wastewater treatment which are separated by a ridgeline dividing the planning area. The dividing line between the two regions begins at the northern portion of the study area adjacent to IH 35 and the north most point of TSZ 583 and ends at the southeastern corner of TSZ 814. All TSZs to the east of this line would be served by the Winfield Plant (Permit No. 14377-001). All TSZs located to the west of this line would be served by the Kyle Plant (Permit No. 11041-002). TSZs 585 and 807 would be served by the Buda plant (Permit No. 11060-001). TSZs served by each plant can be seen in Figure 3-9. For the regional plant model, capture rate calculations can be seen in Table 3.6.

By managing regional wastewater collection and treatment within the study area, the use of OSSF throughout the region could be reduced. Regional management of wastewater collection within the study

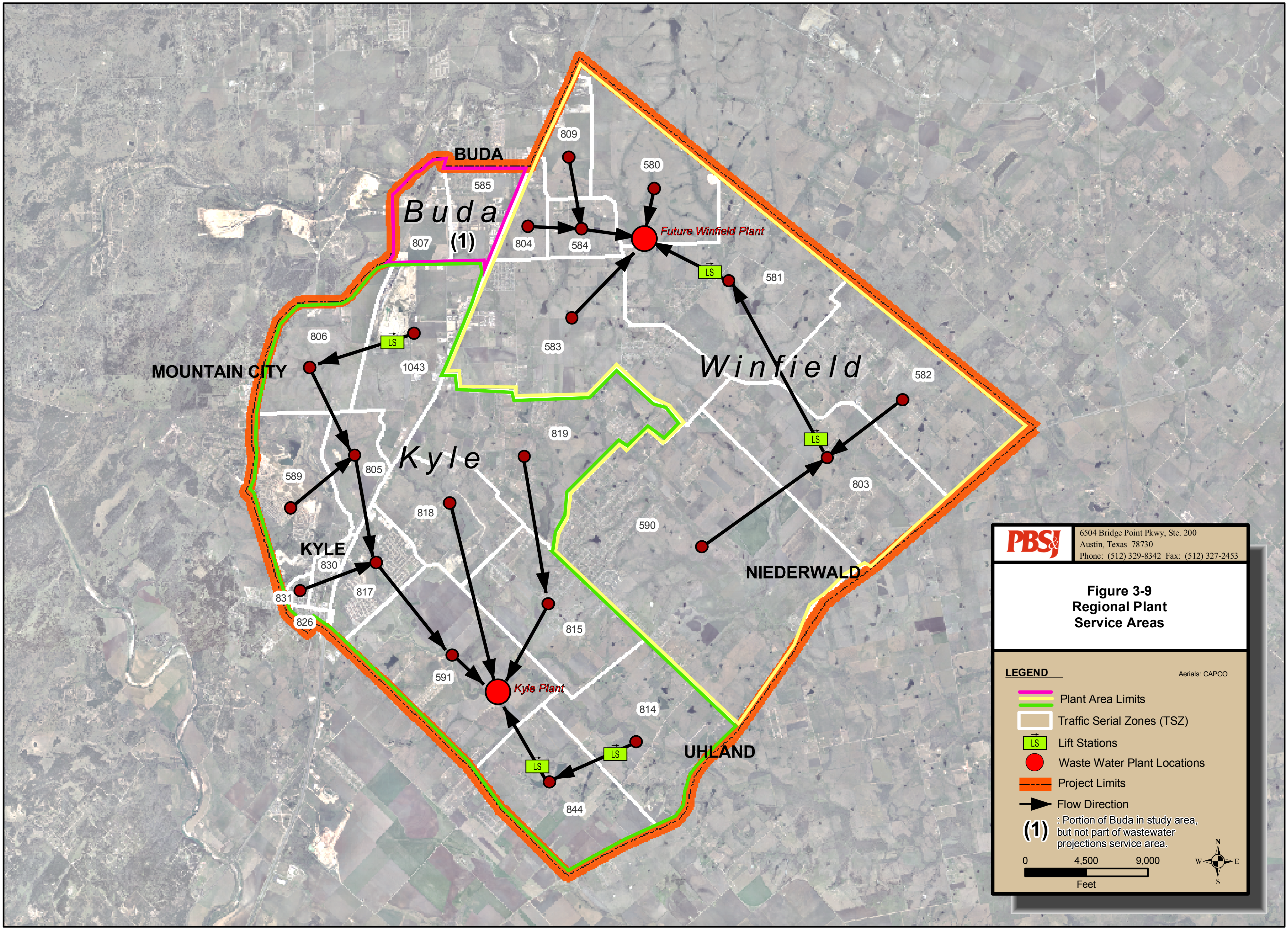

6504 Bridge Point Pkwy, Ste. 200
Austin, Texas 78730
Phone: (512) 329-8342 Fax: (512) 327-2453
Figure 3-9
Regional Plant
Service Areas
LEGEND
Aerials: CAPCO
Plant Area Limits
Traffic Serial Zones (TSZ)
Lift Stations
Waste Water Plant Locations
Project Limits
Flow Direction
(1) : Portion of Buda in study area, but not part of wastewater projections service area.
0
4,500
9,000
Feet
N
S
E
W
BUDA
Buda
(1)
MOUNTAIN CITY
Kyle
KYLE
Winfield
NIEDERWALD
UHLAND
Future Winfield Plant
Kyle Plant
LS
809
580
585
807
804
584
581
806
1043
583
582
819
589
805
803
818
590
830
817
831
826
815
591
814
844

TABLE 3.6
FLOW ANALYSIS
REGIONAL PLANTS

Region	TSZ #	% Area	% Captured	Population 2000 [1]	Population 2030 [2]	Numeric Change (2000 to 2030)	Flow Avg (gpd)	OSSF (gpd)	% Captured Avg (gpd)	% Reuse [3]	% Reuse Avg (gpd)	% Outfall Avg (gpd)
Winfield	809	100%	80%	25	806	781	62,480	12,496	49,984	15.50%	7,748	42,236
	582	100%	55%	917	1,963	1,046	83,680	37,656	46,024	15.50%	7,134	38,890
	584	100%	80%	198	1,691	1,493	119,440	23,888	95,552	15.50%	14,811	80,741
	804	100%	80%	82	305	223	17,840	3,568	14,272	15.50%	2,212	12,060
	580	100%	80%	0	3,632	3,632	290,560	58,112	232,448	15.50%	36,029	196,419
	583	100%	55%	1,981	4,648	2,667	213,360	96,012	117,348	15.50%	18,189	99,159
	590	50%	40%	3,018	3,748	730	29,200	17,520	11,680	15.50%	1,810	9,870
	590	50%	40%	3,018	3,748	730	29,200	17,520	11,680	15.50%	1,810	9,870
	581	100%	55%	392	2,480	2,088	167,040	75,168	91,872	15.50%	14,240	77,632
	803	100%	55%	384	2,196	1,812	144,960	65,232	79,728	15.50%	12,358	67,370
	Total		*62%*	*5,016*	*21,469*	*14,472*	*1,157,760*	*407,172*	*750,588*	*15.50%*	*116,341*	*634,247*
Kyle	591	100%	80%	200	6,716	6,516	521,280	104,256	417,024	15.50%	64,639	352,385
	589	100%	80%	746	5,811	5,065	405,200	81,040	324,160	15.50%	50,245	273,915
	806	20%	55%	3	5,032	5,029	80,464	36,209	44,255	15.50%	6,860	37,396
	806	80%	80%	3	5,032	5,029	321,856	64,371	257,485	15.50%	39,910	217,575
	1043	88%	55%	23	2,527	2,504	176,282	79,327	96,955	15.50%	15,028	81,927
	1043	12%	80%	23	2,527	2,504	24,038	4,808	19,231	15.50%	2,981	16,250
	818	50%	80%	242	2,658	2,416	96,640	19,328	77,312	15.50%	11,983	65,329
	818	50%	55%	242	2,658	2,416	96,640	43,488	53,152	15.50%	8,239	44,913
	805	100%	80%	17	2,560	2,543	203,440	40,688	162,752	15.50%	25,227	137,525
	819	100%	55%	1,646	3,793	2,147	171,760	77,292	94,468	15.50%	14,643	79,825
	844	100%	55%	85	1,138	1,053	84,240	37,908	46,332	15.50%	7,181	39,151
	814	85%	55%	260	1,366	1,106	75,208	33,844	41,364	15.50%	6,411	34,953
	814	15%	55%	260	1,366	1,106	13,272	5,972	7,300	15.50%	1,131	6,168
	815	6%	80%	947	3,043	2,096	10,061	2,012	8,049	15.50%	1,248	6,801
	815	94%	55%	947	3,043	2,096	157,619	70,929	86,691	15.50%	13,437	73,254
	817	100%	80%	1,417	1,431	14	1,120	224	896	15.50%	139	757
	831	100%	80%	304	160	-144	0	0	0	15.50%	0	0
	830	100%	80%	544	377	-167	0	0	0	15.50%	0	0
	826	100%	80%	782	380	-402	0	0	0	15.50%	0	0
	Total	*74%*	*69%*	*7,216*	*36,992*	*29,776*	*2,439,120*	*701,695*	*1,737,425*	*15.50%*	*269,301*	*1,468,124*
Buda	585	100%	100%	1,034	1,125	91	7,280	0	7,280	15.50%	1,128	6,152
	807	100%	100%	2	1,444	1,442	115,360	0	115,360	15.50%	17,881	97,479
	Total			*1,036*	*2,569*	*1,533*	*122,640*	*0*	*122,640*	*15.50%*	*19,009*	*103,631*
Total			***67%***	***13,268***	***61,030***	***45,781***	***3,719,520***	***1,108,867***	***2,610,653***	**15.50%**	***404,651***	***2,206,002***

[1]U.S. Census Bureau - Decennial Census Estimates 2000.

[2]Population Projections by TSZ developed by CAMPO using Texas State Data Center (TSDC) Population Projections Developed for Hays County.

[3]Reuse flow assumed to serve 681 aces based on average peak month turfgrass watering requirements

Table 3.7
Cost Analysis
Regional Plants

Region	TSZ #	Ave Flow (gpd)	Ave Flow (gpd)X5	Line Flow	Cost per gal	Plant Cost	Type	Design Line	Line Length	Line Cost per linear ft	Collection Cost	% Reuse Ave (gpd)[1]	Line Length	Line Size	Line Cost	Distribution Cost	Lift Station Cost
Winfield	809	49984	249,920	249,920			G	6.0	7,920	$28	$221,760.00	7,748					
	582	46024	230,120	230,120			G	6.0	10,890	$32	$348,480.00	7,134					
	584	95552	477,760	799,040			G	10.0	6,600	$32	$211,200.00	14,811					
	804	14272	71,360	321,280			G	6.0	5,940	$28	$166,320.00	2,212					
	580	232448	1,162,240	1,162,240			G	12.0	6,600	$35	$231,000.00	36,029	6,600	4	$22.00	$145,200.00	
	583	117348	586,740	586,740			G	4.0	12,870	$28	$360,360.00	5,639					
	590	23360	116,800	116,800			G	4.0	16,500	$28	$462,000.00	3,621					
	581	91872	459,360	1,204,920			F	12.0	10,560	$35	$369,600.00	14,240					$500,000.00
	803	79728	398,640	745,560			F	10.0	21,450	$32	$686,400.00	12,358					$500,000.00
	Total	750588	3752940		$3.00	$2,251,764.00			99,330.00		$3,057,120.00	103,791	6,600			$145,200.00	$1,000,000.00
Kyle	591	417024	2,085,120	6,613,788			G	24	5,610	$70	$392,700.00	64,639	5,610	6	$26.00	$145,860.00	
	589	324160	1,620,800	1,620,800			G	12	8,580	$35	$300,300.00	50,245					
	806	301740	1,508,700	2,089,628			G	16	9,900	$70	$693,000.00	46,770					
	1043	116186	580,928	580,928			F	8	11,220	$28	$314,160.00	18,009					$500,000.00
	818	130464	652,320	652,320			G	8	19,800	$28	$554,400.00	20,222					
	805	162752	813,760	4,524,188			G	21	11,550	$70	$808,500.00	25,227					
	819	94468	472,340	472,340			G	8	17,160	$28	$480,480.00	14,643					
	844	46332	231,660	474,980			F	8	12,540	$28	$351,120.00	7,181					$500,000.00
	814	48664	243,320	243,320			F	6	11,550	$28	$323,400.00	7,542					$500,000.00
	815	94739	473,696	946,036			G	10	10,560	$32	$337,920.00	14,685					
	817	896	4,480	4,528,668			G	21	13,200	$70	$924,000.00	139					
	831	0	0				G		0	$32	$0.00	0					
	830	0	0				G	4	8,250	$28	$231,000.00	0					
	826	0	0				G		0	$32	$0.00	0					
	Total	1737425	8,687,124		$3.00	$5,212,274.52			139,920		$5,710,980.00	269,301	5,610			$145,860.00	$1,500,000.00
Buda[2]	585		14,560									1,128					
	807		230,720									17,881					
	Total		245,280									19,009					
Total		2,488,013	12,440,064			$7,464,038.52			239,250		$8,768,100.00	373,092	12,210			$291,060.00	$2,500,000.00

[1]Reuse flow assumed to serve 681 aces based on average peak month turfgrass watering requirements

[2] Cost analysis was not conducted on the Buda plant expansion

area would also reduce the number of developer package plants. This would give the region greater potential control over receiving stream water quality by limiting the number of treatment facilities located on the streams. Limiting the amount of discharge points is crucial in minimizing potential adverse environmental effects upon the existing ecosystems. One such cause of these adverse effects could be caused by excess nutrients being discharged into multiple low flowing receiving bodies.

For the regional plant model, TSZs are expected to provide wastewater collection rates of 40–80 percent, with the remaining wastewater being treated by OSSFs. As explained in Section 3.3, TSZs located along the IH 35 corridor would posses the higher collection values, whereas the more rural zones would rely more upon OSSFs. Using the anticipated population growth, the Winfield plant would treat 700,000 gpd, and the Kyle plant would treat a calculated 1.8 million gallons per day (MGD). Total anticipated collection of 2.6 MGD is anticipated for the study area. 15.5 percent reuse was assumed for this model, based on anticipated flows and OSSF usage patterns. With reuse measures in place, an assumed 2.2 MGD would still be discharged into the study area. However, by having only two plants discharging, the water quality impacts upon the six watersheds could be minimized, thus further protecting them from pollution and/or eutrophic conditions. For this model, cost per LUE was calculated at $1,705, as seen in Table 3.7, which was the most costly of the three models analyzed.

3.4.3 Multiple Plants

Multiple Small Plants is a five-plant model, with each plant serving a portion of the planning area with wastewater collection and reuse. The five developed regions are color-coded, and can be viewed in Figure 3-10. Flow calculations for each region, which are shown to the right of each plant name, can be seen in detail in Table 3.8.

- Winfield Plant: 629,000 gpd, NE Section (Yellow)
- Porter Plant: 581,000 gpd, Central Section (Blue)
- Kyle Plant: 1.5 MGD, NW Section (Green)
- Sweetwater Plant: 175,000 gpd, SE Section (DK Green)
- Uhland Plant: 135,000 gpd, SW Section (Orange)

Through the use of proper water management within the regional wastewater collection areas, the use of OSSFs throughout the region could be reduced. The smaller, multiple plants alternative allows for management of wastewater collection within the planning area, reducing the number of developer package plants seen in the “No-Action” model and reducing the number of residents relying upon OSSFs.

Effluent reuse would be more readily utilized in the multiple plant alternative than in the regional plant alternative due to the reduced capital necessary per treated MGD in order to distribute the reused effluent. The five regions alternative within this model of 84 percent of service units would be connected to the system. The remaining 16 percent would still use OSSF. However this represents only .57 MGD of OSSF

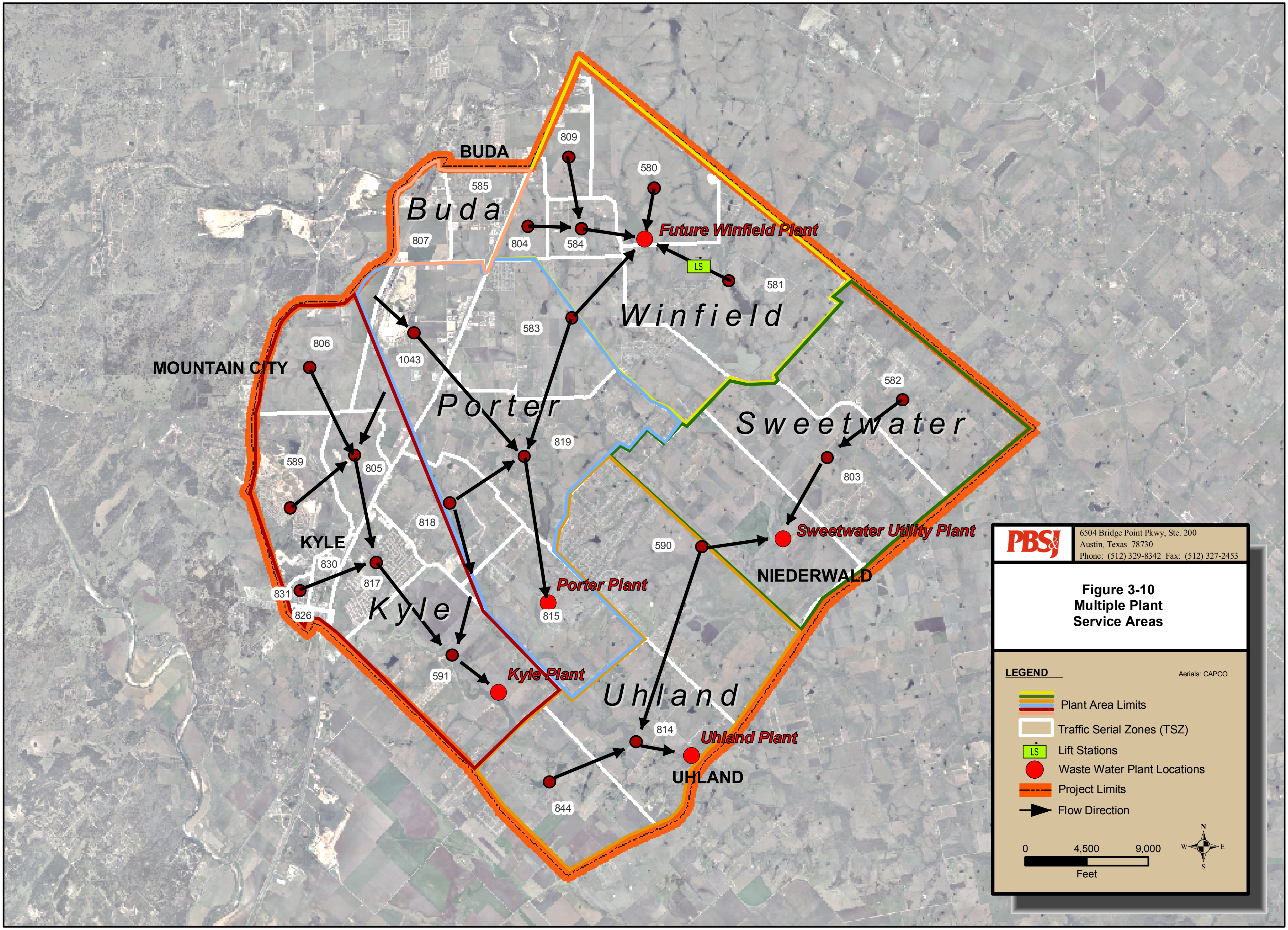

BUDA
Buda
585
807
809
804
584
580
Future Winfield Plant
LS
581
Winfield
583
1043
806
MOUNTAIN CITY
Porter
819
589
805
818
KYLE
830
817
831
826
Kyle
591
Kyle Plant
Porter Plant
815
582
Sweetwater
803
Sweetwater Utility Plant
590
NIEDERWALD
Uhland
814
Uhland Plant
UHLAND
844
PBSJ
6504 Bridge Point Pkwy, Ste. 200
Austin, Texas 78730
Phone: (512) 329-8342 Fax: (512) 327-2453
Figure 3-10
Multiple Plant
Service Areas
LEGEND
Aerials: CAPCO
Plant Area Limits
Traffic Serial Zones (TSZ)
LS
Lift Stations
Waste Water Plant Locations
Project Limits
Flow Direction
0
4,500
9,000
Feet
N
W
E
S

TABLE 3.8
FLOW ANALYSIS
MULTIPLE PLANTS

Plant	TSZ #	% Area	% Captured	Population 2000 [1]	Population 2030 [2]	Numeric Change (2000 to 2030)	Average Flow (gpd)	OSSF (gpd)	% Captured Avg (gpd)	% Reuse [3]	% Reuse Avg (gpd)	% Outfall Avg (gpd)
Winfield	581	100%	70%	392	2,480	2,088	167,040	50,112	116,928	31.00%	36,248	80,680
	580	100%	95%	0	3,632	3,632	290,560	14,528	276,032	31.00%	85,570	190,462
	804	100%	95%	82	305	223	17,840	892	16,948	31.00%	5,254	11,694
	584	100%	95%	198	1,691	1,493	119,440	5,972	113,468	31.00%	35,175	78,293
	583	31%	70%	1,981	4,648	2,667	66,142	19,842	46,299	31.00%	14,353	31,946
	809	100%	95%	25	806	781	62,480	3,124	59,356	31.00%	18,400	40,956
	Total	89%	87%	2,678	13,562	10,884	723,502	94,470	629,031		195,000	434,031
Porter	583	69%	70%	1,981	4,648	2,667	147,218	44,166	103,053	31.00%	31,946	71,106
	815	94%	70%	947	3,043	2,096	157,619	47,286	110,333	31.00%	34,203	76,130
	819	100%	70%	1,646	3,793	2,147	171,760	51,528	120,232	31.00%	37,272	82,960
	1043	88%	70%	23	2,527	2,504	176,282	52,884	123,397	31.00%	38,253	85,144
	806	20%	70%	3	5,032	5,029	80,464	24,139	56,325	31.00%	17,461	38,864
	818	50%	70%	242	2,658	2,416	96,640	28,992	67,648	31.00%	29,958	37,690
	Total	70%	70%	4,842	21,701	16,859	829,983	248,995	580,988		189,094	391,894
Kyle	591	100%	95%	200	6,716	6,516	521,280	26,064	495,216	31.00%	153,517	341,699
	589	100%	95%	746	5,811	5,065	405,200	20,260	384,940	31.00%	119,331	265,609
	831	100%	95%	304	160	-144	0	0	0	31.00%	0	0
	830	100%	95%	544	377	-167	0	0	0	31.00%	0	0
	815	6%	95%	947	3,043	2,096	10,061	503	9,558	31.00%	2,963	6,595
	826	100%	95%	782	380	-402	0	0	0	31.00%	0	0
	805	100%	95%	17	2,560	2,543	203,440	10,172	193,268	31.00%	59,913	133,355
	817	100%	95%	1,417	1,431	14	1,120	56	1,064	31.00%	330	734
	1043	12%	95%	23	2,527	2,504	24,038	1,202	22,836	31.00%	7,079	15,757
	818	50%	95%	242	2,658	2,416	96,640	4,832	91,808	31.00%	28,460	63,348
	806	80%	95%	3	5,032	5,029	321,856	16,093	305,763	31.00%	94,787	210,977
	Total	77%	95%	5,225	30,695	25,470	1,583,635	79,182	1,504,453		466,381	1,038,073
Uland	844	100%	70%	85	1,138	1,053	84,240	25,272	58,968	31.00%	18,280	40,688
	814	100%	70%	260	1,366	1,106	88,480	26,544	61,936	31.00%	19,200	42,736
	590	50%	50%	3,018	3,748	730	29,200	14,600	14,600	31.00%	4,526	10,074
	Total	83%	63%	3,363	6,252	2,889	201,920	66,416	135,504		42,006	93,498
SW	803	100%	70%	384	2,196	1,812	144,960	43,488	101,472	31.00%	31,456	70,016
	582	100%	70%	917	1,963	1,046	83,680	25,104	58,576	31.00%	18,159	40,417
	590	50%	50%	3,018	3,748	730	29,200	14,600	14,600	31.00%	4,526	10,074
	Total	83%	63%	4,319	7,907	3,588	257,840	83,192	174,648		54,141	120,507
Buda	807	100%	100%	2	1,444	1,442	115,360	0	115,360	31.00%	35,762	79,598
	585	100%	100%	1,034	1,125	91	7,280	0	7,280	31.00%	2,257	5,023
	Total	100%	100%	1,036	2,569	1,533	122,640	0	122,640		38,018	84,622
Total			82%	14,989	61,030	45,781	3,719,520	572,255	3,147,265	31%	984,640	2,162,625

[1]U.S. Census Bureau - Decennial Census Estimates 2000.
[2]Population Projections by TSZ developed by CAMPO using Texas State Data Center (TSDC) Population Projections Developed for Hays County.
[3]Reuse flow assumed to serve 681 aces based on annual average peak month turf grass watering requirements

Table 3.9
Cost Analysis
Multiple Plants

Plant	*TSZ #*	*Ave Flow (gpd)*	*Ave Flow (gpd)X5*	*Calculated Flow*	*Cost per gal*	*Plant Cost*	*Type*	*Line Length*	*Design Line*	*Line Cost*	*Collection Cost*	*% Reuse Ave (gpd)* [1]	*Line Length*	*Line Size*	*Line Cost*	*Distribution Cost*	*Lift Station Cost*
Winfield	581	116928	584,640	584,640			F	10,560	8	$28.00	$295,680.00	36,248					$500,000.00
	580	276032	1,380,160	1,380,160			G	6,600	12	$35.00	$231,000.00	85,570	6,600	4	$22.00	$145,200.00	
	804	16948	84,740	84,740			G	12,870	4	$28.00	$360,360.00	5,254					
	584	113468	567,340	948,860			G	6,600	10	$32.00	$211,200.00	35,175					
	583	46299	231,496	231,496			G	12,870	6	$28.00	$360,360.00	14,353					
	809	59356	296,780	296,780			G	6,600	6	$28.00	$184,800.00	18,400					
	Total	*629,031*	*3,145,156*		*$3.00*	*$1,887,093.36*		*56,100*			*$1,643,400.00*	*195,000*	*6,600*		*$22.00*	*$145,200.00*	*$500,000.00*
Porter	583	103053	515,264	515,264			G	10,890	8	$28.00	$304,920.00	31,946					
	815	110333	551,667	551,667			G	1,650	8	$28.00	$46,200.00	34,203					
	819	120232	601,160	1,838,010			G	14,520	16	$70.00	$1,016,400.00	37,272					
	1043	123397	616,986	898,610			G	15,510	10	$32.00	$496,320.00	38,253	15,510	4	$22.00	$341,220.00	
	806	56325	281,624	281,624			G	5,940	6	$28.00	$166,320.00	17,461					
	818	67648	338,240	338,240			G	11,220	6	$28.00	$314,160.00	29,958					
	Total	*580,988*	*2,904,941*		*$3.00*	*$1,742,964.72*		*59,730*			*$2,344,320.00*	*191,974*	*15,510*			*$341,220.00*	
Kyle	591	495216	2,476,080	5,046,187			G	5,610	24	$74.00	$415,140.00	153,517	5,610	6	$26.00	$145,860.00	
	589	384940	1,924,700	1,924,700			G	7,260	16	$70.00	$508,200.00	119,331					
	831	0	0				G	0		$28.00	$0.00	0					
	830	0	0				G	0		$28.00	$0.00	0					
	815	9558	47,789	506,829			G	6,600	8	$28.00	$184,800.00	2,963					
	826	0	0				G	7,260	4	$28.00	$203,280.00	0					
	805	193268	966,340	4,534,038			G	9,240	21	$74.00	$683,760.00	59,913					
	817	1064	5,320	4,539,358			G	11,880	21	$74.00	$879,120.00	330					
	1043	22836	114,182	114,182			G	6,600	4	$28.00	$184,800.00	7,079					
	818	91808	459,040	459,040			G	7,590	8	$28.00	$212,520.00	28,460					
	806	305763	1,528,816	1,528,816			G	10,230	12	$35.00	$358,050.00	94,787					
	Total	*1,504,453*	*7,522,267*		*$3.00*	*$4,513,360.32*		*72,270*			*$3,629,670.00*	*466,381*	*5,610*			*$145,860.00*	
Uland	844	58968	294,840	294,840			G	9,900	6	$28.00	$277,200.00	18,280			$22.00	$0.00	
	814	61936	309,680	677,520			G	4,620	8	$28.00	$129,360.00	16,320					
	590	14600	73,000	73,000			G	16,500	4	$28.00	$462,000.00	4,526					
	Total	*135,504*	*677,520*		*$4.50*	*$609,768.00*		*31,020*			*$868,560.00*	*39,126*	*0*			*$0.00*	
SW	803	101472	507,360	800,240			G	10,230	10	$32.00	$327,360.00	31,456			$22.00	$0.00	
	582	58576	292,880	292,880			G	9,240	6	$28.00	$258,720.00	18,159					
	590	14600	73,000	73,000			G	6,600	4	$28.00	$184,800.00	4,526					
	Total	*174,648*	*873,240*		*$4.50*	*$785,916.00*		*26,070*			*770,880*	*54,141*	*0*			*$0.00*	
Buda [2]	807		576,800									35,762					
	585		36,400									2,257					
	Total	*0*	*613,200*									*38,018*					
Total		3,024,625	15,123,124			$9,539,102.40		245,190			$9,256,830.00	946,621	27,720			$632,280	$500,000

[1] Reuse flow assumed to serve 681 aces based on average peak month turfgrass watering requirements

[2] Cost analysis was not conducted on the Buda plant expansion

flow, which is half of the flow seen in the regional model. This additional collection would increase the available amount of reuse from each plant, which would be made available for redistribution residential and industrial uses. All calculated flows for this model can be seen in Table 3.8.

For the Multiple Plants model, TSZs are expected to provide wastewater collection rates of 50–95 percent, with the remaining wastewater being treated by OSSFs. TSZs located along the IH 35 corridor would possess the higher collection values, whereas the more rural zones would rely more upon OSSFs, as discussed in Section 3.3.

Total anticipated collection of 3.15 MGD is anticipated for the planning area. Reuse of 31 percent was assumed for this model, based on anticipated flows and OSSF usage patterns and an increase in residential clusters. With reuse measures in place, an assumed 2.4 MGD would still be discharged into the study area. However, almost 1 MGD would be recovered for reuse within local industry and residential landscapes. The calculated cost per LUE for this model was $1,467, the least costly of all the models. A breakdown of these costs can be viewed in Table 3.9.

3.5 REUSE REQUIREMENTS

For reuse to be accomplished, the study area must be able to produce what is referred to as Type I or Type II effluent, depending on the intended purpose. The table below displays the types, standards and reuse applications for wastewater reuse as specified by 30 TAC Ch. 210.31-36.

The main objectives for reuse are water conservation, water quality preservation, and generation of income, which should be the goals of any government organization. By reusing WWTP effluent, the study area will utilize up to 1 MG of irrigation water per day, which will aid in decreasing peak water demands. This supply of reuse water will continue to increase in flow as the study area grows, making it more cost effective to extend service.

The TWDB states three main benefits of wastewater effluent reuse:

1. It is a relatively drought-proof water resource.
2. It is the only source of water that automatically increases with economic and population growth.
3. The need for the treated wastewater/effluent is usually near the source, rather than at a remote location, thereby reducing transportation costs.

Type of Effluent	Reuse Applications	Required Quality	Required Monitoring	Setback Distances
Type I Disinfected Tertiary	Urban reuse Food crop irrigation Recreational Impoundments	pH = 6 – 9 BOD5 ≤ 10 milligram per liter (mg/L) Turb. ≤ 2 NTU E. Coli = 0 Res. Cl2 ≥ 1 mg/L	pH = weekly BOD5 = weekly Turb. = cont. E. Coli = daily Res. Cl2 = cont.	15 meters (50 feet) to potable water supply wells
Type II Disinfected Secondary	Restricted access irrigation Food crop irrigation (commercially processed) Non food crop irrigation Landscape impoundments (restricted access) Construction Wetlands Habitat	pH = 6 – 9 BOD5 ≤ 30 mg/L TSS ≤ 30 mg/L E. Coli ≤ 200/100 mL Res. Cl2 ≥ 1 mg/L	pH = weekly BOD5 = weekly Turb. = daily E. Coli = daily Res. Cl2 = cont.	30 meters (100 feet) to areas accessible to the public (if spray irrigation) 90 meters (300 feet) to potable water supply wells

4.0 WATER QUALITY ANALYSIS

As described in the previous section, three wastewater alternatives are considered:

1. Continued individual development with no provision for public wastewater service, i.e., No-Action;
2. Two larger regional wastewater facilities, with limited reuse, and
3. Five smaller regional wastewater facilities “Multiple Plants” with reuse being emphasized.

This section analyzes the likely water quality effects of each alternative. Before going into the effects analysis, the subwatersheds are described.

4.1 WATERSHED DESCRIPTIONS

Subwatersheds of the tributaries of Plum Creek in the study area were delineated as shown in Figure 1-2. In a southwest to northeast direction, the subwatersheds are Plum Creek, Bunton Branch, Porter Creek, Brushy Creek, Upper Brushy Creek, and Elm Creek. For the purpose of this analysis, the downstream limit of the watershed is at the confluence of Plum Creek and Elm Creek. Also shown on Figure 1-2 is the location of existing wastewater outfalls. Table 4.1 presents a summary of the existing wastewater facilities including size, effluent permit limits, and current status.

An important point from a water quality perspective is that the study area is at the upper end of the Plum Creek watershed, and all of the contributing subwatersheds are too small to have a sustained flow. All are intermittent streams and do not appear to have naturally occurring perennial pools that would indicate support of aquatic life uses, as defined by the Texas Commission on Environmental Quality (TCEQ). This is potentially important because streams that do not support aquatic life uses have lower or less demanding water quality criteria and typically do not require as high a level of wastewater treatment as discharges to streams that do support aquatic life uses. Lower treatment requirements can translate into easier permitting. On the other hand, the man-made reservoirs that have been constructed (see below) may be interpreted as perennial pools.

To facilitate a comparison of the subwatersheds, Table 4.2 presents the characteristics of each. The data include watershed area, length and average slope of the main stream, land use/land cover, vegetation, number of ponds, number of wastewater outfalls and permitted discharge flow rate, and CCN areas. The land use/land cover and vegetation data are somewhat dated. Each subwatershed is shown to consist largely of cropland and pasture. A more recent land use characterization would probably indicate the bulk of the land is in pasture rather than cropland, with a higher percentage of residential use.

One significant difference among the subwatersheds is that Bunton Branch and Elm Creek currently have no wastewater discharges. One component of wastewater planning will be to avoid discharge to these

TABLE 4.1
OUTFALL INFORMATION

Permit #	Name	Facility category	Permit limits [1]								Outfall status [1]	Permit status [2]
			Flow (MGD)	CBOD5 (mg/L)	NH3-N (mg/L)	DO (mg/L)	min pH (SU)	max pH (SU)	TSS (mg/L)	TP (mg/L)		
11041	City of Kyle	Municipal	1.5	10	3	5	6	9	15		Active	Issued
11060	City of Buda	Municipal	0.6	10	3	4	6	9	15	2	Active	Amending (major)
13293	Aquasource Utility Inc	Municipal	0.0424	10	3	4	6	9	15		Active	Renewing
14060	Aus-Tex Parts & Services Ltd	Municipal	0.0225	10		2	6	9	15		Active	Issued
14094	Sweetwater Utility LLC	Municipal	0.026	20	2	2	6	9	20		Inactive	Issued
14165	Railyard GP LLC	Municipal	0.08	10		2	6	9	15		Inactive	Renewing
14377	Athena Equity Partners Hays LP and GBRA [3]	Municipal	0.25 [5]	5	2	4	6	9	5	1	Inactive	Issued
14439	Uhland 405 Partners LP [4]	Municipal	0.7									New, not yet issued

[1] From EPA Permit Compliance System (PCS) Database, as of 9/30/04.
[2] From TCEQ web site for Industrial and Municipal Wastewater Permit Applications Query, as of 9/30/04.
[3] Proposed Winfield Plant.
[4] No data in EPA PCS for this discharger.
[5] Initial phase. Final phase 0.99 mgd.

TABLE 4.2
SUBWATERSHED CHARACTERISTICS

	Plum Creek	Bunton Branch	Porter Creek	Brushy Creek	Upper Brushy Creek	Elm Creek
Watershed area (sq. miles)	33.7	8.2	11.4	12.6	12.9	34.2
Main stream length (miles)	22.4	11.5	15.4	12.7	8.8	13.7
Main stream average slope	0.0034	0.0031	0.0023	0.0033	0.0019	0.0042
Land Use/Land Cover [1]						
Commercial Services	0.4%	0.2%				
Cropland and Pasture	94.0%	93.2%	94.1%	90.5%	95.4%	83.8%
Deciduous Forest Land	0.5%					
Herbaceous Rangeland				0.0%		0.5%
Mixed Rangeland	1.2%	0.2%				3.1%
Reservoirs	0.4%	0.6%	0.8%	0.9%	2.1%	0.7%
Residential	1.9%	0.6%	0.9%	1.7%	1.9%	1.1%
Shrub and Brush Rangeland	0.8%				0.6%	10.7%
Strip Mines, Quarries, and Gravel Pits		3.7%	0.0%			
Transitional Areas			2.4%	6.9%		
Transportation, Communications	1.0%	1.5%	1.7%			0.0%
Vegetation [2]						
Crops	67.4%	9.6%	0.3%	21.5%	25.1%	92.9%
Live Oak Ash-Juniper Wood	1.6%	3.2%				
Live Oak Mesquite Ash Juniper Parks		11.0%	1.0%			
Post Oak Woodland Forest Grassland						0.0%
Post-Oak Woods Forest						0.5%
Other (Pasture)	31.0%	76.2%	98.7%	78.5%	74.9%	6.6%
Number of ponds [3]	7	1	1	1	3	4
Wastewater treatment plants						
Outfall	11041-002		11060-001	13293-001 14060-001 14165-001 [4]	14377-001 [4] 14094-001 [4]	
Total permitted discharge [5] (MGD)	1.5	0	0.6	0.145	0.276	0
CCN-Water [6] (sq. miles)	18.5	7.1	11.4	9.5	11.9	7.7
CCN-Wastewater [6] (sq. miles)	13.6	6.4	0.7	3.2	4.9	7.9

[1] Data publication date is 1990. Data collected in 70s or 80s.
[2] Data acquired between 1972 and 1976.
[3] Ponds managed by Plum Creek Conservation District.
[4] Inactive.
[5] From EPA Permit Compliance System Database.
[6] In Hays County.

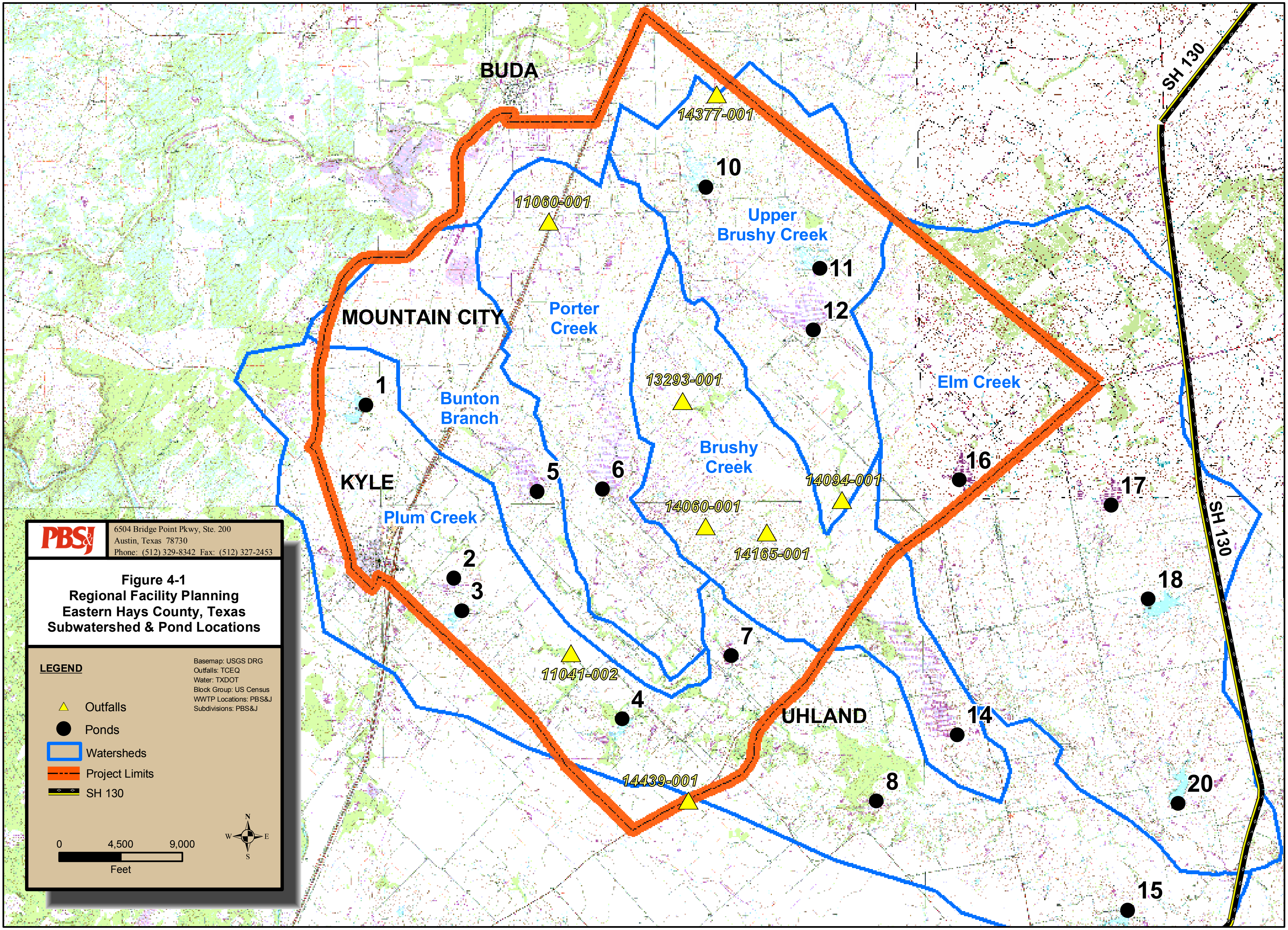
streams. Although the Bunton Branch subwatershed would see a substantial increase in population, this population could be served by one or more WWTPs that discharged into an adjacent subwatershed.

Another salient feature of the subwatersheds in the study area is the reservoirs, frequently referred to as ponds. Reservoirs or ponds are potentially important because they can exhibit adverse reactions to wastewater discharges more easily than open stream reaches. It is possible that TCEQ will interpret these structures as perennial pools. If that is done, the receiving streams would be afforded higher dissolved oxygen (DO) criteria, and the ponds themselves might be viewed as lakes, with still higher DO criteria. Figure 4-1 shows the locations of 17 ponds constructed under the auspices of the U.S. Soil Conservation Service (now Natural Resource Conservation Service [NRCS]) and private landowners mainly during the 1950s and 1960s. This was during a time when most of the study area was being farmed. Details of the ponds are shown on Table 4.3. The pond numbering system was assigned by the Plum Creek Conservation Association, which supplied the data on the ponds. Ponds 9, 13, and 19 are either outside of the study area or were not constructed.

The ponds shown were constructed to serve both flood detention and soil retention functions. They vary in size substantially. The smallest pond watershed is only 0.87 square mile, while the largest, #14, drains over 15 square miles. These ponds are designed to impound a substantial volume of water during heavy rains and release it slowly following the rains. There are two surface areas listed for the ponds in Table 4.3. These are illustrated in Figure 4-2. One is the area of the sediment pool. This is the pond area at the elevation of the top of the standpipe or riser that drains water from the floodwater pool. The area of the floodwater pool area is substantially larger than the sediment pool. Typically water is retained in the sediment pool, but during prolonged dry periods this part of the pool can go dry unless there is some other source of water, such as a spring or wastewater discharge.

Another dimension that needs to be recognized with the ponds is the location of the upstream boundary. As can be seen, these ponds are designed to vary in size with the amount of runoff flow. The boundary between the stream and lake would be the boundary between stream and lake DO criteria. Establishing this boundary can be a technical challenge. If they are considered to be lakes, the higher DO criteria that apply can make it more difficult for a wastewater discharger to demonstrate attainment of DO criteria in the stream leading to the “lake.”

The above discussion is not intended to suggest that the ponds are water quality problems, but rather to alert the reader to potential issues that may arise in the water quality analysis process. The ponds were built as flood control and sediment retention structures, but may ultimately be viewed as environmental enhancements that need to be protected. The analysis of water quality effects that follows is designed to treat all the ponds in an equal fashion, without getting into the details of possible permit hearing situations. But the reader should be aware that the permitting process can produce some surprises when rules designed for rivers and lakes are applied to smaller intermittent streams and ponds.



File:N:\710013\esri\Report_maps\figure_4_1

2/22/2005

TABLE 4.3
STRUCTURE DATA – FLOODWATER RETARDING STRUCTURES
Plum Creek Watershed, Texas
(Data provided by Plum Creek Conservation District)

Item	Unit	1	2	3	4	5	6	7	8	10	11	12	14	15	16	17	18	20
Drainage Area	Sq. Mi.	2.14	2.81	0.48	0.87	6.17	8.40	0.77	2.07	1.89	3.86	1/ 3.62	1/15.11	1.50	5.05	8.56	2.53	1.95
Storage Capacity																		
Sediment Pool (200 AC. or Less)	Ac. Ft.	91	199	64	93	197	197	86	166	181	200	199	193	112	199	196	198	166
Sediment Reserve Below Riser	Ac. Ft.	0	41	0	0	230	833	0	0	0	47	187	1,177	0	232	580	31	0
Sediment in Detention Pool	Ac. Ft.	12	30	8	9	66	90	12	22	20	41	58	161	16	54	91	27	21
Floodwater	Ac. Ft.	885	764	154	267	1,777	2,643	243	596	575	1,132	1,139	4,206	448	1,845	2,552	769	593
Total	Ac. Ft.	988	1,034	226	369	2,270	3,763	341	784	776	1,420	1,583	5,737	576	2,330	3,419	1,025	780
Surface Area																		
Sediment Pool 2/	Acre	27	43	11	12	71	167	11	22	34	48	89	177	15	73	152	44	26
Floodwater Pool	Acre	106	120	32	32	197	355	32	63	96	136	228	435	43	229	375	120	70
Volume of Fill	Cu. Yd.	205,400	147,400	43,500	78,200	177,200	241,400	83,300	140,500	95,500	150,400	105,600	319,000	124,600	226,600	95,200	116,900	122,400
Elevation Top of Dam	Foot	763.7	662.7	662.6	621.0	668.0	642.6	606.3	561.9	685.6	645.9	619.8	541.0	515.6	558.8	548.9	540.4	493.3
Principal Spillway Elevation	Foot	744.6	647.6	652.2	602.8	644.7	620.0	590.6	541.3	671.9	626.4	604.7	510.8	494.0	537.0	527.9	524.7	474.9
Maximum Height of Dam	Foot	32	35	25	37	33	36	35	41	34	33	27	42	46	50	32	35	34
Emergency Spillway																		
Crest Elevation	Foot	758.5	658.5	660.0	617.0	663.0	638.5	603.0	557.0	681.0	641.0	615.0	536.0	511.0	554.0	544.0	535.5	488.5
Bottom Width	Foot	150	150	100	80	310	350	100	110	100	220	400	750	120	450	340	140	120
Type	–	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 3/	–	1.27	3.33	2.50	2.77	2.88	2.33	2.63	3.03	3.13	3.24	2.82	3.39	3.31	1.85	3.03	3.08	2.94
Average Curve No. - Condition II		81	81	81	81	82	81	81	81	81	81	81	81	83	83	83	83	83
Emergency Spillway Hydrograph																		
Storm Rainfall (6-Hour) 4/	Inch	10.97	7.25	7.64	7.53	6.97	6.84	7.65	7.33	7.35	7.14	6.28	6.54	7.42	10.58	6.83	7.27	7.35
Storm Runoff	Inch	8.58	5.04	5.40	5.30	4.88	4.65	5.33	5.11	5.12	4.94	4.14	4.38	5.42	8.46	4.87	5.28	5.36
Velocity of Flow (Vc) 5/	Ft. / Sec.	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.5	0.0	1.3	1.8	2.5	1.2	1.3	1.1
Discharge Rate 6/	c.f.s.	218	0.0	0.0	0.0	0.0	0.0	0.0	0.0	138	326	0.0	1,047	280	1,999	415	196	92
Maximum Water Surface Elev. 6/	Foot	759.6	–	–	–	–	–	–	–	681.9	642.0	–	537.1	512.3	555.8	545.0	536.6	489.2
Freeboard Hydrograph																		
Storm Rainfall (6-Hour) 7/	Inch	25.24	17.75	18.72	18.45	17.08	16.76	18.52	17.96	18.00	17.49	15.39	15.39	18.17	24.34	16.72	17.81	18.00
Storm Runoff	Inch	22.45	15.21	16.17	15.91	15.00	14.23	15.97	15.42	15.46	14.95	12.88	12.88	15.92	21.55	14.49	15.57	15.75
Velocity of Flow (Vc) 8/	Ft. / Sec.	9.7	8.6	6.5	8.4	9.4	8.4	7.5	9.5	9.2	9.4	8.9	9.2	9.2	9.3	9.3	9.3	9.3
Discharge Rate 6/	c.f.s.	4,423	3,065	847	1,520	8,093	6,421	1,405	2,950	2,478	5,816	8,990	18,747	3,000	11,110	8,755	3,604	3,082
Maximum Water Surface Elev. 6/	Foot	763.7	662.7	662.6	621.0	668.0	642.6	606.3	561.9	685.6	645.9	619.8	541.0	515.6	558.8	548.9	540.4	493.3
Principal Spillway																		
Capacity - (Maximum)	c.f.s.	27	35	8	11	77	104	10	26	12	24	59	153	10	41	55	16	18
Capacity Equivalents																		
Sediment Volume (200 Ac. or Less)	Inch	0.80	1.33	2.50	2.00	0.60	0.44	2.10	1.50	1.80	0.97	1.03	0.24	1.40	0.74	0.43	1.47	1.60
Sediment Reserve Below Riser	Inch	xx	0.27	xx	xx	0.70	1.86	XX	XX	XX	0.23	0.97	1.46	xx	0.86	1.27	0.23	xx
Sediment in Detention Pool	Inch	0.10	0.20	0.30	0.20	0.20	0.20	0.30	0.20	0.20	0.20	0.30	0.20	0.20	0.20	0.20	0.20	0.20
Detention Volume	Inch	7.75	5.10	6.03	5.75	5.40	5.90	5.90	5.40	5.70	5.50	5.90	5.22	5.60	6.85	5.59	5.70	5.70
Spillway Storage	Inch	5.60	3.90	3.77	3.15	3.34	3.70	2.85	2.25	5.05	3.90	6.95	2.88	2.80	4.80	4.56	5.00	3.50
Class of Structure	–	B	A	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A

1/ Excluding the area from which runoff is controlled by other structures.

2/ Surface area to the top of the riser.

3/ Is the percent chance that the emergency spillway will function in any given year.

4/ For Class A structures 0.5 x P of the 6-hour rainfall shown by figure 3.21 - 1, NEH-4, Supplement A, and 0.75 x P for Class B structures.

5/ Where velocity is shown it was obtained from the formula V = Q/A and was determined from the routed Hp and Q. Critical velocity was not attained by outflow of the emergency spillway hydrographs.

6/ Values obtained from routing.

7/ For Class A structures 1.23 x P, Class B structures 1.73 x P, for 6-hour rainfall shown on figure 3.21-1, NEH, Sec. 4, Suppl. A.

8/ Obtained from curves drawn from figure 4-R-11472 revised 3/59 and ES 98 dated 4-27-55, based on flows obtained from graphical routing of Freeboard Hydrograph

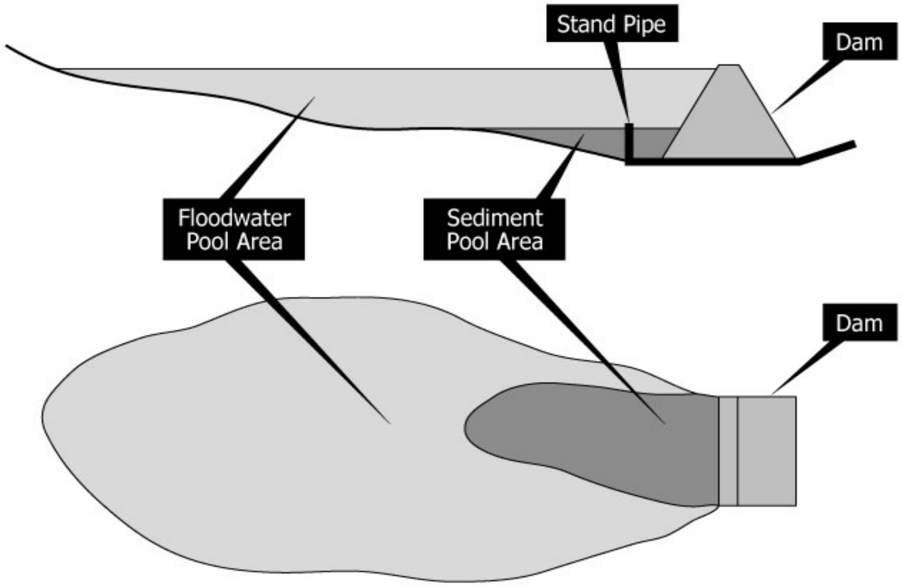


Figure 4-2: Schematic of Ponds in Study Area

4.2 ALTERNATIVE DESCRIPTIONS

As noted at the beginning of the section, three alternatives are considered in this wastewater facilities planning study, no-action, two larger regional facilities, and five smaller regional facilities that emphasize wastewater reuse. A critical element of the wastewater analysis is wastewater reuse, and how this can best be encouraged. One reason for the emphasis on reuse is the overall shortage of water in the planning area and the need to conserve. A second reason is that to the extent that wastewater is reused, it is not discharged and thus has less water quality impact.

Table 4.4 summarizes the population growth and wastewater flows for each scenario. In each scenario the population growth and increase in wastewater flow is the same. The scenarios differ in the amount of wastewater handled by OSSFs and in the amount of reuse. Details of these aspects are discussed under each scenario.

The traditional way to evaluate water quality effects of wastewater discharge alternatives is to use the QUAL-TX model. It is designed to simulate steady-state DO concentrations downstream of proposed discharges under critical (low flow, warm weather) conditions. QUAL-TX simulation results are typically employed in determining needed wastewater permit limits. This is not done for this study because with the level of wastewater treatment typical today, there would be no problem meeting the DO criterion for intermittent streams in the study area. Even with the no-action scenario it is unlikely that a permit applicant would propose a treatment level that would not meet the 2 mg/L criterion for an intermittent stream.

TABLE 4.4
WASTEWATER FLOW ANALYSIS FOR PROJECTED POPULATION GROWTH FROM 2000 TO 2030

Plant [1]	Population increase in service area	Estimated Increase in Annual Ave WW Flow (gpd)	Estimated Annual Average OSSF Flow (gpd)	Estimated Annual Average Reuse (gpd)	Estimated Annual Average Plant Discharge (gpd)	Estimated Jun-Sep Average Reuse (gpd)	Estimated Jun-Sep Average Plant Discharge (gpd)	Receiving Pond
No-Action								
A	3,632	290,560	24,280	0	266,280	0	266,280	10
B	4,755	380,400	190,200	0	190,200	0	190,200	12
C	3,258	260,640	78,192	0	182,448	0	182,448	
D	3,258	260,640	78,192	0	182,448	0	182,448	
E	4,243	339,440	167,708	0	171,732	0	171,732	6
F	2,176	202,600	60,780	0	141,820	0	141,820	
G	2,176	202,600	60,780	0	141,820	0	141,820	
H	2,497	199,760	59,928	0	139,832	0	139,832	6
I	2,515	201,160	68,394	0	132,766	0	132,766	5
J	2,515	201,160	68,394	0	132,766	0	132,766	5
K	2,557	204,560	61,368	0	143,192	0	143,192	
L	2,542	203,360	113,360	0	90,000	0	90,000	16
M	2,504	200,320	60,096	0	140,224	0	140,224	5
N	2,416	193,280	77,312	0	115,968	0	115,968	
O	2,159	172,720	86,360	0	86,360	0	86,360	
P	1,046	83,680	41,840	0	41,840	0	41,840	
Buda	1,533	122,640	0	0	122,640	0	122,640	6
Total	45,781	3,719,520	1,297,185	0	2,422,335	0	2,422,335	
Regional Plants								
Winfield	14,472	1,157,760	407,172	116,341	634,247	262,706	487,882	10
Kyle	29,776	2,439,120	701,695	269,301	1,468,124	608,099	1,129,326	
Buda	1,533	122,640	0	19,009	103,631	42,924	79,716	6
Total	45,781	3,719,520	1,108,867	404,651	2,206,002	913,728	1,696,924	
Multiple Plants								
Winfield	9,044	723,502	94,470	195,000	434,031	440,322	188,709	10
Buda	1,533	122,640	0	38,018	84,622	85,848	36,792	6
Porter	10,375	829,983	248,995	189,094	391,894	406,692	174,296	
Kyle	19,082	1,583,635	79,182	466,381	1,038,073	1,053,117	451,336	
Uhland	2,524	201,920	66,416	42,006	93,498	94,853	40,651	
Sweetwater	3,223	257,840	83,192	54,141	120,507	122,254	52,394	14
Total	45,781	3,719,520	572,255	984,640	2,162,625	2,203,085	944,179	

[1] Refer to Tables 3.4, 3.6 and 3.8 for TSZ served.

The water quality issues that are much more likely to occur are with the ponds. While QUAL-TX could be used to simulate ponds, it is not designed for that use and a great deal of site-specific data that are not available would be needed. To evaluate the effect of the wastewater discharges on the ponds, the BATHTUB model, designed specifically for lakes, is employed. In the following sections, each of the three alternatives is discussed in more detail, followed by a discussion of the modeling and results.

4.2.1 No-Action

If no wastewater facility planning action is taken, it is still reasonable to expect continued growth in the study area in a similar fashion to recent developments. The characteristics of this development would include:

- More 1-acre lots with OSSFs,
- Where smaller lots are needed, wastewater provided by private or special district plants,
- Existing permitted facilities given moderate usage.

The exact percentages of these two methods of wastewater service are not easily predictable, but in the absence of planning, the same percentages that currently exist can be expected to continue. That is the basis of the estimates made in Section 3.0 and shown in Table 4.4.

With relatively large lots and proper enforcement of reasonable installation regulations, OSSFs can function well to protect surface water quality, at least in the short run. At some time, failures can be expected due to age and lack of maintenance. But perhaps the bigger negative aspects of large-scale OSSF use are the lost opportunities for beneficial reuse. These lost opportunities translate to greater water demands for the same population, and greater overall water supply costs.

The other dimension to the "No-Action" scenario is more subdivision-specific wastewater facilities. With no management by an established governmental unit with an overall interest in water quality, such facilities can be expected to have a measure of operational problems. Like OSSF developments, there would be no impetus to require such facilities to supply high quality (Type I) effluent for reuse. The lost reuse opportunity will translate to greater water demands for the same population and greater water supply costs. Finally, these smaller facilities will tend to have a somewhat larger impact on receiving streams and ponds because they would typically not have as high a level of treatment as would be required for reuse. In Section 3.0, it was assumed that most of these facilities would be permitted at the 10-15-2 level (10 mg/L $CBOD_5$, 15 mg/L TSS, 2 mg/L NH_3-N), rather than the more stringent level that might apply to planned facilities. Exceptions include the already permitted facilities that have more stringent permitting limits. Also, they would be discharging in dry conditions when their effect of changing the stream is greatest. As noted earlier, all of the streams in the study area are normally dry in dry weather, so the addition of water at that time would cause a significant ecological change.

The estimated increases in wastewater flow due to the projected population growth are shown in Table 4.4. As discussed above, part of this wastewater will be treated by OSSFs and the other part by existing permitted plants, private or special district plants. Note that the numbers for the Buda Plant refer to the population and wastewater increases within the planning area. A significant part of the Buda Plant service area is outside the planning area. Plans exist to reuse a substantial portion of the existing Buda effluent.

Table 4.4 also shows the ponds that would receive wastewater, the annual average flow and the average flow from June to September. In the No-Action alternative, no reuse was assumed. Therefore, the average flow from June to September is the same as the annual average flow.

4.2.2 Regional Plants

For many years the state environmental agency has encouraged larger regional wastewater treatment facilities, based on achieving a higher level of treatment and reliability with larger plants than smaller, frequently privately (or special district) owned and operated facilities.

To implement this historic policy in the study area, Section 3 describes two WWTPs being the large regional providers. One is assumed to be the Kyle WWTP (Permit 11041-002) at the southwest end of the area and the other the Winfield plant (Permit 14377-001) at the northeast end of the area. The increases in wastewater flow due to the projected population growth are shown in Table 4.4. The amount of OSSF flow is expected to be less than in the No-Action scenario. Some of the wastewater flow may be used for irrigation and/or supplies to users such as the cement facility in Buda. The estimated increases in annual average wastewater discharge for the Winfield Plant and Kyle Plant are 0.63 and 1.47 MGD, respectively. In summer, the reuse rate is higher so that the wastewater discharges are less. While the annual average discharge is only a small percentage less than with the No-Action scenario, the summer discharge would be 70 percent of the No-Action amount.

To achieve reuse, these facilities are assumed to be treated to a higher level (5-5-2-1, with the 1 referring to 1 mg/L of Total Phosphorus [TP]) and have no problem meeting water quality criteria for intermittent streams (DO criterion of 2 mg/L). However, the continuous discharge from Winfield would flow downstream until it reached Pond 10. In this case, the effect on the pond may be important. The Kyle Plant discharges to Plum Creek and there is no pond on the creek downstream in the study area.

4.2.3 Multiple Plants

This alternative would provide wastewater service to the same area, but instead of pumping the sewage to one of two larger regional plants, the flow would be treated with five smaller regional plants located in closer proximity to the developments. These plants were located as shown in Figure 3-10. They are distributed along the high growth corridors, with the restriction that no facility would discharge to Bunton Branch. As with the regional plants, public ownership and operation would be essential. Also, the level of treatment, the concentration limits in the permits, would be the same as for the larger regional plant alternative.

The main feature distinguishing this alternative is that most of the effluent (estimated to be about 31 percent annually) would be reused, primarily to replace potable water for irrigation, during dry weather in the growing season. The summer wastewater discharge would be only 39 percent of that with the No-Action scenario. While the summer discharge is lower, during wet or colder weather, when there was little irrigation demand, the plants would have to discharge all or most of their effluent, unless an industrial reuse was obtained where seasonal fluctuations are minimal. The effect of this discharge would be reduced because it would be diluted by runoff flows and because the cooler conditions would tend to not support excessive algal growth.

4.3 BATHTUB MODEL DESCRIPTION AND DATA DEVELOPMENT

BATHTUB is a steady-state empirical model developed by the Environmental Research and Development Center (ERDC), formerly Waterways Experiment Station (WES) of the U.S. Army Corps of Engineers (USACE) for eutrophication modeling of lakes and reservoirs. The program performs water and nutrient balance calculations in a spatially segmented hydraulic network that accounts for advective and diffusive transport, and nutrient sedimentation. Lake processes, such as nutrient sedimentation and algal response to flushing, light, and nutrient concentrations are modeled with statistical relationships developed from data of the USACE reservoirs.

The statistical relationships could be adjusted to suit local conditions. Since there are no observed water quality data of the ponds for calibration, the default statistical relationships and parameters provided in BATHTUB were used in this study. As such, the results should be useful for comparing relative changes of water quality parameters between scenarios, but are not intended for accurate prediction of their actual concentrations. The morphometry of the ponds were based on the data in Table 4.3. The ponds were assumed to be at the level of the risers.

4.3.1 Inflows

Simulations were performed for an average year and a dry period (June to September). For the water balance, BATHTUB requires inputs of precipitation, evaporation, and tributary inflows. TWDB provides lake evaporation and precipitation rates for each one-degree quadrangle in Texas. Most of the study area is located in QUAD 710. Monthly precipitations are available from 1940 to 2002 and monthly evaporations are available from 1954 to 2002. Table 4.5 shows the average monthly evaporation and precipitation values.

The tributary inflow to a pond was estimated from the U.S. Geological Survey (USGS) daily flow record at gage 08172400 (Plum Creek at Lockhart) based on the ratio of the pond drainage area to the gage drainage area. The drainage area of this gage is 112 square miles and includes the study area. Therefore, the flow record should be representative of the hydrology of the study area. Data from May 1, 1959 to September 30, 2003 are available on the USGS web site. More recent data are also available but are provisional and therefore not used. The record obtained is already sufficient for our purpose. Table 4.6

TABLE 4.5
AVERAGE MONTHLY PRECIPITATION AND EVAPORATION

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Precipitation, 1940-2002 (in)	2.05	2.41	2.12	3.01	4.04	3.28	1.84	2.18	3.30	3.45	2.69	2.46	32.84
Evaporation, 1954-2002 (in)	2.09	2.47	3.70	4.36	4.60	6.10	7.51	6.92	5.35	4.42	2.98	2.20	52.69

Source: TWDB, http://hyper20.twdb.state.tx.us/Evaporation/evap.html

TABLE 4.6
SUMMARY OF FLOW DATA AT USGS GAGE 08172400, PLUM CREEK AT LOCKHART

	Annual volume (ac-ft/yr)	Number of days without flow	Avg flow (cfs) (based on number of days in the year)	Avg flow (cfs) (based on number of days with flow)
1960	78,783	36	108.5	120.4
1961	38,079	55	52.6	61.9
1962	8,222	128	11.4	17.5
1963	4,161	240	5.7	16.8
1964	5,753	278	7.9	33.0
1965	54,027	129	74.6	115.4
1966	10,084	125	13.9	21.2
1967	12,282	198	17.0	37.1
1968	48,874	102	67.3	93.3
1969	39,061	121	54.0	80.7
1970	40,738	161	56.3	100.7
1971	2,019	307	2.8	17.6
1972	3,356	209	4.6	10.8
1973	53,560	20	74.0	78.3
1974	76,569	39	105.8	118.4
1975	78,762	28	108.8	117.8
1976	81,813	32	112.7	123.5
1977	30,152	172	41.6	78.8
1978	3,513	235	4.9	13.6
1979	33,607	158	46.4	81.9
1980	9,490	261	13.1	45.6
1981	62,026	119	85.7	127.1
1982	18,463	132	25.5	40.0
1983	27,071	57	37.4	44.3
1984	934	235	1.3	3.6
1985	73,984	68	102.2	125.6
1986	45,916	63	63.4	76.7
1987	62,571	115	86.4	126.2
1988	730	201	1.0	2.2
1989	4,187	322	5.8	49.1
1990	571	321	0.8	6.5
1991	69,751	152	96.3	165.1
1992	135,659	157	186.9	327.2
1993	16,698	182	23.1	46.0
1994	12,782	228	17.7	47.0
1995	30,156	172	41.7	78.8
1996	1,548	300	2.1	11.8
1997	52,562	79	72.6	92.7
1998	124,209	135	171.6	272.3
1999	2,352	189	3.2	6.7
2000	14,281	268	19.7	73.5
2001	38,681	98	53.4	73.0
2002	46,595	65	64.4	78.3

presents a summary of the flow data. It is evident from the data that the creek is dry for a significant amount of time.

Since the USGS gage is downstream of the Kyle Plant, a question arose whether the plant discharge had changed the natural flow pattern significantly. Figure 4-3 shows the 10th, 25th, 50th and 75th percentiles of flow for each year for the period of record. The Kyle Plant discharge became significant since the 1990s but the flow pattern does not seem to have changed significantly since the 1990.

Table 4.7 shows various percentiles of the annual flow volumes. For the average year, the median (50th percentile) was used to estimate the tributary inflow to a pond. For the dry period, the flow volumes from June to September were analyzed. A value of 2,500 acre-feet was used that was about the 52nd percentile of the yearly June to September flow volume. The median was not used in this case because the median flow was not enough and one of the ponds went dry in the simulation.

4.3.2 Phosphorus Concentrations

Another input required for BATHTUB is the TP concentration of the inflows. Figure 4-4 shows the variation of TP concentration with flow at the Plum Creek sampling station at Plum Creek Road. The data were obtained from the TCEQ Surface Water Quality Monitoring data web site. At low flows, the TP concentration at this location is likely to be significantly influenced by the Kyle plant discharge. However, at higher flows the concentration should reflect phosphorus loading from the watershed. The average TP concentration of the data at flows above 4 cubic feet per second (cfs) is 0.37 mg/L. This value was used as the tributary inflow concentration in BATHTUB.

The TP concentration in effluent was assumed to be 2 mg/L in the No-Action scenario. A higher treatment level was assumed for the planned facilities in the other two scenarios, with 1 mg/L TP used in the modeling, except for the Kyle effluent. Currently, the City of Kyle permit requires 10-15-3, with no TP limit. The choice of limits is not a factor in this evaluation because there are no ponds in the study area downstream of Kyle. The TCEQ has employed a QUAL-TX model on the Kyle permit, and would undoubtedly employ the same model to evaluate higher flows that might be needed in the future, particularly if the larger regional scenario is implemented.

4.4 EFFECTS ANALYSIS WITH BATHTUB

As shown in Table 4.4, the ponds that would receive discharges are Ponds 5, 6, 10, 12, 14, and 16. Pond 6 receives discharge from the Buda Plant. However, a significant portion of the service area of the Buda Plant is not within the study area. The projected wastewater flow for Buda in Table 4.4 is only for those areas within the study limits. Therefore, Pond 6 is not modeled. Ponds 10, 12, and 14 are all on Brushy Creek and are modeled in series in BATHTUB.

710013/050017

FIGURE 4-3
ANNUAL FLOW PERCENTILES AT USGS GAGE 08172400, PLUM CREEK AT LOCKHART

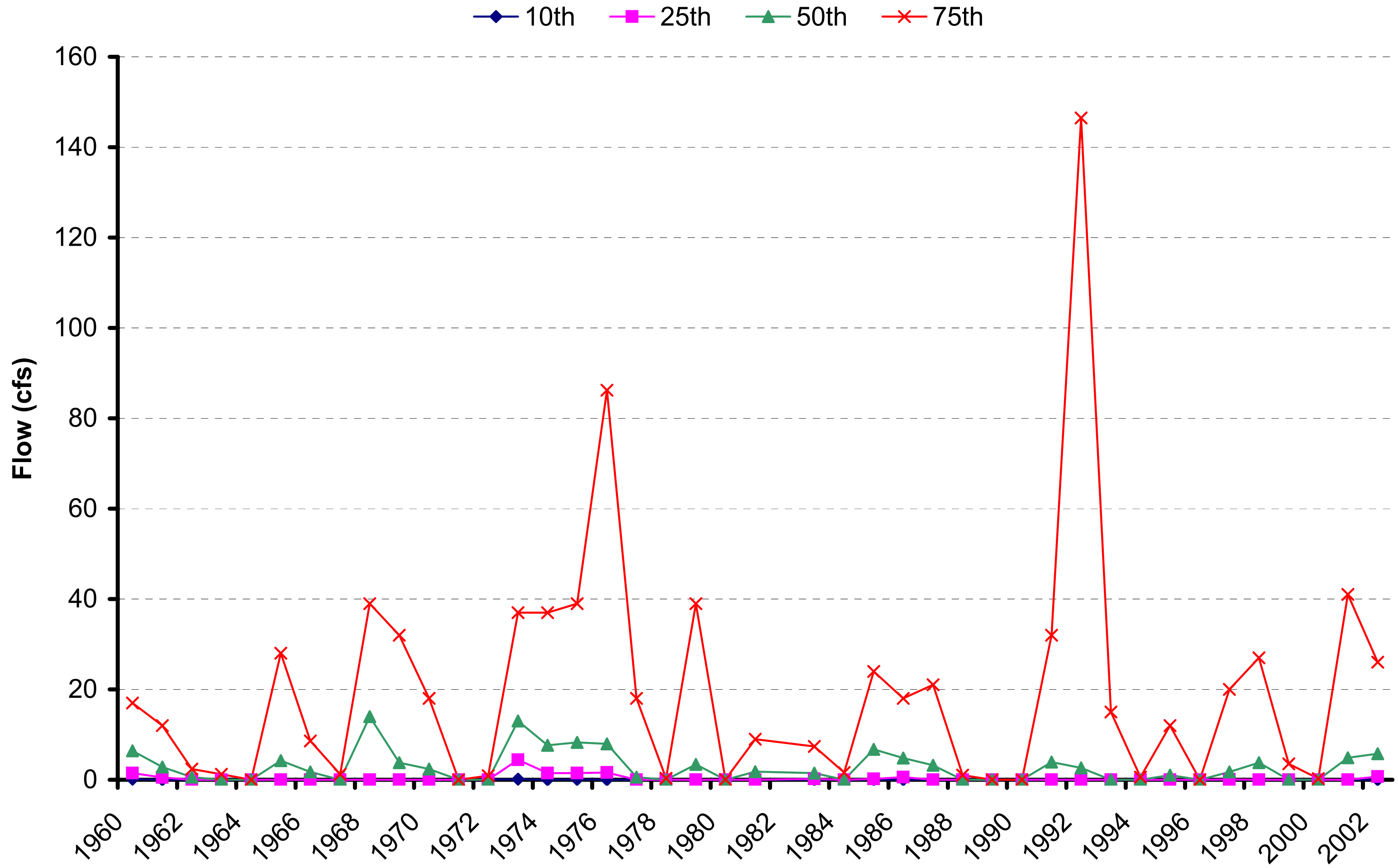
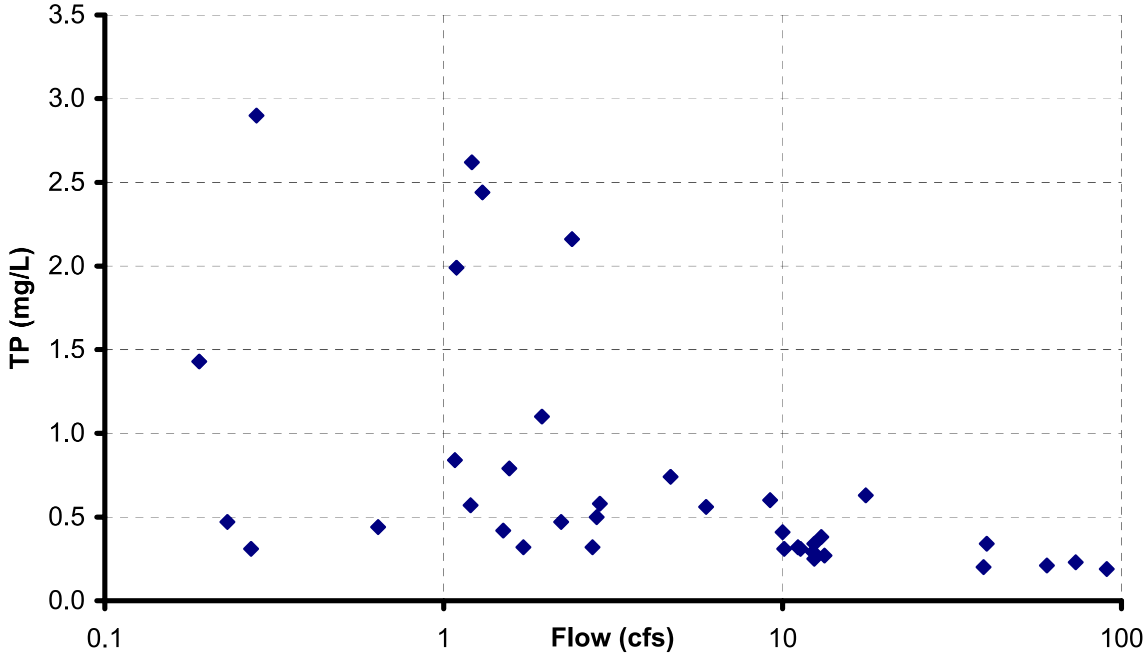


TABLE 4.7
PERCENTILE OF ANNUAL FLOW VOLUME (ACRE-FEET) AT USGS GAGE 08172400, PLUM CREEK AT LOCKHART

10%	20%	25%	30%	40%	50%	60%	70%	75%	80%	90%	100%
2,086	4,172	6,988	9,846	16,215	30,156	39,396	50,349	53,793	62,353	78,323	135,659

FIGURE 4-4
RELATIONSHIP BETWEEN FLOW AND TP,
PLUM CREEK AT PLUM CREEK ROAD



The model inputs of wastewater flows to the ponds are the flows generated by the projected population growth between 2000 and 2030. The wastewater due to the existing population is not included because of uncertainties such as whether the existing population would continue to be served by OSSFs, or by a facility not discharging to the pond under consideration. Moreover, the existing population is a relatively small portion of the projected 2030 population.

Results of the BATHTUB modeling are shown in Tables 4.8 and 4.9 for the average year and dry period simulation respectively. The dry period results in Table 4.9 have higher TP and chlorophyll *a* concentrations than the average condition results because the wastewater inputs are a higher proportion of the runoff inflows. In most cases, the TP and chlorophyll *a* concentrations are highest and Secchi depths are lowest in the No-Action scenario. However, except for Pond 5 and Pond 12, the differences are small. The regional and smaller plants scenarios have essentially the same results. Tables 4.10 and 4.11 show the phosphorus loads for the average year and dry period, respectively. The model results of the three alternatives are similar to no-action for a number of reasons. In some cases (e.g., Pond 14), the runoff is a significant factor in determining the pond water quality. The ponds receive runoff from pasture land that data suggest has a substantial amount of TP. The wastewater flows for the different scenarios are not radically different and are a small part of the total TP loads for the affected ponds. For Pond 16 in dry condition, the phosphorus load in the No-Action scenario is more than double the load in the regional or smaller plant scenarios. However, the wastewater flow has also somewhat offset the concentrating effect of evaporation. As a result, the TP and chlorophyll *a* concentrations in the No-Action scenario are the same as the other scenarios. Another reason for similar results between scenarios is the nonlinear relationship between TP and chlorophyll *a* concentrations. At high level of TP, the chlorophyll *a* concentration tends to become light limited and is less responsive to changes in TP concentration.

The results for Pond 5 provides some support to the wastewater planning goal of avoiding discharge to Bunton Branch. With the No-Action scenario, there would be wastewater discharges to Bunton Branch. The planned facilities that avoid Bunton Branch result in Pond 5 having lower chlorophyll *a* concentrations.

4.5 CONCLUSIONS OF EFFECTS ANALYSIS

From the standpoint of effects on ponds in the study area, the No-Action scenario appears to be the least desirable, as it produces higher chlorophyll *a* concentrations in the ponds and more ponds would be impacted. The difference between the two regional and five smaller plant scenarios is small due to reasons discussed above or the fact that the loads are not radically different.

Despite the fact that the differences shown with BATHTUB are small, it is reasonable to expect that there would be differences. The smaller multiple plants should be able to accommodate more reuse than the two larger regional, larger plants, simply because pumping distances and costs would be less. Greater wastewater reuse means smaller wastewater discharge, which presumably would reduce impact to the

TABLE 4.8
BATHTUB MODELING RESULTS (AVERAGE CONDITION)

Pond	No-Action			Regional Plants			Multiple Plants		
	TP (μg/L)	Chl *a* (μg/L)	Secchi depth (m)	TP (μg/L)	Chl *a* (μg/L)	Secchi depth (m)	TP (μg/L)	Chl *a* (μg/L)	Secchi depth (m)
5	199	74	0.52	131	63	0.61	131	63	0.61
10	254	91	0.42	253	91	0.42	223	87	0.44
12	183	93	0.42	138	79	0.49	131	76	0.50
14	127	53	0.72	123	52	0.73	128	53	0.72
16	152	69	0.56	129	63	0.60	129	63	0.60

TABLE 4.9
BATHTUB MODELING RESULTS (DRY CONDITION)

Pond	No-Action			Regional Plants			Multiple Plants		
	TP (μg/L)	Chl *a* (μg/L)	Secchi depth (m)	TP (μg/L)	Chl *a* (μg/L)	Secchi depth (m)	TP (μg/L)	Chl *a* (μg/L)	Secchi depth (m)
5	277	87	0.44	199	80	0.48	199	80	0.48
10	540	113	0.34	449	110	0.35	394	107	0.36
12	384	127	0.31	247	110	0.35	245	110	0.35
14	179	63	0.60	165	61	0.62	204	66	0.58
16	283	90	0.43	283	91	0.43	283	91	0.43

TABLE 4.10
PHOSPHORUS LOADS (AVERAGE CONDITION)

Pond	No-Action			Regional Plants			Multiple Plants		
	Background (kg/yr)	Upstream pond (kg/yr)	WW (kg/yr)	Background (kg/yr)	Upstream pond (kg/yr)	WW (kg/yr)	Background (kg/yr)	Upstream pond (kg/yr)	WW (kg/yr)
5	759	0	1,120	759	0	0	759	0	0
10	233	0	736	233	0	876	233	0	600
12	444	236	526	444	364	0	444	259	0
14	1,857	403	0	1,857	338	0	1,857	285	167
16	622	0	248	622	0	0	622	0	0

TABLE 4.11
PHOSPHORUS LOADS (DRY CONDITION)

Pond	No-Action			Regional Plants			Multiple Plants		
	Background (kg/yr)	Upstream pond (kg/yr)	WW (kg/yr)	Background (kg/yr)	Upstream pond (kg/yr)	WW (kg/yr)	Background (kg/yr)	Upstream pond (kg/yr)	WW (kg/yr)
5	189	0	1,120	189	0	0	189	0	0
10	59	0	736	59	0	674	59	0	261
12	111	198	526	111	302	0	111	102	0
14	463	195	0	463	136	0	463	34	72
16	155	0	248	155	0	0	155	0	0

ponds and overall waters of the study area. Another environmental benefit of the smaller regional plant alternative, with greater reuse, will be to more closely match natural or baseline conditions. As noted earlier, the streams in the study area are all intermittent. The scenario that minimizes the discharge of wastewater will be the one that is the most natural and, therefore, ecologically desirable.

5.0 WATER QUALITY PROTECTION PLAN

In the previous sections, several aspects of wastewater infrastructure and water quality were addressed. This section analyzes the results of this work and describes the process of selecting a water quality protection plan, considering economic, environmental and policy aspects. The key elements of the selected plan are summarized at the end of the section.

5.1 COST ANALYSIS

Cost comparisons of all three alternatives can be seen in Table 5.1. This table displays all anticipated flow and cost data for the three models. From the table it can be seen that Alternative 3 Smaller Multiple Plants model provided the lowest cost per housing unit ($1,466), as well as highest amount of reuse (964,621 gallons per day). The greater potential for reuse with the Multiple Plant Model will also aid in lowering peak demands and therefore reducing the cost of providing a given supply of water to the study area.

5.2 ENVIRONMENTAL AND PUBLIC POLICY ANALYSIS

Some of the major findings of the water quality analysis in Section 4.0 were:

- The study area is the upstream portion of a watershed, and all the streams in the area are intermittent.
- The water quality criterion established for intermittent streams (those that do not support aquatic life) is a relatively low 2 mg/L of DO. With the level of treatment typically employed today, there would be no problem meeting this criterion downstream of a discharger.
- The ponds that have been constructed for flood control and sediment retention may be viewed as perennial pools or as lakes, resulting in a higher level of water quality concern. Accordingly, the water quality analysis focused on the ponds.

Evaluating the wastewater treatment alternatives on the ponds, No-Action is the least desirable from a water quality perspective because it is likely to result in more, smaller WWTPs, some of which would discharge to ponds. The level of treatment (P removal) may not be as high as is proposed for the two alternatives that involve governmental planning and operation. Two other negative aspects of the No-Action alternative are that it would do the least to minimize the number of homes served by OSSFs and their attendant longer-range water quality concerns, and it would do the least to foster the public stewardship role in providing water quality. While wastewater discharge permits specify a required minimum level of performance, a public entity is more likely to be responsive to public water quality concerns than would a private or special district operator. Clearly exceptions to this idea can be found, but

Table 5.1
Cost Comparison

Comparison Sheet	***No Action***	***Regional Plants***	***Multiple Plants***
Average Percent Served	64%	69%	84%
Population Served	29300	31589	38456
LUE	10540	11363	13833
Water Collected	2,236,807	2,488,013	3,024,625
Water Reused	0	373,092	946,621
Plant Cost	$11,370,744.00	$7,464,038.52	$9,539,102.40
Collection Cost	$4,839,120.00	$8,768,100.00	$9,256,830.00
Reuse Cost	$0.00	$291,060.00	$632,280.00
Lift Station Cost	$0.00	$2,500,000.00	$500,000.00
Total Cost	$16,209,864.00	$19,023,198.52	$19,928,212.40
Cost per LUE	$1,538.01	$1,674.15	$1,440.62

Study Area Population
45781

it is felt that over the longer term, the pressure of public accountability is likely to produce a higher quality of wastewater operation than would be achieved in the absence of this accountability.

Of the two regional alternatives there is little difference in terms of effects on ponds. The smaller Multiple Plant alternative is more desirable because it would produce a higher level of wastewater reuse and also result in fewer homes served by OSSFs.

5.3 RECOMMENDED REGIONAL WATER QUALITY PROTECTION PLAN

The recommended regional water quality protection plan has four main elements:

- Smaller regional facilities that minimize the cost of wastewater pumping and providing service to more locations thus minimizing the number of OSSFs required,
- Treatment to a higher level (5-5-2-1) than would normally be required for discharge to intermittent streams in the area,
- An emphasis on wastewater reuse to both minimize downstream effects on ponds and maintain the receiving creeks in their natural dry state as much as possible and also to minimize potable water demands, and
- Public operation to provide a high level of confidence that the regional facilities will be well operated and maintained.

6.0 IMPLEMENTATION OF RECOMMENDED PLAN

If there is agreement among the major stakeholders on the recommended plan for wastewater service to the area, the next step is defining a pathway for implementation. That pathway could involve the following two components:

1. An agreement or "Wastewater Compact" between the major governmental entities in the study area (City of Buda, Hays County, GBRA, and possibly City of Kyle) that sets expectations for dealing with new development.
2. A letter of endorsement of the Compact goals and procedures by the TCEQ.

The compact or agreement between the major governmental entities would formalize the goals or vision for addressing wastewater issues, and provide guidance to implementation. The letter of endorsement from TCEQ would reinforce the agreement in the event that a party elected to disregard the agreed upon plan, but would not be essential for routine operation.

The Compact would recognize that the exact location of future wastewater facilities will be substantially driven by plans of developers. The wastewater Compact would lay out a set of expectations for dealing with these developer plans that include the four main points of the recommended plan (e.g. encouraging coordination with existing or planned wastewater facilities, and provisions for wastewater reuse (purple pipe). A desirable feature of the agreement would be to state the intention that if a developer elects to have a new WWTP, a member of the Compact could be a co-permittee with the project developer in the application process. The Compact could have the option to approve the plan, proposed level of treatment and conceptual design. However, the developer would assume the cost of the permit application process. It would also be desirable for the Compact to state that when a new plant is permitted and constructed, it may be operated by one of the members of the Compact. Details of plant ownership, inspections, and maintenance should be defined in a contract between the Compact and the developer.

The Compact should also address what to do if a developer elected to act contrary to the principles of the Compact (e.g., applied independently for a permit in the planning area without meeting the treatment level or reuse goals of the plan). In that case, the Compact members could agree to oppose that application. The letter of endorsement of the plan and Compact by the TCEQ, if it could be obtained, could be important in defending the plan.

In effect, the Compact would be the basis for guiding development of wastewater facilities in the study area, while still relying on the private sector to assume the profit potential and risk for new development. The Compact would allow for members to take different roles, depending on the location of new development and specific conditions.

The Compact could also initiate regional rate studies and solicit participation and stakeholder meetings to facilitate permitting of proposed wastewater treatment facilities that are consistent with the recommended plan.

7.0 REFERENCES

Capital Area Metropolitan Planning Organization (CAMPO). 2003. Traffic Serial Zone data 2000 to 2030.

Hays Consolidated Independent School District (HCISD). 2003. Demographic Update Report. Prepared by the Population and Survey Analysts (PASA). April.

Appendix A

Hays County OSS Ordinance History

Regulations for the use of on-site wastewater treatment were established in Hays County in 1974. The regulations were modified 10 years later to include a provision that established minimum lot sizes for homes using on-site wastewater treatment. In 1984 the regulations were adapted to include minimum lot sizes of 1 acre for all lots located over the Edwards Aquifer and 0.46 acre for all lots not located on the Edwards Aquifer, with homes built prior to the 1984 exempt from this provision. A provision prohibiting the use of cesspools and injection wells for effluent disposal was also established at this time.

The current ordinance governing on-site wastewater treatment in Hay County was established in 1997. This ordinance adopted the guidelines of the Texas Administrative Code (TAC) 30 Chapter 285.1-91, which changed the minimum lot size for on-site sewage (OSS) disposal from 0.46 acre to 1 acre. With the adoption of this ordinance in 1997, additional provisions were incorporated into the OSS regulations for Hays County. These additional provisions included the establishment of minimum allowable distance from bodies of water, property lines and human agricultural fields, and the requirement of a permit for all on-site wastewater treatment facilities regardless of lot size.

All other aspects of the 1984 and 1997 regulations can be viewed in their entirety in the following section.

Adopted
June 11, 1984

RULES OF HAYS COUNTY, TEXAS
FOR
PRIVATE SEWAGE FACILITIES

CHAPTER 1
DEFINITIONS

The following words and terms, when used in these Rules, shall have the following meanings, unless the context clearly indicates otherwise:

"Absorption Unit" - Any subsurface system that primarily relies on soil absorption in an absorption trench or absorption bed to dispose of the effluent from a wastewater treatment unit.

"Authorization" - A Subdivision Construction Authorization as required in Chapter 8 of these Rules.

"Commissioners Court" - The Commissioners Court of Hays County, Texas.

"Developer" - Any person, as defined in this Chapter, who proposes to create a subdivision, mobile home park, trailer park, multi-family residential development, or commercial or industrial development within Hays County and outside the corporate limits of a municipality.

"Edwards Aquifer" - For the purpose of these rules means that portion of an arcuate belt of porous water-bearing limestones composed of the Comanche Peak, Edwards, and Georgetown Formations trending from west to east to northeast through Kinney, Uvalde, Medina, Bexar, Comal, Hays, and Travis Counties, respectively.

"Evapotranspiration Unit" - Any subsurface system that primarily relies on evaporation and plant transpiration to dispose of effluent from a wastewater treatment unit.

"Executive Director" - The executive director of the Texas Department of Water Resources.

"Existing Private Sewage Facilities" - Any private sewage facility that was in use on the effective date of these Rules. Such a facility shall be an existing private sewage facility as long as that facility is not causing pollution, a threat to the public, or nuisance conditions, or is not substantially modified after the effective date of these Rules. Any private sewage facility that has been actually used at any time during the twelve (12) month period immediately preceding the effective date of these Rules, shall be conclusively presumed to have been in use on the effective date of the Rules.

"Institution" - Any establishment other than a single family residence.

"License" - A License to Operate as required by Chapter 7 of these Rules.

"Licensing Authority" - The unit of the county government that has been designated by the Commissioners Court in Chapter 4 of these Rules to have the duties and powers to administer and enforce these Rules.

"Living Unit or Equivalent" - A single family residential unit which generates a measure of wastewater flow. The wastewater flow design criteria for one living unit shall be four hundred (400) gallon per day.

"Mobile Home Park" - Any facility or area developed for the lease or rental of two or more mobile homes.

"New Private Sewage Facility" - Any private sewage facility that does not qualify as an existing private sewage facility.

"Nuisance" - Any activity or condition that is or tends to be, injurious to or adversely affects human health or welfare, animal life, vegetation, or property; or interferes with the normal use and enjoyment of animal life, vegetation, or property.

"Organized Disposal System" - Any publicly or privately owned system for the collection, treatment, and disposal of sewage that is operated in accordance with the terms and conditions of a valid waste discharge permit issued by the Texas Water Commission.

"Permit" - A Permit to Construct as required by Chapter 7 of these Rules.

"Person" - Any individual, corporation, organization, government or governmental subdivision or agency, business, trust, estate, partnership and any other legal entity or association, including, but not limited to, owners, developers, installers, operators, or any other person responsible for the construction, installation, or operation, of a private sewage facility.

"Pollution" - The alteration of the physical, thermal, chemical, or biological quality of, or the contamination of any water in the State that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property or to the public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

"Private Sewage Facility" - All systems and methods used for the disposal of sewage, other than organized disposal systems. Private sewage facilities are usually composed of three units; the generating unit (the residence, the institution, etc.), the treatment unit (septic tank, etc.), and the disposal unit (the drainfield that may be an absorption trench or bed, or an evapotranspiration bed).

"Proposed Individual or Public Water Supply Wells or Systems, or Proposed Organized Disposal Systems" - Any such well or system for which the owner or operator has entered into contractual obligations, which cannot be cancelled or modified without substantial loss, for the construction of such well or system that will be completed within a reasonable time.

"Recharge Zone" - Is identified as that area where the Edwards and associated limestones crop out in Hays County, as well as other formations which because of their proximity to surface exposures of the Edwards and associated limestones, pose an imminent threat to the quality of the waters of the Edwards Underground Reservoir, as delineated on the most recent edition of maps in the office of the Executive Director of the Department of Water Resources. When it is difficult to determine from the maps whether a particular area lies within the Recharge Zone or not, the licensing authority or the Department of Water Resources has the discretion to make the determination, based upon a geological inspection of the grounds. Attached to these rules is highway maps generally outlining the Recharge Zone, which should not be construed to be as accurate as the "official" maps in the office of the Executive Director.

"Sewage" - Waterborne wastes that are primarily organic and biodegradable or decomposable and that generally originate as human, animal, or plant wastes from domestic activities, such as washing, bathing, and food preparation, and certain retail or commercial activities, together with groundwater and surface water within which it is commingled.

"Single Family Residence" - A single family dwelling or mobile home.

"Standards" - The standards set forth in the pamplet entitled "Construction Standards for Private Sewage Facilities" and all future amendments thereto, which were adopted by the Texas Board of Health, pursuant to Article 4477-1 (Sec. 23(b)), of the Texas Revised Civil Statutues Annotated, as Texas Department of Health Rules 301.79.03.001-.003 and which were originally published in 2 ~~Tex. Reg.~~ 4978.

"State" - The State of Texas.

"Subdivision" - A subdivision that has been platted and recorded with the county clerk or that is required by statute to be so platted and recorded; or any two (2) or more adjoining lots or tracts, or a mobile home park.

"Substantial Modification" - An increase in the size or use of a private sewage facility's generating unit (residence or institution) that, based on the considerations in the Standards, could be expected to result in an increase of 25% or more in the average daily volume of sewage generated by that unit; or an action that, based on the considerations in the Standards, could be expected to result in an increase or decrease in the capacity of a private sewage facility's treatment unit (septic tank) or disposal unit (drainfield) by 25% or more.

"Water" or "Water in the State" - Groundwater, percolating or otherwise, lakes, bays, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Gulf of Mexico, inside the territorial limits of the State, and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, navigable or nonnavigable, and including the beds and banks of all watercourses and bodies of surface water, that are wholly or partially inside or bordering the State or inside the jurisdiction of the State.

CHAPTER 2
ESTABLISHMENT AND GENERAL PROVISIONS

§2.01. AUTHORITY. These Rules are adopted by the Commissioners Court of Hays County, Texas, acting in its capacity as the governing body of Hays County. Hays County adopts these Rules under the authority of Section 26.032 of the Texas Water Code.

§2.02. PURPOSE. The purpose of these Rules is to abate or prevent pollution, or injury to the public health in Hays County, Texas.

§2.03. AREA OF JURISDICTION.
(a) These Rules shall apply to all of the area of Hays County except for the areas within the boundaries of the incorporated cities and towns of Hays County.
(b) These Rules shall also apply to those incorporated cities or towns that have executed cooperative agreements with the Commissioners Court for coverage under these Rules.
(c) In areas of the county where other governmental entities apply regulations which conflict or overlap with these county-wide Rules, then the more stringent of the Rules shall apply.

§2.04. EFFECTIVE DATE. These Rules shall become effective upon their approval by the Texas Water Development Board.

§2.05. INCORPORATION BY REFERENCE. The Standards and all future amendments thereto are incorporated by reference and are thus made a part of these Rules. A copy of the Standards is attached to these Rules as Appendix 1.

§2.06. CONSTRUCTION, PRECEDENCE, AND INTERPRETATION.
(a) These Rules shall be construed liberally to accomplish their purpose. In construing the Standards, precatory words contained therein shall be deemed mandatory.
(b) In the event of any conflict between these Rules and an order, resolution, or rule adopted by the Texas Water Development Board, the order, resolution, or rule adopted by the Texas Water Development Board shall take precedence. In the event of any conflict between these Rules and the Standards, these Rules shall take precedence.
(c) The licensing authority shall, within the purpose of these Rules, resolve any question regarding any interpretation of these Rules or the Standards.

§2.07. SEVERABILITY. If any provisions of these Rules or the application thereof to any person or circumstances is held invalid the validity of the remainder of these Rules and the application thereof to other persons and circumstances shall not be affected.

CHAPTER 3
ADMINISTRATIVE PROVISIONS

§3.01. EXCEPTION.

(a) A person desiring an exception to any requirement of these Rules shall file a written request with the licensing authority stating:
   (1) The nature of the exception requested;
   (2) The reason that justifies the granting of the exception; and
   (3) Any information that the licensing authority reasonably requests.

(b) Within thirty (30) days after the receipt of said request, the licensing authority shall review the request and reply to the applicant in writing either granting or denying the request. If the request is denied, the licensing authority shall include the reasons for denial in the reply.

§3.02. APPEAL.

(a) Any person aggrieved by an action or decision of the licensing authority made hereunder may, within thirty (30) days of the date of the document giving notice of the action or decision, or within thirty (30) days of the action, if no document is given, appeal to the Commissioners Court.

(b) The appeal shall be initiated by filing a written objection with the Clerk of the Commissioners Court. The written objection shall state what the complainant believes the action or decision of the licensing authority should have been and the reasons therefor. A copy of the document containing the notice of the complained of action or decision, or a written statement of the complained of action or decision, if no document was given, shall be attached to said written objection.

(c) When an objection is filed, the Clerk of the Commissioners Court shall notify the County Judge who shall place the matter on the Agenda of the Commissioners Court for review at the next meeting of the Commissioners Court, that is at least ten (10) days after the date of the filing of the objection. The Clerk of the Commissioners Court shall notify the licensing authority and the complainant that the matter is on the agenda.

(d) The Commissioners Court shall review the matter and consider such information and evidence that the Commissioners Court may deem relevant and that may be offered by the licensing authority or the complainant. The Commissioners Court shall either affirm, reverse, or modify the action or decision of the licensing authority.

(e) These provisions for appeal are not exclusive, but are cumulative of any other remedies at law or in equity.

§3.03. NOTICE. Any notice required to be given pursuant to these Rules shall be considered by depositing the same in the U. S. Mail, postage prepaid, and addressed in accordance with the information given by an applicant or complainant.

§3.04. FEES. To defray the reasonable cost of administering these Rules, the licensing authority shall require fees to be paid in accordance with the schedule established from time to time by the Commissioners Court. Such fees shall be paid with the filing of an application for a permit, license, or authorization; reinspections; subdivision review and recommendation, and installer's license or renewal of an installer's license; a written request for an inspection or exception; or an appeal.

§3.05. LICENSING OF INSTALLERS.

(a) Beginning four(4) months after date of approval of these Rules by the Texas Water Development Board, no installer may commence or proceed in any manner with the construction or installation of, or a substantial modification to, a private sewage facility without first having obtained an installer's license from the licensing authority.

(b) Licensing procedures shall be as follows:

(1) In order to obtain an installer's license, an installer shall make application to the licensing authority and the licensing authority shall provide the installer with a copy of these Rules including all current amendments and all applicable State Laws.

(2) The installer, upon demonstrating a knowledge of the Rules and Standards, and appropriate health laws, shall be issued an installer's license.

(3) An installer's license fee as determined by the Commissioners Court shall be submitted along with an application.

(4) An installer's license is valid for one (1) year from the date of issue and must be renewed annually. A fee will be charged for renewal.

(c) The licensing authority shall keep available a current list of licensed installers.

(d) A licensed installer shall directly supervise and be held accountable for the proper installation of all private sewage facilities installed under his authority and pursuant to his license.

(e) A licensed installer shall be responsible for good workmanship practices and for following these Rules in the installation of all private sewage facilities installed by him or under his authority.

(f) Suspension and Cancellation

(1) On a showing of good cause, the licensing authority may suspend or cancel an installer's license. Grounds for suspension or cancellation of an installer's license include, but are not necessarily limited to, the following:

(a) Installation or alteration of a private sewage facility without a valid permit to construct having been issued by the licensing authority.

(b) Significant alteration or removal of, or damage to, a new private sewage facility after the licensing authority's final inspection thereof.

(c) Repeated and documented faulty workmanship in connection with the installation or repair of private sewage facilities.

(d) Any other violation of these Rules.

(2) Whenever it appears to the licensing authority that a licensed installer has violated or is violating any requirement of this Section 3.05, the licensing authority shall provide the installer with at least ten (10) days written notice of a hearing to be held for the purpose of considering the suspension or cancellation of the installer's license. Following the hearing, the licensing authority shall provide the installer with written notice of its decision, and shall include therein the reasons for any suspension or cancellation. (Note: The appeal procedures specified in Section 3.02 apply to this decision without further mention in this section.)

(3) Violations listed in items (a) and (b) above may result in cancellation of the license. An application for a new license may not be

made for a period of one hundred and eighty (180) days after cancellation. Violation of items (c) or (d) may result in license suspension for a period of sixty (60) days. After two (2) suspensions of a license any further violations may result in cancellation of the license for at least one hundred and eighty (180) days.

(g) A property owner who installs his/her own private sewage facility shall be exempt from the requirements of this Section 3.05 provided, however that the design and installation shall be under the direction of a registered sanitarian or licensed professional engineer. The property owner may retain professional consultation from the licensing authority at hourly rates as per the fee schedule.

CHAPTER 4
DUTIES AND POWERS

§4.01. DUTIES AND POWERS. The San Marcos-Hays County Health Department of Hays County, Texas, is designated by the Commissioners Court to be the licensing authority for these Rules and thus have the duty, and necessary powers, to administer and enforce these Rules. The licensing authority shall have the following duties and necessary concomitant powers:

(1) To enforce these Rules and to make appropriate recommendations to proper County authorities when instances of noncompliance with these Rules have been determined.

(2) To make inspections of any existing private sewage facilities, when requested or required, and all new private sewage facilities.

(3) To collect all fees set by the Commissioners Court as necessary to recover the reasonable costs incurred in meeting the requirements of these Rules.

(4) To make semi-annual reports to the Commissioners Court on all actions, including legal actions, taken concerning these Rules.

(5) To perform all other duties necessary to meet the requirements of these Rules.

CHAPTER 5
LAWFUL DISCHARGES AND GENERAL REQUIREMENTS

§5.01. LAWFUL DISCHARGES. After the effective date of these Rules, only the following types of sewage discharges shall be lawful:

(1) Sewage discharged into an organized disposal system operating under a valid permit issued by the Texas Water Commission.

(2) Sewage discharged into a private sewage facility designed, installed, licensed, operated, and maintained in accordance with these Rules.

(3) Sewage discharged into an existing private sewage facility that is in use on the effective date of these Rules, that has not been substantially modified since the effective date of these Rules, and that is operated and maintained in such a manner as not to cause pollution, a threat to the public health, or nuisance conditions.

§5.02. REQUIREMENTS.

(a) No person, except the person owning or having the right of possession and use of the parcel of land upon which a proposed privated sewage facility is to be located, may apply for a private sewage facility permit or license.

(b) The design, construction, and installation of any new private sewage facility and the maintenance of any private sewage facility shall, at a minimum meet the requirements set forth in the Standards.

(c) No person may cause, suffer, allow, or permit the construction or installation of, or a substantial modification to, a private sewage facility unless a permit therefor has first been issued.

(d) The construction, installation, or substantial modification of a private sewage facility shall be made in accordance with the approved design and requirements of the permit issued therefor.

(e) No component of a private sewage facility shall be covered until an inspection by the licensing authority has been made. Provided, however, absorption trenches or beds, or evapotranspiration beds may be partially backfilled, but all ends and other critical areas shall not be covered until the licensing authority has determined, as evidenced by the issuance of a license, that the installation, construction, or substantial modification complies with these Rules, the Standards, or other special conditions specified in the permit.

(f) No person may cause, suffer, allow, or permit the operation or use of a new private sewage facility unless a license, or necessary license amendment therefor, has first been issued.

(g) No person may cause, suffer, allow, or permit the construction or installation of a private sewage facility on a lot or tract that is smaller than that required to meet the requirements set forth in these Rules. Provided, however, on lots existing prior to the effective date of these Rules, a private sewage facility may be permitted to be constructed and licensed to operate on a lot smaller than twenty thousand (20,000) square feet, if it is demonstrated by a thorough investigation that a private sewage facility can be operated without causing a threat or harm to an existing or proposed water supply system or to the public health, or the threat of pollution or nuisance conditions. In calculating lot or tract sizes, easements or right-of-ways adjacent or through such lots or tracts shall be excluded.

(h) No person may cause, suffer, allow, or permit the construction on installation of a private sewage facility on a lot or tract of land located on the Edwards Aquifer Recharge Zone which is less than one (1) acre in size, unless an exception is granted in accordance with Section 3.01 of these rules or unless exempted as provided herein. Any private sewage facility on a lot less than one (1) acre and not required to connect to an organized collection system under Section 6.01 of these rules and that was platted and recorded prior to March 26, 1974, is exempted from the one (1) acre minimum lot size requirement.

(i) The effluent from a private sewage facility, whether using a aerobic or anaerobic treatment unit, must be discharged into a properly designed and constructed absorption or evapotranspiration unit and shall not be discharged to the ground surface or into or adjacent to any water in the State.

(j) Injection wells, pit privies, and cesspools used to dispose of sewage, and any system utilizing naturally or artificially produced holes, cavities, or drilled wells to ease the disposal of sewage are specifically prohibited from being installed and licensed.

(k) No person may cause, suffer, allow, or permit the maintenance of a private sewage facility in such a manner as to cause, or as may tend to cause, pollution, injury to public health, or nuisance conditions.

CHAPTER 6

DEVELOPMENT OF ORGANIZED DISPOSAL SYSTEMS

§6.01. CONNECTION TO ORGANIZED DISPOSAL SYSTEMS. In order to implement the stated policy of the legislature and the Texas Department of Water Resources to encourage the development and use of organized disposal systems to serve the waste disposal needs of the citizens of the State and to prevent pollution, protect the public health, and maintain and enhance the quality of water in the State, the following requirements are made:

(1) No person may cause or allow the installation of a private sewage facility when any part of the facility is to be within three hundred (300) feet in horizontal distance (measured on the closest practicable assess route) of an existing organized disposal system, unless one of the following requirements has been met:
   (A) The person has received a written denial of service from the owner or governing body of the organized disposal system; or
   (B) The person has received a written determination from the licensing authority that it is not feasible for the person to connect to the organized disposal system.

(2) Whenever an organized disposal system is developed within three hundred (300) feet in horizontal distance (measured on the closest practicable route) from any part of a private sewage facility, that facility shall be connected to the organized system within one hundren and eighty (180) days following notification to the private sewage facility's owner of the organized system's availability unless one of the requirements set forth in Subsections (1)(A) or (1)(B) of this section has been met.

(3) Subdivisions proposing to utilize private sewage facilities and with a minimum lot size of two (2) acres or less shall be arranged to accommodate a collective sewage system in the future.

CHAPTER 7
CONSTRUCTION AND OPERATION REQUIREMENTS

§7.01. REQUIREMENTS FOR NEW PRIVATE SEWAGE FACILITIES.

(a) A Permit to Construct must be obtained from the licensing authority prior to commencing the construction or installation of, or a substantial modification to, a private sewage facility and will be issued upon a finding that construction can commence.

(b) A License to Operate must be obtained from the licensing authority prior to operating a new private sewage facility and will be issued after satisfactory completion and approval of construction.

(c) Issuance of a Permit to Construct shall require compliance with the following:

(1) The licensing authority shall be allowed to require, on the basis of site conditions, existing data, and knowledge of soils in the area, a minimum of three (3) tests over the proposed absorption field site. Provided, however, for lots on the Edwards Aquifer Recharge Zone, a minimum of six (6) percolation tests spaced uniformly over the proposed absorption field site shall be performed.

(2) The licensing authority shall perform, or supervise the performance of, the percolation tests. Percolation tests holes and performance of the tests shall be in accordance with the latest edition of Construction Standards for Private Sewage Facilities as published by the Texas Department of Health.

(3) For lots on which the average percolation rate is less than one (1) inch per sixty (60) minutes alternative system to soil absorption systems, approved by the licensing authority, must be installed.

(4) For lots on which the average percolation rate is greater than one (1) inch in one (1) minute alternative systems to soil absorption system, approved by the licensing authority, must be installed.

(5) Private sewage facilities shall not be constructed on areas with excessive slopes unless proper design and construction techniques, approved by the licensing authority, are utilized to overcome the effects of the slope.

§7.02. PERMIT TO CONSTRUCT.

(a) To make an application for a Permit to Construct, the applicant shall submit to the licensing authority the following:

(1) A properly completed application form.

(2) The required fee.

(3) The results of the percolation tests performed by the licensing authority or a registered sanitarian, or similarly qualified person approved by the licensing authority.

(4) A drawing or drawings reflecting that the proposed private sewage facility will comply with these Rules and demonstrating that the lot or tract is large enough for the private sewage facility to be constructed thereon.

(5) A statement or other evidence that demonstrates that the requirements set forth in §6.01 of these Rules have been met.

(6) Any additional information that the licensing authority may require.

(b) The completed application and all additional information submitted shall not contain any false information or conceal any material facts and shall be sworn to and notarized.

(c) Within thirty (30) days after a proper and complete application has been made, the licensing authority shall make a finding on the issuance of a permit, based upon the information contained in the completed application and any other information available to the licensing authority.
   (1) Upon a finding that construction can commence, a Permit to Construct shall be issued to the applicant.
   (2) Upon a finding that a Permit to Construct cannot be issued, the licensing authority shall so notify the applicant in writing within ten (10) days of that finding and shall include the reasons for denying the issuance of a permit.

(d) A permit shall expire one (1) year from the date of issuance unless construction has commenced on the private sewage facility for which the permit was issued. An expired permit may be re-issued provided the conditions and rules under which the permit was originally issued have not changed. A fee will be charged to defray the cost of re-issuance. When a permit has expired and the original conditions have changed, a new application must be submitted with a new application fee.

S7.03. LICENSE TO OPERATE.

(a) A License to Operate a private sewage facility shall only be issued by the licensing authority if all the requirements of Section 7.03 herein are met by the applicant. Application forms may be obtained from the licensing authority. To initiate the application, the forms must be completed in duplicate and returned to the licensing authority along with payment of the fee and must conform to the following:

(b) Each new private sewage facility shall be inspected and approved by the licensing authority prior to the final covering of the facility.
   (1) The applicant or installer shall notify the licensing authority that an inspection is desired at least four (4) working days, excluding weekends and legal holidays, prior to the need for inspection.
   (2) The applicant shall allow, and make arrangements for, the licensing authority to inspect the fully excavated trench or bed in order to evaluate soils and bottom grade prior to the installation of any pipe or fill material.
   (3) The applicant or installer shall provide whatever reasonable assistance the licensing authority requests in order to make the inspection.

(c) Within five (5) days after an inspection, the licensing authority shall make a finding on the issuance of a license, and any modifications to septic tank or drainfield size or other design considerations, based upon the information obtained from the inspection and any other information available to the licensing authority.
   (1) Upon a finding that the use of the new private sewage facility will not cause pollution, injury to the public health, or nuisance conditions and is not in conflict with these Rules and upon payment of appropriate fees, a License to Operate the facility shall be issued to the applicant.
   (2) Upon a finding that a License to Operate cannot be issued, the licensing authority shall so notify the applicant in writing within five (5) days of that finding and shall include the reasons for denying the issuance of a license.

(d) Licenses to Operate issued under the authority of these Rules shall be for an indefinite period and shall be transferred to a succeeding owner. Upon the request of a new owner of a licensed private sewage facility, the licensing authority shall transfer the license to that new owner, provided the private sewage facility has not been substantially modified.

(e) The licensing authority or the executive director of the Department of Water Resources may revoke or suspend a license for any of the causes listed in paragraphs (1) through (6) of this subsection. Neither revocation of license nor any other provision of this subchapter shall impede the licensing authority or the executive director in taking proper steps to prevent or curtail pollution, to abate a nuisance, or to protect the public health.
  (1) An increase in the volume of or change in the nature of the wastewater being treated by the private sewage facility, or a reduction of the capacity of the facility;
  (2) Failure of the holder of the license to properly maintain or operate the private sewage facility;
  (3) Malfunction of the private sewage facility;
  (4) Evidence that the private sewage facility is causing or will cause pollution;
  (5) Failure to comply with the terms and conditions of the license or this subchapter; and
  (6) Any other reason which the licensing authority or executive director determines to be the reason to revoke or suspend.

§7.04. EXISTING PRIVATE SEWAGE FACILITIES.
(a) Existing private sewage facilities are not required to be licensed, provided the facility is not causing pollution, a threat to the public health, or nuisance conditions, or has not been substantially modified.
(b) If an existing private sewage facility is causing pollution, a threat to the public health, or nuisance conditions, or has been substantially modified, the licensing authority shall require that the facility be licensed in accordance with SS7.01-7.03 of these Rules as appropriate and shall undertake actions pursuant to Chapter 9 of these Rules.

S7.05. SPECIAL REQUIREMENTS FOR INSTITUTIONS. A registered professional engineer, registered professional sanitarian, or similarly qualified person approved by the licensing authority; or the licensing authority, at its discretion, shall design all private sewage facilities serving institutions. Said designs shall be made in accordance with these Rules, including the Standards, except that single compartment treatment units shall not be untilized, but instead, treatment units with two (2) or more compartments or two (2) or mor treatment units connected in series shall be untilized.

CHAPTER 8
SUBDIVISIONS

§8.01. SUBDIVISION CONSTRUCTION AUTHORIZATION. Any person desiring to create a subdivision, including mobile home park, that will utilize private sewage facilities, in whole or in part, must obtain a Subdivision Construction Authorization from the licensing authority prior to submittal of the preliminary plat, or of any other development regulated by these Rules, commencing or continuing construction.

§8.02. APPLICATION.

(a) An applicant for a Subdivision Construction Authorization shall submit an application to the licensing authority containing information that is adequate to establish:

(1) That it is not feasible for the applicant to provide sewer service to the subdivision by means of an organized disposal system, and

(2) That private sewage facilities may be used in the specified subdivision without causing, or threatening to cause, individually or collectively, pollution, injury to the public health, or nuisance conditions. This information will include as a minimum:

(A) A map at a minimum scale one (1) inch equals five hundred (500) feet locating the subdivision relative to on- and off-site:

(i) Surface water,
(ii) Watersheds,
(iii) One hundred (100) year floodplain,
(iv) Topographic map,
(v) Soils map,
(vi) Existing and proposed individual and public water supply wells, and
(vii) Existing and proposed organized disposal system.

(B) An conceptional plan of the subdivision that details the size and intended use of each lot and that details road and utility right-of-ways.

(C) A percolation test and soil boring profile of the entire subdivision consisting of percolation tests and soil borings of a representative (at least one (1) test per five (5) acres) number of proposed lots or tracts must be run by the licensing authority and the results given to the Commissioners Court when the developer files the preliminary plat. Provided, however, that percolation tests and borings are not required if the minimum lot size in a residential subdivision is two (2) acres or larger. All tests shall be run in accordance with the latest edition of the Standards as written by Texas Department of Health. Frequency of soil percolation tests and borings may be raised by the licensing authority but shall be predetermined and approved by the licensing authority in advance of filing the preliminary plat. At the discretion of the licensing authority, and all or part of the tests may be performed by a practicing professional engineer, professional registered sanitarian, or soil testing laboratory. The licensing authority shall notify the developer of the findings of its soil percolation tests and soil boring profile and will point out any deficiencies in the plan for sewage disposal. Specifically, the licensing authority shall notify the developer of any areas not suitable for the use of private sewage facilities and whether the proposed development density is consistent with the use of private sewage faciltíes set forth in these rules. Approval of subdivision constrution authorization does not constitute a license for a specific private sewage facility. An approval plan is, however, a prequisite for obtaining a license to operate a private sewage facility in a subdivision.

(D) A list that specifies the type and maximum size (floorspace, bedrooms, seating, etc.) of the intended construction that will be allowed on each lot. Based on this list, the applicant shall provide further information to confirm that a private sewage facility that meets all of the requirements of these Rules and the Standards can be constructed on each lot. This information shall include:

(i) Preliminary locations and distances between sewage generating units, treatment units, disposal units, water wells, and lot boundaries and setbacks as specified in the Standards. These distances shall be shown between these items on each lot and to any existing or proposed water supply wells on adjacent lots.

(ii) Average daily wastewater volume to be generated by the specified maximum size construction.

(iii) Capacity and/or size of the treatment (tank) and disposal (drainfield) units. The disposal area size shall be calculated assuming a specific type of drainfield (absorption trench or bed or evapotranspiration bed) and using adequately documented permeability measurements taken at or in reasonable proximity to the drainfield locations.

(E) At the discretion of the licensing authority and in consideration of the size and density of the proposed subdivision and other conditions known to exist in the vicinity of the proposed subdivision, one or more geological cross-sections may be required from the applicant. These cross-sections shall illustrate the geologic formations that make up the subsurface below the subdivision down to the first aquifer that supplies, or may be used to supply, drinking water in the area. These cross-sections shall illustrate the primary dip and characteristics (permeable, impermeable, water bearing, etc.) of each formation and the elevation of any water table.

(b) the required fee shall accompany the application.

(c) Within forty-five (45) days after a proper and complete application has been made, the licensing authority shall make recommendation or the issuance of a Subdivision Construction Authorization, based upon the information contained in the completed application and any other information available to the licensing authority. When made, said recommendation for approval, with appropriate restrictions, if any, or denial shall be submitted to the Clerk of the Commissioners Court and mailed to the applicant within five (5) days.

(d) When a recommendation is submitted, the Clerk of the Commissioners Court shall notify the County Judge who shall place the matter on the Agenda of the Commissioners Court for review at the next meeting of the Commissioners Court that is at least ten (10) days after the date of the submission of the recommendation. The Clerk of the Commissioners Court shall notify the licensing authority and the applicant that the matter is on the agenda.

(1) Upon the approval of a Subdivision Construction Athorization by the Commissioners Court, the authorization shall be issued to the applicant. A Subdivision Construction Authorization does not constitute either a Permit to Construct or a License to Operate a specific private sewage facility. An approved Subdivision Construction Authorization, however, is a prerequisite for obtaining a permit or license for a specific private sewage facility in a subdivision.

(2) Upon the disapproval of a Subdivision Construction Authorization by the Commissioners Court, the licensing authority shall so notify the applicant in writing within ten (10) days of the disapproval and shall include the reasons for denying the approval of the authorization.

§8.03. LOT SIZE REQUIREMENTS.

(A) Lot size criteria: Minimum lot size is based on factors used to determine the suitability of the lot for private sewage facility disposal of sewage facility disposal of sewage and provide enough usable land area for location of the original system, area for one repair or replacement of the system, and additional land area when poor soil percolation prohibits the use of private sewage facilities on minimum size lots, or tracts.

(1) The percolation rate is an important factor but in itself is no guarantee that a septic tank system will be trouble free or long lived. Although moderate to marginal percolation rates betweeen one inch in five minutes to one (1) inch in forty-five (45) minutes are not ideal they are more likely to be located and positioned on minimum size lots and more likely to be long lived and trouble free. Therefore percolation above and below these rates will be used in sizing lots as follows.

(2) Steep slopes provide fewer suitable locations for an absorption bed, may present increased danger of erosion and surface water infiltration of the absorption bed, and increase the danger of surfacing effluent and presenting a potential health problem.

(3) Soil type and geological structure may be marginal or unsatisfactory for a number of reasons. The most important of these are:

(i) Impermeable layers of clay or rock near the surface.

(ii) Fractures, caverns or crevices in limestone formations increasing danger of contamination of underground water, if present.

(iii) Highly permeable sand or gravel near water wells, streams, or lakes.

(iv) Areas having a high or fluctuating water table or seasonal springs.

(B) Lot Size Requirements

(1) Private sewage facilities for lots in subdivisions shall be approved by the licensing authority subject to the following provisions:

(i) The minimum lot size in all cases shall be twenty thousand (20,000) square feet per living unit or equivalent.

(ii) For shallow soils or shallow groundwater (forty-eight (48) inches or less to bedrock or water table) add ten thousand

(iii) For clay soils (eighteen (18) inches and deeper) or slowly permeable soils with average percolation rates in excess of forty-five (45) minutes per one (1) inch, add ten thousand (10,000) square fee to lot area.

(iv) If criteria (ii) and (iii) are both present, then the minimum lot size shall be forty thousand (40,000) square feet.

(2) Collective private sewage facilities shall be approved by the licensing authority subject to meeting all of the above (8.03 (b) (1)) but shall not exceed a density in excess of two dwelling units per acre. Such gross density shall be defined as the total number of single family residential units divided by the total acreage within the subdivision.

(3) Institutional or non-residential (Business - Commercial, Industrial) collective or other private sewage facilities shall be approved by the licensing authority provided they will meet conditions in 8.02 (b) (1) above. Each four hundred (400) gallons per day of sewage for such institutions shall be equivalent to that of a single family unit. Lots shall be sized in accordance with the Standards and 8.03 (b) (1) above.

(4) Subdivisions with lots or tracts over the Edwards Aquifer Recharge Zone on which private sewage facilities are to be located must have an area of at least one (1) acre per single family living unit or equivalent.

(5) Lots with Water Wells: When individual water wells are proposed for use the minimum lot size shall be forty thousand (40,000) square feet per single family living unit.

§8.04. NOTICE.

(a) Upon the approval of a Subdivision Construction Authorization, the authorization, the application therefor, and any other critical evaluation information shall be filed as a deed record for the subdivision lots.

(b) Any person, or his agents and assignees, desiring to create a subdivision that will utilize private sewage facilities, in whole or in part, and sell, lease, or rent the lots therein shall inform each prospective purchaser lessee, or renter:

(1) That the subdivision is subject to all of the terms and conditions of these Rules,

(2) That a Permit to Construct shall be required before a private sewage facility can be constructed in the subdivision,

(3) That a License to Operate shall be required for the operation of such a private sewage facility, and

(4) That an application for a Subdivision Construction Authorization has been made and whether or not it has been approved, including any restrictions placed on any such approval.

CHAPTER 9
ENFORCEMENT

§9.01. INFORMAL.

(a) The licensing authority may routinely inspect private sewage facilities to assure continued compliance with these Rules.

(b) The licensing authority shall inspect any private sewage facility that is reasonably believed to be causing pollution, a threat to the public health, or nuisance without complying with these Rules based on a creditable complaint or other information available to the licensing authority and may inspect any new private sewage facility should the conditions existing at the time of licensing be found to have changed. If upon such inspection it is found that pollution, a threat to public health, or nuisance conditions is occurring, or an unpermitted substantial modification was performed, the licensing authority shall so notify the owner of the private sewage facility in writing and include what problems must be remedied in order to achieve compliance, and set a reasonable amount of time to achieve compliance. The private sewage facility shall be reinspected at the expiration of the allotted time.

   (1) If the facility is found to be compliant, a license therefor may be issued or the existing license may be modified.

   (2) If the facility is found to be noncomplaint, appropriate enforcement shall be taken.

§9.02. CRIMINAL (TEXAS WATER CODE, S26.214)

(a) A person who violates any of these Rules, is guilty of a misdemeanor and on conviction is punishable by a fine of not less than $10 nor more than $200. Each day that a violation occurs constitutes a separate offense.

(b) Jurisdiction for prosecution of a suit under this section is in the justice of the peace courts.

(c) Venue for prosecution of a suit under this section is in the justice of the peace precinct in which the violation is alleged to have occurred.

§9.03. CIVIL (TEXAS WATER CODE, S26.124)

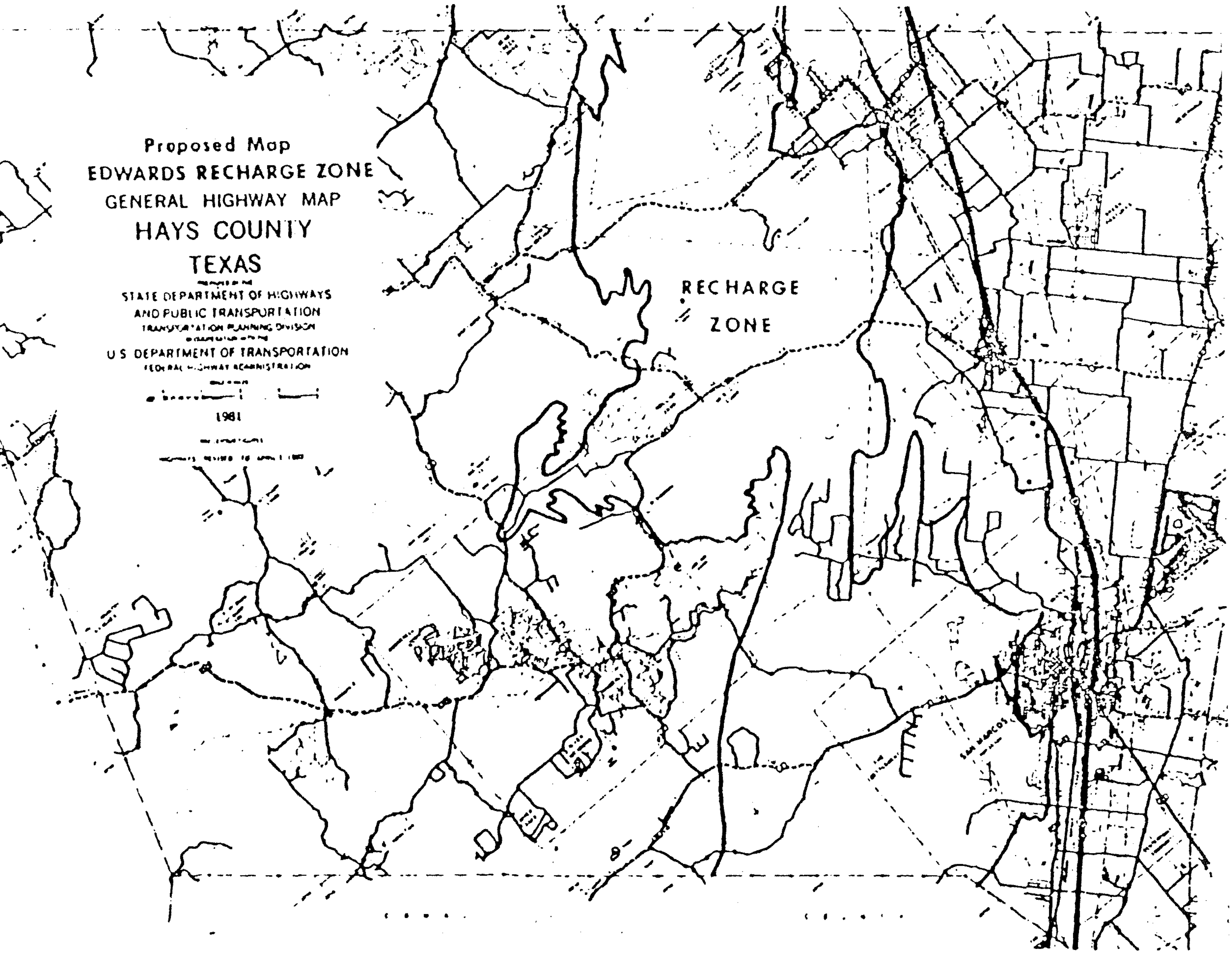
(a) Whenever it appears that a violation or the threat of a violation of any of the terms and conditions of these Rules has occurred or is occurring, the licensing authority may have a suit instituted in a district court through its own attorney for injunctive relief or civil penalties or both against the person who committed, is comitting, or is threatening to commit the violation.

(b) Such suits may not be instituted by the licensing authority unless the Commissioners Court has adopted a resolution authorizing the institution of the suit.

(c) In suits brought under this section, the Texas Department of Water Resources is a necessary and indispensable party.

F E E S

FEE SCHEDULE	FEE
1. Permit to Construct - (Will include license upon final approval)	$100 single fami $150 other than single fami
2. Subdivision Construction Authorization - ($100 plus $2 fee per lot)	$100 plus $2 fee per lot
3. Percolation Tests Performance - (According to county standards and approval)	$25
4. Fee for Inspection or Reinspection of Existing Systems - (Will include one (1) water sample - $25 for additional trips)	$50
5. Installers Licensing Fee	$100 1st year $75 annual ther
6. Reinspection Trip Charge	$25
7. Fees for Written Request, Exceptions or Appeals	$100
8. Fee for Professional Consultation or Design and Installation	$25 per/hour


Proposed Map
EDWARDS RECHARGE ZONE
GENERAL HIGHWAY MAP
HAYS COUNTY
TEXAS
STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
TRANSPORTATION PLANNING DIVISION
U S DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
1981
RECHARGE
ZONE
SAN MARCOS

Amend the "Rules of Hays County for Private Sewage Facilities," Chapter 8.02 under Section (a), #2-C, (Page 16), which now read: Provided, however, that percolation tests and borings are not required if the minimum lot size in a residential subdivision is two (2) acres or larger.

Amend to read: Provided, however, that percolation tests and borings are not required if the minimum lot size in a residential subdivision is one (1) acre or larger.

*Approved as amended by Hays County Commissioner's Court after public hearing of April 14, 1986.

Facility Planning For Developing New Lots

Effective February 4, 1997, all proposed land developments, whether platted or not, which will utilize On-Site-Sewage Facilities (OSSF) must submit to the permitting authority, planning materials to evaluate the development for overall site suitability. Planning materials must at a minimum contain the following:

- Overall site plan
- Topographic map
- 100 year floodplain map
- Soil profile analysis with a complete report detailing the types of OSSFs to be considered and their compatibility with area wide drainage and groundwater
- Comprehensive drainage and 100-year floodplain impact plan
- Planning materials must address suitable potential replacement areas for OSSFs
- Subdivisions utilizing individual water supply wells and OSSFs shall show the location of all existing and proposed water wells and a 100 foot radius sanitary control easement around each well
- All lots must meet minimum lot size requirements (Roadway easements and rights-of-way are excluded when calculating acreage)

This office will provide a response to the submitted planning material within 45 days of receipt of the complete submission.

ORDER ADOPTING RULES OF HAYS COUNTY, TEXAS
FOR ON-SITE SEWAGE FACILITIES

PREAMBLE

A. The Texas Natural Resource Conservation Commission has established Design Criteria for on-site sewage facilities to provide the citizens of Texas with adequate public health protection and a minimum of environmental pollution; and

B. The Legislature has enacted legislation, codified as Texas Health and Safety Code, Chapter 366, which authorizes a local government to regulate the use of on-site sewage disposal facilities in its jurisdiction in order to abate or prevent pollution, or injury to public health arising out of the use of on-site sewage facilities; and

C. Due notice was given of a meeting and public hearing to determine whether the Commissioners Court of Hays County, Texas, should enact an order controlling or prohibiting the installation or use of on-site sewage facilities in the County of Hays, Texas; and

D. Said meeting and public hearing were held in accordance with the notice thereof, and the evidence and argument there presented were considered by the Commissioners Court of Hays County, Texas; and

E. The Commissioners Court of Hays County, Texas, finds that the use of on-site sewage facilities in Hays County, Texas, is causing or may cause pollution, and is injuring or may injure the public health; and

F. The Commissioners Court of Hays County finds that the Texas Natural Resource Conservation Commission has identified the Edwards Aquifer as being one of the most sensitive aquifers in Texas to groundwater pollution; and

G. The Commissioners Court of Hays County, Texas, finds that soil conditions in those portions of Hays County situated over the Recharge Zone of the Edwards Aquifer are generally porous limestone susceptible to rapid transportation of pollutants and therefore, in order to protect the public health, safety and welfare of the residents of Hays County, additional protective measures are appropriate and necessary for the use of on-site sewage systems within those portions of Hays County; and

H. The Commissioners Court of Hays County finds that portions of Hays County within the Contributing Zone of the Barton Springs Segment of the Edwards Aquifer and other areas in western Hays County have been designated by the Texas Natural Resource Conservation Commission as within the "Hill Country Critical Area" (now a Priority Groundwater Management Area) pursuant to Chapter 35 of the Texas Water Code and 30 Texas Administrative Code ("TAC") §294.24; and

I. The Commissioners Court of Hays County finds that the United States Fish and Wildlife Service has described the Contributing Zone of the Barton Springs Segment of the Edwards

Aquifer as a porous limestone, karst aquifer that is heavily influenced by the introduction of pollutants into its recharge features; and

J. The Commissioners Court of Hays County finds that the Texas Natural Resource Conservation Commission, for the stated purpose of protecting existing and potential uses of groundwater, has implemented special protective regulations for the Recharge Zone of the Edwards Aquifer under the Edwards Aquifer Rules promulgated as Chapter 213 of the Texas Administrative Code; and

K. The Commissioners Court of Hays County finds that soils within the Glen Rose Formation within the Contributing Zone of the Barton Springs Segment of the Edwards Aquifer have been described as highly variable, stony and fragile systems easily subject to degradation and that the Glen Rose Formation is characterized by a stair-step topography with alternating hard limestone/dolomite beds and soft marly beds which is highly susceptible to lateral discharge of groundwater through seeps directly into creeks and other bodies of surface water; and

L. The Commissioners Court of Hays County, Texas, upon public hearings, has received public comment from a broad spectrum of residents of Hays County seeking more stringent protective measures for the use of on-site sewage facilities in rural areas of Hays County including those areas within the Recharge Zone of the Edwards Aquifer and the Contributing Zone of the Barton Springs Segment of the Edwards Aquifer; and

M. The Commissioners Court of Hays County finds that protecting water resources is vital to human health and that virtually all residents within Hays County depend solely upon groundwater for their drinking water; and

N. The Commissioners Court of Hays County adopts Section 10 of these Rules as water availability requirements pursuant to Section 35.019 of the Texas Water Code and finds that these Rules are necessary to prevent current or projected water use in the county from exceeding the safe sustainable yield of the county's water supply; and

O. The Commissioners Court of Hays County finds that the population of Hays County has grown at an average annual rate of approximately five percent (5%) since 1990 and it is expected that similar or faster growth rates will be experienced in the future with much of this growth occurring within the unincorporated areas of Hays County; and

P. The Commissioners Court of Hays County finds that all or most of the projected future growth within the unincorporated areas of Hays County is expected to rely on on-site sewage facilities and to obtain drinking water from groundwater and that more stringent regulations of on-site sewage facilities within the Recharge Zone of the Edwards Aquifer, the Contributing Zone of the Barton Springs Segment of the Edwards Aquifer and those portions of Hays County within the Hill Country Priority Groundwater Management Area are necessary and appropriate to avert public health hazards resulting from such increased use of on-site sewage facilities; and

Q. The Commissioners Court of Hays County, Texas, has considered the matter and deems it appropriate to enact an Order adopting Rules regulating on-site sewage facilities to abate or prevent pollution, or injury to public health in Hays County, Texas.

ORDER

NOW, THEREFORE, BE IT ORDERED BY THE COMMISSIONERS COURT OF HAYS COUNTY, TEXAS:

SECTION 1. THAT the matters and facts recited in the preamble hereof are hereby found and determined to be true and correct;

SECTION 2. THAT the use of on-site sewage facilities in Hays County, Texas is causing or may cause pollution or is injuring or may injure the public health;

SECTION 3. THAT an Order for Hays County, Texas, BE adopted entitled "On-Site Sewage Disposal," which shall read as follows:

AN ORDER ENTITLED ON-SITE SEWAGE DISPOSAL

SECTION 4. CONFLICTS.

All Orders or parts of the Orders of Hays County, Texas, not consistent with or in conflict with the provisions of this Order are hereby repealed.

SECTION 5. ADOPTING CHAPTER 366.

The County of Hays, Texas, clearly understands the technical criteria, legal requirements, and administrative procedures and duties associated with regulating on-site sewage facilities, does adopt and will fully enforce Chapter 366 of the Texas Health and Safety Code.

SECTION 6. AREA OF JURISDICTION.

(a) The Rules shall apply to all the area lying in Hays County, Texas, except for the area regulated under an existing Rule and the areas within incorporated cities.

(b) These Rules shall apply to those incorporated cities or towns that have executed intergovernmental contracts with Hays County, Texas.

SECTION 7.

Any structure discharging sewage into an on-site sewage facility within the jurisdictional area of Hays County, Texas must comply with the Rules adopted in Sections 8 and 10 of this Order.

SECTION 8. ON-SITE SEWAGE FACILITY RULES ADOPTED.

The Rules ("Design Criteria For On-Site Sewage Facilities," Texas Administrative Code 30 TAC 285.1-285.91), attached hereto, promulgated by the Texas Natural Resource Conservation Commission for on-site sewage systems are hereby adopted, and all officials and employees of Hays County, Texas, having duties under said Rules are authorized to perform such duties as are required of them under said Rules.

SECTION 9. INCORPORATION BY REFERENCE.

The Design Criteria (30 TAC 285.1-285.91) and all future amendments and revisions thereto are incorporated by reference and are thus made a part of these Rules. A copy of the current Design Criteria is attached to these Rules.

SECTION 10. AMENDMENTS.

The County of Hays, Texas, wishing to adopt more stringent Rules for its On-Site Sewage Facility Order understands that the more stringent conflicting local Rule shall take precedence over the corresponding Texas Natural Resource Conservation Commission requirements if local rules provide greater public health and safety protection. Listed below are the more stringent Rules adopted by Hays County, Texas:

10.1 Facility Planning

(a) Land Planning and Site Evaluation. All of the terms and provisions of 30 TAC Section 285.4 are incorporated within the Rules of Hays County except as expressly amended below.

(1) RESIDENTIAL LOT SIZING

(A) **Platted or unplatted Lots served by Surface Water or Rainwater Collection Systems.** Lots used for Single Family Residences platted or created after the Effective Date of these Rules and served by a Surface Water or Rainwater Collection System shall have surface areas of at least the acreage designated in Table 10.1(A).

(B) **Platted or unplatted Lots served by Public Water Wells.** Lots used for Single Family Residences platted or created after the Effective Date of these Rules and served by a Public Water Well shall have surface areas of at least the acreage designated in Table 10.1(B).

(C) **Platted or unplatted Lots served by Private Wells or other water systems.** Lots used for Single Family Residences platted or created after the Effective Date of these Rules and served by a Private Well or any water system other than those described in 10.1(A) or 10.1(B) above shall have surface areas of at least the acreage designated in Table 10.1(C).

(2) CERTAIN MULTI-UNIT RESIDENTIAL DEVELOPMENTS SERVED BY A

CENTRAL SEWAGE COLLECTION SYSTEM FOR ON-SITE DISPOSAL.

Non-Single Family residential developments with four or fewer living units, such as duplexes, may utilize lots smaller than stated in paragraphs (1)(A), (1)(B) and (1)(C) of this Section provided:

(A) Site Specific Materials, addressing either a central system or individual systems, and Site Evaluation Materials are submitted to the Department and approved by the Commissioners Court.

(B) There are no more than two living units per each minimum lot acreage that would be applicable under Tables 10.1(A), 10.1(B) or 10.1(C); provided that in no event shall lot acreage be lower than permitted under Chapter 366 of the Texas Health and Safety Code or other applicable State law.

(3) APARTMENTS, CONDOMINIUMS, INSTITUTIONAL USES OR NON-RESIDENTIAL (BUSINESS, COMMERCIAL OR INDUSTRIAL).

Platted or unplatted Lots used for apartment or condominium complexes with more than four (4) units, institutional uses or non-residential uses, including office, commercial or industrial uses producing domestic wastewater shall:

(A) Be sized and designed pursuant to a sewage disposal plan submitted to the Director and approved by the Commissioners Court, which shall be based upon approved Site Specific Materials and Site Evaluation Materials; and

(B) Have a surface acreage of at least one (1) acre for each living unit equivalent (LUE) per day. A Living Unit Equivalent is defined as three hundred and fifty (350) gallons of sewage per day.

(b) Averaging. The minimum acreage requirements set forth in Tables 10.1(A), 10.1(B) and 10.1(C) may be obtained by averaging the size of all Lots within a platted development so long as the only Lots with acreage exceeding the minimum set forth in such table that may be included in the averaging calculation shall be: (i) Lots reserved by plat note for use as a publicly dedicated and accepted park, or a private greenbelt in which all owners or residents of the subdivision hold an equal, unrestricted and indivisible right of access and use, or (ii) Lots larger than five acres restricted by a plat note prohibiting all development other than one Single Family Residence or other development excluded from the term "Regulated Activities" under the Edwards Aquifer Rules of the TNRCC (30 TAC Chapter 313), but without regard to the aquifer over which the development occurs. Only platted development may take advantage of these averaging provisions.

(1) Notwithstanding the averaging allowed above or anything else to the contrary in this Paragraph 10, no on-site sewage facility shall be permitted on any Lot smaller than the minimum lot size permitted under Chapter 366 of the Texas Health and Safety Code and the Regulations promulgated thereunder (30 TAC Chapter 285).

10.2 Minimum Required Separation Distances for On-Site Sewage Facilities.

(a) The minimum separation distances set forth in Table X of the Rules for soil absorption systems, unlined ET Beds and soil irrigation spray areas for Lots created or platted after the Effective Date of these Rules are supplemented as follows:

1.	Barton Creek, Bear Creek, Blanco River, Cottonwood Creek, Cypress Creek, Little Bear Creek, Lone Man Creek, Long Branch, Onion Creek, Purgatory Creek, Roy Creek, San Marcos River, Sink Creek, Smith Creek, Willow Creek, and Wilson Creek (measured from the bank at average pool height):	150'
2.	Property lines:	20'
3.	Vegetable gardens or orchards:	20'

10.3 Water Well Sanitary Easements.

Individual Lots in which a Private Well is to be located shall provide, within the boundary of each Lot, an area with a one hundred (100) foot radius around the well in which no on-site sewage facility may be located. This area shall be designated as a private water well sanitary control easement. Applicants seeking subdivision approval from Hays County may, upon application for preliminary plat approval, apply for an exemption from the requirement that the 100-foot sanitary easement be located within the boundaries of the Lot if the easement is clearly depicted on the plat and the location is approved by the Commissioners Court. Public Water Wells shall comply with the sanitary control easements required under 30 TAC Chapter 290, as amended.

10.4 Cluster and Innovative Development

Cluster development and innovative development, such as "planned unit development" style developments, are encouraged and will be considered on a case by case basis, upon the submission of the following with a preliminary plat application for subdivision approval:

1. Site Evaluation Materials demonstrating that such a cluster or innovative development is appropriate in light of lot sizes, soil or other conditions;
2. Site Specific Materials;
3. Site Plan to be recorded with Record Plat, which shall state the future development of the Property shall be in accordance with the Site Plan. The Site Plan shall designate the type of development permitted on each Lot, the location of buildings, paved areas, green belts and on-site sewage facilities (including drainage fields) on each Lot; and
4. All other materials required under Sections 285.6 and 285.30 of the Rules, as applicable.

The Commissioners Court may approve an application for cluster or innovative development permitting minimum lot acreage below those required in 10.1(a) above upon a finding that the proposed development will provide equivalent protection of the public health and environment as development in accordance with this Section 10 and the remainder of these Rules.

10.5 Variances.

Requests for variances from these Rules shall be considered in accordance with the criteria specified in Section 285.3(c) of the Rules and the following additional criteria:

(a) Only lots platted in accordance with the Hays County Subdivision and Development Regulations or legally in existence prior to the Effective Date of these Rules will be eligible for a variance; and

(b) Site Specific Materials and Site Evaluation Materials must be submitted with the preliminary plat application for each Lot for which a variance is sought, with detailed soil profile analysis of the proposed absorption field site demonstrating soil characteristics that meet or exceed the criteria for suitable soils set forth in Table V of the Rules.

The Commissioners Court shall have discretion to approve or deny an application for a variance and may approve an application for a variance only upon a finding that (a) development pursuant to the proposed variance will provide equivalent protection of the public health and environment as development in strict accordance with these Rules, including Paragraph 10, and (b) that there are special circumstances or conditions affecting the land involved such that strict application of the provisions of these Rules would deprive the applicant the reasonable use of his land and that failure to approve the variance would result in undue hardship to the applicant. Pecuniary hardship, standing alone, shall not be deemed to constitute undue hardship.

10.6 Permitting Procedures and Additional Requirements

The Hays County Commissioners Court may from time to time adopt local procedural requirements for applications, permitting and inspection procedures for On-Site Sewage Facilities.

10.7 Amendment to Section 285.34(b)(2) (Pump Tank Sizing)

Pump tanks shall be sized for *one day of flow* above the alarm-on level. (Amended portion in italics).

Comment: This more stringent standard affords a greater level of public health protection by assuring that households will be able to continue using their wastewater facilities for up to one day following a system failure. Hays County is a rural area served by a limited number of wastewater pumping services and it is unrealistic to expect that pumps can be repaired or replaced sooner than one day after a failure.

10.8 Amendment to Section 285.33(a)(1)(A) Criteria for Sewage Disposal System Excavations

Comment: This more stringent standard is adopted to prevent excessive deviation in longer trenches, which would contribute to surface failures at the lowest elevation of the trench.

The bottom of the excavation shall be not less than 18 inches in width and level to within one inch over each 25 feet of excavation, *but in no event shall there be more than two inches of fall over the entire length of the excavation.* (Amended portion in italics).

10.9 Amendment to Section 285.33 (a)(1)(B) (Porous Media)

Chipped tires or iron slag are not a permitted medium.

Comment: Unacceptable levels of iron bacteria have been detected in approximately seventy percent (70%) of wells in Hays County. Hays County has no shortage of gravel for drainfield media and thus there is less need for alternative media.

10.10 Amendment to Section 285.7 (Additional Requirements for Surface Irrigation Systems)

The following requirements are imposed in addition to those set forth in Section 285.7 for an On-Site Sewage Facility utilizing surface irrigation:

(a) Licenses to operate an On-Site Sewage Facility utilizing surface irrigation shall be valid for two years.

(b) Surface irrigation shall be limited to sprinkler application only.

(c) All On-Site Sewage Facilities utilizing surface irrigation shall be designed to facilitate periodic sampling.

(d) Effluent discharge lines shall be equipped with a 100 mesh or smaller filter.

Comment: This more stringent standard affords a greater level of public health protection by assuring that excessive levels of solids in effluent, which may be an indication of inadequate treatment, will be filtered and more quickly detected.

10.11 Miscellaneous

(a) A permit will be required for all On-Site Sewage Facilities, regardless of the size of the lot or acreage onto which it is installed.

(b) Construction of an On-Site Sewage Facility must be commenced within 12 months and completed within 16 months of the date of the application for a permit.

(c) French drains used to support and protect On-Site Sewage Facilities shall be upgradient of the On-Site Sewage Facility and shall be designed by a registered engineer to prevent stormwater drainage from entering into the On-Site Sewage Facility. An applicant desiring to install a french drain must demonstrate that its use will afford a greater level of public health by diverting stormwater away from the On-Site Sewage Facility.

(d) Effluent holding tanks shall be authorized only for temporary use for 90 days, with one 90 day renewal. The permittee must provide metered water usage and pumping manifests.

(e) Property owners requesting certification of existing systems will be required to submit a pumping report to the Department in a form acceptable to the Department containing at least the following information: (i) verification that the septic tank has been pumped within the previous three years; and (ii) the tank capacity and depth of sludge, provided that pumping reports performed prior to the effective dates of these Rules will not be required to identify tank capacity and depth of sludge. Upon review of the pumping report, the Department, upon approval by the Commissioners Court, may require that the septic system be upgraded to satisfy current technical requirements (other than minimum lot acreage) prior to certification.

10.12 Definitions.

The following terms shall have the meanings ascribed to them below when used in this Order or the attached Tables:

Conventional Septic System - On or off site sewerage facilities including septic tanks, sewage holding tanks, chemical toilets, treatment tanks and all other such facilities and systems other than Public Sewer Systems and Permitted Class I On-Site Wastewater Systems.

Contributing Zone of the Barton Springs Segment of the Edwards Aquifer - Any land within the watersheds of Barton, Onion, Slaughter, Williamson, Bear and Little Bear Creeks. In the event an Applicant cannot determine with specificity the location of the boundary of the Contributing Zone of the Barton Springs Segment of the Edwards Aquifer, the Applicant may submit appropriate maps and other evidence as may be requested by the Department for assistance in such determination from the Department.

Department - The Hays County Environmental Health Department.

Edwards Aquifer Recharge Zone - Any area identified as such by the Edwards Aquifer Rules. In the event an Applicant cannot determine with specificity the location of the boundary of the Edwards Aquifer Recharge Zone, the Applicant may submit appropriate maps and other evidence as may be requested by the Department for assistance in such determination from the Department. Any determination by the Department will affect only these Regulations and will not in any manner be binding upon the TNRCC. The Department may require the Applicant to obtain a determination from the TNRCC and any determination by the TNRCC regarding the location of the Recharge Zone will control for purposes of these Regulations. The intent of these Regulations is to coordinate applicable state and local regulations such that the definition of the Edwards Aquifer Recharge Zone under these Regulations shall be identical with the definition found within the Edwards Aquifer Rules.

Edwards Aquifer Rules - The Regulations promulgated by the Texas Natural Resource Conservation Commission relating to the Edwards Aquifer, currently set forth in Title 30 Texas

Administrative Code Chapter 213, as amended from time to time.

Permitted Class I On-Site Wastewater System - An on-site system of sewage treatment other than a septic tank producing no more than 5,000 gallons of sewage per day, which has been licensed by the Department, utilizing advanced treatment processes to produce Class I effluent (as defined in National Sanitation Foundation Testing Standard 40) and designed to encourage the reuse of wastewater for irrigation on the premises. A collective off-site system for cluster development may also be approved by the Department on a case by case basis in accordance with the Rules.

Private Well - Any water well other than a Public Water Well.

Public Sewer System - Any public or private sewerage system for the collection of sewage that flows into a treatment and disposal system that is regulated pursuant to the rules of the Texas Natural Resource Conservation Commission and Chapter 26 of the Texas Water Code.

Public Water Well - A water well providing piped water for human consumption with a potential to serve to at least 15 service connections on a year-round basis or serving at least 25 individuals on a year-round basis. This definition includes all wells defined as a "Community Water System" or a "Public Water System" under Chapter 290 of the Texas Administrative Code.

Rainfall Collection System - An individual potable water supply system approved by the Department and having rainwater as its source and having a capacity sufficient to provide all of the domestic water requirements other than irrigation for development on the Lot. The Department may approve rainfall collection systems using a well for emergency/back-up domestic water requirements on a case by case basis.

Single Family Residence - Any habitable structure constructed on, or brought to, its site and occupied by members of a family, including but not limited to manufactured homes situated on leased space.

Site Evaluation Materials - The site evaluation materials described in Section 285.30 of the Rules.

Site Specific Materials - The facility planning materials described in Sections 285.4 of the Rules and, if applicable, Sections 285.5, 285.6, 285.7 and 285.40 of the Rules.

Surface Water - Water from streams, rivers or lakes or other bodies of water above the surface of the ground and obtained without pumping or extracting underground water. Water that is obtained from groundwater or other underground sources through wells, pumps or other means designed to accelerate natural flows from such underground source and which is then stored in a surface reservoir shall not be considered surface water. In the event any water supply system relies primarily on surface water, with reliance upon groundwater only for back-up supplies or a small percentage of the total water supplied, the Commissioners Court may, on a case by case basis, approve an application to consider such water supply system as qualifying as a Surface Water system under these Rules.

SECTION 11. DUTIES AND POWERS.

The Director of the Environmental Health Department of Hays County, Texas, and any individuals approved pursuant to the succeeding sentence, are herewith declared the designated representative(s) for the enforcement of the Rules within the jurisdictional area of Hays County. The appointed individual(s) must be approved and certified by the Texas Natural Resource Conservation Commission before assuming the duties and responsibilities of the Designated Representative of Hays County.

SECTION 12. COLLECTION OF FEES.

All fees collected for permits and/or inspections shall be made payable to the Hays County Treasurer.

SECTION 13. APPEALS.

Persons aggrieved by an action or decision of the designated representative may appeal such action or decision to the Commissioners Court of Hays County, Texas.

SECTION 14. PENALTIES.

This Order adopts and incorporates all applicable penalty provisions related to on-site sewage facilities, including, but not limited to, those found in Chapters 341 and 366 of the Texas Health and Safety Code, Chapter 26 of the Texas Water Code and 30 TAC Chapter 285.

A person commits an offense if the person violates a requirement of these Rules. An offense under this provision is a Class C misdemeanor punishable by fine.

At the request of the Commissioners Court, the county attorney or other prosecuting attorney for the County may file an action in a court of competent jurisdiction seek one or all of the following:

(a) Enjoin the violation or threatened violation of a requirement established by or adopted by the Commissioners Court under these Regulations; and

(b) Seek civil or criminal penalties as provided by law; and

(c) Take all actions or seek any penalty authorized under law, including the penalties and enforcement provisions of Chapters 341 and 366 of the Texas Health and Safety Code, Chapter 26 of the Texas Water Code and 30 TAC Chapter 285.

SECTION 15. SEVERABILITY.

It is hereby declared to be the intention of the Commissioners Court of Hays County, Texas, that the phrases, clauses, sentences, paragraphs, and sections of this Order are severable, and if any phrase, clause, sentence, paragraph, or section of this Order should be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraph, or sections of this Order, since the same would have been enacted by the Commissioners Court without incorporation in this Order of such unconstitutional phrases, clause, sentence, paragraph or section.

SECTION 16. RELINQUISHMENT OF ORDER.

If the Commissioners Court of Hays County, Texas, decides that it no longer wishes to regulate on-site sewage facilities in it areas of jurisdiction, the Commissioners Court shall follow the procedures outlined below:

(a) The Commissioners Court shall inform the Texas Natural Resource Conservation Commission by certified mail at least thirty (30) days before the published date of the public hearing notice that it wishes to relinquish its On-Site Sewage Facility Order.

(b) The authorized agent shall post the required public notice in a newspaper regularly published or circulated in the area of jurisdiction at least thirty (30) days prior to the anticipated date of action by the authorized agent.

(c) The authorized agent shall send a copy of the public notice, a publisher's affidavit of public notice, and a certified copy of the minutes to the Texas Natural Resource Conservation Commission.

(d) The executive director shall process the request for relinquishment and may issue an order relinquishing the authority to regulate OSSF's within the authorized agent's jurisdiction or may refer the request to relinquish to the Commission.

(e) Prior to issuance of a relinquishment order the local governmental entity and the executive director shall determine the exact date the authorized agent would surrender its authorized agent designation to the executive director.

SECTION 17. EFFECTIVE DATE.

This Order shall be in full force and effect from and after its date of approval as required by law and upon the approval of the Texas Natural Resource Conservation Commission.

AND IT IS SO ORDERED:

PASSED AND APPROVED THIS ________ DAY OF AUGUST, 1997.

APPROVED:

____

County Judge

ATTEST:

____

County Clerk

Appendix B

Minutes of Stakeholder's Meetings

MINUTES OF PROJECT STAKEHOLDERS INITIAL COMMITTEE MEETING
REGIONAL WASTEWATER FACILITY PLANNING STUDY

Location: **Buda City Council Chambers - 121 North Main**
Date: **August 17, 2004 - 2:00 PM**
Attending: **SEE ATTACHED SIGN IN SHEET**

I. WELCOME AND INTRODUCTIONS

Debbie Magin – Director of Water Quality Services – Guadalupe-Blanco River Authority welcomed all stakeholders and thanked them for their attendance and welcomed their participation with the study. Debbie gave a brief synopsis of the study and had each stakeholder introduce themselves. Debbie introduced Keith Jackson – Vice President and District Director - PBS&J to discuss the scope of work for the Study.

II. SCOPE OF WORK

Keith Jackson thanked the City of Buda for allowing the Regional Wastewater Facility Stakeholder Committee for the use of the city council chambers. Keith introduced the PBS&J staff members that will be involved with the Study. Keith Pyron – Project Manager; Robert McCarty – Water and Wastewater and Paul Jensen – Water Resources. Keith Jackson generally discussed the scope of the project which includes the eastern portion of Hays County that is expected to grow exponentially in the next few years, potentially adding up to 12,000 new homes. Numerous developments have been proposed in or near the cities of Kyle, Buda, Niederwald and Uhland. As the study area continues to grow, water quality issues become increasingly important to the residents and businesses in the area. Keith Jackson introduced Keith Pyron to present the project baseline information.

III. PRESENT BASELINE INFORMATION

Keith Pyron presented a series of digital maps which depicted the collected information. Typical data included boundaries associated with Certificates of Convenience and Necessity (CNN's), city, county, subdivision, and other political jurisdictions, existing and proposed developments/subdivisions, topographic maps, existing wastewater treatment facilities and related capacities, and proposed infrastructure. Keith handed out four (4) 11" X 17" maps depicting the following information.

A. Subwatershed
1. Topography
2. Soils
3. Vegetation

B. Land Use
1. Impervious Cover
2. Existing and Proposed Wastewater Systems and Permits
3. CCNs and City Corporate Boundaries

C. Drainage Systems
1. Creeks
2. Reservoirs

D. Public Infrastructure

1. Roads
2. Power Lines
3. Water and Wastewater Systems

E. History of Development Regulations and Ordinances

Keith discussed that the growth in the study area is heavily influenced by the continued growth of and population spillover from the City of Austin. As growth accelerates into Hays County, outside of municipal ordinances and developmental controls, the regional concept becomes lost as each successive development considers only the infrastructure related to that particular development. PBS&J will formulate regional growth projections utilizing local input and data. Analyzing the growth projections and local development ordinances, PBS&J will identify potential areas to feasibly, economically and effectively locate regional treatment facilities that could serve multiple jurisdictions. Keith requested that each jurisdiction provide PBS&J with local development ordinances.

IV. BROAD OBJECTIVE OF THE STUDY AND PROJECT SCHEDULE

Keith informed the stakeholders that the broad objective of the Study is to evaluate existing and proposed wastewater treatment facilities as to their location, capacity and ability to expand to meet the needs of the explosive growth. A project schedule was provided to each stakeholder. The study will be completed by mid December, 2004. The following seven (7) scope tasks for the Study were discussed:

Task 1. Develop Baseline Information

The baseline information was presented earlier in the meeting by Keith Pyron.

Task 2. Public Participation

Three stakeholder/public meetings are planned for this study. Keith Pyron informed the stakeholders that this initial meeting will present the study baseline information and present the broad objective of the study to the public/ stakeholders. The second meeting will include a presentation of current water quality conditions and seek input on water quality goals and direction to formulate and obtain consensus on a more specific set of project objectives from the public/ stakeholders. These objectives would relate to development in the immediate watershed, including analysis of purely regulatory options, the effects of no action, and a general analysis of regional wastewater planning options. The final meeting will be a presentation of water quality protection alternatives, considering the water quality effects and the fiscal implications of the alternatives.

Task 3. Formulation of Conceptual Development Scenarios

Keith Pyron introduced Robert McCarty to discuss the work effort for Task 3. Robert generally discussed how PBS&J will analyze existing population densities and develop expected densities by sub-area based on where growth is expected to occur.

Task 4. Analyze Effects of Conceptual Development Options

Keith Pyron introduced Paul Jensen to discuss the development options. Paul talked about how PBS&J will evaluate the effects of the development ordinances and practices of the various political subdivisions in the study area and the subsequent impact to the water quality of the region. Estimated loadings from the various wastewater treatment systems and loadings from rainfall events in the watershed and the impacts of these contributions on water quality in the Plum Creek watershed will be considered.

Task 5. Develop Regional Water Quality Protection Plan

Robert McCarty generally discussed how PBS&J will document the preferred plan process consensus.

Task 6. Recommendations for Watershed Management Practices

Keith Pyron generally discussed that upon completion of the Regional Water Quality Protection Plan, this task would incorporate the concepts of the plan into best management practices that could be implemented by local governments and GBRA.

Task 7. Reporting

Forty (40) copies of the final report will be provided to GBRA. Each stakeholder will be provided a copy of the final report from GBRA.

V. QUESTIONS AND ANSWERS

Several questions were asked during the course of the meeting. The questions and answers as shown below:

1) Does the baseline information need to include the Edwards Recharge zone? **Yes, it will be added.**

2) Will small wastewater treatment plants want to merge with larger plants? **It depends on the situation; some plants may want to merge while some plants will prefer to remain as is.**

3) What are the problems with MUD's? **Some MUD's are very well run and operated with no problems while there are reported problems with some MUD's that are not properly operated.**

4) What do we do with the water discharge from the plants? **The water will be either discharged into an existing creek or the water can be utilized in a reuse project.**

5) What percent of water will be used for reuse? **The percent can vary from 0 percent to 100 percent. It depends on how the plant reuse is permitted.**

6) Can livestock drink water discharged from treatment plants? **Yes.**

7) What will be the projected total wastewater flow from the Study area? **Approximately 3 to 5 million gallons per day.**

8) Will discharge impact existing ponds? **Yes, the phosphates present in the discharge could impact the ponds.**

9) Are the existing septic tanks in the Study area being considered in the Study? **Yes.**

10) What is the minimum size lot for a septic system in Hayes County? **As per Mr. Allen Walther – Hayes County, the minimum size lot is 1 acre.**

VI. ADJOURN

The meeting was adjourned at 3:45 PM.

MINUTES OF PROJECT STAKEHOLDERS SECOND COMMITTEE MEETING
REGIONAL WASTEWATER FACILITY PLANNING STUDY

Location: **Buda City Council Chambers - 121 North Main**
Date: **November 9, 2004 - 2:00 PM**
Attending: **SEE ATTACHED SIGN IN SHEET**

I. WELCOME AND INTRODUCTIONS

Debbie Magin – Director of Water Quality Services – Guadalupe-Blanco River Authority welcomed all stakeholders to the second committee meeting and thanked them for their attendance and welcomed their participation with the study. Debbie gave a brief synopsis of the study and had each stakeholder introduce themselves. Debbie introduced Keith Pyron – Project Manager - PBS&J to review the baseline information presented at the initial stakeholder meeting.

II. REVIEW BASELINE INFORMATION

Keith reviewed the project baseline information with the group. The baseline information consisted of a series of four digital maps which depicted the collected baseline information. Typical data included boundaries associated with Certificates of Convenience and Necessity (CNN's), city, county, subdivision, and other political jurisdictions, existing and proposed developments/subdivisions, topographic maps, existing wastewater treatment facilities and related capacities, and proposed infrastructure. Keith reminded the stakeholders that the broad objective of the Study is to evaluate existing and proposed wastewater treatment facilities as to their location, capacity and ability to expand to meet the needs of the explosive growth. The proposed North Hays MUD #1 will be added to the wastewater map. The project schedule was also discussed with the group and the consensus was to complete and submit the draft study for review by midDecember, 2004 and conduct the final stakeholder meeting in January, 2005

III. SUBWATERSHED DESCRIPTIONS AND DEVELOPMENT PROJECTIONS

Keith Pyron introduced Robert McCarty – Water and Wastewater - to discuss the subwatershed descriptions and development projections in the study area. Robert handed out five maps to the stakeholders. The maps were also mailed to all stakeholders prior to the meeting for their review. The maps indicated the population growth categories and project area population densities for the years 2000, 2017 and 2030. The population growth and densities were by traffic serial zones developed by CAMPO. Several stakeholders noted there was a much higher population in some of the TSZs reflecting recent subdivisions. They suggested that the local school district or county be contacted and request their current population values. The present estimated population for the study area is approximately 20,000 and is expected to grow to approximately 40,000 by year 2017 and to approximately 60,000 by year 2030. All stakeholders agreed that the study area will experience tremendous growth based upon subdivision activity in the area and the CAMPO population projections appear to berepresentative. Robert introduced Paul Jensen to discuss the conceptual wastewater options and effects.

IV. CONCEPTUAL WASTEWATER OPTIONS AND EFFECTS

Paul identified the various subwatersheds; the existing or proposed wastewater outfalls; and the subsequent impact to the existing water quality of the study area. Estimated loadings from the various wastewater treatment systems and loadings from rainfall events in the watershed and the impacts of these contributions on water quality in the Plum Creek watershed and existing ponds were also discussed. The subwatersheds, outfall locations and existing ponds were indicated on the maps in the handouts. Paul discussed three conceptual wastewater options for the study area. The three options are as follows:

1. NATURAL DEVELOPMENT
2. SEVERAL LARGER CENTRALIZED (1 OR 2) PLANTS — REUSE NOT EMPHASIZED
3. DISPERSED WITH REUSE MANDATED

The option 3 pros and cons are shown below:

PROS	CONS
Reduced peak water need	More expensive to build and operate
Close to natural discharges	May be short of purple water at times
Greater irrigation flexibility	Wastewater facilities closer to people-conflict

The wastewater permitting issues are as follows:

- Will need to permit plants for full wet-weather flow into dry weather creeks—reuse won't do anything for permits.
- May have demands for Phosphate removal for pond protection, but that flies against irrigation reuse and adds cost

The consensus from the group on a broad strategic direction for wastewater service is as follows:

- Emphasize reuse, with source of wastewater in close proximity to users. That implies more smaller plants rather than one or two big ones
- Require public ownership or involvement in plants
- For reuse, go with the big users (cement plants) first, then serve parks and then residents
- When siting, try to avoid discharges to ponds
- When siting plants, try to stay out of the subwatersheds that have no plants at this time (although effect would be minimal)

V. QUESTIONS AND ANSWERS

Several questions were asked or statements were made during the course of the meeting. The questions and answers along with statements are indicated below:

1) Is there a potential for Aquifer Storage and Recovery within the study area? **ASR could possibly be utilized within the study area but treatment costs would be much higher.**
2) Are there any springs within the study area? **Several stakeholders indicated that there is a spring located upstream of the existing Kyle wastewater treatment plant.**
3) Should downstream property owners be concerned with water quality? **Yes**
4) Are any stakeholders opposed to wastewater reuse in the study area? **No stakeholders present were opposed to reuse.**
5) Is rooftop irrigation a good idea? **Yes, but it is usually cost prohibited.**
6) Several stakeholders asked for a total projection of wastewater flow that will need treating and estimates of the amount that can be reused.
7) Several stakeholders indicated they would like to see Phosphate limits on plants that discharge to ponds or surface waters.
8) The stakeholders requested that our report include recommendation that TCEQ streamline the wastewater permitting process for reuse facilities.

VI. ADJOURN

The next meeting was scheduled for January 2005. The draft report is due to the Stakeholders on December 22. The meeting was adjourned at 4:00 PM.

MINUTES OF PROJECT STAKEHOLDERS FINAL COMMITTEE MEETING
REGIONAL WASTEWATER FACILITY PLANNING STUDY

Location: Buda City Council Chambers - 121 North Main
Date: April 14, 2005 - 3:00 PM
Attending: SEE ATTACHED SIGN IN SHEET

I. WELCOME AND INTRODUCTIONS

Debbie Magin – Director of Water Quality Services – Guadalupe-Blanco River Authority welcomed all stakeholders to the final stakeholder committee meeting and thanked them for their attendance and welcomed their participation with the study. Debbie gave a brief synopsis of the study and had each stakeholder introduce themselves. Debbie introduced Keith Pyron – Project Manager - PBS&J to discuss the previously presented baseline information and review the two previous stakeholder committee meetings.

II. REVIEW BASELINE INFORMATION AND PREVIOUS STAKEHOLDER MEETINGS

Mr. Pyron indicated that a draft Regional Wastewater Facility Planning Study Report was sent to each committee member on a CD prior to the final stakeholder committee meeting. All committee members present indicated that they received the study or they were furnished a CD with the draft report after the meeting. After extending apologies for problems with the projector, Keith reviewed the project baseline information presented in Section two of the draft report with the group. The baseline information consisted of a series of four digital maps that depicted the collected baseline information. Typical data included for the planning area was vegetation, soils, land use, and mapping.

Keith also reviewed the previous stakeholder meetings with the group. The initial meeting was held on August 17, 2004 and presented the project scope, baseline information, and presented the broad objective of the study to the group. The second meeting was held on November 9, 2004 and reviewed the project baseline information and subwatershed descriptions, discussed development projections and conceptual wastewater options and effects.

III. REVIEW POPULATION ANALYSIS AND WWTP PLANNING

Keith introduced Robert McCarty to discuss the development projections and WWTP planning in the study area. Robert indicated that the population projections were from two agencies, CAMPO and Hayes CISD. The projections were divided into two periods, 2005-2017, and 2017-2030, and analyzed by Traffic Serial Zones. From this analysis it was determined that the highest overall growth was projected to occur along the IH 35 corridor. Once key areas of growth had been determined, multiple wastewater collection, treatment and disposal methods were evaluated for their suitability and cost-effectiveness to manage the anticipated increase in population area. Three alternatives were considered: No Action, Regional Plants, and Multiple Plants. Each of these three alternatives was evaluated to determine collection volume, possible reuse, environmental effects, and overall cost to serve the projected population growth throughout each of the planning area’s traffic zones.

No Action was an alternative in which there is no governmental effort supporting regionalization and wastewater treatment is left up to each individual development.

The **Regional Plants** alternative considered two plants, one located in Kyle and the other at Winfield, to serve the entire study area with wastewater collection and reuse.

.

Multiple Plants is a five-plant model, with each plant serving a smaller portion of the planning area with wastewater collection and reuse.

Analysis determined that the Multiple Plant scenario should provide the highest level of service, resulting in the smallest percentage of new homes served by OSSFs. It should also have a greater reuse potential due to each plant's proximity to the reuse demands; reuse is shown to reduce water demands on an annual average basis by nearly a million gallons per day. This is significant to water conservation and will affect water treatment costs and water rights impacts. County representatives and GBRA could have significant impact on the management of water and will more likely encourage private development to provide organized wastewater treatment and the reuse infrastructure. The multiple plant model proved to have the lowest anticipated cost per LUE.

Robert introduced Paul Jensen to discuss the water quality analysis and protection plan.

IV. WATER QUALITY ANALYSIS AND PROTECTION PLAN

Paul reviewed the six subwatersheds of the study area and noted that all streams were intermittent and did not support aquatic life uses. He noted that the main water resource features of the area were the ponds, mostly constructed through the PL-566 program of the Soil Conservation Service. He described how the USACE BATHTUB model was used to evaluate the different alternatives on the three subwatersheds that would be affected by wastewater discharges under the three alternatives. These were Bunton Branch (Pond 5); Upper Brushy and Brushy (Ponds 10, 12 and 14) and Elm (Pond 16). The main finding was that the No-Action alternative had the biggest adverse effects on ponds and the effect of the two regional alternatives was similar. However, the Multiple Plants alternative was preferred on the grounds of lower wastewater volume (due to greater reuse).

V. RECOMMENDED PLAN

The recommended plan was the Multiple Plants alternative that has four main points: employs the 5-5-2-1 treatment level, minimizes use of OSSFs, emphasizes reuse, and provides for public operation. To implement the recommended plan, two main actions were recommended—establishing an agreement or Wastewater Compact among the major public entities of the area, and seeking support from the TCEQ for the plan. Paul outlined the recommended elements of the Compact.

VI. QUESTIONS AND ANSWERS

Several questions were asked or statements were made during the course of the meeting. The questions and answers along with statements are indicated below:

1) Does GBRA need to be a co-permittee on all permits? **No, any governmental entity in the study area can be a co--permittee.**
2) Will the study be presented to Hays County Commissioners and the GBRA Board? **Yes.**
3) Will the requirement for higher level of treatment improve water quality? **Yes.**
4) Will large potential reuse customers be marketed? **Yes**
5) Does the estimated wastewater treatment plant cost (2005 cost) presented in the study include proposed high level treatment? **Yes, but not for the no action alternative.**
6) Hays County representative stated that the recommended compact approach appears correct but noted it will take some time to build consensus.
7) Why would a developer agree to co-permit with a governmental entity? **Historically, it is very difficult to permit a proposed wastewater treatment plant when a nearby governmental entity is opposed to the permit. Having a Compact member as a co-permittee should remove that problem.**

VII. ADJOURN

This was the final committee meeting and no additional meetings are scheduled. The meeting was adjourned at 4:30 PM.

Appendix C

TWDB Comments and Responses

TEXAS WATER DEVELOPMENT BOARD

June 17, 2005

Randy
Debbie

Mr. William E. West, Jr.
General Manager
Guadalupe-Blanco River Authority
933 E. Court Street
Seguin, Texas 78155

RE: Regional Facility Planning Contract between the Texas Water Development Board (BOARD) and Guadalupe-Blanco River Authority (GBRA), TWDB Contract No. 2004-483-526, Draft Final Report Review

Dear Mr. West:

Staff members of the Texas Water Development Board have completed a review of the draft report under TWDB Contract No. 2004-483-526. As stated in the above-referenced contract, the CONTRACTOR(S) will consider incorporating comments from the EXECUTIVE ADMINISTRATOR as shown in Attachment 1 and other commentors on the draft final report into a final report. The CONTRACTOR(S) will include a copy of the EXECUTIVE ADMINISTRATOR's comments in the final report.

The Board looks forward to receiving one (1) electronic copy, one (1) unbound single-sided camera-ready original, and nine (9) bound double-sided copies of the final report on this study.

If you have any questions concerning this contract, please contact Mr. Ralph Boeker, the Board's designated Contract Manager for this study, at (512) 936-0851.

Sincerely,

William F. Mullican

William F. Mullican, III
Deputy Executive Administrator
Office of Planning

Attachment

c: Ralph Boeker, TWDB

RECEIVED
JUN 23 2005
GBRA – Seguin Office

ATTACHMENT 1

TEXAS WATER DEVELOPMENT BOARD
Review Comments of the Draft Final Report entitled
"GUADALUPE BLANCO RIVER AUTHORITY REGIONAL WASTEWATER PLANNING STUDY, EASTERN HAYS COUNTY, TEXAS MAY 2005"
Contract No. 2004-483-526

1. In the Executive Summary, on page ES-2, three separate alternatives were described: No Action, Regional Plants and Multiple Plants. In Chapter 4, the alternatives are listed as: No-Action, Traditional Regional Approach and Multiple Plants with Reuse Emphasis, pages 4-9 and 4-10. In Chapter 5, alternatives are listed as: No Action, Regional and Multiple Small, in Table 5.1 on page 5-2. Please use consistent descriptions for the alternatives throughout the report.

2. For Task 1, a portion of the scope of work for the baseline information is met though data entry into a Geographic Information System. Please make this baseline information available to TWDB.

3. Consistent with the scope of work for Task 1, the report should include a history of regulations and ordinances affecting development; and any data on septic system performance.

4. On page 2-4, the report states that, "A map identifying land use types and locations can be seen in Figure 2-1." Figure 2-1 delineates CCN boundaries for water supply. The report text and figures should be consistent.

5. The planning area referenced in this study does not match the boundaries of Water User Groups for which TWDB has made population projections, Board-approved population projections for water supply planning purposes, are available. Thus, a direct comparison of the projections used in this study with Board projections is not possible. Overall, it appears that this study uses projections that are somewhat higher than the TWDB projections. However, the study projections are documented and are likely to be reasonable for facility planning purposes.

6. The study shows three different study area total populations in different tables: Projected population for 2030 is shown as 61,030 on page 3-3, 60,650 on page 3-5, and 65,360 on page 3-6. These discrepancies should be corrected or explained.

7. On page 3-19, in 3.4.2, the report states that, "The two plant models utilized existing plants for wastewater treatment and are separated by a ridgeline which divides the planning area....TSZs served by each plant can be seen in Figure 3-9." Figure 3-9 shows the locations of an existing Kyle plant and a future Winfield plant. The report text and figures should be consistent.

8. The Implementation Plan in Chapter 6.0 calls for an initial agreement between study area governmental entities, and partnership with development interests as facilities come on-line. While the improvements anticipated by the study appear to be eligible for Board financing through either the Texas Water Development Fund or the Clean Water

Attachment 1
(Cont'd)

State Revolving Fund, only facilities that will be owned and operated by governmental entities may be constructed with these monies and only governmental entities may make application for financing.

9. An agreement or "Wastewater Compact" is proposed for implementing the regional strategy. The report should reference the existing statutory authority for such a compact, or alternately describe any legislation needed for implementation.

Responses to comments presented by TWDB

1. Alternative descriptions were changed to read “No Action”, “Regional Plants”, and “Multiple Plants” for all sections of the report.

2. Baseline GIS data were copied to CD and sent to TWDB

3. Appendix A was added that contains a description of Hays County OSS regulations since implantation in the 1970’s. It includes copies of the current regulation and the previous 1984 regulations.

4. Correction made.

5. We agree with the comment. Population projections for this particular study area were developed from several sources and documented.

6. Population figures where corrected.

7. Text was changed to read, “The Two plant model utilized the existing Kyle Plant and the Future Winfield plant for wastewater treatment which are separated by a ridgeline that divides the planning area.

8. We agree with the comment.

9. Our understanding is that all of the governmental entities have the authority to enter into agreements with other governmental units or private parties regarding wastewater service, and that no special legislation would be required to authorize formation of a “Wastewater Compact”.