AMENDED CLOSURE PLAN FOR ASH POND

Plant Barry

Alabama Power Company

Bucks, Alabama

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Design Drawings
CQA Plan
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LIST of ACRONYMS

ADEM	Alabama Department of Environmental Management
APC	Alabama Power Company
CBMPP	construction best management practices plan
CCR	coal combustion residuals
CFR	code of federal regulations
CQA	construction quality assurance
ft	foot/feet
gpm	gallons per minute
HDPE	high density polyethylene
LLDPE	linear-low density polyethylene
MSL	mean sea level
NPDES	national pollutant discharge elimination system
PRW	pressure relief well
P.E.	professional engineer
WWTS	wastewater treatment system

1. INTRODUCTION

This Amended Closure Plan has been prepared to support the permit application previously submitted to the Alabama Department of Environmental Management (ADEM) for the CCR Surface Impoundment known as the Plant Barry Ash Pond, located near Bucks, Mobile County, Alabama. The permit application was submitted in accordance with ADEM Admin. Code r. 335-13-15-.09(1)(c). This Amended Closure Plan, along with other documents, is intended to supplement the previous submittal in response to the ADEM letter dated May 24, 2019 which provided response comments to the original application.

The closure of the ash pond will be accomplished by leaving the CCR in-place, by method of consolidating the existing footprint of approximately 597 acres to approximately 330 acres. CCR removed from outside of the consolidated footprint will be dewatered, excavated, and compacted within the consolidated footprint in order to achieve the design grades which will promote positive drainage of stormwater off of the final cover system.

2. GENERAL

The Plant Barry Ash Pond was originally constructed in 1965 and was designed to receive and store coal combustion residuals produced during the coal-fired electric generating process at Plant Barry. It also served as a low-volume waste treatment pond for the plant, receiving process water and stormwater from various plant sources, sluiced ash and decant water from the gypsum pond. It currently stores approximately 21,700,000 cubic yards of CCR.

The Ash Pond is approximately 597± acres in size. The pond was formed with the creation of dikes on the east, south, and west sides of the impoundment. The north side of the impoundment is natural ground that ties into the east and west dikes. There have been modifications to the embankment in 1972, 1992, 1998, and 2005. The embankments were originally constructed to EL 18 ft. In 1992, the east and west embankments were raised a total of 3 feet to EL 21 ft. In 1998, the east and west embankments were raised again to elevations between 23 feet and 24.5 feet. In 1999, a flow diversion dike was added near the southern end of the impoundment at an elevation of 18 feet to create an additional decant area prior to final release through the outlet structure. In 2005, the diversion dike was raised to EL 24.5 ft to increase storage in the main area of the impoundment. At that time, the south embankment was also raised to EL 21.5 ft.

The Plant Barry Ash Pond will be closed by leaving CCR in place, with consolidation of CCR to an area located on the north-central portion of the impoundment to reduce the closure footprint to an area covering approximately 330 acres. The Ash Pond will initially be dewatered sufficiently to remove the free liquids and to provide a stable base for the construction of an ash containment structure for the consolidated footprint, excavation of ash outside the consolidated footprint and, construction of the final cover system. CCR will be excavated from the area outside the consolidated footprint, transported, and placed in the consolidated footprint to create a subgrade for the final cover system. Excavation will include removing all

visible ash and over excavating into the subgrade soils. Additional details about the dewatering and construction methods to be used can be found within this Amended Closure Plan.

The final cover will be constructed to control, minimize or eliminate, to the maximum extent feasible, post closure infiltration of liquids into the waste and potential releases of CCR from the unit. This will be prevented by providing sufficient grades and slopes to: 1) preclude the probability of future impoundment of water, slurry, or sediment; 2) ensure slope and cover system stability; 3) minimize the need for further maintenance; and 4) be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.

3. NOTIFICATION – INTENT TO CLOSE

Notification of intent to close the Plant Barry Ash Pond was placed in the plant's Operating Record on April 15, 2019. The notice of intent was subsequently submitted directly to ADEM. The surface impoundment is closing under the requirements of § 257.101(a)(1) and r. 335-13-15-.07(2)(a)1. Closure of the surface impoundment will be conducted under §257.102(d) and r. 335-13-15-.07(3)(d), *closure performance standard when leaving CCR in place*. As described in more detail below, the surface impoundment will be closed in a manner that will control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated runoff to the ground or surface waters or to the atmosphere. Closure will also preclude the probability of future impoundment of water, sediment or slurry. Measures will be taken during design and construction of the closure system that provide for major slope stability to prevent the sloughing or movement of the final cover system. Closure will also minimize the need for further maintenance of the CCR unit.

Major closure activities will commence following receipt of a CCR permit from ADEM pursuant to r. 335-13-15-.09.

4. WRITTEN CLOSURE PLAN – § 257.102(B)(1)(I),(III) AND R. 335-13-15-.07(3)(B)1.(I),(III)

4.1 Overview

A written closure plan to comply with § 257.102(b) was posted to the Plant Barry Operating Record on October 17, 2016. A revised written closure plan incorporating reference to applicable ADEM Administrative Codes was submitted as a part of the original CCR Permit application.

As required by § 257.102(b)(3)(ii) and r. 335-13-15-.07(3)(b)3.(ii), the written closure plan must be amended whenever (i) there is a change in the operation of the CCR unit that would substantially affect the written closure plan or (ii) before or after closure activities have commenced when unanticipated events necessitate a revision of the written closure plan. The

time frames for amendment to the written closure plan is in accordance with those specified in § 257.102(b)(3)(iii) and r. 335-13-15-.07(3)(b)3.(iii).

An overview of the closure approach is provided below. More detailed descriptions of phased sequencing of closure and associated procedures are provided subsequently.

- In areas outside of the consolidated footprint, the CCR will be excavated to the bottom of the ash pond, plus an additional 6 inches of underlying native materials.
- The final cover system over the majority of the consolidated footprint (approximately 90 percent or 300 acres) will consist of a ClosureTurf® (i.e. synthetic engineered turf) cover system. The final cover system over the remaining footprint (approximately10 percent or 30 acres, which will serve as a laydown area to support future plant operations) will consist of an aggregate and geosynthetic composite cover system. Specific details (materials, configuration, thicknesses, etc.) of these cover systems are presented in Section 5.5.
- Two final cover system areas within the consolidated footprint are described below:
    - The ClosureTurf® final cover system in the majority of the consolidated footprint, will be graded with relatively gentle slopes at 3.5 percent up to a peak of approximately elevation 74 feet (ft) above mean sea level (MSL) in the center of the closure footprint. This final slope is less than the minimum 5 percent slope required by r. 335-13-15-.07(3)(d)3.(i)(III). Therefore, APC will be requesting a variance on the final minimum slope. Stormwater from cover system will be managed through a set of drainage channels, downchutes, culverts and stormwater ponds located along the majority of the consolidated footprint perimeter.
    - The stone and geosynthetic composite final cover system in the area to be reused by APC as a laydown yard will be graded with relatively gentle slopes at 2 percent up to a peak of approximately elevation 35 ft MSL in the center of the laydown yard footprint. Stormwater from cover system will be managed through a set of drainage channels, culverts, stormwater ponds and flumes.
    - Both final cover systems would virtually eliminate infiltration of surface water into the closed CCR unit while promoting stormwater runoff away from the consolidated footprint of the ash pond.
- When completed, the approximately 330 acre consolidated and covered final limit of CCR will be approximately 45 percent of the current ash pond area.

These closure activities and features are further described in the remainder of this Plan.

4.2 Closure Steps

4.2.1 General Overview

Implementation of the ash pond closure will be completed in steps, consisting of the following general sequence of activities:

- Site preparation activities will be performed, which will include, contractor mobilization, vegetation management, implementation of erosion and sediment control measures, installation of auxiliary equipment including a temporary wastewater treatment system (WWTS), pumps and corresponding pump pad, and piping.
- Free water contained within the ash pond will be removed as per the Dewatering Plan previously submitted to ADEM.
- In areas outside of the consolidated footprint, CCR material will be excavated to the native ground that underlies the impoundment, plus a minimum of 6 inches of native ground. In areas inside the consolidated footprint, limited excavation of CCR material will be necessary to achieve the final cover system grades.
- Interstitial (pore) water removed from CCR to support CCR excavation and placement activities will be treated as per the Dewatering Plan.
- Excavated and dewatered CCR will be placed and compacted within the consolidated footprint.
- A soil containment berm will be constructed to contain the CCR and provide separation between the consolidated footprint and areas where CCR will be excavated and relocated to the consolidated footprint.
- Stormwater ponds along the north, east, and west will be constructed by backfilling and contouring clean fill.
- The final cover system and stormwater management systems will be installed once an area of the consolidated footprint is complete and final grades are achieved.
- Post-closure care monitoring and maintenance will be conducted for a minimum of 30 years following the completion of construction and certification of closure.

Note that many of the activities described above will be conducted in a phased and overlapping manner. Phasing of activities would progress from north to south as discussed below.

4.2.2 Closure Phases

Closure of the ash pond will occur in a phased manner. A conceptual phasing approach with eight phases has been developed based on contractor input. Information on the phase limits, sequencing, and details is presented on the **Design Drawings**. The sequencing of the phases and phase activities are summarized below. During closure, the number of phases, and phase boundaries may be adjusted based on factors such as rate of construction, availability of

disposal capacity within the proposed footprint, and optimization of stormwater and contact water management features, provided that the required design criteria and operational requirements set forth in the permit application package are met.

Phase I – Initial CCR Dewatering and Excavation: The initial phase of closure construction (depicted on **Drawing 046** of the **Design Drawings**) involves the following activities:

- Free water within the pond will be pumped from the southern portion of the ash pond to the temporary WWTS located north of the ash pond prior to discharging the treated water though the existing National Pollutant Discharge Elimination System (NPDES) outfall, in accordance with the Dewatering Plan.
- Construction of a filter berm in the southern most portion of the pond to decrease the turbidity of contact water generated by storm events and in-situ dewatering of the CCR throughout the closure activities prior to being pumped to the temporary WWTS.
- Placement of stockpiled bottom ash or other materials on top of existing CCR to form a bridging layer, which will allow equipment access to areas to be excavated for in-situ dewatering techniques such as trench drains.
- Implementation of a preloading program, as needed, to promote consolidation of soft clayey soils underlying CCR for strength gain, which will result in: (i) improved geotechnical stability of excavation slopes within CCR removal areas; (ii) improved geotechnical stability of foundation soils under the new containment structures; and (iii) reduced long-term settlement of the foundations soils under the new containment structures (preloading program is further described in Section 4.3.3).
- Installation and operation of Pressure Relief Wells (PRWs), as needed, to improve geotechnical stability of excavations within the ash excavation areas adjacent to the existing dikes (further described in Section 4.3.3).
- Excavation and relocation of dewatered CCR in the northeastern and western reaches of the ash pond. Relocated CCR within the consolidated footprint will be moisture conditioned and compacted to final design grades.
- Implement closure-phase operating procedures, controls, and plans as set forth in Section 5.4 of this Closure Plan including but not limited to fugitive dust control and comprehensive stormwater and contact-water management programs.

Phase II – Construction of the soil containment berm and stormwater ponds, lining of final cover grades, and continued excavation and placement of CCR: In the second phase, portions of the ash pond that have been fully excavated will be backfilled to create free draining stormwater ponds and segments of the soil containment berm. Concurrently, CCR will continue to be excavated, dewatered and relocated to within the consolidated footprint. Phase II (as depicted on **Drawing 047** of the **Design Drawings**) will involve the following activities:

- Following the removal and verification of CCR plus a minimum of 6 inches of underlying native materials, segments of the soil containment berm, stormwater ponds, and the future reuse area located in the northeast will be constructed with soil backfill.
- Once portions of the soil containment berm and final grades of CCR have been achieved, the final cover system will be installed. The installation of the final cover system in phases will allow for the segregation of noncontact stormwater (not requiring treatment) and contact water (requiring treatment through the WWTS).
- Continue to utilize preloading and PRWs, as needed, to improve geotechnical stability throughout the closure construction process.
- Continue to form bridging layers which will allow equipment access for excavation and relocation of dewatered CCR in the eastern and western portions of the ash pond. This will continue concurrently to the activities previously described in Phase II.
- Closure-phase operating procedures, controls, and plans set forth in Section 5.4 of this Closure Plan, including but not limited to fugitive dust control and comprehensive stormwater and contact-water management programs will continue to be implemented.

Phase III through Phase VIII– Continued construction of the soil containment berm, stormwater ponds, lining of final cover grades, and excavation and placement of CCR (note: this sequence is repeated for Phases III through VIII – i.e. the final phase). The sequencing described in Phase II, involving the utilization of preloading and PRWs (as needed), construction of segments of the soil containment berm, stormwater ponds and a seepage berm located in the southern portion of the pond will continue following removal of CCR plus a minimum of 6 inches of underlying native soils which in turn are placed within the consolidated footprint will continue throughout the closure activities. The progression of activities would be from north to south, as shown on the phasing plans in the **Design Drawings**. Following the final phase, Phase VIII, the closure construction activities will be completed and would transition from the closure period to the post-closure care period (upon completion of reporting activities discussed subsequently in the Plan and approved by ADEM).

4.3 Procedures During Closure

4.3.1 Dewatering and Stabilization

Dewatering of the ash pond will be performed by removing free water (i.e. open pooled water) and reducing the amount of interstitial water in the CCR (i.e. reducing pore water in the CCR). Dewatering is expected to facilitate removal, relocation, and consolidation of the CCR in the consolidated footprint. Dewatering is also expected to increase geotechnical slope stability of the CCR unit, reduce CCR consolidation settlement, improve constructability, and provide safe access for construction equipment. Free water drawdown will initially be set at a rate not exceed one foot per week. This rate may be increased to as much as 2 feet per week with daily inspections and assessments as to the integrity of the interior slopes of the perimeter embankments.

Proposed CCR dewatering activities are described in detail in the Dewatering Plan. In general, dewatering and CCR excavation and placement will occur in a phased manner. Interstitial water will be pumped or conveyed via temporary control measures (i.e., diversion berms and conveyance channels) to the settling basin located south of the consolidated CCR footprint (i.e., the ponded areas north and south of the existing separator dike). Contact water and interstitial water will pass through a filter berm to reduce total solids concentrations and will then be pumped to the on-site temporary WWTS for treatment prior to discharge.

4.3.2 Liquids Management

Closure construction will involve a dewatering program that includes removing free liquids from the ash pond and interstitial water from the CCR in the ash pond. Closure activities will also result in the generation of contact water. Throughout closure construction, liquids that have been in contact with or generated from CCR will be managed as follows:

- Free water and interstitial water within the ash pond will be routed through the on-site WWTS or otherwise properly managed in accordance with the NPDES permit requirements and then directed to the permitted NPDES discharge outfall (Permit No: AL0002879, Outfall: DSN002).

- Contact water management will be performed in accordance with the **Stormwater and Contact Water Management Plan**. Contact water will be routed through the on-site WWTS or otherwise properly managed in accordance with the NPDES permit requirements as described above.

Following final CCR placement, compaction, grading, and liner installation of discrete portions of the consolidated closure footprint, stormwater runoff from completed areas may be considered non-contact water and may be managed and discharged separately from contact water. Non-contact stormwater will be managed in accordance with applicable stormwater and erosion and sediment control requirements and will be discharged off-site without treatment at designated locations.

4.3.3 Excavation of CCR

Dewatered CCR in the ash pond will be mechanically excavated and transported using haul trucks to fill areas within the consolidated footprint. The depth of CCR to be excavated and placed within the consolidated footprint varies depending upon location, but generally ranges from approximately 5 to 25 feet in depth. It is anticipated that excavation will be accomplished in stages whereby the CCR will be removed in 5- to 10-foot vertical increments until full-depth excavation is achieved. A bridging lift will be placed to prepare areas for excavation and to provide stability for excavators and hauling equipment.

Excavation will be performed in a phased approach, often with two distinct areas being actively excavated at a given time. The phased approach to CCR excavation is provided within the **Design Drawings** (Drawings 046-055).

As previously mentioned, implementation of a preloading program and use of pressure relief wells (PRWs) will be considered to improve geotechnical stability at various phases of the closure construction activities. The preloading and use of PRWs will be conducted in a sequential manner closely tied to CCR excavation efforts.

- Preloading will be implemented, as needed, prior to commencement of CCR excavation. The ash pond is underlain by an organic clay soil (henceforth termed Clay 1). Clay 1 is normally consolidated and soft to very soft in consistency. Preloading is an established ground improvement technique which, at Plant Barry, will involve placing temporary soil fill on top of existing CCR to induce consolidation in underlying Clay 1. The preloading-induced consolidation will increase the shear strength and reduce the compressibility of Clay 1. After Clay 1 has consolidated to the desired level, the preloading fill can be removed and final construction of CCR cut slopes and soil containment berms can begin. Improved performance of the Clay 1 layer is anticipated to add significant value to the overall closure project by: (i) significantly improving the stability of excavation slopes; (ii) allowing for continuous construction of new soil containment dikes through enhanced strength of the foundation soils; and (iii) limiting long term settlement of the new soil containment dike in the post-closure period.

- Pressure relief wells (PRWs) would be used, as needed, to support the deepest portions of CCR excavations. PRWs are commonly used to reduce pore water pressures in confined aquifers or in stratified ground conditions to improve geotechnical stability of excavations. PRWs are typically installed before the excavation has extended below the piezometric level in the aquifer and, as the excavation continues, PRWs are pumped to relieve the pore water pressures in the aquifer to ensure stability of the excavation or surrounding area. PRWs can also increase the constructability of the excavation to its final grade by providing a drier working area. Once excavation and backfilling has been completed in a targeted area (expected to take less than one year), PRWs may be abandoned. The primary purpose of the proposed PRWs at the Site is to provide protection to the integrity of the existing perimeter dikes during CCR excavation and reduce the potential for sand boils and/or heave. The varying threshold across the Site is dependent on the elevation of the excavation and thickness of the underlaying clay unit. Current configuration of a PRW system would involve installing and operating one to two sets of approximately ten PRWs at a time while excavation is being conducted in the adjacent areas. As the excavation is completed, individual PRWs would be abandoned and new PRWs would be installed further down the line to allow new areas to be excavated.

4.3.4 CCR Removal Verification Protocol

In the context of this Closure Plan, the CCR removal verification protocol refers to the process of verifying and documenting that, to the extent practicable, visible CCR has been removed from the areas outside of the consolidated footprint.

The CCR at the Site is underlain by soils that could be visually similar to the CCR (i.e., similar in color), which makes identifying the CCR-soil interface by simple observations based on a color difference challenging. Previously performed soil borings at the Site indicate that organic clay and elastic silt type of natural soil deposits underlie CCR.

A combination of the following procedures will be used to delineate the CCR-soil interface.

- Delineation of CCR-soil interface will be performed by a field geologist/engineer through visual examination (i.e., visual soil classification) of the subsurface samples collected by continuous soil boring methodologies such as direct push technology (DPT) or sonic drilling. The procedures below will be used to delineate the CCR-soil interface by visual examination:
    - The differentiating factors between the organic and inorganic clay and CCR is the presence of plasticity in clay (i.e., can be rolled into a ball and will retain its form) and its absence in CCR (i.e., CCR does not retain form when rolled with fingers). Additionally, there are some subtle differences in color (e.g., organic clay at the site exhibited dark gray to brown in color and inorganic clay at the site exhibited greenish to blueish gray in color, while fly ash exhibited gray to light gray in color).
    - Differentiating between the elastic silt and CCR will require a closer examination of these units using a handheld magnifying lens to compare grain color, shape and consistency. The visual method used to differentiate between the elastic silt and fly ash at this site includes examining the material for light (sometimes white) fine grains mixed into the matrix of gray and dark gray fine grains; this combination of color grains is found in the CCR but not the native elastic silt. The native elastic silt grains are a homogeneous fine-grained matrix of the color gray.
    - At 300-foot centers throughout the closure by removal areas of the site, continuous soil borings by DPT or other methods will be performed to obtain continuous core samples of the subsurface materials to a depth of minimum 20 ft below the bottom of CCR or to the sand layer underlying the organic clay and elastic silt deposits, whichever is earlier. These samples will be inspected by field geologist/engineer to delineate the CCR-soil interface based on visual soil classification procedures described above and documented in boring logs. The boring locations will be surveyed for both horizontal and vertical control. Based on field geologist/engineer's observations and the survey data, the elevation of the CCR- soil interface will be picked for each of the boring locations.

- Delineation of CCR-soil interface will be performed by the Construction Quality Assurance (CQA) engineer using cone penetration test (CPT) results. Soil behavior type can be predicted from CPT results using empirical soil behavior type (SBT) chart. When combined with actual observations from soils borings (i.e., visual classification by field geologist/engineer), the CPT results could be effectively used to differentiate subsurface soil types. The procedures below will be used to delineate the CCR-soil interface by using CPT results:
    - Based on co-located soil borings and CPTs performed at the Site previously, a CPT- based machine learning algorithm (MLA) was developed to identify the CCR-soil interface. The MLA uses computational methods to "learn" information directly from data without relying on a predetermined equation as a model. The MLA adaptively improves its performance as the number of samples available for learning increases. The MLA for the Site was developed based on approximately 5,000 CPT data points from 13 CPT locations that were co-located with 13 soil borings across the Site. The MLA may be refined, as necessary, based on the additional data collected during closure construction (i.e., additional soil borings and CPTs discussed herein to refine the estimated CCR-soil interface).
    - At 100-foot centers throughout the closure by removal areas of the site, CPTs with pore pressure measurements will be advanced to a depth of minimum 20 ft below the estimated bottom of CCR or to the sand layer underlying the organic clay and elastic silt deposits, whichever is earlier. For each of the soil boring (e.g., DPT) locations discussed earlier, a co-located CPT will be advanced within 10 ft of the soil boring location. The CPT locations will be surveyed for both horizontal and vertical control.
    - At any CPT location, the CQA engineer will use the MLA to estimate the CCR-soil interface. The co-located soil borings advanced at a lesser frequency will be used to confirm the MLA's estimates as well as to supply additional data to MLA to increase its robustness.
- Based on the CPT-based MLA estimates, and direct observations from the soil borings (e.g., DPT cores) discussed earlier, CCR-soil interface elevations will be assigned throughout the closure by removal areas on a 100 ft by 100 ft grid. Geospatial kriging techniques will be used to transform the 100-ft grid data in to a CCR-soil interface surface for the entire footprint of closure by removal areas.
- The CCR-soil interface surface will be used to develop the final CCR excavation grades by subtracting an additional 6 inches from the CCR-soil interface.
- The closure contractor will use high-precision GPS and/or other surveying methods to demonstrate and document that the target excavation grades are achieved throughout the closure by removal areas. The horizontal and vertical survey data from excavation efforts

along with the field observations of excavation areas will be reviewed by the CQA engineer (or qualified representative).

- Hand augers borings or other suitable limited excavation methods to 12" depth will be performed at a minimum frequency of every acre and the collected samples visually assessed to check for the presence of CCR materials below the visible surface. Where site conditions lack safe accessibility for hand augering or other excavation methods, a Geo Probe or other means of safely obtaining depth samples at a minimum of one per acre will be performed.

- Once the removal is deemed complete with CQA engineer's approval for a given area, the backfilling operations will commence.

4.3.5 CCR Unloading, Placement and Compaction

The method of CCR disposal will be the area fill method which involves placing relocated CCR fill into efficient phasing areas, spreading the CCR in layers (lifts) and then compacting the CCR with heavy equipment. This process is repeated until the top of CCR elevations shown on the **Design Drawings** are reached. CCR placement and compaction efforts will be conducted in general accordance with the requirements below:

- Dewatered CCR will be transported from excavated or stockpiled areas.
- CCR will be placed in phasing areas in relatively horizontal lifts to facilitate efficient compaction of placed materials.
- The active CCR-placement working area will be limited to the extent practical to limit contact water generation and the potential for dust generation. Proper dust control measures will be implemented as described subsequently in this narrative.
- The placed CCR will be compacted (and moisture conditioned as necessary) such that the CCR working surface is firm and unyielding after several passes of the compaction equipment.
- Sediments deposited may be present at the toes of slopes and in temporary drainage ditches and temporary contact water storage areas. Prior to CCR placement following periods of inclement weather, these areas of potential sedimentation will be inspected. Soft or loose CCR material will be removed or reworked before continuing waste placement. The sediment areas will be reworked, moisture conditioned if necessary, and compacted to a firm and unyielding condition prior to placement of the next lift.
- The working surface or face will be graded in such a way to minimize the run-on/run-off of stormwater.
- At the end of each day's activities, the working surface will be sealed to the extent possible with a smooth drum roller or other effective methods. Prior to placement of

subsequent lifts, sealed CCR surfaces will be lightly scarified using a dozer or other equipment to promote lift bonding.

The compacted CCR material will support the final cover system with only limited short- and long-term settlements. At the outset of CCR placement within the consolidated footprint, a field pilot study or test pad will be performed to evaluate the optimum material placement methods (lift thickness, optimum moisture window, type of compaction equipment, and number of passes). Additional test pads may be performed if CCR materials, compaction equipment, or other field conditions change. Modifications to the general placement procedures will be incorporated based on actual field conditions (e.g. variability in ash properties and placement operations, dust control, material workability, etc.).

4.3.6 Run-On/Run-Off Control

Overall, closure activities will take place within the limits of the existing outer perimeter containment dikes of the ash pond. These dikes prevent run-on from and run-off to areas outside of the ash pond. The **Stormwater and Contact Water Management Plan** included with the detailed design package addresses the hydrologic and hydraulic capacity requirements for the ash pond surface impoundment and how stormwater volumes and peak stages from design storm events will be managed during each phase of construction.

During active closure operations (e.g., during CCR excavation and placement), the generation of contact water from active CCR working areas will be limited to the extent practical. Non-contact stormwater will be diverted away from and around active CCR working areas to minimize the generation of contact water through the use of diversion berms positioned on slopes situated up-gradient from the working areas, diversion channels positioned around working areas, pumps, and temporary or permanent liner systems. Refer to the **Stormwater and Contact Water Management Plan** and the **Design Drawings** for further information on the location and sizing of these features.

4.3.7 Fugitive Dust Control

The purpose of this Fugitive Dust Control Plan is to minimize fugitive dust through the ash pond closure process at Plant Barry and demonstrate compliance with the regulations listed under §257.80(b) and r. 335-13-15-.05(1)(b). USEPA defines “CCR fugitive dust” as “solid airborne particulate matter that contains or is derived from CCR, emitted from any source other than through a stack, or chimney.” [§ 257.53].

This plan identifies and describes the CCR fugitive dust control measures that will be used during closure construction to minimize airborne CCR due to construction and related activities associated with closure of the ash pond. The CCR fugitive dust control measures that will be used are presented below.

- Fugitive dust originating from the closure of the ash pond will be controlled using water suppression or polymer tackifiers.

- CCR that is transported via truck will be conditioned to appropriate moisture content to reduce the potential for fugitive dust.

- Water suppression or polymer tackifiers will be used as needed to control fugitive dust on facility roads used to transport CCR and other CCR management areas.

- Speed limits will be utilized to reduce the potential for fugitive dust.

- Trucks used to transport CCR will not be overfilled (i.e., only filled up to or to less than capacity) to reduce the potential for material spillage.

The fugitive dust control measures described above were selected based upon an evaluation of site-specific conditions at the ash pond, including the physical properties of CCR, the specific closure construction activities, weather conditions, and operating conditions.

On-site personnel will assess the effectiveness of the control measures by performing visual observations of the ash pond and surrounding areas and implementing appropriate corrective actions for fugitive dust, as necessary. Logs will be used to record the utilization of water-spray equipment.

Should a complaint be received from a citizen regarding a CCR fugitive dust event at the facility, the complaint will be documented and investigated. Appropriate steps will be taken, including any corrective action, as appropriate.

4.3.8 Surface Water Management

The stormwater features shown on the **Design Drawings** will be constructed to manage stormwater runoff during closure construction and throughout the post-closure care period. During closure construction, the contractor will follow the **Construction Best Management Practices Plan (CBMPP)** included in the detailed design package and associated NPDES Permit General Permit (ALR100000). Erosion and sediment control measures shown on the **Design Drawings** have been designed with consideration of the contractor's phased construction approach and following the practices outlined in the Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas. Appropriate erosion and sediment control devices include stabilized construction entrances/exits, sediment fencing, diversion channels and berms, silt curtains, settling basins, filter berms, outlet protection for concentrated flows, and other necessary provisions.

Closure construction will involve dewatering efforts which includes removing both free water (i.e., open pooled water) from the southern portion of the ash pond, interstitial water from within the ash (i.e., reducing pore water in the CCR). Free water within the ash pond will be treated and then discharged through the primary discharge structure located on the south end of the pond to the permitted NPDES discharge point (Permit No.: AL0002879, Outfall: DSN002) throughout the construction and following the closure. Any water discharged from the ash pond during construction will be routed through a 4,000 gallons per minute (gpm) WWTS prior to discharge.

Further, the construction sequencing depicted on the **Design Drawings** includes a phased stormwater management approach whereby stormwater and contact water runoff will be routed and discharged separately to isolate the contact water component requiring necessary treatment prior to discharging off-site. Routing of contact water and stormwater along with their respective discharge strategies is described in the **Stormwater and Contact Water Management Plan**.

The final closure design incorporates stormwater management features designed with appropriate capacity to convey stormwater flows from the final cover system under post-closure conditions. Stormwater conveyances are shown on the **Design Drawings** and include cover system benches and down chutes, drainage channels and culverts, pipe outlet protection, lined stormwater ponds, and a settling basin. The design criteria, narrative descriptions, and calculations for the stormwater management system during closure construction and after final closure are provided in the **Stormwater and Contact Water Management Plan.**

4.3.9 Equipment Decontamination

Before removing equipment that has been in contact with CCR from the active work area of the ash pond, the equipment will be washed. CCR residues generated during washing will be either comingled with other CCR within the consolidated footprint prior to completion of the final cover system or sent offsite to an MSW landfill. Water generated from this activity will be managed as contact water.

4.3.10 Site Security

Only authorized personnel will be permitted to access the site during and following closure activities. Site security measures will include guarded gate access as well as deployment of an Observation Without Limits (OWL) surveillance system surrounding the perimeter of the ash pond. Site visitors will require badges and will be accompanied by authorized escorts.

4.3.11 Groundwater Monitoring

A groundwater monitoring plan was submitted with the original Barry Ash Pond permit application. Please refer to Appendix 8 of the original permit application.

4.3.12 Operational Inspections

Inspections will be conducted by a Qualified Person at intervals not exceeding 7 days to look for appearances of structural weakness and for proper operation of all outlet structures maintained for use during closure. Furthermore, an annual inspection will continue to be conducted by a qualified Professional Engineer throughout the closure process.

4.4 Closure Design Features

4.4.1 Soil Containment Berm

The closure in place of Plant Barry's ash pond involves consolidating the existing CCR from the current footprint of 597 acres to a consolidated footprint of approximately 330 acres. To reduce the footprint and provide containment of the final footprint, a soil containment berm will be constructed in areas where the CCR is being excavated along the existing perimeter berm. This soil containment berm will provide physical barrier between the closure by removal area(s) and the consolidated footprint. Along the inside toe of the soil containment berm, an internal drainage system will be installed during pond closure. This drainage corridor will include an HDPE pipe collection corridor (8" HDPE pipe imbedded in a gravel/sand collection area), sumps and forcemains (24" HDPE riser pipes). The corridor will allow for collection of interstitial water during and after closure and mechanisms for pumping and collection. Currently, the internal drainage system includes a perimeter corridor. Studies are ongoing to evaluate the effectiveness of including a network of collection corridors transecting the pond.

4.4.2 Final Cover System

The final cover systems have been designed and will be installed over the final CCR grades to minimize infiltration and erosion. The final cover system will consist of both a ClosureTurf® (i.e. synthetic engineered turf) cover system over the majority of the consolidated footprint (approximately 300 acres), and a stone and geosynthetic composite cover system over an area to be reused by APC as a laydown yard (approximately 30 acres in the northwest portion of the consolidated footprint).

The majority of the consolidated footprint would consist of, from bottom to top:

- 6-inch thick prepared subgrade layer;
- 50-mil thick linear-low density polyethylene (LLDPE) MicroDrain geomembrane; and
- Engineered synthetic turf (ClosureTurf®) which is ballasted by a sand layer 0.5 inches thick.

The northwest area, to be utilized as a laydown yard, would consist of, from bottom to top:

- 6-inch thick prepared subgrade layer;
- 100-mil thick LLDPE geomembrane;
- Geocomposite layer;
- 9 inches of #57 stone;
- 6 inches of high density polyethylene (HDPE) geocell filled with #57 stone; and
- 3 inches of #57 stone wear surface.

Details of both final cover systems are provided in the **Design Drawings**.

4.4.3 Stormwater Management System

The stormwater management features shown on the **Design Drawings** will be constructed to manage stormwater runoff during both closure construction and the post-closure care period. The final closure grades incorporate stormwater management features to prevent erosion and direct stormwater runoff into the stormwater management system. The **Design Drawings** include the layout and details of the stormwater management system, including required erosion and sediment controls. Diversions and channels will be constructed on the final cover system and around the perimeter of the consolidated footprint and to divert run-on to and convey runoff from the site in a controlled manner. The design criteria, narrative descriptions, and calculations for the stormwater management system during closure construction and after final closure are provided in the **Stormwater and Contact Water Management Plan**.

4.5 Final Cover Systems

Upon closure, all CCR within the consolidated footprint will be spread, compacted and capped with the final cover systems shown on the **Design Drawings** (Drawings 070-073). The final cover systems are designed to meet the following design standards of §257.102(d)(1) and r. 335-13-15-.07(3)(d)1.

- Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;
- Preclude the probability of future impoundment of water, sediment, or slurry;
- Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period;
- Minimize the need for further maintenance of the CCR unit; and
- Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.

An alternate final cover system will be used for the Plant Barry Ash Pond closure that meets the requirements of § 257.102(d)(3)(ii) and r. 335-13-15-.07(3)(d)3.(ii). The cover sytem will include the following components:

- Specified final cover infill as outlined in the final closure plan design;
  - 1/2” minimum sand infill
  - 1/2" minimum sand infill with ArmorFill® application
  - 3/4” minimum HydroBinder® infill

- Rock or articulated concrete block overlying a geosynthetic separation and protection layer

- Engineered Synthetic Turf (HydroTurf®)
- A minimum 40 mil polyethylene (LLDPE or HDPE) geomembrane liner

.

A testing and documentation program will be conducted during placement of the final cover systems to provide verification that the final cover materials are constructed in accordance with the specifications. Both final cover systems material property requirements, and quality control and conformance testing methods and frequencies, are provided in the **CQA Plan**.

4.6 Achievement of Closure Performance Standards

Closure of the ash pond, as reflected in this Closure Plan and the accompanying permit application package, is designed and will be constructed to achieve applicable closure performance standards of §257.102(d) and r. 335-13-15-.07(3)(d) as described below.

- The final cover systems will control and minimize infiltration of liquids into the CCR, release of CCR into the environment, and flow of contaminated runoff from the ash pond to groundwater or surface waters, or to the atmosphere. This will be accomplished by using a virtually impermeable geomembrane as part of the final cover system. The geomembrane will isolate the CCR from the surrounding environment and essentially eliminate infiltration into the CCR relative to existing conditions. The final cover systems will be installed over the entire consolidated area, eliminating direct exposure of CCR to the surrounding environment.

- Both final cover system options are alternatives to the final cover system prescribed in §257.102(d)(3)(i) and r. 335-13-15-.07(3)(d)3.(i), and both systems have been designed and will be constructed to achieve an equivalent reduction (and in fact, a greater reduction) in infiltration into the CCR as achieved with the prescriptive final cover system. The proposed final cover systems will also have erosion layers that provide equivalent protection from wind and water erosion as the erosion layer of the prescribed final cover.

- The final cover systems are configured to preclude the probability of future impoundment of water, sediment, or CCR slurry into the ash pond. This will be accomplished by the grading and layout of the final cover system, and by the stormwater management and control system that will be installed (resulting in positive drainage for stormwater runoff from the final cover system and limiting stormwater run-on). Surface-water conveyance structures are designed with

appropriate channel lining materials to resist erosion during the design storm event and to minimize surface water infiltration.

- The consolidated area has been designed and will be constructed with measures that provide for adequate levels of slope stability, that prevent the sloughing or movement of the final cover system, and that minimize the potential for disruption of final cover system due to settling or subsidence. Slope stability factor of safety design criteria will be achieved for static, seismic, liquefaction, and end-of-construction conditions for both the closure and post-closure care periods. An evaluation of the veneer stability of the final cover system has also been performed to verify the interface shear strengths necessary to meet minimum design factors of safety for both static and seismic conditions.

- The final cover systems are designed to minimize the need for further maintenance of the ash pond. This will be accomplished by consolidating CCR within the ash pond from an approximately 597-acre area into an approximately 330 acre area, thereby reducing the total area requiring maintenance by about 45 percent. Additionally, the stormwater management system features on the final cover and in adjacent final closed areas are configured and spaced in a manner to minimize post-closure erosion and adequately handle flows from the design storm, also contributing to minimized need for post-closure maintenance of the ash pond.

- The final cover systems construction will be completed in the shortest amount of time consistent with recognized and generally-accepted and appropriate engineering practice. This will be accomplished by using a phased construction approach designed to allow closure construction to be efficiently implemented. As final CCR elevations are reached in phases during closure construction, the final cover system will be installed incrementally on those areas while other phases of the closure are either being filled and/or dewatered. This approach will allow multiple construction activities to be performed in parallel, shortening the total construction duration compared to conducting the construction operations in series.

- This Closure Plan includes provisions for eliminating free liquids and stabilizing the CCR through dewatering and through CCR placement and compaction methods prior to installing the final cover systems.

An Assessment of Corrective Measures (ACM) for the Plant Barry Ash Pond was placed in the Plant's Operating Record in June 2019 and submitted to the Department in July 2019. The development of the ACM considered the planned closure approach which will include dewatering, consolidating the footprint of the ash, and constructing a cover system over the consolidated footprint that meets the requirements of § 257.102(d)(3) and r. 335-13-15-

.07(3)(d). This closure approach will effectively control the source of CCR constituents to groundwater by removing free water and some interstitial water from the ash, reducing the footprint area of the ash and preventing further infiltration of surface water resulting from rainfall through the ash.

Removal of the free liquid will reduce the volume of water available to flow from the Ash Pond during and after closure, while also minimizing the hydraulic head driving water through the subsurface. A reduction in head that could lead to outward or downward migration will also allow the natural, low permeability clay that is directly below the Ash Pond to more effectively confine vertical seepage flows.

Outside the consolidated footprint, ash will be excavated to remove all visible ash and a minimum of 6 inches of the underlying subgrade soils, thereby removing the source from these areas. The cover system that will be constructed over the consolidated footprint will have a permeability several magnitudes lower than the permeability of the natural clay subsoils beneath the impoundment, reducing the likelihood of future migration of water through the ash below the cover.

At the present time, a combination of the closure process and source control measures discussed above along with Monitored Natural Attenuation and adaptive site management are anticipated to provide the necessary remedy for this facility. However, in an adaptive site management process, system performance is monitored, and one or more of the technologies identified in the ACM will be used to supplement the remedy as needed if the selected approach is not performing as intended or corrective action goals are not met. If necessary, modifications to the closure plan may also be amended or supplemented to include other protective measures.

5. MAXIMUM INVENTORY OF CCR – § 257.102(B)(1)(IV) AND R. 335-13-15-.07(3)(B)1.(IV)

The ash disposal area boundary and CCR surface impoundment facility boundary was surveyed on 21 September 2018 by a Registered Surveyor. These surveyed boundaries and a legal description of the CCR management boundaries are provided in **Appendix A** of this plan. Areas where CCR has been deposited have been located to the best of APC's ability. The boundaries of the CCR deposits in the ash pond will be confirmed and documented during closure construction.

The ash pond currently contains approximately 21,700,000 cubic yards of in-place CCR, of which, approximately 9,000,000 cubic yards of CCR and underlying soils will be placed into the consolidated footprint containing the remaining volume of CCR to be closed in-place.

6. LARGEST AREA REQUIRING FINAL COVER– § 257.102(B)(1)(V) AND R. 335-13-15-.07(3)(B)1.(V)

Based on the closure strategy presented herein, all of the CCR in the ash pond will be consolidated to approximately 330 acres. This entire area will receive final cover. Thus, the largest area ever requiring final cover under the proposed closure is approximately 330 acres.

7. SCHEDULE FOR COMPLETING CLOSURE ACTIVITIES– § 257.102(B)(1)(VI) AND R. 335-13-15-.07(3)(B)1.(VI)

The closure activities are anticipated to start in 2019. It is estimated that the activities necessary to satisfy the applicable regulatory closure criteria will have an approximately 12-year duration. Based on the estimated start of closure activities, this would result in a completion of closure activities in approximately 2031. A list of closure activities is provided subsequently in Section 17 of this document, and a schedule with estimated timeframes is presented in **Table 1**. The closure schedule and milestones are based on estimates of the approximate timeframes to implement closure activities. Closure will be conducted in phases as discussed previously, but it should be recognized that not all activities on the closure schedule will occur on a continuous basis throughout their scheduled durations, consistent with the previously-described sequence of closure steps.

8. CERTIFICATION OF CLOSURE

In accordance with §257.102(h) and r. 335-13-15-.07(3)(h), within 30 days of completion of closure, APC will prepare and submit a notification to ADEM that includes a written certification from a P.E. registered in Alabama verifying that closure has been completed in accordance with this Closure Plan. APC will place this documentation in the operating record for Plant Barry.

Concurrent with the submission of completion of closure, and in accordance with § 257.102(i) and r. 335-13-15-.07(3)(i), APC will record a notation on the deed to the property, or some other instrument that is normally examined during the title search. This recording will notify any potential purchaser of the property of the following:

- The land has been used as a CCR surface impoundment and that its use is restricted under the post-closure care requirements of the r. 335-13-15-.07(5)(d)1.(iii).
- The locations and dimensions of the CCR unit with respect to permanently surveyed benchmarks and section corners shall be on a plat and prepared and sealed by a land surveyor.
- Contain a note, prominently displayed, which states the name of the permittee or operating agency, the type of CCR unit and the beginning and closure dates of the disposal activity.

- Certification by a qualified P.E. registered in Alabama that all closure requirements have been completed as determined necessary by ADEM.

Within 30 days of recording a notation on the deed to the property, APC will prepare and submit a notification to ADEM stating that the notation has been recorded. APC will place this documentation in the operating record for Plant Barry.

9. DIRECTIONAL/INFORMATIONAL SIGNS

A designated construction entrance and access road has been designed and will be completed prior to initiating closure activities. Signs will be posted at the entrance gate notifying users of the ash pond of the closure activities and a telephone number for emergencies will be posted. Emergency evacuation routes will be maintained for the duration of closure activities.

10. ORGANIC MATERIALS MANAGEMENT

Throughout the operational and inactive periods of the CCR ponds, vegetation (e.g., grass, roots, shrubs, cattails, trees, etc.) have naturally established themselves within the pond footprints. These organic materials typically consist of two components: (1) organic materials above the ash surface (e.g., stalks, leaves, grasses, tree, etc.); and (2) organic materials at or below the ash surface (e.g., stumps, roots, decaying vegetation, and organic matter at or near the pre-CCR grades). Proposed organic material management activities are described in detail in the **Organic Material Management Plan** included with the detailed design package.

11. VEGETATIVE PLAN

For the engineered synthetic turf cover system (ClosureTurf®), the system is composed of a geomembrane overlain by an engineered synthetic turf and sand infill material. The alternative cover system is composed of a geomembrane overlain by #57 stone for drainage. Therefore, vegetation will not be required on either final cover system.

During temporary lapses in construction activity, short term stabilization measures will be installed on exposed areas within 14 days of disturbance and in accordance with the Disturbed Area Stabilization (With Mulching Only) or Disturbed Area Stabilization (With Temporary Seeding) details in the **Design Drawings** (Drawings 077-079).

Stabilization of the existing perimeter berms or other areas disturbed during construction which are not covered by the engineered synthetic turf cover system, may be achieved with a vegetative cover. In areas to receive seed, the ground will be scarified, and a layer of topsoil will be placed. Seed and fertilizer will be placed on the seed bed using the methods and rates specified in the **Design Drawings** and **Technical Specifications**.

12. SITE EQUIPMENT NEEDED

The Contractor selected to perform closure construction will be responsible for all equipment needed during the construction period. For post-closure care, APC will provide all necessary company owned, leased or contracted equipment needed to perform maintenance and any necessary repairs.

13. SEDIMENT REMOVAL

On a periodic basis during closure, accumulated sediment will be removed when necessary from drop inlets, drainage pipes, diversion ditches, and other drainage structures.

14. EROSION AND SEDIMENT CONTROL

Upon closure, all proposed ditches, diversion berms, culverts, riprap, and other drainage structures serving disturbed areas, but not already built, will be constructed and placed according to the **Design Drawings**.

15. COST OF CLOSURE

Through coordination with the engineering design team and the subcontractor selected to execute the closure activities, the estimated cost of closing Plant Barry's ash pond is approximately $860 million. The estimate is considered to be at control level with a high level of project definition. However, due to the complexity, quantities, and duration of the overall project, some variability in costs is expected. Additional expenses of post closure care, maintenance, and corrective action are currently estimated at $36 million. Fully detailed long-term maintenance and corrective action strategies have not yet been determined which have the potential to influence current estimates.

Some of the most significant cost items include:

- Water management including contact and noncontact water;
- ClosureTurf® cover system;
- Construction management and construction quality control (CQC);
- Offsite fill materials such as soil and clay fill, gravel and riprap;
- Excavation, placement, compaction, and grading of CCR into the consolidated footprint;
- Pressure relief wells;

- Construction quality assurance (CQA);
- Dust control management;
- Engineering support; and
- General contingency and inflation on construction items.

16. CLOSURE SCHEDULE

The closure of Plant Barry's ash pond is expected to exceed the closure activity timeline of five years (§ 257.102(f)(1)(ii) and r. 335-13-15-.07(3)(f)1.(ii)) and is expected to require the allowable two-year extensions to complete the closure due to the excavation moisture conditioning, placement, compaction, and grading of approximately 9,000,000 cubic yards of CCR and underlying soil. This excavated CCR is currently highly saturated and loosely deposited within the ash pond. The schedule of major milestones and approximate timeframes shown below and in **Table 1** will be followed over the approximately 12-year closure period:

- Remove free liquids, stormwater management, and conduct CCR dewatering – approximately 11 years.
- Excavate, place, compact, and grade relocated CCR into the consolidated footprint – approximately 11 years.
- Construct stormwater ponds, soil containment berm, and other soil fill structures – approximately 11 years.
- Install final cover system and stormwater management features – approximately 7.5 years.

Closure will be conducted in sequential steps consistent with the phases discussed previously, but it should be recognized that not all activities on the closure schedule will occur on a continuous basis throughout their scheduled durations, and that the timeframes are only estimates.

17. RECORDKEEPING/NOTIFICATION/INTERNET REQUIREMENTS

As outlined in § 257.105 and r. 335-13-15-.08(1), each Owner or Operator of a CCR unit subject to the Department regulations must maintain files of certain information in an operating record at the facility. Each file is to be retained for at least five years following the date of each occurrence, measurement, maintenance, corrective action, report, record or study. Electronic storage of the records is acceptable. These records are to be made available to the Department upon request.

Certain notifications are to be made in accordance with the requirements of § 257.106 and r. 335-13-15-.08(2). In many instances, such notifications are to be placed in the facility's Operating Record. In certain instances, further notifications are to be made to the Department Directory within 30 days of placement of a notification into the Operating Records. Furthermore, a publicly accessible internet site must be established for posting of certain notifications and compliance information within 30 days of it being placed in the Operating Record.

APC and Plant Barry maintain an electronic Operating Record for the facility. In addition, a publicly accessible internet site has already been established for compliance with EPA's CCR Rule. Required notifications and compliance data, as outlined in § 257.105 through § 257.107 and r. 335-13-15-.08 and as applicable to the Plant Barry Ash Pond, will be maintained in the electronic Operating Record, and as required, made available on the publicly accessible internet site within 30 days of placement in the Operating Record. Furthermore, required notifications will be made to the Department Director within 30 days of placement in the Operating Record.

Certain plans and assessments are required to be updated at specified intervals and/or upon modification of certain components of the facility. If and when applicable, updates will be made to the respective plans and assessments, and notifications placed in the Operating Record, posted to the publicly accessible internet site, and communicated in writing to the Department Director in accordance with the Department rules.

18. WRITTEN POST-CLOSURE PLAN

40 CFR § 257.104 and ADEM Administrative Code r. 335-13-15-.07(5) require the owner or operator of an existing CCR surface impoundment that is closed in place to provide for post-closure care of the unit for a period of at least 30 years. Post-closure care includes maintenance of the facility, as well as groundwater monitoring in accordance with § 257.90 through § 257.98 and r. 335-13-15-.06(1) through r. 335-13-15-.06(9).

The Plant Barry Ash Pond is currently expected to be closed in place under the performance standards outlined in § 257.102(d) and r. 335-13-15-.07(3)(d). Following closure, maintenance will be provided on the final cover system for the required post-closure care period so that the integrity and effectiveness of the final cover system will be maintained. Maintenance activities will include, as needed, repairs to the final cover to correct any effects related to settlement, subsidence, erosion or other events, and will be performed to prevent run-on or run-off from eroding or otherwise damaging the final cover. Maintenance tasks could include, but not be limited to, repair of subsidence or erosion features, replacement of sand in-fill within the synthetic turf and re-establishment of vegetation, where applicable. Maintenance will be performed on a semi-annual schedule, or more frequently if needed.

The groundwater monitoring system will be maintained throughout the required post-closure care period. Groundwater monitoring will be performed on a semiannual basis during the required post-closure care period as well.

The following office(s) can be contacted about the facility during the post-closure care period.

Barry Steam Plant
Environmental Manager
15300 Highway 43 North, Bucks, AL 36512-0070
1-251-829-2600
G2CCRPostBAR@southernco.com

At the present time, there is no planned use of the facility after closure. If current plans change, they will be noted in an amendment to this post-closure care plan. Any future use of the property after closure will not disturb the integrity of the final cover, liner or any other component of the containment system. Furthermore, the functionality of the groundwater monitoring system will be maintained.

No later than 60 days following completion of the post-closure care period of 30 years, APC will prepare a notification verifying completion of the post-closure care.

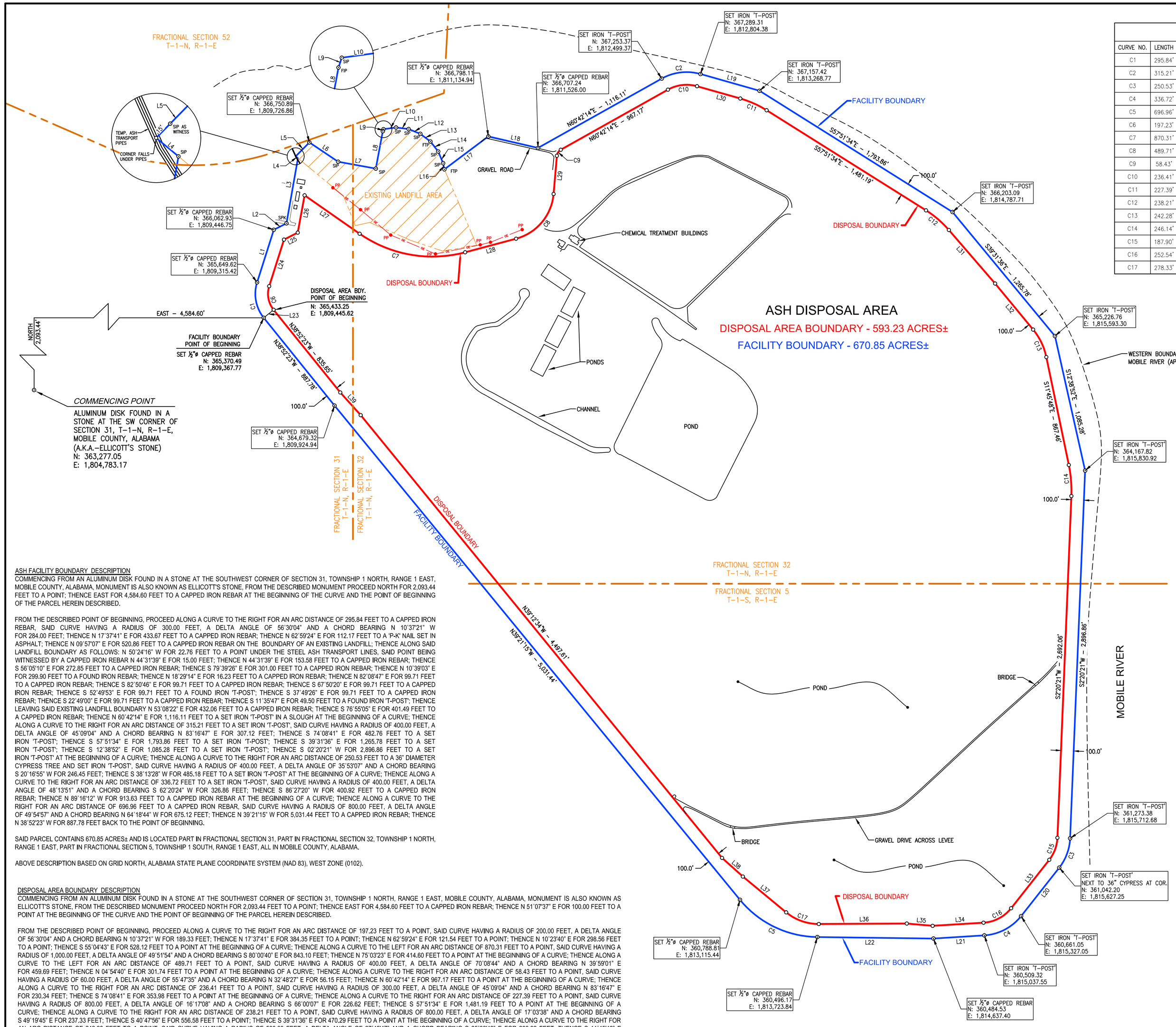
TABLES

Table 1: Barry Ash Pond Closure Milestones Schedule (335-13-15-.07(3)(b)1.(vi))

Closure Activity	Completion Date
Notice of Intent to Close	October 2016
Cease Receipt of Waste Streams/Initiate Construction Activities	April 2019
Initiate Free Water Dewatering Activities	September 2019
Begin CCR Consolidation and Stabilization	September 2019
Auxiliary Spillway Construction	October 2019
Begin Final Cover Cap Construction Activities	April 2020
Begin Construction of Internal Drainage System	August 2020
Complete Construction of Internal Drainage System	July 2022
Begin Pressure Relief Wells for Deep Excavations	October 2020
End Final Cap Construction Activities	August 2030
Project Completion	May 2031

APPENDIX A

Boundary Survey



CURVE TABLE					
CURVE NO.	LENGTH	RADIUS	DELTA	CHORD BEARING	CHORD LENGTH
C1	295.84'	300.00'	56°30'04"	N10°37'21"W	284.00'
C2	315.21'	400.00'	45°09'04"	N83°16'47"E	307.12'
C3	250.53'	400.00'	35°53'07"	S20°16'55"W	246.45'
C4	336.72'	400.00'	48°13'51"	S62°20'24"W	326.86'
C5	696.96'	800.00'	49°54'57"	N64°18'44"W	675.12'
C6	197.23'	200.00'	56°30'04"	N10°37'21"W	189.33'
C7	870.31'	1000.00'	49°51'54"	S80°00'40"E	843.10'
C8	489.71'	400.00'	70°08'44"	N39°59'01"E	459.69'
C9	58.43'	60.00'	55°47'35"	N32°48'27"E	56.15'
C10	236.41'	300.00'	45°09'04"	N83°16'47"E	230.34'
C11	227.39'	800.00'	16°17'08"	S66°00'07"E	226.62'
C12	238.21'	800.00'	17°03'38"	S49°19'45"E	237.33'
C13	242.28'	500.00'	27°45'47"	S25°38'42"E	239.92'
C14	246.14'	1000.00'	14°06'10"	S4°42'44"E	245.52'
C15	187.90'	300.00'	35°53'07"	S20°16'55"W	184.84'
C16	252.54'	300.00'	48°13'51"	S62°20'24"W	245.15'
C17	278.33'	400.00'	39°52'03"	N70°21'45"W	272.75'

LINE TABLE		
LINE NO.	BEARING	LENGTH
L1	N17°37'41"E	433.67'
L2	N62°59'24"E	112.17'
L3	N9°57'07"E	520.86'
L4	N50°24'16"W	22.76'
L5	N44°31'39"E	153.58'
L6	S56°05'10"E	272.85'
L7	S79°39'26"E	301.00'
L8	N10°39'03"E	299.90'
L9	N18°29'14"E	16.23'
L10	N82°08'47"E	99.71'
L11	S82°50'46"E	99.71'
L12	S67°50'20"E	99.71'
L13	S52°49'53"E	99.71'
L14	S37°49'26"E	99.71'
L15	S22°49'00"E	99.71'
L16	S11°35'47"E	49.50'
L17	N53°08'22"E	432.06'
L18	S76°55'05"E	401.49'
L19	S74°08'41"E	482.76'
L20	S38°13'28"W	485.18'
L21	S86°27'20"W	400.92'
L22	N89°16'12"W	913.63'
L23	N51°07'37"E	100.00'
L24	N17°37'41"E	384.35'
L25	N62°59'24"E	121.54'
L26	N10°23'40"E	298.56'
L27	S55°04'43"E	528.12'
L28	N75°03'23"E	414.60'
L29	N4°54'40"E	301.74'
L30	S74°08'41"E	353.98'
L31	S40°47'56"E	556.58'
L32	S39°31'36"E	470.29'
L33	S38°13'28"W	485.18'
L34	S86°27'20"W	400.92'
L35	N84°54'50"W	204.23'
L36	S89°42'14"W	692.30'
L37	N50°25'43"W	442.02'
L38	N48°07'45"W	220.23'
L39	N41°57'54"W	240.24'

LEGEND

- OHE — OVERHEAD ELECTRIC POWER LINE
- CCR SURFACE IMPOUNDMENT FACILITY BOUNDARY
- ASH DISPOSAL AREA BOUNDARY
- PLSS SECTION LINE (APPROX.)
- ⊙ BOUNDARY CORNER MONUMENT - SET / FOUND AS NOTED
- ○ BOUNDARY DIRECTION CHANGE (NO MONUMENT)
- FTP FOUND IRON 'T-POST'
- FIP FOUND IRON PIN
- SIP SET IRON PIN (18" X 1/2"Ø CAPPED REBAR)
- SPK SET 'P-K' NAIL

N

AL SPCS GRID
WEST ZONE

1" = 400'

SURVEY NOTES

1. ALL PARTS OF THIS SURVEY AND DRAWING HAVE BEEN COMPLETED IN ACCORDANCE WITH THE CURRENT REQUIREMENTS OF THE STANDARDS OF PRACTICE FOR SURVEYING IN THE STATE OF ALABAMA.
2. THE LOCATION OF UNDERGROUND UTILITIES ARE NOT SHOWN ON THIS SURVEY, APPROPRIATE UTILITY COMPANIES SHOULD BE CONTACTED FOR VERIFICATION OF LOCATIONS PRIOR TO ANY CONSTRUCTION ACTIVITY.
3. IT IS THE INTENT OF THIS "SPECIAL PURPOSE SURVEY" IS TO PROVIDE ACCURATE BOUNDARIES OF THE FACILITY BOUNDARY AND THE DISPOSAL AREA BOUNDARY FOR THE ALABAMA POWER PLANT ASH STORAGE FACILITY. BOTH BOUNDARIES SHOWN ON THIS SURVEY ARE WITHIN EXISTING ALABAMA POWER OWNED PROPERTY, THEREFORE THIS IS NOT A PROPERTY BOUNDARY SURVEY.
4. THE LOCATION OF THE FACILITY BOUNDARY AND THE DISPOSAL AREA BOUNDARY WERE ESTABLISHED BY ALABAMA POWER REPRESENTATIVES. SCGS MADE NO EFFORT TO DETERMINE THE EXISTENCE OR LOCATION OF EXISTING PROCESS WASTE OR WETLAND BOUNDARIES DURING THIS SURVEY.
5. THERE WAS NO EFFORT MADE DURING THIS SURVEY TO LOCATE TEMPORARY CONSTRUCTION SITES, PROJECT OFFICES, OR OTHER IMPROVEMENTS IN THIS FACILITY PER AL POWER COMPANY REQUEST.
6. THE FIELD SURVEY DATES FOR THIS SURVEY ARE AS FOLLOWS: SEPTEMBER 10-13, 17, 18 2018.
7. REFERENCES:
   - AL POWER MONITORING WELL LOCATION MAP
   - G.L.O. ORIGINAL SURVEY PLATS
   - SURVEY OF THE BARRY STEAM PLANT LANDFILL ON THE NORTH SIDE OF THIS SURVEY, DATED: 06-30-93, REVISION #2 DATED 06-23-10, BY: GORDON P. BURKHALTER, PLS# 22404.

STATE PLANE COORDINATE DATA:

SPC ZONE:	AL WEST 0102
HORIZONTAL DATUM:	NAD 83
DERIVED BY:	GPS OBSERVATION
COMBINED GRID FACTOR:	0.9999612
CONVERGENCE ANGLE:	-00°15'41.87" → P.O.B. - F.B.
CONTROL USED:	ALDOT NETWORK

VICINITY MAP
1" = 2000'

GRAPHIC SCALE

400 0 200 400 800 1600

(IN FEET)

1 INCH = 400 FEET

ASH FACILITY BOUNDARY DESCRIPTION

COMMENCING FROM AN ALUMINUM DISK FOUND IN A STONE AT THE SOUTHWEST CORNER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 1 EAST, MOBILE COUNTY, ALABAMA, MONUMENT IS ALSO KNOWN AS ELLICOTT'S STONE, FROM THE DESCRIBED MONUMENT PROCEED NORTH FOR 2,093.44 FEET TO A POINT; THENCE EAST FOR 4,584.60 FEET TO A CAPPED IRON REBAR AT THE BEGINNING OF THE CURVE AND THE POINT OF BEGINNING OF THE PARCEL HEREIN DESCRIBED.

FROM THE DESCRIBED POINT OF BEGINNING, PROCEED ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 295.84 FEET TO A CAPPED IRON REBAR, SAID CURVE HAVING A RADIUS OF 300.00 FEET, A DELTA ANGLE OF 56°30'04" AND A CHORD BEARING N 10°37'21" W FOR 284.00 FEET; THENCE N 17°37'41" E FOR 433.67 FEET TO A CAPPED IRON REBAR; THENCE N 62°59'24" E FOR 112.17 FEET TO A 'P-K' NAIL SET IN ASPHALT; THENCE N 09°57'07" E FOR 520.86 FEET TO A CAPPED IRON REBAR ON THE BOUNDARY OF AN EXISTING LANDFILL; THENCE ALONG SAID LANDFILL BOUNDARY AS FOLLOWS: N 50°24'16" W FOR 22.76 FEET TO A POINT UNDER THE STEEL ASH TRANSPORT LINES, SAID POINT BEING WITNESSED BY A CAPPED IRON REBAR N 44°31'39" E FOR 15.00 FEET; THENCE N 44°31'39" E FOR 153.58 FEET TO A CAPPED IRON REBAR; THENCE S 56°05'10" E FOR 272.85 FEET TO A CAPPED IRON REBAR; THENCE S 79°39'26" E FOR 301.00 FEET TO A CAPPED IRON REBAR; THENCE N 10°39'03" E FOR 299.90 FEET TO A FOUND IRON REBAR; THENCE N 18°29'14" E FOR 16.23 FEET TO A CAPPED IRON REBAR; THENCE N 82°08'47" E FOR 99.71 FEET TO A CAPPED IRON REBAR; THENCE S 82°50'46" E FOR 99.71 FEET TO A CAPPED IRON REBAR; THENCE S 67°50'20" E FOR 99.71 FEET TO A CAPPED IRON REBAR; THENCE S 52°49'53" E FOR 99.71 FEET TO A FOUND IRON "T-POST"; THENCE S 37°49'26" E FOR 99.71 FEET TO A CAPPED IRON REBAR; THENCE S 22°49'00" E FOR 99.71 FEET TO A CAPPED IRON REBAR; THENCE S 11°35'47" E FOR 49.50 FEET TO A FOUND IRON "T-POST"; THENCE LEAVING SAID EXISTING LANDFILL BOUNDARY N 53°08'22" E FOR 432.06 FEET TO A CAPPED IRON REBAR; THENCE S 76°55'05" E FOR 401.49 FEET TO A CAPPED IRON REBAR; THENCE N 60°42'14" E FOR 1,116.11 FEET TO A SET IRON "T-POST" IN A SLOUGH AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 315.21 FEET TO A SET IRON "T-POST", SAID CURVE HAVING A RADIUS OF 400.00 FEET, A DELTA ANGLE OF 45°09'04" AND A CHORD BEARING N 83°16'47" E FOR 307.12 FEET; THENCE S 74°08'41" E FOR 482.76 FEET TO A SET IRON "T-POST"; THENCE S 57°51'34" E FOR 1,793.86 FEET TO A SET IRON "T-POST"; THENCE S 39°31'36" E FOR 1,265.78 FEET TO A SET IRON "T-POST"; THENCE S 12°38'52" E FOR 1,085.28 FEET TO A SET IRON "T-POST"; THENCE S 02°20'21" W FOR 2,896.86 FEET TO A SET IRON "T-POST" AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 250.53 FEET TO A 36" DIAMETER CYPRESS TREE AND SET IRON "T-POST", SAID CURVE HAVING A RADIUS OF 400.00 FEET, A DELTA ANGLE OF 35°53'07" AND A CHORD BEARING S 20°16'55" W FOR 246.45 FEET; THENCE S 38°13'28" W FOR 485.18 FEET TO A SET IRON "T-POST" AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 336.72 FEET TO A SET IRON "T-POST", SAID CURVE HAVING A RADIUS OF 400.00 FEET, A DELTA ANGLE OF 48°13'51" AND A CHORD BEARING S 62°20'24" W FOR 326.86 FEET; THENCE S 86°27'20" W FOR 400.92 FEET TO A CAPPED IRON REBAR; THENCE N 89°16'12" W FOR 913.63 FEET TO A CAPPED IRON REBAR AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 696.96 FEET TO A CAPPED IRON REBAR, SAID CURVE HAVING A RADIUS OF 800.00 FEET, A DELTA ANGLE OF 49°54'57" AND A CHORD BEARING N 64°18'44" W FOR 675.12 FEET; THENCE N 39°21'15" W FOR 5,031.44 FEET TO A CAPPED IRON REBAR; THENCE N 38°52'23" W FOR 887.78 FEET BACK TO THE POINT OF BEGINNING.

SAID PARCEL CONTAINS 670.85 ACRES± AND IS LOCATED PART IN FRACTIONAL SECTION 31, PART IN FRACTIONAL SECTION 32, TOWNSHIP 1 NORTH, RANGE 1 EAST, PART IN FRACTIONAL SECTION 5, TOWNSHIP 1 SOUTH, RANGE 1 EAST, ALL IN MOBILE COUNTY, ALABAMA.

ABOVE DESCRIPTION BASED ON GRID NORTH, ALABAMA STATE PLANE COORDINATE SYSTEM (NAD 83), WEST ZONE (0102).

DISPOSAL AREA BOUNDARY DESCRIPTION

COMMENCING FROM AN ALUMINUM DISK FOUND IN A STONE AT THE SOUTHWEST CORNER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 1 EAST, MOBILE COUNTY, ALABAMA, MONUMENT IS ALSO KNOWN AS ELLICOTT'S STONE, FROM THE DESCRIBED MONUMENT PROCEED NORTH FOR 2,093.44 FEET TO A POINT; THENCE EAST FOR 4,584.60 FEET TO A CAPPED IRON REBAR; THENCE N 51°07'37" E FOR 100.00 FEET TO A POINT AT THE BEGINNING OF THE CURVE AND THE POINT OF BEGINNING OF THE PARCEL HEREIN DESCRIBED.

FROM THE DESCRIBED POINT OF BEGINNING, PROCEED ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 197.23 FEET TO A POINT, SAID CURVE HAVING A RADIUS OF 200.00 FEET, A DELTA ANGLE OF 56°30'04" AND A CHORD BEARING N 10°37'21" W FOR 189.33 FEET; THENCE N 17°37'41" E FOR 384.35 FEET TO A POINT; THENCE N 62°59'24" E FOR 121.54 FEET TO A POINT; THENCE N 10°23'40" E FOR 298.56 FEET TO A POINT; THENCE S 55°04'43" E FOR 528.12 FEET TO A POINT AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE LEFT FOR AN ARC DISTANCE OF 870.31 FEET TO A POINT, SAID CURVE HAVING A RADIUS OF 1,000.00 FEET, A DELTA ANGLE OF 49°51'54" AND A CHORD BEARING S 80°00'40" E FOR 843.10 FEET; THENCE N 75°03'23" E FOR 414.60 FEET TO A POINT AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE LEFT FOR AN ARC DISTANCE OF 489.71 FEET TO A POINT, SAID CURVE HAVING A RADIUS OF 400.00 FEET, A DELTA ANGLE OF 70°08'44" AND A CHORD BEARING N 39°59'01" E FOR 459.69 FEET; THENCE N 04°54'40" E FOR 301.74 FEET TO A POINT AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 58.43 FEET TO A POINT, SAID CURVE HAVING A RADIUS OF 60.00 FEET, A DELTA ANGLE OF 55°47'35" AND A CHORD BEARING N 32°48'27" E FOR 56.15 FEET; THENCE N 60°42'14" E FOR 967.17 FEET TO A POINT AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 238.41 FEET TO A POINT, SAID CURVE HAVING A RADIUS OF 300.00 FEET, A DELTA ANGLE OF 45°09'04" AND A CHORD BEARING N 83°16'47" E FOR 230.34 FEET; THENCE S 74°08'41" E FOR 353.98 FEET TO A POINT AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 227.39 FEET TO A POINT, SAID CURVE HAVING A RADIUS OF 800.00 FEET, A DELTA ANGLE OF 16°17'08" AND A CHORD BEARING S 66°00'07" E FOR 226.62 FEET; THENCE S 57°51'34" E FOR 1,481.19 FEET TO A POINT AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 238.21 FEET TO A POINT, SAID CURVE HAVING A RADIUS OF 800.00 FEET, A DELTA ANGLE OF 17°03'38" AND A CHORD BEARING S 49°19'45" E FOR 237.33 FEET; THENCE S 40°47'56" E FOR 556.58 FEET TO A POINT; THENCE S 39°31'36" E FOR 470.29 FEET TO A POINT AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 242.28 FEET TO A POINT, SAID CURVE HAVING A RADIUS OF 500.00 FEET, A DELTA ANGLE OF 27°45'47" AND A CHORD BEARING S 25°38'42" E FOR 239.92 FEET; THENCE S 11°45'48" E FOR 867.46 FEET TO A POINT AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 246.14 FEET TO A POINT, SAID CURVE HAVING A RADIUS OF 1,000.00 FEET, A DELTA ANGLE OF 14°06'10" AND A CHORD BEARING S 04°42'44" E FOR 245.52 FEET; THENCE S 02°20'21" W FOR 2,692.06 FEET TO A POINT AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 187.90 FEET TO A POINT, SAID CURVE HAVING A RADIUS OF 300.00 FEET, A DELTA ANGLE OF 35°53'07" AND A CHORD BEARING S 20°16'55" W FOR 184.84 FEET; THENCE S 38°13'28" W FOR 485.18 FEET TO A POINT AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 252.54 FEET TO A POINT, SAID CURVE HAVING A RADIUS OF 300.00 FEET, A DELTA ANGLE OF 48°13'51" AND A CHORD BEARING S 62°20'24" W FOR 245.15 FEET; THENCE S 86°27'20" W FOR 400.92 FEET TO A POINT; THENCE N 84°54'50" W FOR 204.23 FEET TO A POINT; THENCE S 89°42'14" W FOR 692.30 FEET TO A POINT AT THE BEGINNING OF A CURVE; THENCE ALONG A CURVE TO THE RIGHT FOR AN ARC DISTANCE OF 278.33 FEET TO A POINT, SAID CURVE HAVING A RADIUS OF 400.00 FEET, A DELTA ANGLE OF 39°52'03" AND A CHORD BEARING N 70°21'45" W FOR 272.75 FEET; THENCE N 50°25'43" W FOR 442.02 FEET TO A POINT; THENCE N 48°07'45" W FOR 220.23 FEET TO A POINT; THENCE N 39°12'34" W FOR 4,497.61 FEET TO A POINT; THENCE N 41°57'54" W FOR 240.24 FEET TO A POINT; THENCE N 38°52'23" W FOR 835.65 FEET BACK TO THE POINT OF BEGINNING.

SAID PARCEL CONTAINS 593.23 ACRES± AND IS LOCATED PART IN FRACTIONAL SECTION 31, PART IN FRACTIONAL SECTION 32, TOWNSHIP 1 NORTH, RANGE 1 EAST, PART IN FRACTIONAL SECTION 5, TOWNSHIP 1 SOUTH, RANGE 1 EAST, ALL IN MOBILE COUNTY, ALABAMA.

ABOVE DESCRIPTION BASED ON GRID NORTH, ALABAMA STATE PLANE COORDINATE SYSTEM (NAD 83), WEST ZONE (0102).

BEARINGS ORIENTED BY: GPS OBSERVATION GRID - AL SPCS WEST
DRAWING SCALE: 1" = 400'
SURVEYED BY: JAS/RFD
DRAWN BY: JAS
DRAWING SIZE: 24" X 36"
SCGS PROJ. # 132-002
SHEET NO. 1 OF 1

PREPARED BY:
SOUTHCOAST GEOSERVICES
SURVEYING • UTILITY LOCATING • MAPPING
P.O. BOX 487 PURVIS, MS 39475
PHONE (601) 543-4882

PREPARED FOR:
ALABAMA POWER COMPANY

PROJECT TITLE:
BOUNDARY SURVEY
CCR SURFACE IMPOUNDMENT
ASH DISPOSAL AREA
BARRY ELECTRIC GENERATING PLANT
BUCKS, ALABAMA

ALABAMA LICENSED NO. 32377 PROFESSIONAL LAND SURVEYOR JED A. SELLERS

I CERTIFY THAT THE INFORMATION CONTAINED ON THIS PLAT IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Jed A. Sellers
Jed A. Sellers
AL PLS No. 32377

09/21/18
Dated

Geosyntec consultants

engineers | scientists | innovators

Southern Company

STORMWATER AND CONTACT WATER MANAGEMENT PLAN CLOSURE OF ASH POND

Revision A

Alabama Power Company
Plant Barry
Bucks, Alabama

Prepared for

Southern Company Services, Inc.
3535 Colonnade Parkway
Birmingham, Alabama 35243

Prepared by

Geosyntec Consultants, Inc.
1255 Roberts Boulevard NW Suite 200
Kennesaw, Georgia 30144

Project GW6489

October 2018

Geosyntec consultants

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LIST OF ACRONYMS

ADEM	Alabama Department of Environmental Management
APC	Alabama Power Company
BMP	best management practice
CBMPP	Construction Best Management Practices Plan
CCR	coal combustion residual
CFR	Code of Federal Regulations
ft	feet
hr	hour(s)
in.	inch(es)
MSL	mean sea level
NPDES	National Pollutant Discharge Elimination System
NW	northwest
SCS	Southern Company Services
TA	Trans Ash
USEPA	United States Environmental Protection Agency
WWTS	wastewater treatment system
yr	year

1. INTRODUCTION

1.1 Site Description and Purpose

Alabama Power Company's (APC's) Plant Barry (Site) is located near the Mobile River in Bucks, Alabama. The plant began commercial operation in 1954. In 1965, the ash pond was placed into service and has been operating since as a wet pond, receiving sluiced coal combustion residual (CCR) such as fly ash, bottom ash, economizer ash, pyrites, and selective catalytic reduction ash, as well as low-volume wastewater generated as part of the plant operations. Since 2005, the ash pond has been used for dry stacking of the sluiced ash. In addition, the ash pond receives decant water from the gypsum storage area and stormwater from various plant areas. The ash pond is the only active ash pond at the plant property and is subject to permanent closure in accordance with the United States Environmental Protection Agency (USEPA) CCR Rule (40 Code of Federal Regulations [CFR] §257) and Alabama Department of Environmental Management (ADEM) Standards for Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments (Chapter 335-13-15).

This Stormwater and Contact Water Management Plan (Plan) describes the infrastructure, design considerations, and strategy for the regulatory-compliant management of stormwater and contact water and was prepared in support of the design to close the existing ash pond. The ash pond closure design will incorporate a consolidated and in-place closure design which reduces the original footprint of 597 acres to approximately 330 acres.

The activities associated with the ash pond closure at Plant Barry are subject to regulatory criteria for stormwater and contact water management per CCR Rule and additional design considerations by APC and Southern Company Services (SCS) to ensure conservatism, as outlined in the "Water Management During Construction" section of the Design Basis document (Geosyntec 2018a). Thus, the purpose of this Plan is to present an overview of the water management (stormwater and contact water) strategies on-site, design considerations, and the phased construction approach that will be undertaken to support the ash pond closure activities.

1.2 Organization of the Plan

The remainder of this Plan is organized as follows:

- *Section 2 – Background*. This section provides an overview of the ash pond outfall structure, water management strategies, and applicable design considerations for water management during construction.
- *Section 3 – Phasing Approach.* This section presents the conceptual plan for phased construction in support of ash pond closure.
- *Section 4 – Conclusions*. This section summarizes the conclusions from this Plan.
- *Section 5 – References*. This section provides the references cited in this Plan.

1.3 Plan Limitations

This Plan is limited to addressing water management for various interim conditions during the phased construction of the consolidated footprint. The water management strategies and design

criteria presented in this Plan are based on conceptual construction phasing figures prepared by Trans Ash (TA) (i.e. the Contractor). At the time of this Plan preparation, these construction phasing figures are draft and subject to future modifications. This Plan will be revised accordingly in the event the final version of construction phasing plan differs from that presented herein.

1.4 Reference Documents

This Plan cites multiple narrative plans, drawings, and calculation packages that are integral to reviewing and evaluating the water management approaches described herein and are accordingly referenced. These narrative plans and calculation packages contain relevant information and are listed below along with a brief statement of their relation to this Plan.

- *Design Basis for the Ash Pond Closure Project at Plant Barry* (Geosyntec 2018a) – Additional design considerations (recommended by APC and SCS) over and above the regulatory requirements are outlined in the "Water Management During Construction" section of the Design Basis document to achieve a level of conservancy in the closure design.
- *Final Cover System Surface Water Management Design* (Geosyntec 2018b) – Stormwater management upon closure of the ash pond and placement of the final cover system is addressed in the calculation package titled "Final Cover System Surface Water Management Design."
- *Ash Pond Dewatering and Stormwater Management During Construction* (Geosyntec 2018c) – Compliance of stormwater and contact water management system to the design considerations is addressed in the calculation package titled "Ash Pond Dewatering and Stormwater Management During Construction." The design considerations are presented in more detail in Section 2.3 of this Plan.
- *Dewatering Narrative Plan,* (Geosyntec 2018d) – This plan discusses the management of free water and interstitial water resulting from within the ash pond during dewatering activities.
- *Construction Best Management Practices Plan (CBMPP)* (Geosyntec 2018e) – This plan describes erosion and sediment control measures to be implemented during construction and best management practices (BMPs), which will be used to direct, divert, or contain stormwater and contact water.
- *Plant Barry CCR Pond Closure 60% Design Construction Drawings* (Geosyntec 2018f) – Multiple phases of stormwater management plan and appropriate erosion and sediment control measures are depicted on the 60% Design Construction Drawings.

2. BACKGROUND

2.1 Outfall Structure

Discharge from the ash pond is currently regulated under a National Pollutant Discharge Elimination System (NPDES) permit (Permit No. AL0002879, Outfall: DSN002; Effective April 2013), which defines permissible discharge limits into the Mobile River. The permit includes one outfall structure located on the southern end of the Site (**Figure 1)** that currently has a constant (24 hours [hr] per day, 7 days per week) discharge into the Mobile River. During closure construction**,** the outfall structure will be designed and operated such that discharge only occurs for emergency overflows (refer to Section 2.3 for design considerations). The outfall structure is comprised of the following three components (see **Figure 2** for reference**)**:

1. Corrugated metal pipe, 110 feet (ft) in length, 54 inches (in.) in diameter (lined to yield an effective inner diameter of 51 in.), and inlet and outlet elevations at 6.1 ft mean sea level (MSL) and 5.6 ft MSL, respectively;
2. Rectangular orifice/opening, 8 ft (width) x 1 ft (height) present on all four sides of the outfall structure at elevation 14.7 ft MSL; and
3. Open top (i.e., horizontal plane) rectangular opening, 8 ft (width) x 8 ft (length) at elevation 17.9 ft MSL.

2.2 Water Management

2.2.1 Definitions

Water management related to CCR removal (defined as the removal of CCR to the pre-CCR placement surface, and the removal of an additional 6 in. of underlying native soils) and placement during ash pond closure activities includes managing two categories of water based on the source materials from which they are generated. The two categories of water are as follows:

- **Contact Water:** Contact water, as defined per industry accepted terminology, is the runoff generated when stormwater comes in contact with areas of exposed CCR material. As required by the Design Basis (Geosyntec 2018a), contact water must be treated at the on-site wastewater treatment system (WWTS) prior to discharge through the permitted NPDES outfall. The management of free water and interstitial water during dewatering operations has been addressed in the Dewatering Narrative Plan (Geosyntec 2018d).
- **Stormwater:** Noncontact water, also referred to as stormwater, is defined as the runoff generated from areas where stormwater does not come in contact with CCR material. These areas may include stabilized surfaces lined with either temporary or final cover systems and excavation or closure by removal areas (including areas that have been backfilled with clean soil) where CCR has been removed and runoff does not mix with contact water. Based on the source materials from which stormwater is generated, there is no requirement for the stormwater to be treated prior to off-site discharge.

Both types of water will be collected, conveyed, stored, treated (if required), and discharged in accordance with applicable regulatory requirements and additional design considerations described in Section 2.3. To the extent practical, stormwater and contact water runoff will be routed and discharged separately to isolate the contact water component requiring necessary treatment prior to discharging off-site. Routing of contact water and stormwater along with their respective discharge strategies is described below.

2.2.2 Contact Water Management

Contact water generated during construction activities will be conveyed via temporary controls (i.e., diversion berms and conveyance channels) and stored in the settling basin located south of the consolidated CCR footprint (i.e., ponded areas north and south of the separator dike under existing conditions). Contact water in the settling basin will pass through a filter berm (to prevent conveyance of debris) and pumped to the on-site WWTS for treatment prior to discharge. As outlined in the Design Basis (Geosyntec 2018a) and described in Section 2.3.3, the setting basin will contain runoff resulting from storms up to 25-year (yr), 24-hr event, which is over and above the requirement for containing storms up to 10-yr, 24-hr event. Runoff generated from storms exceeding the 25-yr, 24-hr event need not be contained in the settling basin and will discharge off-site through the permitted NPDES outlet, while meeting the effluent quality requirements listed in the NPDES permit.

2.2.3 Stormwater Management

Stormwater runoff, generated from areas described under Section 2.2.1 above will be pumped or conveyed through a combination of drainage channels, benches, and downchutes into the interior drainage channel. Stormwater runoff may be stored within other features, such as finalized portions of the stormwater ponds where CCR removal has occurred and comingling with contact water is prevented. Per discussions with APC/SCS, stormwater runoff generated during construction activities does not require treatment by the WWTS and may be discharged off-site, by-passing both the WWTS and the NPDES outfall. For example, stormwater runoff contained in the interior drainage channel corridor or completed portions of the stormwater ponds on the western and eastern sides of the consolidated CCR footprint may be conveyed into the cooling water discharge canal or the Mobile River. The final conveyance of stormwater runoff to receiving water bodies will only occur in conjunction with appropriate erosion and sediment controls, as shown on the 60% Design Construction Drawings (Geosyntec 2018f) and outlined in the CBMPP (Geosyntec 2018e). The routing of stormwater and contact water on-site is shown as a flowchart on **Figure 3**.

2.2.4 Overview and Summary

During CCR removal and placement, water management infrastructure will be initially used for contact water conveyance and storage. Once areas upgradient of CCR placement have been installed with a temporary or final cover system and all CCR material has been removed from the proposed receiving areas, contact water management features will be transitioned to convey, store, and discharge stormwater. The five phasing construction figures have been annotated as sample plans, color-coded to represent areas that would be segregated and considered stormwater or contact water, as shown on **Figures 4 through 8**.

For any water management feature, if stormwater mixes with contact water, the entire volume of water will be considered contact water. Because contact water requires treatment at the WWTS, measures will be taken by the Contractor to segregate stormwater and minimize the volume of runoff that comingles with contact water. Minimization techniques, such as construction of additional diversion berms or channels to divert stormwater away from contact water are explained in more detail in the CBMPP (Geosyntec 2018e).

2.3 Regulatory Requirements and Design Considerations

2.3.1 Overview

Water management during CCR excavation and placement is subject to regulatory requirements (such as, design storms and appropriate freeboard) contained in the Federal CCR Rule (USEPA 2015), as well as additional design/operational requirements established by APC/SCS and outlined in the "Water Management During Construction" section of the Design Basis (Geosyntec 2018a).

2.3.2 Federal CCR Rule

USEPA's CCR rule for electric utilities (40 CFR 257) issued in 2015 provides guidelines to owners or operators of an existing or new CCR surface impoundment with regard to maintaining sufficient hydrologic and hydrologic capacity of the CCR surface impoundment. The existing ash pond at Plant Barry is classified under the "significant hazard potential" category. Therefore, the relevant requirements for the significant hazard potential category from the Final Federal CCR Rule are referenced as follows:

- §257.82(a): The owner or operator of an existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment must design, construct, operate, and maintain an inflow design flood control system as specified in paragraphs (a)(1) and (2) of this section.
- §257.82(a)(1): The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood specified in paragraph (a)(3) of this section.
- §257.82(a)(2) The inflow design flood control system must adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood specified in paragraph (a)(3) of this section.
- §257.82(a)(3)(ii): The inflow design flood is the 1,000-yr flood for a significant hazard potential CCR surface impoundment.

2.3.3 APC/SCS Operational Considerations

In addition to the requirements of the Federal CCR rule, APC/SCS developed supplemental operating guidelines for managing stormwater and contact water during construction to establish a level of conservancy. The additional operating guidelines are outlined in the "Water Management During Construction" section of the Design Basis (Geosyntec 2018a) and are as follows:

- Dewatering systems and on-site storage capacity will accommodate up to a 25-yr, 24-hr storm event without discharging through the NPDES outfall structure. Any discharge exceeding the 25-yr, 24-hr storm event may be discharged through the NPDES outlet but will meet the effluent quality criteria listed in the NPDES permit.
- The size of active excavation areas will be limited such that the active excavation area can be dewatered, and construction can recommence within 3 days following the 10-yr, 24-hr storm event.

Additional water management criteria established for post-closure conditions are provided within the Design Basis (Geosyntec 2018a) under Table 2.1: Plant Barry Ash Pond Closure – Environmental Systems and Water Management Design Basis.

2.3.4 Summary of Regulations and Design Considerations (During Construction)

Based on the requirements per Federal CCR Rule and APC/SCS operational guidelines described above, the stormwater and contact water management system during closure construction (i.e., CCR excavation and placement) will be designed to meet the following criteria:

- *Managing Flows from 1,000-Year, 24-Hour Storm Event Without Overtopping Perimeter Dike* - Following free water drawdown, the water management system (including storage and conveyance features) will be designed to manage the flow during and following the peak discharge from a 1,000-yr, 24-hr storm event during closure construction, as required per Federal CCR Rule (USEPA 2015).
- *25-Year, 24-Hour Storm Event Containment with No Discharge from NPDES Outfall* - Following free water drawdown, the on-site storage capacity will be designed to accommodate up to a 25-yr, 24-hr storm event without discharging through the NPDES outfall structure. Any discharge exceeding the 25-yr, 24-hr storm event may be discharged through the NPDES outlet but will meet the effluent quality criteria listed in the NPDES permit.
- *Active Excavation Area Dewatering from 10-Year, 24-Hour Storm Event* - The size of active excavation areas will be limited such that they can be dewatered to allow recommencement of construction within 3 days (72 hrs) following a 10-yr, 24-hr storm event.

3. PHASING APPROACH

3.1 Phasing Overview

The conceptual phasing plan prepared by the Contractor subdivides the ash pond into several smaller areas with CCR removal and placement occurring in a phased manner (**Figures 9 through 13**). Although the conceptual phasing plan includes a "year ending" schedule, the intent of the phasing plan is to depict the anticipated sequencing approach to CCR removal and placement. The duration of each phase will be variable based on field conditions, climactic conditions, and other variables. Further, the limits of active excavation (including preparation), fill/CCR placement, areas brought to final grade, and areas closed with either temporary or final cover systems are expected to differ from that depicted on the conceptual phasing plans, allowing the Contractor flexibility to progress in a manner suitable based on field conditions and constructability.

Areas labelled C1 through C5 roughly represent the location of initial excavation or cut areas. These excavations are along the east and west portions of the ash pond, which will ultimately become the East and West Stormwater Ponds. Areas labelled C6 through C15 represent subsequent excavation areas south of the consolidated CCR footprint. These areas will ultimately become the Stormwater Settling Basin. Area C 16 represents the separator dike, currently providing separation between the ponded areas north and south of the separator dike.

Areas labelled F1 through F14 represent the consolidated CCR footprint where the CCR will be consolidated and capped in-place using a liner cover system. Overlap (not depicted on the figures) will occur between areas labelled as excavation/cut and fill. For example, areas C1 through C5 each require excavation to remove CCR and fill placement for construction of the proposed soil containment berms. In addition, there are two areas labelled "Northwest (NW) Laydown Area North" and "NW Laydown Area South." These areas will be brought to final grade, capped-in-place, and continue to be used as a laydown area under post-closure conditions. Lastly, the area near the northeast corner of the ash pond labelled "North Stormwater Pond" encompasses the Northeast Future Use Area and the North Pond and both areas will be closed by removal of CCR.

The conceptual phasing plan has been divided into five phases, however, it is anticipated that two additional phases will be required to bring the ash pond to final closure conditions. Although the final two conceptual construction phases are not depicted on the attached figures, a brief description of these remaining anticipated phases are provided below. Further, this Plan will be updated accordingly once Phases 6 and 7 are complete and approved by APC/SCS and the Contractor.

3.2 Description of Individual Phases

As stated previously, the phasing plan is conceptual at the time of preparing this document and is subject to future modifications. Once the phasing plan has been finalized and agreed upon, the Contractor will have discretion to adjust phase boundaries shown on the phasing plan, with modifications being subject to APC/SCS approval, and the requirement that design criteria related to stormwater and contact water management (summarized in Section 2.3.4) is met. The sequence of the conceptual phasing plan and related activities has been summarized below.

- Phase 1 (See **Figure 9**) – Phase 1 operations will commence following the dewatering of ponded areas north and south of the separator dike, after which, area C16 (i.e., the separator dike) will be removed. Per the phasing plan, areas C1 and the North Stormwater Pond will be excavated while adjacent areas C2 and C3 will be dewatered and prepared for excavation. NW Laydown Areas North and South will be fully lined, and their closure activities completed (including excavation to final grade, CCR placement, subgrade preparation, and installation of geomembrane liner and cover system). Lastly, placement of fill will commence in areas F1, F2, and F3.
- Phase 2 (See **Figure 10**) – Areas F1 and F2 will be lined with geosynthetics following the placement of fill, while areas C1 and the North Stormwater Pond will undergo soil backfill, construction of containment berm, and geosynthetic lining following the completion of excavation. Placement of fill will commence in areas F3 through F5 and F7, while excavation will begin in areas C2 and C3. Areas C4 through C7 and C10 will be dewatered and prepared for excavation.
- Phase 3 (See **Figure 11**) – Areas F1, F2, C1, and the North Stormwater Pond will be fully lined, and their closure activities completed. Area F3 will be lined with geosynthetics following the placement of fill, while areas C2 and C3 will undergo soil backfill, construction of the soil containment berm and installation of geosynthetic lining following the completion of excavation. Placement of fill will commence in areas F6, F8, F9, F11, and F12 (along with continued placement of fill in areas F4, F5, and F7), while excavation will begin in areas C4 and C6. Areas C11 and C15 will be dewatered and prepared for excavation (along with ongoing excavation preparation in C7 and C10).
- Phase 4 (See **Figure 12**) – Areas C2, C3, and F3 will be fully lined, and their closure activities completed. Areas F4, F5 and F7 will be lined with geosynthetics following the placement of fill, while area C4 will undergo soil backfill, construction of a soil containment berm and installation of geosynthetic lining following the completion of excavation. Placement of fill will commence in area F14 (along with continued placement of fill in areas F6, F8, F9, F11, and F12), while excavation will begin in areas C5 and C7. Area C12 will be dewatered and prepared for excavation (along with ongoing excavation preparation in C10, C11, and C15).
- Phase 5 (See **Figure 13**) – Areas F4, F5, F7, and C4 will be fully lined, and their closure activities completed. Areas C5 and C6 will undergo soil backfill, construction of a soil containment berm and installation of geosynthetic lining following the completion of excavation. Placement of fill will continue in areas F6, F8–F14, while excavation will commence in areas C10–C12 (along with ongoing excavation in area C7). Areas C9 and C15 will be dewatered and prepared for excavation.
- Phases 6 and 7 – Following placement of fill in Areas F6, F8–F14, and following soil backfill, soil containment berm construction, and geosynthetic lining installation in Areas C5 and C6, these areas will be fully lined, and their closure activities completed. For Areas C7, C10–C12, ongoing excavation from earlier phases will be completed first, followed by soil backfill and installation of geosynthetic lining to complete the closure activities. For Areas C8, C13, and C14, closure activities shall

first commence in these final two phases (Phase 6 and 7) through initial dewatering and preparation of area for excavation. These activities will be followed by excavation of CCR, placement of soil backfill, and installation of geosynthetic linings to fully line the area and complete closure activities.

4. CONCLUSIONS

This Stormwater and Contact Water Management Plan describes the infrastructure, design criteria, and strategy for the regulatory-compliant management of stormwater and contact water during CCR excavation and placement as part of ash pond closure activities at Plant Barry, which are subject to regulatory criteria for water management per Federal CCR Rule and additional design considerations by APC/SCS.

A conceptual construction phasing plan prepared by the Contractor is presented in this Plan with a phase-by-phase breakdown of closure activities and estimated timeline of completion. The closure activities include initial dewatering and pond preparation, excavation, liner and fill placement, and placement of final cover system. While the closure activities are ongoing, stormwater and contact water management within the ash pond will be designed to meet the following design scenarios and applicable regulatory requirements, as described in Section 2.3.4:

- Managing flows from 1,000-yr, 24-hr storm event without overtopping the perimeter dike;
- Containing the 25-yr, 24-hr storm event without discharge through the NPDES outfall; and
- Minimizing active excavation areas to facilitate dewatering the 10-yr, 24-hr storm event within 3 days (72 hrs).

5. REFERENCES

Geosyntec. 2018a. *Design Basis Document for the Plant Barry Ash Pond Closure Project*. Prepared for Southern Company Services. April 2018a.

Geosyntec 2018b. *Final Cover System Surface Water Management Design Calculation Package*. Prepared for Southern Company Services., August.

Geosyntec. 2018c *Ash Pond Dewatering and Stormwater Management During Construction Calculation Package.* Prepared for Southern Company Services. August.

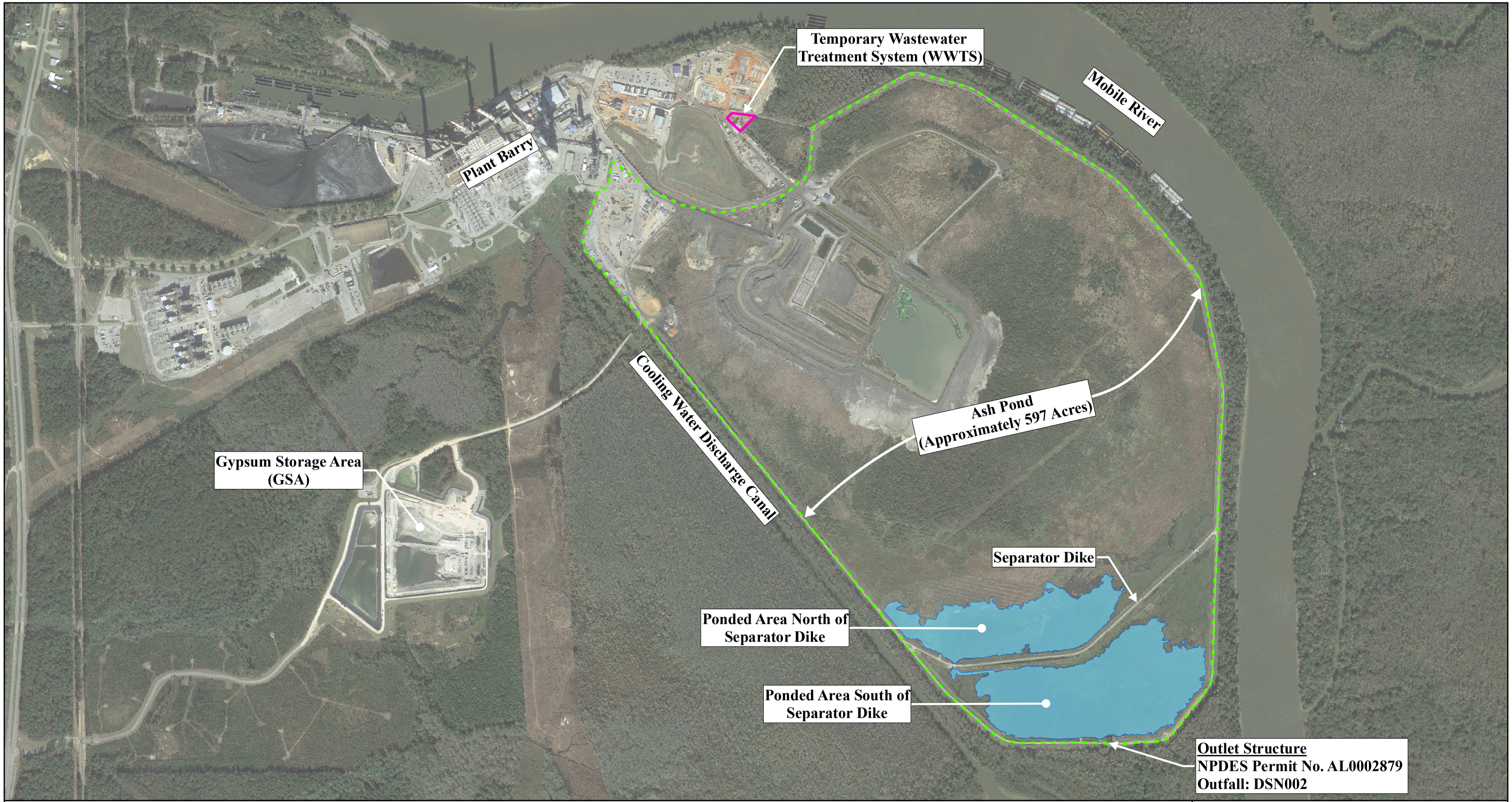
Geosyntec. 2018. *Dewatering Narrative Plan.* Prepared for Southern Company Services. September.

Geosyntec. 2018e. *Construction Best Management Practices Plan (CBMPP) for Plant Barry Coal Combustion Residual (CCR) Pond Closure, 15300 Highway 43 North, Bucks, Alabama 36512.* Prepared for Southern Company Services. September.

Geosyntec. 2018f. *60% Design Drawings, Plant Barry CCR Pond Closure Consolidation and Closure-in-Place, Mobile County, Alabama.*, Prepared for Southern Company Services. August.

USEPA. 2015. "40 CFR Parts 257 and 261 – Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities Final Rule." *United States Environmental Protection Agency Federal Register*, Vol. 80, No. 74, Published April 17.

FIGURES



Legend

- Approximate Ash Pond Boundary
- Temporary WWTS
- Ponded Areas

Aerial source and date: Google Earth, November 2017

N

0 230 460 920 Feet

SITE OVERVIEW
Plant Barry
Bucks, Alabama

Geosyntec consultants

PROJECT NO: GW6489 | October 2018

Figure 1

N:\Alabama Power\Plant Barry\05 GIS\MXD\SWMgmt_Fig01_Site Overview.mxd 10/4/2018 3:37:06 PM

PLANT BARRY ASH POND DISCHARGE

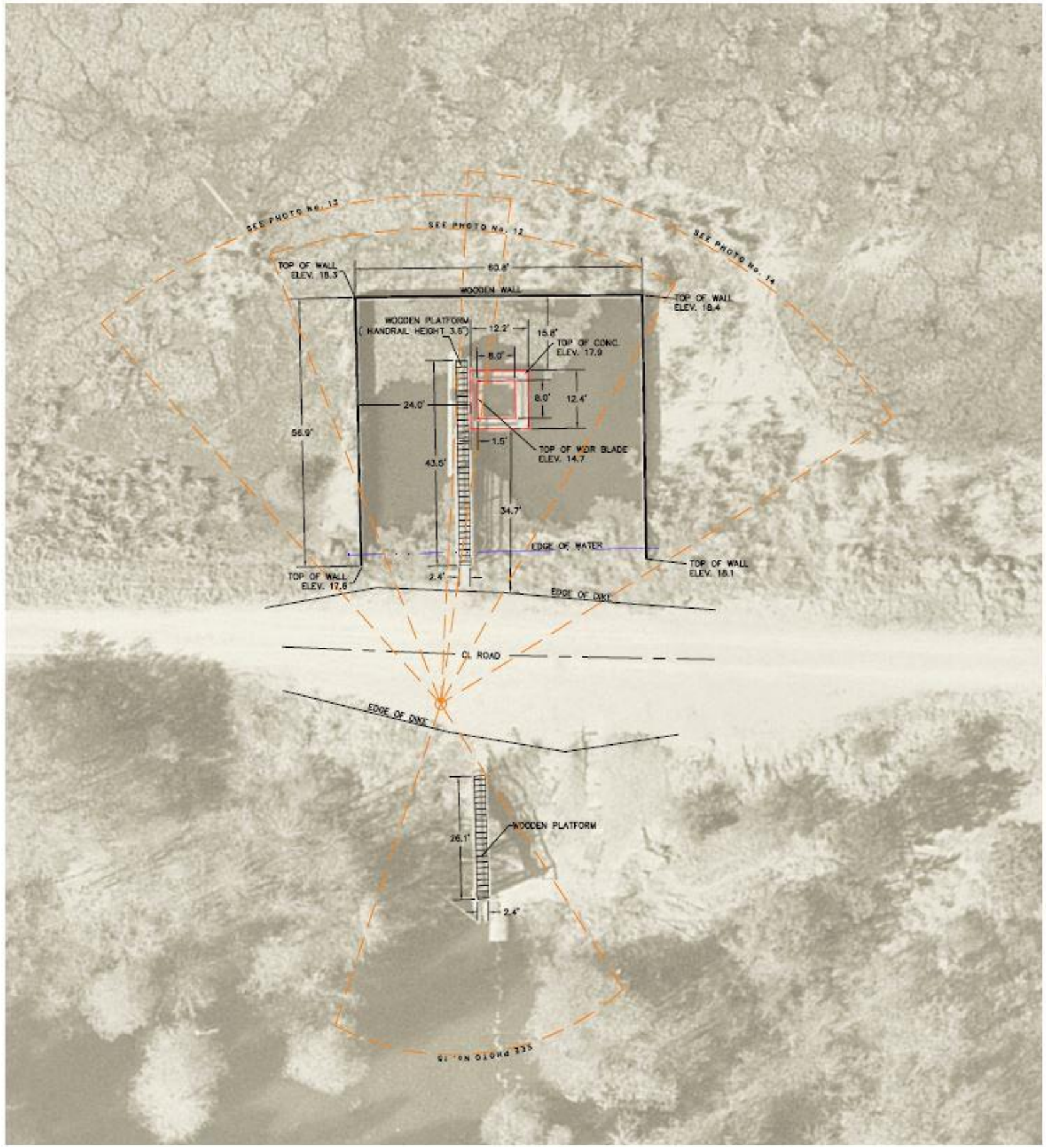


PHOTO No. 5
PLATFORM

PHOTO No. 8
WEIR

PHOTO No. 12

PHOTO No. 13

PHOTO No. 14

PHOTO No. 15

GRID COORDINATES NAD 83
ALABAMA STATE PLANE
WEST ZONE

NOTES:
1) SURVEY DATA COLLECTED 11/09/2004 SOSEM SURVEY AND MAPPING
2) DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE.

EXISTING OUTFALL STRUCTURE
AT PLANT BARRY

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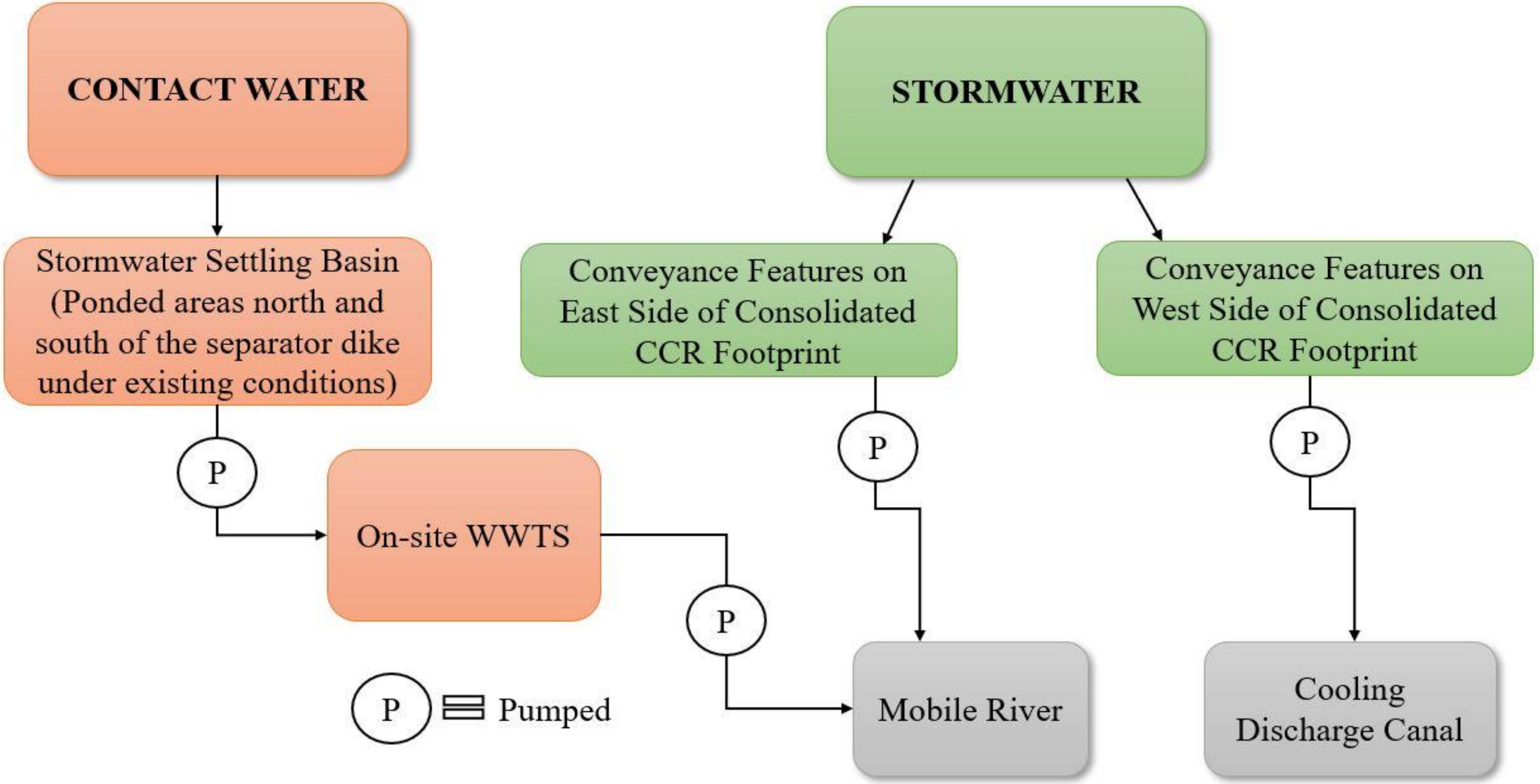
FIGURE
2

PROJECT NO: GW6489 | OCTOBER 2018

Source: This figure was originally prepared as Drawing No. 2959BR (Rev 0) by Southern Company Services, Inc. for Alabama Power Company, dated 11/17/2004.

GENERAL FLOW DIAGRAM FOR STORMWATER AND CONTACT WATER MANAGEMENT



FLOWCHART FOR ON-SITE ROUTING OF STORMWATER AND CONTACT WATER		
Geosyntec consultants		FIGURE 3
PROJECT NO: GW6489	OCTOBER 2018	

PROPERTY BOUNDARY
EXTERNAL LIMIT OF EXCAVATION
EXISTING ACCESS ROAD
NORTHEAST FUTURE USE AREA
NORTHWEST LAYDOWN YARD
DEWATERING DITCH
INTERNAL LIMIT OF EXCAVATION
TEMPORARY PUMPS AND CHECK DAMS (POSITIONED TO FACILITATE LOCAL EXCAVATIONS)
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
MW-8
MW-9
MW-10
MW-11
MW-12
MW-13
MW-14
MW-15
MW-16
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
F11
F12
F13
F14
S 064
R 063
TURBIDITY CURTAIN
64 076
MODIFIED NPDES OUTFALL STRUCTURE
15 038

CONTACT WATER
STORMWATER

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- APPROXIMATE LIMIT OF CCR
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- CUT SEQUENCE (CUT AREA 1)
- FILL SEQUENCE (FILL AREA 1)
- MONITORING WELL
- POWER POLE
- PUMP
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- ACTIVE WORK PAD PREPARATION
- PROPOSED ROAD
- WATER SURFACE

ANNOTATED CONSTRUCTION PHASING FIGURE – PHASE 1

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PROJECT NO: GW6489 | OCTOBER 2018

FIGURE 4

CONTACT WATER

STORMWATER

PROPERTY BOUNDARY

EXTERNAL LIMIT OF EXCAVATION

EXISTING ACCESS ROAD

NORTHEAST FUTURE USE AREA

NORTHWEST LAYDOWN YARD

FINAL COVER NOT LINED

INTERNAL LIMIT OF EXCAVATION

TURBIDITY CURTAIN

MOBILE RIVER

MW-1 MW-2 MW-3 MW-4 MW-5 MW-6 MW-7 MW-9 MW-10 MW-11 MW-12 MW-13 MW-14 MW-15 MW-16

C1 C4 C5 C6 C7 C8 C9 C12 C15 C16

F3 F4 F5 F7

S 064

S 064 078

TC

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- APPROXIMATE LIMIT OF CCR
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- C1 — CUT SEQUENCE (CUT AREA 1)
- F1 — FILL SEQUENCE (FILL AREA 1)
- MW-01 — MONITORING WELL
- POWER POLE
- PUMP
- ACTIVE CCR FILL AREAS
- ACTIVE CCR REMOVAL AREAS
- ACTIVE WORKING PAD PREPARATION
- PROPOSED ROAD
- WATER SURFACE

ANNOTATED CONSTRUCTION PHASING FIGURE – PHASE 2

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FIGURE 5

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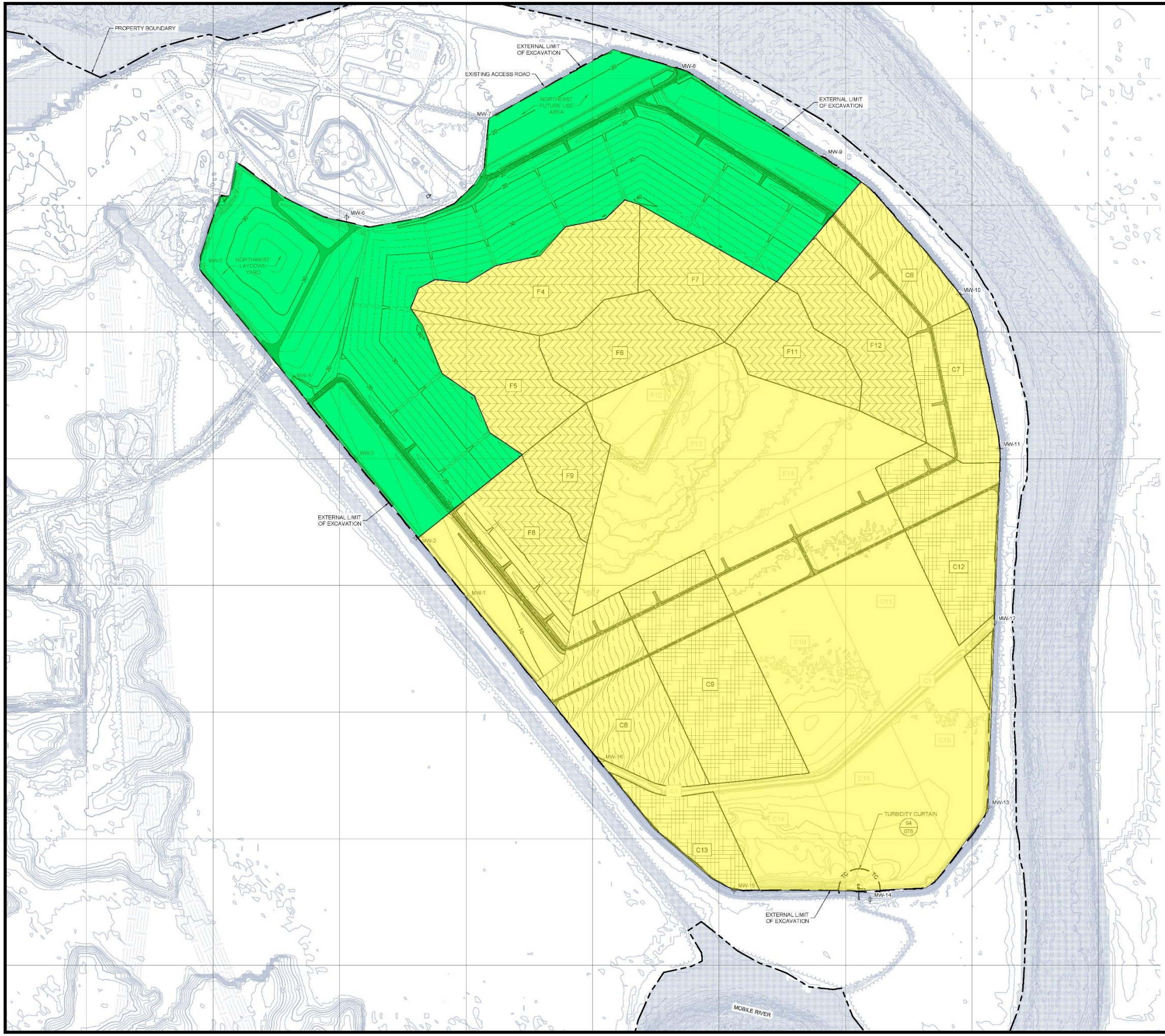

CONTACT WATER

STORMWATER

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- APPROXIMATE LIMIT OF CCR
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- C1 — CUT SEQUENCE (CUT AREA 1)
- F1 — FILL SEQUENCE (FILL AREA 1)
- MW-01 — MONITORING WELL
- POWER POLE
- PUMP
- ACTIVE CCR FILL AREAS
- ACTIVE CCR REMOVAL AREAS
- ACTIVE WORKING PAD PREPARATION
- PROPOSED ROAD
- WATER SURFACE

ANNOTATED CONSTRUCTION PHASING FIGURE – PHASE 3

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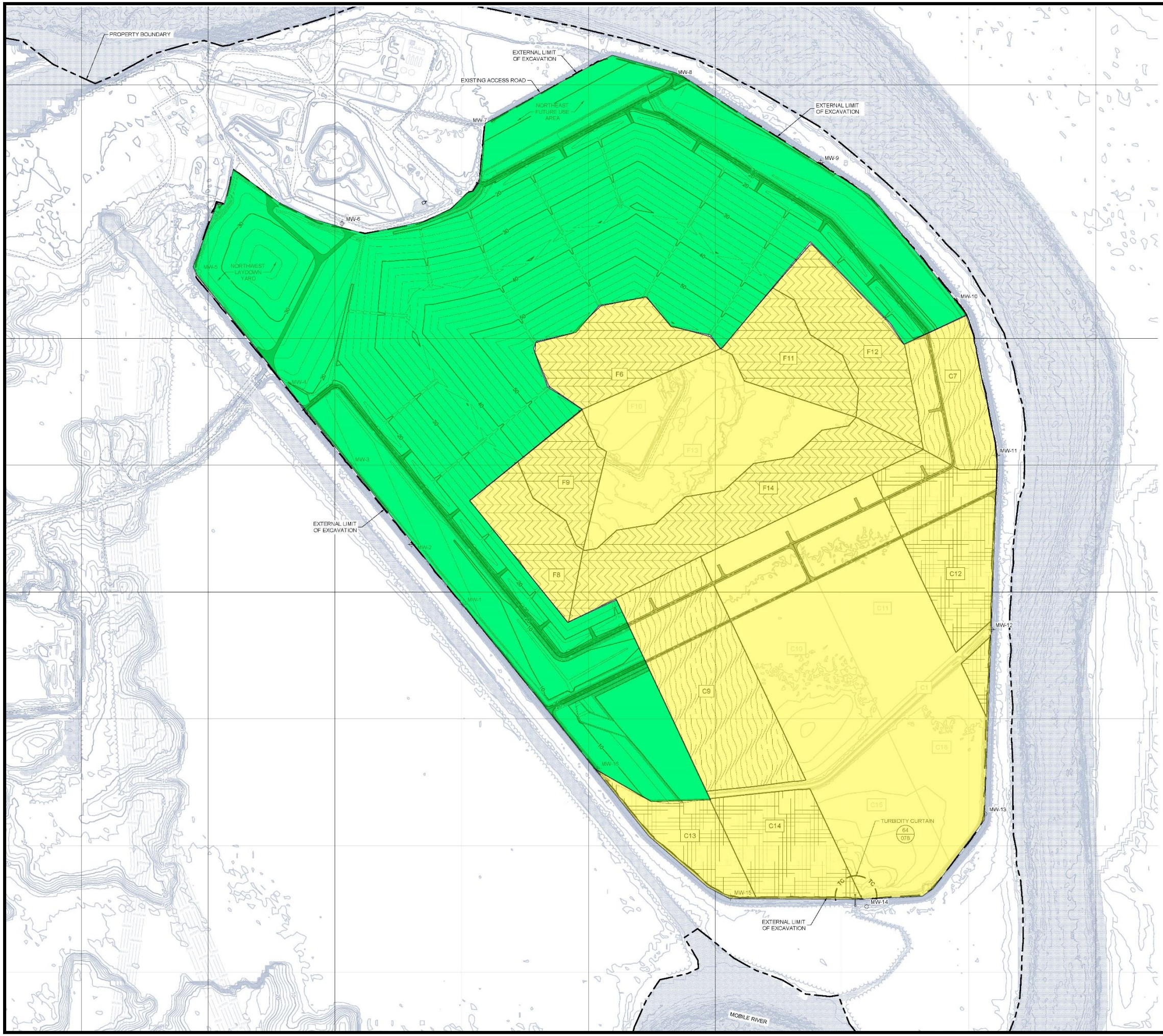
FIGURE 6

PROJECT NO: GW6489

OCTOBER 2018



CONTACT WATER

STORMWATER

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- APPROXIMATE LIMIT OF CCR
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- C1 — CUT SEQUENCE (CUT AREA 1)
- F1 — FILL SEQUENCE (FILL AREA 1)
- MW-01 — MONITORING WELL
- POWER POLE
- PUMP
- ACTIVE CCR FILL AREAS
- ACTIVE CCR REMOVAL AREAS
- ACTIVE WORKING PAD PREPARATION
- PROPOSED ROAD
- WATER SURFACE

ANNOTATED CONSTRUCTION PHASING FIGURE – PHASE 4

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FIGURE 7

PROJECT NO: GW6489 | OCTOBER 2018

CONTACT WATER

STORMWATER

PROPERTY BOUNDARY

EXTERNAL LIMIT OF EXCAVATION

EXISTING ACCESS ROAD

NORTHEAST FUTURE USE AREA

NORTHWEST LAYDOWN YARD

MW-1 MW-2 MW-3 MW-4 MW-5 MW-6 MW-7 MW-8 MW-9 MW-10 MW-11 MW-12 MW-13 MW-14 MW-15 MW-16

F6 F8 F9 F10 F11 F12 F13 F14

C9 C11 C12 C13 C14 C15 C16

TURBIDITY CURTAIN

64
078

MOBILE RIVER

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- APPROXIMATE LIMIT OF CCR
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- C1 — CUT SEQUENCE (CUT AREA 1)
- F1 — FILL SEQUENCE (FILL AREA 1)
- MW-01 — MONITORING WELL
- POWER POLE
- PUMP
- ACTIVE CCR FILL AREAS
- ACTIVE CCR REMOVAL AREAS
- ACTIVE WORKING PAD PREPARATION
- PROPOSED ROAD
- WATER SURFACE

ANNOTATED CONSTRUCTION PHASING FIGURE – PHASE 5

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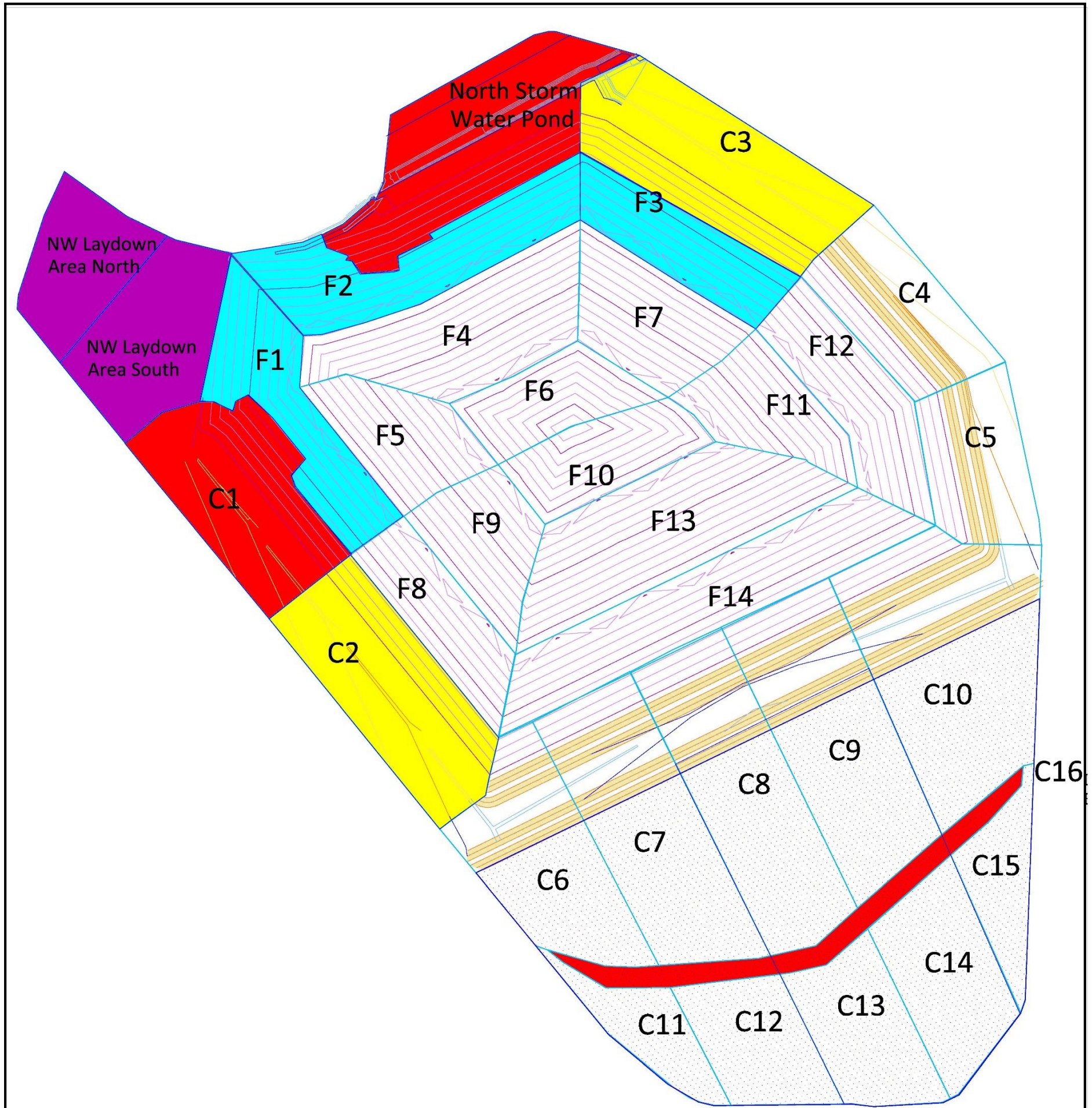
FIGURE 8

PROJECT NO: GW6489

OCTOBER 2018



YEAR END 2019

LEGEND PHASE 1

- POND PREP/ DEWATERING
- EXCAVATION
- SOIL OR LINER PLACEMENT
- ACTIVE FILL AREA
- LINED COMPLETED AREA
- STORMWATER DETENTION AREA

CONCEPTUAL DRAWING FOR INFORMATION ONLY NOT FOR CONSTRUCTION

Source: This figure was originally prepared as Barry Plant Sequencing Plan (Sheet 1 of 5) by Trans-Ash for Southern Company Services, dated 02/23/2018.

CONTRACTOR CONSTRUCTION PHASING PLAN – PHASE 1 SCHEMATIC

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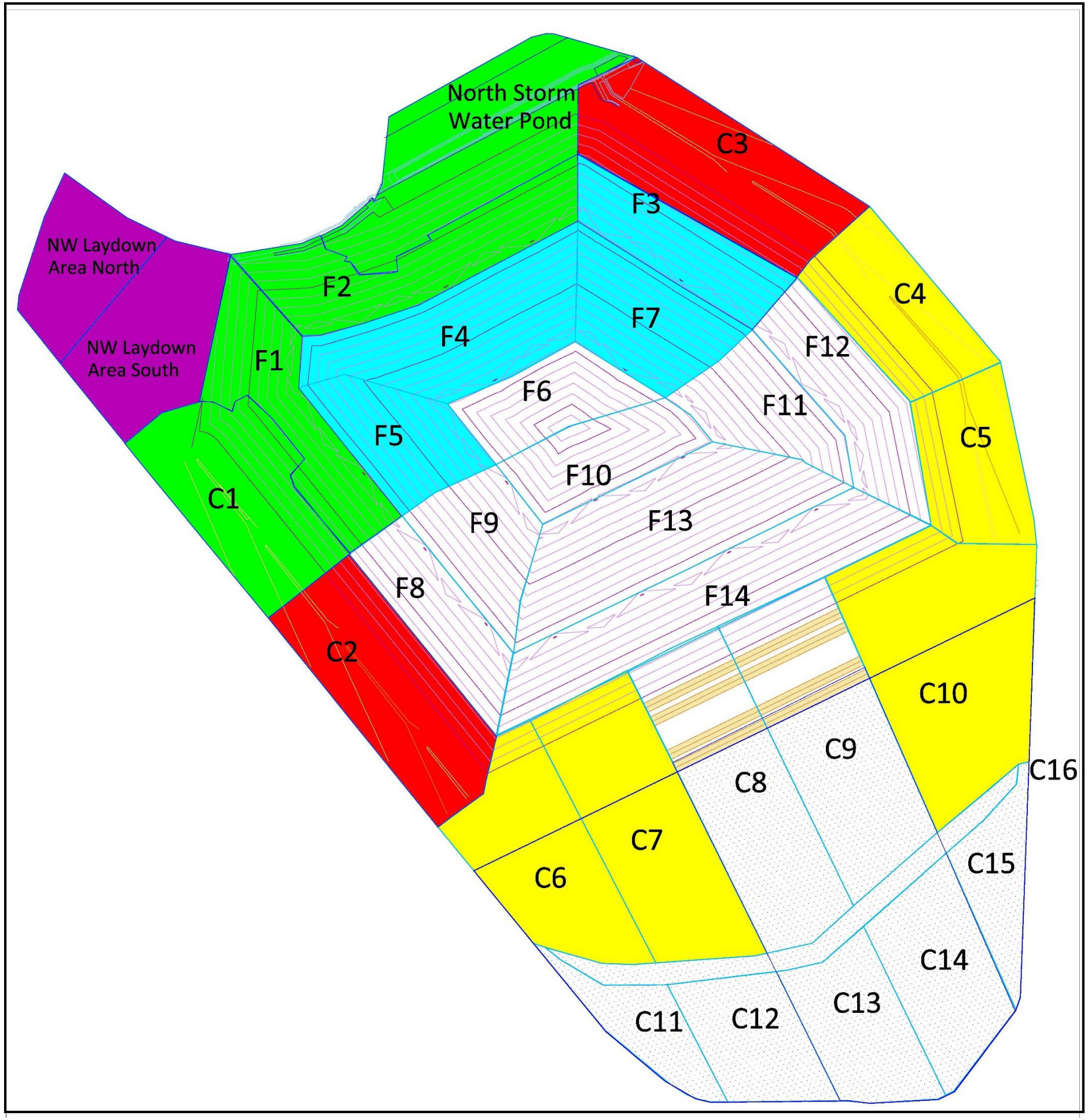
FIGURE 9

PROJECT NO: GW6489 | OCTOBER 2018

YEAR END 2020



LEGEND PHASE 2

- POND PREP/DEWATERING
- EXCAVATION
- SOIL OR LINER PLACEMENT
- ACTIVE FILL AREA
- LINED COMPLETED AREA
- STORMWATER DETENTION AREA

CONCEPTUAL DRAWING FOR INFORMATION ONLY NOT FOR CONSTRUCTION

Source: This figure was originally prepared as Barry Plant Sequencing Plan (Sheet 2 of 5) by Trans-Ash for Southern Company Services, dated 02/23/2018.

CONTRACTOR CONSTRUCTION PHASING PLAN – PHASE 2 SCHEMATIC

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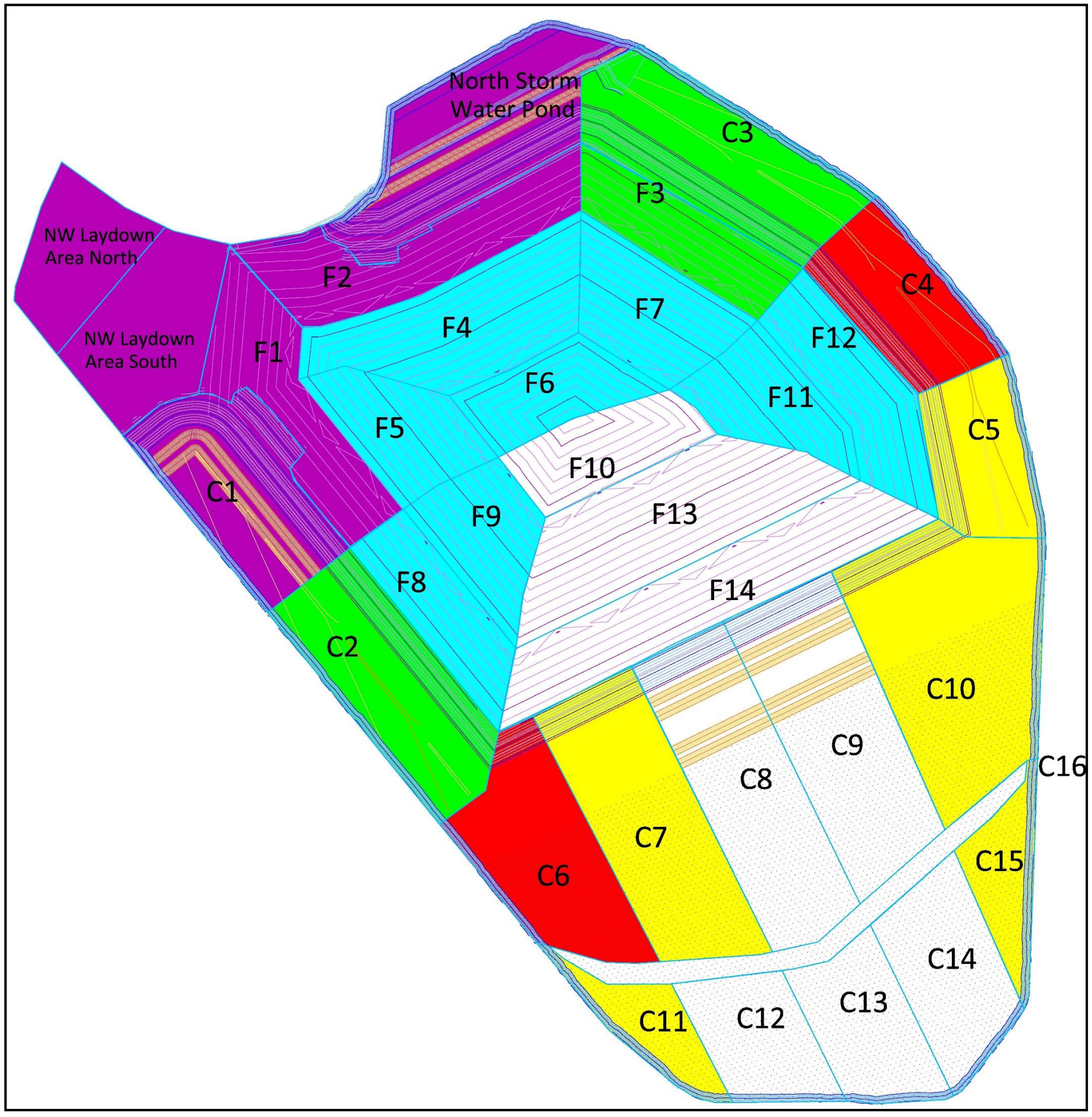
FIGURE **10**

PROJECT NO: GW6489 | OCTOBER 2018

YEAR END 2021



LEGEND PHASE 3

- POND PREP/ DEWATERING
- EXCAVATION
- SOIL OR LINER PLACEMENT
- ACTIVE FILL AREA
- LINED COMPLETED AREA
- STORMWATER DETENTION AREA

CONCEPTUAL DRAWING FOR INFORMATION ONLY NOT FOR CONSTRUCTION

Source: This figure was originally prepared as Barry Plant Sequencing Plan (Sheet 3 of 5) by Trans-Ash for Southern Company Services, dated 02/23/2018.

CONTRACTOR CONSTRUCTION PHASING PLAN – PHASE 3 SCHEMATIC

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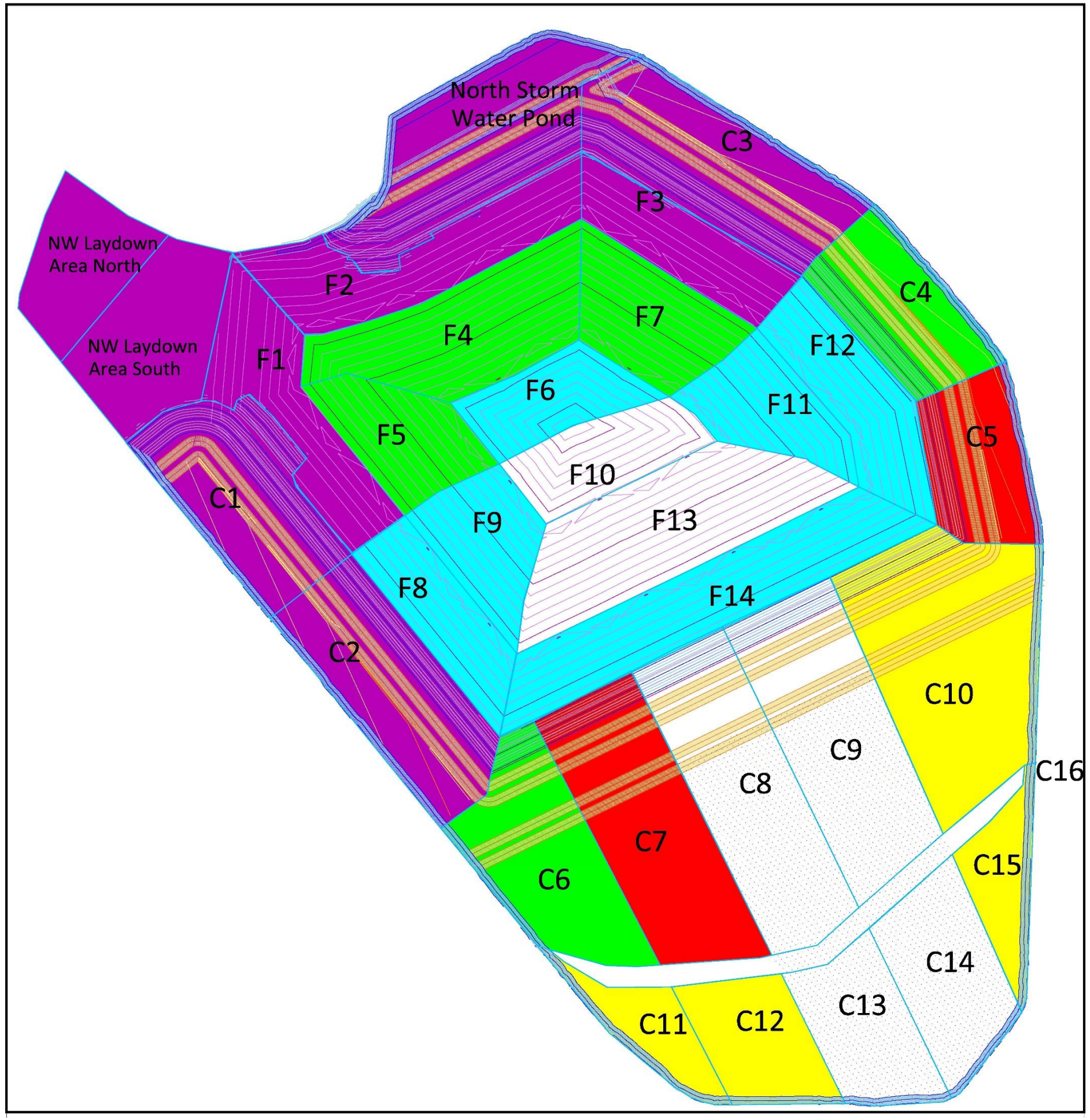
FIGURE **11**

PROJECT NO: GW6489 | OCTOBER 2018

YEAR END 2022



LEGEND PHASE 4

- POND PREP
- EXCAVATION
- SOIL OR LINER PLACEMENT
- ACTIVE FILL AREA
- LINED COMPLETED AREA
- STORMWATER DETENTION AREA

CONCEPTUAL DRAWING FOR INFORMATION ONLY NOT FOR CONSTRUCTION

Source: This figure was originally prepared as Barry Plant Sequencing Plan (Sheet 4 of 5) by Trans-Ash for Southern Company Services, dated 02/23/2018.

CONTRACTOR CONSTRUCTION PHASING PLAN – PHASE 4 SCHEMATIC

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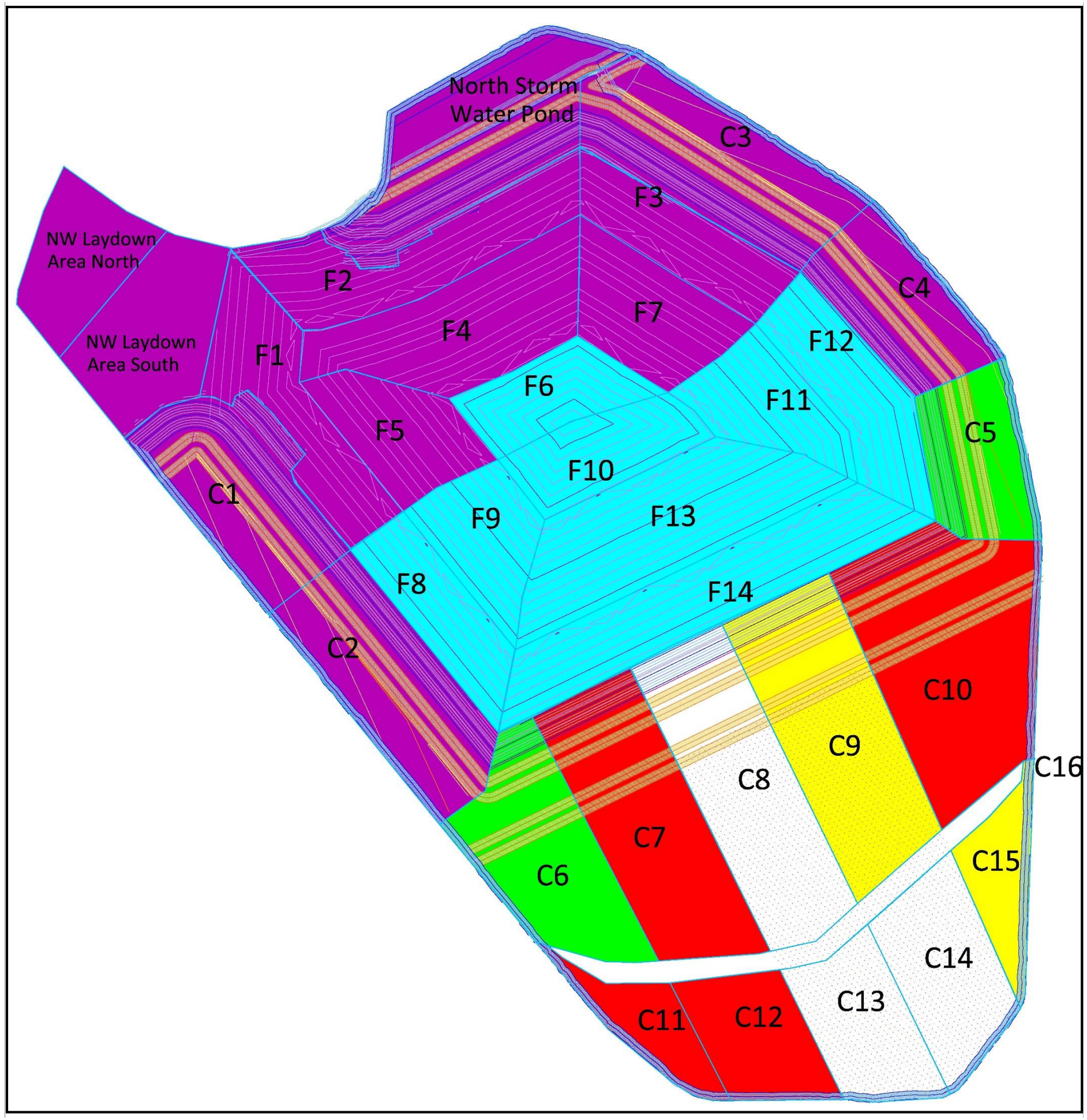
FIGURE **12**

PROJECT NO: GW6489 | OCTOBER 2018

YEAR END 2023



LEGEND PHASE 5

- POND PREP
- EXCAVATION
- SOIL/LINER PLACEMENT
- ACTIVE FILL AREA
- LINED COMPLETED AREA
- STORMWATER DETENTION AREA

CONCEPTUAL DRAWING FOR INFORMATION ONLY NOT FOR CONSTRUCTION

Source: This figure was originally prepared as Barry Plant Sequencing Plan (Sheet 5 of 5) by Trans-Ash for Southern Company Services, dated 02/23/2018.

CONTRACTOR CONSTRUCTION PHASING PLAN – PHASE 5 SCHEMATIC

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FIGURE **13**

PROJECT NO: GW6489 | OCTOBER 2018

Construction Best Management Practices Plan (CBMPP)

Revision A

for:

Plant Barry Ash Pond Closure
15300 Highway 43 North
Bucks, Alabama 36512

Permittee:

Southern Company Services
3535 Colonnade Parkway,
Birmingham, Alabama 35243
205.992.6351

CBMPP Contact(s) / QCP:

Geosyntec Consultants
Cuneyt Gokmen
1255 Roberts Blvd, Suite 200
Kennesaw, GA 30144
678-202-9500
CGokmen@geosyntec.com

CBMPP Preparation Date:

October 2018

Estimated Project Dates:

Project Start Date: __ __ / __ __ / __ __ __ __
Project Completion Date: __ __ / __ __ / __ __ __ __

Contents

SECTION 1: SITE EVALUATION, ASSESSMENT, AND PLANNING 1
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1.3 Nature and Sequence of Construction Activity 3
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SECTION 1: SITE EVALUATION, ASSESSMENT, AND PLANNING

1.1 Project/Site Information

Project/Site Name: Plant Barry Ash Pond Closure
Project Street/Location: 15300 Highway 43 North
City: Bucks State: AL ZIP Code: 36512
County: Mobile

Total Disturbed Acres: 597

Latitude/Longitude of the Project Site (front gate):

Latitude	**Longitude**
31° 0'15.91"N	88° 0'58.47"W

Method for determining latitude/longitude:
☐ USGS topographic map (specify scale): _____ ☐ EPA Web site ☐ GPS
☒ Other (please specify): Google Earth

Southern Company Services is the sole Permittee.

1.2 Contact Information/Responsable Parties

Permittee:
Contact Name:
Southern Company Services
3535 Colonnade Parkway,
Birmingham, Alabama 35243
Contact e-mail: SCS to provide
205.992.6351

Project Manager(s) or Site Supervisor(s):
Insert Company or Organization Name:
Insert Name:
Insert Address:
Insert City, State, Zip Code:
Insert Telephone Number:
Insert Fax/Email:

CBMPP Contact(s) / Qualified Credentialed Professional (QCP):
Geosyntec Consultants, Inc.
Cuneyt Gokmen, P.E.
1255 Roberts Boulevard, Suite 200
Kennesaw, GA 30144
678-202-9500
CGokmen@geosyntec.com
Geosyntec Consultants, Inc.

QCI or Qualified Person(s):
Insert Company or Organization Name:
Insert Name:
Insert Address: SCS to provide
Insert City, State, Zip Code: SCS to provide
Insert Telephone Number: SCS to provide
Insert Fax/Email: SCS to provide

This CBMPP was Prepared by:
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Southern Company Services
Name: Rob Hayes
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1.3 Nature and Sequence of Construction Activity

Construction activities will consist of clearing and grubbing, dewatering, excavation, mass grading, placement of fill, infrastructure installation, road construction, and final stabilization. Stormwater runoff will be collected and conveyed via temporary conveyance and diversion features during construction, such as mid-slope berms, downchutes, culverts, and channels, ultimately discharging into the stormwater settling pond. The stormwater settling pond contains an existing permitted National Pollutant Discharge Elimination System (NPDES) outfall to the Mobile River. The outfall structure will be modified during construction to eliminate discharge to the Mobile River for storm events up to the 25-year (yr), 24-hour (hr) storm event. Preliminary phasing plans have been developed by the Contractor (TransAsh) and are included in Appendix A.

Table 1. Intended Sequence and BMP Implementation

Estimated Dates of Activity[(1)]	Construction Activity and BMPs to be Implemented
	APPLIES TO ALL PHASES. Comprehensive Site Inspections shall be conducted and documented by the QCP, QCI, or a qualified professional under the direction of the QCP at least once per month and following any qualifying precipitation event of 0.75 inches or more in any 24-hour period.
	APPLIES TO ALL PHASES. Conduct QCP evaluations once every six months, observations of active areas daily, and comprehensive site inspections monthly and after each qualifying rain event of 0.75 inches or greater, as specified in the CBMPP.
	INITIAL SITE CONDITIONS
	Contractor to mobilize on-site. Conduct QCP Pre-Construction Inspection prior to implementation of any Best Management Practices (BMPs).
	Mark the Limits of Disturbance (LOD) and install construction entrance postings.
	The following BMPs shall be installed during initial site conditions: • Construction exit pads • Floating turbidity barrier • Rock filter berm • Silt fence Clear only the minimum area necessary to install perimeter controls.
	PHASES I THROUGH VII

	Install additional BMPs and stormwater management controls as work progresses throughout the Site. The following BMPs shall be utilized during subsequent phases of construction: • Construction exit pads • Floating turbidity barrier • Rock filter berm • Silt fence • Diversion channels/berms • Conveyance channels/ditches • Pumps • Check dams • Stone • Block and Gravel Inlet Protection • Outlet protection • Permanent Sediment Basin
	Complete final stabilization with 100% of the soil surface uniformly covered in permanent vegetation with a density of 85% or greater. Submit the Notice of Termination (NOT) pertaining to termination of the Construction General Permit.

Note
(1) Contractor to complete table with estimated dates prior to construction commencing.

Proposed Activity(ies) to be Conducted:

☐ Residential ☐ Commercial ☒ Industrial ☐ Road Construction ☐ Linear Utility

☐ Other (please specify): _____

_____

1.4 Receiving Waters

Description of receiving waters: The receiving water body for the Site is the Mobile River via the existing NPDES outfall structure.

Description of storm sewer systems: N/A

Description of impaired waters or waters subject to TMDLs: The Mobile River is included in the Clean Water Act Section 303(d) list, as low priority for mercury due to atmospheric deposition. Discharges to these receiving waters are not anticipated to cause or contribute to the listed impairments.

Other: The project does not disturb existing wetlands.

1.5 Potential Sources of Pollution

Potential sources of sediment to stormwater runoff:
Grading and dewatering during construction. There shall be no sources of turbidity other than natural origin that will cause substantial visible contrast with the natural appearance of waters or interfere with any beneficial uses which they serve. Additionally, in no case shall turbidity exceed 50 NTU above background. For the purposes of determining compliance with this limitation, background will be interpreted as the natural condition of the receiving water without the influence of man-made or man-induced causes. Turbidity levels caused by natural runoff will be included in establishing background levels.

Potential pollutants and known sources, other than sediment, to stormwater runoff:
Potential pollutants include coal CCR, which shall be hauled and placed within areas noted on the Design Drawings. If additional sources are brought onsite during construction, the Contractor shall inform the QCP and update Table 2 below within seven (7) days.

Table 2. Known Potential Pollutants

Trade Name Material	Potential Known Stormwater Pollutants	Storage Location
Coal Combustion Residuals (CCR)	Heavy metals	Capped in place

1.6 Maps

Site maps included in Appendix B and Appendix C are:

1. USGS map of the site; and
2. Initial Site Conditions; Stormwater Management and ESC Plans; and associated details (*Plant Barry CCR Pond Closure* Design Drawings).

Note: Locations of sampling are not included, as sampling is not required by the General Permit.

SECTION 2: EROSION AND SEDIMENT CONTROL BMPS

Erosion and sediment control BMPs to be utilized during construction include:

- Phased Construction Activity (Section 2.1)
- Rock Check Dam (Section 2.2)
- Diversion Channel/Berm (Section 2.2)
- Temporary Seeding and Mulching (Sections 2.3 and 2.4)
- Dust Control (Section 2.3)
- Block and Gravel Inlet Protection (Section 2.5)
- Rock Filter Dam (Section 2.5)
- Outlet Protection (Section 2.5)
- Silt Fence (Section 2.6)
- Floating Turbidity Barrier (2.6)
- Permanent Sediment Basin (Section 2.7)
- Construction Exit Pad (Section 2.8)
- Dewatering (2.9)
- Portable Toilets (2.9)

2.1 Phased Construction Activity

Phase I

1. Contractor to mobilize on-site. Conduct QCP Pre-Construction Inspection prior to installation of any BMPs.

2. Mark the LOD and install construction entrance postings.

3. Install construction exit pads, floating turbidity barrier, rock filter berm and perimeter controls (i.e., silt fence). Clear only the minimum area necessary to install perimeter controls. Begin proposed modifications to NPDES outfall structure (board up the vertical weirs to contain the 25-yr, 24-hr storm event within the Stormwater Settling Basin).

4. Construct WWTS and associated infrastructure (i.e. forcemain) for free water management and dewatering activities. Install floating submersible pumps 1 and 2 within the ponded areas north and south of the separator dike.

5. Install Phase I ESC and stormwater management controls (i.e. diversion berms, dewatering ditches, pumps), as shown in the *Plant Barry CCR Pond Closure* Design Drawings. Begin Phase I construction activities which includes CCR removal, CCR placement, and active work pad preparation in the north, northeast, and west perimeters of the project area. Install additional BMPs (e.g. check dams, outlet protection, stone filter rings) as various stormwater conveyance features are completed throughout the phase (e.g. channels, culverts).

   Phase I work activities include: Construction of the Northwest Laydown Yard and associated stormwater conveyance features; active filling of Areas F1 and F2 (north section of the consolidated footprint); excavation of the North Stormwater Pond and Area C1 (West Stormwater Pond); and pond preparation and dewatering of Areas C2 (West Stormwater Pond) and C3 (East Stormwater Pond). The ponded areas north and south of the separator dike (C6 through C15) will be used for stormwater detention during this phase. Details are depicted in *Year End 2019* of Appendix A.

   Daily observations shall be conducted and logged by site personnel each day there is activity on the site

6. Comprehensive site inspections shall be conducted and documented by the QCP, QCI, or a qualified professional under the direction of the QCP at least once per month and following any qualifying precipitation event of 0.75 inches or more in any 24-hour period.

7. Conduct QCP evaluations once every six months, observations of active areas daily, and comprehensive site inspections monthly and after each qualifying rain event of 0.75 inches or greater, as specified in the CBMPP.

Phase II

1. Install additional BMPs and stormwater management controls (e.g. diversion berms, dewatering ditches, pumps, check dams, filter rings, outlet protection) for Phase II activities, as shown in the *Plant Barry CCR Pond Closure* Design Drawings (Design Drawings).

2. Begin Phase II construction activities which includes CCR removal, CCR placement, and active work pad preparation.

   Phase II work activities include: Completion (soil/liner placement) of the North Stormwater Pond and Areas C1 (West Stormwater Pond), F1 (north section of the consolidated footprint), and F2 (north section of the consolidated footprint); excavation of Areas C2 (West Stormwater Pond) and C3 (East Stormwater Pond); active filling of Areas F3, F4, F5, and F7 (north section of the consolidated footprint); and pond preparation and dewatering of Areas C4 and C5 (East Stormwater Pond), C6, C7, and C10 (Southeast and Southwest Stormwater Ponds and north section of the Stormwater Settling Basin). The ponded areas north and south of the separator dike (C8, C9, and C11 through C15) will be used for stormwater detention during this phase. Details are depicted in *Year End 2020* of Appendix A.

3. Install additional BMPs (e.g. check dams, outlet protection, stone filter rings) as various stormwater conveyance features are completed throughout the phase (e.g. channels, culverts). Permanently stabilize areas as they are brought to grade, as shown in the Design Drawings.

ADDITIONAL PHASES OF THE PHASING PLAN SHALL BE INCLUDED IN THIS DOCUMENT UPON RECEIPT FROM TRANS ASH AND SUBSEQUENT DEVELOPMENT AND INCLUSION WITHIN THE DESIGN DRAWINGS.

2.2 Control Stormwater Flowing onto and through the Project

Rock Check Dam

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Rock check dams were designed for open channels to aid in trapping sediment from construction activity and reduce flow velocity. Check dams shall be installed in locations specified in the Design Drawings.

Maintenance:	Sediment should be removed if it reaches a depth of ½ the original dam height. Repair erosion at the ends of the dam and in the channel, if necessary.
Inspection:	Inspect weekly and after each qualifying rainfall event. Inspect for rock displacement, erosion, and sediment behind the dam.
Responsible Staff:	Project Manager or Site Supervisor

Diversion Channel/Berm

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Temporary diversion berms/channels were designed to divert stormwater runoff to protect disturbed/active construction areas. Diversions will be utilized on the consolidated footprint to divert runoff to the south and away from active work areas. Diversion channels/berms will be utilized in strategic locations around the perimeter of the consolidated footprint to separate stabilized areas at final grade from active working areas. Diversion channels/berms shall be installed in locations specified in the Design Drawings.

Maintenance:	Remove accumulated trash or sediment immediately. Repair erosion, vegetation, and outlets immediately.
Inspection:	Inspect weekly and after each qualifying rainfall event. Inspect for maintenance items described above.
Responsible Staff:	Project Manager or Site Supervisor

2.3 Stabilize Soils

See Section 7 for permanent stabilization information.

Temporary Seeding and Mulching or Equivalent

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Temporary stabilization is required on any portion of the site where disturbance of exposed soils has temporarily ceased and will not resume for a period of thirteen (13) calendar days. Stabilization techniques were designed in accordance with temporary seeding and mulching specifications provided in Table TS-1 and Table MU-2, respectively, in the Design Drawings.

Maintenance:	Bare or eroded areas shall be repaired as soon as possible.
Inspection:	Inspect weekly and after qualifying rain events for erosion and damage. Continue inspections until vegetation is well established (final stabilization density is defined as 85% coverage).
Responsible Staff:	Project Manager or Site Supervisor

Dust Control

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Dust control includes the prevention of wind-blown soil during land disturbance activities. Methods to control dust include:

- Scheduling: Schedule construction operations so that the smallest area is disturbed at any one time.
- Erosion Control: After grading operations are completed, permanently or temporarily stabilize disturbed areas immediately as described in this CBMPP.
- Sprinkling: Sprinkle the site with water until the surface is moist.
- Street Cleaning: Use a street sweeper on roadways to remove accumulated soil.

Maintenance:	Check vehicular traffic for wind-blown dust.
Inspection:	Inspect daily, particularly during dry weather periods, until all disturbed areas have been stabilized.
Responsible Staff:	Project Manager or Site Supervisor

2.4 Stabilize Slopes

See Section 7 for permanent stabilization information.

Temporary Seeding and Mulching or Equivalent

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Temporary stabilization is required on any portion of the site where disturbance of exposed soils has temporarily ceased and will not resume for a period of thirteen (13) calendar days. Stabilization techniques were designed in accordance with temporary seeding and mulching specifications provided in Table TS-1 and Table MU-2, respectively, in the Design Drawings.

Maintenance:	Bare or eroded areas shall be repaired as soon as possible.
Inspection:	Inspect weekly and after qualifying rain events for erosion and damage. Continue inspections until vegetation is well established (final stabilization density is defined as 85% coverage).
Responsible Staff:	Project Manager or Site Supervisor

2.5 Protect Storm Drain Inlets and Outlets

Block and Gravel Inlet Protection (BIP)

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Inlet protection is designed to remove sediment from storm water runoff before it enters a storm drain pipe system and downstream areas. Block and gravel inlet protection devices are concrete block and stone barriers installed around a drop inlet structure in accordance with the detail provided in the Design Drawings. Block and gravel inlet protection devices are to be installed around culvert inlets as shown in the Design Drawings.

Maintenance:	If the stone filter becomes clogged with sediment so that it no longer adequately performs its function, the stone must be pulled away from the blocks, cleaned, and replaced. Sediment shall be removed, and the trap shall be restored to its original dimensions when the sediment has accumulated to ½ the design depth. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode.
Inspection:	Inspect weekly and after qualifying rain events for erosion and damage.
Responsible Staff:	Project Manager or Site Supervisor

Rock Filter Dam (RD)

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Rock filter dams were designed for open channels to aid in trapping sediment from construction activity and reduce flow velocity near pipe entrances. A rock filter dam shall be installed at the location specified in the Design Drawings.

Maintenance:	Sediment should be removed if it reaches a depth of ½ the original dam height. Repair erosion at the ends of the dam and in the channel if necessary.
Inspection:	Inspect weekly and after each qualifying rainfall event. Inspect for rock displacement, erosion, and sediment behind the dam.
Responsible Staff:	Project Manager or Site Supervisor

Outlet Protection (OP)

☒ ***Permanent*** ☐ ***Temporary***

Detailed BMP Description: Outlet protection was designed for pipe exits to aid in reducing flow velocity and dissipating energy. Outlet Protection shall be installed at the locations specified in the Design Drawings.

Maintenance:	Sediment should be removed if the voids between the stones become clogged. Repair dislodged stones and erosion immediately.
Inspection:	Inspect weekly and after each qualifying rainfall event. Inspect for sediment accumulation, rock displacement, and erosion.
Responsible Staff:	Project Manager or Site Supervisor

2.6 Perimeter Controls and Sediment Barriers

Silt Fence

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Silt fence placement was designed to prevent sediment-laden sheet flow runoff from exiting the site. The designed silt fence was placed on a level contour of the land where possible. Silt fence shall be installed in the locations shown in the Design Drawings.

Maintenance:	Immediately repair holes, tears, collapse, trenching, or other failures. Remove sediment when it reaches a depth of ½ the height of the fence.
Inspection:	Inspect at least once per week and after each qualifying rainfall event.
Responsible Staff:	Project Manager or Site Supervisor

Floating Turbidity Barrier

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: A floating turbidity curtain is proposed to minimize the sediment transport from disturbed areas reaching the existing NPDES outfall. The floating turbidity barrier shall be installed at the locations shown in the Design Drawings.

Maintenance:	The barrier shall be maintained for the duration of the project to ensure the continuous protection of the watercourse. The geotextile fabric shall be inspected and repaired, as needed, in accordance with manufacturer's specifications to ensure the adequacy of the repair.
Inspection:	Inspect at least once per week and after each qualifying rainfall event.
Responsible Staff:	Project Manager or Site Supervisor

2.7 Retain Sediment On-Site

Permanent Sediment Basin

☒ ***Permanent*** ☐ ***Temporary***

Detailed BMP Description: One permanent detention pond (referred to as the Stormwater Settling Pond) shall be utilized as a sediment basin during construction. The sediment basin has adequate capacity to capture runoff and retain sediment on-site. The location of the basin is shown in Appendix C. The General Permit prohibits discharge to surface waters from sediment basins or impoundments unless an outlet structure that withdraws water from the surface is utilized. The Stormwater Settling Pond will retain runoff from the project area up to elevation 17.9, equivalent to the 25-yr, 24-hr storm event during construction. Analyses related to the capacity and function of the Stormwater Settling Basin are included in Appendix K.

Maintenance:	Remove and properly dispose of sediment when it accumulates to one foot above the proposed pond bottom. Remove trash and other debris from the outfall structure, weirs, pipe, and basin area. Periodically check the embankment, outfall structure for clogging, pipe outlet for erosion, settling, seepage, or slumping along the toe/around the barrel and repair immediately.
Inspection:	Inspect at least once per week and after each qualifying rainfall event.
Responsible Staff:	Project Manager or Site Supervisor

2.8 Stabilized Construction Exits

Construction Exit Pad (CEP)

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Construction exit pads were designed to be installed at ingress/egress locations to roadways and serve as a buffer area for sediment and soil from construction vehicle tires to avoid transporting it onto public roads. Proposed construction exits are depicted in the Design Drawings.

Maintenance:	Remove sediment and soil from construction exit pad daily. Reshape stone pad as needed. Top-dress with clean stone as needed to maintain effectiveness. Immediately remove mud or sediment tracked or washed onto public road.
Inspection:	Inspect at least once per week and after each qualifying rainfall event.
Responsible Staff:	Project Manager or Site Supervisor

2.9 Additional BMPs

Dewatering

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Dewatering activities will be necessary throughout construction of the consolidated CCR footprint. Under no circumstances are discharges from dewatering operations in active work areas or contact water discharged directly into wetlands, streams, rivers, or other areas beyond the permitted project area. All dewatered flows (contact and construction stormwater) will be routed to a newly constructed wastewater treatment facility (WWTF) prior to discharge from the Site. Dewatered flows from stabilized areas at final grade may be discharged directly offsite based on direction from Alabama Power and Southern Company Services.

Discharges from dewatering operations must be conducted in a manner sufficient to prevent erosion from discharge runoff. Do not discharge on a slope greater than three percent. Dewatering shall not occur during or immediately after precipitation events.

Discharges from dewatering activities, including discharges of ground water or accumulated stormwater from dewatering trenches, excavations, foundations, vaults, or other similar points of accumulation, unless managed by appropriate controls, are prohibited without treatment through the WWTS.

Discharges where the high turbidity may cause or contribute to a substantial visible contract with the natural appearance of the receiving water are prohibited.

Maintenance:	Inspect hoses and filters for any holes and tears, and repair immediately. Repair erosion around the intake and discharge areas and relocate the pumps if necessary.
Inspection:	Inspect, at a minimum, daily during dewatering operations and after each qualifying rainfall event. Field check your turbidity with a calibrated field turbidity meter.
Responsible Staff:	Project Manager or Site Supervisor

Portable Toilets

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Liquid waste shall not be directly discharged into the storm sewers. Portable toilets shall be located as far away as possible from surface waters, natural buffer areas, stormwater inlets, and conveyances.

Maintenance:	Inspect toilets for leaks. Properly dispose of sanitary waste.
Inspection:	Inspect at least once per week and after each qualifying rainfall event.
Responsible Staff:	Project Manager or Site Supervisor

SECTION 3: GOOD HOUSEKEEPING (GROUNDS KEEPING) BMPS

Good housekeeping measures include measures found in the following sections:

3.1 Material Handling and Waste Management
3.2 Establish Proper Building Material Staging Areas
3.3 Designate Washout Areas
3.4 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices
3.5 Allowable Non-Stormwater Discharges and Control Equipment/Vehicle Washing
3.6 Spill Prevention, Control and Management
3.7 Non-Stormwater Discharge Management

3.1 Material Handling and Waste Management

Waste Disposal

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Construction waste, trash, debris, and other materials shall be disposed of in waste containers. Trash shall not be allowed to enter receiving waters.

Hazardous or toxic waste shall be managed in accordance with federal, state, and local regulations.

Maintenance:	Empty dumpsters when 95% full. Remove trash from site if observed.
Inspection:	Inspect for trash and debris daily.
Responsible Staff:	Project Manager or Site Superintendent

3.2 Establish Proper Building Material Staging Areas

Material Staging

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Construction materials shall be stored such that contact with stormwater is minimized. Construction materials shall not be stored on BMPs. Material staging areas shall be temporarily stabilized with stone. The Contractor may locate material staging operations within the LOD as necessary.

Maintenance:	Keep material storage areas orderly.
Inspection:	Inspect weekly and after qualifying rainfall events.
Responsible Staff:	Project Manager or Site Superintendent

3.3 Designate Washout Areas

Concrete Washout

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: A portable concrete washout container shall be used to remove any concrete wash water from the site, if necessary. Washout and cleanout activities should be located as far away as possible from surface waters, natural buffer areas, stormwater inlets, and conveyances. Concrete wash water cannot be discharged from the site.

Maintenance:	Remove washout container from the site when it is 80% full. Inspect for leaks and clean concrete wash water from soil immediately upon discovery.
Inspection:	Inspect daily and after qualifying rainfall events.
Responsible Staff:	Project Manager or Site Superintendent.

3.4 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices

Fueling and vehicle maintenance shall only take place in designated areas where a spill kit is available. See Section 3.6 for additional information.

3.5 Control Equipment/Vehicle Washing

Vehicle Washing

☐ ***Permanent*** ☒ ***Temporary***

Detailed BMP Description: Vehicle wash water shall be used such that water is captured and discharged to the WWTS. Discharge of soaps or solvents used in vehicle and equipment washing is prohibited.

Maintenance:	Capture any wash water containing detergents.
Inspection:	Weekly and after qualifying rainfall events.
Responsible Staff:	Project Manager or Site Superintendent

3.6 Spill Prevention, Control and Management

On-site petroleum storage tanks shall be placed in secondary containment. Any containment system used to implement this requirement shall be constructed with materials that are compatible with the substance(s) contained within, prevent the contamination of groundwater, and shall be capable of retaining 110 percent of the volume of the largest container of pollutants for which the containment system is provided.

A spill kit containing sufficient oil and grease absorbing material to contain/clean-up fuel or chemical spills and leaks shall be maintained on-site. Soil contaminated by paint or chemical spills, oil spills, etc. must be immediately cleaned up, remediated, or be removed and disposed of in a ADEM approved manner.

As required under Federal Oil Pollution Prevention Regulations (40 CFR 112), a Spill Prevention, Control and Countermeasures (SPCC) Plan shall be developed if the total storage tank capacity for oil and/or petroleum products throughout the site exceeds 1,320 gallons.

3.7 Non-Stormwater Discharge Management

Part I.B.2. of the General Permit authorizes the following non- stormwater discharges provided the non-stormwater component of the discharge is in compliance with Part III.C.:

(a) Discharges from fire-fighting activities;
(b) Fire hydrant flushing;
(c) Water used for washing vehicles where detergents are not used;
(d) Water used for controlling dust;
(e) Potable water including uncontaminated water line flushing not associated with hydrostatic testing;
(f) Routine external building wash down associated with construction that does not use detergents;
(g) Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;
(h) Uncontaminated air conditioning or compressor condensate associated with temporary office trailers and other similar buildings;
(i) Uncontaminated ground water or spring water;
(j) Foundation or footing drains where flows are not contaminated with process materials such as solvents;
(k) Landscape irrigation.

Anticipated non-stormwater discharges are described in Table 4 below.

Table 4. Non-Stormwater Discharges

Non-Stormwater Discharges	Pollution Prevention Measures
Uncontaminated ground water or spring water.	Shall be discharged to the WWTS for treatment before discharged off-site.
Water used to control dust.	Water to control dust shall be sprinkled over the surface to avoid concentrated flows and erosion on bare soils.
Waters used to wash vehicles where detergents are not used.	Vehicle wash water shall be used such that water is discharged to the WWTS.

SECTION 4: SELECTING POST-CONSTRUCTION BMPs

Post-Construction BMPs include stormwater detention ponds, riprap lined channels, pipes, and outlet protection. Post-construction BMPs were designed for the final condition of the consolidated CCR footprint and are detailed in the *Final Cover System Surface Water Management Design Calculation Package* provided in Appendix K.

SECTION 5: INSPECTIONS

5.1 Inspections

Inspection Personnel:

Identify the person(s) who will be responsible for conducting inspections and describe their qualifications:

- Daily Observations: QCI to be determined.
- Weekly (if required): QCI to be determined.
- Monthly Inspections: QCI to be determined.
- Precipitation event Inspections: QCI to be determined.
- Comprehensive CBMPP Evaluation (at minimum, to be conducted once every 6 months by QCP): Cuneyt Gokmen, P.E., Geosyntec Consultants

Inspection Schedule and Procedures:

The following inspections are required in accordance with ADEM's NPDES General Permit (GP) for Discharges from Construction Activities that Result in a Total Land Disturbance of One Acre or Greater (ALR100000):

- Pre-Construction Observations – A pre-construction site inspection shall be conducted prior to the placement of BMPs, or commencement of land disturbing activities.

  The pre-construction inspection shall consist of a complete and comprehensive inspection of the entire proposed construction site, including all proposed areas of land disturbance, proposed area used for storage of materials that may be exposed to precipitation, affected ditches, and other stormwater conveyances, as well as all proposed outfalls, receiving waters and stream banks to determine if there are pre-existing areas of concern.

  The pre-construction inspection shall be conducted by the QCP or a qualified person under the direct supervision of a QCP and shall be documented and made available upon request. Inspection reports shall be maintained in Appendix E.

- Daily Observations - Daily observations shall be conducted by site personnel for each day there is activity on the site. The inspection shall include any portions of the site where active disturbance, work, or construction occurred. The daily log included in Appendix E shall be completed to include rainfall since the previous observation and any BMP deficiencies observed.

- Site Inspections – Site inspections shall consist of a complete and comprehensive observation of the entire construction site and include all areas of land disturbance, areas used for storage of materials that are exposed to precipitation, equipment storage and maintenance areas, affected ditches, and receiving waters to ensure that:

(i) Effective ESC controls have been fully implemented and maintained in accordance with the permit, the site CBMPP, and the Alabama Handbook;

(ii) Pollutant discharges are being prevented/minimized; and

(iii) Discharges do not result in a contravention of applicable State water quality standards for the receiving stream(s) or other waters impacted or affected by the construction activities.

Comprehensive site inspections shall be conducted by the QCP, QCI, or a qualified professional under the direction of the QCP at least once per month and following any qualifying precipitation event of 0.75 inches or more in any 24-hour period. During construction located within the banks of the on-site wetlands, comprehensive site inspections shall be completed at least once per week and following any qualifying precipitation event. Inspections following a rain event shall occur as soon as possible, but no later than 24-hours after resuming/continuing active construction or disturbance and shall be completed no later than five (5) days after the qualifying precipitation event.

A site inspection shall also be performed, as often as is necessary, until any poorly functioning erosion or sediment controls, non-compliant discharges, or any other deficiencies observed during a prior inspection are corrected and documented as being in compliance with the requirements of the General Permit. For all active disturbance, dredging, excavation, or construction undertaken or located within the banks of a waterbody (including but not limited to, equipment/vehicle crossings, pipelines, or other transmission line installation, conveyor structure installation, and waterbody relocation, streambank stabilization, or other alterations), a site inspection shall be performed at least once a week and as often as is necessary until the disturbance impacting the waterbody is complete and reclamation or effective stormwater quality remediation is achieved. Inspections shall be documented utilizing the state-specific forms provided in Appendix E.

- CBMPP Evaluations – A site evaluation, performed by the QCP, shall inspect all erosion and sediment controls being implemented for adequacy and consistency with site conditions. The CBMPP evaluation shall be performed as often as necessary until poorly functioning or damaged controls are corrected and, at a minimum, once every six months. If additional modifications or erosion and sediment controls are needed, the CBMPP shall be updated accordingly. Inspection documentation shall be maintained in Appendix E.

5.2 Corrective Action

Any deficiencies identified during inspections described in Section 5.1 shall be corrected as soon as possible, but not to exceed five (5) days unless prevented by unsafe weather conditions. If unsafe weather conditions are present, they should be documented.

In the event of a breach of a sediment basin or pond, temporary containment measures shall be taken within 24 hours after the inspection. Permanent corrective measures shall be implemented within five (5) days of the inspection; however, if permanent corrective measures cannot be implemented within the timeframes provided herein, the Permittee shall contact the Department.

The operator shall promptly take all reasonable steps to remove, to the maximum extent practical, pollutants deposited offsite or in any waterbody or stormwater conveyance structure.

Dates that corrective actions are implemented shall be documented on the log provided in Appendix F.

SECTION 6: RECORDKEEPING AND TRAINING

6.1 Recordkeeping

As required by the GP, records of all inspections, monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete such reports, must be retained for a period of at least three (3) years from the date of the inspection, sample measurement, or report.

All records required to be kept for a period of three (3) years shall be kept at the permitted facility or an alternate location identified to the ADEM in writing and shall be available for inspection upon request.

The following is a list of additional records that should be kept readily available at the project site for review:

- The signed and certified NOI form or permit application form (Appendix D)
- A copy of the letter from ADEM acknowledging receipt of your complete NOI/application (Appendix D)
- Inspection reports (Appendix E)
- Monitoring Data, if required
- Rainfall data (Appendix E)
- Dates of grading, construction activity, and stabilization (Appendix H)
- Copy of approved *CBMPP Plan* and Design Drawings
- Copy of SPCC, if needed

6.2 Log of Changes to the CBMPP

In accordance with the GP, the CBMPP shall be updated as necessary to address changes in the construction activity, weather patterns, new TMDLs finalized or approved by EPA, new 303(d) listings approved by EPA, or manufacturer specifications for controls. The log of changes to the CMBPP is provided in Appendix G. Additions of new BMPs, replacement of failed BMPs, significant changes in the activities or their timing on the project, changes in personnel, changes in inspection and maintenance procedures, and updates to site maps shall be included on the log.

In addition, identified changes shall be implemented within seven (7) days of identification. If existing sediment control measures, erosion control measures, or management practices prove ineffective in protecting water quality or need to be added or modified, implementation shall be completed before the next storm event whenever practicable. If implementation before the next storm event is impracticable, then new land disturbance activities must cease until the modified or additional controls can be implemented.

6.3 Training

At least one onsite employee shall be certified as a QCI by completing an initial training and annual refreshers through an ADEM-approved QCIP conducted by a cooperating training entity.

Individual(s) Responsible for Training:

Insert Company or Organization Name:
Insert Name:
Insert Address:
Insert City, State, Zip Code:
Insert Telephone Number:
Insert Fax/Email:

General stormwater and BMP awareness training for staff and subcontractors shall be conducted as employees arrive on-site. Training shall be documented in the log provided in Appendix J.

SECTION 7: FINAL STABILIZATION

Permanent Seeding or Equivalent

BMP Description: Permanent Seeding is required to achieve final stabilization in areas where any clearing, grading, excavating, or other earth disturbing activities have permanently ceased. Final stabilization requires 85% vegetative cover.

Installation Schedule:	Areas shall be permanently grassed and mulched immediately as they are brought to final grade in accordance with Table PS-1 and Table MU-2 in the Design Drawings. Areas in which stabilization has been achieved will be marked on the site maps and on the log provided in Appendix H.
Maintenance:	Eroded areas shall be repaired as soon as possible.
Inspection:	Inspect weekly and after qualifying rain events for erosion and damage. Continue inspections until vegetation is well established.
Responsible Staff:	Project Manager or Site Supervisor

SECTION 8: TURBIDITY MONITORING

Turbidity monitoring is not required by the General Permit.

SECTION 9: CERTIFICATION AND NOTIFICATION

I certify under penalty of law that a comprehensive Construction Best Management Practices Plan (CBMPP) for the prevention and minimization of all sources of pollution in stormwater and authorized related process wastewater runoff has been prepared under my supervision for this site/activity, and associated regulated areas/activities. The CBMPP meets the requirements of this permit and if properly implemented and maintained by the operator, discharges of pollutants in stormwater runoff can reasonably be expected to be effectively minimized to the maximum extent practicable according to the requirements of ADEM Administrative Code Chapter 335-6-6-.23 and this Permit. The CBMPP describes the erosion and sediment control measures that must be fully implemented and regularly maintained as needed at the permitted site in accordance with sound sediment and erosion control practices to ensure the protection of water quality.

Name: Cuneyt Gokmen Title: Senior Principal

QCP Designation/Description: Professional Engineer Registration/Certification: 34239

Address: 1255 Roberts Boulevard, Suite 200 Phone Number: 678-202-9500

Kennesaw, GA 30144

Signature: _____ Date: _____

CBMPP APPENDICES

Attach the following documentation to the CBMPP:

Appendix A – Preliminary Phasing Figures

Appendix B – Vicinity Map

Appendix C – Site Maps

Appendix D – NOI and Copy of Permit

Appendix E – Inspection Reports

Appendix F – Corrective Action Log (or in Part 5.2)

Appendix G – CBMPP Amendment Log (or in Part 6.2)

Appendix H – Grading and Stabilization Activities Log (or in Part 6.1)

Appendix I – Construction Site Posting

Appendix J – Training Log

Appendix K – Final Cover System Surface Water Management Design Calculation Package

Appendix A – Preliminary Phasing Figures

Appendix B – Vicinity Map

Appendix C – Site Maps

Site maps included in Appendix C include relevant plans and details from the Design Drawings. These sheets include BMP locations and details.

APPENDIX C WILL BE PROVIDED FOLLOWING THE COMPLETION OF THE 90% DESIGN DRAWINGS. ADDITIONAL UPDATES MAY BE NECISSARY ONCE THE DESIGN DRAWINGS ARE SUBMITTED FOR CONSTRUCTION.

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Appendix D – NOI and Copy of Permit

A blank NOI and a copy of ADEM's General Permit ALR100000 is included in this Appendix. A copy of the completed NOI shall be added to this appendix once submitted to ADEM, along with ADEM's letter acknowledging the receipt of the NOI as and when it is received. Note: The NOI and all reports or information submitted to the Director shall be signed and certified according to ADEM Admin Code r. 335-6-6-.09 as stated below:

(1) The application for an NPDES permit shall be signed by a responsible official, as indicated below:

(a) In the case of a corporation, by a principal executive officer of at least the level of vice president, or a manager assigned or delegated in accordance with corporate procedures, with such delegation submitted in writing if required by the Department, who is responsible for manufacturing, production, or operating facilities and is authorized to make management decisions which govern the operation of the regulated facility;

(b) In the case of a partnership, by a general partner;

(c) In the case of a sole proprietorship, by the proprietor; or

(d) In the case of a municipal, state, federal, or other public entity by either a principal executive officer or ranking elected official. Environmental Management Chapter 335-6-6 Supp. 9/30/15 6-6-21

(2) All reports required by permits and other information requested by the Department shall be signed by a person described in paragraph 335-6-6-.09(1) or by a duly authorized representative of that person. A person is a duly authorized representative only if:

(a) The authorization is made in writing by a person described in paragraph 335-6-6-.09(1);

(b) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity; and

(c) The written authorization is submitted to the Department.

(3) If an authorization under paragraph 335-6-6-.09(2) is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of said paragraph must be submitted to the Department prior to or together with any reports or information signed by the newly authorized representative.

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

Appendix E – Inspection Reports

Required Inspection Reports include the following:

- Pre-Construction Observations
- Daily Observation Log
- Inspection Form (to be completed by a QCI at least once per month and after any qualifying precipitation event of 0.75 inches or more not to exceed five days following the event)
- CBMPP Evaluations (to be completed by the QCP at a minimum of once every 6 months)

Daily Observation Log

Project Name:
CBMPP Contact:

Date	Inspector Name(s)	General Description of Site Activities	Description of BMP Deficiencies Observed	Rainfall (inches)

Appendix F – Corrective Action Log

Corrective actions shall be completed as soon as possible, but not to exceed five (5) days of the inspection.

Project Name:
CBMPP Contact:

Inspection Date	Inspector Name(s)	Description of BMP Deficiency	Corrective Action Needed (including planned date/responsible person)	Date Action Taken/Responsible person

Appendix G – CBMPP Amendment Log

Project Name:
CBMPP Contact:

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

Appendix H – Grading and Stabilization Activities Log

Project Name:
CBMPP Contact:

Date Grading Activity Initiated	Description of Grading Activity	Date Grading Activity Ceased (Indicate Temporary or Permanent)	Date When Stabilization Measures are Initiated	Description of Stabilization Measure(s) and Location(s)

Appendix I – Construction Site Posting

The following construction entrance posting shall be completed and posted at the site entrance prior to construction activities.

Appendix J – Training Log

Project Name:
CBMPP Contact:

Date	Number of Attendees	Subjects Covered	Length of Training

Appendix K – Final Cover System Surface Water Management Design Calculation Package

FINAL COVER SYSTEM SURFACE WATER MANAGEMENT DESIGN CALCULATION PACKAGE WILL BE INCLUDED UPON COMPLETION OF THE CALCULATION PACKAGE.

CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN

PLANT BARRY ASH POND CLOSURE

BUCKS, ALABAMA

ALABAMA POWER COMPANY

Southern Company

NOVEMBER 2018

ENGINEER SEAL

Geosyntec consultants

engineers | scientists | innovators

Geosyntec Consultants, 1255 Roberts Boulevard, Suite 200, Kennesaw, Georgia 30144
Phone: 678-202-9500, Fax: 678-202-9501

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LIST OF ACRONYMS

ADEM	Alabama Department of Environmental Management
APC	Alabama Power Company
ASTM	American Society for Testing and Materials
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
CQA	Construction Quality Assurance
CQC	Construction Quality Control
GCL	Geosynthetic Clay Liner
GRI	Geosynthetic Research Institute
HDPE	High Density Polyethylene
LCRS	Leachate Collection and Removal System
LGP	Low Ground Pressure
LLDPE	Linear-Low Density Polyethylene
MQC	Manufacturer Quality Control
QA	Quality Assurance
QC	Quality Control
SCS	Southern Company Services

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1. INTRODUCTION

1.1 OVERVIEW

This Construction Quality Assurance (CQA) Plan describes the quality assurance (QA) and quality control (QC) activities that will be undertaken during closure construction of the ash pond at Alabama Power Company's (APC's) Plant Barry in Bucks, Alabama. The purpose of this document is to define the scope, procedures, and acceptance criteria necessary to perform QA tasks such that the construction elements of the ash pond closure (hereafter referred to as "the Project") comply with the design as shown or indicated in the design drawings, technical specifications, approved design changes, and other relevant design documents (collectively referred to as "Design Documents" in the remainder of this CQA Plan). The technical specifications will be developed and included in the contract documents for construction to provide the detailed qualifications, processes, inspections, testing, and controls that will assure compliance with the CQA Plan, the construction drawings, and the permit.

1.2 PROJECT DESCRIPTION

The ash pond will be closed using a "consolidated lined closure" approach, whereby the ash pond's coal combustion residuals (CCR) will be consolidated into an approximately 330-acre fully-contained engineered structure (soil containment berm and final covered area) that will be constructed in the north portion of the current ash pond. The Project will include the general activities described below:

- CCR removal, dewatering, consolidation, and placement;
- construction of earthen containment berms for the final consolidated lined area;
- construction of a final cover system and associated stormwater management system features; and
- other general site work.

Note that many of the activities described above will be conducted in a phased and overlapping manner.

1.3 CQA PLAN SCOPE

CQA services will be provided by a consulting engineering firm, reporting to APC and Southern Company Services (SCS), specializing in the inspection and testing of soils and geosynthetics. Resumes and qualifications including experience with projects of similar type, size and complexity will be provided to APC for their review and approval. The scope of the CQA Plan includes:

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- defining the responsibilities of the CQA Consultant overseeing the construction activities;
- establishing testing protocols for the evaluation of the closure components;
- establishing procedures for construction documentation; and
- providing the documentation for the verification of the overall construction conforming to the Design Documents.

The CQA Plan also presents the required properties of materials that will be used during closure construction, as established through the closure design process. The CQA Plan supplements the Design Documents that will be developed as part of detailed design.

2. CQA PLAN DEFINITIONS

2.1 CONSTRUCTION QUALITY ASSURANCE AND CONSTRUCTION QUALITY CONTROL

In the context of this document, construction quality assurance and construction quality control are defined as follows:

- Construction Quality Assurance (CQA) - The planned and systematic means and actions implemented to verify that materials and/or services meet technical (i.e., design), contractual and regulatory requirements and will perform satisfactorily in service. In the context of this document, CQA refers to means and actions employed by the CQA Consultant, Design Engineer, or APC to verify conformity of the various components of the Project with the requirements of the Design Documents.
- Construction Quality Control (CQC) - Those actions that provide a means to measure and regulate the characteristics of an item or service in relation to technical (i.e., design), contractual and regulatory requirements. In the context of this document, CQC refers to those actions taken by the Contractor, Manufacturers, or Installers to verify that the materials and the workmanship of the various components of the Project meet the requirements of the Design Documents.

2.2 DESIGN DOCUMENTS

In this CQA Plan, Design Documents refer to the design drawings, technical specifications, approved design changes, and other relevant design documents issued as a part of a specific contract for the Project.

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3. PERSONNEL

3.1 CQA CONSULTANT

3.1.1 Definition

The CQA Consultant is the party, retained by APC, but independent from APC and the Contractor, responsible for observing and documenting CQA activities related to the Project and reviewing CQC submittals prepared by the Contractor/Manufacturer related to the Project, as described in this CQA Plan. The qualifications and responsibilities of the CQA Consultant are described below.

3.1.2 Qualifications

The CQA Consultant will:

- have specialized experience in the design of geoenvironmental infrastructure involving earthwork, waste materials management, geosynthetics and piping installations, project-site water management, revegetation, containment systems, and final cover system design, and CQA of these components;
- possess the equipment, personnel, and licenses necessary to conduct the monitoring required by this CQA Plan and the Design Documents;
- be experienced in the CQA of earthwork, geosynthetics, piping systems, and other activities required for the Project;
- be experienced in the review of Contractor CQC submittals for conformance with the Project requirements and in the resolution of non-conformances; and
- be experienced in the preparation and/or review of CQA documentation including CQA plans, field documentation, field testing procedures, laboratory testing procedures, technical specifications, technical drawings, and CQA certification reports.

The CQA Consultant organization will be led by the CQA Certifying Engineer, who will be a Professional Engineer registered to practice in the state of Alabama. The CQA Site Manager will be the on-site representative of the CQA Consultant and will have experience in construction activities required for the Project.

3.1.3 Responsibilities

The CQA Consultant will be responsible for:

- reviewing the Design Documents prior to the start of the construction;

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- monitoring the compliance of construction materials delivered to the site with the CQC submittals and conformance requirements and/or shop drawings previously reviewed and approved by the Design Engineer;

- monitoring and documenting the activities of the Contractor relative to the installation of the final cover system components as well as various general site work related to the Project;

- monitoring that the Contractor's construction methods and workmanship are performed in accordance with the Design Documents;

- performing on-site field and/or laboratory QA verification testing if deemed necessary by the CQA Certifying Engineer);

- maintain calibration certificates of CQC field-testing equipment in the CQA Consultant's on-site project file;

- reviewing field and laboratory CQC test results and ensuring they are posted to the project database within a time frame that does not impede or delay construction activities; and

- promptly notifying APC of any nonconformances of the Contractor's work with any CQC requirements of the Project, including those requirements related to the prompt delivery of CQC results to the CQA consultant.

The specific duties of the individual CQA personnel are discussed in the following subsections.

3.1.3.1 CQA Certifying Engineer

The CQA Certifying Engineer:

- reviews the Design Documents;

- attends scheduled, meetings related to Project construction quality activities;

- administers the CQA program (i.e., assigns and manages all on-site CQA personnel, reviews all field reports, provides engineering review of all CQA-related activities);

- provides quality control of CQA documentation;

- reviews and documents changes to the design during construction; and

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- prepares and seals the final CQA Certification Report.

3.1.3.2 CQA Site Manager

The CQA Site Manager:

- serves as the on-site representative of the CQA Consultant;
- familiarizes all CQA field technicians with the site, Design Documents, and the CQA requirements;
- manages the daily activities of the CQA field technicians;
- attends regularly scheduled CQA-related meetings on-site;
- reviews the ongoing preparation of the construction record drawings;
- reviews test results, certifications, and documentation provided by the Contractor, Geosynthetics Manufacturer, and Installer and makes appropriate recommendations;
- reviews the CQA field technicians' daily notes and logs;
- prepares a daily report for the project;
- reviews the results of field and laboratory testing and makes appropriate recommendations;
- reports any unresolved deviations from the CQA Plan and Design Documents to the Construction Manager and CQA Certifying Engineer;
- assists with the preparation of the final CQA Certification Report;
- reviews the Geosynthetics Manufacturer's quality control (MQC) documentation; and
- performs duties of CQA field technician, as needed.

3.1.3.3 CQA Field Technicians

CQA field technicians:

- monitor material stockpiles for any deterioration of materials;

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- monitor surface-water drainage in the areas of soil and geosynthetic material stockpiles;
- monitor foundation improvement and earthwork placement and compaction operations;
- monitor the unloading, storage, and on-site handling of the geosynthetics;
- monitor geosynthetic material deployment and installation operations;
- monitor geosynthetic repair operations;
- document any on-site activities that could result in damage to the soils or geosynthetic components of the construction and report them as soon as practical to the CQA Site Manager;
- prepare daily field reports; and
- report problems to the CQA Site Manager.

3.2 CQC CONSULTANT

3.2.1 Definition

The CQC Consultant is the party, retained by the Contractor, responsible for observing construction, performing QC testing, and documenting CQC activities related to the Project. The CQC Consultant activities are to verify that the materials and workmanship of the various components of the Project meet the requirements of the Design Documents. Specific details of the CQC Consultant's role and responsibilities, CQC activities, and required material testing, will be provided in the Design Documents.

3.2.2 Qualifications

The minimum qualifications of the CQC Consultant will be as set forth in the Design Documents. In summary, the CQC Consultant will be experienced in the CQC of earthwork, geosynthetics, piping systems, and other activities required for the Project. The CQC Consultant will possess the necessary equipment and personnel to conduct the CQC activities specified in the Design Documents; and will be experienced in the preparation and/or review of CQC documentation including manufacturer and supplier documentation, field documentation, field testing procedures, and laboratory testing procedures and results. The CQC Consultant organization will be led by the CQC Engineer, who will be a Professional Engineer registered to practice in the state of Alabama.

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Prior to construction, the CQC Consultant will be required to submit its qualifications and QA/QC procedures to the CQA Consultant and APC for review and comment prior to the commencement of the Project.

3.3 EARTHWORK LABORATORY

3.3.1 Definition

The Earthwork Laboratory is a party of the CQC Consultant and will be responsible for conducting CQC geotechnical laboratory testing in accordance with standards referenced in the Design Documents and this CQA Plan. The testing results generated by the Earthwork Laboratory will be used by the CQC Consultant to verify compliance of the earthwork with the Design Documents and this CQA Plan.

3.3.2 Qualifications

The minimum qualifications of the Earthwork Laboratory will be set forth in the Design Documents. In summary, the Earthwork Laboratory will be experienced in testing of soils and CCR using methods in accordance with American Society of Testing and Materials (ASTM) and other applicable soil test standards. The Earthwork Laboratory will be capable of providing test results within a maximum of seven (7) working days of receipt of samples, except for those tests that require longer to perform, and will maintain that capability throughout the duration of the earthwork construction.

Prior to construction, the Earthwork Laboratory will be required to submit their qualifications and QA/QC procedures to the CQA Consultant and APC for review and comment prior to the commencement of the Project.

3.4 GEOSYNTHETICS LABORATORY

3.4.1 Definition

The Geosynthetics Laboratory is a party of the CQC Consultant and will be responsible for conducting tests on samples of geosynthetic materials used in the construction in accordance with standards referenced in the Design Documents and this CQA Plan. The testing results generated by the Geosynthetics Laboratory will be used by the CQC Consultant to verify compliance of the geosynthetic materials with the Design Documents and this CQA Plan.

3.4.2 Qualifications

The minimum qualifications Geosynthetics Laboratory will be set forth in the Design Documents. In summary, the Geosynthetics Laboratory will be currently accredited by the Geosynthetic Research Institute (GRI) or be approved by the Certifying CQA Engineer and APC and have experience in testing geosynthetics to be used for the Project. The Geosynthetics Laboratory will be familiar with ASTM and other applicable geosynthetic test standards. The Geosynthetics Laboratory will be capable of providing destructive test results for geomembrane field seams within

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24 hours of receipt of samples and will maintain that capability throughout the duration of geosynthetic material installation.

Prior to construction, the Geosynthetics Laboratory will be required to submit their qualifications and QA/QC procedures to the CQA Consultant and APC for review and comment prior to the commencement of the Project.

3.5 DESIGN ENGINEER

The Design Engineer is the engineer-of-record under whose direction the ash pond Closure Design was prepared. The Design Engineer will be a Professional Engineer registered in the state of Alabama. The Design Engineer will be responsible for:

- approving all design and specification changes and making design clarifications that may be required during construction;
- assisting the Construction Manager in reviewing and approving the Contractor's shop drawings and submittals, as necessary;
- periodically visiting the site during construction and attending the project coordination meetings, as required, to verify conformance with the Design Documents and this CQA Plan; and
- discussing and interpreting all elements of the design and having the authority to recommend changes or modifications to the Design Documents for approval by APC and ADEM, as required.

The CQA Consultant and Design Engineer may be from the same organization.

3.6 SURVEYOR

The Surveyor is the party acceptable to APC and retained by the Contractor, who will be responsible for performing surveying activities and issuing survey products in accordance with the Design Documents, and for signing and sealing the construction survey record drawings. The Surveyor will be a State of Alabama licensed Professional Land Surveyor, with personnel experienced in the provision of surveying services and their detailed documentation. APC may also retain a third-party surveyor, having similar qualifications, to perform verification surveys.

3.7 CONSTRUCTION MANAGER

The Construction Manager is an individual, appointed by APC, who will serve as the owner's representative and who will be responsible for overall management of the construction Project. The Construction Manager will give direction to the Contractor. The CQA Consultant will provide the Construction Manager with notifications, reports, and monitoring logs as requested and as described further throughout this CQA Plan.

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4. DOCUMENTATION

4.1 OVERVIEW

The CQA Consultant will prepare and retain necessary documentation related to the CQA monitoring activities performed, including review and evaluation of all CQC daily reports and other submittals provided by the CQC Consultant. The CQA Consultant will provide these records to the Construction Manager as requested. The CQA Consultant will also maintain a complete file of the Design Documents, CQA Plan, Contractor's QC Plan(s), checklists, test procedures, daily field reports, QC data sheets and logs, and other pertinent design, construction, and CQA documentation at the site.

4.2 DAILY RECORD KEEPING

The CQA Consultant's daily reporting procedures will include: (i) daily field report; (ii) monitoring logs; (iii) photographs; and (iv) when appropriate, non-conformance and corrective measures reports.

4.2.1 Daily Field Reports

The CQA Consultant's daily field reports will include the following information as applicable:

- date, project name, location, and other pertinent project identifiers;
- weather conditions;
- site equipment and personnel (including the CQA personnel);
- summary on meetings held and their results;
- a list of off-site materials received, including a list of all QC documentation received;
- process description(s) and location(s) of construction activities underway during the time frame of the report;
- descriptions and specific locations of areas, of work being tested and/or observed and documented;
- descriptions, maps, or sketches of locations where tests and samples were taken;
- a narrative summary of field test results;

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- decisions made regarding acceptance of work, and/or corrective actions to be taken in instances of substandard testing results; and

- reference to data sheets and non-conformance reports used to substantiate the non-conformances described above.

4.2.2 Monitoring Logs

The CQA Consultant will record monitoring observations on appropriate monitoring logs. The CQA Consultant will use the monitoring logs to track completeness of the required CQA activities. Any corrections to the monitoring logs will be a single line cross-out initialed and dated by the CQA personnel responsible for the correction.

The CQA Consultant's monitoring logs will include the following information as applicable:

- project specific information such as project name, location, and other pertinent project identifiers;

- the date the CQA activity was performed;

- a unique identifying sheet number for cross-referencing and document control;

- description or title of the CQA activity, along with the location and type of activity;

- recorded observation;

- results of the CQA activity and comparison with specification requirements (pass/fail); and

- the initials or signature of personnel involved in CQA inspection activity.

The CQA Consultant will maintain separate monitoring logs to track and catalog all QC information received from the CQC Consultant and to document conformance or nonconformance of the information with the requirements of the Design Documents. The CQA Consultant may also maintain a log of period photographic documentation obtained as a pictorial record of construction.

4.2.3 Non-conformance and Corrective Measures Reporting

A non-conformance is defined herein as material or workmanship that does not meet the specified requirement(s) contained in the Design Documents. The CQA Consultant will prepare non-conformance and corrective measures reports as needed and will cross-reference the reports to specific daily field reports or

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monitoring logs where the non-conformance was identified. The reports will include the following information, as applicable:

- a unique identifying sheet number for cross-referencing and document control;
- detailed description of the problem;
- location of the problem;
- probable cause;
- how and when the problem was located;
- estimation of how long problem has existed;
- suggested corrective measures;
- documentation of corrections (referenced to test data sheets);
- suggested methods to prevent similar problems; and
- signature of the appropriate CQA field technicians and the CQA Site Manager.

The CQA Consultant will inform the Construction Manager in writing of any significant recurring non-conformance with the Design Documents or CQA Plan. It will be the responsibility of the Construction Manager to direct the Contractor to make appropriate changes in materials or procedures to correct the non-conformance. The CQA Consultant will document the corrective actions taken to mitigate non-conformances.

4.3 CQA CERTIFICATION REPORT

At the completion of construction phases, the CQA Consultant will provide APC with a final CQA Certification Report pertaining to each construction phase, for submittal to ADEM. This report will acknowledge that: (i) the work has been performed in compliance with the Design Documents and this CQA Plan; (ii) physical sampling and testing has been conducted with appropriate standards and at pre-defined frequencies; (iii) the Contractor's and Manufacturer's CQC documentation is in conformance with the submittal requirements and technical specifications; and (iv) the test results met the minimum requirements defined in the Design Documents, the permit, and this CQA Plan.

At a minimum, the CQA Certification Report will include:

- summary of CQA activities;

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- daily field reports;
- monitoring logs;
- QC test data sheets including sample locations;
- QC certifications and laboratory test results;
- non-conformance and corrective measures reports;
- documentation of design clarifications or revisions; and
- a summary statement indicating compliance with the Design Documents and any approved changes, signed and sealed by the CQA Certifying Engineer.

The record drawings, which include scaled drawings depicting the locations and details pertaining to the extent of construction (e.g., depths, plan dimensions, elevations, soil component thicknesses, etc.), and a geomembrane panel drawing will also be included as part of the final CQA Certification Report.

5. EARTHWORK

5.1 INTRODUCTION

CQA monitoring will be performed during earthwork construction. This earthwork will include: (i) general earthwork for preparation of subgrade and installation of soil for the soil containment berm, channels, roads, ponds, ditches, etc.; (ii) installation of granular materials such as sand, gravel, base aggregate, and riprap; and (iii) installation of soil components of the final cover system. Minimum acceptance criteria to be used for evaluation of acceptability of the various earthwork components are identified in Appendix A this CQA Plan.

5.2 RECORD DRAWINGS AND AS-BUILT SURVEYS

During construction of the earthwork components, the CQA Consultant will routinely review record drawings submitted by the Contractor. Prior to the placement of successive soil or geosynthetic layers, the CQA Consultant will review as-built surveys that indicate compliance of the preceding layer thickness, limits, and grades.

5.3 SUBGRADE

During construction, the CQA Consultant will monitor and document subgrade preparation to confirm that a firm and smooth surface free of vegetation and other deleterious materials is achieved. Material placed to achieve design grades will be monitored by the CQA Consultant to verify that the subgrade material and fill placement, grading, and compaction complies with the Design Documents.

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It will be the responsibility of the CQC Consultant to delineate any areas of non-conformance and observe their mitigation to verify that acceptable results are achieved.

5.4 CONFORMANCE OBSERVATIONS AND TESTING

5.4.1 CQA Conformance Observations

The CQA Consultant will observe the earthwork components to verify they are uniform and conform to the requirements of the Design Documents. For soil materials obtained from on-site sources, visual inspections will be performed by the CQA Consultant prior to the materials being used. If soil materials are obtained from off-site borrow sources, visual inspection may be performed by the CQA Consultant at the source location. Borrow area inspections may also be utilized by the CQA Consultant to verify that only suitable soil materials are transported to the site.

The CQA Consultant will confirm that granular materials (i.e., sand, gravel, base aggregate, and riprap) are certified by the Contractor's supplier to meet the requirements of the material type shown on the Design Documents and are free of contamination. All materials failing to comply with conformance standards will be rejected for use at the site.

Initial on-site evaluation of various soil types by CQA personnel during construction will be largely by visual and manual methods; therefore, the CQA personnel will be experienced with visual and manual soil classification procedures.

5.4.2 QC Conformance Test Methods and Frequencies

Conformance testing to evaluate the suitability of soil and granular materials during construction will be performed by the CQC Consultant in accordance with the current ASTM or other applicable test procedures and at the minimum frequencies indicated in the tables for each material type, as presented in Appendix A.

The CQA Consultant will review for conformance all CQC Consultant QC test results related to the foregoing activities. The CQA Consultant may also conduct independent verification QA testing if deemed necessary by the CQA Certifying Engineer.

5.5 CONSTRUCTION MONITORING

During installation of the earthwork components, the CQA Consultant will observe and document the earthwork components to verify they are installed in accordance with the requirements of the Design Documents and this CQA Plan. The CQA Consultant will also evaluate the procedures, methods, and equipment used by the Contractor to install the earthwork components. This will include visual observation and documentation of the Contractor's earthwork activities for the following:

- changes in soil consistency;

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- thickness of lifts as loosely placed and compacted;
- soil conditioning prior to placement including general observations regarding moisture distribution, clod size, etc.;
- condition of final surfaces;
- placement methods which may damage or cause displacement or wrinkling of geosynthetics;
- the action of the compaction and heavy hauling equipment on the construction surface (sheepsfoot penetration, pumping, cracking, rutting, etc.);
- the number of passes used to compact each lift; and
- desiccation cracks or the presence of ponded water.

5.6 PERFORMANCE TESTING

Performance tests that are used to evaluate the suitability of in-place constructed soil and granular components will be performed by the CQC Consultant in accordance with the current ASTM or other applicable test procedures and at the minimum frequencies indicated in the tables for each material type, as presented in Appendix A.

The CQA Consultant will review for conformance all CQC Consultant QC test results related to the foregoing activities. The CQA Consultant may also conduct independent verification QA testing if deemed necessary by the CQA Certifying Engineer.

5.7 DEFICIENCIES

If a deficiency (i.e., non-conformance of the materials or workmanship with the requirements of the Design Documents) is discovered in the earthwork construction, the CQC Consultant will assess the extent and nature of the deficiency by performing additional tests, observations, review of records, or other means that the CQC Consultant deems appropriate. If the defect is related to adverse site conditions, such as overly wet soils or surface desiccation, the CQC Consultant will define the limits and nature of the defect.

If the deficiency cannot be resolved by the Contractor immediately or as soon as practical after identification, the CQC Consultant will notify the CQA Consultant and will schedule appropriate re-tests for after the work deficiency is corrected.

The CQA Consultant will verify that:

- the Contractor has corrected all noted deficiencies before any additional work can be performed in the area of the deficiency; and

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- if a specified criterion cannot be met because of site-specific reasons or unusual weather conditions hindering the work, the Contractor will submit suggested solutions or alternatives to the Design Engineer and Construction Manager for review.

5.8 DOCUMENTATION

CQA monitoring observations will be documented by the CQA Consultant on forms specifically designed for this purpose. Reports and forms will be submitted to the Construction Manager.

6. CCR REMOVAL AND PLACEMENT

6.1 INTRODUCTION

This section describes the construction oversight activities that will be performed by the CQA Consultant to verify the removal and placement of CCR to the extents and grades shown on the Design Documents.

In addition to the activities listed in the subsections below, the CQA Consultant will photograph the work being conducted and document the following information:

- type of equipment and number of personnel on-site;
- current work being performed;
- QC checks performed by Contractor;
- general observations of the work; and
- notes explaining any deviations from the Design Documents or Contractor's Work Plans, and the proposed resolutions of the deviations.

6.2 CCR REMOVAL AND VERIFICATION PROTOCOL

In the context of this Closure Plan, the CCR removal verification protocol refers to the process of verifying and documenting that, to the extent practicable, visible CCR has been removed from the areas outside of the consolidated footprint.

The CCR at the Site is underlain by soils that could be visually similar to the CCR (i.e., similar in color), which makes identifying the CCR-soil interface by simple observations based on a color difference challenging. Previously performed soil borings at the Site indicate that organic clay and elastic silt type of natural soil deposits underlie CCR.

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A combination of the following procedures will be used to delineate the CCR-soil interface.

- Delineation of CCR-soil interface will be performed by a field geologist/engineer through visual examination (i.e., visual soil classification) of the subsurface samples collected by continuous soil boring methodologies such as direct push technology (DPT) or sonic drilling. The procedures below will be used to delineate the CCR-soil interface by visual examination:
    - The differentiating factors between the organic and inorganic clay and CCR is the presence of plasticity in clay (i.e., can be rolled into a ball and will retain its form) and its absence in CCR (i.e., CCR does not retain form when rolled with fingers). Additionally, there are some subtle differences in color (e.g., organic clay at the site exhibited dark gray to brown in color and inorganic clay at the site exhibited greenish to blueish gray in color, while fly ash exhibited gray to light gray in color).
    - Differentiating between the elastic silt and CCR will require a closer examination of these units using a handheld magnifying lens to compare grain color, shape and consistency. The visual method used to differentiate between the elastic silt and fly ash at this site includes examining the material for light (sometimes white) fine grains mixed into the matrix of gray and dark gray fine grains; this combination of color grains is found in the CCR but not the native elastic silt. The native elastic silt grains are a homogeneous fine-grained matrix of the color gray.
    - At 300-foot centers throughout the closure by removal areas of the site, continuous soil borings by DPT or other methods will be performed to obtain continuous core samples of the subsurface materials to a depth of minimum 20 ft below the bottom of CCR or to the sand layer underlying the organic clay and elastic silt deposits, whichever is earlier. These samples will be inspected by field geologist/engineer to delineate the CCR-soil interface based on visual soil classification procedures described above and documented in boring logs. The boring locations will be surveyed for both horizontal and vertical control. Based on field geologist/engineer's observations and the survey data, the elevation of the CCR- soil interface will be picked for each of the boring location.
- Delineation of CCR-soil interface will be performed by the Construction Quality Assurance (CQA) engineer using cone penetration test (CPT) results. Soil behavior type can be predicted from CPT results using empirical soil behavior type (SBT) chart. When combined with actual observations from soils borings (i.e., visual classification by field geologist/engineer), the

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CPT results could be effectively used to differentiate subsurface soil types. The procedures below will be used to delineate the CCR-soil interface by using CPT results:

- Based on co-located soil borings and CPTs performed at the Site previously, a CPT- based machine learning algorithm (MLA) was developed to identify the CCR-soil interface. The MLA uses computational methods to "learn" information directly from data without relying on a predetermined equation as a model. The MLA adaptively improves its performance as the number of samples available for learning increases. The MLA for the Site was developed based on approximately 5,000 CPT data points from 13 CPT locations that were co-located with 13 soil borings across the Site. The MLA may be refined, as necessary, based on the additional data collected during closure construction (i.e., additional soil borings and CPTs discussed herein to refine the estimated CCR-soil interface).
- At 100-foot centers throughout the closure by removal areas of the site, CPTs with pore pressure measurements will be advanced to a depth of minimum 20 ft below the estimated bottom of CCR or to the sand layer underlying the organic clay and elastic silt deposits, whichever is earlier. For each of the soil boring (e.g., DPT) locations discussed earlier, a co-located CPT will be advanced within 10 ft of the soil boring location. The CPT locations will be surveyed for both horizontal and vertical control.
- At any CPT location, the CQA engineer will use the MLA to estimate the CCR-soil interface. The co-located soil borings advanced at a lesser frequency will be used to confirm the MLA's estimates as well as to supply additional data to MLA to increase its robustness.

- Based on the CPT-based MLA estimates, and direct observations from the soil borings (e.g., DPT cores) discussed earlier, CCR-soil interface elevations will be assigned throughout the closure by removal areas on a 100 ft by 100 ft grid. Geospatial kriging techniques will be used to transform the 100-ft grid data in to a CCR-soil interface surface for the entire footprint of closure by removal areas.
- The CCR-soil interface surface will be used to develop the final CCR excavation grades by subtracting an additional 6 inches to account for potentially impacted soils immediately underlying the CCR.
- The closure contractor will use high-precision GPS and/or other surveying methods to demonstrate and document that the target excavation grades are achieved throughout the closure by removal areas. The horizontal and vertical survey data from excavation efforts along with the field observations of excavation areas will be reviewed by the CQA engineer (or qualified

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representative). Once the removal is deemed complete with CQA engineer's approval for a given area, the backfilling operations will commence.

6.3 CCR PLACEMENT

The CQA Consultant will monitor any field pilot studies required by the Design Documents to evaluate the optimum CCR placement methods (i.e., lift thickness, optimum moisture window, type of compaction equipment, and number of passes). The CQA Consultant will also monitor CCR placement for conformance with the Design Documents, including:

- lift thicknesses and placement of CCRs in relatively horizontal lifts;
- CCR surface being firm and unyielding after several passes of the compaction equipment;
- grading of the working surface in such a way to minimize the stormwater run-on;
- sealing of the surface to the extent possible at the end of each day's activities; and
- scarification of the sealed CCR surface prior to the placement of the next lift to promote lift bonding.

7. CONCRETE

7.1 INTRODUCTION

The CQA Consultant will monitor Contractor's construction and testing of all concrete materials and finished products to verify compliance with the Design Documents.

7.2 INSPECTIONS

The CQA Consultant will monitor concrete workmanship to verify that the Contractor does not place concrete until foundations, forms, reinforcing steel, pipes, conduits, sleeves, anchors, hangers, inserts, and other work required to be built into concrete has been inspected and approved by the CQA Consultant and Construction Manager.

7.3 FIELD QUALITY CONTROL TESTING

QC Conformance testing of placed concrete will be the responsibility of the Contractor. The concrete test program will be developed as part of detailed design.

The CQA Consultant will review for conformance all QC test results related to the foregoing activities. Any nonconformances will be reported to the Contractor and Construction Manager.

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8. GEOMEMBRANE AND CLOSURETURF®

8.1 INTRODUCTION

The CQA Consultant will review the QC documentation and destructive seam testing results and will monitor the installation of geomembranes to verify that the Manufacturer's specifications and the requirements of the Design Documents and this CQA Plan are met. These procedures will also be followed by the CQA Consultant during installation of the geomembrane component of the ClosureTurf® system that may be used as an alternative final cover system.

8.2 MANUFACTURING PLANT VISIT

At the request of APC, the CQA Consultant will visit the plant of the geomembrane Manufacturer to verify that manufacturing quality control procedures are in conformance with the Design Documents. If possible, such a visit will be performed prior to or during the manufacturing of the geomembrane rolls for the Project.

During the project-specific manufacturing plant visit, the CQA Consultant will:

- verify that the measurements of properties by the Manufacturer are properly documented, and test methods used are acceptable;
- spot-inspect the rolls and verify that they are free of holes, blisters, or any sign of contamination by foreign matter;
- review packaging and transportation procedures to verify that these procedures are not damaging the geomembrane;
- verify that all rolls are properly labeled; and
- verify that extrusion rods and/or beads manufactured for the field seaming of the geomembrane are derived from the same base resin type as the geomembrane.

Upon completion of the manufacturing plant visit, a report describing the findings and observations will be completed by the CQA Consultant and be included as an attachment to the final CQA Certification Report.

8.3 TRANSPORTATION, HANDLING, AND STORAGE

The CQA Consultant will monitor the transportation, handling, and storage of the geomembrane on the Project site. Upon delivery at the site, the Contractor, Installer, CQC Consultant, and CQA Consultant will conduct an inspection of the rolls for defects and damage. This inspection will be conducted without unrolling the materials unless defects or damages are found or suspected in the rolled material. The CQA Consultant will indicate to the Construction Manager:

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- rolls, or portions thereof, that will be rejected and removed from the site because they have severe or non-repairable flaws that may compromise geomembrane quality; and

- rolls that include minor and repairable flaws that do not compromise geomembrane quality.

The CQA Consultant will also monitor that equipment used to handle the geomembrane on-site is adequate and does not pose any risk of damage to the geomembrane during handling.

8.4 MANUFACTURER QC (MQC) TESTING AND CONFORMANCE TESTING

8.4.1 Geomembrane Material MQC Testing Requirements

The geomembrane Manufacturer will perform QC testing on the geomembrane materials and panels that will be used on this Project in accordance with the current versions of the ASTM and other applicable test procedures, and at the minimum MQC frequencies presented in the Appendix B tables corresponding to each geomembrane material type that will be used.

The CQA Consultant will review the MQC certifications and test results to verify that the Manufacturer's specifications and the requirements of the Design Documents and this CQA Plan are met. The CQA Consultant may conduct independent conformance testing if deemed necessary by the CQA Certifying Engineer.

8.4.2 Geomembrane Seam Conformance Testing Requirements

Destructive seam testing to evaluate conformance of the geomembrane seams with the requirements of the Design Documents will be performed by the CQC Consultant (using the qualified Geosynthetics Laboratory described previously) as required by the Design Documents and this CQA Plan. The testing will be performed in accordance with the current versions of the ASTM and other applicable test procedures and at the minimum frequencies presented in the Appendix B tables corresponding to each geomembrane material type that will be used.

The CQA Consultant will review the destructive seam test results to verify that the requirements of the Design Documents and this CQA Plan are met. The CQA Consultant may conduct independent destructive seam testing if deemed necessary by the CQA Certifying Engineer.

8.4.3 Test Results

All MQC and conformance test results will be reviewed, accepted, and reported by the CQC Consultant before deployment of the geomembrane. The CQA Consultant will review for conformance all MQC and conformance test results related to the foregoing activities. Any non-conformance of the material properties with the

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requirements of the Design Documents will be reported to the Contractor and Construction Manager.

8.4.4 Test Failure

In the case of failing test results, the Contractor may request that another sample from the failing roll be re-tested. If the re-test fails or if the option to re-test is not exercised, then two isolation conformance samples will be obtained by the CQC Consultant. These isolation samples will be taken from rolls, which have been determined by correlation with the Manufacturer's roll number, to have been manufactured prior to and after the failing roll. This method for choosing isolation rolls for testing will continue until passing tests are achieved. All rolls that fall numerically between the passing roll numbers will be rejected.

The CQA Consultant will verify that the Contractor has replaced all rejected rolls. The CQA Consultant will document all actions taken in conjunction with geomembrane conformance failures.

8.5 ANCHOR TRENCH

The CQA Consultant will monitor, verify, and document that the anchor trench has been constructed as shown in the Design Documents and meets the minimum requirements of this CQA Plan as described below. To confirm conformance with the Design Documents, the CQA Consultant will:

- monitor that the anchor trench is constructed with a slightly rounded corner where the geosynthetics enter the trench and is backfilled as soon as possible after all geosynthetics are installed;
- verify that the CQC Consultant performs in-place moisture/density testing of the compacted anchor trench backfill as required by the Design Documents;
- observe that geosynthetic materials in the anchor trench are temporarily anchored with sand bags or other suitable methods if the trench will remain open after the installation of geosynthetics;
- monitor that no loose soils are left to underlie the geosynthetics in the anchor trench and all temporary ballast (i.e., sandbags) and deleterious materials are removed from the anchor trench prior to backfilling; and
- monitor that backfilling of the anchor trench is performed using extreme care when the geomembrane is in its most contracted state to minimize wrinkling and stress concentrations.

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8.6 GEOMEMBRANE PLACEMENT

8.6.1 CQA Consultant Responsibility During Placement

The CQA Consultant will monitor, verify, and document that geomembrane placement is conducted in accordance with the Design Documents and that CQC activities are performed as described in the subsections below.

8.6.2 Field Panel Identification

A field panel is a piece of geomembrane larger than approximately 10 square feet (ft2) that is to be seamed in the field, i.e., a field panel is a roll or a portion of roll to be seamed in the field. The CQC Consultant will verify that each field panel is given an "identification code" (number or letter-number) that will:

- be selected as simple and logical as possible;
- be substantially consistent with the as-built layout plan; and
- allow tracing of the Manufacturer's roll numbers to the field panel identification code.

The CQC Consultant will document the correspondence between roll numbers, factory panels, and field panel identification codes. The field panel identification code will be used for all QA/QC records.

8.6.3 Field Panel Placement

The CQC Consultant will monitor that field panels are installed substantially at the location indicated in the Installer's layout plan, as approved or modified. The CQC Consultant will record the field panel identification code, Manufacturer’s roll number, location, date of installation, time of installation, and dimensions of each field panel.

The CQC Consultant will monitor that geomembrane placement does not proceed:

- at an ambient temperature below 40°F or above 104°F unless authorized by the Design Engineer; or
- during any precipitation, in the presence of excessive moisture (e.g., fog, dew), in an area of ponded water, or in the presence of excessive winds.

The CQC Consultant will monitor that the above conditions are fulfilled and that the supporting soil has not been damaged by adverse weather conditions. The CQC Consultant will monitor geomembrane deployment for conformance with the Design Documents, including that:

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- the geomembrane is deployed under acceptable temperature and weather conditions;
- any equipment used does not damage the geomembrane by handling, trafficking, excessive heat, leakage of hydrocarbons, or other means;
- the prepared surface underlying the geomembrane has not deteriorated since previous acceptance and is still acceptable immediately prior to geomembrane placement;
- any geosynthetic elements immediately underlying the geomembrane are clean and free of foreign objects or debris;
- all personnel working on the geomembrane do not smoke, wear damaging shoes, or engage in other activities that could damage the geomembrane;
- the method used to unroll the panels does not cause scratches or crimps in the geomembrane and does not damage the supporting subbase;
- the method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels);
- adequate temporary loading and/or anchoring (e.g., sand bags, tires), not likely to damage the geomembrane, has been placed to prevent uplift by wind; and
- direct contact with the geomembrane is minimized; i.e., the geomembrane is protected by geotextiles, extra geomembrane, or other suitable materials, in areas where excessive traffic may be expected.

The CQC Consultant will observe the geomembrane panels, after placement and prior to seaming, for damage. The CQC Consultant will advise the Construction Manager of any panels, or portions of panels, that should be rejected, repaired, or accepted. Damaged panels or portions of damaged panels that have been rejected will be marked and their removal from the work area recorded by the CQC Consultant. CQA and CQC for geomembrane repairs will be in accordance with Section 8.8.

8.7 FIELD PANEL SEAMING

8.7.1 CQA Consultant Responsibility During Seaming

The CQA Consultant will monitor, verify, and document that geomembrane panel layout and field panel seaming is conducted in accordance with the Design Documents and that CQC activities are performed as described in the subsections below.

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8.7.2 Panel Layout

The CQC Consultant will review the panel layout drawing previously submitted to the Construction Manager by the Installer and verify that:

- seams are generally oriented parallel to the line of maximum slope, i.e., oriented along, not across, the slope;
- the number of seams is minimized in corners and odd-shaped geometric locations;
- a seam numbering system is used that is compatible with the field panel identification numbering system and is agreed upon by the CQC Consultant and the Installer prior to any seaming; and
- the panel layout is consistent with accepted state of practice.

8.7.3 Seaming Equipment and Products

The CQC Consultant will verify that only extrusion welding and fusion welding are used for field seaming. The CQC Consultant will document that any alternate process proposed by the Installer is reviewed and approved by the Design Engineer and Construction Manager.

The CQC Consultant will verify that no geomembrane seaming is performed unless the CQC Consultant is on-site. The CQC Consultant will monitor the general seaming procedure used as follows:

- the Installer uses of seaming equipment specifically recommended by the Geosynthetics Manufacturer by make and model, and marked with an identification number;
- the Installer uses of a firm substrate such as a flat board, a conveyor belt, or similar hard surface directly under the seam overlap, if required, to achieve proper support;
- the Installer cuts fishmouths or wrinkles at the seam overlaps along the ridge of the wrinkle in order to achieve a flat overlap;
- the Installer cuts fishmouths or wrinkles, and patches any portion, where the overlap is inadequate, with an oval or round patch of the same geomembrane extending a minimum of 6 inches beyond the cut in all directions;
- the Installer/Contractor provides adequate illumination if seaming operations are carried out at night, and

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- the Installer extends seaming to the outside edge of panels to be placed in the anchor trench.

8.7.3.1 Fusion Process

The CQC Consultant will monitor ambient temperatures, geomembrane surface temperatures, apparatus speed, and apparatus temperatures at appropriate intervals. The CQC Consultant will also monitor that:

- the fusion-welding apparatus is an automated, self-propelled device;
- the fusion-welding apparatus is equipped with gauges giving the applicable temperatures and welding speed;
- the number of spare operable seaming apparatus agreed by the Construction Manager are maintained on-site;
- equipment used for seaming will not damage the geomembrane;
- the seaming zone is dry and clean;
- there is sufficient overlap between panels;
- the electric generator is placed on a smooth base such that no damage occurs to the geomembrane;
- for cross seams, the edge of the cross seam is cut or ground to a smooth incline (top and bottom) prior to welding;
- an insulating material is placed beneath the hot welding apparatus after usage; and
- a movable protective layer is used, as necessary, directly below each overlap of geomembrane that is to be seamed to prevent build-up of moisture between the sheets.

8.7.3.2 Extrusion Process

The CQC Consultant will verify that the extrudate is comprised of the same resin as the geomembrane sheeting. The CQC Consultant will monitor extrudate temperatures, ambient temperatures, and geomembrane surface temperatures at appropriate intervals to document that they conform to the Design Documents.

The CQC Consultant will also monitor that:

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- the extrusion-welding apparatus is equipped with gauges giving the temperature in the apparatus and at the nozzle;
- the number of spare operable seaming apparatus agreed by the Construction Manager are maintained on-site;
- equipment used for seaming is not likely to damage the geomembrane;
- the seaming zone is dry and clean;
- the extruder is purged prior to beginning a seam until all heat-degraded extrudate has been removed from the barrel;
- the electric generator is placed on a smooth base such that no damage occurs to the geomembrane; and
- an insulating material is placed beneath the hot welding apparatus after usage.

8.7.4 Seam Preparation

To confirm conformance with the Design Documents, the CQC Consultant will monitor that:

- prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material;
- seams are overlapped in accordance with the requirements of the Design Documents;
- if seam overlap grinding is required, the process is completed according to the Geosynthetics Manufacturer's instructions or the Design Documents, whichever is the more stringent, prior to the seaming operation, and in a way that does not damage the geomembrane;
- the grind depth is constructed in accordance with the requirements of the Design Documents;
- grinding marks do not appear beyond the extrudate after it is placed; and
- seams are aligned with the fewest possible number of wrinkles and fishmouths.

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8.7.5 Weather Conditions for Seaming

The CQC Consultant will monitor that the weather conditions for seaming are within the acceptable range, as follows:

- the ambient temperature is not below 40°F or above 104°F, unless authorized by the Design Engineer;
- geomembrane is preheated by either sun or hot air device between ambient temperatures of 40°F and 50°F prior to performing seaming; and
- geomembrane seam areas are dry and protected from rain and wind.

The CQC Consultant will verify and document that methods used by the Installer for seaming at ambient temperatures below 40°F or above 104°F will produce seams that are entirely equivalent to seams produced at ambient temperatures between 40°F and 104°F and will protect the overall quality of the geomembrane. The CQC Consultant will monitor that seaming conducted during abnormal weather conditions is performed in accordance with the methods approved by the Design Engineer.

8.7.6 Overlapping and Temporary Bonding

The CQC Consultant will monitor that:

- the panels of geomembrane have a finished overlap of a minimum of 4 inches for both extrusion and fusion welding, but in any event sufficient overlap is provided to allow peel tests to be performed on the seam;
- no solvent or adhesive is used; and
- the procedure used to temporarily bond adjacent panels together does not damage the geomembrane and specifically that the temperature of hot air at the nozzle of any spot-welding apparatus is controlled such that the geomembrane is not damaged.

8.7.7 Trial Seams

The CQC Consultant will verify that the Installer performs trial seam tests in accordance with the Design Documents. The CQC Consultant will observe and document the Installer's trial seam testing procedures. The trial seam samples will be assigned an identification number and marked accordingly by the CQC Consultant. Each sample will be marked with the date, time, machine temperature(s) and setting(s), number of seaming unit, and name of seaming technician. Trial seam samples will be maintained until destructive seam testing of the applicable seams are tested and pass.

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8.7.8 Nondestructive Seam Continuity Testing

The CQC Consultant will monitor that the Installer nondestructively tests all field seams over their full length using a vacuum test unit or air pressure test (for double fusion seams only). The CQC Consultant will monitor that the Installer performs spark testing if the seam cannot be tested using the vacuum or air pressure test methods. The purpose of nondestructive tests is to check the continuity of seams. The CQC Consultant will monitor that the Installer performs continuity testing as the seaming work progresses, not at the completion of all field seaming. The CQC Consultant will:

- monitor nondestructive testing;
- document the results of the nondestructive testing; and
- inform the Contractor and Construction Manager of any non-conformance.

The CQC Consultant will monitor that the Installer performs any required seam repairs in accordance with the Design Documents. The CQC Consultant will:

- observe the repair procedures;
- observe the re-testing procedures; and
- document the results.

The seam number, date of observation, dimensions and/or descriptive location of the seam length tested, name of person performing the test, and outcome of the test will be recorded by the CQC Consultant.

8.7.9 Destructive Testing

The CQC Consultant will monitor the Installer performing destructive seam testing during the geomembrane installation. The purpose of this testing is to evaluate seam strength. The CQC Consultant will monitor that the Installer performs destructive seam testing as the seaming work progresses, not at the completion of all field seaming.

8.7.9.1 Location and Frequency

The CQC Consultant will select all destructive seam test sample locations. Sample locations will be established as follows.

- Destructive testing will be performed at a minimum frequency of one test location per 500 feet of seam length. This minimum frequency is to be determined as an average taken throughout the entire installation. This minimum frequency will be increased for seams

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made outside the normal ambient temperature range of 40°F to 104°F.

- Test locations will be determined during seaming at the CQC Consultant's discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, offset welds, or any other potential cause of imperfect welding.

The Installer will not be informed in advance of the locations where the seam samples will be taken.

8.7.9.2 Sampling Procedures

Destructive seam testing will be performed by the Geosynthetics Laboratory as seaming progresses in order to obtain test results prior to the geomembrane being covered by overlying materials. The CQC Consultant will:

- observe sample cutting;
- assign a number to each sample, and mark it accordingly; and
- record sample location on geomembrane panel layout drawing.

The CQC Consultant will monitor that the Installer performs repairs to all holes in the geomembrane resulting from destructive seam test sampling in accordance with repair procedures described in the Design Documents. In addition, the CQA Consultant will monitor that the Installer performs non-destructive testing as described in this Section to ensure the continuity of the new seams.

8.7.9.3 Size of Samples

The CQC Consultant will monitor that at a given sampling location, two types of samples (field test samples and laboratory test samples) are taken:

- First, a minimum of two field samples or test strips are taken for field testing. Each of these test strips are approximately 1 inch wide by 12 inches long, with the seam centered parallel to the width. The distance between these two specimens is approximately 42 inches. If both specimens pass the field test described in this Section, a second full laboratory destructive sample is taken for testing by the Geosynthetics Laboratory.

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- The full destructive sample is located between the two field test strips. The sample is approximately 12 inches wide by 42 inches long with the seam centered lengthwise. The sample is cut into three parts and distributed as follows:
    - one approximately 12 inches by 12 inches portion to the Installer;
    - one approximately 12 inches by 12 inches portion to the Construction Manager for archive storage; and
    - one approximately 12 inches by 18 inches portion for Geosynthetics Laboratory testing.

8.7.9.4 Field Testing

The CQC Consultant will monitor that the test strips are tested in the field, for peel adhesion, using a gauged tensiometer by the Installer. In addition to meeting the strength requirements outlined in Appendix B, the CQA Consultant will monitor that all specimens exhibit a film tear bond and do not fail in the weld. If any field test sample fails to meet these requirements, the destructive sample has failed.

The CQA Consultant will witness all field tests and mark all samples and portions with their number. The CQA Consultant will also log the date, number of seaming unit, seaming technician identification, destructive sampling, and pass or fail description.

8.7.9.5 Geosynthetics Laboratory Testing

Destructive test samples will be tested by the Geosynthetics Laboratory. Testing will include "Bonded Seam Strength" and "Peel Adhesion". The minimum acceptable values to be obtained in these tests are presented in Appendix B. At least five specimens will be tested for each test method (i.e., five for peel and five for shear). Specimens will be selected alternately by test from the samples (i.e., peel, shear, peel, shear, etc.). Both the inside and outside tracks of the double track fusion seams will be tested for peel adhesion. A passing test will meet the minimum required values in Appendix B.

The Geosynthetics Laboratory will provide test results no more than 24 hours after they receive the samples. The CQC Consultant will review laboratory test results as soon as they become available and report the results to the Construction Manager.

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8.7.9.6 Procedures for Destructive Test Failure

The CQC Consultant will monitor that the following procedures apply whenever a sample fails a destructive test, whether that test was conducted in the field or by the Geosynthetics Laboratory. The CQC Consultant will monitor that the Installer follows one of the two options below:

- The Installer can reconstruct the seam (e.g., remove the old seam and re-seam) between any two passed destructive test locations or between points judged by the CQC Consultant to represent conditions of the failed seam (e.g., a tie-in seam or a seam made by the apparatus and/or operator used in the failing seam); or

- The Installer can trace the welding path to an intermediate location a minimum of 10 feet from the point of the failed test in each direction and take a small sample for additional field testing in accordance with the destructive test procedure at each location. If these additional isolation samples pass the field test, then full laboratory samples are taken at both locations. If these laboratory samples meet the specified strength criteria, then the seam is reconstructed between these locations. If either sample fails, then the process is repeated to establish the zone in which the seam should be reconstructed or repaired.

The CQC Consultant will monitor that all failed seams are bound by two locations from which samples passing laboratory destructive tests have been taken or the entire seam is reconstructed and re-tested. In cases exceeding 150 feet of reconstructed seam, a sample will be taken from the reconstructed portion of the seam and must pass destructive testing. The CQC Consultant will observe that any repairs are made in accordance with Section 8.8. The CQC Consultant will document all actions taken in conjunction with destructive test failures.

8.8 DEFECTS AND REPAIRS

8.8.1 CQA Consultant Responsibility for Monitoring Defects and Repairs

The CQA Consultant will monitor, verify, and document that geomembrane defects are addressed, and repairs are made in accordance with the Design Documents and that CQC activities are performed as described in the subsections below.

8.8.2 Identification

All seams and non-seam areas of the geomembrane will be examined by the CQC Consultant for identification of defects, holes, blisters, undispersed raw materials,

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and any sign of contamination by foreign matter. Because light reflected by the geomembrane helps to detect defects, the surface of the geomembrane will be clean at the time of examination. The CQC Consultant will request that the Contractor broom or wash the geomembrane surface if the amount of dust or mud inhibits examination.

8.8.3 Repair Procedures

The CQC Consultant will monitor that any portion of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test, is repaired by the Installer in accordance with the Design Documents. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure, materials, and equipment will be agreed upon between the Installer and CQC Consultant.

In addition, the following conditions will be monitored by the CQC Consultant:

- surfaces of the geomembrane which are to be repaired are abraded no more than one hour prior to the repair;
- all surfaces are clean and dry at the time of the repair;
- patches or caps extend at least 6 inches beyond the edge of the defect, and all corners of patches are rounded with a radius of at least 3 inches; and
- the geomembrane below large caps is appropriately cut to avoid water or gas collection between the two sheets.

8.8.4 Verification of Repairs

Each repair will be numbered and logged by the CQC Consultant. The CQC Consultant will monitor that each repair is non-destructively tested by the Installer using approved methods. Repairs which pass the non-destructive test will be taken as an indication of an adequate repair. Large caps may be of sufficient extent to require destructive test sampling, at the discretion of the CQC Consultant or as specified in Appendix B. The CQC Consultant will observe all non-destructive testing of repairs and will record the number of each repair, date, and test outcome.

8.9 CAP SYSTEM ACCEPTANCE

In accordance with the Design Documents, the Contractor retains all responsibility for the geosynthetics until acceptance by the Construction Manager. The terms and conditions for liner and cover system acceptance are described in the Design Documents.

8.10 MATERIALS IN CONTACT WITH THE GEOMEMBRANE

The procedures outlined in this section are intended to allow the CQA Consultant to verify that the installation of materials in contact with the geomembrane do not cause damage to it.

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8.10.1 Soils

The CQA Consultant will monitor that the Contractor conforms with the requirements of the Design Documents and takes all necessary precautions to verify that the geomembrane is not damaged during its installation, during the installation of other components of the liner and the final cover systems, or by other construction activities. The CQA Consultant will monitor the following:

- placement of soil materials above the geomembrane and that soils are not placed at an ambient temperature below 40°F or above 104°F unless otherwise approved by the Design Engineer and Construction Manager;
- soil and riprap placement operations above the geomembrane are performed by the Contractor to minimize wrinkles in the geomembrane;
- equipment used for placing soil and riprap are not driven directly on the geomembrane or other geosynthetic layers;
- a minimum soil or riprap thickness of 1 foot is maintained between a low ground pressure (LGP - having a maximum ground pressure of 5 pounds per square inch [psi]) track-mounted dozer and the geomembrane;
- a minimum soil and riprap thickness of 3 feet is maintained between rubber-tired or non-low ground pressure tracked vehicles and the geomembrane during construction activities; and
- soil thickness is greater than 3 feet in heavily trafficked areas such as access ramps.

8.10.2 Appurtenances

The CQA Consultant will monitor that:

- installation of the geomembrane in appurtenant areas and connection of geomembrane to appurtenances (e.g., concrete pads or concrete embedment strips at geomembrane termination) are made in accordance with the Design Documents;
- extreme care is given by the Installer when seaming around appurtenances since neither non-destructive nor destructive testing may be feasible in these areas; and
- the geomembrane is not visibly damaged when making connections to appurtenances.

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9. GEOTEXTILES

9.1 INTRODUCTION

The CQA Consultant will review the QC documentation and will monitor the installation of geotextile layers to verify that the Manufacturer's specifications and the requirements of the Design Documents and this CQA Plan are met.

9.2 TRANSPORTATION, HANDLING, AND STORAGE

The CQA Consultant will monitor the transportation, handling, and storage of the geotextile on the Project site. The CQA Consultant will verify that the geotextile is protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

The CQA Consultant will monitor that transportation, handling, and storage of geotextile conforms with the Design Documents, including:

- handling of the geotextile rolls is performed in a competent manner such that damage does not occur to the geotextile or to its protective wrapping;
- geotextile rolls are not stacked upon one another to the extent that deformation of the core occurs or to the point where accessibility can cause damage in handling;
- geotextile rolls are stacked in such a way that access for conformance sampling is possible;
- protective wrappings are removed less than one hour prior to unrolling the geotextile;
- after unrolling, a geotextile is not exposed to ultraviolet light for more than 30 calendar days;
- outdoor storage of geotextile rolls does not exceed the Manufacturer's recommendations or longer than six months, whichever is less;
- for storage periods longer than six months, a temporary enclosure is placed over the rolls, or they are moved to an enclosed facility; and
- the location of temporary field storage is not in areas where water can accumulate, and the rolls are elevated off the ground to prevent contact with ponded water.

Upon delivery at the site, the Contractor, Installer, CQC Consultant, and CQA Consultant will conduct an inspection of the rolls for defects and damage. This inspection will be conducted without unrolling the materials unless defects or damages are found or suspected. The CQA Consultant will indicate to the Construction Manager:

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- rolls, or portions thereof, that will be rejected and removed from the site because they have severe flaws; and

- rolls that include minor repairable flaws that do not compromise geotextile functionality.

The CQA Consultant will also monitor that equipment used to handle the geotextiles on-site is adequate and does not pose any risk of damage to the geotextiles during handling.

9.3 MANUFACTURER QC (MQC) TESTING AND CONFORMANCE TESTING

9.3.1 Geotextile Material MQC Testing Requirements

The geotextile Manufacturer will perform QC testing on the geotextile rolls that will be used on this Project in accordance with the current versions of the ASTM and other applicable test procedures, and at the minimum MQC frequencies as presented in Appendix C.

The CQA Consultant will review the MQC certifications and test results to verify that the Manufacturer's specification and the requirements of the Design Documents and this CQA Plan are met. The CQA Consultant may conduct independent conformance testing if deemed necessary by the CQA Certifying Engineer.

9.3.2 Test Results

All MQC and conformance test results will be reviewed, accepted, and reported by the CQC Consultant before deployment of geotextiles. The CQA Consultant will review for conformance all MQC and conformance test results related to the foregoing activities. Any non-conformance of the material properties with the requirements of the Design Documents will be reported to the Contractor and Construction Manager.

9.3.3 Test Failure

In the case of failing test results, the Contractor may request that another sample from the failing roll be re-tested. If the re-test fails or if the option to re-test is not exercised, then two isolation conformance samples will be obtained by the CQC Consultant. These isolation samples will be taken from rolls that have been determined by correlation with the Manufacturer's roll number to have been manufactured prior to and after the failing roll. This method for choosing isolation rolls for testing will continue until passing tests are achieved. All rolls that fall numerically between the passing roll numbers will be rejected. The CQA Consultant will verify that the Contractor has replaced all rejected rolls. The CQA Consultant will document all actions taken in conjunction with geotextile conformance failures.

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9.4 PLACEMENT

The CQA Consultant will monitor, verify, and document that geotextile placement is conducted in accordance with the Design Documents and that CQC activities are performed as described below.

The CQC Consultant will monitor the placement of all geotextiles to verify that they are not damaged in any way, and the following requirements of the Design Documents are met:

- on slopes, the geotextiles are securely anchored in the anchor trench and then deployed down the slope in such a manner as to continually keep the geotextile in tension;
- in the presence of wind, all geotextiles are weighted with sandbags or equivalent; such sandbags are installed during placement and will remain until replaced with earth cover material;
- trimming of the geotextiles are performed using only an upward cutting hook blade and special care is given to protect other materials from damage which could be caused by the cutting of the geotextiles;
- the Installer is taking necessary precautions to prevent damage to underlying layers during placement of the geotextile;
- during placement of geotextiles, care is given not to entrap stones, excessive dust, or moisture that could generate clogging of drains or filters; and
- a visual examination of the geotextile is carried out over the entire surface, after installation, to verify that no potentially harmful foreign objects, (e.g., stones, sharp objects, small tools, sandbags, etc.) are present.

9.5 SEAMS AND OVERLAPS

The CQA Consultant will monitor, verify, and document that geotextile seams and overlaps are in accordance with the Design Documents and that CQC activities are performed as described below.

The CQC Consultant will monitor that the following requirements of the Design Documents are met:

- all geotextiles are continuously sewn (i.e., no spot sewing);
- geotextiles are overlapped 6 inches prior to seaming;

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- no horizontal seams are constructed on side slopes that are steeper than 10 horizontal to 1 vertical (i.e., seams to be aligned along, not across the slope), except as part of a patch;

- sewing uses polymeric thread with chemical and ultraviolet resistance properties equal to or exceeding those of the geotextile; and

- seams are sewn using a single row Stich Type 401 two-thread chain stitch.

9.6 REPAIRS

The CQA Consultant will monitor, verify, and document that geotextile repairs are made in accordance with the Design Documents and that CQC activities are performed as described below.

The CQC Consultant will monitor that any holes or tears in the geotextile are repaired as follows:

- For slopes steeper than 10 horizontal to 1 vertical, a patch made from the same geotextile is double seamed into place (with each seam 1/4 inches to 3/4 inches apart and no closer than 1 inch from any edge) with a minimum 12-inch overlap. Should any tear exceed 50 percent of the width of the roll, that roll is removed from the slope and replaced.

- For slopes milder than 10 horizontal to 1 vertical, a patch made from the same geotextile is sewn in place with a minimum of 12-inch overlap in all directions away from the repair area.

The CQC Consultant will observe that care is given to remove any soil or other material which may have penetrated the torn geotextile, and all repairs and verify that any non-conformance with the above requirements is corrected.

9.7 PLACEMENT OF SOILS OR GRANULAR MATERIALS

The CQA Consultant will monitor, verify, and document that placement of soils or granular materials on top of geotextiles is conducted in accordance with the Design Documents and that CQC activities are performed as described below.

The CQC Consultant will monitor that the Contractor's placement of soil or granular materials on top of the geotextile is in conformance with the Design Documents, including:

- that no damage occurs to the geotextile;

- that no shifting of the geotextile from its intended position occurs and underlying materials are not exposed or damaged;

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- that excess tensile stress does not occur in the geotextile;
- that equipment does not drive directly on the geotextile; and
- the Contractor uses only LGP equipment on layers less than 3-feet thick above the geomembrane and geotextile separator or cushion layer in accordance with Section 8.10.1 of this CQA Plan.

The CQC Consultant will monitor that covering of the geotextile with overlying layers is completed within 30 days of installation to prevent UV degradation and on side slopes, soil and granular layers are placed over the geotextile from the bottom of the slope upward.

10. GEOCOMPOSITE DRAINAGE LAYERS

10.1 INTRODUCTION

The CQA Consultant will review the QC documentation and will monitor the installation of the geocomposite to verify that the Manufacturer's specifications and the requirements of the Design Documents and this CQA Plan are met.

10.2 TRANSPORTATION, HANDLING, AND STORAGE

The CQA Consultant will monitor the transportation, handling, and storage of the geocomposite on the Project site. The CQA Consultant will verify that during transportation, handling, and storage, the geocomposite is protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting, or any other damaging or deleterious conditions.

The CQA Consultant will monitor that transportation, handling, and storage of geocomposite conforms with the Design Documents, including:

- geocomposite rolls are handled in a competent manner such that damage does not occur to the geocomposite or to its protective wrapping;
- geocomposite rolls are not to be stacked upon one another to the extent that deformation of the roll occurs or to the point where accessibility can cause damage in handling;
- geocomposite rolls are stacked in such a way that access for conformance sampling is possible;
- protective wrappings are removed less than one hour prior to unrolling the geocomposite; and

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- after unrolling, a geocomposite is not exposed to ultraviolet light for more than 30 calendar days.

The CQA Consultant will monitor that outdoor storage of geocomposite rolls does not exceed the Manufacturer's recommendations or longer than six months whichever is less. For storage periods longer than six months, the CQA Consultant will monitor:

- a temporary enclosure is placed over the rolls, or they are moved to an enclosed facility;
- the location of temporary field storage is not in areas where water can accumulate; and
- rolls are elevated off the ground to prevent contact with ponded water.

Upon delivery at the site, the Contractor, Installer, CQC Consultant, and CQA Consultant will conduct an inspection of the rolls for defects and damage. This inspection will be conducted without unrolling the materials unless defects or damages are found or suspected. The CQA Consultant will indicate to the Construction Manager:

- rolls, or portions thereof, that will be rejected and removed from the site because they have severe flaws; and
- rolls that include minor repairable flaws, that do not compromise geocomposite functionality.

The CQA Consultant will also monitor that equipment used to handle the geocomposite on-site is adequate and does not pose any risk of damage to the geocomposite when used properly.

10.3 MANUFACTURER QC (MQC) TESTING AND CONFORMANCE TESTING

10.3.1 Geocomposite Material MQC Testing Requirements

The geocomposite drainage layer Manufacturer will perform QC testing on the geocomposite rolls that will be used on this Project in accordance with the current versions of the ASTM and other applicable test procedures, and at the minimum MQC frequencies as presented in Appendix D.

The CQA Consultant will review the MQC certifications and test results to verify that the Manufacturer's specifications and the requirements of the Design Documents and this CQA Plan are met. The CQA Consultant may conduct independent conformance testing if deemed necessary by the CQA Certifying Engineer.

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10.3.2 Test Results

All MQC and conformance test results will be reviewed, accepted, and reported by the CQC Consultant before deployment of geocomposites. The CQA Consultant will review for conformance all MQC and conformance test results related to the foregoing activities. Any non-conformance of the material properties with the requirements of the Design Documents will be reported to the Contractor and Construction Manager.

10.3.3 Test Failure

In the case of failing test results, the Contractor may request that another sample from the failing roll be re-tested. If the re-test fails or if the option to re-test is not exercised, then two isolation conformance samples will be obtained by the CQC Consultant. These isolation samples will be taken from rolls, that have been determined by correlation with the Manufacturer's roll number, to have been manufactured prior to and after the failing roll. This method for choosing isolation rolls for testing will continue until passing tests are achieved. All rolls that fall numerically between the passing roll numbers will be rejected. The CQA Consultant will verify that the Contractor has replaced all rejected rolls. The CQA Consultant will document all actions taken in conjunction with geocomposite conformance failures.

10.4 PLACEMENT

The CQA Consultant will monitor, verify, and document that placement of geocomposites is conducted in accordance with the Design Documents and that CQC activities are performed as described below.

The CQC Consultant will monitor the placement of all geocomposites to verify that they are not damaged in any way, and the following conditions are met:

- on slopes, the geocomposites are securely anchored in the anchor trench and then deployed down the slope in such a manner as to continually keep the geocomposites in tension;

- in the presence of wind, all geocomposites are weighted with sandbags or equivalent. Such sandbags are installed during placement and will remain until replaced with the cover material;

- trimming of the geocomposites is performed using only an upward cutting hook blade. Special care must be given to protect other materials from damage which could be caused by the cutting of the geocomposites;

- the Installer is taking necessary precautions to prevent damage to underlying layers during placement of the geocomposite;

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- during placement of geocomposites, care is given not to entrap stones, soil, excessive dust, or moisture that could damage the geomembrane, generate clogging of drains or filters, or hamper subsequent drainage function; and

- a visual examination of the geocomposite is carried out over the entire surface, after installation, to verify that no potentially harmful foreign objects, (e.g., stones, sharp objects, small tools, sandbags, etc.) are present.

10.5 JOINING, SEAMS, AND OVERLAPS

The CQA Consultant will monitor, verify, and document that geocomposite joining, seaming, and/or overlaps are made in accordance with the Design Documents and that CQC activities are performed as described below.

The CQC Consultant will monitor that the geocomposites are joined, seamed, and/or overlapped in conformance with the Design Documents, including:

- the components of the geocomposite (e.g., geotextile and geonet) are seamed, joined, and overlapped to like components in adjacent geocomposites;

- lower geotextile components of the geocomposites are overlapped such that the overlap is a minimum of 4 inches. Adjacent edges of geonet component along the length of the geocomposite are overlapped a minimum 2 to 3 inches and joined by tying the geonet together with plastic fasteners or polymeric thread at a spacing recommended by the Manufacturer. Geonet for adjoining geocomposite panels (end to end) along the roll width are shingled down in direction of slope and overlapped a minimum of 12 inches;

- upper geotextile components of the geocomposites are continuously sewn (i.e., spot sewing is not allowed). Geotextiles are overlapped a minimum of 4 inches prior to sewing;

- no horizontal seams are constructed on side slopes that are steeper than 10 horizontal to 1 vertical (i.e., seams to be aligned along, not across the slope), except as part of a patch;

- sewing of geotextiles uses polymeric thread with chemical and ultraviolet resistance properties equal to or exceeding those of the geotextile; and

- seams are sewn using a single row type "401" two-thread chain stitch.

The CQC Consultant will monitor the geotextile seaming and geonet tying procedures to verify that joining, seams, and overlaps are performed in accordance with the Design Documents.

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10.6 REPAIRS

The CQA Consultant will monitor, verify, and document that geocomposite repairs are made in accordance with the Design Documents and that CQC activities are performed as described below.

The CQC Consultant will monitor that any holes or tears in the geocomposite are repaired in accordance with the Design Documents, including:

- a patch made from the same geocomposite is secured into place by tying fasteners through the bottom geotextile and the geonet of the patch, and through the top geotextile and geonet of the geocomposite needing repair;
- the patch extends 2 feet beyond the edges of the hole or tear;
- the patch is secured every 6 inches and heat-sealed to the top geotextile of the geocomposite needing repair; and
- if the hole or tear is more than 50 percent of the width of the roll, the damaged area will be cut out and the two portions of the geocomposite will be joined.

The CQC Consultant will monitor that care is given to remove any soil or other material which may have penetrated the torn geocomposite component. The CQA Consultant will observe any repair and verify that any non-conformance with the above requirements is corrected.

10.7 PLACEMENT OF SOILS OR GRANULAR MATERIALS

The CQA Consultant will monitor, verify, and document that placement of soils or granular materials on top of geocomposites is conducted in accordance with the Design Documents and that CQC activities are performed as described below.

The CQC Consultant will monitor that the Contractor's placement of soil or granular materials on top of the geocomposite is in conformance with the Design Documents, including:

- no damage occurs to the geocomposite;
- no shifting of the geocomposite from its intended position occurs and underlying materials are not exposed or damaged;
- excess tensile stress does not occur in the geocomposite; and
- equipment does not drive directly on the geocomposite and the Contractor only uses LGP equipment on layers less than 3-feet thick above the geocomposite layer in accordance with Section 8.10.1 of this CQA Plan.

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The CQC Consultant will monitor that covering of the geocomposite with overlying layers is completed within 30 days, and on side slopes, soil layers are placed over the geocomposite from the bottom of the slope upward.

11. HDPE PIPES AND FITTINGS

11.1 INTRODUCTION

The CQA Consultant will review the QC documentation and will monitor the installation of HDPE pipes and fittings to verify that the Manufacturer's specifications and the requirements of the Design Documents and this CQA Plan are met.

11.2 BUTT-FUSION WELDING PROCESS

The CQA Consultant will monitor the assembling of lengths of HDPE pipe into suitable installation lengths by the butt-fusion welding process. Butt-fusion welding is the butt-joining of the pipe by softening the aligned faces of the pipe ends in a suitable apparatus and pressing them together under controlled pressure. The CQA Consultant will monitor that butt-fusion welding of the HDPE pipes and fittings is performed by the Contractor in accordance with the Design Documents and Pipe Manufacturer's recommendations as to equipment and technique.

11.3 TRANSPORTATION, HANDLING, AND STORAGE

The CQA Consultant will monitor:

- the off-loading of the pipes to verify that handling is done in a competent manner and that the pipes are not placed in areas where water can accumulate;
- the pipes are not stacked more than three layers high or in such a manner that could cause damage to the pipe; and
- for outdoor storage periods longer than 12 months, a temporary covering is placed over the pipes, or they are moved to within an enclosed facility.

11.4 INSTALLATION

The CQA Consultant will monitor that pipes are installed in accordance with the Design Documents, including:

- care is given during installation of the pipes such that they are not be cut, kinked, or otherwise damaged;
- ropes, fabric, or rubber-protected slings and straps are used by the Contractor when installing pipes; chains, cables, or hooks inserted into the pipe are not used for this purpose;

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- the Contractor installs the pipes and fittings in such a manner that the materials are not damaged;
- slings for handling the pipe are not positioned at butt-fused joints of HDPE pipes;
- sections of the pipes with deep cuts and/or gouges are removed and the ends of the pipeline re-joined; and
- care is exercised when lowering pipe into the trench to prevent damage or twisting of the pipe.

11.5 TESTING

The CQA Consultant will monitor the testing of all pipes as required by the Design Documents and as necessary to verify that workmanship conforms to the state-of-practice.

12. ROAD CONSTRUCTION

12.1 INTRODUCTION

The CQA Consultant will review the supplier documentation and will monitor construction of the roads to verify that the materials used in the construction of roads and the completed roadways are in conformance with the requirements of the Design Documents and this CQA Plan.

12.2 SUBGRADE PREPARATION

The CQA Consultant will monitor that road subgrade is prepared in accordance with requirements in the Design Documents. For road subgrade, nuclear moisture/density tests are not required. The CQA Consultant will monitor the preparation of the subgrade in accordance with the Design Documents and this CQA Plan.

12.3 GEOTEXTILE SEPARATOR

The CQA Consultant will monitor that the geotextile separator is installed in accordance with requirements of the Design Documents and Sections 9 of this CQA Plan. The CQA Consultant will monitor the installation of the geotextile separator.

12.4 BASE AGGREGATE LAYER

The CQA Consultant will monitor the base aggregate to verify it is constructed to the thickness, grades, and limits shown on Design Documents. The CQA Consultant will confirm that base aggregate material is certified by the supplier to meet the requirements of the material type shown on Design Documents. A test strip including the entire road section (i.e., subgrade, geotextile separator, and base aggregate) will be prepared in the

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field to determine the requirements for placement, compaction, and moisture conditioning of base aggregates. The CQA Consultant will monitor the construction of the test strip and assist the Contractor with evaluating placement methods. The CQA Consultant will document and monitor road construction to verify that materials are placed in accordance with placement methods recommended during test strip construction.

12.5 REPAIRS

If a defective area of road is discovered during construction, the CQA Consultant will evaluate the extent and nature of the defect. After this evaluation, the CQA Consultant will observe that the Contractor corrects the deficiency to the satisfaction of the Construction Manager and does not perform additional work in the area until the Construction Manager approves the correction of the defect. In the event of damage, the CQA Consultant will observe the repairs and replacements made by the Contractor, as necessary, to the satisfaction of the Construction Manager.

13. GENERAL SITE WORK

13.1 INTRODUCTION

The CQA Consultant will monitor the activities that are to be performed for various general site work items including, but not limited to installation of riprap, erosion and sediment control measures, culverts, risers, HDPE manholes, pipes, vegetative cover, topsoil, and vegetation for compliance with the Design Documents.

In addition, the CQA Consultant will verify that materials are in accordance with the Design Documents and are installed in accordance with Manufacturer's recommendations.

13.2 CONFORMANCE

Conformance of materials and construction techniques to verify compliance with the Design Documents will be performed by the CQA Consultant. If non-conformances or other deficiencies are found by the CQA Consultant in the materials or completed work, they will be reported to the Contractor and Construction Manager. The CQA Consultant will observe the repairs or replacements of any non-conforming items.

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APPENDIX A

Material Properties and Acceptance Criteria for Earthwork

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TABLE A.1

MATERIAL PROPERTIES AND ACCEPTANCE CRITERIA
FOR SOIL MATERIALS USED AS FILL

SYSTEM COMPONENT	REQUIRED TEST	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA
Soil Fill Conformance Testing[(1)]	Visual Observation	As required	Substantially free of debris, large rocks, plant materials, or other deleterious material.
	Particle Size Analysis ASTM D422	1 per source & 1 per 10,000 yd^3	Max. 3 in. particle size
	Atterberg Limits ASTM D4318	1 per source & 1 per 10,000 yd^3	Required for soil classification
	Soil Classification ASTM D2487	1 per source & 1 per 10,000 yd^3	SW, SP, SW-SM, SW-SC, SP-SC, SM, or SC for fill and SW-SM, SW-SC, SP-SC, SM, or SC for the soil containment berm or other Engineer approved classifications
	Moisture Content ASTM D2216	1 per source & 1 per 10,000 yd^3	Determine if adequate moisture is present prior to compaction
	Standard Proctor ASTM D698	1 per source & 1 per 25,000 yd^3	Determine compaction conditions
Soil Fill Performance Testing[(2)]	Visual Observation	As required	Final surface firm, smooth, and uniform.
	Lift Depth Check	As required	6 to 8 in. compacted lift (8 to 10 in. loose lifts)
	Nuclear Densometer In-place Density and Moisture Content ASTM D6938	1 per 10,000 sf per lift or 1 test per 100 lf per lift for linear features	≥ 95% Standard Proctor maximum dry density and within specified moisture range, -3% to +3% of optimum moisture content
	Moisture Content ASTM D2216	1 per 10 nuclear densometer tests	Check nuclear densometer measurements to verify moisture correction.
	Sand Cone Density or Drive Tube Sample ASTM D1556 or ASTM D2937	1 per 25 nuclear densometer tests	Check nuclear densometer measurements to verify moisture correction and density.

Notes:
in. – inch % - percent sf – square feet yd^3 – cubic yards

1. Conformance testing is performed on borrow sources prior to placement of material to verify the minimum required values are met and the material remains consistent.
2. Performance testing is performed on materials after placement is complete to verify that the lift or layer meets design requirements.

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TABLE A.2

MATERIAL PROPERTIES AND ACCEPTANCE CRITERIA
FOR SOIL MATERIALS USED AS LOW PERMEABILITY MATERIAL

SYSTEM COMPONENT	REQUIRED TEST	MINIMUM FREQUENCY	ACCEPTANCE CRITERIA
Low permeability Material Conformance Testing[(1)]	Visual Observation	As required	Substantially free of debris, large rocks, plant materials, or other deleterious material.
	Particle Size Analysis ASTM D422	1 per source & 1 per 5,000 yd^3	Maximum 1 in. particle size
	Atterberg Limits ASTM D4318	1 per source & 1 per 10,000 yd^3	Liquid Limit >= 30 and Plasticity Index >= 10
	Soil Classification ASTM D2487	1 per source & 1 per 10,000 yd^3	GC, SC, SM, SM-SC, ML, CL, or CH, or other Engineer approved classifications
	Moisture Content ASTM D2216	1 per source & 1 per 5,000 yd^3	Determine if adequate moisture is present prior to compaction
	Standard Proctor ASTM D698	1 per source & 1 per 10,000 yd^3	Maximum dry unit weight greater than 90 lb/ft^3
	Remolded Permeability ASTM D5084	1 per source & 1 per 10,000 yd^3	Ability to be compacted at a maximum of 1 x 10^{-7} cm/s
Low permeability Material Performance Testing[(2)]	Visual Observation	As required	Final surface firm, smooth, and uniform. No protrusions greater than 0.5-in at final surfaces that will receive geomembrane.
	Lift Depth Check	As required	6 in. compacted lift (8 in. loose lifts)
	Nuclear Densometer In-place Density and Moisture Content ASTM D6938	1 per 5,000 sf per lift	≥ 95% Standard Proctor maximum dry density, , 0% to +3% of optimum moisture content
	Moisture Content ASTM D2216	1 per 10 nuclear densometer tests	Check nuclear densometer measurements to verify moisture correction.
	Sand Cone Density or Drive Tube Sample ASTM D1556 or ASTM D2937	1 per 25 nuclear densometer tests	Check nuclear densometer measurements to verify moisture correction and density.
	Undisturbed Permeability ASTM D5084	1 test per 2 acre per lift	Maximum of 1 x 10^{-7} cm/s

Notes:

cm/s – centimeters per second
in. – inch
sf – square feet
psf – pounds per square feet
lb – pound(s)
lf – linear feet
yd^3 – cubic yards
ft^3 – cubic feet

1. Conformance testing is performed on borrow sources prior to placement of material to verify the minimum required values are met and the material remains consistent.
2. Performance testing is performed on materials after placement is complete to verify that the lift or layer meets design requirements.

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APPENDIX B

Material Properties and Acceptance Criteria for Geomembranes and Seams

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TABLE B.1
MATERIAL PROPERTIES AND MANUFACTURER QUALITY CONTROL REQUIREMENTS
TEXTURED 100-MIL LLDPE GEOMEMBRANE

Properties	Manufacturer QC Test Frequency	Units	Specified Values	Test Method
Physical Properties				
Thickness	Every Roll	mils	96 (min average) 90 (lowest individual reading for 8 out of 10) 86 (lowest individual reading for any of 10)	ASTM D5994
Asperity Height	Every 2nd Roll	mils	16 (min average) (top and bottom)	ASTM D7466
Sheet Density and Resin Specific Gravity	one per 200,000 lb	g/cm^3	0.939 (max)	ASTM D1505/ ASTM D792
Carbon Black Content	one per 20,000 lb	%	2.0-3.0 (range)	ASTM D4218/ ASTM D1603
Carbon Black Dispersion	one per 45,000 lb	None	9 out of 10 in Category 1 or 2(1)	ASTM D5596
Resin - Melt Flow Index	one per 200,000 lb	g/10 min.	≤1.0	ASTM D1238
Tensile Properties (each direction)				
1. Tensile Strength at Break	one per 20,000 lb	lb/in	150 (min average)	ASTM D6693 – Type IV
2. Elongation at Break	one per 20,000 lb	%	250 (min average)	ASTM D6693 – Type IV
Tear Resistance	one per 45,000 lb	lb	55 (min average)	ASTM D1004
Puncture Resistance	one per 45,000 lb	lb	110 (min average)	ASTM D4833
Oxidative Induction Time (OIT) Standard OIT or High Pressure OIT	one per 200,000 lb	Min.	100 (min average) 400 (min average)	ASTM D3895 or ASTM D5885
2% Modulus	Per Formulation	lb/in.	6000 (max)	ASTM D5323
Axi-symmetric Break Resistance Strain(2)	Per Formulation	%	30 (min)	ASTM D5617
Oven Aging at 85°C(2) Std. OIT - retained after 90 days	Per Formulation	%	35 (min average)	ASTM D5721 ASTM D3895
High Pressure OIT - retained after 90 days		%	60 (min average)	ASTM D5885
UV Resistance(2)(3) High Pressure OIT	Per Formulation	%	35 (min average)	ASTM D7238 ASTM D5885

Notes:

% - percent	lb - pound	g - grams
lb/in. - pounds per inch	g/cm^3 - grams per cubic centimeter	mils - milli-inches
min. – minutes	min – minimum	max – maximum
OIT - Oxidative Induction Time	°C – degrees centigrade	UV – ultra violet

1. Carbon dispersion for 10 different views. One view allowed in Category 3.
2. For 2% modulus, axi-symmetric break resistance, oven aging, and UV resistance, Manufacturer's certification may be accepted in lieu of actual test results.
3. The condition of the test will be 20-hour UV cycle at 75°C followed by 4-hour condensation at 60°C.

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TABLE B.2

SEAM PROPERTY AND INSTALLATION ACCEPTANCE CRITERIA
TEXTURED 100-MIL LLDPE GEOMEMBRANE

Material Property	Minimum Frequency	Value	Units	Test Method
Shear Strength Fusion and Extrusion[1]	1 test every 500 ft	150 (min)	lb/in.	ASTM D6392 Strain rate: 12 in./min. 1 in. strips
Peel Adhesion Fusion[2] Extrusion[3]	1 test every 500 ft	125 (min) 114 (min)	lb/in. lb/in.	ASTM D6392 Strain Rate: 12 in./min. 1 in. strips
Vacuum Testing Welded Seams	100% of extrusion welds	-	-	-
Air Pressure Testing Welded Seams	100% of fusion welds	-	-	-

Notes:

in. – inch | lb – pound | ft – feet

% – percent | min. – minute | min – minimum

1. For Shear Testing of both fusion and extrusion welds, the strength of 4 out of 5 specimens must meet or exceed the given value. The 5th specimen must meet at least 80 percent of the specified value. Shear elongation at break must be at least 50 percent.

2. For Peel Testing of fusion welds, the strength of 4 out of 5 specimens must meet or exceed the specified value. The 5th specimen must achieve at least 80% of the specified value. All specimens shall fail due to film tear bond or with less than 25% incursion of the weld (peel).

3. For Peel Testing of extrusion welds, the strength of 4 out of 5 specimens must meet or exceed the specified value with less than 25% incursion at the weld. The 5th specimen must achieve at least 80% of the specified value. One specimen may exhibit greater than 25% incursion at the weld if the specified strength value is achieved.

4. For double fusion welded seams, both tracks will be tested for compliance with the specified minimum seam peel strengths.

5. Required laboratory seam testing will be performed by the Geosynthetics Laboratory at a frequency of one test per 500 linear feet of constructed seam for both extrusion and fusion welding equipment.

6. LLDPE field samples will be allowed to cool to a minimum of 75 degrees Fahrenheit prior to testing. Testing will be performed in a climate-controlled environment at the site such as an office or trailer.

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TABLE B.3

MATERIAL PROPERTIES AND MANUFACTURER QUALITY CONTROL REQUIREMENTS
MICRODRAIN® 50-MIL LLDPE GEOMEMBRANE
(FOR CLOSURETURF®)

Properties	Manufacturer QC Test Frequency	Units	Specified Values	Test Method
Physical Properties				
Thickness	Every Roll	mils	48 (min average) 45 (lowest individual reading for 8 out of 10) 43 (lowest individual reading for any of 10)	ASTM D5994
Drainage Stud Height MicroSpike Height	every 2nd Roll	mils	130 (min average) 20 (min average)	ASTM D7466
Sheet Density and Resin Specific Gravity	one per 200,000 lb	g/cm^3	0.939 (max)	ASTM D1505/ ASTM D792
Carbon Black Content	one per 20,000 lb	%	2.0-3.0 (range)	ASTM D4218/ ASTM D1603
Carbon Black Dispersion	one per 45,000 lb	None	9 in Category 1 or 2(1)	ASTM D5596
Resin - Melt Flow Index	one per 200,000 lb	g/10 min.	≤1.0	ASTM D1238
Tensile Properties (each direction)				
1. Tensile Strength at Break	one per 20,000 lb	lb/in	75 (min average)	ASTM D6693 – Type IV
2. Elongation at Break	one per 20,000 lb	%	250 (min average)	ASTM D6693 – Type IV
Tear Resistance	one per 45,000 lb	lb	27 (min average)	ASTM D1004
Puncture Resistance	one per 45,000 lb	lb	55 (min average)	ASTM D4833
Oxidative Induction Time (OIT) Standard OIT or High Pressure OIT	one per 200,000 lb	Minutes	100 (min average) 400 (min average)	ASTM D3895 or ASTM D5885
2% Modulus	per Formulation	lb/in	3000 (max)	ASTM D5323
Axi-symmetric Break Resistance Strain(2)	per Formulation	%	30 (min)	ASTM D5617
Oven Aging at 85°C(2) Std. OIT - retained after 90 days High Pressure OIT - retained after 90 days	per Formulation	%	35 60	ASTM D5721 ASTM D3895 ASTM D5885
UV Resistance(2), (3) High Pressure OIT	per Formulation	%	35 (min. average)	ASTM D7238 ASTM D5885

Notes:

% – percent
lb – pound
g – grams
lb/in - pounds per inch
g/cm^3 – grams per cubic centimeter
mils – milli-inches
min. – minute
min – minimum
max – maximum
OIT – oxidation induction time
°C – degrees centigrade
UV – ultra violet

1. Carbon dispersion for 10 different views. One view allowed in Category 3.
2. For 2% modulus, axi-symmetric break resistance, oven aging, and UV resistance, Manufacturer's certification may be accepted in lieu of actual test results.
3. The condition of the test will be 20-hour UV cycle at 75°C followed by 4-hour condensation at 60°C.

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TABLE B.4

SEAM PROPERTY AND INSTALLATION ACCEPTANCE CRITERIA
MICRODRAIN® 50-MIL LLDPE GEOMEMBRANE
(FOR CLOSURETURF®)

Material Property	Minimum Frequency	Value	Units	Test Method
Shear Strength Fusion and Extrusion(1)	1 test every 500 ft	75 (min)	lb/in.	ASTM D6392 Strain rate: 12 in./min. 1 in. strips
Peel Adhesion Fusion(2) Extrusion(3)	1 test every 500 ft	63 (min) 57 (min)	lb/in. lb/in.	ASTM D6392 Strain Rate: 12 in./min. 1 in. strips
Vacuum Testing Welded Seams	100% of extrusion welds	-	-	-
Air Pressure Testing Welded Seams	100% of fusion welds	-	-	-

Notes:

in. – inch | lb – pound | ft – feet

% – percent | min. – minute | min – minimum

1. For shear testing of both fusion and extrusion welds, the strength of 4 out of 5 specimens must meet or exceed the given value. The 5th specimen must meet at least 80 percent of the specified value. Shear elongation at break must be at least 50 percent.

2. For peel testing of fusion welds, the strength of 4 out of 5 specimens must meet or exceed the specified value. The 5th specimen must achieve at least 80% of the specified value. All specimens shall fail due to film tear bond or with less than 25% incursion of the weld (peel).

3. For peel testing of extrusion welds, the strength of 4 out of 5 specimens must meet or exceed the specified value with less than 25% incursion at the weld. The 5th specimen must achieve at least 80% of the specified value. One specimen may exhibit greater than 25% incursion at the weld if the specified strength value is achieved.

4. For double fusion welded seams, both tracks will be tested for compliance with the specified minimum seam peel strengths.

5. Required laboratory seam testing will be performed by the Geosynthetics Laboratory at a frequency of one test per 500 linear feet of constructed seam for both extrusion and fusion welding equipment.

6. LLDPE field samples will be allowed to cool to a minimum of 75 degrees Fahrenheit prior to testing. Testing will be performed in a climate-controlled environment at the site such as an office or trailer.

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APPENDIX C

Material Properties and Acceptance Criteria for Geotextiles

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TABLE C.1

MATERIAL PROPERTIES AND MANUFACTURER QUALITY CONTROL REQUIREMENTS
20 OZ/YD^2 NON-WOVEN GEOTEXTILE CUSHION LAYER

Material Property	Qualifier	Manufacturer QC Test Frequency	Units	Specified Value	Test Method
Polymer Composition	Minimum	N/A	% polypropylene or polyester by weight	95	Certification
Mass per Unit Area	Minimum Average	90,000 ft^2	oz/yd^2	20	ASTM D5261
Grab Tensile Strength	Minimum Average	90,000 ft^2	lbs	450	ASTM D4632
Grab Elongation	Minimum	90,000 ft^2	%	50	ASTM D4632
CBR Puncture Strength	Minimum Average	540,000 ft^2	lbs	1,437	ASTM D6241
Trapezoidal Tear Strength	Minimum Average	90,000 ft^2	lbs	125	ASTM D4533
Ultraviolet Resistance	Minimum	Per Formulation	%	70	ASTM D4355

Notes:

ft^2 – square feet
% – percent
yd^2 – square yard
oz – ounce
lbs – pounds

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TABLE C.2

MATERIAL PROPERTIES AND MANUFACTURER QUALITY CONTROL REQUIREMENTS
8 OZ/YD^2 NON-WOVEN GEOTEXTILE SEPARATOR FOR
OUTLET PROTECTION AND GRAVEL/SOIL SEPARATION

Material Property	Qualifier	Manufacturer QC Test Frequency	Units	Specified Value	Test Method
Polymer Composition	Minimum	N/A	% polypropylene or polyester by weight	95	Certification
Mass per Unit Area	Minimum Average	90,000 ft^2	oz/yd^2	8	ASTM D5261
Grab Tensile Strength	Minimum Average	90,000 ft^2	lbs	220	ASTM D4632
Grab Tensile Elongation	Minimum	90,000 ft^2	%	50	ASTM D4632
CBR Puncture Strength	Minimum Average	540,000 ft^2	lbs	575	ASTM D6241
Trapezoidal Tear Strength	Minimum Average	90,000 ft^2	lbs	90	ASTM D4533
Ultraviolet Resistance	Minimum	Per formulation	%/hrs	70/500	ASTM D4355

Notes:

ft^2 – square feet
% – percent
hrs – hours
oz – ounce
lbs – pounds
yd^2 – square yard

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APPENDIX D

Material Properties and Acceptance Criteria for Geocomposites

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TABLE D.1

MATERIAL PROPERTIES AND MANUFACTURER QUALITY CONTROL REQUIREMENTS DOUBLE-SIDED GEOCOMPOSITE WITH NON-WOVEN GEOTEXTILE BACKING

Properties	Qualifier	Manufacturer QC Test Frequency	Units	Specified Values[1]	Test Method
<u>Geonet Component:</u> (HDPE, bi-planar/bi-axial)					
Polymer composition	Minimum	Certify	%	95 polyethylene by weight	N/A
Polymer density	Minimum	1 per 50,000 ft^2	g/cm^3	0.94	ASTM D792 (Method B) or ASTM D1505
Carbon black content	Range	1 per 50,000 ft^2	%	2 - 3	ASTM D1603 or D4218
Nominal thickness	Minimum	1 per 50,000 ft^2	mil	300[3]	ASTM D5199
Tensile Strength	Minimum	1 per 50,000 ft^2	lb/in.	75	ASTM D7179
<u>Geotextile Component:</u> (non-woven needle punched polypropylene)					
Type	N/A	N/A	N/A	Needle punched non-woven	N/A
Polymer composition	Minimum	Certify	%	95 polyester or polypropylene	N/A
Mass per unit area	Minimum	1 per 90,000 ft^2	oz/yd^2	8	ASTM D5261
Apparent opening size	Maximum	1 per 540,000 ft^2	mm	O_{95} < 0.21 mm	ASTM D4751
Permittivity	Minimum	1 per 540,000 ft^2	sec^{-1}	1.3	ASTM D4491
Grab strength	Minimum	1 per 90,000 ft^2	lb	200	ASTM D4632[2]
Tear strength	Minimum	1 per 90,000 ft^2	lb	75	ASTM D4533[2]
CBR puncture strength	Minimum	1 per 540,000 ft^2	psi	500	ASTM D6241
UV Resistance	Minimum	1 per Formulation	% retained after 500 hr.	70	ASTM D4355
<u>Geocomposite:</u> (double sided with geotextile heat laminated on both sides of the geonet)					
Transmissivity[4]	Minimum	1 per 540,000 ft^2	m^2/s	9×10^{-4}	ASTM D4716
Ply Adhesion	Minimum	1 per 50,000 ft^2	lb/in.	1.0	ASTM D7005

<u>Notes:</u>

in. – inch
yd^2 – square yard
m^2/s – meters squared per second
psi - pounds per square inch
N/A – Not Applicable
mm – millimeter
cm – centimeter
ft^2 – square feet
m – meter
UV – ultra violet
oz – ounce
cm^3 – cubic centimeters
lb – pounds
mil – milli-inches
psf – pounds per square foot

1. All values represent minimum average roll values.
2. Minimum value measured in machine and cross-machine direction.
3. Nominal thickness may be reduced to 250 mil, provided the transmissivity requirements are met.
4. Specified value must be met at the following conditions: a gradient of 0.04, normal load of 250 psf, and water temperature at 70° Fahrenheit, between steel plates for 15 minutes.

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ORGANIC MATERIAL MANAGEMENT PLAN

Revision A

Alabama Power Company
Plant Barry
Bucks, Alabama

Prepared for

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Prepared by

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Project GW6489

October 2018

Geosyntec consultants

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Appendix A: Gas Generation Modeling

LIST OF ACRONYMS

ADEM	Alabama Department of Environmental Management
APC	Alabama Power Company
Atm	atmosphere
BMP	biochemical methane potential
°C	degrees Celsius
CAA	Clean Air Act
CCR	coal combustion residual
CFR	code of federal regulations
CH_4	methane
CO_2	carbon dioxide
°F	degrees Fahrenheit
GCCS	gas collection and control system
Ha	hectare
ft	feet
ft^3	cubic feet
k	methane generation rate constant
kg	kilogram
Lo	methane production potential
LLDPE	linear low-density polyethylene
LEL	lower explosive limit
LFG	landfill gas
m2	square meters
m3	cubic meters
Mg	megagram
Mg/yr	megagram(s) per year
mil	1/1,000 of an inch
min	minute
mL	milliliter
mm	millimeter
MSW	municipal solid waste
MSWLF	municipal solid waste landfill

NMOC	non-methane organic compounds
NSPS	New Source Performance Standards
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
scfm	standard cubic feet per minute
SCS	Southern Company Services, Inc.
SMA	specific methanogenic activity
STP	standard conditions for temperature and pressure
USEPA	United States Environmental Protection Agency
yr	year(s)

EXECUTIVE SUMMARY

The Ash Pond at the Alabama Power Company (APC) Plant Barry coal combustion residuals (CCR) surface impoundment (Ash Pond) has been active for several decades, which has allowed significant volumes of vegetation (organic materials) to naturally establish on exposed and partially-submerged areas of CCR in and around the CCR units. The vegetation at these units is both woody (e.g., trees) and non-woody (e.g., bushes, grasses, phragmites, cattails). Additionally, existing CCR and natural soils beneath the CCR contain organic materials associated with vegetation that existed within the pond footprint prior to disposal. If co-disposed with CCR as part of a CCR unit closure, the slow decomposition of these organic materials may generate gas that consists mostly of methane and carbon dioxide. If the rate of methane gas generated does not exceed the transmission rate of methane gas through the final cover system, then it would not be necessary to include a gas collection and control system (GCCS) as part of the closure design. However, a GCCS may be required if the methane gas generation rate exceeds the transmission rate through the final cover system.

Anaerobic decomposition process, which will be the predominant mode of decomposition of organic material that may be co-disposed in a CCR unit, produces gas that is roughly 50 percent methane and 50 percent carbon dioxide. The amount and rate of gas production during anaerobic decomposition of organic materials will vary based on the volume and type of organic materials disposed in the unit, the placement duration, and environmental factors, most importantly, pH, temperature, nutrient levels, and moisture availability.

The methane generation rate constants selected by Geosyntec for the modeling efforts were based on relatively-low (i.e., midrange) bulk k values of 0.02 yr^{-1} modified to account for the specific assumed composition of the organic material (i.e., mass percentages of grasses, leaves, and woody material), high water contents and low temperatures. Project-specific laboratory testing was performed to estimate the methane production potential for different types of organic materials present at the Ash Pond, including grasses (including cattails), woody material (including branches) and organic material in the CCR and existing soils. The project-specific testing performed concluded that the organic material in CCR and the existing soils has no potential to produce measurable amounts of methane; therefore, the organic material present in the existing soils and CCR were not included in the gas generation modeling.

Gas generation modeling was performed to assess gas generation rates from the Ash Pond based on two different organic material disposal scenarios: Scenario 1 (aboveground non-woody vegetation and belowground woody vegetation, and Scenario 2 (above- and belowground non-woody and woody vegetation). The biomasses of organic materials that are assumed for each scenario during closure of the Ash Pond were estimated from site-specific field investigations. Estimated biomasses of grasses, leaves, aboveground woody vegetation, and belowground woody vegetation were used in the modeling. The total biomasses equated to about 240 tons/acre for the modeling of Scenario 1 and 330 tons/acre for Scenario 2. The disposal duration was modeled at 6-year and 12-year durations.

The methane transmission or migration rate through the geomembrane controls the potential for accumulation of methane gas beneath the final cover system. The site-specific methane gas migration rate through the final cover system geomembrane was calculated to be 9.0 scfm, based on methane diffusivity through 40-mil-thick LLDPE geomembrane. For the 12-year disposal

duration, the peak methane generation rate for both Scenarios 1 and 2 were less than 9.0 scfm; therefore a passive gas venting system is not required.

Geosyntec developed five recommended approaches for organic materials management at CCR impoundment closures. A description of each and their potential advantages and disadvantages are discussed in more detail in the Plan.

- Option 1: Organics minimization – Option 1 would involve removing non-impacted and impacted vegetation to the extent practicable. Impacted vegetation would be transported and disposed of in an off-site permitted landfill. Non-impacted vegetation could be chipped and beneficially reused, burned, or otherwise disposed of on-site or off-site.
- Option 2: Uniform comingled disposal – Option 2 would involve co-disposing organic material and CCR as part of the closure. Organic material would be spread out in a relatively uniform manner across the entire consolidated closure footprint and co-disposed at an approximately constant rate throughout closure construction. Based on organic material volume estimates and a 12-year disposal duration, no passive gas venting system would be necessary.
- Option 3: Composting followed by disposal – Option 3 would involve segregating and composting organic material on-site prior to placement within the Ash Pond, and/or beneficial use of non-impacted compost material. A significant limitation of Option 3 is that ADEM restricts the siting of composting facilities within the 100-year floodplain. Thus, for the Ash Pond closure any composting facility would likely need to be operated within the Ash Pond footprint, likely interfering with closure construction.
- Option 4: Localized comingled disposal – Option 4 is similar to Option 2 except that organic material at the Ash Pond would be co-disposed within a more localized portion of the consolidated Ash Pond closure footprint. With this approach, the organic material content per acre would be higher than for Option 2, and a passive gas venting system would be employed, as necessary, in the localized co-disposal area.
- Option 5: Burning or chipping of woody vegetation – Option No. 5 may be considered as an alternative for management of woody vegetation during closure construction. This option could be incorporated into any of the options discussed above. It involves burning and/or chipping woody trees, roots, and stumps. Impacted woody vegetation would be burned on-site, and the resulting ash would be co-disposed with CCR. Non-impacted woody vegetation could be chipped or burned. The wood chips could be stockpiled on-site for reuse, sold for reuse and shipped off-site, or disposed of off-site, depending on whether they were impacted.

This Plan provides APC/SCS with five options for managing organic materials during closure of the Plant Barry Ash Pond. These options can be applied alone, or several can be blended to achieve an optimal approach for the site-specific conditions at the Ash Pond. Many of the recommended options can be implemented without any need to install a passive gas venting system based on the recommended tons per acre. The maximum methane gas generation rate calculated in this Plan for

a 12-year disposal duration and the biomass quantities and compositions described in the Plan is 8.8 scfm, assuming the organic material is uniformly co-disposed with CCR across the consolidated closure footprint and at a constant rate throughout the closure duration. This is less than the calculated methane transmission rate through the final cover system of 9.0 scfm. As long as this condition is met, no passive gas venting system is needed. The calculation method described in this Plan can be used to evaluate other scenarios for organic material co-disposal, including other biomass quantities, compositions, closure duration, and disposal operating practices.

1. INTRODUCTION

1.1 Project Background

This Organic Material Management Plan (Plan) was prepared by Geosyntec Consultants, Inc. (Geosyntec) in support of the closure design at the APC Plant Barry CCR impoundment (Ash Pond or Site). The Ash Pond has been active for several decades and will be closed by consolidating the CCR into a smaller footprint and then installing a final cover system over the CCR. Over the operating life of the Ash Pond, vegetation has become established on the exposed and partially submerged areas of CCR within the pond. The vegetation includes both woody (e.g., trees, branches, wood chips, and root balls) and non-woody (e.g., grasses and cattails) organic materials. These materials are currently in physical contact with CCR because of their root systems, may contact CCR during the removal process, and/or are submerged in the pond or were submerged in the past. Additionally, existing CCR and natural soils beneath the CCR contain organic materials associated with vegetation that existed within the pond footprint prior to disposal. Organic materials co-disposed with CCR as part of Ash Pond closure are expected to slowly decompose thereby generating gas that consists mostly of methane and carbon dioxide. If the rate of methane gas generated does not exceed certain thresholds, then it would not be necessary to include a gas collection and control system (GCCS) as part of the closure design. However, a GCCS could be required if the methane gas generation rate exceeds the transmission rate through the final cover system.

1.2 Plan Objectives

This Plan describes the actions and provisions Geosyntec recommends for managing organic material present at the Site in an environmentally protective and regulatorily compliant manner. The Plan incorporates findings and conclusions from a site-specific evaluation of the gas generation potential of the organic materials that may be co-disposed with CCR as part of the Ash Pond closure. Options for managing organic materials for the closure of the Ash Pond are discussed.

1.3 Plan Organization

This Plan is organized as follows:

- Section 2: Federal and Alabama environmental regulatory requirements pertaining to gas management at CCR disposal facilities
- Section 3: Description of site-specific gas generation modeling analyses and results
- Section 4: Thresholds for methane gas generation
- Section 5: Options for managing organic materials during closure of the Ash Pond
- Section 6: Conclusions and recommendations

2. FEDERAL AND ALABAMA REGULATORY REQUIREMENTS

This section provides a discussion of environmental regulations as they pertain to the control of potential gas emissions from the disposal of organic materials. Federal regulations addressed in this section include those of the Resource Conservation and Recovery Act (RCRA) applicable to solid waste and CCR management and those of the Clean Air Act (CAA) associated with gas emissions. The State of Alabama CCR management regulations are also discussed. Several of the regulations discussed below apply to currently operating or recently closed landfills and may not be fully applicable for closure of CCR units.

2.1 Federal CCR Regulations

2.1.1 Overview

Federal regulation 40 CFR §257 Subpart D, Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments (Final CCR Rule), provides requirements for the disposal of CCR and the closure of CCR landfills and impoundments. These regulations establish minimum national criteria intended to achieve waste disposal facility design, operation, and management practices that *"…do not pose a reasonable probability of adverse effects on health or the environment…"* [40 CFR §257.50(a)]. The Final CCR Rule does not directly address the management of organic materials impacted by CCR nor does it provide specific requirements for management and disposal of organic materials at CCR units. However, as described below, the Final CCR Rule does provide requirements with respect to atmospheric emissions, non-CCR wastes, and methane generation.

2.1.2 Closure Requirements

Section §257.102(d)(i) of the Final CCR Rule provides the following closure requirements for CCR units: "*Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere*." The contamination of the atmosphere by CCR is qualitatively addressed by this regulation, but no mention is made of emission thresholds or sources of emissions (e.g., organic decomposition gases).

2.1.3 Non-CCR Waste

Throughout the Final CCR Rule, the waste or waste stream is referred to as "CCR or non-CCR." An example of this phrase is found in the definitions in section §257.53 which states: *"Active portion means that part of the CCR unit that has received or is receiving CCR or non-CCR waste and that has not completed closure in accordance with §257.102."* Thus, the Final CCR Rule acknowledges the presence of non-CCR waste in CCR disposal facilities. Although the rule does not describe any specific types of non-CCR waste, organic materials would presumably be included in this category.

2.1.4 Safety Issues Related to Organic Waste Disposal

Under specific conditions, methane is an explosive gas. The only direct reference to explosive gases in 40 CFR §257 is found in the section titled "§257.3-8 Safety" (Subpart A). This section states that the concentration of explosive gases (e.g., methane) shall not exceed *"Twenty-five percent (25 percent) of the lower explosive limit (LEL) for the gases in facility structures*

(excluding gas control or recovery system components); and the lower explosive limit for the gases at the property boundary." However, CCR units are exempted from the §257.3-8 Safety (Subpart A) regulations as provided under 40 CFR §257.1 (12). Nonetheless, the explosive gas requirements of §257.3-8 are considered relevant to CCR unit closures for safety reasons.

2.2 Federal Municipal Solid Waste Landfill Regulations

There are two sections of the federal regulations that address the requirements for installation of GCCSs at municipal solid waste landfills (MSWLFs) to control gas emissions:

- Federal MSWLF regulations (40 CFR §258) require installation of a GCCS if any of the following conditions are met:
  - Methane concentrations at or above 50 percent of the LEL in below-grade gas probes.
  - Methane concentrations at or above 25 percent of the LEL in any facility structure.

The New Source Performance Standards Regulations (NSPS) (40 CFR §60.757) under the CAA require installation of an active GCCS if any of the following conditions are met:

- New landfills with a maximum design capacity equal to or greater than 2.5 million Megagrams (Mg) of municipal solid waste (MSW) mass.
- Non-methane organic compounds (NMOC) emissions greater than 35 Mg/year (yr).
- Surface emissions greater than 500 parts per million (ppm) of methane.

Neither the MSWLF or NSPS regulations are directly applicable to CCR impoundments, but Geosyntec will use them as guidance for establishing organic material thresholds.

2.3 Alabama CCR Regulations

The Alabama Department of Environmental Management (ADEM) CCR Rule (335-13-15) does not specifically allow or prohibit the disposal of non-CCR materials within a CCR landfill or a closed CCR unit. Additionally, the ADEM CCR Rule does not mention gas management for CCR units.

2.4 Alabama Municipal Solid Waste Landfill Regulations

ADEM regulations (335-13-4-.16) address the requirements for control and monitoring of explosive gases, especially methane, at landfills that accept organic waste. An explosive gas monitoring and reporting plan is required for MSWLFs receiving organic wastes. Environmental controls may be required to manage explosive gases if the following cases occur:

- Explosive gas concentrations exceed the lower explosive limit (LEL) at the facility boundary.
- Explosive gas concentrations are above 25 percent of the LEL in facility structures except GCCS system components.

CCR surface impoundments are not classified as landfills, and ADEM regulations regarding methane monitoring are not applicable. This Plan addresses on-site management of organic materials, not the acceptance of off-site organic materials. Nonetheless, the ADEM regulations are considered herein as guidance.

3. GAS MODELING

3.1 Introduction

Two types of gas modeling were performed to evaluate the potential impacts of co-disposal of organic materials with CCR in the Ash Pond closure footprint. Gas generation modeling was used to estimate the gas generation rate during anaerobic decomposition of co-disposed organic materials based on the types and masses of the materials disposed of and the length of the disposal period. Methane surface emissions through the final cover system after closure were also estimated for comparison with the calculated gas generation rate.

3.2 Gas Generation Modeling

3.2.1 Model Inputs

3.2.1.1 Literature Review

The major end products of anaerobic decomposition of organic material are methane (CH_4) and carbon dioxide (CO_2), together often referred to as landfill gas (LFG). Landfill gas modeling is used to estimate the amount and rate of methane production due to the anaerobic decomposition process. The input parameters to the model used in the calculation of these quantities are the total methane gas generation potential (i.e., methane production potential [L_o]) and rate constant of methane generation (i.e., methane generation rate constant [k]). These input parameters will vary based on the composition of the organic material, environmental conditions (e.g., pH, nutrient levels, temperature, and water content), and microbiological community in the disposal unit. The composition of the organic material is reflected by its primary constituents (i.e., the organic polymers cellulose, hemicellulose, and lignin). Cellulose and hemicellulose are carbohydrates that can readily be converted to methane and carbon dioxide through anaerobic decomposition while lignin is an irregular chain of substituted aromatic compounds that is recalcitrant under anaerobic conditions and is converted to methane and carbon dioxide much more slowly. As a result, plant materials high in lignin, such as wood and branches, have lower methane production potential than materials higher in cellulose and hemicellulose content (Wang and Barlaz 2016).

As noted in the preceding paragraph, organic material methane generation rate constants are defined by the parameter k (yr^{-1}), and methane production potential is defined by the parameter L_o (m^3 CH_4/Mg). Potential methane generation capacities are in the range of 0 to 120 m^3 CH_4/Mg for wood and branches, while a specific value of 144.4 m^3 CH_4/Mg is generally used for grass (Wang and Barlaz 2016). Methane generation rate constants vary by more than an order of magnitude based on material composition (grass has the highest rates and wood/branches the lowest). They also vary based on environmental factors, which are discussed in Section 3.3. Furthermore, methane generation rate constants in the technical literature for vegetative organic matter such as wood, branches, and grass (i.e., those developed by Cruz and Barlaz [2010]) are for an MSWLF environment. Geosyntec did not find any literature related to methane generation rate constants or production potential for comingled CCR and organic material. Note that the methane generation rate constant is different than the gas generation flow rate, which will be discussed in the following sections.

The optimum pH range for methane-producing bacteria is generally accepted to be in the range of 6.8 to 7.4 (Barlaz and Ham 1990). The optimum temperature range for methane production is in the range of 35°C (95°F) to 55°C (131°F) (USEPA 1999, Zinder 1993).

All other factors being equal, increased water content will result in greater methane production (Barlaz and Ham 1990). Cruz and Barlaz (2010) present both laboratory measured and calculated values for the methane gas generation rate constant (k) for three different moisture scenarios: a dry landfill, a traditional (moist) landfill, and a bioreactor (wet) landfill. The highest k values were obtained from the wet landfill scenario whereas the lowest methane generation rate constants were obtained from the dry landfill scenario.

Material-specific k values for wood, branches, leaves, and grass were also estimated by Cruz and Barlaz (2010) for a range of field moisture conditions (dry, traditional, bioreactor) and for a variety of locations. Geosyntec used the k values from Barlaz and Cruz for a traditional MSWLF in Georgia to develop Table 3-1 for dry, moist, and mid-range between dray and moist moisture conditions. The k values applicable to Georgia were used to generate Table 3-1 because the climate in Georgia is anticipated to be more similar to the climate at the Ash Pond site compared to the climates at the other locations reported by Cruz and Barlaz (i.e., CA, DE, GA, MN, PA, and WI).

It is unknown if the Barlaz and Cruz rate constants would apply in environments where the microbiological community might be different, such as CCR units, then at MSWLFs. It is expected that CCR units will have lower nutrient levels and cooler temperatures (i.e., approximately groundwater temperatures of 60 to 65°F) compared to MSWLFs. Thus, relatively lower decay rates are anticipated in CCR units compared to MSWLFs. Accordingly, based on professional judgement, a methane generation bulk rate constant of $k = 0.02\ yr^{-1}$ (compared to $k = 0.04\ yr^{-1}$ for a traditional landfill) was selected for gas generation modeling of the Ash Pond unit. The material-specific k values for organic materials described above were composited based on the anticipated mass of specific organic materials as shown in Table 3-2. Additional details are provided in gas generation modeling calculations provided in Attachment No. 1.

As previously noted, L_o values reported in the literature are in the range of 0 to 120 m^3 CH_4/Mg for wood and branches and 144.4 m^3 CH_4/Mg for grass (Wang and Barlaz 2016). These values are similar to the values reported by Cruz and Barlaz (2010) (Table 3-1) and the L_o values measured from site-specific laboratory data (see Section 3.2.1.2).

Anthropogenic compounds (e.g., hydrocarbons, alcohols, chlorofluoro compounds), or NMOCs, are found in MSWLF LFG in trace quantities (Staley 2006). For MSWLFs, an NMOC emission rate above 35 Mg/yr is the regulatory trigger for installation of an active gas collection system. NMOCs in methane generated from organic degradation in CCR units are expected to be very low.

3.2.1.2 Site-Specific Investigation Results

Site-specific investigations of biomass unit weight, organic content, specific methanogenetic activity (SMA), and methane production potential (L_o) were conducted by North Carolina State University under the direction of Geosyntec for the organic materials present at the Plant Barry Ash Pond. The investigations included an organic content field sampling and laboratory testing program as well as an on-site woody vegetation inventory. The laboratory testing program

included biomass, SMA, and biochemical methane potential (BMP) testing of the organic materials at the Ash Pond.

SMA testing was performed to assess if there are methane-generating microorganisms in either the organic soils or CCR that are capable of degrading simple substrates (e.g., office paper) which serves as a source of carbon. The SMA testing on both the CCR and organic soils confirm that methanogenic microorganisms capable of producing methane are present in both if a carbon source is provided. Other conclusions from the SMA testing include that methane production was limited by substrate conditions, specifically the amount of free carbon available. Lastly, tests conducted at higher pH levels (7.6–7.9) resulted in a slightly less methanogenic activity compared to tests conducted at lower pH levels (7.4 – 7.5).

BMP testing is used to measure the quantity of methane a sample will generate under optimal conditions. The results are used to calculate L_o values. Site-specific L_o values were selected for the different types of vegetation present at the Ash Pond based on BMP testing.

Volatile solids contents (i.e., organic contents) ranged from 2 to 25 percent in the organic soils and from 2 to 15 percent in the CCR at the Ash Pond. The BMP test results for both of these materials did not measure any methane generation under optimal pH, moisture, and temperature conditions. Therefore, only woody and non-woody vegetation weights were used for inputs in the gas generation modeling. The weight of organic material in the CCR and organic soils was neglected from the gas generation modeling. Additional information on the site-specific investigations and laboratory results are provided in Appendix A.

3.2.2 Methodology

Gas generation modeling was performed using the United States Environmental Protection Agency (USEPA) Landfill Gas Emissions Model (LandGEM) Version 3.02 (USEPA 2005). This model was used to estimate gas generation flow rates for two different CCR-organic material compositions and placement durations. LandGEM modeling provides gas emission (mass per unit time) and gas generation flow rate (volume per unit time) estimates.

3.2.3 Input Parameters

The LandGEM model requires inputs for the weight or biomass of the organic material in short tons or Mg (1 Mg = 1,000 kg), methane generation rate constant (k, yr^{-1}), methane production potential (L_o, m^3 CH_4/Mg), NMOC concentration, and methane content (percent by volume). A summary of the inputs used in the LandGEM model is provided in Table 3-2.

The biomass of organic material to be co-disposed with CCR at the Ash Pond was estimated for above ground (i.e., grasses, cattails, and woody vegetation) and below ground (i.e., roots, stumps, organic soils, unburned coal) organic materials. Additional information on the biomass estimates used for the modeling is provided in the Organic Material Gas Generation Potential Data Package in Appendix A.

Methane generation rate constants used in the LandGEM model were weighted based on the composition of the co-disposed organic material. Methane generation rate constants (k) for different organic materials were selected based on a midrange bulk decay rate of k = 0.02 yr^{-1} (Geosyntec 2018). Information on k values from the literature was discussed in Section 3.2.1.1.

Methane production potential (L_o) values were also weighted based on the organic material composition for each scenario. The weighted values used in the LandGEM model are based on site-specific laboratory BMP testing (Section 3.2.1.2). BMP values were selected for the different types of organic materials at the Ash Pond.

Concentrations of CH_4 and CO_2 in LFG are approximately 50 percent each, by volume. Thus, a methane concentration of 50 percent by volume was selected for the LandGEM modeling.

An NMOC concentration of 600 ppm (USEPA 2005) was used based on typical values at MSWLFs from USEPA's AP-42 database (USEPA 1998). This value is likely very conservative for use in modeling NMOC generation at a CCR impoundment given that vegetative matter is not a source of anthropogenic compounds. The main purpose for inclusion of the NMOC concentration in the modeling is to demonstrate that the modeled NMOCs emission rates, even based on very conservative assumptions, are significantly below regulatory limits that would require an active gas collection system.

The following assumptions were also used for the LandGEM modeling:

- Organic material will be placed uniformly over the closure footprint.
- The duration over which organic material is co-disposed with CCR is 6 years or 12 years.
- The disposal rate of organic materials is constant throughout the disposal duration.

3.3 Gas Generation Modeling Runs

3.3.1 Overview

Two scenarios were analyzed using different compositions and volumes of organic materials: Scenario 1, non-woody aboveground vegetation (i.e., grasses/cattails) and woody belowground vegetation (i.e., roots, root balls and buried trees); and Scenario 2, both non-woody and woody aboveground vegetation, and woody belowground vegetation.

3.3.1 Organic Material Composition

The composition of organic material co-disposed in the Ash Pond will vary based on the organic material management procedures used during the closure. Two organic material composition scenarios were considered for gas generation modeling based on differences in the management of woody vegetation. For Scenario 1, it is assumed that existing aboveground woody vegetation is removed from the CCR unit (e.g., trees are cut above the ground surface and removed from the unit). For Scenario 2, it is assumed that the aboveground woody waste is co-disposed in the CCR unit closure. The percent composition and weight of woody and non-woody vegetation used for each scenario is provided in Table 3-3.

3.3.2 Placement Duration

The duration over which organic material is placed will impact the gas generation rate. Longer placement durations will result in relatively lower peak gas generation flow rates, while shorter placement durations will result in relatively larger peak gas generation flow rates. A 12-year disposal duration was used in LandGEM based on the preliminary closure schedule for the Ash

Pond. To assess the sensitivity of the results to this parameter, a 6-year placement duration was also modeled.

3.3.3 Gas Generation Results

The peak methane flow rate (standard cubic feet per minute [scfm]), peak NMOC emissions (Mg/yr), and peak total gas (i.e., methane and carbon dioxide) generation flow rate scfm) for each scenario were estimated in LandGEM. Scfm is the gas molar flow rate corrected to "standard" conditions of temperature and pressure (STP), thus, representing a fixed number of moles of gas.

The gas generation model results are summarized below in Table 3-4. The gas generation flow rates were plotted versus time and are shown in Figures 3-1 (total gas) and 3-2 (methane) for models run with 6-year and 12-year disposal durations. The curve shapes are consistent with a first-order organic material degradation model where gas generation rates increase as organic material is buried and steadily decrease after organic material placement has been completed.

Peak methane gas generation flow rates are observed to occur immediately after the final year of organic material placement (Figure 3-2). Considering a 12-year disposal duration, Scenario 2 (with aboveground woody vegetation) has a higher calculated methane gas generation flow rate (8.8 scfm) than Scenario 1 (no aboveground woody vegetation, 7.6 scfm). The peak methane gas generation flow rates for 12- and 6-year disposal durations are nearly the same (7.6 scfm versus 8.0 scfm for Scenario 1 and 8.8 scfm versus 9.2 scfm for Scenario 2).

Table 3-4 summarizes the calculated peak NMOC emissions for the various model scenarios. The peak NMOC emissions are two orders of magnitude lower than the regulatory threshold (35 Mg/yr) for installation of an active GCCS at a MSWLF. Based on these low, conservatively calculated NMOC emission rates, an active GCCS would not be required to meet NSPS requirements.

3.4 Gas Emission Modeling Under Post-Closure Conditions

3.4.1 Gas Emission Transport Mechanisms

As described in Section 1.1, the Ash Pond at Plant Barry will be closed by consolidating the CCR into a smaller footprint than currently exists and then placing a final cover system over the consolidated footprint. Once the final cover system is installed, methane gas generated by organic decomposition in the consolidated CCR will migrate up to and eventually through the cover. The rate of migration through the geomembrane will determine how much methane will accumulate inside the CCR mass. The transport of methane gas molecules through the geomembrane component of the final cover system is attributed to two processes: (1) diffusive flow (diffusion) of gas through the nonporous component of the geomembrane; and (2) convective flow (advection) through defects in the geomembrane. Based on these two transport mechanisms, laboratory testing can be performed to measure methane gas transmission rates through geomembranes.

3.4.2 Methane Emission Estimates through Final Cover Systems

The proposed final cover system for the Ash Pond consists of cover soils overlying a 40-mil-thick linear low-density polyethylene (LLDPE) geomembrane. Laboratory testing results for methane gas transmission rates due to diffusion through different geomembrane types are provided by Stark and Choi (2005). For a geomembrane thickness of 40 mil (1.0 mm) and a low gas pressure gradient,

the design methane transmission or flux rate for LLDPE geomembranes is 300 mL (STP)/m^2-day or 0.03 ft^3(STP)/acre-min.

Eun et al. (2018) conducted methane flux testing on different types of geomembranes overlain by one foot of soil and compared the results to methane flux values reported by Stark and Choi (2005). The test results for LLDPE geomembrane obtained by Eun et al. (0.98 Mg/hectares per year [ha-yr]) and Stark and Choi (0.96 Mg/ha-yr) are essentially the same. Note that both the Stark and Choi (2005) and Eun et al. (2018) studies only consider diffusive transport through the geomembrane. Convective flow through any geomembrane defects was not evaluated.

Multiplying the methane transmission or flux rate by the closure footprint of the Ash Pond (i.e., 300 acres) and assuming the organic material is uniformly disposed across the entire CCR unit, a total flow rate for methane through the final cover geomembrane was calculated. For an LLDPE geomembrane, the methane transmission flow rate due to diffusion only is 9.0 scfm. This methane transmission flow rate will be used as the threshold value above which a passive gas management system would be recommended as part of the Ash Pond closure system.

4. THRESHOLD METHANE GAS GENERATION RATES

4.1 No Gas Collection or Monitoring Required

Geosyntec proposes that no gas collection system would be required for a geomembrane-covered CCR unit if the peak rate of methane gas generation does not result in the accumulation of methane gas below the geomembrane. This is believed to be a conservative recommendation because the peak rate of methane generation only occurs for a relatively short period of time, and the method used to develop the gas transmission rate through the geomembrane is conservative. Accumulation of methane gas below the cap is undesirable because if enough methane accumulated, it could migrate in the subsurface beyond the CCR unit boundary.

Figure 4-1 illustrates a methane generation and emission conceptual site model for a CCR unit containing organic material. If the gas generation rate from organic decomposition (i.e., green arrows) is less than or equal to the methane gas leaving the CCR unit (i.e., blue arrows), methane gas will not build-up in the CCR unit. Therefore, if the methane gas generation rate calculated for the Ash Pond is less than the estimated methane gas transmission rate through the final cover system, no gas collection or monitoring is required.

The threshold methane gas generation rate is 9.0 scfm for co-disposal of organic material across the entire Ash Pond closure footprint. The calculated methane gas generation rates for a 12-year disposal duration is compared to the threshold, also referred to as the design criterion, in Figure 4-2. The modeled methane gas generation rates for both waste composition scenarios and a 12-year disposal duration is less than the methane transmission rate through the cap. For the 6-year disposal duration sensitivity analyses, the modeled methane gas generation rate is greater than the methane transmission rate through the cap for Scenario 2 during the first 2 years after closure. However, the actual disposal duration is anticipated to be 12 years and the 6-year model was used to assess the sensitivity to the disposal duration. Thus, no gas collection or monitoring would be necessary for the Ash Pond closure if organic material is co-disposed uniformly in quantities not exceeding those contained in this Plan.

4.2 Passive Gas Venting System

The site-specific evaluation for the gas generation potential at the Ash Pond indicates that no gas collection or monitoring is required for uniform co-disposal of organic material at the levels considered for Scenarios 1 and 2 (equal to about 240 tons/acre and 330 tons/acre, respectively). However, if higher levels of organic material are disposed of in all or portions of the consolidated CCR unit, the use of a passive gas venting system should be incorporated into the design of the Ash Pond closure (i.e., final cover system) to increase the rate at which upward migrating methane gas can leave the unit.

Gas management systems are designed to control and manage gases from organic decomposition with the following key objectives:

- Prevent damage to cover system and mitigate cover system veneer slope stability concerns due to landfill gas pressure buildup beneath the cover liner (for ClosureTurf® system where ballasting material over the geosynthetic layers is

minimal the visual effects of landfill gas pressure buildup would be more significant and evident on the liner system).

- Mitigate health and safety hazards associated with methane gas buildup (e.g., mitigate explosion risks associated with methane generation).
- Prevent vegetation distress (not applicable for ClosureTurf® system).

Passive gas venting system includes a series of passive vents that provide engineered, preferential pathways for landfill gases to vent through the cover system to the atmosphere in a controlled manner. These systems are designed to prevent the buildup of gases beneath the cover system and minimize the lateral migration of gases in the subsurface. The passive vents include a below-grade screen that extends into the waste mass. The vents are completed at the surface using a stick-up casing and either a turned-down exhaust port, turbine vent, or other termination port (Figure 4-2). Passive vents are typically installed on a spacing of one vent per one to two acres of final cover. Figure 4-2 illustrates a vented composite final cover system, but venting can also be adapted to alternate final cover systems such as ClosureTurf®.

Detailed design procedures are generally not performed for passive gas venting systems because they are typically used at older and/or smaller MSWLFs where the potential for LFG generation is limited. Therefore, practice "rules of thumb" are typically used for the design of these systems. With this approach, passive gas vents are typically spaced approximately 200 ft apart or one gas vent per acre for MSWLFs (USACE 2013). However, if a passive gas venting system is selected for the closure design, Geosyntec recommends one passive gas vent for every two acres of final cover system because the estimated gas generation flows are very low.

The need for and benefits of gas monitoring should also be evaluated as part of the design of a passive gas venting system. Gas monitoring may consist of measuring methane concentrations at the gas vents and/or at perimeter gas probes (see Figures 4-2 and 4-3). Monitoring can be conducted through a barb or quick connect fitting to allow sampling with a field methane meter. The typical sampling frequency is on a semi-annual basis initially and may be reduced/eliminated over time based on the monitoring results.

5. PROPOSED ORGANIC MANAGEMENT PRACTICES

5.1 Organics Management Approach for Ash Pond

There are several approaches that APC could use in managing organic materials during closure of the Ash Pond at Plant Barry. Each approach has potential advantages and disadvantages that should be considered. The remainder of this section describes and evaluates the following organic material management options: organics minimization; uniform comingled disposal; composting followed by disposal; passive gas venting system; and burning or chipping of woody vegetation. Note too, that these options can be combined in different ways depending on APC preferences and the Site conditions encountered.

5.2 Option No. 1: Organics Minimization

Option 1 would involve removing CCR-impacted organics to the extent practicable for disposal in an off-site permitted landfill. Non-impacted vegetation would also be removed but would be managed on-site. A representative implementation sequence for Option 1 is as follows:

- Non-impacted aboveground vegetation would be removed from the Ash Pond (e.g., sale as standing timber, chipping, cutting via brush hog, on-site disposal in a designated area outside the in-place closure limits, or mulching for use as a final cover system soil amendment).
- Impacted vegetation (i.e., rootballs, non-woody vegetation, and organic soils) would be removed from the Ash Pond to the extent practicable and transported to a permitted off-site landfill for disposal.
- The final cover system would not incorporate gas management or monitoring features.

Potential advantages of Option 1:

- A gas management system would not be required, as organic material with the potential for generating gas would be removed from the Site.
- Closure construction would potentially be simplified as organics would only be handled once (during removal) and would not need to be temporarily stockpiled and then placed back in the Ash Pond at a later date.
- Certain post-closure care costs would be avoided because no gas management or monitoring system would be needed.
- The value of the CCR for future beneficial use would potentially be preserved because organics would not be introduced into the CCR mass during closure.
- This practice generally consistent with Southern Company Services, Inc/APC (SCS/APC) current practices.

Potential disadvantages of Option 1:

- Hauling and tipping costs would be incurred to transport the impacted organics to an off-site permitted landfill. These costs may be significant and prohibitive if a large volume of impacted organics is present and/or a suitable permitted landfill is not present within a reasonable distance of the Ash Pond.
- Transporting the impacted organics off-site would increase truck traffic on local roadways, increase the risk of traffic-related incidents, and require careful sealing of trucks to prevent the inadvertent release of impacted organics during transport.

5.3 Option No. 2: Uniform Comingled Disposal

Option 2 would involve consolidating organic material and CCR together as part of an in-place closure. The organic material to be consolidated could include CCR-impacted vegetation, non-impacted vegetation, and/or organic soils encountered within the limits of the Ash Pond. The quantity of co-disposed organic material would be low enough that a passive gas venting system is not required. Comingled organic material would be placed within the Ash Pond consolidated closure footprint by spreading out in a relatively uniform manner. A representative implementation sequence for Option 2 is as follows:

- The volume of organic material to be co-disposed in the Ash Pond would be estimated using the gas generation modeling described in Section 3. The estimate would take into consideration the composition of organic material to be co-disposed (i.e., woody versus grass).
- Organic material to be co-disposed would be spread out across the entire footprint of the Ash Pond in layers. Organic material would be co-disposed uniformly across the closure footprint (i.e., tons per acre) and at an approximately constant rate during the closure construction (i.e., tons per year).
- Woody vegetation could be chipped prior to spreading, although chipping would increase the wood surface area and thus methane generation rate. Spreading would occur based on the closure construction schedule.

Potential advantages of Option 2:

- Costs associated with off-site disposal of organic materials would be eliminated or minimized.
- Community impacts associated with truck traffic for off-site disposal would be eliminated or minimized.
- Even distribution of organic material throughout the consolidated closure footprint minimizes the estimated gas generation potential.

Potential disadvantages of Option 2:

- Future beneficial use mining could require screening to remove comingled organics from the CCR.

5.4 Option No. 3: Composting Followed by Disposal

Option 3 would involve on-site segregation and composting of organic material prior to placement within the Ash Pond, and/or beneficial use of non-impacted compost material. Composting would aerobically degrade organic material and significantly reduce the post-closure potential for methane generation. The composting strategy could involve composting non-woody organic material, or only that material with the highest methane production potential. After composting is complete, the impacted compost would be comingled with the CCR. Non-impacted compost could be comingled in the Ash Pond, used as a vegetative soil supplement for the cover system, or used for restoring areas disturbed during closure-by-removal of CCR.

A representative implementation sequence for Option 3 is as follows:

- Composting pads would be constructed during the first phase of closure construction, preferably before performing any vegetation removal to minimize the need to handle the organics multiple times. The pads would allow impacted and non-impacted organics to be composted separately.
- Organics would be placed in the appropriate composting pad (i.e., impacted or non-impacted). Woody vegetation would be chipped prior to composting to speed up the aerobic degradation process.
- The organics would be allowed to compost during closure construction, and the compost piles would be actively managed (i.e., turned and windrowed). Typical composting time periods are three to six months based on composition of compost, water content and pile turning events (CEPA 2003, Michigan Recycling Coalition 2015).
- Impacted compost would be comingled with CCR and placed within the CCR unit after composting is complete, and preferably prior to the placement of the final lifts of CCR. The volume/weight of the composted material would be evaluated prior to placement to confirm the organic materials are below threshold levels.
- Composting operations could be optimized to focus on higher-methane producing non-woody vegetation while woody vegetation could be co-disposed without composting.
- The non-impacted compost could be used as an amendment for the cover soils, as fertilizer to revegetate areas disturbed during closure construction, or comingled with CCR in a similar manner described above.

Potential advantages of Option 3:

- Costs associated with off-site disposal of organic materials would be eliminated or minimized.
- Community impacts associated with truck traffic for off-site disposal would be eliminated or minimized.

- Non-impacted vegetation could be converted into a valuable compost that could be used as a soil supplement. This may reduce the need to purchase fertilizers or soil amendments.
- The total volume of organic material requiring final disposal would be reduced, because the composted volume of the organics would be less than the initial volume of the organics.
- Composting could be considered a "green" method for organics management because composting is a natural process, would reduce the volume of landfilled material, and could potentially reduce the need for importing of fertilizer and cover soil.

Potential disadvantages of Option 3:

- Dedicated composting areas would need to be constructed, operated, and decommissioned after closure and may result in additional costs.
- The ADEM solid waste rule prohibits composting facilities within the 100-year flood plain (335-13-14-.05). The composting pads would likely require placement within the Ash Pond footprint (Figure 5-1).
- Future beneficial use mining would likely require screening to remove comingled compost and CCR.

5.5 Option No. 4: Passive Gas Venting System

Option 4 is similar to Option 2 except that it envisions consolidating organic material within a more localized portion of the Ash Pond and including a passive gas venting system in the final cover design in that localized area. With this approach, the organic material content per acre within this localized area could be higher than for Option 2. The allowable area of the co-disposal area under this scenario would be determined using additional site-specific analyses as outlined in Appendix A. Organic materials both above and below the ground surface would be removed to the extent practicable from throughout the Ash Pond footprint and placed in the co-disposal area.

Potential advantages of Option 4:

- Costs associated with off-site disposal of organic materials would be eliminated or minimized.
- Community impacts associated with truck traffic for off-site disposal would be eliminated or minimized.
- CCR consolidation operations would only need to incorporate organic material comingling in a portion of the Ash Pond rather than the entire footprint (as with Option 2).
- The passive gas venting system would only need to be installed in a localized portion of the Ash Pond.
- By not comingling vegetation with CCR in some of the CCR unit, the need to screen out organics for future beneficial use mining would be limited. Most likely, the CCR

in the localized comingling area would not be mined while other CCR that is mined would not need screening.

Potential disadvantages of Option 4:

- Closure construction outside the localized co-disposal area would require removal of organic materials both above and below the ground surface and hauling and handling for placement in the comingled area.
- Closure construction in the localized comingled area would be more complicated than other areas due to the higher content of organic material being consolidated and the construction of potentially an enhanced passive venting system over this area.
- Depending on the size of the localized comingled area, the cost of the passive venting system may lead to a more expensive closure system design than for the case of uniform comingled disposal.
- Cover system settlements due to organic material decomposition could be larger in the localized comingled disposal area than in the uniform comingled disposal area. Excessive settlements could increase post-closure care costs.

5.6 Option No. 5: Burning or Chipping of Woody Vegetation

Option No. 5 may be considered as an alternative for management of woody vegetation during closure construction. This option could be incorporated into any of the options discussed above. It involves burning and/or chipping of woody trees, roots, and stumps. Impacted woody vegetation would be burned on-site and the resulting ash would be co-disposed with CCR. Non-impacted woody vegetation could be chipped or burned. The wood chips could be stockpiled on-site for reuse, sold for reuse and shipped off-site, or disposed of off-site, depending on whether they were impacted.

Either a burner box or trench burner could be used for the burning of woody vegetation. An air curtain or equivalent method would be used with both burning methods. A 95 to 98 percent reduction in the volume of woody vegetation is anticipated for burning with the air curtain. A burner box could handle about 10 to 30 tons of woody vegetation per day.

Potential advantages of this management option for woody vegetation:

- Costs associated with off-site disposal of organic materials would be reduced.
- Community impacts associated with truck traffic for off-site disposal would be reduced.
- Gas generation from co-disposal of woody vegetation would be eliminated or minimized.
- Root balls and organic soils mixed CCR could be handled in the burners.
- Wood chips generated from non-impacted woody vegetation could be reused.

Potential disadvantages of this alternative option:

- Burning permits may be required through Mobile County and the local fire department.
- Burning may not be allowed during ADEM ban months.
- There is potential for community nuisance issues (e.g., smoke and fuel emissions).
- There are additional costs associated with the burning equipment and diesel fuel for operation of equipment.
- Future beneficial use mining may not be feasible in areas where ash from the burning of organic materials is comingled with CCR.

6. CONCLUSIONS AND RECOMMENDATIONS

This Plan has described the actions and provisions recommended by Geosyntec for managing organic material present at the Plant Barry Ash Pond during the closure of the pond. Closure will involve the on-site consolidation of CCR within the existing Ash Pond footprint followed by installation of a final cover system over the CCR. The recommendations in this Plan are intended to allow co-disposal of organic material with the CCR (or other forms of management of the organic material) in an environmentally protective and regulatorily compliant manner. The Plan incorporates findings and conclusions from a site-specific evaluation of the gas generation potential of the organic materials that may be co-disposed with CCR as part of the Ash Pond closure. Options for managing organic materials during closure of the Ash Pond were also discussed.

The following conclusions and recommendations are based on Geosyntec's site-specific evaluation for management of organic material during closure of the Ash Pond:

- The amount and rate of gas production from co-disposal of organic materials with CCR will vary based on the mass and type of organic materials, the placement duration, and environmental factors within the Ash Pond, including pH, temperature, nutrient levels, and moisture availability.
- Gas generation modeling using the USEPA computer program LandGEM was performed to estimate gas generation rates assuming the co-disposal of organic materials with CCR during closure activities. Model parameters were based on the following inputs:
  - The methane generation rate constant (k) was based on laboratory testing results presented in the technical literature for simulated MSWLF environments because no data are available for organic material decomposition in CCR units. The Ash Pond will likely be cooler and have lower nutrient levels than a MSWLF. Geosyntec anticipates that organic material decomposition will occur at a slower rate in a CCR unit than in an MSWLF. Thus, the methane generation rate constants selected by Geosyntec for the modeling effort described herein were based on relatively-low (i.e., midrange) bulk k values of 0.02 yr^{-1} modified to account for the specific assumed composition of the organic material (i.e., mass percentages of grasses, leaves, and woody material).
  - Methane production potential was based on the BMP results of site-specific laboratory testing for different types of organic materials present at the Ash Pond, including grasses (including cattails), woody material (including branches) and organic material in the CCR and existing soils. Note, however, that project-specific testing concluded that the organic material in CCR and the existing soils has no potential to produce measurable amounts of methane.
  - The biomasses of organic materials that are assumed for modeling purposes to be co-disposed with CCR during closure of the Ash Pond were estimated from site-specific field investigations. Estimated biomasses of grasses, leaves, aboveground woody vegetation, and belowground woody vegetation were used

in the modeling. The total biomasses equated to about 240 tons/acre for the modeling of Scenario 1 (described in this Plan) and 330 tons/acre for Scenario 2.

  - A disposal duration of 12 years was used in the model based on the estimated closure construction duration. Modeling was also performed using a duration of 6 years for purposes of checking the sensitivity of the modeling results to the input duration.
  - In the modeling, the co-disposed organic materials are assumed to be co-disposed uniformly across the approximately 300-acre closure footprint and at a constant rate throughout the disposal duration.

- Using the inputs described above, LandGEM calculated a methane gas generation rate after closure of the Ash Pond to be less than 9.0 scfm for both waste disposal scenarios with a 12-year disposal duration. The modeling performed using a disposal duration of 6 years resulted in calculated methane gas generation rates approximately five percent higher than for the 12-year disposal duration simulations.
- This Plan describes the rationale for not needing to install a passive methane gas venting system as a component of the Ash Pond closure as long as the peak methane generation rate is less than the rate at which the generated methane can migrate upward though the closure final cover system. For the Ash Pond closure, the upward migration rate will be controlled by the methane diffusivity of the geomembrane component of the final cover system. The methane migration rate through the geomembrane controls the potential for accumulation of methane gas beneath the final cover system. The site-specific methane gas migration rate through the final cover system geomembrane was calculated to be 9.0 scfm, based on a 40-mil-thick LLDPE geomembrane.
- Geosyntec developed five potential approaches for consideration by APC/SCS for organic materials management during closure of the Ash Pond. A description of each and their potential advantages and disadvantages are described in Section 5 of this Plan. The five approaches are:
  - Option 1: Organics minimization – Option 1 would involve removing non-impacted and impacted vegetation to the extent practicable. Impacted vegetation would be transported and disposed of in an off-site permitted landfill. Non-impacted vegetation could be chipped and beneficially reused, burned, or otherwise disposed of on-site or off-site.
  - Option 2: Uniform comingled disposal – Option 2 would involve co-disposing organic material and CCR as part of the closure. Organic material that could be co-disposed includes aboveground woody and non-woody vegetation, belowground vegetation (i.e., roots), and existing soils that contain organics. Comingled organic material would be spread out in a relatively uniform manner across the entire consolidated closure footprint and co-disposed at an approximately constant rate throughout closure construction. No gas management system would be required as long as the criteria established in this Plan are met.

- Option 3: Composting followed by disposal – Option 3 would involve segregating and composting organic material on-site prior to placement within the Ash Pond, and/or beneficial use of non-impacted compost material. A significant limitation of Option 3 is that ADEM restricts the siting of composting facilities within the 100-year floodplain. Thus, for the Ash Pond closure, any composting facility would likely need to be operated within the Ash Pond footprint, likely interfering with closure construction.
- Option 4: Localized comingled disposal – Option 4 is similar to Option 2 except that organic material at the Ash Pond would be co-disposed within a more localized portion of the consolidated Ash Pond closure footprint. With this approach, the organic material content per acre would be higher than for Option 2, and a passive gas venting system would be employed, as necessary, in the localized co-disposal area. Additional gas modeling would be required to estimate the area for co-disposal.
- Option 5: Burning or chipping of woody vegetation – Option No. 5 may be considered as an alternative for management of woody vegetation during closure construction. This option could be incorporated into any of the options discussed above. It involves burning and/or chipping woody trees, roots, and stumps. Impacted woody vegetation would be burned on-site, and the resulting ash would be co-disposed with CCR. Non-impacted woody vegetation could be chipped or burned. The wood chips could be stockpiled on-site for reuse, sold for reuse and shipped off-site, or disposed of off-site, depending on whether they were impacted.

In summary, this Plan provides APC/SCS with five options for managing organic materials during closure of the Plant Barry Ash Pond. These options can be applied alone, or several can be blended to achieve an optimal approach for the site-specific conditions at the Ash Pond. Depending on the option, and the biomass of organic material disposed on a unit area basis (e.g., per acre), the option can be implemented without any need to install a passive gas venting system. Specifically, the maximum methane gas generation rate calculated in this Plan for a 12-year disposal duration and the biomass quantities and compositions described in the Plan is 8.8 scfm, assuming the organic material is uniformly co-disposed with CCR across the consolidated closure footprint and at a constant rate throughout the closure duration. This is less than the calculated methane migration rate through the geomembrane component of the final cover system of 9.0 scfm. As long as this condition is met, no passive gas venting system is needed. The calculation method described in this Plan can be used to evaluate other scenarios for organic material co-disposal, including other biomass quantities, compositions, closure duration, and disposal operating practices.

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TABLES

Table 3-1: Methane Generation Parameters for Various Organic Materials Based on Cruz and Barlaz (2010)

	k (yr^{-1})			L_o (m^3 CH_4/Mg)
	Dry	**Mid-Range**	**Moist**	
Wood	0.004	0.009	0.017	62.6
Branches	0.004	0.009	0.017	62.6
Leaves	0.049	0.098	0.196	30.6
Grass	0.086	0.171	0.342	144.4

k = Methane Generation Rate.
Lo = Methane Production Potential.
Estimated for temperatures around 35°C (95°F).
Dry k values were based on a bulk MSW decay rate of 0.01 yr^{-1}.
Mid-range k values were based on a bulk MSW decay rate of 0.02 yr^{-1}.
Moist k values were based on a bulk MSW decay rate of 0.04 yr^{-1}.
Values are based on material composition from Georgia.
Reference: k and Lo values estimated from data in Cruz and Barlaz (2010).

Table 3-2: Summary of Input Values for Gas Generation Modeling

Input Parameter	Scenario 1	Scenario 2
Total Biomass (short tons)	72,900	100,900
6-Year Placement Rate (tons per yr)	12,150	16,817
12-Year Placement Rate (tons per yr)	6,075	8,409
Methane Generation Rate, k (yr^{-1})	0.018	0.016
Methane Generation Potential, L_o (m^3 CH_4/Mg)	104.7	97.8
Non-Methane Organic Compounds, NMOC Concentration (ppm_v)	600	600
Methane Content (percent by volume)	50	50

Table 3-3: Summary of Organic Material Composition (By Weight) for Gas Generation Modeling

	Scenario 1		Scenario 2	
	Biomass (short tons)	**Percent by Weight**	**Biomass (short tons)**	**Percent by Weight**
Wood	68,800	94.4%	96,800	95.9%
Grass	4,100	5.6%	4,100	4.1%
Total	72,900	100%	100,900	100%

Table 3-4: Summary of Gas Generation Modeling Results

	Scenario 1		Scenario 2	
Disposal Duration	**12-year**	**6-year**	**12-year**	**6-year**
Peak Methane Flow Rate (scfm)	7.6	8.0	8.8	9.2
Peak NMOC Emission Rate (Mg/yr)	0.48	0.51	0.56	0.59
Peak Total Gas Flow Rate (scfm)	15	16	18	18

FIGURES

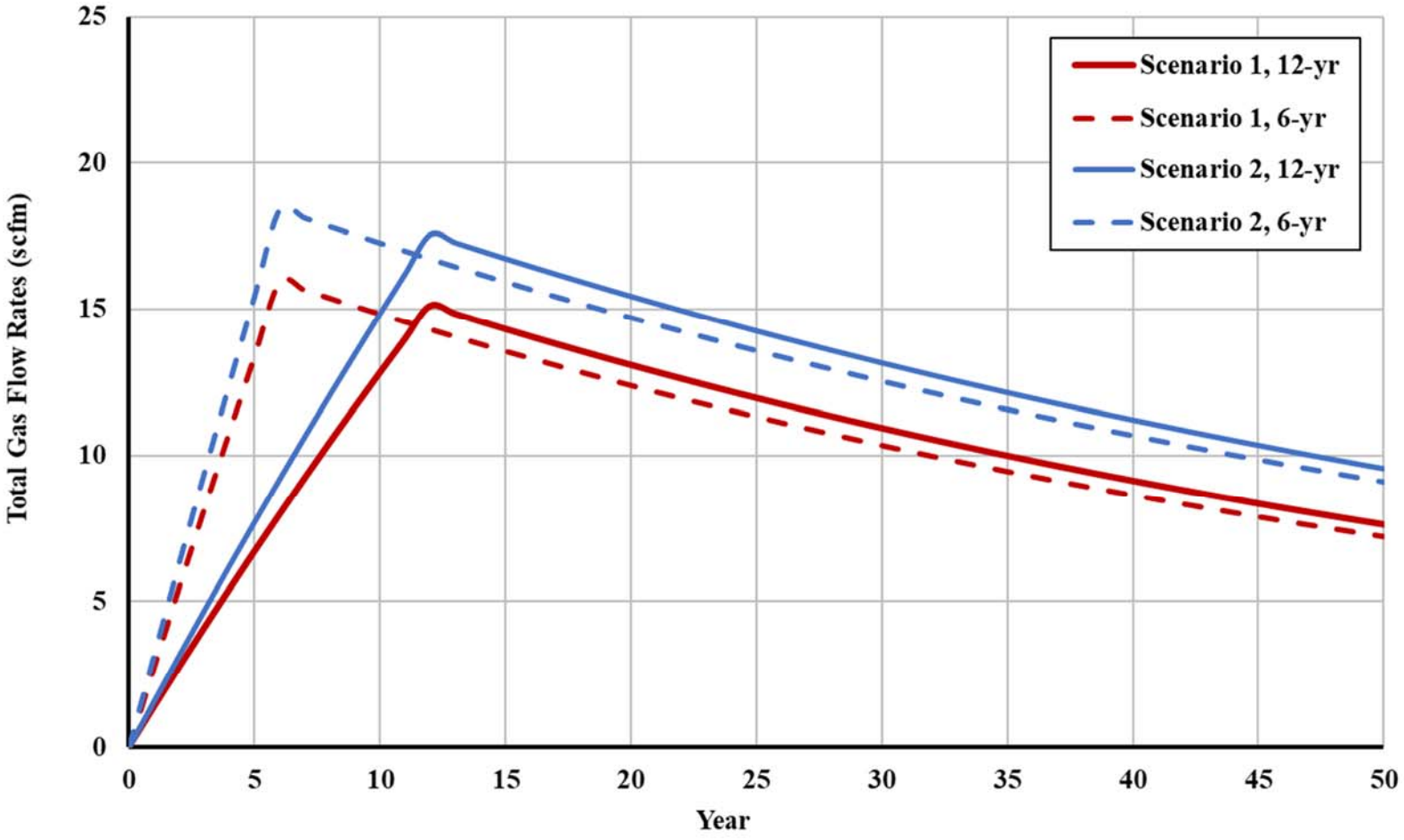


Figure 3-1: Comparison of Modeled Total Gas Flow Rates

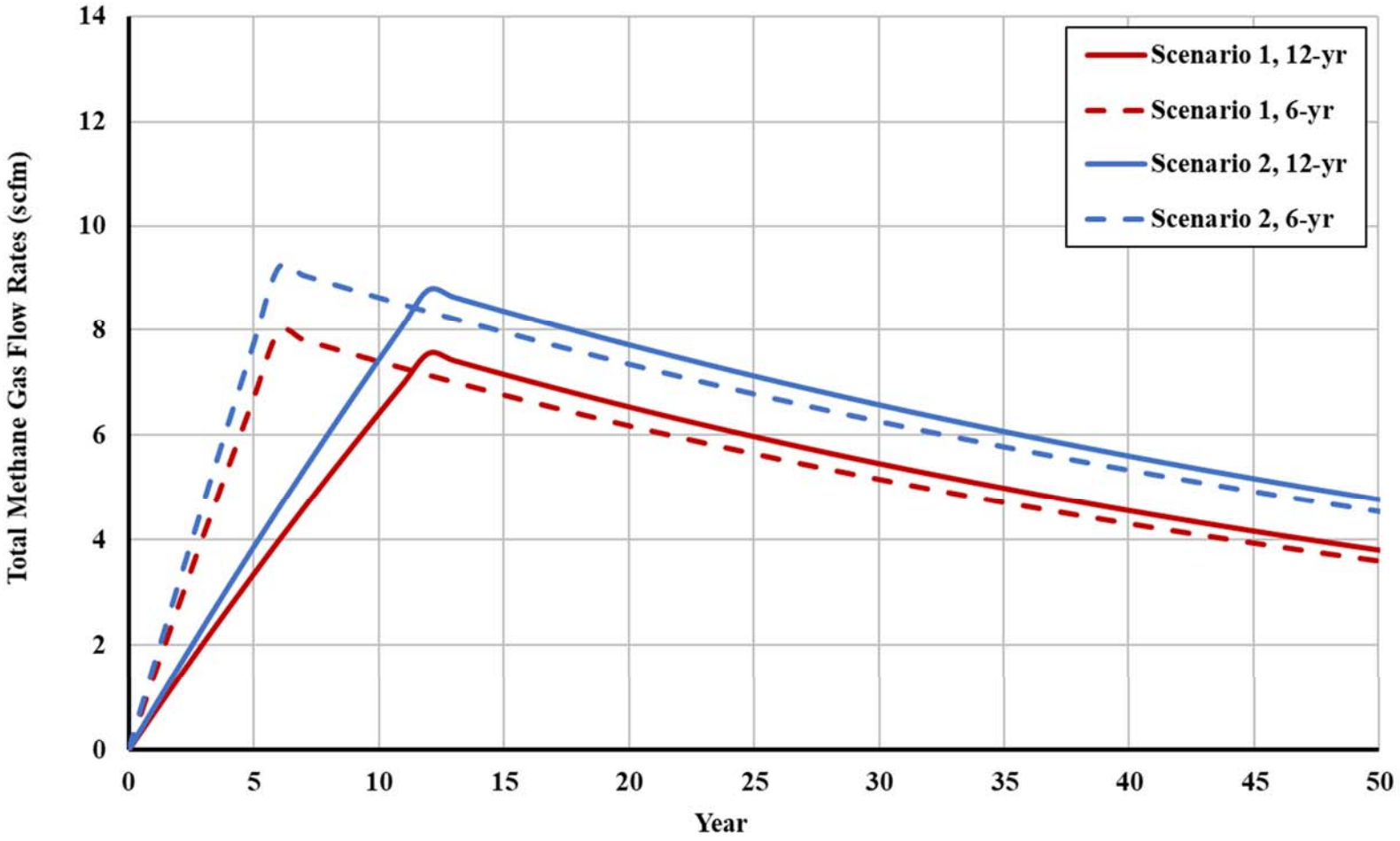


Figure 3-2: Comparison of Modeled Methane Gas Flow Rates

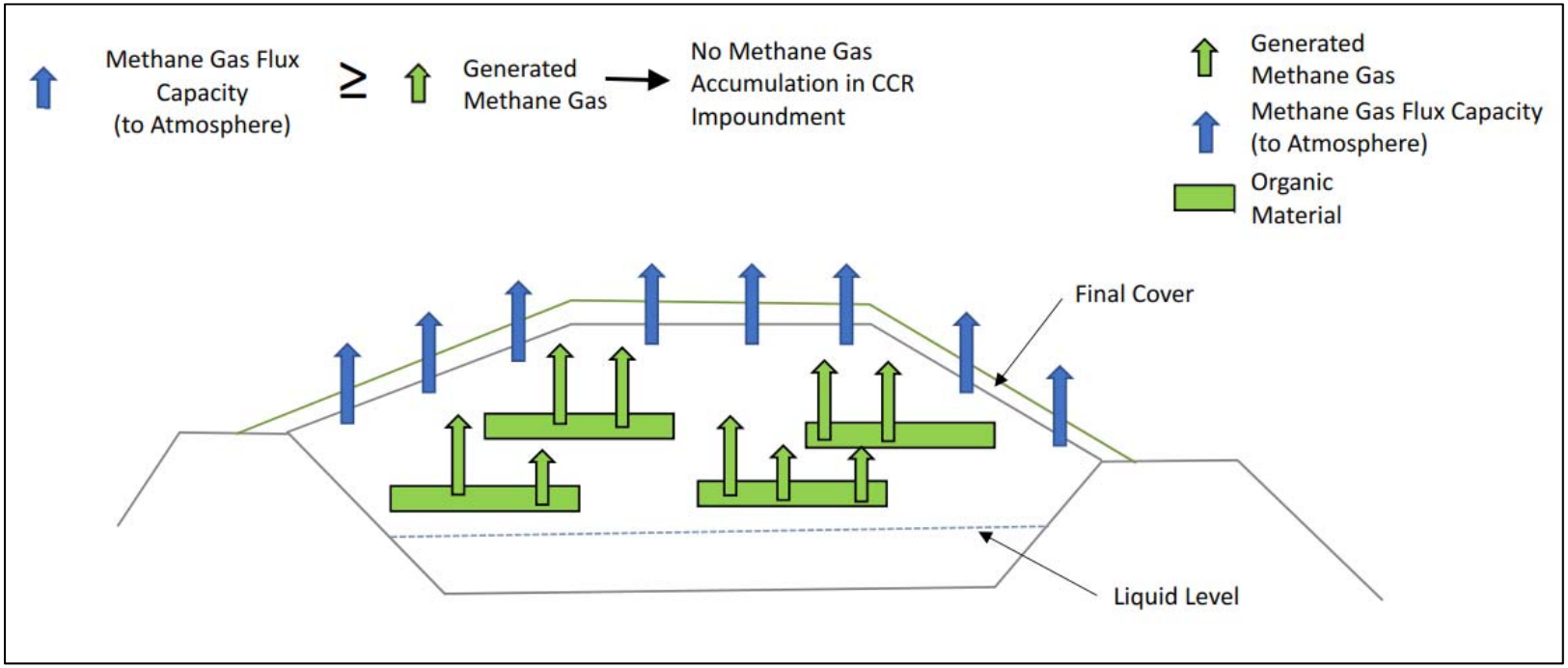


Figure 4-1: Methane Generation and Emission Conceptual Site Model

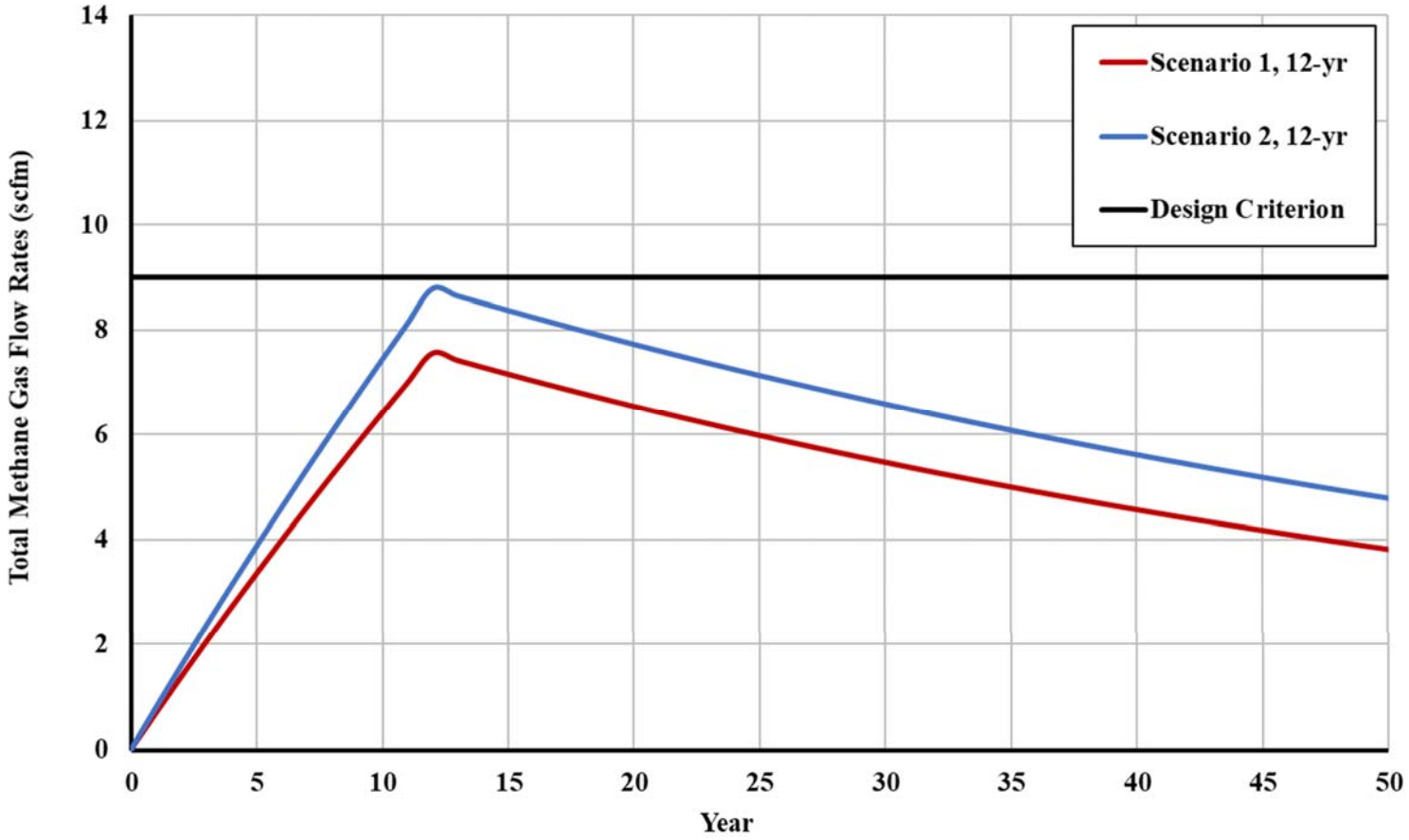


Figure 4-2: Comparsion of Modeled Methane Gas Flow Rates with the Design Criterion for 12-Year Disposal Duration

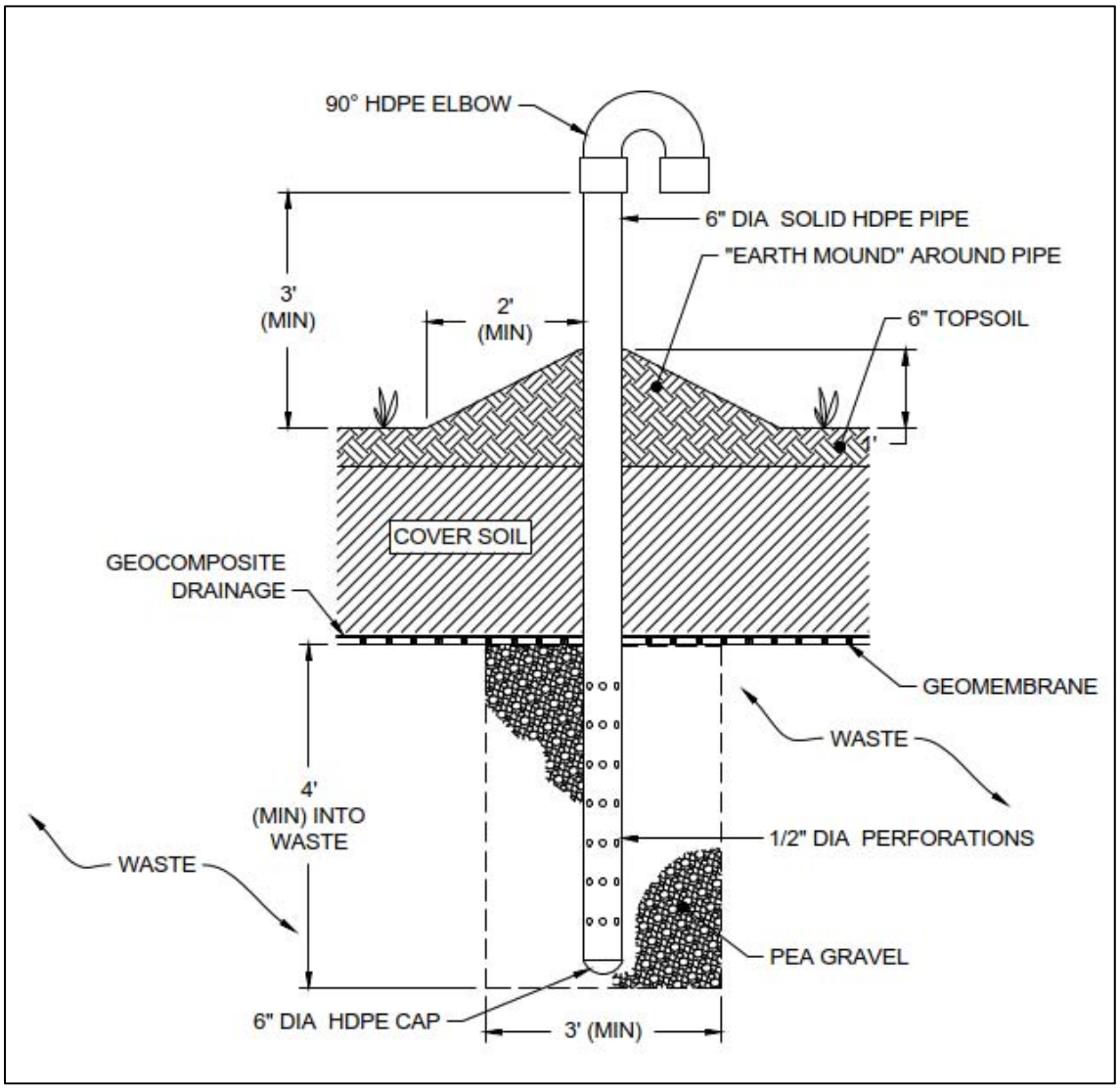


Figure 4-3: Passive Gas Venting System

Notes:
1. Not to Scale
2. For discussion purposes only and not intended for construction.

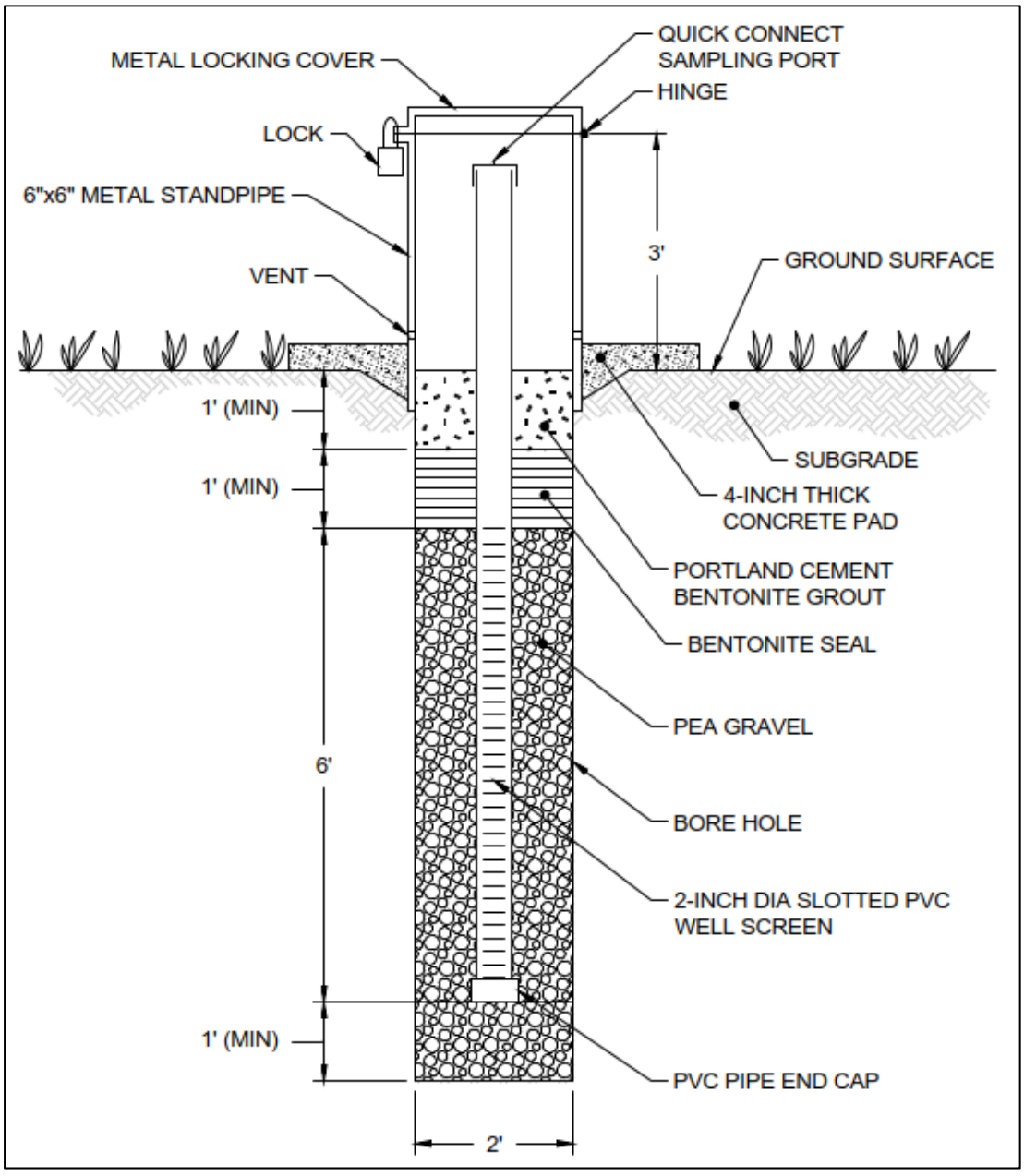


Figure 4-4: Below Grade Gas Monitoring Probe

Notes:
1. Not to Scale
2. For discussion purposes only and not intended for construction.

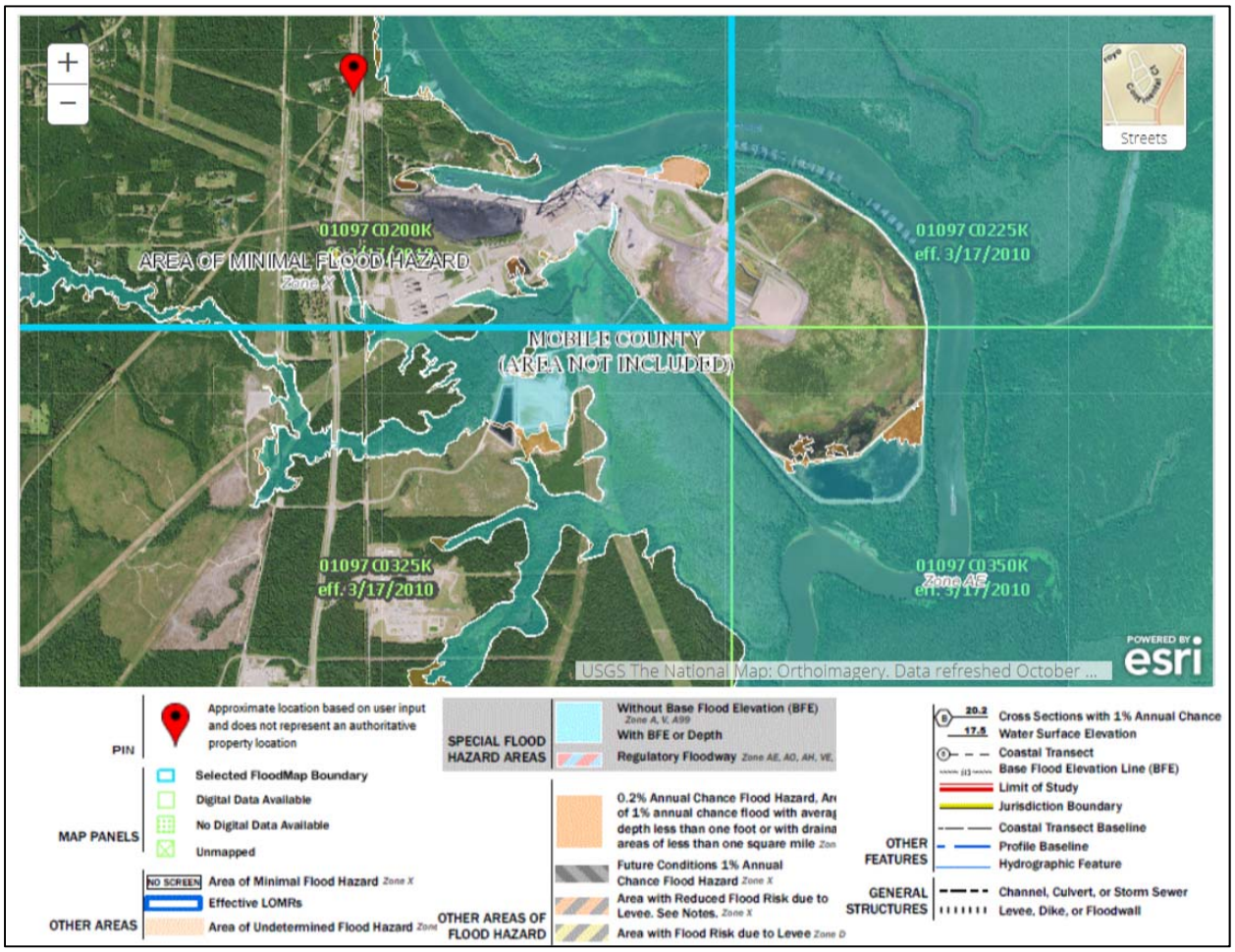


Figure 5-1: 100-Year Floodplain Location around the Ash Pond (after FEMA, 2018)

APPENDIX A
Gas Generation Modeling

Summary Report

Landfill Name or Identifier: Plant Barry CCR Closure

Date: Monday, October 1, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation ($m^3/year$)
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate ($year^{-1}$)
L_o = potential methane generation capacity (m^3/Mg)
M_i = mass of waste accepted in the ith year (Mg)
t_{ij} = age of the jth section of waste mass M_i accepted in the ith year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2019**	
Landfill Closure Year (with 80-year limit)	**2030**	
Actual Closure Year (without limit)	***2030***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity	**72,900**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.018**	$year^{-1}$
Potential Methane Generation Capacity, L_o	**105**	m^3/Mg
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**NMOC**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2019	5,523	6,075	0	0
2020	5,523	6,075	5,523	6,075
2021	5,523	6,075	11,045	12,150
2022	5,523	6,075	16,568	18,225
2023	5,523	6,075	22,091	24,300
2024	5,523	6,075	27,614	30,375
2025	5,523	6,075	33,136	36,450
2026	5,523	6,075	38,659	42,525
2027	5,523	6,075	44,182	48,600
2028	5,523	6,075	49,705	54,675
2029	5,523	6,075	55,227	60,750
2030	5,523	6,075	60,750	66,825
2031	0	0	66,273	72,900
2032	0	0	66,273	72,900
2033	0	0	66,273	72,900
2034	0	0	66,273	72,900
2035	0	0	66,273	72,900
2036	0	0	66,273	72,900
2037	0	0	66,273	72,900
2038	0	0	66,273	72,900
2039	0	0	66,273	72,900
2040	0	0	66,273	72,900
2041	0	0	66,273	72,900
2042	0	0	66,273	72,900
2043	0	0	66,273	72,900
2044	0	0	66,273	72,900
2045	0	0	66,273	72,900
2046	0	0	66,273	72,900
2047	0	0	66,273	72,900
2048	0	0	66,273	72,900
2049	0	0	66,273	72,900
2050	0	0	66,273	72,900
2051	0	0	66,273	72,900
2052	0	0	66,273	72,900
2053	0	0	66,273	72,900
2054	0	0	66,273	72,900
2055	0	0	66,273	72,900
2056	0	0	66,273	72,900
2057	0	0	66,273	72,900
2058	0	0	66,273	72,900

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2059	0	0	66,273	72,900
2060	0	0	66,273	72,900
2061	0	0	66,273	72,900
2062	0	0	66,273	72,900
2063	0	0	66,273	72,900
2064	0	0	66,273	72,900
2065	0	0	66,273	72,900
2066	0	0	66,273	72,900
2067	0	0	66,273	72,900
2068	0	0	66,273	72,900
2069	0	0	66,273	72,900
2070	0	0	66,273	72,900
2071	0	0	66,273	72,900
2072	0	0	66,273	72,900
2073	0	0	66,273	72,900
2074	0	0	66,273	72,900
2075	0	0	66,273	72,900
2076	0	0	66,273	72,900
2077	0	0	66,273	72,900
2078	0	0	66,273	72,900
2079	0	0	66,273	72,900
2080	0	0	66,273	72,900
2081	0	0	66,273	72,900
2082	0	0	66,273	72,900
2083	0	0	66,273	72,900
2084	0	0	66,273	72,900
2085	0	0	66,273	72,900
2086	0	0	66,273	72,900
2087	0	0	66,273	72,900
2088	0	0	66,273	72,900
2089	0	0	66,273	72,900
2090	0	0	66,273	72,900
2091	0	0	66,273	72,900
2092	0	0	66,273	72,900
2093	0	0	66,273	72,900
2094	0	0	66,273	72,900
2095	0	0	66,273	72,900
2096	0	0	66,273	72,900
2097	0	0	66,273	72,900
2098	0	0	66,273	72,900

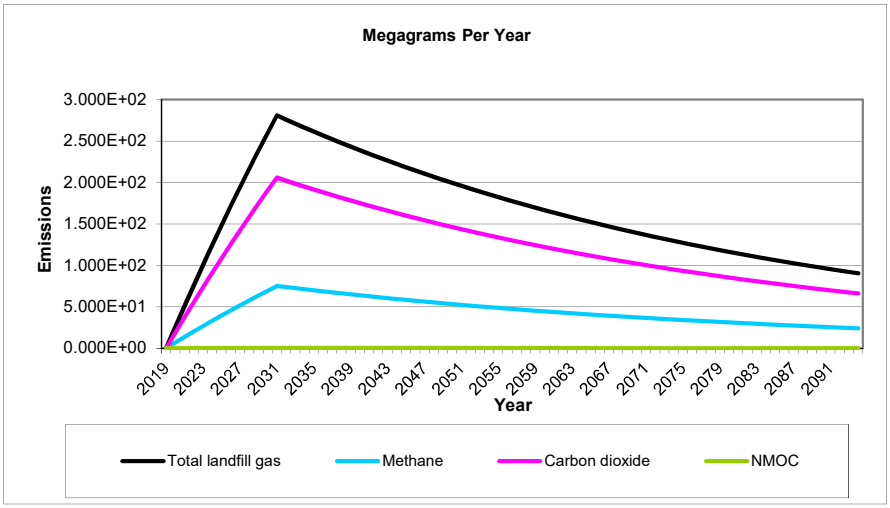
Pollutant Parameters

		Gas / Pollutant Default Parameters:		*User-specified Pollutant Parameters:*	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11		
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84		
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39		
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

Pollutant Parameters (Continued)

		Gas / Pollutant Default Parameters:		*User-specified Pollutant Parameters:*	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88		
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08		
	Mercury (total) - HAP	2.9E-04	200.61		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83		
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40		
	Vinyl chloride - HAP/VOC	7.3	62.50		
	Xylenes - HAP/VOC	12	106.16		

Graphs


Megagrams Per Year
Emissions
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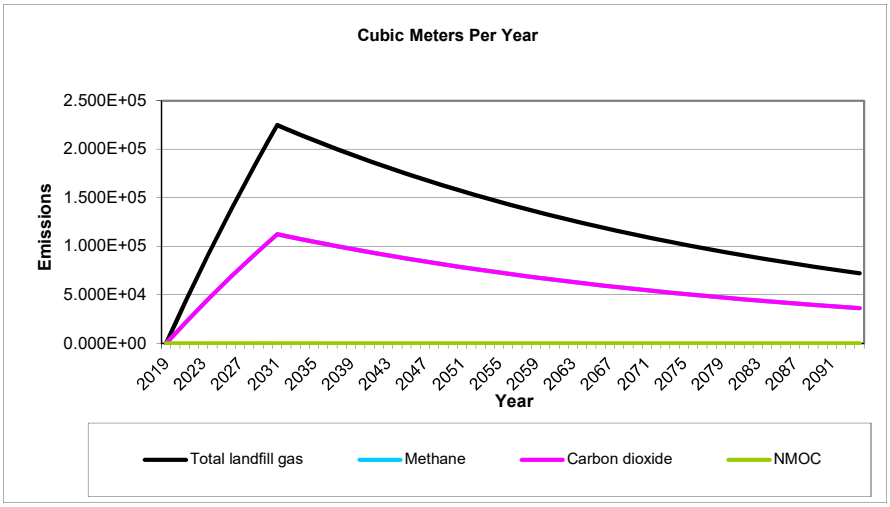
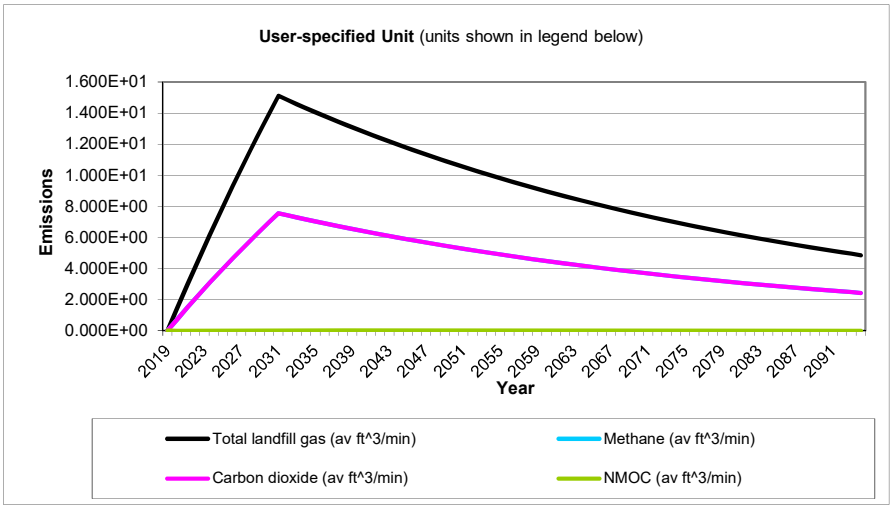
2.500E+02
2.000E+02
1.500E+02
1.000E+02
5.000E+01
0.000E+00
2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059 2063 2067 2071 2075 2079 2083 2087 2091
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


Cubic Meters Per Year
Emissions
2.500E+05
2.000E+05
1.500E+05
1.000E+05
5.000E+04
0.000E+00
2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059 2063 2067 2071 2075 2079 2083 2087 2091
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


User-specified Unit (units shown in legend below)
Emissions
1.600E+01
1.400E+01
1.200E+01
1.000E+01
8.000E+00
6.000E+00
4.000E+00
2.000E+00
0.000E+00
2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059 2063 2067 2071 2075 2079 2083 2087 2091
Year
Total landfill gas (av ft^3/min)
Methane (av ft^3/min)
Carbon dioxide (av ft^3/min)
NMOC (av ft^3/min)

Results

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2019	0	0	0	0	0	0
2020	2.579E+01	2.065E+04	1.387E+00	6.888E+00	1.032E+04	6.937E-01
2021	5.111E+01	4.093E+04	2.750E+00	1.365E+01	2.046E+04	1.375E+00
2022	7.599E+01	6.085E+04	4.088E+00	2.030E+01	3.042E+04	2.044E+00
2023	1.004E+02	8.041E+04	5.403E+00	2.682E+01	4.021E+04	2.701E+00
2024	1.244E+02	9.962E+04	6.694E+00	3.323E+01	4.981E+04	3.347E+00
2025	1.480E+02	1.185E+05	7.962E+00	3.953E+01	5.925E+04	3.981E+00
2026	1.711E+02	1.370E+05	9.207E+00	4.571E+01	6.852E+04	4.604E+00
2027	1.939E+02	1.552E+05	1.043E+01	5.178E+01	7.762E+04	5.215E+00
2028	2.162E+02	1.731E+05	1.163E+01	5.775E+01	8.656E+04	5.816E+00
2029	2.381E+02	1.907E+05	1.281E+01	6.360E+01	9.534E+04	6.406E+00
2030	2.597E+02	2.079E+05	1.397E+01	6.936E+01	1.040E+05	6.985E+00
2031	2.808E+02	2.249E+05	1.511E+01	7.501E+01	1.124E+05	7.554E+00
2032	2.758E+02	2.209E+05	1.484E+01	7.367E+01	1.104E+05	7.419E+00
2033	2.709E+02	2.169E+05	1.457E+01	7.236E+01	1.085E+05	7.287E+00
2034	2.661E+02	2.130E+05	1.431E+01	7.106E+01	1.065E+05	7.157E+00
2035	2.613E+02	2.092E+05	1.406E+01	6.980E+01	1.046E+05	7.029E+00
2036	2.566E+02	2.055E+05	1.381E+01	6.855E+01	1.028E+05	6.904E+00
2037	2.521E+02	2.018E+05	1.356E+01	6.733E+01	1.009E+05	6.781E+00
2038	2.476E+02	1.982E+05	1.332E+01	6.613E+01	9.912E+04	6.660E+00
2039	2.432E+02	1.947E+05	1.308E+01	6.495E+01	9.735E+04	6.541E+00
2040	2.388E+02	1.912E+05	1.285E+01	6.379E+01	9.562E+04	6.424E+00
2041	2.346E+02	1.878E+05	1.262E+01	6.265E+01	9.391E+04	6.310E+00
2042	2.304E+02	1.845E+05	1.239E+01	6.153E+01	9.223E+04	6.197E+00
2043	2.263E+02	1.812E+05	1.217E+01	6.044E+01	9.059E+04	6.087E+00
2044	2.222E+02	1.779E+05	1.196E+01	5.936E+01	8.897E+04	5.978E+00
2045	2.183E+02	1.748E+05	1.174E+01	5.830E+01	8.739E+04	5.871E+00
2046	2.144E+02	1.717E+05	1.153E+01	5.726E+01	8.583E+04	5.767E+00
2047	2.105E+02	1.686E+05	1.133E+01	5.624E+01	8.430E+04	5.664E+00
2048	2.068E+02	1.656E+05	1.113E+01	5.523E+01	8.279E+04	5.563E+00
2049	2.031E+02	1.626E+05	1.093E+01	5.425E+01	8.132E+04	5.464E+00
2050	1.995E+02	1.597E+05	1.073E+01	5.328E+01	7.986E+04	5.366E+00
2051	1.959E+02	1.569E+05	1.054E+01	5.233E+01	7.844E+04	5.270E+00
2052	1.924E+02	1.541E+05	1.035E+01	5.140E+01	7.704E+04	5.176E+00
2053	1.890E+02	1.513E+05	1.017E+01	5.048E+01	7.567E+04	5.084E+00
2054	1.856E+02	1.486E+05	9.987E+00	4.958E+01	7.432E+04	4.993E+00
2055	1.823E+02	1.460E+05	9.809E+00	4.870E+01	7.299E+04	4.904E+00
2056	1.791E+02	1.434E+05	9.634E+00	4.783E+01	7.169E+04	4.817E+00
2057	1.759E+02	1.408E+05	9.462E+00	4.697E+01	7.041E+04	4.731E+00
2058	1.727E+02	1.383E+05	9.293E+00	4.614E+01	6.915E+04	4.646E+00
2059	1.696E+02	1.358E+05	9.127E+00	4.531E+01	6.792E+04	4.564E+00
2060	1.666E+02	1.334E+05	8.964E+00	4.450E+01	6.671E+04	4.482E+00
2061	1.636E+02	1.310E+05	8.804E+00	4.371E+01	6.552E+04	4.402E+00
2062	1.607E+02	1.287E+05	8.647E+00	4.293E+01	6.435E+04	4.324E+00
2063	1.579E+02	1.264E+05	8.493E+00	4.217E+01	6.320E+04	4.247E+00
2064	1.550E+02	1.241E+05	8.342E+00	4.141E+01	6.207E+04	4.171E+00
2065	1.523E+02	1.219E+05	8.193E+00	4.067E+01	6.097E+04	4.096E+00
2066	1.496E+02	1.198E+05	8.047E+00	3.995E+01	5.988E+04	4.023E+00
2067	1.469E+02	1.176E+05	7.903E+00	3.924E+01	5.881E+04	3.952E+00
2068	1.443E+02	1.155E+05	7.762E+00	3.854E+01	5.776E+04	3.881E+00

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2069	1.417E+02	1.135E+05	7.624E+00	3.785E+01	5.673E+04	3.812E+00
2070	1.392E+02	1.114E+05	7.488E+00	3.717E+01	5.572E+04	3.744E+00
2071	1.367E+02	1.095E+05	7.354E+00	3.651E+01	5.473E+04	3.677E+00
2072	1.342E+02	1.075E+05	7.223E+00	3.586E+01	5.375E+04	3.611E+00
2073	1.319E+02	1.056E+05	7.094E+00	3.522E+01	5.279E+04	3.547E+00
2074	1.295E+02	1.037E+05	6.967E+00	3.459E+01	5.185E+04	3.484E+00
2075	1.272E+02	1.018E+05	6.843E+00	3.397E+01	5.092E+04	3.422E+00
2076	1.249E+02	1.000E+05	6.721E+00	3.337E+01	5.002E+04	3.361E+00
2077	1.227E+02	9.825E+04	6.601E+00	3.277E+01	4.912E+04	3.301E+00
2078	1.205E+02	9.649E+04	6.483E+00	3.219E+01	4.825E+04	3.242E+00
2079	1.184E+02	9.477E+04	6.368E+00	3.161E+01	4.739E+04	3.184E+00
2080	1.162E+02	9.308E+04	6.254E+00	3.105E+01	4.654E+04	3.127E+00
2081	1.142E+02	9.142E+04	6.143E+00	3.050E+01	4.571E+04	3.071E+00
2082	1.121E+02	8.979E+04	6.033E+00	2.995E+01	4.490E+04	3.017E+00
2083	1.101E+02	8.819E+04	5.925E+00	2.942E+01	4.409E+04	2.963E+00
2084	1.082E+02	8.662E+04	5.820E+00	2.889E+01	4.331E+04	2.910E+00
2085	1.062E+02	8.507E+04	5.716E+00	2.838E+01	4.254E+04	2.858E+00
2086	1.043E+02	8.355E+04	5.614E+00	2.787E+01	4.178E+04	2.807E+00
2087	1.025E+02	8.206E+04	5.514E+00	2.737E+01	4.103E+04	2.757E+00
2088	1.007E+02	8.060E+04	5.415E+00	2.689E+01	4.030E+04	2.708E+00
2089	9.886E+01	7.916E+04	5.319E+00	2.641E+01	3.958E+04	2.659E+00
2090	9.709E+01	7.775E+04	5.224E+00	2.594E+01	3.887E+04	2.612E+00
2091	9.536E+01	7.636E+04	5.131E+00	2.547E+01	3.818E+04	2.565E+00
2092	9.366E+01	7.500E+04	5.039E+00	2.502E+01	3.750E+04	2.520E+00
2093	9.199E+01	7.366E+04	4.949E+00	2.457E+01	3.683E+04	2.475E+00
2094	9.035E+01	7.235E+04	4.861E+00	2.413E+01	3.617E+04	2.431E+00
2095	8.874E+01	7.106E+04	4.774E+00	2.370E+01	3.553E+04	2.387E+00
2096	8.715E+01	6.979E+04	4.689E+00	2.328E+01	3.489E+04	2.345E+00
2097	8.560E+01	6.854E+04	4.606E+00	2.286E+01	3.427E+04	2.303E+00
2098	8.407E+01	6.732E+04	4.523E+00	2.246E+01	3.366E+04	2.262E+00
2099	8.257E+01	6.612E+04	4.443E+00	2.206E+01	3.306E+04	2.221E+00
2100	8.110E+01	6.494E+04	4.363E+00	2.166E+01	3.247E+04	2.182E+00
2101	7.965E+01	6.378E+04	4.286E+00	2.128E+01	3.189E+04	2.143E+00
2102	7.823E+01	6.265E+04	4.209E+00	2.090E+01	3.132E+04	2.105E+00
2103	7.684E+01	6.153E+04	4.134E+00	2.052E+01	3.076E+04	2.067E+00
2104	7.547E+01	6.043E+04	4.060E+00	2.016E+01	3.021E+04	2.030E+00
2105	7.412E+01	5.935E+04	3.988E+00	1.980E+01	2.968E+04	1.994E+00
2106	7.280E+01	5.829E+04	3.917E+00	1.945E+01	2.915E+04	1.958E+00
2107	7.150E+01	5.725E+04	3.847E+00	1.910E+01	2.863E+04	1.923E+00
2108	7.022E+01	5.623E+04	3.778E+00	1.876E+01	2.812E+04	1.889E+00
2109	6.897E+01	5.523E+04	3.711E+00	1.842E+01	2.761E+04	1.855E+00
2110	6.774E+01	5.424E+04	3.645E+00	1.809E+01	2.712E+04	1.822E+00
2111	6.653E+01	5.328E+04	3.580E+00	1.777E+01	2.664E+04	1.790E+00
2112	6.535E+01	5.233E+04	3.516E+00	1.745E+01	2.616E+04	1.758E+00
2113	6.418E+01	5.139E+04	3.453E+00	1.714E+01	2.570E+04	1.727E+00
2114	6.303E+01	5.048E+04	3.391E+00	1.684E+01	2.524E+04	1.696E+00
2115	6.191E+01	4.957E+04	3.331E+00	1.654E+01	2.479E+04	1.665E+00
2116	6.081E+01	4.869E+04	3.272E+00	1.624E+01	2.435E+04	1.636E+00
2117	5.972E+01	4.782E+04	3.213E+00	1.595E+01	2.391E+04	1.607E+00
2118	5.866E+01	4.697E+04	3.156E+00	1.567E+01	2.348E+04	1.578E+00
2119	5.761E+01	4.613E+04	3.100E+00	1.539E+01	2.307E+04	1.550E+00

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2120	5.658E+01	4.531E+04	3.044E+00	1.511E+01	2.265E+04	1.522E+00
2121	5.557E+01	4.450E+04	2.990E+00	1.484E+01	2.225E+04	1.495E+00
2122	5.458E+01	4.371E+04	2.937E+00	1.458E+01	2.185E+04	1.468E+00
2123	5.361E+01	4.293E+04	2.884E+00	1.432E+01	2.146E+04	1.442E+00
2124	5.265E+01	4.216E+04	2.833E+00	1.406E+01	2.108E+04	1.416E+00
2125	5.171E+01	4.141E+04	2.782E+00	1.381E+01	2.070E+04	1.391E+00
2126	5.079E+01	4.067E+04	2.733E+00	1.357E+01	2.033E+04	1.366E+00
2127	4.988E+01	3.994E+04	2.684E+00	1.332E+01	1.997E+04	1.342E+00
2128	4.899E+01	3.923E+04	2.636E+00	1.309E+01	1.962E+04	1.318E+00
2129	4.812E+01	3.853E+04	2.589E+00	1.285E+01	1.927E+04	1.294E+00
2130	4.726E+01	3.784E+04	2.543E+00	1.262E+01	1.892E+04	1.271E+00
2131	4.642E+01	3.717E+04	2.497E+00	1.240E+01	1.858E+04	1.249E+00
2132	4.559E+01	3.651E+04	2.453E+00	1.218E+01	1.825E+04	1.226E+00
2133	4.478E+01	3.586E+04	2.409E+00	1.196E+01	1.793E+04	1.205E+00
2134	4.398E+01	3.522E+04	2.366E+00	1.175E+01	1.761E+04	1.183E+00
2135	4.319E+01	3.459E+04	2.324E+00	1.154E+01	1.729E+04	1.162E+00
2136	4.242E+01	3.397E+04	2.282E+00	1.133E+01	1.699E+04	1.141E+00
2137	4.167E+01	3.336E+04	2.242E+00	1.113E+01	1.668E+04	1.121E+00
2138	4.092E+01	3.277E+04	2.202E+00	1.093E+01	1.638E+04	1.101E+00
2139	4.019E+01	3.218E+04	2.162E+00	1.074E+01	1.609E+04	1.081E+00
2140	3.948E+01	3.161E+04	2.124E+00	1.054E+01	1.581E+04	1.062E+00
2141	3.877E+01	3.105E+04	2.086E+00	1.036E+01	1.552E+04	1.043E+00
2142	3.808E+01	3.049E+04	2.049E+00	1.017E+01	1.525E+04	1.024E+00
2143	3.740E+01	2.995E+04	2.012E+00	9.990E+00	1.497E+04	1.006E+00
2144	3.673E+01	2.941E+04	1.976E+00	9.812E+00	1.471E+04	9.882E-01
2145	3.608E+01	2.889E+04	1.941E+00	9.637E+00	1.444E+04	9.705E-01
2146	3.543E+01	2.837E+04	1.906E+00	9.465E+00	1.419E+04	9.532E-01
2147	3.480E+01	2.787E+04	1.872E+00	9.296E+00	1.393E+04	9.362E-01
2148	3.418E+01	2.737E+04	1.839E+00	9.130E+00	1.369E+04	9.195E-01
2149	3.357E+01	2.688E+04	1.806E+00	8.967E+00	1.344E+04	9.031E-01
2150	3.297E+01	2.640E+04	1.774E+00	8.807E+00	1.320E+04	8.870E-01
2151	3.238E+01	2.593E+04	1.742E+00	8.650E+00	1.297E+04	8.712E-01
2152	3.181E+01	2.547E+04	1.711E+00	8.496E+00	1.273E+04	8.556E-01
2153	3.124E+01	2.502E+04	1.681E+00	8.344E+00	1.251E+04	8.404E-01
2154	3.068E+01	2.457E+04	1.651E+00	8.196E+00	1.228E+04	8.254E-01
2155	3.013E+01	2.413E+04	1.621E+00	8.049E+00	1.207E+04	8.107E-01
2156	2.960E+01	2.370E+04	1.592E+00	7.906E+00	1.185E+04	7.962E-01
2157	2.907E+01	2.328E+04	1.564E+00	7.765E+00	1.164E+04	7.820E-01
2158	2.855E+01	2.286E+04	1.536E+00	7.626E+00	1.143E+04	7.681E-01
2159	2.804E+01	2.245E+04	1.509E+00	7.490E+00	1.123E+04	7.544E-01

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2019	0	0	0	0	0	0
2020	1.890E+01	1.032E+04	6.937E-01	4.441E-02	1.239E+01	8.324E-04
2021	3.746E+01	2.046E+04	1.375E+00	8.802E-02	2.456E+01	1.650E-03
2022	5.569E+01	3.042E+04	2.044E+00	1.309E-01	3.651E+01	2.453E-03
2023	7.360E+01	4.021E+04	2.701E+00	1.729E-01	4.825E+01	3.242E-03
2024	9.118E+01	4.981E+04	3.347E+00	2.143E-01	5.977E+01	4.016E-03
2025	1.085E+02	5.925E+04	3.981E+00	2.548E-01	7.110E+01	4.777E-03
2026	1.254E+02	6.852E+04	4.604E+00	2.947E-01	8.222E+01	5.524E-03
2027	1.421E+02	7.762E+04	5.215E+00	3.339E-01	9.314E+01	6.258E-03
2028	1.584E+02	8.656E+04	5.816E+00	3.723E-01	1.039E+02	6.979E-03
2029	1.745E+02	9.534E+04	6.406E+00	4.101E-01	1.144E+02	7.687E-03
2030	1.903E+02	1.040E+05	6.985E+00	4.472E-01	1.248E+02	8.382E-03
2031	2.058E+02	1.124E+05	7.554E+00	4.836E-01	1.349E+02	9.065E-03
2032	2.021E+02	1.104E+05	7.419E+00	4.750E-01	1.325E+02	8.903E-03
2033	1.985E+02	1.085E+05	7.287E+00	4.665E-01	1.301E+02	8.745E-03
2034	1.950E+02	1.065E+05	7.157E+00	4.582E-01	1.278E+02	8.589E-03
2035	1.915E+02	1.046E+05	7.029E+00	4.500E-01	1.255E+02	8.435E-03
2036	1.881E+02	1.028E+05	6.904E+00	4.420E-01	1.233E+02	8.285E-03
2037	1.847E+02	1.009E+05	6.781E+00	4.341E-01	1.211E+02	8.137E-03
2038	1.814E+02	9.912E+04	6.660E+00	4.264E-01	1.189E+02	7.992E-03
2039	1.782E+02	9.735E+04	6.541E+00	4.187E-01	1.168E+02	7.849E-03
2040	1.750E+02	9.562E+04	6.424E+00	4.113E-01	1.147E+02	7.709E-03
2041	1.719E+02	9.391E+04	6.310E+00	4.039E-01	1.127E+02	7.572E-03
2042	1.688E+02	9.223E+04	6.197E+00	3.967E-01	1.107E+02	7.437E-03
2043	1.658E+02	9.059E+04	6.087E+00	3.897E-01	1.087E+02	7.304E-03
2044	1.629E+02	8.897E+04	5.978E+00	3.827E-01	1.068E+02	7.174E-03
2045	1.600E+02	8.739E+04	5.871E+00	3.759E-01	1.049E+02	7.046E-03
2046	1.571E+02	8.583E+04	5.767E+00	3.692E-01	1.030E+02	6.920E-03
2047	1.543E+02	8.430E+04	5.664E+00	3.626E-01	1.012E+02	6.797E-03
2048	1.516E+02	8.279E+04	5.563E+00	3.561E-01	9.935E+01	6.675E-03
2049	1.488E+02	8.132E+04	5.464E+00	3.498E-01	9.758E+01	6.556E-03
2050	1.462E+02	7.986E+04	5.366E+00	3.435E-01	9.584E+01	6.439E-03
2051	1.436E+02	7.844E+04	5.270E+00	3.374E-01	9.413E+01	6.324E-03
2052	1.410E+02	7.704E+04	5.176E+00	3.314E-01	9.245E+01	6.212E-03
2053	1.385E+02	7.567E+04	5.084E+00	3.255E-01	9.080E+01	6.101E-03
2054	1.360E+02	7.432E+04	4.993E+00	3.197E-01	8.918E+01	5.992E-03
2055	1.336E+02	7.299E+04	4.904E+00	3.140E-01	8.759E+01	5.885E-03
2056	1.312E+02	7.169E+04	4.817E+00	3.084E-01	8.603E+01	5.780E-03
2057	1.289E+02	7.041E+04	4.731E+00	3.029E-01	8.449E+01	5.677E-03
2058	1.266E+02	6.915E+04	4.646E+00	2.975E-01	8.298E+01	5.576E-03
2059	1.243E+02	6.792E+04	4.564E+00	2.922E-01	8.150E+01	5.476E-03
2060	1.221E+02	6.671E+04	4.482E+00	2.869E-01	8.005E+01	5.379E-03
2061	1.199E+02	6.552E+04	4.402E+00	2.818E-01	7.862E+01	5.283E-03
2062	1.178E+02	6.435E+04	4.324E+00	2.768E-01	7.722E+01	5.188E-03
2063	1.157E+02	6.320E+04	4.247E+00	2.719E-01	7.584E+01	5.096E-03
2064	1.136E+02	6.207E+04	4.171E+00	2.670E-01	7.449E+01	5.005E-03
2065	1.116E+02	6.097E+04	4.096E+00	2.622E-01	7.316E+01	4.916E-03
2066	1.096E+02	5.988E+04	4.023E+00	2.576E-01	7.186E+01	4.828E-03
2067	1.077E+02	5.881E+04	3.952E+00	2.530E-01	7.057E+01	4.742E-03
2068	1.057E+02	5.776E+04	3.881E+00	2.485E-01	6.931E+01	4.657E-03

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2069	1.038E+02	5.673E+04	3.812E+00	2.440E-01	6.808E+01	4.574E-03
2070	1.020E+02	5.572E+04	3.744E+00	2.397E-01	6.686E+01	4.493E-03
2071	1.002E+02	5.473E+04	3.677E+00	2.354E-01	6.567E+01	4.412E-03
2072	9.839E+01	5.375E+04	3.611E+00	2.312E-01	6.450E+01	4.334E-03
2073	9.663E+01	5.279E+04	3.547E+00	2.271E-01	6.335E+01	4.256E-03
2074	9.491E+01	5.185E+04	3.484E+00	2.230E-01	6.222E+01	4.180E-03
2075	9.322E+01	5.092E+04	3.422E+00	2.190E-01	6.111E+01	4.106E-03
2076	9.155E+01	5.002E+04	3.361E+00	2.151E-01	6.002E+01	4.033E-03
2077	8.992E+01	4.912E+04	3.301E+00	2.113E-01	5.895E+01	3.961E-03
2078	8.832E+01	4.825E+04	3.242E+00	2.075E-01	5.790E+01	3.890E-03
2079	8.674E+01	4.739E+04	3.184E+00	2.038E-01	5.686E+01	3.821E-03
2080	8.519E+01	4.654E+04	3.127E+00	2.002E-01	5.585E+01	3.753E-03
2081	8.367E+01	4.571E+04	3.071E+00	1.966E-01	5.485E+01	3.686E-03
2082	8.218E+01	4.490E+04	3.017E+00	1.931E-01	5.387E+01	3.620E-03
2083	8.072E+01	4.409E+04	2.963E+00	1.897E-01	5.291E+01	3.555E-03
2084	7.928E+01	4.331E+04	2.910E+00	1.863E-01	5.197E+01	3.492E-03
2085	7.786E+01	4.254E+04	2.858E+00	1.830E-01	5.104E+01	3.430E-03
2086	7.647E+01	4.178E+04	2.807E+00	1.797E-01	5.013E+01	3.368E-03
2087	7.511E+01	4.103E+04	2.757E+00	1.765E-01	4.924E+01	3.308E-03
2088	7.377E+01	4.030E+04	2.708E+00	1.733E-01	4.836E+01	3.249E-03
2089	7.245E+01	3.958E+04	2.659E+00	1.703E-01	4.750E+01	3.191E-03
2090	7.116E+01	3.887E+04	2.612E+00	1.672E-01	4.665E+01	3.134E-03
2091	6.989E+01	3.818E+04	2.565E+00	1.642E-01	4.582E+01	3.078E-03
2092	6.864E+01	3.750E+04	2.520E+00	1.613E-01	4.500E+01	3.024E-03
2093	6.742E+01	3.683E+04	2.475E+00	1.584E-01	4.420E+01	2.970E-03
2094	6.622E+01	3.617E+04	2.431E+00	1.556E-01	4.341E+01	2.917E-03
2095	6.504E+01	3.553E+04	2.387E+00	1.528E-01	4.263E+01	2.865E-03
2096	6.387E+01	3.489E+04	2.345E+00	1.501E-01	4.187E+01	2.813E-03
2097	6.274E+01	3.427E+04	2.303E+00	1.474E-01	4.113E+01	2.763E-03
2098	6.162E+01	3.366E+04	2.262E+00	1.448E-01	4.039E+01	2.714E-03
2099	6.052E+01	3.306E+04	2.221E+00	1.422E-01	3.967E+01	2.666E-03
2100	5.944E+01	3.247E+04	2.182E+00	1.397E-01	3.896E+01	2.618E-03
2101	5.838E+01	3.189E+04	2.143E+00	1.372E-01	3.827E+01	2.571E-03
2102	5.734E+01	3.132E+04	2.105E+00	1.347E-01	3.759E+01	2.525E-03
2103	5.631E+01	3.076E+04	2.067E+00	1.323E-01	3.692E+01	2.480E-03
2104	5.531E+01	3.021E+04	2.030E+00	1.300E-01	3.626E+01	2.436E-03
2105	5.432E+01	2.968E+04	1.994E+00	1.276E-01	3.561E+01	2.393E-03
2106	5.335E+01	2.915E+04	1.958E+00	1.254E-01	3.498E+01	2.350E-03
2107	5.240E+01	2.863E+04	1.923E+00	1.231E-01	3.435E+01	2.308E-03
2108	5.147E+01	2.812E+04	1.889E+00	1.209E-01	3.374E+01	2.267E-03
2109	5.055E+01	2.761E+04	1.855E+00	1.188E-01	3.314E+01	2.226E-03
2110	4.965E+01	2.712E+04	1.822E+00	1.167E-01	3.255E+01	2.187E-03
2111	4.876E+01	2.664E+04	1.790E+00	1.146E-01	3.197E+01	2.148E-03
2112	4.789E+01	2.616E+04	1.758E+00	1.125E-01	3.140E+01	2.109E-03
2113	4.704E+01	2.570E+04	1.727E+00	1.105E-01	3.084E+01	2.072E-03
2114	4.620E+01	2.524E+04	1.696E+00	1.086E-01	3.029E+01	2.035E-03
2115	4.537E+01	2.479E+04	1.665E+00	1.066E-01	2.974E+01	1.999E-03
2116	4.456E+01	2.435E+04	1.636E+00	1.047E-01	2.921E+01	1.963E-03
2117	4.377E+01	2.391E+04	1.607E+00	1.028E-01	2.869E+01	1.928E-03
2118	4.299E+01	2.348E+04	1.578E+00	1.010E-01	2.818E+01	1.893E-03
2119	4.222E+01	2.307E+04	1.550E+00	9.921E-02	2.768E+01	1.860E-03

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2120	4.147E+01	2.265E+04	1.522E+00	9.744E-02	2.718E+01	1.827E-03
2121	4.073E+01	2.225E+04	1.495E+00	9.570E-02	2.670E+01	1.794E-03
2122	4.000E+01	2.185E+04	1.468E+00	9.400E-02	2.622E+01	1.762E-03
2123	3.929E+01	2.146E+04	1.442E+00	9.232E-02	2.576E+01	1.731E-03
2124	3.859E+01	2.108E+04	1.416E+00	9.067E-02	2.530E+01	1.700E-03
2125	3.790E+01	2.070E+04	1.391E+00	8.906E-02	2.485E+01	1.669E-03
2126	3.722E+01	2.033E+04	1.366E+00	8.747E-02	2.440E+01	1.640E-03
2127	3.656E+01	1.997E+04	1.342E+00	8.591E-02	2.397E+01	1.610E-03
2128	3.591E+01	1.962E+04	1.318E+00	8.437E-02	2.354E+01	1.582E-03
2129	3.527E+01	1.927E+04	1.294E+00	8.287E-02	2.312E+01	1.553E-03
2130	3.464E+01	1.892E+04	1.271E+00	8.139E-02	2.271E+01	1.526E-03
2131	3.402E+01	1.858E+04	1.249E+00	7.994E-02	2.230E+01	1.498E-03
2132	3.341E+01	1.825E+04	1.226E+00	7.851E-02	2.190E+01	1.472E-03
2133	3.282E+01	1.793E+04	1.205E+00	7.711E-02	2.151E+01	1.445E-03
2134	3.223E+01	1.761E+04	1.183E+00	7.574E-02	2.113E+01	1.420E-03
2135	3.166E+01	1.729E+04	1.162E+00	7.439E-02	2.075E+01	1.394E-03
2136	3.109E+01	1.699E+04	1.141E+00	7.306E-02	2.038E+01	1.369E-03
2137	3.054E+01	1.668E+04	1.121E+00	7.176E-02	2.002E+01	1.345E-03
2138	2.999E+01	1.638E+04	1.101E+00	7.048E-02	1.966E+01	1.321E-03
2139	2.946E+01	1.609E+04	1.081E+00	6.922E-02	1.931E+01	1.297E-03
2140	2.893E+01	1.581E+04	1.062E+00	6.798E-02	1.897E+01	1.274E-03
2141	2.842E+01	1.552E+04	1.043E+00	6.677E-02	1.863E+01	1.252E-03
2142	2.791E+01	1.525E+04	1.024E+00	6.558E-02	1.830E+01	1.229E-03
2143	2.741E+01	1.497E+04	1.006E+00	6.441E-02	1.797E+01	1.207E-03
2144	2.692E+01	1.471E+04	9.882E-01	6.326E-02	1.765E+01	1.186E-03
2145	2.644E+01	1.444E+04	9.705E-01	6.213E-02	1.733E+01	1.165E-03
2146	2.597E+01	1.419E+04	9.532E-01	6.102E-02	1.702E+01	1.144E-03
2147	2.551E+01	1.393E+04	9.362E-01	5.994E-02	1.672E+01	1.123E-03
2148	2.505E+01	1.369E+04	9.195E-01	5.887E-02	1.642E+01	1.103E-03
2149	2.460E+01	1.344E+04	9.031E-01	5.782E-02	1.613E+01	1.084E-03
2150	2.417E+01	1.320E+04	8.870E-01	5.678E-02	1.584E+01	1.064E-03
2151	2.373E+01	1.297E+04	8.712E-01	5.577E-02	1.556E+01	1.045E-03
2152	2.331E+01	1.273E+04	8.556E-01	5.478E-02	1.528E+01	1.027E-03
2153	2.290E+01	1.251E+04	8.404E-01	5.380E-02	1.501E+01	1.008E-03
2154	2.249E+01	1.228E+04	8.254E-01	5.284E-02	1.474E+01	9.905E-04
2155	2.209E+01	1.207E+04	8.107E-01	5.190E-02	1.448E+01	9.728E-04
2156	2.169E+01	1.185E+04	7.962E-01	5.097E-02	1.422E+01	9.554E-04
2157	2.130E+01	1.164E+04	7.820E-01	5.006E-02	1.397E+01	9.384E-04
2158	2.092E+01	1.143E+04	7.681E-01	4.917E-02	1.372E+01	9.217E-04
2159	2.055E+01	1.123E+04	7.544E-01	4.829E-02	1.347E+01	9.052E-04

Summary Report

Landfill Name or Identifier: Plant Barry CCR Closure

Date: Monday, October 1, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation ($m^3/year$)

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate ($year^{-1}$)

L_o = potential methane generation capacity (m^3/Mg)

M_i = mass of waste accepted in the ith year (Mg)

t_{ij} = age of the jth section of waste mass M_i accepted in the ith year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2019**	
Landfill Closure Year (with 80-year limit)	**2024**	
Actual Closure Year (without limit)	***2024***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity	**72,900**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.018**	$year^{-1}$
Potential Methane Generation Capacity, L_o	**105**	m^3/Mg
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**NMOC**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2019	11,045	12,150	0	0
2020	11,045	12,150	11,045	12,150
2021	11,045	12,150	22,091	24,300
2022	11,045	12,150	33,136	36,450
2023	11,045	12,150	44,182	48,600
2024	11,045	12,150	55,227	60,750
2025	0	0	66,273	72,900
2026	0	0	66,273	72,900
2027	0	0	66,273	72,900
2028	0	0	66,273	72,900
2029	0	0	66,273	72,900
2030	0	0	66,273	72,900
2031	0	0	66,273	72,900
2032	0	0	66,273	72,900
2033	0	0	66,273	72,900
2034	0	0	66,273	72,900
2035	0	0	66,273	72,900
2036	0	0	66,273	72,900
2037	0	0	66,273	72,900
2038	0	0	66,273	72,900
2039	0	0	66,273	72,900
2040	0	0	66,273	72,900
2041	0	0	66,273	72,900
2042	0	0	66,273	72,900
2043	0	0	66,273	72,900
2044	0	0	66,273	72,900
2045	0	0	66,273	72,900
2046	0	0	66,273	72,900
2047	0	0	66,273	72,900
2048	0	0	66,273	72,900
2049	0	0	66,273	72,900
2050	0	0	66,273	72,900
2051	0	0	66,273	72,900
2052	0	0	66,273	72,900
2053	0	0	66,273	72,900
2054	0	0	66,273	72,900
2055	0	0	66,273	72,900
2056	0	0	66,273	72,900
2057	0	0	66,273	72,900
2058	0	0	66,273	72,900

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2059	0	0	66,273	72,900
2060	0	0	66,273	72,900
2061	0	0	66,273	72,900
2062	0	0	66,273	72,900
2063	0	0	66,273	72,900
2064	0	0	66,273	72,900
2065	0	0	66,273	72,900
2066	0	0	66,273	72,900
2067	0	0	66,273	72,900
2068	0	0	66,273	72,900
2069	0	0	66,273	72,900
2070	0	0	66,273	72,900
2071	0	0	66,273	72,900
2072	0	0	66,273	72,900
2073	0	0	66,273	72,900
2074	0	0	66,273	72,900
2075	0	0	66,273	72,900
2076	0	0	66,273	72,900
2077	0	0	66,273	72,900
2078	0	0	66,273	72,900
2079	0	0	66,273	72,900
2080	0	0	66,273	72,900
2081	0	0	66,273	72,900
2082	0	0	66,273	72,900
2083	0	0	66,273	72,900
2084	0	0	66,273	72,900
2085	0	0	66,273	72,900
2086	0	0	66,273	72,900
2087	0	0	66,273	72,900
2088	0	0	66,273	72,900
2089	0	0	66,273	72,900
2090	0	0	66,273	72,900
2091	0	0	66,273	72,900
2092	0	0	66,273	72,900
2093	0	0	66,273	72,900
2094	0	0	66,273	72,900
2095	0	0	66,273	72,900
2096	0	0	66,273	72,900
2097	0	0	66,273	72,900
2098	0	0	66,273	72,900

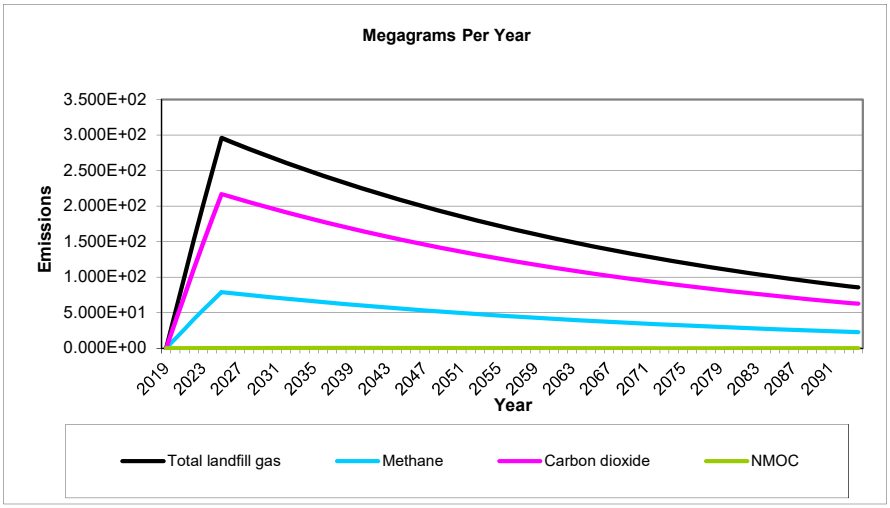
Pollutant Parameters

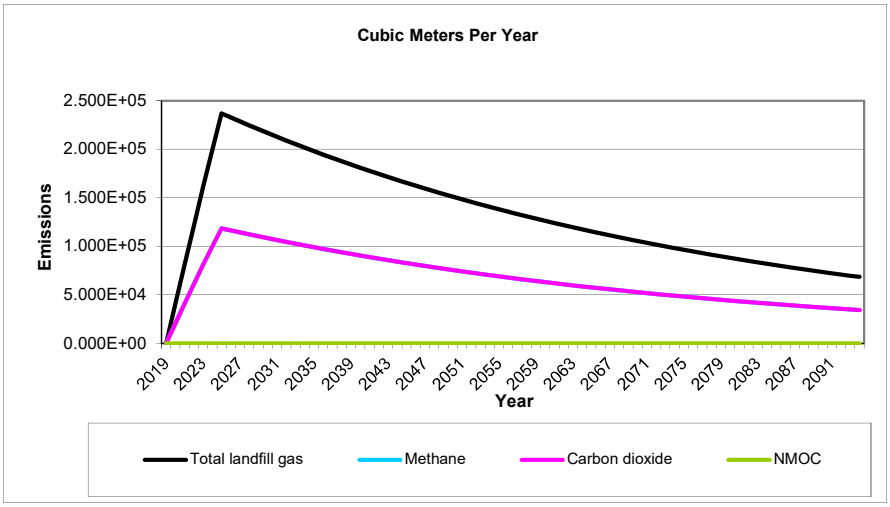
		Gas / Pollutant Default Parameters:		*User-specified Pollutant Parameters:*	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11		
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84		
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39		
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

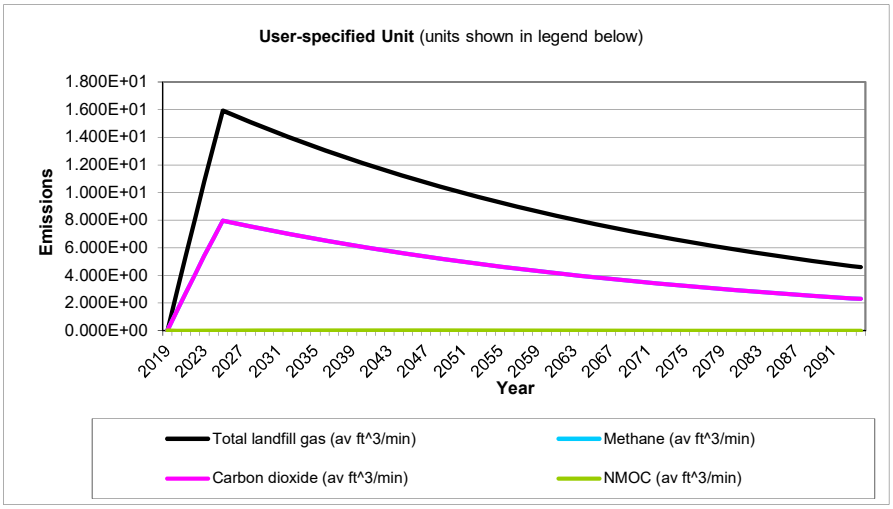
Pollutant Parameters (Continued)

		Gas / Pollutant Default Parameters:		*User-specified Pollutant Parameters:*	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88		
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08		
	Mercury (total) - HAP	2.9E-04	200.61		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83		
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40		
	Vinyl chloride - HAP/VOC	7.3	62.50		
	Xylenes - HAP/VOC	12	106.16		

Graphs


Megagrams Per Year
Emissions
3.500E+02
3.000E+02
2.500E+02
2.000E+02
1.500E+02
1.000E+02
5.000E+01
0.000E+00
2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059 2063 2067 2071 2075 2079 2083 2087 2091
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


Cubic Meters Per Year
Emissions
2.500E+05
2.000E+05
1.500E+05
1.000E+05
5.000E+04
0.000E+00
2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059 2063 2067 2071 2075 2079 2083 2087 2091
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


User-specified Unit (units shown in legend below)
Emissions
1.800E+01
1.600E+01
1.400E+01
1.200E+01
1.000E+01
8.000E+00
6.000E+00
4.000E+00
2.000E+00
0.000E+00
2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059 2063 2067 2071 2075 2079 2083 2087 2091
Year
Total landfill gas (av ft^3/min)
Methane (av ft^3/min)
Carbon dioxide (av ft^3/min)
NMOC (av ft^3/min)

Results

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2019	0	0	0	0	0	0
2020	5.157E+01	4.130E+04	2.775E+00	1.378E+01	2.065E+04	1.387E+00
2021	1.022E+02	8.186E+04	5.500E+00	2.731E+01	4.093E+04	2.750E+00
2022	1.520E+02	1.217E+05	8.177E+00	4.059E+01	6.085E+04	4.088E+00
2023	2.008E+02	1.608E+05	1.081E+01	5.365E+01	8.041E+04	5.403E+00
2024	2.488E+02	1.992E+05	1.339E+01	6.646E+01	9.962E+04	6.694E+00
2025	2.960E+02	2.370E+05	1.592E+01	7.905E+01	1.185E+05	7.962E+00
2026	2.907E+02	2.328E+05	1.564E+01	7.764E+01	1.164E+05	7.820E+00
2027	2.855E+02	2.286E+05	1.536E+01	7.626E+01	1.143E+05	7.680E+00
2028	2.804E+02	2.245E+05	1.509E+01	7.490E+01	1.123E+05	7.543E+00
2029	2.754E+02	2.205E+05	1.482E+01	7.356E+01	1.103E+05	7.409E+00
2030	2.705E+02	2.166E+05	1.455E+01	7.225E+01	1.083E+05	7.276E+00
2031	2.657E+02	2.127E+05	1.429E+01	7.096E+01	1.064E+05	7.147E+00
2032	2.609E+02	2.089E+05	1.404E+01	6.970E+01	1.045E+05	7.019E+00
2033	2.563E+02	2.052E+05	1.379E+01	6.845E+01	1.026E+05	6.894E+00
2034	2.517E+02	2.015E+05	1.354E+01	6.723E+01	1.008E+05	6.771E+00
2035	2.472E+02	1.980E+05	1.330E+01	6.603E+01	9.898E+04	6.650E+00
2036	2.428E+02	1.944E+05	1.306E+01	6.485E+01	9.721E+04	6.532E+00
2037	2.385E+02	1.910E+05	1.283E+01	6.370E+01	9.548E+04	6.415E+00
2038	2.342E+02	1.875E+05	1.260E+01	6.256E+01	9.377E+04	6.301E+00
2039	2.300E+02	1.842E+05	1.238E+01	6.144E+01	9.210E+04	6.188E+00
2040	2.259E+02	1.809E+05	1.216E+01	6.035E+01	9.046E+04	6.078E+00
2041	2.219E+02	1.777E+05	1.194E+01	5.927E+01	8.884E+04	5.969E+00
2042	2.179E+02	1.745E+05	1.173E+01	5.821E+01	8.726E+04	5.863E+00
2043	2.141E+02	1.714E+05	1.152E+01	5.718E+01	8.570E+04	5.758E+00
2044	2.102E+02	1.683E+05	1.131E+01	5.616E+01	8.417E+04	5.656E+00
2045	2.065E+02	1.653E+05	1.111E+01	5.515E+01	8.267E+04	5.555E+00
2046	2.028E+02	1.624E+05	1.091E+01	5.417E+01	8.120E+04	5.456E+00
2047	1.992E+02	1.595E+05	1.072E+01	5.320E+01	7.975E+04	5.358E+00
2048	1.956E+02	1.567E+05	1.053E+01	5.226E+01	7.833E+04	5.263E+00
2049	1.921E+02	1.539E+05	1.034E+01	5.132E+01	7.693E+04	5.169E+00
2050	1.887E+02	1.511E+05	1.015E+01	5.041E+01	7.556E+04	5.077E+00
2051	1.853E+02	1.484E+05	9.972E+00	4.951E+01	7.421E+04	4.986E+00
2052	1.820E+02	1.458E+05	9.794E+00	4.862E+01	7.288E+04	4.897E+00
2053	1.788E+02	1.432E+05	9.620E+00	4.776E+01	7.158E+04	4.810E+00
2054	1.756E+02	1.406E+05	9.448E+00	4.691E+01	7.031E+04	4.724E+00
2055	1.725E+02	1.381E+05	9.279E+00	4.607E+01	6.905E+04	4.640E+00
2056	1.694E+02	1.356E+05	9.114E+00	4.525E+01	6.782E+04	4.557E+00
2057	1.664E+02	1.332E+05	8.951E+00	4.444E+01	6.661E+04	4.476E+00
2058	1.634E+02	1.308E+05	8.792E+00	4.365E+01	6.542E+04	4.396E+00
2059	1.605E+02	1.285E+05	8.635E+00	4.287E+01	6.426E+04	4.317E+00
2060	1.576E+02	1.262E+05	8.481E+00	4.210E+01	6.311E+04	4.240E+00
2061	1.548E+02	1.240E+05	8.329E+00	4.135E+01	6.198E+04	4.165E+00
2062	1.521E+02	1.218E+05	8.181E+00	4.061E+01	6.088E+04	4.090E+00
2063	1.493E+02	1.196E+05	8.035E+00	3.989E+01	5.979E+04	4.017E+00
2064	1.467E+02	1.175E+05	7.892E+00	3.918E+01	5.873E+04	3.946E+00
2065	1.441E+02	1.154E+05	7.751E+00	3.848E+01	5.768E+04	3.875E+00
2066	1.415E+02	1.133E+05	7.613E+00	3.779E+01	5.665E+04	3.806E+00
2067	1.390E+02	1.113E+05	7.477E+00	3.712E+01	5.564E+04	3.738E+00
2068	1.365E+02	1.093E+05	7.343E+00	3.646E+01	5.465E+04	3.672E+00

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2069	1.341E+02	1.073E+05	7.212E+00	3.581E+01	5.367E+04	3.606E+00
2070	1.317E+02	1.054E+05	7.084E+00	3.517E+01	5.271E+04	3.542E+00
2071	1.293E+02	1.035E+05	6.957E+00	3.454E+01	5.177E+04	3.479E+00
2072	1.270E+02	1.017E+05	6.833E+00	3.392E+01	5.085E+04	3.417E+00
2073	1.247E+02	9.989E+04	6.711E+00	3.332E+01	4.994E+04	3.356E+00
2074	1.225E+02	9.810E+04	6.592E+00	3.272E+01	4.905E+04	3.296E+00
2075	1.203E+02	9.635E+04	6.474E+00	3.214E+01	4.818E+04	3.237E+00
2076	1.182E+02	9.463E+04	6.359E+00	3.157E+01	4.732E+04	3.179E+00
2077	1.161E+02	9.295E+04	6.245E+00	3.100E+01	4.647E+04	3.123E+00
2078	1.140E+02	9.129E+04	6.134E+00	3.045E+01	4.564E+04	3.067E+00
2079	1.120E+02	8.966E+04	6.024E+00	2.991E+01	4.483E+04	3.012E+00
2080	1.100E+02	8.806E+04	5.917E+00	2.937E+01	4.403E+04	2.958E+00
2081	1.080E+02	8.649E+04	5.811E+00	2.885E+01	4.324E+04	2.906E+00
2082	1.061E+02	8.495E+04	5.708E+00	2.834E+01	4.247E+04	2.854E+00
2083	1.042E+02	8.343E+04	5.606E+00	2.783E+01	4.172E+04	2.803E+00
2084	1.023E+02	8.194E+04	5.506E+00	2.733E+01	4.097E+04	2.753E+00
2085	1.005E+02	8.048E+04	5.408E+00	2.685E+01	4.024E+04	2.704E+00
2086	9.871E+01	7.905E+04	5.311E+00	2.637E+01	3.952E+04	2.656E+00
2087	9.695E+01	7.764E+04	5.216E+00	2.590E+01	3.882E+04	2.608E+00
2088	9.522E+01	7.625E+04	5.123E+00	2.544E+01	3.813E+04	2.562E+00
2089	9.353E+01	7.489E+04	5.032E+00	2.498E+01	3.745E+04	2.516E+00
2090	9.186E+01	7.355E+04	4.942E+00	2.454E+01	3.678E+04	2.471E+00
2091	9.022E+01	7.224E+04	4.854E+00	2.410E+01	3.612E+04	2.427E+00
2092	8.861E+01	7.095E+04	4.767E+00	2.367E+01	3.548E+04	2.384E+00
2093	8.703E+01	6.969E+04	4.682E+00	2.325E+01	3.484E+04	2.341E+00
2094	8.548E+01	6.844E+04	4.599E+00	2.283E+01	3.422E+04	2.299E+00
2095	8.395E+01	6.722E+04	4.517E+00	2.242E+01	3.361E+04	2.258E+00
2096	8.245E+01	6.602E+04	4.436E+00	2.202E+01	3.301E+04	2.218E+00
2097	8.098E+01	6.485E+04	4.357E+00	2.163E+01	3.242E+04	2.179E+00
2098	7.954E+01	6.369E+04	4.279E+00	2.125E+01	3.184E+04	2.140E+00
2099	7.812E+01	6.255E+04	4.203E+00	2.087E+01	3.128E+04	2.101E+00
2100	7.673E+01	6.144E+04	4.128E+00	2.049E+01	3.072E+04	2.064E+00
2101	7.536E+01	6.034E+04	4.054E+00	2.013E+01	3.017E+04	2.027E+00
2102	7.401E+01	5.927E+04	3.982E+00	1.977E+01	2.963E+04	1.991E+00
2103	7.269E+01	5.821E+04	3.911E+00	1.942E+01	2.910E+04	1.956E+00
2104	7.140E+01	5.717E+04	3.841E+00	1.907E+01	2.858E+04	1.921E+00
2105	7.012E+01	5.615E+04	3.773E+00	1.873E+01	2.808E+04	1.886E+00
2106	6.887E+01	5.515E+04	3.705E+00	1.840E+01	2.757E+04	1.853E+00
2107	6.764E+01	5.416E+04	3.639E+00	1.807E+01	2.708E+04	1.820E+00
2108	6.644E+01	5.320E+04	3.574E+00	1.775E+01	2.660E+04	1.787E+00
2109	6.525E+01	5.225E+04	3.511E+00	1.743E+01	2.612E+04	1.755E+00
2110	6.409E+01	5.132E+04	3.448E+00	1.712E+01	2.566E+04	1.724E+00
2111	6.294E+01	5.040E+04	3.386E+00	1.681E+01	2.520E+04	1.693E+00
2112	6.182E+01	4.950E+04	3.326E+00	1.651E+01	2.475E+04	1.663E+00
2113	6.072E+01	4.862E+04	3.267E+00	1.622E+01	2.431E+04	1.633E+00
2114	5.963E+01	4.775E+04	3.208E+00	1.593E+01	2.388E+04	1.604E+00
2115	5.857E+01	4.690E+04	3.151E+00	1.564E+01	2.345E+04	1.576E+00
2116	5.753E+01	4.606E+04	3.095E+00	1.537E+01	2.303E+04	1.548E+00
2117	5.650E+01	4.524E+04	3.040E+00	1.509E+01	2.262E+04	1.520E+00
2118	5.549E+01	4.443E+04	2.986E+00	1.482E+01	2.222E+04	1.493E+00
2119	5.450E+01	4.364E+04	2.932E+00	1.456E+01	2.182E+04	1.466E+00

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2120	5.353E+01	4.286E+04	2.880E+00	1.430E+01	2.143E+04	1.440E+00
2121	5.257E+01	4.210E+04	2.829E+00	1.404E+01	2.105E+04	1.414E+00
2122	5.164E+01	4.135E+04	2.778E+00	1.379E+01	2.067E+04	1.389E+00
2123	5.072E+01	4.061E+04	2.729E+00	1.355E+01	2.031E+04	1.364E+00
2124	4.981E+01	3.989E+04	2.680E+00	1.330E+01	1.994E+04	1.340E+00
2125	4.892E+01	3.917E+04	2.632E+00	1.307E+01	1.959E+04	1.316E+00
2126	4.805E+01	3.848E+04	2.585E+00	1.283E+01	1.924E+04	1.293E+00
2127	4.719E+01	3.779E+04	2.539E+00	1.261E+01	1.889E+04	1.270E+00
2128	4.635E+01	3.712E+04	2.494E+00	1.238E+01	1.856E+04	1.247E+00
2129	4.552E+01	3.645E+04	2.449E+00	1.216E+01	1.823E+04	1.225E+00
2130	4.471E+01	3.580E+04	2.406E+00	1.194E+01	1.790E+04	1.203E+00
2131	4.391E+01	3.516E+04	2.363E+00	1.173E+01	1.758E+04	1.181E+00
2132	4.313E+01	3.454E+04	2.321E+00	1.152E+01	1.727E+04	1.160E+00
2133	4.236E+01	3.392E+04	2.279E+00	1.132E+01	1.696E+04	1.140E+00
2134	4.161E+01	3.332E+04	2.238E+00	1.111E+01	1.666E+04	1.119E+00
2135	4.086E+01	3.272E+04	2.199E+00	1.091E+01	1.636E+04	1.099E+00
2136	4.013E+01	3.214E+04	2.159E+00	1.072E+01	1.607E+04	1.080E+00
2137	3.942E+01	3.156E+04	2.121E+00	1.053E+01	1.578E+04	1.060E+00
2138	3.872E+01	3.100E+04	2.083E+00	1.034E+01	1.550E+04	1.041E+00
2139	3.802E+01	3.045E+04	2.046E+00	1.016E+01	1.522E+04	1.023E+00
2140	3.735E+01	2.991E+04	2.009E+00	9.976E+00	1.495E+04	1.005E+00
2141	3.668E+01	2.937E+04	1.973E+00	9.798E+00	1.469E+04	9.867E-01
2142	3.603E+01	2.885E+04	1.938E+00	9.623E+00	1.442E+04	9.691E-01
2143	3.538E+01	2.833E+04	1.904E+00	9.451E+00	1.417E+04	9.518E-01
2144	3.475E+01	2.783E+04	1.870E+00	9.283E+00	1.391E+04	9.349E-01
2145	3.413E+01	2.733E+04	1.836E+00	9.117E+00	1.367E+04	9.182E-01
2146	3.352E+01	2.684E+04	1.804E+00	8.954E+00	1.342E+04	9.018E-01
2147	3.292E+01	2.636E+04	1.771E+00	8.795E+00	1.318E+04	8.857E-01
2148	3.234E+01	2.589E+04	1.740E+00	8.638E+00	1.295E+04	8.699E-01
2149	3.176E+01	2.543E+04	1.709E+00	8.484E+00	1.272E+04	8.544E-01
2150	3.119E+01	2.498E+04	1.678E+00	8.332E+00	1.249E+04	8.392E-01
2151	3.064E+01	2.453E+04	1.648E+00	8.184E+00	1.227E+04	8.242E-01
2152	3.009E+01	2.410E+04	1.619E+00	8.038E+00	1.205E+04	8.095E-01
2153	2.955E+01	2.367E+04	1.590E+00	7.894E+00	1.183E+04	7.950E-01
2154	2.903E+01	2.324E+04	1.562E+00	7.753E+00	1.162E+04	7.809E-01
2155	2.851E+01	2.283E+04	1.534E+00	7.615E+00	1.141E+04	7.669E-01
2156	2.800E+01	2.242E+04	1.507E+00	7.479E+00	1.121E+04	7.533E-01
2157	2.750E+01	2.202E+04	1.480E+00	7.346E+00	1.101E+04	7.398E-01
2158	2.701E+01	2.163E+04	1.453E+00	7.215E+00	1.081E+04	7.266E-01
2159	2.653E+01	2.124E+04	1.427E+00	7.086E+00	1.062E+04	7.137E-01

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2019	0	0	0	0	0	0
2020	3.780E+01	2.065E+04	1.387E+00	8.882E-02	2.478E+01	1.665E-03
2021	7.492E+01	4.093E+04	2.750E+00	1.760E-01	4.911E+01	3.300E-03
2022	1.114E+02	6.085E+04	4.088E+00	2.617E-01	7.302E+01	4.906E-03
2023	1.472E+02	8.041E+04	5.403E+00	3.459E-01	9.649E+01	6.483E-03
2024	1.824E+02	9.962E+04	6.694E+00	4.285E-01	1.195E+02	8.033E-03
2025	2.169E+02	1.185E+05	7.962E+00	5.097E-01	1.422E+02	9.554E-03
2026	2.130E+02	1.164E+05	7.820E+00	5.006E-01	1.397E+02	9.384E-03
2027	2.092E+02	1.143E+05	7.680E+00	4.917E-01	1.372E+02	9.216E-03
2028	2.055E+02	1.123E+05	7.543E+00	4.829E-01	1.347E+02	9.052E-03
2029	2.018E+02	1.103E+05	7.409E+00	4.743E-01	1.323E+02	8.890E-03
2030	1.982E+02	1.083E+05	7.276E+00	4.658E-01	1.300E+02	8.732E-03
2031	1.947E+02	1.064E+05	7.147E+00	4.575E-01	1.276E+02	8.576E-03
2032	1.912E+02	1.045E+05	7.019E+00	4.494E-01	1.254E+02	8.423E-03
2033	1.878E+02	1.026E+05	6.894E+00	4.413E-01	1.231E+02	8.273E-03
2034	1.845E+02	1.008E+05	6.771E+00	4.335E-01	1.209E+02	8.125E-03
2035	1.812E+02	9.898E+04	6.650E+00	4.257E-01	1.188E+02	7.980E-03
2036	1.779E+02	9.721E+04	6.532E+00	4.181E-01	1.167E+02	7.838E-03
2037	1.748E+02	9.548E+04	6.415E+00	4.107E-01	1.146E+02	7.698E-03
2038	1.717E+02	9.377E+04	6.301E+00	4.034E-01	1.125E+02	7.561E-03
2039	1.686E+02	9.210E+04	6.188E+00	3.962E-01	1.105E+02	7.426E-03
2040	1.656E+02	9.046E+04	6.078E+00	3.891E-01	1.085E+02	7.293E-03
2041	1.626E+02	8.884E+04	5.969E+00	3.821E-01	1.066E+02	7.163E-03
2042	1.597E+02	8.726E+04	5.863E+00	3.753E-01	1.047E+02	7.036E-03
2043	1.569E+02	8.570E+04	5.758E+00	3.686E-01	1.028E+02	6.910E-03
2044	1.541E+02	8.417E+04	5.656E+00	3.621E-01	1.010E+02	6.787E-03
2045	1.513E+02	8.267E+04	5.555E+00	3.556E-01	9.921E+01	6.666E-03
2046	1.486E+02	8.120E+04	5.456E+00	3.493E-01	9.744E+01	6.547E-03
2047	1.460E+02	7.975E+04	5.358E+00	3.430E-01	9.570E+01	6.430E-03
2048	1.434E+02	7.833E+04	5.263E+00	3.369E-01	9.399E+01	6.315E-03
2049	1.408E+02	7.693E+04	5.169E+00	3.309E-01	9.231E+01	6.203E-03
2050	1.383E+02	7.556E+04	5.077E+00	3.250E-01	9.067E+01	6.092E-03
2051	1.358E+02	7.421E+04	4.986E+00	3.192E-01	8.905E+01	5.983E-03
2052	1.334E+02	7.288E+04	4.897E+00	3.135E-01	8.746E+01	5.877E-03
2053	1.310E+02	7.158E+04	4.810E+00	3.079E-01	8.590E+01	5.772E-03
2054	1.287E+02	7.031E+04	4.724E+00	3.024E-01	8.437E+01	5.669E-03
2055	1.264E+02	6.905E+04	4.640E+00	2.970E-01	8.286E+01	5.568E-03
2056	1.241E+02	6.782E+04	4.557E+00	2.917E-01	8.139E+01	5.468E-03
2057	1.219E+02	6.661E+04	4.476E+00	2.865E-01	7.993E+01	5.371E-03
2058	1.198E+02	6.542E+04	4.396E+00	2.814E-01	7.851E+01	5.275E-03
2059	1.176E+02	6.426E+04	4.317E+00	2.764E-01	7.711E+01	5.181E-03
2060	1.155E+02	6.311E+04	4.240E+00	2.715E-01	7.573E+01	5.088E-03
2061	1.135E+02	6.198E+04	4.165E+00	2.666E-01	7.438E+01	4.998E-03
2062	1.114E+02	6.088E+04	4.090E+00	2.619E-01	7.305E+01	4.909E-03
2063	1.095E+02	5.979E+04	4.017E+00	2.572E-01	7.175E+01	4.821E-03
2064	1.075E+02	5.873E+04	3.946E+00	2.526E-01	7.047E+01	4.735E-03
2065	1.056E+02	5.768E+04	3.875E+00	2.481E-01	6.921E+01	4.650E-03
2066	1.037E+02	5.665E+04	3.806E+00	2.437E-01	6.798E+01	4.568E-03
2067	1.018E+02	5.564E+04	3.738E+00	2.393E-01	6.677E+01	4.486E-03
2068	1.000E+02	5.465E+04	3.672E+00	2.351E-01	6.558E+01	4.406E-03

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2069	9.825E+01	5.367E+04	3.606E+00	2.309E-01	6.441E+01	4.327E-03
2070	9.649E+01	5.271E+04	3.542E+00	2.267E-01	6.326E+01	4.250E-03
2071	9.477E+01	5.177E+04	3.479E+00	2.227E-01	6.213E+01	4.174E-03
2072	9.308E+01	5.085E+04	3.417E+00	2.187E-01	6.102E+01	4.100E-03
2073	9.142E+01	4.994E+04	3.356E+00	2.148E-01	5.993E+01	4.027E-03
2074	8.979E+01	4.905E+04	3.296E+00	2.110E-01	5.886E+01	3.955E-03
2075	8.819E+01	4.818E+04	3.237E+00	2.072E-01	5.781E+01	3.884E-03
2076	8.661E+01	4.732E+04	3.179E+00	2.035E-01	5.678E+01	3.815E-03
2077	8.507E+01	4.647E+04	3.123E+00	1.999E-01	5.577E+01	3.747E-03
2078	8.355E+01	4.564E+04	3.067E+00	1.963E-01	5.477E+01	3.680E-03
2079	8.206E+01	4.483E+04	3.012E+00	1.928E-01	5.380E+01	3.615E-03
2080	8.060E+01	4.403E+04	2.958E+00	1.894E-01	5.284E+01	3.550E-03
2081	7.916E+01	4.324E+04	2.906E+00	1.860E-01	5.189E+01	3.487E-03
2082	7.775E+01	4.247E+04	2.854E+00	1.827E-01	5.097E+01	3.425E-03
2083	7.636E+01	4.172E+04	2.803E+00	1.794E-01	5.006E+01	3.363E-03
2084	7.500E+01	4.097E+04	2.753E+00	1.762E-01	4.917E+01	3.303E-03
2085	7.366E+01	4.024E+04	2.704E+00	1.731E-01	4.829E+01	3.245E-03
2086	7.235E+01	3.952E+04	2.656E+00	1.700E-01	4.743E+01	3.187E-03
2087	7.106E+01	3.882E+04	2.608E+00	1.670E-01	4.658E+01	3.130E-03
2088	6.979E+01	3.813E+04	2.562E+00	1.640E-01	4.575E+01	3.074E-03
2089	6.854E+01	3.745E+04	2.516E+00	1.611E-01	4.493E+01	3.019E-03
2090	6.732E+01	3.678E+04	2.471E+00	1.582E-01	4.413E+01	2.965E-03
2091	6.612E+01	3.612E+04	2.427E+00	1.554E-01	4.335E+01	2.912E-03
2092	6.494E+01	3.548E+04	2.384E+00	1.526E-01	4.257E+01	2.860E-03
2093	6.378E+01	3.484E+04	2.341E+00	1.499E-01	4.181E+01	2.809E-03
2094	6.264E+01	3.422E+04	2.299E+00	1.472E-01	4.107E+01	2.759E-03
2095	6.153E+01	3.361E+04	2.258E+00	1.446E-01	4.033E+01	2.710E-03
2096	6.043E+01	3.301E+04	2.218E+00	1.420E-01	3.961E+01	2.662E-03
2097	5.935E+01	3.242E+04	2.179E+00	1.395E-01	3.891E+01	2.614E-03
2098	5.829E+01	3.184E+04	2.140E+00	1.370E-01	3.821E+01	2.568E-03
2099	5.725E+01	3.128E+04	2.101E+00	1.345E-01	3.753E+01	2.522E-03
2100	5.623E+01	3.072E+04	2.064E+00	1.321E-01	3.686E+01	2.477E-03
2101	5.523E+01	3.017E+04	2.027E+00	1.298E-01	3.621E+01	2.433E-03
2102	5.424E+01	2.963E+04	1.991E+00	1.275E-01	3.556E+01	2.389E-03
2103	5.328E+01	2.910E+04	1.956E+00	1.252E-01	3.492E+01	2.347E-03
2104	5.232E+01	2.858E+04	1.921E+00	1.230E-01	3.430E+01	2.305E-03
2105	5.139E+01	2.808E+04	1.886E+00	1.208E-01	3.369E+01	2.264E-03
2106	5.047E+01	2.757E+04	1.853E+00	1.186E-01	3.309E+01	2.223E-03
2107	4.957E+01	2.708E+04	1.820E+00	1.165E-01	3.250E+01	2.184E-03
2108	4.869E+01	2.660E+04	1.787E+00	1.144E-01	3.192E+01	2.145E-03
2109	4.782E+01	2.612E+04	1.755E+00	1.124E-01	3.135E+01	2.106E-03
2110	4.697E+01	2.566E+04	1.724E+00	1.104E-01	3.079E+01	2.069E-03
2111	4.613E+01	2.520E+04	1.693E+00	1.084E-01	3.024E+01	2.032E-03
2112	4.531E+01	2.475E+04	1.663E+00	1.065E-01	2.970E+01	1.996E-03
2113	4.450E+01	2.431E+04	1.633E+00	1.046E-01	2.917E+01	1.960E-03
2114	4.371E+01	2.388E+04	1.604E+00	1.027E-01	2.865E+01	1.925E-03
2115	4.293E+01	2.345E+04	1.576E+00	1.009E-01	2.814E+01	1.891E-03
2116	4.216E+01	2.303E+04	1.548E+00	9.907E-02	2.764E+01	1.857E-03
2117	4.141E+01	2.262E+04	1.520E+00	9.730E-02	2.715E+01	1.824E-03
2118	4.067E+01	2.222E+04	1.493E+00	9.557E-02	2.666E+01	1.791E-03
2119	3.994E+01	2.182E+04	1.466E+00	9.386E-02	2.619E+01	1.759E-03

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2120	3.923E+01	2.143E+04	1.440E+00	9.219E-02	2.572E+01	1.728E-03
2121	3.853E+01	2.105E+04	1.414E+00	9.054E-02	2.526E+01	1.697E-03
2122	3.784E+01	2.067E+04	1.389E+00	8.893E-02	2.481E+01	1.667E-03
2123	3.717E+01	2.031E+04	1.364E+00	8.734E-02	2.437E+01	1.637E-03
2124	3.651E+01	1.994E+04	1.340E+00	8.578E-02	2.393E+01	1.608E-03
2125	3.585E+01	1.959E+04	1.316E+00	8.425E-02	2.350E+01	1.579E-03
2126	3.521E+01	1.924E+04	1.293E+00	8.275E-02	2.309E+01	1.551E-03
2127	3.459E+01	1.889E+04	1.270E+00	8.127E-02	2.267E+01	1.523E-03
2128	3.397E+01	1.856E+04	1.247E+00	7.982E-02	2.227E+01	1.496E-03
2129	3.336E+01	1.823E+04	1.225E+00	7.840E-02	2.187E+01	1.470E-03
2130	3.277E+01	1.790E+04	1.203E+00	7.700E-02	2.148E+01	1.443E-03
2131	3.218E+01	1.758E+04	1.181E+00	7.563E-02	2.110E+01	1.418E-03
2132	3.161E+01	1.727E+04	1.160E+00	7.428E-02	2.072E+01	1.392E-03
2133	3.105E+01	1.696E+04	1.140E+00	7.295E-02	2.035E+01	1.367E-03
2134	3.049E+01	1.666E+04	1.119E+00	7.165E-02	1.999E+01	1.343E-03
2135	2.995E+01	1.636E+04	1.099E+00	7.037E-02	1.963E+01	1.319E-03
2136	2.941E+01	1.607E+04	1.080E+00	6.912E-02	1.928E+01	1.296E-03
2137	2.889E+01	1.578E+04	1.060E+00	6.788E-02	1.894E+01	1.272E-03
2138	2.837E+01	1.550E+04	1.041E+00	6.667E-02	1.860E+01	1.250E-03
2139	2.787E+01	1.522E+04	1.023E+00	6.548E-02	1.827E+01	1.227E-03
2140	2.737E+01	1.495E+04	1.005E+00	6.432E-02	1.794E+01	1.206E-03
2141	2.688E+01	1.469E+04	9.867E-01	6.317E-02	1.762E+01	1.184E-03
2142	2.640E+01	1.442E+04	9.691E-01	6.204E-02	1.731E+01	1.163E-03
2143	2.593E+01	1.417E+04	9.518E-01	6.094E-02	1.700E+01	1.142E-03
2144	2.547E+01	1.391E+04	9.349E-01	5.985E-02	1.670E+01	1.122E-03
2145	2.501E+01	1.367E+04	9.182E-01	5.878E-02	1.640E+01	1.102E-03
2146	2.457E+01	1.342E+04	9.018E-01	5.773E-02	1.611E+01	1.082E-03
2147	2.413E+01	1.318E+04	8.857E-01	5.670E-02	1.582E+01	1.063E-03
2148	2.370E+01	1.295E+04	8.699E-01	5.569E-02	1.554E+01	1.044E-03
2149	2.328E+01	1.272E+04	8.544E-01	5.470E-02	1.526E+01	1.025E-03
2150	2.286E+01	1.249E+04	8.392E-01	5.372E-02	1.499E+01	1.007E-03
2151	2.245E+01	1.227E+04	8.242E-01	5.276E-02	1.472E+01	9.890E-04
2152	2.205E+01	1.205E+04	8.095E-01	5.182E-02	1.446E+01	9.714E-04
2153	2.166E+01	1.183E+04	7.950E-01	5.090E-02	1.420E+01	9.541E-04
2154	2.127E+01	1.162E+04	7.809E-01	4.999E-02	1.395E+01	9.370E-04
2155	2.089E+01	1.141E+04	7.669E-01	4.910E-02	1.370E+01	9.203E-04
2156	2.052E+01	1.121E+04	7.533E-01	4.822E-02	1.345E+01	9.039E-04
2157	2.016E+01	1.101E+04	7.398E-01	4.736E-02	1.321E+01	8.878E-04
2158	1.980E+01	1.081E+04	7.266E-01	4.652E-02	1.298E+01	8.719E-04
2159	1.944E+01	1.062E+04	7.137E-01	4.569E-02	1.275E+01	8.564E-04

Summary Report

Landfill Name or Identifier: Plant Barry CCR Closure

Date: Monday, October 1, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation ($m^3/year$)

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate ($year^{-1}$)

L_o = potential methane generation capacity (m^3/Mg)

M_i = mass of waste accepted in the ith year (Mg)

t_{ij} = age of the jth section of waste mass M_i accepted in the ith year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2019**	
Landfill Closure Year (with 80-year limit)	**2030**	
Actual Closure Year (without limit)	***2030***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity	**100,900**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.016**	*year $^{-1}$*
Potential Methane Generation Capacity, L_o	**98**	*m^3/Mg*
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**NMOC**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2019	7,645	8,409	0	0
2020	7,645	8,409	7,645	8,409
2021	7,645	8,409	15,289	16,818
2022	7,645	8,409	22,934	25,227
2023	7,645	8,409	30,578	33,636
2024	7,645	8,409	38,223	42,045
2025	7,645	8,409	45,867	50,454
2026	7,645	8,409	53,512	58,863
2027	7,645	8,409	61,156	67,272
2028	7,645	8,409	68,801	75,681
2029	7,645	8,409	76,445	84,090
2030	7,645	8,409	84,090	92,499
2031	0	0	91,735	100,908
2032	0	0	91,735	100,908
2033	0	0	91,735	100,908
2034	0	0	91,735	100,908
2035	0	0	91,735	100,908
2036	0	0	91,735	100,908
2037	0	0	91,735	100,908
2038	0	0	91,735	100,908
2039	0	0	91,735	100,908
2040	0	0	91,735	100,908
2041	0	0	91,735	100,908
2042	0	0	91,735	100,908
2043	0	0	91,735	100,908
2044	0	0	91,735	100,908
2045	0	0	91,735	100,908
2046	0	0	91,735	100,908
2047	0	0	91,735	100,908
2048	0	0	91,735	100,908
2049	0	0	91,735	100,908
2050	0	0	91,735	100,908
2051	0	0	91,735	100,908
2052	0	0	91,735	100,908
2053	0	0	91,735	100,908
2054	0	0	91,735	100,908
2055	0	0	91,735	100,908
2056	0	0	91,735	100,908
2057	0	0	91,735	100,908
2058	0	0	91,735	100,908

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2059	0	0	91,735	100,908
2060	0	0	91,735	100,908
2061	0	0	91,735	100,908
2062	0	0	91,735	100,908
2063	0	0	91,735	100,908
2064	0	0	91,735	100,908
2065	0	0	91,735	100,908
2066	0	0	91,735	100,908
2067	0	0	91,735	100,908
2068	0	0	91,735	100,908
2069	0	0	91,735	100,908
2070	0	0	91,735	100,908
2071	0	0	91,735	100,908
2072	0	0	91,735	100,908
2073	0	0	91,735	100,908
2074	0	0	91,735	100,908
2075	0	0	91,735	100,908
2076	0	0	91,735	100,908
2077	0	0	91,735	100,908
2078	0	0	91,735	100,908
2079	0	0	91,735	100,908
2080	0	0	91,735	100,908
2081	0	0	91,735	100,908
2082	0	0	91,735	100,908
2083	0	0	91,735	100,908
2084	0	0	91,735	100,908
2085	0	0	91,735	100,908
2086	0	0	91,735	100,908
2087	0	0	91,735	100,908
2088	0	0	91,735	100,908
2089	0	0	91,735	100,908
2090	0	0	91,735	100,908
2091	0	0	91,735	100,908
2092	0	0	91,735	100,908
2093	0	0	91,735	100,908
2094	0	0	91,735	100,908
2095	0	0	91,735	100,908
2096	0	0	91,735	100,908
2097	0	0	91,735	100,908
2098	0	0	91,735	100,908

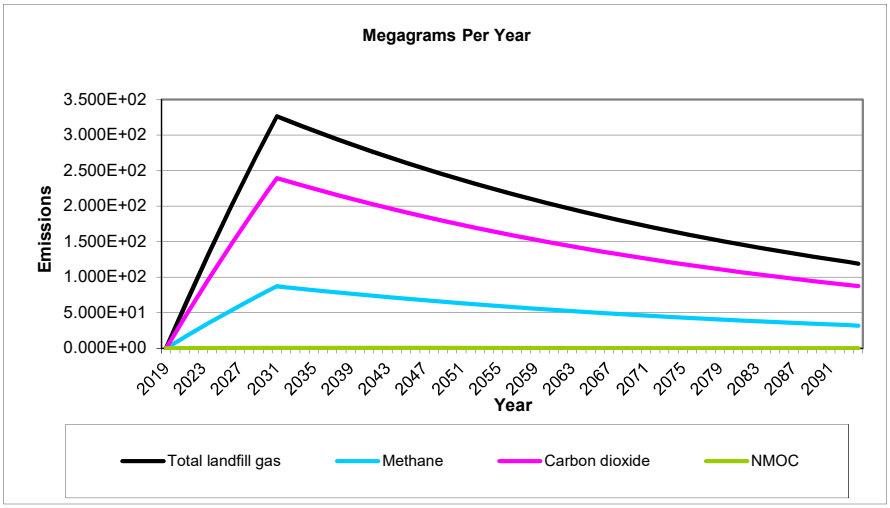
Pollutant Parameters

		Gas / Pollutant Default Parameters:		*User-specified Pollutant Parameters:*	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11		
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84		
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39		
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

Pollutant Parameters (Continued)

		Gas / Pollutant Default Parameters:		*User-specified Pollutant Parameters:*	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88		
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08		
	Mercury (total) - HAP	2.9E-04	200.61		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83		
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40		
	Vinyl chloride - HAP/VOC	7.3	62.50		
	Xylenes - HAP/VOC	12	106.16		

Graphs


Megagrams Per Year
Emissions
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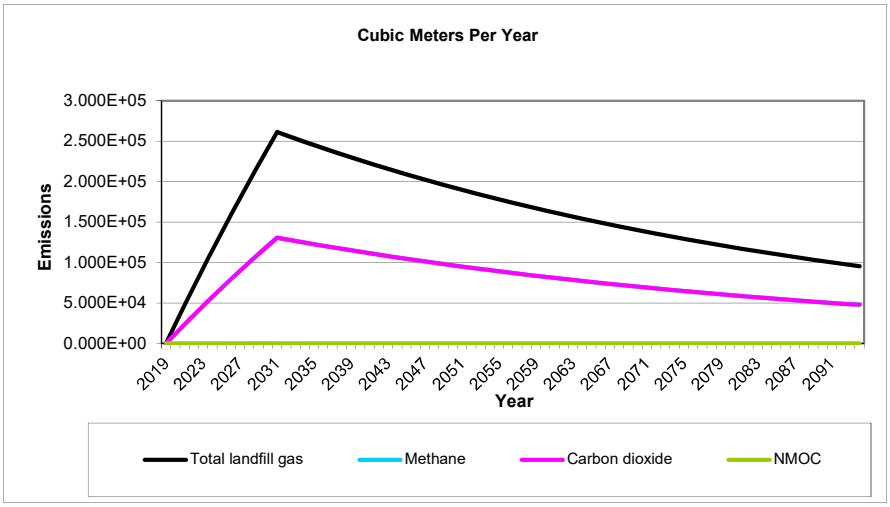
3.000E+02
2.500E+02
2.000E+02
1.500E+02
1.000E+02
5.000E+01
0.000E+00
2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059 2063 2067 2071 2075 2079 2083 2087 2091
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


Cubic Meters Per Year
Emissions
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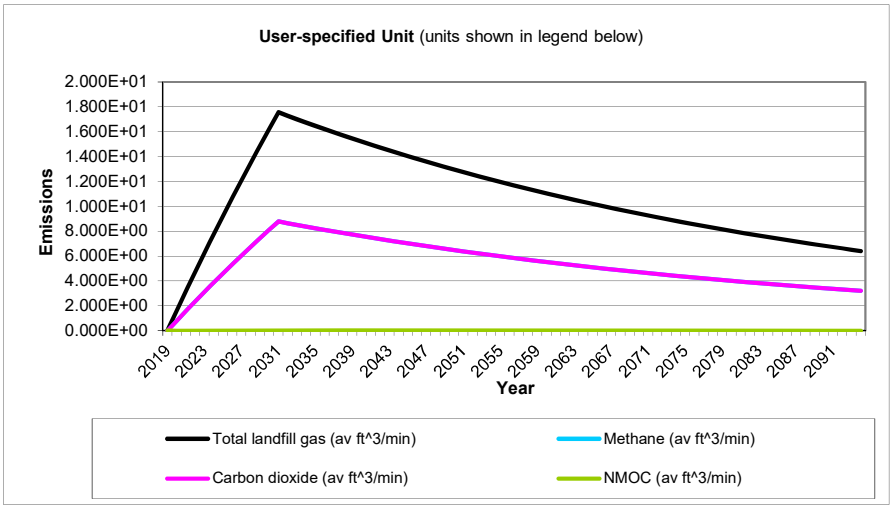
2.500E+05
2.000E+05
1.500E+05
1.000E+05
5.000E+04
0.000E+00
2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059 2063 2067 2071 2075 2079 2083 2087 2091
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


User-specified Unit (units shown in legend below)
Emissions
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1.800E+01
1.600E+01
1.400E+01
1.200E+01
1.000E+01
8.000E+00
6.000E+00
4.000E+00
2.000E+00
0.000E+00
2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059 2063 2067 2071 2075 2079 2083 2087 2091
Year
Total landfill gas (av ft^3/min)
Methane (av ft^3/min)
Carbon dioxide (av ft^3/min)
NMOC (av ft^3/min)

Results

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2019	0	0	0	0	0	0
2020	2.966E+01	2.375E+04	1.596E+00	7.923E+00	1.188E+04	7.980E-01
2021	5.886E+01	4.713E+04	3.167E+00	1.572E+01	2.356E+04	1.583E+00
2022	8.758E+01	7.013E+04	4.712E+00	2.339E+01	3.507E+04	2.356E+00
2023	1.159E+02	9.277E+04	6.233E+00	3.095E+01	4.639E+04	3.117E+00
2024	1.437E+02	1.151E+05	7.730E+00	3.838E+01	5.753E+04	3.865E+00
2025	1.711E+02	1.370E+05	9.204E+00	4.569E+01	6.849E+04	4.602E+00
2026	1.980E+02	1.586E+05	1.065E+01	5.289E+01	7.928E+04	5.327E+00
2027	2.245E+02	1.798E+05	1.208E+01	5.998E+01	8.990E+04	6.040E+00
2028	2.506E+02	2.007E+05	1.348E+01	6.695E+01	1.003E+05	6.742E+00
2029	2.763E+02	2.213E+05	1.487E+01	7.381E+01	1.106E+05	7.433E+00
2030	3.016E+02	2.415E+05	1.623E+01	8.056E+01	1.208E+05	8.113E+00
2031	3.265E+02	2.614E+05	1.756E+01	8.720E+01	1.307E+05	8.782E+00
2032	3.213E+02	2.573E+05	1.729E+01	8.582E+01	1.286E+05	8.643E+00
2033	3.162E+02	2.532E+05	1.701E+01	8.446E+01	1.266E+05	8.506E+00
2034	3.112E+02	2.492E+05	1.674E+01	8.312E+01	1.246E+05	8.371E+00
2035	3.062E+02	2.452E+05	1.648E+01	8.180E+01	1.226E+05	8.238E+00
2036	3.014E+02	2.413E+05	1.621E+01	8.050E+01	1.207E+05	8.107E+00
2037	2.966E+02	2.375E+05	1.596E+01	7.922E+01	1.187E+05	7.979E+00
2038	2.919E+02	2.337E+05	1.570E+01	7.796E+01	1.169E+05	7.852E+00
2039	2.872E+02	2.300E+05	1.545E+01	7.673E+01	1.150E+05	7.727E+00
2040	2.827E+02	2.264E+05	1.521E+01	7.551E+01	1.132E+05	7.605E+00
2041	2.782E+02	2.228E+05	1.497E+01	7.431E+01	1.114E+05	7.484E+00
2042	2.738E+02	2.192E+05	1.473E+01	7.313E+01	1.096E+05	7.365E+00
2043	2.694E+02	2.158E+05	1.450E+01	7.197E+01	1.079E+05	7.248E+00
2044	2.652E+02	2.123E+05	1.427E+01	7.083E+01	1.062E+05	7.133E+00
2045	2.610E+02	2.090E+05	1.404E+01	6.970E+01	1.045E+05	7.020E+00
2046	2.568E+02	2.056E+05	1.382E+01	6.860E+01	1.028E+05	6.909E+00
2047	2.527E+02	2.024E+05	1.360E+01	6.751E+01	1.012E+05	6.799E+00
2048	2.487E+02	1.992E+05	1.338E+01	6.644E+01	9.958E+04	6.691E+00
2049	2.448E+02	1.960E+05	1.317E+01	6.538E+01	9.800E+04	6.585E+00
2050	2.409E+02	1.929E+05	1.296E+01	6.434E+01	9.645E+04	6.480E+00
2051	2.371E+02	1.898E+05	1.275E+01	6.332E+01	9.492E+04	6.377E+00
2052	2.333E+02	1.868E+05	1.255E+01	6.232E+01	9.341E+04	6.276E+00
2053	2.296E+02	1.839E+05	1.235E+01	6.133E+01	9.193E+04	6.177E+00
2054	2.260E+02	1.809E+05	1.216E+01	6.036E+01	9.047E+04	6.079E+00
2055	2.224E+02	1.781E+05	1.196E+01	5.940E+01	8.903E+04	5.982E+00
2056	2.188E+02	1.752E+05	1.177E+01	5.845E+01	8.762E+04	5.887E+00
2057	2.154E+02	1.725E+05	1.159E+01	5.753E+01	8.623E+04	5.794E+00
2058	2.119E+02	1.697E+05	1.140E+01	5.661E+01	8.486E+04	5.702E+00
2059	2.086E+02	1.670E+05	1.122E+01	5.572E+01	8.351E+04	5.611E+00
2060	2.053E+02	1.644E+05	1.104E+01	5.483E+01	8.219E+04	5.522E+00
2061	2.020E+02	1.618E+05	1.087E+01	5.396E+01	8.088E+04	5.434E+00
2062	1.988E+02	1.592E+05	1.070E+01	5.310E+01	7.960E+04	5.348E+00
2063	1.957E+02	1.567E+05	1.053E+01	5.226E+01	7.833E+04	5.263E+00
2064	1.925E+02	1.542E+05	1.036E+01	5.143E+01	7.709E+04	5.180E+00
2065	1.895E+02	1.517E+05	1.020E+01	5.062E+01	7.587E+04	5.098E+00
2066	1.865E+02	1.493E+05	1.003E+01	4.981E+01	7.466E+04	5.017E+00
2067	1.835E+02	1.470E+05	9.874E+00	4.902E+01	7.348E+04	4.937E+00
2068	1.806E+02	1.446E+05	9.717E+00	4.824E+01	7.231E+04	4.859E+00

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2069	1.777E+02	1.423E+05	9.563E+00	4.748E+01	7.116E+04	4.782E+00
2070	1.749E+02	1.401E+05	9.411E+00	4.672E+01	7.003E+04	4.706E+00
2071	1.721E+02	1.378E+05	9.262E+00	4.598E+01	6.892E+04	4.631E+00
2072	1.694E+02	1.357E+05	9.115E+00	4.525E+01	6.783E+04	4.557E+00
2073	1.667E+02	1.335E+05	8.970E+00	4.453E+01	6.675E+04	4.485E+00
2074	1.641E+02	1.314E+05	8.828E+00	4.383E+01	6.569E+04	4.414E+00
2075	1.615E+02	1.293E+05	8.688E+00	4.313E+01	6.465E+04	4.344E+00
2076	1.589E+02	1.272E+05	8.550E+00	4.245E+01	6.362E+04	4.275E+00
2077	1.564E+02	1.252E+05	8.414E+00	4.177E+01	6.261E+04	4.207E+00
2078	1.539E+02	1.232E+05	8.281E+00	4.111E+01	6.162E+04	4.140E+00
2079	1.515E+02	1.213E+05	8.149E+00	4.046E+01	6.064E+04	4.075E+00
2080	1.491E+02	1.194E+05	8.020E+00	3.982E+01	5.968E+04	4.010E+00
2081	1.467E+02	1.175E+05	7.892E+00	3.918E+01	5.873E+04	3.946E+00
2082	1.444E+02	1.156E+05	7.767E+00	3.856E+01	5.780E+04	3.884E+00
2083	1.421E+02	1.138E+05	7.644E+00	3.795E+01	5.688E+04	3.822E+00
2084	1.398E+02	1.120E+05	7.523E+00	3.735E+01	5.598E+04	3.761E+00
2085	1.376E+02	1.102E+05	7.403E+00	3.675E+01	5.509E+04	3.702E+00
2086	1.354E+02	1.084E+05	7.286E+00	3.617E+01	5.422E+04	3.643E+00
2087	1.333E+02	1.067E+05	7.170E+00	3.560E+01	5.336E+04	3.585E+00
2088	1.311E+02	1.050E+05	7.056E+00	3.503E+01	5.251E+04	3.528E+00
2089	1.291E+02	1.034E+05	6.944E+00	3.448E+01	5.168E+04	3.472E+00
2090	1.270E+02	1.017E+05	6.834E+00	3.393E+01	5.086E+04	3.417E+00
2091	1.250E+02	1.001E+05	6.726E+00	3.339E+01	5.005E+04	3.363E+00
2092	1.230E+02	9.851E+04	6.619E+00	3.286E+01	4.925E+04	3.309E+00
2093	1.211E+02	9.694E+04	6.514E+00	3.234E+01	4.847E+04	3.257E+00
2094	1.191E+02	9.541E+04	6.410E+00	3.182E+01	4.770E+04	3.205E+00
2095	1.173E+02	9.389E+04	6.309E+00	3.132E+01	4.695E+04	3.154E+00
2096	1.154E+02	9.240E+04	6.208E+00	3.082E+01	4.620E+04	3.104E+00
2097	1.136E+02	9.093E+04	6.110E+00	3.033E+01	4.547E+04	3.055E+00
2098	1.118E+02	8.949E+04	6.013E+00	2.985E+01	4.475E+04	3.006E+00
2099	1.100E+02	8.807E+04	5.917E+00	2.938E+01	4.404E+04	2.959E+00
2100	1.082E+02	8.667E+04	5.824E+00	2.891E+01	4.334E+04	2.912E+00
2101	1.065E+02	8.530E+04	5.731E+00	2.845E+01	4.265E+04	2.866E+00
2102	1.048E+02	8.394E+04	5.640E+00	2.800E+01	4.197E+04	2.820E+00
2103	1.032E+02	8.261E+04	5.551E+00	2.756E+01	4.131E+04	2.775E+00
2104	1.015E+02	8.130E+04	5.463E+00	2.712E+01	4.065E+04	2.731E+00
2105	9.992E+01	8.001E+04	5.376E+00	2.669E+01	4.000E+04	2.688E+00
2106	9.833E+01	7.874E+04	5.290E+00	2.627E+01	3.937E+04	2.645E+00
2107	9.677E+01	7.749E+04	5.206E+00	2.585E+01	3.874E+04	2.603E+00
2108	9.523E+01	7.626E+04	5.124E+00	2.544E+01	3.813E+04	2.562E+00
2109	9.372E+01	7.505E+04	5.043E+00	2.503E+01	3.752E+04	2.521E+00
2110	9.224E+01	7.386E+04	4.962E+00	2.464E+01	3.693E+04	2.481E+00
2111	9.077E+01	7.269E+04	4.884E+00	2.425E+01	3.634E+04	2.442E+00
2112	8.933E+01	7.153E+04	4.806E+00	2.386E+01	3.577E+04	2.403E+00
2113	8.791E+01	7.040E+04	4.730E+00	2.348E+01	3.520E+04	2.365E+00
2114	8.652E+01	6.928E+04	4.655E+00	2.311E+01	3.464E+04	2.327E+00
2115	8.514E+01	6.818E+04	4.581E+00	2.274E+01	3.409E+04	2.290E+00
2116	8.379E+01	6.710E+04	4.508E+00	2.238E+01	3.355E+04	2.254E+00
2117	8.246E+01	6.603E+04	4.437E+00	2.203E+01	3.302E+04	2.218E+00
2118	8.115E+01	6.498E+04	4.366E+00	2.168E+01	3.249E+04	2.183E+00
2119	7.987E+01	6.395E+04	4.297E+00	2.133E+01	3.198E+04	2.148E+00

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2120	7.860E+01	6.294E+04	4.229E+00	2.099E+01	3.147E+04	2.114E+00
2121	7.735E+01	6.194E+04	4.162E+00	2.066E+01	3.097E+04	2.081E+00
2122	7.612E+01	6.096E+04	4.096E+00	2.033E+01	3.048E+04	2.048E+00
2123	7.491E+01	5.999E+04	4.031E+00	2.001E+01	2.999E+04	2.015E+00
2124	7.372E+01	5.904E+04	3.967E+00	1.969E+01	2.952E+04	1.983E+00
2125	7.255E+01	5.810E+04	3.904E+00	1.938E+01	2.905E+04	1.952E+00
2126	7.140E+01	5.718E+04	3.842E+00	1.907E+01	2.859E+04	1.921E+00
2127	7.027E+01	5.627E+04	3.781E+00	1.877E+01	2.813E+04	1.890E+00
2128	6.915E+01	5.538E+04	3.721E+00	1.847E+01	2.769E+04	1.860E+00
2129	6.806E+01	5.450E+04	3.662E+00	1.818E+01	2.725E+04	1.831E+00
2130	6.698E+01	5.363E+04	3.604E+00	1.789E+01	2.682E+04	1.802E+00
2131	6.591E+01	5.278E+04	3.546E+00	1.761E+01	2.639E+04	1.773E+00
2132	6.487E+01	5.194E+04	3.490E+00	1.733E+01	2.597E+04	1.745E+00
2133	6.384E+01	5.112E+04	3.435E+00	1.705E+01	2.556E+04	1.717E+00
2134	6.282E+01	5.031E+04	3.380E+00	1.678E+01	2.515E+04	1.690E+00
2135	6.183E+01	4.951E+04	3.326E+00	1.651E+01	2.475E+04	1.663E+00
2136	6.085E+01	4.872E+04	3.274E+00	1.625E+01	2.436E+04	1.637E+00
2137	5.988E+01	4.795E+04	3.222E+00	1.599E+01	2.397E+04	1.611E+00
2138	5.893E+01	4.719E+04	3.171E+00	1.574E+01	2.359E+04	1.585E+00
2139	5.799E+01	4.644E+04	3.120E+00	1.549E+01	2.322E+04	1.560E+00
2140	5.707E+01	4.570E+04	3.071E+00	1.524E+01	2.285E+04	1.535E+00
2141	5.617E+01	4.498E+04	3.022E+00	1.500E+01	2.249E+04	1.511E+00
2142	5.528E+01	4.426E+04	2.974E+00	1.476E+01	2.213E+04	1.487E+00
2143	5.440E+01	4.356E+04	2.927E+00	1.453E+01	2.178E+04	1.463E+00
2144	5.354E+01	4.287E+04	2.880E+00	1.430E+01	2.143E+04	1.440E+00
2145	5.269E+01	4.219E+04	2.835E+00	1.407E+01	2.109E+04	1.417E+00
2146	5.185E+01	4.152E+04	2.790E+00	1.385E+01	2.076E+04	1.395E+00
2147	5.103E+01	4.086E+04	2.745E+00	1.363E+01	2.043E+04	1.373E+00
2148	5.022E+01	4.021E+04	2.702E+00	1.341E+01	2.011E+04	1.351E+00
2149	4.942E+01	3.957E+04	2.659E+00	1.320E+01	1.979E+04	1.329E+00
2150	4.863E+01	3.894E+04	2.617E+00	1.299E+01	1.947E+04	1.308E+00
2151	4.786E+01	3.833E+04	2.575E+00	1.278E+01	1.916E+04	1.288E+00
2152	4.710E+01	3.772E+04	2.534E+00	1.258E+01	1.886E+04	1.267E+00
2153	4.636E+01	3.712E+04	2.494E+00	1.238E+01	1.856E+04	1.247E+00
2154	4.562E+01	3.653E+04	2.454E+00	1.219E+01	1.827E+04	1.227E+00
2155	4.490E+01	3.595E+04	2.416E+00	1.199E+01	1.798E+04	1.208E+00
2156	4.418E+01	3.538E+04	2.377E+00	1.180E+01	1.769E+04	1.189E+00
2157	4.348E+01	3.482E+04	2.339E+00	1.161E+01	1.741E+04	1.170E+00
2158	4.279E+01	3.427E+04	2.302E+00	1.143E+01	1.713E+04	1.151E+00
2159	4.211E+01	3.372E+04	2.266E+00	1.125E+01	1.686E+04	1.133E+00

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2019	0	0	0	0	0	0
2020	2.174E+01	1.188E+04	7.980E-01	5.109E-02	1.425E+01	9.576E-04
2021	4.313E+01	2.356E+04	1.583E+00	1.014E-01	2.828E+01	1.900E-03
2022	6.419E+01	3.507E+04	2.356E+00	1.508E-01	4.208E+01	2.827E-03
2023	8.491E+01	4.639E+04	3.117E+00	1.995E-01	5.566E+01	3.740E-03
2024	1.053E+02	5.753E+04	3.865E+00	2.474E-01	6.903E+01	4.638E-03
2025	1.254E+02	6.849E+04	4.602E+00	2.946E-01	8.219E+01	5.522E-03
2026	1.451E+02	7.928E+04	5.327E+00	3.410E-01	9.514E+01	6.392E-03
2027	1.646E+02	8.990E+04	6.040E+00	3.867E-01	1.079E+02	7.248E-03
2028	1.837E+02	1.003E+05	6.742E+00	4.316E-01	1.204E+02	8.091E-03
2029	2.025E+02	1.106E+05	7.433E+00	4.759E-01	1.328E+02	8.920E-03
2030	2.210E+02	1.208E+05	8.113E+00	5.194E-01	1.449E+02	9.736E-03
2031	2.393E+02	1.307E+05	8.782E+00	5.622E-01	1.569E+02	1.054E-02
2032	2.355E+02	1.286E+05	8.643E+00	5.533E-01	1.544E+02	1.037E-02
2033	2.317E+02	1.266E+05	8.506E+00	5.445E-01	1.519E+02	1.021E-02
2034	2.281E+02	1.246E+05	8.371E+00	5.359E-01	1.495E+02	1.005E-02
2035	2.244E+02	1.226E+05	8.238E+00	5.274E-01	1.471E+02	9.886E-03
2036	2.209E+02	1.207E+05	8.107E+00	5.190E-01	1.448E+02	9.729E-03
2037	2.174E+02	1.187E+05	7.979E+00	5.108E-01	1.425E+02	9.574E-03
2038	2.139E+02	1.169E+05	7.852E+00	5.027E-01	1.402E+02	9.422E-03
2039	2.105E+02	1.150E+05	7.727E+00	4.947E-01	1.380E+02	9.273E-03
2040	2.072E+02	1.132E+05	7.605E+00	4.868E-01	1.358E+02	9.126E-03
2041	2.039E+02	1.114E+05	7.484E+00	4.791E-01	1.337E+02	8.981E-03
2042	2.007E+02	1.096E+05	7.365E+00	4.715E-01	1.315E+02	8.838E-03
2043	1.975E+02	1.079E+05	7.248E+00	4.640E-01	1.295E+02	8.698E-03
2044	1.943E+02	1.062E+05	7.133E+00	4.567E-01	1.274E+02	8.560E-03
2045	1.912E+02	1.045E+05	7.020E+00	4.494E-01	1.254E+02	8.424E-03
2046	1.882E+02	1.028E+05	6.909E+00	4.423E-01	1.234E+02	8.290E-03
2047	1.852E+02	1.012E+05	6.799E+00	4.353E-01	1.214E+02	8.159E-03
2048	1.823E+02	9.958E+04	6.691E+00	4.283E-01	1.195E+02	8.029E-03
2049	1.794E+02	9.800E+04	6.585E+00	4.215E-01	1.176E+02	7.902E-03
2050	1.765E+02	9.645E+04	6.480E+00	4.149E-01	1.157E+02	7.776E-03
2051	1.737E+02	9.492E+04	6.377E+00	4.083E-01	1.139E+02	7.653E-03
2052	1.710E+02	9.341E+04	6.276E+00	4.018E-01	1.121E+02	7.531E-03
2053	1.683E+02	9.193E+04	6.177E+00	3.954E-01	1.103E+02	7.412E-03
2054	1.656E+02	9.047E+04	6.079E+00	3.891E-01	1.086E+02	7.294E-03
2055	1.630E+02	8.903E+04	5.982E+00	3.830E-01	1.068E+02	7.178E-03
2056	1.604E+02	8.762E+04	5.887E+00	3.769E-01	1.051E+02	7.064E-03
2057	1.578E+02	8.623E+04	5.794E+00	3.709E-01	1.035E+02	6.952E-03
2058	1.553E+02	8.486E+04	5.702E+00	3.650E-01	1.018E+02	6.842E-03
2059	1.529E+02	8.351E+04	5.611E+00	3.592E-01	1.002E+02	6.733E-03
2060	1.504E+02	8.219E+04	5.522E+00	3.535E-01	9.862E+01	6.627E-03
2061	1.481E+02	8.088E+04	5.434E+00	3.479E-01	9.706E+01	6.521E-03
2062	1.457E+02	7.960E+04	5.348E+00	3.424E-01	9.552E+01	6.418E-03
2063	1.434E+02	7.833E+04	5.263E+00	3.369E-01	9.400E+01	6.316E-03
2064	1.411E+02	7.709E+04	5.180E+00	3.316E-01	9.251E+01	6.216E-03
2065	1.389E+02	7.587E+04	5.098E+00	3.263E-01	9.104E+01	6.117E-03
2066	1.367E+02	7.466E+04	5.017E+00	3.212E-01	8.960E+01	6.020E-03
2067	1.345E+02	7.348E+04	4.937E+00	3.161E-01	8.817E+01	5.924E-03
2068	1.324E+02	7.231E+04	4.859E+00	3.110E-01	8.677E+01	5.830E-03

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2069	1.303E+02	7.116E+04	4.782E+00	3.061E-01	8.540E+01	5.738E-03
2070	1.282E+02	7.003E+04	4.706E+00	3.012E-01	8.404E+01	5.647E-03
2071	1.262E+02	6.892E+04	4.631E+00	2.965E-01	8.271E+01	5.557E-03
2072	1.242E+02	6.783E+04	4.557E+00	2.918E-01	8.140E+01	5.469E-03
2073	1.222E+02	6.675E+04	4.485E+00	2.871E-01	8.010E+01	5.382E-03
2074	1.203E+02	6.569E+04	4.414E+00	2.826E-01	7.883E+01	5.297E-03
2075	1.183E+02	6.465E+04	4.344E+00	2.781E-01	7.758E+01	5.213E-03
2076	1.165E+02	6.362E+04	4.275E+00	2.737E-01	7.635E+01	5.130E-03
2077	1.146E+02	6.261E+04	4.207E+00	2.693E-01	7.514E+01	5.048E-03
2078	1.128E+02	6.162E+04	4.140E+00	2.651E-01	7.394E+01	4.968E-03
2079	1.110E+02	6.064E+04	4.075E+00	2.608E-01	7.277E+01	4.889E-03
2080	1.092E+02	5.968E+04	4.010E+00	2.567E-01	7.162E+01	4.812E-03
2081	1.075E+02	5.873E+04	3.946E+00	2.526E-01	7.048E+01	4.735E-03
2082	1.058E+02	5.780E+04	3.884E+00	2.486E-01	6.936E+01	4.660E-03
2083	1.041E+02	5.688E+04	3.822E+00	2.447E-01	6.826E+01	4.586E-03
2084	1.025E+02	5.598E+04	3.761E+00	2.408E-01	6.718E+01	4.514E-03
2085	1.008E+02	5.509E+04	3.702E+00	2.370E-01	6.611E+01	4.442E-03
2086	9.924E+01	5.422E+04	3.643E+00	2.332E-01	6.506E+01	4.371E-03
2087	9.767E+01	5.336E+04	3.585E+00	2.295E-01	6.403E+01	4.302E-03
2088	9.612E+01	5.251E+04	3.528E+00	2.259E-01	6.301E+01	4.234E-03
2089	9.459E+01	5.168E+04	3.472E+00	2.223E-01	6.201E+01	4.167E-03
2090	9.309E+01	5.086E+04	3.417E+00	2.187E-01	6.103E+01	4.100E-03
2091	9.161E+01	5.005E+04	3.363E+00	2.153E-01	6.006E+01	4.035E-03
2092	9.016E+01	4.925E+04	3.309E+00	2.119E-01	5.910E+01	3.971E-03
2093	8.873E+01	4.847E+04	3.257E+00	2.085E-01	5.817E+01	3.908E-03
2094	8.732E+01	4.770E+04	3.205E+00	2.052E-01	5.724E+01	3.846E-03
2095	8.593E+01	4.695E+04	3.154E+00	2.019E-01	5.633E+01	3.785E-03
2096	8.457E+01	4.620E+04	3.104E+00	1.987E-01	5.544E+01	3.725E-03
2097	8.323E+01	4.547E+04	3.055E+00	1.956E-01	5.456E+01	3.666E-03
2098	8.191E+01	4.475E+04	3.006E+00	1.925E-01	5.369E+01	3.608E-03
2099	8.061E+01	4.404E+04	2.959E+00	1.894E-01	5.284E+01	3.550E-03
2100	7.933E+01	4.334E+04	2.912E+00	1.864E-01	5.200E+01	3.494E-03
2101	7.807E+01	4.265E+04	2.866E+00	1.834E-01	5.118E+01	3.439E-03
2102	7.683E+01	4.197E+04	2.820E+00	1.805E-01	5.037E+01	3.384E-03
2103	7.561E+01	4.131E+04	2.775E+00	1.777E-01	4.957E+01	3.330E-03
2104	7.441E+01	4.065E+04	2.731E+00	1.748E-01	4.878E+01	3.278E-03
2105	7.323E+01	4.000E+04	2.688E+00	1.721E-01	4.801E+01	3.225E-03
2106	7.207E+01	3.937E+04	2.645E+00	1.693E-01	4.724E+01	3.174E-03
2107	7.092E+01	3.874E+04	2.603E+00	1.667E-01	4.649E+01	3.124E-03
2108	6.980E+01	3.813E+04	2.562E+00	1.640E-01	4.576E+01	3.074E-03
2109	6.869E+01	3.752E+04	2.521E+00	1.614E-01	4.503E+01	3.026E-03
2110	6.760E+01	3.693E+04	2.481E+00	1.588E-01	4.431E+01	2.977E-03
2111	6.653E+01	3.634E+04	2.442E+00	1.563E-01	4.361E+01	2.930E-03
2112	6.547E+01	3.577E+04	2.403E+00	1.538E-01	4.292E+01	2.884E-03
2113	6.443E+01	3.520E+04	2.365E+00	1.514E-01	4.224E+01	2.838E-03
2114	6.341E+01	3.464E+04	2.327E+00	1.490E-01	4.157E+01	2.793E-03
2115	6.240E+01	3.409E+04	2.290E+00	1.466E-01	4.091E+01	2.749E-03
2116	6.141E+01	3.355E+04	2.254E+00	1.443E-01	4.026E+01	2.705E-03
2117	6.044E+01	3.302E+04	2.218E+00	1.420E-01	3.962E+01	2.662E-03
2118	5.948E+01	3.249E+04	2.183E+00	1.398E-01	3.899E+01	2.620E-03
2119	5.853E+01	3.198E+04	2.148E+00	1.375E-01	3.837E+01	2.578E-03

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2120	5.760E+01	3.147E+04	2.114E+00	1.354E-01	3.776E+01	2.537E-03
2121	5.669E+01	3.097E+04	2.081E+00	1.332E-01	3.716E+01	2.497E-03
2122	5.579E+01	3.048E+04	2.048E+00	1.311E-01	3.657E+01	2.457E-03
2123	5.490E+01	2.999E+04	2.015E+00	1.290E-01	3.599E+01	2.418E-03
2124	5.403E+01	2.952E+04	1.983E+00	1.270E-01	3.542E+01	2.380E-03
2125	5.317E+01	2.905E+04	1.952E+00	1.250E-01	3.486E+01	2.342E-03
2126	5.233E+01	2.859E+04	1.921E+00	1.230E-01	3.431E+01	2.305E-03
2127	5.150E+01	2.813E+04	1.890E+00	1.210E-01	3.376E+01	2.268E-03
2128	5.068E+01	2.769E+04	1.860E+00	1.191E-01	3.323E+01	2.232E-03
2129	4.988E+01	2.725E+04	1.831E+00	1.172E-01	3.270E+01	2.197E-03
2130	4.909E+01	2.682E+04	1.802E+00	1.153E-01	3.218E+01	2.162E-03
2131	4.831E+01	2.639E+04	1.773E+00	1.135E-01	3.167E+01	2.128E-03
2132	4.754E+01	2.597E+04	1.745E+00	1.117E-01	3.117E+01	2.094E-03
2133	4.679E+01	2.556E+04	1.717E+00	1.099E-01	3.067E+01	2.061E-03
2134	4.604E+01	2.515E+04	1.690E+00	1.082E-01	3.018E+01	2.028E-03
2135	4.531E+01	2.475E+04	1.663E+00	1.065E-01	2.970E+01	1.996E-03
2136	4.459E+01	2.436E+04	1.637E+00	1.048E-01	2.923E+01	1.964E-03
2137	4.389E+01	2.397E+04	1.611E+00	1.031E-01	2.877E+01	1.933E-03
2138	4.319E+01	2.359E+04	1.585E+00	1.015E-01	2.831E+01	1.902E-03
2139	4.250E+01	2.322E+04	1.560E+00	9.988E-02	2.786E+01	1.872E-03
2140	4.183E+01	2.285E+04	1.535E+00	9.829E-02	2.742E+01	1.842E-03
2141	4.116E+01	2.249E+04	1.511E+00	9.673E-02	2.699E+01	1.813E-03
2142	4.051E+01	2.213E+04	1.487E+00	9.519E-02	2.656E+01	1.784E-03
2143	3.987E+01	2.178E+04	1.463E+00	9.368E-02	2.614E+01	1.756E-03
2144	3.924E+01	2.143E+04	1.440E+00	9.220E-02	2.572E+01	1.728E-03
2145	3.861E+01	2.109E+04	1.417E+00	9.073E-02	2.531E+01	1.701E-03
2146	3.800E+01	2.076E+04	1.395E+00	8.929E-02	2.491E+01	1.674E-03
2147	3.740E+01	2.043E+04	1.373E+00	8.788E-02	2.452E+01	1.647E-03
2148	3.680E+01	2.011E+04	1.351E+00	8.648E-02	2.413E+01	1.621E-03
2149	3.622E+01	1.979E+04	1.329E+00	8.511E-02	2.374E+01	1.595E-03
2150	3.564E+01	1.947E+04	1.308E+00	8.376E-02	2.337E+01	1.570E-03
2151	3.508E+01	1.916E+04	1.288E+00	8.243E-02	2.300E+01	1.545E-03
2152	3.452E+01	1.886E+04	1.267E+00	8.112E-02	2.263E+01	1.521E-03
2153	3.397E+01	1.856E+04	1.247E+00	7.983E-02	2.227E+01	1.496E-03
2154	3.343E+01	1.827E+04	1.227E+00	7.856E-02	2.192E+01	1.473E-03
2155	3.290E+01	1.798E+04	1.208E+00	7.732E-02	2.157E+01	1.449E-03
2156	3.238E+01	1.769E+04	1.189E+00	7.609E-02	2.123E+01	1.426E-03
2157	3.187E+01	1.741E+04	1.170E+00	7.488E-02	2.089E+01	1.404E-03
2158	3.136E+01	1.713E+04	1.151E+00	7.369E-02	2.056E+01	1.381E-03
2159	3.086E+01	1.686E+04	1.133E+00	7.252E-02	2.023E+01	1.359E-03

Summary Report

Landfill Name or Identifier: Plant Barry CCR Closure

Date: Monday, October 1, 2018

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where,

Q_{CH4} = annual methane generation in the year of the calculation ($m^3/year$)

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate ($year^{-1}$)

L_o = potential methane generation capacity (m^3/Mg)

M_i = mass of waste accepted in the ith year (Mg)

t_{ij} = age of the jth section of waste mass M_i accepted in the ith year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at http://www.epa.gov/ttnatw01/landfill/landflpg.html.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for convential landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**2019**	
Landfill Closure Year (with 80-year limit)	**2024**	
Actual Closure Year (without limit)	***2024***	
Have Model Calculate Closure Year?	**No**	
Waste Design Capacity	**100,900**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.016**	$year^{-1}$
Potential Methane Generation Capacity, L_o	**98**	m^3/Mg
NMOC Concentration	**600**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	**Total landfill gas**
Gas / Pollutant #2:	**Methane**
Gas / Pollutant #3:	**Carbon dioxide**
Gas / Pollutant #4:	**NMOC**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2019	15,288	16,817	0	0
2020	15,288	16,817	15,288	16,817
2021	15,288	16,817	30,576	33,633
2022	15,288	16,817	45,864	50,450
2023	15,288	16,817	61,152	67,267
2024	15,288	16,817	76,439	84,083
2025	0	0	91,727	100,900
2026	0	0	91,727	100,900
2027	0	0	91,727	100,900
2028	0	0	91,727	100,900
2029	0	0	91,727	100,900
2030	0	0	91,727	100,900
2031	0	0	91,727	100,900
2032	0	0	91,727	100,900
2033	0	0	91,727	100,900
2034	0	0	91,727	100,900
2035	0	0	91,727	100,900
2036	0	0	91,727	100,900
2037	0	0	91,727	100,900
2038	0	0	91,727	100,900
2039	0	0	91,727	100,900
2040	0	0	91,727	100,900
2041	0	0	91,727	100,900
2042	0	0	91,727	100,900
2043	0	0	91,727	100,900
2044	0	0	91,727	100,900
2045	0	0	91,727	100,900
2046	0	0	91,727	100,900
2047	0	0	91,727	100,900
2048	0	0	91,727	100,900
2049	0	0	91,727	100,900
2050	0	0	91,727	100,900
2051	0	0	91,727	100,900
2052	0	0	91,727	100,900
2053	0	0	91,727	100,900
2054	0	0	91,727	100,900
2055	0	0	91,727	100,900
2056	0	0	91,727	100,900
2057	0	0	91,727	100,900
2058	0	0	91,727	100,900

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2059	0	0	91,727	100,900
2060	0	0	91,727	100,900
2061	0	0	91,727	100,900
2062	0	0	91,727	100,900
2063	0	0	91,727	100,900
2064	0	0	91,727	100,900
2065	0	0	91,727	100,900
2066	0	0	91,727	100,900
2067	0	0	91,727	100,900
2068	0	0	91,727	100,900
2069	0	0	91,727	100,900
2070	0	0	91,727	100,900
2071	0	0	91,727	100,900
2072	0	0	91,727	100,900
2073	0	0	91,727	100,900
2074	0	0	91,727	100,900
2075	0	0	91,727	100,900
2076	0	0	91,727	100,900
2077	0	0	91,727	100,900
2078	0	0	91,727	100,900
2079	0	0	91,727	100,900
2080	0	0	91,727	100,900
2081	0	0	91,727	100,900
2082	0	0	91,727	100,900
2083	0	0	91,727	100,900
2084	0	0	91,727	100,900
2085	0	0	91,727	100,900
2086	0	0	91,727	100,900
2087	0	0	91,727	100,900
2088	0	0	91,727	100,900
2089	0	0	91,727	100,900
2090	0	0	91,727	100,900
2091	0	0	91,727	100,900
2092	0	0	91,727	100,900
2093	0	0	91,727	100,900
2094	0	0	91,727	100,900
2095	0	0	91,727	100,900
2096	0	0	91,727	100,900
2097	0	0	91,727	100,900
2098	0	0	91,727	100,900

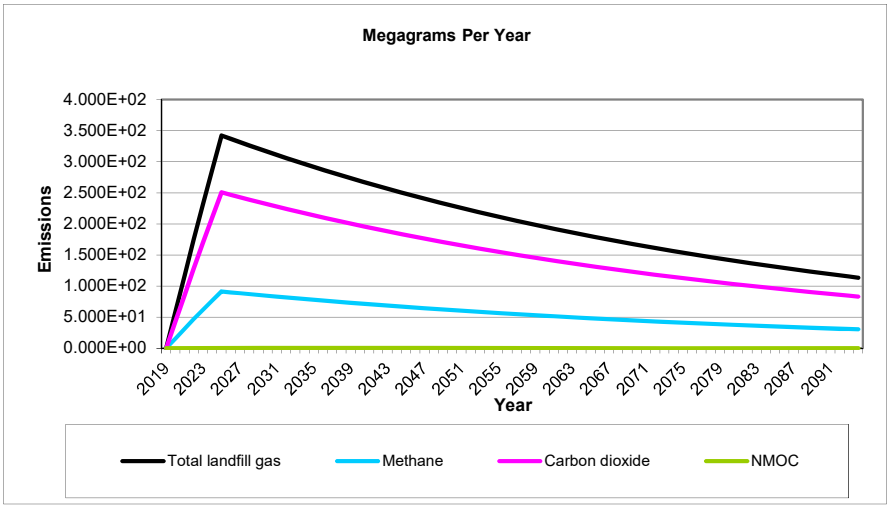
Pollutant Parameters

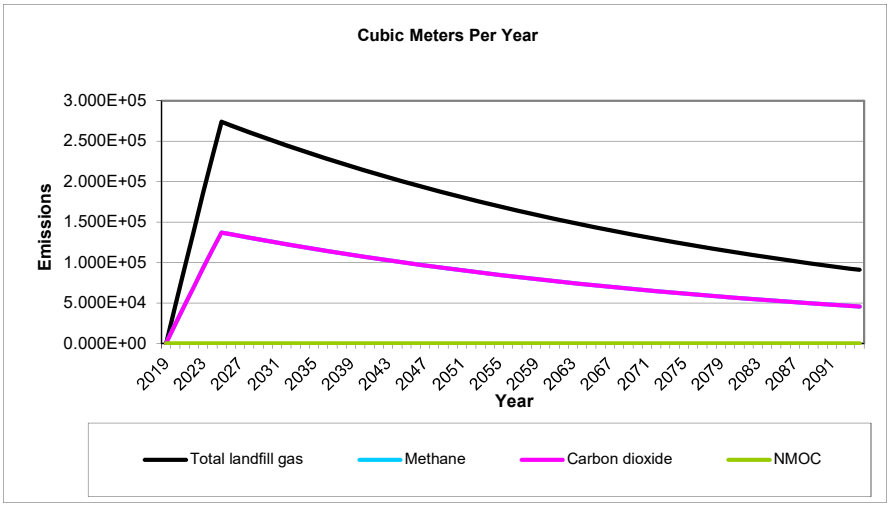
		Gas / Pollutant Default Parameters:		*User-specified Pollutant Parameters:*	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11		
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84		
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39		
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

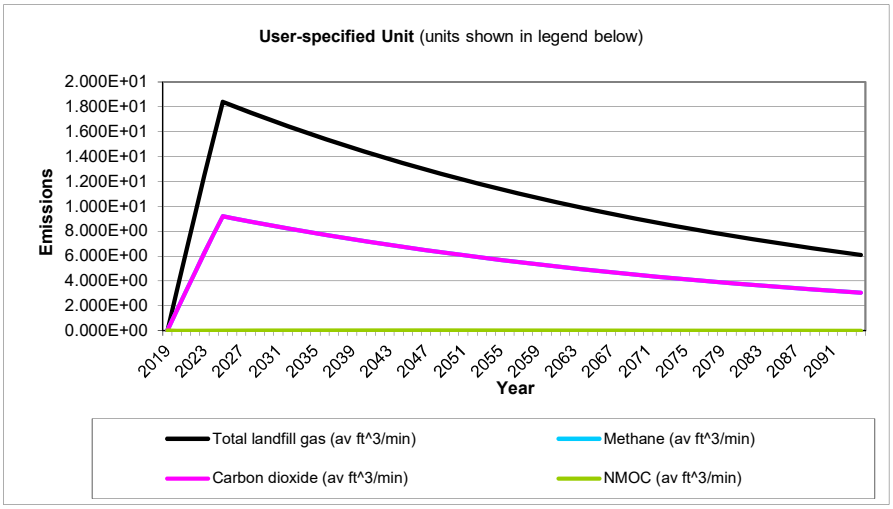
Pollutant Parameters (Continued)

		Gas / Pollutant Default Parameters:		*User-specified Pollutant Parameters:*	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88		
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08		
	Mercury (total) - HAP	2.9E-04	200.61		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83		
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40		
	Vinyl chloride - HAP/VOC	7.3	62.50		
	Xylenes - HAP/VOC	12	106.16		

Graphs


Megagrams Per Year
Emissions
4.000E+02
3.500E+02
3.000E+02
2.500E+02
2.000E+02
1.500E+02
1.000E+02
5.000E+01
0.000E+00
2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059 2063 2067 2071 2075 2079 2083 2087 2091
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


Cubic Meters Per Year
Emissions
3.000E+05
2.500E+05
2.000E+05
1.500E+05
1.000E+05
5.000E+04
0.000E+00
2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059 2063 2067 2071 2075 2079 2083 2087 2091
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


User-specified Unit (units shown in legend below)
Emissions
2.000E+01
1.800E+01
1.600E+01
1.400E+01
1.200E+01
1.000E+01
8.000E+00
6.000E+00
4.000E+00
2.000E+00
0.000E+00
2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059 2063 2067 2071 2075 2079 2083 2087 2091
Year
Total landfill gas (av ft^3/min)
Methane (av ft^3/min)
Carbon dioxide (av ft^3/min)
NMOC (av ft^3/min)

Results

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2019	0	0	0	0	0	0
2020	5.932E+01	4.750E+04	3.192E+00	1.585E+01	2.375E+04	1.596E+00
2021	1.177E+02	9.425E+04	6.333E+00	3.144E+01	4.713E+04	3.166E+00
2022	1.752E+02	1.403E+05	9.424E+00	4.679E+01	7.013E+04	4.712E+00
2023	2.317E+02	1.855E+05	1.247E+01	6.189E+01	9.277E+04	6.233E+00
2024	2.873E+02	2.301E+05	1.546E+01	7.675E+01	1.150E+05	7.730E+00
2025	3.421E+02	2.739E+05	1.841E+01	9.138E+01	1.370E+05	9.203E+00
2026	3.367E+02	2.696E+05	1.811E+01	8.993E+01	1.348E+05	9.057E+00
2027	3.313E+02	2.653E+05	1.783E+01	8.850E+01	1.327E+05	8.913E+00
2028	3.261E+02	2.611E+05	1.754E+01	8.710E+01	1.306E+05	8.772E+00
2029	3.209E+02	2.570E+05	1.726E+01	8.571E+01	1.285E+05	8.632E+00
2030	3.158E+02	2.529E+05	1.699E+01	8.435E+01	1.264E+05	8.495E+00
2031	3.108E+02	2.489E+05	1.672E+01	8.301E+01	1.244E+05	8.361E+00
2032	3.059E+02	2.449E+05	1.646E+01	8.170E+01	1.225E+05	8.228E+00
2033	3.010E+02	2.410E+05	1.619E+01	8.040E+01	1.205E+05	8.097E+00
2034	2.962E+02	2.372E+05	1.594E+01	7.912E+01	1.186E+05	7.969E+00
2035	2.915E+02	2.334E+05	1.568E+01	7.787E+01	1.167E+05	7.842E+00
2036	2.869E+02	2.297E+05	1.544E+01	7.663E+01	1.149E+05	7.718E+00
2037	2.823E+02	2.261E+05	1.519E+01	7.542E+01	1.130E+05	7.595E+00
2038	2.779E+02	2.225E+05	1.495E+01	7.422E+01	1.112E+05	7.475E+00
2039	2.734E+02	2.190E+05	1.471E+01	7.304E+01	1.095E+05	7.356E+00
2040	2.691E+02	2.155E+05	1.448E+01	7.188E+01	1.077E+05	7.239E+00
2041	2.648E+02	2.121E+05	1.425E+01	7.074E+01	1.060E+05	7.124E+00
2042	2.606E+02	2.087E+05	1.402E+01	6.962E+01	1.044E+05	7.011E+00
2043	2.565E+02	2.054E+05	1.380E+01	6.851E+01	1.027E+05	6.900E+00
2044	2.524E+02	2.021E+05	1.358E+01	6.743E+01	1.011E+05	6.791E+00
2045	2.484E+02	1.989E+05	1.337E+01	6.635E+01	9.946E+04	6.683E+00
2046	2.445E+02	1.958E+05	1.315E+01	6.530E+01	9.788E+04	6.577E+00
2047	2.406E+02	1.927E+05	1.294E+01	6.427E+01	9.633E+04	6.472E+00
2048	2.368E+02	1.896E+05	1.274E+01	6.325E+01	9.480E+04	6.370E+00
2049	2.330E+02	1.866E+05	1.254E+01	6.224E+01	9.329E+04	6.268E+00
2050	2.293E+02	1.836E+05	1.234E+01	6.125E+01	9.181E+04	6.169E+00
2051	2.257E+02	1.807E+05	1.214E+01	6.028E+01	9.036E+04	6.071E+00
2052	2.221E+02	1.778E+05	1.195E+01	5.932E+01	8.892E+04	5.975E+00
2053	2.186E+02	1.750E+05	1.176E+01	5.838E+01	8.751E+04	5.880E+00
2054	2.151E+02	1.722E+05	1.157E+01	5.746E+01	8.612E+04	5.787E+00
2055	2.117E+02	1.695E+05	1.139E+01	5.654E+01	8.475E+04	5.695E+00
2056	2.083E+02	1.668E+05	1.121E+01	5.565E+01	8.341E+04	5.604E+00
2057	2.050E+02	1.642E+05	1.103E+01	5.476E+01	8.209E+04	5.515E+00
2058	2.018E+02	1.616E+05	1.086E+01	5.389E+01	8.078E+04	5.428E+00
2059	1.986E+02	1.590E+05	1.068E+01	5.304E+01	7.950E+04	5.342E+00
2060	1.954E+02	1.565E+05	1.051E+01	5.220E+01	7.824E+04	5.257E+00
2061	1.923E+02	1.540E+05	1.035E+01	5.137E+01	7.700E+04	5.173E+00
2062	1.893E+02	1.515E+05	1.018E+01	5.055E+01	7.577E+04	5.091E+00
2063	1.863E+02	1.491E+05	1.002E+01	4.975E+01	7.457E+04	5.010E+00
2064	1.833E+02	1.468E+05	9.862E+00	4.896E+01	7.339E+04	4.931E+00
2065	1.804E+02	1.444E+05	9.705E+00	4.818E+01	7.222E+04	4.853E+00
2066	1.775E+02	1.422E+05	9.551E+00	4.742E+01	7.108E+04	4.776E+00
2067	1.747E+02	1.399E+05	9.400E+00	4.667E+01	6.995E+04	4.700E+00
2068	1.719E+02	1.377E+05	9.250E+00	4.593E+01	6.884E+04	4.625E+00

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2069	1.692E+02	1.355E+05	9.104E+00	4.520E+01	6.775E+04	4.552E+00
2070	1.665E+02	1.333E+05	8.959E+00	4.448E+01	6.667E+04	4.480E+00
2071	1.639E+02	1.312E+05	8.817E+00	4.377E+01	6.561E+04	4.408E+00
2072	1.613E+02	1.291E+05	8.677E+00	4.308E+01	6.457E+04	4.339E+00
2073	1.587E+02	1.271E+05	8.539E+00	4.239E+01	6.355E+04	4.270E+00
2074	1.562E+02	1.251E+05	8.404E+00	4.172E+01	6.254E+04	4.202E+00
2075	1.537E+02	1.231E+05	8.270E+00	4.106E+01	6.154E+04	4.135E+00
2076	1.513E+02	1.211E+05	8.139E+00	4.041E+01	6.057E+04	4.070E+00
2077	1.489E+02	1.192E+05	8.010E+00	3.977E+01	5.961E+04	4.005E+00
2078	1.465E+02	1.173E+05	7.883E+00	3.914E+01	5.866E+04	3.941E+00
2079	1.442E+02	1.155E+05	7.758E+00	3.851E+01	5.773E+04	3.879E+00
2080	1.419E+02	1.136E+05	7.634E+00	3.790E+01	5.681E+04	3.817E+00
2081	1.396E+02	1.118E+05	7.513E+00	3.730E+01	5.591E+04	3.757E+00
2082	1.374E+02	1.100E+05	7.394E+00	3.671E+01	5.502E+04	3.697E+00
2083	1.352E+02	1.083E+05	7.277E+00	3.613E+01	5.415E+04	3.638E+00
2084	1.331E+02	1.066E+05	7.161E+00	3.555E+01	5.329E+04	3.581E+00
2085	1.310E+02	1.049E+05	7.048E+00	3.499E+01	5.244E+04	3.524E+00
2086	1.289E+02	1.032E+05	6.936E+00	3.443E+01	5.161E+04	3.468E+00
2087	1.269E+02	1.016E+05	6.826E+00	3.389E+01	5.079E+04	3.413E+00
2088	1.248E+02	9.997E+04	6.717E+00	3.335E+01	4.999E+04	3.359E+00
2089	1.229E+02	9.839E+04	6.611E+00	3.282E+01	4.919E+04	3.305E+00
2090	1.209E+02	9.683E+04	6.506E+00	3.230E+01	4.841E+04	3.253E+00
2091	1.190E+02	9.529E+04	6.402E+00	3.179E+01	4.764E+04	3.201E+00
2092	1.171E+02	9.378E+04	6.301E+00	3.128E+01	4.689E+04	3.150E+00
2093	1.153E+02	9.229E+04	6.201E+00	3.078E+01	4.614E+04	3.100E+00
2094	1.134E+02	9.082E+04	6.102E+00	3.030E+01	4.541E+04	3.051E+00
2095	1.116E+02	8.938E+04	6.006E+00	2.982E+01	4.469E+04	3.003E+00
2096	1.098E+02	8.796E+04	5.910E+00	2.934E+01	4.398E+04	2.955E+00
2097	1.081E+02	8.657E+04	5.816E+00	2.888E+01	4.328E+04	2.908E+00
2098	1.064E+02	8.519E+04	5.724E+00	2.842E+01	4.260E+04	2.862E+00
2099	1.047E+02	8.384E+04	5.633E+00	2.797E+01	4.192E+04	2.817E+00
2100	1.030E+02	8.251E+04	5.544E+00	2.752E+01	4.125E+04	2.772E+00
2101	1.014E+02	8.120E+04	5.456E+00	2.709E+01	4.060E+04	2.728E+00
2102	9.979E+01	7.991E+04	5.369E+00	2.666E+01	3.996E+04	2.685E+00
2103	9.821E+01	7.864E+04	5.284E+00	2.623E+01	3.932E+04	2.642E+00
2104	9.665E+01	7.739E+04	5.200E+00	2.582E+01	3.870E+04	2.600E+00
2105	9.512E+01	7.617E+04	5.118E+00	2.541E+01	3.808E+04	2.559E+00
2106	9.361E+01	7.496E+04	5.036E+00	2.500E+01	3.748E+04	2.518E+00
2107	9.212E+01	7.377E+04	4.956E+00	2.461E+01	3.688E+04	2.478E+00
2108	9.066E+01	7.260E+04	4.878E+00	2.422E+01	3.630E+04	2.439E+00
2109	8.922E+01	7.144E+04	4.800E+00	2.383E+01	3.572E+04	2.400E+00
2110	8.780E+01	7.031E+04	4.724E+00	2.345E+01	3.515E+04	2.362E+00
2111	8.641E+01	6.919E+04	4.649E+00	2.308E+01	3.460E+04	2.325E+00
2112	8.504E+01	6.810E+04	4.575E+00	2.271E+01	3.405E+04	2.288E+00
2113	8.369E+01	6.701E+04	4.503E+00	2.235E+01	3.351E+04	2.251E+00
2114	8.236E+01	6.595E+04	4.431E+00	2.200E+01	3.298E+04	2.216E+00
2115	8.105E+01	6.490E+04	4.361E+00	2.165E+01	3.245E+04	2.180E+00
2116	7.977E+01	6.387E+04	4.292E+00	2.131E+01	3.194E+04	2.146E+00
2117	7.850E+01	6.286E+04	4.224E+00	2.097E+01	3.143E+04	2.112E+00
2118	7.725E+01	6.186E+04	4.157E+00	2.064E+01	3.093E+04	2.078E+00
2119	7.603E+01	6.088E+04	4.091E+00	2.031E+01	3.044E+04	2.045E+00

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2120	7.482E+01	5.991E+04	4.026E+00	1.999E+01	2.996E+04	2.013E+00
2121	7.363E+01	5.896E+04	3.962E+00	1.967E+01	2.948E+04	1.981E+00
2122	7.247E+01	5.803E+04	3.899E+00	1.936E+01	2.901E+04	1.949E+00
2123	7.132E+01	5.711E+04	3.837E+00	1.905E+01	2.855E+04	1.918E+00
2124	7.018E+01	5.620E+04	3.776E+00	1.875E+01	2.810E+04	1.888E+00
2125	6.907E+01	5.531E+04	3.716E+00	1.845E+01	2.765E+04	1.858E+00
2126	6.797E+01	5.443E+04	3.657E+00	1.816E+01	2.721E+04	1.829E+00
2127	6.689E+01	5.357E+04	3.599E+00	1.787E+01	2.678E+04	1.800E+00
2128	6.583E+01	5.272E+04	3.542E+00	1.758E+01	2.636E+04	1.771E+00
2129	6.479E+01	5.188E+04	3.486E+00	1.731E+01	2.594E+04	1.743E+00
2130	6.376E+01	5.106E+04	3.430E+00	1.703E+01	2.553E+04	1.715E+00
2131	6.275E+01	5.024E+04	3.376E+00	1.676E+01	2.512E+04	1.688E+00
2132	6.175E+01	4.945E+04	3.322E+00	1.649E+01	2.472E+04	1.661E+00
2133	6.077E+01	4.866E+04	3.270E+00	1.623E+01	2.433E+04	1.635E+00
2134	5.981E+01	4.789E+04	3.218E+00	1.597E+01	2.395E+04	1.609E+00
2135	5.886E+01	4.713E+04	3.167E+00	1.572E+01	2.356E+04	1.583E+00
2136	5.792E+01	4.638E+04	3.116E+00	1.547E+01	2.319E+04	1.558E+00
2137	5.700E+01	4.565E+04	3.067E+00	1.523E+01	2.282E+04	1.533E+00
2138	5.610E+01	4.492E+04	3.018E+00	1.498E+01	2.246E+04	1.509E+00
2139	5.521E+01	4.421E+04	2.970E+00	1.475E+01	2.210E+04	1.485E+00
2140	5.433E+01	4.351E+04	2.923E+00	1.451E+01	2.175E+04	1.462E+00
2141	5.347E+01	4.282E+04	2.877E+00	1.428E+01	2.141E+04	1.438E+00
2142	5.262E+01	4.214E+04	2.831E+00	1.406E+01	2.107E+04	1.416E+00
2143	5.179E+01	4.147E+04	2.786E+00	1.383E+01	2.073E+04	1.393E+00
2144	5.096E+01	4.081E+04	2.742E+00	1.361E+01	2.040E+04	1.371E+00
2145	5.015E+01	4.016E+04	2.698E+00	1.340E+01	2.008E+04	1.349E+00
2146	4.936E+01	3.952E+04	2.656E+00	1.318E+01	1.976E+04	1.328E+00
2147	4.858E+01	3.890E+04	2.613E+00	1.297E+01	1.945E+04	1.307E+00
2148	4.780E+01	3.828E+04	2.572E+00	1.277E+01	1.914E+04	1.286E+00
2149	4.705E+01	3.767E+04	2.531E+00	1.257E+01	1.884E+04	1.266E+00
2150	4.630E+01	3.707E+04	2.491E+00	1.237E+01	1.854E+04	1.245E+00
2151	4.556E+01	3.649E+04	2.451E+00	1.217E+01	1.824E+04	1.226E+00
2152	4.484E+01	3.591E+04	2.413E+00	1.198E+01	1.795E+04	1.206E+00
2153	4.413E+01	3.534E+04	2.374E+00	1.179E+01	1.767E+04	1.187E+00
2154	4.343E+01	3.478E+04	2.337E+00	1.160E+01	1.739E+04	1.168E+00
2155	4.274E+01	3.422E+04	2.299E+00	1.142E+01	1.711E+04	1.150E+00
2156	4.206E+01	3.368E+04	2.263E+00	1.123E+01	1.684E+04	1.131E+00
2157	4.139E+01	3.315E+04	2.227E+00	1.106E+01	1.657E+04	1.114E+00
2158	4.074E+01	3.262E+04	2.192E+00	1.088E+01	1.631E+04	1.096E+00
2159	4.009E+01	3.210E+04	2.157E+00	1.071E+01	1.605E+04	1.078E+00

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2019	0	0	0	0	0	0
2020	4.348E+01	2.375E+04	1.596E+00	1.022E-01	2.850E+01	1.915E-03
2021	8.626E+01	4.713E+04	3.166E+00	2.027E-01	5.655E+01	3.800E-03
2022	1.284E+02	7.013E+04	4.712E+00	3.016E-01	8.415E+01	5.654E-03
2023	1.698E+02	9.277E+04	6.233E+00	3.990E-01	1.113E+02	7.480E-03
2024	2.106E+02	1.150E+05	7.730E+00	4.948E-01	1.381E+02	9.276E-03
2025	2.507E+02	1.370E+05	9.203E+00	5.892E-01	1.644E+02	1.104E-02
2026	2.467E+02	1.348E+05	9.057E+00	5.798E-01	1.618E+02	1.087E-02
2027	2.428E+02	1.327E+05	8.913E+00	5.706E-01	1.592E+02	1.070E-02
2028	2.390E+02	1.306E+05	8.772E+00	5.615E-01	1.567E+02	1.053E-02
2029	2.352E+02	1.285E+05	8.632E+00	5.526E-01	1.542E+02	1.036E-02
2030	2.314E+02	1.264E+05	8.495E+00	5.439E-01	1.517E+02	1.019E-02
2031	2.278E+02	1.244E+05	8.361E+00	5.352E-01	1.493E+02	1.003E-02
2032	2.242E+02	1.225E+05	8.228E+00	5.267E-01	1.469E+02	9.873E-03
2033	2.206E+02	1.205E+05	8.097E+00	5.184E-01	1.446E+02	9.717E-03
2034	2.171E+02	1.186E+05	7.969E+00	5.101E-01	1.423E+02	9.563E-03
2035	2.137E+02	1.167E+05	7.842E+00	5.020E-01	1.401E+02	9.411E-03
2036	2.103E+02	1.149E+05	7.718E+00	4.941E-01	1.378E+02	9.261E-03
2037	2.069E+02	1.130E+05	7.595E+00	4.862E-01	1.357E+02	9.114E-03
2038	2.036E+02	1.112E+05	7.475E+00	4.785E-01	1.335E+02	8.970E-03
2039	2.004E+02	1.095E+05	7.356E+00	4.709E-01	1.314E+02	8.827E-03
2040	1.972E+02	1.077E+05	7.239E+00	4.634E-01	1.293E+02	8.687E-03
2041	1.941E+02	1.060E+05	7.124E+00	4.561E-01	1.272E+02	8.549E-03
2042	1.910E+02	1.044E+05	7.011E+00	4.489E-01	1.252E+02	8.414E-03
2043	1.880E+02	1.027E+05	6.900E+00	4.417E-01	1.232E+02	8.280E-03
2044	1.850E+02	1.011E+05	6.791E+00	4.347E-01	1.213E+02	8.149E-03
2045	1.821E+02	9.946E+04	6.683E+00	4.278E-01	1.194E+02	8.019E-03
2046	1.792E+02	9.788E+04	6.577E+00	4.210E-01	1.175E+02	7.892E-03
2047	1.763E+02	9.633E+04	6.472E+00	4.143E-01	1.156E+02	7.767E-03
2048	1.735E+02	9.480E+04	6.370E+00	4.078E-01	1.138E+02	7.643E-03
2049	1.708E+02	9.329E+04	6.268E+00	4.013E-01	1.120E+02	7.522E-03
2050	1.681E+02	9.181E+04	6.169E+00	3.949E-01	1.102E+02	7.403E-03
2051	1.654E+02	9.036E+04	6.071E+00	3.887E-01	1.084E+02	7.285E-03
2052	1.628E+02	8.892E+04	5.975E+00	3.825E-01	1.067E+02	7.170E-03
2053	1.602E+02	8.751E+04	5.880E+00	3.764E-01	1.050E+02	7.056E-03
2054	1.576E+02	8.612E+04	5.787E+00	3.704E-01	1.033E+02	6.944E-03
2055	1.551E+02	8.475E+04	5.695E+00	3.646E-01	1.017E+02	6.834E-03
2056	1.527E+02	8.341E+04	5.604E+00	3.588E-01	1.001E+02	6.725E-03
2057	1.503E+02	8.209E+04	5.515E+00	3.531E-01	9.850E+01	6.618E-03
2058	1.479E+02	8.078E+04	5.428E+00	3.475E-01	9.694E+01	6.513E-03
2059	1.455E+02	7.950E+04	5.342E+00	3.420E-01	9.540E+01	6.410E-03
2060	1.432E+02	7.824E+04	5.257E+00	3.365E-01	9.389E+01	6.308E-03
2061	1.409E+02	7.700E+04	5.173E+00	3.312E-01	9.240E+01	6.208E-03
2062	1.387E+02	7.577E+04	5.091E+00	3.259E-01	9.093E+01	6.110E-03
2063	1.365E+02	7.457E+04	5.010E+00	3.208E-01	8.949E+01	6.013E-03
2064	1.343E+02	7.339E+04	4.931E+00	3.157E-01	8.807E+01	5.917E-03
2065	1.322E+02	7.222E+04	4.853E+00	3.107E-01	8.667E+01	5.823E-03
2066	1.301E+02	7.108E+04	4.776E+00	3.057E-01	8.529E+01	5.731E-03
2067	1.280E+02	6.995E+04	4.700E+00	3.009E-01	8.394E+01	5.640E-03
2068	1.260E+02	6.884E+04	4.625E+00	2.961E-01	8.261E+01	5.550E-03

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2069	1.240E+02	6.775E+04	4.552E+00	2.914E-01	8.129E+01	5.462E-03
2070	1.220E+02	6.667E+04	4.480E+00	2.868E-01	8.000E+01	5.375E-03
2071	1.201E+02	6.561E+04	4.408E+00	2.822E-01	7.873E+01	5.290E-03
2072	1.182E+02	6.457E+04	4.339E+00	2.777E-01	7.748E+01	5.206E-03
2073	1.163E+02	6.355E+04	4.270E+00	2.733E-01	7.626E+01	5.124E-03
2074	1.145E+02	6.254E+04	4.202E+00	2.690E-01	7.504E+01	5.042E-03
2075	1.127E+02	6.154E+04	4.135E+00	2.647E-01	7.385E+01	4.962E-03
2076	1.109E+02	6.057E+04	4.070E+00	2.605E-01	7.268E+01	4.883E-03
2077	1.091E+02	5.961E+04	4.005E+00	2.564E-01	7.153E+01	4.806E-03
2078	1.074E+02	5.866E+04	3.941E+00	2.523E-01	7.039E+01	4.730E-03
2079	1.057E+02	5.773E+04	3.879E+00	2.483E-01	6.927E+01	4.655E-03
2080	1.040E+02	5.681E+04	3.817E+00	2.444E-01	6.818E+01	4.581E-03
2081	1.023E+02	5.591E+04	3.757E+00	2.405E-01	6.709E+01	4.508E-03
2082	1.007E+02	5.502E+04	3.697E+00	2.367E-01	6.603E+01	4.436E-03
2083	9.912E+01	5.415E+04	3.638E+00	2.329E-01	6.498E+01	4.366E-03
2084	9.755E+01	5.329E+04	3.581E+00	2.292E-01	6.395E+01	4.297E-03
2085	9.600E+01	5.244E+04	3.524E+00	2.256E-01	6.293E+01	4.229E-03
2086	9.448E+01	5.161E+04	3.468E+00	2.220E-01	6.193E+01	4.161E-03
2087	9.298E+01	5.079E+04	3.413E+00	2.185E-01	6.095E+01	4.095E-03
2088	9.150E+01	4.999E+04	3.359E+00	2.150E-01	5.998E+01	4.030E-03
2089	9.005E+01	4.919E+04	3.305E+00	2.116E-01	5.903E+01	3.966E-03
2090	8.862E+01	4.841E+04	3.253E+00	2.082E-01	5.810E+01	3.903E-03
2091	8.721E+01	4.764E+04	3.201E+00	2.049E-01	5.717E+01	3.841E-03
2092	8.583E+01	4.689E+04	3.150E+00	2.017E-01	5.627E+01	3.780E-03
2093	8.447E+01	4.614E+04	3.100E+00	1.985E-01	5.537E+01	3.720E-03
2094	8.313E+01	4.541E+04	3.051E+00	1.953E-01	5.449E+01	3.661E-03
2095	8.181E+01	4.469E+04	3.003E+00	1.922E-01	5.363E+01	3.603E-03
2096	8.051E+01	4.398E+04	2.955E+00	1.892E-01	5.278E+01	3.546E-03
2097	7.923E+01	4.328E+04	2.908E+00	1.862E-01	5.194E+01	3.490E-03
2098	7.797E+01	4.260E+04	2.862E+00	1.832E-01	5.112E+01	3.434E-03
2099	7.673E+01	4.192E+04	2.817E+00	1.803E-01	5.030E+01	3.380E-03
2100	7.552E+01	4.125E+04	2.772E+00	1.775E-01	4.951E+01	3.326E-03
2101	7.432E+01	4.060E+04	2.728E+00	1.746E-01	4.872E+01	3.273E-03
2102	7.314E+01	3.996E+04	2.685E+00	1.719E-01	4.795E+01	3.222E-03
2103	7.198E+01	3.932E+04	2.642E+00	1.691E-01	4.719E+01	3.170E-03
2104	7.083E+01	3.870E+04	2.600E+00	1.664E-01	4.644E+01	3.120E-03
2105	6.971E+01	3.808E+04	2.559E+00	1.638E-01	4.570E+01	3.071E-03
2106	6.860E+01	3.748E+04	2.518E+00	1.612E-01	4.497E+01	3.022E-03
2107	6.752E+01	3.688E+04	2.478E+00	1.586E-01	4.426E+01	2.974E-03
2108	6.644E+01	3.630E+04	2.439E+00	1.561E-01	4.356E+01	2.927E-03
2109	6.539E+01	3.572E+04	2.400E+00	1.537E-01	4.287E+01	2.880E-03
2110	6.435E+01	3.515E+04	2.362E+00	1.512E-01	4.219E+01	2.834E-03
2111	6.333E+01	3.460E+04	2.325E+00	1.488E-01	4.152E+01	2.789E-03
2112	6.232E+01	3.405E+04	2.288E+00	1.465E-01	4.086E+01	2.745E-03
2113	6.133E+01	3.351E+04	2.251E+00	1.441E-01	4.021E+01	2.702E-03
2114	6.036E+01	3.298E+04	2.216E+00	1.418E-01	3.957E+01	2.659E-03
2115	5.940E+01	3.245E+04	2.180E+00	1.396E-01	3.894E+01	2.617E-03
2116	5.846E+01	3.194E+04	2.146E+00	1.374E-01	3.832E+01	2.575E-03
2117	5.753E+01	3.143E+04	2.112E+00	1.352E-01	3.772E+01	2.534E-03
2118	5.662E+01	3.093E+04	2.078E+00	1.330E-01	3.712E+01	2.494E-03
2119	5.572E+01	3.044E+04	2.045E+00	1.309E-01	3.653E+01	2.454E-03

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2120	5.484E+01	2.996E+04	2.013E+00	1.289E-01	3.595E+01	2.415E-03
2121	5.397E+01	2.948E+04	1.981E+00	1.268E-01	3.538E+01	2.377E-03
2122	5.311E+01	2.901E+04	1.949E+00	1.248E-01	3.482E+01	2.339E-03
2123	5.227E+01	2.855E+04	1.918E+00	1.228E-01	3.426E+01	2.302E-03
2124	5.144E+01	2.810E+04	1.888E+00	1.209E-01	3.372E+01	2.266E-03
2125	5.062E+01	2.765E+04	1.858E+00	1.189E-01	3.318E+01	2.230E-03
2126	4.982E+01	2.721E+04	1.829E+00	1.171E-01	3.266E+01	2.194E-03
2127	4.903E+01	2.678E+04	1.800E+00	1.152E-01	3.214E+01	2.159E-03
2128	4.825E+01	2.636E+04	1.771E+00	1.134E-01	3.163E+01	2.125E-03
2129	4.748E+01	2.594E+04	1.743E+00	1.116E-01	3.113E+01	2.091E-03
2130	4.673E+01	2.553E+04	1.715E+00	1.098E-01	3.063E+01	2.058E-03
2131	4.599E+01	2.512E+04	1.688E+00	1.081E-01	3.015E+01	2.026E-03
2132	4.526E+01	2.472E+04	1.661E+00	1.063E-01	2.967E+01	1.993E-03
2133	4.454E+01	2.433E+04	1.635E+00	1.047E-01	2.920E+01	1.962E-03
2134	4.383E+01	2.395E+04	1.609E+00	1.030E-01	2.873E+01	1.931E-03
2135	4.314E+01	2.356E+04	1.583E+00	1.014E-01	2.828E+01	1.900E-03
2136	4.245E+01	2.319E+04	1.558E+00	9.975E-02	2.783E+01	1.870E-03
2137	4.178E+01	2.282E+04	1.533E+00	9.817E-02	2.739E+01	1.840E-03
2138	4.111E+01	2.246E+04	1.509E+00	9.661E-02	2.695E+01	1.811E-03
2139	4.046E+01	2.210E+04	1.485E+00	9.508E-02	2.652E+01	1.782E-03
2140	3.982E+01	2.175E+04	1.462E+00	9.357E-02	2.610E+01	1.754E-03
2141	3.919E+01	2.141E+04	1.438E+00	9.208E-02	2.569E+01	1.726E-03
2142	3.857E+01	2.107E+04	1.416E+00	9.062E-02	2.528E+01	1.699E-03
2143	3.795E+01	2.073E+04	1.393E+00	8.918E-02	2.488E+01	1.672E-03
2144	3.735E+01	2.040E+04	1.371E+00	8.777E-02	2.449E+01	1.645E-03
2145	3.676E+01	2.008E+04	1.349E+00	8.637E-02	2.410E+01	1.619E-03
2146	3.617E+01	1.976E+04	1.328E+00	8.500E-02	2.371E+01	1.593E-03
2147	3.560E+01	1.945E+04	1.307E+00	8.365E-02	2.334E+01	1.568E-03
2148	3.504E+01	1.914E+04	1.286E+00	8.233E-02	2.297E+01	1.543E-03
2149	3.448E+01	1.884E+04	1.266E+00	8.102E-02	2.260E+01	1.519E-03
2150	3.393E+01	1.854E+04	1.245E+00	7.973E-02	2.224E+01	1.495E-03
2151	3.339E+01	1.824E+04	1.226E+00	7.847E-02	2.189E+01	1.471E-03
2152	3.286E+01	1.795E+04	1.206E+00	7.722E-02	2.154E+01	1.448E-03
2153	3.234E+01	1.767E+04	1.187E+00	7.600E-02	2.120E+01	1.425E-03
2154	3.183E+01	1.739E+04	1.168E+00	7.479E-02	2.087E+01	1.402E-03
2155	3.132E+01	1.711E+04	1.150E+00	7.360E-02	2.053E+01	1.380E-03
2156	3.083E+01	1.684E+04	1.131E+00	7.244E-02	2.021E+01	1.358E-03
2157	3.034E+01	1.657E+04	1.114E+00	7.129E-02	1.989E+01	1.336E-03
2158	2.985E+01	1.631E+04	1.096E+00	7.015E-02	1.957E+01	1.315E-03
2159	2.938E+01	1.605E+04	1.078E+00	6.904E-02	1.926E+01	1.294E-03

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SPECIFICATION NO: **SECTION 01 57 13**

SPECIFICATION TITLE: **EROSION AND SEDIMENT CONTROL**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
A	11/10/2018	5	Client Review/Approval	CFB	ELM	

☒ Entire Specification Issued this Revision

☐ Revised Pages Only Issued this Revision

SPECIFICATION ISSUED FOR:

☐ In-house Review
☒ Client Review/Approval
☐ Information Only
☐ Bid
☐ Construction
☐ *Other*

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SECTION 01 57 13

EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 DESCRIPTION

A. The primary purpose of this Section is to establish the requirements for temporary erosion and sediment (E&S) controls with the specific intent of minimizing the movement of sediment off the Site. The Contractor shall provide all materials, equipment, and labor necessary to accomplish installation, inspection, maintenance, and removal of the temporary E&S controls.

1.02 RELATED WORK

A. Related Work specified in other sections includes, but is not limited to:

1. Section 31 23 00 – Earthwork

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings
2. Construction Quality Assurance (CQA) Plan
3. Scope of Work

1.03 REFERENCES

A. Alabama Handbook for Erosion Control, Sediment Control, and Stormwater Management on Construction Sites and Urban Areas (Alabama Handbook).

1.04 PERFORMANCE REQUIREMENTS

A. Project Work shall conform to E&S control measure requirements of the State of Alabama.

B. Temporary E&S control measures shall be installed as the first step in construction, shall be routinely inspected, continuously maintained, and

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shall not be removed until permanent vegetation is completely established and stabilized, as approved by the Project Construction Manager (PCM).

PART 2 PRODUCTS

2.01 STORM WATER POLLUTION PREVENTION PLAN

A. The Contractor shall comply with the provisions of the Alabama Department of Environmental Management (ADEM) Water Quality Program – Field Operations Division Administrative Code Chapter 335-6-12.

2.02 MATERIALS

A. The Contractor shall comply with the Erosion and Sediment Control Plan (ESCP) shown in the Construction Drawings. All materials shall meet the applicable requirements of the most recent version of the Alabama Handbook. Materials shall include, but not be limited to, the following items.

1. Sediment barriers shall be earth diversion berms, silt fences, or other approved materials that will prevent migration of silts and sediment to receiving waters.

2. Temporary sediment traps be installed as shown on Construction Drawings.

3. Construction entrance shall be constructed with stone meeting the requirements of the most recent version of the Alabama Handbook.

4. Ditches, channels, and swales shall be constructed in accordance with Section 31 23 00.

5. Temporary and permanent seeding mixes shall be as in accordance with the Alabama Handbook and shall be approved for use by the PCM.

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PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. It is the Contractor's responsibility to implement and maintain E&S control measures which effectively prevent E&S discharges and meet the requirements of federal, state, and local regulations.

B. Earthmoving activities shall be conducted in such a manner as to prevent E&S discharges.

C. E&S control measures shall be inspected by the Contractor on a regular basis and immediately after each major rainfall (1 in. or greater) and at least daily during prolonged rainfall events.

1. Repair and/or maintenance of E&S control measures shall be made as soon as practical.

2. The Contractor shall be held responsible for the implementation and maintenance of E&S control measures for this project.

D. Stabilization shall be implemented within the timeframe described within the ESCP.

E. E&S control measures shall be installed prior to construction activities.

F. Sediment removal from temporary E&S structures and from permanent drainage ditches, channels, and swales shall be the responsibility of the Contractor for the length of the project.

G. Sediment shall be disposed of in locations approved by the PCM and in a manner which does not result in additional erosion.

H. The Contractor shall be responsible for the condition of access roads, ramps and equipment/material laydown areas and shall maintain adequate E&S controls at these locations.

I. It is the Contractor's responsibility to provide resources necessary to prevent erosion of soil from the Site, and to provide silt fences, temporary sediment traps, or other control measures as the need arises during construction at no additional cost to the Owner.

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J. The Contractor shall remove E&S control barriers after construction has been completed and permanent stabilization has been fully established, as approved by the PCM.

K. Implement dust control in accordance with the Contractor's Work Plan.

3.02 SPECIAL CONDITIONS

A. Prohibited construction practices include, but shall not be limited to, the following:

1. Dumping of spoil material into stream corridors, wetlands, surface waters, or at unspecified locations.

2. Operation of equipment in stream corridors, wetlands, or surface waters other than as indicated on the Construction Drawings.

3. Pumping of silt-laden water from trenches or other excavations into surface waters or stream corridors.

4. Disposal of trees, brush and other debris in stream corridors, surface water, or at unspecified locations.

5. Open burning of construction project debris.

3.03 ADJUSTMENT OF PRACTICES

A. If the planned E&S measures do not result in effective control of erosion and sediment runoff meeting the requirements of the General Permit for Discharges of Stormwater from Construction Activities, the Contractor shall immediately adjust his activities and/or institute additional measures to eliminate erosion and sediment runoff at no additional cost to the Owner.

B. If the Contractor fails or refuses to comply promptly, the PCM may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. No time lost due to stop orders by the PCM shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor.

C. Fines and penalties levied by federal, state, and/or local authorities shall be paid by the Contractor at no cost to the Owner. No time lost due to stop orders issued by federal, state and/or local authorities shall be made the

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subject of a claim for extension of time or for excess costs or damages by the Contractor.

[END OF SECTION]

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SPECIFICATION NO: **SECTION 01 71 23.16**

SPECIFICATION TITLE: **SURVEYING**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

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SECTION 01 71 23.16

SURVEYING

PART 1 GENERAL

1.01 DESCRIPTION

A. The Work specified in this Section consists of all labor, equipment, tools, materials, services, supervision, and incidentals necessary to perform all surveying necessary for completion of the Work as described herein, shown on the Construction Drawings, or as approved by the Project Construction Manager (PCM). Work in this Section includes, but is not limited to:

1. Using recognized engineering and survey practices to:

   a. Establish elevations, lines, levels and utility locations, slopes, and invert elevations.

   b. Locate and lay out construction features including necessary stakes for cut, fill, placement, and grading operations.

   c. Verify set-backs and easements.

2. Confirming drawing dimensions and elevations.

3. Establishing survey control.

4. Performing pre-construction, intermediate, and post-construction surveys.

5. Verifying thickness and elevations of placed materials with those shown on the Construction Drawings or as approved by the PCM.

6. Preparing Final Record Survey Drawings of the construction.

1.02 RELATED WORK

A. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings

2. Construction Quality Assurance (CQA) Plan

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3. Scope of Work

1.03 PERFORMANCE REQUIREMENTS

A. The Contractor shall comply with all applicable Federal, State and Local codes, ordinances, regulations, statutes and standards.

B. Surveying shall be performed and certified by, or under the direction of, a Land Surveyor (LS) currently licensed by the State of Alabama.

C. The Contractor shall locate the existing site survey control, survey, and establish additional survey control required for performance of the Work and conducting measurements necessary for proper execution of the Work. The Contractor shall be responsible to re-establish survey control lost during performance of the Work. Project survey control shall be tied into the existing site survey control.

D. The survey instruments used for this Work shall be precise and accurate to meet the needs of the project. Survey instruments shall be capable of reading to a precision of 0.01 of a foot and with a setting accuracy of 10 seconds. Calibration certificates for survey instruments shall be provided as detailed in this Section.

1.04 REFERENCES

A. Federal Geodetic Control Committee (FGCC) – Standards and Specifications for Geodetic Control Networks (1984).

1.05 SUBMITTALS

A. Submit the following to the PCM for review at least 14 calendar days prior to the commencement of surveying activities, unless otherwise described below.

1. Surveyor’s name, contact information, and credentials.

2. Calibration certificates for survey instruments shall be provided to the PCM prior to initiation of surveying activities.

3. Related surveyor information, calibration certificates, field notes and as-built drawings, as requested.

4. Record Drawing of Benchmarks and Control Points.

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5. Initial record survey drawings, for the PCM's approval prior to the beginning of any earthmoving activity at the site.

6. Intermediate record survey drawings, to be submitted to the PCM as soon as is practicable for review and approval prior to start of subsequent construction stage. Electronic survey files are to be submitted with 3D elevated polylines in AutoCAD, version 2013 or more recent, and as electronic files in Microsoft Excel.

7. Signed and sealed as-built survey in D-size (Final Record Survey Drawings with Letter of Certification) and electronic drawing file showing final grades and lines. Final record drawings, to be submitted to the PCM for final acceptance.

1.06 QUALITY CONTROL

A. The Contractor shall conduct all survey measurements and check dimensions necessary for the proper execution of the Work called for by the Construction Drawings and Documents and as listed in this Section.

B. Where the dimensions and locations of existing structures or utilities are of critical importance to the installation or connection of new Work, the Contractor shall verify such dimensions and locations in the field before conducting the Work.

C. The Contractor shall establish the horizontal and vertical control benchmarks from the existing survey control. One or more permanent benchmarks shall be established for the site at a location convenient for daily tie-in. The vertical and horizontal controls for this benchmark shall be established within land surveying industry standards.

D. The following minimum standards are required for Project Control, as per the Standards and Specifications for Geodetic Control Networks (1984):

1. Horizontal control at Third Order, Class I.

2. Vertical control at Third Order.

1.07 PROJECT AND SITE CONDITIONS

A. The Contractor shall carefully examine the site to determine the full extent, nature, and location of Work required to conform to the Construction

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Drawings and Technical Specifications. The Contractor shall bring any inaccuracies or discrepancies between the Construction Drawings and Technical Specifications to the PCM's attention to clarify the exact nature of the Work to be performed.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 GENERAL

A. Original field survey notes shall be retained by the Surveyor and, if requested, provided to the PCM. The surveyor shall produce Record Drawings as the job progresses. The results from the field surveys shall be documented on a set of Record Drawings. At a minimum, these drawings shall show the final elevations of the surfaces listed in this Section at a scale of no less than 1inch equals 50 feet with contour intervals no greater than 1 foot.

B. Special survey requirements and deliverables such as GPS, data management formatted drawings and figures, etc., are stipulated in this Section.

C. The Contractor shall notify the PCM at least 2 working days in advance of any record survey activities planned.

D. The survey shall be sequenced in each designated area as appropriate for Work, or as otherwise approved by the PCM.

E. Topographic elements shall be collected and reported as three-dimensional data within the electronic file surveys as described in this Section.

F. Coordinate systems shall be based on NAD83 datum.

G. Base elevation shall be referenced to NAVD88.

H. Protect and maintain all horizontal and vertical control points during construction.

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I. Work done using methods or equipment not approved by the PCM shall be subject to removal and replacement.

3.02 SURVEY CONTROL POINTS

A. Survey Control Point Requirements

1. Establish survey control points prior to starting Work.

2. Use appropriate offset staking method for grade markers and other survey control points that interfere with the Work.

3. Protect and preserve survey control points during construction.

4. Survey control points shall not be relocated without prior written approval from the PCM.

5. Promptly report any dislocated, damaged or destroyed survey control points to the PCM.

6. Replace dislocated, damaged or destroyed survey control points as per original survey.

B. The Contractor shall provide a Record Drawing of Benchmarks and Control Points to be used for the project at the beginning of survey Work and whenever they are altered or added. The Record Drawing shall include both pre-existing and newly installed benchmarks and control points. This Record Drawing shall be signed and sealed by a LS currently licensed by the State of Alabama.

C. Acceptable tolerances on survey coordinates, within the waste containment areas, shall be 0.0 to -0.2 feet on subgrade elevations (i.e., final coal combustion residuals (CCR) surface or liner grades), and 0.0 to +0.2 feet on Interim Soil Cover, provided minimum permit conditions and state regulations are adhered to (i.e., thickness, grades, etc.). As-built points shall be surveyed within +/-0.2 feet horizontally of the provided construction control points on the top deck and benches, and within +/-0.1 feet horizontally on the side slopes.

D. Surveying spacing shall be, at a minimum, consistent with the control points provided as part of the Construction Drawings. Additional survey points may be utilized as necessary. Generally, surfaces shall be surveyed on a

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square grid not wider than 50 feet. Grade breaks (e.g., crest and toe of slope) and midpoints of slopes shall also be surveyed. A line of survey points no farther than 50 feet apart shall be taken along any slope break, including the inside edge and outside edge of any bench. Along linear features, survey sections or points shall be at a 50-foot maximum spacing.

E. The following features, though not all-inclusive, shall be surveyed to determine the lines and grades achieved during construction:

1. Top of existing surface at CCR removal areas.

2. Top of excavated surface after CCR and an additional 6 inches of material have been removed at CCR removal areas.

3. Top of existing CCR at CCR fill areas.

4. Top of final CCR surface at CCR fill areas.

5. Top surface of Prepared Subgrade prior to geomembrane liner or Closure Turf deployment and installation.

6. Limits of geomembrane, corners of deployed panels, along seams at 50-foot intervals and at grade breaks, location of destructive seam samples, location of repairs, and other pertinent information with collected data labeled to correlate with CQA Consultant's geosynthetic labeling strategy.

7. Top of gravel drainage layers and filter layer.

8. Locations of risers, headwalls, manholes, drop inlets, berms, anchor trenches, pipes, sumps, drainage ditches, swales, channels, roads, sediment basins, and other ancillary features shown on the Construction Drawings (as applicable, inlet and outlet inverts, break lines, crest, toe, etc.).

3.03 INITIAL RECORD SURVEY

A. Prior to performing Work at the site, the Contractor shall conduct a survey of the site within the project boundaries, up to and including the limit of Work and including any area outside of the limit of Work where Work is to be performed (i.e., construction entrance and access road, construction

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laydown area, stockpile areas, etc.). The survey shall document the condition of the site at the initiation of the Project.

3.04 INTERMEDIATE SURVEY

A. Surveying of lines and grades shall be conducted on an ongoing basis during earthwork activities (i.e., excavation, placement, and stockpiling of soils and CCR), installation of drainage systems (i.e., geosynthetics, pipes, and other ancillary features shown on the Project Drawings), and placement of cover system (i.e., Prepared Subgrade and Closure Turf or alternative cover system).

B. Surveying shall be performed to provide documentation for record plans, verify quantities of soils, CCR, geosynthetics, and pipes, and assist the Contractor to comply with the required grades. Additionally, surveys may be needed throughout the progress of the Work to determine pay quantities and document Work that has been performed. Surveying conducted at the site shall be consistent with the control points provided as part of the Construction Drawings.

C. Surveying shall be performed as soon as possible after completion of a given installation to facilitate progress and avoid delaying the next installation. In addition, spot checks shall be used during construction to assist the Contractor in complying with the required grades. As-built construction control points shall be provided to the PCM by the Surveyor for review of layer thicknesses and approval prior to placement of the overlying layer.

3.05 FINAL RECORD AS-BUILT SURVEY

A. At the completion of the Work, the Contractor shall perform a survey of the site within the project boundaries, up to and including the Work limits and including any area outside of the original Work limits where Work was performed. The survey shall document the condition of the site at the completion of the Project. The survey shall accurately locate features that are to be shown on the final record survey drawing. Included in this final record survey will be preparation of as-built sections defining cut and fill limits and as-built records of the actual cover and drainage systems, pipes, and other ancillary features, as well as final restoration grades of other disturbed areas. The Final Record Survey shall be signed and sealed by a

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LS or PE currently licensed by the State of Alabama and provided in hard copy, PDF, and electronic drawing formats.

[END OF SECTION]

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SPECIFICATION NO: **SECTION 01 89 13**

SPECIFICATION TITLE: **SITE PREPARATION**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

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SECTION 01 89 13

SITE PREPARATION

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section describes the necessary activities to prepare the site for construction of the coal combustion residuals (CCR) pond closure. This Section discusses general labor, equipment, tools, materials, services, supervision and incidentals necessary to complete the Work described herein. Work in this Section includes, but is not limited to:

1. Clearing and grubbing, if necessary, to establish access routes, support areas, and other Work areas as necessary to complete the Work, or as approved by the Project Construction Manager (PCM).

2. Verification of existing benchmarks and control point network. Expansion of any existing Facility survey control point network(s), if needed.

3. Protection of existing site features including, but not limited to, groundwater monitoring wells, piezometers, instrumentation, utilities, water conveyance features, infrastructure, structures, etc.

1.02 RELATED WORK

A. Related Work specified in other Sections includes, but is not limited to:

1. Section 01 71 23.16 – Surveying

2. Section 01 57 13 – Erosion and Sediment Control

3. Section 31 10 00 – Site Clearing

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings

2. Construction Quality Assurance (CQA) Plan

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3. Scope of Work

1.03 PERFORMANCE REQUIREMENTS

A. The Contractor shall comply with all applicable Federal, State and Local codes, ordinances, regulations, statutes and standards.

1.04 SUBMITTALS

A. Submit the following to the PCM for review at least 14 calendar days prior to use.

1. Proposed survey control network expansion plans, in accordance with Section 01 71 23.16.

2. Contractor's proposed measures for protection of existing site features during construction activities.

1.05 PROJECT AND SITE CONDITIONS

A. The Contractor shall carefully examine the site to determine the full extent, nature and location of Work required to conform to the Construction Drawings and Technical Specifications. The Contractor shall bring any inaccuracies or discrepancies between the Construction Drawings and Technical Specifications to the PCM's attention to clarify the exact nature of the Work to be performed.

B. The Contractor shall be aware of and protect existing site features including, but not limited to, groundwater monitoring wells, piezometers, instrumentation, utilities, water conveyance features, infrastructure, structures, etc. Any existing site features damaged shall be repaired at no cost to the Owner.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 VERIFICATION OF EXISTING CONDITIONS

A. Prior to the start of clearing, grubbing, stripping, and earthwork activities, verify the accuracy of the existing conditions shown on the Construction

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Drawings in accordance with Section 01 71 23.16. Existing ground and subsurface conditions, based on available site data, are shown on the Construction Drawings.

B. Verify the existing permanent survey monuments, structures, utilities, wells, topography, surface water management and erosion and sediment control measures, construction safety fences, sedimentation basins and appurtenances, and drainage features whether or not shown on the Construction Drawings. Verification shall include both horizontal and vertical confirmation and preparation of adjustments necessary to depict existing conditions in accordance with Section 01 71 23.16.

C. The approximate locations of known underground and aboveground utility lines and structures are shown on the Construction Drawings. Immediately notify the PCM if other utility lines or structures, not shown on the Construction Drawings, are encountered during the verification of existing conditions and execution of Work.

D. Immediately notify the PCM of deviations from the existing conditions shown on the Construction Drawings.

3.02 CONTROL POINT NETWORK EXPANSION

A. Existing site benchmark and control point network shall be verified in accordance with Section 01 71 23.16.

B. As necessary, expand Project survey control point network to properly complete and document construction activities. The survey control network shall be expanded in accordance with Section 01 71 23.16.

3.03 SITE UTILITIES

A. The contractor is responsible for marking out utilities and conducting underground utility investigations to ensure all utilities requiring protection are protected throughout construction.

3.04 SITE ACCESS

A. Construction entrances, exits, staging and laydown areas, etc. shall be constructed as shown on the Construction Drawings.

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3.05 CLEARING AND GRUBBING

A. Clearing and grubbing activities shall be performed in accordance with Section 31 10 00.

3.06 CONSTRUCTION WATER MANAGEMENT

A. Manage construction water in accordance with Section 01 57 13.

B. Implement dust control in accordance with the Contractor's Work Plan.

3.07 PROTECTION OF EXISTING SITE FEATURES

A. The Contractor shall identify and install markers, construction fences, guard posts, etc. as necessary to protect existing site features. Protective measures shall be maintained and repaired or replaced as necessary throughout the duration of construction activities.

[END OF SECTION]

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SPECIFICATION NO: **SECTION 03 30 00**

SPECIFICATION TITLE: **CAST-IN-PLACE CONCRETE**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

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SECTION 03 30 00

CAST IN-PLACE CONCRETE

PART 1 GENERAL

1.01 DESCRIPTION

A. Work in this Section includes material and placement of reinforced cast-in-place concrete, controlled low strength material (CLSM), and related activities. The Contractor shall provide all materials, equipment, and labor necessary to perform the Work in accordance with the requirements included in this Section.

1.02 RELATED WORK

A. Related Work specified in other sections includes, but is not limited to:

1. Section 01 71 23.16 – Surveying
2. Section 01 89 13 – Site Preparation
3. Section 31 23 00 – Earthwork
4. Section 33 44 00 – Stormwater Pipes and Structures

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings
2. Construction Quality Assurance (CQA) Plan
3. Scope of Work

1.03 REFERENCES

A. Latest version of American Concrete Institute (ACI) Standards:

1. ACI 229R Report on Controlled Low Strength Materials
2. ACI 301 Specifications for Structural Concrete
3. ACI 304R Guide for Measuring, Mixing, Transporting, and Placing Concrete

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4. ACI 305.1 Specification for Hot Weather Concreting
5. ACI 306.1 Standard Specification for Cold Weather Concreting
6. ACI 315 Details and Detailing of Concrete Reinforcement
7. ACI 318 Building Code Requirements for Structural Concrete and Commentary
8. ACI 347 Guide to Formwork for Concrete
9. ACI 548.11R Guide for the Application of Epoxy and Latex Adhesives for Bonding Freshly Mixed and Hardened Concretes

B. Latest version of American Society for Testing Materials (ASTM) Standards:

1. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement Construction Drawings
2. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
3. ASTM C94 Standard Specification for Ready-Mixed Concrete
4. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete
5. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
6. ASTM C494 Standard Specification for Chemical Admixtures for Concrete
7. ASTM C1107 Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink)

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1.04 SUBMITTALS

A. Submit the following information to the Project Construction Manager (PCM) for review and approval at least 14 calendar days prior to initiating cast in-place concrete Work.

1. The complete bar schedule, bar details, and drawings and sketches conforming to ACI 315.

    a. Mark each bar with identification corresponding to type, grade, and size.

    b. Provide detail drawings indicating spacing, location, and quantities of reinforcing steel.

2. Design Mix

    a. Submit proposed design mixes for concrete, CLSM, and grout specified in this Section. Proposed mixes shall comply with the minimum requirements of this Section and shall include specific acceptance ranges for mixing time, air entrainment, slump, and unit weight.

    b. Provide name and address of transit ready-mix concrete Supplier, including an example batch ticket.

    c. Include a minimum of five test results for the design mixes showing compressive strength at 3, 7 and 14 calendar days, and two test results at 28 calendar days, in accordance with ASTM C39.

3. Certification from the supplier that concrete, CLSM, and grout materials and mixes conform to the requirements of this Section.

4. Drawings and sketches for cast-in-place concrete structures, including locations of construction joints, if needed.

5. Rebar drawings and sketches for spillway riser bases.

6. Methods for concrete placement during hot weather (ACI 305.1) and cold weather (ACI 306.1).

7. Formwork design.

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B. The contractor shall submit to the PCM a list of equipment and materials; description of construction means, methods, and techniques; and other required information for concrete, CLSM, and grout placement for review. This submittal shall be transmitted at least 14 calendar days prior to commencement of Work described in this Section.

C. Submit, for each load of concrete delivered to the site, the original batch ticket in accordance with ASTM C94 within 7 calendar days of concrete placement.

PART 2 PRODUCTS

2.01 MATERIALS

A. Forms

1. Design concrete formwork for vertical loads and lateral pressures in accordance with ACI 347.

2. Furnish plywood forms that are marked grade B-B Plyform.

3. Furnish minimum 16-gauge steel forms, if steel forms are used.

4. Furnish factory-fabricated snap-off metal form ties of adequate design to minimize form deflection and preclude concrete spalling upon removal.

5. Furnish a bond breaker or form release agent made from non-staining colorless mineral oil or similar liquid product that imparts a waterproof film to prevent adhesion of concrete to formwork and will not impair natural bonding characteristics of subsequent coatings.

B. Concrete Reinforcement

1. Furnish concrete reinforcement as shown on the Construction Drawings.

2. Furnish reinforcing steel bars conforming to the requirements of ASTM A615, Grade 60, in accordance with ACI 318.

3. Furnish bolsters, chairs, and accessories conforming to the requirements of ACI 315.

C. Cast-in-Place Concrete

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1. Cast-in-place concrete shall consist of design mixes with a minimum compressive strength of 4,000 psi.

2. Furnish admixtures for the concrete conforming to ASTM C260 for air-entraining agent and to ASTM C494, Type A, for water-reducing admixtures.

3. Furnish a curing compound conforming to the requirements of ASTM C309 and that does not impair natural bonding characteristics of subsequent coatings.

D. Controlled Low Strength Material (CLSM)

1. Furnish CLSM with 50 to 150 pounds per square inch (psi) 28-day compressive strength.

2. Mix shall be in accordance with ACI 229R, use Type III cement, and achieve 70 percent of its specified strength within 12 to 24 hours.

E. Grout

1. Furnish non-shrink grout for pipe penetrations and precast concrete joints described in Section 33 44 00.

   a. Mix and place as recommended by the Manufacturer and in accordance with ASTM C1107.

   b. Furnish flowable non-metallic grout, manufactured by one of the following or approved equal:

      i. Five Star,

      ii. Euclid Chemical, or

      iii. Sika.

F. Bonding Agent

1. Furnish moisture-insensitive, epoxy-resin bonding agent, manufactured by one of the following or approved equal:

   a. Five Star

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b. Euclid Chemical, or

c. Sika

2. Use in accordance with Manufacturer's instructions.

G. Reinforcement Bar Tags

1. Furnish reinforcement bar tags made of durable material and marked with permanent markings, at least one tag per bundle. Use tags that show grade, size, number of pieces, and length of bars.

2.02 EQUIPMENT

A. Furnish equipment to perform the specified Work in accordance with this Section and the Contractor's Work Plan.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Verify existing conditions in accordance with Section 01 89 13.

B. Maintain access for pedestrian and vehicular traffic during concrete placement.

C. Excavate soft spots in subgrade and prepare subgrade in accordance with Section 31 23 00.

D. Implement dust control in accordance with the Contractor's Work Plan.

E. Perform form cleaning and concrete wash out only in areas approved by the PCM.

F. Place CLSM in locations as shown on the Construction Drawings or as approved by the PCM.

G. Erect formwork and bracing to achieve design requirements in accordance with ACI 301 and ACI 347.

1. Install bracing to ensure stability of formwork.

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2. Align joints and make them watertight. Keep number of form joints to a minimum.

3. Install chamfer strips on external corners of permanently exposed edges.

4. Shore or strengthen formwork subject to overstressing by construction loads.

5. Form vertical surfaces to full depth and securely position to required lines and levels; ensure form ties are not placed to pass through concrete.

6. Arrange and assemble formwork to permit easy dismantling and stripping, and to prevent damage to concrete during formwork removal.

H. Form Release Agent

1. Apply form release agent on formwork in accordance with Manufacturer's instructions prior to placement of reinforcing steel, anchoring devices, and embedded items.

2. Keep surfaces coated prior to placement of concrete

I. Form Removal

1. Do not remove forms or bracing until concrete has gained a minimum of 70 percent of its 28-day compressive strength.

2. Loosen forms carefully.

3. Do not wedge against finished concrete surfaces with pry bars, hammers, or tools.

3.02 REINFORCEMENT AND JOINT PLACEMENT AND FASTENING

A. Arrange and place reinforcing steel as shown on the Construction Drawings and in accordance with ACI 318.

B. Secure reinforcement against displacement during placing of concrete. Do not allow reinforcement to deviate from required position.

C. Allow for minimum concrete cover over reinforcement in accordance with ACI 318 and as shown on the Construction Drawings.

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3.03 ERECTION/INSTALLATION/APPLICATION

A. Maintain concrete cover around reinforcement in accordance with ACI 301 and ACI 318 and as shown on the Construction Drawings.

B. Provide formed openings where required for Work to be embedded in concrete members.

C. Coordinate forming and setting openings, slots, recesses, and other inserts with other concrete activities.

D. Install concrete accessories straight, level, and plumb, as shown on the Construction Drawings.

3.04 CONCRETE, CLSM, AND GROUT PLACEMENT

A. Notify the CQA Consultant at least 24 hours in advance of concrete or CLSM placement.

B. Do not place concrete until foundations, forms, reinforcing steel, pipes, and other Work required to be built into concrete have been inspected by CQA Consultant and approved by the PCM.

C. Notify concrete batch plant prior to batching concrete or CLSM that water withheld from mixes must be indicated on batch tickets for each load prior to delivery. Water adjustments to on-site concrete deliveries shall not exceed the indicated amount of water withheld at the batch plant. Water adjustments to on-site concrete deliveries that exceed the amount of water withheld from the load at the batch plant will result in rejection of the load and replacement at the Contractor's expense.

D. Place the concrete as shown on the Construction Drawings, in accordance with the local building code, and in compliance with practices and recommendations of ACI 304R. Place the concrete in a continuous operation to prevent the formation of seams or install a construction joint in accordance with this Section and the Contractor's Work Plan. Vibrate the concrete in place without dislocation or damage to the reinforcement and built-in items.

E. Mix and place concrete and CLSM only when the temperature is within the limits of ACI 305.1 and ACI 306.1, unless otherwise authorized by the PCM. CLSM may be placed year-round in accordance with ACI 229R provided

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precautions are taken in accordance with ACI 306.1 to prevent freezing prior to CLSM curing.

F. Apply bonding agent on clean, prepared construction joints in accordance with ACI 548.11R prior to placement of concrete against construction joints.

G. When joining precast pipe sections to surface water control structures and when penetrating pipes, fill the joint or penetration with grout fully around the diameter of the pipe.

H. Place concrete and CLSM continuously between forms or other limits shown on the Construction Drawings. Place concrete and CLSM in accordance with ACI 301 and ACI 318 and ensure that reinforcement and forms are not disturbed during concrete placement.

I. Provide broom finish in accordance with ACI 301 on concrete exposed to weather.

3.05 PROTECTION OF WORK

A. Provide concrete curing and protection in accordance with ACI 301. Apply curing compound, where used, in accordance with the Manufacturer's recommendations.

B. Immediately after placement, and until concrete is set, protect Work from weather, vandalism, stains, and material spillage.

3.06 CONSTRUCTION QUALITY REQUIREMENTS

A. CQA shall be performed in accordance with the CQA Plan.

B. CQA Consultant concrete testing technician will be an ACI Certified Concrete Field Testing Technician Grade 1.

C. Contractor shall coordinate construction activities through the PCM to accommodate the activities required of the CQA Consultant.

D. Contractor shall notify the PCM at least 7 calendar days prior to commencement of new Work activities.

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E. Prior to dispatching concrete, CQA Consultant will inspect prepared subgrade, formwork, reinforcing steel layout, and other structures in accordance with this Section and as shown on the Construction Drawings.

F. CQA testing is not required for CLSM; however, testing may be performed at the discretion of the PCM.

G. Concrete loads inspected by CQA Consultant will be rejected by the PCM if the load does not conform to mixing time before placement and design mix requirements for air entrainment, slump, unit weight, and temperature.

H. Contractor shall provide equipment, such as shovels and wheelbarrows, and labor to assist CQA Consultant in obtaining material samples as required.

3.07 SURVEY CONTROL

A. Survey the location and elevations of the concrete structures in accordance with Section 01 71 23.16.

3.08 TOLERANCES

A. Install concrete to within ± 0.04 feet of the elevations indicated on the Construction Drawings.

B. Install concrete to within ±0.1 feet of the surveyed horizontal locations indicated on the Construction Drawings and/or horizontal control points.

[END OF SECTION]

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SPECIFICATION NO: **SECTION 31 05 16**

SPECIFICATION TITLE: **AGGREGATE**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

				APPROVALS		
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SECTION 31 05 16

AGGREGATE

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section describes the materials, procedures, and testing requirements, if applicable, to place aggregate materials (No. 57 stone, graded aggregate base (GAB), coarse gravel, and riprap) as shown on the Construction Drawings.

1.02 RELATED WORK

A. Related Work specified in other Sections includes, but is not limited to:

1. Section 01 71 23.16 – Surveying
2. Section 31 23 00 – Earthwork
3. Section 31 05 19.13 – Geotextile

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings
2. Construction Quality Assurance (CQA) Plan
3. Scope of Work

1.03 REFERENCES

A. Alabama Department of Transportation (ALDOT) Standard Specifications for Highway Construction, 2012 Edition.

1.04 SUBMITTALS

A. Submit the following information to the Project Construction Manager (PCM) for review and approval 14 calendar days prior to initiating earthwork activities:

1. The source of the aggregate;

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2. The method used by the supplier to achieve the required gradation of the aggregate material; and

3. Certification from the supplier and test results in accordance with ALDOT Standard Specifications that the aggregate meets the material requirements of this Section.

1.05 PROJECT AND SITE CONDITIONS

A. Prior to implementing any Work in this Section, the Contractor shall become thoroughly familiar with the site, the site conditions, and all portions of the Work described in this Section.

B. Prior to implementing any Work described in this Section, the Contractor shall carefully inspect the installed Work of all other Sections and verify that all such Work is complete to the point where the installation described in this Section may properly commence without adverse impact.

C. The Contractor shall be responsible for the adequacy and safety of the installation methods.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate shall conform to the ALDOT Standard Specifications as specified for each application detailed in Table 31 05 16-1.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place aggregate to the thickness, elevations, and locations indicated on the Construction Drawings. Depending on field conditions, the quantity of No. 57 stone may vary. The Contractor shall obtain approval from the PCM prior to placement of No. 57 stone or coarse gravel in exceedance of the thicknesses presented on the Construction Drawings.

B. Carefully place aggregate to avoid segregation, disturbance, or damage of the underlying material. Place the aggregate in such a manner as to produce

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a well graded mass of stone with the minimum practicable percentage of voids. Distribute larger pieces of riprap throughout the entire mass such that the finished riprap is free from objectionable pockets of small or large pieces.

C. Do not place aggregate by dumping or by similar methods likely to cause segregation of various sizes.

D. Do not place riprap or aggregate in a manner that causes damage to an underlying layer.

E. Aggregate placed in the down chutes shall be placed working from low to high.

F. The equipment used to place aggregate over the geosynthetics shall be low ground pressure (LGP) equipment, with a maximum ground pressure of 5 psi operating on no less than 6-in. of material over the geosynthetics.

G. Do not operate equipment directly on the geotextile separator.

H. Implement dust control in accordance with the Contractor's Work Plan.

3.02 CONSTRUCTION QUALITY REQUIREMENTS

A. CQA shall be performed in accordance with the CQA Plan.

B. The installation of aggregate will be observed by the CQA Consultant.

C. The Contractor shall correct deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the Owner.

3.03 SURVEY CONTROL

A. Survey the location of aggregate placement in accordance with Section 01 71 23.16.

3.04 TOLERANCES

A. Place riprap to within ±0.3 feet of the thicknesses shown on the Construction Drawings.

B. Place GAB to within ±0.1 feet of the thickness shown on the Construction Drawings.

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C. The thickness of the No. 57 stone and coarse gravel may vary due to field conditions. The Contractor shall get approval from the PCM prior to placement of No. 57 stone or coarse gravel greater than the thicknesses or elevations presented on the Construction Drawings.

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TABLE 31 05 16-1. SIZE REQUIREMENTS FOR AGGREGATES

MATERIAL	ALDOT STANDARD SPECIFICATION AGGREGATE TYPE
No. 57 Stone	No. 57
Coarse Gravel (D_{50}=1”)	No. 357
Coarse Gravel (D_{50}=2”)	No. 2
Riprap (D_{50}=6”)	Class 1
Riprap (D_{50}=12”)	Class 2
Riprap (25 to 500 lbs)	Class 3
Graded Aggregate Base	Type B

[END OF SECTION]

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SPECIFICATION NO: **SECTION 31 05 19.13**

SPECIFICATION TITLE: **GEOTEXTILE**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

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SECTION 31 05 19.13

GEOTEXTILE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section describes the materials, installation, and testing requirements to perform the installation, quality control, and maintenance of the non-woven geotextiles for the closure system, outlet protection, and roads.

1.02 RELATED WORK

A. Related Work specified in other Sections includes, but is not limited to:

1. Section 01 71 23.16 – Surveying

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings
2. Construction Quality Assurance (CQA) Plan
3. Scope of Work

1.03 REFERENCES

A. Latest version of ASTM International (ASTM) Standards:

1. ASTM D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus
2. ASTM D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles
3. ASTM D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
4. ASTM D4873 Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples

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5. ASTM D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles

6. ASTM D6193 Standard Practice for Stitches and Seams

7. ASTM D6241 Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe

1.04 SUBMITTALS

A. Submit the following to the Project Construction Manager (PCM) for review not less than 14 calendar days prior to shipment.

1. Geotextile Manufacturer and product name.

2. Certification of minimum average roll values (95 percent lower confidence limits) and the corresponding test procedures for all geotextile properties listed in Table 31 05 19.13-1 and Table 31 05 19.13-2.

3. Projected geotextile delivery dates.

4. Manufacturer quality control tests and manufacturer certifications in accordance with this Section.

B. Submit manufacturing quality control certificates for each roll of geotextile as specified in this Section to the PCM for review at least 14 calendar days prior to geotextile shipment. This documentation must be reviewed and approved to satisfy the requirements of these specifications prior to transporting any geotextile to the site.

PART 2 PRODUCTS

2.01 GEOTEXTILE

A. Furnish geotextile products with minimum average roll values (95 percent lower confidence limit) meeting or exceeding the required property values in Table 31 05 19.13-1 and Table 31 05 19.13-2 for non-woven geotextiles.

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1. Table 31 05 19.13-1 shall be used for geotextile cushion layers for the closure system and underneath riprap for storm water channels and downchutes.

2. Table 31 05 19.13-2 shall be used for geotextile separator layers for roads and outlet protection.

B. In addition to the property values listed in Table 31 05 19.13-1 and Table 31 05 19.13-2, the geotextile shall:

1. retain its structure during handling, placement, and long-term service; and

2. be capable of withstanding outdoor exposure for a minimum of 30 days or the Manufacturer's specified duration, whichever is more stringent, with no measurable deterioration.

C. Furnish geotextiles that are manufactured from first quality polymers, with not more than 20 percent reclaimed polymer used in production.

D. Furnish polymeric threads for stitching that are ultra-violet (UV) light stabilized to at least the same requirements as the geotextile to be sewn. Furnish polyester or polypropylene threads that have a minimum size of 2,000 denier.

2.02 MANUFACTURING QUALITY CONTROL

A. Sample and test the geotextile to demonstrate that the material conforms to the requirements of this Section. The manufacturer's quality control technician shall be certified through the GCI-ICP Certification Program.

B. Perform manufacturing quality control tests at the specified frequency to demonstrate that the geotextile properties conform to the values specified in Table 31 05 19.13-1 and Table 31 05 19.13-2 for non-woven materials.

C. Prior to shipment, the geotextile Manufacturer shall provide the PCM with quality control certificates for all geotextile rolls manufactured after the first roll number and prior to the final roll allocated to the project along with a roll list indicating the rolls allocated to the project. Submit quality control certificates signed by the geotextile Manufacturer quality control manager. Certificates shall state that the material is resistant to UV exposure and that the geotextiles are continuously inspected and are needle-free. The quality

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control certificates shall also include lot, batch, and roll number and identification; and results of manufacturing quality control tests including description of test methods used.

D. Do not supply any geotextile roll that does not comply with the manufacturing quality control requirements.

E. If a geotextile sample fails to meet the quality control requirements of this Section, sample and test rolls manufactured at the same time or in the same lot as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply failing rolls.

F. Permit the CQA Consultant to visit the manufacturing plant for project specific visits. If possible, such visits will be during the manufacturing of the geotextile rolls for this project. Assist the CQA Consultant in obtaining and shipping samples for conformance testing.

2.03 PACKAGING AND LABELING

A. Supply geotextiles in rolls wrapped in relatively impermeable and opaque protective wrapping. Wrapping which becomes torn or damaged shall be repaired with similar materials.

B. Do not ship geotextile products until the CQA Consultant completes conformance evaluation of the geotextile.

C. Mark or tag geotextile rolls in accordance with ASTM D4873 with the following information:

1. manufacturer's name;
2. product identification;
3. lot or batch number;
4. roll number; and
5. roll dimensions.

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D. Geotextile rolls not labeled in accordance with this Section or on which labels are illegible shall be rejected and replaced by the Contractor at no additional cost to the Owner.

2.04 HANDLING AND STORAGE

A. Protect geotextiles from sunlight, moisture, excessive heat or cold, puncture, mud, dirt, and dust or other damaging or deleterious conditions. Follow all geotextile manufacturer recommendations for handling and storage.

B. Store geotextile rolls on pallets or other elevated structures. Do not store geotextile rolls directly on the ground.

C. Outdoor storage of rolls shall not exceed the manufacturer's recommendation or longer than 6 months, whichever is less.

PART 3 EXECUTION

3.01 PLACEMENT

A. The Contractor shall not commence geotextile installation until the CQA Consultant completes conformance evaluation of the geotextile and evaluation of previous Work, including evaluation and acceptance of Contractor's survey results for previous Work.

B. Inspection:

1. Prior to implementing any of the Work in this Section, the Contractor shall carefully inspect the installed Work of all other layers underlying this layer and verify that all Work is complete to the point where the installation in this Section may properly commence without adverse impact.

2. If the Contractor has any concerns regarding the installed Work of other Sections, the Contractor shall immediately notify the CQA Consultant in writing. Failure to inform the CQA Consultant in writing or continuance of installation of the geotextile will be construed as the Contractor's acceptance of the related Work of all other Sections.

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3. It is the Contractor's responsibility to protect the underlying layers after it has been accepted by the CQA Consultant. It is the responsibility of the Contractor and the CQA Consultant to indicate to the PCM any change in the condition that may require repair Work.

C. Handle geotextiles to ensure they are not damaged in any way.

D. Take necessary precautions to prevent damage to underlying layers including rutting during placement of the geotextiles.

E. After unwrapping the geotextiles from their opaque cover, do not leave them exposed for a period in excess of 30 calendar days or the duration specified by the manufacturer, whichever is more stringent.

F. Anchor or weight geotextile with sandbags, or the equivalent, to prevent damage from wind. Install sandbags during placement and maintain them until overlying material is placed.

G. Examine the geotextile surface after installation to ensure that no potentially harmful foreign objects are present. Remove any such objects and replace any damaged geotextiles at no additional cost to the Owner.

H. The geotextile shall only be cut using Manufacturer's recommendations.

3.02 SEAMS AND OVERLAPS

A. Continuously overlap a minimum of 6 inches and sew geotextile cushion for the liner system using a "single prayer" seam. Sew seams using Stitch Type 401 in accordance with ASTM D6193. Spot sewing shall not be allowed.

B. Geotextile separator panels for roads shall be overlapped a minimum of 2 ft; no seaming is required.

C. The Contractor shall pay particular attention that no material is inadvertently inserted beneath the geotextile.

3.03 REPAIR

A. Repair holes or tears in the geotextile cushion for the liner system using patches made from the same geotextile material. Extend geotextile patches a minimum of 1 foot beyond the damaged area. Sew geotextile patches to

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parent geotextile using a "single prayer" seam. Stitching should be located at least 1 inch from the edge of the patch and the edge of the parent geotextile opening to be repaired. Should a tear exceed 50 percent of the width of the panel, cut across the entire width of the panel and seam as an end seam. For slope areas steeper than 10H:1V, remove and replace geotextile with tears exceeding 50 percent of the width of the panel.

B. Any holes or tears in the geotextile separator for roads shall be repaired by a patch made from the same geotextile overlapping the damaged section. The patch shall have a minimum of 2 ft overlap in all directions and shall be thermally bonded to the geotextile being repaired.

C. Care shall be taken to remove any soil or other material which may have penetrated the torn geotextile. Should any tear exceed 50 percent of the width of the roll, remove, and replace that roll at no additional cost to the Owner.

D. The CQA Consultant shall observe repair, note deviation with the above requirements, and report them to the PCM.

3.04 PLACEMENT OF AGGREGATE MATERIALS

A. The placement of materials on the geotextile shall be as soon as possible, such that the geotextile layer shall not be left exposed to direct sunlight for a period in excess of 30 days or the period specified by the Manufacturer, whichever is more stringent.

B. Place soil materials on top of geotextiles in such a manner as to ensure that:

1. the geotextiles and the underlying materials are not damaged;

2. equipment does not drive on the geotextiles; and

3. slippage does not occur between the geotextile and the underlying layers during placement.

C. Spread soil and aggregate on top of the geotextile to cause the soil and aggregate to cascade over the geotextile rather than be shoved across the geotextile.

D. Equipment placing soil and aggregate material on geotextile shall be as approved by the PCM.

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3.05 PROTECTION OF WORK

A. The Contractor shall use all means necessary to protect all prior Work and all materials and completed Work of other Sections.

B. In the event of damage, the Contractor shall make all repairs and replacements necessary to be in full compliance with the Contract Documents and at no additional cost to Owner.

3.06 CONSTRUCTION QUALITY REQUIREMENTS

A. CQA shall be performed in accordance with the CQA Plan.

B. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.

C. The Contractor shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the Owner.

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TABLE 31 05 19.13-1. REQUIRED PROPERTY VALUES FOR 20 OZ/YD^2 NON-WOVEN GEOTEXTILE CUSHION LAYER FOR CLOSURE SYSTEM AND UNDERNEATH RIPRAP FOR STORM WATER CHANNELS AND DOWNCHUTES

MATERIAL PROPERTY	VALUE	UNITS	TEST METHOD
Polymer Composition(1)	95 (min)	% polypropylene or polyester by weight	Certification
Mass per Unit Area(1)	20 (MARV)	oz/yd^2	ASTM D5261
Grab Tensile Strength(1)	450 (MARV)	lbs	ASTM D4632
CBR Puncture strength(2)	1,437 (MARV)	lbs	ASTM D6241
Tear Strength(1)	125 (MARV)	lbs	ASTM D4533
Ultraviolet Resistance(3)	70 (min)	%	ASTM D4355

Notes:

% – percent
min – minimum
lbs – pounds
oz – ounces
yd^2 –square yard(s)
MARV – minimum average roll

(1) Manufacturer's testing for these properties shall be performed by the Manufacturer at a frequency of one test per 90,000 ft^2 and each resin lot must be tested.

(2) Manufacturer's testing for these properties shall be performed by the Manufacturer at a frequency of one test per 540,000 ft^2 and each resin lot must be tested.

(3) Manufacturer's testing for ultraviolet resistance shall be performed by the Manufacturer at a frequency of once per resin lot.

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TABLE 31 05 19.13-2. REQUIRED PROPERTY VALUES FOR 8 OZ/YD^2 NON-WOVEN GEOTEXTILE SEPARATOR FOR OUTLET PROTECTION AND GRAVEL/SOIL SEPARATION

MATERIAL PROPERTY	VALUE	UNITS	TEST METHOD
Polymer Composition(1)	95 (min)	% polypropylene or polyester by weight	Certification
Mass per Unit Area(1)	8 (MARV)	oz/yd^2	ASTM D5261
Grab Tensile Strength(1)	220 (MARV)	lbs	ASTM D4632
Grab Tensile Elongation(1)	50	%	ASTM D4632
CBR Puncture strength (2)	575 (MARV)	lbs	ASTM D6241
Tear Strength(1)	90 (MARV)	lbs	ASTM D4533
Ultraviolet Resistance(3)	70/500 (min)	%/hrs	ASTM D4355

Notes:

% – percent
oz – ounces
hrs – hours
min – minimum
yd^2 –square yard(s)
lbs – pounds
MARV – minimum average roll

(1) Manufacturer's testing for these properties shall be performed by the Manufacturer at a frequency of one test per 90,000 ft^2 and each resin lot must be tested.
(2) Manufacturer's testing for these properties shall be performed by the Manufacturer at a frequency of one test per 540,000 ft^2 and each resin lot must be tested.
(3) Manufacturer's testing for ultraviolet resistance shall be performed by the Manufacturer at a frequency of once per resin lot.

[END OF SECTION]

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SPECIFICATION NO: **SECTION 31 05 19.16**

SPECIFICATION TITLE: **GEOMEMBRANE**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

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☐ *Other*

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SECTION 31 05 19.16

GEOMEMBRANE

PART 1 GENERAL

1.01 DESCRIPTION

A. The Work covered in this Section consists of the installation of a 100-mil linear low-density polyethylene (LLDPE) geomembrane liner. This geomembrane shall be placed in accordance with the Technical Specifications and Construction Drawings. The LLDPE geomembrane shall be textured on both sides. The Contractor shall furnish all labor, materials, equipment, supervision, and incidentals necessary to perform the scope of Work.

B. All geomembrane material placed as a part of this project shall be placed, tested, and documented in accordance with this Section unless specifically approved by the Project Construction Manager (PCM).

1.02 RELATED WORK

A. Related Work specified in other Sections includes, but is not limited to:

1. Section 01 71 23.16 – Surveying
2. Section 31 23 00 – Earthwork
3. Section 31 05 19.13 – Geotextile

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings
2. Construction Quality Assurance (CQA) Plan
3. Scope of Work

1.03 REFERENCES

A. Latest version of the ASTM International (ASTM) standards:

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1. ASTM D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

2. ASTM D1004 Standard Test Method of Tear Resistance (Graves Tear) of Plastic Film and Sheeting

3. ASTM D1238 Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer

4. ASTM D1505 Standard Test Methods for Density of Plastics by the Density-Gradient Technique

5. ASTM D1603 Standard Test Method for Carbon Black Content in Olefin Plastics

6. ASTM D3895 Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry

7. ASTM D4218 Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique

8. ASTM D4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products

9. ASTM D5596 Standard Test Method for Microscopic Examination the Dispersion of Carbon Black in Polyolefin Geosynthetics

10. ASTM D5994 Standard Test Method for Measuring the Core Thickness of Textured Geomembrane

11. ASTM D6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods

12. ASTM D6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.

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13. ASTM D7466 Standard Test Method for Measuring the Asperity Height of Textured Geomembrane

14. ASTM D746 Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact

15. ASTM D1204 Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature

16. ASTM D5397 Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test

17. GRI GM 9 Cold Weather Seaming of Geomembranes

1.04 SUBMITTALS

A. Submit the following information to the PCM for review not less than 21 calendar days prior to use for all geomembrane furnished.

1. Geomembrane manufacturer capabilities, including daily production capacity available for this contract and manufacturing quality control procedures. The manufacturer's quality control technician shall be certified through the GCI-ICP Certification Program.

2. A list of 10 completed facilities for which the Manufacturer has manufactured a minimum total of 10,000,000 square feet of LLDPE geomembrane. Provide the following information for each facility:

   a. Name, location, purpose of facility, and date of installation;

   b. Names of owner, project manager, design engineer, and installer; and

   c. Thickness and surface area of geomembrane provided.

3. Origin (resin supplier's name, resin production plant) and identification (brand name, number) of the polyethylene resin used.

4. Certification of minimum average roll values (95 percent lower confidence limit) for physical, mechanical, and environmental

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properties and the corresponding test procedures for the geomembrane properties listed in Table 31 05 19.16-1 for the 100-mil geomembrane. Submit values that are specific to the resin used in manufacturing of the geomembrane.

5. Certification that LLDPE welding rod is compatible with the specifications and consists of the same resin as the geomembrane.

6. Manufacturer warranty as specified in this Section.

7. Manufacturer quality control tests and manufacturer certifications per this Section.

B. Submit the following documentation on the resin used to manufacture any geomembranes to the PCM for review not less than 14 calendar days prior to geomembrane use:

1. Copies of quality control certificates issued by the resin supplier including the production dates and origin of the resin used to manufacture the geomembrane for this Contract.

2. Results of tests conducted by the Manufacturer to verify the quality of the resin used to manufacture the geomembrane rolls assigned to the project.

3. Certification that no reclaimed polymer is added to the resin during the manufacturing of the geomembrane to be used for this project except as allowed by this specification.

C. Submit to the PCM for review the following documentation on geomembrane roll production at least 14 calendar days prior to transporting any geomembrane to the site.

1. Manufacturing certificates for each shift's production of geomembrane, signed by the Manufacturer quality control manager.

2. Certificate shall include roll numbers and identification, sampling procedures, and results of Manufacturer quality control tests, including descriptions of the test methods used (the Manufacturer quality control tests to be performed are shown in Table 31 05 19.16-1).

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3. Cold weather seaming procedures (including manufacturer specifications), which should follow the standards of GRI GM 9.

D. Submit the following information from the Installer to the PCM for review at least 14 calendar days prior to mobilization of the Installer to the site.

1. Layout drawings showing the installation layout identifying geomembrane panel configurations, dimensions, details, locations of seams, as well as any variance or additional details which deviate from the Construction Drawings. The layout drawings shall be adequate for use as a construction plan and shall include dimensions, details, etc. The layout drawings, as modified and/or approved by the PCM, shall become part of the contract.

2. Installation schedule.

3. Copy of Installer's letter of approval or license by the Manufacturer.

4. Installation capabilities, including information on equipment proposed for this project, average daily production anticipated for this project, and quality control procedures to include quality control organization. The installer's quality control technician shall be certified through the GCI-ICP Certification Program.

5. A list of 10 completed facilities for which the Installer has installed a minimum of 5,000,000 square feet of polyethylene geomembrane. The following information shall be provided for each facility:

   a. Name and purpose of the facility, its location, and installation dates;

   b. Names of owner, project manager, and geomembrane manufacturer;

   c. Name and qualifications of the supervisor of the installation crew;

   d. Thickness and surface area of installed geomembrane;

   e. Type of seaming and type of seaming apparatus used; and

   f. Duration of installation.

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6. Resumes of the Installer Superintendent and Quality Control Chief to be assigned to this project, including dates and duration of employment.

7. Resumes of all personnel who will perform seaming operations on this project, including dates and duration of employment.

8. Evidence that the installation crew has the following experience:

   a. The foreman shall have supervised the installation of a cumulative total of at least 50 acres of comparable geosynthetic systems, on a minimum of 5 different projects.

   b. At least one seamer shall have experience seaming a minimum of 500,000 square feet of polyethylene geomembrane using the same type of seaming apparatus to be used at this site. Seamers with such experience will be designated "master seamers" and shall provide direct supervision over less experienced seamers.

   c. All other seaming personnel shall have seamed at least 100,000 square feet of polyethylene geomembrane using the same type of seaming apparatus to be used at this site. Personnel who have seamed less than 100,000 square feet of seams shall be allowed to seam only under the direct supervision of the master seamer or Superintendent.

E. Submit a Certificate of Calibration less than 12 months old for the field tensiometer to the PCM for review at least 14 days prior to geomembrane placement. Tensiometer shall be calibrated within one year of date of test. Calibration shall be traceable to national or industry recognized standards where possible.

F. Submit subgrade acceptance certificates, signed by the Installer, for each area to be covered by the geomembrane prior to geomembrane placement in that area.

G. Within 14 calendar days of completion of the geomembrane installation, submit a one-year installation warranty to the PCM.

1.05 AS-BUILT DOCUMENTATION

A. The Contractor shall submit as-built revisions to the Construction Drawings in accordance with Section 01 71 23.16.

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B. In addition to preparation of as-built revisions to the Construction Drawings, the Contractor shall provide as-built documentation for the placed geomembrane.

PART 2 PRODUCTS

2.01 RESIN

A. Provide geomembrane manufactured from new, first-quality polyethylene resin. Do not add reclaimed polymer to the resin. The use of polymer recycled during the manufacturing process is permitted if performed with appropriate cleanliness and if the recycled polymer during the manufacturing process does not exceed 2 percent by weight of the total polymer weight. The percentage of recycled polymer shall not affect the quality of the finished product.

B. Use LLDPE resin having the properties as specified in Table 31 05 19.16-1.

2.02 GEOMEMBRANE PROPERTIES

A. The Contractor shall furnish 100-mil LLDPE geomembrane (both sides textured) having properties that comply with all of the requirements presented in this Section and the other referenced specifications and plans.

B. In addition, furnish geomembrane material that:

1. contains a maximum of 1 percent by weight of additives, fillers, or extenders not including carbon black;

2. does not have striations, pinholes, bubbles, blisters, nodules, undispersed raw materials, or any sign of contamination by foreign matter on the surface or in the interior; and

3. is manufactured in a single layer (thinner layers shall not be welded together to produce the final required thickness).

2.03 MANUFACTURING QUALITY CONTROL

A. Resin:

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1. Sample and test resin at a minimum frequency of one test per rail car (i.e., batch or lot) to demonstrate that the resin complies with the requirements of this Section. Perform tests on resin after the addition of additives to the virgin resin. Certify in writing that the resin meets the requirements of this Section.

2. Do not use any noncomplying resin.

B. Rolls:

1. Continuously monitor for geomembrane defects during manufacturing.

2. Do not supply geomembrane that exhibits any defects.

3. Regularly monitor for geomembrane thickness during manufacturing.

4. Do not supply geomembrane that fails to meet the specified thickness.

5. Sample and test the geomembrane, manufactured for and allocated to the project, to demonstrate that its properties conform to the values specified in Table 31 05 19.16-1. Perform the following Manufacturer quality control tests at a minimum frequency, as shown on Table 31 05 19.16-1.

6. If a geomembrane sample fails to meet the quality control requirements of this Section, sample and test rolls manufactured, in the same resin batch, or at the same time, as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply any failing rolls.

C. Permit the CQA Consultant to visit the manufacturing plant for project specific visits. If possible, such visits will be prior to, or during, the manufacturing of the geomembrane rolls for this project. Assist the CQA Consultant in obtaining and shipping samples for conformance testing.

D. Prior to shipment, the geomembrane Manufacturer shall provide the PCM with quality control certificates for the geomembrane provided. The quality control certificates will be signed by a responsible party employed by the geomembrane Manufacturer. The quality control certificates will include: (i) roll numbers and identification; and (ii) sampling procedures and results of quality control testing.

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2.04 LABELING

A. Label the geomembrane rolls with the following information.

1. thickness of the material;
2. length and width of the roll;
3. name of Manufacturer;
4. product identification;
5. lot number; and
6. roll number.

B. Geomembrane rolls not labeled in accordance with this Section or on which labels are illegible will be rejected and replaced by the Contractor at no additional cost to the Owner.

2.05 CONFORMANCE EVALUATION

A. Prior to delivery of the rolls of geomembrane, the CQA Consultant shall verify that samples are obtained and forwarded to the Testing Laboratory for testing to verify conformance with the test methods, values and frequencies presented in Table 31 05 19.16-2.

B. The CQA Consultant shall determine which runs will be selected for conformance sampling. If the material is shipped in identifiable lots or manufacturing runs, sample selection will be adjusted to assure that the minimum frequency is met and that each different lot or manufacturing run is represented by at least one sample.

C. Samples will be taken across the entire width of the roll and will not include the first 3 linear feet. Unless otherwise specified, samples will be 3-foot long by the roll width.

D. If the test and re-test procedures discussed in the CQA Plan indicate that requirements are not met, the roll shall be rejected, samples from the closest numerical roll on both sides of the failed roll shall be collected and tested for the failed parameter(s). If one or both of these tests do not meet requirements, those roll(s) shall be rejected and the CQA Consultant shall

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determine further testing protocol and criteria for identifying the limits of rejected rolls.

2.06 TRANSPORTATION, HANDLING, AND STORAGE

A. Deliver geomembranes to the site at least 14 calendar days prior to the planned deployment date to allow the CQA Consultant adequate time to perform inventorying of the geomembrane rolls.

B. Provide proper handling and storage of the geomembrane at the site. Protect the geomembrane from excessive heat or cold, dirt, puncture, cutting, or other damaging or deleterious conditions. Provide any additional storage procedures required by the Manufacturer.

C. Store geomembrane rolls on pallets or other elevated structures. Do not store geomembrane rolls directly on the ground surface. Do not store more than 3 rolls high.

PART 3 EXECUTION

3.01 FAMILIARIZATION

A. Prior to implementing any of the Work described in this Section, the Contractor shall become thoroughly familiar with all portions of the Work falling within this Section.

B. Inspection:

1. Prior to implementing any of the Work in this Section, the Installer shall carefully inspect the installed Work of all other Sections and verify that all Work is complete to the point where the installation of this section may properly commence without adverse impact.

2. If the Installer has any concerns regarding the installed Work of other Sections, the Installer shall immediately notify the PCM in writing. Failure to inform the PCM in writing or continuance of installation of the geomembrane will be construed as the Installer's acceptance of the related Work of all other Sections.

3. It is the Contractor's responsibility to protect the graded subgrade after it has been accepted by the PCM. It is the responsibility of the Installer

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to notify the PCM of any change in the condition that may require repair Work.

3.02 SUBGRADE SURFACE PREPARATION

A. The Contractor shall provide certification in writing from the geomembrane Installer that the surface on which the geomembrane liner will be installed is acceptable. This certification of acceptance shall be given to the CQA Consultant prior to commencement of geomembrane liner installation in the area under consideration.

B. The subgrade layer beneath the geomembrane liner shall be firm, smooth, unyielding, and uniform. The contractor shall use appropriate means and methods to prepare the subgrade (e.g., smooth drum rolling).

C. Special care shall be taken to maintain the prepared subgrade layer surface.

D. No geomembrane liner shall be placed onto an area which has been softened or eroded by precipitation or which has excessively cracked due to desiccation. The subgrade layer surface shall be observed daily to evaluate the effects of desiccation cracking and/or softening or erosion on the integrity of the subgrade.

E. Any damage to the underlying layer caused by installation activities shall be repaired by the Installer at no additional cost to the Owner.

3.03 GEOMEMBRANE DEPLOYMENT

A. General:

1. The Contractor shall produce layout drawings prior to geomembrane deployment. These drawings shall indicate the geomembrane configuration, dimensions, details, locations of seams, etc. The layout drawings must be approved by the PCM prior to the installation of any geomembranes. The layout drawings, as modified and/or approved by the PCM, shall become part of these specifications.

2. Do not deploy geomembrane until the layout drawings are approved by the PCM.

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3. Do not deploy a geomembrane panel in an area until the CQA Consultant has been provided with a certificate of acceptance for the underlying layer in that area.

4. Do not deploy geomembranes until CQA Consultant completes conformance evaluation of the geomembrane and performance evaluation of previous Work, including evaluation of Contractor's survey results for previous Work.

5. Deploy each geomembrane panel in accordance with the approved layout drawings.

6. The panel layout should be oriented to maximize panel lengths and minimize seams and material waste. In corners and odd-shaped geometric locations, the number of seams should be minimized. Horizontal seams should be at a distance greater than 10 feet from the toes and crests of slopes, or areas of potential stress concentration, unless otherwise authorized by the PCM.

B. Field Panel Identification:

1. A geomembrane field panel is a roll or a portion of roll cut in the field.

2. Give each field panel an identification code (number or letter-number). This identification code shall be agreed upon by the CQA Consultant and the Installer.

3. It is the responsibility of the Contractor to verify that each field panel placed can be traced to the Manufacturer's original roll number.

C. Field Panel Placement:

1. Each geomembrane panel shall be seamed on the same working shift the panel is deployed.

2. Do not place geomembrane panels when the ambient temperature is below 32° Fahrenheit (F). For cold weather (>32°F and <40°F) deployment, use the additional procedures authorized in writing by the PCM. In addition, all manufacturer specifications for cold weather seaming and panel placement for the selected geomembrane shall be followed.

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3. Do not place geomembrane liner during any precipitation, in the presence of heavy fog or dew, in an area of ponded water, or in the presence of wind in excess of 20 miles per hour.

4. Ensure that:

   a. The prepared surface underlying the geomembrane has not deteriorated since previous acceptance and is still acceptable immediately prior to geomembrane placement.

   b. No vehicular traffic or heavy equipment drives or operates directly on the geomembrane, unless approved in writing by the PCM.

   c. Equipment used does not damage the geomembrane by handling, trafficking, or leakage of hydrocarbons (i.e., fuels).

   d. Personnel working on the geomembrane do not smoke, bring glass onto the geomembrane, or engage in other activities that could damage the geomembrane.

   e. The method used to unroll the panels does not scratch or crimp the geomembrane and does not damage the underlying supporting soil.

   f. The method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels). The method used to place the panels results in intimate contact with the underlying subgrade layer. Adjust or repair any area of geomembrane wrinkles where the wrinkle height causes a concern for wrinkle to fold over during placement of material on top. A wrinkle height of 4 inches measured perpendicular to the slope can be used as a general guide.

   g. The method used to place the panels does not cause the panels to lift up or trampoline during the coolest portion of the day.

   h. The geomembrane is anchored or weighted with sandbags, or the equivalent, to prevent damage or uplift from wind. Install sufficient anchoring or weighting to prevent uplift and maintain such system until overlying material is placed.

   i. Direct contact with the geomembrane is minimized; i.e., the geomembrane is protected by geotextile, extra geomembrane, or

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other suitable materials in areas where excessive traffic may be expected.

5. Replace any field panel or portion thereof that becomes damaged (cut, torn, twisted, or crimped). Remove from the Work area damaged panels or portions of damaged panels.

D. Do not install geomembrane between one hour before sunset and one hour after sunrise unless approved by the PCM.

3.04 FIELD SEAMING

A. Personnel shall be experienced as specified in this Section. Do not perform seaming unless a "master seamer" and the CQA Consultant are on-site.

B. End seams shall be staggered between adjacent rows of geomembrane panels to disperse stress points. Orient seams parallel to the line of maximum slope (i.e., oriented down, not across, the slope). Minimize the number of seams in corners and at odd-shaped geometric locations. No horizontal seam shall be less than 10 feet beyond the toe of the slope and above the crest of the slope, except where approved by the PCM. Do not locate seams at an area of potential stress concentration.

C. Weather Conditions for Seaming:

1. Do not seam geomembrane at ambient temperatures below 32°F. Do not seam geomembrane at sheet temperatures above 158°F. For cold (>32°F and <40°F) or hot (>104°F) weather seaming, use the additional procedures authorized in writing by the PCM.

2. Measure ambient temperatures at approximately 6 inches above the geomembrane surface.

3. In all cases, the geomembrane seam areas shall be dry and protected from wind. Do not seam geomembrane during periods of precipitation or if winds are in excess of 20 miles per hour.

D. Overlapping and Temporary Bonding:

1. Sufficiently overlap geomembrane panels a minimum of 4 inches for both extrusion and fusion welding and to allow peel tests to be

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performed on the seam. Any seams that cannot be destructively tested because of insufficient overlap are failing seams.

2. Control the temperature of the air at the nozzle of heat bonding apparatus such that the geomembrane is not damaged.

3. Seams shall be overlapped in the downslope direction (i.e., shingled) to minimize accumulation of water within the seam.

E. Seam Preparation:

1. Prior to seaming, clean the seam area and ensure that area to be bonded is free of moisture, dust, dirt, debris of any kind, and foreign material.

2. If seam overlap grinding is required, complete the process according to the Manufacturer's instructions or within 60 minutes of the seaming operation. Do not grind to a depth that exceeds ten percent of the geomembrane thickness. Grinding marks shall not appear beyond the extrudate after it is placed.

3. Align seams with the fewest possible number of wrinkles and "fishmouths".

F. General Seaming Requirements:

1. Extend seams to the outside edge of panels to be placed in the anchor trench.

2. If required, place a firm substrate such as a flat board or similar hard surface directly under the seam overlap to achieve proper support.

3. Cut fishmouths or wrinkles at the seam overlaps along the ridge of the wrinkle to achieve a flat overlap. Seam the cut fishmouths or wrinkles and patch any portion where the overlap is less than 6 inches with an oval or round patch of geomembrane that extends a minimum of 6 inches beyond the cut in all directions.

4. Place the electric generator used for power supply to the welding machines outside the area to be lined or mount it on soft tires such that no damage occurs to the geomembrane. Properly ground the electric generator. Place a smooth insulating plate or fabric beneath the hot welding apparatus after use.

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G. Seaming Process:

1. Approved processes for field seaming are extrusion welding and fusion welding. The primary method of welding shall be fusion. Seaming equipment shall not damage the geomembrane. Use only geomembrane Manufacturer-approved equipment.

2. Extrusion Equipment and Procedures:

   a. Maintain at least one spare operable seaming apparatus on site.

   b. Equip extrusion welding apparatus with gauges giving the temperature in the apparatus and at the nozzle.

   c. Prior to beginning a seam, purge the extruder until all heat-degraded extrudate has been removed from the barrel. Whenever the extruder is stopped, purge the barrel of all heat-degraded extrudate.

3. Fusion Equipment and Procedures:

   a. Maintain at least one spare operable seaming apparatus on site.

   b. Fusion-welding apparatus shall be automated self-propelled devices equipped with gauges giving the applicable temperatures and pressures.

   c. Fusion-welding apparatus shall produce a double-track seam.

   d. Abrade the edges of cross seams to a smooth incline (top and bottom) prior to extrusion welding.

H. Trial Seams:

1. Make trial seams on excess pieces of geomembrane to verify that seaming conditions are adequate. Conduct trial seams on the same material to be installed and under similar field conditions as production seams. Conduct trial seaming at the beginning of each seaming period, after every four hours of continuous seaming, every time seaming equipment is changed and if significant changes in geomembrane temperature are observed, for each seaming apparatus used that day prior to seaming. In addition, each seamer shall make at least one trial

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seam each day, for each day that seaming is performed by that seamer. Conduct trial seaming under the same conditions as the actual seaming. Prepare trial seams that are at least 5 feet long by 1 foot wide (after seaming) with the seam centered lengthwise for fusion equipment and at least 3 feet long by 1 foot wide for extrusion equipment. Prepare seam overlap as indicated in the "Overlapping and Temporary Bonding" Article of this Part.

2. Cut six specimens, each 1.0-inch-wide, from the trial seam sample. Test three specimens in shear and three in peel, using a field tensiometer. The test specimens shall not fail in the seam. If a specimen fails, repeat the entire operation. If the additional specimen fails, do not accept the seaming apparatus or seamer until the deficiencies are corrected and two consecutive successful trial seams are achieved. A seamer may not start production seaming prior to testing and passing of the trial seams.

I. Nondestructive Seam Continuity Testing:

1. Nondestructively test for continuity of field seams over their full length. Perform continuity testing as the seaming Work progresses, not at the completion of field seaming. Record the location, date, unit number of test apparatus, name of tester and results of testing. Complete any required repairs in accordance with the "Defects and Repairs" Article of this Part. Apply the following procedures:

a. use vacuum testing for extrusion welds; and

b. use air pressure testing for double-track fusion seams.

J. Vacuum Testing:

a. Use the following equipment:

i. A vacuum box assembly consisting of a stiff housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole or valve assembly, and a vacuum gauge.

ii. A system for applying 5 pounds per square inch (psi) gauge suction to the box.

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iii. A bucket of soapy solution and applicator.

b. Follow these procedures:

i. Energize the vacuum pump and reduce the tank pressure to 5 ±1 psi gauge.

ii. Wet an area of the geomembrane seam larger than the vacuum box with the soapy solution.

iii. Place the box over the wetted area.

iv. Close the bleed valve and open the vacuum valve.

v. Ensure that a leak tight seal is created.

vi. Examine the geomembrane through the viewing window for the presence of soap bubbles for not less than 10 seconds.

vii. If no bubbles appear after 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3-inch overlap, and repeat the process.

viii. Mark all areas where soap bubbles appear with a marker that will not damage the geomembrane and repair in accordance with the "Defects and Repairs" Article of this Part.

K. Air Pressure Testing:

1. Use the following equipment:

a. an air pump (manual or motor driven) or air reservoir, equipped with a pressure gauge, capable of generating and sustaining a pressure between 25 and 30 pounds per square inch;

b. a rubber hose with fittings and connections; and

c. a hollow needle, or other approved pressure feed device.

2. Follow these procedures:

a. Seal both ends of the seam to be tested.

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b. Insert needle, or other approved pressure feed device, into the tunnel created by the fusion weld.

c. Insert a protective cushion between the air pump and the geomembrane.

d. Energize the air pump to a pressure between 25 and 30 pounds per square inch, close valve, and sustain the pressure for not less than 5 minutes.

e. If loss of pressure exceeds 3 pounds per square inch, or does not stabilize, locate faulty area and repair in accordance with the "Defects and Repairs" Article of this Part.

f. Cut opposite end of air channel from pressure gauge and observe release of pressure to ensure air channel is not blocked.

g. Remove needle, or other approved pressure feed device, and seal both ends in accordance with the "Defects and Repairs" Article of this Part.

L. Destructive Testing:

1. Destructive testing shall be performed by the CQA Personnel. The Contractor shall provide assistance if requested by the CQA Personnel to obtain samples. Perform destructive seam tests to evaluate seam strength and integrity (see Table 31 05 19.16-2 for seam properties of 100-mil LLDPE). Perform destructive testing as the seaming Work progresses, not at the completion of field seaming.

2. Sampling and Testing:

a. Collect destructive test samples at a minimum average frequency of one test location per 500 feet of seam length and at additional locations of suspected nonperformance. The CQA Consultant will select test locations, including locations with evidence of excess geomembrane crystallinity, contamination, offset seams, or any other evidence of inadequate seaming.

b. Cut samples at the locations designated by the CQA Consultant at the time the locations are designated. Number each sample and

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identify the sample number and location on the panel layout drawing. Immediately repair all holes in the geomembrane resulting from the destructive seam sampling in accordance with the repair procedures described in the "Defects and Repairs" Article of this Part. Test the continuity of the new seams in the repaired areas according to "Nondestructive Seam Continuity Testing" Article of this Part.

c. Cut two strips 1 inch wide and 12-inch long with the seam centered parallel to the width from either side of the sample location. Test the two 1-inch wide strips in the field tensiometer in the peel mode. The CQA Consultant may request an additional test in the shear mode. If these samples pass the field test, prepare a laboratory sample at least 1 foot wide by 3.5 feet long with the seam centered lengthwise. Cut the laboratory sample into three parts and distribute as follows:

i. one portion 1 foot long to the Installer;

ii. one portion 1.5 feet long to the CQA Consultant for testing; and

iii. one portion 1 foot long to the PCM for archival storage.

3. In the event of failing field or laboratory test results, the Contractor may reconstruct or cap the entire seam between two passing destructive tests; otherwise, the CQA Consultant will identify the extent of the nonconforming area following the procedures given in the CQA Plan. Obtain additional samples for testing as requested by the CQA Consultant.

M. Defects and Repairs:

1. Inspect the geomembrane before and after seaming for evidence of defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of inspection. Sweep or wash the geomembrane surface if surface contamination inhibits inspection.

2. Test each suspect location, both in seam and non-seam areas, using the methods described in the "Nondestructive Seam Continuity Testing"

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Article of this Part. Repair each location that fails nondestructive testing.

3. Cut and reseam wrinkles not conforming with Part 2 of this Section. Test the seams thus produced like any other seam.

4. Repair Procedures:

   a. Repair any portion of the geomembrane exhibiting a flaw or failing a destructive or nondestructive test. Use the most appropriate of the available procedures:

      i. patching, used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter;

      ii. abrading and reseaming, used to repair small sections of extruded seams;

      iii. spot seaming, used to repair minor, localized flaws;

      iv. capping, used to repair long lengths of failed seams;

      v. topping, used to repair areas of inadequate seams, which have an exposed edge less than 4 inches in length; and

      vi. removing bad seam and replacing with a strip of new material seamed into place (used with long lengths of fusion seams).

   b. When making repairs, satisfy the following:

      i. abrade surfaces of the geomembrane that are to be repaired no more than 20 minutes prior to the repair;

      ii. clean and dry all geomembrane surfaces immediately prior to repair;

      iii. only use approved seaming equipment;

      iv. extend patches or caps at least 6 inches beyond the edge of the defect, and round corners of patches to a radius of at least 3 inches; and

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v. cut the geomembrane below large caps to avoid potential for water or gas collection between the two sheets.

5. Repair Verification:

a. Test each repair using the methods described in the "Nondestructive Seam Continuity Testing" Article of this Part. Each repair shall be numbered and logged by the CQA Consultant and the Contractor. Repairs that pass the nondestructive test are adequate unless the CQA Consultant elects to also perform destructive tests. Seam repairs over 150 feet long will require a destructive test to be taken from the repair. Re-repair and retest failed tests.

3.05 ANCHORAGE SYSTEM

A. Anchor trenches shall be excavated prior to geomembrane placement to the lines, grades, and configuration indicated on the Construction Drawings. Anchor trenches shall be adequately drained to prevent ponding or otherwise softening of the adjacent soils while the trench is open.

B. Slightly rounded corners shall be provided in the trench where the geomembrane adjoins the trench to avoid sharp bends in the geomembrane.

C. Temporarily anchor each geomembrane panel in the anchor trench as soon as the panel is deployed or positioned.

D. Do not entrap loose soil, sand bags, or other materials between or beneath the geosynthetics layers.

E. Anchor trenches shall be backfilled and compacted as soon as possible after completion of geosynthetics installation. Backfill the anchor trench in accordance with the Construction Drawings and Section 31 23 00.

F. Do not damage any geosynthetics layer when backfilling the anchor trench.

3.06 MATERIALS IN CONTACT WITH GEOMEMBRANE

A. Take all necessary precautions to prevent damage to the geomembrane during the installation of overlying components of the liner system (i.e., overlying geotextile and aggregate drainage layers).

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B. Do not drive equipment directly on the geomembrane. Only use low ground pressure equipment on aggregate layers above the geomembrane liner and geotextile protection layer.

3.07 SURVEY CONTROL

A. Survey the installed geomembrane for preparing the as-built panel layout drawing in accordance with Section 01 71 23.16.

B. Locate panel seams and intersections as requested by the CQA Consultant.

3.08 GEOMEMBRANE ACCEPTANCE

A. The Contractor shall retain all ownership and responsibility for the geomembrane until accepted by the Owner.

B. The geomembrane shall be accepted by the Owner when:

1. The installation is finished;

2. All documentation of installation is completed and submitted to the CQA Consultant and approved; and

3. Verification of the adequacy of all field seams and repairs, including associated testing, is completed and approved by the CQA Consultant.

3.09 PROTECTION OF WORK

A. The Contractor shall use all means necessary to protect all prior Work and all materials and completed Work of other Sections. Extreme care shall be exercised so as not to damage the geomembrane during placement of the overlying geotextile, drainage, and filter layers. Geotextile shall be installed in accordance with the procedures described in Section 31 05 19.13.

B. In the event of damage, the Contractor shall make all repairs or replacements necessary to be in full compliance with the Contract Documents and at no additional cost to the Owner.

3.10 CONSTRUCTION QUALITY REQUIREMENTS

A. CQA shall be performed in accordance with the CQA Plan.

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B. The CQA Consultant will perform material conformance testing of geomembrane materials and installation quality assurance testing of the geomembrane seams, as required in the CQA Plan.

C. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.

D. The Contractor shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the Owner.

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TABLE 31 05 19.16-1.

MANUFACTURER QUALITY CONTROL REQUIREMENTS BOTH SIDES TEXTURED 100-MIL LLDPE GEOMEMBRANE

Properties	Manufacturer Frequency	Units	Specified Values	Test Method
Physical Properties				
Thickness	Every Roll	mils	96 (min. avg.) 90 (lowest individual reading for 8 out of 10) 86 (lowest individual reading for any of 10)	ASTM D5994
Asperity Height	Every 2nd Roll	mils	16 (min. average) (top and bottom)	ASTM D7466
Sheet Density and Resin Specific Gravity	one per 200,000 lb	g/cm^3	0.939 (min.)	ASTM D1505 / ASTM D792
Carbon Black Content	one per 20,000 lb	%	2.0-3.0 (range)	ASTM D1603 / ASTM D4218
Carbon Black Dispersion	one per 45,000 lb	None	9 of 10 views in Category 1 or 2(1)	ASTM D5596
Resin - Melt Flow Index	one per 200,000 lb	g/10 min.	≤1.0	ASTM D1238
Tensile Properties (each direction)				
Tensile Strength at Break	one per 20,000 lb	lb/in	150 (min. average)	ASTM D6693 – Type IV
Elongation at Break	one per 20,000 lb	%	250 (min. average)	ASTM D6693 – Type IV
Tear Resistance	one per 45,000 lb	lb	55 (min. average)	ASTM D1004
Puncture Resistance	one per 45,000 lb	lb	110 (min. average)	ASTM D4833
Oxidative Induction Time (OIT) Standard OIT or High Pressure OIT	one per 200,000 lb	Minutes	100 (min. average) 400 (min. average)	ASTM D3895 or ASTM D5885
2% Modulus	Per Formulation	lb/in	6000 (max.)	ASTM D5323
Axi-symmetric Break Resistance Strain(2)	Per Formulation	%	30 (min.)	ASTM D5617
Oven Aging at 85°C(2) Std. OIT - retained after 90 days High Pressure OIT - retained after 90 days	Per Formulation	%	35 60	ASTM D5721 ASTM D3895 ASTM D5885
UV Resistance(2), (3) High Pressure OIT	Per Formulation	%	35 (min. average)	ASTM D7238 ASTM D5885

Notes:

% - percent	lb - pound	g - grams
lb/in. - pounds per inch	g/cm^3 - grams per cubic centimeter	mils - milli-inches
min. – minutes	min – minimum	max – maximum
OIT - Oxidative Induction Time	°C – degrees centigrade	UV – ultra violet

1. Carbon dispersion for 10 different views. One view allowed in Category 3.
2. For low temperature brittleness and dimensional stability, manufacturer's certification may be accepted in lieu of actual test results.

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TABLE 31 05 19.16-2.

SEAM PROPERTY REQUIREMENTS

BOTH SIDES TEXTURED 100-MIL LLDPE GEOMEMBRANE

Material Property	Minimum Frequency	Value	Units	Test Method
Shear Strength Fusion and Extrusion(1)	1 test every 500 ft	150 (min)	lb/in.	ASTM D6392 Strain rate: 12 in./min. 1 in. strips
Peel Adhesion Fusion(2) Extrusion(3)	1 test every 500 ft	125 (min) 114 (min)	lb/in. lb/in.	ASTM D6392 Strain Rate: 12 in./min. 1 in. strips

Notes:

in. – inch	lb – pound	ft – feet
% – percent	min. – minute	min – minimum

(1) For Shear Testing of both fusion and extrusion welds, the strength of 4 out of 5 specimens should meet or exceed the given value. The 5th specimen must meet at least 80 percent of the specified value. Shear elongation at break must be at least 50 percent.

(2) For Peel Testing of fusion welds, the strength of 4 out of 5 specimens must meet or exceed the specified value. The 5th specimen must achieve at least 80% of the specified value. All specimens shall fail due to film tear bond or with less than 25% incursion of the weld (peel).

(3) For Peel Testing of extrusion welds, the strength of 4 out of 5 specimens must meet or exceed the specified value with less than 25% incursion at the weld. The 5th specimen must achieve at least 80% of the specified value. One specimen may exhibit greater than 25% incursion at the weld if the specified strength value is achieved.

(4) For double fusion welded seams, both tracks shall be tested for compliance with the specified minimum seam peel strengths.

(5) Required laboratory seam testing shall be performed by a geosynthetics testing laboratory at a frequency of one test per 500 linear feet of constructed seam for both extrusion and fusion welding equipment.

(6) LLDPE field samples will be allowed to cool to a minimum of 75 degrees Fahrenheit prior to testing. Testing will be performed in a climate-controlled environment at the Site such as an office or trailer.

[END OF SECTION]

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SPECIFICATION NO: **SECTION 31 05 19.26**

SPECIFICATION TITLE: **GEOCOMPOSITE**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
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SECTION 31 05 19.26

GEOCOMPOSITE DRAINAGE LAYER

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section describes the materials, installation, and testing requirements to perform the installation, quality control, and maintenance of the Geocomposite Drainage Layer (GDL) for the closure cover system. The Work covered in this Section consists of the installation of a double-sided GDL consisting of a 300-mil high density polyethylene (HDPE) geonet core with 8-oz nonwoven needle-punched polypropylene geotextile heat-laminated on both sides of the geonet. This GDL shall be placed in accordance with the Technical Specifications and Construction Drawings. The Contractor shall furnish all labor, materials, equipment, supervision, and incidentals necessary to perform the scope of Work.

B. All GDL material used as a part of this project shall be placed, tested, and documented in accordance with this Section unless specifically approved by the Project Construction Manager (PCM).

1.02 RELATED WORK

A. Related Work specified in other Sections includes, but is not limited to:

1. Section 01 71 23.16 – Surveying
2. Section 31 23 00 – Earthwork
3. Section 31 05 19.13 – Geotextile
4. Section 31 05 19.16 – Geomembrane
5. Section 31 05 16 – Aggregate

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings
2. Construction Quality Assurance (CQA) Plan

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3. Scope of Work

1.03 REFERENCES

A. Latest version of ASTM International (ASTM) standards:

1. ASTM D1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique

2. ASTM D1603 Standard Test Method for Carbon Black Content in Olefin Plastics

3. ASTM D4218 Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by Muffle-Furnace Technique

4. ASTM D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus

5. ASTM D4491 Standard Test Method for Water Permeability of Geotextiles by Permittivity

6. ASTM D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles

7. ASTM D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

8. ASTM D4716 Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head

9. ASTM D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile

10. ASTM D4873 Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples

11. ASTM D5199 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics

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12. ASTM D5261 Standard Test Method for Measuring Mass Per Unit Area of Geotextiles

13. ASTM D6193 Standard Practice for Stitches and Seams

14. ASTM D6241 Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products using a 50-mm Probe

15. ASTM D7005 Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites

16. ASTM D7179 Standard Test Method for Determining Geonet Breaking Force

1.04 SUBMITTALS

A. Submit the following to the PCM for review not less than 14 calendar days prior to shipment.

1. Geocomposite Manufacturer and product name.

2. Certification of minimum average roll values and the corresponding test procedures for all geocomposite properties listed in Table 31 05 19.26-1.

3. Projected geocomposite delivery dates.

B. This documentation must be reviewed and approved by the PCM to satisfy the requirements of these specifications 14 days prior to transporting any geocomposite to the site.

PART 2 PRODUCTS

2.01 GEOCOMPOSITE

A. Geocomposite shall be composed of a high density polyethylene (HDPE) drainage net (geonet) with a non-woven, needle-punched geotextile heat-laminated to each side of the geonet core (i.e., double-sided). The geotextile shall not be glued or bonded to the geonet in any manner other

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than heat bonding. Along edges, six inches of the geotextile shall not be heat bonded to the geonet to allow connection in the field.

B. The Contractor shall furnish geocomposite having properties that comply with all the requirements presented in this Section and the other referenced specifications and plans. The Manufacturer shall provide test results as well as certifications demonstrating that the materials meet or exceed the specified values.

C. In addition to the property values listed in Table 31 05 19.26-1, the geocomposite shall:

1. Retain its structure during handling, placement, and long-term service; and

2. Be capable of withstanding outdoor exposure (i.e., ultra-violet radiation) for a minimum of 30 days or the Manufacturer's specified duration, whichever is more stringent, with no measurable deterioration.

D. During shipment and storage, the geocomposite shall be protected from mud, dirt, dust, cutting, or other damaging or deleterious conditions.

E. The Contractor shall furnish polymeric threads for stitching that are ultraviolet (UV) light stabilized to at least the same requirements as the geotextile to be sewn. Furnish polyester or polypropylene threads that have a minimum size diameter of 2,000 denier.

2.02 MANUFACTURING QUALITY CONTROL

A. Sample and test the geocomposite to demonstrate that the material conforms to the requirements of this Section. The manufacturer's quality control technician shall be certified through the GCI-ICP Certification Program.

B. Perform manufacturing quality control tests to demonstrate that the geocomposite properties conform to the values specified in Table 31 05 19.26-1. Perform the manufacturing quality control tests at a minimum frequency as shown in Table 31 05 19.26-1.

C. Prior to shipment, the geocomposite Manufacturer shall provide the PCM with quality control certificates for the geocomposite. The quality control certificates will be signed by a responsible party employed by the geocomposite Manufacturer. Certificates shall state that the material is

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resistant to UV exposure and that the geocomposites are continuously inspected and are needle-free. The quality control certificates shall also include: lot, batch, and roll number and identification; and results of manufacturing quality control tests including description of test methods used.

D. Do not supply any geocomposite roll that does not comply with the manufacturing quality control requirements.

E. If a geocomposite sample fails to meet the quality control requirements of this Section, sample and test rolls manufactured at the same time or in the same lot as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply failing rolls.

F. Permit the CQA Consultant to visit the manufacturing plant for project specific visits. If possible, such visits will be prior to, or during, the manufacturing of the geocomposite rolls for this project. Assist the CQA Consultant in obtaining and shipping samples for conformance testing.

2.03 PACKING AND LABELING

A. Supply geocomposite in rolls wrapped in impermeable and opaque protective wrapping. Wrapping which becomes torn or damaged shall be repaired with similar materials.

B. Mark or tag geocomposite rolls in accordance with ASTM D4873 with the following information:

1. manufacturer's name;
2. product identification;
3. lot or batch number;
4. roll number; and
5. roll dimensions.

C. Geocomposite rolls not labeled in accordance with this Section or on which labels are illegible will be rejected and replaced by the Contractor at no additional cost to the Owner.

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2.04 HANDLING AND STORAGE

A. Protect geocomposite from sunlight, moisture, excessive heat or cold, puncture, mud, dirt, and dust or other damaging or deleterious conditions. Follow all geocomposite manufacturer recommendations for handling and storage.

B. Store geocomposite rolls on pallets or other elevated structures. Do not store geocomposite rolls directly on the ground.

C. Outdoor storage of rolls shall not exceed the manufacturer's recommendation or longer than 6 months, whichever is less.

2.05 CONFORMANCE EVALUATION

A. Prior to delivery of the rolls of geocomposite, the CQA Consultant shall verify that samples are obtained and forwarded to the Testing Laboratory for testing to verify conformance with the test methods, values and frequencies presented in the CQA Plan.

B. Using the packing list provided by the Manufacturer or a sequential inventory list made by the CQA Consultant, rolls shall be selected for sampling. If the material is shipped in identifiable lots or manufacturing runs, sample selection will be adjusted to assure that the minimum frequency is met and that each different lot or manufacturing run is represented by at least one sample.

C. Samples will be taken across the entire width of the roll and will not include the first 3 linear ft. Unless otherwise specified, samples will be 3-ft long by the roll width.

D. If the test and re-test procedures discussed in the CQA Plan indicate that requirements are not met, the roll shall be rejected and samples from the closest numerical roll on both sides of the failed roll shall be collected and tested for the failed parameter(s). If one or both of these tests do not meet requirements, those roll(s) shall be rejected and the CQA Consultant shall determine further testing protocol and criteria for identifying the limits of rejected rolls.

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PART 3 EXECUTION

3.01 FAMILIARIZATION

A. Prior to implementing any of the Work described in this Section, the Contractor shall become thoroughly familiar with all portions of the Work in this Section.

B. Inspection:

1. Prior to implementing any of the Work in this Section, the Contractor shall carefully inspect the installed Work of all other Sections and verify that all Work is complete to the point where the installation of this Section may properly commence without adverse impact.

2. If the Contractor has any concerns regarding the installed Work of other Sections, the Contractor shall immediately notify the PCM in writing. Failure to inform the PCM in writing or continuance of installation of the geocomposite drainage layer will be construed as the Contractor's acceptance of the related Work of all other Sections.

3. It is the Contractor's responsibility to protect the graded subgrade after it has been accepted by the PCM. It is the responsibility of the Installer to notify the PCM of any change in the condition that may require repair Work.

3.02 GEOCOMPOSITE DEPLOYMENT

A. The geocomposite shall be handled in such a manner as to ensure the geocomposite is not damaged in any way.

B. Necessary precautions shall be taken to prevent damage to underlying layers during placement of the geocomposite drainage layer.

C. The geocomposite shall only be cut using Manufacturer's recommended procedures.

D. Anchor or weight geocomposite with sandbags, or the equivalent, to prevent damage from wind. Install sandbags during placement and maintain them until overlying layer is placed. Geocomposite drainage layer installed on slopes shall be anchored securely at the top of the slope with the designed minimum run-out distance as shown on the Construction Drawings.

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E. Care shall be taken during placement of geocomposite drainage layer not to entrap dirt or excessive dust in the geocomposite drainage layer that could cause clogging of the drainage system, and/or stones that could damage the adjacent geosynthetic.

F. The geocomposite drainage layer shall be positioned by hand after being unrolled to minimize wrinkles.

G. Tools and sandbags shall not be left on, in, or under the geocomposite drainage layer.

H. After unwrapping the geocomposite from its opaque cover, the geocomposite shall not be left exposed for a period in excess of 30 days or the duration specified by the Manufacturer, whichever is more stringent, unless otherwise approved by the PCM.

I. The Contractor shall not commence geocomposite installation until the CQA Consultant completes conformance evaluation of the geocomposite and quality assurance evaluation of previous Work, including evaluation and acceptance of Contractor's survey results for previous Work.

J. On the slopes of the closure system, the geocomposite shall be secured atop the slope and then rolled down the slope in such manner as to continually keep the geocomposite sheet in tension.

K. Geocomposite drainage layers along the edge of installed phases shall be protected from exposure during the duration of construction and carefully uncovered when tying into adjoining phases.

L. The CQA Consultant shall examine the geocomposite rolls used and the installed geocomposite layer; any deviation from the above requirements shall be reported to the PCM. Any areas of non-compliance shall be rejected and replaced at no cost to the Owner.

3.03 SEAMS AND OVERLAPS

A. The components of the geocomposite (i.e., top geotextile, geonet, and bottom geotextile) are not to be bonded together at the edges of the rolls. Each component shall be secured or seamed to the like component at overlaps of adjoining panels.

B. Geonet Components:

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1. The geonet components shall be overlapped by at least 4 inches along the slope and at least 12 inches along end-to-end seams. These overlaps shall be secured by tying.

2. Tying shall be achieved by plastic fasteners or polymer braid. Tying devices shall be white or yellow for easy inspection. Metallic devices shall not be used.

3. Tying shall be every 5 feet along the slope, every 1 foot on end-to-end seams.

4. End-to-end seams shall be staggered no closer than 5 feet to end seams in adjoining panels.

C. Geotextile Components:

1. The top layers of geotextiles shall be continuously sewn (i.e., spot sewing or thermal bonding is only allowed for repairs). The top layers of geotextiles shall be overlapped a minimum of 6 inches prior to seaming. The bottom layers of geotextile shall be overlapped to the extent possible.

2. To the extent practical, installing horizontal seams shall be avoided. If it is not practical to avoid horizontal seams on the side slopes, then the horizontal seams shall be discontinuous (i.e., staggered) between adjacent panels and not allowed more than one-third the slope height on slopes.

3. Polymeric thread, with chemical resistance properties equal to or exceeding those of the geotextile component, shall be used for all sewing. Sew the seams using a flat or single "prayer" seam (SSa-1) in accordance with ASTM D6193, with the stitching at least 1.5 inches from the edge of the geotextile. Stitching shall have an average of more than 5 stitches per inch, which shall result in seam strength of at least 75 percent of the virgin fabric strength.

3.04 REPAIR

A. If the geonet is undamaged but the geotextile is damaged, the damaged area shall be repaired as follows:

1. remove damaged geotextile;

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2. cut patch of new geotextile to provide minimum 12-inch overlap in all directions; and

3. thermally bond geotextile patch to existing geocomposite.

B. The geotextile used for repair and patching shall meet the minimum requirements of the geotextile utilized in the geocomposite system.

C. All seams that have no geotextile flaps available for sewing shall have a geotextile patch, extending 1-ft beyond the edges of the panel, thermally bonded.

D. Any holes or tears in the geocomposite drainage layer shall be repaired by removing the damaged portion of the geonet, placing a patch extending 0.5 ft beyond the edges of the hole or tear. The patch shall be secured by tying fasteners through the bottom geotextile and the geonet of the patch, and through the panel. The patch shall be secured every 6 inches with approved tying devices. A geotextile patch shall be heat sealed to the top of the geocomposite drainage layer needing repair. If the hole or tear width across the panel is more than 50 percent of the width of the panel, the damaged area shall be cut out and the two portions of the geonet shall be joined in accordance with this Section.

3.05 PLACEMENT OF MATERIALS ON GEOCOMPOSITE

A. The placement of materials on the geocomposite shall be as soon as possible, following acceptance, such that the geocomposite layer shall not be left exposed to direct sunlight for a period in excess of 30 days or the period specified by the Manufacturer, whichever is more stringent.

B. The Contractor shall place overlying layers in accordance with the requirements of Section 31 23 00 and Section 31 05 16 to ensure that: (i) geocomposite is not damaged and (ii) excess tensile stresses are not produced in the geocomposite.

3.06 GEOCOMPOSITE ACCEPTANCE

A. The geocomposite shall be accepted by the Owner when:

1. the installation is finished;

2. all documentation of installation is completed; and

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3. verification of the adequacy of all field seams and repairs, including associated testing, is complete.

3.07 PROTECTION OF WORK

A. The Contractor shall use all means necessary to protect all prior Work and all materials and completed Work of other Sections. Extreme care shall be exercised so as not to damage the geocomposite during placement of the overlying cover soils. Overlying layer shall be placed in accordance with the procedures described in Section 31 23 00 and Section 31 05 16.

B. In the event of damage, the Contractor shall make all repairs and replacements necessary to be in full compliance with the Contract Documents and at no additional cost to Owner.

3.08 CONSTRUCTION QUALITY REQUIREMENTS

A. CQA shall be performed in accordance with the CQA Plan. Additional quality assurance testing may be performed at the discretion of the PCM and shall be accommodated by Contractor and geosynthetics Installer.

B. The CQA Consultant will perform material conformance testing of the geocomposite as required in the CQA Plan.

C. CQA Contractor has the option of collecting conformance samples at the manufacturing facility.

D. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.

E. The Contractor shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the Owner.

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TABLE 31 05 19.26-1

MANUFACTURER QUALITY CONTROL REQUIREMENTS
DOUBLE-SIDED GEOCOMPOSITE DRAINAGE LAYER

Properties	Manufacturer's Testing Frequency	Units	Specified Values(1)	Test Method
Geonet Component: (HDPE, bi-planar/bi-axial)				
Nominal thickness	1 per 50,000 ft^2	mils	300 (minimum)	ASTM D5199
Polymer density	1 per 50,000 ft^2	g/cm^3	0.94 (minimum)	ASTM D1505
Carbon black content	1 per 50,000 ft^2	%	2 – 3 (range)	ASTM D1603 or D4218
Tensile Strength (Machine Direction)	1 per 50,000 ft^2	lbs/in	75 (minimum)	ASTM D7179
Geotextile Components: (non-woven needle-punched polypropylene)				
Mass per unit area	1 per 90,000 ft^2	oz/yd^2	8 (min. average)	ASTM D5261
Apparent opening size (AOS), O_{95}	1 per 540,000 ft^2	mm	$O_{95} \leq 0.21$ mm (max. average)	ASTM D4751
Permittivity [Water Flow]	1 per 540,000 ft^2	sec^{-1} [gpm/ft^2]	1.3 (min. average)	ASTM D4491
Grab strength	1 per 90,000 ft^2	lbs	200 (min. average)	ASTM D4632(2)
Tear strength	1 per 90,000 ft^2	lbs	75 (min. average)	ASTM D4533(2)
CBR Puncture strength	1 per 540,000 ft^2	lbs	500 (min. average)	ASTM D6241(3)
Ultraviolet Resistance	1 per Batch/Lot	%/hrs	70 (min. average)	ASTM D4355 (after 500 hrs)
Geocomposite: (double-sided, geotextile heat laminated on both sides of geonet)				
Transmissivity (double-sided)	1 per 540,000 ft^2	m^2/s	$9x10^{-4}$	ASTM D4716(4)
Peel Strength (Ply Adhesion)	1 per 50,000 ft^2	lb/in	1.0 (min. average)	ASTM D7005

Notes:

in. – inch	mm – millimeter	oz – ounce
yd^2 – square yard	cm – centimeter	cm^3 – cubic centimeters
m^2/s – meters squared per second	ft^2 – square feet	lb – pounds
psi - pounds per square inch	m – meter	mil – milli-inches
N/A – Not Applicable	UV – ultra violet	psf – pounds per square foot

1. All values represent minimum average roll values (i.e., any roll in a lot should meet or exceed the values in this table).
2. Minimum value measured in machine and cross machine direction.
3. Constant-rate-of extension (CRE) testing machine with a 5.9-in. internal diameter concentric plate clamp and 1.9-in. flat diameter plunger centered within the ring clamp.
4. The transmissivity is the hydraulic transmissivity of the double-sided geocomposite drainage layer measured using water at 70ºF with a gradient of 0.04 and under a compressive stress of 250 psf between steel plates after 15 minutes.

[END OF SECTION]

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SPECIFICATION NO: **SECTION 31 10 00**

SPECIFICATION TITLE: **SITE CLEARING**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

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SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.01 SCOPE

A. Work in this Section includes clearing, grubbing, chipping of grubbed material, stripping, stockpiling, and disposal of materials.

1.02 RELATED WORK

A. Related Work specified in other Sections includes, but is not limited to:

1. 01 71 23.16 – Surveying
2. Section 31 23 00 – Earthwork

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings
2. Construction Quality Assurance (CQA) Plan
3. Scope of Work

1.03 DEFINITIONS

A. Clearing consists of the removal of trees, saplings, underbrush, and downed timber and limbs. Tree stumps larger than 4 inches in diameter shall be left approximately 6 inches above the existing ground.

B. Grubbing consists of the removal of stumps and roots approximately ¾ inch in diameter and greater.

C. Stripping consists of the removal of the topsoil layer, including organic matter, grass, vegetation, and other material that is unsuitable for use as subgrade or fill.

D. Impacted vegetation consist of vegetation that has been in direct contact with coal combustion residuals (CCR).

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E. Non-impacted vegetation consist of vegetation that has not been in direct contact with CCR.

1.04 SUBMITTALS

A. Submit the following to the Project Construction Manager (PCM) at least 14 calendar days prior to the start of clearing and grubbing activities:

1. Copies of permits obtained for composting, burning, transportation, and off-site disposal of materials from clearing,grubbing, and stripping activities, if required.

2. A list of equipment and materials; description of construction means, methods, and techniques; and other required information for clearing, grubbing, chipping of grubbed material, stripping, temporary stockpiling, composting, burning, and disposal of material in the Contractor's Work Plan specified in Section 31 23 00.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Contractor shall furnish equipment to perform the scope of Work described in this specification.

PART 3 EXECUTION

3.01 GENERAL

A. Verify existing conditions in accordance with Section 01 71 23.16 prior to clearing, grubbing, stripping, and stockpiling.

B. Prior to performing Work described in this Section, install and maintain erosion and sedimentation control measures as shown on the Construction Drawings and in accordance with Section 01 57 13.

C. Perform clearing, grubbing, and stripping as separate activities.

D. Perform clearing, grubbing, stripping, chipping, composting, and burning within the limits of the construction activities included in the Contract.

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E. Do not perform clearing, grubbing, stripping, and stockpiling activities within the right-of-ways for existing County and State roads, power lines, or railroads unless authorized by the PCM. If authorized, perform activities in these right-of-ways in conformance with the requirements of the jurisdictional agency.

F. Stabilize disturbed areas in accordance with Section 01 57 13 unless otherwise shown on the Construction Drawings.

G. Implement dust control in accordance with the Contractor's Work Plan.

3.02 CLEARING

A. In areas where clearing is required, perform clearing in a manner that minimizes disturbance to the existing ground surface.

B. Non-impacted cleared material including tree trunks, large limbs, dead trees and trunks, downed timber, saplings, and snags shall be disposed by chipping and beneficial reuse, chipping and direct disposal within consolidated footprint, or burning with approved combustion device and direct disposal within consolidated footprint.

C. Impacted cleared material including tree trunks, large limbs, dead trees and trunks, downed timber, saplings, and snags shall be disposed by chipping and direct disposal within consolidated footprint, burning with approved combustion device and direct disposal within consolidated footprint, or transporting for off-site disposal to an approved waste disposal facility.

3.03 GRUBBING

A. Non-impacted grubbed material including stumps and roots shall be disposed by chipping and beneficial reuse, chipping and direct disposal within consolidated footprint, or burning with approved combustion device and direct disposal within consolidated footprint.

B. Impacted cleared material including stumps and roots shall be disposed by chipping and direct disposal within consolidated footprint, burning with approved combustion device and direct disposal within consolidated footprint, or transporting for off-site disposal to an approved waste disposal facility.

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3.04 STRIPPING

A. Non-impacted stripped material including topsoil layer, organic matter, grass, vegetation, and other material that is unsuitable for use as subgrade or fill shall be disposed by composting and beneficial reuse or direct disposal within consolidated footprint.

B. Impacted stripped material including topsoil layer, organic matter, grass, vegetation, and other material that is unsuitable for use as subgrade or fill shall be disposed by direct disposal within consolidated footprint or transporting for off-site disposal to an approved waste disposal facility.

3.05 STOCKPILING

A. Perform temporary stockpiling of materials from clearing, grubbing, and stripping activities in accordance with the Contractor's Work Plan. Stockpile areas shall be as shown on the Construction Drawings or as approved by the PCM.

B. Stockpile material from clearing and grubbing separately from stripped material. Stockpile impacted material separately from non-impacted material.

C. Construct stockpiles to drain, with stable slopes, and maintain on a daily basis during periods when material is taken from or added to the stockpile.

3.06 CONSTRUCTION QUALITY REQUIREMENTS

A. CQA shall be performed in accordance with the Contract Documents and the CQA Plan.

B. Contractor shall coordinate construction activities through the PCM to accommodate the activities required of the CQA Contractor.

C. Contractor shall notify the PCM at least 7 calendar days prior to commencement of new Work activities.

3.07 SURVEY CONTROL

A. Survey the limits of cleared, grubbed, or stripped surfaces and the location and elevation of stockpiles in accordance with Section 01 71 23.16.

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3.08 RECORDKEEPING

A. Contractor shall be responsible for the development and implementation of a recordkeeping system that records the following information: 1) volume and source of organic material and 2) method of disposal.

[END OF SECTION]

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SPECIFICATION NO: **SECTION 31 23 00**

SPECIFICATION TITLE: **EARTHWORK**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

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☐ Construction
☐ *Other*

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SECTION 31 23 00

EARTHWORK

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section includes excavation, trenching and backfilling, dewatering, subgrade preparation, fill placement, placement of coal combustion residuals (CCR), and jacking and boring. The Contractor shall furnish all labor, supervision and equipment to perform the earthwork in accordance with the requirements included in this Section.

1.02 RELATED WORK

A. Related Work specified in other Sections includes, but is not limited to:

1. Section 01 57 13 – Erosion and Sediment Control
2. Section 01 71 23.16 – Surveying
3. Section 01 89 13 – Site Preparation
4. Section 31 05 16 – Aggregate

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings
2. Construction Quality Assurance (CQA) Plan
3. Scope of Work

1.03 REFERENCES

A. Latest version of ASTM International (ASTM) Standards:

1. ASTM D422 Standard Method of Test for Particle Size Analysis of Soils.
2. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3))

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3. ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

4. ASTM D5084 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

5. ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

6. ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.04 SUBMITTALS

A. For each discrete scope of Work, submit to the Project Construction Manager (PCM), within 14 calendar days following Notice to Proceed, a Contractor's Work Plan. The Contractor's Work Plan shall include, at a minimum:

1. Description of construction means, methods, and techniques proposed for the scope specified in this Section and in Sections 01 57 13, 01 71 23.16, 01 89 13, and 31 05 16.

2. A list of equipment and materials to perform the Work;

3. Proposed off-site borrow source(s) including name, location, and additional information detailed in this Section;

4. Written certification from the manufacturer or supplier that materials conform to the requirements of this Section;

5. Results of testing performed by the Manufacturer or Supplier that confirm that materials conform to the requirements of this Section;

6. Dewatering methods and techniques;

7. Quality Control (QC) Work Plan;

8. Dust control equipment and procedures;

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9. Methods for excavation, placement, compaction, grading, erosion and sediment control, and stormwater control for soil and CCR materials;

10. Coordination of survey requirements for the earthwork;

11. Locations of on-site temporary soil and CCR stockpile areas;

12. Coordination of earthwork activities with stormwater management and erosion and sediment control measures;

13. Plan for bridging non-conforming subgrades;

14. Traffic Control Plan; and

15. Schedule for earthwork activities.

B. Submit to the PCM, at least 45 calendar days prior to start of activities described in this Section, a list of equipment and materials; description of construction means, methods, and techniques; locations and sizes of jacking and boring pits; method of dewatering; and other required information for jacking and boring.

C. Submit to the PCM, at least 45 calendar days prior to start of jacking and boring activities, experience of the jacking and boring Installer documenting successful completion of at least 15 similar installations within the last 5 years.

D. Alternative methods for pipe installation may be considered by the Contractor, subject to review and written approval by the PCM (including directional drilling). For alternative methods to be considered, submit to the PCM, at least 30 calendar days prior to commencement of work, a list of equipment and materials; description of construction means, methods, and techniques; and other detailed information necessary to fully describe the proposed alternative method(s).

E. The Contractor shall be responsible for the adequacy and safety of the methods.

1.05 CONSTRUCTION QUALITY CONTROL

A. The Contractor shall submit a QC Work Plan which details borrow source sampling and testing described in this Section for review to the PCM. Once instituted, the Contractor shall use the QC Work Plan to ensure that the Work performed under the contract meets the requirements of the Contract Documents.

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B. The Contractor shall submit the name of a qualified Independent Testing Laboratory (ITL) to the PCM for review. The Contractor shall submit to the PCM for approval, the company name, address, and qualifications of the selected ITL proposed for use at the project. The PCM reserves the right to request other information regarding the qualifications of the ITL for use in the evaluation process.

C. Sampling of Borrow Sources

1. The Contractor shall be responsible for collecting borrow source samples and conducting tests using a qualified ITL to document material property compliance with the specifications. These samples will be collected and transported in compliance with the QC Work Plan. The PCM reserves the right to observe sampling and testing of the materials. The Contractor shall provide at least 24-hour notice of a sampling event to the PCM.

2. Representative samples of each specific material type from each specific material source will be obtained by compositing at least five randomly selected individual samples of approximately equal weight. The total composite sample mass shall be at least the minimum size required to conduct all of the required material property and analytical chemistry tests for that material type. Each of the individual samples will be obtained from within the boundaries of the material mass that the composite sample represents.

3. Contractor quality control samples may be obtained from in situ samples for pre-approval of a dedicated borrow source area. The sampling methodology and means for assuring the material dedication to the project shall be submitted to the PCM for approval prior to the commencement of sampling.

4. Contractor quality control samples may also be obtained from dedicated stockpiles or storage/transportation vessels. The sampling methodology and means for assuring the material dedication to the project shall be submitted to the PCM for approval prior to the commencement of sampling.

5. Earthwork material shall be sampled and tested in accordance with this Section.

D. Analytical Chemistry Testing of Borrow Sources

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1. The Contractor shall submit a certification statement indicating that proposed off-site borrow material is free from contamination. The "clean certification" shall be supported by analytical testing, only after geotechnical testing indicates acceptable physical properties. When analytical testing is required, samples shall be collected and tested in accordance with US EPA and state methods to evaluate if the material is "clean" (i.e., concentrations of 8 RCRA metals, Volatile Organic Compounds (VOCs), semi volatile organic compounds (SVOCs), pesticides and herbicides shall be below the US EPA's Residential Regional Screening Levels, other applicable screening levels, and/or regional background levels).

E. Material Property Testing of Borrow Sources

1. Each composite sample shall be tested for material properties as defined in the specific specification Section or sub-section for that material type.

F. General

1. No imported materials shall be delivered to the project site before the required material property and analytical chemistry testing for that batch has been provided to the PCM and written approval received from the PCM. Unapproved material shall be removed from the site at the Contractor's expense.

2. Contractor shall be responsible for repairing or reconstructing the deficiencies at his own expense to meet this specification and other Contract Documents.

1.06 PROJECT AND SITE CONDITIONS

A. Prior to implementing any Work of this Section, the Contractor shall become thoroughly familiar with the site, the site conditions, and all portions of the Work falling within this Section.

B. Prior to implementing any Work of this Section, the Contractor shall carefully inspect the installed Work of all other Sections and verify that all such Work is complete to the point where the installation of this Section may properly commence without adverse impact.

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PART 2 PRODUCTS

2.01 MATERIALS - GENERAL

A. Material may be obtained from off-site borrow areas identified by the Contractor. The Contractor shall identify such source and provide information necessary for approval by the PCM.

B. Fill materials shall classify as SW, SP, SW-SM, SW-SC, SP-SC, SM, or SC according to the Unified Soil Classification System (per ASTM D2487). Fill material having the indicated classification is expected to be available on-site and from designated or approved borrow sources. Soils having other classifications may be acceptable as fill, if approved by the PCM. The fill materials may be used to construct the following features: prepared subgrade layer, seepage berms, fill outside the soil containment berm, and bridging layer. Fill material used for the construction of the soil containment berm shall classify as SW-SM, SW-SC, SP-SC, SM, or SC according to the Unified Soil Classification System (per ASTM D2487).

C. Fill materials shall be free of debris, foreign objects, large rock fragments, organics, and deleterious materials.

D. Visible rock particles in the fill material shall have a maximum dimension of 3 inches (per ASTM D422).

E. Low permeability material shall classify as GC, SC, SM, SM-SC, ML, CL, or CH according to the Unified Soil Classification System (per ASTM D2487) or shall be other material approved by the PCM. The low permeability material shall be used to construct the cut-off trench in the soil containment berm.

F. Low permeability material shall be free of debris, foreign objects, large rock fragments, organics, and deleterious materials.

G. Visible particles in the low permeability material shall have a maximum dimension of 1 inch (per ASTM D422).

H. Low permeability material shall have a liquid limit greater than or equal to 30 and a plasticity index greater than or equal to 10 (per ASTM D4318) and shall have a maximum permeability of 1×10^{-7} cm/s in accordance with ASTM D5084).

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I. CCR material shall be obtained from the on-site locations indicated in the Construction Drawings.

J. Construction water for moisture conditioning and dust control shall be delivered to the site with a water truck and shall be obtained from an on-site water source approved by the PCM.

2.02 OFF-SITE BORROW MATERIALS

A. Off-site borrow soils shall be identified and pre-qualified prior to importing material from that source. Pre-qualifying geotechnical and analytical sampling and testing are the responsibility of the Contractor. The Contractor shall submit the test results, as well as representative samples of borrow sources, to the PCM for review, further confirmation testing, and approval. The PCM shall confirm in writing that borrow soils meets the Technical Specifications presented in this Section and in the CQA Plan, prior to off-site borrow materials being delivered to the site.

1. Contractor shall submit the name and location of all off-site borrow sources.

2. Quality control tests will be performed at each visual or textural change of the borrow material, or as approved by the PCM. Test results shall be submitted to the PCM in accordance with this Section.

3. Contractor shall submit results of Contractor pre-qualifying testing as well as representative samples of borrow area soils for confirmation testing by the CQA Consultant.

4. Contractor shall submit a certification indicating that proposed off-site borrow soil is free from contamination along with the supporting analytical testing results in accordance with the requirements of this Section.

B. Any off-site borrow soils shall meet the Conformance Specifications (including USCS classification) for the intended use (i.e., fill, low permeability material).

2.03 EQUIPMENT

A. Contractor shall furnish equipment to perform the Scope of Work described in this specification.

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B. Use hand compaction equipment such as walk-behind pad-foot compactors, hand tampers, or vibratory plate compactors for compaction in areas inaccessible to large construction equipment (i.e., beneath pipes and around stormwater management features).

C. Use water tank trucks, pressure distributors, or other equipment designed to apply water uniformly and in controlled quantities to variable surface widths to provide the required in-place moisture for workability and dust control.

D. Provide pumps and accessories to remove stormwater from excavations and other Work areas to prevent water accumulation or ponding.

PART 3 EXECUTION

3.01 GENERAL

A. Site Preparation

1. Prior to performing Work described in this Section, install and maintain stormwater management and erosion and sedimentation control measures as shown on the Construction Drawings and in accordance with Section 01 57 13.

2. Coordinate the Work such that required inspections, testing, and acceptance of Work that will be covered by additional material layers will be complete prior to placement of subsequent layers.

3. Implement dust control in accordance with the Contractor's Work Plan.

B. Roads

1. Construct temporary haul roads and drainage structures as required for the Contractor to access the stacking and stockpile areas.

C. Excavation

1. Remove CCR and an underlaying six inches of soil to the excavation limits and elevations as shown on the Construction Drawings. The excavated CCR will be hauled on-site, placed, and compacted according to the requirements of this Section.

2. Minimize sloughing and caving of excavations.

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D. Excavation Dewatering

1. Manage stormwater run-off from adjacent areas of the ash pond by constructing an exterior berm and run on ditch around the perimeter of excavation footprint in accordance with the requirements of this Section, Section 01 57 13, and the Contractor's Work Plan.

2. Coordinate adjustment of well-points and continued operation/pumping of pressure relief wells to facilitate excavation (i.e., removal of CCR and six inches of natural soils underlying the CCR) during dewatering operations.

3. Convey groundwater pumped during dewatering operations in accordance with the requirements of this Section and the Contractor's Work Plan.

4. In Work areas where water ponding is observed, Contractor shall implement measures to remove the water in accordance with this Section.

E. Stockpiling

1. Materials not immediately used shall be stockpiled in areas and in a manner approved by the PCM.

2. Construct staging and stockpile areas in locations approved by the PCM.

3. Construct stockpiles no steeper than 3-horizontal to 1-vertical (3H:1V), grade to drain, and seal by tracking perpendicular to the slope contours with a bulldozer. If the Contractor proposes to construct stockpiles steeper than 3H:1V, the Contractor shall provide specific geometry and material properties to the PCM for evaluating the slope stability. Obtain approval from the PCM prior to constructing the proposed stockpiles.

4. The Contractor shall maintain erosion and sediment control measures around the stockpile area. Stockpiles that will be left inactive for a period greater than 30 days shall be stabilized.

F. Subgrade Preparation

1. Subgrade shall be free of debris, foreign objects, organics, and other deleterious materials.

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2. In the event saturated subgrade is encountered, construct localized sumps to facilitate removal of water. Manage removed water in accordance with this Section.

3. Proof roll the subgrade using a loaded dump truck or other pneumatic-tired vehicle. Proof rolling equipment shall have a minimum loaded rear axle weight of 8 tons, with a minimum tire pressure of 105 pounds per square inch (psi) unless otherwise approved by the PCM. Drive the equipment at a speed of approximately 2.5 to 3.5 miles per hour across the area to confirm the firmness of subgrade. Overlap passes such that one set of tires on each pass runs between the two sets of tire tracks from the previous pass. Soils shall not exhibit excessive pumping or develop ruts more than 2 inches deep. Remove or rework subgrade material in areas that exhibit excessive pumping and/or rut deeper than 2 inches. Replace or rework areas, in accordance with this Section, to achieve acceptable subgrade. Repeat the proof roll on the replaced or reworked areas in accordance with this Section.

4. In areas where unsuitable soils are encountered, remove the unsuitable soil, survey the area after removal of unsuitable soil, and replace the soils to a minimum depth of 12 inches. If removal of additional unsuitable subgrade material is necessary to obtain a suitable soil surface for fill placement, obtain approval from the PCM. For a soil surface exhibiting pumping or developing ruts more than 2 inches deep, remove soil to a minimum depth of 12 inches and replace or dry in place by discing, raking, or tracking or by other means, methods, and techniques described in the Contractor's Work Plan. In areas from which soil has been removed, replace with fill in accordance with this Section.

5. In areas where suitable subgrade conditions are not practical to achieve, the Contractor may propose bridging the non-conforming subgrade area. Bridging of non-conforming subgrade shall be performed only in areas approved by the PCM and shall be performed in accordance with the Contractor's Work Plan and this Section.

3.02 MATERIAL PLACEMENT

A. Fill

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1. Place fill material that conforms to the material requirements of this Section. Place fill material to the limits and elevations shown on the Construction Drawings.

2. Place fill material on surfaces that are free of debris, branches, vegetation, mud, ice, and other deleterious materials.

3. Place fill material in loose lifts with a maximum thickness of 10 inches. In areas where compaction is to be performed using hand-operated equipment, place fill material in loose lifts with a maximum thickness of 6 inches.

4. Continuously remove visible rock particles with a maximum dimension larger than specified in this Section.

5. Place fill in horizontal lifts, benching into embankments for the full lift depth.

6. Prior to placing a lift of fill material over a previously compacted lift, thoroughly scarify the previous lift to a depth of approximately 2 inches by discing, raking, or tracking. Moisture condition the preceding lift in accordance with this Section if its surface moisture content is not within the range of acceptable moisture contents specified in this Section.

7. The trafficking of scarified surfaces by trucks or other equipment, except compaction equipment and water trucks when necessary, is not permitted.

8. The maximum acceptable soil clod size after processing shall be 3 inches or half the thickness of the lift, whichever is less. Reduce clod size by discing, raking, tracking, or other means, methods, and techniques described in the Contractor's Work Plan.

9. Compact fill material in each lift to at least 95 percent of its standard Proctor maximum dry density as determined by ASTM D698. Compact fill material at a moisture content within ±3 percentage points of the standard Proctor optimum moisture content as determined by ASTM D698.

10. Fill material used to construct the bridging layer shall be compacted to the extent practical; however, the bridging layer is not required to meet a specified percent compaction. Subsequent lifts of fill material placed

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above the bridging layer shall be required to be compacted to 95 percent of the standard Proctor maximum dry density as determined by ASTM D698, at the specified moisture content, and as specified in this Section.

11. Moisture condition the fill material to achieve the compaction requirements specified in this Section. During wetting or drying, regularly disc, rake, track, or otherwise mix the material to thoroughly blend the moisture throughout the lift.

12. Do not place fill during periods of precipitation unless authorized by the PCM.

13. Remove, rework, or replace fill that does not conform to compaction requirements.

B. Backfilling

1. Do not backfill with frozen or saturated material.

2. Place the fill material around structures in maximum of 8-inch thick loose lifts if the compaction equipment operating weight is greater than 2,000 pounds, and in maximum 4-inch thick loose lifts if the compaction equipment operating weight is less than 2,000 pounds. Do not use compaction equipment that exerts greater than 10 pounds per square inch (psi) ground pressure over piping that is covered by less than 12 inches of fill material.

3. Compact the fill material in each lift to the specifications for fill material specified in this Section with a minimum of four passes of a walk-behind pad-foot compactor, vibratory plate compactor, or other means, methods, and techniques described in the Contractor's Work Plan.

C. Low permeability material

1. Place low permeability material that conforms to the material requirements of this Section. Place low permeability material to the limits and elevations shown on the Construction Drawings.

2. Place low permeability material on surfaces that are free of debris, branches, vegetation, mud, ice, and other deleterious materials.

3. Place low permeability material in loose lifts with a maximum thickness of 8 inches. In areas where compaction is to be performed using hand-

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operated equipment, place low permeability material in loose lifts with a maximum thickness of 4 inches.

4. Continuously remove visible rock particles with a maximum dimension larger than specified in this Section.

5. Place low permeability material in horizontal lifts, benching into embankments for the full lift depth.

6. Prior to placing a lift of low permeability material over a previously compacted lift, thoroughly scarify the previous lift to a depth of approximately 2 inches by discing, raking, or tracking. Moisture condition the preceding lift in accordance with this Section if its surface moisture content is not within the range of acceptable moisture contents specified in this Section.

7. The trafficking of scarified surfaces by trucks or other equipment, except compaction equipment and water trucks when necessary, is not permitted.

8. The maximum acceptable soil clod size after processing shall be 1 inch or half the thickness of the lift, whichever is less. Reduce clod size by discing, raking, tracking, or other means, methods, and techniques described in the Contractor's Work Plan.

9. Compact low permeability material in each lift to at least 95 percent of its standard Proctor maximum dry density as determined by ASTM D698. Compact low permeability material at a moisture content within 0 to 3 percentage points of the standard Proctor optimum moisture content as determined by ASTM D698.

10. Moisture condition the low permeability material to achieve the compaction requirements specified in this Section. During wetting or drying, regularly disc, rake, track, or otherwise mix the material to thoroughly blend the moisture throughout the lift.

11. Do not place low permeability material during periods of precipitation unless authorized by the PCM.

12. Low permeability material shall have a maximum in-place permeability of 1 x 10^{-7} cm/s when tested in accordance with ASTM D5084.

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13. Remove, rework, or replace low permeability material that does not conform to compaction requirements.

D. CCR

1. Place CCR material that conforms to the material requirements of this Section. Place CCR material to the limits and elevations shown on the Construction Drawings.

2. Place CCR material on surfaces that are free of debris, branches, vegetation, mud, ice, and other deleterious materials.

3. Place CCR material in accordance to the recommendations outlined in the Final Test Pad Report.

4. Place CCR material in horizontal lifts, benching into embankments for the full lift depth.

5. Prior to placing a lift of CCR material over a previously compacted lift, thoroughly scarify the previous lift to a depth of approximately 2 inches by discing, raking, or tracking. Moisture condition the preceding lift in accordance with this Section if its surface moisture content is not within the range of acceptable moisture contents specified in this Section.

6. The trafficking of scarified surfaces by trucks or other equipment, except compaction equipment and water trucks when necessary, is not permitted.

7. The maximum acceptable soil clod size after processing shall be 3 inches or half the thickness of the lift, whichever is less. Reduce clod size by discing, raking, tracking, or other means, methods, and techniques described in the Contractor's Work Plan.

8. Compact CCR material in each lift in accordance to the recommendations outlined in the Final Test Pad Report.

9. Moisture condition the CCR material to achieve the compaction requirements specified in this Section. During wetting or drying, regularly disc, rake, track, or otherwise mix the material to thoroughly blend the moisture throughout the lift.

10. Do not place CCR materials during periods of precipitation unless authorized by the PCM.

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11. Remove, rework, or replace CCR that does not conform to compaction requirements.

E. Site Grading

1. Perform site grading to the lines and grades shown on the Construction Drawings.

3.03 JACKING AND BORING

A. Coordinate activities within the PCM or designated representative.

B. Excavate temporary bore pits and receiving pits, including locations, dimensions, depths, and side slopes, in accordance with the Construction Drawings and the Contractor's Work Plan.

3.04 CONSTRUCTION QUALITY REQUIREMENTS

A. The CQA Consultant will perform conformance testing of earthwork materials and performance testing in accordance with the CQA Plan.

B. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.

C. The CQA Consultant will conduct conformance sampling on materials delivered to the site.

1. The Contractor shall provide access and support to the delivered materials for representative sampling and testing to be conducted.

2. The CQA Consultant shall have the right to visit the borrow source at any time during borrow pit working hours to observe mining, manufacturing, stockpiling or loading operations.

D. The Contractor shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the Owner.

3.05 SURVEY CONTROL

A. Survey the locations, limits, and elevations of the excavation, haul road, fill, CCR materials, and additional constructed site features in accordance with Section 01 71 23.16.

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3.06 TOLERANCES

A. The anchor trench bottom shall be within -0.3 to +0.1 feet of the depth indicated on the Construction Drawings.

B. Perform the earthwork construction to within ±0.1 feet of the elevations shown on the Construction Drawings.

[END OF SECTION]

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SPECIFICATION NO: **SECTION 31 35 19**

SPECIFICATION TITLE: **CLOSURETURF**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

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				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
A	11/10/2018	31	Client Review/Approval	CFB	ELM	

☒ Entire Specification Issued this Revision

☐ Revised Pages Only Issued this Revision

SPECIFICATION ISSUED FOR:

☐ In-house Review
☒ Client Review/Approval
☐ Information Only
☐ Bid
☐ Construction
☐ *Other*

SECTION 31 35 19

CLOSURETURF

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section consists of the installation of the patented ClosureTurf® cover system utilizing a 50-mil linear low-density polyethylene (LLDPE) geomembrane component. The geomembrane shall be placed in accordance with the Technical Specifications and Construction Drawings. The geomembrane shall be Agru Super Microdrain®. This section also includes specifications for the engineered turf and sand infill components of the patented ClosureTurf® cover system. The Contractor shall furnish all labor, materials, equipment, supervision, and incidentals necessary to perform the scope of Work.

B. All geomembrane material placed as a part of this project shall be placed, tested, and documented in accordance with this Section unless otherwise approved by the Project Construction Manager (PCM).

1.02 RELATED WORK

A. Related Work specified in other Sections includes, but is not limited to:

1. Section 01 71 23.16 – Surveying
2. Section 31 23 00 – Earthwork

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings
2. Construction Quality Assurance (CQA) Plan
3. Scope of Work

1.03 REFERENCES

A. Latest version of the ASTM International (ASTM) standards:

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1. ASTM C33 Standard Specification for Concrete Aggregates
2. ASTM D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
3. ASTM D1004 Standard Test Method of Tear Resistance (Graves Tear) of Plastic Film and Sheeting
4. ASTM D1238 Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
5. ASTM D1505 Standard Test Methods for Density of Plastics by the Density-Gradient Technique
6. ASTM D1603 Standard Test Method for Carbon Black Content in Olefin Plastics
7. ASTM D3895 Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
8. ASTM D4218 Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
9. ASTM D4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
10. ASTM D5596 Standard Test Method for Microscopic Examination the Dispersion of Carbon Black in Polyolefin Geosynthetics
11. ASTM D5994 Standard Test Method for Measuring the Core Thickness of Textured Geomembrane
12. ASTM D6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
13. ASTM D6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and

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Nonreinforced Flexible Polypropylene Geomembranes.

14. ASTM D7466 Standard Test Method for Measuring the Asperity Height of Textured Geomembrane

15. ASTM D746 Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact

16. GRI GM 9 Cold Weather Seaming of Geomembranes

1.04 SUBMITTALS

A. Submit the following information to the PCM for review not less than 21 calendar days prior to use for all geomembrane furnished.

1. Geomembrane manufacturer capabilities, including daily production capacity available for this contract and manufacturing quality control procedures. The manufacturer's quality control technician shall be certified through the GCI-ICP Certification Program.

2. A list of 10 completed facilities for which the Manufacturer has manufactured a minimum total of 10,000,000 square feet of LLDPE geomembrane. Provide the following information for each facility:

   a. Name, location, purpose of facility, and date of installation;

   b. Names of owner, project manager, design engineer, and installer; and

   c. Thickness and surface area of geomembrane provided.

3. Origin (resin supplier's name, resin production plant) and identification (brand name, number) of the polyethylene resin used.

4. Certification of minimum average roll values (95 percent lower confidence limit) for physical, mechanical, and environmental properties and the corresponding test procedures for the geomembrane properties listed in Table 31 05 19.16-1 for the 50-mil geomembrane. Submit values that are specific to the resin used in manufacturing of the geomembrane.

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5. Certification that LLDPE welding rod is compatible with the specifications and consists of the same resin as the geomembrane.

6. Manufacturer warranty as specified in this Section.

7. Manufacturer quality control tests and manufacturer certifications per this Section.

B. Submit the following documentation on the resin used to manufacture any geomembranes to the PCM for review not less than 14 calendar days prior to geomembrane use:

1. Copies of quality control certificates issued by the resin supplier including the production dates and origin of the resin used to manufacture the geomembrane for this Contract.

2. Results of tests conducted by the Manufacturer to verify the quality of the resin used to manufacture the geomembrane rolls assigned to the project.

3. Certification that no reclaimed polymer is added to the resin during the manufacturing of the geomembrane to be used for this project except as allowed by this specification.

C. Submit to the PCM for review the following documentation on geomembrane roll production at least 14 calendar days prior to transporting any geomembrane to the site.

1. Manufacturing certificates for each shift's production of geomembrane, signed by the Manufacturer quality control manager.

2. Certificate shall include roll numbers and identification, sampling procedures, and results of Manufacturer quality control tests, including descriptions of the test methods used (the Manufacturer quality control tests to be performed are shown in Table 31 05 19.16-1).

3. Cold weather seaming procedures (including manufacturer specifications), which should follow the standards of GRI GM 9.

D. Submit to the PCM for review the following Manufacturer's documentation at least 14 calendar days prior to transporting ClosureTurf® materials.

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1. Manufacturer quality control tests and manufacturer certifications per this Section and as recommended by the Manufacturer for engineered turf;

2. Manufacturer's inspection records of tufting gauge, pile height, roll length, roll numbers, total production weight, CBR Puncture, tensile strength properties, and tensile strength of yarn; and

3. Test results in accordance with Manufacturer's requirements for the ClosureTurf® material.

4. Proposed installation procedures in accordance with Manufacturer's requirements (including manufacturer specifications).

5. Fusion seamer factory training certificates from DemTech for engineered turf installation.

6. Manufacturer warranty as specified in this Section.

7. Installation capabilities, including information on equipment proposed for this project, average daily production anticipated for this project, and quality control procedures to include quality control organization.

8. Installation schedule.

E. Submit to the PCM for review the following Manufacturer's documentation at least 14 calendar days prior to transporting sand infill materials.

1. The source of the sand infill material.

2. The method used by the supplier to achieve the required gradation of the sand infill material.

3. Certification from the supplier and test results in accordance with Manufacturer's recommendations that the sand infill material meets the particle size requirements for sand infill material.

4. Proposed installation procedures in accordance with Manufacturer's requirements (including manufacturer specifications).

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5. Installation capabilities, including information on equipment proposed for this project, average daily production anticipated for this project, and quality control procedures to include quality control organization.

6. Pre-qualifying test results and test results for every 250 cubic yards of material that is delivered to the site in accordance with Manufacturer's requirements.

7. Installation schedule.

F. Submit the following information from the Installer to the PCM for review at least 14 calendar days prior to mobilization of the Installer to the site.

1. Layout drawings showing the installation layout identifying geomembrane panel configurations, dimensions, details, locations of seams, as well as any variance or additional details which deviate from the Construction Drawings. The layout drawings shall be adequate for use as a construction plan and shall include dimensions, details, etc. The layout drawings, as modified and/or approved by the PCM, shall become part of the contract.

2. Installation schedule.

3. Copy of Installer's letter of approval by the Manufacturer.

4. Installation capabilities, including information on equipment proposed for this project, average daily production anticipated for this project, and quality control procedures to include quality control organization. The installer's quality control technician shall be certified through the GCI-ICP Certification Program.

5. A list of 10 completed facilities for which the Installer has installed a minimum of 5,000,000 square feet of polyethylene geomembrane. The following information shall be provided for each facility:

a. Name and purpose of the facility, its location, and installation dates;

b. Names of owner, project manager, and geomembrane manufacturer;

c. Name and qualifications of the supervisor of the installation crew;

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d. Thickness and surface area of installed geomembrane;

e. Type of seaming and type of seaming apparatus used; and

f. Duration of installation.

6. Resumes of the Installer Superintendent and Quality Control Chief to be assigned to this project, including dates and duration of employment.

7. Resumes of all personnel who will perform seaming operations on this project, including dates and duration of employment.

8. Evidence that the installation crew has the following experience:

a. The foreman shall have supervised the installation of a cumulative total of at least 50 acres of comparable geosynthetic systems, on a minimum of 5 different projects.

b. At least one seamer shall have experience seaming a minimum of 500,000 square feet of polyethylene geomembrane using the same type of seaming apparatus to be used at this site. Seamers with such experience will be designated "master seamers" and shall provide direct supervision over less experienced seamers.

c. All other seaming personnel shall have seamed at least 100,000 square feet of polyethylene geomembrane using the same type of seaming apparatus to be used at this site. Personnel who have seamed less than 100,000 square feet of seams shall be allowed to seam only under the direct supervision of the master seamer or Superintendent.

G. Submit a Certificate of Calibration less than 12 months old for the field tensiometer to the PCM for review at least 14 days prior to geomembrane placement. Tensiometer shall be calibrated within one year of date of test. Calibration shall be traceable to national or industry recognized standards where possible.

H. Submit subgrade acceptance certificates, signed by the Installer, for each area to be covered by the geomembrane prior to geomembrane placement in that area.

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I. Within 14 calendar days of completion of the geomembrane and cover system installation, submit a one-year installation warranty to the PCM.

1.05 AS-BUILT DOCUMENTATION

A. The Contractor shall submit as-built revisions to the Construction Drawings in accordance with Section 01 71 23.16.

B. In addition to preparation of as-built revisions to the Construction Drawings, the Contractor shall provide as-built documentation for the placed geomembrane.

PART 2 PRODUCTS

2.01 RESIN

A. Provide geomembrane manufactured from new, first-quality polyethylene resin. Do not add reclaimed polymer to the resin. The use of polymer recycled during the manufacturing process is permitted if performed with appropriate cleanliness and if the recycled polymer during the manufacturing process does not exceed 2 percent by weight of the total polymer weight. The percentage of recycled polymer shall not affect the quality of the finished product.

B. Use LLDPE resin having the properties as specified in Table 31 05 19.16-1.

2.02 GEOMEMBRANE PROPERTIES

A. The Contractor shall furnish 50-mil Agru Super Gripnet® LLDPE geomembrane (both sides textured) having properties that comply with all of the requirements presented in this Section and the other referenced specifications and plans.

B. In addition, furnish geomembrane material that:

1. contains a maximum of 1 percent by weight of additives, fillers, or extenders not including carbon black;

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2. does not have striations, pinholes, bubbles, blisters, nodules, undispersed raw materials, or any sign of contamination by foreign matter on the surface or in the interior; and

3. is manufactured in a single layer (thinner layers shall not be welded together to produce the final required thickness).

2.03 MANUFACTURING QUALITY CONTROL

A. Resin:

1. Sample and test resin at a minimum frequency of one test per rail car (i.e., batch or lot) to demonstrate that the resin complies with the requirements of this Section. Perform tests on resin after the addition of additives to the virgin resin. Certify in writing that the resin meets the requirements of this Section.

2. Do not use any noncomplying resin.

B. Rolls:

1. Continuously monitor for geomembrane defects during manufacturing.

2. Do not supply geomembrane that exhibits any defects.

3. Regularly monitor for geomembrane thickness during manufacturing.

4. Do not supply geomembrane that fails to meet the specified thickness.

5. Sample and test the geomembrane, manufactured for and allocated to the project, to demonstrate that its properties conform to the values specified in Table 31 05 19.16-1. Perform the following Manufacturer quality control tests at a minimum frequency, as shown on Table 31 05 19.16-1.

6. If a geomembrane sample fails to meet the quality control requirements of this Section, sample and test rolls manufactured, in the same resin batch, or at the same time, as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply any failing rolls.

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C. Permit the CQA Consultant to visit the manufacturing plant for project specific visits. If possible, such visits will be prior to, or during, the manufacturing of the geomembrane rolls for this project. Assist the CQA Consultant in obtaining and shipping samples for conformance testing.

D. Prior to shipment, the geomembrane Manufacturer shall provide the PCM with quality control certificates for the geomembrane provided. The quality control certificates will be signed by a responsible party employed by the geomembrane Manufacturer. The quality control certificates will include: (i) roll numbers and identification; and (ii) sampling procedures and results of quality control testing.

2.04 LABELING

A. Label the geomembrane rolls with the following information.

1. thickness of the material;
2. length and width of the roll;
3. name of Manufacturer;
4. product identification;
5. lot number; and
6. roll number.

B. Geomembrane rolls not labeled in accordance with this Section or on which labels are illegible will be rejected and replaced by the Contractor at no additional cost to the Owner.

2.05 CONFORMANCE EVALUATION

A. Prior to delivery of the rolls of geomembrane and engineered turf, the CQA Consultant shall verify that samples are obtained and forwarded to the Testing Laboratory for testing to verify conformance with the test methods, values and frequencies presented in Table 31 05 19.16-1 and Manufacturer's requirements.

B. The CQA Consultant shall determine which runs will be selected for conformance sampling. If the material is shipped in identifiable lots or

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manufacturing runs, sample selection will be adjusted to assure that the minimum frequency is met and that each different lot or manufacturing run is represented by at least one sample.

C. Samples will be taken across the entire width of the roll and will not include the first 3 linear feet. Unless otherwise specified, samples will be 3-foot long by the roll width.

D. If the test and re-test procedures discussed in the CQA Plan indicate that requirements are not met, the roll shall be rejected, samples from the closest numerical roll on both sides of the failed roll shall be collected and tested for the failed parameter(s). If one or both of these tests do not meet requirements, those roll(s) shall be rejected and the CQA Consultant shall determine further testing protocol and criteria for identifying the limits of rejected rolls.

2.06 ENGINEERED TURF

A. Furnish patented ClosureTurf® engineered turf for cover system installation.

B. Permit the CQA Consultant to visit the manufacturing plant for project specific visits. If possible, such visits will be prior to, or during, the manufacturing of the engineered turf rolls for this project. Assist the CQA Consultant in obtaining and shipping samples for conformance testing, if required.

C. Prior to shipment, the engineered turf Manufacturer shall provide the PCM with quality control certificates for the engineered turf provided. The quality control certificates will be signed by a responsible party employed by the engineered turf Manufacturer. The quality control certificates will include: (i) roll numbers and identification; and (ii) sampling procedures and results of Manufacturer's quality control testing.

2.07 SAND INFILL

A. Furnish sand infill for cover system installation in accordance with ClosureTurf® Manufacturer's requirements and ASTM C33.

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2.08 TRANSPORTATION, HANDLING, AND STORAGE

A. Deliver geomembranes and cover system materials to the site at least 14 calendar days prior to the planned deployment date to allow the CQA Consultant adequate time to perform inventorying and conformance testing of the geomembrane rolls and final cover materials.

B. Provide proper handling and storage of the geomembrane and engineered turf at the site. Protect the geomembrane and engineered turf from excessive heat or cold, dirt, puncture, cutting, or other damaging or deleterious conditions. Provide any additional storage procedures required by the Manufacturer.

C. Store geomembrane and engineered turf rolls on pallets or other elevated structures. Do not store geomembrane and engineered turf rolls directly on the ground surface. Do not store more than 3 rolls high.

PART 3 EXECUTION

3.01 FAMILIARIZATION

A. Prior to implementing any of the Work described in this Section, the Contractor shall become thoroughly familiar with all portions of the Work in this Section.

B. Inspection:

1. Prior to implementing any of the Work in this Section, the Installer shall carefully inspect the installed Work of all other Sections and verify that all Work is complete to the point where the installation of this section may properly commence without adverse impact.

2. If the Installer has any concerns regarding the installed Work of other Sections, the Installer shall immediately notify the PCM in writing. Failure to inform the PCM in writing or continuance of installation of the geomembrane will be construed as the Installer's acceptance of the related Work of all other Sections.

3. It is the Contractor's responsibility to protect the graded subgrade after it has been accepted by the PCM. It is the responsibility of the

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Installer to notify the PCM of any change in the condition that may require repair Work.

3.02 SUBGRADE SURFACE PREPARATION

A. The Contractor shall provide certification in writing from the geomembrane Installer that the surface on which the geomembrane will be installed is acceptable. This certification of acceptance shall be given to the CQA Consultant prior to commencement of geomembrane installation in the area under consideration.

B. The subgrade layer beneath the geomembrane shall be firm, smooth, unyielding, and uniform. The contractor shall use appropriate means and methods to prepare the subgrade (e.g., smooth drum rolling).

C. Special care shall be taken to maintain the prepared subgrade layer surface.

D. No geomembrane shall be placed onto an area which has been softened or eroded by precipitation or which has excessively cracked due to desiccation. The subgrade layer surface shall be observed daily to evaluate the effects of desiccation cracking and/or softening or erosion on the integrity of the subgrade.

E. Any damage to the underlying layer caused by installation activities shall be repaired by the Installer at no additional cost to the Owner.

3.03 GEOMEMBRANE DEPLOYMENT

A. General:

1. The Contractor shall produce layout drawings prior to geomembrane deployment. These drawings shall indicate the geomembrane configuration, dimensions, details, locations of seams, etc. The layout drawings must be approved by the PCM prior to the installation of any geomembranes. The layout drawings, as modified and/or approved by the PCM, shall become part of these specifications.

2. Do not deploy geomembrane until the layout drawings are approved by the PCM.

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3. Do not deploy a geomembrane panel in an area until the CQA Consultant has been provided with a certificate of acceptance for the underlying layer in that area.

4. Do not deploy geomembrane until CQA Consultant completes conformance evaluation of the geomembrane and performance evaluation of previous Work, including evaluation of Contractor's survey results for previous Work.

5. Deploy each geomembrane panel in accordance with the approved layout drawings.

6. The panel layout should be oriented to maximize panel lengths and minimize seams and material waste. In corners and odd-shaped geometric locations, the number of seams should be minimized. Horizontal seams should be at a distance greater than 10 feet from the toes and crests of slopes, or areas of potential stress concentration, unless otherwise authorized by the PCM.

B. Field Panel Identification:

1. A geomembrane field panel is a roll or a portion of roll cut in the field.

2. Give each field panel an identification code (number or letter-number). This identification code shall be agreed upon by the CQA Consultant and the Installer.

3. It is the responsibility of the Contractor to verify that each field panel placed can be traced to the Manufacturer's original roll number.

C. Field Panel Placement:

1. Each geomembrane panel shall be seamed on the same working shift the panel is deployed.

2. Do not place geomembrane panels when the ambient temperature is below 32° Fahrenheit (F). For cold weather (>32°F and <40°F) deployment, use the additional procedures authorized in writing by the PCM. In addition, all manufacturer specifications for cold weather seaming and panel placement for the selected geomembrane shall be followed.

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3. Do not place geomembrane during any precipitation, in the presence of heavy fog or dew, in an area of ponded water, or in the presence of wind in excess of 20 miles per hour.

4. Ensure that:

   a. The prepared surface underlying the geomembrane has not deteriorated since previous acceptance and is still acceptable immediately prior to geomembrane placement.

   b. No vehicular traffic or heavy equipment drives or operates directly on the geomembrane, unless approved in writing by the PCM.

   c. Equipment used does not damage the geomembrane by handling, trafficking, or leakage of hydrocarbons (i.e., fuels).

   d. Personnel working on the geomembrane do not smoke, bring glass onto the geomembrane, or engage in other activities that could damage the geomembrane.

   e. The method used to unroll the panels does not scratch or crimp the geomembrane and does not damage the underlying supporting soil.

   f. The method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels). The method used to place the panels results in intimate contact with the underlying subgrade layer. Adjust or repair any area of geomembrane wrinkles where the wrinkle height causes a concern for wrinkle to fold over during placement of material on top. A wrinkle height of 4 inches measured perpendicular to the slope can be used as a general guide.

   g. The method used to place the panels does not cause the panels to lift up or trampoline during the coolest portion of the day.

   h. The geomembrane is anchored or weighted with sandbags, or the equivalent, to prevent damage or uplift from wind. Install sufficient anchoring or weighting to prevent uplift and maintain such system until overlying material is placed.

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i. Direct contact with the geomembrane is minimized; i.e., the geomembrane is protected by geotextile, extra geomembrane, or other suitable materials in areas where excessive traffic may be expected.

5. Replace any field panel or portion thereof that becomes damaged (cut, torn, twisted, or crimped). Remove from the Work area damaged panels or portions of damaged panels.

D. Do not install geomembrane between one hour before sunset and one hour after sunrise unless approved by the PCM.

3.04 FIELD SEAMING

A. Personnel shall be experienced as specified in this Section. Do not perform seaming unless a "master seamer" and the CQA Consultant are on-site.

B. End seams shall be staggered between adjacent rows of geomembrane panels to disperse stress points. Orient seams parallel to the line of maximum slope (i.e., oriented down, not across, the slope). Minimize the number of seams in corners and at odd-shaped geometric locations. No horizontal seam shall be less than 10 feet beyond the toe of the slope and above the crest of the slope, except where approved by the PCM. Do not locate seams at an area of potential stress concentration.

C. Weather Conditions for Seaming:

1. Do not seam geomembrane at ambient temperatures below 32°F. Do not seam geomembrane at sheet temperatures above 158°F. For cold (>32°F and <40°F) or hot (>104°F) weather seaming, use the additional procedures authorized in writing by the PCM.

2. Measure ambient temperatures at approximately 6 inches above the geomembrane surface.

3. In all cases, the geomembrane seam areas shall be dry and protected from wind. Do not seam geomembrane during periods of precipitation or if winds are in excess of 20 miles per hour.

D. Overlapping and Temporary Bonding:

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1. Sufficiently overlap geomembrane panels for welding and to allow peel tests to be performed on the seam. Any seams that cannot be destructively tested because of insufficient overlap are failing seams.

2. Control the temperature of the air at the nozzle of heat bonding apparatus such that the geomembrane is not damaged.

3. Seams shall be overlapped in the downslope direction (i.e., shingled) to minimize accumulation of water within the seam.

E. Seam Preparation:

1. Prior to seaming, clean the seam area and ensure that area to be bonded is free of moisture, dust, dirt, debris of any kind, and foreign material.

2. If seam overlap grinding is required, complete the process according to the Manufacturer's instructions or within 60 minutes of the seaming operation. Do not grind to a depth that exceeds ten percent of the geomembrane thickness. Grinding marks shall not appear beyond the extrudate after it is placed.

3. Align seams with the fewest possible number of wrinkles and "fishmouths".

F. General Seaming Requirements:

1. Extend seams to the outside edge of panels to be placed in the anchor trench.

2. If required, place a firm substrate such as a flat board or similar hard surface directly under the seam overlap to achieve proper support.

3. Cut fishmouths or wrinkles at the seam overlaps along the ridge of the wrinkle to achieve a flat overlap. Seam the cut fishmouths or wrinkles and patch any portion where the overlap is less than 6 inches with an oval or round patch of geomembrane that extends a minimum of 6 inches beyond the cut in all directions.

4. Place the electric generator used for power supply to the welding machines outside the area to be lined or mount it on soft tires such that no damage occurs to the geomembrane. Properly ground the electric

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generator. Place a smooth insulating plate or fabric beneath the hot welding apparatus after use.

G. Seaming Process:

1. Approved processes for field seaming are extrusion welding and fusion welding. The primary method of welding shall be fusion. Seaming equipment shall not damage the geomembrane. Use only ClosureTurf® Manufacturer-approved equipment.

2. Extrusion Equipment and Procedures:

   a. Maintain at least one spare operable seaming apparatus on site.

   b. Equip extrusion welding apparatus with gauges giving the temperature in the apparatus and at the nozzle.

   c. Prior to beginning a seam, purge the extruder until all heat-degraded extrudate has been removed from the barrel. Whenever the extruder is stopped, purge the barrel of all heat-degraded extrudate.

3. Fusion Equipment and Procedures:

   a. Maintain at least one spare operable seaming apparatus on site.

   b. Fusion-welding apparatus shall be automated self-propelled devices equipped with gauges giving the applicable temperatures and pressures.

   c. Fusion-welding apparatus shall produce a double-track seam.

   d. Abrade the edges of cross seams to a smooth incline (top and bottom) prior to extrusion welding.

H. Trial Seams:

1. Make trial seams on excess pieces of geomembrane to verify that seaming conditions are adequate. Conduct trial seams on the same material to be installed and under similar field conditions as production seams. Conduct trial seaming at the beginning of each seaming period, after every four hours of continuous seaming, every

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time seaming equipment is changed and if significant changes in geomembrane temperature are observed, for each seaming apparatus used that day prior to seaming. In addition, each seamer shall make at least one trial seam each day, for each day that seaming is performed by that seamer. Conduct trial seaming under the same conditions as the actual seaming. Prepare trial seams that are at least 5 feet long by 1 foot wide (after seaming) with the seam centered lengthwise for fusion equipment and at least 3 feet long by 1 foot wide for extrusion equipment. Prepare seam overlap as indicated in the "Overlapping and Temporary Bonding" Article of this Part.

2. Cut six specimens, each 1.0-inch-wide, from the trial seam sample. Test three specimens in shear and three in peel, using a field tensiometer. The test specimens shall not fail in the seam. If a specimen fails, repeat the entire operation. If the additional specimen fails, do not accept the seaming apparatus or seamer until the deficiencies are corrected and two consecutive successful trial seams are achieved. A seamer may not start production seaming prior to testing and passing of the trial seams.

I. Nondestructive Seam Continuity Testing:

1. Nondestructively test for continuity of field seams over their full length. Perform continuity testing as the seaming Work progresses, not at the completion of field seaming. Record the location, date, unit number of test apparatus, name of tester and results of testing. Complete any required repairs in accordance with the "Defects and Repairs" Article of this Part. Apply the following procedures:

a. use vacuum testing for extrusion welds; and

b. use air pressure testing for double-track fusion seams.

J. Vacuum Testing:

1. Use the following equipment:

a. A vacuum box assembly consisting of a stiff housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole or valve assembly, and a vacuum gauge.

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b. A system for applying 5 pounds per square inch (psi) gauge suction to the box.

c. A bucket of soapy solution and applicator.

2. Follow these procedures:

a. Energize the vacuum pump and reduce the tank pressure to 5 ±1 psi gauge.

b. Wet an area of the geomembrane seam larger than the vacuum box with the soapy solution.

c. Place the box over the wetted area.

d. Close the bleed valve and open the vacuum valve.

e. Ensure that a leak tight seal is created.

f. Examine the geomembrane through the viewing window for the presence of soap bubbles for not less than 10 seconds.

g. If no bubbles appear after 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3-inch overlap, and repeat the process.

h. Mark all areas where soap bubbles appear with a marker that will not damage the geomembrane and repair in accordance with the "Defects and Repairs" Article of this Part.

K. Air Pressure Testing:

1. Use the following equipment:

a. an air pump (manual or motor driven) or air reservoir, equipped with a pressure gauge, capable of generating and sustaining a pressure between 25 and 30 pounds per square inch;

b. a rubber hose with fittings and connections; and

c. a hollow needle, or other approved pressure feed device.

2. Follow these procedures:

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a. Seal both ends of the seam to be tested.

b. Insert needle, or other approved pressure feed device, into the tunnel created by the fusion weld.

c. Insert a protective cushion between the air pump and the geomembrane.

d. Energize the air pump to a pressure between 25 and 30 pounds per square inch, close valve, and sustain the pressure for not less than 5 minutes.

e. If loss of pressure exceeds 3 pounds per square inch, or does not stabilize, locate faulty area and repair in accordance with the "Defects and Repairs" Article of this Part.

f. Cut opposite end of air channel from pressure gauge and observe release of pressure to ensure air channel is not blocked.

g. Remove needle, or other approved pressure feed device, and seal both ends in accordance with the "Defects and Repairs" Article of this Part.

L. Destructive Testing:

1. Destructive testing shall be performed by the CQA Personnel. The Contractor shall provide assistance if requested by the CQA Personnel to obtain samples. Perform destructive seam tests to evaluate seam strength and integrity (see Table 31 05 19.16-2 for seam properties of 50-mil LLDPE). Perform destructive testing as the seaming Work progresses, not at the completion of field seaming.

2. Sampling and Testing:

a. Collect destructive test samples at a minimum average frequency of one test location per 500 feet of seam length and at additional locations of suspected nonperformance. The CQA Consultant will select test locations, including locations with evidence of excess geomembrane crystallinity, contamination, offset seams, or any other evidence of inadequate seaming.

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b. Cut samples at the locations designated by the CQA Consultant at the time the locations are designated. Number each sample and identify the sample number and location on the panel layout drawing. Immediately repair all holes in the geomembrane resulting from the destructive seam sampling in accordance with the repair procedures described in the "Defects and Repairs" Article of this Part. Test the continuity of the new seams in the repaired areas according to "Nondestructive Seam Continuity Testing" Article of this Part.

c. Cut two strips 1-inch wide and 12-inch long with the seam centered parallel to the width from either side of the sample location. Test the two 1-inch wide strips in the field tensiometer in the peel mode. The CQA Consultant may request an additional test in the shear mode. If these samples pass the field test, prepare a laboratory sample at least 1-foot wide by 3.5 feet long with the seam centered lengthwise. Cut the laboratory sample into three parts and distribute as follows:

i. one portion 1 foot long to the Installer;

ii. one portion 1.5 feet long to the CQA Consultant for testing; and

iii. one portion 1 foot long to the PCM for archival storage.

3. In the event of failing field or laboratory test results, the Contractor may reconstruct or cap the entire seam between two passing destructive tests; otherwise, the CQA Consultant will identify the extent of the nonconforming area following the procedures given in the CQA Plan. Obtain additional samples for testing as requested by the CQA Consultant.

M. Defects and Repairs:

1. Inspect the geomembrane before and after seaming for evidence of defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of inspection. Sweep or wash the geomembrane surface if surface contamination inhibits inspection.

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2. Test each suspect location, both in seam and non-seam areas, using the methods described in the "Nondestructive Seam Continuity Testing" Article of this Part. Repair each location that fails nondestructive testing.

3. Cut and re-seam wrinkles not conforming with Part 2 of this Section. Test the seams thus produced like any other seam.

4. Repair Procedures:

   a. Repair any portion of the geomembrane exhibiting a flaw or failing a destructive or nondestructive test. Use the most appropriate of the available procedures:

      i. patching, used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter;

      ii. abrading and re-seaming, used to repair small sections of extruded seams;

      iii. spot seaming, used to repair minor, localized flaws;

      iv. capping, used to repair long lengths of failed seams;

      v. topping, used to repair areas of inadequate seams, which have an exposed edge less than 4 inches in length; and

      vi. removing bad seam and replacing with a strip of new material seamed into place (used with long lengths of fusion seams).

   b. When making repairs, satisfy the following:

      i. abrade surfaces of the geomembrane that are to be repaired no more than 20 minutes prior to the repair;

      ii. clean and dry all geomembrane surfaces immediately prior to repair;

      iii. only use approved seaming equipment;

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iv. extend patches or caps at least 6 inches beyond the edge of the defect, and round corners of patches to a radius of at least 3 inches; and

v. cut the geomembrane below large caps to avoid potential for water or gas collection between the two sheets.

5. Repair Verification:

a. Test each repair using the methods described in the "Nondestructive Seam Continuity Testing" Article of this Part. Each repair shall be numbered and logged by the CQA Consultant and the Contractor. Repairs that pass the nondestructive test are adequate unless the CQA Consultant elects to also perform destructive tests. Seam repairs over 150 feet long will require a destructive test to be taken from the repair. Re-repair and retest failed tests.

3.05 ANCHORAGE SYSTEM

A. Anchor trenches shall be excavated prior to geomembrane placement to the lines, grades, and configuration indicated on the Construction Drawings. Anchor trenches shall be adequately drained to prevent ponding or otherwise softening of the adjacent soils while the trench is open.

B. Slightly rounded corners shall be provided in the trench where the geomembrane adjoins the trench to avoid sharp bends in the geomembrane.

C. Temporarily anchor each geomembrane panel and engineered turf in the anchor trench as soon as the panel is deployed or positioned.

D. Do not entrap loose soil, sand bags, or other materials between or beneath the geosynthetics layers.

E. Anchor trenches shall be backfilled and compacted as soon as possible after completion of geosynthetics installation. Backfill the anchor trench in accordance with the Construction Drawings and Section 31 23 00.

F. Do not damage any geosynthetics layer when backfilling the anchor trench.

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G. For phase interfaces, the Contractor shall anchor the leading edge of the ClosureTurf® and geomembrane in an anchor trench with typical perimeter anchor trench dimensions as shown on the Construction Drawings. The phase interface anchor trench will be excavated through the interim soil cover and into CCR materials. When the ClosureTurf® final cover system is ready to be deployed for the next phase of cells, it shall be joined to the previous phase in the following method:

1. Contractor shall leave the existing anchor trench in place from the previous phase.

2. Contractor shall cut the turf layer of ClosureTurf® from the previous phase to be joined (i.e., without cutting the geomembrane) at the ground surface and fold the turf layer back.

3. Contractor shall grind the two panels of geomembrane to be joined to remove the spikes in the Super Gripnet® and create a smooth surface in accordance with the requirements for joining textured geomembrane described in this Section.

4. The Contractor shall extrusion weld the geomembrane for the two phases together in accordance with this Section.

5. Contractor shall join the two panels of ClosureTurf® by fusion welding in accordance with Manufacturer's installation requirements. If needed, a strip or patch of ClosureTurf® material may be used to join the two panels.

3.06 MATERIALS IN CONTACT WITH GEOMEMBRANE

A. Take all necessary precautions to prevent damage to the geomembrane during the installation of overlying components of the drainage system (i.e., overlying engineered turf, or sand infill).

B. Do not drive equipment directly on the geomembrane. Only use low ground pressure ATV equipment, as approved by the PCM, on layers above the geomembrane.

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3.07 ENGINEERED TURF

A. Manufacturer certified and approved personnel shall install patented ClosureTurf® engineered turf for cover system in accordance with Manufacturer's recommendations.

3.08 SAND INFILL

A. Manufacturer certified and approved personnel shall install sand infill material in accordance with Manufacturer's recommendations and ASTM C33-03 grain size parameters.

3.09 SURVEY CONTROL

A. Survey the installed geomembrane for preparing the as-built panel layout drawing in accordance with Section 01 71 23.16.

B. Locate panel seams and intersections as requested by the CQA Consultant.

3.10 GEOMEMBRANE ACCEPTANCE

A. The Contractor shall retain all ownership and responsibility for the geomembrane and cover system until accepted by the Owner.

B. The geomembrane and cover system shall be accepted by the Owner when:

1. The installation is finished;

2. All documentation of installation is completed and submitted to the CQA Consultant and approved; and

3. Verification of the adequacy of all field seams and repairs, including associated testing, is completed and approved by the CQA Consultant.

3.11 PROTECTION OF WORK

A. The Contractor shall use all means necessary to protect all prior Work and all materials and completed Work of other Sections. Extreme care shall be exercised so as not to damage the geomembrane and cover system during placement of the overlying geotextile, drainage, and filter layers.

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B. In the event of damage, the Contractor shall make all repairs or replacements necessary to be in full compliance with the Contract Documents and at no additional cost to the Owner.

3.12 CONSTRUCTION QUALITY REQUIREMENTS

A. CQA shall be performed in accordance with the CQA Plan.

B. The CQA Consultant will perform material conformance testing of geomembrane and cover system materials and installation quality assurance testing of the geomembrane seams, as required in the CQA Plan.

C. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.

D. The Contractor shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the Owner.

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TABLE 31 35 19-1

MANUFACTURER QUALITY CONTROL REQUIREMENTS MICRODRAIN® 50-MIL LLDPE GEOMEMBRANE (FOR CLOSURETURF®)

Properties	Manufacturer Frequency	Units	Specified Values	Test Method
Physical Properties				
Thickness	Every Roll	mils	48 (min average) 45 (lowest individual reading for 8 out of 10) 43 (lowest individual reading for any of 10)	ASTM D5994
Drainage Stud Height MicroSpike Height	Every 2nd Roll	mils	130 (min average) 20 (mi. average)	ASTM D7466
Sheet Density and Resin Specific Gravity	one per 200,000 lb	g/cm^3	0.939 (max)	ASTM D1505/ ASTM D792
Carbon Black Content	one per 20,000 lb	%	2.0-3.0 (range)	ASTM D4218/ ASTM D1603
Carbon Black Dispersion	one per 45,000 lb	None	9 in Category 1 or 2(1)	ASTM D5596
Resin - Melt Flow Index	one per 200,000 lb	g/10 min.	≤1.0	ASTM D1238
Tensile Properties (each direction)				
1. Tensile Strength at Break	one per 20,000 lb	lb/in	75 (min average)	ASTM D6693 – Type IV
2. Elongation at Break	one per 20,000 lb	%	250 (min average)	ASTM D6693 – Type IV
Tear Resistance	one per 45,000 lb	lb	27 (min average)	ASTM D1004
Puncture Resistance	one per 45,000 lb	lb	55 (min average)	ASTM D4833
Oxidative Induction Time (OIT) Standard OIT or High Pressure OIT	one per 200,000 lb	Minutes	100 (min average) 400 (min average)	ASTM D3895 or ASTM D5885
2% Modulus	Per Formulation	lb/in	3000 (max)	ASTM D5323
Axi-symmetric Break Resistance Strain(2)	Per Formulation	%	30 (min)	ASTM D5617
Oven Aging at 85ºC(2) Std. OIT - retained after 90 days High Pressure OIT - retained after 90 days	Per Formulation	%	35 60	ASTM D5721 ASTM D3895 ASTM D5885
UV Resistance(2), (3) High Pressure OIT	Per Formulation	%	35 (min average)	ASTM D7238 ASTM D5885

Notes:

% – percent
lb – pound
g – grams
lb/in - pounds per inch
g/cm^3 – grams per cubic centimeter
mils – milli-inches
min. – minute
min – minimum
max – maximum
OIT – oxidation induction time
ºC – degrees centigrade
UV – ultra violet

1. Carbon dispersion for 10 different views. One view allowed in Category 3.
2. For 2% modulus, axi-symmetric break resistance, oven aging, and UV resistance, Manufacturer's certification may be accepted in lieu of actual test results.
3. The condition of the test will be 20-hour UV cycle at 75°C followed by 4-hour condensation at 60°C.

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TABLE 31 35 19-2

SEAM PROPERTY REQUIREMENTS MICRODRAIN® 50-MIL LLDPE GEOMEMBRANE (FOR CLOSURETURF®)

Material Property	Value	Units	Test Method
Shear Strength Fusion and Extrusion(1)	75 (min)	lb/in.	ASTM D6392 Strain rate: 12 in./min. 1 in. strips
Peel Adhesion Fusion(2) Extrusion(3)	63 (min) 57 (min)	lb/in. lb/in.	ASTM D6392 Strain rate: 12 in./min. 1 in. strips

Notes:

in. – inch	lb – pound	ft – feet
% – percent	min. – minute	min – minimum

1. For shear testing of both fusion and extrusion welds, the strength of 4 out of 5 specimens must meet or exceed the given value. The 5th specimen must meet at least 80 percent of the specified value. Shear elongation at break must be at least 50 percent.

2. For peel testing of fusion welds, the strength of 4 out of 5 specimens must meet or exceed the specified value. The 5th specimen must achieve at least 80% of the specified value. All specimens shall fail due to film tear bond or with less than 25% incursion of the weld (peel).

3. For peel testing of extrusion welds, the strength of 4 out of 5 specimens must meet or exceed the specified value with less than 25% incursion at the weld. The 5th specimen must achieve at least 80% of the specified value. One specimen may exhibit greater than 25% incursion at the weld if the specified strength value is achieved.

4. For double fusion welded seams, both tracks will be tested for compliance with the specified minimum seam peel strengths.

5. Required laboratory seam testing will be performed by a geosynthetics testing laboratory at a frequency of one test per 500 lineal feet of constructed seam for both extrusion and fusion welding equipment.

6. LLDPE field samples will be allowed to cool to a minimum of 75 degrees Fahrenheit prior to testing. Testing will be performed in a climate-controlled environment at the Site such as an office or trailer.

[END OF SECTION]

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SPECIFICATION NO: **SECTION 33 44 00**

SPECIFICATION TITLE: **STORMWATER PIPES AND STRUCTURES**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
A	11/10/2018	7	Client Review/Approval	CFB	ELM	

☒ Entire Specification Issued this Revision

☐ Revised Pages Only Issued this Revision

SPECIFICATION ISSUED FOR:

☐ In-house Review
☒ Client Review/Approval
☐ Information Only
☐ Bid
☐ Construction
☐ *Other*

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SECTION 33 44 00

STORMWATER PIPES AND STRUCTURES

PART 1 GENERAL

1.01 DESCRIPTION

A. Work in this Section includes materials and installation of stormwater pipes, control structures, and appurtenances.

1.02 RELATED WORK

A. Related Work specified in other sections includes, but it is not limited to:

1. Section 01 57 13 – Erosion and Sediment Control
2. Section 01 71 23.16 – Surveying
3. Section 01 89 13 – Site Preparation
4. Section 03 30 00 – Cast In-place Concrete
5. Section 31 05 16 – Aggregate
6. Section 31 23 00 – Earthwork

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings
2. Construction Quality Assurance (CQA) Plan
3. Scope of Work

1.03 REFERENCES

A. Latest version of American Society for Testing and Materials (ASTM) Standards:

1. ASTM C76 Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

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2. ASTM C478 Standard Specification for Circular Precast Reinforced Concrete Manhole Sections

3. ASTM C913 Standard Specification for Precast Concrete Water and Wastewater Structures

4. ASTM C990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

1.04 SUBMITTALS

A. Submit the following to the Project Construction Manager (PCM) for review at least 14 calendar days prior to use.

1. Manufacturer's product data, drawings and sketches, details of steel reinforcement size and placement, recommended methods for storage, handling, and installation pipes, concrete manholes, steps, drop inlets, headwalls, skimmers, and riser structures, and layout and details of joints, special connections, and fittings.

2. Manufacturer's written certification that pipes, concrete manholes, drop inlets, steps, skimmers, headwalls, riser structures, and joint materials conform to the material requirements of this Section.

3. Manufacturer’s recommended methods for lifting precast surface water control structures.

4. Contractor’s Lift Plan, including means, methods, and techniques for lifting precast surface water control structures. Contractor’s Lift Plan and lift devices shall be approved by the PCM.

B. Submit to the PCM, at least 14 calendar days prior to commencement of Work described in this Section, a list of equipment and materials; description of installation means, methods, and techniques; and other required information for installation of surface water control structures, pipes, and appurtenances in the Contractor’s Work Plan specified in Section 31 23 00.

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PART 2 PRODUCTS

2.01 GENERAL

A. Furnish stormwater control structures, pipe, and appurtenances that conform to requirements of applicable ASTM Standards as specified in this Section and as shown on the Construction Drawings.

B. Furnish stormwater control structures, pipe, and appurtenances that conform to the lines and dimensions shown on the Construction Drawings.

C. Furnish natural or manufactured sand for pipe embedment material and #57 stone in accordance with Section 31 05 16 for manhole embedment material.

D. Obtain materials for fill and backfill in accordance with Section 31 23 00.

2.02 REINFORCED CONCRETE PIPE (RCP) CIRCULAR CULVERTS

A. Furnish reinforced concrete pipe (RCP) circular culverts conforming to the requirements of ASTM C76 for Class III Reinforced Concrete Pipe with Wall B, unless otherwise shown on the Construction Drawings.

B. Furnish non-shrink grout in accordance with Section 03 30 00 for void spaces at headwall and manhole pipe penetrations.

2.03 HIGH DENSITY POLYETHYLENE (HDPE) CIRCULAR CULVERTS

A. Furnish high density polyethylene (HDPE) circular culverts in accordance with Section 40 20 00 and as shown on the Construction Drawings.

2.04 PIPE OUTLET PROTECTION

A. Furnish riprap outlet protection in accordance with Section 31 05 16 and as shown on the Construction Drawings.

2.05 CONCRETE CATCH BASINS, MANHOLES, DROP INLETS, AND HEADWALLS

A. Furnish precast concrete manholes, drop inlets, catch basins, and headwalls conforming to ASTM C478 and ASTM C913 and as shown on the Construction Drawings.

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B. Furnish necessary materials for connections and appurtenances for installation of concrete manholes, drop inlets, and headwalls.

2.06 JOINTS

A. Furnish RCP circular watertight joints with Type A culvert gaskets conforming to the requirements of ASTM C990.

B. Furnish HDPE circular watertight joints in accordance with Section 40 20 00.

2.07 SKIMMERS

A. Furnish skimmers as shown on the Construction Drawings.

B. Furnish couplings for attaching skimmers to corrugated metal pipe (CMP) stubs on principal spillway risers as recommended by the Manufacturer.

2.08 EQUIPMENT

A. Furnish equipment to install stormwater control structures and pipes in accordance with this Section and the Contractor's Work Plan.

PART 3 EXECUTION

3.01 GENERAL

A. Verify existing conditions in accordance with Section 01 89 13.

B. Prior to performing Work described in this Section, install and maintain erosion and sediment controls in accordance with Section 01 57 13 and the Contractor's Work Plan.

C. Prior to installation of RCP, HDPE pipes, stormwater control structures, and appurtenances, inspect the pipes to ensure that they are free of obstructions, debris, and damage. Remove debris and obstructions found during inspection. Repair damaged pipe as recommended by the Manufacturer, or replace the damaged pipe.

D. Prior to stormwater control structure and pipe installation, complete trenching and place pipe and manhole embedment fill as shown on the Construction Drawings.

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E. General Requirements

1. Install stormwater control structures and pipes to the lines and grades shown on the Construction Drawings or as otherwise required.

2. Lift stormwater control structures by lifting devices that have been approved for use at points provided by the precast concrete supplier in accordance with the Contractor's Lift Plan.

3. Install stormwater control structures and pipes in accordance with the Manufacturer's instructions.

4. Backfill surface water control structures and pipes in accordance with Section 31 23 00.

F. Implement dust control in accordance with the Contractor's Work Plan.

3.02 INSTALLATION

A. Install stormwater control structures and pipes as shown on the Construction Drawings. Install joints in accordance with the Manufacturer's recommendations, ASTM C990, and Section 40 20 00.

B. Mix non-shrink grout for pipe penetrations in accordance with Manufacturer's recommendations and trowel grout into void spaces around the entire diameter of the pipe at headwalls, drop inlets, and manholes.

C. After assembling risers and appurtenances in accordance with this Section, Manufacturer's recommendations, and as shown on the Construction Drawings, insert the riser into the formwork prior to pouring the cast-in-place concrete base; concrete base shall be in accordance with Section 03 30 00. Install riser structures and appurtenances to the lines and grades shown on the Construction Drawings and connect the riser to the spillway pipes.

D. Install skimmers as shown on the Construction Drawings and in accordance with Manufacturer's recommendations.

E. Install drop inlets, manholes, and headwalls as shown on the Construction Drawings.

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F. Install outlet protection as shown on the Construction Drawings in accordance with Section 31 05 16.

3.03 CONSTRUCTION QUALITY REQUIREMENTS

A. CQA shall be performed in accordance with the CQA Plan.

B. The installation of riprap, manhole embedment, and pipe embedment will be observed by the CQA Consultant.

C. The Contractor shall correct deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the Owner.

3.04 SURVEY CONTROL

A. Survey the final locations and invert elevations of the stormwater control structures and pipes in accordance with Section 01 71 23.16

3.05 TOLERANCES

A. Install stormwater control structures and pipes within ±0.1 feet of the invert elevations shown on the Construction Drawings and to provide positive drainage.

B. Install stormwater control structures and pipes within ±0.2 feet of the surveyed horizontal locations shown on the Construction Drawings and/or horizontal control points.

[END OF SECTION]

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SPECIFICATION NO: **SECTION 40 20 00**

SPECIFICATION TITLE: **PIPES, FITTINGS, AND VALVES**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
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☐ In-house Review
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☐ Information Only
☐ Bid
☐ Construction
☐ *Other*

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SECTION 40 20 00

PIPES, FITTINGS, AND VALVES

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section describes the requirements for polyvinyl chloride (PVC), high density polyethylene (HDPE), and steel products and placement. The Work covered in this Section consists of the installation of PVC pipes and fittings, ball, check, gate, and air release valves, steel pipes, and HDPE pipes and fittings. PVC, steel, and HDPE products shall be placed in accordance with the Technical Specifications and Construction Drawings. The Contractor shall furnish all labor, materials, equipment, supervision, and incidentals necessary to perform the scope of Work.

B. All steel, PVC, and HDPE products used as a part of this project shall be placed, tested, and documented in accordance with this Section unless otherwise approved by the Project Construction Manager (PCM).

1.02 RELATED WORK

A. Related Work specified in other Sections includes, but is not limited to:

1. Section 01 71 23.16 – Surveying
2. Section 01 89 13 – Site Preparation
3. Section 31 23 00 – Earthwork
4. Section 03 30 00 – Cast In-place Concrete

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings
2. Construction Quality Assurance (CQA) Plan
3. Scope of Work

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1.03 REFERENCES

A. Latest version of ASTM International (ASTM) standards:

1. ASTM A312 Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
2. ASTM A733 Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
3. ASTM D1784 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
4. ASTM D1785 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
5. ASTM D2467 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
6. ASTM D2564 Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
7. ASTM D2657 Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
8. ASTM D2855 Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly(Vinyl Chloride) (PVC) or Chlorinated Poly(Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.
9. ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
10. ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

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11. ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter

12. ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing

13. ASTM F1473 Standard Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins

14. ASTM F2880 Standard Specification for Lap-Joint Type Flange Adapters for Polyethylene Pressure Pipe in Nominal Pipe Sizes ¾ in. to 65 in.

B. Latest version of American Society of Mechanical Engineers (ASME) Standards:

1. ASME B16.5 Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.

2. ASME B13.3 Process Piping.

3. ASME B16.5 Pipe Flanges and Flanged Fittings.

4. ASME B1.20.1 Pipe Threads, General Purpose, Inch

C. *"Committee Report: Design and Installation of PE Pipe,"* Journal of American Water Works Association (AWWA), Vol. 91, Issue 2, pp. 92-100, 1999.

1.04 SUBMITTALS

A. Submit the following to the PCM for review and approval at least 14 calendar days prior to ordering materials:

1. detailed shop drawings and sketches of steel pipes and casing spacers, PVC pipes and fittings, valves, HDPE pipes and fittings, support centralizers, supports, flat stock plates, and appurtenances;

2. a list of materials to be furnished with the names of the suppliers and proposed delivery dates of the materials to the Site;

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3. methods to be used for hydrostatic and pneumatic testing of the pipes and fittings;

4. origin (resin supplier's name, resin production plant) and identification (brand name, number) of the polyethylene resin used;

5. minimum Manufacturer-certifiable values and corresponding test methods for HDPE material properties; submit values that are specific to the resin used in manufacture;

6. identification of pipe joining equipment and methods for butt-fusion welding (including recommended plate temperatures and fusion pressures);

7. pipe joining training plans as specified in this Section (pipe joining training shall be conducted on-site in the presence of CQA Contractor and Manufacturer personnel and shall be on the actual fusion equipment to be used for production welding); and

8. material safety data sheet (MSDS) and/or safety data sheet (SDS) for steel, PVC, and HDPE.

B. Submit to the PCM for review, at least 14 calendar days prior to shipment, the following documentation on the steel pipes, casing spacers, PVC pipes and fittings, valves, HDPE pipes, fittings, supports, gussets, and appurtenances:

1. copies of quality control certificates issued by the resin supplier, including the production dates and origin of the resin used to manufacture the HDPE products for this Project and certification that no reclaimed polymer is added to the resin during manufacture of the HDPE products for this Project; and

2. results of tests conducted by the Manufacturer to verify the quality of the resin used to manufacture the HDPE products assigned to this Project.

C. Submit to the PCM, at least 14 calendar days prior to installation of material covered by this Section, Manufacturer's written certification of compliance of the material with this Section. Include in this certification of compliance

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with final inspection and written record of the inspection. The inspection shall include the following:

1. HDPE pipes, fittings, and appurtenances
   a. dimensional check;
   b. material quality check;
   c. weld quality; and
   d. hydrostatic testing and/or leak check.
2. PVC pipes, fittings, valves, supports, and appurtenances
   a. dimensional check;
   b. material quality check;
   c. hydrostatic testing and/or leak check.
3. Steel pipes (including process pipes and casing pipe)
   a. dimensional check;
   b. material quality check;
   c. hydrostatic testing and/or leak check.

D. Submit to the PCM, at least 14 calendar days prior to commencement of Work described in this Section, a list of equipment and materials; description of construction means, methods, and techniques; and other required information for installation of pipes and fittings in the Contractor's Work Plan specified in Section 31 23 00.

E. Submit to the PCM for review, at least 14 calendar days prior to installation, documentation of training and certification of personnel qualified for performing HDPE pipe joining operations in accordance with this Section.

F. Submit to the PCM, at least 14 calendar days prior to HDPE pipe testing, a certificate of calibration that is less than 12 months old for pressure gauges used for pneumatic and hydrostatic pressure testing.

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G. Submit calibration and pressure setting documentation for the safety relief valves that will be used for pneumatic testing of the HDPE pipe.

H. Submit documentation of pressure testing in accordance with this Section.

I. Submit to the PCM, within 3 calendar days after completion of the Work, results of field tests specified in this Section.

1.05 AS-BUILT DOCUMENTATION

A. The Contractor shall provide as-built revisions to the Construction Drawings in accordance with Section 01 71 23.16.

PART 2 PRODUCTS

2.01 GENERAL

A. Design and proportion parts to have adequate strength and stiffness for the purposes shown on the Construction Drawings.

B. Furnish all components, connectors, valves, tees, adapters, and other appurtenances to complete the installation of the leachate collection and conveyance system as shown on the Construction Drawings.

2.02 HDPE COMPOUND

A. Furnish only HDPE with no sharp projections, homogeneous throughout with respect to resin compound, and with surfaces free of foreign inclusions and surface defects. Furnish HDPE that is as uniform as commercially practical in color, opacity, density, and other physical properties.

B. Furnish HDPE pipe and fittings manufactured from PE 4710 HDPE resin conforming to ASTM D3350 with minimum cell classification of 445574C, and stamped and designated PE 4710.

C. Furnish HDPE welding rod material compatible with HDPE pipe and fittings specified in this Section.

2.03 HDPE PIPES, FITTINGS, AND APPURTENANCES

A. Furnish HDPE pipe and fittings having the Dimension Ratio (DR) shown on the Construction Drawings and conforming to ASTM F714.

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B. Furnish HDPE pipes in standard laying lengths.

C. Furnish HDPE end caps at the end of leachate riser pipes as shown on the Construction Drawings.

D. Furnish HDPE pipe supports that cradle the above ground pipe at spacing that prevents sagging for more than 0.5 inch. Furnish additional pipe supports as shown on the Construction Drawings.

E. For perforated pipe, perforations shall be factory-drilled as shown on the Construction Drawings.

F. If used, lap-joint type flange adapters shall conform to the requirements of ASTM F2880.

2.04 IDENTIFICATION

A. Continuously indent print on the HDPE pipe, or space at intervals not exceeding 5 feet, the following:

1. name and/or trademark of the HDPE pipe Manufacturer;
2. nominal HDPE pipe size;
3. Dimension Ratio;
4. the letters PE followed by the polyethylene grade per ASTM D3350, followed by the hydrostatic design stress in 100's of psi;
5. manufacturing Standard Reference; and
6. production code from which the date and place of manufacture can be determined.

2.05 PVC PIPING AND FITTINGS

A. Process piping and fittings shall be as shown on the Construction Drawings unless otherwise approved by the PCM.

B. Piping, fittings, gaskets, and other wetted parts shall be compatible with the materials being handled.

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C. PVC pipes and fittings shall be Schedule 80 and in accordance with ASTM D1784, ASTM D1785, and ASTM D2467.

D. Joint cement between PVC pipes and fittings shall be in accordance with ASTM D2564.

2.06 JOINTS

A. Joints between PVC and HDPE pipes with flanges shall be in accordance with ASME B16.5.

B. Threaded joints between PVC and steel process pipes shall be in accordance with the Construction Drawings.

2.07 VALVES

A. Valves shall be as shown on the Construction Drawings unless otherwise approved by the PCM.

B. Valves that are 4" and larger shall be flanged. Flanges shall be rated for 125 psi or 150 psi, in accordance with ASME B16.5 standards.

C. Check valves shall be diaphragm type, constructed of PVC, and shall have EPDM, Viton, or Teflon elastomers/seals.

D. Ball valves shall be constructed of PVC or polypropylene, and shall have EPDM, Viton, or BUNA elastomers/seals.

E. Gate Valves shall be constructed of PVC with EPDM seals, visual position indicators, hand wheels, and flanged end connections.

F. Air release valves shall be constructed of PVC with EPDM seals, and rated for 0-150 psi operating pressure.

G. Vacuum Breakers shall be diaphragm type and shall be constructed of PVC with EPDM seals, and rated for 0-100 psi operating pressure.

2.08 STEEL PIPES

A. Steel process pipes and casing pipes shall be ASTM A312 Grade TP316 (i.e. UNS designation S31600 or "316 stainless"), and Schedule 40.

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B. Furnish threaded stainless steel process pipes in accordance with ASTM A312 and ASTM A733, and as shown in the Construction Drawings.

C. Make connections between stainless steel process piping with PVC piping using standard National Pipe Thread (NPT).

D. Furnish steel casing pipes at road crossing(s) as shown in the Construction Drawings.

E. Furnish casing spacers and casing end seals as shown in the Construction Drawings.

2.09 EMBEDMENT FILL AND BACKFILL MATERIALS

A. Furnish pipe embedment fill and backfill materials in accordance with Section 31 23 00.

2.10 EQUIPMENT

A. Furnish equipment to install HDPE pipe, fittings, and appurtenances in accordance with this Section and the Contractor's Work Plan.

PART 3 EXECUTION

3.01 GENERAL

A. Verify existing conditions in accordance with 01 89 13.

B. Obtain construction water for pipe testing from the on-site raw water supply source or at locations approved by the PCM.

C. Concrete for miscellaneous pads shall be in accordance with Section 03 30 00.

D. Implement dust control in accordance with the Contractor's Work Plan.

3.02 HANDLING OF HDPE PIPE, FITTINGS, AND APPURTENANCES

A. Deliver HDPE pipe, fittings, and appurtenances to the Site at least 14 calendar days prior to the planned installation date.

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B. Provide proper handling and storage of HDPE pipe, fittings, and appurtenances at the Site. Protect materials from excessive heat and cold, dirt, moisture, cutting, and other damaging or deleterious conditions. Provide additional storage methods required by the Manufacturer.

C. Exercise care when transporting, handling, and placing HDPE pipe and fittings. Use fabric or nylon slings and straps when handling HDPE pipe. Do not position slings or straps at butt-fusion joints or at fittings.

D. The maximum allowable depth of cuts, gouges, or scratches on the exterior surface of HDPE pipe and fittings is 10 percent of the wall thickness. The interior of the pipe and fittings shall be free of cuts, gouges, and scratches. Replace HDPE pipe and fittings that become gouged, twisted, or crimped. Remove damaged pipes and fittings from the Site.

3.03 HDPE PIPE, FITTINGS, AND APPURTENANCE INSTALLATION

A. General

1. Examine HDPE pipe and fittings for cracks, damage, and defects before installation. Do not use cracked, damaged, or defective material.

2. Inspect the interior of pipe and fittings and remove foreign material from the pipe interior before the pipe is moved into final position.

3. Perform field cutting of pipes, where required, with a machine specifically designed for cutting pipe. Make cuts without damage to pipe, so as to leave a smooth end at right angles to the axis of pipe. Flame cutting is not permitted.

4. Perform trenching and backfilling in accordance with Section 31 23 00.

5. Do not lay pipe until the PCM has approved the bedding conditions.

6. Install HDPE pipe and fittings as shown on the Construction Drawings and in accordance with ASTM D3261, the Manufacturer's recommendations, and the requirements of this Section.

7. Provide necessary adapters and/or fittings required when connecting different types and sizes of pipe or when connecting pipe made by different manufacturers.

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8. Install pipe and fittings to the lines and grades shown on the Construction Drawings.

9. Place and compact pipe embedment fill and backfill material as shown on the Construction Drawings and in accordance with 31 23 00.

10. Whenever pipe laying is not actively in progress, close the open ends of installed pipes using watertight plugs.

B. Install marker tape in accordance with 31 23 00 and as shown on the Construction Drawings.

C. Perform testing of installed pipe, fittings, and appurtenances in accordance with this Section.

3.04 HDPE PIPE JOINTS, FITTINGS, AND APPURTENANCE CONNECTIONS

A. Qualify personnel performing pipe joining as specified in this Section. Personnel performing pipe joining shall be trained on-site, with CQA Contractor and Manufacturer personnel present to observe training unless personnel have already been trained and certified by pipe Manufacturer. Conduct training on the specific type of equipment that will be used during production joining operations.

B. Notify the PCM at least 24 hours prior to pipe joining activities in order to allow scheduling of monitoring by CQA Contractor. Perform pipe joining in the presence of CQA Contractor unless otherwise authorized by the PCM.

C. Weather Conditions for Joining

1. Do not join HDPE pipes and fittings at ambient temperatures below 40 degrees Fahrenheit (°F) or above 104°F unless otherwise authorized by the PCM. For cold (below 40°F) or hot (above 104°F) weather joining, use the additional means, methods, and techniques described in the Contractor's Work Plan.

2. Measure ambient temperature at fusion machine.

3. Do not join HDPE pipe and fittings during precipitation, in the presence of heavy fog or dew, or in areas of ponded water.

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D. Prior to joining, clean the joint area so that it is free of moisture, dust, dirt, debris, and foreign material.

E. Fusion joining equipment shall be approved for the applicable field joining processes, which is thermal butt-fusion. Fusion apparatus shall be automated devices equipped with gauges giving the applicable times, temperatures, and pressures.

F. Join HDPE carrier and containment pipe sections using butt-fusion joining methods unless otherwise shown on the Construction Drawings. Fabricate joints in compliance with ASTM D2657, ASTM F1055, Manufacturer's recommendations, and the requirements of this Section.

3.05 PVC PIPE AND FITTINGS INSTALLATION

A. PVC pipe and fitting joining shall be in accordance with ASTM D2855.

B. After installation and connection Work is completed, check for correctness. Verify that connections are free of leaks by pressure testing at operating pressure and within the limits of the pump, valve, and pipe system pressure rating. Provide hydraulic pressure testing apparatus including, but not limited to pumps, hoses, pressure gauges, pressure relief valves, taps, plugs, drains, temporary connections, and fittings. Alternatively, side slope riser pumps can be used to pressurize the system against a closed downstream isolation valve for up to 30 seconds.

C. Repair or replace defective piping and fittings that fail the pressure test. The use of reagents to temporarily stop leaks is not permitted.

D. Installation of valves shall comply with this specification and ASME B13.3.

E. Valves shall be installed in accordance with the requirements of the Construction Drawings and the Manufacturer’s written installation instructions and recommendations.

F. Unless otherwise specified on the Construction Drawings, valves shall be oriented to allow operator access to handles, hand wheels, or levers.

G. All valves shall be accessible and located to facilitate easy replacement, repair, and service.

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H. Verify proper flow direction in valves whose function is affected by installation direction.

3.06 STEEL PIPE INSTALLATION

A. Supply stainless steel pipes at standard lengths.

B. Stainless steel process and casing pipes can be factory- or field- welded per appropriate codes by American Welding Society (AWS) and by certified welders.

C. Field-cut casing pipes at appropriate lengths to cover the entirety of road crossing distances.

D. Install casing pipe spacers and end seals per Manufacturer's recommendations.

E. Field-cut process pipes as necessary to appropriate lengths as shown on the Construction Drawings.

3.07 FIELD TESTING AND INSPECTION

A. Notify the PCM at least 24 hours in advance of necessary testing or inspection of pipe, including fitting and appurtenances. CQA Contractor will monitor and document pipe testing in accordance with this Section and the CQA Plan.

B. Provide testing apparatus, including pumps, hoses, gauges with pressure relief valves, taps, plugs, drains, temporary connections, and fittings, to perform testing in accordance with this Section.

C. Test gauges shall be calibrated within 12 months of date of test. Calibration shall be traceable to national or industry standards where applicable.

D. HDPE Pipe and Fittings Hydrostatic Testing

1. Hydrostatically pressure test installed HDPE solid wall, carrier, and containment pipe with at least 6 inches of initial backfill placed over the containment pipe. Leave joints, fittings, and flanged connections of containment pipe uncovered so that they can be visually inspected for leaks.

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2. Perform tests in the presence of the CQA Contractor and in accordance with the testing requirements described in this Section. Do not perform containment pipe testing until carrier pipe has been successfully tested.

3. Hydrostatically test HDPE solid wall carrier pipe at 60 psi internal pressure. Test carrier pipe in accordance with the testing requirements described in this Section. Containment pipe shall be at atmospheric pressure when testing carrier pipe.

4. Hydrostatically test HDPE containment pipe at 15 psi internal pressure. Test containment pipe in accordance with the testing requirements described in this Section. Carrier pipe shall be at atmospheric pressure and full of water when testing containment pipe.

5. Initial Expansion Phase: Pipe expansion-stabilization shall be conducted for a period of 4 hours. This phase begins when the pipe is filled with water to the specified pressure. If necessary, add water to the pipe four times at 1-hour intervals to return the pipe to the specified pressure. Stabilization is achieved if there is no further reduction in pressure during the final 1-hour period; this phase shall not exceed 4 hours. The actual test may begin at this time even if stabilization has not been achieved; or the pipe may be inspected for leaks, repaired if necessary, and the expansion-stabilization phase restarted.

6. Actual Test Phase: Start the test at the end of the fourth hour of the expansion-stabilization phase by adding water in order to return to the specified pressure, if necessary. Perform the hydrostatic test for up to 3 hours. At the end of each hour, add make-up water to return the pipe to the test pressure, if necessary. A passing test shall require less than the cumulative make-up water listed in Table 40 20 00-1 (with no visible leaks), after either hour 1, 2, or 3. If the added volume exceeds the cumulative table value after the third and final addition of make-up water, the test fails. Inspect for evidence of leaking, repair as necessary, or take actions to minimize ambient temperature fluctuations prior to repeating the expansion and test phases. Optionally, at the discretion of the technician, pipe pressure may be monitored during a 1-, 2-, or 3-hour period; water is added once as necessary at the end of the selected hour. If make-up water at the end of the selected hour is less than shown in Table 40 20 00-1, the test passes; if make-up water is greater than shown, the test may be continued to the next hour. However, the test

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shall not exceed 3 hours; pass/fail criteria are based on the volume of make-up water shown in Table 40 20 00-1.

7. Alternative Test: Perform the expansion-stabilization phase at 70 psi internal pressure for the carrier pipe and at 25 psi internal pressure for the containment pipe. The stabilization-expansion shall be performed for a period of 4 hours as defined in this Section, with pressures maintained by the addition of water. To begin the actual hydrostatic test, reduce the pipe pressure by 10 psi in accordance with the recommendations of AWWA, 1999. The test passes if the pressure remains within 5 percent of the test pressure for 1 hour with no visible leaks. The test fails if the pressure drop is greater than 5 percent of the test pressure. Inspect for evidence of leaking and repair as necessary, or take actions to minimize ambient temperature fluctuations prior to repeating the expansion and test phases.

E. HDPE Pipe and Fittings Pneumatic Testing

1. Final testing of HDPE piping shall be hydrostatic.

2. Perform preliminary low air pressure (pneumatic) testing at pressure no greater than 10 psi, including soaping of joints for HDPE piping prior to placement in the trench. Pneumatic testing shall be performed as follows.

   a. Pressure relief valve shall be installed prior to pneumatic testing of pipe sections. Relief valve shall be set to release at 15 psi.

   b. Gradually increase the pressure to one-half of the full pneumatic test pressure. Pause for 15 minutes to allow the pipe strains to become equalized and to detect possible major leaks by means of soap bubbles or monitoring of test gauge.

   c. Gradually increase the pressure to the full pneumatic test pressure. Hold the pressure for 15 minutes.

   d. If the gauge pressure does not drop below the full pneumatic test pressure, and no leaks are detected, the pipe passes the pressure/leak test.

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e. If the test fails, each joint shall be inspected for leaks. If the leaking joint(s) cannot be identified, the entire tested length shall be removed, replaced, and re-tested. Repairs shall be in accordance with the requirements of this Section.

F. HDPE Pipe Inspection

1. Inspect fusion joints for evidence of excess or insufficient bead size, contamination, offset, and other evidence of inadequate joining. The surface of the HDPE pipe shall be clean at the time of inspection. Wipe or wash the HDPE pipe surface if surface contamination inhibits inspection.

2. If the inspection indicates the presence of debris in the carrier pipe, flush the pipe with water pumped through the cleanout or by other means, methods, and techniques described in the Contractor's Work Plan.

3. Repair pipe sections that show signs of crushing where greater than 4 percent pipe diameter deflection from vertical is observed.

G. Defects and Repairs

1. Repair Methods

a. Repair the portion of HDPE pipe exhibiting a flaw or poor quality fusion joint by removing the bad joint or pipe section and replacing with a new pipe section.

b. When making repairs:

i. clean and dry pipe surfaces immediately prior to repair;

ii. only use approved fusion equipment; and

iii. extend repairs at least 12 inches in all direction beyond the extent of the defect using the methods described in this Section.

2. Repair Verification

a. Inspect each repair in accordance with this Section.

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b. Document repairs, including acceptance of repairs by the PCM.

3.08 CONSTRUCTION QUALITY REQUIREMENTS

A. CQA shall be performed in accordance with the CQA Plan.

B. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.

C. The Contractor shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the Owner.

3.09 SURVEY CONTROL

A. Survey location and elevation of the HPDE pipe at no greater than 50-foot centers, at each change in direction, and at all fittings and appurtenances in accordance with Section 01 71 23.16.

B. Survey the top of HDPE containment pipe on no greater than 50-foot centers, at each change in direction, at all fittings, and in accordance with Section 01 71 23.16.

3.10 TOLERANCES

A. Install bottom of HDPE pipes to within ±0.1 feet of the elevations shown on the Construction Drawings.

B. Install HDPE pipes to within ±0.2 feet of the surveyed horizontal locations shown on the Construction Drawings and/or horizontal control points.

C. Install PVC and steel pipes to within ± 1/2" inch of the lengths and locations shown on the Construction Drawings.

D. Install valves to within ±1 inch of the locations shown on the Construction Drawings.

E. Provide positive slope of gravity lines at all locations and to within ±0.1 feet of the invert elevations shown on the Construction Drawings.

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TABLE 40 20 00-1

ALLOWANCE* FOR EXPANSION UNDER TEST PRESSURE FOR AMBIENT CONDITIONS+ (in US Gallons / 100 Feet of Pipe)

Nominal Pipe Size (Inches)	1-Hour Test	2-Hour Test	3-Hour Test
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.30	0.60	0.90
8	0.50	1.0	1.5
10	0.75	1.30	2.10
11	1.0	2.0	3.0
12	1.1	2.3	3.4
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.2	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.3
28	5.5	11.1	16.8
32	7.0	14.3	21.5
36	9.0	18.0	27.0
40	11.0	22.0	33.0
48	15.0	27.0	43.0

*These allowances only apply to the actual test phase and not to the initial expansion phase. They also assume pipe is being tested at a maximum design pressure equal to 1.5 times the pressure rating. If pipe is being tested at a lower system design pressure, the allowance should be reduced by the ratio of the system design pressure to the maximum design pressure.

+When testing at temperatures below ambient (approximately 75°F), less pipe expansion takes place, resulting in lower requirements for make-up water. For a test temperature of about 68°F, the values in this table should be multiplied by a reduction factor of 0.75. For 50°F, the reduction factor is 0.50.

The above footnotes are in accordance with the recommendations of AWWA, 1999.

[END OF SECTION]

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SPECIFICATION NO: **SECTION 43 21 00**

SPECIFICATION TITLE: **PUMPS**

PROJECT NO: **GW6489**

PROJECT TITLE: **PLANT BARRY CCR POND CLOSURE**

CLIENT: **SOUTHERN COMPANY SERVICES**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
0	11/10/2018	15	Client Review/Approval	CFB	ELM	

☒ Entire Specification Issued this Revision

☐ Revised Pages Only Issued this Revision

SPECIFICATION ISSUED FOR:

☐ In-house Review ☐ Bid

☒ Client Review/Approval ☐ Construction

☐ Information Only ☐ *Other*

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SECTION 43 21 00

PUMPS

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section consists of all labor, equipment, materials, services, supervision and incidentals necessary to install all pumps and associated electrical components, instrumentation, control panels, and controls systems required for completion of the Work as described herein, shown on the Construction Drawings, or as approved by the Project Construction Manager (PCM).

1.02 RELATED WORK

A. Related Work specified in other Sections includes, but is not limited to:

1. 01 71 23.16 - Surveying

B. Related Work specified in other Plans includes, but is not limited to:

1. Construction Drawings
2. Construction Quality Assurance (CQA) Plan
3. Scope of Work

1.03 REFERENCES

A. Materials and equipment under this Section shall comply with the latest versions of applicable standards of the organizations listed in below:

1. American National Standards Institute (ANSI)
2. American Society for Testing and Materials International (ASTM)
3. American Wire Gauge (AWG)
4. Electrical Testing Laboratories, Inc. (ETL)
5. Factory Mutual (FM)

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6. Insulated Cable Engineers Association (ICEA)

7. Institute of Electrical and Electronic Engineers (IEEE)

8. National Electrical Code (NEC)

9. National Electrical Manufacturers Association (NEMA)

10. National Electrical Safety Code (NESC)

11. InterNational Electrical Testing Association Acceptance Testing Specifications (NETA ATS)

12. National Fire Protection Association (NFPA)

13. National Institute of Standards and Technology (NIST)

14. Nationally Recognized Testing Laboratories (NRTL)

15. Underwriters Laboratories, Inc. (UL)

B. Latest version of American National Standards Institute (ANSI) Standards:

1. ANSI A13.1 Scheme for the Identification of Piping Systems

2. ANSI B31.3 Process Piping

C. Latest version of American Society of Mechanical Engineers (ASME) Standards:

1. ASME B1.2 Pipe Threads, General Purpose, Inch

1.04 TERMINOLOGY

A. When the following terms are used in relation to the Work for this and related Sections, they shall have the following meanings:

TERM	MEANING
Boxes	Outlets, junctions, or pull boxes
Code	Codes currently enforced at the project site
Compression	Compressed using a leverage-powered (hydraulic or approved equal) crimping tool

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TERM	MEANING
Connection	Materials and labor required for equipment to be fully operational
Wiring	Raceways, conductors, and connections

1.05 SUBMITTALS

A. Submit the proposed electrical hook-up locations to the PCM for review at least 14 calendar days after notice to proceed.

B. Submit the following to the PCM for review and approval at least 14 calendar days prior to ordering the specified materials:

1. list of the type of material, manufacturer, and catalog or model number for all materials necessary for the installation of items described in this Section;

2. drawings and sketches including control panel layout, assembly diagrams, and wiring diagrams;

3. control panel installation instructions, including calibration requirements and installation details:

   a. calibration required at the time of system installation and at regular intervals thereafter; and

   b. certification of test equipment (calibration records) to be used to complete the testing in accordance with this Section.

4. drawings and sketches of panel boards, electrical panels, and cabinets;

5. drawings and sketches shall detail type of construction materials, manufacturer and catalog or model number, characteristics, sizes, ratings, mounting requirements, clearances, component interface, wiring diagrams, connections, instructions, and other information required for proper evaluation and complete installation for products in this Section;

6. Manufacturer's published product literature including certificates of compliance, test reports, maintenance recommendations, and replacement parts procurement information;

7. testing and start-up plan for pumps and electrical equipment; and

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8. Manufacturer's make, model number, and specifications of hardware and software for all instrumentation and controls system components including operator's interface terminals, human machine interfaces, and programmable logic controller.

C. Submit a controls narrative for the proposed controls system to the PCM for review at most 14 calendar days after notice to proceed. The controls narrative shall include a diagram of controls system architecture, a functional narrative of controls systems including details on operator's interface terminal, and human machine interface graphics displays.

D. Do not order materials or start shop Work until the PCM's review and approval of drawings and sketches is completed.

E. Submit a list of all measuring and test equipment (M&TE) for approval before use. M&TE shall be calibrated to NIST standards or ANSI Z540.1.C. Submit a certificate of calibration less than 12 months old for M&TE. M&TE shall be calibrated within 12 months of date of use. Calibration shall be traceable to national or industry recognized standards where possible.

F. Submit the following to the PCM for review within 14 calendar days after completion of the specified Work:

1. two complete electrical equipment Systems Manual. Include in each manual one copy of approved drawings and sketches, catalog pages, instruction sheets, operating instructions, installation and maintenance instructions, spare parts bulletins, and a wiring diagram for each system;

2. four copies of complete operating instructions, installation and maintenance instructions, and spare parts bulletins;

3. Manufacturer's certification that the pumps were manufactured, tested, and supplied in accordance with this Section;

4. verification that installation is complete, free of leaks, and ready for operation;

5. test reports listing equipment used, persons performing the tests, date tested, device or circuit tested, and results of testing;

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6. calibration reports;

7. operation manuals including programming instructions for the operator's interface terminal, and human machine interface; and

8. Operation and maintenance (O&M) manuals:

   a. operating instructions, installation and maintenance instructions, and spare parts bulletins;

   b. Manufacturer's certification that the pumps, control panel, instrumentation, and system were manufactured, tested, and supplied in accordance with this Section; and

   c. verification that installation is complete, free of leaks, and ready for operation.

1.06 DRAWINGS AND SKETCHES

A. Construction Drawings are diagrammatic and show the arrangement and location of fixtures, equipment, and conduit. Carefully investigate the structural and finish conditions affecting the Work and arrange the Work accordingly.

1.07 AS-BUILT DOCUMENTATION

A. The Contractor shall provide as-built revisions to the Construction Drawings in accordance with Section 01 71 23.16.

B. Provide and maintain at the Site a set of "red-line" drawings on which the actual installation of Work under this Section shall be accurately shown, indicating any variation from the Construction Drawings. Changes in circuitry shall be clearly and completely indicated on the "red-line" drawings as the Work progresses.

C. The "red-line" drawings shall be available for review by the PCM and shall be used to determine the progress of electrical Work.

D. At the completion of the Work, prepare a new set of as-built drawings of the Work shown on the "red-line" drawings, including the dimensioned location of all underground conduits.

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1.08 SUBSTITUTIONS

A. Where mechanical and electrical equipment is identified by manufacturer and catalog number, the equipment shall be considered the basis of requirements for quality and performance. Where manufacturers for equipment are identified by name, the Contractor may submit for approval and authorization similar equipment of other manufacturers as substitution. It is the Contractor's responsibility to prove that proposed equipment is equal to that specified. The decision of the PCM as to whether the submitted equipment is acceptable is final and binding.

B. Changes necessary to accommodate the substituted equipment shall be made at the Contractor's expense and shall be as authorized by the PCM. Detailed drawings and sketches indicating the required changes shall be submitted for approval at the time the substitution is requested.

PART 2 PRODUCTS

2.01 GROUNDING CONDUCTORS AND CONNECTORS

A. Grounding conductors shall be copper only, sized per code; bare or green insulated in sizes No. 10 American Wire Gauge (AWG) or larger; and green insulated for size No. 12 AWG.

2.02 ROUND RODS

A. Furnish ¾-inch diameter by 10-foot long copper clad steel ground rods.

2.03 GENERAL ELECTRICAL REQUIREMENTS

A. Materials and equipment necessary for the proper installation and operation of the Work included under this Section shall be purchased, procured, installed, wired, and tested as required by this and related Sections. Materials and equipment shall include, but not be limited to, 460 VAC 3 phase 4-wire and 120/240 VAC 1 phase 3-wire system wiring to electrical equipment such as service panel, pumps, and control devices; and other components required for a complete electrical system. The wiring shall include raceways, cables, junction and pull boxes, wireways, and other components required for a complete installation.

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B. Materials and equipment installed shall be tested and listed by UL or other NRTL and shall be so labeled.

C. Materials and equipment shall be new and shall conform to or exceed the applicable standards in accordance with this and related Sections. Materials and equipment shall have a date of manufacture of less than 1 year prior to use on the Project.

D. Materials and equipment shall be provided by manufacturers whose products have been in service for at least 3 years.

E. Include brackets, attachments, mounting, hardware, touch-up paint, and other accessories needed for complete installation.

2.04 NAME PLATES

A. Provide permanently attached equipment nameplates constructed of three-layer plastic laminated material engraved through white surface material to black sub-layer. Lettering shall be ½-inch bold style. Nameplates shall indicate the equipment, maximum voltage, number of phases, and the name of the piece of equipment that provides the source of power as shown on the Construction Drawings.

2.05 PUMP MATERIALS

A. Furnish submersible pumps as shown on the Construction Drawings and accessories including but not limited to pull-out cables and pulley system per the Manufacturer's recommendations.

B. Materials shall be in conformance with ANSI A13.1, ASME B1.2, and ANSI B31.3. Wetted parts shall be 316 stainless steel or better corrosion-resistant materials.

C. Alternative materials shall not be installed without prior approval from the PCM.

2.06 INSTRUMENTATION

A. Instrumentation shall be as shown on the Construction Drawings or as otherwise approved by the PCM.

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B. Wetted parts shall be leachate-compatible plastic (e.g. PVC, polypropylene, polyethylene, etc.), 316 stainless steel, or other metals with better corrosion resistance.

C. Instrumentation exposed to the elements shall be NEMA 4 rated or higher.

D. Flow Meters:

1. Furnish Rosemount 8700 Series flow meter or approved equivalent with flange connections at sizes shown on the Construction Drawings. Transmitter Model 8732 and Sensor Model 8705 or approved equivalent.

2. Accuracy to 0.25 percent;

3. 4-20 mA output; and

4. Integral mount with local readout.

E. Pressure-Indicating Transmitters:

1. Furnish Dwyer DPT-A05 or approved equivalent;

2. Range 0-100 psi;

3. 4-20mA output;

4. digital readout; and

5. corrosion-resistant body materials.

F. Level-Indicating Transmitters:

1. Furnish EPG Companies LevelMaster series or approved equivalent;

2. Range 0-30 psi;

3. Accuracy to 0.25 percent;

4. 4-20 mA output; and

5. 316 Stainless Steel body with chemical-resistant jacketed cable with water block.

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2.07 CONTROL PANELS

A. Furnish pump Manufacturer recommended control panels to operate pumps and associated instrumentation, as shown on the Construction Drawings and to satisfy the requirements of this Section.

B. Furnish one control panel per extractor well as shown on the Construction Drawings, and one main control panel with a programmable logic controller (PLC), a human machine interface (HMI), and appropriate supervisory control and data acquisition (SCADA).

C. Control panel enclosures at extractor wells shall be equipped with a window in the outer door, an inner door, and a drip shield. The enclosures shall be stainless steel and NEMA 4X rated.

D. Furnish one Maple Systems' HMI500L series or approved equivalent HMI at each local control panel for each riser pad. HMIs shall be pre-configured to provide a graphics display necessary to control operational setpoints of associated instruments.

E. The main control panel shall be located in the main control room. Furnish an HMI in the front door of the main control panel, with appropriate HMI and SCADA software. HMI and SCADA software shall be pre-configured to provide graphics displays necessary for regular operation, diagnostics, monitoring, data logging, reporting, and remote alarm functions of the leachate collection and conveyance system.

F. Furnish Allen Bradley (or approved equivalent) PLCs as necessary to satisfy the requirements of this section.

PART 3 EXECUTION

3.01 GENERAL

A. The Work shall include, but not be limited to:

1. connection to existing utility services;

2. power distribution;

3. controls and instrumentation in accordance with this Section;

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4. testing and start-up of electric motors in accordance with Contractor's Plan;

5. testing and start-up of electrical equipment in accordance with Contractor's Work Plan; and

6. an electrical system fully tested and operating to the approval of the PCM.

B. Make connections to equipment in accordance with approved drawings and sketches.

C. Furnish and install connections in accordance with codes, including but not limited to:

1. raceway system;

2. panelboards;

3. service neutral;

4. "separately derived service" (transformer or emergency power supply);

5. electrically-operated equipment and devices; and

6. surge arrestors.

D. Do not connect for electrical service a device or piece of equipment that has a neutral conductor connected to a grounding conductor or to the frame within the device or equipment.

E. Test instrumentation shall conform to NETA ATS.

3.02 GROUNDING

A. Provide grounding for electrical systems and equipment as required by the National Electrical Code (NEC) and National Electrical Safety Code (NESC) and as shown on the Construction Drawings.

B. In conduit runs requiring an expansion fitting, install a bonding jumper around the fitting to maintain continuous ground continuity.

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C. Where exposed to potential physical damage, protect ground wire with rigid non-ferrous conduit as permitted by applicable NESC standards.

D. Provide grounding conductor in all conduit runs except for control circuits 24 V and less.

E. Measure the system's resistance to ground. Perform testing in accordance with the instrument Manufacturer's recommendations using the fall-of-potential method. Provide to the PCM, within 2 calendar days of completion of testing, test reports indicating overall resistance to ground and resistance of each electrode to ground.

F. Perform resistance to ground testing on each ground rod installed and power pole butt plate. Resistance shall be 5 ohms or less. If resistance is greater than 5 ohms, install a second ground rod of equal size a minimum of 6 feet from the original and connect with a minimum No. 2 AWG wire. Test the new ground rod and record results. Notify the PCM if the second ground rod test results are above 25 ohms.

G. Inspect grounding and bonding system conductors and connections for tightness and proper installation in accordance with the Manufacturer's instructions. Accurately record as-built locations of grounding electrodes and submit to the PCM.

3.03 PUMP DELIVERY AND STORAGE

A. Deliver materials in original, unbroken pallets or packages bearing the label of the Manufacturer. Handle materials carefully to prevent damage. Store items in an enclosed area free from contact with soil and water.

3.04 CUTTING CONSTRUCTION

A. Repair or replace construction materials that are damaged or cut with materials of like kind and quality as original materials.

3.05 EQUIPMENT CONNECTION

A. Provide complete electrical connections necessary to serve equipment of this and related Sections. Provide required control connections to equipment so that the equipment is fully operational upon completion of the Project. Where the Construction Drawings show an equipment connection, provide the code-required disconnect switch.

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B. Install materials and equipment in conformance with the Manufacturer's installation instructions and UL requirements.

3.06 WIRE NUMBERING

A. Number field wiring, external to pre-manufactured panels and equipment, in a manner that is uniquely identified with the associated field equipment. The numbering shall be sequential, beginning with 1 and continuing to 999. If a panel requires more than 999 wire numbers, start again at 1 preceded by an alpha character starting with A.

B. Submit a finished wire number schedule with conduit numbers and a functional description of the wires.

3.07 EQUIPMENT SUPPORTS

A. Complete installation of structural steel framing and reinforced concrete before installing supporting devices.

B. Fasten hanger rods, conduit clamps, and outlet and junction boxes to structures in accordance with the Manufacturer's recommendations.

C. Use expansion anchors for support on concrete surfaces.

D. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

E. Fabricate supports from structural steel or steel channel. Rigidly bolt to structural steel to present a neat appearance. Use hexagon head bolts with spring lock washers under nuts.

3.08 TESTING DURING ELECTRICAL INSTALLATION

A. Test wires installed on-site for point to point continuity before termination for a minimum of 10 seconds and document on Contractor’s testing data sheet or equivalent record document.

B. Wire insulation shall be Megger tested between each conductor and ground. Use a 1,000 V Megger for insulation rated 600 V, and 500 V Megger for insulation rated 300 V. Minimum resistance shall be 100 megohms. Perform Megger test for at least 60 seconds or until resistance is stable and document on CQA Contractor’s forms.

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C. Measure and record resistance readings between shield and ground for shielded cables in accordance with the Manufacturer's recommendations. Transfer the readings to the as-built drawings.

D. Provide test results to the PCM.

3.09 PUMP INSTALLATION

A. Install pumps in accordance with the Manufacturer's installation instructions and recommendations.

B. After installation and connection Work is completed, check the installation for correctness, verifying that connections are free of leaks and the system is operational per the standard pump curve based on flow and pressure readings. Installation personnel shall correct discrepancies.

3.10 INSTRUMENTATION AND CONTROLS

A. Flow meters:

1. Install flow meters as shown on the Construction Drawings and in accordance with Manufacturer's instructions, with readout in the upright position. Time base should display gallons per minute (gpm). Connect rate totalizer to readout device and local control panel HMI.

2. Install flow meters with appropriate lengths of straight pipe runs per Manufacturer's recommendations.

3. Flow meters shall provide adequate protection to associated pumps under low-flow conditions.

4. Flow meter pump control shall be in accordance with the Construction Drawings. Flow meter set points shall be approved by the PCM.

B. Pressure Transmitters:

1. Install pressure transmitters such that readout is in the upright position.

2. Pressure transmitters shall provide adequate protection to associated pumps under high discharge pressure conditions.

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3. Pressure transmitter pump control shall be in accordance with the Construction Drawings. Pressure transmitter set points shall be approved by the PCM.

C. Level Transmitters:

1. Install one level transmitter for each submersible pump in each leachate collection sump, as shown on the Construction Drawings.

2. Level transmitters shall provide adequate protection to associated pumps under low level conditions.

3. Level transmitter pump control shall be in accordance with Construction Drawings. Set points for pump control shall be approved by PCM.

3.11 CONSTRUCTION QUALITY REQUIREMENTS

A. CQA shall be performed in accordance with the Contract Documents and the CQA Plan.

B. Contractor shall coordinate construction activities through the PCM to accommodate the activities required of the CQA Contractor.

C. Contractor shall notify the PCM at least 7 calendar days prior to commencement of new Work activities.

3.12 WARRANTY

A. Correct defects in material, equipment, or workmanship disclosed within a period of 1 year from date of project completion.

[END OF SECTION]

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PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA
DRAFT 100 PERCENT DESIGN DRAWINGS
DECEMBER 2018

SOURCE: TIGERLINE SHAPEFILES WWW.CENSUS.GOV

LOCATION MAP
SCALE: NTS

LIST OF DRAWINGS	
DRAWING NO.	DRAWING TITLE
001	COVER SHEET
002	LEGENDS, ABBREVIATIONS, AND REFERENCE NOTES
003	EXISTING SITE CONDITIONS
004	EXISTING SITE CONDITIONS - NORTHERN HALF
005	EXISTING SITE CONDITIONS - SOUTHERN HALF
006	SITE DEVELOPMENT AND ACCESS PLAN
007	DEMOLITION AND MATERIALS REMOVAL PLAN
008	BOTTOM OF CCR - TOP OF UNDERLYING CLAY LAYER
009	THICKNESS OF CCR - ISOPACH
010	THICKNESS OF UNDERLYING CLAY LAYER - ISOPACH
011	CCR REMOVAL PLAN - OVERALL
012	TOP OF FINAL CLOSURE GRADING PLAN - OVERALL
013	TOP OF FINAL CLOSURE GRADING PLAN I
014	TOP OF FINAL CLOSURE GRADING PLAN II
015	TOP OF FINAL CLOSURE GRADING PLAN III
016	TOP OF FINAL CLOSURE GRADING PLAN IV
017	TOP OF FINAL CLOSURE GRADING PLAN V
018	FINAL CLOSURE CROSS SECTIONS I
019	FINAL CLOSURE CROSS SECTIONS II
020	SOIL CONTAINMENT BERM (SCB) GRADING PLAN - OVERALL
021	SCB PLAN AND PROFILE - STA 0+00A TO 31+00A
022	SCB PLAN AND PROFILE - STA 31+00A TO 65+50A
023	SCB PLAN AND PROFILE - STA 65+50A TO 105+78A
024	SCB PLAN AND PROFILE - STA 0+00B TO 20+00B
025	SCB CROSS SECTIONS I
026	SCB CROSS SECTIONS II
027	SCB CROSS SECTIONS III
028	SCB CROSS SECTIONS IV
029	SCB CROSS SECTIONS V
030	SCB DETAILS
031	STORMWATER MANAGEMENT PLAN (FINAL CLOSURE) - OVERALL
032	STORMWATER MANAGEMENT PLAN (FINAL CLOSURE) I
033	STORMWATER MANAGEMENT PLAN (FINAL CLOSURE) II
034	STORMWATER MANAGEMENT PLAN (FINAL CLOSURE) III
035	STORMWATER MANAGEMENT PLAN (FINAL CLOSURE) IV
036	STORMWATER MANAGEMENT PLAN (FINAL CLOSURE) V
037	TEMPORARY INTERNAL DRAINAGE SYSTEM (IDS) FORCEMAIN PLAN
038	TEMPORARY IDS FORCEMAIN PROFILE
039	TEMPORARY IDS PROCESS AND INSTRUMENTATION DIAGRAM I
040	TEMPORARY IDS PROCESS AND INSTRUMENTATION DIAGRAM II
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047	CONSTRUCTION SEQUENCING PLAN - PHASE II
048	CONSTRUCTION SEQUENCING PLAN - PHASE III
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050	CONSTRUCTION SEQUENCING PLAN - PHASE V

DRAWINGS CURRENTLY ON HOLD

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DRAWING NO.	DRAWING TITLE
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052	CONSTRUCTION SEQUENCING PLAN - PHASE VII
053	CONSTRUCTION SEQUENCING PLAN - PHASE VIII
054	CONSTRUCTION SEQUENCING SECTIONS - PHASE I
055	CONSTRUCTION SEQUENCING SECTIONS - PHASE II
056	CONSTRUCTION SEQUENCING SECTIONS - PHASE III
057	CONSTRUCTION SEQUENCING SECTIONS - PHASE IV
058	INITIAL STORMWATER MANAGEMENT AND EROSION AND SEDIMENT CONTROL (ESC) PLAN - OVERALL
059	STORMWATER MANAGEMENT AND ESC PLAN - PHASE I
060	STORMWATER MANAGEMENT AND ESC PLAN - PHASE II
061	STORMWATER MANAGEMENT AND ESC PLAN - PHASE III
062	STORMWATER MANAGEMENT AND ESC PLAN - PHASE IV
063	STORMWATER MANAGEMENT AND ESC PLAN - PHASE V
064	STORMWATER MANAGEMENT AND ESC PLAN - PHASE VI
065	STORMWATER MANAGEMENT AND ESC PLAN - PHASE VII
066	STORMWATER MANAGEMENT AND ESC PLAN - PHASE VIII
067	OUTFALL STRUCTURE MODIFICATIONS - INTERIM CONDITIONS
068	OUTFALL STRUCTURE MODIFICATIONS - FINAL CONDITIONS
069	AUXILIARY OVERFLOW WEIR
070	COVER SYSTEM AND TIE-IN DETAILS I
071	COVER SYSTEM AND TIE-IN DETAILS II
072	COVER SYSTEM AND TIE-IN DETAILS III
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074	HEADWALL DETAILS I
075	HEADWALL DETAILS II
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077	STORMWATER MANAGEMENT SYSTEM (SWMS) AND ESC DETAILS I
078	SWMS AND ESC DETAILS II
079	SWMS AND ESC DETAILS III
080	MISCELLANEOUS DETAILS I
081	MISCELLANEOUS DETAILS II
082	CONSTRUCTION CONTROL POINTS AND TABLES - CCR REMOVAL I
083	CONSTRUCTION CONTROL POINTS AND TABLES - CCR REMOVAL II
084	CONSTRUCTION CONTROL POINTS AND TABLES - CCR REMOVAL III
085	CONSTRUCTION CONTROL POINTS AND TABLES - CCR REMOVAL IV
086	CONSTRUCTION CONTROL POINTS AND TABLES - CCR REMOVAL V
087	CONSTRUCTION CONTROL POINTS AND TABLES - CCR REMOVAL VI
088	CONSTRUCTION CONTROL POINTS AND TABLES - SCB I
089	CONSTRUCTION CONTROL POINTS AND TABLES - SCB II
090	CONSTRUCTION CONTROL POINTS AND TABLES - SCB III
091	CONSTRUCTION CONTROL POINTS AND TABLES - SCB IV
092	CONSTRUCTION CONTROL POINTS AND TABLES - SCB V
093	CONSTRUCTION CONTROL POINTS AND TABLES - PREPARED SUBGRADE I
094	CONSTRUCTION CONTROL POINTS AND TABLES - PREPARED SUBGRADE II
095	CONSTRUCTION CONTROL POINTS AND TABLES - PREPARED SUBGRADE III
096	CONSTRUCTION CONTROL POINTS AND TABLES - PREPARED SUBGRADE IV
097	CONSTRUCTION CONTROL POINTS AND TABLES - PREPARED SUBGRADE V

SOURCE: MICROSOFT CORPORATION BING MAPS 2017

VICINITY MAP
SCALE: 1" = 1,000'

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REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
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A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

COVER SHEET

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

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PROJ. NO.	GW6489	DWG. GW6489.04C001	SHEET 1
SCALE	AS SHOWN	DRAWING 001 OF 097	
DATE	DECEMBER 2018		

ANSI E 44x34

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LINETYPE LEGEND

- ASBESTOS LANDFILL BUFFER ZONE
- BATHYMETRIC SURFACE
- CENTERLINE
- CLOSURETURF® SYSTEM
- CONTACT WATER DIVERSION CHANNEL
- DEWATERING DITCH
- DISPOSAL AREA BOUNDARY (NOTE 8)
- DRAINAGE BASIN
- DRAINAGE CHANNEL
- EDGE OF EXISTING ROAD
- EDGE OF WATER / FREE WATER SURFACE
- EXCAVATION SURFACE
- EXISTING GROUND (NOTE 1)
- FACILITY BOUNDARY
- FINISHED GRADE
- FM — FM — FORCEMAIN
- GEOCOMPOSITE
- GEOMEMBRANE
- GEOTEXTILE SEPARATOR OR CUSHION
- LOD — LIMIT OF DISTURBANCE
- LITHOLOGICAL CONTACT
- MEASURED WATER LEVEL (DATE OF MEASUREMENT)
- E — E — OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY (NOTE 7)
- PROTECTIVE BARRIER
- RAILWAY
- SF — SF — SILT FENCE
- SOIL CONTAINMENT BERM CENTERLINE
- SOIL CONTAINMENT BERM SURFACE
- STREAM / CREEK
- DB — DB — TEMPORARY DIVERSION BERM
- TO BE DEMOLISHED
- TC — TC — TURBIDITY CURTAIN
- TREE LINE

SYMBOL LEGEND

- CHECK DAM
- PDCPT-01 — CONE PENETROMETER TEST (GEOSYNTEC, 2018)
- CPT-01 — CONE PENETROMETER TEST (SCS, 2016)
- C1 — CUT SEQUENCE
- P — DEWATERING PUMP
- 0.00 — EXCAVATION CONTROL ELEVATION
- EXTRUSION WELD
- F1 — FILL SEQUENCE
- FLOW DIRECTION
- GUY WIRE
- GSB-01 — MUD ROTARY BORING (GEOSYNTEC, 2017)
- PDS-01 — MUD ROTARY BORING (GEOSYNTEC, 2018)
- APZ-2 — PIEZOMETER
- POWER POLE
- P — PUMP
- 3.5% — SLOPE GRADE
- CREST / TOE — SLOPE INDICATOR
- 1 / 3 — SLOPE LABEL
- MW-01 — SONIC BORING COMPLETED AS MONITORING WELL (SCS, 2015)
- STONE FILTER RING
- ENTRANCE / EXIT — TEMPORARY CONSTRUCTION ENTRANCE / EXIT
- TRAILER OR BUILDING
- VEGETATION
- WATER SURFACE

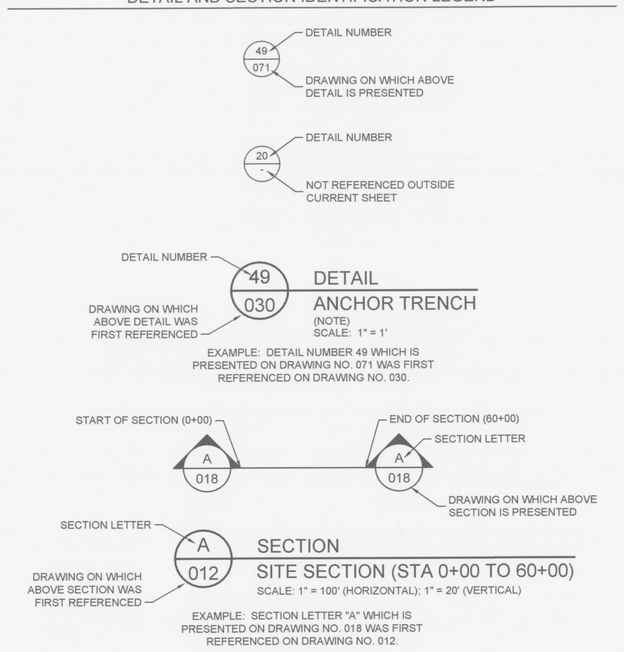
HATCH PATTERN LEGEND

- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- ACTIVE WORK PAD PREPARATION
- PS — AREAS TO RECEIVE PERMANENT STABILIZATION
- CCR / CCR FILL
- CCR REMOVAL AREA (PLAN VIEW)
- CLAY / LOWER CLAY UNIT
- CLAY WITH ORGANICS
- CLSM
- CONCRETE
- DRAINAGE LAYER / GRAVEL
- EXISTING PERIMETER DIKE
- EXISTING ROAD
- FILL
- GRADED AGGREGATE BASE (GAB)
- IN-PLACE CCR
- LOW PERMEABILITY STABILIZING LAYER
- LOWER SAND UNIT
- MIXED UNIT
- NATIVE MATERIAL
- PREPARED SUBGRADE
- RIPRAP
- SAND BACKFILL / SAND DRAINAGE / PIPE EMBEDMENT FILL
- SOIL CONTAINMENT BERM
- SOIL CONTAINMENT BERM AND ROAD (PLAN VIEW)
- WATER SURFACE
- WETLANDS

CONTOUR LEGEND

- 24 — APPROXIMATE TIME FOR PRELOADING (MONTHS)
- 10 — BATHYMETRIC SURFACE ELEVATION (FEET) (NOTE 1)
- 4 — EXCAVATION SURFACE ELEVATION (FEET)
- 4 — EXISTING GROUND ELEVATION (FEET) (NOTE 1)
- 24 — ISOPACH - THICKNESS OF CCR / THICKNESS OF UNDERLYING CLAY (FEET)
- 20 — SOIL CONTAINMENT BERM SURFACE ELEVATION (FEET)
- 50 — TOP OF FINAL COVER SYSTEM / FINISHED GRADE ELEVATION (FEET)
- [-0.5] — APPROXIMATE TOP ELEVATION OF UNDERLYING CLAY LAYER (FEET)

DETAIL AND SECTION IDENTIFICATION LEGEND

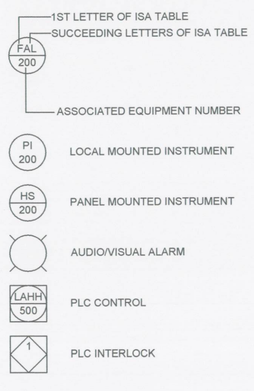


ABBREVIATIONS

AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
AC	ACRES
ALDOT	ALABAMA DEPARTMENT OF TRANSPORTATION
AMP	AMPERE
APC	ALABAMA POWER COMPANY
APP	APPROVED BY
APZ	ASH POND PIEZOMETER
ARV	AIR RELEASE VALVE
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
BOP	BOTTOM OF PIPE
CCR	COAL COMBUSTION RESIDUALS
CJ	CONTRACTION JOINT
℄	CENTERLINE
CLSM	CONTROLLED LOW-STRENGTH MATERIAL
CMP	CORRUGATED METAL PIPE
CO	FORCEMAIN CLEANOUT
CONC	CONCRETE
CPT	CONE PENETROMETER TEST
CQA	CONSTRUCTION QUALITY ASSURANCE
CV	CHECK VALVE
DC	DRAINAGE CHANNEL
DIA	DIAMETER
DRN	DRAWN BY
DWG	DRAWING
E	EAST OR EASTING
EJ	EXPANSION JOINT
EL	ELEVATION
ESC	EROSION AND SEDIMENT CONTROL
FEMA	FEDERAL EMERGENCY MANAGEMENT AGENCY
FIRM	FLOOD INSURANCE RATE MAP
FT	FEET
FT MSL	FEET FROM MEAN SEA LEVEL
GAB	GRADED AGGREGATE BASE
GSB	GEOTECHNICAL SOIL BORING
H:V	HORIZONTAL TO VERTICAL LENGTH RATIO FOR A SLOPE
HDPE	HIGH DENSITY POLYETHYLENE
H/O/A	HAND-OFF-AUTO
HP	HIGH POINT
HV	HAND VALVE
HWY	HIGHWAY
IDS	INTERNAL DRAINAGE SYSTEM
IN	INCH
INV	INVERT
ISA	INTERNATIONAL SOCIETY OF AUTOMATION
KV	KILOVOLT
LBS	POUNDS
LF	LINEAR FOOT
LOD	LIMITS OF DISTURBANCE
LP	LOW POINT
M	MOTOR
MAX	MAXIMUM
MIN	MINIMUM
MW	MONITORING WELL
N	NORTH OR NORTHING
NAD	NORTH AMERICAN DATUM
NAVD88	NORTH AMERICAN VERTICAL DATUM OF 1988
NE	NORTHEAST
NO.	NUMBER
NPDES	NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
NTS	NOT TO SCALE
NW	NORTHWEST
OC	ON CENTER
OZ	OUNCE
PDCPT	PRE-DESIGN CONE PENETROMETER TEST
PDS	PRE-DESIGN SOIL BORING
PLC	PROGRAMMABLE LOGIC CONTROLLER
PROJ	PROJECT
PVC	POLYVINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
REV	REVISION
S	SOUTH
SCB	SOIL CONTAINMENT BERM
SCH	SCHEDULE
SCS	SOUTHERN COMPANY SERVICES
SOCO	SOUTHERN COMPANY
STL	STEEL
SWMS	STORMWATER MANAGEMENT SYSTEM
SWC	STORMWATER CHANNEL
SWP	STORMWATER PIPE
T	TRANSMITTER
TA	TRANSASH
TYP	TYPICAL
USGS	UNITED STATES GEOLOGICAL SURVEY
VFD	VARIABLE FREQUENCY DRIVE
W	WEST OR WIDTH
WS	WATER SURFACE
WSEL	WATER SURFACE ELEVATION
WWTP	WASTEWATER TREATMENT PLANT
WWTS	WASTEWATER TREATMENT SYSTEM
YR	YEAR
%	PERCENT OR PERCENTILE

PIPING AND INSTRUMENTATION

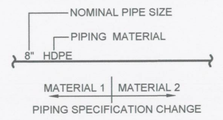
INSTRUMENTATION SYMBOL IDENTIFICATION



VALVE SYMBOLS

EQUIPMENT SYMBOLS

PIPING IDENTIFICATION



PIPING SYMBOLS

REFERENCE NOTES

1. TOPOGRAPHIC CONTOURS IN AND AROUND THE CCR POND (I.E., EXISTING GROUND CONTOURS), SHOWN ON THIS DRAWING SET ARE A COMBINATION OF SOUNDING DATA (BATHYMETRIC DATA) COLLECTED ON APRIL 5, 2016, AERIAL LIDAR TOPO FROM APRIL 12, 2016, AERIAL LIDAR TOPO FROM JANUARY 5, 2018, AND LIDAR TOPO FROM JULY 2018. IN ADDITION, TOPOGRAPHIC CONTOURS OUTSIDE THE VICINITY OF THE CCR POND WERE OBTAINED FROM 'THE NATIONAL ELEVATION DATASET, 1/3 ARC SECOND RESOLUTION' PUBLISHED AUGUST 17, 2016 AND MOBILE RIVER BATHYMETRIC DATA FROM SCS/APC PROVIDED JULY 2018.
2. TOP OF EXISTING CCR WAS TAKEN AS EXISTING GROUND SURFACE IN DRY AREAS AND AS THE BATHYMETRIC SURFACE IN WET/INUNDATED AREAS WITHIN THE DISPOSAL AREA BOUNDARY.
3. UTILITIES, BUILDINGS, AND VEGETATION INFORMATION WERE PROVIDED BY SCS ON JANUARY 17, 2017 (DRAWING ES17925S1), OR TRACED FROM MICROSOFT CORPORATION BING MAPS ACCESSED ON APRIL 16, 2018.
4. SITE ACCESS ROADS SHOWN ARE BASED ON A COMBINATION OF MICROSOFT CORPORATION BING MAPS ACCESSED ON APRIL 16, 2018 AND DRAWINGS PROVIDED BY SCS ON JANUARY 17, 2017. SOME ACCESS ROADS ARE NOT PAVED OR GRAVEL SURFACED. CONTRACTOR SHALL VERIFY CONDITIONS FOR ACCESS PURPOSES.
5. GRID COORDINATE SYSTEM CORRESPONDS TO NORTH AMERICAN DATUM (NAD) 1983, ALABAMA WEST ZONE.
6. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
7. PROPERTY BOUNDARY SHOWN WAS TRACED FROM MAPS.CITYOFMOBILE.ORG ON APRIL 18, 2018 AND IS APPROXIMATE.
8. THE FACILITY BOUNDARY AND DISPOSAL AREA BOUNDARY LINES SHOWN WERE PROVIDED IN SURVEY FILE TITLED 'BOUNDARY SURVEY - CCR SURFACE IMPOUNDMENT ASH DISPOSAL AREA - BARRY ELECTRIC GENERATION PLANT', CREATED BY SOUTHCOAST GEOSERVICES, PUBLISHED SEPTEMBER 21, 2018. THE SURVEY INDICATED THE DISPOSAL AREA BOUNDARY IS APPROXIMATELY 593.2 ACRES IN SIZE, AND THE FACILITY BOUNDARY IS APPROXIMATELY 670.9 ACRES IN SIZE.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR MANAGING AND CONVEYING STORMWATER/CONTACT WATER WITHIN THE DISPOSAL AREA BOUNDARY UP TO A 25-YEAR, 24-HOUR STORM EVENT. CONTACT AND NON-CONTACT WATER DURING CONSTRUCTION SHALL BE PUMPED OR GRAVITY DRAINED INTO THE SOUTHERN PORTION OF THE CCR POND. CONTACT AND NON-CONTACT WATER SHALL BE PUMPED FROM THE SOUTHERN PORTION OF THE POND TO THE ON-SITE WASTEWATER TREATMENT SYSTEM. TREATED DISCHARGE FROM THE ON-SITE WASTEWATER TREATMENT SYSTEM WILL THEN BE DIRECTED BACK TO THE NPDES OUTFALL AND SUBSEQUENTLY RELEASED TO THE MOBILE RIVER. NON-CONTACT STORMWATER FROM CLOSED PORTIONS OF THE CONSOLIDATED IMPOUNDMENT MAY BE DISCHARGED WITHOUT TREATMENT, PROVIDED NO COMMINGLING WITH CONTACT WATER OCCURS AND APC ENVIRONMENTAL AFFAIRS APPROVAL IS RECEIVED.
10. FOR STORM EVENTS GREATER THAN THE 25-YEAR, 24-HOUR STORM, CONTACT WATER MAY FREELY DISCHARGE EITHER THROUGH THE MODIFIED NPDES OUTFALL WITH CONTROL ELEVATION 17.9 FT, OR THROUGH THE AUXILIARY OVERFLOW WEIR (INVERT ELEVATION 20 FT).
11. ADDITIONAL BERMS AND EXTERIOR DIVERSIONS SHALL BE CONSTRUCTED, AS NEEDED, BY THE CONTRACTOR TO ADEQUATELY MANAGE STORMWATER RUNOFF.
12. IN-PLACE VOLUME OF CCR TO BE EXCAVATED FROM THE CCR POND IS ESTIMATED TO REDUCE/SHRINK BY APPROXIMATELY 20 PERCENT UPON DEWATERING, PLACEMENT, AND COMPACTION WITHIN THE FINAL CONSOLIDATION FOOTPRINT. THIS REDUCTION IN VOLUME IS BASED ON IN-SITU DENSITY AND MOISTURE CONTENT DATA OBTAINED FROM UNDISTURBED SHELBY TUBE SAMPLES OF CCR AND STANDARD PROCTOR TESTS PERFORMED ON CCR SAMPLES FROM THE SITE. ACTUAL VOLUME REDUCTION FACTORS OBSERVED IN THE FIELD MAY BE RE-EVALUATED DURING THE INITIAL PHASES OF CONSTRUCTION, AND DESIGN ADJUSTMENTS WILL BE MADE TO REMAINING CONSTRUCTION PHASES AS NEEDED TO ACHIEVE THE OPTIMUM MATERIAL BALANCE AND FINAL GRADING AT CLOSURE.
13. IN ADDITION TO SHRINKAGE FROM EXCAVATED CCR, VOLUME BALANCE ADJUSTMENTS DUE TO SETTLEMENT HAVE BEEN ACCOUNTED FOR BASED ON CURRENT UNDERSTANDING OF THE SUBSURFACE STRATIGRAPHY AND LIMITED MATERIAL CHARACTERISTIC DATA.
14. FINISHED GRADE CONTOURS SHOWN HEREIN REPRESENT FINAL GRADES PRIOR TO THE PLACEMENT OF CHANNEL LINING MATERIALS (E.G., RIPRAP OR GRAVEL), UNLESS OTHERWISE NOTED.
15. EXISTING MONITORING WELLS AND PIEZOMETERS SHALL BE PROTECTED AND PRESERVED TO THE EXTENT POSSIBLE DURING CONSTRUCTION. EXCAVATION AROUND EXISTING MONITORING WELLS AND PIEZOMETERS SHALL BE PERFORMED CAREFULLY TO PREVENT DAMAGE. IF MONITORING WELLS OR PIEZOMETERS ARE DAMAGED BY THE CONTRACTOR DURING CONSTRUCTION, CONTRACTOR SHALL BE RESPONSIBLE FOR COST OF REPAIR OR REPLACEMENT.
16. THREE 18-INCH DIAMETER NPDES FORCEMAIN PIPES ARE BURIED BELOW GROUND SURFACE ALONG THE EXISTING WESTERN PERIMETER DIKE. THE LOCATION OF FORCEMAIN PIPES IS BASED UPON AS-BUILT SURVEY RECEIVED FROM SCS AND BLACK AND VEATCH ON OCTOBER 19, 2018. IF FORCEMAIN PIPES ARE DAMAGED BY THE CONTRACTOR DURING CONSTRUCTION, CONTRACTOR SHALL BE RESPONSIBLE FOR COST OF REPAIR OR REPLACEMENT.
17. DETAILS ARE SHOWN TO SCALE AS NOTED EXCEPT FOR GEOSYNTHETICS WHICH ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY. MATERIAL TOLERANCES SHALL BE WITHIN TOLERANCES GIVEN IN THE TECHNICAL SPECIFICATIONS.
18. THIS DRAWING SET WAS PREPARED ASSUMING DRY EXCAVATION METHODS AND PRELOADING OF CERTAIN EXCAVATIONS AREAS AS SHOWN ON DRAWING 045.
19. EXISTING CONDITIONS SHOWN MAY NOT REFLECT CURRENT CONDITIONS AT THE SITE AT THE TIME OF CONSTRUCTION. THE CONTRACTOR SHALL VERIFY EXISTING CONDITIONS INCLUDING SUBSURFACE UTILITIES PRIOR TO CONSTRUCTION.
20. LIMITS OF ASBESTOS LANDFILL WERE PROVIDED BY APC ON MAY 18, 2018. CONSTRUCTION ACTIVITIES SHALL NOT ENCROACH WITHIN 50 FT OF THE ASBESTOS LANDFILL BOUNDARY.

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
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A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

LEGENDS, ABBREVIATIONS, AND REFERENCE NOTES

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

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PROJ. NO.	GW6489	DWG. GW6489.04C002	SHEET 1
SCALE	AS SHOWN	DRAWING 002 OF 097	
DATE	DECEMBER 2018		

ANSI E: 44x34

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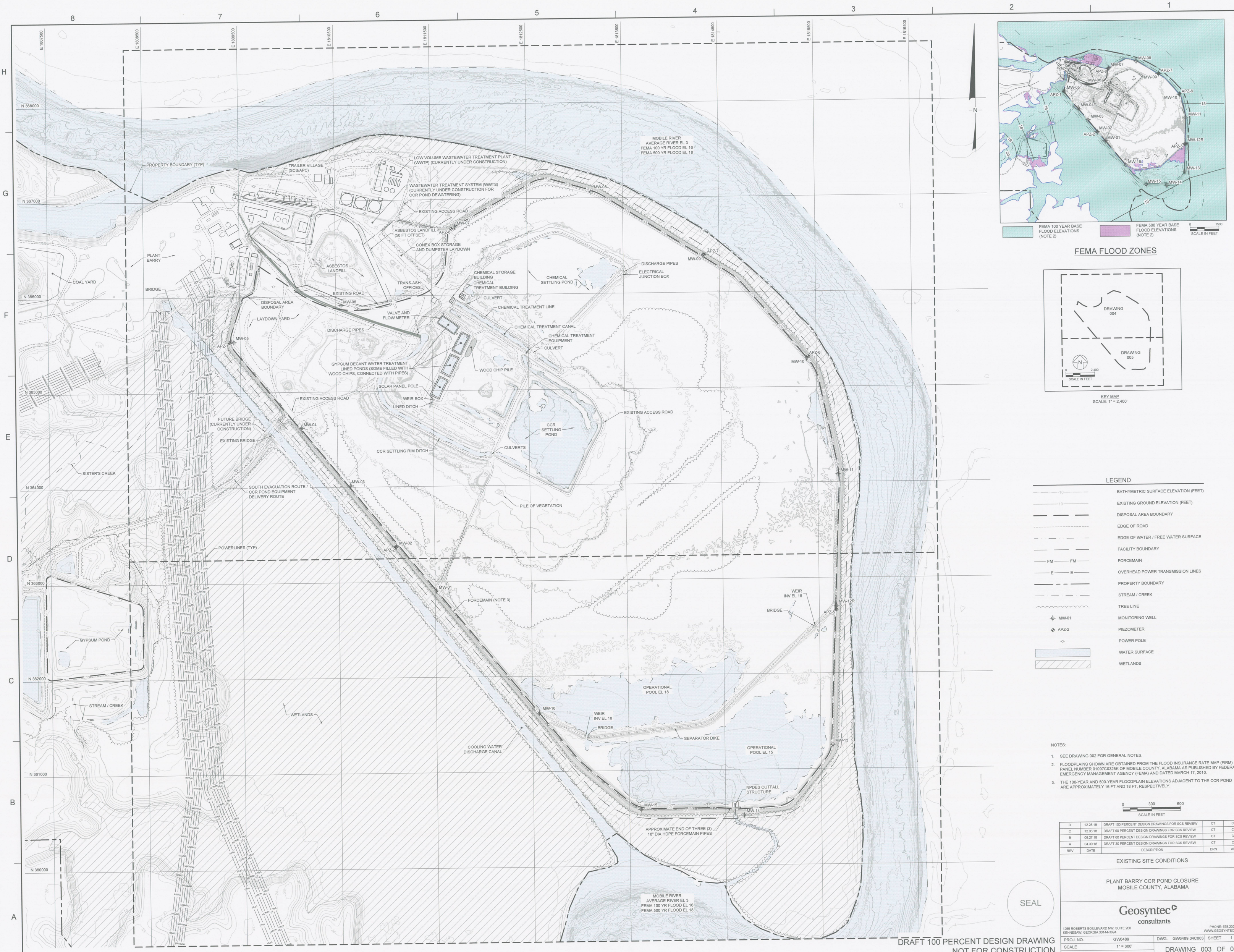

FEMA FLOOD ZONES

KEY MAP
SCALE: 1" = 2,400'

LEGEND

- BATHYMETRIC SURFACE ELEVATION (FEET)
- EXISTING GROUND ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- FORCEMAIN
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- STREAM / CREEK
- TREE LINE
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- WATER SURFACE
- WETLANDS

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. FLOODPLAINS SHOWN ARE OBTAINED FROM THE FLOOD INSURANCE RATE MAP (FIRM) PANEL NUMBER 01097C0325K OF MOBILE COUNTY, ALABAMA AS PUBLISHED BY FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) AND DATED MARCH 17, 2010.
3. THE 100-YEAR AND 500-YEAR FLOODPLAIN ELEVATIONS ADJACENT TO THE CCR POND ARE APPROXIMATELY 16 FT AND 18 FT, RESPECTIVELY.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
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EXISTING SITE CONDITIONS

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

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PROJ. NO.	GW6489	DWG. GW6489.04C003	SHEET 1
SCALE	1" = 300'	DRAWING 003 OF 097	
DATE	DECEMBER 2018		

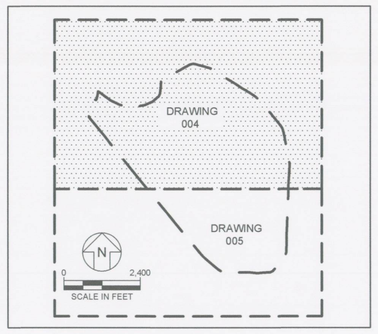
DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

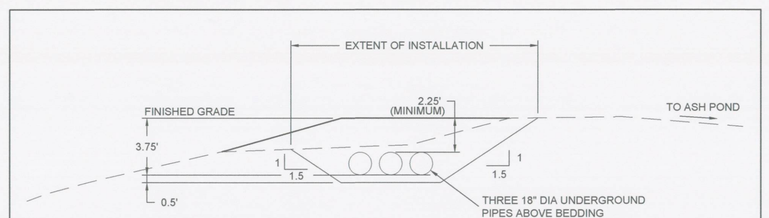
MATCHLINE DRAWING 005

LEGEND

10	BATHYMETRIC SURFACE ELEVATION (FEET)		PROPERTY BOUNDARY
20	EXISTING GROUND ELEVATION (FEET)		STREAM / CREEK
	DISPOSAL AREA BOUNDARY		TREE LINE
	EDGE OF ROAD	MW-02	MONITORING WELL
	EDGE OF WATER / FREE WATER SURFACE	APZ-2	PIEZOMETER
	FACILITY BOUNDARY		POWER POLE
FM FM	FORCEMAIN		WATER SURFACE
E E	OVERHEAD POWER TRANSMISSION LINES		WETLANDS



KEY MAP
SCALE: 1" = 2,400'



ALONG DIKE LOOKING NORTH (FROM BRIDGE NORTHWARD)

1 / 004 SECTION
APPROXIMATE AS-BUILT CROSS SECTION OF DISCHARGE PIPES
SCALE: NTS

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. FLOODPLAINS SHOWN ARE OBTAINED FROM THE FLOOD INSURANCE RATE MAP (FIRM) PANEL NUMBER 01097C0325K OF MOBILE COUNTY, ALABAMA AS PUBLISHED BY FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) AND DATED MARCH 17, 2010.
3. THE 100-YEAR AND 500-YEAR FLOODPLAIN ELEVATIONS ADJACENT TO THE CCR POND ARE APPROXIMATELY 16 FT AND 18 FT, RESPECTIVELY.

0 200 400
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

EXISTING SITE CONDITIONS - NORTHERN HALF

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C004	SHEET 1
SCALE	AS SHOWN	DRAWING 004 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

L:\CAD\MA\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C004

ANSI E: 44x34

MATCHLINE DRAWING 004

MATCHLINE DRAWING 006

E 1808500 E 1809500 E 1810500 E 1811500 E 1812500 E 1813500 E 1814500 E 1815500 E 1816500

N 363000 N 362000 N 361000 N 360000

MW-01 MW-16 MW-15 MW-14 MW-13 MW-12R APZ-2

FORCEMAIN (NOTE 1)

WETLANDS

COOLING WATER DISCHARGE CANAL

DISPOSAL AREA BOUNDARY

CURRENT OPERATIONAL POOL EL 18

CURRENT OPERATIONAL POOL EL 15

WEIR INV EL 18

BRIDGE

SEPARATOR DIKE

FACILITY BOUNDARY

APPROXIMATE END OF THREE (3) 18" DIA HDPE FORCEMAIN PIPES

NPDES OUTFALL STRUCTURE

OVERHEAD POWER TRANSMISSIONS LINES (TYP)

PROPERTY BOUNDARY (TYP)

MOBILE RIVER
AVERAGE RIVER EL 3
FEMA 100 YR FLOOD EL 16
FEMA 500 YR FLOOD EL 18

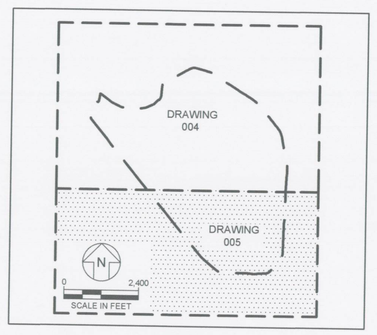
N

2/005

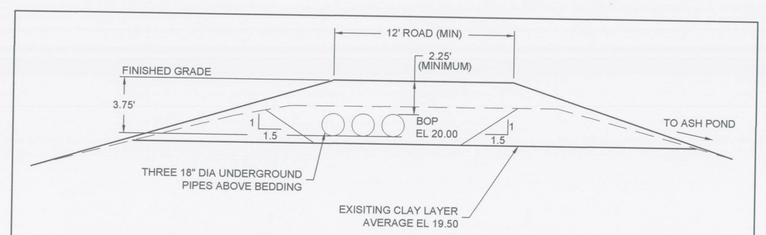
3/005

LEGEND

- BATHYMETRIC SURFACE ELEVATION (FEET)
- EXISTING GROUND ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- FORCEMAIN
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- STREAM / CREEK
- TREE LINE
- MONITORING WELL
- PIEZOMETER
- WATER SURFACE
- WETLANDS

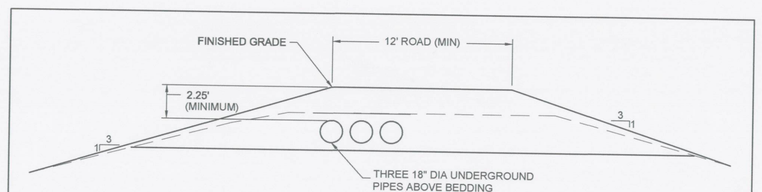


KEY MAP
SCALE: 1" = 2,400'



LOOKING NORTH (APPROXIMATELY FROM SEPARATOR DIKE NORTH TO BRIDGE)

2/005 SECTION
APPROXIMATE AS-BUILT CROSS SECTION OF DISCHARGE PIPES
SCALE: NTS



LOOKING NORTH (SOUTH OF SEPARATOR DIKE)

3/005 SECTION
APPROXIMATE AS-BUILT CROSS SECTION OF DISCHARGE PIPES
SCALE: NTS

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. FLOODPLAINS SHOWN ARE OBTAINED FROM THE FLOOD INSURANCE RATE MAP (FIRM) PANEL NUMBER 01097C0325K OF MOBILE COUNTY, ALABAMA AS PUBLISHED BY FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) AND DATED MARCH 17, 2010.
3. THE 100-YEAR AND 500-YEAR FLOODPLAIN ELEVATIONS ADJACENT TO THE CCR POND ARE APPROXIMATELY 16 FT AND 18 FT, RESPECTIVELY.

0 200 400
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

EXISTING SITE CONDITIONS - SOUTHERN HALF

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

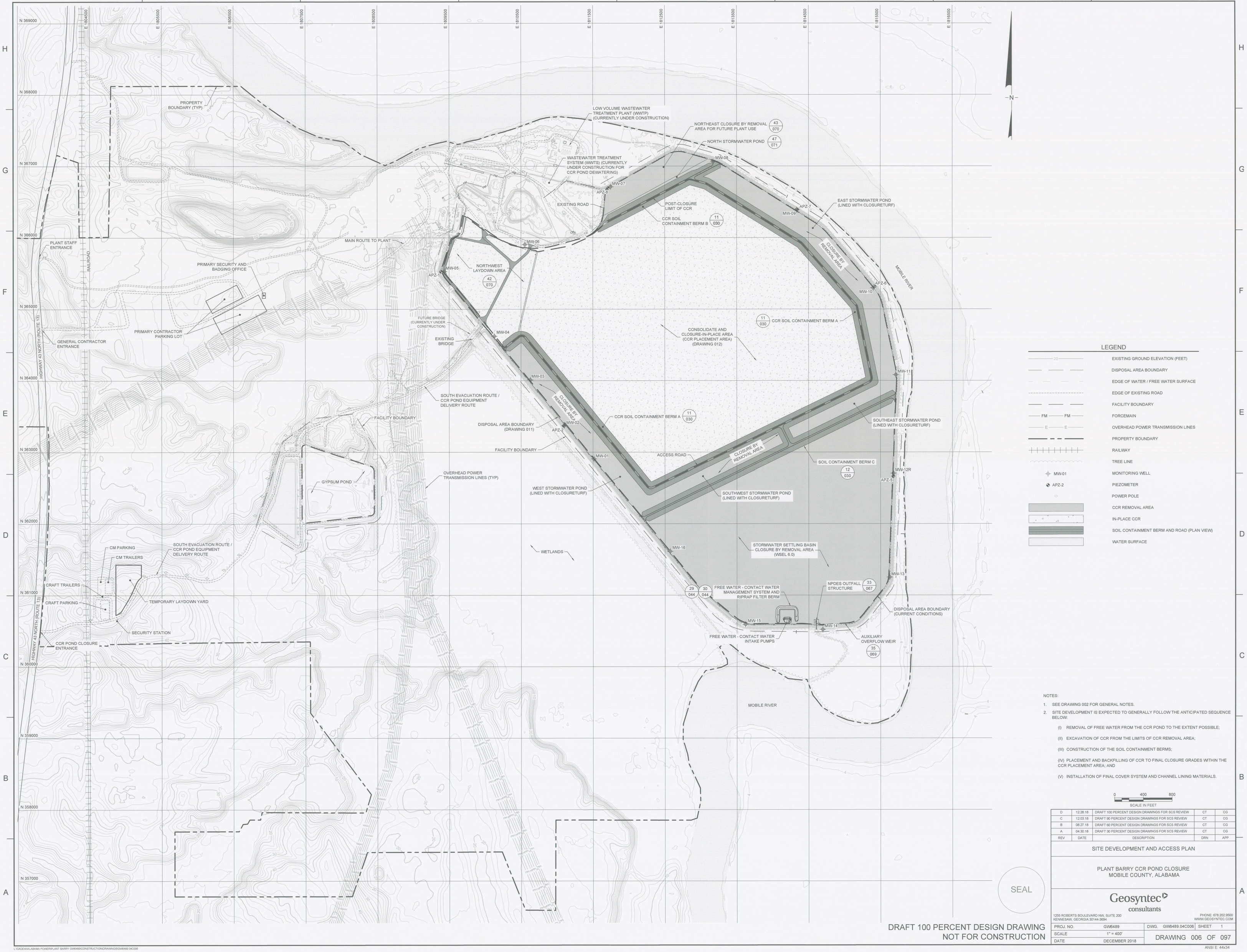
DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C004
SCALE	AS SHOWN	SHEET	2
DATE	DECEMBER 2018	DRAWING 005 OF 097	

ANSI E 44x34

L:\ACAD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C004



NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. SITE DEVELOPMENT IS EXPECTED TO GENERALLY FOLLOW THE ANTICIPATED SEQUENCE BELOW:
   - (I) REMOVAL OF FREE WATER FROM THE CCR POND TO THE EXTENT POSSIBLE;
   - (II) EXCAVATION OF CCR FROM THE LIMITS OF CCR REMOVAL AREA;
   - (III) CONSTRUCTION OF THE SOIL CONTAINMENT BERMS;
   - (IV) PLACEMENT AND BACKFILLING OF CCR TO FINAL CLOSURE GRADES WITHIN THE CCR PLACEMENT AREA; AND
   - (V) INSTALLATION OF FINAL COVER SYSTEM AND CHANNEL LINING MATERIALS.

0 400 800
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

SITE DEVELOPMENT AND ACCESS PLAN

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C006	SHEET 1
SCALE	1" = 400'	DRAWING 006 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C006

E 1809500
E 1810500
E 1811500
E 1812500
E 1813500
N 367000
N 366000
N 365000
N 364000
N 363000
MW-08
MW-07
APZ-8
MW-09
DISPOSAL AREA BOUNDARY
FACILITY BOUNDARY
ASBESTOS LANDFILL
ASBESTOS LANDFILL BOUNDARY
NO CONSTRUCTION ACTIVITIES PERMITTED WITHIN 50 FEET OF ASBESTOS LANDFILL BOUNDARY
EXISTING ROAD TO REMAIN OPERABLE, DO NOT EXCAVATE
CHEMICAL STORAGE FACILITIES
CHEMICAL TREATMENT BUILDING
DISCHARGE PIPES
ELECTRICAL JUNCTION BOX
BRIDGE
CHEMICAL TREATMENT LINE
GUARD RAIL
TRANS ASH OFFICES
MW-06
FIRE SUPPRESSION SYSTEM AND ASSOCIATED INFRASTRUCTURE (NOTE 4)
DISCHARGE PIPES (x9)
APZ-1
MW-05
WOOD CHIP PILE
BRIDGE
GYPSUM DECANT WATER TREATMENT LINED PONDS (SOME FILLED WITH WOOD CHIPS, CONNECTED WITH PIPES)
CHEMICAL TREATMENT EQUIPMENT
EXISTING BURIED PIPES (NOTE 4)
MW-04
CCR SETTLING POND
CULVERTS
MW-03
APZ-2
MW-02
MW-01
N

LEGEND

- ASBESTOS LANDFILL BOUNDARY
- DISPOSAL AREA BOUNDARY
- FACILITY BOUNDARY
- TO BE DEMOLISHED
- MW-01 MONITORING WELL
- APZ-2 PIEZOMETER

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. CONTRACTOR IS RESPONSIBLE FOR ALL CLEARING, GRUBBING, GRADING, MATERIAL REMOVAL, DEMOLITION, AND OTHER WORK NECESSARY TO PREPARE THE SITE FOR CLOSURE ACTIVITIES.
3. CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL ITEMS INDICATED ON THIS DRAWING, BUT ALSO OTHER FEATURES THAT MAY BE PRESENT AND NOT EXPLICITLY SHOWN OR LABELED.
4. FIRE HYDRANTS, WATER CANNONS, AND NPDES PIPES EXIST IN THE CURRENT NORTHWEST LAYDOWN AREA AND SHOULD BE REMOVED. FURTHER INFORMATION AND DIRECTION WILL BE PROVIDED BY APC/SCS.
5. AERIAL IMAGERY PROVIDED BY SCS ON JANUARY 2018.
6. ASBESTOS LANDFILL SHALL NOT BE DISTURBED. CONSTRUCTION ACTIVITIES SHALL NOT ENCROACH WITHIN 50 FT OF THE ASBESTOS LANDFILL BOUNDARY.

0 150 300
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

DEMOLITION AND MATERIALS REMOVAL PLAN

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C007	SHEET 1
SCALE	1" = 150'	DRAWING 007 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

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NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. TOP OF UNDERLYING CLAY CONTOURS PRESENTED ON THIS DRAWING ARE APPROXIMATE AND DEVELOPED BASED ON REVIEW OF HISTORICAL BORINGS AND ADDITIONAL BORINGS AND CPTS COMPLETED AS PART OF THE PRE-DESIGN FIELD INVESTIGATION. SUBSURFACE LITHOLOGICAL CONTACTS BETWEEN BORINGS WERE INTERPOLATED.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

BOTTOM OF CCR - TOP OF UNDERLYING CLAY LAYER

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C008
SCALE	1" = 300'	SHEET	1
DATE	DECEMBER 2018	DRAWING	008 OF 097

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

SEAL

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

THICKNESS OF CCR - ISOPACH

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec consultants
1256 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678 202 8500
WWW.GEOSYNTEC.COM

PROJ. NO.	GM6489	DWG.	GM6489_04C009	SHEET	1
SCALE	1" = 300'	DRAWING 009 OF 097			
DATE	DECEMBER 2018				

SCALE IN FEET
0 300 600

NOTES:
1. SEE DRAWING 002 FOR GENERAL NOTES.
2. THICKNESS OF CCR ISOPACH SHOWN IS APPROXIMATE AND DERIVED FROM COMPARING THE EXISTING TOPOGRAPHIC SURFACE WITH THE TOP OF ORGANIC CLAY CONTOURS FOUND ON DRAWING 008. THICKNESS OF CCR BETWEEN BORINGS WAS INTERPOLATED AND BOUND BY THE APPROXIMATE INTERIOR GRADES OF THE EXISTING PERIMETER BERM

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- ISOPACH - THICKNESS OF CCR (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- CPT-01 CONE PENETRATION TEST (2016, SCS)
- PDCPT-01 CONE PENETRATION TEST (2016, GEO)
- MW-01 MONITORING WELL (2015, SCS)
- GSB-01 MUD ROTARY BORING (2017, GEO)
- PDS-01 MUD ROTARY BORING (2018, GEO)
- APZ-1 PIEZOMETER
- POWER POLE
- WATER SURFACE

N

E 1817500 E 1816500 E 1815500 E 1814500 E 1813500 E 1812500 E 1811500 E 1810500 E 1809500 E 1808500 E 1807500

N 368000 N 367000 N 366000 N 365000 N 364000 N 363000 N 362000 N 361000 N 360000 N 359000

FACILITY BOUNDARY
DISPOSAL AREA BOUNDARY
OVERHEAD POWER TRANSMISSION LINES (TYP)
GYPSUM POND
COOLING WATER DISCHARGE CANAL
ASBESTOS LANDFILL
MOBILE RIVER
PROPERTY BOUNDARY (TYP)

ANSI E 44X34

L:\ACAD\ALABAMA POWER\PLANT BARRY GWS\BRCONSTRUCTION\DRAWINGS\GM6489 04C009

L:\CDCDATA\ALABAMA POWER\NT_BARRY GW\MISC\CONSTRUCTION\DRAWINGS\GW6489-04C010

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

SEAL

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

THICKNESS OF UNDERLYING CLAY LAYER - ISOPACH

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678 202 2600
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489
SCALE	1" = 300'
DATE	DECEMBER 2018
DWG.	GW6489_04C010
SHEET	1

DRAWING 010 OF 097

ANSI E 44X34

SCALE IN FEET
0 300 600

NOTES:
1. SEE DRAWING 002 FOR GENERAL NOTES.
2. UNDERLYING CLAY ISOPACH SHOWN IS APPROXIMATE AND GENERATED BY COMPARING THE ESTIMATED TOP OF UNDERLYING CLAY SURFACE SHOWN ON DRAWING 008 AND THE ESTIMATED BOTTOM OF UNDERLYING CLAY SURFACE. BOTTOM OF UNDERLYING CLAY SURFACE IS APPROXIMATE AND DEVELOPED BASED ON INFORMATION GATHERED FROM SELECT HISTORICAL BORINGS AND ADDITIONAL BORINGS AND CPTS COMPLETED AS PART OF THE PRE-DESIGN FIELD INVESTIGATION. SUBSURFACE LITHOLOGICAL CONTACTS BETWEEN BORINGS WERE INTERPOLATED.

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- ISOPACH - THICKNESS OF UNDERLYING CLAY (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- CPT-01 CONE PENETRATION TEST (2016, SCS)
- PDCPT-01 CONE PENETRATION TEST (2018, GEO)
- MW-01 MONITORING WELL (2015, SCS)
- GSB-01 MUD ROTARY BORING (2017, GEO)
- PDS-01 MUD ROTARY BORING (2016, GEO)
- APZ-1 PIEZOMETER
- POWER POLE
- WATER SURFACE

N

FACILITY BOUNDARY
OVERHEAD POWER TRANSMISSION LINES (TYP)
GYPSUM POND
DISPOSAL AREA BOUNDARY
THINNEST OBSERVED CLAY BORING
COOLING WATER DISCHARGE CANAL
ASBESTOS LANDFILL
PROPERTY BOUNDARY (TYP)
MOBILE RIVER

N 365000
N 364000
N 363000
N 362000
N 361000
N 360000
N 359000
N 368000
N 367000

E 1817500
E 1816500
E 1815500
E 1814500
E 1813500
E 1812500
E 1811500
E 1810500
E 1809500
E 1808500
E 1807500

1 2 3 4 5 6 7 8

A B C D E F G H

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. EXCAVATION SLOPES WERE DESIGNED TO LEAVE A MINIMUM 20-FT WIDE CREST AT THE TOP OF THE PERIMETER DIKE. EXCAVATION GRADES SHOWN AGAINST THE INTERIOR SLOPE OF THE EXISTING PERIMETER DIKES ARE SHOWN ASSUMING A 3H:1V SLOPE FROM THE EXISTING GROUND SURFACE AND ARE APPROXIMATE. THE CONTRACTOR, QC REPRESENTATIVE, AND QA REPRESENTATIVE SHALL VERIFY BOTH HORIZONTAL AND VERTICAL LIMITS OF CCR IN THE FIELD.
3. EXCAVATION GRADING SHOWN REPRESENTS THE EXCAVATION SURFACE FOR CCR REMOVAL. EXCAVATION GRADES AT THE BASE OF EXCAVATION WERE DEVELOPED FROM ESTIMATED TOP OF UNDERLYING CLAY GRADES (DERIVED FROM FIELD BORINGS) AND AN ESTIMATED 3H:1V INTERIOR SLOPE OF THE EXISTING PERIMETER DIKE. A MINIMUM OF SIX INCHES OF ADDITIONAL UNDERLYING SOIL SHALL BE REMOVED TO ACHIEVE CLOSURE BY REMOVAL.
4. INTERIOR LIMITS OF CCR EXCAVATION SLOPES AND BENCHES SHOWN ARE APPROXIMATE AND WILL BE REVISED BASED ON FURTHER GEOTECHNICAL ANALYSIS PERFORMED AS PART OF A FUTURE SUBMITTAL.
5. LIMITS OF INTERIOR CCR EXCAVATION BENCHES ASSUME A MINIMUM WIDTH OF 25 FT, BUT MAY BE ADJUSTED TO MEET THE CONTRACTOR'S MEANS AND METHODS.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

CCR REMOVAL PLAN - OVERALL

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C011	SHEET 1
SCALE	1" = 300'	DRAWING 011 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

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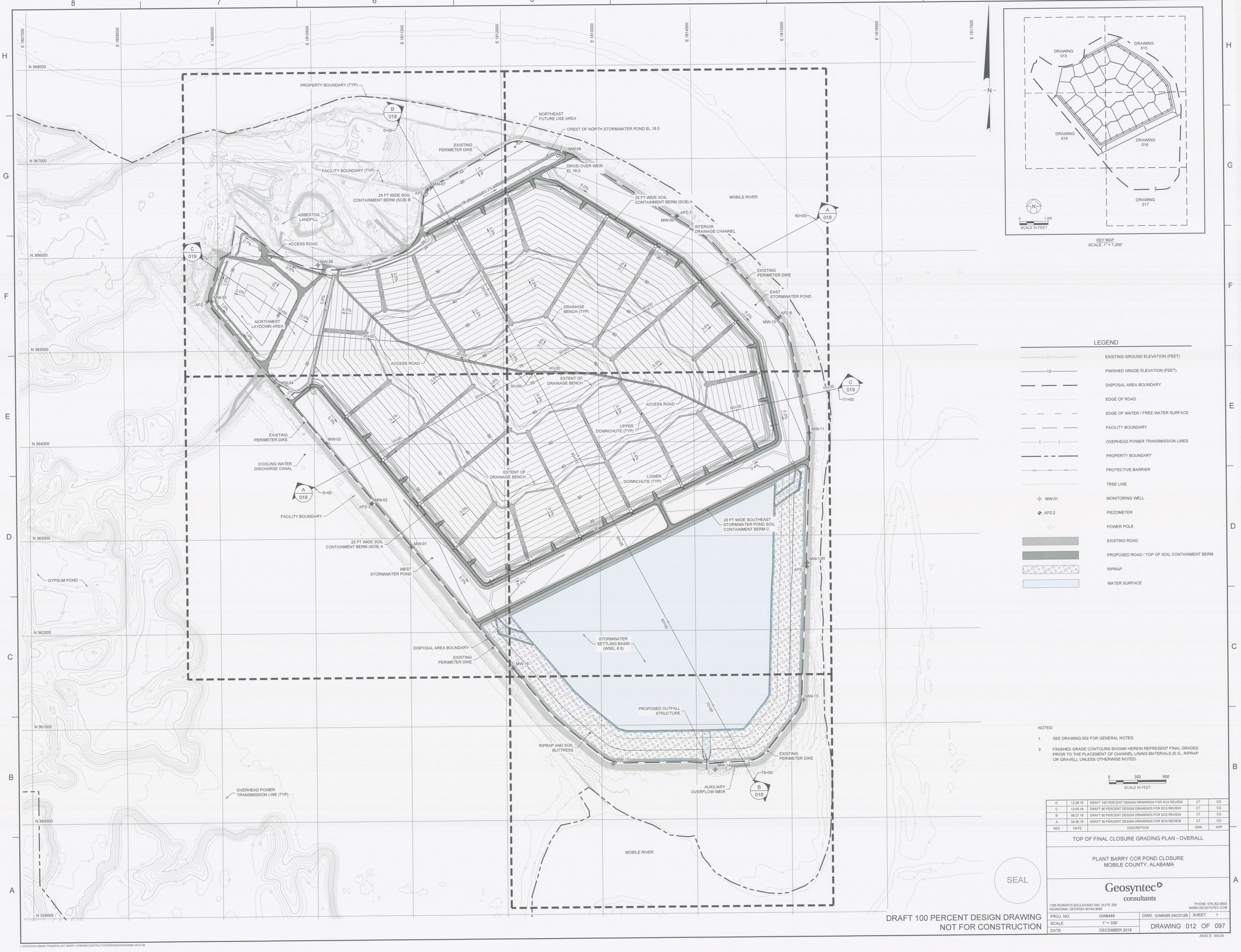


NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. FINISHED GRADE CONTOURS SHOWN HEREIN REPRESENT FINAL GRADES PRIOR TO THE PLACEMENT OF CHANNEL LINING MATERIALS (E.G., RIPRAP OR GRAVEL), UNLESS OTHERWISE NOTED.

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

TOP OF FINAL CLOSURE GRADING PLAN - OVERALL

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

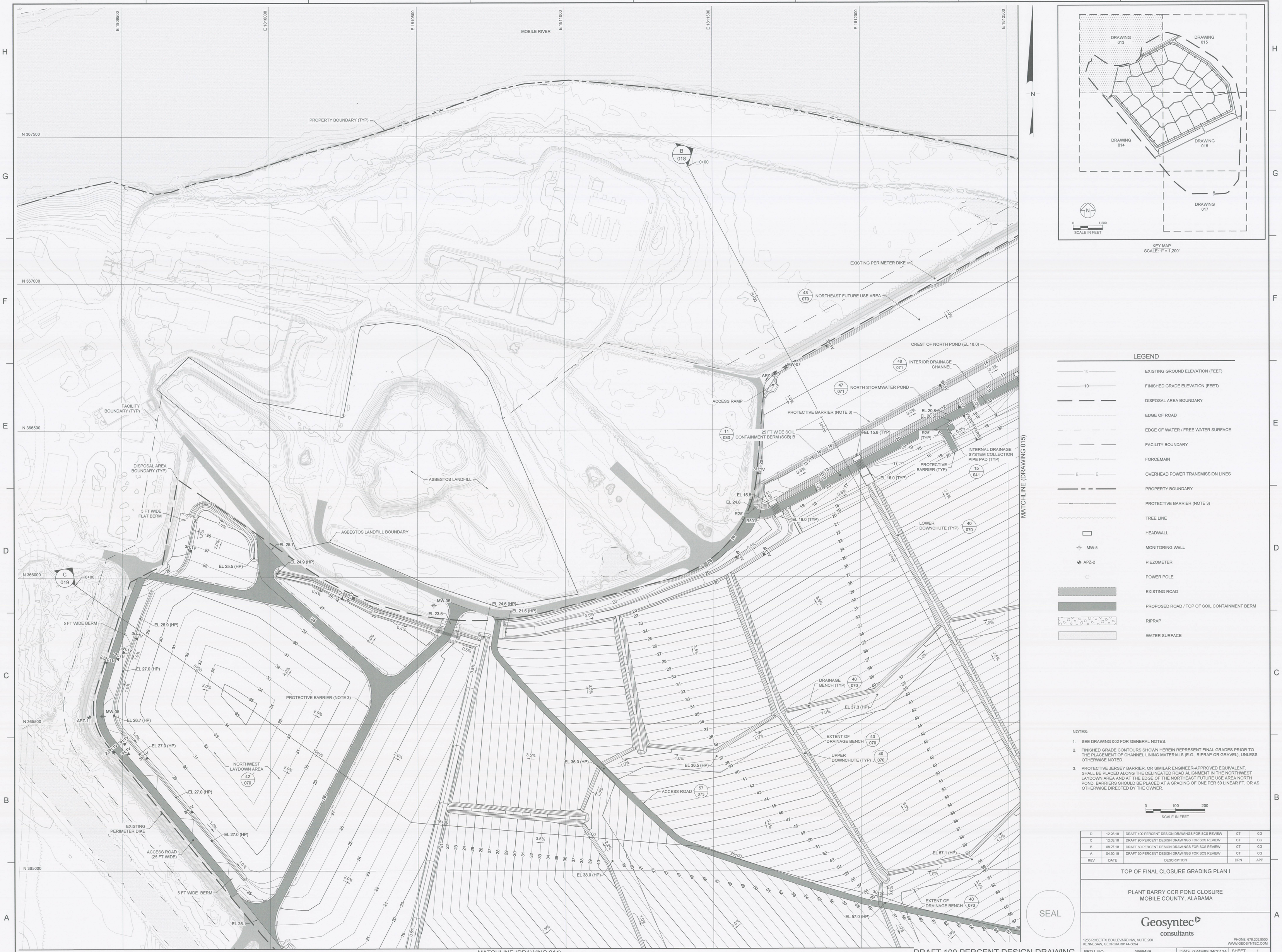
PROJ. NO.	GW6489
SCALE	1" = 300'
DATE	DECEMBER 2018
DWG.	GW6489.04C012B
SHEET	1

DRAWING 012 OF 097

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

L:\CAD\WAL\ABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C012B



NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. FINISHED GRADE CONTOURS SHOWN HEREIN REPRESENT FINAL GRADES PRIOR TO THE PLACEMENT OF CHANNEL LINING MATERIALS (E.G., RIPRAP OR GRAVEL), UNLESS OTHERWISE NOTED.
3. PROTECTIVE JERSEY BARRIER, OR SIMILAR ENGINEER-APPROVED EQUIVALENT, SHALL BE PLACED ALONG THE DELINEATED ROAD ALIGNMENT IN THE NORTHWEST LAYDOWN AREA AND AT THE EDGE OF THE NORTHEAST FUTURE USE AREA NORTH POND. BARRIERS SHOULD BE PLACED AT A SPACING OF ONE PER 50 LINEAR FT, OR AS OTHERWISE DIRECTED BY THE OWNER.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

TOP OF FINAL CLOSURE GRADING PLAN I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW5489	DWG. GW5489.04C012A	SHEET 1
SCALE	1" = 100'	DRAWING 013 OF 097	
DATE	DECEMBER 2018		

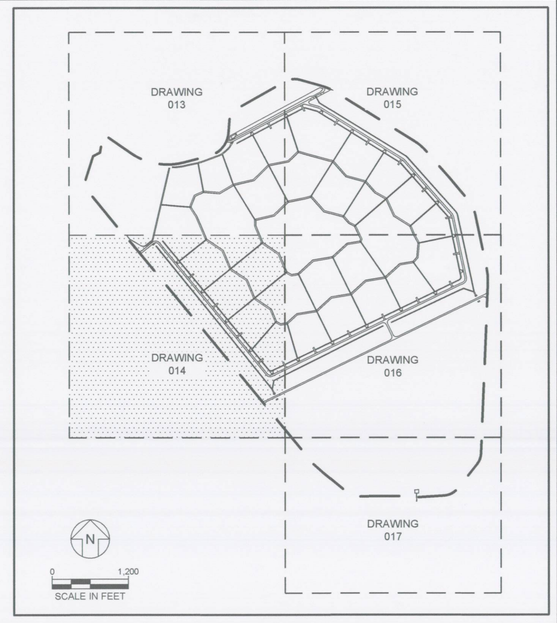
DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E 44x34

L:\CADD\ALABAMA POWER\PLANT BARRY GW5489\CONSTRUCTION\DRAWINGS\GW5489.04C012A

MATCHLINE (DRAWING 013)

MATCHLINE (DRAWING 016)



KEY MAP
SCALE: 1" = 1,200'

E 1809500 E 1810000 E 1810500 E 1811000 E 1811500 E 1812000 E 1812500

N 364500 N 364000 N 363500 N 363000 N 362500 N 362000

MW-04 MW-03 MW-02 MW-01 APZ-2

EL 20.9 EL 24.0 EL 20.7 EL 16.0 (TYP) EL 15.8 (TYP) EL 37.1 (HP) EL 57.1 (HP) EL 36.1 (HP) EL 20.5 EL 20.7 EL 6.6 EL 6.5 EL 6.1 EL 23.0

EXTENT OF DRAINAGE BENCH (40/070)

DRAINAGE BENCH (TYP) (40/070)

UPPER DOWNCHUTE (TYP) (40/070)

LOWER DOWNCHUTE (TYP) (40/070)

INTERNAL DRAINAGE SYSTEM COLLECTION PIPE PAD (TYP) (15/041)

PROTECTIVE BARRIER (TYP)

R25' (TYP)

WEST STORMWATER POND PILOT CHANNEL

PROPOSED PERIMETER ACCESS ROAD

WEST STORMWATER POND

25 FT WIDE SOIL CONTAINMENT BERM (SCB) A (11/030)

INTERIOR DRAINAGE CHANNEL (48/071)

COOLING WATER DISCHARGE CANAL

DISPOSAL AREA BOUNDARY (TYP)

FACILITY BOUNDARY (TYP)

EXISTING PERIMETER DIKE

20 FT WIDE SOIL CONTAINMENT BERM (SCB) C (12/030)

R50' (TYP)

RIPRAP AND SOIL BUTTRESS (1/019)

STORMWATER SETTLING BASIN (WSEL 6.0)

A/018 0+00 5+00 10+00 15+00 20+00

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- FORCEMAIN
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- PROTECTIVE BARRIER (NOTE 3)
- TREE LINE
- HEADWALL
- MW-5 MONITORING WELL
- APZ-2 PIEZOMETER
- POWER POLE
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. FINISHED GRADE CONTOURS SHOWN HEREIN REPRESENT FINAL GRADES PRIOR TO THE PLACEMENT OF CHANNEL LINING MATERIALS (E.G., RIPRAP OR GRAVEL), UNLESS OTHERWISE NOTED.
3. PROTECTIVE JERSEY BARRIER, OR SIMILAR ENGINEER-APPROVED EQUIVALENT, SHALL BE PLACED ALONG THE DELINEATED ROAD ALIGNMENT IN THE NORTHWEST LAYDOWN AREA AND AT THE EDGE OF THE NORTHEAST FUTURE USE AREA NORTH POND. BARRIERS SHOULD BE PLACED AT A SPACING OF ONE PER 50 LINEAR FT, OR AS OTHERWISE DIRECTED BY THE OWNER.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

TOP OF FINAL CLOSURE GRADING PLAN II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C012A	SHEET 2
SCALE	1" = 100'	DRAWING 014 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

MOBILE RIVER

E 1813000 E 1813500 E 1814000 E 1814500 E 1815000 E 1815500

N 367500 N 367000 N 366500 N 366000 N 365500 N 365000

MATCHLINE (DRAWING 013)

MATCHLINE (DRAWING 016)

ACCESS RAMP

NORTHEAST FUTURE USE AREA (43/070)

NORTH POND OUTFALL (88/081)

NORTH STORMWATER POND (47/071)

MW-08

EL 22.8

PROPERTY BOUNDARY (TYP)

R50' (TYP)

EL 21.5

EL 16.5

PROTECTIVE BARRIER (NOTE 3)

EL 15.8

EL 20.8

DRIVE-OVER WEIR

EL 16.0

EL 16.5

EL 15.8 (TYP)

EL 16.0 (TYP)

25 FT WIDE SOIL CONTAINMENT BERM (SCB) B (11/030)

EL 16.1

R25' (TYP)

EXISTING PERIMETER DIKE

25 FT WIDE SOIL CONTAINMENT BERM (SCB) A (11/030)

APZ-7

MW-09

INTERIOR DRAINAGE CHANNEL (48/071)

FACILITY BOUNDARY (TYP)

DISPOSAL AREA BOUNDARY (TYP)

PROTECTIVE BARRIER (TYP)

EL 38.4 (HP)

EL 37.2 (HP)

LOWER DOWNCHUTE (TYP) (40/070)

EL 37.1 (HP)

EAST STORMWATER POND (LINED WITH CLOSURE TURF)

PROPOSED PERIMETER ACCESS ROAD

EL 36.3 (HP)

EAST STORMWATER POND PILOT CHANNEL

APZ-6

MW-10

EL 56.8 (HP)

DRAINAGE BENCH (TYP) (40/070)

UPPER DOWNCHUTE (TYP) (40/070)

EL 57.1 (HP)

EL 37.0 (HP)

EL 20.5 (TYP)

EL 20.7 (TYP)

INTERNAL DRAINAGE SYSTEM COLLECTION PIPE PAD (TYP) (15/041)

EXTENT OF DRAINAGE BENCH (40/070)

EL 55.4 (HP)

EL 73.6

EXTENT OF DRAINAGE BENCH (40/070)

EL 35.6 (HP)

60+00 (A/018)

55+00

50+00

45+00

40+00

35+00

30+00

25+00

DRAWING 013

DRAWING 015

DRAWING 014

DRAWING 016

DRAWING 017

0 1,200
SCALE IN FEET

KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- FORCEMAIN
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- PROTECTIVE BARRIER (NOTE 3)
- TREE LINE
- HEADWALL
- MW-5 MONITORING WELL
- APZ-2 PIEZOMETER
- POWER POLE
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. FINISHED GRADE CONTOURS SHOWN HEREIN REPRESENT FINAL GRADES PRIOR TO THE PLACEMENT OF CHANNEL LINING MATERIALS (E.G., RIPRAP OR GRAVEL), UNLESS OTHERWISE NOTED.
3. PROTECTIVE JERSEY BARRIER, OR SIMILAR ENGINEER-APPROVED EQUIVALENT, SHALL BE PLACED ALONG THE DELINEATED ROAD ALIGNMENT IN THE NORTHWEST LAYDOWN AREA AND AT THE EDGE OF THE NORTHEAST FUTURE USE AREA NORTH POND. BARRIERS SHOULD BE PLACED AT A SPACING OF ONE PER 50 LINEAR FT, OR AS OTHERWISE DIRECTED BY THE OWNER.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

TOP OF FINAL CLOSURE GRADING PLAN III

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
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PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C012A	SHEET 3
SCALE	1" = 100'	DRAWING 015 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E 44x34

L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C012A

MATCHLINE (DRAWING 015)

MATCHLINE (DRAWING 013)

MATCHLINE (DRAWING 017)

EXTENT OF DRAINAGE BENCH (40/070)

DRAINAGE BENCH (TYP) (40/070)

UPPER DOWNCHUTE (TYP) (40/070)

LOWER DOWNCHUTE (TYP) (40/070)

ACCESS ROAD (57/073)

INTERNAL DRAINAGE SYSTEM COLLECTION PIPE PAD (TYP) (15/041)

INTERIOR DRAINAGE CHANNEL (48/071)

25 FT WIDE SOIL CONTAINMENT BERM (SCB) A (11/030)

20-FT WIDE SOIL CONTAINMENT BERM (SCB) C (12/030)

PROTECTIVE BARRIER (TYP)

R25' (TYP)

R50' (TYP)

PROPOSED PERIMETER ACCESS ROAD

EAST STORMWATER POND PILOT CHANNEL

SOUTHEAST STORMWATER POND

SOUTHEAST STORMWATER POND PILOT CHANNEL

SOUTHWEST STORMWATER POND

SOUTHWEST STORMWATER POND PILOT CHANNEL

STORMWATER SETTLING BASIN (WSEL 6.1)

RIPRAP BUTTRESS (HEIGHT = 5 FT)

RIPRAP AND SOIL BUTTRESS (1/019)

EXISTING PERIMETER DIKE

MOBILE RIVER

MW-11

MW-12R

MW-16

APZ-5

EL 56.4 (HP)

EL 57.1 (HP)

EL 55.2 (HP)

EL 37.1 (HP)

EL 36.4 (HP)

EL 7.0

EL 6.6

EL 6.1

EL 21.5

EL 20.7

EL 20.5 (TYP)

EL 20.8

EL 16.0 (TYP)

EL 12.0 (HP)

EL 15.3 (HP)

EL 15.8 (TYP)

EL 20.5

N 364500

N 364000

N 363500

N 363000

N 362500

N 362000

E 1813000

E 1813500

E 1814000

E 1814500

E 1815000

E 1815500

C 019

B 018

KEY MAP
SCALE: 1" = 1,200'

DRAWING 013

DRAWING 014

DRAWING 015

DRAWING 016

DRAWING 017

SCALE IN FEET

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- FORCEMAIN
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- PROTECTIVE BARRIER (NOTE 3)
- TREE LINE
- HEADWALL
- MW-5 MONITORING WELL
- APZ-2 PIEZOMETER
- POWER POLE
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. FINISHED GRADE CONTOURS SHOWN HEREIN REPRESENT FINAL GRADES PRIOR TO THE PLACEMENT OF CHANNEL LINING MATERIALS (E.G., RIPRAP OR GRAVEL), UNLESS OTHERWISE NOTED.
3. PROTECTIVE JERSEY BARRIER, OR SIMILAR ENGINEER-APPROVED EQUIVALENT, SHALL BE PLACED ALONG THE DELINEATED ROAD ALIGNMENT IN THE NORTHWEST LAYDOWN AREA AND AT THE EDGE OF THE NORTHEAST FUTURE USE AREA NORTH POND. BARRIERS SHOULD BE PLACED AT A SPACING OF ONE PER 50 LINEAR FT, OR AS OTHERWISE DIRECTED BY THE OWNER.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

TOP OF FINAL CLOSURE GRADING PLAN IV

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
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KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C012A	SHEET 4
SCALE	1" = 100'	DRAWING 016 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

L:\CAD\MIA\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C012A

ANSI E: 44x34

L:\GCOM\ALABAMA POWER\PLANT BARRY CMM\BASICONSTRUCTION\DRAWINGS\DMI69.04C012A

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

SEAL

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	06.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

TOP OF FINAL CLOSURE GRADING PLAN V

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
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PHONE: 678 202 8500
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PROJ. NO.	GW6489
DWG.	GW6489 04C012A
SHEET	5
SCALE	1" = 100'
DATE	DECEMBER 2018
DRAWING	017 OF 097

ANSI E 44X34

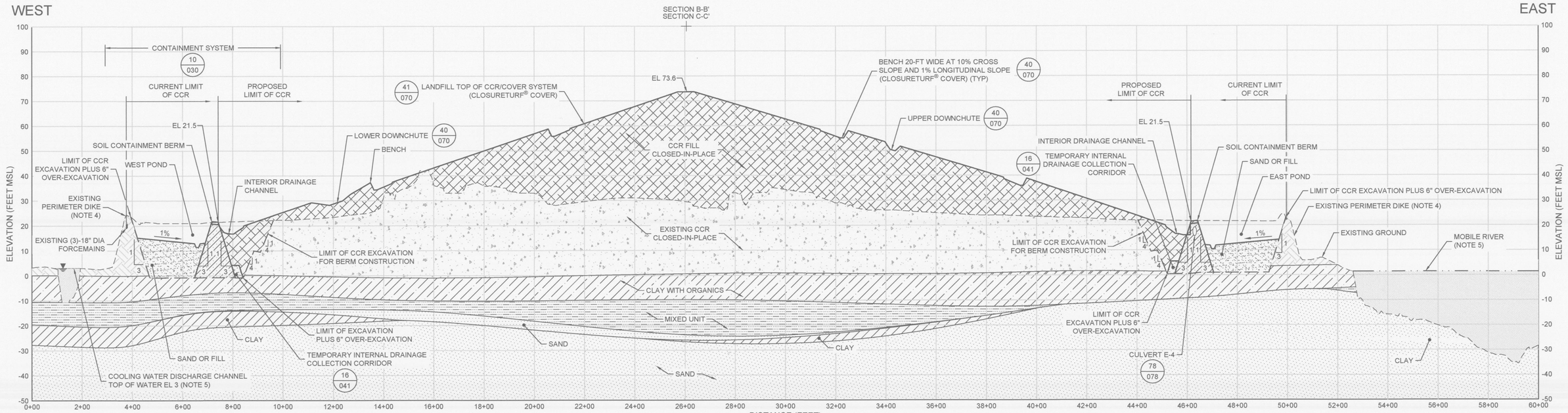
NOTES:
1. SEE DRAWING 002 FOR GENERAL NOTES.
2. FINISHED GRADE CONTOURS SHOWN HEREIN REPRESENT FINAL GRADES PRIOR TO THE PLACEMENT OF CHANNEL LINING MATERIALS (E.G., RIPRAP OR GRAVEL), UNLESS OTHERWISE NOTED.

SCALE IN FEET
0 100 200

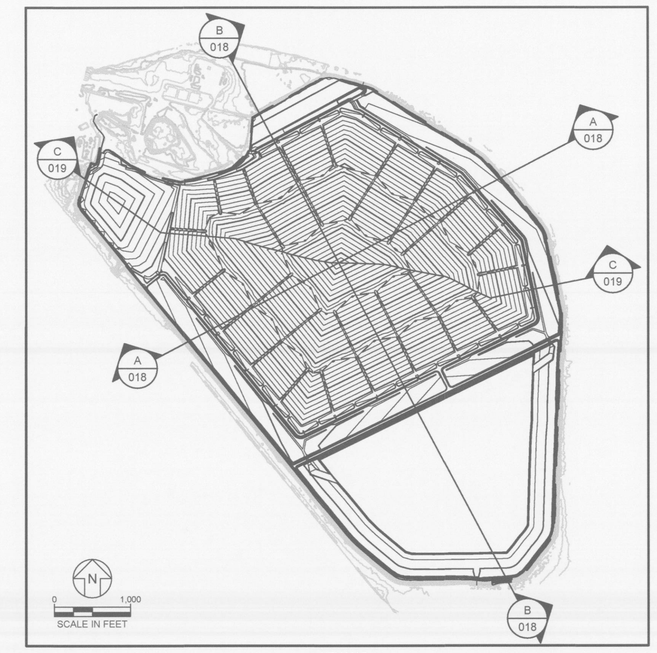
LEGEND
- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- FORCEMAIN
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- HEADWALL
- MW-5 MONITORING WELL
- AP2-2 PIEZOMETER
- POWER POLE
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE

KEY MAP
SCALE: 1" = 1,200'
SCALE IN FEET
0 1,200
N
DRAWING 017
DRAWING 013
DRAWING 014
DRAWING 016

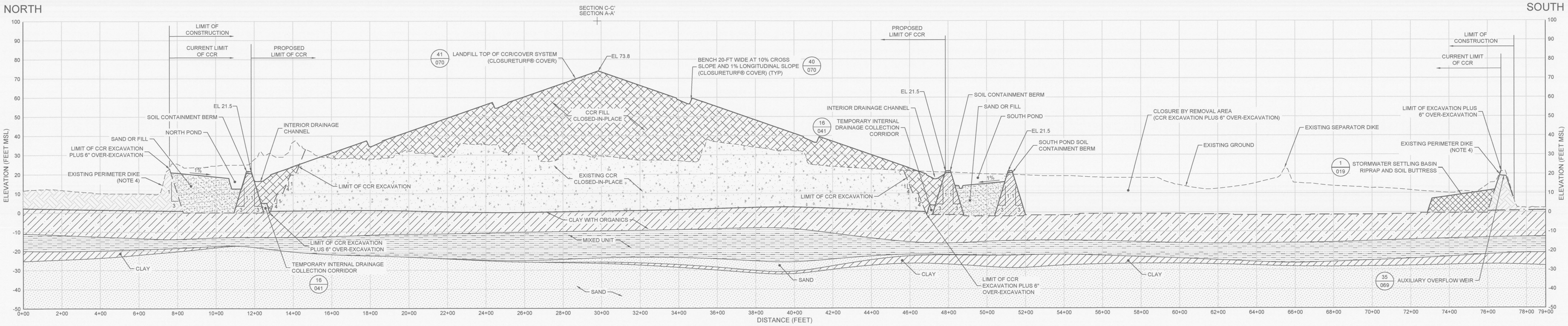
MOBILE RIVER
PROPERTY BOUNDARY (TYP)
N 359500
N 360000
N 360500
N 361000
E 1815000
E 1814500
E 1814000
E 1813500
E 1813000
MATCHLINE (DRAWING 016)
MOBILE RIVER
MW-13
MW-14
MW-15
MW-16
FACILITY BOUNDARY (TYP)
DISPOSAL AREA BOUNDARY (TYP)
AUXILIARY OVERFLOW WEIR
35 068
PROPOSED OUTFALL STRUCTURE
33 067
34 068
EXISTING 110 LF OF 54" DIA CMP, LINED TO 51" ID
UPSTREAM INV EL 5.56
DOWNSTREAM INV EL 5.11
(TO REMAIN)
79+00
B 018
EXISTING PERIMETER DIKE
COOLING WATER DISCHARGE CANAL
STORMWATER SETTLING BASIN (MSEL 6.1)
RIPRAP AND SOIL BUTTRESS 1 019
70+00
3H:1V
4H:1V
2H:1V
1H:1V
-N-



A/012 SECTION
SITE SECTION (STA 0+00 TO 60+00)
SCALE: 1" = 200' (HORIZONTAL); 1" = 20' (VERTICAL)



KEY MAP
SCALE: 1" = 1,000'



B/012 SECTION
SITE SECTION (STA 0+00 TO 79+00)
SCALE: 1" = 200' (HORIZONTAL); 1" = 20' (VERTICAL)

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. GEOLOGIC SURFACES SHOWN ARE APPROXIMATE AND DEVELOPED BASED ON REVIEW OF HISTORICAL BORINGS AND ADDITIONAL BORINGS AND CPTS COMPLETED AS PART OF THE PRE-DESIGN FIELD INVESTIGATION. SUBSURFACE LITHOLOGICAL CONTACTS BETWEEN BORINGS WERE INTERPOLATED. CONTRACTOR SHALL VERIFY BOTH THE HORIZONTAL AND VERTICAL EXTENTS OF CCR AT AREAS OF CLOSURE BY REMOVAL AND REMOVE CCR PER THE EXCAVATION PLAN [GEOSYNTEC, 2018].
3. VERTICAL EXTENT OF EXISTING CCR SHOWN REPRESENTS ESTIMATED TOP OF UNDERLYING CLAY SURFACE (INCLUDING SIX INCHES OVER-EXCAVATION) BASED ON GEOTECHNICAL BORINGS AND REPRESENTATIVE AREAS. IN AREAS TO UNDERGO CLOSURE BY REMOVAL, A MINIMUM OVER-EXCAVATION, BEYOND THE VERTICAL EXTENT OF CCR, OF SIX INCHES WILL BE CONDUCTED TO ACHIEVE THE FINAL EXCAVATION SURFACE. THE CONTRACTOR SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR.
4. INTERIOR SLOPE, GRADES AND LOCATIONS FOR THE EXISTING PERIMETER DIKE WERE ESTIMATED USING ALABAMA POWER COMPANY DRAWINGS 0521372 THROUGH 0521374 TITLED 'DIKE CREST MODIFICATIONS' DATED JULY 7, 1999. EXCAVATION GRADES SHOWN AGAINST THE INTERIOR SLOPE OF THE EXISTING ORIGINAL PERIMETER DIKES WERE GRADED USING A 3H:1V SLOPE AND ASSUMING REMOVAL OF SIX INCHES OF MATERIAL FROM THE SURFACE.
5. MOBILE RIVER WATER SURFACE AT THE SITE TYPICALLY VARIES FROM ELEVATION 1 FT TO 7 FT BASED ON DATA RECORDED AT THE USGS GAUGING STATION NUMBER 02470629 FROM 2008 TO 2016. WATER LEVELS FOR THE DISCHARGE CANAL AND MOBILE RIVER WERE OBTAINED FROM NWIS.WATERDATA.USGS.GOV FROM STATION 02470629 ACCESSED ON JULY 27, 2017. BATHYMETRIC SURFACE WITHIN THE MOBILE RIVER IS APPROXIMATE.
6. INTERBEDDED DEPOSITS OF LOOSE FLY ASH AND BOTTOM ASH THAT ARE GRAY TO DARK GRAY TO BLACK; FLY ASH IS MOSTLY SILT, BOTTOM ASH IS SILTY SAND TO FINE GRAVEL; FINE FRAGMENTS OF COAL AND/OR SLAG ARE PRESENT IN THE BOTTOM ASH.
7. ORGANIC SILT AND ORGANIC CLAY WITH VARYING AMOUNTS OF WOOD DEBRIS AND ORGANIC MATERIAL; THIS UNIT IS GRAY TO GRAY BROWN TO ORANGE; SOFT TO STIFF WITH LOW TO MEDIUM PLASTICITY; INCLUDES TRACE AMOUNTS OF FINE SAND AND/OR SILT.
8. INTERBEDDED LENSES OF SAND, SILTY SAND, CLAYEY SAND, AND SANDY CLAY; THIS UNIT MAY CONTAIN FACIES THAT ARE PREDOMINANTLY SANDY IN SOME AREAS AND PREDOMINANTLY CLAYEY IN OTHER AREAS; UNIT IS NOT LATERALLY CONTINUOUS.
9. FAT CLAY; THIS UNIT IS BLUE-GREEN TO BLUE GRAY; SOFT TO STIFF WITH MEDIUM TO HIGH PLASTICITY; INCLUDES VERY LITTLE TO NO ORGANIC MATTER; UNIT IS NOT LATERALLY CONTINUOUS.
10. POORLY-GRADED, FINE-GRAINED SAND WITH OCCASIONAL LENSES OF CLAY AND SILT AND WELL-GRADED FINE GRAVEL INTERBEDS AT DEPTH.
11. ELEVATIONS OF LITHOLOGIC UNITS ARE ESTIMATED BASED ON GROUND SURFACE ELEVATIONS OF SOIL BORINGS.
12. INTERIOR LIMIT OF CCR EXCAVATION SLOPE AND BENCHES SHOWN ARE APPROXIMATE AND MAY BE REVISED BASED ON FURTHER GEOTECHNICAL ANALYSIS PERFORMED PRIOR TO AND DURING CONSTRUCTION.

LEGEND

- EXISTING GROUND
- EXCAVATION SURFACE
- FINISHED GRADE
- LITHOLOGIC CONTACT
- YEARLY AVERAGE WATER ELEVATION
- CCR / CCR FILL
- CLAY / LOWER CLAY UNIT (NOTE 9)
- CLAY WITH ORGANICS (NOTE 7)
- EXISTING PERIMETER DIKE
- FILL
- IN-PLACE CCR (NOTE 6)
- MIXED UNIT (NOTE 8)
- SAND / LOWER SAND UNIT (NOTE 10)
- SAND BACKFILL / SAND DRAINAGE
- SOIL CONTAINMENT BERM
- SURFACE WATER

0 200 400
HORIZONTAL SCALE IN FEET

0 20 40
VERTICAL SCALE IN FEET

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

FINAL CLOSURE CROSS SECTIONS I

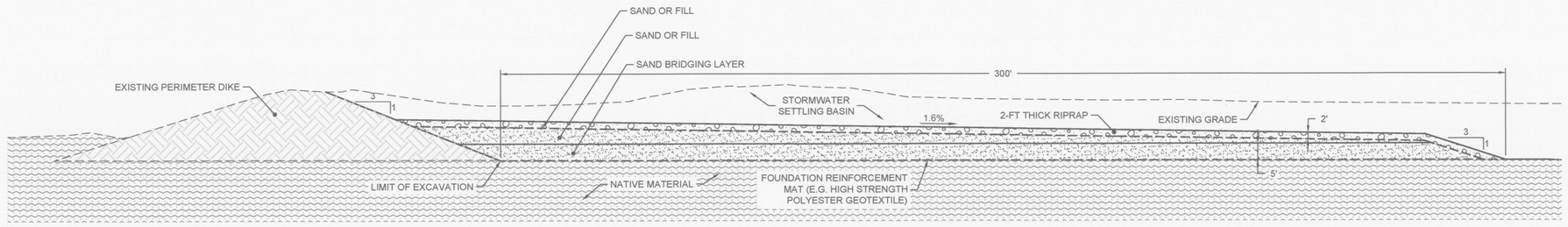
PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C017
SCALE	AS SHOWN	SHEET	1
DATE	DECEMBER 2018	DRAWING	018 OF 097

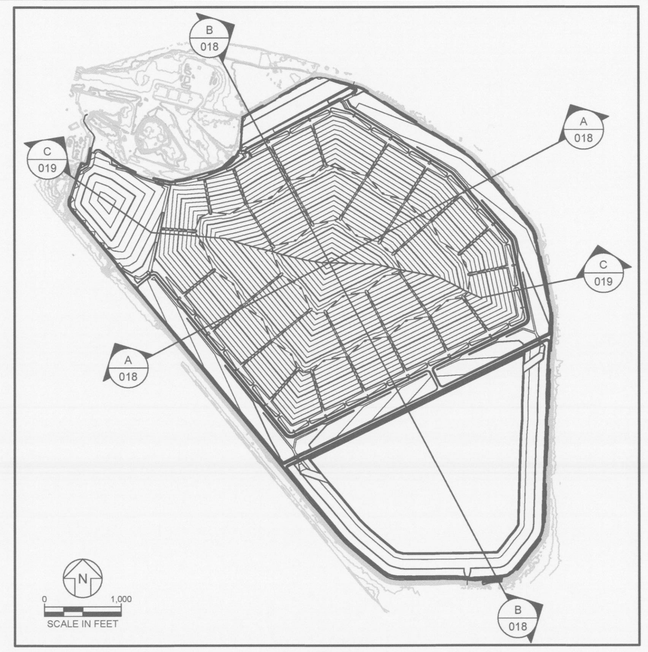
ANSI E: 44x34

L:\CAD\MAL\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C017



1/014 DETAIL
STORMWATER SETTLING BASIN RIPRAP AND SOIL BUTTRESS
SCALE: 1" = 20'

0 20 40
SCALE IN FEET

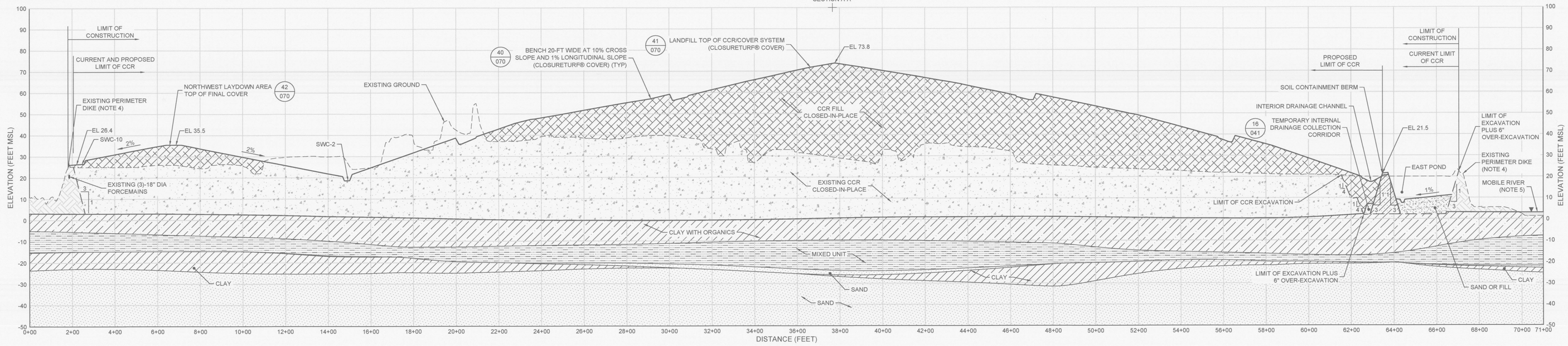


KEY MAP
SCALE: 1" = 1,000'

C
NORTHWEST

C
SOUTHEAST

SECTION B-B'
SECTION A-A'



C/012 SECTION
SITE SECTION (STA 0+00 TO 71+00)
SCALE: 1" = 200' (HORIZONTAL); 1" = 20' (VERTICAL)

0 200 400
HORIZONTAL SCALE IN FEET

0 20 40
VERTICAL SCALE IN FEET

LEGEND

- EXISTING GROUND
- EXCAVATION SURFACE
- FINISHED GRADE
- LITHOLOGIC CONTACT
- YEARLY AVERAGE WATER ELEVATION
- CCR / CCR FILL
- CLAY / LOWER CLAY UNIT (NOTE 9)
- CLAY WITH ORGANICS (NOTE 7)
- EXISTING PERIMETER DIKE
- IN-PLACE CCR (NOTE 6)
- MIXED UNIT (NOTE 8)
- NATIVE MATERIAL
- RIPRAP
- SAND / LOWER SAND UNIT (NOTE 10)
- SAND BACKFILL / SAND DRAINAGE
- SOIL CONTAINMENT BERM
- SURFACE WATER

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. GEOLOGIC SURFACES SHOWN ARE APPROXIMATE AND DEVELOPED BASED ON REVIEW OF HISTORICAL BORINGS AND ADDITIONAL BORINGS AND CPTS COMPLETED AS PART OF THE PRE-DESIGN FIELD INVESTIGATION. SUBSURFACE LITHOLOGICAL CONTACTS BETWEEN BORINGS WERE INTERPOLATED. CONTRACTOR SHALL VERIFY BOTH THE HORIZONTAL AND VERTICAL EXTENTS OF CCR AT AREAS OF CLOSURE BY REMOVAL AND REMOVE CCR PER THE EXCAVATION PLAN [GEOSYNTEC, 2018].
3. VERTICAL EXTENT OF EXISTING CCR PRESENTED REPRESENTS ESTIMATED TOP OF UNDERLYING CLAY SURFACE (INCLUDING SIX INCHES OVER-EXCAVATION) BASED ON GEOTECHNICAL BORINGS AND REPRESENTATIVE AREAS. IN AREAS TO UNDERGO CLOSURE BY REMOVAL, A MINIMUM OVER-EXCAVATION, BEYOND THE VERTICAL EXTENT OF CCR, OF SIX INCHES WILL BE CONDUCTED TO ACHIEVE THE FINAL EXCAVATION SURFACE. THE CONTRACTOR SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR.
4. INTERIOR SLOPE GRADES AND LOCATIONS FOR THE EXISTING PERIMETER DIKE WERE ESTIMATED USING ALABAMA POWER COMPANY DRAWINGS 0521372 THROUGH 0521374 TITLED 'DIKE CREST MODIFICATIONS' DATED JULY 7, 1999. EXCAVATION GRADES SHOWN AGAINST THE INTERIOR SLOPE OF THE EXISTING ORIGINAL PERIMETER DIKES WERE GRADED USING A 3H:1V SLOPE AND REMOVAL OF SIX INCHES OF MATERIAL FROM THE SURFACE.
5. MOBILE RIVER WATER SURFACE AT THE SITE TYPICALLY VARIES FROM ELEVATION 1 FT TO 7 FT BASED ON DATA RECORDED AT THE USGS GAUGING STATION NUMBER 02470629 FROM 2008 TO 2016. WATER LEVELS FOR THE DISCHARGE CANAL AND MOBILE RIVER WERE OBTAINED FROM NWIS.WATERDATA.USGS.GOV FROM STATION 02470629 ACCESSED ON JULY 27, 2017. BATHYMETRIC SURFACE WITHIN THE MOBILE RIVER IS APPROXIMATE.
6. INTERBEDDED DEPOSITS OF LOOSE FLY ASH AND BOTTOM ASH THAT ARE GRAY TO DARK GRAY TO BLACK; FLY ASH IS MOSTLY SILT, BOTTOM ASH IS SILTY SAND TO FINE GRAVEL; FINE FRAGMENTS OF COAL AND/OR SLAG ARE PRESENT IN THE BOTTOM ASH.
7. ORGANIC SILT AND ORGANIC CLAY WITH VARYING AMOUNTS OF WOOD DEBRIS AND ORGANIC MATERIAL; THIS UNIT IS GRAY TO GRAY BROWN TO ORANGE; SOFT TO STIFF WITH LOW TO MEDIUM PLASTICITY; INCLUDES TRACE AMOUNTS OF FINE SAND AND/OR SILT.
8. INTERBEDDED LENSES OF SAND, SILTY SAND, CLAYEY SAND, AND SANDY CLAY; THIS UNIT MAY CONTAIN FACIES THAT ARE PREDOMINANTLY SANDY IN SOME AREAS AND PREDOMINANTLY CLAYEY IN OTHER AREAS; UNIT IS NOT LATERALLY CONTINUOUS.
9. FAT CLAY; THIS UNIT IS BLUE-GREEN TO BLUE GRAY; SOFT TO STIFF WITH MEDIUM TO HIGH PLASTICITY; INCLUDES VERY LITTLE TO NO ORGANIC MATTER; UNIT IS NOT LATERALLY CONTINUOUS.
10. POORLY-GRADED, FINE-GRAINED SAND WITH OCCASIONAL LENSES OF CLAY AND SILT AND WELL-GRADED FINE GRAVEL INTERBEDS AT DEPTH.
11. ELEVATIONS OF LITHOLOGIC UNITS ESTIMATED BASED ON GROUND SURFACE ELEVATIONS OF SOIL BORINGS.
12. INTERIOR LIMIT OF CCR EXCAVATION SLOPE AND BENCHES SHOWN ARE APPROXIMATE AND MAY BE REVISED BASED ON FURTHER GEOTECHNICAL ANALYSIS DURING THE FINAL DESIGN PERIOD.

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

FINAL CLOSURE CROSS SECTIONS II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C018	SHEET 2
SCALE	AS SHOWN	DRAWING 019 OF 097	
DATE	DECEMBER 2018		

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ANSI E 44x34

C:\DOCS\MOBILE\ALABAMA POWER\PLANT BARRY GYM\489\CONSTRUCTION\DRAWINGS\GM489 04C027A.DWG

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

SEAL

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

SOIL CONTAINMENT BERM (SCB) GRADING PLAN - OVERALL

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678 202 3500
WWW.GEOSYNTEC.COM

PROJ. NO.	GM6489	DWG.	GM6489 04C027A	SHEET	1
SCALE	1" = 300'				
DATE	DECEMBER 2018				DRAWING 020 OF 097

ANSI E 44X34

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. SOIL CONTAINMENT BERM SECTIONS ARE PROVIDED ON DRAWINGS 025 THROUGH 029.
3. EXCAVATION GRADING REPRESENTS THE EXCAVATION SURFACE FOR CCR REMOVAL, INCLUDING AN ADDITIONAL MINIMUM SIX INCHES OVER-EXCAVATION. EXCAVATION GRADES WERE DEVELOPED FROM ESTIMATED TOP OF UNDERLYING CLAY GRADES AND AN ESTIMATED 3H:1V INTERIOR SLOPE OF THE EXISTING PERIMETER DIKE. THE VERTICAL EXTENT OF EXISTING CCR DERIVED FROM FIELD BORINGS. IN AREAS TO UNDERGO CLOSURE BY REMOVAL, A PRESENTED IS BASED ON ESTIMATED TOP OF UNDERLYING CLAY SURFACE MINIMUM OVER-EXCAVATION BEYOND THE VERTICAL EXTENT OF CCR, OF SIX INCHES WILL BE CONDUCTED TO ACHIEVE THE FINAL EXCAVATION SURFACE. THE CONTRACTOR SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR. A MINIMUM OF SIX INCHES OF ADDITIONAL UNDERLYING SOIL SHALL BE REMOVED AS DEFINED AS CLOSURE BY REMOVAL.
4. INTERIOR LIMITS OF CCR EXCAVATION SLOPE AND BENCHES SHOWN ARE APPROXIMATE AND MAY BE REVISED BASED ON FURTHER GEOTECHNICAL ANALYSIS PERFORMED PRIOR TO AND DURING CONSTRUCTION.

SCALE IN FEET
0 300 600

LEGEND

- EXCAVATION SURFACE ELEVATION (FEET)
- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE SURFACE ELEVATION (FEET)
- SOIL CONTAINMENT BERM SURFACE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- MW-01 MONITORING WELL
- AP2-2 PIEZOMETER
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE

L:\CADD\ALABAMA POWER\PLANT BARRY CWM\BIDCONSTRUCTION\DRAWINGS\DWG\B1220229

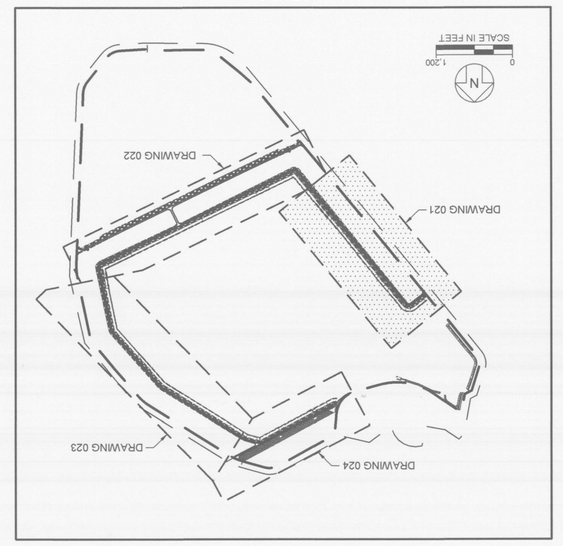
DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

SEAL

LEGEND

EXISTING GROUND ELEVATION (FEET)	MONITORING WELL
EXCAVATION GRADES	TREE LINE
SOIL CONTAINMENT BERM SURFACE ELEVATION (FEET)	SOIL CONTAINMENT BERM CENTERLINE
TOP OF FINAL COVER SYSTEM / FINISHED GRADE ELEVATION (FEET)	LITHOLOGICAL PROFILE CONTACT
DISPOSAL AREA BOUNDARY	FACILITY BOUNDARY
EDGE OF WATER / FREE WATER SURFACE	EXISTING GROUND IN PROFILE
PIEZOMETER	PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
PIPE PENETRATION	RIPRAP
EXISTING PERIMETER DIKE	SOIL CONTAINMENT BERM
LOWER CLAY UNIT	WATER SURFACE
LOWER SAND UNIT	
MIXED UNIT	
CLAY WITH ORGANIC UNIT	

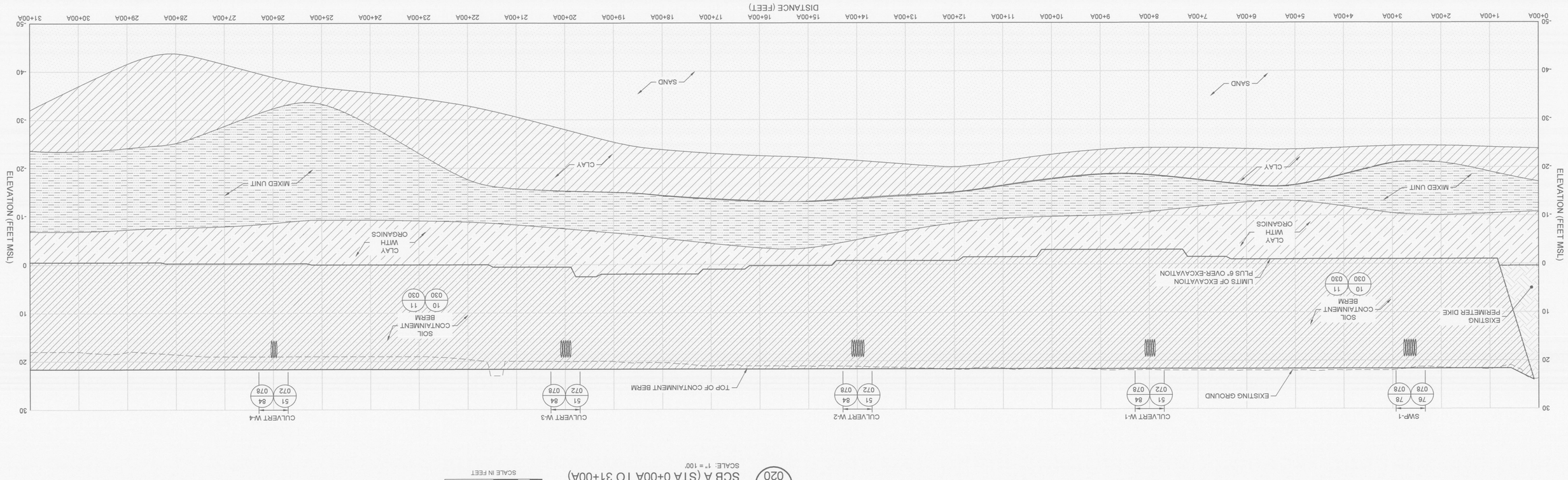
KEY MAP
SCALE: 1" = 1,200'



3 020 PROFILE
SCB A (STA 0+00A TO 31+00A)
SCALE: 1" = 100' (HORIZONTAL), 1" = 10' (VERTICAL)

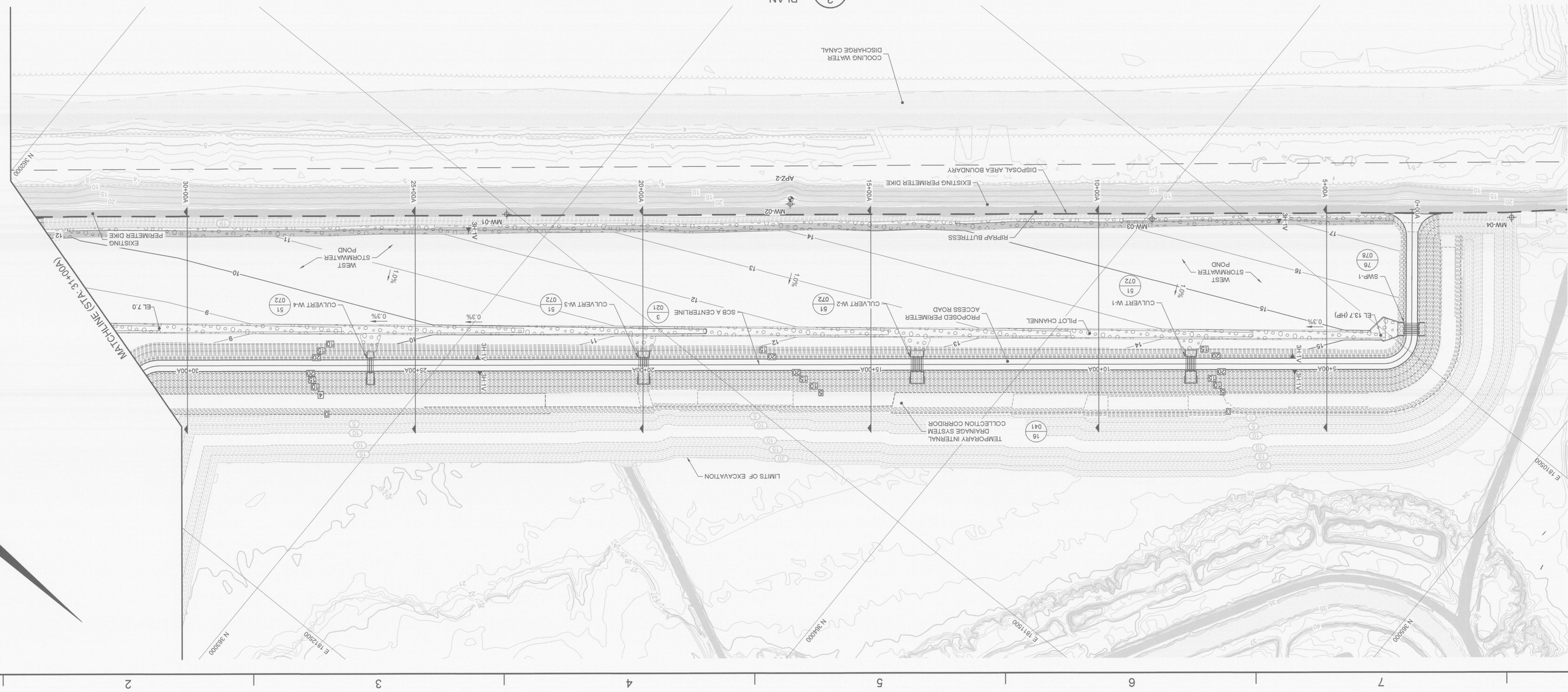
HORIZONTAL SCALE IN FEET: 0, 100, 200
VERTICAL SCALE IN FEET: 0, 10, 20

DISTANCE (FEET)
ELEVATION (FEET MSL)



2 020 PLAN
SCB A (STA 0+00A TO 31+00A)
SCALE: 1" = 100'

SCALE IN FEET: 0, 100, 200



NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. SOIL CONTAINMENT BERM SECTIONS ARE PROVIDED ON DRAWINGS 025 THROUGH 029.
3. EXCAVATION GRADING SHOWN REPRESENTS THE EXCAVATION SURFACE FOR CCR REMOVAL, INCLUDING AN ADDITIONAL MINIMUM SIX INCHES OVER-EXCAVATION. EXCAVATION GRADES WERE DEVELOPED FROM ESTIMATED TOP OF UNDERLYING CLAY GRADES AND AN ESTIMATED 3H:1V INTERIOR SLOPE OF THE EXISTING PERIMETER DIKE. THE VERTICAL EXTENT OF EXISTING CCR PRESENTED IN BASED ON ESTIMATED TOP OF UNDERLYING CLAY SURFACE DERIVED FROM PILED BORINGS. IN AREAS TO UNDERGO CLOSURE BY REMOVAL, INCHES WILL BE CONDUCTED TO ACHIEVE THE FINAL EXCAVATION SURFACE. THE CONTRACTOR SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR. A MINIMUM OF SIX INCHES OF ADDITIONAL UNDERLYING SOIL SHALL BE REMOVED AS DEFINED AS CLOSURE BY REMOVAL.
4. INTERIOR LIMITS OF CCR EXCAVATION SLOPE AND BENCHES SHOWN ARE APPROXIMATE AND MAY BE REVISED BASED ON FURTHER GEOTECHNICAL ANALYSIS PERFORMED PRIOR TO AND DURING CONSTRUCTION.

SCB PLAN AND PROFILE - STA 0+00A TO 31+00A

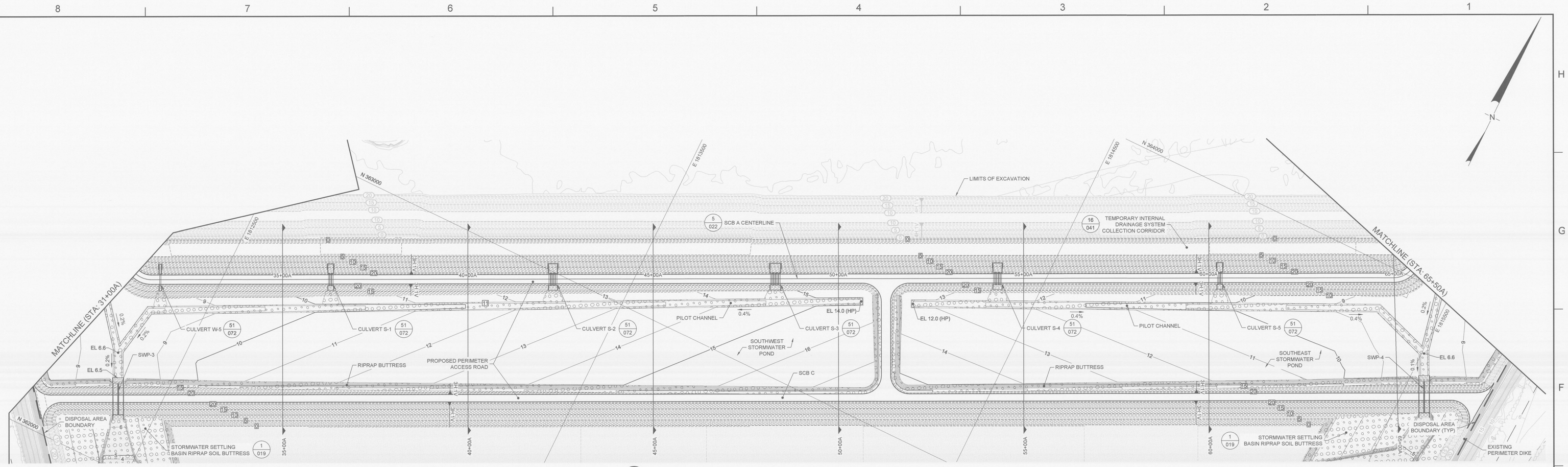
PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

REV	DATE	DESCRIPTION	DRN	APP
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
B	06.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3684
PHONE: 678 202 8900
WWW.GEOSYNTEC.COM

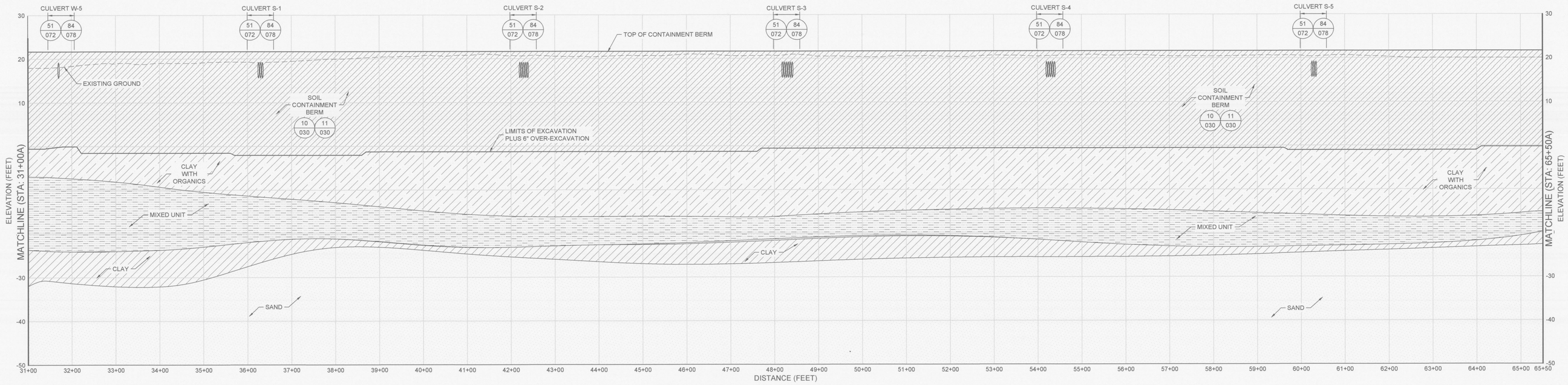
PROJ. NO.	GM6489	DWG.	GM6489 04C0228
SCALE	AS SHOWN	SHEET	1
DATE	DECEMBER 2018	DRAWING	021 OF 097

ANSI E 44X34



4/020 PLAN
SCB A (STA 31+00A TO 65+50A)
SCALE: 1" = 100'

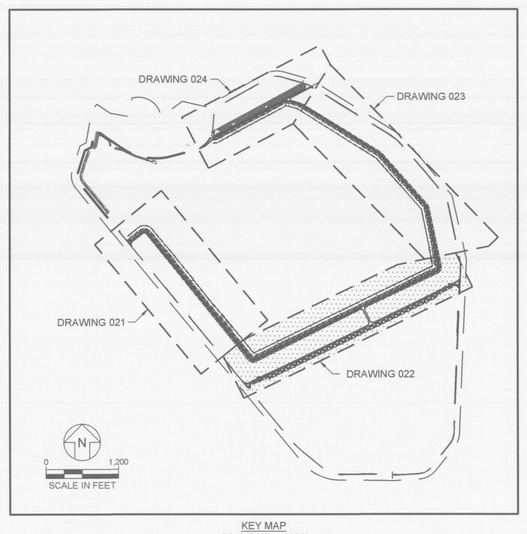
0 100 200
SCALE IN FEET



5/020 PROFILE
SCB A (STA 31+00A TO 65+50A)
SCALE: 1" = 100' (HORIZONTAL); 1" = 10' (VERTICAL)

0 100 200
HORIZONTAL SCALE IN FEET

0 10 20
VERTICAL SCALE IN FEET



KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- EXCAVATION GRADES
- SOIL CONTAINMENT BERM SURFACE ELEVATION (FEET)
- TOP OF FINAL COVER SYSTEM / FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF WATER / FREE WATER SURFACE
- EXISTING GROUND IN PROFILE
- FACILITY BOUNDARY
- LITHOLOGICAL PROFILE CONTACT
- SOIL CONTAINMENT BERM CENTERLINE
- TREE LINE
- MW-01 MONITORING WELL
- APZ-2 PIEZOMETER
- PIPE PENETRATION
- EXISTING PERIMETER DIKE
- LOWER CLAY UNIT
- LOWER SAND UNIT
- MIXED UNIT
- CLAY WITH ORGANIC UNIT
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- SOIL CONTAINMENT BERM
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. SOIL CONTAINMENT BERM SECTIONS ARE PROVIDED ON DRAWINGS 025 THROUGH 029.
3. EXCAVATION GRADING SHOWN REPRESENTS THE EXCAVATION SURFACE FOR CCR REMOVAL, INCLUDING AN ADDITIONAL MINIMUM SIX INCHES OVER-EXCAVATION. EXCAVATION GRADES WERE DEVELOPED FROM ESTIMATED TOP OF UNDERLYING CLAY GRADES AND AN ESTIMATED 3H:1V INTERIOR SLOPE OF THE EXISTING PERIMETER DIKE. THE VERTICAL EXTENT OF EXISTING CCR PRESENTED IS BASED ON ESTIMATED TOP OF UNDERLYING CLAY SURFACE DERIVED FROM FIELD BORINGS. IN AREAS TO UNDERGO CLOSURE BY REMOVAL, A MINIMUM OVER-EXCAVATION, BEYOND THE VERTICAL EXTENT OF CCR, OF SIX INCHES WILL BE CONDUCTED TO ACHIEVE THE FINAL EXCAVATION SURFACE. THE CONTRACTOR SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR. A MINIMUM OF SIX INCHES OF ADDITIONAL UNDERLYING SOIL SHALL BE REMOVED AS DEFINED AS CLOSURE BY REMOVAL.
4. INTERIOR LIMITS OF CCR EXCAVATION SLOPE AND BENCHES SHOWN ARE APPROXIMATE AND MAY BE REVISED BASED ON FURTHER GEOTECHNICAL ANALYSIS PERFORMED PRIOR TO AND DURING CONSTRUCTION.

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

SCB PLAN AND PROFILE - STA 31+00A TO 65+50A

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

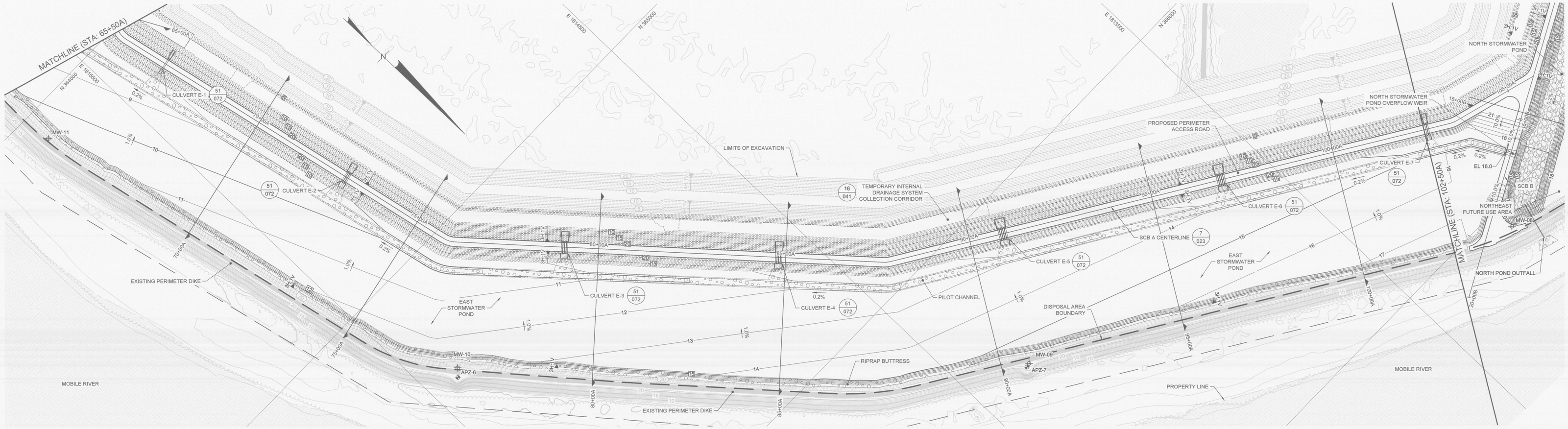
DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C028
SCALE	AS SHOWN	SHEET	2
DATE	DECEMBER 2018	DRAWING	022 OF 097

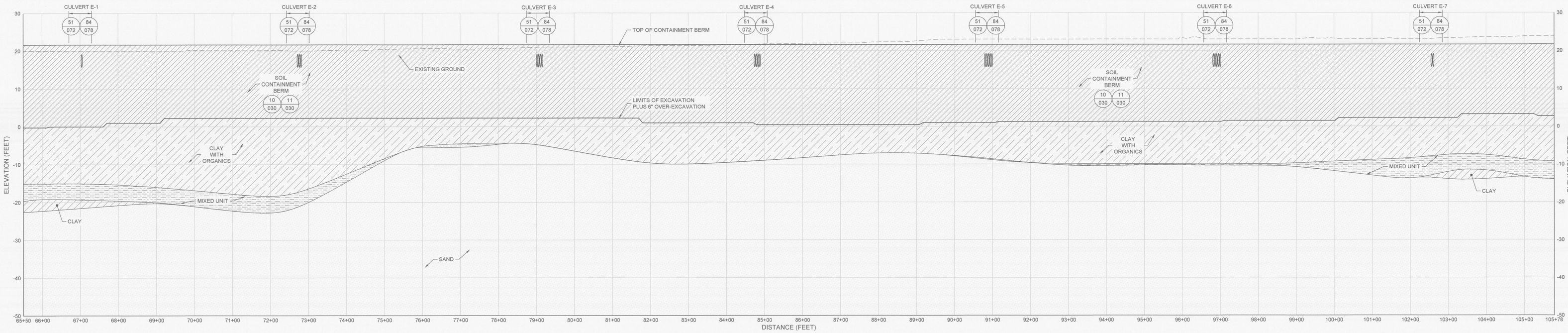
ANSI E: 44x34

I:\CAD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\BGW6489.04C028



6/020 PLAN
SCB A (STA 65+50A TO 105+78A)
SCALE: 1" = 100'

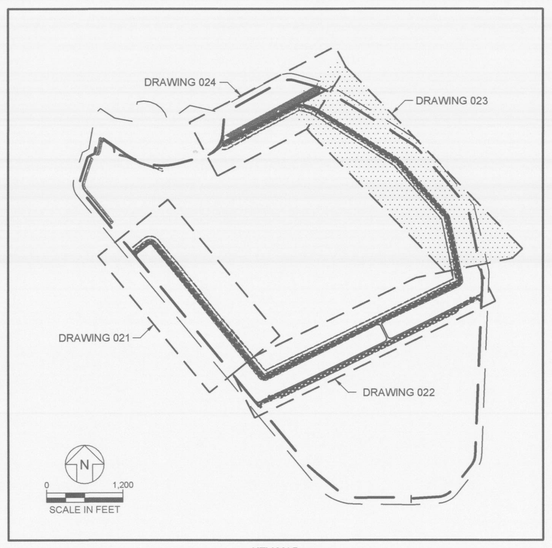
0 100 200
SCALE IN FEET



7/020 PROFILE
SCB A (STA 65+50A TO 105+78A)
SCALE: 1" = 100' (HORIZONTAL); 1" = 10' (VERTICAL)

0 100 200
HORIZONTAL SCALE IN FEET

0 10 20
VERTICAL SCALE IN FEET



KEY MAP
SCALE: 1" = 1,200'

LEGEND

20	EXISTING GROUND ELEVATION (FEET)	APZ-2	PIEZOMETER
8	EXCAVATION GRADES		PIPE PENETRATION
10	SOIL CONTAINMENT BERM SURFACE ELEVATION (FEET)		EXISTING PERIMETER DIKE
50	TOP OF FINAL COVER SYSTEM / FINISHED GRADE ELEVATION (FEET)		LOWER CLAY UNIT
	DISPOSAL AREA BOUNDARY		LOWER SAND UNIT
	EDGE OF WATER / FREE WATER SURFACE		MIXED UNIT
	EXISTING GROUND IN PROFILE		CLAY WITH ORGANIC UNIT
	FACILITY BOUNDARY		PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
	LITHOLOGICAL PROFILE CONTACT		RIPRAP
	SOIL CONTAINMENT BERM CENTERLINE		SOIL CONTAINMENT BERM
	TREE LINE		WATER SURFACE
MW-01	MONITORING WELL		

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. SOIL CONTAINMENT BERM SECTIONS ARE PROVIDED ON DRAWINGS 025 THROUGH 029.
3. EXCAVATION GRADING SHOWN REPRESENTS THE EXCAVATION SURFACE FOR CCR REMOVAL, INCLUDING AN ADDITIONAL MINIMUM SIX INCHES OVER-EXCAVATION. EXCAVATION GRADES WERE DEVELOPED FROM ESTIMATED TOP OF UNDERLYING CLAY GRADES AND AN ESTIMATED 3H:1V INTERIOR SLOPE OF THE EXISTING PERIMETER DIKE. THE VERTICAL EXTENT OF EXISTING CCR PRESENTED IS BASED ON ESTIMATED TOP OF UNDERLYING CLAY SURFACE DERIVED FROM FIELD BORINGS. IN AREAS TO UNDERGO CLOSURE BY REMOVAL, A MINIMUM OVER-EXCAVATION, BEYOND THE VERTICAL EXTENT OF CCR, OF SIX INCHES WILL BE CONDUCTED TO ACHIEVE THE FINAL EXCAVATION SURFACE. THE CONTRACTOR SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR. A MINIMUM OF SIX INCHES OF ADDITIONAL UNDERLYING SOIL SHALL BE REMOVED AS DEFINED AS CLOSURE BY REMOVAL.
4. INTERIOR LIMITS OF CCR EXCAVATION SLOPE AND BENCHES SHOWN ARE APPROXIMATE AND MAY BE REVISED BASED ON FURTHER GEOTECHNICAL ANALYSIS PERFORMED PRIOR TO AND DURING CONSTRUCTION.

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

SCB PLAN AND PROFILE - STA 65+50A TO 105+78A

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

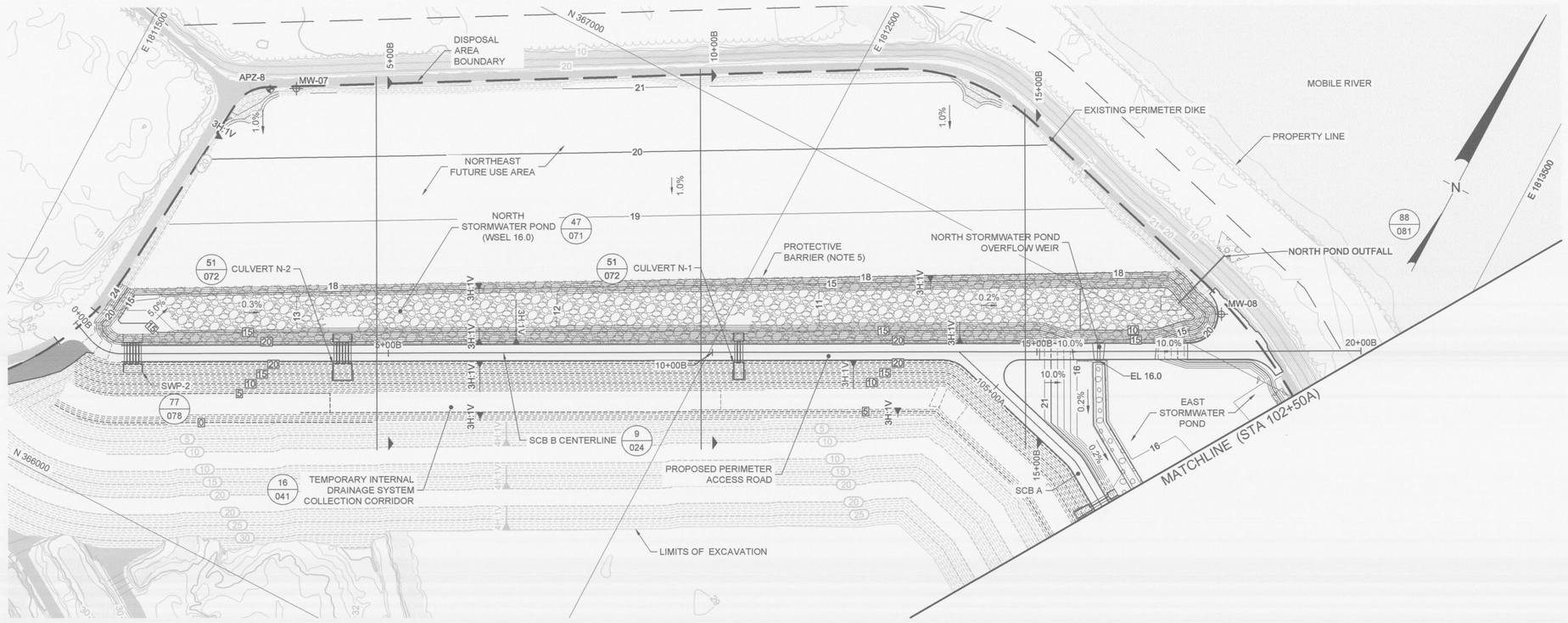
DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C028	SHEET 3
SCALE	AS SHOWN		
DATE	DECEMBER 2018	DRAWING 023 OF 097	

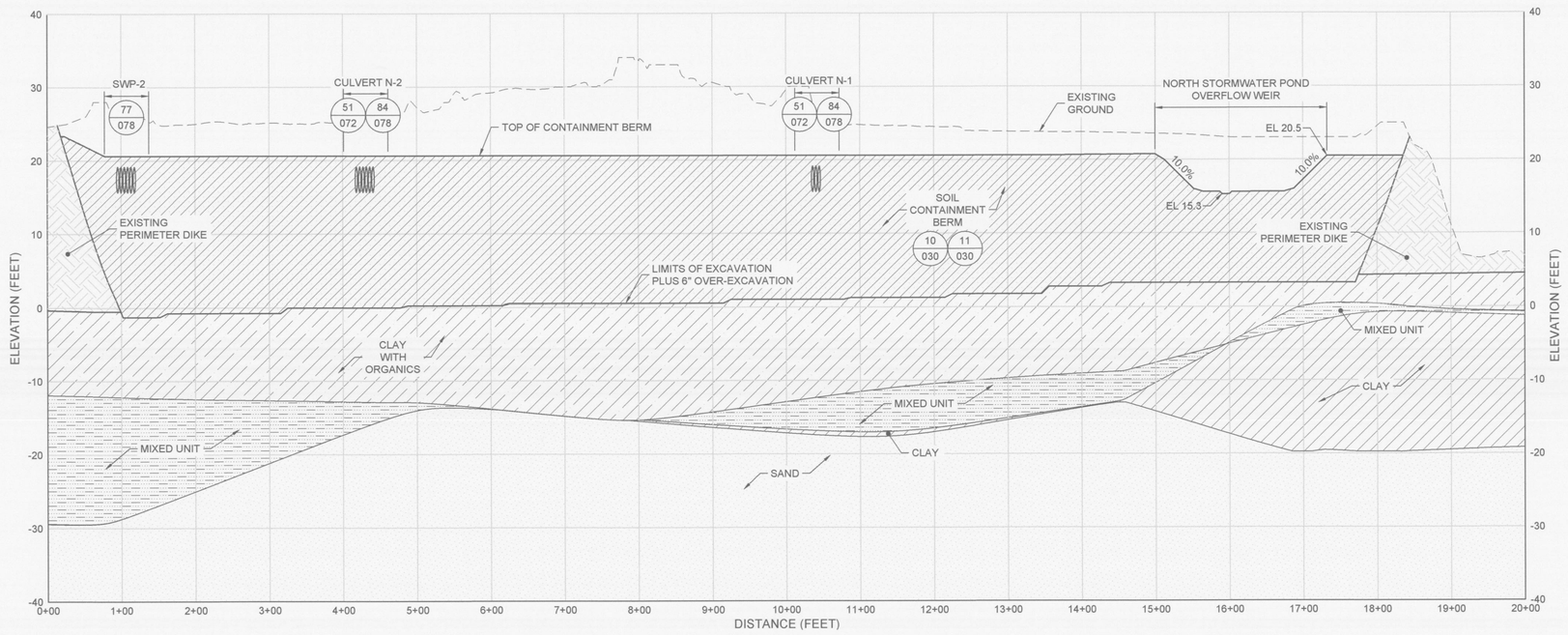
L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C028

ANSI E: 44x34



8/020 PLAN
SCB B (STA 0+00B TO 18+70B)
SCALE: 1" = 100'

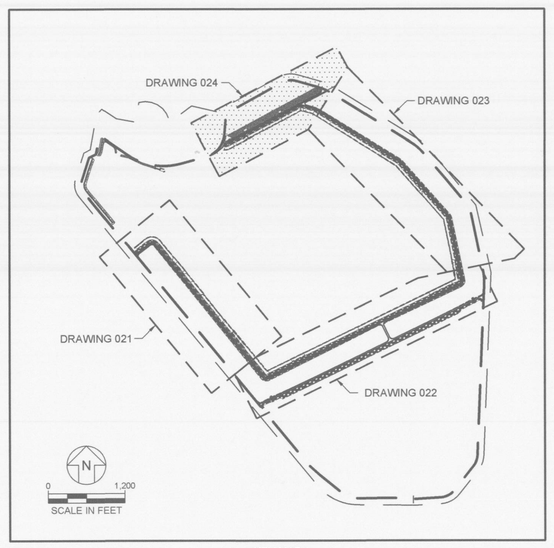
0 100 200
SCALE IN FEET



9/020 PROFILE
SCB B (STA 0+00B TO 18+70B)
SCALE: 1" = 100' (HORIZONTAL); 1" = 10' (VERTICAL)

0 100 200
HORIZONTAL SCALE IN FEET

0 10 20
VERTICAL SCALE IN FEET



KEY MAP
SCALE: 1" = 1,200'

LEGEND

20	EXISTING GROUND ELEVATION (FEET)	APZ-2	PIEZOMETER
5	EXCAVATION GRADES		PIPE PENETRATION
10	SOIL CONTAINMENT BERM SURFACE ELEVATION (FEET)		EXISTING PERIMETER DIKE
50	TOP OF FINAL COVER SYSTEM / FINISHED GRADE ELEVATION (FEET)		LOWER CLAY UNIT
	DISPOSAL AREA BOUNDARY		LOWER SAND UNIT
	EDGE OF WATER / FREE WATER SURFACE		MIXED UNIT
	EXISTING GROUND IN PROFILE		CLAY WITH ORGANIC UNIT
	FACILITY BOUNDARY		PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
	LITHOLOGICAL PROFILE CONTACT		RIPRAP
	SOIL CONTAINMENT BERM CENTERLINE		SOIL CONTAINMENT BERM
	TREE LINE		WATER SURFACE
MW-01	MONITORING WELL		

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. SOIL CONTAINMENT BERM SECTIONS ARE PROVIDED ON DRAWINGS 025 THROUGH 029.
3. EXCAVATION GRADING SHOWN REPRESENTS THE EXCAVATION SURFACE FOR CCR REMOVAL, INCLUDING AN ADDITIONAL MINIMUM SIX INCHES OVER-EXCAVATION. EXCAVATION GRADES WERE DEVELOPED FROM ESTIMATED TOP OF UNDERLYING CLAY GRADES AND AN ESTIMATED 3H:1V INTERIOR SLOPE OF THE EXISTING PERIMETER DIKE. THE VERTICAL EXTENT OF EXISTING CCR PRESENTED IS BASED ON ESTIMATED TOP OF UNDERLYING CLAY SURFACE DERIVED FROM FIELD BORINGS. IN AREAS TO UNDERGO CLOSURE BY REMOVAL, A MINIMUM OVER-EXCAVATION, BEYOND THE VERTICAL EXTENT OF CCR, OF SIX INCHES WILL BE CONDUCTED TO ACHIEVE THE FINAL EXCAVATION SURFACE. THE CONTRACTOR SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR. A MINIMUM OF SIX INCHES OF ADDITIONAL UNDERLYING SOIL SHALL BE REMOVED AS DEFINED AS CLOSURE BY REMOVAL.
4. INTERIOR LIMITS OF CCR EXCAVATION SLOPE AND BENCHES SHOWN ARE APPROXIMATE AND MAY BE REVISED BASED ON FURTHER GEOTECHNICAL ANALYSIS PERFORMED PRIOR TO AND DURING CONSTRUCTION.
5. PROTECTIVE JERSEY BARRIER, OR SIMILAR ENGINEER-APPROVED EQUIVALENT, SHALL BE PLACED ALONG THE DELINEATED ROAD ALIGNMENT IN THE NORTHWEST LAYDOWN AREA AND AT THE EDGE OF THE NORTHEAST FUTURE USE AREA NORTH POND. BARRIERS SHOULD BE PLACED AT A SPACING OF ONE PER 50 LINEAR FT, OR AS OTHERWISE DIRECTED BY THE OWNER.

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

SCB PLAN AND PROFILE - STA 0+00B TO 20+00B

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

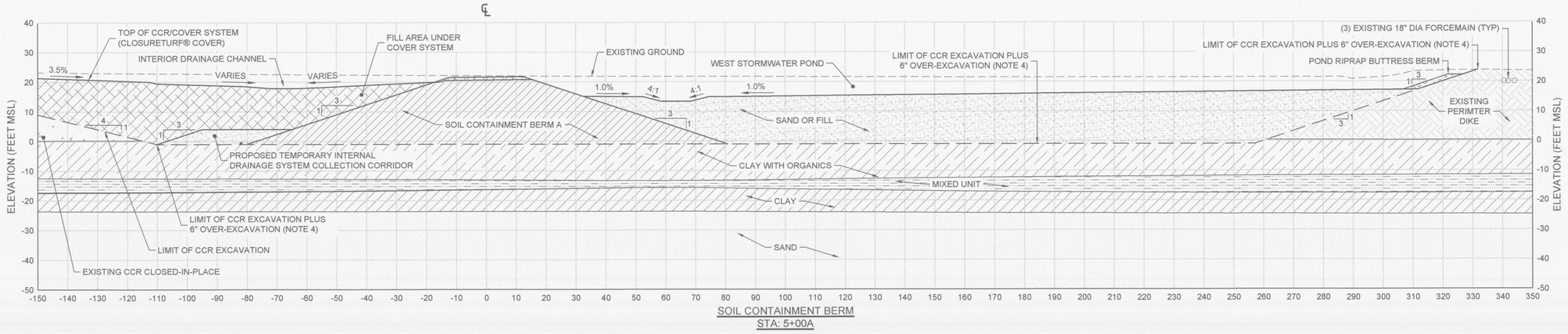
Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9600
WWW.GEOSYNTEC.COM

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

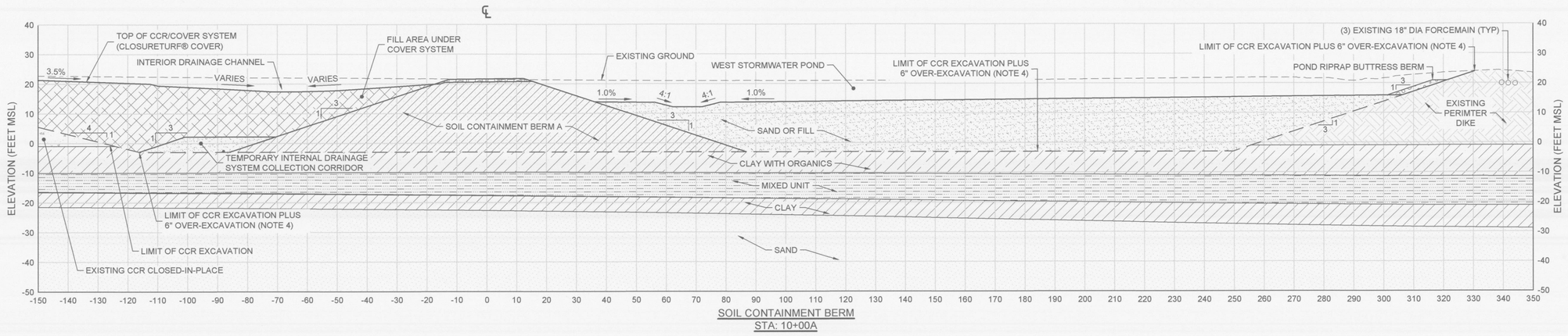
PROJ. NO.	GW6489	DWG.	GW6489.04C028
SCALE	AS SHOWN	SHEET	4
DATE	DECEMBER 2018	DRAWING 024 OF 097	

L:\CADD\AL\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C028

ANSI E: 44x34



SOIL CONTAINMENT BERM
STA: 5+00A



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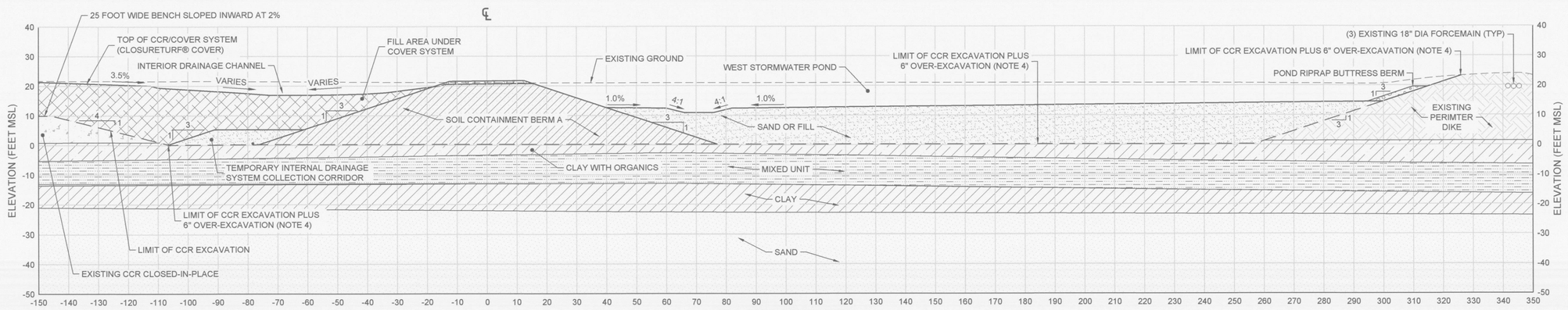
STA: 10+00A



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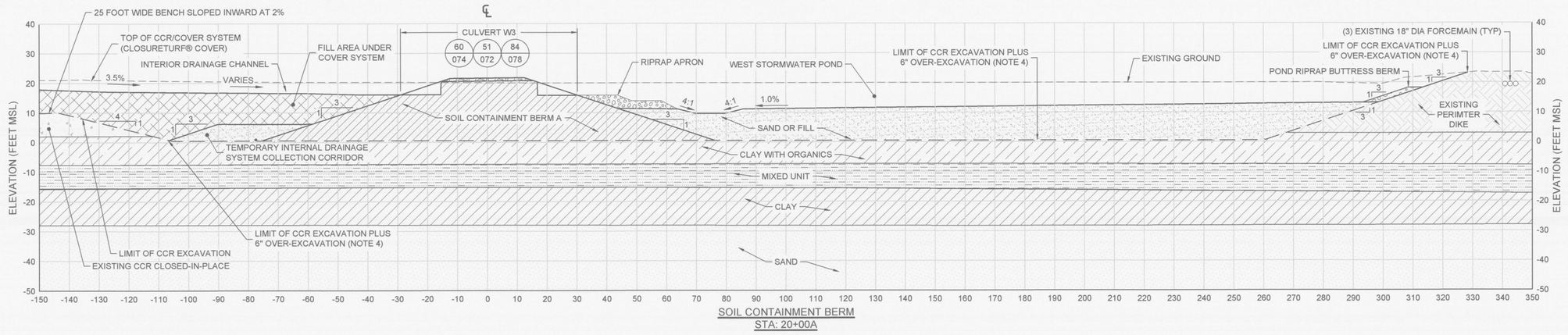

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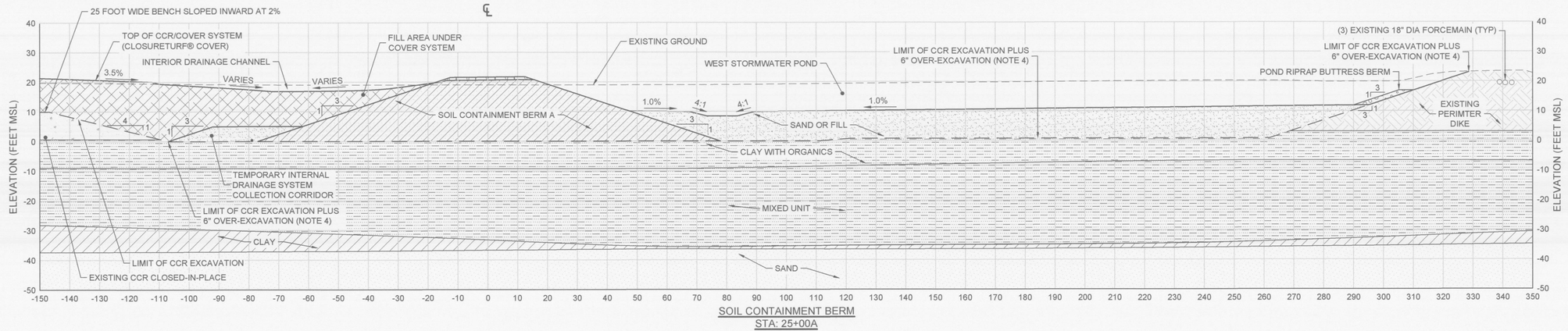
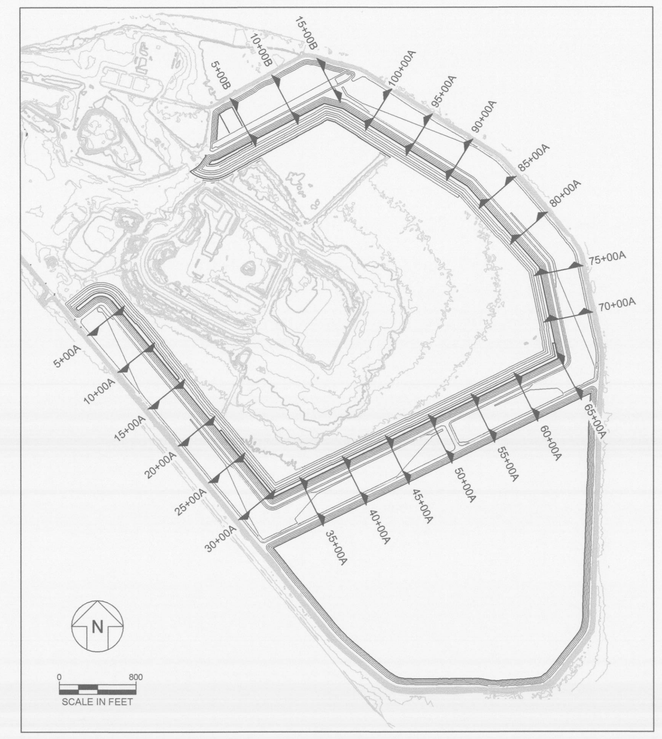


SOIL CONTAINMENT BERM
STA: 25+00A



KEY MAP
SCALE: 1" = 800'

LEGEND

- EXCAVATION SURFACE
- EXISTING GROUND
- FINISHED GRADE
- LITHOLOGIC CONTACT
- CCR / CCR FILL
- CCR CLOSED-IN-PLACE
- CLAY WITH ORGANICS
- EXISTING PERIMETER DIKE
- LOWER CLAY UNIT
- LOWER SAND UNIT
- MIXED UNIT
- SAND OR FILL / SAND DRAINAGE
- SOIL CONTAINMENT BERM
- EXISTING FORCEMAINS

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. SOIL CONTAINMENT BERM PLANS AND PROFILES ARE PRESENTED ON DRAWINGS 020 THROUGH 024.
3. LIMIT OF CCR EXCAVATION SLOPES AND CONFIGURATION OF CUT SLOPES WILL BE OPTIMIZED BASED ON FURTHER GEOTECHNICAL ANALYSIS PERFORMED PRIOR TO AND DURING CONSTRUCTION.
4. EXCAVATION GRADING SHOWN REPRESENTS THE EXCAVATION SURFACE FOR CCR REMOVAL, INCLUDING AN ADDITIONAL MINIMUM SIX INCHES OVER-EXCAVATION. EXCAVATION GRADES WERE DEVELOPED FROM ESTIMATED TOP OF UNDERLYING CLAY GRADES AND AN ESTIMATED 3H:1V INTERIOR SLOPE OF THE EXISTING PERIMETER DIKE. THE VERTICAL EXTENT OF EXISTING CCR PRESENTED IS BASED ON ESTIMATED TOP OF UNDERLYING CLAY SURFACE DERIVED FROM FIELD BORINGS. IN AREAS TO UNDERGO CLOSURE BY REMOVAL, A MINIMUM OVER-EXCAVATION, BEYOND THE VERTICAL EXTENT OF CCR, OF SIX INCHES WILL BE CONDUCTED TO ACHIEVE THE FINAL EXCAVATION SURFACE. THE CONTRACTOR SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR. A MINIMUM OF SIX INCHES OF ADDITIONAL UNDERLYING SOIL SHALL BE REMOVED AS DEFINED AS CLOSURE BY REMOVAL.
5. PROJECTED LIMITS OF THE 6-INCH OVER EXCAVATION TO BE FIELD VERIFIED.

0 20 40
SCALE IN FEET
(HORIZONTAL AND VERTICAL)

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

SCB CROSS SECTIONS I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

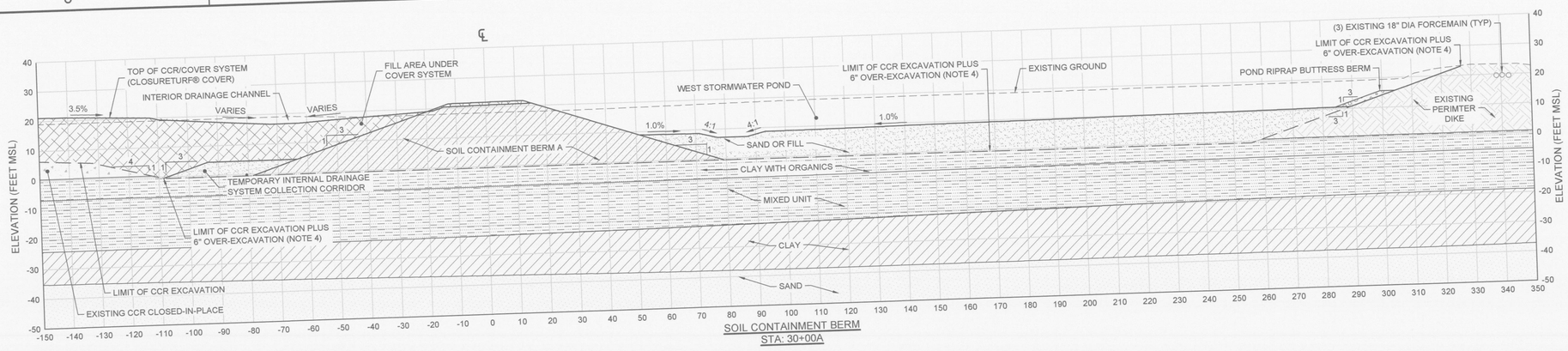
DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

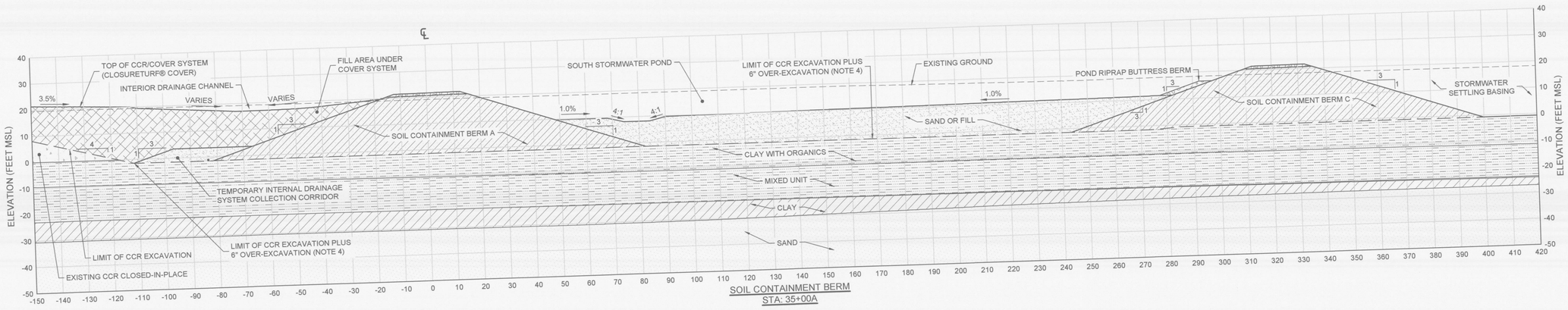
PROJ. NO.	GW6489	DWG. GW6489.04C025	SHEET 1
SCALE	1" = 20'	DRAWING 025 OF 097	
DATE	DECEMBER 2018		

ANSI E: 44x34

L:\CADD\AVL\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C025



SOIL CONTAINMENT BERM
STA: 30+00A



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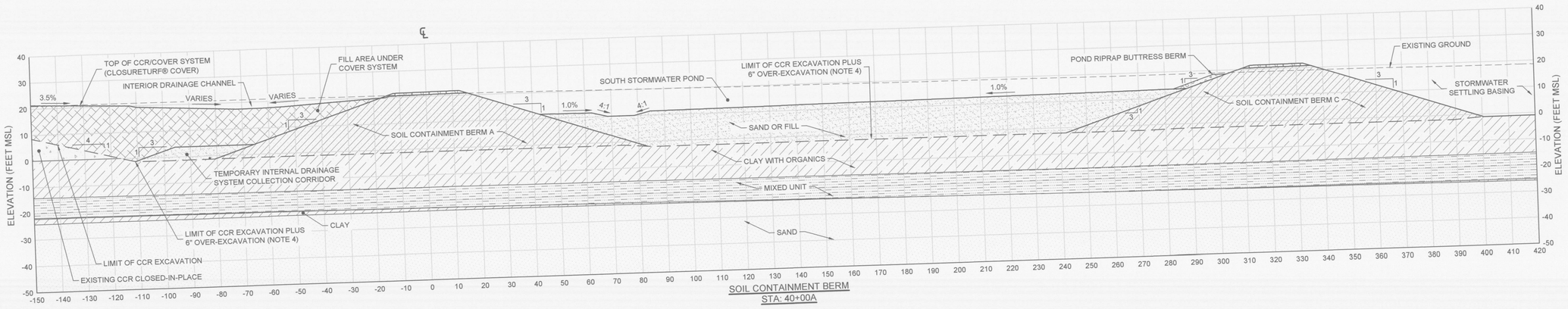
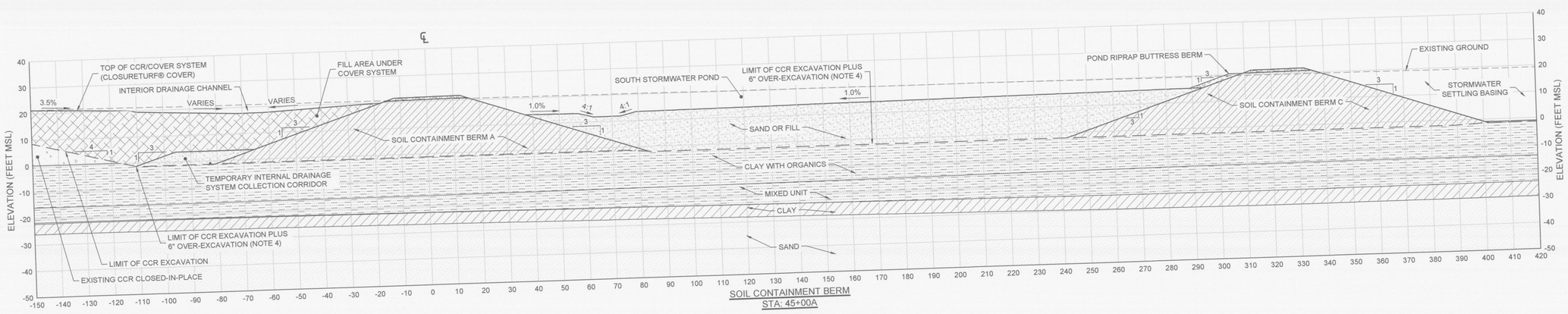
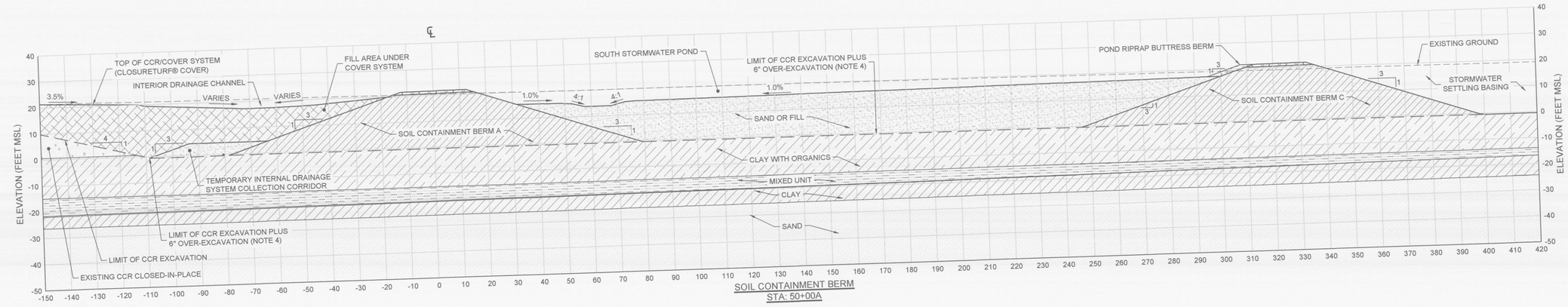
STA: 35+00A



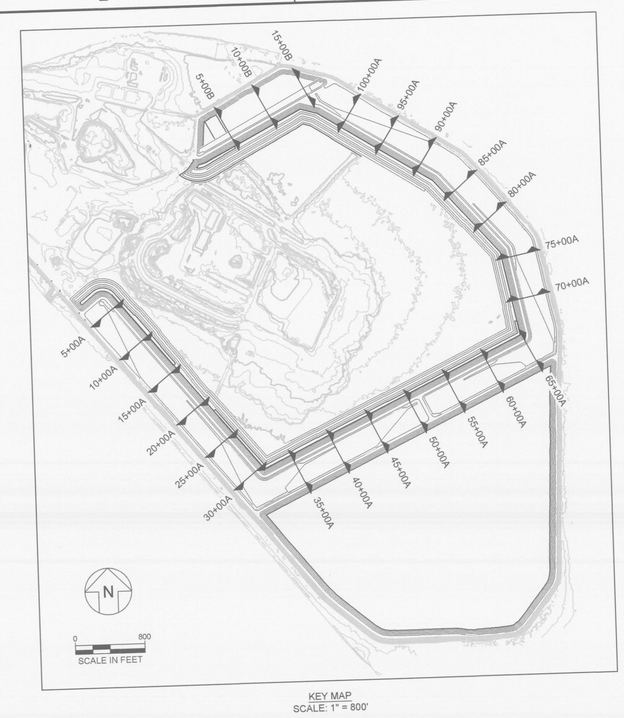
SOIL CONTAINMENT BERM
STA: 40+00A



SOIL CONTAINMENT BERM
STA: 45+00A



SOIL CONTAINMENT BERM
STA: 50+00A



KEY MAP
SCALE: 1" = 800'

LEGEND

- EXCAVATION SURFACE
- EXISTING GROUND
- FINISHED GRADE
- LITHOLOGIC CONTACT
- CCR / CCR FILL
- CCR CLOSED-IN-PLACE
- CLAY WITH ORGANICS
- EXISTING PERIMETER DIKE
- FILL
- LOWER CLAY UNIT
- LOWER SAND UNIT
- MIXED UNIT
- SAND OR FILL / SAND DRAINAGE
- SOIL CONTAINMENT BERM
- EXISTING FORCEMAINS

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. SOIL CONTAINMENT BERM PLANS AND PROFILES ARE PRESENTED ON DRAWINGS 020 THROUGH 024.
3. LIMIT OF CCR EXCAVATION SLOPES AND CONFIGURATION OF CUT SLOPES WILL BE OPTIMIZED BASED ON FURTHER GEOTECHNICAL ANALYSIS PERFORMED PRIOR TO AND DURING CONSTRUCTION.
4. EXCAVATION GRADING SHOWN REPRESENTS THE EXCAVATION SURFACE FOR CCR REMOVAL, INCLUDING AN ADDITIONAL MINIMUM SIX INCHES OVER-EXCAVATION. EXCAVATION GRADES WERE DEVELOPED FROM ESTIMATED TOP OF UNDERLYING CLAY GRADES AND AN ESTIMATED 3H:1V INTERIOR SLOPE OF THE EXISTING PERIMETER DIKE. THE VERTICAL EXTENT OF EXISTING CCR PRESENTED IS BASED ON ESTIMATED TOP OF UNDERLYING CLAY SURFACE DERIVED FROM FIELD BORINGS. IN AREAS TO UNDERGO CLOSURE BY REMOVAL, A MINIMUM OVER-EXCAVATION, BEYOND THE VERTICAL EXTENT OF CCR, OF SIX INCHES WILL BE CONDUCTED TO ACHIEVE THE FINAL EXCAVATION SURFACE. THE CONTRACTOR SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR. A MINIMUM OF SIX INCHES OF ADDITIONAL UNDERLYING SOIL SHALL BE REMOVED AS DEFINED AS CLOSURE BY REMOVAL.
5. PROJECTED LIMITS OF THE 6-INCH OVER EXCAVATION TO BE FIELD VERIFIED.

0 20 40
SCALE IN FEET
(HORIZONTAL AND VERTICAL)

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

SCB CROSS SECTIONS II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

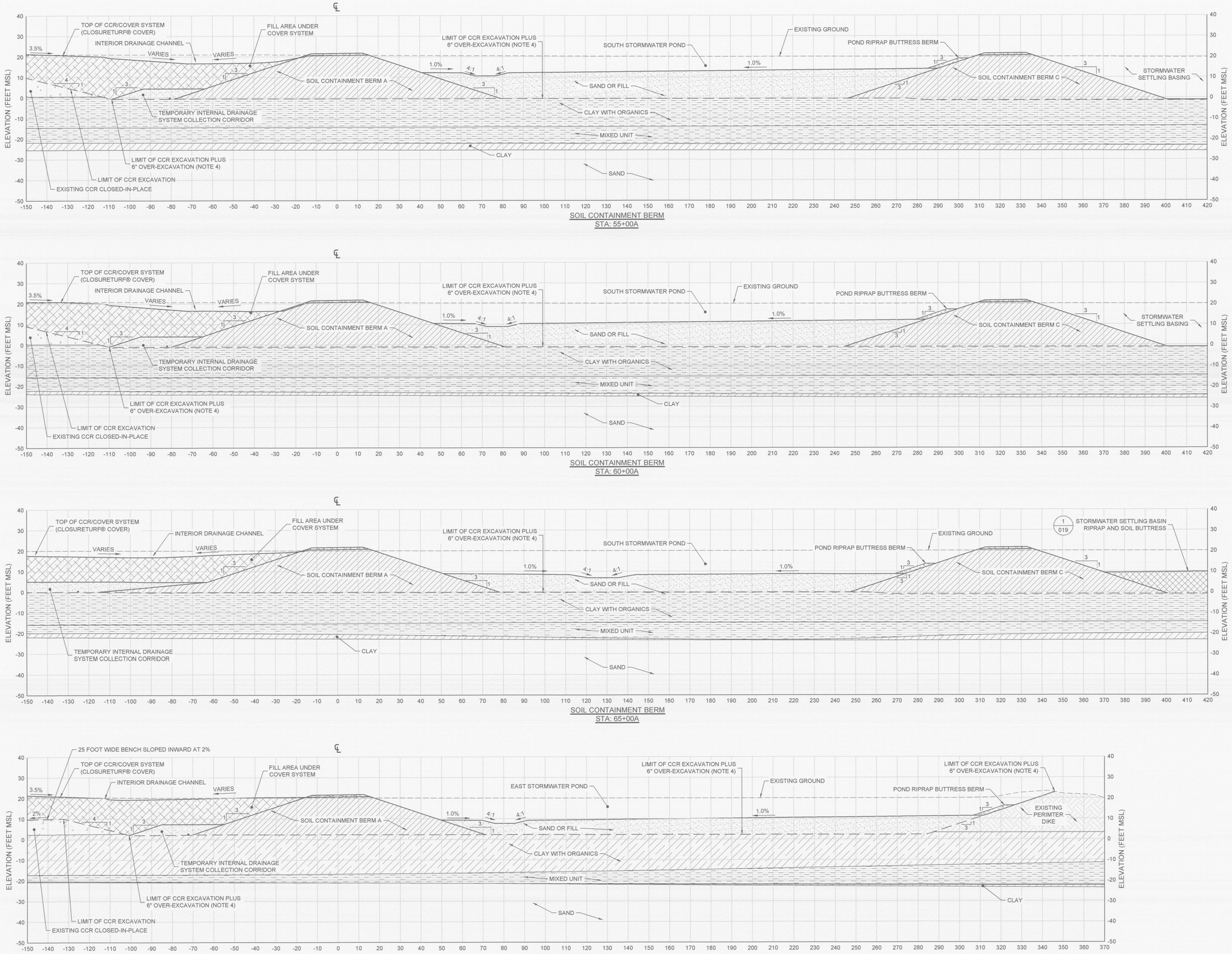
Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.222.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C025	SHEET 2
SCALE	1" = 20'	DRAWING 026 OF 097	
DATE	DECEMBER 2018		

ANSI E: 44x34

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

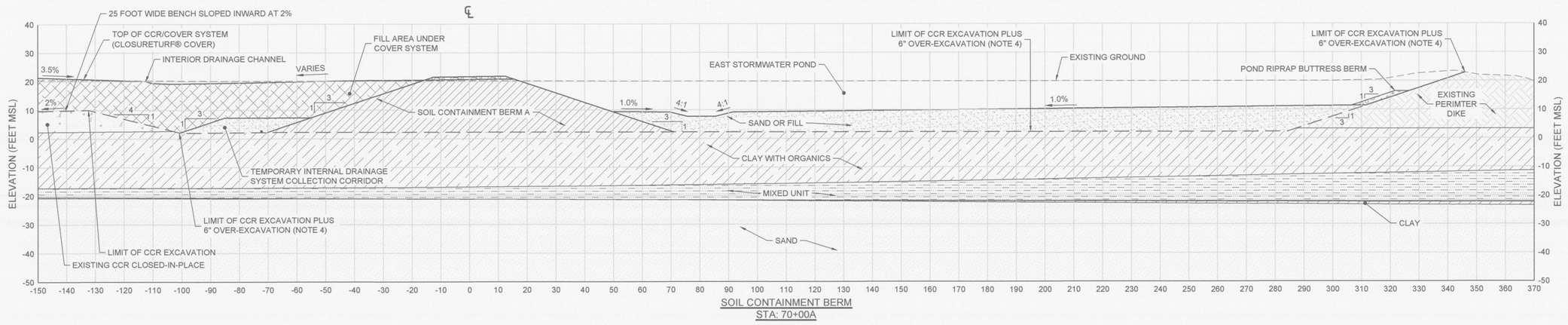
L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C025



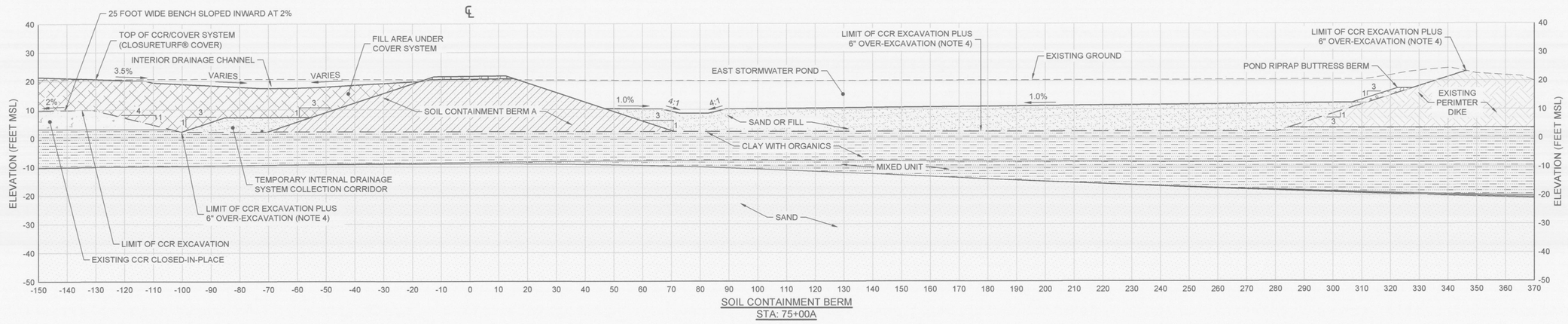
SOIL CONTAINMENT BERM
STA: 55+00A

SOIL CONTAINMENT BERM
STA: 60+00A

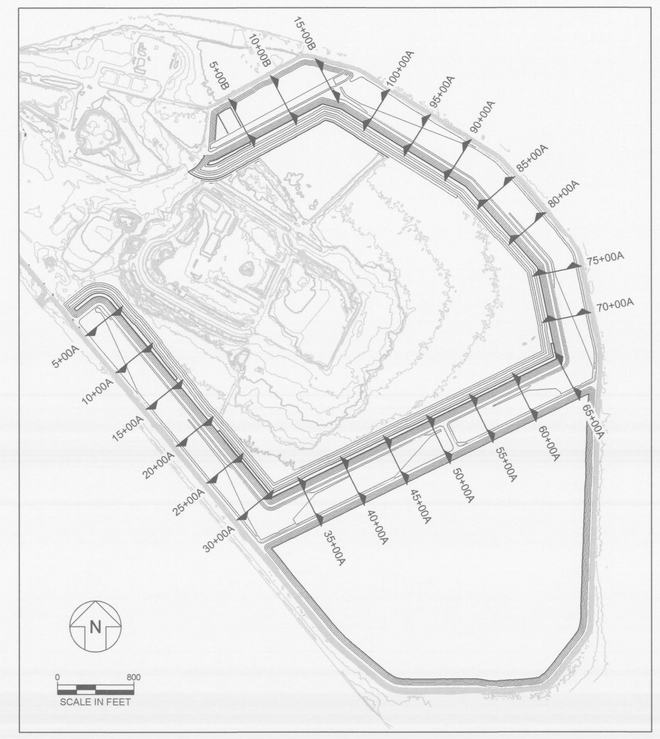
SOIL CONTAINMENT BERM
STA: 65+00A



SOIL CONTAINMENT BERM
STA: 70+00A



SOIL CONTAINMENT BERM
STA: 75+00A



KEY MAP
SCALE: 1" = 800'

LEGEND

- EXCAVATION SURFACE
- EXISTING GROUND
- FINISHED GRADE
- LITHOLOGIC CONTACT
- CCR / CCR FILL
- CCR CLOSED-IN-PLACE
- CLAY WITH ORGANICS
- EXISTING PERIMETER DIKE
- FILL
- LOWER CLAY UNIT
- LOWER SAND UNIT
- MIXED UNIT
- SAND OR FILL / SAND DRAINAGE
- SOIL CONTAINMENT BERM

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. SOIL CONTAINMENT BERM PLANS AND PROFILES ARE PRESENTED ON DRAWINGS 020 THROUGH 024.
3. LIMIT OF CCR EXCAVATION SLOPES AND CONFIGURATION OF CUT SLOPES WILL BE OPTIMIZED BASED ON FURTHER GEOTECHNICAL ANALYSIS PERFORMED PRIOR TO AND DURING CONSTRUCTION.
4. EXCAVATION GRADING SHOWN REPRESENTS THE EXCAVATION SURFACE FOR CCR REMOVAL, INCLUDING AN ADDITIONAL MINIMUM SIX INCHES OVER-EXCAVATION. EXCAVATION GRADES WERE DEVELOPED FROM ESTIMATED TOP OF UNDERLYING CLAY GRADES AND AN ESTIMATED 3H:1V INTERIOR SLOPE OF THE EXISTING PERIMETER DIKE. THE VERTICAL EXTENT OF EXISTING CCR PRESENTED IS BASED ON ESTIMATED TOP OF UNDERLYING CLAY SURFACE DERIVED FROM FIELD BORINGS. IN AREAS TO UNDERGO CLOSURE BY REMOVAL, A MINIMUM OVER-EXCAVATION, BEYOND THE VERTICAL EXTENT OF CCR, OF SIX INCHES WILL BE CONDUCTED TO ACHIEVE THE FINAL EXCAVATION SURFACE. THE CONTRACTOR SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR. A MINIMUM OF SIX INCHES OF ADDITIONAL UNDERLYING SOIL SHALL BE REMOVED AS DEFINED AS CLOSURE BY REMOVAL.
5. PROJECTED LIMITS OF THE 6-INCH OVER-EXCAVATION TO BE FIELD VERIFIED.

0 20 40
SCALE IN FEET
(HORIZONTAL AND VERTICAL)

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

SCB CROSS SECTIONS III

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

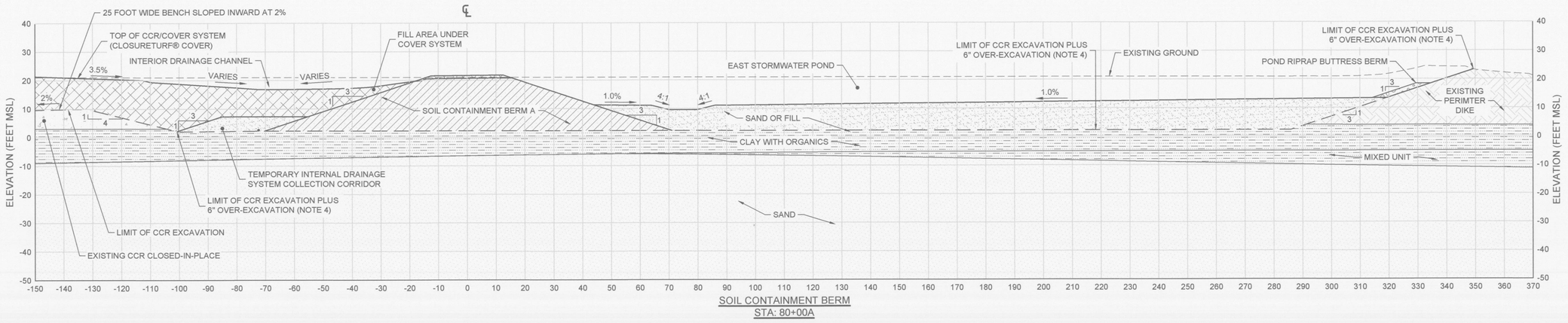
DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

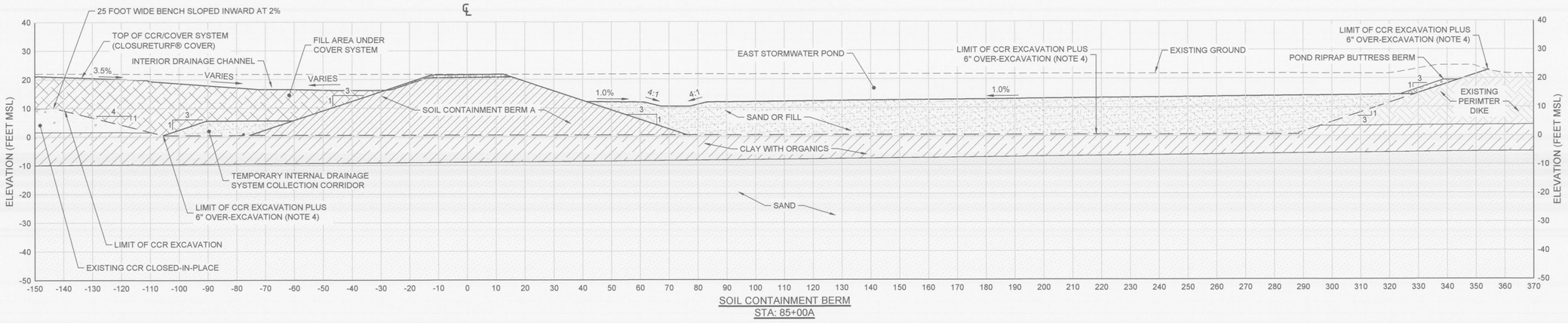
PROJ. NO.	GW6489	DWG. GW6489.04C025	SHEET 3
SCALE	1" = 20'	DRAWING 027 OF 097	
DATE	DECEMBER 2018		

L:\CADD\AVALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C025

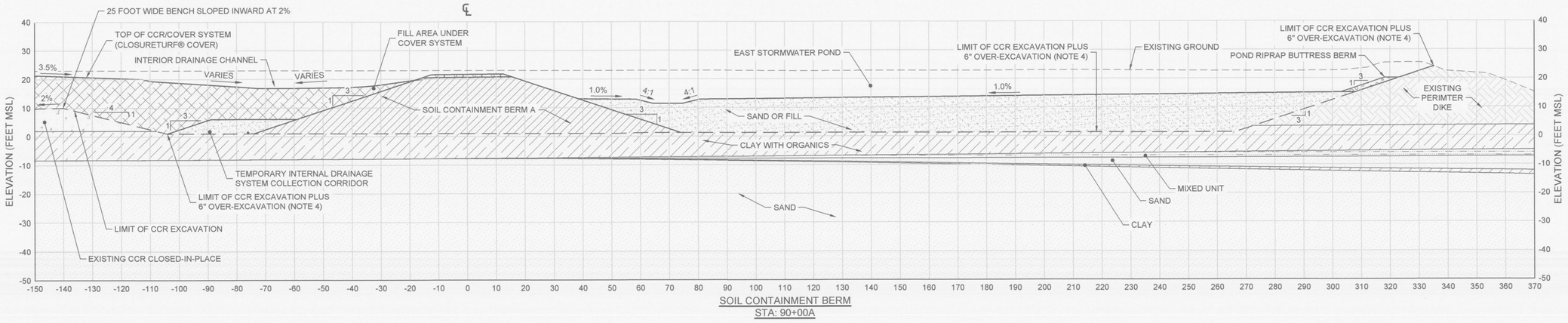
ANSI E: 44x34



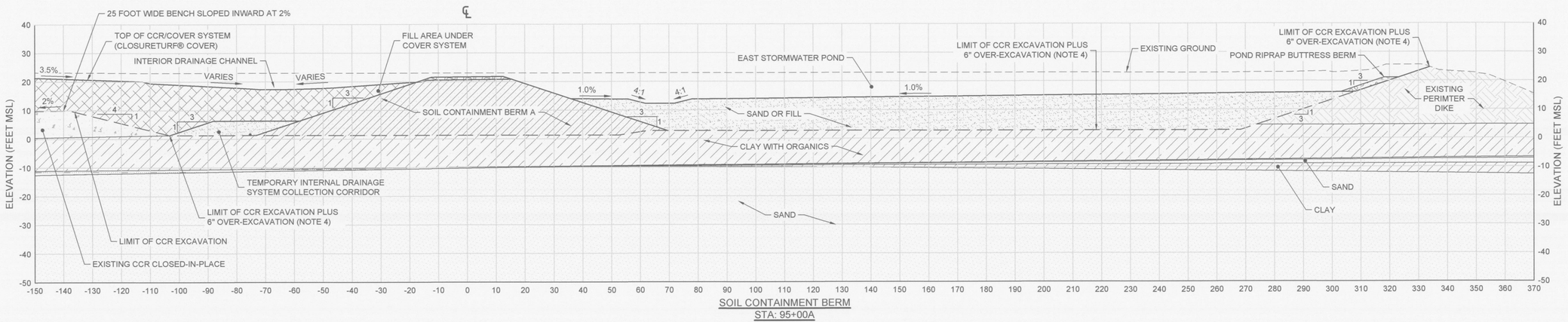
SOIL CONTAINMENT BERM
STA: 80+00A



SOIL CONTAINMENT BERM
STA: 85+00A



SOIL CONTAINMENT BERM
STA: 90+00A



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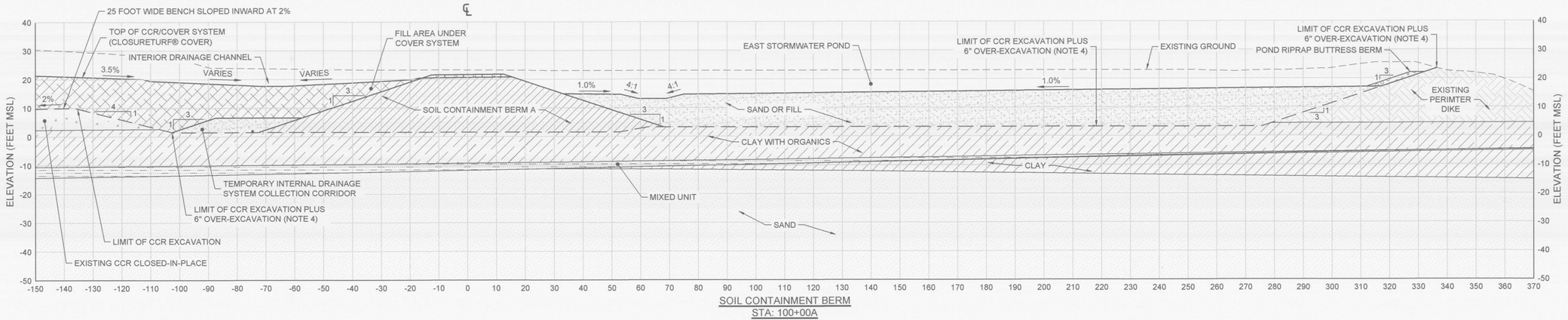
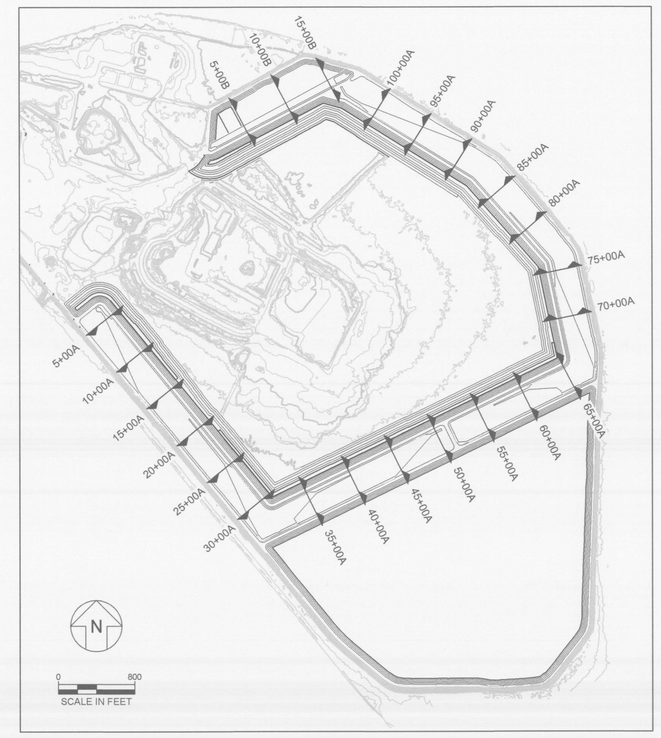
STA: 95+00A



SOIL CONTAINMENT BERM
STA: 100+00A



KEY MAP
SCALE: 1" = 800'

LEGEND

- EXCAVATION SURFACE
- EXISTING GROUND
- FINISHED GRADE
- LITHOLOGIC CONTACT
- CCR / CCR FILL
- CCR CLOSED-IN-PLACE
- CLAY WITH ORGANICS
- EXISTING PERIMETER DIKE
- LOWER CLAY UNIT
- LOWER SAND UNIT
- MIXED UNIT
- SAND OR FILL / SAND DRAINAGE
- SOIL CONTAINMENT BERM

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. SOIL CONTAINMENT BERM PLANS AND PROFILES ARE PRESENTED ON DRAWINGS 020 THROUGH 024.
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5. PROJECTED LIMITS OF THE 6-INCH OVER EXCAVATION TO BE FIELD VERIFIED.

0 20 40
SCALE IN FEET
(HORIZONTAL AND VERTICAL)

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

SCB CROSS SECTIONS IV

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

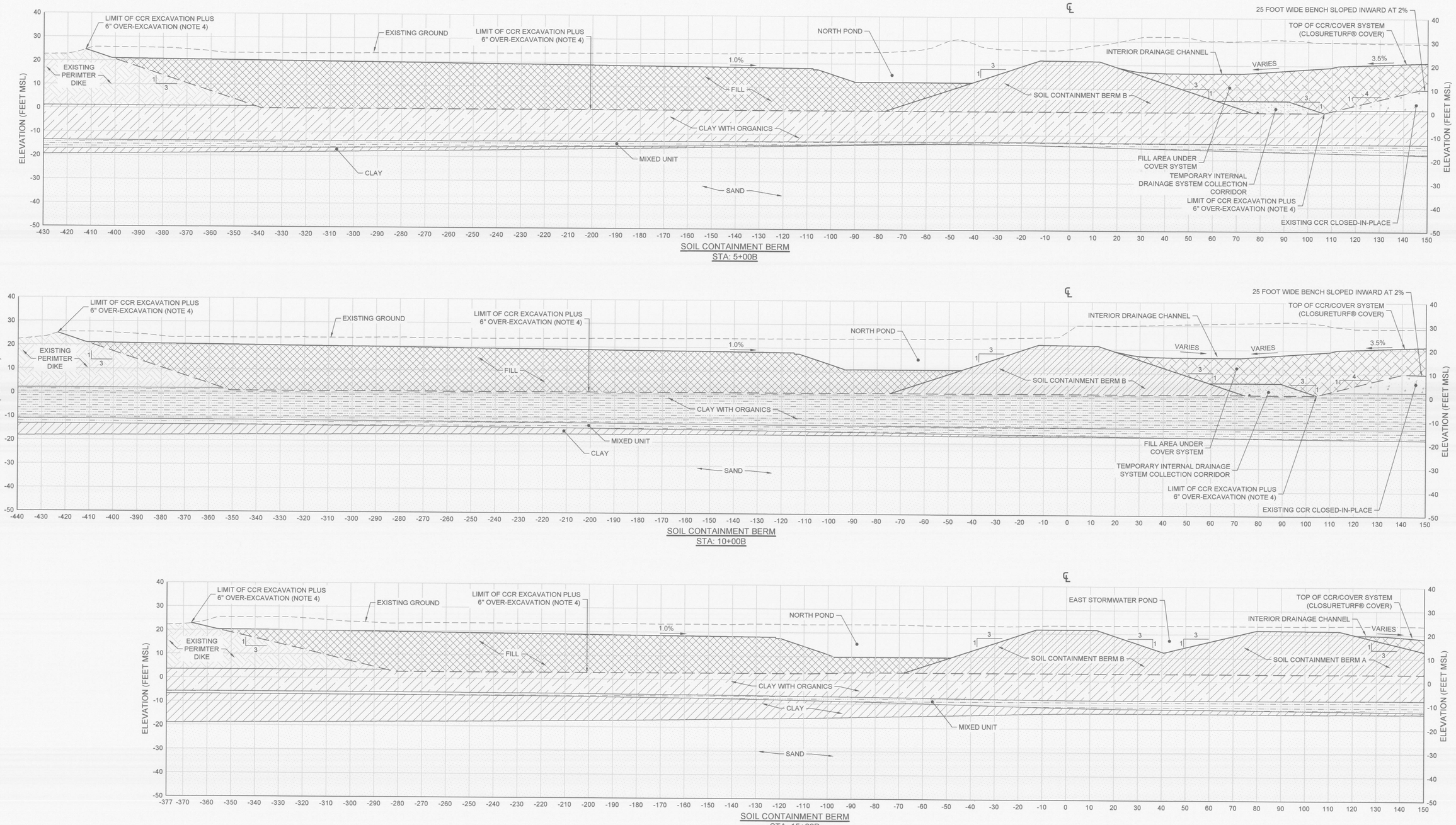
Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

PROJ. NO.	GW6489	DWG. GW6489.04C025	SHEET 4
SCALE	1" = 20'	DRAWING 028 OF 097	
DATE	DECEMBER 2018		

ANSI E: 44x34

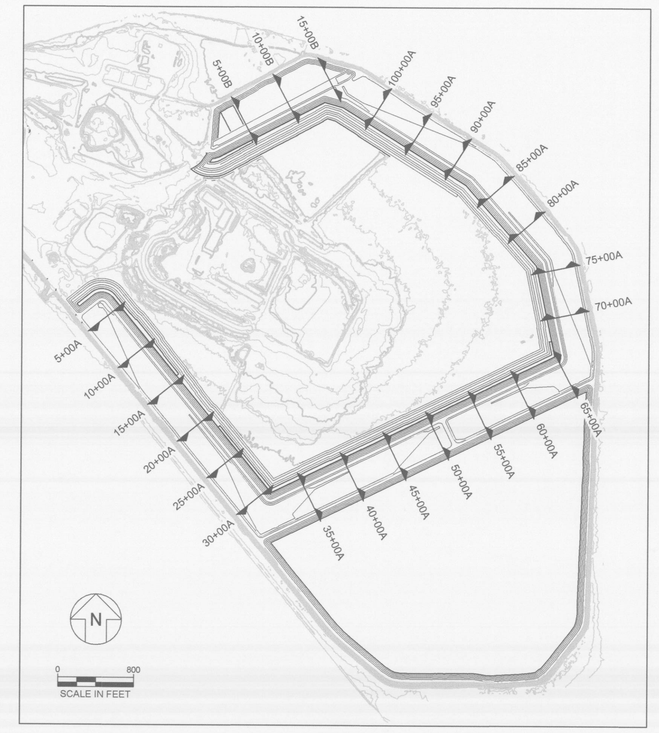
L:\CADD\AVL\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C025



SOIL CONTAINMENT BERM
STA: 5+00B

SOIL CONTAINMENT BERM
STA: 10+00B

SOIL CONTAINMENT BERM
STA: 15+00B



KEY MAP
SCALE: 1" = 800'

LEGEND

- EXCAVATION SURFACE
- EXISTING GROUND
- FINISHED GRADE
- LITHOLOGIC CONTACT
- CCR / CCR FILL
- CCR CLOSED-IN-PLACE
- CLAY WITH ORGANICS
- EXISTING PERIMETER DIKE
- FILL
- LOWER CLAY UNIT
- LOWER SAND UNIT
- MIXED UNIT
- SAND OR FILL / SAND DRAINAGE
- SOIL CONTAINMENT BERM

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. SOIL CONTAINMENT BERM PLANS AND PROFILES ARE PRESENTED ON DRAWINGS 020 THROUGH 024.
3. LIMIT OF CCR EXCAVATION SLOPES AND CONFIGURATION OF CUT SLOPES WILL BE OPTIMIZED BASED ON FURTHER GEOTECHNICAL ANALYSIS PERFORMED PRIOR TO AND DURING CONSTRUCTION.
4. EXCAVATION GRADING SHOWN REPRESENTS THE EXCAVATION SURFACE FOR CCR REMOVAL, INCLUDING AN ADDITIONAL MINIMUM SIX INCHES OVER-EXCAVATION. EXCAVATION GRADES WERE DEVELOPED FROM ESTIMATED TOP OF UNDERLYING CLAY GRADES AND AN ESTIMATED 3H:1V INTERIOR SLOPE OF THE EXISTING PERIMETER DIKE. THE VERTICAL EXTENT OF EXISTING CCR PRESENTED IS BASED ON ESTIMATED TOP OF UNDERLYING CLAY SURFACE DERIVED FROM FIELD BORINGS. IN AREAS TO UNDERGO CLOSURE BY REMOVAL, A MINIMUM OVER-EXCAVATION, BEYOND THE VERTICAL EXTENT OF CCR, OF SIX INCHES WILL BE CONDUCTED TO ACHIEVE THE FINAL EXCAVATION SURFACE. THE CONTRACTOR SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR. A MINIMUM OF SIX INCHES OF ADDITIONAL UNDERLYING SOIL SHALL BE REMOVED AS DEFINED AS CLOSURE BY REMOVAL.
5. PROJECTED LIMITS OF THE 6-INCH OVER EXCAVATION TO BE FIELD VERIFIED.

0 20 40
SCALE IN FEET
(HORIZONTAL AND VERTICAL)

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

SCB CROSS SECTIONS V

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C025	SHEET 5
SCALE	1" = 20'	DRAWING 029 OF 097	
DATE	DECEMBER 2018		

L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C025

ANSI E: 44x34

L:\CADD\ALABAMA POWER\PLANT BARRY CWM\BIDCONSTRUCTION\DWMISC\DWM69.04C029

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

SEAL

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO

SCS DETAILS

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3644
PHONE: 678.202.8600
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6469
SCALE	AS SHOWN
DATE	DECEMBER 2018
DWG.	GW6469 04C029
SHEET	1

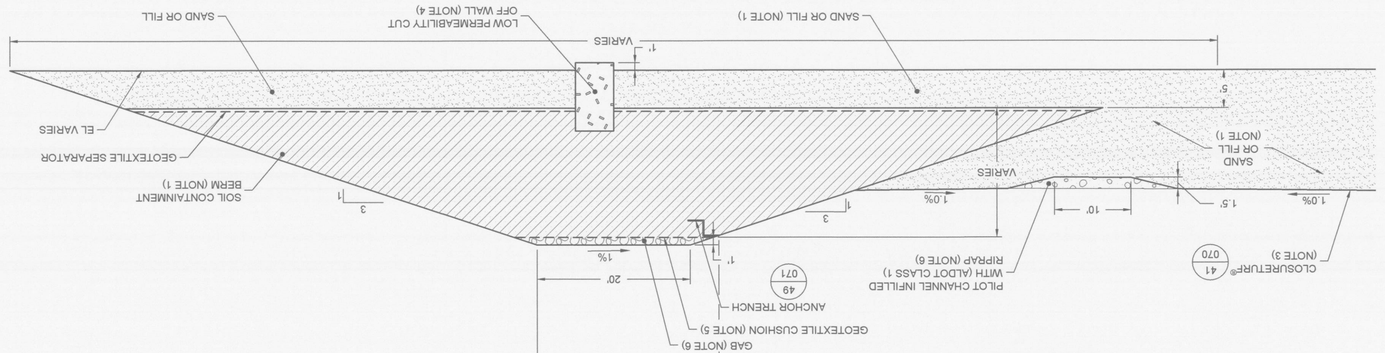
DRAWING 030 OF 097

ANSI E 44X34

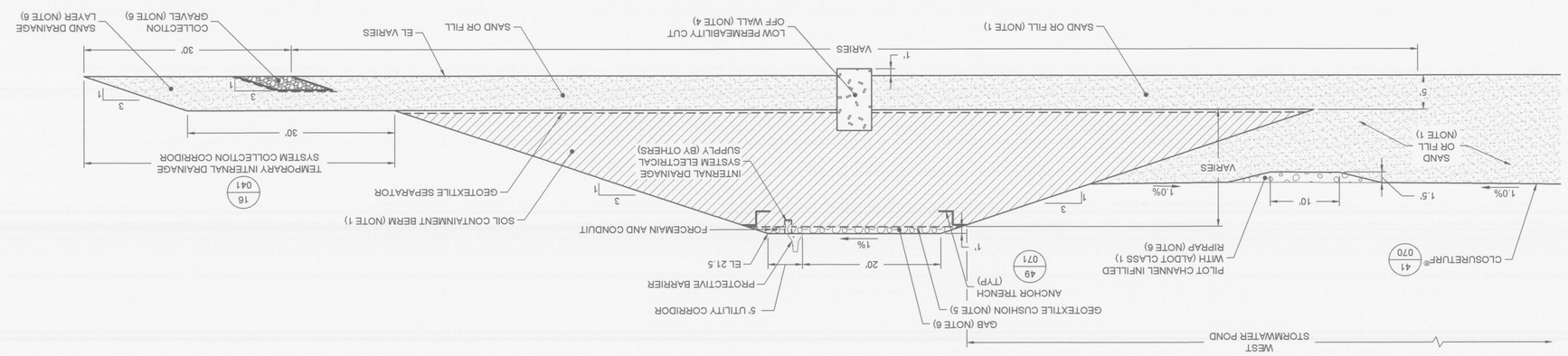
NOTES:

1. FILL MATERIALS FOR THE STORMWATER PONDS AND THE SOIL CONTAINMENT BERM SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 23 00.
2. THE METHODS TO PROVIDE HYDRAULIC CONTAINMENT OF THE SOIL CONTAINMENT BERM ARE UNDER CONSIDERATION WITH SCS/APC/TA AND WILL BE OPTIMIZED DURING LATER DESIGN STAGES.
3. CLOSURETURF SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 35 19.
4. EARTHWORK SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 23 00.
5. GEOTEXTILE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.13.
6. AGGREGATE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 16.

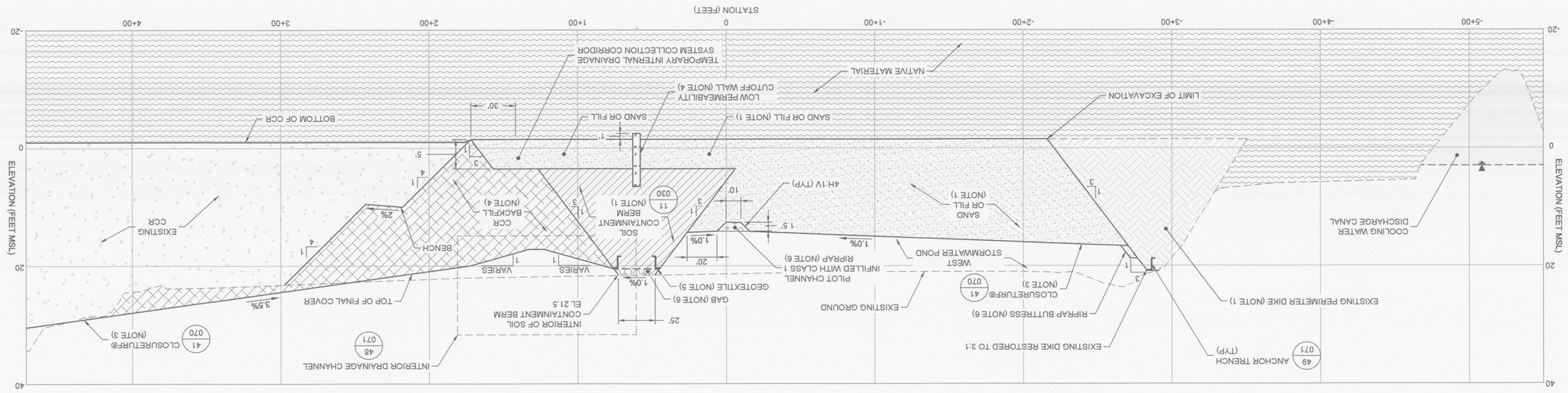
12 / 006 DETAIL
SOIL CONTAINMENT BERM C
SCALE: 1" = 10'

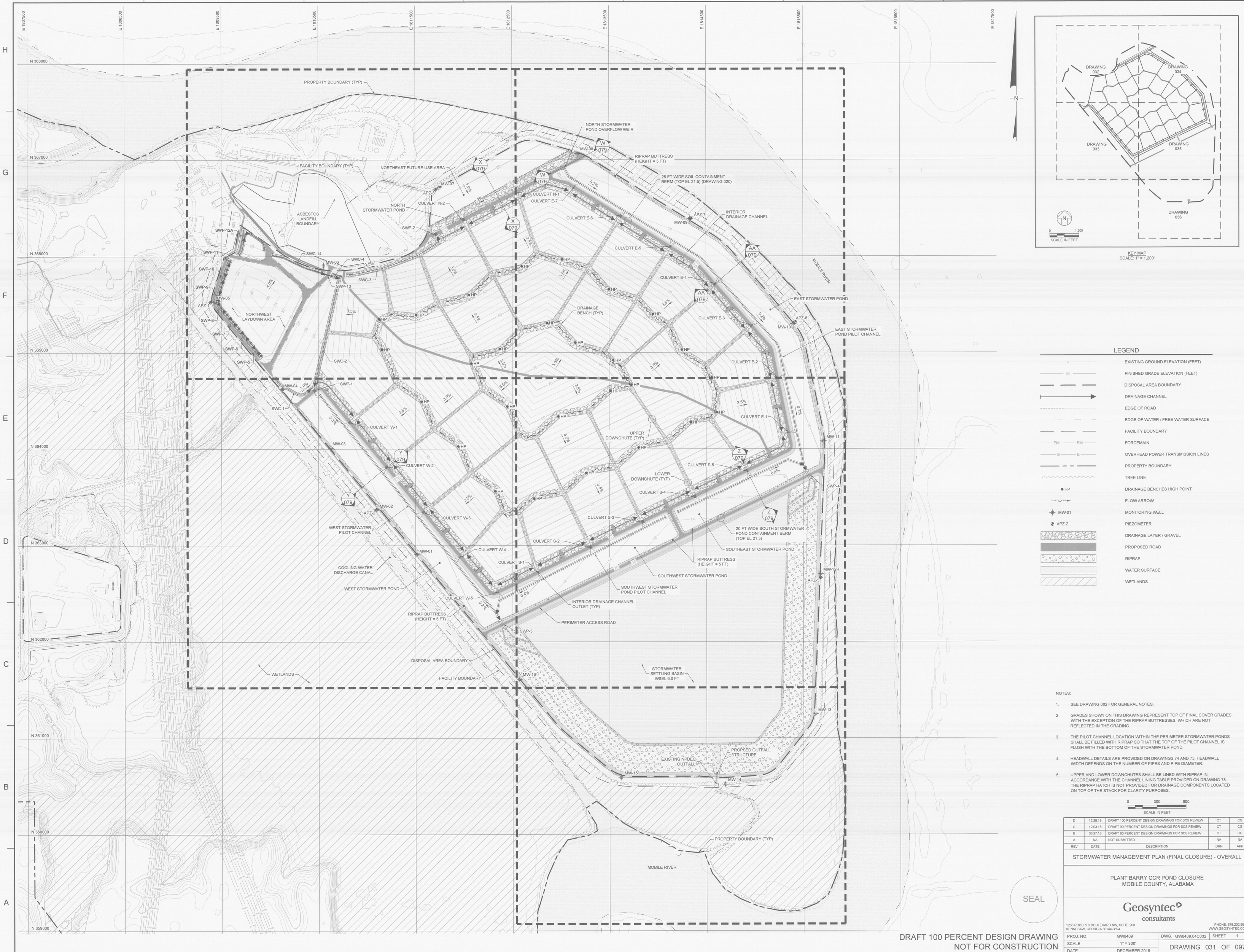


11 / 006 DETAIL
SOIL CONTAINMENT BERMS A AND B
SCALE: 1" = 10'



10 / 018 DETAIL
CONTAINMENT SYSTEM
SCALE: 1" = 40' (H), 1" = 10' (V)





KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- DRAINAGE CHANNEL
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- FORCEMAIN
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- DRAINAGE BENCHES HIGH POINT
- FLOW ARROW
- MONITORING WELL
- PIEZOMETER
- DRAINAGE LAYER / GRAVEL
- PROPOSED ROAD
- RIPRAP
- WATER SURFACE
- WETLANDS

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. GRADES SHOWN ON THIS DRAWING REPRESENT TOP OF FINAL COVER GRADES WITH THE EXCEPTION OF THE RIPRAP BUTTRESSES, WHICH ARE NOT REFLECTED IN THE GRADING.
3. THE PILOT CHANNEL LOCATION WITHIN THE PERIMETER STORMWATER PONDS SHALL BE FILLED WITH RIPRAP SO THAT THE TOP OF THE PILOT CHANNEL IS FLUSH WITH THE BOTTOM OF THE STORMWATER POND.
4. HEADWALL DETAILS ARE PROVIDED ON DRAWINGS 74 AND 75. HEADWALL WIDTH DEPENDS ON THE NUMBER OF PIPES AND PIPE DIAMETER.
5. UPPER AND LOWER DOWNCHUTES SHALL BE LINED WITH RIPRAP IN ACCORDANCE WITH THE CHANNEL LINING TABLE PROVIDED ON DRAWING 78. THE RIPRAP HATCH IS NOT PROVIDED FOR DRAINAGE COMPONENTS LOCATED ON TOP OF THE STACK FOR CLARITY PURPOSES.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT PLAN (FINAL CLOSURE) - OVERALL

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

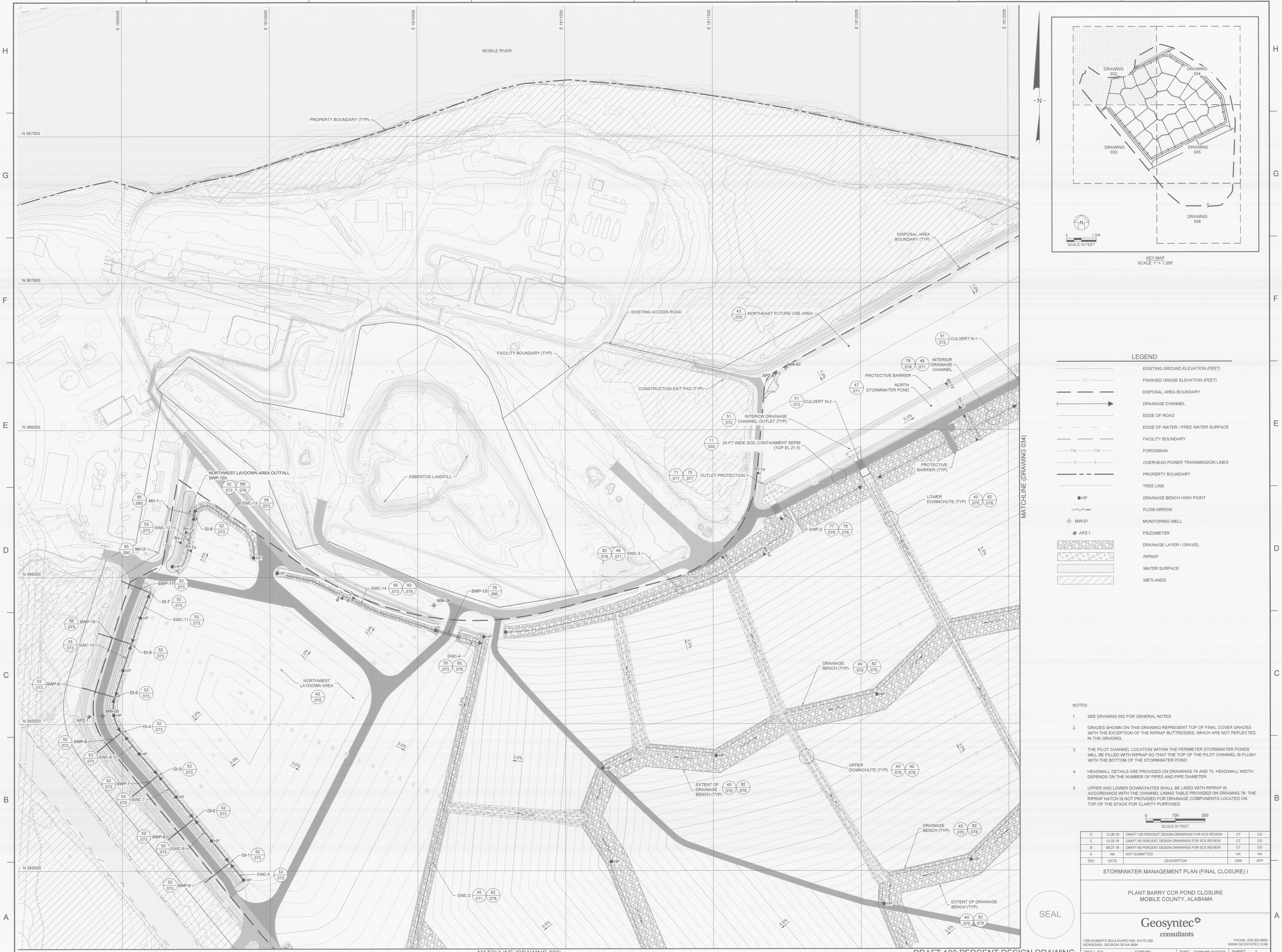
Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C032	SHEET 1
SCALE	1" = 300'	DRAWING 031 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

L:\CADD\MAL\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C032



KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- DRAINAGE CHANNEL
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- FORCEMAIN
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- DRAINAGE BENCH HIGH POINT
- FLOW ARROW
- MONITORING WELL
- PIEZOMETER
- DRAINAGE LAYER / GRAVEL
- RIPRAP
- WATER SURFACE
- WETLANDS

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. GRADES SHOWN ON THIS DRAWING REPRESENT TOP OF FINAL COVER GRADES WITH THE EXCEPTION OF THE RIPRAP BUTTRESSES, WHICH ARE NOT REFLECTED IN THE GRADING.
3. THE PILOT CHANNEL LOCATION WITHIN THE PERIMETER STORMWATER PONDS WILL BE FILLED WITH RIPRAP SO THAT THE TOP OF THE PILOT CHANNEL IS FLUSH WITH THE BOTTOM OF THE STORMWATER POND.
4. HEADWALL DETAILS ARE PROVIDED ON DRAWINGS 74 AND 75. HEADWALL WIDTH DEPENDS ON THE NUMBER OF PIPES AND PIPE DIAMETER.
5. UPPER AND LOWER DOWNCHUTES SHALL BE LINED WITH RIPRAP IN ACCORDANCE WITH THE CHANNEL LINING TABLE PROVIDED ON DRAWING 78. THE RIPRAP HATCH IS NOT PROVIDED FOR DRAINAGE COMPONENTS LOCATED ON TOP OF THE STACK FOR CLARITY PURPOSES.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT PLAN (FINAL CLOSURE) I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
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KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C033
SCALE	1" = 100'	SHEET	1
DATE	DECEMBER 2018	DRAWING	032 OF 097

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

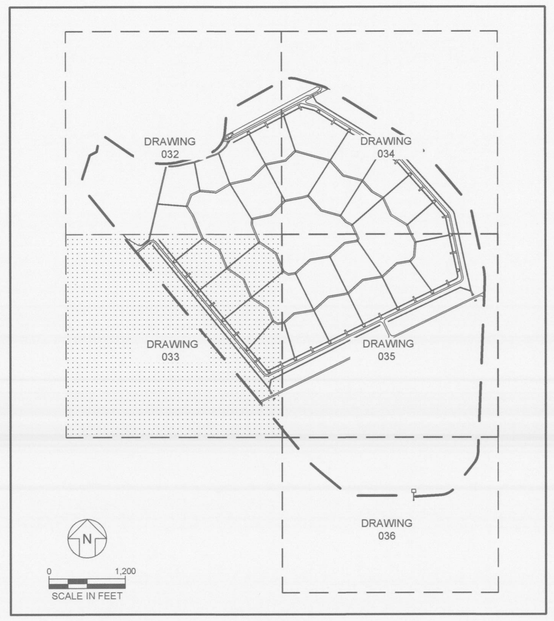
MATCHLINE (DRAWING 032)

MATCHLINE (DRAWING 035)

E 1809500 E 1810000 E 1810500 E 1811000 E 1811500 E 1812000 E 1812500

N 364500 N 364000 N 363500 N 363000 N 362500 N 362000

SWC-2 (45/071, 82/078)
SWC-1 (44/071, 82/078)
SWP-1 (76/078, 78/078)
MW-04
OUTLET PROTECTION (70/077, 71/077)
CULVERT W-1 (51/072)
WEST STORMWATER POND PILOT CHANNEL
PROPOSED PERIMETER ACCESS ROAD
FACILITY BOUNDARY (TYP)
MW-03
DISPOSAL AREA BOUNDARY
CULVERT W-2 (51/072)
WETLANDS
RIPRAP BUTTRESS (HEIGHT = 5 FT) (Y/079)
25-FT WIDE SOIL CONTAINMENT BERM (TOP EL 21.5) (11/030)
MW-02
APZ-2
WEST STORMWATER POND
CULVERT W-3 (51/072)
COOLING WATER DISCHARGE CANAL
OUTLET PROTECTION (TYP) (70/077, 71/077)
INTERIOR DRAINAGE CHANNEL OUTLET (TYP) (51/072)
MW-01
INTERIOR DRAINAGE CHANNEL (48/071, 78/078)
CULVERT W-4 (51/072)
CULVERT W-5 (51/072)
SOUTHWEST STORMWATER POND
20-FT WIDE SOUTH STORMWATER POND CONTAINMENT BERM (TOP EL 21.5) (DRAWING 020)
PROPOSED PERIMETER ACCESS ROAD
SWP-3 (79/078, 62/075)
DRAINAGE BENCH (TYP) (40/070, 82/078)
EXTENT OF DRAINAGE BENCH (TYP) (40/070, 82/078)
UPPER DOWNCHUTE (TYP) (40/070, 82/078)
LOWER DOWNCHUTE (TYP) (40/070, 82/078)
HP
3.5%
1.0%
0.2%
3H:1V



KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- DRAINAGE CHANNEL
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- FM — FORCEMAIN
- E — OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- HP — DRAINAGE BENCH HIGH POINT
- FLOW ARROW
- MW-01 — MONITORING WELL
- APZ-1 — PIEZOMETER
- DRAINAGE LAYER / GRAVEL
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE
- WETLANDS

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. GRADES SHOWN ON THIS DRAWING REPRESENT TOP OF FINAL COVER GRADES WITH THE EXCEPTION OF THE RIPRAP BUTTRESSES, WHICH ARE NOT REFLECTED IN THE GRADING.
3. THE PILOT CHANNEL LOCATION WITHIN THE PERIMETER STORMWATER PONDS SHALL BE FILLED WITH RIPRAP SO THAT THE TOP OF THE PILOT CHANNEL IS FLUSH WITH THE BOTTOM OF THE STORMWATER POND.
4. HEADWALL DETAILS ARE PROVIDED ON DRAWINGS 74 AND 75. HEADWALL WIDTH DEPENDS ON THE NUMBER OF PIPES AND PIPE DIAMETER.
5. UPPER AND LOWER DOWNCHUTES SHALL BE LINED WITH RIPRAP IN ACCORDANCE WITH THE CHANNEL LINING TABLE PROVIDED ON DRAWING 78. THE RIPRAP HATCH IS NOT PROVIDED FOR DRAINAGE COMPONENTS LOCATED ON TOP OF THE STACK FOR CLARITY PURPOSES.
6. ESTABLISH SIGNAGE AT END OF TURNAROUND ROAD AND AT ENTRANCES TO ACCESS ROADS. SIGNAGE TO STATE 'PASSENGER VEHICLES ONLY. NO HEAVY LOADS'. SIGNAGE TO BE ATTACHED TO PROTECTIVE BARRIERS OR OTHER SURFICIAL ANCHORAGE SO AS NOT TO PENETRATE FINAL GROUND SURFACE AND POTENTIALLY PIERCE THE GEOMEMBRANE LINER SYSTEM.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT PLAN (FINAL CLOSURE) II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

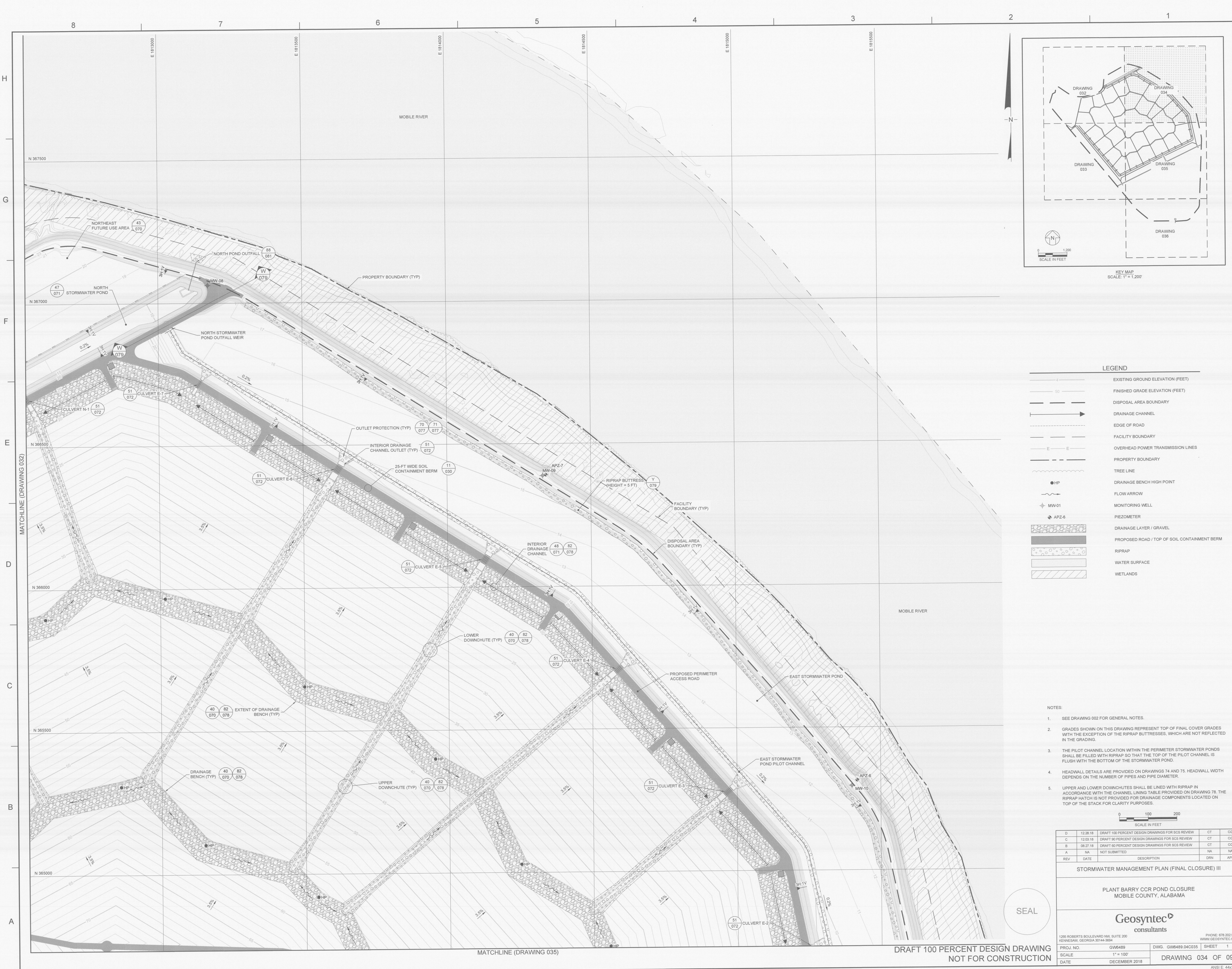
Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C034	SHEET 1
SCALE	1" = 100'	DRAWING 033 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

L:\CAD\WA\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C034

ANSI E: 44x34



KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- DRAINAGE CHANNEL
- EDGE OF ROAD
- FACILITY BOUNDARY
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- HP — DRAINAGE BENCH HIGH POINT
- FLOW ARROW
- MW-01 — MONITORING WELL
- APZ-6 — PIEZOMETER
- DRAINAGE LAYER / GRAVEL
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE
- WETLANDS

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. GRADES SHOWN ON THIS DRAWING REPRESENT TOP OF FINAL COVER GRADES WITH THE EXCEPTION OF THE RIPRAP BUTTRESSES, WHICH ARE NOT REFLECTED IN THE GRADING.
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0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT PLAN (FINAL CLOSURE) III

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C035	SHEET 1
SCALE	1" = 100'	DRAWING 034 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C035

MATCHLINE (DRAWING 034)

MATCHLINE (DRAWING 033)

MATCHLINE (DRAWING 036)

E 1813000 E 1813500 E 1814000 E 1814500 E 1815000 E 1815500

N 364500 N 364000 N 363500 N 363000 N 362500 N 362000

DRAINAGE BENCH (TYP) 40/070 82/078

UPPER DOWNCHUTE (TYP) 40/070 82/078

EXTENT OF DRAINAGE BENCH (TYP) 40/070 82/078

LOWER DOWNCHUTE (TYP) 40/070 82/078

CULVERT E-2 51/072

CULVERT E-1 51/072

EAST STORMWATER POND

RIPRAP BUTTRESS (HEIGHT = 5 FT) Y/079

FACILITY BOUNDARY (TYP)

DISPOSAL AREA BOUNDARY

EAST STORMWATER POND PILOT CHANNEL

MW-11

SWP-4 62/075 83/078

CULVERT S-5 51/072

SOUTHEAST STORMWATER POND PILOT CHANNEL

PROPOSED PERIMETER ACCESS ROAD

CULVERT S-4 51/072

OUTLET PROTECTION 70/077 71/077

SOUTHEAST STORMWATER POND

20 FT WIDE SOIL CONTAINMENT BERM 12/030

CULVERT S-3 51/072

25 FT WIDE SOIL CONTAINMENT BERM 11/030

CULVERT S-2 51/072

SOUTHWEST STORMWATER POND

SOUTHWEST STORMWATER POND PILOT CHANNEL

CULVERT S-1 51/072

COVER SYSTEM FOR INTERIOR DRAINAGE CHANNEL 48/071 78/078

RIPRAP BUTTRESS (HEIGHT = 5 FT) Y/079

PERIMETER ACCESS ROAD

STORMWATER SETTLING BASIN

MW-16

MW-12R

APZ-5

MOBILE RIVER

PROPERTY BOUNDARY (TYP)

3H:1V 0.2% 0.4% 3.5%

N

KEY MAP
SCALE: 1" = 1,200'

DRAWING 032 DRAWING 034 DRAWING 033 DRAWING 035 DRAWING 036

0 1,200
SCALE IN FEET

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- DRAINAGE CHANNEL
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- PROPERTY BOUNDARY
- TREE LINE
- HP — DRAINAGE BENCH HIGH POINT
- FLOW ARROW
- MW-01 — MONITORING WELL
- APZ-5 — PIEZOMETER
- DRAINAGE LAYER / GRAVEL
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE
- WETLANDS

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. GRADES SHOWN ON THIS DRAWING REPRESENT TOP OF FINAL COVER GRADES WITH THE EXCEPTION OF THE RIPRAP BUTTRESSES, WHICH ARE NOT REFLECTED IN THE GRADING.
3. THE PILOT CHANNEL LOCATION WITHIN THE PERIMETER STORMWATER PONDS SHALL BE FILLED WITH RIPRAP SO THAT THE TOP OF THE PILOT CHANNEL IS FLUSH WITH THE BOTTOM OF THE STORMWATER POND.
4. HEADWALL DETAILS ARE PROVIDED ON DRAWINGS 74 AND 75. HEADWALL WIDTH DEPENDS ON THE NUMBER OF PIPES AND PIPE DIAMETER.
5. UPPER AND LOWER DOWNCHUTES SHALL BE LINED WITH RIPRAP IN ACCORDANCE WITH THE CHANNEL LINING TABLE PROVIDED ON DRAWING 78. THE RIPRAP HATCH IS NOT PROVIDED FOR DRAINAGE COMPONENTS LOCATED ON TOP OF THE STACK FOR CLARITY PURPOSES.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT PLAN (FINAL CLOSURE) IV

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3604
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C036	SHEET 1
SCALE	1" = 100'	DRAWING 035 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

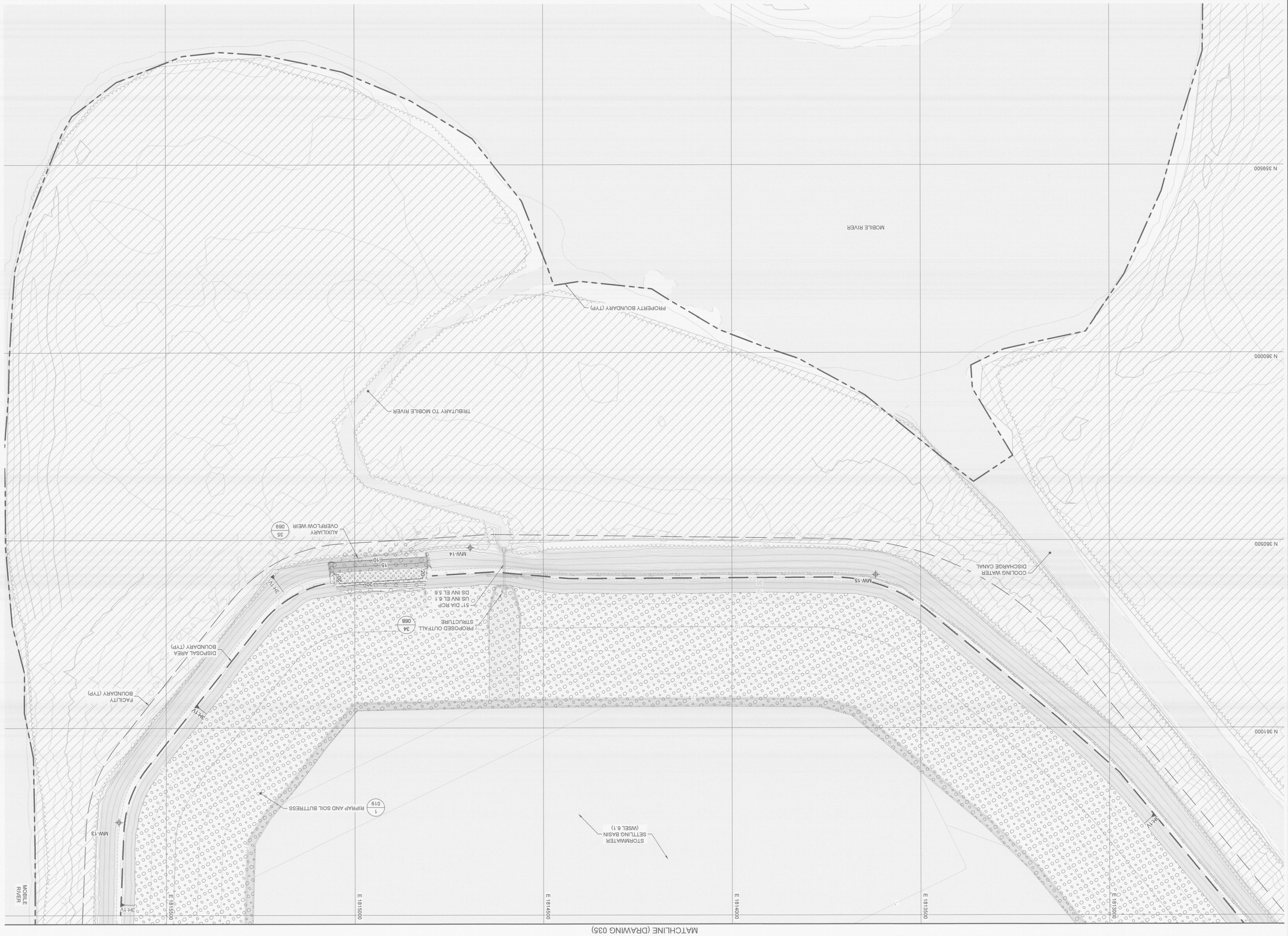
ANSI E: 44x34

L:\ACAD\AVIALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C036

L:\CAD\CIVIL\ALABAMA POWER\PLANT BARRY GWMB\GCONSTRUCTION\DRAWINGS\GW6489 040237

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

SEAL



LEGEND

4	EXISTING GROUND ELEVATION (FEET)
50	FINISHED GRADE ELEVATION (FEET)
	DISPOSAL AREA BOUNDARY
	EDGE OF ROAD
	EDGE OF WATER / FREE WATER SURFACE
FM FM	FACILITY BOUNDARY
FM FM	FOREMAIN
	PROPERTY BOUNDARY
	TREE LINE
HP	DRAINAGE BENCH HIGH POINT
MW-01	MONITORING WELL
	RIPRAP
	WATER SURFACE
	WETLANDS

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. GRADES SHOWN ON THIS DRAWING REPRESENT TOP OF FINAL COVER GRADES WITH THE EXCEPTION OF THE RIPRAP BUTTRESSES, WHICH ARE NOT REFLECTED IN THE GRADING.
3. THE PILOT CHANNEL LOCATION WITHIN THE PERIMETER STORMWATER PONDS SHALL BE FILLED WITH RIPRAP SO THAT THE TOP OF THE PILOT CHANNEL IS FLUSH WITH THE BOTTOM OF THE STORMWATER POND.
4. HEADWALL DETAILS ARE PROVIDED ON DRAWINGS 74 AND 75. HEADWALL WIDTH DEPENDS ON THE NUMBER OF PIPES AND PIPE DIAMETER.
5. UPPER AND LOWER DOWNCHUTES SHALL BE LINED WITH RIPRAP IN ACCORDANCE WITH THE CHANNEL LINING TABLE PROVIDED ON DRAWING 78. THE RIPRAP HATCH IS NOT PROVIDED FOR DRAINAGE COMPONENTS LOCATED ON TOP OF THE STACK FOR CLARITY PURPOSES.

SCALE IN FEET
0 100 200

REV	DATE	DESCRIPTION	DES	APP
A	NA	NOT SUBMITTED	NA	NA
B	08 27 18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12 03 18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
D	12 28 18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

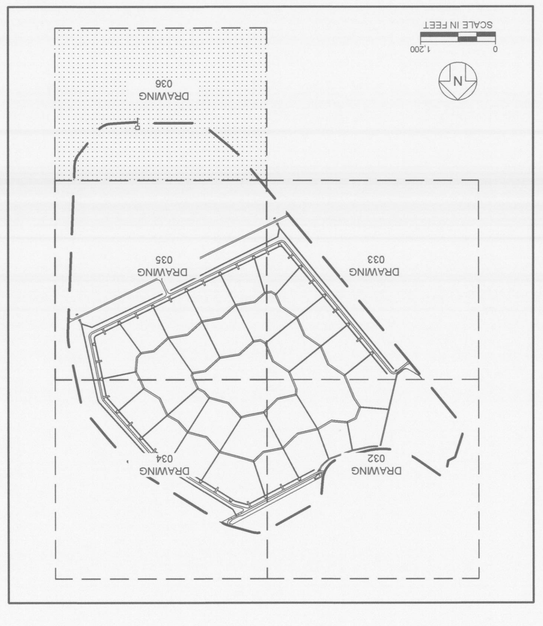
STORMWATER MANAGEMENT PLAN (FINAL CLOSURE) V

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

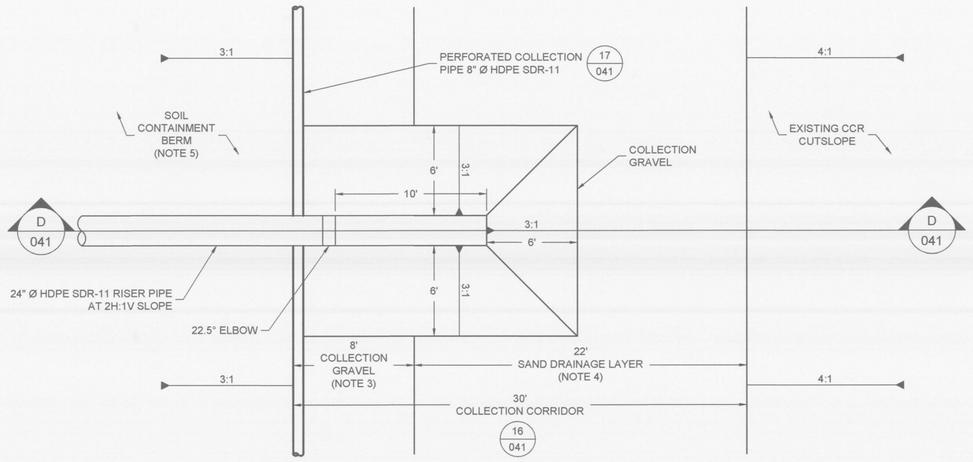
Geosyntec
consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678 202 8600
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489 040237	SHEET 1
SCALE	1" = 100'	DRAWING 036 OF 097	
DATE	DECEMBER 2018		

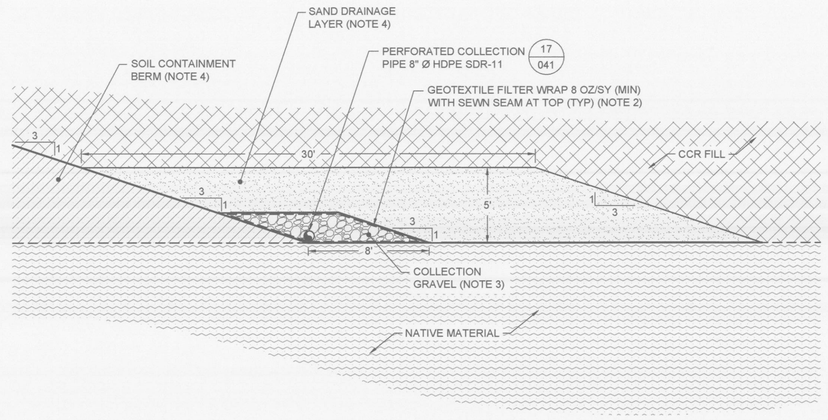
KEY MAP
SCALE: 1" = 1,200'



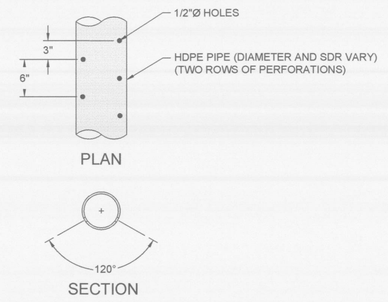
ANSI E: 44X34



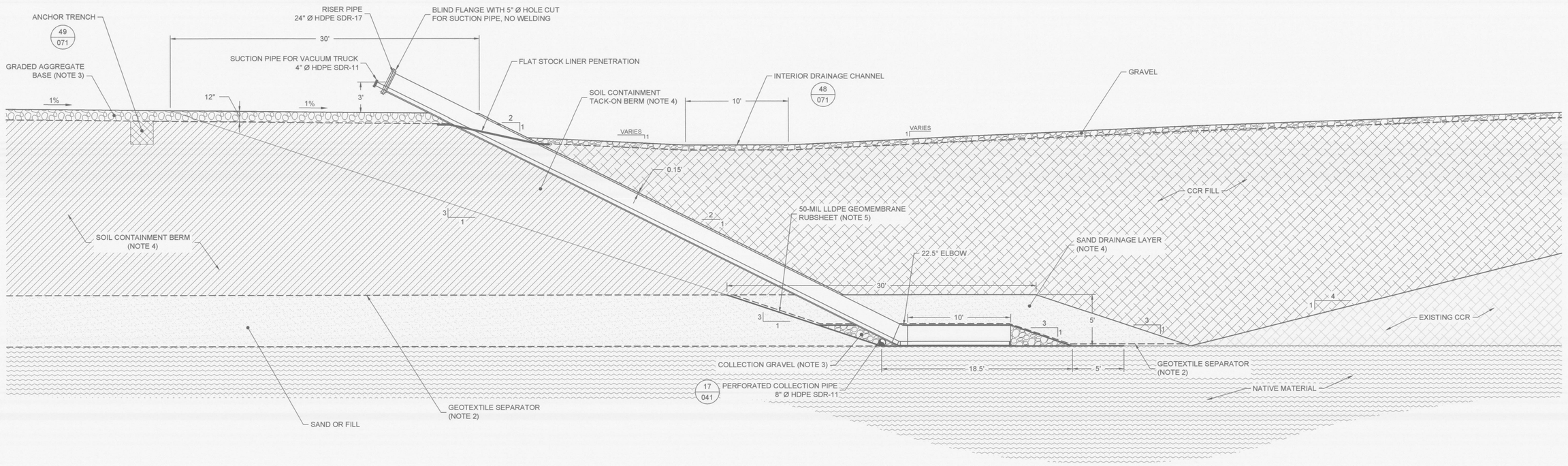
15 / 013 PLAN
TEMPORARY INTERNAL DRAINAGE SYSTEM COLLECTION PIPE
SCALE: 1" = 5'



16 / 018 DETAIL
TEMPORARY INTERNAL DRAINAGE SYSTEM COLLECTION CORRIDOR
SCALE: 1" = 5'



17 / 041 DETAIL
PERFORATIONS FOR TEMPORARY IDS PIPING
(NOTE 8)
SCALE: NTS



D / 037 SECTION
TEMPORARY INTERNAL DRAINAGE SYSTEM RISER PIPE
SCALE: 1" = 5'

NOTES:

1. PROCESS PIPING, VALVES, AND INSTRUMENTATION SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION 40 20 00.
2. GEOTEXTILE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.13.
3. AGGREGATE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 16.
4. EARTHWORK SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 23 00.
5. GEOMEMBRANE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.16.

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

TEMPORARY IDS DETAILS I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C047	SHEET 1
SCALE	AS SHOWN	DRAWING 041 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3684
PHONE: 678.202.8500
WWW.GEOSYNTEC.COM

SCALE	AS SHOWN
DATE	DECEMBER 2018

PROJ. NO.	GM6469	DWG.	GM6469 04C061	SHEET	1

DRAWING 044 OF 097

ANSI E 44X34

FREE WATER - CONTACT WATER MANAGEMENT SYSTEM

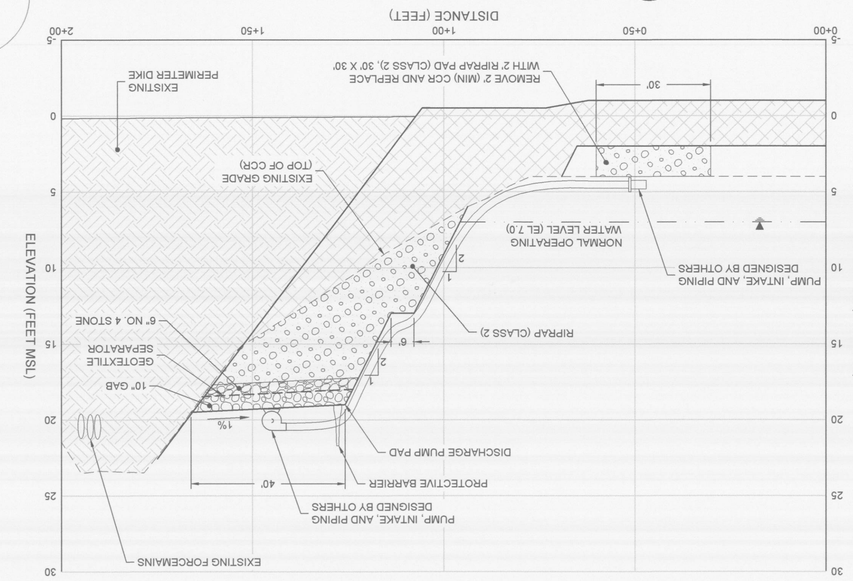
REV	DATE	DESCRIPTION	DSN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	06.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

NOTES:
1. SEE DRAWING 002 FOR GENERAL NOTES.
2. INSTALL DEWATERING PUMP NO. 1 AND ASSOCIATED DISCHARGE PIPING.
3. DO NOT EXCEED MAXIMUM ALLOWABLE DRAWDOWN RATE OF ONE FOOT PER WEEK PER ASH POND DEWATERING PLAN (GEOSYNTEC, 2018). INITIATE AND CONTINUE PUMPING SOUTH POND AT 4,000 GPM UNTIL POND LEVEL REACHES ELEVATION 7.0 (3 FT ABOVE TOP OF CCR).
4. INSTALL RIPRAP FILTER BERM WHILE MAINTAINING SOUTH POND LEVEL AT EL 7.0. REMOVE CCR WHERE INDICATED WITHIN INTERIOR LIMITS OF FILTER BERM AND REPLACE WITH 2 FT OF RIPRAP LAYER. CONTINUE OPERATING PUMP NO. 1.
5. INSTALL DEWATERING PUMP NO. 2 AND ASSOCIATED DISCHARGE PIPING.
6. INITIATE AND CONTINUE PUMPING NORTH POND UNTIL POND IS DEWATERED TO THE DESIRED LEVEL. DO NOT EXCEED MAXIMUM ALLOWABLE DRAWDOWN RATE PER ASH POND DEWATERING PLAN (GEOSYNTEC, 2018).

DEWATERING PUMP SCHEDULE

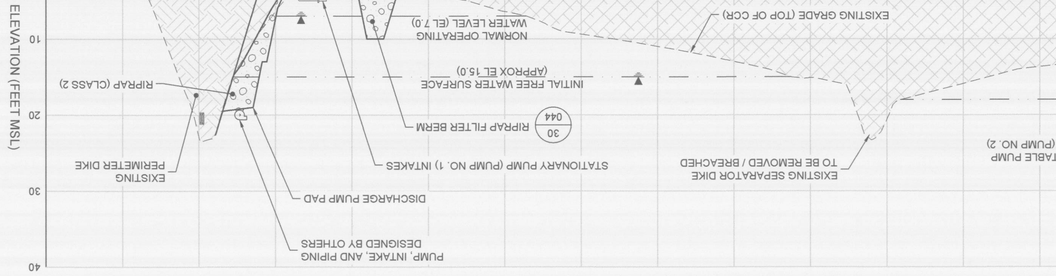
PUMP NO.	APPROXIMATE INITIAL WATER SURFACE ELEVATION (FT MSL)	APPROXIMATE TOP OF CCR (FT MSL)	APPROXIMATE VOLUME OF FREE WATER TO BE REMOVED (AC-FT)	ANTICIPATED PUMPING RATE (GPM)	MAXIMUM ALLOWABLE FREE WATER DRAWDOWN RATE
1	15.0	4.0	158	4,000	1 FT PER WEEK
2	18.0	12.0	97	TBD	1 FT PER WEEK

32 / - TABLE
DEWATERING PUMP SCHEDULE

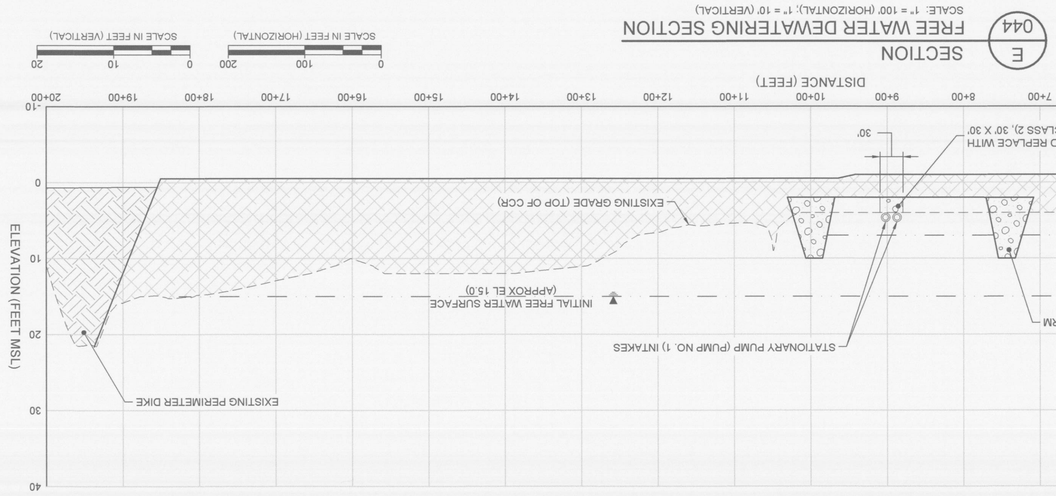


G / 044 SECTION
DEWATERING PUMP PAD
SCALE: 1" = 20' (HORIZONTAL); 1" = 5' (VERTICAL)
SCALE IN FEET (HORIZONTAL): 0, 20, 40
SCALE IN FEET (VERTICAL): 0, 5, 10

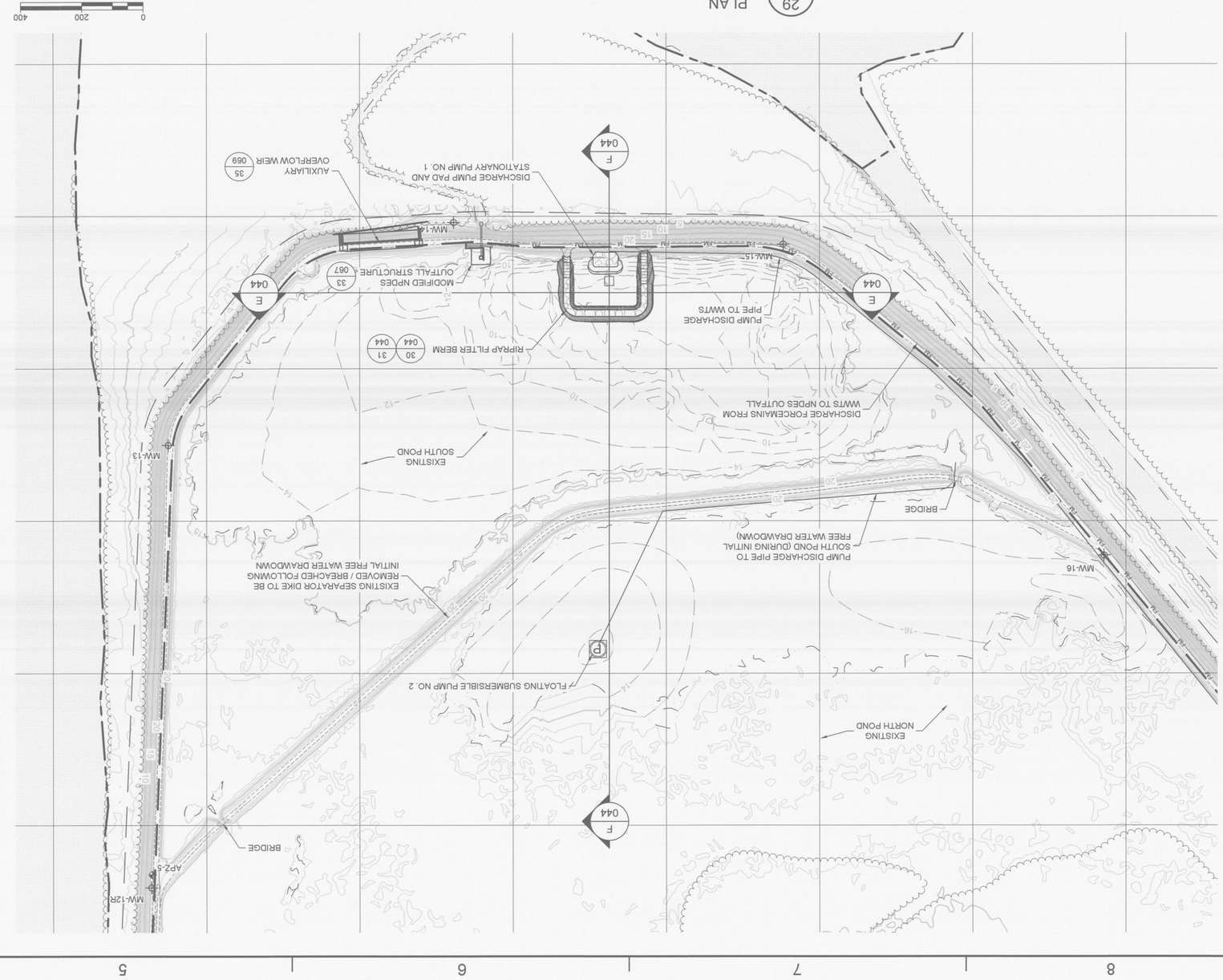
SEAL



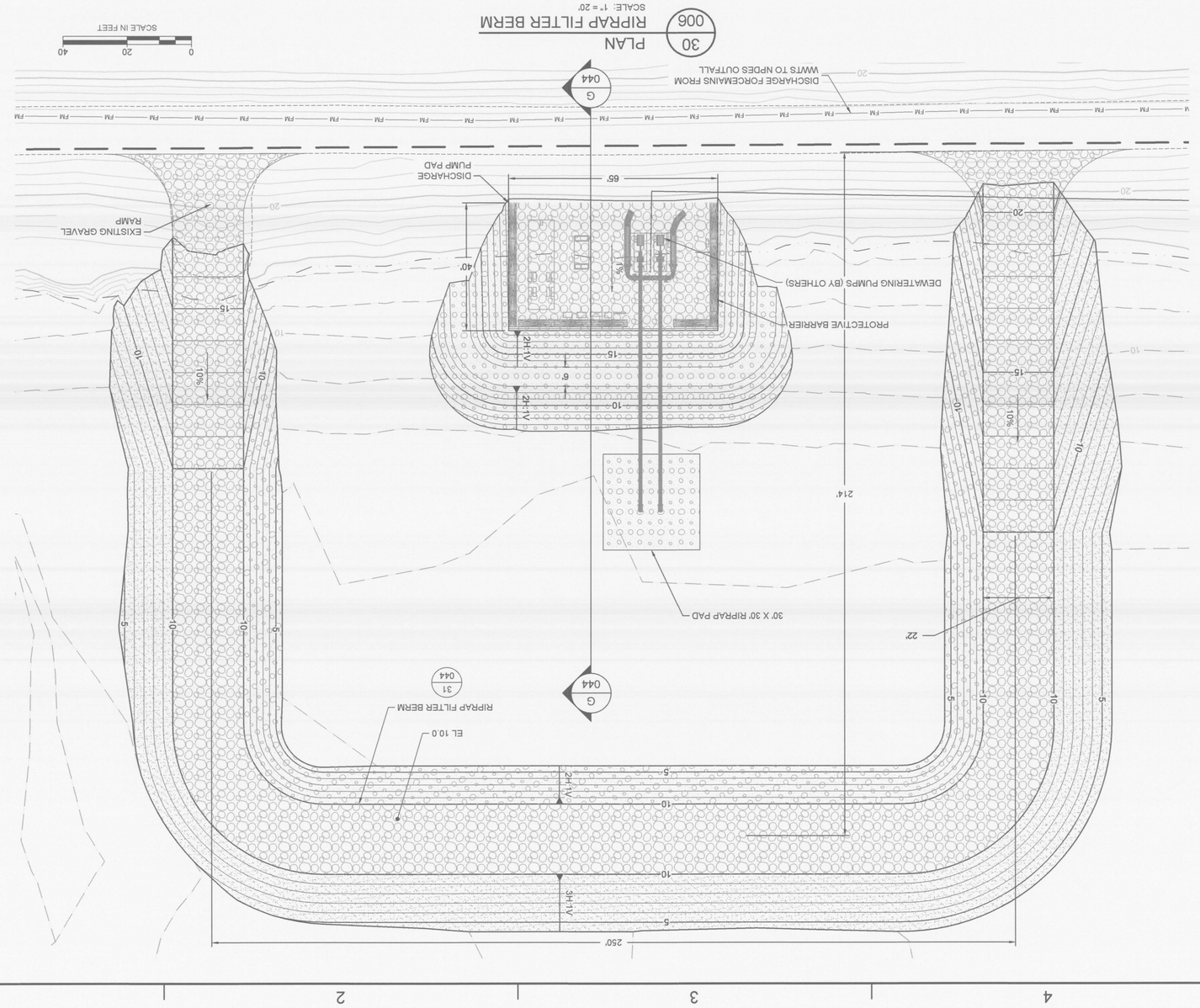
F / 044 SECTION
FREE WATER DEWATERING SECTION
SCALE: 1" = 100' (HORIZONTAL); 1" = 10' (VERTICAL)
SCALE IN FEET (HORIZONTAL): 0, 100, 200
SCALE IN FEET (VERTICAL): 0, 10, 20



E / 044 SECTION
FREE WATER DEWATERING SECTION
SCALE: 1" = 100' (HORIZONTAL); 1" = 10' (VERTICAL)
SCALE IN FEET (HORIZONTAL): 0, 100, 200
SCALE IN FEET (VERTICAL): 0, 10, 20

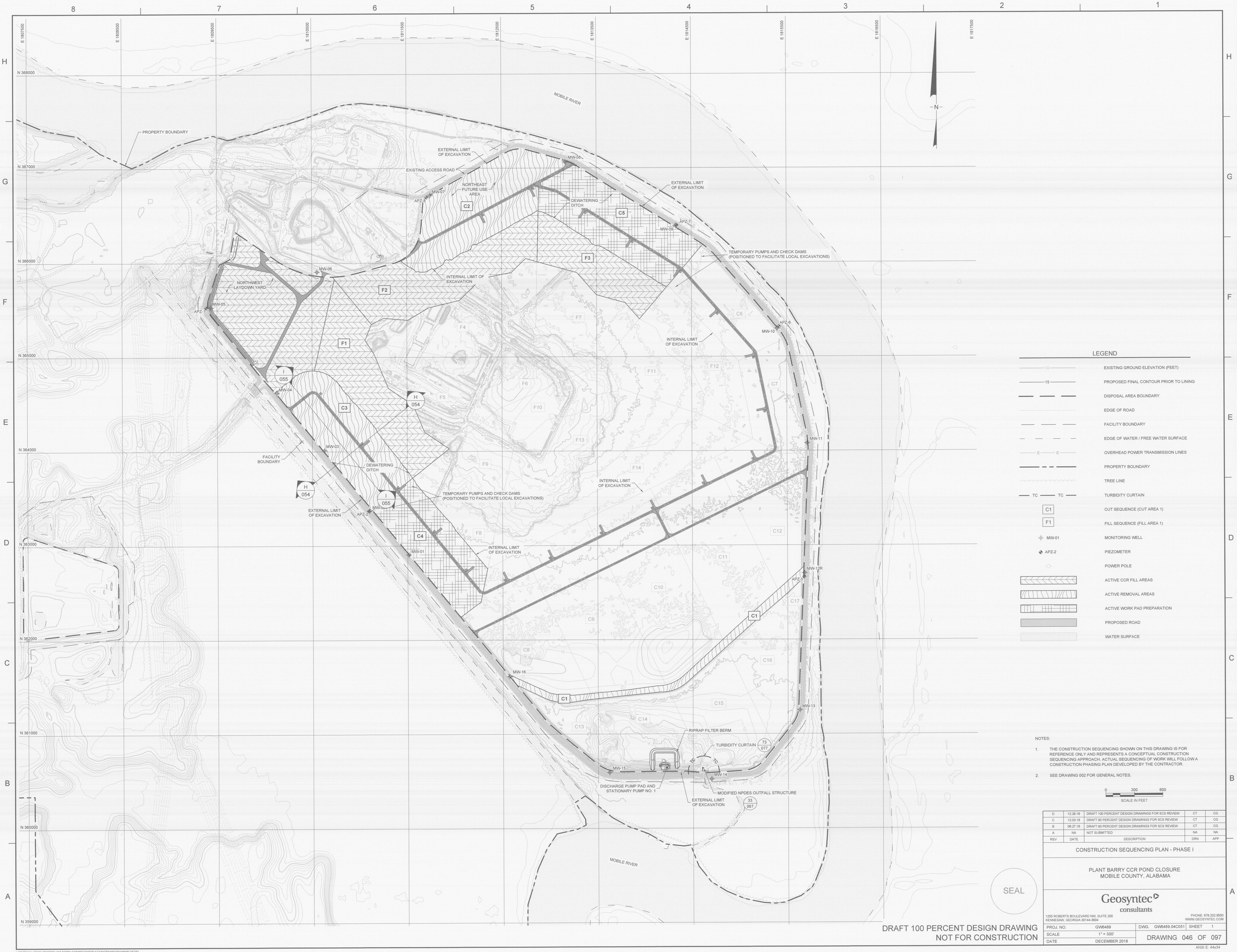


29 / 006 PLAN
FREE WATER - CONTACT WATER MANAGEMENT SYSTEM
SCALE: 1" = 200'
SCALE IN FEET: 0, 200, 400



30 / 006 PLAN
RIPRAP FILLER BERM
SCALE: 1" = 20'
SCALE IN FEET: 0, 20, 40

31 / 044 DETAIL
RIPRAP FILLER BERM
SCALE: 1" = 5'



LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- FACILITY BOUNDARY
- EDGE OF WATER / FREE WATER SURFACE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- TURBIDITY CURTAIN
- CUT SEQUENCE (CUT AREA 1)
- FILL SEQUENCE (FILL AREA 1)
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- ACTIVE WORK PAD PREPARATION
- PROPOSED ROAD
- WATER SURFACE

NOTES:

1. THE CONSTRUCTION SEQUENCING SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENTS A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL SEQUENCING OF WORK WILL FOLLOW A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION SEQUENCING PLAN - PHASE I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C051	SHEET 1
SCALE	1" = 300'	DRAWING 046 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E 44x34

I:\ACCDUA\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C051

L:\CADD\MULLABAKA POWDER\PLANT BARRY CWM\BIDDOCS\RTS\CONSTRUCTION\CMS\MWD\BIDWM0849.DACD41

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

SEAL

REV	DATE	DESCRIPTION	DRN	APP
A	NA	NOT SUBMITTED	NA	NA
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO

CONSTRUCTION SEQUENCING PLAN - PHASE II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3644
PHONE: 678 202 8600
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489 04C041	SHEET	1
SCALE	1" = 300'				
DATE	DECEMBER 2018				

DRAWING 047 OF 097

ANSI E 44X34

SCALE IN FEET
0 300 600

NOTES:
1. THE CONSTRUCTION SEQUENCING SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENTS A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL SEQUENCING OF WORK WILL FOLLOW A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- TURBIDITY CURTAIN
- C1 CUT SEQUENCE (CUT AREA 1)
- F1 FILL SEQUENCE (FILL AREA 1)
- MW-01 MONITORING WELL
- APZ-2 PIEZOMETER
- POWER POLE
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- ACTIVE WORK PAD PREPARATION
- PROPOSED ROAD
- WATER SURFACE

N

MOBILE RIVER

PROPERTY BOUNDARY

EXISTING ACCESS ROAD

EXTERNAL LIMIT OF EXCAVATION

NORTHEAST FUTURE USE AREA

FINAL COVER NOT LINED

DISPOSAL AREA BOUNDARY

NORTHWEST LAYDOWN YARD

FACILITY BOUNDARY

EXTERNAL LIMIT OF EXCAVATION

INTERNAL LIMIT OF EXCAVATION

EXTERNAL LIMIT OF EXCAVATION

INTERNAL LIMIT OF EXCAVATION

EXTERNAL LIMIT OF EXCAVATION

RIPRAP FILTER BERM

TURBIDITY CURTAIN

DISCHARGE PUMP PAD AND STATIONARY PUMP NO. 1

MOBILE RIVER

MW-01 MW-02 MW-03 MW-04 MW-05 MW-06 MW-07 MW-08 MW-09 MW-10 MW-11 MW-12R MW-13 MW-14 MW-15 MW-16

APZ-1 APZ-2 APZ-3 APZ-4 APZ-5 APZ-6 APZ-7

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16

F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 F13 F14

055

N 364000 N 365000 N 366000 N 367000 N 368000

E 1815500 E 1816000 E 1816500 E 1817000 E 1817500 E 1818000 E 1818500 E 1819000 E 1819500

1 2 3 4 5 6 7 8

A B C D E F G H

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

CONSTRUCTION SEQUENCING PLAN - PHASE III

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

REV	DATE	DESCRIPTION	DSN	APP
A	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SOS REVIEW	CT	CG
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SOS REVIEW	CT	CG

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.3500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489_DAC055	SHEET	1
SCALE	1" = 300'				
DATE	DECEMBER 2018				

DRAWING 048 OF 097

SEAL

NOTES:

1. THE CONSTRUCTION SEQUENCING SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENTS A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL SEQUENCING OF WORK WILL FOLLOW A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.

SCALE IN FEET
0 300 600

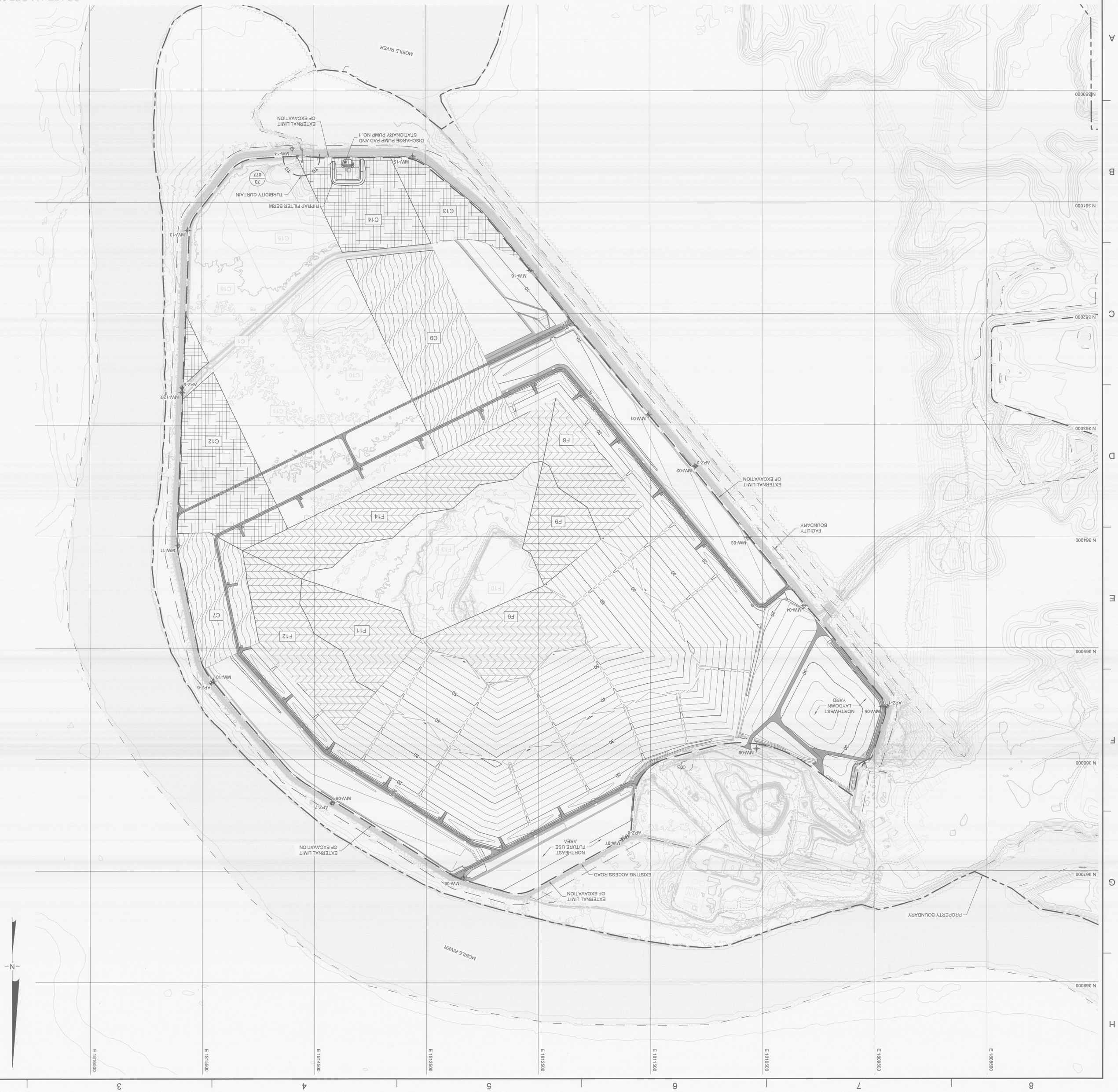
LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- TURBIDITY CURTAIN
- CUT SEQUENCE (CUT AREA 1)
- FILL SEQUENCE (FILL AREA 1)
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- ACTIVE WORK PAD PREPARATION
- PROPOSED ROAD
- WATER SURFACE

MOBILE RIVER
PROPERTY BOUNDARY
EXISTING ACCESS ROAD
EXTERNAL LIMIT OF EXCAVATION
NORTHEAST FUTURE USE AREA
DISPOSAL AREA BOUNDARY
NORTHWEST LAYDOWN YARD
FACILITY BOUNDARY
EXTERNAL LIMIT OF EXCAVATION
EXTERNAL LIMIT OF EXCAVATION
RIPRAP FILTER BERM
TURBIDITY CURTAIN
DISCHARGE PUMP PAD AND STATIONARY PUMP NO. 1
MW-01
MW-02
MW-03
MW-04
MW-05
MW-06
MW-07
MW-08
MW-09
MW-10
MW-11
MW-12R
MW-13
MW-14
MW-15
MW-16
AP2-1
AP2-2
AP2-6
AP2-7
AP2-8
C1
C6
C7
C8
C9
C12
C13
F4
F5
F6
F7
F8
F9
F11
F12
N 3660000
N 3650000
N 3640000
N 3630000
N 3620000
N 3610000
N 3600000
E 1816500
E 1815500
E 1814500
E 1813500
E 1812500
E 1811500
E 1810500
E 1809500
E 1808500
N
1 2 3 4 5 6 7 8
A B C D E F G H

L:\CAD\CIVIL\ALABAMA POWER\BARRY PLANT QAM\6489CONSTRUCTIONDRAWINGS\6489_DAC055.DWG
ANSI E 44X34

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION



LEGEND

10	EXISTING GROUND ELEVATION (FEET)
15	PROPOSED FINAL CONTOUR PRIOR TO LINING
	DISPOSAL AREA BOUNDARY
	EDGE OF ROAD
	EDGE OF WATER / FREE WATER SURFACE
	FACILITY BOUNDARY
E E	OVERHEAD POWER TRANSMISSION LINES
	PROPERTY BOUNDARY
	TREE LINE
TC TC	TURBIDITY CURTAIN
C1	CUT SEQUENCE (CUT AREA 1)
F1	FILL SEQUENCE (FILL AREA 1)
MW-01	MONITORING WELL
AP2-2	PIEZOMETER
	POWER POLE
P	PUMP
	ACTIVE CCR FILL AREAS
	ACTIVE REMOVAL AREAS
	ACTIVE WORK PAD PREPARATION
	PROPOSED ROAD
	WATER SURFACE

NOTES:

1. THE CONSTRUCTION SEQUENCING SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENTS A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL SEQUENCING OF WORK WILL FOLLOW A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.

REV	DATE	DESCRIPTION	DES	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION SEQUENCING PLAN - PHASE IV

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678 202 2600
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489 04C056
SCALE	1" = 300'	SHEET	1
DATE	DECEMBER 2018	DRAWING 049 OF 097	

ANSI E 44X34

L:\CAD\CAL\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DWG\GW6489 04C056

NOTES:

1. THE CONSTRUCTION SEQUENCING SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENTS A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL SEQUENCING OF WORK WILL FOLLOW A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION SEQUENCING PLAN - PHASE V

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C057	SHEET 1
SCALE	1" = 300'	DRAWING 050 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E 44x34

L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWING\GW6489.04C057

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- TURBIDITY CURTAIN
- CUT SEQUENCE (CUT AREA 1)
- FILL SEQUENCE (FILL AREA 1)
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- ACTIVE WORK PAD PREPARATION
- PROPOSED ROAD
- WATER SURFACE

NOTES:

1. THE CONSTRUCTION SEQUENCING SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENTS A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL SEQUENCING OF WORK WILL FOLLOW A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION SEQUENCING PLAN - PHASE VI

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

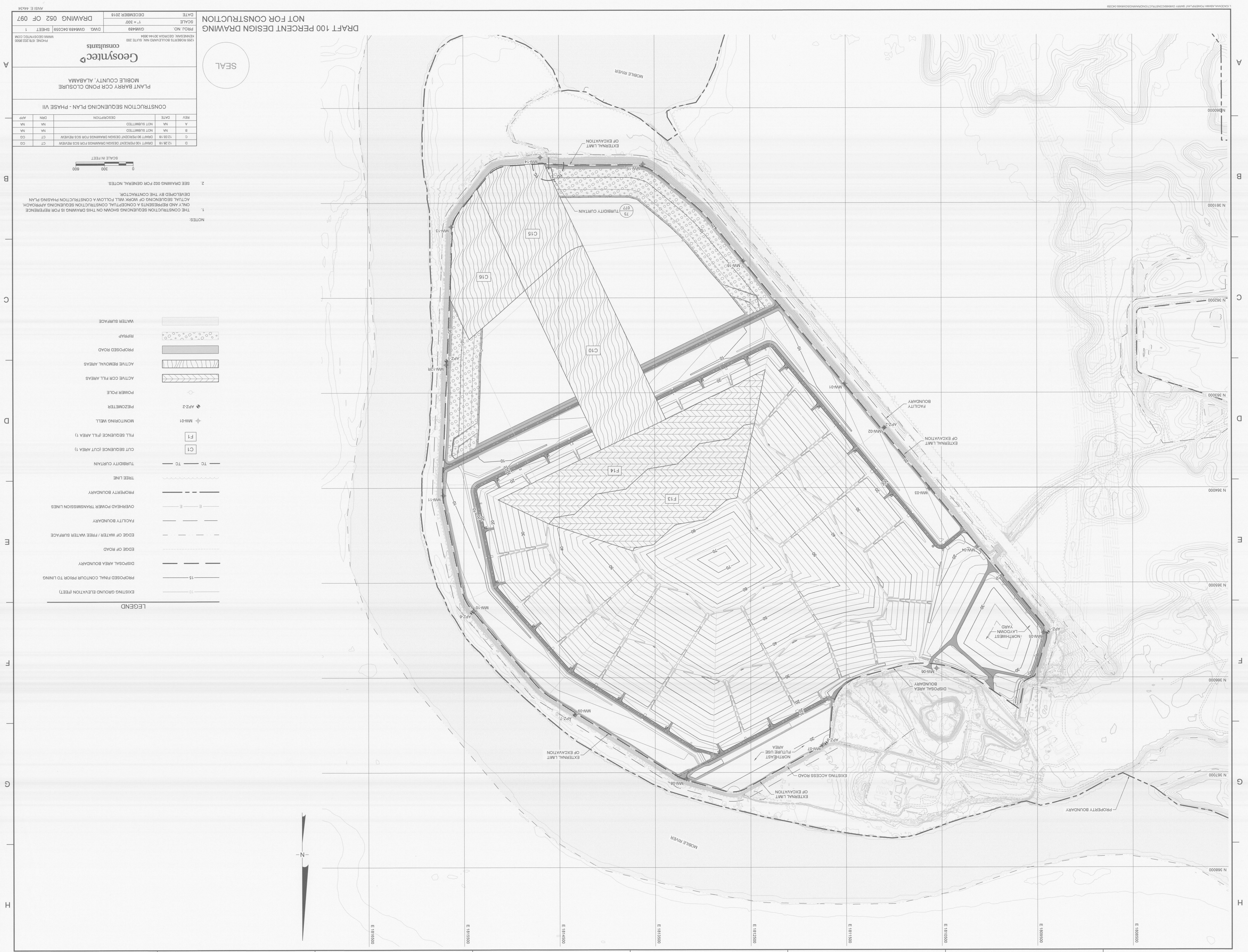
PROJ. NO.	GW6489	DWG. GW6489.04C058	SHEET 1
SCALE	1" = 300'	DRAWING 051 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

L:\CADD\AL\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C058

ANSI E: 44x34

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION



LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- TURBIDITY CURTAIN
- CUT SEQUENCE (CUT AREA 1)
- FILL SEQUENCE (FILL AREA 1)
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- PROPOSED ROAD
- RIPRAP
- WATER SURFACE

NOTES:

1. THE CONSTRUCTION SEQUENCING SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENTS A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL SEQUENCING OF WORK WILL FOLLOW A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.

SCALE IN FEET
0 300 600

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION SEQUENCING PLAN - PHASE VII

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3644
PHONE: 678 202 3500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489 04C059	SHEET	1
SCALE	1" = 300'				
DATE	DECEMBER 2018				

DRAWING 052 OF 097

ANSI E 44X34

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L:\CAD\CIVIL\BAMA POWER\PLANT BARRY GW\BRECONSTRUCTION\DRAWINGS\GW4689.DWG
ANSI E 44X34

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

SEAL

Geosyntec
consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3644
PHONE: 678 202 8600
WWW.GEOSYNTEC.COM

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

CONSTRUCTION SEQUENCING PLAN - PHASE VIII

REV	DATE	DESCRIPTION	DSN	APP
A	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO

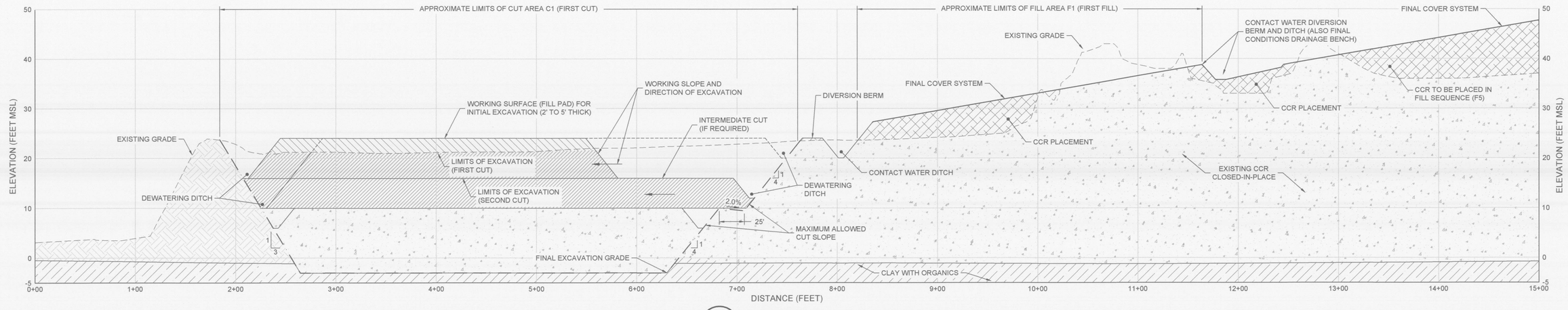
PROJ. NO.	GW4689	DWG.	GW4689 04C060	SHEET	1	DRAWING 053 OF 097
SCALE	1" = 300'					
DATE	DECEMBER 2018					

SCALE IN FEET
0 300 600

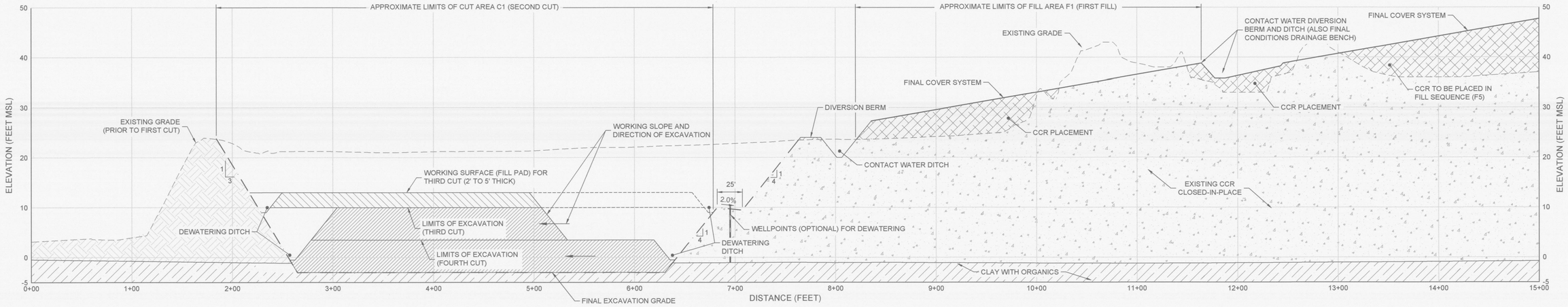
NOTES:
1. THE CONSTRUCTION SEQUENCING SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENTS A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL SEQUENCING OF WORK WILL FOLLOW A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.
3. FINAL COVER GRADES AND CULVERTS TO BE INSTALLED FOLLOWING SETTLEMENT AS PER CONSTRUCTION TECHNICAL SPECIFICATIONS.

LEGEND
- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- TREE LINE
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- PROPOSED ROAD
- RIPRAP
- WATER SURFACE

MOBILE RIVER
EXTERNAL LIMIT OF EXCAVATION
NORTHEAST FUTURE USE AREA
EXISTING ACCESS ROAD
FACILITY BOUNDARY
DISPOSAL AREA BOUNDARY
NORTHWEST LAYDOWN YARD
PROPERTY BOUNDARY
MW-01
MW-02
MW-03
MW-04
MW-05
MW-06
MW-07
MW-08
MW-09
MW-10
MW-11
MW-12R
MW-13
MW-14
MW-15
MW-16
AP2-1
AP2-2
AP2-6
AP2-7
AP2-8
N 364000
N 365000
N 366000
N 367000
N 368000
E 1816500
E 1815500
E 1814500
E 1813500
E 1812500
E 1811500
E 1810500
E 1809500
E 1808500



H / 046 SECTION
PHASE I - CUT 3 - STAGE I
SCALE: 1" = 50' (HORIZONTAL); 1" = 1' (VERTICAL)



H / 046 SECTION
PHASE I - CUT 3 - STAGE II
SCALE: 1" = 50' (HORIZONTAL); 1" = 1' (VERTICAL)

LEGEND

- EXISTING GRADE PROFILE
- FINAL EXCAVATION PROFILE
- PROPOSED GRADE PROFILE
- WELL POINT
- CCR PLACEMENT (FILL)
- CCR REMOVAL (CUT)
- CLAY WITH ORGANICS
- IN-PLACE CCR
- TEMPORARY WORKING SURFACE (FILL PAD)

NOTES:

1. THE CONSTRUCTION SEQUENCING SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENTS A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL SEQUENCING OF WORK WILL FOLLOW A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.
3. EXCAVATION GRADING SHOWN REPRESENTS THE EXCAVATION SURFACE FOR CCR REMOVAL, INCLUDING AN ADDITIONAL MINIMUM SIX INCHES OVER-EXCAVATION. EXCAVATION GRADES WERE DEVELOPED FROM ESTIMATED TOP OF UNDERLYING CLAY GRADES AND AN ESTIMATED 3H:1V INTERIOR SLOPE OF THE EXISTING PERIMETER DIKE. A MINIMUM OF SIX INCHES OF ADDITIONAL UNDERLYING SOIL WILL BE REMOVED AS DEFINED AS CLOSURE BY REMOVAL. THE VERTICAL EXTENT OF EXISTING CCR PRESENTED IS BASED ON ESTIMATED TOP OF UNDERLYING CLAY SURFACE DERIVED FROM FIELD BORINGS. THE CONTRACTOR, QC REPRESENTATIVE, AND QA REPRESENTATIVE SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR.
4. INTERIOR LIMITS OF CCR EXCAVATION SLOPE AND BENCHES SHOWN ARE APPROXIMATE AND WILL BE REVISED BASED ON FURTHER GEOTECHNICAL ANALYSIS DURING THE FINAL DESIGN PERIOD.

0 50 100
HORIZONTAL SCALE IN FEET

0 10 20
VERTICAL SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION SEQUENCING SECTIONS - PHASE I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

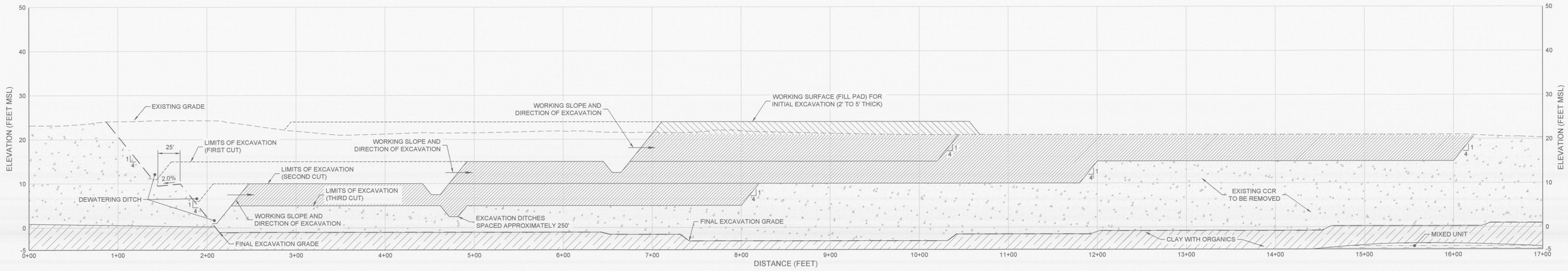
DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

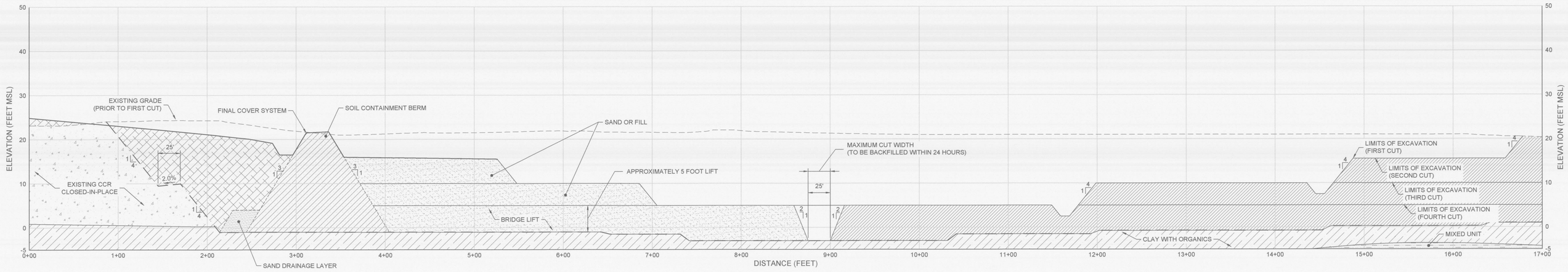
PROJ. NO.	GW6489	DWG.	GW6489.04C050	SHEET	1
SCALE	AS SHOWN	DRAWING 054 OF 097			
DATE	DECEMBER 2018				

L:\CADD\AL\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWING\BGW6489.04C050

ANSI E 44x34



I/046 PROFILE
CUT PROGRESSION
SCALE: 1" = 50' (HORIZONTAL); 1" = 1' (VERTICAL)



I/046 PROFILE
CUT AND FILL PROGRESSION
SCALE: 1" = 50' (HORIZONTAL); 1" = 1' (VERTICAL)

LEGEND

- EXISTING GRADE PROFILE
- FINAL EXCAVATION PROFILE
- PROPOSED GRADE PROFILE
- CCR PLACEMENT (FILL)
- CCR REMOVAL (CUT)
- CLAY WITH ORGANICS
- IN-PLACE CCR
- MIXED UNIT
- TEMPORARY WORKING SURFACE (FILL PAD)

NOTES:

1. THE CONSTRUCTION SEQUENCING SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENTS A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL SEQUENCING OF WORK WILL FOLLOW A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.
3. EXCAVATION GRADING SHOWN REPRESENTS THE EXCAVATION SURFACE FOR CCR REMOVAL, INCLUDING AN ADDITIONAL MINIMUM SIX INCHES OVER-EXCAVATION. EXCAVATION GRADES WERE DEVELOPED FROM ESTIMATED TOP OF UNDERLYING CLAY GRADES AND AN ESTIMATED 3H:1V INTERIOR SLOPE OF THE EXISTING PERIMETER DIKE. A MINIMUM OF SIX INCHES OF ADDITIONAL UNDERLYING SOIL WILL BE REMOVED AS DEFINED AS CLOSURE BY REMOVAL. THE VERTICAL EXTENT OF EXISTING CCR PRESENTED IS BASED ON ESTIMATED TOP OF UNDERLYING CLAY SURFACE DERIVED FROM FIELD BORINGS. THE CONTRACTOR, QC REPRESENTATIVE, AND QA REPRESENTATIVE SHALL VERIFY BOTH HORIZONTAL AND VERTICAL EXTENTS OF CCR.
4. INTERIOR LIMITS OF CCR EXCAVATION SLOPE AND BENCHES SHOWN ARE APPROXIMATE AND WILL BE REVISED BASED ON FURTHER GEOTECHNICAL ANALYSIS DURING THE FINAL DESIGN PERIOD.

0 50 100
HORIZONTAL SCALE IN FEET

0 10 20
VERTICAL SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION SEQUENCING SECTIONS - PHASE II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

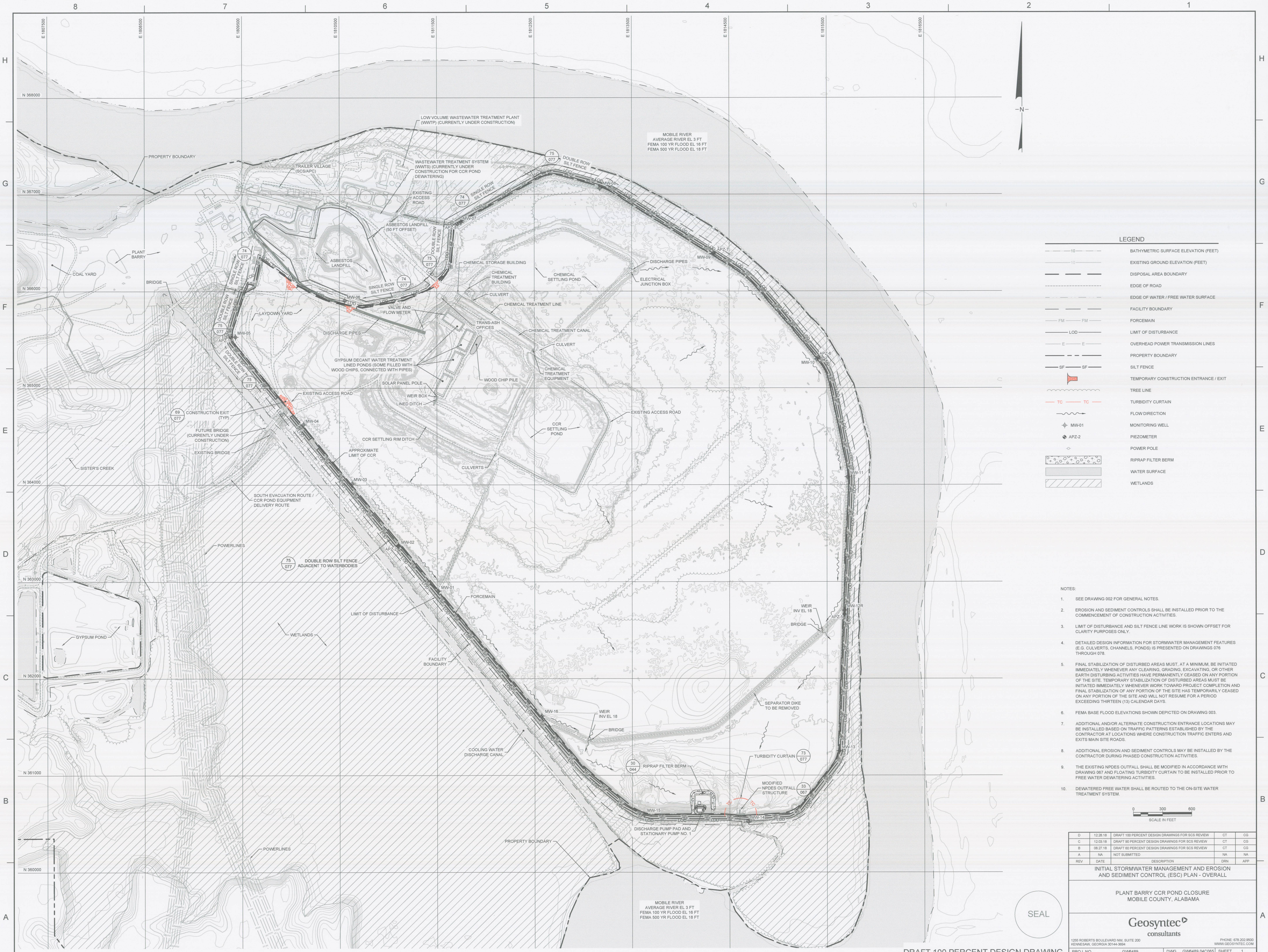
DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C050	SHEET	2
SCALE	AS SHOWN	DRAWING	055	OF	097
DATE	DECEMBER 2018				

ANSI E: 44x34

L:\ACAD\VAL\ABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C050



NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES.
3. LIMIT OF DISTURBANCE AND SILT FENCE LINE WORK IS SHOWN OFFSET FOR CLARITY PURPOSES ONLY.
4. DETAILED DESIGN INFORMATION FOR STORMWATER MANAGEMENT FEATURES (E.G. CULVERTS, CHANNELS, PONDS) IS PRESENTED ON DRAWINGS 076 THROUGH 078.
5. FINAL STABILIZATION OF DISTURBED AREAS MUST, AT A MINIMUM, BE INITIATED IMMEDIATELY WHENEVER ANY CLEARING, GRADING, EXCAVATING, OR OTHER EARTH DISTURBING ACTIVITIES HAVE PERMANENTLY CEASED ON ANY PORTION OF THE SITE. TEMPORARY STABILIZATION OF DISTURBED AREAS MUST BE INITIATED IMMEDIATELY WHENEVER WORK TOWARD PROJECT COMPLETION AND FINAL STABILIZATION OF ANY PORTION OF THE SITE HAS TEMPORARILY CEASED ON ANY PORTION OF THE SITE AND WILL NOT RESUME FOR A PERIOD EXCEEDING THIRTEEN (13) CALENDAR DAYS.
6. FEMA BASE FLOOD ELEVATIONS SHOWN DEPICTED ON DRAWING 003.
7. ADDITIONAL AND/OR ALTERNATE CONSTRUCTION ENTRANCE LOCATIONS MAY BE INSTALLED BASED ON TRAFFIC PATTERNS ESTABLISHED BY THE CONTRACTOR AT LOCATIONS WHERE CONSTRUCTION TRAFFIC ENTERS AND EXITS MAIN SITE ROADS.
8. ADDITIONAL EROSION AND SEDIMENT CONTROLS MAY BE INSTALLED BY THE CONTRACTOR DURING PHASED CONSTRUCTION ACTIVITIES.
9. THE EXISTING NPDES OUTFALL SHALL BE MODIFIED IN ACCORDANCE WITH DRAWING 067 AND FLOATING TURBIDITY CURTAIN TO BE INSTALLED PRIOR TO FREE WATER DEWATERING ACTIVITIES.
10. DEWATERED FREE WATER SHALL BE ROUTED TO THE ON-SITE WATER TREATMENT SYSTEM.

SCALE IN FEET: 0 300 600

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

INITIAL STORMWATER MANAGEMENT AND EROSION AND SEDIMENT CONTROL (ESC) PLAN - OVERALL

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C065
SCALE	1" = 300'	SHEET	1
DATE	DECEMBER 2018	DRAWING	058 OF 097

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- CONTACT WATER DIVERSION CHANNEL
- DEWATERING DITCH
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- LIMIT OF DISTURBANCE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- SILT FENCE
- TEMPORARY DIVERSION BERM
- TREE LINE
- TURBIDITY CURTAIN
- CUT SEQUENCE
- FILL SEQUENCE
- DEWATER PUMP
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- TEMPORARY CONSTRUCTION ENTRANCE / EXIT
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- ACTIVE WORK PAD PREPARATION
- PROPOSED ROAD / CONTAINMENT BERM
- TEMPORARY CONSTRUCTION ENTRANCE/EXIT
- WATER SURFACE
- WETLANDS

NOTES:

1. THE STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENT A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES WILL BE BASED ON A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.
3. EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES.
4. LIMIT OF DISTURBANCE AND SILT FENCE LINE WORK IS SHOWN OFFSET FOR CLARITY PURPOSES ONLY.
5. DETAILED DESIGN INFORMATION FOR STORMWATER MANAGEMENT FEATURES (E.G. CULVERTS, CHANNELS, PONDS) IS PRESENTED ON DRAWINGS 076 THROUGH 078.
6. FINAL STABILIZATION OF DISTURBED AREAS MUST, AT A MINIMUM, BE INITIATED IMMEDIATELY WHENEVER ANY CLEARING, GRADING, EXCAVATING OR OTHER EARTH DISTURBING ACTIVITIES HAVE PERMANENTLY CEASED ON ANY PORTION OF THE SITE. TEMPORARY STABILIZATION OF DISTURBED AREAS MUST BE INITIATED IMMEDIATELY WHENEVER WORK TOWARD PROJECT COMPLETION AND FINAL STABILIZATION OF ANY PORTION OF THE SITE HAS TEMPORARILY CEASED ON ANY PORTION OF THE SITE AND WILL NOT RESUME FOR A PERIOD EXCEEDING THIRTEEN (13) CALENDAR DAYS.
7. FEMA BASE FLOOD ELEVATIONS SHOWN DEPICTED ON DRAWING 003.
8. ADDITIONAL AND/OR ALTERNATE CONSTRUCTION ENTRANCE LOCATIONS MAY BE INSTALLED BASED ON TRAFFIC PATTERNS ESTABLISHED BY THE CONTRACTOR AT LOCATIONS WHERE CONSTRUCTION TRAFFIC ENTERS AND EXITS MAIN SITE ROADS.
9. ADDITIONAL EROSION AND SEDIMENT CONTROLS MAY BE INSTALLED BY THE CONTRACTOR DURING PHASED CONSTRUCTION ACTIVITIES.
10. THE EXISTING NPDES OUTFALL SHALL BE MODIFIED IN ACCORDANCE WITH DRAWING 067 AND FLOATING TURBIDITY CURTAIN TO BE INSTALLED PRIOR TO FREE WATER DEWATERING ACTIVITIES.
11. DEWATERED FREE WATER SHALL BE ROUTED TO THE ON-SITE WATER TREATMENT SYSTEM.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT AND ESC PLAN - PHASE I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C066
SCALE	1" = 300'	SHEET	1
DATE	DECEMBER 2018	DRAWING	059 OF 097

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

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LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- CONTACT WATER DIVERSION CHANNEL
- DEWATERING DITCH
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- LIMIT OF DISTURBANCE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- SILT FENCE
- TEMPORARY DIVERSION BERM
- TREE LINE
- TURBIDITY CURTAIN
- CHECK DAM
- CUT SEQUENCE
- FILL SEQUENCE
- DEWATER PUMP
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- STONE FILTER RING
- TEMPORARY CONSTRUCTION ENTRANCE / EXIT
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- ACTIVE WORK PAD PREPARATION
- AREAS TO RECEIVE PERMANENT STABILIZATION
- PROPOSED ROAD / CONTAINMENT BERM
- TEMPORARY CONSTRUCTION ENTRANCE/EXIT
- WATER SURFACE
- WETLANDS

NOTES:

1. THE STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENT A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES WILL BE BASED ON A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.
3. EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES.
4. LIMIT OF DISTURBANCE AND SILT FENCE LINE WORK IS SHOWN OFFSET FOR CLARITY PURPOSES ONLY.
5. DETAILED DESIGN INFORMATION FOR STORMWATER MANAGEMENT FEATURES (E.G. CULVERTS, CHANNELS, PONDS) IS PRESENTED ON DRAWINGS 076 THROUGH 078.
6. FINAL STABILIZATION OF DISTURBED AREAS MUST, AT A MINIMUM, BE INITIATED IMMEDIATELY WHENEVER ANY CLEARING, GRADING, EXCAVATING OR OTHER EARTH DISTURBING ACTIVITIES HAVE PERMANENTLY CEASED ON ANY PORTION OF THE SITE. TEMPORARY STABILIZATION OF DISTURBED AREAS MUST BE INITIATED IMMEDIATELY WHENEVER WORK TOWARD PROJECT COMPLETION AND FINAL STABILIZATION OF ANY PORTION OF THE SITE HAS TEMPORARILY CEASED ON ANY PORTION OF THE SITE AND WILL NOT RESUME FOR A PERIOD EXCEEDING THIRTEEN (13) CALENDAR DAYS.
7. FEMA BASE FLOOD ELEVATIONS SHOWN DEPICTED ON DRAWING 003.
8. ADDITIONAL AND/OR ALTERNATE CONSTRUCTION ENTRANCE LOCATIONS MAY BE INSTALLED BASED ON TRAFFIC PATTERNS ESTABLISHED BY THE CONTRACTOR AT LOCATIONS WHERE CONSTRUCTION TRAFFIC ENTERS AND EXITS MAIN SITE ROADS.
9. ADDITIONAL EROSION AND SEDIMENT CONTROLS MAY BE INSTALLED BY THE CONTRACTOR DURING PHASED CONSTRUCTION ACTIVITIES.
10. NON-CONTACT STORMWATER MAY BE DISCHARGED DIRECTLY INTO THE ADJACENT WATER BODIES WITHOUT TREATMENT UNDER THE DIRECTION OF APC ENVIRONMENTAL AFFAIRS.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT AND ESC PLAN - PHASE II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C067	SHEET 1
SCALE	1" = 300'	DRAWING 060 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

N

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- CONTACT WATER DIVERSION CHANNEL
- DEWATERING DITCH
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- LIMIT OF DISTURBANCE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- SILT FENCE
- TEMPORARY DIVERSION BERM
- TREE LINE
- TURBIDITY CURTAIN
- CHECK DAM
- CUT SEQUENCE
- FILL SEQUENCE
- DEWATER PUMP
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- STONE FILTER RING
- TEMPORARY CONSTRUCTION ENTRANCE / EXIT
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- ACTIVE WORK PAD PREPARATION
- AREAS TO RECEIVE PERMANENT STABILIZATION
- PROPOSED ROAD / CONTAINMENT BERM
- TEMPORARY CONSTRUCTION ENTRANCE/EXIT
- WATER SURFACE
- WETLANDS

NOTES:

1. THE STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENT A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES WILL BE BASED ON A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.
3. EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES.
4. LIMIT OF DISTURBANCE AND SILT FENCE LINE WORK IS SHOWN OFFSET FOR CLARITY PURPOSES ONLY.
5. DETAILED DESIGN INFORMATION FOR STORMWATER MANAGEMENT FEATURES (E.G. CULVERTS, CHANNELS, PONDS) IS PRESENTED ON DRAWINGS 076 THROUGH 078.
6. FINAL STABILIZATION OF DISTURBED AREAS MUST, AT A MINIMUM, BE INITIATED IMMEDIATELY WHENEVER ANY CLEARING, GRADING, EXCAVATING OR OTHER EARTH DISTURBING ACTIVITIES HAVE PERMANENTLY CEASED ON ANY PORTION OF THE SITE. TEMPORARY STABILIZATION OF DISTURBED AREAS MUST BE INITIATED IMMEDIATELY WHENEVER WORK TOWARD PROJECT COMPLETION AND FINAL STABILIZATION OF ANY PORTION OF THE SITE HAS TEMPORARILY CEASED ON ANY PORTION OF THE SITE AND WILL NOT RESUME FOR A PERIOD EXCEEDING THIRTEEN (13) CALENDAR DAYS.
7. FEMA BASE FLOOD ELEVATIONS SHOWN DEPICTED ON DRAWING 003.
8. ADDITIONAL AND/OR ALTERNATE CONSTRUCTION ENTRANCE LOCATIONS MAY BE INSTALLED BASED ON TRAFFIC PATTERNS ESTABLISHED BY THE CONTRACTOR AT LOCATIONS WHERE CONSTRUCTION TRAFFIC ENTERS AND EXITS MAIN SITE ROADS.
9. ADDITIONAL EROSION AND SEDIMENT CONTROLS MAY BE INSTALLED BY THE CONTRACTOR DURING PHASED CONSTRUCTION ACTIVITIES.
10. NON-CONTACT STORMWATER MAY BE DISCHARGED DIRECTLY INTO THE ADJACENT WATER BODIES WITHOUT TREATMENT UNDER THE DIRECTION OF APC ENVIRONMENTAL AFFAIRS.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT AND ESC PLAN - PHASE III

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C070
SCALE	1" = 300'	SHEET	1
DATE	DECEMBER 2018	DRAWING	061 OF 097

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

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N

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- CONTACT WATER DIVERSION CHANNEL
- DEWATERING DITCH
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- LIMIT OF DISTURBANCE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- SILT FENCE
- TEMPORARY DIVERSION BERM
- TREE LINE
- TURBIDITY CURTAIN
- CHECK DAM
- CUT SEQUENCE
- FILL SEQUENCE
- DEWATER PUMP
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- STONE FILTER RING
- TEMPORARY CONSTRUCTION ENTRANCE / EXIT
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- ACTIVE WORK PAD PREPARATION
- AREAS TO RECEIVE PERMANENT STABILIZATION
- PROPOSED ROAD / CONTAINMENT BERM
- TEMPORARY CONSTRUCTION ENTRANCE/EXIT
- WATER SURFACE
- WETLANDS

NOTES:

1. THE STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENT A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES WILL BE BASED ON A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.
3. EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES.
4. LIMIT OF DISTURBANCE AND SILT FENCE LINE WORK IS SHOWN OFFSET FOR CLARITY PURPOSES ONLY.
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7. FEMA BASE FLOOD ELEVATIONS SHOWN DEPICTED ON DRAWING 003.
8. ADDITIONAL AND/OR ALTERNATE CONSTRUCTION ENTRANCE LOCATIONS MAY BE INSTALLED BASED ON TRAFFIC PATTERNS ESTABLISHED BY THE CONTRACTOR AT LOCATIONS WHERE CONSTRUCTION TRAFFIC ENTERS AND EXITS MAIN SITE ROADS.
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10. NON-CONTACT STORMWATER MAY BE DISCHARGED DIRECTLY INTO THE ADJACENT WATER BODIES WITHOUT TREATMENT UNDER THE DIRECTION OF APC ENVIRONMENTAL AFFAIRS.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT AND ESC PLAN - PHASE IV

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

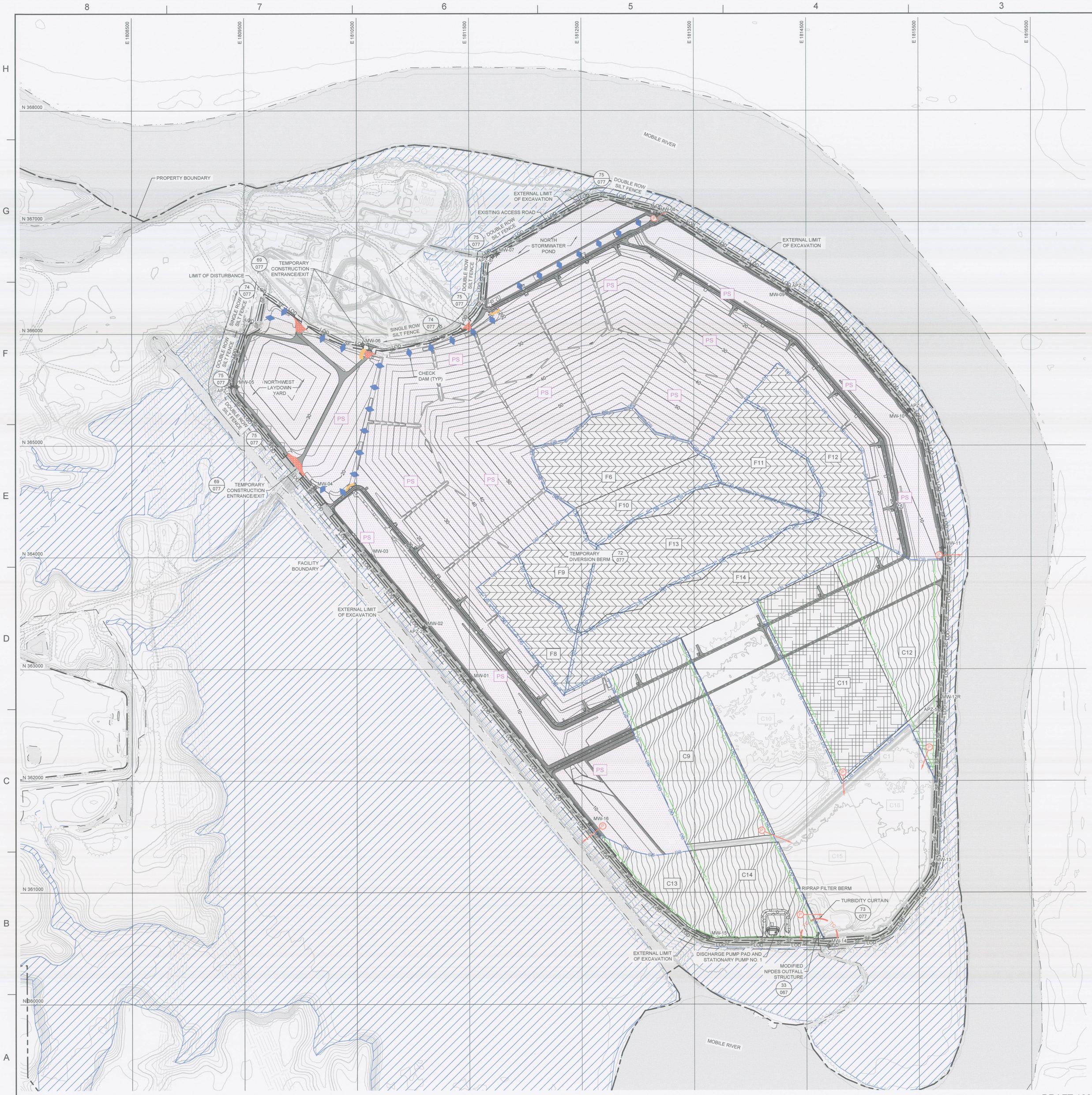
Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C071
SCALE	1" = 300'	SHEET	1
DATE	DECEMBER 2018	DRAWING	062 OF 097

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C071



LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- CONTACT WATER DIVERSION CHANNEL
- DEWATERING DITCH
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- LIMIT OF DISTURBANCE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- SILT FENCE
- TEMPORARY DIVERSION BERM
- TREE LINE
- TURBIDITY CURTAIN
- CHECK DAM
- CUT SEQUENCE
- FILL SEQUENCE
- DEWATER PUMP
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- STONE FILTER RING
- TEMPORARY CONSTRUCTION ENTRANCE / EXIT
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- ACTIVE WORK PAD PREPARATION
- AREAS TO RECEIVE PERMANENT STABILIZATION
- PROPOSED ROAD / CONTAINMENT BERM
- TEMPORARY CONSTRUCTION ENTRANCE/EXIT
- WATER SURFACE
- WETLANDS

NOTES:

1. THE STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENT A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES WILL BE BASED ON A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
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7. FEMA BASE FLOOD ELEVATIONS SHOWN DEPICTED ON DRAWING 003.
8. ADDITIONAL AND/OR ALTERNATE CONSTRUCTION ENTRANCE LOCATIONS MAY BE INSTALLED BASED ON TRAFFIC PATTERNS ESTABLISHED BY THE CONTRACTOR AT LOCATIONS WHERE CONSTRUCTION TRAFFIC ENTERS AND EXITS MAIN SITE ROADS.
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10. NON-CONTACT STORMWATER MAY BE DISCHARGED DIRECTLY INTO THE ADJACENT WATER BODIES WITHOUT TREATMENT UNDER THE DIRECTION OF APC ENVIRONMENTAL AFFAIRS.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT AND ESC PLAN - PHASE V

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

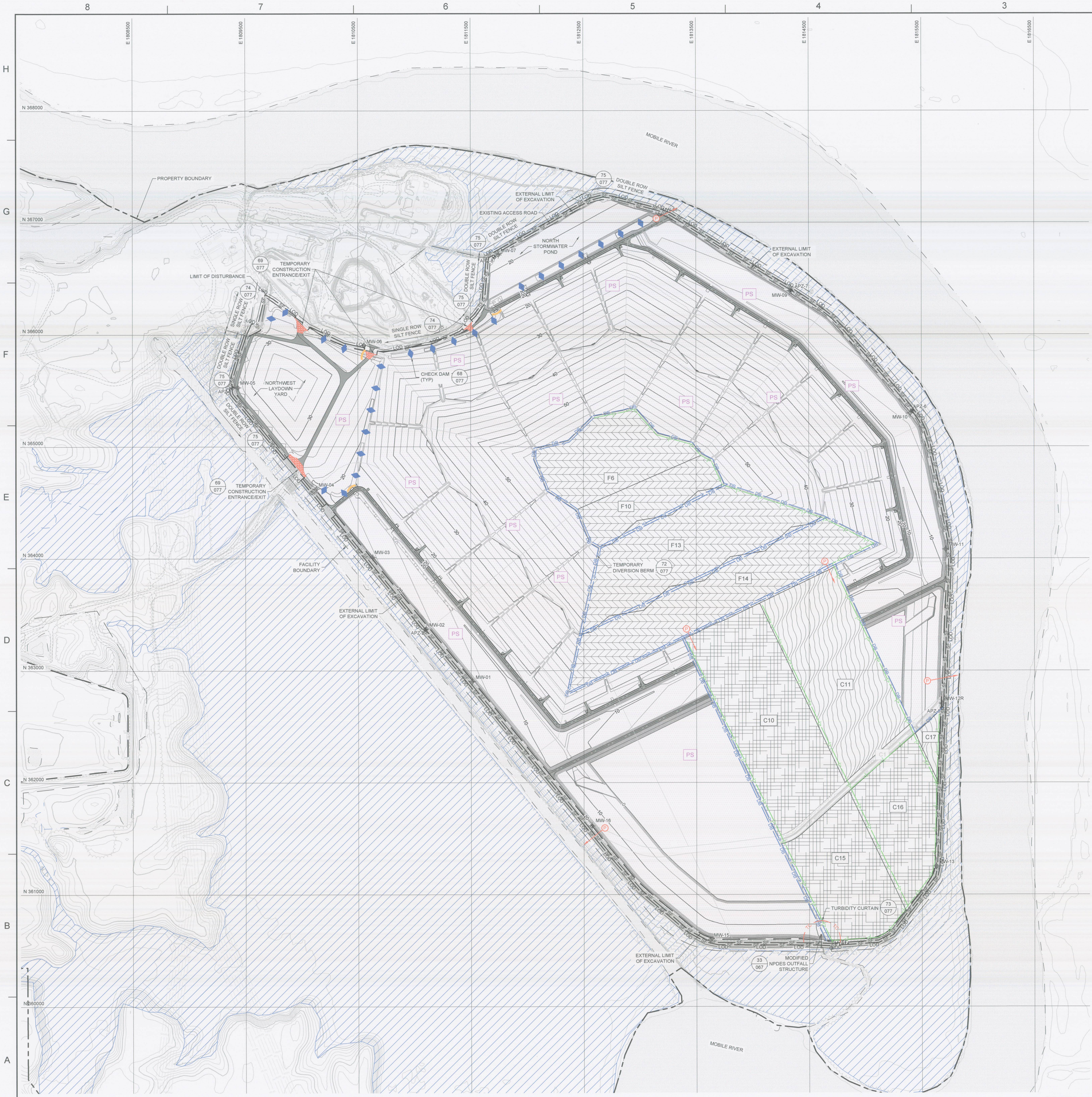
Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C072
SCALE	1" = 300'	SHEET	1
DATE	DECEMBER 2018	DRAWING	063 OF 097

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTIONDRAWINGS\GW6489.04C072



LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- CONTACT WATER DIVERSION CHANNEL
- DEWATERING DITCH
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- LIMIT OF DISTURBANCE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- SILT FENCE
- TEMPORARY DIVERSION BERM
- TREE LINE
- TURBIDITY CURTAIN
- CHECK DAM
- CUT SEQUENCE
- FILL SEQUENCE
- DEWATER PUMP
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- STONE FILTER RING
- TEMPORARY CONSTRUCTION ENTRANCE / EXIT
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- ACTIVE WORK PAD PREPARATION
- AREAS TO RECEIVE PERMANENT STABILIZATION
- PROPOSED ROAD / CONTAINMENT BERM
- TEMPORARY CONSTRUCTION ENTRANCE/EXIT
- WATER SURFACE
- WETLANDS

NOTES:

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0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT AND ESC PLAN - PHASE VI

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

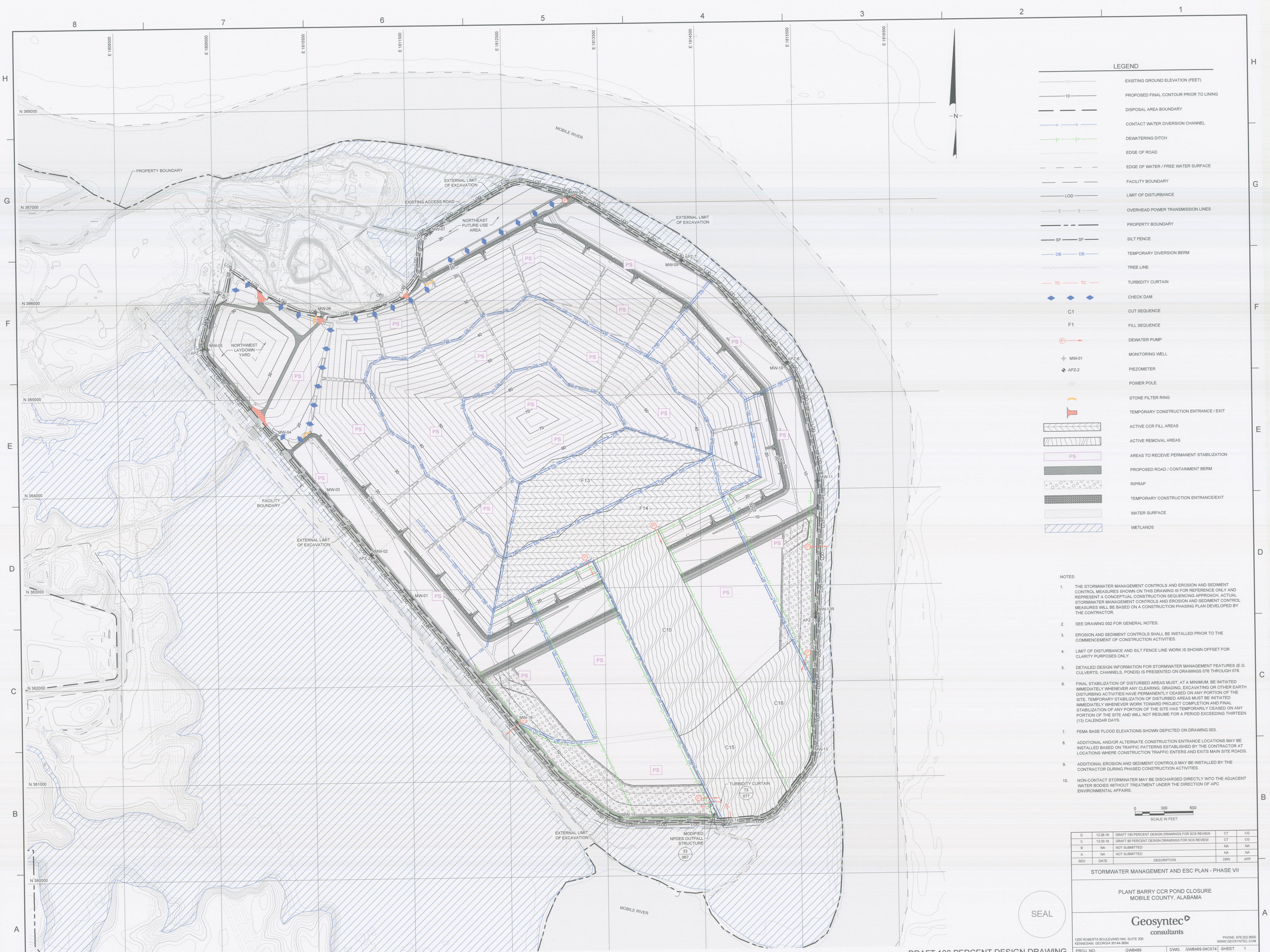
Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C073	SHEET 1
SCALE	1" = 300'		
DATE	DECEMBER 2018	DRAWING 064 OF 097	

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C073

ANSI E: 44x34



LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- CONTACT WATER DIVERSION CHANNEL
- DEWATERING DITCH
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- LIMIT OF DISTURBANCE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- SILT FENCE
- TEMPORARY DIVERSION BERM
- TREE LINE
- TURBIDITY CURTAIN
- CHECK DAM
- CUT SEQUENCE
- FILL SEQUENCE
- DEWATER PUMP
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- STONE FILTER RING
- TEMPORARY CONSTRUCTION ENTRANCE / EXIT
- ACTIVE CCR FILL AREAS
- ACTIVE REMOVAL AREAS
- AREAS TO RECEIVE PERMANENT STABILIZATION
- PROPOSED ROAD / CONTAINMENT BERM
- RIPRAP
- TEMPORARY CONSTRUCTION ENTRANCE/EXIT
- WATER SURFACE
- WETLANDS

NOTES:

1. THE STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENT A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES WILL BE BASED ON A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
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0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT AND ESC PLAN - PHASE VII

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

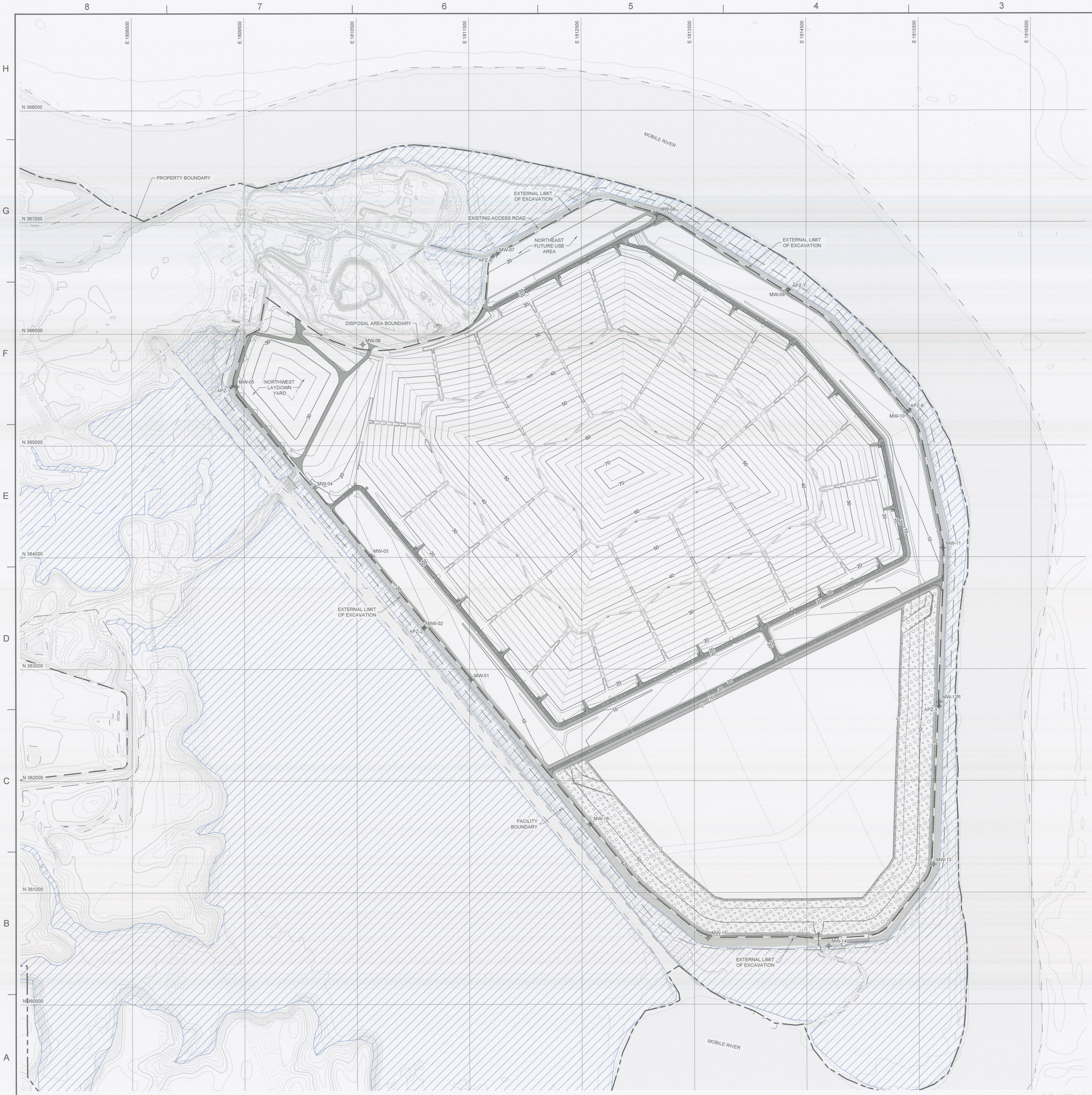
Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C074
SCALE	1" = 300'	SHEET	1
DATE	DECEMBER 2018	DRAWING	065 OF 097

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

L:\ACDS\AL\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C074



LEGEND

- EXISTING GROUND ELEVATION (FEET)
- PROPOSED FINAL CONTOUR PRIOR TO LINING
- DISPOSAL AREA BOUNDARY
- CONTACT WATER DIVERSION CHANNEL
- DEWATERING DITCH
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- LIMIT OF DISTURBANCE
- OVERHEAD POWER TRANSMISSION LINES
- PROPERTY BOUNDARY
- SILT FENCE
- TEMPORARY DIVERSION BERM
- TREE LINE
- MONITORING WELL
- PIEZOMETER
- POWER POLE
- RIPRAP
- PROPOSED ROAD / SOIL CONTAINMENT BERM
- WATER SURFACE
- WETLANDS

NOTES:

1. THE STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES SHOWN ON THIS DRAWING IS FOR REFERENCE ONLY AND REPRESENT A CONCEPTUAL CONSTRUCTION SEQUENCING APPROACH. ACTUAL STORMWATER MANAGEMENT CONTROLS AND EROSION AND SEDIMENT CONTROL MEASURES WILL BE BASED ON A CONSTRUCTION PHASING PLAN DEVELOPED BY THE CONTRACTOR.
2. SEE DRAWING 002 FOR GENERAL NOTES.
3. EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES.
4. LIMIT OF DISTURBANCE AND SILT FENCE LINE WORK IS SHOWN OFFSET FOR CLARITY PURPOSES ONLY.
5. DETAILED DESIGN INFORMATION FOR STORMWATER MANAGEMENT FEATURES (E.G. CULVERTS, CHANNELS, PONDS) IS PRESENTED ON DRAWINGS 076 THROUGH 078.
6. FINAL STABILIZATION OF DISTURBED AREAS MUST, AT A MINIMUM, BE INITIATED IMMEDIATELY WHENEVER ANY CLEARING, GRADING, EXCAVATING OR OTHER EARTH DISTURBING ACTIVITIES HAVE PERMANENTLY CEASED ON ANY PORTION OF THE SITE. TEMPORARY STABILIZATION OF DISTURBED AREAS MUST BE INITIATED IMMEDIATELY WHENEVER WORK TOWARD PROJECT COMPLETION AND FINAL STABILIZATION OF ANY PORTION OF THE SITE HAS TEMPORARILY CEASED ON ANY PORTION OF THE SITE AND WILL NOT RESUME FOR A PERIOD EXCEEDING THIRTEEN (13) CALENDAR DAYS.
7. FEMA BASE FLOOD ELEVATIONS SHOWN DEPICTED ON DRAWING 003.
8. ADDITIONAL AND/OR ALTERNATE CONSTRUCTION ENTRANCE LOCATIONS MAY BE INSTALLED BASED ON TRAFFIC PATTERNS ESTABLISHED BY THE CONTRACTOR AT LOCATIONS WHERE CONSTRUCTION TRAFFIC ENTERS AND EXITS MAIN SITE ROADS.
9. ADDITIONAL EROSION AND SEDIMENT CONTROLS MAY BE INSTALLED BY THE CONTRACTOR DURING PHASED CONSTRUCTION ACTIVITIES.
10. NON-CONTACT STORMWATER MAY BE DISCHARGED DIRECTLY INTO THE ADJACENT WATER BODIES WITHOUT TREATMENT UNDER THE DIRECTION OF APC ENVIRONMENTAL AFFAIRS.

0 300 600
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT AND ESC PLAN - PHASE VIII

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C062	SHEET 1
SCALE	1" = 300'	DRAWING 066 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

L:\CADD\AL\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C062

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DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

SEAL

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KENNESAW, GEORGIA 30144-3594
PHONE: 678 202 3600
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489_0AC038	SHEET	1
SCALE	AS SHOWN				
DATE	DECEMBER 2018				

DRAWING 067 OF 097

OUTFALL STRUCTURE MODIFICATIONS - INTERIM CONDITIONS

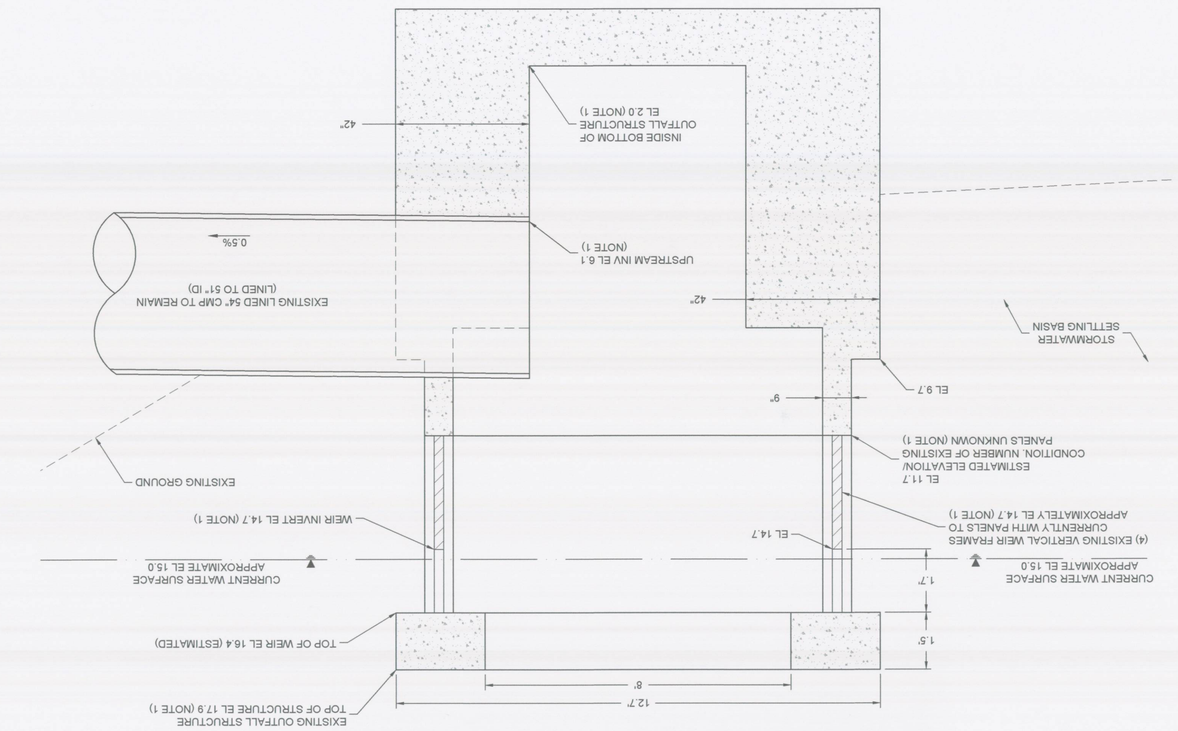
PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

REV	DATE	DESCRIPTION	DSN	APP
A	NA	NOT SUBMITTED	NA	NA
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

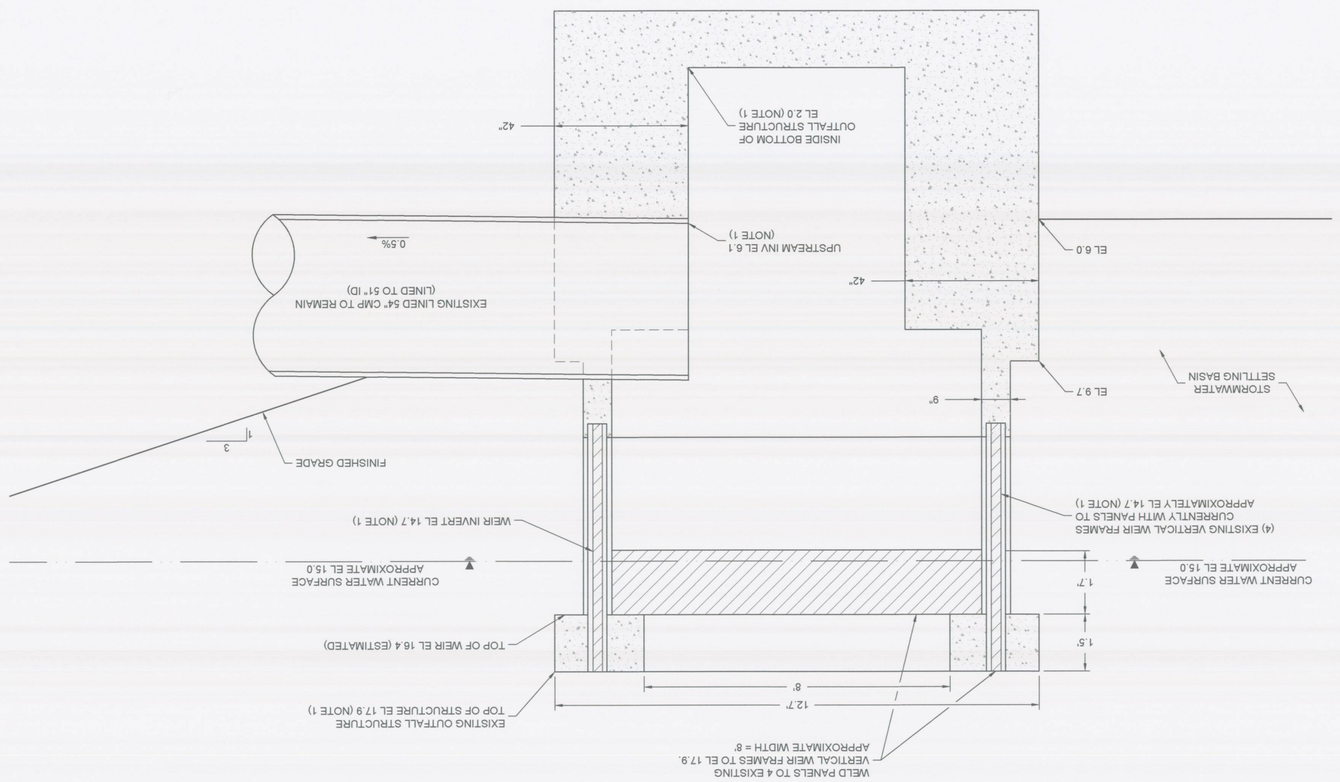
NOTES:

1. EXISTING DATA FOR THE CURRENT OUTFALL STRUCTURE IS LIMITED. DIMENSIONS, MATERIALS, DETAILS, AND ELEVATIONS SHOWN ARE APPROXIMATE AND BASED UPON:
   a. SCS ENGINEERING AND CONSTRUCTION CALCULATION NUMBER TS-BA-ECS94-002 AND DOCUMENT TITLED 'INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN, PLANT BARRY ASH POND, ALABAMA POWER COMPANY'.
   b. SURVEYED ELEVATION MEASUREMENT OF INSIDE BOTTOM OF CURRENT OUTFALL STRUCTURE PROVIDED BY SCS ON SEPTEMBER 7, 2018, AND
   c. FIELD MEASUREMENTS TAKEN BY SOUTHERN COMPANY SUBCONTRACTOR ON NOVEMBER 14, 2018.
2. EXISTING GABION BASKET WALL LIMITS, ALIGNMENT, AND ELEVATION ARE BASED ON SCS DRAWINGS 'PLANT BARRY ASH POND DIKE WALL AND CROSS SECTIONS AT DISCHARGE', DATED MARCH 21, 2005 (DRAWING NO. D-552580).

EXISTING CONDITIONS

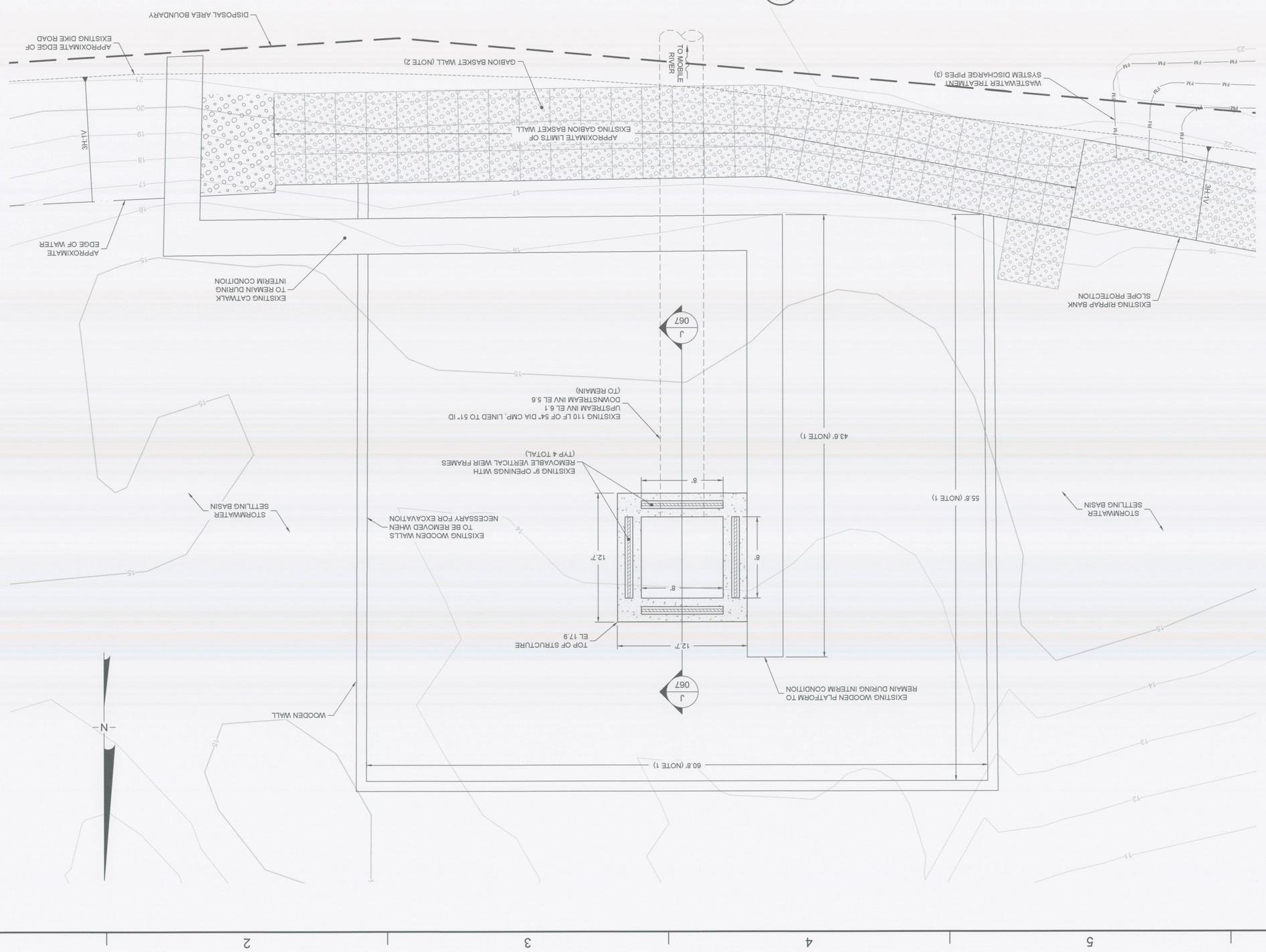


PROPOSED INTERIM CONDITIONS

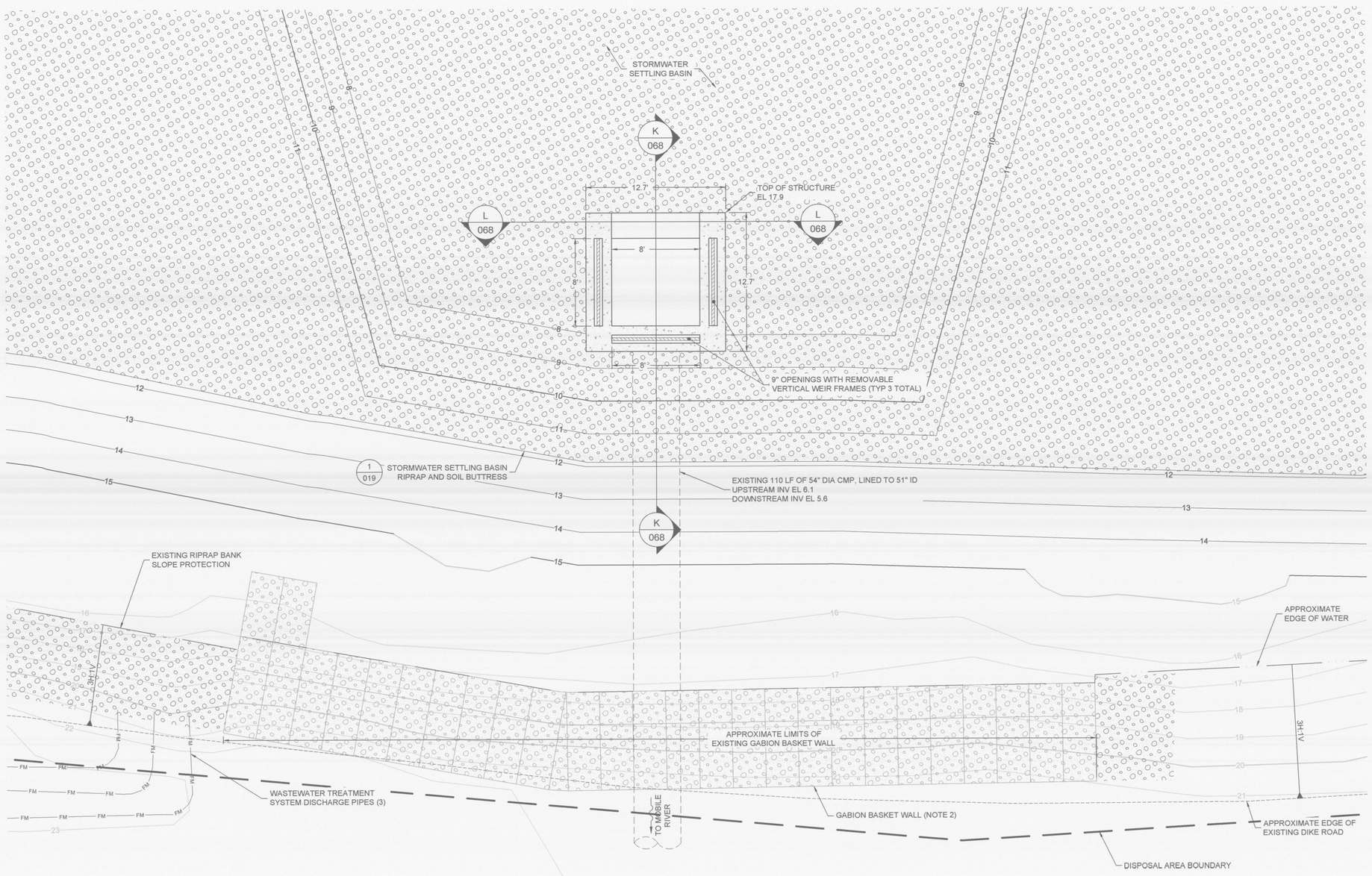


SOURCE: APC DRAWING TITLED "ASH POND DISCHARGE"

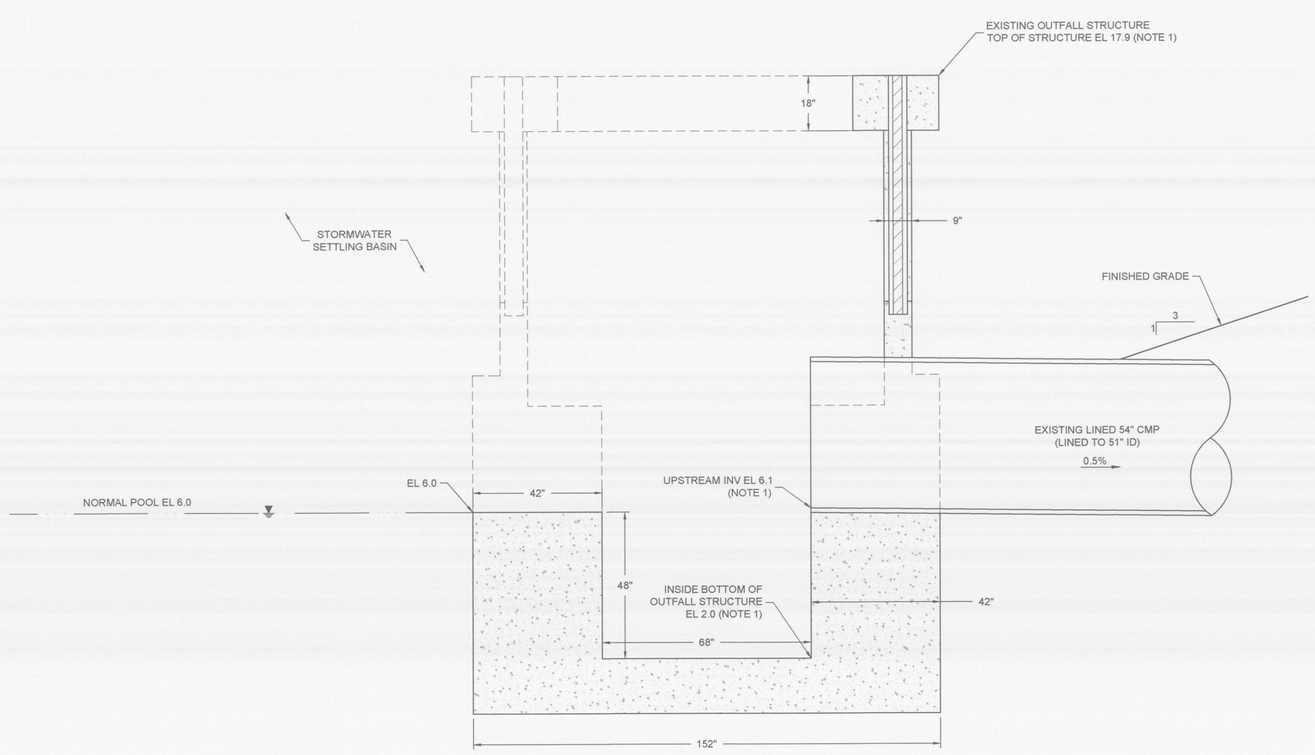
PLAN
33
067
J
SCALE: 1" = 5'



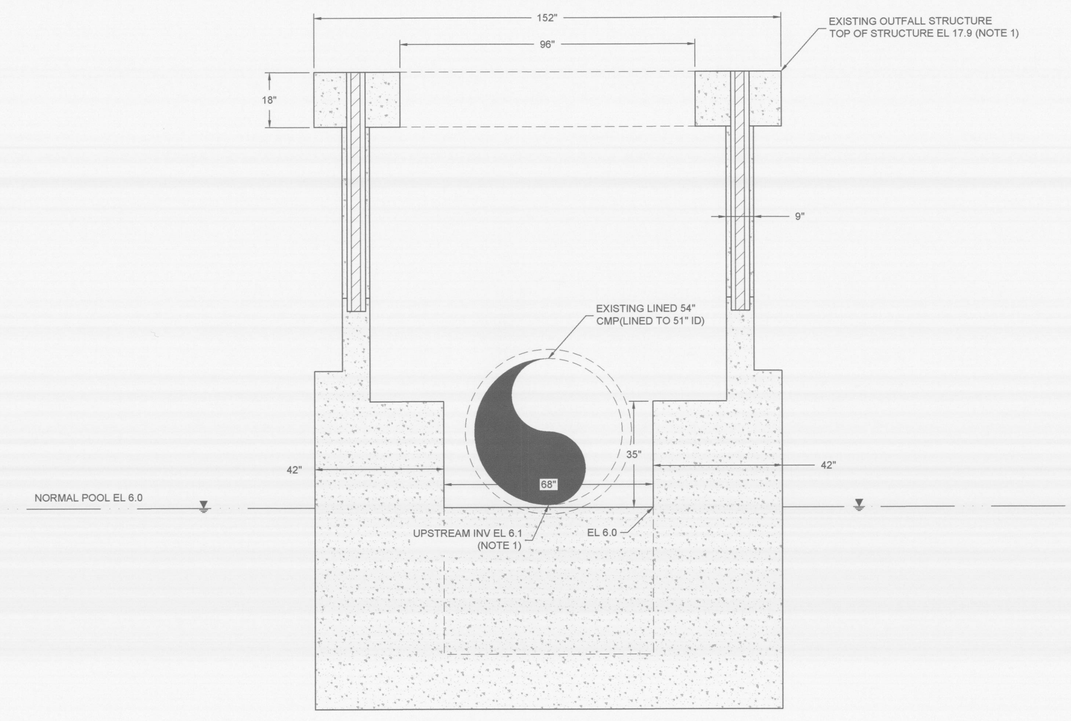
OUTFALL STRUCTURE MODIFICATIONS
067
J
SCALE: 1" = 2'



34/017 PLAN
OUTFALL STRUCTURE - FINAL CONDITIONS
SCALE: 1" = 5'



K/068 SECTION
OUTFALL STRUCTURE - FINAL CONDITIONS
SCALE: 1" = 2'



L/068 SECTION
OUTFALL STRUCTURE - FINAL CONDITIONS
SCALE: 1" = 2'

NOTE:

1. EXISTING DATA FOR THE CURRENT OUTFALL STRUCTURE IS LIMITED. DIMENSIONS, MATERIALS, DETAILS, AND ELEVATIONS SHOWN ARE APPROXIMATE AND BASED UPON:
   a. SCS ENGINEERING AND CONSTRUCTION CALCULATION NUMBER TS-BA-ECS94-002 AND DOCUMENT TITLED 'INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN, PLANT BARRY ASH POND, ALABAMA POWER COMPANY';
   b. SURVEYED ELEVATION MEASUREMENT OF INSIDE BOTTOM OF CURRENT OUTFALL STRUCTURE PROVIDED BY SCS ON SEPTEMBER 7, 2018; AND
   c. FIELD MEASUREMENTS TAKEN BY SOUTHERN COMPANY SUBCONTRACTOR ON NOVEMBER 14, 2018.
2. EXISTING GABION BASKET WALL LIMITS, ALIGNMENT, AND ELEVATION ARE BASED ON SCS DRAWINGS 'PLANT BARRY ASH POND DIKE WALL AND CROSS SECTIONS AT DISCHARGE', DATED MARCH 21, 2005 (DRAWING NO. D-552580).

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

OUTFALL STRUCTURE MODIFICATIONS - FINAL CONDITIONS

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

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WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C039	SHEET	1
SCALE	AS SHOWN	DRAWING 068 OF 097			
DATE	DECEMBER 2018				

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

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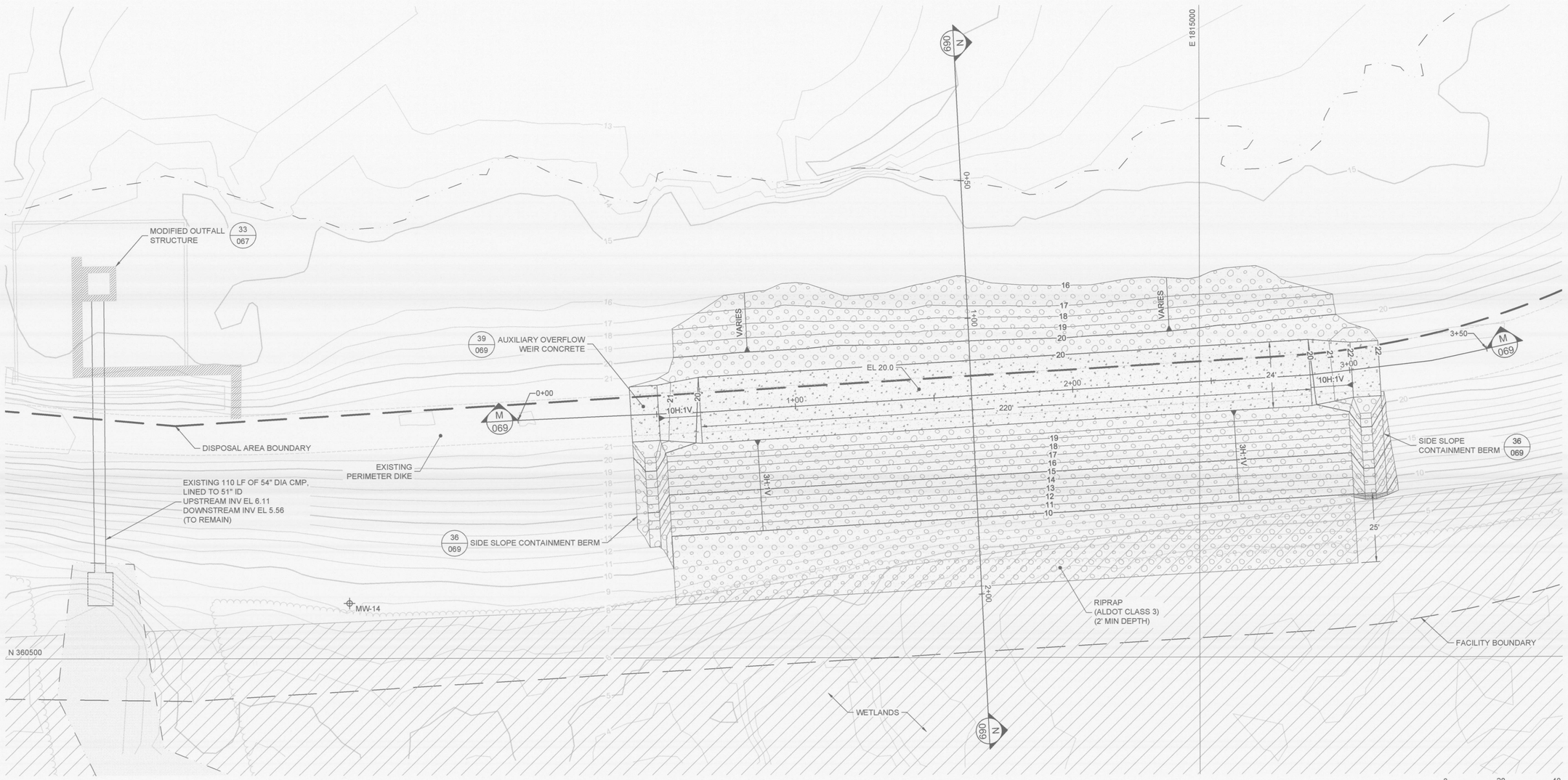
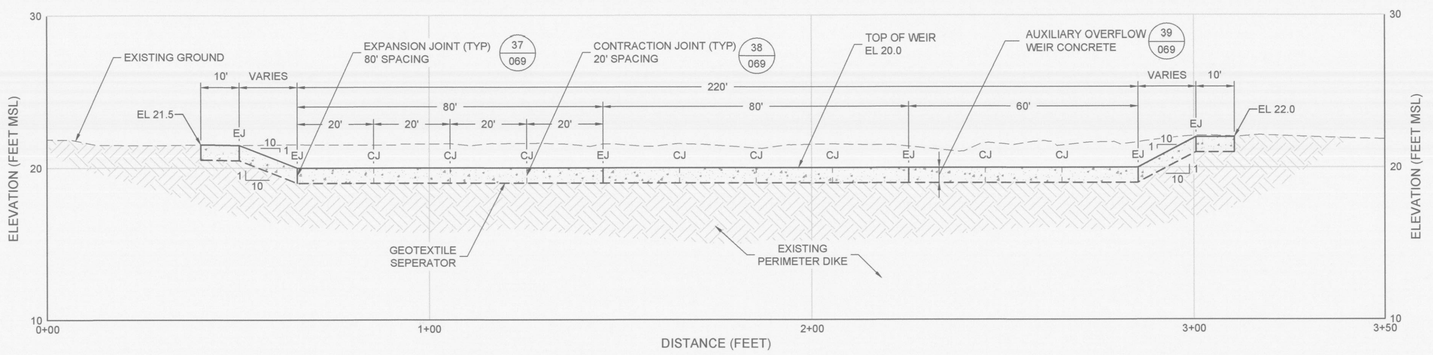


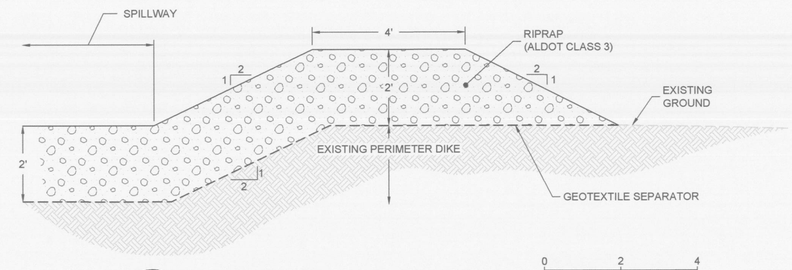
35 006 PLAN
AUXILIARY OVERFLOW WEIR - INTERIM CONDITIONS
(NOTE 1)
SCALE: 1" = 20'

0 20 40
HORIZONTAL SCALE IN FEET



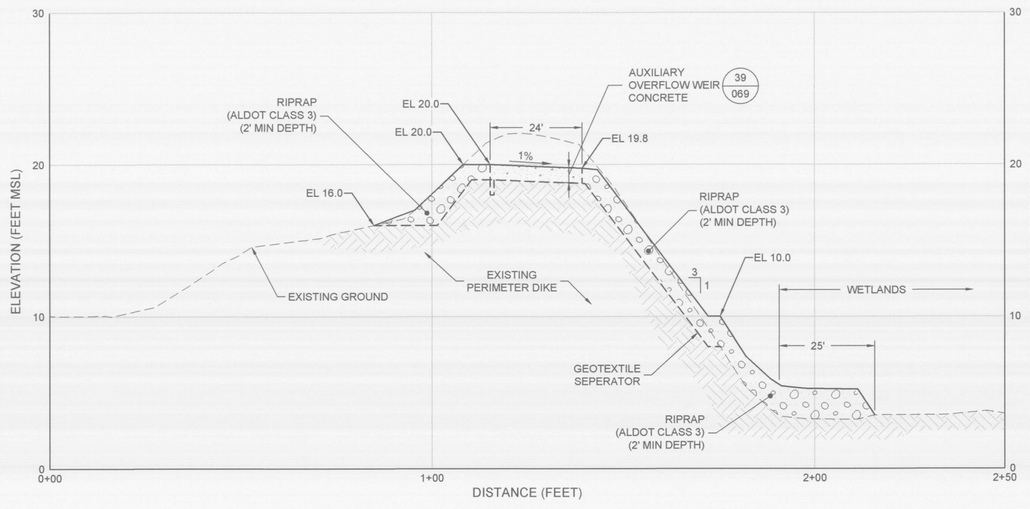
M 069 SECTION
AUXILIARY OVERFLOW WEIR - INTERIM CONDITION
SCALE: 1" = 20' (HORIZONTAL); 1" = 5' (VERTICAL)

0 20 40
HORIZONTAL SCALE IN FEET
0 5 10
VERTICAL SCALE IN FEET

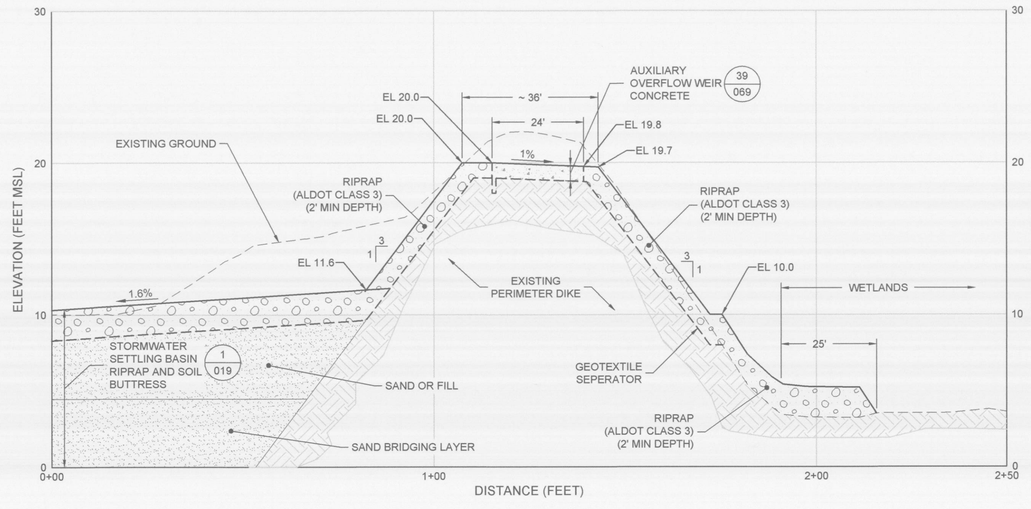


36 069 DETAIL
SIDE SLOPE CONTAINMENT BERM
SCALE: 1" = 2'

0 2 4
HORIZONTAL SCALE IN FEET



INTERIM CONDITION



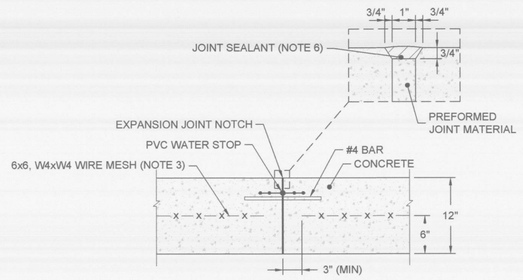
FINAL CONDITION

N 069 SECTION
AUXILIARY OVERFLOW WEIR
SCALE: 1" = 20' (HORIZONTAL); 1" = 5' (VERTICAL)

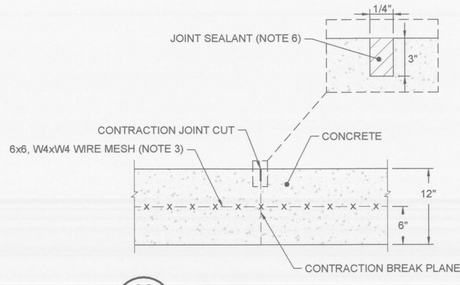
0 20 40
HORIZONTAL SCALE IN FEET
0 5 10
VERTICAL SCALE IN FEET

LEGEND

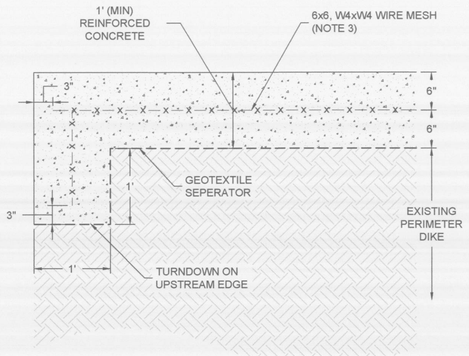
- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- FORCEMAIN
- TREE LINE
- MW-13 MONITORING WELL
- CONCRETE
- EXISTING PERIMETER DIKE
- RIPRAP
- WATER SURFACE
- WETLAND



37 069 DETAIL
EXPANSION JOINT
(NOTE 4)
SCALE: 1" = 1'



38 069 DETAIL
CONTRACTION JOINT
(NOTE 5)
SCALE: 1" = 1'



0 1 2
HORIZONTAL SCALE IN FEET

39 069 SECTION
AUXILIARY OVERFLOW WEIR CONCRETE
SCALE: 1" = 1'

NOTES:

1. AUXILIARY OVERFLOW WEIR SHALL BE INSTALLED PRIOR TO CCR EXCAVATION. FACE OF THE AUXILIARY OVERFLOW WEIR SHALL BE KEYED 2 FT INTO THE EXISTING DIKE (I.E., TOP OF RIP RAP SHALL BE AT THE CURRENT DIKE ELEVATION GRADES ALONG THE SLOPE).
2. AUXILIARY OVERFLOW WEIR SHALL BE REBUILT TO THE GRADES SHOWN IN THE FINAL CONDITIONS FOLLOWING COMPLETION OF CCR EXCAVATION AND INSTALLATION OF THE RIPRAP AND SOIL BUTTRESS.
3. WIRE MESH SHALL BE A 6"X6" GRID USING 4 GAUGE WIRE (6X6, W4XW4), OR ENGINEER-APPROVED EQUIVALENT. MESH SHALL BE EMBEDDED IN THE MIDDLE OF THE CONCRETE THICKNESS. A MINIMUM OF 3" OF CLEARANCE SHALL BE MAINTAINED BETWEEN THE WIRE MESH AND ANY EDGE OF THE CONCRETE UNLESS OTHERWISE DETAILED. MESH SHALL BE CONTINUOUS ACROSS THE CHANNEL WITH TIED OVERLAPS A MINIMUM OF 6" BETWEEN ADJOINING PANELS.
4. EXPANSION JOINTS SHALL BE SPACED EVERY 80 FT ALONG THE LENGTH OF THE WEIR AND AS ELSEWHERE NOTED IN THE CONSTRUCTION DRAWINGS UNLESS OTHERWISE SHOWN IN THE CONTRACTOR'S PLACEMENT PLAN AND APPROVED BY THE CERTIFICATION ENGINEER. JOINTS SHALL BE 1" WIDE WITH PREFORMED JOINT MATERIAL (I.E., BITUMINOUS IMPREGNATED CELLULOSE OR CORK, SPONGE, RUBBER, OR RESIN-BOUND CORK, AND SHALL CONFORM TO ASTM 1751 OR 1752), PVC WATER STOP, AND JOINT SEALANT. DOWELS/REINFORCING STEEL SHALL BE PLACED ACROSS EXPANSION JOINTS. DOWELS/REINFORCING STEEL SHALL BE #4 BARS CUT TO 12" IN LENGTH, SPACED EVERY 12" ON CENTER (O.C.), AND EMBEDDED 3" (MIN) BELOW THE CONCRETE SURFACE. DOWELS/REINFORCING STEEL SHALL HAVE 6" (MIN) OF LENGTH ON EITHER SIDE OF THE EXPANSION JOINT AND MUST BE PAINTED AND OILED ON ONE END WITH ALL OILED ENDS ORIENTED TO THE SAME SIDE OF THE JOINT. THE REINFORCING WIRE MESH SHALL NOT PASS THROUGH THE EXPANSION JOINT. JOINT SEALANT SHALL BE APPLIED ALONG ALL EXPOSED EDGES OF THE EXPANSION JOINT.
5. CONTRACTION JOINTS SHALL BE SPACED EVERY 20 FT ALONG THE LENGTH OF THE WEIR AND AS NOTED ELSEWHERE IN THE CONSTRUCTION DRAWINGS UNLESS OTHERWISE NOTED IN THE CONTRACTOR'S PLACEMENT PLAN AND APPROVED BY THE CERTIFICATION ENGINEER. JOINTS SHALL BE SAW CUT ¼" IN WIDTH, 3" DEEP, AND FILLED WITH A JOINT SEALING COM COMPOUND. THE WIRE MESH SHALL BE CONTINUOUS THROUGH THE CONTRACTION BREAK PLANE.
6. JOINT SEALANT SHALL BE INSTALLED TO THE MANUFACTURER'S RECOMMENDATIONS AND WITHOUT OVER-FILLING. SURFACES SHALL BE CLEAN, FREE OF GREASE, DUST, AND LOOSE PARTICLES PRIOR TO INSTALLATION OF SEALANT.
7. REFER TO THE PROJECT TECHNICAL SPECIFICATIONS FOR REQUIRED MATERIAL PROPERTIES AND INSTALLATION TOLERANCES.

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

AUXILIARY OVERFLOW WEIR

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
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KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C069	SHEET 1
SCALE	AS SHOWN	DRAWING 069 OF 097	
DATE	DECEMBER 2018		

ANSI E: 44x34

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DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DSN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO

COVER SYSTEM AND TIE-IN DETAILS I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec^D
consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
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PHONE: 678 202 9600
WWW.GEOSYNTEC.COM

PROJ. NO.	GM6489
DWG.	GM6489 04C052
SHEET	1
SCALE	AS SHOWN
DATE	DECEMBER 2018
DRAWING 070 OF 097	

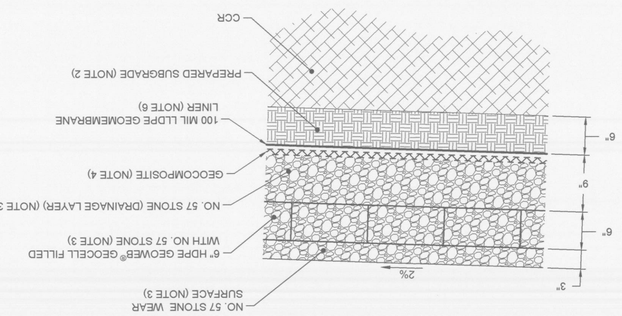
ANSI E 44X34

NOTES:

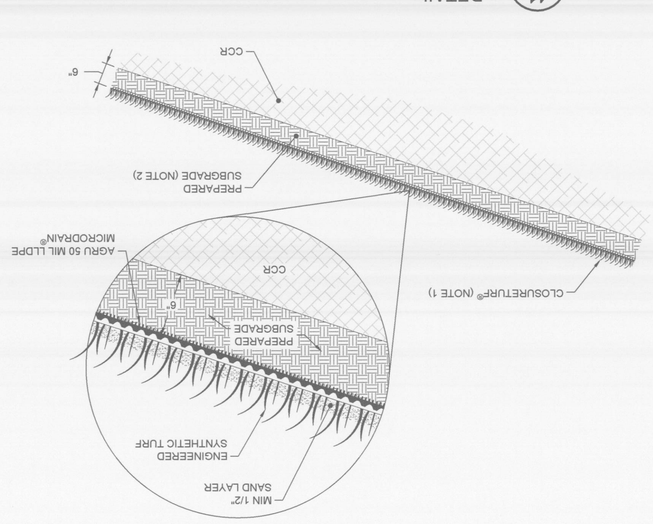
1. CLOSURETURF SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 35 19.
2. EARTHWORK SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 23 00.
3. AGGREGATE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 16.
4. GEOCOMPOSITE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.26.
5. GEOTEXTILE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.13.
6. GEOMEMBRANE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.16.

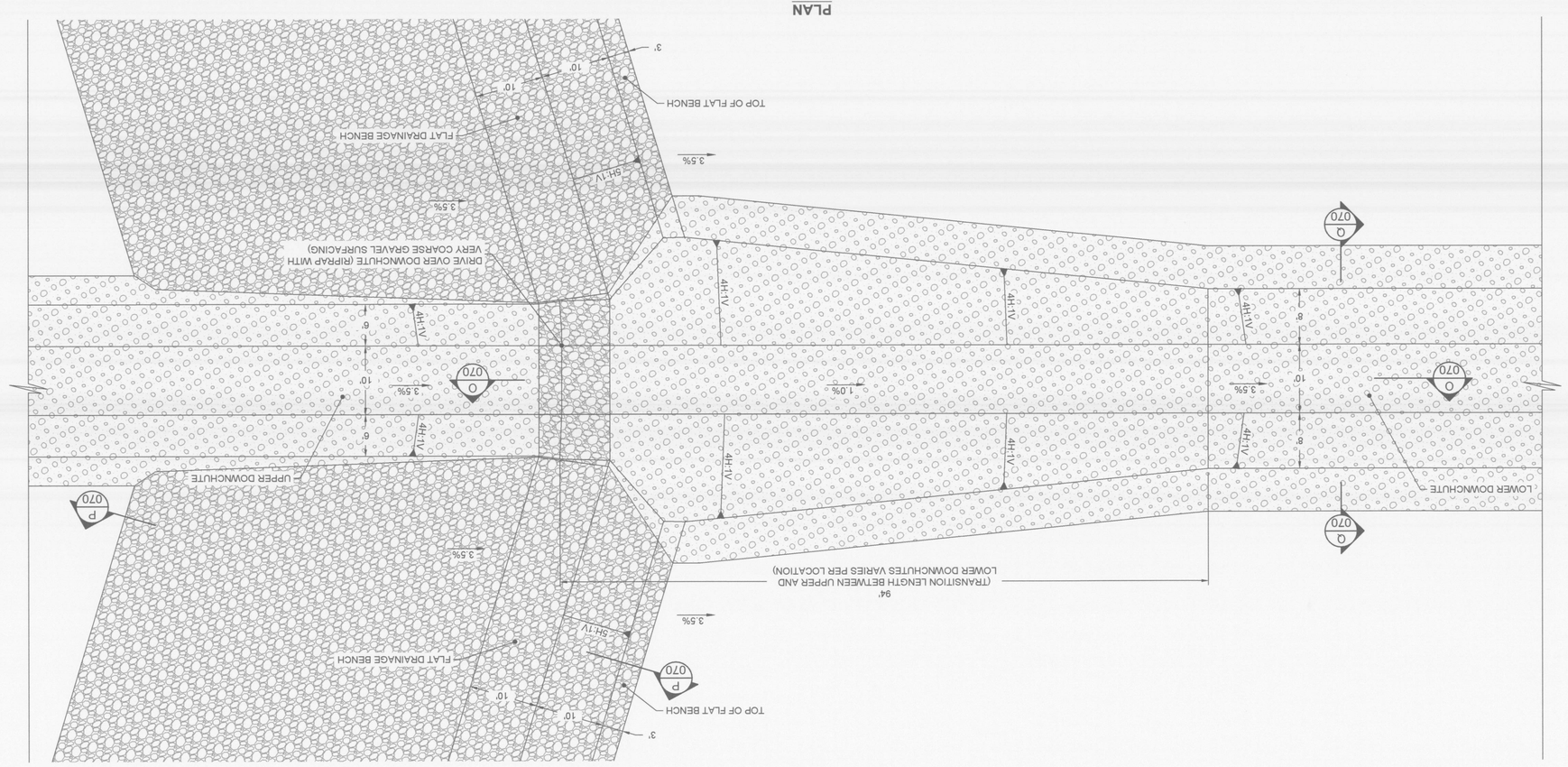
43 / 070 DETAIL
NORTHEAST FUTURE USE AREA COVER SYSTEM
SCALE: 1" = 1'

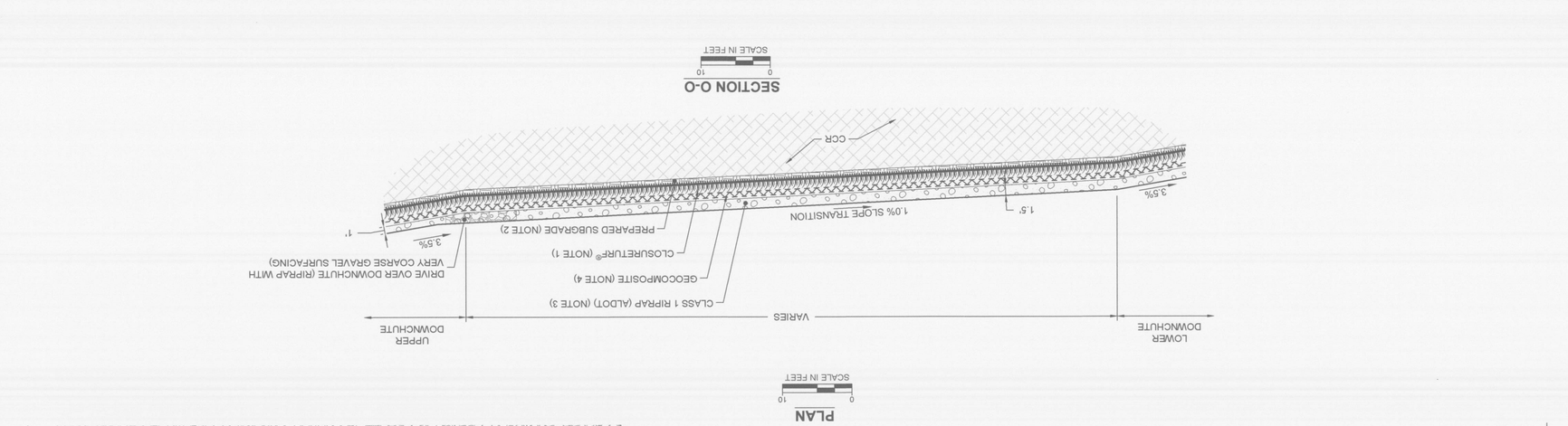
42 / 006 DETAIL
NORTHWEST LAYDOWN AREA COVER SYSTEM
SCALE: 1" = 1'



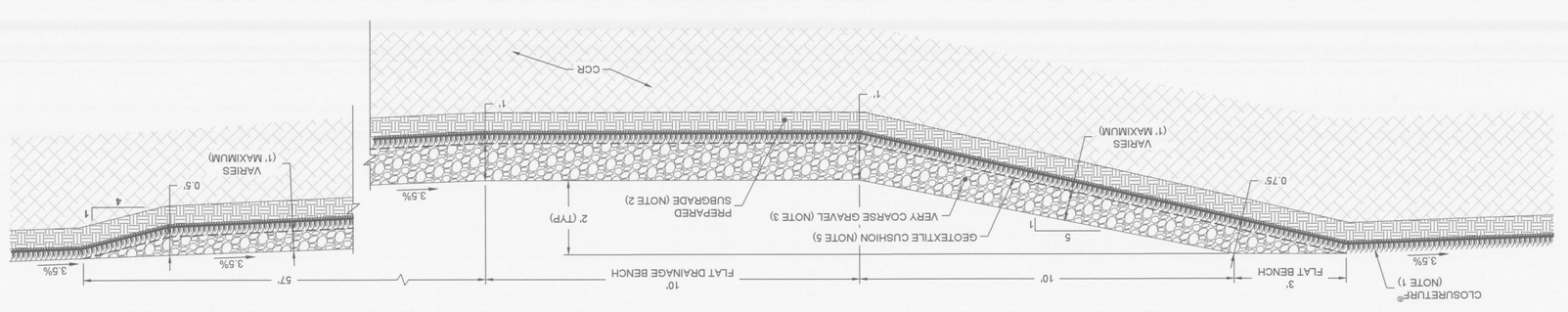
41 / 018 DETAIL
CLOSURETURF® - TYPICAL SECTION
SCALE: 1" = 2'







40 / 013 DETAIL
DOWNCHUTE AND DRAINAGE BENCHES
SCALE: AS NOTED



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DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

SEAL

REV	DATE	DESCRIPTION	DRN	APP
A	04.30.19	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
B	06.27.19	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
C	12.03.19	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO
D	12.26.19	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CO

COVER SYSTEM AND TIE-IN DETAILS II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3684
PHONE: 678 202 2600
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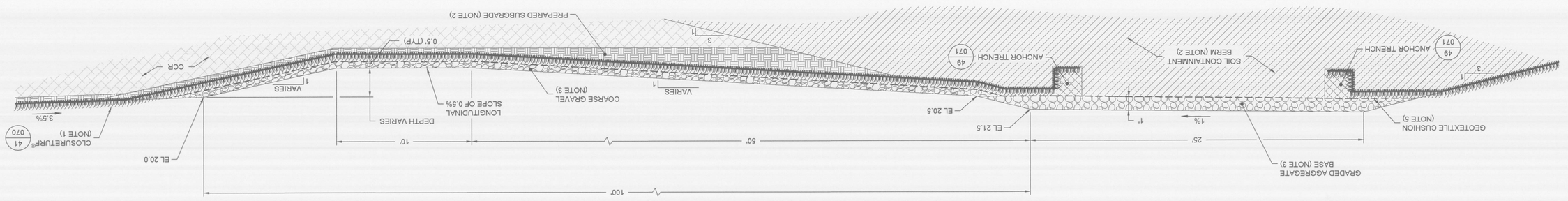
PROJ. NO.	GM6489	DWG.	GM6489 04C053	SHEET	1
SCALE	AS SHOWN				
DATE	DECEMBER 2019		DRAWING 071 OF 097		

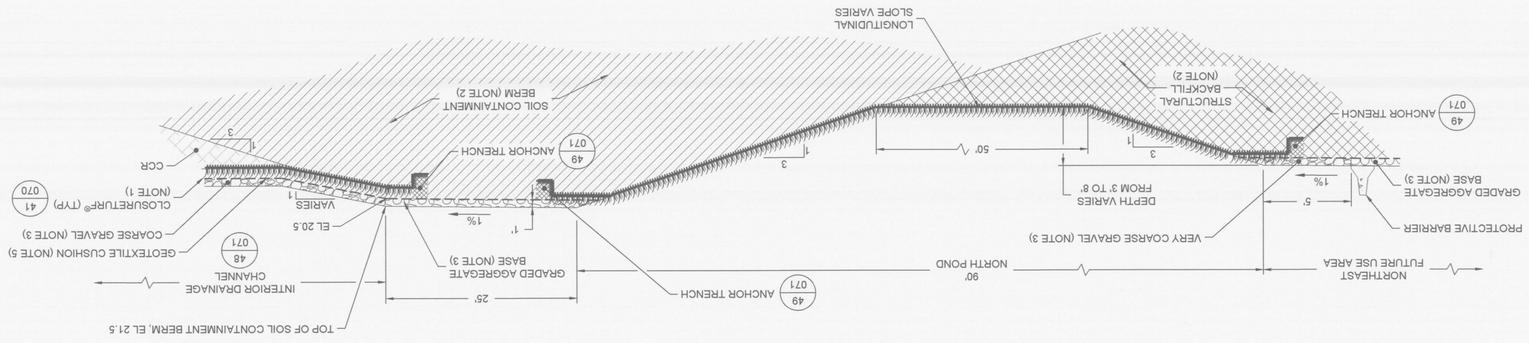
ANSI E 44X34

48 DETAIL 013
COVER SYSTEM FOR INTERIOR DRAINAGE CHANNEL
SCALE: 1" = 4'

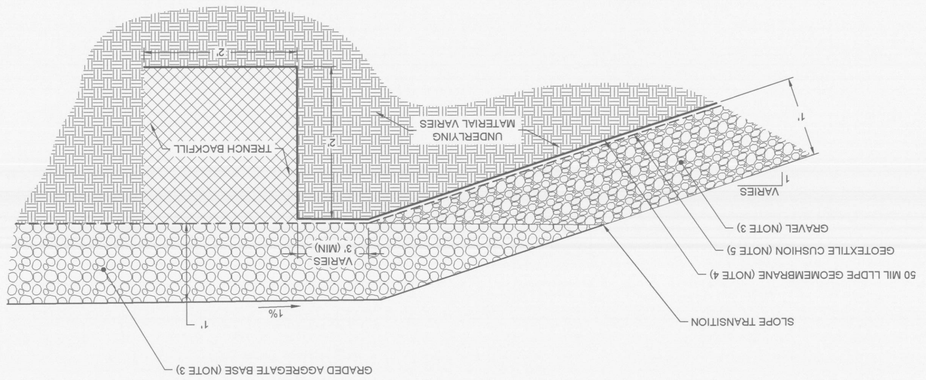


NOTES:
1. CLOSURETURF SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 35 19.
2. EARTHWORK SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 23 00.
3. AGGREGATE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 16.
4. GEOMEMBRANE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.16.
5. GEOTEXTILE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.13.
6. GEOCOMPOSITE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.26.

47 DETAIL 013
COVER SYSTEM AT NORTH STORMWATER POND
SCALE: 1" = 10'

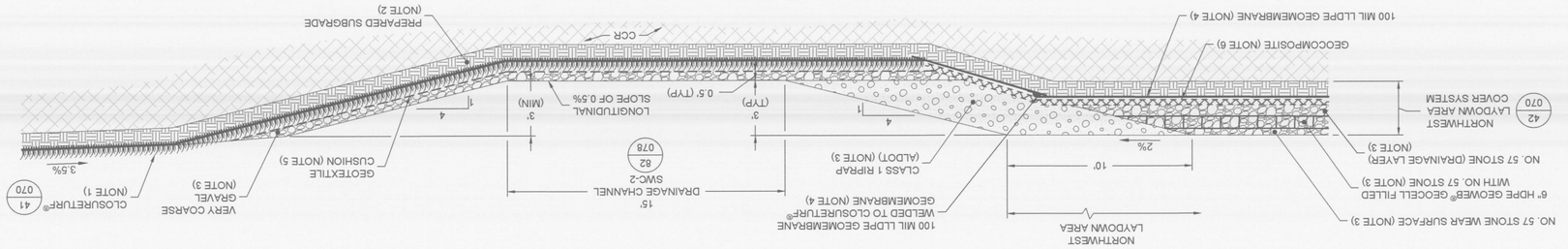


50 DETAIL 071
NORTH STORMWATER POND ANCHOR TRENCH
SCALE: 1" = 1'

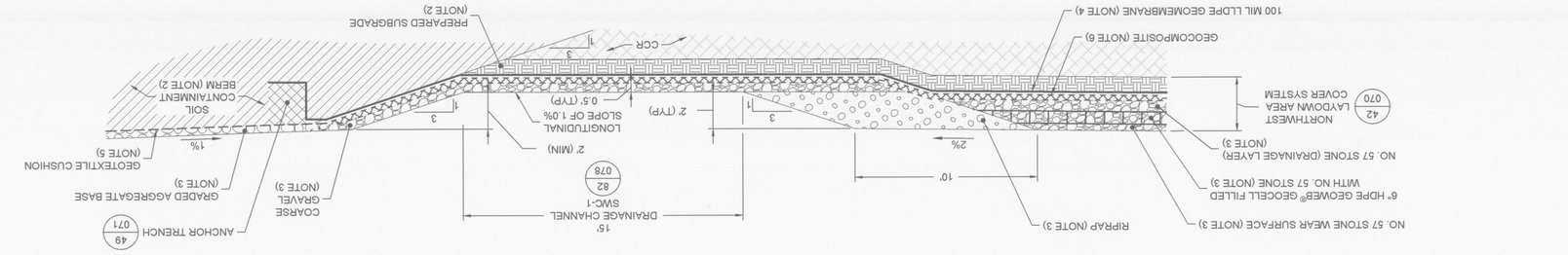


46 DETAIL 032
COVER SYSTEM AT SWC-3
SCALE: 1" = 4'

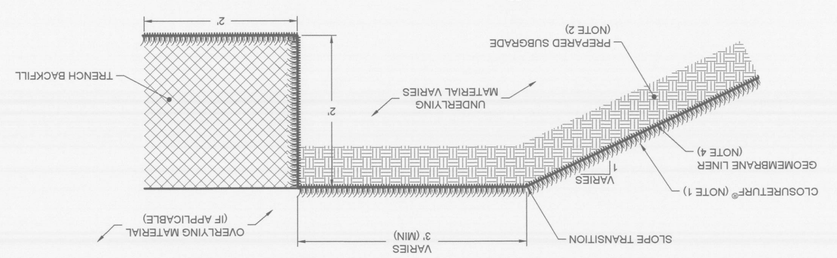
45 DETAIL 032
COVER SYSTEM AT SWC-2
SCALE: 1" = 4'

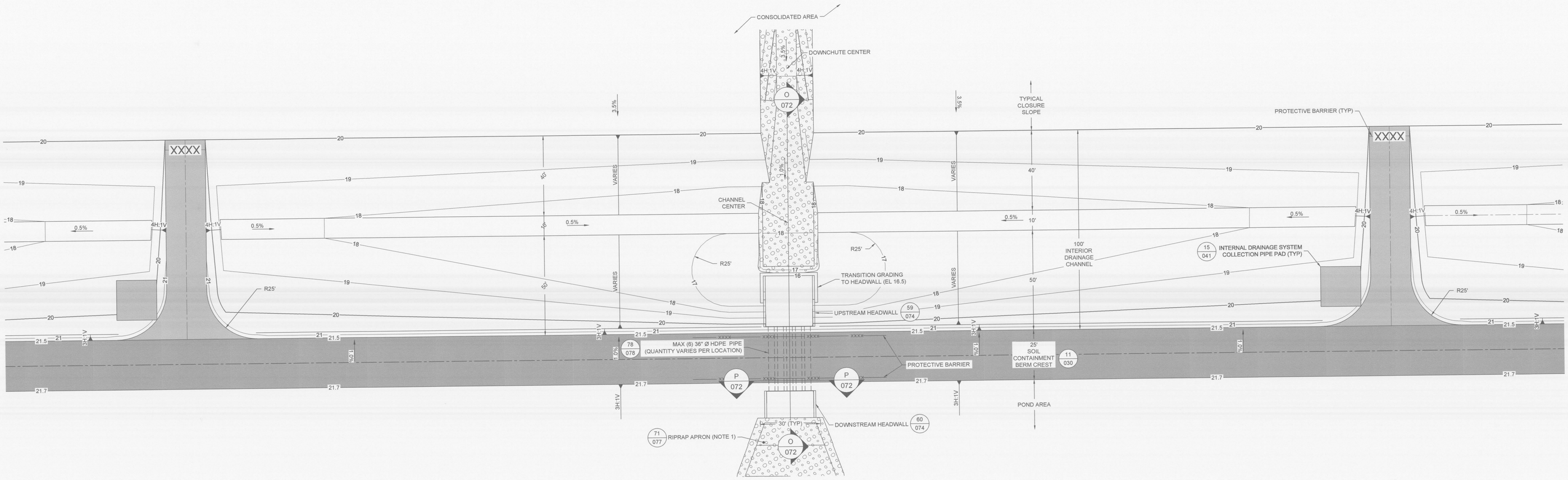


44 DETAIL 032
COVER SYSTEM AT SWC-1
SCALE: 1" = 4'

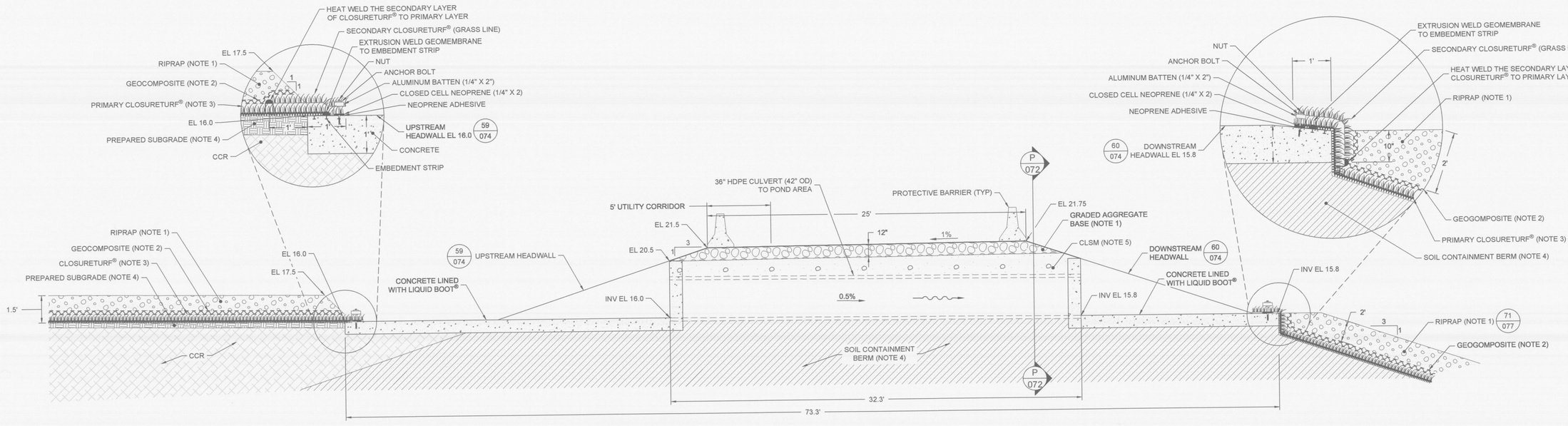


49 DETAIL 030
ANCHOR TRENCH
SCALE: 1" = 1'

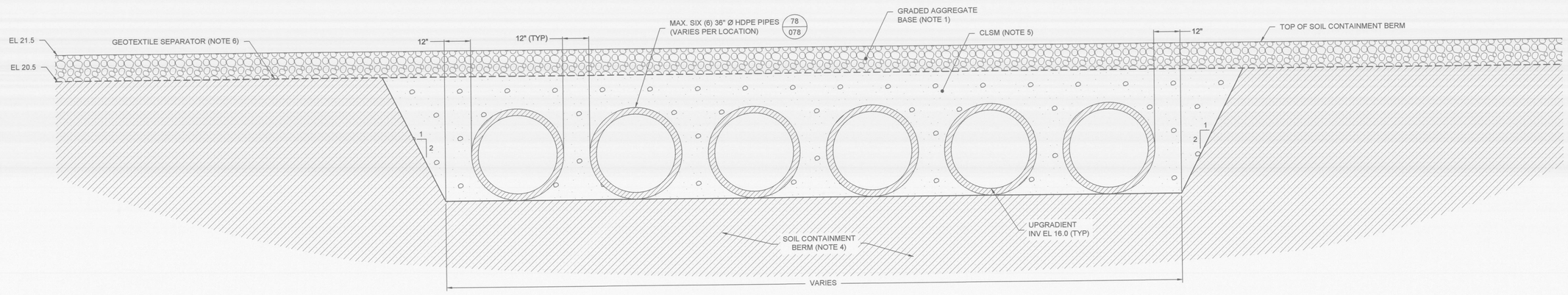




51 / 021 DETAIL
INTERIOR DRAINAGE CHANNEL OUTLET (TYP)
SCALE: 1" = 20'



O 021 SECTION
INTERIOR DRAINAGE CHANNEL OUTLET
SCALE: 1" = 4'



P 072 SECTION
INTERIOR DRAINAGE CHANNEL OUTLET
SCALE: 1" = 2'

NOTES:

1. AGGREGATE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 16.
2. GEOCOMPOSITE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.26.
3. CLOSURETURF SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 35 19.
4. EARTHWORK SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 23 00.
5. CAST-IN-PLACE CONCRETE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 03 30 00.
6. GEOTEXTILE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.13.

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	04.30.18	DRAFT 30 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG

COVER SYSTEM AND TIE-IN DETAILS III

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

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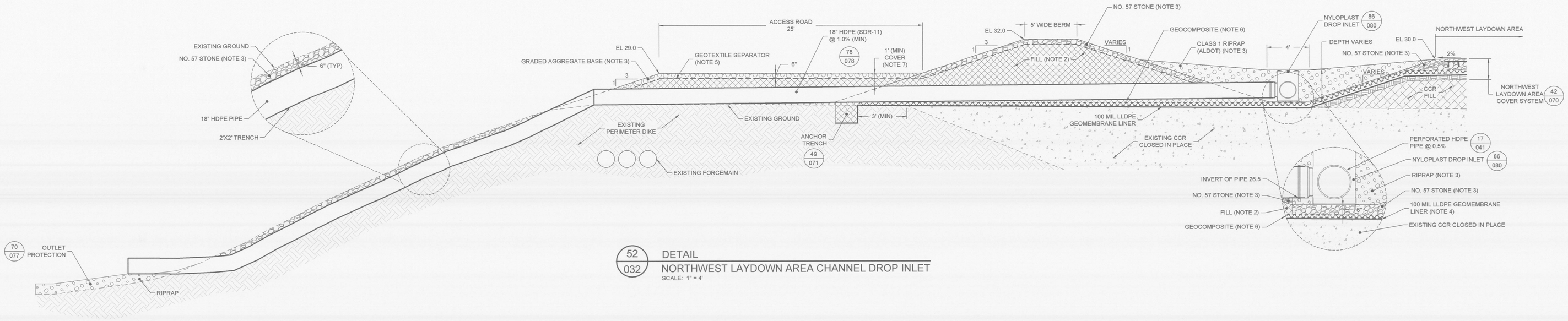
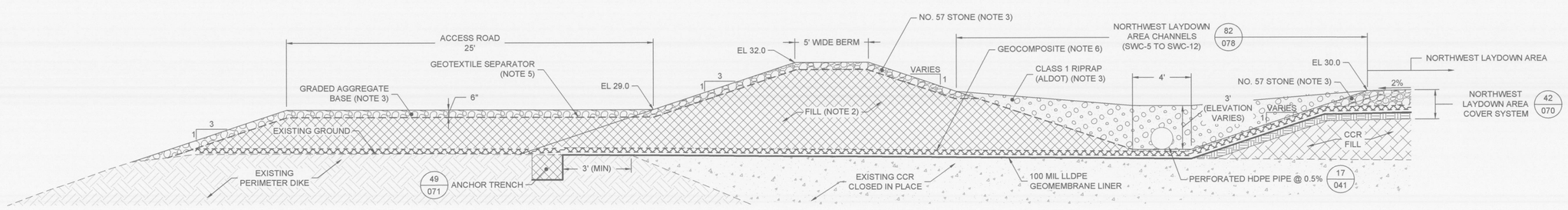
PROJ. NO.	GW6489	DWG. GW6489.04C054	SHEET 1
SCALE	AS SHOWN	DRAWING 072 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

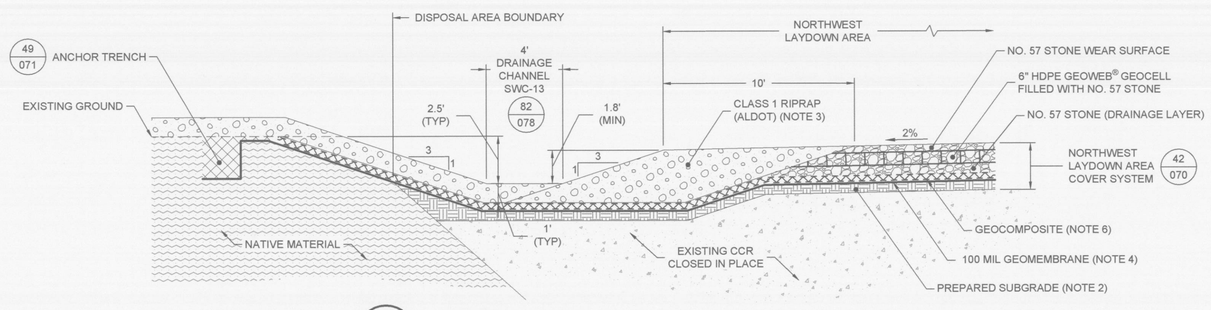
ANSI E: 44x34



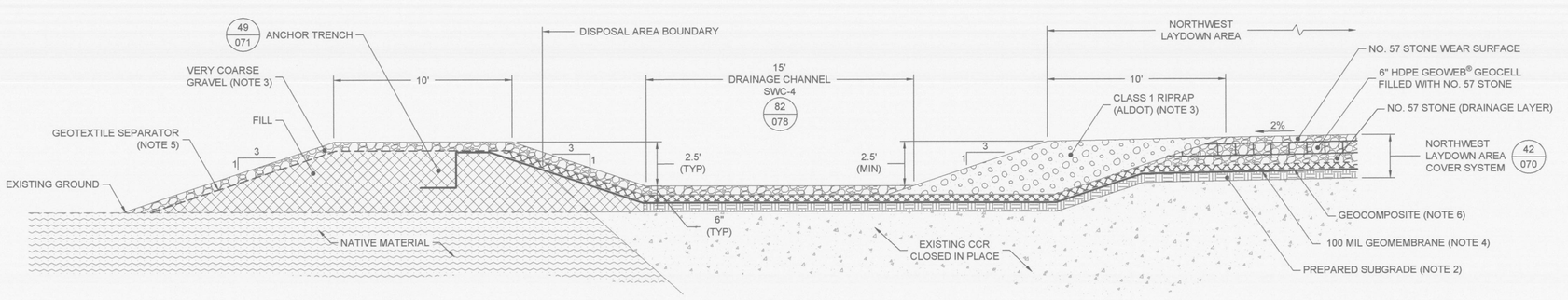
52/032 DETAIL
NORTHWEST LAYDOWN AREA CHANNEL DROP INLET
SCALE: 1" = 4'



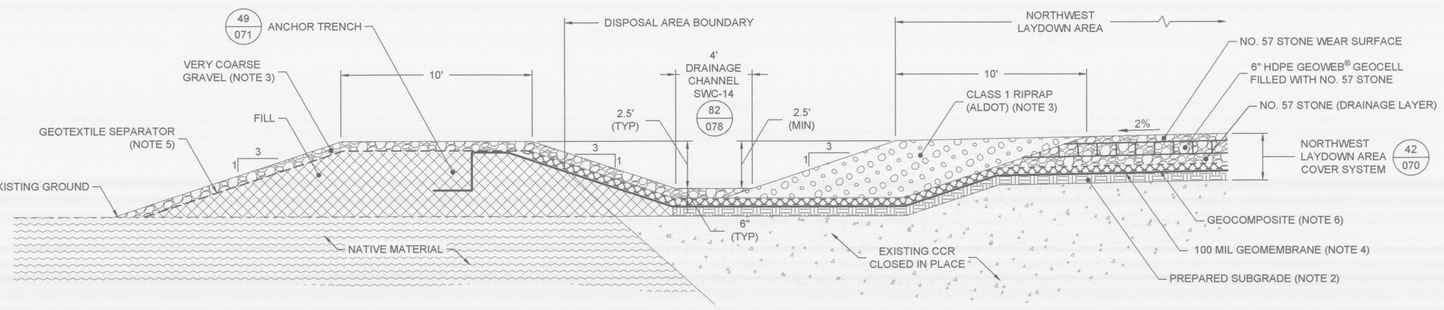
53/032 DETAIL
NORTHWEST LAYDOWN AREA CHANNELS
(SWC-5 TO SWC-12)
SCALE: 1" = 4'



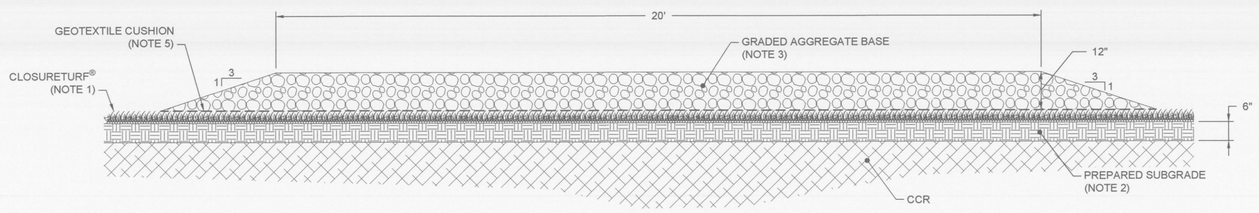
54/032 DETAIL
COVER SYSTEM AT SWC-13
SCALE: 1" = 4'



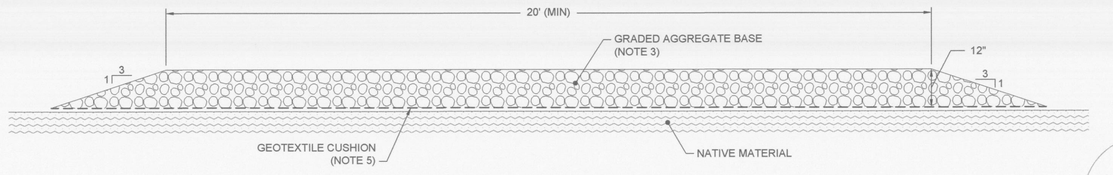
55/032 DETAIL
COVER SYSTEM AT SWC-4
SCALE: 1" = 4'



56/032 DETAIL
COVER SYSTEM AT SWC-14
SCALE: 1" = 4'



57/013 DETAIL
TACK-ON ACCESS ROAD WITHIN LIMIT OF CCR
SCALE: 1" = 2'



58/073 DETAIL
TACK-ON ACCESS ROAD OUTSIDE LIMIT OF CCR
SCALE: 1"=2'

NOTES:

1. CLOSURETURF SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 35 19.
2. EARTHWORK SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 23 00.
3. AGGREGATE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 16.
4. GEOMEMBRANE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.16.
5. GEOTEXTILE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.13.
6. GEOCOMPOSITE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.26.
7. THE NORTHWEST AREA 25-FT CORRIDOR ALONG THE DIKE IS DESIGNED FOR PASSENGER VEHICLES ONLY. NO HEAVY LOADS.

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B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

COVER SYSTEM AND TIE-IN DETAILS IV

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

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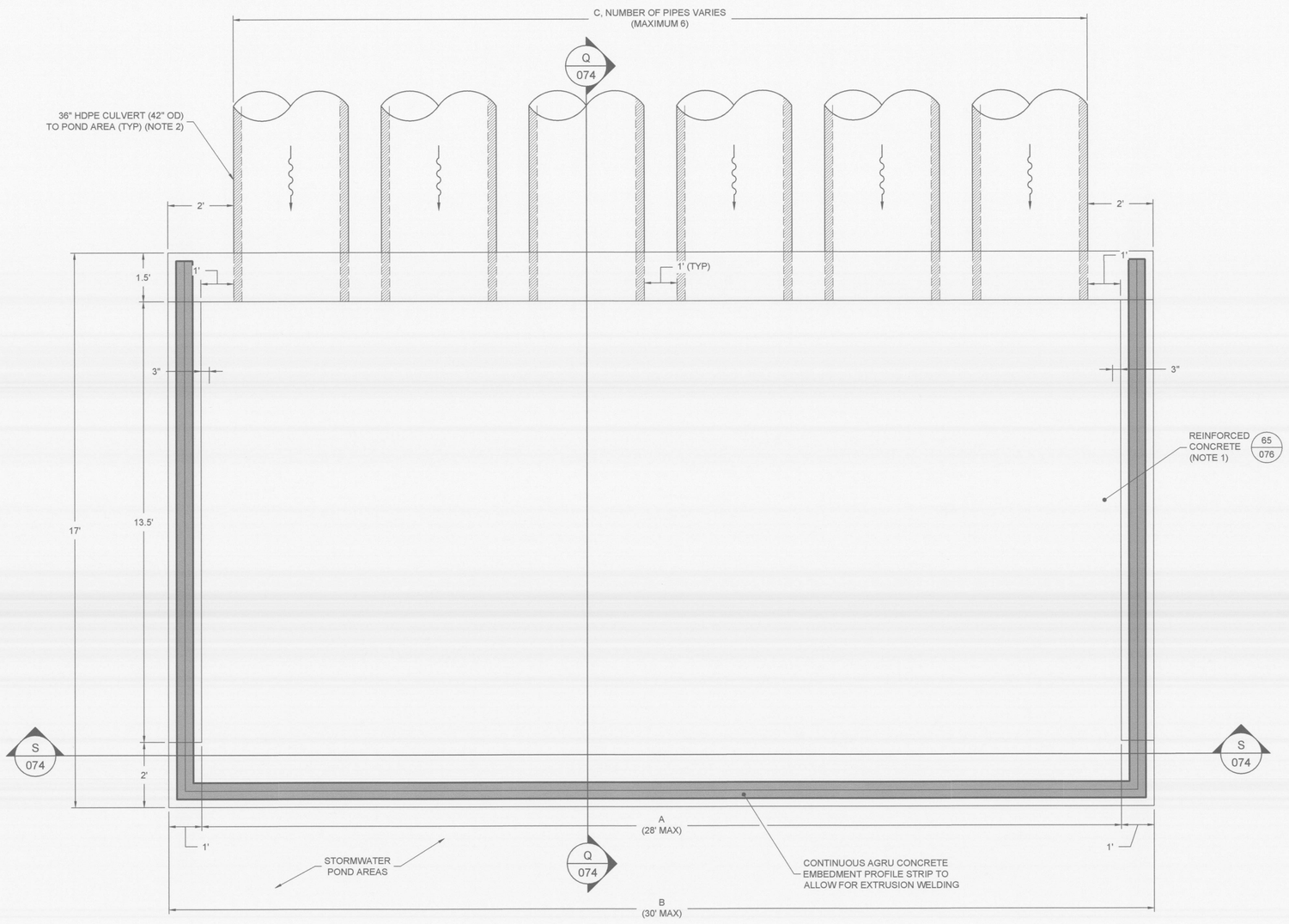
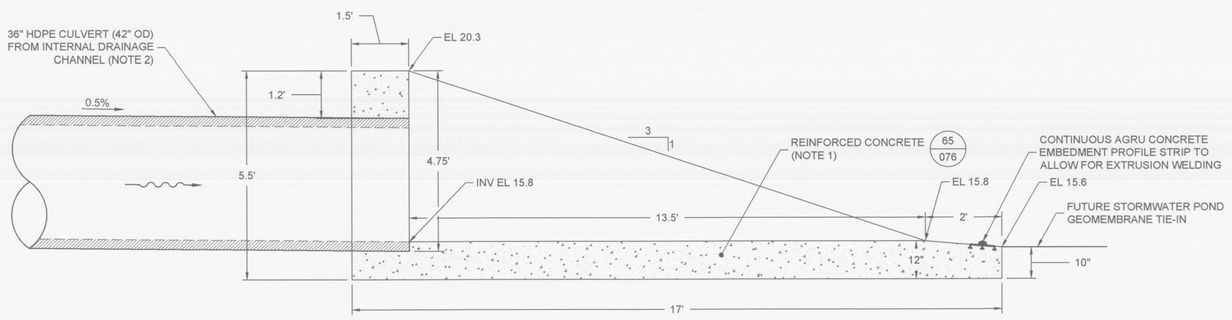
PROJ. NO.	GW6489	DWG. GW6489.04C043	SHEET 1
SCALE	AS SHOWN	DRAWING 073 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION



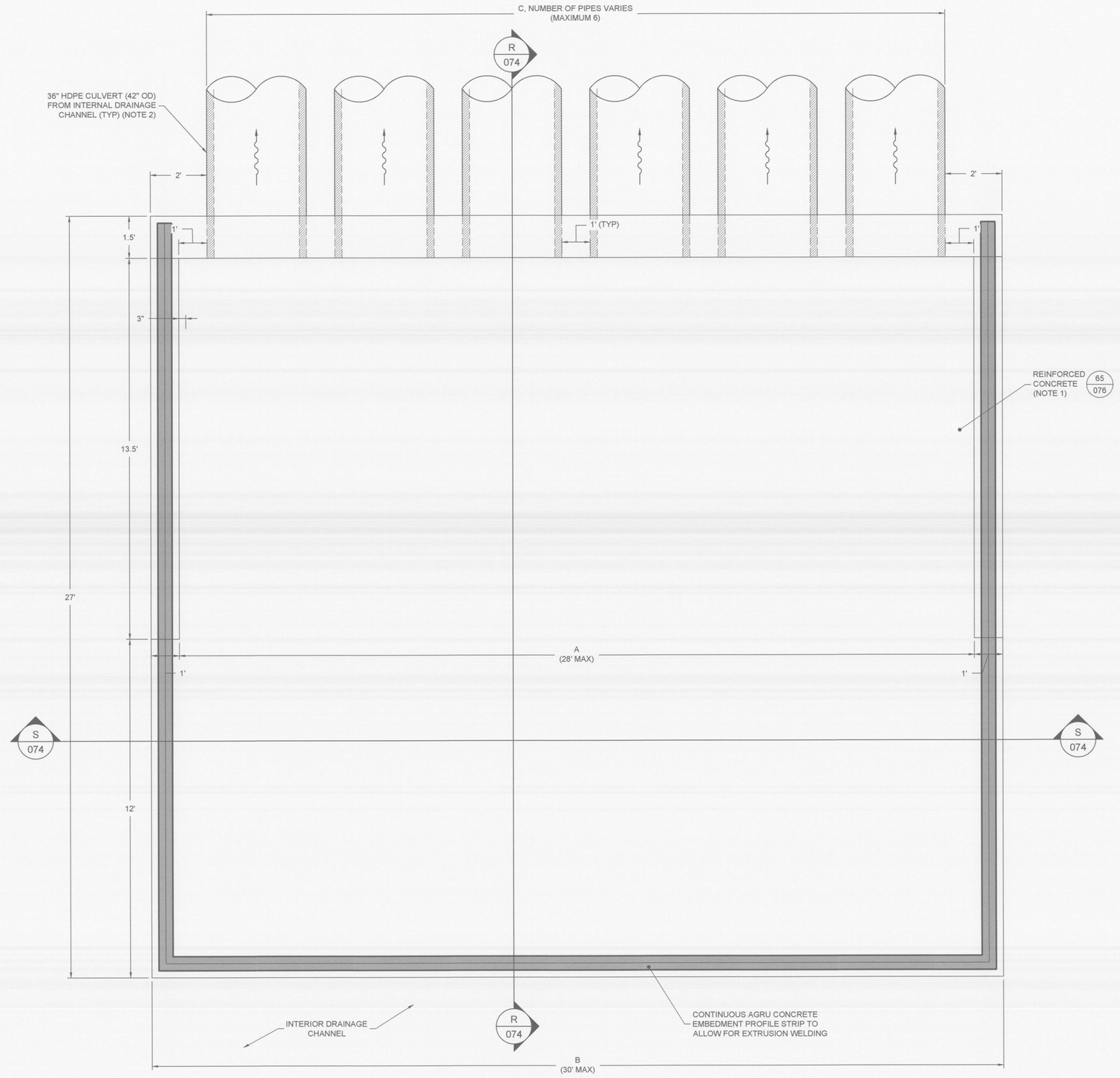
60 / 072 DETAIL
DOWNSTREAM CONCRETE HEADWALLS
SCALE: 1" = 2'



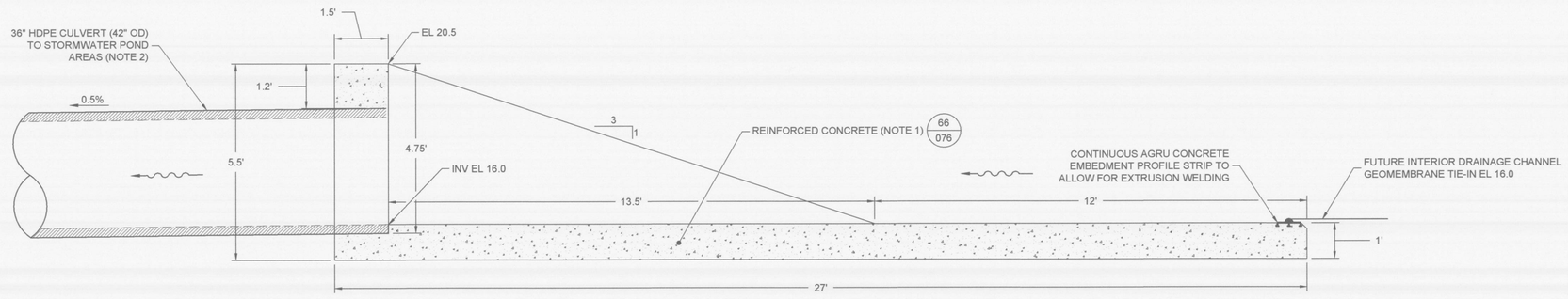
Q 074 SECTION
DOWNSTREAM CONCRETE HEADWALLS
SCALE: 1" = 2'

CONCRETE HEADWALLS				
CULVERT NAME	PHYSICAL CHARACTERISTICS OF HEADWALL			
	(A) WALL-TO-WALL WIDTH (FT)	(B) TOTAL WIDTH (FT)	(C) NUMBER OF PIPES	HEADWALL DETAIL
SWP-1	28	30	6	DOWNSTREAM AND UPSTREAM CONCRETE HEADWALLS
SWP-2	28	30	6	
SWP-3	12' X 4' BOX CULVERT	30	2	PRECAST BOX CULVERT END SECTION
SWP-4	12' X 4' BOX CULVERT	30	2	
NORTH POND OUTFALL	ON HOLD			NORTH POND OUTFALL FLAT STOCK HEADWALL
W-1	23.5	25.5	5	DOWNSTREAM AND UPSTREAM CONCRETE HEADWALLS
W-2	28	30	6	
W-3	23.5	25.5	5	
W-4	14.5	16.5	3	
W-5	5.5	7.5	1	
S-1	14.5	16.5	3	
S-2	23.5	25.5	5	
S-3	28	30	6	
S-4	23.5	25.5	5	
S-5	14.5	16.5	3	
E-1	5.5	7.5	1	
E-2	14.5	16.5	3	
E-3	19	21	4	
E-4	19	21	4	
E-5	23.5	25.5	5	
E-6	23.5	25.5	5	
E-7	10	12	2	
N-1	14.5	16.5	3	
N-2	28	30	6	

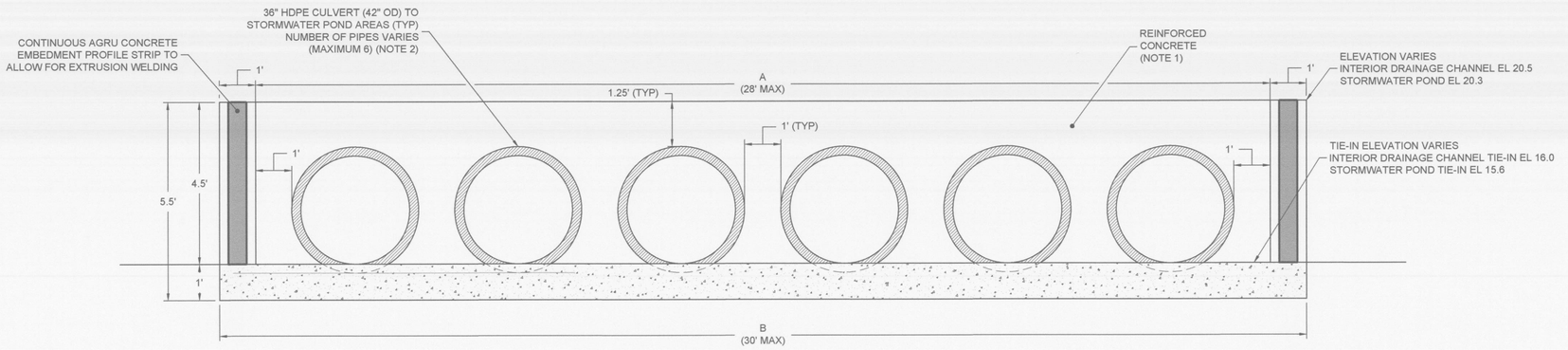
61 / 074 TABLE
CONCRETE HEADWALLS



59 / 072 DETAIL
UPSTREAM CONCRETE HEADWALLS
SCALE: 1" = 2'



R 074 SECTION
UPSTREAM CONCRETE HEADWALLS
SCALE: 1" = 2'



S 074 SECTION
CONCRETE HEADWALLS
SCALE: 1" = 2'

NOTES:

1. CAST-IN-PLACE CONCRETE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 03 30 00.
2. STORMWATER PIPES AND STRUCTURES SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 33 44 00.
3. MINIMUM COVER OF CONCRETE FROM EDGE OF STEEL REINFORCEMENT SHALL BE 3 INCHES, UNLESS NOTED OTHERWISE.

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A	NA	NOT SUBMITTED	NA	NA

HEADWALL DETAILS I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

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PHONE: 678.202.9500
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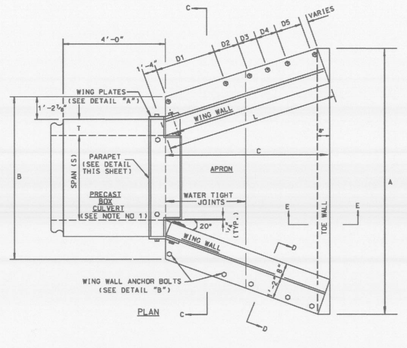
PROJ. NO.	GW6489	DWG. GW6489.04C031	SHEET 1
SCALE	1" = 2'	DRAWING 074 OF 097	
DATE	DECEMBER 2018		

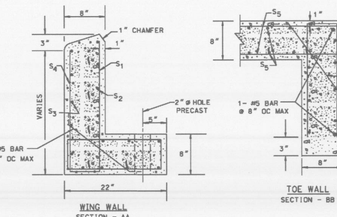
DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

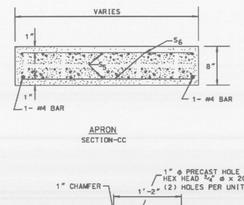
ANSI E: 44x34

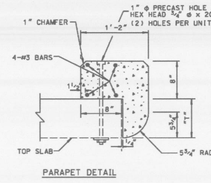
L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C031

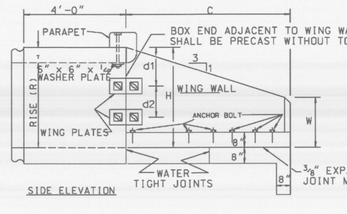
REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO

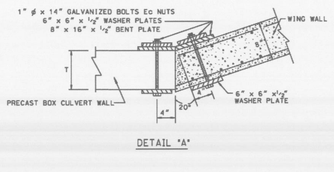




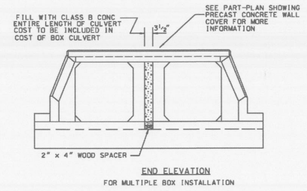


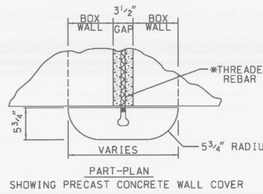


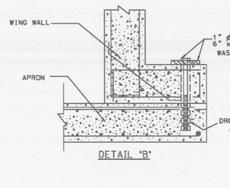




APRON LENGTH AND JOINT SCHEDULE			
RISE	INSIDE	MIDDLE	END W/TOE WALL
4'& 5'	—	—	8'-0"
6'	8'-0"	—	4'-0"
8'	8'-0"	—	8'-0"
10'	8'-0"	4'-0"	8'-0"







*NOTE: THE THREADED REBAR IS PLACED AS NEEDED TO MEET THE PRECAST MANUFACTURERS ATTACHMENT REQUIREMENTS FOR THE CONCRETE COVER

GENERAL NOTES

1. FOR BOX CULVERT SECTION DESIGN AND TABLE OF DIMENSIONS, SEE AASHTO M-273 AND M-259. NOTE – IF LOAD AND RESISTANCE FACTOR DESIGN (LRFD) IS REQUIRED, THEN USE ASTM C-1577.
2. CONCRETE SHALL HAVE 5000 P.S.I. COMPRESSIVE STRENGTH.
3. REINFORCING WIRE SHALL HAVE A MIN. YIELD STRENGTH OF 65000 P.S.I.
4. STEEL PLATES SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH AASHTO M111. BOLTS AASHTO M298, CLASS 50.
5. PRECAST APRON JOINTS SHALL BE INSTALLED WITH A WATER TIGHT SEAL.
6. BEVELED PRECAST BOX CULVERT END SECTIONS MAY BE USED IN LIEU OF PRECAST END SECTIONS AS DETAILED. PRIOR APPROVAL FOR USE WILL BE REQUIRED
7. ALTERNATE PRECAST WINGWALL DESIGNS SHALL BE SUBMITTED PRIOR TO APPROVAL.
8. CAST IN PLACE CULVERT WING WALLS, PARAPETS AND APRONS MAY BE USED IN LIEU OF PRECAST END SECTIONS AS DETAILED. DRILL AND GROUT IN NO 5 DEFORMED BARS– 24" LONG @ 8" OC FOR ATTACHING.
9. APRONS WITH TOE WALL AS DETAILED MAY BE CAST IN PLACE IN LIEU OF PRECASTING. JOINTING WILL NOT BE REQUIRED. FOR EXTRA DEPTH TOE WALLS (TOE WALL EXTENSION) SEE STD-DWG NO CS-3-1.
10. DETAILS AND DESIGN CALCULATIONS, SEALED BY A LICENSED PROFESSIONAL ENGINEER, SHALL BE SUBMITTED AS WORKING DRAWINGS IN ACCORDANCE WITH ALL OF THE REQUIREMENTS GIVEN IN ARTICLE 105.02 WHEN PRECAST BOX CULVERTS. THE CONDITIONS OF LOADING, SIZE (SPAN OR RISE), WALL AND SLAB THICKNESS (T) FALL OUTSIDE THE ASTM TABLES INCLUDED IN GENERAL NOTE NO. 1.
11. "TABLE OF DIMENSIONS" IS NOT RESTRICTED TO PRECAST BOX SIZES LISTED. OTHER SPANS AND RISES ARE INDUSTRY STANDARDS.
12. UNLESS OTHERWISE INDICATED ON THE PLANS, THE CONTRACTOR MAY SUBSTITUTE PRECAST BOX SECTIONS MEETING THE REQUIREMENTS OF NOTE 1 ABOVE, FOR ALL FILL HEIGHTS FOR CAST IN PLACE CONCRETE BOX SECTIONS.

--SPECIFICATIONS--
CURRENT ALABAMA DEPARTMENT OF TRANSPORTATION

THIS DRAWING REPRESENTS DESIGNS PREPARED FOR USE BY THE ALABAMA DEPARTMENT OF TRANSPORTATION AND IS NOT TO BE COPIED, REPRODUCED, ALTERED, OR USED BY ANYONE, OR ANY ORGANIZATION, WITHOUT THE EXPRESSED WRITTEN CONSENT OF THE ALABAMA DEPARTMENT OF TRANSPORTATION REPRESENTATIVE AUTHORIZED TO APPROVE THIS USE. ANYONE MAKING UNAUTHORIZED USE OF THIS DRAWING MAY BE PROSECUTED TO THE FULLEST EXTENT OF THE LAW.

REVISIONS
1. Added chapter 9 to Bridge Specifications & Tied Bid Section-09 on 10-10-08. (KT)
2. Added "DETAIL Lifted Inlet" PLAN" and "DETAIL Lifted Inlet" ELEVATION" to sheet number 2 and other cosmetic "CAP" changes. 10-22-08 (KT)
3. Added clarification note on "Pipe" detail for "threaded rebar" on 09-18-11 by LKA.

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 COLISEUM BOULEVARD
MONTGOMERY, AL 36130-3050

DESIGN BUREAU SPECIAL DRAWING

DETAILS FOR PRECAST CONCRETE BOX CULVERT AND END SECTION

Bureau Std Engr. L.K.A. DRAWN BY: A.P.T. DATE DRAWN: 10-23-98

SPECIAL DRAWING NO: PCC-524 (SHEET 1 OF 2) | INDEX NO: 438

NOT TO SCALE

62/033 DETAIL
PRECAST BOX CULVERT END SECTION
SCALE: 1" = 2'
SOURCE: ALABAMA DEPARTMENT OF TRANSPORTATION

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO

TABLE OF DIMENSIONS

SPAN (S)	RISE (R)	t	SINGLE BOX	DOUBLE BOX		TRIPLE BOX		QUADRUPLE BOX		APRON LENGTH	WING HEIGHT	WING LENGTH	WING HEIGHT	WING WALL ANCHORS				WING PLATE		* REINFORCING STEEL					
			APRON @ A	APRON @ B	APRON @ A	APRON @ B	APRON @ A	APRON @ B	APRON @ A	APRON @ B	@ C	@ H	@ L	@ W	D1	D2	D3	D4	D5	D6	d1	d2	S1	S2	S3	S4	S5	S6
6'	3'	7"	15'-0¼"	9'-7⅜"	22'-6"	17'-1½"	29'-11⅜"	24'-6¾"	37'-4¾"	32'-0¼"	8'-0"	4'-8"	8'-6"	1'-2"	6'-2"	—	—	—	—	2'-0"	—	#10	#10	#10	#10	#10	#10
6'	4'	7"	15'-0¼"	9'-7⅜"	22'-6"	17'-1½"	29'-11⅜"	24'-6¾"	37'-4¾"	32'-0¼"	8'-0"	4'-8"	8'-6"	1'-10"	6'-2"	—	—	—	—	2'-0"	—	#10	#10	#10	#10	#10	#10
6'	5'	7"	15'-0¼"	9'-7⅜"	22'-6"	17'-1½"	29'-11⅜"	24'-6¾"	37'-4¾"	32'-0¼"	8'-0"	5'-8"	8'-6"	2'-10"	6'-2"	—	—	—	—	2'-0"	—	#12	#10	#10	#10	#10	#10
6'	6'	7"	17'-11⅞"	9'-7⅜"	25'-4¾"	17'-1½"	32'-10¼"	24'-6¾"	40'-3¼"	32'-0¼"	12'-0"	6'-8"	12'-9¼"	2'-5"	6'-2"	2'-4"	1'-11"	—	—	2'-0"*2'-0"	20	#10	#10	#10	#10	#10	#10
8'	3'	8"	17'-2¼"	11'-9⅜"	26'-9¾"	2'-5¼"	36'-5¼"	31'-0⅞"	46'-0¾"	40'-8¼"	8'-0"	3'-8"	8'-6"	1'-2"	6'-2"	—	—	—	—	2'-0"	—	#10	#10	#10	#10	#10	#10
8'	4'	8"	17'-2¼"	11'-9⅜"	26'-9¾"	2'-5¼"	36'-5¼"	31'-0⅞"	46'-0¾"	40'-8¼"	8'-0"	4'-8"	8'-6"	1'-10"	6'-2"	—	—	—	—	2'-0"	—	#10	#10	#10	#10	#10	#10
8'	5'	8"	17'-2¼"	11'-9⅜"	26'-9¾"	2'-5¼"	36'-5¼"	31'-0⅞"	46'-0¾"	40'-8¼"	8'-0"	5'-8"	8'-6"	2'-10"	6'-2"	—	—	—	—	2'-0"	—	#12	#10	#10	#10	#10	#10
8'	6'	8"	20'-1⅝"	11'-9⅜"	29'-8¾"	2'-5¼"	39'-4⅝"	31'-0⅞"	48'-11¾"	40'-8¼"	12'-0"	6'-8"	12'-9¼"	2'-5"	6'-2"	2'-4"	1'-11"	—	—	2'-0"*2'-0"	20	#10	#10	#10	#10	#10	#10
8'	8'	8"	23'-0⅝"	11'-9⅜"	32'-1¾"	2'-5¼"	42'-3⅛"	31'-0⅞"	51'-10¾"	40'-8¼"	16'-0"	6'-8"	17'-0¼"	3'-0"	6'-2"	2'-4"	1'-11"	2'-4"	1'-11"	2'-0"*2'-0"	.45	#10	#10	#10	#10	#10	#10
10'	3'	10"	19'-6¼"	14'-1⅜"	31'-6"	26'-1⅜"	43'-5⅜"	38'-0¾"	55'-4¾"	50'-0¼"	8'-0"	3'-10"	8'-6"	1'-2"	6'-2"	—	—	—	—	2'-0"	—	#10	#10	#10	#10	#10	#10
10'	4'	10"	19'-6¼"	14'-1⅜"	31'-6"	26'-1⅜"	43'-5⅜"	38'-0¾"	55'-4¾"	50'-0¼"	8'-0"	4'-10"	8'-6"	1'-10"	6'-2"	—	—	—	—	2'-0"	—	#10	#10	#10	#10	#10	#10
10'	5'	10"	19'-6¼"	14'-1⅜"	31'-6"	26'-1⅜"	43'-5⅜"	38'-0¾"	55'-4¾"	50'-0¼"	8'-0"	5'-10"	8'-6"	2'-10"	6'-2"	—	—	—	—	2'-0"	—	#12	#10	#10	#10	#10	#10
10'	6'	10"	22'-5⅞"	14'-1⅜"	34'-4¾"	26'-1⅜"	46'-4¼"	38'-0¾"	58'-3¼"	50'-0¼"	12'-0"	6'-10"	12'-9¼"	2'-7"	6'-2"	2'-4"	1'-11"	—	—	2'-0"*2'-0"	.20	#10	#10	#10	#10	#10	#10
10'	8'	10"	25'-4⅝"	14'-1⅜"	37'-3⅝"	26'-1⅜"	49'-3⅝"	38'-0¾"	61'-2¾"	50'-0¼"	16'-0"	8'-10"	17'-1"	3'-2"	6'-2"	2'-4"	1'-11"	2'-4"	1'-11"	2'-0"*2'-0"	.45	#10	#10	#10	#10	#10	#10
10'	10'	10"	28'-3⅛"	14'-1⅜"	40'-2½"	26'-1⅜"	52'-2⅛"	38'-0¾"	64'-1½"	50'-0¼"	20'-0"	10'-10"	21'-3½"	3'-9"	6'-2"	2'-4"	1'-11"	2'-4"	1'-11"	2'-0"*2'-0"	.91	#10	#10	#10	#10	#10	#10
12'	3'	12"	21'-10¼"	16'-6"	36'-1⅞"	30'-9¼"	50'-5⅜"	45'-0¼"	64'-8¾"	59'-4½"	8'-0"	4'-0"	8'-6"	1'-2"	6'-2"	—	—	—	—	2'-0"	—	#10	#10	#10	#10	#10	#10
12'	4'	12"	21'-10¼"	16'-6"	36'-1⅞"	30'-9¼"	50'-5⅜"	45'-0¼"	64'-8¾"	59'-4½"	8'-0"	5'-0"	8'-6"	1'-10"	6'-2"	—	—	—	—	2'-0"	—	#10	#10	#10	#10	#10	#10
12'	5'	12"	21'-10¼"	16'-6"	36'-1⅞"	30'-9¼"	50'-5⅜"	45'-0¼"	64'-8¾"	59'-4½"	8'-0"	6'-0"	8'-6"	2'-10"	6'-2"	—	—	—	—	2'-0"	—	#12	#10	#10	#10	#10	#10
12'	6'	12"	24'-9½"	16'-6"	39'-0⅝"	30'-9¼"	53'-4½"	45'-0¼"	64'-8¾"	59'-4½"	12'-0"	7'-0"	12'-9¼"	2'-9"	6'-2"	2'-4"	1'-11"	—	—	2'-0"*2'-0"	.20	#10	#10	#10	#10	#10	#10
12'	8'	12"	27'-8½"	16'-6"	41'-11⅞"	30'-9¼"	56'-3⅛"	45'-0¼"	70'-6⅛"	59'-4½"	16'-0"	9'-0"	17'-0¼"	3'-4"	6'-2"	2'-4"	1'-11"	2'-4"	1'-11"	2'-0"*2'-0"	.47	#10	#10	#10	#10	#10	#10
12'	10'	12"	30'-7"	16'-6"	44'-10⅝"	30'-9¼"	59'-2⅛"	45'-0¼"	73'-5½"	59'-4½"	20'-0"	11'-0"	21'-3½"	3'-11"	6'-2"	2'-4"	1'-11"	2'-4"	1'-11"	2'-0"*2'-0"	.91	#10	#10	#10	#10	#10	#10
12'	12'	12"	30'-7"	16'-6"	44'-10⅝"	30'-9¼"	59'-2⅛"	45'-0¼"	73'-5½"	59'-4½"	20'-0"	13'-0"	25'-6¾"	4'-6"	6'-2"	2'-4"	1'-11"	2'-4"	1'-11"	2'-4"*3'-3"	1.60	#10	#10	#10	#10	#10	#10

* REINFORCING STEEL SCHEDULE-SQUARE INCHES OF STEEL PER LINEAR FOOT OF WING.

NOTE: SPACE BETWEEN MULTI-BARRELS IS 3½"

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REVISIONS
1. Added "TABLE OF DIMENSIONS" to sheet and moved view of nose on 11-09-13 by CJC.

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 COLISEUM BOULEVARD
MONTGOMERY, AL 36130-3050

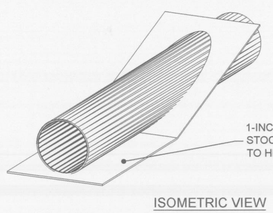
DESIGN BUREAU SPECIAL DRAWING

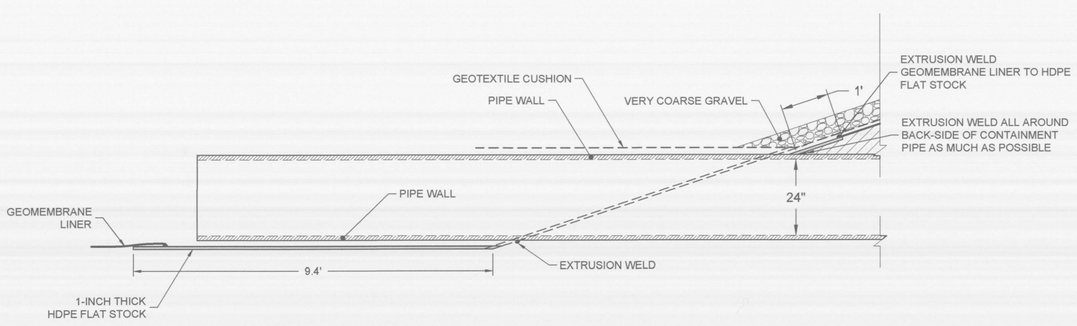
DETAILS FOR PRECAST CONCRETE BOX CULVERT AND END SECTION

Bureau Std Engr. L.K.A. DRAWN BY: A.P.T. DATE DRAWN: 10-23-98

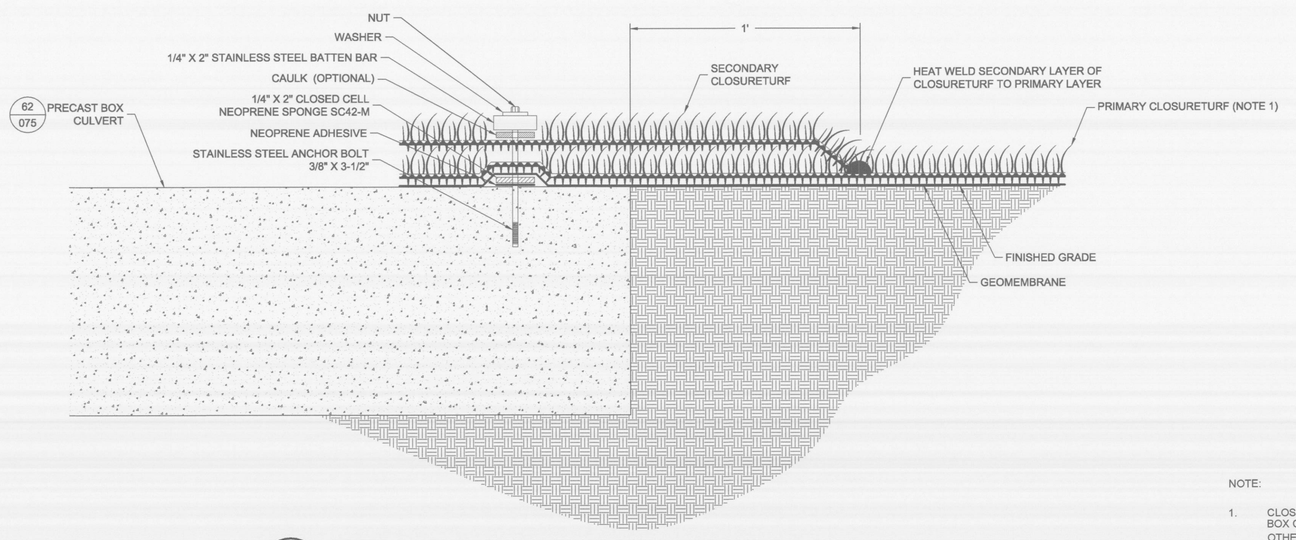
SPECIAL DRAWING NO: PCC-524 (SHEET 2 OF 2) | INDEX NO: 438-A

NOT TO SCALE





63/075 DETAIL
NORTH POND OUTFALL FLAT STOCK HEADWALL
SCALE: 1" = 2'



64/075 DETAIL
CLOSURETURF CONNECTION TO PRECAST BOX CULVERT
SCALE: 1" = 3"

NOTE:
1. CLOSURETURF® SYSTEM SHALL BE CONTINUOUSLY ATTACHED TO THE PRECAST BOX CULVERT END SECTION AS SHOWN IN THE DETAIL ON THIS DRAWING, OR BY OTHER ENGINEER-APPROVED EQUIVALENT.

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

HEADWALL DETAILS II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

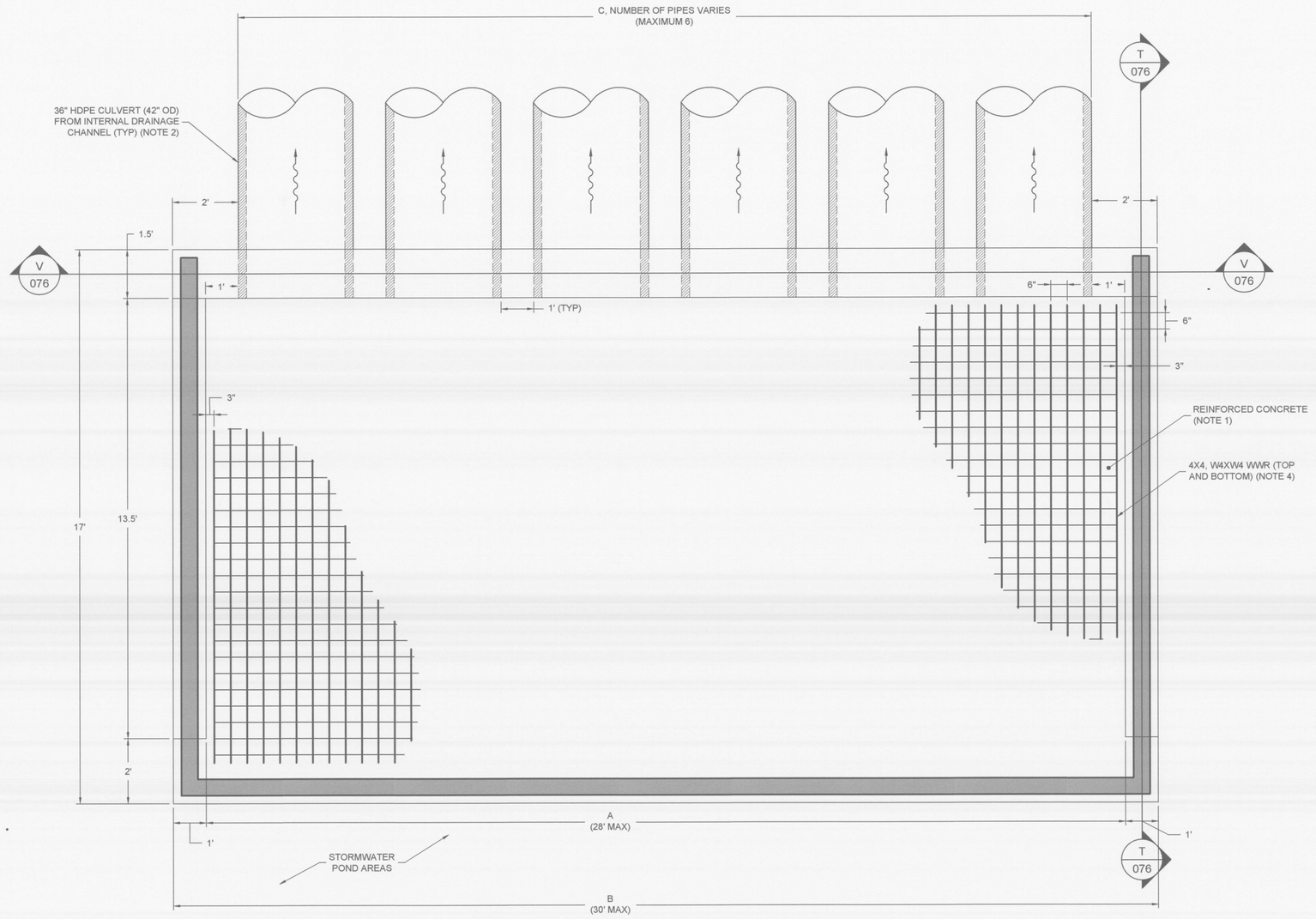
Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

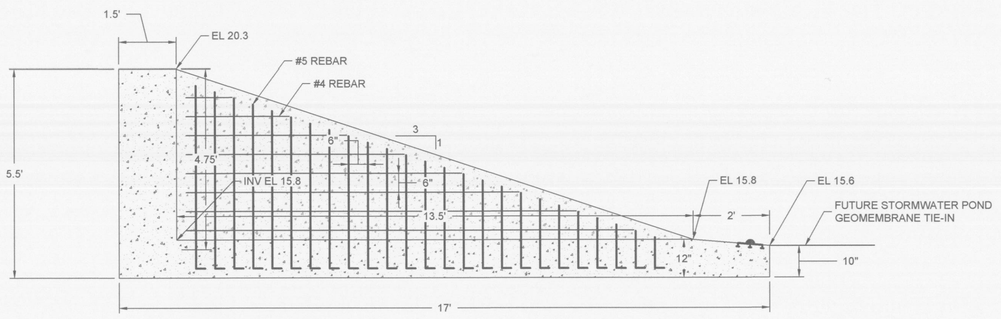
PROJ. NO.	GW6489	DWG.	GW6489.04C075	SHEET	1
SCALE	1" = 2'	DRAWING 075 OF 097			
DATE	DECEMBER 2018				

ANSI E: 44x34

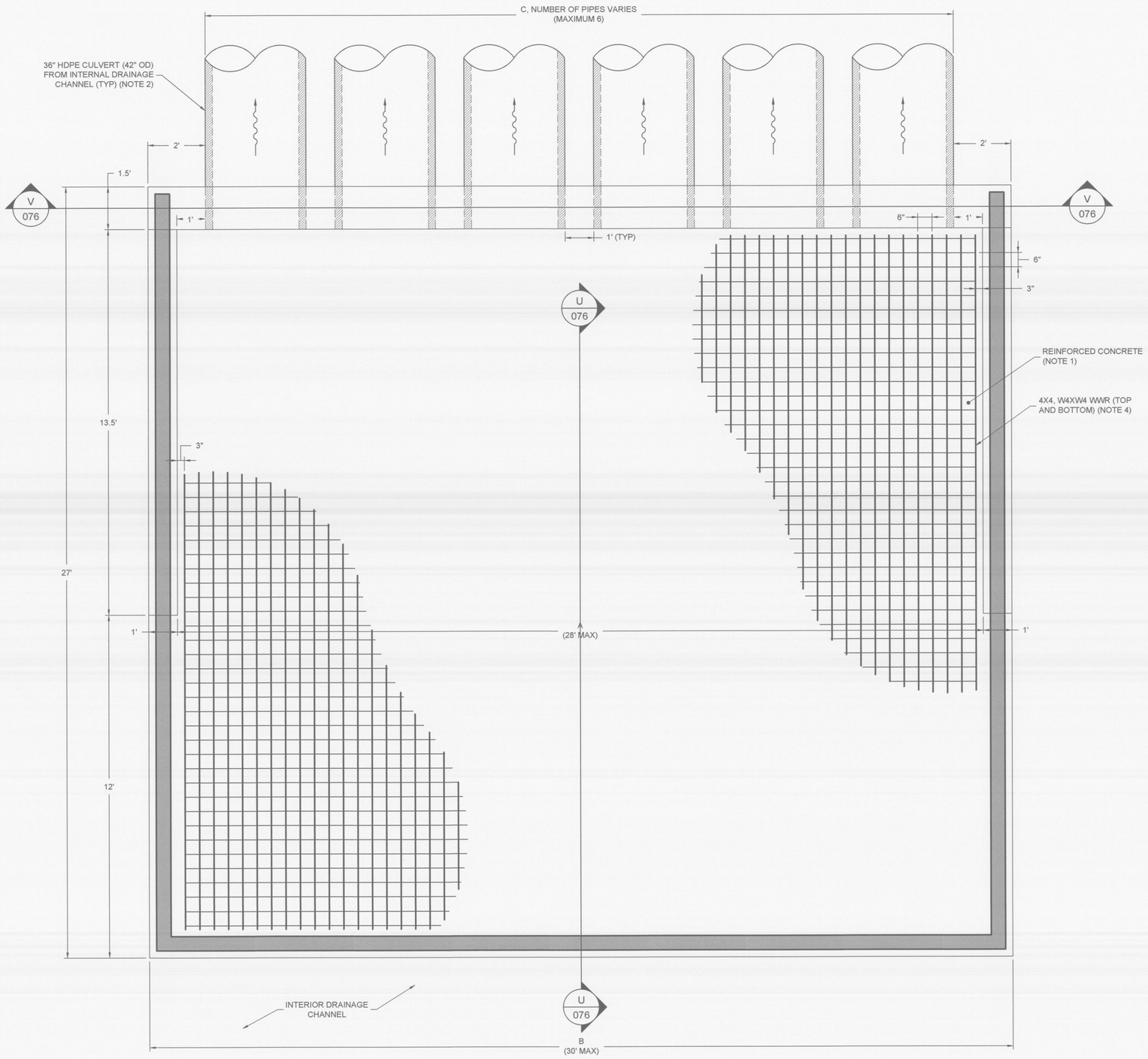
L:\CADD\WaLABAMA POWER\PLANT BARRY GW6489\CONSTRUCTIONDRAWINGS\GW6489.04C075



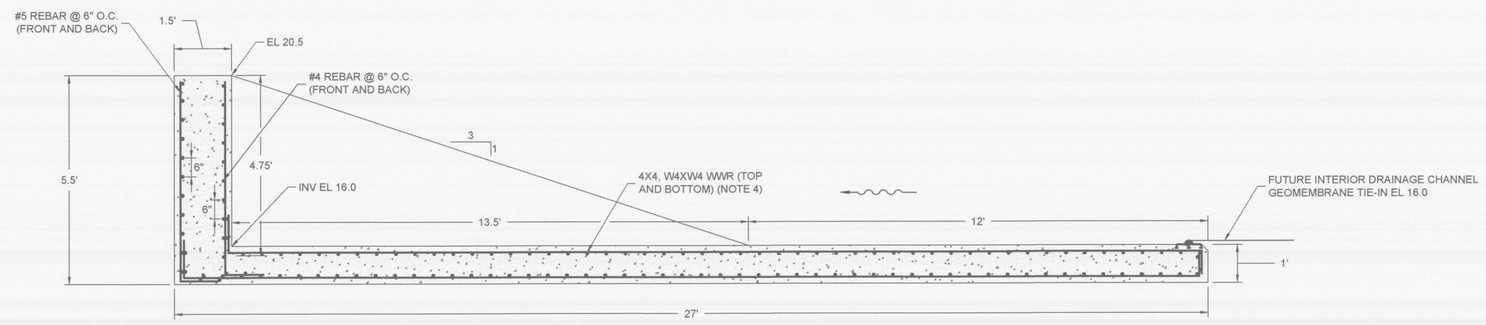
65/074 DETAIL
DOWNSTREAM CONCRETE HEADWALLS
SCALE: 1" = 2'



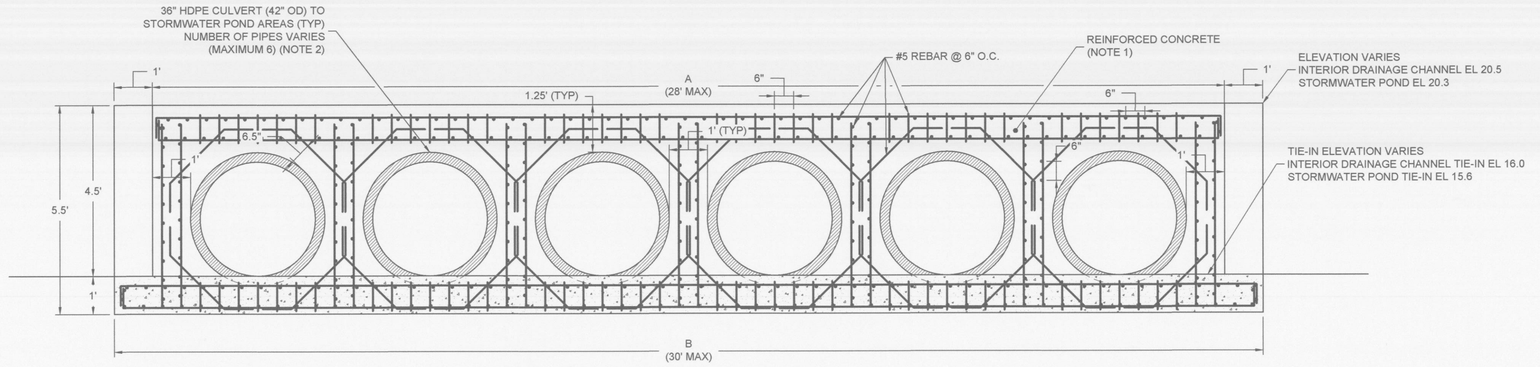
T 076 SECTION
DOWNSTREAM CONCRETE HEADWALLS
SCALE: 1" = 2'



66/074 DETAIL
UPSTREAM CONCRETE HEADWALLS
SCALE: 1" = 2'



U 076 SECTION
UPSTREAM CONCRETE HEADWALLS
SCALE: 1" = 2'



V 076 SECTION
CONCRETE HEADWALLS
SCALE: 1" = 2'

NOTES:

1. CAST-IN-PLACE CONCRETE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 03 30 00.
2. STORMWATER PIPES AND STRUCTURES SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 33 44 00.
3. MINIMUM COVER OF CONCRETE FROM EDGE OF STEEL REINFORCEMENT SHALL BE 3 INCHES, UNLESS NOTED OTHERWISE.
4. WELDED WIRE REINFORCEMENT (WWR) SHALL BE A 4"X4" GRID USING 4 GAUGE WIRE (4X4, W4XW4), OR ENGINEER APPROVED EQUIVALENT. WWR SHALL BE EMBEDDED ALONG THE TOP AND BOTTOM OF THE SLAB SECTION. WWR SHALL BE CONTINUOUS ACROSS THE SECTION WITH TIED OVERLAPS A MINIMUM OF 6" BETWEEN ADJOINING PIECES.

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

HEADWALL DETAILS III

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

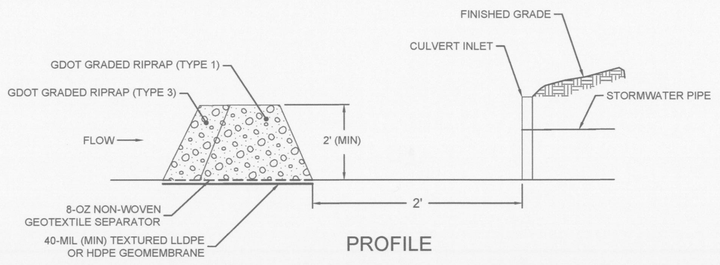
Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C068	SHEET 1
SCALE	1" = 2'	DRAWING 076 OF 097	
DATE	DECEMBER 2018		

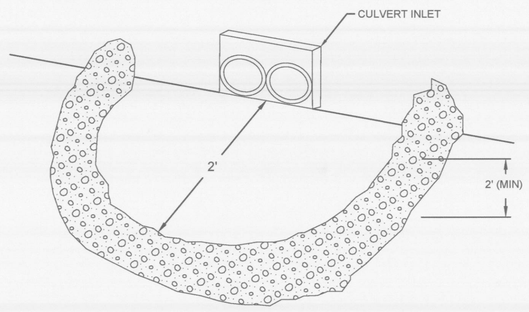
DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E 44x34

L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTIONDRAWINGS\GW6489.04C068

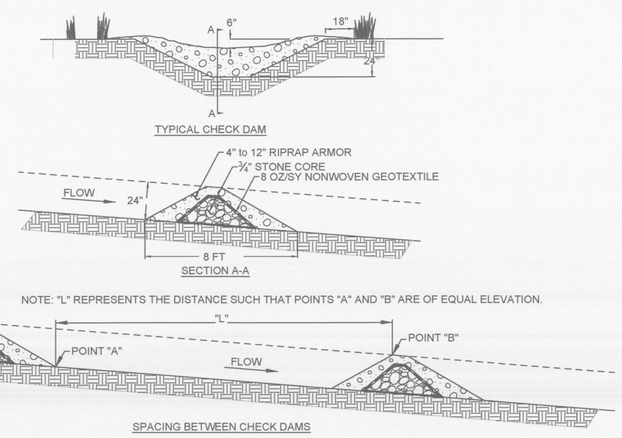


PROFILE



PERSPECTIVE

67/060 DETAIL
STONE FILTER RING
SCALE: NTS



CONSTRUCTION SPECIFICATIONS:

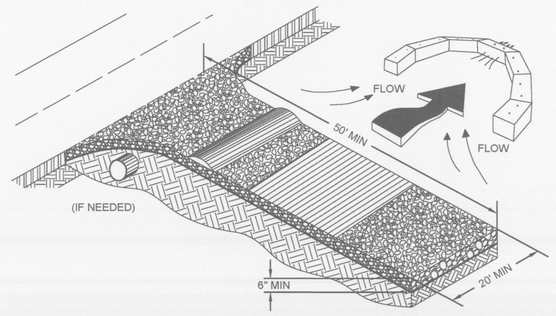
1. CHECK DAMS SHALL BE PLACED AT A DISTANCE AND HEIGHT TO ALLOW SMALL POOLS TO FORM BEHIND THEM. THE MAXIMUM SPACING BETWEEN THE DAMS SHALL BE SUCH THAT THE TOE OF THE UPSTREAM DAM IS AT THE SAME ELEVATION AS THE TOP OF THE DOWNSTREAM DAM.
2. HIGH FLOWS (TYPICALLY A 2-YEAR STORM OR LARGER) SHALL SAFELY FLOW OVER THE CHECK DAM WITHOUT AN INCREASE IN UPSTREAM FLOODING OR DAMAGE TO THE CHECK DAM.
3. CONSTRUCT ROCK DAMS SUCH THAT STRUCTURES ARE NOT DAMAGED BY VEHICLES AND DO NOT IMPEDE TRAVEL WAYS.
4. ROCK DAMS SHALL BE CONSTRUCTED WITH A ME DOT CRUSHED STONE ¾ INCH (S 703.13) OR SIMILAR CORE, WRAPPED IN NONWOVEN GEOTEXTILE, WITH 4 TO 12 INCH DIAMETER ROCK ARMOR OVER THE CORE. THE GEOTEXTILE SHALL OVERLAP BY A MINIMUM 24 INCHES.
5. KEEP THE CENTER ROCK (SPILLWAY) SECTION AT LEAST 6 INCHES LOWER THAN THE OUTER EDGE.
6. EXTEND THE ABUTMENTS 18" INTO THE CHANNEL BANK.

MAINTENANCE:

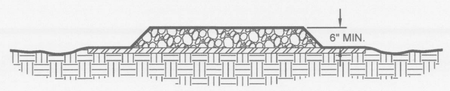
1. MONITOR CHECK DAMS BEFORE, DURING OR AFTER EACH RAINFALL EVENT THAT EXCEEDS 0.5 INCHES. REPAIR DAMAGE AS NEEDED.
2. REMOVE ACCUMULATED SEDIMENT WHEN DEPTH REACHES ONE-THIRD OF CHECK DAM HEIGHT (I.E. 8 INCHES). SEDIMENT SHALL BE DISPOSED OF PROPERLY.

68/060 DETAIL
CHECK DAM
SCALE: NTS

EXIT DIAGRAM



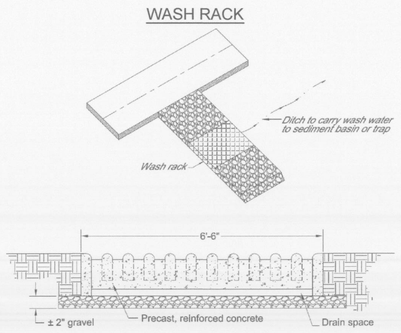
ENTRANCE ELEVATION



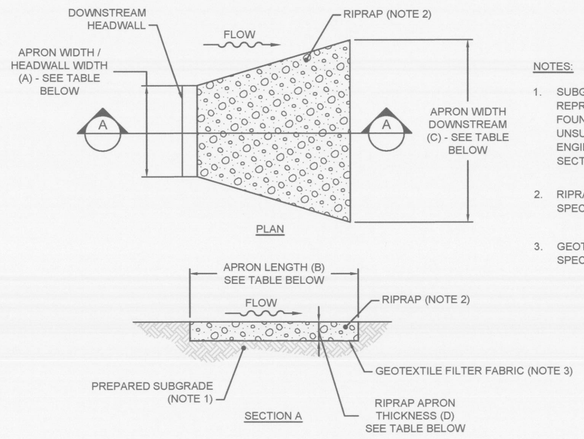
NOTES:

1. AVOID LOCATING ON STEEP SLOPES OR AT CURVES ON PUBLIC ROADS.
2. REMOVE ALL VEGETATION AND OTHER UNSUITABLE MATERIAL FROM THE FOUNDATION AREA, GRADE, AND CROWN FOR POSITIVE DRAINAGE.
3. AGGREGATE SIZE SHALL BE IN ACCORDANCE WITH NATIONAL STONE ASSOCIATION R-2 (1.5"-3.5" STONE).
4. GRAVEL PAD SHALL HAVE A MINIMUM THICKNESS OF 6".
5. PAD WIDTH SHALL EQUAL FULL WIDTH AT ALL POINTS OF VEHICULAR EGRESS, BUT NO LESS THAN 20'.
6. A DIVERSION RIDGE SHOULD BE CONSTRUCTED WHEN GRADE TOWARD PAVED AREA IS GREATER THAN 2%.
7. INSTALL PIPE UNDER THE ENTRANCE IF NEEDED TO MAINTAIN DRAINAGE DITCHES.
8. WHEN WASHING IS REQUIRED, IT SHOULD BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN (DIVERT ALL SURFACE RUNOFF AND DRAINAGE FROM THE ENTRANCE TO A SEDIMENT CONTROL DEVICE).
9. WASHRACKS AND/OR TIRE WASHERS MAY BE REQUIRED DEPENDING ON SCALE AND CIRCUMSTANCE. IF NECESSARY, WASHRACK DESIGN MAY CONSIST OF ANY MATERIAL SUITABLE FOR TRUCK TRAFFIC THAT REMOVES MUD AND DIRT.
10. MAINTAIN AREA IN A WAY THAT PREVENTS TRACKING AND/OR FLOW OF MUD ONTO PUBLIC RIGHTS-OF-WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.

WASH RACK



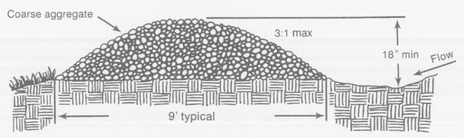
69/058 DETAIL
CONSTRUCTION EXIT
SCALE: NTS



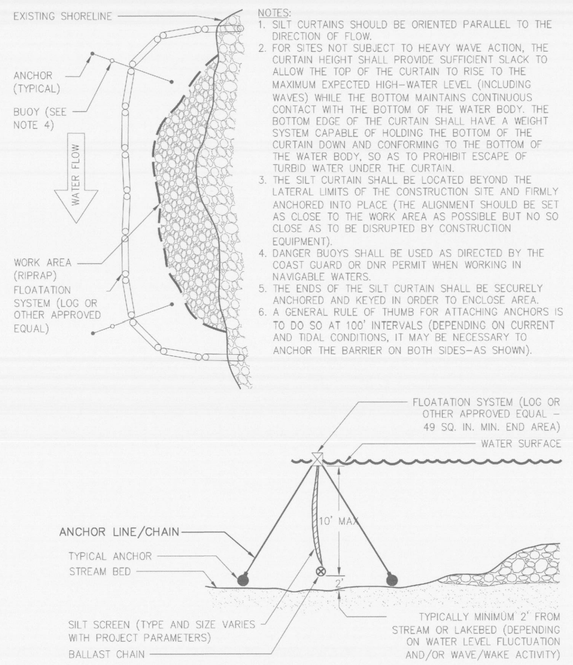
NOTES:

1. SUBGRADE SHALL BE INSPECTED AND APPROVED BY THE OWNER'S REPRESENTATIVE PRIOR TO PLACEMENT RIPRAP. IF THE SUBGRADE IS FOUND TO BE UNSUITABLE, THE CONTRACTOR SHALL REMOVE THE UNSUITABLE MATERIAL TO A MINIMUM DEPTH OF 2' AND REPLACE WITH ENGINEERED FILL IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 23 00.
2. RIPRAP SHALL BE PLACED IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 16.
3. GEOTEXTILE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.13.

70/032 DETAIL
OUTLET PROTECTION
SCALE: 1" = 5'



72/059 DETAIL
DIVERSION BERM
SCALE: 1" = 2'



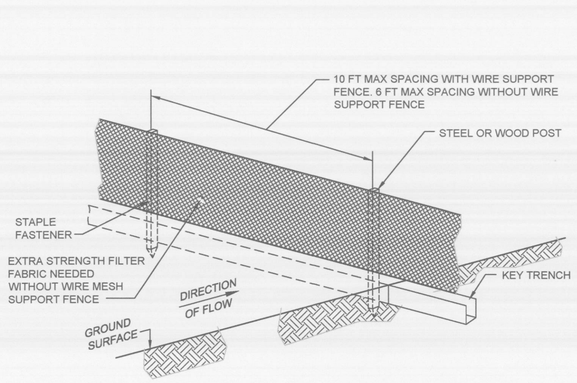
NOTES:

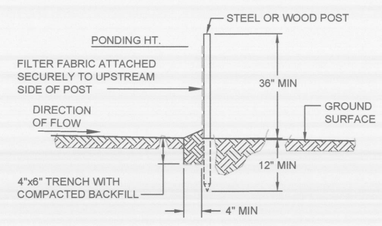
1. SILT CURTAINS SHOULD BE ORIENTED PARALLEL TO THE DIRECTION OF FLOW.
2. FOR SITES NOT SUBJECT TO HEAVY WAVE ACTION, THE CURTAIN HEIGHT SHALL PROVIDE SUFFICIENT SLACK TO ALLOW THE TOP OF THE CURTAIN TO RISE TO THE MAXIMUM EXPECTED HIGH-WATER LEVEL (INCLUDING WAVES) WHILE THE BOTTOM MAINTAINS CONTINUOUS CONTACT WITH THE BOTTOM OF THE WATER BODY. THE BOTTOM EDGE OF THE CURTAIN SHALL HAVE A WEIGHT SYSTEM CAPABLE OF HOLDING THE BOTTOM OF THE CURTAIN DOWN AND CONFORMING TO THE BOTTOM OF THE WATER BODY, SO AS TO PROHIBIT ESCAPE OF TURBID WATER UNDER THE CURTAIN.
3. THE SILT CURTAIN SHALL BE LOCATED BEYOND THE LATERAL LIMITS OF THE CONSTRUCTION SITE AND FIRMLY ANCHORED INTO PLACE (THE ALIGNMENT SHOULD BE SET AS CLOSE TO THE WORK AREA AS POSSIBLE BUT NO SO CLOSE AS TO BE DISRUPTED BY CONSTRUCTION EQUIPMENT).
4. DANGER BUOYS SHALL BE USED AS DIRECTED BY THE COAST GUARD OR DNR PERMIT WHEN WORKING IN NAVIGABLE WATERS.
5. THE ENDS OF THE SILT CURTAIN SHALL BE SECURELY ANCHORED AND KEYED IN ORDER TO ENCLOSE AREA.
6. A GENERAL RULE OF THUMB FOR ATTACHING ANCHORS IS TO DO SO AT 100' INTERVALS (DEPENDING ON CURRENT AND TIDAL CONDITIONS, IT MAY BE NECESSARY TO ANCHOR THE BARRIER ON BOTH SIDES–AS SHOWN).

73/046 DETAIL
TURBIDITY CURTAIN
SOURCE: GSWCC 2018 MANUAL
SCALE: NTS

OUTLET PROTECTION						
CULVERT ID	(A) UPSTREAM APRON (HEADWALL) WIDTH (FT)	(B) MINIMUM APRON LENGTH (FT)	(C) DOWNSTREAM APRON WIDTH (FT)	(D) APRON THICKNESS (FT)	MINIMUM D50 (FT)	ALDOT RIPRAP CLASS
SWP-1	30	14	44	1.0	0.4	CLASS 1
SWP-2	30	14	44	1.0	0.4	CLASS 1
SWP-3	30	66	96	3.5	1.4	CLASS 3
SWP-4	30	66	96	3.5	1.4	CLASS 3
SWP-5	4.5	10	14.5	2.0	0.8	CLASS 1
SWP-6	4.5	12	16.5	2.0	0.8	CLASS 1
SWP-7	4.5	15	19.5	2.0	0.8	CLASS 1
SWP-8	4.5	10	14.5	1.5	0.5	CLASS 1
SWP-9	4.5	10	14.5	1.5	0.5	CLASS 1
SWP-10	4.5	13	17.5	2.0	0.8	CLASS 1
SWP-11	4.5	10	14.5	1.5	0.5	CLASS 1
SWP-12	7.5	18	25.5	1.5	0.7	CLASS 1
SWP-13	15	13	28	1.5	0.6	CLASS 1
NORTH POND OUTFALL	ON HOLD					
W-1	25.5	20	45.5	2.0	0.8	CLASS 1
W-2	30	20	50	2.0	0.8	CLASS 1
W-3	25.5	20	45.5	2.0	0.8	CLASS 1
W-4	16.5	20	36.5	2.0	0.8	CLASS 1
W-5	7.5	20	27.5	2.0	0.8	CLASS 1
S-1	16.5	20	36.5	2.0	0.8	CLASS 1
S-2	25.5	20	45.5	2.0	0.8	CLASS 1
S-3	30	20	50	2.0	0.8	CLASS 1
S-4	25.5	20	45.5	2.0	0.8	CLASS 1
S-5	16.5	20	36.5	2.0	0.8	CLASS 1
E-1	7.5	20	27.5	2.0	0.8	CLASS 1
E-2	16.5	20	36.5	2.0	0.8	CLASS 1
E-3	21	20	41	2.0	0.8	CLASS 1
E-4	21	20	41	2.0	0.8	CLASS 1
E-5	25.5	20	45.5	2.0	0.8	CLASS 1
E-6	25.5	20	45.5	2.0	0.8	CLASS 1
E-7	12	20	32	2.0	0.8	CLASS 1
N-1	16.5	20	36.5	2.0	0.8	CLASS 1
N-2	30	20	50	2.0	0.8	CLASS 1

71/032 TABLE
OUTLET PROTECTION

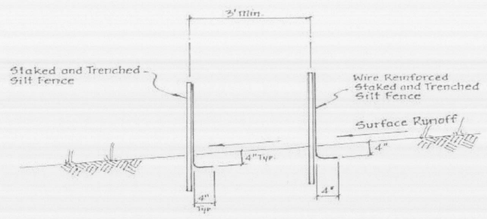




SILT FENCE NOTES:

1. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.
2. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.
3. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.

74/058 DETAIL
SILT FENCE
SCALE: 1" = 5'



75/058 DETAIL
DOUBLE ROW SILT FENCE
SCALE: NTS

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

STORMWATER MANAGEMENT SYSTEM (SWMS) AND ESC DETAILS I

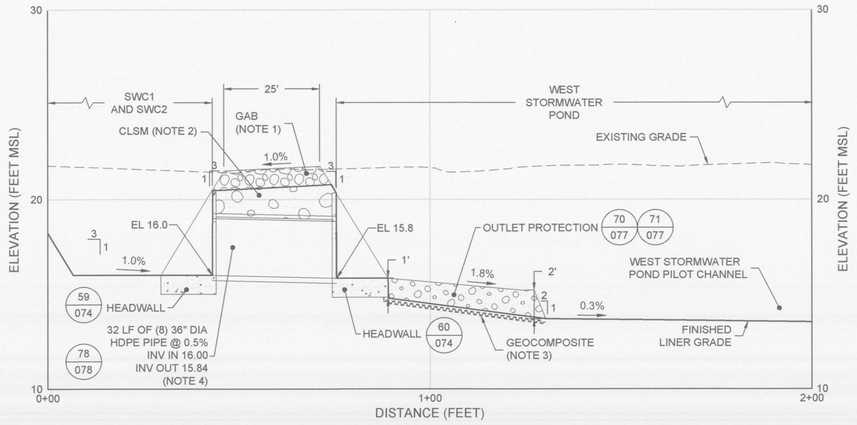
PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

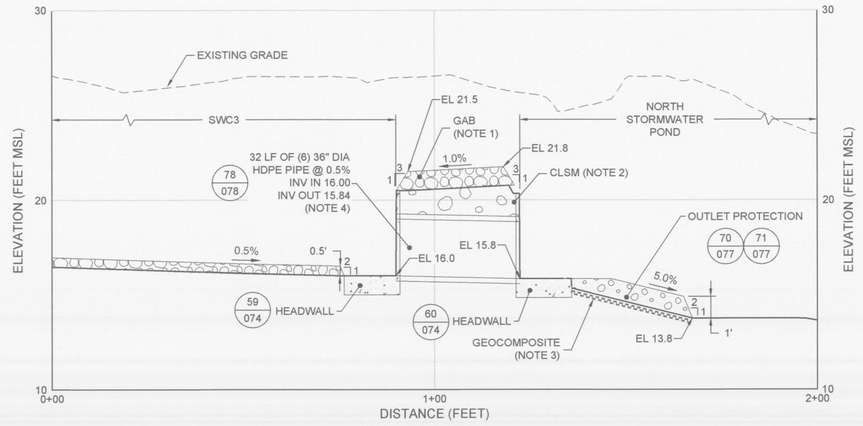
PROJ. NO.	GW6489	DWG. GW6489.04C076	SHEET 1
SCALE	AS SHOWN	DRAWING 077 OF 097	
DATE	DECEMBER 2018		

ANSI E: 44x34

L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTIONDRAWINGS\GW6489.04C076



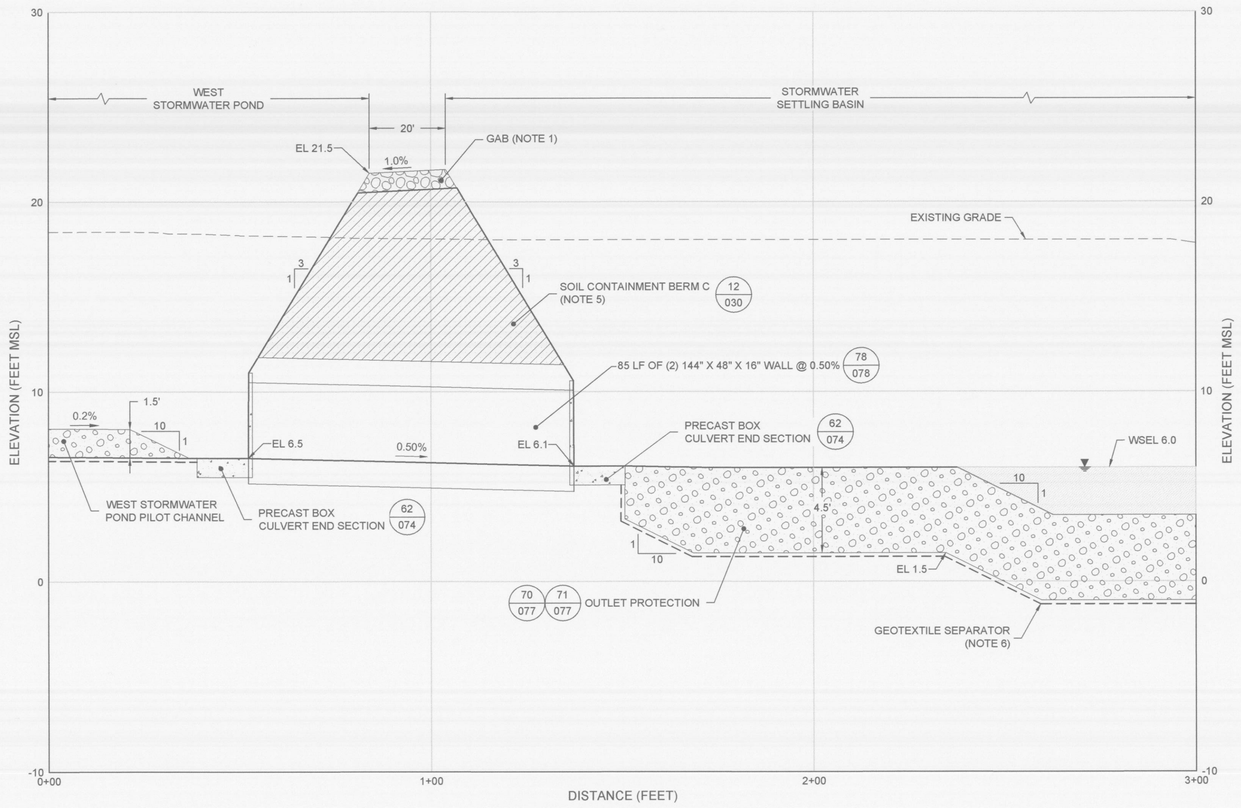
76 / 021 PROFILE
SWP-1
SCALE: 1" = 20' (H); 1" = 4' (V)



77 / 024 PROFILE
SWP-2
SCALE: 1" = 20' (H); 1" = 4' (V)

STORMWATER CULVERTS								
CULVERT ID	MATERIAL TYPE	STANDARD DIAMETER RATIO	INNER DIAMETER (IN)	OUTER DIAMETER (IN)	NUMBER OF CULVERTS	LENGTH (FT)	INLET INVERT ELEVATION (FT)	OUTLET INVERT ELEVATION (FT)	SLOPE (FT/FT)
SWP-1	HDPE	SDR-11	36	42	6	32	16.0	15.8	0.005
SWP-2	HDPE	SDR-11	36	42	6	32	16.0	15.8	0.005
SWP-3	CONCRETE	-	12' X 4' BOX CULVERTS		2	85	6.5	6.1	0.005
SWP-4	CONCRETE	-	12' X 4' BOX CULVERTS		2	85	6.5	6.1	0.005
SWP-5	HDPE	SDR-11	18	22	1	70	26.5	25.3	0.018
SWP-6	HDPE	SDR-11	18	22	1	70	26.5	25.3	0.018
SWP-7	HDPE	SDR-11	18	22	1	69	26.5	25.3	0.018
SWP-8	HDPE	SDR-11	18	22	1	72	26.5	26.0	0.007
SWP-9	HDPE	SDR-11	18	22	1	70	26.5	25.3	0.018
SWP-10	HDPE	SDR-11	18	22	1	68	26.5	25.3	0.018
SWP-11	HDPE	SDR-11	18	22	1	76	26.5	25.3	0.016
SWP-12A	HDPE	SDR-11	30	36	1	87	23.5	22.0	0.017
SWP-12B	HDPE	SDR-11	30	36	1	154	18.0	16.4	0.010
SWP-12C	HDPE	SDR-11	30	36	1	152	16.3	14.0	0.015
SWP-13	HDPE	SDR-11	24	30	4	68	22.7	22.2	0.008
NORTH POND OUTFALL	ON HOLD								
W-1	HDPE	SDR-11	36	42	5	32	16.0	15.8	0.006
W-2	HDPE	SDR-11	36	42	6	32	16.0	15.8	0.006
W-3	HDPE	SDR-11	36	42	5	32	16.0	15.8	0.006
W-4	HDPE	SDR-11	36	42	3	32	16.0	15.8	0.006
W-5	HDPE	SDR-11	36	42	1	32	16.0	15.8	0.006
S-1	HDPE	SDR-11	36	42	3	32	16.0	15.8	0.006
S-2	HDPE	SDR-11	36	42	5	32	16.0	15.8	0.006
S-3	HDPE	SDR-11	36	42	6	32	16.0	15.8	0.006
S-4	HDPE	SDR-11	36	42	5	32	16.0	15.8	0.006
S-5	HDPE	SDR-11	36	42	3	32	16.0	15.8	0.006
E-1	HDPE	SDR-11	36	42	1	32	16.0	15.8	0.006
E-2	HDPE	SDR-11	36	42	3	32	16.0	15.8	0.006
E-3	HDPE	SDR-11	36	42	4	32	16.0	15.8	0.006
E-4	HDPE	SDR-11	36	42	4	32	16.0	15.8	0.006
E-5	HDPE	SDR-11	36	42	5	32	16.0	15.8	0.006
E-6	HDPE	SDR-11	36	42	5	32	16.0	15.8	0.006
E-7	HDPE	SDR-11	36	42	2	32	16.0	15.8	0.006
N-1	HDPE	SDR-11	36	42	3	32	16.0	15.8	0.006
N-2	HDPE	SDR-11	36	42	6	32	16.0	15.8	0.006

78 / 018 TABLE
STORMWATER CULVERTS



79 / 033 PROFILE
SWP-3
SCALE: 1" = 20' (H); 1" = 4' (V)

Table PS-1 Commonly Used Plants for Permanent Cover with Seeding Rates and Dates

Species	Seeding Rates/Ac PLS	North	Central	South
		Seeding Dates		
Bahiagrass, Pensacola	40 lbs	--	Mar 1-July 1	Feb 1-Nov 1
Bermudagrass, Common	10 lbs	Apr 1-July 1	Mar 15-July 15	Mar 1-July 15
Bahiagrass, Pensacola Bermudagrass, Common	30 lbs 5 lbs	--	Mar 1-July 1	Mar 1-July 15
Bermudagrass, Hybrid (Lawn Types)	Solid Sod	Anytime	Anytime	Anytime
Bermudagrass, Hybrid (Lawn Types)	Sprigs 1/sq ft	Mar 1-Aug 1	Mar 1-Aug 1	Feb 15-Sep 1
Fescue, Tall	40-50 lbs	Sep 1-Nov 1	Sep 1-Nov 1	--
Sericea	40-60 lbs	Mar 15-July 15	Mar 1-July 15	Feb 15-July 15
Sericea & Common Bermudagrass	40lbs 10 lbs	Mar 15-July 15	Mar 1-July 15	Feb 15-July 15
Switchgrass, Alamo	4 Lbs	Apr 1-Jun 15	Mar 15-Jun 15	Mar 15-Jun15

PLS means pure live seed and is used to adjust seeding rates. For example, to plant 10 lbs PLS of a species with germination of 80% and purity of 90%, PLS= 0.8X 0.9 = 72%. 10 lbs PLS = 10/0.72 = 13.9 lbs of the species to be planted.

80 / 060 TABLE
PERMANENT SEEDING

Table TS-I Commonly Used Plants for Temporary Cover

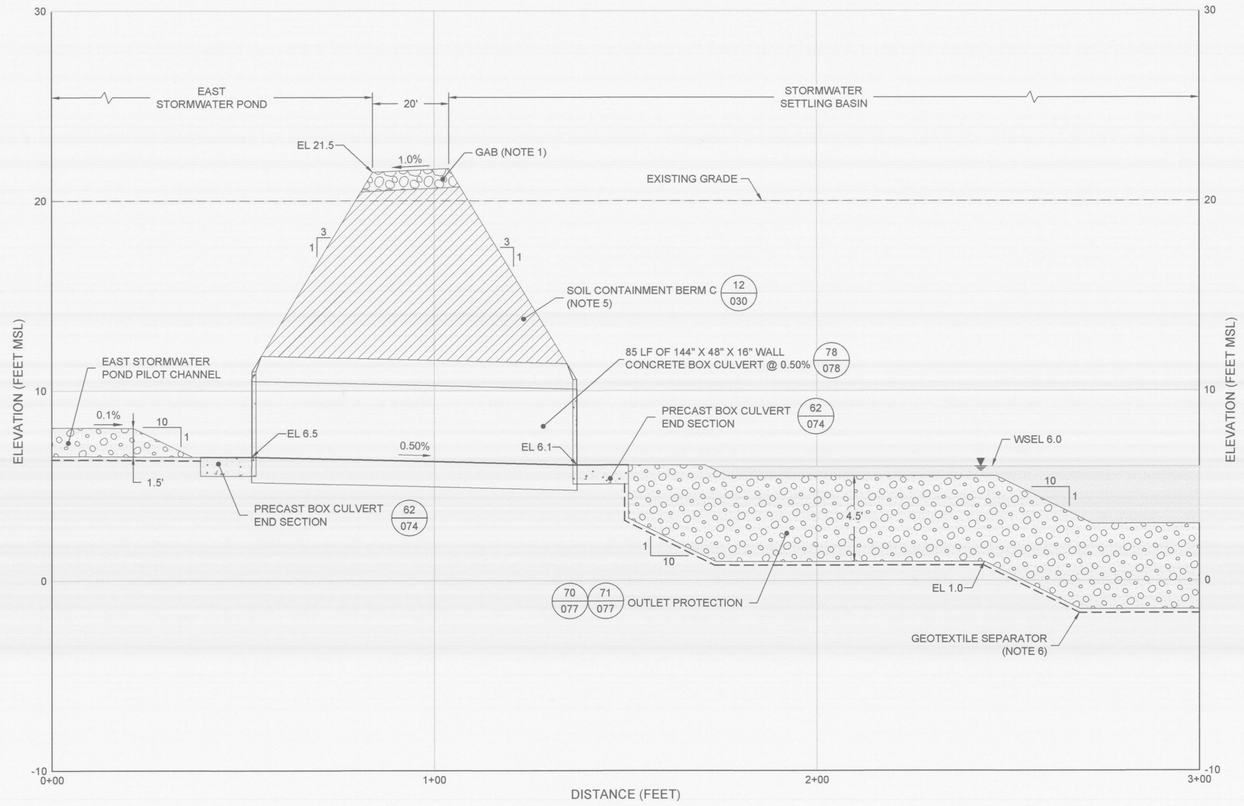
Species	Seeding Rate/AC PLS	North	Central	South
		Seeding Dates		
Millet, Browntop or German	40 lbs	Apr1-Aug 1	Apr1- Aug 15	Apr 1-Aug 15
Rye	3 bu	Sep 1-Nov 15	Sep 15-Nov 15	Sep 15-Nov 15
Ryegrass	30 lbs	Aug 1-Sep 15	Sep 1-Oct 15	Sep 1-Oct 15
Sorghum-Sudan Hybrids	40 lbs	May 1-Aug 1	Apr 15-Aug 1	Apr 1-Aug 15
Sudangrass	40 lbs	May 1-Aug 1	Apr 15-Aug	Apr 1-Aug 15
Wheat	3 bu	Sep 1-Nov 1	Sep 15-Nov 15	Sep 15-Nov 15
Common Bermudagrass	10 lbs	Apr 1-July 1	Mar 15-July 15	Mar 1-July 15
Crimson Clover	10lbs	Sept 1-Nov 1	Sept 1-Nov 1	Sept 1-Nov 1

PLS means pure live seed and is used to adjust seeding rates. For example, to plant 10 lbs PLS of a species with germination of 80% and purity of 90%, PLS= 0.8X 0.9 = 72%. 10 lbs PLS = 10/0.72 = 13.9 lbs of the species to be planted.

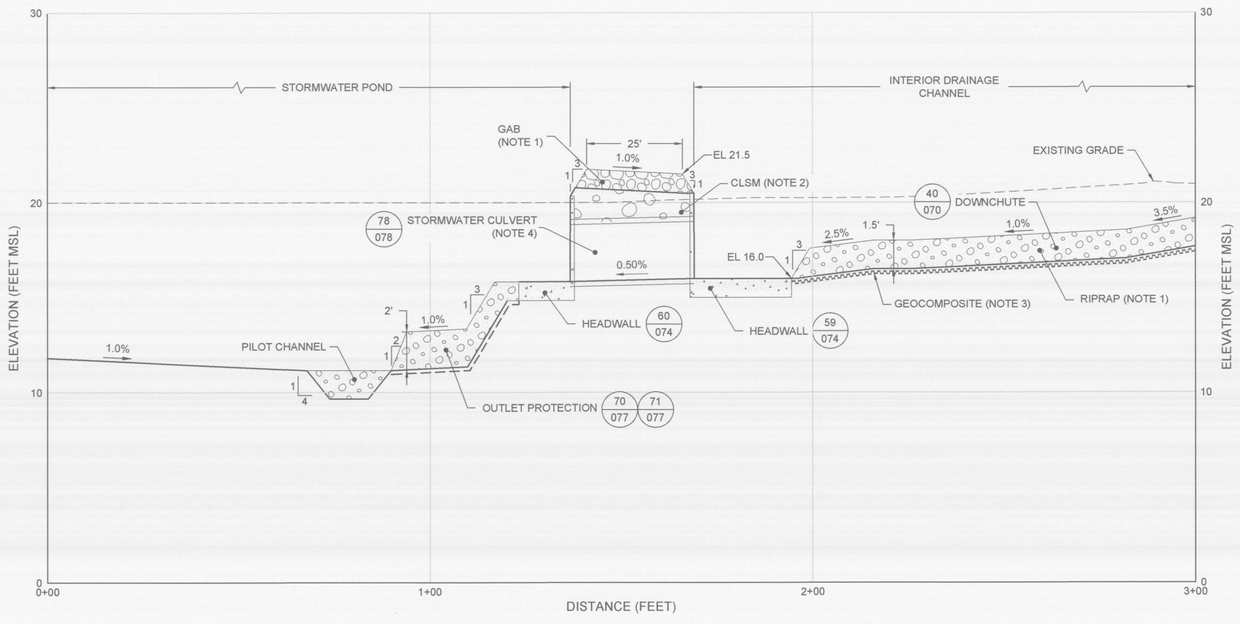
81 / - TABLE
TEMPORARY SEEDING

STORMWATER CHANNELS								
CHANNEL ID	MIN. CHANNEL DEPTH (FT)	MIN. BOTTOM WIDTH (FT)	SIDE SLOPE M1:1	SIDE SLOPE M2:1	CHANNEL LINING MATERIAL	ALDOT CLASS	D50 (IN)	CHANNEL LINING THICKNESS (FT)
SWC-1	2.0	15.0	3.0	3.0	COARSE GRAVEL	-	1.0	0.5
SWC-2	3.0	15.0	4.0	4.0	VERY COARSE GRAVEL	-	2.0	0.5
SWC-3	2.3	25.0	4.0	4.0	VERY COARSE GRAVEL	-	2.0	0.5
SWC-4	2.5	15.0	3.0	3.0	COARSE GRAVEL	-	1.0	0.5
SWC-5A	3.3	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-5B	3.0	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-6A	3.0	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-6B	3.0	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-7A	3.0	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-7B	3.0	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-8A	3.0	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-8B	3.4	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-9A	3.4	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-9B	3.1	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-10A	3.1	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-10B	3.1	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-11	3.1	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-12	3.5	4.0	3.0	3.0	RIPRAP	CLASS 1	6.0	1.0
SWC-13	1.8	4.0	4.0	4.0	RIPRAP	CLASS 1	6.0	1.0
SWC-14	2.5	4.0	3.0	3.0	VERY COARSE GRAVEL	-	2.0	0.5
INTERIOR DRAINAGE CHANNEL (TYP)	1.5	10.0	23.5	26.7	COARSE GRAVEL	-	1.0	0.5
UPPER DRAINAGE BENCH	2.0	3.0	10.0	28.6	VERY COARSE GRAVEL	-	2.0	0.5
UPPER DOWNCHUTE	1.5	10.0	4.0	4.0	RIPRAP	CLASS 1	6.0	1.0
LOWER DRAINAGE BENCH	2.0	3.0	10.0	28.6	VERY COARSE GRAVEL	-	2.0	0.5
LOWER DOWNCHUTE	2.0	10.0	4.0	4.0	RIPRAP	CLASS 2	12.0	1.5

82 / 032 TABLE
STORMWATER CHANNELS



83 / 035 PROFILE
SWP-4
SCALE: 1" = 20' (H); 1" = 4' (V)



84 / 021 PROFILE
REPRESENTATIVE INTERIOR DRAINAGE CHANNEL CULVERT
SCALE: 1" = 20' (H); 1" = 4' (V)

NOTES:

1. AGGREGATE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 16.
2. CAST-IN-PLACE CONCRETE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 03 30 00.
3. GEOCOMPOSITE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.26.
4. STORMWATER PIPES AND STRUCTURES SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 33 44 00.
5. EARTHWORK SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 23 00.
6. GEOTEXTILE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 19.13.

0 20 40 HORIZONTAL SCALE IN FEET
0 4 8 VERTICAL SCALE IN FEET

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

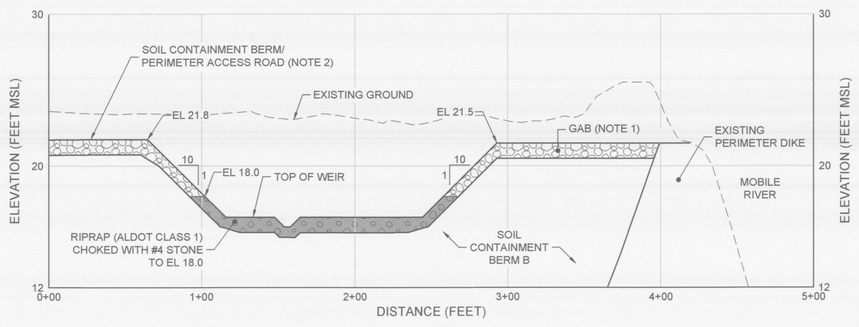
REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

SWMS AND ESC DETAILS II

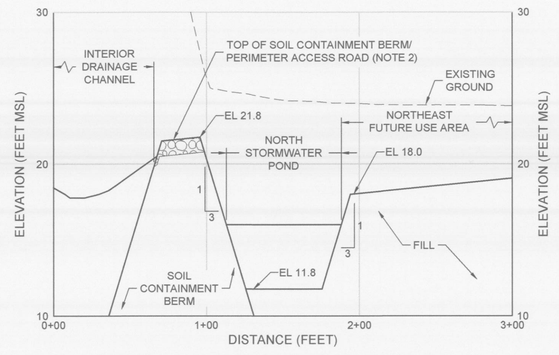
PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

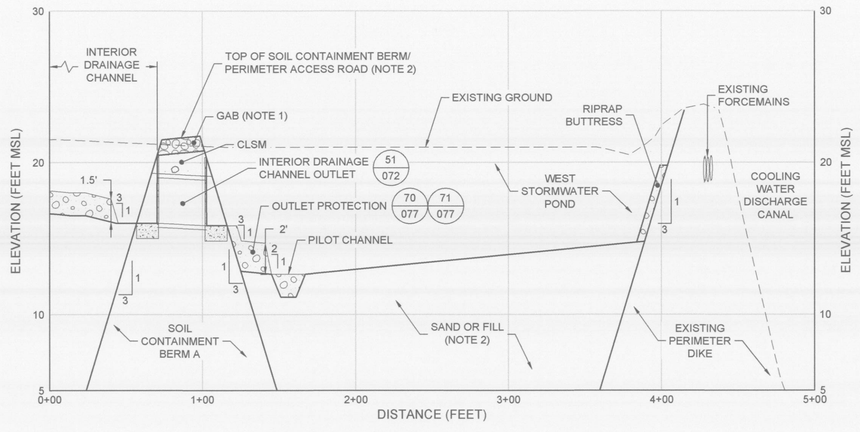
PROJ. NO.	GW6489	DWG. GW6489.04C077	SHEET 1
SCALE	AS SHOWN	DRAWING 078 OF 097	
DATE	DECEMBER 2018		



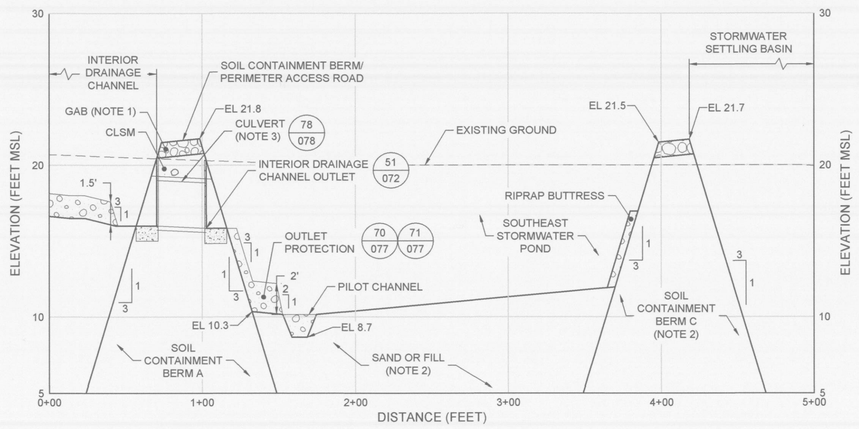
W / 031 SECTION
NORTH STORMWATER POND OUTFALL WEIR
SCALE: 1" = 50' (HORIZONTAL); 1" = 5' (VERTICAL)



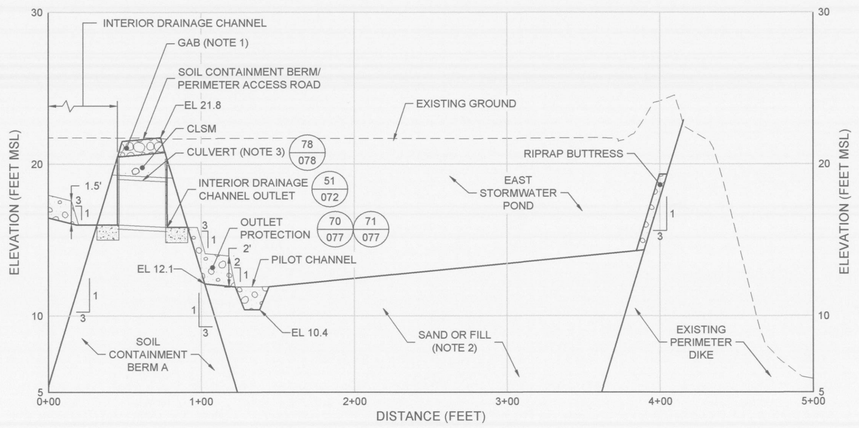
X / 031 SECTION
NORTH STORMWATER POND
SCALE: 1" = 50' (HORIZONTAL); 1" = 5' (VERTICAL)



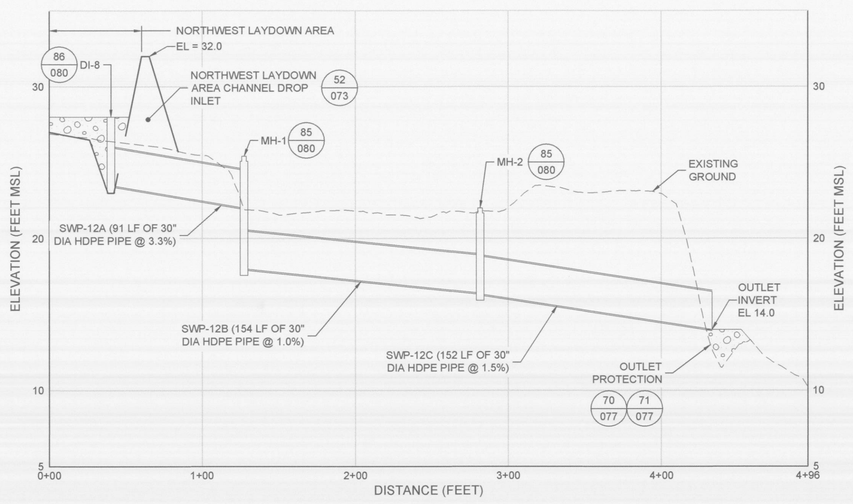
Y / 031 SECTION
WEST STORMWATER POND
SCALE: 1" = 50' (HORIZONTAL); 1" = 5' (VERTICAL)



Z / 031 SECTION
SOUTHEAST AND SOUTHWEST STORMWATER POND
SCALE: 1" = 50' (HORIZONTAL); 1" = 5' (VERTICAL)



AA / 031 SECTION
EAST STORMWATER POND
SCALE: 1" = 50' (HORIZONTAL); 1" = 5' (VERTICAL)



BB / 032 SECTION
NORTHWEST LAYDOWN AREA OUTFALL
SCALE: 1" = 50' (HORIZONTAL); 1" = 5' (VERTICAL)

NOTES:

1. AGGREGATE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 16.
2. EARTHWORK SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 23 00.
3. STORMWATER PIPES AND STRUCTURES SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 33 44 00.

0 50 100
HORIZONTAL SCALE IN FEET

0 5 10
VERTICAL SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	08.27.18	DRAFT 60 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
A	NA	NOT SUBMITTED	NA	NA

SWMS AND ESC DETAILS III

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
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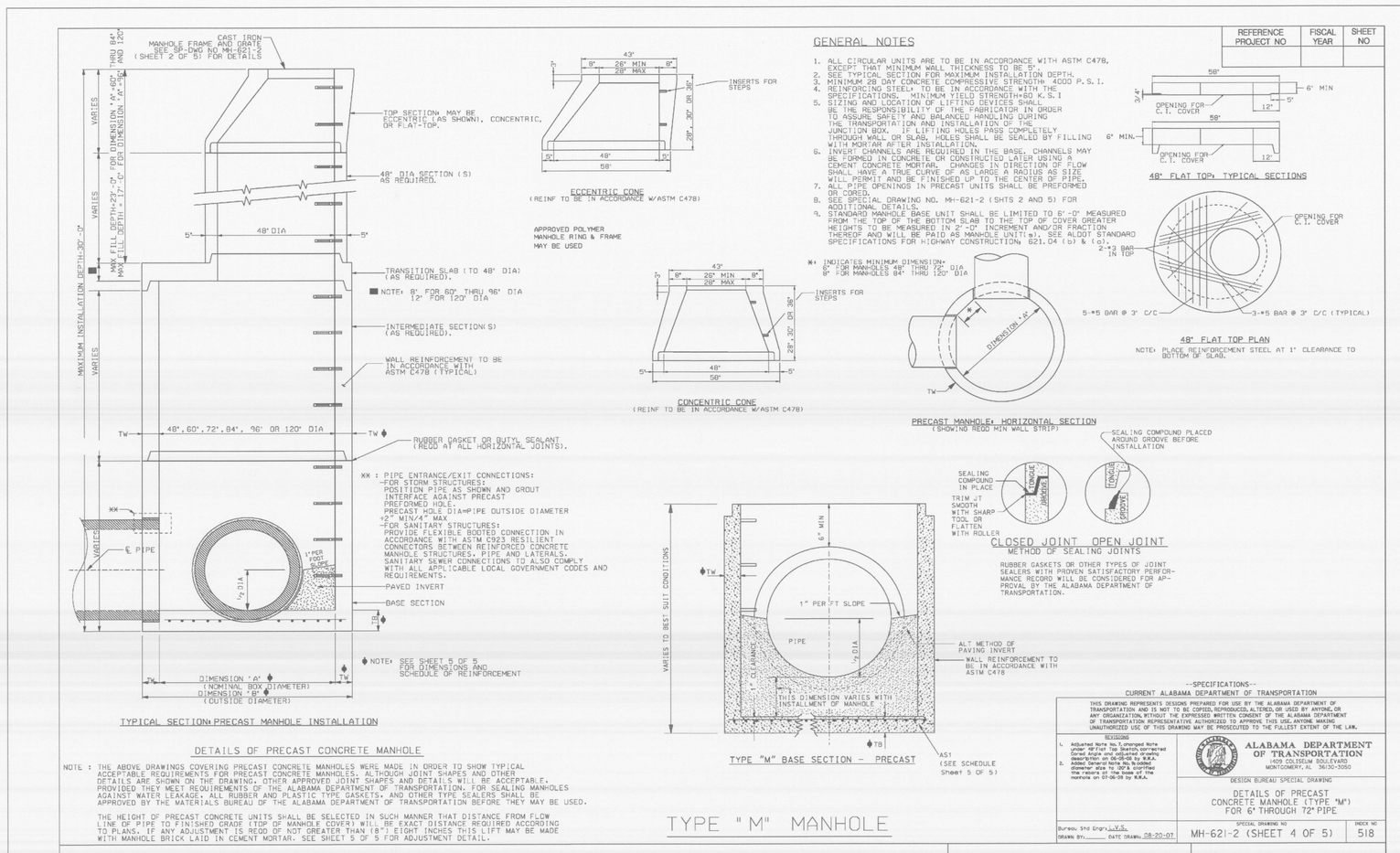
PROJ. NO.	GW6489	DWG. GW6489.04C078	SHEET 1
SCALE	AS SHOWN	DRAWING 079 OF 097	
DATE	DECEMBER 2018		

L:\CADD\AVALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTIONDRAWINGS\GW6489.04C078

ANSI E: 44x34



TYPICAL SECTION PRECAST MANHOLE INSTALLATION

ECCENTRIC CONE
(REINF TO BE IN ACCORDANCE W/ASTM C478)

APPROVED POLYMER MANHOLE RING & FRAME MAY BE USED

CONCENTRIC CONE
(REINF TO BE IN ACCORDANCE W/ASTM C478)

GENERAL NOTES

1. ALL CIRCULAR UNITS ARE TO BE IN ACCORDANCE WITH ASTM C478, LATEST REVISION, WALL THICKNESS TO BE "B".
2. SEE TYPICAL SECTION FOR MAXIMUM INSTALLATION DEPTH.
3. MINIMUM 28 DAY CONCRETE COMPRESSIVE STRENGTH= 4000 P.S.I.
4. REINFORCING STEEL: TO BE IN ACCORDANCE WITH THE SPECIFICATIONS. MINIMUM YIELD STRENGTH=60 K.S.I
5. SIZING AND LOCATION OF LIFTING DEVICES SHALL BE THE RESPONSIBILITY OF THE FABRICATOR IN ORDER TO PROVIDE FOR SAFE HANDLING AND ASSISTING THE TRANSPORTATION AND INSTALLATION OF THE MANHOLE JUNCTION BOX. IF LIFTING HOLES PASS COMPLETELY THROUGH WALL OR SLAB, HOLES SHALL BE SEALED BY FILLING WITH MORTAR AFTER INSTALLATION.
6. INVERT CHANNELS ARE REQUIRED IN THE BASE. CHANNELS MAY BE FORMED DURING PLACEMENT OF CONCRETE OR CONSTRUCTED LATER USING A CEMENT CONCRETE MORTAR. CHANGES IN DIRECTION OF FLOW SHALL HAVE A TRUE CURVE OF AS LARGE A RADIUS AS SIZE WILL PERMIT AND BE FINISHED UP TO THE CENTER OF PIPE. ALL PIPE OPENINGS IN PRECAST UNITS SHALL BE PREFORMED OR CORED.
7. SEE ADDITIONAL DRAWING NO. MH-621-2 (SHTS 2 AND 5) FOR ADDITIONAL DETAILS.
8. STANDARD MANHOLE BASE UNIT SHALL BE LIMITED TO 6'-0" MEASURED FROM THE TOP OF THE BOTTOM SLAB TO THE TOP OF COVER GREATER HEIGHTS TO BE MEASURED IN 2'-0" INCREMENT AND/OR FRACTION THEREOF AND WILL BE PAID AS MANHOLE UNIT(s). SEE ALDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION 621.04 (b) & (c).

*+ (INDICATES MINIMUM DIMENSION)
48" MANHOLES 24" THRU 72" DIA
8" FOR MANHOLES 84" THRU 120" DIA

PRECAST MANHOLE HORIZONTAL SECTION
(SHOWING REQD MIN WALL STRIP)

48" FLAT TOP, TYPICAL SECTIONS

48" FLAT TOP PLAN
NOTE: PLACE REINFORCEMENT STEEL AT 1" CLEARANCE TO BOTTOM OF SLAB.

METHOD OF SEALING JOINTS

RUBBER GASKETS OR OTHER TYPES OF JOINT SEALERS WITH PROVEN SATISFACTORY PERFORMANCE RECORD WILL BE CONSIDERED FOR APPROVAL BY THE ALABAMA DEPARTMENT OF TRANSPORTATION.

TYPE "M" BASE SECTION - PRECAST

DETAILS OF PRECAST CONCRETE MANHOLE

NOTE : THE ABOVE DRAWINGS COVERING PRECAST CONCRETE MANHOLES WERE MADE IN ORDER TO SHOW TYPICAL ACCEPTABLE REQUIREMENTS FOR PRECAST CONCRETE MANHOLES. ALTHOUGH JOINT SHAPES AND OTHER DETAILS ARE SHOWN ON THE DRAWING, OTHER APPROVED JOINT SHAPES AND DETAILS WILL BE ACCEPTABLE, PROVIDED THEY MEET REQUIREMENTS OF THE ALABAMA DEPARTMENT OF TRANSPORTATION FOR SEALING MANHOLES AGAINST WATER AND INFILTRATION. RUBBER GASKETS OR OTHER TYPES OF JOINT SEALERS WITH PROVEN SATISFACTORY PERFORMANCE RECORD MAY BE USED. APPROVED BY THE MATERIALS BUREAU OF THE ALABAMA DEPARTMENT OF TRANSPORTATION BEFORE THEY MAY BE USED.

THE HEIGHT OF PRECAST CONCRETE UNITS SHALL BE SELECTED IN SUCH MANNER THAT DISTANCE FROM FLOW LINE OF PIPE TO FINISHED GRADE (TOP OF MANHOLE COVER) WILL BE EXACT DISTANCE REQUIRED ACCORDING TO PLANS. IF ANY ADJUSTMENT IS REQD OF NOT GREATER THAN (8") EIGHT INCHES THIS LIFT MAY BE MADE WITH MANHOLE BRICK LAID IN CEMENT MORTAR. SEE SHEET 5 OF 5 FOR ADJUSTMENT DETAIL.

TYPE "M" MANHOLE

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO

--SPECIFICATIONS--
CURRENT ALABAMA DEPARTMENT OF TRANSPORTATION

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REVISIONS
1. Adjusted Note No.1 changed Note under Detail Top Sheets corrected Note No.2 under Detail Top Sheets corrected on 04-05-06 by R.M.A.
2. Changed Note No.1 under Detail Diameter also to 30" & modified the returns at the base of the manhole on 07-06-06 by R.M.A.

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 COLISEUM BOULEVARD
MONTGOMERY, AL 36130-5050

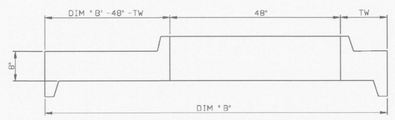
DESIGN BUREAU SPECIAL DRAWING

DETAILS OF PRECAST CONCRETE MANHOLE (TYPE "M") FOR 6' THROUGH 72' PIPE

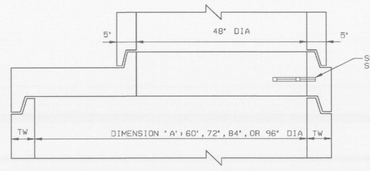
Bureau Std Engr: J.Y.S.
Drawn By: _____ Date Drawn: 08-20-07

SPECIAL DRAWING NO: MH-621-2 (SHEET 4 OF 5)
INDEX NO: 518

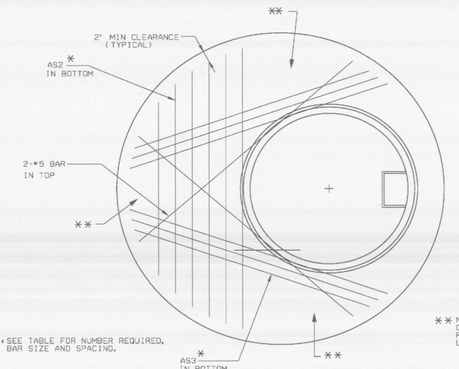
NOT TO SCALE



TYPICAL TRANSITION SECTION TO 48" DIA.

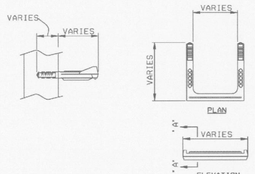


MANHOLE TRANSITION TO 48" DIA. ASSEMBLY



*+SEE TABLE FOR NUMBER REQUIRED, BAR SIZE AND SPACING.

TYPICAL TRANSITION TO 48" SECTION LAYOUT
NOTE: PLACE REINFORCING STEEL AT 1" CLEARANCE TO BOTTOM OF SLAB.



STEPS SHOWN ARE TO BE USED AS A GUIDE. OTHER TYPES MAY BE USED IF APPROVED.

POLYPROPYLENE STEPS

FOOTNOTES:
1. STEPS SHALL BE PLACED IN WET CONCRETE AT THE TIME OF MANUFACTURE OR MORTARED INTO HOLES AFTER CONCRETE HAS SET.
2. DIMENSIONS WILL VARY ACCORDING TO SPECIFIC APPLICATIONS.
3. ALL MANHOLE STEPS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-199, SECTION 16.

NOTE: SEE "TYPICAL SECTION..." ON DRAWING NO MH-621-2 (4 OF 5), FOR LOCATION OF DIMENSIONS "TW" AND "TB"

DIMENSIONS "A"	DIMENSIONS "B"	MAX PIPE INSIDE DIA FOR■■ NO"OR 180° INTERSECTION ANGLE		THICKNESS TW	THICKNESS TB	REQD REINF IN BASE OR TRANS.SECT. AS1	AS2	AS3
4'-0"	4'-10"	18"	180°	5"	6"	*5@6"	———	———
5'-0"	6'-0"	24"	30°	5"	6"	*5@6"	4-#6@3"	3-#6@3"
6'-0"	7'-2"	30"	48°	7"	8"	*6@6"	6-#6@3"	3-#6@3"
7'-0"	8'-4"	36"	60°	8"	8"	*6@6"	7-#6@3"	5-#6@3"
8'-0"	9'-6"	42"	66°	9"	8"	*6@4"	7-#6@3"	7-#6@3"

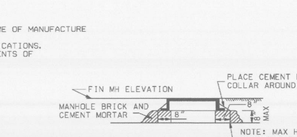
NOTE: WALL REINFORCEMENT TO BE IN ACCORDANCE WITH ASTM C478.

■■: MAXIMUM ENTRANCE/EXIT PIPE SIZES NOT SPECIFICALLY INDICATED IN TABLE SHALL BE CONTROLLED BY THE MINIMUM WALL STRIP BETWEEN INTERSECTING PIPE. SEE HORIZONTAL SECTION FOR ADDITIONAL INFORMATION.

TABLE OF DIMENSIONS AND SCHEDULE OF REINFORCING STEEL

NOTES:
1. WALL AND SLAB THICKNESSES DENOTED ARE MINIMUM VALUES AND MAY BE INCREASED AT THE DISCRETION OF THE PRECAST MANUFACTURER.
2. WELDED WIRE REINFORCEMENT PROVIDING EQUIVALENT AREAS OF STEEL TO THOSE DENOTED ABOVE MAY BE SUBSTITUTED FOR REINFORCING BARS. WELDED WIRE REINFORCEMENT SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.

** NOTE: PROVIDE A MINIMUM AREA OF REINFORCEMENT OF 0.31 SQUARE INCHES PER FOOT EACH WAY WHERE THE REINFORCEMENT INDICATED IN THIS DETAIL PROVIDES LESS THAN THAT AMOUNT.



NOTE: WHEN FOUND NECESSARY ON CONSTRUCTION TO ADJUST TOP OF MANHOLE COVER TO MEET FINISH MANHOLE COVER ELEVATION THE NECESSARY ADJUSTMENT SHALL BE MADE WITH MANHOLE BRICKS AND CEMENT MORTAR.

MANHOLE HEIGHT ADJUSTMENT

TYPE "M" MANHOLE

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO

--SPECIFICATIONS--
CURRENT ALABAMA DEPARTMENT OF TRANSPORTATION

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REVISIONS
1. Changed sheet to conform to ALDOT Standard Specifications for HDPE on one page on 11-15-12 by JJF.

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 COLISEUM BOULEVARD
MONTGOMERY, AL 36130-5050

DESIGN BUREAU SPECIAL DRAWING

DETAILS OF PRECAST CONCRETE MANHOLE (TYPE "M") FOR 6' THROUGH 72' PIPE

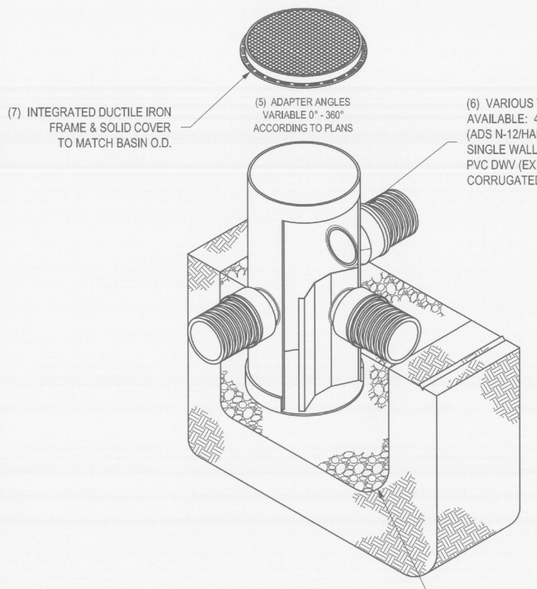
Bureau Std Engr: J.Y.S.
Drawn By: _____ Date Drawn: 08-20-07

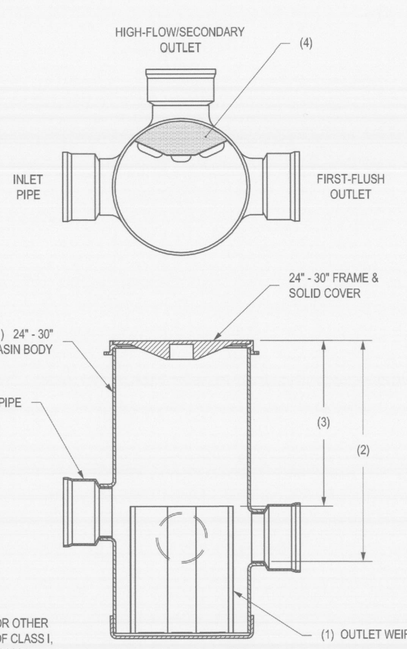
SPECIAL DRAWING NO: MH-621-2 (SHEET 5 OF 5)
INDEX NO: 519

NOT TO SCALE

85/032 DETAIL
PRECAST MANHOLE
SOURCE: ALDOT
SCALE: NTS

NYLOPLAST DRAIN BASIN WITH WEIR





SIDE SECTION & TOP VIEW:
ENLARGED TO SHOW DETAIL

1 - WEIR AVAILABLE FOR ALL 24" - 30" STRUCTURE OPTIONS (CUSTOM BASIN, ROAD & HIGHWAY, & CURB INLET).
2 - DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS. RISERS ARE NEEDED FOR BASINS OVER 84" DUE TO SHIPPING RESTRICTIONS SEE DRAWING NO. 7001-110-065.
3 - HEIGHT OF WEIR TO BE DETERMINED BY ENGINEER. **WEIR HEIGHT CANNOT EXCEED 84" DUE TO MANUFACTURING AND SHIPPING RESTRICTIONS.**
4 - WEIR MANUFACTURED TO MINIMIZE LOSS OF OUTLET PIPE OPEN AREA.
5 - ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0° TO 360°. TO DETERMINE MINIMUM ANGLE BETWEEN ADAPTERS SEE DRAWING NO. 7001-110-012.
6 - DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS N-12/HANCOR DUAL WALL), N-12 HP, & PVC SEWER (4" - 24").
7 - FRAMES, GRATES, COVERS, HOODS, & BASE PLATES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.

THE BACKFILL MATERIAL SHALL BE CRUSHED STONE OR OTHER GRANULAR MATERIAL MEETING THE REQUIREMENTS OF CLASS I, CLASS II, OR CLASS III MATERIAL AS DEFINED IN ASTM D2321. BEDDING & BACKFILL FOR SURFACE DRAINAGE INLETS SHALL BE PLACED & COMPACTED UNIFORMLY IN ACCORDANCE WITH ASTM D2321.

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DRAWN BY	EBC	MATERIAL	
DATE	05-10-06		
REVISED BY	NMH	PROJECT NO./NAME	
DATE	03-16-16		
DWG SIZE	A	SCALE 1:40	SHEET 1 OF 1

Nyloplast
3130 VERONA AVE
BUFORD, GA 30518
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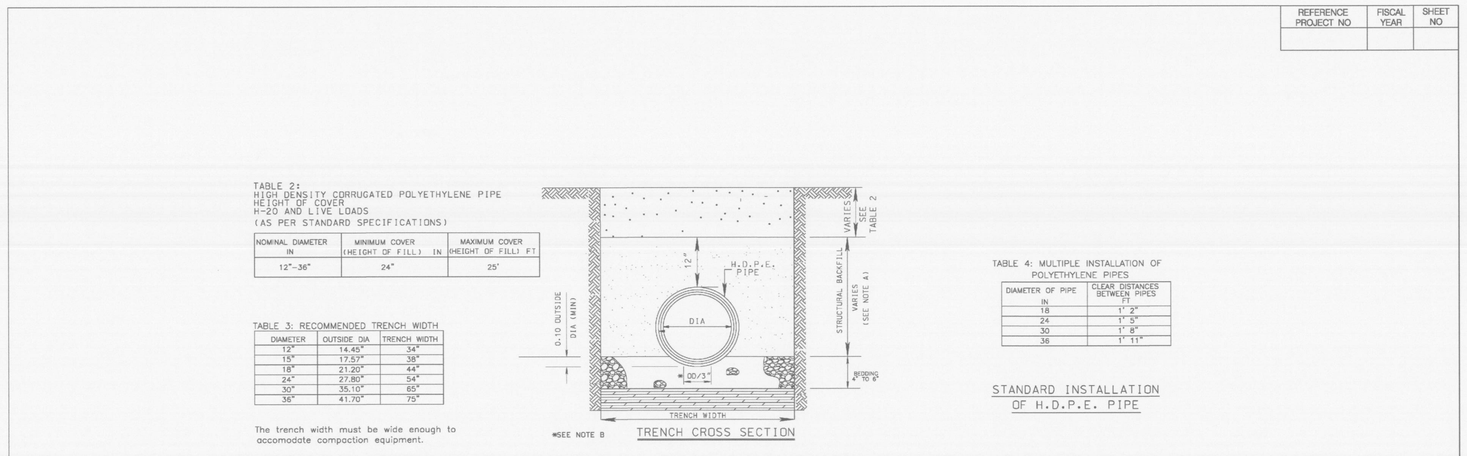
www.nyloplast-us.com

TITLE: DRAIN BASIN WITH WEIR
QUICK SPEC INSTALLATION DETAIL

DWG NO. 7004-110-058 REV G

86/073 DETAIL
NYLOPLAST DROP INLET
SOURCE: NYLOPLAST
SCALE: NTS



TRENCH CROSS SECTION

TABLE 2:
HIGH DENSITY CORRUGATED POLYETHYLENE PIPE
HEIGHT OF COVER
H-20 AND LIVE LOADS
(AS PER STANDARD SPECIFICATIONS)

NOMINAL DIAMETER IN	MINIMUM COVER (HEIGHT OF FILL) IN	MAXIMUM COVER (HEIGHT OF FILL) FT
12"-36"	24"	25'

TABLE 3: RECOMMENDED TRENCH WIDTH

DIAMETER	OUTSIDE DIA	TRENCH WIDTH
12"	14.45"	34"
18"	17.57"	38"
18"	21.20"	44"
24"	27.80"	54"
30"	35.10"	65"
36"	41.70"	75"

The trench width must be wide enough to accomodate compaction equipment.

TABLE 4: MULTIPLE INSTALLATION OF POLYETHYLENE PIPES

DIAMETER OF PIPE IN	CLEAR DISTANCES BETWEEN PIPES FT
18	1'-3"
24	1'-5"
30	1'-8"
36	1'-11"

STANDARD INSTALLATION OF H.D.P.E. PIPE

GENERAL NOTES (H.D.P.E. PIPE)

A. MATERIALS: THERMOPLASTIC PIPE: POLYETHYLENE PIPE SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 294, LATEST EDITION.
BEDDING MATERIAL AND STRUCTURAL BACKFILL: SHALL MEET THE REQUIREMENTS OF AASHTO A-1, A-3, A-2-4 OR A-2-5.
B. INSTALLATION: MINIMUM TRENCH WIDTHS SHALL MEET THE REQUIREMENTS OF TABLE 3. THE MIDDLE THIRD OF THE BEDDING MATERIAL UNDER THE PIPE SHOULD BE LOOSELY PLACED. WHILE THE REMAINDER SHALL BE COMPACTED TO A MINIMUM 95% OF MAXIMUM DENSITY PER AASHTO T-99. A MINIMUM OF 4 INCHES OF BEDDING SHALL BE PROVIDED PRIOR TO PLACEMENT OF THE PIPE. STRUCTURAL BACKFILL SHALL BE PLACED AND COMPACTED IN LAYERS NOT EXCEEDING 6 & 1/2INCH LOOSE LIFT THICKNESS AND BROUGHT UP EVENLY ON BOTH SIDES OF THE PIPE TO AN ELEVATION NOT LESS THAN 12 INCHES ABOVE THE THE TOP OF THE PIPE. A MINIMUM COMPACTION LEVEL OF 95% STANDARD DENSITY PER AASHTO T-99 SHALL BE ACHIEVED. MINIMUM COVER REQUIREMENT SHALL MEET THE REQUIREMENTS OF TABLE 2. FOR MULTIPLE INSTALLATION OF POLYETHYLENE PIPES. A CLEAR DISTANCE BETWEEN PIPES SHALL MEET THE REQUIREMENTS OF TABLE 4.
C. CALCULATIONS FOR FILL DEPTHS ARE BASED ON PROPERTIES DEFINED IN AASHTO M294 AND CALCULATIONS IN AASHTO SEC 12 AND SEC 30.
D. ANY COST OF BEDDING AND BACKFILL MATERIAL REQUIRED TO INSTALL THE H.D.P.E. PIPE IN ADDITION TO THAT SHOWN IN THE PLANS SHALL BE INCLUDED IN THE PRICE BID FOR THE PIPE.

--SPECIFICATIONS--
CURRENT ALABAMA DEPARTMENT OF TRANSPORTATION

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REVISIONS
1. Created sheet to conform to ALDOT HDPE on one page on 11-15-12 by JJF.

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 COLISEUM BOULEVARD
MONTGOMERY, AL 36130-5050

DESIGN BUREAU SPECIAL DRAWING

BEDDING AND FILL HEIGHTS FOR ALL ROADWAY PIPE CULVERTS (N,D,P,E, PIPE)

Bureau Std Engr: J.Y.S.
Drawn By: _____ Date Drawn: 05-26-15

SPECIAL DRAWING NO: RPC-530 (SHEET 3 OF 3)
INDEX NO: 449

NOT TO SCALE

87/- DETAIL
HDPE PIPE BEDDING
SOURCE: ALDOT
SCALE: NTS

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

MISCELLANEOUS DETAILS I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C080	SHEET 1
SCALE	AS SHOWN	DRAWING 080 OF 097	
DATE	DECEMBER 2018		

ANSI E: 44x34

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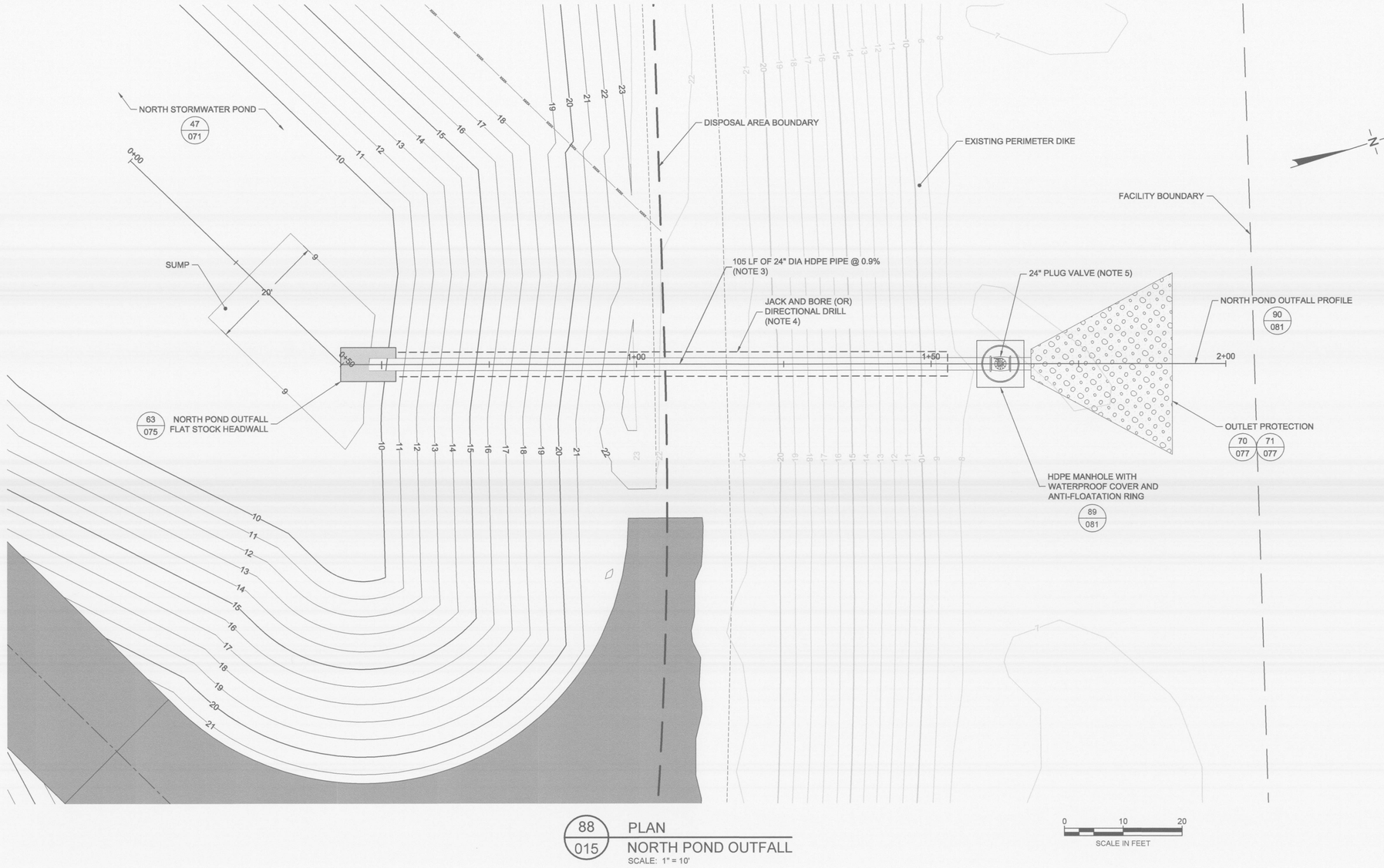
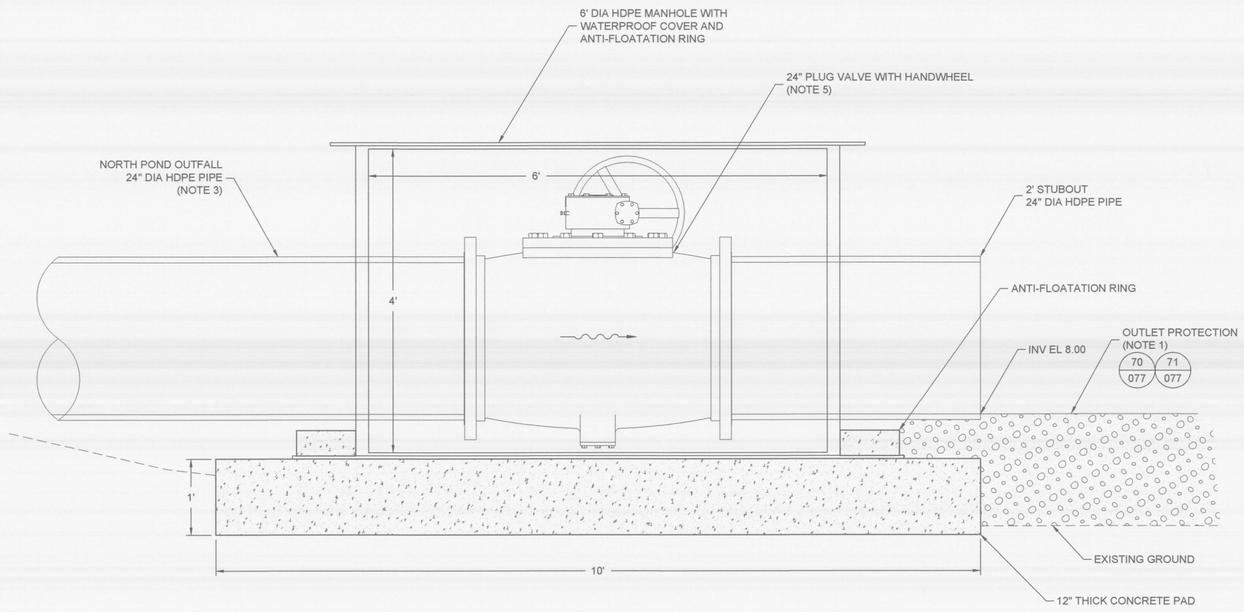
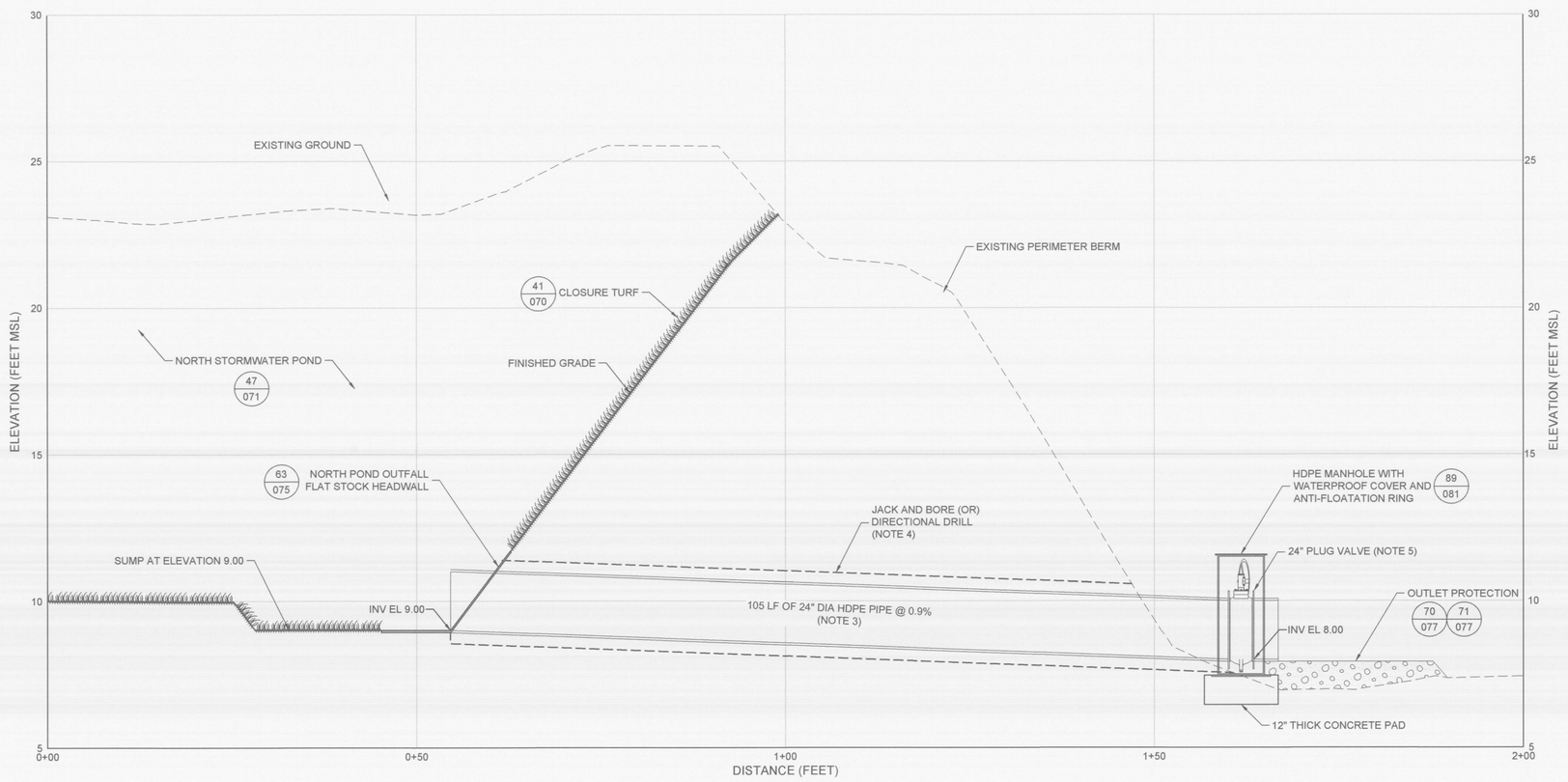


88 / 015 PLAN
NORTH POND OUTFALL
SCALE: 1" = 10'

0 10 20
SCALE IN FEET



89 / 081 DETAIL
HDPE MANHOLE
SCALE: 1" = 1'



90 / 081 PROFILE
NORTH POND OUTFALL
SCALE: 1" = 10' (HORIZONTAL); 1" = 5' (VERTICAL)

0 10 20
HORIZONTAL SCALE IN FEET

0 5 10
VERTICAL SCALE IN FEET

NOTES:

1. AGGREGATE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 05 16.
2. EARTHWORK SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 23 00.
3. STORMWATER PIPES AND STRUCTURES SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 33 44 00.
4. TWENTY-FOUR INCH HDPE PIPE SHALL BE INSTALLED BY JACK-AND-BORE OR DIRECTIONAL DRILLING (NOT OPEN CUT TRENCHING THROUGH EXISTING PERIMETER DIKE) IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 31 23 00.
5. TWENTY-FOUR INCH PLUG VALVE SHALL BE FLOMATIC MJ FLO-E-CENTRIC PLUG VALVE, OR SIMILAR ENGINEERED-APPROVED EQUIVALENT.

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

MISCELLANEOUS DETAILS II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C083	SHEET 1
SCALE	AS NOTED	DRAWING 081 OF 097	
DATE	DECEMBER 2018		

ANSI E: 44x34

L:\CAD\MAL\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTIONDRAWINGS\GW6489.04C083

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT BOTTOM OF CCR EXCAVATION.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - CCR REMOVAL I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

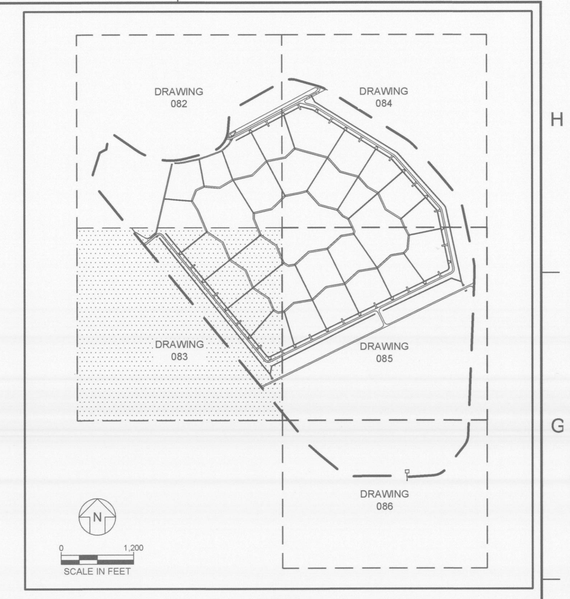
PROJ. NO.	GW6489	DWG. GW6489.04C084	SHEET 1
SCALE	1" = 100'	DRAWING 082 OF 097	
DATE	DECEMBER 2018		

L:\GAD\AVA\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C084

ANSI E: 44x34

MATCHLINE (DRAWING 082)

MATCHLINE (DRAWING 085)



KEY MAP
SCALE: 1" = 1,200'

EXTERNAL LIMIT OF EXCAVATION

INTERNAL LIMIT OF EXCAVATION

DISPOSAL AREA BOUNDARY

FACILITY BOUNDARY

EXISTING PERIMETER DIKE

MW-01 MW-02 MW-03 APZ-2

LEGEND

- EXCAVATION SURFACE ELEVATION (FEET)
- EXISTING GROUND ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- PROPERTY BOUNDARY
- TREE LINE
- N01E07-03-01 — CONTROL POINT (GRID-SURFACE-POINT)
- 1.00 — EXCAVATION CONTROL ELEVATION
- MW-01 — MONITORING WELL
- APZ-2 — PIEZOMETER
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT BOTTOM OF CCR EXCAVATION.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - CCR REMOVAL II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
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PROJ. NO.	GW6489	DWG. GW6489.04C084	SHEET 2
SCALE	1" = 100'	DRAWING 083 OF 097	
DATE	DECEMBER 2018		

ANSI E 44x34

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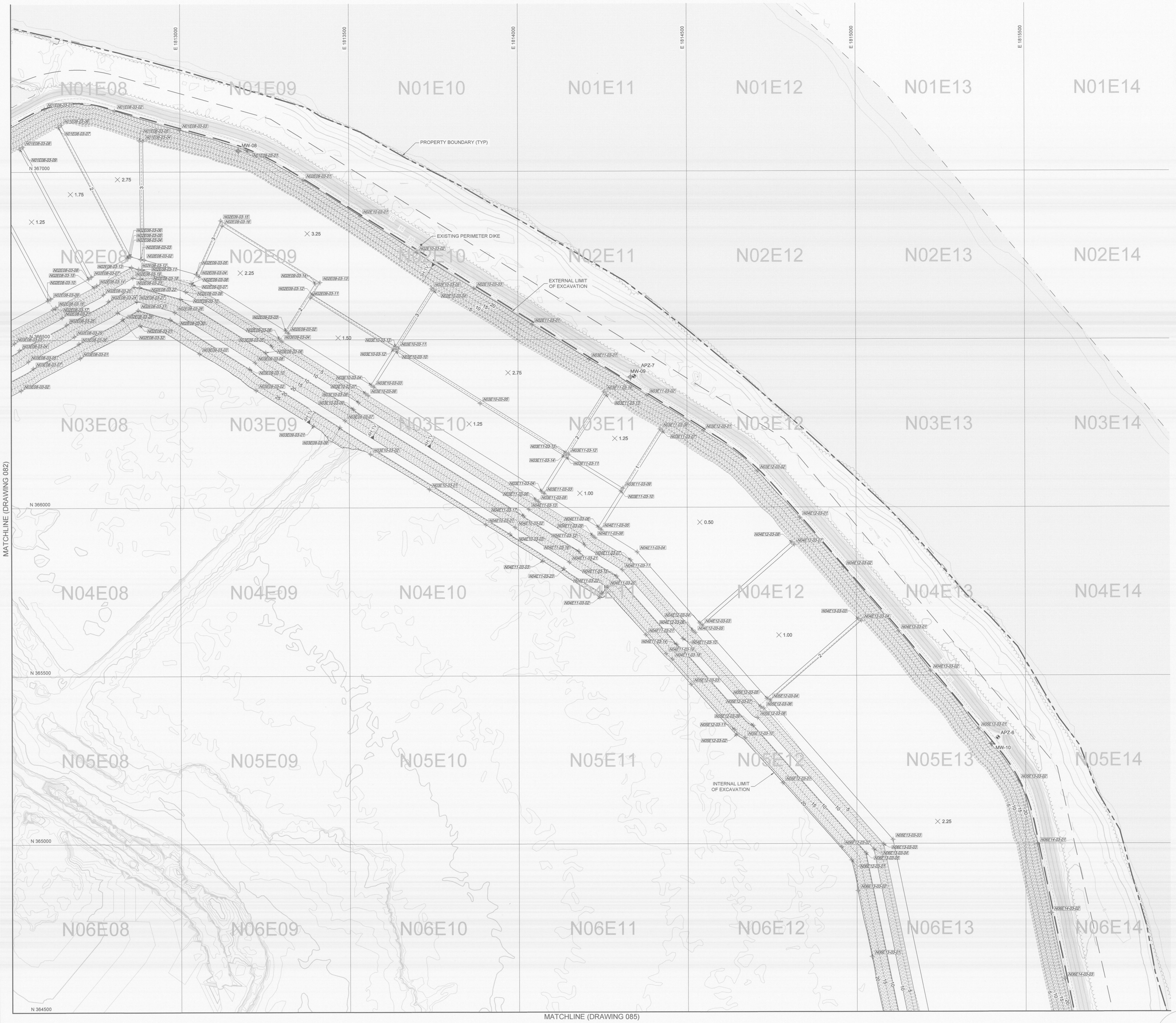

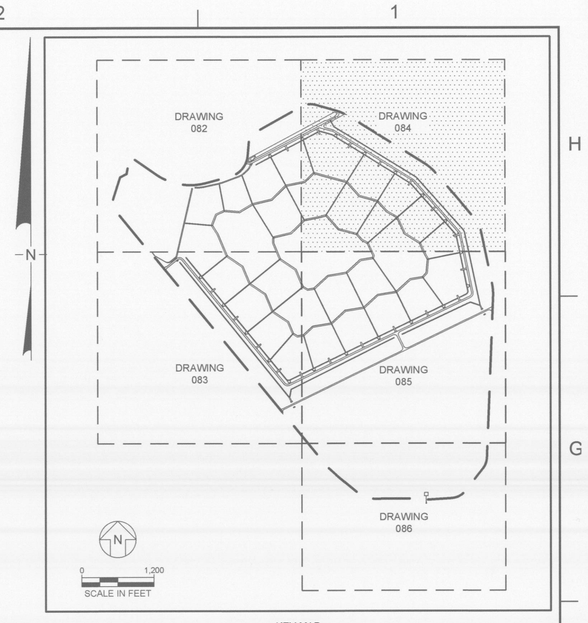

KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXCAVATION SURFACE ELEVATION (FEET)
- EXISTING GROUND ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- PROPERTY BOUNDARY
- TREE LINE
- N01E07-03-01 — CONTROL POINT (GRID-SURFACE-POINT)
- 0.00 — EXCAVATION CONTROL ELEVATION
- MW-01 — MONITORING WELL
- APZ-2 — PIEZOMETER
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT BOTTOM OF CCR EXCAVATION.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - CCR REMOVAL III

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C084	SHEET 3
SCALE	1" = 100'	DRAWING 084 OF 097	
DATE	DECEMBER 2018		

ANSI E: 44x34

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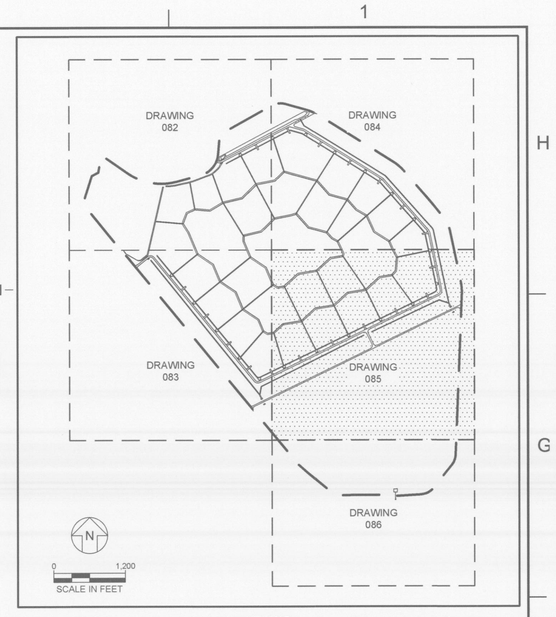
MATCHLINE (DRAWING 084)

MATCHLINE (DRAWING 083)

MATCHLINE (DRAWING 086)



KEY MAP
SCALE: 1" = 1,200'

E 1813000
E 1813500
E 1814000
E 1814500
E 1815000
E 1815500

N 364000
N 363500
N 363000
N 362500
N 362000

N07E08 N07E09 N07E10 N07E11 N07E12 N07E13 N07E14
N08E08 N08E09 N08E10 N08E11 N08E12 N08E13 N08E14
N09E08 N09E09 N09E10 N09E11 N09E12 N09E13 N09E14
N10E08 N10E09 N10E10 N10E11 N10E12 N10E13 N10E14
N11E08 N11E09 N11E10 N11E11 N11E12 N11E13 N11E14
N12E08 N12E09 N12E10 N12E11 N12E12 N12E13 N12E14

INTERNAL LIMIT OF EXCAVATION

MW-11
MW-12R
MW-16
APZ-5
EXISTING PERIMETER DIKE
PROPERTY BOUNDARY (TYP)
MOBILE RIVER

LEGEND

- EXCAVATION SURFACE ELEVATION (FEET)
- EXISTING GROUND ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- PROPERTY BOUNDARY
- TREE LINE
- N01E07-03-01 — CONTROL POINT (GRID-SURFACE-POINT)
- 0.00 — EXCAVATION CONTROL ELEVATION
- MW-01 — MONITORING WELL
- APZ-2 — PIEZOMETER
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT BOTTOM OF CCR EXCAVATION.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - CCR REMOVAL IV

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C084	SHEET 4
SCALE	1" = 100'	DRAWING 085 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

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MATCHLINE (DRAWING 085)

N13E08 N13E09 N13E10 N13E11 N13E12 N13E13 N13E14

N14E08 N14E09 N14E10 N14E11 N14E12 N14E13 N14E14

N15E08 N15E09 N15E10 N15E11 N15E12 N15E13 N15E14

N16E08 N16E09 N16E10 N16E11 N16E12 N16E13 N16E14

E 1815000 E 1815500 E 1814000 E 1814500 E 1815000 E 1815500

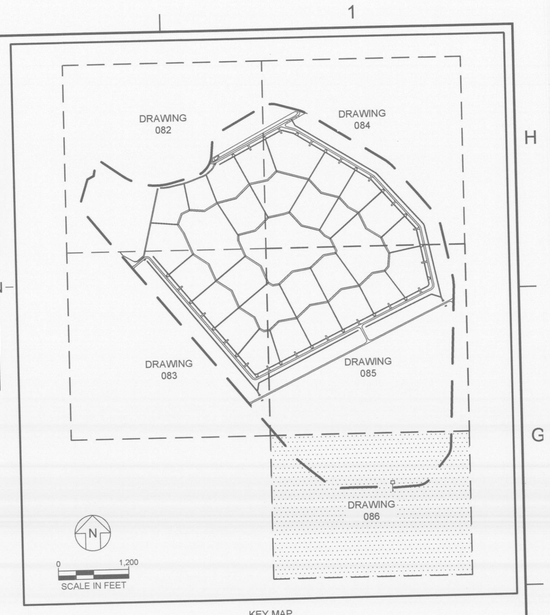
N 361000 N 360500 N 360000 N 359500 N 359000

-1.00 -1.25 -1.00 -0.50 -0.75

MW-15 MW-14 MW-13

EXTERNAL LIMIT OF EXCAVATION

MOBILE RIVER



KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXCAVATION SURFACE ELEVATION (FEET)
- EXISTING GROUND ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- FACILITY BOUNDARY
- PROPERTY BOUNDARY
- TREE LINE
- N01E07-03-01 — CONTROL POINT (GRID-SURFACE-POINT)
- 0.00 — EXCAVATION CONTROL ELEVATION
- MW-01 — MONITORING WELL
- APZ-2 — PIEZOMETER
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT BOTTOM OF CCR EXCAVATION.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - CCR REMOVAL V

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C084	SHEET 5
SCALE	NA	DRAWING 086 OF 097	
DATE	DECEMBER 2018		

ANSI E 44x34

L:\CADD\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C084

CONTROL POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
N01E07-03-01	367099.53	1812434.79	23.86
N01E07-03-02	367010.15	1812413.63	1.25
N01E07-03-03	367003.52	1812405.82	1.00
N01E08-03-01	367187.99	1812599.41	23.73
N01E08-03-02	367182.16	1812806.73	23.06
N01E08-03-03	367124.81	1812998.22	23.44
N01E08-03-04	367091.72	1812890.19	3.25
N01E08-03-05	367093.12	1812880.18	2.75
N01E08-03-06	367139.81	1812647.79	2.75
N01E08-03-07	367133.66	1812639.72	1.75
N01E08-03-08	367074.13	1812534.27	1.75
N01E08-03-09	367068.22	1812526.08	1.25
N01E09-03-01	367064.32	1813196.75	22.83
N02E06-03-01	366538.81	1811665.08	22.90
N02E06-03-02	366704.57	1811739.96	23.39
N02E06-03-03	366803.97	1811914.31	24.92
N02E06-03-04	366707.97	1811893.08	0.25
N02E06-03-05	366702.60	1811884.60	0.00
N02E06-03-06	366631.34	1811750.27	0.00
N02E06-03-07	366621.02	1811744.40	-0.75
N02E07-03-01	366901.47	1812088.82	24.83
N02E07-03-02	366997.64	1812263.47	24.56
N02E07-03-03	366546.21	1812473.02	1.00
N02E07-03-04	366540.23	1812464.87	0.50
N02E07-03-05	366520.70	1812488.97	0.94
N02E07-03-06	366514.72	1812480.82	0.50
N02E07-03-07	366926.01	1812273.22	1.00
N02E07-03-08	366921.74	1812264.16	0.50
N02E07-03-09	366774.08	1812014.16	0.50
N02E07-03-10	366768.02	1812006.05	0.25
N02E08-03-01	366543.83	1812881.63	29.83
N02E08-03-02	366738.76	1812893.91	3.25
N02E08-03-03	366740.03	1812883.90	2.75
N02E08-03-04	366748.60	1812853.60	2.75
N02E08-03-05	366748.64	1812849.09	2.35
N02E08-03-06	366744.24	1812844.60	1.75
N02E08-03-07	366687.88	1812737.48	1.75
N02E08-03-08	366681.90	1812729.32	1.25
N02E08-03-09	366622.97	1812617.32	1.25
N02E08-03-10	366617.66	1812608.82	1.00
N02E08-03-11	366709.28	1812887.90	3.19
N02E08-03-12	366710.55	1812877.88	2.75
N02E08-03-13	366716.60	1812856.51	2.75
N02E08-03-14	366662.37	1812753.42	1.69
N02E08-03-15	366656.39	1812745.27	1.25
N02E08-03-16	366596.95	1812632.29	1.24
N02E08-03-17	366591.63	1812623.78	1.00
N02E08-03-18	366682.23	1812883.44	10.00
N02E08-03-19	366685.39	1812860.32	10.00
N02E08-03-20	366635.11	1812772.62	10.00
N02E08-03-21	366566.88	1812650.42	10.00
N02E08-03-22	366657.06	1812880.47	9.50
N02E08-03-23	366658.47	1812863.63	9.50
N02E08-03-24	366615.22	1812788.18	9.50
N02E08-03-25	366545.74	1812663.94	9.50
N02E08-03-26	366581.91	1812984.34	20.00
N02E08-03-27	366614.67	1812871.68	20.00
N02E08-03-28	366581.79	1812814.34	20.00
N02E08-03-29	366510.23	1812686.64	20.00
N02E08-03-30	366561.01	1812970.60	19.50
N02E08-03-31	366588.50	1812876.29	19.50
N02E08-03-32	366561.90	1812829.90	19.50
N02E09-03-01	366974.82	1813364.72	22.85
N02E09-03-02	366519.85	1813319.24	1.50
N02E09-03-03	366527.08	1813311.96	2.25
N02E09-03-04	366688.43	1813055.34	2.26
N02E09-03-05	366695.28	1813047.55	3.25
N02E09-03-06	366503.45	1813293.18	2.25
N02E09-03-07	366664.32	1813037.34	2.26
N02E09-03-08	366668.27	1813032.84	2.92
N02E09-03-09	366643.80	1813015.63	10.00
N02E09-03-10	366622.21	1813000.34	9.50
N02E09-03-11	366625.81	1813385.85	1.50
N02E09-03-12	366634.27	1813391.17	3.25
N02E09-03-13	366670.30	1813413.82	3.25
N02E09-03-14	366667.15	1813400.03	2.25
N02E09-03-15	366854.78	1813120.37	3.25
N02E09-03-16	366840.24	1813124.72	2.25
N02E10-03-01	366868.56	1813532.94	23.39
N02E10-03-02	366759.19	1813700.19	24.82
N02E10-03-03	366652.48	1813870.22	24.55
N02E10-03-04	366645.02	1813752.29	2.75
N02E10-03-05	366651.62	1813744.63	3.25
N02E11-03-01	366544.73	1814041.02	24.93
N03E05-03-01	366023.53	1811434.41	26.04
N03E05-03-02	366038.06	1811498.75	20.00
N03E05-03-03	366022.97	1811476.72	19.50
N03E06-03-01	366154.50	1811583.43	26.10
N03E06-03-02	366339.52	1811648.27	23.74
N03E06-03-03	366264.20	1811943.42	0.00
N03E06-03-04	366257.55	1811935.62	-0.75
N03E06-03-05	366186.27	1811800.12	-0.75
N03E06-03-06	366180.28	1811791.96	-1.25
N03E06-03-07	366147.21	1811729.10	-1.25
N03E06-03-08	366142.87	1811720.12	-1.25
N03E06-03-09	366130.52	1811668.26	-0.92
N03E06-03-10	366239.20	1811960.34	-0.12
N03E06-03-11	366232.56	1811952.54	-0.75
N03E06-03-12	366160.76	1811816.06	-0.81
N03E06-03-13	366154.77	1811807.91	-1.25

CONTROL POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
N03E06-03-14	366120.42	1811742.62	-1.25
N03E06-03-15	366115.65	1811732.74	-1.25
N03E06-03-16	366100.95	1811646.00	-0.73
N03E06-03-17	366194.50	1811972.56	10.00
N03E06-03-18	366124.84	1811840.61	10.00
N03E06-03-19	366072.52	1811746.37	10.00
N03E06-03-20	366069.94	1811581.62	10.00
N03E06-03-21	366172.71	1811984.82	9.50
N03E06-03-22	366104.63	1811855.87	9.50
N03E06-03-23	366049.46	1811756.02	9.50
N03E06-03-24	366049.86	1811564.56	9.50
N03E06-03-25	366070.67	1811881.50	20.00
N03E06-03-26	366010.79	1811772.21	20.00
N03E06-03-27	366050.19	1811896.26	19.50
N03E06-03-28	366335.18	1811721.77	-0.75
N03E06-03-29	366314.04	1811721.59	-1.25
N03E07-03-01	366255.70	1812352.75	29.39
N03E07-03-02	366156.27	1812186.72	31.30
N03E07-03-03	366059.48	1812026.91	32.69
N03E07-03-04	366405.21	1812208.22	0.50
N03E07-03-05	366399.89	1812199.72	0.25
N03E07-03-06	366340.32	1812086.50	0.25
N03E07-03-07	366335.00	1812078.00	0.00
N03E07-03-08	366379.18	1812223.18	0.49
N03E07-03-09	366373.86	1812214.68	0.25
N03E07-03-10	366314.29	1812101.46	0.24
N03E07-03-11	366308.97	1812092.96	0.00
N03E07-03-12	366346.54	1812242.87	10.00
N03E07-03-13	366280.79	1812121.66	10.00
N03E07-03-14	366325.40	1812256.38	9.50
N03E07-03-15	366259.65	1812135.18	9.50
N03E07-03-16	366289.88	1812279.08	20.00
N03E07-03-17	366224.14	1812157.88	20.00
N03E07-03-18	366135.57	1812004.43	20.00
N03E07-03-19	366268.74	1812292.60	19.50
N03E07-03-20	366203.01	1812171.40	19.50
N03E07-03-21	366113.61	1812016.40	19.50
N03E08-03-01	366446.12	1812704.30	29.08
N03E08-03-02	366350.07	1812529.07	29.02
N03E08-03-03	366490.61	1812509.54	10.00
N03E08-03-04	366470.39	1812524.80	9.50
N03E08-03-05	366436.43	1812550.44	20.00
N03E08-03-06	366489.09	1812700.16	19.50
N03E08-03-07	366415.97	1812565.24	19.50
N03E09-03-01	366243.59	1813393.89	29.03
N03E09-03-02	366349.99	1813224.54	29.05
N03E09-03-03	366458.69	1813057.54	29.56
N03E09-03-04	366496.22	1813300.45	1.50
N03E09-03-05	366480.10	1813272.07	10.00
N03E09-03-06	366462.38	1813253.29	9.50
N03E09-03-07	366259.22	1813487.56	20.00
N03E09-03-08	366432.36	1813222.14	20.00
N03E09-03-09	366239.18	1813472.46	19.50
N03E09-03-10	366413.51	1813205.15	19.50
N03E10-03-01	366054.32	1813736.80	23.02
N03E10-03-02	366159.29	1813563.21	23.91
N03E10-03-03	366359.54	1813572.82	1.25
N03E10-03-04	366365.50	1813564.75	1.50
N03E10-03-05	366310.46	1813887.46	1.25
N03E10-03-06	366334.74	1813555.90	1.25
N03E10-03-07	366340.70	1813547.83	1.49
N03E10-03-08	366312.93	1813528.02	10.00
N03E10-03-09	366292.89	1813512.92	9.50
N03E10-03-10	366466.14	1813639.83	1.25
N03E10-03-11	366474.60	1813645.15	2.75
N03E10-03-12	366471.46	1813631.36	1.50
N03E10-03-13	366479.92	1813636.69	3.25
N03E11-03-01	366441.08	1814209.86	23.32
N03E11-03-02	366333.93	1814380.85	24.05
N03E11-03-03	366042.23	1814076.14	1.00
N03E11-03-04	366048.18	1814068.08	1.25
N03E11-03-05	366017.43	1814059.22	1.00
N03E11-03-06	366023.38	1814051.16	1.24
N03E11-03-07	366226.33	1814427.19	0.50
N03E11-03-08	366233.15	1814419.66	1.25
N03E11-03-09	366057.22	1814309.06	1.25
N03E11-03-10	366048.75	1814303.74	1.00
N03E11-03-11	366149.46	1814143.56	1.00
N03E11-03-12	366157.92	1814148.88	1.25
N03E11-03-13	366335.45	1814260.49	1.25
N03E11-03-14	366154.78	1814135.09	1.25
N03E11-03-15	366163.24	1814140.41	2.75
N03E11-03-16	366344.26	1814254.21	2.75
N03E12-03-01	366228.67	1814547.69	23.13
N03E12-03-02	366107.51	1814707.15	23.11
N04E06-03-01	365971.07	1811869.18	33.00
N04E06-03-02	365902.16	1811687.15	35.01
N04E06-03-03	365958.84	1811519.06	28.18
N04E06-03-04	365987.73	1811781.86	19.50
N04E10-03-01	365949.38	1813903.67	23.00
N04E10-03-02	365941.09	1813990.31	20.00
N04E10-03-03	365921.05	1813975.21	19.50
N04E11-03-01	365621.82	1814376.07	22.01
N04E11-03-02	365733.72	1814240.20	22.58
N04E11-03-03	365841.44	1814071.94	23.00
N04E11-03-04	365867.54	1814351.18	0.50
N04E11-03-05	365934.93	1814243.99	0.50
N04E11-03-06	365941.52	1814236.32	1.00
N04E11-03-07	365844.49	1814331.49	0.50
N04E11-03-08	365910.72	1814226.13	0.50

CONTROL POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
N04E11-03-09	365917.32	1814218.46	0.94
N04E11-03-10	365610.11	1814485.92	10.00
N04E11-03-11	365815.28	1814306.55	10.00
N04E11-03-12	365888.89	1814195.64	10.00
N04E11-03-13	365994.79	1814030.77	10.00
N04E11-03-14	365593.31	1814467.40	9.50
N04E11-03-15	365796.07	1814290.14	9.50
N04E11-03-16	365869.90	1814178.88	9.50
N04E11-03-17	365974.75	1814015.67	9.50
N04E11-03-18	365549.26	1814454.49	20.00
N04E11-03-19	365565.66	1814435.78	20.00
N04E11-03-20	365763.79	1814262.57	20.00
N04E11-03-21	365838.00	1814150.71	20.00
N04E11-03-22	365744.57	1814246.16	19.50
N04E11-03-23	365818.74	1814134.38	19.50
N04E12-03-01	365969.43	1814832.99	22.90
N04E12-03-02	365822.10	1814962.37	22.98
N04E12-03-03	365650.01	1814543.35	1.00
N04E12-03-04	365656.55	1814535.64	0.50
N04E12-03-05	365628.58	1814522.24	0.94
N04E12-03-06	365635.12	1814514.52	0.50
N04E12-03-07	365888.86	1814816.55	1.00
N04E12-03-08	365895.35	1814808.78	0.50
N04E13-03-01	365631.49	1815124.41	23.18
N04E13-03-02	365514.04	1815218.29	23.72
N04E13-03-03	365668.21	1815004.78	1.00
N04E13-03-04	365663.11	1815014.12	2.25
N05E12-03-01	365180.64	1814781.17	21.19
N05E12-03-02	365324.74	1814643.81	21.64
N05E12-03-03	365474.08	1814509.68	22.00
N05E12-03-04	365426.62	1814743.63	2.25
N05E12-03-05	365431.68	1814734.22	1.00
N05E12-03-06	365402.78	1814724.62	1.93
N05E12-03-07	365407.84	1814715.22	1.00
N05E12-03-08	365374.86	1814706.19	10.00
N05E12-03-09	365351.59	1814693.36	9.50
N05E12-03-10	365315.26	1814669.36	20.00
N05E12-03-11	365339.46	1814638.19	20.00
N05E13-03-01	365341.52	1815360.46	24.00
N05E13-03-02	365186.22	1815478.56	23.29
N05E13-03-03	365011.50	1815106.55	2.25
N06E03-03-01	364633.12	1810113.63	24.00
N06E03-03-02	364743.51	1810251.45	23.89
N06E03-03-03	364844.72	1810419.83	22.00
N06E03-03-04	364556.97	1810269.41	-1.00
N06E03-03-05	364678.40	1810420.25	-1.00
N06E03-03-06	364580.17	1810250.38	-1.00
N06E03-03-07	364701.77	1810401.44	-1.00
N06E03-03-08	364594.10	1810197.52	10.00
N06E03-03-09	364736.04	1810373.85	10.00
N06E03-03-10	364614.45	1810182.93	9.50
N06E03-03-11	364755.61	1810358.29	9.50
N06E04-03-01	364842.59	1810616.87	22.96
N06E04-03-02	364479.72	1810768.94	23.69
N06E04-03-03	364573.43	1810889.35	23.66
N06E04-03-04	364657.34	1810620.13	-1.00
N06E04-03-05	364676.28	1810643.40	-1.00
N06E04-03-06	364704.05	1810677.52	10.00
N06E04-03-07	364511.65	1810834.40	10.00
N06E04-03-08	364478.38	1810696.81	9.50
N06E04-03-09	364530.60	1810851.20	9.50
N06E12-03-01	364950.81	1814984.18	20.98
N06E12-03-02	364989.96	1814955.12	20.00
N06E13-03-01	364663.66	1815044.42	20.51
N06E13-03-02	364859.56	1815003.08	20.88
N06E13-03-03	364997.72	1815078.75	2.25
N06E13-03-04	364983.46	1815050.01	10.00
N06E13-03-05	364971.97	1815026.83	9.50
N06E14-03-01	364997.38	1815534.61	23.17
N06E14-03-02	364792.70	1815575.10	22.75
N06E14-03-03	364597.07	1815615.69	22.92
N07E03-03-01	364309.06	1810372.70	23.91
N07E03-03-02	364462.35	1810249.04	24.00
N07E04-03-01	364154.28	1810499.51	23.00
N07E04-03-02	364459.10	1810781.47	-1.00
N07E04-03-03	364452.29	1810788.95	-1.50
N07E04-03-04	364390.92	1810838.90	-1.50
N07E04-03-05	364386.00	1810848.70	-3.00
N07E04-03-06	364479.78	1810803.33	-1.06
N07E04-03-07	364472.97	1810810.80	-1.50
N07E04-03-08	364414.85	1810858.10	-1.94
N07E04-03-09	364409.94	1810867.91	-3.00
N07E04-03-10	364442.76	1810908.24	10.00
N07E04-03-11	364459.05	1810927.21	9.50
N07E04-03-12	364245.23	1810518.36	-1.00
N07E04-03-13	364238.43	1810525.85	-1.50
N07E04-03-14	364177.22	1810576.33	-1.50
N07E04-03-15	364172.40	1810586.25	-3.00
N07E05-03-01	364419.94	1811031.48	23.55
N07E05-03-02	364264.61	1811156.35	23.22
N07E05-03-03	364099.92	1811267.26	22.39
N07E05-03-04	364161.08	1811031.76	-3.00
N07E05-03-05	364150.49	1811034.58	-1.50
N07E05-03-06	364033.49	1811129.81	-1.50
N07E05-03-07	364024.31	1811134.38	-0.75
N07E05-03-08	364175.03	1811059.09	-3.00
N07E05-03-09	364164.43	1811061.92	-1.50
N07E05-03-10	364049.84	1811155.18	-1.50
N07E05-03-11	364040.66	1811159.75	-0.87
N07E05-03-12	364207.85	1811099.42	10.00

CONTROL POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
N07E05-03-13	364062.33	1811198.16	10.00
N07E05-03-14	364223.12	1811119.23	9.50
N07E05-03-15	364073.53	1811221.27	9.50
N07E12-03-01	364016.73	1814912.99	20.78
N07E13-03-01	364125.45	1815139.77	20.35
N07E13-03-02	364271.57	1815116.35	20.33
N07E13-03-03	364467.90	1815083.78	20.57
N07E13-03-04	364022.60	1815253.98	-1.00
N07E13-03-05	364024.99	1815264.01	-0.25
N07E13-03-06	364041.39	1815297.64	-0.25
N07E13-03-07	364058.86	1815294.06	-0.25
N07E13-03-08	364068.80	1815292.79	0.00
N07E13-03-09	364205.95	1815264.69	0.00
N07E13-03-10	364216.35	1815265.62	1.00
N07E13-03-11	364353.50	1815237.52	1.00
N07E13-03-12	364364.05	1815239.19	2.25
N07E13-03-13	364051.02	1815243.81	-1.00
N07E13-03-14	364053.40	1815253.83	-0.37
N07E13-03-15	364058.31	1815263.88	-0.17
N07E13-03-16	364063.88	1815263.17	-0.01
N07E13-03-17	364204.25	1815234.42	0.00
N07E13-03-18	364214.65	1815235.35	0.58
N07E13-03-19	364352.81	1815207.04	1.00
N07E13-03-20	364363.36	1815208.71	1.93
N07E13-03-21	364087.15	1815217.53	10.00
N07E13-03-22	364215.09	1815196.88	10.00
N07E13-03-23	364365.59	1815175.32	10.00
N07E13-03-24	364101.13	1815189.16	9.50
N07E13-03-25	364216.61	1815171.14	9.50
N07E13-03-26	364369.46	1815149.03	9.50
N07E13-03-27	364108.19	1815485.03	1.00
N07E13-03-28	364106.18	1815475.23	0.00
N07E13-03-29	364243.33	1815447.14	0.00
N07E13-03-30	364245.34	1815456.93	1.00
N07E13-03-31	364253.13	1815445.13	1.00
N07E13-03-32	364255.14	1815454.93	1.50
N07E13-03-33	364390.28	1815417.03	1.00
N07E13-03-34	364392.29	1815426.83	1.50
N07E14-03-01	364409.62	1815654.92	22.76
N07E14-03-02	364232.17	1815692.11	22.36
N07E14-03-03	364021.45	1815719.15	22.67
N07E14-03-04	364130.94	1815645.93	-0.25
N07E14-03-05	364141.61	1815648.19	1.00
N07E14-03-06	364277.81	1815615.42	1.00
N07E14-03-07	364287.98	1815615.25	1.50
N07E14-03-08	364424.99	1815586.45	1.50
N07E14-03-09	364435.23	1815586.63	2.25
N08E04-03-01	363692.78	1810883.16	23.15
N08E04-03-02	363843.34	1810751.74	24.00
N08E04-03-03	363999.86	1810627.07	23.50
N08E04-03-04	363949.02	1810771.21	-3.00
N08E04-03-05	363938.36	1810773.95	-1.50
N08E04-03-06	363820.97	1810868.70	-1.50
N08E04-03-07	363811.89	1810873.38	-0.75
N08E05-03-01	363535.37	1811010.36	23.16
N08E05-03-02	363943.41	1811391.24	22.00
N08E05-03-03	363830.22	1811292.34	-0.75
N08E05-03-04	363820.57	1811296.32	0.25
N08E05-03-05	363689.57	1811402.94	0.25
N08E05-03-06	363680.40	1811407.51	1.00
N08E05-03-07	363614.13	1811461.44	1.00
N08E05-03-08	363604.48	1811465.43	2.00
N08E05-03-09	363845.74	1811318.38	-0.75
N08E05-03-10	363836.10	1811322.37	0.04
N08E05-03-11	363705.93	1811428.31	0.25
N08E05-03-12	363696.75	1811432.88	0.88
N08E05-03-13	363629.66	1811487.49	1.00
N08E05-03-14	363620.00	1811491.48	1.79
N08E05-03-15	363872.89	1811351.74	10.00
N08E05-03-16	363714.88	1811465.12	10.00
N08E05-03-17	363888.18	1811371.52	9.50
N08E05-03-18	363726.03	1811488.24	9.50
N08E05-03-19	363619.17	1811033.02	-0.75
N08E05-03-20	363609.72	1811037.25	0.25
N08E06-03-01	363784.15	1811511.02	21.84
N08E06-03-02	363619.89	1811627.32	21.45
N08E06-03-03	363652.38	1811515.41	10.00
N08E06-03-04	363644.87	1811545.73	9.50
N08E06-03-05	363502.12	1811660.90	9.50
N08E11-03-01	363579.01	1814014.38	21.71
N08E11-03-02	363665.29	1814194.69	21.34
N08E11-03-03	363751.70	1814375.02	21.00
N08E11-03-04	363550.31	1814289.30	-0.50
N08E11-03-05	363577.51	1814276.64	-0.59
N08E11-03-06	363616.10	1814259.14	10.00
N08E11-03-07	363638.96	1814248.99	9.50
N08E12-03-01	363839.35	1814554.80	21.00
N08E12-03-02	363927.00	1814734.56	21.00
N08E12-03-03	363811.19	1814824.05	-0.50
N08E12-03-04	363816.92	1814832.38	-1.00
N08E12-03-05	363837.17	1814808.89	-0.56
N08E12-03-06	363842.90	1814817.22	-1.00
N08E12-03-07	363882.45	1814797.93	10.00
N08E12-03-08	363904.71	1814786.55	9.50
N08E13-03-01	363756.58	1815251.61	-1.00
N08E13-03-02	363761.28	1815261.66	-0.25
N08E14-03-01	363817.57	1815709.24	21.86
N08E14-03-02	363618.18	1815694.04	21.70
N08E14-03-03	363741.87	1815636.29	-0.25
N08E14-03-04	363732.04	1815632.82	-1.00

CONTROL POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
N09E05-03-01	363070.61	1811385.09	23.00
N09E05-03-02	363225.48	1811263.03	23.17
N09E05-03-03	363380.18	1811131.41	23.42
N09E05-03-04	363476.91	1811141.65	0.25
N09E05-03-05	363467.79	1811146.28	1.00
N09E05-03-06	363401.76	1811201.40	1.00
N09E05-03-07	363392.23	1811205.53	2.00
N09E05-03-08	363239.12	1811332.65	2.00
N09E05-03-09	363230.20	1811337.53	2.50
N09E05-03-10	363196.54	1811363.07	2.50
N09E05-03-11	363192.36	1811373.76	0.50
N09E05-03-12	363068.46	1811474.20	0.50
N09E05-03-13	363060.22	1811479.92	0.75
N09E06-03-01	363472.92	1811757.70	21.02
N09E06-03-02	363324.72	1811879.85	20.45
N09E06-03-03	363449.70	1811591.40	2.00
N09E06-03-04	363441.00	1811596.54	2.50
N09E06-03-05	363408.68	1811622.88	2.49
N09E06-03-06	363404.73	1811633.80	0.50
N09E06-03-07	363280.59	1811734.84	0.50
N09E06-03-08	363273.78	1811742.32	0.00
N09E06-03-09	363466.91	1811616.08	2.00
N09E06-03-10	363458.21	1811621.22	2.44
N09E06-03-11	363434.07	1811640.89	1.78
N09E06-03-12	363430.12	1811651.82	0.50
N09E06-03-13	363301.26	1811756.70	0.44
N09E06-03-14	363294.45	1811764.17	0.00
N09E06-03-15	363011.82	1811994.19	-0.01
N09E06-03-16	363487.11	1811640.90	10.00
N09E06-03-17	363319.70	1811795.20	10.00
N09E06-03-18	363335.84	1811814.29	9.50
N09E06-03-19	363148.57	1811588.48	0.75
N09E06-03-20	363154.88	1811596.23	0.00
N09E07-03-01	363168.65	1812004.56	20.00
N09E07-03-02	363015.03	1812130.28	19.70
N09E07-03-03	363004.54	1812001.09	-0.25
N09E07-03-04	363038.92	1812023.78	10.00
N09E07-03-05	363056.34	1812041.84	9.50
N09E08-03-01	363055.67	1812935.51	21.06
N09E09-03-01	363145.96	1813113.96	21.81
N09E09-03-02	363233.80	1813293.59	21.91
N09E09-03-03	363321.12	1813473.45	21.82
N09E10-03-01	363408.34	1813653.33	21.75
N09E10-03-02	363491.30	1813834.76	21.68
N09E10-03-03	363287.06	1813744.57	-1.25
N09E10-03-04	363289.42	1813754.54	-0.50
N09E10-03-05	363315.48	1813734.41	-1.25
N09E10-03-06	363317.85	1813744.38	-0.62
N09E10-03-07	363355.93	1813714.68	10.00
N09E10-03-08	363378.70	1813704.34	9.50
N09E10-03-09	363147.34	1813812.73	-1.25
N09E10-03-10	363082.83	1813703.32	-2.00
N09E10-03-11	363087.22	1813712.31	-1.00
N09E10-03-12	363138.35	1813817.12	-1.00
N09E11-03-01	363098.75	1814170.23	-0.50
N09E11-03-02	363094.14	1814183.60	-1.25
N09E12-03-01	363006.71	1814893.86	-0.50
N09E12-03-02	363366.21	1814718.47	-0.50
N09E12-03-03	363352.84	1814713.87	-1.25
N09E12-03-04	363002.32	1814884.87	-1.25
N09E13-03-01	363133.86	1815154.49	-0.50
N09E13-03-02	363138.25	1815163.48	-1.00
N09E13-03-03	363219.62	1815353.08	-0.25
N09E13-03-04	363129.26	1815167.86	-0.50
N09E13-03-05	363215.23	1815344.09	-0.50
N09E13-03-06	363124.87	1815158.88	-1.00
N09E14-03-01	363418.60	1815681.18	21.68
N09E14-03-02	363222.48	1815673.19	21.00
N09E14-03-03	362971.90	1815664.63	21.58
N09E14-03-04	363356.19	1815610.21	-1.00
N09E14-03-05	363345.93	1815612.00	-0.25
N10E06-03-01	362604.67	1811767.43	22.98
N10E06-03-02	362758.02	1811639.08	0.00
N10E06-03-03	362915.46	1811511.33	23.00
N10E06-03-04	362992.02	1811971.64	0.00
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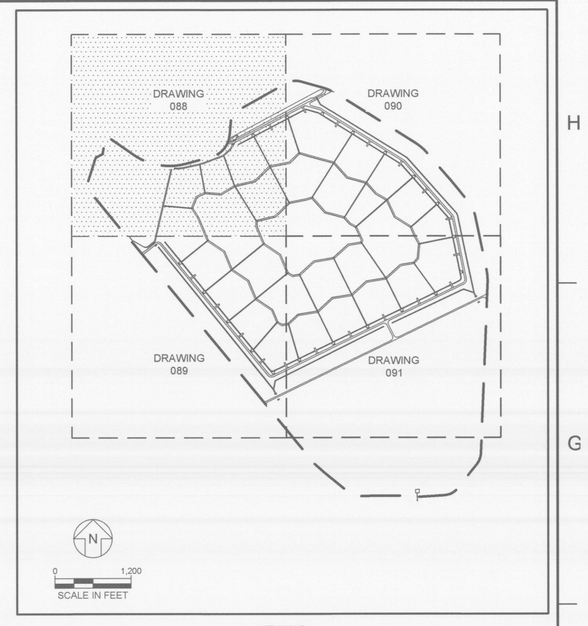
N10E06-03-06	362873.12	1811825.55



KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- PROPERTY BOUNDARY
- TREE LINE
- CONTROL POINT
- HEADWALL
- MONITORING WELL
- PIEZOMETER
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT TOP OF SOIL CONTAINMENT BERM.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - SCB I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C089	SHEET 1
SCALE	1" = 100'		
DATE	DECEMBER 2018	DRAWING 088 OF 097	

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

L:\CADD\AL\ALABAMA POWER\PLANT BARRY GW6489\CONSTRUCTION\DRAWINGS\GW6489.04C089

MATCHLINE (DRAWING 088)

MATCHLINE (DRAWING 091)

E 1809500 E 1810000 E 1810500 E 1811000 E 1811500 E 1812000 E 1812500

N 364000 N 363500 N 363000 N 362500 N 362000 N 361500

N07E01 N07E02 N07E03 N07E04 N07E05 N07E06 N07E07

N08E01 N08E02 N08E03 N08E04 N08E05 N08E06 N08E07

N09E01 N09E02 N09E03 N09E04 N09E05 N09E06 N09E07

N10E01 N10E02 N10E03 N10E04 N10E05 N10E06 N10E07

N11E01 N11E02 N11E03 N11E04 N11E05 N11E06 N11E07

N12E01 N12E02 N12E03 N12E04 N12E05 N12E06 N12E07

MW-03

MW-02

APZ-2

MW-01

WEST STORMWATER POND

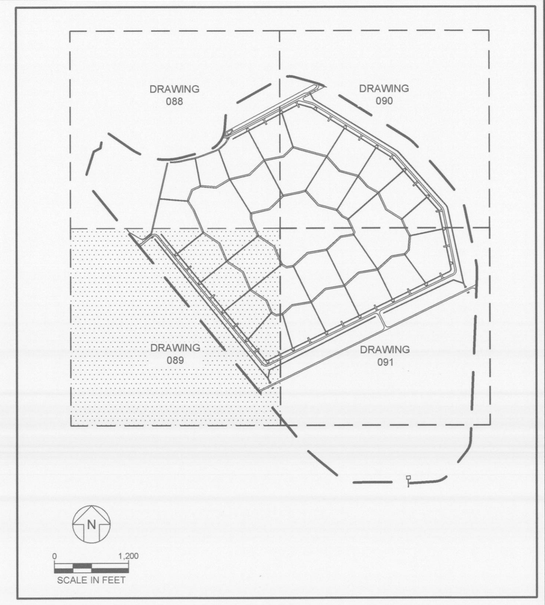
COOLING WATER DISCHARGE CANAL

EXISTING PERIMETER DIKE

PROPOSED PERIMETER ACCESS ROAD

STORMWATER SETTLING BASIN (WSEL 6.0)

N



KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- PROPERTY BOUNDARY
- TREE LINE
- CONTROL POINT (N01E09-02-01)
- HEADWALL
- MW-01 MONITORING WELL
- APZ-2 PIEZOMETER
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT TOP OF SOIL CONTAINMENT BERM.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - SCB II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C089	SHEET 2
SCALE	1" = 100'	DRAWING 089 OF 097	
DATE	DECEMBER 2018		

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E: 44x34

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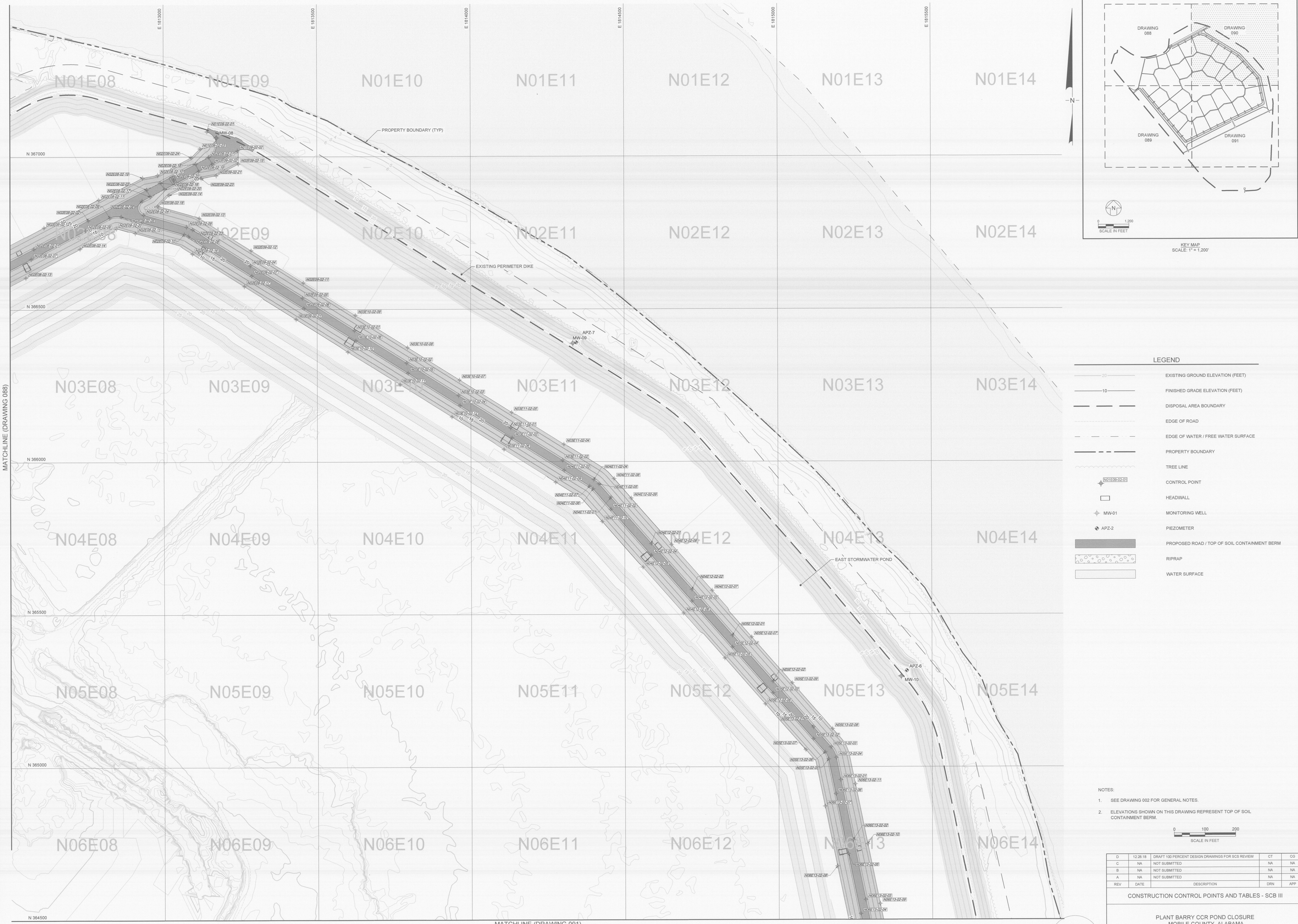

KEY MAP
SCALE: 1" = 1,200'

LEGEND

20	EXISTING GROUND ELEVATION (FEET)
10	FINISHED GRADE ELEVATION (FEET)
	DISPOSAL AREA BOUNDARY
	EDGE OF ROAD
	EDGE OF WATER / FREE WATER SURFACE
	PROPERTY BOUNDARY
	TREE LINE
N01E09-02-01	CONTROL POINT
	HEADWALL
MW-01	MONITORING WELL
APZ-2	PIEZOMETER
	PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
	RIPRAP
	WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT TOP OF SOIL CONTAINMENT BERM.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - SCB III

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9600
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C089	SHEET 3
SCALE	1" = 100'	DRAWING 090 OF 097	
DATE	DECEMBER 2018		

ANSI E: 44x34

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MATCHLINE (DRAWING 090)

MATCHLINE (DRAWING 089)

E 1813000 E 1813500 E 1814000 E 1814500 E 1815000 E 1815500

N 364000 N 363500 N 363000 N 362500 N 362000 N 361500

N07E08 N07E09 N07E10 N07E11 N07E12 N07E13 N07E14

N08E08 N08E09 N08E10 N08E11 N08E12 N08E13 N08E14

N09E08 N09E09 N09E10 N09E11 N09E12 N09E13 N09E14

N10E08 N10E09 N10E10 N10E11 N10E12 N10E13 N10E14

N11E08 N11E09 N11E10 N11E11 N11E12 N11E13 N11E14

N12E08 N12E09 N12E10 N12E11 N12E12 N12E13 N12E14

SOUTHEAST STORMWATER POND

SOUTHWEST STORMWATER POND

STORMWATER SETTLING BASIN (WSEL 6.0)

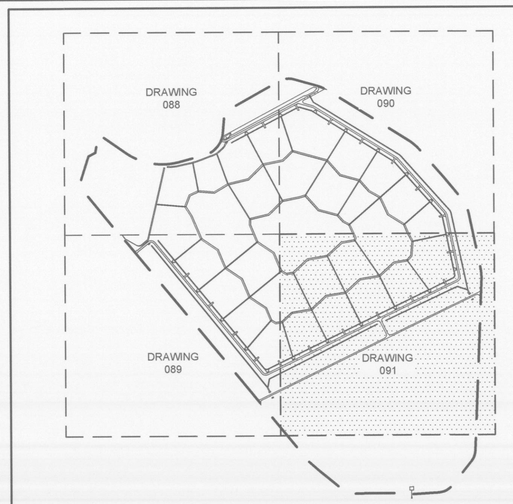
MW-11 MW-12R APZ-5 MW-16

EXISTING PERIMETER DIKE

PROPERTY BOUNDARY (TYP)

MOBILE RIVER

N



KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- PROPERTY BOUNDARY
- TREE LINE
- N01E09-02-01 CONTROL POINT
- HEADWALL
- MW-01 MONITORING WELL
- APZ-2 PIEZOMETER
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT TOP OF SOIL CONTAINMENT BERM.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - SCB IV

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C089	SHEET 4
SCALE	1" = 100'	DRAWING 091 OF 097	
DATE	DECEMBER 2018		

ANSI E 44x34

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C:\ACCOM\ALABAMA POWER\PLANT BARRY GWS\REDCONSTRUCTION\CIVIL\PAVING\SCV\GWS489 04C089.DWG

CONTROL POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
N01E09-02-01	3670621.36	1818141.95	21.50
N01E09-02-02	3670719.70	1818240.95	21.50
N01E09-02-03	3670726.22	1818118.52	8.25
N02E09-02-01	3667012.69	1818223.51	21.75
N02E09-02-02	3666805.80	1818240.51	21.75
N02E09-02-03	3666573.04	1818239.94	21.50
N02E09-02-04	3666376.49	1818233.80	6.00
N02E09-02-05	3666564.75	1818255.60	5.50
N02E09-02-06	3666510.12	1818223.51	5.50
N02E09-02-07	3666603.29	1818286.87	21.50
N02E09-02-08	3666759.28	1818274.94	21.50
N02E09-02-09	3666666.16	1818256.94	21.50
N02E09-02-10	3666556.16	1818293.15	21.75
N02E09-02-11	3666939.86	1818299.96	21.50
N02E09-02-12	3666824.97	1818286.84	8.23
N02E09-02-13	3666604.51	1818251.61	6.00
N02E09-02-14	3666999.11	1818272.71	6.58
N02E09-02-15	3667350.26	1818290.13	8.23
N02E09-02-16	3668938.75	1818282.40	8.23
N02E09-02-17	3668970.16	1818256.70	21.75
N02E09-02-18	3668915.57	1818289.31	16.75
N02E09-02-19	3669332.21	1818314.55	16.50
N02E09-02-20	3668984.61	1818003.16	16.50
N02E09-02-21	3669938.42	1818171.82	8.25
N02E09-02-22	3669298.98	1818103.24	16.00
N02E09-02-23	3669229.53	1818123.70	8.25
N03E09-02-01	3669997.23	1818103.77	8.25
N03E09-02-02	3669792.04	1818275.51	21.75
N03E09-02-03	3669692.29	1818245.96	21.75
N03E09-02-04	3669810.02	1818294.98	21.75
N03E09-02-05	3669804.72	1818286.87	21.50
N03E09-02-06	3669759.28	1818274.94	21.50
N03E09-02-07	3669666.16	1818256.94	21.50
N03E09-02-08	3669556.16	1818293.15	21.75
N03E09-02-09	3669939.86	1818286.84	8.23
N03E09-02-10	3669791.49	1818135.12	16.75
N03E09-02-11	3669754.93	1818135.45	16.50
N03E09-02-12	3669592.87	1818285.45	7.25
N03E09-02-13	3669790.30	1818135.12	7.25
N03E09-02-14	3669744.41	1818310.82	8.24
N03E09-02-15	3669916.36	1818245.94	8.25
N03E09-02-16	3669910.44	1818497.35	21.50
N03E09-02-17	3669919.87	1818436.32	21.50
N03E09-02-18	3669504.39	1818445.10	21.50
N04E11-02-01	3668618.83	1818454.89	21.75
N04E11-02-02	3668323.23	1818282.66	21.75
N04E11-02-03	3668376.88	1818093.95	21.75
N04E11-02-04	3668669.48	1818158.80	21.50
N04E11-02-05	3668640.20	1818107.55	6.00
N04E11-02-06	3668326.45	1818189.52	21.75
N04E11-02-07	3668439.99	1818465.99	5.50
N04E11-02-08	3668902.54	1818275.98	5.50
N04E11-02-09	3668926.90	1818465.53	5.50
N04E11-02-10	3668641.03	1818399.63	21.75
N04E11-02-11	3668941.68	1818249.32	7.25
N04E11-02-12	3668746.50	1818067.64	21.50
N04E11-02-13	3668770.55	1818074.45	21.75
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N04E11-02-19	3668761.88	1818093.95	21.75
N04E11-02-20	3668761.20	1818242.30	21.75
N04E11-02-21	3668957.14	1818202.16	21.75
N05E11-02-01	3669583.54	1818122.46	5.25
N05E11-02-02	3669539.33	1818136.64	21.50
N05E11-02-03	3669539.45	1818125.39	21.50
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N05E11-02-06	3669539.33	1818136.64	21.50
N05E11-02-07	3669640.04	1818142.01	6.00
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N05E11-02-10	3669643.43	1818109.16	4.25
N05E11-02-11	3669583.54	1818122.46	5.25
N05E11-02-12	3669540.52	1818139.29	6.00
N05E11-02-13	3669455.12	1818145.36	21.75
N05E11-02-14	3669455.27	1818282.44	21.75
N05E11-02-15	3669761.20	1818242.30	21.75
N05E11-02-16	3669957.14	1818202.16	21.75
N05E11-02-17	3669714.24	1818632.86	21.75
N05E11-02-18	3669531.51	1818264.98	4.50
N05E11-02-19	3669619.20	1818466.73	4.50
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N05E11-02-21	3669455.27	1818282.44	21.75
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N05E12-02-17	3669536.78	1818452.00	21.75
N05E12-02-18	3669644.23	1818282.66	21.75
N05E12-02-19	3669761.88	1818093.95	21.75
N05E12-02-20	3669761.20	1818242.30	21.75
N05E12-02-21	3669957.14	1818202.16	21.75
N05E12-02-22	3669714.24	1818632.86	21.75
N05E12-02-23	3669531.51	1818264.98	4.50
N05E12-02-24	3669619.20	1818466.73	4.50
N05E12-02-25	3669528.53	1818395.18	21.50
N05E12-02-26	3669455.27	1818282.44	21.75
N05E12-02-27	3669761.20	1818242.30	21.75
N05E12-02-28	3669957.14	1818202.16	21.75
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N05E12-02-30	3669531.51	1818264.98	4.50
N05E12-02-31	3669619.20	1818466.73	4.50
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N05E12-02-33	3669455.27	1818282.44	21.75
N05E12-02-34	3669761.20	1818242.30	21.75
N05E12-02-35	3669957.14	1818202.16	21.75
N05E12-02-36	3669714.24	1818632.86	21.75
N05E12-02-37	3669531.51	1818264.98	4.50
N05E12-02-38	3669619.20	1818466.73	4.50
N05E12-02-39	3669528.53	1818395.18	21.50
N05E12-02-40	3669455.27	1818282.44	21.75
N05E12-02-41	3669761.20	1818242.30	21.75
N05E12-02-42	3669957.14	1818202.16	21.75
N05E12-02-43	3669714.24	1818632.86	21.75
N05E12-02-44	3669531.51	1818264.98	4.50
N05E12-02-45	3669619.20	1818466.73	4.50
N05E12-02-46	3669528.53	1818395.18	21.50
N05E12-02-47	3669455.27	1818282.44	21.75
N05E12-02-48	3669761.20	1818242.30	21.75
N05E12-02-49	3669957.14	1818202.16	21.75
N05E12-02-50	3669714.24	1818632.86	21.75
N05E12-02-51	3669531.51	1818264.98	4.50
N05E12-02-52	3669619.20	1818466.73	4.50
N05E12-02-53	3669528.53	1818395.18	21.50
N05E12-02-54	3669455.27	1818282.44	21.75
N05E12-02-55	3669761.20	1818242.30	21.75
N05E12-02-56	3669957.14	1818202.16	21.75
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N05E12-02-58	3669531.51	1818264.98	4.50
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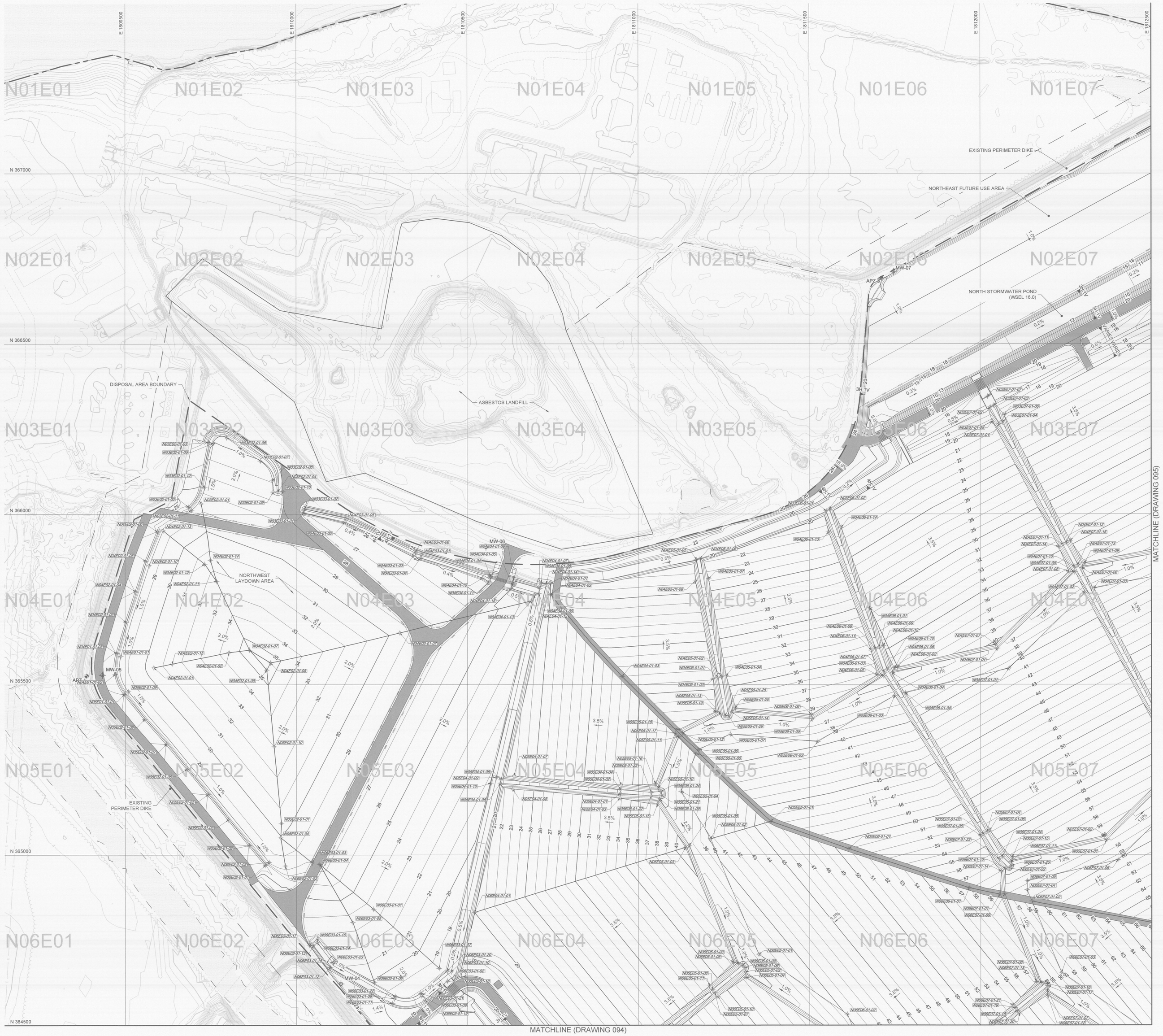
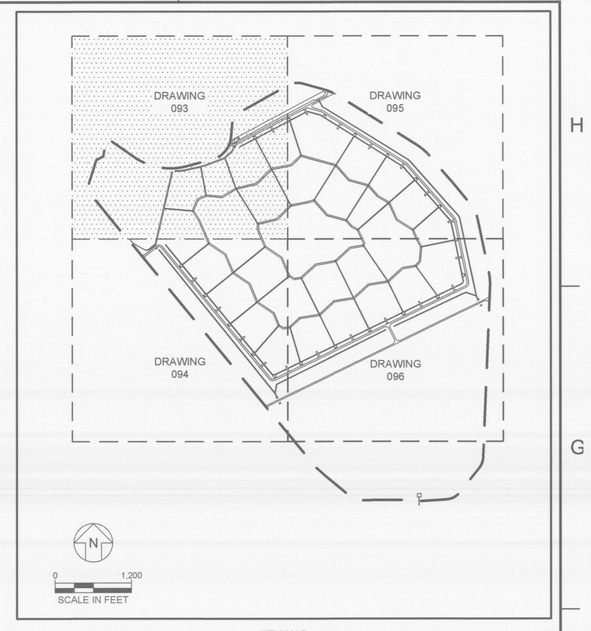
N05E12-02-60	3669528.53	1818395.18	21.50
N05E12-02-61	3669455.27	1818282.44	21.75
N05E12-02-62	3669761.20	1818242.30	21.75
N05E12-02-63	3669957.14	1818202.16	21.75
N05E12-02-64	3669714.24	1818632.86	21.75
N05E12-02-65	3669531.51	1818264.98	4.50
N05E12-02-66	3669619.20	1818466.73	4.50
N05E12-02-67	3669528.53	1818395.18	21.50
N05E12-02-68	3669455.27	1818282.44	21.75
N05E12-02-69	3669761.20	1818242.30	21.75
N05E12-02-70	3669957.14	1818202.16	21.75
N05E12-02-71	3669714.24	1818632.86	21.75
N05E12-02-72	3669531.51	1818264.98	4.50
N05E12-02-73	3669619.20	1818466.73	4.50
N05E12-02-74	3669528.53	1818395.18	21.50
N05E12-02-75	3669455.27	1818282.44	21.75
N05E12-02-76	3669761.20	1818242.30	21.75
N05E12-02-77	3669957.14	1818202.16	21.75
N05E12-02-78	3669714.24	1818632.86	21.75
N05E12-02-79	3669531.51	1818264.98	4.50
N05E12-02-80	3669619.20	1818466.73	4.50
N05E12-02-81	3669528.53	1818395.18	21.50
N05E12-02-82	3669455.27	1818282.44	21.75
N05E12-02-83	3669761.20	1818242.30	21.75
N05E12-02-84	3669957.14	1818202.16	21.75
N05E12-02-85	3669714.24	1818632.86	21.75
N05E12-02-86	3669531.51	1818264.98	4.50
N05E12-02-87	3669619.20	1818466.73	4.50
N05E12-02-88	3669528.53	1818395.18	21.50
N05E12-02-89	3669455.27	1818282.44	21.75
N05E12-02-90	3669761.20	1818242.30	21.75
N05E12-02-91	3669957.14	1818202.16	21.75
N05E12-02-92	3669714.24	1818632.86	21.75
N05E12-02-93	3669531.51	1818264.98	4.50
N05E12-02-94	3669619.20	1818466.73	4.50
N05E12-02-95	3669528.53	1818395.18	21.50
N05E12-02-96	3669455.27	1818282.44	21.75
N05E12-02-97	3669761.20	1818242.30	21.75
N05E12-02-98	3669957.14	1818202.16	21.75
N05E12-02-99	3669714.24	1818632.86	21.75
N05E12-02-100	3669531.51	1818264.98	4.50
N05E12-02-101	3669619.20	1818466.73	4.50
N05E12-02-102	3669528.53	1818395.18	21.50
N05E12-02-103	3669455.27	1818282.44	21.75
N05E12-02-104	3669761.20	1818242.30	21.75
N05E12-02-105	3669957.14	1818202.16	21.75
N05E12-02-106	3669714.24	1818632.86	21.75
N05E12-02-107	3669531.51	1818264.98	4.50
N05E12-02-108	3669619.20	1818466.73	4.50
N05E12-02-109	3669528.53	1818395.18	21.50
N05E12-02-110	3669455.27	1818282.44	21.75
N05E12-02-111	3669761.20	1818242.30	21.75
N05E12-02-112	3669957.14	1818202.16	21.75
N05E12-02-113	3669714.24	1818632.86	21.75
N05E12-02-114	3669531.51	1818264.98	4.50
N05E12-02-115	3669619.20	1818466.73	4.50
N05E12-02-116	3669528.53	1818395.18	21.50
N05E12-02-117	3669455.27	1818282.44	21.75
N05E12-02-118	3669761.20	1818242.30	21.75
N05E12-02-119	3669957.14	1818202.16	21.75
N05E12-02-120	3669714.24	1818632.86	21.75
N05E12-02-121	3669531.51	1818264.98	4.50
N05E12-02-122	3669619.20	1818466.73	4.50
N05E12-02-123	3669528.53	1818395.18	21.50
N05E12-02-124	3669455.27	1818282.44	21.75
N05E12-02-125	3669761.20	1818242.30	21.75
N05E12-02-126	3669957.14	1818202.16	21.75
N05E12-02-127	3669714.24	1818632.86	21.75
N05E12-02-128	3669531.51	1818264.98	4.50
N05E12-02-129	3669619.20	1818466.73	4.50
N05E12-02-130	3669528.53	1818395.18	21.50
N05E12-02-131	3669455.27	1818282.44	21.75
N05E12-02-132	3669761.20	1818242.30	21.75
N05E12-02-133	3669957.14	1818202.16	21.75
N05E12-02-134	3669714.24	1818632.86	21.75
N05E12-02-135	3669531.51	1818264.98	4.50
N05E12-02-136	3669619.20	1818466.73	4.50
N05E12-02-137	3669528.53	1818395.18	21.50
N05E12-02-138	3669455.27	1818282.44	21.75
N05E12-02-139	3669761.20	1818242.30	21.75
N05E12-02-140	3669957.14	1818202.16	21.75
N05E12-02-141	3669714.24	1818632.86	21.75
N05E12-02-142	3669531.51	1818264.98	4.50
N05E12-02-143	3669619.20	1818466.73	4.50
N05E12-02-144	3669528.53	1818395.18	21.50
N05E12-02-145	3669455.27	1818282.44	21.75
N05E12-02-146	3669761.20	1818242.30	21.75
N05E12-02-147	3669957.14	1818202.16	21.75
N05E12-02-148	3669714.24	1818632.86	21.75
N05E12-02-149	3669531.51	1818264.98	4.50
N05E12-02-150	3669619.20	1818466.73	4.50
N05E12-02-151	3669528.53	1818395.18	21.50
N05E12-02-152	3669455.27	1818282.44	21.75
N05E12-02-153	3669761.20	1818242.30	21.75
N05E12-02-154	3669957.14	1818202.16	21.75
N05E12-02-155	3669714.24	1818632.86	21.75
N05E12-02-156	3669531.51	1818264.98	4.50
N05E12-02-157	3669619.20	1818466.73	4.50
N05E12-02-158	3669528.53	1818395.18	21.50
N05E12-02-159	3669455.27	1818282.44	21.75
N05E12-02-160	3669761.20	1818242.30	21.75
N05E12-02-161	3669957.14	1818202.16	21.75
N05E12-02-162	3669714.24	1818632.86	21.75
N05E12-02-163	3669531.51	1818264.98	4.50
N05E12-02-164	3669619.20	1818466.73	4.50
N05E12-02-165	3669528.53	1818395.18	21.50
N05E12-02-166	3669455.27	1818282.44	21.75
N05E12-02-167	3669761.20	1818242.30	21.75
N05E12-02-168	3669957.14	1818202.16	21.75
N05E12-02-169	3669714.24	1818632.86	21.75
N05E12-02-170	3669531.51	1818264.98	4.50
N05E12-02-171	3669619.20	1818466.73	4.50
N05E12-02-172	3669528.53	1818395.18	21.50
N05E12-02-173	3669455.27	1818282.44	21.75
N05E12-02-174	3669761.20	1818242.30	21.75
N05E12-02-175	3669957.14	1818202.16	21.75
N05E12-02-176	3669714.24	1818632.86	21.75
N05E12-02-177	3669531.51	1818264.98	4.50
N05E12-02-178	3669619.20	1818466.73	4.50
N05E12-02-179	3669528.53	1818395.18	21.50
N05E12-02-180	3669455.27	1818282.44	21.75
N05E12-02-181	3669761.20	1818242.30	21.75
N05E12-02-182	3669957.14	1818202.16	21.75
N05E12-02-183	3669714.24	1818632.86	21.75
N05E12-02-184	3669531.51	1818264.98	4.50
N05E12-02-185	3669619.20	1818466.73	4.50
N05E12-02-186	3669528.53	1818395.18	21.50
N05E12-02-187	3669455.27	1818282.44	21.75
N05E12-02-188	3669761.20	1818242.30	21.75
N05E12-02-189	3669957.14	1818202.16	21.75
N05E12-02-190	3669714.24	1818632.86	21.75
N05E12-02-191	3669531.51	1818264.98	4.50
N05E12-02-192	3669619.20	1818466.73	4.50
N05E12-02-193	3669528.53	1818395.18	21.50
N05E12-02-194	3669455.27	1818282.44	21.75
N05E12-02-195	3669761.20	1818242.30	21.75
N05E12-02-196	3669957.14	1818202.16	21.75
N05E12-02-197	3669714.24	1818632.86	21.75
N05E12-02-198	3669531.51	1818264.98	4.50
N05E12-02-199	3669619.20	1818466.73	4.50
N05E12-02-200	3669528.53	1818395.18	21.50
N05E12-02-201	3669455.27	1818282.44	21.75
N05E12-02-202	3669761.20	1818242.30	21.75
N05E12-02-203	3669957.14	1818202.16	21.75
N05E12-02-204	3669714.24	1818632.86	21.75
N05E12-02-205	3669531.51	1818264.98	4.50
N05E12-02-206	3669619.20	1818466.73	4.50
N05E12-02-207	3669528.53	1818395.18	21.50
N05E12-02-208	3669455.27	1818282.44	21.75
N05E12-02-209	3669761.20	1818242.30	21.75
N05E12-02-210	3669957.14	1818202.16	21.75
N05E12-02-211	3669714.24	1818632.86	21.75
N05E12-02-212	3669531.51	1818264.98	4.50
N05E12-02-213	3669619.20	1818466.73	4.50
N05E12-02-214	3669528.53	1818395.18	21.50
N05E12-02-215	3669455.27	1818282.44	21.75
N05E12-02-216	3669761.20	1818242.30	21.75
N05E12-02-217	3669957.14	1818202.16	21.75
N05E12-02-218	3669714.24	1818632.86	21.75
N05E12-02-219	3669531.51	1818264.98	4.50
N05E12-02-220	3669619.20	1818466.73	4.50
N05E12-02-221	3669528.53	1818395.18	21.50
N05E12-02-222	3669455.27	1818282.44	21.75
N05E12-02-223	3669761.20	1818242.30	21.75
N05E12-02-224	3669957.14	1818202.16	21.75
N05E12-02-225	3669714.24	1818632.86	21.75
N05E12-02-226	3669531.51	1818264.98	4.50
N05E12-02-227	3669619.20	1818466.73	4.50
N05E12-02-228	3669528.53	1818395.18	21.50
N05E12-02-229	3669455.27	1818282.44	21.75
N05E12-02-230	3669761.20	1818242.30	21.75
N05E12-02-231	3669957.14	1818202.16	21.75
N05E12-02-232	3669714.24	1818632.86	21.75
N05E12-02-233	3669531.51	1818264.98	4.50
N05E12-02-234	3669619.20	1818466.73	4.50
N05E12-02-235	3669528.53	1818395.18	21.50
N05E12-02-236	3669455.27	1818282.44	21.75
N05E12-02-237	3669761.20	1818242.30	21.75
N05E12-02-238	3669957.14	1818202.16	21.75
N05E12-02-239	3669714.24	1818632.86	21.75
N05E12-02-240	3669531.51	1818264.98	4.50
N05E12-02-241	3669619.20	1818466.73	4.50
N05E12-02-242	3669528.53	1818395.18	21.50
N05E12-02-243	3669455.27	1818282.44	21.75
N05E12-02-244	3669761.20	1818242.30	21.75
N05E12-02-245	3669957.14	1818202.16	21.75
N05E12-02-246	3669714.24	1818632.86	21.75
N05E12-02-247	3669531.51	1818264.98	4.50
N05E12-02-248	3669619.20	1818466.73	4.50
N05E12-02-249	3669528.53	1818395.18	21.50
N05E12-02-250	3669455.27	1818282.44	21.75
N05E12-02-251	3669761.20	1818242.30	21.75
N05E12-02-252	3669957.14	1818202.16	21.75
N05E12-02-253	3669714.24	1818632.86	21.75
N05E12-02-254	3669531.51	1818264.98	4.50
N05E12-02-255	3669619.20	1818466.73	4.50
N05E12-02-256	3669528.53	1818395.18	21.50
N05E12-02-257	3669455.27	1818282.44	21.75
N05E12-02-258	3669761.20	1818242.30	21.75
N05E12-02-259	3669957.14	1818202.16	21.75
N05E12-02-260	3669714.24	1818632.86	21.75
N05E12-02-261	3669531.51	1818264.98	4.50
N05E12-02-262	3669619.20	1818466.73	4.50
N05E12-02-263	3669528.53	1818395.18	21.50
N05E12-02-264	3669455.27	1818282.44	21.75
N05E12-02-265	3669761.20	1818242.30	21.75
N05E12-02-266	3669957.14	1818202.16	21.75
N05E12-02-267	3669714.24	1818632.86	21.75
N05E12-02-268	3669531.51	1818264.98	4.50
N05E12-02-269	3669619.20	1818466.73	4.50
N05E12-02-270	3669528.53	1818395.18	21.50
N05E12-02-271	3669455.27	1818282.44	21.75
N05E12-02-272	3669761.20	1818242.30	21.75
N05E12-02-273	3669957.14	1818202.16	21.75
N05E12-02-274	3669714.24	1818632.86	21.75
N05E12-02-275	3669531.51	1818264.98	4.50
N05E12-02-276	3669619.20	1818466.73	4.50
N05E12-02-277	3669528.53	1818395.18	21.50
N05E12-02-278	3669455.27	1818282.44	21.75
N05E12-02-279	3669761.20	1818242.30	21.75
N05E12-02-280	3669957.14	1818202.16	21.75
N05E12-02-281	3669714.24	1818632.86	21.75
N05E12-02-282	3669531.51	1818264.98	4.50
N05E12-02-283	3669619.20	1818466.73	4.50
N05E12-02-284	3669528.53	1818395.18	21.50
N05E12-02-285	3669455.27	1818282.44	21.75
N05E12-02-286	3669761.20	1818242.30	21.75
N05E12-02-287	3669957.14	1818202.16	21.75
N05E12-02-288	3669714.24	1818632.86	21.75
N05E12-02-289	3669531.51	1818264.98	4.50
N05E12-02-290	3669619.20	1818466.73	4.50
N05E12-02-291	3669528.53	1818395.18	21.50
N05E12-02-292	3669455.27	1818282.44	21.75
N05E12-02-293	3669761.20	1818242.30	21.75
N05E12-02-294	3669957.14	1818202.16	21.75
N05E12-02-295	3669714.24	1818632.86	21.75
N05E12-02-296	3669531.51	1818264.98	4.50
N05E12-02-297	3669619.20	1818466.73	4.50
N05E12-02-298	3669528.53	1818395.18	21.50
N05E12-02-299	3669455.27	1818282.44	21.75
N05E12-02-300	3669761.20	1818242.30	21.75
N05E12-02-301	3669957.14	1818202.16	21.75
N05E12-02-302	3669714.24	1818632.86	21.75
N05E12-02-303	3669531.51	1818264.98	4.50
N05E12-02-304	3669619.20	1818466.73	4.50
N05E12-02-305	3669528.53	1818395.18	21.50
N05E12-02-306	3669455.27	1818282.44	21.75
N05E12-02-307	3669761.20	1818242.30	21.75
N05E12-02-308	3669957.14	1818202.16	21.75
N05E12-02-309	3669714.24	1818632.86	21.75
N05E12-02-310	3669531.51	1818264.98	4.50
N05E12-02-311	3669619.20	1818466.73	4.50
N05E12-02-312	3669528.53	1818395.18	21.50
N05E12-02-313	3669455.27	1818282.44	21.75
N05E12-02-314	3669761.20	1818242.30	21.75
N05E12-02-315	3669957.14	1818202.16	21.75
N05E12-02-316	3669714.24	1818632.86	21.75
N05E12-02-317	3669531.51	1818264.98	4.50
N05E12-02-318	3669619.20	1818466.73	4.50
N05E12-02-319	3669528.53	1818395.18	21.50
N05E12-02-320	3669455.27	1818282.44	21.75
N05E12-02-321	3669761.20	1818242.30	21.75
N05E12-02-322	3669957.14	1818202.16	21.75
N05E12-02-323	3669714.24	1818632.86	21.75
N05E12-02-324	3669531.51	1818264.98	4.50
N05E12-02-325	3669619.20	1818466.73	4.50
N05E12-02-326	3669528.53	1818395.18	21.50
N05E12-02-327	3669455.27	1818282.44	21.75
N05E12-02-328	3669761.20	1818242.30	21.75
N05E12-02-329	3669957.14	1818202.16	21.75
N05E12-02-330	3669714.24	1818632.86	21.75
N05E12-02-331	3669531.51	1818264.98	4.50
N05E12-02-332	3669619.20	1818466.73	4.50
N05E12-02-333	3669528.53	1818395.18	21.50
N05E12-02-334	3669455.27	1818282.44	21.75
N05E12-02-335	3669761.20	1818242.30	21.75
N05E12-02-336	3669957.14	1818202.16	21.75
N05E12-02-337	3669714.24	1818632.86	21.75
N05E12-02-338	3669531.51	1818264.98	4.50
N05E12-02-339	3669619.20	1818466.73	4.50
N05E12-02-340	3669528.53	1818395.18	21.50
N05E12-02-341	3669455.27	1818282.44	21.75
N05E12-02-342	3669761.20	1818242.30	21.75
N05E12-02-343	3669957.14	1818202.16	21.75
N05E12-02-344	3669714.24	1818632.86	21.75
N05E12-02-345	3669531.51	1818264.98	4.50
N05E12-02-346	3669619.20	1818466.73	4.50
N05E12-02-347	3669528.53	1818395.18	21.50
N05E12-02-348	3669455.27	1818282.44	21.75
N05E12-02-349	3669761.20	1818242.30	21.75
N05E12-02-350	3669957.14	1818202.16	21.75
N05E12-02-351	3669714.24	1818632.86	21.75
N05E12-02-352	3669531.51	1818264.98	4.50
N05E12-02-353	3669619.20	1818466.73	4.50
N05E12-02-354	3669528.53	1818395.18	21.50
N05E12-02-355	3669455.27	1818282.44	21.75
N05E12-02-356	3669761.20	1818242.30	21.75
N05E12-02-357	3669957.14	1818202.16	21.75
N05E12-02-358	3669714.24	1818632.86	21.75
N05E12-02-359	3669531.51	1818264.98	4.50
N05E12-02-360	3669619.20	1818466.73	4.50
N05E12-02-361	3669528.53	1818395.18	21.50
N05E12-02-362	3669455.27	1818282.44	21.75
N05E12-02-363	3669761.20	1818242.30	21.75
N05E12-02-364	3669957.14	1818202.16	21.75
N05E12-02-365	3669714.24	1818632.86	21.75
N05E12-02-366	3669531.51	1818264.98	4.50
N05E12-02-367	3669619.20	1818466.73	4.50
N05E12-02-368	3669528.53	1818395.18	21.50
N05E12-02-369	3669455.27	1818282.44	21.75
N05E12-02-370	3669761.20	1818242.30	21.75
N05E12-02-371	3669957.14	1818202.16	21.75
N05E12-02-372	3669714.24	1818632.86	21.75
N05E12-02-373	3669531.51	1818264.98	4.50
N05E12-02-374	3669619.20	1818466.73	4.50
N05E12-02-375	3669528.53	1818395.18	21.50
N05E12-02-376	3669455.27	1818282.44	21.75
N05E12-02-377	3669761.20	1818242.30	21.75
N05E12-02-378	3669957.14	1818202.16	21.75
N05E12-02-379	3669714.24	1818632.86	21.75
N05E12-02-380	3669531.51	1818264.98	4.50
N05E12-02-381	3669619.20	1818466.73	4.50





KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- PROPERTY BOUNDARY
- TREE LINE
- CONTROL POINT
- HEADWALL
- MONITORING WELL
- PIEZOMETER
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT TOP OF PREPARED SUBGRADE.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - PREPARED SUBGRADE I

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG.	GW6489.04C092	SHEET	1
SCALE	1" = 100'	DRAWING 093 OF 097			
DATE	DECEMBER 2018				

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

ANSI E 44x34

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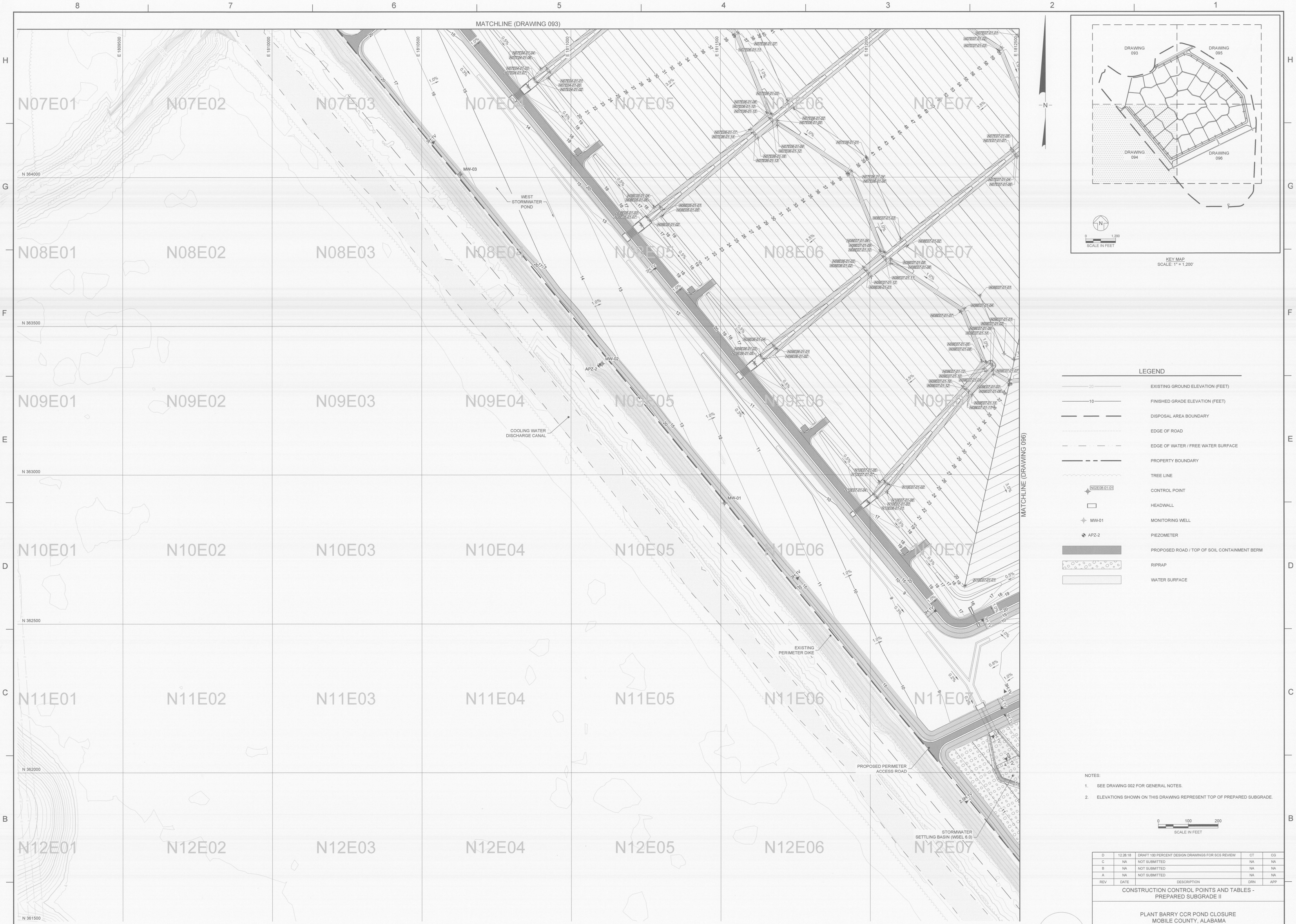

KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- PROPERTY BOUNDARY
- TREE LINE
- N02E08-01-01 — CONTROL POINT
- HEADWALL
- MW-01 — MONITORING WELL
- APZ-2 — PIEZOMETER
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT TOP OF PREPARED SUBGRADE.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - PREPARED SUBGRADE II

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C092	SHEET 2
SCALE	1" = 100'	DRAWING 094 OF 097	
DATE	DECEMBER 2018		

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ANSI E: 44x34

KEY MAP
SCALE: 1" = 1,200'

LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- PROPERTY BOUNDARY
- TREE LINE
- N02E08-01-01 — CONTROL POINT
- HEADWALL
- MW-01 — MONITORING WELL
- APZ-2 — PIEZOMETER
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT TOP OF PREPARED SUBGRADE.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	NA	NOT SUBMITTED	NA	NA
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - PREPARED SUBGRADE III

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C092	SHEET 3
SCALE	1" = 100'		
DATE	DECEMBER 2018	DRAWING 095 OF 096	

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MATCHLINE (DRAWING 095)

MATCHLINE (DRAWING 094)

SOUTHEAST STORMWATER POND

SOUTHWEST STORMWATER POND

STORMWATER SETTLING BASIN (WSEL 6.0)

EAST STORMWATER POND PILOT CHANNEL

EXISTING PERIMETER DIKE

PROPERTY BOUNDARY (TYP)

MOBILE RIVER

MW-11

MW-12R

APZ-5

MW-16

N 364000

N 363500

N 363000

N 362500

N 362000

N 361500

E 1813500

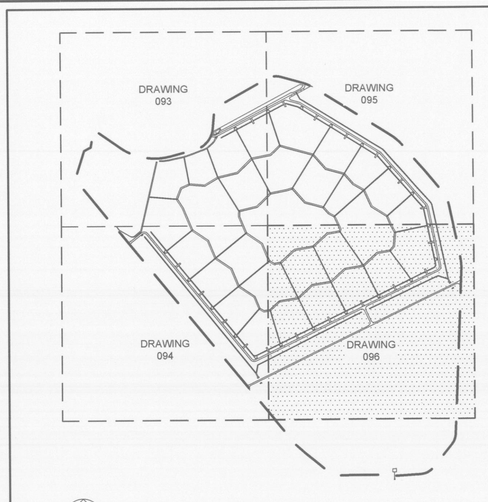
E 1814000

E 1814500

E 1815000

E 1815500

KEY MAP
SCALE: 1" = 1,200'



LEGEND

- EXISTING GROUND ELEVATION (FEET)
- FINISHED GRADE ELEVATION (FEET)
- DISPOSAL AREA BOUNDARY
- EDGE OF ROAD
- EDGE OF WATER / FREE WATER SURFACE
- PROPERTY BOUNDARY
- TREE LINE
- N02E08-01-01 — CONTROL POINT
- HEADWALL
- MW-01 — MONITORING WELL
- APZ-2 — PIEZOMETER
- PROPOSED ROAD / TOP OF SOIL CONTAINMENT BERM
- RIPRAP
- WATER SURFACE

NOTES:

1. SEE DRAWING 002 FOR GENERAL NOTES.
2. ELEVATIONS SHOWN ON THIS DRAWING REPRESENT TOP OF PREPARED SUBGRADE.

0 100 200
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP
D	12.28.18	DRAFT 100 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
C	12.03.18	DRAFT 90 PERCENT DESIGN DRAWINGS FOR SCS REVIEW	CT	CG
B	NA	NOT SUBMITTED	NA	NA
A	NA	NOT SUBMITTED	NA	NA

CONSTRUCTION CONTROL POINTS AND TABLES - PREPARED SUBGRADE IV

PLANT BARRY CCR POND CLOSURE
MOBILE COUNTY, ALABAMA

SEAL

DRAFT 100 PERCENT DESIGN DRAWING
NOT FOR CONSTRUCTION

Geosyntec consultants
1255 ROBERTS BOULEVARD NW, SUITE 200
KENNESAW, GEORGIA 30144-3694
PHONE: 678.202.9500
WWW.GEOSYNTEC.COM

PROJ. NO.	GW6489	DWG. GW6489.04C092	SHEET 4
SCALE	1" = 100'	DRAWING 096 OF 097	
DATE	DECEMBER 2018		

ANSI E 44x34

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POINT #	NORTHING	EASTING	ELEVATION
N2ZE00-01-01	3667025.08	1815853.66	20.00
N2ZE00-01-02	3665523.27	1816243.91	19.61
N2ZE00-01-03	3663994.42	1816622.30	20.37
N2ZE00-01-04	3662447.44	1817000.64	20.14
N2ZE00-01-05	3660882.34	1817378.93	20.91
N2ZE00-01-06	3659299.04	1817756.99	21.68
N2ZE00-01-07	3657697.65	1818134.82	22.45
N2ZE00-01-08	3656078.26	1818512.63	23.22
N2ZE00-01-09	3654440.98	1818890.41	23.99
N2ZE00-01-10	3652785.91	1819268.16	24.76
N2ZE00-01-11	3651113.14	1819645.87	25.53
N2ZE00-01-12	3649422.78	1820023.54	26.30
N2ZE00-01-13	3647714.94	1820401.16	27.07
N2ZE00-01-14	3645989.74	1820778.74	27.84
N2ZE00-01-15	3644247.29	1821156.27	28.61
N2ZE00-01-16	3642487.70	1821533.75	29.38
N2ZE00-01-17	3640711.09	1821911.19	30.15
N2ZE00-01-18	3638917.57	1822288.58	30.92
N2ZE00-01-19	3637107.26	1822665.93	31.69
N2ZE00-01-20	3635280.27	1823043.24	32.46
N2ZE00-01-21	3633436.72	1823420.50	33.23
N2ZE00-01-22	3631576.73	1823797.72	34.00
N2ZE00-01-23	3629700.42	1824174.89	34.77
N2ZE00-01-24	3627807.92	1824552.02	35.54
N2ZE00-01-25	3625899.35	1824929.10	36.31
N2ZE00-01-26	3623974.84	1825306.14	37.08
N2ZE00-01-27	3622034.52	1825683.14	37.85
N2ZE00-01-28	3620078.52	1826060.10	38.62
N2ZE00-01-29	3618106.97	1826437.02	39.39
N2ZE00-01-30	3616120.01	1826813.90	40.16
N2ZE00-01-31	3614117.78	1827190.74	40.93
N2ZE00-01-32	3612100.42	1827567.54	41.70
N2ZE00-01-33	3610068.07	1827944.30	42.47
N2ZE00-01-34	3608020.89	1828321.02	43.24
N2ZE00-01-35	3605959.04	1828697.70	44.01
N2ZE00-01-36	3603882.69	1829074.34	44.78
N2ZE00-01-37	3601792.01	1829450.94	45.55
N2ZE00-01-38	3599687.18	1829827.51	46.32
N2ZE00-01-39	3597568.38	1830204.04	47.09
N2ZE00-01-40	3595435.80	1830580.53	47.86
N2ZE00-01-41	3593289.64	1830956.99	48.63
N2ZE00-01-42	3591130.09	1831333.41	49.40
N2ZE00-01-43	3588957.34	1831709.80	50.17
N2ZE00-01-44	3586771.59	1832086.16	50.94
N2ZE00-01-45	3584573.04	1832462.48	51.71
N2ZE00-01-46	3582361.89	1832838.77	52.48
N2ZE00-01-47	3580138.34	1833215.03	53.25
N2ZE00-01-48	3577902.59	1833591.26	54.02
N2ZE00-01-49	3575654.84	1833967.46	54.79
N2ZE00-01-50	3573395.30	1834343.62	55.56
N2ZE00-01-51	3571124.17	1834719.76	56.33
N2ZE00-01-52	3568841.66	1835095.87	57.10
N2ZE00-01-53	3566547.97	1835471.96	57.87
N2ZE00-01-54	3564243.31	1835848.03	58.64
N2ZE00-01-55	3561927.89	1836224.08	59.41
N2ZE00-01-56	3559601.92	1836600.12	60.18
N2ZE00-01-57	3557265.61	1836976.15	60.95
N2ZE00-01-58	3554919.17	1837352.17	61.72
N2ZE00-01-59	3552562.81	1837728.19	62.49
N2ZE00-01-60	3550196.75	1838104.21	63.26
N2ZE00-01-61	3547821.20	1838480.23	64.03
N2ZE00-01-62	3545436.38	1838856.26	64.80
N2ZE00-01-63	3543042.49	1839232.30	65.57
N2ZE00-01-64	3540639.75	1839608.36	66.34
N2ZE00-01-65	3538228.36	1839984.44	67.11
N2ZE00-01-66	3535808.54	1840360.54	67.88
N2ZE00-01-67	3533380.49	1840736.67	68.65
N2ZE00-01-68	3530944.42	1841112.82	69.42
N2ZE00-01-69	3528500.55	1841489.00	70.19
N2ZE00-01-70	3526049.09	1841865.21	70.96
N2ZE00-01-71	3523590.26	1842241.45	71.73
N2ZE00-01-72	3521124.27	1842617.72	72.50
N2ZE00-01-73	3518651.34	1842994.03	73.27
N2ZE00-01-74	3516171.68	1843370.37	74.04
N2ZE00-01-75	3513685.50	1843746.74	74.81
N2ZE00-01-76	3511193.01	1844123.15	75.58
N2ZE00-01-77	3508694.43	1844499.60	76.35
N2ZE00-01-78	3506189.98	1844876.09	77.12
N2ZE00-01-79	3503679.88	1845252.62	77.89
N2ZE00-01-80	3501164.34	1845629.20	78.66
N2ZE00-01-81	3498643.58	1846005.82	79.43
N2ZE00-01-82	3496117.81	1846382.49	80.20
N2ZE00-01-83	3493587.26	1846759.21	80.97
N2ZE00-01-84	3491052.16	1847135.98	81.74
N2ZE00-01-85	3488512.73	1847512.80	82.51
N2ZE00-01-86	3485969.20	1847889.67	83.28
N2ZE00-01-87	3483421.80	1848266.60	84.05
N2ZE00-01-88	3480870.77	1848643.59	84.82
N2ZE00-01-89	3478316.34	1849020.64	85.59
N2ZE00-01-90	3475758.74	1849397.76	86.36
N2ZE00-01-91	3473198.20	1849774.94	87.13
N2ZE00-01-92	3470634.96	1850152.19	87.90
N2ZE00-01-93	3468069.25	1850529.51	88.67
N2ZE00-01-94	3465501.30	1850906.90	89.44
N2ZE00-01-95	3462931.34	1851284.36	90.21
N2ZE00-01-96	3460359.61	1851661.90	90.98
N2ZE00-01-97	3457786.33	1852039.52	91.75
N2ZE00-01-98	3455211.73	1852417.22	92.52
N2ZE00-01-99	3452636.05	1852795.00	93.29
N2ZE00-01-100	3450059.52	1853172.86	94.06
N2ZE00-01-101	3447482.38	1853550.80	94.83
N2ZE00-01-102	3444904.87	1853928.83	95.60
N2ZE00-01-103	3442327.22	1854306.94	96.37
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N2ZE00-01-105	3437172.46	1855063.43	97.91
N2ZE00-01-106	3434595.84	1855441.81	98.68
N2ZE00-01-107	3432020.05	1855820.28	99.45
N2ZE00-01-108	3429445.33	1856198.84	100.22
N2ZE00-01-109	3426871.92	1856577.49	100.99
N2ZE00-01-110	3424300.07	1856956.23	101.76
N2ZE00-01-111	3421730.03	1857335.06	102.53
N2ZE00-01-112	3419162.05	1857713.98	103.30
N2ZE00-01-113	3416596.38	1858093.00	104.07
N2ZE00-01-114	3414033.29	1858472.11	104.84
N2ZE00-01-115	3411473.03	1858851.32	105.61
N2ZE00-01-116	3408915.87	1859230.63	106.38
N2ZE00-01-117	3406362.08	1859610.04	107.15
N2ZE00-01-118	3403811.93	1859989.56	107.92
N2ZE00-01-119	3401265.69	1860369.18	108.69
N2ZE00-01-120	3398723.64	1860748.91	109.46
N2ZE00-01-121	3396186.06	1861128.75	110.23
N2ZE00-01-122	3393653.24	1861508.69	111.00
N2ZE00-01-123	3391125.48	1861888.75	111.77
N2ZE00-01-124	3388603.07	1862268.92	112.54
N2ZE00-01-125	3386086.32	1862649.21	113.31
N2ZE00-01-126	3383575.54	1863029.62	114.08
N2ZE00-01-127	3381071.04	1863410.15	114.85
N2ZE00-01-128	3378573.14	1863790.80	115.62
N2ZE00-01-129	3376082.17	1864171.58	116.39
N2ZE00-01-130	3373598.46	1864552.49	117.16
N2ZE00-01-131	3371122.34	1864933.53	117.93
N2ZE00-01-132	3368654.15	1865314.70	118.70
N2ZE00-01-133	3366194.23	1865696.01	119.47
N2ZE00-01-134	3363742.93	1866077.46	120.24
N2ZE00-01-135	3361300.61	1866459.05	121.01
N2ZE00-01-136	3358867.64	1866840.78	121.78
N2ZE00-01-137	3356444.41	1867222.66	122.55
N2ZE00-01-138	3354031.32	1867604.68	123.32
N2ZE00-01-139	3351628.79	1867986.85	124.09
N2ZE00-01-140	3349237.26	1868369.17	124.86
N2ZE00-01-141	3346857.17	1868751.64	125.63
N2ZE00-01-142	3344488.98	1869134.26	126.40
N2ZE00-01-143	3342133.16	1869517.03	127.17
N2ZE00-01-144	3339790.19	1869899.96	127.94
N2ZE00-01-145	3337460.56	1870283.04	128.71
N2ZE00-01-146	3335144.77	1870666.28	129.48
N2ZE00-01-147	3332843.32	1871049.68	130.25
N2ZE00-01-148	3330556.72	1871433.24	131.02
N2ZE00-01-149	3328285.48	1871816.97	131.79
N2ZE00-01-150	3326030.13	1872200.86	132.56
N2ZE00-01-151	3323791.19	1872584.92	133.33
N2ZE00-01-152	3321569.20	1872969.15	134.10
N2ZE00-01-153	3319364.71	1873353.55	134.87
N2ZE00-01-154	3317178.28	1873738.13	135.64
N2ZE00-01-155	3315010.47	1874122.89	136.41
N2ZE00-01-156	3312861.87	1874507.83	137.18
N2ZE00-01-157	3310733.07	1874892.95	137.95
N2ZE00-01-158	3308624.68	1875278.26	138.72
N2ZE00-01-159	3306537.32	1875663.76	139.49
N2ZE00-01-160	3304471.64	1876049.45	140.26
N2ZE00-01-161	3302428.28	1876435.34	141.03
N2ZE00-01-162	3300408.91	1876821.43	141.80
N2ZE00-01-163	3298414.21	1877207.72	142.57
N2ZE00-01-164	3296445.86	1877594.22	143.34
N2ZE00-01-165	3294504.56	1877980.93	144.11
N2ZE00-01-166	3292591.01	1878367.86	144.88
N2ZE00-01-167	3290706.93	1878755.00	145.65
N2ZE00-01-168	3288853.04	1879142.37	146.42
N2ZE00-01-169	3287030.08	1879529.97	147.19
N2ZE00-01-170	3285238.80	1879917.80	147.96
N2ZE00-01-171	3283479.98	1880305.87	148.73
N2ZE00-01-172	3281754.41	1880694.19	149.50
N2ZE00-01-173	3280062.91	1881082.76	150.27
N2ZE00-01-174	3278406.31	1881471.58	151.04
N2ZE00-01-175	3276785.48	1881860.66	151.81
N2ZE00-01-176	3275201.28	1882250.00	152.58
N2ZE00-01-177	3273654.62	1882639.61	153.35
N2ZE00-01-178	3272146.41	1883029.49	154.12
N2ZE00-01-179	3270677.59	1883419.65	154.89
N2ZE00-01-180	3269249.12	1883810.09	155.66
N2ZE00-01-181	3267862.00	1884200.82	156.43
N2ZE00-01-182	3266517.26	1884591.84	157.20
N2ZE00-01-183	3265215.96	1884983.15	157.97
N2ZE00-01-184	3263959.16	1885374.76	158.74
N2ZE00-01-185	3262747.92	1885766.67	159.51
N2ZE00-01-186	3261583.32	1886158.88	160.28
N2ZE00-01-187	3260466.45	1886551.40	161.05
N2ZE00-01-188	3259398.38	1886944.23	161.82
N2ZE00-01-189	3258380.19	1887337.38	162.59
N2ZE00-01-190	3257412.94	1887730.85	163.36
N2ZE00-01-191	3256497.68	1888124.65	164.13
N2ZE00-01-192	3255635.45	1888518.78	164.90
N2ZE00-01-193	3254827.28	1888913.24	165.67
N2ZE00-01-194	3254074.19	1889308.04	166.44
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N2ZE00-01-196	3252737.27	1890098.66	167.98
N2ZE00-01-197	3252155.41	1890494.49	168.75
N2ZE00-01-198	3251632.57	1890890.66	169.52
N2ZE00-01-199	3251169.69	1891287.18	170.29
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N2ZE00-01-201	3250430.39	1892081.24	171.83
N2ZE00-01-202	3250156.69	1892478.78	172.60
N2ZE00-01-203	3249949.34	1892876.65	173.37
N2ZE00-01-204	3249810.03	1893274.85	174.14
N2ZE00-01-205	3249740.39	1893673.38	174.91
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N2ZE00-01-208	3249962.77	1894870.92	177.22
N2ZE00-01-209	3250185.66	1895270.73	177.99
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N2ZE00-01-211	3250863.77	1896071.27	179.53
N2ZE00-01-212	3251322.30	1896471.99	180.30
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N2ZE00-01-214	3252487.04	1897274.32	181.84
N2ZE00-01-215	3253195.39	1897675.92	182.61
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N2ZE00-01-217	3254865.11	1898479.98	184.15
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N2ZE00-01-219	3256872.16	1899285.16	185.69
N2ZE00-01-220	3258002.17	1899688.16	186.46
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N2ZE00-01-225	3264898.74	1901707.17	190.31
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N2ZE00-01-228	3270025.80	1902921.68	192.62
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N2ZE00-01-241	3300704.13	1908208.92	202.63
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N2ZE00-01-244	3309705.69	1909433.82	204.94
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N2ZE00-01-250	3329853.22	1911887.92	209.56
N2ZE00-01-251	3333487.89	1912297.45	210.33
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N2ZE00-01-257	3356942.62	1914757.30	214.95
N2ZE00-01-258	3361124.46	1915167.70	215.72
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N2ZE00-01-272	3427679.34	1920923.17	226.50
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N2ZE00-01-277	3454984.31	1922981.35	230.35
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N2ZE00-01-281	3478127.55	1924627.94	233.43
N2ZE00-01-282	3484090.32	1925039.52	234.20
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N2ZE00-01-287	3514941.74	1927096.47	238.05
N2ZE00-01-288	3521317.40	1927507.60	238.82
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N2ZE00-01-291	3540849.71	1928740.32	241.13
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N2ZE00-01-293	3554205.99	1929561.50	242.67
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N2ZE00-01-296	3574736.46	1930792.12	244.98
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N2ZE00-01-299	3595855.08	1932021.18	247.29
N2ZE00-01-300	3603023.94	1932430.48	248.06
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N2ZE00-01-346	3997253.50	1950848.32	283.48
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