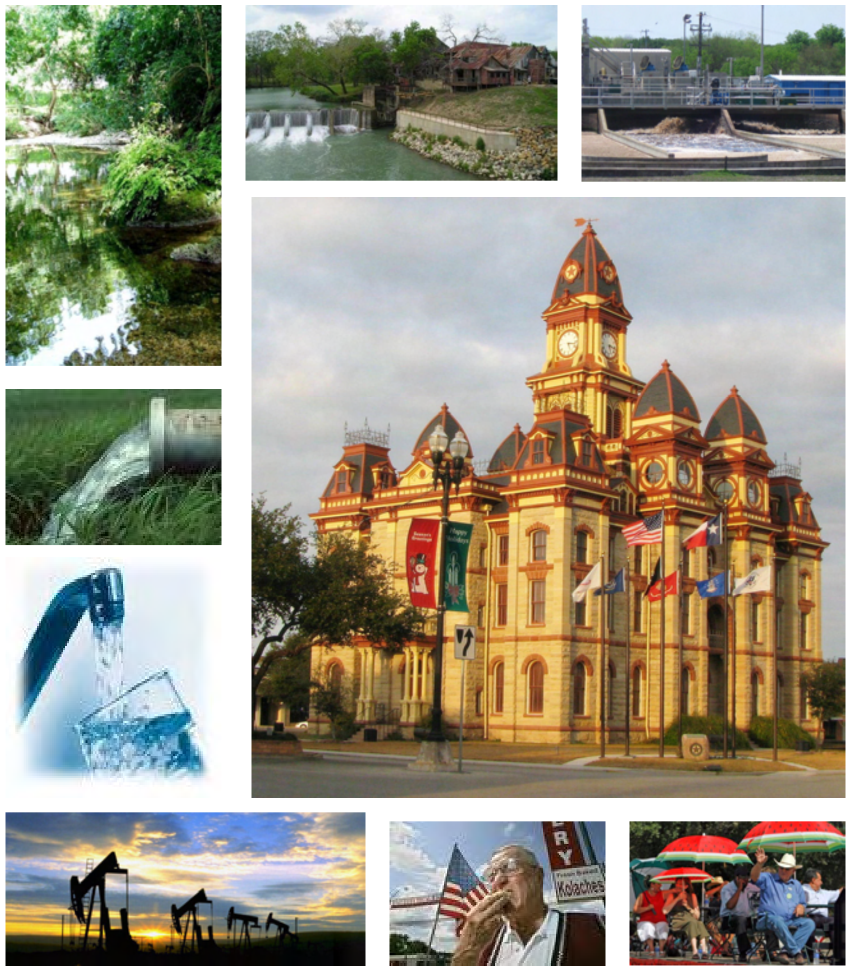
CALDWELL COUNTY REGIONAL WATER AND WASTEWATER PLANNING STUDY



Prepared for
GUADALUPE-BLANCO RIVER AUTHORITY
January 2010

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LIST OF ABBREVIATIONS

ASR	Aquifer Storage and Recovery
BOD	Biochemical Oxygen Demand
BMP	best management practices
CCEFN	Consensus Criteria for Environmental Flow Needs
CCWQCS	Central Carrizo-Wilcox, Queen City and Sparta
CWA	Clean Water Act
CAPCOG	Capital Area Council of Governments
CCN	Certificate of Convenience and Necessity
EPA	Environmental Protection Agency
ERCOT	Electric Reliability Council of Texas
EST	elevated storage tanks
ETJ	Extra Territorial Jurisdiction
GBRA	Guadalupe-Blanco River Authority
GCUWCD	Gonzales Ground Water Conservation District
GCD	Groundwater Conservation District
GAM	Generalized Additive Models
GST	ground storage tank
HCPUA	Hays Caldwell Public Utility Agency
HB	House Bill
LDC	Load Duration Curve
LLC	Limited Liability Company
MUD	Municipal Utility District
NRCS	National Resource Conservation Service
NPDES	National Pollutant Discharge Elimination System
OSSF	On-site sewage facility
O&M	Operation and Maintenance
PCCD	Plum Creek Conservation District
PUA	Public Utility Agency

LIST OF ABBREVIATIONS CONTINUED

SAWS	San Antonio Water System
SCTRWP	South Central Texas Regional Water Plan
SB	Senate Bill
SELECT	Spatially Explicit Load Enrichment Calculation Tool
SSLGC	Schertz-Seguin Local Government Corporation
SUD	Special Utility District
TCEQ	Texas Commission on Environmental Quality
TMDL	Total Maximum Daily Loads
TxDOT	Texas Department of Transportation
TSDC	Texas State Data Center
TSS	Total Suspended Solids
TWDB	Texas Water Development Board
US	United States
USGS	United States Geologic Survey
USDA	United States Department of Agriculture
WWTP	Wastewater Treatment Plant
WWTF	Wastewater Treatment Facility
WUD	Water Utility District

UNITS OF MEASUREMENT

gpm	gallons per minute
ppm	parts per million
MGD	million gallons per day
ac-ft	acre – feet
gpcd	gallons per capita per day
mg/l	milligrams per liter

EXECUTIVE SUMMARY

Meeting the challenges of developing, managing, conserving and protecting precious water resources requires proactive leadership that understands the problems, identifies the solutions and empowers implementation. Completion of a regional water and wastewater planning study is one of the first steps to meet the challenges.

The study examines population projections, projected water supply needs, existing water resources, proposed water plans, and proposed cost estimates. The study also examines the current availability and viability of the proposed projects in the 2006 South Central Texas Regional Water Plan (Region L Plan) developed under guidance from the Texas Water Development Board (TWDB) to meet the water supply needs of Caldwell County. Potential regional water and wastewater projects were identified for consideration to meet the needs of the county.

In addition, management strategies are identified that could be considered for implementation to reduce potential non-point pollution loads into the surface water and groundwater resources of Caldwell County

Caldwell County, located in South Central Texas, is poised to grow at an increasing rate with a population estimate of 35,843 in 2008 to over 100,000 by the year 2040. The addition of over 64,000 citizens to Caldwell County will pose new demands on local resources for basic services including potable water for consumption. In addition, new strategies will be needed to protect the quality of surface water and groundwater.

These increased demands are occurring at a time when the availability of surface water and groundwater to serve new growth is limited. Surface waters in Caldwell County have been appropriated and only innovative strategies that scalp flood flows without impacting environmental stream flows can be considered to develop additional surface water supplies. There is no additional "run-of-the-river" surface water available for permitting in Caldwell County.

Groundwater that is suitable for use with minimal treatment is available in Caldwell County from the Carrizo-Wilcox Aquifer. Studies completed by the Plum Creek Conservation District (PCCD) estimate that about 23,000 acre-feet (ac-ft) of water per year is the sustainable yield from the Carrizo-Wilcox Aquifer for Caldwell County. However, groundwater laws, developing groundwater regulations and a limited amount of groundwater are creating a permitting frenzy as potential users try to secure water for their needs. Water suppliers from outside the county and river basin have come to the Carrizo-Wilcox Aquifer in Caldwell and Gonzales Counties as a source for inexpensive high quality water. There may be little groundwater remaining to be permitted for increasing local demands because the water has been permitted to others for use out of the county or river basin. According to PCCD, as of February 2009, 16,514 ac-ft per year of groundwater withdrawals have been permitted in Caldwell County. Other large permits are pending.

Groundwater in the Carrizo/Wilcox Aquifer in Gonzales County is also subject to intense permitting pressure. Water modeling studies in Gonzales County indicate that a sustainable yield of about 13,600 ac-ft per year of water can be withdrawn on the east side of the county with a 100-foot drawdown and a sustainable yield of about 15,400 ac-ft of water can be withdrawn on the western side of the county. Permits totals of more than 15,400 ac-ft per year have been applied for on the western side of Gonzales County. The Gonzales County Underground Water Conservation District (GCUWCD) is refining its groundwater management plan for Gonzales County and it appears that permits will be granted with terms and conditions that curtail use when drawdown limits are reached. Pending permit applications are for the Hays/Caldwell Public Utility Agency and the San Antonio Water System.

The planning horizon for this study was selected as the period through the year 2040. Based on input from the Stakeholders and the State Demographer, during the approximate 30 year period, the population is projected to increase approximately 180% from 35,843 in 2008 to 100,000 in the year 2040. When a per capita demand of 150 gallons per day per person is applied, the yearly demand for municipal water will increase from 6,164 ac-ft to 16,803 ac-ft. Adding demands identified for mining, manufacturing, irrigation and livestock indicate a total current demand of 8,155 ac-ft per year in 2008 increasing to 18,495 ac-ft in the year 2040.

The population and water demand projections developed and adopted for this study are higher than the population and water demand values adopted for the 2006 Region L Plan. The 2006 Region L Plan estimated that the year 2040 population of Caldwell County would be 83,250 (compared to 100,000 adopted for this plan). The 2006 Region L Plan estimated the year 2040 total water demand for all uses would be 12,247 acre-feet per year (compared to 18,695 acre-feet developed for this plan). The larger population projections result from a higher migration rate to the county for this plan compared to the Region L population projections. The larger future water demands result from larger population projections and the adoption of larger per capita consumption rates for this plan than those adopted for the 2006 Region L Plan.

Over the planning horizon, a total of 8,432 ac-ft of water supply must be developed to meet projected water needs. Other types of water uses will collectively diminish and result in no need for additional water to supply mining, manufacturing, livestock or irrigation needs.

The proposed water management strategies contained in the 2006 South Central Texas Regional Water Plan were reviewed for applicability to meet the needs of Caldwell County. The only strategies identified in the 2006 Plan that are still viable for Caldwell County are water conservation, additional development of the Carrizo/Wilcox, the Hays/Caldwell PUA and purchase from other wholesale water providers such as GBRA and CRWA.

Water conservation is a viable option. Public education, water use restrictions and inverse water rates are tools to implement water conservation. An aggressive water conservation program could reduce municipal water consumption from 150 gallons per capita per day to as low as 120 gallons per capita per day. The amount conserved would be 3,361 ac-ft on an annual basis and the new water required would be 5,071 ac-ft per year.

Carrizo/Wilcox groundwater can be developed in southeast Caldwell County or in Gonzales County. This is the approach taken by the Hays/ Caldwell PUA. However, uncertainty regarding the long-term availability of this water is questionable as groundwater conservation districts adopt policies that will grant permits for all requests for water and limit future drawdown conditions. A regional water supply project yielding 8,432 ac-ft of water per year could be developed from the Carrizo/Wilcox aquifer. However, the possibility of future curtailment exists if groundwater district rules require reducing consumption when water table drawdown limits are reached.

Purchase of water from wholesale water providers is a viable option if there is water available. All surface water rights are currently appropriated and there are no viable strategies in the 2006 Water Plan that bring water to Caldwell County. Thus, regional development of a new conjunctive use groundwater/surface water project would appear to be a possible solution to meet future needs.

A conjunctive use project that combines storing water ordinarily lost in excessive flood flows with groundwater for firming up the project yield appears to be an option for developing a water supply project to serve a region larger than Caldwell County. It has been estimated by the Guadalupe-Blanco River Authority that 20,000 ac-ft - 25,000 ac-ft per year could be developed out of a conjunctive use project with surface water diversions occurring on the Guadalupe River at Gonzales (Mid-Basin Project). This water could be diverted, treated and piped through Caldwell County up to Comal and Hays County. The water providers in Caldwell, Hays and Comal Counties could benefit from this project.

The cost of development of water from the local Carrizo/Wilcox Aquifer to serve Caldwell County using a regional approach is estimated as $34 million including collection, treatment and transmission to a regional distribution point. If a total of 8,432 ac-ft of water is developed by the project, the cost per ac-ft is estimated as $4,032. The estimated unit cost of treated water at the regional water delivery point is estimated as $3.46 per 1,000 gallons.

A main distribution system to disperse treated water from the regional distribution point near Lockhart along US Highway 183 and State Highway 130 is estimated as $29 million.

Development cost for the Gonzales Mid-Basin Project has not been published but the total project cost will be spread over a larger annual water yield.

These water supply projects appear to be most reasonable to meet the long term needs of Caldwell County. Other opportunities may occur in the future but moving forward with these projects is a reasonable course of action.

Wastewater treatment in Caldwell County is currently accomplished with two centralized systems and numerous on-site sewage facilities (OSSF). As growth and densification occurs and subdivisions are constructed in the northern part of the county, the entities providing wastewater treatment and disposal will be faced with using a centralized, regional approach with a limited number of plants or a de-centralized approach with numerous plants each plant having its own operating parameters and needs. For purposes of this plan, the centralized treatment plant approach was analyzed with plants located in the Martindale area, the Lockhart area and the Luling area. A fourth plant would be placed in the Peach Creek Basin once sufficient development has occurred in this area. These plants will provide service generally within topographic basins and be managed by public utilities to ensure proper operation and maintenance.

The total wastewater flow estimated for 2040 is 10.2 million gallons per day with total project development cost of the plants estimated as $39 million. The cost is only associated with developing the treatment facilities and the network for collecting the sewage is not included in this number.

The new wastewater treatment plants would be permitted and constructed to enable reuse of the plant effluent for non-potable purposes. The reuse water would offset a portion of the need for development of new water. Water reuse systems generally require extensive piping networks to take the water to its point of use. For this reason, it is not cost-effective to retrofit current facilities, but rather incorporate into new systems.

Growth often results in degradation of surface water quality and can result in pollution of groundwater. Return wastewater plant discharges to streams can degrade water quality. Pollutant wash-off from impervious cover is a large contributor to increased pollution of streams but recent studies have shown that runoff from fields, pastures and lawns can add significant non-point pollutant loads. Inefficient and failing OSSF systems can add to pollutant loads in streams. The Plum Creek Watershed Protection Plan has identified point-source and non-point pollutant contributors which have impaired Plum Creek.

The following measures are recommended for consideration to assist in protecting water quality in streams:

- Reuse water from treatment plants without discharge to streams
- Implement water quality protection requirements for new impervious cover
- Review and if warranted, revise the OSSF permitting rules for setbacks from water bodies and increase separation distance
- Require periodic inspections and reports for all OSSF systems
- Develop and carry out an urban-oriented water quality protection education program that targets pollutants normally generated in urban areas
- Develop and carry out an agriculture-based water quality education program that targets pollutants ordinarily generated in rural areas
- Work with leaders in the county to make water quality protection an everyday concern

The limited depth of the study results in many generalizations and assumptions. Some opportunities have been identified for further consideration as additional planning and implementation work is done.

In the course of the study, the energy and interest of the leaders and citizens of Caldwell County were clearly identified. Water and water quality is important to Caldwell County and its citizens. Working together as a group, water needs can be met and long term, cost-effective solutions can be developed. Lack of water should not be the limiting factor that prevents the citizens of Caldwell County from realizing their potential.

SECTION 1

INTRODUCTION

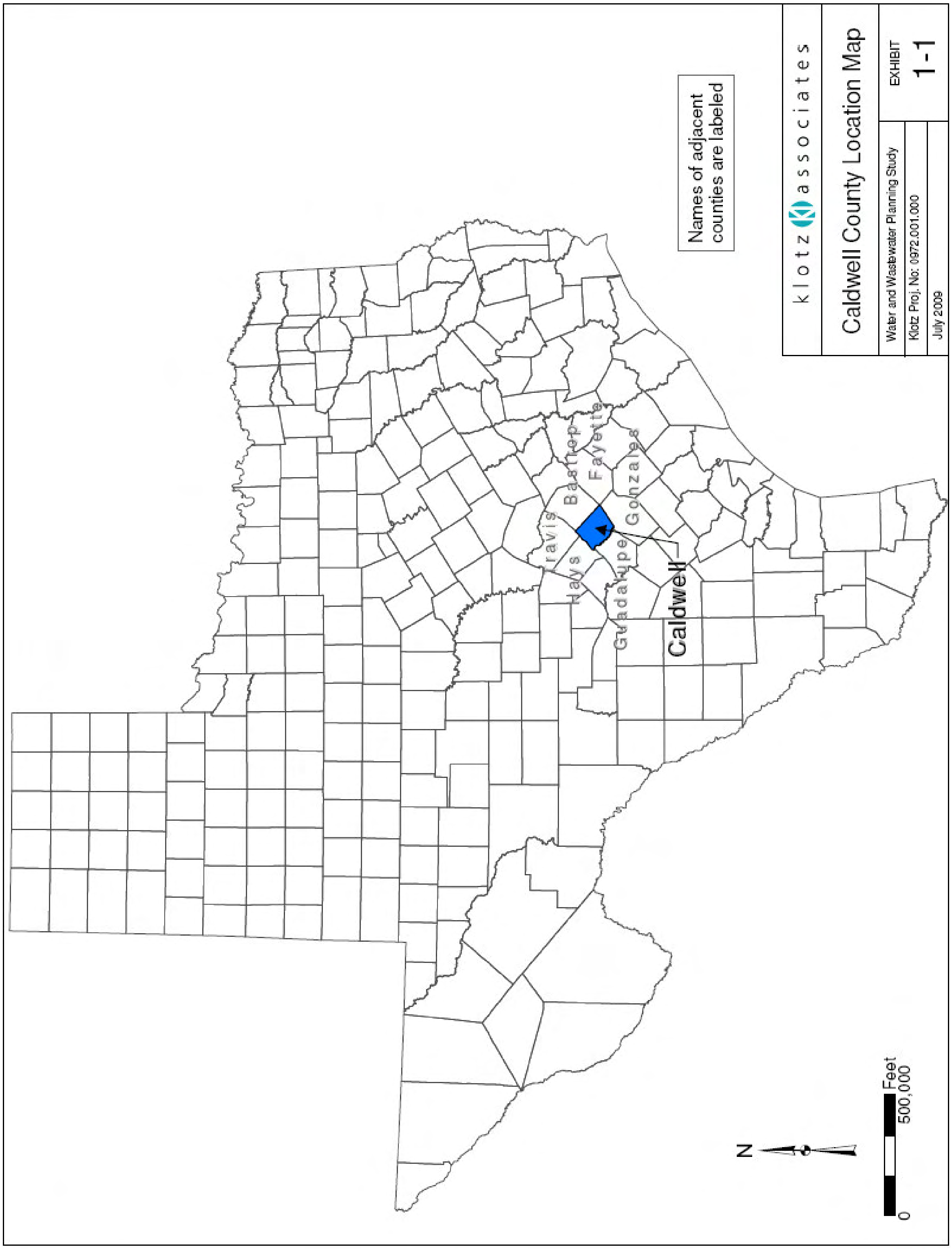
1.1 Background

Caldwell County, located in South Central Texas, was established by the Texas Legislature in 1848 by partitioning land from Gonzales County. Subsequent land additions to Caldwell County in 1850 from Bastrop and Gonzales Counties resulted in a total area of 545 square miles.

Caldwell County, as shown in ***Exhibit 1-1***, is bordered on the northwest by some of the fastest growing counties in the United States. Travis and Hays Counties are to the northwest with Guadalupe County on the southwest side. Gonzales County is on the southeast side of Caldwell County while Bastrop County is on the northeast side. Fayette County just touches the eastern corner of Caldwell County.

Located adjacent to fast-growing counties and with significant growth and development pressure from within its own boundaries, Caldwell County will almost triple its current population within 30 years while the availability of water is diminishing. The volume of wastewater produced in the county will grow with the population and new treatment facilities will be required to serve an increasingly dense population. Without controls, stormwater discharges will increase in volume as impervious cover increases and water quality degradation will occur with more non-point pollutants washed into streams and rivers.

Meeting the challenges of developing, managing, conserving and protecting precious water resources requires proactive leadership that has the vision and will to understand the problems, identify the solutions and empower implementation. Completion of a regional water and wastewater planning study is one of the first steps to meet the challenge.


Names of adjacent counties are labeled
klotz associates
Caldwell County Location Map
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
July 2009
EXHIBIT
1-1
Travis
Bastrop
Fayette
Gonzales
Guadalupe
Hays
Caldwell
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Feet

A Grant Application for a Regional Water Supply and Wastewater Planning Study for Caldwell County, Texas, was submitted to the Texas Water Development Board (TWDB) in December 2007 by the Guadalupe-Blanco River Authority (GBRA) and Caldwell County. The request for a study was influenced by continued development along the Interstate Highway 35 (I-35) corridor and the anticipated growth upon completion of State Highway (SH) 130 in 2012. The SH 130 corridor will provide easy and fast access to both Austin and San Antonio, two of the fastest growing cities in Texas. Caldwell County is included in the five-county region that the Austin Chamber of Commerce advertises for living and working.

Planning was considered important for this region not only to GBRA and Caldwell County but also the TWDB. The TWDB agreed that planning was necessary by participating in the funding of the "Caldwell County Water & Wastewater Regional Planning Study." After grant approval in October of 2008, GBRA awarded Klotz Associates, Inc. (Klotz Associates) a contract to provide professional services for the Caldwell County Regional Water and Wastewater Planning Study.

1.2 Purpose and Scope

The Caldwell County Regional Water and Wastewater Planning Study will serve as a guide and living document to assist in the planning and development of the region. Regional planning is an efficient and cost effective way to meet future water and wastewater needs. The Regional Water and Wastewater Planning Study joined the county, cities, towns, water supply corporations, groundwater districts, local departments and agencies, governmental entities, environmental groups, planners, developers, and other interested individuals together to participate, interact, and develop ideas. The regional approach for Caldwell County creates a synergy that captures the resources of numerous entities, focuses them on problems to be mutually solved and enables efficient and cost-effective solutions.

The energy spent when communities compete for resources is focused on mutual solutions for the benefit of all.

The study examines population projections, projected water supply needs, existing water resources, proposed water plans, and proposed cost estimates. The study also examined the current availability and viability of the proposed projects in the Region L plan to meet the water supply needs of Caldwell County. Region L is one of the 16 regional water planning groups in Texas.

In addition, management strategies were identified that could be considered for implementation to reduce potential non-point pollution loads into the surface water and groundwater resources of Caldwell County

1.3 Project Task

The tasks included in the Caldwell County Regional Water and Wastewater Planning Study were as follows:

Task	Title
I.	Development of Baseline Information
II.	Public Participation
III.	Developing Consensus on Objectives
IV.	Formulation of Development Scenarios
V.	Analyze Water Quality Options
VI.	Develop Regional Water Supply and Quality Protection Plan
VII.	Recommendations for Watershed Management Practices
VIII.	Reports
IX.	Public Meetings

1.4 Participants and Sponsors

The Caldwell County Regional Water and Wastewater Planning study was sponsored by the following entities:

Guadalupe Blanco-River Authority
Caldwell County
Texas Water Development Board

The following individuals served as an Advisory Group to assist in guiding the study and providing feedback as the study progressed.

Members:

The Honorable H.T. Wright, County Judge, Caldwell County, Texas

Mr. Vance Rodgers, City Manager, City of Lockhart, Texas

Mr. Bobby Berger, City Manager, City of Luling, Texas

Mr. Johnie Halliburton, Executive Manager, Plum Creek Conservation District

Mr. Bob Richards, Project Director, Cooper Land Development

Ms. Nikki Dictson, Extension Program Specialist, Texas AgriLife Extension Service

Mr. Paul Pitman, Manager, Polonia Water Supply Corporation

Ms. Joyce Buckner, Community Representative for Lockhart, Bluebonnet Electric Cooperative

Ex-Officio:

Mr. Matt Nelson, Manager, Regional Water Planning, Texas Water Development Board

Ms. Debbie Magin, Director of Water Quality Services, Guadalupe-Blanco River Authority

Three Stakeholder Meetings were held as an important part of collecting data, receiving input from the community and developing solutions for regional water supply, wastewater treatment, and non-point pollution controls.

The stakeholder meetings were held on the dates listed below and sign-in sheets are included in **Appendix A**.

Stakeholder Meeting 1:	September 25, 2008
Stakeholder Meeting 2:	January 8, 2009
Stakeholder Meeting 3:	August 3, 2009 (Public Meeting)

GBRA staff provided valuable oversight and assistance as the study progressed and their contribution is hereby acknowledged:

Ms. Debbie Magin, Director of Water Quality Services, Guadalupe-Blanco River Authority

Ms. Liz Sedlacek, Administrative Assistant, Guadalupe-Blanco River Authority

SECTION 2

CALDWELLL COUNTY CHARACTERISTICS

2.1 City Limits and ETJ Boundaries

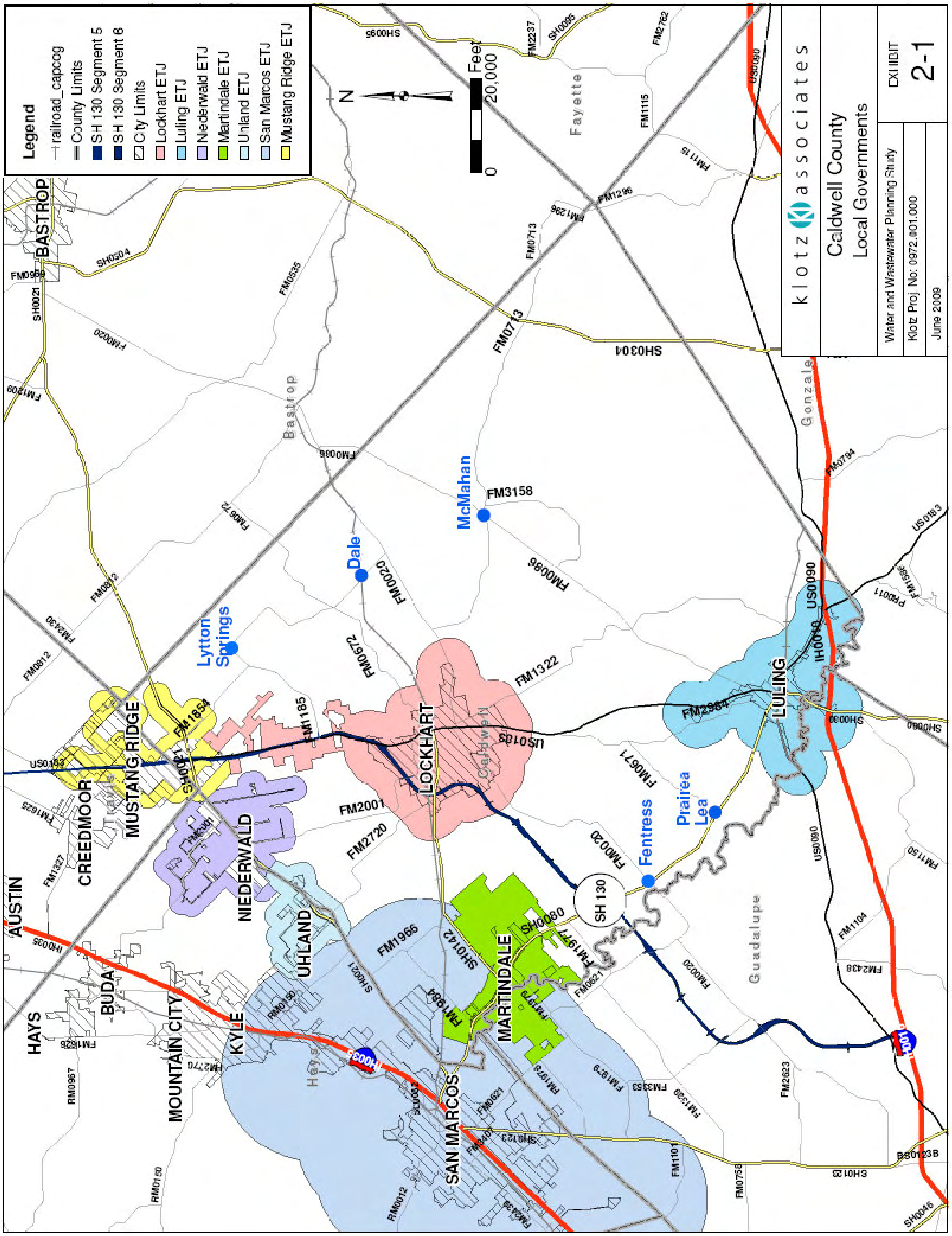
The name Caldwell was given to the county in recognition of an Indian Fighter named Matthew Caldwell, who led a group of militia against the Comanches at Plum Creek in 1840. The county seat was named for Byrd Lockhart who owned the land over which the town of Lockhart would be established. Lockhart was incorporated in 1852. Luling, the other large city in Caldwell County, was incorporated in 1884 and is a significant center for railroads, cattle, cotton and oil.

Martindale is an incorporated city within Caldwell County. Mustang Ridge, Niederwald, and Uhland are incorporated cities that straddle the Caldwell County line with either Hays or Travis Counties.

Dale, Fentress, Lytton Springs, McMahan and Prairie Lea are some of the larger unincorporated communities in Caldwell County. ***Exhibit 2-1*** illustrates the location of the cities and more populated communities in Caldwell County.

There are numerous other settlements in the County that are recognized geographically and include Brownsboro, Delhi, Elm Grove, Joilet, Maxwell, McNeil, Mendoza, Pettytown, Reedville, Saint Johns Colony, Seawillow, Soda Springs, Stairtown, Taylorsville, Tilman and Watts.

Major roadways that cross the county include United States (US) Highway 90 (east-west), US Highway 183 (north-south), SH 21, SH 80 and future SH 130 (northeast-southwest). Numerous other state and county roadways exist in the county that will provide easy connection to SH 130 and enable easy and fast travel to San Antonio, Austin and other destinations along the central Texas "I-35 corridor".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County Limits
SH 130 Segment 5
SH 130 Segment 6
City Limits
Lockhart ETJ
Luling ETJ
Niederwald ETJ
Martindale ETJ
Uhland ETJ
San Marcos ETJ
Mustang Ridge ETJ
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Caldwell County
Local Governments
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
June 2009
EXHIBIT
2-1
BASTROP
AUSTIN
CREEDMOOR
MUSTANG RIDGE
NIEDERWALD
UHLAND
HAYS
BUDA
MOUNTAIN CITY
KYLE
SAN MARCOS
MARTINDALE
LOCKHART
LULING
Lytton Springs
Dale
McMahan
Fentress
Prairea Lea
SH 130
Bastrop
Fayette
Gonzales
Guadalupe
Caldwell
Hays

Construction for segments 5 and 6 of SH 130 is underway and completion is scheduled for the year 2012. Segment 5 will begin in Mustang Ridge and continue to north of Lockhart while Segment 6 will pick up at the southern end of Segment 5 and exit Caldwell County between Martindale and Fentress on the way to the intersection of SH 130 with I-10 near the City of Seguin in Guadalupe County. Approximately 40 miles of roadway will be constructed for these segments of SH 130.

SH 130 will be a four lane divided highway. It will have direct connection to interchanges and provide ramps for access to non-toll lanes. SH 130 will be a toll road and it is anticipated that tolls may remain to fund maintenance and future local transportation projects.

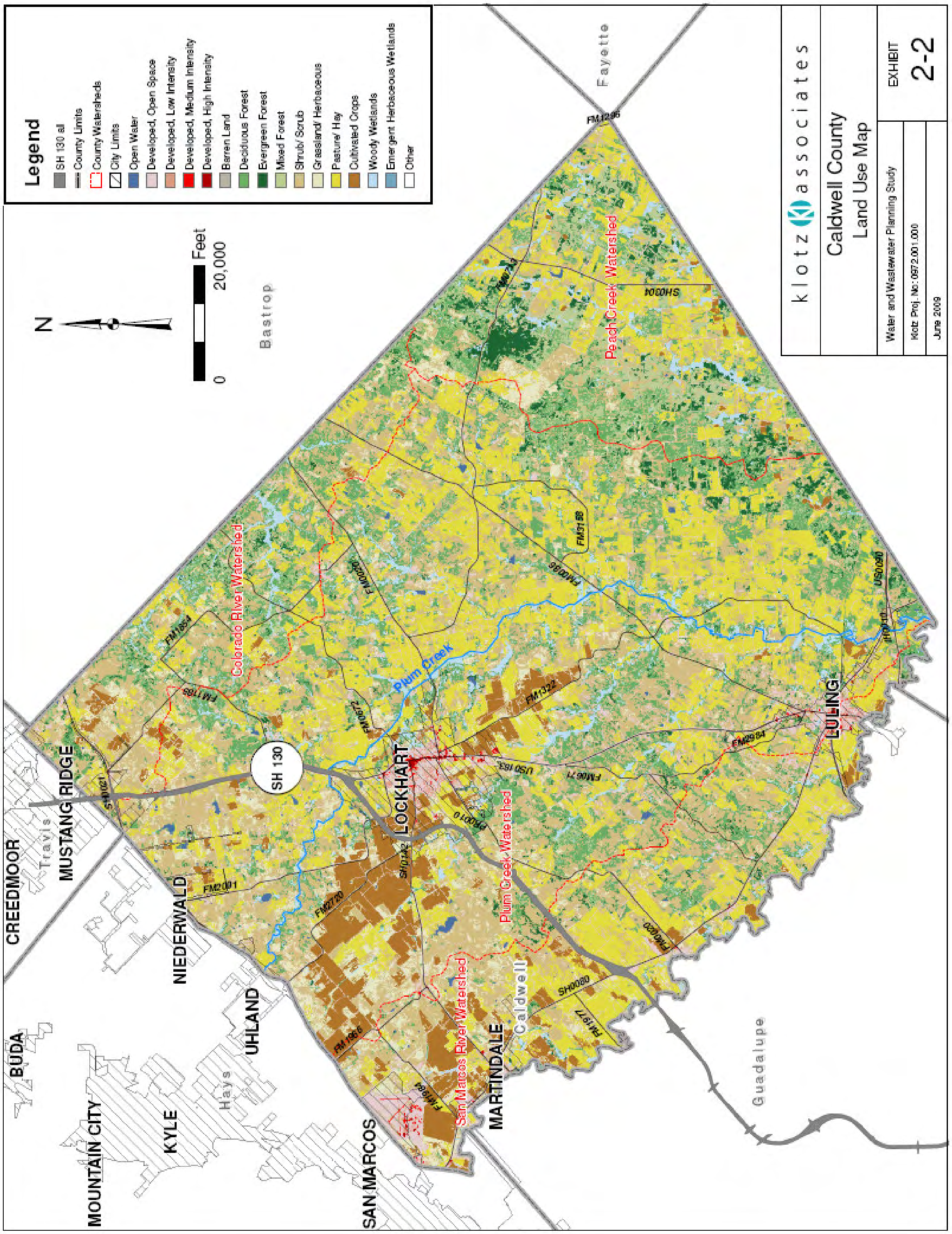
2.2 Land Use

Current land use within Caldwell County is illustrated by ***Exhibit 2-2*** and was obtained from the United States Department of Agriculture (USDA). Land in Caldwell County is mostly undeveloped and is used as pastureland, grassland, forestland or cropland. The developed areas are primarily located along US Highway 183, SH 21 and SH 80. Current population density is greatest in the northwest and north central portions of the county because of the area's proximity to San Marcos, Austin and the I-35 corridor.

The southern and southeast portions of the county, with the exception of Luling, remain largely rural in character in nature. The oil and gas industry has been an important part of the economy in Caldwell County but its footprint and impact on land use is relatively small.

2.3 Watersheds

Land in Caldwell County drains primarily to the Guadalupe River Basin. Regional watersheds in the basin include the San Marcos Watershed, Plum Creek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County Limits
County Watersheds
City Limits
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/ Scrub
Grassland/ Herbaceous
Pasture/ Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetlands
Other
N
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20,000
Feet
Bastrop
Fayette
Travis
Hays
Caldwell
Guadalupe
CREEDMOOR
MUSTANG RIDGE
BUDA
MOUNTAIN CITY
KYLE
NIEDERWALD
UHLAND
SAN MARCOS
MARTINDALE
LOCKHART
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SH 130
Plum Creek
Colorado River Watershed
Plum Creek Watershed
San Marcos River Watershed
Peach Creek Watershed
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Caldwell County
Land Use Map
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
June 2009
EXHIBIT
2-2

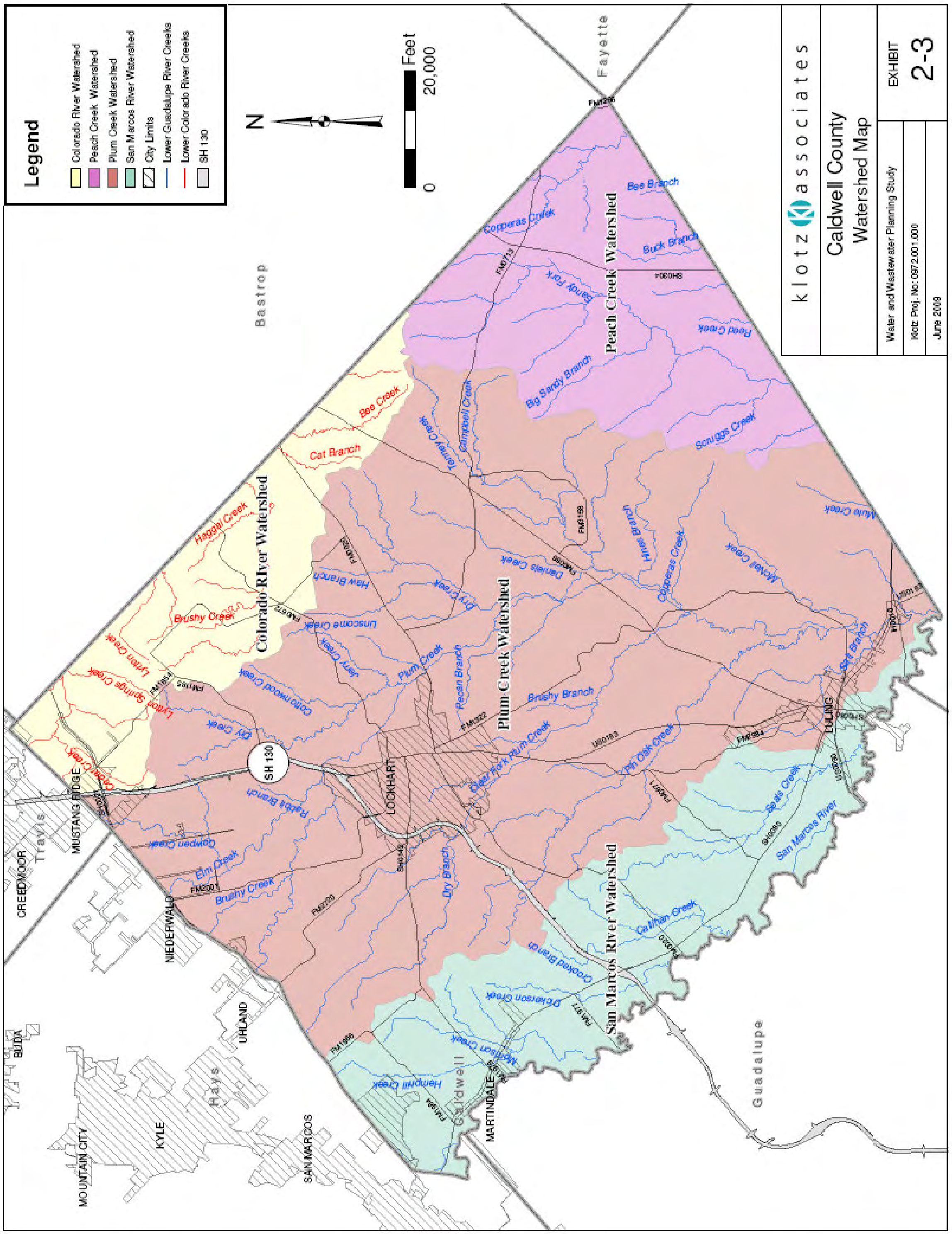
Watershed and Peach Creek Watershed. ***Exhibit 2-3*** illustrates the major watershed boundaries in the county.

A 58 square mile area in the northeastern corner of the county drains to the Colorado River Basin. The 58 square miles represents about 11 percent of the area of Caldwell County with the remaining 487 square miles draining to the Guadalupe River Basin.

Plum Creek is the largest watershed in Caldwell County. Plum Creek rises in Hays County and enters Caldwell County near Niederwald. It then flows from north to south through the heart of Caldwell County and enters the San Marcos River at the Caldwell/Gonzales County line. At its mouth, Plum Creek has a drainage area of 397 square miles and a stream length of 52 river miles. Approximately 80 percent (319 square miles) of the Plum Creek Watershed is in Caldwell County. The 319 square miles of the Plum Creek Watershed in Caldwell County comprises about 59 percent of the total area within Caldwell County. Plum Creek is an important surface water feature in Caldwell County and the citizens of the county have a vested interest in protecting the character and health of this historic and highly-valued water course.

The area within Caldwell County draining to the San Marcos River Watershed is 88 square miles or about 16 percent of the county. The San Marcos River flows south from the San Marcos city limits until it joins the Guadalupe River approximately 75 miles downstream near Gonzales, Texas. At its confluence with the Guadalupe River, the San Marcos River Basin has a total drainage area of 522 square miles. The San Marcos River is the western boundary of Caldwell County with a length along this boundary of 43 stream miles.

The Peach Creek Watershed has a total drainage area of 480 square miles at its mouth with approximately 81 square miles (about 14 percent of the county) of the watershed in Caldwell County. Peach Creek joins the Guadalupe River near the community of Harmon in Gonzales County.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Peach Creek Watershed
Plum Creek Watershed
San Marcos River Watershed
City Limits
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Lower Colorado River Creeks
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Watershed Map
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Colorado River Watershed
Plum Creek Watershed
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Hays
Caldwell
LOCKHART
LULING
MARTINDALE
MUSTANG RIDGE
NIEDERWALD
UHLAND
CREEDMOOR
BUDA
KYLE
MOUNTAIN CITY
SAN MARCOS
SH 130

2.4 Certificates of Convenience and Necessity (CCN)

In Caldwell County, there are twelve (12) water and four (4) wastewater utilities that hold a Certificate of Convenience and Necessity (CCN). A CCN is obtained by utilities for the purpose of defining a service area for municipal and public utility providers. A municipal utility defines a city, village or township and a public utility or water supply corporation (WSC) identifies a corporation or individual has ownership and responsibility.

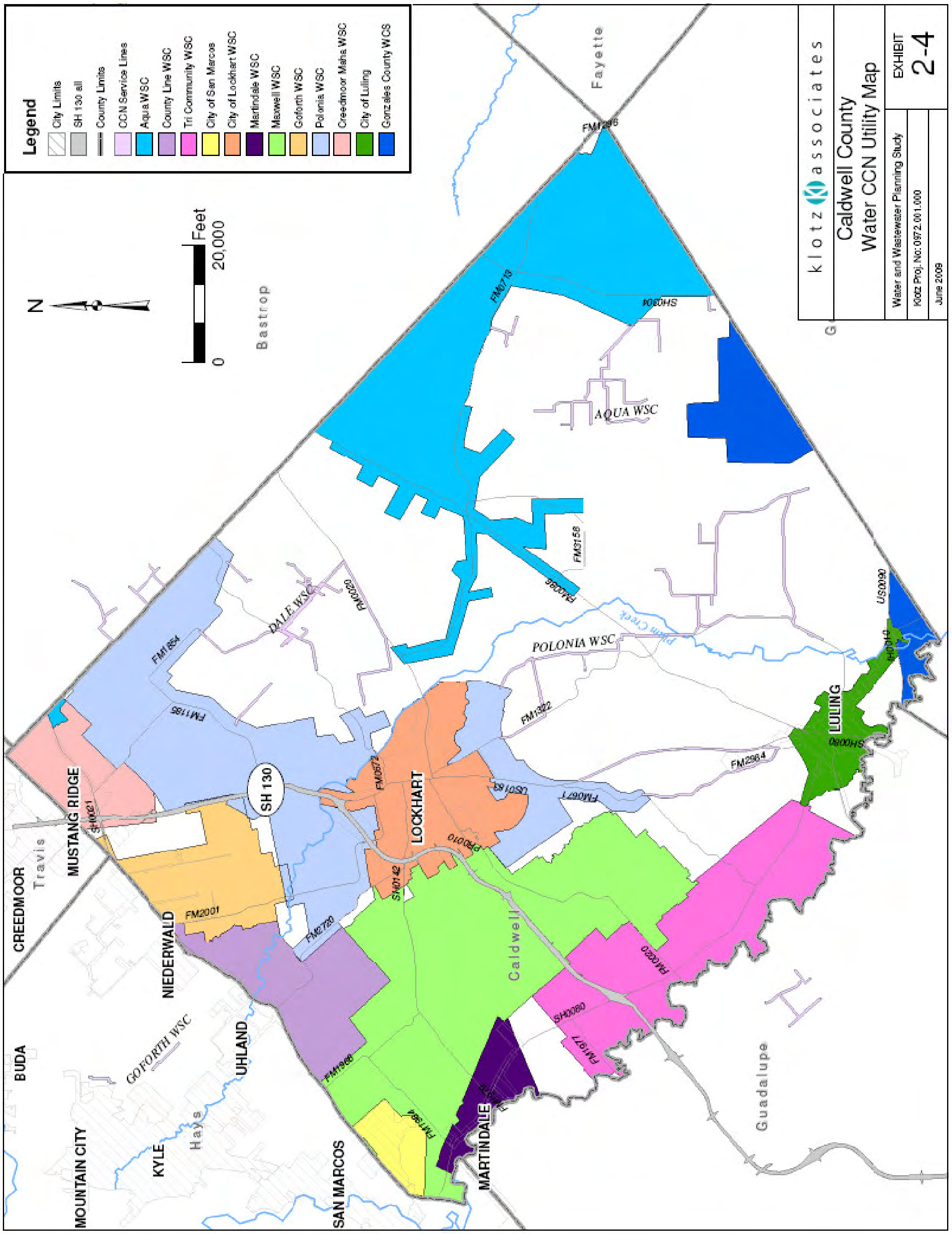
2.4.1 Water CCN Utilities

Caldwell County has twelve (12) water providers that serve portions of Caldwell County. ***Exhibit 2-4*** outlines the areas within the CCN in Caldwell County that is held by the water service providers. The Texas Commission on Environmental Quality (TCEQ) provided the geographic information system (GIS) data through the Water Utility District (WUD) database. Luling and Lockhart are municipal utilities and the other providers are water supply corporations and special utility districts.

2.4.2 Wastewater CCN Utilities

Wastewater utilities in the county are limited due to the largely rural land use in the county. Undeveloped areas rely on on-site sewage facilities (OSSF) for treatment and disposal of sewage. The TCEQ discharge permits that were identified are shown in ***Exhibit 2-5***.

Although Turner Crest Village LLC has obtained a wastewater discharge permit, the wastewater facilities have not been constructed. The intended service area is a large subdivision that will be developed based on demand for residential lots grows.


Legend
City Limits
SH 130 all
County Limits
CCN Service Lines
Aqua WSC
County Line WSC
Tri Community WSC
City of San Marcos
City of Lockhart WSC
Martindale WSC
Maxwell WSC
Goforth WSC
Polonia WSC
Creedmoor Maha WSC
City of Luling
Gonzales County WCS
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Caldwell County
Water CCN Utility Map
EXHIBIT
2-4
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
June 2009
Bastrop
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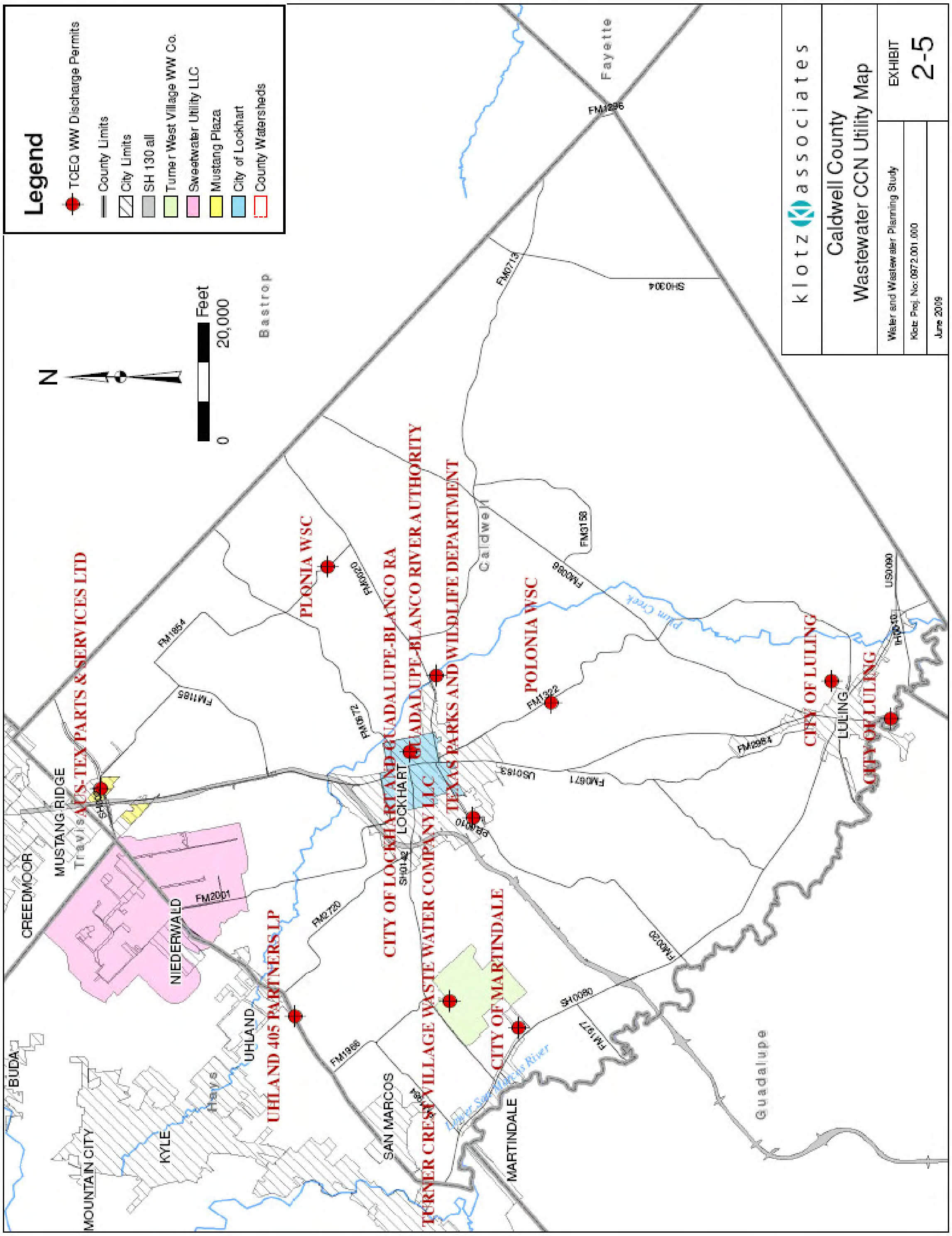
Travis
Hays
Caldwell
Guadalupe
AQUA WSC
DALE WSC
POLONIA WSC
GOFORTH WSC
CREEDMOOR
MUSTANG RIDGE
NIEDERWALD
BUDA
UHLAND
MOUNTAIN CITY
KYLE
SAN MARCOS
MARTINDALE
LOCKHART
LULING
SH 130


Legend
TCEQ WW Discharge Permits
County Limits
City Limits
SH 130 all
Turner West Village WW Co.
Sweetwater Utility LLC
Mustang Plaza
City of Lockhart
County Watersheds
N
0
20,000
Feet
klotz associates
Caldwell County
Wastewater CCN Utility Map
EXHIBIT
2-5
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
June 2009
AUS-TEX PARTS & SERVICES LTD
PLONIA WSC
CITY OF LOCKHART AND GUADALUPE-BLANCO RA
GUADALUPE-BLANCO RIVER AUTHORITY
TEXAS PARKS AND WILDLIFE DEPARTMENT
POLONIA WSC
CITY OF LULING
UHLAND 405 PARTNERS LP
TURNER CREST VILLAGE WASTE WATER COMPANY LLC
CITY OF MARTINDALE
CREEDMOOR
MUSTANG RIDGE
NIEDERWALD
BUDA
MOUNTAIN CITY
KYLE
UHLAND
SAN MARCOS
MARTINDALE
LOCKHART
LULING
Travis
Hays
Bastrop
Caldwell
Fayette
Guadalupe
Plum Creek

The City of Lockhart has two wastewater treatment plants that are operated and maintained by GBRA to serve the city residents. The facilities are located to the east of Lockhart.

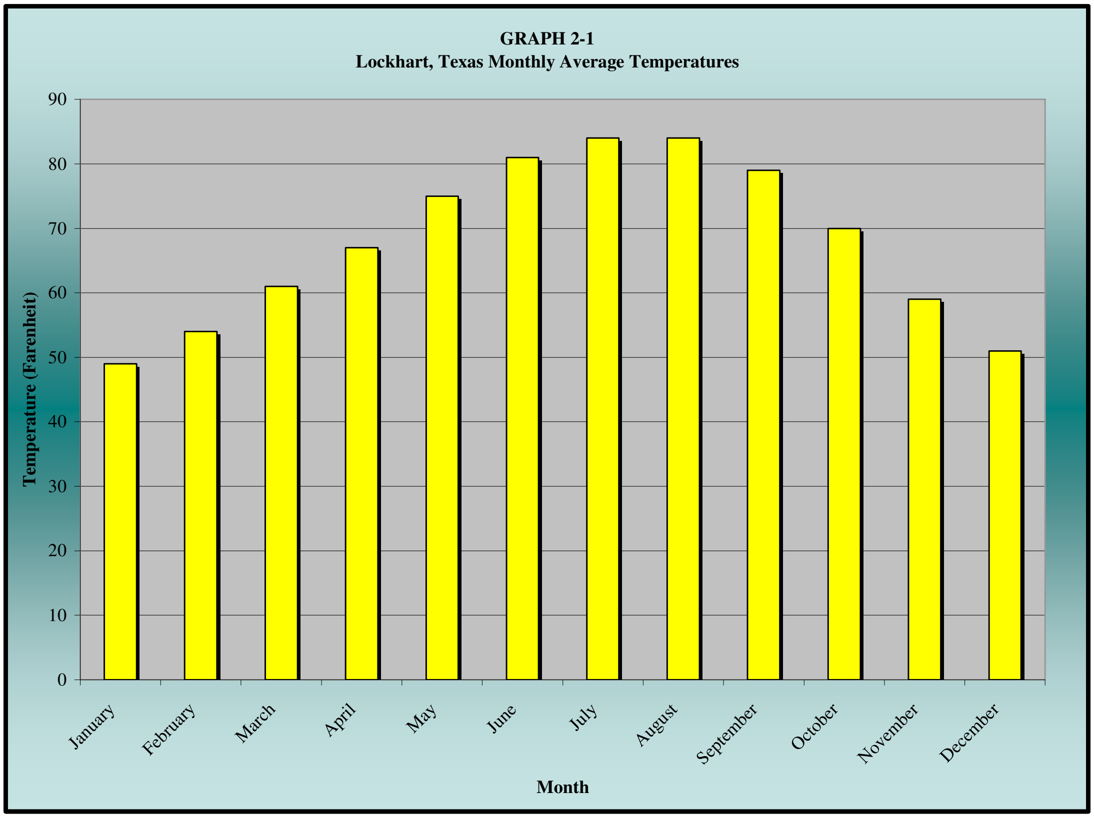
The City of Luling also has two municipal facilities each to serve the city. The facilities in Luling are located to the northeast and southwest of the city limits.

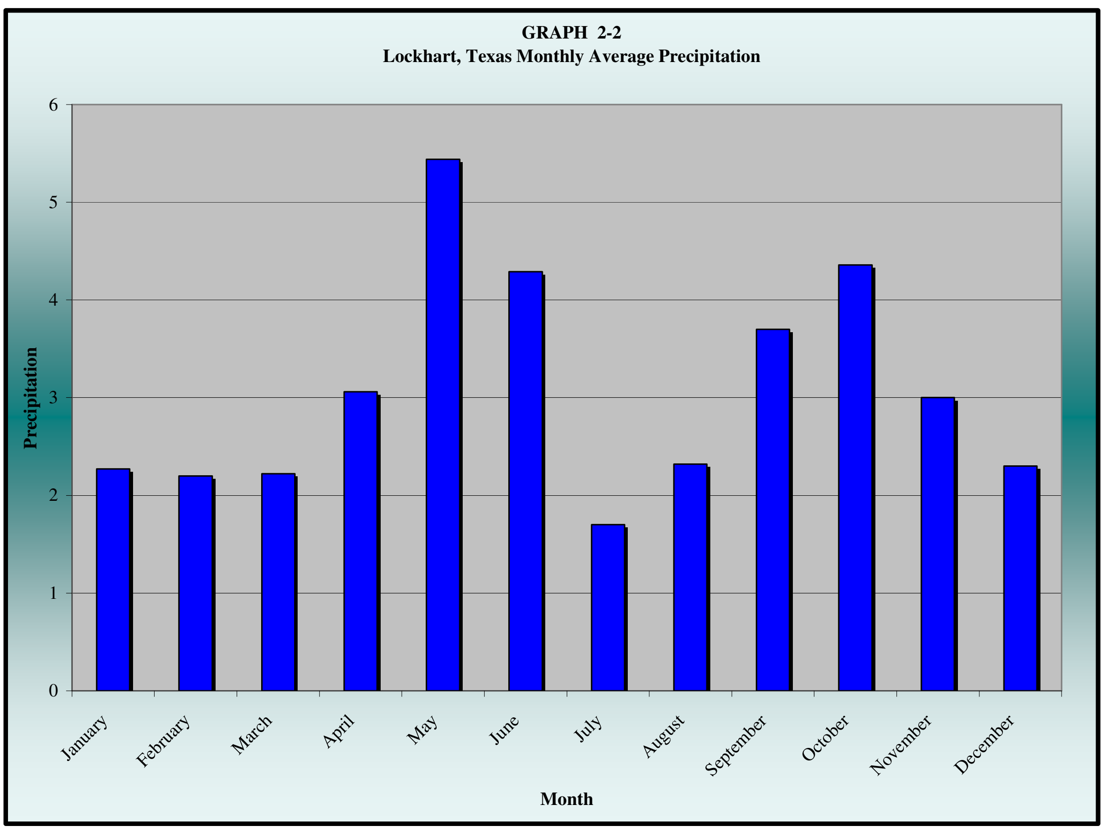
2.5 Climate

The climate in Caldwell County is sub-tropical and humid. Low temperatures (40 degrees Fahrenheit (ºF)) occur in the months of January and December and high temperatures (95 ºF) occur in July and August. Average annual rainfall is approximately 37 inches per year and average the monthly precipitation varies from 1.8 inches in July to 4.4 inches in May. ***Table 2-1*** presents the average temperatures, precipitation with record lows and highs as measured in the county at Lockhart, Texas. ***Graph 2-1*** and ***Graph 2-2*** graphically presents the information provided in the tables.

TABLE 2-1
Lockhart, Texas Monthly Average Temperatures and Precipitation

Month	Average High	Average Low	Mean	Average Precipitation	Record High	Record Low
January	61°F	37°F	49	2.27	89°F (1975)	-3°F (1949)
February	66°F	41°F	54	2.2	99°F (1996)	4°F (1951)
March	74°F	48°F	61	2.22	100°F (1971)	17°F (2002)
April	80°F	55°F	67	3.06	100°F (1939)	26°F (1971)
May	86°F	64°F	75	5.44	105°F (1967)	40°F (1903)
June	92°F	70°F	81	4.29	108°F (1934)	50°F (1919)
July	96°F	72°F	84	1.7	110°F (1954)	58°F (1967)
August	96°F	71°F	84	2.32	109°F (1943)	56°F (1992)
September	91°F	66°F	79	3.7	110°F (2000)	41°F (1981)
October	83°F	56°F	70	4.36	99°F (1937)	26°F (1993)
November	72°F	47°F	59	3	92°F (1969)	19°F (1911)
December	64°F	39°F	51	2.3	88°F (1955)	4°F (1989)


GRAPH 2-1
Lockhart, Texas Monthly Average Temperatures
Temperature (Farenheit)
0
10
20
30
40
50
60
70
80
90
January
February
March
April
May
June
July
August
September
October
November
December
Month


GRAPH 2-2
Lockhart, Texas Monthly Average Precipitation
Precipitation
0
1
2
3
4
5
6
January
February
March
April
May
June
July
August
September
October
November
December
Month

2.6 Topography

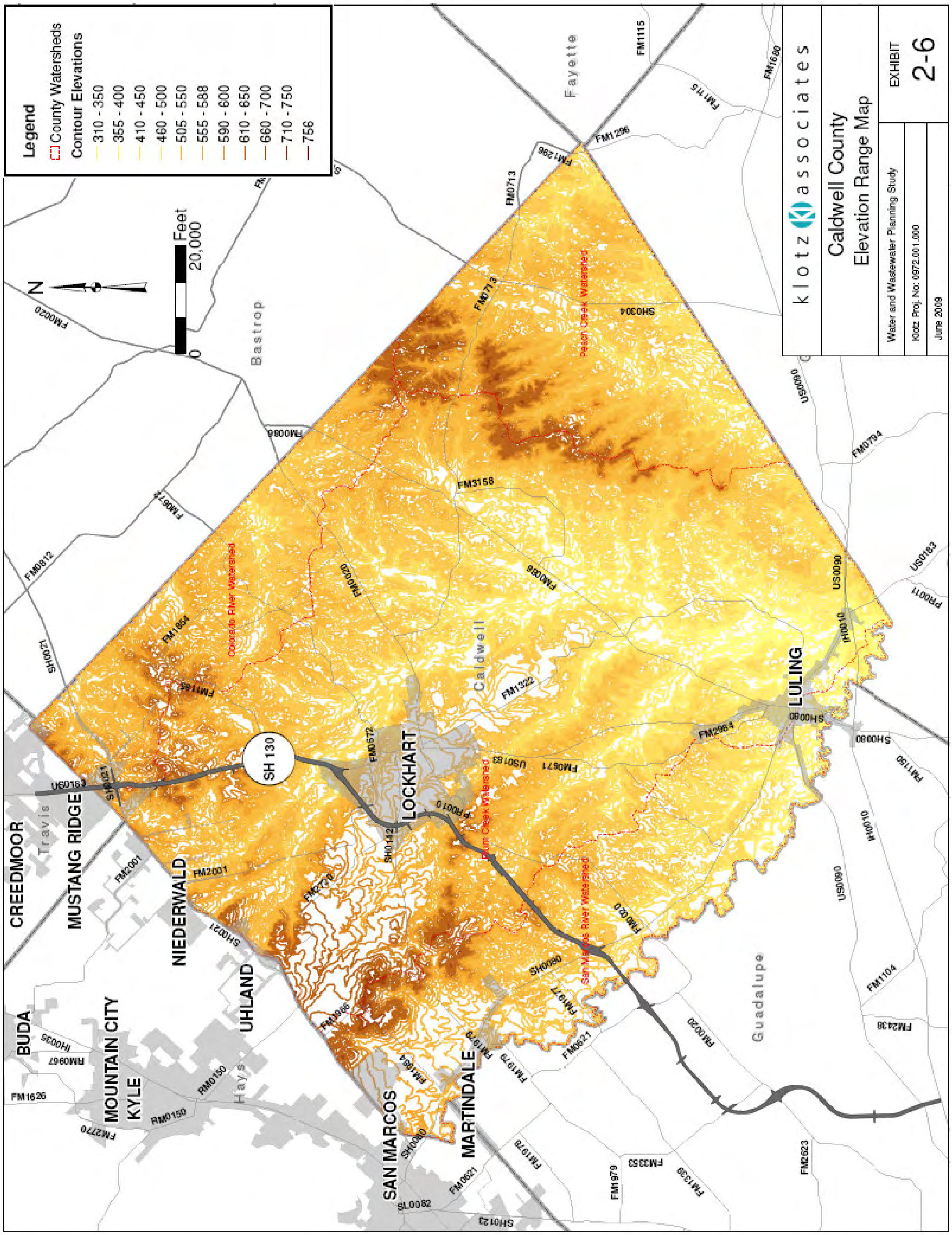
The topography of Caldwell County is comprised of flat to rolling terrain with elevations ranging from 310 feet to approximately 750 feet above sea level. The highest elevations are in the northern part of the county and are in the range of 750 feet above mean sea level along the ridges that divide the San Marcos and Plum Creek watersheds. The lowest elevations are found in the southern portion of the county at the confluence of the San Marcos River and Plum Creek. The lowest elevation at the confluence is approximately 310 feet. ***Exhibit 2-6*** illustrates elevation variances in the county. The elevation at Lockhart is about 515 feet and the elevation at Luling approximately 410 feet.

2.7 Transmission System

The Transmission System in Caldwell County consist of a 345 KV transmission line with one Substation North of Lockhart, some138 KV transmission lines with 4 substations and several 69 KV transmission lines with 9 substations***. Exhibit 2-7*** illustrates the approximate line locations and identifies the northern area of the county with the most activity. The map was prepared using the ERCOT 2008 Texas Transmission Map.

2.8 Impervious Cover

Impervious cover data obtained for Caldwell County indicates that the overall impervious cover percentage is approximately 0.6%. High impervious cover percentages are found in cities and near state roadways. ***Exhibit 2-8*** illustrates impervious cover locations in the county. The red color in the map identifies the areas with a high value of impervious cover while the predominantly blue color symbolizes the most pervious areas. The impervious cover data was obtained from USGS spatial data.


Legend
County Watersheds
Contour Elevations
310 - 350
355 - 400
410 - 450
460 - 500
505 - 550
555 - 588
590 - 600
610 - 650
660 - 700
710 - 750
756
Feet
0
20,000
N
klotz associates
Caldwell County
Elevation Range Map
EXHIBIT
2-6
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
June 2009
Bastrop
Fayette
Caldwell
Guadalupe
Travis
Hays
CREEDMOOR
MUSTANG RIDGE
NIEDERWALD
UHLAND
BUDA
MOUNTAIN CITY
KYLE
SAN MARCOS
MARTINDALE
LOCKHART
LULING
SH 130
Colorado River Watershed
Peach Creek Watershed
Plum Creek Watershed
San Marcos River Watershed

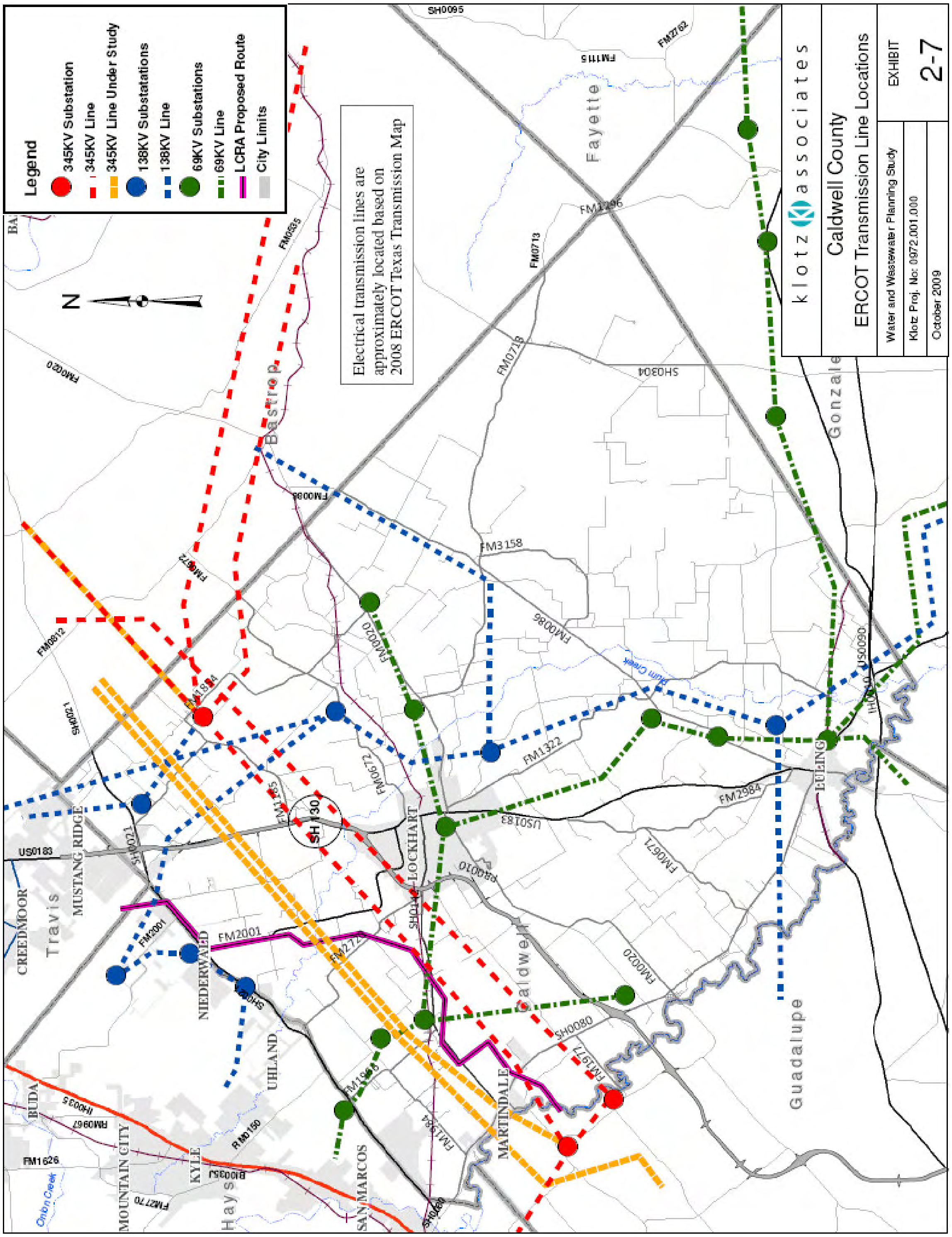

Legend
345KV Substation
345KV Line
345KV Line Under Study
138KV Substatations
138KV Line
69KV Substations
69KV Line
LCRA Proposed Route
City Limits
Electrical transmission lines are approximately located based on 2008 ERCOT Texas Transmission Map
klotz associates
Caldwell County
ERCOT Transmission Line Locations
Water and Wastewater Planning Study
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EXHIBIT
2-7
Bastrop
Fayette
Gonzales
Guadalupe
Caldwell
Travis
Hays
LOCKHART
LULING
MARTINDALE
UHLAND
NIEDERWALD
MUSTANG RIDGE
CREEDMOOR
BUDA
KYLE
MOUNTAIN CITY
SAN MARCOS
SH 130

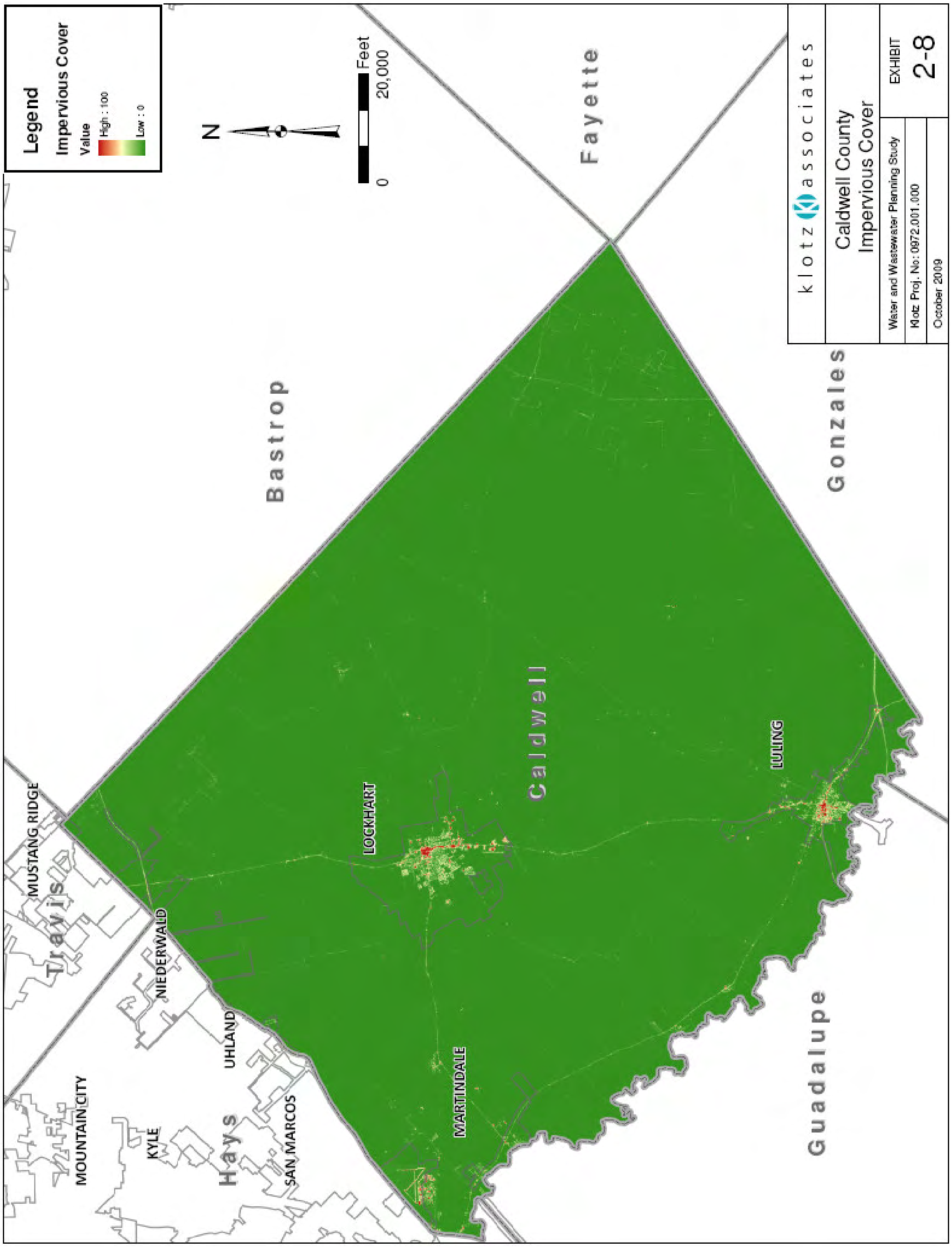
Legend
Impervious Cover
Value
High : 100
Low : 0
N
Feet
0
20,000
Bastrop
Fayette
Gonzales
Guadalupe
Caldwell
Travis
Hays
MUSTANG RIDGE
NIEDERWALD
UHLAND
MOUNTAIN CITY
KYLE
SAN MARCOS
LOCKHART
MARTINDALE
LULING
klotz associates
Caldwell County
Impervious Cover
Water and Wastewater Planning Study
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EXHIBIT
2-8

SECTION 3

DATA COLLECTION

3.1 General

Information for the study was obtained through interviews, meetings, surveys, and existing reports and studies. The data collected was specific to water use, population estimates, water quality issues and concerns. The information obtained from surveys regarding existing facilities was used to analyze current systems and develop recommendations for future systems.

3.2 Survey

The survey for this study was prepared in January 2009 and sent by fax and email to participants. The questionnaire was prepared for water and wastewater utilities that held CCNs in Caldwell County. The information requested in the survey was classified as general information, population information, water quality, water conservation and plans to meet future needs. The survey provided an opportunity for respondents to provide additional information the respondent believed to be pertinent to the study. A copy of the survey can be found in **Appendix B**.

The information requested from water utilities related to the groundwater sources, usage and water quality. Questions included; source of the water supply, CCN number and year granted, average daily water use, historic peak volume for water delivery and year, volume of water pumped into the system, volume of water billed, customer data on type of meters, future planning projections on meters use, description of water production facilities, population estimates for past five years and projections for next 30 years, and a list of top water users and amount. National Pollutant Discharge Elimination System (NPDES) permit information was also requested as well as any issues with water sources and concerns regarding point source discharges and non-point source pollution that may impact water quality in the county. Finally, water conservation measures and future efforts were listed.

Wastewater collection utilities were requested to indicate whether they owned and operated a wastewater collection system, treatment plant, or if others operated the facility. Information requested included CCN number(s) and date granted, average daily wastewater flow for plants, historic peak day volume for wastewater treatment, volume of water treated, volume of water billed, sewer connection types, future projections for sewer connections, type of treatment plant and rated capacity, top wastewater producers, and a list of NPDES permits held by facility. Lastly, inquiries were also made about re-use of treated wastewater, plans to support future growth, and description of changes/upgrades for treatment facilities. The survey requested additional comments that the respondents believed to be pertinent to the study.

The survey was completed by eleven (11) of the twelve (12) water providers and three (3) of the four (4) wastewater CCN permit holders. The task of gathering the information requested in the survey did require time and effort from the respondents and the information provided was valuable in understanding the current conditions in the county and developing potential solutions.

The entities participating in the survey were contacted by phone to schedule times, if preferred, to visit with and clarify any questions about the survey and the information being requested. These surveyed participants included:

Aqua Water Supply Corporation	County Line WSC
City of Lockhart	City of Luling
Creedmoor Maha	Goforth WSC
Gonzales County WSC	Martindale WSC
Maxwell WSC	Polonia WSC
Tri Community WSC	Turner Crest Village

Throughout the planning study three meetings were held at the Caldwell County Annex in Lockhart, Texas to gather input from the community. Updates and presentations were held on the progress of the study and input was received on the draft report. Sign in sheets for the stakeholder meetings have been included in **Appendix A.**

3.3 Regional Coordination

Exchanging information with local government entities, groundwater districts, water authorities, and state agencies was considered necessary as a part of the study. Interviews were conducted with Canyon Regional Water Authority, Gonzales County Groundwater Conservation District, Hays/Caldwell Public Utility Agency (PUA), San Antonio River Authority, and the Texas State Data Center (TSDC). Other information was obtained from Capital Area Council of Governments, TWDB, TCEQ, the Texas Department of Transportation (TxDOT), Caldwell County Appraisal District (CCAD), and the Electric Reliability Council of Texas (ERCOT).

The following participants were represented in the Stakeholder Meetings for this study:

Bluebonnet Electric Cooperative
Crystal Clear Water Supply Corporation
Caldwell County
Canyon Regional Water Authority
Luling Foundation
Edwards Aquifer Authority
Guadalupe-Blanco River Authority
Plum Creek Watershed Partnership
Gonzales County Groundwater Conservation District
Texas State Soil & Water Conservation Board
Texas Water Development Board
Envision Central Texas
Hays Caldwell Public Utility Agency
City of Lockhart
Lockhart I.S.D
Plum Creek Conservation District
County Landowner

SECTION 4

GROUNDWATER

4.1 Groundwater Sources

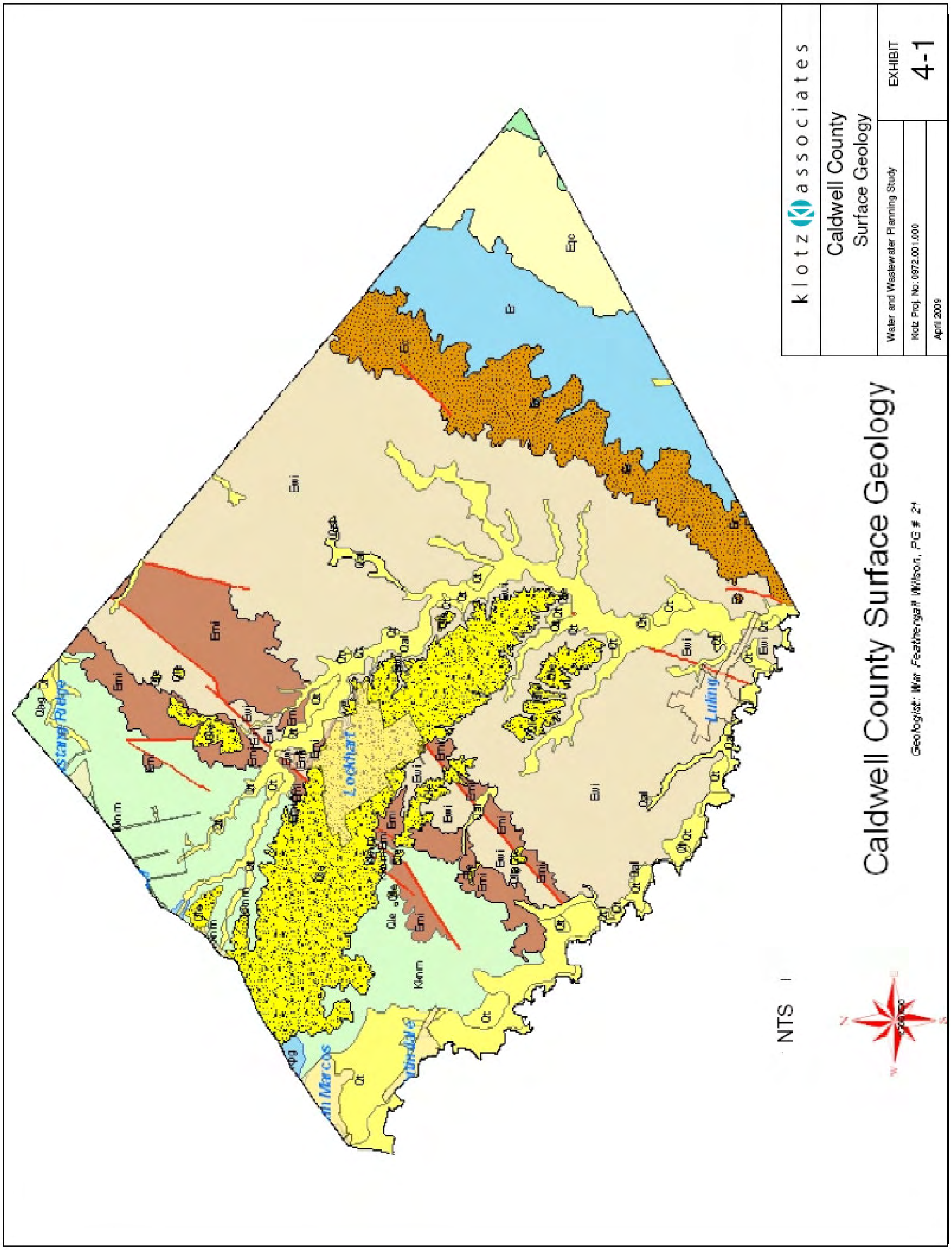
Groundwater in Caldwell County remains the primary source of potable water. Most water utilities have wells that pump water from local aquifers. Groundwater in the region is produced by aquifer formations that include the Leona, Carrizo, and Wilcox Aquifers. The formations vary from the Cretaceous to Quaternary time period as listed in ***Table 4-1.*** The table and ***Exhibit 4-1*** were provided by Feathergail Wilson, Professional Geologist. Mr. Wilson also provided valuable details and information regarding the groundwater resources in the region.

TABLE 4-1
Caldwell County Stratigraphy

PERIOD	EPOCH	FORMATION/GROUP	MAP SYMBOL	LITHOLOGY
Quaternary	Holocene	Undesignated	Qal, Qt	alluvium sand, silt, clay
	Pleistocene	Leona	Qle	gravel
Paleogene	Eocene	Weches	Ew	glauconitic fossiliferous clay
		Queen City	Eqc	sand and clay
		Reklaw	Er	clay and sand
		Carrizo	Ec	sand
		Wilcox	Ewi	sand and clay
	Paleocene	Midway	Emi	clay
Cretaceous	Late	Navarro	Kknm	expanding clay
		Pecan Gap	kpg	chalk

4.1.1 Leona Formation

The Leona Formation is an alluvial outcrop formation that extends from Kyle to about 10 miles southeast of Lockhart. It is primarily gravel stratified with some sands, clay and silt. "In some locations the gravel is so well cemented that the end result is a hard compact conglomerate resembling concrete." (Follet, 1966) Lockhart's water supply was completely provided for by the Leona Formation


klotz associates
Caldwell County
Surface Geology
Water and Wastewater Planning Study
April 2009
EXHIBIT
4-1
Caldwell County Surface Geology
NTS
Lockhart
Luling

before 1953. Deterioration in water quality from the Leona Formation has made this source of water unsuitable for potable water use unless the water is treated. The extensive use of chemicals in agricultural production is a likely reason for high nitrate levels in the Leona Formation. The water from this shallow formation is used primarily used for irrigation.

The Leona aquifer has an approximate thickness of about 40 feet and can yield small to large quantities of water. It has a gradient that averages 10 feet per mile. The hydraulic conductivity, which describes the movement of water through pores spaces, is expected to range from 10^0 to 10^{-7} centimeters per second (cm/sec). Flow is generally to the southeast and is believed to recharge the underlying Wilcox.

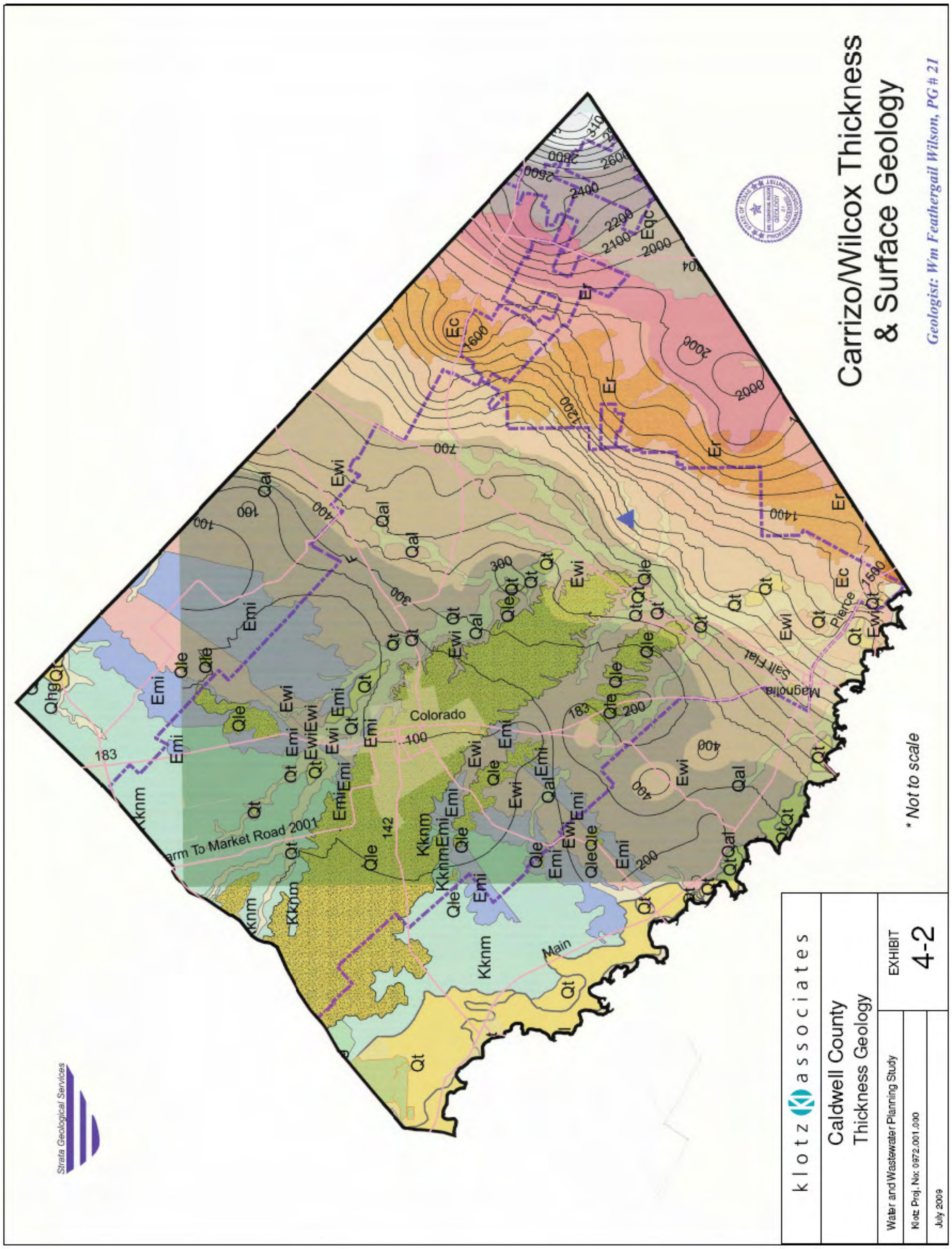
4.1.2 Wilcox Formation

The Wilcox Formation is another water bearing unit in Caldwell County. The formation outcrops in the central part of the county, as shown in the Caldwell County Surface Geology Map, ***Exhibit 4-1***. The Wilcox Group, from youngest to oldest formations, includes the Hooper, Simsboro, and Calvert Bluff. The geological label for the Wilcox outcrop label, Ewi, is shown in ***Table 4-1***.

The outcrop width range is approximately 8 to 10 miles. It then slopes steeply downward at about 150 feet per mile. The thickness of the formation increases as the depth increases and is mostly composed of sand and clay. Maximum thickness in the study area is approximately 2,000 feet and occurs in the southeastern portion of the county as shown in ***Exhibit 4-2***. Fresh to saline water can be found at depths of 50 feet to 2,800 feet in the southeastern area.

4.1.3 Carrizo Formation

The overlying formation on the Wilcox Formation is the Carrizo Formation. In Caldwell County, the Carrizo Formation is generally white, coarser-grained and


Carrizo/Wilcox Thickness
& Surface Geology
Geologist: Wm Feathergail Wilson, PG # 21
* Not to scale
Strata Geological Services
klotz associates
Caldwell County
Thickness Geology
EXHIBIT
4-2
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
July 2009
Colorado
Farm To Market Road 2001
Main
Magnolia
Salt Flat
Pierce

loose sand. The sand tends to be free of finer clays. The Carrizo outcrop is located in the southeastern part of the county. The cement-like characteristics of the Carrizo at the outcrop cause a rise in elevation. The stratum of the Carrizo dips downward from the outcrop at about 140 feet per mile with a general thickness of about 400 feet. The overlying sands have a higher hydraulic conductivity than the Wilcox. In some parts of the county a clay liner acts as a seal to separate the two water-bearing units.

4.1.4 Recklaw Formation

The Recklaw Formation overlays the Carrizo and crops out at the southeast corner of the county. It is about 2 to 3 miles wide and with a maximum thickness at approximately 400 feet. It dips downward at about 140 feet every mile. Sand and silt define the lower portion of the formation and clay with thin beds of sandstone classifies the upper portion.

4.1.5 Queen City Sands Outcrop

The Queen City Sands outcrop is approximately 3 to 4 miles in width. The formation dips southeast at about 120 feet per mile. The thickness increases to approximately 500 feet. The formation includes fine to medium sands and clay.

The water in this formation was reported to have total dissolved solids that ranged from about 500 parts per million (ppm) near Bastrop and Fayette Counties to 3,000 ppm near the Gonzales county line.

4.2 Groundwater Quality

The water quality of the region varies depending on the aquifer and the depth at which it is found. The chemical constituents in ground water originate primarily from the soil and rocks it seeps through. As depth increases so does the chemical and sodium content while hardness decreases. The suitability of the water depends largely on the chemical quality.

Chemical constituents found in water are compared to water quality standards developed by states. The state standards have to be approved by the Environmental Protection Agency (EPA) for implementation. Current drinking water standards for Texas are listed in the Texas Administrative Code (TAC) 209 Subchapter F. A list of the water quality standards has been placed in **Appendix C.** Various requirements have been imposed to regulate maximum contaminant levels in drinking water. Some of the most common contaminants include total dissolved solids (TDS), chloride (Cl), fluoride (F), iron (Fe), manganese (Mn), nitrate (NO_3), and sulfate (SO_4).

A Water Quality Publication Report prepared by the TWDB lists wells and the water quality testing results in Caldwell County. A page of the report has been included in **Appendix D** for review. The report list the constituents found and their respective contaminant levels.

Due to the high quality of groundwater in the Wilcox-Carrizo formation, it is the most desired source for developing wells. TDS in the southeast and southwest corner of the county are less than 500 ppm. However, TDS increase significantly in between these corners. Well monitoring and observations indicate an arch in the formation which degrades the water quality in this area.

There are few areas in the Wilcox-Carrizo formation near Caldwell County that exceed the sulfate and chloride drinking water standards of 300 ppm. In the southeast corner of the county sulfate was found to exceed 300 ppm in areas where total dissolved solids were under 1000 ppm. Chloride constituents were not reported to exceed the standards.

4.3 Groundwater Conservation Districts

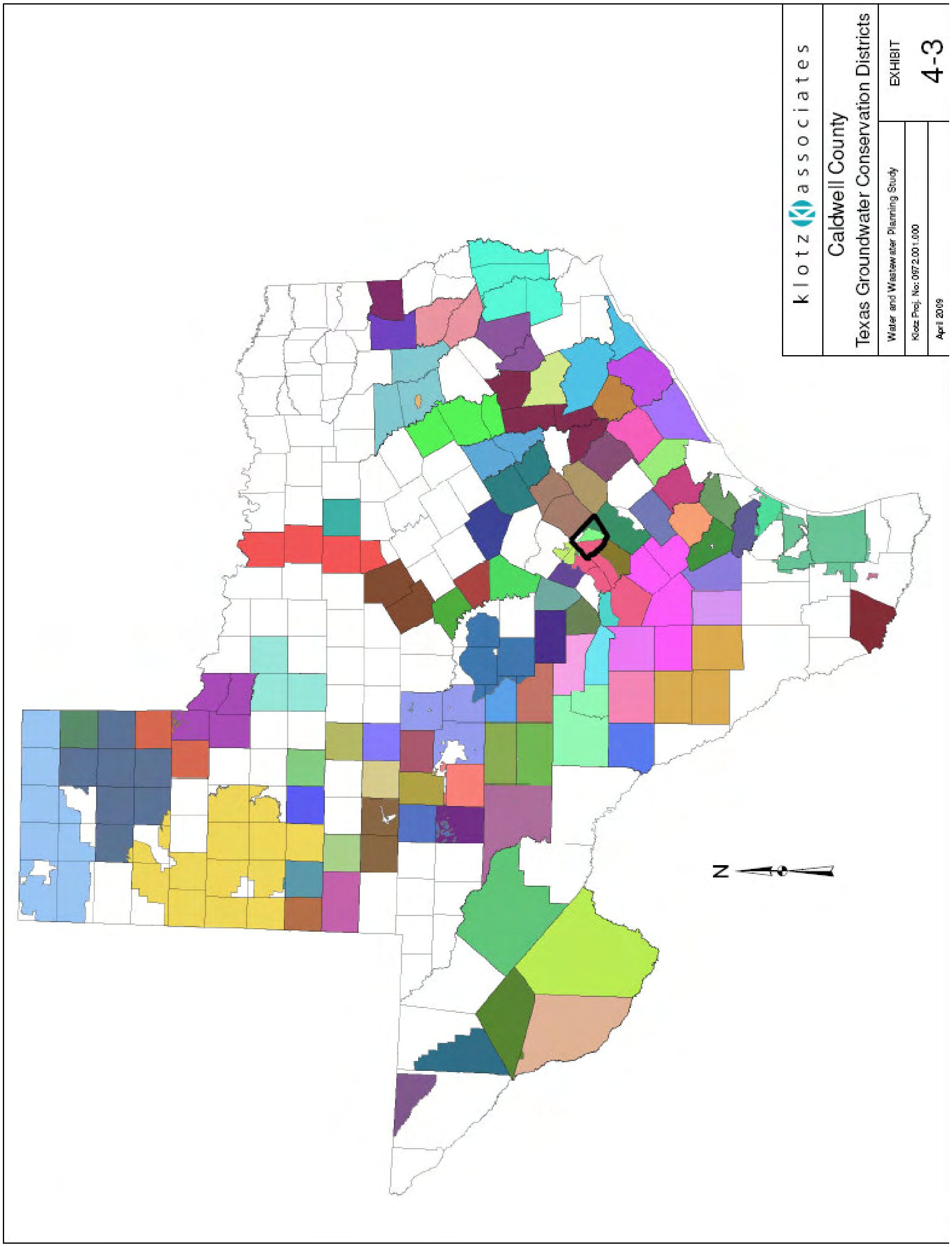
Groundwater conservation districts (GCD) were first created by the Texas Legislature in 1949. They are charged with developing and implementing comprehensive management plans that conserve and protect groundwater resources. ***Exhibit 4-3*** illustrates the GCD that have been established in Texas. The districts plan for the future, work to collect data, educate consumers about water conservation, and prevent waste of water. A board of directors oversees the districts with guidance from the TWDB.

In Caldwell County the management districts are the Plum Creek Conservation District (PCCD), the Gonzales County Underground Water Conservation District (GCUWCD), and the Edwards Aquifer Authority (EAA). These boundaries of these districts are illustrated in ***Exhibit 4-4***. The PCCD and the GCUWCD currently have some overlapping areas that have created uncertainty about the rules that apply for the land owners in the overlapping area.

Rules for developing wells and issuing permits by the PCCD and the GCUWCD are similar at times but generally defined and managed differently. In general, the approach to manage groundwater are established in Management Plans and Rules established by each district.

4.3.1 Plum Creek Conservation District

PCCD is currently working with other districts within groundwater management area (GMA) 13 develop and adopt a desired future condition (DFC) for the aquifers within the management area. Once adopted, the DFC of the aquifers will establish quantified conditions of available groundwater resources based on hydrological studies and modeling. Due to the current status of the DFC not being established, PCCD has potentially issued more permits for groundwater than is currently available. Current laws require GCD to permit to the extent possible of


klotz associates
Caldwell County
Texas Groundwater Conservation Districts
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April 2009
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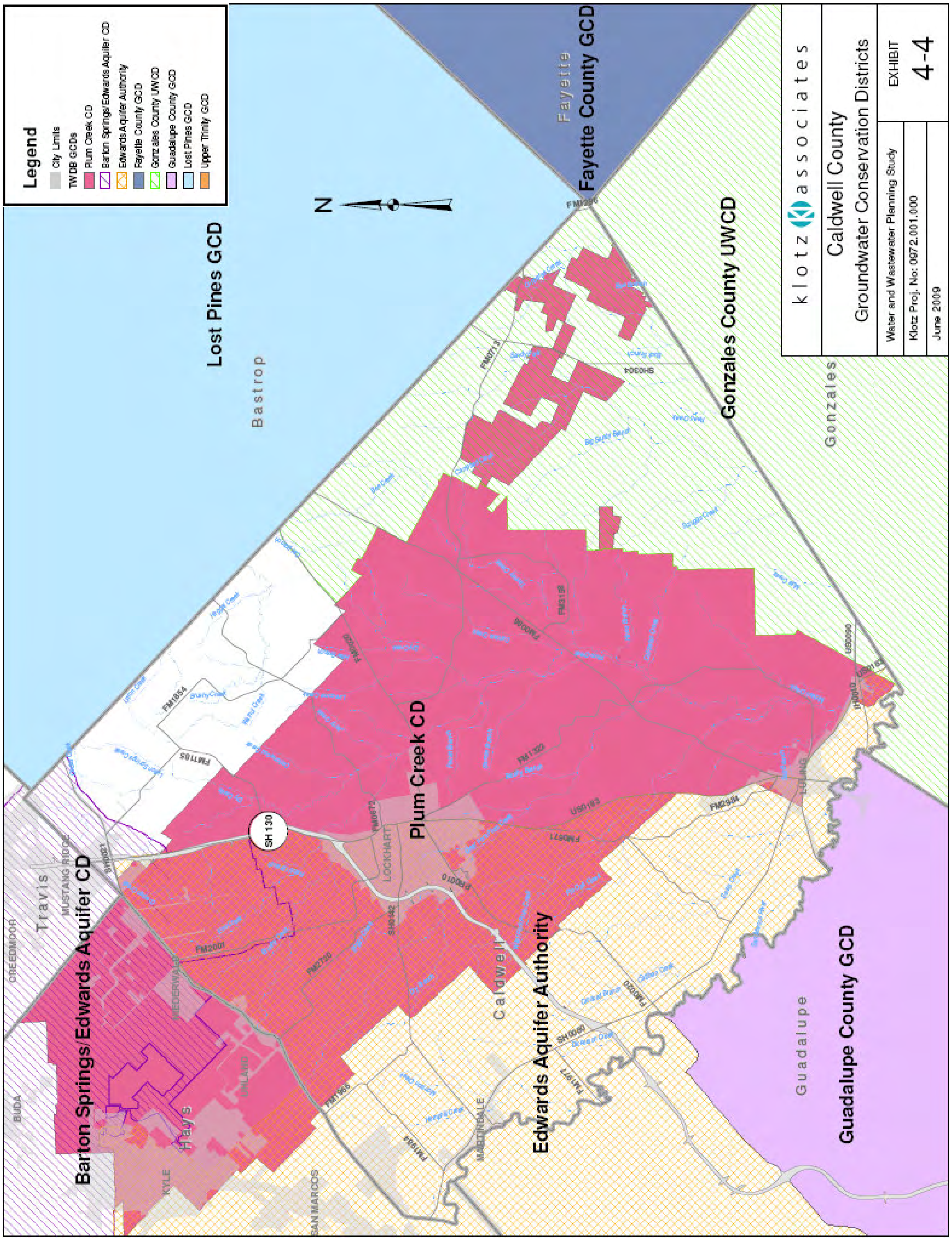
Legend
City Limits
TWDB GCDs
Plum Creek CD
Barton Springs/Edwards Aquifer CD
Edwards Aquifer Authority
Fayette County GCD
Gonzales County UWCD
Guadalupe County GCD
Lost Pines GCD
Upper Trinity GCD
N
Lost Pines GCD
Bastrop
Fayette
Fayette County GCD
Gonzales County UWCD
Gonzales
Plum Creek CD
LOCKHART
LULING
SH 130
Barton Springs/Edwards Aquifer CD
Edwards Aquifer Authority
Caldwell
Travis
Hays
Guadalupe
Guadalupe County GCD
BUDA
KYLE
SAN MARCOS
MUSTANG RIDGE
CREEDMOOR
MARTINDALE
klotz associates
Caldwell County
Groundwater Conservation Districts
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the managed available groundwater. The groundwater permits that have been approved by PCCD are shown in ***Table 4-2***. In addition to the listed permits in Table 4-2, PCCD received an application from the Plum Creek Group (prepared by Murfee Engineering Company) requesting 15,000 acre feet per year from the 4,384 acres that PCCD annexed on March 25, 2008 in the Southeastern part of Caldwell County.

TABLE 4-2

Plum Creek Conservation District Groundwater Permits

Type of Permit	Name	Number of Wells	Quantity (acft/year)	Date Permitted
Agriculture- Irrigation Permits	Joe Smith	2	400	2/21/06
Agriculture- Irrigation Permits	Brenda Horton	1	43	6/21/07
Agriculture- Irrigation Permits	Ben Tidwell	1	168	12/18/07
Agriculture- Irrigation Permits	Giacomel	1	22	9/12/07
Agriculture- Irrigation Permits	Joe Wells	1	31	6/2004
Agriculture- Irrigation Permits	Martin Pratka	1	43	9/12/06
Agriculture- Irrigation Permits	A.E. Nicholson	4	4,000	2/17/09
Public Supply Permits	City of Lockhart	7	5,475	7/15/08
Public Supply Permits	Dale WSC	1	269	6/17/08
Public Supply Permits	Polonia WSC	5	2,283	6/17/08
*Public Supply Permits	Polonia WSC	1	1,343	-
*Public Supply Permits	Hazelette	1	200	-
Public Supply Permits	Luling	4	1,612	8/19/08
Public Supply Permits	Aqua Water	3	625	11/20/07
		Total	**16,514**	

PCCD has established a Groundwater Management Plan & Protection Rules (adopted December 16, 2003) in effort to protect, preserve, enhance, and insure the beneficial resources within its jurisdiction. A Groundwater Management Plan, which is a separate document, has also been prepared and was adopted in 2007 to support the efforts of PCCD. The district rules attempt to regulate groundwater by means of well spacing based on production rates. ***Table 4-3*** provides a list of the spacing production provisions.

TABLE 4-3 PCCD Classification, Spacing, and Production Provisions		
Actual Pumping Capacity of Proposed Well (GPM)	**Classification of Proposed Well**	**Minimum Distance from Newest Existing Well on Authorized Well Site**
Less than 25 GPM	Domestic	None
25 - 100	A	600 Feet
101 - 250	B	1,500 Feet
251 - 500	C	3,000 Feet
501 - 1,000	D	6,000 Feet
1,001 GPM and over	E	12,000 Feet

Note:

Wells drilled after December 31, 2003 shall either perform a hydrologic study approved by the District designed to demonstrate the impact of the permitted well on wells located within a one-half mile radius, or comply with the District's spacing requirements. Wells are classified according to actual pumping capacity in gallons per minute (GPM) under normal operating conditions.

4.3.2 Gonzales County Underground Water Conservation District

The GCUWCD was created on an order of the Texas Natural Resource conservation Commission number 101692-Do4 and is charged specifically with managing the Sparta, Queen City, and the Carrizo-Wilcox aquifers in Gonzales County. The goals of the Management Plan and Rules established by the district are to conserve, preserve, protect and prevent waste for the future of Gonzales County.

The goals of the district are carried out through the GCUWCD Rules and Management Plan. The plan defines spacing requirements and pumping production limitation to manage the groundwater. Although the DFC has not been developed, a drawdown of 100 feet in the Carrizo will curtail pumping. A list of tables and rules from the PCCD and the GCUWCD has been included in **Appendix E**.

The GCUWCD is also working with other districts in GMA 13 to develop DFC which will revise the current Management Plan to reflect the managed available groundwater (MAG). The GCUWCD is in the same situation as PCCD with possible over permitting of the Carrizo-Wilcox Aquifer.

In February 2009, the GCUWCD stated that the only permitted public transporter was the Schertz-Seguin Local Government Corporation (SSLGC) for 12,900 acre-feet per year. The length of the transport permit is 30 years. The SSLGC supplies water to the cities of Schertz and Seguin. Permits under review were submitted by CRWA and SAWS. Aqua WSC also has wells that were established before the creation of the GCUWCD and have been grandfathered on the east side of Gonzales County. Those existing wells remain operational under the grandfather provision and do not need to adhere to the current rules of the district.

SECTION 5

SURFACE WATER

5.1 General

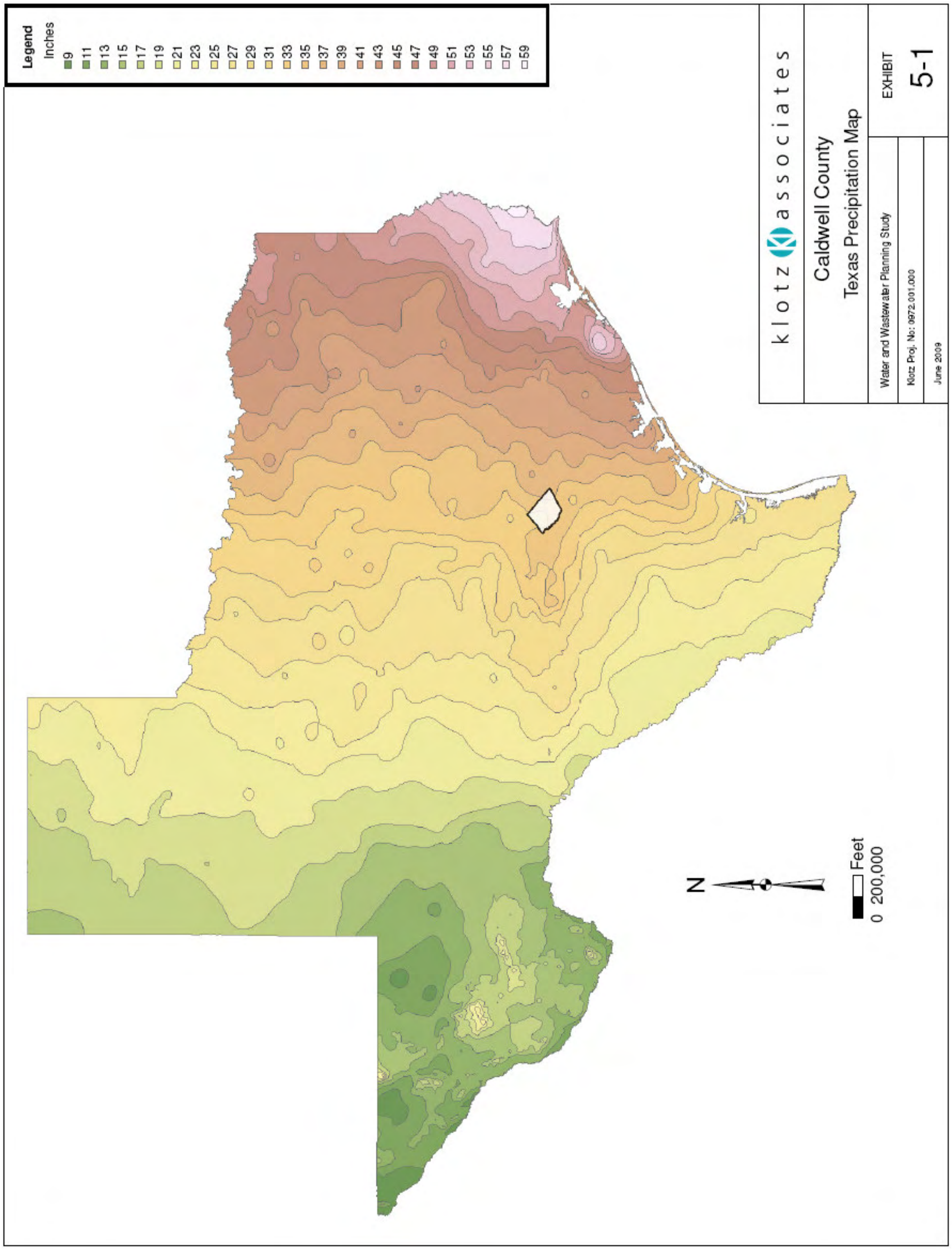
Surface water in Texas is owned by the state and permission to use the water is granted through a "water right". When a water right is acquired, water may then be diverted from its natural channel for use. However, a water right does not guarantee that water will be available. Water availability is determined by many factors but the most important are precipitation and subsequent water recharge. Average annual precipitation in Texas is illustrated in ***Exhibit 5-1*** with average annual precipitation in Caldwell County ranging from about 32 inches to 38 inches. Water rights permit allow the holder to divert stream flow for municipal, industrial, irrigation, mining, hydropower, and recreational use provided water is available and the use is not wasteful.

5.2 Surface Water Supply Sources

Surface water use for Caldwell County has ranged annually depending on availability from the Guadalupe and Colorado River Basins. Data obtained from the TWDB indicates that historic annual surface water use for Caldwell County ranged from 2,500 ac-ft to about 3,500 ac-ft. The surface water use illustrated in ***Graph 5-1*** depicts the total of the Guadalupe and Colorado River Basins from 1974 to 2004. The TWDB reports that provided the data are in **Appendix F**.

5.2.1 Guadalupe River Basin

The Guadalupe River Basin serves as the primary source of surface water for Caldwell County. The Guadalupe River Basin is entirely in Texas and is largely within the statutory district of the GBRA as shown in ***Exhibit 5-2***. The Guadalupe River Basin is a valued source of water to local and regional suppliers.


Legend
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klotz associates
Caldwell County
Texas Precipitation Map
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
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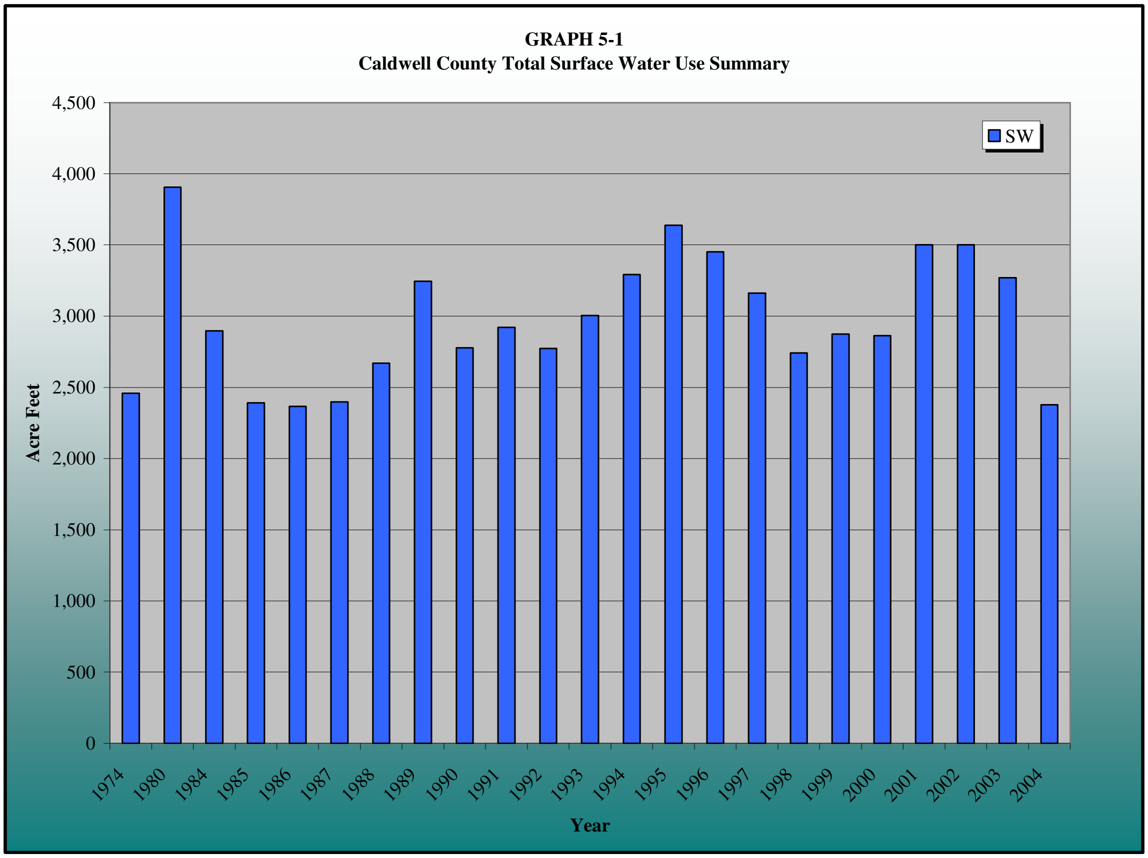
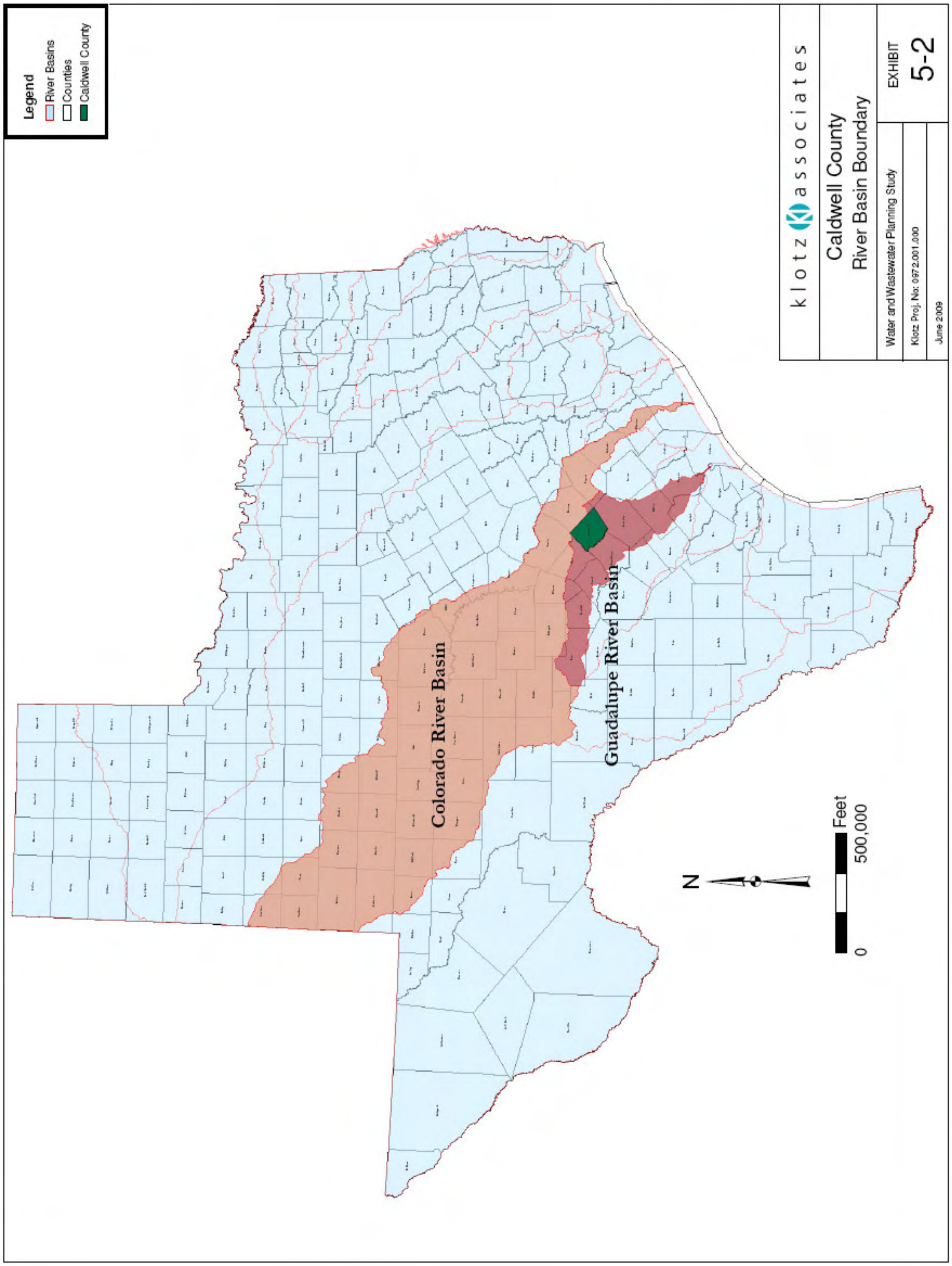


Approximately 66% of the water vendors surveyed indicated that they use surface water purchased from GBRA.

Water (surface water and groundwater) used in Caldwell County from within the boundaries of the Guadalupe River Basin has historically averaged about 6,500 ac-ft per year. The Guadalupe Basin remains the primary source of water for the county. ***Graph 5-2*** illustrates the historical water in Caldwell County by basin of origin.

5.2.2 Colorado River Basin

The Colorado River Drainage basin has reportedly provided less than 6.5% of the reported water use in Caldwell County. The portion of the drainage basin in the


Legend
River Basins
Counties
Caldwell County
Colorado River Basin
Guadalupe River Basin
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0
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River Basin Boundary
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
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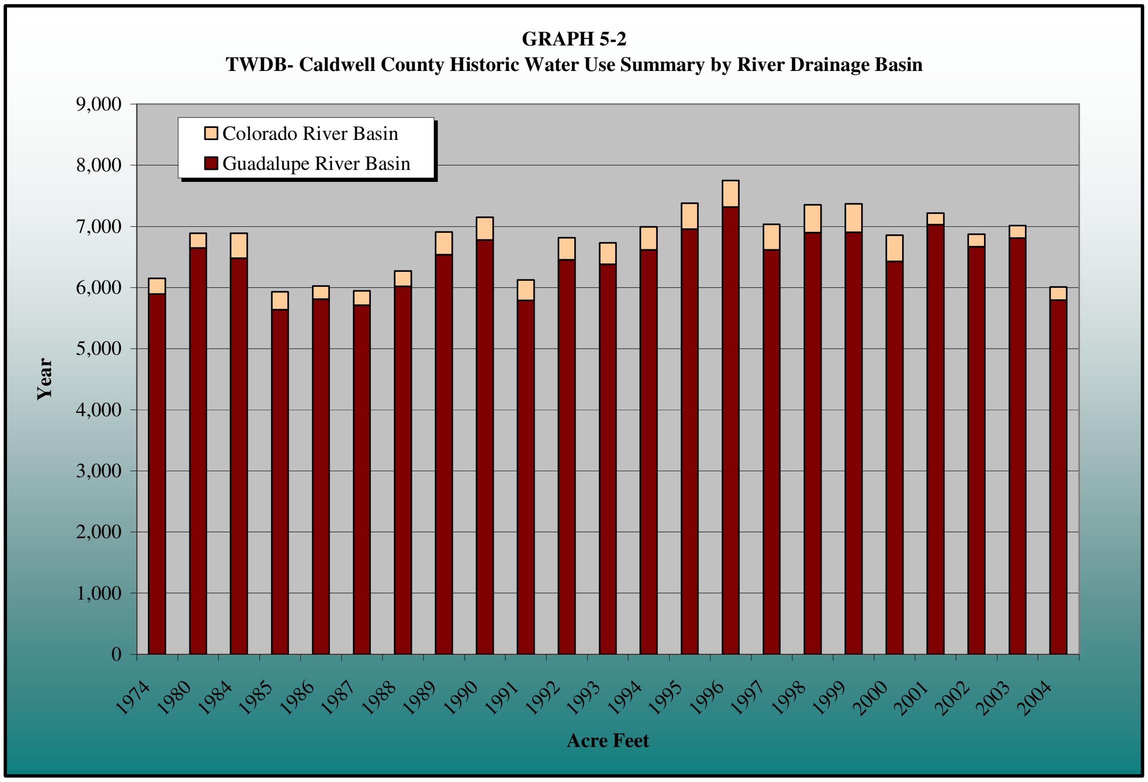


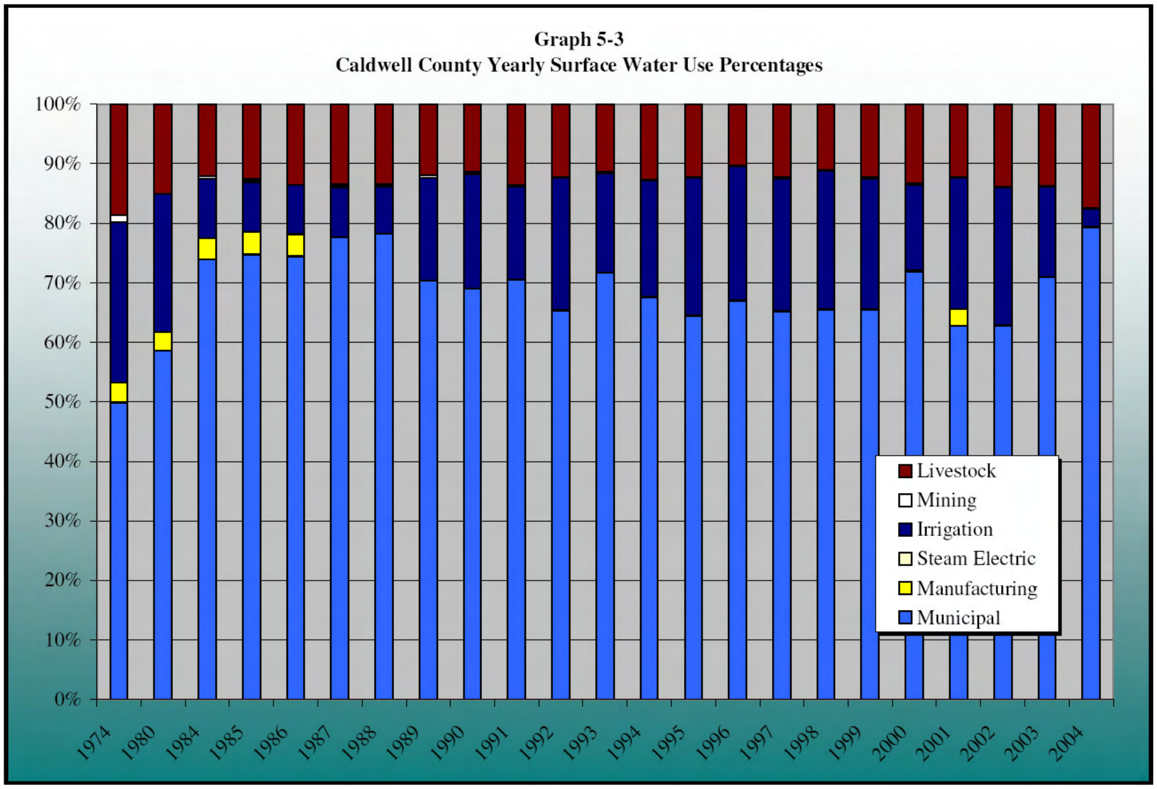
county has yielded an average of 350 ac-ft annually. The Colorado River Basin is managed by the Lower Colorado River Authority (LCRA).

5.3 Surface Water Supply Uses

Municipal use is the county's major use of surface water. Based on historical data from 1990 to 2004, municipal water use has accounted for between 65% and 80% of the total water used in the county. ***Graph 5-3*** illustrates historical percentages of surface water use for typical categories. Although irrigation and livestock water use have decreased, they still account for about 20%. Mining, steam electric and manufacturing account for less than 0.5% of the water used in the County.

5.4 Surface Water Rights

Currently, surface water is accessed and obtained through a water rights permitting process prescribed by the TCEQ. Anyone desiring to use surface water



needs a permit from the State of Texas. Exemptions from this requirement are available for (1) domestic and livestock use, (2) wildlife management, (3) emergency use, and (4) other specified uses listed in the Texas Water Code.

Through these appropriated rights users are allowed to divert and store water for use. However, a priority date is assigned to each right granted. The priority date determines the order of water to be used. It is a pecking order for water use. In drought conditions and when stream flows are lowered and reduced, the TCEQ administers water rights on a priority basis known as "first in time, first in right."

A list of water rights for Caldwell County can be found in **Appendix G**. This data was obtained from a TCEQ water rights database. Most of the water rights listed for Caldwell County are associated with the San Marcos River. The largest permitted volumes are owned by GBRA and Hydraco Power, Inc.

SECTION 6

POPULATION

6.1 Population Projections

Population projections are necessary planning tools to prepare for future growth and development. Preparing for future growth can prevent overburdening current infrastructure and help identify systems and resources that are necessary to successfully handle an increase in population.

The science of predicting future population is at best, an estimate. Projections use existing data estimate available for births, deaths, migration, age/sex, and ethnicity to develop rates and run population scenarios that are plausible for future growth patterns. The US Census Bureau and the Texas State Data Center (TSDC) are two agencies that provide these estimates to be used or further analyzed by local communities for planning purposes.

The US Census Bureau and TSDC estimates vary due to accessible, updated, and available information. For example, the US Census Bureau uses the income tax data that is not available to other agencies to do the estimates. The TSDC uses current birth and death data not readily accessible to the US Census Bureau. The US Census Bureau also performs analysis at a national level with no regard to annexation and boundary changes that the TSDC considers.

6.2 Texas State Data Center

Population projection estimates developed by the TSDC incorporate migration patterns of ethnic groups by sex, age, standard birth and death rates to produce four scenarios of expected growth. The four common migration scenarios considered for Caldwell County are as follows:

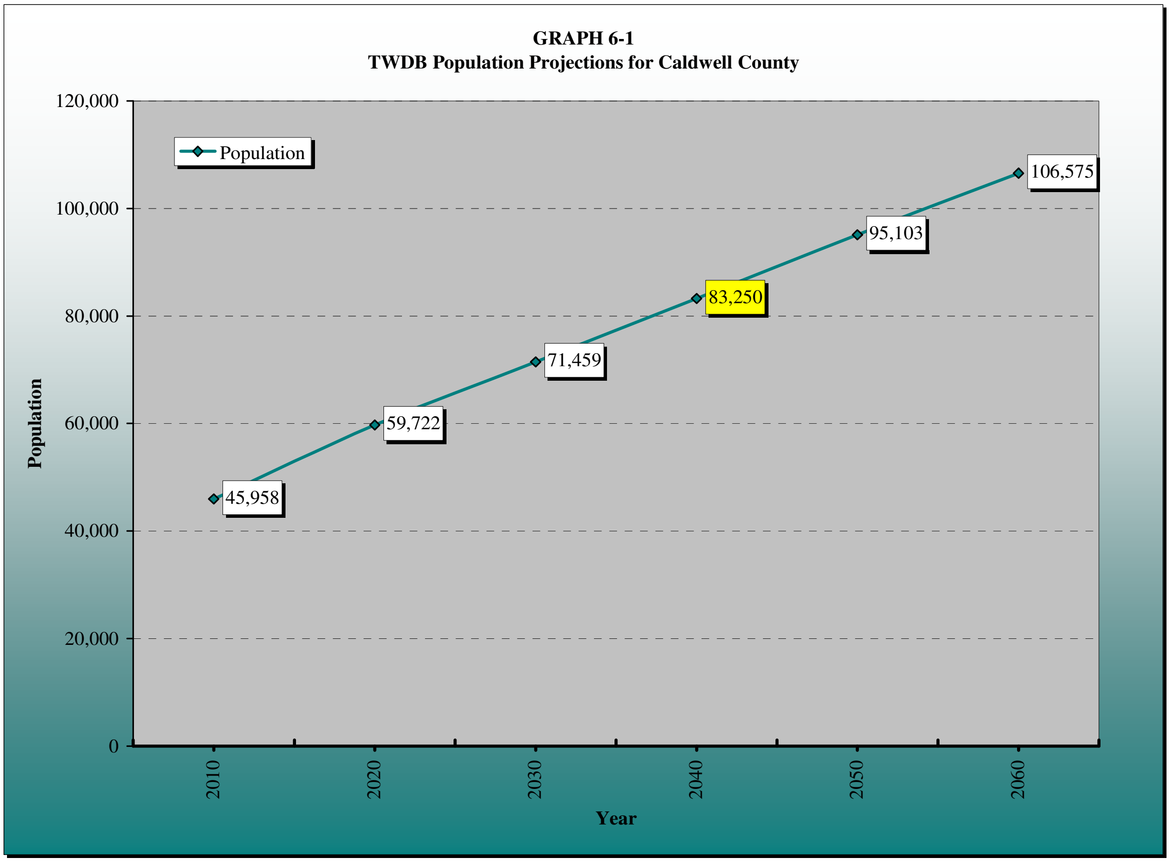
1. Zero Net Migration (0) – Assumes immigration and migration rates are equal
2. Net Migration Equals One-Half 1990-2000 (0.5) – Average of Zero and 1990-2000 Net Migration rates. Assumes rates of one-half of the 1990's.
3. Net Migration Equal to 1990-2000 (1.0) – High growth alternative based on high growth rates on 1990's.
4. Net Migration Equal to 2000-2007 (200-2007) – Post 2000 population trends with reduced levels of migration.

According to the State Demographer, who develops the projections at the TSDC, the recommendation for most cases is the 0.5 scenario, where Net Migration is equal to one-half 1990-2000. The 0.5 scenario predicts the most practical growth scenario. However, after further review and consideration of SH 130, the State Demographer suggested that Caldwell County consider Scenario 1.0 for planning purposes.

Population projections for scenario 1.0 may be more practical with the change SH 130 will bring in connecting two of fastest growing cities. A population projection estimate at a micro-level can reveal that factors such as transportation, land use, development planning, density in adjacent counties and other local level data would cause a wave of growth for Caldwell County. The limitation of forecasting for projected population estimates at a micro-level is acknowledged by the TWDB.

6.3 Texas Water Development Board

The population projections that were developed by the TWDB and adopted into the State Water Plan on September 13, 2003 are presented in ***Graph 6-1.*** The projection for Caldwell County assumes that the population growth rate will be the same in the future as it was in 1990 and 2000. The growth rate estimates were



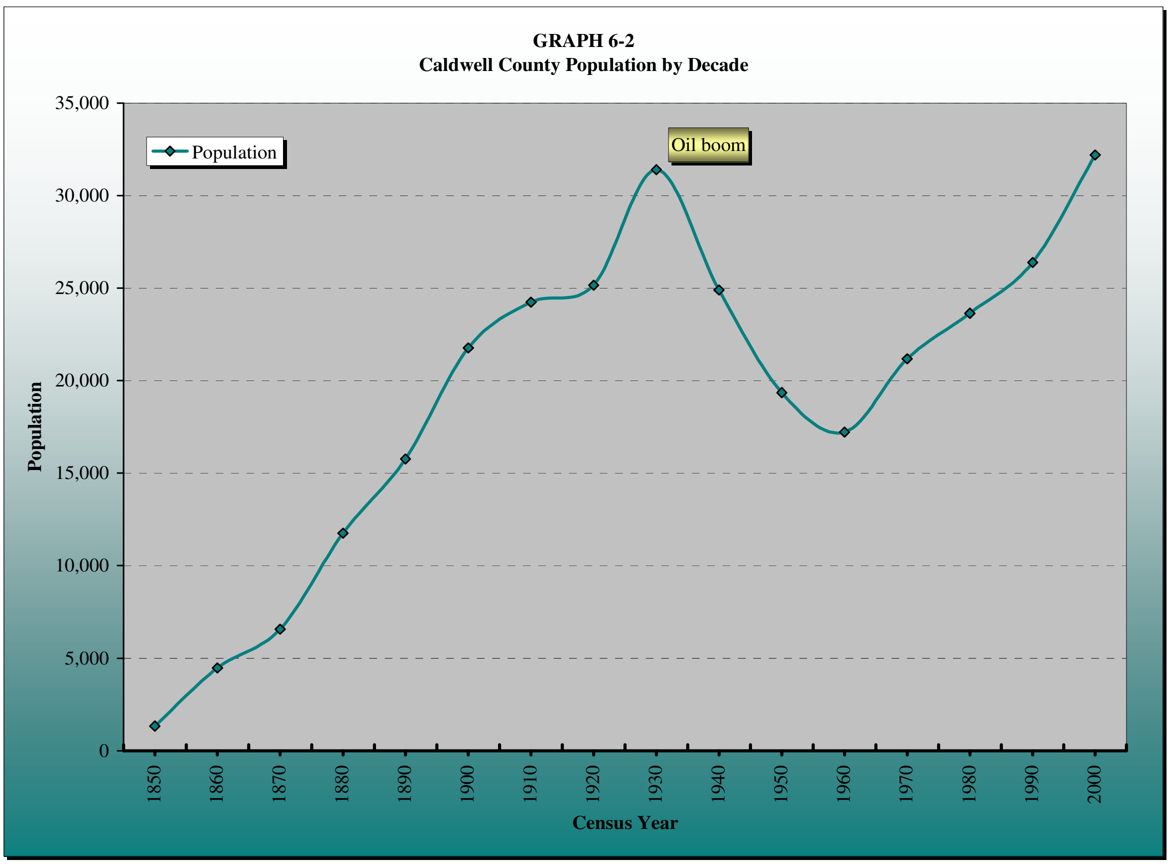
calculated using the most probable scenario from the Texas State Data Center (Scenario 0.5) for migration. The information from the Texas State Data Center was used as a baseline in establishing population projections.

The projections established by the TWDB are limited at forecasting the micro-level growth. The estimates do not account for events and moments that alter the demographics of a county. An event such as the completion of SH 130 can not be measured. The result in population change due to this event is considered to be underestimated. Historic patterns have not described the implications of new routes to population growth waves.

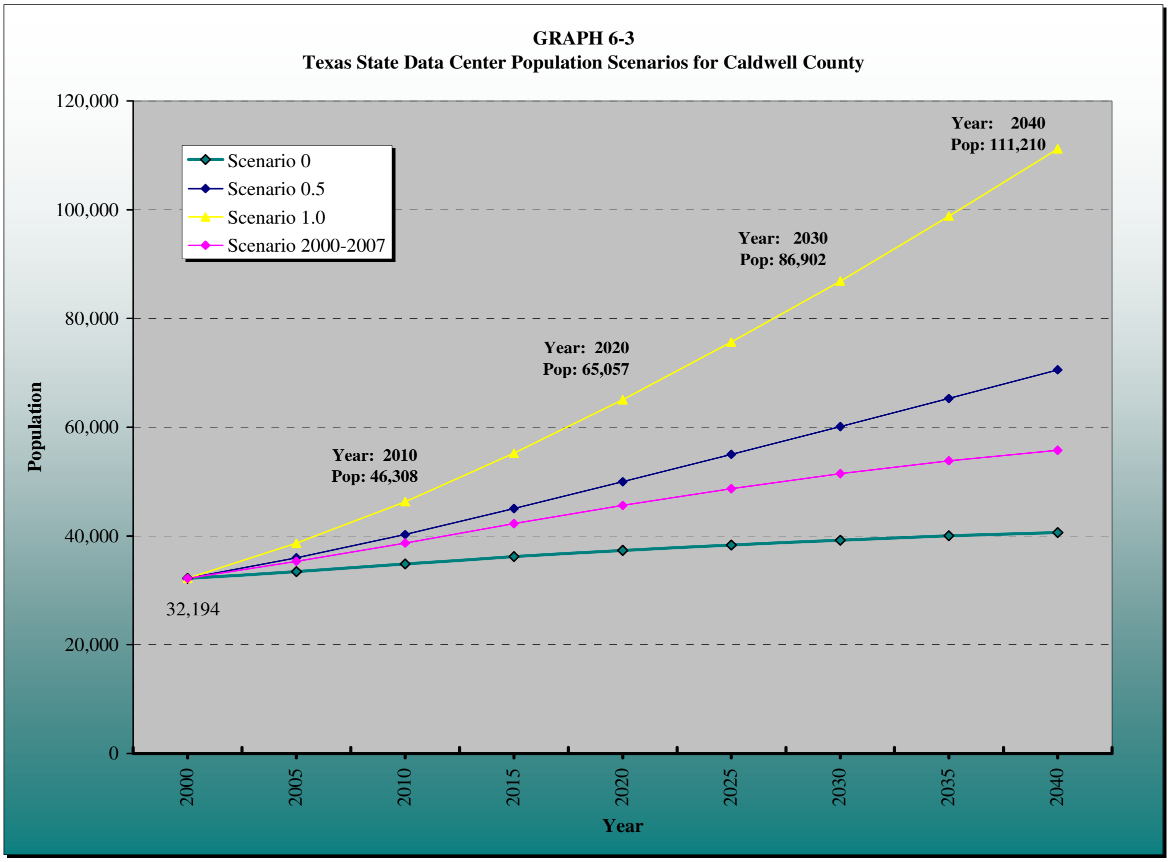
The population projections are presented in Volume II, Appendix 4.1, of Water for Texas dated January 2007.

6.4 Population History and Growth Estimates

Historically, a change in population due to events is noticeable in the acquisition of data. For example, in 1922 a man by the name of Edgar B. Davis discovered oil in what is now Luling, Texas. The "oil boom" was an event that impacted and changed Caldwell County. Only historic data, shown in ***Graph 6-2***, can accurately illustrate the change.



As the future of Caldwell County is being planned, it is recommended to plan for the most conservative scenario as stated by the State Demographer. As shown in ***Graph 6-3***, the fastest growth case scenario from the data available is provided by the Texas State Data Center, scenario 1.0.



The TWDB estimates the population to be at 83,250 by the year 2040 and the Texas State Data Center estimates the population at 111,210 by the year 2040, as shown ***Graph 6-4.*** The individuals that will populate Caldwell County vary in opinion by as much as 25%. The TWDB does project population estimates in the hundred thousandths but it is not until the year 2060.

6.5 Population Consensus

The population projections were presented to the Caldwell County Technical Advisory Committee and Stakeholders in meetings. Although Caldwell County did not dispute the population projections developed by the TWDB in the SCTRWP, there was disagreement about the estimate. Through a consensus it was agreed to proceed with the estimates from the TSDC (Scenario 1.0) with a revision. The revision was to decrease the population projection in the year 2040 to a value that was within the values of the TSDC and the TWDB. ***Table 6-1*** has been prepared to list the estimated population values developed by the TSDC and the TWDB. It was agreed to proceed with an estimate of 100,000 in 2040 for the purpose of this study. Accordingly, population projections used for this study are listed in ***Table 6-2***.

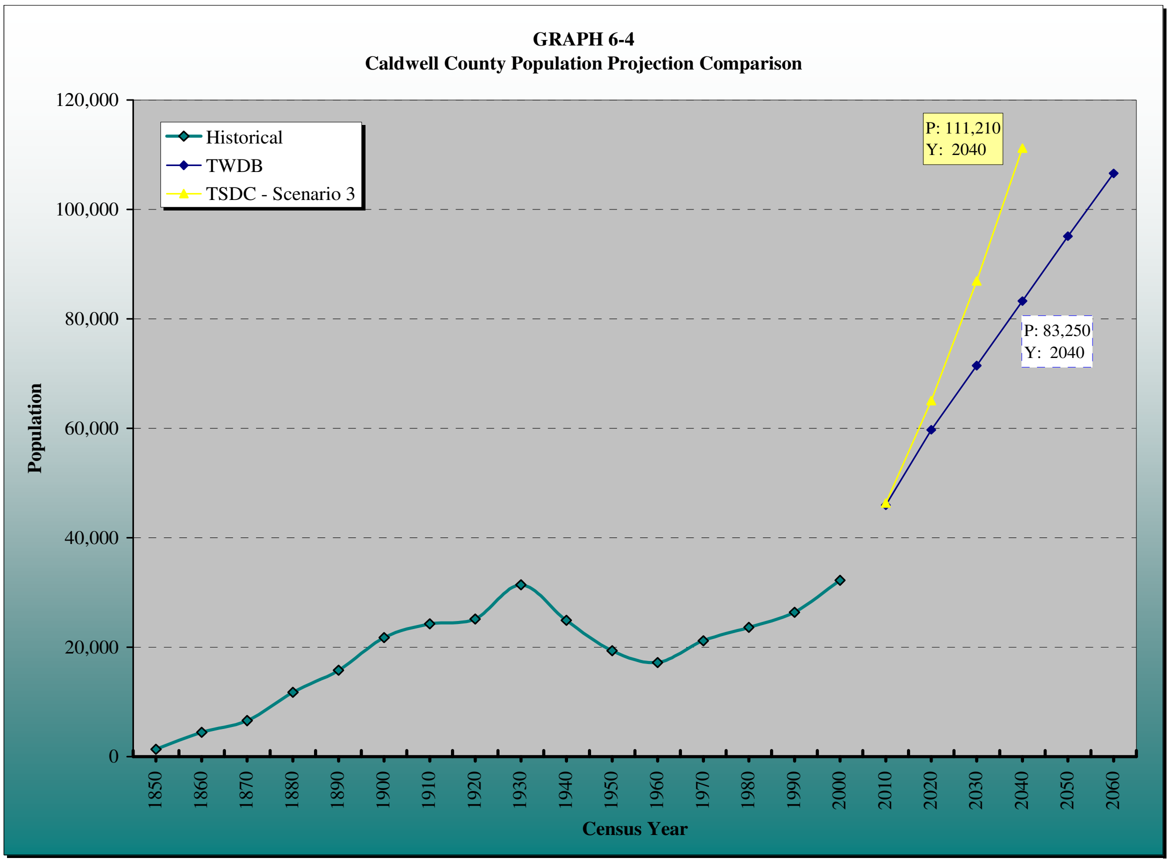


TABLE 6-1
Population Projection Estimates

Year	Texas State Data Center Population Scenarios				TWDB
	0.0	0.5	1	2000-2007	
2010	34,844	40,289	46,308	38,724	45,958
2020	37,355	49,975	65,057	45,622	59,722
2030	39,258	60,127	86,902	51,469	71,459
2040	40,677	70,593	111,210	55,752	83,250

TABLE 6-2
Planning Study Population Projections

Year	Population
2010	46,308
2020	65,057
2030	86,902
2040	100,000

SECTION 7

FACILITIES INVENTORY

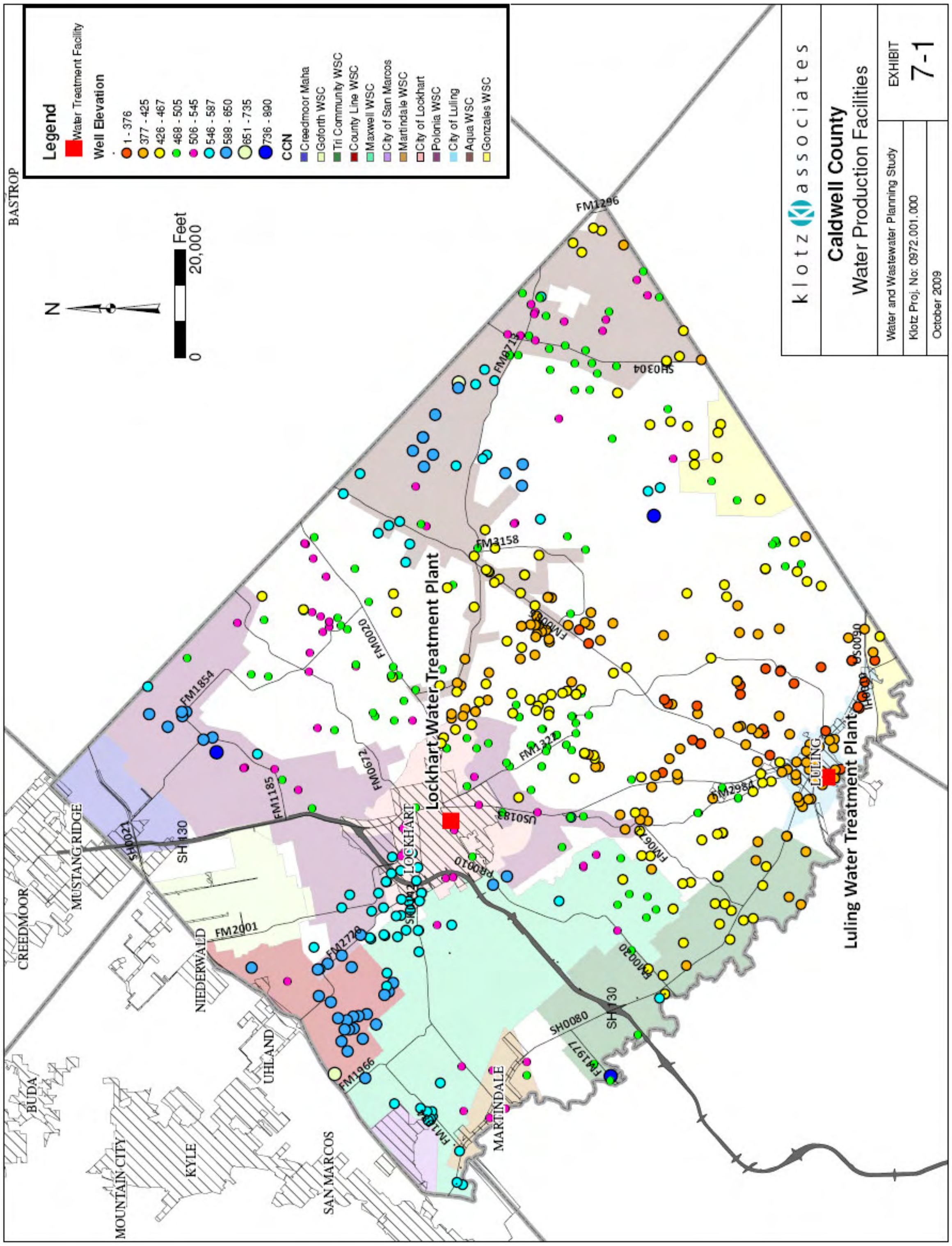
7.1 Water Facilities Inventory

Caldwell County is supplied water by 12 CCN and numerous private wells. The information provided below is a compilation of data obtained from the TCEQ database and surveys. ***Table 7-1*** provides a list of the CCNs for water. The 12 CCN holders, production wells, and water treatment plants are shown in ***Exhibit 7-1***. Although water is primarily produced through the allocation of groundwater well permits, 66% of the water providers obtain additional water through surface water rights. The CCN holders in the county are Municipal, Water Supply Corporations (WSC), and Special Utility Districts (SUD).

TABLE 7-1

Water Supply CCN

Utility Name	Ownership Type	Primary County	Serving Counties
Aqua	WSC	Bastrop	Caldwell, Lee, Travis
City of Lockhart	Municipality	Caldwell	None
City of Luling	Municipality	Caldwell	None
County Line	WSC	Hays	Caldwell
Creedmoor Maha	WSC	Travis	Caldwell, Bastrop, Hays
Goforth	WSC	Hays	Caldwell, Travis
Gonzales County	WSC	Gonzales	Caldwell, Dewitt, Guadalupe
Martindale	WSC	Caldwell	Guadalupe, Hays
Maxwell	WSC	Caldwell	Hays
Polonia	WSC	Caldwell	Bastrop
San Marcos	Municipal	Hays	Caldwell, Comal, Guadalupe
Tri-Community	WSC	Caldwell	Guadalupe


Legend
Water Treatment Facility
Well Elevation
1 - 376
377 - 425
426 - 467
468 - 505
506 - 545
546 - 587
588 - 650
651 - 735
736 - 890
CCN
Creedmoor Maha
Goforth WSC
Tri Community WSC
County Line WSC
Maxwell WSC
City of San Marcos
Martindale WSC
City of Lockhart
Polonia WSC
City of Luling
Aqua WSC
Gonzales WSC
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Caldwell County
Water Production Facilities
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Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
October 2009
Lockhart Water Treatment Plant
Luling Water Treatment Plant
LOCKHART
LULING
BASTROP
CREEDMOOR
MUSTANG RIDGE
NIEDERWALD
UHLAND
BUDA
KYLE
MOUNTAIN CITY
SAN MARCOS
MARTINDALE
SH130
FM1296
FM2001
FM1854
FM1185
FM3158
FM2984
FM1966
SH0080
SH0304
US0183
SH0021

An inventory of the information to be presented in this section below has been prepared in ***Table 7-2***.

TABLE 7-2
TCEQ Water CCN Database Inventory

Water User Group	Total Storage (MG)	Elevated Storage (MG)	Total Production (MGD)	Average Daily Consumption (MGD)
Aqua WSC	12.12	5.64	24.71	4.97
City of Lockhart WSC	3.65	1.05	8.298	1.8
City of Luling	1.65	0.9	2.5	1.99
Creedmoor Maha	1.511	1.325	5.083	0.61
Martindale WSC	0.344	0.28	0.378	0.205
Maxwell WSC	1.238	1.238	2.67	0.431
Polonia WSC	0.961	0.475	1.845	0.367
TriCommunity WSC	0.338	0.12	0.713	0.125
County Line WSC	1.5	1.37	0.864	0.47
Goforth WSC	1.992	1.068	6.192	0.936
San Marcos	6.941	3.161	36.850	6.507
Gonzales County WSC	1.44	0.459	3.37	1.229

7.1.1 Aqua Water Supply Corporation

Aqua Water Supply Corporation (CCN# 10294 est. 1969) produces groundwater from the Carrizo Aquifer. The service area includes Bastrop, Caldwell, Lee and Travis Counties. Aqua WSC currently services the southeast area of Caldwell County.

It is reported to have a total storage capacity of 12.12 million gallons (MG) with an elevated storage capacity of 5.640 MG. Production of Aqua WCS is 24.71 million gallons per day (MGD) with an average daily consumption of 4.970 MGD for the service area. In Caldwell County, the uses are primarily for residential.

7.1.2 City of Lockhart

The City of Lockhart (CCN# 10295 est. 1952) is a municipality that provides groundwater from the Carrizo Aquifer. Surface water is supplied by GBRA through run-of-river rights. Surface water currently accounts for more than half of the water supply. The service area for Lockhart is entirely in Caldwell County.

The total storage capacity is 3.650 MG with an elevated storage capacity of 1.050 MG. The total production is 8.298 MGD with a maximum purchase capacity noted to be 4.0 MGD and a service pump capacity of 4.896 MGD. Average daily consumption is 1.818 MGD. The meter count was 3,865 and uses in Caldwell County were classified as residential, commercial/industrial and other.

7.1.3 Creedmoor Maha Water Supply Corporation

Creedmoor Maha (CCN# 11029 est. 1965) produces groundwater from the Edwards (Barton Springs) Aquifer and purchases groundwater from Aqua WSC. Creedmoor Maha obtains treated and raw surface water from Austin. The service area extends into Bastrop, Caldwell, Hays, and Travis with the latter being the primary county. Creedmoor Maha services Mustang Ridge which has city limits inside Caldwell County.

The total storage capacity is 1.511 MG with an elevated storage capacity of 1.325 MG and pressure tank capacity of 0.01420 MG. The total production is 5.083 MGD with a service pump capacity of 3.154 MGD and an average daily consumption of 0.610 MGD. A total meter count was listed to be 2,244 in 2008. Customer base in Caldwell County is presently residential and commercial.

7.1.4 City of Luling

The City of Luling (CCN# 10291) is a municipality that provides surface water from run-of-river rights from GBRA. In addition, the City has one well that can, if needed, supply groundwater from the Carrizo Aquifer. Caldwell is the only county listed in the service area of the City of Luling.

The total storage capacity is 1.650 MG with an elevated storage capacity of 0.900 MG. The total production was not listed but a maximum purchase capacity was noted at 2.50 MGD and a service pump capacity at 2.304 MGD. Average daily consumption is 1.990 MGD. The meter count was 2,169 and uses were classified as residential, commercial/industrial, and other.

7.1.5 County Line Water Supply Corporation

County Line Water Supply Corporation (CCN# 10292) produces groundwater from the Edwards Aquifer and obtains surface water from GBRA and CRWA. The service area is in Hays and Caldwell County with Hays County listed as the primary county. County Line WSC services Uhland, which has city limits in northwest Caldwell County. Uhland is southwest of Neiderwald and northeast of Maxwell WSC.

The total storage capacity is 1.500 MG with an elevated storage capacity of 1.370 MG. It has a total production capacity of 0.864 MGD with a maximum purchase capacity of 2.040 MGD. The average daily consumption is 0.470 MGD with 1,977 meters in service. Residential meters are the primary use in Caldwell County.

7.1.6 Goforth Special Utility District

Goforth Special Utility District (CCN# 11356) produces groundwater from the Edwards (Barton Springs) Aquifer and purchases surface from CRWA and GBRA. Surface water, approximately 90%, is the primary source of water supply. The counties this utility serves include Caldwell, Hays, and Travis. The primary county for the utility is Hays. Goforth Special Utility District supplies water to

Neiderwald. The service area in Caldwell County is located northwest of Lockhart. The area borders Polonia WSC to the north and west.

The total storage capacity is 1.992 MG with an elevated storage capacity of 1.068 MG and pressure tank capacity of 0.01 MG. The total production is 6.192 MGD with a maximum purchase capacity noted to be 0.90 MGD and a service pump capacity of 9.446 MGD. Average daily consumption is 0.936 MGD. The meter count was 4,002 and uses in Caldwell County were classified as residential and commercial/industrial.

7.1.7 Gonzales County Water Supply Corporation

Gonzales County Water Supply Corporation (CCN# 10704) produces groundwater from the Carrizo Aquifer and surface water is supplied from the Canyon Reservoir. The service area includes the counties of Caldwell, Dewitt, Gonzales, and Guadalupe. Gonzales County is the primary county of service.

The total storage capacity is listed to be 1.440 MG with an elevated storage capacity of 0.459 MG and pressure tank capacity of 0.06580 MG. Total production is 3.370 MGD with a maximum purchased capacity of 0.666 MGD. The service pump capacity is 16.013 MGD. Average daily consumption is 1.229 MGD with 2,293 meters in service. Caldwell County meters currently obtain water for residential use.

7.1.8 TriCommunity Water Supply Corporation

Tri Community Water Supply Corporation (CCN# 10313) produces groundwater from the Carrizo Aquifer. The service area includes the counties of Caldwell and Gonzales. Caldwell County is listed as the primary county. Tri Community WSC is located to the southwest of Lockhart and services the unincorporated areas of Fentress and Prairie Lea in Caldwell County.

The total storage capacity is listed to be 0.338 MG with an elevated storage capacity of 0.120 MG. Total production is 0.713 MGD with a service pump capacity of 1.872 MGD. Average daily consumption of 0.125 MGD is provided to 536 meters in service. Caldwell County meters primarily obtain water for residential use.

7.1.9 Martindale Water Supply Corporation

Martindale Water Supply Corporation (CCN#10312 est. 1965) produces groundwater from alluvial wells and obtains surface water from CRWA and GBRA. The Martindale WSC service area extends into Hays, and Guadalupe County. Caldwell County is listed as the primary service area. Martindale WSC provides water for all types of uses to the city of Martindale.

The total storage capacity is listed to be 0.344 MG with an elevated storage capacity of 0.280 MG and pressure tank capacity of 0.00200 MG. Total production is 0.648 MGD with a maximum purchased capacity of 0.378 MGD. The service pump has a capacity of 0.864 MGD. Average daily consumption is 0.205 MGD. Total service meter count is 838. Caldwell County meters currently obtain water for residential and commercial/industrial use.

7.1.10 Maxwell Water Supply Corporation

Maxwell Water Supply Corporation (CCN#10293 est. 1979) produces groundwater from the Edwards Aquifer and obtains surface water from GBRA and CRWA. The service area for Maxwell WSC lies in Hays and Caldwell counties. Caldwell County is listed as the primary service area. Maxwell WSC services the unincorporated area of Maxwell and Reedville. The service area lies in between the Martindale WSC area and the Lockhart Municipality territory.

The total storage capacity is 1.238 MG with an elevated storage capacity of 1.238 MGD. It has a total production capacity of 2.670 MGD with a maximum purchase capacity of 6.0 MGD. The average daily consumption is 0.431 MGD with 1,437 meters in service. The majority of use is for residential use and some in commercial/industrial.

7.1.11 Polonia Water Supply Corporation

Polonia Water Supply Corporation (CCN#10420) produces groundwater from the Carrizo Aquifer and can purchase water from the City of Lockhart when needed. The Polonia WSC service area is primarily in Caldwell County with a portion extending into Bastrop County.

The total storage capacity is listed to be 0.961 MG with an elevated storage capacity of 0.475 MG and pressure tank capacity of 0.00400 MG. Total production is 1.845 MGD with a service pump capacity of 3.686 MGD. Average daily consumption is 0.367 MGD with a total of 1,884 meters in service for residential use.

7.1.12 City of San Marcos

The City of San Marcos Municipality (CCN # 10298) has the smallest service area extending into Caldwell County. Out of the 9,500 plus meters, only about 24 are located in Caldwell County for commercial use at the airport.

7.2 Regional Water Wholesalers

Regional water wholesalers for the county include Canyon Regional Water Authority (CRWA) and the Guadalupe-Blanco River Authority (GBRA).

7.2.1 Canyon Regional Water Authority

Canyon Regional Water Authority was created by the Texas Legislature in 1989 to supply cities and districts with potable water. The water they distribute is treated before being routed to water supply corporations. CRWA currently serves Bexar, Wilson, Guadalupe, Comal, Hays and Caldwell Counties.

CRWA has operational responsibilities for two water treatment plants, Lake Dunlap Water Treatment Plant (WTP) and the Hays Caldwell WTP. The Lake Dunlap Water Treatment Plant is rated at 16.4 MGD and receives water from Canyon Lake. The Hays Caldwell WTP receives water from the San Marcos River and Guadalupe River (Lake Dunlap) and is rated at 6 MGD.

The water supply corporations that currently receive water from CRWA are Martindale WSC, Maxwell WSC, and County Line WSC.

7.2.2 Guadalupe Blanco River Authority

The GBRA (CCN# 20892, 12977) was established by the Texas Legislature in 1933 and reauthorized in 1935 as the Guadalupe-Blanco River Authority. GBRA serves the counties of Kendall, Comal, Hays, Caldwell, Guadalupe, Gonzales, DeWitt, Victoria, Calhoun and Refugio. The mandate of the GBRA is to conserve and protect the resources of the Guadalupe River Basin.

The services provided by GBRA include hydroelectric generation, water and wastewater treatment and raw water supply for municipal, industrial, and agricultural use.

In 2001 GBRA assumed operations as the contract operator for the Lockhart Water Treatment Plant. The well systems and water treatment plant are managed by the GBRA.

In 1978, GBRA constructed a water treatment plant in Luling with a capacity of 2.5 MG. Surface water from the San Marcos River is treated at the GBRA Luling Water Treatment Plant and delivered to the City of Luling and the City of

Lockhart. The plant is capable of diverting up to 4,422 acre-feet annually from the San Marcos River under a water rights permit issued by the State of Texas. Peak rated capacity is 2.779 MGD. Performance of the plant has earned state recognition through of the EPA with "The Environmental Excellence Award for Public Water Supply".

7.3 Wastewater Facilities Inventory

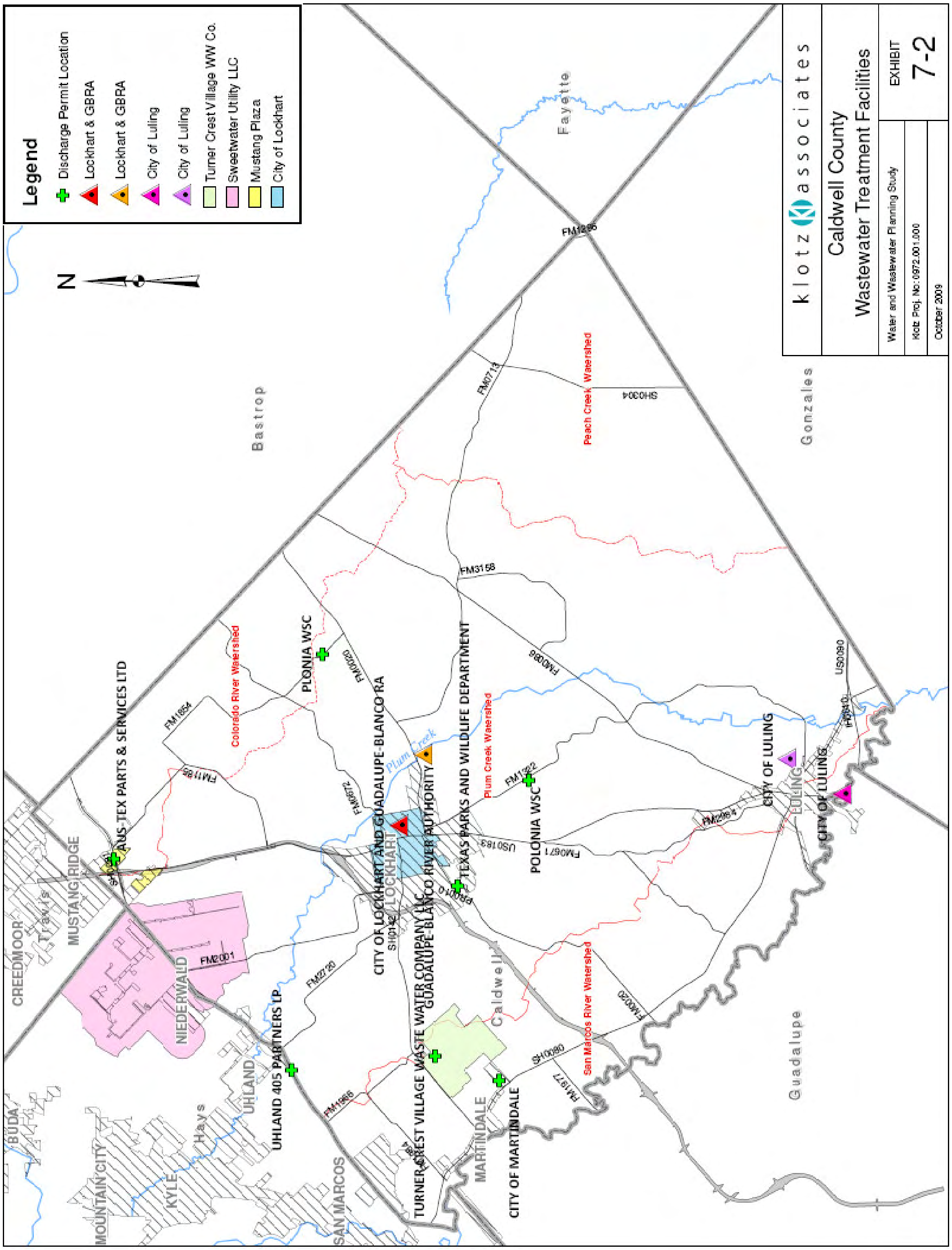
There are currently five wastewater facilities that are listed in the TCEQ database. Information regarding the facilities has been summarized in the following sections and an inventory of the data listed in ***Table 7-3***. The location of these facilities can bee seen in ***Exhibit 7-2***.

TABLE 7-3
Wastewater CCN

Utility Name	Ownership Type	Primary County	Total Permitted Discharge (gpd)
City of Lockhart	Municipality	Caldwell	2,600,000
City of Luling (North/South)	Municipality	Caldwell	1,400,000
Mustang Plaza	Private	Caldwell	99,000
Sweetwater Utility LLC	Private	Hays	N/A
Turner Crest	Private	Caldwell	300,000

7.3.1 The City of Lockhart/ GBRA

The City of Lockhart (CCN# 20114) has two operational wastewater plants. The plants have a total combined discharge amount of 2.6 MGD. GBRA operates the Lockhart plants under state permit numbers WQ0010210-001 and WQ0010210-002.


Legend
Discharge Permit Location
Lockhart & GBRA
Lockhart & GBRA
City of Luling
City of Luling
Turner Crest Village WW Co.
Sweetwater Utility LLC
Mustang Plaza
City of Lockhart
klotz associates
Caldwell County
Wastewater Treatment Facilities
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
October 2009
EXHIBIT
7-2
AUS-TEX PARTS & SERVICES LTD
PLONIA WSC
CITY OF LOCKHART AND GUADALUPE-BLANCO RA
GUADALUPE-BLANCO RIVER AUTHORITY
TEXAS PARKS AND WILDLIFE DEPARTMENT
POLONIA WSC
CITY OF LULING
CITY OF LULING
UHLAND 405 PARTNERS LP
TURNER CREST VILLAGE WASTE WATER COMPANY LLC
CITY OF MARTINDALE
Colorado River Watershed
Plum Creek Watershed
San Marcos River Watershed
Peach Creek Watershed
Plum Creek
Bastrop
Fayette
Gonzales
Guadalupe
Caldwell
Travis
Hays
CREEDMOOR
MUSTANG RIDGE
NIEDERWALD
UHLAND
BUDA
MOUNTAIN CITY
KYLE
SAN MARCOS
MARTINDALE
LOCKHART
LULING
FM2001
FM2720
FM1966
FM1854
FM1185
FM0672
FM0020
FM3158
FM0086
FM1322
FM0671
FM2984
FM0713
FM1295
FM1977
SH0304
SH0080
US0183
US0090
SH0142

In 1994 GBRA began operating the City of Lockhart's 1.1 MGD wastewater treatment plant on Larremore Street. The treated effluent is discharged through a pipeline to Town Branch and then into Plum Creek, Segment No. 1810 of the Guadalupe River Basin.

In 1999 an additional 1.5 MGD plant on F.M. 20 became operational in Lockhart. Septic tank waste is accepted and treated at the F.M. 20 Plant. A carousel activated sludge process is implemented at the plant along with ultraviolet (UV) light disinfection instead of chlorine. To ensure the effluent will not impair aquatic and other environments, daily sample tests are conducted to confirm the effluent meets all state and federal standards. The effluent is discharged into Plum Creek Segment No. 1810 of the Guadalupe River Basin.

7.3.2 The City of Luling

The City of Luling (CCN# 20113) has a North and South plant in operation. The plants have a combined discharge permit of 1.4 MGD. The wastewater treatment plants and collection systems are owned and operated by the City. The facilities are permitted under state permit numbers WQ0010582-001 and WQ0010582-002.

The North Plant has an operational permit that authorizes the discharge of treated wastewater at a volume not to exceed a daily average flow of 900,000 gallons per day. The discharge route is from the plant to Salt Branch then to Plum Creek.

The South Plant has an operational permit that authorizes the discharge of treated wastewater at a volume not to exceed a daily average flow of 500,000 gallons per day. The discharge from the site is routed to the Lower San Marcos River.

Wastewater is treated through the contact stabilization method and then discharged. The "sequence of operations in this process is aeration of raw wastewater with return activated sludge, sedimentation to yield a clarified effluent, and re-aeration of the clarifier underflow with a portion wasted to an aerobic digester. Supernatant drawn from the digester is returned to the process influent. The raw wastewater aeration chamber, also referred to as the contact zone, is approximately one third of the total aeration volume." (Hammer, 1986)

Because system inefficiencies may develop with increases in population to process larger flows, the systems may not be as economical as conventional methods with larger demands.

7.3.3 Turner Crest Village Wastewater Company, LLC

Turner Crest Village WW CO (CCN# 21004) submitted an application for a facility that would be authorized to discharge treated wastewater at a volume no greater than 300,000 gallons per day. Under state permit no. WQ0014831-001 the discharge would be routed to an unnamed tributary of Morrison Creek, then to the Lower San Marcos River.

Turner Crest Village WW has not yet constructed the facility due to the conditions of the economy. The development of the subdivision has been postponed, perhaps indefinitely. No other information is available at this time.

7.3.4 Mustang Plaza

Mustang Plaza (CCN# 20953) affiliated with Aus-Tex Parts & Services, Ltd, is authorized to discharge treated wastewater at a volume not to exceed a daily average flow of 99,000 gallons per day. The discharge route is to an unnamed tributary of Cedar Creek and then to the Colorado River above La Grange. Limited information was available and obtained. Although the discharge point is located within Caldwell County the facility services Mustang Ridge.

7.3.5 Sweetwater Utility, LLC

Sweetwater Utility LLC (CCN# 20887) was listed to have a service area in Caldwell County for Neiderwald. The CCN boundaries extend into Caldwell County but the service area is primarily in Hays. Limited information was available and obtained. Unsuccessful attempts were made to contact and locate the CCN owners for more information on the utility.

7.3.6 Additional State Wastewater Permits

In addition to performing a CCN query on the TCEQ Database for Caldwell County, permitted wastewater facilities were also investigated. A list of the results has been presented in ***Table 7-4***.

Additional active wastewater treatment facilities not located within a CCN include City of Martindale. The City of Martindale has been approved to treat domestic wastewater at a volume not to exceed a daily average flow of 57,000 gallons per day via surface irrigation of 32 acres of non-public access agricultural land. The permit submitted September 9, 2004 does not authorize discharge of pollutants into State waters. A few of the facilities are listed as inactive due to inactivity on the permit.

TABLE 7-4
TCEQ Permitted Wastewater Treatment Facilities

State Permit No.	Applicant	Stream Segment	Status	Treatment
WQ0010273-003	City of San Marcos and GBRA	1808	Inactive	Inactive
WQ0011233-001	Texas Parks and Wildlife Department	1810	Inactive	Inactive
WQ0013450-001	City of Martindale	1808	Active	Ground Application
WQ0014033-001	Polonia WSC	1810	Active	Filter Backwash Effluent
WQ0014033-002	Polonia WSC	1810	Active	Filter Backwash Effluent
WQ0014104-001	AUS-TEX Parts & Services LLC	1434	Inactive	Inactive
WQ0014439-001	Caldwell/Uhland 405 L P	1810	Inactive	Inactive

SECTION 8

WATER DEMANDS

8.1 Historical Water Use

Caldwell County currently has 14 water user groups (WUG) that supply water for various types of uses. There are twelve (12) entities that hold CCN and are listed as Municipal, Specialty Utility Districts, and Water Supply Corporations. The two (2) remaining user groups are state agencies. Several of the WUG supply water to other counties in addition to Caldwell.

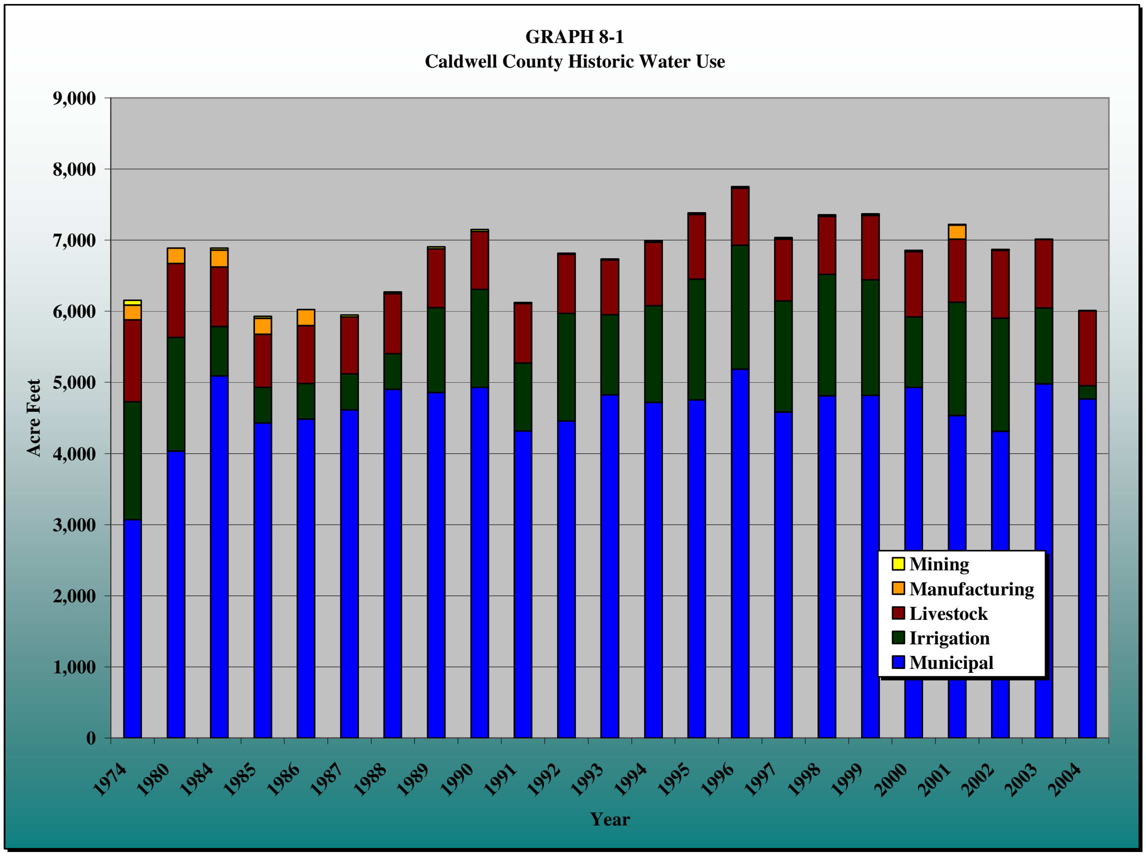
Caldwell County water use has been primarily for municipal purposes. It appeared that prior to 1980 municipal water use accounted for about half of the water consumed, with livestock and irrigation representing the remainder. Historical water use data made available through the TWDB website is shown in ***Table 8-1*** and illustrated in ***Graph 8-1.*** The water consumption for the county, at an average of 4,800 ac-ft, has historically been used to meet municipal demands, and the remainder to meet demands for mining, manufacturing, livestock, and irrigation.

Water utilization for livestock has remained, for the most part, within the range of 800-950 ac-ft annually with an average of 850 ac-ft. Water consumption averaged about 220 ac-ft per year for manufacturing before 1986, after which there is none recorded for a few years. In 1993, manufacturing water use started up again with fluctuation of use typically less than 20 ac-ft. Irrigation use varies and ranges with minimum use of 182 ac-ft to a maximum of 1742 ac-ft annually. Mining water use has historically been limited to less than 70 ac-ft with a gradual decline in use. There is no record of water consumption for steam electric.

TABLE 8-1
Caldwell County - TWDB Historical Water Use Summary
Unit: Acre Feet (ac-ft)

Year	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
1974	3,069	206	0	1,660	70	1,149	6,154
1980	4,033	219	0	1,600	0	1,036	6,888
1984	5,092	240	0	694	27	834	6,887
1985	4,430	224	0	499	27	747	5,927
1986	4,483	223	0	500	0	817	6,023
1987	4,617	0	0	500	28	803	5,948
1988	4,904	0	0	500	25	841	6,270
1989	4,855	0	0	1,198	27	827	6,907
1990	4,931	0	0	1,375	27	816	7,149
1991	4,320	0	0	954	13	836	6,123
1992	4,456	0	0	1,513	13	835	6,817
1993	4,825	2	0	1,127	12	769	6,735
1994	4,718	11	0	1,361	12	890	6,992
1995	4,755	10	0	1,696	12	907	7,380
1996	5,186	12	0	1,742	12	801	7,753
1997	4,584	10	0	1,560	12	869	7,035
1998	4,813	8	0	1,705	12	816	7,354
1999	4,818	8	0	1,621	12	910	7,369
2000	4,929	11	0	989	12	917	6,858
2001	4,534	200	0	1,590	6	888	7,218
2002	4,311	6	0	1,590	6	958	6,871
2003	4,978	0	0	1,065	6	965	7,014
2004	4,770	1	0	183	6	1,051	6,011

Data Source: Texas Water Development Board



8.2 TWDB Water Use Projections

The future water demands in ***Table 8-2*** and ***Graph 8-2*** were developed by the TWDB for Caldwell County. The demands have been estimated up to 2060. The years beyond 2040 have been shaded in the table since this study is not considering the same planning horizon.

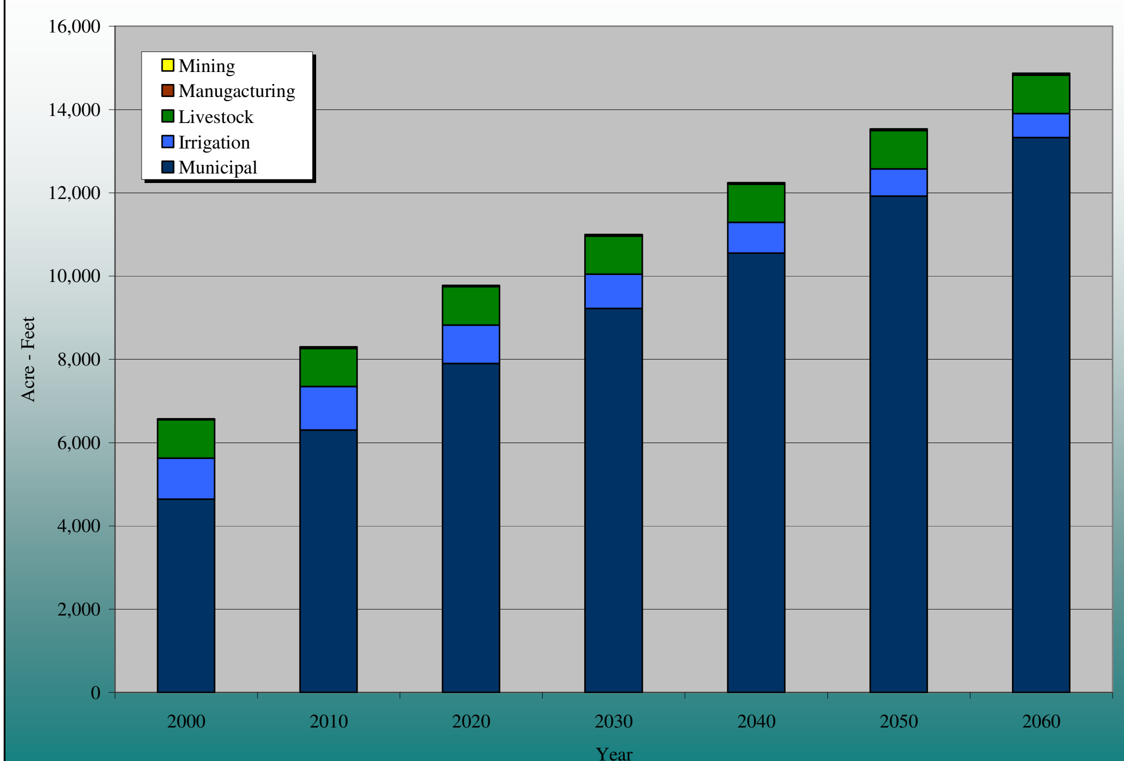
The municipal water demand projections show a consistent linear increase from 6,306 ac-ft in 2010 to 10,555 ac-ft in 2040. According to the TWDB, the municipal water demand is based on population and expected water consumption for each person with a reduction to account for conservation. The GPCD varied in the county for each water user group.

Municipal water demand projections in the 2006 Region L Plan for Caldwell County were based on 122.5 gallons per capita per day (gpcpd) for year 2010 and 113.2 gpcpd for the year 2040. These demands are lower than the demands estimated for the whole of the South Central Region in the 2006 Region L Plan of 143 gpcpd in the year 2010 and 135 gpcpd in the year 2040.

The Caldwell County Study reported on herein used 150 gpcpd for the planning horizon of 2010 to 2040. These values were adopted based on surveys completed for water supply entities in Caldwell County. Water conservation practices could reduce the per capita demand by 10 to 20 percent. The larger per capita use rates in the Caldwell County study increase the volume of future water that must be developed to meet future needs when compared to the 2006 Region L Plan.

Water demands for mining are also expected to gradually increase about 1 ac-ft a decade from 14 ac-ft in 2010 to 17 ac-ft in 2040. Manufacturing increases about 3

GRAPH 8-2
Caldwell County Water Demands by Use Category



ac-ft a decade from 15 ac-ft in 2010 to 24 ac-ft in 2040. The livestock water demands are projected to remain constant at 918 ac-ft. The constant demand implies no increase to the number or type of livestock in Caldwell County. A steady decrease is projected in irrigation from 1044 ac-ft in 2010 to 733 ac-ft in 2040. The decrease could signify a decrease in the acreage of crop land or crop type that requires less water application. The steam electric consumption is expected to remain zero as historical use has indicated.

TABLE 8-2
2006 Regional L - Caldwell County Water Demand Projections

County Name	Category	2000	2010	2020	2030	2040	2050	2060
CALDWELL	Irrigation	989	1,044	928	824	733	651	578
CALDWELL	Livestock	918	918	918	918	918	918	918
CALDWELL	Manufacturing	11	15	18	21	24	27	29
CALDWELL	Mining	12	14	15	16	17	18	18
CALDWELL	**Municipal**	**4,643**	**6,306**	**7,898**	**9,222**	**10,555**	**11,926**	**13,328**
CALDWELL	Steam Electric	0	0	0	0	0	0	0
	Total	**6,573**	**8,297**	**9,777**	**11,001**	**12,247**	**13,540**	**14,871**

Source: Texas Water Development Board 2006 Regional Water Plan
1) Projections for years 2000 - 2060 in ac-ft[1]. An ac-ft is an amount of water to cover one acre with one foot of water and equals 325,851 gallons.

In addition to projecting water demands by use, the TWDB also determined county municipal water demands for each WUG in Caldwell County. The demands are shown in ***Table 8-3***. According to the TWDB, the municipal water demands increase steadily with an amount no greater than 1,500 ac-ft for every decade after 2020. The demands are based on projections of their population estimates that were discussed in Section 6 of this report.

The water user groups presented by the TWDB were developed using the population projections for the WUG in Caldwell County. The population projection estimates up to the year 2060 have been included in ***Table 8-4***. The water demand and population projections according to the TWDB were last updated September 17, 2004. The tables indicate a split in region or county when applicable. A "P" in the Region Split indicates that the WUG is located in more than one region. The values determined represent only the WUG population's projections within that particular region. A "P" in the County Split column indicates the WUG is located in more than one county. The projections listed will be representative of the WUG's population projections within Caldwell County only.

TABLE 8-3
2006 Region L – Caldwell County Municipal Water Demand Projections in Acre-Feet

Water User Group	2010	2020	2030	2040	Region Split[1)]	County Split[2)]
Aqua WSC	267	339	396	458	P	P
County Line WSC	204	308	405	501		P
County-Other	237	223	199	176		
Creedmoor Maha WSC	234	304	367	431	P	P
Goforth WSC	184	269	342	417	P	P
Gonzales County WSC	63	79	94	108		P
Lockhart	2,451	3,094	3,629	4,180		
Luling	1,067	1,210	1,299	1,384		
Martindale	125	134	139	143		
Martindale WSC	142	153	158	162		P
Maxwell WSC	503	678	844	996		P
Mustang Ridge	135	178	215	253	P	P
Niederwald	26	43	61	78		P
Polonia WSC	668	886	1,074	1,268	P	P
Caldwell Total	**6,306**	**7,898**	**9,222**	**10,555**		

Source: Texas Water Development Board 2006 Regional Water Plan
1) If "P" is present in this column, the Water User Group (WUG) is located in more than one Region and the projections listed in the row represent only the WUG's population projections within that particular Region, not the WUG's total population projections. If the "P" is present for a county total entry, then the county has been split by Regional boundaries and the projections listed in the row represent only the county's populations within the particular Region, not the county's total population projections.
2) If "P" is present in this column, the Water User Group (WUG) is located in more than one county and the projections listed in the row represent only the WUG's population projections within that particular county, not the WUG's total population projections.

TABLE 8-4
2006 Region L – Caldwell County Water User Group Population Projections

Water User Group	2010	2020	2030	2040	Region Split[1)]	County Split[2)]
Aqua WSC	1,782	2,313	2,764	3,217	P	P
County Line WSC	1,262	1,939	2,565	3,193		P
County-Other	1,229	1,172	1,066	968		
Creedmoor Maha WSC	2,217	3,015	3,717	4,423	P	P
Goforth WSC	1,770	2,636	3,429	4,226	P	P
Gonzales County WSC	215	277	329	381		P
Lockhart	16,328	21,083	25,111	29,154		
Luling	6,309	7,301	7,998	8,700		
Martindale	1,150	1,291	1,378	1,465		
Martindale WSC	1,307	1,468	1,566	1,666		P
Maxwell WSC	4,356	6,113	7,685	9,260		P
Mustang Ridge	555	746	911	1,077	P	P
Niederwald	203	349	489	629		P
Polonia WSC	7,275	10,019	12,451	14,891	P	P
Caldwell Total	**45,958**	**59,722**	**71,459**	**83,250**		

Source: Texas Water Development Board 2006 Regional Water Plan
1) If "P" is present in this column, the Water User Group (WUG) is located in more than one Region and the projections listed in the row represent only the WUG's population projections within that particular Region, not the WUG's total population projections. If the "P" is present for a county total entry, then the county has been split by Regional boundaries and the projections listed in the row represent only the county's populations within the particular Region, not the county's total population projections
2) If "P" is present in this column, the Water User Group (WUG) is located in more than one county and the projections listed in the row represent only the WUG's population projections within that particular county, not the WUG's total population projections.

8.3 Development of Water Demands

Municipal water demands for this study were based on information obtained from the TWDB, input from the Study Advisory Group and the State Demographer.

The TWDB population projections for each WUG in ***Table 8-4*** were further analyzed to determine percentages of the total population. The percentages calculated for each WUG, as shown in ***Table 8-5***, indicated that Luling, Lockhart, and Polonia were the greatest water users in the county and accounted for over 50% of the population. The TWDB percentages of the WUG were multiplied by the modified TSDC Scenario 1.0, shown in ***Table 8-6***, to compare the growth estimates. The modification, as mentioned in Section 6, was to adjust the population projection in 2040 to 100,000. The product of ***Table 8-5*** and ***Table 8-6*** is given in ***Table 8-7***.

TABLE 8-5
TWDB - Water User Groups Population Percentages

Water User Group	2010	2020	2030	2040
Aqua WSC	0.039	0.039	0.039	0.039
County Line WSC	0.027	0.032	0.036	0.038
County - Other	0.027	0.020	0.015	0.012
Creedmoor Maha WSC	0.048	0.050	0.052	0.053
Goforth WSC	0.039	0.044	0.048	0.051
Gonzales County WSC	0.005	0.005	0.005	0.005
Lockhart	0.355	0.353	0.351	0.350
Luling	0.137	0.122	0.112	0.105
Martindale	0.025	0.022	0.019	0.018
Martindale WSC	0.028	0.025	0.022	0.020
Maxwell WSC	0.095	0.102	0.108	0.111
Mustang Ridge	0.012	0.012	0.013	0.013
Niederwald	0.004	0.006	0.007	0.008
Polonia WSC	0.158	0.168	0.174	0.179
Total	**1.000**	**1.000**	**1.000**	**1.000**

TABLE 8-6
TSDC Population Scenario 1.0 – Modified

TSDC Scenario 1.0 Population	2010	2020	2030	*2040
Projected Population	*46,308*	*65,057*	*86,902*	*100,000*

Table 8-7 presents the water user group population projections used in this study based on the modified TSDC Population Scenario 1.0.

In addition to calculating population projections for each WUG based on the TSDC Scenario 1.0, a per capita value was also determined to develop the water demands for this study. The per capita value has units of gallons per capita per day (gpcd). The value represents the average rate of water demand used per person per day for a given population within a distribution system.

TABLE 8-7 Developed Water User Group Populations for Caldwell County				
Water User Group	**2010**	**2020**	**2030**	**2040**
Aqua WSC	1,796	2,520	3,361	3,864
County Line WSC	1,272	2,112	3,119	3,835
County - Other	1,238	1,277	1,296	1,163
Creedmoor Maha WSC	2,234	3,284	4,520	5,313
Goforth WSC	1,783	2,871	4,170	5,076
Gonzales County WSC	217	302	400	458
Lockhart	16,452	22,966	30,538	35,020
Luling	6,357	7,953	9,726	10,450
Martindale	1,159	1,406	1,676	1,760
Martindale WSC	1,317	1,599	1,904	2,001
Maxwell WSC	4,389	6,659	9,346	11,123
Mustang Ridge	559	813	1,108	1,294
Niederwald	205	380	595	756
Polonia WSC	7,330	10,914	15,142	17,887
Total	**46,308**	**65,057**	**86,902**	**100,000**

The water use and population data obtained from the surveys were factors in determining the per capita values for each utility. The per capita values determined from the surveys varied from about 84 gpcd in any one year to 160 gpcd. As shown in ***Graph 8-3*** the average water consumption per person has gradually increased since 2005. In 2005, the average for the utilities surveyed was 113 gpcd and increased in 2006 to 116 gpcd. There was a slight decrease in 2007 with an increase again 2008 to an average of 135 gpcd.

The compiled data was presented to the Technical Advisory Committee for a consensus on the daily per capita value to be used for the study. The Technical Advisory Committee, after discussion, agreed to proceed with a value of 150 gpcd to determine water demand projections for the county. The 150 gpcd rate was applied to the projected population figures to estimate average daily water demands. The estimated demands are shown in MGD and ac-ft respectively in ***Table 8-8*** and ***Table 8-9.***

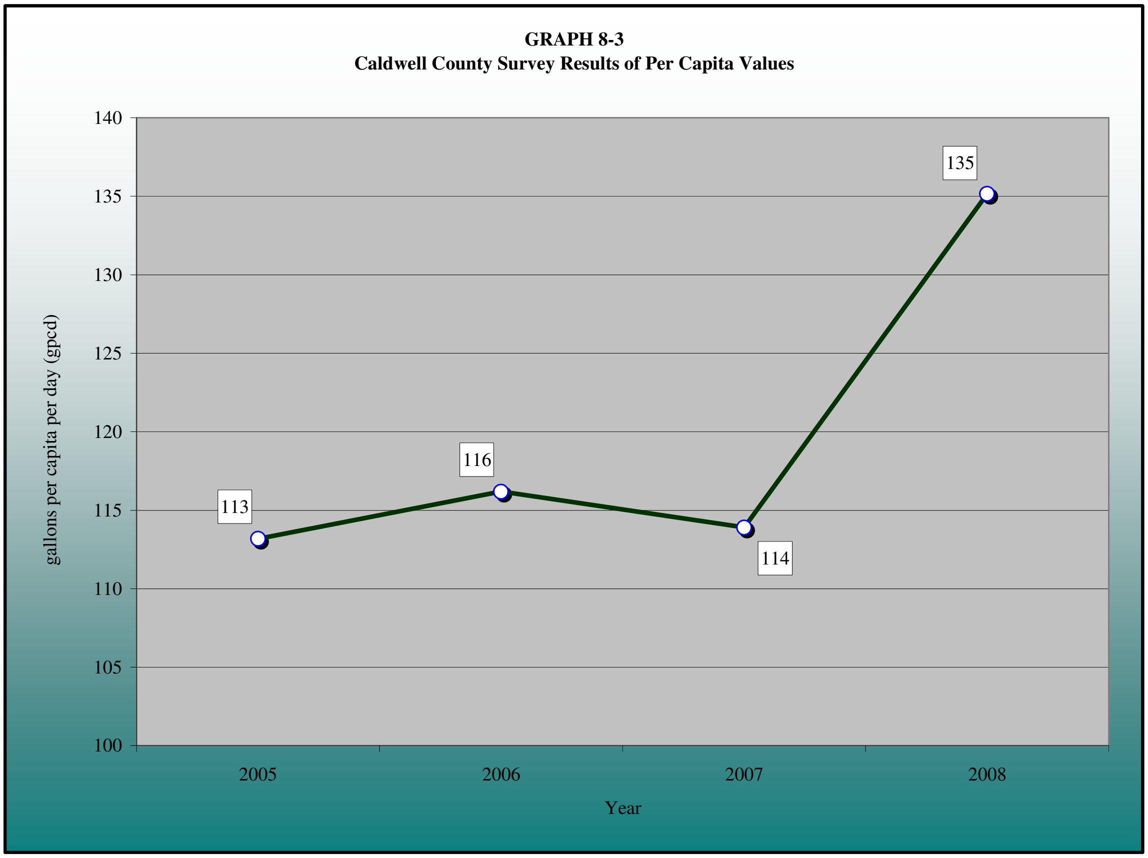


TABLE 8-8
Municipal Average - Yearly Water Demands
Million Gallons Per Day

Water User Group	2010	2020	2030	2040
Aqua WSC	0.269	0.378	0.504	0.580
County Line WSC	0.191	0.317	0.468	0.575
County - Other	0.186	0.192	0.194	0.174
Creedmoor Maha WSC	0.335	0.493	0.678	0.797
Goforth WSC	0.268	0.431	0.626	0.761
Gonzales County WSC	0.032	0.045	0.060	0.069
Lockhart	2.468	3.445	4.581	5.253
Luling	0.954	1.193	1.459	1.568
Martindale	0.174	0.211	0.251	0.264
Martindale WSC	0.198	0.240	0.286	0.300
Maxwell WSC	0.658	0.999	1.402	1.668
Mustang Ridge	0.084	0.122	0.166	0.194
Niederwald	0.031	0.057	0.089	0.113
Polonia WSC	1.100	1.637	2.271	2.683
Total	**6.946**	**9.759**	**13.035**	**15.000**

TABLE 8-9
Municipal Average - Yearly Water Demands
Acre-Feet Per Year

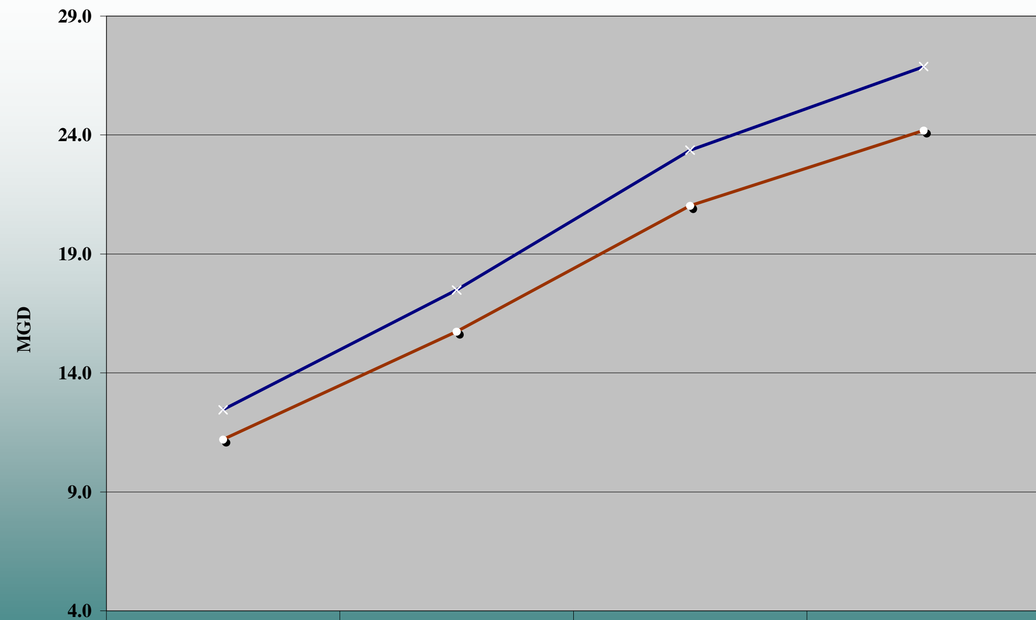
Water User Group	2010	2020	2030	2040
Aqua WSC	302	423	565	649
County Line WSC	214	355	524	644
County – Other	208	215	218	195
Creedmoor Maha WSC	375	552	760	893
Goforth WSC	300	483	701	853
Gonzales County WSC	36	51	67	77
Lockhart	2,765	3,859	5,131	5,884
Luling	1,068	1,336	1,634	1,756
Martindale	195	236	282	296
Martindale WSC	221	269	320	336
Maxwell WSC	738	1,119	1,570	1,869
Mustang Ridge	94	137	186	217
Niederwald	34	64	100	127
Polonia WSC	1,232	1,834	2,544	3,006
Total	**7,781**	**10,932**	**14,602**	**16,803**

The municipal water demands based on population in Caldwell County are expected to increase from 7,781 ac-ft in 2010 to 16,803 ac-ft in 2040. These municipal water demands will need to be met through surface and groundwater resources. The demands can also be reduced through various conservation measures.

8.4 Conservation Measures

Conservation measures will be required from all WUG to reduce the expected water demands. A conservation measure of 10%, illustrated in ***Graph 8-4***, will decrease expected water demands and is a recommended goal for all WUGs. Many water saving strategies to achieve this goal have been added in **Appendix H.** Several of the WUG have indicated that they are already implementing some conservation measures to reduce demands and will continue to develop new strategies. The strategies developed by the WUG are also discussed in the appendix.

GRAPH 8-4
Caldwell County Yearly Water Demand with 10% Water Conservation



	2010	2020	2030	2040
Average	12.445	17.484	23.355	26.875
Conservation	11.201	15.736	21.019	24.188

Year

SECTION 9

WASTEWATER FLOWS

9.1 General

Wastewater flows are generated from domestic, industrial, and commercial uses. Inflow and infiltration are terms used to describe the groundwater and stormwater seepage. Inflow enters the system at direct connection points while infiltration is the groundwater that seeps in through cracks and leaks in the system.

The domestic water that is returned to the treatment facility comes from sinks, showers, tubs, lavatories and toilets. In an average system, 60% - 90% of the potable water is directed to a wastewater treatment facility or an on-site septic system. Water not returned to the wastewater treatment plant is typically used for irrigation and industrial applications.

The rate of return flow determined for the study was developed by comparing the average daily water use and average daily wastewater flow. Lockhart and Luling were the only systems that had data available to evaluate.

9.2 Wastewater Flows

Limited wastewater flow data exists for Caldwell County. Large portions of the county are served by OSSF systems that are regulated by the County or city.

Lockhart and Luling provided the only data in the survey to determine average daily wastewater flows and peak flow factors. The average daily wastewater flow ranged from 0.4 MGD to 1.2 MGD with an average of 0.8 MGD. The average flow was considered to be the base flow and the peak flows considered as infiltration and inflow.

Given the sewer base flow and population, a per capita value was determined. The sewer populations for Lockhart and Luling were estimated to be 13,464 and 4,978 respectively from the information provided in the survey. ***Table 9-1*** provides the survey data used to determine wastewater flows. The average daily wastewater flow for the county was 85 gpcd. The peak day wastewater flow factors for Luling and Lockhart, as shown in ***Table 9-2***, were 3.75 and 1.25 respectively.

TABLE 9-1
Wastewater Connections

System	Total Water Connections	Total Sewer Connections	Percent of Sewer Connections	Population	Sewer Population	Average Daily Wastewater Flow (MGD)	Average Daily Wastewater Flow Per Capita (gpd)
Lockhart	4,095	4,085	0.998	13,600	13,464	1.2	89
Luling	2,152	2,122	0.986	5,080	4,978	0.4	80
					Average	0.8	85

TABLE 9-2
Wastewater Peak Day Flow Factors

System	Peak Day Flow Factor
Lockhart	1.25
Luling	3.75

As seen from ***Table 9-2***, the water to wastewater return rates varied from 56% to 79%. The lower return rate can indicate greater outdoor water use or loss and the higher return rates can imply water inflow and infiltration. Normally, average return rates vary from about 60% - 80%. The return rate determined from the survey information provided was an average of 68%. The return rate was used to estimate return flows from the projected water demands.

TABLE 9-3
Wastewater Return Rate

System	Wastewater per capita	Water per capita	Return Rate
Lockhart	89	113	79%
Luling	80	143	56%
	Average		68%

The projected wastewater flows for Caldwell County are presented in ***Table 9-3***. The wastewater flows are based on 150 gpcd at a 68% return rate. The projected wastewater flows will increase along with population as shown in the table below. The wastewater flow is expected to increase approximately 5.5 MGD from 2010 to 2040.

TABLE 9-4
Caldwell County Projected Wastewater Flows

Projected Population	2010	2020	2030	2040
	46,308	65,057	86,902	100,000
Total Projected Wastewater Flows (MGD)	4.723	6.636	8.864	10.200

Caldwell County will be required to increase or develop new treatment facilities as limits are reached on facilities that treat 4.9 MGD.

9.3 Wastewater Loads

Loads produced from the expected wastewater flows are shown in ***Table 9-5*** and ***Table 9-6*** assumes the adoption of stringent discharge parameters**.** The BOD, TSS, Ammonia, and Phosphorus loading values are based on existing water quality conditions and the need for remediation in Plum Creek, where wastewater is discharged.

TABLE 9-5
Caldwell County Projected Wastewater Loads, (lbs/day)

BOD	5	mg/ L	Ammonia	2	mg/L
TSS	5	mg/ L	Phosphorous	1	mg/L

Year of Projected Wastewater Flows (MGD)	2010	2020	2030	2040
	4.723	6.636	8.864	10.200
BOD	197	277	370	425
TSS	197	277	370	425
Ammonia	79	111	148	170
Phosphorous	39	55	74	85

TABLE 9-6

Caldwell County Projected Wastewater Loads, (lbs/year)

Year	2010	2020	2030	2040
BOD	71,893	101,000	134,915	155,249
TSS	71,893	101,000	134,915	155,249
Ammonia	28,757	40,400	53,966	62,100
Phosphorous	14,379	20,200	26,983	31,050

SECTION 10

WATER QUALITY

10.1 General

Local ordinances in the Caldwell County political subdivisions regarding water quality and quantity issues are minimal. The county does not have authority to create, implement and enforce regulations related to water quality and quantity. Incorporated cities do have that authority and can exercise that right under local charter rules to adopt new ordinances. The US Environmental Protection Agency (USEPA) and the Texas Commission on Environmental Quality (TCEQ) are the national and state agencies that provide standards and regulate water quality.

10.2 City Ordinances

A search conducted on www.municode.com provided some detail of existing regulations for the cities of Lockhart and Luling. These two cities were the only local governments listed for Caldwell County. The city of Martindale's website provided minimal city code information and a phone number to call for inquires. Searches for Mustang Ridge, Uhland, and Neiderwald were unsuccessful.

In reviewing the local code for Lockhart and Luling, only ordinances regulating water quantity and not water quality are discussed briefly. Water quantity is controlled by limiting or preventing an increase in run-off from a site. The quality of the run-off from a site however is not discussed.

Water quality issues arise from uncontrolled and unregulated point source and non-point source pollution. The uncontrolled quality of discharges into streams and rivers has resulted in substandard water quality in rivers and streams that is not acceptable at the State and National level.

10.3 United States Environmental Protection Agency (USEPA)

The USEPA is a federal agency that was established in 1970 to regulate and monitor various aspects of the environment. The USEPA creates and enforces regulations such as the Clean Water Act (CWA). The CWA was passed in 1972 and intended to restore and maintain the chemical, physical, and biological integrity of the nation's waters. This task was to be accomplished by preventing point and nonpoint pollution sources, providing assistance to publicly-owned facilities for the improvement of wastewater treatment, and maintaining the integrity of wetlands. The USEPA provides partnerships, educational programs, and grants to protect the environment.

10.3.1 The National Pollutant Discharge Elimination System (NPDES)

Section 402 of the CWA controls direct discharges or "point source" discharges into navigable waters. These are from sources such as pipes and sewers. NPDES permits are issued by either the EPA or an authorized state/tribe. Water quality criteria and standards vary from state to state and site to site, depending on the use classification of the receiving body of water. Most states follow USEPA guidelines that define aquatic life and human health criteria for many of the 126 priority pollutants.

10.4 Texas Commission on Environmental Quality (TCEQ)

The TCEQ is the environmental regulating agency for the state. The TCEQ was commissioned to "protect our state's human and natural resources consistent with sustainable economic development." The "goal is clean air, clean water, and the safe management of waste." All activities relating to water quality require permits, registrations, and conformance to standards. The regulated water quality activities include but are not limited to:

- Stormwater
- Wastewater

- General activities
- Agricultural operations
- City MS4s
- Industrial facilities

10.4.1 The Texas 303(d) List

As mandated by the CWA, *the Texas 303(d) List* is a management tool to identify streams that fail to have water quality that supports aquatic life and recreational use. In order to fulfill the requirements of the Section 303(d) of the federal CWA the state requires Total Maximum Daily Loads be established for the impaired watershed. The Plum Creek Watershed Partnership was developed in an effort to initiate remediation on a voluntary basis and in effort to mitigate sources of pollution within the watershed and restore full use of the water body.

Due to the unhealthy condition of the largest watershed in Caldwell County, Plum Creek was put on the *Texas 303(d) List* in 2002. The Texas Water Quality Inventory and 303(d) List reports on the status of the state's waters.

10.4.2 Texas Pollutant Discharge Elimination System (TPDES)

The state of Texas in 1998 assumed the authority to administer the National Pollutant Discharge Elimination System (NPDES) program for the USEPA. The Texas Commission on Environmental Quality (TCEQ) Texas Pollutant Discharge Elimination System (TPDES) program now has regulatory authority over discharges of pollutants to Texas surface water, with the exception of discharges associated with oil, gas, and geothermal exploration and development activities, which are regulated by the Railroad Commission of Texas.

10.4.3 Source Water Protection

Source Water Protection is not a regulated activity but a voluntary program that helps public water systems protect their drinking water sources. The program requires only time from the water utility staff to participate.

10.5 Total Maximum Daily Loads Program (TMDL)

A TMDL program works to improve water quality in impaired or threatened water bodies. The program is intended to control and monitor pollution by targeting pollutants and their respective levels. The development of TMDL's is a scientifically rigorous process of intensive data collection and analysis. The loads are established after adoption by the TCEQ and review and approval by the USEPA.

With established TMDL, wastewater permit holders are required to adhere to higher levels of tertiary treatment to reduce the loadings on the stream. This will include implementation of new technologies and requirements to treat run-off from streets. Livestock and agricultural practices will need to implement better methods in order to reduce non-point source loadings.

At this time TMDL have not been established for any stream segments in Caldwell County. Enforcement by the USEPA has not been implemented and only voluntary monitoring has been established.

10.6 Plum Creek Watershed Protection Plan

The Plum Creek Watershed Protection Plan was developed in response to being posted on the 303d list. Efforts of the Plum Creek Watershed Protection Plan were voluntary and not mandated by the USEPA. Efforts to remediate Plum Creek are underway with recommended strategies to mitigate and eliminate pollution contributions.

Pollution sources listed in the Plum Creek Watershed Protection Plan included pets, sheep, goats, horses, cattle, deer, hogs, croplands, urban run-off, septic systems, WWTF, and oil production facilities. Pollution contributions include bacteria, nutrients, and other constituents such as E.coli. Voluntary monitoring of these constituents in Plum Creek will continue until recommended standards are met.

Estimated loading sources of pollution in the Plum Creek Watershed are listed in ***Table 10-1***. The Plum Creek Watershed Protection Plan monitored the stream levels and collected data at monitoring stations to estimate pollutant loads and required reductions. A Load Duration Curve (LDC) to predict point and nonpoint source pollution was used with the SELECT approach to identify sources and contributions. SELECT is a **S**patially **E**xplicit **L**oad **E**nrichment **C**alculation **T**ool developed by the Spatial Sciences Laboratory and the Biological and Agricultural Engineering Department at Texas A&M University.

TABLE 10-1
Potential Pollution Sources

Source	*Bacteria*	*Nutrients*	*Other*
URBAN			
Run-off	x	x	x
Pets	x	x	
WASTEWATER			
Septic Systems	x	x	x
WWTF	x	x	x
AGRICULTURE			
Sheep and Goats	x	x	
Horses	x	x	
Cattle	x	x	
Cropland	x	x	x
WILDLIFE			
Deer	x	x	
Feral Hogs	x	x	
OTHER			
Oil and Productions			x

10.6.1 E.coli Potential

It is estimated that the sub-watersheds with the most impervious cover have the greatest potential to load the stream with the most average daily E.coli. In Caldwell County the cities of Lockhart and Luling have the greatest impervious cover. The impervious cover creates a mode of transporting more constituents and bacteria found in pet waste to streams and rivers. Densities of pets are greater in urban areas yielding an increase in the concentrations and contribution from the cities.

Estimated wastewater and septic systems loads for Caldwell County were also greatest in Lockhart and Luling. Permitted discharges for wastewater treatment facilities have the potential to release concentrated amounts of bacterial larger than what is allowed by the Texas Water Quality Standard criterion of 126 cfu/100 mL.

The potential impacts of agricultural contributions varied depending on the source. For example, the E.coli from horse and cattle had the most significant loading impacts in the watershed, whereas sheep and goats only appeared to contaminate the south and northwest portions of the basin. Deer and feral hogs also have significant loading potential in Caldwell County.

Oil and gas contributions were not assessed for E.coli in the Plum Creek Watershed Protection Plan. The loads contributed by oil and gas include other compounds. Although, other pollutants such as trash and solid waste materials in the watershed are not believed to contribute E.coli loadings, they do contribute to the deterioration of the stream.

10.7 Seasonal Loading Impacts

Significant nonpoint source pollution loading contributions that degrade water quality are made during rainfall events. Stormwater runoff contains high TSS, VSS, COD, Bacteria, Nutrients, and Lead concentrations that are transported to the streams. The continuous additions of constituents further concentrate the contaminant levels in the water. The concentration levels are also increased when runoff disturbs once settled sediment. The agitation of the water reloads the once settled constituents back into the system. The concentrations of sampled data at monitoring stations during dry and wet conditions help correlate loadings with high, mid-range, and low flow levels.

Monitoring stations in Lockhart, Luling and Uhland sampled constituents and plotted the results on a LDC. The LDC plots the condition of the stream flow with the percent of days the flow exceeds the water quality standards. The LDC and monitored data provide a means to calculate the load reduction required to meet water quality standards. ***Tables 10-2, 10-3*** and ***10-4*** list the load reductions calculated to meet water quality standards. E.coli, Nitrate, Phosphorus, and Orthophosphorus were the constituents monitored.

TABLE 10-2
Estimated Loadings from Lockhart Monitoring Station

Load	Required % Reduction in Flow			
	High- Moist	Mid Range	Dry - Low	Target
E.coli			15	15
Nitrate	18	66	80	80
Orthophosphorus			49	49
Total Phosphorus			5	5

TABLE 10-3
Estimated Loadings from Luling Monitoring Station

Load	Required % Reduction in Flow			
	High- Moist	Mid Range	Dry - Low	Target
E.coli	41	11	8	41
Nitrate			1	1
Phosphorus				-

TABLE 10-4 Estimated Loadings from Uhland Monitoring Station				
Load	**Required % Reduction in Flow**			
	High- Moist	Mid Range	Dry - Low	**Target**
E.coli	65	51	26	65
Nitrate		0.3	43	43
Phosphorus			27	27

E.coli was the consistent load that exceeded the standard in most flow conditions at all monitoring sites. Nitrate was consistent in Dry-Low flow conditions as was phosphorous. Phosphorus and Orthophosphorus also exceeded the standards in Dry-Low flow conditions. The results correlate with the land use. The monitored nutrients are found in fertilizers and pesticides commonly used in agriculture.

The initiatives in the Plum Creek Watershed Protection Plan to control the contaminant levels and restore Plum Creek to a healthy stream segment are discussed in Section 14. The BMP recommendations in the Plum Creek Watershed Protection Plan can be implemented in any watershed as a proactive approach to maintaining healthy streams and rivers.

SECTION 11
WATER SUPPLY OPTIONS

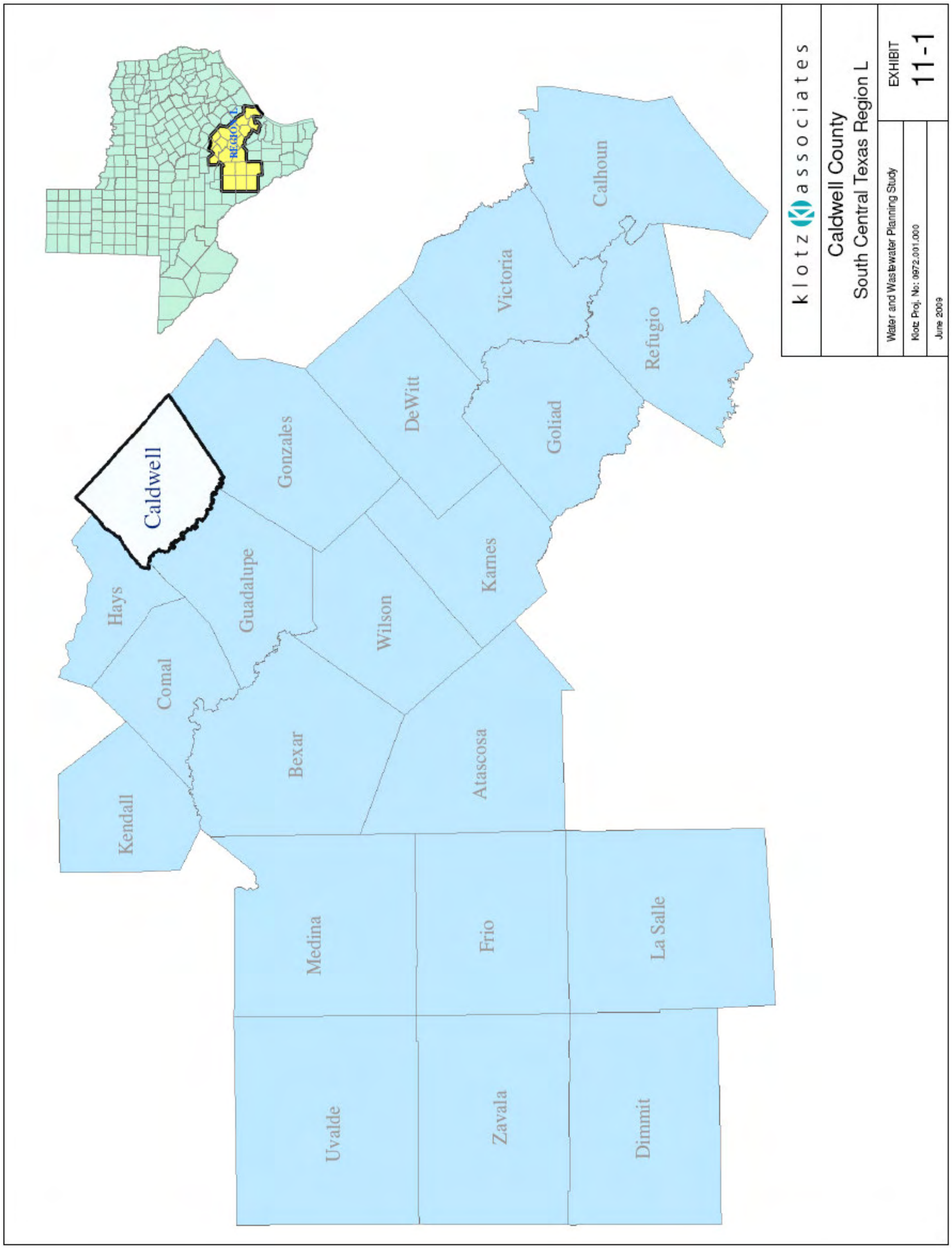
11.1 Regional Water Plans

The "*2006 South Central Texas Regional Water Plan*" (SCTRWP) represents 66 water user groups that have identified water needs. The water plan details the strategies to develop water resources to meet the needs and reduce demands through conservation. The South Central Texas Region, also know as Region L, is shown in ***Exhibit 11-1***. The exhibit illustrates the represented counties in Region L. In this section, a closer look is given at the plans and viability of the projects mentioned. For the purpose of this study, only the proposed plans that influence the supply for Caldwell County are discussed.

The plans and strategies in the 2006 SCTRWP that are reviewed include:

- Hays Caldwell Public Utility Agency (Plumbing Plan) supply project
- Lower Guadalupe Water Supply Project
- Lockhart Reservoir
- Recycled Water Programs
- Surface water rights
- Local Carrizo
- Local Storage (Aquifer Storage and Recovery)
- Simsboro Aquifer
- Weather Modification
- Rainwater Harvesting
- Water Conservation.

Additionally, the GBRA Mid-Basin Project, which is currently not in the 2006 SCTRWP, will be discussed. The work effort to review the Mid-Basin project for this study was sponsored by funds solely from the GBRA.


klotz associates
Caldwell County
South Central Texas Region L
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
June 2009
EXHIBIT
11-1
Caldwell
Hays
Guadalupe
Gonzales
DeWitt
Victoria
Calhoun
Refugio
Goliad
Karnes
Wilson
Comal
Kendall
Bexar
Atascosa
Medina
Frio
La Salle
Uvalde
Zavala
Dimmit

11.1.1 GBRA Mid-Basin Project

The Guadalupe-Blanco River Authority (GBRA) is proposing a project that will provide 25,000 ac-ft to customers of Caldwell, Comal, Gonzales, Guadalupe, and Hays Counties. The source of water will be primarily surface water from the Guadalupe River with a point of diversion below the confluence of the San Marcos River. The water in the river at the proposed diversion point is not considered firm yield unless it is backed up with off channel storage or a groundwater source. Off-channel storage in Guadalupe County is being considered for the Mid-Basin Project as well as a secondary source of supply from the Carrizo and/or Wilcox Aquifers in west-central or northeast Gonzales County.

A feasibility report has been prepared by HDR to assess the use of groundwater to supplement surface water during dry periods. During dry periods, water would be supplemented with groundwater from the Carrizo/ Wilcox Aquifer to provide a constant supply of 25,000 ac-ft/ yr.

Groundwater availability from the study was determined using the CCWQCS GAM model. The pumping simulation model was run over a period of 55 years from 2010 to 2065. Pumping and well distribution from the proposed field was analyzed in three scenarios. Two pumping scenarios were capable of producing up to 25,000 ac-ft/ yr alone from the Carrizo. The other alternative utilized the Carrizo-Wilcox wells with river water. The layout of the well field was assessed using current GCUWCD rules for well spacing and requirements of 1 ac-ft per acre.

The study used a baseline scenario for comparative purposes and to illustrate the groundwater level and projected draw down. Instream flow restrictions in the pumping simulations were based on the historical period from 1934 to 1989.

The proposed GBRA Mid-Basin Project is a viable solution to meet the water needs of Caldwell County. The permits for this project have not been issued by permitting agencies. Although it is a feasible solution, some concerns have developed regarding environmental flows. Preservation of fresh water in streams to maintain healthy ecosystems has caused some concern. Maintaining base flows of fresh water are necessary for rivers and streams to remain healthy and balanced. The TCEQ, Texas Parks & Wildlife and the TWDB are working to establish environmental flows and these flows will probably need to be established before permits will be issued.

Other issues that the project must resolve include:

- Carrizo-Wilcox groundwater availability (if needed for the project)
- Well spacing according to GCUWCD may require more land leases or acquisitions (if groundwater is needed)
- Obtaining groundwater leases from landowners if groundwater is a part of the project

11.1.2 Hays Caldwell Public Utility Agency Supply Project (HCPUA)

The HCPUA was initially formed with the Canyon Regional Water Authority, Buda, Kyle, and San Marcos for the purpose of sharing water supplies and cost of infrastructure development. The HCPUA was created under Chapter 422 of the Local Government Code General Law in January 2007. The role of the HCPUA is to provide wholesale water through the participants. The participants, who are part owners in percentage distribution, could take a role of wholesale water distributors.

The participants have been working together for approximately five years and initially had several interested entities. Many who were invited to participate chose not to pursue the project as a water supply strategy.

The water supply strategies developed by the HCPUA are described in The Plumbing Plan Report prepared by Lockwood, Andrews, and Newnam, Inc. The plan outlines the purpose, approach, timeline, and cost of the projects the HCPUA proposes. An evaluation is given of the water supply options in the report and then makes recommendations on infrastructure improvements and build-out phases.

The plan also developed scenarios based on a 50 year projection of water need. It was determined in the Plumbing Plan that water demand will surpass supply 2018. Some participants have been identified to need water before 2018. The plan projects a minimum water demand of 27,000 ac-ft/ yr in 2060 based on information they received from participants. The projected demand with high growth estimates from the State Data Center is approximately 142,000 ac-ft/ yr.

The project proposes to pump from wells in the southeast corner of Caldwell County adjacent to Bastrop, Fayette and Gonzales Counties. Available yield in this region of the Carrizo is expected to reach 15,000 ac-ft.

The HCPUA is a viable project but will not meet all the needs for Caldwell County. The project would need to consider additional WUG to meet the demands of the county. Other issues that the project must resolve include:

- Carrizo-Wilcox groundwater availability
- Well spacing according to GCUWCD may require more land lease/ acquisitions
- Obtaining leases from landowners (at the time of this study no leases have been obtained)

11.1.3 Lower Guadalupe Water Supply Project for GBRA Needs

The Lower Guadalupe Water Supply Project (LGWSP) for GBRA was introduced into the 2006 South Central Texas Regional Water Plan (SCTRWP) to meet water supply needs for customers in Caldwell, Comal, Guadalupe, Hays, and Kendall Counties. The strategy would deliver 36,710 ac-ft/ yr of available water through underutilized GBRA and Union Carbide Corporation water rights from the Guadalupe River.

The original LGWSP is no longer considered a viable strategy and has been removed from the SCTRWP. However, a smaller scale project using the concepts of the original LGWSP is considered a viable strategy for water supply development. The smaller project appears to have fewer potential participants than the original LGWSP.

11.1.4 Lockhart Reservoir

The Lockhart Dam and Reservoir project as described in the 2006 Region L Water Plan would be located upstream from Lockhart on Plum Creek as a means of meeting projected water needs. The Lockhart Reservoir was recommended to be included and considered as an important economic development. However, the original Lockhart Reservoir Project is no longer viable because the area where the dam was proposed is being used to mitigate loss of wetlands associated with the construction of SH 130. A reconfigured Lockhart Reservoir Project may be viable but this strategy is not currently being actively pursued.

11.1.5 Recycled Water Programs

The Recycled Waters Program involves the expansion or development of programs that reclaim municipal water for non-potable uses. Recycled water can be used in to irrigate parks, cemeteries, golf courses, athletic fields, open spaces, and landscape watering. The water can also be used to cool building and for industrial processes.

This strategy is a feasible solution with the development of new treatment facilities. It may not be cost-effective to retrofit and modify existing systems to provide this alternative.

11.1.6 Surface Water Rights

The Surface Water Rights management strategy refers to the recognition of existing water rights available for purchase or lease under agreements from sellers and buyers. Additional diversion points consistent with TCEQ rules and applicable laws are consistent with the 2006 Regional Water Plan.

In Caldwell County run-of-the-river surface water rights are not viable. The water rights for the San Marcos River have all been appropriated. There are no water rights available.

11.1.7 Local Carrizo

The Local Carrizo management strategy involves the development and expansion of well fields in the Carrizo-Wilcox Aquifer. Local municipal and steam-electrical needs would be met in Atascosa, Caldwell, Gonzales, Guadalupe, and Wilson Counties. The planned implementation of this strategy as listed in the 2006 SCTRWP would provide new supplies totaling approximately 20,279 acft/ yr. The cost would range from about $114 acft/yr to $443 acft/yr.

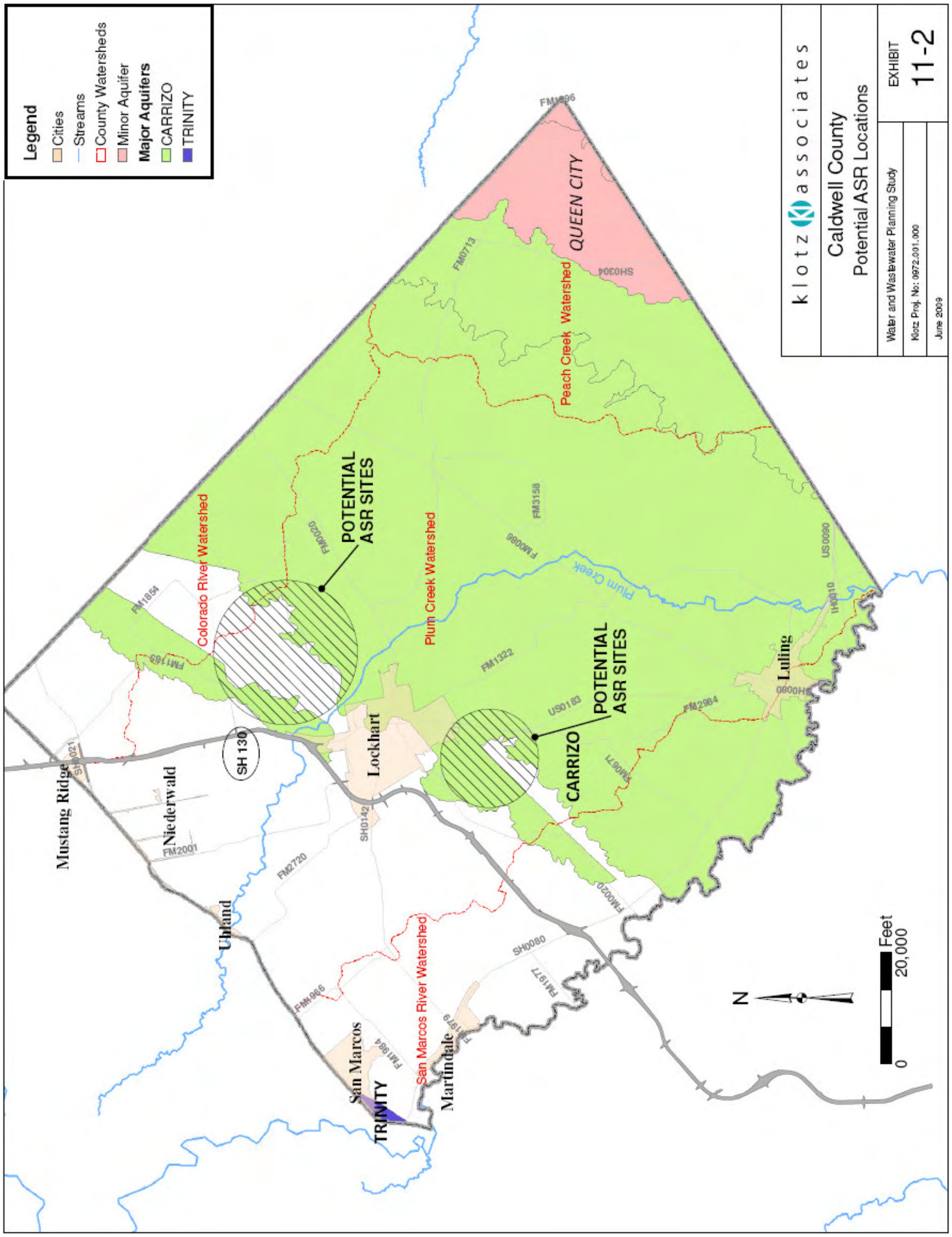
This strategy is viable and utilized by the HCPUA (Plumbing Plan) and the GBRA Mid-Basin Project. However, groundwater withdrawal permits and if required, export permits, are currently being granted by groundwater districts on almost a “first come first serve basis” without a limitation on the total permitted volume. In the future, the process to establish desired future conditions (DFC) and the maximum available groundwater from the aquifer may result in groundwater management rules that restrict or curtail groundwater production.

11.1.8 Local Storage

According to the SCTRWP, local storage involves implementing large, regional scale Aquifer Storage and Recovery (ASR) Projects and/or surface storage facilities adequate in size to store surplus flows of surface water during periods of high stream flows, including flood flows, to be available during extended periods of drought. Present management strategies of the South Central Texas Regional Water Plan are sized and scheduled to meet seasonal and daily variations of demand, but some current supplies may not be fully reliable during extended or multi-year droughts. The lack of reliability creates the need for surface reservoirs, large scale ASR systems or multipurpose reservoirs. If the water management need is for a water source that could be made available for emergencies or used during drought, surplus water available during wet periods could be stored in the Carrizo or Gulf Coast Aquifers for future use or stored in surface water reservoirs.

Surface water would generally require treatment prior to storing it in an ASR project. Water treatment capacity necessary to meet peak day demands may be available at non-peak times (fall, winter, spring) to treat water for aquifer storage and subsequent recovery.

At this time, no ASR has been formally proposed for Caldwell County. The Plum Creek Conservation District has taken the initiative to investigate the availability of an ASR in the county. Some potential sites have been located and will be studied further to determine the characteristics and storage capacity of the formation. ***Exhibit 11-2*** illustrates the potential ASR location as described by Mr. Feather Wilson.


Legend
Cities
Streams
County Watersheds
Minor Aquifer
Major Aquifers
CARRIZO
TRINITY
klotz associates
Caldwell County
Potential ASR Locations
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
June 2009
EXHIBIT
11-2
QUEEN CITY
Peach Creek Watershed
POTENTIAL
ASR SITES
Colorado River Watershed
Plum Creek Watershed
Plum Creek
POTENTIAL
ASR SITES
CARRIZO
Lockhart
Luling
Mustang Ridge
Niederwald
SH 130
Uhland
San Marcos River Watershed
San Marcos
Martindale
TRINITY
N
0
20,000
Feet

An ASR is a viable solution. Groundwater rights can be fully exhausted on a regional basis and stored in an ASR. Diverted flows from rivers that exceed base flood flows could also be stored with some treatment. The costs associated with an ASR would be dependent on the size of the void. The pipe network, transmission lines, and water treatment would also be cost to consider.

11.1.9 The Simsboro Aquifer

The Simsboro Aquifer water supply strategy involved the development of well fields over the Simsboro Aquifer. The project was reportedly headed by the San Antonio Water System (SAWS). SAWS and GBRA in 2008 were approached by a group of landowners, known as the Brazos Valley Water Alliance, to develop a project that would supply 200,000 ac-ft/ yr to participants.

The Brazos Valley Water Alliance was formed in 2002 to represent landowners over the Simsboro Aquifer. The Alliance has approximately 180,000 acres of land and more than 1,200 landowners. The Simsboro Aquifer is a member of the Carrizo/ Wilcox Aquifer which is capable of producing high quality water. After further investigation with SAWS no formal announcement or decision has been reached to continue evaluating this strategy. Additional studies are needed to fully evaluate this option.

11.1.10 Weather Modification

The weather modification strategy involves the practice of seeding clouds to increase precipitation. Licensed professionals within the planning region would seed clouds with iodide. The practice does not guarantee precipitation and water quantity estimates can not be measured. The strategy would be intended for cropland, livestock, and aquifer recharge. The strategy is still being studied and has been practiced since 2005 in some Texas counties.

Weather modification is a good strategy but is not considered an applicable or viable solution to meet the future water needs of Caldwell County. Without consistent results it can not be relied on to yield definite amounts of rainfall.

11.1.11 Rainwater Harvesting

The rainwater harvesting management strategy captures and stores runoff from rooftops for potable and non-potable use. In some instances this approach can adequately supply the needs of households and businesses.

Rainwater harvesting is a strategy that can assist in the demands projected by reducing per capita consumption. The effects of rainwater harvesting if consumers participated on a city wide basis could have great results. Reducing demand on a regional level would decrease the cost associated with developing new water sources or delay the timing. The Region L Water Plan estimated the cost of water developed by rainwater harvesting as $2,000 per ac-ft. This cost is considered high. The cost associated with this strategy could be shared cities and homeowners for existing homes. New development could be given incentives for installing systems on homes and buildings. Changes in city development standards could also require such systems.

11.1.12 Water Conservation Strategy

The water conservation strategy is suggested to be part of every water management plan. It involves implementing programs and practices that will decrease water use per capita.

Municipally this approach is done by the use of low flow plumbing fixtures, selection of water efficient appliances, modifying landscaping or xeriscaping, addressing plumbing repairs, and modifying personal behavior.

Agricultural conservation methods include installing low energy precision application (LEPA) irrigation systems and furrow dikes.

The water conservation strategy is feasible and recommended to be employed with any other viable solution.

11.1.13 Desalination

Desalination is a water management strategy that involves treating brackish groundwater or seawater. The desalination strategy lead to developing facilities adjacent to well fields in the Carrizo or intake and treatment facilities on the shore of the San Antonio Bay.

Although desalination could meet the water needs of Caldwell County, at this time this strategy is not a feasible solution. This strategy requires support from many local, state, and governmental participants to be considered a viable solution in meeting water needs for Caldwell County.

11.2 Conclusions

The strategies reviewed for use in meeting the future water needs of Caldwell County indicate that there are potential solutions but the implementation of any of the projects will be costly and will require a dedicated effort to implement on a schedule that does not limit growth or development within the county. Multiple strategies may be implemented to ensure the “water future” of Caldwell County.

The most viable near term strategies appear to be the development of the GBRA Mid-Basin Project and/or the HCPUA Project. Each of these projects will rely on withdrawal of water from the Carrizo Aquifer. The GBRA Mid-Basin project has the added advantage of groundwater plus surface water supplies.

The use of a local ASR project to store surplus water in wetter years for future withdrawal is a strategy that merits further investigation. The ASR Project could be combined with the Mid-Basin Project or HCPUA to increase available water supplies during times of drought.

Developing water from the Simsboro Aquifer appears to be a strategy that could yield significant amounts of water for use in the central Texas region including Caldwell County. Development of this project will depend on a large number of potential users with significant needs coming together and jointly developing the project. The schedule for development of his project appears to be beyond the time when water will be needed in Caldwell County.

Desalination is a strategy that can meet the future water of the central Texas region. However, the cost and challenges associated with this project indicate that desalination will probably not be implemented within the planning horizon of this study.

SECTION 12

REGIONAL WATER PLANNING

12.1 General

According to the 2006 SCTRWP, several of the water providers in Caldwell County are expected to have shortages in the coming years. ***Table 12-1*** lists the entities in Caldwell County and their respective shortage, as determined by the SCTRWP. The expansion and/or creation of new water management strategies will be necessary to meet the needs in Caldwell County. Proposed water management strategies in the SCTRWP will be expanded on and a regional network will be developed in this section.

Regional cooperation is necessary not only to mitigate cost but also to jointly find solutions that will benefit all participants. Communication and collaboration are efforts that are required to plan and implement a regional water plan.

TABLE 12-1
Caldwell County 2006 SCTRWP Projected Shortages (ac-ft)

Water Supplier	Projected Shortage					
	2010	2020	2030	2040	2050	2060
Aqua WSC	49	121	178	240	300	362
City of Lockhart WSC	341	984	1,519	2,070	2,615	3,175
City of Luling	168	311	400	485	587	695
Creedmoor Maha		0	0	0	0	0
Martindale WSC				2	19	41
Maxwell WSC			73	249	479	692
Polonia WSC			137	331	520	719
Tri Community WSC						
County Line WSC	44	1,096	1,416	1,582	1,900	2,365
Goforth WSC	79	532	969	1,415	1,963	2,408
San Marcos	79	532	969	1,415	1,963	2,408
Gonzales County	0	14	75	208	254	255

12.2 Water Supply Sources

Water supplies vary for the local water utilities. Surface water is supplied from GBRA and CRWA through river-run-of-rights. Groundwater is supplied through well permits in the Edwards (Barton Springs) Aquifer, Wilcox-Carrizo Aquifer, and Alluvial Wells. Future water supplies from these sources are expected to develop further to meet demands. Water supplies that are available to Caldwell County have been listed in ***Table 12-2***. The information presented is from a query performed on the TWDB website on available water by source. The water sources listed in the survey by the WUG's were searched to provide information on the water available.

The accessible water supplies from the named sources in ***Table 12-2*** decrease for each decade. The available supplies in 2010 are 10,878 ac-ft, 2020 has 10,838 ac-ft, 2030 has 10,071 ac-ft, and 2040 has 10,063 ac-ft.

Given the listed supplies and calculated water demands discussed in Section 8, the expected shortages are slightly greater that the SCTRWPG. The difference is likely based on greater population estimates and different per capita values. A revised municipal demand for the "TWDB County Water Demand Projections" is presented in ***Table 12-3***. The municipal demand revision reflects the water demands determined in this study. ***Table 12-4*** presents the expected shortages based on these revisions and study determinations.

TABLE 12-2 Caldwell County Water Supplies (ac-ft)					
Source Name	WUG Name	Supply 2010	Supply 2020	Supply 2030	Supply 2040
CARRIZO-WILCOX AQUIFER	Mining	16	10	4	0
CARRIZO-WILCOX AQUIFER	Manufacturing	84	84	84	84
CARRIZO-WILCOX AQUIFER	Irrigation	1,037	916	809	714
CARRIZO-WILCOX AQUIFER	Lockhart	2,310	2,310	2,310	2,310
CARRIZO-WILCOX AQUIFER	Luling	2,730	2,730	2,730	2,730
CARRIZO-WILCOX AQUIFER	County-Other	3,173	3,264	2,604	2,698
	Sub-Total	***9,350***	***9,314***	***8,541***	***8,536***
GUADALUPE RUN-OF-RIVER	Luling	99	99	99	99
GUADALUPE RUN-OF-RIVER	Martindale	198	198	198	198
GUADALUPE RUN-OF-RIVER	County-Other	613	613	613	613
	Sub-Total	***910***	***910***	***910***	***910***
CANYON LAKE/RESERVOIR	Martindale	50	50	50	50
CANYON LAKE/RESERVOIR	County-Other	258	258	258	258
	Sub-Total	***308***	***308***	***308***	***308***
EDWARDS-BFZ AQUIFER	County Other	161	161	161	161
	Sub-Total	***161***	***161***	***161***	***161***
QUEEN CITY AQUIFER	Mining	0	0	0	0
QUEEN CITY AQUIFER	Manufacturing	3	3	3	3
QUEEN CITY AQUIFER	Irrigation	36	32	28	25
QUEEN CITY AQUIFER	County-Other	110	110	120	120
	Sub-Total	***149***	***145***	***151***	***148***
Total Supply		**10,878**	**10,838**	**10,071**	**10,063**

Data obtained from TWDB WUG Supplies at http://www.twdb.state.tx.us/assistance/rwpg/DB02/index.asp

TABLE 12-3 TWDB County Water Demand Projections Based on Revised Municipal Demands 2010-2040 in ac-ft				
Category	2010	2020	2030	2040
Irrigation	1,044	928	824	733
Livestock	918	918	918	918
Manufacturing	15	18	21	24
Mining	14	15	16	17
Municipal	*7,781*	*10,932*	*14,602*	*16,803*
Steam Electric	0	0	0	0
Total Demand	**9,772**	**12,811**	**16,381**	**18,495**

TABLE 12-4 Caldwell County Additional Water Need (ac-ft)				
Year	2010	2020	2030	2040
Expected Need	(1,106)	1,973	6,310	8,432

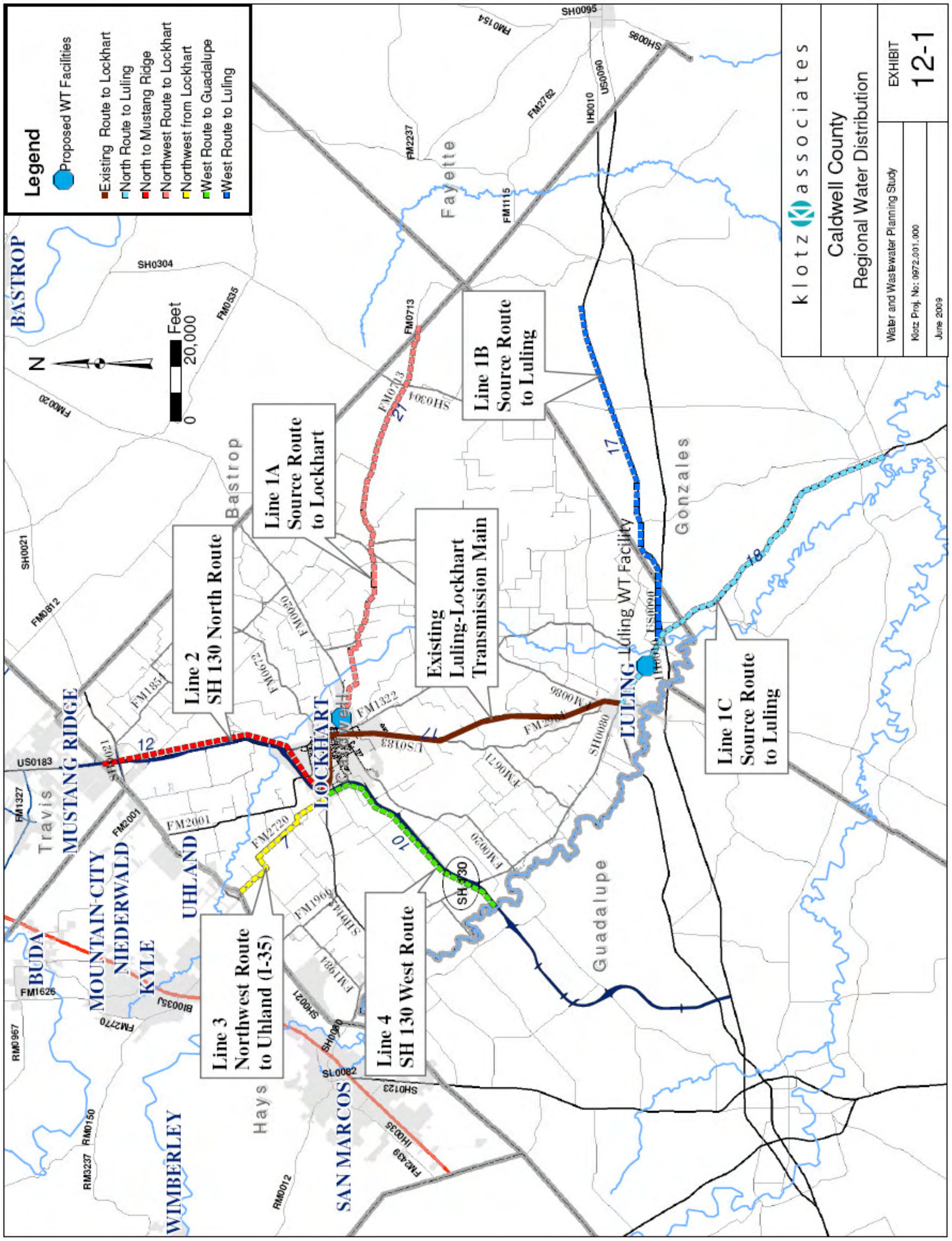
Regional facilities in this study will be developed to meet the approximate additional need of 8,500 ac-ft. Facilities and transmission lines will be sized to provide the determined need.

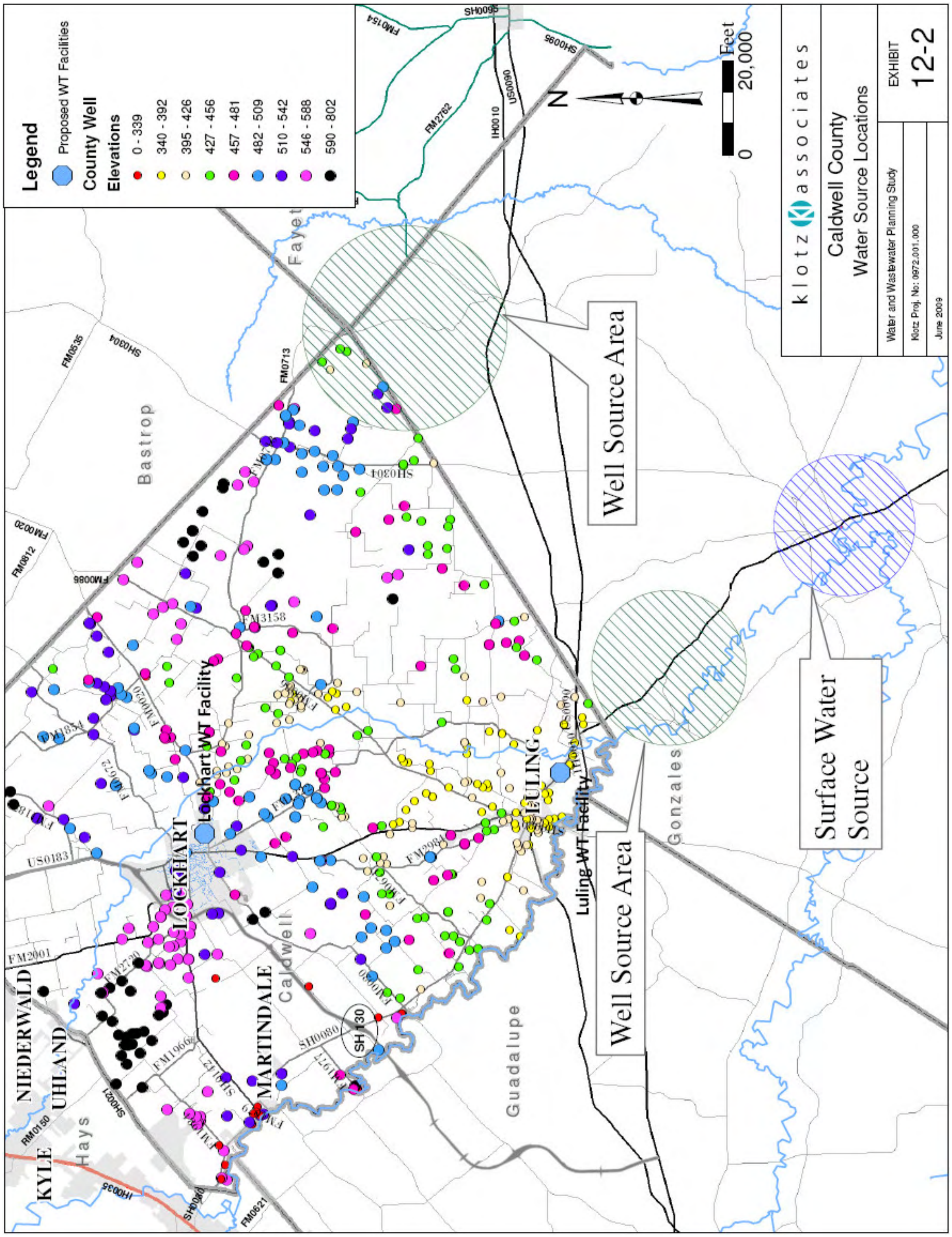
12.3 Conceptual Planning

In the evaluation of the population projections it was stated earlier that most of the development and growth is expected to occur to the north and west between the I-35 and SH 130 Highways. Planning for Caldwell County will develop with the understanding that growth will begin from the north and west and then south to Luling. Water systems will be planned to accommodate the growth and allow for further regional expansion. This approach will also consider both the HCPUA and the GBRA Mid-Basin Project strategies.

12.3.1 Source Development

Utilizing the viable strategies of the HCPUA and the Mid-Basin Project, water sources from the Carrizo-Wilcox and Guadalupe River Basin will be developed. As shown in ***Exhibit 12-1***, the initial delivery of the raw surface water will be to Luling and the delivery of groundwater will be to Lockhart. Luling currently operates a water treatment plant that is capable of diverting up to 4,422 ac-ft/ yr of water with a peak rate treatment capacity of 2.779 MGD. The plant delivers the water to the city of Luling and Lockhart. The transmission line that would route water to Luling for treatment is shown in a dashed blue line and the existing line that delivers the water to Lockhart is solid red. The dashed red line indicates the groundwater route delivered to Lockhart. Another route to consider for groundwater is taken from a well field south of Caldwell County and delivered to Luling. Well fields that have been located for groundwater development are noted as "Well Area" in ***Exhibit 12-2***. Surface water diversions at the confluence of the San Marcos and Guadalupe River are noted as "Surface Water Area" in the exhibit.


Legend
Proposed WT Facilities
Existing Route to Lockhart
North Route to Luling
North to Mustang Ridge
Northwest Route to Lockhart
Northwest from Lockhart
West Route to Guadalupe
West Route to Luling
N
0
20,000
Feet
Line 1A Source Route to Lockhart
Line 1B Source Route to Luling
Line 1C Source Route to Luling
Line 2 SH 130 North Route
Line 3 Northwest Route to Uhland (I-35)
Line 4 SH 130 West Route
Existing Luling-Lockhart Transmission Main
Luling WT Facility
BASTROP
MUSTANG RIDGE
LOCKHART
LULING
UHLAND
KYLE
BUDA
MOUNTAIN CITY
NIEDERWALD
SAN MARCOS
WIMBERLEY
Travis
Bastrop
Fayette
Gonzales
Guadalupe
Hays
klotz associates
Caldwell County
Regional Water Distribution
EXHIBIT
12-1
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
June 2009


Legend
Proposed WT Facilities
County Well
Elevations
0 - 339
340 - 392
395 - 426
427 - 456
457 - 481
482 - 509
510 - 542
546 - 588
590 - 802
Feet
0
20,000
N
klotz associates
Caldwell County
Water Source Locations
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
June 2009
EXHIBIT
12-2
Well Source Area
Well Source Area
Surface Water Source
Lockhart WT Facility
Luling WT Facility
LOCKHART
LULING
MARTINDALE
NIEDERWALD
UHLAND
KYLE
Bastrop
Caldwell
Guadalupe
Gonzales
Hays
SH 130

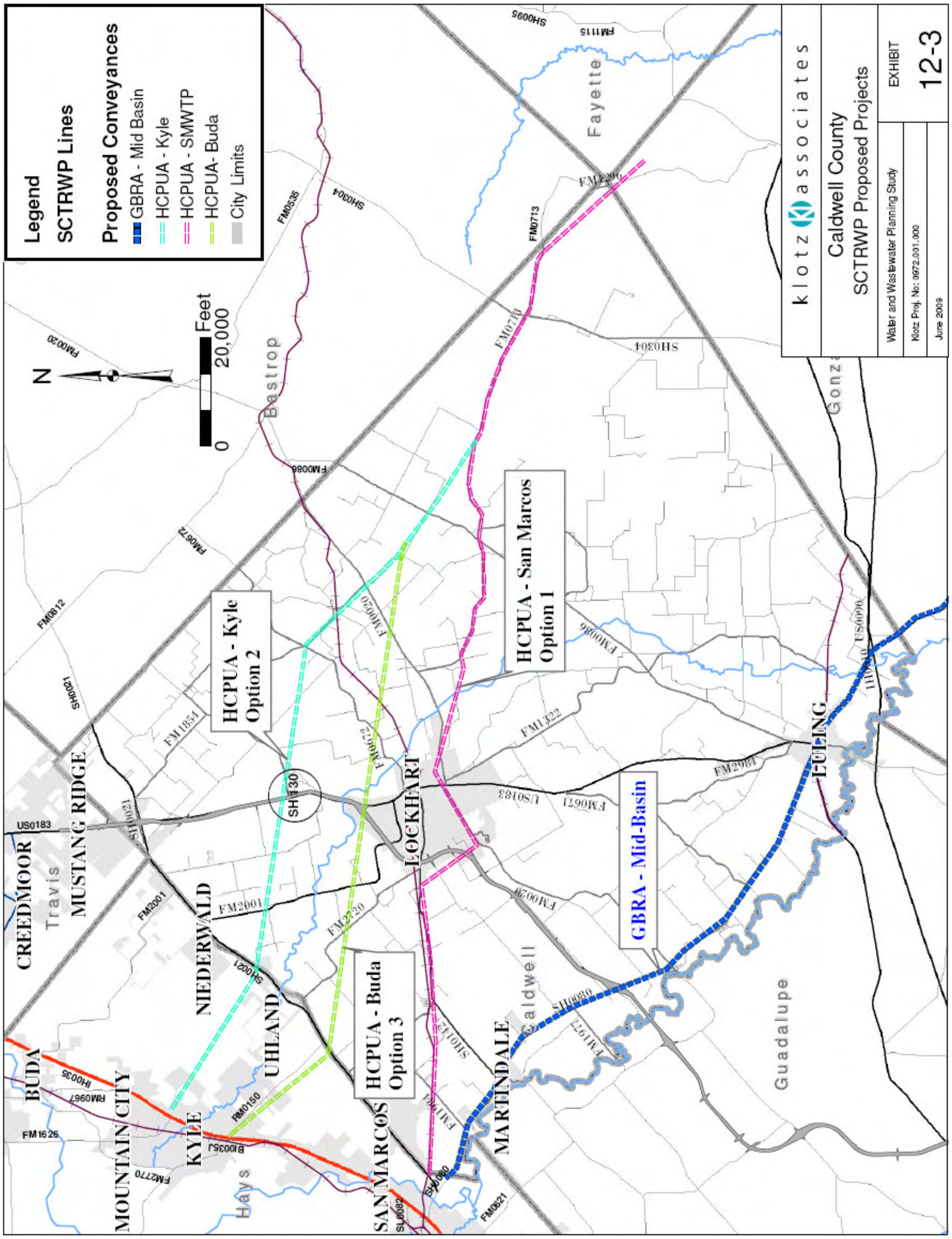
12.3.2 Distribution

The water will be delivered through a 24” transmission line flowing at 5 fps. Once water is delivered to designation delivery points it is recommended to develop a regional water distribution system as shown in ***Exhibit 12-2***. The development of the Luling-Lockhart water transmission was a project that formed the beginning of a regional water distribution system. The following actions are recommended to further develop a regional water distribution system:

- Develop water sources to initial delivery point (Lockhart/ Luling)
- Develop a route to Uhland where population growth is expected to be the greatest
- Develop a transmission line route along SH 130 toward I-35 N
- Develop a transmission line route along SH-130 West
- Develop a transmission line route to loop the system

Development of the transmission lines would create a regional water distribution system that would not only aid Caldwell County, but also the neighboring counties in need of water. The benefit of including adjacent counties to participate is cost related. Sharing cost provides an incentive for many participants to pool together resources to develop the water sources needed for future water demands.

Current plans in the SCTRWP that detail the same routes are the Plumbing Plan developed by the Hays/Caldwell PUA and the GBRA Mid-Basin Project. ***Exhibit 12-3*** provides an illustration of approximate line locations. The Plumbing Report lists three options of delivery points that include the San Marcos WTP, the City of Kyle elevated storage tank (EST) and the City of Buda well site #3 where they have a ground storage tank (GST) that can be utilized. The Mid-Basin Project transmission main would in all scenarios deliver 4,000 acft of surface water to the San Marcos WTP.


Legend
SCTRWP Lines
Proposed Conveyances
GBRA - Mid Basin
HCPUA - Kyle
HCPUA - SMWTP
HCPUA- Buda
City Limits
Feet
0
20,000
HCPUA - Kyle Option 2
HCPUA - San Marcos Option 1
HCPUA - Buda Option 3
GBRA - Mid-Basin
CREEDMOOR
MUSTANG RIDGE
NIEDERWALD
UHLAND
BUDA
MOUNTAIN CITY
KYLE
SAN MARCOS
MARTINDALE
LOCKHART
LULING
Travis
Hays
Bastrop
Caldwell
Guadalupe
Fayette
Gonz
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Caldwell County
SCTRWP Proposed Projects
Water and Wastewater Planning Study
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June 2009
EXHIBIT
12-3

12.4 Water System Cost Estimates

Various studies, reports, and recent bids were used to develop cost estimates. ***Table 12-5*** presents a summary of the estimated associated project cost for the proposed transmission lines. Current economic conditions may cause moderate fluctuations in construction costs and estimates. **Appendix M** provides a basis for the proposed cost estimate.

TABLE 12-5
Project Summary Cost

ITEM NO.	ITEM DESCRIPTION	AMOUNT
1	Line 1A - Groundwater Source Route to Lockhart	$33,800,000
2	Line 1B - Groundwater Source Route to Luling	$30,000,000
3	Line 1C - Surface Water Source Route to Luling	$51,500,000
4	Line 2 - SH 130 North Route	$12,000,000
5	Line 3 - Northwest Route to Uhland	$7,000,000
6	Line 4 - SH 130 West	$10,000,000

It is recommended first to develop wells in the Carrizo/ Wilcox Aquifer initially with either Transmission Line 1A or 1B and begin to branch out before the expected growth. As growth occurs, a network of pipelines can begin to be established regionally to provide for a regional supply. The construction of SH 130 presents an opportunity to develop two of the branch network lines to supply water in the areas of expected growth. Transmission Line 2 and Line 4 are recommended to parallel SH 130.

SECTION 13

REGIONAL WASTEWATER PLANNING

13.1 Introduction

Regional wastewater planning is needed with the expected growth in Caldwell County. Evaluation of several options regarding collection treatment systems was necessary to provide recommendations for planning and implementation. Identifying the existing facilities in the county was a task necessary to understand the current systems and identify needed improvements or changes.

13.2 Existing Wastewater Collection Systems

Lockhart and Luling are the two municipalities that currently provide wastewater collection services. The remainder of the county is rural with septic systems in use. As previously mentioned, Lockhart has two facilities that treat a combined flow of 2.6 MGD and Luling also has two plants that treat a combined flow of 1.1 MGD. Three of the four treatment plants discharge into Plum Creek. One plant from Luling discharges into the San Marcos River.

Areas outside city limits and in unincorporated areas utilize on-site sewage facilities (OSSF) also known as septic systems. Septic system use in Caldwell County for urban regions and undeveloped portions of the county is typical and has steadily risen since 2005. The Director of Sanitation for Caldwell County provided the data shown in ***Table 13-1*** and ***Graph 13-1***. The numbers of Septic System Certificates of Completion are listed for the last ten years.

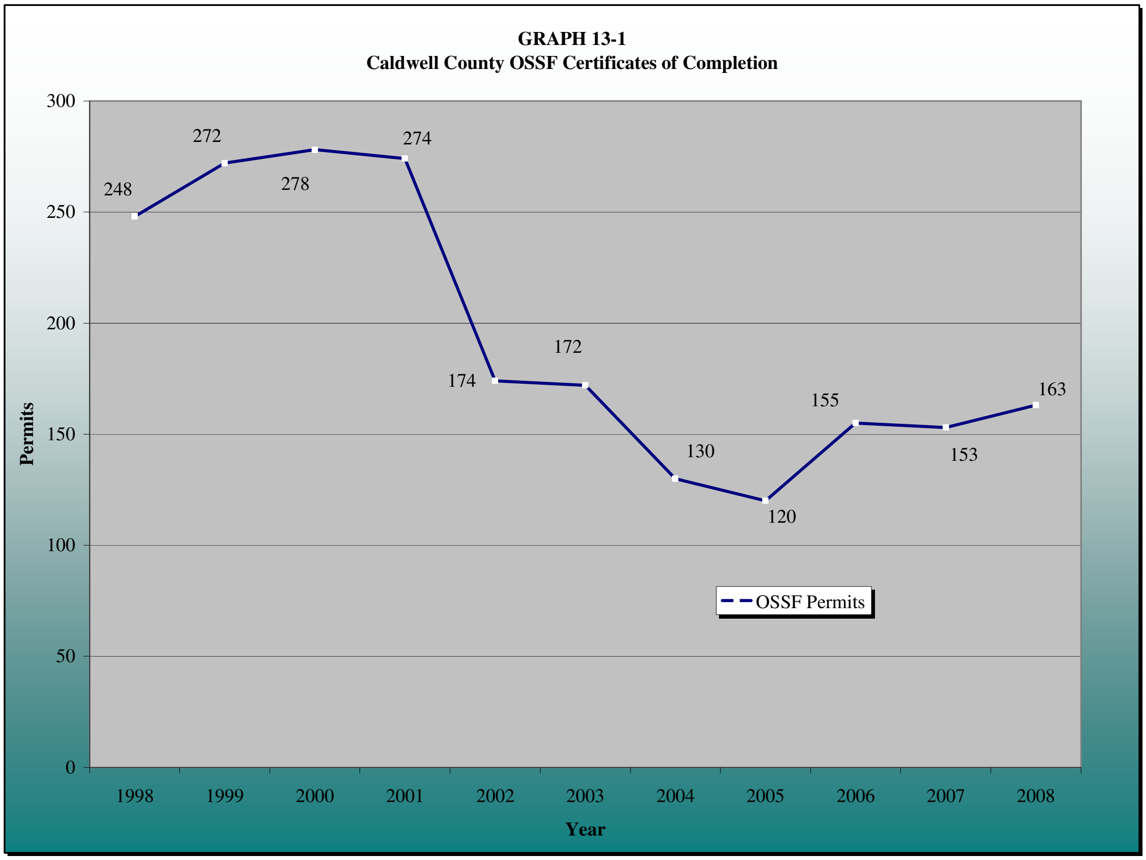

TABLE 13-1

Caldwell County On-Site Sewage Facilities (OSSF) Certificates of Completion

Year	Permits
1998	248
1999	272
2000	278
2001	274
2002	174
2003	172
2004	130
2005	120
2006	155
2007	153
2008	163

13.3 Wastewater System Planning

The development of wastewater facilities will be based on growth and land topography. A gravity flow systems is the expected design. Assumptions of land development are made based on typical patterns that occur along corridors. ***Exhibit 13-1*** illustrates the general areas that were considered in the evaluation of future growth. Steep elevation zones, floodplains, and drainage basins were the governing factors for determining the locations of the regional facilities and the decentralized systems.

It will be expected that as the population grows, the areas between San Marcos, Luling, Lockhart, and Mustang Ridge will become densely populated. Area 2 as shown in the exhibit is expected to show the initial growth with development following in areas 1 and 3. Areas 4 and 5 are not expected to grow as rapidly and become as densely populated. The construction of SH 130 will bring about a change in the land development for the area.

13.4 Wastewater Collection System Service Areas

The location of collection systems were based on the naturally occurring drainage basins. There are three major drainage basins in the county which can be utilized to develop systems transported by gravity. Gravity systems require very little energy and are typically less costly to develop and maintain than systems that require pumping. Evaluations of the service areas, as shown in ***Exhibit 13-2***, were defined as follows:

1. The Lockhart Regional Facility Area - This service area will include Lockhart and the northern area of the county that will develop as SH 130 develops from Mustang Ridge.

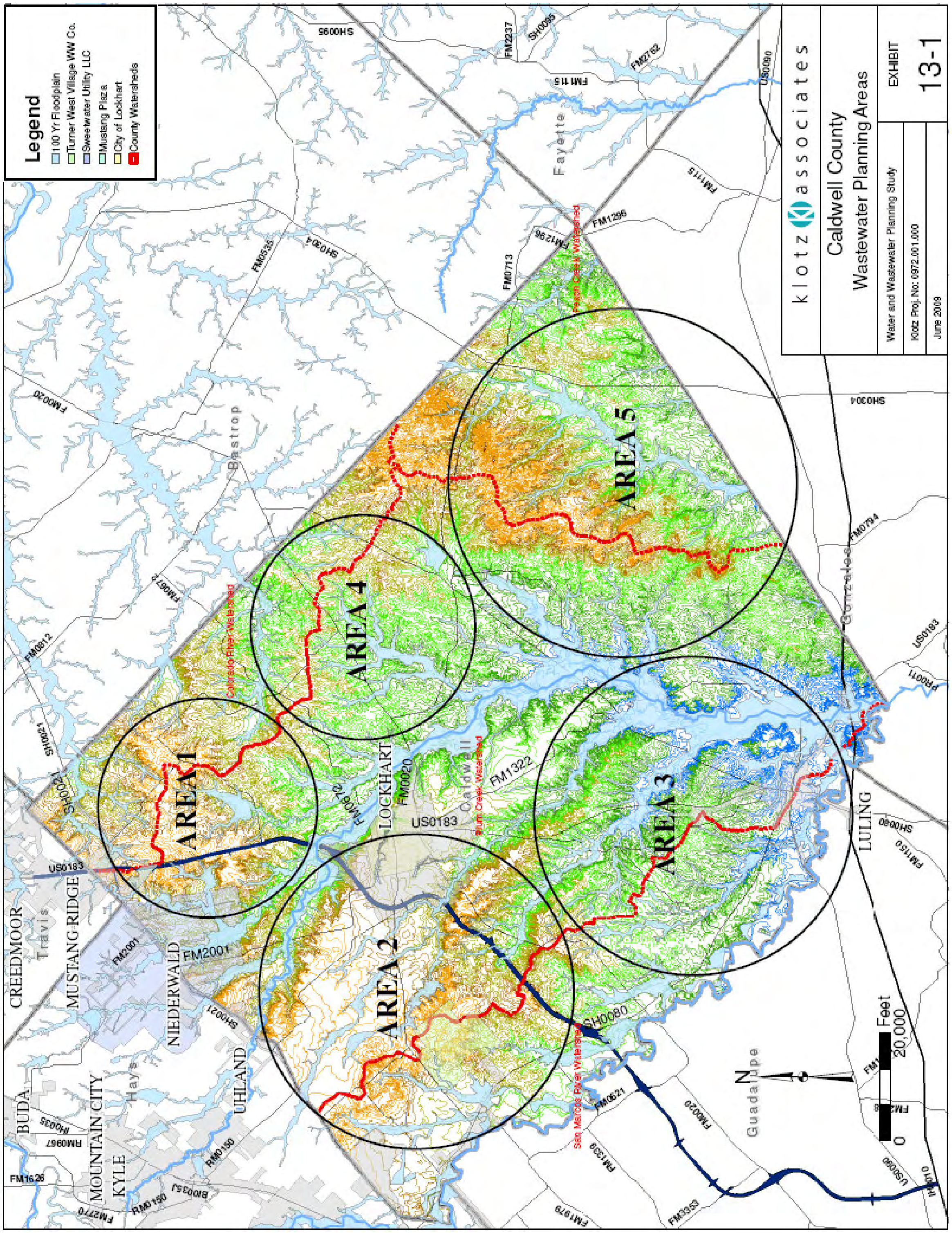
Legend
100 Yr Floodplain
Turner West Village WW Co.
Sweetwater Utility LLC
Mustang Plaza
City of Lockhart
County Watersheds
klotz associates
Caldwell County
Wastewater Planning Areas
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
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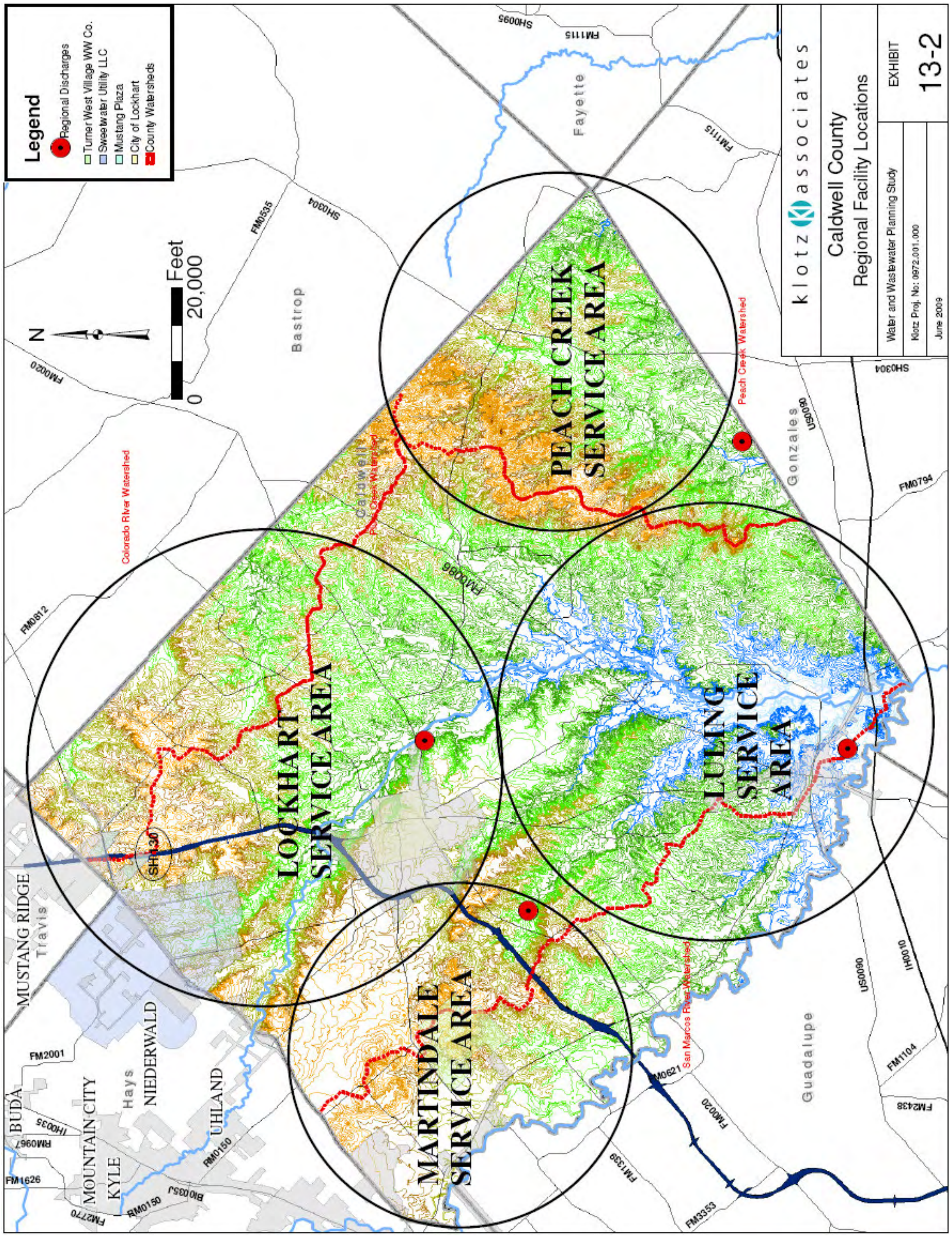
EXHIBIT
13-1
AREA 1
AREA 2
AREA 3
AREA 4
AREA 5
LOCKHART
LULING
CREEDMOOR
MUSTANG RIDGE
NIEDERWALD
UHLAND
BUDA
MOUNTAIN CITY
KYLE
Travis
Bastrop
Fayette
Caldwell
Gonzales
Guadalupe
Hays
US0183
SH0080
FM2001
FM1322
Feet
0
20,000



Legend
Regional Discharges
Turner West Village WW Co.
Sweetwater Utility LLC
Mustang Plaza
City of Lockhart
County Watersheds
N
Feet
0
20,000
klotz associates
Caldwell County
Regional Facility Locations
Water and Wastewater Planning Study
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EXHIBIT
13-2
LOCKHART SERVICE AREA
PEACH CREEK SERVICE AREA
LULING SERVICE AREA
MARTINDALE SERVICE AREA
Bastrop
Fayette
Gonzales
Guadalupe
Hays
Travis
Caldwell
MUSTANG RIDGE
NIEDERWALD
UHLAND
MOUNTAIN CITY
KYLE
BUDA
Colorado River Watershed
Peach Creek Watershed
San Marcos River Watershed
SH130

2. The Martindale Regional Facility Area – This service area will include Martindale and the area west of Lockhart. It is expected that this segment of SH 130 will bring development and growth.

3. The Luling Regional Facility Area – This service area will include Luling and the area north of Luling. This service area will also include the portion of Caldwell County that is in the San Marcos Drainage Basin.

4. The Peach Creek Regional Facility Area – This service will include the Peach Creek Drainage Basin areas in Caldwell County. This area is not expected to develop at significant rates. This area was established in this study for the purpose of providing a facility in every drainage basin represented.

13.5 Wastewater Collection System Options

Regional facilities and decentralized systems, which include package treatment facilities and OSSF's, were considered in the evaluation of wastewater treatment facilities. The recommended facilities were based on:

1. Population projections developed in this study
2. Wastewater return flows were based on 150 gpcd of water
3. 68% return flow rate
4. Wastewater treatment would be provided for 100% of population
5. Service plan does not include individual connections (lateral)

13.5.1 On-Site Sewage Facilities (OSSF) / Septic Systems

Upon evaluation of septic systems use in the county, septic systems were not considered to be an appropriate alternative to serve a growing community. Installation of these systems in an already impaired watershed could prove to be more costly financially and environmentally in long-term planning. Discharge of these systems cannot be monitored and evaluated on a regular basis to ensure the discharge meets standard requirements. Homeowners, in most cases, are not concerned or aware of problems until the issues become visible. Remediation efforts due to the contribution of failing OSSF's are unnecessary if appropriate planning measures are implemented to limit these systems. Larger lot sizes and buffer zones can decrease the loads imposed by OSSF.

Development of more stringent ordinances and preferences should be established to regulate private sewage facilities. The county has a position to take on these systems in areas expected to develop. Provisions need to be made for private owners in isolated rural areas that are not planning to develop the property and are not within 300 feet of a sewer line.

13.5.2 Regional Treatment Facilities

Regional treatment facilities have traditionally been implemented in regional planning efforts. Economies of scale have been the motivating factor for the "bigger is better" selection rationale. Larger treatment facilities do provide cost effective solutions for wastewater treatment. Communities typically have an expectation of safer and better quality standards due to the municipal oversight. Federal regulations and funding have also been oriented toward centralized collection and delivery of point source discharges.

The regionalization of wastewater systems for the county does provides the benefit of minimizing the number of decentralized systems, including OSSF. Minimizing the number of point source discharges have the additional benefit of ensuring regulation and monitoring by municipalities or river authorities.

13.5.3 Decentralized Treatment Facilities

Multiple treatment facilities within a service area can be described as decentralized systems. The Turner Crest WW treatment facility is an example of a decentralized system providing sewer services to the subdivision it would develop.

A shift in paradigm is occurring where decentralized systems are being considered more feasible, environmentally friendly, and aesthetically pleasing if designed, constructed, and operated properly.

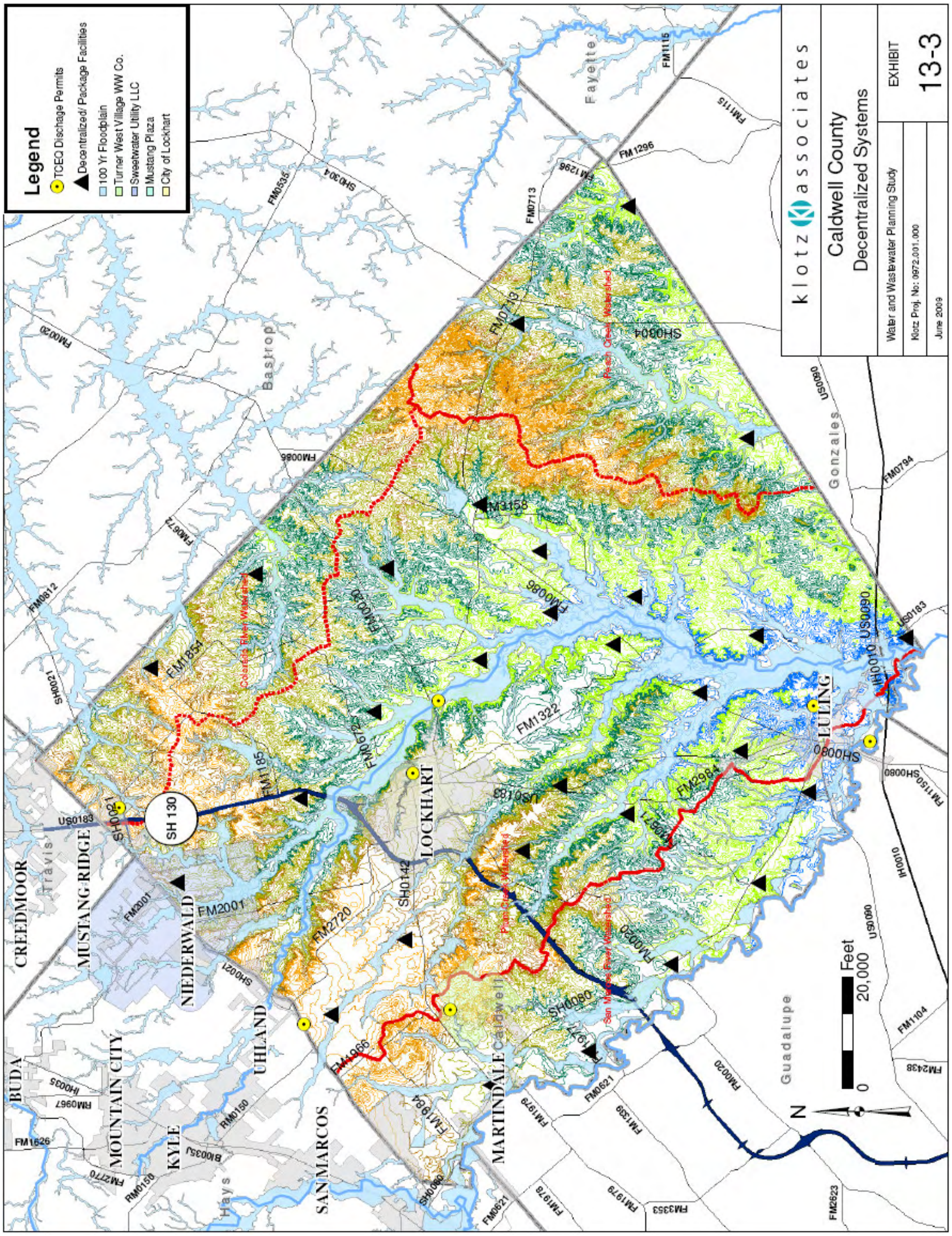
As permanent components of infrastructure, it would be in the best interest of the public for the facilities to be managed by a public utility.

The smaller footprint of a decentralized system impacts the environment minimally. The system would require less land and minimize or eliminate effluent discharges. Recycling 100% of the discharge can also provide monetary benefits and reduce per capita water demands. The systems in the communities can be landscaped to be appealing and provide an aesthetic value to the area. The systems can also allow for development in rural areas where sewer service is not available. Energy use of a decentralized system can be substantially lower than a regional facility. Lastly, air quality issues are minimized.

The decentralized systems would be sized and located to serve smaller watersheds and communities. Placement of these facilities would require analysis of smaller regions. An example of these system locations at the regional level are shown in ***Exhibit 13-3.***

13.5.4 Package Treatment Facilities

Package treatment plants are pre-assembled and factory installed treatment facilities that effectively utilize energy and mechanical, biological, chemical or physical treatments processes. They offer minimal on-site construction cost, fast plant start-up and cost efficient operation and maintenance (O&M). O&M is simple and requires minimal supervision.



Legend
TCEQ Dischage Permits
Decentralized/ Package Facilities
100 Yr Floodplain
Turner West Village WW Co.
Sweetwater Utility LLC
Mustang Plaza
City of Lockhart
klotz associates
Caldwell County
Decentralized Systems
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
June 2009
EXHIBIT
13-3
LOCKHART
LULING
SAN MARCOS
KYLE
BUDA
MOUNTAIN CITY
UHLAND
NIEDERWALD
MUSTANG RIDGE
CREEDMOOR
MARTINDALE
SH 130
Feet
0
20,000

Unfortunately, the simplicity of O&M has reportedly caused some plants to be out of compliance. The results of these facilities being managed incorrectly can cause detriment and degradation to the surrounding environment. For this reason, it will be recommended for these facilities to be operated by trained personnel.

Typical applications are in land development subdivisions, small cities, mobile home parks, and recreational areas. These package treatment facilities may be beneficial to apply as growth develops in urban areas and then to replace as the life of the system expires. These systems would act as decentralized systems and are recommended to be operated by public utilities to provide a service for the public health.

13.6 Proposed Wastewater Collection Facilities

The proposed regional and decentralized facilities are recommended to reuse 100% of the effluent. With stringent treatment levels for all collection facilities, the treated wastewater can be reused within the community it is serving. There is opportunity for reuse in both centralized and decentralized systems. The reuse water can serve to irrigate developments in nearby communities. Hospitals, schools, theaters, manufacturers, industries, and other facilities that require large amounts of water for irrigation and cooling of buildings are target customers of reclaimed water.

Although the recommendation is to reuse 100% of the wastewater, it may not entirely feasible for utilities to provide this service in existing facilities. The cost may exceed the benefits. Also, development and design of new facilities should employ this strategy with further investigation into the effects of instream flows and current laws.

The proposed regional collection facilities are to provide sewer services to the Lockhart, Martindale, Luling, and Peach Creek service areas as discussed earlier.

The projected flows developed in Section 9 and found in *Table 9-3* were further evaluated to determine wastewater flows for the service areas mentioned. A percentage of the expected population was assigned to each service area to estimate a wastewater flow for that service area. The percentages and expected wastewater flows are shown in ***Table 13-2.*** Lockhart was expected to produce 40%, Luling 35%, Martindale 20% and Peach Creek 5% of the projected wastewater flows.

Table 13-2
Service Areas Projected Wastewater Flows

Total Projected Wastewater Flows (MGD) in given Year		2010	2020	2030	2040
		4.723	**6.636**	**8.864**	**10.200**
Service Area	Percentage	**Wastewater Flows for Service Areas**			
Lockhart	40%	1.889	2.654	3.546	4.080
Luling	35%	1.653	2.323	3.102	3.570
Martindale	20%	0.945	1.327	1.773	2.040
Peach Creek	5%	0.236	0.332	0.443	0.510

13.6.1 Option 1 - Regional Facilities

The regional facilities option is to develop one regional facility in the four determined service areas. This option reduces the number of treatment systems with an anticipated lower unit cost of treatment. However, with a 100% reuse distribution system, this may prove to be more costly than other options. Reuse lines in a regional facility may be limited.

13.6.2 Option 2 - Decentralized/ Package Treatment Systems

It is suggested by other industry professionals to consider implementing systems delineated by smaller drainage basins to serve local subdivisions and commercial/industrial sites. Having a smaller community collection and reuse distribution system can provide environmental benefits that outweigh other associated costs. Efficient and functional planning of these facilities with planned community development is necessary to be cost-effective.

This alternative also considers phasing out ineffective systems that are not functional. The collections systems can be removed and lines extended to connect to a network in place. Connection to a sewer main will route the wastewater to a regional facility. These systems should be strategically placed in locations that allow for the option to be phased out.

13.6.3 Option 3 - Combined Facilities

Decentralized systems, in combination with regional facilities, can work together to provide load reductions in streams and rivers. Decentralized systems can collect, treat the wastewater and enable local reuse of the water. This approach promotes reuse of treated wastewater. The unusable sludge slurry can be piped to a regional treatment plant and treated at that plant prior to disposal.

13.7 Proposed Regional Wastewater Facilities

The recommended regional wastewater facilities for Caldwell County are presented in ***Exhibit 13-4*** and include:

- Lockhart Regional Wastewater Treatment Plant in 2040 is expected to treat 4.1 million gallons per day receiving 40% of the total wastewater produced in the county. Approximately 32 miles of main wastewater collection lines are proposed for this treatment plant.

- Luling Regional Wastewater Treatment Plant in 2040 is expected to treat 3.6 million gallons per day receiving 35% of the total wastewater produced in the county. Approximately 33 miles of main wastewater collection lines are proposed to service this treatment plant.

- Martindale Regional Wastewater Treatment Plant in 2040 is expected to treat 2.1 million gallons per day receiving 20% of the total wastewater produced in the county. Approximately 11 miles of main wastewater collection lines are proposed to service this treatment plant.

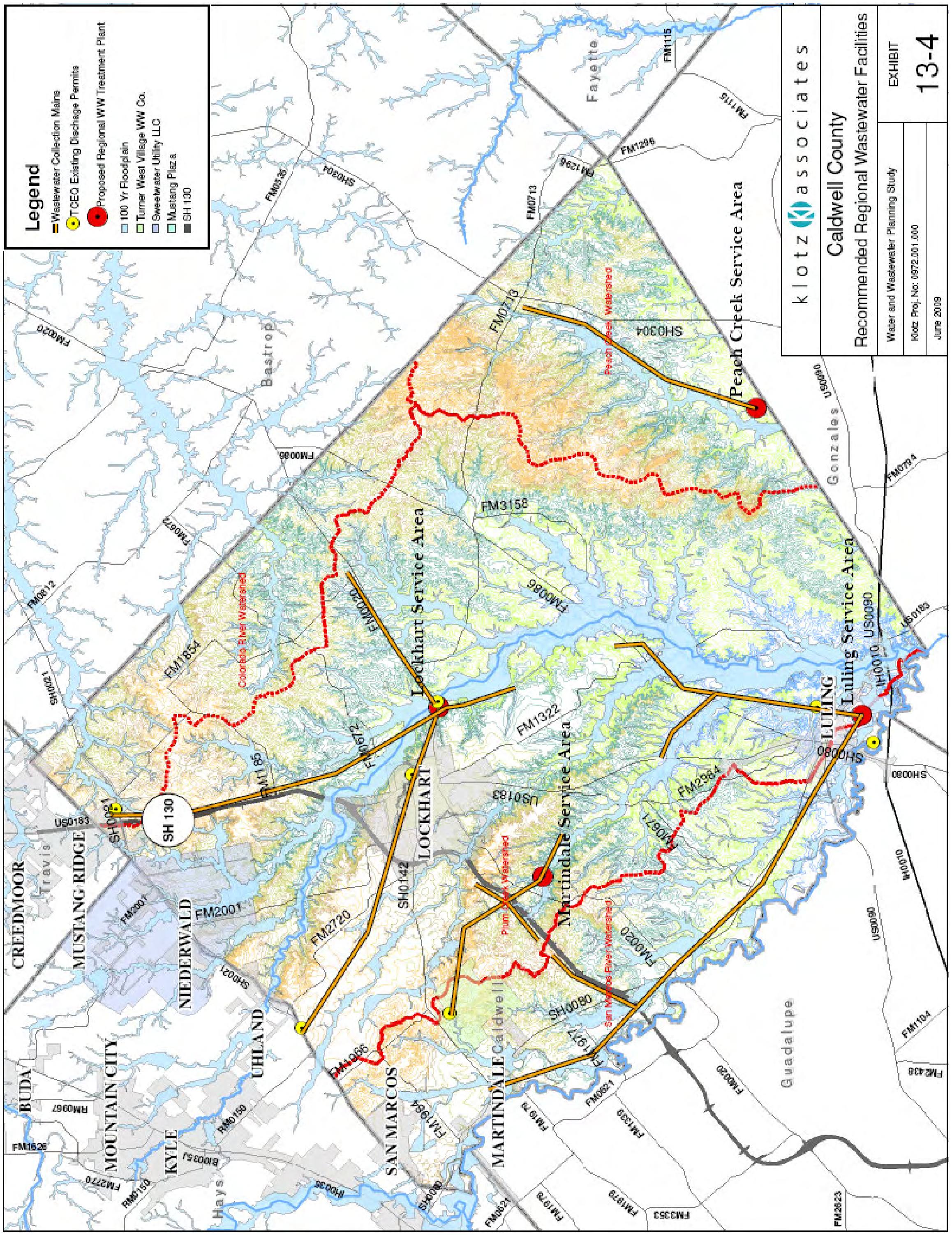
- Peach Creek Regional Wastewater Treatment Plant in 2040 is expected to treat 0.6 million gallons per day receiving 5% of the total wastewater produced. Approximately 9 miles of main wastewater collection lines are proposed to service this treatment plant.

Table 13-3 presents estimated cost for each regional treatment plant based on a plant cost of $3.75 per gallon of treatment capacity and in-place wastewater main cost of $125 per linear foot of pipeline. Appendix M presents additional information on the wastewater cost estimates

TABLE 13-3

Regional Wastewater Collection and Treatment Plant Cost Estimates

	Estimated Cost in Millions of Dollars			
	Lockhart Plant	Luling Plant	Martindale Plant	Peach Creek Plant
Item	4.1 mgd	3.6 mgd	2.1 mgd	0.6 mgd
Plant Cost	$15.3	$13.4	$7.7	$1.9
Main Collection Lines	$21.1	$20.1	$7.0	$5.7
Total	**$36.4**	**$33.5**	**$14.7**	**$7.6**


Legend
Wastewater Collection Mains
TCEQ Existing Discharge Permits
Proposed Regional WW Treatment Plant
100 Yr Floodplain
Turner West Village WW Co.
Sweetwater Utility LLC
Mustang Plaza
SH 130
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Caldwell County
Recommended Regional Wastewater Facilities
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EXHIBIT
13-4
Peach Creek Service Area
Lockhart Service Area
Martindale Service Area
Luling Service Area
Colorado River Watershed
Peach Creek Watershed
San Marcos River Watershed
LOCKHART
LULING
MARTINDALE
SAN MARCOS
UHLAND
NIEDERWALD
MUSTANG RIDGE
CREEDMOOR
MOUNTAIN CITY
KYLE
BUDA
Bastrop
Fayette
Gonzales
Guadalupe
Caldwell
Travis
Hays
SH 130

SECTION 14

REGIONAL WATER QUALITY PROTECTION PLAN

14.1 Introduction

The Caldwell County Regional Water Quality Protection Plan (CCRWQPP) identifies actions that will assist in preventing continuing degradation of groundwater and surface water quality within Caldwell County. Regional water quality measures are necessary to assist in maintaining healthy streams, preventing contamination of groundwater from surface sources and in support of efforts to improve the quality of water flowing in streams within the county.

Segments of Plum Creek, the major drainage Basin within Caldwell County, have experienced declining water quality with increasing nutrient concentrations, sediment loads and bacterial contamination. Stream segment 1810 of Plum Creek was listed in 2002 as an impaired stream segment in accordance the requirements of the Federal Clean Water Act, Section 303(d).

Measures presented in the CCRWQPP include structural and non-structural best management practices (BMPs) that can assist in reducing pollutant loads to streams in the county, assist in improving water quality in streams and assist in guarding against groundwater degradation.

14.2 Caldwell County Watersheds

As discussed in Section 2 of this Report, the streams that are included in the planning region receive discharge from the Guadalupe and Colorado River Basins. The Colorado River Basin receives approximately 11 percent of the drainage and the Guadalupe River Basin receives the remaining 89 percent. The sub-watersheds of the Guadalupe River Basin in the county include Plum Creek (59%), the San Marcos River (16%), and Peach Creek (14%).

14.3 Water Quality Concerns and Sources of Impairment

The constituents that threaten stream water quality in Caldwell County originate from several sources and have resulted in streams being classified as impaired because of the presence of excessive bacteria, concern with dissolved oxygen levels (DO), and high concentrations of total phosphorus, ortho-phosphate, and ammonia-nitrogen. Sources of these pollutants are as follows:

- Urbanization and Runoff – Urbanization almost always results in removal of vegetation that in turn reduces the natural filter processes performed by vegetation and increases soil erosion from caused by larger peak runoff rates and volumes. Pollutants from human activity, pet waste and natural processes reach drains, storm sewers and streams without the benefit of vegetative filtering.

- Livestock and Wildlife – Animal waste deposited in or near waterways can contribute significant pollutant loading to streams. Feral hogs, deer, sheep, goats, horses, cattle, chickens, turkeys and ducks are potential significant pollutant sources in Caldwell County.

- On-Site Sewage Facilities (OSSF) – Improperly designed or installed, leaking and/or failing OSSF facilities can add significant pollutant loading to streams and groundwater. Bacteria from OSSF systems can reach drinking water sources and have severe and life-threatening impacts to human health.

- Wastewater Treatment Facilities – Improperly designed, constructed and/or operated wastewater collection and treatment facilities can result in leaks, overflows and/or discharges to drains, storm sewers and streams that can add significant pollutant loads to natural water bodies.

- Agricultural Practices – Improper and poor agricultural practices can significantly increase sediment, nutrient, organic, bacterial and/or chemical loading to streams. Over-fertilization is an example of a poor practice that can increase nutrient loads and increase production cost without a commensurate return on investment.

- Oil and Gas Production – Brine leakage, nitrogen compounds, salts, and hydrocarbons (petroleum byproducts) can leak to waterways and result in diminished water quality and decrease the quality of the aquatic habitat.

- Solid Waste Sources – Solid waste (such as used tires, home appliances and construction debris) that is improperly disposed of in drainageways and streams add to pollutant loads and can degrade aquatic habitat, stream functions and visual appearance.

- Natural Geological Characteristics – Naturally occurring geological formations can contribute nutrients and other pollutants to water passing through the formation. The nutrient and pollutant loads can impair groundwater quality and surface water quality where groundwater discharges to streams.

The CCRWQPP addresses the potential pollutant sources and recommends BMPs that will reduce the impact of the various pollutant sources. Deployment of the BMPs may be an iterative process to meet pollutant goal removal. Monitoring will be necessary to determine the effectiveness of the management measures.

14.4 Water Quality Standards

Water quality standards established by TCEQ and Environmental Protection Agency (EPA) are used to define the acceptability and suitability of water for various uses including such uses as drinking water, water in streams and wastewater plant return flows. The standards are defined using chemical, biological and physical parameters.

The stream water quality standards for contact recreational waters in Texas include the following provisions for bacteria:

- the geometric mean of samples tested for E.coli should not exceed 126 colony-forming units per 100 milliliters (CFU/100mL)
- the geometric mean of samples tested for fecal coliform should not exceed 200 CFU/100ml fecal coliform
- For grab samples, not more than 25% of the samples tested for E.coli can exceed 394 CFU/100ml
- For grab samples, not more than 25% of the samples tested for fecal coliform can exceed 400 CFU/100ml

If a tested water body does not meet these standards, it can be classified as an impaired water body for bacteria.

For segments of stream where a high level of aquatic life is desired, the following water quality parameters are recommended:

- DO equal to or more than 5.0 mg/L
- pH in the range of 6.5 to 9.0
- Temperature not greater than 90º F

Water quality parameters used to evaluate drinking water for public water supplies include the following secondary criteria:

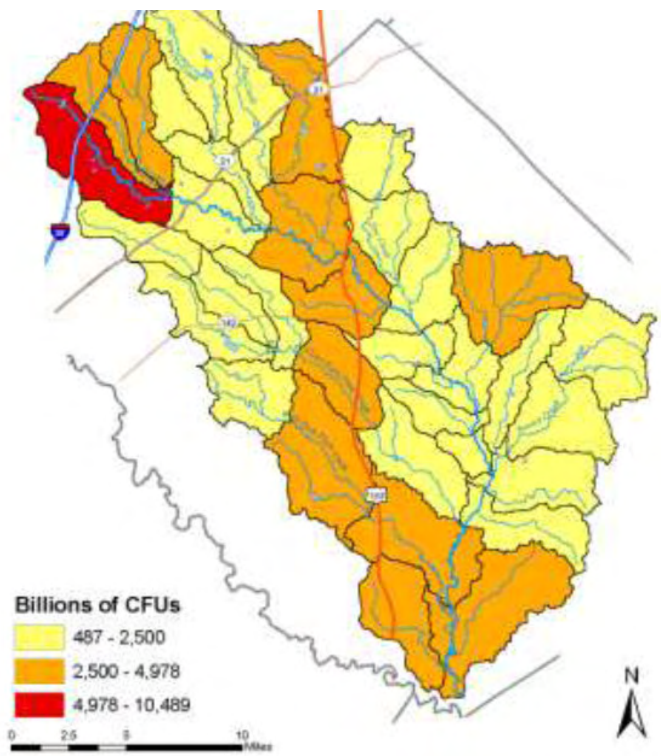
- Chloride not more than 300 mg/L
- Sulfate not more than 300 mg/L
- Total Dissolved Solids not more than 1000 mg/L

14.5 Impairment Locations

Through SELECT modeling in the Plum Creek WPP, subwatersheds were identified that have the greatest potential to contribute specific pollutant parameters. For example, in ***Exhibit 14-1*** E.coli was identified to have the potential to contribute the specified amounts in Billions of CFUs in the delineated watersheds. The E.coli loads were based on average bacteria production rates and the concentration of a source within a subwatershed. The exhibit is taken from the Plum Creek WPP and illustrates one of many parameters analyzed for Daily Potential Loads.

Exhibit 14-1

Total Average Daily Potential E.coli Load



Source: Plum Creek Watershed Protection Plan

14.6 Recommended Load Reductions

Load Duration Curves in the Plum Creek WPP, prepared by the Texas AgriLife Extension Service, indicate both point and non-point pollution sources should be reduced. Water quantity and quality monitoring stations at Lockhart and Luling provided flows and water quality data used to compute existing pollutant loads. The recommended allowable pollutant loads were subtracted from the existing loads to determine the load reduction required. The recommended pollutant load reductions as a percentage of existing loads are shown in ***Table 14-1.***

TABLE 14-1
Pollution Reduction Needed

Location	Parameter		
	E.coli Bacteria	Phosphorus	Nitrate
Lockhart	65%	27%	43%
Luling	15%	49%	80%

14.7 Proposed Management Measures

The proposed management measures identified in the Plum Creek WPP are specific to Plum Creek but can be implemented in parts of the county that are not within the Plum Creek Watershed. The measures are intended to reduce bacterial loads but will also influence the reduction in nutrient loads. Nutrient loads associated from urban landscaping and cropland will also be addressed. Additionally, management measures will also focus on the reduction of phosphorus loads.

Naturally occurring nitrate in groundwater has been reported to discharge into Plum Creek and create impaired water quality conditions (nitrate concentrations exceed desired limits). Management efforts directed at nitrates should be focused on ensuring that additional nitrates from non-groundwater sources are not added to streams and measures are implemented to prevent further increases in nitrate concentrations in groundwater.

14.7.1 Urban Stormwater Management Measures

A workgroup from the Plum Creek WPP specified implementation goals and placed emphasis on programs consistent with Municipal Separate Storm Sewer System (MS4) requirements. **Appendix I** lists the city specific measures to be implemented in Lockhart and Luling.

A study, "Predicting Effect of Urban Development on Water Quality in the Cities of New Braunfels, San Marcos, Seguin and Victoria" was completed in November 2000 by PBSJ. The study developed a series of equations to predict the impact of impervious cover on concentrations of four water quality parameters in stormwater runoff. These formulas may be useful in predicting water quality impacts from the construction of impervious cover in watersheds and assist in determining pollutant removal required as part of a construction permit.

The formulas are:

Total Suspended Solids in mg/L, TSS: TSS = 10^(2.41+(0.0149 IC))
Total Nitrogen in mg/L, TN: TN = 1.08+(0.0564* IC)
Total Phosphorus in mg/L, TP: TP = 0.0231*IC
Fecal Coliform, FC in CFU/100mL: FC = 10^(4.0+(0.0229* IC))

Where IC is impervious cover expressed as a percentage, ^ is the symbol for exponential and * is the symbol for multiplication.

It should be noted that the calculated concentration is an "Event Mean Concentration" (EMC) which is defined as a flow-weighted average. The EMC is used because the concentration of any parameter varies greatly in a storm event as the hydrograph rises (the first flush event), crests and falls in the trailing limb of the hydrograph.

14.7.2 Water Quality Development Ordinances and Policy

Several water quality guidelines can be implemented at the local level to effectively control non-point source pollution and point source pollution. Local governments have a responsibility to the community to develop sound and practical policies that will improve the quality of life. The uneducated, uninformed, and unwilling require nudges to comply. Growing and developing cities have an opportunity to guide, plan, and manage growth. Policies and procedures recommended to provide water quality protection and are not limited to:

- Buffer Ordinances
- Open/ Natural Space Conservation
- Tree Ordinance
- Zoning Ordinances
- BMP Ordinances
- Stringent OSSF Ordinances

These water quality ordinances and policy practices can be accomplished through the development and implementation of a Master Plan for the City that clearly defines buffer areas and open space conservation that protects natural areas. Widths of buffers can be based on contributing drainage areas and their location relative to a stream centerline. The plan should also define development practices through zoning requirements and provide guidance on tree protection and preservation.

Providing comprehensive site planning and pre-development reviews can ensure compliance and the review of water quality measures being incorporated into the design of the site. The preliminary reviews should demonstrate the technical elements that support the operation and maintenance of the water quality measures.

14.8 Structural BMPs for Discharges from Developed Land

Discharges from developed land can be managed through the implementation of structural BMPs. Structural BMPs that can offset the impact of development on water quality can include:

- Infiltration Systems
- Detention/ Sedimentation Basins
- Vegetative Filter Strips
- Vegetative Swales
- Riparian Buffers
- Rain Gardens

A long term operation and maintenance plan should be included in the design and construction of the BMPs. Funding and maintenance schedules should also be included prior to approval of construction.

14.8.1 Infiltration Systems

Infiltration systems are designed to filter out particulates as water percolates through the soil, infiltrating the ground over some area and period of time. Infiltration systems include porous pavement, infiltration basins and trenches. Due to the removal efficiency and potential for migration, this system may not be appropriate over ground water sources.

14.8.2 Detention/ Sedimentation Basins

Detention/Sedimentation Basins are utilized to capture storm water and are effective at removing suspended constituents such as sediment. They can remove up to approximately 80% of suspended solids.

14.8.3 Vegetative Filter Strips

Vegetative filter strips are land areas that are designed to treat stormwater for the purpose of removing sediment and other pollutants. The strips are effective in shallow sheet flow. For concentrated flow, design measures should be taken to distribute the flow and dissipate energy and reduce flow velocity. Vegetative filter strips generally remove suspended particulates and limited dissolved constituents. Vegetated filter strips should be used in series with other BMPs

14.8.4 Vegetative Swales

Grassy swales are vegetated channels that convey stormwater and remove pollutants by filtering, settlement and infiltration through soil. They require shallow slopes and soils that drain well and are limited to light and moderate flows. The swales can be easily integrated into landscaping plans. The placement of these swales along roadside ditches has proven to be effective.

14.8.5 Riparian Buffers

Riparian forest buffers combine trees, shrubs, and native grasses to remove sediment and chemicals from runoff before they reach a waterway. The width of the buffer strips can vary from 35-100 feet depending on slope, soil type, adjacent land use, floodplain, and type of vegetation. The buffers, once established need to be maintained and monitored yearly to remain effective.

14.8.6 Rain Gardens

Rain gardens are man-made depressions in the ground that forms a small bioretention area. The landscaping of the area improves the water quality by filtering the water that is slowly absorbed by the soil. These gardens are functional when placed strategically to intercept water runoff. Placement of these gardens in new proposed development can be accomplished cost-effectively. The rain garden will add value to the home as well as providing a water quality measure.

14.9 Agricultural Best Management Practices

In 1998, the national water quality inventory indicated that 59% of the impaired river miles were a result of agriculture that included crop production, animal operations, and pastures and rangeland. Many agricultural producers are unaware of the practices that may cause impairment to water quality and may require assistance to implement the recommended practices. The following recommendations are presented to assist in reducing the impacts of livestock operations on water quality:

- Utilize rotational grazing – assists in reducing soil erosion
- Develop off-stream water sources for livestock – helps develop and maintain healthy riparian vegetation that filters nutrients and sediment
- Composting of solids – use methods that prevent leaching of fluids or produce runoff to streams
- Accumulate and store manure appropriately – store away from ditches and streams; kept covered to prevent leaching of bacteria and nutrients
- Protect water supply sources - locate wells upgradient from confinement areas
- Plant and maintain buffer zone vegetation - use buffer areas around manure storage and along drainageways and streams
- Armor heavy use areas - use armoring materials to prevent soil erosion in heavily used areas
- Use livestock fences– prevent overgrazing and protect riparian buffers
- Use anaerobic digestion of waste to recover energy

- Use constructed wetlands to capture and treat runoff
- Use bio-filtration to control odor, gas, and dust emissions from facilities
- Use sequencing batch reactor for nitrogen management – nitrogen removal
- Protect groundwater sources from contaminated water sources by installing liners to protect groundwater and allow water to evaporate

Recommendations for crop operations to improve water quality include:

- Use crop rotation to reduce soil loss and prevent nutrient depletion
- Control sediment using straw mulch to reduce erosion and prevent nutrient loss
- Plant streamside buffers to reduces nutrient pollution into streams
- Manage manure and nutrient applications so they are evenly applied as needed by crop type
- Apply fertilizers and chemicals in accordance with soil and plant needs to prevent excess nutrients and chemicals being washed into streams or percolating to groundwater
- Test manure to assist in establishing appropriate levels of manure application and guide fertilizer applications
- Test soils to prevent over application of nutrients
- Schedule irrigation based on crop needs, soil type, climate, topography, and infiltration rates to reduce run-off caused by over-watering

Assessments of the current practices in the county should be identified through survey mailings and questionnaires. Identification of the agricultural practices will determine the needs of the area and assist in developing guides to assist farmers and crop producers.

14.10 Public Education/ Outreach

Public involvement facilitates interest and education while spreading the word. As citizens become informed and educated about the community initiatives they are more likely to participate and volunteer in programs. Public awareness and acceptance are crucial for the political and financial sustainability of water quality programs and efforts by local governments. Specific public education efforts include:

TV Commercials	Newspaper prints
Flyers	Poster Contest
Brochures	Photo Contest
Essay Contest	Billboard Announcements
Workshops	HOA Newsletters
Adopt-a-Stream	Stream Plantings

14.11 Municipal Practices and Good Housekeeping

Activities and efforts by municipalities to participate in pollution prevention and good housekeeping are:

- Municipal Training and Education
- Parking Lot and Street Cleaning
- Municipal Landscaping
- Roadway Maintenance
- Spill Response and Prevention
- Hazardous Waste Pick-up and Drop-off days

The proactive efforts in establishing good housekeeping policies contribute to maintaining healthy streams and rivers by preventing pollution that would otherwise reach our waters.

14.12 Implementation Recommendations for the CCRWQPP

The following elements are recommended for implementation in Caldwell County to assist in improvement of existing water quality in degraded streams and prevent water quality degradation of streams in the future:

- Point Discharge Load Reductions
- Stormwater Filter Strips Along Streams
- Water Quality Remediation Associated with Impervious Cover Installation
- OSSF Inspection and Certification

14.12.1 Point Discharge Load Reductions

Wastewater treatment plant discharges represent a continuous point source of pollutants discharging into streams. Two practices can materially impact the pollutant discharge loading to streams. Producing "higher" quality of water for discharge will reduce loading and implementing reuse of reclaimed water can reduce loading.

Higher quality of discharge water refers to improving the treatment processes within a treatment plant to remove additional pollutants before the treated water is discharged to the stream. The effluent pollutant limits for wastewater treatment plants are established in permits issued by the TCEQ and based on the quality of the discharge and its impact on the receiving waters. The permits consider the ability of the stream to assimilate the pollutants discharged into it without lowering the water quality in the stream below the standards established for the reaches of stream below the outfall.

The larger wastewater treatment plants in the county are operated by the City of Lockhart and the City of Luling. The total existing plant capacity for Lockhart is 2.6 mgd and for Luling it is 1.4 mgd.

The existing wastewater treatment plant discharge parameters for these plants are shown in ***Table 14-2***:

Table 14-2				
Wastewater Treatment Plant Permit Parameters				
Parameter	**Lockhart Plant 1**	**Lockhart Plant 2**	**Luling Plant 1**	**Luling Plant 2**
Permitted Flow Capacity, mgd	1.1	1.5	0.5	0.9
$BOD_{5,}$ mg/l	-	-	20	-
$CBOD_{5,}$ mg/l	10	10	-	10
NH^3 as N, mg/l	3	3	-	3
Dissolved Oxygen, mg/l	4	5	2	5
Total Suspended Solids, mg/l	15	15	20	15

As the quality of discharge from wastewater treatment plants is raised to a higher standard, it becomes cost effective to implement water reclamation and a water reuse program. The following explanations provide information regarding implementation of a water use program.

Water reuse is the beneficial use of reclaimed water. Examples of water reuse include irrigation, cooling, or washing.

Reclaimed water is domestic or municipal wastewater which has been treated to a quality suitable for beneficial use.

Reclaimed water is not the same as ***greywater*** which is untreated, non-toilet, and household water including water from sinks, showers, and baths.

Type I reclaimed water is defined as use of reclaimed water where contact between humans and the reclaimed water is likely. Examples include landscape irrigation at individual homes or on public golf courses, fire protection, toilet or urinal flushing, and irrigation of pastures for milking animals.

Type II reclaimed water is defined as reclaimed water where contact between humans and the water is unlikely. Examples of Type II use include dust control, cooling tower applications, irrigation of food crops where the reclaimed water is not expected to come in direct contact with the edible part of the crop, and maintenance of impoundments or natural water bodies where direct human contact is not likely.

Direct use means the beneficial use of reclaimed water that has been transported from the point of production to the point of use without intervening discharge to waters of the state.

Indirect use means the beneficial use of reclaimed water that has been transported from the point of production to the point of use with an intervening discharge to waters of the state.

Bed and Banks Permit refers to authorization from the State of Texas to discharge water to waters of the state and subsequently recover that water at a downstream point. Water moved under a bed and banks permit cannot degrade the quality of water in the state waters, must not impact existing water rights, must not negatively impact instream uses, aquatic or riparian habitats or freshwater flows to bays and estuaries.

The use of reclaimed water in Texas is governed by TCEQ Chapter 210 (Use of Reclaimed Water) which provides for the quality criteria, design, and operational requirements for the beneficial use of reclaimed water.

Benefits of using reclaimed water include:

- The water is less expensive to use or to treat and users benefit from the savings
- It is a drought-proof source of water

- It is a source of water that automatically increases with increased economic activity and population growth
- It conserves traditional sources of water such as groundwater and surface water.

Disadvantages of using reclaimed water include:

- Water reuse may be seasonal in nature and can result in the overloading of treatment and disposal facilities during off seasons
- Reclaiming wastewater for reuse requires a treatment system which could result in higher initial costs
- Public acceptance of what some may consider as "dirty water" may be hard to overcome
- The end use for the reclaimed water can be located at a distance from the source and require a conveyance and distribution system that adds to the cost of the reclaimed water

If the wastewater plants produce Type I reclaimed water for reuse, the discharge parameters would be as follows in ***Table 14-3***:

Table 14-3
Reclaimed Water Quality Parameters

Parameter	Type I Reclaimed Water	Type II Reclaimed Water
BOD_5	5 mg/l	20 mg/l
$CBOD_5$	5 mg/l	15 mg/l
Turbidity	3 NTU	No Requirement
Fecal Coliform	20 CFU/100 ml*	200 CFU/100 ml*
Fecal Coliform (not to exceed)	75 CFU/100 ml**	800 CFU/100 ml**

* geometric mean
** single grab sample

Pollutant loading to streams from existing and future wastewater treatment plants can be meaningfully reduced and minimized by implementing two practices. These are:

- Renovate existing wastewater treatment plants and construct future wastewater treatment plants to produce and discharge effluent that has less pollutant load
- Produce reclaimed water that can be diverted for reuse away from streams

Renovating existing treatment plants to produce higher quality effluent can reduce pollutant loading for organic loading, nutrient loading and bacterial loading. If a goal is established for treatment plants to produce Type I reclaimed water, pollutants loads can be reduced as illustrated in Table ***14-4***. If reuse of reclaimed water is implemented, there will be additional reductions in pollutant loading to streams. ***Table 14-5*** illustrates the load reductions if the existing treatment plants are upgraded and 50 percent of the reclaimed water is reused and the remaining 50 percent is discharged to streams.

Table 14-4
Annual Pollutant Load to Streams for Upgraded Existing Wastewater Treatment Plants

Plant	Permitted Flow Capacity, mgd		$CBOD_{5,}$ pounds per year		Total Suspended Solids, pounds per year		NH^3 as N, pounds per year	
	Existing	Upgraded	Existing 10 mg/l	Upgraded 5 mg/l	Existing 15 mg/l	Upgraded 5 mg/l	Existing 3 mg/l	Upgraded 2 mg/l
Lockhart 1	1.1	1.1	33,503	16,751	50,254	16,751	10,051	6,701
Lockhart 2	1.5	1.5	45,685	22,843	68,528	22,843	13,706	9,137
Luling 1	0.5	0.5	30,457*	7,614	30,457**	7,614	4,569***	3,046
Luling 2	0.9	0.9	27,411	13,706	41,117	13,706	8,223	5,482
Total	4	4	137,056	60,914	190,356	60,914	36,549	24,366

**Based on 20 mg/l for BOD_5
** Based on 20 mg/l for Total Suspended Solids
*** Based on 3 mg/l for NH^3 as N, permit has no limit

The pollutant load reduction from the upgrade of existing treatment plants for the shown parameters would be:

- $CBOD_5$ or BOD5 (with 5 mg/l as limit): 76,412 pounds per year
- Total Suspended Solids (with 5 mg/l as limit): 129,442 pounds per year
- NH^3 as N (with 2 mg/l as limit): 12,183 pounds per year

Table 14-5
Annual Pollutant Load to Streams for Upgraded Existing Wastewater Treatment Plants with 50 Percent Reuse of Reclaimed Water

Plant	Permitted Flow Capacity, mgd		$CBOD_5$, pounds per year		Total Suspended Solids, pounds per year		NH^3 as N, pounds per year	
	Existing	Upgraded with Reuse	Existing 10 mg/l	Upgraded 5 mg/l with Reuse	Existing 15 mg/l	Upgraded 5 mg/l with Reuse	Existing 3 mg/l	Upgraded 2 mg/l with Reuse
Lockhart 1	1.1	0.55	33,503	8,376	50,254	8,376	10,051	3,350
Lockhart 2	1.5	0.75	45,685	11,421	68,528	11,421	13,706	4,569
Luling 1	0.5	0.25	30,457*	3,807	30,457**	3,807	4,569***	1,523
Luling 2	0.45	0.9	27,411	6,853	41,117	6,853	8,223	2,741
Total	4	2	137,056	30,457	190,356	30,457	36,549	12,183

**Based on 20 mg/l for BOD_5
** Based on 20 mg/l for Total Suspended Solids
*** Based on 3 mg/l for NH^3 as N, permit has no limit

The pollutant load reduction from the upgrade of existing treatment plants and implementing reuse of 50 percent of the reclaimed water for the shown parameters would be:

- $CBOD_5$ or BOD5 (with 5 mg/l as limit): 106,599 pounds per year
- Total Suspended Solids (with 5 mg/l as limit): 159,899 pounds per year
- NH^3 as N (with 2 mg/l as limit): 24,366 pounds per year

Future growth in Caldwell County will increase wastewater production to an estimated 10.2 mgd. If 70 percent of the wastewater is treated by regional wastewater treatment plants, the volume of wastewater produced will be 7.1 mgd. If 50 percent of the reclaimed water is reused, the wastewater to be discharged to streams will be 3.6 mgd. If Type I reclaimed water is produced, the future pollutant loading will be less than the current loading. Table ***14-6*** illustrates this comparison.

Table 14-6
Comparison of Future Changes to Annual Pollutant Load to Streams

Year	Portion of Permitted Flow Discharged to Streams, mgd	$CBOD_5$, pounds per year	Total Suspended Solids, pounds per year	NH^3 as N, pounds per year
2010*	4	137,056	190,356	36,549
2040**	3.6	54,822	54,822	21,929
Difference	0.4	82,234	135,534	14,620

* Based on existing discharge pollutant limits
** Based on Type I Reclaimed Water and 50 % reuse of reclaimed water

14.12.2 Stormwater Filter Strips Along Streams

Stormwater runoff produces significant pollutant loading for streams in Caldwell County. Vegetated filter strips adjacent to streams can provide significant stormwater treatment as overland flow passes through the filter strips.

It is recommended that entities in Caldwell County that have regulatory authority implement requirements for filter strips adjacent to streams. The filter strips should be on each side of the stream with the width of the filter strip being measured from the top of bank for the stream. The recommended filter strips widths are presented in ***Table 14-7***.

Table 14-7 Vegetated Filter Strip Width Requirements	
Drainage Area of Stream at Design Point, Acres	**Filter Strip Width, Feet**
0 to 10	10
>10 to 100	25
>100	50

14.12.3 Water Quality Remediation Associated with Impervious Cover Installation

Increased stormwater runoff associated with installation of impervious cover results in increased pollutant loading associated with the stormwater. Capturing and filtering the "first-flush" runoff can significantly reduce pollutant loads. In addition, development rules that encourage limited impervious cover on tracts should be utilized.

It is recommended that entities in Caldwell County (those that have regulatory authority) implement requirements for limited impervious cover on tracts and requirements to capture and filter first flush runoff. The recommended impervious cover limits and filter requirements are presented in ***Table 14-8***.

Table 14-8 Impervious Cover Filtration Requirements	
Impervious Cover Percentage	**Volume of Water to Be Filtered, Inches**
0 to 20	0.00
>20 to 50	0.50
>50 to 80	0.75
>80 to 100	1.00

14.12.4 OSSF Annual Inspection and Certification

Failed OSSFs can be significant sources of bacteria and other pollutants for streams. In addition, improperly constructed, operated and/or maintained OSSFs can be contributors to bacteria and pollutants in streams.

Each entity responsible for permitting OSSFs should implement inspection and recertification programs. The frequency of inspection and recertification should be based the type of facility being served by each OSSF. ***Table 14-9*** presents the recommended program.

Table 14-9

Frequency of OSSF Inspection and Recertification Program

Type of System	Frequency of Self Inspection with Report to Regulatory Entity, years	Recertification by Regulatory Entity, years
Single Family Residential	2	5
Multiple Family Units	1	3
Commercial	1	3
Other	Established at Permitting	Established at Permitting

SECTION 15

REGIONAL WATER QUALITY IMPLEMENTAION

15.1 General

Regional implementation will require county, city, district, and local officials to be engaged and committed to the success of the planning strategies. Caldwell County has an opportunity to create new development standards that include stormwater, landscaping, and natural resource protection before development growth escalates. Unmanaged development and lack of natural resources protection will permit further deterioration of waterways.

Preservation of the natural resources will be accomplished by developing stormwater management policies, development ordinances, regional cooperation, and funding.

15.2 Stormwater Management Implementation

Training and education of personnel at the management and staff level of the EPA's water quality and TMDL standards is necessary for understanding stormwater pollution. Technical staff reviewing and approving development permits need to have some knowledge of nonpoint source pollution and the effects if uncontrolled.

- Development of a Stormwater Management Manual – policy manual that covers principles in design and construction of permanent structural controls for stormwater runoff. Instruction to staff on policies and procedures to improve plan review. Having staff understand the design of low-impact and smart-growth developments can benefit developers and investors in planning.

- Water Quality Monitoring Program – test and monitor stormwater runoff and establish a database with results. The establishment of a database and mapping system can track and monitor development contributions to water quality.

- Water Quality Technical Committee – the committee role could be to develop standards for local governments such as:

  - Sampling methods
  - Monitoring of data collected
  - Establishment of database
  - Data management

- Stormwater Operations and Maintenance – management program to ensure proper drainage and pollutant removal efficiency. Inspection and maintenance of drainage structures and conveyance systems. Development of a plan for routine and remedial maintenance with an emergency containment plan in the event of a hazardous spill.

- Hazardous Household Waste Collection Program – provide accessible recycling centers or drop off locations for the disposal of hazardous household items.

- Agricultural Management Programs – provide tools for agricultural producers to remain profitable while protecting natural resources. Such tools could be:

  - On farm research and demonstration of BMP's
  - Pilot projects that evaluate or transfer technology
  - Conduct interviews and collect data
  - Educate and increase awareness of local practices
  - Workshops on new technology

Additional management measures recommended for implementation in the Plum Creek Watershed Protection Plan have been included in **Appendix J.**

15.3 Development of Ordinances

Many cities currently have ordinances that monitor and control stormwater quality and quantity. Ordinances include:

- Stormwater Development Ordinance – management of runoff quality and quantity
- Illegal Stormwater Connection Ordinance – prevents illegal connections to stormwater systems
- Floodplain Development Ordinance – management of flood prevention and mitigation
- Buffer Ordinance – control of runoff near streams by listing the type of developments allowed near floodplains/streams/creeks and give buffer width recommendations for each type of development or land use
- Greenspace Conservation Ordinance – control of impervious cover development
- Tree Ordinance – control of tree canopy reduction for developments

15.4 Regional Agreement

An agreement established by local governments in Caldwell County will ensure that all entities are informed about the proposed regional practices and development of facilities**.** A Regional Compact has been included in **Appendix K**.

15.5 Funding

Funding to implement the recommended strategies requires community leaders to actively and rigorously apply for grants and search for monies available to execute strategies. Local, state, and federal sources are expected to fully fund programs. The EPA, TCEQ, TWDB, the Natural Resources Conservation Service (NRCS) and additional Foundations and Partnerships offer possible funding sources.

- **Agriculture Best Management Practices (BMP) Loans**

  Develop low to no interest loans to producers for BMP implementation and new technology that enhances animal agriculture. This option will need to be developed for Texas. Currently, the Virginia Department of Environmental Quality and Minnesota Department of Agriculture provide these funding services. Further investigation to develop this program is required at the state or county.

- **Agriculture Water Conservation Grants and Loans**

  State agencies and political subdivisions of the state are eligible for the grants and loans made available to political subdivisions of the state, institutions of higher education, interstate compact commissions, and nonprofit water supply corporations (Chapter 69 of Water Code). Banks and farm credit system may apply for link deposit funds to make loans available to individuals.

- **Clean Water State Revolving Fund (CWSRF)**

  The CWSRF provides funding for water quality projects that are associated with wastewater treatment, nonpoint source pollution control, and watershed and estuary management. Funds are available through full grants and low-interest loans with flexible terms for planning, acquisition and construction, wastewater treatment, stormwater and nonpoint source pollution control, and reclamation/reuse projects.

- **Economically Distressed Area Program**

  The TWDB provides grants, loans or a combination for water and wastewater services in areas of economic distress where current facilities are inadequate to meet residents' minimum standards.

- **Environmental Quality Incentives Program (EQIP)**

  The Environmental Quality Incentives Program (EQIP), implemented by the NRCS, offers financial and technical assistance for application of structural and management BMP's on agricultural land.

- **Drinking Water State Revolving Fund**

  The Drinking Water State Revolving Fund (DWSRF) program awards capitalization grants to states to provide low-cost loans to public water supply systems for infrastructure needed to achieve or maintain SDWA compliance. These loans and additional subsidies are available for disadvantaged communities only. Community water system owners, political subdivisions of the state and private individuals are eligible to apply for the funding.

- **Environmental Educational Grants**

  The Environmental Educational Grants provide funding for educational projects that enhance the public's awareness, knowledge, and skills to help people make informed decisions that affect environmental quality.

- **EPA Smart Growth Grants**

  Limited grants are occasionally offered by the EPA to support activities that improve the quality of developments and protect human health and the environment. Funding for the program ranges between $2 and $3 million with average grants in the $15,000 to $25,000 range.

- **Foundations and Partnerships**

  Over 200 Foundations and Partnerships are listed in the National Council for Science and the Environment that can provide an additional source of funding. Numerous funding opportunities were also listed at the National Science Foundation.

- **Federal Clean Water Act Grant Program (Section 319(h))**

  Under the Federal Act Grant Program, the USEPA appropriates funds to TCEQ to fund nonpoint source pollution management. Administered funds are used to assess nonpoint sources of pollution, provide education and outreach, develop and implementing watershed protection plans, implement nonpoint source portions of TMDL Implementation Plans, and implement both the technology-based and water-quality-based management measures contained in the coastal nonpoint pollution control programs.

- **General Revenues**

  A fee based on the amount of runoff to tie into the local MS4 can be allocated through a development permit. Bond sales, development impact fees and stormwater user fee are other alternatives and options. Property taxes and sales taxes can also be a source of contribution.

  Several bond types are currently available to provide financing. Depending on goals, tax situation and risk tolerance, the options available are: municipal, government, corporate, asset-backed, securities and international bonds.

Development impact fees can be applied at the application stage of development. Fees can be based on site acreage, location, and type of development.

Stormwater user fees can be assessed on a one time basis or annually depending on discharge rate and quality of runoff. Fees can be appropriated to fund O&M programs.

The general tax revenue fund may have available monies for to develop and/or maintain programs.

- **Privatization**

  Privatization involves partnering with the private sector to plan, finance and develop, operate and maintain facilities for the public sector. Contracts outline the obligations and agreements of the responsible party.

- **Supplemental Environmental Project Program**

  The Supplemental Environmental Project Program (SEP) provides funds collected through penalties and fines. Instead of applying monies to the State's General Revenue Fund, TCEQ will apply them toward remediation and improvements in the environmental quality of the region where the fines were collected.

- **Targeted Watersheds Grants Program**

  The Targeted Watershed Grants Program funds are designed to encourage successful community-based approaches and management techniques to protect and restore watersheds. The awarded funds have been given on a competitive basis for water quality trading, agricultural best management practices, wetland and riparian restoration, nutrient management, fish habitat restoration and public outreach and education. The stakeholders of the watershed organizations should include various types of community leaders from educational to political and non-profit affiliations.

- **Water Quality Management Plan Program**

  The Water Quality Management (WQMP) Plan program is implemented by the Texas State Soil and Water Conservation Board (TSSWCB) for the development of a site specific plan. The TSSWCB determines the level of pollution prevention or abatement that is consistent with the state's water quality standards. The methods for meeting these standards include appropriate land treatment practices, production practices, management measures, technologies or combinations thereof.

- **Water Pollution Control Program Grants (Section 106)**

  The Water Pollution Control Program funds ongoing water pollution control programs that include permitting, pollution control activities, surveillance, monitoring, and enforcement; advice and assistance to local agencies, and the provision of training and public information.

SECTION 16

SUMMARY OF RECOMMENDATIONS FOR WATER AND WASTEWATER FACILITIES

16.1 Introduction

The following paragraphs summarize the general facilities plans for water and wastewater treatment that resulted from the Caldwell County Regional Water and Wastewater Planning Study.

16.2 Recommended Regional Water Supply Facilities

The recommended regional water supply facilities are those that will be developed to utilize water made available under a proposed conjunctive-use groundwater-surface water project to be developed by the GBRA. This project, known as the Mid-Basin Project, was not included in the 2006 Region L Plan and a request has been made by GBRA to add the project to the 2011 Region L Plan.

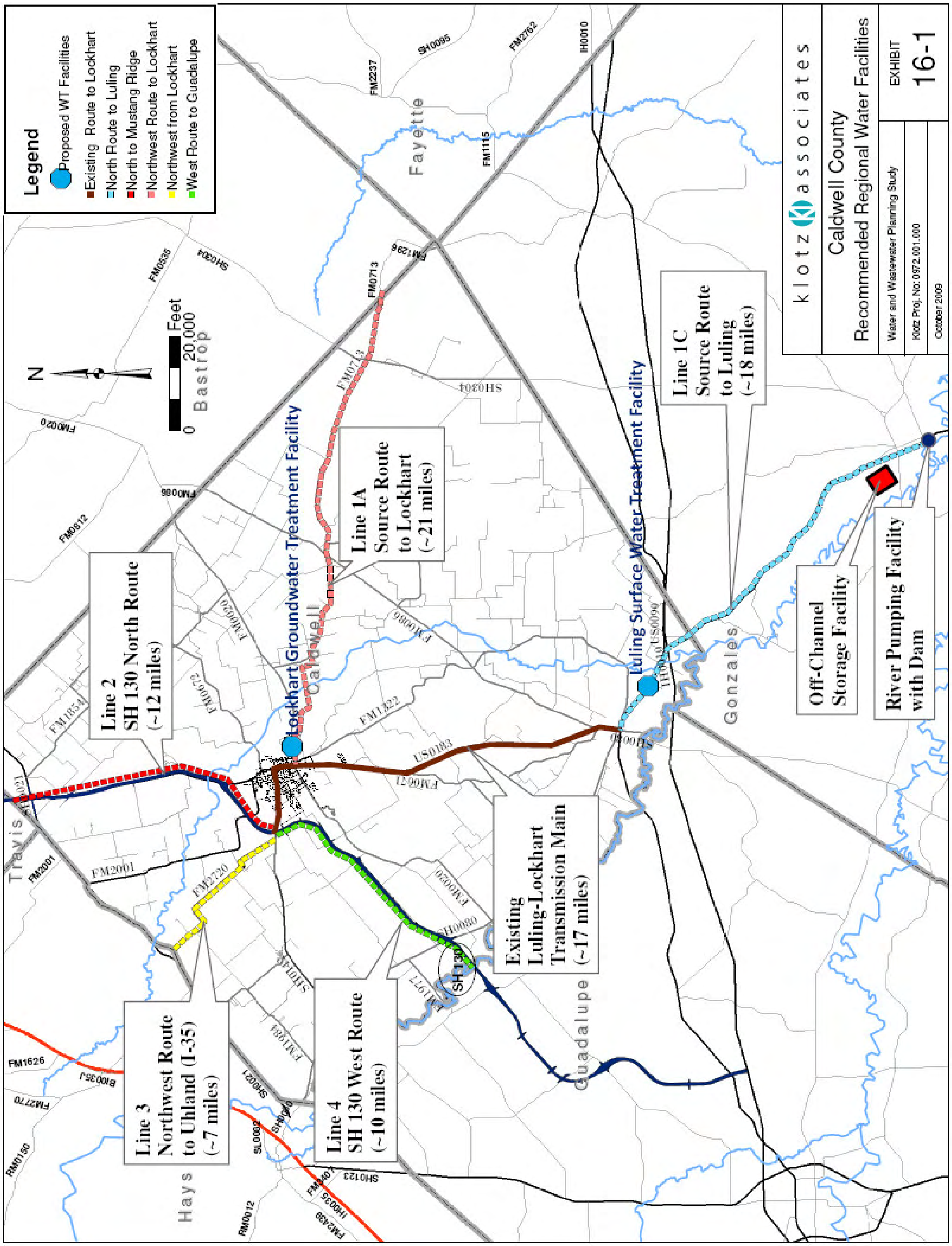
The proposed Mid-Basin Project will provide 25,000 ac-ft to customers of Caldwell, Comal, Gonzales, Guadalupe, and Hays Counties. The source of water will be primarily surface water from the Guadalupe River with a point of diversion below the confluence of the San Marcos River. The water in the river at the proposed diversion point is not considered firm yield unless it is backed up with off channel storage or a groundwater source. Off-channel storage in Guadalupe County is being considered for the Mid-Basin Project as well as a secondary source of supply from the Carrizo and/or Wilcox Aquifers in west-central or northeast Gonzales County.

The advantage of the Mid-Basin Project compared to the proposed Hays-Caldwell PUA Project is the ability of the Mid-Basin Project to draw on either surface water or groundwater to meet future water supply needs. Redundancy in water sources is an important part of a long-term water supply plan to buffer impacts from droughts, aquifer management rules and potential pollutant contamination of water sources.

Exhibit 16-1 presents the features of the recommended regional water supply plan. The primary features include:

- River pumping plant with dam to create pumping pool in Guadalupe River for scalping flood flows
- Off-channel storage reservoir near river pumping plant to provide water delivery system water balance
- Carrizo Aquifer Well Field in southern Caldwell/northeastern Gonzales Counties
- Pipeline (approximately 18 miles) to convey raw surface water from off-channel storage reservoir to Luling
- New surface water treatment plant at Luling
- Pipeline (approximately 21 miles) to convey unchlorinated groundwater from Carrizo well field to Lockhart
- New groundwater treatment plant at Lockhart
- Pipeline (approximately 12 miles) to convey treated water north from Lockhart along SH 130
- Pipeline (approximately 10 miles) to convey treated water west from Lockhart along SH 130
- Pipeline (approximately 7 miles) to convey treated water north from Lockhart along FM 2720
- Use existing pipeline from Lockhart to Luling to move water in either direction as demands and supplies are balanced

The majority of the stakeholders attending the regional planning meetings supported either the proposed Mid-Basin Project or the HCPUA Project. The


Legend
Proposed WT Facilities
Existing Route to Lockhart
North Route to Luling
North to Mustang Ridge
Northwest Route to Lockhart
Northwest from Lockhart
West Route to Guadalupe
N
0 20,000 Feet
klotz associates
Caldwell County
Recommended Regional Water Facilities
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
October 2009
EXHIBIT
16-1
Lockhart Groundwater Treatment Facility
Luling Surface Water Treatment Facility
Line 1A
Source Route
to Lockhart
(~21 miles)
Line 1C
Source Route
to Luling
(~18 miles)
Line 2
SH 130 North Route
(~12 miles)
Line 3
Northwest Route
to Uhland (I-35)
(~7 miles)
Line 4
SH 130 West Route
(~10 miles)
Existing
Luling-Lockhart
Transmission Main
(~17 miles)
Off-Channel
Storage Facility
River Pumping Facility
with Dam
Travis
Hays
Bastrop
Caldwell
Fayette
Gonzales
Guadalupe

Mid-Basin Project and associated facilities were recommended for implementation. There was no voiced or written opposition to the Mid-Basin Project but the owners of the HCPUA project have expressed that they will continue to move the HCPUA project forward.

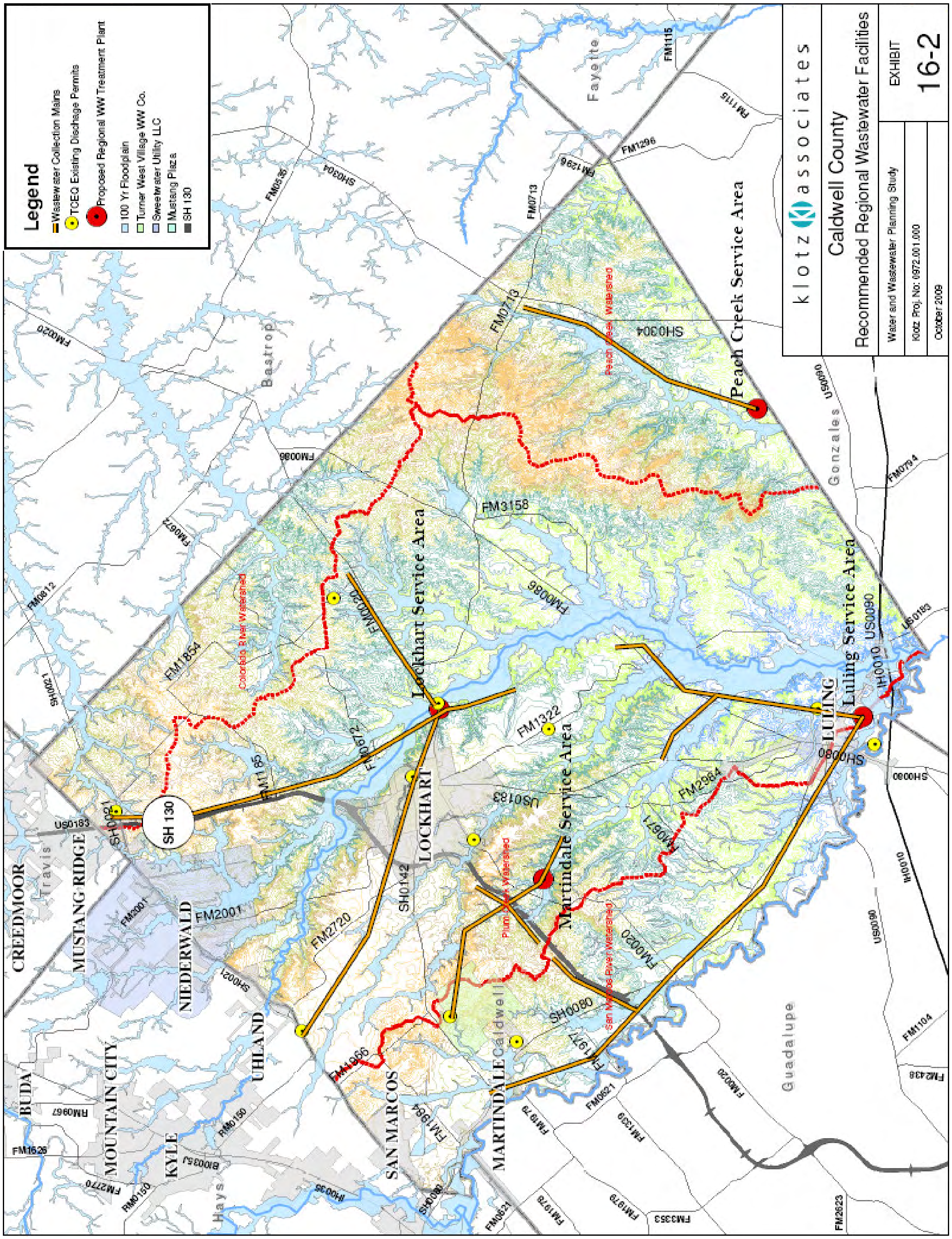
16.3 Recommended Regional Wastewater Treatment Facilities

The recommended regional wastewater treatment facilities are based on a regionalization concept that will ultimately provide four regional wastewater facilities in the county. These facilities will be sized and phased to accommodate growth and enable reuse of reclaimed water.

Exhibit 16-2 presents the features of the recommended regional wastewater treatment plan. The primary features include:

- Wastewater treatment plant at Lockhart
- Wastewater treatment plant at Martindale
- Wastewater treatment plant at Luling
- Wastewater treatment plant in Peach Creek Basin
- Regional wastewater collection pipelines with downstream connectivity

The majority of the stakeholders attending the regional planning meetings supported either the proposed regional plan or a decentralized plan of multiple smaller treatment plants throughout the County. The large plant regionalization plan was recommended for implementation. There was no voiced opposition to the large plant regionalization plan but there is growing interest in the decentralized treatment plant concepts.


Legend
Wastewater Collection Mains
TCEQ Existing Dischage Permits
Proposed Regional WW Treatment Plant
100 Yr Floodplain
Turner West Village WW Co.
Sweetwater Utility LLC
Mustang Plaza
SH 130
klotz associates
Caldwell County
Recommended Regional Wastewater Facilities
Water and Wastewater Planning Study
Klotz Proj. No: 0972.001.000
October 2009
EXHIBIT
16-2
Peach Creek Service Area
Lockhart Service Area
Martindale Service Area
Luling Service Area
LOCKHART
LULING
MARTINDALE
SAN MARCOS
KYLE
BUDA
MOUNTAIN CITY
UHLAND
NIEDERWALD
MUSTANG RIDGE
CREEDMOOR
SH 130

Appendix A

Caldwell County Stakeholder Sign-In Sheets

Caldwell County Regional Water and Wastewater Planning Study

Kick-off Meeting - September 25, 2008
Sign in Sheet

Group	Here	Contact	Address	City	Email
Texas State Soil & Water Conservation Board	✓	Pam Casebolt & Aaron Wendt	P. O. Box 658	Temple, Texas 76503-0658	awendt@tsswcb.state.tx.us pcasebolt@tsswcb.state.tx.us
Tri-Community Water Supply Corporation		Tommy Forester	92 Ward Street	Fentress, Texas 78622	tri-commwater@hwtx.com
Turner Crest		Bob Richards	100 E. San Antonio St., Suite 103A	San Marcos, Texas 78666	brichards@ccias.com
Creedmoor- Maha WSC		Charles Laws	12100 Laws	Buda, TX 78610-9607	
Luling Independent School District		Mark Weisner	212 E. Bowie	Luling, TX 78648	
San Marcos Consolidated Independent School District		Dr. Patty Shafer	P.O. Box 1087	San Marcos, TX 78667	

Caldwell County Regional Water and Wastewater Planning Study

Kick-off Meeting - September 25, 2008
Sign in Sheet

Group	Here	Contact	Address	City	Email
Texas Water Development Board	✓	Matt Nelson	P.O. Box 13231	Austin, Texas 78711-3231	mnelson@twdb.state.tx.us
Hays County		Liz Sumter, County Judge	111 E. San Antonio, Suite 300	San Marcos, Texas 78666	
Guadalupe County		Mike Wiggins, County Judge	307 W. Court Street	Seguin, Texas 78155	
Gonzales County		David Bird, County Judge	414 St. Joseph St., Suite 200	Gonzales, Texas 78629	
Bluebonnet Electric	✓	Tommy Frizzell	650 Hwy 21E	Bastrop, TX 78602	
Bluebonnet Electric	✓	Joyce Buckner	1916 W. San Antonio St.	Lockhart, TX 78644	

Caldwell County Regional Water and Wastewater Planning Study

Kick-off Meeting - September 25, 2008
Sign in Sheet

Group	Here	Contact	Address	City	Email
County Line Water Supply Corporation	✓	Daniel Heideman	~~140 Grist Mill Road~~ 1315 Camino Real	~~Kyle~~, Texas 78640 Uhland	heideman@clws.com 512-398-4748
Crystal Clear Water Supply Corporation	✓	Mark Speed	2370 FM 1979	San Marcos, Texas 78666	mark@crystalclearwsc.com
Envision Central Texas		Jim Walker	P.O. Box 17848	Austin, Texas 78760-7848	info@envisioncentraltexas.org
Envision Central Texas	✓	Sally Campbell, Executive Director	P.O. Box 17848	Austin, Texas 78760-7848	info@envisioncentraltexas.org
Gary Job Corp		Bob Elsey	P.O.Box 967	San Marcos, Texas 78666	elsey.bob@jobcorp.com
GoForth Water Supply Corporation		Mario Tobias	8900 Niederwald Strasse	Kyle, Texas 78640	mario@goforthwater.org
Gonzales County Water Supply Corporation		~~Barry Miller~~ ✓ [illegible]	1903 E. Sarah DeWitt Drive	Gonzales, Texas 78629	
Lockhart Independent School District		Dr. Jose Parra	P.O.Box 120	Lockhart, Texas 78644	

Caldwell County Regional Water and Wastewater Planning Study

Kick-off Meeting - September 25, 2008
Sign in Sheet

Group	Here	Contact	Address	City	Email/Phone no.
Aqua Water Supply Corporation	✓	John Burke	P.O. Box P	Bastrop, Texas 78602	jburke@aquawsc.com
Caldwell County	✓	H. T. Wright	110 S. Main St.	Lockhart, Texas 78644	htwright@lockharttx.net or marie.cavanagh@co.caldwell.tx.us
Canyon Regional Water Authority	✓	David Davenport	850 Lakeside Pass	New Braunfels, Texas 78130	crwa@crwa.com
City of Lockhart		James Bertram	P.O. Box 239	Lockhart, Texas 78644	jbertram@lockhart-tx.org
City of Lockhart	✓	Vance Rogers	P. O. Box 239	Lockhart, Texas 78644	vrodgers@lockhart-tx.org
City of Luling		Bobby Berger	509 E. Crockett	Luling, Texas 78648	
City of Luling		Mike Hendricks	509 E. Crockett	Luling, Texas 78648	mhendricks5@austin.rr.com
City of Martindale		Patricia Petersen	P. O. Box 365	Martindale, Texas 78655	bethh@martindaletexas.org

Caldwell County Regional Water and Wastewater Planning Study

Kick-off Meeting - September 25, 2008
Sign in Sheet

Group	Here	Contact	Address	City	Email
Prairie Lea Independent School District		Mr. Jesse Lopez	6910 San Marcos Hwy	Prairie Lea, TX 78661	
Edwards Aquifer Authority	✓	Mr. Mark Taylor, Board Member – District 11	~~1615 N. St. Mary's Street~~ 130 E Sierra Circle	~~San Antonio, TX 78215~~ San Marcos TX 78666	markbtaylor@grandecom.net
Hays Caldwell Public Utility Agency	✓	Graham Moore	400 West Hopkins, Suite 203	San Marcos, TX 78666	gmmoore@lan-inc.com
Gonzales County Groundwater Conservation District	✓	Greg Sengelmann	P.O.Box 1919	Gonzales, Texas 78629	gcuwcd@gvec.net
Caldwell County Environmental Enforcement		Robert Hall	405 E. Market Street	Lockhart, Texas 78644	
Oscar Fogle	✓	GBRA Director	3146 Westwood Road	Lockhart, Texas 78644	oscar@fogle.org

Caldwell County Regional Water and Wastewater Planning Study

Kick-off Meeting - September 25, 2008
Sign in Sheet

Group	Here	Contact	Address	City	Email
Luling Foundation Farm	✓	Mike Kuck	523 S. Mulberry	Luling, Texas 78648	lffmanager@sbcglobal.net
Maxwell Water Supply Corporation		Mike Hurlbert	P.O.Box 158	Maxwell, Texas 78656	
Plum Creek Conservation District	✓ ✓	Johnie Halliburton Daniel Meyer	1403 Blackjack Street, Suite 3	Lockhart, Texas 78644	pccdjohnie@~~austin.rr.com~~pccd.org info@pcd.org
Plum Creek Watershed Partnership		Nikki Dictson	355A Heep Center 2474 TAMU	College Station, Texas 77843-2474	n-dictson@tamu.edu
Polonia Water Supply Corporation	✓ ✓	Paul Pittman Joe Kelly	P. O. Box 778	Lockhart, Texas 78644	paulp@ctxu.net
San Marcos River Foundation		Dianne Wassenich	11 Tanglewood St.	San Marcos, Texas 78666	wassenich@sanmarcos.net
South Central Texas Water Planning Group		Con Mims	Nueces River Authority P.O.Box 349	Uvalde, Texas 78802	
Texas Commission on Environmental Quality Region 11		Claudia Chaffin	2800 South IH 35, Suite 100	Austin, Texas 78704	cchaffin@tceq.state.tx.us

Austin Pittman, Pres. of Board, Polonia WSC
502 Old Lytton Springs Rd.
Lock

398-2857

Griselda Gonzales
7550 IH 10 West Suite 300
S.A. Tx
(210) 736-0425
griselda.gonzales@klotz.com

Alan Thompson
Klotz Associates
alan.thompson@klotz.com

Pamela Hohman
Eastern Caldwell Co. Landowners
pamelahohman@gmail.com
830 540 3727

Caldwell County Water and Wastewater Planning Study
Advisory Group Meeting 2

klotz associates

SIGN IN SHEET

Please verify information and check next to name. Please add a contact phone number where you can be reached. Add contact information if not listed. Thank you.

Organization	Address/Phone #	Attendees	✓	Email
Texas State Soil & Water Conservation Board	PO Box 658 Temple, Texas 76503-0658	Pam Casebolt		pcasebolt@tsswcb.state.tx.us
		Aaron Wendt		awendt@tsswcb.state.tx.us
Texas Water Development Board	PO BOX 13231 Austin, Tx 78711-3231	Matt Nelson		mnelson@twdb.state.tx.us
~~Bluebonnet Electric~~	~~650 Hwy 21E Bastrop, Tx 78602~~	~~Tommy Frizzell~~		
Bluebonnet Electric	1916 W San Antonio St. Lockhart Tx, 78644	Joyce Buckner	✓	joyce.buckner@bluebonnet electric.coop?
County Line Water Supply Coorporation	131~~6~~ South Camino Real Uhland, Texas 78640	Daniel Heideman 512-738-2073	✓	heidman@clws.com
Crystal Clear Water Supply corporation	2370 FM 1979 San Marcos, Texas 78666	Mark Speed	✓	
Envision Central Texas	PO Box 17848 Austin, Texas 78760-7848	Sally Campbell		info@envisioncentraltexas.org scampbell@envisioncentraltexas.org
Aqua Water Supply Corporation	PO Box P Bastrop, Tx 78602	John Burke		
Caldwell County	110 S Main St Lockhart Tx, 78644	HT Wright	✓	htwright@lockharttx.net
		Tom Bonn	✓	tbonn71@gmail.com
Canyon Regional Water Authority	850 Lakeside Pass New Brausfels, Texas 78130	David Davenport		crwa@crwa.com
		Craig Hines		chines@gvec.net
City of Lockhart	PO Box 239 Lockhart Tx, 78644	Vance Rogers		vrodgers@lockhart-tx.org
Edwards Aquifer Authority	130 E Sierra Circle San Marcos, Texas 78666	Mark Taylor	✓	markbtaylor@grandecom.net
Hays Caldwell Public Utility Agency	400 West Hopskins, Ste 203 San Marcos, Texas 78666	Graham Moore		gmmoore@lan-inc.com
Gonzales County Graoundwater Conservation District	PO Box 1919 Gonzales, Texas 78629	Greg Sengelmann		gcuwcd@gvec.net
GBRA	3146 Westwood Road Lockhart Tx, 78644	Oscar Fogle, GBRA Director		oscar@fogle.org
GBRA	3146 Westwood Road Lockhart Tx, 78644	Bill West		gm@gbra.org
		Debbie Magin		dmagin@gbra.org
Luling Foundation	523 Mulberry Luling, Texas 78648	Mike Kuck		lffmanager@sbcglobal.net
Plum Creek Conservation District	1403 Blackjack St, Ste B Lockhart Tx, 78644	Johnie Halliburton	✓	[redacted]johnie@pccd.org
		Daniel Meyer	✓	info@pccd.org

Caldwell County Water and Wastewater Planning Study
Advisory Group Meeting 2

klotz associates

Polonia Water SupplyCorporation	PO Box 778 Lockhart Tx, 78644	Paul Pitman Joe Kelly Austin Pittman, Board President	✓	paulp@ctxu.net
Eastern Caldwell County Landowner		Pamela Hobman		pamelahohman@gmail.com
Klotz Associates Inc.	7550 IH-10 West, Ste 300 San Antonio, Texas 78229 210-736-0425	Alan Thompson, PE Griselda Gonzales		alan.thompson@klotz.com griselda.gonzales@klotz.xom
CITY OF MARTINDALE	P.O. BOX 365 MARTINDALE TX 78655	PATRICIA PETERSEN MAYOR		epHemera@austin.rr.com
Prairie Lea ISD	6910 San Marcos Hwy Prairie Lea TX 78661	Jesse Lopez Superintendent	✓	jesus.lopez@prairielea.txed.net
Lockhart ISD	P.O. Box 120 Lockhart, TX 78644	Jose Parra, Supt. Ed Sheppard, Principal		jose.parra@lockhart.txed.net ed.sheppard@lockhart.txed.net
City of Luling	509 E. Crockett Luling, Tx. 78648	Bobby Berger Chris Powell		publicworks@cityofluling.net
Creedmoor Maha WSC	12100 Laws Rd. Mustang Ridge TX 78610	Charles L Laws Gen. Manager		CharlesPLaws.AOL.com
Plum Creek ~~[illegible]~~ Watershed Partnership	2474 TAMU College Station, Tx 77843-2474	Nikki Dictson	✓	ndictson@ag.tamu.edu
CITY OF SAN MARCOS/ HCPUA	630 E. HOPKINS SAN MARCOS, TX 78666	TOM TAGGART		taggart_tom@ci.san-marcos.tx.us
Gonzales Co. W.S.C.	P O Box 749 Gonzales, Tx	Barry Miller		bmiller@gvec.net

Appendix B

Caldwell County Regional Water and Wastewater Planning Study Utility Survey

Utility Survey
Caldwell County Water and Wastewater Planning Study Survey

Utility Name ____

Interview Completed By ______________________________________

Date ______________________________

Do you supply ☐ **Potable Water Service** ☐ **Wastewater Collection and Treatment**

Under what law or statue was utility created?____

____

____

General Information – Please consider only services to Caldwell County

What are your sources of water (please check all that apply):

- ☐ **Groundwater – self produced – permitted annual volume:**______________
- ☐ **Groundwater – purchased from others – permitted annual volume:**__________
- ☐ **Surface Water – own water rights/self treat – maximum annual volume:**_______
- ☐ **Surface Water – buy raw from others/self treat – maximum annual volume:**_____
- ☐ **Surface Water – buy treated water from others - maximum annual volume:**_____
- ☐ **Other (describe):** ______________________________________

____

____

Please List Certificates of Convenience and Necessity (CCN) that your utility holds for water.

Number	**Date Granted**
____________	____________________
____________	____________________
____________	____________________
____________	____________________

For Calendar Year 2008, what was your average daily water delivery? _____________mgd

What is your historic peak day volume for water delivery? ____________mgd that occurred on ____________________(month, day, year)

Please provide the following water use data:

Calendar Year	Volume of Water Pumped into System	Volume of Water Billed
2008	__________________Million Gallons	___________Million Gallons
2007	__________________Million Gallons	___________Million Gallons
2006	__________________Million Gallons	___________Million Gallons
2005	__________________Million Gallons	___________Million Gallons
2004	__________________Million Gallons	___________Million Gallons

Please provide the following customer data:

Calendar Year	Residential Meters	Commercial/ Industrial Meters	Other Meters
January 1, 2009	________________	________________	_______________
January 1, 2008	________________	________________	_______________
January 1, 2007	________________	________________	_______________
January 1, 2006	________________	________________	_______________
January 1, 2005	________________	________________	_______________

Your Future Projections (based on your planning):

Calendar Year	Residential Meters	Commercial/ Industrial Meters	Other Meters
January 1, 2010	______________	______________	______________
January 1, 2011	______________	______________	______________
January 1, 2014	______________	______________	______________
January 1, 2019	______________	______________	______________
January 1, 2039	______________	______________	______________

Please Describe Your Water Production Facilities:

Name	Type (well, treatment plant)	Rated Capacity, mgd
__________	____________________	________________
__________	____________________	________________
__________	____________________	________________
__________	____________________	________________
__________	____________________	________________
__________	____________________	________________
__________	____________________	________________
__________	____________________	________________
__________	____________________	________________

Population Information – Please consider only population in Caldwell County

Based on the information you have available, can you estimate:

Calendar Year	**Estimated Population in your service area in Caldwell County**
January 1, 2009	___________________________________
January 1, 2008	___________________________________
January 1, 2007	___________________________________
January 1, 2006	___________________________________
January 1, 2005	___________________________________

Future Projections (based on your planning):

Calendar Year	**Estimated Population in your service area in Caldwell County**
January 1, 2010	___________________________________
January 1, 2011	___________________________________
January 1, 2014	___________________________________
January 1, 2019	___________________________________
January 1, 2039	___________________________________

Please list your top five water users (in annual volume of water consumed):

1. ______________________________________ ______________**million gallons/year**

2. ______________________________________ ______________**million gallons/year**

3. ______________________________________ ______________**million gallons/year**

4. ______________________________________ ______________**million gallons/year**

5. ______________________________________ ______________**million gallons/year**

Please list any NDEPS permits you hold for your water production facilities:

Number	**Date Granted**	**Permitted Volume**
________________	__________________________	______________**million gallons/year**

________________ ____________________________ ______________**million gallons/year**

________________ ____________________________ ______________**million gallons/year**

________________ ____________________________ ______________**million gallons/year**

Water Quality

Please describe any quality issues or concerns you have experienced with your source water:

Do you have any recurring potable water quality issues that are related to your source water?

Describe any concerns you may have regarding point source discharges and non-point source pollution that occurs in Caldwell County that may impact water quality.

Water Conservation

What measures have you implemented to encourage water conservation?

What future measures are being considered to encourage water conservation?

____

____

____

My utility has a state approved drought contingency plan. ☐ Yes. Date of Plan _____________
☐ No

Plans for the Future

Please describe any plans (available options) that will be considered or implemented to support future growth.

____

____

____

Please describe any planned additions, changes, and/or upgrades for water production facilities.

____

____

____

Wastewater Services

If you are wastewater service provider, how do you operate? (Please check all that apply)

- **☐ Own and operate wastewater collection system**
- **☐ Own and operate wastewater treatment plant**
- **☐ Own wastewater treatment plant operated by others**
- **☐ Other (describe): ____**

____

____

Please List Certificates of Convenience and Necessity (CCN) that your utility holds for wastewater.

Number	**Date Granted**
____________	______________________
____________	______________________
____________	______________________
____________	______________________

For Calendar Year 2008, what was your average daily wastewater flow treated (if multiple plants, please break out by plant)? ______________________________________mgd

What is your historic peak day volume for wastewater water treatment? ____________mgd that occurred on ____________________(month, day, year)

Please provide the following water use data:

Calendar Year	Volume of Wastewater Treated	Volume of Water Billed
2008	_____________Million Gallons	___________Million Gallons
2007	_____________Million Gallons	___________Million Gallons
2006	_____________Million Gallons	___________Million Gallons
2005	_____________Million Gallons	___________Million Gallons
2004	_____________Million Gallons	___________Million Gallons

Please provide the following data regarding sewer connections:

Calendar Year	Residential Sewer	Commercial/ Industrial Sewer	Other Sewer
January 1, 2009	________________	________________	_______________
January 1, 2008	________________	________________	_______________
January 1, 2007	________________	________________	_______________
January 1, 2006	________________	________________	_______________
January 1, 2005	________________	________________	_______________

What are your future projections for sewer connections? (Based on your planning)

Calendar Year	Residential Sewer	Commercial/ Industrial Sewer	Other Sewer
January 1, 2010	________________	________________	_______________
January 1, 2011	________________	________________	_______________
January 1, 2014	________________	________________	_______________
January 1, 2019	________________	________________	_______________
January 1, 2039	________________	________________	_______________

Please Describe Your Wastewater Treatment Facilities:

Name	Type of Treatment Plant	Rated Capacity, mgd

Please list your top five wastewater producers (in annual volume of wastewater):

1. ______________________________ ___________**million gallons/year**

2. ______________________________ ___________**million gallons/year**

3. ______________________________ ___________**million gallons/year**

4. ______________________________ ___________**million gallons/year**

5. ______________________________ ___________**million gallons/year**

Please list any NDEPS Permits you hold for your wastewater treatment facilities:

Number	Date Granted	Permitted Volume
____________	____________________	___________**million gallons/year**
____________	____________________	___________**million gallons/year**
____________	____________________	___________**million gallons/year**
____________	____________________	___________**million gallons/year**

Do you re-use treated wastewater and/or do you have plans to do so?

Please describe any wastewater treatment plans (available options) that will be considered or implemented to support future growth?

Please describe any planned additions, changes, and/or upgrades for wastewater treatment facilities.

Other

Please provide any other comments pertinent to the study:

Appendix C

Water Quality Standards

APPENDIX C

The following tables are found in 30 TAC 290 Subchapter F: Drinking Water Standards. Refer to this section of the Texas Administrative Code (TAC) for further details on drinking water standards.

Secondary Constituents

Summary of Secondary Standards	
CONTAMINANT	**LEVEL (mg/l except where otherwise stated)**
Chloride	300
Flouride	2.0
Iron	0.3
Manganese	0.05
Sulfate	300
Total Dissolved Solids	1,000

Inorganic Contaminants

Inorganic Contaminants	
CONTAMINANT	**MCL (mg/l)**
Nitrate	10 (as Nitrogen)
Nitrate	1 (as Nitrogen)
Nitrate & Nitrate (Total)	10 (as Nitrogen)

Appendix D

TWDB Groundwater Quality Report

Texas Water Development Board
Groundwater Database Reports

groundwater resources division

Water Quality Publication Report

County: Caldwell

State Well Number	Aquifer	Depth	Date	B/U	pH	Silica	Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarb.	Sulfate	Chloride	Fluoride	Nitrate	Dissolved Solids	Spec. Cond umhos	Hardness as CaCO3	% Sodium	SAR	RSC
5860703	124WLCX	49	2 / 27/ 1946	U							0	65.9	28	41		62						
5860704	124WLCX	18	2 / 27/ 1946	B	7.2	35	46	6.7	36	4.6	0	152.54	20	51	0.2	9.8	284	470	142	35	1.29	0
5860705	124WLCX	44	6 / 11/ 1946	U							0	84	13	102		41						
5860706	124WLCX	26	6 / 11/ 1946	U							0	328	16	84		2.2						
5860707	124WLCX	150	1 / 9 / 1964	B	7.6	16	24	7.8	c 150		0	334.09	37	74	0.6	0	473	795	92	78	6.77	3.64
5860709	124WLCX	180	7 / 19/ 1977	B	7.6	29	50.6	9.97	103		0	219.66	44	115	0.3	2.4	462	846	167	57	3.45	0.25
6702503	110AVML	29	6 / 13/ 1946	U							0	270	16	16		30						
6702507	110AVML	21	6 / 12/ 1946	U							7.9	230	20	16		41						
6702601	110AVML	19	6 / 12/ 1946	U							12	202	32	26		34						
6702602	110AVML	21	6 / 12/ 1946	U							9.8	144	13	28		60						
6702603	110AVML	35	6 / 13/ 1946	U							11	231	25	27		55						
6702702	100ALVM	27	2 / 26/ 1968	B	7.3	19	98	7	30		0	339.26	20	22	0.3	7	370	680	273	19	0.79	0.09
6702703	100ALVM	31	2 / 26/ 1968	B	7.2	20	130.2	8.5	57.3		0	345.36	58	55	0.4	72	571	1038	359	25	1.3	0
6702704	110AVML	31	3 / 28/ 1946	U							0	294	65	71		59						
6702705	110AVML	22	3 / 28/ 1946	U							0	286	34	64		47						
6702706	110AVML	25	3 / 28/ 1946	U							0	356	65	141		176						
6702707	100ALVM	26	2 / 26/ 1968	B	7.3	18	106.4	7.66	27.8		0	356.34	27	18	0.5	13	393	716	297	16	0.71	0
6702708	100ALVM	29	2 / 28/ 1968	B	7.1	18	201	21	180		0	339.26	211	334	0.5	16.5	1148	2272	587	39	3.23	0
6702801																						

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State Well Number	Aquifer	Depth	Date	B/U	pH	Silica	Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarb.	Sulfate	Chloride	Fluoride	Nitrate	Dissolved Solids	Spec. Cond umhos	Hardness as CaCO3	% Sodium	SAR	RSC
	100ALVM	22	2 / 14/ 1946	B			122	5.1	c 38		0	268.07	40	81		40	457	891	325	20	0.92	0
6702902	112LEON	25	3 / 28/ 1946	U							0	264	110	358		58						
6702905	112LEON	24	3 / 29/ 1946	U							0	248	65	239		38						
6702908	112LEON	20	7 / 18/ 1976	B	7.2	17	133.6	5.5	44.4		0	405.15	35	57	0.4	5.8	497	924	356	21	1.02	0
6703301	124WLCX	20	6 / 11/ 1946	U							0	340	1150	1240								
	124WLCX	20	7 / 19/ 1977	B	7.8	24	514	215	660		0	817.63	1788	808	1.5	1.3	4413	8344	2167	39	6.17	0
6703303	124WLCX	67	6 / 11/ 1946	U							0	298	24	54		0						
6703304	124WLCX	72	2 / 27/ 1946	U							0	336	85	560		1.5						
6703401	110AVML	14	6 / 12/ 1946	U							0	308	65	32		25						
6703402	110AVML	30	6 / 12/ 1946	U							0	284	54	70		33						
6703601	124WLCX	49	4 / 12/ 1946	U							0	412	80	94		0.5						
6703602	124WLCX	35	6 / 11/ 1946	U							0	340	765	148								
6703603	124WLCX	26	6 / 11/ 1946	U							0	338	430	800								
6703703	112LEON	29	1 / 24/ 1946	U							0	326	46	22		26						
6703704	218EDRDA	3367	2 / 20/ 1964	B	6.9	17	894	433	c 2480		0	547.15	2130	4770			10993	15800	4012	57	17.03	0
6703705	112LEON	23	1 / 25/ 1946	U							0	278	45	27								
6703706	112LEON	23	7 / 14/ 1943	U										195								
	112LEON	23	8 / 23/ 1943	U										209								
	112LEON	23	1 / 25/ 1946	U							0	274	60	42		16						
6703707	112LEON	23	1 / 24/ 1946	U							0	272	26	20		20						
6703708	112LEON	16	1 / 24/ 1946	U							0	253	35	26								
6703709	112LEON	17	1 / 24/ 1946	U							0	282	26	38		39						
6703711	112LEON	31	1 / 24/ 1946	U							0	316	45	37		26						
6703712	112LEON	22	1 / 24/ 1946	U							0	298	45	30								

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State Well Number	Aquifer	Depth	Date	B/U	pH	Silica	Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarb.	Sulfate	Chloride	Fluoride	Nitrate	Dissolved Solids	Spec. Cond umhos	Hardness as CaCO3	% Sodium	SAR	RSC
6703713																						
	112LEON	17	1 / 24/ 1946	U							0	303	90	100								
6703715																						
	112LEON	12	3 / 28/ 1946	U							0	310	34	32		30						
6703717																						
	112LEON	25	7 / 14/ 1943	U										370								
	112LEON	25	8 / 23/ 1943	U										390								
	112LEON	25	1 / 25/ 1946	U							0	251	70	191								
6703718																						
	112LEON	21	1 / 25/ 1946	U							0	276	32	45								
6703719																						
	112LEON	21	1 / 25/ 1946	U							0	260	22	30								
6703720																						
	112LEON	25	8 / 23/ 1943	U										30								
	112LEON	25	1 / 25/ 1946	U							0	274	28	32		48						
6703721																						
	112LEON	28	7 / 2 / 1943	B			158	12	c 121		0	299.08	127	215		32	812	1380	443	37	2.5	0
	112LEON	28	7 / 14/ 1943	U										210								
	112LEON	28	8 / 23/ 1943	U										197								
	112LEON	28	1 / 25/ 1946	U							0	320	70	155								
	112LEON	28	6 / 20/ 1964	B	6.8	21	119	9	c 80		0	314.09	54	112	0.4	45	594	986	334	34	1.9	0
6703722																						
	112LEON	15	1 / 25/ 1946	U							0	277	40	29								
6703723																						
	112LEON	21	7 / 14/ 1943	B			252	9	c 112		0	226.07	108	402		55	1049		665	26	1.89	0
	112LEON	21	1 / 25/ 1946	U							26	306	60	102								
6703801																						
	112LEON	15	3 / 16/ 1943	B	7.2	17	142	7.05	c 75		0	273.08	49	160	0.4	53	637		383	29	1.67	0
	112LEON	15	3 / 31/ 1944	B	7.2	20	142	7	c 70		0	292.88	69	128	< 0.4	55	635		383	28	1.56	0
	112LEON	15	4 / 3 / 1945	B	7.5	21	125	8	c 86		0	298.98	70	91	0.4	106	654		344	35	2.01	0
	112LEON	15	2 / 8 / 1946	B	7.3	14	126	6.1	54	12	0	322.09	47	82	< 0.4	54	553	941	339	25	1.28	0
	112LEON	15	8 / 12/ 1947	B	7.2	19	122	14	c 25		0	336.1	47	43	0.2	40	475		362	13	0.57	0
	112LEON	15	5 / 4 / 1951	B	7.4	21	107	7	c 50		0	336.1	49	43	0.2	23	465		295	26	1.26	0
6703802																						
	112LEON	25	3 / 16/ 1943	B	7.1	25	420	29	c 304		0	223.07	187	1030	< 0.4	20	2125		1167	36	3.87	0
	112LEON	25	4 / 2 / 1944	B	7.2	32	343	21	c 276		0	241.07	292	724	< 0.4	27	1833		942	38	3.91	0
	112LEON	25	4 / 3 / 1945	B	7.2	32	346	25	c 359		0	250.07	370	781	0.5	71	2107		966	44	5.02	0
	112LEON	25	2 / 8 / 1946	B	7.4	12	246	15	269	15	0	293.08	321	465	0.6	60	1547	2560	675	46	4.5	0
	112LEON	25	8 / 12/ 1947	B	7.5	25	158	11	c 212		0	342.1	263	224	0.2	38	1099		439	51	4.4	0
	112LEON	25	7 / 16/ 1951	B	7.5	20	109	7	c 116		0	329.09	141	85	0.3	22	662		300	45	2.91	0
6703803																						
	112LEON	15	11 / 29/ 1938	B	7.7	27	168	15	c 99		0	290.08	86	211	0.4	89	838		480	30	1.96	0
	112LEON	15	3 / 16/ 1943	B	7.1	24	286	19	c 167		0	183.05	121	604	0.4	35	1346		791	31	2.58	0
	112LEON	15	3 / 31/ 1944	B	7.2	30	285	18	c 204		0	250.07	220	540	< 0.4	44	1464		785	36	3.17	0

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	112LEON	15	4 / 3 / 1945	B	7.2	23	207	14	c 199		0	281.08	200	355	0.4	84	1220		574	42	3.61	0
	112LEON	15	2 / 8 / 1946	B	7.4	15	166	10	147	11	0	308.09	174	218	0	60	952	1600	455	41	3	0
	112LEON	15	8 / 12/ 1947	B	7.4	21	133	13	c 121		0	329.09	141	142	0.2	40	773		385	40	2.68	0
	112LEON	15	5 / 4 / 1951	B	7.6	24	104	8	c 116		0	323.09	109	103	0.5	27	650		292	46	2.95	0
	112LEON	15	1 / 7 / 1963	B	7.5		114	9	85		0	311.09	72	101	0.3	54	588	1140	321	36	2.06	0
	112LEON	15	1 / 12/ 1965	B	7.5		120	9	89		0	330.71	80	104	0.6	48	613	1145	336	36	2.11	0
	112LEON	15	2 / 22/ 1966	B	7.6		112	7	77		0	295.32	69	84	0.6	39	533	1020	308	35	1.91	0
	112LEON	15	5 / 12/ 1967	B	7.4		115	6	78		0	294.1	66	97	0.6	33	540	1050	311	35	1.92	0
	112LEON	15	2 / 15/ 1968	B	7.5		116	9	83		0	322.17	89	98	0.5	32	585	1113	326	35	2	0
	112LEON	15	2 / 17/ 1969	B	7.4		114	10	66		0	297.76	66	84	0.6	39.5	526	996	325	30	1.59	0
	112LEON	15	4 / 13/ 1970	B	7.2		122	8	71		0	298.98	73	100	0.5	31	552	1057	337	31	1.68	0
	112LEON	15	2 / 15/ 1971	B	7.3		131	11	71		0	286.78	65	131	0.4	39	589	1141	372	29	1.6	0
	112LEON	15	2 / 17/ 1972	B	7.4		122	9	78		0	292.08	73	111	0.5	40	577	1120	341	33	1.84	0
	112LEON	15	7 / 19/ 1977	B	7.5	21	130	7.9	54		0	352.68	48	79	0.4	20.9	534	987	357	24	1.24	0
6703804																						
	112LEON	25	5 / 4 / 1951	B	7.6	21	88	9	c 106		0	311.19	96	78	0.4	26	577		256	47	2.88	0
	112LEON	25	2 / 22/ 1966	B	7.4		102	11	63		0	285.56	65	66	0.5	42	489	930	299	31	1.58	0
6703805																						
	112LEON	21	7 / 14/ 1943	U										262								
	112LEON	21	8 / 23/ 1943	U										315								
	112LEON	21	1 / 29/ 1946	U							0	361	60	162								
6703806																						
	112LEON	29	7 / 14/ 1943	U										88								
	112LEON	29	8 / 23/ 1943	U										84								
	112LEON	29	1 / 29/ 1946	U							0	278	34	43		61						
6703807																						
	112LEON	24	1 / 24/ 1946	U							0	381	90	72								
6703808																						
	112LEON	18	1 / 29/ 1946	U							0	268	95	93		165						
6703809																						
	112LEON	28	1 / 29/ 1946	U							0	332	105	292								
6703810																						
	112LEON	30	1 / 24/ 1946	U							0	340	230	327								
6703811																						
	112LEON	35	1 / 25/ 1946	U							0	330	40	46								
6704202																						
	124WLCX	27	8 / 7 / 1946	U							0	317	46	38		0						
6704401																						
	124WLCX	128	4 / 12/ 1946	U							24	460.07	90	408		2.5						
6704501																						
	124WLCX	120	7 / 27/ 1953	U		47					0	159	137	119	0.1	0.2	653	1090				
	124WLCX	120	2 / 12/ 1962	B	7	49	194	20	c 81		0	264.07	332	128	0.2	0	934	1330	566	23	1.48	0
6704502																						
	124WLCX	110	3 / 14/ 1946	B	7.4	36	132	18	36	17	0	376	72	85	0	0.8	581	961	403	16	0.78	0

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6704503																						
	124WLCX	70	4 / 12/ 1946	U							0	100	75	374		5.5						
	124WLCX	70	1 / 13/ 1970	B	7	43	73	13.5	65	5	0	112.27	28	189	0.1	4.5	476	903	237	37	1.83	0
	124WLCX	70	7 / 19/ 1977	B	7.1	49	83	15.7	73		0	137.9	27	196	0.1	10.9	522	1008	271	36	1.92	0
6704504																						
	124WLCX	150	8 / 7 / 1946	U							0	339	60	44		0						
6704506																						
	124WLCX	97	8 / 7 / 1946	U							0	332	45	101								
6704511																						
	124WLCX	323	4 / 29/ 1978	B	7.8		120.1	27.2	108		0	285.56	151.5	181	0.4	0	728	1150	411	36	2.32	0
	124WLCX	323	10 / 21/ 1992	B	7.19	31	87	22	92	7.3	0	285.56	125	107	0.58	< 0.04	612	963	308	39	2.28	0
6704512																						
	124WLCX	336	6 / 5 / 1998	B	6.95	42.6	107	20.8	73.8	3.79	0	258.71	113	121	0.11	< 0.22	610	1114	353	31	1.71	0
	124WLCX	336	3 / 25/ 2002	B	7.08	38.2	96.6	19	72.8	3.41	0	262.37	102	115	0.25	0.18	577	970	319	33	1.77	0
	124WLCX	336	6 / 14/ 2006	B	7.2	33.5	103	20.5	72.4	3.3	0	268.47	108	113	0.3	< 0.44	587	843	342	32	1.7	0
6704601																						
	124WLCX	185	8 / 5 / 1946	U							0	416	220	372		0						
6704602																						
	124WLCX	174	8 / 5 / 1946	U							0	622	200	141		0						
6704605																						
	124WLCX	100	6 / 12/ 1978	B	7.7	46	68	15	90		0	250.17	50	128	0.3	< 0.4	520	959	231	45	2.57	0
6704701																						
	124WLCX	82	4 / 4 / 1947	B			118	23	c 43		0	236.06	120	116		2	538	909	389	19	0.95	0
6704709																						
	124WLCX	136	9 / 26/ 1963	B	7.1		172	45	545	16	0	305.09	725	650			2303	4044	614	65	9.57	0
6704710																						
	124WLCX	445	2 / 4 / 1952	B	7.38	22	67.2	13.5	c 65.5		0	158.6	108.6	86			440		223	38	1.91	0
6704801																						
	124WLCX	206	8 / 2 / 1946	U							0	370	26	35								
6704803																						
	124WLCX	494	10 / 11/ 1995	B	7.9		30	13	109		0	279.46	43	61	0.6	< 0.04	394	748	128	64	4.19	2.01
6704901																						
	124WLCX	327	8 / 3 / 1946	U							0	266	25	152								
6704902																						
	124WLCX	216	4 / 17/ 1946	U							12	568	480	180								
6704904																						
	124WLCX	270	11 / 6 / 1969	B	7.6	31	92	36	54	4	0	261.15	23	186	0.5	< 0.4	555	1106	377	23	1.21	0
6704905																						
	124WLCX	200	8 / 3 / 1946	U							0	352	20	76								
6704906																						
	124WLCX	295	6 / 24/ 1964	B	7.3	19	108	88	c 451		0	604.17	244	610	0.1	2	1819	3000	631	60	7.81	0
6705402																						
	124WLCX	200	8 / 5 / 1946	U							0	517	70	308								
6705701																						

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	124WLCX	165	8 / 3 / 1946	U							0	662	95	332								
6705702	124WLCX	350	8 / 5 / 1946	U							0	364	130	205								
6705703	124WLCX	160	6 / 24/ 1964	B	7	15	178	88	c 474		0	636.18	216	770	0.3	3	2057	3410	806	56	7.26	0
6705801	124CRRZ	27	6 / 24/ 1964	B	6	95	26	13	c 60		0	32.01	17	96	1.1	83	406	565	118	52	2.4	0
6705802	124WLCX	419	6 / 24/ 1964	B	7.4	38	80	16	c 99		0	236.06	4.8	200	0.2	0.2	554	1010	265	44	2.64	0
6710101	112LEON	26	2 / 0 / 1943	B	7.6	14	90	23	c 18	3.4	0	325.09	19	21	0.2	57	405	737	319	10	0.44	0
6710103	112LEON	29	6 / 13/ 1946	U							9.8	245	60	102		60						
6710104	100ALVM	23	3 / 4 / 1986	B	8.1	15	96	5.2	12	2	0	251.39	43	9	0.3	44.57	350	625	260	9	0.32	0
6710201	112LEON	25	2 / 14/ 1946	B	7.2	14	244	28	155	22	0	265.07	183	426	0.6	99	1301	2250	724	31	2.51	0
6710202	112LEON	34	4 / 9 / 1946	U							0	244	170	450		52						
6710203	100ALVM	30	6 / 20/ 1964	B	6.8	22	178	19	c 189		0	268.07	273	268	0.7	62	1143	1780	522	44	3.6	0
	100ALVM	30	8 / 18/ 1977	B	8	25	315	31	250		0	264.82	291	637	0.6	78.8	1758	3562	913	37	3.6	0
6710301	112LEON		3 / 28/ 1946	U							0	306	240	248		81						
6710501	100ALVM	35	8 / 9 / 1946	U							0	268	65	126		108						
6710502	112LEON	21	5 / 9 / 1946	U							0	420	210	443		168						
6710504	112LEON	24	4 / 8 / 1946	U							0	296	55	30		38						
6710801	100ALVM	34	2 / 13/ 1962	B	6.7	12	78	16	11	0.7	0	275.08	26	22	0.3	3.8	305	538	260	8	0.3	0
6710802	100ALVM	30	4 / 8 / 1946	U							0	391	24	28		0.5						
6710901	124WLCX	27	2 / 0 / 1943	B	8	15	67	19	c 12	3.4	0	257.08	26	20	0.6	10	299		245	9	0.33	0
6710907	124WLCX	18	4 / 3 / 1946	U							17	275	1460	467								
6710908	124WLCX	30	4 / 3 / 1946	U							0	638	340	308		231						
6711101	112LEON	20	4 / 19/ 1946	U							0	308	75	98		86						
6711104	112LEON		3 / 29/ 1946	U							0	300	36	27		19						

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6711105																						
	112LEON		1 / 30/ 1946	U							0	261	36	36		49						
6711202																						
	112LEON	28	4 / 19/ 1946	U							0	304	40	72		62						
6711203																						
	112LEON	74	3 / 20/ 1946	U							0	346	100	770		260						
6711204																						
	112LEON	29	3 / 20/ 1946	U							0	357	20	157		150						
6711301																						
	124WLCX	324	2 / 14/ 1952	B	7.35	16	85.8	9.6	c 81.2		0	373.3	27.7	67			470		253	41	2.2	1.05
6711306																						
	124WLCX	138	3 / 3 / 1964	B	7.4	33	155	22	c 177		0	486.14	66	265	0.2	24	981	1680	477	44	3.52	0
6711307																						
	124WLCX	76	4 / 16/ 1946	U							0	292	12	80		118						
6711308																						
	124WLCX	52	4 / 16/ 1946	U							0	292	15	20		20						
6711309																						
	124WLCX	100	4 / 2 / 1964	B	7	20	92	2.6	c 17		0	272.08	15	20	0.3	13	313	532	240	13	0.48	0
	124WLCX	100	7 / 20/ 1977	B	7.6	9	63	17	151		0	124.48	121	229	0.2	< 0.4	651	1305	226	59	4.36	0
6711310																						
	124WLCX	50	1 / 30/ 1946	U							0	309	16	36		32						
6711311																						
	124WLCX	110	4 / 2 / 1964	B	7.1	28	168	29	c 165		0	308.09	181	322	0.5	1.2	1046	1780	538	39	3.09	0
6711312																						
	124WLCX	2500	1 / 30/ 1946	B			66	19	c 279		0	356.1	50	358		1.2	948		242	71	7.79	0.98
6711501																						
	124WLCX	168	3 / 20/ 1946	U							0	344	140	156		0.5						
6711502																						
	124WLCX	94	3 / 20/ 1946	U							0	300	650	430		30						
6711601																						
	124WLCX	125	5 / 9 / 1958	B	7.8	32	82	5.8	c 49		0	358.1	15	17	0.4	0	377	611	228	31	1.41	1.3
6711606																						
	124WLCX	97	5 / 3 / 1946	U							15	222	14	30		85						
6711607																						
	112LEON	68	5 / 3 / 1946	U							22	214	22	35		126						
6711608																						
	112LEON	86	5 / 3 / 1946	U							29	207	16	33		130						
6711618																						
	124WLCX	35	2 / 2 / 1946	B			364	67	c 172		0	432.12	613	400		1.5	1829		1183	24	2.17	0
6711619																						
	124WLCX	168	5 / 19/ 1971	B	7.4	32	121	14	29		0	367.32	41	54	0.2	< 0.4	472	852	359	14	0.67	0
6711620																						
	124WLCX		5 / 20/ 1971	B	7.2	34	284	22	118		0	311.19	49	530	0.4	4.5	1194	2496	799	24	1.82	0
6711623																						

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State Well Number	Aquifer	Depth	Date	B/U	pH	Silica	Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarb.	Sulfate	Chloride	Fluoride	Nitrate	Dissolved Solids	Spec. Cond umhos	Hardness as CaCO3	% Sodium	SAR	RSC
	124WLCX	400	10 / 21/ 1992	B	6.72	37	158	17	63	4	0	322.17	66	178	0.19	< 0.04	682	1122	465	22	1.27	0
	124WLCX	400	6 / 5 / 1998	B	6.57	41.8	163	18.5	69	3.44	0	314.85	79	223	0.06	< 0.22	754	1450	484	23	1.37	0
	124WLCX	400	3 / 25/ 2002	B	6.68	37.8	164	18.2	71.9	3.41	0	317.29	78.9	223	0.15	0.14	754	1323	485	24	1.42	0
	124WLCX	400	6 / 14/ 2006	B	6.78	33.6	186	19.7	74.8	3.3	0	317.28	87	235	0.2	< 0.44	797	1149	547	23	1.39	0
6711701																						
	124WLCX	30	4 / 3 / 1946	U							0	478	300	480		540						
6711702																						
	124WLCX	42	4 / 3 / 1946	U							0	542	55	104		0						
6711703																						
	124WLCX	56	4 / 3 / 1946	U							0	408	44	42		1						
6711704																						
	124WLCX	65	4 / 3 / 1946	U							0	38	850	190								
6711705																						
	124WLCX	130	11 / 14/ 1963	B	7.6	28	280	61	c 290		0	360.1	240	730		6.7	1812	3130	949	39	4.09	0
6711801																						
	124WLCX	14	3 / 20/ 1946	U							0	106	100	49		110						
6711902																						
	124WLCX	44	5 / 7 / 1946	U							20	262	360	184		8.7						
6711905																						
	124WLCX	203	1 / 8 / 1964	B	7.6	23	54	16	138	3.6	0	370	68	97	0.3	0	581	972	200	59	4.24	2.05
6711912																						
	124WLCX	220	5 / 4 / 1978	B	7.4	51	141	33	136		0	319.73	330	110	0.6	< 0.4	959	1690	487	37	2.68	0
6712101																						
	124WLCX	368 *	2 / 18/ 1952	B	7.3	11	98.4	10	c 85.9		0	395.3	31.5	82			513		286	39	2.19	0.75
	124WLCX	240	8 / 11/ 1952	B	7.7	38	98	12	61	1.2	0	367.1	28	71	0.2	0	489	878	293	31	1.55	0.14
6712102																						
	124WLCX	140 *	4 / 24/ 1952	B	7.8	15	34.4	6.8	c 197		0	339.1	44.3	154			618		113	79	8.19	3.28
	124WLCX	276 *	5 / 22/ 1952	B	8.12	21	15.7	5	c 206.4		0	375.11	33.4	116			581		59	88	11.62	4.95
	124WLCX	283	8 / 6 / 1952	B	7.8	22	19	6.6	201	0.4	0	354.1	39	124	1	2	589	1030	74	85	10.02	4.31
6712103																						
	124WLCX	342	2 / 9 / 1952	B	7.25	26.8	88.6	18.4	c 69.7		0	363.6	27.3	86			495		296	33	1.77	0.02
6712104																						
	124WLCX	484	2 / 22/ 1952	B	7.9	8	24.6	7.8	c 159.1		0	293.08	81.5	80			505		93	78	7.09	2.93
6712105																						
	124WLCX	364	5 / 17/ 1952	B	8	14	13	3.2	c 226.1		0	423	0	136			600		45	91	14.69	6.02
6712106																						
	124WLCX	91	6 / 17/ 1946	U							0	57	140	179		34						
6712107																						
	218EDRD	2539	8 / 23/ 1943	B	7.8	37	87	20	c 104		0	369.11	26	139	0	0.2	594	986	299	43	2.61	0.06
	218EDRD	2539	1 / 30/ 1946	U							0	374	26	126								
6712110																						
	124WLCX	39	6 / 27/ 1946	U							0	294	90	209		1						
6712111																						
	124WLCX	175	1 / 13/ 1970	B	8	33	70	17	66	7	0	90.31	133	136	0.2	3	509	952	244	36	1.84	0

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State Well Number	Aquifer	Depth	Date	B/U	pH	Silica	Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarb.	Sulfate	Chloride	Fluoride	Nitrate	Dissolved Solids	Spec. Cond umhos	Hardness as CaCO3	% Sodium	SAR	RSC
6712112	124WLCX	300	6 / 7 / 1964	B	7.6	22	35	12	c 154		0	214.06	168	85	0.3	0	581	921	136	71	5.73	0.77
6712113	124WLCX	213	6 / 23/ 1952	B	7.22	51	43.2	6.2	c 40.1		0	124.4	35.2	58			294		133	39	1.51	0
6712114	124WLCX	201	6 / 24/ 1952	B	7.25	28	74.8	5.5	c 44.3		0	209.8	35.8	68			359		209	31	1.33	0
6712115	124WLCX	552	10 / 29/ 1952	B	8.4	15	9.6	3.5	c 221.3		0	398	26.2	116			587		38	92	15.54	5.76
6712116	124WLCX	240	11 / 10/ 1969	B	6.9	17	50	16	61	5	0	93.97	80	115	0.3	< 0.4	390	750	190	41	1.92	0
6712117	124WLCX	200	5 / 20/ 1971	B	7.2	34	99	7	42		0	250	36	91	0.7	1	433	798	276	24	1.1	0
6712119	124WLCX	302	9 / 17/ 1970	B	7.83	13	9	3	c 228		0	394.17	13	138			597	1040	34	93	16.81	5.76
6712202	124WLCX	153	6 / 17/ 1946	U							0	322	120	158		1.8						
6712203	124WLCX	87	6 / 19/ 1946	U							0	164	50	206		0						
6712301	124WLCX	300	3 / 14/ 1946	B	7.5	22	96	59	134	16	0	430.12	96	229	0.6	22	886	1580	482	37	2.65	0
6712302	124WLCX	126	7 / 16/ 1946	U							0	358	60	230		0						
6712303	124WLCX	66	6 / 20/ 1946	U							22	316	250	550	6.5							
6712305	124WLCX	335	6 / 20/ 1946	U							24	248	150	375								
6712306	124WLCX	100	8 / 2 / 1946	U							0	302	40	80		0.5						
6712307	124WLCX	140	8 / 2 / 1946	U							0	446	45	181		22	467					
6712312	124WLCX	520	3 / 22/ 1971	B	8		40	15	105		0	298.98	45	60	0.4	5	417		161	58	3.59	1.67
	124WLCX	520	6 / 5 / 1998	B	7.52	26.4	24.7	9.99	128	3.19	0	319.73	41.1	50.4	0.35	< 0.22	442	896	103	73	5.49	3.19
	124WLCX	520	3 / 25/ 2002	B	7.53	25.6	25.6	10.2	112	2.9	0	318.51	35.7	46.7	0.46	0.26	416	698	106	69	4.74	3.1
6712406	124WLCX	47	4 / 16/ 1946	U							5.9	318	16	22		45						
6712407	124WLCX	88	5 / 3 / 1946	U							0	549	65	755		125						
6712408	124WLCX	113	5 / 3 / 1946	U							0	307	17	25		0.8						
6712412	124WLCX	300	5 / 19/ 1971	B	7.5	29	66	27	62		0	314.85	58	69	0.3	< 0.4	466	852	275	32	1.62	0
6712413	112LWCX	80	5 / 19/ 1971	B	7	42	156	21	47		0	335.6	54	173	0.4	< 0.4	658	1260	475	17	0.94	0

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State Well Number	Aquifer	Depth	Date	B/U	pH	Silica	Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarb.	Sulfate	Chloride	Fluoride	Nitrate	Dissolved Solids	Spec. Cond umhos	Hardness as CaCO3	% Sodium	SAR	RSC
6712414																						
	124WLCX	120	5 / 20/ 1971	B	7	32	550	28	258		0	453.97	93	920	0.3	315	2419	4805	1487	27	2.91	0
6712415																						
	112LWCX	110	5 / 19/ 1971	B	7.3	21	93	3.2	15		0	273.36	12	14	< 0.1	17	309	544	245	11	0.42	0
6712416																						
	124WLCX	120	5 / 19/ 1971	B	7.7	25	49	19	86		0	335.6	24	63	0.1	< 0.4	431	786	200	48	2.64	1.49
6712417																						
	112LWCX	90	5 / 19/ 1971	B	7.5	23	93	2.67	8.3		0	253.83	14	13	0.2	12	290	508	242	6	0.23	0
6712418																						
	112LWCX	90	5 / 20/ 1971	B	7.3	31	118	2.4	25.1		0	378.31	9	24	0.2	< 0.4	396	720	304	15	0.63	0.11
6712419																						
	112LWCX	80	5 / 20/ 1971	B	7.2	22	151	12	64		0	305.09	56	179	0.5	2.5	637	1242	425	24	1.35	0
6712421																						
	124WLCX	99	4 / 12/ 1981	B	8.2	29	103	4	9		0	303.87	6	14	0.2	22	336	580	273	6	0.24	0
6712423																						
	124WLCX	273	5 / 20/ 1971	B	7.2	32	106	9.7	37		0	366.1	24	41	0.3	< 0.4	430	750	304	20	0.92	0
6712501																						
	124WLCX	340	3 / 25/ 1953	B	7.5	45	55	14	c 51		0	241.07	21	60	0.1	0	364	619	194	36	1.59	0.06
	124WLCX	340	4 / 14/ 1964	B	6.8	43	62	17	57	3.1	0	232	44	85	0.3	0	425	708	224	35	1.65	0
	124WLCX	340	3 / 3 / 1986	B	8	39	79	20.3	105	4	0	270.92	71	158	0.3	0.04	609	1168	280	44	2.73	0
6712502																						
	124WLCX	320	4 / 28/ 1953	B	7.97	20	56	9.6	c 60.2		0	212.06	30	74			354		179	42	1.96	0
	124WLCX	320	5 / 23/ 1953	B	7.4	65	60	14	c 63		0	208.06	44	89	0.4	0.2	437	701	207	39	1.9	0
	124WLCX	320	5 / 26/ 1961	B	7.2		53	15	61		0	203.05	53	70	0.2	< 0.4	352	650	193	40	1.91	0
	124WLCX	320	1 / 7 / 1963	B	7.2		58	11	55		0	210.06	43	74	0.1	< 0.4	344	702	189	38	1.74	0
	124WLCX	320	4 / 15/ 1964	B	6.8	48	55	14	56	4.2	0	212	43	75	0.2	0	399	654	194	37	1.75	0
	124WLCX	320	2 / 22/ 1966	B	7.4		59	12	56		0	207.06	40	78	0.3	< 0.4	347	700	196	38	1.74	0
	124WLCX	320	5 / 12/ 1967	B	7.2		60	13	59		0	212.06	40	82	0.4	< 0.4	359	720	202	38	1.8	0
	124WLCX	320	2 / 15/ 1968	B	7.2		58	14	58		0	212.34	40	82	0.4	< 0.4	357	730	202	38	1.77	0
	124WLCX	320	2 / 17/ 1969	B	7.1		61	13	56		0	211.12	42	82	0.3	< 0.4	358	704	205	37	1.7	0
	124WLCX	320	4 / 13/ 1970	B	7.1		59	17	56		0	209.9	53	80	0.4	< 0.4	369	720	216	35	1.65	0
	124WLCX	320	2 / 12/ 1971	B	7.1		63	13	54		0	211.12	43	85	0.3	< 0.4	362	725	210	35	1.62	0
	124WLCX	320	2 / 16/ 1972	B	7.3		62	14	59		0	209.9	44	86	0.4	< 0.4	369	735	212	37	1.76	0
	124WLCX	320	2 / 26/ 1973	B	7.1		63	14	58		0	211.12	47	89	0.3	< 0.4	375	750	214	37	1.72	0
	124WLCX	320	7 / 29/ 1977	B	7.9	50	68	13	62		0	212.34	50	91	0.3	< 0.4	439	770	222	37	1.81	0
	124WLCX	320	3 / 3 / 1986	B	8	44	92	18	81	4	0	242.85	64	164	< 0.1	0.04	586	1120	303	36	2.02	0
6712503																						
	124WLCX	290	2 / 15/ 1946	U							0	82	70	104								
6712516																						
	124WLCX	482 *	11 / 10/ 1952	B	8	14	58.8	13.8	c 50.8		0	251.3	20.6	54			335		203	35	1.55	0.04
	124WLCX	482 *	11 / 13/ 1952	B	7.3	36	66	14.4	c 59		0	246.4	26	86			408		223	36	1.72	0
	124WLCX	482 *	11 / 14/ 1952	B	7.85	12	28	6.3	c 155		0	327.09	37	88			487		95	77	6.89	3.45
6712517																						
	124WLCX	456	4 / 22/ 1953	B	8.3	8	51	12.8	c 154.6		0	336	31.8	146			569		179	65	5.02	1.91

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State Well Number	Aquifer	Depth	Date	B/U	pH	Silica	Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarb.	Sulfate	Chloride	Fluoride	Nitrate	Dissolved Solids	Spec. Cond umhos	Hardness as CaCO3	% Sodium	SAR	RSC
6712518																						
	124WLCX	50	5 / 17/ 1946	U							0	312	56	286		0.5						
6712519																						
	124WLCX	160	11 / 17/ 1969	B	7.6	44	80	19	65	4	0	211.12	60	130	0.3	< 0.4	506	930	277	33	1.7	0
6712520																						
	124WLCX	368	5 / 11/ 1967	B	6.98	39	52	9	c 61		0	234.31	34	51			361	578	166	44	2.05	0.5
	124WLCX	368	11 / 12/ 1969	B	7.3	40	66	13	54	4	0	230.65	40	77	0.4	< 0.4	408	740	217	34	1.59	0
6712522																						
	124WLCX	403	3 / 21/ 1977	B	7.1	32	89	23	93		0	248.95	75	162	0.4		596		316	38	2.27	0
	124WLCX	403	10 / 21/ 1992	B	6.98	45	103	24	80	4.7	0	247.73	69	179	0.26	< 0.04	627	1038	356	32	1.85	0
6712601																						
	124WLCX	352	6 / 20/ 1946	U							0	390	30	106								
6712603																						
	124WLCX	171	2 / 15/ 1946	U							0	101	7	101		0.8						
6712607																						
	124WLCX	71	6 / 19/ 1946	U							0	50	764	338		1.5						
6712701																						
	124WLCX	49	6 / 14/ 1946	U							0	394	80	224		0						
6712703																						
	112LEON	19	6 / 14/ 1946	U							17	196	16	6		3.2						
6712801																						
	124WLCX	34	5 / 17/ 1946	U							11	100	40	57		9.6						
6712803																						
	124WLCX	31	5 / 17/ 1946	U							0	170	848	658								
6713101																						
	124WLCX	620	3 / 5 / 1964	B	7.9	4.6	12	1.5	102	4.5	0	122.03	78	60	0.2	1.2	324	566	36	86	7.18	1.28
	124WLCX	620	11 / 17/ 1969	B	7.6	12	23	6.6	272	3	0	261.15	220	174	0.4	< 0.4	839	1573	84	87	12.74	2.59
	124WLCX	620	7 / 20/ 1977	B	7.8	14	27	6	282		0	270.92	233	177	0.2	< 0.4	872	1617	92	86	12.79	2.6
	124WLCX	620	3 / 3 / 1986	B	8.1	13	20.6	5.6	291	3	0	261.15	232	182	0.2	0.13	875	1650	74	89	14.42	2.79
6713102																						
	124WLCX	450	3 / 5 / 1964	B	7.9	19	67	17	81	7.9	0	209.06	103	106	0.2	0	503	846	236	42	2.29	0
	124WLCX	450	11 / 17/ 1969	B	7.6	15	39	10	143	5	0	305.09	102	75	0.6	< 0.4	540	1001	138	69	5.29	2.23
6713103																						
	124WLCX	302	2 / 0 / 1964	B	7.4	30	535	120	c 190		0	374.11	802	780	0	1	2641	3850	1828	18	1.93	0
6713201																						
	124CRRZ	198	1 / 12/ 1970	B	6.5	19	4.2	1.7	9	4	0	14.64	7	17	< 0.1	< 0.4	69	96	17	52	0.92	0
6713303																						
	124RKLW	14	4 / 18/ 1946	U							0	16	200	154		40						
6713502																						
	124CRRZ	240	1 / 10/ 1964	U	4	53	5.5	4.4	30	8.4	0	0	80	53	0.2	0.2	234	424	31	67	2.31	0
6713601																						
	124QNCT	65	4 / 18/ 1946	U							0	72	90	96		76						
6713602																						
	124RKLW	77	3 / 1 / 1946	U	6.3						0	0	738	300		1						

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6713603																						
	124CRRZ	171	4 / 26/ 1946	U							0	0	700	1100								
6713605																						
	124CRRZ	470	2 / 20/ 1964	B	6.8	37	14	1.2	c 55		0	95.03	33	32	0.4	0	219	326	39	74	3.83	0.76
	124CRRZ	470	1 / 12/ 1970	B	7.8	19	305	58	72	16	0	173.29	620	269	0.5	< 0.4	1445	2704	999	13	0.99	0
6713613																						
	124RKLW	100	6 / 20/ 1964	B	6.1	25	118	57	c 131		0	94.03	99	448	0.2	1.8	926	1730	529	35	2.48	0
6713702																						
	124CRRZ	270	6 / 20/ 1964	B	6.1	25	6	9.5	c 20		0	65.02	15	20	0	0	127	206	54	44	1.16	0
6713801																						
	124CRRZ	250	5 / 17/ 1946	U							0	0	240	114		0						
6713802																						
	124CRRZ	270	2 / 19/ 1964	B	6.9	37	195	41	c 104		0	225.07	356	230	0.2	0.2	1074	1660	655	25	1.77	0
6713901																						
	124QNCT	16	4 / 26/ 1946	U							16	206	35	102		110						
6714401																						
	124RKLW	120	1 / 14/ 1964	B	6.1	76	39	19	c 114		0	48.01	186	135	0.1	0.2	592	912	175	58	3.74	0
6714403																						
	124CRRZ	500	10 / 3 / 1963	B	4.3		48	9	90		0	0	270	50			467		157	55	3.13	0
	124CRRZ	500	2 / 19/ 1964	B	7.1	27	0.2	0.1	c 174		0	90.02	240	39	0.2	0	524	808	0	99	79.33	1.46
	124CRRZ	500	5 / 5 / 1992	U												1.02						
6714406																						
	124CRRZ	550	6 / 20/ 1964	B	7.3	10	105	26	c 41		0	268.07	199	22	0	0	534	868	368	19	0.93	0
6714701																						
	124QNCT	97	5 / 2 / 1946	U							0	65	45	256		3.5						
6714704																						
	124QNCT	110	2 / 6 / 1964	B	6.9	49	6	2	c 66		0	70.02	88	12	0.2	0.2	257	338	23	86	5.96	0.68
6714801																						
	124QNCT	59	2 / 19/ 1964	B	6.7	45	74	20	78		0	66.02	6	261	0.3	9.6	526	997	266	38	2.08	0
	124QNCT	59	8 / 12/ 1970	B	6.9	46	52	10	54	4	0	106.17	13	128	0.3	5	364	660	170	40	1.8	0
	124QNCT	59	8 / 17/ 1977	B	7.4	52	47	7	48		0	125.7	23	89	0.4	7.1	335	592	146	41	1.73	0
	124QNCT	59	3 / 3 / 1986	B	7.7	45	34	7	51	2	0	92.75	26	88	0.4	6.56	305	544	113	49	2.08	0
	124QNCT	59	9 / 22/ 1993	B	6.4	48	47	8.5	64	2.7	0	115.93	35	107	0.38	10.54	380	583	152	47	4.07	0
6714803																						
	124QNCT	475	10 / 26/ 1998	B	7.08	26.31	264	62	87.1	22.3	0	179.39	866	104	0.08	< 0.22	1521		915	17	1.25	0
	124QNCT	475	3 / 25/ 2002	B	6.95	24.3	263	62.8	86.4	22	0	180.61	800	101	< 0.1	0.28	1449	1948	915	17	1.24	0
6719108																						
	124WLCX	99	4 / 3 / 1946	U							0	308	260	845		1.5						
6719201																						
	124WLCX	182	3 / 20/ 1946	U							0	226	500	231		0.5						
6719202																						
	124WLCX	123	8 / 9 / 1946	U							0	242	1110	468		0						
6719301																						
	124WLCX	370	3 / 0 / 1946	U	6.95		80		170		0	198	120	200			768					

* Depth value here reflects the bottom of the SAMPLED INTERVAL which was different from the completed well depth

State Well Number	Aquifer	Depth	Date	B/U	pH	Silica	Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarb.	Sulfate	Chloride	Fluoride	Nitrate	Dissolved Solids	Spec. Cond umhos	Hardness as CaCO3	% Sodium	SAR	RSC
	124WLCX	370	5 / 17/ 1946	U							0	198	120	196		2						
6719302																						
	124WLCX	190	8 / 9 / 1946	U							0	118	13	70		0						
6719304																						
	124WLCX	406	1 / 8 / 1964	B	8.1	11	13	8.1	c 846		0	720.2	16	920		1.8	2170	3840	65	96	45.52	10.49
6719306																						
	124WLCX	330	1 / 8 / 1964	B	6.7	43	142	31	92	5.3	0	240	190	212	0.8	0	834	1370	482	29	1.82	0
	124WLCX	330	1 / 14/ 1970	B	7.6	35	126	30	106	4	0	290.44	180	177	0.6	< 0.4	801	1503	437	34	2.2	0
	124WLCX	330	8 / 17/ 1977	B	7.9	32	87	24	135	7	0	318.51	194	117	0.2	< 0.4	753	1395	315	48	3.3	0
6719308																						
	124WLCX	72	1 / 8 / 1964	B	6.6	45	75	21	117	4.3	0	190	172	146	0.6	0	674	1080	274	47	3.08	0
6719401																						
	100ALVM	27	6 / 25/ 1946	U							0	538	140	164		24						
6719402																						
	124WLCX	120	8 / 6 / 1946	U							0	407	50	83		0						
6719506																						
	124WLCX	36	6 / 25/ 1946	U							0	360	8	18		9.6						
6719507																						
	124WLCX	315	2 / 12/ 1946	U							0	366	3	84		0						
6719601																						
	124WLCX	259	10 / 22/ 1942	B	8.5	16	12	5	409		0	653	163	167	< 0.4	< 0.4	1093		50	94	25.03	9.69
	124WLCX	259	2 / 0 / 1943	B	8.4	6	2.7	1.7	c 419	5	46	534	178	163	0.2	0	1084		13	98	45.98	10.01
	124WLCX	259	8 / 19/ 1943	B	8.3	21	29	7	c 385		0	628	180	168	0.5	< 0.4	1099		101	89	16.65	8.27
	124WLCX	259	5 / 8 / 1945	B	8.4	14	5	1	430		0	609	196	176	0.9	0.9	1123		16	98	45.92	9.65
	124WLCX	259	7 / 23/ 1947	B	8.5	16	10	4	444		0	732	161	170	0.2	1.3	1166		41	95	30.01	11.17
	124WLCX	259	1 / 25/ 1951	B	8.6	12	11	6	430		0	652	183	185	0.1	< 0.4	1148		52	94	25.91	9.64
	124WLCX	259	6 / 21/ 1954	B	8.7	10	2	4	451		0	634	211	185	0.3	0.9	1175		21	97	42.36	9.96
	124WLCX	259	12 / 12/ 1955	B	8.8	12	2	1	440		0	591	221	178	0.2	< 0.4	1145		9	99	63.43	9.5
	124WLCX	259	6 / 6 / 1960	B	8.5		3	1	405		0	597	215	183	0.2	< 0.4	1101	1916	11	98	51.73	9.55
	124WLCX	259	6 / 24/ 1964	B	8.3	14	2	1	433	1.6	14	542	227	175	0.5	0.2	1134	1840	9	99	62.42	9.17
	124WLCX	259	12 / 2 / 1969	B	8.5	11	1.8	2.06	433	1	10.8	527.19	240	170	0.5	< 0.4	1129	2025	12	98	52.31	8.74
	124WLCX	259	2 / 27/ 1986	B	8.4	10	79	17	21	2	2.4	252.61	35	46	0.8	5.36	342	675	267	14	0.56	0
6719602																						
	124WLCX	304	10 / 22/ 1942	B	8.7	17	15	6	405		0	560	223	174	0.6	0.7	1116		62	93	22.35	7.94
	124WLCX	304	2 / 0 / 1943	B	8.4	8	2	1.4	c 416	5.2	43	457	227	170	0	0	1097		10	98	55.19	8.71
	124WLCX	304	8 / 19/ 1943	B	8.5	23	27	6	c 393		0	569	226	173	0.5	< 0.4	1128		92	90	17.82	7.48
	124WLCX	304	5 / 8 / 1945	B	8.4	15	7	1	c 404		0	546	218	174	0.8	< 0.4	1088		21	97	37.83	8.52
	124WLCX	304	6 / 23/ 1947	B	9	19	7	4	c 441		0	629	222	174	0.2	1.3	1177		33	96	32.94	9.63
6719603																						
	124WLCX	312	6 / 22/ 1954	B	8.6	13	7	5	c 813		24	647	91	809	0.3	< 0.4	2080		38	97	57.34	10.64
6719605																						
	124WLCX	307	1 / 25/ 1951	B	8.6	11	9	4	c 419		18	677.29	133	160	0.1	< 0.4	1087		38	95	29.22	10.92
	124WLCX	307	6 / 22/ 1954	B	8.7	12	3	4	c 437		24	671.19	158	156	0.3	1.3	1125		23	97	38.85	11.32
	124WLCX	307	12 / 12/ 1955	B	9	12	12	3	c 450		30	646.78	157	174	0.2	< 0.4	1156		42	95	30.1	10.75

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State Well Number	Aquifer	Depth	Date	B/U	pH	Silica	Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarb.	Sulfate	Chloride	Fluoride	Nitrate	Dissolved Solids	Spec. Cond umhos	Hardness as CaCO3	% Sodium	SAR	RSC
	124WLCX	307	6 / 6 / 1960	B	8.4		6	2	500		4.8	656.55	170	343	0.2	< 0.4	1349	2575	23	97	45.16	10.46
	124WLCX	307	6 / 20/ 1964	B	8.2	14	5.8	3.8	575	2.2	0	686.2	171	385	0.4	0.8	1495	2500	30	97	45.59	10.64
	124WLCX	307	12 / 2 / 1969	B	8.5	12	9	5	610	3	8.4	629.7	195	462	0.5	< 0.4	1614	3042	43	96	40.45	9.74
	124WLCX	307	9 / 12/ 1972	B	7.8		11	7	770		0	646.78	225	710	0.5	< 0.4	2041	3875	56	96	44.66	9.48
6719606																						
	124WLCX	447	4 / 16/ 1957	B	8.5		2	1	470		14.4	721.22	135	170	0.5	< 0.4	1147		9	99	67.76	12.12
	124WLCX	447	10 / 15/ 1962	B	8.2		2	3	518		0	673.63	248	239	0.2	< 0.4	1341	2475	17	98	54.12	10.69
	124WLCX	447	6 / 24/ 1964	B	8.3	14	1.5	1.8	505	2.3	37	642	202	220	0.6	2.5	1302	2100	10	98	65.79	11.53
	124WLCX	447	9 / 12/ 1972	B	8.6		1	2	482		18	744.41	140	198	0.7	< 0.4	1208	2240	10	98	64.03	12.59
6719607																						
	124WLCX	331	12 / 12/ 1955	B	9	15	2	1	c 441		0	731	123	170	0.4	< 0.4	1112		9	99	63.58	11.8
	124WLCX	331	6 / 7 / 1960	B	8.5		2	< 0.5	c 425		0	732	138	200	0.3	< 0.4	1126	1956	7	99	61.27	11.86
	124WLCX	331	6 / 20/ 1964	B	8.2	14	1.2	1.7	488	3.4	0	716.21	155	229	0.4	1	1245	2040	9	99	67.17	11.54
	124WLCX	331	12 / 2 / 1969	B	8.6	8	5.4	3.65	630	2	15.6	688.28	145	479	0.6	< 0.4	1628	3068	28	97	51.34	11.23
6719608																						
	124WLCX	519	2 / 7 / 1946	B	8.3	15	2.2	1.3	525	22	51	682	212	222	0.4	1.2	1387	2310	10	99	69.37	12.66
6719609																						
	124WLCX	284	8 / 6 / 1946	U							0	803	3	1410								
6719612																						
	124WLCX	300	2 / 7 / 1946	B	7.4	26	122	6.1	78	9.9	0	427.12	63	68	0	0.5	583	981	329	33	1.87	0.41
6719613																						
	124WLCX	150	2 / 7 / 1946	B	7.7	21	90	23	65	6.5	0	419.12	23	72	0	0.2	506	923	319	30	1.58	0.49
	124WLCX	150	12 / 4 / 1969	B	7.7	18	49	18	115	3	0	394.17	19	77	0.3	< 0.4	493	912	196	56	3.57	2.53
6719614																						
	124WLCX	260	2 / 11/ 1949	B	8.05	8	77	26	c 101		0	215.06	76	188			581		298	42	2.54	0
6719615																						
	124WLCX	230	12 / 9 / 1969	B	7.3	17	123	39	97		0	231.87	129	252	0.2	< 0.4	771	1551	467	31	1.95	0
	124WLCX	230	12 / 9 / 1969	B	7.4	17	117	41	98	3	0	246.51	122	251	0.2	< 0.4	770	1540	460	31	1.99	0
6719628																						
	124WLCX	232 *	5 / 8 / 1968	B	8.58	12	7	3	c 326		13.2	435.66	135	181			891	1560	29	95	25.97	6.98
	124WLCX	339 *	5 / 9 / 1968	B	8.77	11	3	1	c 308		21.6	569.9	< 4	127			755	1280	11	98	39.34	9.83
	124WLCX	435	5 / 22/ 1968	B	8.37	13	6	3	c 379		0	512	95	235			982	1680	27	96	31.55	7.85
6719629																						
	124WLCX	525	12 / 8 / 1969	B	8.7	11	3	2	520		20.4	727.33	197	217	0.4	< 0.4	1328	2400	15	98	57.06	12.29
	124WLCX	525	12 / 8 / 1969	B	8.7	12	3	2	520	1	25.2	727.33	197	214	0.6	< 0.4	1332	2400	15	98	57.06	12.45
6719643																						
	124WLCX	340	5 / 4 / 1978	B	7.9	12	11	11	1296		0	710.24	7	1692	0.4	< 0.4	3379	6804	72	97	66.12	10.19
6719644																						
	124WLCX	180	2 / 12/ 1962	B	7.4	33	58	27	72	4.1	0	290.08	42	98	0.3	1.8	478	826	255	37	1.96	0
6719645																						
	124WLCX	149	4 / 22/ 1946	U							20	218	55	158		0.8						
6719647																						
	124WLCX	150	7 / 26/ 1946	U							0	1114	2	498		0						
6720101																						

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State Well Number	Aquifer	Depth	Date	B/U	pH	Silica	Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarb.	Sulfate	Chloride	Fluoride	Nitrate	Dissolved Solids	Spec. Cond umhos	Hardness as CaCO3	% Sodium	SAR	RSC
6720102	124WLCX	300	5 / 7 / 1946	U							20	252	120	153		3.5						
	124WLCX	300	3 / 27/ 1979	B	8.1	23	39	13	182		0	268.48	100	164	0.4	< 0.1	653	1240	150	72	6.45	1.38
6720104	124WLCX		2 / 2 / 1946	B			4.6	1.9	c 786		30	1082	2	558		2	1916		19	98	77.84	18.35
6720108	124WLCX	580	3 / 4 / 1964	B	8.6	12	3	1.3	c 756		83	924	0	540		0.2	1849	3140	12	99	96.56	17.65
6720109	124WLCX	263	3 / 27/ 1979	B	8.5	16	16	6	530		12	915.26	2	320	1.3	< 0.1	1353	2560	64	94	28.68	14.11
6720202	124WLCX	185	3 / 27/ 1979	B	8.7	13	4	2	648		30	839.6	95	433	1.6	0.3	1639	3045	18	98	66.06	14.4
6720203	124WLCX	14	7 / 16/ 1946	U							0	62	190	83		76						
6720204	124WLCX	46	7 / 16/ 1946	U							0	410	17	146		9.4						
6720205	124WLCX	360	6 / 11/ 1956	B			24	32	690		0	1020.29	17	599			1863		191	88	21.69	12.89
6720402	124WLCX	190	6 / 24/ 1964	B	6.6	44	320	88	c 127		0	296.08	467	500	0.5	2	1694	2540	1160	19	1.62	0
6720403	124WLCX	24	7 / 16/ 1946	U							12	257	60	39		7.6						
6720408	124WLCX	321	11 / 29/ 1963	B	8	15	1	2.3	c 713		0	1010.29	0	520		1.8	1749	3020	11	99	89.69	16.32
6720501	124WLCX	172	3 / 27/ 1979	B	8.8	13	2.8	1.7	656		37.2	835.94	100	431	1.6	< 0.1	1654	3129	13	99	76.32	14.66
6720601	124WLCX	19	7 / 3 / 1946	U							0	76	32	78		100						
6720602	124CRRZ	91	4 / 4 / 1947	B			23	10	c 70		0	20	55	116		16	299	547	98	60	3.07	0
6720604	124CRRZ	80	5 / 7 / 1946	U							0	0	85	69		0						
6720703	124CRRZ	97	4 / 4 / 1947	B			32	22	c 118		0	8.01	185	154		15	529	934	170	60	3.93	0
6720704	124WLCX	285	5 / 7 / 1946	U							0	837	1	1210		0						
	124WLCX	285	12 / 6 / 1963	B	7.7	13	14	14	c 1510		0	2080.59	0	1180		0	3754	6130	92	97	68.28	32.25
6720706	124WLCX	19	5 / 7 / 1946	U							0	145	280	246		3						
6720707	124WLCX	200	1 / 23/ 1964	B	8.1	14	1.8	0.4	c 517		0	876.25	125	198	0.7	0.2	1287	2130	6	99	90.78	14.24
6720708	124WLCX	240	1 / 23/ 1964	B	7.8	13	6	3.2	c 1100		0	1940.55	0.2	590		0.5	2667	4270	28	98	90.21	31.24
6720801	124WLCX	81	5 / 7 / 1946	U							0	944	55	215		0						

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State Well Number	Aquifer	Depth	Date	B/U	pH	Silica	Calcium	Magnesium	Sodium	Potassium	Carbonate	Bicarb.	Sulfate	Chloride	Fluoride	Nitrate	Dissolved Solids	Spec. Cond umhos	Hardness as CaCO3	% Sodium	SAR	RSC
	124CRRZ	120	5 / 3 / 1946	U							0	29	14	57		0						
6720802																						
	124WLCX	200	1 / 23/ 1964	B	6.2	30	16	14	c 41		0	80.02	23	68	0.1	0.2	231	399	97	47	1.81	0
	124WLCX	200	7 / 29/ 1977	B	7.1	66	132	29	52		0	141.56	315	88	0.7	< 0.4	752	1290	448	20	1.07	0
6721104																						
	124CRRZ	300	6 / 20/ 1964	B	4.3	50	13	5.2	23	9.5	0	0	59	44	0	0	203	303	53	48	1.37	0
	124CRRZ	300	7 / 29/ 1977	B	6.7	48	35	7	26	10	0	23.19	105	39	0.2	< 0.4	282	438	116	32	1.05	0
6721202																						
	124CRRZ	157	5 / 17/ 1946	U							0	109	360	165		0						
6721203																						
	124CRRZ	381	5 / 2 / 1978	B	7.2	41	138	22	74		0	128.14	308	112	0.2	< 0.4	758	1352	435	27	1.54	0
6721302																						
	124CRRZ	334	1 / 10/ 1964	B	7.6	17	48	30	c 78		0	334.09	18	85	0.3	0	440	771	243	41	2.18	0.61
6721303																						
	124QNCT	148	1 / 10/ 1964	B	6.4	33	430	148	137	23	0	100.03	1440	365		2	2627	3250	1681	15	1.45	0
6721401																						
	124WLCX	440	12 / 31/ 1963	B	4.8	47	6.2	2.6	c 27		0	0	32	37	0.1	0.2	152	224	26	69	2.25	0

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Appendix E

Groundwater Conservation Districts Rules

APPENDIX E

The tables presented in this appendix are taken from the *Gonzales County Underground Water Conservation District Management Plan* and the *Rules of the Gonzales County Underground Water Conservation District*. They are presented to provide additional information on the conditions of the aquifers that provide groundwater to Caldwell County. Tables are listed as they are presented.

Gonzales County Underground Water Conservation District Management Plan

TABLE 5
GROUNDWATER RECHARGE/ DISCHARGE/ FLOW GONZALES AND CALDWELL COUNTIES

Groundwater Recharge/Discharge/Flow Gonzales and Caldwell Counties Gonzales County Underground Water Conservation District				
Aquifer or Confining Unit	**Annual Recharge from Precipitation (acre-feet/yr)**	**Annual Discharge from Aquifer to Surface Water (acre-feet/yr)**	**Annual Flow Into District (acre-feet/yr)**	**Annual Flow Out of District (acre-feet/yr)**
Sparta	3,105	2,127	386	70
Weches	808	521	117	35
Queen City	7,291	3,583	1,172	126
Reklaw	2,168	1,935	170	156
Carrizo	6,927	6,896	8,897	5,732
Wilcox (upper)	0	0	30	48
Wilcox (middle)	921	31	2,031	3,488
Wilcox (lower)	0	0	4,052	2,506

Data from GAM 08-22 Revised

Table 5 describes the following as listed in the GCUWCD:

1. Precipitation Recharge – this is the aerially distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at the land surface) within the District.

2. Surface Water Outflow – this is the total water existing the aquifer (outflow) to surface water features such as streams, reservoirs, and drains (springs).

3. Flow Into and Out of District – this component describes lateral flow within the aquifer between the districts and adjacent counties.

4. Flow Between Aquifers – this describes the vertical flow, or leakage, between aquifers or confining units. Inflow to an aquifer from as overlaying aquifer will always equal the outflow from the other aquifer.

TABLE 6
GROUNDWATER NET FLOW BETWEEN AQUIFERS
GONZALES & CALDWELL COUNTIES

Groundwater Net Flow Between Aquifers Gonzales and Caldwell Counties Gonzales County Underground Water Conservation District	
Aquifer or Confining Unit	**Annual Net Flow Between Aquifers (acre-feet/yr)**
Weches into Sparta	4,511
Queen City into Weches	4,183
Reklaw into Queen City	3,190
Carrizo into Reklaw	1,945
Carrizo into Wilcox (upper)	649
Wilcox (upper) into Wilcox (middle)	194
Wilcox (lower) into Wilcox (middle)	190

Data from GAM 08-22 Revised

TABLE 7
PROJECTED SURFACE WATER SUPPLY
GONZALES COUNTY UNDERGROUND WATER CONSERVATION DISTRICT

Projected Surface Water Supply Gonzales County Underground Water Conservation District										
Water User Group	**County**	**River Basin**	**Source Name**	**2000 ac-ft/yr**	**2010 ac-ft/yr**	**2020 ac-ft/yr**	**2030 ac-ft/yr**	**2040 ac-ft/yr**	**2050 ac-ft/yr**	**2060 ac-ft/yr**
Gonzales	*Gonzales*	*Guadalupe*	*Guadalupe Run-of-River*	*1,892*	*1,892*	*1,892*	*1,892*	*1,892*	*1,892*	*1,892*
Gonzales CO WSC	*Gonzales*	*Guadalupe*	*Canyon Lake/ Reservoir*	*0*	*532*	*532*	*532*	*532*	*532*	*532*
Irrigation	*Gonzales*	*Guadalupe*	*Canyon Lake/ Reservoir*	*0*	*6*	*6*	*6*	*6*	*6*	*6*
Irrigation	*Gonzales*	*Guadalupe*	*Guadalupe River Combined Run-of-River Irr.*	*0*	*1,730*	*1,730*	*1,730*	*1,730*	*1,730*	*1,730*
Livestock	*Gonzales*	*Lavaca*	*Livestock Local Supply*	*46*	*62*	*62*	*62*	*62*	*62*	*62*
Livestock	*Gonzales*	*Guadalupe*	*Livestock Local Supply*	*5,022*	*2,366*	*2,366*	*2,366*	*2,366*	*2,366*	*2,366*
			Total Gonzales	**6,960**	**6,588**	**6,588**	**6,588**	**6,588**	**6,588**	**6,588**
County Other	*Caldwell*	*Guadalupe*	*Guadalupe Run-of-River*	*0*	*110*	*110*	*110*	*110*	*110*	*110*
Irrigation	*Caldwell*	*Guadalupe*	*Guadalupe Run-of-River*	*0*	*73*	*73*	*73*	*73*	*73*	*73*
Livestock	*Caldwell*	*Guadalupe*	*Livestock Local Supply*	*31*	*17*	*17*	*17*	*17*	*17*	*17*
Livestock	*Caldwell*	*Guadalupe*	*Livestock Local Supply*	*153*	*84*	*84*	*84*	*84*	*84*	*84*
Gonzales CO WSC	*Caldwell*	*Guadalupe*	*Canyon Lake/Reservoir*	*0*	*5*	*5*	*5*	*5*	*5*	*5*
			Total Caldwell	**184**	**289**	**289**	**289**	**289**	**289**	**289**
			Total Projected Surface Water Supply	**7,144**	**6,877**	**6,877**	**6,877**	**6,877**	**6,877**	**6,877**

Data from the TWDB 207 State Water Plan, Volume 3, Regional Water Planning Group. Apportioned values are presented in italics.

Section 8.1 of the GCUWCD Management Plan indicates that in 2010 water is expected to decrease by 267 acre-feet per year from the 2000 surface water supply estimates (Table 7). The years 2010-2060 are expected to remain stable.

APPENDIX E

Section 8.2 describes the pumping capacity of a well field and states that the projected groundwater supplies of a water user group may significantly exceed the amount of water actually used by the user because the well fields supplying the user groups have additional or redundant capacity. Overall the district is expected to decrease by 244 acre-feet/ year from 2010 to 2060 (Table 8).

TABLE 8
PROJECTED GROUNDWATER SUPPLY

Projected Groundwater Supply Gonzales County Underground Water Conservation District								
Water User Group	**County**	**Source Name**	**2010 ac-ft/yr**	**2020 ac-ft/yr**	**2030 ac-ft/yr**	**2040 ac-ft/yr**	**2050 ac-ft/yr**	**2060 ac-ft/yr**
Gonzales	Gonzales	Carrizo-Wilcox	403	403	403	403	403	403
Nixon	Gonzales	Carrizo-Wilcox	600	600	600	600	600	600
Waelder	Gonzales	Queen City	665	665	665	665	665	665
County Other	Gonzales	Carrizo-Wilcox	13	13	13	13	13	13
County Other	Gonzales	Carrizo-Wilcox	559	559	559	559	559	559
Manufacturing	Gonzales	Sparta	1,632	1,632	1,632	1,632	1,632	1,632
Manufacturing	Gonzales	Carrizo-Wilcox	1,786	1,786	1,786	1,786	1,786	1,786
Mining	Gonzales	Carrizo-Wilcox	3	2	2	2	2	2
Mining	Gonzales	Queen City	6	6	6	6	5	5
Mining	Gonzales	Sparta	5	5	5	5	5	5
Mining	Gonzales	Carrizo-Wilcox	14	14	13	12	12	12
Irrigation	Gonzales	Queen City	47	40	35	30	26	22
Irrigation	Gonzales	Sparta	51	44	38	33	28	24
Irrigation	Gonzales	Carrizo-Wilcox	210	181	156	134	116	100
Livestock	Gonzales	Carrizo-Wilcox	26	26	26	26	26	26
Livestock	Gonzales	Queen City	805	805	805	805	805	805
Livestock	Gonzales	Sparta	329	329	329	329	329	329
Livestock	Gonzales	Carrizo-Wilcox	1,419	1,419	1,419	1,419	1,419	1,419
Gonzales CO WSC	Gonzales	Carrizo-Wilcox	1,103	1,103	1,103	1,103	1,103	1,103
		Total Gonzales	**9,676**	**9,632**	**9,595**	**9,562**	**9,534**	**9,510**
County Other	Caldwell	Carrizo-Wilcox	6	6	6	6	6	6
County Other	Caldwell	Carrizo-Wilcox	19	19	19	19	19	19
County Other	Caldwell	Queen City	121	125	129	132	135	138
Manufacturing	Caldwell	Carrizo-Wilcox	7	7	7	7	7	7
Mining	Caldwell	Carrizo-Wilcox	2	2	2	2	2	2
Mining	Caldwell	Carrizo-Wilcox	1	1	2	2	2	2
Irrigation	Caldwell	Carrizo-Wilcox	4	3	3	2	2	2
Irrigation	Caldwell	Carrizo-Wilcox	138	123	109	97	86	77
Irrigation	Caldwell	Queen City	89	81	74	68	62	56
Livestock	Caldwell	Carrizo-Wilcox	17	17	17	17	17	17
Livestock	Caldwell	Carrizo-Wilcox	84	84	84	84	84	84
Aqua WSC	Caldwell	Carrizo-Wilcox	48	48	48	48	48	48
Gonzales CO WSC	Caldwell	Carrizo-Wilcox	10	10	10	10	10	10
		Total Caldwell	**546**	**526**	**510**	**494**	**480**	**468**
		Total Projected Groundwater Supply	**10,222**	**10,158**	**10,105**	**10,056**	**10,014**	**9,978**

<u>Rules of the Gonzales County Underground Water Conservation District</u>

TABLE 1
WELL CLASSIFICATION

Actual pumping Capacity of Proposed Well (GPM)	Classification	Minimum Distance From Nearest Existing Well or Authorized Well Site	
		Carrizo/Wilcox	Queen City/Sparta
Less than 17.5 GPM	Domestic	None	None
17.5-100 GPM	A	600 Feet	2000 Feet
101-250 GPM	B	1500 Feet	4850 Feet
251-500 GPM	C	3000 Feet	8400 Feet
501-1000 GPM	Domestic	6000 Feet	9600 Feet
1001 GPM and over	E	12000 Feet	>18,000 Feet

E. Production provision:

The maximum permitted production for a tract of land shall not exceed a total of one (1) acre/foot f water per acre of land owner per year form the Carrizo aquifer or combination of the allowable production from the Queen City and Sparta and Carrizo aquifers. Production from the Queen City Aquifer shall be one (1) acre/foot per year and shall be considered part of the one (1) acre/foot total production allowed on any tract of land. Production from the Sparta aquifer shall be on half (1/2) acre/foot per year and shall be considered part of the one (1) acre/foot total production allowed on any tract of land. Production from the Wilcox aquifer shall be one (1) acre/foot per year and may in addition to any other production permitted for any tract of land. Production is allowed to exceed the permitted capacity by 25% in any average monthly reporting period. The actual calendar year production beginning on January 1st and ending on December 31st may not exceed the permitted pumping capacity for that year. Wells previously permitted to produce at a higher rate shall be reduced to the rate stated in this rule beginning with permits scheduled to be reissued in 2010 and all permits therein after shall be reissued at this rate.

Rule 10 – The Rate of Decline in the confined Portion or Outcrop or any Aquifer

APPENDIX E

Reductions in the allowable permitted production when levels in artesian wells exceed the levels of drawdown indicated:

TABLE 2
CARRIZO OR WILCOX AVERAGE ARTESIAN DECLINE

Carrizo or Wilcox Average Artesian Decline	
Annual Monthly Average Drawdown	**Reduction in current permitted pumpage**
80 feet	5% Reduction of current Ac/ft per Acre
85 feet	10% Reduction of current Ac/ft per Acre
90 feet	15% Reduction of current Ac/ft per Acre
95 feet	20% Reduction of current Ac/ft per Acre
100 feet	Reduce original permitted pumpage 10%
105 feet	Reduce original permitted pumpage 20%
110 feet	Reduce original permitted pumpage 30%
>115 feet	The Board shall apply additional 10% reductions to the permitted pumpage in addition to the 30% reduction annually.

TABLE 3
CARRIZO OUTCROP AVERAGE WATER LEVEL DECLINE

Carrizo Outcrop Average Water Level Decline	
Annual Monthly Average Water Level Decline in the Outcrop Area	**Reduction in current permitted pumpage**
10% of saturated thickness	Reduce original permitted pumpage 5%
15% of saturated thickness	Reduce permitted pumpage 10%
20% of saturated thickness	Reduce permitted pumpage 15%
25% of saturated thickness	Reduce permitted pumpage 20%
30% of saturated thickness	Reduce permitted pumpage 25%
35% of saturated thickness	Reduce permitted pumpage 30%
40% of saturated thickness	Reduce permitted pumpage 35%
45% of saturated thickness	Reduce permitted pumpage 40%
>50% of saturated thickness	The Board shall apply additional 10% reductions to the permitted pumpage in addition to the 40% reduction annually.

TABLE 4

APPENDIX E

AVERAGE QUEEN CITY OR SPARTA AVERAGE ARTESIAN DECLINE

Queen City or Sparta Average Artesian Decline	
Annual Monthly Average Drawdown	**Reduction in current permitted pumpage**
40 feet	10% Reduction of current Ac/ft per Acre
45 feet	20% Reduction of current Ac/ft per Acre
50 feet	Reduce original permitted pumpage 10%
55 feet	Reduce original permitted pumpage 20%
60 feet	Reduce original permitted pumpage 30%
>65 feet	The Board shall apply additional 10% reductions to the permitted pumpage in addition to the 30% reduction annually.

TABLE 5
QUEEN CITY OR SPARTA OUTCROP AVERAGE WATER LEVEL DECLINE

Queen City or Sparta Outcrop Average Water Level Decline	
Annual Monthly Average Water Level Decline in the Outcrop Area	**Reduction in current permitted pumpage**
5% of saturated thickness	Reduce original permitted pumpage 10%
10% of saturated thickness	Reduce permitted pumpage 20%
15% of saturated thickness	Reduce permitted pumpage 30%
20% of saturated thickness	Reduce permitted pumpage 40%
25% of saturated thickness	Reduce permitted pumpage 50%
>30% of saturated thickness	The Board shall apply additional 10% reductions to the permitted pumpage in addition to the 50% reduction annually.

Appendix F

TWDB Water Use Summary Reports

Historical Water Use Summary by County/Basin

Unit: Acre Feet (ACFT)

CALDWELL COUNTY

Year	Basin	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
1974	COLORADO	34	0	0	0	16	207	257
1974	GUADALUPE	3,035	206	0	1,660	54	942	5,897
		3,069	**206**	**0**	**1,660**	**70**	**1,149**	**6,154**
1980	COLORADO	69	0	0	0	0	172	241
1980	GUADALUPE	3,964	219	0	1,600	0	864	6,647
		4,033	**219**	**0**	**1,600**	**0**	**1,036**	**6,888**
1984	COLORADO	265	0	0	6	0	138	409
1984	GUADALUPE	4,827	240	0	688	27	696	6,478
		5,092	**240**	**0**	**694**	**27**	**834**	**6,887**
1985	COLORADO	162	0	0	4	0	124	290
1985	GUADALUPE	4,268	224	0	495	27	623	5,637
		4,430	**224**	**0**	**499**	**27**	**747**	**5,927**
1986	COLORADO	71	0	0	4	0	136	211
1986	GUADALUPE	4,412	223	0	496	0	681	5,812
		4,483	**223**	**0**	**500**	**0**	**817**	**6,023**
1987	COLORADO	99	0	0	4	0	133	236
1987	GUADALUPE	4,518	0	0	496	28	670	5,712
		4,617	**0**	**0**	**500**	**28**	**803**	**5,948**
1988	COLORADO	108	0	0	4	0	140	252
1988	GUADALUPE	4,796	0	0	496	25	701	6,018
		4,904	**0**	**0**	**500**	**25**	**841**	**6,270**
1989	COLORADO	226	0	0	10	0	137	373
1989	GUADALUPE	4,629	0	0	1,188	27	690	6,534
		4,855	**0**	**0**	**1,198**	**27**	**827**	**6,907**
1990	COLORADO	216	0	0	20	0	135	371
1990	GUADALUPE	4,715	0	0	1,355	27	681	6,778
		4,931	**0**	**0**	**1,375**	**27**	**816**	**7,149**
1991	COLORADO	188	0	0	0	6	140	334
1991	GUADALUPE	4,132	0	0	954	7	696	5,789
		4,320	**0**	**0**	**954**	**13**	**836**	**6,123**
1992	COLORADO	192	0	0	22	6	139	359
1992	GUADALUPE	4,264	0	0	1,491	7	696	6,458
		4,456	**0**	**0**	**1,513**	**13**	**835**	**6,817**
1993	COLORADO	211	0	0	9	6	129	355
1993	GUADALUPE	4,614	2	0	1,118	6	640	6,380
		4,825	**2**	**0**	**1,127**	**12**	**769**	**6,735**
1994	COLORADO	213	0	0	10	6	149	378

CALDWELL COUNTY								
Year	**Basin**	**Municipal**	**Manufacturing**	**Steam Electric**	**Irrigation**	**Mining**	**Livestock**	**Total**
1994	GUADALUPE	4,505	11	0	1,351	6	741	6,614
		4,718	**11**	**0**	**1,361**	**12**	**890**	**6,992**
1995	COLORADO	255	0	0	13	6	151	425
1995	GUADALUPE	4,500	10	0	1,683	6	756	6,955
		4,755	**10**	**0**	**1,696**	**12**	**907**	**7,380**
1996	COLORADO	282	0	0	14	6	133	435
1996	GUADALUPE	4,904	12	0	1,728	6	668	7,318
		5,186	**12**	**0**	**1,742**	**12**	**801**	**7,753**
1997	COLORADO	254	0	0	12	6	146	418
1997	GUADALUPE	4,330	10	0	1,548	6	723	6,617
		4,584	**10**	**0**	**1,560**	**12**	**869**	**7,035**
1998	COLORADO	270	0	0	42	6	137	455
1998	GUADALUPE	4,543	8	0	1,663	6	679	6,899
		4,813	**8**	**0**	**1,705**	**12**	**816**	**7,354**
1999	COLORADO	268	0	0	36	6	153	463
1999	GUADALUPE	4,550	8	0	1,585	6	757	6,906
		4,818	**8**	**0**	**1,621**	**12**	**910**	**7,369**
2000	COLORADO	268	0	0	4	6	154	432
2000	GUADALUPE	4,661	11	0	985	6	763	6,426
		4,929	**11**	**0**	**989**	**12**	**917**	**6,858**
2001	COLORADO	31	0	0	7	3	149	190
2001	GUADALUPE	4,503	200	0	1,583	3	739	7,028
		4,534	**200**	**0**	**1,590**	**6**	**888**	**7,218**
2002	COLORADO	30	0	0	7	3	161	201
2002	GUADALUPE	4,281	6	0	1,583	3	797	6,670
		4,311	**6**	**0**	**1,590**	**6**	**958**	**6,871**
2003	COLORADO	34	0	0	4	3	162	203
2003	GUADALUPE	4,944	0	0	1,061	3	803	6,811
		4,978	**0**	**0**	**1,065**	**6**	**965**	**7,014**
2004	COLORADO	34	0	0	5	3	176	218
2004	GUADALUPE	4,736	1	0	178	3	875	5,793
		4,770	**1**	**0**	**183**	**6**	**1,051**	**6,011**

Disclaimer: The Water Use estimates posted are subject to revision as additional data and corrections are made available to the TWDB.

Historical Water Use Summary by Groundwater (GW) and Surface Water (SW)

Unit: Acre Feet (ACFT)

CALDWELL COUNTY

Year	Source	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
1974	GW	3,069	206	0	97	70	253	3,695
1974	SW	0	0	0	1,563	0	896	2,459
	Total	**3,069**	**206**	**0**	**1,660**	**70**	**1,149**	**6,154**
1980	GW	2,679	34	0	100	0	169	2,982
1980	SW	1,354	185	0	1,500	0	867	3,906
	Total	**4,033**	**219**	**0**	**1,600**	**0**	**1,036**	**6,888**
1984	GW	3,662	37	0	205	3	82	3,989
1984	SW	1,430	203	0	489	24	752	2,898
	Total	**5,092**	**240**	**0**	**694**	**27**	**834**	**6,887**
1985	GW	3,252	38	0	144	27	74	3,535
1985	SW	1,178	186	0	355	0	673	2,392
	Total	**4,430**	**224**	**0**	**499**	**27**	**747**	**5,927**
1986	GW	3,392	38	0	145	0	81	3,656
1986	SW	1,091	185	0	355	0	736	2,367
	Total	**4,483**	**223**	**0**	**500**	**0**	**817**	**6,023**
1987	GW	3,298	0	0	145	28	80	3,551
1987	SW	1,319	0	0	355	0	723	2,397
	Total	**4,617**	**0**	**0**	**500**	**28**	**803**	**5,948**
1988	GW	3,345	0	0	145	25	84	3,599
1988	SW	1,559	0	0	355	0	757	2,671
	Total	**4,904**	**0**	**0**	**500**	**25**	**841**	**6,270**
1989	GW	3,406	0	0	147	27	82	3,662
1989	SW	1,449	0	0	1,051	0	745	3,245
	Total	**4,855**	**0**	**0**	**1,198**	**27**	**827**	**6,907**
1990	GW	3,589	0	0	674	27	81	4,371
1990	SW	1,342	0	0	701	0	735	2,778
	Total	**4,931**	**0**	**0**	**1,375**	**27**	**816**	**7,149**
1991	GW	3,106	0	0	0	13	84	3,203
1991	SW	1,214	0	0	954	0	752	2,920
	Total	**4,320**	**0**	**0**	**954**	**13**	**836**	**6,123**
1992	GW	3,205	0	0	741	13	84	4,043
1992	SW	1,251	0	0	772	0	751	2,774
	Total	**4,456**	**0**	**0**	**1,513**	**13**	**835**	**6,817**
1993	GW	3,491	2	0	147	12	77	3,729
1993	SW	1,334	0	0	980	0	692	3,006
	Total	**4,825**	**2**	**0**	**1,127**	**12**	**769**	**6,735**
1994	GW	3,441	11	0	147	12	89	3,700

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CALDWELL COUNTY

Year	Source	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
1994	SW	1,277	0	0	1,214	0	801	3,292
	Total	**4,718**	**11**	**0**	**1,361**	**12**	**890**	**6,992**
1995	GW	3,408	10	0	220	12	91	3,741
1995	SW	1,347	0	0	1,476	0	816	3,639
	Total	**4,755**	**10**	**0**	**1,696**	**12**	**907**	**7,380**
1996	GW	3,970	12	0	227	12	80	4,301
1996	SW	1,216	0	0	1,515	0	721	3,452
	Total	**5,186**	**12**	**0**	**1,742**	**12**	**801**	**7,753**
1997	GW	3,561	10	0	203	12	87	3,873
1997	SW	1,023	0	0	1,357	0	782	3,162
	Total	**4,584**	**10**	**0**	**1,560**	**12**	**869**	**7,035**
1998	GW	3,794	8	0	716	12	82	4,612
1998	SW	1,019	0	0	989	0	734	2,742
	Total	**4,813**	**8**	**0**	**1,705**	**12**	**816**	**7,354**
1999	GW	3,768	8	0	616	12	91	4,495
1999	SW	1,050	0	0	1,005	0	819	2,874
	Total	**4,818**	**8**	**0**	**1,621**	**12**	**910**	**7,369**
2000	GW	3,743	11	0	137	12	91	3,994
2000	SW	1,186	0	0	852	0	826	2,864
	Total	**4,929**	**11**	**0**	**989**	**12**	**917**	**6,858**
2001	GW	3,224	200	0	223	6	64	3,717
2001	SW	1,310	0	0	1,367	0	824	3,501
	Total	**4,534**	**200**	**0**	**1,590**	**6**	**888**	**7,218**
2002	GW	3,065	6	0	223	6	69	3,369
2002	SW	1,246	0	0	1,367	0	889	3,502
	Total	**4,311**	**6**	**0**	**1,590**	**6**	**958**	**6,871**
2003	GW	3,540	0	0	129	6	69	3,744
2003	SW	1,438	0	0	936	0	896	3,270
	Total	**4,978**	**0**	**0**	**1,065**	**6**	**965**	**7,014**
2004	GW	3,391	1	0	159	6	75	3,632
2004	SW	1,379	0	0	24	0	976	2,379
	Total	**4,770**	**1**	**0**	**183**	**6**	**1,051**	**6,011**

Disclaimer: The Water Use estimates posted are subject to revision as additional data and corrections are made available to the TWDB.

Appendix G

Caldwell County Water Rights and Database Dictionary

Data Dictionary - Water Rights Database
(last updated: July 14, 2008)

Field Name	Description
WRNo	Water Right Number; identifier for water rights.
WRType	Water Right Type; any of the following: 1 = Application/Permit 2 = Claim 3 = Certified Filing 4 = Returned or Withdrawn 5 = Dismissed/Rejected 6 = Certificate of Adjudication 8 = Temporary Permit 9 = Contract/Contractual Permit/Agreement
WRSeq	Water Right Sequence Number; numbers the lines of data in each water right.
AppNo	Indicates the Application number associated with the Permit number (water right number). Use this number to request a Central Records Permit file.
WRIssueDate	Indicates the date the water right was issued by the TCEQ or predecessors.
AmendmentLetter	Unique identifier for amendments to water rights.
CancelledStatusCode	Indicates water right status; any of the following: R = Dismissed/Rejected/Combined T = Totally Cancelled A = Adjudicated P = Partially Cancelled Blank = Current
Owner Name	Indicates the water right owner name.
OwnerTypeCode	Indicates type of owner; any of the following: 1 = Individual 2 = Organization 3 = Et Ux 4 = Et Al 5 = Estate or Trust 6 = Et Vir 7 = Individual Unverified 8 = Organization Unverified 9 = Estate or Trust Unverified 10 = Archive 11 = Et Ux Unverified 12 = Et Al Unverified
DivAmountValue	Indicates the amount of water authorized for diversion per year, in acre-feet.
WMCode	Indicates the Watermaster Area in which the water right is located, as follows: CR = Concho River ST = South Texas RG = Rio Grande blank = not in a Watermaster Area

UseCode	Indicates the appropriated use of the water right; any of the following: 1 = Municipal/Domestic 7 = Recreation 2 = Industrial 8 = Other 3 = Irrigation 9 = Recharge 4 = Mining 11 = Domestic & Livestock Only 5 = Hydroelectric 13 = Storage 6 = Navigation
Priority Date	Indicates the original date of the original use of the water allocated under that water right. In the Rio Grande basin, priority is instead indicated by class (Priority Class Code).
Priority Month, Priority Day, Priority Year (three fields)	Priority date parsed into three columns. Use these columns to sort.
PriorityClassCode	Indicates the priority of the water right in the Rio Grande basin. In order of highest to lowest priority: M or D (municipal or domestic and livestock) A B
DateCancelled	Indicates the date the water right was cancelled, per order of the TCEQ.
ExpireRemarks	Indicates the date the water right or contract is scheduled to expire.
Acreage	With use 3 (irrigation) data, indicates the number of acres authorized for irrigation.
ResName, ResCap (two fields)	Reservoir Name and Reservoir Capacity in Acre-Feet: Indicates the name of the reservoir and the amount of impoundment authorized by the water right.
SiteName	Indicates the facility/plant name associated with the water right.
BasinCode	Indicates river basin where the base right is located; any of the following: 1 = Canadian 13 = Brazos-Colorado 2 = Red 14 = Colorado 3 = Sulphur 15 = Colorado-Lavaca 4 = Cypress 16 = Lavaca 5 = Sabine 17 = Lavaca-Guadalupe 6 = Neches 18 = Guadalupe 7 = Neches-Trinity 19 = San Antonio 8 = Trinity 20 = San Antonio-Nueces 9 = Trinity-San Jacinto 21 = Nueces 10 = San Jacinto 22 = Nueces-Rio Grande 11 = San Jacinto-Brazos 23 = Rio Grande 12 = Brazos
RiverOrderNo	River Order Number: Indicates 10 digit number assigned by the Application Unit of Water Rights Permitting and locates the diversion point in relation to other diversion points on the stream.

RegionCode	Indicates the Regional Water Planning Group region(s) where the water right is located, or to which the water right is related. A = Panhandle B = Region B C = Region C D = North East Texas E = Far West Texas F = Region F G = Brazos H = Region H I = East Texas J = Plateau K = Lower Colorado L = South Central M = Rio Grande N = Coastal Bend O = Llano-Estacado P = Lavaca
SWRACode	Indicates the Special Water Resource Area where the water right is located, or to which a water supply contract is related; any of the following: 1 = Meredith 2 = Alan Henry 3 = Chapman (Cooper) 4 = Tawakoni 5 = Lake Fork 6 = Athens 7 = Palestine 8 = Cherokee 9 = Oak Creek 10 = Ivie 11 = Travis 12 = Amistad 13 = Medina 14 = Canyon 15 = Texana 16 = Greenbelt 17 = Possum Kingdom 18 = Granbury 19 = Whitney 20 = Aquilla 21 = Proctor 22 = Belton 23 = Stillhouse Hollow 24 = Georgetown 25 = Granger 26 = Somerville 27 = Limestone
UnnamedTrib	When Y (Yes), indicates that the Diversion point is located on an unnamed tributary of 'stream name', the next field in the database; for example: Unnamed Tributary of the Trinity River. When N (No) or blank, indicates that the Diversion point is located directly on 'stream name', the next field in the database; for example: Trinity River.
StreamName	Indicates the stream where the diversion point for the water right is located.
OtherStreamName	Indicates the stream where the additional diversion point for the water right is located.

CountyName	1 = Anderson 2 = Andrews 3 = Angelina 4 = Aransas 5 = Archer 6 = Armstrong 7 = Atascosa 8 = Austin 9 = Bailey 10 = Bandera 11 = Bastrop 12 = Baylor 13 = Bee 14 = Bell 15 = Bexar 16 = Blanco 17 = Borden 18 = Bosque 19 = Bowie 20 = Brazoria 21 = Brazos 22 = Brewster 23 = Briscoe 24 = Brooks 25 = Brown 26 = Burleson 27 = Burnet 28 = Caldwell 29 = Calhoun 30 = Callahan 31 = Cameron 32 = Camp 33 = Carson 34 = Cass 35 = Castro 36 = Chambers 37 = Cherokee 38 = Childress 39 = Clay 40 = Cochran 41 = Coke 42 = Coleman 43 = Collin 44 = Collingsworth 45 = Colorado 46 = Comal 47 = Comanche 48 = Concho 49 = Cooke 50 = Coryell 51 = Cottle 52 = Crane 53 = Crockett 54 = Crosby 55 = Culberson 56 = Dallam 57 = Dallas 58 = Dawson 59 = Deaf Smith 60 = Delta 61 = Denton 62 = De Witt 63 = Dickens 64 = Dimmit 65 = Donley 66 = Duval 67 = Eastland 68 = Ector 69 = Edwards 70 = Ellis 71 = El Paso 72 = Erath 73 = Falls 74 = Fannin 75 = Fayette 76 = Fisher 77 = Floyd 78 = Foard 79 = Fort Bend 80 = Franklin 81 = Freestone 82 = Frio 83 = Gaines 84 = Galveston 85 = Garza 86 = Gillespie 87 = Glasscock 88 = Goliad 89 = Gonzales 90 = Gray 91 = Grayson 92 = Gregg 93 = Grimes 94 = Guadalupe 95 = Hale 96 = Hall 97 = Hamilton 98 = Hansford 99 = Hardeman 100 =Hardin 101 = Harris 102 = Harrison 103 = Hartley 104 = Haskell 105 = Hays 106 = Hemphill 107 = Henderson 108 = Hidalgo 109 = Hill 110 = Hockley 111 = Hood 112 = Hopkins 113 = Houston 114 = Howard 115 = Hudspeth 116 = Hunt 117 = Hutchinson 118 = Irion 119 = Jack 120 = Jackson 121 = Jasper 122 = Jeff Davis 123 = Jefferson 124 = Jim Hogg 125 = Jim Wells 126 = Johnson 127 = Jones 128 = Karnes 129 = Kaufman 130 = Kendall 131 = Kenedy 132 = Kent 133 = Kerr 134 = Kimble 135 = King 136 = Kinney 137 = Kleberg 138 = Knox 139 = Lamar 140 = Lamb 141 = Lampasas 142 = La Salle 143 = Lavaca 144 = Lee 145 = Leon 146 = Liberty 147 = Limestone 148 = Lipscomb 149 = Live Oak 150 = Llano 151 = Loving 152 = Lubbock 153 = Lynn 154 = McCulloch 155 = McLennan 156 = McMullen 157 = Madison 158 = Marion 159 = Martin 160 = Mason 161 = Matagorda 162 = Maverick 163 = Medina 164 = Menard 165 = Midland 166 = Milam 167 = Mills 168 = Mitchell 169 = Montague 170 = Montgomery 171 = Moore 172 = Morris 173 = Motley 174 = Nacogdoches 175 = Navarro 176 = Newton 177 = Nolan 178 = Nueces 179 = Ochiltree 180 = Oldham 181 = Orange 182 = Palo Pinto 183 = Panola 184 = Parker 185 = Parmer 186 = Pecos 187 = Polk 188 = Potter 189 = Presidio 190 = Rains 191 = Randall 192 = Reagan 193 = Real 194 = Red River 195 = Reeves 196 = Refugio 197 = Roberts 198 = Robertson 199 = Rockwall 200 = Runnels 201 = Rusk 202 = Sabine 203 = San Augustine 204 = San Jacinto 205 = San Patricio 206 = San Saba 207 = Schleicher 208 = Scurry 209 = Shackelford 210 = Shelby 211 = Sherman 212 = Smith 213 = Somervell 214 = Starr 215 = Stephens 216 = Sterling 217 = Stonewall 218 = Sutton 219 = Swisher 220 = Tarrant 221 = Taylor 222 = Terrell 223 = Terry 224 = Throckmorton 225 = Titus 226 = Tom Green 227 = Travis 228 = Trinity 229 = Tyler 230 = Upshur 231 = Upton 232 = Uvalde 233 = Val Verde 234 = Van Zandt 235 = Victoria 236 = Walker 237 = Waller 238 = Ward 239 = Washington 240 = Webb 241 = Wharton 242 = Wheeler 243 = Wichita 244 = Wilbarger 245 = Willacy 246 = Williamson 247 = Wilson 248 = Winkler 249 = Wise 250 = Wood 251 = Yoakum 252 = Young 253 = Zapata 254 = Zavala
Remarks	Indicates any additional information necessary to explain or define the water right. Once used for displaying amendment dates. SC=Special Condition, SCs=Special Conditions. SCS SITE=Soil Conservation Service Site.
BaseWRNo and Type (two fields)	For a Contract (type 9), indicates the supplier's water right number and type. Example: For Contract No. 000088-9, City of San Angelo, the Base Water Right and Type is 001008-6, Colorado River MWD.

APPENDIX G
TCEQ SURFACE WATER RIGHTS DATABASE FOR CALDWELL COUNTY

WR No	WR Type	WR Seq	Owner Name	Owner Type Code	Div Amt Value	Priority Date	Basin Code	Region Code	StreamName
3906	6	1	TEXAS PARKS & WILDLIFE DEPT	2	12	2/22/1972	18	L	CLEAR FRK PLUM CRK
3906	6	2	TEXAS PARKS & WILDLIFE DEPT	2	63	11/26/1979	18	L	CLEAR FRK PLUM CRK
3906	6	3	TEXAS PARKS & WILDLIFE DEPT	2		11/26/1979	18	L	CLEAR FRK PLUM CRK
3905	6	1	ALLAN C ASHCRAFT ET AL	4		9/28/1964	18	L	DRY CRK
3904	6	1	SPENCEWOOD INC	2	28	12/31/1951	18	L	ELM CRK
4213	1	1	BEN B TWIDWELL ET UX	3	120	11/20/1984	18	L	PLUM CRK
3719	1	1	MIGUEL CALZADA URQUIZA ET UX	3	45	7/30/1979	18	L	SALT CRK
3719	1	2	SCHMIDT RANCH LLC	2	623	7/30/1979	18	L	SALT CRK
3594	1	1	ROBERT M KIEHN	1	144	1/30/1978	18	L	SAN MARCOS RIVER
3724	1	1	ROBERT GLASS LANGFORD	1	149	1/28/1980	18	L	SAN MARCOS RIVER
3742	1	1	GEORGE PARTNERSHIP LTD	2	300	3/17/1980	18	L	SAN MARCOS RIVER
3787	1	1	BEN O CORPORATION	2	104	10/6/1980	18	L	SAN MARCOS RIVER
3812	1	1	VNS & CLS PARTNERS LTD	2	240	3/30/1981	18	L	SAN MARCOS RIVER
4057	1	1	CHRISTOPHER G SEEKER ET UX	2	300	6/13/1983	18	L	SAN MARCOS RIVER
4242	1	1	ROBERT L BOOTHE	1	240	5/29/1985	18	L	SAN MARCOS RIVER
4253	1	1	HYDRACO POWER INC	2	15,000	9/25/1984	18	L	SAN MARCOS RIVER
4287	1	1	JOHN T O'BANION JR ET AL	4	320	7/30/1985	18	L	SAN MARCOS RIVER
5092	1	1	CITY OF SAN MARCOS	2	150	9/2/1986	18	L	SAN MARCOS RIVER
5234	1	1	GUADALUPE-BLANCO RIVER AUTHORITY	2	1,022	5/12/1989	18	L	SAN MARCOS RIVER
5857	1	1	GENE MILLIGAN	1	1	10/18/2004	18	L	SAN MARCOS RIVER
3724	1	2	GAYLE LANGFORD TURNER	1	106	1/28/1980	18	L	SAN MARCOS RIVER
3787	1	2	BEN O CORPORATION	2	250	9/6/1985	18	L	SAN MARCOS RIVER
4057	1	2	CHRISTOPHER G SEEKER ET UX	2	300	3/4/1986	18	L	SAN MARCOS RIVER
4242	1	2	DON B MORGAN ET UX	3		5/29/1985	18	L	SAN MARCOS RIVER
5234	1	2	GUADALUPE-BLANCO RIVER AUTHORITY	2		8/6/2003	18	L	SAN MARCOS RIVER
5857	1	2	GENE MILLIGAN	1		10/18/2004	18	L	SAN MARCOS RIVER
3724	1	3	JEARL LEDBETTER ET UX	3	194	1/28/1980	18	L	SAN MARCOS RIVER
3787	1	3	MICHAEL W OHLENDORF ET UX	3	21	10/6/1980	18	L	SAN MARCOS RIVER
5234	1	3	GUADALUPE-BLANCO RIVER AUTHORITY	2		8/6/2003	18	L	SAN MARCOS RIVER
3724	1	4	JEROME V MILLER ET UX	3	1	1/28/1980	18	L	SAN MARCOS RIVER

APPENDIX G
TCEQ SURFACE WATER RIGHTS DATABASE FOR CALDWELL COUNTY

WR No	WR Type	WR Seq	Owner Name	Owner Type Code	Div Amt Value	Priority Date	Basin Code	Region Code	StreamName
3787	1	4	MICHAEL W OHLENDORF ET UX	3	50	9/6/1985	18	L	SAN MARCOS RIVER
3889	6	1	CANYON REGIONAL WATER AUTHORITY	2	24	6/23/1914	18	L	SAN MARCOS RIVER
3890	6	1	GEORGE PARTNERSHIP LTD	2	50	8/9/1971	18	L	SAN MARCOS RIVER
3891	6	1	TRI-COMMUNITY WSC	2	500	12/29/1922	18	L	SAN MARCOS RIVER
3895	6	1	EBL INC DEF BEN PENSION PLAN & TRUST	5	580	3/21/1977	18	L	SAN MARCOS RIVER
3896	6	1	GUADALUPE-BLANCO RIVER AUTHORITY	2	1,500	10/12/1976	18	L	SAN MARCOS RIVER
3897	6	1	LULING ECONOMIC DEVELOPMENT CORP	4		6/22/1914	18	L	SAN MARCOS RIVER
3898	6	1	CITY OF LULING	2	20	8/16/1976	18	L	SAN MARCOS RIVER
3899	6	1	SCHMIDT RANCH LLC	2	1,180	3/21/1977	18	L	SAN MARCOS RIVER
3900	6	1	DAVID NEAL PAPE ET AL	4		2/12/1973	18	L	SAN MARCOS RIVER
3895	6	2	EBL INC DEF BEN PENSION PLAN & TRUST	5		3/21/1977	18	L	SAN MARCOS RIVER
3896	6	2	GUADALUPE-BLANCO RIVER AUTHORITY	2		1/7/1980	18	L	SAN MARCOS RIVER
3900	6	2	ESTATE OF JAMES D JAMISON	5	750	2/12/1973	18	L	SAN MARCOS RIVER
3895	6	3	EBL INC DEF BEN PENSION PLAN & TRUST	5		3/21/1977	18	L	SAN MARCOS RIVER
3896	6	3	GUADALUPE-BLANCO RIVER AUTHORITY	2	1,300	1/31/1983	18	L	SAN MARCOS RIVER

Appendix H

Water Conservation Measures

APPENDIX H

WATER CONSERVATION MEASURES

Introduction

Water conservation will provide benefits not only to customers in cost but to society by preserving the environment and our resources by reducing demands on water and wastewater systems. The objective of the Caldwell County Conservation Plan will be to provide on brief overview of current measures undertaken by water utilities and to promote and implement water conservation.

Water conservation has been identified by Region L as a measure to meet future water demands. As growth occurs and new developments flourish, it will be helpful to consider having a list of action items to be implemented to accommodate the increase in customers without a substantial increase in water demands.

Water Supply System Conservation Measures

The water supply systems that currently serve Caldwell County responded in a survey as having implemented the following measures to encourage water conservation:

- Increasing water rates
- Prohibit landscaping between the hours of 10 am to 8 pm
- Biannual newsletters with conservation tips
- Increasing rate blocks
- Install accurate metering devices
- Universal metering
- Meter testing and replacement programs
- Record management system
- Water audits
- Public Education
- Non-promotional water rates
- Leak detection and replacement

- Annual presentations
- Conservation water rate
- Strict Plumbing code enforcement
- Mail updates and conservation mail from groundwater districts

Measures under consideration by water supply systems to encourage water conservation:

- Education
- Reducing per capita consumption by 3%
- Joined SWAP
- Replace meters on schedule to reduce water loss
- Leak monitoring program to identify and repair leaks
- Encourage xeriscaping
- Implement year round water restriction
- Mail out information on a percent basis

As conservation measures are implemented, communicating the benefits of the strategy is one of the best ways to encourage other water suppliers to do likewise. Not only will Conservation Programs slow groundwater drawdown but also reduce cost of water treatment plants by eliminating or delaying expansion resulting in considerable financial savings.

Record Management System

Maintaining accurate and updated records of water distribution and sales are essential record keeping tools needed for operation and management of a profitable water business. Establishing a central system which is able to segregate water sales and water uses for various user classes can provide data quickly and efficiently for review of systems. User classes can include; single-family, multifamily, commercial, industrial, schools, and irrigation.

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Water Rate Structure

An increasing water rate structure can motivate customers to reduce water use and practice conservation measures. Establishing an average monthly consumption rate for all classes of users and gradually increasing charge will encourage limits on watering and use. Peak seasonal rates and City Limit boundary considerations should also be included in the rate structure.

Water Audits

Although it is impractical to attain 0% loss in water systems, it can be substantially minimized with monthly, quarterly, semi-annual, or annual audits. Audits require accountability and responsibility for substantial loss is a system. Improvements are required and goals should be established to decrease the losses in a system and kept to a minimum. Larger cities than those in Caldwell have recorded water loss under 10%. Long-term planning at the city level should develop goals of minimum and maximum water loss with action plans ready to be implemented in the event goals are not met.

HB 3338 Water Auditing Reporting Information was enacted in the 78th Legislature in 2003. The bill requires "each retail public utility that provides potable water to conduct a water loss audit once every five years and to report the results of the audit to the Texas Water Development Board (TWDB). The water audit addresses four main points of water loss: loss from distribution lines; inaccuracies in meters; deficiencies in accounting practices; and, theft of service." Submission of the 2006 deadline for the report has resulted in a response rate under 50%.

Metering

Metering all the customer base is the only tool available that can account for water use. Proper calibration and routine testing can increase accuracy of measurements. It would be beneficial to test every meter before installation and develop a frequent routine to test installed meters. Proper metering for use is important to reduce cost and errors in billings.

Reuse

Reuse/ reclaimed waste water can be utilized for non-potable water uses. Several customers from residential to commercial can utilize the water. Reuse can be considered for the following:

- Schools
- Athletic fields
- Manufacturing businesses
- Gold courses
- Parks
- Apartment/ various housing complexes

Components of the water system to consider would include transmission mains, storage tanks, and pump stations. These systems need to be reviewed further to consider a benefit and cost

Plumbing Fixtures

Rebate Programs and Replacement Programs for single family homes to include toilets, sinks, and shower heads. Eligible fixtures should demonstrate a 20% or more efficiency in water use. Water efficient clothes washers can also be included in the program.



Leak Detection and Repair

Sound detection of leaks is the most common practice to locate faulty joints and broken sections of pipe. Once located, a log should be maintained for repair and a database established and utilized.

Water Efficient Landscaping

As water resources become scarce and rates continue increase other viable solutions for customers include rain water harvesting. The TWDB has published a series of technical guides on rainwater harvesting to promote use. Participation in workshops, seminars, and conference can further the education of local customers.

- Soil Composition
- Depth of soil
- Depth of mulch

Rainwater Harvesting Systems

Rainwater harvesting has gained popularity as different sizes and shapes of tanks are emerging. Below ground rainwater tanks and smaller cisterns are available to offset municipal water use. The water from the cisterns can be for potable and non-potable use.

The TWDB presented a report to the Legislature in 2006 to on recommendations for minimum water quality standards for indoor potable and non-potable use, treatment methods, conjunctive use with municipal water systems, and ways in which the state can further promote rainwater harvesting. Additional information can be obtained at http://www.twdb.state.tx.us/iwt/rainwater.asp.

Agricultural Irrigation

Irrigation of agriculture is one the greatest water consumers and currently accounts for a significant amount of the water use in Texas. Surface, sprinkler and drip irrigation art the basic types of irrigation. Drip irrigation has been found to be the most efficient for certain crops.

Establishing schedules based on the crop's needs and monitoring soil moisture and weather help determine the amount of water to apply. Proper grading of the land for use and irrigation practice can be a natural way to reduce water use. Additional conservation methods include:

- Furrow Dinking
- Conservation Tillage
- Tail water Reuse
- Surge Flow
- Low Elevation Spray Application Systems (LESA)
- Canal and Conveyance System Management

Public Education

There are several modes of informing and educating the public that can be utilized. Water conservation education can be transmitted through the following:

- Public Service Announcements
- Workshops and Seminars
- Pamphlets
- Outreach programs
- Schools
- Awards and Recognition
- Creative Competitions (Drawing, Photo, and Essay)

Appendix I

Plum Creek Watershed Protection Plan Best Management Practices

APPENDIX I

BEST MANAGEMENT PRACTICES

Best Management Practices listed in the Plum Creek Watershed Protection Plan to be implemented.

Urban Stormwater Measures

Common Goals

- Implement non-structural components of MS4 permits on a voluntary basis in advance of program requirements
- Conduct stormwater engineering analyses and city-wide assessments to determine placement of structural management measures in individual cities
- Pet waste management, including passage or modification of ordinances and installation and management of pet waste stations

Lockhart

- Enact a pet waste ordinance
- Install 10 pet waste stations and signage
- Nutrient/irrigation water management in park areas
- Manage/periodically relocate duck population at City Park
- Continue/expand existing street sweeping program

Luling

- Reconstruct Cottonwood Creek stormwater retention pond
- Enact a pet waste ordinance
- Install 6 pet waste stations and signage
- Continue/expand existing street sweeping program

Wastewater Management Measures

Wastewater Treatment Facilities

- Promote signing of the East Hays County Wastewater Compact, a key interlocal agreement between multiple entities in the region.
- All WWTFs agree to work toward treatment levels of 5-5-2-1 (BOD/TSS/NH_3/TP) by way of permits for new facilities and voluntary action by existing plants.
- All WWTFs will begin monthly self-monitoring of effluent for bacteria and nutrients.
- All WWTF operators will demonstrate the appropriate licenses and certifications and be current on continuing education opportunities.

- The cities of Kyle, Lockhart, and Luling will evaluate costs and feasibility in an effort to implement phosphorous removal techniques for all effluent entering Plum Creek.

Wastewater Infrastructure

- Cities will continue or initiate daily inspections of lift stations and equip all stations with dialers and/or Supervisory Control and Data Acquisition (SCADA) systems.
- Cities will continue to apply for grants to replace old clay pipe sewer lines, and clean and maintain existing sewer lines.
- Cities will work to locate any septic systems that may still be within the city limits and connect those residences to central wastewater treatment.

Cropland Operations Management Measures

To focus management plan development and implementation, management measures, addressing bacteria and nutrient issues will be encouraged and given top priority. Based on site-specific characteristics, plans should include one or more of the following management practices to reduce pollutant loads from agricultural lands:

- Prescribed Grazing: Manages the controlled harvest of vegetation with grazing animals to improve or maintain the desired species composition and vigor of plant communities, which improves surface and subsurface water quality and quantity.

- Riparian Herbaceous Buffers: Establishes an area of grasses, glasslike plants, and forbs along water courses to improve and protect water quality by reducing sediment and other pollutants in runoff as well as nutrients and chemicals in shallow groundwater.

- Grasses Waterways: Natural or constructed channel-shaped or graded and established with suitable vegetation to protect and improve water quality.

- Riparian Forest Buffers: Establishes area dominated by trees and shrubs located adjacent to and up-gradient from watercourses to reduce excess amounts of sediment, organic material, nutrients, and pesticides in surface runoff and excess nutrients and other chemicals in shallow groundwater flow.

- Watering Facilities: Places a device (tank, trough, or other watertight container) that provides animal access to water and protects streams, ponds, and water supplies from contamination through alternative access to water.

- Field Borders: Establishes a strip of permanent vegetation at the edge or around the perimeter of a field to protect soil and water quality.

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- Filter Strips: Establishes a strip or area of herbaceous vegetation between agricultural lands and environmentally sensitive areas to reduce pollutant loading in runoff.

- Nutrient Management: Manages the amount, source, placement, form, and timing of the application of plant nutrients and soil amendments to minimize agricultural nonpoint source pollution of surface and groundwater resources.

- Conservation Cover: Establishes permanent vegetative cover to protect soil and water.

- Stream Crossings: Creates a stabilized area or structure constructed across a stream to provide a travel way for people, livestock, equipment, or vehicles, improving water quality by reducing sediment, nutrient, organic, and inorganic loading of the stream.

- Alternative Shade: Although not currently an approved cost-share practice, creation of shade reduces time spent loafing in streams and riparian areas, thus reducing pollutant loading. Efforts will be made to include this practice as a component of livestock management plans.

Appendix J

Plum Creek Watershed Protection Plan Management

Measures and Outreach Activities

Management Measures
as described in the
Plum Creek Watershed Protection Plan

Management Measure	Responsible Party	Unit Cost	Number Implemented			Total Cost
			Year			
			1-3	4-6	7-10	
Urban Stormwater Management Measures						
Pet Waste Collection Stations	City of Lockhart	$620/station installation $85 annual/station	10	4	4	$22,040
Pet Waste Collection Stations	City of Luling	$620/station installation $85 annual/station	6	2	2	$12,475
Comprehensive Urban Stormwater Assessment	City of Lockhart	$25,000/survey	1	---	---	$25,000
Manage Urban Waterfowl Populations	City of Lockhart	---	---	---	---	N/A
Comprehensive Urban Stormwater Assessment	City of Luling	$20,000/survey	1	---	---	$20,000
Rehabilitate Stormwater Retention Pond	City of Luling	$500,000/pond	1		---	$500,000
Wastewater Management Measures						
Wastewater Upgrade (TSS Reduction)	WWTF Operators	$500,000/ 1 MGD facility		3	7	$6,000
Wastewater Upgrade (Phosphorous Removal)	WWTF Operators	$60,000/facility (includes material costs)		3	7	$600,000
Voluntary Monthly E. coli Monitoring	WWTF Operators	$22/monthly/facility	---	---	---	$31,000
Voluntary Monthly Phosphorous Monitoring	WWTF Operators	$25/monthly/facility	---	---	---	$35,000
Wastewater Management Measures (continued)						
Sanitary Sewer Pipe Replacement	City of Lockhart	$320,000/year	1,800 ft	1,800 ft	2,400 ft	$3,200,00[3]
Initiate Sanitary Sewer Inspection Program	City of Luling	$17,000/camera	1	---	---	$17,000[2]
Sanitary Sewer Pipe Replacement	City of Luling	$100,000/year	2,400 ft	2,400 ft	3,200 ft	$10,000,000[3]
Lift Station SCADA Installation	City of Luling	$12,000/station	4	1		$60,000

Management Measures
as described in the
Plum Creek Watershed Protection Plan

Management Measure	Responsible Party	Unit Cost	Number Implemented Year 1-3	4-6	7-10	Total Cost
Septic System Inspection/ Enforcement (New Position)	Caldwell County	$50,000/year	2			$1,000,000
Septic System Repair	Caldwell/ Hays Cos.	$5,000/system	300	300	400	$5,000,000
Septic System Replacement	Caldwell/ Hays Cos.	$10,000/system	150	150	200	$5,000,000
Septic System Connection to Sewer	City of Uhland	$2,000/system	100	100	150	$700,000
Agricultural Management Measures						
WQMP Technician (New Position)	SWCD	$75,000/year	1			$750,000
Livestock Water Quality Management Plans	SWCD	$10,000/plan	65	70	100	$2,350,000
Cropland Water Quality Management Plans	SWCD	$10,000/plan	6	9	9	$240,000
Non-Domestic Animal and Wildlife Management Measures						
Feral Hog Control (New Position)	TWDMS	$90,000/year	1			$900,000
Feral Hog Control (Equipment)	TWDMS	---	---	---	---	$5,000
Monitoring Component						
Targeted Water Quality Monitoring	GBRA	---	1	---	---	$142,000[4]
Comprehensive Stream Assessment	GBRA	$1,500/assessment	12	12	16	$60,000
Bacterial Source Tracking	TAMU	---	1	---	---	$200,000

Outreach Activities
as described in the
Plum Creek Watershed Protection Plan

Outreach Activity	Responsible Party	Year			Total Cost
		1-3	4-6	7-10	
Broad-Based Programs					
Texas Watershed Steward Training Sessions	Extension	3	2	1	N/A
Elementary School Water Quality Project	GBRA	---	---	---	$25,000
Plum Creek Watershed Protection Brochure	GBRA	---	---	---	$15,000[1]
Tributary and Watershed Roadway Signage	PCW Partnership	60	---	---	$6,000
Displays at Local Events	Extension/TSSWCB	9	9	9	$5,400
Watershed Billboards	PCW Partnership	1 sign biennially			$30,000
Urban Programs					
Pet Waste Programs	Cities/TCEQ/ Extension	---	---	---	$35,000
NEMO Workshops	GBRA/TCEQ/ Extension	2	---	---	$20,000[1]
Fats, Oils, and Grease Workshop		2	---	---	
Municipal Site Assessment Visits		4	---	---	
Urban Sector Nutrient Education	Extension	3	3	3	N/A
Sports and Athletic Field Education (SAFE)	Extension	3	3	3	N/A
Wastewater Programs					
Develop Septic System Online Training Modules	GBRA	4	---	---	$30,000[1]
Septic System Workshops and Assistance	Extension/ GBRA	4	3	3	$25,000[1]
Agricultural Programs					
Soil and Water Testing Campaigns	Extension	3	3	3	N/A
Agricultural Nutrient Management Education	Extension	3	3	3	N/A
Crop Management Seminars	Extension	3	3	3	N/A
Agricultural Waste Pesticide Collection Days	TCEQ	1	1	1	$75,000

Outreach Activities
as described in the
Plum Creek Watershed Protection Plan

Outreach Activity	Responsible Party	Year			Total Cost
		1-3	4-6	7-10	
Agricultural Programs (continued)					
Livestock Grazing Management Education	Extension	3	3	3	N/A
Non-Domestic Animal and Wildlife Programs					
Feral Hog Management Workshop	Extension	2	1	2	N/A
Stream and Rparian Workshops	Extension	2	1	2	N/A
Additional Programs					
Illegal Dumping Site Targeted Cleanup	GBRA	3	3	3	$40,000[1]
Community Stream Cleanup Events		2	3	3	
Rainwater Harvesting Education/Demonstration	Extension	2	1	2	$25,000

Appendix K

Regional Compact

APPENDIX K

Whereas the parties to this compact, the cities of Lockhart, Luling, Martindale, Niederwald, Uhland and the Guadalupe-Blanco River Authority (GBRA) all function in Caldwell County and

Whereas all parties share the responsibility to:

1. To promote the development, use, and conservation of the water resources in the county
2. To plan for the welfare of all local governments and make it possible for all communities to utilize public works services
3. To promote and implement feasible conservation measures established
4. To balance development in the region and promote sustainable designs
5. To develop water quality management measures that will ensure the future use and quality of groundwater and surface water
6. To minimizing reliance on On-Site Sewage Facilities (OSSFs)
7. To develop inter local agreements and cooperation for the purpose of developing water and wastewater facilities to serve the future population of Caldwell

and whereas all parties recognize that much of the future water and wastewater infrastructure in Caldwell will have to be provided initially by the private sector in new developments, and whereas all parties understand that the common interests will be served by adopting a uniform approach, the parties jointly enter into this compact. The key elements to the compact are:

1. The parties recognize that protection of the water resources in Caldwell will require a regional cooperative effort. The overutilization of natural resources is not a sustainable practice and conservation and reuse measures practices will be implemented.

2. The parties agree jointly to participate, to the extent desired, in the review of new proposed projects and plans, and in special studies involving rates or other issues. Development of a Good Neighbor Policy to share ideas and plan conservation of resources on a regional basis will provide benefits to the region as a whole.

3. The parties will develop and agree on specific conditions that will determine the number of housing units needed for a central wastewater system, but as an initial target agree that OSSFs would not be appropriate for developments of 10 or more homes.

4. The parties believe that domestic wastewater treatment is an important public service, with the potential to affect citizens outside of the immediate project area. The parties also recognize that proper operation and maintenance of wastewater infrastructure is essential to the public welfare. Because it is important to the public, the parties agree that central wastewater facility operations should be a public function, and that future wastewater facilities in Caldwell County should

be operated by a public rather than a private entity. The parties recognize that the private sector must be involved in the design, permitting and construction of wastewater facilities to serve new developments, but the parties anticipate that these new developments will at some future time become a part of a municipality. As such, the parties agree that central wastewater facilities associated with new developments should be jointly permitted (e.g. private developer and public entity) and operated by the public entity.

5. An important aspect of wastewater operations is the quality of the water produced. The parties agree that a high quality effluent that is discharged to surface waters is important and will encourage the level represented by the Texas Commission on Environmental Quality's (TCEQ) 5-5-2-1 effluent set will be the goal for all new facilities. That is operating at full flow with a monthly average effluent quality of BOD5 OF 5MG/l, tss OF 5 MG/l, AMMONIA-Nitrogen of 2 mg/L and total Phosphorus of 1 mg/L. The parties recognize that this goal can be met in several ways including direct treatment, treating to a different level, and meeting the goal by use of an offsetting amount of effluent for irrigation, or through wetland polishing.

6. The parties recognize that Caldwell County has limited water resources supplies and that providing good quality water to serve future growth will be a challenge. To conserve water supplies to the extent practical, the parties jointly desire new developments to include provisions to minimize potable water use in irrigation. This can include a purple pipe system for irrigation and/or cisterns for providing water for toilet flushing and lawn irrigation.

7. All parties agree to participate in supporting the core provisions of the Compact. For examples, this could include opposing a private permit applicant in the TCEQ hearing process that refused to follow the central treatment, effluent quality, or reuse provisions of the Compact.

Appendix L

Public Meeting Comments on Report and Responses to Comments

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SIGN-IN SHEET

Project Name: Caldwell County Regional Water and Wastewater Planning Study

Job No.: 0972.001.000

Date: August 3, 2009

Meeting Type: Stakeholder Group Meeting #3

Name	Organization/Title	Phone/Fax/Cell
David McMullen	Maxwell WSC	512 757 4104
Doug Spillmann	Maxwell WSC	512 227 2241
Mark Speed	Crystal Clear WSC	830 372 1031
Tony Bennett	AECOM	512-457-7766
Graham Moore	LAN/HCPUA	512-396-4040
Barry Miller	Gonzales Co WSC	830-672-6579
Daniel Meyer	PCCD	512-398-2383
Daniel R. Haideman	County Line SUD	512-738-2073
Oscar H. Fogle	GBRA	512-376-9950
David Welsch	GBRA	830-379-5822
Tom Benn	Lockhart	
Vance Rodgers	City of Lockhart	1-512-376-8149
Johnie Halliburton	Plum Creek Cons. Dist.	512-398-2383

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SIGN-IN SHEET

Project Name: Caldwell County Regional Water and Wastewater Planning Study

Job No.: 0972.001.000

Date: August 3, 2009

Meeting Type: Stakeholder Group Meeting #3

Name	Organization/Title	Phone/Fax/Cell
Debbie Magin	Guadalupe-Blanco River Authority	(830) 379 5822 (w) (830) 372-2757 (fax)
Liz Sedlacek	" "	379-5822 ext 312
MATT NELSON	TXWDB	512 936 3550

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COMMENTS
PUBLIC MEETING
CALDWELL COUNTY WATER AND WASTEWATER PLANNING STUDY
AUGUST 3, 2009

In the space below please provide input or comments regarding the recommendations in the report.

SLIDE STATED 8,845 AF/YR AVAILABLE IN GROUNDWATER WITHIN THE COUNTY IN 2040, YET VERBALLY STATED 23,000 AF/YR IS AVAILABLE. WHAT ARE THE SOURCES OF THE DATA (PLUM CREEK CONSERVATION DISTRICT? OTHER?)? HOW ARE THESE TWO NUMBERS JUSTIFIED?

SUGGEST IN THE REPORT THAT THE SAME CHALLENGES ASSOCIATED WITH THE HAYS CALDWELL PUA PROJECT ARE CHALLENGES FOR ALL OF THE GROUNDWATER PROJECTS DISCUSSED.

Name: GRAHAM MOORE

Phone: 512-396-4040

Can we contact you? ☒ Yes ☐ No

klotz associates

7550 IH-10 West San Antonio, Texas 78229 210.736.0425

COMMENTS
PUBLIC MEETING
CALDWELL COUNTY WATER AND WASTEWATER PLANNING STUDY
AUGUST 3, 2009

In the space below please provide input or comments regarding the recommendations in the report.

I think the report was right on target. I think the mid basin project may be the route to take for now.

Name: Johnie Halliburton

Phone: 512-398-2383

Can we contact you? ☑ Yes ☐ No

RESPONSE TO WRITTEN COMMENT BY GRAHAM MOORE

We agree that the groundwater portions of the GBRA Mid-Basin Project will face the same challenges as the HCPUA Project and have modified the report to reflect that information.

RESPONSE TO WRITTEN COMMENT BY JOHNIE HALLIBURTON

The report recommends the GBRA Mid-Basin Project as one of the strategies to be pursued. No changes were made to the report.

Appendix M

Water Treatment Facilities Cost Estimate

Wastewater Treatment Facilities Cost Estimates

APPENDIX M

Caldwell County Regional Water and Wastewater Planning Study
Regional Water Planning
Water Transmission Line Options
Prepared June 2009

PROJECT COST SUMMARY WITH 12" DISTRIBUTION SYSTEM

ITEM NO.	ITEM DESCRIPTION	AMOUNT
1	Line 1A - Groundwater Source Route to Lockhart	$33,800,000
2	Line 1B - Groundwater Source Route to Luling	$30,200,000
3	Line 1C - Surface Water Source Route to Luling	$51,300,000
4	Line 2 - SH 130 North Route	$10,221,128
5	Line 3 - Northwest Route to Uhland	$6,282,922
6	Line 4 - SH 130 West	$8,608,917

Level of Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

The engineer has no control over the cost of labor, materials, or equipment, or over the Contractor's methods of determining prices, or over competitive bidding or market conditions. As a result, this opinion of probable construction cost is based on the

APPENDIX M

Caldwell County Regional Water and Wastewater Planning Study
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Water Transmission Line Options
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Transmission Line 1A

GENERAL DEVELOPMENT

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	MOBILIZATION (10%)	LS	1	$2,152,524.28	$2,152,524
2	SITE PREPARATION (7%)	LS	1	$1,506,767.00	$1,506,767
3	SEDIMENTATION AND EROSION CONTROL (5%)	LS	1	$1,076,262.14	$1,076,262
4	TRAFFIC MAINTENANCE (1.0%)	LS	1	$215,252.43	$215,252
5	REPLACING ASPHALT PAVEMENT	SY	93	$90.00	$8,400
6	DRIVEWAY REPLACEMENT (AVG)	SY	1,667	$60.00	$100,000
7	REMOVE AND REPLACE FENCING (5%)	LF	5,500	$50.00	$275,000
8	FILTER FABRIC	LF	109,869	$1.20	$131,843
9	INSTALLATION OF CATHODIC TEST STATIONS	LS	1	$10,000.00	$10,000
				ESTIMATED SUB TOTAL	**$5,500,000**

WELL DEVELOPMENT

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	PUMPS (1,000 GPM) & INSTALLATION	EA	6	$15,000.00	$90,000
2	FIELD WELL DEVELOPMENT	LS	1	$5,000,000.00	$5,000,000
3	LAND PURCHASE COST	LS	1	$75,000.00	$75,000
				ESTIMATED SUB TOTAL	**$5,200,000**

WATER FACILITIES

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	STORAGE TANK	GAL	1,000,000	$0.50	$500,000
2	WATER TREATMENT PLANT	GPD	8,000,000	$0.50	$4,000,000
					$0
				ESTIMATED SUB TOTAL	**$4,500,000**

30-INCH TRANSMISSION MAIN COST

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	MOBILIZATION	LS	1	$84,000.00	$84,000
2	30-INCH D.I. WATER MAIN (OPEN CUT)	LF	109,701	$95.00	$10,421,595
3	30-INCH D.I. WATER MAIN (BORE)	LF	168	$150.00	$25,200
4	4 INCH COMBINATION AIR VALVE WITH MANHOLE	EA	10	$12,000.00	$120,000
5	30-INCH BUTTERFLY VALVE WITH MANHOLE	EA	10	$13,000.00	$130,000
6	FILTER FABRIC	LF	109,869	$1.00	$109,869
7	CATHODE ROTECTION	LS	1	$250,000.00	$250,000
8	DISINFECT WATER TRANSMISSION MAIN	LF	109,869	$0.50	$54,935
9	INSTALLATION CATHODIC TEST STATIONS	LS	1	$15,000.00	$15,000
10	TRENCH SAFETY	LF	109,701	$1.25	$137,126
				ESTIMATED SUB TOTAL	**$11,300,000**

MISC

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY.	UNIT PRICE	AMOUNT
1	SURVEY (1.0 %)	LS	1	$265,000.00	$265,000
2	ENGINEERING (10%)	LS	1	$2,650,000.00	$2,650,000
				ESTIMATED SUB TOTAL	**$2,915,000**

Level of Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

TOTAL CONSTRUCTION COST =	$26,500,000.00
TOTAL ENGINEERING COST =	**$2,900,000**
TOTAL=	$29,400,000
15% CONTINGENCY=	$4,400,000
GRAND TOTAL =	**$33,800,000**

The engineer has no control over the cost of labor, materials, or equipment, or over the Contractor's methods of determining prices, or over competitive bidding or market conditions. As a result, this opinion of probable construction cost is based on the engineer's experience and qualifications and represents our best judgment as design professionals familiar with the construction industry. The engineer cannot and does not guarantee the proposals, bids, or the construction cost will not vary from this opinion of probable cost.

APPENDIX M

Caldwell County Regional Water and Wastewater Planning Study
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Water Transmission Line Options
Prepared June 2009

Transmission Line 1B

GENERAL DEVELOPMENT

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	MOBILIZATION (10%)	LS	1	$1,923,971.00	$1,923,971
2	SITE PREPARATION (7%)	LS	1	$1,346,779.70	$1,346,780
3	SEDIMENTATION AND EROSION CONTROL (5%)	LS	1	$961,985.50	$961,986
4	TRAFFIC MAINTENANCE (1.0%)	LS	1	$192,397.10	$192,397
5	REPLACING ASPHALT PAVEMENT	SY	31	$90.00	$2,800
6	DRIVEWAY REPLACEMENT (AVG)	SY	250	$60.00	$15,000
7	REMOVE AND REPLACE FENCING (5%)	LF	5,500	$50.00	$275,000
8	INSTALLATION OF CATHODIC TEST STATIONS	LS	1	$10,000.00	$10,000
				ESTIMATED SUB TOTAL	**$4,727,933**

WELL DEVELOPMENT

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	PUMPS (1,000 GPM) & INSTALLATION	EA	6	$15,000.00	$90,000
2	FIELD WELL DEVELOPMENT	LS	1	$5,000,000.00	$5,000,000
3	LAND PURCHASE COST	LS	1	$45,000.00	$45,000
				ESTIMATED SUB TOTAL	**$5,135,000**

WATER FACILITIES

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	STORAGE TANK	GAL	1,000,000	$0.50	$500,000
2	WATER TREATMENT PLANT	GPD	8,000,000	$0.50	$4,000,000
					$0
				ESTIMATED SUB TOTAL	**$4,500,000**

30-INCH TRANSMISSION MAIN COST

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	MOBILIZATION	LS	1	$84,000.00	$84,000
2	30-INCH D.I. WATER MAIN (OPEN CUT)	LF	89,688	$95.00	$8,520,360
3	30-INCH D.I. WATER MAIN (BORE)	LF	72	$150.00	$10,800
4	4 INCH COMBINATION AIR VALVE WITH MANHOLE	EA	7	$12,000.00	$84,000
5	30 INCH BUTTERFLY VALVE WITH MANHOLE	EA	7	$13,000.00	$91,000
6	FILTER FABRIC	LF	89,760	$1.00	$89,760
7	CATHODE PROTECTION	LS	1	$250,000.00	$250,000
8	DISINFECT WATER TRANSMISSION MAIN	LF	89,760	$0.50	$44,880
9	INSTALLATION CATHODE TEST STATIONS	LS	1	$15,000.00	$15,000
10	TRENCH SAFETY	LF	89,688	$1.25	$112,110
				ESTIMATED SUB TOTAL	**$9,301,910**

MISC

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY.	UNIT PRICE	AMOUNT
1	SURVEY (1.0 %)	LS	1	$236,648.43	$236,648
2	ENGINEERING (10%)	LS	1	$2,366,484.33	$2,366,484
				ESTIMATED SUB TOTAL	**$2,603,133**

Level of Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

TOTAL CONSTRUCTION COST =	$23,664,843.30
TOTAL ENGINEERING COST =	**$2,603,133**
TOTAL=	$26,267,976
15% CONTINGENCY=	$3,940,196
GRAND TOTAL =	**$30,200,000**

The engineer has no control over the cost of labor, materials, or equipment, or over the Contractor's methods of determining prices, or over competitive bidding or market conditions. As a result, this opinion of probable construction cost is based on the engineer's experience and qualifications and represents our best judgment as design professionals familiar with the construction industry. The engineer cannot and does not guarantee the proposals, bids, or the construction cost will not vary from this opinion of probable cost.

APPENDIX M

Caldwell County Regional Water and Wastewater Planning Study
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Water Transmission Line Options
Prepared June 2009

Transmission Line 1C

GENERAL DEVELOPMENT

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	MOBILIZATION (10%)	LS	1	$3,266,540.00	$3,266,540
2	SITE PREPARATION (7%)	LS	1	$2,286,578.00	$2,286,578
3	SEDIMENTATION AND EROSION CONTROL (5%)	LS	1	$1,633,270.00	$1,633,270
4	TRAFFIC MAINTENANCE (1.0%)	LS	1	$326,654.00	$326,654
5	REPLACING ASPHALT PAVEMENT	SY	31	$90.00	$2,800
6	DRIVEWAY REPLACEMENT (AVG)	SY	250	$60.00	$15,000
7	REMOVE AND REPLACE FENCING	LF	4,752	$50.00	$237,600
8	INSTALLATION OF CATHODIC TEST STATIONS	LS	1	$10,000.00	$10,000
				ESTIMATED SUB TOTAL	**$7,800,000**

WATER FACILITIES

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	STORAGE TANK	GAL	1,000,000	$0.50	$500,000
2	WATER TREATMENT PLANT	GPD	8,000,000	$2.75	$22,000,000
3	PUMPS (1,000 GPM) & INSTALLATION	EA	6	$12,000.00	$72,000
4	LAND PURCHASE COST	LS	1	$30,000.00	$30,000
				ESTIMATED SUB TOTAL	**$22,600,000**

30-INCH TRANSMISSION MAIN COST

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	MOBILIZATION	LS	1	$84,000.00	$84,000
2	30-INCH D.I. WATER MAIN (OPEN CUT)	LF	94,956	$95.00	$9,020,820
3	30-INCH D.I. WATER MAIN (BORE)	LF	84	$150.00	$12,600
4	4 INCH COMBINATION AIR VALVE WITH MANHOLE	EA	7	$12,000.00	$84,000
5	30 INCH BUTTERFLY VALVE WITH MANHOLE	EA	7	$13,000.00	$91,000
6	FILTER FABRIC	LF	95,040	$1.00	$95,040
7	CATHODE PROTECTION	LS	1	$250,000.00	$250,000
8	DISINFECT WATER TRANSMISSION MAIN	LF	95,040	$0.50	$47,520
9	INSTALLATION CATHODIC TEST STATIONS	LS	1	$15,000.00	$15,000
10	TRENCH SAFETY	LF	94,956	$1.25	$118,695
				ESTIMATED SUB TOTAL	**$9,800,000**

MISC

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY.	UNIT PRICE	AMOUNT
1	SURVEY (1.0 %)	LS	1	$402,000.00	$402,000
2	ENGINEERING (10%)	LS	1	$4,020,000.00	$4,020,000
				ESTIMATED SUB TOTAL	**$4,400,000**

Level of Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

TOTAL CONSTRUCTION COST =	$40,200,000.00
TOTAL ENGINEERING COST =	**$4,400,000**
TOTAL=	$44,600,000
15% CONTINGENCY=	$6,700,000
GRAND TOTAL =	**$51,300,000**

The engineer has no control over the cost of labor, materials, or equipment, or over the Contractor’s methods of determining prices, or over competitive bidding or market conditions. As a result, this opinion of probable construction cost is based on the engineer’s experience and qualifications and represents our best judgment as design professionals familiar with the construction industry. The engineer cannot and does not guarantee the proposals, bids, or the construction cost will not vary from this opinion of probable cost.

APPENDIX M

Caldwell County Regional Water and Wastewater Planning Study
Regional Water Planning
Water Transmission Line Options
Prepared June 2009

Transmission Line 2

GENERAL DEVELOPMENT

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	MOBILIZATION (10%)	LS	1	$650,987.90	$650,988
2	SITE PREPARATION (7%)	LS	1	$455,691.53	$455,692
3	SEDIMENTATION AND EROSION CONTROL (5%)	LS	1	$325,493.95	$325,494
4	TRAFFIC MAINTENANCE (1.0%)	LS	1	$65,098.79	$65,099
5	REPLACING ASPHALT PAVEMENT	SY	202	$90.00	$18,200
6	DRIVEWAY REPLACEMENT (AVG)	SY	1,000	$60.00	$60,000
7	REMOVE AND REPLACE FENCING	LF	3,168	$50.00	$158,400
8	INSTALLATION OF CATHODIC TEST STATIONS	LS	1	$10,000.00	$10,000
	ESTIMATED SUB TOTAL				**$1,743,872**

30-INCH TRANSMISSION MAIN COST

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	MOBILIZATION	LS	1	$569,389.00	$569,389
2	12-INCH D.I. WATER MAIN (OPEN CUT)	LF	63,080	$80.00	$5,046,400
3	12-INCH D.I. WATER MAIN (BORE)	LF	280	$120.00	$33,600
4	4 INCH COMBINATION AIR VALVE WITH MANHOLE	EA	7	$12,000.00	$84,000
5	12 INCH BUTTERFLY VALVE WITH MANHOLE	EA	7	$13,000.00	$91,000
6	FILTER FABRIC	LF	63,360	$1.00	$63,360
7	CATHODE PROTECTION	LS	1	$250,000.00	$250,000
8	DISINFECT WATER TRANSMISSION MAIN	LF	63,360	$0.50	$31,680
9	INSTALLATION CATHODIC TEST STATIONS	LS	1	$15,000.00	$15,000
10	TRENCH SAFETY	LF	63,080	$1.25	$78,850
	ESTIMATED SUB TOTAL				**$6,263,279**

MISC

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY.	UNIT PRICE	AMOUNT
1	SURVEY (1.0 %)	LS	1	$80,071.51	$80,072
2	ENGINEERING (10%)	LS	1	$800,715.12	$800,715
	ESTIMATED SUB TOTAL				**$880,787**

Level of Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

TOTAL CONSTRUCTION COST =	$8,007,151.17
TOTAL ENGINEERING COST =	**$880,787**
TOTAL=	$8,887,938
15% CONTINGENCY=	$1,333,191
GRAND TOTAL =	**$10,221,128**

The engineer has no control over the cost of labor, materials, or equipment, or over the Contractor’s methods of determining prices, or over competitive bidding or market conditions. As a result, this opinion of probable construction cost is based on the

Caldwell County Regional Water and Wastewater Planning Study
Regional Water Planning
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Prepared June 2009

Transmission Line 3

GENERAL DEVELOPMENT

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	MOBILIZATION (10%)	LS	1	$400,161.90	$400,162
2	SITE PREPARATION (7%)	LS	1	$280,113.33	$280,113
3	SEDIMENTATION AND EROSION CONTROL (5%)	LS	1	$200,080.95	$200,081
4	TRAFFIC MAINTENANCE (1.0%)	LS	1	$40,016.19	$40,016
5	REPLACING ASPHALT PAVEMENT	SY	156	$90.00	$14,000
6	DRIVEWAY REPLACEMENT (AVG)	SY	417	$60.00	$25,000
7	REMOVE AND REPLACE FENCING	LF	1,848	$50.00	$92,400
8	INSTALLATION OF CATHODIC TEST STATIONS	LS	1	$10,000.00	$10,000
				ESTIMATED SUB TOTAL	**$1,061,772**

30-INCH TRANSMISSION MAIN COST

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	MOBILIZATION	LS	1	$350,929.00	$350,929
2	12-INCH D.I. WATER MAIN (OPEN CUT)	LF	36,680	$80.00	$2,934,400
3	12-INCH D.I. WATER MAIN (BORE)	LF	280	$120.00	$33,600
4	4 INCH COMBINATION AIR VALVE WITH MANHOLE	EA	7	$12,000.00	$84,000
5	12 INCH BUTTERFLY VALVE WITH MANHOLE	EA	7	$13,000.00	$91,000
6	FILTER FABRIC	LF	36,960	$1.00	$36,960
7	CATHODE PROTECTION	LS	1	$250,000.00	$250,000
8	DISINFECT WATER TRANSMISSION MAIN	LF	36,960	$0.50	$18,480
9	INSTALLATION CATHODIC TEST STATIONS	LS	1	$15,000.00	$15,000
10	TRENCH SAFETY	LF	36,680	$1.25	$45,850
				ESTIMATED SUB TOTAL	**$3,860,219**

MISC

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY.	UNIT PRICE	AMOUNT
1	SURVEY (1.0 %)	LS	1	$49,219.91	$49,220
2	ENGINEERING (10%)	LS	1	$492,199.14	$492,199
				ESTIMATED SUB TOTAL	**$541,419**

Level of Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

TOTAL CONSTRUCTION COST =	$4,921,991.37
TOTAL ENGINEERING COST =	**$541,419**
TOTAL=	$5,463,410
15% CONTINGENCY=	$819,512
GRAND TOTAL =	**$6,282,922**

The engineer has no control over the cost of labor, materials, or equipment, or over the Contractor’s methods of determining prices, or over competitive bidding or market conditions. As a result, this opinion of probable construction cost is based on the

Caldwell County Regional Water and Wastewater Planning Study
Regional Water Planning
Water Transmission Line Options
Prepared June 2009

Transmission Line 4

GENERAL DEVELOPMENT

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	MOBILIZATION (10%)	LS	1	$548,305.50	$548,306
2	SITE PREPARATION (7%)	LS	1	$383,813.85	$383,814
3	SEDIMENTATION AND EROSION CONTROL (5%)	LS	1	$274,152.75	$274,153
4	TRAFFIC MAINTENANCE (1.0%)	LS	1	$54,830.55	$54,831
5	REPLACING ASPHALT PAVEMENT	SY	156	$90.00	$14,000
6	DRIVEWAY REPLACEMENT (AVG)	SY	417	$60.00	$25,000
7	REMOVE AND REPLACE FENCING	LF	2,640	$50.00	$132,000
8	INSTALLATION OF CATHODIC TEST STATIONS	LS	1	$10,000.00	$10,000
	ESTIMATED SUB TOTAL				**$1,442,103**

30-INCH TRANSMISSION MAIN COST

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1	MOBILIZATION	LS	1	$482,005.00	$482,005
2	12-INCH D.I. WATER MAIN (OPEN CUT)	LF	52,520	$80.00	$4,201,600
3	12-INCH D.I. WATER MAIN (BORE)	LF	280	$120.00	$33,600
4	4 INCH COMBINATION AIR VALVE WITH MANHOLE	EA	7	$12,000.00	$84,000
5	12 INCH BUTTERFLY VALVE WITH MANHOLE	EA	7	$13,000.00	$91,000
6	FILTER FABRIC	LF	52,800	$1.00	$52,800
7	CATHODE PROTECTION	LS	1	$250,000.00	$250,000
8	DISINFECT WATER TRANSMISSION MAIN	LF	52,800	$0.50	$26,400
9	INSTALLATION CATHODIC TEST STATIONS	LS	1	$15,000.00	$15,000
10	TRENCH SAFETY	LF	52,520	$1.25	$65,650
	ESTIMATED SUB TOTAL				**$5,302,055**

MISC

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY.	UNIT PRICE	AMOUNT
1	SURVEY (1.0 %)	LS	1	$67,441.58	$67,442
2	ENGINEERING (10%)	LS	1	$674,415.77	$674,416
	ESTIMATED SUB TOTAL				**$741,857**

Level of Cost Projection:

- ☑ No Design Completed
- ☐ Preliminary Design
- ☐ Final Design

TOTAL CONSTRUCTION COST =	$6,744,157.65
TOTAL ENGINEERING COST =	**$741,857**
TOTAL=	$7,486,015
15% CONTINGENCY=	$1,122,902
GRAND TOTAL =	**$8,608,917**

The engineer has no control over the cost of labor, materials, or equipment, or over the Contractor's methods of determining prices, or over competitive bidding or market conditions. As a result, this opinion of probable construction cost is based on the

APPENDIX M

Caldwell County Regional Water and Wastewater Planning Study
Regional Wastewater Planning
Package Treatment Plants

Extended Aeration Package Treatment Plant Planning Cost Estimate in Millions of Dollars

Population Projections	2010			2020			2030			2040		
	46,308			65,057			86,902			100,000		
Wastewater Flows	4.723			6.636			8.864			10.200		
Proposed Plant Size	0.015 MGD	0.04 MGD	1.0 MGD	0.015 MGD	0.04 MGD	1.0 MGD	0.015 MGD	0.04 MGD	1.0 MGD	0.015 MGD	0.04 MGD	1.0 MGD
Estimated Cost Per Gallon	$10.0	$7.0	$1.3	$10.0	$7.0	$1.3	$10.0	$7.0	$1.3	$10.0	$7.0	$1.3
Estimated Number of Plants	315	94	5	442	133	7	591	177	9	680	204	10
Estimated Total Cost	**47.23**	**33.06**	**6.14**	**66.36**	**46.45**	**8.63**	**88.64**	**62.05**	**11.52**	**102.00**	**71.40**	**13.26**

Sequencing Batch Reactor (SBR) Package Treatment Plant Planning Cost Estimate in Millions of Dollars

Population Projections	2010			2020			2030			2040		
	46,308			65,057			86,902			100,000		
Wastewater Flows	4.723			6.636			8.864			10.200		
Proposed Plant Size	0.01 MGD	0.20 MGD	1.0 MGD	0.01 MGD	0.20 MGD	1.0 MGD	0.01 MGD	0.20 MGD	1.0 MGD	0.01 MGD	0.20 MGD	1.0 MGD
Estimated Cost Per Gallon	$4.50	$0.70	$0.25	$4.50	$0.70	$0.25	$4.50	$0.70	$0.25	$4.50	$0.70	$0.25
Estimated Number of Plants	3149	945	47	4424	1327	66	5909	1773	89	6800	2040	102
Estimated Total Cost	**21.26**	**3.31**	**1.18**	**29.86**	**4.65**	**1.66**	**39.89**	**6.20**	**2.22**	**45.90**	**7.14**	**2.55**

Notes:
Population estimates based on this study
Estimated cost per gallon based on EPA Wastewater Technology Fact Sheet Package Plants

APPENDIX M

Caldwell County Regional Water and Wastewater Planning Study
Regional Wastewater Planning
Multiple Regional Treatment Facilities

Multiple Regional Treatment Facility Planning Cost Estimate											
Service Area	**Year**	**Population**	**Total Wastewater Flow (MGD)**	**Percent of Flow**	**Total Treated Flow (MGD)**	**Cost Per Gallon ($)**	**Plant Cost**	**Line Length (ft)**	**Pipeline Cost ($/ft)**	**Total Line Cost**	**Total Plant Cost**
Lockhart	2010	46,308	4.723	40%	1.89	$3.75	$7,084,500	168,289	$125	$21,036,125	$28,120,625
	2020	65,057	6.636	40%	2.65	$3.75	$9,954,000	168,289	$125	$21,036,125	$30,990,125
	2030	86,902	8.864	40%	3.55	$3.75	$13,296,000	168,289	$125	$21,036,125	$34,332,125
	2040	100,000	10.200	40%	***4.08***	$3.75	***$15,300,000***	168,289	$125	***$21,036,125***	***$36,336,125***
Luling	2010	46,308	4.723	35%	1.65	$3.75	$6,198,938	160,972	$125	$20,121,500	$26,320,438
	2020	65,057	6.636	35%	2.32	$3.75	$8,709,750	160,972	$125	$20,121,500	$28,831,250
	2030	86,902	8.864	35%	3.10	$3.75	$11,634,000	160,972	$125	$20,121,500	$31,755,500
	2040	100,000	10.200	35%	***3.57***	$3.75	***$13,387,500***	160,972	$125	***$20,121,500***	***$33,509,000***
Martindale	2010	46,308	4.723	20%	0.94	$3.75	$3,542,250	56,173	$125	$7,021,625	$10,563,875
	2020	65,057	6.636	20%	1.33	$3.75	$4,977,000	56,173	$125	$7,021,625	$11,998,625
	2030	86,902	8.864	20%	1.77	$3.75	$6,648,000	56,173	$125	$7,021,625	$13,669,625
	2040	100,000	10.200	20%	***2.04***	$3.75	***$7,650,000***	56,173	$125	***$7,021,625***	***$14,671,625***
Peach Creek	2010	46,308	4.723	5%	0.24	$3.75	$885,563	45,676	$125	$5,709,500	$6,595,063
	2020	65,057	6.636	5%	0.33	$3.75	$1,244,250	45,676	$125	$5,709,500	$6,953,750
	2030	86,902	8.864	5%	0.44	$3.75	$1,662,000	45,676	$125	$5,709,500	$7,371,500
	2040	100,000	10.200	5%	***0.51***	$3.75	***$1,912,500***	45,676	$125	***$5,709,500***	***$7,622,000***

Notes:
Population estimates based on this study
Estimated cost per gallon based on EPA Wastewater Technology Fact Sheet Package Plants

Appendix N

Texas Water Development Board Comment Letter Regarding Draft Report and Response to Comments

APPENDIX N

TEXAS WATER DEVELOPMENT BOARD COMMENT LETTER
DATED SEPTEMBER 28, 2009
AND KLOTZ ASSOCIATES RESPONSES TO COMMENTS

RECEIVED
OCT 1 2009
GBRA – Seguin

TEXAS WATER DEVELOPMENT BOARD

September 28, 2009

William West
General Manager
Guadalupe-Blanco RA
933 E. Court Street
Seguin, Texas 78155

Re: Regional Facility Planning Grant Contract between the Texas Water Development Board (TWDB) and the Guadalupe-Blanco River Authority (GBRA), TWDB Contract No. 0804830843, Draft Final Report Comments

Dear Mr. West:

Staff members of the TWDB have completed a review of the draft report prepared under the above-referenced contract. ATTACHMENT I provides the comments resulting from this review. As stated in the TWDB contract, GBRA will consider incorporating draft report comments from the EXECUTIVE ADMINISTRATOR as well as other reviewers into the final report. In addition, GBRA will include a copy of the EXECUTIVE ADMINISTRATOR's draft report comments in the Final Report.

The TWDB looks forward to receiving one (1) electronic copy of the entire Final Report in Portable Document Format (PDF) and six (6) bound double-sided copies. GBRA shall also submit one (1) electronic copy of any computer programs or models, and, if applicable, an operations manual developed under the terms of this Contract.

If you have any questions concerning the contract, please contact Matt Nelson, the TWDB's designated Contract Manager for this project at (512) 936-3550.

Sincerely,

Dan Harden
for Carolyn L. Brittin
Deputy Executive Administrator
Water Resources Planning and Information

Enclosures

c: Matt Nelson, TWDB

ATTACHMENT 1

TWDB Contract No. 0804830843

Guadalupe-Blanco River Authority

Caldwell County Regional Water and Wastewater Planning Study

<u>TWDB Comments on Draft Final Report</u>:

1. Pages with figures/exhibits are missing page numbers while the numbering of the remaining pages overlooks the exhibit pages (e.g. exhibit 11-2). Please number each report page, including figures, consecutively.

2. Report does not include information on existing impervious cover in the county or show the locations of existing WTPs and proposed WTPs & WWTPs as required by contract scope of work Task 1.a. Please include this information in report.

3. Report does not include information regarding the locations of major power lines as required by contract scope of work Task 1.c. Please include this information in report.

4. Page ES-3: Please note within the Executive Summary that the population and water demand projections used in the study were higher than those approved by TWDB for regional water planning purposes.

5. Section 7: The Caldwell County Water CCN Utility Map should be labeled 7-1, not 2-4.

6. Page 8-7: Report does not appear to specify whether and/or how per capita water demands varied from regional and state water planning per capita water demand estimates. Please discuss whether and/or how per capita water demands varied from TWDB approved per capita demands and whether and/or how this may have further amplified the total water demand projections used in the study considering that higher population projections (due to a higher migration rate) were also being used.

7. Page 12-6, Table 12-5: Please provide the basis for the costs estimates presented in the table.

8. Exhibit 12-1 (no page): The key to the figure is missing. Please include a key that also indicates which are planned projects.

9. Page 13-9, Table 13-3: Please provide the basis for the costs estimates presented in the table.

10. Exhibit 13-4: Figure Legend does not explain what the black-outlined orange lines indicate. Please include this symbol in the legend.

11. Page 14-1: The 5-page Regional Water Quality Protection Plan appears to be a standard list of common practices. Please prepare a water quality protection plan specific to Caldwell County's existing characteristics and needs.

12. Report does not clearly present in one place the preferred general facilities plan for regionalization of water and wastewater treatment that is required by contract scope of work, Task 6. Please present the preferred water and wastewater plan(s), more clearly in one place in the report including associated map(s), and indicate whether consensus was achieved on its selection per contract scope of work Task 6.

APPENDIX N

KLOTZ ASSOCIATES RESPONSES TO COMMENTS
FROM
TEXAS WATER DEVELOPMENT BOARD COMMENT LETTER
DATED SEPTEMBER 28, 2009

APPENDIX N

Klotz Associates, Inc.
Responses to Texas Water Development Board Comments Dated September 28, 2009

TWDB Comments on Draft Final Report:

1. Pages with figures/exhibits are missing page numbers while the numbering of the remaining pages overlooks the exhibit pages (e.g. exhibit 11-2). Please number each report page, including figures, consecutively.

   Klotz Associates Response:

   All Figures and Exhibits have been assigned page numbers.

2. Report does not include information on existing impervious cover in the county or show the locations of existing WTPs and proposed WTPs & WWTPs as required by contract scope of work Task 1.a. Please include this information in report.

   Klotz Associates Response:

   The following items have been added to the Report:
   - *a. Impervious Cover Exhibit 2-8*
   - *b. Exhibit 7-1 has been revised to illustrate the locations of existing WTP*
   - *c. Exhibit 7-2 has been added to illustrate the locations of existing WWTP*
   - *d. Exhibit 12-1 has been revised to illustrate the locations of the proposed WTP*
   - *e. Exhibit 13-2 has been revised to illustrate the locations of the proposed WWTF*

3. Report does not include information regarding the locations of major power lines as required by contract scope of work Task 1.c. Please include this information in report.

   Klotz Associates Response:

   Exhibit 2-7 has been added to include the approximate location of the major power lines.

4. Page ES-3: Please note within the Executive Summary that the population and water demand projections used in the study were higher than those approved by TWDB for regional water planning purposes.

Klotz Associates Response:

We have noted in the Executive Summary that the population and water demands for our study are higher than the approved values used in TWDB planning studies.

5. Section 7: The Caldwell County Water CNN Utility Map should be labeled 7-1, not 2-4.

Klotz Associates Response:

The Caldwell County Water CCN Map has been labeled Exhibit 7-1, Water Production Facilities.

6. Page 8-7: Report does not appear to specify whether and/or how per capita water demands varied from regional and state water planning per capita water demand estimates. Please discuss whether and/or how per capita water demands varied from TWDB approved per capita demands and whether and/or how this may have further amplified the total water demand projections used in the study considering that higher population projections (due to a higher migration rate) were also being used.

Klotz Associates Response:

We have added a discussion to the report explaining the source of our per capita water demands and why and how they differ from TWDB values.

7. Page 12-6, Table 12-5: Please provide the basis for the costs estimates presented in the table.

Klotz Associates Response:

Basis for cost estimates presented in Table 12-5 have been added in Appendix M.

8. Exhibit 12-1 (no page): The key to the figure is missing. Please include a key that also indicates which are planned projects.

Klotz Associates Response:

A legend has been added to Exhibit 12-1 that includes planned projects.

9. Page 13-9, Table 13-3: Please provide the basis for the costs estimates presented in the table.

Klotz Associates Response:

A paragraph has been added to Section 13.7 to elaborate on the basis for the cost estimates presented in the Table 13-3.

10. Exhibit 13-4: Figure Legend does not explain what the black-outlined orange lines indicate. Please include this symbol in the legend.

Klotz Associates Response:

Exhibit 13-4 Legend has been revised to address the black-outlined orange lines.

11. Page 14-1: The 5-page Regional Water Quality Protection Plan appears to be a standard list of common practices. Please prepare a water quality protection plan specific to Caldwell County's existing characteristics and needs.

Klotz Associates Response:

A Water Quality Protection Plan for Caldwell County has been added. The Plan includes upgrading of wastewater treatment plant facilities to produce higher quality effluent; reuse of reclaimed water, use of vegetated filter strips along waterways, water quality basins to treat runoff from areas with impervious cover and periodic inspection and recertification of OSSF systems.

12. Report does not clearly present in one place the preferred general facilities plan for regionalization of water and wastewater treatment that is required by contract scope of work, Task 6. Please present the preferred water and wastewater plan(s), more clearly in one place in the report including associated map(s), and indicate whether consensus was achieved on its selection per contract scope of work Task 6.

Klotz Associates Response:

Section 16 has been added to the Report to illustrate in one place the preferred facilities plan with a discussion on consensus.

REFERENCES

Texas Water Development Board. (2007). *Water for Texas 2007* (Document No. GP-8-1)

Texas Water Development Board. (2006). *2006 South Central Texas Regional Water Plan*. Volume I & II.

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Steven M. Haubner. *Implementation of Watershed management requirements and Model Ordinances*

Graham M. Moore. *Plumbing Plan Prepared for: Hays Caldwell Public Utility Agency*. Lockwood, Andrews, & Newnam, Inc. September 2007

Rules of the Gonzales County Underground Water Conservation District

Management Plan of the Gonzales County Underground Water Conservation District

Plum Creek Conservation District Groundwater Management & Protection Rules. Adopted December 16, 2003.

Canyon Regional Water Authority website
http://www.crwa.com/index.html

Guadalupe-Blanco River Authority website
http://www.gbra.org/About/Default.aspx

The Portal to Texas History
Inventory of the county archives of Texas; Caldwell County, No. 28
http://texashistory.unt.edu/data/UNT/County_Inventory/meta-pth-25254.tkl

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Final Report Predicting Effects of Urban Development on Water Quality in the Cities of New Braunfels, San Marcos, Seguin and Victoria. Prepared by PBSJ. November 2000