

**ASA Properties  
Sewage Collection System Plan  
Veramendi Wastewater Extension.**

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# Texas Commission on Environmental Quality

## Edwards Aquifer Application Cover Page

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### Our Review of Your Application

**The Edwards Aquifer Program staff conducts an administrative and technical review of all applications. The turnaround time for administrative review can be up to 30 days as outlined in 30 TAC 213.4(e). Generally administrative completeness is determined during the intake meeting or within a few days of receipt. The turnaround time for technical review of an administratively complete Edwards Aquifer application is 90 days as outlined in 30 TAC 213.4(e). Please know that the review and approval time is directly impacted by the quality and completeness of the initial application that is received. In order to conduct a timely review, it is imperative that the information provided in an Edwards Aquifer application include final plans, be accurate, complete, and in compliance with [30 TAC 213](#).**

### Administrative Review

1. [Edwards Aquifer applications](#) must be deemed administratively complete before a technical review can begin. To be considered administratively complete, the application must contain completed forms and attachments, provide the requested information, and meet all the site plan requirements. The submitted application and plan sheets should be final plans. Please submit one full-size set of plan sheets with the original application, and half-size sets with the additional copies.

To ensure that all applicable documents are included in the application, the program has developed tools to guide you and web pages to provide all forms, checklists, and guidance. Please visit the below website for assistance: <http://www.tceq.texas.gov/field/eapp>.

2. This Edwards Aquifer Application Cover Page form (certified by the applicant or agent) must be included in the application and brought to the administrative review meeting.
3. Administrative reviews are scheduled with program staff who will conduct the review. Applicants or their authorized agent should call the appropriate regional office, according to the county in which the project is located, to schedule a review. The average meeting time is one hour.
4. In the meeting, the application is examined for administrative completeness. Deficiencies will be noted by staff and emailed or faxed to the applicant and authorized agent at the end of the meeting, or shortly after. Administrative deficiencies will cause the application to be deemed incomplete and returned.

An appointment should be made to resubmit the application. The application is re-examined to ensure all deficiencies are resolved. The application will only be deemed administratively complete when all administrative deficiencies are addressed.

5. If an application is received by mail, courier service, or otherwise submitted without a review meeting, the administrative review will be conducted within 30 days. The applicant and agent will be contacted with the results of the administrative review. If the application is found to be administratively incomplete, it can be retrieved from the regional office or returned by regular mail. If returned by mail, the regional office may require arrangements for return shipping.
6. If the geologic assessment was completed before October 1, 2004 and the site contains “possibly sensitive” features, the assessment must be updated in accordance with the *Instructions to Geologists* (TCEQ-0585 Instructions).

### Technical Review

1. When an application is deemed administratively complete, the technical review period begins. The regional office will distribute copies of the application to the identified affected city, county, and groundwater conservation district whose jurisdiction includes the subject site. These entities and the public have 30 days to provide comments on the application to the regional office. All comments received are reviewed by TCEQ.
2. A site assessment is usually conducted as part of the technical review, to evaluate the geologic assessment and observe existing site conditions. The site must be accessible to our staff. The site boundaries should be

clearly marked, features identified in the geologic assessment should be flagged, roadways marked and the alignment of the Sewage Collection System and manholes should be staked at the time the application is submitted. If the site is not marked the application may be returned.

3. We evaluate the application for technical completeness and contact the applicant and agent via Notice of Deficiency (NOD) to request additional information and identify technical deficiencies. There are two deficiency response periods available to the applicant. There are 14 days to resolve deficiencies noted in the first NOD. If a second NOD is issued, there is an additional 14 days to resolve deficiencies. If the response to the second notice is not received, is incomplete or inadequate, or provides new information that is incomplete or inadequate, the application must be withdrawn or will be denied. Please note that because the technical review is underway, whether the application is withdrawn or denied **the application fee will be forfeited**.
4. The program has 90 calendar days to complete the technical review of the application. If the application is technically adequate, such that it complies with the Edwards Aquifer rules, and is protective of the Edwards Aquifer during and after construction, an approval letter will be issued. Construction or other regulated activity may not begin until an approval is issued.

**Mid-Review Modifications**

It is important to have final site plans prior to beginning the permitting process with TCEQ to avoid delays.

Occasionally, circumstances arise where you may have significant design and/or site plan changes after your Edwards Aquifer application has been deemed administratively complete by TCEQ. This is considered a “Mid-Review Modification”. Mid-Review Modifications may require redistribution of an application that includes the proposed modifications for public comment.

If you are proposing a Mid-Review Modification, two options are available:

- If the technical review has begun your application can be denied/withdrawn, your fees will be forfeited, and the plan will have to be resubmitted.
- TCEQ can continue the technical review of the application as it was submitted, and a modification application can be submitted at a later time.

If the application is denied/withdrawn, the resubmitted application will be subject to the administrative and technical review processes and will be treated as a new application. The application will be redistributed to the affected jurisdictions.

Please contact the regional office if you have questions. If your project is located in Williamson, Travis, or Hays County, contact TCEQ’s Austin Regional Office at 512-339-2929. If your project is in Comal, Bexar, Medina, Uvalde, or Kinney County, contact TCEQ’s San Antonio Regional Office at 210-490-3096

Please fill out all required fields below and submit with your application.

<b>1. Regulated Entity Name:</b> New Braunfels					<b>2. Regulated Entity No.:</b>				
<b>3. Customer Name:</b> ASA Properties					<b>4. Customer No.:</b>				
<b>5. Project Type:</b> (Please circle/check one)	New	Modification			Extension		Exception		
<b>6. Plan Type:</b> (Please circle/check one)	WPAP	CZP	SCS	UST	AST	EXP	EXT	Technical Clarification	Optional Enhanced Measures
<b>7. Land Use:</b> (Please circle/check one)	Residential		Non-residential			<b>8. Site (acres):</b>		3.53	
<b>9. Application Fee:</b>	\$5,126.5		<b>10. Permanent BMP(s):</b>						
<b>11. SCS (Linear Ft.):</b>	10,438		<b>12. AST/UST (No. Tanks):</b>			N/A			
<b>13. County:</b>	Comal		<b>14. Watershed:</b>			Comal River-Guadalupe River			

# Application Distribution

Instructions: Use the table below to determine the number of applications required. One original and one copy of the application, plus additional copies (as needed) for each affected incorporated city, county, and groundwater conservation district are required. Linear projects or large projects, which cross into multiple jurisdictions, can require additional copies. Refer to the “Texas Groundwater Conservation Districts within the EAPP Boundaries” map found at:

[http://www.tceq.texas.gov/assets/public/compliance/field\\_ops/eapp/EAPP%20GWCD%20map.pdf](http://www.tceq.texas.gov/assets/public/compliance/field_ops/eapp/EAPP%20GWCD%20map.pdf)

For more detailed boundaries, please contact the conservation district directly.

<b>Austin Region</b>			
<b>County:</b>	<b>Hays</b>	<b>Travis</b>	<b>Williamson</b>
Original (1 req.)	—	—	—
Region (1 req.)	—	—	—
County(ies)	—	—	—
Groundwater Conservation District(s)	<input type="checkbox"/> Edwards Aquifer Authority <input type="checkbox"/> Barton Springs/Edwards Aquifer <input type="checkbox"/> Hays Trinity <input type="checkbox"/> Plum Creek	<input type="checkbox"/> Barton Springs/Edwards Aquifer	NA
City(ies) Jurisdiction	<input type="checkbox"/> Austin <input type="checkbox"/> Buda <input type="checkbox"/> Dripping Springs <input type="checkbox"/> Kyle <input type="checkbox"/> Mountain City <input type="checkbox"/> San Marcos <input type="checkbox"/> Wimberley <input type="checkbox"/> Woodcreek	<input type="checkbox"/> Austin <input type="checkbox"/> Bee Cave <input type="checkbox"/> Pflugerville <input type="checkbox"/> Rollingwood <input type="checkbox"/> Round Rock <input type="checkbox"/> Sunset Valley <input type="checkbox"/> West Lake Hills	<input type="checkbox"/> Austin <input type="checkbox"/> Cedar Park <input type="checkbox"/> Florence <input type="checkbox"/> Georgetown <input type="checkbox"/> Jerrell <input type="checkbox"/> Leander <input type="checkbox"/> Liberty Hill <input type="checkbox"/> Pflugerville <input type="checkbox"/> Round Rock

<b>San Antonio Region</b>					
<b>County:</b>	<b>Bexar</b>	<b>Comal</b>	<b>Kinney</b>	<b>Medina</b>	<b>Uvalde</b>
Original (1 req.)	—	_1_	—	—	—
Region (1 req.)	—	_1_	—	—	—
County(ies)	—	_1_	—	—	—
Groundwater Conservation District(s)	<input type="checkbox"/> Edwards Aquifer Authority <input type="checkbox"/> Trinity-Glen Rose	<input type="checkbox"/> Edwards Aquifer Authority	<input type="checkbox"/> Kinney	<input type="checkbox"/> EAA <input type="checkbox"/> Medina	<input type="checkbox"/> EAA <input type="checkbox"/> Uvalde
City(ies) Jurisdiction	<input type="checkbox"/> Castle Hills <input type="checkbox"/> Fair Oaks Ranch <input type="checkbox"/> Helotes <input type="checkbox"/> Hill Country Village <input type="checkbox"/> Hollywood Park <input type="checkbox"/> San Antonio (SAWS) <input type="checkbox"/> Shavano Park	<input type="checkbox"/> Bulverde <input type="checkbox"/> Fair Oaks Ranch <input type="checkbox"/> Garden Ridge <input type="checkbox"/> New Braunfels <input type="checkbox"/> Schertz	NA	<input type="checkbox"/> San Antonio ETJ (SAWS)	NA

I certify that to the best of my knowledge, that the application is complete and accurate. This application is hereby submitted to TCEQ for administrative review and technical review.

Stuart Cowell

Print Name of Customer/Authorized Agent



04/03/2023

Signature of Customer/Authorized Agent

Date

**\*\*FOR TCEQ INTERNAL USE ONLY\*\***

Date(s) Reviewed:		Date Administratively Complete:	
Received From:		Correct Number of Copies:	
Received By:		Distribution Date:	
EAPP File Number:		Complex:	
Admin. Review(s) (No.):		No. AR Rounds:	
Delinquent Fees (Y/N):		Review Time Spent:	
Lat./Long. Verified:		SOS Customer Verification:	
Agent Authorization Complete/Notarized (Y/N):		Fee Check:	Payable to TCEQ (Y/N):
Core Data Form Complete (Y/N):			Signed (Y/N):
Core Data Form Incomplete Nos.:			Less than 90 days old (Y/N):

# **Edwards Aquifer Application Cover Page (TCEQ-20705)**

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# **General Information Form (TCEQ-0587)**

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# General Information Form

## Texas Commission on Environmental Quality

For Regulated Activities on the Edwards Aquifer Recharge and Transition Zones and Relating to 30 TAC §213.4(b) & §213.5(b)(2)(A), (B) Effective June 1, 1999

**To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.**

**Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.**

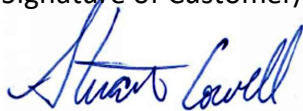
## Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **General Information Form** is hereby submitted for TCEQ review. The application was prepared by:

Print Name of Customer/Agent: Stuart Cowell

Date: 04/03/2023

Signature of Customer/Agent:



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## Project Information

1. Regulated Entity Name: New Braunfels
2. County: Comal
3. Stream Basin: Blieders Creek
4. Groundwater Conservation District (If applicable): Edwards Aquifer Authority
5. Edwards Aquifer Zone:
  - Recharge Zone
  - Transition Zone
6. Plan Type:
  - WPAP
  - SCS
  - Modification
  - AST
  - UST
  - Exception Request

7. Customer (Applicant):

Contact Person: Mr. Garrett Mechler  
Entity: Veramendi-PE Emerald LLC  
Mailing Address: 2156 Oak Run Pkwy  
City, State: New Braunfels, TX Zip: 78132  
Telephone: (512) 761-0061 FAX: \_\_\_\_\_  
Email Address: garrett.mechler@asaproperties.us.com

8. Agent/Representative (If any):

Contact Person: Stuart Cowell  
Entity: LJA Engineering, Inc  
Mailing Address: 2700 La Frontera, Suite 150  
City, State: Round Rock, TX Zip: 78681  
Telephone: (512) 439-4700 FAX: (512) 439-4716  
Email Address: scowell@lja.com

9. Project Location:

- The project site is located inside the city limits of \_\_\_\_\_.
- The project site is located outside the city limits but inside the ETJ (extra-territorial jurisdiction) of City of New Braunfels.
- The project site is not located within any city's limits or ETJ.

10.  The location of the project site is described below. The description provides sufficient detail and clarity so that the TCEQ's Regional staff can easily locate the project and site boundaries for a field investigation.

From TCEQ Regional 13 Office, head south 1.50 miles on Judson Rd and then proceed 15 miles north on I-35. Take exit 184 toward TX-337 Loop. Follow Loop 337 N for approximately 5.26 miles and then turn left onto River Rd going North. Go north on River Rd for approximately .25 miles and then turn left into the gate with a rock paved entrance. Continue approximately .53 miles along rock paved path to reach the starting location.

The main wastewater alignment will run 9,510 LF from beginning to end with an offset of approximately 15 ft from the existing ww1. Wastewater alignment B will tie into mainline at Sta 51+33.49 and will go north to River Rd for 794 LF.

11.  **Attachment A – Road Map.** A road map showing directions to and the location of the project site is attached. The project location and site boundaries are clearly shown on the map.
12.  **Attachment B - USGS / Edwards Recharge Zone Map.** A copy of the official 7 ½ minute USGS Quadrangle Map (Scale: 1" = 2000') of the Edwards Recharge Zone is attached. The map(s) clearly show:
- Project site boundaries.

- USGS Quadrangle Name(s).
- Boundaries of the Recharge Zone (and Transition Zone, if applicable).
- Drainage path from the project site to the boundary of the Recharge Zone.

13.  **The TCEQ must be able to inspect the project site or the application will be returned.** Sufficient survey staking is provided on the project to allow TCEQ regional staff to locate the boundaries and alignment of the regulated activities and the geologic or manmade features noted in the Geologic Assessment.

Survey staking will be completed by this date: Let me know when TCEQ plans to have their site visit. Contact me at (512) 439-4717

14.  **Attachment C – Project Description.** Attached at the end of this form is a detailed narrative description of the proposed project. The project description is consistent throughout the application and contains, at a minimum, the following details:

- Area of the site
- Offsite areas
- Impervious cover
- Permanent BMP(s)
- Proposed site use
- Site history
- Previous development
- Area(s) to be demolished

15. Existing project site conditions are noted below:

- Existing commercial site
- Existing industrial site
- Existing residential site
- Existing paved and/or unpaved roads
- Undeveloped (Cleared)
- Undeveloped (Undisturbed/Uncleared)
- Other: \_\_\_\_\_

### ***Prohibited Activities***

16.  I am aware that the following activities are prohibited on the Recharge Zone and are not proposed for this project:

- (1) Waste disposal wells regulated under 30 TAC Chapter 331 of this title (relating to Underground Injection Control);
- (2) New feedlot/concentrated animal feeding operations, as defined in 30 TAC §213.3;
- (3) Land disposal of Class I wastes, as defined in 30 TAC §335.1;
- (4) The use of sewage holding tanks as parts of organized collection systems; and

- (5) New municipal solid waste landfill facilities required to meet and comply with Type I standards which are defined in §330.41(b), (c), and (d) of this title (relating to Types of Municipal Solid Waste Facilities).
  - (6) New municipal and industrial wastewater discharges into or adjacent to water in the state that would create additional pollutant loading.
17.  I am aware that the following activities are prohibited on the Transition Zone and are not proposed for this project:
- (1) Waste disposal wells regulated under 30 TAC Chapter 331 (relating to Underground Injection Control);
  - (2) Land disposal of Class I wastes, as defined in 30 TAC §335.1; and
  - (3) New municipal solid waste landfill facilities required to meet and comply with Type I standards which are defined in §330.41 (b), (c), and (d) of this title.

### ***Administrative Information***

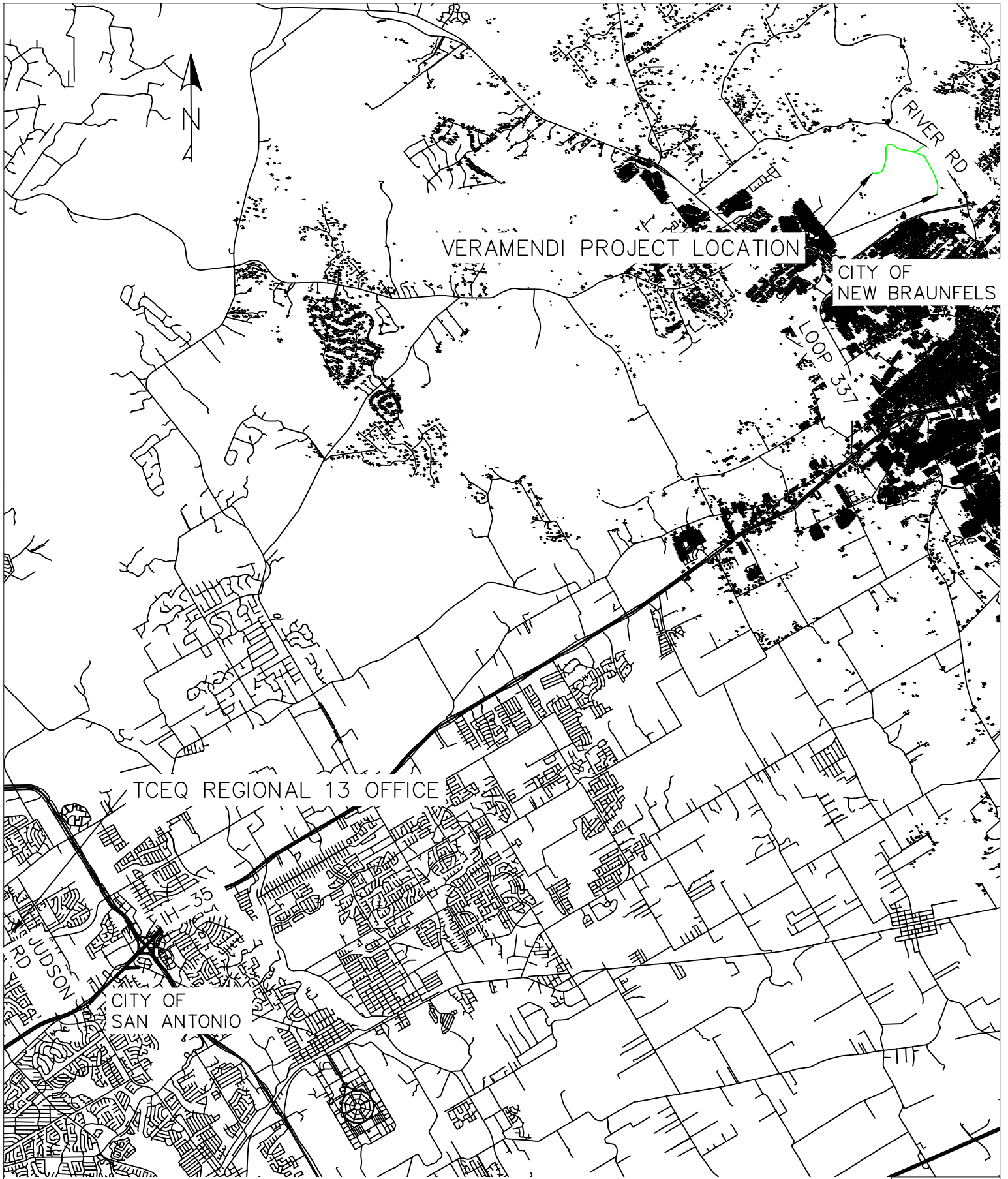
18. The fee for the plan(s) is based on:
- For a Water Pollution Abatement Plan or Modification, the total acreage of the site where regulated activities will occur.
  - For an Organized Sewage Collection System Plan or Modification, the total linear footage of all collection system lines.
  - For a UST Facility Plan or Modification or an AST Facility Plan or Modification, the total number of tanks or piping systems.
  - A request for an exception to any substantive portion of the regulations related to the protection of water quality.
  - A request for an extension to a previously approved plan.
19.  Application fees are due and payable at the time the application is filed. If the correct fee is not submitted, the TCEQ is not required to consider the application until the correct fee is submitted. Both the fee and the Edwards Aquifer Fee Form have been sent to the Commission's:
- TCEQ cashier
  - Austin Regional Office (for projects in Hays, Travis, and Williamson Counties)
  - San Antonio Regional Office (for projects in Bexar, Comal, Kinney, Medina, and Uvalde Counties)
20.  Submit one (1) original and one (1) copy of the application, plus additional copies as needed for each affected incorporated city, groundwater conservation district, and county in which the project will be located. The TCEQ will distribute the additional copies to these jurisdictions. The copies must be submitted to the appropriate regional office.
21.  No person shall commence any regulated activity until the Edwards Aquifer Protection Plan(s) for the activity has been filed with and approved by the Executive Director.

# Attachment A

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VERAMENDI PROJECT LOCATION

CITY OF  
NEW BRAUNFELS

TCEQ REGIONAL 13 OFFICE

CITY OF  
SAN ANTONIO

ROADWAY MAP	
SCALE:	
HORIZONTAL:	N/A
VERTICAL:	N/A
SHEET NO.	1
OF	1 SHEETS

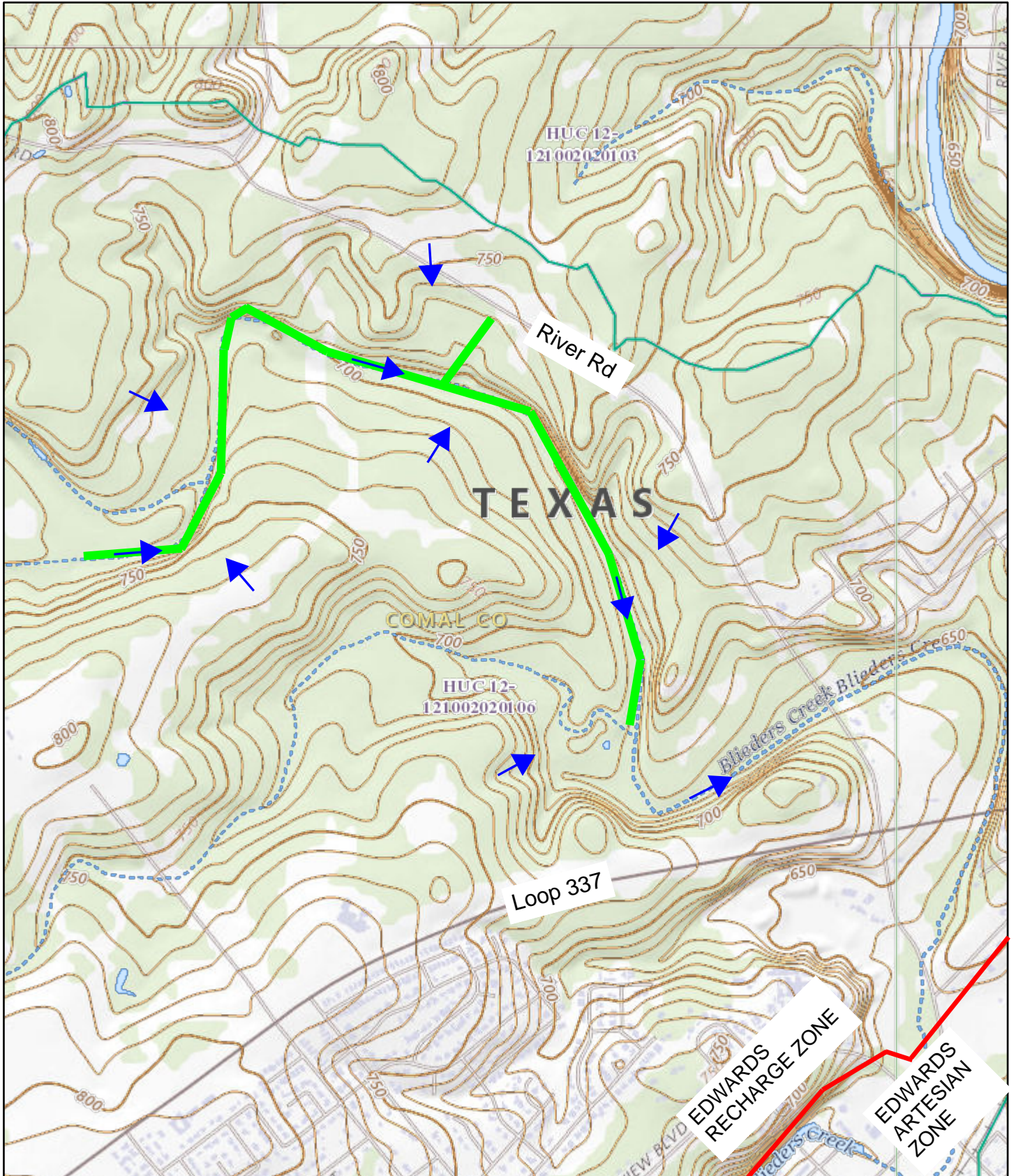
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# Attachment B

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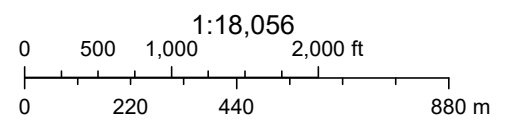
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# The National Map Advanced Viewer



6/20/2022, 2:01:24 PM

- Incorporated Places
- County or Equivalent
- ▭ State or Territory Large-Scale
- 3.75 Minute Index
- 7.5 Minute (1:24K) Index
- 15 Minute (1:63K) Index
- 30x60 Minute (1:100K) Index
- 1x1 Degree Index WBDLine
- 2-digit Hydrologic Unit
- 4-digit Hydrologic Unit
- 6-digit Hydrologic Unit
- 8-digit Hydrologic Unit
- 10-digit Hydrologic Unit



- Prop Wastewater Line
- ▲ Existing Ground Drainage Arrow

USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S.

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# Attachment C

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## PROJECT DESCRIPTION

This wastewater collection system extension is associated with the Veramendi Master Wastewater Plan to construct the wastewater trunk main (1.8 mi) to serve the Veramendi development. The site will be developed over the next 25-30 years as a mix of residential and commercial land uses. There will be one branch (Alignment B) that will connect to the main line. This project lies within Comal County and is within the limits of the New Braunfels ETJ. The proposed line parallels an existing 18" wastewater line along Blieders Creek northwest of River Rd and Loop 337. These proposed wastewater lines will be in a proposed 15 ft wide wastewater easement. The total area affected by this project will be approximately 3.53 acres.

Wastewater Line "A" section extends 9,510 LF varying in size from 21", 15", and 12" PVC SDR26. Wastewater Line "B" will be 794 LF of 12" SDR26 PVC D3034.

The proposed temporary erosion controls implemented will silt fence and erosion control logs as a temporary measure to treat runoff from the construction site.

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# **Geologic Assessment Form (TCEQ-0585)**

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***Geologic Site Assessment (SCS)  
for Regulated Activities / Development  
on the Edwards Aquifer Recharge / Transition Zone***

**Veramendi N1 - N6 Sewer Line  
+/- 10,254 Linear Feet  
of Sanitary Sewer  
New Braunfels, Texas**

***FROST GEOSCIENCES CONTROL # FGS-E22237***

***January 12, 2023***

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***Prepared exclusively for***

***ASA Properties  
PO Box 310699  
New Braunfels, Texas 78131***

***Frost GeoSciences***

***Geotechnical ▪ Construction Materials  
Forensics ▪ Environmental***

***13406 Western Oak Helotes, Texas 78023 Phone: (210) 372-1315 Fax: (210) 372-1318***

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Forensics • Environmental

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[www.frostgeosciences.com](http://www.frostgeosciences.com)  
TBPE Firm Registration # F-9227  
TBPG Firm Registration # 50040

January 12, 2023

ASA Properties  
PO Box 310699  
New Braunfels, Texas 78131

Attn: Mr. Garrett Mechler, P.E.

Re: Geologic Site Assessment (SCS)  
for Regulated Activities / Development on the  
Edwards Aquifer Recharge / Transition Zone  
Veramendi N1 - N6 Sewer Line  
+/- 10,254 Linear Feet of Sanitary Sewer  
New Braunfels, Texas

Frost GeoSciences, Inc. Control # FGS-E22237

Dear Sir:

Attached is a copy of the Geologic Assessment Report completed for the above referenced project site as it relates to 30 TAC §213.5(b)(3), effective June 1, 1999. Our investigation was conducted and this report was prepared in general accordance with the "Instructions to Geologists", TCEQ-0585-Instructions (Rev. 10-1-04). The results of our investigation, along with any recommendations for Best Management Practices (BMP's), are provided in the following report.

If you have any questions regarding this report, or if Frost GeoSciences, Inc. may be of additional assistance to you on this project, please feel free to call our office. It has been a pleasure to work with you and we wish to thank you for the opportunity to be of service to you on this project. We look forward to being of continued service.



Sincerely,  
Frost GeoSciences, Inc.

A handwritten signature in black ink that reads "Steve Frost".

Steve Frost, C.P.G., P.G.  
President, Senior Geologist

Distribution: (6) ASA Properties

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APPENDIX

A:    Plate 1:    Site Plan

        Plate 2:    Street Map

        Plate 3:    USGS Topographic Map

        Plate 4:    Official Edwards Aquifer Recharge Zone Map

        Plate 5:    FEMA Flood Map

        Plate 6:    1973 Aerial Photograph, 1"=1000'

        Plate 7:    Geologic Map

        Plate 8:    2022 Aerial Photograph, 1"=1000'

        Plate 9:    2022 Aerial Photograph with PRF's, 1"=500'

        00'

B:    Site Photographs

C:    Site Geologic Map

# Geologic Assessment

## Texas Commission on Environmental Quality

For Regulated Activities on The Edwards Aquifer Recharge/transition Zones and Relating to 30 TAC §213.5(b)(3), Effective June 1, 1999

**To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.**

**Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.**

## Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. My signature certifies that I am qualified as a geologist as defined by 30 TAC Chapter 213.

Print Name of Geologist: Steve Frost, C.P.G., P.G. Telephone: (210) 372-1315

Date: January 12, 2023 Fax: (210) 372-1318

Representing: Frost GeoSciences, Inc.

Signature of Geologist:



Regulated Entity Name: Veramendi N1 - N6 Sewer Line

## Project Information

1. Date(s) Geologic Assessment was performed: December 29, 2022

2. Type of Project:

- |   |                              |
|---|------------------------------|
| <input type="checkbox"/> WPAP           | <input type="checkbox"/> AST |
| <input checked="" type="checkbox"/> SCS | <input type="checkbox"/> UST |

3. Location of Project:

- |   |
|---|
| <input checked="" type="checkbox"/> Recharge Zone                     |
| <input type="checkbox"/> Transition Zone                              |
| <input type="checkbox"/> Contributing Zone within the Transition Zone |



- 4.  **Attachment A - Geologic Assessment Table.** Completed Geologic Assessment Table (Form TCEQ-0585-Table) is attached.
- 5.  Soil cover on the project site is summarized in the table below and uses the SCS Hydrologic Soil Groups\* (Urban Hydrology for Small Watersheds, Technical Release No. 55, Appendix A, Soil Conservation Service, 1986). If there is more than one soil type on the project site, show each soil type on the site Geologic Map or a separate soils map.

**Table 1 - Soil Units, Infiltration Characteristics and Thickness**

Soil Name	Group*	Thickness(feet)
RuD	C/D	1 to 2
CrD	D/D	0 to 2

\* Soil Group Definitions (Abbreviated)

- A. Soils having a high infiltration rate when thoroughly wetted.
- B. Soils having a moderate infiltration rate when thoroughly wetted.
- C. Soils having a slow infiltration rate when thoroughly wetted.
- D. Soils having a very slow infiltration rate when thoroughly wetted.

- 6.  **Attachment B – Stratigraphic Column.** A stratigraphic column showing formations, members, and thicknesses is attached. The outcropping unit, if present, should be at the top of the stratigraphic column. Otherwise, the uppermost unit should be at the top of the stratigraphic column.
- 7.  **Attachment C – Site Geology.** A narrative description of the site specific geology including any features identified in the Geologic Assessment Table, a discussion of the potential for fluid movement to the Edwards Aquifer, stratigraphy, structure(s), and karst characteristics is attached.
- 8.  **Attachment D – Site Geologic Map(s).** The Site Geologic Map must be the same scale as the applicant's Site Plan. The minimum scale is 1": 400'  
 Applicant's Site Plan Scale: 1" = 200 '  
 Site Geologic Map Scale: 1" = 200 '  
 Site Soils Map Scale (if more than 1 soil type): 1" = 1000 '
- 9. Method of collecting positional data:
  - Global Positioning System (GPS) technology.
  - Other method(s). Please describe method of data collection: 2022 Aerial Photograph
- 10.  The project site and boundaries are clearly shown and labeled on the Site Geologic Map.
- 11.  Surface geologic units are shown and labeled on the Site Geologic Map.

12.  Geologic or manmade features were discovered on the project site during the field investigation. They are shown and labeled on the Site Geologic Map and are described in the attached Geologic Assessment Table.
- Geologic or manmade features were not discovered on the project site during the field investigation.
13.  The Recharge Zone boundary is shown and labeled, if appropriate.
14. All known wells (test holes, water, oil, unplugged, capped and/or abandoned, etc.): If applicable, the information must agree with Item No. 20 of the WPAP Application Section.
- There are \_\_\_\_\_ (#) wells present on the project site and the locations are shown and labeled. (Check all of the following that apply.)
- The wells are not in use and have been properly abandoned.
- The wells are not in use and will be properly abandoned.
- The wells are in use and comply with 16 TAC Chapter 76.
- There are no wells or test holes of any kind known to exist on the project site.

### ***Administrative Information***

15.  Submit one (1) original and one (1) copy of the application, plus additional copies as needed for each affected incorporated city, groundwater conservation district, and county in which the project will be located. The TCEQ will distribute the additional copies to these jurisdictions. The copies must be submitted to the appropriate regional office.

## Stratigraphic Column

[Hydrogeologic subdivisions modified from Maclay and Small (1976); groups, formations, and members modified from Rose (1972); lithology modified from Dunham (1962); and porosity type modified from Choquette and Pray (1970). CU, confining unit; AQ, aquifer]

Hydrogeologic subdivision	Group, formation, or member	Hydro-logic function	Thickness (feet)	Lithology	Field identification	Cavern development	Porosity/permeability type					
Upper Cretaceous	Upper confining units	Eagle Ford Group	CU	30 – 50	Brown, flaggy shale and argillaceous limestone	Thin flagstones; petroliferous	None	Primary porosity lost/ low permeability				
		Buda Limestone	CU	40 – 50	Buff, light gray, dense mudstone	Porcelaneous limestone with calcite-filled veins	Minor surface karst	Low porosity/low permeability				
		Del Rio Clay	CU	40 – 50	Blue-green to yellow-brown clay	Fossiliferous; <i>Ilymatogyra arietina</i>	None	None/primary upper confining unit				
Lower Cretaceous	Edwards aquifer	Edwards Group	Kainer Formation	I	Georgetown Formation	Karst AQ; not karst CU	2 – 20	Reddish-brown, gray to light tan marly limestone	Marker fossil; <i>Waconella wacoensis</i>	None	Low porosity/low permeability	
				II	Person Formation	Cyclic and marine members, undivided	AQ	80 – 90	Mudstone to packstone; <i>miliolid</i> grainstone; chert	Thin graded cycles; massive beds to relatively thin beds; crossbeds	Many subsurface; might be associated with earlier karst development	Laterally extensive; both fabric and not fabric/water-yielding
				III		Leached and collapsed members, undivided	AQ	70 – 90	Crystalline limestone; mudstone to grainstone; chert; collapsed breccia	Bioturbated iron-stained beds separated by massive limestone beds; stromatolitic limestone	Extensive lateral development; large rooms	Majority not fabric/one of the most permeable
				IV	Regional dense member	CU	20 – 24	Dense, argillaceous mudstone	Wispy iron-oxide stains	Very few; only vertical fracture enlargement	Not fabric/low permeability; vertical barrier	
				V	Grainstone member	AQ	50 – 60	<i>Miliolid</i> grainstone; mudstone to wackestone; chert	White crossbedded grainstone	Few	Not fabric/ recrystallization reduces permeability	
				VI	Kirschberg evaporite member	AQ	50 – 60	Highly altered crystalline limestone; chalky mudstone; chert	Boxwork voids, with neospar and travertine frame	Probably extensive cave development	Majority fabric/one of the most permeable	
				VII	Dolomitic member	AQ	110 – 130	Mudstone to grainstone; crystalline limestone; chert	Massively bedded light gray, <i>Toucasia</i> abundant	Caves related to structure or bedding planes	Mostly not fabric; some bedding plane-fabric/water-yielding	
				VIII	Basal nodular member	Karst AQ; not karst CU	50 – 60	Shaly, nodular limestone; mudstone and <i>miliolid</i> grainstone	Massive, nodular and mottled, <i>Exogyra texana</i>	Large lateral caves at surface; a few caves near Cibolo Creek	Fabric; stratigraphically controlled/large conduit flow at surface; no permeability in subsurface	
				Lower confining unit	Upper member of the Glen Rose Limestone	CU; evaporite beds AQ	350 – 500	Yellowish tan, thinly bedded limestone and marl	Stair-step topography; alternating limestone and marl	Some surface cave development	Some water production at evaporite beds/relatively impermeable	

**GEOLOGIC ASSESSMENT TABLE** PROJECT NAME: **Veramendi N1 - N6 Sewer Line** FGS-E22237

1	LOCATION		FEATURE CHARACTERISTICS										EVALUATION		PHYSICAL SETTING			
	2*	3*	2A	2B	3	4			5	5A	6	7	8A	8B	9	10	11	12
FEATURE	LATITUDE	LONGITUDE	FEATURE TYPE	POINTS	FORMATION	DIMENSIONS (FEET)			TREND (DEGREES)	DOM	DENSITY (NOFF?)	APERTURE (FEET)	INFILL	RELATIVE INFILTRATION RATE	TOTAL	SENSITIVITY	CATCHMENT AREA (ACRES)	TOPOGRAPHY
						X	Y	Z								< 40	>1.6	
S-501	29° 43.895'	98° 07.987'	MB	30	Kep	3	3	-	-	-	10	-	F	5	35	35	X	Floodplain
S-502	29° 43.897'	98° 07.985'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-503	29° 43.895'	98° 07.989'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-504	29° 44.022'	98° 07.971'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-505	29° 44.100'	98° 08.000'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-506	29° 44.179'	98° 08.029'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-507	29° 44.258'	98° 08.080'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-508	29° 44.330'	98° 08.123'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-509	29° 44.349'	98° 08.135'	F	20	Kep	-	-	-	N45°	10	-	-	F	17	47	47	X	Floodplain
S-510	29° 44.410'	98° 08.175'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-511	29° 44.460'	98° 08.316'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-512	29° 44.519'	98° 08.285'	F	20	Kep	-	-	-	N108°	-	-	-	F	17	37	37	X	Hillside

\* DATUM 1983 North American Datum (NAD83)

2A TYPE	TYPE	2B POINTS
C	Cave	30
SC	Solution Cavity	20
SF	Solution-enlarged fracture(s)	20
F	Fault	20
O	Other natural bedrock features	5
MB	Manmade feature in bedrock	30
SW	Swallow Hole	30
SH	Sinkhole	20
CD	Non-karst closed depression	5
Z	Zone, clustered or aligned features	30

8A INFILLING

N None, exposed bedrock  
 C Coarse - cobbles, breakdown, sand, gravel  
 O Loose or soft mud or soil, organics, leaves, sticks, dark colors  
 F Fines, compacted clay-rich sediment, soil profile, gray or red colors  
 V Vegetation. Give details in narrative description  
 FS Flowstone, cements, cave deposits  
 X Other materials

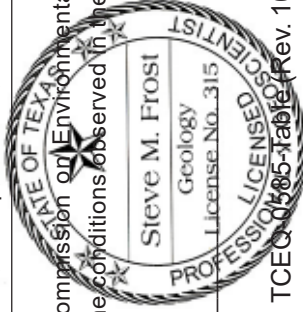
12 TOPOGRAPHY

Cliff, Hilltop, Hillside, Drainage, Floodplain, Streambed

I have read, I understood and I have followed the Texas Commission on Environmental Quality's Instructions to Geologists. The information presented here complies with that document and is a true representation of the conditions observed in the field. My signature certifies that I am qualified as a geologist as defined by 30 TAC 213.



Signature \_\_\_\_\_



Date January 12, 2023

Sheet 1 of 3

**GEOLOGIC ASSESSMENT TABLE** PROJECT NAME: **Veramendi N1 - N6 Sewer Line** FGS-E22237

1	LOCATION		FEATURE CHARACTERISTICS										EVALUATION		PHYSICAL SETTING			
	2*	3*	2A	2B	3	4			5	5A	6	7	8A	8B	9	10	11	12
FEATURE	LATITUDE	LONGITUDE	FEATURE TYPE	POINTS	FORMATION	DIMENSIONS (FEET)			TREND (DEGREES)	DOM	DENSITY (NOFF?)	APERTURE (FEET)	INFILL	RELATIVE INFILTRATION RATE	TOTAL	SENSITIVITY	CATCHMENT AREA (ACRES)	TOPOGRAPHY
						X	Y	Z								< 40	> 1.6	
S-513	29° 44.484'	98° 08.453'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-514	29° 44.494'	98° 08.512'	F	20	Kep	-	-	-	N45°	10	-	-	F	17	47	47	X	Floodplain
S-515	29° 44.564'	98° 08.670'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-516	29° 44.569'	98° 08.728'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-517	29° 44.532'	98° 08.748'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-518	29° 44.442'	98° 08.754'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-519	29° 44.362'	98° 08.760'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-520	29° 44.317'	98° 08.772'	F	20	Kep	-	-	-	N50°	10	-	-	F	17	47	47	X	Floodplain
S-521	29° 44.252'	98° 08.790'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-522	29° 44.210'	98° 08.823'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-523	29° 44.188'	98° 08.880'	MB	30	Kep	3	3	-	-	-	-	-	F	5	35	35	X	Floodplain
S-524	29° 44.182'	98° 08.984'	F	20	Kep	-	-	-	N50°	10	-	-	F	17	47	47	X	Floodplain

\* DATUM **1983 North American Datum (NAD83)**

2A TYPE	TYPE	2B POINTS
C	Cave	30
SC	Solution Cavity	20
SF	Solution-enlarged fracture(s)	20
F	Fault	20
O	Other natural bedrock features	5
MB	Manmade feature in bedrock	30
SW	Swallow Hole	30
SH	Sinkhole	20
CD	Non-karst closed depression	5
Z	Zone, clustered or aligned features	30

8A INFILLING	
N	None, exposed bedrock
C	Coarse - cobbles, breakdown, sand, gravel
O	Loose or soft mud or soil, organics, leaves, sticks, dark colors
F	Fines, compacted clay-rich sediment, soil profile, gray or red colors
V	Vegetation. Give details in narrative description
FS	Flowstone, cements, cave deposits
X	Other materials

12 TOPOGRAPHY	
	Cliff, Hilltop, Hillside, Drainage, Floodplain, Streambed

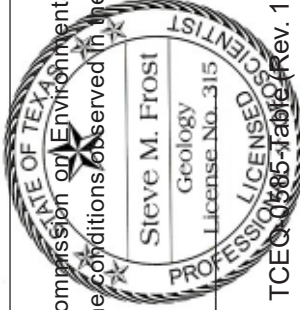
I have read, I understood and I have followed the Texas Commission on Environmental Quality's Instructions to Geologists. The information presented here complies with that document and is a true representation of the conditions observed in the field. My signature certifies that I am qualified as a geologist as defined by 30 TAC 213.



Signature \_\_\_\_\_

Date January 12, 2023

Sheet 2 of 3





## LOCATION

The project site consists of approximately 10,254 linear feet of proposed sewer line located within the existing Veramendi Subdivision, along Blieders Creek, north of Loop 337 and west of River Road in New Braunfels, Texas. An overall view of the area is shown on copies of the site plan, a street map, the USGS Topographic Map, the Edwards Aquifer Recharge Zone Map, the Flood Insurance Rate Map (FIRM), a 1973 aerial photograph from the USDA at a scale of 1"=1000', a geologic map, a 2022 aerial photograph at a scale of 1"=1000', and a 2022 aerial photograph with potential recharge features at a scale of 1"=500', Plates 1 through 9 in Appendix A.

## METHODOLOGY

The Geologic Assessment was performed by Mr. Steve Frost, C.P.G., President and Principal Geologist with Frost GeoSciences, Inc. Mr. Frost is a Licensed Professional Geoscientist in the State of Texas (License # 315) and is a Certified Professional Geologist with the American Institute of Professional Geologist (Certification # 10176).

Frost GeoSciences, Inc. researched the geology of the area in the immediate vicinity of the project site. The research included, but was not limited to, the Geologic Atlas of Texas, San Antonio Sheet, FIRM maps, Edwards Aquifer Recharge Zone Maps, USGS 7.5 Minute Quadrangle Maps, the Geologic Map of the New Braunfels, Texas 30 X 60 Minute Quadrangle, the USGS Water-Resources Investigations Report 94-4117, and the USDA Soil Survey of Comal & Hays County, Texas.

After reviewing the available information, a field investigation was performed to identify any geologic or man-made potential recharge features. A transect spacing of approximately 50 feet or less, depending on vegetation thickness, was used to inspect the project site within a 50 foot radius of the proposed sewer lines. A 2022 aerial photograph, in conjunction with a hand held Global Positioning System with an Estimated Potential Error ranging from 7 to 10 feet, was used to navigate around the property and identify the locations of potential recharge features, as

recommended in the “Instructions to Geologists”, TCEQ-0585-Instructions (Rev. 10-1-04). The locations of any potential recharge features noted in the field were identified on the Site Geologic Map in Appendix C of this report. A copy of a 2022 aerial photograph at an approximate scale of 1”=500’, indicating the locations of the potential recharge features, is included on Plate 9 in Appendix A. The Geologic Assessment Form (Rev. 2-11-15), Stratigraphic Column, and the Geologic Assessment Table have been filled with the appropriate information for this project site and are included on pages 1-7 of this report.

## **RESEARCH & OBSERVATIONS**

### **7.5 Minute Quadrangle Map Review**

According to the USGS 7.5 Minute Quadrangle Map, New Braunfels West, Texas Sheet (1988), the elevation of the project site ranges from 665 feet at the southeastern limits of the project site along Blieders Creek to 740 feet near the northern limits of the project site along River Road. These elevations are calculated above mean sea level (AMSL). The surface runoff from the project site flows into unnamed tributaries of Blieders Creek, and Blieders Creek. State Highway 46 (Loop 337) is located south of the project site. River Road is located immediately north of the sewer line segment. A copy of the above referenced USGS 7.5 Minute Quadrangle Map, indicating the location of the project site, is included in this report on Plate 3 in Appendix A.

### **Recharge / Transition Zone**

According to Official Edwards Aquifer Recharge Zone Map, New Braunfels West, Texas Sheet, (2014), the project site is located within the Recharge Zone of the Edwards Aquifer. A copy of the Official Edwards Aquifer Recharge Zone Map, indicating the location of the project site, is included on Plate 4 in Appendix A.



### **100-Year Floodplain**

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map for Comal County, Texas, Community Panel Number 48091C0435F, (Revised 9/02/09) was reviewed to determine if the project site is located in areas prone to flooding. A review of the above-mentioned panel indicates that portions of the project site is located within the 100 year floodplain. The project site is located within Zone AE, Zone X Shaded, and Zone X.

According to the panel legend, Zone AE represents areas within the 100 year floodplain where base flood elevations have been determined. The areas of the property within Zone AE are located along Blieders Creek.

Zone X shaded represents areas of 0.2% annual chance of flooding, areas of 1% annual chance of flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance of flooding. The areas of the property with Zone X Shaded are generally narrow bands located immediately adjacent to areas determined to be within Zone AE.

Zone X represents areas determined to be outside the 0.2% annual chance floodplain. A copy of the Comal County, Texas, FIRM map, indicating the location of the project site is included in this report on Plate 5 in Appendix A.

### **Soils**

According to the United States Department of Agriculture, Soil Conservation Service, Soil Survey of Comal & Hays County, Texas (1982), the project site is located on the Rumble-Comfort Association (RUD), and the Comfort Rock Outcrop Complex, Undulating (CrD). A copy of the 1973 aerial photograph (approximate scale: 1"=1000') from the USDA Soil Survey of Comal & Hays County, Texas (1982) indicating the location of the project site and the soil types is included on Plate 6 in Appendix A.

The Rumble-Comfort Association (RuD) consists of shallow and moderately deep soils on

uplands in the Edwards Plateau Land Resource Area. The surface layer of the Rumble Soil is dark reddish brown very cherty clay loam about 10 inches thick. Rounded chert and limestone cobbles and gravel cover about 20 percent of the surface. The subsoil to a depth of 14 inches is dark reddish-brown very cherty clay, and to a depth of 28 inches it is dark reddish-brown extremely stony clay. The underlying material is indurated fractured limestone. The Comfort Soil is dark brown, neutral, extremely stony clay about 7 inches thick. The subsoil to a depth of 12 inches is dark reddish-brown, mildly alkaline, extremely stony clay. The underlying material is indurated fractured limestone. The soil is noncalcareous throughout. The soils in this association are well drained. Surface runoff is medium, but varies due to the occurrence of caves, fracture zones, and sinks. Permeability is moderately slow. Water erosion is a moderate hazard.

The Comfort-Rock Outcrop Complex (CrD) consists of shallow, clayey soils and Rock Outcrop on side slopes and on hilltops and ridgetops on uplands in the Edwards Plateau Land Resource Area. The Comfort Extremely Stony Clay makes up 49 to more than 95 percent of the complex, but on the average it makes up 70 percent. Rock Outcrop and areas of soil less than 4 inches deep make up 5 to 36 percent, but the average is 15 percent. Typically, the surface layer of the Comfort soil is dark brown extremely stony clay about 6 inches thick. Cobbles and stones as much as 4 feet across cover about 45 percent of the surface. The subsoil extends to a depth of 13 inches. It is dark reddish brown extremely stony clay. The underlying material is indurated fractured limestone. The soil is mildly alkaline and noncalcareous throughout. The Comfort Soil is well drained. Surface runoff is slow to medium. Permeability is slow, and the available water capacity is very low. Water erosion is a slight hazard. This soil has a USDA Texture Classification of extremely stony clay, stony clay, very stony clay, and weathered bedrock. The Unified Classification is CH, GC, CL, or SC. The AASHO Classification is A-2-7, and A-7-6. This soil has an average permeability from 0.6 to 0.2 inches/hour.

### **Narrative Description of the Site Geology**

The project site consists of approximately 10,254 linear feet of proposed sewer line

located within the existing Veramendi Subdivision, along Blieders Creek, north of Loop 337 and west of River Road in New Braunfels, Texas. An overall view of the area is shown on Plates 1 through 9 in Appendix A. Portions of the project site have a very well developed soil layer on the property. A bull rock improved road is located along the existing sewer line adjacent to Blieders Creek. These factors give way to relatively few rock outcrops and dense stands of native grasses outside the improved access road. The variations in the vegetative cover across the project site are visible in the 2022 aerial photographs on Plates 8 and 9 in Appendix A and in the site visit photographs included in Appendix B. Twenty five Potential Recharge Features (PRF's) were identified during our site inspection. None of these are considered sensitive by Frost GeoSciences, Inc. The features are described in the following paragraphs and detailed on the Geologic Assessment Tables on pages 5 through 7.

#### **Faults (F)**

Two faults and an inferred fault were noted within the limits of the project site. Potential Recharge Feature (PRF) # S-509 is a fault crossing the proposed sewer line in the north central portion of the site. PRF # S-512 is an inferred fault crossing a sewer line extension to River Road in the northern portion of the site. PRF's S-514, S-520, and S-525 are a single fault that crosses the proposed sewer line three times. There were no obvious visual indications of fractures or displacements associated with these fault locations. The faults are considered to be sensitive by FGS. These features score a 47 on the Geologic Assessment Table because the angle of the fault lies within the dominant trend. The inferred fault is not considered sensitive by FGS. This feature scores a 37 on the Geologic Assessment Table because the angle of the fault lies outside the dominant trend.

#### **Manmade Features in Bedrock (MB)**

Potential Recharge Features S-501 through S-508, S-510 and S-511, S-513, S-515 through S-519, and S-521 through S-523, and S-525 are manmade features in bedrock consisting of sanitary sewer manholes associated with an existing sanitary sewer easement. These features are not considered sensitive by FGS. These features score a 35 on the Geologic Assessment Table.

According to the USGS 7.5 Minute Quadrangle Map, New Braunfels West, Texas Sheet (1988), the elevation of the project site ranges from 665 feet at the southeastern limits of the project site along Blieders Creek to 740 feet near the northern limits of the project site along River Road. These elevations are calculated above mean sea level (AMSL). According to topographic data obtained from LJA Engineering, the elevations on the project site range from 675 feet at the southeastern limits of the project site to 730 feet in the northern portion of the project site adjacent to River Road. A copy of the site plan, indicating the boundary of the project site and the elevations, is included on Plate I in Appendix A and on the Site Geologic Map in Appendix C of this report.

According to the Geologic Framework and Hydrogeologic Characteristics of the Edwards Aquifer Recharge Zone, Comal County, Texas. U.S. Geological Survey Water Resources Investigations 94-4117 (1994) the project site is located on the Cyclic and Marine Member and the Leached and Collapsed Member of the Edwards Person Limestone (Kep).

The Cyclic and Marine Member of the Cretaceous Edwards Person Limestone consists of mudstone to packstone and miliolid grainstone with chert. The member is characterized by massive beds of limestone to relatively thin beds of limestone with some crossbedding. The Cyclic and Marine Member forms a few caves some that are laterally extensive. Overall thickness ranges from 80 to 90 feet thick.

The Leached and Collapsed Member of the Edwards Person Limestone consists of crystalline limestone, mudstone to grainstone with chert, and collapsed breccia. This member is stromatolitic limestone. The Leached and Collapsed Member is characterized by bioturbated iron stained beds separated by massive limestone beds. This member is typically one of the most permeable and has extensive lateral development with large rooms. Overall thickness ranges from 70 to 90 feet thick.

This geologic map indicates that two faults are located on the project site. These faults run on a southwest to northeast trend through the project site. An inferred fault on a northwest to southeast trend was noted in the north central portion of the site. No obvious visual

indications of these faults were noted in the field at the time of the site inspection.

A copy of the Geologic Framework and Hydrogeologic Characteristics of the Edwards Aquifer Recharge Zone, Comal County, Texas. U.S. Geological Survey Water Resources Investigations 94-4117 (1994) indicating the location of the project site, is included on Plate 7 in Appendix A.

### **BEST MANAGEMENT PRACTICE (BMP)**

**Based on a visual inspection of the ground surface the overall potential for fluid flow from the surface of the project site into the Edwards Aquifer appears to be low with isolated areas having higher potential around faults.** The potential always exists to encounter subsurface features that lack a surface expression. Frost GeoSciences, Inc. recommends that we be included in the pre-construction meeting to inform construction personnel of the potential to encounter subsurface karst features during excavating activities. Construction personnel should also be informed of the proper protocol to follow in the event that a solution cavity and/or cave is encountered during the excavation and development of the property, particularly in the areas around the faults.

### **DISCLAIMER**

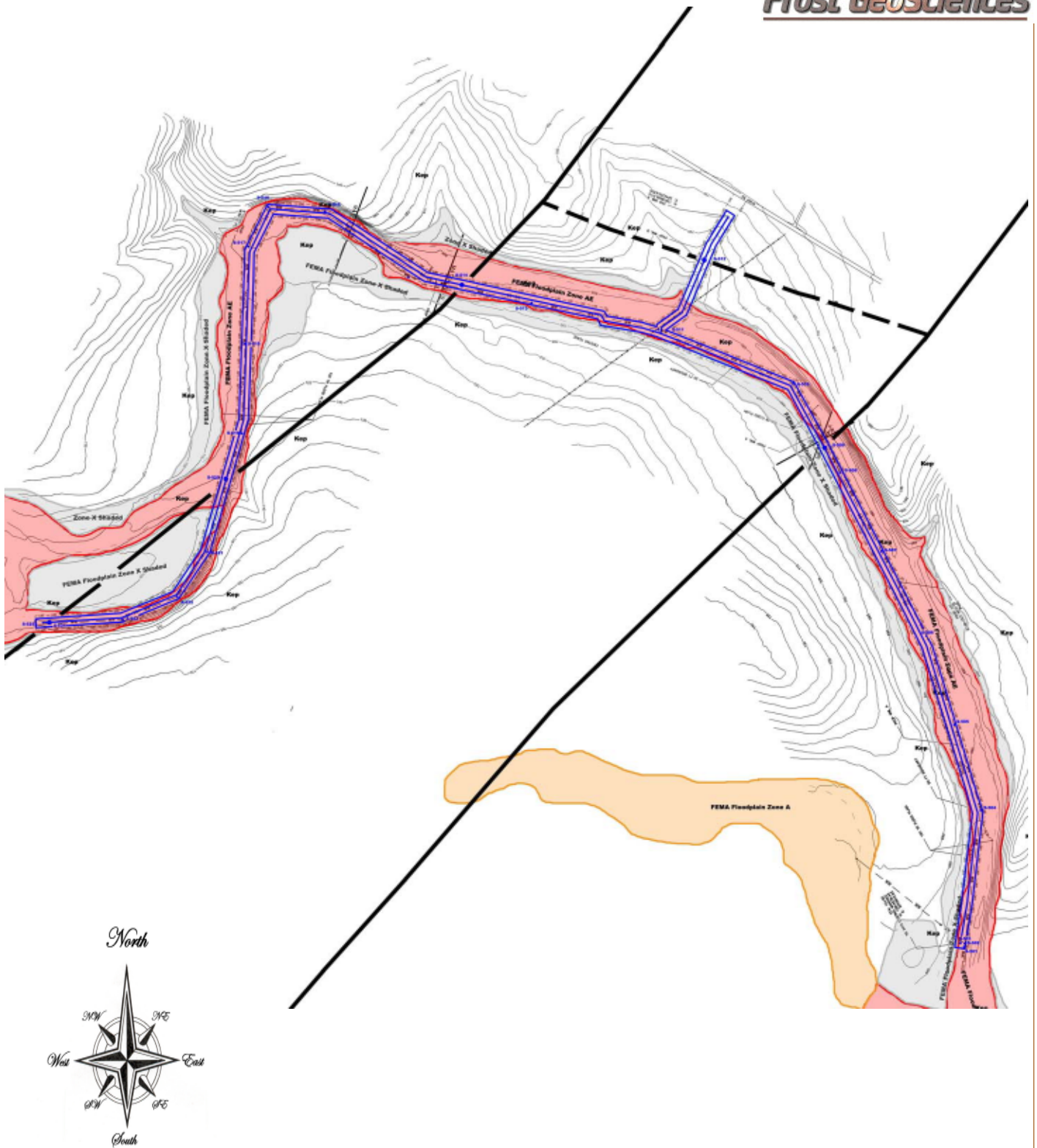
This report has been prepared in general accordance with the "Instructions to Geologists", TCEQ-0585-Instructions (Rev. 10-1-04) by a Licensed Texas Professional Geoscientist. All areas of the project site were carefully inspected for features that could contribute to the recharge of the Edwards Aquifer, however, this survey cannot preclude the presence of subsurface karst features that lack surface expression. This report is not intended to be a definitive investigation of all possible geologic or karst features at this site. All conclusions, opinions and recommendations for Best Management Practices (BMP's) in this report are based on information obtained while researching the project and on the site conditions at the time of our field investigation.

This report has been prepared for and may be relied upon by ASA Properties. This report is based on available known records, a visual inspection of the project site and the work generally accepted for a Geologic Assessment TAC §213.5(b)(3), effective June 1, 1999.

## REFERENCES

- 1) USGS 7.5 Minute Quadrangle Maps, New Braunfels West, Texas Sheet (1988).
- 2) Official Edwards Aquifer Recharge Zone Map 31, New Braunfels West, Texas Sheet (2014).
- 3) Stein, W.G. and Ozuna, G.B., 1995, Geologic Framework and Hydrogeologic Characteristics of the Edwards Aquifer Recharge Zone, Comal County, Texas. U.S. Geological Survey Water Resources Investigations 94-4117.
- 4) Collins, Edward, W., 2000, Geologic Map of the New Braunfels, Texas 30 X 60 Minute Quadrangle.
- 5) Federal Emergency Management Agency (FEMA), Bexar County, Texas and Incorporated Areas, Flood Insurance Rate Maps (FIRM), Panel #, 48091C0435F (9/02/09), FEMA, Washington D.C.
- 7) USDA Soil Conservation Service, Soil Survey of Comal & Hays Counties, Texas (1982).
- 8) TCEQ-0585-Instructions (Rev. 10-1-04). "Instructions to Geologists for Geologic Assessments on the Edwards Aquifer Recharge/Transition Zone".

Appendix A  
Site Location Plates



**PROJECT NAME:**

Geologic Site Assessment (SCS)  
for Regulated Activities / Development on the  
Edwards Aquifer Recharge / Transition Zone  
Veramendi N1 to N6 Sewer Line  
New Braunfels, Texas

**Site Plan**

**PROJECT NO.:**

FGS-E22237

**DATE:**

January 12, 2023



White Water Rd

**Project Site**

River Rd

Edwards Blvd  
Mary Prie

337

New Braunfels

Landa Park Highlands

Ohio Ave

Lakeview Blvd

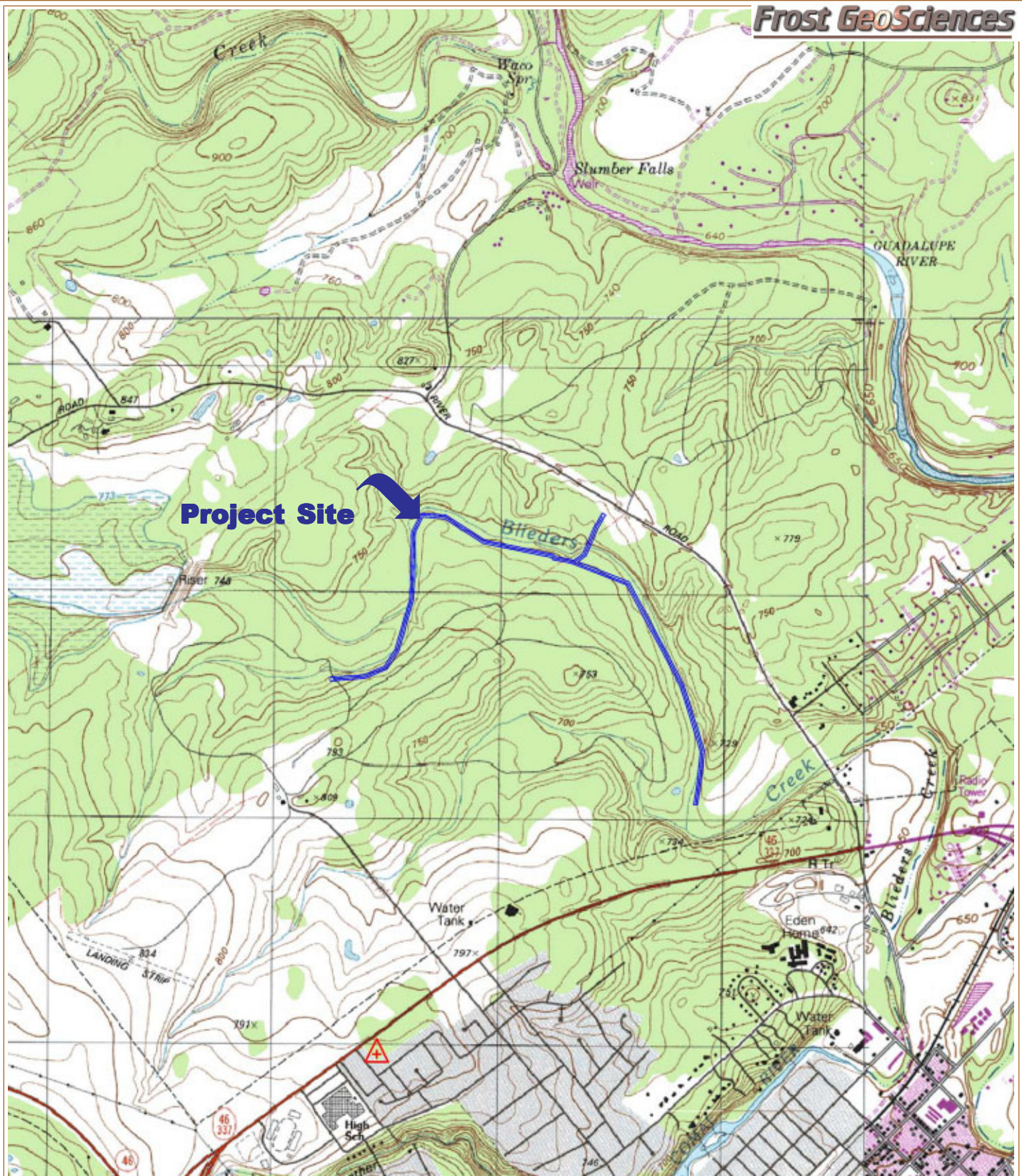
Kingemarm St  
Dallas St  
E Torrey St  
E Austin St  
Garza

**Street Map**

**PROJECT NAME:**  
Geologic Site Assessment (SCS)  
for Regulated Activities / Development on the  
Edwards Aquifer Recharge / Transition Zone  
Veramendi N1 to N6 Sewer Line  
New Braunfels, Texas

**PROJECT NO.:**  
FGS-E22237

**DATE:**  
January 12, 2023



**PROJECT NAME:**

Geologic Site Assessment (SCS)  
for Regulated Activities / Development on the  
Edwards Aquifer Recharge / Transition Zone  
Veramendi N1 to N6 Sewer Line  
New Braunfels, Texas

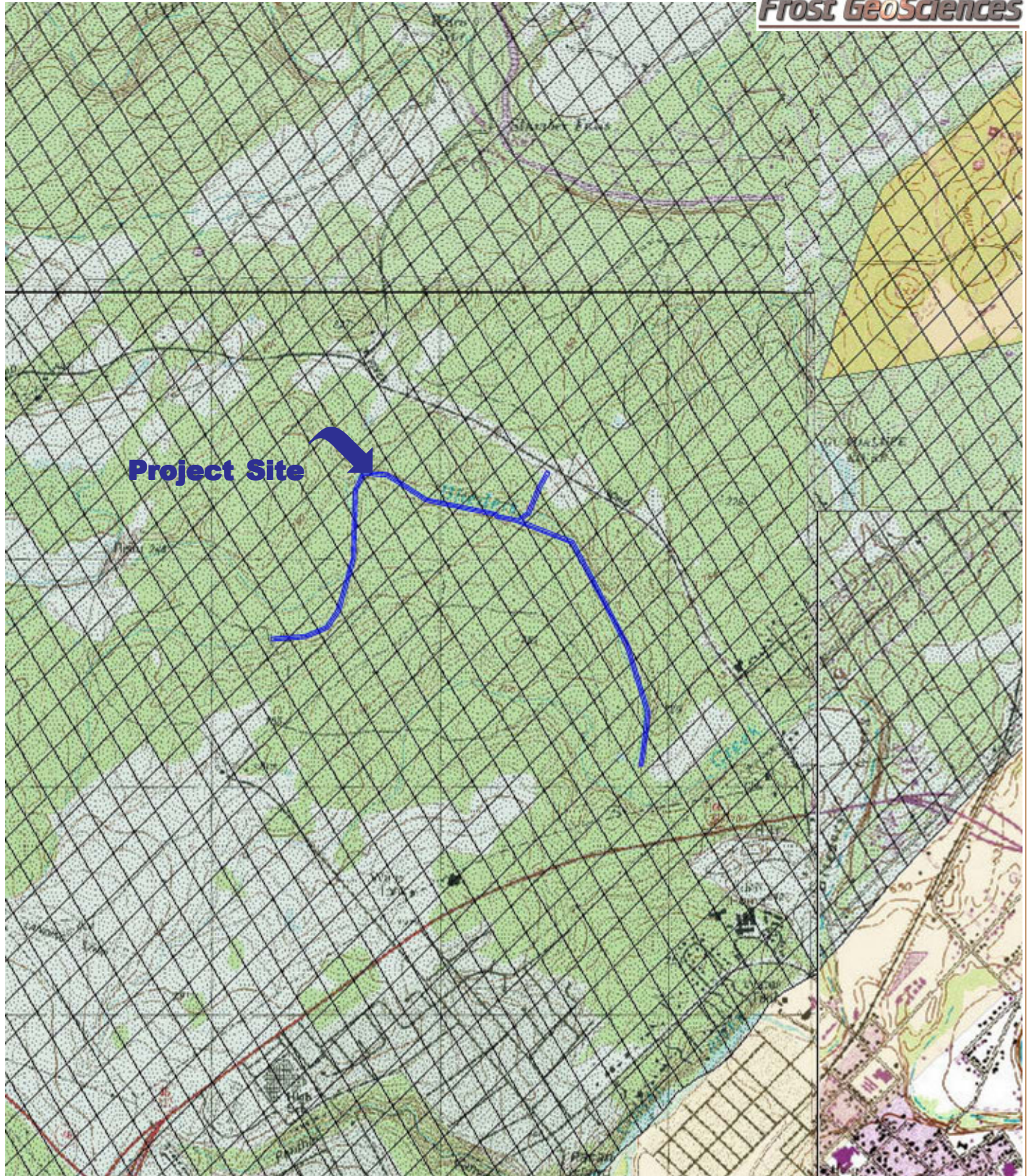
U.S.G.S. 7.5 Minute Quadrangle Map  
New Braunfels West, Texas Sheet (1988)

**PROJECT NO.:**

FGS-E22237

**DATE:**

January 12, 2023



**PROJECT NAME:**

Geologic Site Assessment (SCS)  
for Regulated Activities / Development on the  
Edwards Aquifer Recharge / Transition Zone  
Veramendi N1 to N6 Sewer Line  
New Braunfels, Texas

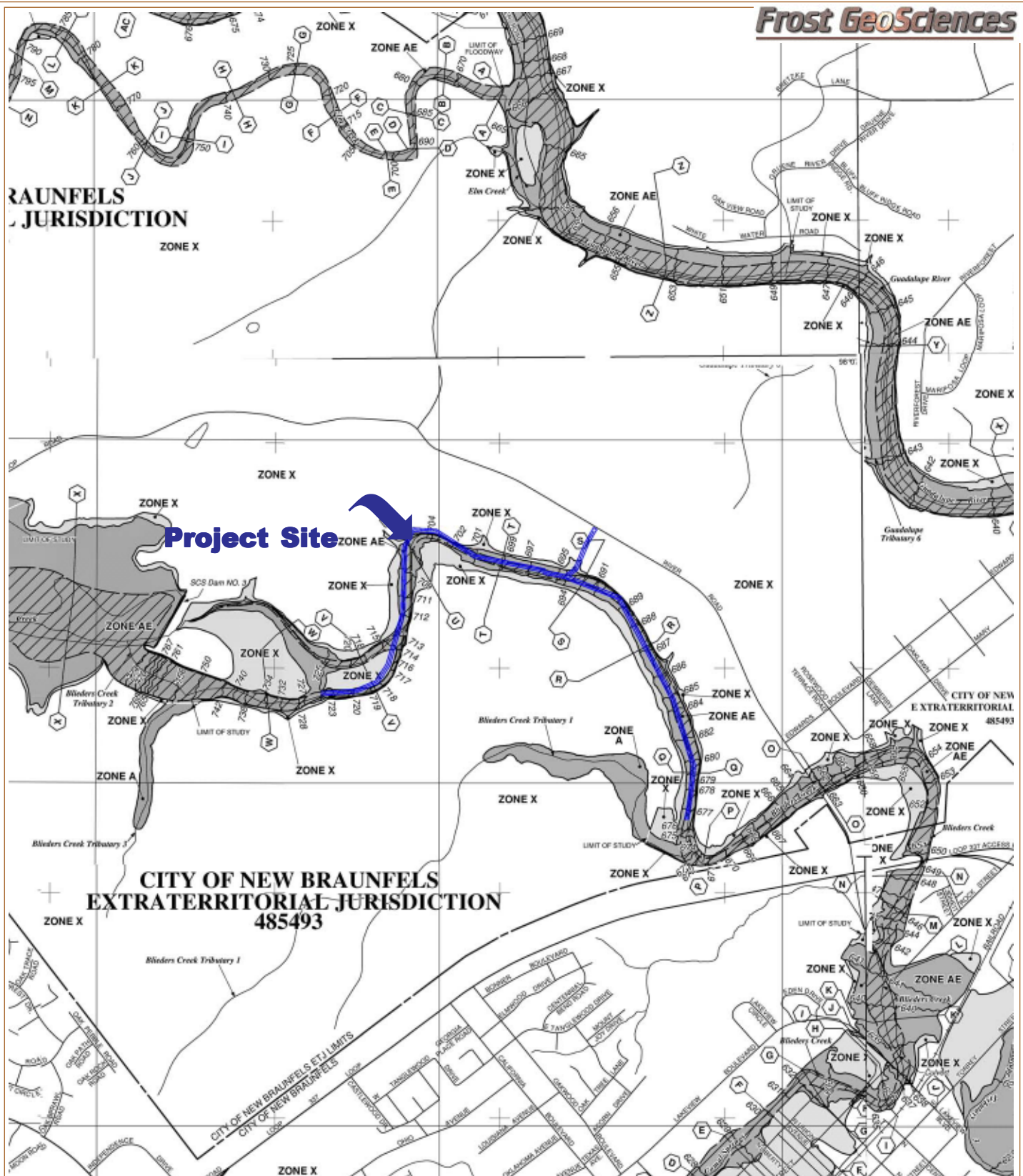
Official Edwards Aquifer Recharge Zone Map  
New Braunfels West, Texas Sheet (2014)

**PROJECT NO.:**

FGS-E22237

**DATE:**

January 12, 2023



**PROJECT NAME:**

Geologic Site Assessment (SCS)  
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Edwards Aquifer Recharge / Transition Zone  
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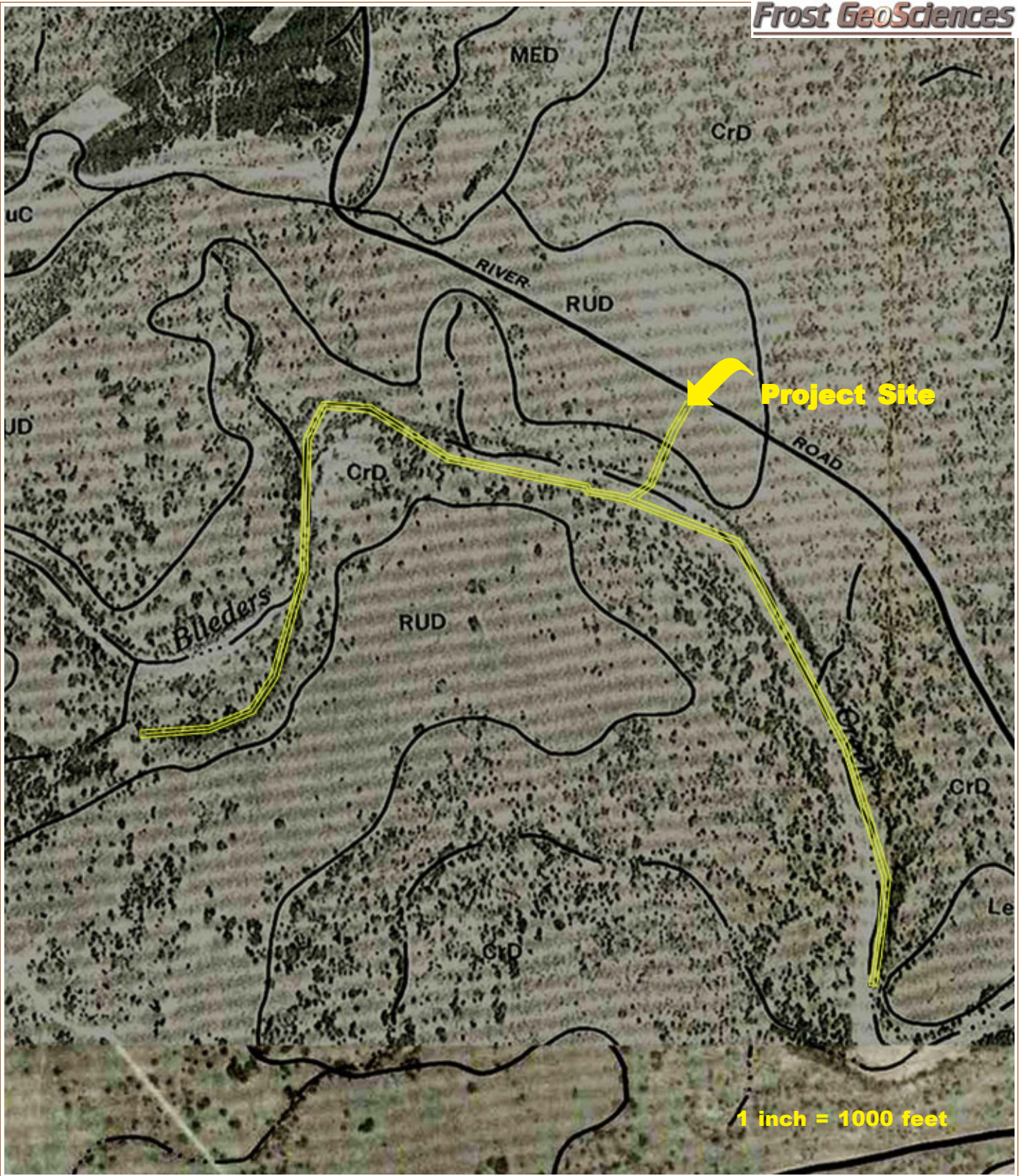
**Flood Insurance Rate Map (FIRM)**  
Community Panel # 48091C0435F  
(Revised 9/02/09)

**PROJECT NO.:**

FGS-E22237

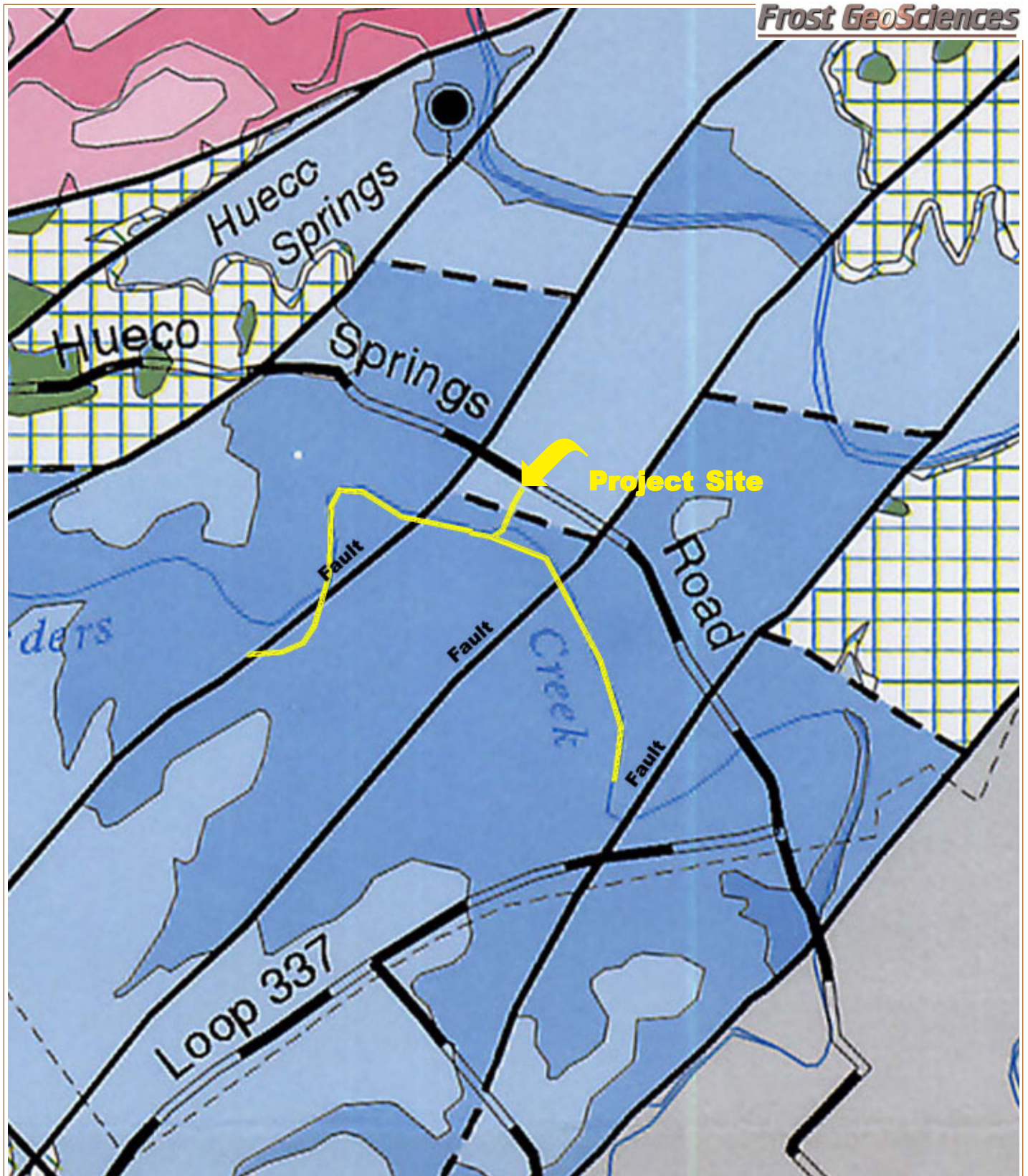
**DATE:**

January 12, 2023



**PROJECT NAME:**  
Geologic Site Assessment (SCS)  
for Regulated Activities / Development on the  
Edwards Aquifer Recharge / Transition Zone  
Veramendi N1 to N6 Sewer Line  
New Braunfels, Texas

<b>1973 Aerial Photograph</b> United States Department of Agriculture	
<b>PROJECT NO.:</b> FGS-E22237	<b>DATE:</b> January 12, 2023



**PROJECT NAME:**

Geologic Site Assessment (SCS)  
for Regulated Activities / Development on the  
Edwards Aquifer Recharge / Transition Zone  
Veramendi NI to N6 Sewer Line  
New Braunfels, Texas

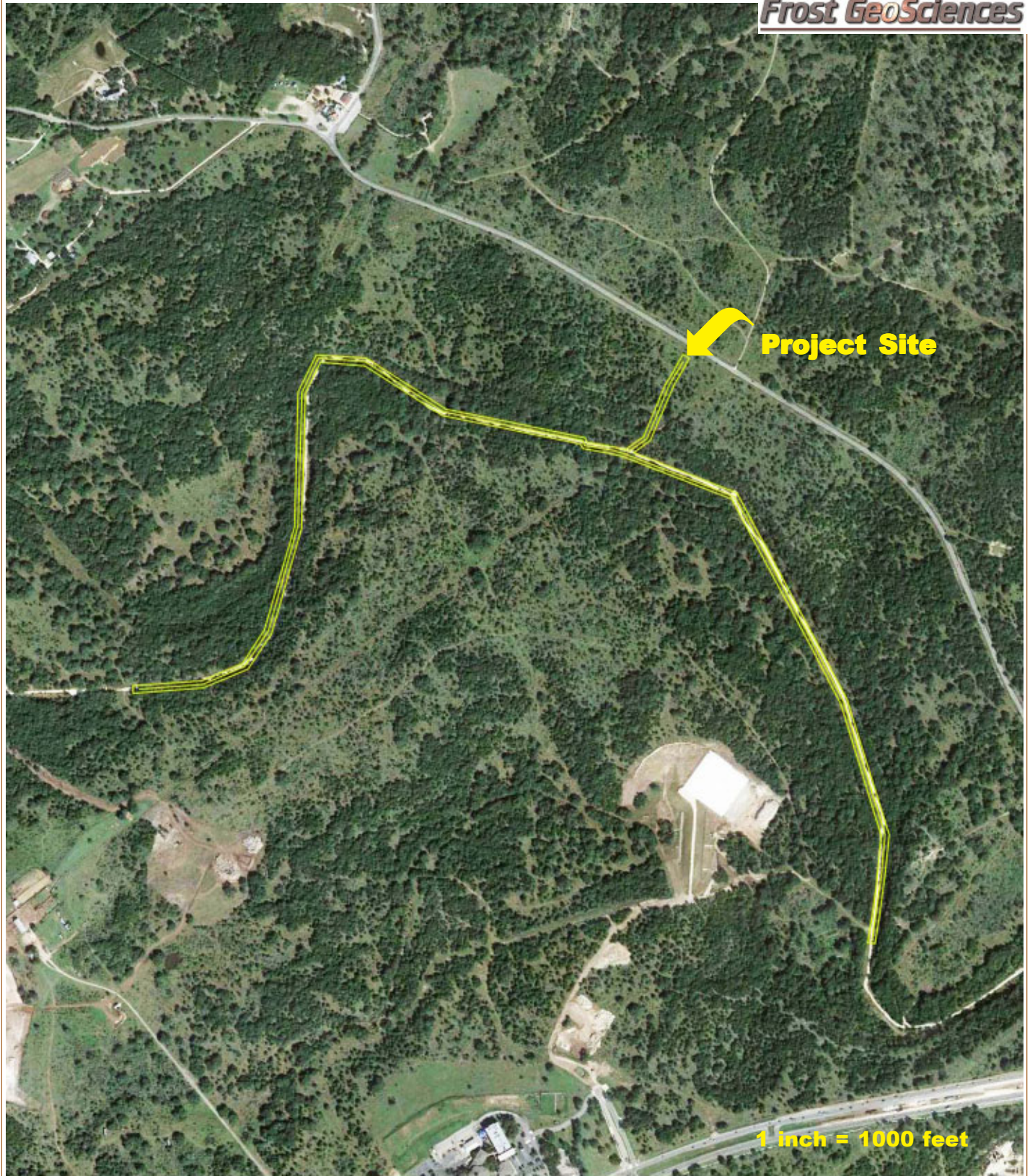
U.S. Geological Survey Water Resources  
Investigations 94-4117 (1994)

**PROJECT NO.:**

FGS-E22237

**DATE:**

January 12, 2023



**PROJECT NAME:**

Geologic Site Assessment (SCS)  
for Regulated Activities / Development on the  
Edwards Aquifer Recharge / Transition Zone  
Veramendi N1 to N6 Sewer Line  
New Braunfels, Texas

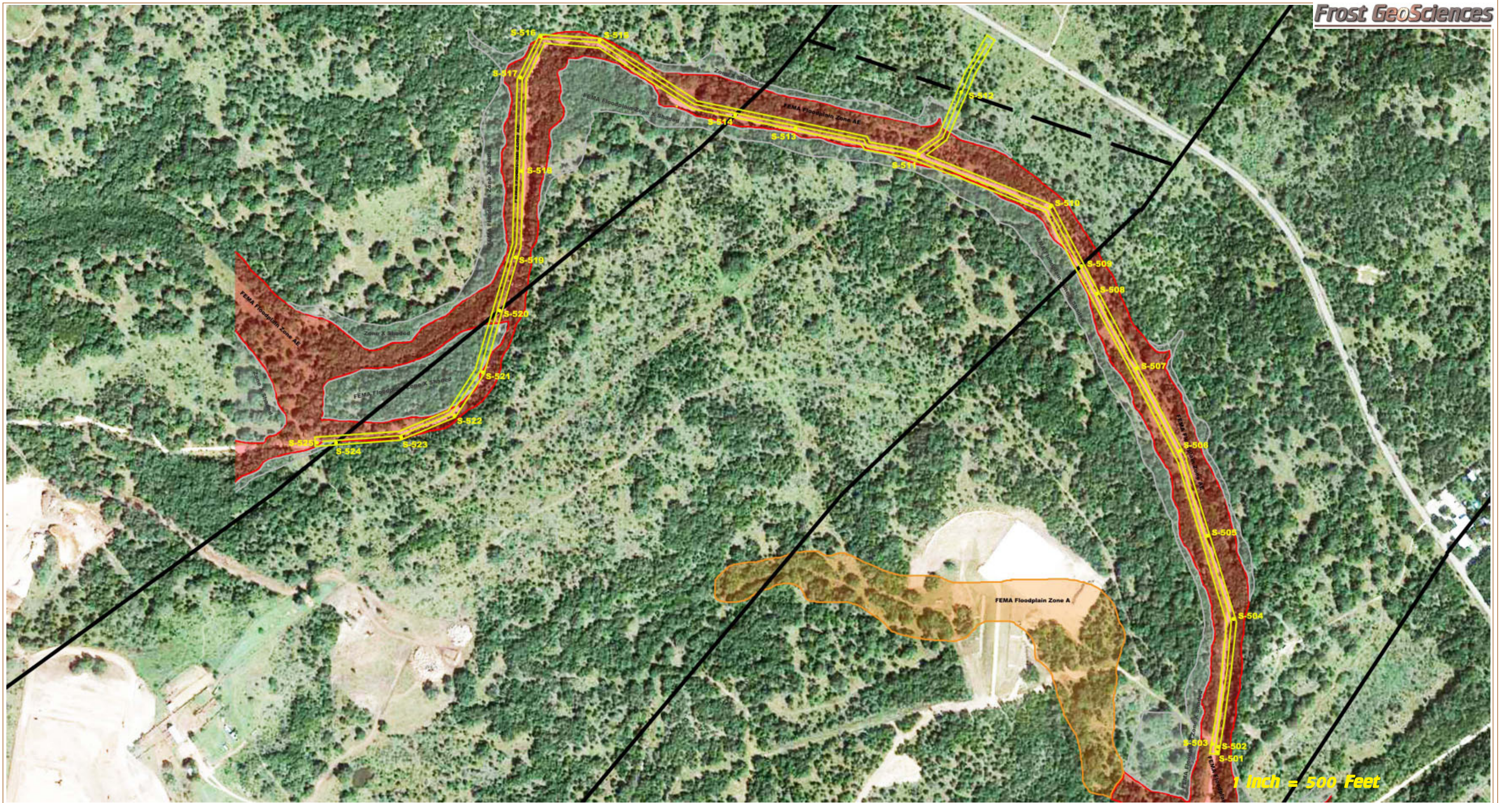
2022 Aerial Photograph  
Google Earth

**PROJECT NO.:**

FGS-E22237

**DATE:**

January 12, 2023



**PROJECT NAME:** Geologic Site Assessment (SCS) for Regulated Activities / Development on the Edwards Aquifer Recharge / Transition Zone Veramendi N1 to N6 Sewer Line New Braunfels, Texas

2022 Aerial Photograph with PRF's  
Google Earth

**PROJECT NO.:** FGS-E22237

**DATE:** January 12, 2023



## Appendix B

### Site Inspection Photographs



View of Potential Recharge Feature # S-501.



View of Potential Recharge Feature # S-502.



View to the south of the project site near PRF #S-501.



View to the north of the project site near PRF #S-502.



View of Potential Recharge Feature # S-504.



View to the north of the project site near PRF #S-504.



View to the south of the project site near PRF #S-504.



View of Potential Recharge Feature # S-505.



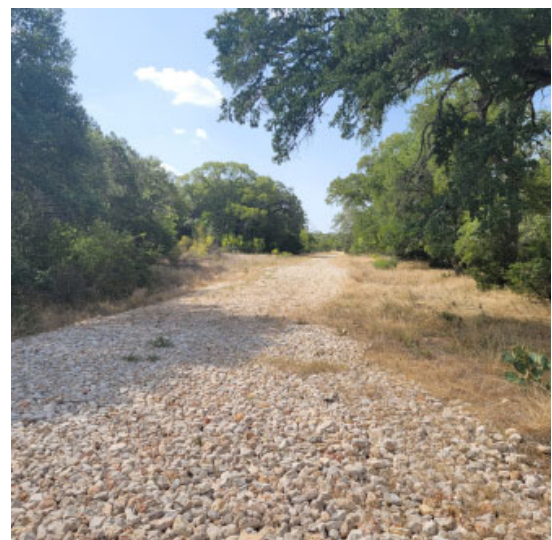
View to the northwest of the project site near PRF #S-505.



View to the southeast of the project site near PRF #S-505.



View of Potential Recharge Feature # S-506.



View to the northwest of the project site near PRF #S-506.



View to the southeast of the project site near PRF #S-506.



View of Potential Recharge Feature # S-507.



View to the northwest of the project site near PRF #S-507.



View to the southeast of the project site near PRF #S-507.



View of Potential Recharge Feature # S-510.



View to the northwest of the project site near PRF #S-510.



**View to the southeast of the project site near PRF #S-510.**



**View of Potential Recharge Feature # S-511.**



**View to the west of the project site near PRF #S-511.**



**View to the east of the project site near PRF #S-511.**



**View to the north of the project site from PRF #S-511.**



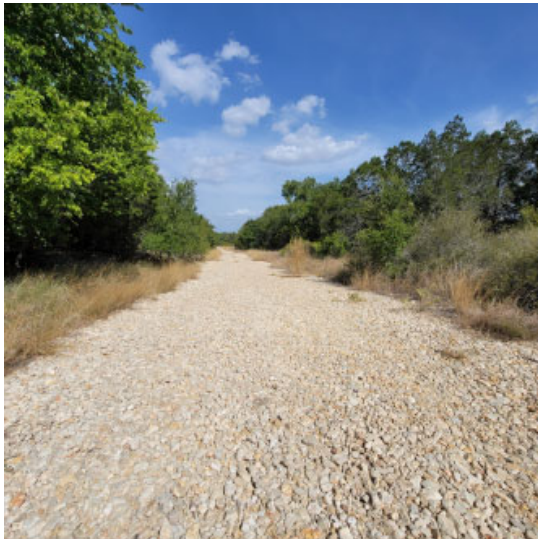
**View to the south, of the project site near River Road toward PRF #S-511.**



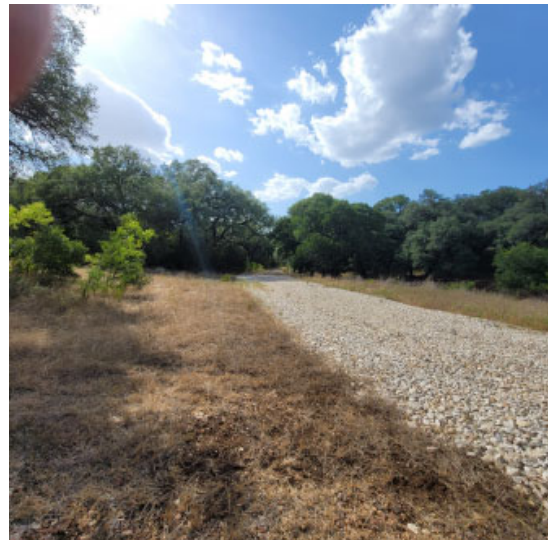
View of Potential Recharge Feature # S-513.



View to the west of the project site near PRF #S-513.



View to the east of the project site near PRF #S-513.



View to the west of the project site just west of PRF #S-514.



View to the east of the project site just west of PRF # S-514.



View of Potential Recharge Feature # S-515.



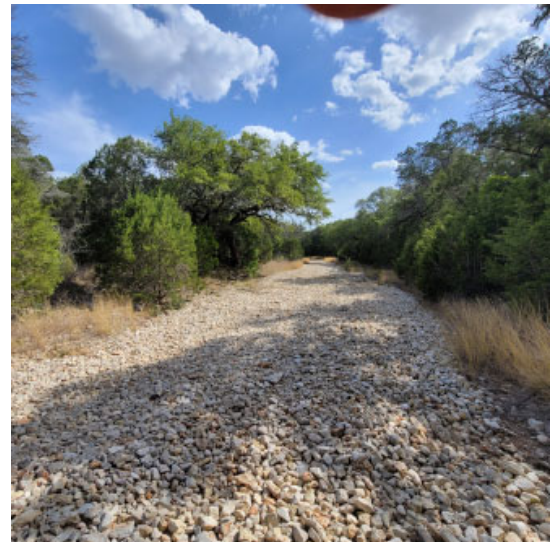
View to the west of the project site near PRF #S-515.



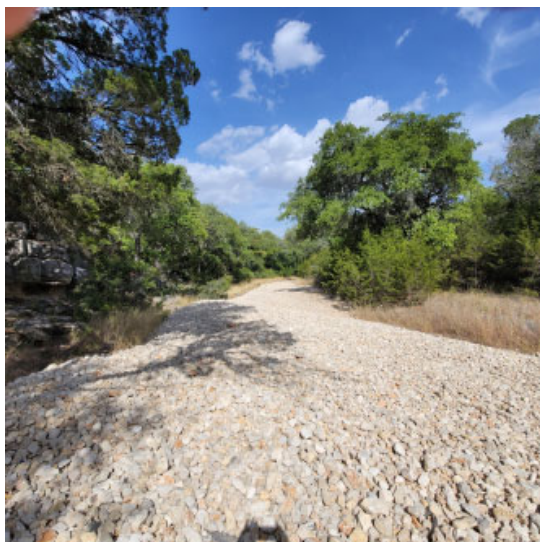
View to the southeast of the project site near PRF #S-515.



View of Potential Recharge Feature # S-516.



View to the southwest of the project site near PRF #S-516.



View to the east of the project site near PRF # -516.



View of Potential Recharge Feature # S-517.



View to the south of the project site near PRF #S-517.



View to the north of the project site near PRF #S-517.



View of Potential Recharge Feature # S-518.



View to the north of the project site near PRF #S-518.



View to the south, of the project site near PRF # S-518.

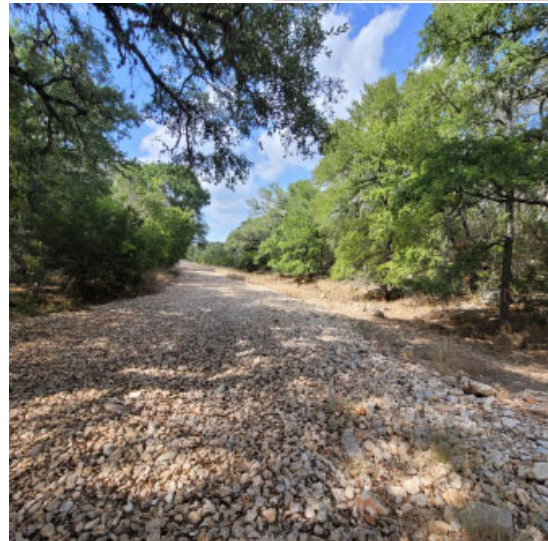


View of Potential Recharge Feature # S-519.





View to the north of the project site near PRF #S-519.



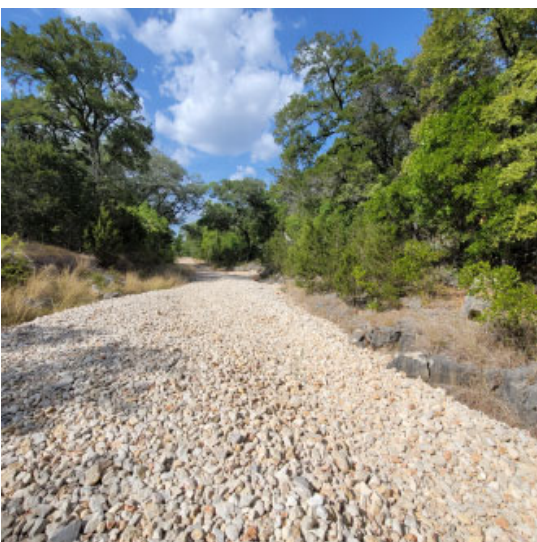
View to the south of the project site near PRF #S-519.



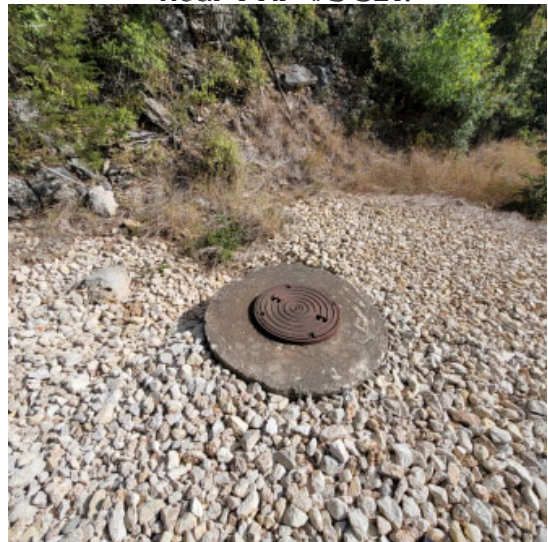
View of Potential Recharge Feature # S-521.



View to the north of the project site near PRF #S-521.



View to the southwest, of the project site near PRF # S-521.



View of Potential Recharge Feature # S-522.



**View to the southwest of the project site near PRF #S-522.**



**View to the northeast of the project site near PRF #S-522.**



**View of Potential Recharge Feature # S-523.**

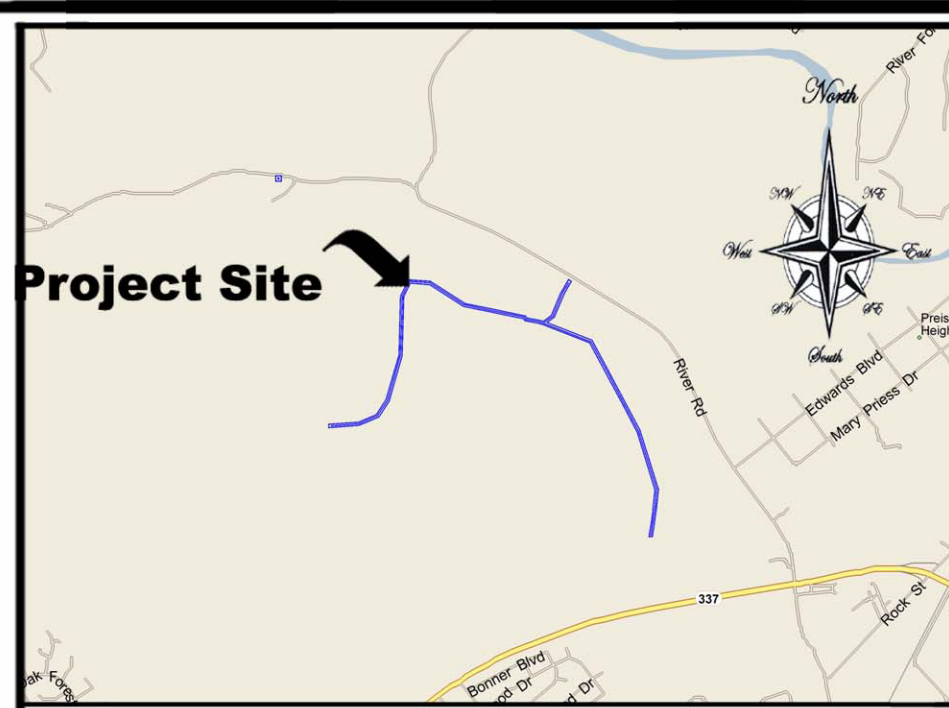


**View to the northeast of the project site near PRF #S-523.**

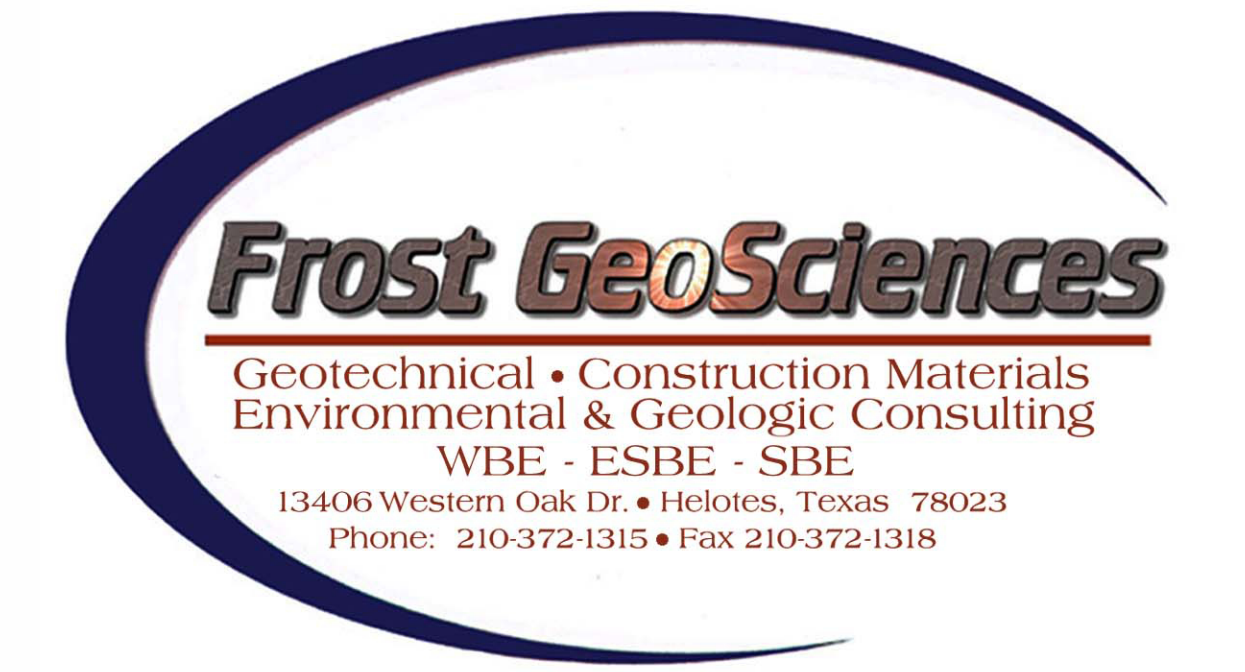
# Appendix C

## Site Geologic Map

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Location Map



# Site Geologic Map

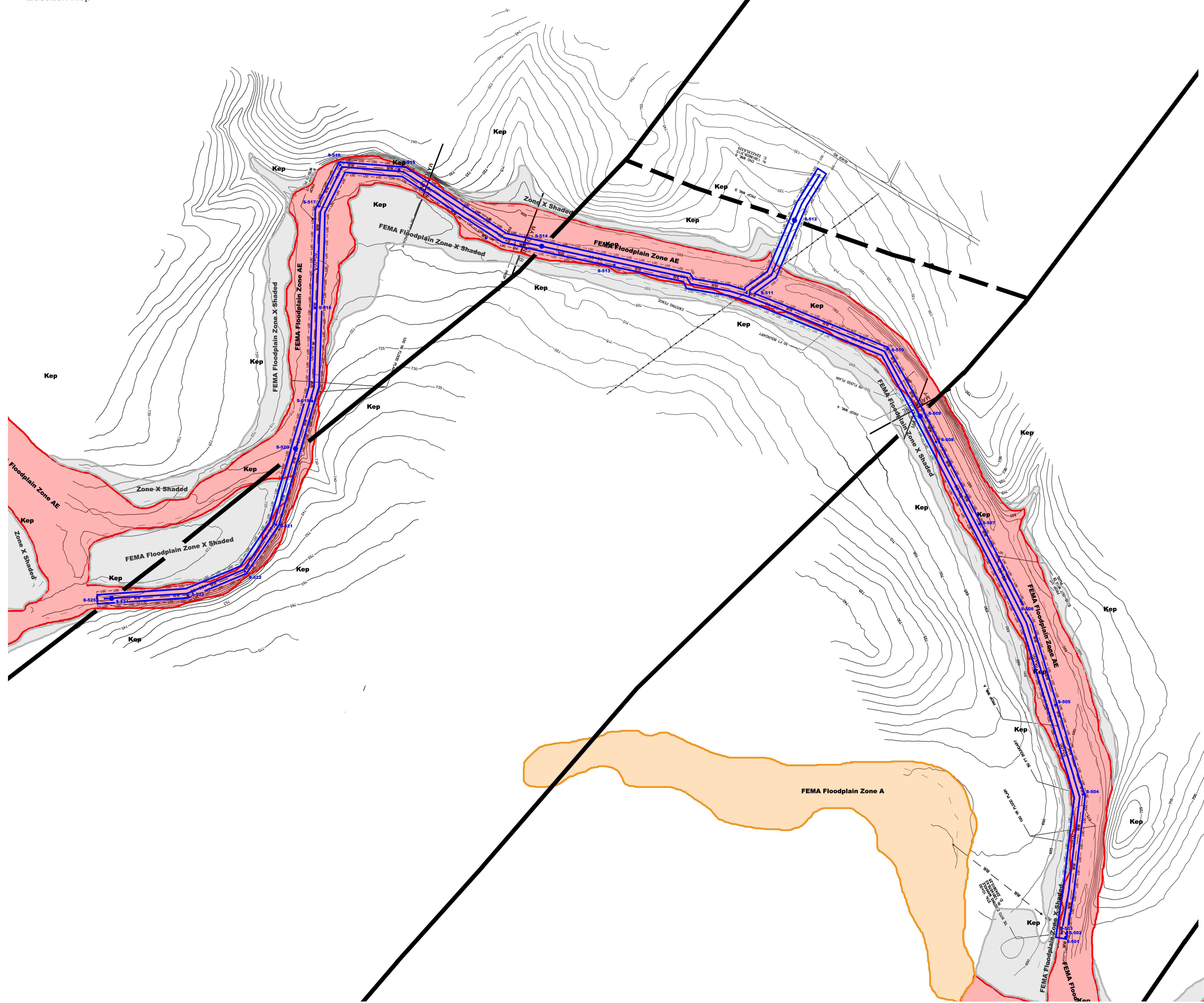
Geologic Site Assessment (SCS)  
 for Regulated Activities / Development on the  
 Edwards Aquifer Recharge / Transition Zone  
 for the  
 Veramendi Subdivision  
 N1 to N6 Sewer Line  
 New Braunfels, Texas

Frost GeoSciences, Inc. Control # FGS-E22237

## Legend

- Fill - Fill Material
- Qal - Alluvium
- Kau - Austin Chalk
- Kef - Eagle Ford Shale
- Kbu - Buda Limestone
- Kdr - Del Rio Clay
- Kgt - Georgetown Limestone
- Kep - Edwards Person Limestone
- Kek - Edwards Kainer Limestone
- Kgr - Glen Rose Formation

- S-# - Potential Recharge Feature (PRF)
- ..... - Formation Contact
- - 100-Year Floodplain - Zone A
- - 100-Year Floodplain - Zone AE
- - Other Flood Hazard Area - Zone X (shaded)
- - Fault

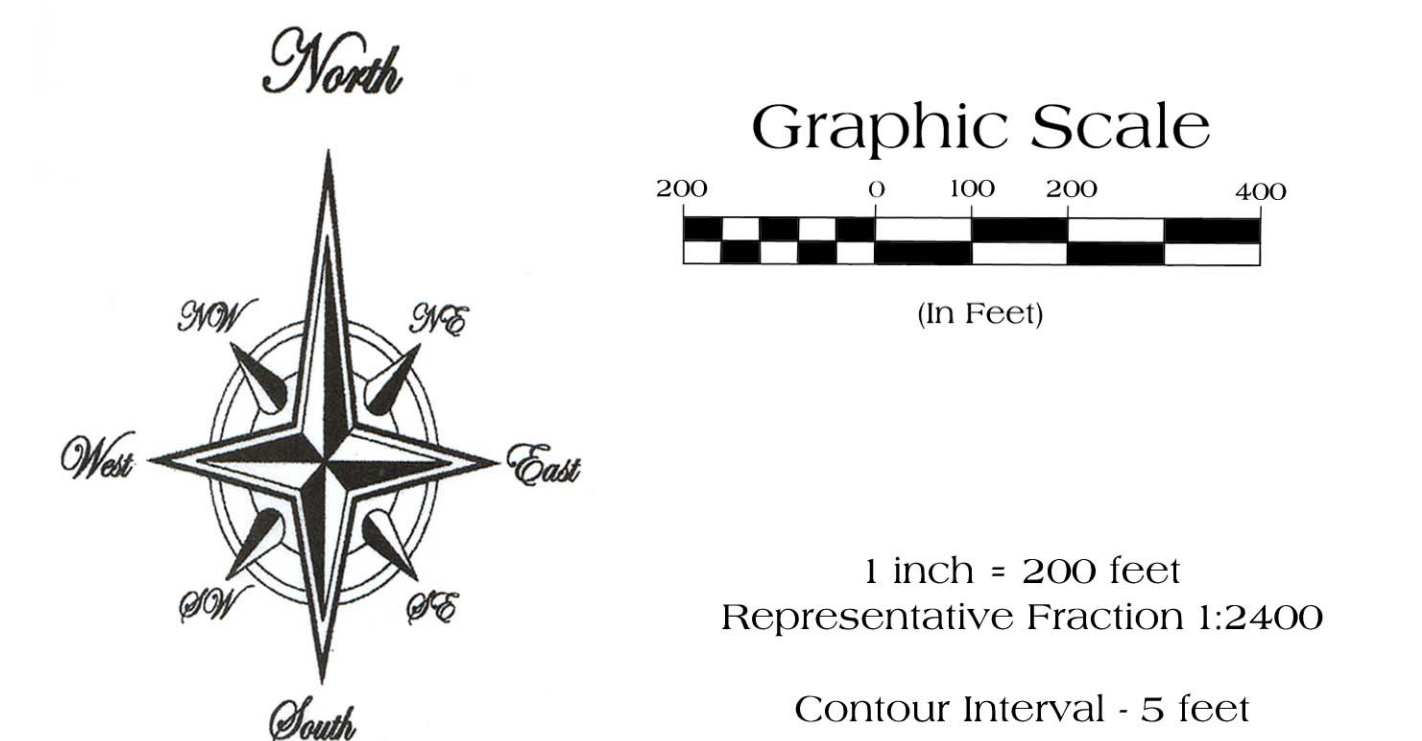


Floodplain Information Obtained From  
 FIRMA: Flood Insurance Rate Map  
 Comal County, Texas: Panel # 4809IC0435F, Revised 9/02/09

Fault Information Obtained From:  
 Bureau of Economic Geology, Geologic Atlas of Texas, San Antonio Sheet (1983)  
 U.S. Geological Survey, Water Resources Investigations Report 94-4117 (1994)  
 Geologic Map of the New Braunfels, Texas 30 X 60 Minute Quadrangle (2000)



Signature of Texas Licensed Geocientist  
 Steve Frost, TPG# 315, AIPG # 10176



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# Organized Sewage Collection System Application

## Texas Commission on Environmental Quality

For Regulated Activities on the Edwards Aquifer Recharge Zone and Relating to 30 TAC §213.5(c), Effective June 1, 1999

***To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.***

***Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.***

**Regulated Entity Name:** City of New Braunfels

1.  **Attachment A – SCS Engineering Design Report.** This Engineering Design Report is provided to fulfill the requirements of 30 TAC Chapter 217, including 217.10 of Subchapter A, §§217.51 – 217.70 of Subchapter C, and Subchapter D as applicable, and is required to be submitted with this SCS Application Form.

## ***Customer Information***

2. The entity and contact person responsible for providing the required engineering certification of testing for this sewage collection system upon completion (including private service connections) and every five years thereafter to the appropriate TCEQ region office pursuant to 30 TAC §213.5(c) is:

Contact Person: Mr. Garrett Mechler

Entity: ASA Properties LLC

Mailing Address: 387 W. Mill Street, Suite 108

City, State: New Braunfels, TX

Zip: 78130

Telephone: (512) 761-0061

Fax: \_\_\_\_\_

Email Address: \_\_\_\_\_

***The appropriate regional office must be informed of any changes in this information within 30 days of the change.***

3. The engineer responsible for the design of this sewage collection system is:

Contact Person: Stuart Cowell

Texas Licensed Professional Engineer's Number: 126674

Entity: LJA Engineering, Inc.

Mailing Address: 2700 La Frontera, Suite 150

City, State: Round Rock, TX

Zip: 78681

Telephone: (512) 439-4700

Fax: (512) 439-4716

Email Address: scowell@lja.com

## Project Information

4. Anticipated type of development to be served (estimated future population to be served, plus adequate allowance for institutional and commercial flows):

- Residential: Number of single-family lots: 1058
- Multi-family: Number of residential units: \_\_\_\_\_
- Commercial
- Industrial
- Off-site system (not associated with any development)
- Other: \_\_\_\_\_

5. The character and volume of wastewater is shown below:

<u>82%</u> Domestic	<u>607,292</u> gallons/day
_____% Industrial	_____ gallons/day
<u>18%</u> Commingled	<u>133,308</u> gallons/day
Total gallons/day: <u>740,600</u>	

6. Existing and anticipated infiltration/inflow is 6022.5 gallons/day. This will be addressed by: For the proposed wastewater line, water tight manholes will be used. All sewer lines to manholes will have water tight seals, all sewer lines will be pressure tested as well and leak tested.

7. A Water Pollution Abatement Plan (WPAP) is required for construction of any associated commercial, industrial or residential project located on the Recharge Zone.

- The WPAP application for this development was approved by letter dated \_\_\_\_\_. A copy of the approval letter is attached.
- The WPAP application for this development was submitted to the TCEQ on \_\_\_\_\_, but has not been approved.
- A WPAP application is required for an associated project, but it has not been submitted.
- There is no associated project requiring a WPAP application.

8. Pipe description:

**Table 1 - Pipe Description**

<i>Pipe Diameter(Inches)</i>	<i>Linear Feet (1)</i>	<i>Pipe Material (2)</i>	<i>Specifications (3)</i>
21	2862	PVC SDR26	ASTM F679
15	3869	PVC SDR 26	ASTM D3034
12	3607	PVC SDR 26	ASTM D3034
8	100	PVC SDR 26	ASTM D3034

**Total Linear Feet: 10,438**

(1) Linear feet - Include stub-outs and double service connections. Do not include private service laterals.



(2) Pipe Material - If PVC, state SDR value.

(3) Specifications - ASTM / ANSI / AWWA specification and class numbers should be included.

9. The sewage collection system will convey the wastewater to the The Gruene WWTP (name) Treatment Plant. The treatment facility is:

- Existing  
 Proposed

10. All components of this sewage collection system will comply with:

- The City of New Braunfels standard specifications.  
 Other. Specifications are attached.

11.  No force main(s) and/or lift station(s) are associated with this sewage collection system.  
 A force main(s) and/or lift station(s) is associated with this sewage collection system and the **Lift Station/Force Main System Application** form (TCEQ-0624) is included with this application.

### ***Alignment***

12.  There are no deviations from uniform grade in this sewage collection system without manholes and with open cut construction.

13.  There are no deviations from straight alignment in this sewage collection system without manholes.

**Attachment B - Justification and Calculations for Deviation in Straight Alignment without Manholes.** A justification for deviations from straight alignment in this sewage collection system without manholes with documentation from pipe manufacturer allowing pipe curvature is attached.

For curved sewer lines, all curved sewer line notes (TCEQ-0596) are included on the construction plans for the wastewater collection system.

### ***Manholes and Cleanouts***

14.  Manholes or clean-outs exist at the end of each sewer line(s). These locations are listed below: (Please attach additional sheet if necessary)

**Table 2 - Manholes and Cleanouts**

<i>Line</i>	<i>Shown on Sheet</i>	<i>Station</i>	<i>Manhole or Clean-out?</i>
SEE EXHIBIT A FOR FULL LIST	Of		
	Of		
	Of		
	Of		
	Of		

<i>Line</i>	<i>Shown on Sheet</i>	<i>Station</i>	<i>Manhole or Clean-out?</i>
	Of		
	Of		
	Of		
	Of		
	Of		

15.  Manholes are installed at all Points of Curvature and Points of Termination of a sewer line.
16.  The maximum spacing between manholes on this project for each pipe diameter is no greater than:

<b>Pipe Diameter (inches)</b>	<b>Max. Manhole Spacing (feet)</b>
6 - 15	500
16 - 30	800
36 - 48	1000
≥54	2000

- Attachment C – Justification for Variance from Maximum Manhole Spacing.** The maximum spacing between manholes on this project (for each pipe diameter used) is greater than listed in the table above. A justification for any variance from the maximum spacing is attached, and must include a letter from the entity which will operate and maintain the system stating that it has the capability to maintain lines with manhole spacing greater than the allowed spacing.
17.  All manholes will be monolithic, cast-in-place concrete.
- The use of pre-cast manholes is requested for this project. The manufacturer's specifications and construction drawings, showing the method of sealing the joints, are attached.

## **Site Plan Requirements**

**Items 18 - 25 must be included on the Site Plan.**

18.  The Site Plan must have a minimum scale of 1" = 400'.  
Site Plan Scale: 1" = 200'.
19.  The Site Plan must include the sewage collection system general layout, including manholes with station numbers, and sewer pipe stub outs (if any). Site plan must be overlain by topographic contour lines, using a contour interval of not greater than ten feet and showing the area within both the five-year floodplain and the 100-year floodplain of any drainage way.
20. Lateral stub-outs:

- The location of all lateral stub-outs are shown and labeled.
- No lateral stub-outs will be installed during the construction of this sewer collection system.

21. Location of existing and proposed water lines:

- The entire water distribution system for this project is shown and labeled.
- If not shown on the Site Plan, a Utility Plan is provided showing the entire water and sewer systems.
- There will be no water lines associated with this project.

22. 100-year floodplain:

- After construction is complete, no part of this project will be in or cross a 100-year floodplain, either naturally occurring or manmade. (Do not include streets or concrete-lined channels constructed above of sewer lines.)
- After construction is complete, all sections located within the 100-year floodplain will have water-tight manholes. These locations are listed in the table below and are shown and labeled on the Site Plan. (Do not include streets or concrete-lined channels constructed above sewer lines.)

**Table 3 - 100-Year Floodplain**

<i>Line</i>	<i>Sheet</i>	<i>Station</i>
SEE EXHIBIT B FOR FULL LIST	of	to
	of	to
	of	to
	of	to

23. 5-year floodplain:

- After construction is complete, no part of this project will be in or cross a 5-year floodplain, either naturally occurring or man-made. (Do not include streets or concrete-lined channels constructed above sewer lines.)
- After construction is complete, all sections located within the 5-year floodplain will be encased in concrete or capped with concrete. These locations are listed in the table below and are shown and labeled on the Site Plan. (Do not include streets or concrete-lined channels constructed above sewer lines.)

**Table 4 - 5-Year Floodplain**

<i>Line</i>	<i>Sheet</i>	<i>Station</i>
SEE EXHIBIT C FOR FULL LIST	of	to
	of	to
	of	to
	of	to

- 24.  Legal boundaries of the site are shown.

25.  The **final plans and technical specifications** are submitted for the TCEQ's review. Each sheet of the construction plans and specifications are dated, signed, and sealed by the Texas Licensed Professional Engineer responsible for the design on each sheet.

**Items 26 - 33 must be included on the Plan and Profile sheets.**

26.  All existing or proposed water line crossings and any parallel water lines within 9 feet of sewer lines are listed in the table below. These lines must have the type of pressure rated pipe to be installed shown on the plan and profile sheets. Any request for a variance from the required pressure rated piping at crossings must include a variance approval from 30 TAC Chapter 290.

There will be no water line crossings.

There will be no water lines within 9 feet of proposed sewer lines.

**Table 5 - Water Line Crossings**

<i>Line</i>	<i>Station or Closest Point</i>	<i>Crossing or Parallel</i>	<i>Horizontal Separation Distance</i>	<i>Vertical Separation Distance</i>

27. Vented Manholes:

**No part** of this sewer line is within the 100-year floodplain and vented manholes are not required by 30 TAC Chapter 217.

**A portion** of this sewer line is within the 100-year floodplain and vented manholes will be provided at less than 1500 foot intervals. These water-tight manholes are listed in the table below and labeled on the appropriate profile sheets.

**A portion** of this sewer line is within the 100-year floodplain and an alternative means of venting shall be provided at less than 1500 feet intervals. A description of the alternative means is described on the following page.

**A portion** of this sewer line is within the 100-year floodplain; however, there is no interval longer than 1500 feet located within. No vented manholes will be used.

**Table 6 - Vented Manholes**

<i>Line</i>	<i>Manhole</i>	<i>Station</i>	<i>Sheet</i>
SEE EXHIBIT D FOR FULL LIST			

<i>Line</i>	<i>Manhole</i>	<i>Station</i>	<i>Sheet</i>

28. Drop manholes:

- There are no drop manholes associated with this project.
- Sewer lines which enter new or existing manholes or "manhole structures" higher than 24 inches above the manhole invert are listed in the table below and labeled on the appropriate profile sheets. These lines meet the requirements of 30 TAC §217.55(l)(2)(H).

**Table 7 - Drop Manholes**

<i>Line</i>	<i>Manhole</i>	<i>Station</i>	<i>Sheet</i>
WWL "A"	WWMH 17	68+01.69	27 OF 43
WWL "B"	WWMH 11A	10+33.53	37 OF 43
WWL "B"	WWMH 11B	11+72.02	37 OF 43
WWL "B"	WWMH 11C	15+92.02	38 OF 43
WWL "B"	WWMH 11D	16+60.00	38 OF 43

29. Sewer line stub-outs (For proposed extensions):

- The placement and markings of all sewer line stub-outs are shown and labeled.
- No sewer line stub-outs are to be installed during the construction of this sewage collection system.

30. Lateral stub-outs (For proposed private service connections):

- The placement and markings of all lateral stub-outs are shown and labeled.
- No lateral stub-outs are to be installed during the construction of this sewage collection system.

31. Minimum flow velocity (From Appendix A)

- Assuming pipes are flowing full; all slopes are designed to produce flows equal to or greater than 2.0 feet per second for this system/line.

32. Maximum flow velocity/slopes (From Appendix A)

- Assuming pipes are flowing full, all slopes are designed to produce maximum flows of less than or equal to 10 feet per second for this system/line.
- Attachment D – Calculations for Slopes for Flows Greater Than 10.0 Feet per Second.** Assuming pipes are flowing full, some slopes produce flows which are greater than 10 feet per second. These locations are listed in the table below. Calculations are attached.

**Table 8 - Flows Greater Than 10 Feet per Second**

<i>Line</i>	<i>Profile Sheet</i>	<i>Station to Station</i>	<i>FPS</i>	<i>% Slope</i>	<i>Erosion/Shock Protection</i>

33. Assuming pipes are flowing full, where flows are  $\geq 10$  feet per second, the provisions noted below have been made to protect against pipe displacement by erosion and/or shock under 30 TAC §217.53(l)(2)(B).

- Concrete encasement shown on appropriate Plan and Profile sheets for the locations listed in the table above.
- Steel-reinforced, anchored concrete baffles/retards placed every 50 feet shown on appropriate Plan and Profile sheets for the locations listed in the table above.
- N/A

**Administrative Information**

- 34.  The final plans and technical specifications are submitted for TCEQ review. Each sheet of the construction plans and specifications are dated, signed, and sealed by the Texas Licensed Professional Engineer responsible for the design on each sheet.
- 35.  Standard details are shown on the detail sheets, which are dated, signed, and sealed by the Texas Licensed Professional Engineer, as listed in the table below:

**Table 9 - Standard Details**

<b>Standard Details</b>	<b>Shown on Sheet</b>
Lateral stub-out marking <b>[Required]</b>	of
Manhole, showing inverts comply with 30 TAC §217.55(l)(2) <b>[Required]</b>	39 of 43
Alternate method of joining lateral to existing SCS line for potential future connections <b>[Required]</b>	of
Typical trench cross-sections <b>[Required]</b>	40 of 43
Bolted manholes <b>[Required]</b>	39 of 43
Sewer Service lateral standard details <b>[Required]</b>	of
Clean-out at end of line <b>[Required, if used]</b>	of
Baffles or concrete encasement for shock/erosion protection <b>[Required, if flow velocity of any section of pipe &gt;10 fps]</b>	of
Detail showing Wastewater Line/Water Line Crossing <b>[Required, if crossings are proposed]</b>	40 of 43
Mandrel detail or specifications showing compliance with 30 TAC §217.57(b) and (c) <b>[Required, if Flexible Pipe is used]</b>	39 of 43

<b>Standard Details</b>	<b>Shown on Sheet</b>
Drop manholes [Required, if a pipe entering a manhole is more than 24 inches above manhole invert]	39 of 43

36.  All organized sewage collection system general construction notes (TCEQ-0596) are included on the construction plans for this sewage collection system.
37.  All proposed sewer lines will be sufficiently surveyed/staked to allow an assessment prior to TCEQ executive director approval. If the alignments of the proposed sewer lines are not walkable on that date, the application will be deemed incomplete and returned.
- Survey staking was completed on this date: \_\_\_\_\_
38.  Submit one (1) original and one (1) copy of the application, plus additional copies as needed for each affected incorporated city, groundwater conservation district, and county in which the project will be located. The TCEQ will distribute the additional copies to these jurisdictions. The copies must be submitted to the appropriate regional office.
39.  Any modification of this SCS application will require TCEQ approval, prior to construction, and may require submission of a revised application, with appropriate fees.

### **Signature**

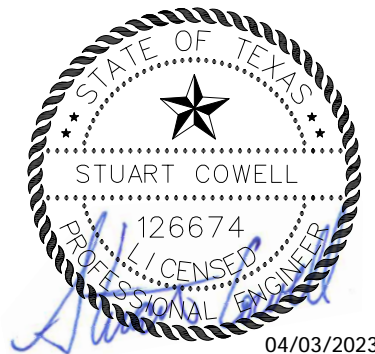
To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **Organized Sewage Collection System Application** is hereby submitted for TCEQ review and executive director approval. The system was designed in accordance with the requirements of 30 TAC §213.5(c) and 30 TAC §217 and prepared by:

Print Name of Licensed Professional Engineer: Stuart Cowell

Date: 03/10/2023

Place engineer's seal here:

Signature of Licensed Professional Engineer:



\_\_\_\_\_

## Appendix A-Flow Velocity Table

**Flow Velocity (Flowing Full)** All gravity sewer lines on the Edwards Aquifer Recharge Zone shall be designed and constructed with hydraulic slopes sufficient to give a velocity when flowing full of not less than 2.0 feet per second, and not greater than 10 feet per second. The grades shown in the following table are based on Manning's formula and an n factor of 0.013 and shall be the minimum and maximum acceptable slopes unless provisions are made otherwise.

**Table 10 - Slope Velocity**

Pipe Diameter(Inches)	% Slope required for minimum flow velocity of 2.0 fps	% Slope which produces flow velocity of 10.0 fps
6	0.50	12.35
8	0.33	8.40
10	0.25	6.23
12	0.20	4.88
15	0.15	3.62
18	0.11	2.83
21	0.09	2.30
24	0.08	1.93
27	0.06	1.65
30	0.055	1.43
33	0.05	1.26
36	0.045	1.12
39	0.04	1.01
>39	*	*

\*For lines larger than 39 inches in diameter, the slope may be determined by Manning's formula (as shown below) to maintain a minimum velocity greater than 2.0 feet per second when flowing full and a maximum velocity less than 10 feet per second when flowing full.

$$v = \frac{1.49}{n} \times R_h^{0.67} \times \sqrt{S}$$

**Figure 1 - Manning's Formula**

Where:

v = velocity (ft/sec)  
n = Manning's roughness coefficient (0.013)  
Rh = hydraulic radius (ft)  
S = slope (ft/ft)



# Attachment A

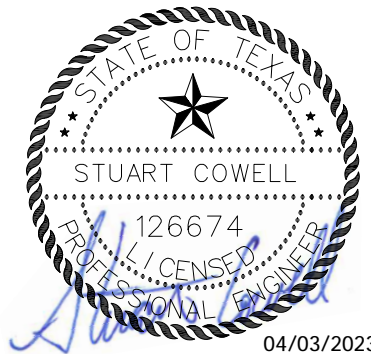
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**ORGANIZED SEWAGE COLLECTION SYSTEM (SCS) ENGINEERING DESIGN REPORT  
FOR VERAMENDI WASTEWATER  
EXTENSION LINE**

**PREPARED FOR**

**ASA PROPERTIES LLC  
387 W. MILL STREET, SUITE 108  
NEW BRAUNFELS, TEXAS 78130**



**PREPARED BY**

**LJA ENGINEERING, INC.  
2700 LA FRONTERA, SUITE 150  
ROUND ROCK, TEXAS 78681  
(512) 439-4700  
FIRM NO. F-1386**

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# Veramendi Extension Wastewater Improvements

## SCS Engineering Design Report

### A. SITE DESCRIPTION

1. Project Name:  
Veramendi Wastewater Line N1 to N6, AND N17
2. Location:  
The project consists of 2 connected wastewater lines to the northwest intersection of River Rd and Loop 337 in the city of New Braunfels ETJ. Wastewater line N1 to N6 ties into the previous Veramendi S6 manhole and will follow Blieders Creek north-west while paralleling the existing 18" wwl for approximately 9,506 LF. There will be one connecting wastewater line N17 ending at manhole west of River Rd.
3. Treatment Facility:  
The Gruene Wastewater Treatment Plant will receive and treat flows from this project.
4. Project Summary:  
The project consists of the installation of approximately 2,862 linear feet of 21" gravity wastewater pipe, 3,869 linear feet of 15" gravity wastewater pipe, 3,607 linear feet of 12" gravity wastewater pipe, and 100 linear feet of 8" gravity wastewater pipe as part of the utility extension for the Veramendi Wastewater line project.

### B. CAPACITY DESIGN

1. Basis for Average Flow:  
The average flow used for design of the collection system is based on the projected flows in this area provided by the utility agreement.
2. Peak Flow Factor:  
The following equation is used to calculate the peak flow factor. A peak flow factor of at least 4 must be used.

$$\text{Average Daily Flow, } F = 200 \text{ (gal/LUE/day)} * (\# \text{ LUE}) * (3.5 \text{ persons/LUE})$$
$$\text{Peak Flow Factor, PFF} = \frac{18 + (0.0206 * F)^{0.5}}{4 + (0.0206 * F)^{0.5}}$$

3. Flow Analysis:

$$\text{Line Capacity } (Q_{\text{full}}) = (1.49/n) * A * R^{2/3} * S^{1/2}$$
$$n = 0.013$$

Specified Pipe Size	12 inch	15 inch	21 inch
Minimum design slope (%)	0.42	0.33	0.10
$Q_{\text{PWWF}}$ (gpm)	715.16	1145.60	1981.87
$Q_{\text{full}}$ (gpm)	974.09	1565.51	2113.85

Therefore, the line is of sufficient size to carry the peak flows.

WASTEWATER LINE 'A'				
PEAK WET WEATHER FLOW (PWWF)	PIPE SIZE	MANNING'S COEFFICIENT	TCEQ SLOPE CRITERIA	
GPM	IN	n	MINIMUM	MAXIMUM
			%	%
1,892.75	21	0.013	0.095	2.30
CALCULATED VELOCITY (FPS) AT CRITERIA SLOPE <sup>1</sup>			2.31	11.36
CALCULATED CAPACITY @ 85% FULL AT CRITERIA SLOPE			2,119.63	10,429.44
LINE CAPACITY(Q <sub>full</sub> ) @ MINIMUM DESIGN SLOPE (GPM)			2,174.30	
MAXIMUM CALCULATED SLOPE (%)				1.78
VELOCITY @ MAXIMUM CALCULATED SLOPE (FPS)				10.00
WASTEWATER LINE 'A' SUMMARY				
PIPE SIZE	PWWF	Minimum Design Slope	Maximum Slope	
IN	GPM	%	%	
21	1,892.75	0.1	1.78	
<sup>1</sup> THE CALCULATED VELOCITY FOR THE PWWF AT THE MAXIMUM TCEQ SLOPE EXCEEDS THE MAXIMUM ALLOWABLE VELOCITY OF 10 FEET PER SECOND (FPS). MAXIMUM SLOPE CALCULATED TO BE 1.78%.				

WASTEWATER LINE 'A'				
PEAK WET WEATHER FLOW (PWWF)	PIPE SIZE	MANNING'S COEFFICIENT	TCEQ SLOPE CRITERIA	
GPM	IN	n	MINIMUM	MAXIMUM
			%	%
1064.19	15	0.013	0.15	3.62
CALCULATED VELOCITY (FPS) AT CRITERIA SLOPE <sup>1</sup>			2.25	11.04
CALCULATED CAPACITY @ 85% FULL AT CRITERIA SLOPE			1,052.59	5,170.92
LINE CAPACITY(Q <sub>full</sub> ) @ DESIGN SLOPE (GPM)			1,565.51	
MAXIMUM CALCULATED SLOPE (%)				2.97
VELOCITY @ MAXIMUM CALCULATED SLOPE (FPS)				10.00

<b>WASTEWATER LINE 'A' SUMMARY</b>			
<b>PIPE SIZE</b>	<b>PWWF</b>	<b>Minimum Design Slope</b>	<b>Maximum Slope</b>
<b>IN</b>	<b>GPM</b>	<b>%</b>	<b>%</b>
15	1,064.19	0.15	2.97
<sup>1</sup> THE CALCULATED VELOCITY FOR THE PWWF AT THE MAXIMUM TCEQ ALLOWABLE SLOPE EXCEEDS THE MAXIMUM ALLOWABLE VELOCITY OF 10 FEET PER SECOND (FPS). THE MAXIMUM SLOPE CALCULATED TO BE 2.97%.			

<b>WASTEWATER LINE 'A'</b>				
<b>PEAK WET WEATHER FLOW (PWWF)</b>	<b>PIPE SIZE</b>	<b>MANNING'S COEFFICIENT</b>	<b>TCEQ SLOPE CRITERIA</b>	
<b>GPM</b>	<b>IN</b>	<b>n</b>	<b>MINIMUM</b>	<b>MAXIMUM</b>
			<b>%</b>	<b>%</b>
727.92	12	0.013	0.20	4.88
<b>CALCULATED VELOCITY (FPS) AT CRITERIA SLOPE<sup>1</sup></b>			2.24	11.05
<b>CALCULATED CAPACITY @ 85% FULL AT CRITERIA SLOPE</b>			670.35	3,311.28
<b>LINE CAPACITY(Q<sub>full</sub>) @ DESIGN SLOPE (GPM)</b>			1,041.34	
<b>MAXIMUM CALCULATED SLOPE (%)</b>				4.00
<b>VELOCITY @ MAXIMUM CALCULATED SLOPE (FPS)</b>				10.00

<b>WASTEWATER LINE 'A' SUMMARY</b>			
<b>PIPE SIZE</b>	<b>PWWF</b>	<b>Minimum Slope</b>	<b>Maximum Slope</b>
<b>IN</b>	<b>GPM</b>	<b>%</b>	<b>%</b>
12	727.92	0.20	4.0
<sup>1</sup> THE CALCULATED VELOCITY FOR THE PWWF AT THE MAXIMUM TCEQ ALLOWABLE SLOPE EXCEEDS THE MAXIMUM ALLOWABLE VELOCITY OF 10 FEET PER SECOND (FPS). THE MAXIMUM SLOPE CALCULATED TO BE 4.00%.			

WASTEWATER LINE 'B'				
PEAK WET WEATHER FLOW (PWWF)	PIPE SIZE	MANNING'S COEFFICIENT	TCEQ SLOPE CRITERIA	
GPM	IN	n	MINIMUM	MAXIMUM
			%	%
590.79	12	0.013	0.20	4.88
CALCULATED VELOCITY (FPS) AT CRITERIA SLOPE <sup>1</sup>			2.24	11.05
CALCULATED CAPACITY @ 85% FULL AT CRITERIA SLOPE			670.35	3,311.28
LINE CAPACITY(Q <sub>full</sub> ) @ DESIGN SLOPE (GPM)			1,041.34	
MAXIMUM CALCULATED SLOPE (%)				4.00
VELOCITY @ MAXIMUM CALCULATED SLOPE (FPS)				10.00
WASTEWATER LINE 'B' SUMMARY				
PIPE SIZE	PWWF	Minimum Design Slope	Maximum Slope	
IN	GPM	%	%	
12	590.79	3.19	4	
<sup>1</sup> THE CALCULATED VELOCITY FOR THE PWWF AT THE MAXIMUM TCEQ ALLOWABLE SLOPE EXCEEDS THE MAXIMUM ALLOWABLE VELOCITY OF 10 FEET PER SECOND (FPS). THE MAXIMUM SLOPE CALCULATED TO BE 4.00%.				

4. Minimum/Maximum Slopes:

All pipes must be designed with a slope that will provide a minimum velocity of at least 2 ft/s and a maximum velocity of at least 10 ft/s when flowing full.

Pipe Size (inch)	Minimum Design Slope (%)	Minimum Velocity (FPS)	Maximum Design Slope (%)	Maximum Velocity (FPS)
21	0.10	2.31	0.17	3.009
15	0.33	3.33	0.43	3.81
12	0.48	3.47	3.19	8.93

C. STRUCTURAL COMPONENTS

1. Type of Pipe:

SDR-26 ASTM F679 Polyvinyl Chloride (PVC)

Product Standard: ASTM F679  
 Pipe Compound: ASTM D1784 Cell Class 12454 or 12364  
 Gasket: ASTM F477  
 Integral Bell Joint: ASTM D3212  
 Pipe Stiffness: ASTM D2412,



F/ΔY = 115 psi

Installation: ASTM D2321  
 Tensile Strength: 7,000 psi  
 Modulus of Elasticity: 400,000 psi

SDR-26 ASTM D3034 Polyvinyl Chloride (PVC)

Product Standard: ASTM 3034  
 Pipe Compound: ASTM D1784 Cell Class 12454 or 12364  
 Gasket: ASTM F477  
 Integral Bell Joint: ASTM D3212  
 Pipe Stiffness: ASTM D2412,  
 F/ΔY = 115 psi  
 Installation: ASTM D2321  
 Tensile Strength: 7,000 psi  
 Modulus of Elasticity: 400,000 psi

	12-inch	15-inch	21-inch
Nominal Inside Diameter:	11.538 inches	14.125 inches	20.465 inches
Average Outside Diameter:	12.500 inches	15.300 inches	22.047 inches
Wall Thickness:	0.481 inches	0.588 inches	0.791 inches
Approximate Weight:	12.7 lbs/ft	19.2 lbs/ft	29.3 lbs/ft

2. Pipe Bedding Class:

The pipe bedding class must comply with ASTM D2321 Class IA, IB, II, or III for materials and densification. No sand bedding will be allowed. A class III material is assumed to be used, since it has the most conservative value for the Modulus of Soil Reaction,  $E_b$ .

From Table 7.3, Pg. 209 of the UNI-BELL Handbook of PVC PIPE, 5th Edition Coarse-grained Soils with Fines (Bedding Class III) and 85% to 95% Compaction  
 $E_b = 1000$  psi

3. Manholes:

Manholes are provided at all changes in size, grade and alignment of pipe. Manholes are also provided at the end of all lines. All manholes have a maximum spacing of 500 feet. All manholes will be coated per the City of New Braunfels standard specifications and detail.

4. Buckling Analysis:

a) Allowable buckling pressure

$$R_w = 1 - 0.33 * (h_w / h)$$

$$B' = \frac{1}{1 + 4 * e^{-0.065(h/D)}}$$

$$I = (t^3 / 12) \text{ (inches}^4\text{/L inch)}$$

$$q_a = 0.4 \sqrt{32 * R_w * B' * E_b * (E * \frac{I}{D^3})}$$

- $q_a$  = allowable buckling pressure, pounds per square inch (psi)
- $h$  = height of soil surface above top of pipe in inches (in)
- $h_w$  = height of water surface above top of pipe in inches (in) (groundwater elevation)
- $R_w$  = Water buoyancy factor. If  $h_w = 0$ ,  $R_w = 1$ .  
If  $0 \leq h_w \leq h$  (groundwater elevation is between the top of the pipe and the ground surface), calculate  $R_w$  with Equation 2
- $H$  = Depth of burial in feet (ft) from ground surface to crown of pipe.
- $B'$  = Empirical coefficient of elastic support
- $E_b$  = modulus of soil reaction for the bedding material (psi) = 1,000
- $E$  = modulus of elasticity of the pipe material (psi)
- $I$  = moment of inertia of the pipe wall cross section per linear inch of pipe,  $\text{inch}^4/\text{lineal inch} = \text{inch}^3$ . If the pipe used is not solid wall pipe (for example a pipe with a ribbed cross section), the proper moment of inertia formula must be obtained from the manufacturer.
- $t$  = pipe structural wall thickness (in)
- $D$  = mean pipe diameter (in)

	12-inch	15-inch	21-inch
$H = \text{Deepest bury depth (ft)}$	16.99	17.35	15.45
$h_w = 0$ (no ground water)	0	0	0
$I = t^3/12$ ( $\text{in}^4/\text{in}$ )	0.00927	0.01694	0.04124
$R_w = 1+0.33(h_w/h)$	1	1	1
$B' = 1/(1+4e^{-0.065H})$	0.433	0.439	0.409
$q_a = 0.4*[32 * R_w * B' * E_b * (E * I / D^3)]^{0.5}$	69.01 psi	67.19 psi	61.05 psi

b) Calculate pressure applied to pipe under installed conditions:

$$W_c = \gamma_s * H * (D+t) / 144$$

$$q_p = \gamma_w * h_w + R_w * (W_c / D) + L_l$$

- $q_p$  = pressure applied to pipe under installed conditions (psi)
- $\gamma_w$  = 0.0361 pounds per cubic inch (pci), specific weight of water
- $\gamma_s$  = unit weight of soil in pounds per cubic foot (pcf) = 135
- $W_c$  = vertical soil load on the pipe per unit length in pounds per linear inch (lb/in)
- $L_l$  = Live load = 0 (All bury depths are greater than 3 feet)

#### SDR-26 ASTM D3034/F679 PVC

$$W_c = \gamma_s * H * (D+t) / 144$$

$$q_p = \gamma_w * h_w + R_w * (W_c / D) + L_l$$

ASTM	D3034	D3034	D3034	F679
Dia.	10	12	15	21
$W_c$ (psi)	179.27	198.80	253.55	315.63
$q_p$ (psi)	17.93	16.57	16.90	15.03

**SDR-26 ASTM D3034/F679 PVC**

**12-inch**

$$q_p < q_a$$

$$16.57 < 69.01,$$

**15-inch**

$$q_p < q_a$$

$$16.90 < 67.19,$$

**21-inch**

$$q_p < q_a$$

$$15.03 < 61.05,$$

The buckling pressure under installed conditions is less than the allowable buckling pressure of the specified pipe.

5. Wall Crushing:

There is no encased flexible pipe used, therefore the minimum wall crushing depth does not need to be calculated.

6. Deflection Analysis: Zeta Factor

Leonhard's Zeta Factor can be calculated using Equation 7.31 of the UNI-BELL Handbook of PVC PIPE, 5th Edition.

$$\text{Zeta} = \frac{1.44}{f + (1.44 - f) * \left(\frac{E_b}{E'_n}\right)}$$

$$f = \frac{\frac{b}{d_a} - 1}{1.154 + 0.444 * \left(\frac{b}{d_a} - 1\right)}$$

$f$  = pipe/trench width coefficient

$b$  = trench width = 4.0 ft (48 in)

$d_a$  = pipe diameter (in)

$E_b$  = modulus of soil reaction for the bedding material (psi) = 1,000

$E'_n$  = modulus of soil reaction for the insitu soil (psi) = 1,000

	12-inch	15-inch	21-inch
$f =$	1.207	1.032	.745
Zeta =	1	1	1

7. Pipe Stiffness:

Using equation 7.1, from the Uni-Bell Handbook of PVC Pipe, 5th Edition.

$$P_s = \frac{EI}{0.149 * r^3}$$

$P_s$  = Pipe Stiffness (psi)

$E$  = modulus of elasticity of the pipe material (psi)

$I$  = moment of inertia of the pipe wall cross section per linear inch of pipe,  $\text{inch}^4/\text{linear inch} = \text{inch}^3$ .

If the pipe used is not solid wall pipe (for example a pipe with a ribbed cross section), the proper

moment of inertia formula must be obtained from the manufacturer.

$r$  = mean radius (in)

	12-inch	15-inch	21-inch
$P_s$	115.26	107.81	95.64

8. Pipe Stiffness to Soil Stiffness Factor Ratio ( $P_s / SSF$ ):  
The Pipe Stiffness to Soil Stiffness Factor must be greater than 0.15

$P_s$  = Pipe Stiffness (psi)  
 $E_b$  = modulus of soil reaction for the bedding material = 1,000 psi  
 zeta = 1.0  
 SSF = soil stiffness factor ( $0.061 * \text{zeta} * E_b$ ) = 61  
 $P_s / SSF$  = 1.93 (10-inch)  
           1.89 (12-inch)  
           1.77 (15-inch)  
           1.959 (21-inch)

9. Predicted Pipe Deflection:  
Using equation 7.9, from the Uni-Bell Handbook of PVC Pipe, 5th Edition.

$$\frac{\Delta Y}{D} = \frac{D_L K P (100)}{0.149 P_s + 0.061 E_b}$$

$P$  =  $\gamma_s * H / 144$   
 $\Delta Y/D$  = Predicted % vertical deflection under load  
 $P$  = Prism Load (psi)  
 $K$  = Bedding angle constant. Assumed to be 0.1  
 $E_b$  = Modulus of soil reaction = 1000 psi  
 $D_L$  = Deflection lag factor = 1.5  
 $\gamma_s$  = Unit weight of soil = 135 pcf  
 $H$  = Depth of burial (ft) from ground surface to crown of pipe

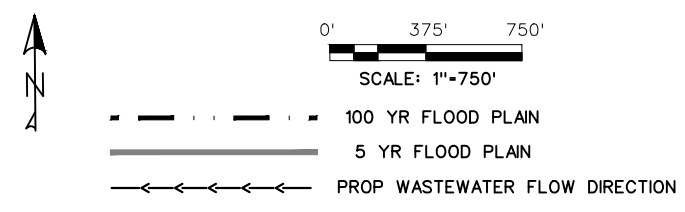
	12-inch	15-inch	21-inch
<b>P =</b>	15.93	16.27	14.48

**SDR-26 ASTM D3034/F679 PVC**

	12-inch	15-inch	21-inch
<b><math>\Delta Y/D, (\%) =</math></b>	3.06%	3.17%	2.89%

**APPENDIX A - PROJECT LOCATION MAP**

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DEAN WORD CALLED 694 ACRES VOLUME 78, PAGE 503 D.R.C.C.TX.

NEW BRAUNFELS UTILITIES DOCUMENT NO. 202106010080 O.P.R.C.C.TX.

LOT 1, BLOCK 77 VERAMENDI PRECINCT 22A UNIT 1 CALLED 5.671 ACRES DOCUMENT NO. 202106006261 O.P.R.C.C.TX.

DEAN WORD AND WIFE EUNICE WORD CALLED 2086 ACRES VOLUME 74, PAGE 510 D.R.C.C.TX.

VERAMENDI PE - DARWIN, LLC CALLED 129.369 ACRES DOCUMENT NO. 202006025702 O.P.R.C.C.TX.

VERAMENDI PE - DARWIN, LLC CALLED 57.95 ACRES DOCUMENT NO. 201706024109 O.P.R.C.C.TX.

- NOTES:
1. ALL HORIZONTAL DATA IS HELD TO TEXAS STATE PLANE COORDINATE SYSTEM OF 1983(2011)(EPOCH 2010), CENTRAL ZONE (4203). U.S. SURVEY FOOT.
  2. ALL VERTICAL DATA IS HELD TO NAVD88 GEOID 18.
  3. ALL DISTANCES ARE SURFACE DISTANCES. GRID VALUES CAN BE OBTAINED BY DIVIDING BY A SCALE FACTOR OF 0.999870017. ALL DISTANCE UNITS ARE U.S. SURVEY FEET.
  4. UNDERGROUND UTILITIES SHOWN HEREIN ARE BASED ON VISIBLE SURFACE APPURTENANCES, VISIBLE 811 UTILITY LOCATE MARKS, AND PUBLIC GIS MAPS. ADDITIONAL UTILITIES MAY EXIST.

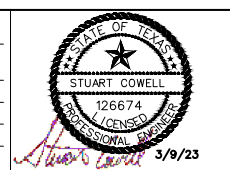
CONTROL POINT	NORTHING	EASTING	SURFACE NORTHING	SURFACE EASTING	ELEVATION	DESCRIPTION
1	13819158.61	2241620.57	13820955.10	2241911.98	748.44	5/8-INCH IR W/ CAP STAMPED "LJA CONTROL"
4	13818265.58	2239587.09	13820061.95	2239878.23	706.45	5/8-INCH IR W/ CAP STAMPED "LJA CONTROL"
5	13818254.17	2240503.11	13820050.54	2240794.37	697.81	5/8-INCH IR W/ CAP STAMPED "LJA CONTROL"

02/28/2023 2/28/2023 I:\A441\2201\CADD\WORKING\PROJ\_LAYOUT.dwg scowell

REVISIONS		DATE
NO.	DESCRIPTION	DATE

DATE: 3/9/23

DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC



## VERAMENDI WASTEWATER LINE

**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD.  
 SUITE 150  
 ROUND ROCK, TEXAS 78735

Phone 512.767.7300  
 Fax 512.439.4716  
 FRN-F-1386

PROJECT LAYOUT

JOB NUMBER: A441-2201  
 SCALE: N/A  
 HORIZONTAL: 1"=750'  
 VERTICAL: N/A  
 SHEET NO. 5  
 OF 43 SHEETS

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## APPENDIX B - WASTEWATER FLOW CALCULATIONS

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**VERAMENDI WASTEWATER EXTENSION**

**WASTEWATER CALCULATIONS**

Service Area = 3.53 ac

**AVERAGE DRY WEATHER FLOW**

$F = 200 \text{ (gal/LUE/day)} * (\# \text{ LUE}) (*3.5 \text{ persons/LUE})$

**PEAK FLOW FACTOR (<=4)**

$PFF = \frac{[(18 + (0.0206 \times F)0.5)]}{(4 + (0.0206 \times F)0.5)}$

**INFLOW/INFILTRATION**

$(I/I) = 750 \text{ gal/day/acre} = 1.84 \text{ gpm}$

**PEAK DRY WEATHER FLOW**

$Q_{pdwf} = PFF \times F$

**PEAK WET WEATHER FLOW**

$Q_{pwwf} = Q_{pdwf} + I/I$

LINE	STA START	STA END	Size (in)	SLOPE	PWWF (85%)			PDWF (65%)		
					Q (gpm)	Q (MGD)	V (fps)	Q (gpm)	Q (MGD)	V (fps)
A	10+00.00	12+52.94	21	0.17%	3,022	4.35	2.80	2218.19	3.19	2.05
A	12+52.94	17+34.01	21	0.17%	3,022	4.35	2.80	2218.19	3.19	2.05
A	17+34.01	22+07.68	21	0.17%	3,022	4.35	2.80	2218.19	3.19	2.05
A	22+07.68	27+06.29	21	0.17%	3,022	4.35	2.80	2218.19	3.19	2.05
A	27+06.29	30+60.01	21	0.17%	3,022	4.35	2.80	2218.19	3.19	2.05
A	30+60.01	35+57.87	21	0.10%	2,317	3.34	2.15	1701.27	2.45	1.58
A	35+57.87	38+61.82	21	0.10%	2,317	3.34	2.15	1701.27	2.45	1.58
A	38+61.82	43+48.55	15	0.43%	1,959	2.82	3.56	1438.25	2.07	2.61
A	43+48.55	47+17.24	15	0.43%	1,959	2.82	3.56	1438.25	2.07	2.61
A	47+17.24	51+33.49	15	0.43%	1,959	2.82	3.56	1438.25	2.07	2.61
A	51+33.49	52+45.52	15	0.43%	1,959	2.82	3.56	1438.25	2.07	2.61
A	52+45.52	54+54.76	15	0.43%	1,959	2.82	3.56	1438.25	2.07	2.61
A	54+54.76	54+92.73	15	0.43%	1,959	2.82	3.56	1438.25	2.07	2.61
A	54+92.73	59+92.33	15	0.43%	1,959	2.82	3.56	1438.25	2.07	2.61
A	59+92.33	64+89.42	15	0.43%	1,959	2.82	3.56	1438.25	2.07	2.61
A	64+89.42	68+01.69	15	0.33%	1,716	2.47	3.12	1259.96	1.81	2.29
A	68+01.69	71+38.47	15	0.33%	1,716	2.47	3.12	1259.96	1.81	2.29
A	71+38.47	74+67.41	15	0.33%	1,716	2.47	3.12	1259.96	1.81	2.29
A	74+67.41	77+31.47	15	0.33%	947	1.36	2.69	694.91	1.00	1.97
A	77+31.47	82+31.46	12	0.42%	1,068	1.54	3.03	783.97	1.13	2.22
A	82+31.46	86+73.01	12	0.86%	1,528	2.20	4.34	1121.82	1.62	3.18
A	86+73.01	90+80.18	12	0.86%	1,528	2.20	4.34	1121.82	1.62	3.18
A	90+80.18	94+34.46	12	0.48%	1,142	1.64	3.24	838.09	1.21	2.38
A	94+34.46	97+30.92	12	0.48%	1,142	1.64	3.24	838.09	1.21	2.38
A	97+30.92	100+57.42	12	0.48%	1,142	1.64	3.24	838.09	1.21	2.38
A	100+57.42	104+81.10	12	0.48%	1,142	1.64	3.24	838.09	1.21	2.38

LINE	STA START	STA END	Size (in)	SLOPE	PWWF (85%)			PDWF (65%)		
					Q (gpm)	Q (MGD)	V (fps)	Q (gpm)	Q (MGD)	V (fps)
B	10+00.00	10+33.53	12	3.19%	2,943	4.24	8.35	2160.57	3.11	6.13
B	10+33.53	11+72.02	12	3.19%	2,943	4.24	8.35	2160.57	3.11	6.13
B	11+72.02	15+92.02	12	3.19%	2,943	4.24	8.35	2160.57	3.11	6.13
B	15+92.02	16+60.00	12	3.19%	2,943	4.24	8.35	2160.57	3.11	6.13
B	16+60.00	17+72.02	12	3.19%	2,943	4.24	8.35	2160.57	3.11	6.13

No of person per LUE	3.5	people/homes
Total LUE	1,365	LUE
Flow per LUE	200	gpd/LUE
Avg Dry Weather Flow (ADWF) for service area	955,500	gpd
Peaking Factor	1.10	

INPUT DATA HERE			
PWWF Rate	PWWF Rate	PWWF Rate	PWWF Rate
Q (mgd)	Q (gpd)	Q (gpm)	Q (cfs)
1.048	1,048,205	727.92	1.62

	85%	65%
	0.85	0.65
Constant	36.72	26.95

**GRAVITY PIPE ESTIMATOR - MANNINGS FORMULA**

**Gravity Flow Estimator - Mannings Equation**

PWWF Rate Q (gpm)	PWWF Rate Q (cfs)	Diameter d (in)	Diameter d (ft.)	Area of Pipe A (ft <sup>2</sup> )	Mannings Coef. (n)	Velocity V (fps)
727.92	1.62	12	1.000	0.7854	0.013	3.4657
Slope S (%)	Slope S (ft/ft)	Pipe Flow Ratio (y/d <sub>0</sub> )	Corresponding R/d <sub>0</sub>	Hydraulic Radius R	A/d <sub>0</sub> <sup>2</sup>	AR <sup>2.49</sup> /d <sub>0</sub> <sup>8.93</sup>
0.48	0.0048	0.94	0.2896	0.2896	0.7662	0.3353

Allowable Flow for Slope Provided Above			Minimum Slope Allowed to Transport Peak Flow		Allowable Flow Q (MGD)
Allowable Flow Q (cfs)	Allowable Flow Q (gpm)	Velocity at Peak Flow (fps)	Allowable Slope (ft/ft)	Allowable Slope (%)	
2.3203	1041.34	2.0651	0.0019279	0.193	1.500

y/d <sub>0</sub>	A/d <sub>0</sub> <sup>2</sup>	R/d <sub>0</sub>	AR <sup>2.49</sup> /d <sub>0</sub> <sup>8.93</sup>
0.01	0.0013	0.0066	0
0.05	0.0147	0.0326	0.0015
0.10	0.0409	0.0635	0.0065
0.15	0.0739	0.0929	0.0152
0.20	0.1118	0.1206	0.0273
0.25	0.1535	0.1466	0.0427
0.30	0.1982	0.1709	0.061
0.35	0.245	0.1935	0.082
0.40	0.2934	0.2142	0.105
0.45	0.3428	0.2331	0.1298
0.50	0.3927	0.2500	0.1558
0.55	0.4426	0.2649	0.1825
0.60	0.492	0.2776	0.2092
0.65	0.5404	0.2881	0.2358
0.70	0.5872	0.2962	0.2608
0.75	0.6318	0.3017	0.284
0.80	0.6736	0.3042	0.3045
0.85	0.7115	0.3033	0.3212
0.90	0.7445	0.2980	0.3324
0.94	0.7662	0.2896	0.3353
0.95	0.7707	0.2864	0.3349
1.00	0.7854	0.2500	0.3117

Peak Wet Weather Flow (gpm)	Capacity				
727.92	85%				
Slope	Pipe Slope (%)	Velocity (fps)	Capacity (gpm)	85% Flow (gpm)	>= Peak Wet Weather Flow (Y/N)
Minimum	0.2	2.24	788.65	670.35	N
Maximum	4.88	11.05	3895.63	3311.28	Y
Min V (fps)	2	0.16	705.07	599.31	
Max V (fps)	10	4.00	3525.34	2996.54	

No of person per LUE	3.5	people/homes
Total LUE	2,027	LUE
Flow per LUE	200	gpd/LUE
Avg Dry Weather Flow (ADWF) for service area	1,418,900	gpd
Peaking Factor	1.08	

INPUT DATA HERE			
PWWF Rate	PWWF Rate	PWWF Rate	PWWF Rate
Q (mgd)	Q (gpd)	Q (gpm)	Q (cfs)
1.532	1,532,434	1064.19	2.37

Constant      85%      65%  
 0.85      0.65  
 66.57      48.87

**GRAVITY PIPE ESTIMATOR - MANNINGS FORMULA**

**Gravity Flow Estimator - Mannings Equation**

PWWF Rate Q (gpm)	PWWF Rate Q (cfs)	Diameter d (in)	Diameter d (ft.)	Area of Pipe A (ft <sup>2</sup> )	Mannings Coef. (n)	Velocity V (fps)
1064.19	2.37	15	1.250	1.2272	0.013	3.3345
Slope S (%)	Slope S (ft/ft)	Pipe Flow Ratio (y/d <sub>0</sub> )	Corresponding R/d <sub>0</sub>	Hydraulic Radius R	A/d <sub>0</sub> <sup>2</sup>	AR <sup>2.49</sup> /d <sub>0</sub> <sup>8.93</sup>
0.33	0.0033	0.94	0.2896	0.362	0.7662	0.3353

Allowable Flow for Slope Provided Above			Minimum Slope Allowed to Transport Peak Flow		Allowable Flow Q (MGD)
Allowable Flow Q (cfs)	Allowable Flow Q (gpm)	Velocity at Peak Flow (fps)	Allowable Slope (ft/ft)	Allowable Slope (%)	
3.4882	1565.51	1.9322	0.0012534	0.125	2.254

y/d <sub>0</sub>	A/d <sub>0</sub> <sup>2</sup>	R/d <sub>0</sub>	AR <sup>2.49</sup> /d <sub>0</sub> <sup>8.93</sup>
0.01	0.0013	0.0066	0
0.05	0.0147	0.0326	0.0015
0.10	0.0409	0.0635	0.0065
0.15	0.0739	0.0929	0.0152
0.20	0.1118	0.1206	0.0273
0.25	0.1535	0.1466	0.0427
0.30	0.1982	0.1709	0.061
0.35	0.245	0.1935	0.082
0.40	0.2934	0.2142	0.105
0.45	0.3428	0.2331	0.1298
0.50	0.3927	0.2500	0.1558
0.55	0.4426	0.2649	0.1825
0.60	0.492	0.2776	0.2092
0.65	0.5404	0.2881	0.2358
0.70	0.5872	0.2962	0.2608
0.75	0.6318	0.3017	0.284
0.80	0.6736	0.3042	0.3045
0.85	0.7115	0.3033	0.3212
0.90	0.7445	0.2980	0.3324
0.94	0.7662	0.2896	0.3353
0.95	0.7707	0.2864	0.3349
1.00	0.7854	0.2500	0.3117

Peak Wet Weather Flow (gpm)		Capacity				
1064.19		85%				
Slope	Pipe Slope (%)	Velocity (fps)	Capacity (gpm)	85% Flow (gpm)	>= Peak Wet Weather Flow (Y/N)	
Minimum	0.15	2.25	1238.34	1052.59	N	
Maximum	3.62	11.04	6083.43	5170.92	Y	
Min V (fps)	Pipe Slope (%)	Capacity (gpm)	85% Flow (gpm)			
2	0.12	1101.67	936.42			
Max V (fps)	10	2.97	5508.34	4682.09		

No of person per LUE	3.5	
Total LUE	3,674	LUE
Flow per LUE	200	gpd/LUE
Avg Dry Weather Flow (ADWF) for service area	2,571,800	gpd
Peaking Factor	1.06	

INPUT DATA HERE			
PWWF Rate	PWWF Rate	PWWF Rate	PWWF Rate
Q (mgd)	Q (gpd)	Q (gpm)	Q (cfs)
2.726	2,725,555	1,893	4.22

85%                      65%

0.85                      0.65

Constant                      163.29                      119.87

**GRAVITY PIPE ESTIMATOR - MANNINGS FORMULA**

**Gravity Flow Estimator - Mannings Equation**

PWWF Rate Q (gpm)	PWWF Rate Q (cfs)	Diameter d (in)	Diameter d (ft.)	Area of Pipe A (ft <sup>2</sup> )	Mannings Coef. (n)	Velocity V (fps)
1892.75	4.22	21	1.750	2.4053	0.013	2.3697
Slope S (%)	Slope S (ft/ft)	Pipe Flow Ratio (y/d <sub>0</sub> )	Corresponding R/d <sub>0</sub>	Hydraulic Radius R	A/d <sub>0</sub> <sup>2</sup>	AR <sup>2/3</sup> /d <sub>0</sub> <sup>8/3</sup>
0.1	0.001	0.85	0.3033	0.530775	0.7115	0.3212

Allowable Flow for Slope Provided Above			Minimum Slope Allowed to Transport Peak Flow		Allowable Flow Q (MGD)
Allowable Flow Q (cfs)	Allowable Flow Q (gpm)	Velocity at Peak Flow (fps)	Allowable Slope (ft/ft)	Allowable Slope (%)	
4.2590	1911.46	1.7534	0.0007578	0.076	2.753

y/d <sub>0</sub>	A/d <sub>0</sub> <sup>2</sup>	R/d <sub>0</sub>	AR <sup>2/3</sup> /d <sub>0</sub> <sup>8/3</sup>
0.01	0.0013	0.0066	0
0.05	0.0147	0.0326	0.0015
0.10	0.0409	0.0635	0.0065
0.15	0.0739	0.0929	0.0152
0.20	0.1118	0.1206	0.0273
0.25	0.1535	0.1466	0.0427
0.30	0.1982	0.1709	0.061
0.35	0.245	0.1935	0.082
0.40	0.2934	0.2142	0.105
0.45	0.3428	0.2331	0.1298
0.50	0.3927	0.2500	0.1558
0.55	0.4426	0.2649	0.1825
0.60	0.492	0.2776	0.2092
0.65	0.5404	0.2881	0.2358
0.70	0.5872	0.2962	0.2608
0.75	0.6318	0.3017	0.284
0.80	0.6736	0.3042	0.3045
0.85	0.7115	0.3033	0.3212
0.90	0.7445	0.2980	0.3324
0.94	0.7662	0.2896	0.3353
0.95	0.7707	0.2864	0.3349
1.00	0.7854	0.2500	0.3117

Peak Wet Weather Flow (gpm)	Capacity				
1892.75	85%				
Slope	Pipe Slope (%)	Velocity (fps)	Capacity (gpm)	85% Flow (gpm)	>= Peak Wet Weather Flow (Y/N)
Minimum	0.095	2.31	2493.68	2119.63	N
Maximum	2.3	11.36	12269.93	10429.44	Y
Min V (fps)	2	Pipe Slope (%)	Capacity (gpm)	85% Flow (gpm)	
Max V (fps)	10	0.07	2159.27	1835.38	
		1.78	10796.35	9176.90	

No of person per LUE	3.5	people/homes
Total LUE	1,097	LUE
Flow per LUE	200	gpd/LUE
Avg Dry Weather Flow (ADWF) for service area	767,900	gpd
Peaking Factor	1.11	

INPUT DATA HERE			
PWWF Rate	PWWF Rate	PWWF Rate	PWWF Rate
Q (mgd)	Q (gpd)	Q (gpm)	Q (cfs)
0.851	850,742	590.79	1.32

	85%	65%
	0.85	0.65
Constant	36.72	26.95

**GRAVITY PIPE ESTIMATOR - MANNINGS FORMULA**

**Gravity Flow Estimator - Mannings Equation**

PWWF Rate Q (gpm)	PWWF Rate Q (cfs)	Diameter d (in)	Diameter d (ft.)	Area of Pipe A (ft <sup>2</sup> )	Mannings Coef. (n)	Velocity V (fps)
590.79	1.32	12	1.000	0.7854	0.013	8.9343
Slope S (%)	Slope S (ft/ft)	Pipe Flow Ratio (y/d <sub>0</sub> )	Corresponding R/d <sub>0</sub>	Hydraulic Radius R	A/d <sub>0</sub> <sup>2</sup>	AR <sup>2/3</sup> /d <sub>0</sub> <sup>8/3</sup>
3.19	0.0319	0.94	0.2896	0.2896	0.7662	0.3353
Allowable Flow for Slope Provided Above			Minimum Slope Allowed to Transport Peak Flow			
Allowable Flow Q (cfs)	Allowable Flow Q (gpm)	Velocity at Peak Flow (fps)	Allowable Slope (ft/ft)	Allowable Slope (%)	Allowable Flow Q (MGD)	
5.9816	2684.53	1.6761	0.0012699	0.127	3.866	

y/d <sub>0</sub>	A/d <sub>0</sub> <sup>2</sup>	R/d <sub>0</sub>	AR <sup>2/3</sup> /d <sub>0</sub> <sup>8/3</sup>
0.01	0.0013	0.0066	0
0.05	0.0147	0.0326	0.0015
0.10	0.0409	0.0635	0.0065
0.15	0.0739	0.0929	0.0152
0.20	0.1118	0.1206	0.0273
0.25	0.1535	0.1466	0.0427
0.30	0.1982	0.1709	0.061
0.35	0.245	0.1935	0.082
0.40	0.2934	0.2142	0.105
0.45	0.3428	0.2331	0.1298
0.50	0.3927	0.2500	0.1558
0.55	0.4426	0.2649	0.1825
0.60	0.492	0.2776	0.2092
0.65	0.5404	0.2881	0.2358
0.70	0.5872	0.2962	0.2608
0.75	0.6318	0.3017	0.284
0.80	0.6736	0.3042	0.3045
0.85	0.7115	0.3033	0.3212
0.90	0.7445	0.2980	0.3324
0.94	0.7662	0.2896	0.3353
0.95	0.7707	0.2864	0.3349
1.00	0.7854	0.2500	0.3117

Peak Wet Weather Flow (gpm)	Capacity				
590.79	85%				
Slope	Pipe Slope (%)	Velocity (fps)	Capacity (gpm)	85% Flow (gpm)	>= Peak Wet Weather Flow (Y/N)
Minimum	0.2	2.24	788.65	670.35	N
Maximum	4.88	11.05	3895.63	3311.28	Y
Min V (fps)	Pipe Slope (%)	Capacity (gpm)	85% Flow (gpm)		
2	0.16	705.07	599.31		
Max V (fps)	10	4.00	3525.34	2996.54	

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**APPENDIX C - TCEQ SCS GENERAL CONSTRUCTION NOTES**

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**Texas Commission on Environmental Quality  
Organized Sewage Collection System  
General Construction Notes**

**Edwards Aquifer Protection Program Construction Notes – Legal Disclaimer**

*The following/listed “construction notes” are intended to be advisory in nature only and do not constitute an approval or conditional approval by the Executive Director, nor do they constitute a comprehensive listing of rules or conditions to be followed during construction. Further actions may be required to achieve compliance with TCEQ regulations found in Title 30, Texas Administrative Code, Chapters 213 and 217, as well as local ordinances and regulations providing for the protection of water quality. Additionally, nothing contained in the following/listed “construction notes” restricts the powers of the Executive Director, the commission or any other governmental entity to prevent, correct, or curtail activities that result or may result in pollution of the Edwards Aquifer or hydrologically connected surface waters. The holder of any Edwards Aquifer Protection Plan containing “construction notes” is still responsible for compliance with Title 30, Texas Administrative Code, Chapters 213 or any other applicable TCEQ regulation, as well as all conditions of an Edwards Aquifer Protection Plan through all phases of plan implementation. Failure to comply with any condition of the Executive Director’s approval, whether or not in contradiction of any “construction notes,” is a violation of TCEQ regulations and any violation is subject to administrative rules, orders, and penalties as provided under Title 30, Texas Administrative Code § 213.10 (relating to Enforcement). Such violations may also be subject to civil penalties and injunction. The following/listed “construction notes” in no way represent an approved exception by the Executive Director to any part of Title 30 Texas Administrative Code, Chapters 213 and 217, or any other TCEQ applicable regulation.*

1. This Organized Sewage Collection System (SCS) must be constructed in accordance with 30 Texas Administrative Code (TAC) §213.5(c), the Texas Commission on Environmental Quality’s (TCEQ) Edwards Aquifer Rules and any local government standard specifications.
2. All contractors conducting regulated activities associated with this proposed regulated project must be provided with copies of the SCS plan and the TCEQ letter indicating the specific conditions of its approval. During the course of these regulated activities, the contractors must be required to keep on-site copies of the plan and the approval letter.
3. A written notice of construction must be submitted to the presiding TCEQ regional office at least 48 hours prior to the start of any regulated activities. This notice must include:
  - the name of the approved project;
  - the activity start date; and
  - the contact information of the prime contractor.
4. Any modification to the activities described in the referenced SCS application following the date of approval may require the submittal of an SCS application to modify this approval, including the payment of appropriate fees and all information necessary for its review and approval.
5. Prior to beginning any construction activity, all temporary erosion and sedimentation (E&S) control measures must be properly installed and maintained in accordance with the manufacturers specifications. These controls must remain in place until the disturbed areas have been permanently stabilized.
6. If any sensitive features are discovered during the wastewater line trenching activities, all regulated activities near the sensitive feature must be suspended immediately. The applicant must immediately notify the appropriate regional office of the TCEQ of the feature discovered. A geologist’s assessment of the location and extent of the feature discovered must be reported to that regional office in writing and the applicant must submit a plan for ensuring the structural integrity of the sewer line or for modifying the proposed collection system alignment around the feature. The regulated activities near the sensitive feature may not proceed until the

executive director has reviewed and approved the methods proposed to protect the sensitive feature and the Edwards Aquifer from any potentially adverse impacts to water quality while maintaining the structural integrity of the line.

7. Sewer lines located within or crossing the 5-year floodplain of a drainage way will be protected from inundation and stream velocities which could cause erosion and scouring of backfill. The trench must be capped with concrete to prevent scouring of backfill, or the sewer lines must be encased in concrete. All concrete shall have a minimum thickness of 6 inches.
8. Blasting procedures for protection of existing sewer lines and other utilities will be in accordance with the National Fire Protection Association criteria. Sand is not allowed as bedding or backfill in trenches that have been blasted. If any existing sewer lines are damaged, the lines must be repaired and retested.
9. All manholes constructed or rehabilitated on this project must have watertight size on size resilient connectors allowing for differential settlement. If manholes are constructed within the 100-year floodplain, the cover must have a gasket and be bolted to the ring. Where gasketed manhole covers are required for more than three manholes in sequence or for more than 1500 feet, alternate means of venting will be provided. Bricks are not an acceptable construction material for any portion of the manhole.

The diameter of the manholes must be a minimum of four feet and the manhole for entry must have a minimum clear opening diameter of 30 inches. These dimensions and other details showing compliance with the commission's rules concerning manholes and sewer line/manhole inverts described in 30 TAC §217.55 are included on Plan Sheet \_\_\_ of \_\_\_.

It is suggested that entrance into manholes in excess of four feet deep be accomplished by means of a portable ladder. The inclusion of steps in a manhole is prohibited.

10. Where water lines and new sewer line are installed with a separation distance closer than nine feet (i.e., water lines crossing wastewater lines, water lines paralleling wastewater lines, or water lines next to manholes) the installation must meet the requirements of 30 TAC §217.53(d) (Pipe Design) and 30 TAC §290.44(e) (Water Distribution).
11. Where sewers lines deviate from straight alignment and uniform grade all curvature of sewer pipe must be achieved by the following procedure which is recommended by the pipe manufacturer: \_\_\_\_\_.

If pipe flexure is proposed, the following method of preventing deflection of the joint must be used: \_\_\_\_\_.

Specific care must be taken to ensure that the joint is placed in the center of the trench and properly bedded in accordance with 30 TAC §217.54.

12. New sewage collection system lines must be constructed with stub outs for the connection of anticipated extensions. The location of such stub outs must be marked on the ground such that their location can be easily determined at the time of connection of the extensions. Such stub outs must be manufactured wyes or tees that are compatible in size and material with both the sewer line and the extension. At the time of original construction, new stub-outs must be constructed sufficiently to extend beyond the end of the street pavement. All stub-outs must be sealed with a manufactured cap to prevent leakage. Extensions that were not anticipated at the time of original construction or that are to be connected to an existing sewer line not furnished with stub outs must be connected using a manufactured saddle and in accordance with accepted plumbing techniques.

If no stub-out is present an alternate method of joining laterals is shown in the detail on Plan Sheet \_\_\_ of \_\_\_. (For potential future laterals).

The private service lateral stub-outs must be installed as shown on the plan and profile sheets on Plan Sheet \_\_\_ of \_\_\_ and marked after backfilling as shown in the detail on Plan Sheet \_\_\_ of \_\_\_.

13. Trenching, bedding and backfill must conform with 30 TAC §217.54. The bedding and backfill for flexible pipe must comply with the standards of ASTM D-2321, Classes IA, IB, II or III. Rigid pipe bedding must comply with the requirements of ASTM C 12 (ANSI A 106.2) classes A, B or C.
14. Sewer lines must be tested from manhole to manhole. When a new sewer line is connected to an existing stub or clean-out, it must be tested from existing manhole to new manhole. If a stub or clean-out is used at the end of the proposed sewer line, no private service attachments may be connected between the last manhole and the cleanout unless it can be certified as conforming with the provisions of 30 TAC §213.5(c)(3)(E).
15. All sewer lines must be tested in accordance with 30 TAC §217.57. The engineer must retain copies of all test results which must be made available to the executive director upon request. The engineer must certify in writing that all wastewater lines have passed all required testing to the appropriate regional office within 30 days of test completion and prior to use of the new collection system. Testing method will be:
  - (a) For a collection system pipe that will transport wastewater by gravity flow, the design must specify an infiltration and exfiltration test or a low-pressure air test. A test must conform to the following requirements:
    - (1) *Low Pressure Air Test.*
      - (A) A low pressure air test must follow the procedures described in American Society For Testing And Materials (ASTM) C-828, ASTM C-924, or ASTM F-1417 or other procedure approved by the executive director, except as to testing times as required in Table C.3 in subparagraph (C) of this paragraph or Equation C.3 in subparagraph (B)(ii) of this paragraph.
      - (B) For sections of collection system pipe less than 36 inch average inside diameter, the following procedure must apply, unless a pipe is to be tested as required by paragraph (2) of this subsection.
        - (i) A pipe must be pressurized to 3.5 pounds per square inch (psi) greater than the pressure exerted by groundwater above the pipe.
        - (ii) Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5 psi gauge to 2.5 psi gauge is computed from the following equation:

Equation C.3

$$T = \frac{0.085 \times D \times K}{Q}$$

Where:

- T = time for pressure to drop 1.0 pound per square inch gauge in seconds  
K = 0.000419 X D X L, but not less than 1.0  
D = average inside pipe diameter in inches

L = length of line of same size being tested, in feet  
 Q = rate of loss, 0.0015 cubic feet per minute per square foot internal surface

(C) Since a K value of less than 1.0 may not be used, the minimum testing time for each pipe diameter is shown in the following Table C.3:

Pipe Diameter (inches)	Minimum Time (seconds)	Maximum Length for Minimum Time (feet)	Time for Longer Length (seconds/foot)
6	340	398	0.855
8	454	298	1.520
10	567	239	2.374
12	680	199	3.419
15	850	159	5.342
18	1020	133	7.693
21	1190	114	10.471
24	1360	100	13.676
27	1530	88	17.309
30	1700	80	21.369
33	1870	72	25.856

- (D) An owner may stop a test if no pressure loss has occurred during the first 25% of the calculated testing time.
- (E) If any pressure loss or leakage has occurred during the first 25% of a testing period, then the test must continue for the entire test duration as outlined above or until failure.
- (F) Wastewater collection system pipes with a 27 inch or larger average inside diameter may be air tested at each joint instead of following the procedure outlined in this section.
- (G) A testing procedure for pipe with an inside diameter greater than 33 inches must be approved by the executive director.

(2) *Infiltration/Exfiltration Test.*

- (A) The total exfiltration, as determined by a hydrostatic head test, must not exceed 50 gallons per inch of diameter per mile of pipe per 24 hours at a minimum test head of 2.0 feet above the crown of a pipe at an upstream manhole.
- (B) An owner shall use an infiltration test in lieu of an exfiltration test when pipes are installed below the groundwater level.
- (C) The total exfiltration, as determined by a hydrostatic head test, must not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of two feet above the crown of a pipe at an upstream manhole, or at least two feet above existing groundwater level, whichever is greater.
- (D) For construction within a 25-year flood plain, the infiltration or exfiltration must not exceed 10 gallons per inch diameter per mile of pipe per 24 hours at the same minimum test head as in subparagraph (C) of this paragraph.
- (E) If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, an owner shall undertake remedial action in order to reduce

the infiltration or exfiltration to an amount within the limits specified. An owner shall retest a pipe following a remediation action.

- (b) If a gravity collection pipe is composed of flexible pipe, deflection testing is also required. The following procedures must be followed:
- (1) For a collection pipe with inside diameter less than 27 inches, deflection measurement requires a rigid mandrel.
    - (A) *Mandrel Sizing.*
      - (i) A rigid mandrel must have an outside diameter (OD) not less than 95% of the base inside diameter (ID) or average ID of a pipe, as specified in the appropriate standard by the ASTMs, American Water Works Association, UNI-BELL, or American National Standards Institute, or any related appendix.
      - (ii) If a mandrel sizing diameter is not specified in the appropriate standard, the mandrel must have an OD equal to 95% of the ID of a pipe. In this case, the ID of the pipe, for the purpose of determining the OD of the mandrel, must equal be the average outside diameter minus two minimum wall thicknesses for OD controlled pipe and the average inside diameter for ID controlled pipe.
      - (iii) All dimensions must meet the appropriate standard.
    - (B) *Mandrel Design.*
      - (i) A rigid mandrel must be constructed of a metal or a rigid plastic material that can withstand 200 psi without being deformed.
      - (ii) A mandrel must have nine or more odd number of runners or legs.
      - (iii) A barrel section length must equal at least 75% of the inside diameter of a pipe.
      - (iv) Each size mandrel must use a separate proving ring.
    - (C) *Method Options.*
      - (i) An adjustable or flexible mandrel is prohibited.
      - (ii) A test may not use television inspection as a substitute for a deflection test.
      - (iii) If requested, the executive director may approve the use of a deflectometer or a mandrel with removable legs or runners on a case-by-case basis.
  - (2) For a gravity collection system pipe with an inside diameter 27 inches and greater, other test methods may be used to determine vertical deflection.
  - (3) A deflection test method must be accurate to within plus or minus 0.2% deflection.
  - (4) An owner shall not conduct a deflection test until at least 30 days after the final backfill.
  - (5) Gravity collection system pipe deflection must not exceed five percent (5%).
  - (6) If a pipe section fails a deflection test, an owner shall correct the problem and conduct a second test after the final backfill has been in place at least 30 days.
16. All manholes must be tested to meet or exceed the requirements of 30 TAC §217.58.
- (a) All manholes must pass a leakage test.
  - (b) An owner shall test each manhole (after assembly and backfilling) for leakage, separate and independent of the collection system pipes, by hydrostatic exfiltration testing, vacuum testing, or other method approved by the executive director.
    - (1) Hydrostatic Testing.

- (A) The maximum leakage for hydrostatic testing or any alternative test methods is 0.025 gallons per foot diameter per foot of manhole depth per hour.
- (B) To perform a hydrostatic exfiltration test, an owner shall seal all wastewater pipes coming into a manhole with an internal pipe plug, fill the manhole with water, and maintain the test for at least one hour.
- (C) A test for concrete manholes may use a 24-hour wetting period before testing to allow saturation of the concrete.

(2) Vacuum Testing.

- (A) To perform a vacuum test, an owner shall plug all lift holes and exterior joints with a non-shrink grout and plug all pipes entering a manhole.
- (B) No grout must be placed in horizontal joints before testing.
- (C) Stub-outs, manhole boots, and pipe plugs must be secured to prevent movement while a vacuum is drawn.
- (D) An owner shall use a minimum 60 inch/lb torque wrench to tighten the external clamps that secure a test cover to the top of a manhole.
- (E) A test head must be placed at the inside of the top of a cone section, and the seal inflated in accordance with the manufacturer's recommendations.
- (F) There must be a vacuum of 10 inches of mercury inside a manhole to perform a valid test.
- (G) A test does not begin until after the vacuum pump is off.
- (H) A manhole passes the test if after 2.0 minutes and with all valves closed, the vacuum is at least 9.0 inches of mercury.

17. All private service laterals must be inspected and certified in accordance with 30 TAC §213.5(c)(3)(I). After installation of and, prior to covering and connecting a private service lateral to an existing organized sewage collection system, a Texas Licensed Professional Engineer, Texas Registered Sanitarian, or appropriate city inspector must visually inspect the private service lateral and the connection to the sewage collection system, and certify that it is constructed in conformity with the applicable provisions of this section. The owner of the collection system must maintain such certifications for five years and forward copies to the appropriate regional office upon request. Connections may only be made to an approved sewage collection system.

<p>Austin Regional Office          12100 Park 35 Circle, Building A          Austin, Texas 78753-1808          Phone (512) 339-2929          Fax (512) 339-3795</p>	<p>San Antonio Regional Office          14250 Judson Road          San Antonio, Texas 78233-4480          Phone (210) 490-3096          Fax (210) 545-4329</p>
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**THESE GENERAL CONSTRUCTION NOTES MUST BE INCLUDED ON THE CONSTRUCTION PLANS PROVIDED TO THE CONTRACTOR AND ALL SUBCONTRACTORS.**



# Exhibit A

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Manhole & Cleanouts

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MANHOLE LOCATIONS

Line	Shown on Sheet	Station	Manhole or Cleanout?
WWL "A"	13 OF 43	12+52.94	MH
WWL "A"	14 OF 43	17+34.01	MH
WWL "A"	16 OF 43	22+07.68	MH
WWL "A"	17 OF 43	27+06.29	MH
WWL "A"	18 OF 43	30+60.01	MH
WWL "A"	19 OF 43	35+57.87	MH
WWL "A"	20 OF 43	38+61.82	MH
WWL "A"	20 OF 43	40+50.00	MH
WWL "A"	21 OF 43	43+48.55	MH
WWL "A"	22 OF 43	47+17.24	MH
WWL "A"	23 OF 43	51+33.49	MH
WWL "A"	23 OF 43	52+45.52	MH
WWL "A"	24 OF 43	54+54.76	MH
WWL "A"	24 OF 43	54+92.73	MH
WWL "A"	25 OF 43	59+92.33	MH
WWL "A"	26 OF 43	64+89.42	MH
WWL "A"	27 OF 43	68+01.69	MH
WWL "A"	28 OF 43	71+38.47	MH
WWL "A"	29 OF 43	74+67.41	MH
WWL "A"	29 OF 43	77+31.47	MH
WWL "A"	31 OF 43	82+31.46	MH
WWL "A"	32 OF 43	86+73.01	MH
WWL "A"	33 OF 43	90+80.18	MH
WWL "A"	34 OF 43	94+34.46	MH
WWL "A"	34 OF 43	97+30.92	MH
WWL "A"	35 OF 43	100+57.42	MH
WWL "A"	36 OF 43	104+81.10	MH
WWL "B"	37 OF 43	10+33.53	MH
WWL "B"	37 OF 43	11+72.02	MH
WWL "B"	38 OF 43	15+92.02	MH
WWL "B"	38 OF 43	16+60.00	MH
WWL "B"	38 OF 43	17+72.02	MH

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# Site Plan

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See Engineering Report Appendix A – Project Location Map

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# Exhibit B

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100-YR Floodplain

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Table 3 - 100 - Year Floodplain

Line	Shown on Sheet	Station	Manhole or Cleanout?
WWL "A"	13 OF 43	12+52.94	MH
WWL "A"	14 OF 43	17+34.01	MH
WWL "A"	16 OF 43	22+07.68	MH
WWL "A"	17 OF 43	27+06.29	MH
WWL "A"	18 OF 43	30+60.01	MH
WWL "A"	19 OF 43	35+57.87	MH
WWL "A"	20 OF 43	38+61.82	MH
WWL "A"	20 OF 43	40+50.00	MH
WWL "A"	21 OF 43	43+48.55	MH
WWL "A"	22 OF 43	47+17.24	MH
WWL "A"	23 OF 43	51+33.49	MH
WWL "A"	23 OF 43	52+45.52	MH
WWL "A"	24 OF 43	54+54.76	MH
WWL "A"	24 OF 43	54+92.73	MH
WWL "A"	25 OF 43	59+92.33	MH
WWL "A"	26 OF 43	64+89.42	MH
WWL "A"	27 OF 43	68+01.69	MH
WWL "A"	28 OF 43	71+38.47	MH
WWL "A"	29 OF 43	74+67.41	MH
WWL "A"	29 OF 43	77+31.47	MH
WWL "A"	31 OF 43	82+31.46	MH
WWL "A"	32 OF 43	86+73.01	MH
WWL "A"	33 OF 43	90+80.18	MH
WWL "A"	34 OF 43	94+34.46	MH
WWL "A"	34 OF 43	97+30.92	MH
WWL "A"	35 OF 43	100+57.42	MH
WWL "A"	36 OF 43	104+81.10	MH
WWL "B"	37 OF 43	10+33.53	MH
WWL "B"	37 OF 43	11+72.02	MH

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# Exhibit C

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5-YR Floodplain

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Table 3 - 5 - Year Floodplain

Line	Shown on Sheet	Station	Manhole or Cleanout?
WWL "A"	13 OF 43	12+52.94	MH
WWL "A"	14 OF 43	17+34.01	MH
WWL "A"	16 OF 43	22+07.68	MH
WWL "A"	17 OF 43	27+06.29	MH
WWL "A"	18 OF 43	30+60.01	MH
WWL "A"	19 OF 43	35+57.87	MH
WWL "A"	21 OF 43	43+48.55	MH
WWL "A"	23 OF 43	51+33.49	MH
WWL "A"	23 OF 43	52+45.52	MH
WWL "A"	24 OF 43	54+54.76	MH
WWL "A"	24 OF 43	54+92.73	MH
WWL "A"	25 OF 43	59+92.33	MH
WWL "A"	26 OF 43	64+89.42	MH
WWL "A"	27 OF 43	68+01.69	MH
WWL "A"	28 OF 43	71+38.47	MH
WWL "A"	29 OF 43	74+67.41	MH
WWL "A"	29 OF 43	77+31.47	MH
WWL "A"	31 OF 43	82+31.46	MH
WWL "A"	32 OF 43	86+73.01	MH
WWL "A"	33 OF 43	90+80.18	MH
WWL "A"	34 OF 43	94+34.46	MH
WWL "A"	34 OF 43	97+30.92	MH
WWL "A"	35 OF 43	100+57.42	MH
WWL "A"	36 OF 43	104+81.10	MH
WWL "B"	37 OF 43	10+33.53	MH

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# Final Plans and Specifications

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Utility Plans

Drainage Area Map Plans

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**SHEET INDEX:**

**GENERAL**

1. COVER SHEET
2. GENERAL NOTES
3. TCEQ NOTES
4. NBU NOTES
5. PROJECT LAYOUT
6. EROSION AND SEDIMENTATION PLAN
7. EROSION AND SEDIMENTATION PLAN
8. EROSION AND SEDIMENTATION PLAN
9. EROSION AND SEDIMENTATION PLAN
10. EROSION AND SEDIMENTATION DETAILS
11. EROSION AND SEDIMENTATION DETAILS
12. QUANTITIES
13. WASTEWATER LINE A PLAN AND PROFILE BEGIN TO STA 14+00
14. WASTEWATER LINE A PLAN AND PROFILE STA 14+00 TO STA 18+00
15. WASTEWATER LINE A PLAN AND PROFILE STA 18+00 TO STA 22+00
16. WASTEWATER LINE A PLAN AND PROFILE STA 22+00 TO STA 26+00
17. WASTEWATER LINE A PLAN AND PROFILE STA 26+00 TO STA 30+00
18. WASTEWATER LINE A PLAN AND PROFILE STA 30+00 TO STA 34+00
19. WASTEWATER LINE A PLAN AND PROFILE STA 34+00 TO STA 38+00
20. WASTEWATER LINE A PLAN AND PROFILE STA 38+00 TO STA 42+00
21. WASTEWATER LINE A PLAN AND PROFILE STA 42+00 TO STA 46+00
22. WASTEWATER LINE A PLAN AND PROFILE STA 46+00 TO STA 50+00
23. WASTEWATER LINE A PLAN AND PROFILE STA 50+00 TO STA 54+00
24. WASTEWATER LINE A PLAN AND PROFILE STA 54+00 TO STA 58+00
25. WASTEWATER LINE A PLAN AND PROFILE STA 58+00 TO STA 62+00
26. WASTEWATER LINE A PLAN AND PROFILE STA 62+00 TO STA 66+00
27. WASTEWATER LINE A PLAN AND PROFILE STA 66+00 TO STA 70+00
28. WASTEWATER LINE A PLAN AND PROFILE STA 70+00 TO STA 74+00
29. WASTEWATER LINE A PLAN AND PROFILE STA 74+00 TO STA 78+00
30. WASTEWATER LINE A PLAN AND PROFILE STA 78+00 TO STA 82+00
31. WASTEWATER LINE A PLAN AND PROFILE STA 82+00 TO STA 86+00
32. WASTEWATER LINE A PLAN AND PROFILE STA 86+00 TO STA 90+00
33. WASTEWATER LINE A PLAN AND PROFILE STA 90+00 TO STA 94+00
34. WASTEWATER LINE A PLAN AND PROFILE STA 94+00 TO STA 98+00
35. WASTEWATER LINE A PLAN AND PROFILE STA 98+00 TO STA 102+00
36. WASTEWATER LINE A PLAN AND PROFILE STA 102+00 TO END
37. WASTEWATER LINE B PLAN AND PROFILE BEGIN TO STA 14+00
38. WASTEWATER LINE B PLAN AND PROFILE STA 14+00 TO STA END
39. WASTEWATER LINE DETAILS
40. WASTEWATER LINE DETAILS
41. BARRICADE AND CONSTRUCTION NOTES
42. BARRICADE AND CONSTRUCTION NOTES
43. BARRICADE AND CONSTRUCTION NOTES

# VERAMENDI WASTEWATER LINE

## N1 - N6

**PROJECT INFORMATION:**

**OWNER:**  
 ASA PROPERTIES  
 387 W. MILL STREET, SUITE 108  
 NEW BRAUNFELS, TEXAS 78130

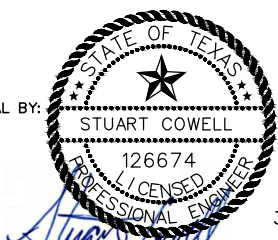
**CONTACT:**  
 STUART COWELL, P.E.  
 LJA ENGINEERING, INC  
 2700 L. & FRONTERA, SUITE 150  
 ROUND ROCK, TX 78681

**SUBMITTAL PREPARED BY:**

**LJA Engineering, Inc.**   
 FRN - F-1386

2700 L. & FRONTERA, STE 150  
 ROUND ROCK, TEXAS 78681  
 (512) 439-4700  
 TBPE FIRM REGISTRATION: F-1386

**CONTACT:**  
 STUART COWELL, P.E.  
 PHONE:  
 (512) 439-4700



SUBMITTED FOR APPROVAL BY:

3/11/23

ENGINEER OF RECORD

DATE

**PROJECT LENGTH**

9,501 LF OF WWL "A"  
 794 LF OF WWL "B"

10,295 LF TOTAL

**NBU AS-BUILT REQUIREMENTS**

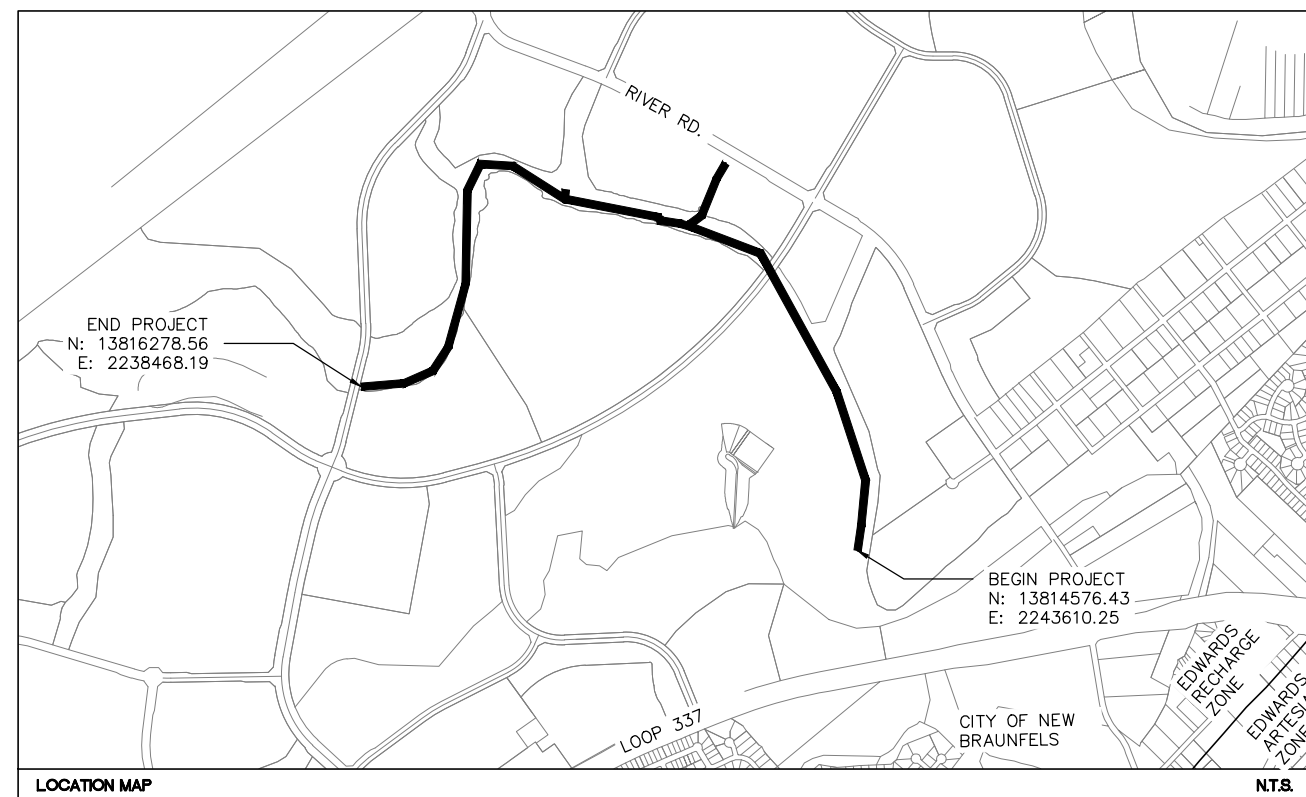
NBU REQUIRES GPS POINTS FOR CERTAIN WATER, WASTEWATER AND ELECTRIC IMPROVEMENTS. SOME OF THIS INFORMATION/DATA MUST BE PERFORMED DURING CONSTRUCTION, PRIOR TO BACKFILLING OPERATIONS. CONTRACTOR SHALL COORDINATE WITH NBU INSPECTOR TO VERIFY ANY ADDITIONAL ITEMS NOT SHOWN BELOW THAT NEED TO BE GPS LOCATED AND THE SURVEY/DELIVERY REQUIREMENTS REGARDING THIS INFORMATION.

GPS POINTS SHALL BE REQUIRED FROM THE DEVELOPER'S CONTRACTOR OR ENGINEER. A MINIMUM OF THREE COORDINATE POINTS FOR GEOREFERENCING SHALL BE REQUIRED. THE WATER AND WASTEWATER GPS POINTS SHALL BE TO SURVEY GRADE. THE ELECTRIC GPS POINTS SHALL BE TO MAP GRADE.

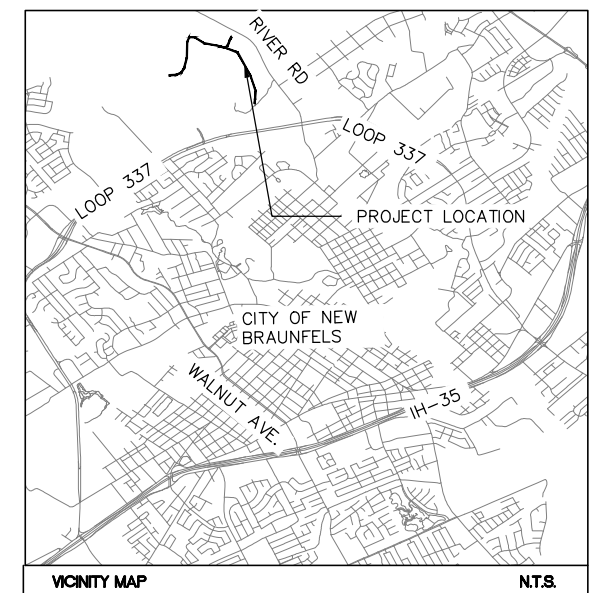
**WASTEWATER**

MANHOLES AND INVERT DEPTH(S)

CORRECTIONS RECORD					
No.	DESCRIPTION	BY	CORRECT (C) ADD (A) VOID (V) SHEET Nos.	TOTAL No. SHEETS IN CORRECTION PLAN SET	DATE IMAGED



LJA PROJECT NUMBER: A441-2201



LOCATION OF EXISTING UNDERGROUND AND OVERHEAD UTILITIES ARE APPROXIMATE LOCATIONS ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES PRIOR TO BEGINNING WORK AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT OCCUR.

**811**  
 Know what's below.  
 Call before you dig.

**CONSTRUCTION PLAN NOTES**

THESE NOTES MUST APPEAR ON THE COVER AND/OR "NOTES" SHEET OF ALL SUBDIVISION CONSTRUCTION

PLANS AND ON COMMERCIAL PLANS WHERE APPLICABLE:

REVISED 03/2020

IF CONSTRUCTION HAS NOT COMMENCED WITHIN ONE-YEAR OF CITY APPROVAL FOR CONSTRUCTION INSPECTION, THAT APPROVAL IS NO LONGER VALID.

THE MOST CURRENT EDITIONS OF THE CITY OF SAN ANTONIO STANDARD SPECIFICATIONS AND THE TEXAS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION OF HIGHWAYS, STREETS AND BRIDGES SHALL BE FOLLOWED FOR ALL CONSTRUCTION EXCEPT AS AMENDED BY THE CITY OF NEW BRAUNFELS STANDARD DETAILS.

ALL RESPONSIBILITY FOR THE ADEQUACY OF THESE PLANS REMAINS WITH THE ENGINEER OF RECORD. IN ACCEPTING THESE PLANS, THE CITY OF NEW BRAUNFELS MUST RELY UPON THE ADEQUACY OF THE WORK OF THE ENGINEER OF RECORD.

PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR SHALL CONTACT THE CITY OF NEW BRAUNFELS TO SCHEDULE A PRECONSTRUCTION MEETING.

FOR PUBLIC INFRASTRUCTURE PERMIT OR GRADING PERMIT PROJECTS:

FOR INSPECTIONS, YOU MUST CALL BEFORE 12:00 P.M., 48 HOURS PRIOR TO YOUR INSPECTION REQUEST.

EACH INSPECTION WILL BE ALLOTTED 1 HOUR UNLESS YOU REQUEST FOR MORE TIME.

ONCE YOUR REQUEST HAS BEEN ACCEPTED, YOU WILL RECEIVE A CALL FROM THE CITY OF NEW BRAUNFELS INSPECTOR.

FOR COMMERCIAL PERMIT (CP) PROJECTS:

ALL INSPECTIONS ARE TO BE CALLED IN AT 830-221-4068 OR,

FAXED IN AT 830-608-2117 OR,

E-MAILED AT INSPECTIONS@NBTEXAS.ORG.

IT IS THE CONTRACTOR'S RESPONSIBILITY TO SEE THAT ALL TEMPORARY AND PERMANENT TRAFFIC CONTROL DEVICES ARE PROPERLY INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE PLANS AND LATEST EDITION OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES. IF, IN THE OPINION OF THE ENGINEERING REPRESENTATIVE AND THE CONSTRUCTION INSPECTOR, THE BARRICADES AND SIGNS DO NOT CONFORM TO ESTABLISHED STANDARDS OR ARE INCORRECTLY PLACED OR ARE INSUFFICIENT IN QUANTITY TO PROTECT THE GENERAL PUBLIC, THE CONSTRUCTION INSPECTOR SHALL HAVE THE OPTION TO STOP OPERATIONS UNTIL SUCH TIME AS THE CONDITIONS ARE CORRECTED. IF THE NEED ARISES, ADDITIONAL TEMPORARY TRAFFIC CONTROL DEVICES MAY BE ORDERED BY THE ENGINEERING REPRESENTATIVE AT THE CONTRACTOR'S EXPENSE.

A TXDOT TYPE II B-B BLUE REFLECTIVE RAISED PAVEMENT MARKER SHALL BE INSTALLED IN THE CENTER OF THE ROADWAY ADJACENT TO ALL FIRE HYDRANTS. IN LOCATIONS WHERE HYDRANTS ARE SITUATED ON CORNERS, BLUE REFLECTIVE RAISED PAVEMENT MARKERS SHALL BE INSTALLED ON BOTH APPROACHES WHICH FRONT THE HYDRANT. THE RAISED PAVEMENT MARKER SHALL MEET TXDOT MATERIAL, EPOXY AND ADHESIVE SPECIFICATIONS.

**GROUNDWATER**

IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER, CONTRACTOR, SUBCONTRACTORS, BUILDERS, GEO-TECHNICAL ENGINEER, AND PROJECT ENGINEER TO IMMEDIATELY NOTIFY THE OFFICE OF THE CITY ENGINEER AND PROJECT ENGINEER IF THE PRESENCE OF GROUNDWATER WITHIN THE SITE IS EVIDENT. UPON NOTIFICATION THE PROJECT ENGINEER SHALL RESPOND WITH PLAN REVISIONS FOR THE MITIGATION OF THE GROUNDWATER ISSUE. THE CITY ENGINEER SHALL RESPOND WITHIN TWO (2) BUSINESS DAYS UPON RECEIPT OF THE MITIGATION PLAN. ALL CONSTRUCTION ACTIVITY, IMPACTED BY THE DISCOVERY OF GROUNDWATER, SHALL BE SUSPENDED UNTIL THE CITY ENGINEER GRANTS A WRITTEN APPROVAL OF THE GROUNDWATER MITIGATION PLAN.

**RECORD DRAWINGS**

AS PER PLATTING ORDINANCE SECTION 118-38M.: WHEN ALL OF THE IMPROVEMENTS ARE FOUND TO BE CONSTRUCTED AND COMPLETED IN ACCORDANCE WITH THE APPROVED PLANS AND SPECIFICATIONS AND WITH THE CITY'S STANDARDS, AND UPON RECEIPT OF ONE SET OF "RECORD DRAWING" PLANS, AND A DIGITAL COPY OF ALL PLANS (PDF COPY) THE CITY ENGINEER SHALL ACCEPT SUCH IMPROVEMENTS FOR THE CITY OF NEW BRAUNFELS, SUBJECT TO THE GUARANTY OF MATERIAL AND WORKMANSHIP PROVISIONS IN THIS SECTION.

**CONSTRUCTION NOTE**

ENGINEER OF RECORD IS RESPONSIBLE TO ENSURE THAT EROSION CONTROL MEASURES AND STORMWATER CONTROL SUFFICIENT TO MITIGATE OFF SITE IMPACTS ARE IN PLACE AT ALL STAGES OF CONSTRUCTION.

**DRAINAGE NOTE**

DRAINAGE IMPROVEMENTS SUFFICIENT TO MITIGATE THE IMPACT OF CONSTRUCTION SHALL BE INSTALLED PRIOR TO ADDING IMPERVIOUS COVER.

**FINISHED FLOOR ELEVATIONS**

THE ELEVATION OF THE LOWEST FLOOR SHALL BE AT LEAST 10 INCHES ABOVE THE FINISHED GRADE OF THE SURROUNDING GROUND, WHICH SHALL BE SLOPED IN A FASHION SO AS TO DIRECT STORMWATER AWAY FROM THE

STRUCTURE. PROPERTIES ADJACENT TO STORMWATER CONVEYANCE STRUCTURES MUST HAVE FLOOR SLAB ELEVATION OR BOTTOM OF FLOOR JOISTS A MINIMUM OF ONE FOOT ABOVE THE 100-YEAR WATER FLOW ELEVATION IN THE STRUCTURE. DRIVEWAYS SERVING HOUSES ON THE DOWNHILL SIDE OF THE STREET SHALL HAVE A PROPERLY SIZED CROSS SWALE PREVENTING RUNOFF FROM ENTERING THE GARAGE.

**SOILS TESTING**

PROCTORS SHALL BE SAMPLED FROM ON-SITE MATERIAL (ON-SITE IS DEFINED AS LIMITS OF CONSTRUCTION FOR THIS -PLAN SET) AND A COPY OF THE PROCTOR RESULTS SHALL BE DELIVERED TO THE CITY OF NEW BRAUNFELS STREET INSPECTOR PRIOR TO ANY DENSITY TESTS.

**ROADWAY**

ALL ROADWAY COMPACTION TESTS SHALL BE THE RESPONSIBILITY OF THE DEVELOPER'S GEOTECHNICAL ENGINEER. FLEXIBLE BASE OR FILL/EMBANKMENT MATERIAL SHALL BE PLACED IN UNIFORM LAYERS NOT TO EXCEED EIGHT INCHES (8") LOOSE. THE REQUIRED DENSITY FOR THE FILL/EMBANKMENT MATERIAL SHALL MEET THE REQUIREMENTS OF TXDOT'S SPECIFICATION ITEM 132. THE REQUIRED DENSITY FOR THE FLEXIBLE BASE MATERIAL SHALL MEET THE REQUIREMENTS OF TXDOT'S SPECIFICATION ITEM 247. EACH LAYER OF MATERIAL, INCLUSIVE OF SUBGRADE, SHALL BE COMPACTED AS SPECIFIED AND TESTED FOR DENSITY AND MOISTURE IN ACCORDANCE WITH TEST METHODS TEX-113-E, TEX-114-E, TEX-115-E. THE NUMBER AND LOCATION OF REQUIRED TESTS SHALL BE DETERMINED BY THE GEOTECHNICAL ENGINEER AND APPROVED BY THE CITY OF NEW BRAUNFELS STREET INSPECTOR. AT A MINIMUM, TESTS SHALL BE TAKEN EVERY 200 LF FOR EACH LIFT. UPON COMPLETION OF TESTING, THE GEOTECHNICAL ENGINEER WILL PROVIDE THE CITY OF NEW BRAUNFELS STREET INSPECTOR WITH ALL TESTING DOCUMENTATION AND A CERTIFICATION STATING THAT THE PLACEMENT OF FLEXIBLE BASE, AND FILL MATERIAL, AND SUBGRADE, HAS BEEN COMPLETED IN ACCORDANCE WITH THE PLANS. ADDITIONAL DENSITY TESTS MAY BE REQUESTED BY THE CITY OF NEW BRAUNFELS INSPECTOR.

**ITEM 340**

ASPHALTIC CONCRETE PAVEMENT SHALL BE THE TYPE OF HOT MIX ASPHALT AS DEFINED IN TXDOT'S STANDARD SPECIFICATIONS FOR CURRENT TXDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION OF HIGHWAYS, STREET AND BRIDGES.

THE CITY OF NEW BRAUNFELS WILL NOT ACCEPT THE USE OF RECYCLED ASPHALT PAVEMENT (RAP) OR RECYCLED ASPHALT SHINGLES (RAS) IN ASPHALT MIXTURES FOR NEW ROADWAYS. ANY DEBRIS INCLUSIONS WITHIN NEW ASPHALT PAVEMENTS WILL RESULT IN ASPHALT REMOVAL AND REPLACEMENT FROM CURB TO CURB FOR LIMITS TO BE DETERMINED BY THE CITY OF NEW BRAUNFELS.

THE ASPHALTIC CONCRETE PAVEMENT SURFACE COURSE SHALL BE PLANT MIXED, HOT LAID TYPE "D" MEETING THE SPECIFICATION REQUIREMENTS OF TXDOT ITEM 340. THE ASPHALTIC CONCRETE PAVEMENT SUB-SURFACE COURSES SHALL BE PLANT MIXED, HOT LAID TYPE "B" MEETING THE SPECIFICATION REQUIREMENTS OF TXDOT ITEM 340. THE MIXTURE SHALL BE DESIGNED PER THE DESIGN REQUIREMENTS SPECIFIED IN TXDOT ITEM 340 AND SHALL BE COMPACTED TO BETWEEN 91 AND 95 PERCENT OF THE MAXIMUM THEORETICAL DENSITY AS DETERMINED BY TXDOT TEST METHOD TEX-227-F. PLACE THE MIXTURE WHEN THE ROADWAY SURFACE TEMPERATURE IS AT OR ABOVE 60°F. COMPLETE ALL COMPACTION OPERATIONS BEFORE THE PAVEMENT TEMPERATURE DROPS BELOW 160°F. THE ASPHALT CEMENT CONTENT BY PERCENT OF TOTAL MIXTURE WEIGHT SHALL FALL WITHIN A TOLERANCE OF +0.5 PERCENT FROM A SPECIFIC MIX DESIGN.

**UTILITY TRENCH COMPACTION (ADDED TO THE CONSTRUCTION PLANS ON ALL UTILITY PLAN SHEETS).**

ALL UTILITY TRENCH COMPACTION TESTS WITHIN THE STREET PAVEMENT/SIDEWALK SECTION SHALL BE THE RESPONSIBILITY OF THE DEVELOPER'S GEOTECHNICAL ENGINEER. FILL MATERIAL SHALL BE PLACED IN UNIFORM LAYERS NOT TO EXCEED TWELVE INCHES (12") LOOSE. DETERMINE THE MAXIMUM LIFT THICKNESS BASED ON THE ABILITY OF THE COMPACTING OPERATION AND EQUIPMENT USED TO MEET THE REQUIRED DENSITY. EACH LAYER OF MATERIAL SHALL BE COMPACTED TO A MINIMUM 95% DENSITY AND TESTED FOR DENSITY AND MOISTURE IN ACCORDANCE WITH TEST METHODS TEX-113-E, TEX-114-E, TEX-115-E. THE NUMBER AND LOCATION OF REQUIRED TESTS SHALL BE DETERMINED BY THE GEOTECHNICAL ENGINEER AND APPROVED BY THE CITY OF NEW BRAUNFELS STREET INSPECTOR. AT A MINIMUM, TESTS SHALL BE TAKEN EVERY 200 LF FOR EACH LIFT AND EVERY OTHER SERVICE LINE. UPON COMPLETION OF TESTING THE GEOTECHNICAL ENGINEER SHALL PROVIDE THE CITY OF NEW BRAUNFELS STREET INSPECTOR WITH ALL TESTING DOCUMENTATION AND A CERTIFICATION STATING THAT THE PLACEMENT OF FILL MATERIAL HAS BEEN COMPLETED IN ACCORDANCE WITH THE PLANS. ADDITIONAL DENSITY TESTS MAY BE REQUESTED BY THE CITY OF NEW BRAUNFELS INSPECTOR.

**CURB CUT DUE TO CONSTRUCTION OF NEW RIGHT-OF-WAY CONSTRUCTION**

(INDICATE THE 2 OPTIONS ON THE CONSTRUCTION PLANS).

- 1. SAWCUT EXISTING STREET AND MATCH TO NEW CONSTRUCTION.
- 2. SAWCUT EXISTING CURB TO TIE INTO EXISTING CONSTRUCTION.

**CONSTRUCTION STABILIZED ENTRANCE**

SAWCUT CURB FOR CONSTRUCTION ENTRANCE.

STABILIZED CONSTRUCTION AREA SHALL BE CONSTRUCTED OF 3"x5" ROCK TO BE PLACED A MINIMUM LENGTH OF 25-FT. AND MAINTAINED SO THAT CONSTRUCTION DEBRIS DOES NOT FALL WITHIN THE CITY RIGHT-OF-WAY. RIGHT OF-WAY MUST BE CLEARED FROM MUD, ROCKS, ETC. AT ALL TIMES.

**(NOTES TO BE PLACED ON ALL WW PLAN & DETAIL SHEETS)**

ENSURE ALL DRIVEWAY APPROACHES ARE BUILT IN GENERAL ACCORDANCE WITH A.D.A. SPECIFICATIONS. NO VALVES, HYDRANTS, ETC. SHALL BE CONSTRUCTED WITHIN CURBS, SIDEWALKS, OR DRIVEWAYS.

**SIGNING AND PAVEMENT MARKING PLAN NOTES**

THE CONTRACTOR SHALL FURNISH AND INSTALL ALL REGULATORY AND WARNING SIGNS, STREETS NAME SIGNS AND SIGN MOUNTS IN ACCORDANCE WITH APPROVED ENGINEERING PLANS. THE CITY WILL INSPECT ALL SIGNS AT FINAL INSPECTION.

THE CONTRACTOR SHALL INSTALL ALL PAVEMENT MARKINGS IN ACCORDANCE WITH APPROVED ENGINEERING PLANS. THE CONTRACTOR SHALL NOTIFY THE CITY AT LEAST TWENTY-FOUR (24 HOURS PRIOR TO THE INSTALLATION OF ALL SEALER AND FINAL MARKINGS. THE CITY WILL INSPECT ALL MARKINGS AT FINAL APPLICATION.

**SEEDING AND ESTABLISHMENT OF VEGETATION WITHIN EARTHEN CHANNELS, STORMWATER BASINS AND DISTURBED AREAS**

SEEDING FOR THE PURPOSE OF ESTABLISHING VEGETATION WITHIN CONSTRUCTED EARTHEN CHANNELS, BASINS AND DISTURBED AREAS SHALL BE CONDUCTED IN ACCORDANCE WITH ITEM 164 (SEEDING FOR EROSION CONTROL OF TXDOT'S STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS AND BRIDGES MANUAL. ONLY SEED TYPES AND MIXES SPECIFIED FOR THE SAN ANTONIO DISTRICT (DISTRICT 15 IN TABLES 1 AND 2 UNDER ITEM 164 SHALL BE UTILIZED. DURING THE COOL SEASON (SEPT 1-NOV 30, CEREAL RYE AND SEED SPECIES SPECIFIED FOR THE SAN ANTONIO DISTRICT IN TABLE 3 MAY BE USED. FOR COOL SEASON SEEDING APPLICATIONS, COOL SEASON SEED MIXES SHALL BE USED IN CONJUNCTION WITH SEED MIXES FOR THE SAN ANTONIO DISTRICT AS SPECIFIED IN TABLE 1 AND 2 UNDER ITEM 164.

IT MAY BE DEEMED NECESSARY TO INCORPORATE TOPSOIL AND SOIL AMENDMENTS (I.E. COMPOST/ FERTILIZER INTO EXISTING SOIL IN ORDER TO FACILITATE VEGETATION GROWTH. TOPSOIL, COMPOST AND FERTILIZER ADDITIONS SHALL BE CONDUCTED ACCORDING TO ITEMS 160, 161 AND 166 OF TXDOT'S STANDARD SPECIFICATIONS MANUAL, RESPECTIVELY.

AREAS REQUIRING PERMANENT VEGETATION (EARTHEN CHANNELS, PONDS, ETC.) ARE REQUIRED TO MEET TXDOT SPECIFICATIONS FOR ITEM 160 TOPSOIL. TESTING PER TEX-128-E WILL BE REQUIRED AT THE CITY'S REQUEST.

WATERING MAY ALSO BE NECESSARY TO FACILITATE AND EXPEDITE THE SPROUTING AND GROWTH OF VEGETATION. ITEM 168 OF TXDOT'S STANDARD SPECIFICATIONS MANUAL SHALL BE ADHERED TO FOR VEGETATIVE WATERING.

IF EXTENDED DROUGHT CONDITIONS EXIST THAT HINDER OR PROHIBIT THE GROWTH AND ESTABLISHMENT OF VEGETATION, THE CONTRACTOR/ DEVELOPER SHALL PROVIDE A PLAN TO THE CITY OF NEW BRAUNFELS DESCRIBING THE MEASURES THAT WILL BE TAKEN TO STABILIZE EARTHEN DRAINAGE INFRASTRUCTURE UNTIL A TIME WHEN GROWING CONDITIONS BECOME MORE FAVORABLE.

**MANHOLES**

NEW MANHOLES MUST BE CONSTRUCTED OF OR LINED WITH A CORROSION RESISTANT MATERIAL. WHERE NEW CONSTRUCTION CONNECTS TO AN EXISTING MANHOLE THAT IS NOT CONSTRUCTED OF A CORROSION RESISTANT MATERIAL, THE EXISTING MANHOLE MUST BE LINED WITH OR REPLACED WITH A CORROSION RESISTANT MATERIAL.

ALL MANHOLES SHALL BE CONSTRUCTED SO THAT THE TOP RING IS TWO INCHES (2") ABOVE THE SURROUNDING GROUND EXCEPT WHEN LOCATED IN PAVED AREA. IN PAVED AREAS, THE MANHOLE RING SHALL BE FLUSH WITH PAVEMENT.

ABBREVIATIONS		HORZ.	HORIZONTAL	RCP	REINFORCED CONCRETE PIPE
@	AT	I.D.	INSIDE DIAMETER	RD.	ROAD
APPROX.	APPROXIMATE	INST.	INSTALL	REINF.	REINFORCEMENT
BLDG.	BUILDING	JT.	JOINT	RT.	RIGHT
BL	BUILDING LINE	L.F.	LINEAR FEET	S	SOUTH
BM	BENCH MARK	LT.	LEFT	S.S.	STAINLESS STEEL
CF	CUBIC FEET	LEN.	LENGTH	WW	WASTEWATER
CI	CAST IRON	M.H.	MANHOLE	SCH.	SCHEDULE
C.I.P.	CAST IN PLACE	M.J.	MECHANICAL JOINT	SPEC'S	SPECIFICATIONS
CMP	CORRUGATED METAL PIPE	MIN.	MINIMUM	SQ.	SQUARE
CONC	CONCRETE	MISC.	MISCELLANEOUS	ST.	STREET
CONST	CONSTRUCT	N	NORTH	STA.	STATION
CONT	CONTINUOUS	N.T.S.	NOT TO SCALE	STD.	STANDARD
CU	CUBIC	N/A	NOT APPLICABLE	STL.	STEEL
CULV.	CULVERT	NO.	NUMBER	T.O.B.	TOP OF BANK
Δ	DEFLECTION ANGLE	O.C.E.W.	OFF CENTER EACH WAY	T.O.P.	TOP OF PIPE
DI	DUCTILE IRON	O.D.	OUTSIDE DIAMETER	TEL.	TELEPHONE
DIA	DIAMETER	P.C.	POINT OF CURVATURE	TELE	TELECOMMUNICATION
DTB	DITCH BOTTOM	P.R.	PRESSURE RATED	VERT.	VERTICAL
DTT	DITCH TOP	P.T.	POINT OF TANGENCY	W	WEST
DG	DOWN GUY	P/L	PIPELINE	W/	WITH
EA.	EACH	PL	PROPERTY LINE	W/O	WITHOUT
ELEC.	ELECTRIC	PP	UTILITY POLE	W.L.	WATERLINE
ELEV.	ELEVATION	PROP.	PROPOSED	WM	WATER METER
ENC.	ENCASEMENT	PSI	POUNDS PER SQUARE INCH	WT.	WATERTIGHT
E.O.G.	EDGE OF GRAVEL	PVC	POLYVINYL CHLORIDE	WV	WATER VALVE
EXIST.	EXISTING	PVMT.	PAVEMENT		
EXP.	EXPOSED	RJ	RESTRAINED JOINT		
FEN.	FENCE	R.O.W.	RIGHT OF WAY		
FH	FIRE HYDRANT				
FL	FLOWLINE				
FT.	FEET (FOOT)				
GAL.	GALLON				
GALV.	GALVANIZED				
HMAC	HOT MIX ASPHALTIC CONCRETE				

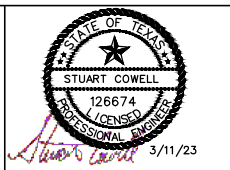
LOCATION OF EXISTING UNDERGROUND AND OVERHEAD UTILITIES ARE APPROXIMATE LOCATIONS ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES PRIOR TO BEGINNING WORK AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT OCCUR.



Know what's below. Call before you dig.

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23  
DESIGNED BY: JT  
DRAWN BY: JT  
CHECKED BY: SC  
APPROVED BY: SC



VERAMENDI WASTEWATER LINE

**LJA Engineering, Inc.**  
2700 LA FRONTERA BLVD. SUITE 150 ROUND ROCK, TEXAS 78735  
Phone 512.767.7300 Fax 512.439.4716 FRN-F-1386

GENERAL NOTES	JOB NUMBER: A441-2201
	SCALE: HORIZONTAL: N/A VERTICAL: N/A
	SHEET NO. 2 OF 43 SHEETS

03/10/2023 3/10/2023 P:\4412201\CADD\WORKING\FRONT\_END\_SHEETS.dwg scowell

**TEXAS COMMISSION ON ENVIRONMENTAL QUALITY ORGANIZED SEWAGE COLLECTION SYSTEM GENERAL CONSTRUCTION NOTES:**

1. THIS ORGANIZED SEWAGE COLLECTION SYSTEM (SCS) MUST BE CONSTRUCTED IN ACCORDANCE WITH 30 TEXAS ADMINISTRATIVE CODE (TAC) §213.5(C), THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY'S (TCEQ) EDWARDS AQUIFER RULES AND ANY LOCAL GOVERNMENT STANDARD SPECIFICATIONS.
2. ALL CONTRACTORS CONDUCTING REGULATED ACTIVITIES ASSOCIATED WITH THIS PROPOSED REGULATED PROJECT MUST BE PROVIDED WITH COPIES OF THE SCS PLAN AND THE TCEQ LETTER INDICATING THE SPECIFIC CONDITIONS OF ITS APPROVAL. DURING THE COURSE OF THESE REGULATED ACTIVITIES, THE CONTRACTORS MUST BE REQUIRED TO KEEP ON-SITE COPIES OF THE PLAN AND THE APPROVAL LETTER.
3. A WRITTEN NOTICE OF CONSTRUCTION MUST BE SUBMITTED TO THE PRESIDING TCEQ REGIONAL OFFICE AT LEAST 48 HOURS PRIOR TO THE START OF ANY REGULATED ACTIVITIES. THIS NOTICE MUST INCLUDE:
  - THE NAME OF THE APPROVED PROJECT;
  - THE ACTIVITY START DATE; AND
  - THE CONTACT INFORMATION OF THE PRIME CONTRACTOR.
4. ANY MODIFICATION TO THE ACTIVITIES DESCRIBED IN THE REFERENCED SCS APPLICATION FOLLOWING THE DATE OF APPROVAL MAY REQUIRE THE SUBMITTAL OF AN SCS APPLICATION TO MODIFY THIS APPROVAL, INCLUDING THE PAYMENT OF APPROPRIATE FEES AND ALL INFORMATION NECESSARY FOR ITS REVIEW AND APPROVAL.
5. PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITY, ALL TEMPORARY EROSION AND SEDIMENTATION (E&S) CONTROL MEASURES MUST BE PROPERLY INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS. THESE CONTROLS MUST REMAIN IN PLACE UNTIL THE DISTURBED AREAS HAVE BEEN PERMANENTLY STABILIZED.
6. IF ANY SENSITIVE FEATURES ARE DISCOVERED DURING THE WASTEWATER LINE TRENCHING ACTIVITIES, ALL REGULATED ACTIVITIES NEAR THE SENSITIVE FEATURE MUST BE SUSPENDED IMMEDIATELY. THE APPLICANT MUST IMMEDIATELY NOTIFY THE APPROPRIATE REGIONAL OFFICE OF THE TCEQ OF THE FEATURE DISCOVERED. A GEOLOGIST'S ASSESSMENT OF THE LOCATION AND EXTENT OF THE FEATURE DISCOVERED MUST BE REPORTED TO THAT REGIONAL OFFICE IN WRITING AND THE APPLICANT MUST SUBMIT A PLAN FOR ENSURING THE STRUCTURAL INTEGRITY OF THE SEWER LINE OR FOR MODIFYING THE PROPOSED COLLECTION SYSTEM ALIGNMENT AROUND THE FEATURE. THE REGULATED ACTIVITIES NEAR THE SENSITIVE FEATURE MAY NOT PROCEED UNTIL THE EXECUTIVE DIRECTOR HAS REVIEWED AND APPROVED THE METHODS PROPOSED TO PROTECT THE SENSITIVE FEATURE AND THE EDWARDS AQUIFER FROM ANY POTENTIALLY ADVERSE IMPACTS TO WATER QUALITY WHILE MAINTAINING THE STRUCTURAL INTEGRITY OF THE LINE.
7. SEWER LINES LOCATED WITHIN OR CROSSING THE 5-YEAR FLOODPLAIN OF A DRAINAGE WAY WILL BE PROTECTED FROM INUNDATION AND STREAM VELOCITIES WHICH COULD CAUSE EROSION AND SCOURING OF BACKFILL. THE TRENCH MUST BE CAPPED WITH CONCRETE TO PREVENT SCOURING OF BACKFILL, OR THE SEWER LINES MUST BE ENCASED IN CONCRETE. ALL CONCRETE SHALL HAVE A MINIMUM THICKNESS OF 6 INCHES.
8. BLASTING PROCEDURES FOR PROTECTION OF EXISTING SEWER LINES AND OTHER UTILITIES WILL BE IN ACCORDANCE WITH THE NATIONAL FIRE PROTECTION ASSOCIATION CRITERIA. SAND IS NOT ALLOWED AS BEDDING OR BACKFILL IN TRENCHES THAT HAVE BEEN BLASTED. IF ANY EXISTING SEWER LINES ARE DAMAGED, THE LINES MUST BE REPAIRED AND RETESTED.
9. ALL MANHOLES CONSTRUCTED OR REHABILITATED ON THIS PROJECT MUST HAVE WATERTIGHT SIZE ON SIZE RESILIENT CONNECTORS ALLOWING FOR DIFFERENTIAL SETTLEMENT. IF MANHOLES ARE CONSTRUCTED WITHIN THE 100-YEAR FLOODPLAIN, THE COVER MUST HAVE A GASKET AND BE BOLTED TO THE RING. WHERE GASKETED MANHOLE COVERS ARE REQUIRED FOR MORE THAN THREE MANHOLES IN SEQUENCE OR FOR MORE THAN 1500 FEET, ALTERNATE MEANS OF VENTING WILL BE PROVIDED. BRICKS ARE NOT AN ACCEPTABLE CONSTRUCTION MATERIAL FOR ANY PORTION OF THE MANHOLE.
 

THE DIAMETER OF THE MANHOLES MUST BE A MINIMUM OF FOUR FEET AND THE MANHOLE FOR ENTRY MUST HAVE A MINIMUM CLEAR OPENING DIAMETER OF 30 INCHES. THESE DIMENSIONS AND OTHER DETAILS SHOWING COMPLIANCE WITH THE COMMISSION'S RULES CONCERNING MANHOLES AND SEWER LINE/MANHOLE INVERTS DESCRIBED IN 30 TAC §217.55 ARE INCLUDED ON PLAN SHEET 260.

IT IS SUGGESTED THAT ENTRANCE INTO MANHOLES IN EXCESS OF FOUR FEET DEEP BE ACCOMPLISHED BY MEANS OF A PORTABLE LADDER. THE INCLUSION OF STEPS IN A MANHOLE IS PROHIBITED.
10. WHERE WATER LINES AND NEW SEWER LINE ARE INSTALLED WITH A SEPARATION DISTANCE CLOSER THAN NINE FEET (I.E., WATER LINES CROSSING WASTEWATER LINES, WATER LINES PARALLELING WASTEWATER LINES, OR WATER LINES NEXT TO MANHOLES) THE INSTALLATION MUST MEET THE REQUIREMENTS OF 30 TAC §217.53(D) (PIPE DESIGN) AND 30 TAC §290.44(E) (WATER DISTRIBUTION).
11. WHERE SEWERS LINES DEVIATE FROM STRAIGHT ALIGNMENT AND UNIFORM GRADE ALL CURVATURE OF SEWER PIPE MUST BE ACHIEVED BY THE FOLLOWING PROCEDURE WHICH IS RECOMMENDED BY THE PIPE MANUFACTURER: N/A.
 

IF PIPE FLEXURE IS PROPOSED, THE FOLLOWING METHOD OF PREVENTING DEFLECTION OF THE JOINT MUST BE USED: N/A.

SPECIFIC CARE MUST BE TAKEN TO ENSURE THAT THE JOINT IS PLACED IN THE CENTER OF THE TRENCH AND PROPERLY BEDDED IN ACCORDANCE WITH 30 TAC §217.54.
12. NEW SEWAGE COLLECTION SYSTEM LINES MUST BE CONSTRUCTED WITH STUB OUTS FOR THE CONNECTION OF ANTICIPATED EXTENSIONS. THE LOCATION OF SUCH STUB OUTS MUST BE MARKED ON THE GROUND SUCH THAT THEIR LOCATION CAN BE EASILY DETERMINED AT THE TIME OF CONNECTION OF THE EXTENSIONS. SUCH STUB OUTS MUST BE MANUFACTURED WYES OR TEES THAT ARE COMPATIBLE IN SIZE AND MATERIAL WITH BOTH THE SEWER LINE AND THE EXTENSION. AT THE TIME OF ORIGINAL CONSTRUCTION, NEW STUB-OUTS MUST BE CONSTRUCTED SUFFICIENTLY TO EXTEND BEYOND THE END OF THE STREET PAVEMENT. ALL STUB-OUTS MUST BE SEALED WITH A MANUFACTURED CAP TO PREVENT LEAKAGE. EXTENSIONS THAT WERE NOT ANTICIPATED AT THE TIME OF ORIGINAL CONSTRUCTION OR THAT ARE TO BE CONNECTED TO AN EXISTING SEWER LINE NOT FURNISHED WITH STUB OUTS MUST BE CONNECTED USING A MANUFACTURED SADDLE AND IN ACCORDANCE WITH ACCEPTED PLUMBING TECHNIQUES.
 

IF NO STUB-OUT IS PRESENT AN ALTERNATE METHOD OF JOINING LATERALS IS SHOWN IN THE DETAIL ON PLAN SHEET 263 OF 264. (FOR POTENTIAL FUTURE LATERALS).

THE PRIVATE SERVICE LATERAL STUB-OUTS MUST BE INSTALLED AS SHOWN ON THE PLAN AND PROFILE SHEETS ON PLAN SHEET 263 AND MARKED AFTER BACKFILLING AS SHOWN IN THE DETAIL ON PLAN SHEET 263 OF 264.
13. TRENCHING, BEDDING AND BACKFILL MUST CONFORM WITH 30 TAC §217.54. THE BEDDING AND BACKFILL FOR FLEXIBLE PIPE MUST COMPLY WITH THE STANDARDS OF ASTM D-2321, CLASSES IA, IB, II OR III. RIGID PIPE BEDDING MUST COMPLY WITH THE REQUIREMENTS OF ASTM C 12 (ANSI A 106.2) CLASSES A, B OR C.
14. SEWER LINES MUST BE TESTED FROM MANHOLE TO MANHOLE. WHEN A NEW SEWER LINE IS CONNECTED TO AN EXISTING STUB OR CLEAN-OUT, IT MUST BE TESTED FROM EXISTING MANHOLE TO NEW MANHOLE. IF A STUB OR CLEAN-OUT IS USED AT THE END OF THE PROPOSED SEWER LINE, NO PRIVATE SERVICE ATTACHMENTS MAY BE CONNECTED BETWEEN THE LAST MANHOLE AND THE CLEAN-OUT UNLESS IT CAN BE CERTIFIED AS CONFORMING WITH THE PROVISIONS OF 30 TAC §213.5(C)(3)(E).
15. ALL SEWER LINES MUST BE TESTED IN ACCORDANCE WITH 30 TAC §217.57. THE ENGINEER MUST RETAIN COPIES OF ALL TEST RESULTS WHICH MUST BE MADE AVAILABLE TO THE EXECUTIVE DIRECTOR UPON REQUEST. THE ENGINEER MUST CERTIFY IN WRITING THAT ALL WASTEWATER LINES HAVE PASSED ALL REQUIRED TESTING TO THE APPROPRIATE REGIONAL OFFICE WITHIN 30 DAYS OF TEST COMPLETION AND PRIOR TO USE OF THE NEW COLLECTION SYSTEM. TESTING METHOD WILL BE:
  - a. FOR A COLLECTION SYSTEM PIPE THAT WILL TRANSPORT WASTEWATER BY GRAVITY FLOW, THE DESIGN MUST SPECIFY AN INFILTRATION AND EXFILTRATION TEST OR A LOW-PRESSURE AIR TEST. A TEST MUST CONFORM TO THE FOLLOWING REQUIREMENTS:
    - (1) LOW PRESSURE AIR TEST.
      - (A) A LOW PRESSURE AIR TEST MUST FOLLOW THE PROCEDURES DESCRIBED IN AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) C-828, ASTM C-924, OR ASTM F-1417 OR OTHER PROCEDURE APPROVED BY THE EXECUTIVE DIRECTOR, EXCEPT AS TO TESTING TIMES AS REQUIRED IN TABLE C.3 IN SUBPARAGRAPH (C) OF THIS PARAGRAPH OR EQUATION C.3 IN SUBPARAGRAPH (B) (II) OF THIS PARAGRAPH.

- (B) FOR SECTIONS OF COLLECTION SYSTEM PIPE LESS THAN 36 INCH AVERAGE INSIDE DIAMETER, THE FOLLOWING PROCEDURE MUST APPLY, UNLESS A PIPE IS TO BE TESTED AS REQUIRED BY PARAGRAPH (2) OF THIS SUBSECTION.
  - (i) A PIPE MUST BE PRESSURIZED TO 3.5 POUNDS PER SQUARE INCH (PSI) GREATER THAN THE PRESSURE EXERTED BY GROUNDWATER ABOVE THE PIPE.
    - (ii) ONCE THE PRESSURE IS STABILIZED, THE MINIMUM TIME ALLOWABLE FOR THE PRESSURE TO DROP FROM 3.5 PSI GAUGE TO 2.5 PSI GAUGE IS COMPUTED FROM THE FOLLOWING EQUATION:
 
$$T = \frac{0.085xDxK}{Q}$$

EQUATION C.3

WHERE:

T = TIME FOR PRESSURE TO DROP 1.0 POUND PER SQUARE INCH GAUGE IN SECONDS  
 K = 0.000419 X D X L, BUT NOT LESS THAN 1.0  
 D = AVERAGE INSIDE PIPE DIAMETER IN INCHES  
 L = LENGTH OF LINE OF SAME SIZE BEING TESTED, IN FEET  
 Q = RATE OF LOSS, 0.0015 CUBIC FEET PER MINUTE PER SQUARE FOOT INTERNAL SURFACE
- (C) SINCE A K VALUE OF LESS THAN 1.0 MAY NOT BE USED, THE MINIMUM TESTING TIME FOR EACH PIPE DIAMETER IS SHOWN IN THE FOLLOWING TABLE C.3:

Pipe Diameter (inches)	Minimum Time (seconds)	Maximum Length for Minimum Time (feet)	Time for Longer Length (seconds/foot)
6	340	398	0.855
8	454	298	1.520
10	567	239	2.374
12	680	199	3.419
15	850	159	5.342
18	1020	133	7.693
21	1190	114	10.471
24	1360	100	13.676
27	1530	88	17.309
30	1700	80	21.369
33	1870	72	26.856

- (D) AN OWNER MAY STOP A TEST IF NO PRESSURE LOSS HAS OCCURRED DURING THE FIRST 25% OF THE CALCULATED TESTING TIME.
- (E) IF ANY PRESSURE LOSS OR LEAKAGE HAS OCCURRED DURING THE FIRST 25% OF A TESTING PERIOD, THEN THE TEST MUST CONTINUE FOR THE ENTIRE TEST DURATION AS OUTLINED ABOVE OR UNTIL FAILURE.
- (F) WASTEWATER COLLECTION SYSTEM PIPES WITH A 27 INCH OR LARGER AVERAGE INSIDE DIAMETER MAY BE AIR TESTED AT EACH JOINT INSTEAD OF FOLLOWING THE PROCEDURE OUTLINED IN THIS SECTION.
- (G) A TESTING PROCEDURE FOR PIPE WITH AN INSIDE DIAMETER GREATER THAN 33 INCHES MUST BE APPROVED BY THE EXECUTIVE DIRECTOR.
- (2) INFILTRATION/EXFILTRATION TEST.
  - (A) THE TOTAL EXFILTRATION, AS DETERMINED BY A HYDROSTATIC HEAD TEST, MUST NOT EXCEED 50 GALLONS PER INCH OF DIAMETER PER MILE OF PIPE PER 24 HOURS AT A MINIMUM TEST HEAD OF 2.0 FEET ABOVE THE CROWN OF A PIPE AT AN UPSTREAM MANHOLE.
  - (B) AN OWNER SHALL USE AN INFILTRATION TEST IN LIEU OF AN EXFILTRATION TEST WHEN PIPES ARE INSTALLED BELOW THE GROUNDWATER LEVEL.
  - (C) THE TOTAL EXFILTRATION, AS DETERMINED BY A HYDROSTATIC HEAD TEST, MUST NOT EXCEED 50 GALLONS PER INCH DIAMETER PER MILE OF PIPE PER 24 HOURS AT A MINIMUM TEST HEAD OF TWO FEET ABOVE THE CROWN OF A PIPE AT AN UPSTREAM MANHOLE, OR AT LEAST TWO FEET ABOVE EXISTING GROUNDWATER LEVEL, WHICHEVER IS GREATER.
  - (D) FOR CONSTRUCTION WITHIN A 25-YEAR FLOOD PLAIN, THE INFILTRATION OR EXFILTRATION MUST NOT EXCEED 10 GALLONS PER INCH DIAMETER PER MILE OF PIPE PER 24 HOURS AT THE SAME MINIMUM TEST HEAD AS IN SUBPARAGRAPH (C) OF THIS PARAGRAPH.
  - (E) IF THE QUANTITY OF INFILTRATION OR EXFILTRATION EXCEEDS THE MAXIMUM QUANTITY SPECIFIED, AN OWNER SHALL UNDERTAKE REMEDIAL ACTION IN ORDER TO REDUCE THE INFILTRATION OR EXFILTRATION TO AN AMOUNT WITHIN THE LIMITS SPECIFIED. AN OWNER SHALL RETEST A PIPE FOLLOWING A REMEDIATION ACTION.
- (b) IF A GRAVITY COLLECTION PIPE IS COMPOSED OF FLEXIBLE PIPE, DEFLECTION TESTING IS ALSO REQUIRED. THE FOLLOWING PROCEDURES MUST BE FOLLOWED:
  - (1) FOR A COLLECTION PIPE WITH INSIDE DIAMETER LESS THAN 27 INCHES, DEFLECTION MEASUREMENT REQUIRES A RIGID MANDREL.
    - (A) MANDREL SIZING.
      - (i) A RIGID MANDREL MUST HAVE AN OUTSIDE DIAMETER (OD) NOT LESS THAN 95% OF THE BASE INSIDE DIAMETER (ID) OR AVERAGE ID OF A PIPE, AS SPECIFIED IN THE APPROPRIATE STANDARD BY THE ASTM, AMERICAN WATER WORKS ASSOCIATION, UNI-BELL, OR AMERICAN NATIONAL STANDARDS INSTITUTE, OR ANY RELATED APPENDIX.
      - (ii) IF A MANDREL SIZING DIAMETER IS NOT SPECIFIED IN THE APPROPRIATE STANDARD, THE MANDREL MUST HAVE AN OD EQUAL TO 95% OF THE ID OF A PIPE. IN THIS CASE, THE ID OF THE PIPE, FOR THE PURPOSE OF DETERMINING THE OD OF THE MANDREL, MUST EQUAL BE THE AVERAGE OUTSIDE DIAMETER MINUS TWO MINIMUM WALL THICKNESSES FOR OD CONTROLLED PIPE AND THE AVERAGE INSIDE DIAMETER FOR ID CONTROLLED PIPE.
    - (iii) ALL DIMENSIONS MUST MEET THE APPROPRIATE STANDARD.
  - (B) MANDREL DESIGN.
    - (i) A RIGID MANDREL MUST BE CONSTRUCTED OF A METAL OR A RIGID PLASTIC MATERIAL THAT CAN WITHSTAND 200 PSI WITHOUT BEING DEFORMED.
    - (ii) A MANDREL MUST HAVE NINE OR MORE ODD NUMBER OF RUNNERS OR LEGS.
    - (iii) A BARREL SECTION LENGTH MUST EQUAL AT LEAST 75% OF THE INSIDE DIAMETER OF A PIPE.
    - (iv) EACH SIZE MANDREL MUST USE A SEPARATE PROVING RING.
- (C) METHOD OPTIONS.
  - (i) AN ADJUSTABLE OR FLEXIBLE MANDREL IS PROHIBITED.
  - (ii) A TEST MAY NOT USE TELEVISION INSPECTION AS A SUBSTITUTE FOR A DEFLECTION TEST.

- (iii) IF REQUESTED, THE EXECUTIVE DIRECTOR MAY APPROVE THE USE OF A DEFLECTOMETER OR A MANDREL WITH REMOVABLE LEGS OR RUNNERS ON A CASE-BY-CASE BASIS.
- (2) FOR A GRAVITY COLLECTION SYSTEM PIPE WITH AN INSIDE DIAMETER 27 INCHES AND GREATER, OTHER TEST METHODS MAYBE USED TO DETERMINE VERTICAL DEFLECTION.
  - (3) A DEFLECTION TEST METHOD MUST BE ACCURATE TO WITHIN PLUS OR MINUS 0.2% DEFLECTION.
  - (4) AN OWNER SHALL NOT CONDUCT A DEFLECTION TEST UNTIL AT LEAST 30 DAYS AFTER THE FINAL BACKFILL.
  - (5) GRAVITY COLLECTION SYSTEM PIPE DEFLECTION MUST NOT EXCEED FIVE PERCENT (5%).
  - (6) IF A PIPE SECTION FAILS A DEFLECTION TEST, AN OWNER SHALL CORRECT THE PROBLEM AND CONDUCT A SECOND TEST AFTER THE FINAL BACKFILL HAS BEEN IN PLACE AT LEAST 30 DAYS.
16. ALL MANHOLES MUST BE TESTED TO MEET OR EXCEED THE REQUIREMENTS OF 30 TAC §217.58.
  - a. ALL MANHOLES MUST PASS A LEAKAGE TEST.
  - b. AN OWNER SHALL TEST EACH MANHOLE (AFTER ASSEMBLY AND BACKFILLING) FOR LEAKAGE, SEPARATE AND INDEPENDENT OF THE COLLECTION SYSTEM PIPES, BY HYDROSTATIC EXFILTRATION TESTING, VACUUM TESTING, OR OTHER METHOD APPROVED BY THE EXECUTIVE DIRECTOR.
    - (1) HYDROSTATIC TESTING.
      - (A) THE MAXIMUM LEAKAGE FOR HYDROSTATIC TESTING OR ANY ALTERNATIVE TEST METHODS IS 0.025 GALLONS PER FOOT DIAMETER PER FOOT OF MANHOLE DEPTH PER HOUR.
      - (B) TO PERFORM A HYDROSTATIC EXFILTRATION TEST, AN OWNER SHALL SEAL ALL WASTEWATER PIPES COMING INTO A MANHOLE WITH AN INTERNAL PIPE PLUG, FILL THE MANHOLE WITH WATER, AND MAINTAIN THE TEST FOR AT LEAST ONE HOUR.
      - (C) A TEST FOR CONCRETE MANHOLES MAY USE A 24-HOUR WETTING PERIOD BEFORE TESTING TO ALLOW SATURATION OF THE CONCRETE.
    - (2) VACUUM TESTING.
      - (A) TO PERFORM A VACUUM TEST, AN OWNER SHALL PLUG ALL LIFT HOLES AND EXTERIOR JOINTS WITH A NON-SHRINK GROUT AND PLUG ALL PIPES ENTERING A MANHOLE.
      - (B) NO GROUT MUST BE PLACED IN HORIZONTAL JOINTS BEFORE TESTING.
      - (C) STUB-OUTS, MANHOLE BOOTS, AND PIPE PLUGS MUST BE SECURED TO PREVENT MOVEMENT WHILE A VACUUM IS DRAWN.
      - (D) AN OWNER SHALL USE A MINIMUM 60 INCH/LB TORQUE WRENCH TO TIGHTEN THE EXTERNAL CLAMPS THAT SECURE A TEST COVER TO THE TOP OF A MANHOLE.
      - (E) A TEST HEAD MUST BE PLACED AT THE INSIDE OF THE TOP OF A CONE SECTION, AND THE SEAL INFLATED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
      - (F) THERE MUST BE A VACUUM OF 10 INCHES OF MERCURY INSIDE A MANHOLE TO PERFORM A VALID TEST.
      - (G) A TEST DOES NOT BEGIN UNTIL AFTER THE VACUUM PUMP IS OFF.
      - (H) A MANHOLE PASSES THE TEST IF AFTER 2.0 MINUTES AND WITH ALL VALVES CLOSED, THE VACUUM IS AT LEAST 9.0 INCHES OF MERCURY.
17. ALL PRIVATE SERVICE LATERALS MUST BE INSPECTED AND CERTIFIED IN ACCORDANCE WITH 30 TAC §213.5(C)(3)(I). AFTER INSTALLATION OF AND, PRIOR TO COVERING AND CONNECTING A PRIVATE SERVICE LATERAL TO AN EXISTING ORGANIZED SEWAGE COLLECTION SYSTEM, A TEXAS LICENSED PROFESSIONAL ENGINEER, TEXAS REGISTERED SANITARIAN, OR APPROPRIATE CITY INSPECTOR MUST VISUALLY INSPECT THE PRIVATE SERVICE LATERAL AND THE CONNECTION TO THE SEWAGE COLLECTION SYSTEM, AND CERTIFY THAT IT IS CONSTRUCTED IN CONFORMITY WITH THE APPLICABLE PROVISIONS OF THIS SECTION. THE OWNER OF THE COLLECTION SYSTEM MUST MAINTAIN SUCH CERTIFICATIONS FOR FIVE YEARS AND FORWARD COPIES TO THE APPROPRIATE REGIONAL OFFICE UPON REQUEST. CONNECTIONS MAY ONLY BE MADE TO AN APPROVED SEWAGE COLLECTION SYSTEM.

AUSTIN REGIONAL OFFICE  
 12100 PARK 35 CIRCLE, BUILDING A  
 AUSTIN, TEXAS 78753-1808  
 PHONE (512) 339-2929  
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 14250 JUDSON ROAD  
 SAN ANTONIO, TEXAS 78233-4480  
 PHONE (210) 490-3096  
 FAX (210) 545-4329

LOCATION OF EXISTING UNDERGROUND AND OVERHEAD UTILITIES ARE APPROXIMATE LOCATIONS ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES PRIOR TO BEGINNING WORK AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT OCCUR.



REVISIONS		BY	DATE
NO.	DESCRIPTION		

DATE: 3/11/23

DESIGNED BY: JT

DRAWN BY: JT

CHECKED BY: SC

APPROVED BY: SC

VERAMENDI  
WASTEWATER LINE

**LJA Engineering, Inc.**

2700 LA FRONTERA BLVD. Phone 512.767.7300  
 SUITE 150 Fax 512.439.4716  
 ROUND ROCK, TEXAS 78735 FRN-F-1386

TCEQ NOTES

JOB NUMBER: A441-2201

SCALE:  
 HORIZONTAL: 1" = 40'  
 VERTICAL: 1" = 10'

SHEET NO. 3  
 OF 43 SHEETS

**NBU GENERAL NOTES:**

REVISED MARCH 31, 2011

- ALL MATERIALS AND CONSTRUCTION PROCEDURES WITHIN THE SCOPE OF THE PROJECT SHALL BE APPROVED BY NEW BRAUNFELS UTILITIES AND COMPLY WITH THE CURRENT "NEW BRAUNFELS UTILITIES WATER SYSTEMS CONNECTION/CONSTRUCTION POLICY".
- CONTRACTOR SHALL NOT PROCEED WITH ANY PIPE INSTALLATION WORK UNTIL THEY OBTAIN A COPY OF THE PLANS FROM THE CONSULTANT OR ENGINEER AND NOTIFY NBU WATER SYSTEMS ENGINEERING AT 830-608-8971 WITH AT LEAST TWO (2) WORKING DAYS (48 HOURS) NOTICE. WORK COMPLETED BY THE CONTRACTOR, WHICH HAS NOT RECEIVED A NOTICE TO PROCEED FROM NEW BRAUNFELS UTILITIES WATER SYSTEMS ENGINEERING WILL BE SUBJECT TO REMOVAL AND REPLACEMENT BY AND AT THE EXPENSE OF THE CONTRACTOR.
- THE DEVELOPER DEDICATES THE WATER / WASTEWATER MAINS UPON COMPLETION BY THE CONTRACTOR AND ACCEPTANCE BY THE NEW BRAUNFELS UTILITIES WATER SYSTEM. NBU WILL OWN AND MAINTAIN SAID WATER / WASTEWATER MAINS WHICH ARE LOCATED WITHIN PLATTED UTILITY EASEMENTS OR PUBLIC ROW OF PROPOSED DEVELOPMENTS. (AS APPLICABLE).
- CONTRACTOR AGREES TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNERS AND THE ENGINEER AND HIS EMPLOYEES, PARTNERS OFFICERS, DIRECTORS, OR CONSULTANTS HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF THE WORK ON THIS PROJECT, EXCEPTING FROM LIABILITY ARISING FROM SOLE NEGLIGENCE OF THE OWNER OR ENGINEER, ENGINEER'S DIRECTORS, OFFICERS, EMPLOYEES, OR CONSULTANTS.
- CONTRACTOR TO CONTACT THE ENGINEER-OF-RECORD (EOR) FOR ANY FIELD CHANGES. ANY REVISIONS OR CHANGES TO THE APPROVED CONSTRUCTION PLANS WILL REQUIRE ADDITIONAL APPROVAL BY NBU IN WRITING.
- CONTRACTOR AND / OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR SAFETY CONSULTANT SHALL IMPLEMENT A TRENCH SAFETY PROGRAM IN ACCORDANCE WITH OSHA STANDARDS GOVERNING THE PRESENCE AND ACTIVITIES OF INDIVIDUALS WORKING IN AND AROUND TRENCH EXCAVATION.
- CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING TO ITS ORIGINAL OR BETTER CONDITION, ANY DAMAGES DONE TO EXISTING FENCES, CURBS, STREETS, DRIVEWAYS, LANDSCAPING AND STRUCTURES, AND EXISTING UTILITIES (NOT ADJUSTED ON PLANS). COST OF RESTORATIONS, IF ANY, SHALL BE THE CONTRACTOR'S ENTIRE EXPENSE.
- THE CONTRACTOR SHALL AVOID CUTTING ROOTS LARGER THAN ONE INCH IN DIAMETER WHEN EXCAVATING NEAR EXISTING TREES. EXCAVATION IN VICINITY OF TREES SHALL PROCEED WITH CAUTION.
- CONTRACTOR SHALL PROCURE ALL PERMITS AND LICENSES, PAY ALL CHARGES, FEES AND TAXES AND GIVE ALL NOTICES NECESSARY AND INCIDENTAL TO THE DUE AND LAWFUL PROSECUTION OF THE WORK.
- NO EXTRA PAYMENT SHALL BE ALLOWED FOR WORK CALLED FOR ON THE PLANS BUT NOT INCLUDED ON THE BID SCHEDULE. THIS INCIDENTAL WORK WILL BE REQUIRED AND SHALL BE INCLUDED UNDER THE PAY ITEM TO WHICH IT RELATES.
- CONTRACTOR IS RESPONSIBLE FOR REMOVAL OF ALL WASTE MATERIALS UPON PROJECT COMPLETION. THE CONTRACTOR SHALL NOT PERMANENTLY PLACE ANY WASTE MATERIALS IN THE 100-YEAR FLOOD PLAIN WITHOUT FIRST OBTAINING AN APPROVED FLOOD PLAIN DEVELOPMENT PERMIT.
- THE CONTRACTOR SHALL NOT PLACE ANY MATERIALS ON THE RECHARGE ZONE OF THE EDWARDS AQUIFER WITHOUT AN APPROVED WATER POLLUTION ABATEMENT PLAN FROM THE TCEQ 31 TAC 313.4 AND 31 TAC 313.9.
- BARRICADES AND WARNING SIGNS SHALL CONFORM TO THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AND SHALL BE LOCATED TO PROVIDE MAXIMUM PROTECTION TO THE PUBLIC AS WELL AS CONSTRUCTION PERSONNEL AND EQUIPMENT WHILE PROVIDING CONTINUOUS TRAFFIC FLOW AT ALL TIMES DURING CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL DEVICES DURING CONSTRUCTION.
- CONTRACTOR IS REQUIRED TO VERIFY PROJECT ELEVATIONS. THE TERM "MATCH EXISTING" SHALL BE UNDERSTOOD TO SIGNIFY BOTH HORIZONTAL AND VERTICAL ALIGNMENT.
- THE LOCATION OF UTILITIES, EITHER UNDERGROUND OR OVERHEAD, SHOWN WITHIN THE RIGHT OF WAY ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR BEFORE BEGINNING CONSTRUCTION OPERATIONS.
- OSHA REGULATIONS PROHIBIT OPERATIONS THAT WILL BRING PERSONS OR EQUIPMENT WITHIN 10 FEET OF AN ENERGIZED LINE. WHERE WORKMEN AND/OR EQUIPMENT HAVE TO WORK CLOSE TO AN ENERGIZED ELECTRICAL LINE, THE CONTRACTOR SHALL NOTIFY THE ELECTRICAL POWER COMPANY INVOLVED AND MAKE WHATEVER ADJUSTMENTS NECESSARY TO ENSURE THE SAFETY OF THOSE WORKMEN.
- IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LOCATE UTILITY SERVICE LINES AS REQUIRED FOR CONSTRUCTION. CONTRACTORS SHALL CALL THE ONE CALL SYSTEM FOR WATER/WASTEWATER LOCATION.
- DUE TO FEDERAL REGULATIONS TITLE 49, PART 192 (8), GAS COMPANIES MUST MAINTAIN ACCESS TO GAS VALVES AT ALL TIMES. THE CONTRACTOR MUST PROTECT AND WORK AROUND ANY GAS VALVES THAT ARE IN THE PROJECT AREA.
- THE CONTRACTOR IS FULLY RESPONSIBLE FOR THE TRAFFIC CONTROL AND WILL BE RESPONSIBLE FOR FURNISHING ALL TRAFFIC CONTROL DEVICES, AND FLAGGERS. THE CONSTRUCTION METHODS SHALL BE CONDUCTED TO PROVIDE THE LEAST POSSIBLE INTERFERENCE TO TRAFFIC SO AS TO PERMIT THE CONTINUOUS MOVEMENT OF THE TRAFFIC IN ONE DIRECTION AT ALL TIMES. THE CONTRACTOR SHALL CLEAN UP AND REMOVE FROM THE WORK AREA ANY LOOSE MATERIAL RESULTING FROM CONTRACT OPERATIONS AT THE END OF EACH WORKDAY.
- PRIOR TO ORDERING MATERIALS TO BE USED IN CONSTRUCTION, CONTRACTOR SHALL PROVIDE THE ENGINEER WITH FOUR (4) COPIES OF THE SOURCE, TYPE, GRADATION, MATERIAL SPECIFICATION DATA AND / OR SHOP DRAWINGS, AS APPLICABLE, TO SATISFY THE REQUIREMENTS OF THE FOLLOWING ITEMS AND ALL MATERIAL ITEMS REFERRED TO IN THESE LISTED ITEMS:
  - WATER MAINS AND SERVICES
  - WASTEWATER MAINS AND SERVICES
- THRUST BLOCKS WILL NOT BE ALLOWED ON THE SYSTEM WITHOUT SPECIAL APPROVAL. JOINTS WILL BE RESTRAINED WITH RESTRAINING SYSTEMS APPROVED BY NBU AND RESTRAINT LENGTH SHALL BE SUBMITTED TO NBU AT THE TIME OF PLAN SUBMITTAL.
- WATER JETTING THE BACKFILL WITHIN A STREET WILL NOT BE PERMITTED. WASTEWATER TRENCHES SUBJECT TO TRAFFIC SHALL CONFORM TO NBU CONNECTION AND CONSTRUCTION POLICY MANUAL.
- WHERE THE MINIMUM 9 FOOT SEPARATION DISTANCE BETWEEN WASTEWATER LINES AND WATER LINES / MAINS CANNOT BE MAINTAINED, THE INSTALLATION OF WASTEWATER LINES SHALL BE IN STRICT ACCORDANCE WITH 30 TAC 217.
- CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR STRUCTURAL DESIGN/GEOTECHNICAL/SAFETY/EQUIPMENT CONSULTANT, IF ANY, SHALL REVIEW THESE PLANS AND AVAILABLE GEOTECHNICAL INFORMATION AND THE ANTICIPATED INSTALLATION SITE(S) WITHIN THE PROJECT WORK AREA IN ORDER TO IMPLEMENT CONTRACTOR'S TRENCH EXCAVATION SAFETY PROTECTION SYSTEMS, PROGRAMS AND/OR PROCEDURES. THE CONTRACTOR'S IMPLEMENTATION OF THE SYSTEMS, PROGRAMS AND/OR PROCEDURES SHALL PROVIDE FOR ADEQUATE TRENCH EXCAVATION SAFETY PROTECTION THAT COMPLIES WITH AS A MINIMUM, OSHA STANDARDS FOR TRENCH EXCAVATIONS. SPECIFICALLY, CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR SAFETY CONSULTANT SHALL IMPLEMENT A TRENCH SAFETY PROGRAM IN ACCORDANCE WITH OSHA STANDARDS GOVERNING THE PRESENCE AND ACTIVITIES OF INDIVIDUALS WORKING IN AND AROUND TRENCH EXCAVATION.

**25. UTILITY TRENCH COMPACTION WITH STREET R.O.W.**

- ALL UTILITY TRENCH COMPACTION TEST WITHIN THE STREET PAVEMENT SECTION SHALL BE THE RESPONSIBILITY OF THE DEVELOPER'S GEO-TECHNICAL ENGINEER.
- FILL MATERIAL SHALL BE PLACED IN UNIFORM LAYERS NOT TO EXCEED TWELVE INCHES (12") LOOSE.
- EACH LAYER OF MATERIAL SHALL BE COMPACTED AS SPECIFIED AND TESTED FOR DENSITY AND MOISTURE IN ACCORDANCE WITH TEXT METHODS TEX-113-E, TEX- 114-E, TEX-115-E.
- THE NUMBER AND LOCATION OF REQUIRED TESTS SHALL BE DETERMINED BY THE GEO- TECHNICAL ENGINEER AND APPROVED BY THE CITY OF NEW BRAUNFELS STREET INSPECTOR.
- UPON COMPLETION OF TESTING THE GEO-TECHNICAL ENGINEER SHALL PROVIDE THE CITY OF NEW BRAUNFELS STREET INSPECTOR WITH ALL TESTING DOCUMENTATION AND A CERTIFICATION STATING THAT THE PLACEMENT OF FILL MATERIAL HAS BEEN COMPLETED IN ACCORDANCE WITH THE PLANS.

**NBU WASTEWATER NOTES:**

REVISED MARCH 3, 2020

- THE CONTRACTOR SHALL MAINTAIN SERVICE TO EXISTING WASTEWATER SYSTEM AT ALL TIMES DURING CONSTRUCTION.
- A MINIMUM OF 8" WASTEWATER PIPE AND FITTINGS (P.V.C. SDR-26, ASTM, D- 3034, D-3212, F-477) ARE REQUIRED ON NEW INSTALLATION.
- ALL RESIDENTIAL WASTEWATER SERVICE LATERALS SHALL BE EXTENDED TO THE PROPERTY LINE AND A CLEANOUT SHALL BE INSTALLED AT THE PROPERTY LINE. SERVICES TO LOTS WILL EXTEND FOUR (4) FEET PAST THE UNDERGROUND ELECTRIC CONDUIT IF ELECTRIC IS INSTALLED IN THE FRONT EASEMENT. ALL SEWER CLEANOUTS THAT LEAD TO NBU MAINS SHALL BE INSTALLED WITH A PROTECTIVE UTILITY SHROUD AND PIVOTING MARKER POLE DURING TIME OF CONSTRUCTION.
- PIPE BEDDING OF WASTEWATER LINES SHALL BE MANUFACTURED SAND OR PEA GRAVEL AS PER NBU SPECIFICATIONS.
- SECONDARY BACKFILL OF WASTEWATER LINES SHALL GENERALLY CONSIST OF MATERIALS REMOVED FROM THE TRENCH AND SHALL BE FREE FROM BRUSH, DEBRIS AND TRASH, NO ROCKS OR STONES HAVING ANY DIMENSION LARGER THAN 6 INCHES AT THE LARGEST DIMENSION.
- ALL WASTEWATER PIPES SHALL HAVE COMPRESSION OR MECHANICAL JOINTS AS PER 30 TAC §217.53 (C) (2).
- FOR WASTEWATER LINES LESS THAN 24" IN DIAMETER, SELECT INITIAL BACKFILL MATERIAL SHALL BE PLACED IN TWO LIFTS.
  - THE FIRST LIFT SHALL BE SPREAD UNIFORMLY AND SIMULTANEOUSLY ON EACH SIDE AND UNDER THE SHOULDERS OF THE PIPE TO THE MID POINT OR SPRING LINE OF THE PIPE.
  - THE SECOND LIFT SHALL BE PLACED TO A DEPTH AS SHOWN ON THE PIPE BACKFILL DETAIL. FOR PIPES LARGER THAN 24", 12" MAXIMUM LIFTS SHALL BE USED.
- ALL MANHOLES MUST BE WATER TIGHT, EITHER MONOLITHIC, CAST-IN-PLACE CONCRETE STRUCTURES OR PREFABRICATED MANHOLES SPECIFICALLY APPROVED BY NBU. THE MANHOLES SHALL HAVE WATER-TIGHT RINGS AND COVERS. WHEREVER THEY ARE WITHIN THE 100 YEAR FLOODPLAIN, THE MANHOLE COVERS SHALL BE BOLTED. EVERY THIRD MANHOLE IN SEQUENCE SHALL HAVE AN ALTERNATE MEANS OF VENTING. 30 TAC §213.5 (C) (3) (A) AND 30 TAC §217.55 (O).
- ALL MANHOLES SHALL BE CONSTRUCTED SO THAT THE TOP OF THE RING IS TWO INCHES (2") ABOVE SURROUNDING GROUND EXCEPT WHEN LOCATED IN PAVED AREA. IN PAVED AREAS, THE MANHOLE RING SHALL BE FLUSH WITH PAVEMENT.
- ALL NEW MANHOLES, UNLESS APPROVED BY NBU ENGINEERING, ARE TO HAVE COVERS WITH 32" OPENINGS.
- WASTEWATER PIPE CONNECTIONS TO PRE-CAST MANHOLES WILL BE COMPRESSION JOINTS OR MECHANICAL "BOOT TYPE" JOINT AS APPROVED BY NBU.
- WASTEWATER LINES SHALL BE TESTED FROM MANHOLE TO MANHOLE.
- IN AREAS WHERE A NEW WASTEWATER MANHOLE IS TO BE CONSTRUCTED OVER AN EXISTING WASTEWATER SYSTEM, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO TEST THE EXISTING MANHOLES BEFORE CONSTRUCTION. AFTER THE PROPOSED MANHOLE(S) HAS BEEN BUILT, THE CONTRACTOR SHALL RE-TEST THE EXISTING SYSTEM TO THE SATISFACTION OF THE CONSTRUCTION INSPECTOR. (NO SEPARATE PAY ITEM).
- WHERE THE MINIMUM 9 FOOT SEPARATION DISTANCE BETWEEN WASTEWATER LINES AND WATER LINES / MAINS CANNOT BE MAINTAINED, THE INSTALLATION OF WASTEWATER LINES SHALL BE IN STRICT ACCORDANCE WITH TCEQ. THE WASTEWATER LINE SHALL BE CONSTRUCTED OF CAST IRON, DUCTILE IRON OR PVC MEETING THE ASTM SPECIFICATION FOR BOTH PIPES AND JOINTS OF 150 PSI AND SHALL BE IN ACCORDANCE WITH 30 TAC §217.53 (D) (3) (A) (I).
- NO TESTING WILL BE PERFORMED PRIOR TO 30 DAYS FROM COMPLETE INSTALLATION OF THE WASTEWATER LINES. THE FOLLOWING SEQUENCE WILL BE STRICTLY ADHERED TO:
  - PULL MANDREL
  - PERFORM AIR TEST
  - CLEANING OF ANY DEBRIS
  - FLUSHING OF SYSTEM
  - TV INSPECTION (WITHIN 72 HOURS OF FLUSHING)
- A MINIMUM OF 3 FEET OF COVER IS TO BE MAINTAINED OVER THE WASTEWATER MAIN AND LATERALS AT SUBGRADE, OTHERWISE CONCRETE ENCASEMENT WILL BE REQUIRED.
- WASTEWATER MAIN CONNECTIONS MADE DIRECTLY TO EXISTING MANHOLES WILL REQUIRE SUCCESSFUL TESTING OF THE MANHOLE IN ACCORDANCE WITH NBU CONNECTION & CONSTRUCTION POLICY MANUAL.
- TCEQ AND EPA REQUIRE EROSION AND SEDIMENTATION CONTROL FOR CONSTRUCTION OF WASTEWATER COLLECTION SYSTEMS. DEVELOPER OR AUTHORIZED REPRESENTATIVE SHALL PROVIDE EROSION AND SEDIMENTATION CONTROL AS NOTES ON THE PROJECT'S PLAN AND PROFILE SHEETS. ALL TEMPORARY EROSION AND SEDIMENTATION CONTROLS SHALL BE REMOVED BY THE CONTRACTOR AT FINAL ACCEPTANCE OF THE PROJECT BY NBU WATER SYSTEMS.
- ALL MANHOLES NOT WITHIN PAVED STREETS SHALL HAVE LOCKING CONCRETE COLLAR TO SECURE RING AND COVER TO MANHOLE CONE PER NBU DETAIL DRAWING #329.
- ALL MANHOLES OVER THE EDWARDS AQUIFER RECHARGE ZONE SHALL HAVE LOCKING CONCRETE COLLAR TO SECURE RING AND COVER TO MANHOLE CONE PER NBU DETAIL DRAWING #329.

**ADDITIONAL NOTES:**

- ALL RESPONSIBILITY FOR THE ADEQUACY OF THESE PLANS REMAINS WITH THE ENGINEER OF RECORD. IN ACCEPTING THESE PLANS, NEW BRAUNFELS UTILITIES MUST RELY UPON THE ADEQUACY OF THE WORK OF THE ENGINEER OF RECORD.
- THE ENGINEER OF RECORD ACKNOWLEDGES THAT ALL PROPOSED WATER OR WASTEWATER IMPROVEMENTS MUST COMPLY WITH TCEQ, CITY OF NEW BRAUNFELS, W&WW DESIGN CRITERIA, SOUND ENGINEERING JUDGMENT, AND ANY OTHER GOVERNING ENTITY ORDINANCES OR CODES.
- ENGINEER OF RECORD ACKNOWLEDGES THAT THE POINT OF DELIVERY FOR THE NBU WATER SYSTEM IS THE MAIN SIDE OF THE SERVICE/LATERAL/LEAD FROM THE CUSTOMER'S METER/BACKFLOW/EASEMENT EDGE. THE CUSTOMER IS RESPONSIBLE FOR DESIGN, CONSTRUCTION, OPERATION AND MAINTENANCE BEYOND THE POINT OF DELIVERY AND HAS SOLE CONTROL AND SUPERVISION OVER THE CUSTOMER'S INSTALLATION INCLUDING REVIEW, PERMITTING, AND COMPLIANCE WITH ALL CITY PLUMBING CODES OR OTHER APPLICABLE CODES.
- ENGINEER OF RECORD ACKNOWLEDGES THAT THE POINT OF DELIVERY FOR AN NBU WASTEWATER SYSTEM IS THE MAIN SIDE OF THE SERVICE/LATERAL/LEAD FROM THE CUSTOMER'S CLEAN OUT OR PROPERTY LINE WHICHEVER IS NEARER. THE CUSTOMER IS RESPONSIBLE FOR DESIGN, CONSTRUCTION, OPERATION AND MAINTENANCE BEYOND THE POINT OF DELIVERY AND HAS SOLE CONTROL AND SUPERVISION OVER THE CUSTOMER'S INSTALLATION INCLUDING REVIEW, PERMITTING AND COMPLIANCE WITH ALL CITY PLUMBING CODES AND OTHER CODES AS APPLICABLE.
- WATER IS A PRECIOUS COMMODITY IN THE STATE OF TEXAS AND NEW BRAUNFELS UTILITIES (NBU) IS PASSIONATE ABOUT PROTECTING THE LOCAL RESOURCE. NBU'S CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ACQUIRING A FIRE HYDRANT METER SO THAT ALL WATER USED FOR CONSTRUCTION OR TESTING PURPOSES ARE PROPERLY ACCOUNTED FOR. NBU WILL NOT TOLERATE ANY WATER THEFT, REGARDLESS OF THE AMOUNT. IF WATER THEFT IS DISCOVERED THE CONTRACTOR SHALL BE SUBJECT TO MONETARY PENALTIES, CRIMINAL CHARGES, AND STOPPAGE OF ALL CONSTRUCTION ACTIVITIES RELATED TO THE PROJECT. COSTS ASSOCIATED WITH ANY WORK STOPPAGE RESULTING FROM WATER THEFT SHALL BE AT THE FULL EXPENSE OF THE CONTRACTOR.
- PLEASE NOTE: NBU REQUIRES GPS POINTS FOR CERTAIN ELECTRIC, WATER AND WASTEWATER ATTRIBUTES, SOME OF WHICH MUST BE TAKEN PRIOR TO BACKFILL DURING CONSTRUCTION.

GPS POINTS SHALL BE REQUIRED FROM THE DEVELOPER'S CONTRACTOR OR ENGINEER. A MINIMUM OF THREE COORDINATE POINTS FOR GEOREFERENCING SHALL BE REQUIRED. THE WATER AND WASTEWATER GPS POINTS SHALL BE TO SURVEY GRADE AND ELECTRIC GPS POINTS SHALL BE MAP GRADE. REFERENCE NBU'S WATER CONNECTION POLICY FOR ADDITIONAL CAD DELIVERABLE REQUIREMENTS.

WATER:  
VERTICAL BENDS AND EDGE OF STEEL CASING (IF APPLICABLE) PRIOR TO BACKFILL.  
HORIZONTAL BENDS PRIOR TO BACKFILL  
TEES PRIOR TO BACKFILL  
FITTINGS (REDUCERS AND COUPLINGS) PRIOR TO BACKFILL  
FIRE HYDRANTS (TOP FLANGE)

VALVES  
METER (TOP CENTER OF BOX)  
BLOW OFF ASSEMBLY  
CORNER SLAB OF WATER TANK & GATE VALVE ON THE WATER TANK

WASTEWATER:  
MANHOLES  
CLEANOUTS  
CORNER SLAB OF LIFT STATION

LOCATION OF EXISTING UNDERGROUND AND OVERHEAD UTILITIES ARE APPROXIMATE LOCATIONS ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES PRIOR TO BEGINNING WORK AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT OCCUR.

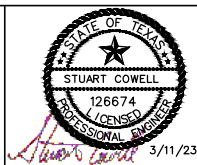


Know what's below. Call before you dig.

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23

DESIGNED BY: JT  
DRAWN BY: JT  
CHECKED BY: SC  
APPROVED BY: SC



VERAMENDI WASTEWATER LINE

**LJA Engineering, Inc.**

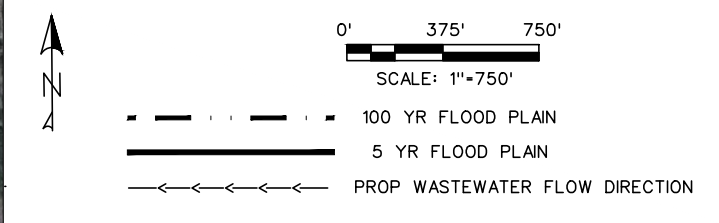
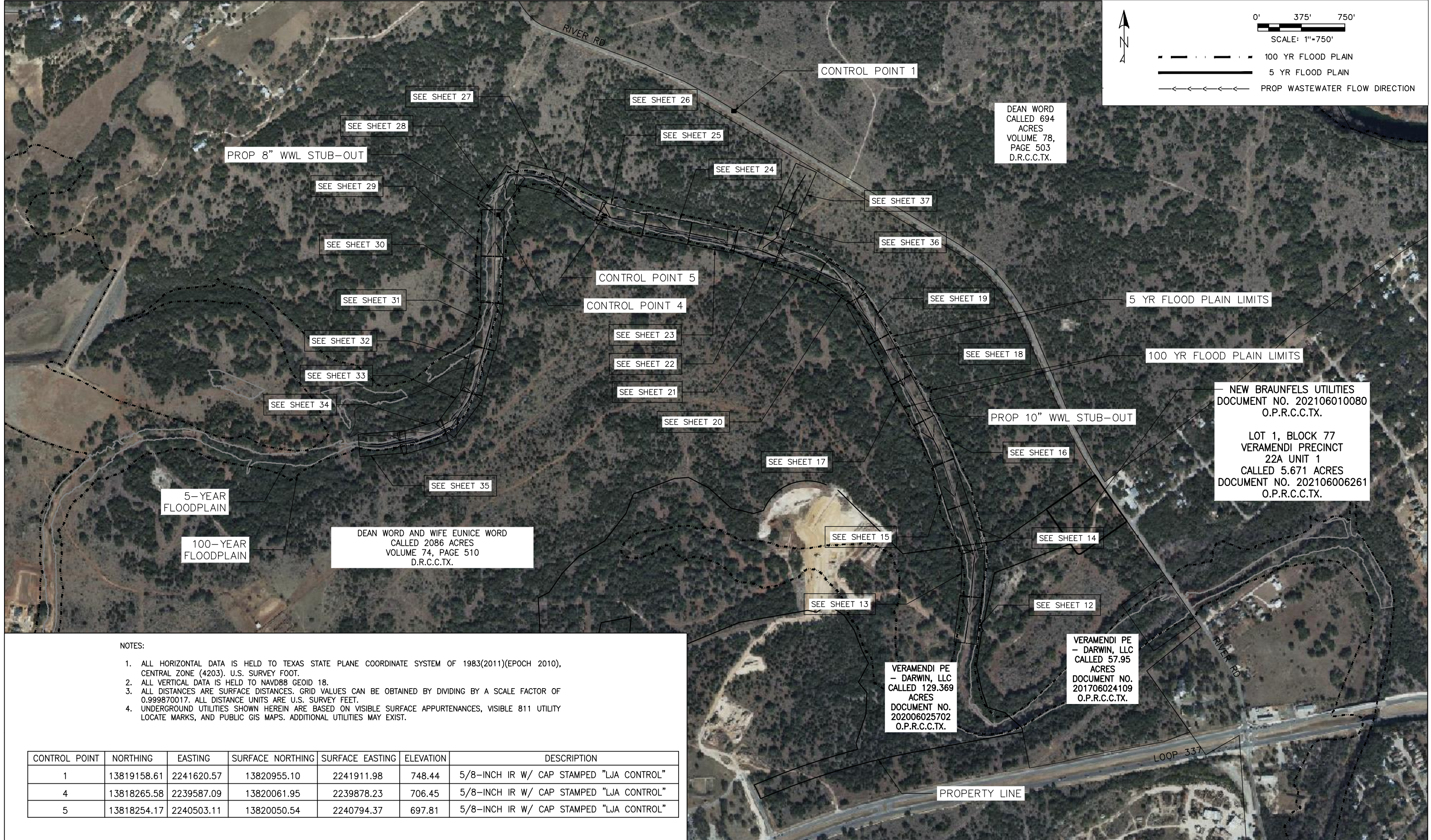
2700 LA FRONTERA BLVD.  
SUITE 150  
ROUND ROCK, TEXAS 78735

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FRN-F-1386

NBU NOTES

JOB NUMBER: A441-2201  
SCALE:  
HORIZONTAL: N/A  
VERTICAL: N/A  
SHEET NO. 4  
OF 43 SHEETS

03/10/2023 3/10/2023 I:\441\2201\CADD\WORKING\FRONT\_END\_SHEETS.dwg scowell



- NOTES:
1. ALL HORIZONTAL DATA IS HELD TO TEXAS STATE PLANE COORDINATE SYSTEM OF 1983(2011)(EPOCH 2010), CENTRAL ZONE (4203). U.S. SURVEY FOOT.
  2. ALL VERTICAL DATA IS HELD TO NAVD88 GEOID 18.
  3. ALL DISTANCES ARE SURFACE DISTANCES. GRID VALUES CAN BE OBTAINED BY DIVIDING BY A SCALE FACTOR OF 0.999870017. ALL DISTANCE UNITS ARE U.S. SURVEY FEET.
  4. UNDERGROUND UTILITIES SHOWN HEREIN ARE BASED ON VISIBLE SURFACE APPURTENANCES, VISIBLE 811 UTILITY LOCATE MARKS, AND PUBLIC GIS MAPS. ADDITIONAL UTILITIES MAY EXIST.

CONTROL POINT	NORTHING	EASTING	SURFACE NORTHING	SURFACE EASTING	ELEVATION	DESCRIPTION
1	13819158.61	2241620.57	13820955.10	2241911.98	748.44	5/8-INCH IR W/ CAP STAMPED "LJA CONTROL"
4	13818265.58	2239587.09	13820061.95	2239878.23	706.45	5/8-INCH IR W/ CAP STAMPED "LJA CONTROL"
5	13818254.17	2240503.11	13820050.54	2240794.37	697.81	5/8-INCH IR W/ CAP STAMPED "LJA CONTROL"

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23

DESIGNED BY: JT

DRAWN BY: JT

CHECKED BY: SC

APPROVED BY: SC

## VERAMENDI WASTEWATER LINE

**LJA Engineering, Inc.**

2700 LA FRONTERA BLVD. Phone 512.767.7300  
 SUITE 150 Fax 512.439.4716  
 ROUND ROCK, TEXAS 78735 FRN-F-1386

PROJECT LAYOUT

JOB NUMBER: A441-2201

SCALE: HORIZONTAL: 1"=750'  
 VERTICAL: N/A

SHEET NO. 5 OF 43 SHEETS

03/09/2023 3/9/2023 I:\A441\2201\CADD\WORKING\PROJ\_LAYOUT.dwg scowell

THE 100-YR FLOOD PLAIN LIMITS IS BASED ON THE FEMA FLOOD PLAIN DATA DATED SEPTEMBER 2009. THE 5-YR FLOOD PLAIN WAS MODELED BY LJA UTILIZING DATA FROM THE NOAA ATLAS 14 VOL 11, VER 2 (APRIL 2017), AND RECENT LIDAR TERRAIN DATA FROM 2019.



- EXISTING ROADWAY
- LIMITS OF CONSTRUCTION
- SILT FENCE
- SURVEY CONTROL POINT
- CONSTRUCTION ENTRANCE/EXIT
- TREE PROTECTION
- TREE TO BE REMOVED
- EXISTING FLOW ARROW
- 100 YR FLOOD PLAIN
- 5 YR FLOOD PLAIN

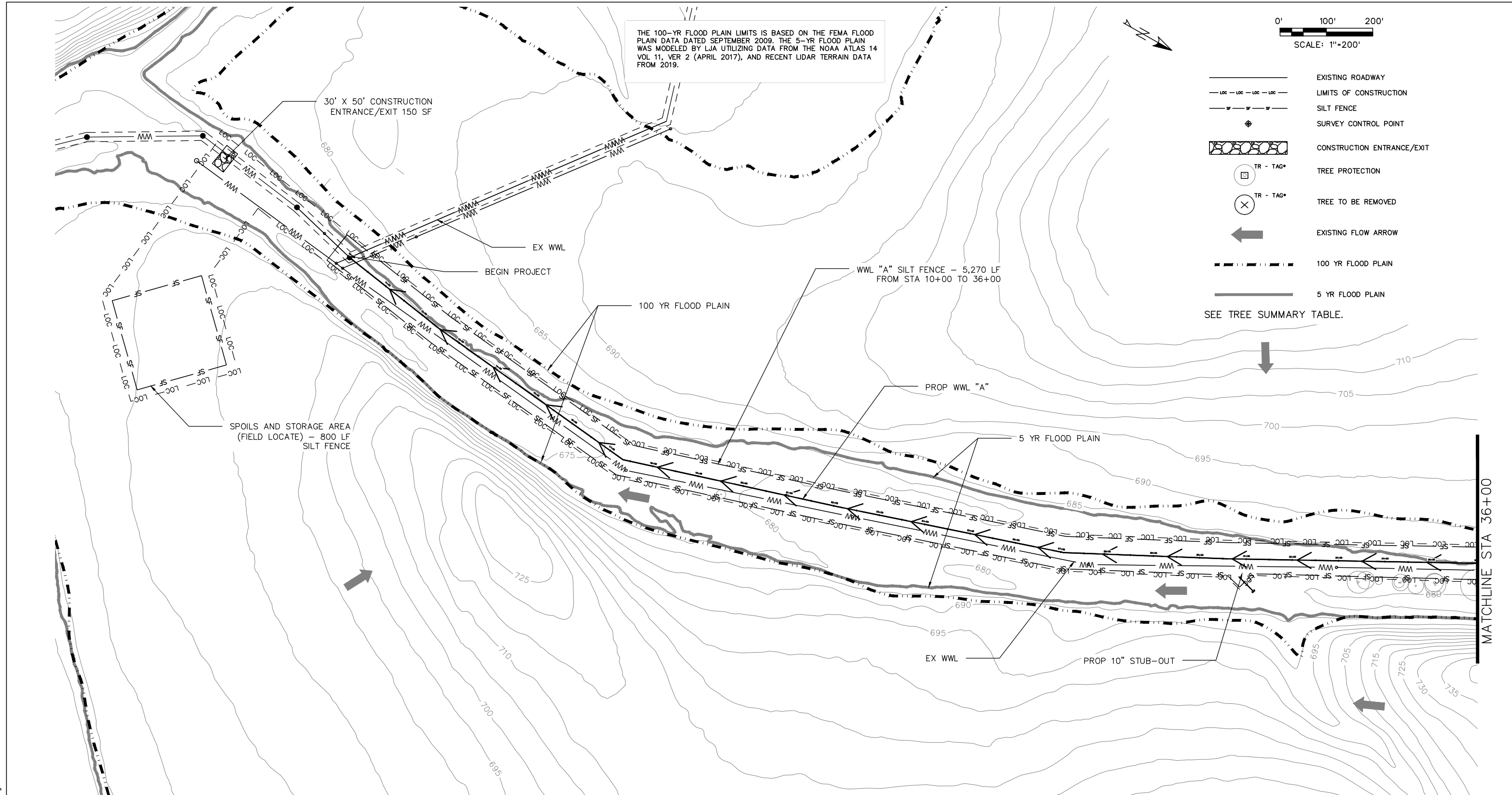
SEE TREE SUMMARY TABLE.

30' X 50' CONSTRUCTION ENTRANCE/EXIT 150 SF

WWL "A" SILT FENCE - 5,270 LF FROM STA 10+00 TO 36+00

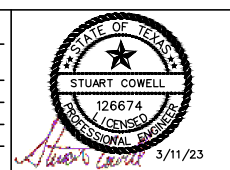
SPOILS AND STORAGE AREA (FIELD LOCATE) - 800 LF SILT FENCE

MATCHLINE STA 36+00



REVISIONS			
NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23  
 DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC



### VERAMENDI WASTEWATER LINE

**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD. Phone 512.767.7300  
 SUITE 150 Fax 512.439.4716  
 ROUND ROCK, TEXAS 78735 FRN-F-1386

LOCATION OF EXISTING UNDERGROUND AND OVERHEAD UTILITIES ARE APPROXIMATE LOCATIONS ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES PRIOR TO BEGINNING WORK AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT OCCUR.



EROSION AND SEDIMENTATION CONTROL

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 200'  
 VERTICAL: 1" = 20'  
 SHEET NO. 6  
 OF 43 SHEETS

02/22/2023 2/22/2023 I:\A441\2201\CADD\WORKING\EROSION\_CONTROL.dwg kroese

CONTROL POINT	NORTHING	EASTING	SURFACE NORTHING	SURFACE EASTING	ELEVATION	DESCRIPTION
1	13819158.61	2241620.57	13820955.10	2241911.98	748.44	5/8-INCH IR W/ CAP STAMPED "LJA CONTROL"

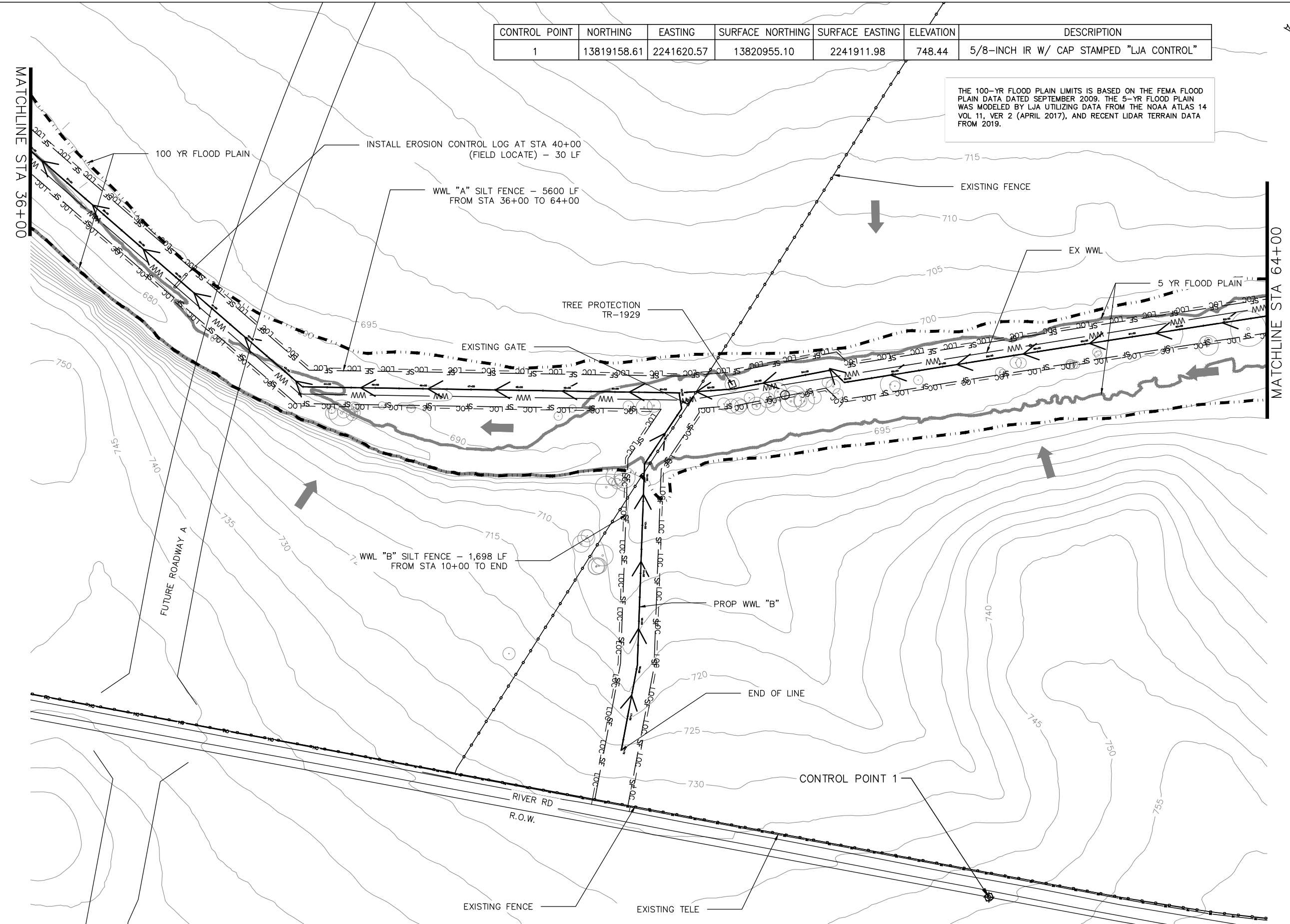
0' 100' 200'  
SCALE: 1"=200'



THE 100-YR FLOOD PLAIN LIMITS IS BASED ON THE FEMA FLOOD PLAIN DATA DATED SEPTEMBER 2009. THE 5-YR FLOOD PLAIN WAS MODELED BY LJA UTILIZING DATA FROM THE NOAA ATLAS 14 VOL 11, VER 2 (APRIL 2017), AND RECENT LIDAR TERRAIN DATA FROM 2019.

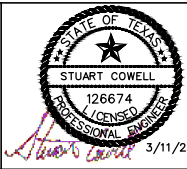
- EXISTING ROADWAY
- LIMITS OF CONSTRUCTION
- SILT FENCE
- SURVEY CONTROL POINT
- CONSTRUCTION ENTRANCE/EXIT
- TREE PROTECTION
- TREE TO BE REMOVED
- EXISTING FLOW ARROW
- 100 YR FLOOD PLAIN
- 5 YR FLOOD PLAIN

SEE TREE SUMMARY TABLE.



REVISIONS		NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23  
 DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC



VERAMENDI WASTEWATER LINE

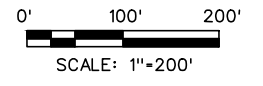
**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD.  
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 FRN-F-1386

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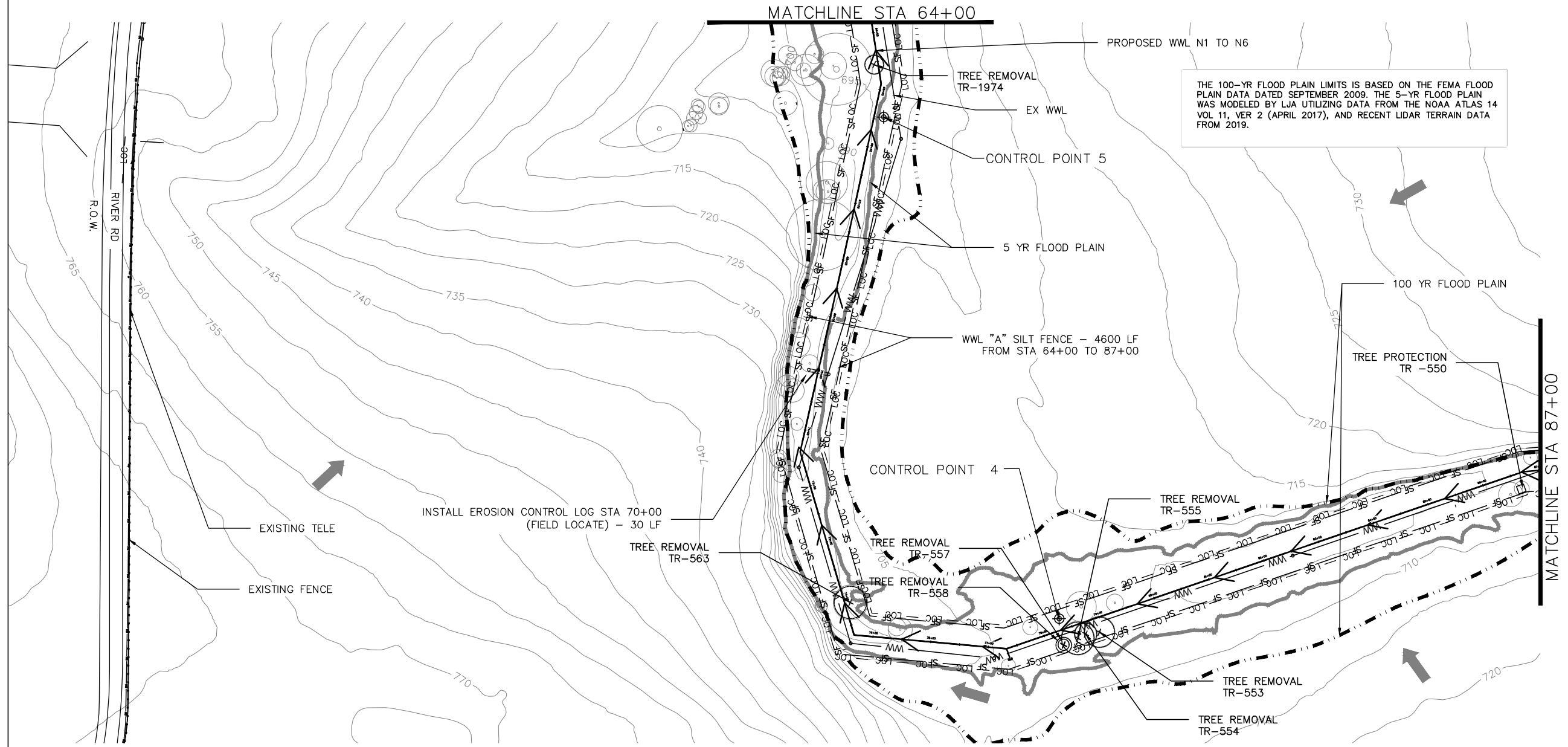
EROSION AND SEDIMENTATION CONTROL  
 JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1"=200' VERTICAL:  
 SHEET NO. 7  
 OF 43 SHEETS

CONTROL POINT	NORTHING	EASTING	SURFACE NORTHING	SURFACE EASTING	ELEVATION	DESCRIPTION
4	13818265.58	2239587.09	13820061.95	2239878.23	706.45	5/8-INCH IR W/ CAP STAMPED "LJA CONTROL"
5	13818254.17	2240503.11	13820050.54	2240794.37	697.81	5/8-INCH IR W/ CAP STAMPED "LJA CONTROL"



- EXISTING ROADWAY
- LIMITS OF CONSTRUCTION
- SILT FENCE
- SURVEY CONTROL POINT
- CONSTRUCTION ENTRANCE/EXIT
- TREE PROTECTION
- TREE TO BE REMOVED
- EXISTING FLOW ARROW
- 100 YR FLOOD PLAIN
- 5 YR FLOOD PLAIN

SEE TREE SUMMARY TABLE.

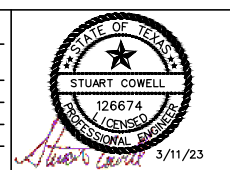


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02/22/2023 2/22/2023 I:\A441\2201\CADD\WORKING\EROSION\_CONTROL.dwg kroese

REVISIONS		NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23  
 DESIGNED BY: JT  
 DRAWN BY: JT  
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 APPROVED BY: SC



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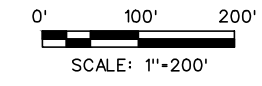





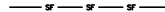






EROSION AND SEDIMENTATION CONTROL

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 200'  
 VERTICAL: SHEET NO. 8 OF 43 SHEETS

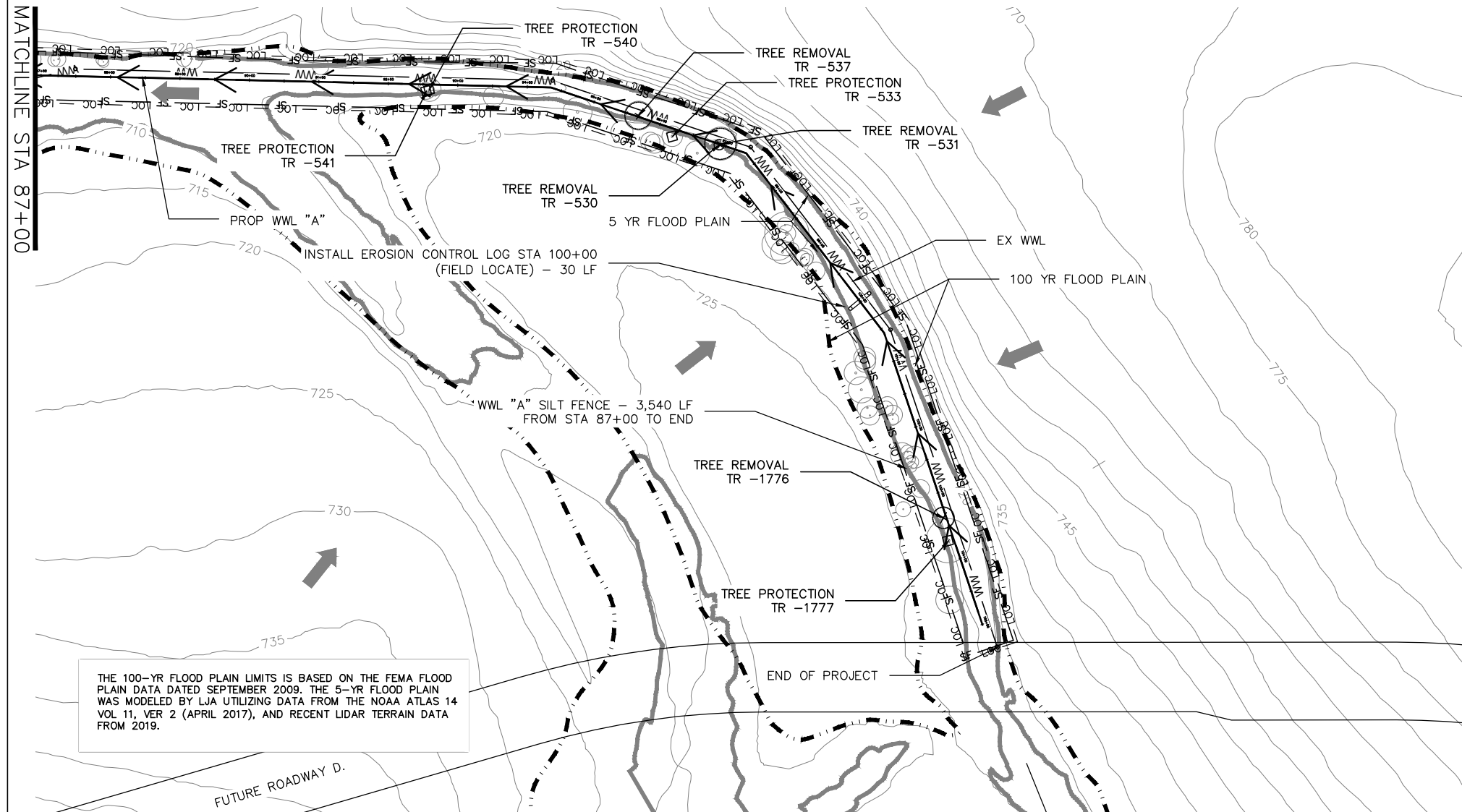


MATCHLINE STA 87+00



-  EXISTING ROADWAY
-  LIMITS OF CONSTRUCTION
-  SILT FENCE
-  SURVEY CONTROL POINT
-  CONSTRUCTION ENTRANCE/EXIT
-  TREE PROTECTION
-  TREE TO BE REMOVED
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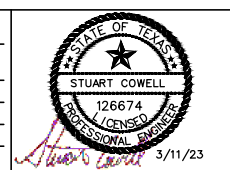
SEE TREE SUMMARY TABLE.



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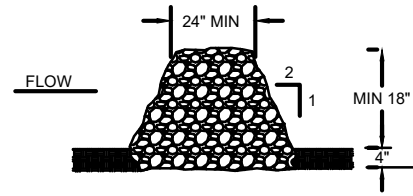
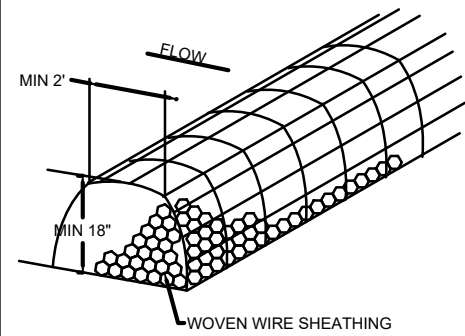
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### EROSION AND SEDIMENTATION CONTROL

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 200'  
 VERTICAL: SHEET NO. 9  
 OF 43 SHEETS

02/22/2023 2/22/2023 I:\A441\2201\CADD\WORKING\EROSION\_CONTROL.dwg kroese

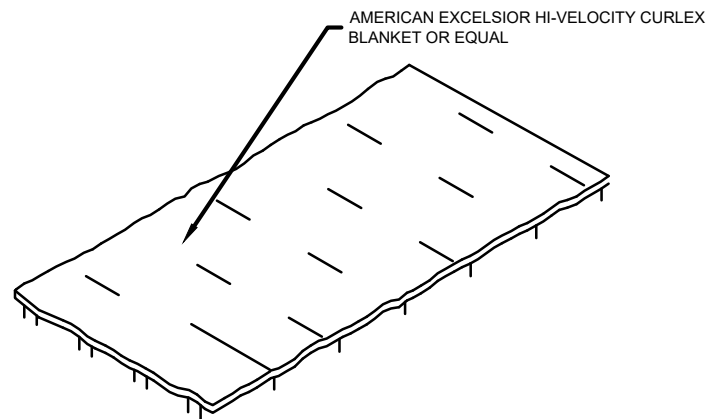


STANDARD SYMBOL FOR ROCK BERM (RB)  
 RB

NOTES:

1. USE ONLY OPEN GRADED ROCK 3 TO 5" DIAMETER FOR ALL CONDITIONS.
2. THE ROCK BERM SHALL BE SECURED WITH A WOVEN WIRE SHEATHING HAVING MAXIMUM 1" OPENING AND MINIMUM WIRE DIAMETER OF 20 GAUGE.
3. THE ROCK BERM SHALL BE INSPECTED DAILY OR AFTER EACH RAIN, AND THE STONE AND/OR FABRIC CORE-WOVEN SHEATHING SHALL BE REPLACED WHEN THE STRUCTURE CEASES TO FUNCTION AS INTENDED, DUE TO SEDIMENT ACCUMULATION AMONG THE ROCKS, WASHOUT, CONSTRUCTION TRAFFIC DAMAGE, ETC.
4. IF SEDIMENT REACHES A DEPTH EQUAL TO ONE-THIRD THE HEIGHT OF THE BERM OR 6", WHICHEVER IS LESS, THE SEDIMENT SHALL BE REMOVED AND DISPOSED OF ON AN APPROVED SITE AND IN A MANNER THAT WILL NOT CREATE A SEDIMENTATION PROBLEM.
5. WHEN THE SITE IS COMPLETELY STABILIZED, THE BERM AND ACCUMULATED SEDIMENT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED MANNER.

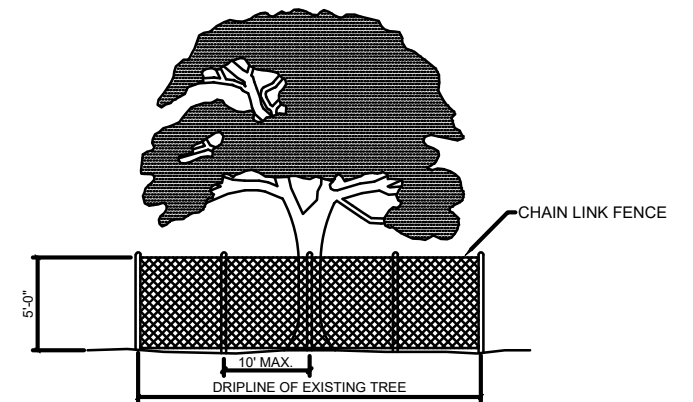
**ROCK BERM**  
 N.T.S.



**EROSION CONTROL MATTING NOTE:**

1. USE 4 STAPLES ACROSS AT THE START OF EACH ROLL AND CONTINUE TO STAPLE THROUGHOUT THE LENGTH OF THE ROLL AT 2 FT. INTERVALS. OVERLAP ADJACENT ROLLS 2" - 3" WHEN USED ON HORIZONTAL INSTALLATION. END AND BEGINNING OF ROLLS SHALL OVERLAP 6" MINIMUM.
2. MATTING SHALL BE USED TO STABILIZE ALL SLOPES GREATER THAN 5' RISE IN 100 FT.

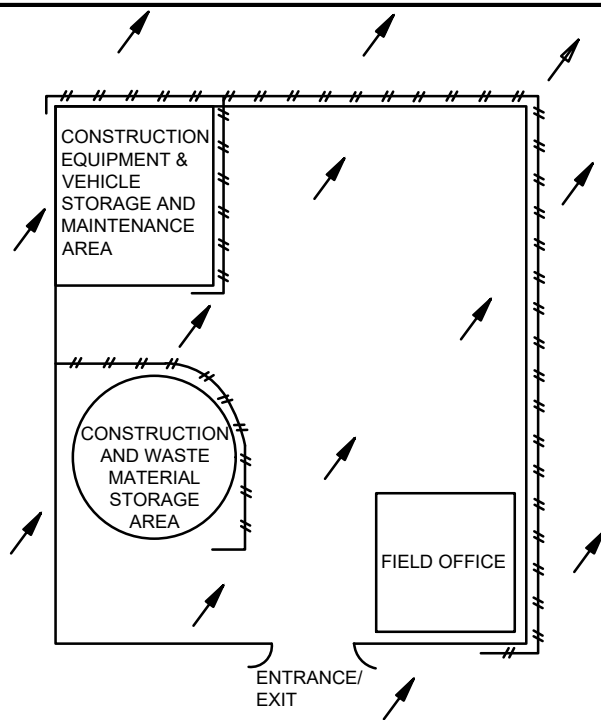
**EROSION CONTROL MATTING DETAIL**  
 N.T.S.



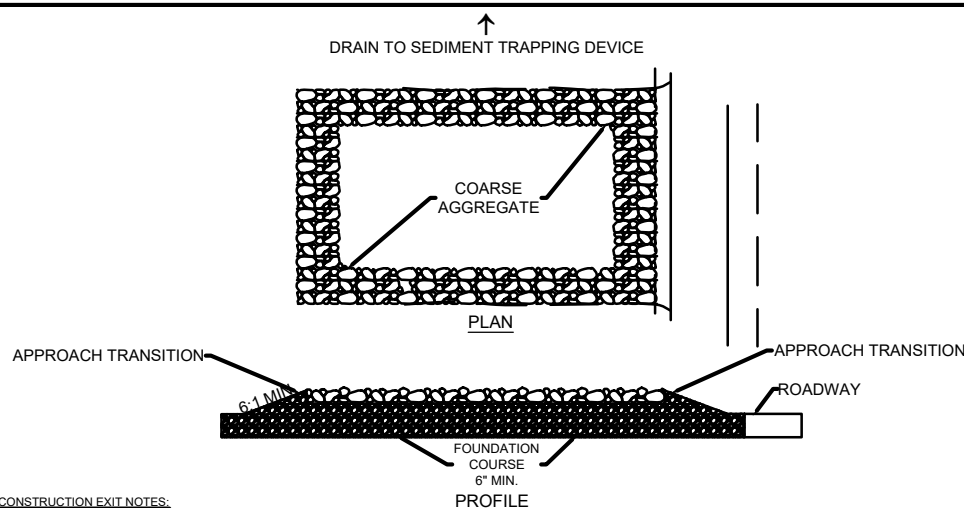
NOTES:

1. TREE PROTECTION FENCES SHALL BE INSTALLED PRIOR TO THE COMMENCEMENT OF ANY SITE PREPARATION WORK (CLEARING, GRUBBING OR GRADING).
2. FENCES SHALL COMPLETELY SURROUND THE TREE, OR CLUSTERS OF TREES; SHALL BE LOCATED AT THE OUTERMOST LIMIT OF THE TREE BRANCHES (DRIPLINE), AND SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PROJECT IN ORDER TO PREVENT THE FOLLOWING:
  - A. SOIL COMPACTION IN THE ROOT ZONE AREA RESULTING FROM VEHICULAR TRAFFIC, OR STORAGE OF EQUIPMENT OR MATERIALS.
  - B. ROOT ZONE DISTURBANCES DUE TO GRADE CHANGES (GREATER THAN SIX INCHES (6") ) CUT OR FILL, OR TRENCHING NOT REVIEWED AND AUTHORIZED BY THE CITY.
  - C. WOUNDS TO EXPOSED ROOTS, TRUNKS OR LIMBS BY MECHANICAL EQUIPMENT.
  - D. OTHER ACTIVITIES DETRIMENTAL TO TREES, SUCH AS CHEMICAL STORAGE, CEMENT TRUCK CLEANING AND FIRE.
3. EXCEPTIONS TO INSTALLING FENCES AT TREE DRIPLINES MAY BE PERMITTED IN THE FOLLOWING CASES:
  - A. WHERE PERMEABLE PAVING IS TO BE INSTALLED, ERECT THE FENCE AT THE OUTER LIMITS OF THE PERMEABLE PAVING AREA.
  - B. WHERE TREES ARE CLOSE TO PROPOSED BUILDINGS, ERECT THE FENCE NO CLOSER THAN SIX FEET (6'-0") TO BUILDING.

**TREE PROTECTION - CHAIN LINK FENCE**  
 N.T.S.



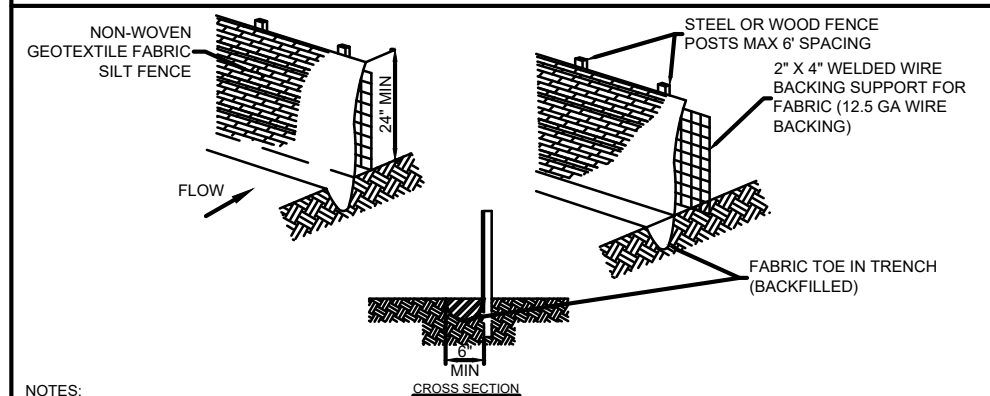
**TYPICAL CONSTRUCTION STAGING AREA**  
 N.T.S.



**CONSTRUCTION EXIT NOTES:**

1. CONTRACTOR SHALL CONSTRUCT A CONSTRUCTION EXIT FOR THE PURPOSE OF PARKING CONSTRUCTION MACHINERY AND OTHER VEHICLES.
2. APPROACH TRANSITIONS SHOULD BE NO STEEPER THAN 6:1 AND 3. CONSTRUCTED AS DIRECTED BY THE ENGINEER.
3. STONE SIZE: 3-5" OPEN GRADED ROCK.
4. LENGTH: AS EFFECTIVE BUT NOT LESS THAN 50'.
5. THICKNESS: NOT LESS THAN 8".
6. WIDTH: NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS/EGRESS.
7. WASHING: WHEN NECESSARY, VEHICLE WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC ROADWAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE AND DRAINS INTO AN APPROVED TRAP OR SEDIMENT BASIN. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH OR WATERCOURSE USING APPROVED METHODS.
8. MAINTENANCE: THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC ROADWAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND, AS WELL AS REPAIR AND CLEAN OUT OF ANY MEASURE DEVICES USED TO TRAP SEDIMENT. ALL SEDIMENTS THAT IS SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC ROADWAY MUST BE REMOVED IMMEDIATELY.
9. DRAINAGE: ENTRANCE MUST BE PROPERLY GRADED OR INCORPORATE A DRAINAGE SWALE TO PREVENT RUNOFF FROM LEAVING THE CONSTRUCTION SITE.

**STABILIZED CONSTRUCTION ENTRANCE**  
 N.T.S.



NOTES:

1. STEEL OR WOOD POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF 12 INCHES. IF WOOD POSTS CANNOT ACHIEVE 12 INCHES DEPTH, USE STEEL POSTS.
2. THE TOE OF THE SILT FENCE SHALL BE TRENCHED IN WITH A SPADE OR MECHANICAL TRENCHER, SO THAT THE DOWNSLOPE FACE OF THE TRENCH IS FLAT AND PERPENDICULAR TO THE LINE OF FLOW.
3. THE TRENCH MUST BE A MINIMUM OF 6 INCHES DEEP AND 6 INCHES WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAID IN THE GROUND AND BACKFILLED WITH COMPACTED MATERIAL.
4. SILT FENCE FABRIC SHOULD BE SECURELY FASTENED TO EACH STEEL OR WOOD SUPPORT POST OR TO WOVEN WIRE, WHICH IS IN TURN ATTACHED TO THE STEEL OR WOOD FENCE POST.
5. INSPECTION SHALL BE MADE WEEKLY OR AFTER EACH RAINFALL EVENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
6. SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.
7. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 150 mm (6 inches). THE SILT SHALL BE DISPOSED OF ON AN APPROVED SITE AND IN SUCH A MANNER THAT WILL NOT CONTRIBUTE TO ADDITIONAL SILTATION.

**SILT FENCE**  
 N.T.S.

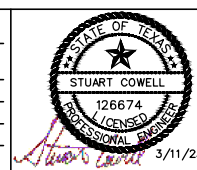
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Know what's below. Call before you dig.

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23  
 DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC



VERAMENDI WASTEWATER LINE

**LJA Engineering, Inc.**

2700 LA FRONTERA BLVD.  
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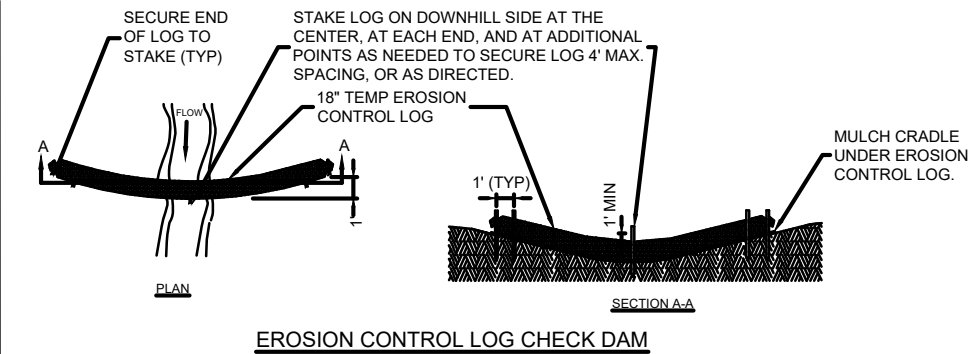
Phone 512.767.7300  
 Fax 512.439.4716  
 FRN-F-1386

EROSION AND SEDIMENTATION CONTROL DETAILS

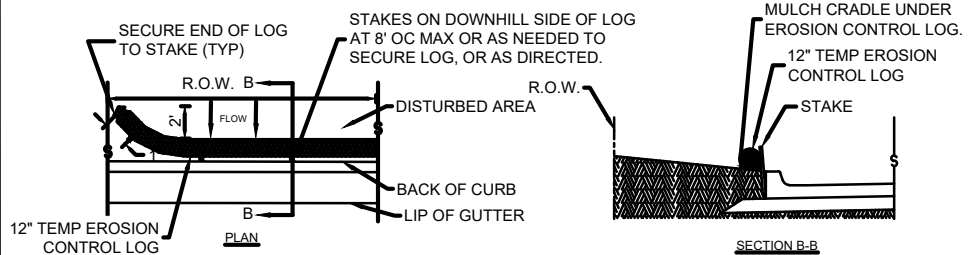
JOB NUMBER: 2291-1601  
 SCALE: HORIZONTAL: 1" = 40', VERTICAL: 1" = 10'  
 SHEET NO. 10 OF 43 SHEETS

02/22/2023 2/22/2023 I:\4441\2201\CADD\WORKING\EROSION\_CONTROL.dwg kroese

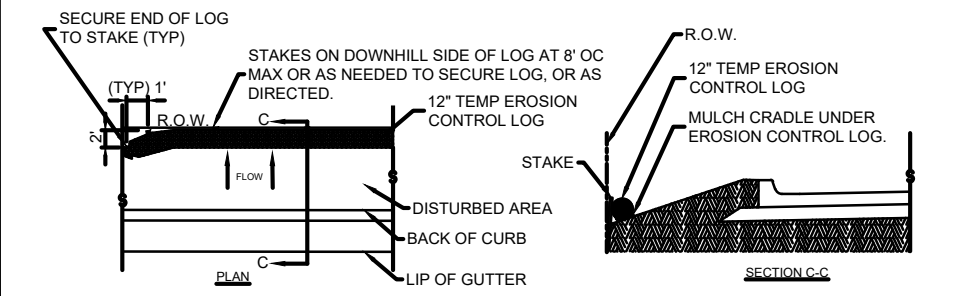
TREE SUMMARY TABLE					
TAG NUMBER	SIZE (DIA.)	CRITICAL ROOT ZONE (RADIUS)	TYPE	REMOVE	PROTECT
530	8-INCH	8-FEET	CEDAR ELM	X	
531	24-INCH	24-FEET	LIVE OAK	X	
533	15-INCH	15-FEET	CEDAR ELM		X
537	21-INCH	21-FEET	LIVE OAK	X	
540	17-INCH	17-FEET	LIVE OAK		X
541	12-INCH	12-FEET	LIVE OAK		X
550	13-INCH	13-FEET	CEDAR ELM		X
553	27-INCH	27-FEET	LIVE OAK	X	
554	20-INCH	20-FEET	LIVE OAK	X	
555	29-INCH	29-FEET	LIVE OAK	X	
557	14-INCH	14-FEET	CEDAR ELM	X	
558	10-INCH	10-FEET	LIVE OAK	X	
563	30-INCH	30-FEET	LIVE OAK	X	
1776	32-INCH	32-FEET	LIVE OAK	X	
1777	16-INCH	16-FEET	CEDAR ELM		X
1929	15-INCH	15-FEET	LIVE OAK		X
1974	17-INCH	17-FEET	CEDAR ELM	X	



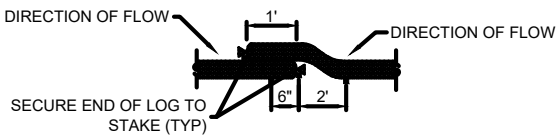
**EROSION CONTROL LOG CHECK DAM**



**LOG PLACED AT BACK OF CURB**



**LOG PLACED AT EDGE OF RIGHT OF WAY**

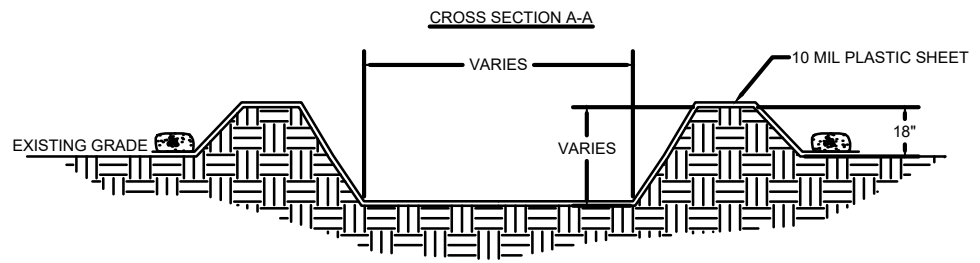


**LAP DETAIL**

- NOTES:**
- DAILY INSPECTION SHALL BE MADE BY THE CONTRACTOR AND SILT ACCUMULATION MUST BE REMOVED WHEN DEPTH REACHES 6".
  - CONTRACTOR SHALL MONITOR THE PERFORMANCE OF LOGS DURING RAINFALL EVENT FOR PROPER PERFORMANCE.
  - LOGS SHALL CONSIST OF 100% BIODEGRADABLE, PHOTODEGRADABLE OR RECYCLABLE CONTAINMENT MESH STUFFED WITH FILTER MATERIAL.
  - STUFF LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE DENSITY THAT WILL HOLD SHAPE WITHOUT EXCESSIVE DEFORMATION. FILTER MATERIAL SHALL CONSIST OF MULCH, ASPEN EXCELSIOR WOOD FIBERS, CHIPPED SITE VEGETATION, COCONUT FIBERS, 100% RECYCLABLE FIBERS, OR ANY OTHER ACCEPTABLE MATERIAL, EXCLUDING STRAW AND HAY.
  - STAKES SHALL BE 2" X 2" WOOD, 4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED.

**EROSION CONTROL LOG**

N.T.S.



**CONCRETE TRUCK WASHOUT PIT**

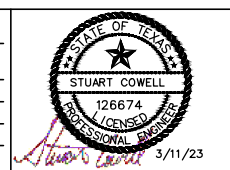
N.T.S.

- NOTES:**
- SET LENGTH AND WIDTH AS NECESSARY TO PROVIDE ADEQUATE SPACE FOR WASHOUT ACTIVITIES.
  - IF RESTRICTED BY DEPTH DUE TO BELOW GRADE APPURTENANCES, PLACE EARTHEN BERMS AT GRADE.
  - USE EXCAVATED MATERIAL TO CREATE EARTHEN BERMS SURROUNDING THE AREA TO BE DESIGNATED AS A CONCRETE WASHOUT.
  - PLACE 10ML OR GREATER PLASTIC SHEETING.
  - SECURE SHEETING ON OUTSIDE OF BERM AREA USING SAND BAGS OR ROCK EQUIVALENT.
  - WASHOUT PIT SHALL BE LOCATED IN AN AREA EASILY ACCESSIBLE TO CONSTRUCTION TRAFFIC.

02/22/2023 2/22/2023 I:\4441\2201\CADD\WORKING\EROSION\_CONTROL.dwg krose

REVISIONS			
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VERAMENDI  
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EROSION AND  
SEDIMENTATION CONTROL  
DETAILS

JOB NUMBER:  
2291-1601  
SCALE:  
HORIZONTAL: 1" = 40'  
VERTICAL: 1" = 10'  
SHEET NO.  
1  
OF 43 SHEETS

SUMMARY OF WASTEWATER UTILITY ITEMS

WW P&P SHEET NO.	LOCATION	WW-1	WW-2	WW-3	WW-4	WW-5	WW-6	WW-7	WW-8	WW-9	WW-10	WW-11	WW-12	WW-13	WW-14	WW-15	WW-16	WW-17	WW-18
		STD PRECAST MANH W/ PRECAST BS, 48" DIA	STD PRECAST MANH W/ PRECAST BS, 48" DIA VENTED	STD PRECAST DROP MANH INCL EXTERNAL DROP ASSEMBLY ON PRECAST BS, 48" DIA VENTED	STD PRECAST DROP MANH INCL EXTERNAL DROP ASSEMBLY ON PRECAST BS, 48" DIA	STD PRECAST MANH W/ PRECAST BS, 60" DIA	STD PRECAST MANH W/ PRECAST BS, 60" DIA VENTED	EXTRA DEPTH OF MANHOLE (OVER 8' DEPTH), 48-IN DIA	EXTRA DEPTH OF MANHOLE (OVER 8' DEPTH), 60-IN DIA	8" DI PLUG ON STUB-OUT	12" DI PLUG ON STUB-OUT	TRENCH EXCAVATION SAFETY PROTECTION SYSTEMS (ALL DEPTHS)	PIPE, 8 IN DIA PVC SDR26 D3034 (ALL DEPTHS), INCLUDING EXCAVATION AND BACKFILL	PIPE, 12 IN DIA PVC SDR26 D3034 (ALL DEPTHS), INCLUDING EXCAVATION AND BACKFILL	PIPE, 15 IN DIA PVC SDR26 D3034 (ALL DEPTHS), INCLUDING EXCAVATION AND BACKFILL	PIPE, 21 IN DIA PVC PS115 F679 (ALL DEPTHS), INCLUDING EXCAVATION AND BACKFILL	CONNECT TO EXISTING MANHOLE	REMOVE AND REPLACE EXISTING FENCE	CONCRETE TRENCH CAP
UNIT		EA	EA	EA	EA	EA	EA	VF	VF	EA	EA	LF	LF	LF	LF	LF	EA	LF	LF
VERAMENDI WASTEWATER LINE A																			
13	BEGIN TO STA 14+00					1			2.7			400				400	1		392.5
14	STA 14+00 TO STA 18+00						1		2.3			400				400			395
15	STA 18+00 TO STA 22+00											400				400			400
16	STA 22+00 TO STA 26+00					1			6.6			400				400			395
17	STA 26+00 TO STA 30+00					1			6.1			400				400			395
18	STA 30+00 TO STA 34+00						1		5.6		1	445		45		400			395
19	STA 34+00 TO STA 38+00					1			8.2			400				400			257
20	STA 38+00 TO STA 42+00		1			1			18.3	1.0		420	20		338.18	61.82			
21	STA 42+00 TO STA 46+00	1						6.1				400			400				185
22	STA 46+00 TO STA 50+00	1						10.1		1.0		420	20		400				39
23	STA 50+00 TO STA 54+00	1	1					15.8		1.0		420	20		400			20	392
24	STA 54+00 TO STA 58+00	1	1					12.6				400			400				392
25	STA 58+00 TO STA 62+00	1						6.5				400			400				396
26	STA 62+00 TO STA 66+00	1						7.3		1.0		420	20		400				396
27	STA 66+00 TO STA 70+00			1				2.7				400			400				396
28	STA 70+00 TO STA 74+00	1						1.7				400			400				396
29	STA 74+00 TO STA 78+00	1	1					15.6		1		420	20	68.53	331.47				392
30	STA 78+00 TO STA 82+00											400		400					400
31	STA 82+00 TO STA 86+00	1						3.7				400		400					396
32	STA 86+00 TO STA 90+00	1						1.8				400		400					396
33	STA 90+00 TO STA 94+00		1					2.3				400		400					396
34	STA 94+00 TO 98+00	2						5.9				400		400					392
35	STA 98+00 TO 102+00		1					4.4				400		400					396
36	STA 102+00 TO END	1						4.2			1	301.1		301					297
VERAMENDI WASTEWATER LINE B																			
37	STA BEGIN TO STA 14+00				2			17.6				400		400				30	169
38	STA 14+00 TO STA 18+00	1		1	1			7.2				392		392					
PROJECT TOTALS		14	6	2	3	5	2	125	50	5	2	10,438	100	3,607	3,870	2,862	1	50	8,456

VERAMENDI EROSION AND SEDIMENTATION

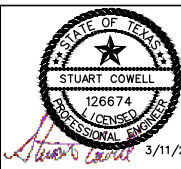
WW P&P SHEET NO.	LOCATION	WW-21	WW-22	WW-23	WW-24	WW-25
		STABILIZED CONSTRUCTION ENTRANCE/EXIT	SILT FENCE (INSTALL, MAINTAIN AND REMOVE)	TREE REMOVAL	TREE PROTECTION	EROSION CONTROL LOG
UNIT		SF	LF	EA	EA	LF
6	BEGIN TO STA 36+00	150	6,070			
7	STA 36+00 TO STA 64+00		7,298		1	30
8	STA 64+00 TO STA 87+00		4,600	7	1	30
9	STA 87+00 TO FINISH		3,540	4	4	30
PROJECT TOTALS		150	21,508	11	6	90

REVISIONS

NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23

DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC



VERAMENDI WASTEWATER LINE

LJA Engineering, Inc.

2700 LA FRONTERA BLVD.  
 SUITE 150  
 ROUND ROCK, TEXAS 78735

Phone 512.767.7300  
 Fax 512.439.4716  
 FRN-F-1386

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Know what's below. Call before you dig.

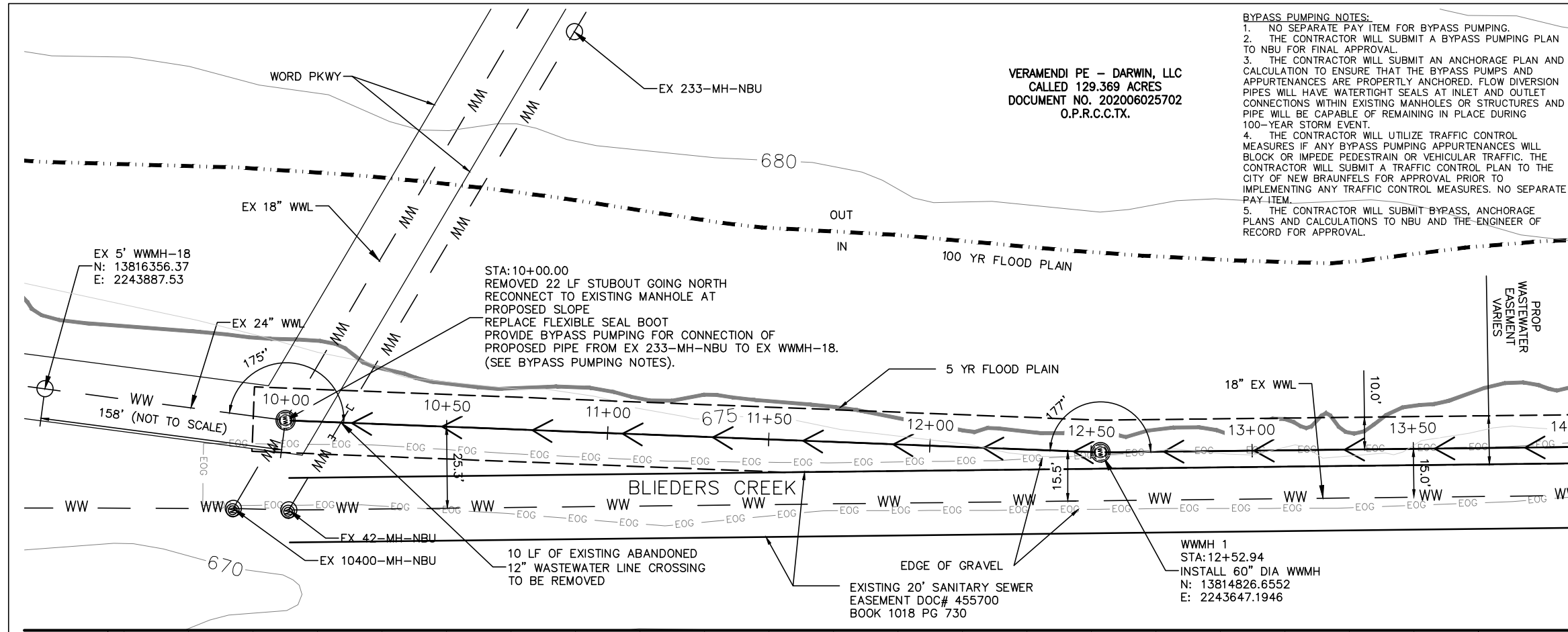
QUANTITIES

JOB NUMBER: A441-2201

SCALE: HORIZONTAL: N/A VERTICAL: N/A

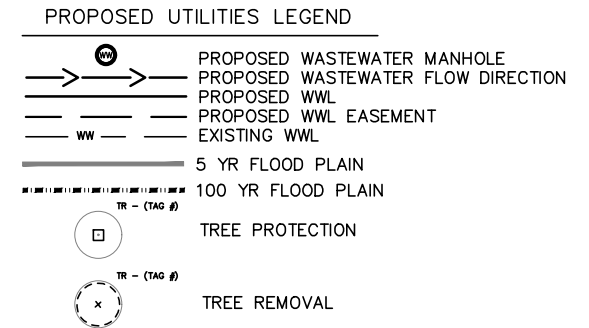
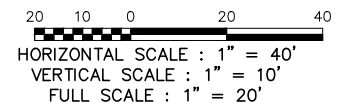
SHEET NO. 12

OF 43 SHEETS



**BYPASS PUMPING NOTES:**

1. NO SEPARATE PAY ITEM FOR BYPASS PUMPING.
2. THE CONTRACTOR WILL SUBMIT A BYPASS PUMPING PLAN TO NBU FOR FINAL APPROVAL.
3. THE CONTRACTOR WILL SUBMIT AN ANCHORAGE PLAN AND CALCULATION TO ENSURE THAT THE BYPASS PUMPS AND APPURTENANCES ARE PROPERLY ANCHORED. FLOW DIVERSION PIPES WILL HAVE WATERTIGHT SEALS AT INLET AND OUTLET CONNECTIONS WITHIN EXISTING MANHOLES OR STRUCTURES AND PIPE WILL BE CAPABLE OF REMAINING IN PLACE DURING 100-YEAR STORM EVENT.
4. THE CONTRACTOR WILL UTILIZE TRAFFIC CONTROL MEASURES IF ANY BYPASS PUMPING APPURTENANCES WILL BLOCK OR IMPEDE PEDESTRIAN OR VEHICULAR TRAFFIC. THE CONTRACTOR WILL SUBMIT A TRAFFIC CONTROL PLAN TO THE CITY OF NEW BRAUNFELS FOR APPROVAL PRIOR TO IMPLEMENTING ANY TRAFFIC CONTROL MEASURES. NO SEPARATE PAY ITEM.
5. THE CONTRACTOR WILL SUBMIT BYPASS, ANCHORAGE PLANS AND CALCULATIONS TO NBU AND THE ENGINEER OF RECORD FOR APPROVAL.

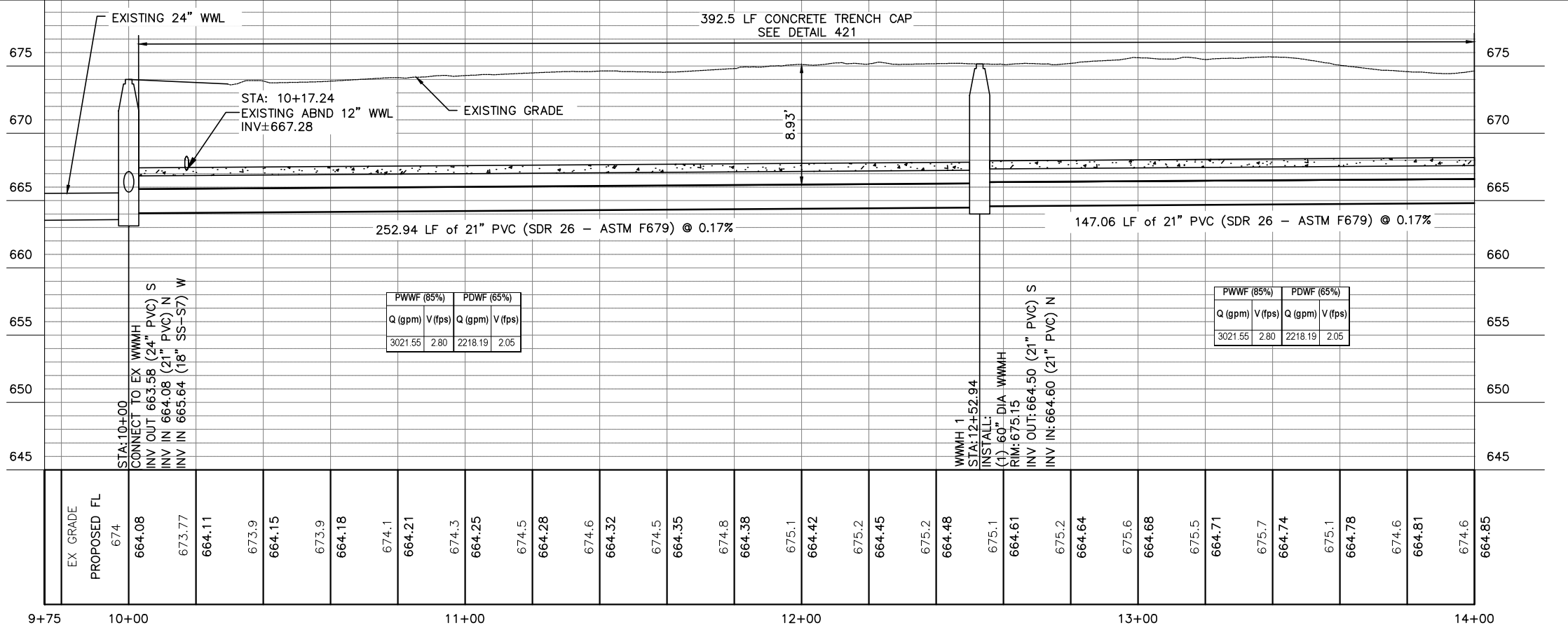


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  2. CONTRACTOR TO MAINTAIN 60" OF COVER OVER THE PROPOSED UTILITY AND 24" OF VERTICAL AND HORIZONTAL CLEARANCE FROM ALL EXISTING UTILITIES.
  3. ALL WASTEWATER MANHOLES TO BE CONSTRUCTED PER NBU DETAIL 328 (STANDARD MANHOLE), NBU DETAIL 325 PRECAST MANHOLE W/ DROP INLET AND RIM ELEVATION WILL BE 2" ABOVE FINISHED GRADE.
  5. ANY SIGNIFICANT DEVIATION FROM THE PLAN ALIGNMENT WILL BE BROUGHT TO THE ATTENTION OF THE ENGINEER. FIELD MODIFICATION SHALL BE APPROVED PRIOR TO PROCEEDING WITH CONSTRUCTION.
  6. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE CONTROL OF GROUND WATER AND SURFACE WATER AS NECESSARY FOR THE CONSTRUCTION OF THIS WATER.
  9. ALL GRAVITY SANITARY SEWER LINES WILL CONFORM TO ASTM D3034/F679 PVC, SDR 26 WITH ASTM 3212 JOINTS. GRAVITY SANITARY SEWER LINES CROSSING POTABLE WATER LINES WILL CONFORM TO 30 TAC 217.53 (d).
  10. CONTRACTOR TO VERIFY ALL WASTEWATER LINE GRADE AND ALIGNMENTS AT NO GREATER THAN 50' INTERVALS.
  11. PIPE STATIONING, AND LINEAR FOOTAGE IS FROM CENTER OF MANHOLE TO CENTER OF MANHOLE. PIPE SLOPE IS CALCULATED FROM INSIDE FACE OF MANHOLE TO INSIDE FACE OF MANHOLE.
  12. NO PERMANENT FILL, TRENCH SPOILS, BACKFILL MATERIALS OR MATERIALS STORAGE SHALL BE PLACED WITHIN THE 100-YR FLOOD PLAIN.
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**TRENCH EXCAVATION SAFETY PROTECTION:**

CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR STRUCTURAL DESIGN/GEOTECHNICAL/SAFETY/EQUIPMENT CONSULTANT, IF ANY, SHALL REVIEW THESE PLANS AND ANY AVAILABLE GEOTECHNICAL INFORMATION AND THE ANTICIPATED INSTALLATION SITES WITHIN THE PROJECT WORK AREA IN ORDER TO IMPLEMENT CONTRACTOR'S TRENCH EXCAVATION SAFETY PROTECTION SYSTEMS, PROGRAMS AND/OR PROCEDURES SHALL PROVIDE FOR ADEQUATE TRENCH EXCAVATION SAFETY PROTECTION THAT COMPLIES WITH, AT A MINIMUM, OSHA STANDARDS FOR TRENCH EXCAVATIONS. SPECIFICALLY, CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR SAFETY CONSULTANT SHALL IMPLEMENT A TRENCH SAFETY PROGRAM IN ACCORDANCE WITH OSHA STANDARDS GOVERNING THE PRESENCE AND ACTIVITIES OF INDIVIDUALS WORKING IN AND AROUND TRENCH EXCAVATION.

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PWWF (85%)		PDWF (65%)	
Q (gpm)	V (fps)	Q (gpm)	V (fps)
3021.55	2.80	2218.19	2.05

PWWF (85%)		PDWF (65%)	
Q (gpm)	V (fps)	Q (gpm)	V (fps)
3021.55	2.80	2218.19	2.05

**REVISIONS**

NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23

DESIGNED BY: JT

DRAWN BY: JT

CHECKED BY: SC

APPROVED BY: SC

**VERAMENDI WASTEWATER LINE**

**LJA Engineering, Inc.**

2700 LA FRONTERA BLVD. Phone 512.767.3300  
 SUITE 150 Fax 512.439.4716  
 ROUND ROCK, TEXAS 78735 FRN-F-1386

WWL "A"

PLAN AND PROFILE

BEGIN TO STA 14+00

JOB NUMBER: A441-2201

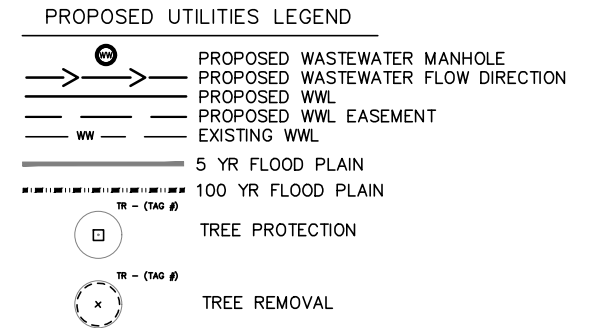
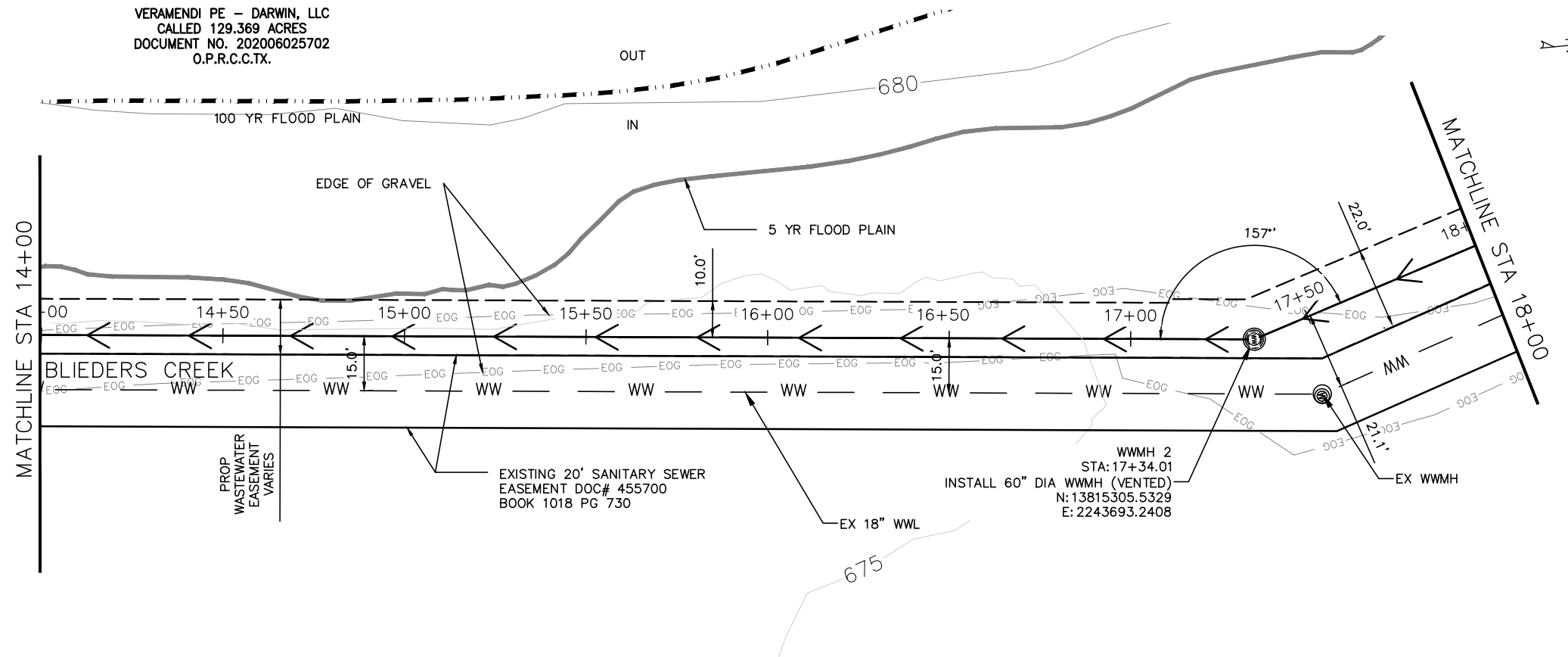
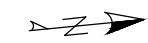
SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'

SHEET NO. 13 OF 43 SHEETS

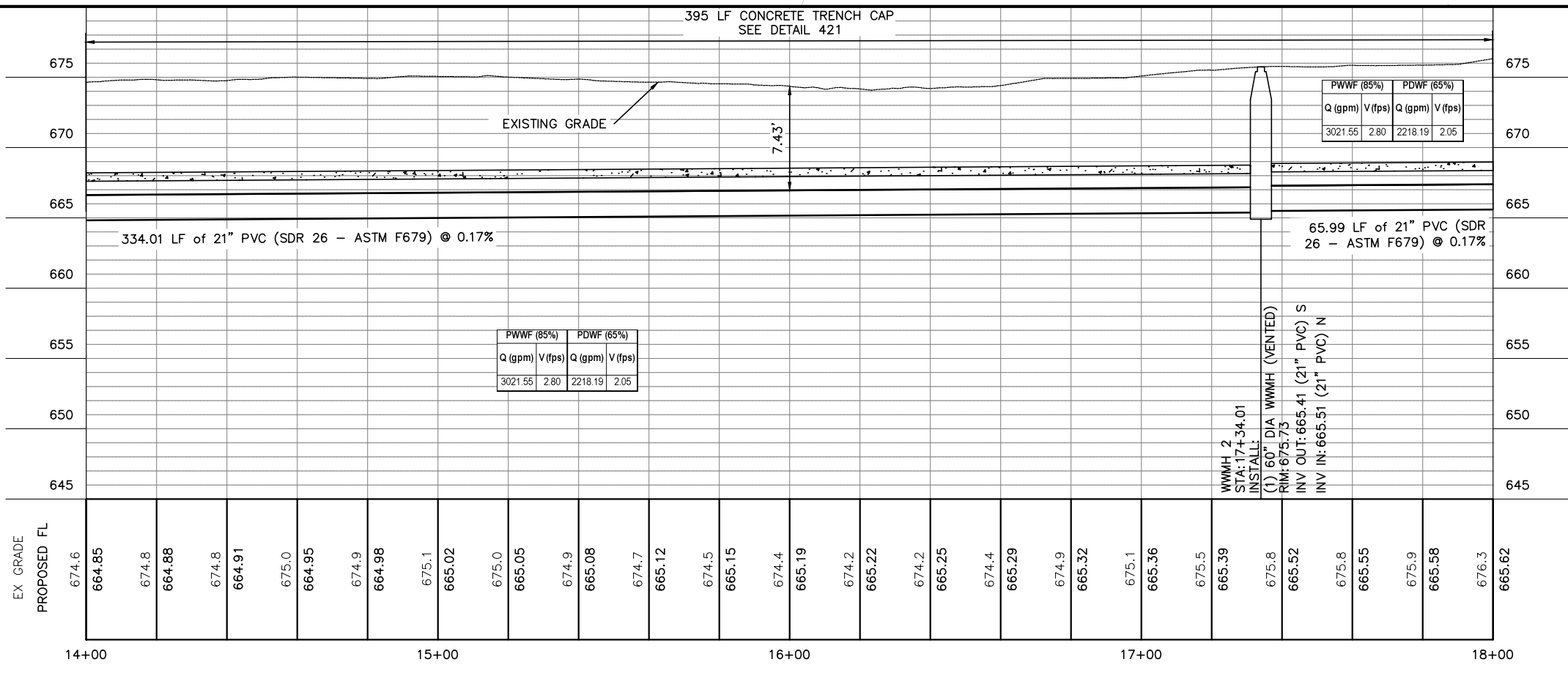
03/11/2023 3/11/2023 I:\A441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

VERAMENDI PE - DARWIN, LLC  
 CALLED 129.369 ACRES  
 DOCUMENT NO. 202006025702  
 O.P.R.C.C.TX.

20 10 0 20 40  
 HORIZONTAL SCALE : 1" = 40'  
 VERTICAL SCALE : 1" = 10'  
 FULL SCALE : 1" = 20'



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**REVISIONS**

NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23  
 DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC

VERAMENDI  
 WASTEWATER LINE

**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD.  
 SUITE 150  
 ROUND ROCK, TEXAS 78735  
 Phone 512.767.7300  
 Fax 512.439.4716  
 FRN-F-1386

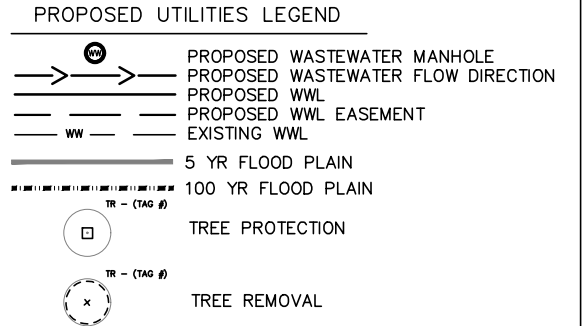
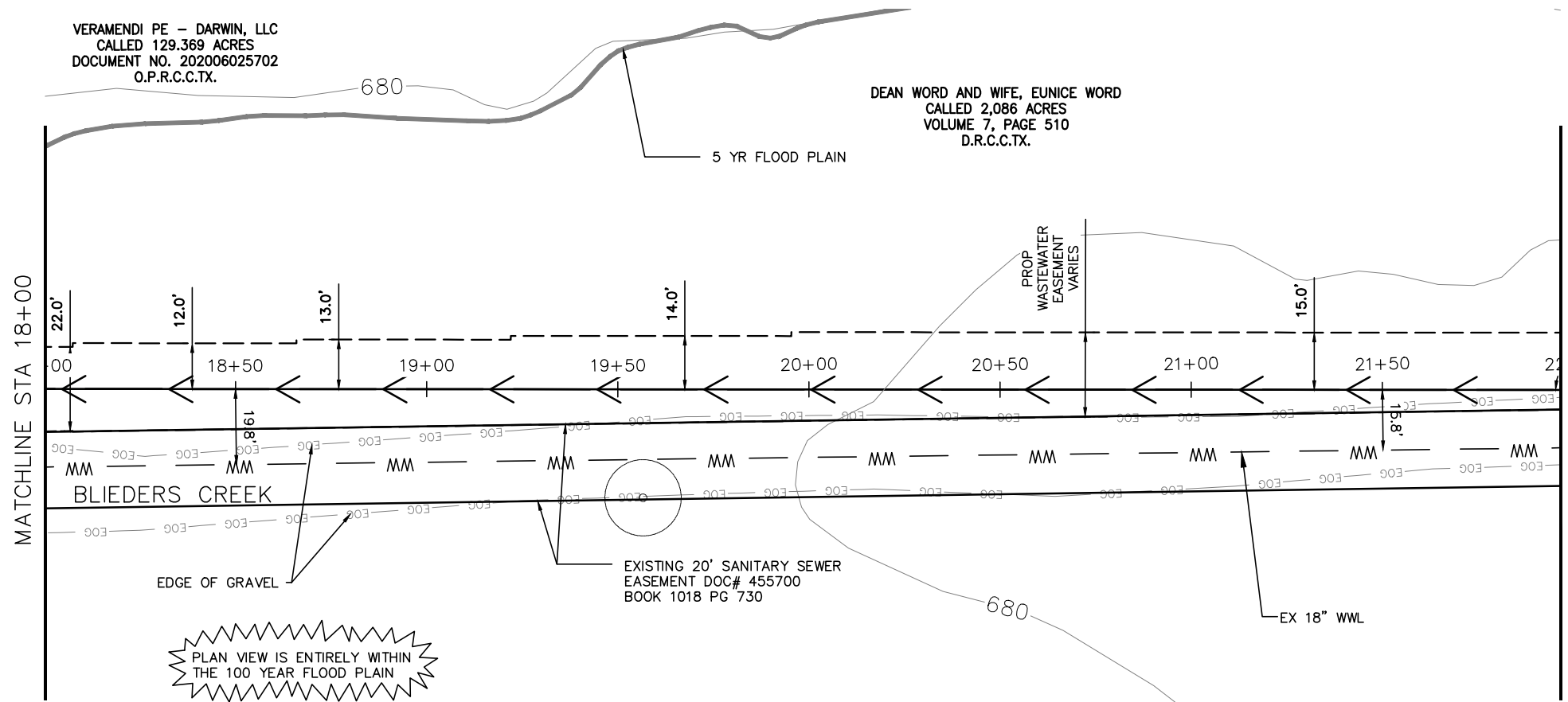
JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'  
 SHEET NO. 14 OF 43 SHEETS  
 WWL "A"  
 PLAN AND PROFILE  
 STA 14+00 TO STA 18+00

03/11/2023 3/11/2023 I:\A441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

VERAMENDI PE - DARWIN, LLC  
 CALLED 129.369 ACRES  
 DOCUMENT NO. 202006025702  
 O.P.R.C.C.TX.

DEAN WORD AND WIFE, EUNICE WORD  
 CALLED 2,086 ACRES  
 VOLUME 7, PAGE 510  
 D.R.C.C.TX.

20 10 0 20 40  
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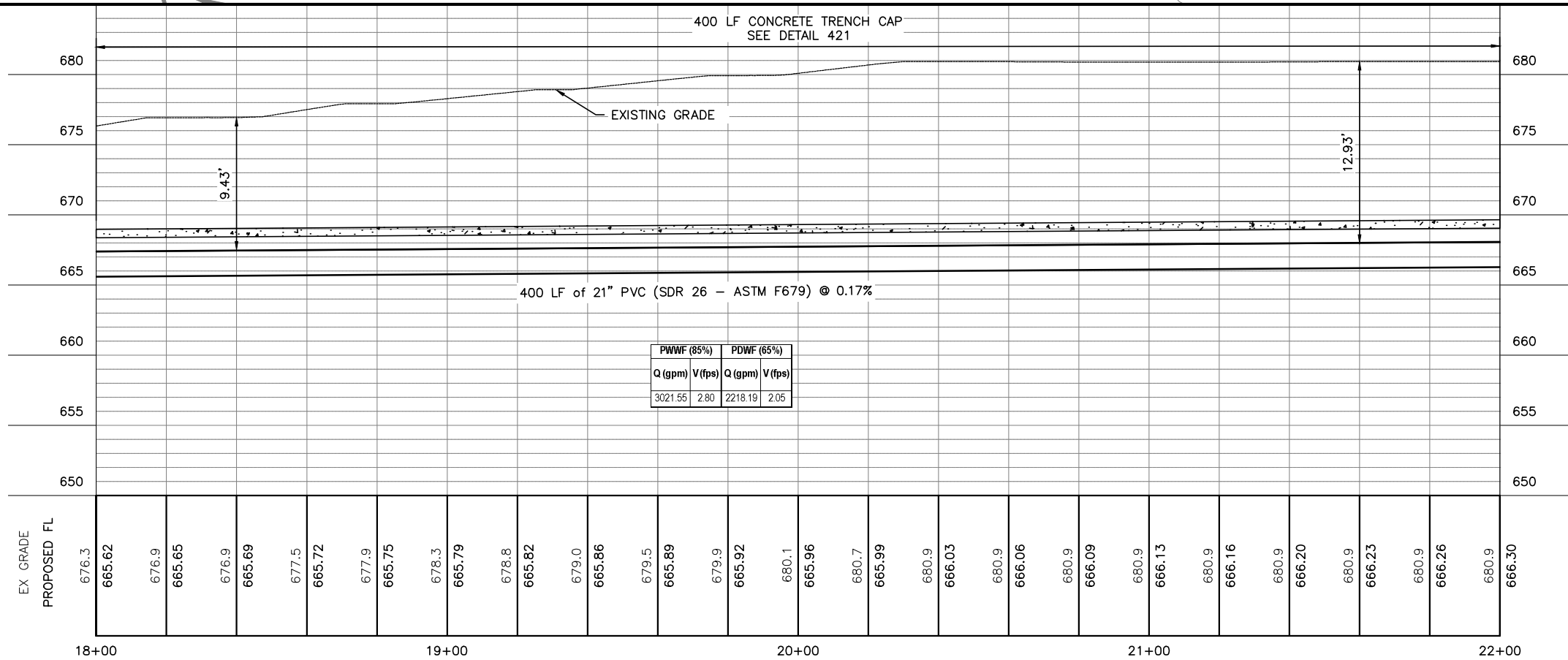
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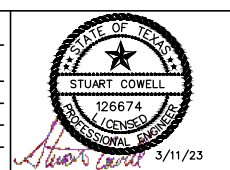


PWWF (85%)		PDWF (65%)	
Q (gpm)	V (fps)	Q (gpm)	V (fps)
3021.55	2.80	2218.19	2.05

EX GRADE	PROPOSED FL	18+00	19+00	20+00	21+00	22+00
676.3	676.3					
665.62	665.62					
676.9	676.9					
665.65	665.65					
676.9	676.9					
665.69	665.69					
677.5	677.5					
665.72	665.72					
677.9	677.9					
665.75	665.75					
678.3	678.3					
665.79	665.79					
678.8	678.8					
665.82	665.82					
679.0	679.0					
665.86	665.86					
679.5	679.5					
665.89	665.89					
679.9	679.9					
665.92	665.92					
680.1	680.1					
665.96	665.96					
680.7	680.7					
665.99	665.99					
680.9	680.9					
666.03	666.03					
680.9	680.9					
666.06	666.06					
680.9	680.9					
666.09	666.09					
680.9	680.9					
666.13	666.13					
680.9	680.9					
666.16	666.16					
680.9	680.9					
666.20	666.20					
680.9	680.9					
666.23	666.23					
680.9	680.9					
666.26	666.26					
680.9	680.9					
666.30	666.30					

03/11/2023 3/11/2023 I:\4441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

REVISIONS		DATE:	3/11/23
NO.	DESCRIPTION	BY	DATE



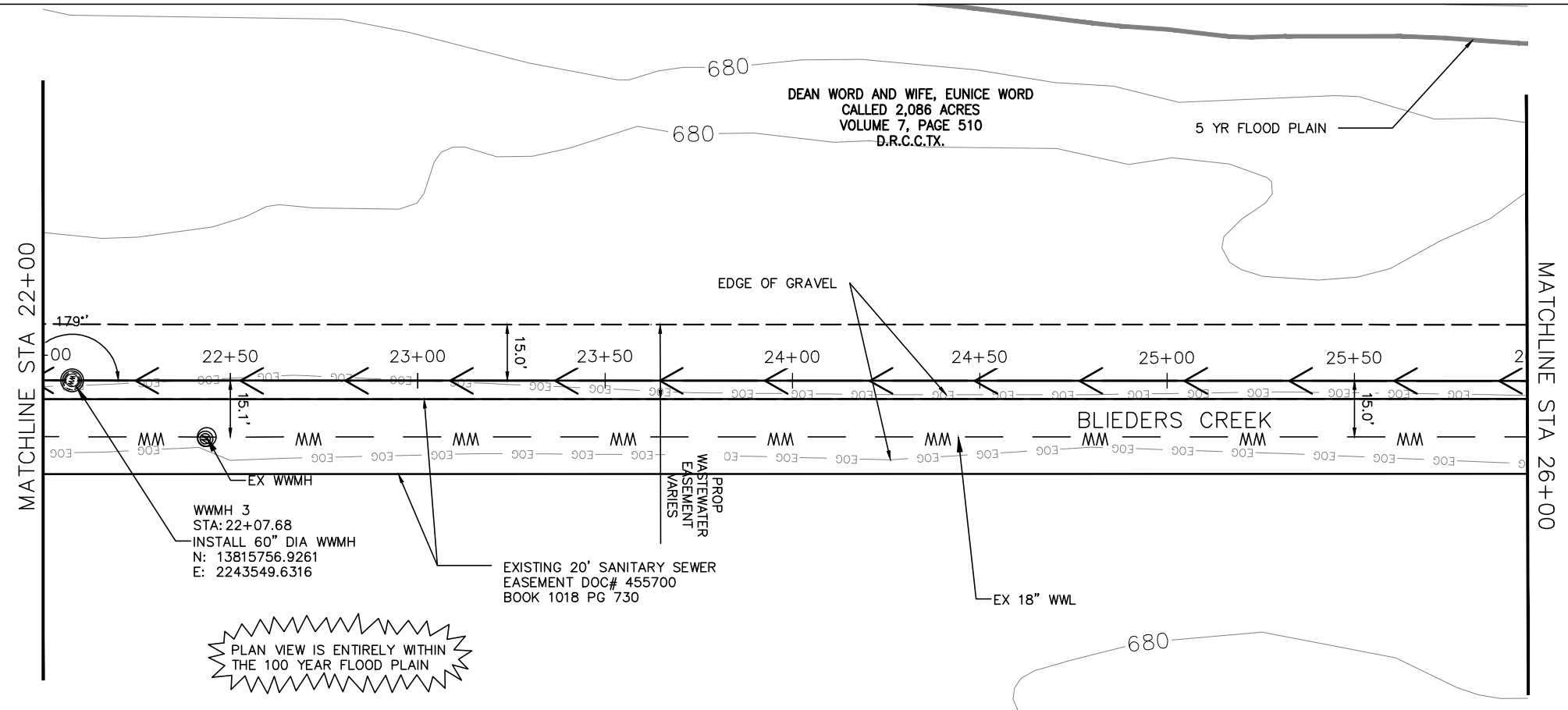
**VERAMENDI WASTEWATER LINE**

**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD.  
 SUITE 150  
 ROUND ROCK, TEXAS 78735  
 Phone 512.767.7300  
 Fax 512.439.4716  
 FRN-F-1386

WWL "A"  
 PLAN AND PROFILE  
 STA 18+00 TO STA 22+00  
 JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'  
 SHEET NO. 15 OF 43 SHEETS



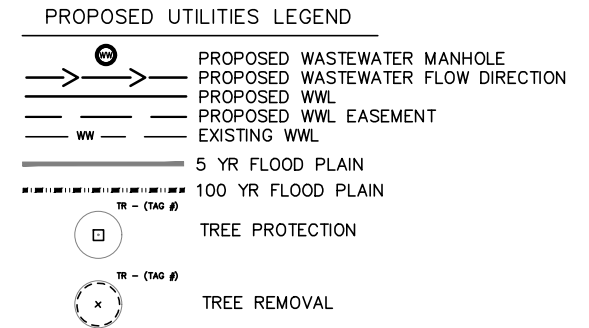
HORIZONTAL SCALE : 1" = 40'  
 VERTICAL SCALE : 1" = 10'  
 FULL SCALE : 1" = 20'



WWMH 3  
 STA: 22+07.68  
 INSTALL 60" DIA WWMH  
 N: 13815756.9261  
 E: 2243549.6316

EXISTING 20' SANITARY SEWER  
 EASEMENT DOC# 455700  
 BOOK 1018 PG 730

PLAN VIEW IS ENTIRELY WITHIN  
 THE 100 YEAR FLOOD PLAIN



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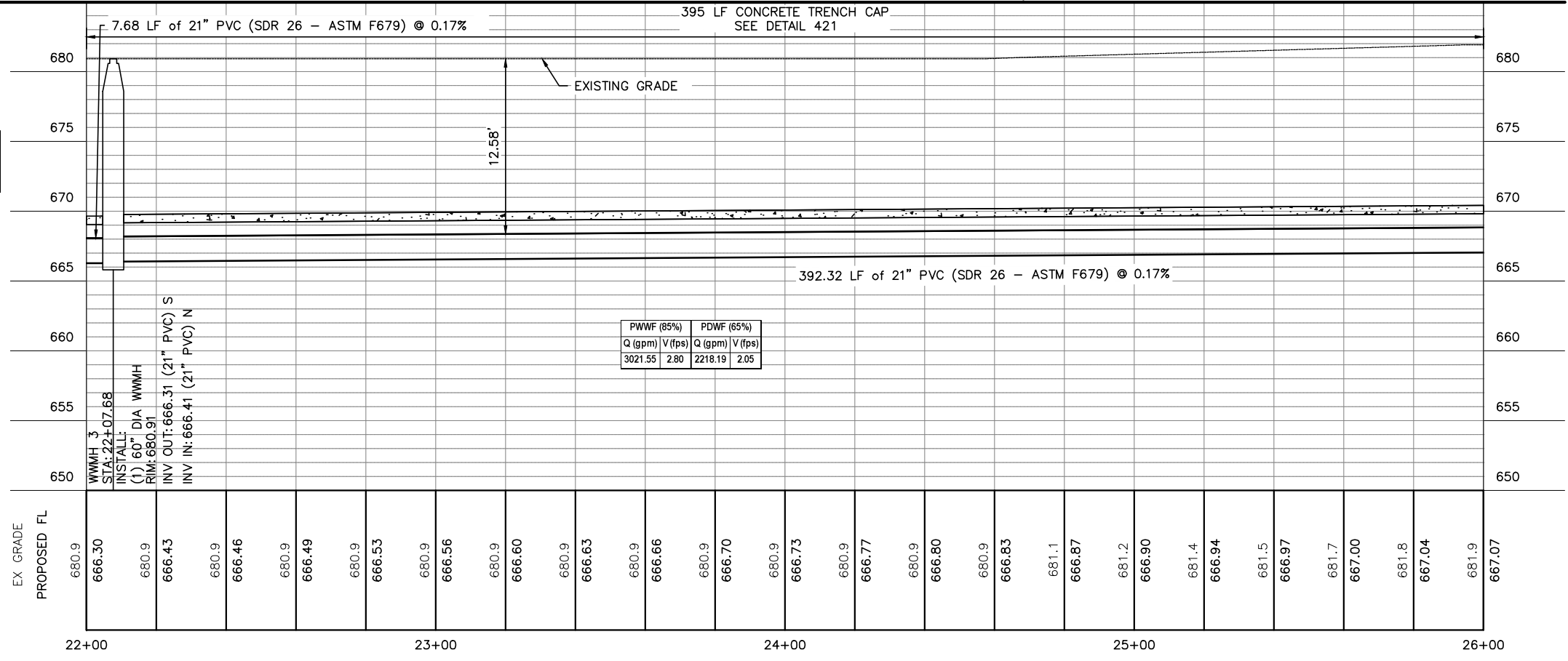
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PWWF (85%)		PDWF (65%)	
Q (gpm)	V (fps)	Q (gpm)	V (fps)
3021.55	2.80	2218.19	2.05

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Q (gpm)	V (fps)	Q (gpm)	V (fps)
3021.55	2.80	2218.19	2.05

EX GRADE	PROPOSED FL	STA	ELEVATION
680.9	680.9	22+00	680.9
666.30	666.30		666.30
680.9	680.9		680.9
666.43	666.43		666.43
680.9	680.9		680.9
666.46	666.46		666.46
680.9	680.9		680.9
666.49	666.49		666.49
680.9	680.9		680.9
666.53	666.53		666.53
680.9	680.9		680.9
666.56	666.56		666.56
680.9	680.9		680.9
666.60	666.60		666.60
680.9	680.9		680.9
666.63	666.63		666.63
680.9	680.9		680.9
666.66	666.66		666.66
680.9	680.9		680.9
666.70	666.70		666.70
680.9	680.9		680.9
666.73	666.73		666.73
680.9	680.9		680.9
666.77	666.77		666.77
680.9	680.9		680.9
666.80	666.80		666.80
680.9	680.9		680.9
666.83	666.83		666.83
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666.87	666.87		666.87
681.2	681.2		681.2
666.90	666.90		666.90
681.4	681.4		681.4
666.94	666.94		666.94
681.5	681.5		681.5
666.97	666.97		666.97
681.7	681.7		681.7
667.00	667.00		667.00
681.8	681.8		681.8
667.04	667.04		667.04
681.9	681.9		681.9
667.07	667.07		667.07

**REVISIONS**

NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23

DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC

**VERAMENDI WASTEWATER LINE**

**LJA Engineering, Inc.**

2700 LA FRONTERA BLVD.  
 SUITE 150  
 ROUND ROCK, TEXAS 78735

Phone 512.767.7300  
 Fax 512.439.4716  
 FRN-F-1386

JOB NUMBER: A441-2201

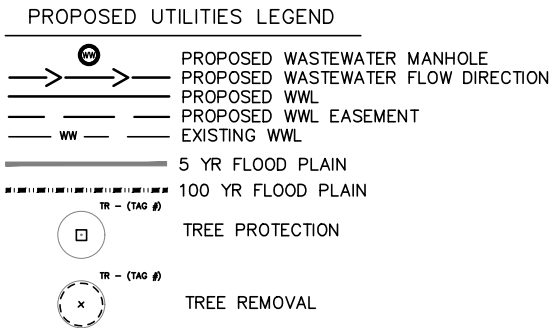
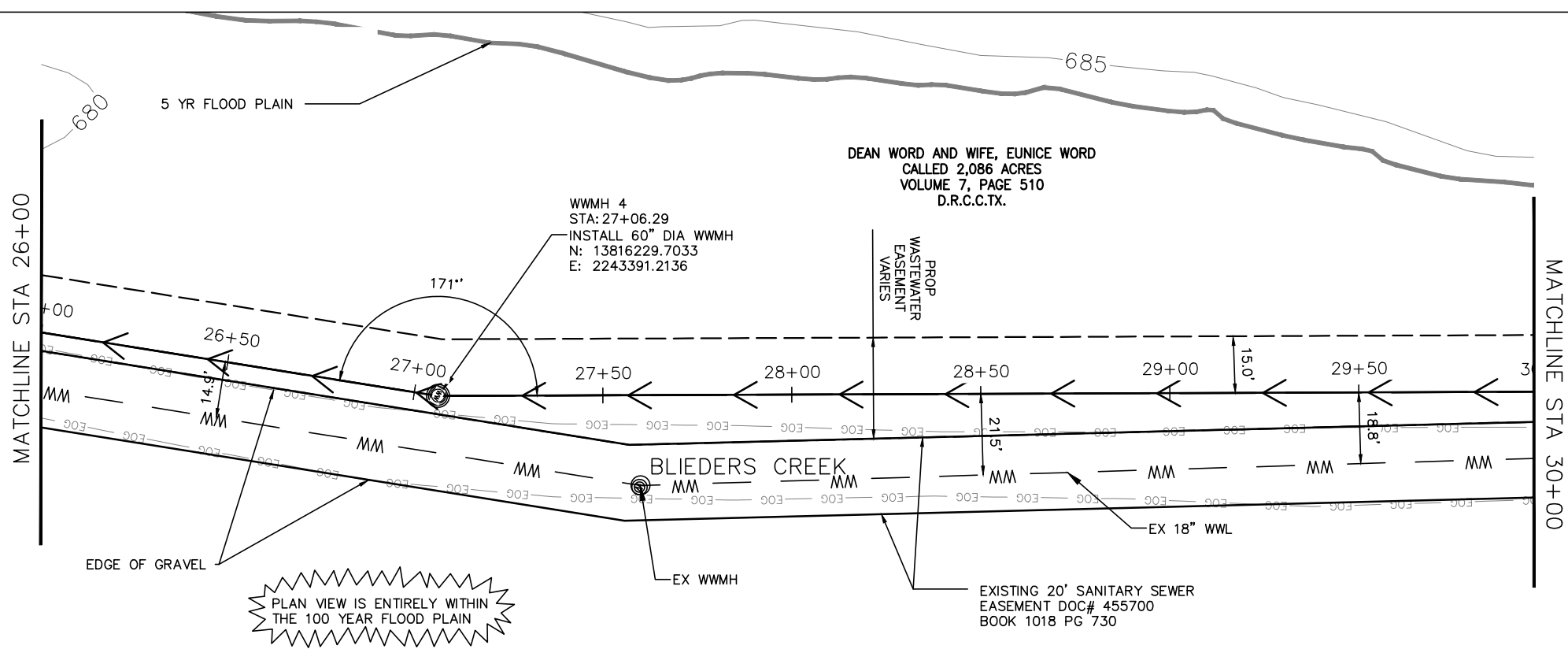
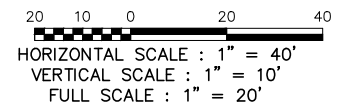
SCALE: HORIZONTAL: 1" = 40'  
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WWL "A"  
 PLAN AND PROFILE  
 STA 22+00 TO STA 26+00

SHEET NO. 16 OF 43 SHEETS

03/11/2023 3/11/2023 I:\441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell





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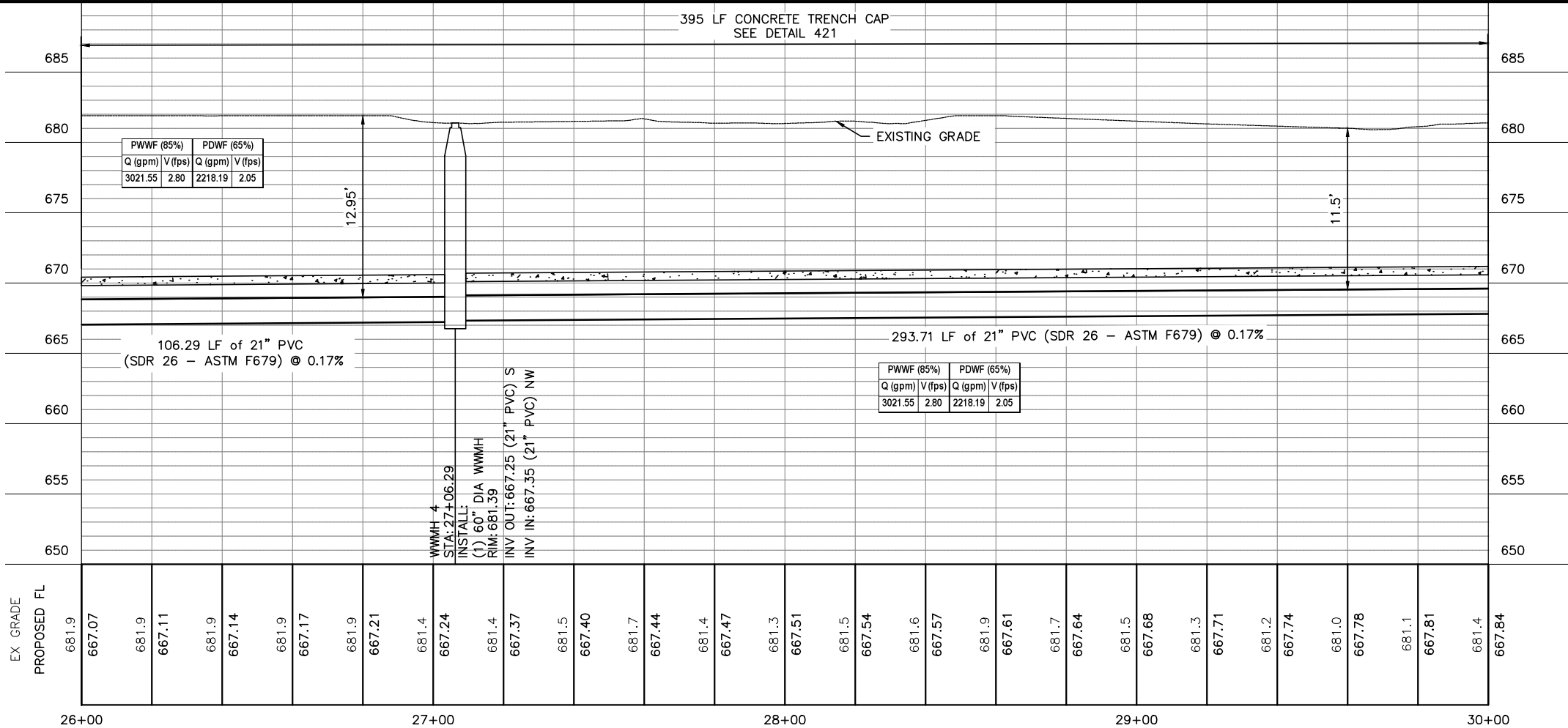
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REVISIONS			
NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23

DESIGNED BY: JT

DRAWN BY: JT

CHECKED BY: SC

APPROVED BY: SC

## VERAMENDI WASTEWATER LINE

**LJA Engineering, Inc.**

2700 LA FRONTERA BLVD. Phone 512.767.7300  
SUITE 150 Fax 512.439.4716  
ROUND ROCK, TEXAS 78735 FRN-F-1386

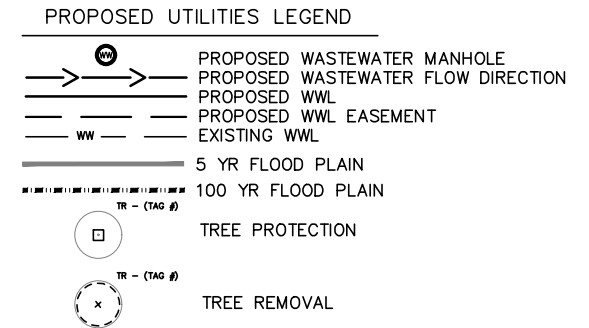
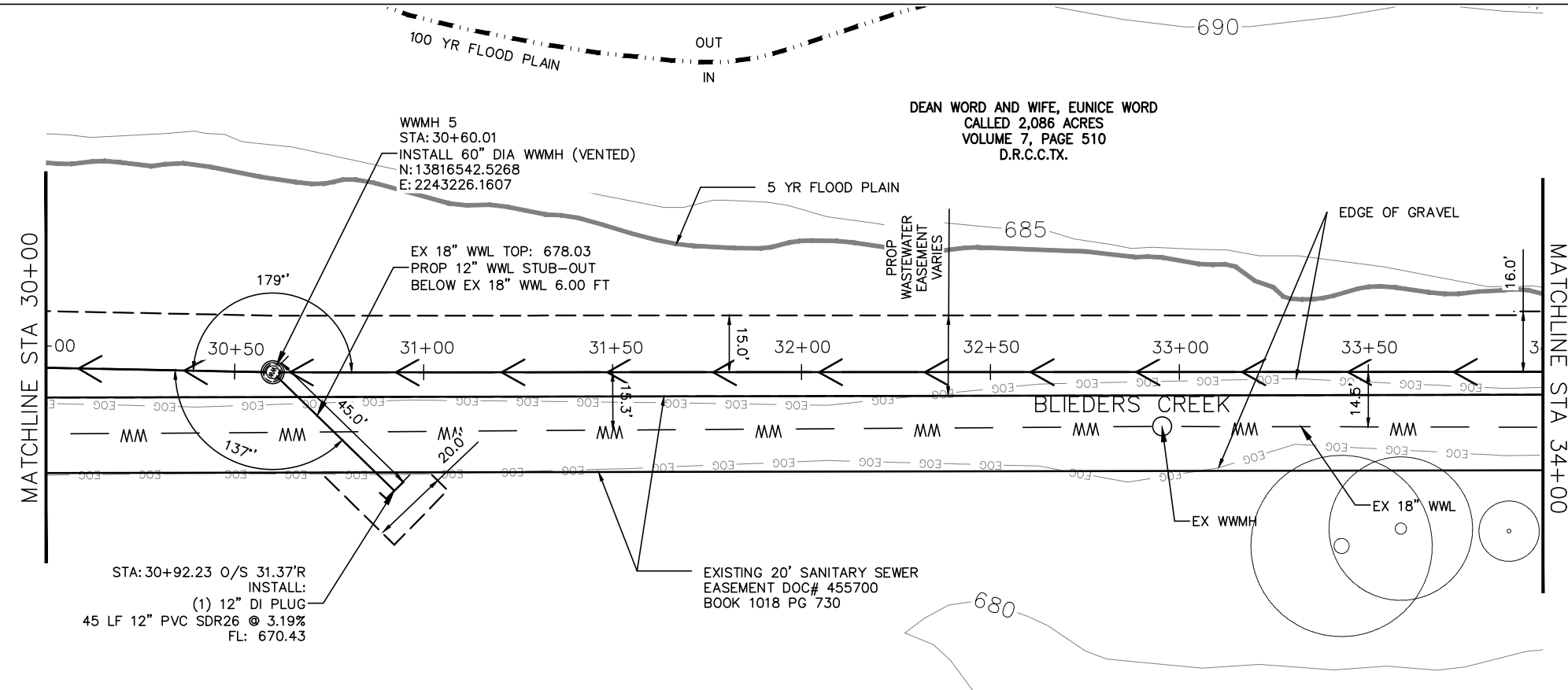
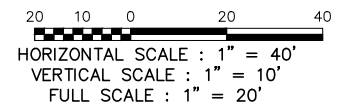
JOB NUMBER: A441-2201

SCALE: HORIZONTAL: 1" = 40'  
VERTICAL: 1" = 10'

SHEET NO. 17 OF 43 SHEETS

WWL "A"  
PLAN AND PROFILE  
STA 26+00 TO STA 30+00

03/11/2023 3/11/2023 I:\A441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell



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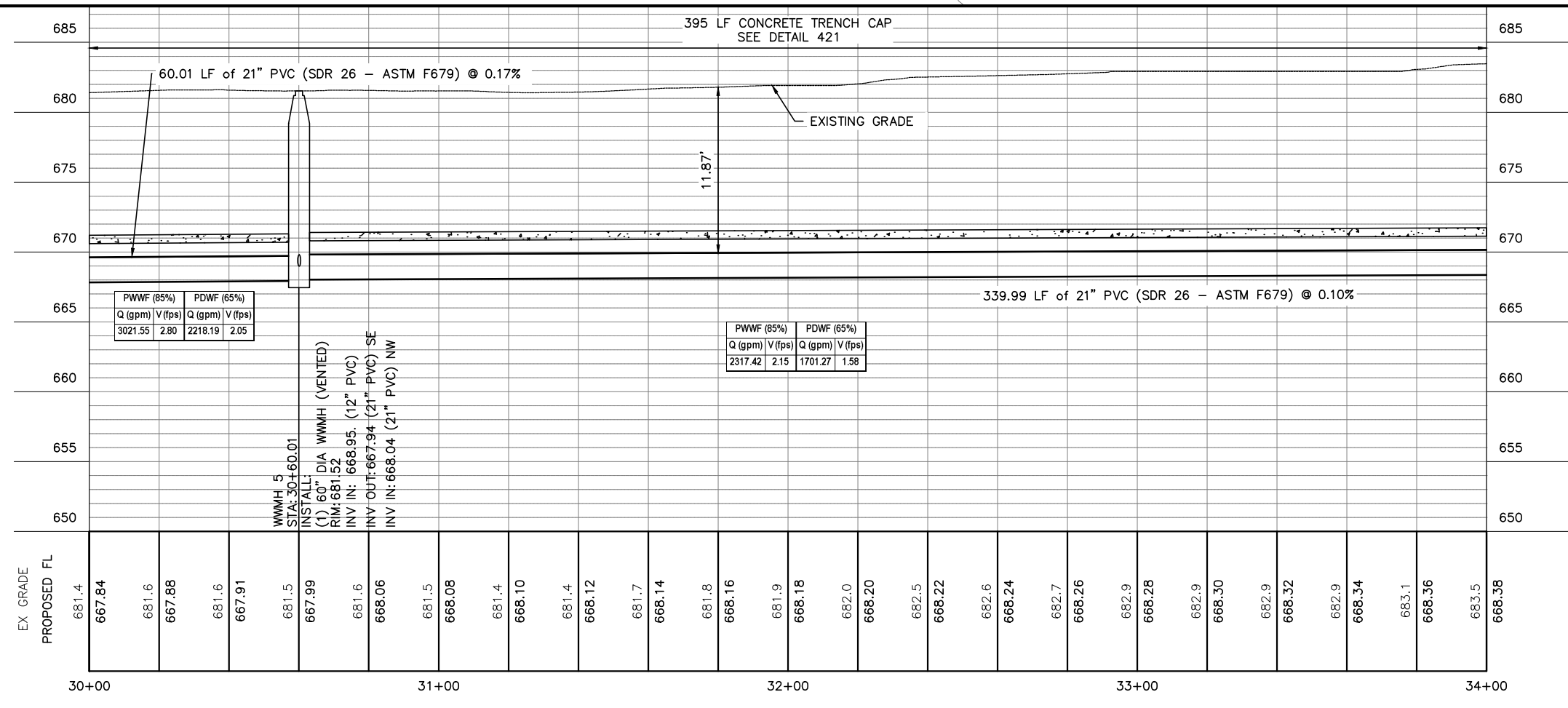
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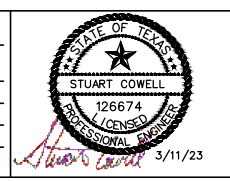
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REVISIONS		NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23  
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 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC

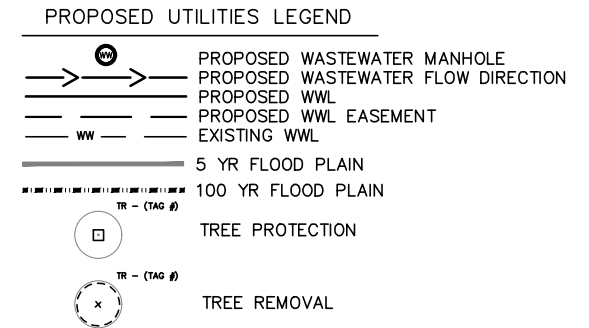
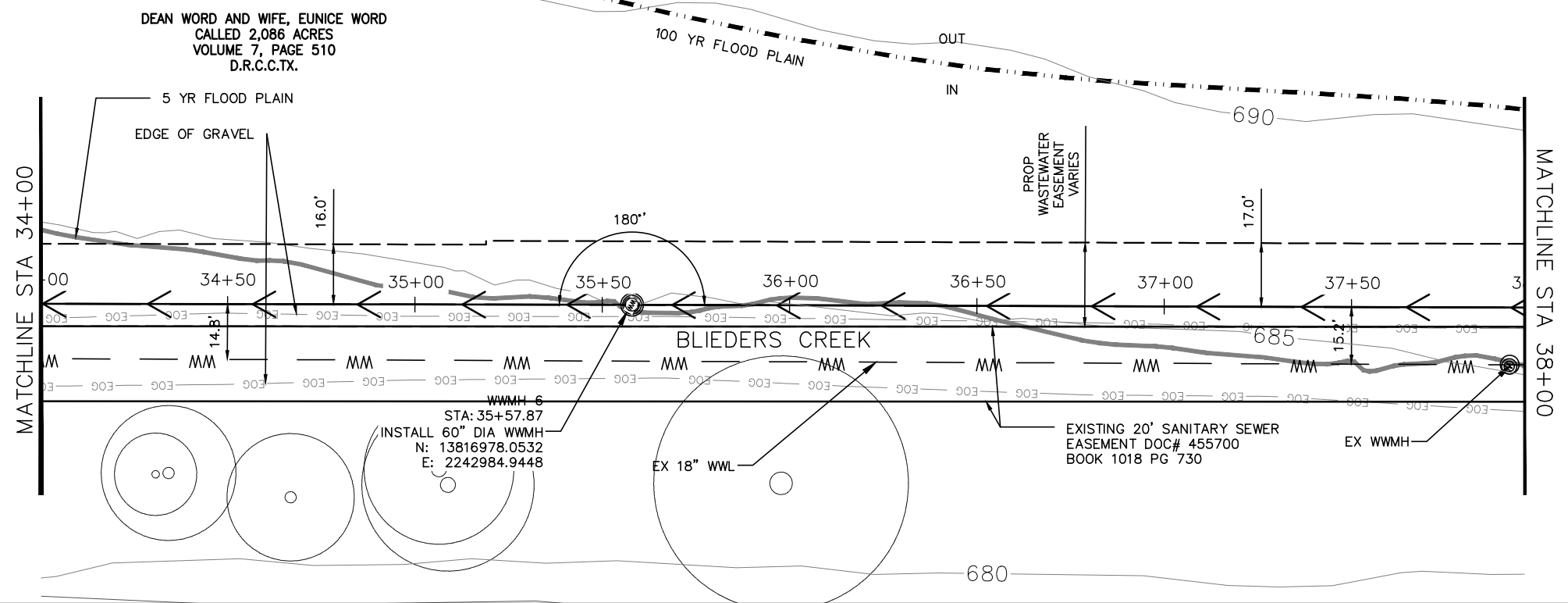


VERAMENDI WASTEWATER LINE

**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD.  
 SUITE 150  
 ROUND ROCK, TEXAS 78735  
 Phone 512.767.7300  
 Fax 512.439.4716  
 FRN-F-1386

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'  
 SHEET NO. 18 OF 43 SHEETS  
 WWL "A" PLAN AND PROFILE STA 30+00 TO STA 34+00

20 10 0 20 40  
 HORIZONTAL SCALE : 1" = 40'  
 VERTICAL SCALE : 1" = 10'  
 FULL SCALE : 1" = 20'



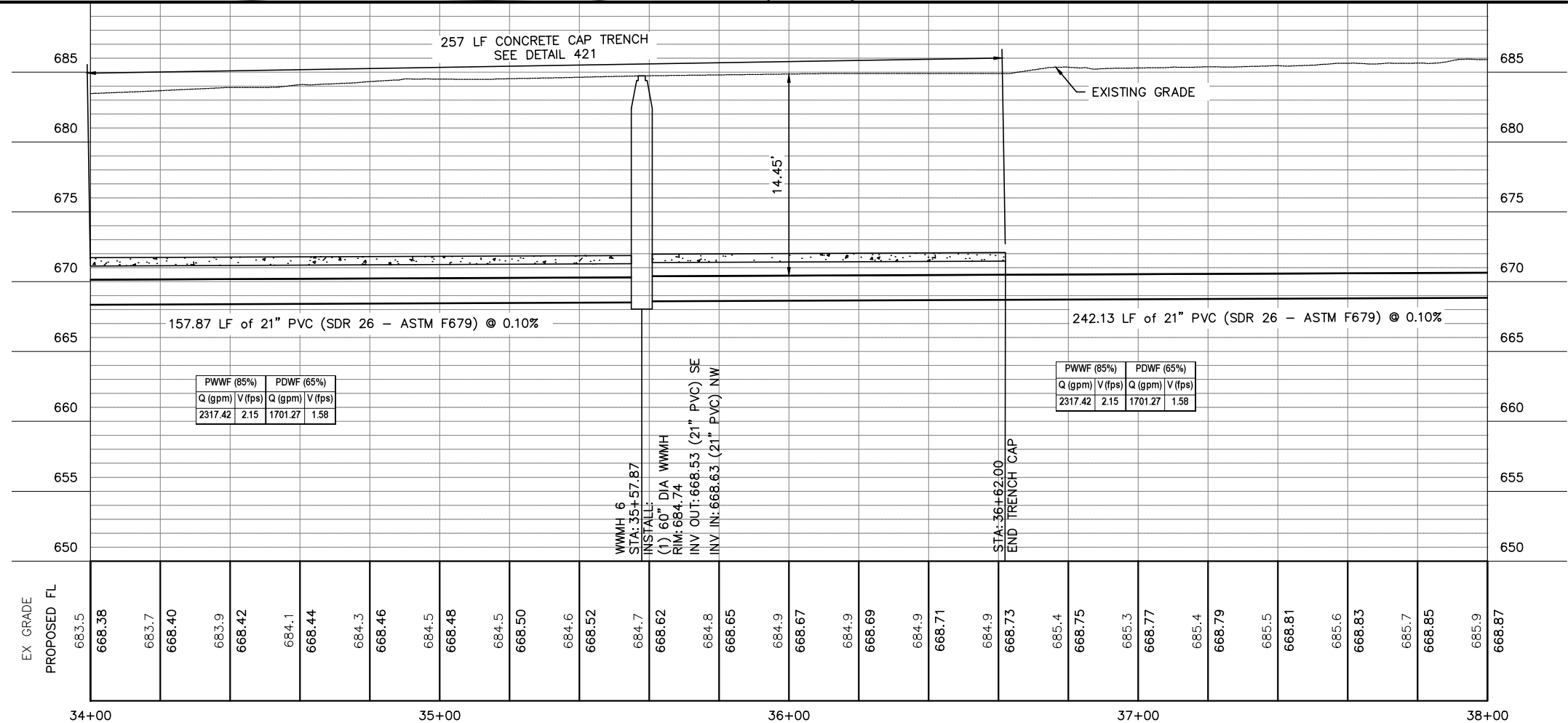
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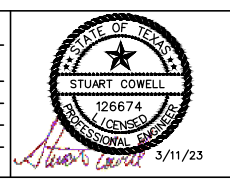
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03/11/2023 3/11/2023 R:\4441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

REVISIONS		DATE:	3/11/23
NO.	DESCRIPTION	BY	DATE

DESIGNED BY: JT  
 DRAWN BY: JT  
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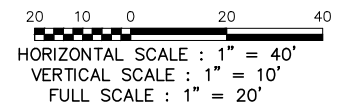


VERAMENDI  
 WASTEWATER LINE

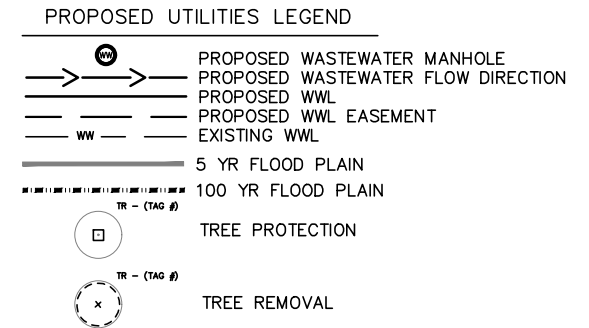
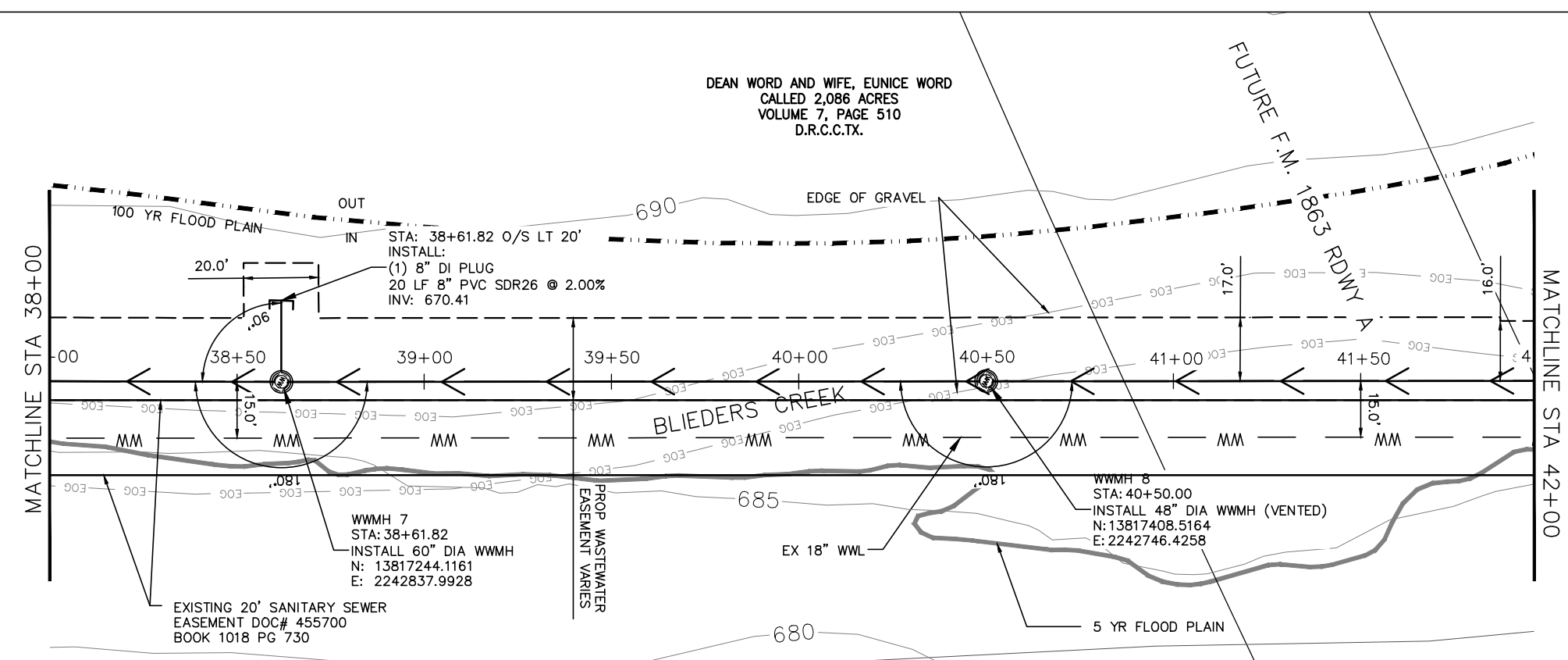
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WWL "A"  
 PLAN AND PROFILE  
 STA 34+00 TO STA 38+00

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'  
 SHEET NO. 19 OF 43 SHEETS



DEAN WORD AND WIFE, EUNICE WORD  
CALLED 2,086 ACRES  
VOLUME 7, PAGE 510  
D.R.C.C.TX.



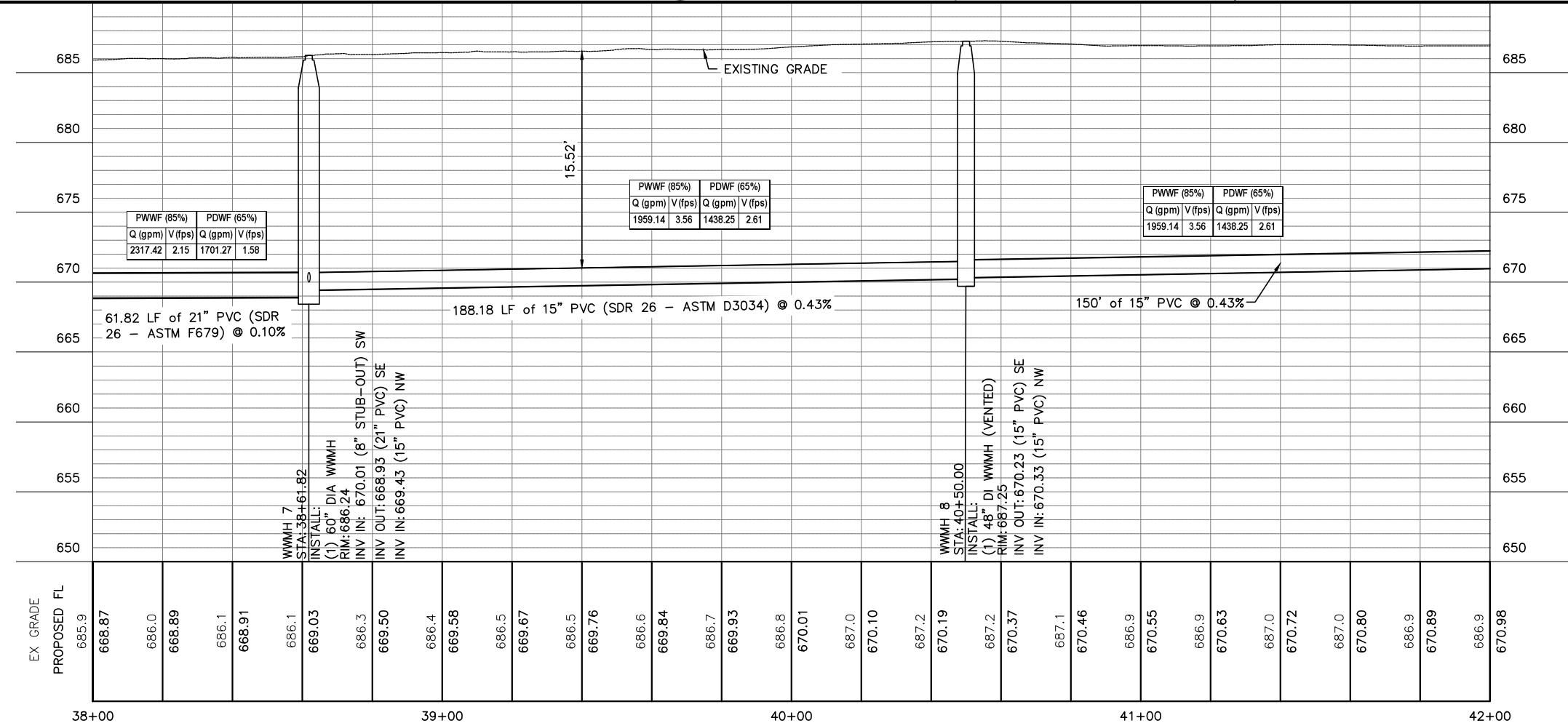
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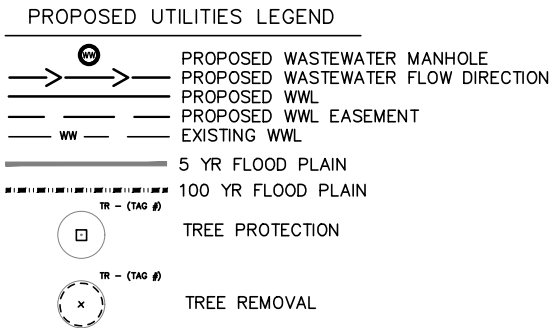
REVISIONS		DATE:
NO.	DESCRIPTION	DATE
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FRN-F-1386

**WWL "A"**  
PLAN AND PROFILE  
STA 38+00 TO STA 42+00  
JOB NUMBER: A441-2201  
SCALE: HORIZONTAL: 1" = 40'  
VERTICAL: 1" = 10'  
SHEET NO. 20  
OF 43 SHEETS

20 10 0 20 40  
 HORIZONTAL SCALE : 1" = 40'  
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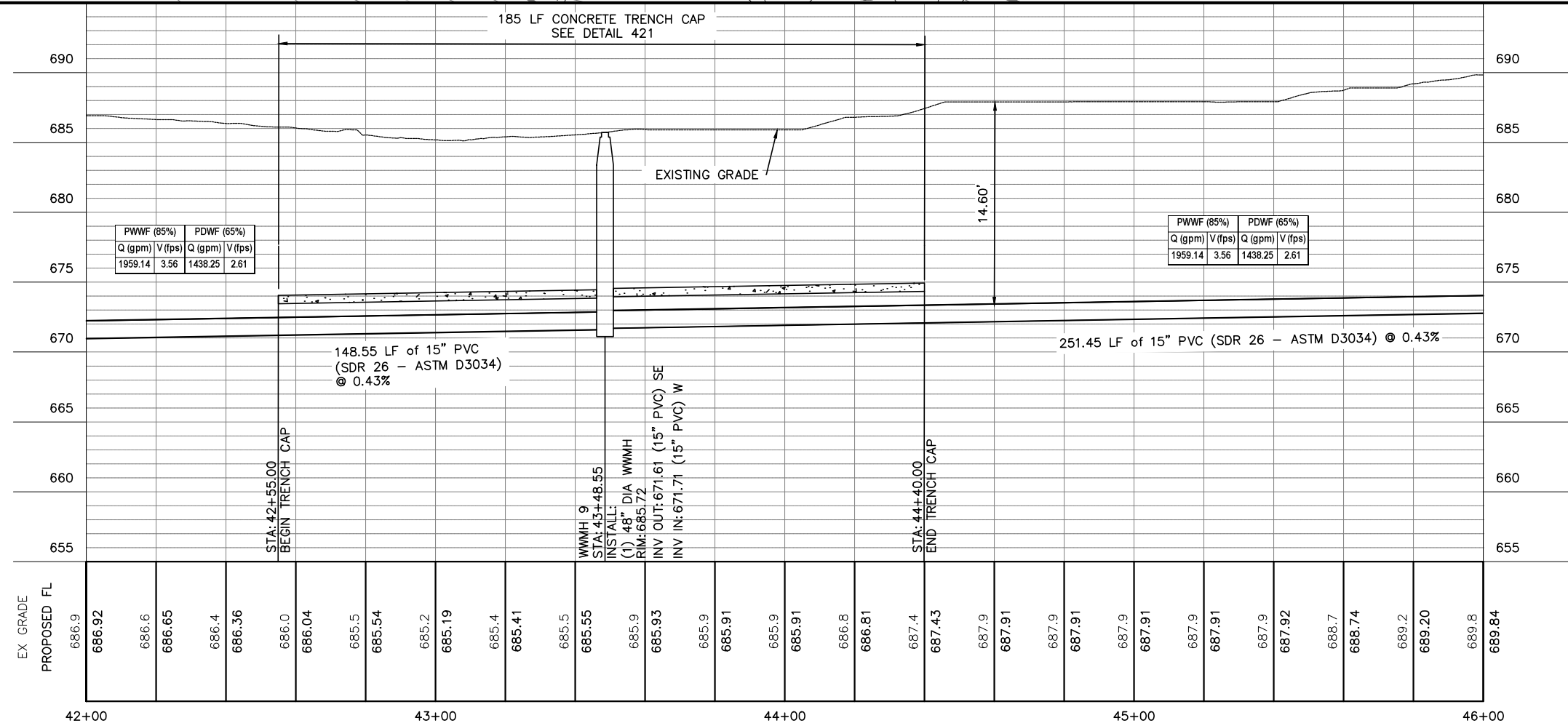
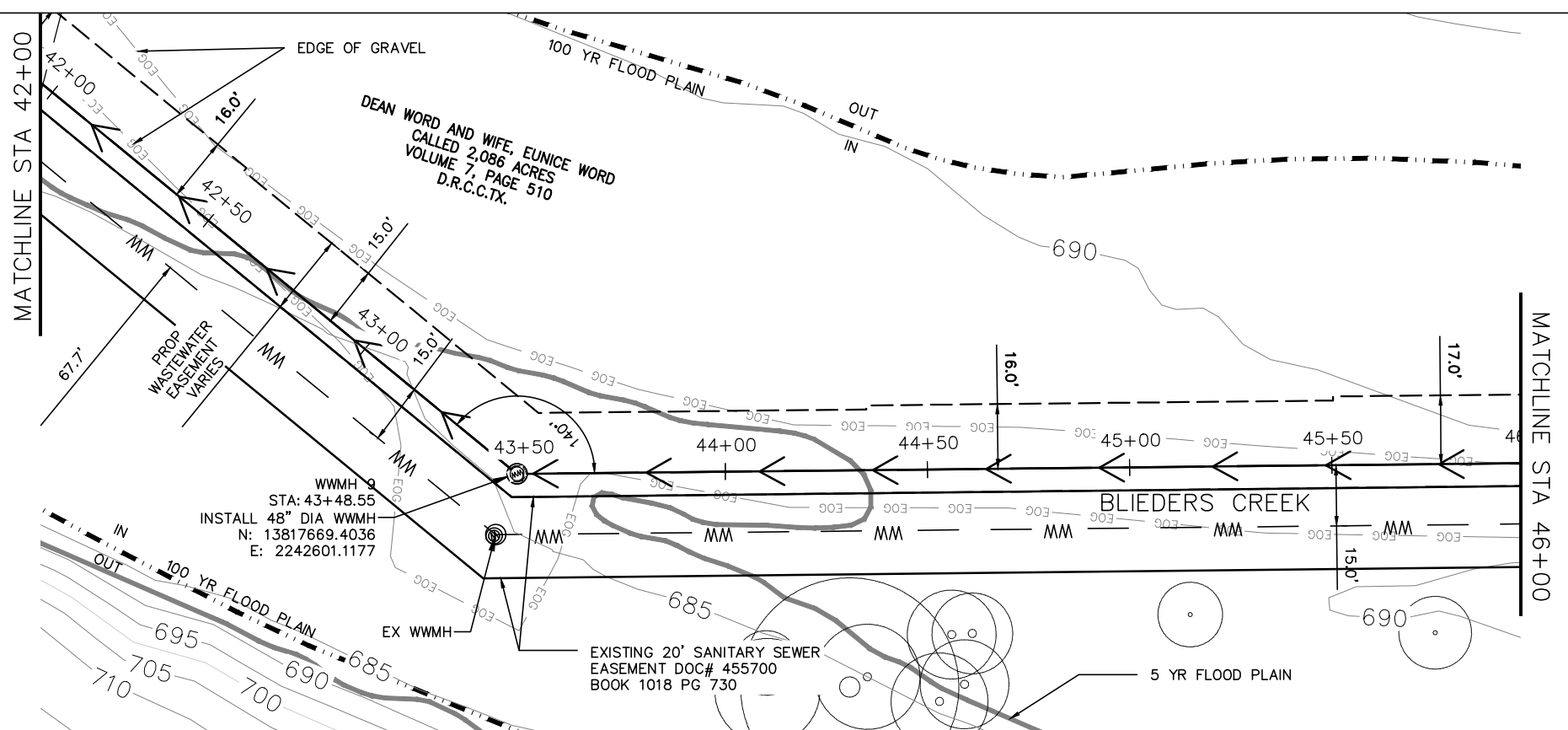
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NO.	DESCRIPTION	DATE
		3/11/23

DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC

STATE OF TEXAS  
 STUART COWELL  
 126674  
 LICENSED PROFESSIONAL ENGINEER  
 3/11/23

VERAMENDI WASTEWATER LINE

**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD. Phone 512.767.7300  
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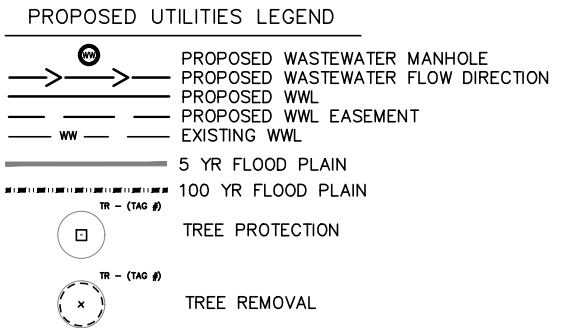
WWL "A"  
 PLAN AND PROFILE  
 STA 42+00 TO STA 46+00

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'  
 SHEET NO. 21 OF 43 SHEETS

03/11/2023 3/11/2023 I:\A441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell



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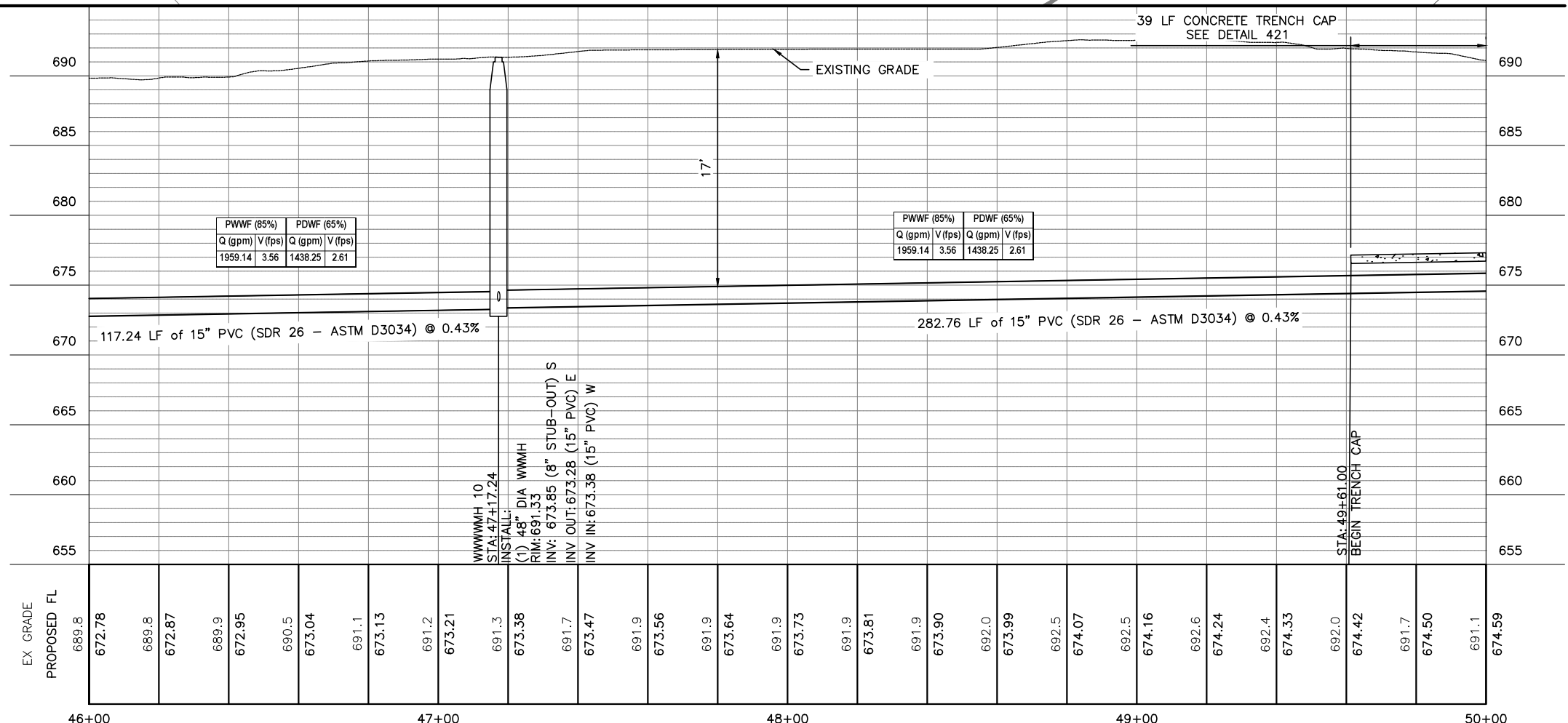
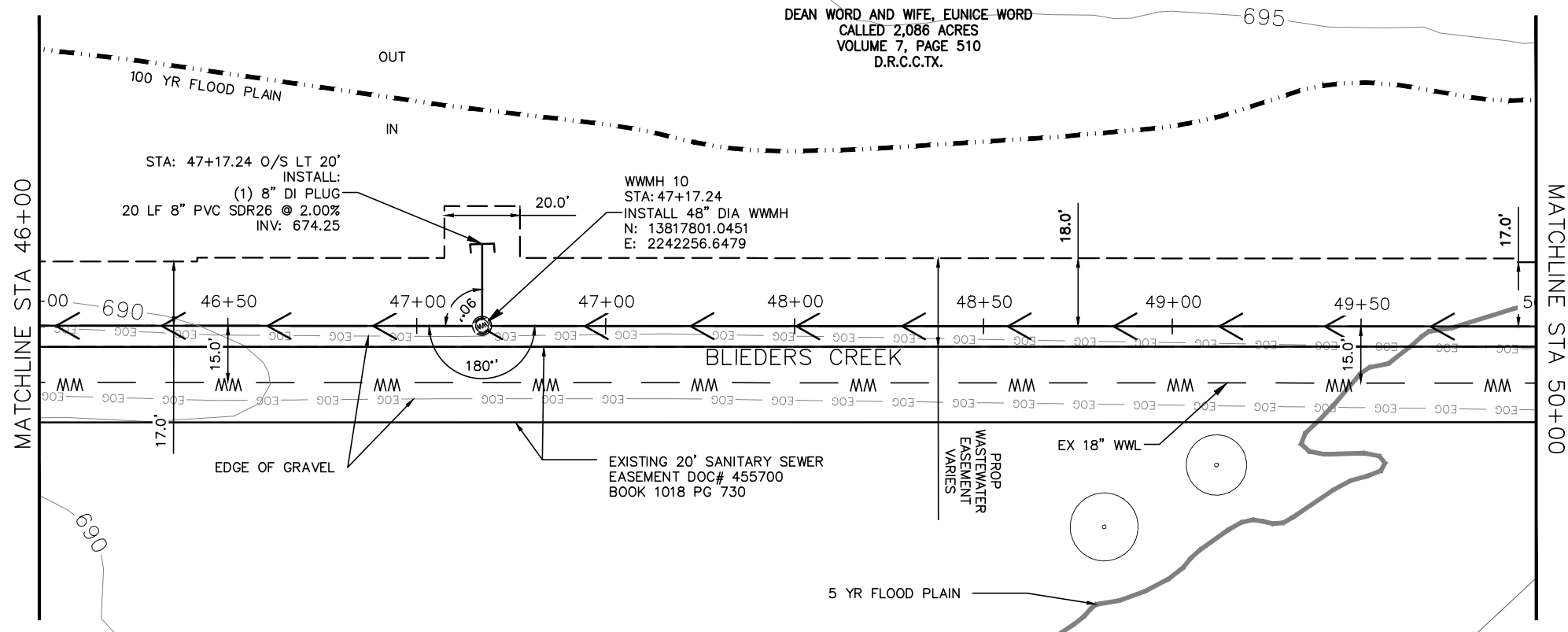
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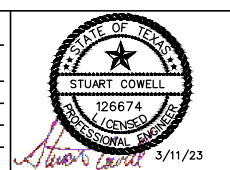
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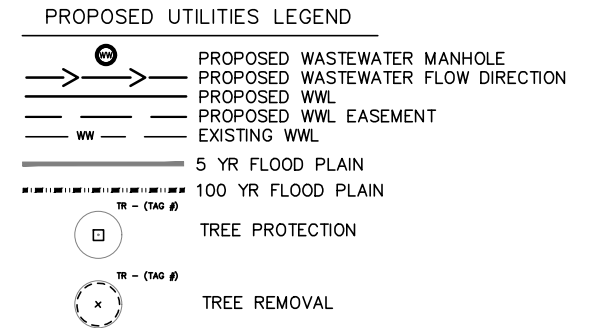
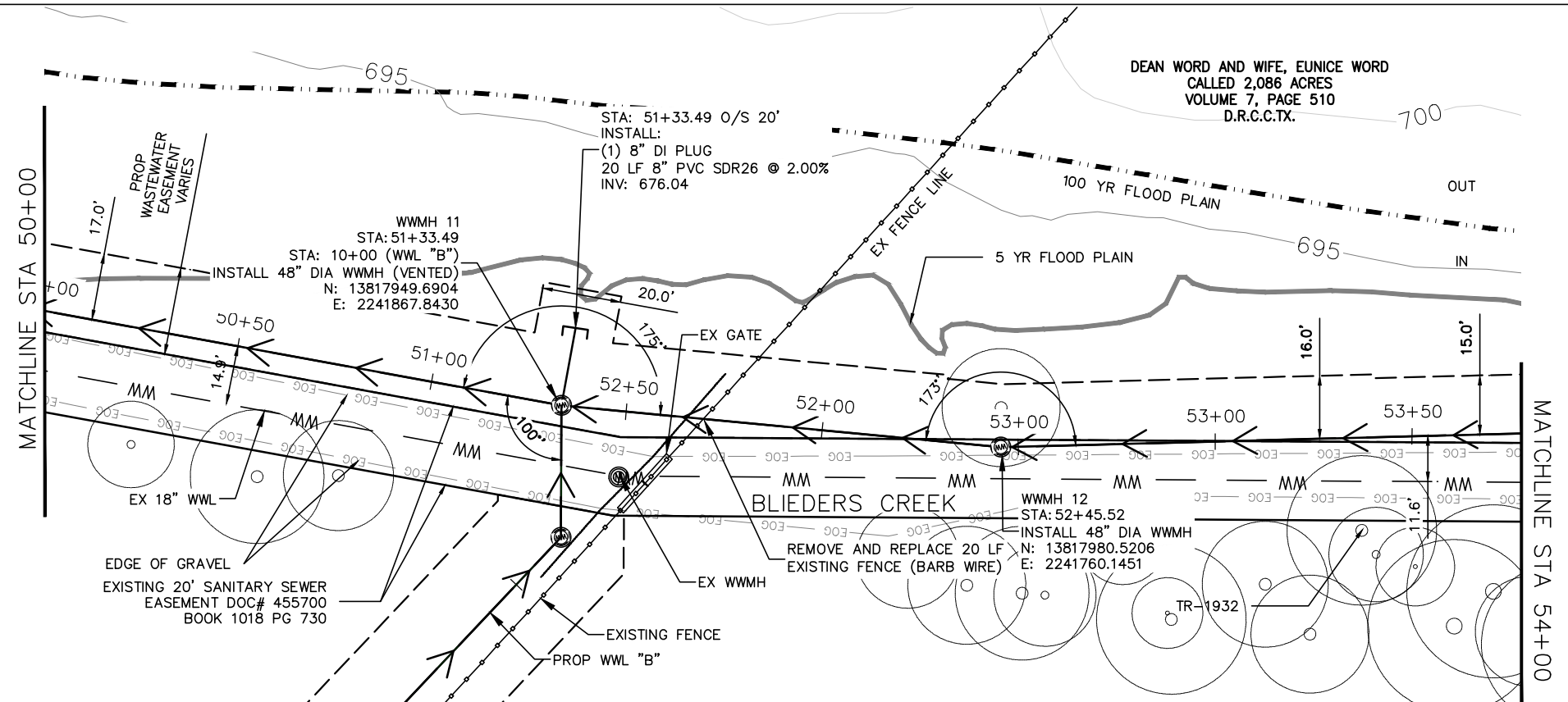
**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD.  
 SUITE 150  
 ROUND ROCK, TEXAS 78735

Phone 512.767.7300  
 Fax 512.439.4716  
 FRN-F-1386

WWL "A"  
 PLAN AND PROFILE  
 STA 46+00 TO STA 50+00

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40'  
 VERTICAL: 1" = 10'  
 SHEET NO. 22  
 OF 43 SHEETS

20 10 0 20 40  
 HORIZONTAL SCALE : 1" = 40'  
 VERTICAL SCALE : 1" = 10'  
 FULL SCALE : 1" = 20'



- GENERAL NOTES:
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  - CONTRACTOR TO MAINTAIN 60" OF COVER OVER THE PROPOSED UTILITY AND 24" OF VERTICAL AND HORIZONTAL CLEARANCE FROM ALL EXISTING UTILITIES.
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  - PIPE STATIONING, AND LINEAR FOOTAGE IS FROM CENTER OF MANHOLE TO CENTER OF MANHOLE. PIPE SLOPE IS CALCULATED FROM INSIDE FACE OF MANHOLE TO INSIDE FACE OF MANHOLE.
  - NO PERMANENT FILL, TRENCH SPOILS, BACKFILL MATERIALS OR MATERIALS STORAGE SHALL BE PLACED WITHIN THE 100-YR FLOOD PLAIN.
  - ALL WWMH WITHIN 100-YR FLOOD PLAIN WILL BE WATERTIGHT WITH GASKETED & BOLTED MANHOLE COVERS.

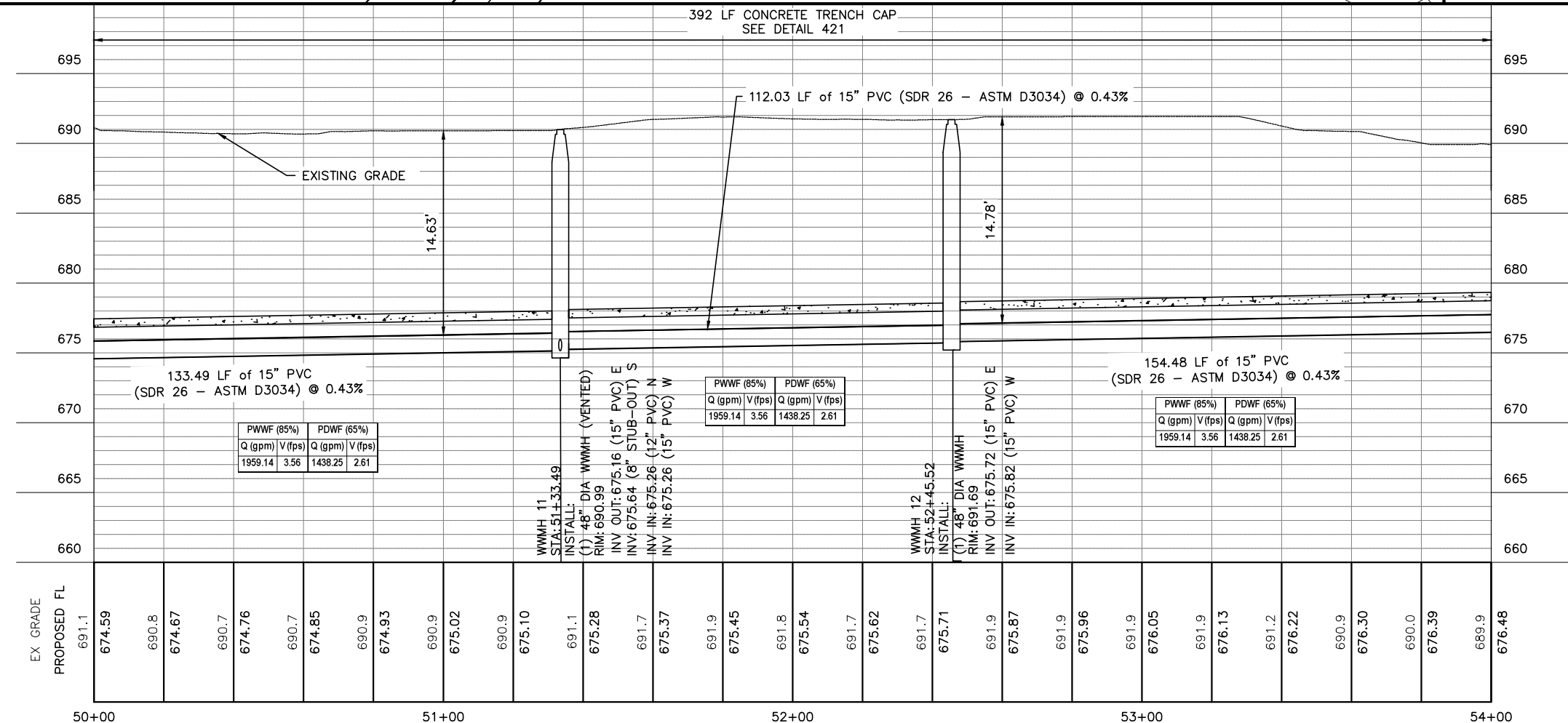
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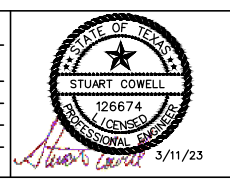
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03/11/2023 3/11/2023 I:\4441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

REVISIONS		DATE:	3/11/23
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VERAMENDI WASTEWATER LINE

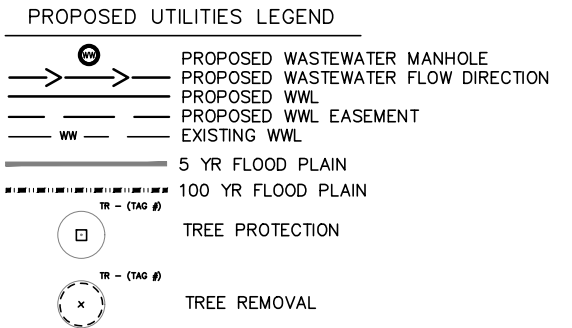
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WWL "A"  
 PLAN AND PROFILE  
 STA 50+00 TO STA 54+00

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40'  
 VERTICAL: 1" = 10'  
 SHEET NO. 23  
 OF 43 SHEETS



HORIZONTAL SCALE : 1" = 40'  
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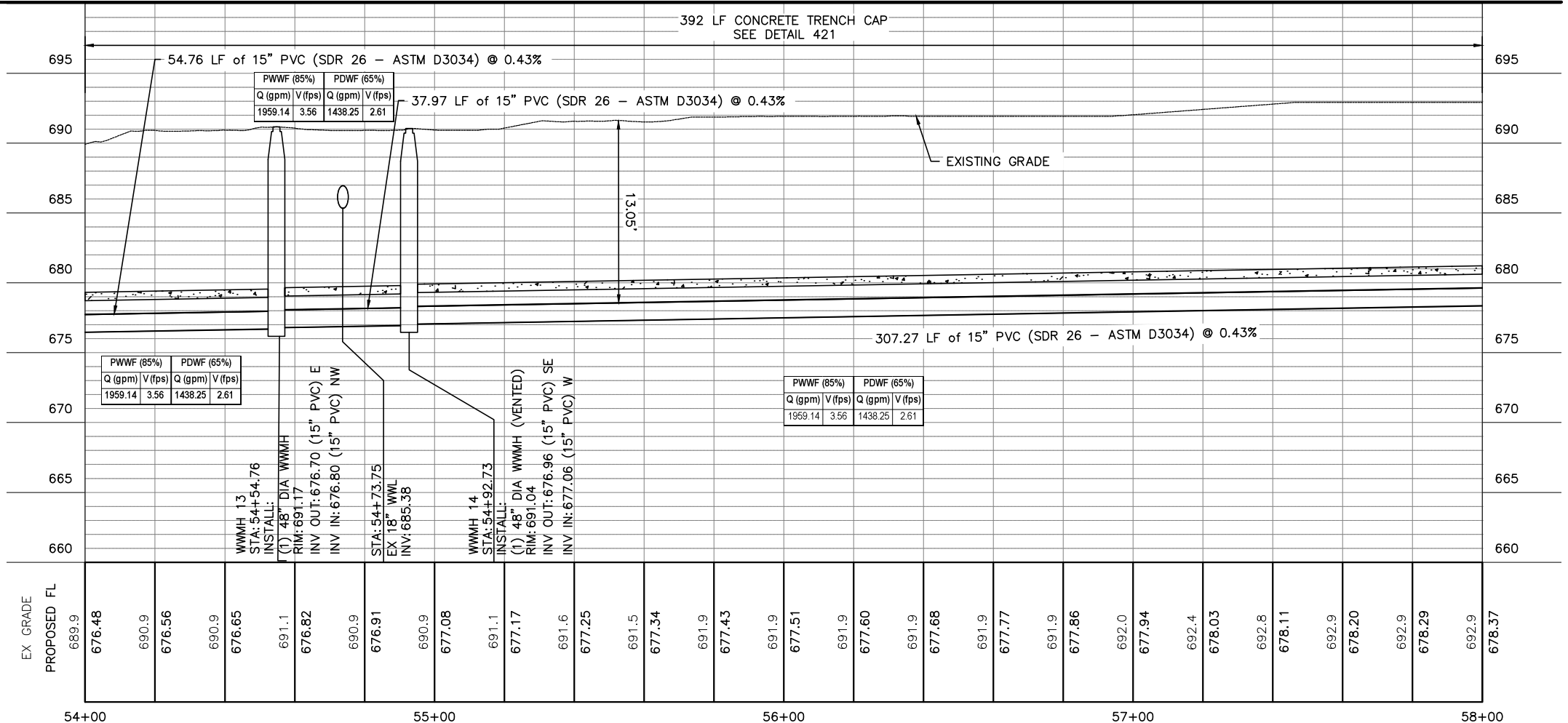
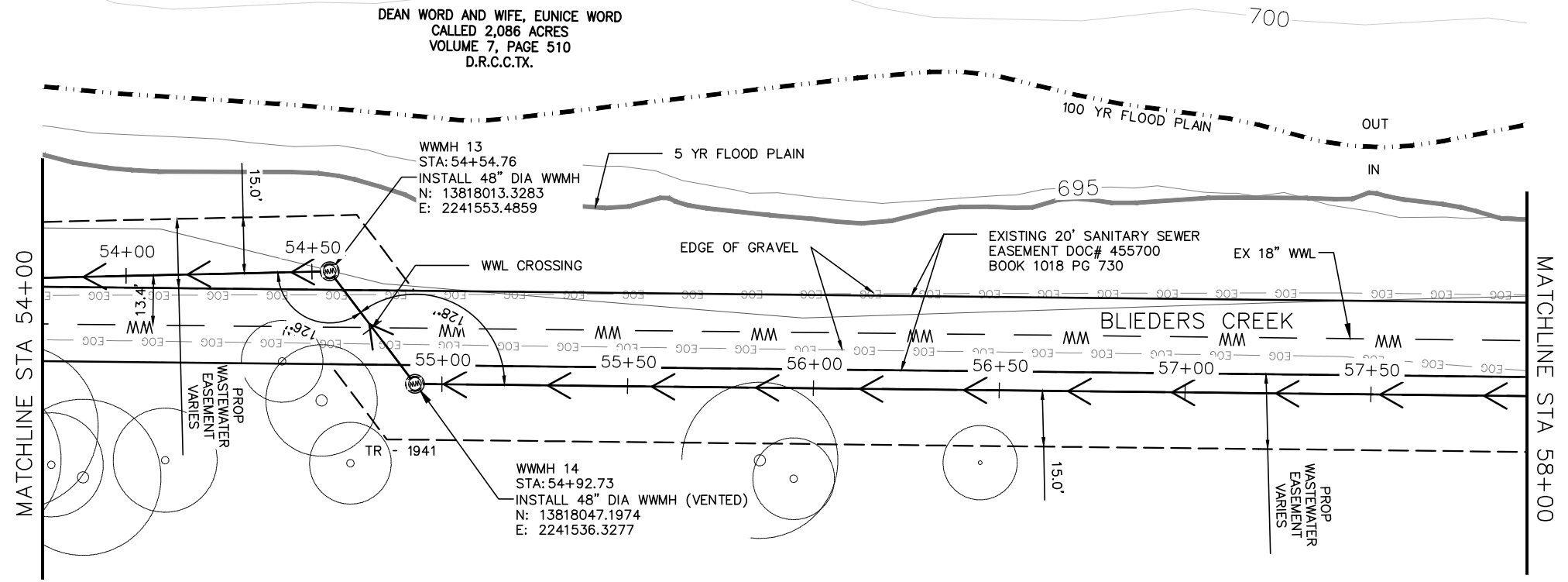
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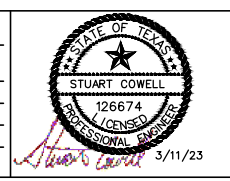
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NO.	DESCRIPTION	BY	DATE

DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC



**VERAMENDI  
 WASTEWATER LINE**

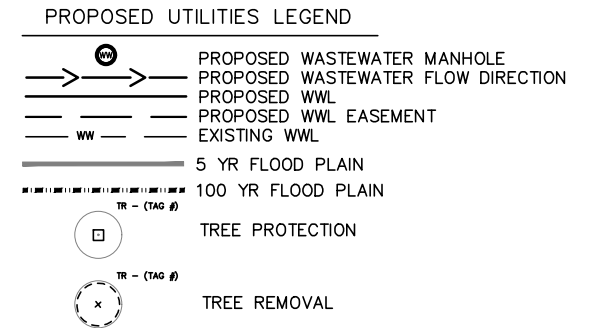
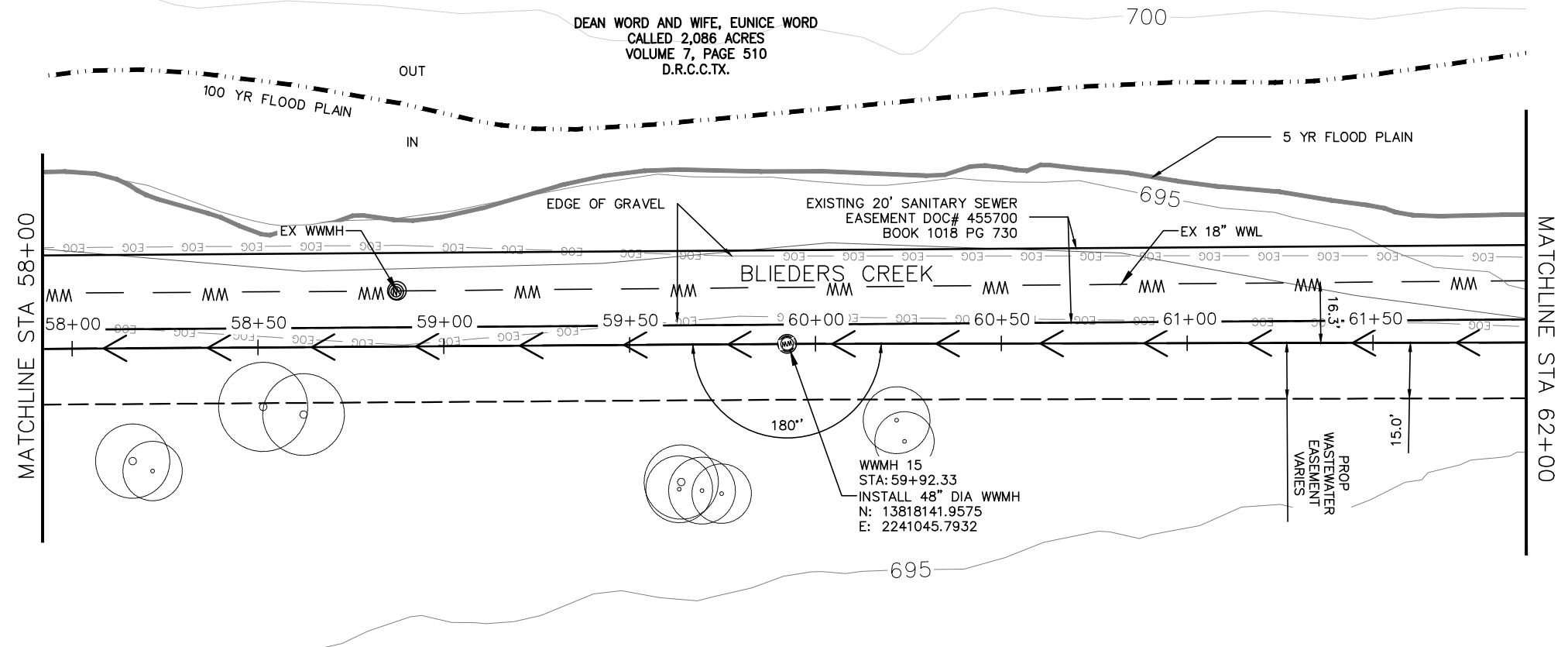
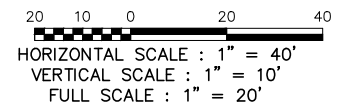
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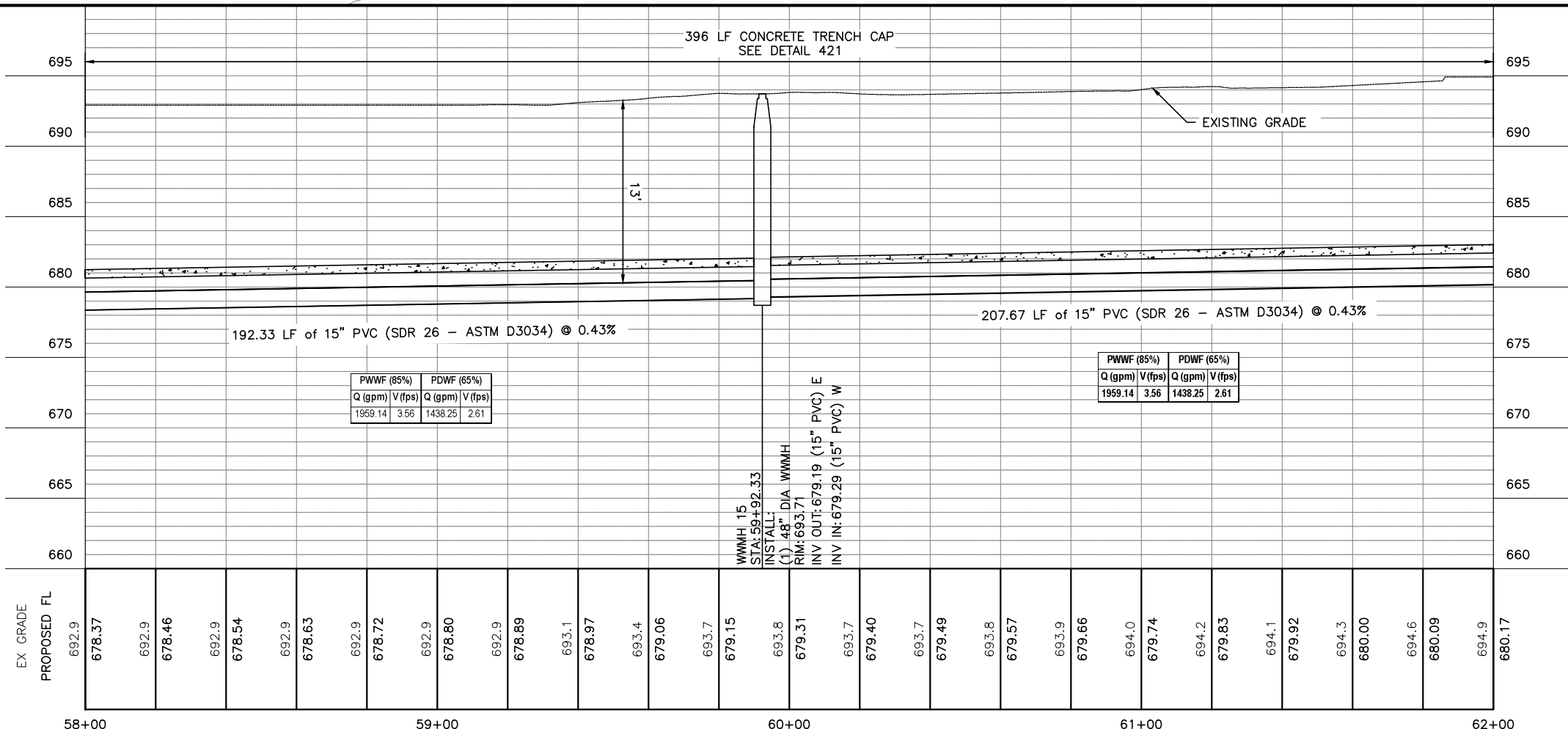
WWL "A"  
 PLAN AND PROFILE  
 STA 54+00 TO STA 58+00

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40'  
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 SHEET NO. 24  
 OF 43 SHEETS





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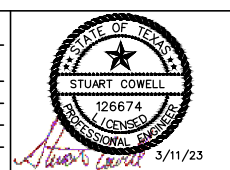
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		3/11/23



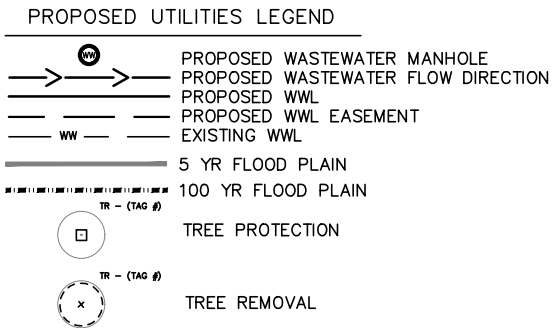
**VERAMENDI WASTEWATER LINE**

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 2700 LA FRONTERA BLVD.  
 SUITE 150  
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JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40'  
 VERTICAL: 1" = 10'  
 SHEET NO. 25  
 OF 43 SHEETS

03/11/2023 3/11/2023 I:\A441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

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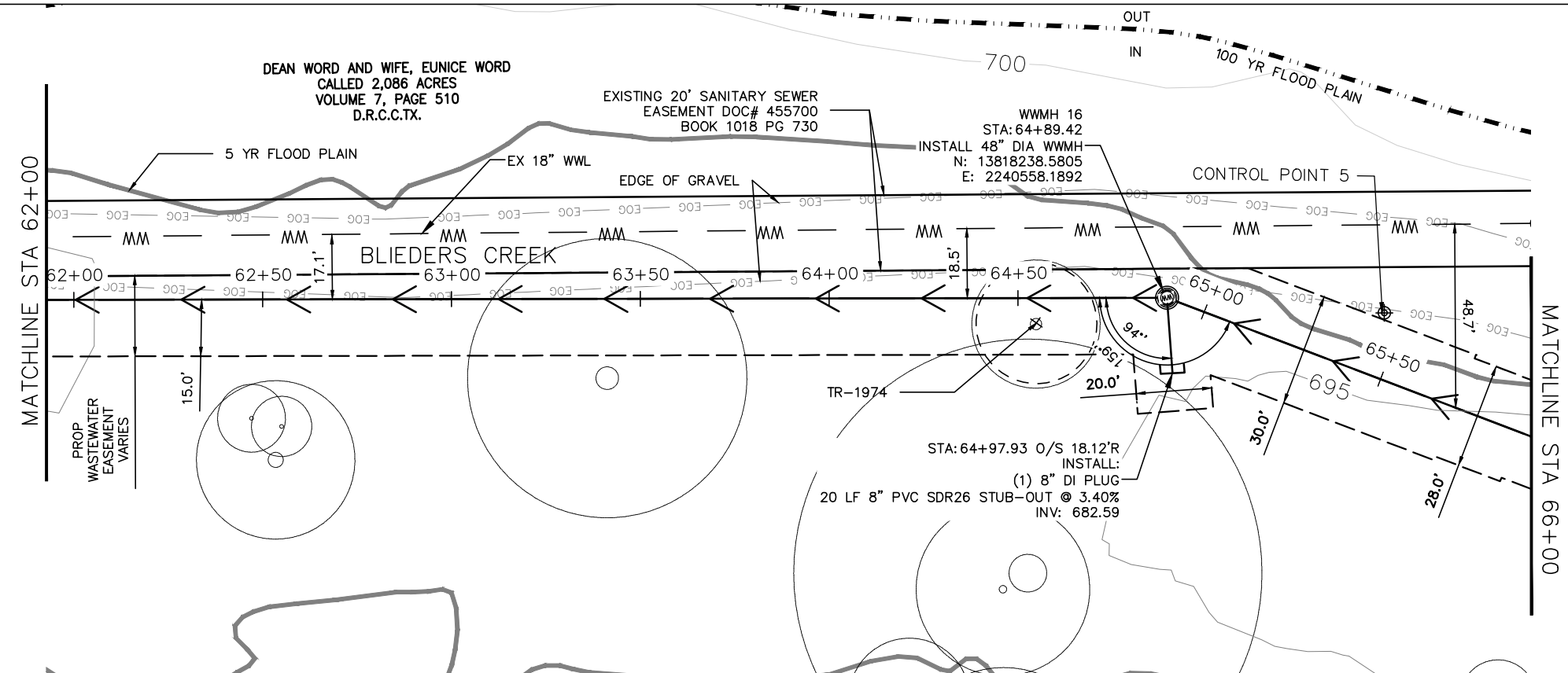
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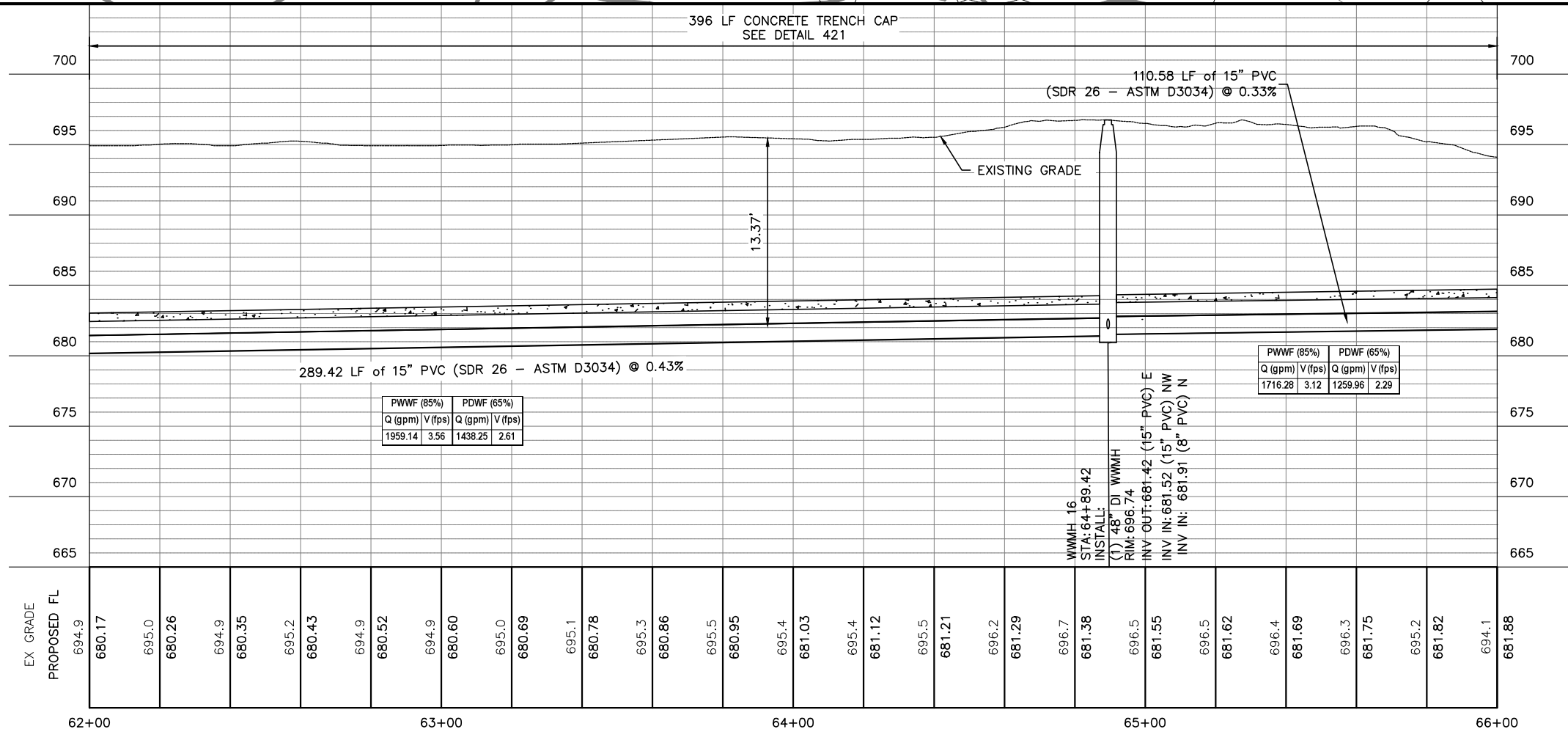
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STA: 64+97.93 O/S 18.12'R  
 INSTALL:  
 (1) 8" DI PLUG  
 20 LF 8" PVC SDR26 STUB-OUT @ 3.40%  
 INV: 682.59

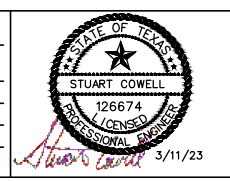


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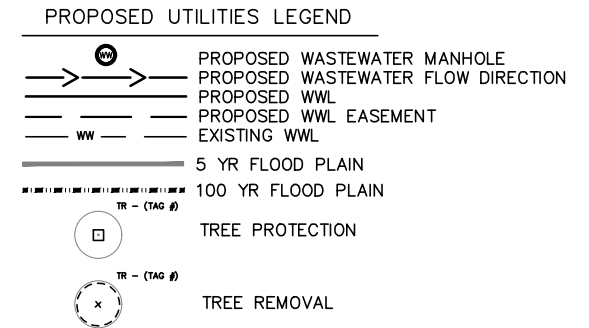
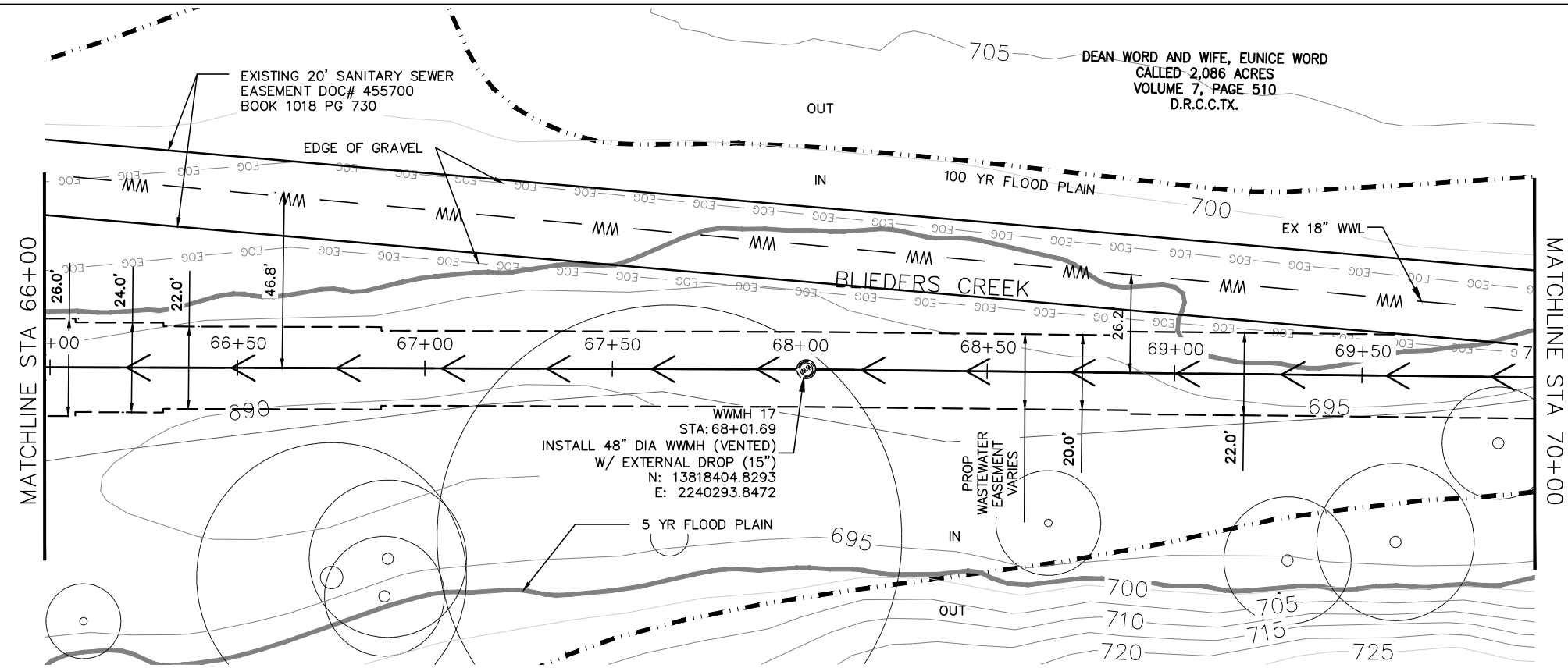
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WWL "A"  
 PLAN AND PROFILE  
 STA 62+00 TO STA 66+00

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40'  
 VERTICAL: 1" = 10'  
 SHEET NO. 26  
 OF 43 SHEETS

20 10 0 20 40  
 HORIZONTAL SCALE : 1" = 40'  
 VERTICAL SCALE : 1" = 10'  
 FULL SCALE : 1" = 20'



- GENERAL NOTES:
- THE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE APPROXIMATE. THE CONTRACTOR WILL DETERMINE THE EXACT LOCATION AND DEPTH OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES OCCURRED BY THE FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
  - CONTRACTOR TO MAINTAIN 60" OF COVER OVER THE PROPOSED UTILITY AND 24" OF VERTICAL AND HORIZONTAL CLEARANCE FROM ALL EXISTING UTILITIES.
  - ALL WASTEWATER MANHOLES TO BE CONSTRUCTED PER NBU DETAIL 328 (STANDARD MANHOLE), NBU DETAIL 325 PRECAST MANHOLE W/ DROP INLET AND RIM ELEVATION WILL BE 2" ABOVE FINISHED GRADE.
  - ANY SIGNIFICANT DEVIATION FROM THE PLAN ALIGNMENT WILL BE BROUGHT TO THE ATTENTION OF THE ENGINEER. FIELD MODIFICATION SHALL BE APPROVED PRIOR TO PROCEEDING WITH CONSTRUCTION.
  - THE CONTRACTOR WILL BE RESPONSIBLE FOR THE CONTROL OF GROUND WATER AND SURFACE WATER AS NECESSARY FOR THE CONSTRUCTION OF THIS PROJECT.
  - ALL GRAVITY SANITARY SEWER LINES WILL CONFORM TO ASTM D3034/F679 PVC, SDR 26 WITH ASTM 3212 JOINTS. GRAVITY SANITARY SEWER LINES CROSSING POTABLE WATER LINES WILL CONFORM TO 30 TAC 217.53 (d).
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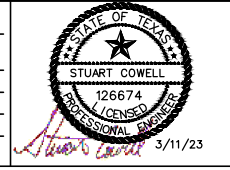
EX GRADE	PROPOSED FL	66+00	67+00	68+00	69+00	70+00
694.1	681.88	693.5	681.95	692.5	682.02	692.3
		682.08	692.3	682.15	691.8	682.21
		691.6	682.28	691.5	682.35	691.8
		682.41	692.5	682.48	693.3	682.81
		693.6	684.40	693.4	684.47	694.1
		684.54	694.5	684.60	696.2	684.67
		696.9	684.73	697.1	684.80	696.8
		684.87	696.5	684.93	696.3	685.00

PWWF (85%)	PDWF (65%)
Q (gpm)   V (fps)	Q (gpm)   V (fps)
1716.28   3.12	1259.96   2.29

PWWF (85%)	PDWF (65%)
Q (gpm)   V (fps)	Q (gpm)   V (fps)
1716.28   3.12	1259.96   2.29

03/11/2023 3/11/2023 I:\4441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

REVISIONS		DATE:	3/11/23
NO.	DESCRIPTION	BY	DATE



VERAMENDI WASTEWATER LINE

LJA Engineering, Inc.  
 2700 LA FRONTERA BLVD. Phone 512.767.7300  
 SUITE 150 Fax 512.439.4716  
 ROUND ROCK, TEXAS 78735 FRN-F-1386

WWL "A"  
 PLAN AND PROFILE  
 STA 66+00 TO STA 70+00

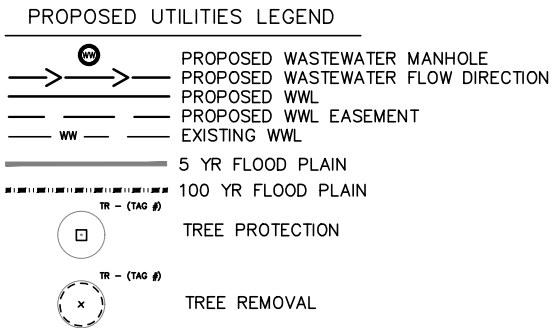
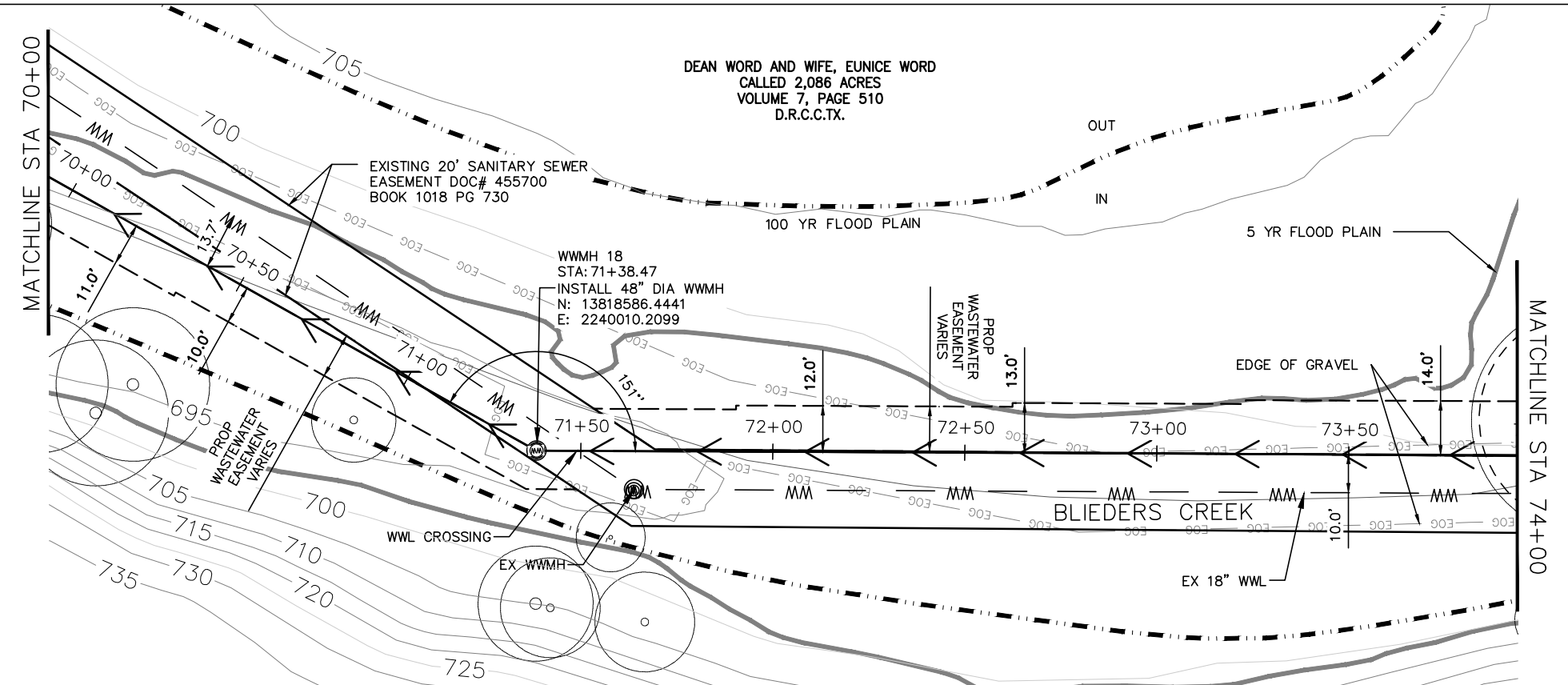
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JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'  
 SHEET NO. 27 OF 43 SHEETS

20 10 0 20 40  
 HORIZONTAL SCALE : 1" = 40'  
 VERTICAL SCALE : 1" = 10'  
 FULL SCALE : 1" = 20'

DEAN WORD AND WIFE, EUNICE WORD  
 CALLED 2,086 ACRES  
 VOLUME 7, PAGE 510  
 D.R.C.C.TX.



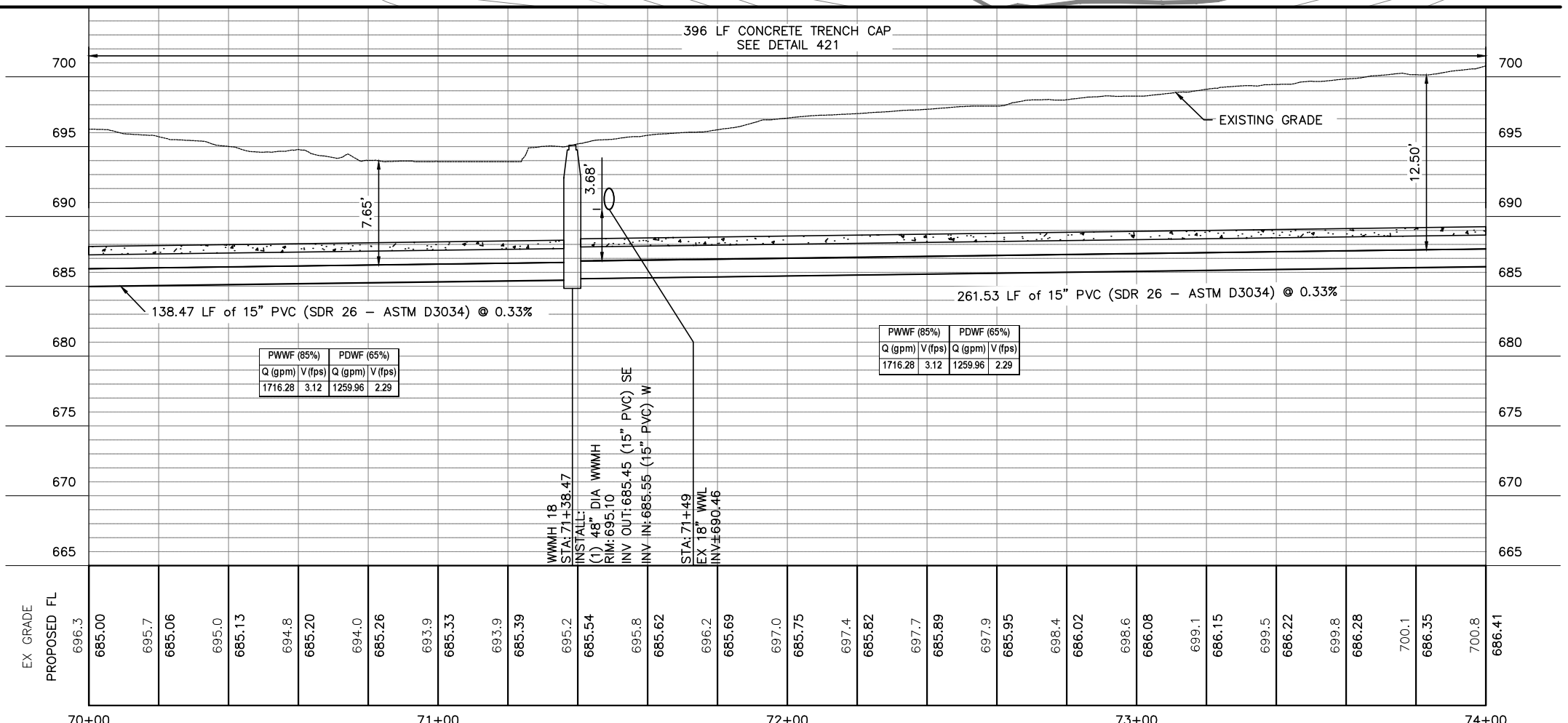
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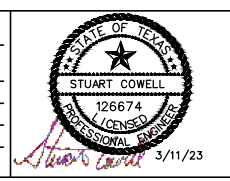
PWWF (85%)	PDWF (65%)		
Q (gpm)	V (fps)	Q (gpm)	V (fps)
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REVISIONS		DATE:
NO.	DESCRIPTION	DATE
		3/11/23



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**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD.  
 SUITE 150  
 ROUND ROCK, TEXAS 78735  
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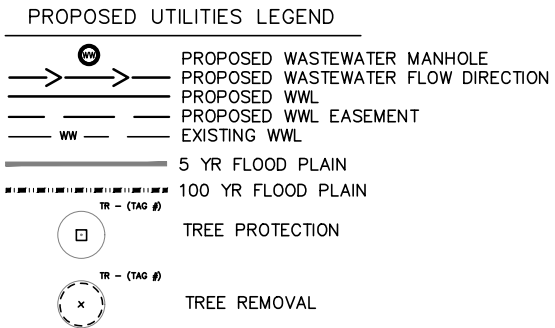
**WWL "A"**

PLAN AND PROFILE

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40'  
 VERTICAL: 1" = 10'  
 SHEET NO. 28  
 OF 43 SHEETS

03/11/2023 3/11/2023 I:\A441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

20 10 0 20 40  
 HORIZONTAL SCALE : 1" = 40'  
 VERTICAL SCALE : 1" = 10'  
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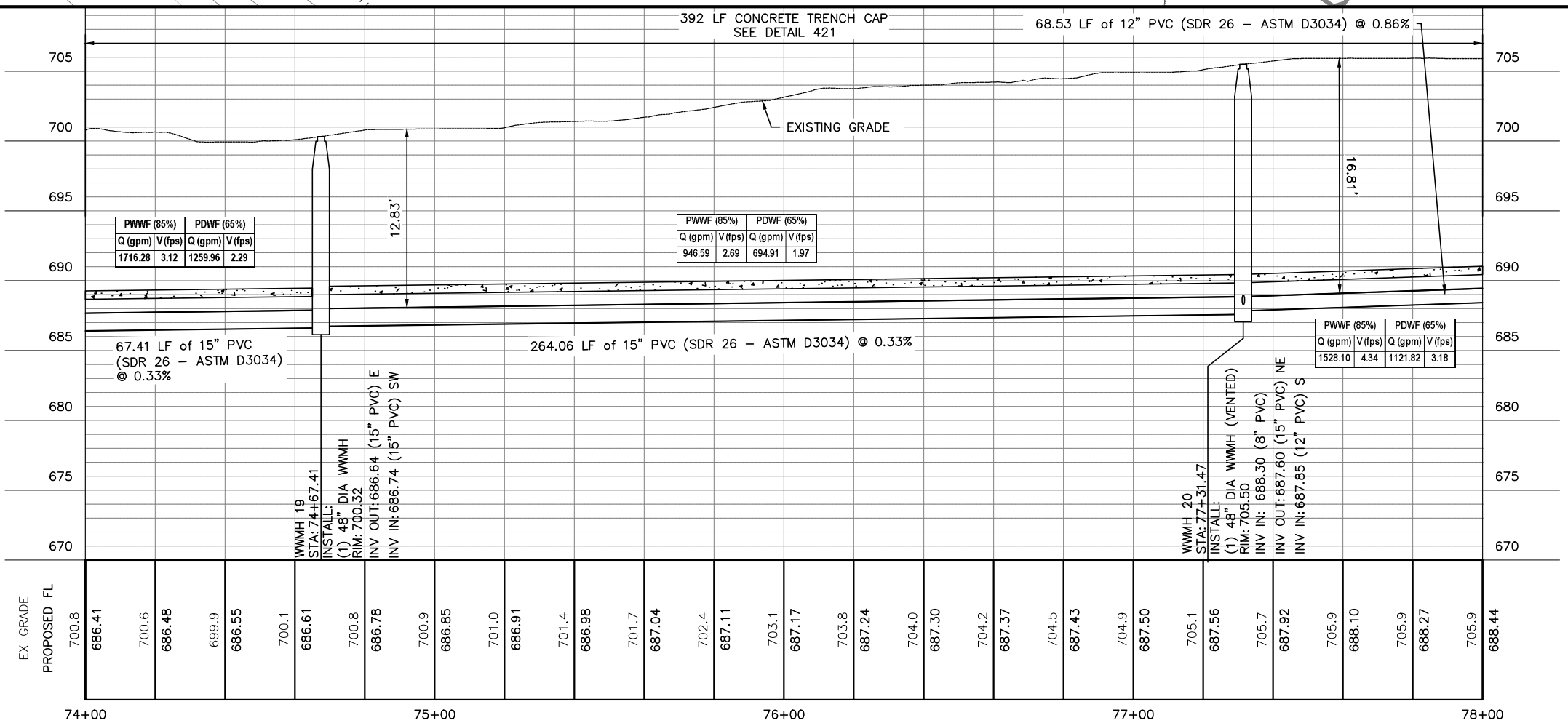
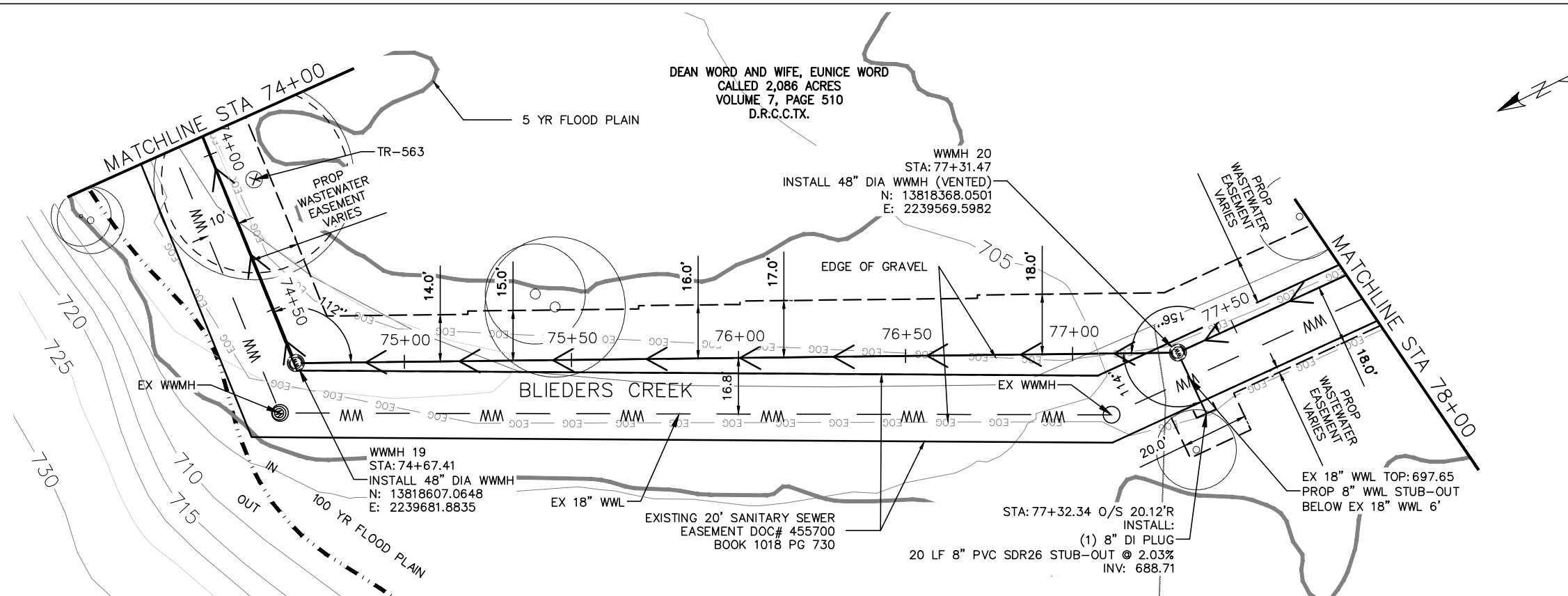
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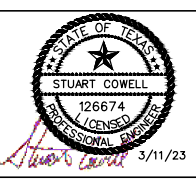
**811**  
 Know what's below.  
 Call before you dig.



03/11/2023 3/11/2023 I:\4441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23  
 DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC



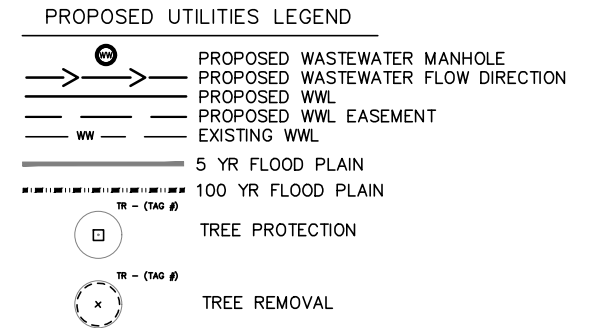
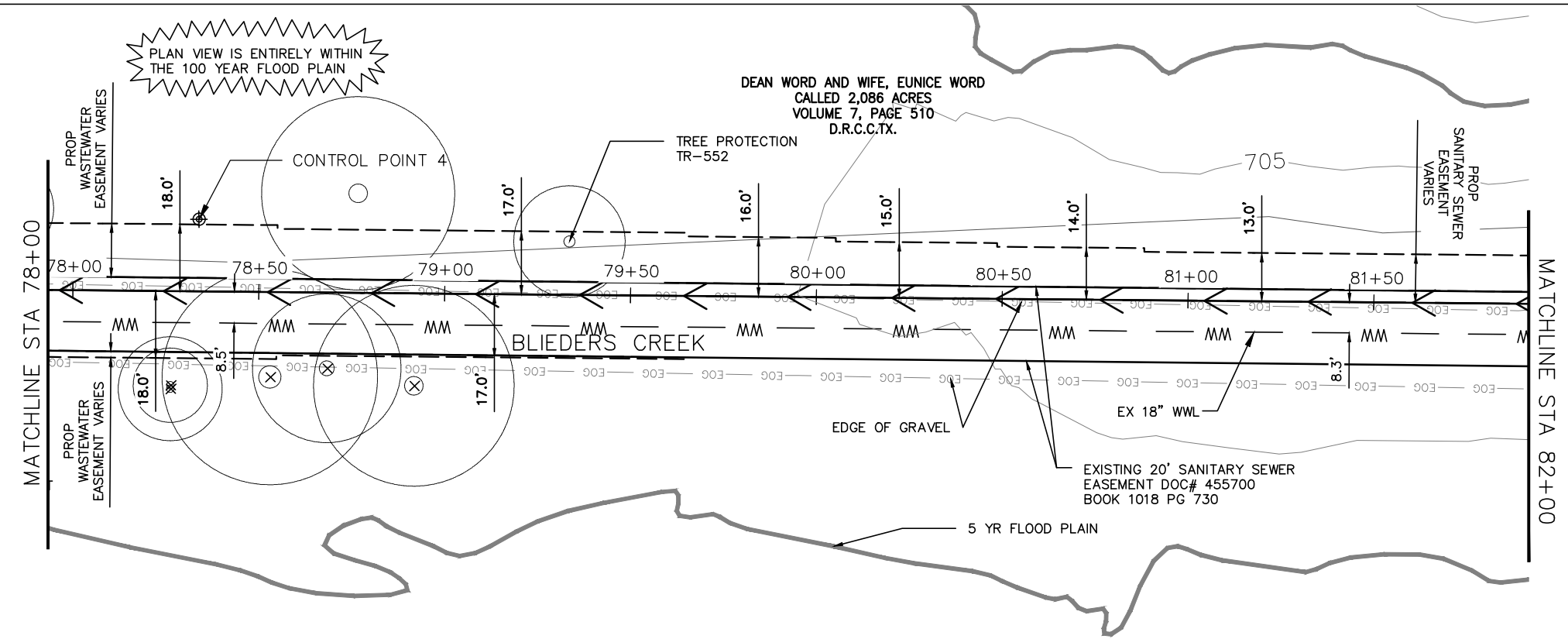
VERAMENDI  
 WASTEWATER LINE

**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD.  
 SUITE 150  
 ROUND ROCK, TEXAS 78735  
 Phone 512.767.7300  
 Fax 512.439.4716  
 FRN-F-1386

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'  
 SHEET NO. 29  
 OF 43 SHEETS



HORIZONTAL SCALE : 1" = 40'  
 VERTICAL SCALE : 1" = 10'  
 FULL SCALE : 1" = 20'



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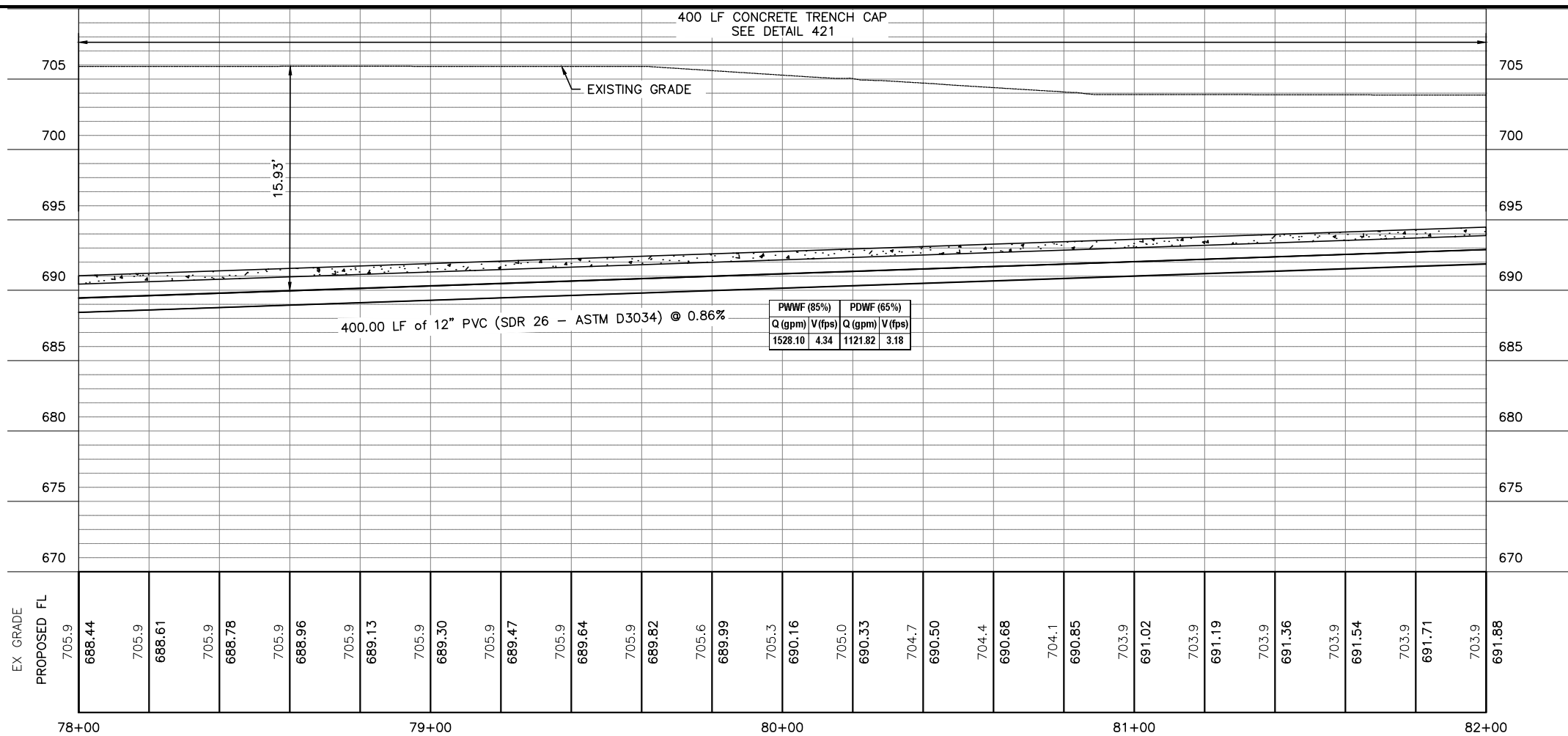
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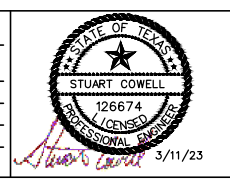
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705.9	688.44	705.9	705.9	705.9	703.9	691.71
688.44	688.61	688.78	688.96	689.13	689.30	689.47
689.13	689.30	689.47	689.64	689.82	689.99	705.3
690.16	690.33	704.7	690.50	704.4	690.68	704.1
691.02	691.19	703.9	691.02	703.9	691.36	703.9
691.54	691.71	703.9	691.54	703.9	691.71	703.9
691.88	691.88	691.88	691.88	691.88	691.88	691.88

REVISIONS		DATE:	3/11/23
NO.	DESCRIPTION	BY	DATE



**VERAMENDI  
WASTEWATER LINE**

**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD.  
 SUITE 150  
 ROUND ROCK, TEXAS 78735  
 Phone 512.767.7300  
 Fax 512.439.4716  
 FRN-F-1386

**WWL "A"**

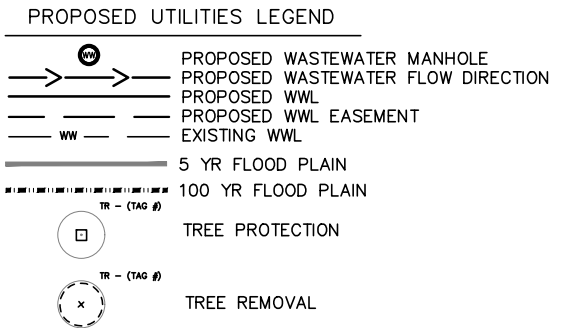
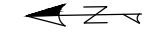
**PLAN AND PROFILE**

STA 78+00 TO STA 82+00

JOB NUMBER:  
A441-2201  
SCALE:  
HORIZONTAL: 1" = 40'  
VERTICAL: 1" = 10'  
SHEET NO.  
**30**  
OF 43 SHEETS

03/11/2023 3/11/2023 R:\441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

20 10 0 20 40  
 HORIZONTAL SCALE : 1" = 40'  
 VERTICAL SCALE : 1" = 10'  
 FULL SCALE : 1" = 20'



- GENERAL NOTES:**
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**TRENCH EXCAVATION SAFETY PROTECTION:**

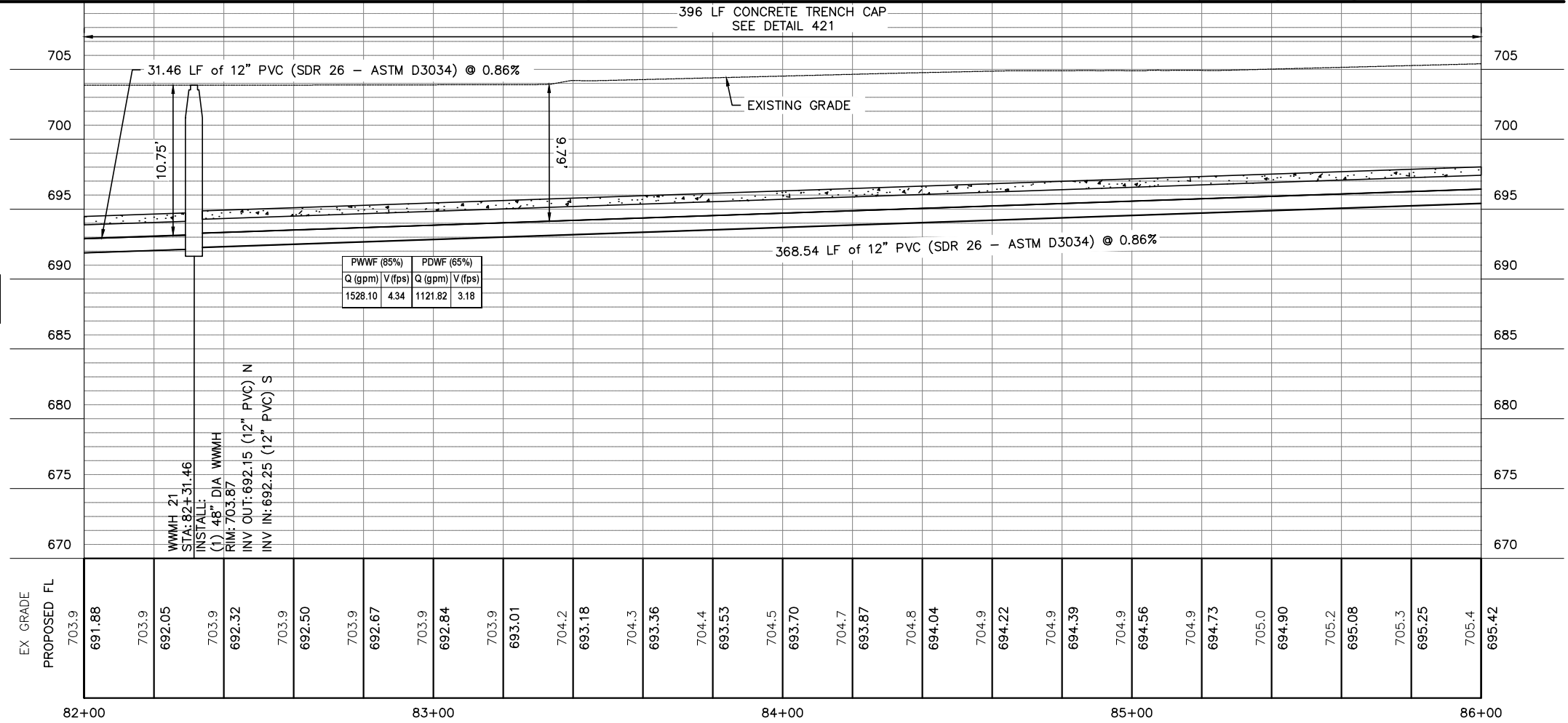
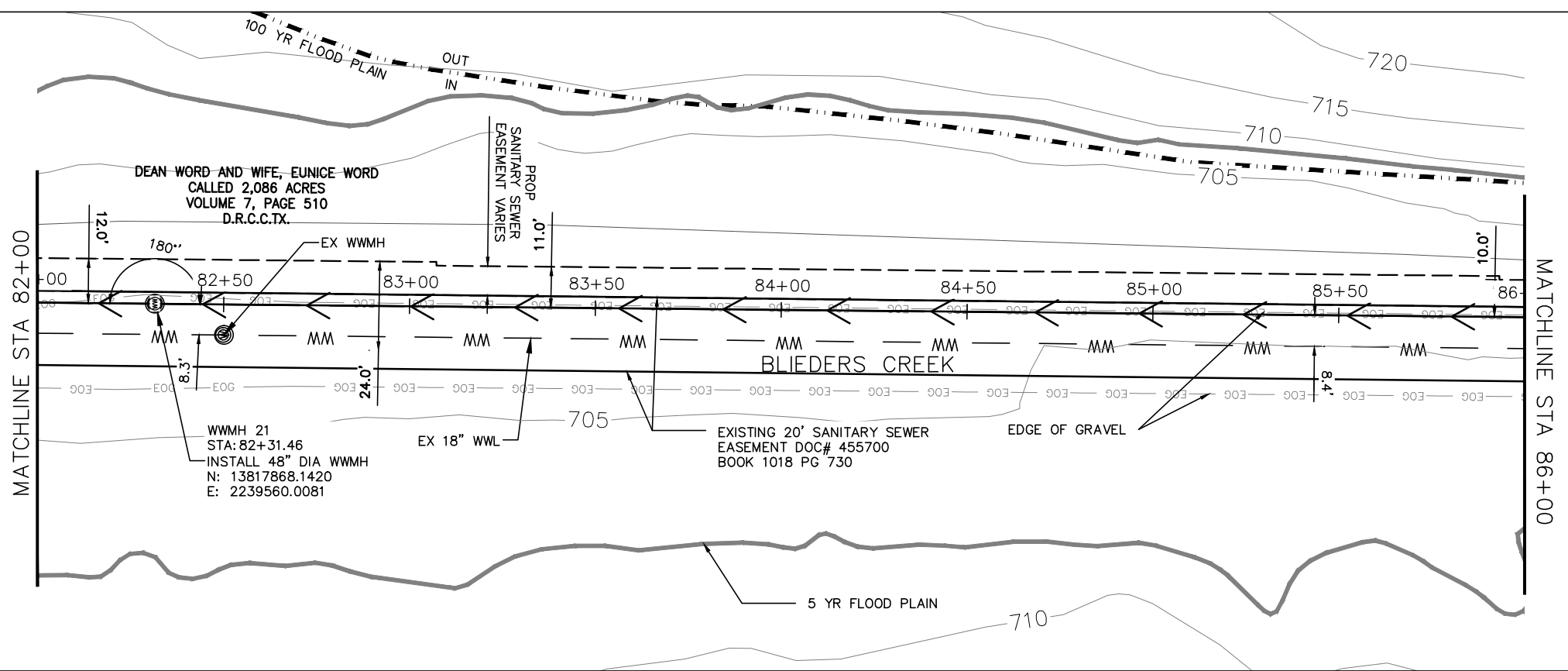
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Know what's below. Call before you dig.

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'  
 SHEET NO. 31 OF 43 SHEETS

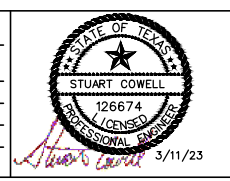


PWWF (85%)		PDWF (65%)	
Q (gpm)	V (fps)	Q (gpm)	V (fps)
1528.10	4.34	1121.82	3.18

**REVISIONS**

NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23  
 DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC



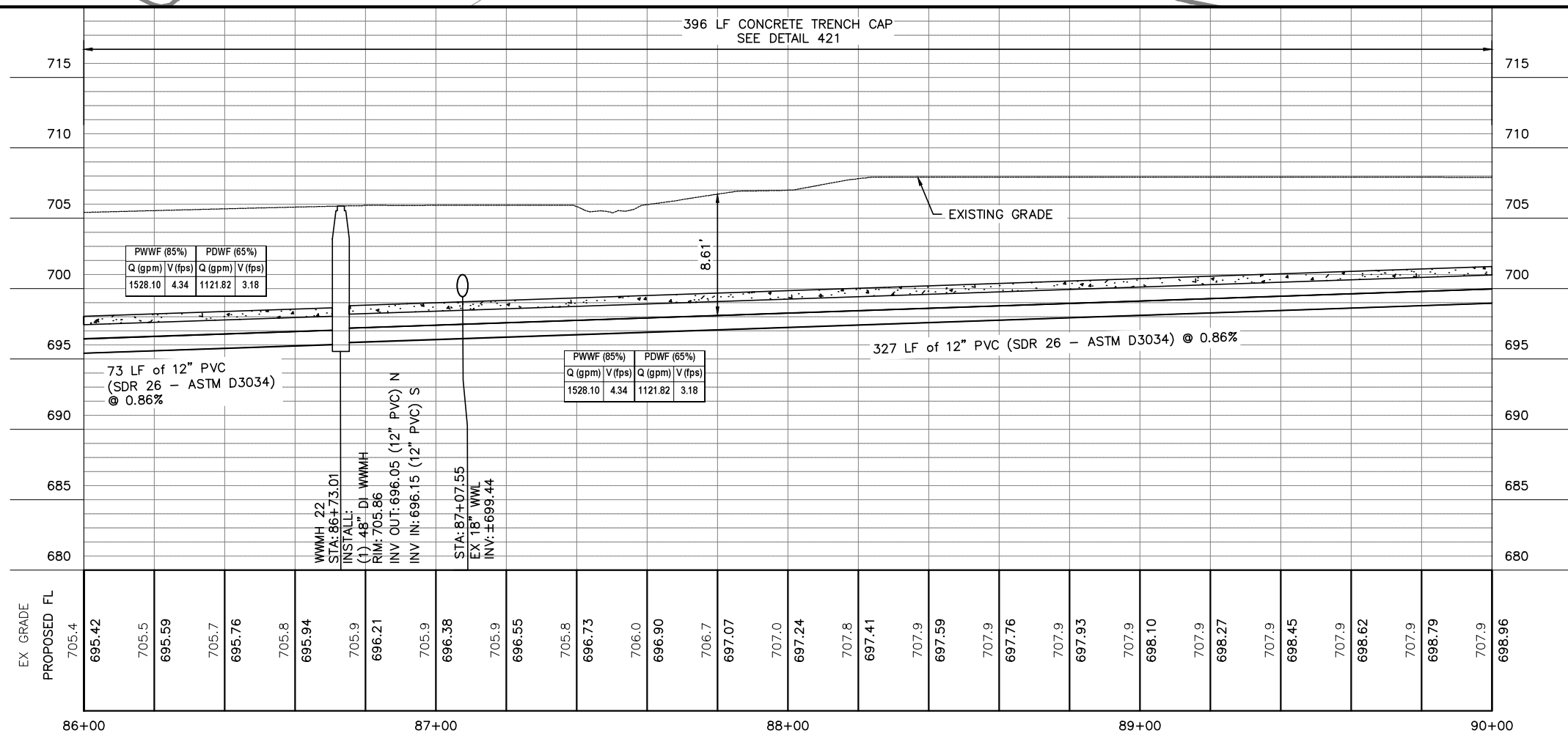
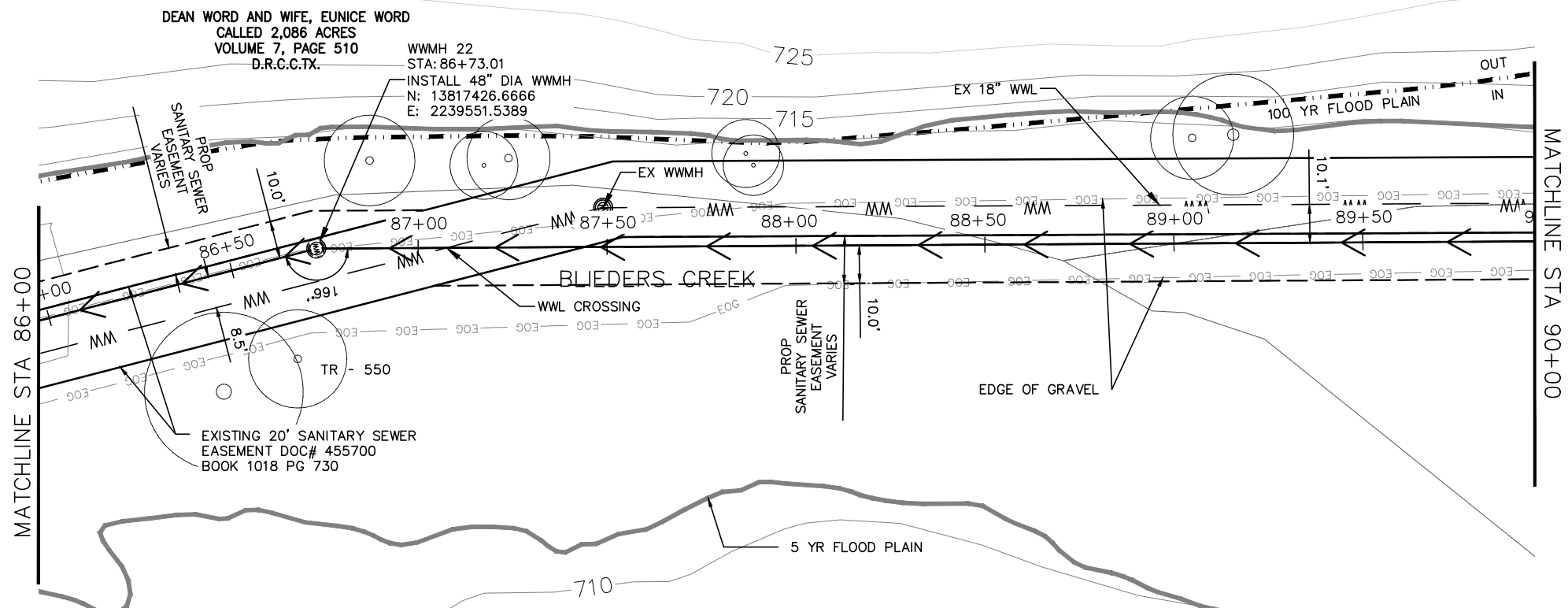
VERAMENDI WASTEWATER LINE

**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD. Phone 512.767.7300  
 SUITE 150 Fax 512.439.4716  
 ROUND ROCK, TEXAS 78735 FRN-F-1386

WWL "A"  
 PLAN AND PROFILE  
 STA 82+00 TO STA 86+00

03/11/2023 3/11/2023 R:\A441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

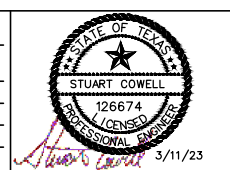
20 10 0 20 40  
 HORIZONTAL SCALE : 1" = 40'  
 VERTICAL SCALE : 1" = 10'  
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REVISIONS		BY	DATE
NO.	DESCRIPTION		

DATE: 3/11/23

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 WASTEWATER LINE

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 SUITE 150  
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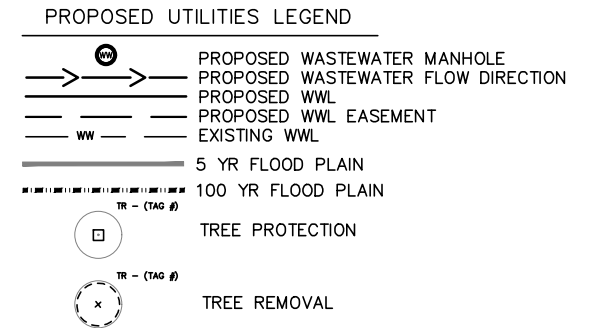
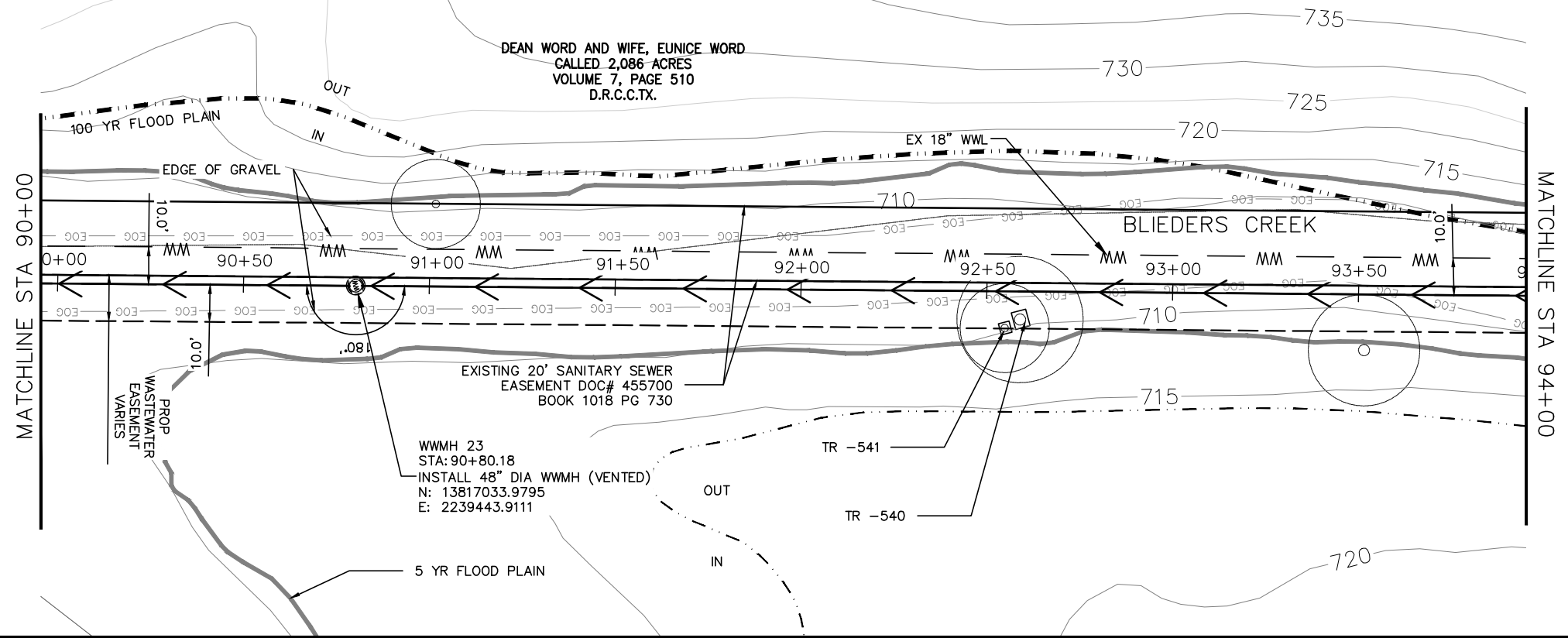
JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'  
 SHEET NO. 32 OF 43 SHEETS

WWL "A"  
 PLAN AND PROFILE  
 STA 86+00 TO STA 90+00

03/11/2023 3/11/2023 R:\A441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell



20 10 0 20 40  
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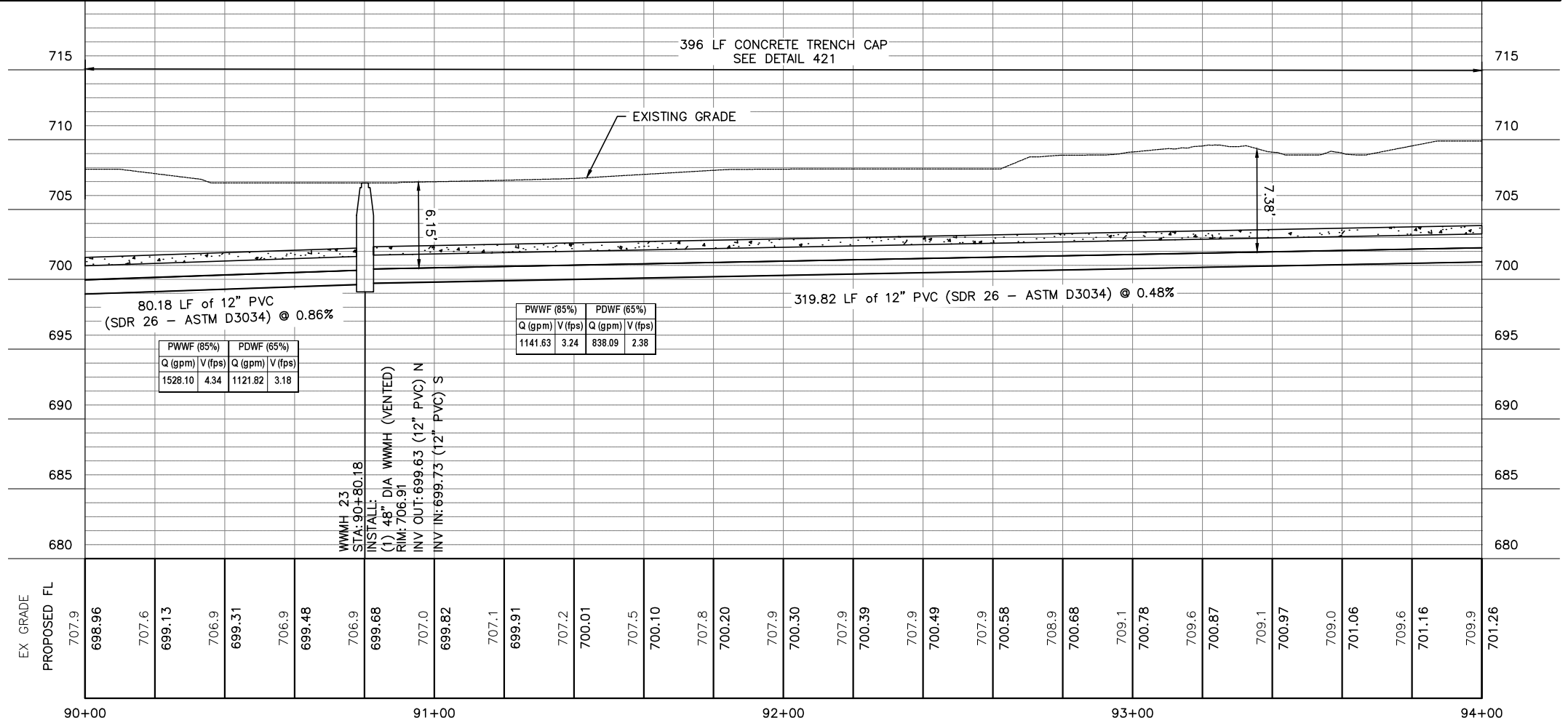
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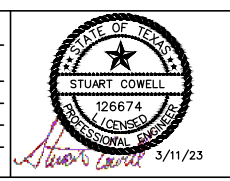


**REVISIONS**

NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23

DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC



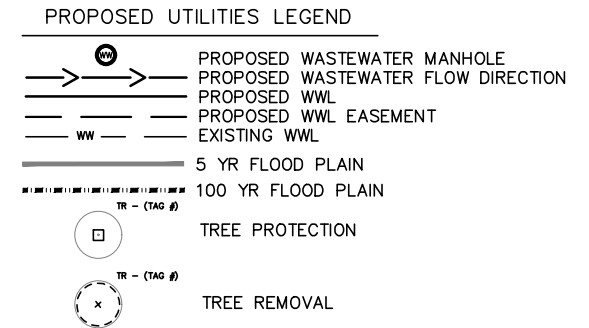
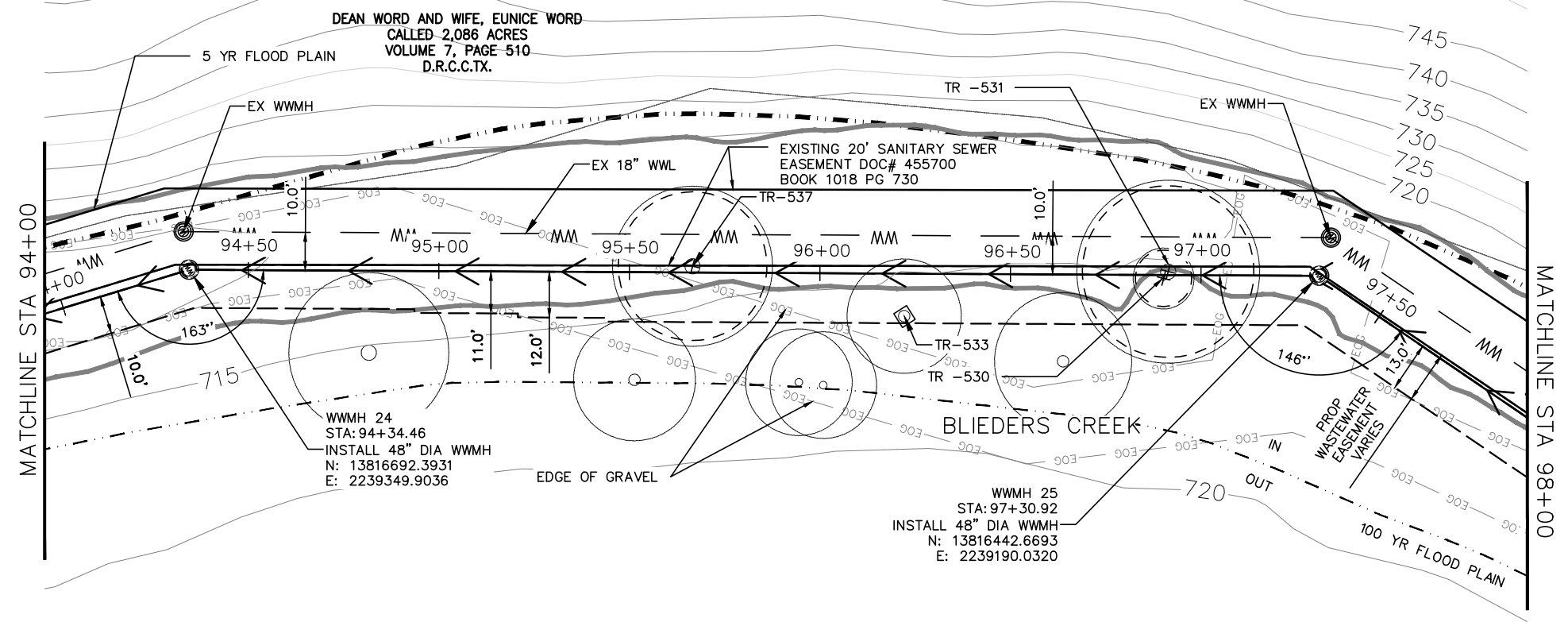
**VERAMENDI WASTEWATER LINE**

**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD.  
 SUITE 150  
 ROUND ROCK, TEXAS 78735  
 Phone 512.767.7300  
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 FRN-F-1386

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'  
 SHEET NO. 33 OF 43 SHEETS  
 WWL "A"  
 PLAN AND PROFILE  
 STA 90+00 TO STA 94+00

03/11/2023 3/11/2023 R:\A441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

20 10 0 20 40  
 HORIZONTAL SCALE : 1" = 40'  
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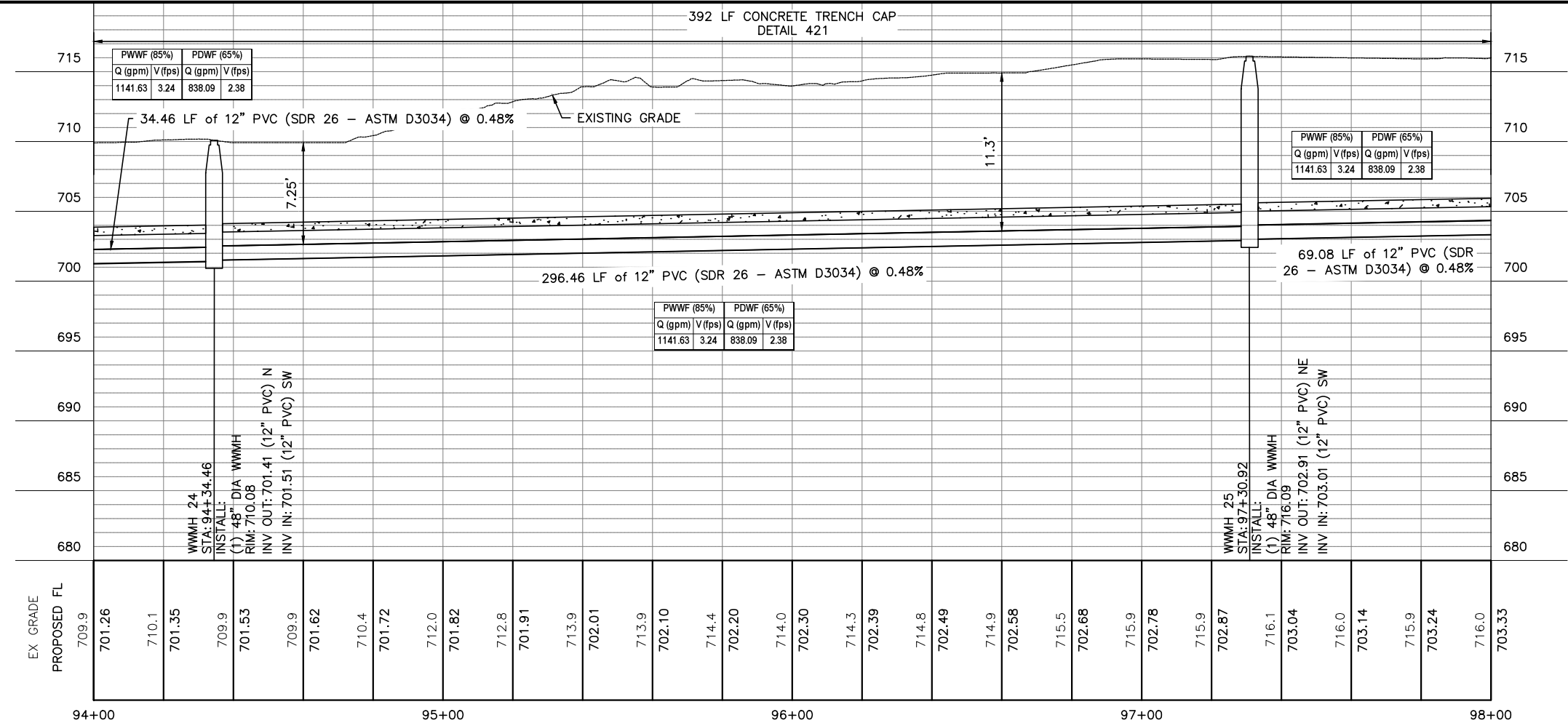
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03/11/2023 3/11/2023 I:\4441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

REVISIONS		BY	DATE
NO.	DESCRIPTION		

DATE: 3/11/23

DESIGNED BY: JT

DRAWN BY: JT

CHECKED BY: SC

APPROVED BY: SC

VERAMENDI  
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WWL "A"

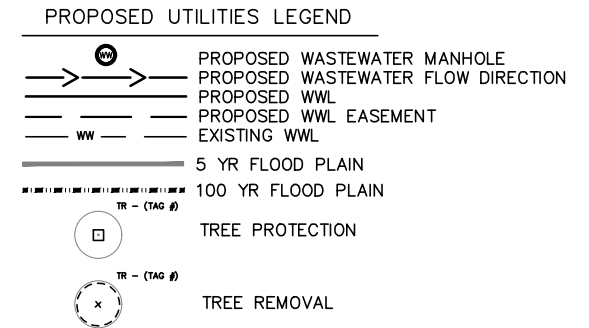
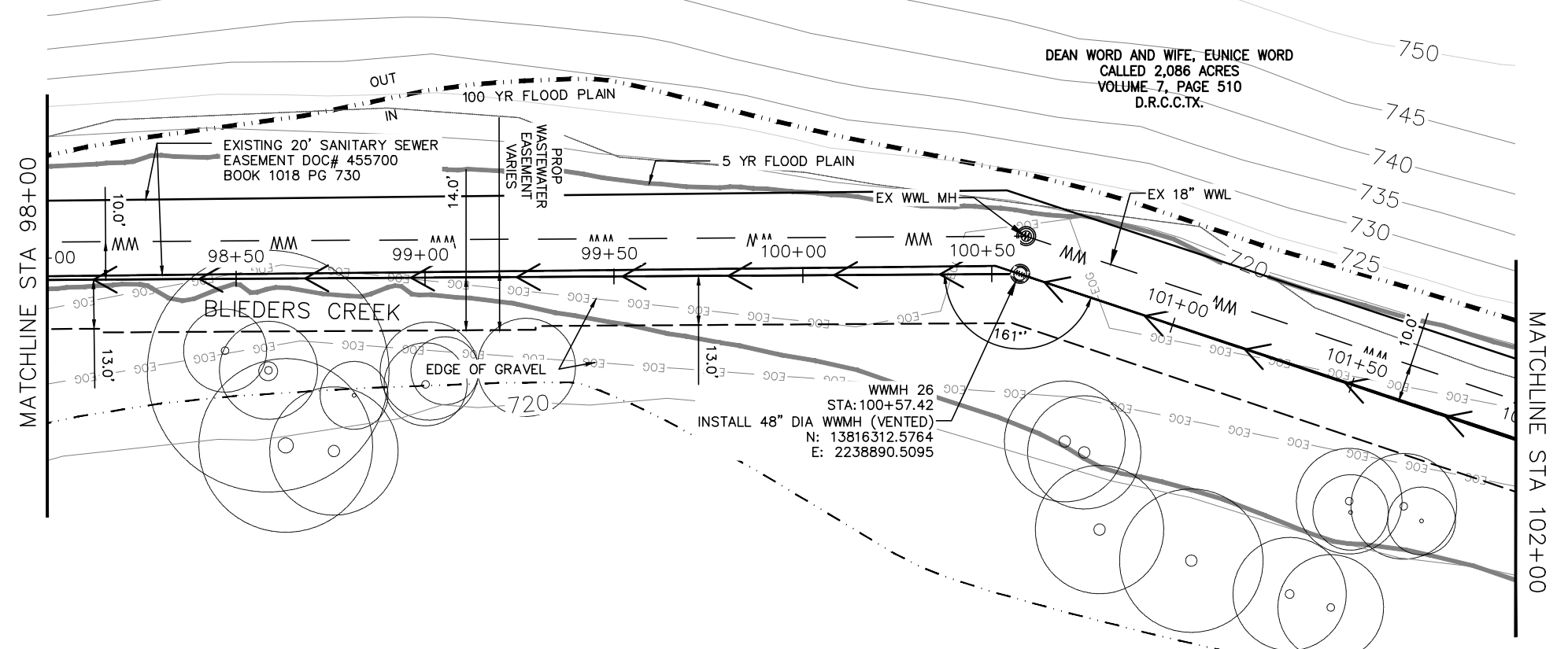
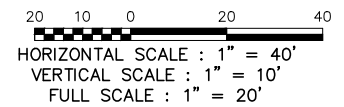
PLAN AND PROFILE

STA 94+00 TO STA 98+00

JOB NUMBER: A441-2201

SCALE:  
 HORIZONTAL: 1" = 40'  
 VERTICAL: 1" = 10'

SHEET NO. 34 OF 43 SHEETS



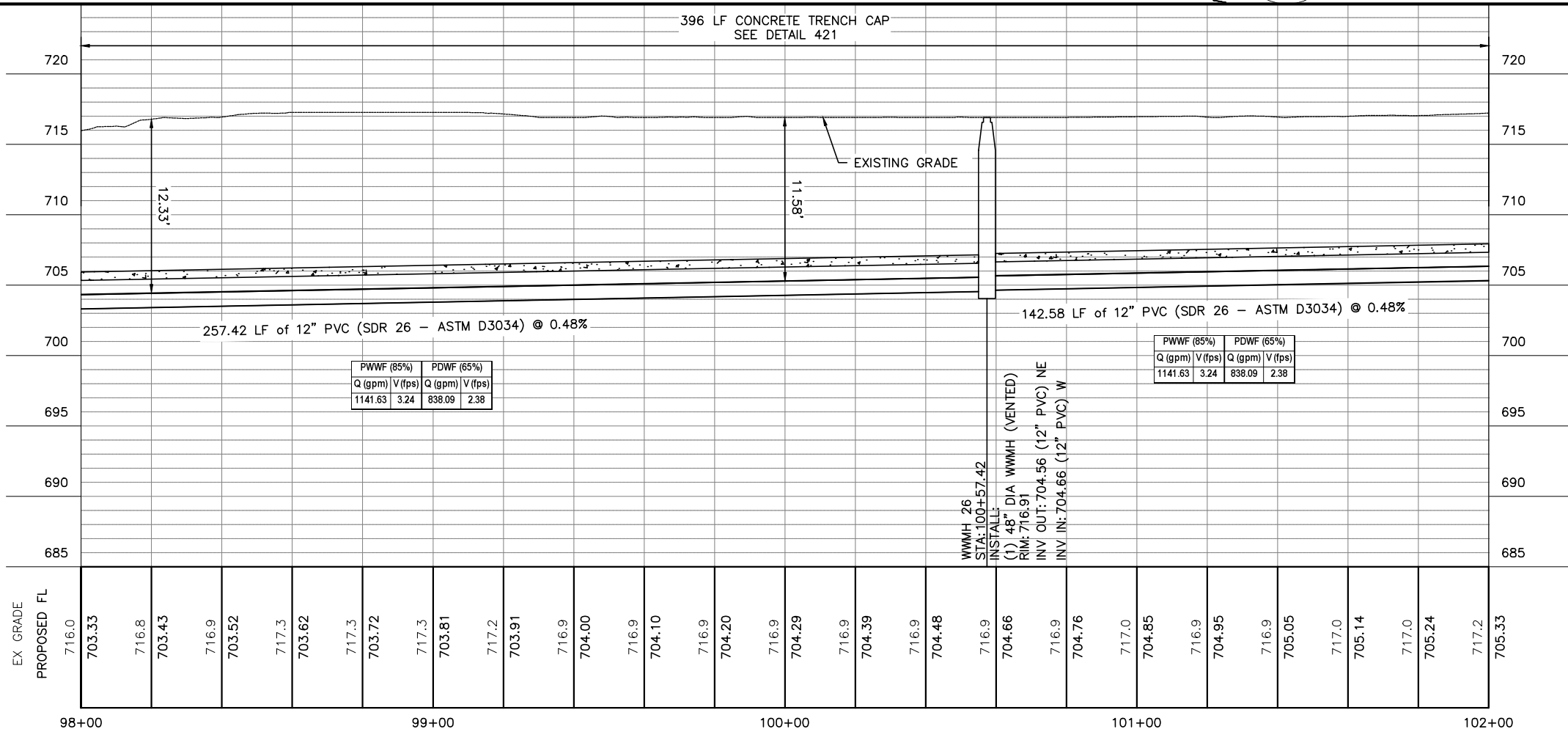
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**TRENCH EXCAVATION SAFETY PROTECTION:**

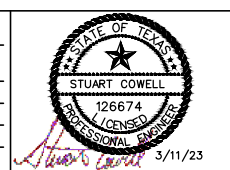
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REVISIONS			
NO.	DESCRIPTION	BY	DATE



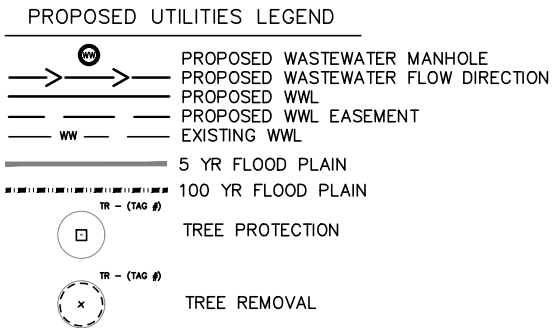
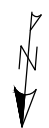
**VERAMENDI WASTEWATER LINE**

**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD.  
 SUITE 150  
 ROUND ROCK, TEXAS 78735  
 Phone 512.767.7300  
 Fax 512.439.4716  
 FRN-F-1386

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40'  
 VERTICAL: 1" = 10'  
 SHEET NO. 35  
 OF 43 SHEETS

03/11/2023 3/11/2023 I:\441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

20 10 0 20 40  
 HORIZONTAL SCALE : 1" = 40'  
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 FULL SCALE : 1" = 20'



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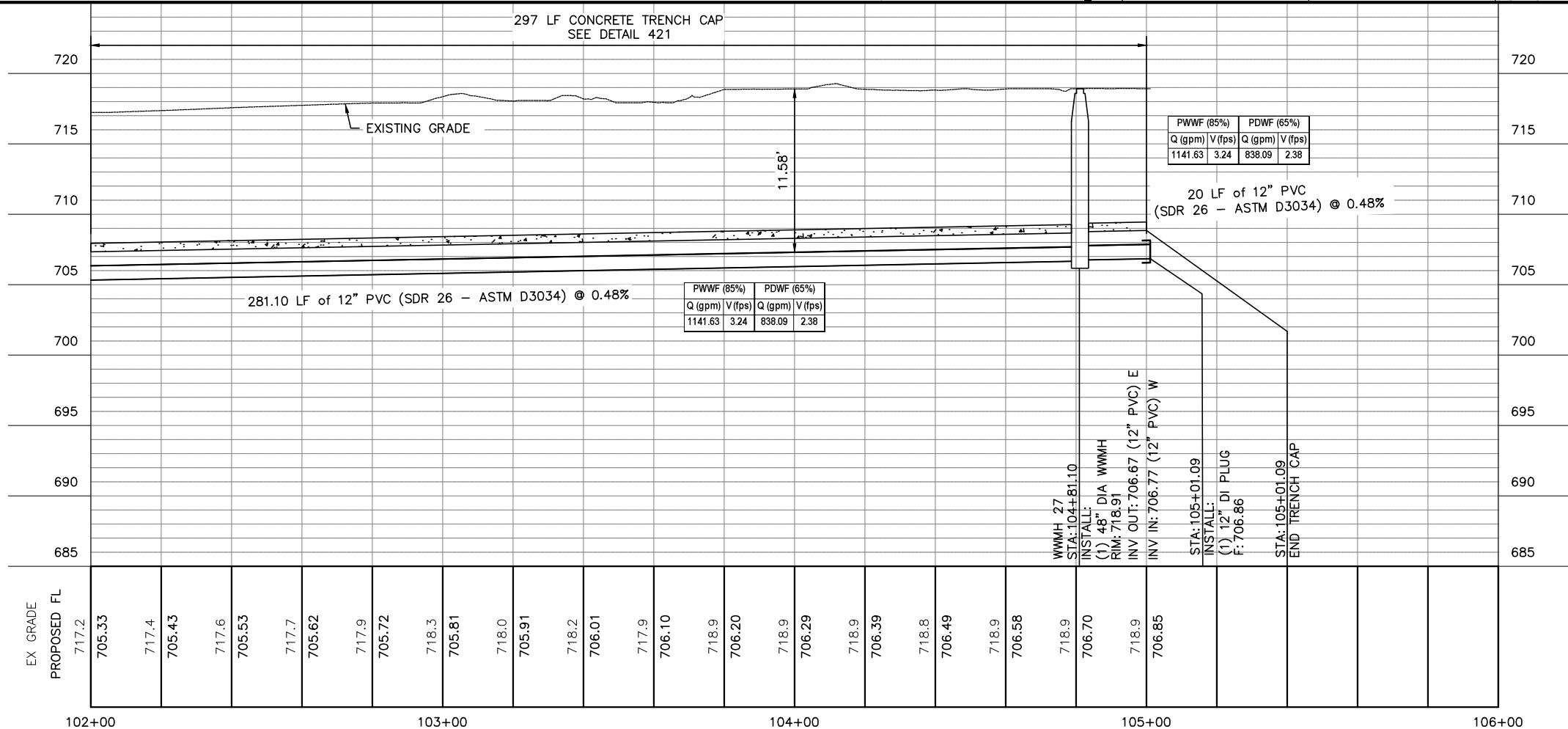
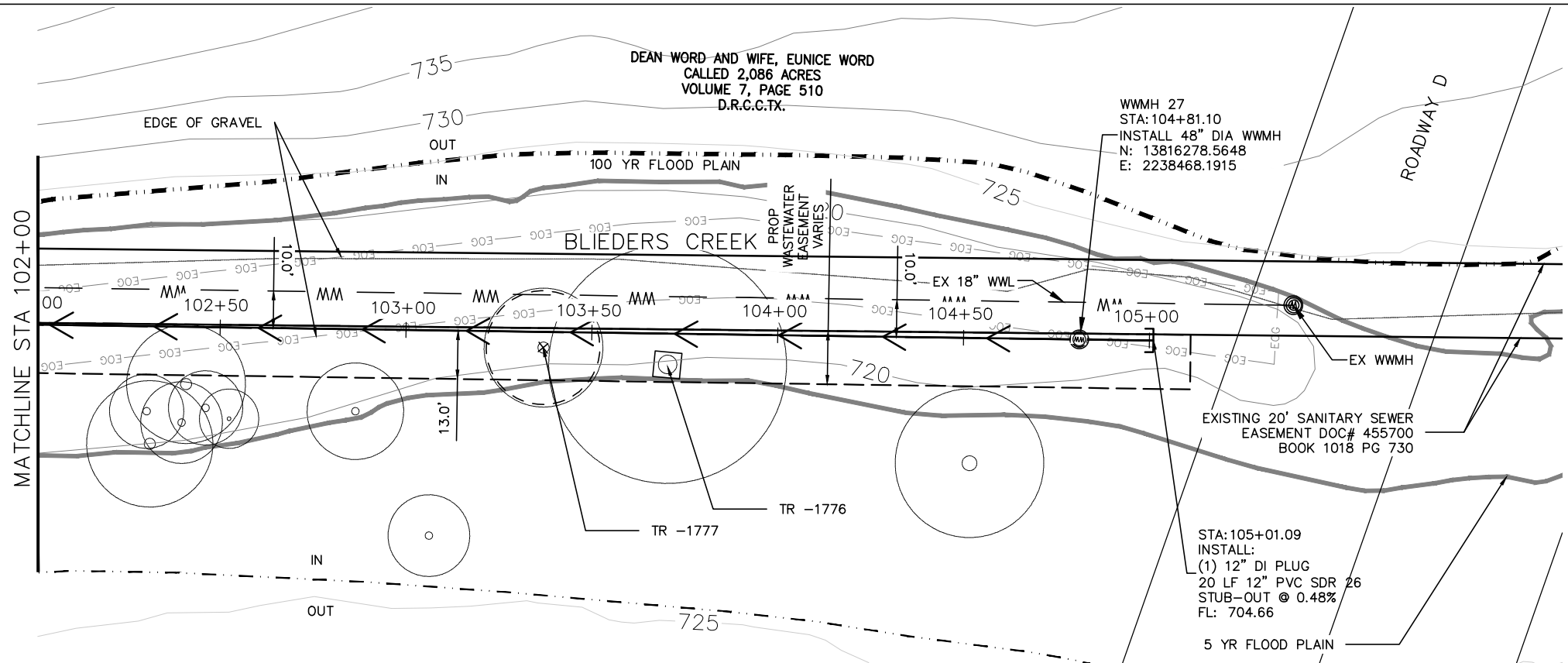
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03/11/2023 3/11/2023 I:\4441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

REVISIONS		BY	DATE
NO.	DESCRIPTION		

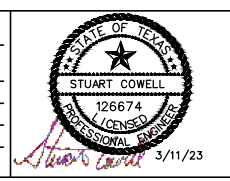
DATE: 3/11/23

DESIGNED BY: JT

DRAWN BY: JT

CHECKED BY: SC

APPROVED BY: SC



**VERAMENDI WASTEWATER LINE**

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2700 LA FRONTERA BLVD. SUITE 150 ROUND ROCK, TEXAS 78735

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WWL "A"

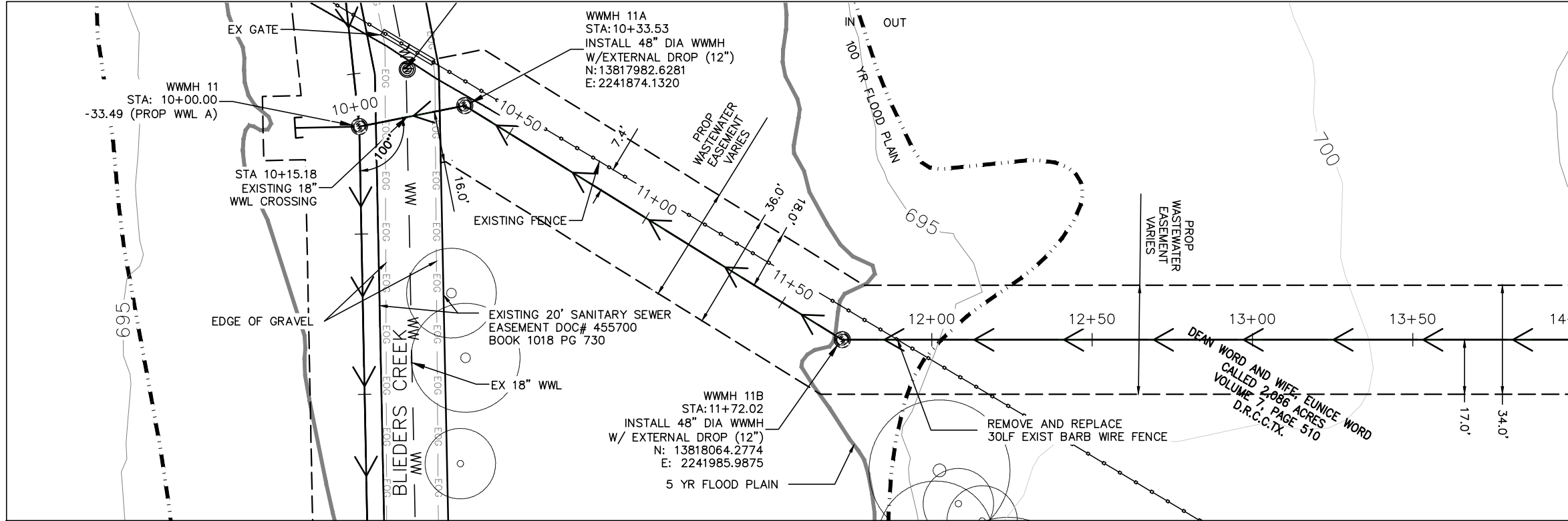
PLAN AND PROFILE

STA 102+00 TO END

JOB NUMBER: A441-2201

SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'

SHEET NO. 36 OF 43 SHEETS



HORIZONTAL SCALE : 1" = 40'  
VERTICAL SCALE : 1" = 10'  
FULL SCALE : 1" = 20'

**PROPOSED UTILITIES LEGEND**

- PROPOSED WASTEWATER MANHOLE
- PROPOSED WASTEWATER FLOW DIRECTION
- PROPOSED WWL
- PROPOSED WWL EASEMENT
- EXISTING WWL
- 5 YR FLOOD PLAIN
- 100 YR FLOOD PLAIN
- TREE PROTECTION
- TREE REMOVAL

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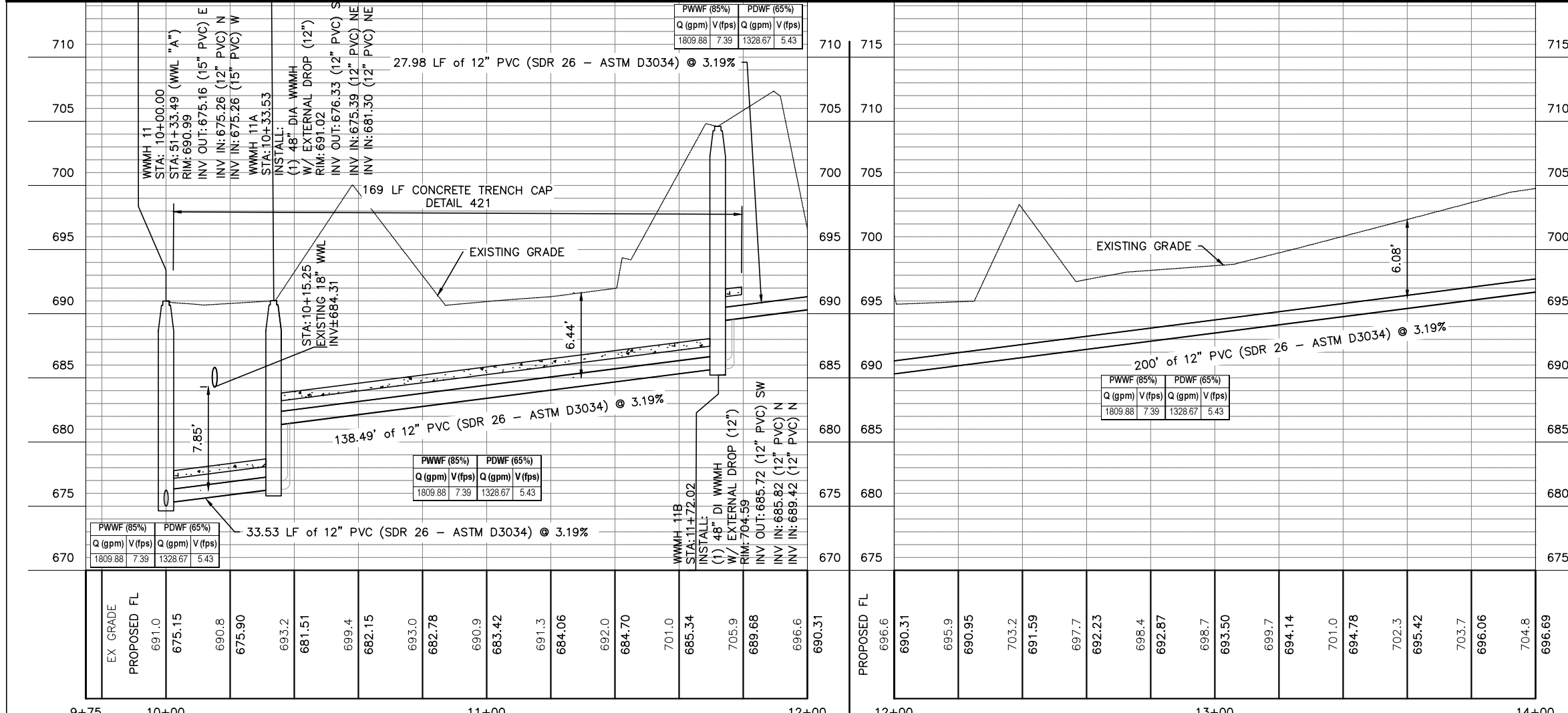
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**REVISIONS**

NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23

DESIGNED BY: JT

DRAWN BY: JT

CHECKED BY: SC

APPROVED BY: JT

3/11/23

**VERAMENDI  
WASTEWATER LINE**

**LJA Engineering, Inc.**

2700 LA FRONTERA BLVD.  
SUITE 150  
ROUND ROCK, TEXAS 78735

Phone 512.767.7300  
Fax 512.439.4716  
FRN-F-1386

**WWL "B"**

PLAN AND PROFILE

STA 10+00 TO STA 14+00

JOB NUMBER:  
A441-2201

SCALE:  
HORIZONTAL: 1" = 40'  
VERTICAL: 1" = 10'

SHEET NO.  
37  
OF 43 SHEETS



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03/11/2023 3/11/2023 R:\A441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell



HORIZONTAL SCALE : 1" = 40'  
 VERTICAL SCALE : 1" = 10'  
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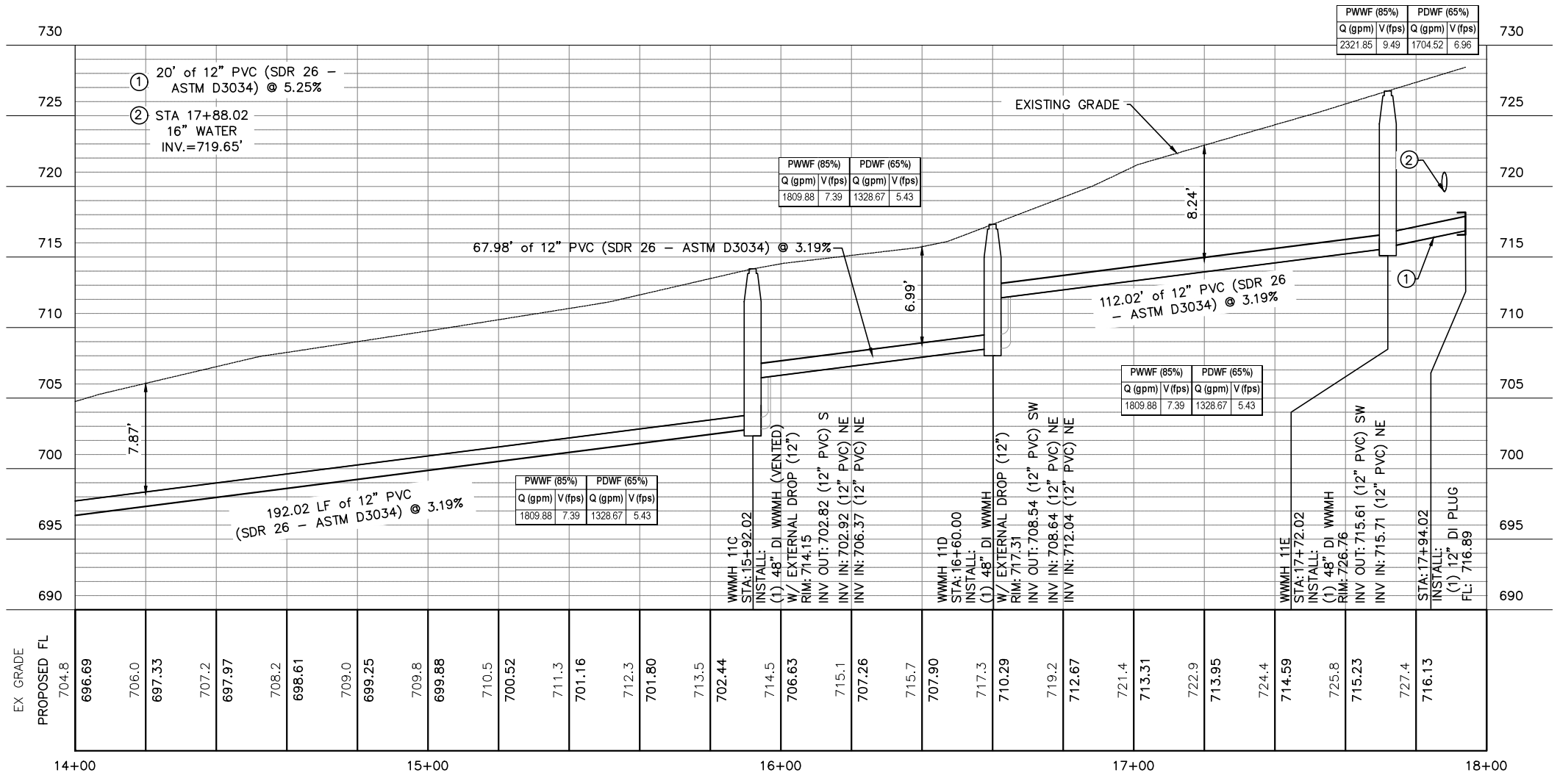
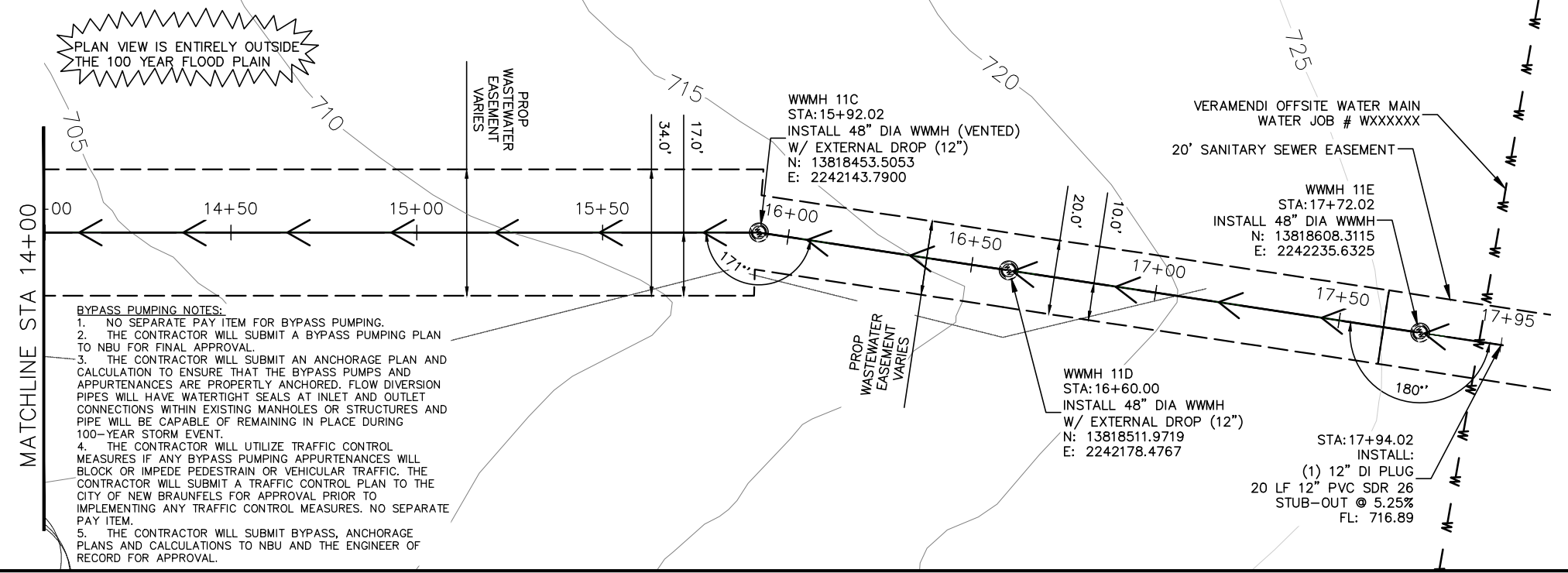
Know what's below.  
Call before you dig.

JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: 1" = 40' VERTICAL: 1" = 10'  
 SHEET NO. 38 OF 43 SHEETS

PLAN VIEW IS ENTIRELY OUTSIDE THE 100 YEAR FLOOD PLAIN

MATCHLINE STA 14+00

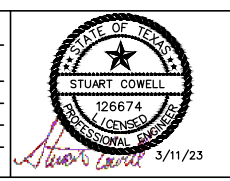
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1. NO SEPARATE PAY ITEM FOR BYPASS PUMPING.
  2. THE CONTRACTOR WILL SUBMIT A BYPASS PUMPING PLAN TO NBU FOR FINAL APPROVAL.
  3. THE CONTRACTOR WILL SUBMIT AN ANCHORAGE PLAN AND CALCULATION TO ENSURE THAT THE BYPASS PUMPS AND APPURTENANCES ARE PROPERLY ANCHORED. FLOW DIVERSION PIPES WILL HAVE WATERTIGHT SEALS AT INLET AND OUTLET CONNECTIONS WITHIN EXISTING MANHOLES OR STRUCTURES AND PIPE WILL BE CAPABLE OF REMAINING IN PLACE DURING 100-YEAR STORM EVENT.
  4. THE CONTRACTOR WILL UTILIZE TRAFFIC CONTROL MEASURES IF ANY BYPASS PUMPING APPURTENANCES WILL BLOCK OR IMPEDE PEDESTRAIN OR VEHICULAR TRAFFIC. THE CONTRACTOR WILL SUBMIT A TRAFFIC CONTROL PLAN TO THE CITY OF NEW BRAUNFELS FOR APPROVAL PRIOR TO IMPLEMENTING ANY TRAFFIC CONTROL MEASURES. NO SEPARATE PAY ITEM.
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03/11/2023 3/11/2023 R:\A441\2201\CADD\WORKING\VERAMENDI\_WWL\_P&P\_SHEETS.dwg scowell

REVISIONS		DATE:
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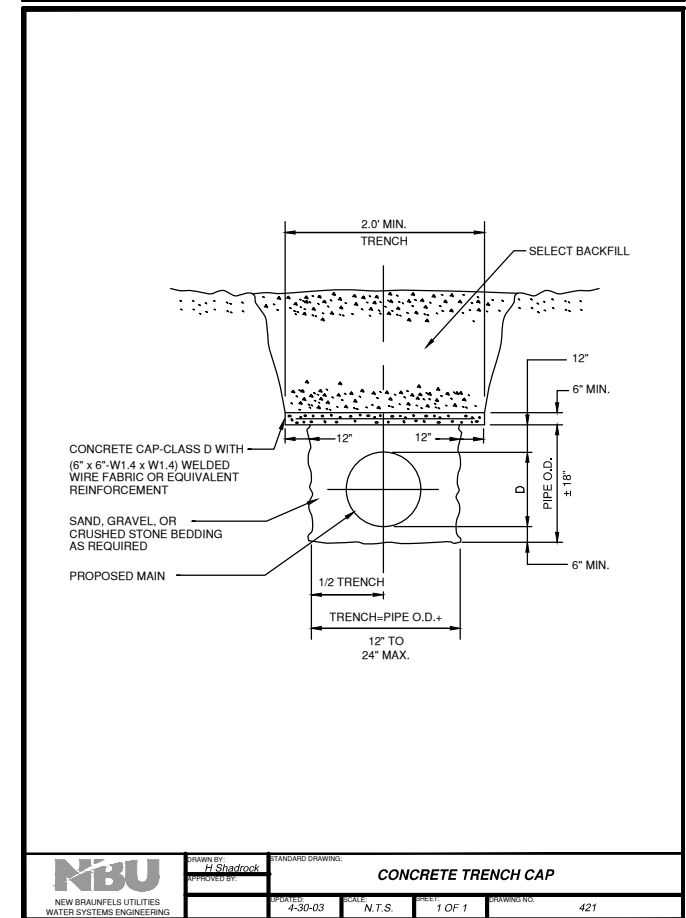
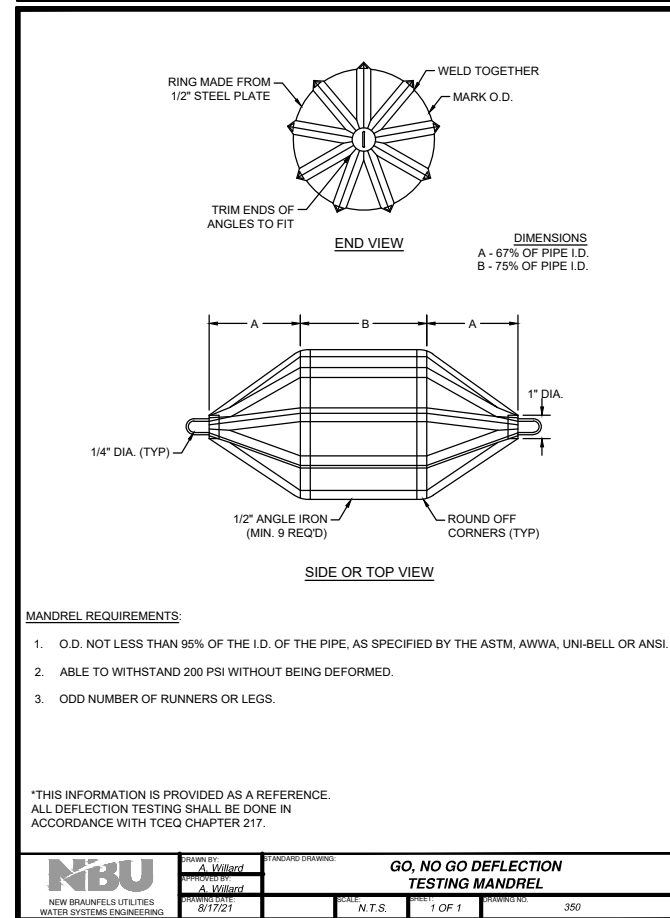
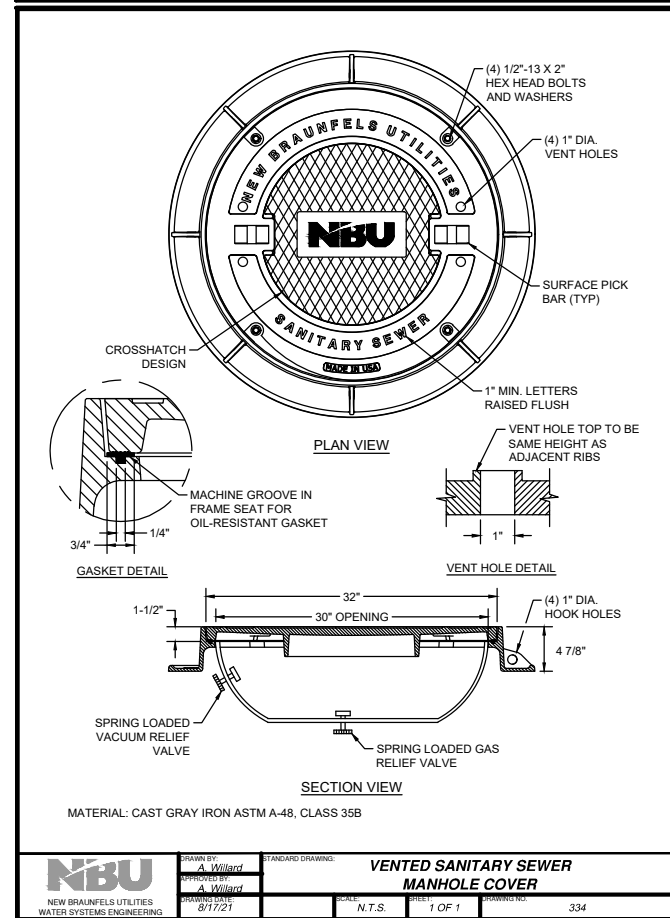
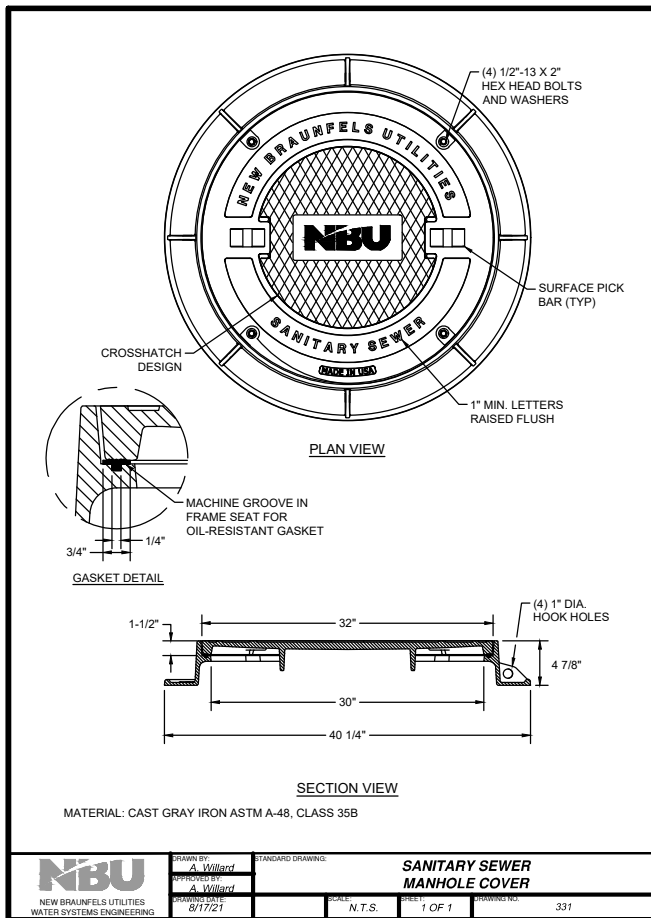
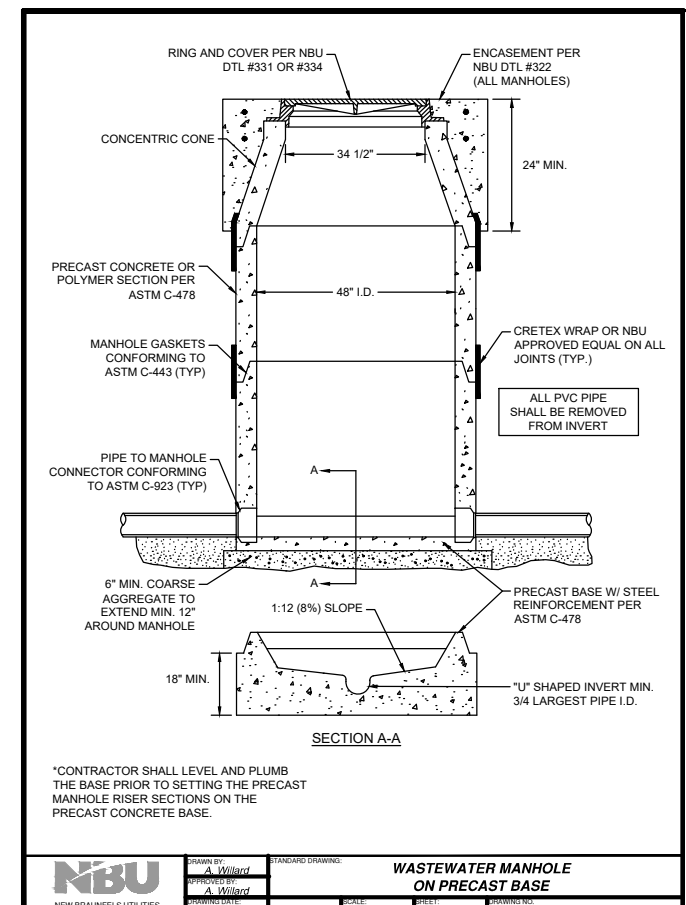
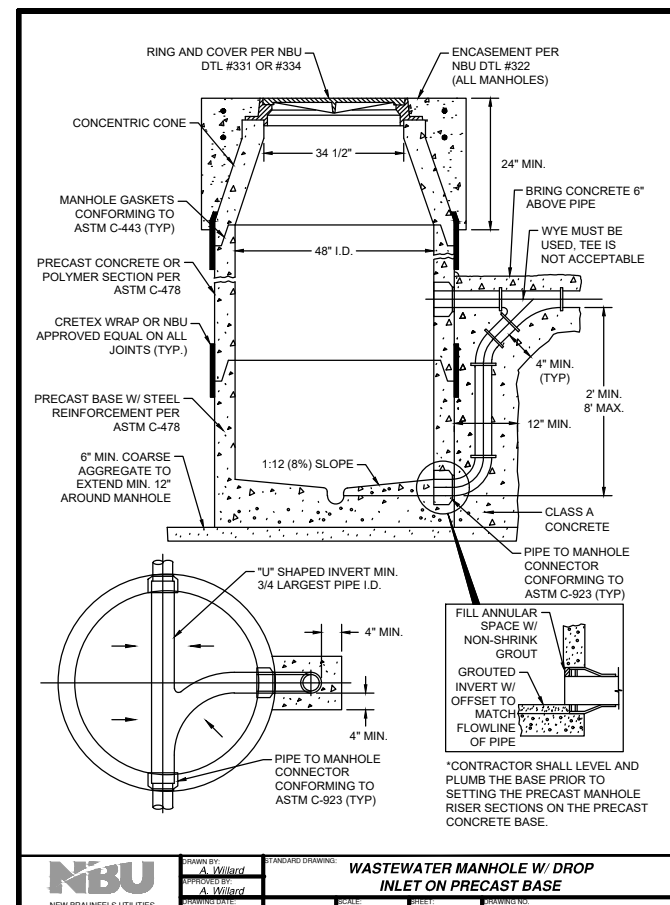
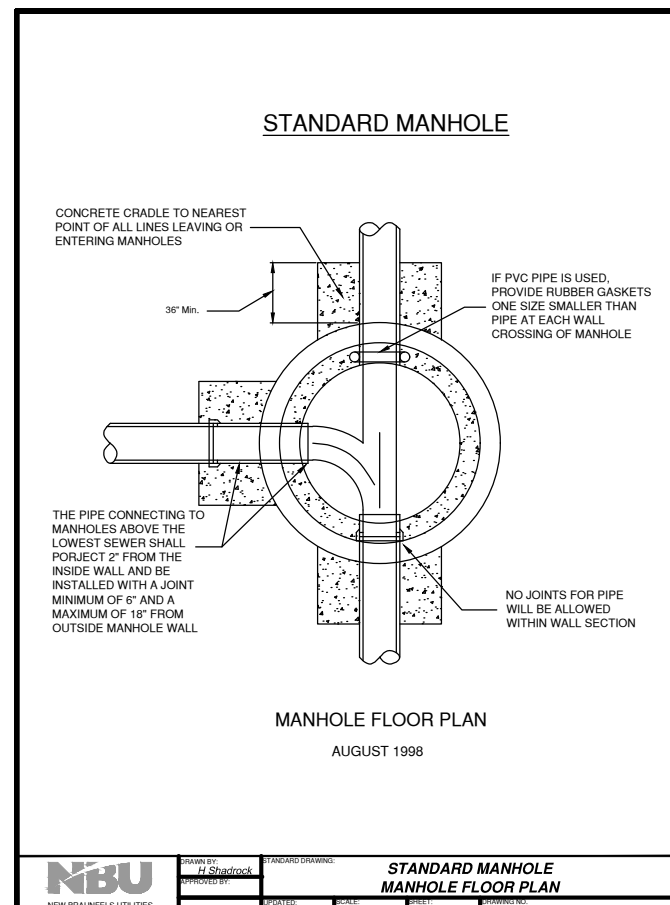
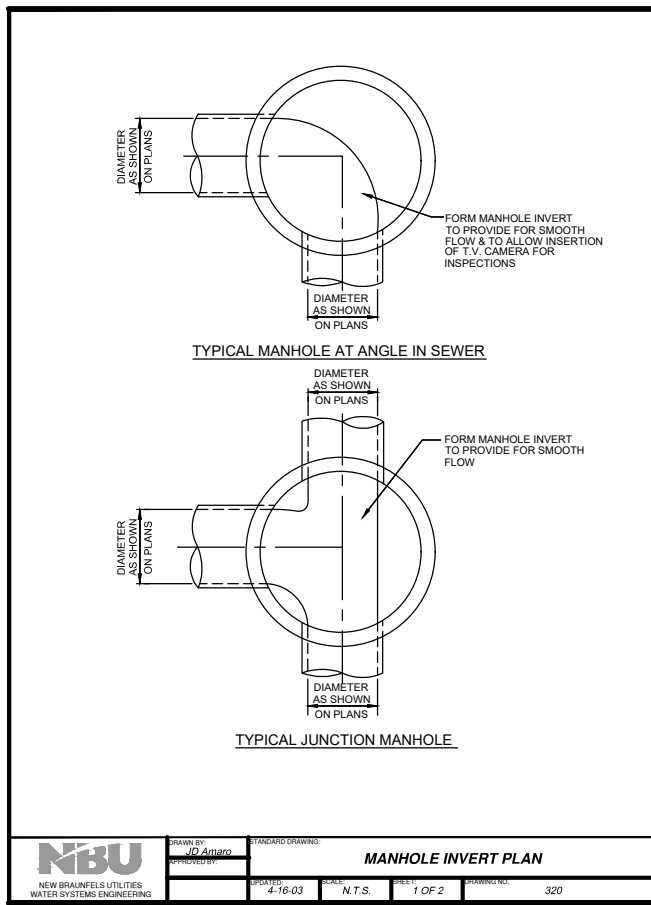
DESIGNED BY: JT  
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**VERAMENDI WASTEWATER LINE**

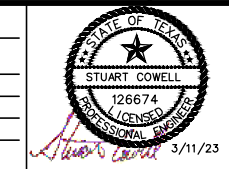
**LJA Engineering, Inc.**  
 2700 LA FRONTERA BLVD. Phone 512.767.7300  
 SUITE 150 Fax 512.439.4716  
 ROUND ROCK, TEXAS 78735 FRN-F-1386

WWL "B"  
 PLAN AND PROFILE  
 STA 14+00 TO STA 18+00



REVISIONS			
NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23  
 DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC

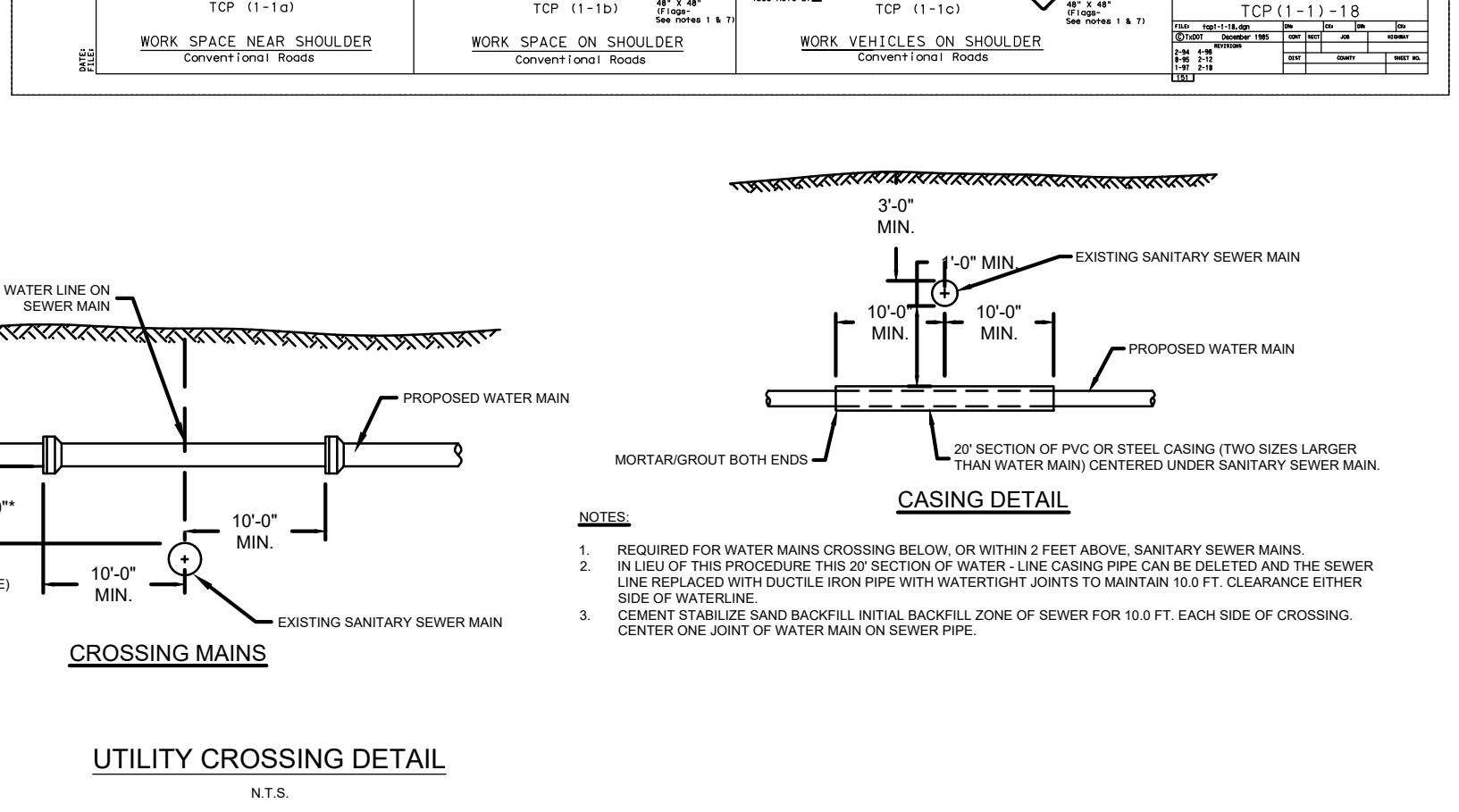
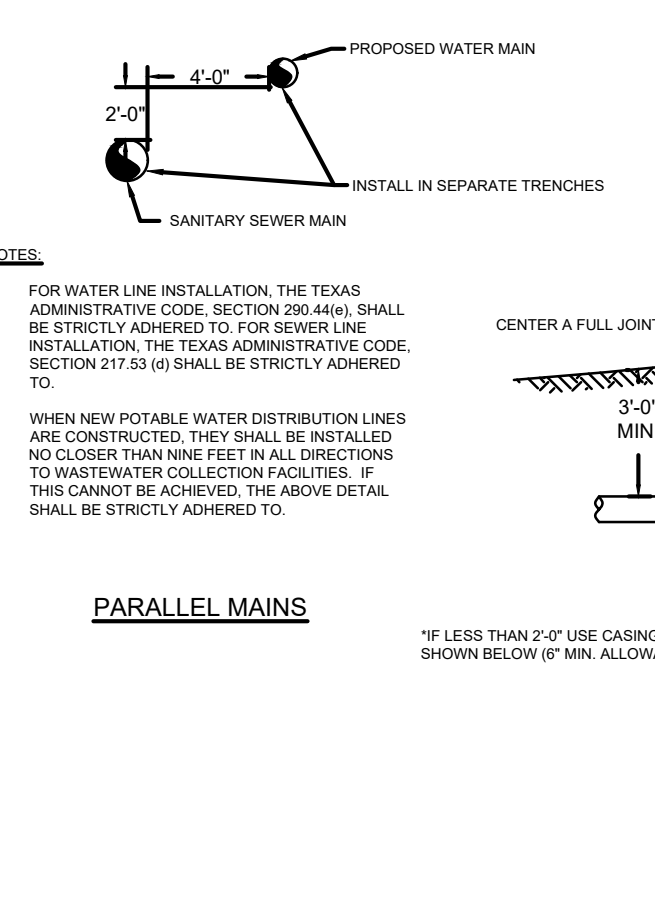
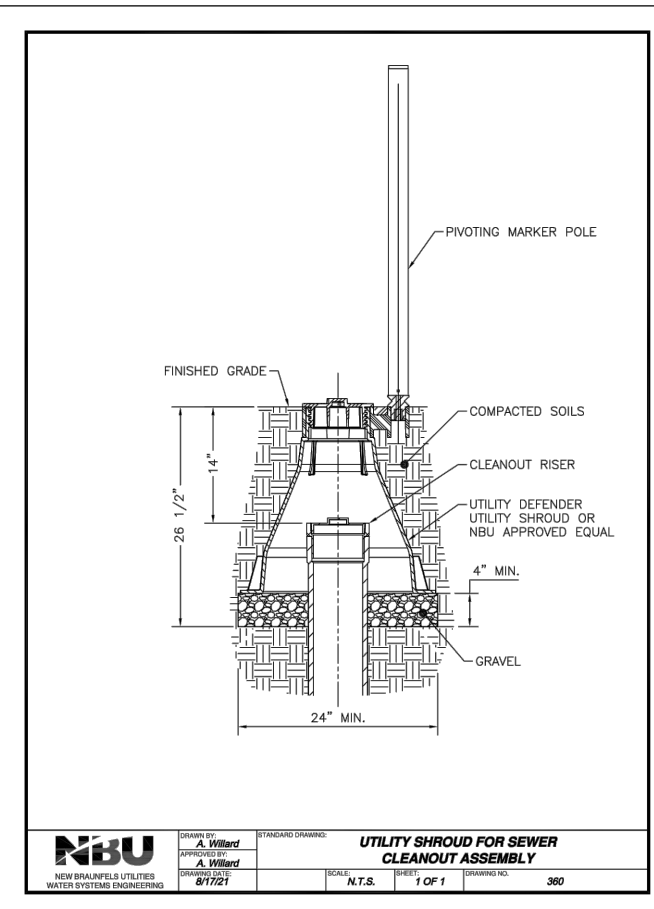
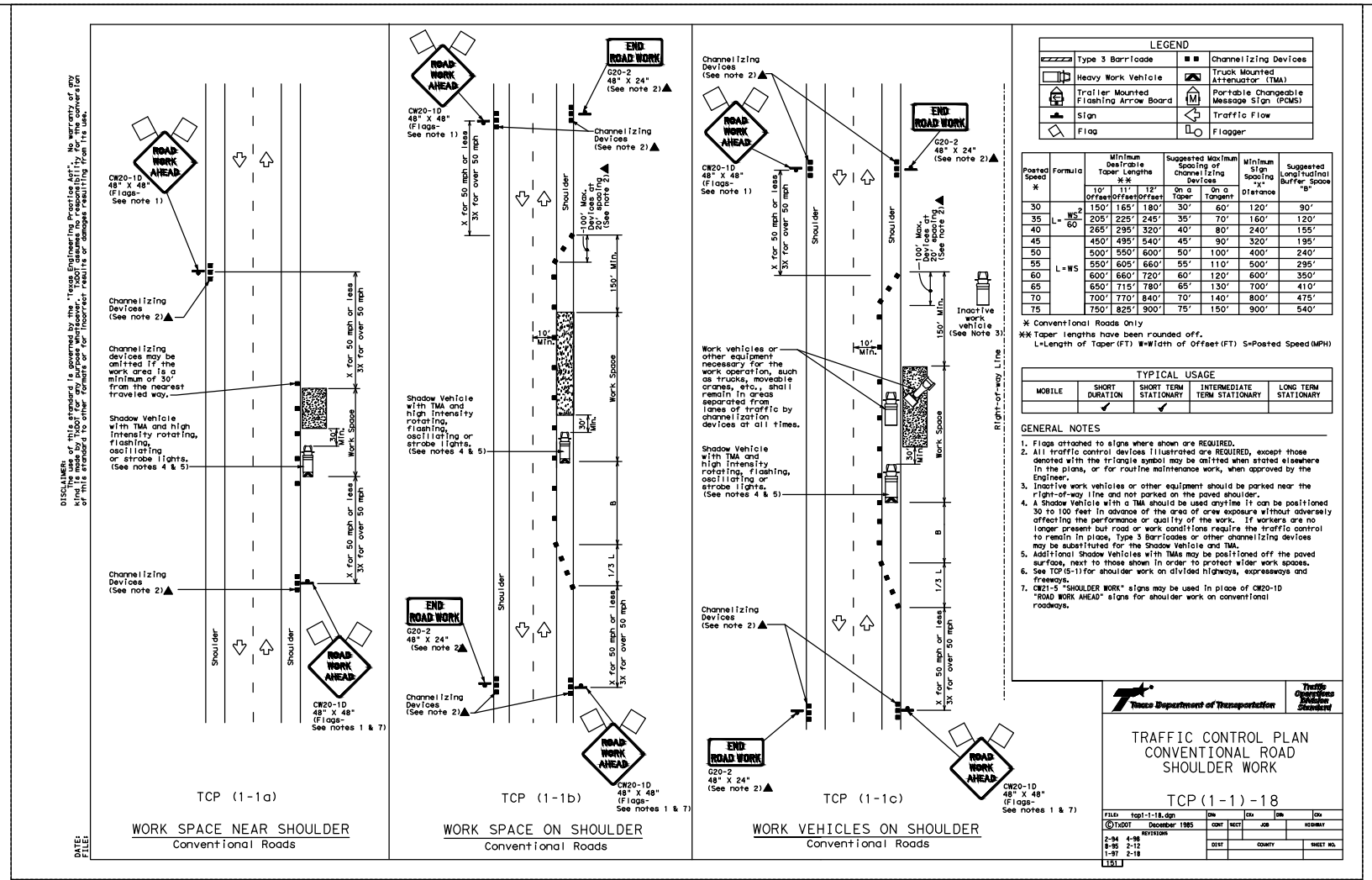
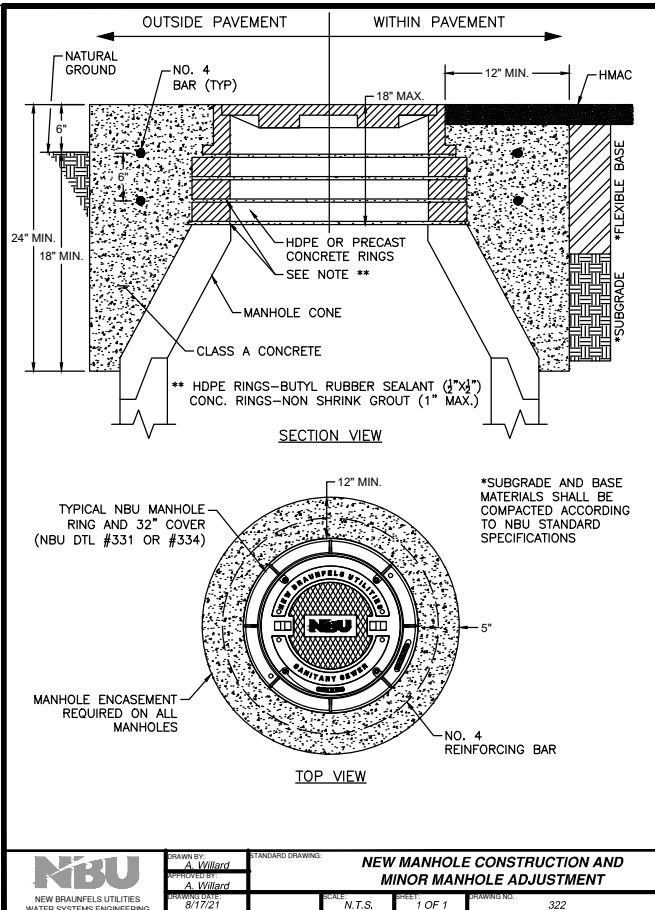
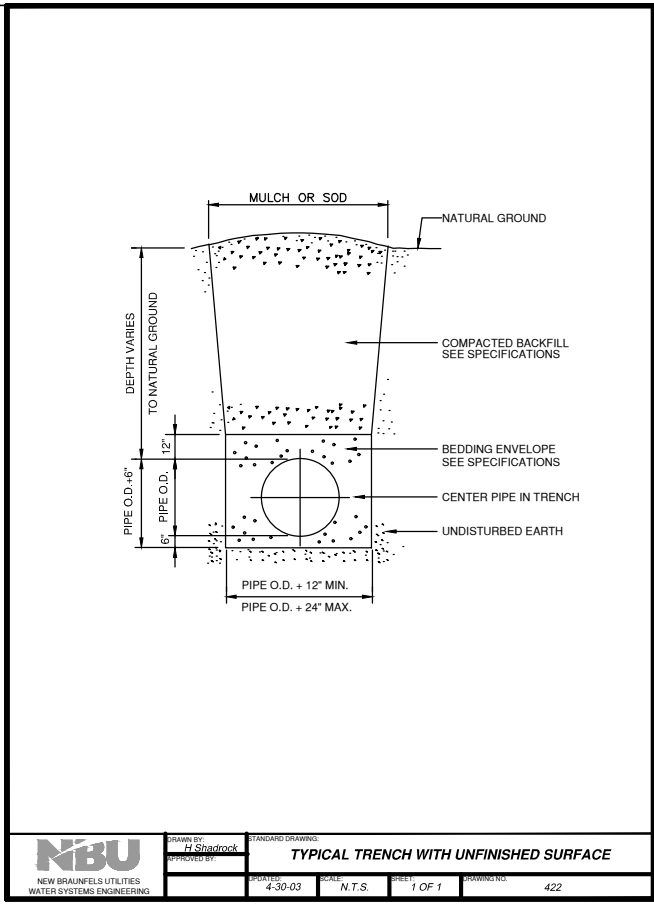


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DETAILS  
 JOB NUMBER: A441-2201  
 SCALE: N/A  
 HORIZONTAL: N/A  
 VERTICAL: N/A  
 SHEET NO. 39  
 OF 43 SHEETS

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REVISIONS		NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23  
 DESIGNED BY: JT  
 DRAWN BY: JT  
 CHECKED BY: SC  
 APPROVED BY: SC



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JOB NUMBER: A441-2201  
 SCALE: HORIZONTAL: N/A VERTICAL: N/A  
 SHEET NO. 40 OF 43 SHEETS

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES

- 1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

WORKER SAFETY NOTES:

- 1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA American National Standard for High-Visibility Apparel, or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

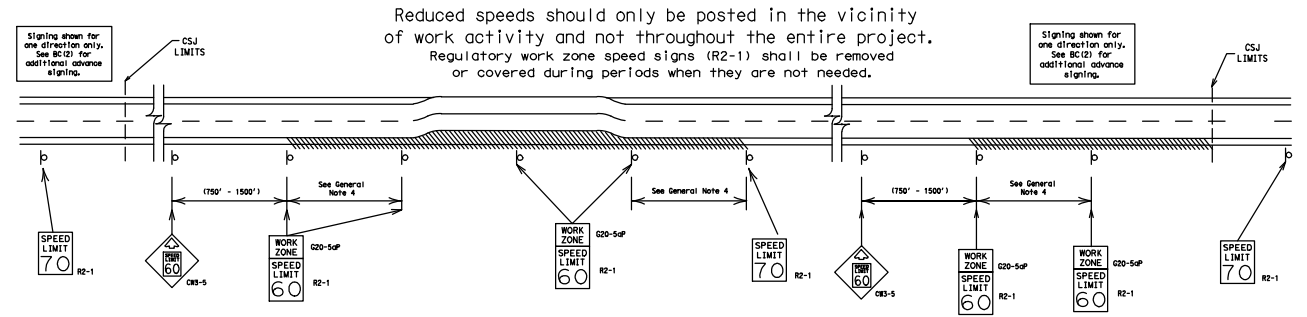
- 1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTD) describes pre-qualified products and their sources.

Table with 2 columns: DOCUMENT TITLE and URL. Includes CWZTD, DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS), MATERIAL PRODUCER LIST (MPL), ROADWAY DESIGN MANUAL, STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD), TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD), and TRAFFIC ENGINEERING STANDARD SHEETS.

SHEET 1 OF 12. BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS BC(1)-21. Includes project details and revision table.

TYPICAL LOCATION OF CROSSROAD SIGNS, T-INTERSECTION, TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING. Includes diagrams of sign placement and a table of sign sizes for different road types and speeds.

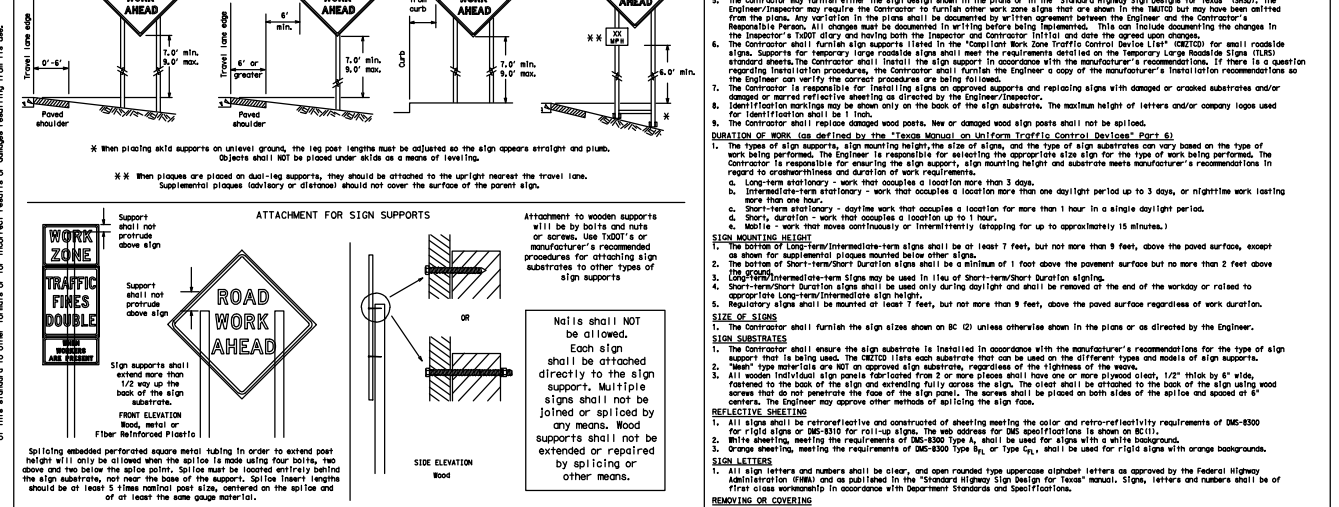
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS



GUIDANCE FOR USE: LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS. GENERAL NOTES. Includes detailed instructions on sign placement, speed limits, and reflective sheeting requirements.

SHEET 3 OF 12. BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT BC(3)-21. Includes project details and revision table.

TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

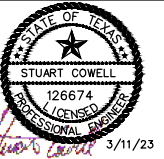


ATTACHMENT FOR SIGN SUPPORTS. CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS. Includes diagrams of sign supports and a list of requirements for permanent signs.

SHEET 4 OF 12. BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES BC(4)-21. Includes project details and revision table.

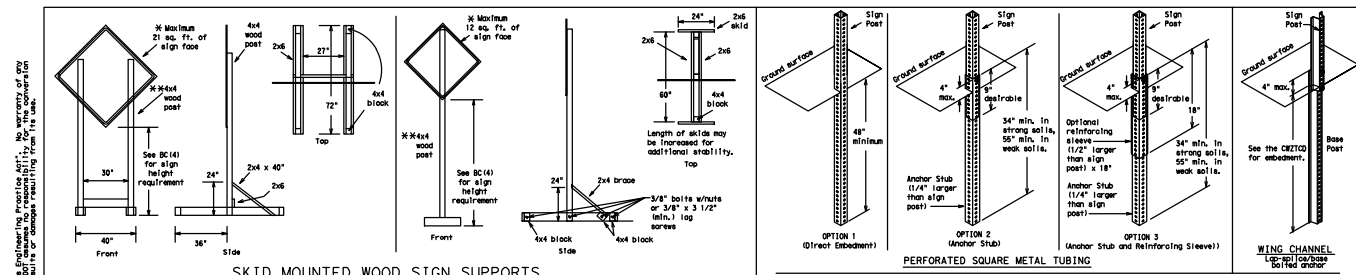
REVISIONS table with columns for NO., DESCRIPTION, BY, DATE.

DATE: 3/11/23. DESIGNED BY: JT. DRAWN BY: JT. CHECKED BY: SC. APPROVED BY: SC.



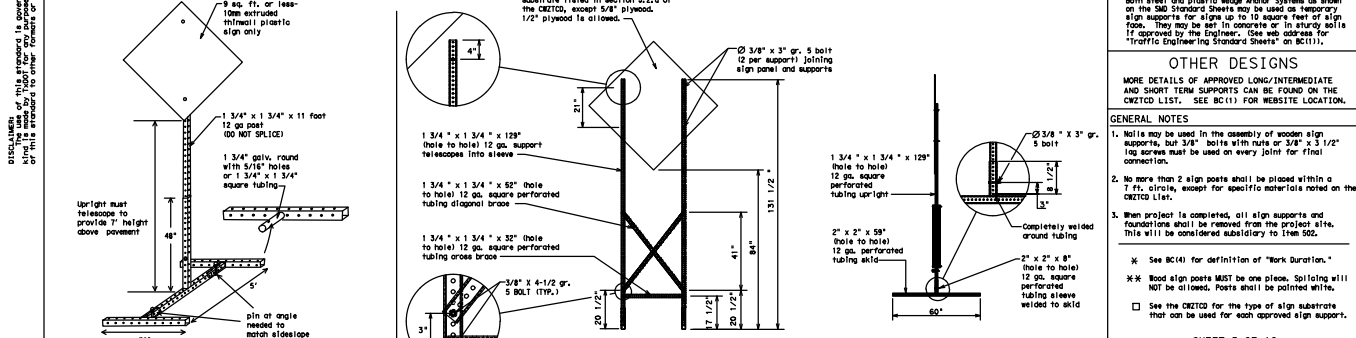
VERMENDI WASTEWATER LINE. LJA Engineering, Inc. 2700 LA FRONTERA BLVD. SUITE 150. ROUND ROCK, TEXAS 78735. Phone 512.767.7300. Fax 512.439.4716. FRN-F-1386.

DETAILS. JOB NUMBER: A441-2201. SCALE: HORIZONTAL: N/A. VERTICAL: N/A. SHEET NO. 41 OF 43 SHEETS.



SKID MOUNTED WOOD SIGN SUPPORTS  
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

GROUND MOUNTED SIGN SUPPORTS  
Refer to the CDOTD and the manufacturer's installation procedure for each sign support. The maximum sign square footage shall adhere to the manufacturer's recommendation. Two post installation can be used for larger signs.



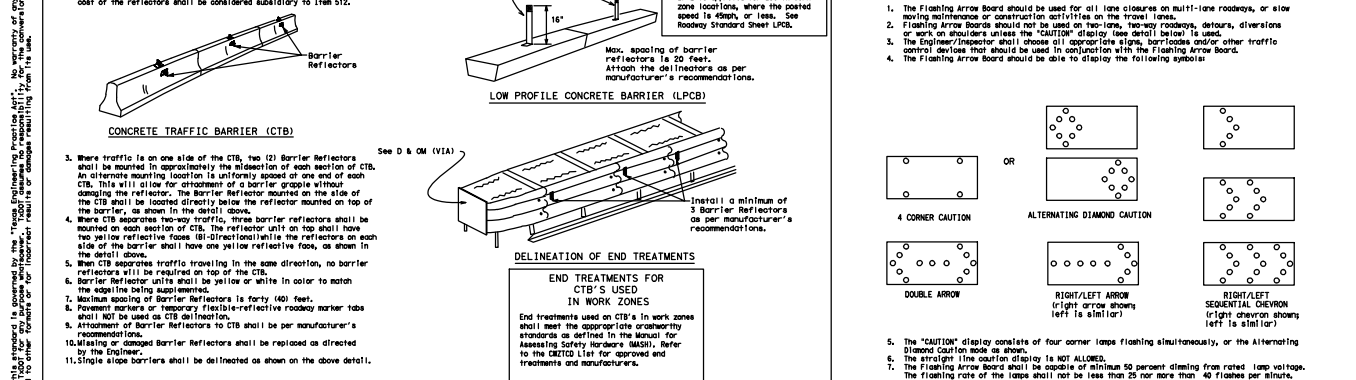
SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS  
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

WEDGE ANCHORS  
Both steel and plastic Wedge Anchor Systems as shown on the SD Standard Sheets may be used as temporary sign supports for signs up to 15 square feet of sign face. They may be set in concrete or in sturdy soil if approved by the Engineer. See web address for Traffic Engineer (in Standard Sheet) on BC(1).

OTHER DESIGNS  
MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CDOTD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES  
1. Signs may be used in the assembly of wooden sign supports, but 3/4" bolts with nuts or 3/4" x 1/2" lag screws must be used on every joint for final connection.  
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CDOTD List.  
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered satisfactory to Item 502.

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT  
BC(5)-21

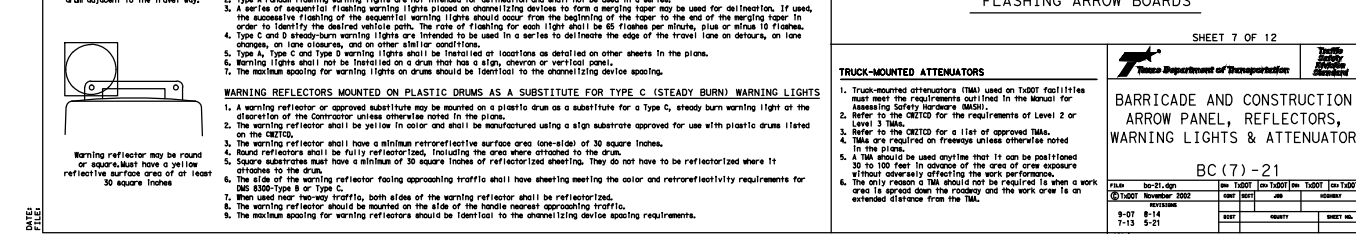


BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT  
BC(5)-21

REQUIREMENTS

TYPE	MINIMUM SIZE	MINIMUM PANE LAMPS	MINIMUM VISIBILITY DISTANCE
1	30 x 40	13	5/4 miles
2	30 x 40	13	5/4 miles
3	48 x 96	15	1 mile

ATTENTION  
When Not in Use, REMOVE THE ARROW BOARD FROM THE ROADWAY AND PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.



FLASHING ARROW BOARDS  
SHEET 7 OF 12

TRUCK-MOUNTED ATTENUATORS  
1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MSAH).  
2. The attenuator shall be placed in color and meet the requirements of Level 2 or Level 3 TMA.  
3. The attenuator shall be placed in color and meet the requirements of Level 2 or Level 3 TMA.  
4. TMA are required on freeways unless otherwise noted in the CDOTD.  
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of work.  
6. The only reason a TMA should not be used is if it is not approved without affecting the work performance.  
7. The only reason a TMA should not be used is if it is not approved without affecting the work performance.

BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR  
BC(7)-21

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES  
(The Engineer may approve other messages not specifically covered here.)

WHEN NOT IN USE, REMOVE THE POMS FROM THE RIGHT-OF-WAY OR PLACE THE POMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- Messages on PCMS should contain no more than 8 words (about four to eight characters per word) not including alpha words such as "TO," "ON," "AT," "etc."
- Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
- Use the word "EXIT" to refer to an exit ramp on a freeway, i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Use the word "LANE" to refer to a lane on a freeway, i.e., "LANE CLOSED." Do not use the term "LANE."
- Use the word "MILE" to refer to a distance on a freeway, i.e., "MILE AHEAD." Do not use the term "MILE."
- The message term "MESSAGE" should be used only if the work is to start on Saturday morning and end by Sunday evening or later.
- Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Saturday morning.
- The Engineer/Inspector may select one of two options which are available for displaying a message on a PCMS. The first option is to display the message for either four seconds or for three seconds.
- Do not "flash" messages or use "flashing" messages. The message should be steady burn or continuous while displayed.
- Do not present redundant information on a two-phase message, i.e., listing two lines of the message the same and changing the third line.
- Do not use the word "DANGER" in any message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that are not horizontally or vertically across the face of the sign.
- Displaying multiple messages on a two-phase message that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the MUTCD.
- PCMS character height should be at least 1/2 inch for smaller mounted units. They should be visible from at least 1/2 mile and the next nearest lane. The message text should be in black on a white background. Do not use "daylight." Truck-mounted units must have a character height of 10 inches and be visible from at least 1/2 mile and the next nearest lane. Each line of text should be centered on the message board rather than left or right aligned.
- If a message is not legible or difficult to read, it should not be used. The PCMS should be replaced with a static sign or other means of traffic control.

OTHER PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

Phase 1: Condition Lists	Other Condition List	Phase 2: Possible Component Lists
FREWAY/RAMP CLOSED X MILE	ROADWORK XXXX FT	MERGE RIGHT
ROAD CLOSED AT SH XXX	ROADWORK XXXX FT	DETOUR NEXT X EXITS
ROAD CLOSED AT SH XXX	ROADWORK XXXX FT	EXIT XXX
RIGHT X LANES CLOSED	RIGHT LN CLOSED XXXX FT	STAY ON US XXX SOUTH
CENTER LANE CLOSED	DAYTIME LANE CLOSURES	TRUCKS USE XXXX N
NIGHT LANE CLOSURES	1-X SOUTH LANE CLOSURES	WATCH FOR TRUCKS
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE	EXPECT DELAYS
EXIT CLOSED	RIGHT LN TO BE CLOSED	REDUCE SPEED XXX FT
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI	USE OTHER WORKERS
XXXXXXX CLOSED		STAY IN LANE

APPLICATION GUIDELINES

- Only 1 or 2 phases are to be used on a PCMS.
- The first phase (or both) should be selected from the "Roadwork Closure List" and the "Other Condition List."
- A 2nd phase can be selected from the "Action to Take/Effect" or "Warning" list, General Warning, or Advance Notice "Phase Lists."
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- If two PCMS are used in sequence, they must be separated by a minimum of 100 ft. Each PCMS shall be limited to two phases, and should be used in the order of the "Phase Lists."
- For advance notice, when the current date is within seven days of the actual work, advance notice should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- roadway designations IH, US, SH, FM and LF can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AM, PM and MILE and MILES interchanged as needed.
- AT, BEFORE and PAST interchanged as needed.
- Distances or AHEAD should be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE POMS. WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC, WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

- When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Item 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS".
- When static signs, such as the "Flagger Symbol" (W07-7) are represented graphically on the Full Matrix PCMS sign, and with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
- When static signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
- A Full Matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements in BC(1), for the same size area.

CONTRACTOR'S USE ONLY

REVISIONS

NO.	DESCRIPTION	BY	DATE

DATE: 3/11/23

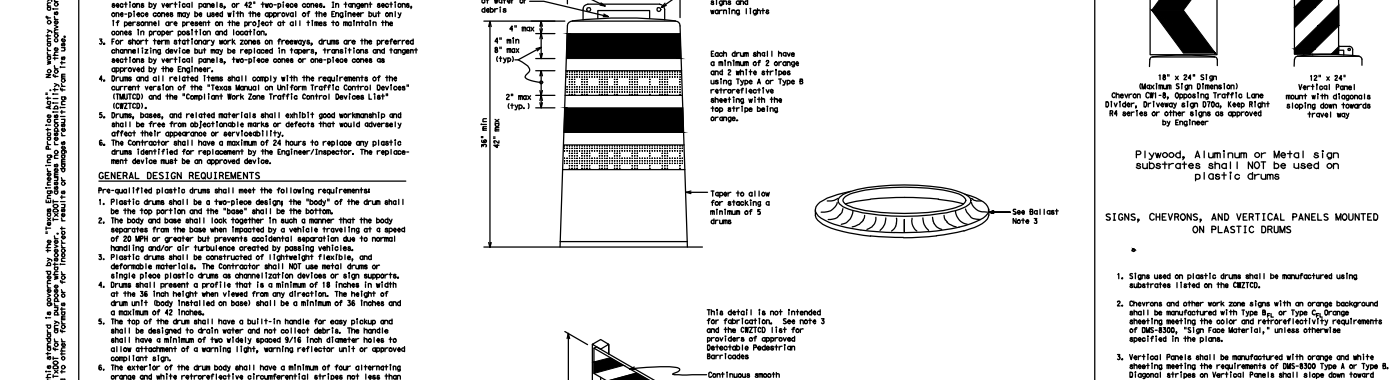
DESIGNED BY: JT

DRAWN BY: JT

CHECKED BY: SC

APPROVED BY: SC

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)  
BC(6)-21

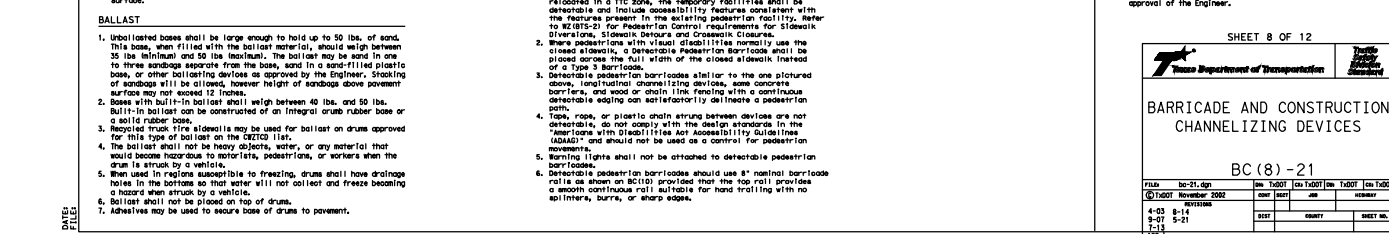


BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)  
BC(6)-21

REQUIREMENTS

TYPE	MINIMUM SIZE	MINIMUM PANE LAMPS	MINIMUM VISIBILITY DISTANCE
1	30 x 40	13	5/4 miles
2	30 x 40	13	5/4 miles
3	48 x 96	15	1 mile

ATTENTION  
When Not in Use, REMOVE THE ARROW BOARD FROM THE ROADWAY AND PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

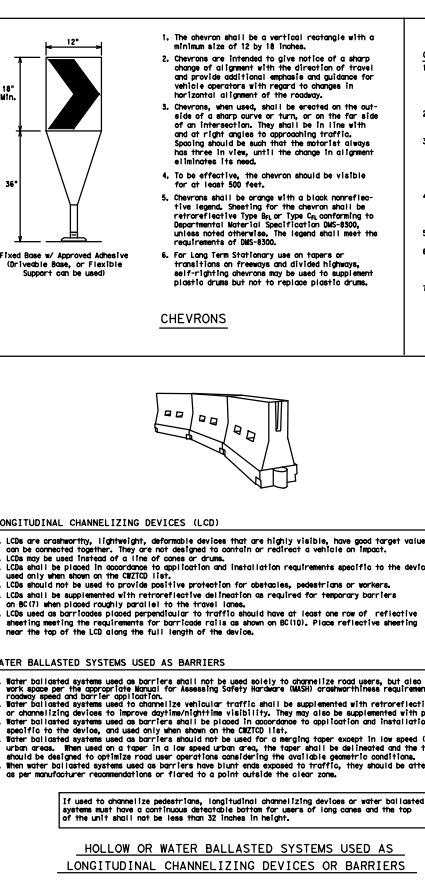
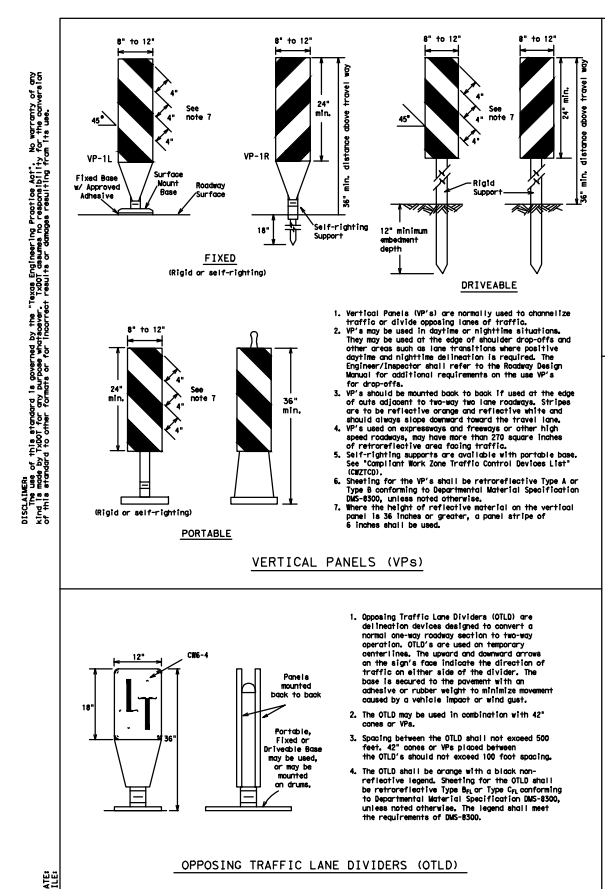


BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES  
BC(8)-21

REQUIREMENTS

TYPE	MINIMUM SIZE	MINIMUM PANE LAMPS	MINIMUM VISIBILITY DISTANCE
1	30 x 40	13	5/4 miles
2	30 x 40	13	5/4 miles
3	48 x 96	15	1 mile

ATTENTION  
When Not in Use, REMOVE THE ARROW BOARD FROM THE ROADWAY AND PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.



**GENERAL NOTES**

- Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways.
- Channelizing devices shown on this sheet may have a 'driveable', fixed or portable base.
- Channelizing devices shall be made of a durable, fixed or portable base.
- Channelizing devices shall be made of a durable, fixed or portable base.
- Channelizing devices shall be made of a durable, fixed or portable base.

Posted Speed	Formula	Minimum Desirable Taper Length	Suggested Maximum Spacing of Channelizing Device
30	$\frac{S^2}{11}$	180'	60'
40	$\frac{S^2}{10}$	240'	70'
45	$\frac{S^2}{9}$	270'	80'
50	$\frac{S^2}{8}$	360'	90'
55	$\frac{S^2}{7}$	495'	100'
60	$\frac{S^2}{6}$	660'	110'
65	$\frac{S^2}{5}$	880'	120'
70	$\frac{S^2}{4}$	1210'	130'
75	$\frac{S^2}{3}$	1650'	140'
80	$\frac{S^2}{2}$	2640'	150'

**SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS**

**SHEET 9 OF 12**

**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (9) - 21**

**REMOVAL OF PAVEMENT MARKINGS**

**WORK ZONE PAVEMENT MARKINGS**

**TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS**

**RAISED PAVEMENT MARKERS**

**MAINTAINING WORK ZONE PAVEMENT MARKINGS**

**TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS**

**RAISED PAVEMENT MARKERS USED AS GUIDEMARKS**

**DEPARTMENTAL MATERIAL SPECIFICATIONS**

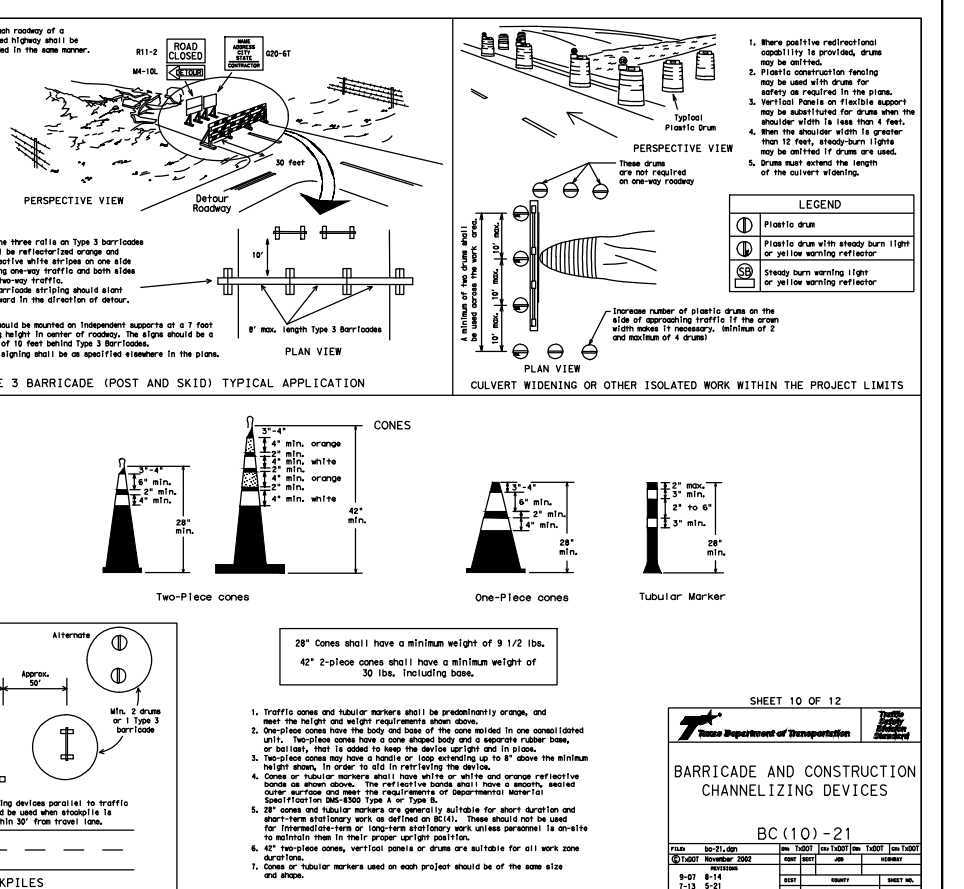
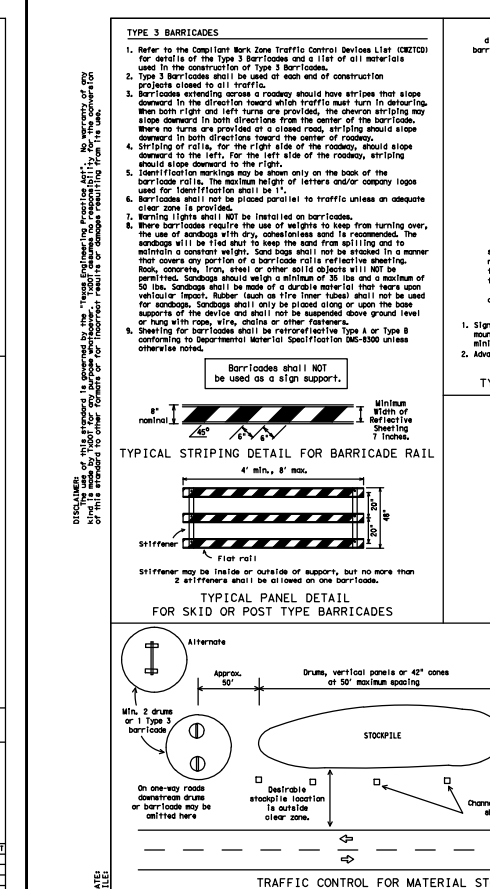
**PAVEMENT MARKING PATTERNS**

**CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS**

**EDGE & LANE LINES FOR DIVIDED HIGHWAY**

**LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS**

**TWO-WAY LEFT TURN LANE**



**STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS**

**DOUBLE NO-PASSING LINE**

**SOLID LINES**

**BROKEN LINES**

**AUXILIARY OR LANEDROP LINE**

**REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS**

**BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS**

**BC (11) - 21**

**REMOVED PAVEMENT MARKINGS**

**REMOVED PAVEMENT MARKINGS**

**BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS**

**BC (12) - 21**

**REVISIONS**

NO.	DESCRIPTION	BY	DATE

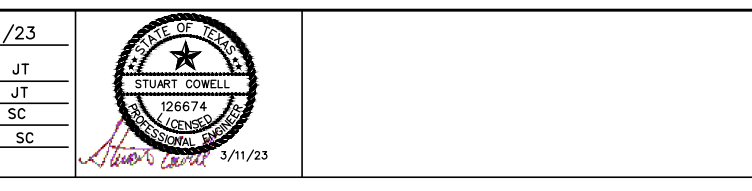
DATE: 3/11/23

DESIGNED BY: JT

DRAWN BY: JT

CHECKED BY: SC

APPROVED BY: SC



**VERAMENDI WASTEWATER LINE**

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ROUND ROCK, TEXAS 78735

Phone 512.767.7300  
Fax 512.439.4716  
FRN-F-1386

**JOB NUMBER:** 4441-2201

**SCALE:** HORIZONTAL: N/A VERTICAL: N/A

**SHEET NO. 43**

**OF 43 SHEETS**

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# VERAMENDI WASTEWATER LINE UTILITY SPECIFICATIONS

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102 CLEARING AND GRUBBING

503 FRAMES, GRATES, RINGS AND COVERS

506 MANHOLES

509 TRENCH SAFETY SYSTEMS

510 PIPE

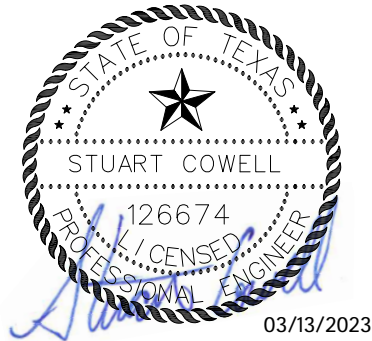
512 CONDUCTIVE TRACE WIRE FOR NON-METALLIC PIPE INSTALLATION

604 SEEDING FOR EROSION CONTROL

610 PRESERVATION OF TREES AND OTHER VEGETATION

620 FILTER FABRIC

703 BARRICADES, SIGNS AND TRAFFIC HANDLING



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### 102.1 Description

This item shall govern the removal and disposal of all trees, stumps, brush, roots, shrubs, vegetation, logs, rubbish and other objectionable material.

### 102.2 Submittals

The submittal requirements of this specification item may include:

- A. A permit when utility adjustments are made in the right-of-way, and
- B. A plan for removal and deposition of all clearing and grubbing materials and debris.

### 102.3 Construction Methods

Prior to commencement of this work, all required erosion control and tree protection measures indicated on the Drawings shall be in place. The existing utilities shall be located and protected as specified in the Standard Contract Documents, and/or indicated on the Drawings. A permit shall be required when utility adjustments are to be made in preparation for construction in the right-of-way.

Areas within the construction limits indicated on the Drawings shall be cleared of all trees, stumps, brush, etc., as defined in section 102.1; except trees or shrubs scheduled for preservation which shall be carefully trimmed as directed, in accordance with Item No. 610, "Preservation of Trees and Other Vegetation" and shall be protected from scarring, barking or other injuries during construction operations. All exposed cuts over 2 inches in diameter, exposed ends of pruned limbs or scarred bark shall be treated with an approved asphalt material within 24 hours of the pruning or injury.

Construction equipment shall not be operated nor construction materials stockpiled under the canopies of trees, unless otherwise indicated on the Drawings and/or specified in the Contract Documents. Excavation or embankment materials shall not be placed within the drip line of trees until tree wells are constructed.

Within the construction limits or areas indicated, all obstructions, stumps, roots, vegetation, abandoned structures, rubbish and objectionable material shall be removed to the following depths:

1. In areas to receive 6 inches or more embankment, a minimum of 12 inches below natural ground.
2. In areas to receive embankment less than 6 inches a minimum of 18 inches below the lower elevation of embankment, structure or excavation.
3. In areas to be excavated a minimum of 18 inches below the lower elevation of the embankment, structure or excavation.
4. In all other areas a minimum of 12 inches below natural ground.

Holes remaining after removal of all obstructions, objectionable material, trees, stumps, etc. shall be backfilled with select embankment material and compacted by approved

## New Braunfels Utilities: 12/09/03

methods. All cleared and grubbed material shall be disposed of in a manner satisfactory to the Engineer or designated representative. Unless otherwise provided, all materials as described above shall become the property of the Contractor and removed from the site and disposed of at a permitted disposal site.

Burning materials at the site shall conform to City of New Braunfels and County Regulations.

### 102.4 Measurement

"Clearing and Grubbing", when included in the contract as a pay item, will be measured by the acre, 100 foot stations or lump sum, regardless of the width of the right of way.

### 102.5 Payment

All work performed by this item will be considered subsidiary to other bid items unless it is included as a separate bid item in the contract documents then all work performed as required herein and measured as provided under "Measurement" will be paid for at the unit bid price. The bid prices shall include full compensation for furnishing all labor; all materials; all royalty and freight involved; all hauling and delivering on the road; and all tools, equipment and incidentals necessary to complete the work. Payment will not be made for unauthorized work.

Payment, when included as a contract pay items, will be made under one of the following:

<b>Pay Item:</b> Clearing and Grubbing	Per Acre.
<b>Pay Item:</b> Clearing and Grubbing	Per 100 foot Station.
<b>Pay Item:</b> Clearing and Grubbing	Lump Sum.

**End**



**Item No. 503**  
**Frames, Grates, Rings and Covers**

**503.1 Description**

This item shall govern furnishing and installation of frames, grates, rings and covers for inlets, manholes and other structures indicated on the Drawings.

**503.2 Submittals**

The submittal requirements of this specification item include manufacturer, model number, description, painting requirements and characteristics of frames, grates, rings, covers, height adjustment insert and nuts and bolts required for completion of the work.

**503.3 Materials**

The Contractor shall submit descriptive information and evidence that the materials and equipment the Contractor proposes for incorporation in the Work is the kind and quality that satisfies the specified functions and quality. New Braunfels Utilities Standard Products Lists (SPLs) form a part of these Specifications. Contractors may, when appropriate, elect to use products from the SPLs; however, submittal to the Engineer or designated representative is still required. If the Contractor elects to use any materials from these lists, each product shall be completely and clearly identified by its corresponding SPL number when making the product submittal.

The purpose of the SPLs is to expedite the review by the Engineer or designated representative and, if necessary, New Braunfels Utilities Products Committee of Contractor product submittals. The SPL's should not be interpreted as being a pre-approved list of products necessarily meeting the requirements for a given construction Project. Items contained in the SPL cannot be substituted for items that are shown on the Drawings, called for in the specifications, or specified in the Bidding Requirements, Contract Forms and Conditions of Contract, unless approved by the Engineer or designated representative in conjunction with New Braunfels Utilities Standard Products Committee. The Standard Product List current at the time of plan approval will govern.

**A. Welded Steel**

Welded steel grates and frames shall conform to the number; size, dimensions and details indicated on the Drawings and shall be welded into an assembly in accordance with those details. Steel shall conform to the requirements of ASTM A 36/A 36M, "Specification for Structural Steel".

**B. Castings**

Castings, whether Carbon-Steel, Gray Cast Iron or Ductile Iron shall conform to the shape and dimensions indicated on the Drawings and shall be clean substantial castings, free from sand or blowholes or other defects. Surfaces of the castings shall be free from burnt on sand and shall be reasonably smooth. Runners, risers, fins and other cast on pieces shall be removed from the castings and such areas ground smooth. Bearing surfaces between manhole rings and covers or grates and frames

shall be cast or machined with such precision that uniform bearing shall be provided throughout the perimeter area of contact. Pairs of machined castings shall be matchmarked to facilitate subsequent identification at installation with the exception of water and wastewater manhole and valve castings. These manhole and valve castings shall be fabricated with such draft, tolerances, bolt hole spacing, etc., that all rings and covers of a particular type or class are interchangeable and match-marking will not be required.

Steel castings shall conform to ASTM A 27/27M, "Specifications for Steel Castings, Carbon, for General Application". Grade 70-36 (480-250) shall be furnished unless otherwise specified on the Drawings.

Cast iron castings shall conform to ASTM A 48, "Specification for Gray Iron Castings", Class 30.

Ductile Iron castings shall conform to ASTM A 536, "Specification for Ductile Iron Castings". Grade 60-40-18 (415-275-125) shall be used unless otherwise indicated on the Drawings.

#### C. Manhole Cover Riser Rings

Height-adjustment inserts for wastewater manhole rings, which are used for raising standard manhole covers, shall be those models listed in New Braunfels Utilities Standard Products List.

#### D. Nuts and Bolts

Nuts and bolts shall be hex head 5/8" x 2.5" #11 National Coarse Thread, Type 316 stainless steel. For bolted manhole covers, a thin film of an approved "Anti-freeze" compound, approved by the Engineer or designated representative, shall be applied to all bolts.

#### E. Mortar

Unless otherwise specified or approved by the Engineer or designated representative, the mortar for bedding castings shall consist of one (1) part Portland cement and three (3) parts sand and sufficient water to provide the desired consistency. The gradation of the fine aggregate shall meet the requirements for Grade No. 1, Item No. 403, "Concrete for Structures".

### 503.4 Construction Methods

Frames, grates, rings and covers shall be constructed of the specified materials in accordance with the details indicated on the Drawings or in New Braunfels Utilities Standard Details. The Frames, grates, rings and covers shall be placed carefully to the lines or grades indicated on the Drawings or as directed by the Engineer or designated representative.

All welding shall conform to the requirements of the ANSI/AWS Structural Welding Code D1.1. Welded frames, grates, rings and covers shall be given 1 coat of a commercial grade red lead oil paint and 2 coats of commercial grade aluminum paint. All coats shall be a minimum of 1.5 mils, dry.

Painting of gray iron castings will not be required, except when used in conjunction with structural steel shapes.

**503.5 Measurement and Payment**

Frames, grates, rings and covers will not be measured and payment for furnishing all materials, tools, equipment, labor and incidentals to complete the Work will be included in the Bid Items which constitute the complete structures.

**End**

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**Item No. 506  
Manholes****506.1 Description**

This item shall govern construction of manholes, complete in place, and the materials used therein, including excavation, installation, backfilling and surface restoration. It shall also include furnishing and installing rings, covers, **protective coatings**, and appurtenances, as well as any pumping and drainage necessary to complete the work. Wastewater manholes shall be 'acceptance tested' by the Contractor.

The Contractor shall submit descriptive information and evidence that the materials and equipment the Contractor proposes for incorporation in the Work are of the kind and quality that satisfies the specified functions and quality as specified or presented in the Drawings. The New Braunfels Utilities Standard Products Lists (SPLs) form a part of the Specifications for the Work. Contractors may, when appropriate, elect to use products from the SPL; however, submittal to the Engineer or designated representative shall still be required. If the Contractor elects to use any materials from these lists, each product shall be completely and clearly identified by its corresponding SPL number, when making the product submittal. This will expedite the review process in which the Engineer or designated representative decide whether the products meet the Contract requirements and the specific use foreseen by the Engineer or designated representative in the design of this engineered Project.

Items contained in the SPL cannot be substituted for items shown on the Drawings, or called for in the specifications, or specified in the Bidding Requirements, Contract Forms and Conditions of Contract, unless approved by the Engineer or designated representative. The Standard Product List current at the time of plan approval will govern.

**506.2 Submittals**

The submittal requirements of this specification item include:

- A. Type, size and manufacturer of manhole (diameter of water or wastewater manhole), structure (precast, cast in place; Standard, Tee, etc), and materials and equipment to be furnished (concrete, seals, rings, covers, etc.)
- B. Aggregate types, gradations and physical characteristics for the Portland cement concrete mix.
- C. Proposed proportioning of materials for the mortar mix.
- D. Proposed Acceptance testing procedure and associated test equipment and materials Type structures and proposed adjustment technique (lowering, raising, lateral displacement).
- E. Proposed product for coating the interior surface of new and/or existing wastewater manholes.

Submittal of test Records is required and shall include as a minimum the following items. The test records shall also be included as part of the Project records turned in with the acceptance package.

Name of the manhole manufacturer  
Interior surface coating type and application method for Wastewater Manholes  
**Protective coating test reports**  
Model and manufacturer of vacuum tester  
Date tested/date re-tested  
Passed/failed and state what was done to correct the problem  
Test Method Used  
Location/station of manhole  
Precast/cast-in- place bottom  
Any repairs made to the joints

### 506.3 Materials and Components

#### A. Concrete and Cement Stabilized Sand

All concrete shall conform to Standard Specification Item No. 403, "Concrete for Structures". The cast in place concrete shall be Class A, and the precast concrete manhole base sections, riser sections and appurtenances shall conform to the requirements of ASTM C478/C478M, "Standard Specification for Precast Reinforced Concrete Manhole" with Class I concrete. All interior surfaces of wastewater manholes shall receive a coating by an application method acceptable to the Engineer or designated representative or shall be otherwise acceptably protected from the acidic effects of municipal wastewater. Concrete for backfill of over-excavated areas shall be Class A or Class J as indicated on the Drawings. Cement stabilized sand for bedding or backfilling, when indicated or required on the Drawings, shall contain 2 bags of Portland Cement per cubic yard. The sand shall meet the requirements for "Fine Aggregate" in Standard Specification Item No. 403, "Concrete For Structures".

#### B. Mortar

The mortar shall be composed of one part Portland cement, one part masonry cement (or 1/4 part hydrated lime), and sand equal to 2-1/2 to 3 times the sum of the volumes of the cements and lime used. The sand shall meet the requirements for "Fine Aggregate" as given in Standard Specification Item No. 403 "Concrete For Structures".

#### C. Reinforcement

The reinforcing steel shall conform to the requirements of Standard Specification Item No. 406, "Reinforcing Steel". Secondary, non-structural steel in cast-in-place wastewater manholes may be replaced by collated fibrillated polypropylene fibers, if approved by the Engineer or designated representative.

#### D. Rings and Covers

Rings and covers shall conform to the requirements of Standard Specification Item No. 503, "Frames, Grates, Rings and Covers".

1. Replacement Rings and Covers, 24 in. Diameter Lids.

This ring and cover shall be used for the replacement of broken rings and covers, minor manhole adjustment, or as otherwise directed by the Engineer or designated representative.

2. Rings and Covers, 32 in. Diameter Lids.

This ring and cover shall be used for all new manhole construction, except as otherwise directed by the Engineer or designated representative.

E. Bulkheads.

Bulkheads shall meet the requirements of Standard Specification Item No. 507 "Bulkheads"

F. Precast Base Sections, Riser Sections, and Cones.

Precast concrete base sections, riser sections, and cones shall conform to the requirements of ASTM C 478. The width of the invert shall be specifically sized for the connecting pipes. Inverts shall be "U" shaped with a minimum depth of three fourths of the largest pipe diameter. Where lines enter the manhole up to 24 inches above the flowline of the outlet, the invert shall be filleted to prevent splashing and solids deposition. A drop pipe shall be provided for a sewer entering a manhole at more than 24 inches above the flowline of the outlet.

Joints for wastewater base sections, riser sections, and cones shall conform to the requirements of ASTM C 443. Precast bases for 48 inch inside diameter manholes shall have preformed inverts. Inserts acceptable to the Engineer or designated representative shall be embedded in the concrete wall of the manhole sections to facilitate handling; however, through-wall holes for lifting will not be permitted. Any voids between the pipe and boot shall be filled to the springline with a product recommended by the manhole manufacturer to prevent solids collection.

G. Precast Junction Boxes.

Precast junction boxes shall be allowed only where indicated on the Drawings or acceptable to the Engineer or designated representative. Joints for wastewater junction boxes shall conform to the requirements of ASTM C 443.

H. Pipe-to-Manhole/Junction Box Assemblies

Precast bases and precast junction boxes shall have flexible, resilient and non-corrosive boot connectors or ring waterstops acceptable to the Engineer or designated representative conforming to the requirements of ASTM C 923 on all wastewater pipe connections.

I. Precast Flat-Slab Transition/Junction Box Lids.

Precast slab transitions and lids shall be designed to safely resist pressures resulting from loads which might result from any combination of forces imposed by an HS-20 loading as defined by the American Association of State Highway and Transportation Officials (AASHTO). The joints of precast slab transitions and of lids for wastewater applications shall conform to the requirements of ASTM C443.

J. Precast-Prefabricated Tee Manholes.

Tee manholes shall be allowed only where indicated on the Drawings or as directed by the Engineer or designated representative. The main pipe section shall conform

to the requirements of New Braunfels Utilities Standard Specification Item No. 510, "Pipe". The vertical manhole portion (tee) above the main pipe shall conform to the requirements of the precast components.

The manhole tee shall have a minimum inside diameter of 48 inches and shall rise vertically centered or tangent to the main pipe, as indicated on the Drawings or as directed by the Engineer or designated representative. An access hole less than 48-inches in diameter shall be cut into the main pipe to allow a ledge for support of access ladders. Unless otherwise specified on the Drawings, the main pipe portion of the tee manhole shall be paid subsidiary to the unit tee manhole price.

K. Precast Grade Rings

Rings shall be reinforced Class A or I concrete.

1. Precast Grade Rings, 24-1/2 inches Inside Diameter:

This adjustment ring shall be used only for adjusting existing manholes with 24 inch lids and for Wastewater Access Device. Inside to outside diameter dimension of ring shall be 6 inches with a thickness of 3 inches to 6 inches.

2. Precast Grade Rings, 35 inches Inside Diameter:

This adjustment ring shall be used for all new manhole construction with 32 inches lids. Inside to outside diameter dimension of ring shall be 6 inches with a thickness of 4 inches to 6 inches.

L. New Manhole Construction and Minor Manhole Adjustment:

New manhole construction and minor manhole adjustments shall be performed as indicated on Standard Detail 322, "New Manhole Construction and Minor Manhole Adjustment", and shall consist of adding precast reinforced concrete rings to adjust the manhole to final grade.

For new manhole construction, the maximum vertical allowable ring adjustment, including the depth of the ring casting, shall be limited to 18 inches. For adjustments of existing manholes that fall within the limits of overlay and street reconstruction projects, the maximum vertical allowable, including the depth of the ring casting, shall be limited to two feet. All other existing manholes shall have a maximum allowable ring adjustment, including the depth of the ring casting, of one foot. Any adjustment that will exceed these requirements shall be accomplished as indicated on Standard Detail 321, "Major Manhole Adjustment" and as described below in subsection (M). All manholes not located in paved areas shall have bolted covers.

M. Major Manhole Adjustment:

Any adjustment that exceeds the requirements of subsection (L) Minor Manhole Adjustments, shall be accomplished as indicated on Standard Detail 321, "Major Manhole Adjustment", and shall consist of any combination of removing the concrete rings, and/or the manhole cone section, and/or the straight riser section of the manhole in order to bring the manhole to final grade. All manholes not located in paved areas shall have bolted covers.



N. Waterproofing Joint Materials.

O-rings and wedge seals for the joints of all wastewater manholes, when indicated on the Drawings, shall conform to the requirements of ASTM C443. The connections between reinforced concrete wastewater manhole structures and pipes shall meet the requirements of ASTM C923.

O. Interior Surface Coatings for Wastewater Manholes

1. New Construction

The interior surface of the wastewater manholes should be properly prepared prior to product application per specifications of the approved product, typically NACE No.6/SSPC-SP13.

The interior surfaces shall be coated with one of the following products:

Carboline Plasite 4500 Series – 125 mils

Raven 405 - 125 mils

SprayWall – 125 mils

Product to be applied per specification and by certified personnel. or approved equal product) or designated in writing by the Engineer.

2. Documentation

Contractor shall submit to NBU documentation regarding the certified applicator of the product(s) and type of product(s) used for coating of the wastewater manhole(s).

P. Abandonment of Existing Manholes

When designated on the Drawings for abandonment, existing manholes shall be removed to a level not less than four feet below grade. The inlets and outlets shall be securely plugged and the structure filled with material in accordance with Standard Detail 340 or as directed by the Engineer or designated representative.

#### 506.4 Construction

All manholes shall have a minimum inside diameter of 48 inches. Manhole base section or junction box dimension shall be appropriately increased to accommodate all converging pipe. A minimum horizontal clearance of 12 inches shall be maintained between adjacent pipes. Pipe ends within the base section or junction box walls shall not be relied upon to support overlying manhole dead and live load weights. All wastewater branch connections to new or existing mains shall be made at manholes with the influent pipe crown installed at the elevation of the effluent pipe crown. Where lines enter the manhole up to 24 inches above the flowline of the outlet, the invert shall be sloped upward to receive the flow, thus preventing splashing or solids deposition. Where the springline of an influent pipe is 24 inches or more above the springline of the effluent pipe, a drop manhole shall be used. Construction of extensions to existing systems shall require placement of bulkheads at locations indicated or directed by the Engineer or designated representative. Unless otherwise indicated on the Drawings; wastewater manholes shall have concentric cones, except on manholes over large mains where an eccentric cone shall be situated to provide access to an invert ledge.

Eccentric cones may be used where conflicts with other utilities dictate. Flat-slab tops may be used where clearance problems exist [see 506.3(I) above].

Manholes shall be founded at the established elevations on uniformly stable subgrade. Unstable subgrade shall be over-excavated a minimum of 12 inches (and replaced with a material acceptable to the Engineer or designated representative. Precast base units shall be founded and leveled on a 6 inch coarse aggregate bedding. A pipe section with a prefabricated tee manhole and half the length of the adjoining pipe sections on each side shall be founded on a minimum of 6 inch unreinforced Class A concrete (Standard Specification Item No. 403, "Concrete For Structures). The cast-in-place concrete cradle shall be placed against undisturbed trench walls up to the pipe's springline.

All adjustments shall be completed prior to the placement of the final surface.

Manhole components to be reused shall be carefully removed and the contact areas shall be cleaned of all mortar, concrete, grease and sealing compounds. Any items broken in the process of removal and cleaning shall be replaced in kind by the Contractor at its expense.

If the adjustment involves lowering the top of a manhole, a sufficient depth of precast concrete rings or brick courses shall be removed to permit reconstruction. The mortar shall be cleaned from the top surface remaining in place and from all brick or concrete rings to be reused and the manhole rebuilt to the required elevation. The manhole ring and cover shall then be installed with the top surface conforming to the proposed grade.

If the adjustment involves raising the elevation of the top of the manhole in accordance with 506.3 (L), "New Manhole Construction and Minor Manhole Adjustment", the top of brick or concrete ring shall be cleaned and built up vertically to the new elevation, using new or salvaged concrete rings and the ring and cover installed with the top surface conforming to the proposed grade.

Cast-in-place foundations shall have a minimum depth of 12 inches at the invert flowline. The widths of all manhole inverts shall be specifically sized for the connecting pipes. Inverts shall be "U" shaped with a minimum depth of three fourths of the largest pipe diameter. The lowermost riser section may be set in the Portland cement concrete, while still green, after which the foundation shall be cured a minimum of 24 hours prior to proceeding with construction of the manhole up to 12 feet in depth. The foundation shall be cured an additional 24 hours prior to continuing construction above the 12 foot level. Manhole depth shall be measured from the invert flowline to the finish surface elevation.

Wastewater manholes having cast in place foundations may be constructed over existing wastewater pipes, except polyvinyl chloride (PVC), and the top half of the pipe removed to facilitate invert construction. The manhole bottom shall rise from the springline elevation of the pipe, approximately one inch for each 12 inches of run (1:12,8%). Wastewater manholes with lines larger than 18 inches shall require precast bases; manholes constructed over in-service mains however, may be built on cast-in-place foundations if the flow cannot be interrupted. Precast and cast-in-place wastewater junction boxes shall be allowed only where indicated on the Drawings or acceptable to the Engineer or designated representative.

Wastewater lines, except reinforced concrete pipe, set in cast-in-place foundations, shall require a waterstop seal or gasket acceptable to the Engineer or designated

representative around the outside perimeter of the pipe. It shall be approximately centered under the manhole section wall.

Cast-in-place wastewater manholes, junction boxes and flat-slab transitions shall be reinforced, Class A concrete (Standard Specification Item No. 403, "Concrete for Structures"). All structural concrete work shall conform to Standard Specification Item No. 410, "Concrete Structures". Forms will be required for all cast-in-place walls above the foundation. Where the surrounding material can be trimmed to a smooth vertical face, outside forms may be omitted.

Backfilling for manholes shall conform to the density requirements of Special Specification Item No. 510, "Pipe". Manhole construction in roadways may be staged to facilitate base construction. Manholes constructed to interim elevations shall be covered with steel plates of sufficient thickness to support vehicular traffic. Steel plates on wastewater manholes shall be set in mortar to minimize inflow. Manholes shall be completed to finish elevation prior to placement of the roadway's finish surface. The excavation for completion of manhole construction shall be backfilled with cement stabilized sand with 2 sacks of cement per cubic yard up to the bottom of Portland Cement pavement slabs or to within 2 inches of finish elevation of asphaltic concrete pavements. The cement stabilized sand shall be a minimum of 12 inches thick.

After rings and covers are set to grade, the inside and outside of the concrete rings shall be wiped with mortar so placed as to form a durable water-tight joint smooth and even with the manhole cone section. No grouting shall be performed when the atmospheric temperature is at or below 40°F (5°C), and when necessary, because of a sudden drop in temperature, joints shall be protected against freezing for at least 24 hours.

When applying manhole protective coating, surface is to be prepped per NACE No.6 / SSPC – SP13. 125 mils of approved protective coating is to be applied per the manufacturer's instructions.

#### **506.5 Acceptance Testing of Wastewater Manholes:**

Manholes shall be tested separately and independently of the wastewater lines.

##### **A. Test by the Vacuum Method:**

A vacuum test shall be performed by the Contractor prior to backfilling those manholes that fall within the right-of-way that require detouring of vehicular traffic. A second vacuum test will not be required after backfilling and compaction is complete unless there is evidence that the manhole has been damaged or disturbed subsequent to the initial vacuum test.

For manhole installations which do not require detouring of vehicular traffic, the vacuum method is recommended and may be used by the Contractor prior to backfilling the manhole to insure proper installation so that defects may be located and repaired; however, a vacuum test shall be performed after backfilling, and compaction are complete. Testing after backfill and compaction are complete will be the basis for acceptance of the manhole.

##### **1. Equipment:**

- a) The manhole vacuum tester shall be a device approved for use by the Engineer or designated representative.

- b) Pipe sealing plugs shall have a load resisting capacity equal to or greater than that required for the size of the connected pipe to be sealed.
2. Procedures - applicable to new 4'-0" diameter manholes.
- a) Manhole section interiors shall be carefully inspected; units found to have through-wall lift holes, or any penetration of the interior surface by inserts provided to facilitate handling, will not be accepted. Coating shall be applied after the testing unless coating is applied before installation or unless it is applied at the factory. All lift holes and exterior joints shall be plugged with an acceptable non-shrink grout. No grout shall be placed in horizontal joints.
  - b) After cleaning the interior surfaces of the manhole, the Contractor shall place and inflate pneumatic plugs in all of the connecting pipes to isolate the manhole; sealing pressure within the plugs shall be as recommended by the plug manufacturer. Plugs and the ends of pipes connected by flexible boots shall be blocked to prevent their movement during the vacuum test.
  - c) The vacuum test head shall be placed on the top of the cone section or, inside of the top of the manhole cone section, and the compression seal band inflated to the pressure recommended by its manufacturer. The vacuum pump shall be connected to the outlet port with the valve open. When a vacuum of 10 inches of mercury [(-5 psig) has been attained, the valve shall be closed and the time noted. Tampering with the test equipment will not be allowed.
  - d) The manhole shall have passed the test if the vacuum does not drop below 9 inches of mercury [(-4.5 psig) within three (3) minutes of the time the valve was closed. The actual vacuum shall be recorded at the end of the three (3) minutes during which the valve was closed.
  - e) When the standard vacuum test cannot be performed because of design or material constraints (examples: T-Type manholes, T-Lock Liners, or other reasons acceptable to the Engineer or designated representative), testing of individual joints shall be performed as directed by the Engineer or designated representative.

B. Test by the Exfiltration Method:

At the discretion of the Engineer or designated representative, the Contractor may substitute the Exfiltration Method of testing for the Vacuum test described in Section 506.5. A above. This method may only be used when ground water is not present. If ground water is present a Vacuum Test shall be used unless otherwise directed by the Engineer or designated representative. All backfilling and compaction shall be completed prior to the commencement of testing.

The procedures for the test shall include the following:

1. Manhole section interiors shall be carefully inspected; units found to have through-wall lift holes, or any penetration of the interior surface by inserts provided to facilitate handling, will not be accepted. Coating shall be applied after the testing unless coating is applied before field assembly, or at the factory. All lift holes and exterior joints shall be plugged with an acceptable non-shrink grout. No grout shall be placed in horizontal joints.
2. After cleaning the interior surface of the manhole, the Contractor shall place and inflate pneumatic plugs in all of the connecting pipes to isolate the manhole;

sealing pressure within the plugs shall be as recommended by the plug manufacturer.

3. Concrete manholes shall be filled with water or otherwise thoroughly wetted for a period of 24 hours prior to testing.
4. At the start of the test, the manhole shall be filled to the top with water. The test time shall be 1 hour (60 minutes). The Construction Inspector must be present for observation during the entire time of the test. Permissible loss of water in the 1 hour test time is 0.025 gallons per diameter foot, per foot of manhole depth. For a 4 foot diameter manhole, this quantity converts to a maximum permissible drop in the water level (from the top of the manhole cone) of 0.05 inches per foot of manhole depth or 0.5 inches for a 10 foot deep manhole.

#### C. Failure to Pass the Test - Records of Tests.

If the manhole fails to pass the initial test method as described in (A) Test by the Vacuum Method and, if allowed, (B) Test by the Exfiltration Method, or if visible groundwater leakage into the manhole is observed, the Contractor shall locate the leak, if necessary by disassembly of the manhole. The Contractor shall check the gaskets and replace them if necessary. The Contractor may re-lubricate the joints and re-assemble the manhole, or the Contractor may install an acceptable exterior joint sealing product on all joints and then retest the manhole. If any manhole fails the vacuum and/or exfiltration test twice, the Contractor shall consider replacing that manhole. If the Contractor chooses to attempt to repair that manhole, the manhole must be retested until it passes. In no case shall cold applied preformed plastic gaskets be used for repair. Records of all manhole testing shall be made available to the Engineer or designated representative at the close of each working day, or as otherwise directed by the Engineer or designated representative. Any damaged or visually defective products, or any products out of acceptable tolerance shall be removed from the site.

#### D. Protective Coating Testing

- a. Spark (Holiday) Test – After the coating product(s) have cured in accordance with manufacturer recommendations, all surfaces shall be inspected for holidays per NACE RPO188-99, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates, or ASTM D4787, Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates. All detected holidays shall be marked and repaired according to the coating product(s) manufacturer's recommendations.
  - i. Test voltage shall be a minimum of 100 volts per mil of coating system thickness.
  - ii. Detection of a known or induced holiday in the coating product shall be confirmed to ensure proper operation of the test unit.
  - iii. All areas repaired shall be retested following cure of the repair material(s).
- b. Adhesion Test – Adhesion of the coating system to the substrate shall be confirmed in a minimum of 5% of the manholes coated (no fewer than 1 manhole). After the coating product(s) have cured in accordance with manufacturer recommendations, testing shall be conducted in accordance with ASTM D7234, Pull-Off Adhesion Strength of Coatings on Concrete Using

Portable Pull-Off Adhesion Testers. Owner's representative shall select the manholes and areas to be tested.

E. Inspection.

The Engineer or designated representative shall make a visual inspection of each manhole after it has passed the testing requirements and is considered to be in its final condition. The inspection shall determine the completeness of the manhole; any defects shall be corrected to the satisfaction of Engineer or designated representative.

**506.6 Measurement:**

All junction boxes and manholes of the type indicated shall be measured as units complete in place.

New manholes constructed to interim elevations to facilitate stage construction shall be measured as one unit regardless of the number of interim elevations constructed. All labor, materials and other expenses necessary for the stage construction shall be considered subsidiary to the completed unit. Abandonment of existing manholes shall be considered subsidiary to the completed unit, unless separate Pay Item is indicated on the Drawings and identified in Standard Contract Bid Form.

An "Extra Depth Manhole" will be measured by linear vertical foot of Standard Pre-cast Manhole with Pre-cast Base, Standard Pre-cast Manhole with CIP Base, Drop Manhole with Pre-cast Base, Drop Manhole with CIP Base, Special Manhole, Centered Tee Manhole, or Tangent Tee Manhole of the indicated size in excess of eight feet of depth. Manhole depth will be measured from the invert flow line to the finished surface elevation.

**506.7 Payment:**

Payment for completed junction boxes and manholes of the type indicated shall be made at the unit bid price for each. The unit bid price shall include all labor, equipment, materials, time and incidentals necessary to complete the work. When indicated in the Drawings, abandonment of existing manholes shall be made at the unit price for abandonment.

Payment for that portion of a Standard Pre-cast Manhole with Pre-cast Base, Standard Pre-cast Manhole with CIP Base, Drop Manhole with Pre-cast Base, Drop Manhole with CIP Base, Special Manhole, Centered Tee Manhole, or Tangent Tee Manhole in excess of 8 feet in depth will be made at the unit price bid for "Extra Depth Manhole" of the indicated type and size, complete in place.

<b>Pay Item:</b>	New Manhole Construction, ___ Dia.	Per Each
<b>Pay Item:</b>	Special Manhole, ___ Dia.	Per Each
<b>Pay Item:</b>	Drop Manhole, ___ Dia.	Per Each
<b>Pay Item:</b>	Centered Tee Manhole, ___ Dia. x ___ Dia.	Per Each

<b>Pay Item:</b>	Tangent Tee Manhole, ___ Dia. x ___ Dia.	Per Each
<b>Pay Item:</b>	Junction Box, ___ Ft x ___ Ft	Per Each
<b>Pay Item:</b>	Major Manhole Adjustment, ___ Dia.	Per Each
<b>Pay Item:</b>	Minor Manhole Adjustment, ___ Dia.	Per Each
<b>Pay Item:</b>	Abandonment of existing Manholes:	Per Each
<b>Pay Item:</b>	Extra Depth___Manhole, ___Dia.	Per Linear Vert. Foot

**End**

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**Item No. 509  
Trench Safety Systems****509.1 Description**

This item shall govern the following:

- A. Designing, furnishing, and installing a Trench Safety System for trench excavation;
- B. Dewatering the area as specified on the Drawings and/or required; and
- C. Maintenance and removal of the trench safety systems as determined by Contractor's Trench Safety Engineer and/or Contractor's Competent Person(s).

This Item also includes special clearing, excavation and backfilling for safety systems. At a minimum, this work shall conform to United States Department of Labor Rules 29 CFR, Part 1926 Occupational Safety and Health Administration (OSHA). The Competent Person(s) shall be on the project whenever workers are in an excavation trench.

**509.2 Trench Safety System Plan Submittal**

Prior to, or at the Pre-Construction Conference, the Contractor shall submit to the Owner a Trench Safety System Plan sealed by a registered Professional Engineer licensed in the State of Texas. Notice To Proceed with construction will not be issued by the Owner until the Contractor has submitted a Trench Safety System Plan to the Owner.

The Trench Safety System Plan at a minimum shall conform to OSHA standards for sloping of sides, utilization of trench boxes, and/or utilization of shoring, sheeting and bracing methods. The Contractor shall be responsible for obtaining the geotechnical information necessary to the design of the Trench Safety System Plan [normally acquired from borings taken at 500 foot intervals along the proposed centerline to a minimum depth of five feet below proposed flowline]. If the geotechnical information for the design of the improvements is acquired by the Owner or designated representative, it shall be provided to the Contractor for information purposes subject to the provisions of Standard Contract.

The Trench Safety System Plan submittal shall include:

- A. A Drawing or plan indicating specific designation of areas in which each type of system will be used, including the length of trench to be opened, the length of time that the trench will remain open, the means of egress, the storage of materials, allowable loads on trench walls, the methods for placing/compacting bedding/backfill within the safety of the system, any equipment restrictions and the subsequent removal of system,
- B. Drawings or manufacturer's data, as applicable, that describe the various elements of the Trench Safety System in sufficient detail that the workers can properly install the Trench Safety System,
- C. Recommendations and limitations for using systems.
- D. Sealed engineering calculations and/or equipment manufacturer's certifications, as applicable, that confirm that the system is designed to withstand the anticipated

loadings and that it can be fully installed/implemented in the designated space within the street right of way or easement provided by Owner or designated representative.

- E. A Certificate of Insurance of the Trench Safety Engineer's Professional Liability Insurance coverage meeting the requirements of the Standard Contract Documents shall be provided.
- F. Certificate of Completion of an OSHA-approved program indicating that the Contractor's Competent Person(s) has received training in "Excavation Safety".

### **509.3 Trench Safety System Plan Review**

The review of the Trench Safety System Plan that will be conducted by the Owner or designated representative shall only relate to general conformance with OSHA standards and regulations. The Owner's failure to note exception(s) to the submittal shall not relieve the Contractor of any or all responsibility or liability for the Trench Safety System Plan. The Contractor shall remain solely and completely responsible for all trench safety systems and for the associated means, methods, procedures, and materials.

### **509.4 Construction Methods**

The Contractor's Competent Person(s) shall be responsible for the maintenance of a copy of appropriate OSHA regulations onsite and the implementation of OSHA trenching safety regulations at the work site. Trenching shall be completed to the lines and grades indicated on the Drawings or as specified in various technical standard specification items requiring excavation and trenching and/or backfilling. The Contractor shall perform all trenching in a safe manner and shall maintain safety systems to prevent death or injury to personnel or damage to structures, utilities or property in or near excavation.

If evidence of possible cave-ins or earthen slides is apparent or an installed trench safety system is damaged, the work in trench shall immediately cease, personnel evacuated from hazardous area and the Owner notified. Personnel shall not be allowed to re-enter the excavation until necessary repairs or replacements are completed and are inspected and approved by the Contractor's Competent Person(s). Repair and replacement of damaged safety system shall be at the Contractor's sole expense.

### **509.5 Changed Conditions**

When changed conditions require modifications to the Trench Safety System, the Contractor shall provide to the Owner or designated representative a new design or an alternate Trench Safety System that is proposed by the Contractor's Trench Safety Engineer to address the changed conditions encountered. Copies of the new design or alternate system shall be provided to the Owner or designated representative in accordance with the requirements of section 509.2, "Trench Safety System Plan Submittal". A copy of the most current Trench Safety System shall be maintained on site and made available to inspection and enforcement officials at all times.

Any changes to the Trench Safety System Plan that are initiated by the Contractor for operational efficiency or as a result of changed conditions, that could be reasonably

anticipated, will not be cause for contract time extension or cost adjustment. When changes to the Trench Safety System Plan are necessitated by severe and uncharacteristic natural conditions or other conditions totally out of the control of the Contractor, the Contractor may make a written request to the Owner for a Change Order to address the anticipated work. The Contractor shall notify the Owner in writing within 24 hours of the occurrence of changed conditions that the Contractor anticipates the submittal of a claim for additional compensation. Under "Changed Conditions" the work deemed immediately necessary by the Contractor to protect the safety of workers and public, equipment or materials may only be accomplished until the Owner or designated representative has a reasonable opportunity to investigate the Contractor's written request for a Change Order and respond in writing to the request.

**509.6 Measurement**

Trench Safety Systems shall be measured by lineal foot (meter: 1 meter equals 3.281 feet) through manholes and other appurtenances along the centerline of trench conforming to the Contractor's Drawings and specifications.

**509.7 Payment**

Payment for Trench Safety Systems, measured as prescribed above, will be made at unit bid price per centerline lineal foot of trench per Contractor's Drawings and specifications. The unit bid price shall include full compensation for designing, furnishing, installing the system; for dewatering, maintenance, replacement and removal of the Trench Safety Systems and for sloping, special clearing, and excavation necessary to safely implement the Trench Safety System Plan.

Payment will be made under the following:

<b>Pay Item:</b>	Trench Safety Systems (all depths)	Per Lineal Foot.
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**END**

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**Item No. 510  
Pipe****510.1 Description**

This item shall consist of furnishing and installing all pipe and/or materials for constructing pipe mains, sewers, laterals, stubs and, service connections including all applicable Work such as excavating, bedding, jointing, backfilling materials, tests, concrete trench cap, concrete cap and encasement, etc., prescribed under this item in accordance with the provisions of the Edwards Aquifer Protection Ordinance, when applicable, and New Braunfels Utilities Design Criteria Manual. The pipe shall be of the sizes, types, class and dimensions indicated or as designated by the Engineer/Architect (E/A) and shall include all joints or connections to new or existing mains, pipes, sewers, manholes, etc., as may be required to complete the Work in accordance with specifications and published standard practices of the trade associations for the material specified and to the lines and grades indicated. This item shall include any pumping, bailing, drainage and Item No. 509, "Trench Safety Systems" for trench walls, when indicated or applicable. Unless otherwise provided, this item shall consist of the removal and disposition of trees, stumps and other obstructions, old structures or portions thereof such as house foundations, old sewers, masonry or concrete walls, the plugging of the ends of abandoned piped utilities cut and left in place and the restoration of existing utilities damaged in the process of excavation, cutting and restoration of pavement and base courses, the furnishing and placing of select bedding, backfilling and cement or lime stabilized backfill, the hauling and disposition of surplus materials, bridging of trenches and other provisions for maintenance of traffic or access as indicated.

**510.2 Pipe****A. General**

Fire line leads and fire hydrant leads shall be ductile iron, only. Domestic water services shall not be supplied from fire service leads, unless the domestic and fire connections are on separately valved branches with an approved backflow prevention device in the fire service branch. All wastewater force mains shall be constructed of ductile iron pipe Pressure Class 250 minimum for pipe greater than 12-inch size and Pressure Class 350 for pipe or PVC class 200 (SDR 26) for pipe 12-inch size and smaller. Wastewater pipe shall be in accordance with New Braunfels Utilities Standard Products List and shall have a corrosion resistant interior lining acceptable to the Owner.

Approved service clamps or saddles shall be used when tapping ductile iron pipe 12 inch size and smaller. All service tubing (1 inch thru 2 inches) installed in utility easements shall be 150 psi annealed seamless Type K copper tubing with no sweat or soldered joints.

For pipes 16" and larger all pipe manufacturers and suppliers shall be certified by the American National Standards Institute (ANSI) for ISO 9000 compliance. It is the intent of this certification that all appropriate tests be documented with sampling criteria, frequency of testing, date of testing and date in which every piece was manufactured. A copy of the testing data to include results shall be sent with the shipment with appropriate identification as it relates to the specific shipment.

The quality of materials, the process of manufacture and the finished pipe shall be subject to inspection and approval by the E/A at the pipe manufacturing plant and at the project site prior to and during installation. Plant inspections shall be conducted at the discretion of the City Representative and shall require only 48 hours of advance notice to the manufacturer. Only manufacturers and suppliers meeting this certification will be considered as approved providers of products as listed in the Standard Products List (SPL).

All water distribution pipe and fittings shall be listed in the Fire Protection Equipment Directory published by the Underwriter's Laboratories, Inc., or shall be Factory Mutual approved for fire service.

## B. Water

### 1. Iron Pipe

Iron pipe shall be ductile iron pipe meeting all requirements of standards as follows:

- For push-on and mechanical joint pipe: AWWA C-151
- For flanged pipe: AWWA C-115

Barrels shall have a nominal thickness required by Table 1 of AWWA C-115, which thickness corresponds to Special Class 53 in sizes through 54 inch, and Class 350 in 60 and 64-inch sizes. Flanges shall be ductile iron (gray iron is not acceptable); they shall be as shown in ANSI/AWWA C115/A21.15 and shall conform to dimensions shown in Table 2 and Figure 1 of AWWA C115. These flanges are the same in all respects as flanges shown in ANSI/AWWA C110/A21.10 for fittings and are standard for all flanges used with pipe, valve, and equipment units in the water distribution and wastewater force main systems. Flanges shall be fabricated and attached to the pipe barrels by U.S. fabricators using flanges and pipe barrels of U.S. manufacture. If fabrication is to be by other than the pipe barrel manufacturer, a complete product submittal and approval by New Braunfels Utilities will be required. Additionally, such fabricator shall furnish certification that each fabricated joint has been satisfactorily tested hydrostatically at a minimum pressure of 300 psi.

- Linings and Coating:

Interior surfaces of all iron water pipe shall be cement-mortar lined and seal coated as required by AWWA C104. Pipe exteriors shall be coated as required by the applicable pipe specification. The type and brand of interior lining shall be clearly marked on the outside of the pipe and fittings. Except as authorized by the E/A, only one type and brand of pipe lining shall be used on a given project.

Except as described above for flanged pipe (Thickness Class 53) and where not otherwise indicated, ductile iron pipe shall be minimum Class 250 as defined by ANSI/AWWA C150/A21.50-current; all ductile iron pipe and flanges shall meet the following minimum physical requirements:

Grade 60-42-10:

- Minimum tensile strength: 60,000 psi (414 mPa).
- Minimum yield strength: 42,000 psi (290 mPa).

- Minimum elongation: 10 percent.

The flanges for AWWA C115 pipe may be also be made from:

Grade 70-50-05:

- Minimum tensile strength: 70,000 psi (483 map).
- Minimum yield strength: 50,000 psi (345 mPa).
- Minimum elongation: 5 percent.

(a) Ductile Iron Fittings:

Fittings shall be push-on, flanged or mechanical joint as indicated or approved and shall meet all requirements of standards as follows:

- Sizes 4 inch through 24 inch: AWWA C-110 or AWWA C-153
- Sizes larger than 24 inch: AWWA C-110.
- Lining and Coating:

Interior surfaces of all iron water pipe fittings shall be lined with cement- mortar and seal coated as required by AWWA C104. Interior surfaces of all iron wastewater and force main fittings shall be coated with a non-corrosive lining material acceptable to Owner. Fitting exteriors shall be coated as required by the applicable pipe specification.

(b) Joint Materials

Gaskets for mechanical joints shall conform to ANSI/AWWA A21.11/C-111.

Joining of slip joint iron pipe shall, without exception, be accomplished with the natural or synthetic rubber gaskets of the manufacturer of that particular pipe being used. A joint lubricant shall be used and applicable recommendations of the manufacturer shall be followed.

Gaskets for flanged joints shall be continuous full face gaskets, of 1/8 inch minimum thickness of natural or synthetic rubber, cloth-reinforced rubber or neoprene material, preferably of deformed cross section design and shall meet all applicable requirements of ANSI/AWWA A21.11/C-111 for gaskets. They shall be manufactured by, or satisfy all recommendations of, the manufacturer of the pipe/fittings being used and be fabricated for use with Class 125 ANSI B16.1 flanges.

Tee-head bolts, nuts and washers for mechanical joints shall be high strength, low alloy, corrosion resistant steel stock equal to "COR-TEN A" having UNC Class 2 rolled threads or alloyed ductile iron conforming to ASTM A 536; either shall be fabricated in accordance with ANSI/AWWA A21.11/C-111.

Hex head bolts and nuts shall satisfy the chemical and mechanical requirements of ASTM A449 SAE Grade 5 plain, and shall be fabricated in accordance with ASTM B 18.2 with UNC Class 2 rolled threads.

Either Tee-Head or Hex-Head bolts, nuts and washers as required, shall be protected with bonded fluoro-polymer corrosion resistant coating where specifically required by the E/A.

All threaded fasteners shall be marked with a readily visible symbol cast, forged or stamped on each nut and bolt, which will identify the fastener material and grade. The producer and the supplier shall provide adequate literature to facilitate such identification; painted markings are not acceptable.

(c) Polyethylene Film Wrap

All iron pipe, fittings and accessories shall be wrapped with standard 8 mil (minimum) low density polyethylene film or 4-mil (minimum) cross laminated high-density polyethylene conforming to AWWA C-105, with all edges overlapped and taped securely with duct tape to provide a continuous wrap to prevent contact between the piping and the surrounding backfill. Repair all punctures of the polyethylene, including those caused in the placement of bedding aggregates, with duct tape to restore the continuous protective wrap before backfilling.

(d) Marking

Each pipe joint and fitting shall be marked as required by the applicable AWWA specification. This includes in all cases: Manufacturer's identification, Country where cast, year of casting, and "DUCTILE" or "DI". Barrels of flanged pipe shall show thickness class; others shall show pressure class. The flanges of pipe sections shall be stamped with the fabricators identification; fittings shall show pressure rating, the nominal diameter of openings and the number of degrees for bends. Painted markings are not acceptable.

2. Copper Tubing

All copper service tubing shall be annealed seamless Type K water tube meeting ASTM B88 and rated at 150 psi working pressure. The tubing shall be homogenous throughout and free from cracks, holes, crimping, foreign inclusions or other defects. It shall be uniform in density and other physical properties.

Nominal Tube Size, inches	Outside Diameter, inches		Wall Thickness, inches	
	Average	Tolerance	Average	Tolerance
3/4	0.875	± 0.003	0.065	± 0.0045
1	1.125	± 0.0035	0.065	± 0.0045
1 1/4	1.375	± 0.004	0.065	± 0.0045
1 1/2	1.625	± 0.0045	0.072	± 0.005
2	2.125	± 0.005	0.083	± 0.007

3. Service Connection Fittings

All fittings used in customer service connection - tapping mains, connecting meters, etc. - must be currently listed on the Standard Products List, or called for in the New Braunfels Utilities Standard Details.

4. Brass Goods

All brass valves, couplings, bends, connections, nipples and miscellaneous brass pipe fittings and accessories used in meter connections, service lines, air release piping assemblies, and wherever needed in the water distribution system, shall



conform to the detail Standards, Standard Products Lists, and AWWA C-800, except as herein modified or supplemented.

Unless otherwise noted, the goods described herein shall be fabricated of standard Red Brass (Waterworks Brass) meeting ASTM B62 or B584, alloy 83600, consisting of 85 percent copper and 5 percent each of tin, lead and zinc.

Exposed threads shall be covered with plastic caps or sheeting to protect the threads.

Brass goods of each type and class shall be compatible with other fittings in common usage for similar purposes. Where not otherwise indicated, all such materials shall meet the following requirements:

Inlet threads of corporation valves shall be AWWA iron pipe (IP) thread (male); outlets of service saddles shall be tapped with AWWA IP thread (female). AWWA IP threads shall conform to ANSI/ASME B1.20.1 as required by AWWA C800 for "General Purpose (Inch) Pipe Threads". For 3/4" and 1" sizes only, corporation valve inlet threads, and the internal threads of saddles may be the AWWA taper thread conforming to AWWA C800 Figure 1 and Table 6. External threads of corporation valve inlet must be compatible with internal threads of the service saddle.

Connections of all new tubing, and of tubing repairs wherever possible, shall be by flared fittings. Flare connections - and compression connections when permitted - shall be designed to provide a seal and to retain the tubing, without slippage, at a working water pressure of 150 psig.

Flanges shall conform to ANSI B16.1, Class 125, as to dimensions, drillings, etc. Copper tubing, when used, shall be Type K tubing having dimensions and weights given in Table A.1 of AWWA C800.

Brass pipe shall conform to the weights and dimensions for Extra Strong pipe given in Table A.2 of AWWA C800.

All fittings shall be suitable for use at hydrostatic working pressures up to 150 psig (hydrostatic testing of installed systems is at 200 psig).

## 5. Polyvinyl Chloride Water Pipe

### (a) General

All polyvinyl chloride (PVC) water pipe shall be of the rigid (unplasticized) type and must bear the National Sanitation Foundation seal of approval for potable water pipe. Each joint of pipe shall consist of single continuous extrusion; bells or other components attached by solvent welding are not acceptable. Pipe shall be pressure rated at 200 psi (DR-14) or 150 psi (DR-18) as indicated.

Pipe shall have push-on, rubber gasket joints of the bell and spigot type with thickened integral bells with rubber gasket joints. The wall thickness of each pipe bell and joint coupling must be greater than the standard pipe barrel thickness. Clearance must be provided in every gasket joint for both lateral pipe deflection and for linear expansion and contraction. Concrete thrust blocking shall be placed behind bends and tees. Concrete support cradles or blocking shall be required for support of all fire hydrants, valves and AWWA C110 fittings; such support shall be provided for AWWA C153 fittings when required by the E/A.

(b) Applicable Specifications

Except as modified or supplemented herein, PVC pipe shall meet the following standards:

AWWA C-900, DR 18 or DR 14 for PVC Pressure Pipe, in 4, 6, 8 and 12 inch nominal sizes, having Cast Iron Pipe size outside diameters.

Fittings used with PVC Pressure pipe shall be AWWA C-110 or AWWA C-153 compact ductile iron fittings.

Standard sizes, dimensions and tolerances shall be as follows:

Nominal Size (inches)	Outside Diameter, inches		DR-18		DR-14	
			Wall Thickness, inches		Wall Thickness, inches	
	Avg.	Tolerance	Min.	Tolerance	Min.	Tolerance
4	4.800	+ 0.009	0.267	+ 0.032	0.343	+ 0.041
6	6.900	+ 0.011	0.383	+ 0.046	0.493	+ 0.059
8	9.050	+ 0.015	0.503	+ 0.060	0.646	+ 0.078
12	13.200	+ 0.015	0.733	+ 0.088	0.943	+ 0.113

All pipe 4 inches and larger must be approved Underwriter's Laboratories for use in buried water supply and fire protection systems.

(c) Material Requirements

All pipe and fittings shall be made from clean, virgin, NSF approved, Class 12454B PVC. Clean reworked materials generated from the manufacturers own production may be used within the current limits of the referenced AWWA C-900.

(d) Marking

Permanent marking on each joint of pipe shall include the following at intervals of not more than 5 feet:

- Nominal pipe size and OD base (e.g., 4 CIPS).
- Type of plastic material (e.g., PVC 12454B).
- Dimension Ratio and the pressure rating in psi for water at 73° F (e.g., DR 18, 150 psi).
- AWWA designation with which the pipe complies (e.g., AWWA C-900).
- Manufacturer's name or code and the National Sanitation Foundation (NSF) mark.

(e) Tracer Wire

Tracer wire shall be installed on all non-ductile iron water mains. The wire shall be installed in such a manner as to be able to properly trace all water mains without loss or deterioration of signal or without the transmittal signal migrating off the tracer wire. Tracer wire shall be placed as per specifications in 512, "Conductive Trace Wire for Non-Metallic Pipe Installation".

6. Steel Pipe

- (a) Standard Weight  
ASTM A 53, Schedule 40.
  - (b) Extra Heavy Weight  
Seamless ASTM A 53, Schedule 80.
  - (c) Encasement Pipe  
Welded or Seamless pipe piles ASTM A-252, Grade 2. Pipe used as casing for insertion of ductile iron carrier pipe, shall be new, smooth bore, steel pipe, with bituminous coating both inside and outside and a minimum of ¼ inch thickness. Joints shall be welded to form a true alignment of each pipe length. Encasement pipe ends shall be sealed with boot or sealed wrap on each end.
  - (d) Fittings  
Nipples and fittings extra strong Federal Specification WW-N 351 or WW-P 521.
  - (e) Coatings  
Black or galvanized as indicated.
7. Welded Steel Pipe and Fittings for Water-Pipe
- (a) General Reference Standards Specification.  
Specifications of the American Water Works Association (AWWA) listed below shall apply to this Section.
    - C – 200 Steel Water Pipe 6 inches and larger.
    - C – 205 Cement-Mortar Protective Lining and Coating for Steel Water Pipe, 4 inches and larger, Shop Applied.
    - C – 206 Field Welding of Steel Water Pipe.
    - C – 207 Steel Pipe Flanges for Waterworks Services, Sizes 4 inches through 144 inches.
    - C – 208 Dimensions for Steel Water Pipe Fittings.
    - C – 602 Cement-Mortar Lining of Water Pipelines, 4 inches and larger in Place.
  - (b) Submittals  
Furnish Shop Drawings, product data, design calculations and test reports as described below:
    - (i) Certified copies of mill tests confirming the type of materials used in steel plates, mill pipe flanges and bolts and nuts to show compliance with the requirements of the applicable standards.
    - (ii) Complete and dimensional working drawings of all pipe layouts. Shop Drawings shall include the grade of material, size, wall thickness of the pipe and fittings, type and location of fittings and the type and limits of the lining and coating systems of the pipe and fittings.
    - (iii) Product data to show compliance of all couplings, supports, fittings, coatings and related items.
  - (c) Job Conditions

- (i) The internal design pressure of all steel pipe and fittings shall be as indicated.
- (ii) The interior of all steel pipe for potable water, 4 inches and larger, shall be cement-mortar lined.
- (d) Manufacturing
  - (i) Description

Pipe shall comply with AWWA C-200.

    - 1) Circumferential deflection of all pipe in-place shall not exceed 2.0 percent of pipe diameter.
    - 2) Diameter

Nominal pipe diameter shall be the inside diameter of lining or pipe barrel, unless otherwise designated in Job Conditions.
  - (ii) Wall Thickness

Steel pipe wall thickness shall be designed for the internal and external loads specified in this section. The cylinder thickness needed to resist internal pressure shall be based on an allowable stress in the steel equal to 1/2 the minimum yield stress of the material used.
- (e) Fittings
  - (i) Welded

Fabricated steel fittings shall be of the same material as pipe and shall comply with AWWA C-208.
- (f) Flanges
  - (i) Flanges shall comply with the requirements of AWWA C-207, Class D or Class E. The class shall be based on operating conditions and mating flanges of valves and equipment.
  - (ii) Gaskets shall be cloth-inserted rubber, 1/8 inch thick.
  - (iii) Flanges shall be flat faced with a serrated finish.
- (g) Pipe Joints
  - (i) Lap Joints for Field Welding
    - 1) Lap joints for field welding shall conform to AWWA C-206. This item applies only to pipes 72 inches in diameter and larger.
    - 2) The bell ends shall be formed by pressing on a hydraulic expander or a plug die. After forming, the minimum radius of curvature of the bell end at any point shall not be less than 15 times the thickness of the steel shell. Bell ends shall be formed in a manner to avoid impairment of the physical properties of the steel shell. Joints shall permit a lap at least 1 1/2 inches when assembled. The longitudinal or spiral weld on the inside of the bell end and the outside of the spigot end on each section of pipe shall be ground flush with the plate surface. The inside edge of the bell and the outside edge of the spigot shall be scarfed or lightly ground to remove the sharp edges or burrs.
  - (ii) Bell and Spigot Joints with O-Ring Gasket
    - 1) Bell and spigot joints with rubber gasket shall conform to AWWA C-200.

- 2) The bell and spigot ends shall be so designed that when the joint is assembled, it will be self-centered and the gasket will be confined to an annular space in such manner that movement of the pipe or hydrostatic pressure cannot displace it. Compression of the gasket when the joint is completed shall not be dependent upon water pressure in the pipe and shall be adequate to ensure a watertight seal when subjected to the specified conditions of service. Bell and spigot ends shall be welded on preformed shapes. The bell and spigot ends shall conform to the reviewed Shop Drawings.
- (h) Interior and Exterior Protective Surface Coatings
    - (i) Exterior Surface to be mortar coated shall conform to AWWA C-205 for shop application and AWWA C-602 for field application. Pipe materials shall be the product of an organization, which has had not less than 5 years successful experience manufacturing pipe materials, and the design and manufacture of the pipe, including all materials, shall be the product of one company.
    - (ii) All surfaces except as noted in (iii) and (iv) below shall receive shop application of mortar lining and coating.
    - (iii) Field Welded Joints. After installation, clean, line and coat unlined or uncoated ends adjacent to welded field joints, including the weld proper, as specified for pipe adjacent to the weld.
    - (iv) Machined Surfaces. Shop coat machined surfaces with a rust preventative compound. After jointing surfaces, remaining exposed surfaces shall be coated per (i) and (ii) above.

### C. Wastewater

#### 1. Polyvinyl Chloride (PVC) Pipe (Nonpressure) and Fittings

##### (a) General

Where PVC sewer or wastewater pipe is indicated, it shall conform to ASTM D 3034. Cell Class shall be as required by applicable ASTM pipe specification; pipe stiffness shall be 115 psi minimum for pipe to 15" size, or 72 psi minimum for larger pipe.

##### (b) Joint Material

PVC pipe and fitting shall have elastomeric gasket joints conforming to ASTM D 3212; gaskets to ASTM F 477.

##### (c) Pipe Markings

Permanent marking on the pipe shall include the following at intervals of not more than 5 feet:

- Manufacturer's name and/or trademark
- Nominal pipe size
- PVC cell classification per ASTM D 1784

ASTM designation and legend:

- For pipe 6 inch to 15-inch size: ASTM D 3034, type PSM, SDR-26 PVC Sewer Pipe.

- For pipe 18 inches and larger: ASTM F 679. T-1 wall PVC sewer pipe.

(d) Fitting Markings

Fittings shall be clearly marked as follows:

- Manufacturer's name or trademark,
- Nominal size,
- The material designation "PVC",
- PSM, and
- The designation, "Specification D3034".

(e) Tracer Wire and Tape

Tracer wire shall be installed on all non-ductile iron force mains. The wire shall be installed in such a manner as to be able to properly trace all force mains without loss or deterioration of signal or without the transmittal signal migrating off the tracer wire. Tracer wire shall be placed as per specifications in 512, "Conductive Trace Wire for Non-Metallic Pipe Installation".

Tracer tape shall be installed on all force mains in accordance to TCEQ §217.66 rules. The tape should be a minimum of 12 inches below subgrade, or a minimum of 18 inches below finished grade on areas outside the limits of pavement. The tape shall be encased in a protective, inert, plastic jacket and color-coded in accordance with APWA Uniform Color Code.

### 510.3 Construction Methods

#### A. General

Prior to commencing this Work, all erosion control and tree protection measures required shall be in place and all utilities located and protected as set forth in "General Conditions". Clearing the site shall conform to Item No. 102, "Clearing and Grubbing". Maintenance of environmental quality protection shall comply with all requirements of "General Conditions" and Item No. 601, "Salvaging and Placing Topsoil".

The Contractor shall conduct his Work such that a reasonable minimum of disturbance to existing utilities will result. Particular care shall be exercised to avoid the cutting or breakage of all existing utilities. If at any time the Contractor damages the utilities in place through his operations, the Contractor shall immediately notify the owner of the utility to make the necessary repairs. When active wastewater sewer lines are cut in the trenching operations, temporary flumes shall be provided across the trench while open and the lines shall be restored when the backfilling has progressed to the original bedding lines of the sewer so cut.

The Contractor shall inform utility owners sufficiently in advance of the Contractor's operations to enable such utility owners to reroute, provide temporary detours or to make other adjustments to utility lines in order that the Contractor may proceed with his Work with a minimum of delay and expense. The Contractor shall cooperate with all utility owners concerned in effecting any utility adjustments necessary and shall

not hold New Braunfels Utilities liable for any expense due to delay or additional Work because of conflicts arising from existing utilities.

The Contractor shall do all trenching in accordance with the provisions and the directions of the E/A as to the amount of trench left unfilled at any time. All excavation and backfilling shall be accomplished as indicated and in compliance with State Statutes.

Where excavation for a pipe line is required in an existing City street, a street cut permit is required and control of traffic shall be as indicated in accordance with the Texas Manual on Uniform Traffic Control Devices.

Wherever existing utility branch connections, sewers, drains, conduits, ducts, pipes or structures present obstructions to the grade and alignment of the pipe, they shall be permanently supported, removed, relocated or reconstructed by the Contractor through cooperation with the owner of the utility, structure or obstruction involved. In those instances where their relocation or reconstruction is impractical, a deviation from line and grade will be ordered by the E/A and the change shall be made in the manner directed.

Adequate temporary support, protection and maintenance of all underground and surface utility structures, drains, sewers and other obstructions encountered in the progress of the Work shall be furnished by the Contractor, at his expense and as approved by the E/A.

Where traffic must cross open trenches, the Contractor shall provide suitable bridges. For trenches less than 2 feet in width, sheet steel plates having a minimum thickness of 1/2 inch shall be used. For trenches up to 4 feet in width, sheet steel plates having a minimum thickness of 3/4 inches shall be used. In all cases, the plates shall overlay the top of the trench a minimum of 18 inches on both sides and secured by asphalt. Adequate provisions shall be made for the flow of sewers; drains and watercourses encountered during construction and any structures, which may have been disturbed, shall be satisfactorily restored upon completion of Work.

When rainfall or runoff is occurring or is forecast by the U.S. Weather Service, the Contractor shall not perform or attempt any excavation or other earth moving Work in or near the flood plain of any stream or watercourse or on slopes subject to erosion or runoff, unless given specific approval by the E/A. When such conditions delay the Work, an extension of time for working day contracts will be allowed in accordance with "General Conditions".

#### B. Water Line/New Wastewater Line Separation

Installation of new water or wastewater lines shall conform to the following:

Where feasible, water and wastewater lines shall be no closer to each other than 9 feet between outside diameters in all directions and shall be in separate trenches.

If the 9 foot separation cannot be achieved, any portion of a new gravity wastewater line within 9 feet in any direction (between OD's) of a potable water line, shall be in a separate trench and constructed of ductile iron, AWWA C-900 (DR-18) 150 psi rated PVC in sizes up to 12 inch, or AWWA C-905 (DR-25) 165 psi rated PVC in sizes larger than 12 inches.

If the lines are parallel, they shall not be closer than 4 feet horizontally or 2 feet vertically between OD's with the wastewater lower than the water line. If the lines cross, they may be no closer than 6 inches vertically between OD's with the sewer

below the water line and one standard 20 foot length of ductile iron, AWWA C-900 (DR-18) 150 psi rated PVC in sizes to 12 inch, or AWWA C-905 (DR-25) 165 psi rated PVC in sizes larger than 12 inches shall be centered at the point of crossing the water line.

Unless wastewater manholes and the connection to the sewer can be made completely watertight and tested for no leakage, they must be installed so as to provide a minimum of 9 feet of horizontal clearance from an existing or proposed water line.

#### C. Utility and Storm Sewer Crossings

When the Contractor installs a pipe that crosses under a utility structure or storm sewer and the top of the pipe is within 18 inches of the bottom of the utility structure, the pipe shall be encased as specified in Item No. 505, "Concrete Encasement and Encasement Pipe", for a distance of at least 1 foot on either side of the ditch line of the utility structure or the storm sewer. Unless otherwise specified by the E/A, concrete encasement will not be required for ductile iron, AWWA C-900 (DR-18) 150 psi rated PVC in sizes to 12 inch, or AWWA C-905 (DR-25) 165 psi rated PVC in sizes larger than 12 inches. When the Contractor installs a pipe that crosses over a utility structure or storm sewer and the top of the utility structure or storm sewer is within 18 inches of the bottom of the pipe, the pipe shall be either ductile iron, AWWA C-900 (DR-18) 150 psi rated PVC in sizes to 12 inch, or AWWA C-905 (DR-25) 165 psi rated PVC in sizes larger than 12 inches, unless otherwise specified by the E/A.

Where trenches wider than 12 inches cross under existing wastewater lines, the sewer lines shall be replaced with one 20 foot joint of ductile iron, AWWA C-900 (DR-18) 150 psi rated PVC in sizes to 12 inch, or AWWA C-905 (DR-25) 165 psi rated PVC in sizes larger than 12 inches, centered over the trench.

#### D. Trench Excavation

Underground piped utilities shall be constructed in an open cut in accordance with Federal regulations, applicable State Statutes conforming to Item No. 509, "Trench Safety Systems" and with a trench width and depth described below. When pipe is to be constructed in fill above the natural ground, Contractor shall construct embankment to an elevation not less than one foot above the top of the pipe, after which trench is excavated. Required vertical sides shall be sheeted and braced as indicated to maintain the sides of the required vertical excavation throughout the construction period. Adequacy of the design of sheeting and bracing shall be the responsibility of the Contractor's design professional. The Contractor shall be responsible for installation as indicated. After the pipe has been laid and the backfill placed and compacted to 12 inches above the top of the pipe, any sheeting, shoring and bracing required may be removed with special care to insure that the pipe is not disturbed. As each piece of sheeting is removed, the space left by its removal must be thoroughly filled and compacted with suitable material and provisions made to prevent the sides of the trench from caving until the backfill has been completed. Any sheeting left in place will not be paid for and shall be considered subsidiary to the pipe item bid.

#### E. Trench Width



Trenches for water and wastewater lines shall have a clear width on each side beyond the outside surfaces of the pipe bell or coupling of not less than 6 inches nor more than 12 inches.

If the trench width within the pipe zone exceeds this maximum, the entire pipe zone shall be refilled with approved backfill material, thoroughly compacted to a minimum of 95 percent of maximum density as determined by TxDOT Test Method Tex-114-E and then re-excavated to the proper grade and dimensions. Excavation along curves and bends shall be so oriented that the trench and pipe are approximately centered on the centerline of the curve, using short lengths of pipe and/or bend fittings if necessary.

For all utilities to be constructed in fill above natural ground, the embankment shall first be constructed to an elevation not less than 1 foot above the top of the utility after which excavation for the utility shall be made.

#### F. Trench Depth and Depth of Cover

All pipe and in-line appurtenances shall be laid to the grades indicated. The depth of cover shall be measured from the established finish grade, natural ground surface, subgrade for staged construction, street or other permanent surface to the top or uppermost projection of the pipe.

1. Where not otherwise indicated, all water piping shall be laid to the following minimum depths:
  - (a) Water piping installed in undisturbed ground in easements of undeveloped areas, which are not within existing or planned streets, roads or other traffic areas shall be laid with at least 42 inches of cover.
  - (b) Water piping installed in existing streets, roads or other traffic areas shall be laid with at least 42 inches of cover below finish grade.
  - (c) Unless approved by the E/A, installation of water piping in proposed new streets will not be accepted by NBU, unless approved otherwise, with all parkways and sidewalk areas graded according to any applicable provisions of the drainage plans or sloped upward from the curb line to the right of way line at a minimum slope of 1/4 inch per foot.
2. Where not otherwise indicated, all wastewater piping shall be laid to the following minimum depths:
  - (a) Wastewater piping installed in natural ground in easements or other undeveloped areas, which are not within existing or planned streets, roads or other traffic areas shall be laid with at least 36 inches of cover for wastewater service.
  - (b) Wastewater piping installed in existing streets, roads or other traffic areas shall be laid with at least 60 inches of cover.
  - (c) Wastewater piping installed in such proposed streets shall be laid with at least 42 inches of cover below the actual subgrade.

#### G. Classification of Excavation

Excavation will not be considered or paid for as a separate item of Work, so excavated material will not be classified as to type or measured as to quantity. Full payment for all excavation required for the construction shall be included in the various unit or lump sum Contract prices for the various items of Work installed, complete in place. No extra compensation, special treatment or other consideration

will be allowed due to rock, pavement, caving, sheeting and bracing, falling or rising water, working under and in the proximity of trees or any other handicaps to excavation.

#### H. Dewatering Excavation

Underground piped utilities shall not be constructed or the pipe laid in the presence of water. All water shall be removed from the excavation prior to the pipe placing operation to insure a dry firm granular bed on which to place the underground piped utilities and shall be maintained in such unwatered condition until all concrete and mortar is set. Removal of water may be accomplished by bailing, pumping or by a well-point installation as conditions warrant.

In the event that the excavation cannot be dewatered to the point where the pipe bedding is free of mud, a seal shall be used in the bottom of the excavation. Such seal shall consist of Class B concrete, conforming to Item No. 403, "Concrete for Structures", with a minimum depth of 3 inches.

#### I. Trench Conditions

Before attempting to lay pipe, all water, slush, debris, loose material, etc., encountered in the trench must be pumped or bailed out and the trench must be kept clean and dry while the pipe is laid and backfilled. Where needed, sump pits shall be dug adjoining the trench and pumped as necessary to keep the excavation dewatered.

Backfilling shall closely follow pipe laying so that no pipe is left exposed and unattended after initial assembly. All open ends, outlets or other openings in the pipe shall be protected from damage and shall be properly plugged and blocked watertight to prevent the entrance of trench water, dirt, etc. The interior of the pipeline shall at all times be kept clean, dry and unobstructed.

Where the soil encountered at established footing grade is a quicksand, saturated or unstable material, the following procedure shall be used unless other methods are indicated:

All unstable soils shall be removed to a depth of a minimum 2 feet below bottom of piped utility or as required to stabilize the trench foundation. Such excavation shall be carried out for the entire trench width.

All unstable soil so removed shall be replaced with a concrete seal, foundation rock or coarse aggregate materials placed across the entire trench width in uniform layers not to exceed 6 inches, loose measure and compacted by mechanical tamping or other means which shall provide a stable foundation for the utility.

Forms, sheathing and bracing, pumping, additional excavation and backfill required in unstable trench conditions shall be subsidiary to pipe bid.

#### J. Blasting

All blasting shall conform to the provisions of the "General Conditions" and/or "Public Safety and Convenience".

#### K. Removing Old Structures

When out of service masonry structures or foundations are encountered in the excavation, such obstructions shall be removed for the full width of the trench and to a depth of 1 foot below the bottom of the trench. When abandoned inlets or

manholes are encountered and no plan provision is made for adjustment or connection to the new sewers, such manholes and inlets within the construction limits shall be removed completely to a depth 1 foot below the bottom of the trench. In each instance, the bottom of the trench shall be restored to grade by backfilling and compacting by the methods provided above. Where the trench cuts through storm or wastewater sewers which are known to be abandoned, these sewers shall be cut flush with the sides of the trench and blocked with a concrete plug in a manner satisfactory to the E/A. When old structures are encountered, which are not visible from the existing surface and are still in service, they shall be protected and adjusted as required to the finished grade.

#### L. Lines and Grades

Grades, lines and levels shall conform to the General Conditions and/or "Grades, Lines and Levels". Any damage to the above by the Contractor shall be re-established at the Contractor's expense. The Contractor shall furnish copies of all field notes and "cut sheets" to New Braunfels Utilities.

The location of the lines and grades indicated may be changed only by direction of the E/A and it is understood that the Contractor will be paid on the basis of his unit Contract prices bid for such Work actually performed and shall make no claim for damages or loss of anticipated profits due to the change of location or grade.

The Contractor shall furnish, at his expense, all necessary batter boards or electronic devices for controlling the Work. Batter boards shall be of adequate size material and shall be supported substantially. The boards and all location stakes must be protected from possible damage or change of location. The Contractor shall furnish good, sound twilled lines for use in achieving lines and grades and the necessary plummets and graduated poles.

The Contractor shall submit to the E/A at least 6 copies of any layout Drawings from the pipe manufacturer for review and approval. The Contractor shall submit the layout Drawings at least 30 days in advance of any actual construction of the project. The E/A will forward all comments of the review to the Contractor for revision. Revisions shall be made and forwarded to the E/A for his acceptance. Prior to commencement of the Project, reviewed layout Drawings will be sent to the Contractor marked for construction.

Should the Contractor's procedures not produce a finished pipe placed to grade and alignment, the pipe shall be removed and relayed and the Contractors procedures modified to the satisfaction of the E/A. No additional compensation shall be paid for the removal and relaying of pipe required above.

#### M. Surplus Excavated Materials

Excess material or material which cannot be made suitable for use in embankments will be declared surplus by the E/A and shall become the property of the Contractor to dispose of off site at a permitted fill site, without liability to the City or any individual. Such surplus material shall be removed from the Work site promptly following the completion of the portion of the utility involved.

#### N. Pipe Bedding Envelope

Pipe shall be installed in a continuous bedding envelope of the type shown on the drawings or as described herein. The envelope shall extend the full trench width, to

a depth of 6 inches below the pipe and to 12 inches above water and wastewater pipe.

1. Standard Bedding Materials

USE / PIPE MATERIAL	Cement Stabilized Backfill	Natural or Mfd Sand	Pea Gravel	PIPE BEDDING STONE	
				Uncrushed Gravel	Stone Screenings
<b>WATER</b>					
Welded Steel	X				
Service Tubing 3/4" to 2-1/2"		X	X		X
<b>WATER and WASTEWATER</b>					
Up to 15 Inch ID		X	X	X	X
Larger Than 15 Inch ID			X	X	

2. General requirements and limitations governing bedding selection.

- (a) Crushed gravel or crushed stone shall not be used.
- (b) Uncrushed gravel may be used with polyethylene film wrap in trenches up to 6 feet deep and in deeper trenches where ample trench width, a tremmie, or conditions will allow controlled placement of the gravel without damaging the polyethylene wrap.
- (c) Pea Gravel or bedding stone shall be used in blasted trenches.

3. Requirements to prevent particle migration.

Bedding material shall be compatible with the materials in the trench bottom, walls and backfill so that particle migration from, into or through the bedding is minimized. The E/A may require one or more of the following measures to minimize particle migration: use of impervious cut-off collars; selected bedding materials, such as pea gravel or bedding stone mixed with sand; filter fabric envelopment of the bedding; cement stabilized backfill; or other approved materials or methods. Measures to minimize particle migration will be shown on the Drawings or designated by the E/A, and, unless provisions for payment are provided in the contract documents, the cost of these measures shall be agreed by change order. The following limitations shall apply.

- (a) Sand, alone, shall not be used in watercourses, in trenches where groundwater is present, or in trenches with grades greater than 5 percent.
- (b) Pea gravel or bedding stone, alone, shall not be used in the street right-of-way within 5 feet of subgrade elevation in trenches that are 3 feet or wider.
- (c) Each gravel or bedding stone, alone, shall not be used where the trench bottom, sides, or backfill is composed of non-cementitious, silty or sandy soils having plasticity indices less than 20, as determined by the E/A.

O. Laying Pipe

No pipe shall be installed in the trench until excavation has been completed, the bottom of the trench graded and the trench completed as indicated.

All recommendations of the manufacturer shall be carefully observed during handling and installation of each material. Unless otherwise indicated, all materials shall be delivered to the project by the manufacturer or agent and unloaded as directed by the Contractor. Each piece shall be placed facing the proper direction near to where it will be installed.

The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times and stored in a manner that will protect them from damage. Stockpiled materials shall be stacked so as to minimize entrance of foreign matter.

The interior of all pipeline components shall be clean, dry and unobstructed when installed.

Piping materials shall not be skidded or rolled against other pipe, etc. and under no circumstances shall pipe, fittings or other accessories be dropped or jolted.

During handling and placement, materials shall be carefully observed and inspected and any damaged, defective or unsound materials shall be marked, rejected and removed from the job site. Minor damage shall be marked and repaired in a manner satisfactory to the E/A. Joints, which have been placed, but not joined, backfilled, etc., shall be protected in a manner satisfactory to the E/A.

#### P. Assembling of Pipe

Angular spacing of all joints shall meet the manufacturer's recommendations for the pipe and accessories being used. Side outlets shall be rotated so that the operating stems of valves shall be vertical when the valves are installed. Pressure pipe shall be laid with bell ends facing the direction of pipe installation. Pipe end bells shall be placed upgrade for all wastewater lines.

Orientation marks, when applicable, shall be in their proper position before pipe is seated.

Before joining any pipe, all foreign matter, lumps, blisters, excess coal tar coating, oil or grease shall be removed from the ends of each pipe and the pipe ends shall then be wire brushed and wiped clean and dry. Pipe ends shall be kept clean until joints are made.

Every precaution shall be taken to prevent foreign material from entering the pipe during installation. No debris, tools, clothing or other materials shall be placed in the pipe.

#### Q. Joints

##### 1. O-Ring and Push-on Joints

Just before making a joint the ends of the pipe shall be clean, dry, free of any foreign matter, lump blisters, excessive coal tar coating and grease or oil and shall be wire brushed. The gasket and the inside surface of the bell shall be lubricated with a light film of soft vegetable soap compound (Flax Soap) to facilitate telescoping the joints. The rubber gasket if not factory installed shall be stretched uniformly as it is placed in the spigot groove to insure a uniform volume of rubber around the circumference of the groove. The spigot shall be centered in the bell, the pipe pushed home uniformly and brought into true alignment. Bedding material shall be placed and tamped against pipe to secure

the joint. Care should be taken to prevent dirt or foreign matter from entering the joint space.

2. Bolted Joints

All flanged, mechanical or other bolted joints shall be joined with nuts and bolts and be coated as indicated above in Iron Pipe.

R. Placing Pipe in Tunnels

Piping installed as a carrier pipe in a tunnel, encasement pipe, etc., shall have uniform alignment, grade, bearing and conform to the reviewed Shop Drawings. All necessary casing spacers, bedding material, grout cradle or paving, bracing, blocking, etc., as stipulated by the Contract or as may be required to provide and maintain the required pipe alignment and grade, shall be provided by the Contractor at no cost except as provided by the Bid Items. This shall include casing spacers acceptable to the Owner attached to the carrier pipe in accordance with the manufacturer's recommendations. The insertion pushing forces shall not exceed the pipe manufacturer's recommendation. Such carrier piping shall have flexible bolted or gasketed push-on joints installed as follows:

1. 21 Inch Pipe and Smaller

Prior to placing the pipe in the tunnel, the inside joint recess at the bell shall be buttered with cement mortar.

After the joint is engaged, the excess mortar shall be smoothed by pulling a tight fitting swab through the joint. Cement mortar protection shall then be placed in the normal manner to the exterior of the joint and allowed to harden sufficiently to avoid dislodgment during installation. If time is of the essence, a quick setting compound may be used.

2. 24 Inch Pipe and Larger

Each length of pipe shall be pushed into the tunnel as single units. A flexible mastic sealer shall be applied to the exterior of the joint prior to joint engagement. The surfaces receiving the mastic sealer shall be cleaned and primed in accordance with the manufacturer's recommendation. Sufficient quantities of the mastic sealer shall be applied to assure complete protection of all steel in the joint area. The interior of the joint shall be filled with cement mortar in the normal manner after the pipe is in its final position within the tunnel.

S. Temporary Pipe Plugs, Caps, Bulkheads and Trench Caps

Temporary plugs, caps or plywood bulkheads shall be installed to close all openings of the pipe and fittings when pipeline construction is not in progress.

All temporary end plugs or caps shall be secured to the pipe as provided under Item No. 507, "Bulkheads".

Trench caps shall be reinforced Class D concrete as indicated.

T. Corrosion Control

1. Protective Covering

Unless otherwise indicated, all flanges, nuts, bolts, threaded outlets and all other iron or steel components buried and in contact with earth or backfill shall be

wrapped with 8-mil (minimum) polyethylene film meeting ANSI/AWWA C-105 to provide a continuous wrap.

#### U. Pipe Anchorage, Support and Protection

Pressure pipeline tees, plugs, caps and bends exceeding 22-1/2 degrees; other bends as directed shall be securely anchored by suitable concrete thrust blocking or by approved metal harness. Unless otherwise indicated, on 24 inch or larger piping, all bends greater than 11 1/4 degrees shall be anchored as described herein.

##### 1. Concrete Thrust Blocking

Concrete for use as reaction or thrust blocking shall be Class B conforming to Item No. 403, "Concrete for Structures".

Concrete blocking shall be placed between solid ground and the fitting to be anchored. The area of bearing on the pipe and on the ground shall be as indicated or directed by the E/A. The blocking shall, unless otherwise indicated, be so placed that the pipe, fittings and joints will be accessible for repair.

The trench shall be excavated at least 6 inches outside the outermost projections of the pipe or appurtenance and the trench walls shaped or undercut according to the detail Drawings or as required to provide adequate space and bearing area for the concrete.

The pipe and fittings shall be adequately weighted and laterally braced to prevent floating, shifting or straining of the pipeline while the concrete is being placed and taking initial set. The Contractor shall be solely responsible for the sufficiency of such restraints.

##### 2. Metal Thrust Restraint

Fabricated thrust restraint systems such as those described below may be approved for use instead of concrete blocking. To obtain approval, the project Drawings must include sufficient drawings, notes, schedules, etc., to assure that the proposed restraints as installed will be adequate to prevent undesirable movement of the piping components. Such restraint systems may only be used where and as specifically detailed and scheduled on approved Project Drawings.

###### (a) Thrust Harness

A metal thrust harness of tie rods, pipe clamps or lugs, turnbuckles, etc., may be approved. All carbon steel components of such systems, including nuts and washers, shall be hot-dip galvanized; all other members shall be cast ductile iron. After installation, the entire assembly shall be wrapped with 8-mil polyethylene film, overlapped and taped in place with duct tape to form a continuous protective wrap.

###### (b) Restrained Joints

Piping or fitting systems utilizing integral mechanically restrained joints may be approved. All components of such systems shall be standard manufactured products fabricated from cast ductile iron, hot-dip galvanized steel, brass or other corrosion resistant materials and the entire assembly shall be protected with a continuous film wrap as described for (a) above.

Location, configuration and description of such products shall be specifically detailed on the Drawings. (Add-on attachments such as retainer glands, all-thread rods, etc., are not acceptable.)

3. Concrete Encasement, Cradles, Caps and Seals

When trench foundation is excessively wet or unstable or installation of water or wastewater pipe will result in less than 36 inches of cover, Contractor shall notify E/A. E/A may require Contractor to install a concrete seal, cradle, cap, encasement or other appropriate action.

All concrete cap, etc., shall be continuous and begin and end within 6 inches of pipe joints. Concrete cap, cradle and encasement shall conform to Standard No. 421, "Concrete Trench Cap". The pipe shall be well secured to prevent shifting or flotation while the concrete is being placed.

4. Anchorage Bulkheads

Concrete bulkheads keyed into the undisturbed earth shall be placed as indicated to support and anchor the pipe and/or backfill against end thrust, slippage on slopes, etc. Concrete material and placement shall be Class A, Item No. 403, "Concrete for Structures".

5. Trench Caps, Concrete Rip-Rap and Shaped Retards

Where called for by the Contract or as directed by the E/A, concrete trench caps, concrete rip-rap and/or shaped retards shall be placed as detailed by the Drawings as protection against erosion. Concrete material and placement shall be Class B, Item No. 403, "Concrete for Structures".

- V. Wastewater Connections

1. Connections to Mains 12 Inches and Smaller

All branch connections of new main lines shall be made by use of manholes.

Service stubs shall be installed as indicated. Minimum grade shall be 1 percent downward to main and minimum cover shall be 4 1/2 feet at the curb. Standard plugs shall be installed in the dead end before backfilling.

Where a service connection to a main 12 inches or smaller is indicated, a wye, tee or double wye shall be installed.

Where a service connection to a main 15 inches or larger is indicated, a field tap may be made with the pipes installed crown to crown. The tap should be made conforming to the pipe manufacturer's recommendations with the E/A's approval.

Where not otherwise indicated, (wastewater) service connections shall be installed so that the outlet is at an angle of not more than 45 degrees above horizontal at the main line.

2. Connections to the Existing System

Unless otherwise specified by the E/A, all connections made to existing mains shall be made at manholes with the crown of the inlet pipe installed at the same elevation as the crown of the existing pipe. Service stubs installed on the existing system shall be installed by use of tapping saddles unless otherwise approved by the E/A. Extreme care shall be exercised to prevent material from depositing in the existing pipe as the taps are being made.

When connections to existing mains are made, a temporary plug approved by the E/A must be installed downstream in the manhole to prevent water and debris from entering the existing system before Final Completion. These plugs



shall be removed after the castings are adjusted to finish grade or prior to Final Completion.

#### W. Water System Connections

The Contractor shall, at his expense, make all necessary connections of new piping or accessories to the existing water system. To minimize any inconvenience from outages, the Contractor shall schedule all such connections in advance and such schedule must be approved by the E/A before beginning any Work.

##### 1. Line Stoppers

NBU will require contractors to use line stoppers to take an outage during construction if system valves are not available or existing valves do not function. Line stoppers will be required based on the following criteria.

- (a) If the number of residential customers affected is greater than 20 and expected to last more than 4 hours.
- (b) If any commercial customers are affected by the outage then the use of line stoppers will be determined on a case by case basis.
- (c) If any critical care customers are affected by the outage then the use of line stoppers will be determined on a case by case basis.
- (d) System conditions may require a line stopper and may not be known until construction commences.

##### 2. Shutoffs

New Braunfels Utilities will make all shutoffs on existing water mains. The Contractor shall be required to notify the E/A's field representative on the job at least 72 hours prior to the desired time for any shutoff. The E/A's field representative will notify any affected utility customers at least 24 hours prior to the shutoff. The Utility will make the shutoff after ensuring that all appropriate measures have been taken to protect the water system, customers and employees.

New Braunfels Utilities will operate all valves to fill existing mains. Where a newly constructed main has not been placed in service and has only one connection to the public water supply, the Contractor may operate one valve to fill the main after approval has been obtained from the Utility. The operation of the valve is to be conducted under the immediate supervision of the E/A's field representative.

Water for the Work shall be metered and furnished by the Contractor in accordance with of the Standard Contract Documents.

##### 3. Wet Connections to Existing Water System

The Contractor shall make all wet connections called for by the Contract or required to complete the Work. Two connections to an existing line performed during the same shutout, at the same time and at a distance less than 50 linear feet apart, will be considered one wet connection. Two connections to an existing line performed during the same shutout, at the same time and at a distance equal to, or greater than 50 linear feet will be considered two wet connections. A wet connection shall include draining and cutting into existing piping and connecting a new pipeline or other extension into the existing pressure piping, forming an addition to the water transmission and distribution network.

The Contract price for wet connections shall be full payment for all necessary shutoffs, excavation, removing plugs and fittings, pumping water to drain the lines, cutting in new fittings, blocking and anchoring piping, bedding and backfilling, placing the lines and service and all site cleanup.

No water containing detectable amounts of chlorine may be drained, released or discharged until specific planning and appropriate preparations to handle, dilute and dispose of such chlorinated water are approved in advance by the Utility and the disposal operations will be witnessed by an authorized representative from the Utility.

#### 4. Pressure Taps to Existing Water System

*(Note: Only Contractors / Subcontractors on an NBU approved list may make such taps)*

The Contractor shall make all pressure taps called for by the Contract Documents or required to complete the Work. A pressure tap shall consist of connecting new piping to the existing water system by drilling into the existing pipe while it is carrying water under normal pressure without taking the existing piping out of service.

Unless otherwise provided by the Contract, the Contractor shall, at his expense, perform all necessary excavation, furnish and install the tapping sleeve, valve and accessories, provide the tapping machine, drill the tap and shall block, anchor and backfill the piping, valve and all accessories, place the new piping in service and perform all site cleanup. When NBU makes the tap, NBU crews will tap the main and install the service to the property line. In this case, the Contractor will need to pay for the tap in advance at NBU's Service Center located at 355 FM 306.

If a private Contractor makes the tap, a Utility Inspector must be present. "Size on size" taps will not be permitted, unless made by use of an approved full circle gasket tapping sleeve. Concrete blocking shall be placed behind and under all tap sleeves 24 hours prior to making the wet tap.

#### 5. Service Connections

Service connection taps into PVC or AC pipe or into CI or DI pipe 12 inches or smaller shall be made using either a service clamp or saddle or a tapping sleeve as recommended by the pipe manufacturer and as approved by the E/A. Direct tapping of these pipes will not be permitted.

All water service connections shall be installed so that the outlet is at an angle of not more than 45 degrees above horizontal at the main line.

Precautions should be taken to ensure that the tapping saddle or sleeve is placed on the pipe straight to prevent any binding or deformation of the PVC pipe. The mounting chain or U-bolt strap must be tight.

Tapping shall be performed with a sharp shell type cutter so designed that it will smoothly penetrate heavy walled PVC DR14 and 200 psi AC and will retain and extract the coupon from the pipe.

## X. Backfilling

### 1. General

Special emphasis is placed upon the need to obtain uniform density throughout the backfill material. The maximum lift of backfill shall be determined by the compaction equipment selected and in no case shall it exceed 18 inches, loose measurement.

No heavy equipment, which might damage pipe, will be allowed over the pipe until sufficient cover has been placed and compacted. All internal pipe bracing installed or recommended by the manufacturer shall be kept in place until the pipe bedding and trench backfill have been completed over the braced pipe section. Testing of the completed backfill in streets and under and around structures shall meet the specified density requirements. Initial testing shall not be at Contractor's expense and shall conform to the "General Conditions."

## 2. Backfill Materials

The E/A may approve any of the following well graded materials:

- (a) Select trench material
- (b) Sand
- (c) Crushed rock cuttings
- (d) Rock cuttings
- (e) Foundation Rock
- (f) Blasted material with fines and rock
- (g) Cement stabilized material
- (h) Borrow

Within the 100-year flood plain, sand will not be permitted for backfilling. The E/A will approve the topsoil for areas to be seeded or sodded.

## 3. Backfill in Street Right of Way

Placement of backfill under existing or future pavement structures and within 2 feet of any structures shall be compacted to the required density using any method, type and size of equipment, which will give the required compaction without damaging the pipe or bedding. Placement of backfill greater than 2 feet beyond structures in Right of Way shall be conform to (6.) below. The depth of layers, prior to compaction, shall depend upon the type of sprinkling and compacting equipment used and the test results thereby obtained. Prior to and in conjunction with the compaction operation, each layer shall be brought to the moisture content necessary to obtain the required density and shall be kept level to insure uniform compaction over the entire layer. Testing for density shall be in accordance with Test Method Tex-114-E and Test Method Tex-115-E.

Each layer of backfill must provide the density as required herein. Swelling soils (soils with plasticity index of 20 or more) shall be sprinkled as required to provide not less than optimum moisture nor more than 2 percent over optimum moisture content and compacted to the extent necessary to provide not less than 95 percent nor more than 102 percent of the density as determined in accordance with Test Method Tex-114-E. Non-swelling soils (soils with plasticity index less than 20) shall be sprinkled as required and compacted to the extent necessary to provide not less than 95 percent of the density as determined in accordance with Test Method Tex-114-E.

After each layer of backfill is complete, tests may be made by the E/A. If the material fails to meet the density indicated, the course shall be reworked as

necessary to obtain the indicated compaction and the compaction method shall be altered on subsequent Work to obtain indicated density.

At any time, the E/A may order proof rolling to test the uniformity of compaction of the backfill layers. All irregularities, depressions, weak or soft spots that develop shall be corrected immediately by the Contractor.

Should the backfill, due to any reason, lose the required stability, density or finish before the pavement structure is placed, it shall be recompacted and refinished at the sole expense of the Contractor. Excessive loss of moisture in the subgrade shall be prevented by sprinkling, sealing or covering with a subsequent backfill layer or granular material. Excessive loss of moisture shall be construed to exist when the subgrade soil moisture content is more than 4 percent below the optimum of compaction ratio density. Backfill shall be placed from the top of the bedding material to the existing grade, base course, subgrade or as indicated. The remainder of the street backfill shall be Flexible Base, Concrete or Hot Mix Asphalt Concrete as indicated or to be replaced in kind to the surface removed to construct the pipe.

4. Backfill in County Street or State Highway Right of Way

All Work within the right of way shall meet the requirements of (3.) above, as a minimum and shall meet the requirements of the permit issued by the County when their requirements are more stringent. Prior to the start of construction, the Contractor shall be responsible for contacting the appropriate TxDOT office or County Commissioner's Precinct Office and for coordinating his activities with the operating procedures in effect for utility cut permits and pavement repair under their jurisdiction. Approval for all completed Work in the State or County right of way shall be obtained from the appropriate Official prior to final payment by the Owner.

5. Backfill in Railroad Right of Way

All Work within the railroad right of way shall meet the requirements of (3.) above, as a minimum and shall meet the requirements of the permit issued by the Railroad Owner when their requirements are more stringent. Approval for all completed Work in the railroad right of way shall be obtained from the Railroad prior to Final Completion.

6. Backfill in Easements

Where not otherwise indicated, Contractor may select whatever methods and procedures may be necessary to restore entire Work area to a safe, useful and geologically stable condition with a minimum density of 85 percent or a density superior to that prior to construction.

In and near flood plain of all streams and watercourses, under or adjacent to utilities, structures, etc. all backfill shall be compacted to a density of not less than 95 percent conforming to TxDOT Test Method Tex-114-E, unless otherwise directed by E/A.

All soil areas disturbed by construction shall be covered with top soil and seeded conforming to Item No. 604, "Seeding for Erosion Control". All turf, drainways and drainage structures shall be constructed or replaced to their original condition or better. No debris shall remain in the drainways or drainage structures.

Quality Control Testing. The Contractor shall be responsible for compaction in accordance with the appropriate Specification. Compaction tests may be done at one location point randomly selected or as indicated by the NBU Inspector, per each 12 inch loose lift per 400 linear feet. These tests shall be performed by a nationally-accredited, independent testing laboratory. Payment for such tests shall be the responsibility of the Contractor, including the material proctor tests and density tests.

Any failed test shall require the Contractor to remove and replace that layer of backfill to 50 feet from either side from the failed test location. The Contractor will also be required at no cost to NBU to provide two additional tests at the replaced location where the initial test failed and at one location point, randomly selected or as indicated by the NBU Inspector.

#### Y. Wastewater Pipe Acceptance Testing

Wastewater pipe installed in the New Braunfels Utility System shall be tested for exfiltration or infiltration as described below in "Exfiltration Test" and "Infiltration Test" or by acceptable low pressure air test, as described below. At the conclusion of either test series, the Work shall be further tested for pipeline settlement and also for deflection as described below. Finally, the pipe shall be inspected with closed circuit television (CCTV) camera. The Contractor shall be solely responsible for making proper repairs to those elements which do not pass these test requirements.

##### 1. Wastewater Exfiltration Test

Water for the Work shall be metered and furnished by the Contractor in accordance with of the Standard Contract Documents.

The pipeline shall be completely filled with water for its complete length or by sections as determined by the E/A. If tested for its complete length, the maximum head at any point shall not exceed 25 feet unless otherwise indicated. If tested in sections, the manholes in the test section shall be completely filled with water. After the pipeline has been filled and allowed to stand for 24 hours, the amount of exfiltration shall be calculated. Any amount in excess of 200 gallons per inch of inside pipe diameter per mile per day shall be cause for rejection.

For portions of lines located within the Edwards Aquifer Recharge Zone or within any recharge area or recharge feature within the Edwards Aquifer Transition Zone, the minimum head during testing shall not be less than 2 feet and the leakage rate shall not exceed 50 gallons per inch of inside pipe diameter per mile per day. This rate shall apply for the entire portion of the line extending up to the first manhole located outside the recharge zone, recharge area, or recharge features indicated on Drawings and shall also be applicable for any recharge areas or recharge features which may be identified during construction. For construction within the 25-year flood plain, the exfiltration rate shall not exceed 10 gallons per inch diameter per mile of pipe per 24 hours at the same minimum test head.

##### 2. Wastewater Infiltration Test

When the pipe placed in easements is completed, the upper portion of the trench backfill shall be removed to a depth of not less than 18 inches below the finished surface and width equal to the original trench width. The trench shall then be flooded with water until it is completely saturated and water stands in the ditch a minimum of 12 inches deep. In cases of steep terrain, earthen dikes shall be

used to assure that water will stand over the trench. After it is apparent that the trench is completely saturated, the main shall then be inspected with closed-circuit television for infiltration. Any section of the main or any service stub that indicates infiltration above the maximum quantity specified shall be cause for rejection.

This procedure shall not be used for pipes installed in areas where the Plasticity Index (P.I.) of the surrounding material is 20 or higher or where the backfill material has a P.I. of 20 or more.

For portions of lines located within the Edwards Aquifer Recharge Zone or within any recharge area or recharge feature within the Edwards Aquifer Transition Zone, the total infiltration as determined by water test, must be at a rate not greater than 50 gallons per inch of pipe diameter per mile of pipe per 24 hours at a minimum test head of two feet. This rate shall apply for the entire portion of the line extending up to the first manhole located outside the recharge zone, recharge area, or recharge features indicated on Drawings and shall also be applicable for any recharge areas or recharge features which may be identified during construction. For construction within the 25-year flood plain, the infiltration rate shall not exceed 10 gallons per inch diameter per mile of pipe per 24 hours at the same minimum test head.

If the quantity of infiltration exceeds the maximum quantity specified, remedial action must be undertaken in order to reduce the infiltration to an amount within the limits specified.

### 3. Wastewater Pipeline Settlement Test

During the infiltration test or after the exfiltration test, the pipe will be TV inspected for possible settlement. When air testing has been used, water shall be flushed into the pipe to permit meaningful observations. Prior to flushing, the manholes and pipes should be cleared of all debris. Any pipe settlement which causes excessive ponding of water in the pipe shall be cause for rejection. Excessive ponding shall be defined as a golf ball (1-5/8" dia.) submerged at any point along the line.

### 4. Low Pressure Air Test of Plastic Gravity Flow Wastewater Lines

#### (a) General

Wastewater lines, at the discretion of the E/A, shall be air tested between manholes. Backfilling to grade shall be completed before the test and all laterals and stubs shall be capped or plugged by the Contractor so as not to allow air losses, which could cause an erroneous, test result. Manholes shall be plugged so they are isolated from the pipe and cannot be included in the test.

All plugs used to close the sewer for the air test shall be capable of resisting the internal pressures and must be securely braced. Place all air testing equipment above ground and allow no one to enter a manhole or trench where a plugged sewer is under pressure. Release all pressure before the plugs are removed. The testing equipment used must include a pressure relief device designed to relieve pressure in the sewer under test at 10 psi or less and must allow continuous monitoring of the test pressures in order to avoid excessive pressure. Use care to avoid the flooding of the air inlet by infiltrated ground water. (Inject the air at the upper plug if possible.) Use only qualified personnel to conduct the test.

(b) Ground Water

Since the presence of ground water will affect the test results, test holes shall be dug to the pipe zone at intervals of not more than 100 feet and the average height of ground water above the pipe (if any) shall be determined before starting the test.

(c) Test Procedure

The E/A may, at any time, require a calibration check of the instrumentation used. Use a pressure gauge having minimum divisions of 0.10 psi and an accuracy of 0.0625 psi. (One ounce per square inch.) All air used shall pass through a single control panel. Clean the sewer to be tested and remove all debris where indicated. Wet the sewer prior to testing. The average back pressure of any groundwater shall be determined (0.433 psi) for each foot of average water depth (if any) above the sewer.

Add air slowly to the section of sewer being tested until the internal air pressure is raised to 4.0 psig greater than the average back pressure of any ground water that may submerge the pipe. After the internal test pressure is reached, allow at least 2 minutes for the air temperature to stabilize, adding only the amount of air required to maintain pressure. After the temperature stabilization period, disconnect the air supply. Determine and record the time in seconds that is required for the internal air pressure to drop from 3.5 psig to 2.5 psig greater than the average backpressure of any ground water that may submerge the pipe. Compare the time recorded with the specification time for the size and length of pipe as given in the following table:

Table for Low Pressure Air Testing of Plastic Pipe:

Minimum Specified Time Required For 1.0 psig Pressure Drop For Size and Length of Pipe Indicated								
Diameter of Pipe, (in.)	Specification Time (min: sec) for length shown							
	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

**NOTES:** 1. Specification times are as given in UNI-B-6 RECOMMENDED PRACTICE FOR LOW-PRESSURE TESTING OF INSTALLED PIPE -- by Uni-Bell PVC Pipe Association, 2655 Villa Creek Dr., Ste. 155, Dallas Texas 75234.

Any drop in pressure, from 3.5 psig to 2.5 psig (adjusted for groundwater level), in a time less than that required by the above table shall be cause for rejection. When the line tested includes more than one size pipe, the minimum time shall be that given for the largest size pipe included.

Test procedure for wastewater pipe located in the Edwards Aquifer Recharge Zone or identified recharge areas or recharge features within the Edwards Aquifer Transition Zone:

Low-pressure air tests must conform to the procedure described in ASTM C-924 or other equivalent procedures. For safety reasons, air testing of pipe sections will be limited to line sizes of 36 inches inside diameter or less. Lines that are 36 inches or larger inside diameter may be air tested at each joint. The minimum time allowable for the pressure to drop from 3.5 pounds per square inch to 2.5 pounds per square inch gauge during a joint test, regardless of pipe size, shall be twenty (20) seconds.

For sections of pipe less than 36-inch inside diameter, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge must be computed by the following equation:

$$T = 0.0850 (D)(K)/(Q), \text{ where}$$

T = time for pressure to drop 1.0 pounds per square inch gauge in seconds;

K =  $0.000419(D)(L)$ , but not less than 1.0

D = nominal inside diameter in inches;

L = length of line of same pipe size in feet; and

Q = rate of loss, assume 0.0015 cubic feet per minute per square foot ( $\text{ft}^3/\text{min}/\text{ft sq}$ ) of internal surface area.

Any drop in pressure, from 3.5 psig to 2.5 psig, in a time less than that required by the above formula shall be cause for rejection. When the line tested includes more than one size of pipe, the minimum time shall be that calculated for the largest size pipe included.

Manholes must be tested separately and independently. All manholes must be hydrostatically tested with a maximum loss allowance of 0.025 gallon per foot diameter per foot of head per hour.

When lines are air tested, manholes are to be tested separately by exfiltration or vacuum method (see Standard Specification Item No. 506, "Manholes").

#### 5. Wastewater Deflection Test

Deflection tests shall be performed by the Contractor on all flexible and semi-rigid wastewater pipes. The tests shall be conducted after the final backfill has been in place at least 30 days. Testing for in-place deflection shall be with a pipe



mandrel or rigid ball sized at 95% of the inside diameter of the pipe. A second test of flexible and semi-rigid wastewater pipes 18 inch size and larger, also with a pipe mandrel or ball sized at 95% of the inside diameter of the pipe, shall be conducted by the Contractor 30 days prior to expiration of his warranty on the Work.

Contractor shall submit his proposed pipe mandrels or testing balls to the E/A or his designated representative for concurrence prior to testing the line.

Test(s) must be performed without mechanical pulling devices and must be witnessed by the E/A or his designated representative.

Any deficiencies noted shall be corrected by the Contractor and the test(s) shall be redone.

#### 6. Closed Circuit Television (CCTV) Inspection

##### (a) General

##### (i) Description of Work

Furnish all labor, tools, test equipment and materials, including any and all permits required to televise, inspect, video, still photograph and document the gravity wastewater collection systems.

##### (ii) Quality Assurance

- 1) Equipment used shall be in good working order and provide continuous operation during TV/video inspection.
- 2) CD / DVD disks shall be of good visual quality capable of slow motion and pausing without significant reduction of visual quality.
- 3) Inspector(s) must be NASSCO / PACP certified and certification number submitted to NBU prior to commencement of work.
- 4) Video image shall be calibrated using a Marconi Resolution Chart No. 1 or equivalent.

##### (iii) Submittals

Submit to NBU a PACP Report and Top View Report and CD / DVD disks completed.

##### (b) Materials

##### (i) General

Equipment used shall be designed for use in gravity wastewater collection systems. Contractor has the option of an approved equal device or other material than that which is specified. Submittals are required prior to commencement of work.

##### (ii) Television Camera

Camera used shall be 360 degree COLOR RVC camera. Camera shall be operative in 100% relative humidity and be specifically designed for the environment. Camera shall have an integral lighting system capable of producing clearly focused, well-defined images of the entire periphery of the pipe. The quality of video picture and definition provided shall be to the satisfaction of NBU and, if unsatisfactory, equipment shall be removed and replaced with satisfactory equipment.

##### (iii) Video Recording Equipment

Furnish video equipment to provide a visual and audio recording of all areas in the pipe. Video recording system at the site shall be capable of rewind, play back, slow motion and stop motion. The video shall be recorded on a CD, DVD, or equal portable storage device whose format is compatible with Windows XP Pro. Also, an audio channel for clearly recording the camera locations and operator observations (cracks, leaks, service connections, etc.). The system shall continuously indicate distance, in feet, from manhole to manhole and the manhole-to-manhole run numbers on the video recording.

(iv) Power Supply

Power supply shall be continuous. If night operations occur, supply all labor, power and lighting equipment for operations, traffic safety, permits, etc.

(c) Execution

(i) General

1) a. New Mains: Recommended Cleaning

All mains and manholes should be clean of debris prior to televising. The sanitary sewer main shall be flushed within 72 hours of televising and recording. This will assure the main is clean of debris as well as identify any potential sags within the main

b. New Mains: All sanitary sewer gravity lines shall be televised at the Contractor’s expense; and a video recording of the subject mains provided prior to preliminary acceptance and at the 1-year warranty inspection by NBU. Televiewing may only occur after the stabilized subgrade has been installed and satisfactory density tests have been submitted to the City of New Braunfels. An NBU authorized representative must be present during the televising, unless otherwise approved by NBU. The sewer video inspection shall include rotating the camera lens to inspect the interior of each sewer lateral.

c. Existing Mains: Cleaning

i. Recommended Cleaning

Purpose of Inspection	Recommended Cleaning
To determine the serviceability of the pipe, e.g. is the pipe silting up	Do not clean prior to CCTV inspection only clean if the camera cannot travel through the pipeline.
Inspection of structurally suspect pipelines	Do not clean prior to CCTV inspection. Cleaning may damage the pipeline.
To identify the general structural condition of the pipeline. Identification of small severity faults is not a concern.	Light cleaning to remove slime and spider webs.
To identify all faults in the pipeline, including small severity faults, e.g. in order to determine whether the pipeline is suitable of grouting.	Full cleaning of the pipeline to remove all foreign material.

ii. Cleaning Method – Cleaning is normally completed by hydraulic jetting. Equipment capable of delivering 2000 psi pressure and volume rating of 45 gpm is normally used for

- light cleaning. Jetting units that have been specifically set up for root cutting and removal of heavy debris may be required to fully clean the pipeline.
- iii. Cleaning Considerations – Consideration needs to be given to ensure that:
    - a) Adjacent properties are not damaged or flooded.
    - b) Sewer overflows do not occur.
    - c) The sewer being cleaned is not damaged.
    - d) All debris from the cleaning is collected and removed from the sewer system.
  - iv. Cleaning Direction – Cleaning should generally be carried out from a downstream manhole, in a downstream direction. Upstream cleaning should be avoided wherever possible because it increases the possibility of water being blown up lateral and causing p-traps or toilets at adjacent buildings to overflow.
  - v. Inspection after Cleaning – The pipeline should be inspected as soon as possible after it has been cleaned. In any case the inspection should be completed within seven days of cleaning. For pipes that have material with high levels of debris or grease flowing through them seven days may be too long and re-cleaning may be required.
- 2) Demonstrate the ability of the TV/video equipment (camera/light/video/audio/photograph system) to the satisfaction of NBU. Distance meter shall be furnished on the digital video recording. Meter shall be checked using distances between manholes. Meter distances and actual distances shall be consistent.
- (ii) Televising / Inspection
- 1) Inspection shall be done one manhole section at a time.
  - 2) Locate video vehicle on upstream side of manhole. Recording shall begin during the lowering of the camera into the manhole opening. Video in the downstream direction such that camera movement is with the flow. Camera lens shall be positioned looking along the axis of the sewer. The camera axis should be within  $\pm 10\%$  of the vertical sewer centerline of the pipe. For oval shaped pipes, the camera shall be positioned vertically above the invert at a height  $\frac{2}{3}$  of the vertical dimension of the pipe.
  - 3) Insert the camera in the upstream manhole after flow restrictions required have been accomplished. Flow into the system being inspected shall be stopped, with the exception of service laterals into the system being inspected. Move camera through the pipe lines at a moderate speed not exceeding 30 feet per minute. Excessive use of the pan and tilt features should be avoided. Stop camera at locations where one or more of the following conditions is observed:
    - a. Infiltration/inflow sources.
    - b. Service Laterals.

- c. Structural defects including broken pipe; collapsed or collapsing pipe, cracks, deterioration, punctures, etc.
  - d. Abnormal joint conditions such as misalignments, open joints and joints not sealed.
  - e. Unusual conditions such as root intrusion, protruding pipes, in-line pipe size changes, mineral deposits, grease and obstructions.
- 4) Stop camera long enough for a thorough visual inspection of the conditions. All such conditions as specified above, along with the corresponding PACP code for each condition, shall be audio recorded on video and the inspection log sheet. Move the camera and rotate to obtain optimum view of the conditions. Each condition should be framed as to provide a full perspective. If requested by an NBU representative, view problem areas in the opposite direction by pulling the TV camera from the opposite direction at no additional cost to the NBU.
  - 5) While the camera is stopped at each service connection, rotate the camera so as to be able to view the service connection for a length of time that enables a good visual inspection of the service connection for damage and infiltration. Be responsible for measurements such as service lateral locations, if used for subsequent rehabilitation work.
  - 6) When, during the inspection operation, the television camera will not pass through the entire manhole-to-manhole section, set up equipment so that the inspection can be performed from the opposite manhole at no additional cost to NBU. All reasonable effort should be given to video the entire segment including the removal of obstructions, reversals, location/exposure of buried manholes, use of more versatile equipment, etc.
  - 7) Any defects or anomalies detected on new construction that does not meet NBU requirements shall be corrected by the Contractor prior to NBU acceptance. Once corrected, the portion(s) shall be videoed, again, to assure the modification(s) was made correctly.
- (iii) Documentation
- 1) Furnish a detailed report and digital video of the system inspected. The minimum information supplied shall be the following:
    - a. Name and address of Contractor and the Developer.
    - b. Name of Project, system(s) inspected, and Project's representative involved.
    - c. Log reports:
      - i. PACP Report and Top View Report for each section of pipe using NASSCO's PACP Standards unless otherwise instructed by NBU.
      - ii. Separate line for each deficiency and location
      - iii. Corresponding video and location of each section of pipe and deficiencies on digital video.
  - 2) Video shall be labeled with the following information:

- a. System that is video (street name and manhole to manhole numbers) and log report number corresponding to video
  - b. Date video was recorded
  - c. Contractor's name and representative
  - d. Project's name, if applicable
- 3) All recordings shall be rendered unable to be copied over after they are completed.
- (iv) Maintenance of Traffic
- 1) Be responsible for all maintenance of traffic around work site. Contractor shall maintain traffic in accordance to all federal, state and local regulations. At no additional cost to NBU, submit a Maintenance of Traffic Plan, for review and approval by NBU as necessary, prior to commencing work. Obtain all necessary permits prior to commencing work, at no additional cost to NBU.
  - 2) Maintenance of Traffic shall also include construction and maintenance of any necessary detour facilities, furnishings, installing and maintaining of traffic control and safety devices during construction, control of dust, and any other special requirements for safe and expeditious movement of traffic around or through the work site.
  - 3) Be responsible for coordination with all affected agencies when roadways will be closed or traffic will be detoured. No detours or roadway closings shall be permitted unless specifically approved in writing by the City of New Braunfels and NBU.

## Z. Water Pipe Acceptance Testing

Acceptance testing for potable water pipes involves two (2) types of tests, bacteriological and hydrostatic. Both types of these testing methods are defined in the following sections.

Note: Bacteriological testing (AB.5) should be done on the pipe prior to the hydrostatic testing unless the pipe is isolated in the system such that there are no services or trunk line connected and approved by an NBU inspector.

After the pipe has been installed and backfilled and all service laterals, fire hydrants and other appurtenances installed and connected, a pressure test, followed by a leakage test, will be conducted by the Contractor. The Contractor will furnish the pump and gauges for the tests. The Utilities Representative shall be present during the tests. The specified test pressures will be based on the elevation of the lowest point of the line or section under test. Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points.

All drain hydrant and fire hydrant leads, with the main 6-inch gate valve open, the hydrant valve seats closed and nozzle caps open, shall be included in the test.

Prior to pressure testing against an existing system valve, a bacteriological test shall be performed to determine potability of water.

### 1. Hydrostatic Test

A hydrostatic test will be conducted on the entire project or each valved section to test for leakage. The leakage test shall be at 150 psi for at least 4 hour.

(a) Allowable Leakage

Leakage shall be defined as the quantity of water that must be supplied into any test section of pipe to maintain the specified leakage test pressure (see above, "Pressure Pipe Leakage Test") after the air in the pipeline has been expelled and the pipe has been filled with water.

No pipe installation will be accepted if the leakage exceeds 25 gallons/24 hours/mile of pipe/inch nominal pipe diameter.

$$\frac{(25 \text{ gpd})}{(\text{in.} \cdot \text{mi.})}$$

(b) Location and Correction of Leakage

If such testing discloses leakage in excess of this specified allowable, the Contractor, at his expense, shall locate and correct all defects in the pipeline until the leakage is within the indicated allowance.

All visible leakage in pipe shall also be corrected by Contractor at his own expense.

AA. Service Charges for Testing

The Contractor shall be responsible for all expenses relating to acceptance testing.

AB. Disinfection of Potable Water Lines

1. Preventing Contamination

The Contractor shall protect all piping materials from contamination during storage, handling and installation. Prior to disinfection, the pipeline interior shall be clean, dry and unobstructed. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work.

2. Cleaning

Prior to disinfection the Contractor shall clean the pipeline to remove foreign matter. For pipelines 16" in diameter or smaller, cleaning shall consist of flushing the pipeline. For pipelines greater than 16" in diameter, cleaning shall be performed by operating hydrants and blow-offs located at low points in the pipeline, or by mechanical means (sweeping or pigging). Water for the Work shall be metered and furnished by the Contractor in accordance with of the Standard Contract Documents.

3. Procedure and Dosage

The Contractor, at its expense, will supply the test gauges and the Sodium Hypochlorite conforming to ANSI/AWWA B300, which contains approximately five percent (5%) to fifteen percent (15%) available chlorine, and will submit for approval a written plan for the disinfection process. Calcium Hypochlorite conforming to ANSI/AWWA B300, which contains approximately 65 percent available chlorine by weight, may be used in granular form or in 5 g tablets for 16" diameter or smaller lines, if it is included as part of the written plan of disinfection that is approved by New Braunfels Utilities. The Contractor, at its

expense, shall provide all other equipment, supplies and the necessary labor to perform the disinfection under the general supervision of the Utility.

One connection to the existing system will be allowed with a valve arranged to prevent the strong disinfecting dosage from flowing back into the existing water supply piping. The valve shall be kept closed and locked in a valve box with the lid painted red. No other connection shall be made until the disinfection of the new line is complete and the water samples have met the established criteria. The valve shall remain closed at all times except when filling or flushing the line and must be manned during these operations. Backflow prevention in the form of a reduced pressure backflow assembly must be provided if the valve is left unattended. The new pipeline shall be filled completely with disinfecting solution by feeding the concentrated chlorine and approved water from the existing system uniformly into the new piping in such proportions that every part of the line has a minimum concentration of 50 mg/liter available chlorine.

The disinfecting solution shall be retained in the piping for at least 24 hours and all valves, hydrants, services, stubs, etc. shall be operated so as to disinfect all their parts. After this retention period, the water shall contain no less than 25 mg/liter chlorine throughout the treated section of the pipeline.

For pipelines larger than 16" in diameter, the Contractor may use the AWWA C-651 "Slug Method" for disinfecting the pipeline. Chlorine shall be fed at a constant rate and at a sufficient concentration at one end of the pipeline to develop a slug of chlorinated water having not less than 100 mg/liter of free chlorine. The Contractor shall move the slug through the main so that all interior surfaces are exposed to the slug for at least three (3) hours. The chlorine concentration in the slug shall be measured as it moves through the pipeline. If the chlorine concentration drops below 50 mg/liter, the Contractor shall stop the slug and feed additional chlorine to the head of the slug to restore the chlorine concentration to at least 100 mg/liter before proceeding. As the slug flows past fittings and valves, related valves and hydrants shall be operated so as to disinfect appurtenances and pipe branches.

Unless otherwise indicated, all quantities specified herein refer to measurements required by the testing procedures included in the current edition of "Standard Methods". The chlorine concentration at each step in the disinfection procedure shall be verified by chlorine residual determinations.

#### 4. Final Flushing

The heavily chlorinated water shall then be carefully flushed from the potable water line until the chlorine concentration is no higher than the residual generally prevailing in the existing distribution system. Proper planning and appropriate preparations in handling, diluting, if necessary, and disposing of this strong chlorine solution is necessary to insure that there is no injury or damage to the public, the water system or the environment. The plans and preparations of the Contractor must be approved by Utility before flushing of the line may begin. Additionally the flushing must be witnessed by an authorized representative of the Utility.

Approval for discharge of the diluted chlorine water or heavily chlorinated water into the wastewater system must be obtained from New Braunfels Utilities. The line flushing operations shall be regulated by the Contractor so as not to overload the wastewater system or cause damage to the odor feed systems at

the lift stations. The Utility shall designate its own representative to oversee the work. Daily notice of line discharging must be reported to New Braunfels Utilities Dispatch office.

#### 5. Bacteriological Testing

After final flushing of the strong disinfecting solution, two (2) sets of water samples from the line, that are taken at least twenty-four (24) hours apart, will be tested for bacteriological quality by the Utility and must be found free of coliform organisms before the pipeline may be placed in service. Each set shall consist of one (1) sample that is drawn from the end of the main and additional samples that are collected at intervals of not more than 1000 feet along the pipeline. All stubs shall be tested before connections are made to existing systems.

The Contractor, at its expense, shall install sufficient sampling taps at proper locations along the pipeline. Each sampling tap shall consist of a standard corporation cock installed in the line and extended with a copper tubing gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use.

Samples for bacteriological analysis will only be collected from suitable sampling taps in sterile bottles treated with sodium thiosulfate. Samples shall not be drawn from hoses or unregulated sources. The Utility, at its expense, will furnish the sterile sample bottles and may, at its discretion, collect the test samples with Utility personnel.

If the initial disinfection fails to produce acceptable sample test results, the disinfection procedure shall be repeated at the Contractor's expense. Before the piping may be placed in service, two (2) consecutive sets of acceptable test results must be obtained.

An acceptable test sample is one in which: (1) the chlorine level is similar to the level of the existing distribution system; (2) there is no free chlorine and (3) total coliform organisms are absent. An invalid sample is one, which has excessive free chlorine, silt or non-coliform growth as defined in the current issue of the "Standards Methods." If unacceptable sample results are obtained for any pipe, the Contractor may, with the concurrence of the Inspector, for one time only flush the lines and then collect a second series of test samples for testing by the Utility. After this flushing sequence is completed, any pipe with one or more failed samples must be disinfected again in accordance with the approved disinfection procedure followed by appropriate sampling and testing of the water.

New Braunfels Utilities Water Quality Laboratory will notify the assigned Utility Inspector in writing of all test results. The Inspector will subsequently notify the Contractor of all test results. The Water Quality Laboratory will not release test results directly to the Contractor.

#### AC. Cleanup and Restoration

It shall be the Contractor's responsibility to keep the construction site neat, clean and orderly at all times. Cleanup shall be vigorous and continuous to minimize traffic hazards or obstructions along the streets and to driveways. Trenching, backfill, pavement repair (as necessary), and cleanup shall be coordinated as directed by the Utility. The E/A will regulate the amount of open ditch and may halt additional trenching if cleanup is not adequate to allow for orderly traffic flow and access.



Materials at the site shall be stored in a neat and orderly manner so as not to obstruct pedestrian or vehicular traffic. All damaged material shall be removed from the construction site immediately and disposed of in a proper manner. All surplus excavated materials become the property of the Contractor for disposal at his expense. After trenching, the Contractor shall immediately remove all excavated materials unsuitable for or in excess of, backfill requirements. Immediately following the pipe laying Work as it progresses, the Contractor shall backfill, grade and compact all excavations as provided elsewhere and shall immediately clean up and remove all unused soil, waste and debris and restore all surfaces and improvements to a condition equal or superior to that before construction began and to an appearance which complements the surroundings. The Contractor shall grade and dress the top 6 inches of earth surfaces with soil or other material similar and equal to the surrounding, fill and smooth any visible tracks or ruts, replace and re-establish all damaged or disturbed turf or other vegetation and otherwise make every effort to encourage the return of the entire surface and all improvements to a pleasant appearance and useful condition appropriate and complementary to the surroundings and equal or similar to that before construction began.

Permanent pavement replacement, if necessary, shall begin immediately after all testing of each segment of piping is satisfactorily completed.

#### 510.4 Materials

The Contractor shall submit descriptive information and evidence that the materials and equipment the Contractor proposes for incorporation into the Work is of the kind and quality that satisfies the specified functions and quality. **New Braunfels Utilities Standard Products Lists (SPL)** forms a part of the Specifications. Contractors may, when appropriate, elect to use products from the SPL; however, submittal to the E/A is still required. Should the Contractor elect to use any materials from these lists, each product shall be completely and clearly identified by its corresponding SPL number when making the product submittal. This will expedite the review process in which the E/A, decides whether the products meet the Contract requirements and the specific use foreseen by the E/A in the design of this engineered Project. The purpose of the SPL's is to expedite review, by the E/A of Contractor product submittals. The SPL's should not be interpreted as being a pre-approved list of products necessarily meeting the requirements for a given construction Project. Items contained in the SPL cannot be substituted for items shown on the Drawings, or called for in the specifications, or specified in the Bidding Requirements, Contract Forms and Conditions of Contract, unless approved by the E/A. The Standard Product List current at the time of plan approval will govern.

A. Concrete

Concrete shall conform to Item No. 403, "Concrete for Structures".

B. Coarse Aggregate

Coarse aggregate shall conform to Item No. 403, "Concrete for Structures" or one of the following:

1. Pipe Bedding Stone

Pipe bedding stone shall be clean gravel, crushed gravel or crushed limestone, free of mud, clay, vegetation or other debris, conforming to ASTM C 33 for stone

quality. Size gradation shall conform to ASTM C-33 No. 57 or No. 67 or the following Table:

SIEVE SIZE	% RETAINED BY WEIGHT
1-1/2"	0
1"	0-10
1/2"	40-85
#4	90-100
#8	95-100

2. Foundation Rock

Foundation rock shall be well graded coarse aggregate ranging in size from 2 to 8 inches.

3. Flexible Base

Flexible base shall conform to Item No. 210, "Flexible Base".

C. Fine Aggregate

1. Concrete and Mortar Sand

Fine aggregate shall conform to Item No. 403, "Concrete for Structures".

2. Bedding Sand

Sand for use as pipe bedding shall be clean, granular and homogeneous material composed mainly of mineral matter, free of mud, silt, clay lumps or clods, vegetation or debris. The material removed by decantation TxDOT Test Method Tex-406-A, plus the weight of any clay lumps, shall not exceed 4.5 percent by weight.

The resistivity shall not be less than 3000 ohms-cm as determined by TxDOT Test Method Tex-129-E. Size gradation of sand for bedding shall be as follows:

GRADATION TABLE	
SIEVE SIZE	% RETAINED BY WEIGHT
1/4"	0
#60	75-100
#100	95-100

3. Stone Screenings

Stone screenings shall be free of mud, clay, vegetation or other debris, and shall conform to the following Table:

SIEVE SIZE	% PASSING
3/8"	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60

No. 50	10 to 30
No. 100	2 to 10

All screenings shall be the result of a rock crushing operation.

D. Pea Gravel

Pea gravel bedding shall be clean washed material, hard and insoluble in water, free of mud, clay, silt, vegetation or other debris. Stone quality shall meet ASTM C 33. Size gradation shall be as follows:

SIEVE SIZE	% RETAINED BY WEIGHT
3/4"	0
1/2"	0-25
1/4"	90-100

E. Select Backfill or Borrow

This material shall consist of borrow or suitable material excavated from the trench. It shall be free of stones or rocks over 8 inches and shall have a plasticity index of less than 20. The moisture content at the time of compaction shall be within 2 percent of optimum as determined by TxDOT Test Method Tex-114-E. Sandy loam borrow will not be allowed unless shown on the Drawings or authorized by the E/A.

All suitable materials from excavation operations not required for backfilling the trench may be placed in embankments, if applicable. All unsuitable materials that cannot be made suitable shall be considered surplus excavated materials as described in 510.3(M). The Contractor may, if approved by the engineer, modify unsuitable materials to make them suitable for use. Modification may include drying, removal or crushing of over-size material, and lime or cement treatment.

F. Cement Stabilized Backfill

When indicated or directed by the E/A, all backfill shall be with cement-stabilized backfill rather than the usual materials. Unless otherwise indicated, cement stabilized backfill material shall consist of a mixture of the dry constituents described for Class J Concrete. The cement and aggregates shall be thoroughly dry mixed with no water added to the mixture except as may be directed by the E/A.

**510.5 Measurement**

Pipe will be measured by the linear foot for the various types, sizes and classes. Parallel lines will be measured individually.

Where a line ties into an existing system, the length of the new line will be measured from the visible end of the existing system at the completed joint. Unless otherwise indicated, the length of water and wastewater lines will be measured along pipe horizontal centerline stationing through fittings, valves, manholes, and other appurtenances.

Unless otherwise provided, ductile fitting 24-inch and smaller will be measured by the ton and paid for in accordance with the schedule in Standard Product List. Unless otherwise provided, fittings larger than 24 inch sizes will be subsidiary to the pipe.

Welded steel pipe fittings will not be measured separately. These will be subsidiary to the bid item Pipe.

Excavation and backfill, when included as pipe installation will not be measured as such but shall be included in the unit price bid for constructing pipe and measured as pipe complete in place including excavation and backfill.

When pay items are provided for the other components of the system, measurement will be made as addressed hereunder.

### **510.6 Payment**

Payment for pipe, measured as prescribed above, will be made at the unit price bid per linear foot for the various sizes of pipe, of the materials and type indicated, unless unstable material is encountered or trench excavation and backfill is bid as a separate item.

The concrete seal, foundation rock or coarse aggregate when used as directed in unstable material will be paid for at the unit price bid per cubic yard, which shall be full payment for all excavation and removal of unsuitable material and furnishing, placing and compacting the foundation rock, coarse aggregate or other approved material all complete in place. Excavation and backfill, when included as a separate pay item, will be paid for by the designated Pay Item.

#### **A. Pipe**

Payment for pipe, measured as prescribed above, will be made at the unit price bid per linear foot complete-in-place as designed and represented in the Drawings and other Contract documents. Unless otherwise provided herein, as separate pay item(s), subsidiary items to the bid price per linear foot of pipe shall include the following:

1. clearing
2. constructing any necessary embankment
3. excavation
4. disposal of surplus or unusable excavated material
5. furnishing, hauling and placing pipe
6. fittings larger than 24 inch
7. field constructed joints, collars, temporary plugs, caps or bulkheads
8. all necessary lugs, rods or braces
9. pipe coatings and protection
10. connections to existing systems or structures, concrete blocking and thrust blocks and restrained joints
11. preparing, shaping, pumping for dewatering, and shoring of trenches
12. bedding materials
13. backfill materials
14. hauling, placing and preparing bedding materials

15. particle migration measures
16. hauling, moving, placing and compacting backfill materials
17. temporary and permanent pavement repairs and maintenance
18. temporary and permanent removal and replacement of pavement, curb, drainage structures, driveways, sidewalks and any other improvements damaged or removed during construction
19. cleanup
20. vertical stack on deep wastewater services
21. all other incidentals necessary to complete the pipe installation as indicated

No separate payment will be made for thrust restraint measures.

Steel cylinder concrete pipe fittings and welded steel pipe fittings will not be paid for separately. These will be subsidiary to the bid item Pipe.

**B. Concrete Cradles and Seals**

When called for in the Bid, concrete cradles and seals will be paid for at the unit Contract price bid per linear foot for the size of pipe specified, complete in place.

**C. Concrete Retards**

When called for in the Bid, Concrete retards will be paid under respected bid Item, Concrete Retards."

**D. Boring, Jacking and Tunneling**

When called for in the Bid, boring, jacking and tunneling will be paid under respected bid Item, "Jacking or Boring Pipe" or "Tunneling".

**E. Wet Connections to Water Mains**

When called for in the bid, wet connections will be paid at the unit price bid per each, complete in place, according to the size of the main that is in service and shall be full compensation for all Work required to make the connection and place the pipe in service.

**F. Fittings**

Cast iron and ductile iron fittings of the class indicated, furnished in accordance with these specifications will be paid for at the unit price bid per ton, complete in place, according to scheduled weights for mechanical joint fittings furnished, including glands, bolts and gaskets, as published in the following standards:

1. AWWA C-153 for all fittings 4-inch through-24 inch sizes, regardless of whether AWWA C-110 or AWWA C-153 fittings are furnished or the type of end connections supplied.
2. AWWA C-110 for all fittings larger than 24-inch size.

**G. Concrete Trench Cap and Encasement**

Where the distance between the top of the concrete encasement and the top of the trench cap is less than 36 inches, the concrete cap and encasement shall be poured as one unit and paid for under this bid item at the Contract price bid per linear foot. When the distance above is greater than 36 inches or when the trench cap is placed

separately, the trench cap shall be paid for as a separate item, per linear foot, complete in place.

H. Cement-Stabilized Backfill

Cement-stabilized backfill will be paid for at the unit price bid per linear foot and shall be full payment to the Contractor for furnishing and installing the required material, mixed, placed and cured complete in place.

I. Concrete Encasement

When called for in the Bid, Concrete Pipe Encasement will be paid under respected bid Item, "Encasement and Encasement Pipe".

J. Pressure Taps

Pressure taps will be paid for at the unit price bid, complete in place, according to the size tap made and the size main tapped and shall be full payment for furnishing all necessary materials, including tapping sleeve and valve, making the tap, testing and placing the connection in service.

K. Trench Safety Systems

When called for in Bid, Trench Safety Systems shall conform to Item No. 509, "Trench Safety Systems".

L. In-Place Slip lining with or without In-Place Pipe Destruction/Replacement

As called for in the corresponding bid items, pipe slip lining with or without in-place pipe destruction/replacement will be paid for at the Contract price per linear foot for the specified liner and pipe size and type pipe, at all depths, complete in place.

Installation of new services, or reconnection of existing services, to the liner will be paid for at the Contract price per each for the specified size and type of service, at all depths, complete in place.

M. Cured Resin Pipe Lining

When called for in the bid, cured resin pipe lining will be paid for per linear foot, for the size and type of pipe lined, at all depths, complete in place including all equipment set-ups, video inspection and cleaning of existing pipe. Installation of new services or reconnection of existing services to the relined pipe will be paid for per each, for the specified size and type of service, at all depths, complete in place.

Payment, when included as a Contract pay item, will be made under one of the following:

- Pay Item:** Pipe, \_\_\_Dia. \_\_\_ (all depths), including Excavation and Backfill Per Linear Foot.
- Pay Item:** In-Place Sliplining without In-Place Pipe Destruction/Replacement  
( \_\_\_ Dia. \_\_\_ Pipe Lining \_\_\_ in. Dia. Existing Pipe) Per Linear Foot.
- Pay Item:** In-Place Sliplining with Pipe Destruction/Replacement  
( \_\_\_ Dia. \_\_\_ Replacement Pipe \_\_\_ in. Dia. Existing Pipe) Per Linear Foot.
- Pay Item:** Installing or Reconnecting Lateral Service to Existing, Relined or Replaced  
Pipe ( \_\_\_Dia. \_\_\_ Service) in. ( \_\_\_Dia. \_\_\_ Pipe) Per Each.
- Pay Item:** Pipe Excavation, \_\_\_Ft. Width Per Linear Foot.

## New Braunfels Utilities

## Specifications

<b>Pay Item:</b> Pipe Trench Backfill, ___Ft. Width	Per Linear Foot.
<b>Pay Item:</b> Concrete Seal or Cradle, ___Dia. Pipe	Per Linear Foot.
<b>Pay Item:</b> Concrete Trench Cap, ___Ft. Width	Per Linear Foot.
<b>Pay Item:</b> Concrete Cap and Encasement, ___Dia. Pipe	Per Linear Foot.
<b>Pay Item:</b> Cement Stabilized Backfill, ___Dia. Pipe	Per Linear Foot.
<b>Pay Item:</b> Cured Resin Pipe Lining (for ___ Dia. Pipe)	Per Linear Foot.
<b>Pay Item:</b> Installing or Reconnecting Lateral Service to Cured Resin Lined Pipe, (___Dia. ___Service for ___Dia. Main)	Per Each.
<b>Pay Item:</b> Pressure Taps, ___ Dia. x ___ Dia.	Per Each.
<b>Pay Item:</b> Wet Connections, ___ Dia. x ___ Dia.	Per Each.
<b>Pay Item:</b> Ductile Iron Fittings 4 inch through 24 inch	Per Ton.

A "W" after the pay item indicates the use for water.

A "WW" after the pay item indicates the use for wastewater.

**End**

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**Item No. 512**  
**Conductive Trace Wire for**  
**Non-Metallic Pipe Installation**

**512.1 Description**

Install electrically continuous trace wire with access points as described herein to be used for locating non metallic pipe with an electronic pipe locator after installation.

**512.2 Materials**

Trace wire to be twelve (12) gauge minimum solid copper with thermoplastic insulation recommended for direct burial. Wire connectors to be 3M DBR, or approved equal and shall be watertight and provide electrical continuity.

**512.3 Construction Methods**

Tracer wire shall be installed on all non-ductile iron water mains and force mains. The wire shall be installed in such a manner as to be able to properly trace all water/force mains without loss or deterioration of signal or without the transmitted signal migrating off the tracer wire.

Trace wire shall be installed in the same trench and inside bored holes and casing with nonmetallic pipe during pipe installation. It shall be secured to the pipe as required to insure that the wire remains adjacent to the pipe. The trace wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be accessible at all new water valve boxes.

**A. Wastewater – Force Mains**

For access points along force mains, valve boxes should be placed at intervals of no greater than 500 feet including one at the pump station and one at the discharge point.

**B. Water**

Tracer wires in valve boxes should be secured to the wall of the valve box and an excess of approximately 3 feet of wire should be coiled under the valve cap. This will keep the wire from being vulnerable to being twisted around valve keys and snapped, or pushed to the bottom of the valve box where it would be out of reach and inaccessible to the locator.

**C. Pipe Application**

At the point of connection between cast or ductile iron water mains, with any non iron water main, the tracer wire shall be properly connected to the iron pipe with a cad weld or approved equivalent. Tracer wire welds shall be completely sealed with the use of an approved mastic type sealer specifically manufactured for underground use. Mastic shall be applied in a thick coat a minimum of 2 inches thick and shall be protected from contamination by the backfill material with the use of a plastic membrane.

Tracer wire shall be laid flat and securely affixed to the top of the pipe at 10 foot intervals. The wire shall be protected from damage during the execution of the works. No breaks or cuts in the tracer wire or tracer wire insulation shall be permitted. At water

service saddles, the tracer wire shall not be allowed to be placed between the saddle and the water main.

The tracer wire will be allowed some slack to allow for bends in laying and for future installation of joints, splices, tapping saddles, etc. The slack should also be sufficient to allow for small earth movements occurring in compacting trench fill or through natural subsidence.

At all water main end caps, a minimum, of 6 feet of tracer wire shall be extended beyond the end of the pipe, coiled and secured for future connections. The end of the tracer wire shall be spliced to the wire of a six pound zinc anode and is to be buried at the same elevations as the water main.

#### D. Boring

For directional drilling, auguring or boring installations, four #12 tracer wires shall be installed with the pipe and connected to the tracer wire at both ends, or cad welded to the existing iron pipe at both ends.

#### E. Splicing

Except for approved spliced-in connections, tracer wire shall be continuous and without splices from valve chamber to valve chamber.

Spliced connections between the main line tracer wire and branch connection tracer wire shall only be allowed at water main tees, crosses or at iron or copper water services where a portion of the branch connection water main or water service is replaced with a non iron or non copper material. The branch connection tracer wire shall be a single tracer wire properly spliced to the main line tracer wire. Where the existing branch connection is neither iron nor copper, then the new branch connection tracer wire shall be properly spliced to the existing tracer wire on the branch connection.

When tying new construction to old construction, tracer wire will not be terminated to or on another tracer wire or metallic utility line unless the two systems are demonstrably compatible. This is to reduce the potential for rapid corrosion of one system due to a 'reverse' cathodic effect.

At all repair locations where there is existing tracer wire, the tracer wire shall be properly reconnected and spliced as outlined above.

### 512.4 Testing Requirements

Contractor shall perform a continuity test on all trace wire in the presence of the Engineer or the Engineers' representative.

- A. All tracer wire for new utility installations will be tested before acceptance. The test will take the following form:
  - 1. A standard 5 watt generator will be used to provide an AC current on the wire.
  - 2. The frequency of the signal from the generator will be initially restricted to 33 kHz or less.
  - 3. A standard hand held detector will be used to trace the signal.
- B. The installed tracer wire will be deemed to pass the test if using this set up:
  - 1. The tracer wire is accessible at all access points.
  - 2. The tracer wire can be traced from access point to access point.

3. Widely-spaced access points can be traced out in the worst case from each 'end' to a common meeting point between them.
  4. Depth readings are consistent and accurate to within 15 to 1 depth to diameter ratio.
- C. If the trace wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of the wire.

#### **512.5 Measurement and Payment**

There is no separate payment for the supply and installation of tracer wire on any construction or installation of non-ductile iron water main or force main by the Contractor. The Contractor shall consider the supply and installation of the tracer wire incidental to all construction of non-ductile water main and force main.

**End**

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# Exhibit D

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Vented Manholes

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Table 6 - Vented Manholes

Line	Manhole	Station	Sheet
WWL "A"	WWMH 2	17+34.01	14 OF 43
WWL "A"	WWMH 5	30+60.01	18 OF 43
WWL "A"	WWMH 8	40+50.00	20 OF 43
WWL "A"	WWMH 11	51+33.49	23 OF 43
WWL "A"	WWMH 14	54+92.73	24 OF 43
WWL "A"	WWMH 17	68+01.69	27 OF 43
WWL "A"	WWMH 20	77+31.47	29 OF 43
WWL "A"	WWMH 23	90+80.18	33 OF 43
WWL "A"	WWMH 26	100+57.42	35 OF 43
WWL "B"	WWN17 MH 11C	15+92.02	38 OF 43

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# **Temporary Stormwater Section (TCEQ-0602)**

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# Temporary Stormwater Section

## Texas Commission on Environmental Quality

for Regulated Activities on the Edwards Aquifer Recharge Zone and Relating to 30 TAC §213.5(b)(4)(A), (B), (D)(I) and (G); Effective June 1, 1999

**To ensure that the application is administratively complete, confirm that all fields in the form are complete, verify that all requested information is provided, consistently reference the same site and contact person in all forms in the application, and ensure forms are signed by the appropriate party.**

**Note: Including all the information requested in the form and attachments contributes to more streamlined technical reviews.**

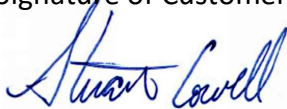
## Signature

To the best of my knowledge, the responses to this form accurately reflect all information requested concerning the proposed regulated activities and methods to protect the Edwards Aquifer. This **Temporary Stormwater Section** is hereby submitted for TCEQ review and executive director approval. The application was prepared by:

Print Name of Customer/Agent: Stuart Cowell

Date: 03/10/2023

Signature of Customer/Agent:



Regulated Entity Name: LJA Engineering, Inc.

## Project Information

### Potential Sources of Contamination

*Examples: Fuel storage and use, chemical storage and use, use of asphaltic products, construction vehicles tracking onto public roads, and existing solid waste.*

1. Fuels for construction equipment and hazardous substances which will be used during construction:

The following fuels and/or hazardous substances will be stored on the site: N/A

These fuels and/or hazardous substances will be stored in:

Aboveground storage tanks with a cumulative storage capacity of less than 250 gallons will be stored on the site for less than one (1) year.

- Aboveground storage tanks with a cumulative storage capacity between 250 gallons and 499 gallons will be stored on the site for less than one (1) year.
- Aboveground storage tanks with a cumulative storage capacity of 500 gallons or more will be stored on the site. An Aboveground Storage Tank Facility Plan application must be submitted to the appropriate regional office of the TCEQ prior to moving the tanks onto the project.
- Fuels and hazardous substances will not be stored on the site.
- 2.  **Attachment A - Spill Response Actions.** A site specific description of the measures to be taken to contain any spill of hydrocarbons or hazardous substances is attached.
- 3.  Temporary aboveground storage tank systems of 250 gallons or more cumulative storage capacity must be located a minimum horizontal distance of 150 feet from any domestic, industrial, irrigation, or public water supply well, or other sensitive feature.
- 4.  **Attachment B - Potential Sources of Contamination.** A description of any activities or processes which may be a potential source of contamination affecting surface water quality is attached.

### ***Sequence of Construction***

- 5.  **Attachment C - Sequence of Major Activities.** A description of the sequence of major activities which will disturb soils for major portions of the site (grubbing, excavation, grading, utilities, and infrastructure installation) is attached.
  - For each activity described, an estimate (in acres) of the total area of the site to be disturbed by each activity is given.
  - For each activity described, include a description of appropriate temporary control measures and the general timing (or sequence) during the construction process that the measures will be implemented.
- 6.  Name the receiving water(s) at or near the site which will be disturbed or which will receive discharges from disturbed areas of the project: BLIEDERS CREEK

### ***Temporary Best Management Practices (TBMPs)***

*Erosion control examples: tree protection, interceptor swales, level spreaders, outlet stabilization, blankets or matting, mulch, and sod. Sediment control examples: stabilized construction exit, silt fence, filter dikes, rock berms, buffer strips, sediment traps, and sediment basins. Please refer to the Technical Guidance Manual for guidelines and specifications. All structural BMPs must be shown on the site plan.*

- 7.  **Attachment D – Temporary Best Management Practices and Measures.** TBMPs and measures will prevent pollution of surface water, groundwater, and stormwater. The construction-phase BMPs for erosion and sediment controls have been designed to retain sediment on site to the extent practicable. The following information is attached:

- A description of how BMPs and measures will prevent pollution of surface water, groundwater or stormwater that originates upgradient from the site and flows across the site.
  - A description of how BMPs and measures will prevent pollution of surface water or groundwater that originates on-site or flows off site, including pollution caused by contaminated stormwater runoff from the site.
  - A description of how BMPs and measures will prevent pollutants from entering surface streams, sensitive features, or the aquifer.
  - A description of how, to the maximum extent practicable, BMPs and measures will maintain flow to naturally-occurring sensitive features identified in either the geologic assessment, TCEQ inspections, or during excavation, blasting, or construction.
8.  The temporary sealing of a naturally-occurring sensitive feature which accepts recharge to the Edwards Aquifer as a temporary pollution abatement measure during active construction should be avoided.
- Attachment E - Request to Temporarily Seal a Feature.** A request to temporarily seal a feature is attached. The request includes justification as to why no reasonable and practicable alternative exists for each feature.
  - There will be no temporary sealing of naturally-occurring sensitive features on the site.
9.  **Attachment F - Structural Practices.** A description of the structural practices that will be used to divert flows away from exposed soils, to store flows, or to otherwise limit runoff discharge of pollutants from exposed areas of the site is attached. Placement of structural practices in floodplains has been avoided.
10.  **Attachment G - Drainage Area Map.** A drainage area map supporting the following requirements is attached:
- For areas that will have more than 10 acres within a common drainage area disturbed at one time, a sediment basin will be provided.
  - For areas that will have more than 10 acres within a common drainage area disturbed at one time, a smaller sediment basin and/or sediment trap(s) will be used.
  - For areas that will have more than 10 acres within a common drainage area disturbed at one time, a sediment basin or other equivalent controls are not attainable, but other TBMPs and measures will be used in combination to protect down slope and side slope boundaries of the construction area.
  - There are no areas greater than 10 acres within a common drainage area that will be disturbed at one time. A smaller sediment basin and/or sediment trap(s) will be used in combination with other erosion and sediment controls within each disturbed drainage area.

- There are no areas greater than 10 acres within a common drainage area that will be disturbed at one time. Erosion and sediment controls other than sediment basins or sediment traps within each disturbed drainage area will be used.
11.  **Attachment H - Temporary Sediment Pond(s) Plans and Calculations.** Temporary sediment pond or basin construction plans and design calculations for a proposed temporary BMP or measure have been prepared by or under the direct supervision of a Texas Licensed Professional Engineer. All construction plans and design information must be signed, sealed, and dated by the Texas Licensed Professional Engineer. Construction plans for the proposed temporary BMPs and measures are attached.
- N/A
12.  **Attachment I - Inspection and Maintenance for BMPs.** A plan for the inspection of each temporary BMP(s) and measure(s) and for their timely maintenance, repairs, and, if necessary, retrofit is attached. A description of the documentation procedures, recordkeeping practices, and inspection frequency are included in the plan and are specific to the site and/or BMP.
13.  All control measures must be properly selected, installed, and maintained in accordance with the manufacturer's specifications and good engineering practices. If periodic inspections by the applicant or the executive director, or other information indicate a control has been used inappropriately, or incorrectly, the applicant must replace or modify the control for site situations.
14.  If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize offsite impacts to water quality (e.g., fugitive sediment in street being washed into surface streams or sensitive features by the next rain).
15.  Sediment must be removed from sediment traps or sedimentation ponds not later than when design capacity has been reduced by 50%. A permanent stake will be provided that can indicate when the sediment occupies 50% of the basin volume.
16.  Litter, construction debris, and construction chemicals exposed to stormwater shall be prevented from becoming a pollutant source for stormwater discharges (e.g., screening outfalls, picked up daily).

### ***Soil Stabilization Practices***

*Examples: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, or preservation of mature vegetation.*

17.  **Attachment J - Schedule of Interim and Permanent Soil Stabilization Practices.** A schedule of the interim and permanent soil stabilization practices for the site is attached.

18.  Records must be kept at the site of the dates when major grading activities occur, the dates when construction activities temporarily or permanently cease on a portion of the site, and the dates when stabilization measures are initiated.
19.  Stabilization practices must be initiated as soon as practicable where construction activities have temporarily or permanently ceased.

### ***Administrative Information***

20.  All structural controls will be inspected and maintained according to the submitted and approved operation and maintenance plan for the project.
21.  If any geologic or manmade features, such as caves, faults, sinkholes, etc., are discovered, all regulated activities near the feature will be immediately suspended. The appropriate TCEQ Regional Office shall be immediately notified. Regulated activities must cease and not continue until the TCEQ has reviewed and approved the methods proposed to protect the aquifer from any adverse impacts.
22.  Silt fences, diversion berms, and other temporary erosion and sediment controls will be constructed and maintained as appropriate to prevent pollutants from entering sensitive features discovered during construction.

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# Attachment A

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### **Spill Response Actions**

In the event of an accidental spill:

1. Contractor will take action to contain spill. Contractor may use sand or other absorbent material stockpiled on site to absorb spill. Absorbent material should be spread over the spill area to absorb the spilled product.
2. In the event of an uncontained discharge the contractor will utilize onsite equipment to construct berms downgradient of the spill with sand or other absorbent material to contain and absorb the spilled product.
3. Sand or material used to contain the spill should be collected and stored in such a way so as not to continue to affect additional ground. Once the spill has been contained, collected material should be placed on poly or plastic sheeting until removed from the site. In the event of potential rainfall, the material should be covered with poly or plastic sheeting.
4. The contractor will be required to notify the owner, who will in turn contact TCEQ to notify them in the event of a spill. Additional notifications as required by the type and amount of spill will be conducted by owner or owner's representative.
5. The contractor will be required to report significant or hazardous spills in reportable quantities to:
  - The National Response Center at (800) 424-8802
  - The Edwards Aquifer Authority at (210) 222-2204
  - The TCEQ Regional Office (210) 403-4010 (if during business hours: 8 AM to 5 PM) or
  - The State Emergency Response Center (800) 832-8224 (if after hours)
6. Contaminated soils will be sampled for waste characterization. When the analysis results are known the contaminated soils will be removed from the site and disposed in a permitted landfill in accordance with applicable regulations.

Additional guidance can be obtained from TCEQ's Technical Guidance Manual (TGM) RG-348 (2005) Section 1.4.16. Contractor will review this section.

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# Attachment B

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### **Potential Sources of Contamination**

Potential sources of contamination include:

- Oil, grease, fuel and hydraulic fluid from construction equipment and vehicle drippings;
- Dirt and dust which may fall off construction vehicles;
- Miscellaneous trash and litter from construction workers and material wrappings;
- Concrete truck washout;
- Discharge from sewer lines, manholes and cleans during utility replacements.

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# Attachment C

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### **Sequence of Major Activities**

Site preparation for this project will generally include the following:

1. Grubbing will provide removal of stumps and roots from the sewer improvement alignment. It is anticipated that this may disturb approximately 3.53 acres.
2. Excavation for the sewer improvements is anticipated to disturb approximately 3.53 acres.

Construction would generally include the following:

1. Placement of temporary erosion control devices. It is anticipated that this may disturb a negligible amount of the site area.
2. Excavation of sewer lines, placement of pipe bedding, base material, and placement of asphalt, and concrete material. It is anticipated that this may disturb approximately 3.53 acres.
3. Site cleanup, top dressing, and revegetation (if applicable). It is anticipated that this may disturb the whole project area, approximately 3.53 acres.

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# Attachment D

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### **Temporary Best Management Practices (TBMPs)**

Silt fences, erosion control logs, soil retention blankets, and sodding will be used during and/or after construction and will be installed prior to site preparation, as applicable. Prior to the initiation of construction activities, all previously installed control measures will be repaired or reestablished for their designed or intended purpose.

Engineered temporary sediment control fences will be used to prevent pollution of surface water, groundwater, or stormwater that originates upgradient from the site and flows across the site. This will occur throughout the proposed construction area, where stormwater will originate along Blieders Creek and flow to Landa Lake.

Site preparation, which is the initiation of all activity on the project, will disturb the largest amount of soil. Therefore, before any work can begin, the contractor will be responsible for the installation of all on-site control measures. The methodology for pollution prevention of on-site stormwater will include:

- Erection of temporary sediment control fences along the downgradient boundary of construction activities for temporary erosion and sediment controls.

Prior to the initiation of construction activities, all previously installed control measures will be repaired or reestablished for their designed or intended purpose. This work, which is the remainder of all activity on the project, may also disturb additional soil.

Temporary measures are intended to provide a method of slowing the flow of runoff from the construction site in order to allow sediment and suspended solids to settle out of the runoff. By containing the sediment and solids within the site, they will not enter surface streams and/or sensitive features.

BMP measures utilized in this plan are intended to allow stormwater to continue downstream after passing through the BMPs. This will allow stormwater runoff to continue downgradient to streams and/or features that may exist downstream of this site.

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# Attachment F

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### **Structural Practices**

Structural practices to be used include temporary sediment control fence. Refer to Attachment D for additional details.

# Attachment G

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### **Drainage Area Map**

Please see Erosion And Sedimentation Control for the project's drainage area map.

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# Attachment I

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2700 La Frontera, Suite 150, Round Rock, Texas 78681  
t 512.767.7300 LJA.com

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### **Inspection and Maintenance for BMP's**

Inspections and maintenance will be in accordance with TCEQ construction General Permit No. TXR150000.

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**STORM WATER POLLUTION PREVENTION PLAN  
 INSPECTION AND MAINTENANCE REPORT**

**OTHER CONTROLS  
 STABILIZATION MEASURES:**

INSPECTOR: \_\_\_\_\_ DATE \_\_\_\_\_

DAYS SINCE LAST RAINFALL: \_\_\_\_\_ AMOUNT OF LAST RAINFALL: \_\_\_\_\_ INCHES

AREA	DATE SINCE LAST DISTURBED	DATE OF NEXT DISTURBANCE	STABILIZED?	STABILIZED WITH	CONDITION
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

STABILIZATION REQUIRED:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TO BE PERFORMED BY: \_\_\_\_\_ ON OR BEFORE: \_\_\_\_\_

**STORM WATER POLLUTION PREVENTION PLAN  
 INSPECTION AND MAINTENANCE REPORT**

**OTHER CONTROLS  
 FILTER FABRIC FENCE:**

LOCATION	BOTTOM OF FABRIC STILL BURIED	FABRIC TORN OR SAGGING	POST TIPPING OVER?	HOW DEEP IS THE SEDIMENT?
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

MAINTENANCE REQUIRED FOR SILT FENCE:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TO BE PERFORMED BY: \_\_\_\_\_ ON OR BEFORE: \_\_\_\_\_

Inspector: \_\_\_\_\_ Date: \_\_\_\_\_

**STORM WATER POLLUTION PREVENTION PLAN  
 INSPECTION AND MAINTENANCE REPORT**

**STRUCTURAL CONTROLS  
 ROCK BERM:**

DATE: \_\_\_\_\_

ROCK BERM LOCATION	IS ROCK BERM STABILIZED?	IS THERE EVIDENCE OF WASHOUT OR OVERTOPPING?

MAINTENANCE REQUIRED FOR SILT FENCE:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TO BE PERFORMED BY: \_\_\_\_\_ ON OR BEFORE: \_\_\_\_\_

Inspector: \_\_\_\_\_ Date: \_\_\_\_\_



# Attachment J

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### **Schedule of Interim and Permanent Soil Stabilization Practices**

Interim stabilization would be performed pursuant to TCEQ Construction General Permit TXR150000. All areas not planned for impervious cover (i.e. asphalt, concrete, etc) will be permanently stabilized with soil retention blankets and sodding prior to completion of this project.

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# **Agent Authorization Form (TCEQ-0599)**

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**Agent Authorization Form**  
For Required Signature  
Edwards Aquifer Protection Program  
Relating to 30 TAC Chapter 213  
Effective June 1, 1999

I \_\_\_\_\_ Mr. Garrett Mechler  
Print Name

of \_\_\_\_\_ VP of Operations

' \_\_\_\_\_  
Title - Owner/President/Other

of \_\_\_\_\_ Veramendi PE-Emerald LLC  
Corporation/Partnership/Entity Name

have authorized \_\_\_\_\_ Stuart Cowell, P.E.  
Print Name of Agent/Engineer

of \_\_\_\_\_ LJA Engineering  
Print Name of Firm

to represent and act on the behalf of the above named Corporation, Partnership, or Entity for the purpose of preparing and submitting this plan application to the Texas Commission on Environmental Quality (TCEQ) for the review and approval consideration of regulated activities.

I also understand that:

1. The applicant is responsible for compliance with 30 Texas Administrative Code Chapter 213 and any condition of the TCEQ's approval letter. The TCEQ is authorized to assess administrative penalties of up to \$10,000 per day per violation.
2. For those submitting an application who are not the property owner, but who have the right to control and possess the property, additional authorization is required from the owner.
3. Application fees are due and payable at the time the application is submitted. The application fee must be sent to the TCEQ cashier or to the appropriate regional office. The application will not be considered until the correct fee is received by the commission.
4. A notarized copy of the Agent Authorization Form must be provided for the person preparing the application, and this form must accompany the completed application.
5. No person shall commence any regulated activity on the Edwards Aquifer Recharge Zone, Contributing Zone or Transition Zone until the appropriate application for the activity has been filed with and approved by the Executive Director.

SIGNATURE PAGE:

[Handwritten Signature]  
Applicant's Signature

01/03/2023  
Date

THE STATE OF Texas §

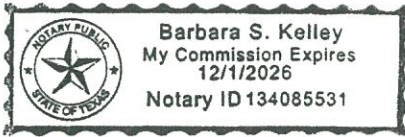
County of Comal §

BEFORE ME, the undersigned authority, on this day personally appeared GARRETT MELHIER known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that (s)he executed same for the purpose and consideration therein expressed.

GIVEN under my hand and seal of office on this 3<sup>rd</sup> day of January, 2023.

Barbara S. Kelley  
NOTARY PUBLIC

BARBARA S. KELLEY  
Typed or Printed Name of Notary



MY COMMISSION EXPIRES: 12/01/2026

# Application Fee Form

## Texas Commission on Environmental Quality

Name of Proposed Regulated Entity: Veramendi Wastewater Extension

Regulated Entity Location: WWL A will run 9,510 LF from start to end. WWL B will tie into WWL A at STA 51+33.49 and go north towards River Rd for 794 LF.

Name of Customer: City of New Braunfels

Contact Person: \_\_\_\_\_

Phone: (512) 761-0061

Customer Reference Number (if issued):CN \_\_\_\_\_

Regulated Entity Reference Number (if issued):RN \_\_\_\_\_

### Austin Regional Office (3373)

Hays

Travis

Williamson

### San Antonio Regional Office (3362)

Bexar

Medina

Uvalde

Comal

Kinney

Application fees must be paid by check, certified check, or money order, payable to the **Texas Commission on Environmental Quality**. Your canceled check will serve as your receipt. **This form must be submitted with your fee payment.** This payment is being submitted to:

Austin Regional Office

San Antonio Regional Office

Mailed to: TCEQ - Cashier

Overnight Delivery to: TCEQ - Cashier

Revenues Section

12100 Park 35 Circle

Mail Code 214

Building A, 3rd Floor

P.O. Box 13088

Austin, TX 78753

Austin, TX 78711-3088

(512)239-0357

### Site Location (Check All That Apply):

Recharge Zone

Contributing Zone

Transition Zone

<i>Type of Plan</i>	<i>Size</i>	<i>Fee Due</i>
Water Pollution Abatement Plan, Contributing Zone Plan: One Single Family Residential Dwelling	Acres	\$
Water Pollution Abatement Plan, Contributing Zone Plan: Multiple Single Family Residential and Parks	Acres	\$
Water Pollution Abatement Plan, Contributing Zone Plan: Non-residential	Acres	\$
Sewage Collection System	10,438 L.F.	\$ 5,219
Lift Stations without sewer lines	Acres	\$
Underground or Aboveground Storage Tank Facility	Tanks	\$
Piping System(s)(only)	Each	\$
Exception	Each	\$
Extension of Time	Each	\$

Signature: 

Date: 03/13/2023

## Application Fee Schedule

Texas Commission on Environmental Quality

Edwards Aquifer Protection Program 30 TAC Chapter 213 (effective 05/01/2008)

### **Water Pollution Abatement Plans and Modifications**

#### **Contributing Zone Plans and Modifications**

<i>Project</i>	<i>Project Area in Acres</i>	<i>Fee</i>
One Single Family Residential Dwelling	< 5	\$650
Multiple Single Family Residential and Parks	< 5	\$1,500
	5 < 10	\$3,000
	10 < 40	\$4,000
	40 < 100	\$6,500
	100 < 500	\$8,000
	≥ 500	\$10,000
Non-residential (Commercial, industrial, institutional, multi-family residential, schools, and other sites where regulated activities will occur)	< 1	\$3,000
	1 < 5	\$4,000
	5 < 10	\$5,000
	10 < 40	\$6,500
	40 < 100	\$8,000
	≥ 100	\$10,000

#### **Organized Sewage Collection Systems and Modifications**

<i>Project</i>	<i>Cost per Linear Foot</i>	<i>Minimum Fee- Maximum Fee</i>
Sewage Collection Systems	\$0.50	\$650 - \$6,500

#### **Underground and Aboveground Storage Tank System Facility Plans and Modifications**

<i>Project</i>	<i>Cost per Tank or Piping System</i>	<i>Minimum Fee- Maximum Fee</i>
Underground and Aboveground Storage Tank Facility	\$650	\$650 - \$6,500

#### **Exception Requests**

<i>Project</i>	<i>Fee</i>
Exception Request	\$500



***Extension of Time Requests***

<b><i>Project</i></b>	<b><i>Fee</i></b>
Extension of Time Request	\$150

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# Core Data Form (TCEQ-10400)

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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

<b>1. Reason for Submission</b> (If other is checked please describe in space provided.)		
<input checked="" type="checkbox"/> New Permit, Registration or Authorization (Core Data Form should be submitted with the program application.)		
<input type="checkbox"/> Renewal (Core Data Form should be submitted with the renewal form)	<input type="checkbox"/> Other	
<b>2. Customer Reference Number (if issued)</b>	<a href="#">Follow this link to search for CN or RN numbers in Central Registry**</a>	<b>3. Regulated Entity Reference Number (if issued)</b>
CN		RN 1104433

## SECTION II: Customer Information

<b>4. General Customer Information</b>		<b>5. Effective Date for Customer Information Updates (mm/dd/yyyy)</b>	
<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)	
<b>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).</b>			
<b>6. Customer Legal Name</b> (If an individual, print last name first: eg: Doe, John)		If new Customer, enter previous Customer below:	
Veramendi-PE Emerald LLC			
<b>7. TX SOS/CPA Filing Number</b>	<b>8. TX State Tax ID</b> (11 digits)	<b>9. Federal Tax ID</b> (9 digits)	<b>10. DUNS Number</b> (if applicable)
0803277761	32070223675		
<b>11. Type of Customer:</b>	<input checked="" type="checkbox"/> Corporation	<input type="checkbox"/> Individual	Partnership: <input type="checkbox"/> General <input checked="" 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:	
<b>12. Number of Employees</b>		<b>13. Independently Owned and Operated?</b>	
<input type="checkbox"/> 0-20 <input checked="" type="checkbox"/> 21-100 <input type="checkbox"/> 101-250 <input type="checkbox"/> 251-500 <input type="checkbox"/> 501 and higher		<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>14. Customer Role</b> (Proposed or Actual) – as it relates to the Regulated Entity listed on this form. Please check one of the following:			
<input checked="" type="checkbox"/> Owner <input type="checkbox"/> Operator <input type="checkbox"/> Owner & Operator			
<input type="checkbox"/> Occupational Licensee <input type="checkbox"/> Responsible Party <input type="checkbox"/> Voluntary Cleanup Applicant <input type="checkbox"/> Other:			
<b>15. Mailing Address:</b>	Veramendi-PE Emerald LLC		
	2156 Oak Run Pkwy		
	City	New Braunfels	State TX ZIP 78132 ZIP + 4
<b>16. Country Mailing Information</b> (if outside USA)		<b>17. E-Mail Address</b> (if applicable)	
		james.tipton@asaproperties.us.com	
<b>18. Telephone Number</b>	<b>19. Extension or Code</b>	<b>20. Fax Number</b> (if applicable)	
( 512 ) 761-0061		( ) -	

## SECTION III: Regulated Entity Information

<b>21. General Regulated Entity Information</b> (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 type="checkbox"/> Update to Regulated Entity Information	
<b>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.)</b>	
<b>22. Regulated Entity Name</b> (Enter name of the site where the regulated action is taking place.)	
Veramendi Wastewater Extension Line	

23. Street Address of the Regulated Entity: <i>(No PO Boxes)</i>	Veramendi-PE Emerald LLC						
	2156 Oak Run Pkwy						
	City	New Braunfels	State	TX	ZIP	78132	ZIP + 4
24. County	Comal						
<b>Enter Physical Location Description if no street address is provided.</b>							
25. Description to Physical Location:	APPROXIMATELY 0.5 MI NW OF RIVER RD AND HWY 46						
26. Nearest City					State	Nearest ZIP Code	
New Braunfels					TX	78131	
27. Latitude (N) In Decimal:	29.7317			28. Longitude (W) In Decimal:	-98.1331		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds		
29	43.8	6.12	-98	7.8	11.16		
29. Primary SIC Code (4 digits)	30. Secondary SIC Code (4 digits)		31. Primary NAICS Code (5 or 6 digits)		32. Secondary NAICS Code (5 or 6 digits)		
1623			237111				
33. What is the Primary Business of this entity? <i>(Do not repeat the SIC or NAICS description.)</i>							
Wastewater line extension							
34. Mailing Address:	Mr. Garrett Mechler						
	396 North Seguin Avenue						
	City	New Braunfels	State	TX	ZIP	78131	ZIP + 4
35. E-Mail Address:							
36. Telephone Number			37. Extension or Code		38. Fax Number <i>(if applicable)</i>		
( ) -					( ) -		

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.

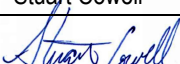
<input type="checkbox"/> Dam Safety	<input type="checkbox"/> Districts	<input checked="" type="checkbox"/> Edwards Aquifer	<input type="checkbox"/> Emissions Inventory Air	<input type="checkbox"/> Industrial Hazardous Waste
<input type="checkbox"/> Municipal Solid Waste	<input type="checkbox"/> New Source 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:	Stuart Cowell			41. Title:	Senior Project Manager		
42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address				
( 512 ) 439-4600	4717	( ) -	scowell@lja.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:	LJA Engineering	Job Title:	Senior Project Manager				
Name <i>(In Print)</i> :	Stuart Cowell			Phone:	( 512 ) 439-4600		
Signature:				Date:	3/28/2023		