



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
**DOMESTIC WASTEWATER PERMIT APPLICATION
CHECKLIST**

Complete and submit this checklist with the application.

APPLICANT: River Oaks Land Partners II, LLC

PERMIT NUMBER: WQ0015559001

Indicate if each of the following items is included in your application.

	Y	N		Y	N
Administrative Report 1.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Original USGS Map	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Administrative Report 1.1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Affected Landowners Map	<input checked="" type="checkbox"/>	<input type="checkbox"/>
SPIF	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Landowner Disk or Labels	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Core Data Form	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Buffer Zone Map	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Technical Report 1.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Flow Diagram	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Technical Report 1.1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Site Drawing	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Worksheet 2.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Original Photographs	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Worksheet 2.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Design Calculations	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Worksheet 3.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Solids Management Plan	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Worksheet 3.1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Water Balance	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Worksheet 3.2	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
Worksheet 3.3	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
Worksheet 4.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
Worksheet 5.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
Worksheet 6.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
Worksheet 7.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>			

For TCEQ Use Only

Segment Number _____ County _____
Expiration Date _____ Region _____
Permit Number _____



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

APPLICATION FOR A DOMESTIC WASTEWATER PERMIT

ADMINISTRATIVE REPORT 1.0

If you have questions about completing this form please contact the Applications Review and Processing Team at 512-239-4671.

Section 1. Application Fees (Instructions Page 29)

Indicate the amount submitted for the application fee (check only one).

Flow	New/Major Amendment	Renewal
<0.05 MGD	\$350.00 <input type="checkbox"/>	\$315.00 <input type="checkbox"/>
≥0.05 but <0.10 MGD	\$550.00 <input type="checkbox"/>	\$515.00 <input type="checkbox"/>
≥0.10 but <0.25 MGD	\$850.00 <input type="checkbox"/>	\$815.00 <input type="checkbox"/>
≥0.25 but <0.50 MGD	\$1,250.00 <input checked="" type="checkbox"/>	\$1,215.00 <input type="checkbox"/>
≥0.50 but <1.0 MGD	\$1,650.00 <input type="checkbox"/>	\$1,615.00 <input type="checkbox"/>
≥1.0 MGD	\$2,050.00 <input type="checkbox"/>	\$2,015.00 <input type="checkbox"/>

Minor Amendment (for any flow) \$150.00 ☐

Payment Information:

Mailed Check/Money Order Number:

Check/Money Order Amount: \$1,250.00

Name Printed on Check: Steger Bizzell

EPAY Voucher Number:

Copy of Payment Voucher enclosed? Yes ☐

Section 2. Type of Application (Instructions Page 29)

- | | |
|---|---|
| <input type="checkbox"/> New TPDES | <input type="checkbox"/> New TLAP |
| <input checked="" type="checkbox"/> Major Amendment <u>with</u> Renewal | <input type="checkbox"/> Minor Amendment <u>with</u> Renewal |
| <input type="checkbox"/> Major Amendment <u>without</u> Renewal | <input type="checkbox"/> Minor Amendment <u>without</u> Renewal |
| <input type="checkbox"/> Renewal without changes | <input type="checkbox"/> Minor Modification of permit |

For amendments or modifications, describe the proposed changes:

For existing permits:

Permit Number: WQ0015559001

EPA I.D. (TPDES only): TX

Expiration Date: 12/1/2023

Section 3. Facility Owner (Applicant) and Co-Applicant Information (Instructions Page 29)

A. The owner of the facility must apply for the permit.

What is the Legal Name of the entity (applicant) applying for this permit?

River Oaks Land Partners II, LLC

(The legal name must be spelled exactly as filed with the Texas Secretary of State, County, or in the legal documents forming the entity.)

If the applicant is currently a customer with the TCEQ, what is the Customer Number (CN)?
You may search for your CN on the TCEQ website at <http://www15.tceq.texas.gov/crpub/>

CN: CN605909704

What is the name and title of the person signing the application? The person must be an executive official meeting signatory requirements in 30 TAC § 305.44.

Prefix (Mr., Ms., Miss): Mr.

First and Last Name: Grant Rollo

Credential (P.E, P.G., Ph.D., etc.):

Title:

B. Co-applicant information. Complete this section only if another person or entity is required to apply as a co-permittee.

What is the Legal Name of the co-applicant applying for this permit?

(The legal name must be spelled exactly as filed with the TX SOS, with the County, or in the legal documents forming the entity.)

If the co-applicant is currently a customer with the TCEQ, what is the Customer Number (CN)? You may search for your CN on the TCEQ website at:

<http://www15.tceq.texas.gov/crpub/>

CN:

What is the name and title of the person signing the application? The person must be an executive official meeting signatory requirements in 30 TAC § 305.44.

Prefix (Mr., Ms., Miss):

First and Last Name:

Credential (P.E, P.G., Ph.D., etc.):

Title:

Provide a brief description of the need for a co-permittee:

C. Core Data Form

Complete the Core Data Form for each customer and include as an attachment. If the customer type selected on the Core Data Form is **Individual**, complete **Attachment 1** of Administrative Report 1.0.

Attachment: 1

Section 4. Application Contact Information (Instructions Page 30)

This is the person(s) TCEQ will contact if additional information is needed about this application. Provide a contact for administrative questions and technical questions.

A. Prefix (Mr., Ms., Miss): Mr.

First and Last Name: Grant Rollo

Credential (P.E, P.G., Ph.D., etc.):

Title: Vice President

Organization Name: Randolph Texas Development

Mailing Address: 14001 West State Highway 29

City, State, Zip Code: Liberty Hill, TX 78642

Phone No.: 512-750-0896 Ext.: Fax No.:

E-mail Address: grollo@randolphtexas.com

Check one or both: ☒ Administrative Contact ☐ Technical Contact

B. Prefix (Mr., Ms., Miss): Mr.

First and Last Name: Aaron Laughlin

Credential (P.E, P.G., Ph.D., etc.): P.E.

Title: Project Manager

Organization Name: Steger Bizzell

Mailing Address: 1978 South Austin Ave

City, State, Zip Code: Georgetown, TX 78626

Phone No.: 512-930-9412 Ext.: Fax No.:

E-mail Address: alaughlin@stegerbizzell.com

Check one or both: ☒ Administrative Contact ☒ Technical Contact

Section 5. Permit Contact Information (Instructions Page 30)

Provide two names of individuals that can be contacted throughout the permit term.

A. Prefix (Mr., Ms., Miss): Mr.

First and Last Name: Grant Rollo

Credential (P.E, P.G., Ph.D., etc.): [REDACTED]

Title: Vice President

Organization Name: Randolph Texas Development

Mailing Address: 14001 West State Highway 29

City, State, Zip Code: Liberty Hill, TX 78642

Phone No.: 512-750-0896 Ext.: [REDACTED]

Fax No.: [REDACTED]

E-mail Address: grollo@randolphtexas.com

B. Prefix (Mr., Ms., Miss): Mr.

First and Last Name: Aaron Laughlin

Credential (P.E, P.G., Ph.D., etc.): P.E.

Title: Project Manager

Organization Name: Steger Bizzell

Mailing Address: 1978 South Austin Ave

City, State, Zip Code: Georgetown, TX 78626

Phone No.: 512-930-9412 Ext.: [REDACTED]

Fax No.: [REDACTED]

E-mail Address: alaughlin@stegerbizzell.com

Section 6. Billing Information (Instructions Page 30)

The permittee is responsible for paying the annual fee. The annual fee will be assessed to permits ***in effect on September 1 of each year***. The TCEQ will send a bill to the address provided in this section. The permittee is responsible for terminating the permit when it is no longer needed (using form TCEQ-20029).

Prefix (Mr., Ms., Miss): Mr.

First and Last Name: Grant Rollo

Credential (P.E, P.G., Ph.D., etc.): [REDACTED]

Title: Vice President

Organization Name: Randolph Texas Development

Mailing Address: 14001 West State Highway 29

City, State, Zip Code: Liberty Hill, TX 78642

Phone No.: 512-750-0896 Ext.: [REDACTED]

Fax No.: [REDACTED]

E-mail Address: grollo@randolphtexas.com

Section 7. DMR/MER Contact Information (Instructions Page 31)

Provide the name and complete mailing address of the person delegated to receive and submit Discharge Monitoring Reports (EPA 3320-1) or maintain Monthly Effluent Reports.

Prefix (Mr., Ms., Miss): Mr.

First and Last Name: William Abshire

Credential (P.E, P.G., Ph.D., etc.): [REDACTED]

Title: Operator

Organization Name: Capital Area Utility Management, LLC

Mailing Address: 12129 RR 620 N, Suite 600

City, State, Zip Code: Austin, TX 78750

Phone No.: 512-738-8840 Ext.: [REDACTED]

Fax No.: [REDACTED]

E-mail Address: wabshire@capitalareaum.com

DMR data is required to be submitted electronically. Create an account at:

<https://www.tceq.texas.gov/permitting/netdmr/netdmr.html>.

Section 8. Public Notice Information (Instructions Page 31)

A. Individual Publishing the Notices

Prefix (Mr., Ms., Miss): Mr.

First and Last Name: Aaron Laughlin

Credential (P.E, P.G., Ph.D., etc.): P.E.

Title: Project Manager

Organization Name: Steger Bizzell

Mailing Address: 1978 South Austin Avenue

City, State, Zip Code: Georgetown, TX 78626

Phone No.: 512-930-9412 Ext.: [REDACTED]

Fax No.: [REDACTED]

E-mail Address: alaughlin@stegerbizzell.com

B. Method for Receiving Notice of Receipt and Intent to Obtain a Water Quality Permit Package

Indicate by a check mark the preferred method for receiving the first notice and instructions:

☒ E-mail Address

☐ Fax

☒ Regular Mail

C. Contact person to be listed in the Notices

Prefix (Mr., Ms., Miss): Mr.

First and Last Name: Aaron Laughlin

Credential (P.E, P.G., Ph.D., etc.): P.E.

Title: Project Manager

Organization Name: Steger Bizzell

Phone No.: 512-930-9412 Ext.:

E-mail: alaughlin@stegerbizzell.com

D. Public Viewing Information

If the facility or outfall is located in more than one county, a public viewing place for each county must be provided.

Public building name: Liberty Hill Public Library

Location within the building: Front Desk

Physical Address of Building: 355 Loop 332, Liberty Hill, TX 78642

City: Liberty Hill

County: Williamson

Contact Name: Angela Palmer

Phone No.: 512-778-6400 Ext.:

E. Bilingual Notice Requirements:

This information **is required** for **new, major amendment, and renewal applications**. It is not required for minor amendment or minor modification applications.

This section of the application is only used to determine if alternative language notices will be needed. Complete instructions on publishing the alternative language notices will be in your public notice package.

Please call the bilingual/ESL coordinator at the nearest elementary and middle schools and obtain the following information to determine whether an alternative language notices are required.

1. Is a bilingual education program required by the Texas Education Code at the elementary or middle school nearest to the facility or proposed facility?

☐ Yes ☒ No

If **no**, publication of an alternative language notice is not required; **skip to** Section 9 below.

2. Are the students who attend either the elementary school or the middle school enrolled in a bilingual education program at that school?

☐ Yes ☐ No

3. Do the students at these schools attend a bilingual education program at another location?

☐ Yes ☐ No

4. Would the school be required to provide a bilingual education program but the school has waived out of this requirement under 19 TAC §89.1205(g)?
- ☐ Yes ☐ No
5. If the answer is yes to question 1, 2, 3, or 4, public notices in an alternative language are required. Which language is required by the bilingual program?

Section 9. Regulated Entity and Permitted Site Information (Instructions Page 33)

- A. If the site is currently regulated by TCEQ, provide the Regulated Entity Number (RN) issued to this site. RN109672469

Search the TCEQ's Central Registry at <http://www15.tceq.texas.gov/crpub/> to determine if the site is currently regulated by TCEQ.

- B. Name of project or site (the name known by the community where located):

River Oaks Land Partners Wastewater Treatment Facility

- C. Owner of treatment facility: River Oaks Land Partners II, LLC

Ownership of Facility: ☐ Public ☒ Private ☐ Both ☐ Federal

- D. Owner of land where treatment facility is or will be:

Prefix (Mr., Ms., Miss):

First and Last Name: River Oaks Land Partners II, LLC

Mailing Address: 14001 West State Highway 29

City, State, Zip Code: Liberty Hill, TX 78642

Phone No.: 512-750-0896

E-mail Address: grollo@randolphtexas.com

If the landowner is not the same person as the facility owner or co-applicant, attach a lease agreement or deed recorded easement. See instructions.

Attachment:

- E. Owner of effluent disposal site:

Prefix (Mr., Ms., Miss):

First and Last Name: River Oaks Land Partners II, LLC

Mailing Address: 14001 West State Highway 29

City, State, Zip Code: Liberty Hill, TX 78642

Phone No.: 512-750-0896

E-mail Address: grollo@randolphtexas.com

If the landowner is not the same person as the facility owner or co-applicant, attach a lease agreement or deed recorded easement. See instructions.

Attachment:

- F. Owner of sewage sludge disposal site (if authorization is requested for sludge disposal on property owned or controlled by the applicant):

Prefix (Mr., Ms., Miss):

First and Last Name:

Mailing Address:

City, State, Zip Code:

Phone No.: E-mail Address:

If the landowner is not the same person as the facility owner or co-applicant, attach a lease agreement or deed recorded easement. See instructions.

Attachment:

Section 10. TPDES Discharge Information (Instructions Page 34)

- A. Is the wastewater treatment facility location in the existing permit accurate?

☐ Yes ☐ No

If **no**, or a new permit application, please give an accurate description:

- B. Are the point(s) of discharge and the discharge route(s) in the existing permit correct?

☐ Yes ☐ No

If **no**, or a new or amendment permit application, provide an accurate description of the point of discharge and the discharge route to the nearest classified segment as defined in 30 TAC Chapter 307:

City nearest the outfall(s):

County in which the outfalls(s) is/are located:

Outfall Latitude: [Click here to enter text.](#) Longitude: [Click here to enter text.](#)

- C. Is or will the treated wastewater discharge to a city, county, or state highway right-of-way, or a flood control district drainage ditch?

☐ Yes ☐ No

If **yes**, indicate by a check mark if:

☐ Authorization granted ☐ Authorization pending

For **new and amendment** applications, provide copies of letters that show proof of contact and the approval letter upon receipt.

Attachment: [REDACTED]

- D. For all applications involving an average daily discharge of 5 MGD or more, provide the names of all counties located within 100 statute miles downstream of the point(s) of discharge.

[REDACTED]

Section 11. TLAP Disposal Information (Instructions Page 36)

- A. For TLAPs, is the location of the effluent disposal site in the existing permit accurate?

☒ Yes ☐ No

If **no**, or a new or amendment permit application, provide an accurate description of the disposal site location:

[REDACTED]

- B. City nearest the disposal site: Liberty Hill

- C. County in which the disposal site is located: Williamson

- D. Disposal Site Latitude: 30°42'18"N Longitude: 97°53'29"W

- E. For TLAPs, describe the routing of effluent from the treatment facility to the disposal site:

The treated effluent will be conveyed from the WWTP via a lift station through 18-inch and 12-inch PVC force mains to the treated effluent holding pond(s). The effluent will then be pumped out of the holding ponds via a booster pump station for spray irrigation through 8-inch and 6-inch PVC pipe.

- F. For TLAPs, please identify the nearest watercourse to the disposal site to which rainfall runoff might flow if not contained:

North Fork San Gabriel River

Section 12. Miscellaneous Information (Instructions Page 37)

- A. Is the facility located on or does the treated effluent cross American Indian Land?

☐ Yes ☒ No

- B. If the existing permit contains an onsite sludge disposal authorization, is the location of the sewage sludge disposal site in the existing permit accurate?

☐ Yes ☐ No ☒ Not Applicable

If No, or if a new onsite sludge disposal authorization is being requested in this permit

application, provide an accurate location description of the sewage sludge disposal site.

- C. Did any person formerly employed by the TCEQ represent your company and get paid for service regarding this application?

☐ Yes ☒ No

If yes, list each person formerly employed by the TCEQ who represented your company and was paid for service regarding the application:

- D. Do you owe any fees to the TCEQ?

☐ Yes ☒ No

If **yes**, provide the following information:

Account number:

Amount past due:

- E. Do you owe any penalties to the TCEQ?

☐ Yes ☒ No

If **yes**, please provide the following information:

Enforcement order number:

Amount past due:

Section 13. Attachments (Instructions Page 38)

Indicate which attachments are included with the Administrative Report. Check all that apply:

- ☐ Lease agreement or deed recorded easement, if the land where the treatment facility is located or the effluent disposal site are not owned by the applicant or co-applicant.
- ☒ Original full-size USGS Topographic Map with the following information:
- Applicant's property boundary
 - Treatment facility boundary
 - Labeled point of discharge for each discharge point (TPDES only)
 - Highlighted discharge route for each discharge point (TPDES only)
 - Onsite sewage sludge disposal site (if applicable)
 - Effluent disposal site boundaries (TLAP only)
 - New and future construction (if applicable)
 - 1 mile radius information

- 3 miles downstream information (TPDES only)
- All ponds.
- ☐ Attachment 1 for Individuals as co-applicants
- ☐ Other Attachments. Please specify: [Click here to enter text.](#)

Section 14. Signature Page (Instructions Page 39)

If co-applicants are necessary, each entity must submit an original, separate signature page.

Permit Number: WQ0015559001

Applicant: River Oaks Land Partners II, LLC

Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I further certify that I am authorized under 30 Texas Administrative Code § 305.44 to sign and submit this document, and can provide documentation in proof of such authorization upon request.

Signatory name (typed or printed): Grant Rollo

Signatory title:

Signature: _____ Date: _____

(Use blue ink)

Subscribed and Sworn to before me by the said _____

on this _____ day of _____, 20____.

My commission expires on the _____ day of _____, 20____.

Notary Public

[SEAL]

County, Texas

DOMESTIC ADMINISTRATIVE REPORT 1.1

The following information is required for new and amendment applications.

Section 1. Affected Landowner Information (Instructions Page 41)

- A. Indicate by a check mark that the landowners map or drawing, with scale, includes the following information, as applicable:
- ☒ The applicant's property boundaries
 - ☒ The facility site boundaries within the applicant's property boundaries
 - ☐ The distance the buffer zone falls into adjacent properties and the property boundaries of the landowners located within the buffer zone
 - ☒ The property boundaries of all landowners surrounding the applicant's property (Note: if the application is a major amendment for a lignite mine, the map must include the property boundaries of all landowners adjacent to the new facility (ponds).)
 - ☐ The point(s) of discharge and highlighted discharge route(s) clearly shown for one mile downstream
 - ☐ The property boundaries of the landowners located on both sides of the discharge route for one full stream mile downstream of the point of discharge
 - ☐ The property boundaries of the landowners along the watercourse for a one-half mile radius from the point of discharge if the point of discharge is into a lake, bay, estuary, or affected by tides
 - ☒ The boundaries of the effluent disposal site (for example, irrigation area or subsurface drainfield site) and all evaporation/holding ponds within the applicant's property
 - ☒ The property boundaries of all landowners surrounding the effluent disposal site
 - ☐ The boundaries of the sludge land application site (for land application of sewage sludge for beneficial use) and the property boundaries of landowners surrounding the applicant's property boundaries where the sewage sludge land application site is located
 - ☐ The property boundaries of landowners within one-half mile in all directions from the applicant's property boundaries where the sewage sludge disposal site (for example, sludge surface disposal site or sludge monofill) is located
- B. ☒ Indicate by a check mark that a separate list with the landowners' names and mailing addresses cross-referenced to the landowner's map has been provided.
- C. Indicate by a check mark in which format the landowners list is submitted:
- ☒ Readable/Writeable CD
 - ☐ Four sets of labels
- D. Provide the source of the landowners' names and mailing addresses: Appraisal District
- E. As required by *Texas Water Code § 5.115*, is any permanent school fund land affected by this application?
- ☐ Yes
 - ☒ No

If **yes**, provide the location and foreseeable impacts and effects this application has on the land(s):

Section 2. Original Photographs (Instructions Page 44)

Provide original ground level photographs. Indicate with checkmarks that the following information is provided.

- ☒ At least one original photograph of the new or expanded treatment unit location
- ☐ At least two photographs of the existing/proposed point of discharge and as much area downstream (photo 1) and upstream (photo 2) as can be captured. If the discharge is to an open water body (e.g., lake, bay), the point of discharge should be in the right or left edge of each photograph showing the open water and with as much area on each respective side of the discharge as can be captured.
- ☒ At least one photograph of the existing/proposed effluent disposal site
- ☒ A plot plan or map showing the location and direction of each photograph

Section 3. Buffer Zone Map (Instructions Page 44)

A. Buffer zone map. Provide a buffer zone map on 8.5 x 11-inch paper with all of the following information. The applicant's property line and the buffer zone line may be distinguished by using dashes or symbols and appropriate labels.

- The applicant's property boundary;
- The required buffer zone; and
- Each treatment unit; and
- The distance from each treatment unit to the property boundaries.

B. Buffer zone compliance method. Indicate how the buffer zone requirements will be met. Check all that apply.

- ☒ Ownership
- ☐ Restrictive easement
- ☐ Nuisance odor control
- ☐ Variance

C. Unsuitable site characteristics. Does the facility comply with the requirements regarding unsuitable site characteristic found in 30 TAC § 309.13(a) through (d)?

- ☒ Yes ☐ No



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
DOMESTIC WASTEWATER PERMIT APPLICATION

DOMESTIC TECHNICAL REPORT 1.0

The Following Is Required For All Applications
Renewal, New, And Amendment

Section 1. Permitted or Proposed Flows (Instructions Page 51)

A. Existing/Interim I Phase

Design Flow (MGD): 0.060

2-Hr Peak Flow (MGD): 0.24

Estimated construction start date: August, 2021

Estimated waste disposal start date: March, 2023

B. Interim II Phase

Design Flow (MGD): 0.36

2-Hr Peak Flow (MGD): 1.44

Estimated construction start date: January, 2023

Estimated waste disposal start date: December, 2023

C. Final Phase

Design Flow (MGD): 0.475

2-Hr Peak Flow (MGD): 1.44

Estimated construction start date: December, 2024

Estimated waste disposal start date: December, 2025

D. Current operating phase: N/A Phase 1 Under Construction

Provide the startup date of the facility: Estimated March 1, 2023

Section 2. Treatment Process (Instructions Page 51)

A. Treatment process description

Provide a detailed description of the treatment process. **Include the type of**

treatment plant, mode of operation, and all treatment units. Start with the plant's head works and finish with the point of discharge. Include all sludge processing and drying units. **If more than one phase exists or is proposed in the permit, a description of each phase must be provided.** Process description:

Interim I Phase- 0.06 MGD Package MBR WWTP, including primary fine screen, EQ basin, secondary fine screen, anoxic basin, aeration basin, two MBR basins, chlorine contact basin, aerated sludge storage, and irrigation pump station/piping for conveyance of treated effluent to a 31-acre-foot storage pond and land application irrigation system. Interim II Phase- 0.36 MGD full-scale MBR WWTP, including primary fine screen, secondary fine screen, EQ basin, anoxic basin, two aeration basins, two MBR basins, RAS basin, chlorine contact basin, aerated sludge storage, and irrigation pump station/pipeline for conveyance of treated effluent to a 31-acre-foot and 100-acre-foot storage ponds and land application irrigation system. Final Phase- 0.475 MGD full-scale MBR WWTP, including primary fine screen, secondary fine screen, EQ basin, anoxic basin, two aeration basins, two MBR basins, RAS basin, chlorine contact basin, aerated sludge storage, and irrigation pump station/pipeline for conveyance of treated effluent to a 31-acre-foot and 100-acre-foot storage ponds and land application irrigation system.

Port or pipe diameter at the discharge point, in inches: 18" pipe from lift station to pond 1, 12" pipe from pond 1 to pond 2, 8"/6" irrigation system piping.

B. Treatment Units

In Table 1.0(1), provide the treatment unit type, the number of units, and dimensions (length, width, depth) **of each treatment unit, accounting for all phases of operation.**

Table 1.0(1) – Treatment Units

Treatment Unit Type	Number of Units	Dimensions (L x W x D)
Phase 1 EQ Basin	1	14'9" H x 11'10" diameter
Phase 1 Anoxic Basin	1	8'6" x 11'11" x 9'6" SWD
Phase 1 Aeration Basin	1	8'6" x 6'4" x 10'6" SWD
Phase 1 MBR Basins	2	8'6" x 6'7" x 10' SWD
Phase 1 Sludge Storage	1	11'10" H x 12' diameter
Chlorine Contact Basin (all phases)	1	51'4" x 13' x 5'6" SWD
Phase 2/3 EQ Basin	1	27' x 19'10.5" x 16' max SWD
Phase 2/3 Anoxic Basin	1	27' x 11'9" x 16' SWD
Phase 2/3 Aeration Basins	2	30'9" x 12'10.5" x 15'6" SWD

Treatment Unit Type	Number of Units	Dimensions (L x W x D)
Phase 2/3 MBR Basins	2	14'9" x 12'10.5" x 15' SWD (Ph. 2 8 MBR modules, Ph. 3 12 MBR modules)
Phase 2/3 RAS Basin	1	27' x 4'10.5" x 14'6" SWD
Phase 2/3 Sludge Storage Basin	1	53'3" x 14'5" x 14'6" SWD

C. Process flow diagrams

Provide flow diagrams for the existing facilities and **each** proposed phase of construction.

Attachment: 8

Section 3. Site Drawing (Instructions Page 52)

Provide a site drawing for the facility that shows the following:

- The boundaries of the treatment facility;
- The boundaries of the area served by the treatment facility;
- If land disposal of effluent, the boundaries of the disposal site and all storage/holding ponds; and
- If sludge disposal is authorized in the permit, the boundaries of the land application or disposal site.

Attachment: 9

Provide the name and a description of the area served by the treatment facility.

Northgate Ranch single-family residential development (approximately 942 acres) located approximately 1.85 miles north of the intersection of CR 214 and Highway 29 in the Liberty Hill, TX vicinity.

Section 4. Unbuilt Phases (Instructions Page 52)

Is the application for a renewal of a permit that contains an unbuilt phase or phases?

Yes ☒

No ☐

If yes, does the existing permit contain a phase that has not been constructed within five years of being authorized by the TCEQ?

Yes ☒

No ☐

If **yes**, provide a detailed discussion regarding the continued need for the unbuilt phase. Failure to provide sufficient justification may result in the Executive Director recommending denial of the unbuilt phase or phases.

The proposed plant will serve the Northgate Ranch development. The Northgate Ranch development has a planned ultimate build-out of approximately 1,800 LUEs. Based on a daily average flow demand of 263 gpd/LUE for the proposed development, the final phase permitted plant capacity of 475,000 gpd is necessary to serve the ultimate buildout for the development.

Section 5. Closure Plans (Instructions Page 53)

Have any treatment units been taken out of service permanently, or will any units be taken out of service in the next five years?

Yes ☐

No ☒

If **yes**, was a closure plan submitted to the TCEQ?

Yes ☐

No ☐

If **yes**, provide a brief description of the closure and the date of plan approval.

Section 6. Permit Specific Requirements (Instructions Page 53)

For applicants with an existing permit, check the *Other Requirements* or *Special Provisions* of the permit.

A. Summary transmittal

Have plans and specifications been approved for the existing facilities and each proposed phase?

Yes ☒

No ☐

If **yes**, provide the date(s) of approval for each phase: Phase 1 plans approved 6/15/2021

Provide information, including dates, on any actions taken to meet a requirement or provision pertaining to the submission of a summary transmittal letter. Provide a copy of an approval letter from the TCEQ, if applicable.

N/A

B. Buffer zones

Have the buffer zone requirements been met?

Yes ☒ No ☐

Provide information below, including dates, on any actions taken to meet the conditions of the buffer zone. If available, provide any new documentation relevant to maintaining the buffer zones.

C. Other actions required by the current permit

Does the *Other Requirements* or *Special Provisions* section in the existing permit require submission of any other information or other required actions? Examples include Notification of Completion, progress reports, soil monitoring data, etc.

Yes ☐ No ☐

If yes, provide information below on the status of any actions taken to meet the conditions of an *Other Requirement* or *Special Provision*.

N/A

D. Grit and grease treatment

1. Acceptance of grit and grease waste

Does the facility have a grit and/or grease processing facility onsite that

treats and decants or accepts transported loads of grit and grease waste that are discharged directly to the wastewater treatment plant prior to any treatment?

Yes ☐ No ☒

If No, stop here and continue with Subsection E. Stormwater Management.

2. Grit and grease processing

Describe below how the grit and grease waste is treated at the facility. In your description, include how and where the grit and grease is introduced to the treatment works and how it is separated or processed. Provide a flow diagram showing how grit and grease is processed at the facility.

3. Grit disposal

Does the facility have a Municipal Solid Waste (MSW) registration or permit for grit disposal?

Yes ☐ No ☐

If No, contact the TCEQ Municipal Solid Waste team at 512-239-0000. Note: A registration or permit is required for grit disposal. Grit shall not be combined with treatment plant sludge. See the instruction booklet for additional information on grit disposal requirements and restrictions.

Describe the method of grit disposal.

4. Grease and decanted liquid disposal

Note: A registration or permit is required for grease disposal. Grease shall not be combined with treatment plant sludge. For more information, contact the TCEQ Municipal Solid Waste team at 512-239-0000.

Describe how the decant and grease are treated and disposed of after grit separation.

E. Stormwater management

1. Applicability

Does the facility have a design flow of 1.0 MGD or greater in any phase?

Yes ☐ No ☒

Does the facility have an approved pretreatment program, under 40 CFR Part 403?

Yes ☐ No ☒

If no to both of the above, then skip to Subsection F, Other Wastes Received.

2. MSGP coverage

Is the stormwater runoff from the WWTP and dedicated lands for sewage disposal currently permitted under the TPDES Multi-Sector General Permit (MSGP), TXR050000?

Yes ☐ No ☐

If yes, please provide MSGP Authorization Number and skip to Subsection F, Other Wastes Received:

TXR05 or TXRNE

If no, do you intend to seek coverage under TXR050000?

Yes ☐ No ☐

3. Conditional exclusion

Alternatively, do you intend to apply for a conditional exclusion from permitting based TXR050000 (Multi Sector General Permit) Part II B.2 or TXR050000 (Multi Sector General Permit) Part V, Sector T 3(b)?

Yes ☐ No ☐

If yes, please explain below then proceed to Subsection F, Other Wastes Received:

4. Existing coverage in individual permit

Is your stormwater discharge currently permitted through this individual TPDES or TLAP permit?

Yes ☐ No ☐

If yes, provide a description of stormwater runoff management practices at the site that are authorized in the wastewater permit then skip to Subsection F, Other Wastes Received.

5. Zero stormwater discharge

Do you intend to have no discharge of stormwater via use of evaporation or other means?

Yes ☐ No ☐

If yes, explain below then skip to Subsection F. Other Wastes Received.

Note: If there is a potential to discharge any stormwater to surface water in the state as the result of any storm event, then permit coverage is required under the MSGP or an individual discharge permit. This requirement applies to all areas of facilities with treatment plants or systems that treat, store, recycle, or reclaim domestic sewage, wastewater or sewage sludge (including dedicated lands for sewage sludge disposal located within the onsite property boundaries) that meet the applicability criteria of above. You have the option of obtaining coverage under the MSGP for direct discharges, (recommended), or obtaining coverage under this individual permit.

6. Request for coverage in individual permit

Are you requesting coverage of stormwater discharges associated with your

treatment plant under this individual permit?

Yes ☐ No ☐

If **yes**, provide a description of stormwater runoff management practices at the site for which you are requesting authorization in this individual wastewater permit and describe whether you intend to comingle this discharge with your treated effluent or discharge it via a separate dedicated stormwater outfall. Please also indicate if you intend to divert stormwater to the treatment plant headworks and indirectly discharge it to water in the state.

Note: Direct stormwater discharges to waters in the state authorized through this individual permit will require the development and implementation of a stormwater pollution prevention plan (SWPPP) and will be subject to additional monitoring and reporting requirements. Indirect discharges of stormwater via headworks recycling will require compliance with all individual permit requirements including 2-hour peak flow limitations. All stormwater discharge authorization requests will require additional information during the technical review of your application.

F. Discharges to the Lake Houston Watershed

Does the facility discharge in the Lake Houston watershed?

Yes ☐ No ☒

If yes, a Sewage Sludge Solids Management Plan is required. See Example 5 in the instructions.

G. Other wastes received including sludge from other WWTPs and septic waste

1. Acceptance of sludge from other WWTPs

Does the facility accept or will it accept sludge from other treatment plants at the facility site?

Yes ☐ No ☒

If yes, attach sewage sludge solids management plan. See Example 5 of the instructions.

In addition, provide the date that the plant started accepting sludge or is anticipated to start accepting sludge, an estimate of monthly sludge

acceptance (gallons or millions of gallons), an estimate of the BOD₅ concentration of the sludge, and the design BOD₅ concentration of the influent from the collection system. Also note if this information has or has not changed since the last permit action.

Note: Permits that accept sludge from other wastewater treatment plants may be required to have influent flow and organic loading monitoring.

2. Acceptance of septic waste

Is the facility accepting or will it accept septic waste?

Yes ☐ No ☒

If yes, does the facility have a Type V processing unit?

Yes ☐ No ☐

If yes, does the unit have a Municipal Solid Waste permit?

Yes ☐ No ☐

If yes to any of the above, provide a the date that the plant started accepting septic waste, or is anticipated to start accepting septic waste, an estimate of monthly septic waste acceptance (gallons or millions of gallons), an estimate of the BOD₅ concentration of the septic waste, and the design BOD₅ concentration of the influent from the collection system. Also note if this information has or has not changed since the last permit action.

Note: Permits that accept sludge from other wastewater treatment plants may be required to have influent flow and organic loading monitoring.

3. Acceptance of other wastes (not including septic, grease, grit, or RCRA, CERCLA or as discharged by IUs listed in Worksheet 6)

Is the facility accepting or will it accept wastes that are not domestic in nature excluding the categories listed above?

Yes ☐ No ☒

If **yes**, provide the date that the plant started accepting the waste, an estimate how much waste is accepted on a monthly basis (gallons or millions of gallons), a description of the entities generating the waste, and any distinguishing chemical or other physical characteristic of the waste. Also note if this information has or has not changed since the last permit action.

Section 7. Pollutant Analysis of Treated Effluent (Instructions Page 58)

Is the facility in operation?

Yes ☐ No ☒

If **no**, this section is not applicable. Proceed to Section 8.

If **yes**, provide effluent analysis data for the listed pollutants. **Wastewater treatment facilities** complete Table 1.0(2). **Water treatment facilities** discharging filter backwash water, complete Table 1.0(3).

Note: The sample date must be within 1 year of application submission.

Table 1.0(2) - Pollutant Analysis for Wastewater Treatment Facilities

Pollutant	Average Conc.	Max Conc.	No. of Samples	Sample Type	Sample Date/Time
CBOD ₅ , mg/l					
Total Suspended Solids, mg/l					
Ammonia Nitrogen, mg/l					
Nitrate Nitrogen, mg/l					
Total Kjeldahl Nitrogen, mg/l					
Sulfate, mg/l					
Chloride, mg/l					
Total Phosphorus, mg/l					
pH, standard units					
Dissolved Oxygen*, mg/l					

Pollutant	Average Conc.	Max Conc.	No. of Samples	Sample Type	Sample Date/Time
Chlorine Residual, mg/l					
<i>E.coli</i> (CFU/100ml) freshwater					
Enterococci (CFU/100ml) saltwater					
Total Dissolved Solids, mg/l					
Electrical Conductivity, μ mohs/cm, †					
Oil & Grease, mg/l					
Alkalinity (CaCO ₃)*, mg/l					

*TPDES permits only

†TLAP permits only

Table 1.0(3) - Pollutant Analysis for Water Treatment Facilities

Pollutant	Average Conc.	Max Conc.	No. of Samples	Sample Type	Sample Date/Time
Total Suspended Solids, mg/l					
Total Dissolved Solids, mg/l					
pH, standard units					
Fluoride, mg/l					
Aluminum, mg/l					
Alkalinity (CaCO ₃), mg/l					

Section 8. Facility Operator (Instructions Page 60)

Facility Operator Name: William Abshire

Facility Operator's License Classification and Level: Class A WW

Facility Operator's License Number: WW0014404

Section 9. Sewage Sludge Management and Disposal (Instructions Page 60)

A. Sludge disposal method

Identify the current or anticipated sludge disposal method or methods from the following list. Check all that apply.

- ☐ Permitted landfill
- ☐ Permitted or Registered land application site for beneficial use
- ☐ Land application for beneficial use authorized in the wastewater permit
- ☐ Permitted sludge processing facility
- ☐ Marketing and distribution as authorized in the wastewater permit
- ☐ Composting as authorized in the wastewater permit
- ☐ Permitted surface disposal site (sludge monofill)
- ☐ Surface disposal site (sludge monofill) authorized in the wastewater permit
- ☒ Transported to another permitted wastewater treatment plant or permitted sludge processing facility. If you selected this method, a written statement or contractual agreement from the wastewater treatment plant or permitted sludge processing facility accepting the sludge must be included with this application.
- ☐ Other:

B. Sludge disposal site

Disposal site name: TBD

TCEQ permit or registration number: TBD

County where disposal site is located: Williamson

Section 11. Sewage Sludge Lagoons (Instructions Page 61)

Does this facility include sewage sludge lagoons?

Yes ☐ No ☒

If yes, complete the remainder of this section. If no, proceed to Section 12.

A. Location information

The following maps are required to be submitted as part of the application. For each map, provide the Attachment Number.

- Original General Highway (County) Map:

Attachment:

- USDA Natural Resources Conservation Service Soil Map:

Attachment:

- Federal Emergency Management Map:

Attachment:

- Site map:

Attachment:

Discuss in a description if any of the following exist within the lagoon area.

Check all that apply.

- ☐ Overlap a designated 100-year frequency flood plain
- ☐ Soils with flooding classification
- ☐ Overlap an unstable area
- ☐ Wetlands
- ☐ Located less than 60 meters from a fault
- ☐ None of the above

Attachment:

If a portion of the lagoon(s) is located within the 100-year frequency flood plain, provide the protective measures to be utilized including type and size of protective structures:

click here to enter text

B. Temporary storage information

Provide the results for the pollutant screening of sludge lagoons. These results are in addition to pollutant results in Section 7 of Technical Report 1.0.

Nitrate Nitrogen, mg/kg:

click here to enter text

Total Kjeldahl Nitrogen, mg/kg:

click here to enter text

Total Nitrogen (=nitrate nitrogen + TKN), mg/kg:

click here to enter text

Phosphorus, mg/kg:

click here to enter text

Potassium, mg/kg:

click here to enter text

pH, standard units:

click here to enter text

Ammonia Nitrogen mg/kg:

click here to enter text

Arsenic:

click here to enter text

Cadmium:

click here to enter text

Chromium:

click here to enter text

Copper:

click here to enter text

Lead:

click here to enter text

Mercury:

click here to enter text

Molybdenum:

click here to enter text

Nickel:

click here to enter text

Selenium:

click here to enter text

Zinc:

click here to enter text

Total PCBs:

click here to enter text

Provide the following information:

Volume and frequency of sludge to the lagoon(s):

click here to enter text

Total dry tons stored in the lagoons(s) per 365-day period:

click here to enter text

click here to enter text

Total dry tons stored in the lagoons(s) over the life of the unit:

click here to enter text

click here to enter text

C. Liner information

Does the active/proposed sludge lagoon(s) have a liner with a maximum hydraulic conductivity of 1×10^{-7} cm/sec?

Yes ☐ No ☒

If yes, describe the liner below. Please note that a liner is required.

D. Site development plan

Provide a detailed description of the methods used to deposit sludge in the lagoon(s):

Attach the following documents to the application.

- Plan view and cross-section of the sludge lagoon(s)

Attachment:

- Copy of the closure plan

Attachment:

- Copy of deed recordation for the site

Attachment:

- Size of the sludge lagoon(s) in surface acres and capacity in cubic feet and gallons

Attachment:

- Description of the method of controlling infiltration of groundwater and surface water from entering the site

Attachment:

- Procedures to prevent the occurrence of nuisance conditions

Attachment:

E. Groundwater monitoring

Is groundwater monitoring currently conducted at this site, or are any wells

available for groundwater monitoring, or are groundwater monitoring data otherwise available for the sludge lagoon(s)?

Yes ☐ No ☐

If groundwater monitoring data are available, provide a copy. Provide a profile of soil types encountered down to the groundwater table and the depth to the shallowest groundwater as a separate attachment.

Attachment:

Section 12. Authorizations/Compliance/Enforcement (Instructions Page 63)

A. Additional authorizations

Does the permittee have additional authorizations for this facility, such as reuse authorization, sludge permit, etc?

Yes ☐ No ☒

If yes, provide the TCEQ authorization number and description of the authorization:

<input type="text"/>

B. Permittee enforcement status

Is the permittee currently under enforcement for this facility?

Yes ☐ No ☒

Is the permittee required to meet an implementation schedule for compliance or enforcement?

Yes ☐ No ☒

If yes to either question, provide a brief summary of the enforcement, the implementation schedule, and the current status:

<input type="text"/>

Section 13. RCRA/CERCLA Wastes (Instructions Page 63)

A. RCRA hazardous wastes

Has the facility received in the past three years, does it currently receive, or will it receive RCRA hazardous waste?

Yes ☐ No ☒

B. Remediation activity wastewater

Has the facility received in the past three years, does it currently receive, or will it receive CERCLA wastewater, RCRA remediation/corrective action wastewater or other remediation activity wastewater?

Yes ☐ No ☒

C. Details about wastes received

If **yes** to either Subsection A or B above, provide detailed information concerning these wastes with the application.

Attachment: [click here to enter text](#)

Section 14. Laboratory Accreditation (Instructions Page 64)

All laboratory tests performed must meet the requirements of *30 TAC Chapter 25, Environmental Testing Laboratory Accreditation and Certification*, which includes the following general exemptions from National Environmental Laboratory Accreditation Program (NELAP) certification requirements:

- The laboratory is an in-house laboratory and is:
 - periodically inspected by the TCEQ; or
 - located in another state and is accredited or inspected by that state; or
 - performing work for another company with a unit located in the same site; or
 - performing pro bono work for a governmental agency or charitable organization.
- The laboratory is accredited under federal law.
- The data are needed for emergency-response activities, and a laboratory accredited under the Texas Laboratory Accreditation Program is not available.
- The laboratory supplies data for which the TCEQ does not offer accreditation.

The applicant should review *30 TAC Chapter 25* for specific requirements.

The following certification statement shall be signed and submitted with every application. See the *Signature Page* section in the Instructions, for a list of designated representatives who may sign the certification.

CERTIFICATION:

I certify that all laboratory tests submitted with this application meet the requirements of *30 TAC Chapter 25, Environmental Testing Laboratory Accreditation and Certification*.

Printed Name: Grant Rollo

Title: Principal

Signature: _____

Date: _____

DOMESTIC TECHNICAL REPORT 1.1

The following is required for new and amendment applications

Section 1. Justification for Permit (Instructions Page 66)

A. Justification of permit need

Provide a detailed discussion regarding the need for any phase(s) not currently permitted. Failure to provide sufficient justification may result in the Executive Director recommending denial of the proposed phase(s) or permit.

Wastewater service from the City of Liberty Hill is not available and the development is outside the city the limits. The applicant is therefore requesting a permit to build a WWTP in three (3) phases to provide wastewater service to the proposed development.

B. Regionalization of facilities

Provide the following information concerning the potential for regionalization of domestic wastewater treatment facilities:

1. Municipally incorporated areas

If the applicant is a city, then Item 1 is not applicable. Proceed to Item 2 Utility CCN areas.

Is any portion of the proposed service area located in an incorporated city?

Yes ☐ No ☐ Not Applicable ☒

If yes, within the city limits of:

If yes, attach correspondence from the city.

Attachment:

If consent to provide service is available from the city, attach a justification for the proposed facility and a cost analysis of expenditures that includes the cost of connecting to the city versus the cost of the proposed facility or expansion attached.

Attachment:

2. Utility CCN areas

Is any portion of the proposed service area located inside another utility's CCN area?

Yes ☐

No ☒

If yes, attach a justification for the proposed facility and a cost analysis of expenditures that includes the cost of connecting to the CCN facilities versus the cost of the proposed facility or expansion.

Attachment:

3. Nearby WWTPs or collection systems

Are there any domestic permitted wastewater treatment facilities or collection systems located within a three-mile radius of the proposed facility?

Yes ☐

No ☒

If yes, attach a list of these facilities that includes the permittee's name and permit number, and an area map showing the location of these facilities.

Attachment:

If yes, attach copies of your certified letters to these facilities **and** their response letters concerning connection with their system.

Attachment:

Does a permitted domestic wastewater treatment facility or a collection system located within three (3) miles of the proposed facility currently have the capacity to accept or is willing to expand to accept the volume of wastewater proposed in this application?

Yes ☐

No ☒

If yes, attach an analysis of expenditures required to connect to a permitted wastewater treatment facility or collection system located within 3 miles versus the cost of the proposed facility or expansion.

Attachment:

Section 2. Organic Loading (Instructions Page 67)

Is this facility in operation?

Yes ☐

No ☒

If no, proceed to Item B, Proposed Organic Loading.

If yes, provide organic loading information in Item A, Current Organic Loading

A. Current organic loading

Facility Design Flow (flow being requested in application): [redacted]

Average Influent Organic Strength or BOD₅ Concentration in mg/l: [redacted]

Average Influent Loading (lbs/day = total average flow X average BOD₅ conc. X 8.34): [redacted]

Provide the source of the average organic strength or BOD₅ concentration.

[redacted]

B. Proposed organic loading

This table must be completed if this application is for a facility that is not in operation or if this application is to request an increased flow that will impact organic loading.

Table 1.1(1) - Design Organic Loading

Source	Total Average Flow (MGD)	Influent BOD ₅ Concentration (mg/l)
Municipality		
Subdivision	0.06/0.360/0.475	260 (all phases)
Trailer park - transient		
Mobile home park		
School with cafeteria and showers		
School with cafeteria,		

Source	Total Average Flow (MGD)	Influent BOD ₅ Concentration (mg/l)
no showers		
Recreational park, overnight use		
Recreational park, day use		
Office building or factory		
Motel		
Restaurant		
Hospital		
Nursing home		
Other		
TOTAL FLOW from all sources	0.06/0.360/0.475	
AVERAGE BOD ₅ from all sources		260

Section 3. Proposed Effluent Quality and Disinfection (Instructions Page 68)

A. Existing/Interim I Phase Design Effluent Quality

Biochemical Oxygen Demand (5-day), mg/l: 10

Total Suspended Solids, mg/l: 15

Ammonia Nitrogen, mg/l: N/A

Total Phosphorus, mg/l: N/A

Dissolved Oxygen, mg/l: N/A

Other: N/A

B. Interim II Phase Design Effluent Quality

Biochemical Oxygen Demand (5-day), mg/l: 10

Total Suspended Solids, mg/l: 15

Ammonia Nitrogen, mg/l: N/A

Total Phosphorus, mg/l: N/A

Dissolved Oxygen, mg/l: N/A

Other: N/A

C. Final Phase Design Effluent Quality

Biochemical Oxygen Demand (5-day), mg/l: 10

Total Suspended Solids, mg/l: 15

Ammonia Nitrogen, mg/l: N/A

Total Phosphorus, mg/l: N/A

Dissolved Oxygen, mg/l: N/A

Other: N/A

D. Disinfection Method

Identify the proposed method of disinfection.

- ☐ Chlorine: 1.0 mg/l after 20 minutes detention time at peak flow
Dechlorination process: N/A
- ☐ Ultraviolet Light: 10 seconds contact time at peak flow
- ☐ Other:

Section 4. Design Calculations (Instructions Page 68)

Attach design calculations and plant features for each proposed phase. Example 4 of the instructions includes sample design calculations and plant features.

Attachment: 10

Section 5. Facility Site (Instructions Page 68)

A. 100-year floodplain

Will the proposed facilities be located above the 100-year frequency flood level?

Yes ☒ No ☐

If **no**, describe measures used to protect the facility during a flood event. Include a site map showing the location of the treatment plant within the 100-year frequency flood level. If applicable, provide the size and types of protective structures.

Provide the source(s) used to determine 100-year frequency flood plain.

FEMA Firm Map Panel 250E Map Number 4849160250E

For a new or expansion of a facility, will a wetland or part of a wetland be filled?

Yes ☐ No ☒

If **yes**, has the applicant applied for a US Corps of Engineers 404 Dredge and Fill Permit?

Yes ☐ No ☐

If **yes**, provide the permit number:

If **no**, provide the approximate date you anticipate submitting your application to the Corps:

B. Wind rose

Attach a wind rose. **Attachment:** 11

Section 6. Permit Authorization for Sewage Sludge Disposal (Instructions Page 69)

A. Beneficial use authorization

Are you requesting to include authorization to land apply sewage sludge for beneficial use on property located adjacent to the wastewater treatment facility under the wastewater permit?

Yes ☐ No ☒

If **yes**, attach the completed Application for Permit for Beneficial Land Use of Sewage Sludge (TCEQ Form No. 10451)

Attachment:

B. Sludge processing authorization

Identify the sludge processing, storage or disposal options that will be conducted at the wastewater treatment facility:

- ☐ Sludge Composting
- ☐ Marketing and Distribution of sludge
- ☐ Sludge Surface Disposal or Sludge Monofill

If **any of the above** sludge options are selected, attach a completed DOMESTIC WASTEWATER PERMIT APPLICATION: SEWAGE SLUDGE TECHNICAL REPORT (TCEQ Form No. 10056).

Attachment:

Section 7. Sewage Sludge Solids Management Plan (Instructions Page 69)

Attach a solids management plan to the application.

Attachment: 12

The sewage sludge solids management plan must contain the following information:

- Treatment units and processes dimensions and capacities
- Solids generated at 100, 75, 50, and 25 percent of design flow
- Mixed liquor suspended solids operating range at design and projected actual flow
- Quantity of solids to be removed and a schedule for solids removal
- Identification and ownership of the ultimate sludge disposal site
- For facultative lagoons, design life calculations, monitoring well locations and depths, and the ultimate disposal method for the sludge from the facultative lagoon

An example of a sewage sludge solids management plan has been included as Example 5 of the instructions.

DOMESTIC WORKSHEET 3.0

LAND DISPOSAL OF EFFLUENT

The following is required for all permit applications

Renewal, New, and Amendments

Section 1. Type of Disposal System (Instructions Page 77)

Identify the method of land disposal:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Surface application | <input type="checkbox"/> Subsurface application |
| <input type="checkbox"/> Irrigation | <input type="checkbox"/> Subsurface soils absorption |
| <input type="checkbox"/> Drip irrigation system | <input type="checkbox"/> Subsurface area drip dispersal system |
| <input type="checkbox"/> Evaporation | |
| <input type="checkbox"/> Evapotranspiration beds | |
| <input type="checkbox"/> Other (describe in detail): | |

NOTE: All applicants without authorization or proposing new/amended subsurface disposal MUST complete and submit Worksheet 7.0.

For existing authorizations, provide Registration Number:

Section 2. Land Application Site(s) (Instructions Page 77)

In table 3.0(1), provide the requested information for the land application sites. Include the agricultural or cover crop type (wheat, cotton, alfalfa, bermuda grass, native grasses, etc.), land use (golf course, hayland, pastureland, park, row crop, etc.), irrigation area, amount of effluent applied, and whether or not the public has access to the area. Specify the amount of land area and the amount of effluent that will be allotted to each agricultural or cover crop, if more than one crop will be used.

Table 3.0(1) - Land Application Site Crops

Crop Type & Land Use	Irrigation Area (acres)	Effluent Application (GPD)	Public Access? Y/N
Native grass/Open Space (Interim I)	20	60,000	Y

Crop Type & Land Use	Irrigation Area (acres)	Effluent Application (GPD)	Public Access? Y/N
Native grass/Open Space (Interim II)	108	360,000	Y
Native grass/Open Space (Final Phase)	140	475,000	Y
Cool season-Interim I: annual ryegrass/open space	20	60,000	Y
Cool season-Interim II: annual ryegrass/open space	108	360,000	Y
Cool season-Final: annual ryegrass/open space	140	475,000	Y

Section 3. Storage and Evaporation Lagoons/Ponds (Instructions Page 77)

Table 3.0(2) - Storage and Evaporation Ponds

Pond Number	Surface Area (acres)	Storage Volume (acre-feet)	Dimensions	Liner Type
1	2.22	31	24 feet total depth	Synthetic membrane
2	6.12	100	24 feet total depth	Synthetic membrane

Attach a copy of a liner certification that was prepared, signed, and sealed by a Texas licensed professional engineer for each pond.

Attachment: 13

Section 4. Flood and Runoff Protection (Instructions Page 77)

Is the land application site within the 100-year frequency flood level?

Yes ☒ No ☐

If yes, describe how the site will be protected from inundation.

Treated effluent will not be applied to any irrigation areas within the 100-year floodplain that are inundated. Irrigation will only take place within the floodplain areas during periods when the areas are not inundated.

Provide the source used to determine the 100-year frequency flood level:

FEMA FIRM Map Panel 250E Map Number 4849160250E.

Provide a description of tailwater controls and rainfall run-on controls used for the land application site.

Berms and/or swales will be placed along the perimeter of the land application site as required to control tailwater and rainfall run-on.

Section 5. Annual Cropping Plan (Instructions Page 77)

Attach an Annual Cropping Plan which includes a discussion of each of the following items. If not applicable, provide a detailed explanation indicating why.

Attachment: 14

- Soils map with crops
- Cool and warm season plant species
- Crop yield goals
- Crop growing season
- Crop nutrient requirements
- Additional fertilizer requirements
- Minimum/maximum harvest height (for grass crops)
- Supplemental watering requirements

- Crop salt tolerances
- Harvesting method/number of harvests
- Justification for not removing existing vegetation to be irrigated

Section 6. Well and Map Information (Instructions Page 78)

Attach a USGS map with the following information shown and labeled. If not applicable, provide a detailed explanation (on a separate page) indicating why.

Attachment: 2

- The boundaries of the land application site(s)
- Waste disposal or treatment facility site(s)
- On-site buildings
- Buffer zones
- Effluent storage and tailwater control facilities
- All water wells within 1 mile of the disposal site or property boundaries
- All springs and seeps onsite and within 500 feet of the property boundaries
- All surface waters in the state onsite and within 500 feet of the property boundaries
- All faults and sinkholes onsite and within 500 feet of the property

List and cross reference all water wells shown on the USGS map in the following table. Attach additional pages as necessary to include all of the wells.

Table 3.0(3) – Water Well Data

Well ID	Well Use	Producing? Y/N	Open, cased, capped, or plugged?	Proposed Best Management Practice
445176	Public Supply	Y	cased	Monitor well at treated effluent ponds to detect leakage; maintain 500'
282218	Irrigation	Y	cased	Monitor well at treated effluent ponds to detect leakage; maintain 500'
5817303	Public Supply	Y	cased	Monitor well at treated effluent ponds to detect leakage; maintain 500'
5817601	Irrigation	Y	cased	Monitor well at treated effluent ponds to detect leakage; maintain 150'

Well ID	Well Use	Producing? Y/N	Open, cased, capped, or plugged?	Proposed Best Management Practice
5817603	Stock	Y	cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
5817602	Domestic	Y	cased	Monitor well at treated effluent ponds to detect leakage; maintain 500' buffer.
5817302	Stock	Y	cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
77315	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
291274	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
244348	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
376899	Stock	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
104692	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
79487	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
183538	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.

Well ID	Well Use	Producing? Y/N	Open, cased, capped, or plugged?	Proposed Best Management Practice
265218	Irrigation	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
5817604	Unused	N	Plugged	None
5818404	Unused	N	Plugged	None
5818402	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
5818405	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
200509	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
5818406	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
156930	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
217783	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
289414	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.

Well ID	Well Use	Producing? Y/N	Open, cased, capped, or plugged?	Proposed Best Management Practice
113990	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
42888	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
42885	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
444409	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
443464	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
443628	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
443631	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
443562	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.
444408	Domestic	Y	Cased	Monitor well at treated effluent ponds to detect leakage; maintain 150' buffer.

If water quality data or well log information is available please include the information in an attachment listed by Well ID.

Attachment: 15

Section 7. Groundwater Quality (Instructions Page 79)

Attach a Groundwater Quality Technical Report which assesses the impact of the wastewater disposal system on groundwater. This report shall include an evaluation of the water wells (including the information in the well table provided in Item 6. above), the wastewater application rate, and pond liners. Indicate by a check mark that this report is provided.

Attachment: 16

Are groundwater monitoring wells available onsite? Yes ☐ No ☒

Do you plan to install ground water monitoring wells or lysimeters around the land application site? Yes ☐ No ☒

If **yes**, then provide the proposed location of the monitoring wells or lysimeters on a site map.

Attachment: 17

Section 8. Soil Map and Soil Analyses (Instructions Page 79)

A. Soil map

Attach a USDA Soil Survey map that shows the area to be used for effluent disposal.

Attachment: 17

B. Soil analyses

Attach the laboratory results sheets from the soil analyses. **Note:** for renewal applications, the current annual soil analyses required by the permit are acceptable as long as the test date is less than one year prior to the submission of the application.

Attachment: 18

List all USDA designated soil series on the proposed land application site. Attach additional pages as necessary.

Table 3.0(4) – Soil Data

Soil Series	Depth from Surface	Permeability	Available Water Capacity	Curve Number
BkE	5'	9.0E-08	0.16	80
BkG	5'	3.3E-08	0.16	80

Soil Series	Depth from Surface	Permeability	Available Water Capacity	Curve Number
DnB	3'	1.2E-08	0.12	80
SuB	5'	5.0E-06	0.14	61

Section 9. Effluent Monitoring Data (Instructions Page 80)

Is the facility in operation?

Yes ☐ No ☒

If **no**, this section is not applicable and the worksheet is complete.

If **yes**, provide the effluent monitoring data for the parameters regulated in the existing permit. If a parameter is not regulated in the existing permit, enter N/A.

Table 3.0(5) - Effluent Monitoring Data

Date	30 Day Avg Flow MGD	BOD ₅ mg/l	TSS mg/l	pH	Chlorine Residual mg/l	Acres irrigated

Date	30 Day Avg Flow MGD	BOD₅ mg/l	TSS mg/l	pH	Chlorine Residual mg/l	Acres irrigated

Provide a discussion of all persistent excursions above the permitted limits and any corrective actions taken.

DOMESTIC WORKSHEET 3.1

SURFACE LAND DISPOSAL OF EFFLUENT

The following is required for new and major amendment applications.

Renewal and minor amendments applicants may be asked for the worksheet on a case by case basis.

Section 1. Surface Disposal (Instructions Page 81)

Complete the item that applies for the method of disposal being used.

A. Irrigation

Area under irrigation, in acres: 20 (Phase 1)/108 (phase 2)/140 (Phase 3)

Design application frequency:

hours/day 8 And days/week 7

Land grade (slope):

average percent (%):5

maximum percent (%):52

Design application rate in acre-feet/acre/year: 4.5 - actual 3.8 all phases

Design total nitrogen loading rate, in lbs N/acre/year: 175 lbs/ac/yr; 3.24 ft/yr

Soil conductivity (mmhos/cm): 8

Method of application: Spray irrigation

Attach a separate engineering report with the water balance and storage volume calculations, method of application, irrigation efficiency, and nitrogen balance.

Attachment: 19

B. Evaporation ponds

Daily average effluent flow into ponds, in gallons per day: N/A

Attach a separate engineering report with the water balance and storage volume calculations.

Attachment:

C. Evapotranspiration beds

Number of beds:

Area of bed(s), in acres:

Depth of bed(s), in feet:

Void ratio of soil in the beds:

Storage volume within the beds, in acre-feet:

Attach a separate engineering report with the water balance and storage volume calculations, and a description of the lining.

Attachment:

D. Overland flow

Area used for application, in acres:

Slopes for application area, percent (%):

Design application rate, in gpm/foot of slope width:

Slope length, in feet:

Design BOD₅ loading rate, in lbs BOD₅/acre/day:

Design application frequency:

hours/day: And days/week:

Attach a separate engineering report with the method of application and design requirements according to *30 TAC Chapter 217*.

Attachment:

Section 2. Edwards Aquifer (Instructions Page 82)

Is the facility subject to *30 TAC Chapter 213*, Edwards Aquifer Rules?

Yes ☒ No ☐

If yes, attach a report concerning the recharge zone.

Attachment: N/A, project is in the Contributing Zone only



TCEQ Use Only

TCEQ Core Data Form

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission (If other is checked please describe in space provided.)		
<input type="checkbox"/> New Permit, Registration or Authorization (Core Data Form should be submitted with the program application.)		
<input checked="" type="checkbox"/> Renewal (Core Data Form should be submitted with the renewal form)		<input type="checkbox"/> Other
2. Customer Reference Number (if issued)	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number (if issued)
CN 605909704		RN 109672469

SECTION II: Customer Information

4. General Customer Information	5. Effective Date for Customer Information Updates (mm/dd/yyyy)	09/14/2022					
<input type="checkbox"/> New Customer <input type="checkbox"/> Update to Customer Information <input type="checkbox"/> Change in Regulated Entity Ownership							
<input type="checkbox"/> Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)							
The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).							
6. Customer Legal Name (If an individual, print last name first: eg: Doe, John)		If new Customer, enter previous Customer below:					
River Oaks Land Partners II, LLC							
7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number (if applicable)				
0803693221	31075125701	86-1862961	N/A				
11. Type of Customer:	<input checked="" type="checkbox"/> Corporation	<input type="checkbox"/> Individual	Partnership: <input type="checkbox"/> General <input type="checkbox"/> Limited				
Government: <input type="checkbox"/> City <input type="checkbox"/> County <input type="checkbox"/> Federal <input type="checkbox"/> State <input type="checkbox"/> Other	<input type="checkbox"/> Sole Proprietorship	<input type="checkbox"/> Other:					
12. Number of Employees		13. Independently Owned and Operated?					
<input checked="" type="checkbox"/> 0-20 <input type="checkbox"/> 21-100 <input type="checkbox"/> 101-250 <input type="checkbox"/> 251-500 <input type="checkbox"/> 501 and higher		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					
14. Customer Role (Proposed or Actual) – as it relates to the Regulated Entity listed on this form. Please check one of the following							
<input type="checkbox"/> Owner <input type="checkbox"/> Operator <input checked="" type="checkbox"/> Owner & Operator							
<input type="checkbox"/> Occupational Licensee <input type="checkbox"/> Responsible Party <input type="checkbox"/> Voluntary Cleanup Applicant <input type="checkbox"/> Other:							
15. Mailing Address:	14001 W State Hwy 29						
	Suite 203						
	City	Liberty Hill	State	TX	ZIP	78642	ZIP + 4
16. Country Mailing Information (if outside USA)				17. E-Mail Address (if applicable)			
				grollo@randolphtexas.com			
18. Telephone Number		19. Extension or Code		20. Fax Number (if applicable)			
(512) 657-2992				() -			

SECTION III: Regulated Entity Information

21. General Regulated Entity Information (If 'New Regulated Entity' is selected below this form should be accompanied by a permit application)	
<input type="checkbox"/> New Regulated Entity <input type="checkbox"/> Update to Regulated Entity Name <input checked="" type="checkbox"/> Update to Regulated Entity Information	
The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC).	
22. Regulated Entity Name (Enter name of the site where the regulated action is taking place.)	
Northgate Ranch Wastewater Treatment Plant	

23. Street Address of the Regulated Entity: (No PO Boxes)							
	City		State		ZIP		ZIP + 4
24. County							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:	Approximately 1.0 mile northwest of CR 214 and San Gabriel Ranch Road										
26. Nearest City	Liberty Hill				State	TX		Nearest ZIP Code	78642		
27. Latitude (N) In Decimal:	30.7097			28. Longitude (W) In Decimal:	-97.8947						
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds						
30	42	35	-97	53	41						
29. Primary SIC Code (4 digits)	4952		30. Secondary SIC Code (4 digits)			31. Primary NAICS Code (5 or 6 digits)	22132		32. Secondary NAICS Code (5 or 6 digits)		
33. What is the Primary Business of this entity? (Do not repeat the SIC or NAICS description.)											
Land Development											
34. Mailing Address:	1108 Lavaca St., Suite 510										
	City	Austin		State	TX	ZIP	78701		ZIP + 4		
35. E-Mail Address:	grollo@randolphptexas.com										
36. Telephone Number			37. Extension or Code			38. Fax Number (if applicable)					
(512) 657-2992						() -					

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

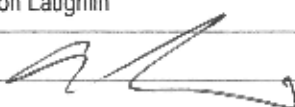
<input type="checkbox"/> Dam Safety	<input type="checkbox"/> Districts	<input type="checkbox"/> Edwards Aquifer	<input type="checkbox"/> Emissions Inventory Air	<input type="checkbox"/> Industrial Hazardous Waste
<input type="checkbox"/> Municipal Solid Waste	<input type="checkbox"/> New Source Review Air	<input type="checkbox"/> OSSF	<input type="checkbox"/> Petroleum Storage Tank	<input type="checkbox"/> PWS
<input type="checkbox"/> Sludge	<input type="checkbox"/> Storm Water	<input type="checkbox"/> Title V Air	<input type="checkbox"/> Tires	<input type="checkbox"/> Used Oil
<input type="checkbox"/> Voluntary Cleanup	<input checked="" type="checkbox"/> Waste Water	<input type="checkbox"/> Wastewater Agriculture	<input type="checkbox"/> Water Rights	<input type="checkbox"/> Other:

SECTION IV: Preparer Information

40. Name:	Aaron Laughlin, P.E.		41. Title:	Project Manager	
42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address		
(512) 930-9412		() -	alaughlin@stegerbizzell.com		

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	Steger Bizzell		Job Title:	Project Manager	
Name (In Print):	Aaron Laughlin			Phone:	(512) 930- 9412
Signature:				Date:	9/14/22

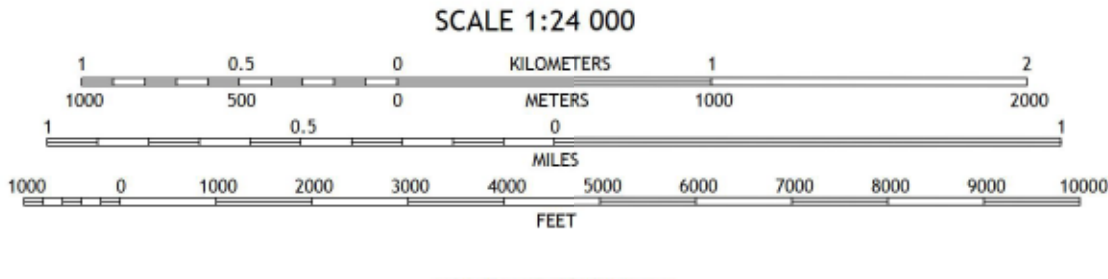
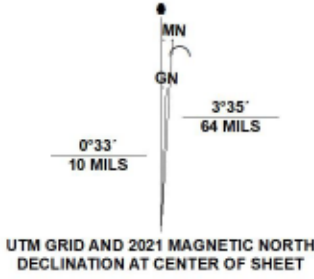


Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid/Universal Transverse Mercator, Zone 14R
Data is provided by The National Map (TNM), is the best available at the time of map
generation, and includes data content from supporting themes of Elevation,
Hydrography, Geographic Names, Boundaries, Transportation, Structures, Land Cover,
and Orthomaps. Refer to associated Federal Geographic Data Committee (FGDC)
Metadata for additional source data information.

This map is not a legal document. Boundaries may be generalized for this map scale.
Private lands within government reservations may not be shown. Obtain permission
before entering private lands. Temporal changes may have occurred since these data
were collected and some data may no longer represent actual surface conditions.

Learn About The National Map: <https://nationalmap.gov>



CONTOUR INTERVAL 10 FEET
NORTH AMERICAN DATUM OF 1983
CONTOUR SMOOTHNESS = Medium



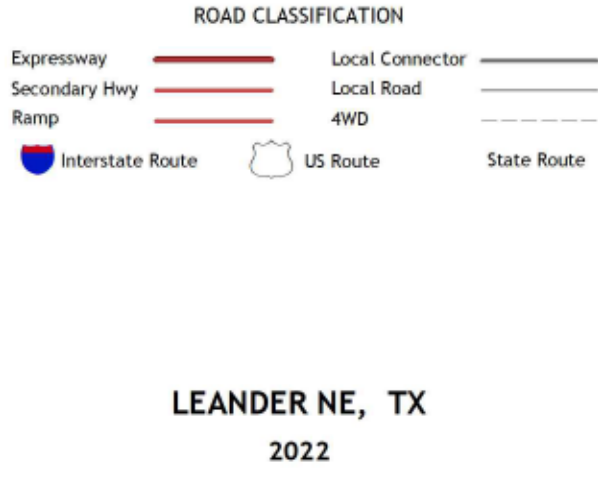
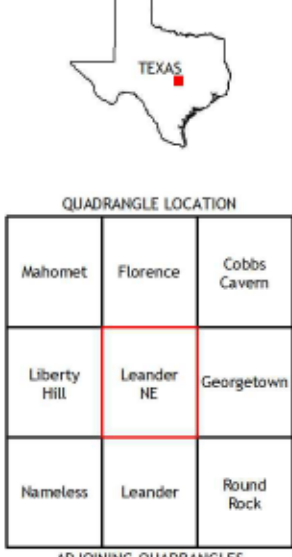
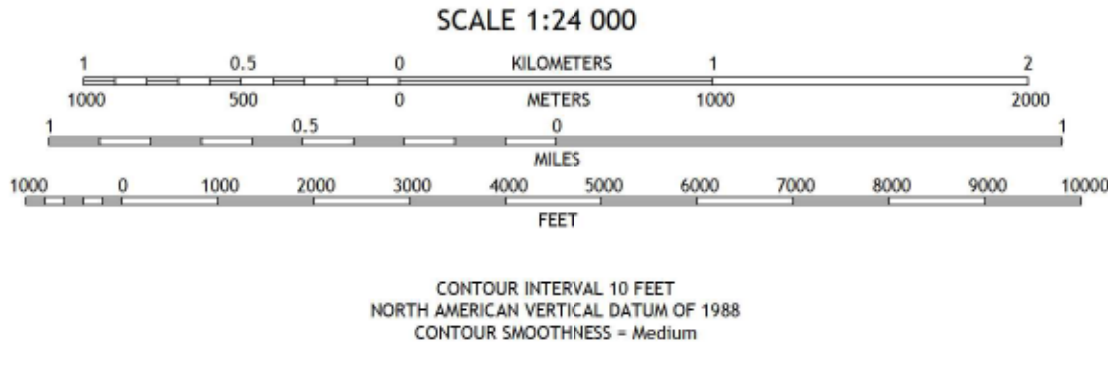
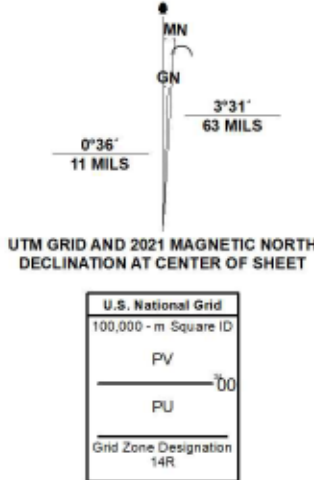
QUADRANGLE LOCATION		
Joppa	Mahomet	Florence
Bertram	Liberty Hill	Leander NE
Travis Peak	Hamless	Leander



LIBERTY HILL, TX
2022

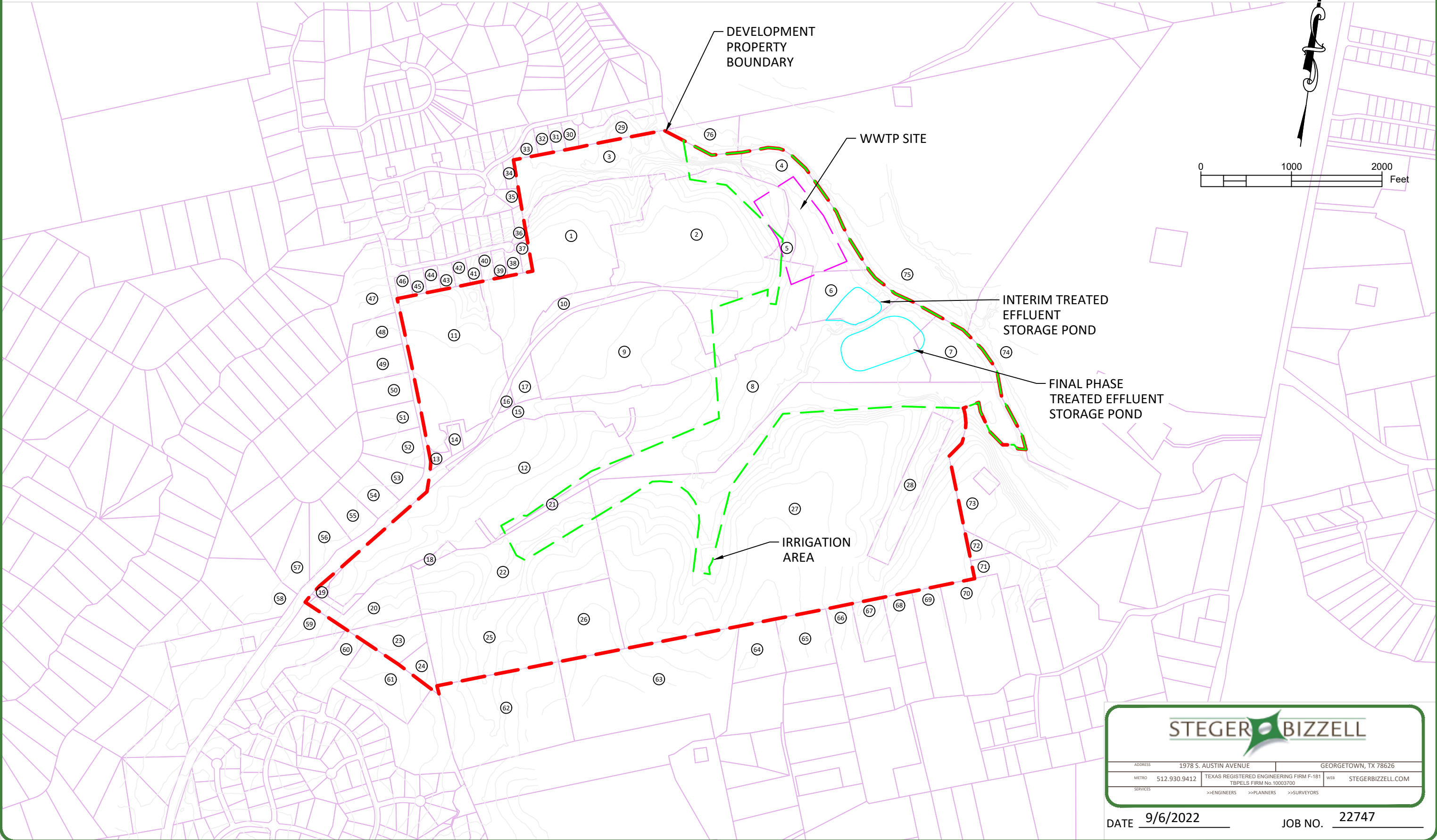



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North American Datum of 1983 (NAD83)
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ATTACHMENT 3 - LANDOWNER'S MAP





ADDRESS		1978 S. AUSTIN AVENUE		GEORGETOWN, TX 78626	
METRO	512.930.9412	TEXAS REGISTERED ENGINEERING FIRM F-181 TBPELS FIRM No. 10003700		WEB	STEGEBIZZELL.COM
SERVICES		>>ENGINEERS >>PLANNERS >>SURVEYORS			

DATE 9/6/2022 JOB NO. 22747

Attachment 4 – List of Affected Landowners

1. Tri Pointe Homes Texas Inc 13640 Briarwick Dr Ste 170 Austin, TX 78729	11. Same as #2	21. Permittee Owned
2. Phau-Lariat 108 LLC 9000 Gulf Fwy Houston, TX 77017	12. Same as #1	22. Permittee Owned
3. Permittee Owned	13. Permittee Owned	23. Permittee Owned
4. Permittee Owned	14. Haskell, Frank A & Jody M 2455 County Road 214 Liberty Hill, TX 78642-4527-	24. Permittee Owned
5. Permittee Owned	15. Permittee Owned	25. Permittee Owned
6. Permittee Owned	16. Same as #2	26. Permittee Owned
7. Berman Mark & John L Lohr & Lisa Anderson & Delanie & Andrew McDonald 11500 Reading Way Austin, TX 78717	17. Same as #1	27. Permittee Owned
8. Permittee Owned	18. Permittee Owned	28. Permittee Owned
9. DRP TX 4 LLC ATTN Chris Bornemann 590 Madison Ave #FL 13 New York, NY 10022	19. Permittee Owned	29. Cherokee Ridge LLC 1285 County Road 260 Bertram, TX 78605
10. Same as #9	20. Permittee Owned	30. Dacus, Galyon M & Roberta A 120 Horizon Ridge Cv Liberty Hill, TX 78642-2079

Attachment 4 – List of Affected Landowners

31. Steer, John & Gerda
116 Horizon Ridge Cv
Liberty Hill, TX 78642

41. San Filippo, Justine
1539 County Road 215
Bertram, TX 78605

51. Lochte, Glen E & Reagan A
192 Thoroughbred Trace
Liberty Hill, TX 78642

32. Same as #31

42. Kieley, Brian Edward
116 Taylor Creek Way
Liberty Hill, TX 78642

52. Shearer, Erica M & Grant
180 Thoroughbred Trace
Liberty Hill, TX 78642

33. Swierc, Conrad R & Debbie
108 Horizon Ridge Cv
Liberty Hill, TX 78642

43. Maniaci, Dave & Michelle
2821 Deerfern Ln
Round Rock, TX 78665-2574

53. Etheredge, Jim Tom & Rose
Marie
172 Thoroughbred Trace
Liberty Hill, TX 78642

34. Nad, Tomislav & Shasha
Zhang
104 Horizon Ridge Cv
Liberty Hill, TX 78642

44. Hamilton, Kelsey & Tyler
108 Taylor Creek Way
Liberty Hill, TX 78642

54. Nicolas, Pablo Antolin &
Cathleen
160 Thoroughbred Trace
Liberty Hill, TX 78642

35. Owner Unknown
301 San Gabriel Hideaway Cv
Liberty Hill, TX 78642

45. Singh, Gulab & Poonam
9703 Dover Springs Ct
Katy, TX 77494

55. Walker, Harry C & Denise E
152 Thoroughbred Trace
Liberty Hill, TX 78642

36. Hernandez, Cesar Margarito
141 Taylor Creek Way
Liberty Hill, TX 78642

46. Guevara-George, Joany &
Juan J Varela Albarran
100 Taylor Creek Way
Liberty Hill, TX 78642

56. Hagerman, Eric & Wendy
144 Thoroughbred Trace
Liberty Hill, TX 78642

37. Wills, Timothy P & Jody K
4572 Loganview Dr
Yorba Linda, CA 92886

47. Rosenhagen, Brad & Lisa
291 N Showhorse Dr
Liberty Hill, TX 78642

57. Barto, Richard Kyle
136 Thoroughbred Trace
Liberty Hill, TX 78642

38. Kunze, Dana P & Hilary
Schreckenbach
616 Sawyer Trail
Leander, TX 78641

48. Strable, George Charles Jr &
Jamie Lei
220 Thoroughbred Trace
Liberty Hill, TX 78642

58. Carlson, Judith Ann
136 N Showhorse Dr
Liberty Hill, TX 78642

39. Drosche, Renee & Jason
128 Taylor Creek Way
Liberty Hill, TX 78642

49. McIntosh, Thomas D & Laura E
210 Thoroughbred Trace
Liberty Hill, TX 78642

59. Permittee Owned

40. Irick, Jack Thomas & Sheryl
512 Los Escondidos
Marble Falls, TX 78659

50. Fillmore, Spencer J & Andrea
200 Thoroughbred Trace
Liberty Hill, TX 78642

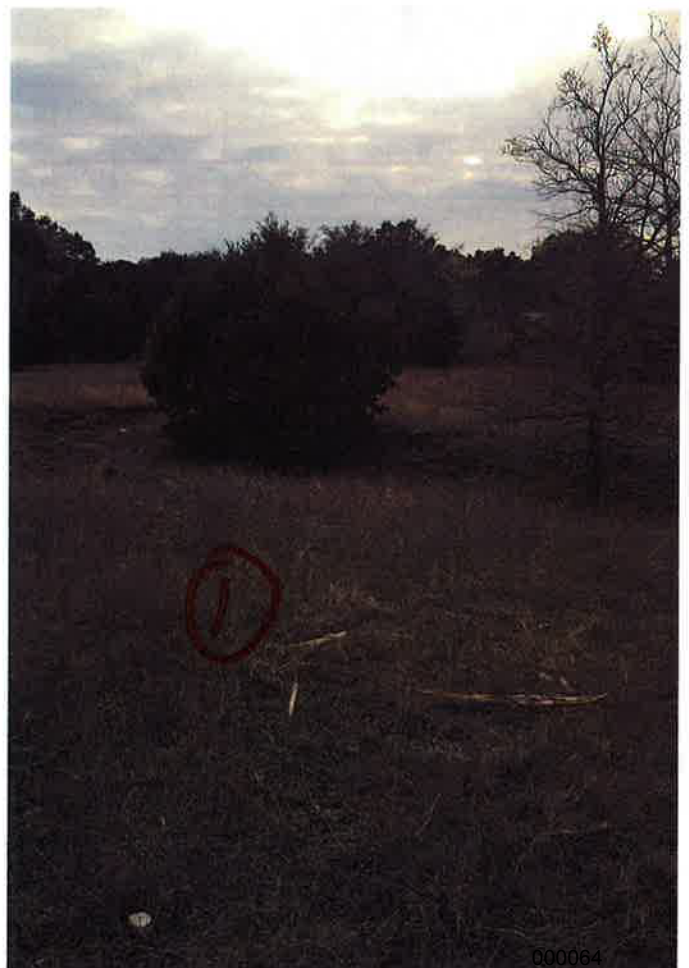
60. Permittee Owned

Attachment 4 – List of Affected Landowners

61. Permittee Owned	71. Hurst, Wayne 1103 Rivery Blvd, Ste 160 Georgetown, TX 78628-3035
62. Watson Ranch, LTD 777 Oak Lane Liberty Hill, TX 78642	72. Same as #71
63. Same as #62	73. Huffstutler, M Conrad Jr & Gail J 280 Cole Dr Liberty Hill, TX 78642-4511
64. Fleming, Debra Gwen 807 Oak Ln Liberty Hill, TX 78642	74. BDH Liberty Holdings LP 7350 FM 3405 Liberty Hill, TX 78642
65. Nixon, Lynn Wade & Sandra Jo 6008 Gateridge Dr Flower Mound, TX 75028-2393	75. Warren, Bill D & Patricia 6702 Mesa Dr Austin, TX 78731-2818
66. Pilgrim, Clinton S & Laura Kathleen 810 Cole Dr Liberty Hill, TX 78642	76. Same as #75
67. Nelson, Judy & Jeffrey A 800 Cole Dr Liberty Hill, TX 78642	
68. Gillespie, Thad & Kerstin 216 Arrowhead Mound Rd Georgetown, TX 78628-2319	
69. Parker, David James & Majda 650 Cole Dr Liberty Hill, TX 78642-4531	
70. Snelgrooes, Richard & Carri Eddo Trustees of R&C Snelgrooes Trust 600 Cole Dr Liberty Hill, TX 78642	

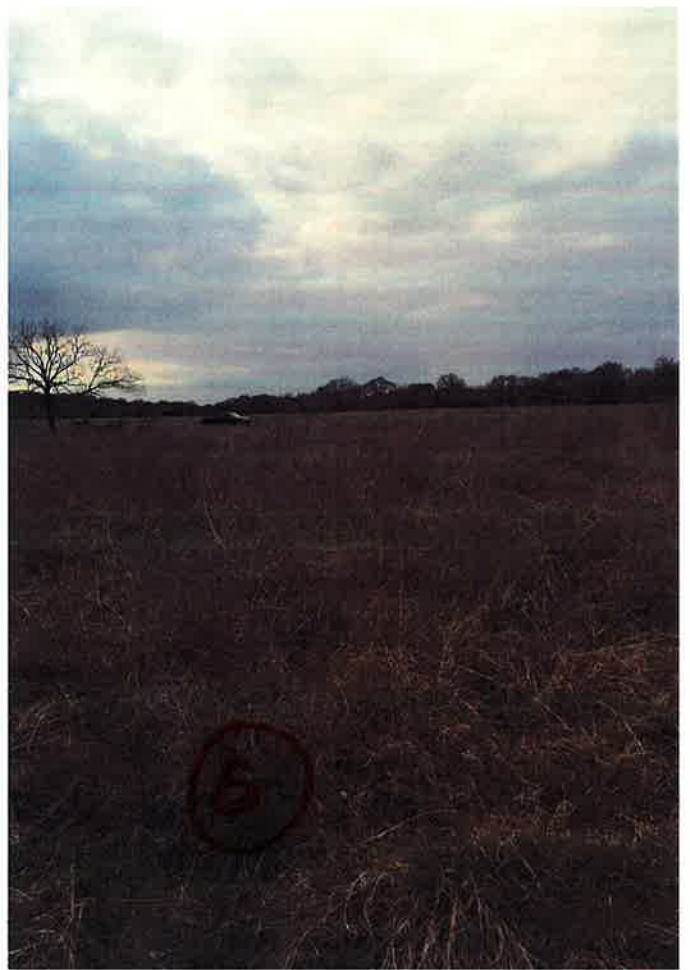
ATTACHMENT 5

PHOTOS



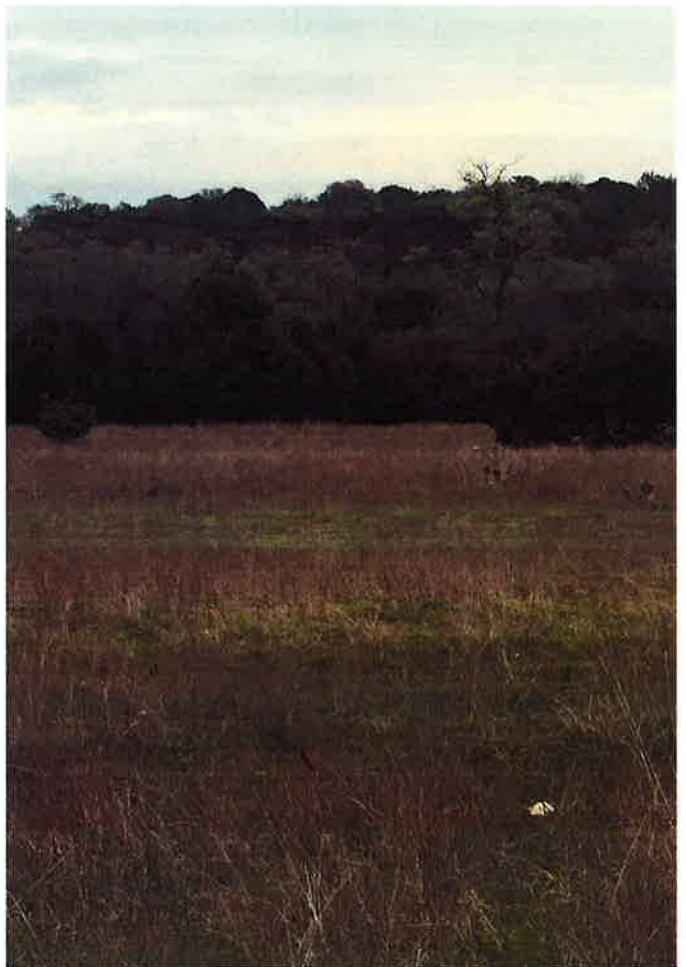


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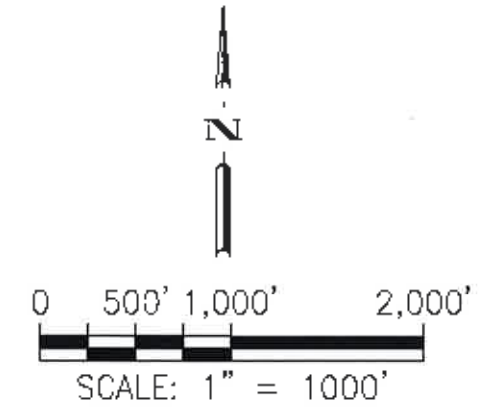
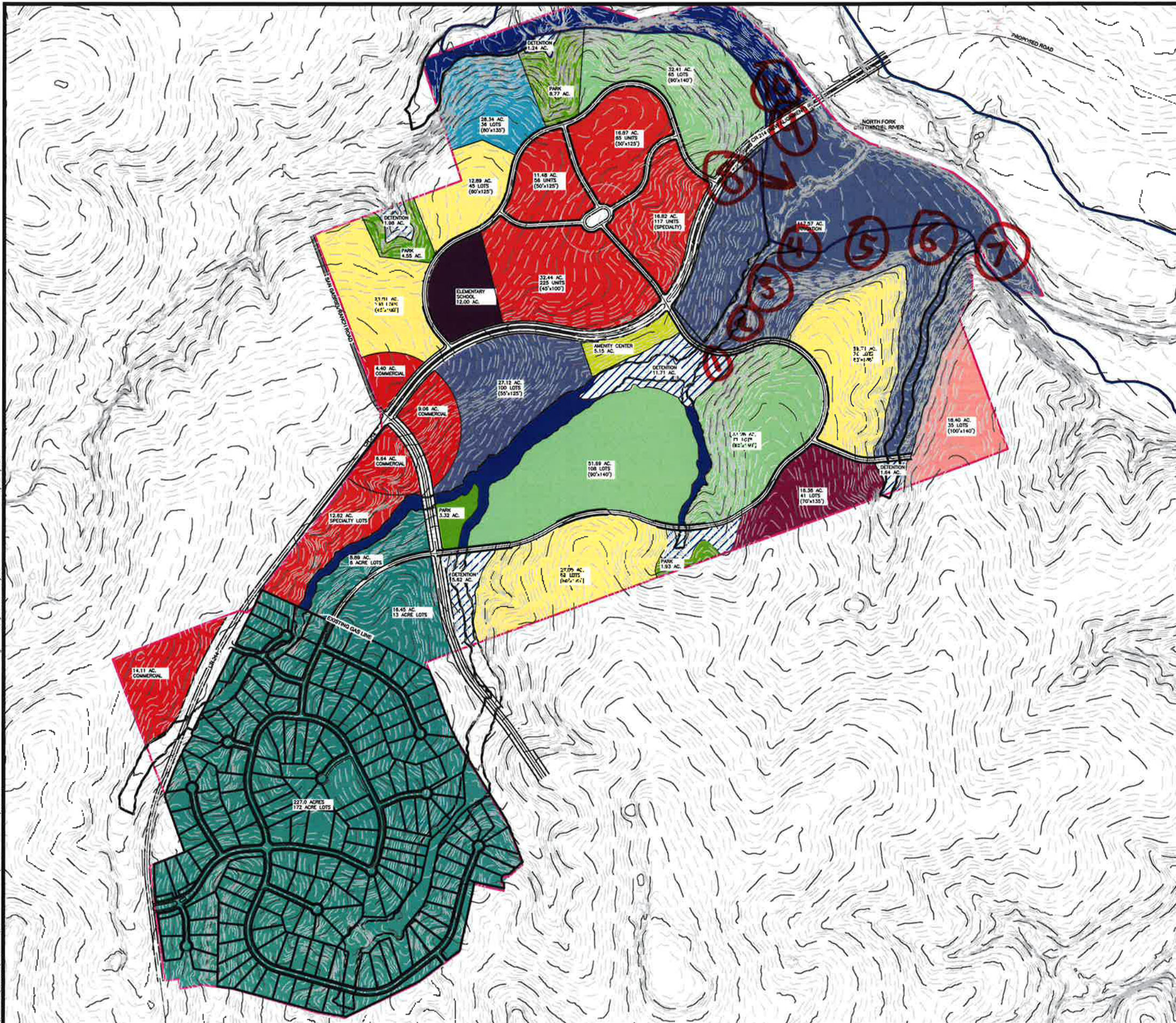








V:\01Projects\Randolph_Tecd Co\River_Caks_AYU\T1 BFC_Ycwq Layout: Layout: 3/20/20' : 1 57.45. nld



ATTACHMENT 6 - PHOTO PLOT PLAN

NORTHGATE
LIBERTY HILL, TEXAS

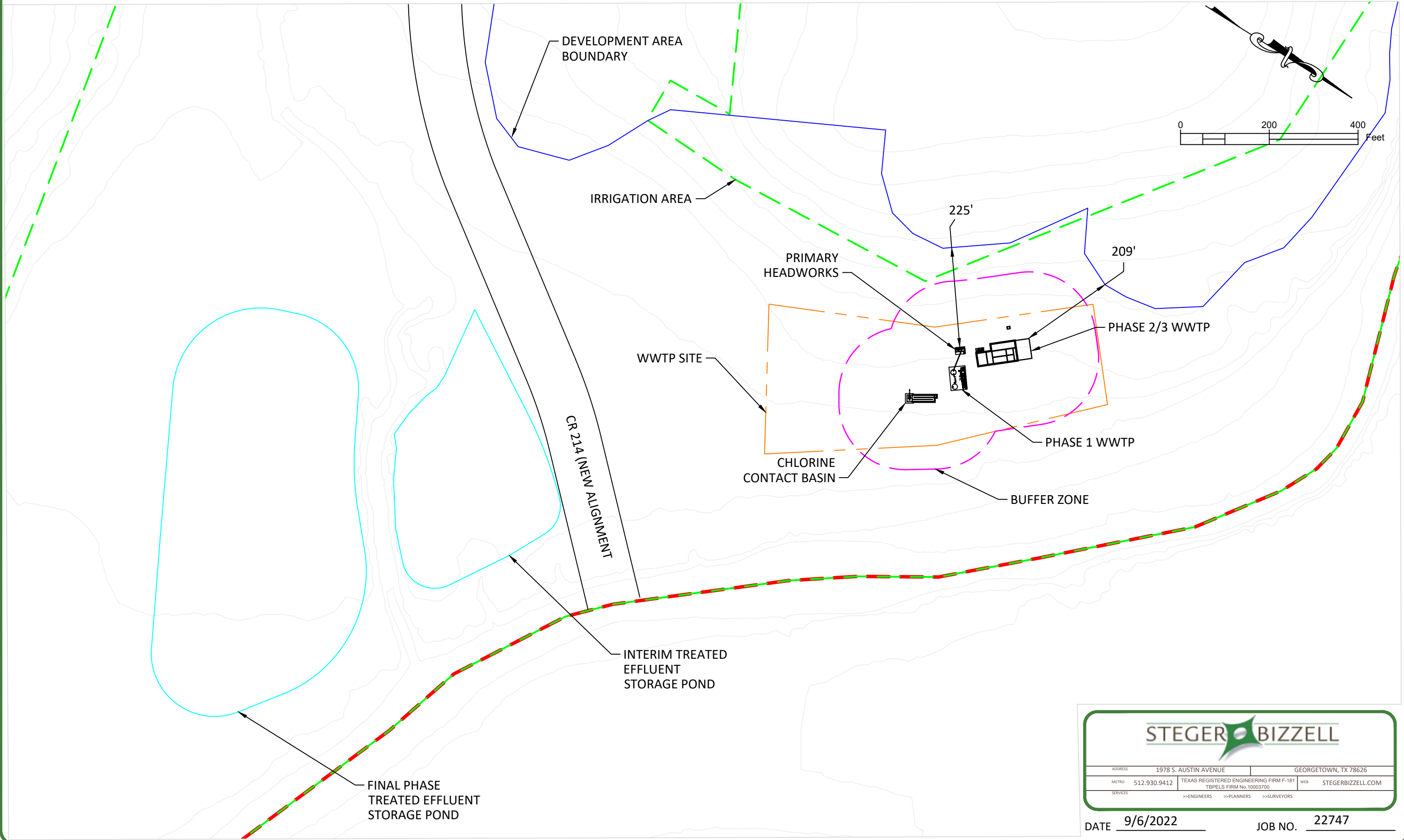
CONCEPTUAL DEVELOPMENT PLAN

BGE, INC.
7000 NORTH MOFAC, SUITE 330 AUSTIN,
TX 78731 TQPE Registration No. 17-1048
TEL 512-879-0400 www.bgeinc.com



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ATTACHMENT 7 - BUFFER ZONE MAP



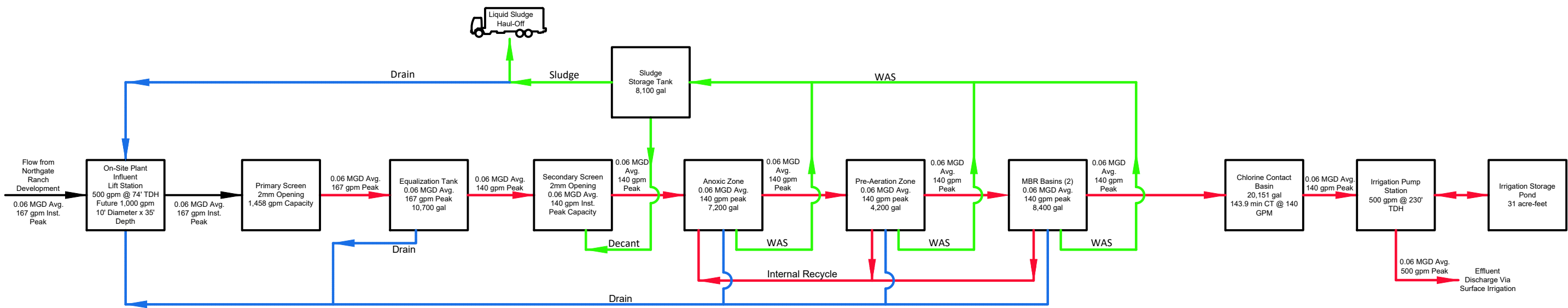
ADDRESS		1978 S. AUSTIN AVENUE		GEORGETOWN, TX 78626	
METRO	512.930.9412	TEXAS REGISTERED ENGINEERING FIRM F-181 TBPELS FIRM No. 10003700		WEB	STEGEBIZZELL.COM
SERVICES		>>ENGINEERS	>>PLANNERS	>>SURVEYORS	

DATE 9/6/2022 JOB NO. 22747

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ATTACHMENT 8A

PROCESS FLOW DIAGRAM INTERIM PHASE 1





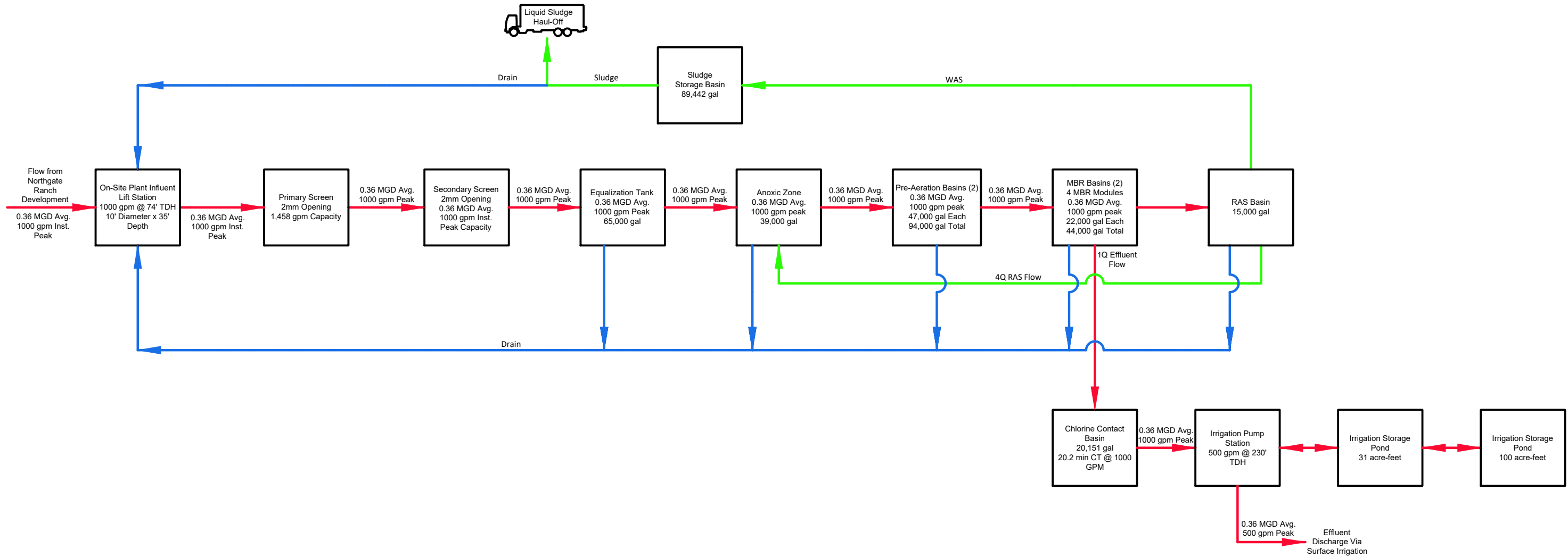
ADDRESS		1978 S. AUSTIN AVENUE		GEORGETOWN, TX 78626	
METRO	512.930.9412	TEXAS REGISTERED ENGINEERING FIRM F-181	WEB	STEBERBIZZELL.COM	
SERVICES		>>ENGINEERS >>PLANNERS >>SURVEYORS			

DATE 9/6/2022 JOB NO. 22747

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ATTACHMENT 8B

PROCESS FLOW DIAGRAM INTERIM PHASE 2





STEGER & BIZZELL

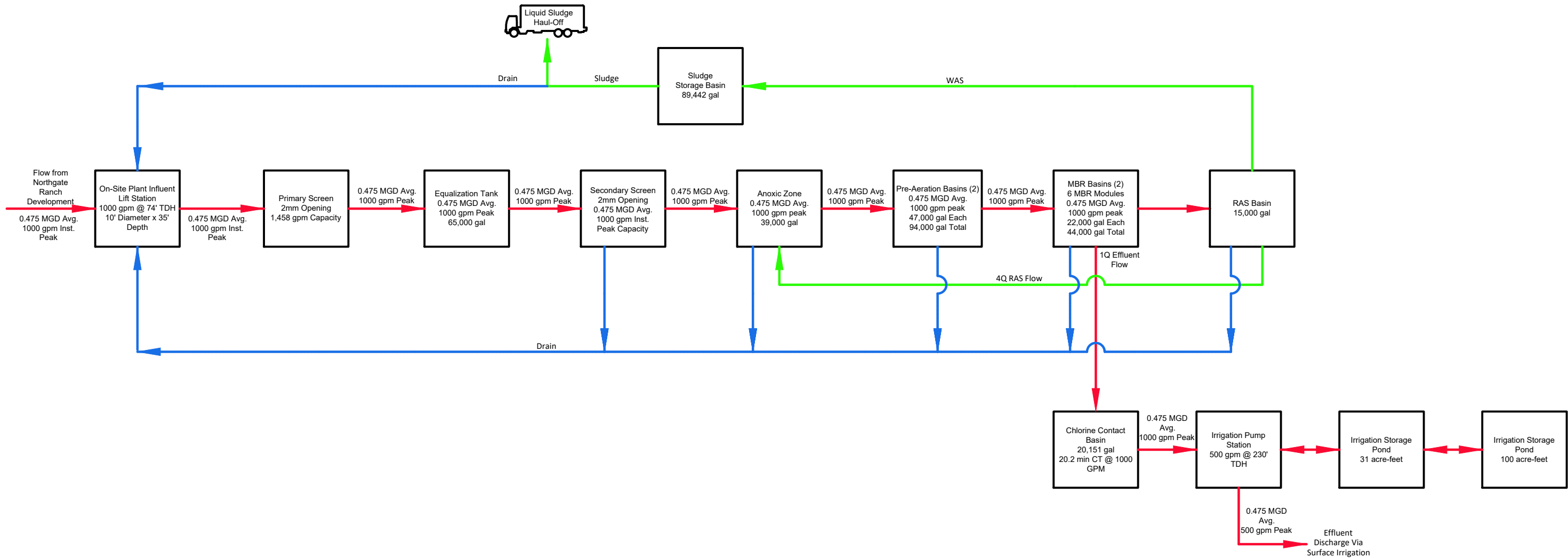
ADDRESS	1978 S. AUSTIN AVENUE	GEORGETOWN, TX 78626
METRO	512.930.9412	TEXAS REGISTERED ENGINEERING FIRM F-181 TBPELS FIRM No. 10003700
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ATTACHMENT 8C

PROCESS FLOW DIAGRAM FINAL PHASE 3

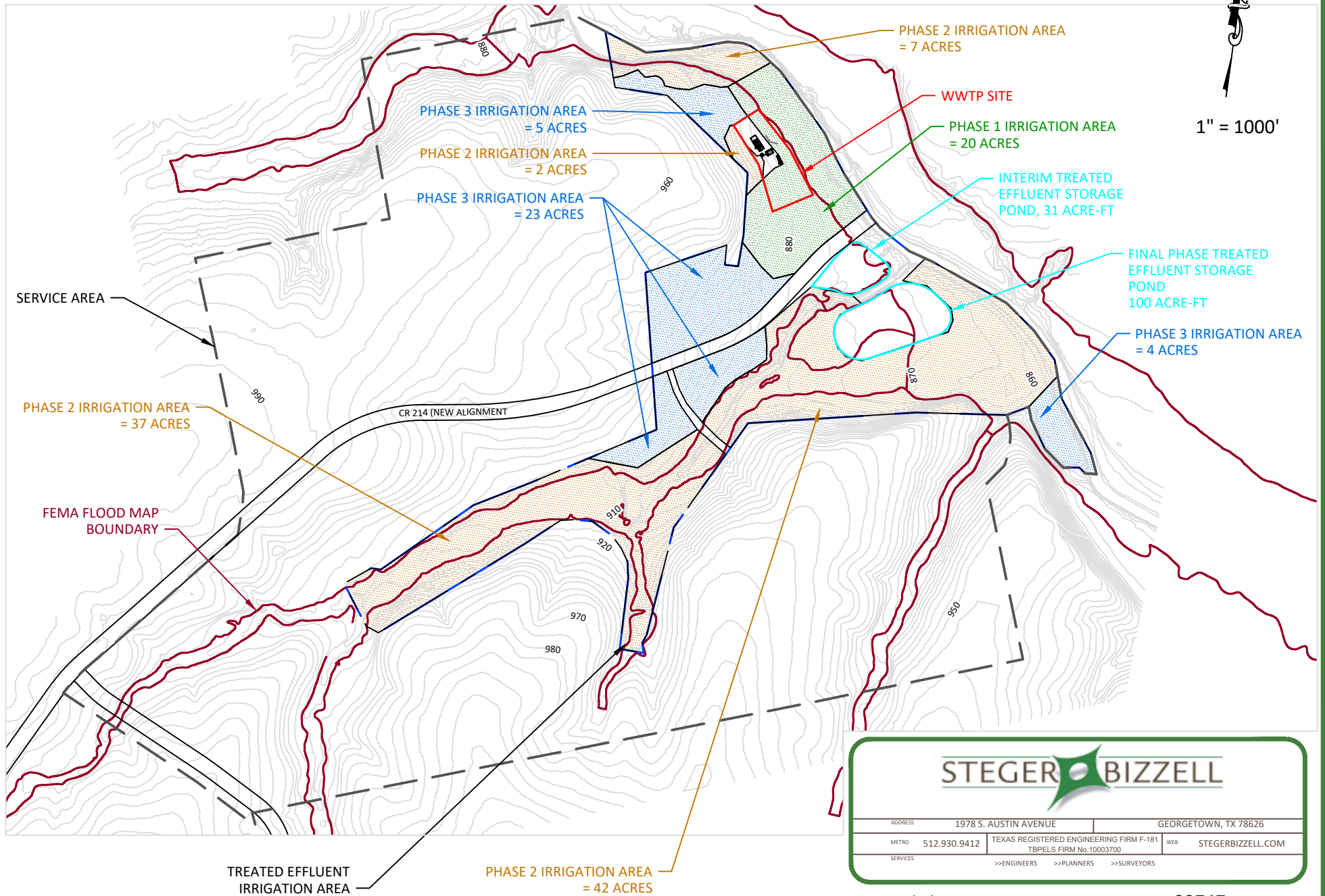




ADDRESS		1978 S. AUSTIN AVENUE		GEORGETOWN, TX 78626	
METRO	512.930.9412	TEXAS REGISTERED ENGINEERING FIRM F-181		WEB	STEGERBIZZELL.COM
SERVICES		>>ENGINEERS >>PLANNERS >>SURVEYORS			

DATE 9/6/2022 JOB NO. 22747

ATTACHMENT 9 - SITE DRAWING



ADDRESS		1978 S. AUSTIN AVENUE	GEORGETOWN, TX 78626
METRO	512.930.9412	TEXAS REGISTERED ENGINEERING FIRM F-181 TBPELS FIRM No. 10003700	WEB STEGERBIZZELL.COM
SERVICES		>>ENGINEERS	>>PLANNERS >>SURVEYORS

DATE 9/6/2022

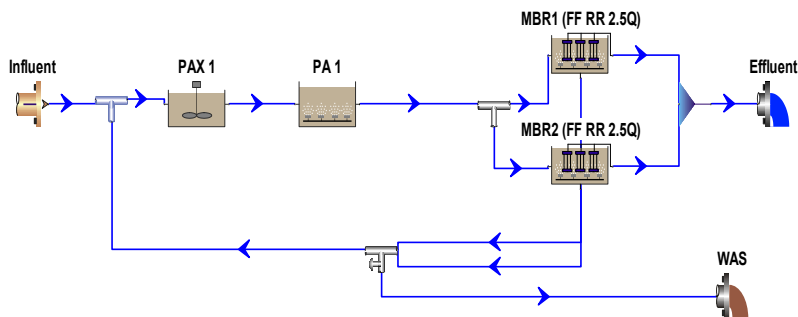
JOB NO. 22747
000078

Northgate WWTP

Biowin Report

60,000 gpd

Flowsheet



Steady state solution

Target SRT: 12.00 days

Temperature: 15.0°C

Configuration information for all Bioreactor units

Physical data

Element name	Volume [Mil. Gal]	Area [ft2]	Depth [ft]
PAX 1	7.200E-3	101.3158	9.500
PA 1	4.400E-3	56.0185	10.500

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
PAX 1	0
PA 1	2.0

Configuration information for all Bioreactor - Membrane units

Physical data

Element name	Volume [Mil. Gal]	Area [ft2]	Depth [ft]	# of diffusers	# of cassettes	Displaced volume / cassette [ft3/cassette]	Membrane area / cassette [ft2/cassette]	Total displaced volume [Mil. Gal]	Membrane surface area [ft2]
MBR2 (FF RR 2.5Q)	4.200E-3	56.1458	10.000	1	1.00	33.900	5,167.00	0.00	5,167.00
MBR1 (FF RR 2.5Q)	4.200E-3	56.1458	10.000	1	1.00	33.900	5,167.00	0.00	5,167.00

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
MBR2 (FF RR 2.5Q)	Flow paced	200.00 %
MBR1 (FF RR 2.5Q)	Flow paced	200.00 %

Element name	Average Air flow rate [ft3/min (20C, 1 atm)]
MBR2 (FF RR 2.5Q)	67.0
MBR1 (FF RR 2.5Q)	67.0

Air flow rates to MBR basins

Configuration information for all Influent - BOD units

Operating data Average (flow/time weighted as required)

Element name	Influent
Flow	0.06
BOD - Total Carbonaceous mgBOD/L	240.00
Volatile suspended solids mg/L	188.00
Total suspended solids mg/L	251.00
N - Total Kjeldahl Nitrogen mgN/L	70.00
P - Total P mgP/L	10.00
N - Nitrate mgN/L	0
pH	7.30
Alkalinity mmol/L	8.00
Metal soluble - Calcium mg/L	160.00
Metal soluble - Magnesium mg/L	25.00
Gas - Dissolved oxygen mg/L	0

Influent
Characteristics

Element name	Influent
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.1600
Fac - Acetate [gCOD/g of readily biodegradable COD]	0.1500
Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable COD]	0.7068
Fus - Unbiodegradable soluble [gCOD/g of total COD]	0.0500
Fup - Unbiodegradable particulate [gCOD/g of total COD]	0.1300
Fcel - Cellulose fraction of unbiodegradable particulate [gCOD/gCOD]	0.5000
Fna - Ammonia [gNH3-N/gTKN]	0.7500
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.5000
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.0200
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.0350
Fpo4 - Phosphate [gPO4-P/gTP]	0.5000
FupP - P:COD ratio for unbiodegradable part. COD [gP/gCOD]	0.0110
Fsr - Reduced sulfur [H2S] [gS/gS]	0.1500
FZbh - Ordinary heterotrophic COD fraction [gCOD/g of total COD]	0.0200
FZbm - Methylothetic COD fraction [gCOD/g of total COD]	1.000E-4

FZao - Ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZno - Nitrite oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZaao - Anaerobic ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZppa - Phosphorus accumulating COD fraction [gCOD/g of total COD]	1.000E-4
FZpa - Propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZam - Acetoclastic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZhm - Hydrogenotrophic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZso - Sulfur oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZsrpa - Sulfur reducing propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZsra - Sulfur reducing acetotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZsrh - Sulfur reducing hydrogenotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZe - Endogenous products COD fraction [gCOD/g of total COD]	0

Configuration information for all Splitter units

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
WAS	Flowrate, MGD	0.00143470660899799

WAS
Flowrate

BioWin Album

Album page - Influent

Influent			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	8.00	1.82	mmol/L and kmol/d
BOD - Filtered Carbonaceous	108.01	54.08	
BOD - Total Carbonaceous	240.00	120.17	
COD - Filtered	194.45	97.36	
COD - Particulate	294.94	147.68	
COD - Total	489.39	245.05	
COD - Volatile fatty acids	11.75	5.88	
Influent inorganic suspended solids	61.18	30.63	
ISS cellular	0.88	0.44	
ISS precipitate	0	0	

ISS Total	63.00	31.55	
N - Ammonia	52.50	26.29	
N - Filtered TKN	61.03	30.56	
N - Nitrate	0	0	
N - Nitrite + Nitrate	0	0	
N - Particulate TKN	8.97	4.49	
N - Total inorganic N	52.50	26.29	
N - Total Kjeldahl Nitrogen	70.00	35.05	
N - Total N	70.00	35.05	
P - Phosphorus in HMO	0	0	
P - Soluble PO4-P	5.00	2.50	
P - Total P	10.00	5.01	
pH	7.30		
S - Total S	0	0	
Total aluminium (all forms)	0	0	
Total iron (all forms)	0	0	
Total suspended solids	251.00	125.68	
Volatile suspended solids	188.00	94.14	
Parameter	Value	Units	

Album page - PAX1

PAX 1			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	4.03	4.55	mmol/L and kmol/d
BOD - Filtered Carbonaceous	2.16	5.38	
BOD - Total Carbonaceous	1,801.05	4,487.58	
COD - Filtered	28.07	69.94	
COD - Particulate	6,529.96	16,270.37	
COD - Total	6,558.03	16,340.31	
COD - Volatile fatty acids	0.08	0.19	
Influent inorganic suspended solids	2,056.58	5,124.28	
ISS cellular	347.47	865.77	

ISS precipitate	0	0	
ISS Total	2,404.99	5,992.40	
N - Ammonia	11.69	29.12	
N - Filtered TKN	13.59	33.87	
N - Nitrate	14.18	35.32	
N - Nitrite + Nitrate	14.48	36.07	
N - Particulate TKN	339.31	845.45	
N - Total inorganic N	26.16	65.19	
N - Total Kjeldahl Nitrogen	352.91	879.32	
N - Total N	367.38	915.39	
P - Phosphorus in HMO	0	0	
P - Soluble PO4-P	6.39	15.93	
P - Total P	113.95	283.93	
pH	6.92		
S - Total S	0.00	0.00	
Total aluminium (all forms)	0	0	
Total iron (all forms)	0	0	
Total suspended solids	6,912.17	17,222.70	
Volatile suspended solids	4,507.18	11,230.31	
Parameter	Value	Units	
# of diffusers	0		
Actual DO sat. conc.	9.43	mg/L	
Air flow rate	0	ft3/min (20C, 1 atm)	
Air flow rate / diffuser	0	ft3/min (20C, 1 atm)	
Alpha	0.50	□	
Beta	0.95	□	
Deamm - Ammonia removal rate	0.01	mgN/L/hr	
Deamm - N2 production rate	0.02	mgN/L/hr	
Deamm - Nitrate production rate	0.00	mgN/L/hr	
Deamm - Nitrite removal rate	0.01	mgN/L/hr	
Denit - N2 production rate	9.72	mgN/L/hr	
Denit - Nitrate removal rate	9.75	mgN/L/hr	
Denit - Nitrite removal rate	4.79	mgN/L/hr	

Denit Auto - N2 production rate	0.00	mgN/L/hr	
Denit Hetero - N2 production rate	9.72	mgN/L/hr	
Denit Methylo - N2 production rate	0	mgN/L/hr	
Element HRT	0.6	hours	
Nit - Ammonia removal rate	0.38	mgN/L/hr	
Nit - Nitrate production rate	0.12	mgN/L/hr	
Nit - Nitrite production rate	0.37	mgN/L/hr	
Nit - Nitrous oxide production rate	0	mgN/L/hr	
Off gas Ammonia	0	%	
Off gas Carbon dioxide	75.65	%	
Off gas flow rate (dry)	0.07	ft3/min (field)	
Off gas Hydrogen	0.95	%	
Off gas Hydrogen sulfide	0	%	
Off gas Ind #1	0	%	
Off gas Ind #2	0	%	
Off gas Ind #3	0	%	
Off gas Methane	0.00	%	
Off gas Nitrous oxide	0	%	
Off gas Oxygen	0	%	
OTE	100.00	%	
OTR	0	lb/hr	
OUR - Carbonaceous	1.05	mgO/L/hr	
OUR - Nitrification	1.35	mgO/L/hr	
OUR - Sulfur	0.00	mgO/L/hr	
OUR - Total	2.40	mgO/L/hr	
Power	0	kW	
Power cost (Excl. heating)	0	\$/hour	
SOTE	100.00	%	
SOTR	0	lb/hr	
Sulfate production rate	0.00	mgS/L/hr	
Sulfate removal rate	0.00	mgS/L/hr	
Total readily biodegradable COD	1.31	mg/L	
Total solids mass	415.33	lb	
Velocity gradient	3.04	1/s	

VSS destruction	0	%	
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Album page - PA 1

PA 1			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	3.21	3.63	mmol/L and kmol/d
BOD - Filtered Carbonaceous	1.30	3.23	
BOD - Total Carbonaceous	1,793.24	4,468.12	
COD - Filtered	26.40	65.78	
COD - Particulate	6,519.65	16,244.67	
COD - Total	6,546.05	16,310.44	
COD - Volatile fatty acids	0.00	0.01	
Influent inorganic suspended solids	2,056.58	5,124.28	
ISS cellular	348.05	867.23	
ISS precipitate	0	0	
ISS Total	2,405.50	5,993.67	
N - Ammonia	5.73	14.28	
N - Filtered TKN	7.74	19.27	
N - Nitrate	18.50	46.09	
N - Nitrite + Nitrate	20.00	49.83	
N - Particulate TKN	339.37	845.60	
N - Total inorganic N	25.73	64.11	
N - Total Kjeldahl Nitrogen	347.11	864.87	
N - Total N	367.11	914.70	
P - Phosphorus in HMO	0	0	
P - Soluble PO ₄ -P	6.51	16.21	
P - Total P	113.95	283.93	
pH	6.79		
S - Total S	0.00	0.00	
Total aluminium (all forms)	0	0	
Total iron (all forms)	0	0	
Total suspended solids	6,906.79	17,209.30	
Volatile suspended solids	4,501.29	11,215.63	

Parameter	Value	Units	
# of diffusers	15.00		
Actual DO sat. conc.	9.55	mg/L	
Air flow rate	61.48	ft3/min (20C, 1 atm)	
Air flow rate / diffuser	4.10	ft3/min (20C, 1 atm)	
Alpha	0.50		
Beta	0.95		
Deamm - Ammonia removal rate	0.00	mgN/L/hr	
Deamm - N2 production rate	0.00	mgN/L/hr	
Deamm - Nitrate production rate	0.00	mgN/L/hr	
Deamm - Nitrite removal rate	0.00	mgN/L/hr	
Denit - N2 production rate	0.78	mgN/L/hr	
Denit - Nitrate removal rate	0.75	mgN/L/hr	
Denit - Nitrite removal rate	0.39	mgN/L/hr	
Denit Auto - N2 production rate	0.00	mgN/L/hr	
Denit Hetero - N2 production rate	0.78	mgN/L/hr	
Denit Methylo - N2 production rate	0.00	mgN/L/hr	
Element HRT	0.4	hours	
Nit - Ammonia removal rate	16.57	mgN/L/hr	
Nit - Nitrate production rate	12.97	mgN/L/hr	
Nit - Nitrite production rate	16.40	mgN/L/hr	
Nit - Nitrous oxide production rate	0	mgN/L/hr	
Off gas Ammonia	0	%	
Off gas Carbon dioxide	1.24	%	
Off gas flow rate (dry)	60.68	ft3/min (field)	
Off gas Hydrogen	0.01	%	
Off gas Hydrogen sulfide	0	%	
Off gas Ind #1	0	%	
Off gas Ind #2	0	%	
Off gas Ind #3	0	%	
Off gas Methane	0.00	%	
Off gas Nitrous oxide	0	%	
Off gas Oxygen	19.64	%	
OTE	6.18	%	

Air supply
rate to PA
basin

OTR	3.97	lb/hr	
OUR - Carbonaceous	34.98	mgO/L/hr	
OUR - Nitrification	67.37	mgO/L/hr	
OUR - Sulfur	0.00	mgO/L/hr	
OUR - Total	102.35	mgO/L/hr	
Power	0	kW	
Power cost (Excl. heating)	0	\$/hour	
SOTE	18.83	%	
SOTR	12.09	lb/hr	
Sulfate production rate	0.00	mgS/L/hr	
Sulfate removal rate	0.00	mgS/L/hr	
Total readily biodegradable COD	1.53	mg/L	
Total solids mass	253.62	lb	
Velocity gradient	231.41	1/s	
VSS destruction	0.13	%	

Album page - MBR 1

MBR1 (FF RR 2.5Q)			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	2.46	0.27	mmol/L and kmol/d
BOD - Filtered Carbonaceous	0.98	0.24	
BOD - Total Carbonaceous	0.98	0.24	
COD - Filtered	25.86	6.32	
COD - Particulate	0	0	
COD - Total	25.86	6.32	
COD - Volatile fatty acids	0.00	0.00	
Influent inorganic suspended solids	0	0	
ISS cellular	0	0	
ISS precipitate	0	0	
ISS Total	0	0	
N - Ammonia	0.45	0.11	
N - Filtered TKN	2.48	0.61	
N - Nitrate	24.71	6.04	
N - Nitrite + Nitrate	24.90	6.08	

N - Particulate TKN	0	0	
N - Total inorganic N	25.35	6.20	
N - Total Kjeldahl Nitrogen	2.48	0.61	
N - Total N	27.38	6.69	
P - Phosphorus in HMO	0	0	
P - Soluble PO4-P	6.81	1.66	
P - Total P	6.81	1.66	
pH	6.64		
S - Total S	0.00	0.00	
Total aluminium (all forms)	0	0	
Total iron (all forms)	0	0	
Total suspended solids	0	0	
Volatile suspended solids	0	0	
Parameter	Value	Units	
# of cassettes	1.00		
# of diffusers	1.00		
Actual DO sat. conc.	9.48	mg/L	
Air flow rate	67.00	ft3/min (20C, 1 atm)	
Air flow rate / cassette	67.00	ft3/min (20C, 1 atm)	
Air flow rate / diffuser	67.00	ft3/min (20C, 1 atm)	
Alpha	0.50	[]	
Beta	0.95	[]	
Deamm - Ammonia removal rate	0.00	mgN/L/hr	
Deamm - N2 production rate	0.00	mgN/L/hr	
Deamm - Nitrate production rate	0.00	mgN/L/hr	
Deamm - Nitrite removal rate	0.00	mgN/L/hr	
Denit - N2 production rate	0.98	mgN/L/hr	
Denit - Nitrate removal rate	1.00	mgN/L/hr	
Denit - Nitrite removal rate	0.48	mgN/L/hr	
Denit Auto - N2 production rate	0.00	mgN/L/hr	
Denit Hetero - N2 production rate	0.98	mgN/L/hr	
Denit Methylo - N2 production rate	0.00	mgN/L/hr	
Element HRT	0.6	hours	

Air
supply
to
MBR 1

Membrane flux	5.67	gal/ft2/d (gfd)	
Mixed liquor flow	0.12	mgd	
Nit - Ammonia removal rate	8.88	mgN/L/hr	
Nit - Nitrate production rate	10.80	mgN/L/hr	
Nit - Nitrite production rate	8.79	mgN/L/hr	
Nit - Nitrous oxide production rate	0	mgN/L/hr	
Off gas Ammonia	0	%	
Off gas Carbon dioxide	0.79	%	
Off gas flow rate (dry)	65.86	ft3/min (field)	
Off gas Hydrogen	0.00	%	
Off gas Hydrogen sulfide	0	%	
Off gas Ind #1	0	%	
Off gas Ind #2	0	%	
Off gas Ind #3	0	%	
Off gas Methane	0.00	%	
Off gas Nitrous oxide	0	%	
Off gas Oxygen	20.17	%	
OTE	3.74	%	
OTR	2.61	lb/hr	
OUR - Carbonaceous	39.59	mgO/L/hr	
OUR - Nitrification	40.17	mgO/L/hr	
OUR - Sulfur	0.00	mgO/L/hr	
OUR - Total	79.75	mgO/L/hr	
Power	0	kW	
Power cost (Excl. heating)	0	\$/hour	
SOTE	11.01	%	
SOTR	7.70	lb/hr	
Sulfate production rate	0.00	mgS/L/hr	
Sulfate removal rate	0.00	mgS/L/hr	
Total readily biodegradable COD	1.39	mg/L	
Total solids mass	282.39	lb	
Velocity gradient	240.58	1/s	
VSS destruction	100.00	%	

Album page - MBR 2

MBR2 (FF RR 2.5Q)			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	2.46	0.27	mmol/L and kmol/d
BOD - Filtered Carbonaceous	0.98	0.24	
BOD - Total Carbonaceous	0.98	0.24	
COD - Filtered	25.86	6.32	
COD - Particulate	0	0	
COD - Total	25.86	6.32	
COD - Volatile fatty acids	0.00	0.00	
Influent inorganic suspended solids	0	0	
ISS cellular	0	0	
ISS precipitate	0	0	
ISS Total	0	0	
N - Ammonia	0.45	0.11	
N - Filtered TKN	2.48	0.61	
N - Nitrate	24.71	6.04	
N - Nitrite + Nitrate	24.90	6.08	
N - Particulate TKN	0	0	
N - Total inorganic N	25.35	6.20	
N - Total Kjeldahl Nitrogen	2.48	0.61	
N - Total N	27.38	6.69	
P - Phosphorus in HMO	0	0	
P - Soluble PO4-P	6.81	1.66	
P - Total P	6.81	1.66	
pH	6.64		
S - Total S	0.00	0.00	
Total aluminium (all forms)	0	0	
Total iron (all forms)	0	0	
Total suspended solids	0	0	
Volatile suspended solids	0	0	
Parameter	Value	Units	

# of cassettes	1.00		
# of diffusers	1.00		
Actual DO sat. conc.	9.48	mg/L	
Air flow rate	67.00	ft3/min (20C, 1 atm)	
Air flow rate / cassette	67.00	ft3/min (20C, 1 atm)	
Air flow rate / diffuser	67.00	ft3/min (20C, 1 atm)	
Alpha	0.50	□	
Beta	0.95	□	
Deamm - Ammonia removal rate	0.00	mgN/L/hr	
Deamm - N2 production rate	0.00	mgN/L/hr	
Deamm - Nitrate production rate	0.00	mgN/L/hr	
Deamm - Nitrite removal rate	0.00	mgN/L/hr	
Denit - N2 production rate	0.98	mgN/L/hr	
Denit - Nitrate removal rate	1.00	mgN/L/hr	
Denit - Nitrite removal rate	0.48	mgN/L/hr	
Denit Auto - N2 production rate	0.00	mgN/L/hr	
Denit Hetero - N2 production rate	0.98	mgN/L/hr	
Denit Methylo - N2 production rate	0	mgN/L/hr	
Element HRT	0.6	hours	
Membrane flux	5.67	gal/ft2/d (gfd)	
Mixed liquor flow	0.12	mgd	
Nit - Ammonia removal rate	8.88	mgN/L/hr	
Nit - Nitrate production rate	10.80	mgN/L/hr	
Nit - Nitrite production rate	8.79	mgN/L/hr	
Nit - Nitrous oxide production rate	0	mgN/L/hr	
Off gas Ammonia	0	%	
Off gas Carbon dioxide	0.79	%	
Off gas flow rate (dry)	65.86	ft3/min (field)	
Off gas Hydrogen	0.00	%	
Off gas Hydrogen sulfide	0	%	
Off gas Ind #1	0	%	
Off gas Ind #2	0	%	
Off gas Ind #3	0	%	
Off gas Methane	0.00	%	
Off gas Nitrous oxide	0	%	

Air
supply to
MBR 2

Off gas Oxygen	20.17	%	
OTE	3.74	%	
OTR	2.61	lb/hr	
OUR - Carbonaceous	39.59	mgO/L/hr	
OUR - Nitrification	40.17	mgO/L/hr	
OUR - Sulfur	0.00	mgO/L/hr	
OUR - Total	79.75	mgO/L/hr	
Power	0	kW	
Power cost (Excl. heating)	0	\$/hour	
SOTE	11.01	%	
SOTR	7.70	lb/hr	
Sulfate production rate	0.00	mgS/L/hr	
Sulfate removal rate	0.00	mgS/L/hr	
Total readily biodegradable COD	1.39	mg/L	
Total solids mass	282.39	lb	
Velocity gradient	240.56	1/s	
VSS destruction	100.00	%	

Album page - WAS

WAS			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	2.46	0.01	mmol/L and kmol/d
BOD - Filtered Carbonaceous	1.00	0.01	
BOD - Total Carbonaceous	2,209.51	26.45	
COD - Filtered	25.90	0.31	
COD - Particulate	8,079.29	96.74	
COD - Total	8,105.19	97.05	
COD - Volatile fatty acids	0.00	0.00	
Influent inorganic suspended solids	2,558.43	30.63	
ISS cellular	433.96	5.20	
ISS precipitate	0	0	
ISS Total	2,993.29	35.84	
N - Ammonia	0.45	0.01	
N - Filtered TKN	2.48	0.03	

N - Nitrate	24.71	0.30	
N - Nitrite + Nitrate	24.90	0.30	
N - Particulate TKN	421.85	5.05	
N - Total inorganic N	25.35	0.30	
N - Total Kjeldahl Nitrogen	424.33	5.08	
N - Total N	449.23	5.38	
P - Phosphorus in HMO	0	0	
P - Soluble PO4-P	6.81	0.08	
P - Total P	140.10	1.68	
pH	6.67		
S - Total S	0.00	0.00	
Total aluminium (all forms)	0	0	
Total iron (all forms)	0	0	
Total suspended solids	8,574.37	102.66	
Volatile suspended solids	5,581.08	66.82	
Parameter	Value	Units	
Cost (Sludge)	0	\$/hour	
Power	0	kW	
Power cost (Excl. heating)	0	\$/hour	

Total Suspended
solids

Album page - Effluent

Effluent			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	2.46	0.55	mmol/L and kmol/d
BOD - Filtered Carbonaceous	0.98	0.48	
BOD - Total Carbonaceous	0.98	0.48	
COD - Filtered	25.86	12.64	
COD - Particulate	0	0	
COD - Total	25.86	12.64	

Effluent
Charatcteristics

COD - Volatile fatty acids	0.00	0.00	
Influent inorganic suspended solids	0	0	
ISS cellular	0	0	
ISS precipitate	0	0	
ISS Total	0	0	
N - Ammonia	0.45	0.22	
N - Filtered TKN	2.48	1.21	
N - Nitrate	24.71	12.08	
N - Nitrite + Nitrate	24.90	12.17	
N - Particulate TKN	0	0	
N - Total inorganic N	25.35	12.39	
N - Total Kjeldahl Nitrogen	2.48	1.21	
N - Total N	27.38	13.38	
P - Phosphorus in HMO	0	0	
P - Soluble PO4-P	6.81	3.33	
P - Total P	6.81	3.33	
pH	6.67		
S - Total S	0.00	0.00	
Total aluminium (all forms)	0	0	
Total iron (all forms)	0	0	
Total suspended solids	0	0	
Volatile suspended solids	0	0	
Parameter	Value	Units	
Cost (Chemicals)	0	\$/hour	
Power	0	kW	
Power cost (Excl. heating)	0	\$/hour	

BioWin user and configuration data

Project details

Project name: North San Gabriel Municipal Utility District No. 1 Project ref.: MMF

Plant name: User name: N. Garguilo

Created: 2/24/2022

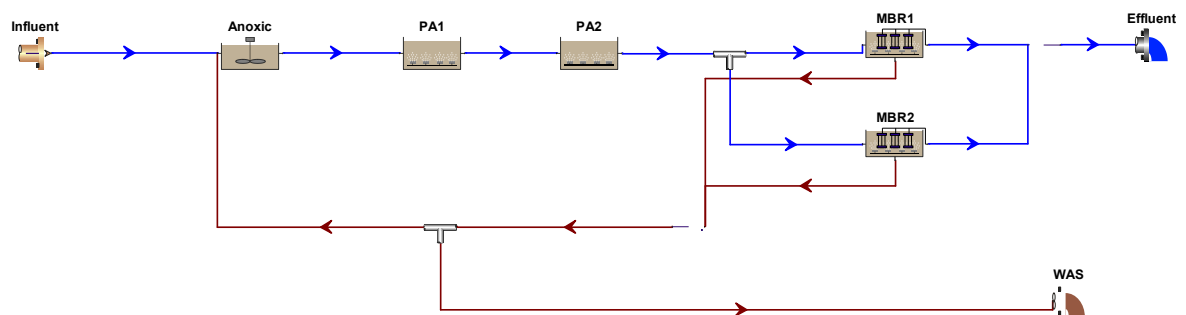
Saved: 7/11/2022

Steady state solution

SRT #0: 26.67 days

Temperature: 15.0°C

Flowsheet



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Notes

This model was developed to check the performance of the preliminary system design for the North San Gabriel Municipal Utility District No. 1 RFP for pre-selection of membrane system supplier. The system flow and loading are provided in the RFP. This model was developed based on the max month flow/biological design conditions for the first phase (360k gpd). Design temperature was assumed. Other influent parameters including alkalinity are based on the default Biowin values.

Influent and Effluent:

Effluent limits to meet TCEQ permit number WQ0015559001 requirements as well as Type 1 Reclaimed Water standards:

BOD₅: 5.0 mg/L
TSS: 15.0 mg/L
Turbidity: 3 NTU

The plant is located at 3201 CR 214, Liberty Hill, TX 78642 (See Attachment A). Plant wastewater influent data is anticipated to be:

BOD₅: 300 mg/L
TSS: 300 mg/L
TKN: 48 mg/L
TN: 70 mg/L
TP: 10 mg/L

Flow:

The project will consist of furnishing equipment for a complete MBR wastewater treatment system with a design flow of 360,000 gpd (1.44 MGD peak 2-hour flow). The system will be capable of expansion of to design flows 475,000 gpd (1.44 MGD peak 2-hour flow). The system

BioWin Album

Basin Summary

Elements	Liquid volume [gallons]	Flow [gal/d]	pH []	Temperature [deg. C]
Anoxic	39000.00	3234000.00	6.52	15.00
PA1	47000.00	3234000.00	6.25	15.00
PA2	47000.00	3234000.00	6.13	15.00
MBR1	20728.31	177000.00	6.21	15.00
MBR2	20728.31	177000.00	6.21	15.00
-----	-----	-----	-----	-----

Influent	0	360000.00	7.30	15.00
Effluent	0	354000.00	6.25	15.00
WAS	0	6000.00	6.25	15.00

Performance Summary

Elements	BOD - Filtered Carbonaceous [mg/L]	N - Total N [mgN/L]	P - Total P [mgP/L]	pH []	Temperature [deg. C]
Influent	127.12	70.00	10.00	7.30	15.00
Effluent	0.89	30.13	6.59	6.25	15.00

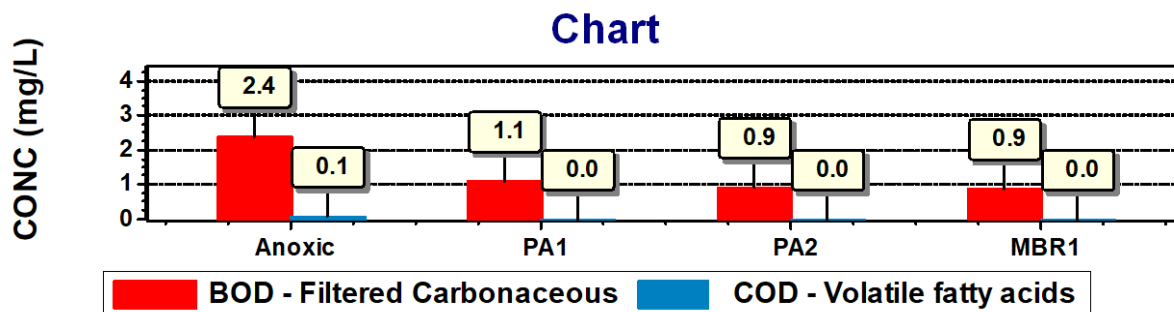
Aeration

Elements	Air flow rate [ft3/min (20C, 1 atm)]	OTE [%]	SOTE [%]	Gas - Dissolved oxygen [mg/L]	OTR [lb/hr]	OUR - Total [mgO/L/hr]
Anoxic	0	100.00	100.00	0.05	0	18.45
PA1	265.00	10.74	29.60	1.34	29.70	72.00
PA2	265.00	8.47	29.60	3.17	23.43	54.50
MBR1	170.00	5.21	27.94	6.06	9.24	44.00
MBR2	170.00	5.21	27.94	6.06	9.24	44.00

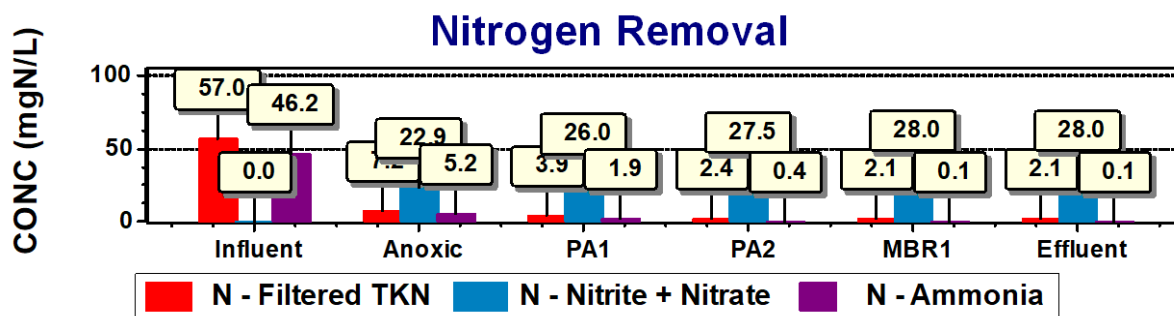
N Removal

Elements	Nit - Ammonia removal rate [mgN/L/hr]	Denit - N2 production rate [mgN/L/hr]
Anoxic	2.38	9.21
PA1	9.94	1.00
PA2	4.98	0.42
MBR1	2.15	0.21
MBR2	2.15	0.21

BOD Removal



N and P Removal



Anoxic

Anoxic			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	1.37	16.80	mmol/L and kmol/d
BOD - Filtered Carbonaceous	2.40	64.70	
BOD - Total Carbonaceous	1814.98	48984.63	
COD - Filtered	34.45	929.85	
COD - Particulate	10463.54	282400.87	
COD - Total	10497.99	283330.73	
COD - Volatile fatty acids	0.09	2.39	
Influent inorganic suspended solids	3081.00	83153.20	

ISS cellular	503.64	13592.82
ISS precipitate	0.00	0.00
ISS Total	3585.36	96765.40
N - Ammonia	5.16	139.25
N - Filtered TKN	7.23	195.00
N - Nitrate	22.50	607.28
N - Nitrite + Nitrate	22.92	618.51
N - Particulate TKN	580.18	15658.61
N - Total inorganic N	28.08	757.77
N - Total Kjeldahl Nitrogen	587.41	15853.62
N - Total N	610.33	16472.13
P - Phosphorus in HMO	0.00	0.00
P - Soluble PO4-P	6.33	170.81
P - Total P	188.97	5100.17
pH	6.52	
S - Total S	10.15	273.95
Total aluminium (all forms)	0.00	0.00
Total Calcium (all forms)	105.33	2842.69
Total iron (all forms)	0	0
Total Magnesium (all forms)	38.51	1039.26
Total suspended solids	10791.72	291258.12
Volatile suspended solids	7206.36	194492.73
Parameter	Value	Units
# of diffusers	0	
Actual DO sat. conc.	10.05	mg/L
Air flow rate	0	ft ³ /min (20C, 1 atm)
Air flow rate / diffuser	0	ft ³ /min (20C, 1 atm)
Alpha	0.50	□
Beta	0.95	□
Deamm - Ammonia removal rate	0.00	mgN/L/hr
Deamm - N2 production rate	0.01	mgN/L/hr
Deamm - Nitrate production rate	0.00	mgN/L/hr
Deamm - Nitrite removal rate	0.01	mgN/L/hr

Denit - N2 production rate	9.21	mgN/L/hr
Denit - Nitrate removal rate	9.21	mgN/L/hr
Denit - Nitrite removal rate	4.54	mgN/L/hr
Denit Auto - N2 production rate	0.03	mgN/L/hr
Denit Hetero - N2 production rate	9.18	mgN/L/hr
Denit Methylo - N2 production rate	0.00	mgN/L/hr
Element HRT	0.3	hours
Liquid depth	16.00	ft
Nit - Ammonia removal rate	2.38	mgN/L/hr
Nit - Nitrate production rate	0.97	mgN/L/hr
Nit - Nitrite production rate	2.35	mgN/L/hr
Nit - Nitrous oxide production rate	0	mgN/L/hr
Off gas Ammonia	0	%
Off gas Carbon dioxide	79.09	%
Off gas flow rate (dry)	0.18	ft3/min (field)
Off gas Hydrogen	0.39	%
Off gas Hydrogen sulfide	0	%
Off gas Ind #1	0	%
Off gas Ind #2	0	%
Off gas Ind #3	0	%
Off gas Methane	0.00	%
Off gas Nitrous oxide	0	%
Off gas Oxygen	0	%
OTE	100.00	%
OTR	0	lb/hr
OUR - Carbonaceous	9.37	mgO/L/hr
OUR - Nitrification	8.73	mgO/L/hr
OUR - Sulfur	0.35	mgO/L/hr
OUR - Total	18.45	mgO/L/hr
Power	0	kW
Power cost (Excl. heating)	0	\$/hour
SOTE	100.00	%
SOTR	0	lb/hr
Sulfate production rate	0.08	mgS/L/hr
Sulfate removal rate	0.00	mgS/L/hr

Total readily biodegradable COD	1.59	mg/L
Total solids mass	3512.39	lb
Velocity gradient	12.42	1/s
VSS destruction	0	%

PA1

PA1			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	0.91	11.20	mmol/L and kmol/d
BOD - Filtered Carbonaceous	1.13	30.50	
BOD - Total Carbonaceous	1807.79	48790.46	
COD - Filtered	32.27	871.05	
COD - Particulate	10454.93	282168.38	
COD - Total	10487.20	283039.43	
COD - Volatile fatty acids	0.00	0.09	
Influent inorganic suspended solids	3081.00	83153.20	
ISS cellular	503.92	13600.32	
ISS precipitate	0.00	0.00	
ISS Total	3585.59	96771.51	
N - Ammonia	1.88	50.67	
N - Filtered TKN	3.88	104.79	
N - Nitrate	25.20	680.21	
N - Nitrite + Nitrate	25.99	701.56	
N - Particulate TKN	580.10	15656.34	
N - Total inorganic N	27.87	752.22	
N - Total Kjeldahl Nitrogen	583.98	15761.14	
N - Total N	609.98	16462.69	
P - Phosphorus in HMO	0.00	0.00	
P - Soluble PO4-P	6.39	172.39	
P - Total P	188.97	5100.17	
pH	6.25		
S - Total S	10.15	273.95	
Total aluminium (all forms)	0.00	0.00	
Total Calcium (all forms)	105.33	2842.69	

Total iron (all forms)	0	0
Total Magnesium (all forms)	38.51	1039.26
Total suspended solids	10786.98	291130.10
Volatile suspended solids	7201.39	194358.59
Parameter	Value	Units
# of diffusers	92.00	
Actual DO sat. conc.	10.01	mg/L
Air flow rate	265.00	ft ³ /min (20C, 1 atm)
Air flow rate / diffuser	2.88	ft ³ /min (20C, 1 atm)
Alpha	0.50	□
Beta	0.95	□
Deamm - Ammonia removal rate	0.00	mgN/L/hr
Deamm - N2 production rate	0.00	mgN/L/hr
Deamm - Nitrate production rate	0.00	mgN/L/hr
Deamm - Nitrite removal rate	0.00	mgN/L/hr
Denit - N2 production rate	1.00	mgN/L/hr
Denit - Nitrate removal rate	0.99	mgN/L/hr
Denit - Nitrite removal rate	0.50	mgN/L/hr
Denit Auto - N2 production rate	0.00	mgN/L/hr
Denit Hetero - N2 production rate	1.00	mgN/L/hr
Denit Methylo - N2 production rate	0.00	mgN/L/hr
Element HRT	0.3	hours
Liquid depth	15.50	ft
Nit - Ammonia removal rate	9.94	mgN/L/hr
Nit - Nitrate production rate	8.74	mgN/L/hr
Nit - Nitrite production rate	9.84	mgN/L/hr
Nit - Nitrous oxide production rate	0	mgN/L/hr
Off gas Ammonia	0	%
Off gas Carbon dioxide	1.54	%
Off gas flow rate (dry)	259.03	ft ³ /min (field)
Off gas Hydrogen	0.01	%
Off gas Hydrogen sulfide	0	%
Off gas Ind #1	0	%

Off gas Ind #2	0	%
Off gas Ind #3	0	%
Off gas Methane	0.00	%
Off gas Nitrous oxide	0	%
Off gas Oxygen	18.81	%
OTE	10.74	%
OTR	29.70	lb/hr
OUR - Carbonaceous	30.25	mgO/L/hr
OUR - Nitrification	41.44	mgO/L/hr
OUR - Sulfur	0.32	mgO/L/hr
OUR - Total	72.00	mgO/L/hr
Power	0	kW
Power cost (Excl. heating)	0	\$/hour
SOTE	29.60	%
SOTR	81.89	lb/hr
Sulfate production rate	0.14	mgS/L/hr
Sulfate removal rate	0.00	mgS/L/hr
Total readily biodegradable COD	1.29	mg/L
Total solids mass	4231.02	lb
Velocity gradient	183.63	1/s
VSS destruction	0.07	%

PA2

PA2			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	0.69	8.45	mmol/L and kmol/d
BOD - Filtered Carbonaceous	0.93	25.04	
BOD - Total Carbonaceous	1800.55	48595.05	
COD - Filtered	31.92	861.52	
COD - Particulate	10444.39	281884.09	
COD - Total	10476.31	282745.61	
COD - Volatile fatty acids	0.00	0.01	

Influent inorganic suspended solids	3081.00	83153.20
ISS cellular	504.10	13605.04
ISS precipitate	0.00	0.00
ISS Total	3585.71	96774.78
N - Ammonia	0.37	9.95
N - Filtered TKN	2.38	64.12
N - Nitrate	27.38	739.05
N - Nitrite + Nitrate	27.54	743.21
N - Particulate TKN	579.92	15651.36
N - Total inorganic N	27.91	753.16
N - Total Kjeldahl Nitrogen	582.29	15715.48
N - Total N	609.83	16458.70
P - Phosphorus in HMO	0.00	0.00
P - Soluble PO4-P	6.47	174.72
P - Total P	188.97	5100.17
pH	6.13	
S - Total S	10.15	273.95
Total aluminium (all forms)	0.00	0.00
Total Calcium (all forms)	105.33	2842.69
Total iron (all forms)	0	0
Total Magnesium (all forms)	38.51	1039.26
Total suspended solids	10780.84	290964.45
Volatile suspended solids	7195.13	194189.67
Parameter	Value	Units
# of diffusers	92.00	
Actual DO sat. conc.	10.01	mg/L
Air flow rate	265.00	ft3/min (20C, 1 atm)
Air flow rate / diffuser	2.88	ft3/min (20C, 1 atm)
Alpha	0.50	[]
Beta	0.95	[]
Deamm - Ammonia removal rate	0.00	mgN/L/hr
Deamm - N2 production rate	0.00	mgN/L/hr
Deamm - Nitrate production rate	0.00	mgN/L/hr

Deamm - Nitrite removal rate	0.00	mgN/L/hr
Denit - N2 production rate	0.42	mgN/L/hr
Denit - Nitrate removal rate	0.44	mgN/L/hr
Denit - Nitrite removal rate	0.21	mgN/L/hr
Denit Auto - N2 production rate	0.00	mgN/L/hr
Denit Hetero - N2 production rate	0.42	mgN/L/hr
Denit Methylo - N2 production rate	0.00	mgN/L/hr
Element HRT	0.3	hours
Liquid depth	15.50	ft
Nit - Ammonia removal rate	4.98	mgN/L/hr
Nit - Nitrate production rate	6.69	mgN/L/hr
Nit - Nitrite production rate	4.93	mgN/L/hr
Nit - Nitrous oxide production rate	0	mgN/L/hr
Off gas Ammonia	0	%
Off gas Carbon dioxide	1.55	%
Off gas flow rate (dry)	259.93	ft3/min (field)
Off gas Hydrogen	0.00	%
Off gas Hydrogen sulfide	0	%
Off gas Ind #1	0	%
Off gas Ind #2	0	%
Off gas Ind #3	0	%
Off gas Methane	0.00	%
Off gas Nitrous oxide	0	%
Off gas Oxygen	19.22	%
OTE	8.47	%
OTR	23.43	lb/hr
OUR - Carbonaceous	31.06	mgO/L/hr
OUR - Nitrification	23.20	mgO/L/hr
OUR - Sulfur	0.24	mgO/L/hr
OUR - Total	54.50	mgO/L/hr
Power	0	kW
Power cost (Excl. heating)	0	\$/hour
SOTE	29.60	%
SOTR	81.89	lb/hr
Sulfate production rate	0.13	mgS/L/hr

Sulfate removal rate	0.00	mgS/L/hr
Total readily biodegradable COD	1.26	mg/L
Total solids mass	4228.61	lb
Velocity gradient	183.63	1/s
VSS destruction	0.09	%

MBR1

MBR1			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	0.63	0.42	mmol/L and kmol/d
BOD - Filtered Carbonaceous	0.89	1.31	
BOD - Total Carbonaceous	0.89	1.31	
COD - Filtered	31.85	47.05	
COD - Particulate	0	0	
COD - Total	31.85	47.05	
COD - Volatile fatty acids	0.00	0.00	
Influent inorganic suspended solids	0	0	
ISS cellular	0	0	
ISS precipitate	0	0	
ISS Total	0	0	
N - Ammonia	0.10	0.14	
N - Filtered TKN	2.11	3.12	
N - Nitrate	28.00	41.36	
N - Nitrite + Nitrate	28.02	41.39	
N - Particulate TKN	0	0	
N - Total inorganic N	28.12	41.54	
N - Total Kjeldahl Nitrogen	2.11	3.12	
N - Total N	30.13	44.51	
P - Phosphorus in HMO	0	0	
P - Soluble PO4-P	6.59	9.73	
P - Total P	6.59	9.73	
pH	6.21		

S - Total S	10.00	14.77
Total aluminium (all forms)	0.00	0.00
Total Calcium (all forms)	81.13	119.84
Total iron (all forms)	0	0
Total Magnesium (all forms)	14.75	21.79
Total suspended solids	0	0
Volatile suspended solids	0	0
Parameter	Value	Units
# of cassettes	2.00	
# of diffusers	66.00	
Actual DO sat. conc.	10.46	mg/L
Air flow rate	170.00	ft ³ /min (20C, 1 atm)
Air flow rate / cassette	85.00	ft ³ /min (20C, 1 atm)
Air flow rate / diffuser	2.58	ft ³ /min (20C, 1 atm)
Alpha	0.50	□
Beta	0.95	□
Deamm - Ammonia removal rate	0.00	mgN/L/hr
Deamm - N2 production rate	0.00	mgN/L/hr
Deamm - Nitrate production rate	0.00	mgN/L/hr
Deamm - Nitrite removal rate	0.00	mgN/L/hr
Denit - N2 production rate	0.21	mgN/L/hr
Denit - Nitrate removal rate	0.25	mgN/L/hr
Denit - Nitrite removal rate	0.09	mgN/L/hr
Denit Auto - N2 production rate	0.00	mgN/L/hr
Denit Hetero - N2 production rate	0.21	mgN/L/hr
Denit Methylo - N2 production rate	0.00	mgN/L/hr
Element HRT	0.3	hours
Liquid depth	15.10	ft
Membrane flux	12.19	gal/ft ² /d (gfd)
Mixed liquor flow	1440000.00	gal/d
Nit - Ammonia removal rate	2.15	mgN/L/hr
Nit - Nitrate production rate	2.37	mgN/L/hr
Nit - Nitrite production rate	2.13	mgN/L/hr

Nit - Nitrous oxide production rate	0	mgN/L/hr
Off gas Ammonia	0	%
Off gas Carbon dioxide	1.66	%
Off gas flow rate (dry)	168.06	ft3/min (field)
Off gas Hydrogen	0.00	%
Off gas Hydrogen sulfide	0	%
Off gas Ind #1	0	%
Off gas Ind #2	0	%
Off gas Ind #3	0	%
Off gas Methane	0.00	%
Off gas Nitrous oxide	0	%
Off gas Oxygen	19.75	%
OTE	5.21	%
OTR	9.24	lb/hr
OUR - Carbonaceous	34.28	mgO/L/hr
OUR - Nitrification	9.48	mgO/L/hr
OUR - Sulfur	0.24	mgO/L/hr
OUR - Total	44.00	mgO/L/hr
Power	0	kW
Power cost (Excl. heating)	0	\$/hour
SOTE	27.94	%
SOTR	49.58	lb/hr
Sulfate production rate	0.13	mgS/L/hr
Sulfate removal rate	0.00	mgS/L/hr
Total readily biodegradable COD	1.26	mg/L
Total solids mass	2092.88	lb
Velocity gradient	211.52	1/s
VSS destruction	100.00	%

MBR2

MBR2			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes

Alkalinity	0.63	0.42	mmol/L and kmol/d
BOD - Filtered Carbonaceous	0.89	1.31	
BOD - Total Carbonaceous	0.89	1.31	
COD - Filtered	31.85	47.05	
COD - Particulate	0	0	
COD - Total	31.85	47.05	
COD - Volatile fatty acids	0.00	0.00	
Influent inorganic suspended solids	0	0	
ISS cellular	0	0	
ISS precipitate	0	0	
ISS Total	0	0	
N - Ammonia	0.10	0.14	
N - Filtered TKN	2.11	3.12	
N - Nitrate	28.00	41.36	
N - Nitrite + Nitrate	28.02	41.39	
N - Particulate TKN	0	0	
N - Total inorganic N	28.12	41.54	
N - Total Kjeldahl Nitrogen	2.11	3.12	
N - Total N	30.13	44.51	
P - Phosphorus in HMO	0	0	
P - Soluble PO4-P	6.59	9.73	
P - Total P	6.59	9.73	
pH	6.21		
S - Total S	10.00	14.77	
Total aluminium (all forms)	0.00	0.00	
Total Calcium (all forms)	81.13	119.84	
Total iron (all forms)	0	0	
Total Magnesium (all forms)	14.75	21.79	
Total suspended solids	0	0	
Volatile suspended solids	0	0	
Parameter	Value	Units	
# of cassettes	2.00		
# of diffusers	66.00		

Actual DO sat. conc.	10.46	mg/L
Air flow rate	170.00	ft ³ /min (20C, 1 atm)
Air flow rate / cassette	85.00	ft ³ /min (20C, 1 atm)
Air flow rate / diffuser	2.58	ft ³ /min (20C, 1 atm)
Alpha	0.50	□
Beta	0.95	□
Deamm - Ammonia removal rate	0.00	mgN/L/hr
Deamm - N ₂ production rate	0.00	mgN/L/hr
Deamm - Nitrate production rate	0.00	mgN/L/hr
Deamm - Nitrite removal rate	0.00	mgN/L/hr
Denit - N ₂ production rate	0.21	mgN/L/hr
Denit - Nitrate removal rate	0.25	mgN/L/hr
Denit - Nitrite removal rate	0.09	mgN/L/hr
Denit Auto - N ₂ production rate	0.00	mgN/L/hr
Denit Hetero - N ₂ production rate	0.21	mgN/L/hr
Denit Methylo - N ₂ production rate	0.00	mgN/L/hr
Element HRT	0.3	hours
Liquid depth	15.10	ft
Membrane flux	12.19	gal/ft ² /d (gfd)
Mixed liquor flow	1440000.00	gal/d
Nit - Ammonia removal rate	2.15	mgN/L/hr
Nit - Nitrate production rate	2.37	mgN/L/hr
Nit - Nitrite production rate	2.13	mgN/L/hr
Nit - Nitrous oxide production rate	0	mgN/L/hr
Off gas Ammonia	0	%
Off gas Carbon dioxide	1.66	%
Off gas flow rate (dry)	168.06	ft ³ /min (field)
Off gas Hydrogen	0.00	%
Off gas Hydrogen sulfide	0	%
Off gas Ind #1	0	%
Off gas Ind #2	0	%
Off gas Ind #3	0	%
Off gas Methane	0.00	%
Off gas Nitrous oxide	0	%
Off gas Oxygen	19.75	%

OTE	5.21	%
OTR	9.24	lb/hr
OUR - Carbonaceous	34.28	mgO/L/hr
OUR - Nitrification	9.48	mgO/L/hr
OUR - Sulfur	0.24	mgO/L/hr
OUR - Total	44.00	mgO/L/hr
Power	0	kW
Power cost (Excl. heating)	0	\$/hour
SOTE	27.94	%
SOTR	49.58	lb/hr
Sulfate production rate	0.13	mgS/L/hr
Sulfate removal rate	0.00	mgS/L/hr
Total readily biodegradable COD	1.26	mg/L
Total solids mass	2092.88	lb
Velocity gradient	211.52	1/s
VSS destruction	100.00	%

Influent

Influent			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	6.00	8.18	mmol/L and kmol/d
BOD - Filtered Carbonaceous	127.12	381.92	
BOD - Total Carbonaceous	300.00	901.30	
COD - Filtered	229.25	688.74	
COD - Particulate	382.48	1149.11	
COD - Total	611.73	1837.86	
COD - Volatile fatty acids	14.68	44.11	
Influent inorganic suspended solids	57.66	173.24	
ISS cellular	1.10	3.29	
ISS precipitate	0	0	
ISS Total	60.00	180.26	
N - Ammonia	46.20	138.80	

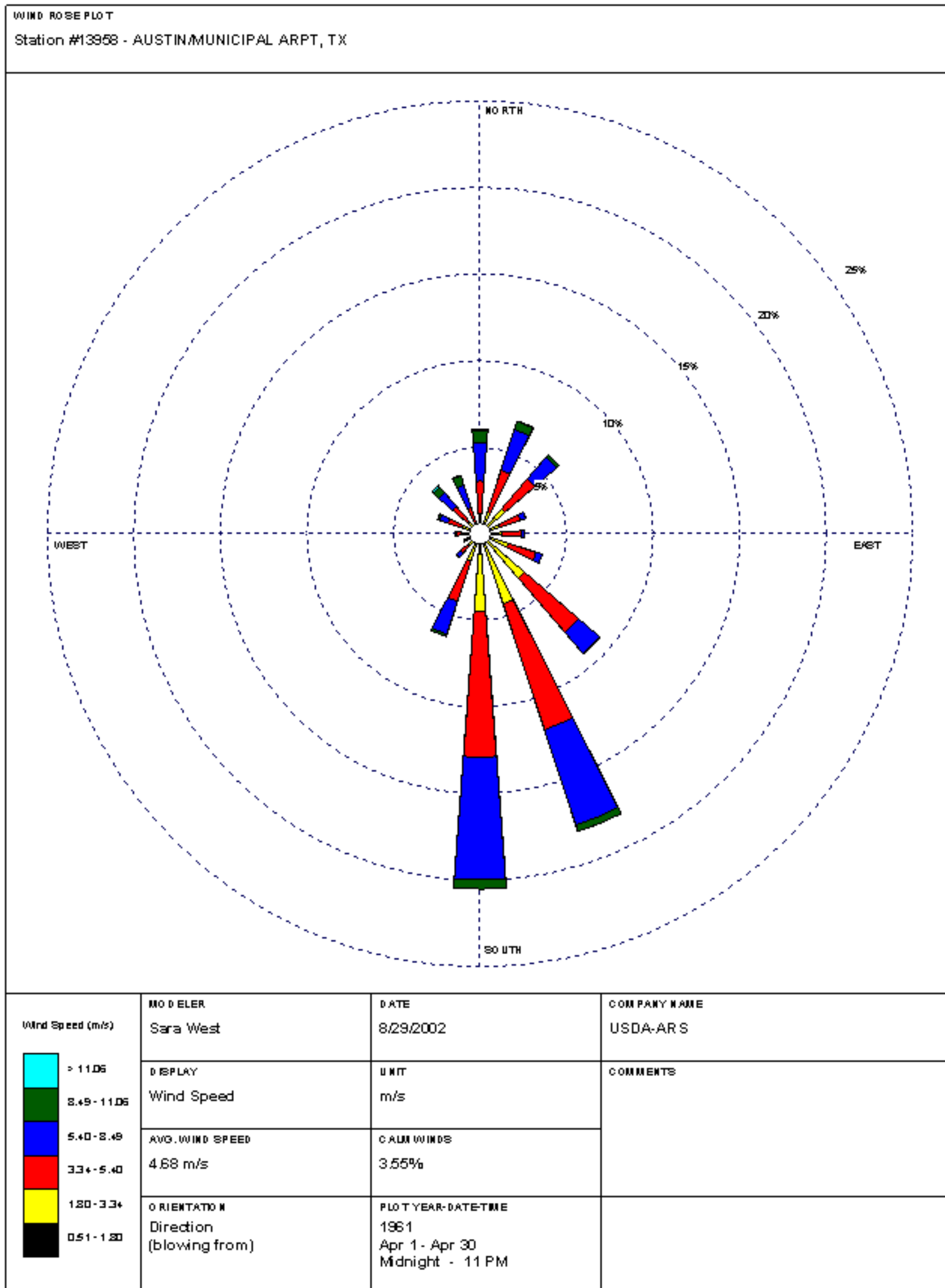
N - Filtered TKN	56.95	171.11
N - Nitrate	0	0
N - Nitrite + Nitrate	0	0
N - Particulate TKN	13.05	39.19
N - Total inorganic N	46.20	138.80
N - Total Kjeldahl Nitrogen	70.00	210.30
N - Total N	70.00	210.30
P - Phosphorus in HMO	0	0
P - Soluble PO4-P	5.00	15.02
P - Total P	10.00	30.04
pH	7.30	
S - Total S	10.00	30.04
Total aluminium (all forms)	0	0
Total Calcium (all forms)	81.58	245.09
Total iron (all forms)	0	0
Total Magnesium (all forms)	15.20	45.66
Total suspended solids	300.00	901.30
Volatile suspended solids	240.00	721.04
Parameter	Value	Units

Effluent

Effluent			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Alkalinity	0.63	0.85	mmol/L and kmol/d
BOD - Filtered Carbonaceous	0.89	2.62	
BOD - Total Carbonaceous	0.89	2.62	
COD - Filtered	31.85	94.09	
COD - Particulate	0	0	
COD - Total	31.85	94.09	
COD - Volatile fatty acids	0.00	0.00	

Influent inorganic suspended solids	0	0
ISS cellular	0	0
ISS precipitate	0	0
ISS Total	0	0
N - Ammonia	0.10	0.29
N - Filtered TKN	2.11	6.23
N - Nitrate	28.00	82.72
N - Nitrite + Nitrate	28.02	82.79
N - Particulate TKN	0	0
N - Total inorganic N	28.12	83.08
N - Total Kjeldahl Nitrogen	2.11	6.23
N - Total N	30.13	89.02
P - Phosphorus in HMO	0	0
P - Soluble PO4-P	6.59	19.46
P - Total P	6.59	19.46
pH	6.25	
S - Total S	10.00	29.53
Total aluminium (all forms)	0.00	0.00
Total Calcium (all forms)	81.13	239.67
Total iron (all forms)	0	0
Total Magnesium (all forms)	14.75	43.58
Total suspended solids	0	0
Volatile suspended solids	0	0
Parameter	Value	Units
Cost (Chemicals)	0	\$/hour
Power	0	kW
Power cost (Excl. heating)	0	\$/hour

ATTACHMENT 11 - WIND ROSE



ATTACHMENT 12 – SOLIDS MANAGEMENT PLAN

SEWAGE SLUDGE SOLIDS MANAGEMENT PLAN – PHASE 1

When sludge is wasted, sludge will be concentrated in an aerated sludge holding tank. A TCEQ licensed hauler will draw concentrated sludge in liquid form from the bottom of the holding tank. The proposed withdrawal will be 1,200 – 1,500 gallons of liquid sludge

Wasting sludge will be scheduled when it has been determined by a settling test that wasting is necessary. Sludge will be hauled by a TCEQ licensed hauler to a nearby facility for processing.

Calculations for average influent #s of BOD:

of BOD removed/day at 100% flow = $250 \times 8.34 \times .06 = 125.1$ lb/day

<u>Solids generated</u>	<u>100% Flow</u>	<u>75% Flow</u>	<u>50% Flow</u>	<u>25% Flow</u>
Pounds BOD ₅ /day removed	125.1	93.8	62.6	31.3
Pounds dry sludge produced	4.3	3.2	2.2	1.1
Volume wet sludge produced	24.6 gal	18.5 gal	12.3 gal	6.2 gal

Assuming that an MBBR treatment process generates approximately 10% of what an Extended Aeration Activated Sludge plant generates and assuming that an extended aeration process produces approximately 0.35 pounds of digested dry sludge per pound of influent BOD.

Accurate records will be maintained to provide management with information needed to account for sludge removed from the site. The receiving plant will complete the sludge disposal process.

Liquid sludge will be removed from the ASH tank for disposal on an as needed basis. Plant manager will concentrate the sludge in the ASH tank by regularly decanting the contents of the tank.

ATTACHMENT 12 – SOLIDS MANAGEMENT PLAN

SEWAGE SLUDGE SOLIDS MANAGEMENT PLAN – PHASE 2

When sludge is wasted, sludge will be concentrated in an aerated sludge holding tank. A TCEQ licensed hauler will draw concentrated sludge in liquid form from the bottom of the holding tank. The proposed withdrawal will be 1,200 – 1,500 gallons of liquid sludge

Wasting sludge will be scheduled when it has been determined by a settling test that wasting is necessary. Sludge will be hauled by a TCEQ licensed hauler to a nearby facility for processing.

Calculations for average influent #s of BOD:

of BOD removed/day at 100% flow = $250 \times 8.34 \times .360 = 750.6$ lb/day

<u>Solids generated</u>	<u>100% Flow</u>	<u>75% Flow</u>	<u>50% Flow</u>	<u>25% Flow</u>
Pounds BOD ₅ /day removed	750.6	563.0	375.3	187.7
Pounds dry sludge produced	25.8	19.4	12.9	6.5
Volume wet sludge produced	147.6 gal	110.7 gal	73.8 gal	36.9 gal

Assuming that an MBBR treatment process generates approximately 10% of what an Extended Aeration Activated Sludge plant generates and assuming that an extended aeration process produces approximately 0.35 pounds of digested dry sludge per pound of influent BOD.

Accurate records will be maintained to provide management with information needed to account for sludge removed from the site. The receiving plant will complete the sludge disposal process.

Liquid sludge will be removed from the ASH tank for disposal on an as needed basis. Plant manager will concentrate the sludge in the ASH tank by regularly decanting the contents of the tank.

ATTACHMENT 12 – SOLIDS MANAGEMENT PLAN

SEWAGE SLUDGE SOLIDS MANAGEMENT PLAN – PHASE 3

When sludge is wasted, sludge will be concentrated in an aerated sludge holding tank. A TCEQ licensed hauler will draw concentrated sludge in liquid form from the bottom of the holding tank. The proposed withdrawal will be 1,200 – 1,500 gallons of liquid sludge

Wasting sludge will be scheduled when it has been determined by a settling test that wasting is necessary. Sludge will be hauled by a TCEQ licensed hauler to a nearby facility for processing

Calculations for average influent #s of BOD:

of BOD removed/day at 100% flow = $250 \times 8.34 \times .475 = 990.4$ lb/day

<u>Solids generated</u>	<u>100% Flow</u>	<u>75% Flow</u>	<u>50% Flow</u>	<u>25% Flow</u>
Pounds BOD ₅ /day removed	990.4	742.8	495.2	247.6
Pounds dry sludge produced	34.0	25.5	17.0	8.5
Volume wet sludge produced	194.8 gal	146.1 gal	97.4 gal	48.7 gal

Assuming that an MBBR treatment process generates approximately 10% of what an Extended Aeration Activated Sludge plant generates and assuming that an extended aeration process produces approximately 0.35 pounds of digested dry sludge per pound of influent BOD.

Accurate records will be maintained to provide management with information needed to account for sludge removed from the site. The receiving plant will complete the sludge disposal process.

Liquid sludge will be removed from the ASH tank for disposal on an as needed basis. Plant manager will concentrate the sludge in the ASH tank by regularly decanting the contents of the tank.

DURA♦SKRIM® N45B

RAVEN

SCRIM REINFORCED POLYETHYLENE – NSF/ANSI STANDARD 61 CERTIFIED

PRODUCT DESCRIPTION

DURA♦SKRIM® N45B is a flexible geomembrane, reinforced with a closely knit 9x9 weft inserted polyester scrim fully encapsulated between two layers of highly UV stabilized linear low density polyethylene. Exceptional toughness, high tensile and puncture strength is achieved with the combination of premium high strength LLDPE and dense scrim reinforcement. A highly stabilized formulation consisting of antioxidants, UV stabilizers and carbon black provide excellent protection for long-term exposed or barrier applications. DURA♦SKRIM® N-Series geomembranes are produced in the color black as standard, and are available in other custom manufactured colors with minimum order quantity requirements.

PRODUCT USE

DURA♦SKRIM® N45B is used in applications that require exceptional outdoor life requiring up to 20 years of exposure depending upon the geographical location. Applications requiring high tear properties, exceptional tensile strength and puncture resistance utilize N45B to meet these demands. DURA♦SKRIM® N-Series is manufactured from a chemical-resistant, linear-low-density polyethylene with excellent cold crack performance and resistance to thermal expansion.

DURA♦SKRIM® N45B meets the physical property values as stated in GRI test method GM25, and is certified under the NSF/ANSI Standard 61, Drinking Water System Components – Health Effects.

SIZE & PACKAGING

DURA♦SKRIM® N45B is available in a variety of widths and lengths to meet the project requirements. Large diameter mill rolls are available to assure an efficient seaming process. Factory welded panels are produced in a controlled environment and are accordion folded and tightly rolled on a heavy-duty core for ease of handling and time saving installation.

DURA♦SKRIM®

Bio Cell Liner

PRODUCT

PART

DURA♦SKRIM N45B

APPLICATIONS

Waste Lagoon Liners	Landfill Caps
Floating Covers	Erosion Control Covers
Daily Landfill Covers	Canal Liners
Modular Tank Liners	Disposal Pit Liner
Tunnel Liners	Water Containment Ponds
Remediation Liners	Heap Leach Liner
Earthen Liners	Secondary Containment
Interim Landfill Covers	Remediation Covers



9/14/22

DURA♦SKRIM® N45B

SCRIM REINFORCED POLYETHYLENE — NSF/ANSI STANDARD 61 CERTIFIED

PRO-FORMA DATA SHEET

		DURA♦SKRIM® N45B			
		IMPERIAL		METRIC	
PROPERTIES	TEST METHOD	MINIMUM	TYPICAL	MINIMUM	TYPICAL
APPEARANCE		Black		Black	
CORE THICKNESS	ASTM D5199	40 mil	45 mil	1.02 mm	1.14 mm
WEIGHT	ASTM D751	189 lbf/msf	213 lbf/msf	923 g/m ²	1040 g/m ²
CONSTRUCTION		9x9-1000 Denier PET scrim reinforced polyethylene			
TONGUE TEAR STRENGTH	ASTM D5884	100 lbf	135 lbf	445 N	601 N
GRAB TENSILE AT BREAK	ASTM D7004	275 lbf	350 lbf	1223 N	1557 N
TENSILE ELONGATION AT BREAK	ASTM D7004	22 %	30 %	22 %	30 %
PUNCTURE RESISTANCE	ASTM D4833	108 lbf	125 lbf	480 N	556 N
STANDARD OIT OR HIGH PRESSURE HPOIT	ASTM D3895 ASTM D5885	100 min 400 min	150 min 2400 min	100 min 400 min	150 min 2400 min
HYDRAULIC CONDUCTIVITY		1.47 x 10 ⁻¹⁰ cm/sec			
MAXIMUM STATIC USE TEMPERATURE		180° F		82° C	
MINIMUM STATIC USE TEMPERATURE		-70° F		-57° C	

PRO-FORMA SHEET CONTENTS: The data listed in the Pro-Forma data sheet is representative of initial production runs. These values may be revised at anytime without notice as additional test data becomes available.

DURA♦SKRIM®

DURA♦SKRIM® N45B is a flexible geomembrane, reinforced with a closely knit 9x9 weft inserted polyester scrim fully encapsulated between two layers of highly UV stabilized linear low density polyethylene. Exceptional toughness, high tensile and puncture strength is achieved with the combination of premium high strength LLDPE and dense scrim reinforcement. A highly stabilized formulation consisting of antioxidants, UV stabilizers and carbon black provide excellent protection for long-term exposed or barrier applications.



Scan QR Code to
download technical
data sheets.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance, odor transmission, longevity as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage. Limited Warranty available at www.ravenefd.com

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RAVEN

000121
02/6/18 EFD 1355

ATTACHMENT 14 Annual Cropping Plan

A copy of the soils map depicting the location of the irrigation areas is attached. The applicant is proposed to irrigate these areas in their natural state which consist of native grasses in the warm seasons and annual ryegrass in the cool seasons. Regular mowing and maintenance of the irrigation areas will be scheduled as needed.



PROPERTY
BOUNDARY

PROPOSED LAND
APPLICATION
SITE BOUNDARY

PROPOSED LAND
APPLICATION
SITE BOUNDARY

ATTACHMENT 15

WELL LOG INFORMATION

[GWDB Reports and Downloads](#)
[Well Basic Details](#)
[Scanned Documents](#)

State Well Number	5817302
County	Williamson
River Basin	Brazos
Groundwater Management Area	8
Regional Water Planning Area	G - Brazos G
Groundwater Conservation District	
Latitude (decimal degrees)	30.708889
Latitude (degrees minutes seconds)	30° 42' 32" N
Longitude (decimal degrees)	-97.878611
Longitude (degrees minutes seconds)	097° 52' 43" W
Coordinate Source	+/- 1 Second
Aquifer Code	218HNSL - Hensell Sand Member of Travis Peak Formation
Aquifer	Trinity
Aquifer Pick Method	
Land Surface Elevation (feet above sea level)	896
Land Surface Elevation Method	Interpolated From Topo Map
Well Depth (feet below land surface)	465
Well Depth Source	Memory of Owner
Drilling Start Date	
Drilling End Date	
Drilling Method	
Borehole Completion	

Well Type	Withdrawal of Water
Well Use	Stock
Water Level Observation	Miscellaneous Measurements
Water Quality Available	Yes
Pump	Submersible
Pump Depth (feet below land surface)	
Power Type	Electric Motor
Annular Seal Method	
Surface Completion	
Owner	H.O.Lay
Driller	
Other Data Available	
Well Report Tracking Number	
Plugging Report Tracking Number	
U.S. Geological Survey Site Number	
Texas Commission on Environmental Quality Source Id	
Groundwater Conservation District Well Number	
Owner Well Number	
Other Well Number	
Previous State Well Number	
Reporting Agency	Texas Water Development Board
Created Date	11/2/1994
Last Update Date	3/13/2003

Remarks	
---------	--

Casing

Diameter (in.)	Casing Type	Casing Material	Schedule	Gauge	Top Depth (ft.)	Bottom Depth (ft.)
6	Blank	Steel			0	465

Well Tests - No Data

Lithology - No Data

Annular Seal Range - No Data

Borehole - No Data

Plugged Back - No Data

Filter Pack - No Data

Packers - No Data

Water Level Measurements



Status Code	Date	Time	Water Level (ft. below land surface)	Change value in () indicates rise in level	Water Elevation (ft. above sea level)	Meas #	Measuring Agency	Method	Remark ID	Comments
P	3/13/1972		118.1		777.9	1	Texas Water Development Board	Steel Tape		

Code Descriptions

Status Code	Status Description
P	Publishable

Water Quality Analysis

Sample Date: 3/13/1972 **Sample Time:** 0000 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Hensell Sand Member of Travis Peak Formation

Analyzed Lab: Texas Department of Health **Reliability:** Collected from pumped well, but not filtered or preserved

Collection Remarks: No Data

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO3)		295	mg/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO3)		360	mg/L	
00910	CALCIUM (MG/L)		43	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO3)		0	mg/L	
00940	CHLORIDE, TOTAL (MG/L AS CL)		96	mg/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		1.8	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)		214	mg/L	
00920	MAGNESIUM (MG/L)		26	mg/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO3)	<	0.4	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.7	SU	
00937	POTASSIUM, TOTAL (MG/L AS K)		22	mg/L	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		1.62		
00955	SILICA, DISSOLVED (MG/L AS SiO2)		15	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		4.04	meq/l	
00932	SODIUM, CALCULATED, PERCENT		57	PCT	
00929	SODIUM, TOTAL (MG/L AS Na)		136	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		1160	MICR	
00945	SULFATE, TOTAL (MG/L AS SO4)		108	mg/L	
00010	TEMPERATURE, WATER (CELSIUS)		21	C	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		625	mg/L	

GWDB DISCLAIMER: Except where noted, all of the information provided in the Texas Water Development Board (TWDB) Groundwater Database (<http://www.twdb.texas.gov/groundwater/data/gwdbbrpt.asp>) is believed to be accurate and reliable; however, the TWDB assumes no responsibility for any errors appearing in rules or otherwise. Further, TWDB assumes no responsibility for the use of the information provided. PLEASE NOTE that users of these data are responsible for checking the accuracy, completeness, currency and/or suitability of all information themselves. TWDB makes no guarantees or warranties as to the accuracy, completeness, currency, or suitability of the information provided via the Groundwater Database (GWDB). TWDB specifically disclaims any and all liability for any claims or damages that may result from providing GWDB data or the information it contains. For additional information or answers to questions concerning the TWDB GWDB, contact the Groundwater Data Team at GroundwaterData@twdb.texas.gov.

[GWDB Reports and Downloads](#)
[Well Basic Details](#)
[Scanned Documents](#)

State Well Number	5817303
County	Williamson
River Basin	Brazos
Groundwater Management Area	8
Regional Water Planning Area	G - Brazos G
Groundwater Conservation District	
Latitude (decimal degrees)	30.710834
Latitude (degrees minutes seconds)	30° 42' 39" N
Longitude (decimal degrees)	-97.912223
Longitude (degrees minutes seconds)	097° 54' 44" W
Coordinate Source	+/- 1 Second
Aquifer Code	218HSCC - Hensell Sand and Cow Creek Limestone
Aquifer	Trinity
Aquifer Pick Method	
Land Surface Elevation (feet above sea level)	977
Land Surface Elevation Method	Interpolated From Topo Map
Well Depth (feet below land surface)	680
Well Depth Source	Driller's Log
Drilling Start Date	
Drilling End Date	7/30/1973
Drilling Method	Air Rotary
Borehole Completion	Open Hole

Well Type	Withdrawal of Water
Well Use	Public Supply
Water Level Observation	Miscellaneous Measurements
Water Quality Available	Yes
Pump	Submersible
Pump Depth (feet below land surface)	
Power Type	Electric Motor
Annular Seal Method	
Surface Completion	
Owner	San Gabriel River Ranches
Driller	Wright Water Wells
Other Data Available	Drillers Log; Electric Log; Specific Capacity
Well Report Tracking Number	
Plugging Report Tracking Number	
U.S. Geological Survey Site Number	
Texas Commission on Environmental Quality Source Id	
Groundwater Conservation District Well Number	
Owner Well Number	
Other Well Number	
Previous State Well Number	
Reporting Agency	Texas Water Development Board
Created Date	
Last Update Date	

Remarks Owner's #1 well. Deepened from 480 to 680 feet in 1995. Pump set at 400 feet. Estimated yield 100 GPM in 1995.

Casing

Diameter (in.)	Casing Type	Casing Material	Schedule	Gauge	Top Depth (ft.)	Bottom Depth (ft.)
8	Blank	Steel			0	420
6	Open Hole				420	680

Well Tests - No Data

Lithology - No Data

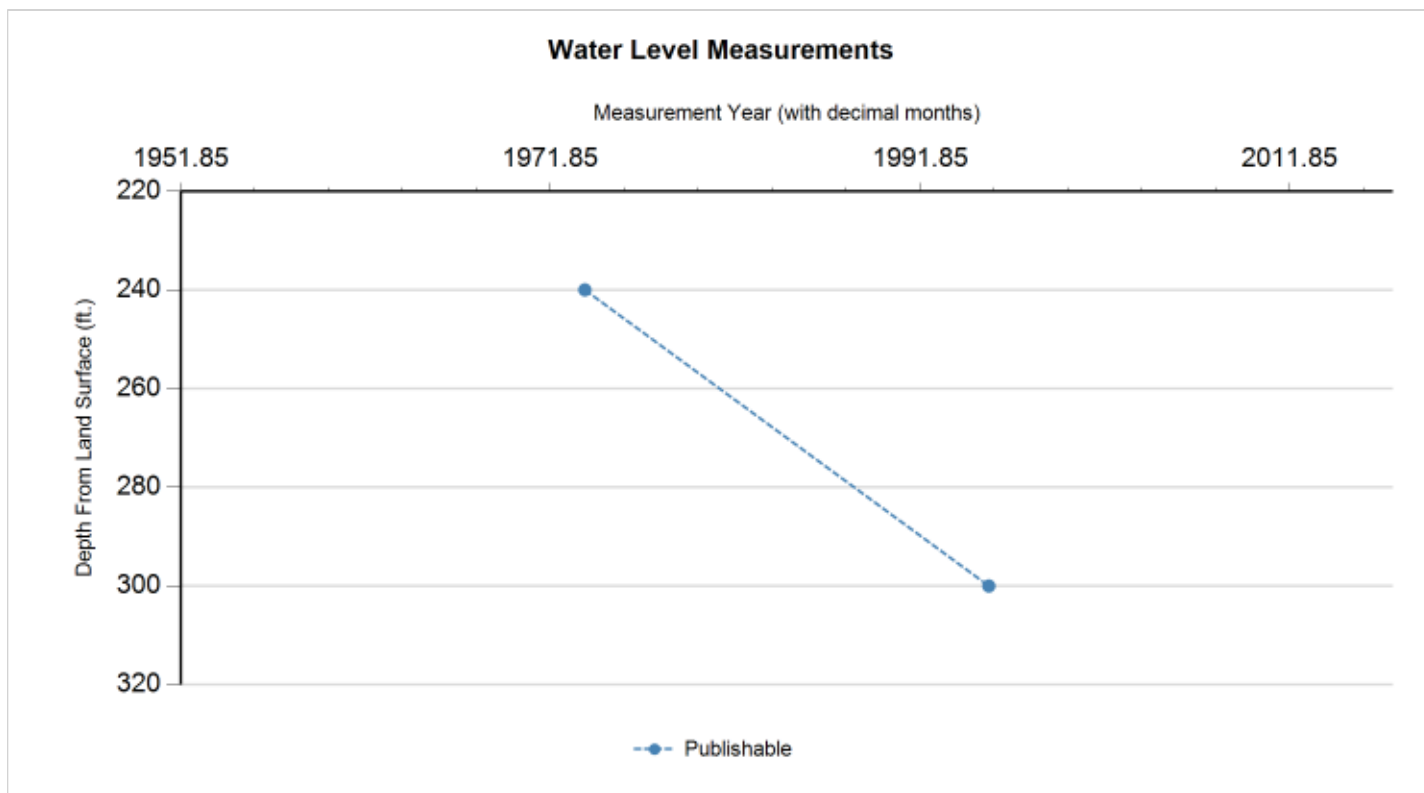
Annular Seal Range - No Data

Borehole - No Data

Plugged Back - No Data

Filter Pack - No Data

Packers - No Data



Status Code	Date	Time	Water Level (ft. below land surface)	Change value in () indicates rise in level	Water Elevation (ft. above sea level)	Meas #	Measuring Agency	Method	Remark ID	Comments
P	9/19/1973		240		737	1	Texas Water Development Board	Steel Tape		
P	7/27/1995		300	60.00	677	1	Registered Water Well Driller	Unknown		

Code Descriptions

Status Code	Status Description
P	Publishable

Water Quality Analysis

Sample Date: 8/2/1989 **Sample Time:** 0000 **Sample Number:** 1 **Collection Entity:** Texas Department of Health

Sampled Aquifer: Hensell Sand and Cow Creek Limestone

Analyzed Lab: Texas Department of Health

Reliability: Collected from pumped well, but not filtered or preserved

Collection Remarks: raw supply

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO3)		296	mg/L	
01005	BARIUM, DISSOLVED (UG/L AS BA)		70	ug/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO3)		361.22	mg/L	
00910	CALCIUM (MG/L)		44	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO3)		0	mg/L	
00940	CHLORIDE, TOTAL (MG/L AS CL)		105	mg/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		0.9	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)		204	mg/L	
01045	IRON, TOTAL (UG/L AS FE)		140	ug/L	
00920	MAGNESIUM (MG/L)		23	mg/L	
01055	MANGANESE, TOTAL (UG/L AS MN)	<	20	ug/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO3)	<	0.04	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.4	SU	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		1.83		
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		3.8	meq/l	
00932	SODIUM, CALCULATED, PERCENT		57	PCT	
00929	SODIUM, TOTAL (MG/L AS NA)		125	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		1071	MICR	
00945	SULFATE, TOTAL (MG/L AS SO4)		57	mg/L	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		532	mg/L	
01092	ZINC, TOTAL (UG/L AS ZN)		20	ug/L	

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[Scanned Documents](#)

State Well Number	5817601
County	Williamson
River Basin	Brazos
Groundwater Management Area	8
Regional Water Planning Area	G - Brazos G
Groundwater Conservation District	
Latitude (decimal degrees)	30.69
Latitude (degrees minutes seconds)	30° 41' 24" N
Longitude (decimal degrees)	-97.893334
Longitude (degrees minutes seconds)	097° 53' 36" W
Coordinate Source	Global Positioning System - GPS
Aquifer Code	218HNSL - Hensell Sand Member of Travis Peak Formation
Aquifer	Trinity
Aquifer Pick Method	
Land Surface Elevation (feet above sea level)	1025
Land Surface Elevation Method	Interpolated From Topo Map
Well Depth (feet below land surface)	492
Well Depth Source	Driller's Log
Drilling Start Date	
Drilling End Date	5/0/1968
Drilling Method	Cable Tool
Borehole Completion	Open Hole

Well Type	Withdrawal of Water
Well Use	Irrigation
Water Level Observation	Historical Observation Well
Water Quality Available	Yes
Pump	Submersible
Pump Depth (feet below land surface)	
Power Type	Electric Motor
Annular Seal Method	
Surface Completion	
Owner	Rick Hollar
Driller	Hunt Drlg. Co.
Other Data Available	Drillers Log
Well Report Tracking Number	
Plugging Report Tracking Number	
U.S. Geological Survey Site Number	
Texas Commission on Environmental Quality Source Id	
Groundwater Conservation District Well Number	
Owner Well Number	
Other Well Number	
Previous State Well Number	
Reporting Agency	Texas Water Development Board
Created Date	11/2/1994
Last Update Date	5/9/2007

Remarks	Observation well. Measured yield 50 GPM with 60 feet drawdown after pumping 14 hours. Specific capacity 2.5 GPM/ft. Pump set at 280 feet.
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Casing						
Diameter (in.)	Casing Type	Casing Material	Schedule	Gauge	Top Depth (ft.)	Bottom Depth (ft.)
7	Blank	Steel			0	455
	Open Hole				455	492

Well Tests - No Data

Lithology - No Data

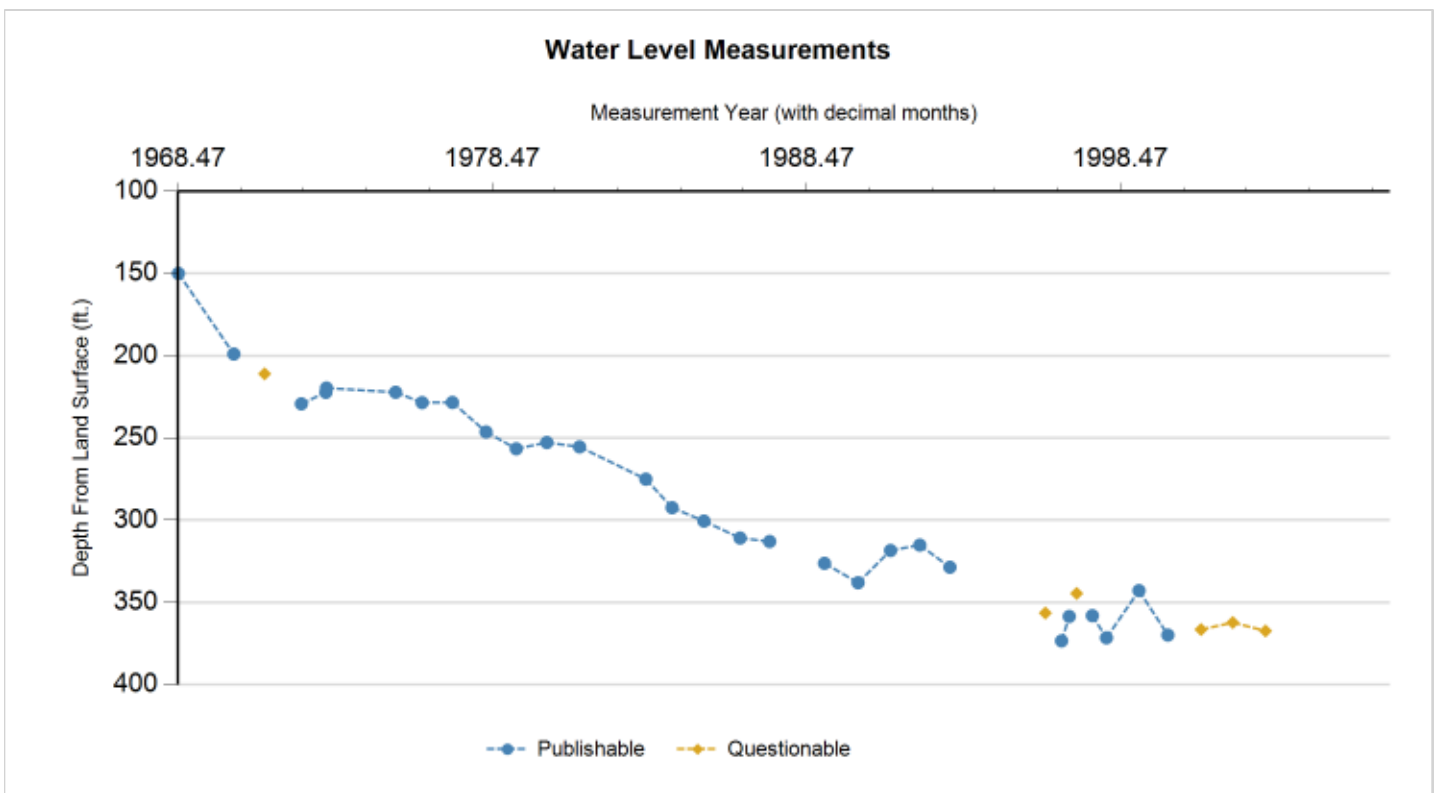
Annular Seal Range - No Data

Borehole - No Data

Plugged Back - No Data

Filter Pack - No Data

Packers - No Data



Status Code	Date	Time	Water Level (ft. below land surface)	Change value in () indicates rise in level	Water Elevation (ft. above sea level)	Meas #	Measuring Agency	Method	Remark ID	Comments
P	5/0/1968		150		875	1	Registered Water Well Driller	Unknown		
P	4/2/1970		198.99	48.99	826.01	1	Texas Water Development Board	Steel Tape		
Q	3/25/1971		211.03	12.04	813.97	1	Texas Water Development Board	Steel Tape	4	
P	5/27/1972		229.27	18.24	795.73	1	Texas Water Development Board	Steel Tape		
P	3/6/1973		222.29	(6.98)	802.71	1	Texas Water Development Board	Steel Tape		
P	3/13/1973		219.67	(2.62)	805.33	1	Texas Water Development Board	Steel Tape		
P	5/27/1975		222.25	2.58	802.75	1	Texas Water Development Board	Steel Tape		
P	3/29/1976		228.52	6.27	796.48	1	Texas Water Development Board	Steel Tape		
P	3/16/1977		228.4	(0.12)	796.6	1	Texas Water Development Board	Steel Tape		
P	4/12/1978		246.35	17.95	778.65	1	Texas Water Development Board	Steel Tape		
P	3/28/1979		256.58	10.23	768.42	1	Texas Water Development Board	Steel Tape		
P	3/18/1980		252.76	(3.82)	772.24	1	Texas Water Development Board	Steel Tape		
P	4/3/1981		255.42	2.66	769.58	1	Texas Water Development Board	Steel Tape		
P	5/13/1983		275.06	19.64	749.94	1	Texas Water Development Board	Steel Tape		
P	3/13/1984		292.37	17.31	732.63	1	Texas Water Development Board	Steel Tape		
P	3/18/1985		300.53	8.16	724.47	1	Texas Water Development Board	Steel Tape		
P	5/13/1986		310.85	10.32	714.15	1	Texas Water Development Board	Steel Tape		
P	4/21/1987		312.93	2.08	712.07	1	Texas Water Development Board	Steel Tape		
X	2/26/1988					1	Texas Water Development Board		20	
P	1/18/1989		326.2		698.8	1	Texas Water Development Board	Steel Tape		
P	2/13/1990		338	11.80	687	1	Texas Water Development Board	Steel Tape		

**Texas Water Development Board (TWDB)
Groundwater Database (GWDB)
Well Information Report for State Well Number
58-17-601**

Status Code	Date	Time	Water Level (ft. below land surface)	Change value in () indicates rise in level	Water Elevation (ft. above sea level)	Meas #	Measuring Agency	Method	Remark ID	Comments
P	2/25/1991		318.4	(19.60)	706.6	1	Texas Water Development Board	Steel Tape		
P	1/30/1992		315.1	(3.30)	709.9	1	Texas Water Development Board	Steel Tape		
P	1/15/1993		328.6	13.50	696.4	1	Texas Water Development Board	Steel Tape		
X	2/24/1994					1	Texas Water Development Board		20	
X	11/9/1994					1	Texas Water Development Board		20	
Q	1/29/1996		356.4		668.6	1	Texas Water Development Board	Steel Tape	10	
P	8/7/1996		373.35	16.95	651.65	1	Texas Water Development Board	Steel Tape		
P	11/6/1996		358.5	(14.85)	666.5	1	Texas Water Development Board	Steel Tape		
Q	1/28/1997		344.5	(14.00)	680.5	1	Texas Water Development Board	Steel Tape	10	
P	7/29/1997		358	13.50	667	1	Texas Water Development Board	Steel Tape		
P	1/8/1998		371.5	13.50	653.5	1	Texas Water Development Board	Steel Tape		
P	1/21/1999		342.8	(28.70)	682.2	1	Texas Water Development Board	Steel Tape		
P	12/27/1999		369.8	27.00	655.2	1	Texas Water Development Board	Steel Tape		
Q	1/12/2001		366.45	(3.35)	658.55	1	Texas Water Development Board	Steel Tape	10	
Q	1/16/2002		362.2	(4.25)	662.8	1	Texas Water Development Board	Steel Tape	10	
Q	1/31/2003		367.3	5.10	657.7	1	Texas Water Development Board	Steel Tape	10	
X	2/26/2004					1	Texas Water Development Board	Steel Tape	25	
X	1/28/2005					1	Texas Water Development Board	Steel Tape	25	
X	1/26/2006					1	Texas Water Development Board	Steel Tape	25	
X	1/8/2007					1	Texas Water Development Board	Steel Tape	25	

Code Descriptions

Status Code	Status Description
P	Publishable
Q	Questionable
X	No Measurement

Remark ID	Remark Description
4	Well pumped recently
10	Inconsistent or spotty tape mark due to wet or leaking casing
20	Unable to insert tape into well
25	Wet or leaking casing

Water Quality Analysis

Sample Date: 5/27/1972 **Sample Time:** 0000 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board
Sampled Aquifer: Hensell Sand Member of Travis Peak Formation
Analyzed Lab: Texas Department of Health **Reliability:** Collected from pumped well, but not filtered or preserved
Collection Remarks: No Data

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO3)		302	mg/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO3)		368.54	mg/L	
00910	CALCIUM (MG/L)		67	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO3)		0	mg/L	
00940	CHLORIDE, TOTAL (MG/L AS CL)		119	mg/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		3.5	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)		422	mg/L	
00920	MAGNESIUM (MG/L)		62	mg/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO3)		1.5	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.6	SU	
00937	POTASSIUM, TOTAL (MG/L AS K)		31	mg/L	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		0		
00955	SILICA, DISSOLVED (MG/L AS SiO2)		12	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		3.07	meq/l	
00932	SODIUM, CALCULATED, PERCENT		42	PCT	
00929	SODIUM, TOTAL (MG/L AS Na)		145	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		1705	MICR	
00945	SULFATE, TOTAL (MG/L AS SO4)		296	mg/L	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		918	mg/L	

Water Quality Analysis

Sample Date: 3/18/1980 **Sample Time:** 0000 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Hensell Sand Member of Travis Peak Formation

Analyzed Lab: Texas Department of Health **Reliability:** From well not sufficiently pumped; not filtered or preserved

Collection Remarks: faucet at pressure tank

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO3)		340	mg/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO3)		414.92	mg/L	
00910	CALCIUM (MG/L)		79	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO3)		0	mg/L	
00940	CHLORIDE, TOTAL (MG/L AS CL)		100	mg/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		4	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)		530	mg/L	
00920	MAGNESIUM (MG/L)		81	mg/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO3)		0.6	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.9	SU	
00937	POTASSIUM, TOTAL (MG/L AS K)		34	mg/L	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		0		
00955	SILICA, DISSOLVED (MG/L AS SiO2)		9	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		2.46	meq/l	
00932	SODIUM, CALCULATED, PERCENT		34	PCT	
00929	SODIUM, TOTAL (MG/L AS Na)		130	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		1823	MICR	
00945	SULFATE, TOTAL (MG/L AS SO4)		335	mg/L	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		976	mg/L	

Water Quality Analysis

Sample Date: 5/13/1986 **Sample Time:** 0000 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Hensell Sand Member of Travis Peak Formation

Analyzed Lab: Texas Department of Health **Reliability:** Collected from pumped well, but not filtered or preserved

Collection Remarks: No Data

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO3)		332	mg/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO3)		405.15	mg/L	
00910	CALCIUM (MG/L)		71	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO3)		0	mg/L	
00940	CHLORIDE, TOTAL (MG/L AS CL)		101	mg/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		3.5	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)		452	mg/L	
00920	MAGNESIUM (MG/L)		67	mg/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO3)		0.58	mg/L	
00400	PH (STANDARD UNITS), FIELD		8	SU	
00937	POTASSIUM, TOTAL (MG/L AS K)		22	mg/L	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		0		
00955	SILICA, DISSOLVED (MG/L AS SiO2)		10	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		2.68	meq/l	
00932	SODIUM, CALCULATED, PERCENT		38	PCT	
00929	SODIUM, TOTAL (MG/L AS Na)		131	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		1705	MICR	
00945	SULFATE, TOTAL (MG/L AS SO4)		288	mg/L	
00010	TEMPERATURE, WATER (CELSIUS)		24	C	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		893	mg/L	

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State Well Number	5817602
County	Williamson
River Basin	Brazos
Groundwater Management Area	8
Regional Water Planning Area	G - Brazos G
Groundwater Conservation District	
Latitude (decimal degrees)	30.704723
Latitude (degrees minutes seconds)	30° 42' 17" N
Longitude (decimal degrees)	-97.881111
Longitude (degrees minutes seconds)	097° 52' 52" W
Coordinate Source	Global Positioning System - GPS
Aquifer Code	218HNSL - Hensell Sand Member of Travis Peak Formation
Aquifer	Trinity
Aquifer Pick Method	
Land Surface Elevation (feet above sea level)	873
Land Surface Elevation Method	Digital Elevation Model -DEM
Well Depth (feet below land surface)	430
Well Depth Source	Memory of Owner
Drilling Start Date	
Drilling End Date	
Drilling Method	Mud (Hydraulic) Rotary
Borehole Completion	Perforated or Slotted

Well Type	Withdrawal of Water
Well Use	Domestic
Water Level Observation	Miscellaneous Measurements
Water Quality Available	Yes
Pump	Submersible
Pump Depth (feet below land surface)	
Power Type	Electric Motor
Annular Seal Method	
Surface Completion	
Owner	Ms. H.O. Lay
Driller	
Other Data Available	
Well Report Tracking Number	
Plugging Report Tracking Number	
U.S. Geological Survey Site Number	
Texas Commission on Environmental Quality Source Id	
Groundwater Conservation District Well Number	
Owner Well Number	
Other Well Number	
Previous State Well Number	
Reporting Agency	Texas Water Development Board
Created Date	9/10/1999
Last Update Date	6/23/2011

Remarks	
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Casing						
Diameter (in.)	Casing Type	Casing Material	Schedule	Gauge	Top Depth (ft.)	Bottom Depth (ft.)
6	Screen	Steel				
6	Blank	Steel			0	430

Well Tests - No Data

Lithology - No Data

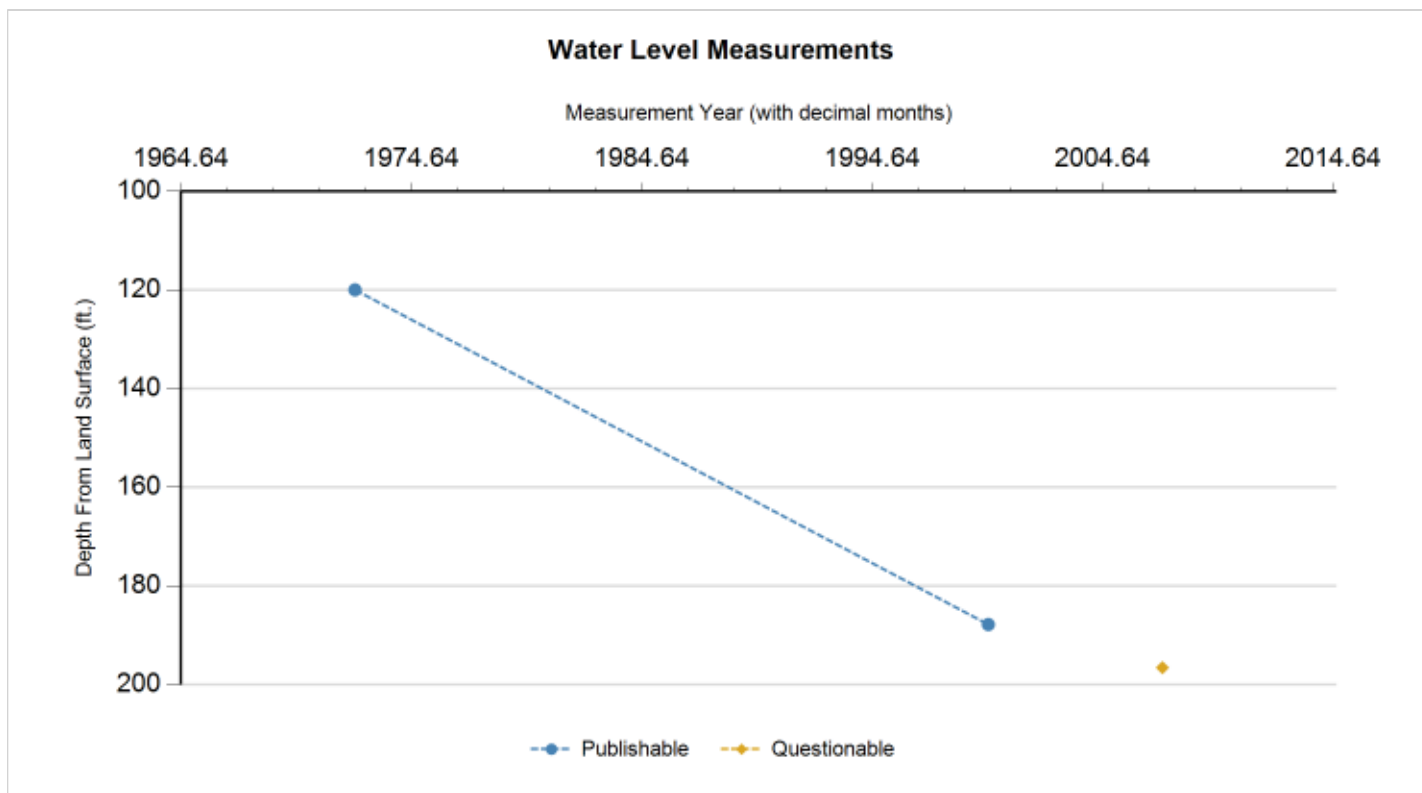
Annular Seal Range - No Data

Borehole - No Data

Plugged Back - No Data

Filter Pack - No Data

Packers - No Data



Status Code	Date	Time	Water Level (ft. below land surface)	Change value in () indicates rise in level	Water Elevation (ft. above sea level)	Meas #	Measuring Agency	Method	Remark ID	Comments
P	3/13/1972		120		753	1	Texas Water Development Board	Steel Tape		
P	9/10/1999		187.8	67.80	685.2	1	Texas Water Development Board	Steel Tape		
Q	3/28/2007		196.54	8.74	676.46	1	Texas Water Development Board	Steel Tape	10	

Code Descriptions

Status Code	Status Description
P	Publishable
Q	Questionable

Remark ID	Remark Description
10	Inconsistent or spotty tape mark due to wet or leaking casing

Water Quality Analysis

Sample Date: 3/13/1972 **Sample Time:** 0000 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Hensell Sand Member of Travis Peak Formation

Analyzed Lab: Texas Department of Health **Reliability:** Collected from pumped well, but not filtered or preserved

Collection Remarks: No Data

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO3)		294	mg/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO3)		358.78	mg/L	
00910	CALCIUM (MG/L)		40	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO3)		0	mg/L	
00940	CHLORIDE, TOTAL (MG/L AS CL)		99	mg/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		1.5	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)		211	mg/L	
00920	MAGNESIUM (MG/L)		27	mg/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO3)	<	0.4	mg/L	
00620	NITRATE NITROGEN, TOTAL (MG/L AS N)	<	0.03	mg/L	
00615	NITRITE NITROGEN, TOTAL (MG/L AS N)	<	0.05	mg/L	
00610	NITROGEN, AMMONIA, TOTAL (MG/L AS N)		1	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.8	SU	
00937	POTASSIUM, TOTAL (MG/L AS K)		21	mg/L	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		1.66		
00955	SILICA, DISSOLVED (MG/L AS SiO2)		15	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		3.92	meq/l	
00932	SODIUM, CALCULATED, PERCENT		57	PCT	
00929	SODIUM, TOTAL (MG/L AS Na)		131	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		1112	MICR	
00945	SULFATE, TOTAL (MG/L AS SO4)		85	mg/L	
00010	TEMPERATURE, WATER (CELSIUS)		21	C	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		596	mg/L	

Water Quality Analysis

Sample Date: 8/21/1980 **Sample Time:** 0000 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Hensell Sand Member of Travis Peak Formation

Analyzed Lab: Texas Department of Health **Reliability:** Collected from pumped well, but not filtered or preserved

Collection Remarks: No Data

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO3)		290	mg/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO3)		353.9	mg/L	
00910	CALCIUM (MG/L)		56	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO3)		0	mg/L	
00940	CHLORIDE, TOTAL (MG/L AS CL)		121	mg/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		3.6	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)		308	mg/L	
00920	MAGNESIUM (MG/L)		41	mg/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO3)		1.2	mg/L	
00400	PH (STANDARD UNITS), FIELD		8.3	SU	
00937	POTASSIUM, TOTAL (MG/L AS K)		28	mg/L	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		0		
00955	SILICA, DISSOLVED (MG/L AS SiO2)		14	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		4.46	meq/l	
00932	SODIUM, CALCULATED, PERCENT		55	PCT	
00929	SODIUM, TOTAL (MG/L AS Na)		180	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		1600	MICR	
00945	SULFATE, TOTAL (MG/L AS SO4)		254	mg/L	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		872	mg/L	

Water Quality Analysis

Sample Date: 9/10/1999 **Sample Time:** 1100 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Hensell Sand Member of Travis Peak Formation

Analyzed Lab: LCRA - Lower Colorado River Authority

Reliability: Sampled using TWDB protocols

Collection Remarks: No Data

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
39086	ALKALINITY FIELD DISSOLVED AS CaCO ₃		289	mg/L	
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO ₃)		277	mg/L	
01106	ALUMINUM, DISSOLVED (UG/L AS AL)		5.35	ug/L	
01095	ANTIMONY, DISSOLVED (UG/L AS SB)	<	1	ug/L	
01000	ARSENIC, DISSOLVED (UG/L AS AS)	<	2	ug/L	
01005	BARIUM, DISSOLVED (UG/L AS BA)		48.8	ug/L	
01010	BERYLLIUM, DISSOLVED (UG/L AS BE)	<	1	ug/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO ₃)		338.04	mg/L	
01020	BORON, DISSOLVED (UG/L AS B)		1130	ug/L	
71870	BROMIDE, DISSOLVED, (MG/L AS BR)		0.45	mg/L	
01025	CADMIUM, DISSOLVED (UG/L AS CD)	<	1	ug/L	
00915	CALCIUM, DISSOLVED (MG/L AS CA)		35.9	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO ₃)		0	mg/L	
00941	CHLORIDE, DISSOLVED (MG/L AS CL)		105	mg/L	
01030	CHROMIUM, DISSOLVED (UG/L AS CR)	<	1	ug/L	
01035	COBALT, DISSOLVED (UG/L AS CO)	<	1	ug/L	
01040	COPPER, DISSOLVED (UG/L AS CU)	<	2	ug/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		1.1	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO ₃)		193	mg/L	
01046	IRON, DISSOLVED (UG/L AS FE)		227	ug/L	
01049	LEAD, DISSOLVED (UG/L AS PB)	<	1	ug/L	
01130	LITHIUM, DISSOLVED (UG/L AS LI)		98.6	ug/L	
00925	MAGNESIUM, DISSOLVED (MG/L AS MG)		22.8	mg/L	
01056	MANGANESE, DISSOLVED (UG/L AS MN)		11.3	ug/L	
01060	MOLYBDENUM, DISSOLVED (UG/L AS MO)	<	1	ug/L	
01065	NICKEL, DISSOLVED (UG/L AS NI)		1.66	ug/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO ₃)		0.11	mg/L	
00631	NITRITE PLUS NITRATE, DISSOLVED (MG/L AS N)		0.025	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.42	SU	
00935	POTASSIUM, DISSOLVED (MG/L AS K)		20.5	mg/L	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		1.87		
01145	SELENIUM, DISSOLVED (UG/L AS SE)	<	4	ug/L	
00955	SILICA, DISSOLVED (MG/L AS SiO ₂)		17.3	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		4.11	meq/l	
00932	SODIUM, CALCULATED, PERCENT		60	PCT	

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Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00930	SODIUM, DISSOLVED (MG/L AS NA)		128	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		1022	MICR	
01080	STRONTIUM, DISSOLVED (UG/L AS SR)		8730	ug/L	
00946	SULFATE, DISSOLVED (MG/L AS SO4)		67.3	mg/L	
00010	TEMPERATURE, WATER (CELSIUS)		23.3	C	
01057	THALLIUM, DISSOLVED (UG/L AS TL)	<	1	ug/L	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		572	mg/L	
01085	VANADIUM, DISSOLVED (UG/L AS V)	<	1	ug/L	
01090	ZINC, DISSOLVED (UG/L AS ZN)		24.5	ug/L	

Water Quality Analysis

Sample Date: 9/23/2003 **Sample Time:** 1320 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Hensell Sand Member of Travis Peak Formation

Analyzed Lab: LCRA - Lower Colorado River Authority

Reliability: Sampled using TWDB protocols

Collection Remarks: No Data

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
39086	ALKALINITY FIELD DISSOLVED AS CaCO ₃		298	mg/L	
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO ₃)		285	mg/L	
01106	ALUMINUM, DISSOLVED (UG/L AS AL)	<	4	ug/L	
01095	ANTIMONY, DISSOLVED (UG/L AS SB)	<	1	ug/L	
01000	ARSENIC, DISSOLVED (UG/L AS AS)	<	2	ug/L	
01005	BARIUM, DISSOLVED (UG/L AS BA)		41.5	ug/L	
01010	BERYLLIUM, DISSOLVED (UG/L AS BE)	<	1	ug/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO ₃)		347.8	mg/L	
01020	BORON, DISSOLVED (UG/L AS B)		2930	ug/L	
71870	BROMIDE, DISSOLVED, (MG/L AS BR)		0.323	mg/L	
01025	CADMIUM, DISSOLVED (UG/L AS CD)	<	1	ug/L	
00915	CALCIUM, DISSOLVED (MG/L AS CA)		39.2	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO ₃)		0	mg/L	
00941	CHLORIDE, DISSOLVED (MG/L AS CL)		107	mg/L	
01030	CHROMIUM, DISSOLVED (UG/L AS CR)	<	1	ug/L	
01035	COBALT, DISSOLVED (UG/L AS CO)	<	1	ug/L	
01040	COPPER, DISSOLVED (UG/L AS CU)		1.43	ug/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		2.89	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO ₃)		266	mg/L	
01046	IRON, DISSOLVED (UG/L AS FE)	<	50	ug/L	
01049	LEAD, DISSOLVED (UG/L AS PB)	<	1	ug/L	
01130	LITHIUM, DISSOLVED (UG/L AS LI)		148	ug/L	
00925	MAGNESIUM, DISSOLVED (MG/L AS MG)		37.5	mg/L	
01056	MANGANESE, DISSOLVED (UG/L AS MN)	<	1	ug/L	
01060	MOLYBDENUM, DISSOLVED (UG/L AS MO)	<	1	ug/L	
01065	NICKEL, DISSOLVED (UG/L AS NI)		2.12	ug/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO ₃)		1.89	mg/L	
00631	NITRITE PLUS NITRATE, DISSOLVED (MG/L AS N)		0.426	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.43	SU	
00935	POTASSIUM, DISSOLVED (MG/L AS K)		24.6	mg/L	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		0.66		
01145	SELENIUM, DISSOLVED (UG/L AS SE)	<	4	ug/L	
00955	SILICA, DISSOLVED (MG/L AS SiO ₂)		14.7	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		4.49	meq/l	
00932	SODIUM, CALCULATED, PERCENT		58	PCT	

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Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00930	SODIUM, DISSOLVED (MG/L AS NA)		164	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		1353	MICR	
01080	STRONTIUM, DISSOLVED (UG/L AS SR)		12400	ug/L	
00946	SULFATE, DISSOLVED (MG/L AS SO4)		206	mg/L	
00010	TEMPERATURE, WATER (CELSIUS)		22.8	C	
01057	THALLIUM, DISSOLVED (UG/L AS TL)	<	1	ug/L	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		781	mg/L	
01085	VANADIUM, DISSOLVED (UG/L AS V)	<	1	ug/L	
01090	ZINC, DISSOLVED (UG/L AS ZN)		78.6	ug/L	

Water Quality Analysis

Sample Date: 3/28/2007 **Sample Time:** 1215 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Hensell Sand Member of Travis Peak Formation

Analyzed Lab: Energy Labs Inc.

Reliability: Sampled using TWDB protocols

Collection Remarks: No Data

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
39086	ALKALINITY FIELD DISSOLVED AS CaCO ₃		287	mg/L	
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)	<	1	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO ₃)		284	mg/L	
01106	ALUMINUM, DISSOLVED (UG/L AS AL)	<	1	ug/L	
01095	ANTIMONY, DISSOLVED (UG/L AS SB)	<	1	ug/L	
01000	ARSENIC, DISSOLVED (UG/L AS AS)	<	1	ug/L	
01005	BARIUM, DISSOLVED (UG/L AS BA)		40	ug/L	
01010	BERYLLIUM, DISSOLVED (UG/L AS BE)	<	1	ug/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO ₃)		346.57	mg/L	
01020	BORON, DISSOLVED (UG/L AS B)		3470	ug/L	
71870	BROMIDE, DISSOLVED, (MG/L AS BR)	<	0.5	mg/L	
01025	CADMIUM, DISSOLVED (UG/L AS CD)	<	1	ug/L	
00915	CALCIUM, DISSOLVED (MG/L AS CA)		44.7	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO ₃)		0	mg/L	
00941	CHLORIDE, DISSOLVED (MG/L AS CL)		111	mg/L	
01030	CHROMIUM, DISSOLVED (UG/L AS CR)	<	1	ug/L	
01035	COBALT, DISSOLVED (UG/L AS CO)	<	1	ug/L	
01040	COPPER, DISSOLVED (UG/L AS CU)		1	ug/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		4.3	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO ₃)		320	mg/L	
01046	IRON, DISSOLVED (UG/L AS FE)	<	30	ug/L	
01049	LEAD, DISSOLVED (UG/L AS PB)	<	1	ug/L	
01130	LITHIUM, DISSOLVED (UG/L AS LI)		173	ug/L	
00925	MAGNESIUM, DISSOLVED (MG/L AS MG)		46.9	mg/L	
01056	MANGANESE, DISSOLVED (UG/L AS MN)	<	1	ug/L	
01060	MOLYBDENUM, DISSOLVED (UG/L AS MO)	<	1	ug/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO ₃)		2.66	mg/L	
00631	NITRITE PLUS NITRATE, DISSOLVED (MG/L AS N)		0.6	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.44	SU	
00935	POTASSIUM, DISSOLVED (MG/L AS K)		28.4	mg/L	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		0		
01145	SELENIUM, DISSOLVED (UG/L AS SE)	<	1	ug/L	
00955	SILICA, DISSOLVED (MG/L AS SiO ₂)		12.8	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		4.58	meq/l	
00932	SODIUM, CALCULATED, PERCENT		57	PCT	
00930	SODIUM, DISSOLVED (MG/L AS NA)		184	mg/L	

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Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		1380	MICR	
01080	STRONTIUM, DISSOLVED (UG/L AS SR)		13600	ug/L	
00946	SULFATE, DISSOLVED (MG/L AS SO4)		249	mg/L	
00010	TEMPERATURE, WATER (CELSIUS)		22	C	
01057	THALLIUM, DISSOLVED (UG/L AS TL)	<	1	ug/L	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		868	mg/L	
01085	VANADIUM, DISSOLVED (UG/L AS V)	<	1	ug/L	
01090	ZINC, DISSOLVED (UG/L AS ZN)		27	ug/L	

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Water Quality Analysis

Sample Date: 3/28/2007 **Sample Time:** **Sample Number:** 1 **Collection Entity:** Texas Commission on Environmental Quality

Sampled Aquifer: Hensell Sand Member of Travis Peak Formation

Analyzed Lab: Immunoassay at TCEQ

Reliability: Sampled using TWDB protocols, but NOT filtered

Collection Remarks: No Data

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
39033	ATRAZINE, TOTAL, UG/L		0	ug/L	
82612	METOLACHLOR, WHOLE WATER, TOTAL RECOVERABLE, UG/L		0	ug/L	

Water Quality Analysis

Sample Date: 6/20/2011 **Sample Time:** 1045 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Hensell Sand Member of Travis Peak Formation

Analyzed Lab: LCRA - Lower Colorado River Authority

Reliability: Sampled using TWDB protocols

Collection Remarks: No Data

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
39086	ALKALINITY FIELD DISSOLVED AS CaCO ₃		288	mg/L	
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)	<	2	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO ₃)		285	mg/L	
01503	ALPHA, DISSOLVED (PC/L)	<	7.2	PC/L	3.8
01106	ALUMINUM, DISSOLVED (UG/L AS AL)	<	4	ug/L	
50938	ANION/CATION CHG BAL, PERCENT		2.36	PCT	
01095	ANTIMONY, DISSOLVED (UG/L AS SB)	<	1	ug/L	
01000	ARSENIC, DISSOLVED (UG/L AS AS)	<	2	ug/L	
01005	BARIUM, DISSOLVED (UG/L AS BA)		55.7	ug/L	
01010	BERYLLIUM, DISSOLVED (UG/L AS BE)	<	1	ug/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO ₃)		347.79	mg/L	
01020	BORON, DISSOLVED (UG/L AS B)		846	ug/L	
71870	BROMIDE, DISSOLVED, (MG/L AS BR)		0.42	mg/L	
01025	CADMIUM, DISSOLVED (UG/L AS CD)	<	1	ug/L	
00915	CALCIUM, DISSOLVED (MG/L AS CA)		33.4	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO ₃)		0	mg/L	
00941	CHLORIDE, DISSOLVED (MG/L AS CL)		103	mg/L	
01030	CHROMIUM, DISSOLVED (UG/L AS CR)		2	ug/L	
01035	COBALT, DISSOLVED (UG/L AS CO)	<	1	ug/L	
01040	COPPER, DISSOLVED (UG/L AS CU)		2	ug/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		1.09	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO ₃)		177	mg/L	
01046	IRON, DISSOLVED (UG/L AS FE)	<	50	ug/L	
01049	LEAD, DISSOLVED (UG/L AS PB)	<	1	ug/L	
01130	LITHIUM, DISSOLVED (UG/L AS LI)		77	ug/L	
00925	MAGNESIUM, DISSOLVED (MG/L AS MG)		20.2	mg/L	
01056	MANGANESE, DISSOLVED (UG/L AS MN)		1	ug/L	
71890	MERCURY, DISSOLVED (UG/L AS HG)	<	0.2	ug/L	
01060	MOLYBDENUM, DISSOLVED (UG/L AS MO)	<	1	ug/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO ₃)	<	0.02	mg/L	
00631	NITRITE PLUS NITRATE, DISSOLVED (MG/L AS N)	<	0.02	mg/L	
00400	PH (STANDARD UNITS), FIELD		6.83	SU	
00666	PHOSPHORUS, DISSOLVED (MG/L AS P)	<	0.02	mg/L	
00935	POTASSIUM, DISSOLVED (MG/L AS K)		19.5	mg/L	
09511	RADIUM 226, DISSOLVED, RADON METHOD, PC/L		1	PC/L	0.19
81366	RADIUM 228, DISSOLVED (PC/L AS RA-228)		4.2	PC/L	0.9

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Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		2.37		
01145	SELENIUM, DISSOLVED (UG/L AS SE)	<	4	ug/L	
00955	SILICA, DISSOLVED (MG/L AS SI02)		16.1	mg/L	
01075	SILVER, DISSOLVED (UG/L AS AG)	<	1	ug/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		4.14	meq/l	
00932	SODIUM, CALCULATED, PERCENT		62	PCT	
00930	SODIUM, DISSOLVED (MG/L AS NA)		123	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		910	MICR	
01080	STRONTIUM, DISSOLVED (UG/L AS SR)		8700	ug/L	
00946	SULFATE, DISSOLVED (MG/L AS SO4)		56.3	mg/L	
00010	TEMPERATURE, WATER (CELSIUS)		24.6	C	
01057	THALLIUM, DISSOLVED (UG/L AS TL)	<	1	ug/L	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		552	mg/L	
22703	URANIUM, NATURAL, DISSOLVED (UG/L AS U)	<	1	ug/L	
01085	VANADIUM, DISSOLVED (UG/L AS V)	<	1	ug/L	
01090	ZINC, DISSOLVED (UG/L AS ZN)		5.6	ug/L	

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State Well Number	5817603
County	Williamson
River Basin	Brazos
Groundwater Management Area	8
Regional Water Planning Area	G - Brazos G
Groundwater Conservation District	
Latitude (decimal degrees)	30.699722
Latitude (degrees minutes seconds)	30° 41' 59" N
Longitude (decimal degrees)	-97.879444
Longitude (degrees minutes seconds)	097° 52' 46" W
Coordinate Source	+/- 1 Second
Aquifer Code	218GLRS - Glen Rose Limestone
Aquifer	Trinity
Aquifer Pick Method	
Land Surface Elevation (feet above sea level)	887
Land Surface Elevation Method	Interpolated From Topo Map
Well Depth (feet below land surface)	277
Well Depth Source	Measured
Drilling Start Date	
Drilling End Date	
Drilling Method	
Borehole Completion	

Well Type	Withdrawal of Water
Well Use	Stock
Water Level Observation	Miscellaneous Measurements
Water Quality Available	Yes
Pump	Piston
Pump Depth (feet below land surface)	
Power Type	Windmill
Annular Seal Method	
Surface Completion	
Owner	George Sims
Driller	
Other Data Available	
Well Report Tracking Number	
Plugging Report Tracking Number	
U.S. Geological Survey Site Number	
Texas Commission on Environmental Quality Source Id	
Groundwater Conservation District Well Number	
Owner Well Number	
Other Well Number	
Previous State Well Number	
Reporting Agency	Texas Water Development Board
Created Date	11/2/1994
Last Update Date	3/13/2003

Remarks	
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Casing

Diameter (in.)	Casing Type	Casing Material	Schedule	Gauge	Top Depth (ft.)	Bottom Depth (ft.)
4	Blank	Steel				

Well Tests - No Data

Lithology - No Data

Annular Seal Range - No Data

Borehole - No Data

Plugged Back - No Data

Filter Pack - No Data

Packers - No Data

Water Level Measurements



Status Code	Date	Time	Water Level (ft. below land surface)	Change value in () indicates rise in level	Water Elevation (ft. above sea level)	Meas #	Measuring Agency	Method	Remark ID	Comments
P	3/13/1972		56.1		830.9	1	Texas Water Development Board	Steel Tape		

Code Descriptions

Status Code	Status Description
P	Publishable

Water Quality Analysis

Sample Date: 3/13/1971 **Sample Time:** 0000 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Glen Rose Limestone

Analyzed Lab: Texas Department of Health **Reliability:** From well not sufficiently pumped; not filtered or preserved

Collection Remarks: collection tank

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO3)		500	mg/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO3)		610.17	mg/L	
00910	CALCIUM (MG/L)		39	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO3)		0	mg/L	
00940	CHLORIDE, TOTAL (MG/L AS CL)		116	mg/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		4.4	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)		294	mg/L	
00920	MAGNESIUM (MG/L)		48	mg/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO3)	<	0.4	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.8	SU	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		4.1		
00955	SILICA, DISSOLVED (MG/L AS SiO2)		7	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		4.28	meq/l	
00932	SODIUM, CALCULATED, PERCENT		55	PCT	
00929	SODIUM, TOTAL (MG/L AS NA)		169	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		1400	MICR	
00945	SULFATE, TOTAL (MG/L AS SO4)	<	4	mg/L	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		687	mg/L	

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State Well Number	5817604
County	Williamson
River Basin	Brazos
Groundwater Management Area	8
Regional Water Planning Area	G - Brazos G
Groundwater Conservation District	
Latitude (decimal degrees)	30.692778
Latitude (degrees minutes seconds)	30° 41' 34" N
Longitude (decimal degrees)	-97.8775
Longitude (degrees minutes seconds)	097° 52' 39" W
Coordinate Source	+/- 1 Second
Aquifer Code	100ALVM - Alluvium
Aquifer	Other
Aquifer Pick Method	
Land Surface Elevation (feet above sea level)	875
Land Surface Elevation Method	Interpolated From Topo Map
Well Depth (feet below land surface)	30
Well Depth Source	Measured
Drilling Start Date	
Drilling End Date	
Drilling Method	Dug
Borehole Completion	Open End

Well Type	Withdrawal of Water
Well Use	Unused
Water Level Observation	Miscellaneous Measurements
Water Quality Available	Yes
Pump	None
Pump Depth (feet below land surface)	
Power Type	
Annular Seal Method	
Surface Completion	
Owner	J.E.Ross
Driller	
Other Data Available	
Well Report Tracking Number	
Plugging Report Tracking Number	
U.S. Geological Survey Site Number	
Texas Commission on Environmental Quality Source Id	
Groundwater Conservation District Well Number	
Owner Well Number	
Other Well Number	
Previous State Well Number	
Reporting Agency	Texas Water Development Board
Created Date	11/2/1994
Last Update Date	3/13/2003

Remarks	
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Casing

Diameter (in.)	Casing Type	Casing Material	Schedule	Gauge	Top Depth (ft.)	Bottom Depth (ft.)
36	Blank	Brick			0	30

Well Tests - No Data

Lithology - No Data

Annular Seal Range - No Data

Borehole - No Data

Plugged Back - No Data

Filter Pack - No Data

Packers - No Data

Water Level Measurements



Status Code	Date	Time	Water Level (ft. below land surface)	Change value in () indicates rise in level	Water Elevation (ft. above sea level)	Meas #	Measuring Agency	Method	Remark ID	Comments
P	3/13/1972		8.1		866.9	1	Texas Water Development Board	Steel Tape		

Code Descriptions

Status Code	Status Description
P	Publishable

Water Quality Analysis

Sample Date: 3/13/1972 **Sample Time:** 0000 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Alluvium

Analyzed Lab: Texas Department of Health

Reliability: Not indicative of aquifer quality.

Collection Remarks: bailer

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO3)		237	mg/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO3)		289.22	mg/L	
00910	CALCIUM (MG/L)		79	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO3)		0	mg/L	
00940	CHLORIDE, TOTAL (MG/L AS CL)		16	mg/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		0.2	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)		275	mg/L	
00920	MAGNESIUM (MG/L)		19	mg/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO3)		2	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.4	SU	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		0		
00955	SILICA, DISSOLVED (MG/L AS SiO2)		9	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		0.21		
00932	SODIUM, CALCULATED, PERCENT		5	PCT	
00929	SODIUM, TOTAL (MG/L AS Na)		8	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		580	MICR	
00945	SULFATE, TOTAL (MG/L AS SO4)		24	mg/L	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		299	mg/L	

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[GWDB Reports and Downloads](#)
[Well Basic Details](#)
[Scanned Documents](#)

State Well Number	5818402
County	Williamson
River Basin	Brazos
Groundwater Management Area	8
Regional Water Planning Area	G - Brazos G
Groundwater Conservation District	
Latitude (decimal degrees)	30.701667
Latitude (degrees minutes seconds)	30° 42' 06" N
Longitude (decimal degrees)	-97.871944
Longitude (degrees minutes seconds)	097° 52' 19" W
Coordinate Source	+/- 1 Second
Aquifer Code	218TRNT - Trinity Group
Aquifer	Trinity
Aquifer Pick Method	
Land Surface Elevation (feet above sea level)	872
Land Surface Elevation Method	Interpolated From Topo Map
Well Depth (feet below land surface)	450
Well Depth Source	Driller's Log
Drilling Start Date	
Drilling End Date	10/0/1970
Drilling Method	Cable Tool
Borehole Completion	Open Hole

Well Type	Withdrawal of Water
Well Use	Domestic
Water Level Observation	Miscellaneous Measurements
Water Quality Available	Yes
Pump	Submersible
Pump Depth (feet below land surface)	
Power Type	Electric Motor
Annular Seal Method	
Surface Completion	
Owner	Edwin York
Driller	Powell Drlg.
Other Data Available	Drillers Log
Well Report Tracking Number	
Plugging Report Tracking Number	
U.S. Geological Survey Site Number	
Texas Commission on Environmental Quality Source Id	
Groundwater Conservation District Well Number	
Owner Well Number	
Other Well Number	
Previous State Well Number	
Reporting Agency	Texas Water Development Board
Created Date	11/3/1994
Last Update Date	11/3/1994

Remarks Measured yield 30 GPM with 10 feet drawdown after pumping 2 hours in 1970. Pump set at 126 feet.

Casing

Diameter (in.)	Casing Type	Casing Material	Schedule	Gauge	Top Depth (ft.)	Bottom Depth (ft.)
7	Blank	Steel			0	32
7	Open Hole				32	450

Well Tests - No Data

Lithology - No Data

Annular Seal Range - No Data

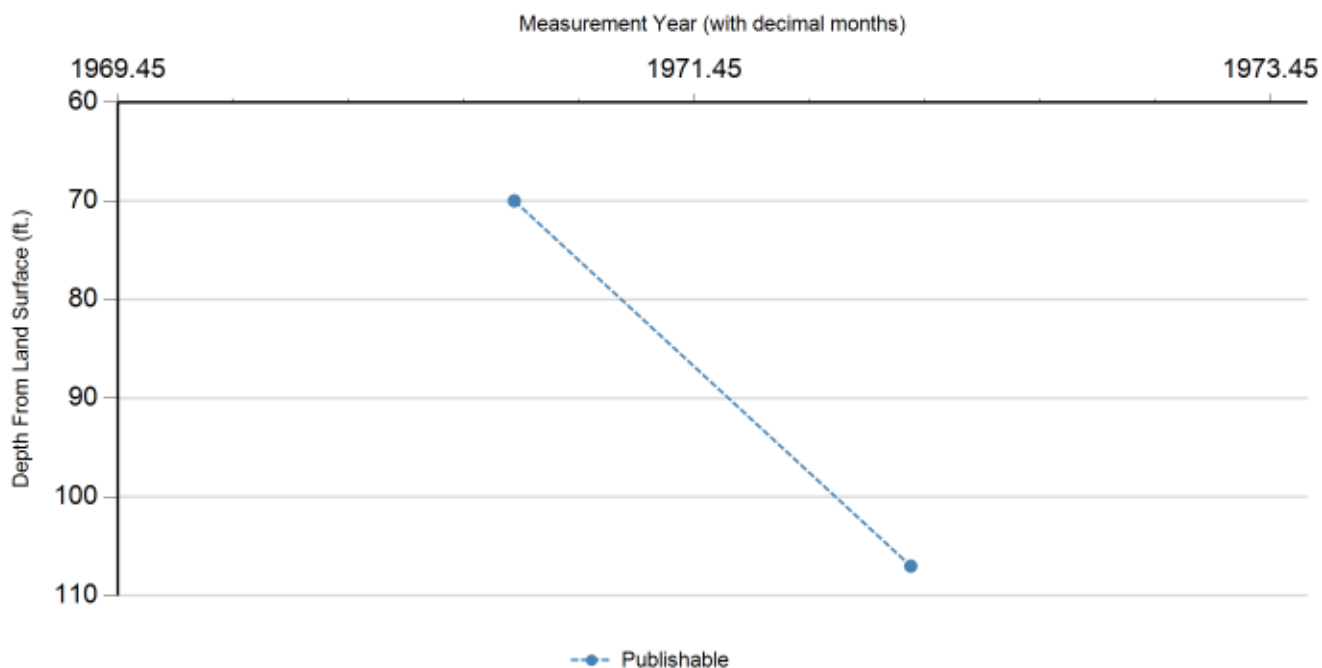
Borehole - No Data

Plugged Back - No Data

Filter Pack - No Data

Packers - No Data

Water Level Measurements



Status Code	Date	Time	Water Level (ft. below land surface)	Change value in () indicates rise in level	Water Elevation (ft. above sea level)	Meas #	Measuring Agency	Method	Remark ID	Comments
P	11/1/1970		70		802	1	Registered Water Well Driller	Electric Line		
P	3/13/1972		107	37.00	765	1	Texas Water Development Board	Steel Tape		

Code Descriptions

Status Code	Status Description
P	Publishable

Water Quality Analysis

Sample Date: 3/13/1972 **Sample Time:** 0000 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Trinity Group

Analyzed Lab: Texas Department of Health

Reliability: Collected from pumped well, but not filtered or preserved

Collection Remarks: No Data

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO3)		303	mg/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO3)		369.76	mg/L	
00910	CALCIUM (MG/L)		62	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO3)		0	mg/L	
00940	CHLORIDE, TOTAL (MG/L AS CL)		129	mg/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		5.1	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)		442	mg/L	
00920	MAGNESIUM (MG/L)		70	mg/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO3)	<	0.4	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.8	SU	
00937	POTASSIUM, TOTAL (MG/L AS K)		28	mg/L	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		0		
00955	SILICA, DISSOLVED (MG/L AS SiO2)		11	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		3.99		
00932	SODIUM, CALCULATED, PERCENT		48	PCT	
00929	SODIUM, TOTAL (MG/L AS Na)		193	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		2058	MICR	
00945	SULFATE, TOTAL (MG/L AS SO4)		408	mg/L	
00010	TEMPERATURE, WATER (CELSIUS)		25	C	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		1088	mg/L	

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[GWDB Reports and Downloads](#)
[Well Basic Details](#)
[Scanned Documents](#)

State Well Number	5818404
County	Williamson
River Basin	Brazos
Groundwater Management Area	8
Regional Water Planning Area	G - Brazos G
Groundwater Conservation District	
Latitude (decimal degrees)	30.701945
Latitude (degrees minutes seconds)	30° 42' 07" N
Longitude (decimal degrees)	-97.871111
Longitude (degrees minutes seconds)	097° 52' 16" W
Coordinate Source	+/- 1 Second
Aquifer Code	218GLRS - Glen Rose Limestone
Aquifer	Trinity
Aquifer Pick Method	
Land Surface Elevation (feet above sea level)	883
Land Surface Elevation Method	Interpolated From Topo Map
Well Depth (feet below land surface)	150
Well Depth Source	Measured
Drilling Start Date	
Drilling End Date	
Drilling Method	Cable Tool
Borehole Completion	Open Hole

Well Type	Withdrawal of Water
Well Use	Unused
Water Level Observation	Miscellaneous Measurements
Water Quality Available	Yes
Pump	Piston
Pump Depth (feet below land surface)	
Power Type	Windmill
Annular Seal Method	
Surface Completion	
Owner	Edwin York
Driller	
Other Data Available	
Well Report Tracking Number	
Plugging Report Tracking Number	
U.S. Geological Survey Site Number	
Texas Commission on Environmental Quality Source Id	
Groundwater Conservation District Well Number	
Owner Well Number	
Other Well Number	
Previous State Well Number	
Reporting Agency	Texas Water Development Board
Created Date	11/3/1994
Last Update Date	11/3/1994

Remarks	
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Casing

Diameter (in.)	Casing Type	Casing Material	Schedule	Gauge	Top Depth (ft.)	Bottom Depth (ft.)
6	Blank	Steel				

Well Tests - No Data

Lithology - No Data

Annular Seal Range - No Data

Borehole - No Data

Plugged Back - No Data

Filter Pack - No Data

Packers - No Data

Water Level Measurements



Status Code	Date	Time	Water Level (ft. below land surface)	Change value in () indicates rise in level	Water Elevation (ft. above sea level)	Meas #	Measuring Agency	Method	Remark ID	Comments
P	3/13/1972		77.9		805.1	1	Texas Water Development Board	Steel Tape		

Code Descriptions

Status Code	Status Description
P	Publishable

Water Quality Analysis

Sample Date: 3/13/1972 **Sample Time:** 0000 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Glen Rose Limestone

Analyzed Lab: Texas Department of Health

Reliability: Not indicative of aquifer quality.

Collection Remarks: bailer-roots in water

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO3)		310	mg/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO3)		378.31	mg/L	
00910	CALCIUM (MG/L)		73	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO3)		0	mg/L	
00940	CHLORIDE, TOTAL (MG/L AS CL)		125	mg/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		4.5	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)		428	mg/L	
00920	MAGNESIUM (MG/L)		60	mg/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO3)	<	0.4	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.5	SU	
00937	POTASSIUM, TOTAL (MG/L AS K)		66	mg/L	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		0		
00955	SILICA, DISSOLVED (MG/L AS SiO2)		10	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		4.05		
00932	SODIUM, CALCULATED, PERCENT		49	PCT	
00929	SODIUM, TOTAL (MG/L AS Na)		193	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		2121	MICR	
00945	SULFATE, TOTAL (MG/L AS SO4)		439	mg/L	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		1156	mg/L	

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**Texas Water Development Board (TWDB)
Groundwater Database (GWDB)
Well Information Report for State Well Number
58-18-405**

[GWDB Reports and Downloads](#)
[Well Basic Details](#)
[Scanned Documents](#)

State Well Number	5818405
County	Williamson
River Basin	Brazos
Groundwater Management Area	8
Regional Water Planning Area	G - Brazos G
Groundwater Conservation District	
Latitude (decimal degrees)	30.704167
Latitude (degrees minutes seconds)	30° 42' 15" N
Longitude (decimal degrees)	-97.873055
Longitude (degrees minutes seconds)	097° 52' 23" W
Coordinate Source	+/- 1 Second
Aquifer Code	218HNSL - Hensell Sand Member of Travis Peak Formation
Aquifer	Trinity
Aquifer Pick Method	
Land Surface Elevation (feet above sea level)	892
Land Surface Elevation Method	Interpolated From Topo Map
Well Depth (feet below land surface)	400
Well Depth Source	Person Other than Owner
Drilling Start Date	
Drilling End Date	0/0/1970
Drilling Method	Mud (Hydraulic) Rotary
Borehole Completion	

Well Type	Withdrawal of Water
Well Use	Domestic
Water Level Observation	Miscellaneous Measurements
Water Quality Available	Yes
Pump	Submersible
Pump Depth (feet below land surface)	
Power Type	Electric Motor
Annular Seal Method	
Surface Completion	
Owner	T.C.Joseph
Driller	
Other Data Available	
Well Report Tracking Number	
Plugging Report Tracking Number	
U.S. Geological Survey Site Number	
Texas Commission on Environmental Quality Source Id	
Groundwater Conservation District Well Number	
Owner Well Number	
Other Well Number	
Previous State Well Number	
Reporting Agency	Texas Water Development Board
Created Date	11/3/1994
Last Update Date	8/1/2006

Remarks	Estimated yield 10-15 GPM.
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Casing

Diameter (in.)	Casing Type	Casing Material	Schedule	Gauge	Top Depth (ft.)	Bottom Depth (ft.)
8	Blank	Steel				

Well Tests - No Data

Lithology - No Data

Annular Seal Range - No Data

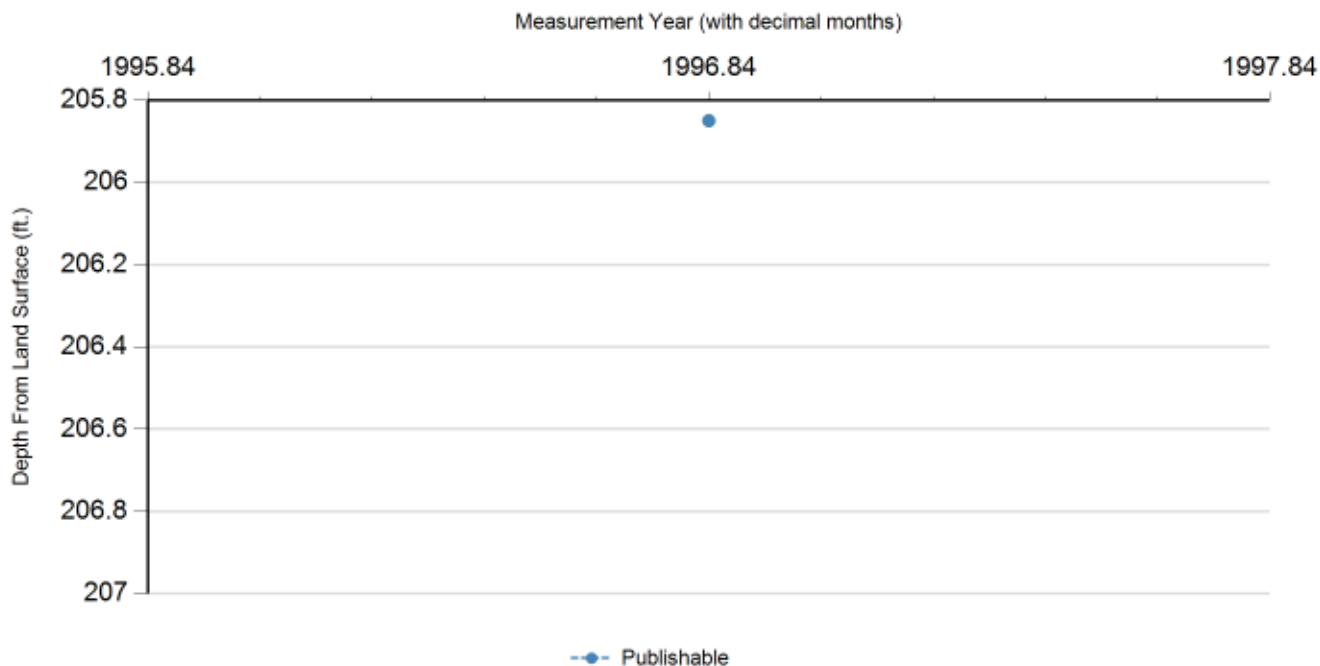
Borehole - No Data

Plugged Back - No Data

Filter Pack - No Data

Packers - No Data

Water Level Measurements



Status Code	Date	Time	Water Level (ft. below land surface)	Change value in () indicates rise in level	Water Elevation (ft. above sea level)	Meas #	Measuring Agency	Method	Remark ID	Comments
P	11/6/1996		205.85		686.15	1	Texas Water Development Board	Steel Tape		

Code Descriptions

Status Code	Status Description
P	Publishable

Water Quality Analysis

Sample Date: 3/13/1972 **Sample Time:** 0000 **Sample Number:** 1 **Collection Entity:** Texas Water Development Board

Sampled Aquifer: Hensell Sand Member of Travis Peak Formation

Analyzed Lab: Texas Department of Health **Reliability:** Collected from pumped well, but not filtered or preserved

Collection Remarks: No Data

Parameter Code	Parameter Description	Flag	Value	Units	Plus/Minus
00415	ALKALINITY, PHENOLPHTHALEIN (MG/L)		0	mg/L	
00410	ALKALINITY, TOTAL (MG/L AS CaCO3)		296	mg/L	
00440	BICARBONATE ION, CALCULATED (MG/L AS HCO3)		361.22	mg/L	
00910	CALCIUM (MG/L)		44	mg/L	
00445	CARBONATE ION, CALCULATED (MG/L AS CO3)		0	mg/L	
00940	CHLORIDE, TOTAL (MG/L AS CL)		97	mg/L	
00950	FLUORIDE, DISSOLVED (MG/L AS F)		2.3	mg/L	
00900	HARDNESS, TOTAL, CALCULATED (MG/L AS CaCO3)		249	mg/L	
00920	MAGNESIUM (MG/L)		34	mg/L	
71851	NITRATE NITROGEN, DISSOLVED, CALCULATED (MG/L AS NO3)	<	0.4	mg/L	
00400	PH (STANDARD UNITS), FIELD		7.8	SU	
00937	POTASSIUM, TOTAL (MG/L AS K)		23	mg/L	
71860	RESIDUAL SODIUM CARBONATE, CALCULATED		0.93		
00955	SILICA, DISSOLVED (MG/L AS SiO2)		15	mg/L	
00931	SODIUM ADSORPTION RATIO, CALCULATED (SAR)		4.02		
00932	SODIUM, CALCULATED, PERCENT		55	PCT	
00929	SODIUM, TOTAL (MG/L AS NA)		146	mg/L	
00094	SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM AT 25C)		1287	MICR	
00945	SULFATE, TOTAL (MG/L AS SO4)		157	mg/L	
00010	TEMPERATURE, WATER (CELSIUS)		25	C	
70301	TOTAL DISSOLVED SOLIDS , SUM OF CONSTITUENTS (MG/L)		696	mg/L	

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[Well Basic Details](#)
[Scanned Documents](#)

State Well Number	5818406
County	Williamson
River Basin	Brazos
Groundwater Management Area	8
Regional Water Planning Area	G - Brazos G
Groundwater Conservation District	
Latitude (decimal degrees)	30.705001
Latitude (degrees minutes seconds)	30° 42' 18" N
Longitude (decimal degrees)	-97.873333
Longitude (degrees minutes seconds)	097° 52' 24" W
Coordinate Source	+/- 1 Second
Aquifer Code	218HNSL - Hensell Sand Member of Travis Peak Formation
Aquifer	Trinity
Aquifer Pick Method	
Land Surface Elevation (feet above sea level)	900
Land Surface Elevation Method	Interpolated From Topo Map
Well Depth (feet below land surface)	432
Well Depth Source	Driller's Log
Drilling Start Date	
Drilling End Date	0/0/1971
Drilling Method	Cable Tool
Borehole Completion	Open Hole

Well Type	Withdrawal of Water
Well Use	Domestic
Water Level Observation	Miscellaneous Measurements
Water Quality Available	No
Pump	Submersible
Pump Depth (feet below land surface)	
Power Type	Electric Motor
Annular Seal Method	
Surface Completion	
Owner	Leland Sullins
Driller	R B Bonnet
Other Data Available	Drillers Log
Well Report Tracking Number	
Plugging Report Tracking Number	
U.S. Geological Survey Site Number	
Texas Commission on Environmental Quality Source Id	
Groundwater Conservation District Well Number	
Owner Well Number	
Other Well Number	
Previous State Well Number	
Reporting Agency	Texas Water Development Board
Created Date	11/3/1994
Last Update Date	3/13/2003

Remarks	
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Casing

Diameter (in.)	Casing Type	Casing Material	Schedule	Gauge	Top Depth (ft.)	Bottom Depth (ft.)
7	Blank	Steel			0	52
7	Open Hole				52	432

Well Tests - No Data

Lithology - No Data

Annular Seal Range - No Data

Borehole - No Data

Plugged Back - No Data

Filter Pack - No Data

Packers - No Data

Water Level Measurements



Status Code	Date	Time	Water Level (ft. below land surface)	Change value in () indicates rise in level	Water Elevation (ft. above sea level)	Meas #	Measuring Agency	Method	Remark ID	Comments
P	5/17/1976		89.15		810.85	1	Texas Water Development Board	Steel Tape		

Code Descriptions

Status Code	Status Description
P	Publishable

Water Quality Analysis - No Data Available

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STATE OF TEXAS WELL REPORT for Tracking #104692

Owner: **Wayne Christi**

Owner Well #: **No Data**

Address: **601 Oak Lane
Liberty Hill, TX 78642**

Grid #: **58-17-6**

Well Location: **601 Oak Lane
Liberty Hill, TX 78642**

Latitude: **30° 41' 36" N**

Longitude: **097° 53' 41" W**

Well County: **Williamson**

Elevation: **No Data**

Type of Work: **New Well**

Proposed Use: **Domestic**

Drilling Start Date: **8/7/2003**

Drilling End Date: **8/14/2003**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	10	0	18
	6.5	18	505

Drilling Method: **Air Hammer**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	18	6

Seal Method: **Hand Poured**

Distance to Property Line (ft.): **No Data**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **155**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **Tape Measure**

Surface Completion: **Surface Sleeve Installed**

Water Level: **359 ft. below land surface on 2003-08-14** Measurement Method: **Unknown**

Packers: **Shale Catcher 445**

Type of Pump: **Submersible**

Pump Depth (ft.): **440**

Well Tests: **Estimated** Yield: **50 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Tom Arnold Drilling**
1147 CR 170
Round Rock, TX 78664

Driller Name: **Tommy D. Arnold**

License Number: **2096**

Comments: **Logged by DT\$**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	1	Top Soil
1	8	Brown Limestone
8	19	Yellow Limestone
19	51	Gray Limestone
51	60	Brown Limestone
60	66	Blue Limestone
66	168	Gray Limestone
168	178	Blue Limestone and Shale
178	200	Brown Limestone
200	324	Gray Limestone
324	347	Blue Shale
347	360	Brown Limestone
360	365	Gray Sandstone and Shale
365	368	Blue Shale
368	405	Gray Sandstone
405	475	Gray and White Sand and Sandstone
475	480	Gray Sandstone

<i>Dia. (in.)</i>	<i>New/Used</i>	<i>Type</i>	<i>Setting From/To (ft.)</i>
6 N	Plastic	0/18	
4 1/2 N	Plastic	0/505	
Perf.	445/485		

480	492	Gray Limestone
492	505	Green Limestone

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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P.O. Box 12157
Austin, TX 78711
(512) 463-7880**

STATE OF TEXAS WELL REPORT for Tracking #113990

Owner:	R H BALZEN	Owner Well #:	No Data
Address:	309 BLESSING RANCH ROAD LIBERTY HILL, TX 78642	Grid #:	58-17-3
Well Location:	719 LACKEY CREEK RD SAME, TX 78642	Latitude:	30° 42' 56" N
Well County:	Williamson	Longitude:	097° 54' 38" W
		Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **4/19/2004** Drilling End Date: **5/3/2004**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	12	0	18
	6.5	15	382

Drilling Method: **Air Hammer**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	18	8
	0	22	5

Seal Method: **HAND POURED**

Distance to Property Line (ft.): **No Data**

Sealed By: **TOM ARNOLD DRILLING**

Distance to Septic Field or other
concentrated contamination (ft.): **110**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **TAPE MEASURE**

Surface Completion: **Surface Sleeve Installed**

Water Level: **245 ft. below land surface on 2004-05-03** Measurement Method: **Unknown**

Packers: **SHALE 362 342 22
TRAP**

Type of Pump: **No Data**

Well Tests: **Estimated** Yield: **100 GPM**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **TOM ARNOLD DRILLING**
1147 CR 170
ROUND ROCK, TX 78664

Driller Name: **Tommy Arnold**

License Number: **2096**

Comments: **LCS\$**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

Top (ft.)	Bottom (ft.)	Description
0	1	TOPSOIL
1	6	LOOSE ROCK
6	13	YELLOW LIMETONE
13	65	BLUE LIMESTONE & SHALE
65	78	BROWN LIMESTONE
78	107	GREY LIMESTONE
107	121	BROWN LIMESTONE
121	210	GREY LIMESTONE
210	214	BLUE LIMESTONE & SHALE
214	266	GREY LIMESTONE
266	275	BROWN LIMESTONE
275	285	BLUE LIMESTONE & SHALE
285	309	GREY LIMESTONE
309	320	GREY SANDSTONE
320	333	GREY SAND
333	345	GREEN SANDSTONE
345	350	GREY SAND
350	362	GREY SANDSTONE

Dia. (in.)	New/Used	Type	Setting From/To (ft.)
8	NEW	PLASTIC	0 18
4 1/2	NEW	PLASTIC	0 382
PERF	362	382	

362	380	GREY SAND
380	382	WHITE LIMESTONE

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STATE OF TEXAS WELL REPORT for Tracking #156930

Owner:	Bill Warren	Owner Well #:	No Data
Address:	6702 Mesa Drive Austin, TX 78731	Grid #:	58-17-3
Well Location:	C.R. 211 Liberty Hill, TX 78642	Latitude:	30° 42' 48" N
Well County:	Williamson	Longitude:	097° 53' 28" W
		Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **8/10/2008** Drilling End Date: **8/10/2008**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	9	0	40
	6	40	420

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	40	8

Seal Method: **Slurry**

Sealed By: **Driller**

Distance to Property Line (ft.): **50+**

Distance to Septic Field or other
concentrated contamination (ft.): **100+**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **Owner**

Surface Completion: **Surface Sleeve Installed**

Water Level: **No Data**

Packers: **3 PVC & Burlap @ 40', 335', 340'**

Type of Pump: **Submersible**

Well Tests: **Jetted** **Yield: 30 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
40	Hensell

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Western Water Wells**
500 Southland Dr.
Burnet, TX 78611

Driller Name: **Frank Glass**

License Number: **1313**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	1	Top Soil
1	20	Caliche & Lime
20	65	Blue Lime
65	275	Gray Lime
275	300	Hensell Sand & Clay
300	340	Brown Lime
340	420	Hensell Sand

<i>Dia. (in.)</i>	<i>New/Used</i>	<i>Type</i>	<i>Setting From/To (ft.)</i>
5 OD New Plastic +2 to 420 17,40			

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(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #183538

Owner: **Kathy Adams**

Owner Well #: **No Data**

Address: **480 Liberty Drive
Liberty Hill, TX 78642**

Grid #: **58-17-6**

Well Location: **480 Liberty Drive
Liberty Hill, TX 78642**

Latitude: **30° 41' 27" N**

Longitude: **097° 53' 17" W**

Well County: **Williamson**

Elevation: **No Data**

Type of Work: **New Well**

Proposed Use: **Domestic**

Drilling Start Date: **9/16/2004**

Drilling End Date: **9/19/2004**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	9	0	25
	6	25	483

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	25	6

Seal Method: **Gravity Feed**

Distance to Property Line (ft.): **No Data**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **100+**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **Visual**

Surface Completion: **Surface Sleeve Installed**

Water Level: **335 ft. below land surface on 2004-09-19** Measurement Method: **Unknown**

Packers: **Rubber 45',400'**

Type of Pump: **No Data**

Well Tests: **Jetted** **Yield: 30 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
No Data	Good

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Harrison Drilling**
P. O. Box 986
Lampasas, TX 76550

Driller Name: **Juan Munoz** License Number: **54176**

Comments: **\$dfs**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	25	Overburden
25	180	Gray Shale
180	182	Hard Limestone
182	194	Sandstone
194	364	Gray Shale
364	434	Hard Limestone
434	453	Sand (water)
453	483	Hard White Limestone

<i>Dia. (in.)</i>	<i>New/Used</i>	<i>Type</i>	<i>Setting From/To (ft.)</i>
6	New	Sch40 PVC	0 25
4.5	New	SDR 17 PVC	3 483
Perforated		423	483

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STATE OF TEXAS WELL REPORT for Tracking #200509

Owner: **Smetzer, Jack**
Address: **1351 CR 257**
Liberty Hill, TX 78624
Well Location: **1351 CR 257**
Liberty Hill, TX 78647
Well County: **Williamson**

Owner Well #: **1**
Grid #: **58-18-4**
Latitude: **30° 42' 16" N**
Longitude: **097° 52' 23" W**
Elevation: **No Data**

Type of Work: **New Well**

Proposed Use: **Domestic**

Drilling Start Date: **9/30/2009**

Drilling End Date: **9/30/2009**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	12	0	22
	6.75	22	460

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	5	3 Cement
	5	30	4 Benseal

Seal Method: **Gravity Feed**

Distance to Property Line (ft.): **50+**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **100+**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **Measured**

Surface Completion: **Surface Sleeve Installed**

Water Level: **313 ft. below land surface on 2009-09-30** Measurement Method: **Unknown**

Packers: **Shale 380'-370'**
Cement 30'

Type of Pump: **Submersible** Pump Depth (ft.): **400**

Well Tests: **Jetted** Yield: **33 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
390-460	Trinity

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Tom Lovelace Water Well Serv.**
4997 Elm Grove Rd.
Belton, TX 76513

Driller Name: **Jimmy Okun**

License Number: **55015**

Comments: **^EO**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	20	over burden
20	380	gray lime & shale
380	390	gray & brown sandy lime
390	420	water sand
420	450	white lime & green sandy shale
450	460	brown & gray lime

<i>Dia. (in.)</i>	<i>New/Used</i>	<i>Type</i>	<i>Setting From/To (ft.)</i>
4 1/2"	New	Plastic Solid	+2'-390'
4 12/"	New	Plastic MFG Screen	390'-460' .032

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STATE OF TEXAS WELL REPORT for Tracking #217783

Owner: **Waldrop, Robert**

Owner Well #: **#1**

Address: **750 CR 107
Liberty Hill, TX 78642**

Grid #: **58-17-3**

Well Location: **750 CR 107
Liberty Hill, TX 78642**

Latitude: **30° 43' 19" N**

Longitude: **097° 53' 45" W**

Well County: **Williamson**

Elevation: **No Data**

Type of Work: **New Well**

Proposed Use: **Domestic**

Drilling Start Date: **4/5/2010**

Drilling End Date: **4/5/2010**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	9	0	20
	6	20	440

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	40	15 Cement

Seal Method: **Gravity**

Distance to Property Line (ft.): **50+**

Sealed By: **Alpine**

Distance to Septic Field or other
concentrated contamination (ft.): **None**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **Owner**

Surface Completion: **Surface Sleeve Installed**

Water Level: **250 ft. below land surface on 2010-04-05** Measurement Method: **Unknown**

Packers: **Rubber 100'
Rubber 200'
Rubber 300'**

Type of Pump: **Submersible**

Pump Depth (ft.): **400**

Well Tests: **Estimated** **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
360-380	Trinity

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **Unknown**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Alpine Water Well**
10121 IH-35
Jarrell, TX 76537

Driller Name: **Bob Strok**

License Number: **2912**

Comments: **^EO**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

Top (ft.)	Bottom (ft.)	Description
0	2	brown topsoil
2	12	clay & caliche
12	30	sand-gravel
30	300	grey shale
300	360	limestone
360	380	water sand
380	440	limestone

Dia. (in.)	New/Used	Type	Setting From/To (ft.)
6 5/8"	N	Steel	+2'-20'
4 1/2"	N	PVC	+1'-400'
4 1/2"	N	PVC Slotted	400'-440'

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(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #244348

Owner:	B & B Rentals	Owner Well #:	No Data
Address:	4309 Blessing Ranch Road Liberty, TX 78642	Grid #:	58-17-6
Well Location:	706 CR 201 Liberty Hill, TX 78642	Latitude:	30° 41' 45" N
Well County:	Williamson	Longitude:	097° 54' 31" W
		Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **7/18/2006** Drilling End Date: **8/18/2006**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8	0	20
	6.5	20	525

Drilling Method: **Air Hammer**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	20	8

Seal Method: **Hand Poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **137**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **Tape Measure**

Surface Completion: **Surface Sleeve Installed**

Water Level: **420 ft. below land surface on 2006-08-18** Measurement Method: **Unknown**

Packers: **Shale Trap 20',465',500'**

Type of Pump: **No Data**

Well Tests: **Estimated Yield: 25 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Tom Arnold Drilling**
1147 CR 170
Round Rock, TX 78664

Driller Name: **Tommy D. Arnold**

License Number: **2096**

Comments: **\$dfs**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	1	Top Soil
1	12	Yellow Limestone
12	59	Gray Limestone
59	101	Brown Limestone
101	189	Gray Limestone
189	190	Blue Limestone and Shale
190	305	Gray Limestone
305	307	Blue Limestone and Shale
307	370	Gray Limestone
370	380	Gray Sandstone
380	410	Gray Sandstone and Sand
410	460	Brown Sandstone
460	465	Gray Sand
465	484	Gray sand and Sandstone
484	500	Green Limestone and Shale
500	508	Gray Sand
508	525	White Limestone

<i>Dia. (in.)</i>	<i>New/Used</i>	<i>Type</i>	<i>Setting From/To (ft.)</i>
4 1/2	New	Plastic	0 525
		Perforated	465 485
		Perforated	505 525

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(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #265218

Owner: **Quint Cardwell**

Owner Well #: **No Data**

Address: **600 Cole Dr.
Liberty Hill, TX 78642**

Grid #: **58-17-6**

Well Location: **600 Cole Dr.
Liberty Hill, TX 78642**

Latitude: **30° 41' 52" N**

Longitude: **097° 53' 13" W**

Well County: **Williamson**

Elevation: **No Data**

Type of Work: **New Well**

Proposed Use: **Irrigation**

Drilling Start Date: **8/16/2011**

Drilling End Date: **8/17/2011**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	9	0	25
	6.75	25	560

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	40	14

Seal Method: **gravity poured**

Distance to Property Line (ft.): **55+**

Sealed By: **ADC**

Distance to Septic Field or other
concentrated contamination (ft.): **100+**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **tape**

Surface Completion: **Surface Sleeve Installed**

Water Level: **366 ft. below land surface on 2011-09-12** Measurement Method: **Unknown**

Packers: **neoprene rubber and burlap 400' and 40'**

Type of Pump: **Submersible**

Pump Depth (ft.): **500**

Well Tests: **Jetted** **Yield: 35 GPM**

	<i>Description (number of sacks & material)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Plug Information:	n/a		

Water Quality:

Strata Depth (ft.)	Water Type
430-490	trinity

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Associated Drilling Inc.**
12928 Lowden Ln.
Manchaca, TX 78652

Driller Name: **James Benoit**

License Number: **4064**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

Top (ft.)	Bottom (ft.)	Description
0	2	topsoil/bedrock
2	15	white limestone
15	180	grey lime
180	195	tan lime
195	280	grey lime
280	285	grey clay
285	360	grey lime
360	390	tan limestone
390	430	grey limestone
430	490	course sand
490	520	tan limestone
520	560	grey limestone

Dia. (in.)	New/Used	Type	Setting From/To (ft.)
50d	new	sdr17pvc	-2 to 520
50d	new	sdr17pvc screen (.032)	520-560

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STATE OF TEXAS WELL REPORT for Tracking #282218

Owner:	Ron Petru	Owner Well #:	#1
Address:	261 Buckskin Blvd. Liberty Hill, TX 78642	Grid #:	58-17-6
Well Location:	261 Buckskin Blvd. Liberty Hill, TX 78642	Latitude:	30° 42' 24" N
Well County:	Williamson	Longitude:	097° 54' 57" W
		Elevation:	985 ft. above sea level
Type of Work:	New Well	Proposed Use:	Irrigation

Drilling Start Date: **12/30/2011** Drilling End Date: **1/21/2012**

Borehole:	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
	10	0	10
	6.75	10	520

Drilling Method: **Air Hammer; Air Rotary**

Borehole Completion: **Open Hole**

Annular Seal Data:	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
	1	30	6 / Cement

Seal Method: **Slurry and poured**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **Tape - wheel**

Surface Completion: **Pitless Adapter Used**

Water Level: **No Data**

Packers: **Neoprene 30'
Neoprene 395' and 400'**

Type of Pump: **Submersible**

Well Tests: **Jetted Yield: 30 GPM**

Plug Information:	Description (number of sacks & material)	Top Depth (ft.)	Bottom Depth (ft.)
	N/A		

Water Quality:

Strata Depth (ft.)	Water Type
No Data	Fresh

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Bee Cave Drilling**
185 Angelfire Drive
Dripping Springs, TX 78620

Driller Name: **Charles Coffindaffer #58658**

License Number: **58658**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

From (ft)	To (ft)	Description
0	4	Surface rock
4	10	Caliche
10	200	White limestone
200	270	Grey limestone
270	350	White limestone
350	420	Grey sandstone-1st H2O 20 gpm
420	470	Grey / white sandstone-2nd H2O
		30 gpm
470	485	White sandstone with black rock
485	495	White / grey sandstone
495	520	Grey sandstone-3rd H2O 30 gpm
		600 TDS

Dia. (in.)	New/Used	Type	Setting From/To (ft.)
4.5	New	Plastic	0 to 480'
4.5	New	Screen	Mfg. 480' to 520' .050

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Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #289414

Owner:	John Solis	Owner Well #:	No Data
Address:	1125 CR 257 Liberty Hill, TX 78642	Grid #:	58-18-4
Well Location:	1125 Cr 257 Liberty Hill, TX 78642	Latitude:	30° 42' 07" N
Well County:	Williamson	Longitude:	097° 52' 10" W
		Elevation:	902 ft. above sea level
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **6/7/2012**

Drilling End Date: **6/7/2012**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8	0	440

Drilling Method: **Air Hammer**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	20	4 Cement

Seal Method: **Poured Slurry**

Distance to Property Line (ft.): **50+**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **100+**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **Estimated**

Surface Completion: **Surface Sleeve Installed**

Water Level: **290 ft. below land surface on 2012-06-07** Measurement Method: **Unknown**

Packers: **Rubber 360
Rubber 20**

Type of Pump: **Submersible**

Well Tests: **Estimated** **Yield: 50 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Highland Drilling Inc**
4145 Hwy 29 E
Burnet, TX 78611

Driller Name: **Clifford Bohannon**

License Number: **4386**

Apprentice Name: **Kenneth Allen Jr**

Apprentice Number: **58232**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	1	Topsoil
1	12	Calechy
12	360	Blue Shale
360	410	Sand w/ Blue Shale Stringers
410	440	Blue Shale

<i>Dia. (in.)</i>	<i>New/Used</i>	<i>Type</i>	<i>Setting From/To (ft.)</i>
4.5	New	PVC	0-380 SDR-17
4.5	New	Pefr PVC	380-420 SDR-17
4.5	New	PVC	420-440 SDR-17

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Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #291274

Owner:	BARBARA WESSEL	Owner Well #:	1
Address:	135 SOUTH SHOW HORSE LIBERTY HILL, TX 78642	Grid #:	58-17-5
Well Location:	135 SOUTH SHOW HORSE LIBERTY HILL, TX 78642	Latitude:	30° 41' 31" N
Well County:	Williamson	Longitude:	097° 55' 01" W
		Elevation:	1078 ft. above sea level
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **5/21/2012** Drilling End Date: **5/23/2012**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	9.75	0	20
	6.25	20	580

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	20	5

Seal Method: **MIXED**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed**

Water Level: **402 ft. below land surface on 2012-05-23** Measurement Method: **Unknown**

Packers: **RUBBER 40'**
RUBBER 400'
RUBBER 500'

Type of Pump: **Submersible**

Well Tests: **Jetted** **Yield: 35 GPM**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	TRINITY

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **HILL COUNTRY WATER WELL**

**POBOX 220
BRIGGS, TX 78608**

Driller Name: **JOE MCDEARMON**

License Number: **2334**

Apprentice Name: **COTY BLAIR**

Apprentice Number: **59037**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

Top (ft.)	Bottom (ft.)	Description
0	18	CALICHE
18	180	GRAY LIME
180	185	GRAY SHALE
185	280	BROWN LIME
280	420	GRAY LIME
420	425	GRAY SHALE
425	460	GRAY LIME
460	490	BROWN LIME
490	495	SAND
495	515	SANDSTONE
515	525	TRINITY SAND
525	545	SANDSTONE
545	550	TRINITY SAND
550	570	SANDSTONE
570	575	TRINITY SAND
575	580	SANDSTONE

Dia. (in.)	New/Used	Type	Setting From/To (ft.)
4.5	NEW	PLASTIC	0/580 SDR17
4.5	NEW	SCREEN	520 & 560 .032

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Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #376899

Owner: **Running W Land Co. S. Watson**

Owner Well #: **No Data**

Address: **777 Oak Lane
Liberty Hill, TX 78642**

Grid #: **58-17-6**

Well Location: **777 Oak Lane
Liberty Hill, TX 78642**

Latitude: **30° 41' 24" N**

Longitude: **097° 53' 54" W**

Well County: **Williamson**

Elevation: **No Data**

Type of Work: **New Well**

Proposed Use: **Stock**

Drilling Start Date: **8/14/2014**

Drilling End Date: **8/14/2014**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	9	0	50
	6.25	50	625

Drilling Method: **Air Rotary**

Borehole Completion: **cased; Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	1	50	6cmt 2gel

Seal Method: **hand poured**

Distance to Property Line (ft.): **75+**

Sealed By: **ADC**

Distance to Septic Field or other
concentrated contamination (ft.): **300+**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **owner**

Surface Completion: **Surface Sleeve Installed**

Water Level: **413 ft. below land surface on 2014-08-14** Measurement Method: **Unknown**

Packers: **burlap,plastic,rubber @ 485,465,50**

Type of Pump: **Submersible**

Pump Depth (ft.): **0**

Well Tests: **Jetted** **Yield: 10-12 GPM**

	<i>Description (number of sacks & material)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Plug Information:	n/a		

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
505-570	Glen Rose

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Associated Drilling Inc.**
PO Box 673
Dripping Springs, TX 78620

Driller Name: **James Benoit** License Number: **4064**

Comments: **Bud Dobson**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	20	white limestone
20	505	gray lime few strips of shale
505	570	tan and white limestone
570	615	gray and white limestone
615	625	gray shale

<i>Dia. (in.)</i>	<i>New/Used</i>	<i>Type</i>	<i>Setting From/To (ft.)</i>
5 od	new	sdr17 pvc	-3 to 545
5 od	new	sdr17 pvc (.032)	screen 545 to 605
5 od	new	sdr17 pvc	605 to 625

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P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #42885

Owner:	BILL BALZEN	Owner Well #:	No Data
Address:	400 HIDDEN BEAR LIBERTY HILL, TX 78642	Grid #:	58-17-3
Well Location:	400 HIDDEN BEAR LIBERTY HILL, TX 78642	Latitude:	30° 42' 55" N
Well County:	Williamson	Longitude:	097° 54' 46" W
		Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **4/12/2004** Drilling End Date: **4/13/2004**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8	0	19
	6.5	19	385

Drilling Method: **Air Hammer**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	20	7

Seal Method: **HAND POURED**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **120**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **TAPE MEASURE**

Surface Completion: **Surface Sleeve Installed**

Water Level: **243 ft. below land surface on 2004-04-13** Measurement Method: **Unknown**

Packers: **SHALE TRAP 345'**

Type of Pump: **No Data**

Well Tests: **Estimated** **Yield: 100 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **TOM ARNOLD DRILLING**
1147 CR 170
ROUND ROCK, TX 78664

Driller Name: **TOMMY D ARNOLD**

License Number: **2096**

Comments: **DG**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	2	TOP SOIL
2	13	YELLOW LIMESTONE
13	28	BLUE LIMESTONE & SHALE
28	87	GRAY LIMESTONE
87	100	BLUE LIMESTONE
100	300	GRAY LIMESTONE
300	310	GRAY SANDSTONE
310	320	GRAY SAND & SANDSTONE
320	328	GRAY SANDSTONE
328	338	GRAY SAND
338	345	GRAY SANDSTONE & SHALE
345	360	GRAY SAND
360	385	WHITE SANDSTONE & SAND

<i>Dia. (in.)</i>	<i>New/Used</i>	<i>Type</i>	<i>Setting From/To (ft.)</i>
4.5	N	PLASTIC	0-385
PERF.			345-365

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(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #42888

Owner:	R.H. BALZEN	Owner Well #:	No Data
Address:	309 BLESSING RANCH ROAD LIBERTY HILL, TX 78642	Grid #:	58-17-3
Well Location:	715 LACKY CREEK ROAD LIBERTY HILL, TX 78642	Latitude:	30° 42' 56" N
Well County:	Williamson	Longitude:	097° 54' 41" W
		Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **4/15/2004** Drilling End Date: **4/16/2004**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	12	0	22
	6.5	20	402

Drilling Method: **Air Hammer**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	22	10
	0	22	4

Seal Method: **HAND POURED**

Distance to Property Line (ft.): **No Data**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **132**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **TAPE MEASURE**

Surface Completion: **Surface Sleeve Installed**

Water Level:	241 ft. below land surface on 2004-04-16	Measurement Method:	Unknown
Packers:	SHALE TRAP 363', 343'		
Type of Pump:	No Data		
Well Tests:	Estimated	Yield: 100 GPM	

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **TOM ARNOLD DRILLING**
1147 CR 170
ROUND ROCK, TX 78664

Driller Name: **TOMMY D ARNOLD**

License Number: **2096**

Comments: **^DG**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	2	TOP SOIL
2	12	YELLOW LIMESTONE & GRAVEL
12	144	GRAY LIMESTONE
144	160	BROWN LIMESTONE
160	305	GRAY LIMESTONE
305	320	GREEN SHALE & SANDSTONE
320	330	GRAY SANDSTONE & SAND
330	342	GREEN SANDSTONE & SHALE
342	363	WHITE SANDSTONE & SAND
363	375	GRAY SAND
375	384	WHITE LIMESTONE
384	402	GREEN LIMESTONE

<i>Dia. (in.)</i>	<i>New/Used</i>	<i>Type</i>	<i>Setting From/To (ft.)</i>
8 N	STEEL	0-22	
6 N	PLASTIC	0-22	
4 N	PLASTIC	0-402	
PERF.	363-383		

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P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #443462

Owner:	Paul Qwilliam	Owner Well #:	No Data
Address:	Lackey Creek Subdivision Lot C-7 Liberty Hill, TX 78642	Grid #:	58-17-3
Well Location:	Lackey Creek Subdivision Lot C-7 Liberty Hill, TX 78642	Latitude:	30° 43' 00.48" N
		Longitude:	097° 54' 46.17" W
Well County:	Williamson	Elevation:	933 ft. above sea level
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **12/26/2016** Drilling End Date: **12/27/2016**

Borehole:	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
	9.75	0	20
	8	20	120
	6.75	120	440

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

Annular Seal Data:	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
	0	120	Cement 13 Bags/Sacks

Seal Method: **Pressure**

Sealed By: **Driller**

Variance Number: **NO DATA**

Distance to Property Line (ft.): **NO DATA**

Distance to Septic Field or other
concentrated contamination (ft.): **NO DATA**

Distance to Septic Tank (ft.): **NO DATA**

Method of Verification: **NO DATA**

Surface Completion: **Surface Sleeve Installed**

Surface Completion by Driller

Water Level: **189 ft. below land surface on 2016-12-27** Measurement Method: **Electric Line**

Packers: **Rubber at 120 ft.
Rubber at 300 ft.
Rubber at 320 ft.**

Type of Pump: **Submersible** Pump Depth (ft.): **400**

Well Tests: **Jetted** Yield: **60 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
340 - 440	Trinity

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **HILL COUNTRY WATER WELL**
POBOX 220
BRIGGS, TX 78608

Driller Name: **Joe E. McDearmon**

License Number: **2334**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	440	0-10 Caliche, 10-100 Gray Lime, 100-180 Brown Lime, 180-220 Gray Lime, 220-280 Brown Lime, 280-285 Gray Shale, 285-340 Sandstone, 340-345 Trinity Sand, 345-380 Sandstone, 380-385 Trinity Sand, 385-420 Sandstone, 420-425 Trinity Sand, 425-440 Sandstone

<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
4.5	Blank	New Plastic (PVC)	SDR-17 0.032	380	420

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Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #443464

Owner:	Paul Qwilliam	Owner Well #:	No Data
Address:	Lackey Creek Subdivision Lot C-8 Liberty Hill, TX 78642	Grid #:	58-17-3
Well Location:	Lackey Creek Subdivision Lot C-8 Liberty Hill, TX 78642	Latitude:	30° 43' 00.78" N
		Longitude:	097° 54' 45.71" W
Well County:	Williamson	Elevation:	935 ft. above sea level
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **1/4/2017**

Drilling End Date: **1/5/2017**

Borehole:	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
	9.75	0	20
	8	20	120
	6.75	120	440

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

Annular Seal Data:	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
	0	120	Cement 14 Bags/Sacks

Seal Method: **Pressure**

Distance to Property Line (ft.): **NO DATA**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **NO DATA**

Variance Number: **NO DATA**

Distance to Septic Tank (ft.): **NO DATA**

Method of Verification: **NO DATA**

Surface Completion: **Surface Sleeve Installed**

Surface Completion by Driller

Water Level: **190 ft. below land surface on 2017-01-05** Measurement Method: **Electric Line**

Packers: **Rubber at 120 ft.
Rubber at 300 ft.
Rubber at 320 ft.**

Type of Pump: **Submersible**

Pump Depth (ft.): **400**

Well Tests: **Jetted** **Yield: 60 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
340 - 440	Trinity

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **HILL COUNTRY WATER WELL**
POBOX 220
BRIGGS, TX 78608

Driller Name: **Joe E. McDearmon**

License Number: **2334**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	440	0-10 Caliche, 10-100 Gray Lime, 100-180 Brown Lime, 180-220 Gray Lime, 220-280 Brown Lime, 280-285 Gray Shale, 285-340 Sandstone, 340-345 Trinity Sand, 345-380 Sandstone, 380-385 Trinity Sand, 385-420 Sandstone, 420-425 Trinity Sand, 425-440 Sandstone

<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
4.5	Blank	New Plastic (PVC)	SDR-17 0.032	380	420

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

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Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #443628

Owner:	Paul Qwilliam	Owner Well #:	No Data
Address:	Lackey Creek Subdivision Lot C-7 Liberty Hill, TX 78642	Grid #:	58-17-3
Well Location:	Lackey Creek Subdivision Lot C-7 Liberty Hill, TX 78642	Latitude:	30° 43' 00.48" N
		Longitude:	097° 54' 46.17" W
Well County:	Williamson	Elevation:	933 ft. above sea level
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **12/26/2016** Drilling End Date: **12/27/2016**

Borehole:	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
	9.75	0	20
	8	20	120
	6.75	120	440

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

Annular Seal Data:	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
	0	120	Cement 13 Bags/Sacks

Seal Method: **Pressure**

Sealed By: **Driller**

Variance Number: **NO DATA**

Distance to Property Line (ft.): **NO DATA**

Distance to Septic Field or other
concentrated contamination (ft.): **NO DATA**

Distance to Septic Tank (ft.): **NO DATA**

Method of Verification: **NO DATA**

Surface Completion: **Surface Sleeve Installed**

Surface Completion by Driller

Water Level: **189 ft. below land surface on 2016-12-27** Measurement Method: **Electric Line**

Packers: **Rubber at 120 ft.
Rubber at 300 ft.
Rubber at 320 ft.**

Type of Pump: **Submersible** Pump Depth (ft.): **360**

Well Tests: **Jetted** Yield: **60 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
340 - 400	Trinity

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **HILL COUNTRY WATER WELL**
POBOX 220
BRIGGS, TX 78608

Driller Name: **Joe E. McDearmon**

License Number: **2334**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	440	0-10 Caliche, 10-100 Gray Lime, 100-175 Brown Lime, 175-178 Gray Shale, 178-280 Gray Lime, 280-340 Sandstone, 340-345 Trinity Sand, 345-355 Sandstone, 355-360 Trinity Sand, 360-375 Sandstone, 375-378 Trinity Sand, 378-400 Sandstone

<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
4.5	Blank	New Plastic (PVC)	SDR-17 0.032	380	400

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Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #443631

Owner:	Paul Qwilliam	Owner Well #:	No Data
Address:	Lackey Creek Subdivision Lot C-7 Liberty Hill, TX 78642	Grid #:	58-17-3
Well Location:	Lackey Creek Subdivision Lot C-7 Liberty Hill, TX 78642	Latitude:	30° 43' 00.48" N
		Longitude:	097° 54' 46.17" W
Well County:	Williamson	Elevation:	933 ft. above sea level
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **12/26/2016** Drilling End Date: **12/27/2016**

Borehole:	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
	9.75	0	20
	8	20	120
	6.75	120	400

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

Annular Seal Data:	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
	0	120	Cement 13 Bags/Sacks

Seal Method: **Pressure**

Sealed By: **Driller**

Variance Number: **NO DATA**

Distance to Property Line (ft.): **NO DATA**

Distance to Septic Field or other
concentrated contamination (ft.): **NO DATA**

Distance to Septic Tank (ft.): **NO DATA**

Method of Verification: **NO DATA**

Surface Completion: **Surface Sleeve Installed**

Surface Completion by Driller

Water Level: **189 ft. below land surface on 2016-12-27** Measurement Method: **Electric Line**

Packers: **Rubber at 120 ft.
Rubber at 300 ft.
Rubber at 320 ft.**

Type of Pump: **Submersible**

Pump Depth (ft.): **360**

Well Tests: **Jetted** **Yield: 60 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
340 - 400	Trinity

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **HILL COUNTRY WATER WELL**
POBOX 220
BRIGGS, TX 78608

Driller Name: **Joe E. McDearmon**

License Number: **2334**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	440	0-10 Caliche, 10-100 Gray Lime, 100-175 Brown Lime, 175-178 Gray Shale, 178-280 Gray Lime, 280-340 Sandstone, 340-345 Trinity Sand, 345-355 Sandstone, 355-360 Trinity Sand, 360-375 Sandstone, 375-378 Trinity Sand, 378-400 Sandstone

<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
4.5	Blank	New Plastic (PVC)	SDR-17 0.032	380	400

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Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #444408

Owner:	Paul & Sarah Gwilliam Sierra Hills	Owner Well #:	No Data
Address:	111 Independence Liberty Hill, TX 78642	Grid #:	58-17-3
Well Location:	Lackey Creek Subdivision Lot C-7 Liberty Hill, TX 78642	Latitude:	30° 43' 00.48" N
Well County:	Williamson	Longitude:	097° 54' 46.17" W
		Elevation:	933 ft. above sea level
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **12/26/2016** Drilling End Date: **12/27/2016**

Borehole:	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
	9.75	0	20
	8	20	120
	6.75	120	400

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

Annular Seal Data:	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
	0	120	Cement 13 Bags/Sacks

Seal Method: **Pressure**

Sealed By: **Driller**

Variance Number: **NO DATA**

Distance to Property Line (ft.): **NO DATA**

Distance to Septic Field or other
concentrated contamination (ft.): **NO DATA**

Distance to Septic Tank (ft.): **NO DATA**

Method of Verification: **NO DATA**

Surface Completion: **Surface Sleeve Installed**

Surface Completion by Driller

Water Level: **189 ft. below land surface on 2016-12-27** Measurement Method: **Electric Line**

Packers: **Rubber at 120 ft.
Rubber at 300 ft.
Rubber at 320 ft.**

Type of Pump: **Submersible**

Pump Depth (ft.): **360**

Well Tests: **Jetted** **Yield: 60 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
340 - 400	Trinity

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **HILL COUNTRY WATER WELL**
POBOX 220
BRIGGS, TX 78608

Driller Name: **Joe E. McDearmon**

License Number: **2334**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	440	0-10 Caliche, 10-100 Gray Lime, 100-175 Brown Lime, 175-178 Gray Shale, 178-280 Gray Lime, 280-340 Sandstone, 340-345 Trinity Sand, 345-355 Sandstone, 355-360 Trinity Sand, 360-375 Sandstone, 375-378 Trinity Sand, 378-400 Sandstone

<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
4.5	Blank	New Plastic (PVC)	SDR-17 0.032	380	400

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P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #444409

Owner:	Paul & Sarah Gwilliam Sierra Hills	Owner Well #:	No Data
Address:	111 Independence Liberty Hill, TX 78642	Grid #:	58-17-3
Well Location:	Lackey Creek Subdivision Lot C-8 Liberty Hill, TX 78642	Latitude:	30° 43' 00.78" N
Well County:	Williamson	Longitude:	097° 54' 45.71" W
		Elevation:	935 ft. above sea level
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **1/4/2017**

Drilling End Date: **1/5/2017**

Borehole:	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
	9.75	0	20
	8	20	120
	6.75	120	400

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

Annular Seal Data:	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
	0	120	Cement 14 Bags/Sacks

Seal Method: **Pressure**

Distance to Property Line (ft.): **NO DATA**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **NO DATA**

Variance Number: **NO DATA**

Distance to Septic Tank (ft.): **NO DATA**

Method of Verification: **NO DATA**

Surface Completion: **Surface Sleeve Installed**

Surface Completion by Driller

Water Level: **190 ft. below land surface on 2017-01-05** Measurement Method: **Electric Line**

Packers: **Rubber at 120 ft.
Rubber at 300 ft.
Rubber at 320 ft.**

Type of Pump: **Submersible**

Pump Depth (ft.): **360**

Well Tests: **Jetted** Yield: **60 GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
340 - 440	Trinity

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **HILL COUNTRY WATER WELL**
POBOX 220
BRIGGS, TX 78608

Driller Name: **Joe E. McDearmon**

License Number: **2334**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	440	0-10 Caliche, 10-100 Gray Lime, 100-180 Brown Lime, 180-182 Gray Shale, 182-275 Gray Lime, 275-350 Sandstone, 350-355 Trinity Sand, 355-365 Sandstone, 365-370 Trinity Sand, 370-385 Sandstone, 385-390 Trinity Sand, 390-400 Sandstone

<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
4.5	Blank	New Plastic (PVC)	SDR-17 0.032	380	400

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Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #445176

Owner:	AQUA TEXAS	Owner Well #:	No Data
Address:	SAN GABRIEL #4 1106 CLAYTON LANE STE 400W AUSTIN, TX 78723	Grid #:	58-17-3
Well Location:	608 SAN GABRIEL RANCH ROAD LIBERTY HILL, TX 78642	Latitude:	30° 42' 35" N
Well County:	Williamson	Longitude:	097° 54' 27" W
		Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Public Supply

Drilling Start Date: **1/13/2017**

Drilling End Date: **2/20/2017**

Plans Approved by TCEQ - YES
PWS# 2460046

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	12.25	0	505

Drilling Method: **Air Rotary**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	335	505	Sand	12-20

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	335	Cement 167 Bags/Sacks
	335	340	Bentonite 6 Bags/Sacks

Seal Method: **Positive Displacement**

Distance to Property Line (ft.): **150+**

Sealed By: **BASIC/HYDRO**

Distance to Septic Field or other
concentrated contamination (ft.): **N/A**

Distance to Septic Tank (ft.): **N/A**

Method of Verification: **TAPE**

Surface Completion: **Surface Slab Installed**

Surface Completion NOT by Driller

Water Level: **320 ft. below land surface on 2017-02-16** Measurement Method: **Electric Line**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **Jetted** **Yield: 60+ GPM**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
380 - 450	GOOD

Chemical Analysis Made: **Yes**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Hydro Resources Mid-Continent, Inc.**

**31866 RR 12
DRIPPING SPRINGS, TX 78620**

Driller Name: **CANON KUTSCHER**

License Number: **58773**

Comments: **No Data**

Report Amended on 3/23/2017 by Request #21017

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	10	TOPSOIL & LOOSE ROCK
10	20	YELLOW LIMESTONE
20	160	LIGHT BLUE LIMESTONE
160	175	LIGHT BROWN LIMESTONE
175	320	LIGHT BLUE LIMESTONE
320	400	GRAY & GREEN LIMESTONE
400	420	LIGHT BROWN LIMESTONE & SAND
420	430	GRAY LIMESTONE & SAND
430	505	GRAY LIMESTONE

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
6	Blank	New Steel		2	380
6	Screen	New Steel	0.035	380	490
6	Blank	New Steel		490	500

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Texas Department of Licensing and Regulation
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Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #77315

Owner:	Al Stephan	Owner Well #:	1
Address:	P.O Box 1293 Liberty Hill, TX 78642	Grid #:	58-17-6
Well Location:	145 N. ShowhorseDr. LIBERTY HILL, TX 78642	Latitude:	30° 41' 51" N
Well County:	Williamson	Longitude:	097° 54' 55" W
		Elevation:	944 ft. above sea level
Type of Work:	New Well	Proposed Use:	Domestic

Drilling Start Date: **1/25/2006** Drilling End Date: **1/25/2006**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8	0	420

Drilling Method: **Air Hammer**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	20	4 cement

Seal Method: **Poured Slurry**

Distance to Property Line (ft.): **88**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **115**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **measuring wheel**

Surface Completion: **Surface Sleeve Installed**

Water Level: **121 ft. below land surface on 2006-01-25** Measurement Method: **Unknown**

Packers: **Rubber 20'**

Type of Pump: **Submersible**

Well Tests: **Estimated Yield: 50 GPM**

	<i>Description (number of sacks & material)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Plug Information:	N/A		

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Highland Drilling Inc.**
309 Frazier St.
Tow, TX 78672

Driller Name: **Clifford Bohannon**

License Number: **4386**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	4	Topsoil
4	8	Caleche rock
8	17	Blue shale
17	325	Blue sandstone
325	332	Sand
332	385	Blue shale w/blue sandstone stringers
385	395	Course sand
395	398	Blue shale
398	407	Course sand
407	420	Blue sandstone

<i>Dia. (in.)</i>	<i>New/Used</i>	<i>Type</i>	<i>Setting From/To (ft.)</i>
41/2	New	Pvc	0-400 Sch 40
41/2	New	Perf. pvc	400-420 Sch 40

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P.O. Box 12157
Austin, TX 78711
(512) 463-7880

STATE OF TEXAS WELL REPORT for Tracking #79487

Owner: **Shawn Preece**

Owner Well #: **No Data**

Address: **PO Box 1238
Liberty Hill, TX 78642**

Grid #: **58-17-6**

Well Location: **CR 1869
Liberty Hill, TX 78642**

Latitude: **30° 41' 13" N**

Longitude: **097° 53' 26" W**

Well County: **Williamson**

Elevation: **No Data**

Type of Work: **New Well**

Proposed Use: **Domestic**

Drilling Start Date: **12/5/2005**

Drilling End Date: **12/6/2005**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	9.75	0	20
	6	20	520

Drilling Method: **Air Rotary**

Borehole Completion: **Straight Wall**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	40	5

Seal Method: **mixed**

Distance to Property Line (ft.): **No Data**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed**

Water Level: **No Data**

Packers: **Rubber 40'
Rubber 440'**

Type of Pump: **Submersible**

Well Tests: **Jetted** **Yield: 50 GPM**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	Good

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Hill Country Water Well**

**PO Box 220
Briggs, TX 78608**

Driller Name: **Joe E McDearmon**

License Number: **2334**

Comments: **Verbal Warning issued late filing 8/13/09**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

Top (ft.)	Bottom (ft.)	Description
0	16	cal
16	25	gry lime
25	35	cal
35	90	gry lime
90	95	gry shale
95	115	gry lime
115	117	gry shale
117	180	gry lime
180	185	bro shale
185	260	bro lime
260	365	gry lime
365	370	sand water
370	385	gry shale
385	395	gry shale
395	445	sandstone
445	450	trinty sand water
450	465	sand stone
465	470	trinty sandwater

Dia. (in.)	New/Used	Type	Setting From/To (ft.)
6 New Plastic 0-520 sdr-17			

470	490	sandstone
490	500	trinty sand water
500	520	sandstone

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880

ATTACHMENT 16

Groundwater Quality Technical Report

In accordance with 30 TAC 309.20(a)(4)(A), the attached exhibit shows all water wells within 0.5 miles of the land application site for all three (3) phases of the project. A listing of these wells is shown below:

Well ID	Well Use	Casing
156930	Domestic	5" PVC
5817602	Domestic	6" Steel
5817603	Stock	4" Steel
265218	Irrigation	5" PVC
104692	Domestic	4.5" PVC
244348	Domestic	4.5" PVC

Available well data has also been attached for each of the listed wells that are within 0.5 mile of the land application area. There are no existing monitoring wells on the project site, so preoperational baseline groundwater quality data isn't available.

In order to protect groundwater quality, the permittee will comply with buffer zones requirements of 30 TAC 309.13(c). No private or public wells were found to be located closer than 500 feet from the wastewater treatment plant or the land application boundary. Minimum separation distances from wastewater treatment units and wells are exceeded with the proposed design. The permittee will also comply with 30 TAC 213 subchapter B, requirements for proposed facilities overlaying the Edwards Aquifer Contributing Zone.

Once constructed, the treated effluent wastewater ponds will adhere to the standards in 30 TAC 217.203 pertaining to the design criteria for domestic wastewater systems. Each pond will be lined with geo-textile material having a coefficient of permeability less than 1×10^{-7} centimeters per second for a thickness of two feet corresponding to water depths less than eight feet. If clay liners are used they will adhere to the standards found in 30 TAC 309.13 (d). Lithology information obtained from area wells indicate that the aquifer is confined in the proposed project location, prohibiting the downward migration of treated effluent.

Application of the treated effluent will not occur during periods of inundation, frozen or saturated ground and no runoff of effluent will be allowed. Treated effluent will be distributed to crops at agronomic rates limited to what is necessary to sustain the vegetation.

ATTACHMENT 17
USDA SOIL SURVEY



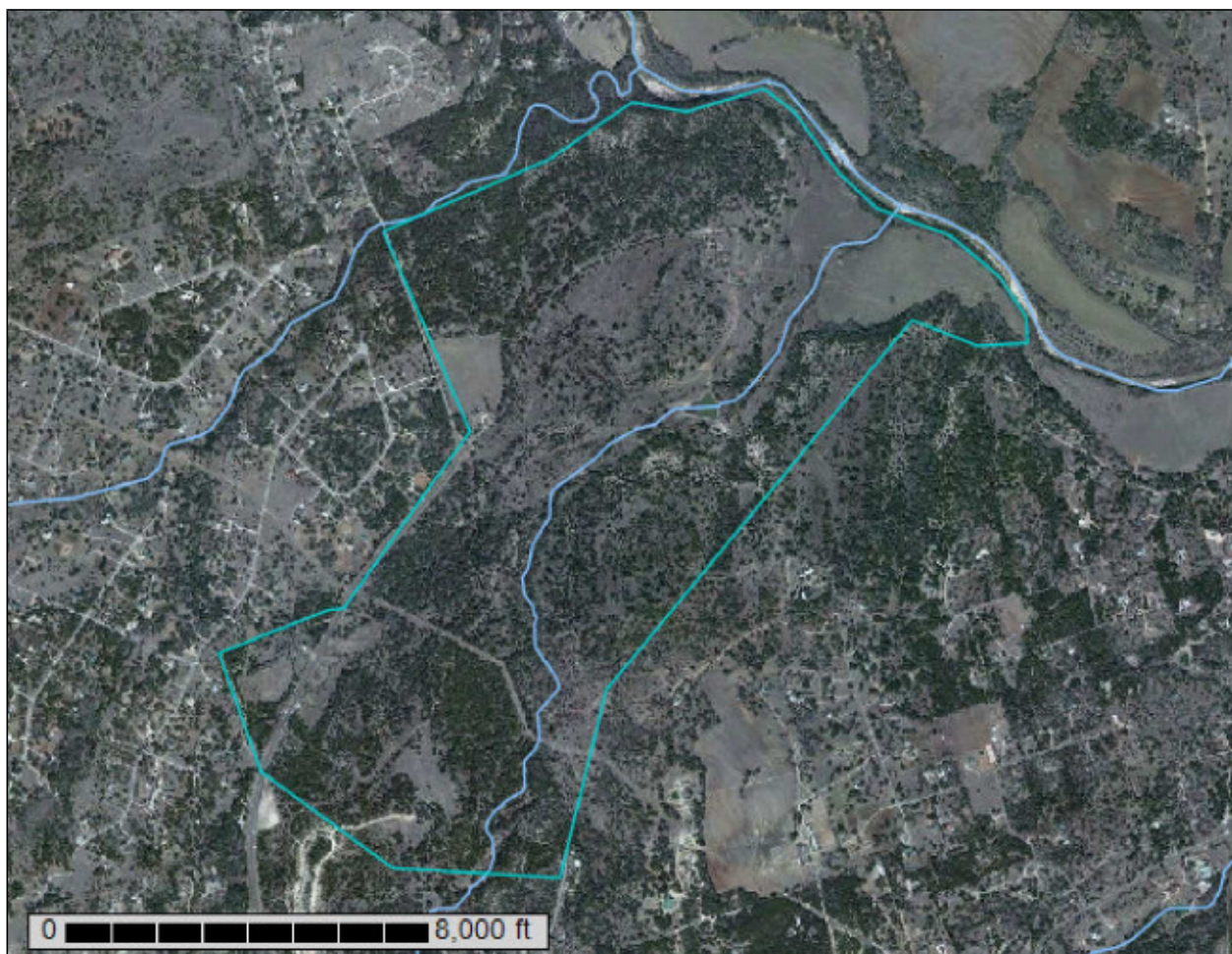
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **Williamson County, Texas**



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

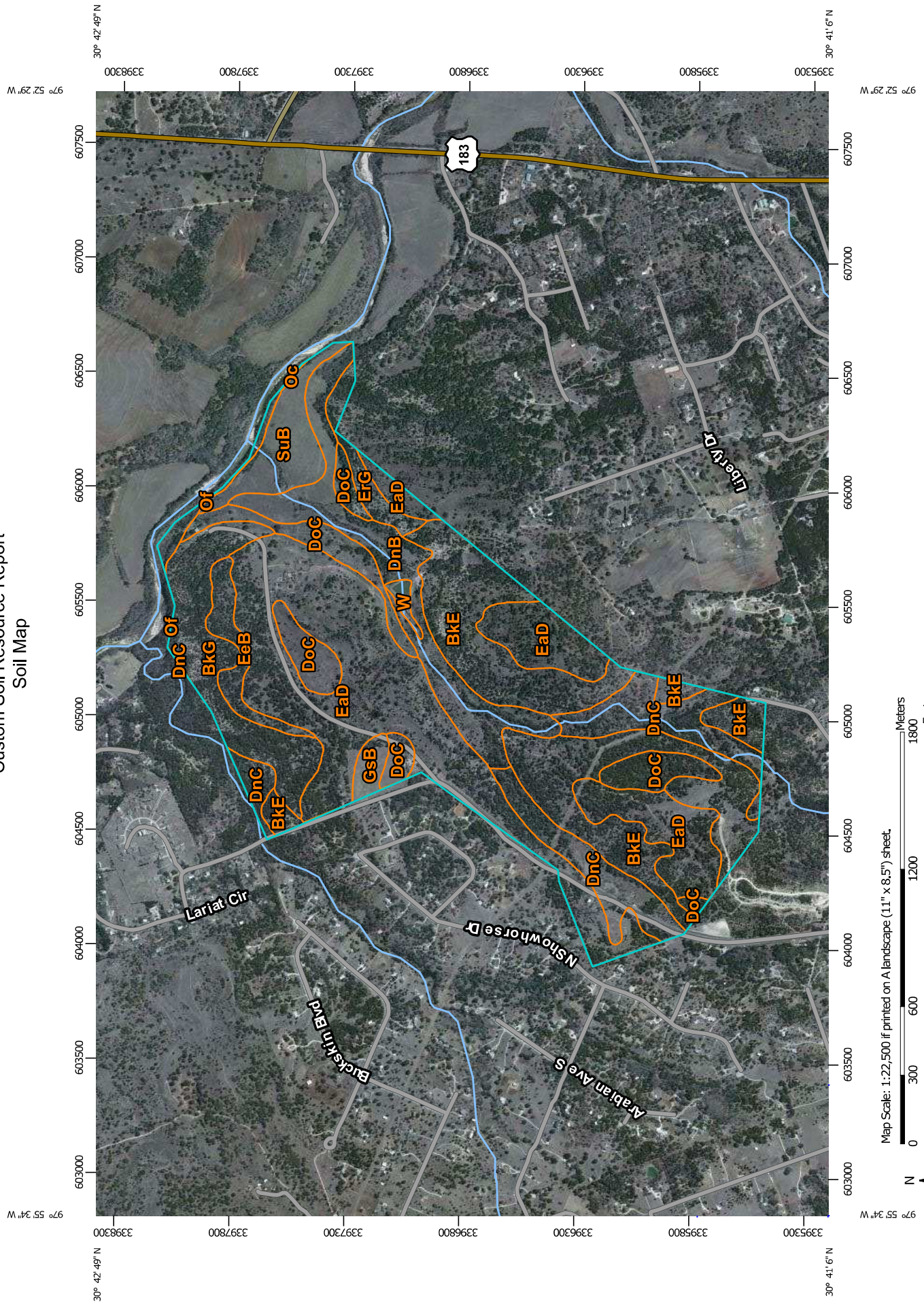
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


Custom Soil Resource Report Soil Map




Map Scale: 1:22,500 if printed on A landscape (11" x 8.5") sheet.
 0 300 600 1200 1800 Meters
 0 1000 2000 4000 6000 Feet
 Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84


MAP LEGEND


Area of Interest (AOI)

 Area of Interest (AOI)


Soils


 Soil Map Unit Polygons


 Soil Map Unit Lines


 Soil Map Unit Points


Special Point Features


 Blowout


 Borrow Pit


 Clay Spot


 Closed Depression


 Gravel Pit


 Gravelly Spot


 Landfill


 Lava Flow


 Marsh or swamp


 Mine or Quarry


 Miscellaneous Water


 Perennial Water


 Rock Outcrop


 Saline Spot

 Sandy Spot


 Severely Eroded Spot

 Sinkhole


 Slide or Slip


 Sodic Spot


Water Features


 Streams and Canals


Transportation

 Rails


 Interstate Highways

 US Routes


 Major Roads

 Local Roads


Background

 Aerial Photography


Spoil Area

 Spoil Area


Stony Spot

 Stony Spot


Very Stony Spot

 Very Stony Spot


Wet Spot

 Wet Spot

Other

 Other

Special Line Features

 Special Line Features

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000. Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Williamson County, Texas
Survey Area Data: Version 14, Sep 23, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 18, 2010—Feb 13, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Williamson County, Texas (TX491)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BkE	Brackett gravelly clay loam, 3 to 12 percent slopes	178.0	22.0%
BkG	Brackett-Rock outcrop-Real complex, 8 to 30 percent slopes	63.9	7.9%
DnB	Denton silty clay, 1 to 3 percent slopes	76.4	9.5%
DnC	Denton silty clay, 3 to 5 percent slopes	77.2	9.6%
DoC	Doss silty clay, moist, 1 to 5 percent slopes	64.4	8.0%
EaD	Eckrant cobbly clay, 1 to 8 percent slopes	263.5	32.6%
EeB	Eckrant extremely stony clay, 0 to 3 percent slopes	18.3	2.3%
ErG	Eckrant-Rock outcrop complex, hilly	14.8	1.8%
GsB	Georgetown stony clay loam, 1 to 3 percent slopes	7.7	1.0%
Oc	Oakalla soils, 0 to 1 percent slopes, channeled, frequently flooded	0.3	0.0%
Of	Oakalla silty clay loam, 0 to 2 percent slopes, frequently flooded	6.7	0.8%
SuB	Sunev silty clay loam, 1 to 3 percent slopes	33.1	4.1%
W	Water	3.6	0.4%
Totals for Area of Interest		807.9	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic

class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

Custom Soil Resource Report

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Williamson County, Texas

BkE—Brackett gravelly clay loam, 3 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2t2m5
Elevation: 700 to 1,450 feet
Mean annual precipitation: 30 to 36 inches
Mean annual air temperature: 66 to 69 degrees F
Frost-free period: 230 to 265 days
Farmland classification: Not prime farmland

Map Unit Composition

Brackett and similar soils: 92 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brackett

Setting

Landform: Ridges
Landform position (two-dimensional): Backslope, summit, shoulder, footslope
Landform position (three-dimensional): Side slope, interfluvium
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from limestone

Typical profile

A - 0 to 5 inches: gravelly clay loam
Bk - 5 to 16 inches: clay loam
Cr - 16 to 60 inches: bedrock

Properties and qualities

Slope: 3 to 12 percent
Percent of area covered with surface fragments: 3.0 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 90 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Adobe 29-35" PZ (R081CY355TX)
Hydric soil rating: No

Minor Components

Sunev

Percent of map unit: 6 percent
Landform: Drainageways
Landform position (two-dimensional): Footslope, backslope
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

Austin

Percent of map unit: 2 percent
Landform: Ridges
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

BkG—Brackett-Rock outcrop-Real complex, 8 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2t2m3
Elevation: 470 to 1,900 feet
Mean annual precipitation: 32 to 37 inches
Mean annual air temperature: 66 to 68 degrees F
Frost-free period: 230 to 265 days
Farmland classification: Not prime farmland

Map Unit Composition

Brackett and similar soils: 38 percent
Rock outcrop: 25 percent
Real and similar soils: 22 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brackett

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder, backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Residuum weathered from limestone

Typical profile

A - 0 to 6 inches: gravelly clay loam

Custom Soil Resource Report

Bk - 6 to 14 inches: gravelly clay loam

Cr - 14 to 60 inches: bedrock

Properties and qualities

Slope: 8 to 30 percent

Percent of area covered with surface fragments: 0.0 percent

Depth to restrictive feature: 10 to 20 inches to paralithic bedrock

Natural drainage class: Well drained

Runoff class: High

*Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high
(0.06 to 1.98 in/hr)*

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 90 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: Steep Adobe 29-35" PZ (R081CY362TX)

Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Side slope, base slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Limestone

Typical profile

R - 0 to 80 inches: bedrock

Properties and qualities

Slope: 8 to 30 percent

Depth to restrictive feature: 0 to 2 inches to lithic bedrock

Runoff class: Very high

*Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high
(0.06 to 1.98 in/hr)*

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s

Hydrologic Soil Group: D

Hydric soil rating: No

Description of Real

Setting

Landform: Ridges

Landform position (two-dimensional): Footslope, backslope

Landform position (three-dimensional): Base slope, side slope

Down-slope shape: Convex

Custom Soil Resource Report

Across-slope shape: Convex

Parent material: Residuum weathered from limestone

Typical profile

A - 0 to 4 inches: gravelly loam

Ak - 4 to 14 inches: extremely gravelly loam

Cr - 14 to 40 inches: bedrock

Properties and qualities

Slope: 8 to 30 percent

Percent of area covered with surface fragments: 0.0 percent

Depth to restrictive feature: 8 to 19 inches to paralithic bedrock

Natural drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high
(0.06 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 70 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Very low (about 1.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: Steep Adobe 29-35" PZ (R081CY362TX)

Hydric soil rating: No

Minor Components

Eckrant

Percent of map unit: 10 percent

Landform: Ridges

Landform position (two-dimensional): Shoulder, summit, backslope, footslope

Landform position (three-dimensional): Crest

Down-slope shape: Linear

Across-slope shape: Convex

Ecological site: Steep Rocky 23-31" PZ (R081BY350TX)

Hydric soil rating: No

Volente

Percent of map unit: 5 percent

Landform: Drainageways

Landform position (two-dimensional): Footslope, toeslope, backslope

Down-slope shape: Linear

Across-slope shape: Concave

Ecological site: Clay Loam 29-35" PZ (R081CY357TX)

Hydric soil rating: No

DnB—Denton silty clay, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2t26l
Elevation: 570 to 1,870 feet
Mean annual precipitation: 31 to 36 inches
Mean annual air temperature: 65 to 68 degrees F
Frost-free period: 220 to 260 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Denton and similar soils: 88 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Denton

Setting

Landform: Hillslopes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Silty and clayey slope alluvium over residuum weathered from limestone

Typical profile

A - 0 to 14 inches: silty clay
Bw - 14 to 25 inches: silty clay
Bk - 25 to 33 inches: silty clay
Ck - 33 to 36 inches: gravelly silty clay
R - 36 to 80 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: 22 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 80 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Custom Soil Resource Report

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: D
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

Minor Components

Krum

Percent of map unit: 6 percent
Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

Doss

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Shallow 23-31" PZ (R081BY343TX)
Hydric soil rating: No

Anhalt

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Deep Redland 29-35" PZ (R081CY358TX)
Hydric soil rating: No

DnC—Denton silty clay, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2t26r
Elevation: 570 to 1,870 feet
Mean annual precipitation: 31 to 36 inches
Mean annual air temperature: 65 to 68 degrees F
Frost-free period: 220 to 260 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Denton and similar soils: 88 percent

Minor components: 12 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Denton

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Linear

Parent material: Silty and clayey slope alluvium over residuum weathered from limestone

Typical profile

A - 0 to 14 inches: silty clay

Bw - 14 to 25 inches: silty clay

Bk - 25 to 33 inches: silty clay

Ck - 33 to 36 inches: gravelly silty clay

R - 36 to 80 inches: bedrock

Properties and qualities

Slope: 3 to 5 percent

Depth to restrictive feature: 22 to 60 inches to lithic bedrock

Natural drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 80 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 3s

Land capability classification (nonirrigated): 3s

Hydrologic Soil Group: D

Ecological site: Clay Loam 29-35" PZ (R081CY357TX)

Hydric soil rating: No

Minor Components

Brackett

Percent of map unit: 6 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Convex

Ecological site: Adobe 29-35" PZ (R081CY355TX)

Hydric soil rating: No

Doss

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Shallow 29-35" PZ (R081CY574TX)
Hydric soil rating: No

Purves

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluvium
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Shallow 29-35" PZ (R081CY574TX)
Hydric soil rating: No

DoC—Doss silty clay, moist, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2s0st
Elevation: 630 to 1,840 feet
Mean annual precipitation: 30 to 36 inches
Mean annual air temperature: 66 to 68 degrees F
Frost-free period: 210 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Doss and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Doss

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from limestone

Typical profile

A - 0 to 9 inches: silty clay
Bk - 9 to 17 inches: silty clay
Cr - 17 to 80 inches: bedrock

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: 11 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 70 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: Shallow 29-35" PZ (R081CY574TX)
Hydric soil rating: No

Minor Components

Brackett

Percent of map unit: 7 percent
Landform: Ridges
Landform position (two-dimensional): Backslope, shoulder, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: Steep Adobe 29-35" PZ (R081CY362TX)
Hydric soil rating: No

Bolar

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

Eckrant

Percent of map unit: 1 percent
Landform: Ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Low Stony Hill 29-35" PZ (R081CY360TX)
Hydric soil rating: No

Purves

Percent of map unit: 1 percent
Landform: Plains
Down-slope shape: Convex

Custom Soil Resource Report

Across-slope shape: Linear
Ecological site: Shallow 29-35" PZ (R081CY574TX)
Hydric soil rating: No

Denton

Percent of map unit: 1 percent
Landform: Plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

EaD—Eckrant cobbly clay, 1 to 8 percent slopes

Map Unit Setting

National map unit symbol: djpt
Elevation: 1,000 to 2,400 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 66 to 70 degrees F
Frost-free period: 210 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Eckrant and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eckrant

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from limestone

Typical profile

H1 - 0 to 4 inches: cobbly clay
H2 - 4 to 11 inches: very cobbly clay
H3 - 11 to 16 inches: bedrock

Properties and qualities

Slope: 1 to 8 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 8 percent

Custom Soil Resource Report

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Very low (about 1.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: Low Stony Hill 29-35" PZ (R081CY360TX)

Hydric soil rating: No

EeB—Eckrant extremely stony clay, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: djpv

Elevation: 1,000 to 2,400 feet

Mean annual precipitation: 22 to 32 inches

Mean annual air temperature: 66 to 70 degrees F

Frost-free period: 210 to 240 days

Farmland classification: Not prime farmland

Map Unit Composition

Eckrant and similar soils: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eckrant

Setting

Landform: Ridges

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from limestone

Typical profile

H1 - 0 to 4 inches: extremely stony clay

H2 - 4 to 11 inches: extremely stony clay

H3 - 11 to 16 inches: bedrock

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: 10 to 20 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 8 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Very low (about 0.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Low Stony Hill 29-35" PZ (R081CY360TX)
Hydric soil rating: No

ErG—Eckrant-Rock outcrop complex, hilly

Map Unit Setting

National map unit symbol: djpx
Elevation: 1,000 to 2,400 feet
Mean annual precipitation: 22 to 32 inches
Mean annual air temperature: 66 to 70 degrees F
Frost-free period: 120 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Eckrant and similar soils: 41 percent
Rock outcrop: 38 percent
Minor components: 21 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eckrant

Setting

Landform: Ridges
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from limestone

Typical profile

H1 - 0 to 4 inches: extremely stony clay
H2 - 4 to 11 inches: extremely stony clay
H3 - 11 to 16 inches: bedrock

Properties and qualities

Slope: 16 to 30 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 8 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 0.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Steep Rocky 29-35" PZ (R081CY363TX)
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Limestone

Typical profile

H1 - 0 to 80 inches: bedrock

Properties and qualities

Slope: 10 to 30 percent
Depth to restrictive feature: 0 to 2 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 19.98 in/hr)

Minor Components

Unnamed

Percent of map unit: 21 percent
Hydric soil rating: No

GsB—Georgetown stony clay loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2t277
Elevation: 620 to 1,250 feet
Mean annual precipitation: 32 to 36 inches
Mean annual air temperature: 65 to 68 degrees F
Frost-free period: 230 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Georgetown and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Georgetown

Setting

Landform: Ridges
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from limestone

Typical profile

A - 0 to 7 inches: stony clay loam
Bt - 7 to 35 inches: cobbly clay
R - 35 to 60 inches: bedrock

Properties and qualities

Slope: 1 to 3 percent
Percent of area covered with surface fragments: 0.1 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: Redland 29-35" PZ (R081CY361TX)
Hydric soil rating: No

Minor Components

Tarpley

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Redland 29-35" PZ (R081CY361TX)
Hydric soil rating: No

Eckrant

Percent of map unit: 3 percent
Landform: Ridges
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex

Custom Soil Resource Report

Ecological site: Low Stony Hill 29-35" PZ (R081CY360TX)

Hydric soil rating: No

Fairlie

Percent of map unit: 2 percent

Landform: Ridges

Landform position (two-dimensional): Summit, backslope

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Linear

Across-slope shape: Concave

Ecological site: Blackland 28-40" PZ (R086AY196TX)

Hydric soil rating: No

Georgetown

Percent of map unit: 0 percent

Landform: Ridges

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Redland 29-35" PZ (R081CY361TX)

Hydric soil rating: No

Oc—Oakalla soils, 0 to 1 percent slopes, channeled, frequently flooded

Map Unit Setting

National map unit symbol: 2t26x

Elevation: 370 to 1,450 feet

Mean annual precipitation: 30 to 35 inches

Mean annual air temperature: 66 to 69 degrees F

Frost-free period: 210 to 250 days

Farmland classification: Not prime farmland

Map Unit Composition

Oakalla, channeled, and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oakalla, Channeled

Setting

Landform: Flood plains

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium derived from limestone

Typical profile

Ap - 0 to 8 inches: silty clay loam

Ak - 8 to 23 inches: silty clay loam

Bk1 - 23 to 53 inches: silty clay loam

Custom Soil Resource Report

Bk2 - 53 to 80 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Negligible

*Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 1.98 in/hr)*

Depth to water table: More than 80 inches

Frequency of flooding: Frequent

Frequency of ponding: None

Calcium carbonate, maximum in profile: 60 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): 5w

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: B

Ecological site: Loamy Bottomland 29-35" PZ (R081CY561TX)

Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 5 percent

Landform: Channels

Down-slope shape: Linear

Across-slope shape: Convex

Hydric soil rating: No

Dev

Percent of map unit: 4 percent

Landform: Flood plains

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Concave

Ecological site: DRAW 19-31" PZ (R081BY682TX)

Hydric soil rating: No

Unnamed, hydric

Percent of map unit: 1 percent

Landform: Depressions, flood-plain steps

Landform position (three-dimensional): Tread

Down-slope shape: Concave, linear

Across-slope shape: Concave

Hydric soil rating: Yes

Of—Oakalla silty clay loam, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2t26p
Elevation: 370 to 1,450 feet
Mean annual precipitation: 24 to 35 inches
Mean annual air temperature: 64 to 69 degrees F
Frost-free period: 210 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Oakalla and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Oakalla

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from limestone

Typical profile

Ap - 0 to 8 inches: silty clay loam
Ak - 8 to 23 inches: silty clay loam
Bk1 - 23 to 53 inches: silty clay loam
Bk2 - 53 to 80 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 60 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): 5w
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B
Ecological site: Loamy Bottomland 29-35" PZ (R081CY561TX)
Hydric soil rating: No

Minor Components

Oakalla, occasionally flooded

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Bottomland 29-35" PZ (R081CY561TX)
Hydric soil rating: No

Dev

Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: DRAW 19-31" PZ (R081BY682TX)
Hydric soil rating: No

Krum

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Clay Loam 29-35" PZ (R081CY357TX)
Hydric soil rating: No

Unnamed, hydric

Percent of map unit: 1 percent
Landform: Depressions, flood-plain steps
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

SuB—Sunev silty clay loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: djqr
Elevation: 430 to 1,500 feet
Mean annual precipitation: 28 to 34 inches
Mean annual air temperature: 63 to 70 degrees F
Frost-free period: 230 to 245 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Sunev and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sunev

Setting

Landform: Stream terraces

Landform position (three-dimensional): Riser

Down-slope shape: Linear

Across-slope shape: Convex

Parent material: Loamy alluvium of quaternary age derived from mixed sources

Typical profile

H1 - 0 to 18 inches: silty clay loam

H2 - 18 to 52 inches: silty clay loam

H3 - 52 to 60 inches: silty clay loam

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 70 percent

Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: B

Ecological site: Clay Loam 28-40" PZ (R086AY199TX)

Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Engineering Properties (Riveroaks)

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(<http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba>). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic

soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number.

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Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

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Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007 (<http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba>). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
BkE—Brackett gravelly clay loam, 3 to 12 percent slopes														
Brackett	92 D		0-5	Gravelly clay loam	CL, GC	A-7-6, A-2-6, A-6	0-0-1	0-0-12	56-76-100	53-75-100	43-66-95	33-53-79	34-42-49	13-18-24
			5-16	Loam, clay loam, gravelly clay loam, gravelly loam	CL, GC, SC	A-7-6, A-6, A-2-4	0-0-1	0-0-2	53-92-100	50-91-100	39-78-94	30-65-82	26-38-47	7-16-23
			16-60	Bedrock	—	—	—	—	—	—	—	—	—	—

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Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
BkG—Brackett-Rock outcrop-Real complex, 8 to 30 percent slopes														
Brackett	38 D		0-6	Gravelly clay loam	CL, GC	A-7-6, A-6, A-2-6	0-0-0	0-0-7	53-76-98	51-75-98	42-68-96	32-53-77	34-42-49	13-18-24
			6-14	Gravelly loam, loam, clay loam, gravelly clay loam	GC-GM, GC, CL	A-6, A-7-6, A-2-4	0-0-0	0-0-7	53-70-98	51-68-98	39-58-90	29-47-75	26-39-47	7-17-23
			14-60	Bedrock	—	—	—	—	—	—	—	—	—	—
Rock outcrop	25 D		0-80	Bedrock	—	—	—	—	—	—	—	—	—	—
Real	22 D		0-4	Gravelly loam	GC, GM, MH	A-2-6, A-2-4, A-7-5	0-0-0	0-7-14	52-68-76	50-66-75	44-60-70	33-47-54	33-46-57	10-15-17
			4-14	Very gravelly clay loam, extremely gravelly clay loam, extremely gravelly loam, extremely cobbly loam, very gravelly loam	GP-GC, GM	A-2-4, A-2-7, A-7-5	0-0-0	2-11-16	17-28-51	14-25-49	12-23-49	9-18-42	30-42-64	10-14-27
			14-40	Bedrock	—	—	—	—	—	—	—	—	—	—

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Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
DnB—Denton silty clay, 1 to 3 percent slopes														
Denton	88	D	0-14	Silty clay	CH, CL	A-7-6	0-0-0	0-0-0	92-95-100	90-94-100	84-93-100	81-90-100	48-59-70	24-32-41
			14-25	Clay, silty clay, silty clay loam	CH, CL	A-7-6	0-0-0	0-0-0	85-95-100	83-94-100	73-93-100	68-88-100	43-55-67	20-30-39
			25-33	Silty clay, silty clay loam, clay	CH, CL	A-7-6	0-0-0	0-0-0	85-95-100	83-94-100	73-93-100	68-88-100	41-54-67	17-30-39
			33-36	Very gravelly silty clay, silty clay, gravelly very gravelly silty clay loam, silty clay loam, clay, clay loam, very gravelly gravelly clay, very gravelly gravelly clay loam, gravelly silty clay	CL, CH, GC	A-7-6, A-2-6, A-6	0-0-0	0-2-11	35-66-92	27-61-91	26-61-91	24-57-91	31-47-63	11-26-39
			36-80	Bedrock	—	—	—	—	—	—	—	—	—	—

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Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
DnC—Denton silty clay, 3 to 5 percent slopes														
	88	D	0-14	Silty clay	CH, CL	A-7-6	0-0-0	0-0-0	92-95-100	90-94-100	84-93-100	81-90-100	48-59-70	24-32-41
			14-25	Silty clay, silty clay loam, clay	CH, CL	A-7-6	0-0-0	0-0-0	85-95-100	83-94-100	73-93-100	68-88-100	43-55-67	20-30-39
			25-33	Silty clay, silty clay loam, clay	CH, CL	A-7-6	0-0-0	0-0-0	85-95-100	83-94-100	73-93-100	68-88-100	41-54-67	17-30-39
			33-36	Gravelly silty clay, very gravelly silty clay, silty clay loam, clay, clay loam, very gravelly gravelly clay, very gravelly gravelly clay loam, silty clay, gravelly very gravelly silty clay loam	CH, GC, CL	A-2-6, A-7-6, A-6	0-0-0	0-2-11	35-66-92	27-61-91	26-61-91	24-57-91	31-47-63	11-26-39
			36-80	Bedrock	—	—	—	—	—	—	—	—	—	—
DoC—Doss silty clay, moist, 1 to 5 percent slopes														
Doss	85	D	0-9	Silty clay	CH	A-7-6	0-0-0	0-1-15	70-96-100	69-96-100	65-95-100	62-91-99	48-55-62	20-29-34
			9-17	Silty clay loam, clay loam, silty clay	CH, CL	A-7-6	0-0-0	0-2-16	68-92-100	67-92-100	60-91-100	57-87-99	41-53-61	15-27-34
			17-80	Bedrock	—	—	—	—	—	—	—	—	—	—

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Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
EaD—Eckrant cobbly clay, 1 to 8 percent slopes														
Eckrant	100 D		0-4	Cobbly clay	CH, CL	A-7-6	0-13-25	10-30-50	75-88-100	71-86-100	70-84-98	65-80-94	47-60-73	25-35-45
			4-11	Very cobbly clay, very stony clay, extremely stony clay	CH, CL, GC, SC	A-7-6	0-38-75	15-45-75	56-71-85	50-65-79	45-60-75	44-59-74	47-60-73	25-35-45
			11-16	Bedrock	—	—	—	—	—	—	—	—	—	—
EeB—Eckrant extremely stony clay, 0 to 3 percent slopes														
Eckrant	100 D		0-4	Extremely stony clay	CH, CL, GC, SC	A-7-6	25-50-75	10-43-75	56-71-85	50-65-80	45-60-75	44-59-74	47-60-73	25-35-45
			4-11	Very cobbly clay, very stony clay, extremely stony clay	CH, CL, GC, SC	A-7-6	0-38-75	15-45-75	56-71-85	50-65-79	45-60-75	44-59-74	47-60-73	25-35-45
			11-16	Bedrock	—	—	—	—	—	—	—	—	—	—
ErG—Eckrant-Rock outcrop complex, hilly														
Eckrant	41 D		0-4	Extremely stony clay	CH, CL, GC, SC	A-7-6	25-50-75	10-43-75	56-71-85	50-65-80	45-60-75	44-59-74	47-60-73	25-35-45
			4-11	Very cobbly clay, very stony clay, extremely stony clay	CH, CL, GC, SC	A-7-6	0-38-75	15-45-75	56-71-85	50-65-79	45-60-75	44-59-74	47-60-73	25-35-45
			11-16	Bedrock	—	—	—	—	—	—	—	—	—	—
Rock outcrop	38 D		0-80	Bedrock	—	—	—	—	—	—	—	—	—	—

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Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
GsB—Georgetown stony clay loam, 1 to 3 percent slopes														
Georgetown	90 D		0-7	Stony clay loam	CL, GC, CH	A-6, A-7-6	5-8-15	8-8-15	68-82-88	64-80-87	55-74-87	45-60-74	33-41-53	16-23-33
			7-35	Clay, stony clay, cobbly clay, gravelly clay	CH, GC	A-7-6	0-0-7	0-11-14	57-84-96	51-82-96	45-80-96	43-76-96	60-70-80	36-48-55
			35-60	Bedrock	—	—	—	—	—	—	—	—	—	—
Oc—Oakalla soils, 0 to 1 percent slopes, channeled, frequently flooded														
Oakalla, channeled	90 B		0-8	Silty clay loam	CH, CL	A-6, A-7-6	0-0-0	0-0-0	91-98-100	82-96-100	76-95-100	67-85-97	35-49-58	13-24-30
			8-23	Loam, clay loam, silty clay loam, silty clay, clay	CL, CH	A-4, A-6, A-7-6	0-0-0	0-0-0	91-98-100	82-96-100	73-95-100	64-85-100	28-43-62	10-17-38
			23-53	Clay loam, silty clay loam, clay, loam	CL, CH	A-4, A-6, A-7-6	0-0-0	0-0-0	84-90-100	83-89-100	74-89-100	65-79-100	25-38-56	8-16-35
			53-80	Loam, clay loam, silty clay loam, fine sandy loam, clay	CL, CH, ML, CL-ML	A-4, A-6, A-7-6	0-0-0	0-0-0	84-90-100	83-89-100	70-89-100	61-79-100	21-38-56	2-16-35

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Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			<i>In</i>				<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>
Of—Oakalla silty clay loam, 0 to 2 percent slopes, frequently flooded														
Oakalla	90 B		0-8	Silty clay loam	CH, CL	A-6, A-7-6	0-0-0	0-0-0	91-98-1 00	82-96-1 00	76-95-1 00	67-85-97	35-49 -58	13-24-30
			8-23	Loam, clay loam, silty clay loam, silty clay, clay	CL, CH	A-4, A-6, A-7-6	0-0-0	0-0-0	91-98-1 00	82-96-1 00	73-95-1 00	64-85-100	28-43 -62	10-17-38
			23-53	Clay loam, silty clay loam, clay, loam	CL, CH	A-4, A-6, A-7-6	0-0-0	0-0-0	84-90-1 00	83-89-1 00	74-89-1 00	65-79-100	25-38 -56	8-16-35
			53-80	Loam, clay loam, silty clay loam, fine sandy loam, clay	CL, CH, ML, CL-ML	A-4, A-6, A-7-6	0-0-0	0-0-0	84-90-1 00	83-89-1 00	70-89-1 00	61-79-100	21-38 -56	2-16-35
SuB—Sunev silty clay loam, 1 to 3 percent slopes														
Sunev	100 B		0-18	Silty clay loam	CH, CL	A-6, A-7-6	0-0-0	0-0-0	90-95-1 00	80-90-1 00	80-90-1 00	55-68-80	30-41 -51	12-22-32
			18-52	Loam, clay loam, silty clay loam	CL	A-4, A-6	0-0-0	0-0-0	85-93-1 00	80-90-1 00	70-85-1 00	51-68-85	28-34 -40	8-14-20
			52-60	Loam, clay loam, silty clay loam	CL	A-4, A-6, A-7-6	0-0-0	0-0-0	80-92-1 00	70-85-1 00	65-83-1 00	51-61-70	25-34 -42	8-15-22

Engineering Properties (Riveroaks)

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(<http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba>). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

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American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

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Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007 (<http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba>). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
BkE—Brackett gravelly clay loam, 3 to 12 percent slopes														
Brackett	92 D		0-5	Gravelly clay loam	CL, GC	A-7-6, A-2-6, A-6	0-0-1	0-0-12	56-76-100	53-75-100	43-66-95	33-53-79	34-42-49	13-18-24
			5-16	Loam, clay loam, gravelly clay loam, gravelly loam	CL, GC, SC	A-7-6, A-6, A-2-4	0-0-1	0-0-2	53-92-100	50-91-100	39-78-94	30-65-82	26-38-47	7-16-23
			16-60	Bedrock	—	—	—	—	—	—	—	—	—	—

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Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
BkG—Brackett-Rock outcrop-Real complex, 8 to 30 percent slopes														
Brackett	38 D		0-6	Gravelly clay loam	CL, GC	A-7-6, A-6, A-2-6	0-0-0	0-0-7	53-76-98	51-75-98	42-68-96	32-53-77	34-42-49	13-18-24
			6-14	Gravelly loam, loam, clay loam, gravelly clay loam	GC-GM, GC, CL	A-6, A-7-6, A-2-4	0-0-0	0-0-7	53-70-98	51-68-98	39-58-90	29-47-75	26-39-47	7-17-23
			14-60	Bedrock	—	—	—	—	—	—	—	—	—	—
Rock outcrop	25 D		0-80	Bedrock	—	—	—	—	—	—	—	—	—	—
Real	22 D		0-4	Gravelly loam	GC, GM, MH	A-2-6, A-2-4, A-7-5	0-0-0	0-7-14	52-68-76	50-66-75	44-60-70	33-47-54	33-46-57	10-15-17
			4-14	Very gravelly clay loam, extremely gravelly clay loam, extremely gravelly loam, extremely cobbly loam, very gravelly loam	GP-GC, GM	A-2-4, A-2-7, A-7-5	0-0-0	2-11-16	17-28-51	14-25-49	12-23-49	9-18-42	30-42-64	10-14-27
			14-40	Bedrock	—	—	—	—	—	—	—	—	—	—

Custom Soil Resource Report

Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
DnB—Denton silty clay, 1 to 3 percent slopes														
Denton	88	D	0-14	Silty clay	CH, CL	A-7-6	0-0-0	0-0-0	92-95-100	90-94-100	84-93-100	81-90-100	48-59-70	24-32-41
			14-25	Clay, silty clay, silty clay loam	CH, CL	A-7-6	0-0-0	0-0-0	85-95-100	83-94-100	73-93-100	68-88-100	43-55-67	20-30-39
			25-33	Silty clay, silty clay loam, clay	CH, CL	A-7-6	0-0-0	0-0-0	85-95-100	83-94-100	73-93-100	68-88-100	41-54-67	17-30-39
			33-36	Very gravelly silty clay, silty clay, gravelly very gravelly silty clay loam, silty clay loam, clay, clay loam, very gravelly gravelly clay, very gravelly gravelly clay loam, gravelly silty clay	CL, CH, GC	A-7-6, A-2-6, A-6	0-0-0	0-2-11	35-66-92	27-61-91	26-61-91	24-57-91	31-47-63	11-26-39
			36-80	Bedrock	—	—	—	—	—	—	—	—	—	—

Custom Soil Resource Report

Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
DnC—Denton silty clay, 3 to 5 percent slopes														
Denton	88	D	0-14	Silty clay	CH, CL	A-7-6	0-0-0	0-0-0	92-95-100	90-94-100	84-93-100	81-90-100	48-59-70	24-32-41
			14-25	Silty clay, silty clay loam, clay	CH, CL	A-7-6	0-0-0	0-0-0	85-95-100	83-94-100	73-93-100	68-88-100	43-55-67	20-30-39
			25-33	Silty clay, silty clay loam, clay	CH, CL	A-7-6	0-0-0	0-0-0	85-95-100	83-94-100	73-93-100	68-88-100	41-54-67	17-30-39
			33-36	Gravelly silty clay, very gravelly silty clay, silty clay loam, clay, clay loam, very gravelly gravelly clay, very gravelly gravelly clay loam, silty clay, gravelly very gravelly silty clay loam	CH, GC, CL	A-2-6, A-7-6, A-6	0-0-0	0-2-11	35-66-92	27-61-91	26-61-91	24-57-91	31-47-63	11-26-39
			36-80	Bedrock	—	—	—	—	—	—	—	—	—	—
DoC—Doss silty clay, moist, 1 to 5 percent slopes														
Doss	85	D	0-9	Silty clay	CH	A-7-6	0-0-0	0-1-15	70-96-100	69-96-100	65-95-100	62-91-99	48-55-62	20-29-34
			9-17	Silty clay loam, clay loam, silty clay	CH, CL	A-7-6	0-0-0	0-2-16	68-92-100	67-92-100	60-91-100	57-87-99	41-53-61	15-27-34
			17-80	Bedrock	—	—	—	—	—	—	—	—	—	—

Custom Soil Resource Report

Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
EaD—Eckrant cobbly clay, 1 to 8 percent slopes														
Eckrant	100	D	0-4	Cobbly clay	CH, CL	A-7-6	0-13-25	10-30-50	75-88-100	71-86-100	70-84-98	65-80-94	47-60-73	25-35-45
			4-11	Very cobbly clay, very stony clay, extremely stony clay	CH, CL, GC, SC	A-7-6	0-38-75	15-45-75	56-71-85	50-65-79	45-60-75	44-59-74	47-60-73	25-35-45
			11-16	Bedrock	—	—	—	—	—	—	—	—	—	—
EeB—Eckrant extremely stony clay, 0 to 3 percent slopes														
Eckrant	100	D	0-4	Extremely stony clay	CH, CL, GC, SC	A-7-6	25-50-75	10-43-75	56-71-85	50-65-80	45-60-75	44-59-74	47-60-73	25-35-45
			4-11	Very cobbly clay, very stony clay, extremely stony clay	CH, CL, GC, SC	A-7-6	0-38-75	15-45-75	56-71-85	50-65-79	45-60-75	44-59-74	47-60-73	25-35-45
			11-16	Bedrock	—	—	—	—	—	—	—	—	—	—
ErG—Eckrant-Rock outcrop complex, hilly														
Eckrant	41	D	0-4	Extremely stony clay	CH, CL, GC, SC	A-7-6	25-50-75	10-43-75	56-71-85	50-65-80	45-60-75	44-59-74	47-60-73	25-35-45
			4-11	Very cobbly clay, very stony clay, extremely stony clay	CH, CL, GC, SC	A-7-6	0-38-75	15-45-75	56-71-85	50-65-79	45-60-75	44-59-74	47-60-73	25-35-45
			11-16	Bedrock	—	—	—	—	—	—	—	—	—	—
Rock outcrop	38	D	0-80	Bedrock	—	—	—	—	—	—	—	—	—	—

Custom Soil Resource Report

Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			<i>In</i>				<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>
GsB—Georgetown stony clay loam, 1 to 3 percent slopes														
Georgetown	90 D		0-7	Stony clay loam	CL, GC, CH	A-6, A-7-6	5-8-15	8-8-15	68-82-88	64-80-87	55-74-87	45-60-74	33-41-53	16-23-33
			7-35	Clay, stony clay, cobbly clay, gravelly clay	CH, GC	A-7-6	0-0-7	0-11-14	57-84-96	51-82-96	45-80-96	43-76-96	60-70-80	36-48-55
			35-60	Bedrock	—	—	—	—	—	—	—	—	—	—
Oc—Oakalla soils, 0 to 1 percent slopes, channeled, frequently flooded														
Oakalla, channeled	90 B		0-8	Silty clay loam	CH, CL	A-6, A-7-6	0-0-0	0-0-0	91-98-100	82-96-100	76-95-100	67-85-97	35-49-58	13-24-30
			8-23	Loam, clay loam, silty clay loam, silty clay, clay	CL, CH	A-4, A-6, A-7-6	0-0-0	0-0-0	91-98-100	82-96-100	73-95-100	64-85-100	28-43-62	10-17-38
			23-53	Clay loam, silty clay loam, clay, loam	CL, CH	A-4, A-6, A-7-6	0-0-0	0-0-0	84-90-100	83-89-100	74-89-100	65-79-100	25-38-56	8-16-35
			53-80	Loam, clay loam, silty clay loam, fine sandy loam, clay	CL, CH, ML, CL-ML	A-4, A-6, A-7-6	0-0-0	0-0-0	84-90-100	83-89-100	70-89-100	61-79-100	21-38-56	2-16-35

Custom Soil Resource Report

Engineering Properties—Williamson County, Texas														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			<i>In</i>				<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>	<i>L-R-H</i>
Of—Oakalla silty clay loam, 0 to 2 percent slopes, frequently flooded														
Oakalla	90	B	0-8	Silty clay loam	CH, CL	A-6, A-7-6	0-0-0	0-0-0	91-98-1 00	82-96-1 00	76-95-1 00	67-85-97	35-49 -58	13-24-30
			8-23	Loam, clay loam, silty clay loam, silty clay, clay	CL, CH	A-4, A-6, A-7-6	0-0-0	0-0-0	91-98-1 00	82-96-1 00	73-95-1 00	64-85-100	28-43 -62	10-17-38
			23-53	Clay loam, silty clay loam, clay, loam	CL, CH	A-4, A-6, A-7-6	0-0-0	0-0-0	84-90-1 00	83-89-1 00	74-89-1 00	65-79-100	25-38 -56	8-16-35
			53-80	Loam, clay loam, silty clay loam, fine sandy loam, clay	CL, CH, ML, CL-ML	A-4, A-6, A-7-6	0-0-0	0-0-0	84-90-1 00	83-89-1 00	70-89-1 00	61-79-100	21-38 -56	2-16-35
SuB—Sunev silty clay loam, 1 to 3 percent slopes														
Sunev	100	B	0-18	Silty clay loam	CH, CL	A-6, A-7-6	0-0-0	0-0-0	90-95-1 00	80-90-1 00	80-90-1 00	55-68-80	30-41 -51	12-22-32
			18-52	Loam, clay loam, silty clay loam	CL	A-4, A-6	0-0-0	0-0-0	85-93-1 00	80-90-1 00	70-85-1 00	51-68-85	28-34 -40	8-14-20
			52-60	Loam, clay loam, silty clay loam	CL	A-4, A-6, A-7-6	0-0-0	0-0-0	80-92-1 00	70-85-1 00	65-83-1 00	51-61-70	25-34 -42	8-15-22

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ATTACHMENT 18

SOIL ANALYSES RESULTS



April 13, 2017
Project No.: 20174204.001A

Mr. Randy Rollo
River Oaks Land Partners, LLC
PO Box 171112
Austin, Texas 78717

**Subject: Soil Sampling and Laboratory Analysis
Proposed River Oaks Wastewater Land Treatment Area
Liberty Hill, Texas**

Dear Mr. Rollo:

This letter transmits the findings of our soil sampling and laboratory analysis for the planned Liberty Hill, Texas development River Oaks, and the proposed wastewater land treatment area. The information obtained during our field work and results of our laboratory testing are included.

PROJECT DESCRIPTION

Kleinfelder completed soil sampling program as outlined by TRE & Associates which included the location and size of the proposed land treatment area. The treatment area was sampled in accordance with United States Department of Agriculture benchmark sampling procedures.

Four (4) benchmark locations were selected in accordance with our Proposal dated February 21, 2017. Seven (7) individual hand auger or Shelby tube samples were obtained at each benchmark location to create composite samples for three depth zones. These composite samples were collected for each benchmark at the following depths from 0 to 6 inches, 6 to 18 inches, and 18 to 30 inches. The subsamples for each benchmark location are described as subsamples A, B, and C based upon the depths they were obtained.

In addition to the composite samples two samples for permeability tests were collected at each benchmark location, one in the depth range of 6 to 18 inches (subsample B) and one from 18 to 30 inches (subsample C).

LABORATORY TESTING

Laboratory testing was performed on the composite samples collected from each benchmark location. These samples were selected and tested in accordance with Texas Commission on Environmental Quality (TCEQ) for land application sites. Testing was performed to allow for material classification according to the Unified Soil Classification System (ASTM D 2487), and to evaluate the properties of the materials. These tests included:

- Moisture content
- Atterberg limits (liquid and plastic limits)
- Sieve analysis (percent passing No. 200 Sieve)

- Flexible Wall Permeability Testing
- Soil Conductance (Electronic Resistivity)
- Total Kjeldahl Nitrogen/Total Nitrogen/Nitrate-Nitrogen
- Plant Available Minerals and Nutrients

The classification and hydraulic conductivity laboratory results are summarized in the table below, and the complete laboratory and analytical testing results are presented in Appendix A and Appendix B attached to this letter.

Benchmark	Subsample	Depth (in)	Material Type	Liquid Limit / Plastic Limit	#200	Hydraulic conductivity (cm/sec)
I	A	0 to 6	Lean Clay (CL)	37/15	90	-
I	B	6 to 18	Sandy Lean Clay (CL)	34/17	61	7.3×10^{-10}
I	C	18 to 30	Lean Clay w/Sand (CL)	31/16	80	9.9×10^{-7}
II	A	0 to 6	Silt with Sand (ML)	NP	77	-
II	B	6 to 18	Sandy Silt (ML)	NP	53	3.5×10^{-8}
II	C	18 to 30	Sandy Silt (ML)	NP	59	3.1×10^{-8}
III	A	0 to 6	Lean Clay (CL)	39/16	91	-
III	B	6 to 18	Sandy Lean Clay (CL)	39/16	57	1.2×10^{-8}
III	C	18 to 30	Sandy Lean Clay (CL)	33/17	68	1.1×10^{-8}
IV	A	0 to 6	Fat Clay (CH)	52/20	92	-
IV	B	6 to 18	Fat Clay (CH)	50/19	92	1.5×10^{-7}
IV	C	18 to 30	Lean Clay (CL)	45/15	89	2.9×10^{-8}

Where: Depth - Approximate depth from existing ground surface at time of exploration, inches
 #200 - Percent passing No. 200 sieve, %
 - - No test

LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date of services provided. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee or warranty, express or implied, regarding the series, communication (oral or written), report, opinion, or instrument of service provided.

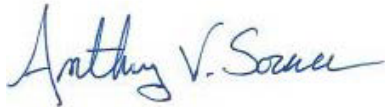
This report may be used only by the Client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two (2) years from the date of the report.

The scope of services was limited to collecting a total of four (4) benchmark samples with subsamples at varying depths with associated laboratory testing. It should be recognized that Kleinfelder was requested to perform these services to aid in the permit application for wastewater land treatment as part of the River Oaks project.

Sincerely,

KLEINFELDER TEXAS 100, LLC

Texas Registered Engineering Firm F-16440



Anthony V. Sorace, PE
Project Manager



Sri Dinakaran, PE, DGE
Associate

Attachments:

Figure 1 – Exploration Location and Vicinity Map

Appendix A – Classification Testing and Hydraulic Conductivity

Appendix B – Analytical Testing Results





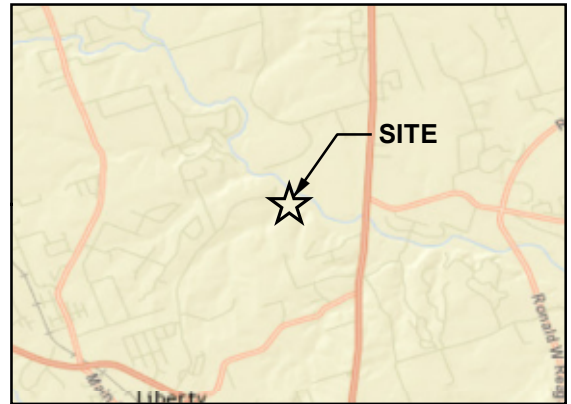
LEGEND



BENCHMARK SAMPLING LOCATION

NOTE:

BASE MAPPING AND VICINITY MAP CREATED FROM LAYERS COMPILED BY ESRI PRODUCTS AND 2017 MICROSOFT CORPORATION.



VICINITY MAP

NOT TO SCALE



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.



1" = 600 SCALE IN FEET



PROJECT NO. 20174204
 DRAWN BY: MAP
 CHECKED BY: AS
 DATE: 04-11-2017
 REVISED: -

EXPLORATION LOCATION PLAN AND VICINITY MAP

River Oaks Wastewater Land Treatment Area

FIGURE

1

000284

Appendix A



Exploration ID	Depth (ft.)	Sample Description	Water Content (%)	Dry Unit Wt. (pcf)	Sieve Analysis (%)			Atterberg Limits			Additional Tests
					Passing 3/4"	Passing #4	Passing #200	Liquid Limit	Plastic Limit	Plasticity Index	
BM-1	0.0 - 0.5	LEAN CLAY (CL)	17.6				90	37	15	22	
BM-1	0.5 - 1.5	SANDY LEAN CLAY (CL)	12.9				61	34	17	17	Hydraulic Conductivity 7.3×10^{-10} cm/s
BM-1	1.5 - 2.5	LEAN CLAY WITH SAND (CL)	16.0				80	31	16	15	Hydraulic Conductivity 9.9×10^{-7} cm/s
BM-2	0.0 - 0.5	SILT WITH SAND (ML)	14.0				77	NP	NP	NP	
BM-2	0.5 - 1.5	SANDY SILT (ML)	9.5				53	NP	NP	NP	Hydraulic Conductivity 3.5×10^{-8} cm/s
BM-2	1.5 - 2.5	SANDY SILT (ML)	8.9				59	NP	NP	NP	Hydraulic Conductivity 3.1×10^{-8} cm/s
BM-3	0.0 - 0.5	LEAN CLAY (CL)	18.5				91	39	16	23	
BM-3	0.5 - 1.5	SANDY LEAN CLAY (CL)	15.3				57	39	16	23	Hydraulic Conductivity 1.2×10^{-8} cm/s
BM-3	1.5 - 2.5	SANDY LEAN CLAY (CL)	18.0				68	33	17	16	Hydraulic Conductivity 1.1×10^{-8} cm/s
BM-4	0.0 - 0.5	FAT CLAY (CH)	25.6				92	52	20	32	
BM-4	0.5 - 1.5	FAT CLAY (CH)	21.2				92	50	19	31	Hydraulic Conductivity 1.5×10^{-7} cm/s
BM-4	1.5 - 2.5	LEAN CLAY (CL)	20.0				89	45	15	30	Hydraulic Conductivity 2.9×10^{-8} cm/s

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NP = NonPlastic



PROJECT NO.: 20174204

DRAWN BY: MAP

CHECKED BY: AS

DATE: 4/11/2017

REVISED: -

LABORATORY TEST RESULT SUMMARY

River Oaks Wastewater Land Treatment Area

000286

TABLE

A-1

Appendix B





April 12, 2017

Anthony Sorace
Kleinfelder
1826 Kramer Lane, Suite M
Austin, Texas 78758
TEL: (512) 926-6650
FAX (512) 926-3312
RE: River Oaks

Order No.: 1703151

Dear Anthony Sorace:

DHL Analytical, Inc. received 12 sample(s) on 3/20/2017 for the analyses presented in the following report.

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative and all estimated uncertainties of results are within method specifications.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

A handwritten signature in red ink, appearing to read "John DuPont".

John DuPont
General Manager

This report was performed under the accreditation of the State of Texas Laboratory Certification Number: T104704211-17-18



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N.º
CHAIN-OF-CUSTODY

CLIENT: Kleinfelder
ADDRESS: 1826 Kramer Lane Suite m
PHONE: 512-926-6650 FAX/E-MAIL: ASorace@Kleinfelder.com
DATA REPORTED TO: ASorace@Kleinfelder.com
ADDITIONAL REPORT COPIES TO: LCFrickson@Kleinfelder.com

DATE: 3/20/17 PAGE 1 OF 1
PO #: 51-0000 DHL WORK ORDER #: 1703151
PROJECT LOCATION OR NAME: River Oaks
CLIENT PROJECT #: 20174204 COLLECTOR:

[illegible]

Please overnight to testing lab please.

Sample Receipt Checklist

Client Name KleinfelderDate Received: 3/20/2017Work Order Number 1703151Received by JTChecklist completed by:  3/20/2017
Signature DateReviewed by:  3/20/2017
Initials DateCarrier name Hand Delivered

Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on shipping container/cooler?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Custody seals intact on sample bottles?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Not Present <input checked="" type="checkbox"/>
Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper container/bottle?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
All samples received within holding time?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Container/Temp Blank temperature in compliance?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	23.5 °C
Water - VOA vials have zero headspace?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	No VOA vials submitted <input checked="" type="checkbox"/>
Water - pH<2 acceptable upon receipt?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/> LOT #
	Adjusted? _____	Checked by _____	
Water - pH>9 (S) or pH>12 (CN) acceptable upon receipt?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/> LOT #
	Adjusted? _____	Checked by _____	

Any No response must be detailed in the comments section below.

Client contacted _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments: _____

Corrective Action _____

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder

Project: River Oaks

Lab Order: 1703151

CASE NARRATIVE

All analyses were sub-contracted to Texas A&M AgriLife Extension.

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder
Project: River Oaks
Project No: 20174204
Lab Order: 1703151

Client Sample ID: BM-1 0-6"
Lab ID: 1703151-01
Collection Date: 03/20/17
Matrix: SOIL

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
NITRATE-N (1N KCL)		ASA M-9					Analyst: SUB
Nitrate-N	5.00	0.500	0.500	N	mg/Kg-dry	1	04/10/17
PLANT AVAILABLE MINERALS AND NUTRIENTS		MEHLICH					Analyst: SUB
Calcium	11500	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Magnesium	309	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Phosphorus	9.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Potassium	251	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sodium	8.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sulfur	46.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
PH OF SOLID (2:1 RATIO)		SSAP19:164					Analyst: SUB
pH	8.00	0	0	N	pH Units	1	04/10/17
SODIUM ADSORPTION RATIO (SAR)		USDA 1978					Analyst: SUB
Calcium	159	0.0100	0.100	N	mg/L	1	04/10/17
Magnesium	13.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium	18.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium Adsorption Ratio	0.380	0	0	N	ratio	1	04/10/17
SOIL CONDUCTANCE (2:1 RATIO)		ASA 2:167					Analyst: SUB
Specific Conductance	0.352	0.0100	0.0100	N	mmhos/cm	1	04/10/17
TOTAL KJELDAHL NITROGEN IN SOIL		ASA M-9					Analyst: SUB
Nitrogen, Total	930	0.150	0.150	N	mg/Kg-dry	1	04/10/17
Total Kjeldahl Nitrogen	925	0.150	0.150	N	mg/Kg-dry	1	04/10/17

Qualifiers:	*	Value exceeds TCLP Maximum Concentration Level	B	Analyte detected in the associated Method Blank
	C	Sample Result or QC discussed in the Case Narrative	DF	Dilution Factor
	E	TPH pattern not Gas or Diesel Range Pattern	J	Analyte detected between MDL and RL
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit
	RL	Reporting Limit	S	Spike Recovery outside control limits
	N	Parameter not NELAC certified		

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder
Project: River Oaks
Project No: 20174204
Lab Order: 1703151

Client Sample ID: BM-1 6"-18"
Lab ID: 1703151-02
Collection Date: 03/20/17
Matrix: SOIL

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
NITRATE-N (1N KCL)		ASA M-9					Analyst: SUB
Nitrate-N	4.00	0.500	0.500	N	mg/Kg-dry	1	04/10/17
PLANT AVAILABLE MINERALS AND NUTRIENTS		MEHLICH					Analyst: SUB
Calcium	12800	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Magnesium	242	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Phosphorus	10.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Potassium	261	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sodium	8.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sulfur	18.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
PH OF SOLID (2:1 RATIO)		SSAP19:164					Analyst: SUB
pH	8.10	0	0	N	pH Units	1	04/10/17
SODIUM ADSORPTION RATIO (SAR)		USDA 1978					Analyst: SUB
Calcium	163	0.0100	0.100	N	mg/L	1	04/10/17
Magnesium	12.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium	21.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium Adsorption Ratio	0.430	0	0	N	ratio	1	04/10/17
SOIL CONDUCTANCE (2:1 RATIO)		ASA 2:167					Analyst: SUB
Specific Conductance	0.206	0.0100	0.0100	N	mmhos/cm	1	04/10/17
TOTAL KJELDAHL NITROGEN IN SOIL		ASA M-9					Analyst: SUB
Nitrogen, Total	1290	0.150	0.150	N	mg/Kg-dry	1	04/10/17
Total Kjeldahl Nitrogen	1280	0.150	0.150	N	mg/Kg-dry	1	04/10/17

Qualifiers:	*	Value exceeds TCLP Maximum Concentration Level	B	Analyte detected in the associated Method Blank
	C	Sample Result or QC discussed in the Case Narrative	DF	Dilution Factor
	E	TPH pattern not Gas or Diesel Range Pattern	J	Analyte detected between MDL and RL
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit
	RL	Reporting Limit	S	Spike Recovery outside control limits
	N	Parameter not NELAC certified		

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder
 Project: River Oaks
 Project No: 20174204
 Lab Order: 1703151

Client Sample ID: BM-1 18"-30"
 Lab ID: 1703151-03
 Collection Date: 03/20/17
 Matrix: SOIL

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
NITRATE-N (1N KCL)		ASA M-9					Analyst: SUB
Nitrate-N	4.00	0.500	0.500	N	mg/Kg-dry	1	04/10/17
PLANT AVAILABLE MINERALS AND NUTRIENTS		MEHLICH					Analyst: SUB
Calcium	11500	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Magnesium	262	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Phosphorus	7.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Potassium	216	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sodium	7.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sulfur	15.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
PH OF SOLID (2:1 RATIO)		SSAP19:164					Analyst: SUB
pH	8.10	0	0	N	pH Units	1	04/10/17
SODIUM ADSORPTION RATIO (SAR)		USDA 1978					Analyst: SUB
Calcium	86.0	0.0100	0.100	N	mg/L	1	04/10/17
Magnesium	7.00	0.0100	0.100	N	mg/L	1	04/10/17
Sodium	15.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium Adsorption Ratio	0.410	0	0	N	ratio	1	04/10/17
SOIL CONDUCTANCE (2:1 RATIO)		ASA 2:167					Analyst: SUB
Specific Conductance	0.188	0.0100	0.0100	N	mmhos/cm	1	04/10/17
TOTAL KJELDAHL NITROGEN IN SOIL		ASA M-9					Analyst: SUB
Nitrogen, Total	890	0.150	0.150	N	mg/Kg-dry	1	04/10/17
Total Kjeldahl Nitrogen	886	0.150	0.150	N	mg/Kg-dry	1	04/10/17

Qualifiers:	*	Value exceeds TCLP Maximum Concentration Level	B	Analyte detected in the associated Method Blank
	C	Sample Result or QC discussed in the Case Narrative	DF	Dilution Factor
	E	TPH pattern not Gas or Diesel Range Pattern	J	Analyte detected between MDL and RL
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit
	RL	Reporting Limit	S	Spike Recovery outside control limits
	N	Parameter not NELAC certified		

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder
 Project: River Oaks
 Project No: 20174204
 Lab Order: 1703151

Client Sample ID: BM-2 0-6"
 Lab ID: 1703151-04
 Collection Date: 03/20/17
 Matrix: SOIL

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
NITRATE-N (1N KCL)		ASA M-9					Analyst: SUB
Nitrate-N	4.00	0.500	0.500	N	mg/Kg-dry	1	04/10/17
PLANT AVAILABLE MINERALS AND NUTRIENTS		MEHLICH					Analyst: SUB
Calcium	29600	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Magnesium	196	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Phosphorus	2.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Potassium	85.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sodium	6.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sulfur	16.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
PH OF SOLID (2:1 RATIO)		SSAP19:164					Analyst: SUB
pH	8.30	0	0	N	pH Units	1	04/10/17
SODIUM ADSORPTION RATIO (SAR)		USDA 1978					Analyst: SUB
Calcium	106	0.0100	0.100	N	mg/L	1	04/10/17
Magnesium	5.00	0.0100	0.100	N	mg/L	1	04/10/17
Sodium	28.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium Adsorption Ratio	0.730	0	0	N	ratio	1	04/10/17
SOIL CONDUCTANCE (2:1 RATIO)		ASA 2:167					Analyst: SUB
Specific Conductance	0.163	0.0100	0.0100	N	mmhos/cm	1	04/10/17
TOTAL KJELDAHL NITROGEN IN SOIL		ASA M-9					Analyst: SUB
Nitrogen, Total	803	0.150	0.150	N	mg/Kg-dry	1	04/10/17
Total Kjeldahl Nitrogen	799	0.150	0.150	N	mg/Kg-dry	1	04/10/17

Qualifiers:	*	Value exceeds TCLP Maximum Concentration Level	B	Analyte detected in the associated Method Blank
	C	Sample Result or QC discussed in the Case Narrative	DF	Dilution Factor
	E	TPH pattern not Gas or Diesel Range Pattern	J	Analyte detected between MDL and RL
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit
	RL	Reporting Limit	S	Spike Recovery outside control limits
	N	Parameter not NELAC certified		

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder
Project: River Oaks
Project No: 20174204
Lab Order: 1703151

Client Sample ID: BM-2 6"-18"
Lab ID: 1703151-05
Collection Date: 03/20/17
Matrix: SOIL

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
NITRATE-N (1N KCL)		ASA M-9					Analyst: SUB
Nitrate-N	3.00	0.500	0.500	N	mg/Kg-dry	1	04/10/17
PLANT AVAILABLE MINERALS AND NUTRIENTS		MEHLICH					Analyst: SUB
Calcium	30300	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Magnesium	195	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Phosphorus	2.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Potassium	72.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sodium	7.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sulfur	16.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
PH OF SOLID (2:1 RATIO)		SSAP19:164					Analyst: SUB
pH	8.40	0	0	N	pH Units	1	04/10/17
SODIUM ADSORPTION RATIO (SAR)		USDA 1978					Analyst: SUB
Calcium	70.0	0.0100	0.100	N	mg/L	1	04/10/17
Magnesium	3.00	0.0100	0.100	N	mg/L	1	04/10/17
Sodium	25.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium Adsorption Ratio	0.780	0	0	N	ratio	1	04/10/17
SOIL CONDUCTANCE (2:1 RATIO)		ASA 2:167					Analyst: SUB
Specific Conductance	0.122	0.0100	0.0100	N	mmhos/cm	1	04/10/17
TOTAL KJELDAHL NITROGEN IN SOIL		ASA M-9					Analyst: SUB
Nitrogen, Total	222	0.150	0.150	N	mg/Kg-dry	1	04/10/17
Total Kjeldahl Nitrogen	219	0.150	0.150	N	mg/Kg-dry	1	04/10/17

Qualifiers:	*	Value exceeds TCLP Maximum Concentration Level	B	Analyte detected in the associated Method Blank
	C	Sample Result or QC discussed in the Case Narrative	DF	Dilution Factor
	E	TPH pattern not Gas or Diesel Range Pattern	J	Analyte detected between MDL and RL
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit
	RL	Reporting Limit	S	Spike Recovery outside control limits
	N	Parameter not NELAC certified		

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder
Project: River Oaks
Project No: 20174204
Lab Order: 1703151

Client Sample ID: BM-2 18"-30"
Lab ID: 1703151-06
Collection Date: 03/20/17
Matrix: SOIL

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
NITRATE-N (1N KCL)		ASA M-9					Analyst: SUB
Nitrate-N	3.00	0.500	0.500	N	mg/Kg-dry	1	04/10/17
PLANT AVAILABLE MINERALS AND NUTRIENTS		MEHLICH					Analyst: SUB
Calcium	29800	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Magnesium	195	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Phosphorus	<1.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Potassium	74.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sodium	8.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sulfur	17.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
PH OF SOLID (2:1 RATIO)		SSAP19:164					Analyst: SUB
pH	8.40	0	0	N	pH Units	1	04/10/17
SODIUM ADSORPTION RATIO (SAR)		USDA 1978					Analyst: SUB
Calcium	63.0	0.0100	0.100	N	mg/L	1	04/10/17
Magnesium	2.00	0.0100	0.100	N	mg/L	1	04/10/17
Sodium	26.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium Adsorption Ratio	0.880	0	0	N	ratio	1	04/10/17
SOIL CONDUCTANCE (2:1 RATIO)		ASA 2:167					Analyst: SUB
Specific Conductance	0.140	0.0100	0.0100	N	mmhos/cm	1	04/10/17
TOTAL KJELDAHL NITROGEN IN SOIL		ASA M-9					Analyst: SUB
Nitrogen, Total	119	0.150	0.150	N	mg/Kg-dry	1	04/10/17
Total Kjeldahl Nitrogen	116	0.150	0.150	N	mg/Kg-dry	1	04/10/17

Qualifiers:	*	Value exceeds TCLP Maximum Concentration Level	B	Analyte detected in the associated Method Blank
	C	Sample Result or QC discussed in the Case Narrative	DF	Dilution Factor
	E	TPH pattern not Gas or Diesel Range Pattern	J	Analyte detected between MDL and RL
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit
	RL	Reporting Limit	S	Spike Recovery outside control limits
	N	Parameter not NELAC certified		

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder
 Project: River Oaks
 Project No: 20174204
 Lab Order: 1703151

Client Sample ID: BM-3 0-6"
 Lab ID: 1703151-07
 Collection Date: 03/20/17
 Matrix: SOIL

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
NITRATE-N (1N KCL)		ASA M-9					Analyst: SUB
Nitrate-N	5.00	0.500	0.500	N	mg/Kg-dry	1	04/10/17
PLANT AVAILABLE MINERALS AND NUTRIENTS		MEHLICH					Analyst: SUB
Calcium	9340	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Magnesium	289	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Phosphorus	9.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Potassium	213	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sodium	6.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sulfur	12.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
PH OF SOLID (2:1 RATIO)		SSAP19:164					Analyst: SUB
pH	7.90	0	0	N	pH Units	1	04/10/17
SODIUM ADSORPTION RATIO (SAR)		USDA 1978					Analyst: SUB
Calcium	130	0.0100	0.100	N	mg/L	1	04/10/17
Magnesium	11.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium	17.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium Adsorption Ratio	0.390	0	0	N	ratio	1	04/10/17
SOIL CONDUCTANCE (2:1 RATIO)		ASA 2:167					Analyst: SUB
Specific Conductance	0.238	0.0100	0.0100	N	mmhos/cm	1	04/10/17
TOTAL KJELDAHL NITROGEN IN SOIL		ASA M-9					Analyst: SUB
Nitrogen, Total	1170	0.150	0.150	N	mg/Kg-dry	1	04/10/17
Total Kjeldahl Nitrogen	1170	0.150	0.150	N	mg/Kg-dry	1	04/10/17

Qualifiers:	*	Value exceeds TCLP Maximum Concentration Level	B	Analyte detected in the associated Method Blank
	C	Sample Result or QC discussed in the Case Narrative	DF	Dilution Factor
	E	TPH pattern not Gas or Diesel Range Pattern	J	Analyte detected between MDL and RL
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit
	RL	Reporting Limit	S	Spike Recovery outside control limits
	N	Parameter not NELAC certified		

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder
Project: River Oaks
Project No: 20174204
Lab Order: 1703151

Client Sample ID: BM-3 6"-18"
Lab ID: 1703151-08
Collection Date: 03/20/17
Matrix: SOIL

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
NITRATE-N (1N KCL)		ASA M-9					Analyst: SUB
Nitrate-N	3.00	0.500	0.500	N	mg/Kg-dry	1	04/10/17
PLANT AVAILABLE MINERALS AND NUTRIENTS		MEHLICH					Analyst: SUB
Calcium	12000	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Magnesium	227	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Phosphorus	6.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Potassium	232	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sodium	7.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sulfur	9.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
PH OF SOLID (2:1 RATIO)		SSAP19:164					Analyst: SUB
pH	8.10	0	0	N	pH Units	1	04/10/17
SODIUM ADSORPTION RATIO (SAR)		USDA 1978					Analyst: SUB
Calcium	89.0	0.0100	0.100	N	mg/L	1	04/10/17
Magnesium	6.00	0.0100	0.100	N	mg/L	1	04/10/17
Sodium	13.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium Adsorption Ratio	0.370	0	0	N	ratio	1	04/10/17
SOIL CONDUCTANCE (2:1 RATIO)		ASA 2:167					Analyst: SUB
Specific Conductance	0.216	0.0100	0.0100	N	mmhos/cm	1	04/10/17
TOTAL KJELDAHL NITROGEN IN SOIL		ASA M-9					Analyst: SUB
Nitrogen, Total	930	0.150	0.150	N	mg/Kg-dry	1	04/10/17
Total Kjeldahl Nitrogen	927	0.150	0.150	N	mg/Kg-dry	1	04/10/17

Qualifiers:	*	Value exceeds TCLP Maximum Concentration Level	B	Analyte detected in the associated Method Blank
	C	Sample Result or QC discussed in the Case Narrative	DF	Dilution Factor
	E	TPH pattern not Gas or Diesel Range Pattern	J	Analyte detected between MDL and RL
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit
	RL	Reporting Limit	S	Spike Recovery outside control limits
	N	Parameter not NELAC certified		

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder
Project: River Oaks
Project No: 20174204
Lab Order: 1703151

Client Sample ID: BM-3 18"-30
Lab ID: 1703151-09
Collection Date: 03/20/17
Matrix: SOIL

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
NITRATE-N (1N KCL)		ASA M-9					Analyst: SUB
Nitrate-N	3.00	0.500	0.500	N	mg/Kg-dry	1	04/10/17
PLANT AVAILABLE MINERALS AND NUTRIENTS		MEHLICH					Analyst: SUB
Calcium	11700	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Magnesium	245	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Phosphorus	4.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Potassium	202	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sodium	9.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sulfur	9.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
PH OF SOLID (2:1 RATIO)		SSAP19:164					Analyst: SUB
pH	8.10	0	0	N	pH Units	1	04/10/17
SODIUM ADSORPTION RATIO (SAR)		USDA 1978					Analyst: SUB
Calcium	72.0	0.0100	0.100	N	mg/L	1	04/10/17
Magnesium	4.00	0.0100	0.100	N	mg/L	1	04/10/17
Sodium	15.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium Adsorption Ratio	0.470	0	0	N	ratio	1	04/10/17
SOIL CONDUCTANCE (2:1 RATIO)		ASA 2:167					Analyst: SUB
Specific Conductance	0.204	0.0100	0.0100	N	mmhos/cm	1	04/10/17
TOTAL KJELDAHL NITROGEN IN SOIL		ASA M-9					Analyst: SUB
Nitrogen, Total	715	0.150	0.150	N	mg/Kg-dry	1	04/10/17
Total Kjeldahl Nitrogen	712	0.150	0.150	N	mg/Kg-dry	1	04/10/17

Qualifiers:

*	Value exceeds TCLP Maximum Concentration Level	B	Analyte detected in the associated Method Blank
C	Sample Result or QC discussed in the Case Narrative	DF	Dilution Factor
E	TPH pattern not Gas or Diesel Range Pattern	J	Analyte detected between MDL and RL
MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit
RL	Reporting Limit	S	Spike Recovery outside control limits
N	Parameter not NELAC certified		

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder
 Project: River Oaks
 Project No: 20174204
 Lab Order: 1703151

Client Sample ID: BM-4 0-6"
 Lab ID: 1703151-10
 Collection Date: 03/20/17
 Matrix: SOIL

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
NITRATE-N (1N KCL)		ASA M-9					Analyst: SUB
Nitrate-N	4.00	0.500	0.500	N	mg/Kg-dry	1	04/10/17
PLANT AVAILABLE MINERALS AND NUTRIENTS		MEHLICH					Analyst: SUB
Calcium	15000	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Magnesium	312	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Phosphorus	9.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Potassium	466	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sodium	10.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sulfur	9.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
PH OF SOLID (2:1 RATIO)		SSAP19:164					Analyst: SUB
pH	8.00	0	0	N	pH Units	1	04/10/17
SODIUM ADSORPTION RATIO (SAR)		USDA 1978					Analyst: SUB
Calcium	150	0.0100	0.100	N	mg/L	1	04/10/17
Magnesium	8.00	0.0100	0.100	N	mg/L	1	04/10/17
Sodium	14.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium Adsorption Ratio	0.290	0	0	N	ratio	1	04/10/17
SOIL CONDUCTANCE (2:1 RATIO)		ASA 2:167					Analyst: SUB
Specific Conductance	0.402	0.0100	0.0100	N	mmhos/cm	1	04/10/17
TOTAL KJELDAHL NITROGEN IN SOIL		ASA M-9					Analyst: SUB
Nitrogen, Total	1670	0.150	0.150	N	mg/Kg-dry	1	04/10/17
Total Kjeldahl Nitrogen	1660	0.150	0.150	N	mg/Kg-dry	1	04/10/17

Qualifiers:	*	Value exceeds TCLP Maximum Concentration Level	B	Analyte detected in the associated Method Blank
	C	Sample Result or QC discussed in the Case Narrative	DF	Dilution Factor
	E	TPH pattern not Gas or Diesel Range Pattern	J	Analyte detected between MDL and RL
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit
	RL	Reporting Limit	S	Spike Recovery outside control limits
	N	Parameter not NELAC certified		

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder
Project: River Oaks
Project No: 20174204
Lab Order: 1703151

Client Sample ID: BM4 6"-18"
Lab ID: 1703151-11
Collection Date: 03/20/17
Matrix: SOIL

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
NITRATE-N (1N KCL)		ASA M-9					Analyst: SUB
Nitrate-N	3.00	0.500	0.500	N	mg/Kg-dry	1	04/10/17
PLANT AVAILABLE MINERALS AND NUTRIENTS		MEHLICH					Analyst: SUB
Calcium	16200	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Magnesium	313	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Phosphorus	3.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Potassium	316	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sodium	24.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sulfur	10.0	1.00	1.00	N	mg/Kg-dry	1	04/10/17
PH OF SOLID (2:1 RATIO)		SSAP19:164					Analyst: SUB
pH	8.10	0	0	N	pH Units	1	04/10/17
SODIUM ADSORPTION RATIO (SAR)		USDA 1978					Analyst: SUB
Calcium	97.0	0.0100	0.100	N	mg/L	1	04/10/17
Magnesium	6.00	0.0100	0.100	N	mg/L	1	04/10/17
Sodium	23.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium Adsorption Ratio	0.620	0	0	N	ratio	1	04/10/17
SOIL CONDUCTANCE (2:1 RATIO)		ASA 2:167					Analyst: SUB
Specific Conductance	0.302	0.0100	0.0100	N	mmhos/cm	1	04/10/17
TOTAL KJELDAHL NITROGEN IN SOIL		ASA M-9					Analyst: SUB
Nitrogen, Total	914	0.150	0.150	N	mg/Kg-dry	1	04/10/17
Total Kjeldahl Nitrogen	911	0.150	0.150	N	mg/Kg-dry	1	04/10/17

Qualifiers:

*	Value exceeds TCLP Maximum Concentration Level	B	Analyte detected in the associated Method Blank
C	Sample Result or QC discussed in the Case Narrative	DF	Dilution Factor
E	TPH pattern not Gas or Diesel Range Pattern	J	Analyte detected between MDL and RL
MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit
RL	Reporting Limit	S	Spike Recovery outside control limits
N	Parameter not NELAC certified		

DHL Analytical, Inc.

Date: 12-Apr-17

CLIENT: Kleinfelder
 Project: River Oaks
 Project No: 20174204
 Lab Order: 1703151

Client Sample ID: BM-4 18"-30"
 Lab ID: 1703151-12
 Collection Date: 03/20/17
 Matrix: SOIL

Analyses	Result	MDL	RL	Qual	Units	DF	Date Analyzed
NITRATE-N (1N KCL)		ASA M-9					Analyst: SUB
Nitrate-N	3.00	0.500	0.500	N	mg/Kg-dry	1	04/10/17
PLANT AVAILABLE MINERALS AND NUTRIENTS		MEHLICH					Analyst: SUB
Calcium	14600	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Magnesium	363	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Phosphorus	1.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Potassium	229	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sodium	267	1.00	1.00	N	mg/Kg-dry	1	04/10/17
Sulfur	9.00	1.00	1.00	N	mg/Kg-dry	1	04/10/17
PH OF SOLID (2:1 RATIO)		SSAP19:164					Analyst: SUB
pH	8.50	0	0	N	pH Units	1	04/10/17
SODIUM ADSORPTION RATIO (SAR)		USDA 1978					Analyst: SUB
Calcium	28.0	0.0100	0.100	N	mg/L	1	04/10/17
Magnesium	4.00	0.0100	0.100	N	mg/L	1	04/10/17
Sodium	80.0	0.0100	0.100	N	mg/L	1	04/10/17
Sodium Adsorption Ratio	3.76	0	0	N	ratio	1	04/10/17
SOIL CONDUCTANCE (2:1 RATIO)		ASA 2:167					Analyst: SUB
Specific Conductance	0.283	0.0100	0.0100	N	mmhos/cm	1	04/10/17
TOTAL KJELDAHL NITROGEN IN SOIL		ASA M-9					Analyst: SUB
Nitrogen, Total	507	0.150	0.150	N	mg/Kg-dry	1	04/10/17
Total Kjeldahl Nitrogen	504	0.150	0.150	N	mg/Kg-dry	1	04/10/17

Qualifiers:	*	Value exceeds TCLP Maximum Concentration Level	B	Analyte detected in the associated Method Blank
	C	Sample Result or QC discussed in the Case Narrative	DF	Dilution Factor
	E	TPH pattern not Gas or Diesel Range Pattern	J	Analyte detected between MDL and RL
	MDL	Method Detection Limit	ND	Not Detected at the Method Detection Limit
	RL	Reporting Limit	S	Spike Recovery outside control limits
	N	Parameter not NELAC certified		

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Soil Analysis Report

Soil, Water and Forage Testing Laboratory
Department of Soil and Crop Sciences
2478 TAMU
College Station, TX 77843-2478
979-845-4816 (phone)
979-845-5958 (FAX)
Visit our website: <http://soiltesting.tamu.edu>

Sample received on: 3/24/2017
Printed on: 4/10/2017
Area Represented: not provided

Other County

Laboratory Number: 481958
Customer Sample ID: BM-1 0-6

Crop Grown: **IMPROVED AND HYBRID BERMUDA GRASS (ESTABLISHMENT)**

Analysis	Results	CL*	Units	ExLow	VLow	Low	Mod	High	VHigh	Excess.
pH	8.0	(5.8)	-	Mod. Alkaline						
Conductivity	352	(-)	umho/cm	None				CL*		Fertilizer Recommended
Nitrate-N	5	(-)	ppm**							30 lbs N/acre
Phosphorus	9	(50)	ppm							85 lbs P2O5/acre
Potassium	251	(125)	ppm							0 lbs K2O/acre
Calcium	11,508	(180)	ppm							0 lbs Ca/acre
Magnesium	309	(50)	ppm							0 lbs Mg/acre
Sulfur	46	(13)	ppm							0 lbs S/acre
Sodium	8	(-)	ppm	I						
Iron										
Zinc										
Manganese										
Copper										
Boron										
Limestone Requirement										0.00 tons 100ECCE/acre
Detailed Salinity Test (Saturated Paste Extract)										
			pH							7.1
			Conductivity							0.76 mmhos/cm
			Sodium							18 ppm
			Potassium							8 ppm
			Calcium							159 ppm
			Magnesium							13 ppm
TKN	925	ppm	SAR							0.38
			SSP							8.02

*CL=Critical level is the point which no additional nutrient (excluding nitrate-N, sodium and conductivity) is recommended. **ppm=mg/kg

Nitrogen: Apply an additional 40 lbs/A of nitrogen upon 75% vegetative cover.

New online fertilizer calculators have been placed on the laboratory's website to determine appropriate fertilizers to purchase and determine their application rates.
<http://soiltesting.tamu.edu/webpages/calculator.html>

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Sample received on: 3/24/2017
Printed on: 4/10/2017
Area Represented: not provided

Other County

Laboratory Number: 481959
Customer Sample ID: BM-1 6-18

Crop Grown: **IMPROVED AND HYBRID BERMUDA GRASS (ESTABLISHMENT)**

Analysis	Results	CL*	Units	ExLow	VLow	Low	Mod	High	VHigh	Excess.
pH	8.1	(5.8)	-	Mod. Alkaline						
Conductivity	206	(-)	umho/cm	None				CL*		Fertilizer Recommended
Nitrate-N	4	(-)	ppm**							30 lbs N/acre
Phosphorus	10	(50)	ppm							85 lbs P2O5/acre
Potassium	261	(125)	ppm							0 lbs K2O/acre
Calcium	12,803	(180)	ppm							0 lbs Ca/acre
Magnesium	242	(50)	ppm							0 lbs Mg/acre
Sulfur	18	(13)	ppm							0 lbs S/acre
Sodium	8	(-)	ppm	I						
Iron										
Zinc										
Manganese										
Copper										
Boron										
Limestone Requirement										0.00 tons 100ECCE/acre
Detailed Salinity Test (Saturated Paste Extract)										
			pH							7.3
			Conductivity							0.84 mmhos/cm
			Sodium							21 ppm
			Potassium							14 ppm
			Calcium							163 ppm
			Magnesium							12 ppm
TKN	1282	ppm	SAR							0.43
			SSP							8.86

*CL=Critical level is the point which no additional nutrient (excluding nitrate-N, sodium and conductivity) is recommended. **ppm=mg/kg

Nitrogen: Apply an additional 40 lbs/A of nitrogen upon 75% vegetative cover.

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Soil Analysis Report

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College Station, TX 77843-2478

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979-845-5958 (FAX)

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Sample received on: 3/24/2017

Printed on: 4/10/2017

Area Represented: not provided

Other County

Laboratory Number: 481960

Customer Sample ID: BM-1 18-30

Crop Grown: **IMPROVED AND HYBRID BERMUDA GRASS (ESTABLISHMENT)**

Analysis	Results	CL*	Units	ExLow	VLow	Low	Mod	High	VHigh	Excess.
pH	8.1	(5.8)	-	Mod. Alkaline						
Conductivity	188	(-)	umho/cm	None						
Nitrate-N	4	(-)	ppm**	CL*						
Phosphorus	7	(50)	ppm	Fertilizer Recommended						
Potassium	216	(125)	ppm	30 lbs N/acre						
Calcium	11,512	(180)	ppm	90 lbs P2O5/acre						
Magnesium	262	(50)	ppm	0 lbs K2O/acre						
Sulfur	15	(13)	ppm	0 lbs Ca/acre						
Sodium	7	(-)	ppm	0 lbs Mg/acre						
Iron				0 lbs S/acre						
Zinc										
Manganese										
Copper										
Boron										
Limestone Requirement										0.00 tons 100ECCE/acre
Detailed Salinity Test (Saturated Paste Extract)										
pH										
7.2										
Conductivity										
0.46 mmhos/cm										
Sodium										
15 ppm										
0.639 meq/L										
Potassium										
8 ppm										
0.216 meq/L										
Calcium										
86 ppm										
4.297 meq/L										
Magnesium										
7 ppm										
0.594 meq/L										
SAR										
0.41										
SSP										
11.11										

*CL=Critical level is the point which no additional nutrient (excluding nitrate-N, sodium and conductivity) is recommended. **ppm=mg/kg

Nitrogen: Apply an additional 40 lbs/A of nitrogen upon 75% vegetative cover.

New online fertilizer calculators have been placed on the laboratory's website to determine appropriate fertilizers to purchase and determine their application rates.
<http://soiltesting.tamu.edu/webpages/calculator.html>

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Soil Analysis Report

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Other County

Laboratory Number: 481961
Customer Sample ID: BM-2 0-6

Sample received on: 3/24/2017
Printed on: 4/10/2017
Area Represented: not provided

Crop Grown: **IMPROVED AND HYBRID BERMUDA GRASS (ESTABLISHMENT)**

Analysis	Results	CL*	Units	ExLow	VLow	Low	Mod	High	VHigh	Excess.
pH	8.3	(5.8)	-	Mod. Alkaline						
Conductivity	163	(-)	umho/cm	None						
Nitrate-N	4	(-)	ppm**	II						Fertilizer Recommended
Phosphorus	2	(50)	ppm							30 lbs N/acre
Potassium	85	(125)	ppm							100 lbs P2O5/acre
Calcium	29,637	(180)	ppm							30 lbs K2O/acre
Magnesium	196	(50)	ppm							0 lbs Ca/acre
Sulfur	16	(13)	ppm							0 lbs Mg/acre
Sodium	6	(-)	ppm	I						0 lbs S/acre
Iron										
Zinc										
Manganese										
Copper										
Boron										
Limestone Requirement										0.00 tons 100ECCE/acre
Detailed Salinity Test (Saturated Paste Extract)										
			pH							7.1
			Conductivity							0.61 mmhos/cm
			Sodium							28 ppm
			Potassium							1.225 meq/L
			Calcium							13 ppm
			Magnesium							0.339 meq/L
TKN	799	ppm	Calcium							106 ppm
			Magnesium							5 ppm
			SAR							0.73
			SSP							16.97

*CL=Critical level is the point which no additional nutrient (excluding nitrate-N, sodium and conductivity) is recommended. **ppm=mg/kg

Nitrogen: Apply an additional 40 lbs/A of nitrogen upon 75% vegetative cover.

New online fertilizer calculators have been placed on the laboratory's website to determine appropriate fertilizers to purchase and determine their application rates.
<http://soiltesting.tamu.edu/webpages/calculator.html>

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Other County

Laboratory Number: 481962
Customer Sample ID: BM-2 6-18

Sample received on: 3/24/2017
Printed on: 4/10/2017
Area Represented: not provided

Crop Grown: **IMPROVED AND HYBRID BERMUDA GRASS (ESTABLISHMENT)**

Analysis	Results	CL*	Units	ExLow	VLow	Low	Mod	High	VHigh	Excess.
pH	8.4	(5.8)	-	Mod. Alkaline						
Conductivity	122	(-)	umho/cm	None						
Nitrate-N	3	(-)	ppm**	I						Fertilizer Recommended
Phosphorus	2	(50)	ppm	III						30 lbs N/acre
Potassium	72	(125)	ppm							100 lbs P2O5/acre
Calcium	30,295	(180)	ppm							40 lbs K2O/acre
Magnesium	195	(50)	ppm							0 lbs Ca/acre
Sulfur	16	(13)	ppm							0 lbs Mg/acre
Sodium	7	(-)	ppm	I						0 lbs S/acre
Iron										
Zinc										
Manganese										
Copper										
Boron										
Limestone Requirement										0.00 tons 100ECCE/acre
Detailed Salinity Test (Saturated Paste Extract)										
			pH	7.2						
			Conductivity	0.40 mmhos/cm						
			Sodium	25 ppm						
			Potassium	4 ppm						
			Calcium	70 ppm						
			Magnesium	3 ppm						
TKN	219	ppm	SAR	0.78						
			SSP	21.94						

*CL=Critical level is the point which no additional nutrient (excluding nitrate-N, sodium and conductivity) is recommended. **ppm=mg/kg

Nitrogen: Apply an additional 40 lbs/A of nitrogen upon 75% vegetative cover.

New online fertilizer calculators have been placed on the laboratory's website to determine appropriate fertilizers to purchase and determine their application rates.
<http://soiltesting.tamu.edu/webpages/calculator.html>

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Sample received on: 3/24/2017
Printed on: 4/10/2017
Area Represented: not provided

Other County
Laboratory Number: 481963
Customer Sample ID: BM-2 18-30

Crop Grown: IMPROVED AND HYBRID BERMUDA GRASS (ESTABLISHMENT)

Analysis	Results	CL*	Units	ExLow	VLow	Low	Mod	High	VHigh	Excess.
pH	8.4	(5.8)	-	Mod. Alkaline						
Conductivity	140	(-)	umho/cm	None					CL*	Fertilizer Recommended
Nitrate-N	3	(-)	ppm**	I						30 lbs N/acre
Phosphorus	0	(50)	ppm							105 lbs P2O5/acre
Potassium	74	(125)	ppm							40 lbs K2O/acre
Calcium	29,846	(180)	ppm							0 lbs Ca/acre
Magnesium	195	(50)	ppm							0 lbs Mg/acre
Sulfur	17	(13)	ppm							0 lbs S/acre
Sodium	8	(-)	ppm	I						
Iron										
Zinc										
Manganese										
Copper										
Boron										
Limestone Requirement										0.00 tons 100ECCE/acre
Detailed Salinity Test (Saturated Paste Extract)										
			pH					7.2		
			Conductivity					0.40 mmhos/cm		
			Sodium					26 ppm		1.133 meq/L
			Potassium					3 ppm		0.081 meq/L
			Calcium					63 ppm		3.130 meq/L
TKN	116		ppm					Magnesium	2 ppm	0.188 meq/L
								SAR	0.88	
								SSP	25.01	

*CL=Critical level is the point which no additional nutrient (excluding nitrate-N, sodium and conductivity) is recommended. **ppm=mg/kg

Nitrogen: Apply an additional 40 lbs/A of nitrogen upon 75% vegetative cover.

New online fertilizer calculators have been placed on the laboratory's website to determine appropriate fertilizers to purchase and determine their application rates.
<http://soiltesting.tamu.edu/webpages/calculator.html>



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Round Rock, TX 78664

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College Station, TX 77843-2478
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979-845-5958 (FAX)
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Sample received on: 3/24/2017
Printed on: 4/10/2017
Area Represented: not provided

Other County

Laboratory Number: 481964
Customer Sample ID: BM-3 0-6

Crop Grown: IMPROVED AND HYBRID BERMUDA GRASS (ESTABLISHMENT)

Analysis	Results	CL*	Units	ExLow	VLow	Low	Mod	High	VHigh	Excess.
pH	7.9	(5.8)	-	Mod. Alkaline						
Conductivity	238	(-)	umho/cm	None						
Nitrate-N	5	(-)	ppm**	CL*						
Phosphorus	9	(50)	ppm							
Potassium	213	(125)	ppm							
Calcium	9,339	(180)	ppm							
Magnesium	289	(50)	ppm							
Sulfur	12	(13)	ppm							
Sodium	6	(-)	ppm							
Iron										
Zinc										
Manganese										
Copper										
Boron										
Limestone Requirement				0.00 tons 100ECCE/acre						
				Detailed Salinity Test (Saturated Paste Extract)						
				pH		7.2				
				Conductivity		0.71 mmhos/cm				
				Sodium		17 ppm		0.754 meq/L		
				Potassium		6 ppm		0.149 meq/L		
				Calcium		130 ppm		6.506 meq/L		
TKN	1167		ppm	Magnesium		11 ppm		0.902 meq/L		
				SAR		0.39				
				SSP		9.07				

*CL=Critical level is the point which no additional nutrient (excluding nitrate-N, sodium and conductivity) is recommended. **ppm=mg/kg

Nitrogen: Apply an additional 40 lbs/A of nitrogen upon 75% vegetative cover.

Sulfur: Available sulfur may be found deeper in soil profile, thus limiting any response to added sulfur.

New online fertilizer calculators have been placed on the laboratory's website to determine appropriate fertilizers to purchase and determine their application rates.
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2300 Double Creek
Round Rock, TX 78664

Soil Analysis Report

Soil, Water and Forage Testing Laboratory
Department of Soil and Crop Sciences
2478 TAMU
College Station, TX 77843-2478
979-845-4816 (phone)
979-845-5958 (FAX)
Visit our website: <http://soiltesting.tamu.edu>

Sample received on: 3/24/2017
Printed on: 4/10/2017
Area Represented: not provided

Other County

Laboratory Number: 481965
Customer Sample ID: BM-3 6-18

Crop Grown: **IMPROVED AND HYBRID BERMUDA GRASS (ESTABLISHMENT)**

Analysis	Results	CL*	Units	ExLow	VLow	Low	Mod	High	VHigh	Excess.
pH	8.1	(5.8)	-	Mod. Alkaline						
Conductivity	216	(-)	umho/cm	None						
Nitrate-N	3	(-)	ppm**	CL*						
Phosphorus	6	(50)	ppm	Fertilizer Recommended						
Potassium	232	(125)	ppm	30 lbs N/acre						
Calcium	11,962	(180)	ppm	90 lbs P2O5/acre						
Magnesium	227	(50)	ppm	0 lbs K2O/acre						
Sulfur	9	(13)	ppm	0 lbs Ca/acre						
Sodium	7	(-)	ppm	0 lbs Mg/acre						
Iron				5 lbs S/acre						
Zinc										
Manganese										
Copper										
Boron										
Limestone Requirement										0.00 tons 100ECCE/acre
				Detailed Salinity Test (Saturated Paste Extract)						
				pH		7.2				
				Conductivity		0.51 mmhos/cm				
				Sodium		13 ppm		0.578 meq/L		
				Potassium		5 ppm		0.129 meq/L		
				Calcium		89 ppm		4.432 meq/L		
TKN	927		ppm	Magnesium		6 ppm		0.457 meq/L		
				SAR		0.37				
				SSP		10.33				

*CL=Critical level is the point which no additional nutrient (excluding nitrate-N, sodium and conductivity) is recommended. **ppm=mg/kg

Nitrogen: Apply an additional 40 lbs/A of nitrogen upon 75% vegetative cover.

Sulfur: Available sulfur may be found deeper in soil profile, thus limiting any response to added sulfur.

New online fertilizer calculators have been placed on the laboratory's website to determine appropriate fertilizers to purchase and determine their application rates.
<http://soiltesting.tamu.edu/webpages/calculator.html>



Report generated for:
DHL Analytical Inc
2300 Double Creek
Round Rock, TX 78664

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Other County

Laboratory Number: 481966
Customer Sample ID: BM-3 18-30

Sample received on: 3/24/2017
Printed on: 4/10/2017
Area Represented: not provided

Crop Grown: IMPROVED AND HYBRID BERMUDA GRASS (ESTABLISHMENT)

Analysis	Results	CL*	Units	ExLow	VLow	Low	Mod	High	VHigh	Excess.
pH	8.1	(5.8)	-	Mod. Alkaline						
Conductivity	204	(-)	umho/cm	None						
Nitrate-N	3	(-)	ppm**	CL*						
Phosphorus	4	(50)	ppm	Fertilizer Recommended						
Potassium	202	(125)	ppm	30 lbs N/acre						
Calcium	11,676	(180)	ppm	95 lbs P2O5/acre						
Magnesium	245	(50)	ppm	0 lbs K2O/acre						
Sulfur	9	(13)	ppm	0 lbs Ca/acre						
Sodium	9	(-)	ppm	0 lbs Mg/acre						
Iron				5 lbs S/acre						
Zinc										
Manganese										
Copper										
Boron										
Limestone Requirement										0.00 tons 100ECCE/acre
				Detailed Salinity Test (Saturated Paste Extract)						
				pH		7.3				
				Conductivity		0.39 mmhos/cm				
				Sodium		15 ppm		0.666 meq/L		
				Potassium		5 ppm		0.118 meq/L		
				Calcium		72 ppm		3.601 meq/L		
TKN	712		ppm	Magnesium		4 ppm		0.353 meq/L		
				SAR		0.47				
				SSP		14.05				

*CL=Critical level is the point which no additional nutrient (excluding nitrate-N, sodium and conductivity) is recommended. **ppm=mg/kg

Nitrogen: Apply an additional 40 lbs/A of nitrogen upon 75% vegetative cover.

Sulfur: Available sulfur may be found deeper in soil profile, thus limiting any response to added sulfur.

New online fertilizer calculators have been placed on the laboratory's website to determine appropriate fertilizers to purchase and determine their application rates.
<http://soiltesting.tamu.edu/webpages/calculator.html>

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Sample received on: 3/24/2017
Printed on: 4/10/2017
Area Represented: not provided

Other County

Laboratory Number: 481967
Customer Sample ID: BM-4 0-6

Crop Grown: IMPROVED AND HYBRID BERMUDA GRASS (ESTABLISHMENT)

Analysis	Results	CL*	Units	ExLow	VLow	Low	Mod	High	VHigh	Excess.
pH	8.0	(5.8)	-	Mod. Alkaline						
Conductivity	402	(-)	umho/cm	None						
Nitrate-N	4	(-)	ppm**	CL*						
Phosphorus	9	(50)	ppm							
Potassium	466	(125)	ppm							
Calcium	15,015	(180)	ppm							
Magnesium	312	(50)	ppm							
Sulfur	9	(13)	ppm							
Sodium	10	(-)	ppm							
Iron										
Zinc										
Manganese										
Copper										
Boron										
Limestone Requirement				0.00 tons 100ECCE/acre						
				Detailed Salinity Test (Saturated Paste Extract)						
				pH		7.1				
				Conductivity		0.74 mmhos/cm				
				Sodium		14 ppm		0.594 meq/L		
				Potassium		12 ppm		0.300 meq/L		
				Calcium		150 ppm		7.499 meq/L		
TKN	1665		ppm	Magnesium		8 ppm		0.686 meq/L		
				SAR		0.29				
				SSP		6.54				

*CL=Critical level is the point which no additional nutrient (excluding nitrate-N, sodium and conductivity) is recommended. **ppm=mg/kg

Nitrogen: Apply an additional 40 lbs/A of nitrogen upon 75% vegetative cover.

Sulfur: Available sulfur may be found deeper in soil profile, thus limiting any response to added sulfur.

New online fertilizer calculators have been placed on the laboratory's website to determine appropriate fertilizers to purchase and determine their application rates.
<http://soiltesting.tamu.edu/webpages/calculator.html>

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Sample received on: 3/24/2017
Printed on: 4/10/2017
Area Represented: not provided

Other County

Laboratory Number: 481968
Customer Sample ID: BM-4 6-18

Crop Grown: **IMPROVED AND HYBRID BERMUDA GRASS (ESTABLISHMENT)**

Analysis	Results	CL*	Units	ExLow	VLow	Low	Mod	High	VHigh	Excess.
pH	8.1	(5.8)	-	Mod. Alkaline						
Conductivity	302	(-)	umho/cm	None						
Nitrate-N	3	(-)	ppm**	CL*						
Phosphorus	3	(50)	ppm	Fertilizer Recommended						
Potassium	316	(125)	ppm	0 lbs K20/acre						
Calcium	16,239	(180)	ppm	0 lbs Ca/acre						
Magnesium	313	(50)	ppm	0 lbs Mg/acre						
Sulfur	10	(13)	ppm	5 lbs S/acre						
Sodium	24	(-)	ppm							
Iron										
Zinc										
Manganese										
Copper										
Boron										
Limestone Requirement										0.00 tons 100ECCE/acre
Detailed Salinity Test (Saturated Paste Extract)										
pH										7.2
Conductivity										0.55 mmhos/cm
Sodium										23 ppm
Potassium										5 ppm
Calcium										97 ppm
Magnesium										6 ppm
SAR										0.62
SSP										15.66
TKN	911		ppm							

*CL=Critical level is the point which no additional nutrient (excluding nitrate-N, sodium and conductivity) is recommended. **ppm=mg/kg

Nitrogen: Apply an additional 40 lbs/A of nitrogen upon 75% vegetative cover.

Sulfur: Available sulfur may be found deeper in soil profile, thus limiting any response to added sulfur.

New online fertilizer calculators have been placed on the laboratory's website to determine appropriate fertilizers to purchase and determine their application rates.
<http://soiltesting.tamu.edu/webpages/calculator.html>

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Sample received on: 3/24/2017
Printed on: 4/10/2017
Area Represented: not provided

Other County
Laboratory Number: 481969
Customer Sample ID: BM-4 18-30

Crop Grown: **IMPROVED AND HYBRID BERMUDA GRASS (ESTABLISHMENT)**

Analysis	Results	CL*	Units	ExLow	VLow	Low	Mod	High	VHigh	Excess.
pH	8.5	(5.8)	-	Mod. Alkaline						
Conductivity	283	(-)	umho/cm	None						
Nitrate-N	3	(-)	ppm**	I						Fertilizer Recommended
Phosphorus	1	(50)	ppm	II						35 lbs N/acre
Potassium	229	(125)	ppm							
Calcium	14,585	(180)	ppm							
Magnesium	363	(50)	ppm							
Sulfur	9	(13)	ppm							
Sodium	267	(-)	ppm							
Iron										
Zinc										
Manganese										
Copper										
Boron										
Limestone Requirement										0.00 tons 100ECCE/acre
Detailed Salinity Test (Saturated Paste Extract)										
			pH							7.7
			Conductivity							0.39 mmhos/cm
			Sodium							80 ppm
			Potassium							3 ppm
			Calcium							28 ppm
			Magnesium							4 ppm
TKN	504	ppm	SAR							3.76
			SSP							66.19

*CL=Critical level is the point which no additional nutrient (excluding nitrate-N, sodium and conductivity) is recommended. **ppm=mg/kg

Nitrogen: Apply an additional 40 lbs/A of nitrogen upon 75% vegetative cover.

Sulfur: Available sulfur may be found deeper in soil profile, thus limiting any response to added sulfur.

New online fertilizer calculators have been placed on the laboratory's website to determine appropriate fertilizers to purchase and determine their application rates.
<http://soiltesting.tamu.edu/webpages/calculator.html>

Design conditions		
Max Flow Rate	475000	GPD
Surface Acres of Ponds	8.34	acre
Acres of Irrigated Land	140	acre
SCS Curve Number of Soil Type	80	
Irrigation Efficiency (K)	0.85	
Max Conductivity of Soil Solution (Cl)	8	
Max Elect. Conductivity of Effluent (Ce)	5.4	

Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Effluent Production (MG/Month)	14.73	13.30	14.73	14.25	14.73	14.25	14.73	14.73	14.25	14.73	14.25	14.73	173.38
Average Precipitation, in. (1997-2021)	2.52	1.99	2.96	2.69	4.41	3.26	2.34	2.34	3.16	4.21	2.82	2.33	35.03
Average Evaporation, in. (1997-2021)	2.22	2.34	3.42	4.27	4.65	6.10	6.79	7.11	5.33	4.01	2.90	2.14	51.28

1	Water Balance	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
2	Average Precipitation (in)	2.52	1.99	2.96	2.69	4.41	3.26	2.34	2.34	3.16	4.21	2.82	2.33	35.03
3	Average Runoff (in)	0.90	0.56	1.22	1.02	2.39	1.45	0.78	0.78	1.37	2.22	1.12	0.77	14.57
4	Average Infiltrated Rainfall (2-3) (in)	1.62	1.43	1.74	1.67	2.02	1.81	1.56	1.56	1.79	1.99	1.70	1.56	20.46
5	Evapotranspiration (in)	1.5	1.5	3.8	4.5	8.3	8.6	8.9	5.6	6.9	5.4	2.7	1.2	58.9
6	Required Leaching (in)	0.00	0.14	4.28	5.88	13.03	14.10	15.24	8.39	10.62	7.07	2.07	0.00	80.83
7	Total Water Needs (5+6) (in)	1.50	1.64	8.08	10.38	21.33	22.70	24.14	13.99	17.52	12.47	4.77	1.20	139.73
8	Root Zone Requirement (7-4) (in)	0.00	0.20	6.34	8.72	19.31	20.89	22.58	12.43	15.73	10.48	3.07	0.00	119.74
9	Reservoir Surface Evaporation (in)	0.13	0.14	0.20	0.25	0.28	0.36	0.40	0.42	0.32	0.24	0.17	0.13	3.05
10	Effluent Application (8/K) (in)	0.00	0.24	7.46	10.25	22.72	24.57	26.57	14.62	18.50	12.33	3.61	0.00	140.88
11	Reservoir Consumption (9+10) (in/acre)	0.13	0.38	7.66	10.51	22.99	24.94	26.97	15.05	18.82	12.57	3.78	0.13	143.93
12	Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
13	Effluent Production (in/irrig. ac)	3.87	3.50	3.87	3.75	3.87	3.75	3.87	3.87	3.75	3.87	3.75	3.87	45.61
14	Rainfall (worst 25-year event) (2004)	3.73	2.95	4.38	3.98	6.53	4.83	3.47	3.47	4.68	6.24	4.18	3.45	51.88
15	Runoff (from 14)	1.82	1.21	2.36	2.03	4.26	2.74	1.61	1.61	2.62	3.99	2.19	1.60	28.05
16	Infiltration (14-15)	1.91	1.74	2.02	1.96	2.27	2.08	1.86	1.86	2.06	2.24	1.99	1.85	23.83
17	Available Water (13+16)	5.78	5.24	5.89	5.70	6.14	5.83	5.73	5.73	5.81	6.11	5.74	5.73	69.44
18	Net 25-year Low Evaporation (2004)	0.11	0.12	0.17	0.21	0.23	0.31	0.34	0.36	0.27	0.20	0.15	0.11	2.58
19	Storage	3.76	3.38	-3.43	-6.38	-18.79	-20.81	-22.69	-10.76	-14.70	-8.37	0.33	3.77	
20	Accumulated Storage	7.86	11.24	7.81	1.43	-17.36	-38.17	-60.86	-71.62	-86.31	-94.68	0.33	4.10	11.24

Storage volume requirement = 11.24 in-ac/ac, or (11.24 in-ac/ac)(140 ac)(1ft/12in) = 131 ac-ft

Storage volume available = 31 ac-ft (pond 1) + 100 ac-ft (pond 2) = 131 ac-ft



October 17, 2022

Ms. Hannah Zellner, P.G.
TCEQ - MC150
P.O. Box 13087
Austin, Texas 78711-3087

Re: Application for Major Amendment Permit No. WQ0015559001
To be issued to River Oaks Land Partners II, LLC (CN605909704)
River Oaks Land Partners WWTF (RN109672469)

Dear Ms. Zellner,

This letter is in response to your correspondence back to us listing a total of 2 geology comments and 3 agronomy comments for the River Oaks Land Partners WWTF permit application. A copy of the letter you sent to us is included with this correspondence. The following items are responses (in bold) to the items requested (in italics):

- 1. Worksheet 3.0 Section 3. Storage and Evaporation Lagoons/Ponds- Attachment 13 includes information on the synthetic pond liner, signed and sealed by an engineer, however Special Provision 18 of the existing permit requires that the pond liner certification include a description of how the liner meets the requirements of 30 TAC 217.203 and 30 TAC 309.13(d). These requirements include the installation of an underdrain with a leachate detection and collection system and that soil compaction meets the liner manufacturer's requirements. Please provide a certification that includes a description of how the liner meets all of the requirements.*

As discussed on a telephone call on October 6, 2022, the irrigation storage ponds are not subject to the requirements of 30 TAC 217.203 and 30 TAC 309.13(d), as these irrigation storage ponds are by definition not treatment units, because they are not holding wastewater that is not final treated effluent. These holding ponds are only holding final treated effluent water. In addition, design plans for the phase 1 irrigation storage pond that is already built were submitted to TCEQ plan review and approved for construction with the synthetic liner system submitted with the permit application. This treated effluent holding pond meets all site requirements in 30 TAC 309.13(d) and the synthetic pond liner meets the permeability requirements listed in this section of the rules as well. A copy of this TCEQ plan review approval letter is included with this correspondence.

- 2. Special Provision 22 of the existing permit requires a 100-foot buffer distance between the North Fork of the San Gabriel River and an intermittent drainage, oriented southwest to*

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000318

northeast across the irrigation site, and the land application area. Please identify this buffer area on the USGS topographic map and site map.

A revised USGS topographic map and revised site map are included with this correspondence.

1. *Domestic Worksheet 3.0 Section 5 (Annual Cropping Plan): Cropping plan is not attached as indicated on the application. Please answer each bullet point and submit a cropping plan at its entirety.*

A revised cropping plan is included with this correspondence.

2. *Domestic worksheet 3.0, Section 8.A (Soil Map): Please submit a soil map depicting the actual application area instead of the property boundaries.*

The original soil map submitted with the application included both the development property boundary and the irrigation application area. A revised soils map which more clearly depicts the actual application area is enclosed with this correspondence.

3. *Domestic Worksheet 3.0, Section 8.B (Soil Analyses): The submitted soil samples are from the original application in 2017. It appears no activity or development has taken place since the permit approval. Please submit a statement that no activities have occurred at the site that would change the properties of the soil and that the submitted soil samples are still representative of the application area.*

I can verify that no activities have occurred at the site that would change the properties of the soil and that the submitted soil samples are still representative of the application area. The original permitted irrigation area of 140 acres total is unchanged as a result of this amendment application.

If you should have any questions with regard to this letter, please feel free to contact me by email at alaughlin@stegerbizzell.com.

Sincerely,



Aaron Laughlin, P.E.



cc: Grant Rollo

RIVER OAKS LAND PARTNERS
PERMIT NO. WQ0015559-001
APPLICATION FOR A MAJOR AMENDMENT WITH RENEWAL
Technical Completeness Review

Please address the following items:

GEOLOGY

1. Worksheet 3.0 Section 3. Storage and Evaporation Lagoons/Ponds- Attachment 13 includes information on the synthetic pond liner, signed and sealed by an engineer, however Special Provision 18 of the existing permit requires that the pond liner certification include a description of how the liner meets the requirements of 30 TAC §217.203 and 30 TAC 309.13(d). These requirements include the installation of an underdrain with a leachate detection and collection system and that soil compaction meets the liner manufacturer's requirements. Please provide a certification that includes a description of how the liner meets all of the requirements.
2. Special Provision 22 of the existing permit requires a 100-foot buffer distance between the North Fork of the San Gabriel River and an intermittent drainage, orientated southwest to northeast across the irrigation site, and the land application area. Please identify this buffer area on the USGS topographic map and site map.

AGRONOMY

1. Domestic Worksheet 3.0, Section 5 (Annual Cropping Plan): Cropping Plan is not attached as indicated on the application. Please answer each bullet point and submit an cropping plan at its entirety.
2. Domestic Worksheet 3.0, Section 8.A (Soil Map): Please submit a soil map depicting the actual application area instead of the property boundaries.
3. Domestic Worksheet 3.0, Section 8.B (Soil Analyses): The submitted soil samples are from the original application in 2017. It appears no activity or development has taken place since the permit approval. Please submit a statement that no activities have occurred at the site that would change the properties of the soil and that the submitted soil samples are still representative of the application area.

For geology-related questions, please contact Hannah Zellner, P.G. at (512) 239-2908 or via email at Hannah.Zellner@tceq.texas.gov (preferred). For soils/agronomy-related questions, please contact Alan Barraza at (512) 239-4642 or via email at Alan.Barraza@tceq.texas.gov (preferred).

Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Bobby Janecka, *Commissioner*
Toby Baker, *Executive Director*



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

June 15, 2021

Aaron J. Laughlin, P.E.
STEGER BIZZELL
1978 S. Austin Avenue
Georgetown, Texas 78626

Re: North San Gabriel Municipal Utility District 1
Northgate Ranch Phase 1 Wastewater Treatment Plant
Permit No. WQ0015559-001
WWPR Log No. 1220/067
CN605317809, RN109672469
Williamson County

Dear Mr. Laughlin:

This letter is being issued as an update to the initial conditional project approval letter dated April 15, 2021 for the North San Gabriel MUD 1 Northgate Ranch Phase 1 wastewater treatment plant. The plant will be regulated by Texas Land Application Permit (TLAP) WQ0015559001 and is designed to treat an average daily flow of 60,000 gpd, the permitted interim 1 flow phase. Updates within this letter are regarding the requested variance for using the magnetic flow meter, and the removal of the approval condition for amending the existing permit. All other conditions and remaining language within the initial approval letter remain.

On December 17, 2020, TCEQ received the project summary transmittal letter dated December 17, 2020 for the installation of a package membrane bioreactor (MBR) type wastewater treatment plant for North San Gabriel MUD 1 in Williamson County, Texas.

The rules which regulate the design, installation and testing of domestic wastewater projects are found in 30 TAC, Chapter 217, of the Texas Commission on Environmental Quality (TCEQ) rules titled, Design Criteria for Wastewater Systems.

The MBR wastewater treatment plant will include the following units:

- Primary headworks
 - 2 mm perforated plant drum screen
 - rated capacity of 1,458 gpm
- Pre-equalization tank
 - 12' diameter, 14.95' overall height
 - Capacity of 10,700 gallons
- Anoxic basin; dimensions of 8.5' x 11' x 9.5' SWD
- Aeration basin; dimensions of 8.5' x 6.33' x 10.5' SWD

Treatment Plant units continued

- MBR Zones
 - Number of zones – 2
 - 8.5' x 6.67' x 10' per zone
- Chlorine Contact Basin: 51.33' x 13' x 7' high (SWD 5.5')
- Sludge storage tank; 12' diameter, 11.88' height
- Influent lift station and wet well
 - 9' width x 6' length x 35' depth
 - VFD operating pumps
- Irrigation pump station and wet well
 - 10' width x 13' length x 37' depth
 - Vertical turbine pumps
 - Hydro-pneumatic pressure tank; 7,500 gallons capacity
- Irrigation storage pond; 31.07 AC-Ft, 169 days storage capacity

The summary transmittal letter and engineering report contained a variance request. The variance requested was for 30 TAC 217.33(b) which requires an effluent flow measuring device to have an open channel to allow for easy inspection, calibration, and cleaning. Initially, it was understood that the engineer was proposing to solely use a magnetic flow. The placement of the magnetic flow meter will be in a place where the pipe will always be flowing full per the manufacturer's recommendations. TCEQ had concerns with the ability to calibrate the magnetic flow meter to ensure flow measurement accuracy. In late April, after issuance of the initial conditional approval letter a conversation took place during which the Engineer relayed that the plant would also include a channel and staff gauge for flow measurement. The staff flow measurement device satisfies the definition of a primary measuring device. The magnetic flow measurement device can serve as a secondary measuring device. The combined use of the primary and secondary flow measuring devices will produce the permit required totalizing flow measurement. **Given that the flow can be totalized by a primary and secondary measurement device the requested variance is conditionally granted on the condition that the requisite O&M manual require the necessary calibration and that the records of said calibration be maintained on site to be presented upon request to any TCEQ employee.**

The TCEQ review of the submitted information for the MBR wastewater treatment plant seems to indicate that the plant, as designed, meets the general requirements of 30 TAC Chapter 217: Design Criteria for Wastewater Systems and should be able to produce an effluent to meet both the permitted effluent concentration limits and the Type I reclaimed water standards. Given the result of the TCEQ review the plant as designed is conditionally approved for treating 60,000 gpd. The conditions of this approval are:

- The screenings be held within a completely covered receptacle to alleviate the possibility of nuisance odor issues
- The screening must be washed to remove organic matter before being stored in the screenings receptacle to alleviate possible nuisance odor conditions
- The drain with the screening wash water must be flow to the equalization basin or to the headworks
- The equalization basin should be aerated

Conditions of System Approval continued

- **The MLSS concentration should never exceed 10,000 mg/l in the bioreactor**
- **The MLSS concentration should never exceed 14,000 mg/l in the membrane unit**
- **A method for calibrating the inline magnetic meter must be placed within the treatment system**
- **Some method of back-up emergency power, or method to connect a portable emergency power source should be incorporated into the plant design to at least operate the major necessary treatment components**
- **All redundancy requirements in 30 TAC 217 should be met**
- **If not already completed, a liner certification of the irrigation storage pond should be provided for TCEQ to review and approve as a separate submittal**

If the desire is to have an ultimate flow phase value of 360,000 gpd, as stated in the Engineering Report, a permit amendment would be necessary to lower final phase flow value from the current value of 475,000 gpd to the desired value.

You must keep certain materials on file for the life of the project and provide them to TCEQ upon request. These materials include an engineering report, test results, a summary transmittal letter, and the final version of the project plans and specifications. These materials shall be prepared and sealed by a Professional Engineer licensed in the State of Texas and must show substantial compliance with Chapter 217. All plans and specifications must conform to any waste discharge requirements authorized in a permit by the TCEQ. Certain specific items which shall be addressed in the engineering report are discussed in §217.10. Additionally, the engineering report must include all constants, graphs, equations, and calculations needed to show substantial compliance with Chapter 217.

If in the future, additional variances from the Chapter 217 requirements are desired for the project, each variance must be requested in writing by the design engineer. Then, the TCEQ will consider granting a written approval to the variance from the rules for the specific project and the specific circumstances.

Within 60 days of the completion of construction, an appointed engineer shall notify both the Wastewater Permits Section of the TCEQ and the appropriate Region Office of the date of completion. The engineer shall also provide written certification that all construction, materials, and equipment were substantially in accordance with the approved project, the rules of the TCEQ, and any change orders filed with the TCEQ. All notifications, certifications, and change orders must include the signed and dated seal of a Professional Engineer licensed in the State of Texas.

Please be reminded of 30 TAC §217.7(a) of the rules which states, "Approval given by the executive director or other authorized review authority does not relieve an owner of any liability or responsibility with respect to designing, constructing, or operating a collection system or treatment facility in accordance with applicable commission rules and the associated wastewater permit".

Aaron J. Laughlin, P.E.
Page 4
June 15, 2021

If you have any questions, or if we can be of any further assistance, please call me at (512) 239-1372.

Sincerely,


Paul A. Brochi, P.E.
Wastewater Permits Section (MC 148)
Water Quality Division
Texas Commission on Environmental Quality

PAB/tc



U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY



LIBERTY HILL QUADRANGLE
TEXAS
7.5-MINUTE TOPO

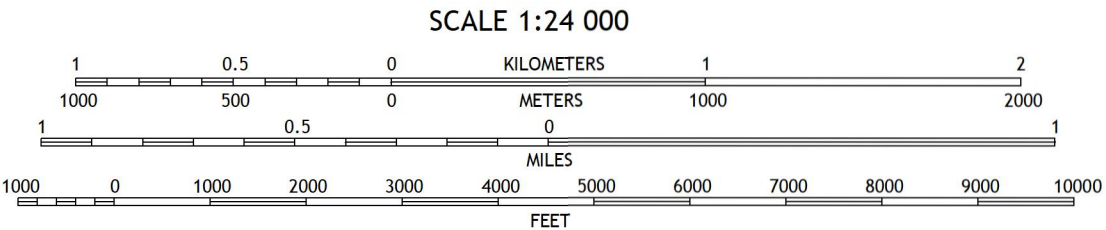
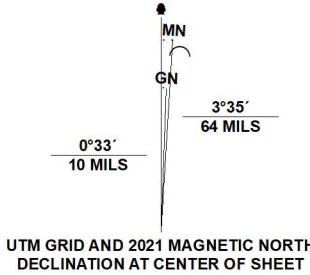


Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid/Universal Transverse Mercator, Zone 14R
Data is provided by The National Map (TNM), is the best available at the time of map
generation, and includes data content from supporting themes of Elevation,
Hydrography, Geographic Names, Boundaries, Transportation, Structures, Land Cover,
and Orthorectification. Refer to associated Federal Geographic Data Committee (FGDC)
Metadata for additional source data information.

This map is not a legal document. Boundaries may be generalized for this map scale.
Private lands within government reservations may not be shown. Obtain permission
before entering private lands. Temporal changes may have occurred since these data
were collected and some data may no longer represent actual surface conditions.

Learn About The National Map: <https://nationalmap.gov>

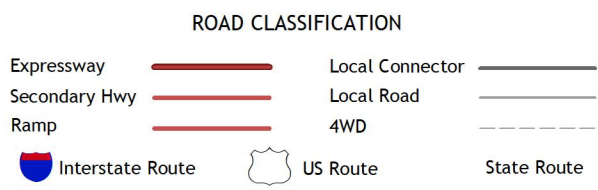


CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988
CONTOUR SMOOTHNESS = Medium



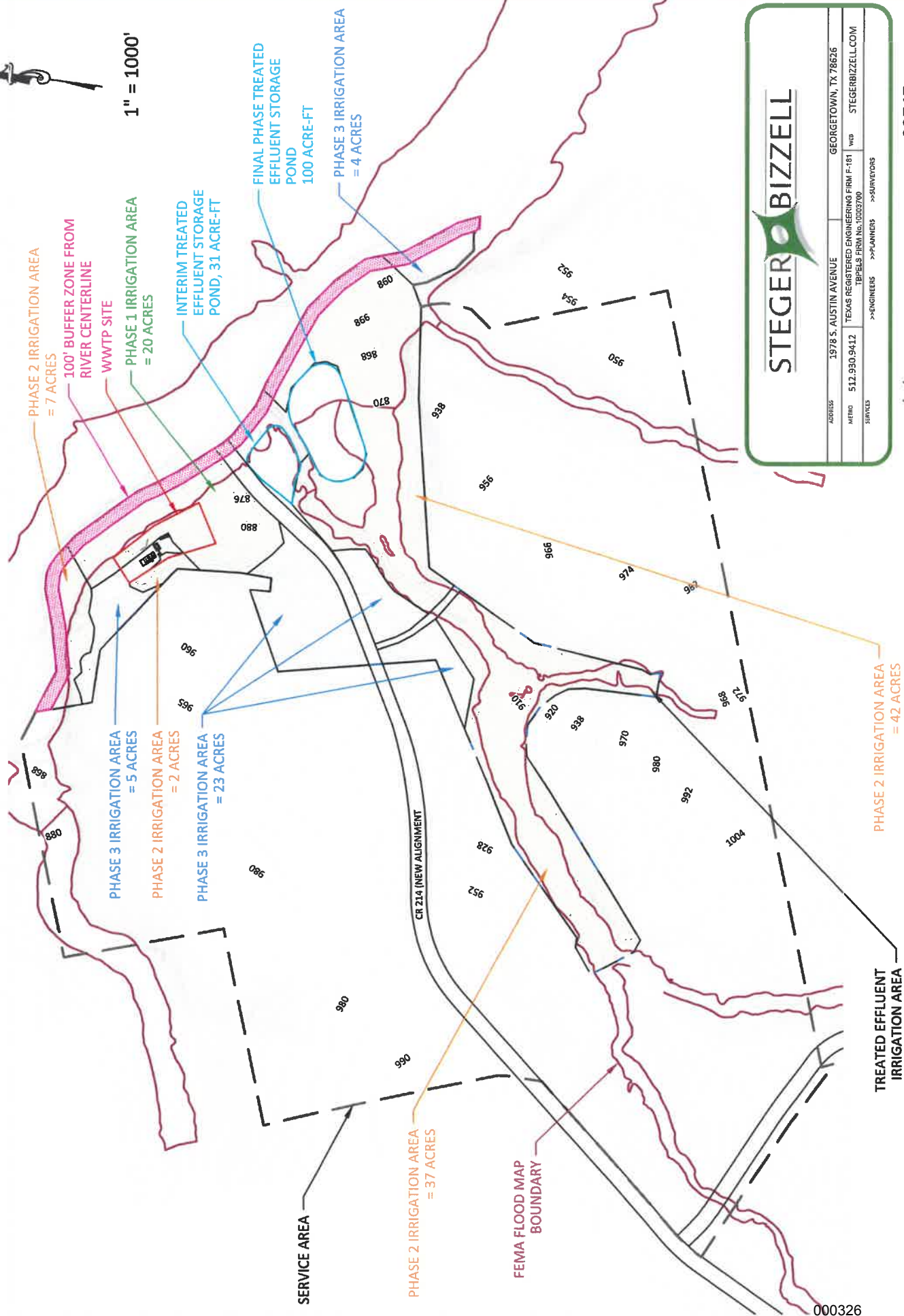
QUADRANGLE LOCATION		
Joppa	Mahomet	Florence
Bertram	Liberty Hill	Leander NE
Travis Peak	Hamless	Leander

ADJOINING QUADRANGLES



LIBERTY HILL, TX
2022

ATTACHMENT 9 - SITE DRAWING



ADDRESS	1978 S. AUSTIN AVENUE	GEORGETOWN, TX 78626
METRO	512.930.9412	TEXAS REGISTERED ENGINEERING FIRM F-181
SERVICES	TEPELS FIRM No. 10033700	WB STEGERBIZZELL.COM
	>>ENGINEERS	>>PLANNERS
	>>SURVEYORS	

DATE 9/6/2022

JOB NO. 22747

ATTACHMENT 14 – ANNUAL CROPPING PLAN

A. Soils Map: See Attachment 14 for Soils Map

B. Type of Crops and Acreage:

The cropping plan involves effluent spray irrigation on 140 acres of vegetated area covers with native bermuda grass in the warm season and overseeded with ryegrass in the cool season.

C. Yield Goal Estimates:

The estimated hay yield goals are 6 tons/ac-yr of bermuda grass and 5 tons/ac-yr of ryegrass.

D. Growing Season of Crops:

Crop will be grown as a perennial crop but the peak growing period will be from February through November.

E. Nutrient Requirements for Crops:

The summary of estimated nutrient requirements are shown below:

Crop	Design Yield (tons/acre)	Nitrogen-N (lb/acre)	Phosphorus P2O5 (lb/acre)	Potassium K2O (lb/acre)
Bermuda grass	6.00	225.6	52.4	201.6
Ryegrass	5.00	167	62.1	170.4
Totals		392.6	114.5	372

No additional fertilizer requirements are recommended based on soil sampling results.

F. Minimum and maximum harvest height:

The maximum harvest height is 18 inches and the minimum harvest height is 2 inches.

G. Supplemental Watering Requirements for Each Crop:

No supplemental watering will be required in addition to spray irrigation of effluent.

H. Salt Tolerances of Each Crop:

6.9 mmho/cm with no anticipated reduction in yield, and 10.8 mmho/cm with up to 25% reduction in yield. (source: Metcalf & Eddy, 3rd Ed. Wastewater Engineering, Treatment, Disposal and Reuse)

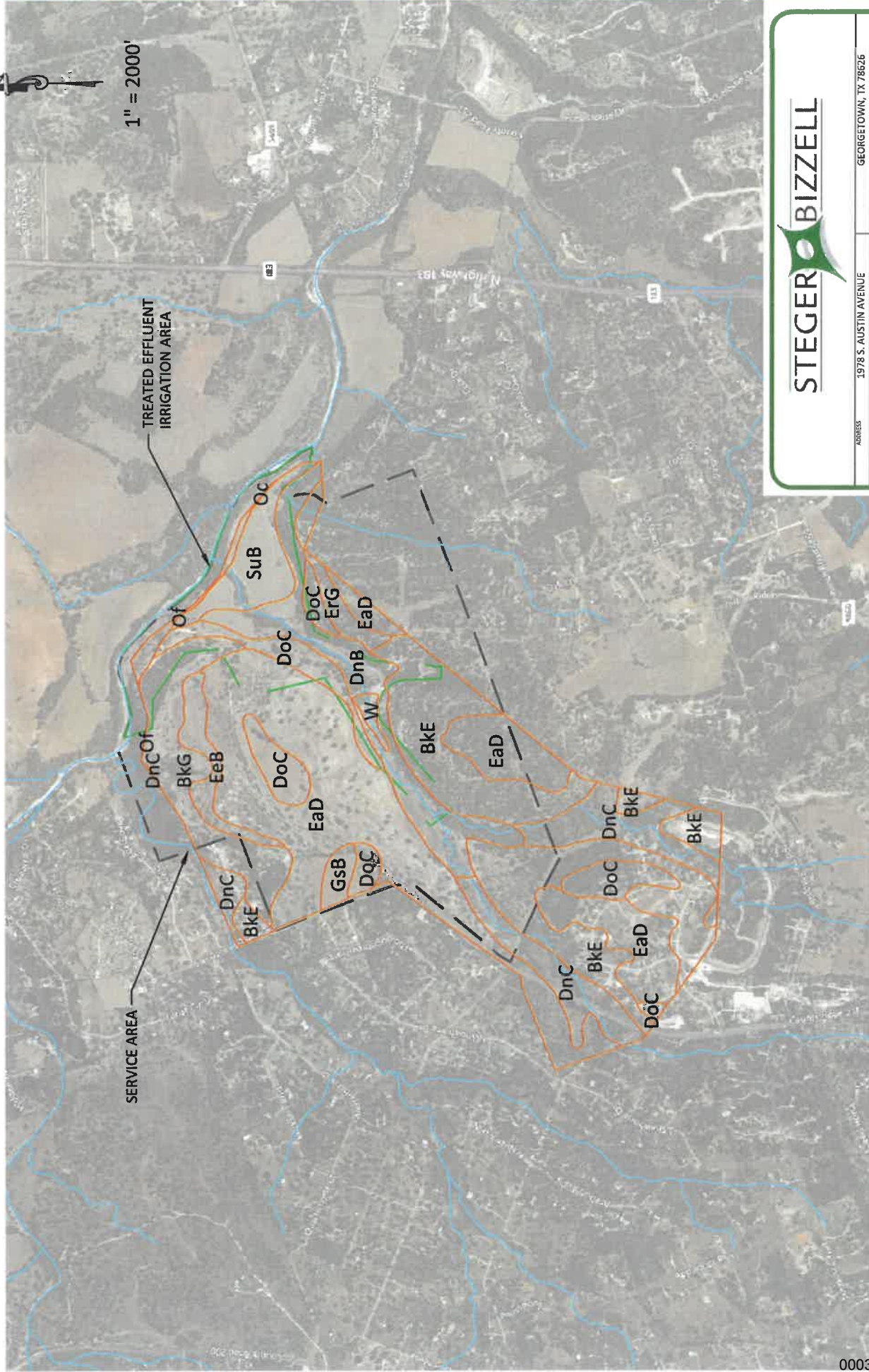
I. Harvesting Method and Number of Harvests:

Local farmers and ranchers will be contracted to harvest crops. Crops will be harvested and grazed. Typical number of harvests per year is three to four, with additional harvests as required dependent on climatic conditions and irrigation requirements.

J. Justification of Non-Harvesting:

N/A – Crops will be harvested.

ATTACHMENT 14 - SOIL MAP



STEGER BIZZELL

ADDRESS	1978 S. AUSTIN AVENUE	GEORGETOWN, TX 78626
METRO	512.930.9412	TEXAS REGISTERED ENGINEERING FIRM F-181
SERVICES	TELEPHONE FIRM NO. 1003700	WEB STEGERBIZZELL.COM
	>>ENGINEERS	>>PLANNERS
		>>SURVEYORS

DATE 9/6/2022 JOB NO. 22747

000328



March 8, 2023

Mr. Edwin Madrid
TCEQ Applications Review and Processing Team – MC 148
Water Quality Division
P.O. Box 13087
Austin, Texas 78711-3087

Re: Application for Major Amendment Permit No. WQ0015559001
To be issued to River Oaks Land Partners II, LLC (CN Pending)
River Oaks Land Partners WWTF (RN109672469)

Dear Mr. Madrid,

This letter is in response to your correspondence back to us listing a total of four review comments for the River Oaks Land Partners WWTF permit application. A copy of the letter you sent to us is included with this correspondence. The following items are responses (in bold) to the items requested (in italics):

1. *The staff at the TCEQ has determined that River Oaks Land Partners, LLC is delinquent regarding the payment of fees and/or penalties. Please see Attachment 1 for more information on these fees.*

The outstanding fee amount of \$620 has been paid as of February 28. A copy of the receipt and confirmation of payment is enclosed with this correspondence.

2. *Section 1.C on page 14 of the Domestic Administrative Report 1.1: The application indicates that the required affected landowner mailing list labels were provided via a readable/writeable CD. However, the disk could not be located. Please either submit the landowners mailing list on a CD-RW disk typed in label form Avery 5160 (using software compatible with Word) or four sets of printed labels. Furthermore, the addresses should not contain punctuation. If possible, please email the response.*

A CD-RW disk with the landowners information in MS Word format is enclosed with this correspondence, and the word document has also been emailed to Edwin Madrid on March 8.

ADDRESS

1978 S. AUSTIN AVENUE | GEORGETOWN, TX 78626

PHONE

512.930.9412

FAX

512.930.9416

WEB

STEGERBIZZELL.COM

TEXAS REGISTERED ENGINEERING FIRM F-181

SERVICES

>> ENGINEERS

>> PLANNERS

>> SURVEYORS

000329

Mr. Edwin Madrid
March 8, 2023
Page 2

4. *Please use the attached plain language summary (PLS) Template to provide a plain language summary in English. Please provide the PLS in a Microsoft Word Document.*

A CD-RW disk with the plain language summary document in MS Word format is enclosed with this correspondence, and the word document has also been emailed to Edwin Madrid on March 8.

5. *Please review the Notice of Receipt of Application and Intent to Obtain a Water Quality Permit and indicate if it contains any errors or omissions..*

All information in the draft notice text appears to be accurate.

If you should have any questions with regard to this letter, please feel free to contact me by email at alaughlin@stegerbizzell.com.

Sincerely,

A handwritten signature in blue ink, appearing to read 'A. Laughlin', with a stylized flourish at the end.

Aaron Laughlin, P.E.

cc: Grant Rollo

Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Bobby Janecka, *Commissioner*
Toby Baker, *Executive Director*



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

February 27, 2023

VIA EMAIL

Mr. Aaron Laughlin, P.E.
Project Manager
Steger Bizzell

Re: Application to Amend Permit No. WQ0015559001
To be Issued to River Oaks Land Partners II, LLC (*previously River Oaks Land Partners, LLC and Texas Land Fund No. 6. L.P.*)
CN (*pending*), RN109672469

Dear Mr. Laughlin:

1. The staff of the Texas Commission on Environmental Quality (TCEQ) has determined that River Oaks Land Partners, LLC is delinquent regarding the payment of fees and/or penalties. Please see Attachment 1 for more information on these fees.
2. Section 1.C on page 14 of the Domestic Administrative Report 1.1: The application indicates that the required affected landowner mailing list labels were provided via a readable/writeable CD. However, the disk could not be located. Please either submit the landowners mailing list on a CD-RW disk typed in label form Avery 5160 (using software compatible with Word) or four sets of printed labels. Furthermore, the addresses should not contain punctuations. If possible, please email the response.

New rule requirements under Title 30 Texas Administrative Code (TAC) Chapter 39 relating to public notices have been implemented. The deficiencies listed below are new items that need to be provided to meet the alternative language requirements.

4. Please use the attached Plain Language Summary (PLS) Template to provide a plain language summary in English. Please provide the PLS in a Microsoft Word Document.
5. The following is a portion of the Notice of Receipt of Application and Intent to Obtain a Water Quality Permit which contains information relevant to your application. Please read it carefully and indicate if it contains any errors or omissions. The complete notice will be sent to you once the application is declared administratively complete.

APPLICATION. River Oaks Land Partners II, LLC (*pending ownership transfer*), has applied to the Texas Commission on Environmental Quality (TCEQ) to amend Texas Land Application Permit (TLAP) No. WQ0015559001 to authorize changing the flow rate on Interim phase II, changing the size of irrigation ponds, and changing the irrigation area for Interim phase I and II. The domestic wastewater treatment facility and disposal area are located approximately 1.0 mile northwest of the intersection of County Road 214 and San Gabriel Ranch Road, in Williamson County, Texas 78642. TCEQ received this application on September 29, 2022. The permit application will be available for viewing and copying at Liberty Hill Public Library, Liberty Hill, in Williamson County,

Mr. Aaron Laughlin, P.E.
Page 2
February 27, 2023
Permit No. WQ0015559001

Texas prior to the date this notice is published in the newspaper. This link to an electronic map of the site or facility's general location is provided as a public courtesy and not part of the application or notice. For the exact location, refer to the application. <https://gisweb.tceq.texas.gov/LocationMapper/?marker=-97.891388,30.705&level=18>

Further information may also be obtained from River Oaks Land Partners II, LLC at the address stated above or by calling Mr. Aaron Laughlin, Steger Bizzell, at 512-930-9412.

Please submit the complete response, addressed to my attention by March 13, 2023. If you should have any questions, please do not hesitate to call me at (512) 239-2191.

Sincerely,



Erwin Madrid
Applications Review and Processing Team (MC 148)
Water Quality Division
Texas Commission of Environmental Quality

Enclosures:
Attachment 1 – Municipal TPDES and TLAP PLS Form

cc: Mr. Grant Rollo, Vice President, Randolph Texas Development, 14001 West State Highway 29, Suite 203, Liberty Hill, Texas 78642

TCEQ ePay Voucher Receipt

Transaction Information

Voucher Number: 622890
Trace Number: 582EA000533341
Date: 02/28/2023 09:38 AM
Payment Method: ACH - Authorization 0037590202
Voucher Amount: \$620.00
Fee Type: Consolidated Water Quality Fee (WWI + WQA)
Fee AR Number: 23007266
ePay Actor: SARAH MADDING

Payment Contact Information

Name: SARAH MADDING
Company: RANDOLPH TEXAS DEVELOPMENT
Address: 14001 WEST SH 29 STE 203, LIBERTY HILL, TX 76542
Phone: 512-788-4000

Billing Information

Billing Name: RIVER OAKS LAND PARTNERS LLC
Bill Address: 14001 W STATE HIGHWAY 29 STE 2, LIBERTY HILL, TX 78642 2250

Your transaction is complete. Thank you for using TCEQ ePay.

Note: It may take up to 3 working days for this electronic payment to be processed and be reflected in the TCEQ ePay system. Print this receipt and the vouchers for your records. An email receipt has also been sent.

Transaction Information

Trace Number: 582EA000533341
Date: 02/28/2023 09:38 AM
Payment Method: ACH - Authorization 0037590202
ePay Actor: SARAH MADDING
Actor Email: smadding@randolphtexas.com
IP: 70.125.165.197
TCEQ Amount: \$620.00
Texas.gov Price: \$620.00*

* This service is provided by Texas.gov, the official website of Texas. The price of this service includes funds that support the ongoing operations and enhancements of Texas.gov, which is provided by a third party in partnership with the State.

Payment Contact Information

Name: SARAH MADDING
Company: RANDOLPH TEXAS DEVELOPMENT
Address: 14001 WEST SH 29 STE 203, LIBERTY HILL, TX 76542
Phone: 512-788-4000

Cart Items

Click on the voucher number to see the voucher details.

Voucher	Fee Description	AR Number	Amount
622890	CONSOLIDATED WATER QUALITY FEE (WWI + WQA)	23007266	\$620.00
TCEQ Amount:			\$620.00

[ePay Again](#) [Exit ePay](#)

Note: It may take up to 3 working days for this electronic payment to be processed and be reflected in the TCEQ ePay system. Print this receipt for your records.

Attachment 4 – List of Affected Landowners

1. Tri Pointe Homes Texas Inc
13640 Briarwick Dr Ste 170
Austin TX 78729

11. Same as #2

21. Permittee Owned

2. Phau-Lariat 108 LLC
9000 Gulf Fwy
Houston TX 77017

12. Same as #1

22. Permittee Owned

3. Permittee Owned

13. Permittee Owned

23. Permittee Owned

4. Permittee Owned

14. Haskell Frank A & Jody M
2455 County Road 214
Liberty Hill TX 78642-4527

24. Permittee Owned

5. Permittee Owned

15. Permittee Owned

25. Permittee Owned

6. Permittee Owned

16. Same as #2

26. Permittee Owned

7. Berman Mark & John L Lohr &
Lisa Anderson & Delanie & Andrew
McDonald
11500 Reading Way
Austin TX 78717

17. Same as #1

27. Permittee Owned

8. Permittee Owned

18. Permittee Owned

28. Permittee Owned

9. DRP TX 4 LLC
ATTN Chris Bornemann
590 Madison Ave #FL 13
New York NY 10022

19. Permittee Owned

29. Cherokee Ridge LLC
1285 County Road 260
Bertram TX 78605

10. Same as #9

20. Permittee Owned

30. Dacus Galyon M & Roberta A
120 Horizon Ridge Cv
Liberty Hill TX 78642-2079

Attachment 4 – List of Affected Landowners

31. Steer John & Gerda
116 Horizon Ridge Cv
Liberty Hill TX 78642

41. San Filippo Justine
1539 County Road 215
Bertram TX 78605

51. Lochte Glen E & Reagan A
192 Thoroughbred Trace
Liberty Hill TX 78642

32. Same as #31

42. Kieley Brian Edward
116 Taylor Creek Way
Liberty Hill TX 78642

52. Shearer Erica M & Grant
180 Thoroughbred Trace
Liberty Hill TX 78642

33. Swierc Conrad R & Debbie
108 Horizon Ridge Cv
Liberty Hill TX 78642

43. Maniaci Dave & Michelle
2821 Deerfern Ln
Round Rock TX 78665-2574

53. Etheredge Jim Tom & Rose
Marie
172 Thoroughbred Trace
Liberty Hill TX 78642

34. Nad Tomislav & Shasha Zhang
104 Horizon Ridge Cv
Liberty Hill TX 78642

44. Hamilton Kelsey & Tyler
108 Taylor Creek Way
Liberty Hill TX 78642

54. Nicolas Pablo Antolin &
Cathleen
160 Thoroughbred Trace
Liberty Hill TX 78642

35. Owner Unknown
301 San Gabriel Hideaway Cv
Liberty Hill TX 78642

45. Singh Gulab & Poonam
9703 Dover Springs Ct
Katy TX 77494

55. Walker Harry C & Denise E
152 Thoroughbred Trace
Liberty Hill TX 78642

36. Hernandez Cesar Margarito
141 Taylor Creek Way
Liberty Hill TX 78642

46. Guevara-George Joany & Juan
J Varela Albarran
100 Taylor Creek Way
Liberty Hill TX 78642

56. Hagerman Eric & Wendy
144 Thoroughbred Trace
Liberty Hill TX 78642

37. Wills Timothy P & Jody K
4572 Loganview Dr
Yorba Linda CA 92886

47. Rosenhagen Brad & Lisa
291 N Showhorse Dr
Liberty Hill TX 78642

57. Barto Richard Kyle
136 Thoroughbred Trace
Liberty Hill TX 78642

38. Kunze Dana P & Hilary
Schreckenbach
616 Sawyer Trail
Leander TX 78641

48. Strable George Charles Jr &
Jamie Lei
220 Thoroughbred Trace
Liberty Hill TX 78642

58. Carlson Judith Ann
136 N Showhorse Dr
Liberty Hill TX 78642

39. Drosche Renee & Jason
128 Taylor Creek Way
Liberty Hill TX 78642

49. McIntosh Thomas D & Laura E
210 Thoroughbred Trace
Liberty Hill TX 78642

59. Permittee Owned

40. Irick Jack Thomas & Sheryl
512 Los Escondidos
Marble Falls TX 78659

50. Fillmore Spencer J & Andrea
200 Thoroughbred Trace
Liberty Hill TX 78642

60. Permittee Owned

Attachment 4 – List of Affected Landowners

61. Permittee Owned	71. Hurst Wayne 1103 Rivery Blvd, Ste 160 Georgetown TX 78628-3035
62. Watson Ranch LTD 777 Oak Lane Liberty Hill TX 78642	72. Same as #71
63. Same as #62	73. Huffstutler M Conrad Jr & Gail J 280 Cole Dr Liberty Hill TX 78642-4511
64. Fleming Debra Gwen 807 Oak Ln Liberty Hill TX 78642	74. BDH Liberty Holdings LP 7350 FM 3405 Liberty Hill TX 78642
65. Nixon Lynn Wade & Sandra Jo 6008 Gateridge Dr Flower Mound TX 75028-2393	75. Warren Bill D & Patricia 6702 Mesa Dr Austin TX 78731-2818
66. Pilgrim Clinton S & Laura Kathleen 810 Cole Dr Liberty Hill TX 78642	76. Same as #75
67. Nelson Judy & Jeffrey A 800 Cole Dr Liberty Hill TX 78642	
68. Gillespie Thad & Kerstin 216 Arrowhead Mound Rd Georgetown TX 78628-2319	
69. Parker David James & Majda 650 Cole Dr Liberty Hill TX 78642-4531	
70. Snelgrooes Richard & Carri Eddo Trustees of R&C Snelgrooes Trust 600 Cole Dr Liberty Hill TX 78642	

Plain Language Summary Template and Instructions for Texas Pollutant Discharge Elimination System (TPDES) and Texas Land Application (TLAP) Permit Applications

This template is a guide to assist applicant's in developing a plain language summary as required by [30 Texas Administrative Code Chapter 39 Subchapter H](#). Applicant's may modify the template as necessary to accurately describe their facility as long as the summary includes the following information: (1) the function of the proposed plant or facility; (2) the expected output of the proposed plant or facility; (3) the expected pollutants that may be emitted or discharged by the proposed plant or facility; and (4) how the applicant will control those pollutants, so that the proposed plant will not have an adverse impact on human health or the environment.

Fill in the blanks below to describe your facility and application. Instructions and examples are provided below. Make any other edits necessary to improve readability or grammar and to comply with the rule requirements.

If you are subject to the alternative language notice requirements in [30 Texas Administrative Code §39.426](#), **you must provide a translated copy of the completed plain language summary in the appropriate alternative language as part of your application package.** For your convenience, a Spanish template has been provided below.

ENGLISH TEMPLATE FOR TPDES or TLAP NEW/RENEWAL/AMENDMENT APPLICATIONS

DOMESTIC WASTEWATER

The following summary is provided for this pending water quality permit application being reviewed by the Texas Commission on Environmental Quality as required by 30 Texas Administrative Code Chapter 39. The information provided in this summary may change during the technical review of the application and are not federal enforceable representations of the permit application.

River Oaks Land Partners II, LLC (CN Pending) operates River Oaks Partners Wastewater Treatment Facility RN109672469. an MBR treatment plant. The facility is located approximately 1.0 mile northwest of the intersection of County Road 214 and San Gabriel Ranch Road, in Liberty Hill, Williamson County, Texas 78642.

This application is for a renewal to dispose a daily average flow not to exceed 475,000 gallons per day of treated domestic wastewater via public access surface irrigation with a maximum area of 140 acres. This application includes changing the flow rate of interim phase II, changing the size of the irrigation ponds, and changing the irrigation area for Interim Phase I and II. This permit will not authorize a discharge of pollutants into water in the state.

Land application of domestic wastewater from the facility are expected to contain <10 mg/L 5-day Biochemical Oxygen Demand (BOD5) and <15 mg/L Total Suspended Solids (TSS). Domestic wastewater is treated by *an MBR treatment plant process, including fine screens, equalization basin, anoxic basins, aerobic basins, MBR basins, and a chlorine contact basin*. The irrigation storage ponds provide 90 days of storage volume.

Aaron Laughlin

From: Aaron Laughlin
Sent: Tuesday, November 28, 2023 4:16 PM
To: Deba Dutta
Cc: jmill@jawastewater.com
Subject: RE: Location_WQ0015559001 River Oaks Land Partners II, LLC
Attachments: Attachment 3 - Landowners Map.pdf; Pond Map.pdf

Deba,

There has been some realignment of CR 214 since the application was submitted.

By my measurements, the WWTP is located approximately 0.9 miles northeast of the intersection of CR 214 and San Gabriel Ranch Road in Liberty Hill Texas.

As for the location of the two ponds, we created a new exhibit drawing (attached) which shows the location of the development boundary, WWTP, ponds, irrigation area, and parcel data with an aerial photo background. I have also attached our original landowner map, which I think is the best map that shows the location of the plant and ponds in relation to existing parcels and existing roadways.

Finally, I will separately try add this to the TCEQ FTP site, but this is a link on one drive to download our entire permit application in PDF format:

https://stegerbizzell1-my.sharepoint.com/:b:/g/personal/alaughlin_stegerbizzell_com/EdiHPhWYQetNqkp19o5mWiYBGgUE_royO-hoDI5PkDnYCw?e=H09cIC

Thanks,
Aaron

From: Deba Dutta <Deba.Dutta@tceq.texas.gov>
Sent: Sunday, November 26, 2023 4:20 PM
To: Aaron Laughlin <alaughlin@stegerbizzell.com>
Cc: jmill@jawastewater.com; Deba Dutta <Deba.Dutta@tceq.texas.gov>
Subject: RE: Location_WQ0015559001 River Oaks Land Partners II, LLC

Also, could you please email me an electronic copy (PDF/Word) of the permit application with all attachments for our records? Alternatively, you can share the application via TCEQ FTPS at: <https://ftps.tceq.texas.gov/>.

Thanks.

Deba

From: Deba Dutta <Deba.Dutta@tceq.texas.gov>
Sent: Sunday, November 26, 2023 4:17 PM
To: Aaron Laughlin <alaughlin@stegerbizzell.com>
Cc: jmill@jawastewater.com; Deba Dutta <Deba.Dutta@tceq.texas.gov>
Subject: Location_WQ0015559001 River Oaks Land Partners II, LLC
Importance: High

Hello Aaron,

Probably you are aware that we have received hearing request/comments for the subject application (attached). Currently, we are preparing a response to the comments. Could you please help us preparing the response, by providing your opinion on the protestant's below concerns?

"The map of the proposed facilities included as "Attachment A" is extremely confusing. For example, the wastewater treatment plant is supposedly located northwest of the intersection of County Road 214 and San Gabriel Ranch Road. However, it appears the proposed facility is actually northeast of the referenced intersection. In addition, it is very hard to determine where the various ponds and irrigation areas are located when the base map is a topographic map with very few roads identified on it. The map refers to of a future alignment County Road 214, yet does not match with Google maps of the area. The map also refers to a "service area" but we have been unable to locate a sewer service CCN for this area on the PUC Maps".

I would appreciate your response ASAP; but no later than Wednesday; 11/29/2023.

Thanks.

Deba Dutta

Deba P. Dutta, P.E.
Municipal Permits Team, MC-148
Wastewater Permitting Section
Water Quality Division, TCEQ
12100 Park 35 Circle, Austin, Texas 78753
Phone: 512-239-4608
Email: Deba.Dutta@tceq.texas.gov



How is our Customer Service? Fill out our online customer satisfactory survey at <https://www.tceq.texas.gov/customersurvey>

From: Aaron Laughlin <alaughlin@stegerbizzell.com>
Sent: Friday, August 4, 2023 11:23 AM
To: Deba Dutta <Deba.Dutta@tceq.texas.gov>
Cc: jmiller@jawastewater.com
Subject: RE: WQ0015559001 River Oaks Land Partners II, LLC

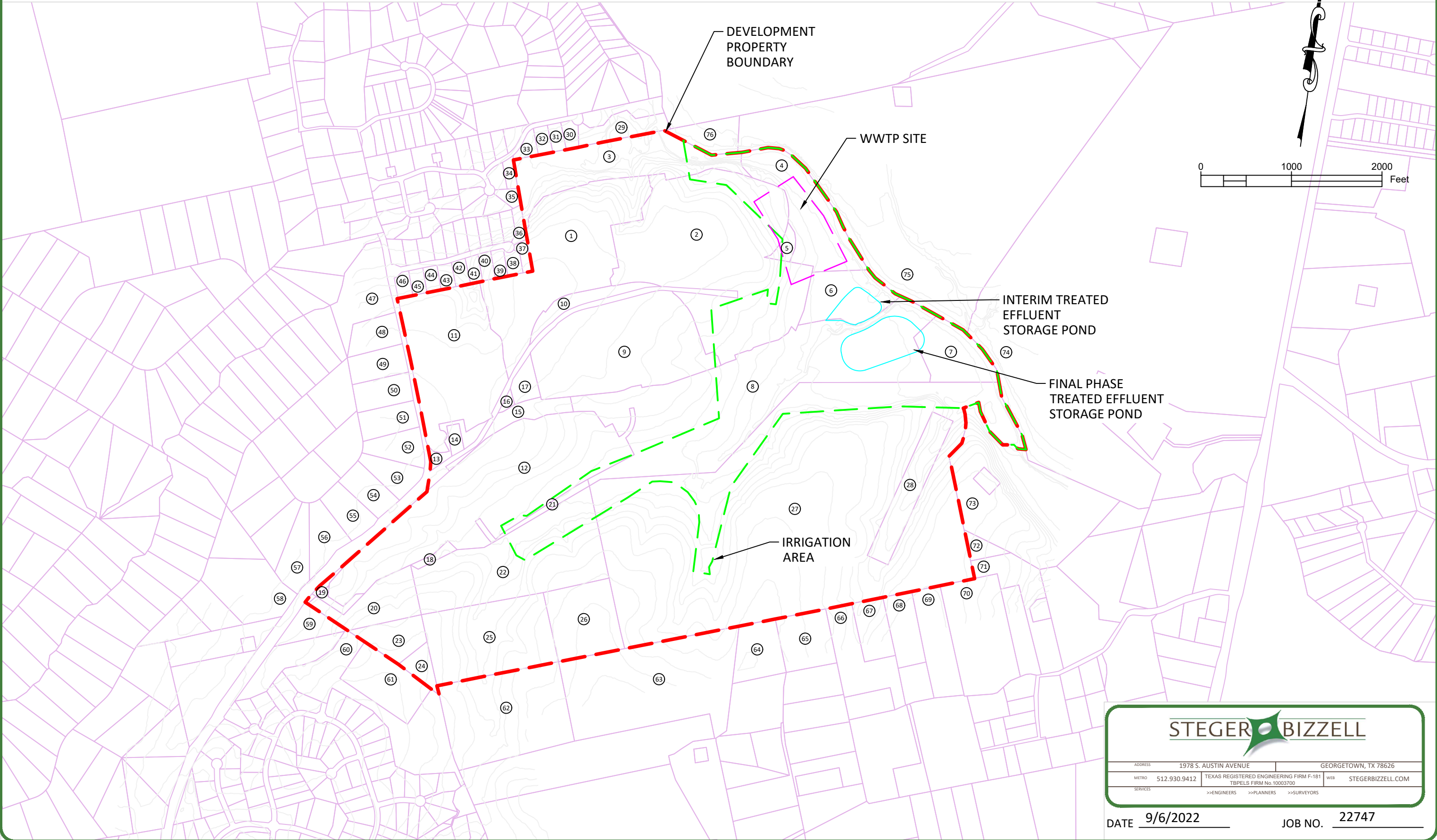
Deba,


We have no comments on the draft permit. Please proceed with processing the NAPD notice and getting it out to us for publication.

Thanks,
Aaron

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ATTACHMENT 3 - LANDOWNER'S MAP

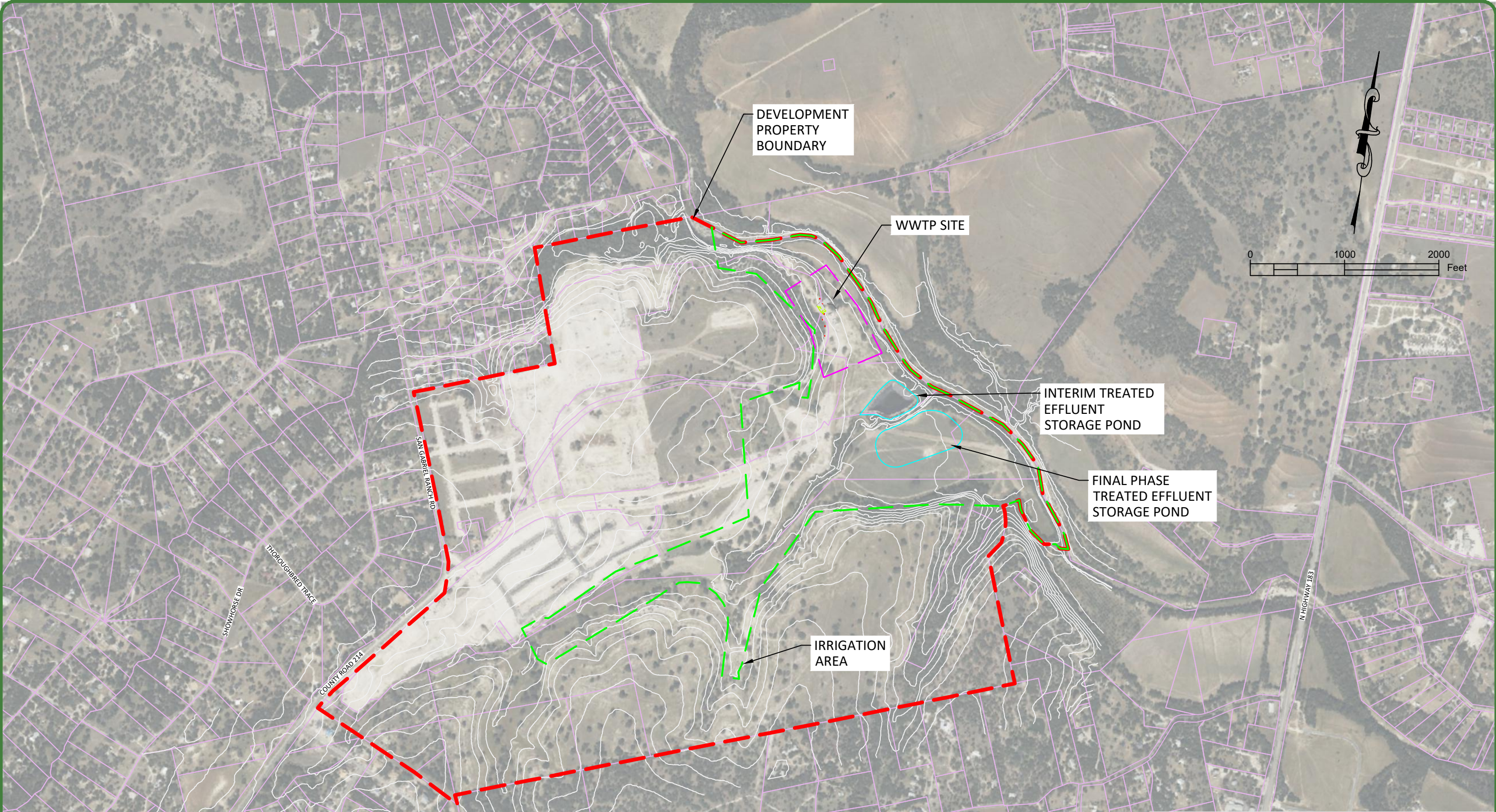




ADDRESS		1978 S. AUSTIN AVENUE		GEORGETOWN, TX 78626	
METRO	512.930.9412	TEXAS REGISTERED ENGINEERING FIRM F-181		WEB	STEGEBIZZELL.COM
SERVICES		TBPELS FIRM No. 10003700			
		>>ENGINEERS >>PLANNERS >>SURVEYORS			

DATE 9/6/2022 JOB NO. 22747

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STEGER

BIZZELL

ADDRESS	1978 S. AUSTIN AVENUE	GEORGETOWN, TX 78626
METRO	512.930.9412	TEXAS REGISTERED ENGINEERING FIRM F-181 TBPELS FIRM No.10003700
SERVICES	>>ENGINEERS	>>PLANNERS >>SURVEYORS
		WEB STEGERBIZZELL.COM

DATE 11/28/2023

JOB NO. 22747