

*Prepared for*



**Lower Colorado River Authority (LCRA)**  
P.O. Box 220  
Austin, Texas 78767

**CLOSURE PLAN AND POST-CLOSURE PLAN  
FOR COMBUSTION BYPRODUCT LANDFILL  
REGISTRATION NO. 31575**

LCRA FAYETTE POWER PROJECT  
FAYETTE COUNTY, TEXAS

*Prepared by*

**Geosyntec**   
consultants

8217 Shoal Creek Blvd., Suite 200  
Austin, Texas 78757

October 2016

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## 1. INTRODUCTION

### 1.1 Purpose

This document presents the Closure Plan and Post-Closure Plan for the Combustion Byproduct Landfill (CBL) at LCRA's Fayette Power Project (FPP). The plans were prepared to comply with the United States Environmental Protection Agency's (USEPA's) requirements for written closure and post-closure plans (40 CFR §257.102(b) and 104(d)) for coal combustion residuals (CCR) landfills. The report was prepared by Geosyntec Consultants (Geosyntec) under the direction of Dr. Beth A. Gross, P.E., a qualified professional engineer.

### 1.2 Background

The FPP is a coal-fired power plant located east of La Grange in Fayette County, Texas. CCR generated at the facility are disposed in the CBL, a CCR landfill located south of the power plant and north of the railroad that borders the FPP site (Drawing 1). At final buildout, the CBL will consist of up to three cells, Cells 1 to 3 (Drawing 2). Depending on the rates of CCR production and beneficial use, all cells may not be needed for CCR disposal and the final CBL footprint would be smaller (e.g., Cells 1 and 2, Drawing 3).

Cell 1 was constructed in 1988 with a recompacted clay liner installed over natural clay subgrade. This liner is equivalent to the liner recommended at that time in Texas Water Commission (TWC) Guideline No. 3 for Class 2 industrial waste landfills: a 2-foot thick (minimum) recompacted clay-rich liner or 3 feet of in-place soil exhibiting a permeability less than  $1 \times 10^{-7}$  cm/s (TWC, 1988). The northern slope of Cell 1 was closed with a final cover system in 1992 (Drawing 2). From October 2014 to May 2015, Subcell 2D was constructed with a 3-foot thick compacted clay liner with a hydraulic conductivity less than  $1 \times 10^{-7}$  cm/s, which meets the recommendations of Texas Commission on Environmental Quality (TCEQ) Technical Guideline No. 3 (2015) for Class 2 monofills of consistent, well characterized waste. This subcell currently includes a contact water retention pond lined with a geomembrane/compacted clay composite liner (Drawing 2). Subcell 2D is being used as a waste storage/product preparation area during CCR operations in Cell 1 and future Subcells 2A, 2B and 2C. Cell 1 and Subcell 2D are existing CCR landfill areas under 40 CFR §257.53. The remainder of Cells 2 and 3 will be constructed with a liner system that meets the requirements of 40 CFR §257.70(b) and (d), which includes a leachate collection system and underlying geomembrane/compacted clay composite liner.

Runoff from active areas in Cell 1 of the CBL currently drains to the Runoff Retention Pond via the runoff channel (Drawing 2). Contact water from the Subcell 2D Contact Water Retention Pond can also drain to the Runoff Retention Pond by pumping it to the runoff channel. The Runoff Retention Pond is permitted under LCRA's Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0002105000 and is designated as the CBL Pond in the permit. The permit allows water in the pond to be managed by conveying it to the FPP Reclaim Pond or,

if effluent limitations are met, by discharging via Outfall 004. The Runoff Retention Pond will be used for management of contact water and leachate from the active area until the Leachate Evaporation Pond (Drawing 4) is constructed, which will occur prior to disposal of CCR in Subcell 2A (Drawing 4).

Stormwater run-off from the final cover system of the CBL flows in drainage channels along the perimeter of the CBL that primarily discharge south of the CBL but also discharge to a drainage ditch north of the CBL. When CCR disposal operations are initiated in Cell 2, the majority of stormwater run-off from the final cover system will flow into a stormwater pond prior to being discharged from the site (Drawing 4).

### **1.3 Organization of Plan**

The remainder of this Plan is organized as follows:

- Section 2 presents a narrative description of the CBL closure process, including estimates of the maximum inventory of CCR in the CBL that could ever be on site and the largest area of the CBL that would require final cover system at any time during the active life of the CBL (40 CFR §257.102(b)(1)(iv) and (v));
- Section 3 describes the design and installation procedures for a final cover system for the CBL that meets the closure performance standard (40 CFR §257.102(b)(1)(iii) and (d));
- Section 4 presents a schedule for completing closure activities (40 CFR §257.102(b)(1)(vi));
- Section 5 presents a narrative description of the CBL post-closure process (40 CFR §257.104(d));
- Section 6 presents a certification by a qualified professional engineer that this Closure and Post-Closure Plan meets the requirements of 40 CFR §257.102(b); and
- Section 7 provides a list of references cited in the Plan.

## **2. CBL CLOSURE**

### **2.1 Overview**

The CBL will be closed in accordance with recognized and generally accepted good engineering practices as described in this Closure Plan. Closure of the CBL will be accomplished by leaving CCR in place and constructing a final cover system over the CCR. Closure of the CBL also includes installing associated stormwater management features and establishing vegetation on the final cover. When no longer needed for management of CCR, contact water, and leachate, facility equipment will be cleaned and decontaminated and ancillary components will be removed.

### **2.2 Largest Area Requiring Final Cover**

The largest area of the CBL that would ever require a final cover during the active life of the CBL is approximately 22 acres. This area represents the CBL as it currently exists (Drawing 2). It is anticipated that the CBL will undergo partial closure, in 10 to 15 acre increments, as additional cells are constructed through a phased installation of final cover system as sections of the landfill are brought to their final design top of waste grades. Therefore, the current scenario of a 22-acre active area is a temporary condition that is not expected to exist after Subcell 2A is constructed.

### **2.3 Maximum Waste Inventory**

The CBL is designed to be developed with two cells (Drawing 3) or three cells (Drawing 5), depending on the total CCR disposal capacity required. The maximum inventory of CCR in the CBL will occur if three cells are developed and filled. For this scenario (Drawing 5), the calculated maximum waste inventory in the CBL is approximately 12,400,000 cubic yards. If the CBL is closed prematurely as Cell 1 only, the maximum inventory of CCR requiring a final cover in the 22-acre active area of the cell is approximately 2,400,000 cubic yards.

### **2.4 Closure Activities**

The closure activities for the CBL, organized in general accordance with the sequence in which they will occur during a closure event, are summarized below.

- Notification of Intent to Close. In accordance with 40 CFR §257.102(g), no later than the date of closure initiation, a notice of intent to close the CBL or portion thereof will be prepared and placed in the facility's Operating Record. The notification will include a certification by a qualified professional engineer that the design of the final cover system meets the requirements of 40 CFR §257.102(d)(3).
- Construct Final Cover System and Install Stormwater Management Features. After the final cover system subgrade has been graded and surveyed, the final cover system

components will be constructed and the stormwater management features will be installed. The design and installation of the final cover system is described in Section 3 of this Closure Plan.

- Equipment Cleaning and Decontamination. During final facility closure, facility equipment that contacted waste during active operations or closure activities will be cleaned prior to moving the equipment from the facility or placing it into service for post-closure activities.

## **2.5 Certification of Closure Completion**

In accordance with 40 CFR §257.102(f)(3), upon completion of closure of the CBL or portion thereof, a certification from a qualified professional engineer must be obtained to confirm that closure has been completed in accordance with the Closure Plan and the requirements of 40 CFR §257.102(d). Note that this certification is not required for the approximately 7.9 acres of final cover previously constructed over the north end of Cell 1 as that area was closed in 1992, more than two decades before the effective date of 40 CFR §257.102(f)(3),

In accordance with 40 CFR §257.102(h), within 30 days of completion of closure of the CBL or portion thereof, a notification of closure will be prepared and placed in the facility's Operating Record. The notification will include the professional engineer certification of closure.

## **2.6 Deed Notation**

In accordance with 40 CFR §257.102(i), following closure of the CBL, a notation will be recorded on the facility deed indicating that: (i) the property has been used for CCR disposal; and (ii) the use of the property is restricted under the post-closure care requirements as provided by 40 CFR §257.104(d)(1)(iii).

In accordance with 40 CFR §257.102(i)(3), within 30 days of recording the deed notation, a notification stating that the notation has been recorded in the Fayette County Deed Records will be placed in the facility's Operating Record.

## **2.7 Amendment of Closure Plan**

In accordance with 40 CFR §257.102(b)(3), this Closure Plan may be amended at any time. Any amendment of the Closure Plan requires a written certification by a qualified professional engineer that the amendment meets the requirements of 40 CFR §257.102(b).

When conditions occur that necessitate a change to the Closure Plan, it must be amended within the following timeframes:

- at least 60 days prior to changing the operation of the CBL in a manner that would substantially affect the activities described in this Closure Plan;

- within 60 days after an unanticipated event requires the need to revise the activities described in this Closure Plan, if closure activities have not yet been initiated for the CBL; and
- within 30 days after an unanticipated event requires the need to revise the activities described in this Closure Plan, if closure activities are underway.



### **3. FINAL COVER SYSTEM**

#### **3.1 Closure Performance Standard**

The CBL will be closed in a manner that meets the performance standard of 40 CFR §257.102(d). As such, it will be closed with a final cover system designed to isolate CCR from surface water and the atmosphere, promote good surface drainage, minimize erosion, minimize water infiltration into the underlying CCR and thus leachate generation and potential release, provide for slope stability, and minimize the need for further maintenance.

#### **3.2 Final Cover Grades**

Consistent with the closure performance standard of 40 CFR §257.102(d), the final cover system of the CBL will be graded to promote runoff and minimize erosion. The final grades (top of final cover system) for the CBL are shown on Drawings 3 for the scenario with Cells 1 and 2 constructed. The final cover system will have a maximum elevation of approximately 470 feet above mean sea level, minimum top deck slope of 3%, and maximum side slope of 3 horizontal: 1 vertical (Drawings 3). The side slopes will include 12-foot (minimum) wide drainage benches orientated approximately parallel to the slopes with a maximum vertical spacing of 63 feet. The maximum spacing of the drainage benches was selected to limit calculated annual soil loss to 3 tons/acre/year consistent with TCEQ guidance (TCEQ, 2007). The CBL perimeter will include a perimeter berm consisting of compacted soil with exterior side slopes of 3 horizontal: 1 vertical. Landfill cross sections showing the overall CBL configuration for the scenario with Cells 1 and 2 constructed are presented on Drawing 6.

#### **3.3 Stormwater Management**

For the scenario with Cells 1 and 2 constructed, the stormwater management system for the CBL is designed to divert surface water run-on from a 100-year, 24-hour storm event (rainfall depth of 10.5 inches) as recommended by TCEQ (2015). It is also designed to control runoff from that design storm. Designing the stormwater management system on the final cover system to accommodate runoff from a 100-year, 24-hour storm event reduces the potential for overtopping of the stormwater features during intense precipitation events and, hence, meets the final cover system performance goal of minimizing the need for further final cover maintenance. The stormwater management features will include drainage benches orientated approximately parallel to the final cover system side slopes and drainage downchutes that intersect the drainage benches and convey runoff to a perimeter drainage channel and then to one or two Stormwater Ponds (Drawings 3 and 4).

#### **3.4 Final Cover System Configuration**

In accordance with 40 CFR § 257.102 (d)(3)(i), the final cover system must consist of at least two components: (i) a low-permeability infiltration layer (i.e., barrier layer) that minimizes

infiltration of liquids into the closed CCR unit, and (ii) an overlying erosion layer (i.e., vegetative support layer) that is capable of sustaining native plant growth. The permeability of the infiltration layer for a final cover system must be less than or equal to the permeability of the liner or no greater than  $1 \times 10^{-5}$  cm/sec, whichever is less, and the thickness of this layer must be at least 18 inches (40 CFR § 257.102 (d)(3)(i)(A) and (B)). The thickness of the erosion layer must be at least 6 inches (40 CFR § 257.102 (d)(3)(i)(C)).

The final cover system recommended in TCEQ Technical Guideline No. 3 (2015) for Class 2 monofills of consistent, well characterized waste consists of a 3-foot thick compacted clay layer with a hydraulic conductivity no greater than  $1 \times 10^{-7}$  cm/sec and an overlying 18-inch thick uncompacted topsoil layer. Further, TCEQ recommends a drainage layer beneath the topsoil to reduce infiltration through the cover and increase slope stability.

In 1992, an approximately 7.9 acre area on the north side of Cell 1 was closed with a final cover system consisting of a 2-foot thick compacted clay layer (with hydraulic conductivity no greater than  $1 \times 10^{-7}$  centimeter/second [cm/s]) overlain by 1 foot of general fill and at least 1 foot of topsoil. In the March 2013 Revision to Notification for the Combustion Byproduct Landfill (Geosyntec, 2013), two final cover system designs generally consistent with the recommendations of TCEQ (2015) were identified for final closure. These closure designs have been modified, where necessary, to meet the requirements of 40 CFR §257.102(d)(3)(i). Either of these options may be implemented as the CBL is incrementally closed.

The Option 1 final cover system meets both the requirements of 40 CFR § 257.102 (d)(3)(i) and the recommendations of TCEQ (2015) and consists of, from top to bottom:

- 18-inch thick vegetative support layer (erosion layer); and
- 3-foot thick compacted clay layer (infiltration layer) with a hydraulic conductivity no greater  $1 \times 10^{-7}$  cm/s.

The slope stability calculations presented subsequently in Section 3.6 demonstrate that an internal drainage layer is not needed to provide slope stability of the Option 1 final cover system. Further the existing final cover system constructed on the north side of Cell 1 has performed well, without evidence of slope instability, over the 24 years since it was constructed.

The Option 2 final cover system meets the requirements of 40 CFR § 257.102 (d)(3)(i) and the recommended erosion layer thickness of TCEQ (2015) and consists of the following components, from top to bottom (40 CFR §257.102(d)(3)(i)):

- 18-inch thick vegetative support layer (erosion layer);
- double-sided geocomposite drainage layer (required on side slopes only); and

composite cap (infiltration layer) with a 40-mil thick textured linear low density polyethylene (LLDPE) geomembrane upper component and an 18-inch thick compacted clay lower component with a hydraulic conductivity no greater  $1 \times 10^{-5}$  cm/s; CCR may be used to construct the barrier below the geomembrane component for the final cover system if such barrier meets the hydraulic conductivity and maximum particle size criteria of the compacted clay layer.

### **3.5 Design and Installation of Final Cover System Components**

#### **3.5.1 Infiltration Layer**

The final cover system infiltration layer will be a composite cap or a compacted clay layer. The infiltration layer is designed with a low hydraulic conductivity to minimize water infiltration into the underlying CCR.

- Compacted Clay. The compacted clay component of the final cover system will meet the following material specifications:
  - maximum particle size of 2 in.;
  - no more than 10% retained on the No. 4 sieve;
  - no less than 30% passing the No. 200 sieve;
  - minimum liquid limit of 30;
  - minimum plasticity index of 15; and
  - maximum hydraulic conductivity of  $1 \times 10^{-5}$  cm/s when the compacted clay layer is a component of a composite infiltration layer and  $1 \times 10^{-7}$  cm/s when the compacted clay layer is the infiltration layer.

The compacted clay will be placed in 9-inch thick (maximum) loose lifts to allow adequate compaction to be achieved throughout the overall layer thickness. The clay will be compacted to at least 95% of its Standard Proctor maximum dry density at a moisture content from 0 to 4 percentage points wet of the optimum to form a low hydraulic conductivity layer. Prior to installation of an overlying geomembrane, the surface of the compacted clay layer will be inspected and verified to be smooth and few of particles greater than ½ inch in diameter, sticks, roots, sharp objects, and other deleterious objects that could damage the geomembrane.

- Geomembrane. The textured LLDPE geomembrane will be placed in direct contact with the underlying compacted clay layer so that a compression seal (composite barrier) forms

between the two layers from the overburden load. After geomembrane panels are deployed, they will be welded together to create a continuous sheet.

### 3.5.2 Geocomposite Drainage Layer

A geocomposite drainage layer will be installed between the erosion layer and the infiltration layer on landfill side slopes when a composite infiltration layer is used. The purpose of the geocomposite drainage layer is to reduce the head of water on the infiltration layer, thereby reducing the potential for leakage into the infiltration layer and enhancing the slope stability of the final cover system side slopes. The geocomposite will consist of a high density polyethylene (HDPE) geonet with a nonwoven geotextile bonded to its top and bottom surfaces (i.e., double-sided geocomposite). Water collected in the drainage layer will be conveyed to the edges of the final cover system where it will exit into the stormwater management system.

### 3.5.3 Erosion Layer

The final cover system erosion layer will be a vegetative support layer. The vegetative support layer will be placed on top of the geocomposite drainage layer, vegetated, and maintained to prevent erosion.

## 3.6 Final Cover Slope Stability

An infinite slope stability analysis was conducted for the two final cover system options. Based on TCEQ (2015), the target factor of safety is 1.3 using peak strength and 1.0 using residual strength. For Option 1, the critical interface is between the vegetative support layer (saturated) and the underlying compacted clay layer. For Option 2, the critical interface for slope stability is between the geomembrane and the underlying compacted clay layer. The factor of safety for stability of an infinite slope that may include a saturated zone that acts on a critical interface can be calculated using a simplified version of the Giroud et al. (1995) equation:

$$FS = \left( \frac{\gamma_{sat} - \gamma_w}{\gamma_{sat}} \right) \frac{\tan\phi}{\tan\beta} + \frac{c/\sin\beta}{\gamma_{sat}t}$$

where:  $\gamma_{sat}$  = saturated soil unit weight;  $\gamma_w$  = water unit weight = 0 if there is not a hydraulic head in the soil layer;  $\phi$  = geosynthetic interface friction angle or soil internal friction angle;  $\beta$  = slope angle;  $c$  = geosynthetic interface adhesion (assumed to be 0) or soil cohesion; and  $t$  = soil thickness.

The input parameters used to evaluate the slope stability of the two final cover options on the CBL side slopes were selected based on published interface shear strengths, data from Geosyntec's project database, and the final cover side slope inclination. For Option 1, the following input parameters were selected:  $\gamma_{sat}$  = 105 pcf,  $\gamma_w$  = 62.4 pcf;  $\phi$  = 28° (peak) and 20° (residual);  $\beta$  = 18.4°;  $c$  = 50 psf; and  $t$  = 1.5 ft. With these parameters, the calculated FSs are 1.65 (peak) and 1.45 (residual), respectively. The following input parameters were selected for Option

2:  $\gamma_{\text{sat}} = 105$  pcf,  $\gamma_w = 0$  pcf,  $\phi = 25^\circ$  (peak) and  $19^\circ$  (residual),  $\beta = 18.4^\circ$ ,  $c = 0$  psf, and  $t = 1.5$  ft. With these parameters, the calculated FSs are 1.40 (peak) and 1.03 (residual), respectively. The calculated FS values exceed the minimum slope stability factors of safety recommended by TCEQ (2015).

#### 4. CLOSURE SCHEDULE

The anticipated schedule for implementing the closure activities for the CBL is presented below. Based on the remaining airspace in the CBL of approximately 10,900,000 cubic yards and an annual CCR disposal rate of 160,000 cubic yards, it is calculated that the CBL will reach final grades in approximately 2084 and all closure activities will be completed by 2085, within 6 months after final receipt of CCR or removal of CCR from the CBL.

Table 1. Closure Schedule

Task	Duration (days)	Time (calendar days)
Final receipt of waste for placement in the CBL or removal of CCR from the CBL for beneficial use.	30	-30 – 0
Initiate final closure of CBL and place Notification of Intent to Close in the facility’s Operating Record	0	0
Construct final cover system	150	0 – 150
Equipment cleaning and decontamination	5	115 – 120
Install stormwater management features on final cover system and hydroseed final cover system	45	135 – 180
Closure complete	0	180

In accordance with 40 CFR §257.102(f)(2), the timeframe for completing closure may be extended if it is not feasible to complete closure of the CBL within the required timeframe due to factors beyond the facility’s control (e.g., unusual amounts of precipitation). In that case, a demonstration of infeasibility that includes a narrative discussion providing the basis for additional time will be placed in the facility’s Operating Record.

## **5. CBL POST-CLOSURE**

### **5.1 Introduction**

After the CBL is closed, the facility will enter a 30-year post-closure care period. This section presents the Post-Closure Plan for the facility, which describes how the CBL will be maintained and monitored during the post-closure care period.

### **5.2 Facility Contact**

During the post-closure care period, the primary contact for the CBL will be:

Ms. Nancy Overesch, P.G., CPEA  
LCRA Environmental Compliance and Permitting  
P.O. Box 220, MS H322  
Austin, Texas 78767  
Phone: (512) 578-2939  
Email: [Nancy.Overesh@LCRA.org](mailto:Nancy.Overesh@LCRA.org)

### **5.3 Post-Closure Overview**

The post-closure activities for the CBL will comply with requirements of 40 CFR §257.104 and will begin after closure is completed. Facility activities conducted during the post-closure care period will include:

- maintaining the integrity and effectiveness of the final cover system, including making repairs to the final cover as necessary to correct the effects of settlement, subsidence, erosion, or other events;
- preventing run-on and run-off from eroding or otherwise damaging the landfill final cover;
- maintaining the integrity and effectiveness of the leachate collection system; and
- maintaining the groundwater monitoring system and monitoring groundwater.

### **5.4 Post-Closure Maintenance Activities**

During the post-closure care period, the facility will conduct regularly scheduled inspections of the CBL (Section 5.5) and will perform maintenance as needed to mitigate potential performance issues identified during the inspections. The facility will also continue to conduct groundwater monitoring. Additional details of the maintenance activities are provided below.

- Final Cover System. The upper portion of the final cover system consists of a vegetative support layer, which is overlain in some locations by stormwater management features. A

vegetative cover will be established on the final cover system and maintained to reduce the potential for final cover system erosion. The vegetative cover will be mowed at least once a year to help maintain healthy vegetation, prevent brush and trees from being established, and allow for visual inspection of the final cover system. Areas of missing or deficient vegetation will be re-seeded. Erosion gullies in the vegetative support layer or areas that have standing water due to settlement or subsidence will be repaired by in-filling the gullies or depressions and re-seeding. If erosion or other final cover damage (e.g., burrowing animals) extends through the vegetative support layer, the affected area of the final cover system will be repaired to the same design specifications as the original cover. Stormwater management features on the final cover system or at the CBL perimeter will be maintained as needed (e.g., remove sediment, vegetation, or other obstructions to restore the dimensions and surface of stormwater conveyances).

- Perimeter Berm. The vegetative cover on the perimeter berm will be mowed at least once a year to help maintain healthy vegetation, prevent brush and trees from being established, and allow for visual inspection. Areas of missing or deficient vegetation will be re-seeded. Erosion gullies will be repaired by in-filling the gullies and re-seeding.
- Leachate Collection System. The leachate collection system will be operated during the post-closure period until landfills stops generating leachate. Maintenance will consist of replacing features that are deteriorated or that will not function as intended, as identified during the routine inspections.
- Runoff Retention Pond or Leachate Evaporation Pond. The pond in place at the time of closure will remain in operation during the post-closure care period to receive leachate collected from the CBL. Maintenance will consist of replacing features that are deteriorated or that will not function as intended, as identified during the routine inspections.
- Groundwater Monitoring System. Groundwater monitoring (and associated sampling, analysis, and reporting) will be performed during the post-closure care period. Groundwater monitoring wells will be maintained by keeping the wells unobscured by vegetation and repairing/replacing monitoring well features (casing, bollards, locks, etc.) that are deteriorated or that will not function as intended, as identified during inspections during the monitoring events. Other possible maintenance may include well redevelopment or replacement, as needed.

## **5.5 Post-Closure Inspection Requirements and Frequencies**

The post-closure care inspection requirements and frequencies are presented in Table 2.



Table 2. Post-Closure Inspection Requirements and Frequencies.

Component	Inspection Issue/Item	Inspection Frequency <sup>(1)</sup>
Final Cover System: Vegetative Cover	Erosion, damage or deterioration, inadequate vegetation, slope instability, standing water due to settlement or subsidence	Quarterly and after major storms
Final Cover System: Stormwater Management System	Erosion, siltation, damage or deterioration, standing water due to settlement or subsidence	Quarterly and after major storms
CBL Perimeter Berm	Erosion, inadequate vegetation, surface sloughing, slope instability	Quarterly and after major storms
Leachate Collection System	Presence of leachate in sumps, proper functioning	Quarterly and after major storms
Runoff Retention Pond or Leachate Evaporation Pond	Liquid level in pond, pond liner damage or deterioration, pond perimeter berm conditions (erosion, inadequate vegetation, surface sloughing, slope instability), proper functioning of leachate transmission system to pond	Monthly and after major storms for liquid level in pond; Quarterly and after major storms for other issues/items
Groundwater Monitoring Wells: Integrity Check	Well damage (well casing, base, bollards, etc.), missing or damaged locks, missing or obscured labels	Semi-Annually
Groundwater Monitoring: Sampling and Analysis	Sampling and analysis in accordance with Groundwater Sampling and Analysis Plan	Semi-Annually

Note: (1) The inspection frequencies for the final cover system, perimeter berm, and leachate collection system may be decreased from quarterly to semi-annual and then to annual if the results of the inspections indicate that a reduced inspection frequency is sufficient.

## **5.6 Notification of Completion of Post-Closure**

In accordance with 40 CFR §257.104(e), no later than 60 days following the completion of the post-closure care period, a written notification by a qualified professional engineer verifying that post-closure care has been completed in accordance with this Post-Closure Plan will be placed in the facility's Operating Record.

## **5.7 Post-Closure Land Use**

At this time there are no planned post-closure land uses for the CBL other than open green space. In accordance with 40 CFR §257.104(d)(1)(iii), the post-closure use will not disturb the integrity of the final cover, liner, or any other components of the containment system or the function of the post-closure monitoring systems unless necessary to comply with the CCR regulations.

## **5.8 Amendment of Post-Closure Plan**

In accordance with CFR §257.104(d)(3), this Post-Closure Plan may be amended at any time. Any amendment of the Post-Closure Plan requires a written certification by a qualified professional engineer that the amendment meets the requirements of CFR §257.104(d).

When conditions occur that necessitate a change to the Post-Closure Plan, it must be amended within the following timeframes:

- at least 60 days prior to changing the operation of the CBL in a manner that would substantially affect the activities described in this Post-Closure Plan;
- within 60 days after an unanticipated event requires the need to revise the activities described in this Post-Closure Plan, if post-closure activities have not yet been initiated for the CBL; and
- within 30 days after an unanticipated event requires the need to revise the activities described in this Post-Closure Plan, if post-closure activities are underway.

## 6. PROFESSIONAL ENGINEER CERTIFICATION

Based on the demonstrations and evaluations presented in this Closure Plan and Post-Closure Plan for the Combustion Byproduct Landfill at LCRA's Fayette Power Project, it is my professional opinion that the Plans meet the requirements of 40 CFR §257.102(b), including demonstrating that the final cover system meets the performance standard of 40 CFR §257.102(d).



GEOSYNTEC CONSULTANTS  
F- 1182

*Beth Ann Gross*

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Beth Ann Gross, Ph.D., P.E., D.GE

10/14/2016

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Date

## 7. REFERENCES

Geosyntec Consultants (2013). "Revision to Notification for the Combustion Byproduct Landfill, Registration No. 31575, LCRA Fayette Power Project, Fayette County, Texas," prepared for LCRA, March.

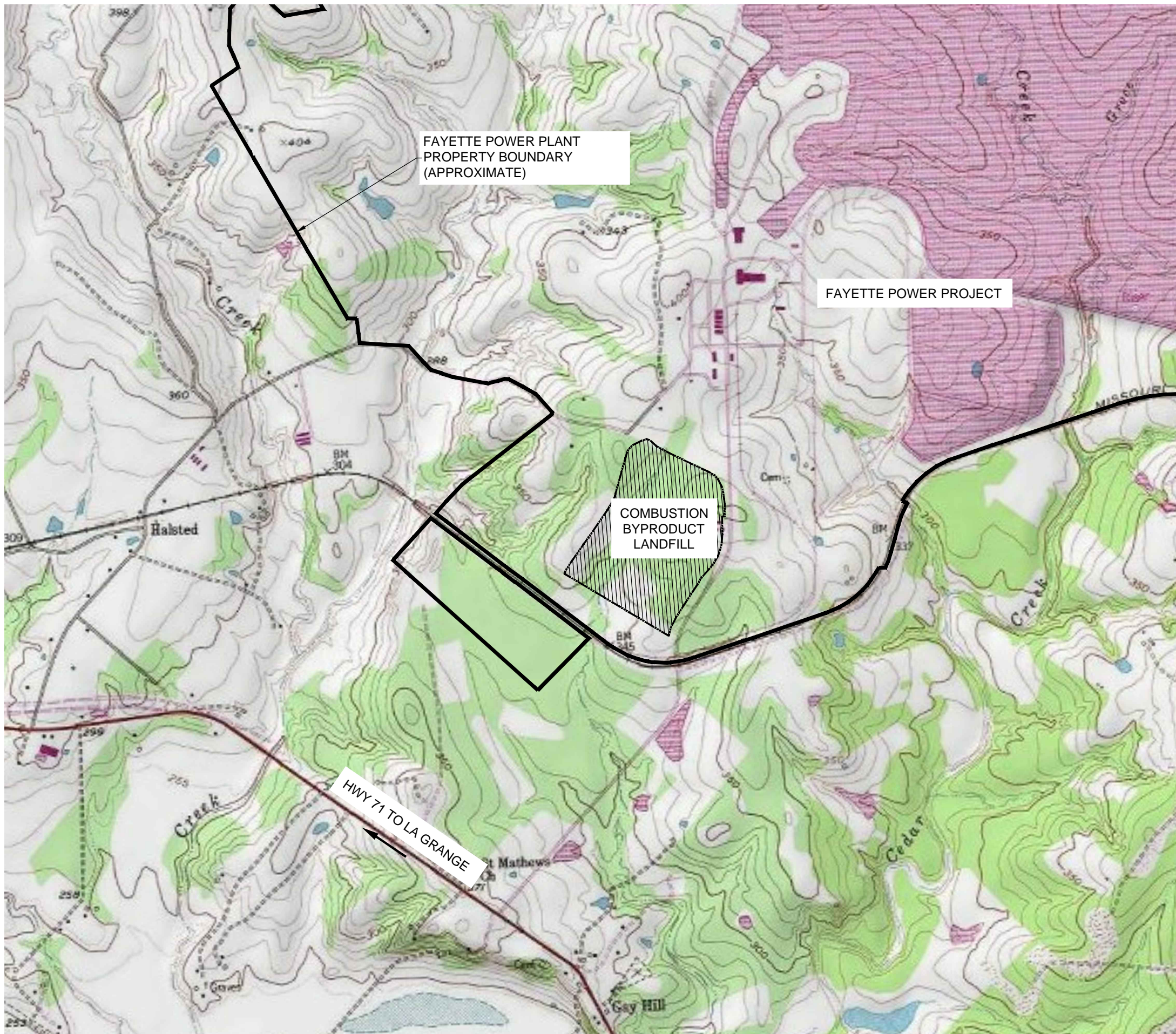
Giroud, J.P., Bachus, R.C., and Bonaparte, R. (1995). "Influence of Water Flow on the Stability of Geosynthetic-Soil Layered Systems on Slopes," *Geosynthetics International*, Vol. 2, No. 6, pp. 1149-1180.

Texas Commission on Environmental Quality (2015). "Nonhazardous Industrial Solid Waste Landfills," Industrial Solid Waste Management, Draft Technical Guideline No. 3.

Texas Commission on Environmental Quality (2007). "Guidance for Addressing Erosional Stability During All Phases of Landfill Operation (Draft)," 14 February.

Texas Water Commission (1988). Letter from Minor Brooks Hibbs, Permits Section Chief, Hazardous and Solid Waste Division of TWC to Tom Remaley, Director of Environmental Quality, LCRA, indicating that the design of Cell 1 substantially conforms to the TWC Industrial Solid Waste Technical Guidelines, Jan 18.

# **DRAWINGS**



FAYETTE POWER PLANT  
PROPERTY BOUNDARY  
(APPROXIMATE)

FAYETTE POWER PROJECT





COMBUSTION  
BYPRODUCT  
LANDFILL

HWY 71 TO LA GRANGE

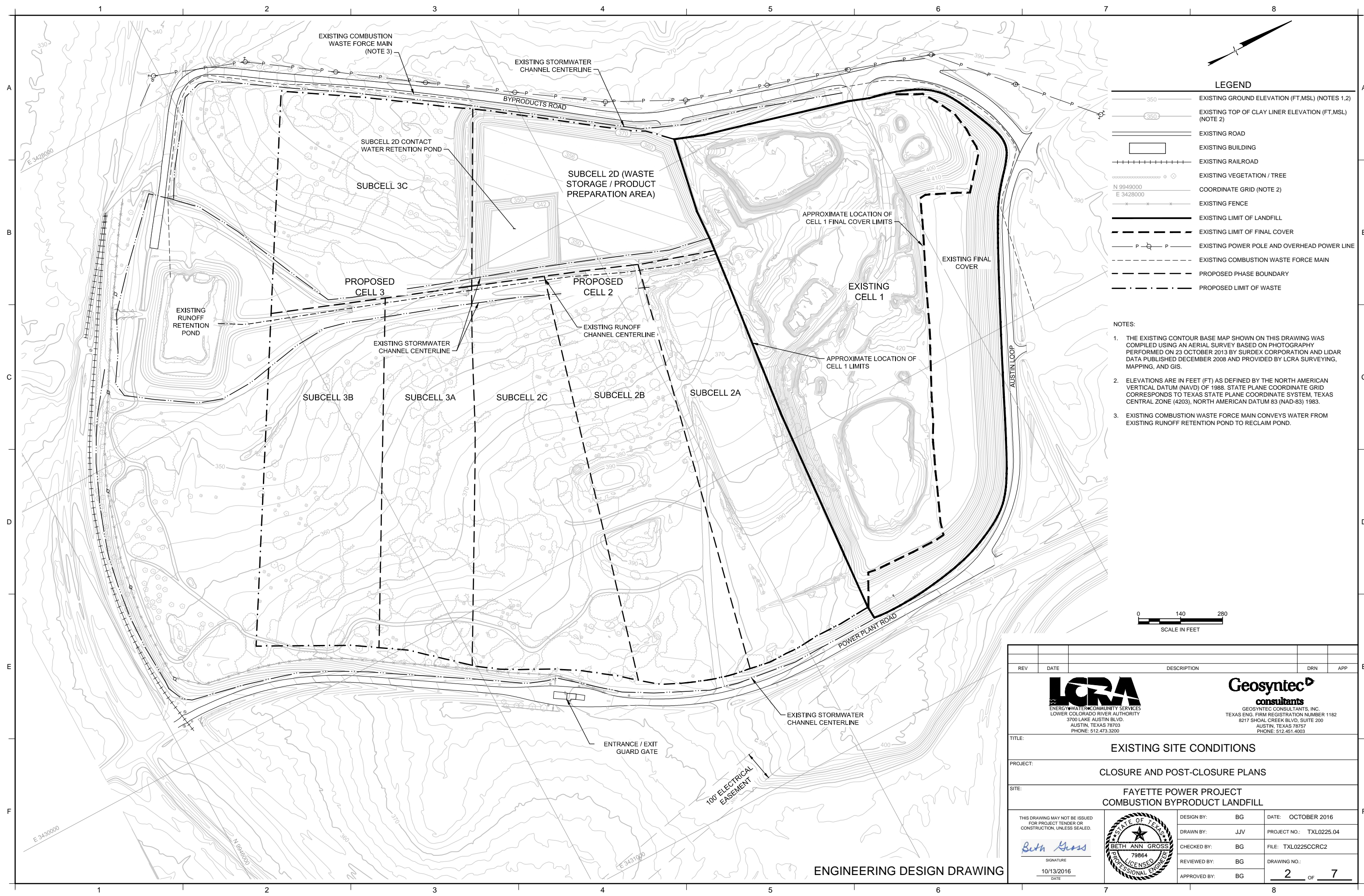


NOTE:  
BASE MAP SOURCE: UNITED STATES GEOLOGIC SURVEY (USGS), 7.5  
MINUTE SERIES QUADRANGLE (TOPOGRAPHIC) MAP OF  
LA GRANGE EAST, TEXAS 1957, REVISED 1981 AND  
FAYETTEVILLE, TEXAS 1958, REVISED 1981



REV	DATE	DESCRIPTION	DRN	APP
  <small>ENERGY WATER COMMUNITY SERVICES LOWER COLORADO RIVER AUTHORITY 3700 LAKE AUSTIN BLVD. AUSTIN, TEXAS 78703 PHONE: 512.473.3200</small>				
TITLE:		OVERALL SITE PLAN		
PROJECT:		CLOSURE AND POST-CLOSURE PLANS		
SITE:		FAYETTE POWER PROJECT COMBUSTION BYPRODUCT LANDFILL		
<small>THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.</small>  SIGNATURE 10/13/2016 DATE		 DESIGN BY: BG DRAWN BY: JJV CHECKED BY: BG REVIEWED BY: BG APPROVED BY: BG		DATE: OCTOBER 2016 PROJECT NO.: TXL0225.04 FILE: TXL0225CCRC1 DRAWING NO.: <b>1</b> OF <b>7</b>

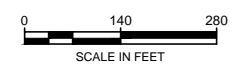
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**LEGEND**

- 350 EXISTING GROUND ELEVATION (FT,MSL) (NOTES 1,2)
- 350 EXISTING TOP OF CLAY LINER ELEVATION (FT,MSL) (NOTE 2)
- EXISTING ROAD
- EXISTING BUILDING
- EXISTING RAILROAD
- EXISTING VEGETATION / TREE
- N 9949000  
E 3428000 COORDINATE GRID (NOTE 2)
- EXISTING FENCE
- EXISTING LIMIT OF LANDFILL
- EXISTING LIMIT OF FINAL COVER
- EXISTING POWER POLE AND OVERHEAD POWER LINE
- EXISTING COMBUSTION WASTE FORCE MAIN
- PROPOSED PHASE BOUNDARY
- PROPOSED LIMIT OF WASTE

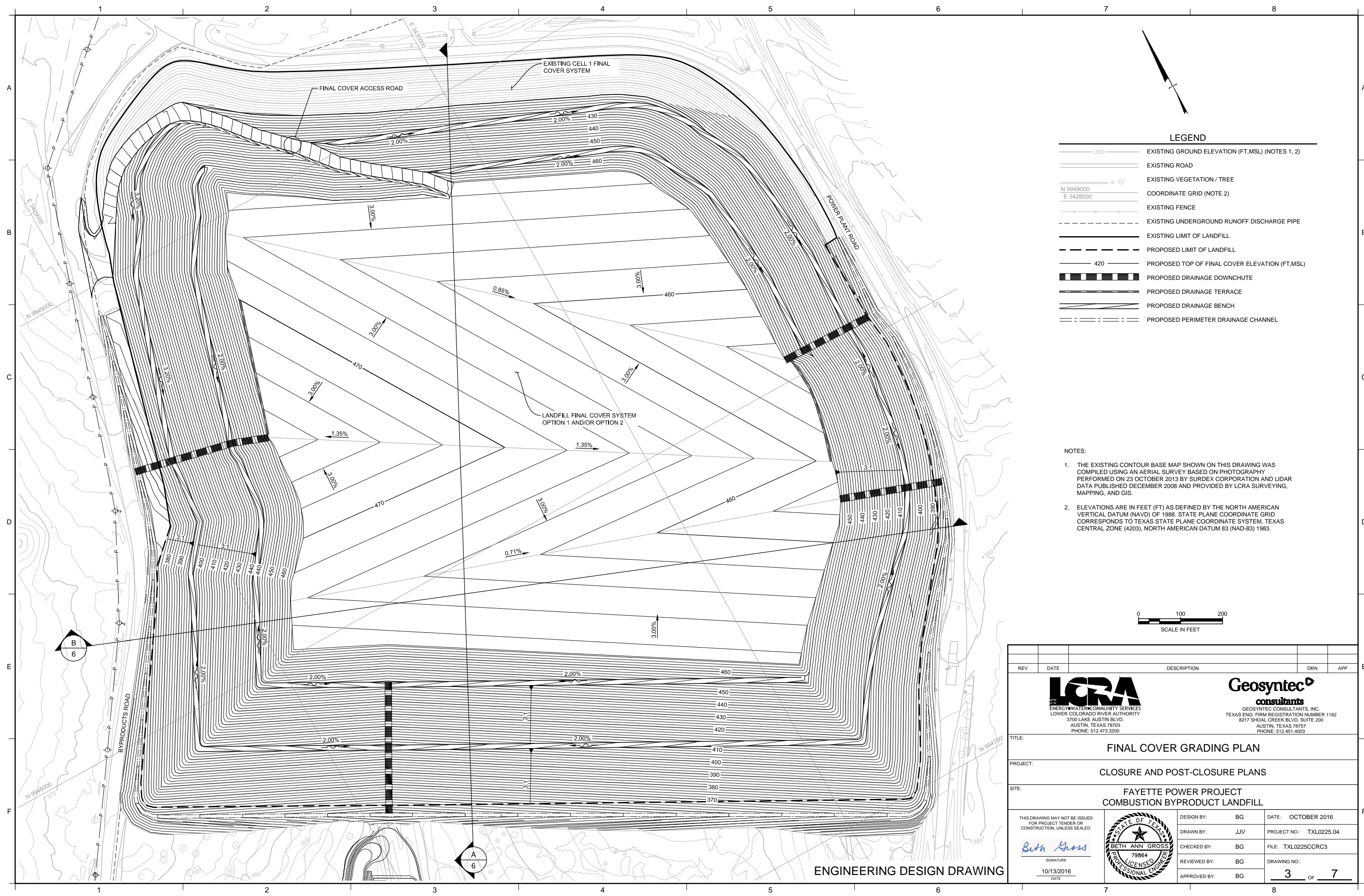
- NOTES:**
1. THE EXISTING CONTOUR BASE MAP SHOWN ON THIS DRAWING WAS COMPILED USING AN AERIAL SURVEY BASED ON PHOTOGRAPHY PERFORMED ON 23 OCTOBER 2013 BY SURDEX CORPORATION AND LIDAR DATA PUBLISHED DECEMBER 2008 AND PROVIDED BY LCRA SURVEYING, MAPPING, AND GIS.
  2. ELEVATIONS ARE IN FEET (FT) AS DEFINED BY THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988. STATE PLANE COORDINATE GRID CORRESPONDS TO TEXAS STATE PLANE COORDINATE SYSTEM, TEXAS CENTRAL ZONE (4203), NORTH AMERICAN DATUM 83 (NAD-83) 1983.
  3. EXISTING COMBUSTION WASTE FORCE MAIN CONVEYS WATER FROM EXISTING RUNOFF RETENTION POND TO RECLAIM POND.



REV	DATE	DESCRIPTION	DRN	APP
		<p style="font-size: small;"> <b>LCRA</b>            ENERGY WATER COMMUNITY SERVICES            LOWER COLORADO RIVER AUTHORITY            3700 LAKE AUSTIN BLVD.            AUSTIN, TEXAS 78703            PHONE: 512.473.3200         </p> <p style="font-size: small;"> <b>Geosyntec consultants</b>            GEOSYNTEC CONSULTANTS, INC.            TEXAS ENG. FIRM REGISTRATION NUMBER 1182            8217 SHOAL CREEK BLVD, SUITE 200            AUSTIN, TEXAS 78757            PHONE: 512.451.4003         </p>		
TITLE: <b>EXISTING SITE CONDITIONS</b>				
PROJECT: <b>CLOSURE AND POST-CLOSURE PLANS</b>				
SITE: <b>FAYETTE POWER PROJECT COMBUSTION BYPRODUCT LANDFILL</b>				
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.			DESIGN BY: BG DRAWN BY: JJV CHECKED BY: BG REVIEWED BY: BG APPROVED BY: BG	DATE: OCTOBER 2016 PROJECT NO.: TXL0225.04 FILE: TXL0225CCR2 DRAWING NO.: <b>2</b> OF <b>7</b>
SIGNATURE  DATE 10/13/2016				

**ENGINEERING DESIGN DRAWING**

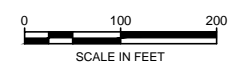
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**LEGEND**

	EXISTING GROUND ELEVATION (FT.MSL) (NOTES 1, 2)
	EXISTING ROAD
	EXISTING VEGETATION / TREE
	COORDINATE GRID (NOTE 2)
	EXISTING FENCE
	EXISTING UNDERGROUND RUNOFF DISCHARGE PIPE
	EXISTING LIMIT OF LANDFILL
	PROPOSED LIMIT OF LANDFILL
	PROPOSED TOP OF FINAL COVER ELEVATION (FT.MSL)
	PROPOSED DRAINAGE DOWNCHUTE
	PROPOSED DRAINAGE TERRACE
	PROPOSED DRAINAGE BENCH
	PROPOSED PERIMETER DRAINAGE CHANNEL

- NOTES:**
1. THE EXISTING CONTOUR BASE MAP SHOWN ON THIS DRAWING WAS COMPILED USING AN AERIAL SURVEY BASED ON PHOTOGRAPHY PERFORMED ON 23 OCTOBER 2013 BY SURDEX CORPORATION AND LIDAR DATA PUBLISHED DECEMBER 2008 AND PROVIDED BY LCRA SURVEYING, MAPPING, AND GIS.
  2. ELEVATIONS ARE IN FEET (FT) AS DEFINED BY THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988. STATE PLANE COORDINATE GRID CORRESPONDS TO TEXAS STATE PLANE COORDINATE SYSTEM, TEXAS CENTRAL ZONE (4203), NORTH AMERICAN DATUM 83 (NAD-83) 1983.

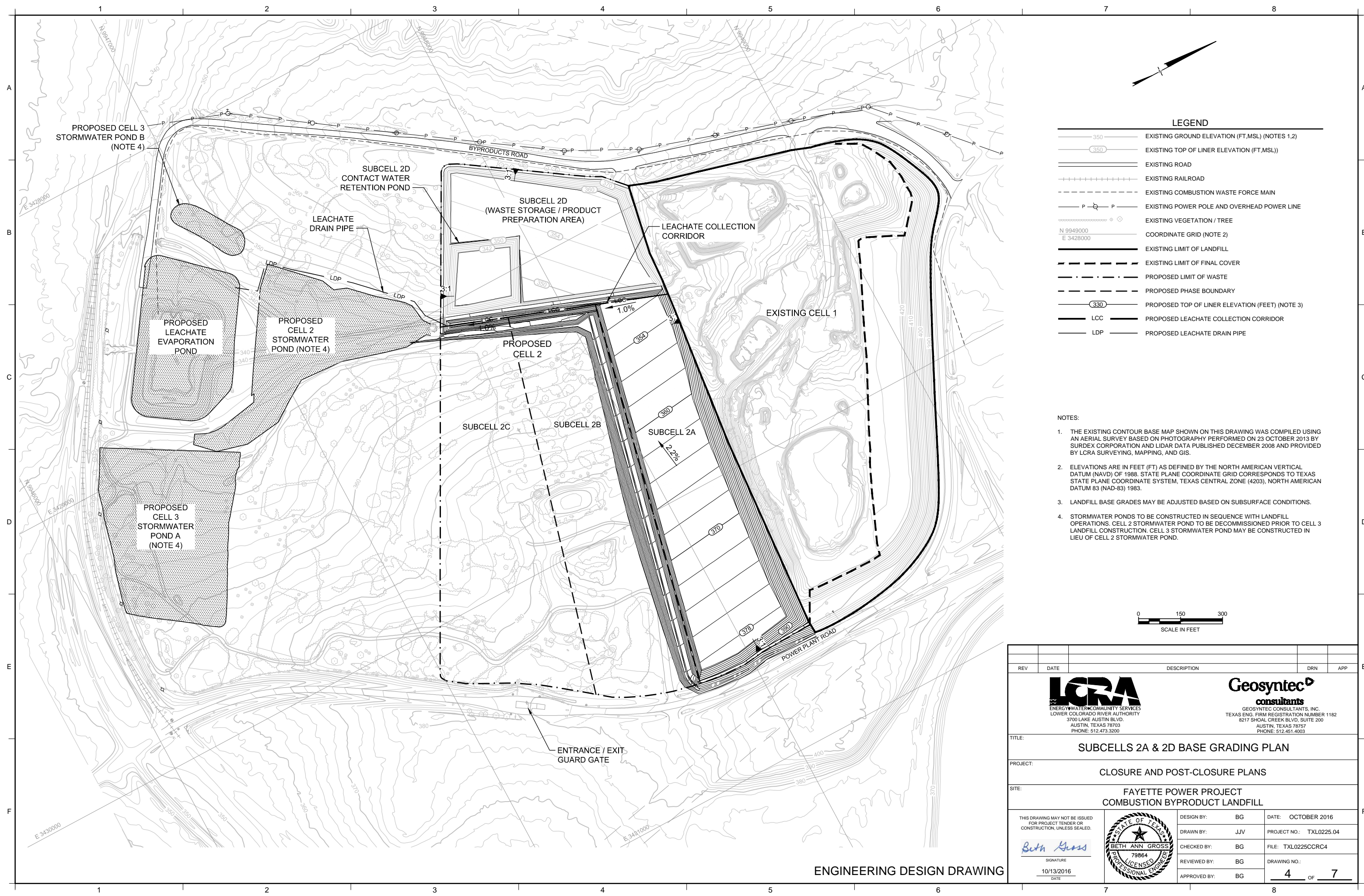


REV	DATE	DESCRIPTION	DRN	APP
 				
<b>TITLE:</b> FINAL COVER GRADING PLAN				
<b>PROJECT:</b> CLOSURE AND POST-CLOSURE PLANS				
<b>SITE:</b> FAYETTE POWER PROJECT COMBUSTION BYPRODUCT LANDFILL				
<small>THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.</small>  SIGNATURE 10/13/2016 DATE				
DESIGN BY:	BG	DATE:	OCTOBER 2016	
DRAWN BY:	JJV	PROJECT NO.:	TXL0225.04	
CHECKED BY:	BG	FILE:	TXL0225CCRC3	
REVIEWED BY:	BG	DRAWING NO.:	3 OF 7	
APPROVED BY:	BG			

ENGINEERING DESIGN DRAWING

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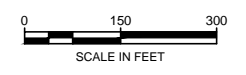


**LEGEND**

- EXISTING GROUND ELEVATION (FT.MSL) (NOTES 1.2)
- EXISTING TOP OF LINER ELEVATION (FT.MSL)
- EXISTING ROAD
- EXISTING RAILROAD
- EXISTING COMBUSTION WASTE FORCE MAIN
- EXISTING POWER POLE AND OVERHEAD POWER LINE
- EXISTING VEGETATION / TREE
- COORDINATE GRID (NOTE 2)
- EXISTING LIMIT OF LANDFILL
- EXISTING LIMIT OF FINAL COVER
- PROPOSED LIMIT OF WASTE
- PROPOSED PHASE BOUNDARY
- PROPOSED TOP OF LINER ELEVATION (FEET) (NOTE 3)
- PROPOSED LEACHATE COLLECTION CORRIDOR
- PROPOSED LEACHATE DRAIN PIPE

**NOTES:**

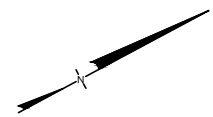
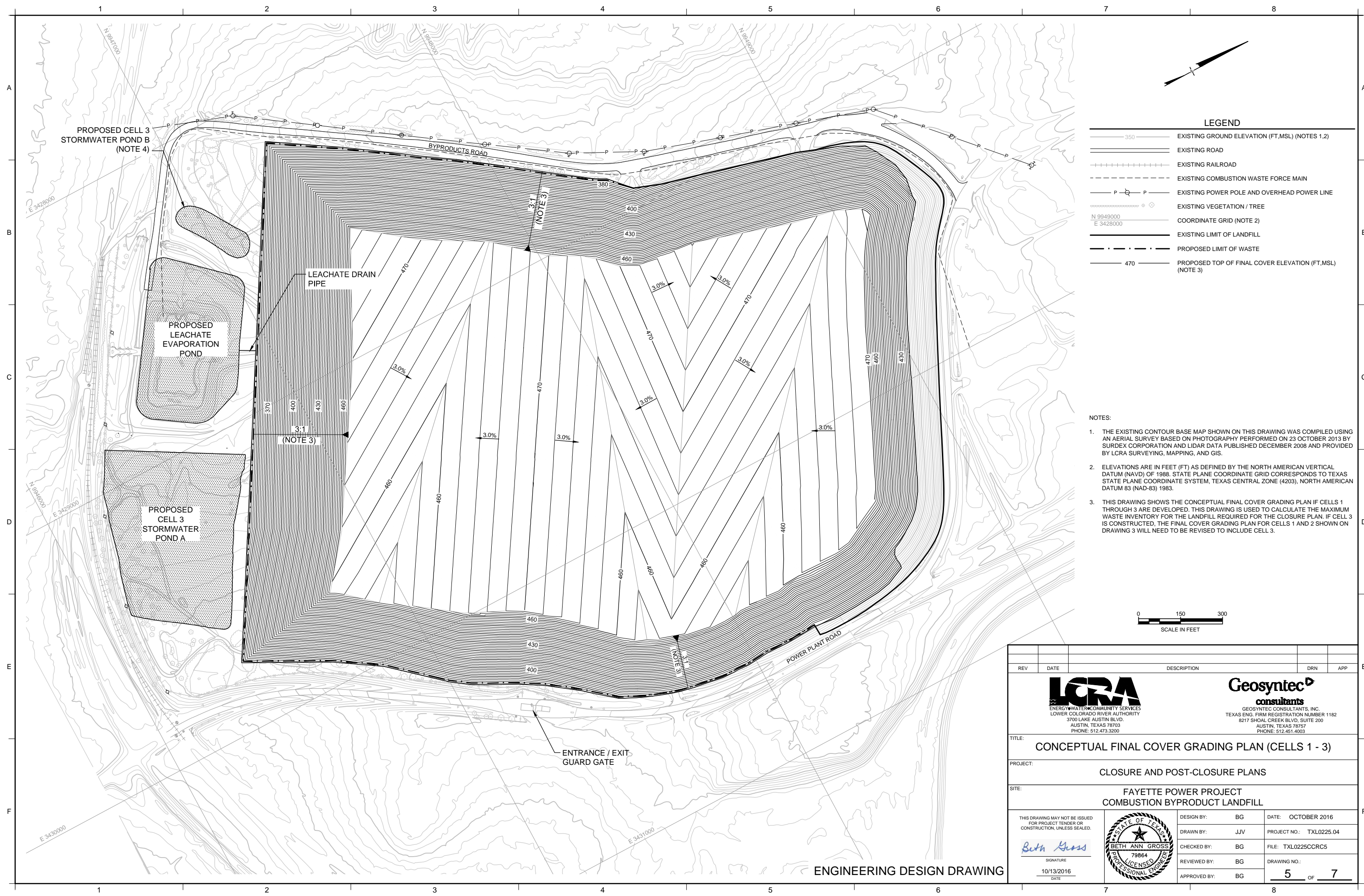
1. THE EXISTING CONTOUR BASE MAP SHOWN ON THIS DRAWING WAS COMPILED USING AN AERIAL SURVEY BASED ON PHOTOGRAPHY PERFORMED ON 23 OCTOBER 2013 BY SURDEX CORPORATION AND LIDAR DATA PUBLISHED DECEMBER 2008 AND PROVIDED BY LCRA SURVEYING, MAPPING, AND GIS.
2. ELEVATIONS ARE IN FEET (FT) AS DEFINED BY THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988. STATE PLANE COORDINATE GRID CORRESPONDS TO TEXAS STATE PLANE COORDINATE SYSTEM, TEXAS CENTRAL ZONE (4203), NORTH AMERICAN DATUM 83 (NAD-83) 1983.
3. LANDFILL BASE GRADES MAY BE ADJUSTED BASED ON SUBSURFACE CONDITIONS.
4. STORMWATER PONDS TO BE CONSTRUCTED IN SEQUENCE WITH LANDFILL OPERATIONS. CELL 2 STORMWATER POND TO BE DECOMMISSIONED PRIOR TO CELL 3 LANDFILL CONSTRUCTION. CELL 3 STORMWATER POND MAY BE CONSTRUCTED IN LIEU OF CELL 2 STORMWATER POND.



REV	DATE	DESCRIPTION	DRN	APP
ENERGY WATER COMMUNITY SERVICES LOWER COLORADO RIVER AUTHORITY 3700 LAKE AUSTIN BLVD. AUSTIN, TEXAS 78703 PHONE: 512.473.3200				
GEOSYNTEC CONSULTANTS, INC. TEXAS ENG. FIRM REGISTRATION NUMBER 1182 8217 SHOAL CREEK BLVD, SUITE 200 AUSTIN, TEXAS 78757 PHONE: 512.451.4003				
TITLE: SUBCELLS 2A & 2D BASE GRADING PLAN				
PROJECT: CLOSURE AND POST-CLOSURE PLANS				
SITE: FAYETTE POWER PROJECT COMBUSTION BYPRODUCT LANDFILL				
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.				DESIGN BY: BG DATE: OCTOBER 2016 DRAWN BY: JJV PROJECT NO.: TXL0225.04 CHECKED BY: BG FILE: TXL0225CCRC4 REVIEWED BY: BG DRAWING NO.: APPROVED BY: BG 4 OF 7
SIGNATURE  DATE 10/13/2016		DATE 10/13/2016		

**ENGINEERING DESIGN DRAWING**

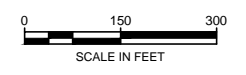
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**LEGEND**

	EXISTING GROUND ELEVATION (FT.MSL) (NOTES 1,2)
	EXISTING ROAD
	EXISTING RAILROAD
	EXISTING COMBUSTION WASTE FORCE MAIN
	EXISTING POWER POLE AND OVERHEAD POWER LINE
	EXISTING VEGETATION / TREE
	COORDINATE GRID (NOTE 2)
	EXISTING LIMIT OF LANDFILL
	PROPOSED LIMIT OF WASTE
	PROPOSED TOP OF FINAL COVER ELEVATION (FT.MSL) (NOTE 3)

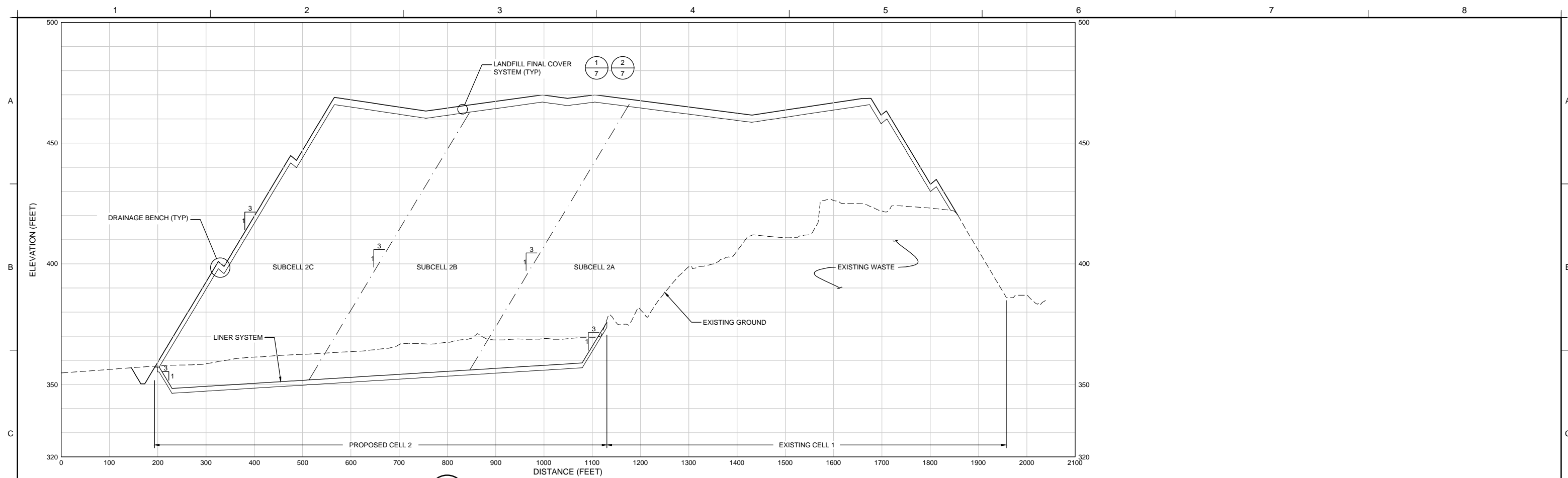
- NOTES:**
1. THE EXISTING CONTOUR BASE MAP SHOWN ON THIS DRAWING WAS COMPILED USING AN AERIAL SURVEY BASED ON PHOTOGRAPHY PERFORMED ON 23 OCTOBER 2013 BY SURDEX CORPORATION AND LIDAR DATA PUBLISHED DECEMBER 2008 AND PROVIDED BY LCRA SURVEYING, MAPPING, AND GIS.
  2. ELEVATIONS ARE IN FEET (FT) AS DEFINED BY THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988. STATE PLANE COORDINATE GRID CORRESPONDS TO TEXAS STATE PLANE COORDINATE SYSTEM, TEXAS CENTRAL ZONE (4203), NORTH AMERICAN DATUM 83 (NAD-83) 1983.
  3. THIS DRAWING SHOWS THE CONCEPTUAL FINAL COVER GRADING PLAN IF CELLS 1 THROUGH 3 ARE DEVELOPED. THIS DRAWING IS USED TO CALCULATE THE MAXIMUM WASTE INVENTORY FOR THE LANDFILL REQUIRED FOR THE CLOSURE PLAN. IF CELL 3 IS CONSTRUCTED, THE FINAL COVER GRADING PLAN FOR CELLS 1 AND 2 SHOWN ON DRAWING 3 WILL NEED TO BE REVISED TO INCLUDE CELL 3.



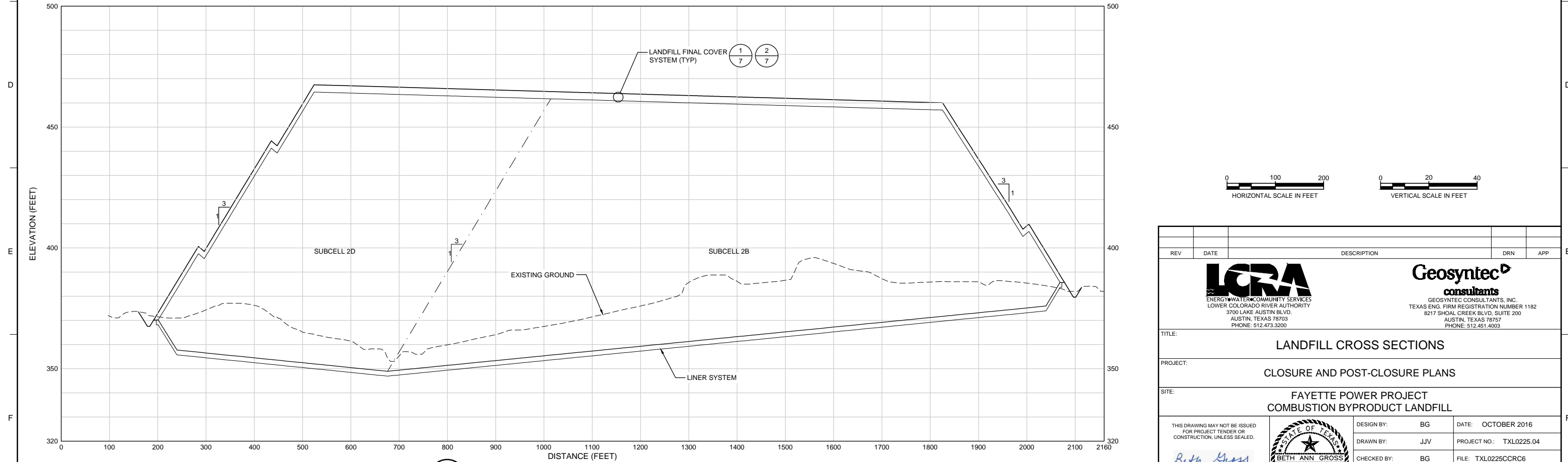
REV	DATE	DESCRIPTION	DRN	APP
<b>TITLE:</b> CONCEPTUAL FINAL COVER GRADING PLAN (CELLS 1 - 3)				
<b>PROJECT:</b> CLOSURE AND POST-CLOSURE PLANS				
<b>SITE:</b> FAYETTE POWER PROJECT COMBUSTION BYPRODUCT LANDFILL				
<small>THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.</small>				DESIGN BY: BG DATE: OCTOBER 2016
		DRAWN BY: JJV PROJECT NO.: TXL0225.04		CHECKED BY: BG FILE: TXL0225CCRC5
SIGNATURE 10/13/2016 DATE		REVIEWED BY: BG DRAWING NO.:		APPROVED BY: BG 5 OF 7

ENGINEERING DESIGN DRAWING

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**A** SECTION A  
5 SOUTH-NORTH FINAL CROSS-SECTION



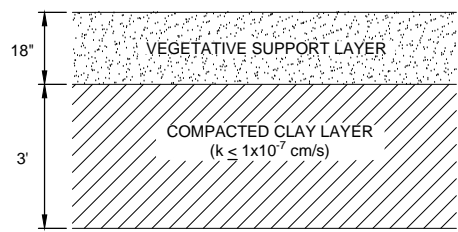
**B** SECTION B  
5 WEST-EAST FINAL CROSS-SECTION



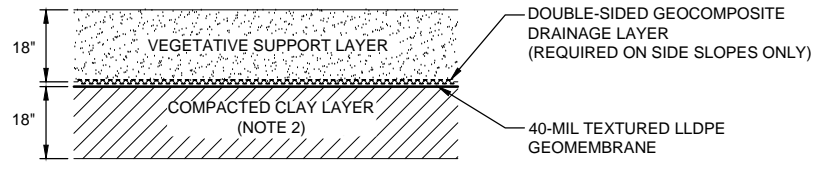
REV	DATE	DESCRIPTION	DRN	APP
		<b>TITLE:</b> LANDFILL CROSS SECTIONS		
		<b>PROJECT:</b> CLOSURE AND POST-CLOSURE PLANS		
		<b>SITE:</b> FAYETTE POWER PROJECT COMBUSTION BYPRODUCT LANDFILL		
<small>THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.</small>			<b>DESIGN BY:</b> BG <b>DRAWN BY:</b> JJV <b>CHECKED BY:</b> BG <b>REVIEWED BY:</b> BG <b>APPROVED BY:</b> BG	<b>DATE:</b> OCTOBER 2016 <b>PROJECT NO.:</b> TXL0225.04 <b>FILE:</b> TXL0225CCRC6 <b>DRAWING NO.:</b> 6 OF 7
SIGNATURE: <i>Beth Gross</i> DATE: 10/13/2016				

ENGINEERING DESIGN DRAWING

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1  
6 DETAIL  
LANDFILL FINAL COVER SYSTEM OPTION 1



2  
6 DETAIL  
LANDFILL FINAL COVER SYSTEM OPTION 2

- NOTES:
1. DETAILS ARE DRAWN TO SCALE AS NOTED EXCEPT FOR GEOSYNTHETICS WHICH MAY BE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.
  2. WASTE MAY BE USED IN PLACE OF THE COMPACTED CLAY LAYER BELOW THE GEOMEMBRANE COMPONENT OF THE FINAL COVER SYSTEM IF IT MEETS HYDRAULIC CONDUCTIVITY AND MAXIMUM PARTICLE SIZE CRITERIA OF THE COMPACTED CLAY LAYER.



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REV	DATE	DESCRIPTION	DRN	APP
TITLE: FINAL COVER SYSTEM DETAILS				
PROJECT: CLOSURE AND POST-CLOSURE PLANS				
SITE: FAYETTE POWER PROJECT COMBUSTION BYPRODUCT LANDFILL				
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.   SIGNATURE 10/13/2016 DATE			DESIGN BY: BG DRAWN BY: JJV CHECKED BY: BG REVIEWED BY: BG APPROVED BY: BG	DATE: OCTOBER 2016 PROJECT NO.: TXL0225.04 FILE: TXL0225CCR07 DRAWING NO.: 7 OF 7

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