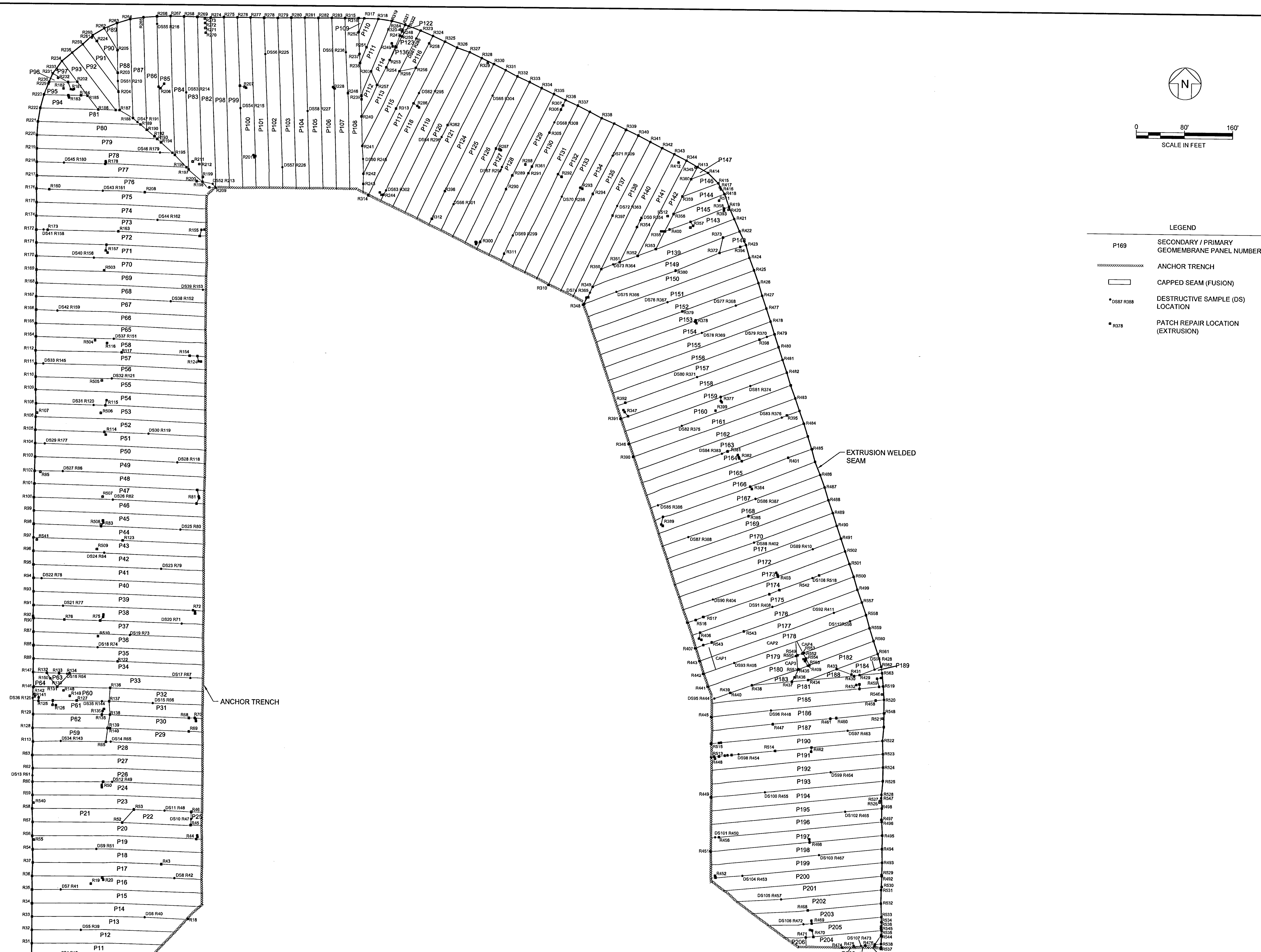
DOCUMENT RECEIVED IN ELECTRONIC FORMAT FOLLOWS:

- **SEAL CERTIFICATION PAGE - Drawing D6**



LEGEND

P169	SECONDARY / PRIMARY GEOMEMBRANE PANEL NUMBER
xxxxxxxxxxxxxxxxxxxxxxxx	ANCHOR TRENCH
▭	CAPPED SEAM (FUSION)
• DS87 R388	DESTRUCTIVE SAMPLE (DS) LOCATION
▪ R378	PATCH REPAIR LOCATION (EXTRUSION)

CRAIG R. BROWNE
PE No. 68613

JED LANDFILL
PARTIAL CLOSURE AS-BUILT

Geosyntec consultants — TAMPA, FL

DATE:	OCTOBER 2009	FILE NO.	FQ1672.01P01
PROJECT NO.	FQ1672	FIGURE NO.	-

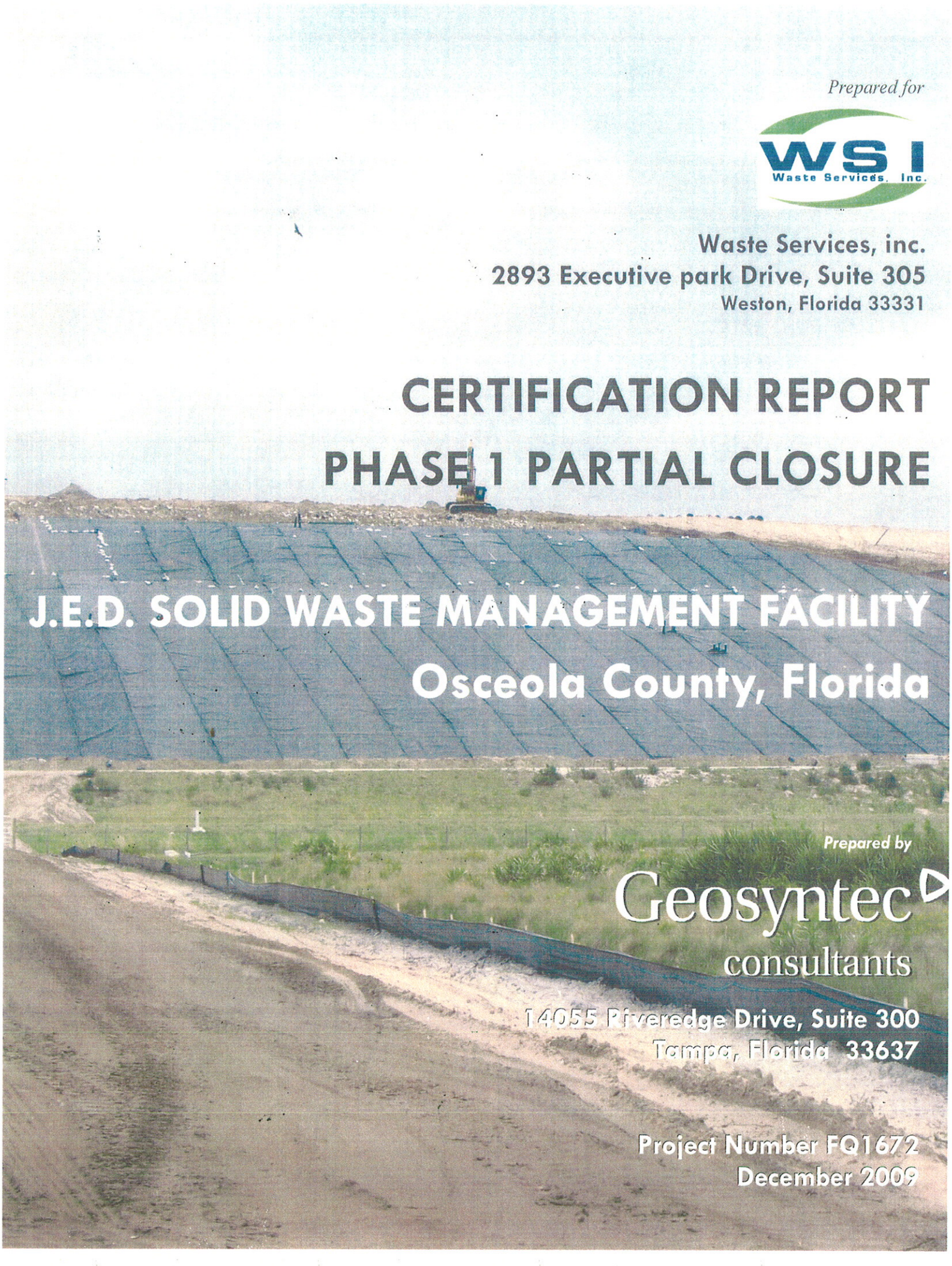
Prepared for

WSI
Waste Services, Inc.

Waste Services, inc.
2893 Executive park Drive, Suite 305
Weston, Florida 33331

CERTIFICATION REPORT
PHASE 1 PARTIAL CLOSURE

J.E.D. SOLID WASTE MANAGEMENT FACILITY
Osceola County, Florida



Prepared by

Geosyntec consultants

14055 Riveredge Drive, Suite 300
Tampa, Florida 33637

Project Number FQ1672
December 2009

DEP Form # 62-701.900(2)
Form Title Certification of Construction Completion
Effective Date May 19, 1994

DEP Application No. _____
(Filled by DEP)

Florida Department of Environmental Protection
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, FL 32399-2400

Certification of Construction Completion of a Solid Waste Management Facility

DEP Construction Permit No: SO49-0199726-011 County: Osceola

Name of Project: Phase 1 Partial Closure, J.E.D. Solid Waste Management Facility

Name of Owner: Omni Waste of Osceola County, LLC

Name of Engineer: Geosyntec Consultants

Type of Project: Closure

Cost: Estimate $ 2,210,980 Actual $ 2,300,000

Site Design: Quantity: _____ ton/day Site Acreage: Phase 1 Closure - Apprx. 25 Acres

Deviations from Plans and Application Approved by DEP:

No substantial deviations

Address and Telephone No. of Site: 1501 Omni Way, St. Cloud, Florida (404) 891-3720

Name(s) of Site Supervisor: Mike Kaiser

Date Site inspection is requested: As soon as possible

This is to certify that, with the exception of any deviation noted above, the construction of the project has been completed in substantial accordance with the plans authorized by Construction

Permit No. SO49-0199726-011 :Dated: 17 February 2009

Date: 12/31/09

Signature of Professional Engineer

CRAIG R. BROWNE
PE NO. 68613

Northwest District
160 Governmental Center
Pensacola, FL 32501-5794
850-595-8360

Northeast District
7825 Baymeadows Way, Ste. B200
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Central District
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813-744-6100

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Fort Myers, FL 33901-3881
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Southeast District
400 North Congress Ave.
West Palm Beach, FL 33401
561-681-6600

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APPENDICES

1. INTRODUCTION

1.1 Overview

This certification report summarizes the Construction Quality Assurance (CQA) activities performed by Geosyntec Consultants (Geosyntec), Tampa, Florida during construction of the Phase 1 partial closure system at the J.E.D. Solid Waste Management (JED) facility, a Class I landfill located in Osceola County, Florida. The landfill is owned and operated by Omni Waste of Osceola County, LLC, a wholly owned subsidiary of Waste Services, Inc. (WSI). The CQA activities performed by Geosyntec included monitoring of:

(i) earthwork construction;

(ii) geosynthetics installation; and

(iii) ancillary construction associated with the partial closure.

The CQA activities were performed to confirm that the construction materials and procedures were in compliance with the Partial Closure of Side Slopes of Phase 1 – Intermediate Modification Permit No. SO49-0199726-010 (Permit) issued by the Florida Department of Environmental Protection (FDEP), Central District on 17 February 2009 and in accordance with Chapter 62-701, Solid Waste Management Facilities, Florida Administrative Code (FAC).

The Permit covers the construction of the Phase 1 partial closure system which includes the construction of the final cover system on the side slopes up to elevation 180-ft of Phase 1 development (i.e., Cells 1 through 4) and features of the storm water management system associated with the final closure of the Phase 1 landfill side slopes. This certification report covers the Phase 1 partial closure system construction activities and was prepared for Mr. Mike Kaiser of WSI. The report was prepared by Mr. Kirk Wills, Mr. Richard Hastie, and Mr. Craig Browne, P.E., all with Geosyntec.

1.2 Report Organization

This certification report is organized as described below.

- A brief description of the project is provided in Section 2;
- A summary of the CQA program is presented in Section 3;

- A description of the CQA monitoring and testing activities performed during earthwork related construction activities for partial closure system construction is provided in Section 4;

- A description of the CQA monitoring and testing activities performed during the installation of geosynthetics in the partial closure system is provided in Section 5;

- A description of the CQA monitoring performed during construction of ancillary facilities associated with construction of the partial cover system of the facility (i.e., storm water management system features) is provided in Section 6; and

- A summary of the observations resulting from the CQA monitoring and testing activities performed by Geosyntec and a certification statement signed and sealed by a professional engineer registered in the State of Florida are presented in Section 7.

2. PROJECT DESCRIPTION

2.1 General

The JED facility is located at 1501 Omni Way, Osceola County, Florida. The site is located west of highway U.S. 441, approximately 6.5 miles south of US 441/US 192 intersection in Holopaw, Florida. The landfill facility is connected to highway U.S. highway 441 by a 2.86 mile paved access road.

The JED facility site comprises a total of approximately 2,179 acres. The landfill footprint at final build-out is approximately 264 acres and consists of a total of 21 landfill cells that provide available waste capacity for approximately 30 years. The first five-year construction and operation permit for Phase 1 development of the facility was issued by FDEP in October 2002. A five-year construction and operation renewal permit for development of Phases 2 and 3 was issued in March 2007.

Phase 1 development at the JED facility includes four landfill cells, Cells 1 through 4 located in the northern part of the landfill. Waste placement within Phase 1 commenced in January 2004 with the completion of Cell 1 construction. Waste has been placed up to approximately elevation 190-ft within the Phase 1 development area. A gas collection and control system (GCCS) was installed within the Phase 1 development area between August 2008 and January 2009. A partial closure was performed for management of storm water and to improve the function and safety of the GCCS operation. The footprint of Phase 1 partial closure system is approximately 25 acres.

On behalf of Omni Waste of Osceola County, LLC, Geosyntec submitted an application for an intermediate permit modification for the JED facility on 26 November 2008. The FDEP issued a First Request for Additional Information on 18 December 2008. Geosyntec submitted a Response to the First Request for Additional Information on 31 December 2008. FDEP issued a file complete status on 31 January 2009, noted as file complete as of 31 December 2008. FDEP issued Permit No. SO49-0199726-010 for the partial closure of the Phase 1 side slopes on 17 February 2009. The Permit addresses all activities associated with the construction of the partial closure system. The Phase 1 partial closure system includes approximately 25 acres of lined, landfill cells (i.e., Cells 1 through 4). A temporary soil cover (daily cover) approximately 6 inches thick had been previously installed on the side slopes prior to this partial closure system construction project.

2.2 Construction Activities

This certification report summarizes the CQA monitoring and testing activities performed during construction of the final cover system on the Phase 1 side slopes as indicated in the construction drawings prepared for the project, hereafter referred to as Phase 1 partial closure system. The final cover system construction at the JED Facility documented herein includes:

- preparation of the existing landfill side slope surface;
- placement, compaction, and grading of the 12-inch thick intermediate soil layer;
- installation of the geomembrane component of the final cover system to include the welded tie-in of the cover geomembrane to the existing base liner geomembrane along the perimeter of the closure footprint area;
- installation of the drainage geocomposite component;
- earth components of the final cover system above the geosynthetic layers to include cap protective layer and vegetative layer soils; and
- storm water management system consisting of drainage collector pipes, drainage swales on the final cover system side-slopes, piping, and structures to convey surface water runoff to the on-site dry retention area.

The construction of the final cover system on the Phase 1 side slopes, including the storm water management system, was the primary focus of the CQA activity, as this was considered critical with respect to the adequate performance of the closure system and protection of the surrounding environment. The final cover system design incorporates components that meet or exceed the requirements of Chapter 62-701, FAC. The final cover system consists of the following components (from top to bottom):

- minimum 24-inch thick protective soil layer comprised of a 6-inch thick vegetative layer (Vegetative Layer Soil) and an 18-inch thick soil layer (Cap Protective Layer);

- geocomposite drainage layer, consisting of a high-density polyethylene (HDPE) geonet with a needle-punched, non-woven geotextile heat bonded to each side, hereafter referred to as drainage geocomposite;

- geomembrane barrier layer, consisting of a 40-mil (1.0-mm) thick textured LLDPE liner; and

- prepared subgrade (6-inch layer of daily cover and 12-inch layer of intermediate cover soils).

3. CONSTRUCTION QUALITY ASSURANCE PROGRAM

3.1 General

The scope of CQA monitoring, testing, and documentation services performed by Geosyntec during the construction of the partial closure system at the JED facility included review of documents, field CQA operations, and preparation of this certification report, which includes as-built drawings for the Phase 1 partial closure system. These activities are described in the following sections of this report.

Geosyntec provided the CQA monitoring, testing, and documentation as well as the construction drawings associated with the closure project. A list of personnel involved in construction of the Phase 1 partial closure system at the JED facility is included in Section 3.6 of this report.

The activities related to the construction of the Phase 1 partial closure system began on 9 March 2009. The installation of the cover geomembrane commenced on 14 April 2009. The placement of the cap protective cover soil commenced on 28 April 2009. Construction of the final closure system (described in this certification report) was completed on 23 November 2009.

3.2 Related Documents

As previously noted, this certification report summarizes the CQA activities performed by Geosyntec during construction of the Phase 1 partial closure system at the JED facility. The CQA activities conducted by Geosyntec were intended to satisfy the requirements of the modified Permit issued 17 February 2009, which references the following documents:

- Permit modification application entitled "*Partial Landfill Closure – Application for an Intermediate Permit Modification, J.E.D. Solid Waste Management Facility*", prepared by Geosyntec Consultants, dated November 2008;
- Response to Request for Additional Information "*Partial Landfill Closure – Application for an Intermediate Permit Modification, J.E.D. Solid Waste Management Facility*", prepared by Geosyntec Consultants, dated 30 December 2008;
- Major permit modification application entitled *"Vertical Expansion of the J.E.D. Solid Waste Management Facility, Phases 1 through 3, Volume 1 of 2 and 2 of 2"*, prepared by Geosyntec Consultants, dated September 2007.

All of the above documents are hereafter collectively referred to as the CQA Documents in this certification report.

3.3 Minor Changes for Construction

During the construction of the Phase 1 partial closure system at the JED facility, some minor changes were made to accommodate existing site conditions and/or construction procedures. This section presents a description of the changes made as well as the rationale for each change.

The limits of the Phase 1 partial closure were modified at the southeast corner of the Phase 1 area since placement of the existing waste had not reached the design elevations required for closure. The actual area of closure construction was reduced by approximately 2.6 acres. Posts marking the actual limit of liner were installed around the Phase 1 partial closure limits.

The installation of the 4-inch perforated drainage header pipe as shown on sheet 11 of 13, details 2/8, 2A/8, and 3/8 of the Construction Drawings for the partial closure construction was modified. The connection of the drainage geocomposite to the header pipe was not practical since the sewn seam would be on the underside of the geocomposite. Also, to help contain the water in the header pipe until draining out through the discharge outlet pipe, a 3-ft wide piece of the same 40-mil textured LLDPE geomembrane liner was tack welded to the closure liner and wrapped around the geocomposite and header pipe. The liner was temporarily held in place above the pipe using sandbags until the cap protective soil was placed over the liner flap. A figure depicting this modification is included in Appendix A.

The pipe penetrations in the final cover as shown in detail 13/13 on sheet 13 of 13 of the Construction Drawings for the Phase 1 partial closure system could not be constructed with the 40-mil LLDPE geomembrane liner used in the closure construction due to the inability to put slack into the geomembrane boot. All pipe penetrations for the gas system were constructed in accordance with detail 11/13 on sheet 13 of 13 of the Construction Drawings for the partial closure system, with the exception that all geomembrane boots and skirts were constructed with 40-mil LLDPE textured geomembrane and not 40-mil smooth as shown on the detail.

Substantial settlement was encountered on the upper slopes (between elevation 140 and 180-ft) where waste placement occurred within the last year, which in affect, flattened the slopes below 3 horizontal to 1 vertical (3H:1V) and lowered the elevation of discharge outlet pipes. The lower elevation created a minimal slope on the discharge outlet pipe day-lighting into the side slope drainage swale. To improve the drainage capabilities of the discharge outlet pipe, an additional gravel drainage feature (drainage bed) was constructed around the existing discharge outlet pipe. The pipes as installed are functioning adequately; the gravel drainage bed was added as a supplemental feature to aide in drainage from the header pipe.

3.4 Field CQA Operations

The following activities were performed as part of Geosyntec's on-site CQA services:

Earthwork:

- collecting samples of soils, referred to as General Fill in the Technical Specifications used as intermediate cover, for testing at an off-site geotechnical laboratory;
- collecting samples of soils used for the protective layer component of the final cover system, referred to as Cap Protective Layer and Vegetative Soil Layer in the Technical Specifications, for testing at the off-site geotechnical laboratory;
- reviewing and evaluating geotechnical laboratory test results on soil samples to ensure compliance with the requirements of the CQA Documents;
- monitoring placement, grading, and compaction of earthwork related construction activities (including the side-slope storm water management swales);
- testing in-situ density, moisture content, and percent compaction of earthwork related construction activities to ensure compliance with the requirements of the CQA Documents;
- notifying Contractor of areas that need additional compaction based on failing in-situ tests and re-testing these areas to ensure compliance with the requirements of the CQA Documents.

Geosynthetics:

- monitoring delivery, storage, and tracking the inventory of geosynthetic materials delivered for the project;
- coordinating the collection of geosynthetic conformance samples from in-plant sources and forwarding samples to the off-site geosynthetics testing laboratory;
- collecting and reviewing geosynthetic manufacturers' quality control (MQC) certification documents and geosynthetic laboratory conformance test results to verify compliance with the requirements of the CQA Documents;

- monitoring installation of geosynthetic materials in the landfill partial closure system including trial seams, production seaming, nondestructive testing, and repair operations; and

- performing destructive testing of geomembrane seams at the minimum frequency required by the CQA Documents.

Miscellaneous Activities:

- reviewing quality control (QC) documents of materials used in the construction of drainage collector piping and storm water piping; and

- monitoring installation of storm water pipes and inlet structures.

During construction activities involving monitoring and/or testing, the observations made and results obtained by Geosyntec CQA personnel were compared with the requirements of the CQA Documents. The Contractor's site superintendent and/or Project Manager were notified of deficiencies in construction practices and/or materials to ensure appropriate corrective actions are taken. The corrective actions were monitored and/or tested by CQA personnel to ensure compliance with the requirements of the CQA Documents.

During construction of the Phase 1 partial closure system, CQA monitoring and testing activities were documented by CQA personnel. Select photographs depicting the various construction activities have been included in Appendix B. Copies of the daily field reports are included in Appendix C. Various other field forms (i.e., density test logs, geosynthetic forms, etc.) are included in appendices referenced in appropriate sections of this certification report. In addition, MQC certificates for the geosynthetics and other materials were provided to Geosyntec for review. These and other documents are also included with this report. All results of CQA monitoring and testing activities that are critical with respect to the satisfactory performance of Phase 1 partial closure system at the JED facility and protection of the surrounding environment have been included in this certification report.

3.5 Certification Report and As-Built Drawings

This CQA Certification Report and as-built drawings were prepared as the final task of the CQA program for construction of the Phase 1 partial closure system at the JED Facility. As-built drawings include:

- survey of existing conditions (i.e., top daily cover);

- survey of top of intermediate cover;

- survey of the top of cap protective cover;
- survey of the top of vegetative layer;
- survey of storm water management system features; and
- geomembrane panel layout record drawing prepared by Geosyntec.

The as-built surveys are included in Appendix D of this certification report. This certification report summarizes all the CQA monitoring, testing, and documentation activities performed by Geosyntec.

3.6 Project Personnel

Principal personnel or representatives of the firms involved in the project include the following:

Owner: Omni Waste of Osceola County, LLC

- Mike Kaiser, WSI, VP Engineering/Project Manager
- Matt Orr, District/Facility Manager

CQA Consultant: Geosyntec Consultants, Tampa, Florida

- Craig Browne, P.E., Engineer of Record
- Kirk Wills, CQA / Project Manager
- Rick Hastie, Site CQA Manager
- Brett Banquer, CQA Technician
- Tom Wissler, CQA Technician
- Shaun Long, CQA Technician
- Roland Derosier, CQA Technician

General Contractor: Hewitt Contracting Company Inc., Leesburg, Florida

- Charles Taylor, Project Manager
- Eric Burt, Project Manager

- Jim Harding, Site Superintendent
- C.J. Finn, Field Superintendent

Geosynthetics Installer: Comanco Environmental Corp., Plant City, Florida

- David Barnett, Project Manager
- Luis Espinal, Crew Chief

Surveyor: John B. Webb & Associates, Winter Park, Florida

- William F. Grizzell, Professional Surveyor

Geotechnical Laboratory: Excel Geotechnical Testing, Roswell, Georgia

- Nader Rad, Ph.D., P.E., Project Manager

Geosynthetics Laboratories: TRI/Environmental, Austin, Texas

- Sam Allen, Project Manager

SGI Testing Services, LLC, Norcross, Georgia

- Zehong Yuan, PhD, P.E., Chief Technical Officer

4. CONSTRUCTION QUALITY ASSURANCE - EARTHWORK

4.1 General

Geosyntec monitored the construction of the earthwork related to various components of the Phase 1 partial closure at the JED facility. The earthwork included: grading of the existing daily cover and waste on the Phase 1 side slopes, placement, compaction and grading of General Fill material for use as intermediate cover; placement, compaction and grading of the protective soil layers (Cap Protective Layer and Vegetative Layer); and the construction of the side-slope drainage swales. The soils used to construct the various components of the Phase 1 partial closure system were all obtained from the Bronson's borrow source and are similar in nature, with the exception of the Vegetative Layer soil, which consisted of Cap Protective Layer soil amended with screened organic matter. These materials included General Fill as intermediate cover below the geomembrane and the protective soil including Cap Protective Layer soil and Vegetative Layer soil above the geomembrane.

General Fill was used as intermediate fill and to fill in areas of the existing slopes where the waste grades were lower than the proposed final grades. The Cap Protective Layer was placed in a minimum 18-inch thickness to protect the geosynthetic components of the final cover system and in the storm water drainage swales on the Phase 1 partial closure side-slopes. The Vegetative Layer was placed in a minimum 6-inch thickness above the lower soil layers and was sodded.

CQA personnel observed the earthwork related construction activities and tested the soils to confirm that the material properties conformed to the CQA Documents, that maximum lift thicknesses were not exceeded, and that minimum protective soil thicknesses and compaction requirements were met. During construction, geotechnical soil tests were performed at the off-site geotechnical laboratory. The off-site geotechnical laboratory for soils testing was Excel Geotechnical Testing (EGT) located in Roswell, Georgia.

4.2 Soil Source and Requirements

General Fill

The General Fill was obtained from an existing borrow area (Bronson's) located on the adjacent property to the west of the JED facility. Representative samples of General Fill were obtained and geotechnical tests were performed to verify conformance with specified material requirements in the CQA Documents.

The Technical Specifications require that the General Fill classify as SW, SP, SW-SM, SW-SC, SP-SM, SP-SC, SM, or SC in accordance with the Unified Soil Classification System (USCS) per ASTM D 2487.

Additionally, General Fill material should be free of debris, foreign objects, large rock fragments, organics, and other deleterious materials.

Cap Protective Layer

The soil used as Cap Protective Layer was also obtained from the Bronson's borrow area located on the adjacent property to the west of the JED facility. Representative soil samples of Cap Protective Layer were obtained and geotechnical tests were performed to verify conformance with specified material requirements in the CQA Documents.

The Technical Specifications require that the Cap Protective Layer soil classify as SW, SP, SW-SM, SW-SC, SP-SM, SP-SC in accordance with the USCS. Other soil classifications may be accepted provided the soil meets the hydraulic conductivity requirement.

Additionally, Cap Protective Layer soil must have a hydraulic conductivity within the range of 1.0×10^{-2} cm/sec to 1.0×10^{-5} cm/sec when tested in accordance with ASTM D 2434, and less than 15% (typically) passing through a standard U.S. No. 200 sieve per STM D 422. A higher fines content may be accepted provided the soil meets the hydraulic conductivity and interface friction requirements.

Vegetative Soil

The soil for the Vegetative Soil layer was also obtained from the Bronson's borrow area located on the adjacent property to the west of the JED facility. Since the borrow soils are primarily sandy soils excavated at depth, the local cooperative extension was consulted on ways to improve the soil nutrient levels for supporting the growth of the proposed Bahia sod. Two samples were prepared on–site by mixing the proposed borrow area soils with screened organics from the existing stockpiles of mulch on site. One sample was prepared by mixing screened organics (passed through a 2-inch minus screen) with the borrow area soils at ratio of 30% organics to 70% soil (by volume), and the second sample at a 50% organics to 50% soils (by volume). Both samples were analyzed by the University of Florida's (UF/IFAS) soil testing laboratory located in Gainesville, Florida. The results for the two samples were comparable. Based on this analysis, screened organics were mixed with the Cap Protective Cover soils (obtained form the Bronson's borrow area) at a typical ratio of 30% organics to 70% Cap Protective Cover soils (by volume). The organics were mixed in with the borrow soils utilizing a

front end loader. Representative samples of Vegetative Soil were obtained after the mixing and geotechnical tests were performed to verify conformance with specified material requirements in the CQA Documents.

The Technical Specifications require that Vegetative Layer soil classify as ML, SC, or SM in accordance with the USCS. Additionally, Vegetative Layer soil must be free of deleterious materials, contain not less than 5% not more than 20% organic matter as determined by organic matter testing in accordance with ASTM D 2974, and have a pH ranging between 5.5 and 7 standard units when tested in accordance with ASTM D 4972.

4.3 CQA Monitoring and Testing

Geosyntec CQA personnel monitored the grading of existing daily cover/waste and filling in of low areas on the Phase 1 partial closure area. Grading activities were closely monitored in and around the gas system components including gas wells, valves, and lateral and header piping. In three instances the gas system piping was damaged by one of the bull dozers grading the existing surface. The damaged pipe was repaired by cutting out the damaged section, replacing with new HDPE pipe, and welded in place using electro-fusion couplers. The repairs were monitored by Geosyntec's on-site CQA technician.

CQA personnel also monitored the placement and/or compaction of soils as described in Section 4.2 above. Potentially nonconforming or questionable practices observed by CQA personnel were brought to the attention of the concerned parties for review and correction.

As part of CQA activities, geotechnical testing was performed on the soils used in construction of the Phase 1 partial closure system. Testing was performed on-site and also performed at the off-site geotechnical laboratory, EGT.

The following geotechnical tests were performed on the soils used in construction of the intermediate cover, cap protective cover, and vegetative layer soils of the Phase 1 partial closure system, as noted:

- in-situ nuclear moisture/density tests on compacted lifts of the General Fill and the Cap Protective Layer (the tests were performed in accordance with ASTM D 2922 for density and ASTM D 3017 for moisture content);
- standard Proctor compaction tests on the General Fill and the Cap Protective Layer in accordance with ASTM D 698;

- grain-size analyses on all soils in accordance with ASTM D 422;
- classification on all soils in accordance with ASTM D-2487;
- hydraulic conductivity tests on the Cap Protective Layer in accordance with ASTM D 2434; and
- interface friction tests for the interfaces between General Fill and geomembrane and between the Cap Protective Layer and geocomposite, as discussed in Section 5.

Geosyntec supplied two nuclear gauges (Troxler Model #3440, Serial #15334 and #22295) to perform in-place moisture/density testing for the General Fill and Cap Protective Layer materials used during construction of the Phase 1 partial closure system.

4.4 General Fill

4.4.1 General

CQA personnel monitored the placement and compaction of General Fill material, which was used primarily as intermediate cover and leveling the existing daily cover over the Phase 1 partial closure area. Earthwork using General Fill consisted of following activities:

- grading of existing daily cover on the Phase 1 partial closure area which would receive General Fill;
- excavating and hauling General Fill from the adjacent borrow area using articulated off-road dump trucks;
- placing, spreading, and grading General Fill in lifts using GPS equipped bulldozers;
- compacting General Fill material by tracking-in with the bulldozers.

General Fill was typically required to be compacted to at least 85 percent of the corresponding standard Proctor (ASTM D 698) maximum dry unit weight. The tests performed on General Fill materials are discussed below.

4.4.2 Grain Size Analyses and USCS Classification

Grain-size distribution analyses (ASTM D 422) were performed to evaluate the USCS classification (ASTM D 2487) of General Fill materials used in the construction of the

Phase 1 partial closure system. Grain size distribution analyses and USCS classification were required to be performed at a minimum frequency of 1 test per 10,000 cubic yards (cyd) of General Fill.

Thirteen (13) grain-size distribution analyses and USCS classification were performed for approximately 75,000 cyd of General Fill used in the construction of the Phase 1 partial closure system. The actual CQA test frequency of 1 test per 5,770 cyd (approx.) of General Fill exceeded the minimum testing frequency required by the CQA Documents. The grain-size distribution analyses and USCS classification performed during construction are summarized on Table 4-1 and are included in Appendix E.

4.4.3 Standard Proctor Tests

Standard Proctor tests were performed to evaluate the percent compaction from the measured in-place densities of the General Fill. Standard Proctor tests were required to be performed at a minimum frequency of 1 test per 25,000 cubic yards (cyd) of General Fill.

Three (3) standard Proctor tests were performed for approximately 75,000 cyd of General Fill placed during the construction of the Phase 1 Partial closure system. The actual CQA test frequency of 1 test per 25,000 cyd (approx.) of General Fill meets the minimum testing frequency required by the CQA Documents. The standard Proctor tests performed during construction are summarized on Table 4-1 and included in Appendix E of this Certification Report.

4.4.4 Density and Percent Compaction

In-situ nuclear moisture/density tests were required to be performed at a frequency of 5 tests per acre per lift for earthwork performed using General Fill. If the density test failed to meet the minimum compaction requirements, the contractor reworked and recompacted the area surrounding the failure and the area was retested by CQA personnel. The procedure was repeated until satisfactory moisture/density test results were obtained at each test location.

Approximately 75,000 cyd of General Fill was used in the construction of the Phase 1 partial closure system. Field logs of the in-place nuclear moisture/density tests performed to evaluate the compaction of General Fill are presented in Appendix F. A total of 169 nuclear moisture/density tests were performed on General Fill, which correspond to a CQA test frequency of 7 tests per/lift acre (approx.), which exceeds the minimum required compaction testing of 5 tests per/lift acre.

4.5 Cap Protective Layer

4.5.1 General

The primary protective soil layer component of the Phase 1 partial closure system included a minimum 18-inch layer of Cap Protective Layer over the geosynthetic components. The Cap Protective Layer material was also used in the construction of the side-slope storm water drainage swales on the partial closure system. Earthwork using Cap Protective Layer consisted of the following activities:

- excavation and hauling Cap Protective Layer material from the Bronson's borrow area to the site in articulated, off-road dump trucks;
- dumping the material at the toe of the Phase 1 partial closure area slopes on which the soils were to be spread;
- placing, spreading, and grading Cap Protective Layer using low ground pressure GPS equipped bulldozers from the toe of slope upwards;
- compacting Cap Protective Layer by tracking-in with low ground pressure bulldozers; and
- scarifying the surface of each compacted lift using tracks of a bulldozer prior to placement and compaction of subsequent lifts.

During placement of the Cap Protective Layer, CQA personnel monitored the contractor's activities to assure that the risk of damage to the underlying geosynthetics was minimized. CQA personnel also monitored the placement and compaction of the Cap Protective Layer materials used in construction of the Phase 1 partial closure system. Cap Protective Layer was typically required to be placed in an initial 18-inch lift above the geosynthetics and compacted to at least 85 percent of the corresponding standard Proctor (ASTM D 698) maximum dry unit weight.

CQA personnel confirmed that a first lift of at least 18 inches of Cap Protective Layer was placed over the geosynthetics prior to compaction. CQA personnel also assured that a total minimum Cap Protective Layer thickness of 1.5-ft was placed over the geosynthetics by checking the as-built survey data for the Cap Protective Layer. Additionally, CQA personnel verified that a temporary minimum 3-ft thick layer of soils was maintained where the articulated off-road dump trucks operated above the geosynthetics.

4.5.2 Grain Size Analyses and USCS Classification

Grain-size distribution analyses (ASTM D 422) were performed to evaluate the USCS classification (ASTM D 2487) of Cap Protective Layer material used in the construction of the Phase 1 partial closure system. Grain size distribution analyses and USCS classification were required to be performed at a minimum frequency of 1 test per 5,000 cubic yards (cyd) of Cap Protective Layer.

Fourteen (14) grain-size distribution analyses and USCS classification were performed for approximately 68,750 cyd of compacted Cap Protective Layer used in the construction of the Phase 1 partial closure system. The actual CQA test frequency of 1 test per 4,900 cyd (approx.) of compacted Cap Protective Layer exceeded the minimum testing frequency required by the CQA Documents. The grain-size distribution analyses and USCS classification performed during construction are summarized on Table 4-2 and included in Appendix G. As noted, the Cap Protective Layer material used in construction of the Phase 1 partial closure system classified as SP-SM and SM in accordance with the USCS classification.

4.5.3 Standard Proctor Tests

Standard Proctor tests were performed to evaluate the percent compaction from the measured in-place densities of compacted Cap Protective Layer. Standard Proctor tests were required to be performed at a minimum frequency of 1 test per 25,000 cubic yards (cyd) of Cap Protective Cover.

Three (3) standard Proctor tests were performed during construction of approximately 68,750 cyd of compacted Cap Protective Layer placed in the Phase 1 partial closure system. The actual CQA test frequency of 1 test per 22,920 cyd (approx.) of compacted Cap Protective Layer exceeded the minimum testing frequency required by the CQA Documents. The standard Proctor tests performed during construction are summarized on Table 4-2 and are included in Appendix G.

4.5.4 Hydraulic Conductivity

Fourteen (14) hydraulic conductivity (ASTM D 2434) tests were performed on samples of Cap Protective Layer at the off-site geotechnical laboratory, EGT. Samples of the Cap Protective Layer were collected as the material was placed. Hydraulic conductivity tests were to be performed at a minimum frequency of 1 test per 5,000 cubic yards (cyd) of Cap Protective Layer. The actual CQA test frequency of 1 test per 4,910 cyd (approx.) of Cap Protective Layer exceeded the minimum testing frequency required by the CQA Documents. As indicated in summary Table 4-2 and the test reports included in Appendix G, the measured hydraulic conductivities of all Cap Protective Layer samples met the range of hydraulic conductivity of 1.0×10^{-2} cm/sec to 1.0×10^{-5} cm/sec required by the CQA Documents.

4.5.5 Density and Percent Compaction

In-situ nuclear moisture/density tests were required to be performed at a frequency of 5 tests per acre per lift for earthwork performed using Cap Protective Layer. If the density test failed to meet the minimum compaction requirements, the contractor reworked and recompacted the area surrounding the failure, and the area was retested by CQA personnel. The procedure was repeated until satisfactory moisture/density test results were obtained at each test location.

Approximately 68,750 cyd of Cap Protective Layer was used to construct the Phase 1 partial closure system. Field logs of the in-place nuclear moisture/density tests performed to evaluate the compaction of the Cap Protective Layer are presented in Appendix H. A total of 180 nuclear moisture/density tests met CQA criteria, which correspond to a CQA test frequency of 7 tests per acre (approx.) of compacted Cap Protective Layer, which exceeds the minimum frequency stipulated in the CQA Documents.

4.5.6 Drive Cylinder Tests

In-situ moisture/densities were measured using the drive cylinder method (ASTM D 2937) periodically to verify the moisture/density tests results obtained using the nuclear gauge. A total of 8 moisture/densities were measured using the drive cylinder method for the Cap Protective Layer used in the construction of the Phase 1 partial closure system. A drive cylinder was collected for approximately every 25 nuclear density tests performed on the Cap Protective Layer, which meets the minimum testing frequency required by the CQA Documents. The Drive cylinder test logs have been included in Appendix I. As noted, the densities measured using the two methods were in general agreement.

4.6 Vegetative Layer Soil

4.6.1 General

The second protective soil layer component of the Phase 1 partial closure system included a minimum 6-inch layer of Vegetative Layer Soil over the Cap Protective Cover Layer. Earthwork using Vegetative Layer Soil consisted of the following activities:

- excavation, mixing with screened organics, and hauling of Vegetative Layer Soil material to the site in articulated, off-road dump trucks from the adjacent borrow area;
- dumping the material at the toe of the side slopes or down slope from the area on top of the Phase 1 area on which the soils were to be spread;

- placing, spreading, and grading Vegetative Layer Soil using low ground pressure GPS equipped bulldozers; and

- tracking-in the Vegetative Layer Soil using a bulldozer.

During placement of the Vegetative Layer Soil, CQA personnel monitored the contractor's activities to assure that the risk of damage to the underlying geosynthetics was minimized. CQA personnel also monitored the placement of the Vegetative Layer Soil materials used in construction of the Phase 1 partial closure system. Vegetative Layer Soil was not compacted except by tracking-in the material with a bulldozer. The testing performed on Vegetative Layer Soil materials are discussed below.

4.6.2 Grain Size Analyses, USCS Classification, and Organic Content

Grain-size distribution analyses (ASTM D 422) were performed to evaluate the USCS classification (ASTM D 2487) of Vegetative Layer Soil material used in the construction of the Phase 1 partial closure system. Organic content tests, as measured in accordance with ASTM D 2974, were also performed. Grain size distribution analyses, USCS classification and organic content were required to be performed at a minimum frequency of 1 test per 5,000 cubic yards (cyd) of Vegetative Layer Soil.

Five (5) grain-size distribution analyses, USCS classification and organic content tests were performed for approximately 21,000 cyd of in-place Vegetative Layer Soil used in the Phase 1 partial closure construction. The actual CQA test frequency of 1 test per 4,200 cyd (approx.) of in-place Vegetative Layer Soil exceeded the minimum testing frequency required by the CQA Documents. The grain-size distribution analyses, USCS classification, and organic content analyses performed during construction are summarized on Table 4-3 and included in Appendix J. As noted, the fill materials used to construct the Phase 1 partial closure system classified as SP-SM or SM in accordance with the USCS classification.

Table 4-1

LABORATORY TEST RESULTS FOR GENERAL FILL USED IN CONSTRUCTION OF THE PHASE 1 PARTIAL CLOSURE SYSTEM

	PARTICLE SIZE ANALYSIS	SOIL CLASSIFICATION	STANDARD PROCTOR
TEST STANDARD	ASTM D 422	ASTM D 2487	ASTM D 698
TESTING FREQUENCY	1 test per 10,000 yd^3	1 test per 10,000 yd^3	1 test per 25,000 yd^3
TEST RESULTS			
Sample ID	Percent Passing No. 200 Sieve (%)	Soil Classification [1]	Max Dry Unit Wt. @ Optimum Moisture Content	Pass/Fail (P/F)
GF-01	7.4	SP-SM	105.0 pcf @14.5%	P
GF-02	9.2	SP-SM	105.1 pcf @13%	P
GF-03	9.5	SP-SM	105.4 pcf @14.6%	P
GF-04	10.1	SP-SM	N/A [2]	P
GF-05	10.3	SP-SM	N/A	P
GF-06	2.7	SP	N/A	P
GF-07	4.0	SP	N/A	P
GF-08	5.3	SP-SM	N/A	P
GF-09	5.8	SP-SM	N/A	P
GF-10	6.2	SP-SM	N/A	P
GF-11	5.1	SM	N/A	P
GF-12	5.4	SP-SM	N/A	P
GF-13	10.8	SP-SM	N/A	P

Notes:

[1] General fill soils were required to classify as SW, SP, SW-SM, SW-SC, SP-SM, SP-SC, SM or SC.

[2] N/A = Not applicable

Table 4-2

LABORATORY TEST RESULTS FOR CAP PROTECTIVE LAYER SOILS USED IN CONSTRUCTION OF THE PHASE 1 PARTIAL CLOSURE SYSTEM

	PARTICLE SIZE ANALYSIS	SOIL CLASSIFICATION	ATTERBERG LIMITS	STANDARD PROCTOR	HYDRAULIC CONDUCTIVITY
TEST STANDARD	ASTM D 422	ASTM D 2487	ASTM D 4318	ASTM D 698	ASTM D 2434
TESTING FREQUENCY	1 test per 5,000 yd^3	1 test per 5,000 yd^3	1 test per 5,000 yd^3	1 test per 25,000 yd^3	1 test per 5,000 yd^3

TEST RESULTS

Sample ID	Percent Passing No. 200 Sieve (%) [1]	Soil Classification [2]	LL/PL/PI [3]	Max Dry Unit Wt. @ Optimum Moisture Content	Hydraulic Conductivity [4] (cm/sec)	Pass/Fail (P/F)
PC-01	8.2	SP-SM	NP/NP/NP	105.2 pcf @14.6%	4.0E-03	P
PC-02	8.0	SP-SM	NP/NP/NP	101.1 pcf @18%	2.6E-03	P
PC-03	7.6	SP-SM	NP/NP/NP	104.0 pcf @14.7%	3.1E-03	P
PC-04	5.3	SP-SM	NP/NP/NP	N/A [5]	8.6E-03	P
PC-05	8.1	SP-SM	NP/NP/NP	N/A	8.4E-03	P
PC-06	6.9	SP-SM	NP/NP/NP	N/A	4.5E-03	P
PC-07	6.3	SP-SM	NP/NP/NP	N/A	4.7E-03	P
PC-08	9.4	SP-SM	NP/NP/NP	N/A	7.1E-03	P
PC-09	6.7	SP-SM	NP/NP/NP	N/A	3.3E-03	P
PC-10	6.6	SP-SM	NP/NP/NP	N/A	3.9E-03	P
PC-11	18.4	SM	NP/NP/NP	N/A	5.5E-03	P
PC-12	6.8	SP-SM	NP/NP/NP	N/A	5.4E-03	P
PC-13	6.9	SP-SM	NP/NP/NP	N/A	6.2E-03	P
PC-14	5.6	SP-SM	NP/NP/NP	N/A	6.4E-03	P

Notes:

[1] Soils with fines content higher than 15% were accepted provided they met the specified hydraulic conductivity requirements.

[2] Cap protective layer soils were required to classify as SW, SP, SW-SM, SW-SC, SP-SM, or SP-SC; other soil classification may be accepted by the Engineer provided the soil meets the hydraulic conductivity requirement.

[3] NP= Non Plastic

[4] Required hydraulic conductivity within the range of $1.0x10^{-2}$ cm/sec to $1.0x10^{-5}$ cm/sec

[5] N/A = Not applicable

Table 4-3

LABORATORY TEST RESULTS FOR VEGETATIVE LAYER SOIL USED IN CONSTRUCTION OF THE PHASE 1 PARTIAL CLOSURE SYSTEM

	PARTICLE SIZE ANALYSIS	SOIL CLASSIFICATION	ORGANIC CONTENT	
TEST STANDARD	ASTM D 422	ASTM D 2847	ASTM D 2974	
TESTING FREQUENCY	1 test per 5,000 yd^3	1 test per 5,000 yd^3	1 test per 5,000 yd^3	
TEST RESULTS				
Sample No.	Percent Passing No.200 Sieve (%)	Classification	Organic Content (%)	Pass/Fail (P/F)
VC-01	9.8	SP-SM	5.4	P
VC-02	10.9	SP-SM	7.3	P
VC-03	6.4	SP-SM	6.7	P
VC-04	12.0	SP-SM	7.2	P
VC-05	14.7	SM	6.1	P

5. CONSTRUCTION QUALITY ASSURANCE - GEOSYNTHETICS

5.1 General

Geosyntec monitored the installation of the geosynthetic components of the Phase 1 partial closure system at the JED facility, to include the geomembrane used as the primary infiltration barrier and the drainage geocomposite used to convey infiltration from the protective soil layers to the storm water management system. This section includes documentation that shows all geosynthetic materials used in the project met the requirements of the CQA Documents.

5.2 CQA of Textured Geomembrane

5.2.1 Conformance Testing and Documentation

A 40-mil textured geomembrane was installed as part of the Phase 1 partial closure system. The 40-mil textured, Micro spike LLDPE geomembrane, was supplied by Agru America, Inc. (Agru), Georgetown, South Carolina. Conformance samples of textured geomembrane were collected (from the rolls produced for the project) by the off-site geosynthetics laboratory, TRI, which coordinated with the manufacturer to collect the CQA samples at Agru's manufacturing plant located in Georgetown, South Carolina. TRI also performed the CQA conformance testing in accordance with the CQA Documents on the samples of textured geomembrane collected.

The MQC certificates and test results and the CQA conformance test results were reviewed by CQA personnel and were found to be in compliance with the CQA Documents. The results of the MQC and CQA conformance tests are summarized in Tables 5-2A, 5-2B, and 5-2C. Table 5-2A presents the CQA and MQC test results for the textured geomembrane. Table 5-2B presents the MQC test results for the resin used in the manufacture of the geomembrane lots and welding rods used for the project. Table 5-2C presents MQC geomembrane properties for dimensional stability and notched constant tensile load. Tables' 5-2A, 5-2B, and 5-2C summarize the CQA tests performed, the required CQA test frequencies, and the CQA Documents acceptance criteria. The geomembrane MQC certificates have been included in Appendix K.

It is noted that Table 5-2A is organized with respect to the resin lot numbers and indicates the roll numbers from each resin lot that were sampled and tested as part of the MQC and CQA conformance testing. Each sheet of Table 5-2A also presents the total number of rolls (and square footage) of the textured geomembrane received from the respective resin lot number and the cumulative number of rolls (and square footage) of the textured

geomembrane received for the project (to evaluate the MQC and CQA test frequencies for each lot and for the project).

A total of thirteen (13) CQA conformance samples were tested. The number of conformance tests was based on the approximately 1,260,630 ft^2 of textured geomembrane delivered to the site for installation in the Phase 1 partial closure system. The actual rolls delivered to the site are recorded in geomembrane material inventory logs included in Appendix L to this certification report. The actual CQA test frequency of 1 test per 96,972 ft^2 for the textured geomembrane exceeded the minimum frequency of 1 test per 100,000 ft^2 required by the CQA Documents. As a minimum, one conformance sample was tested during CQA from each resin lot supplied for the project. The CQA laboratory test results for the geomembrane conformance samples have been included in Appendix M.

5.2.2 Field Monitoring Activities

5.2.2.1 Delivery and On-Site Storage

Upon delivery to the site, geomembrane rolls were inventoried and stored in an area located on top of the landfill at the southeast corner of the Phase 1 area. The geomembrane rolls were stacked on an elevated earthen platform. The rolls were transported on the site by an off-road forklift or front end loader with a spreader bar attachment using the nylon slings which were attached to each roll. CQA personnel monitored the installer's delivery, unloading, and storage procedures to ensure that the material was handled in an appropriate manner. The CQA personnel also compared the roll numbers of the geomembrane rolls delivered to the manufacturer's bill of lading and to the MQC and CQA data previously collected on the rolls. Only approved rolls were found to have been shipped and were subsequently incorporated into the work.

5.2.2.2 Deployment

The geomembrane rolls were lifted using a spreader bar attached to an off-road forklift or front end loader and unrolled by winching from equipment positioned at the base of the landfill side slopes. The panels were positioned as necessary using laborers. Vehicles were not allowed to traffic directly over deployed geosynthetics.

CQA personnel monitored the deployment of each geomembrane panel. During deployment, the CQA personnel checked for the following:

- manufacturing defects;
- damage that may have occurred during shipment, storage, and handling; and

- damage resulting from installation activities, including damage as a consequence of panel placement, seaming operations, or weather.

If any materials were observed to be damaged or deficient, the installer was notified and the damaged materials were either discarded or repaired. CQA personnel observed and documented the repair locations to verify compliance with the CQA Documents. Details of the geomembrane panel placement were recorded by CQA personnel on panel placement logs, which are included in Appendix N of this certification report.

Prior to deployment of any geomembrane panel, the surface on which the geomembrane would be installed was inspected by the geosynthetics installer and CQA personnel. Any areas that could potentially damage the geomembrane liner were identified and repaired as required. Once acceptable, the installer provided a signed and dated certificate of acceptance of the subgrade surface which has been included ion Appendix O.

5.2.2.3 *Trial Seams*

Prior to production seaming, the installer prepared geomembrane trial seams for each piece of seaming equipment proposed to be used that day. Additional trial seams were prepared at mid-shift during the day or when field conditions changed. CQA personnel evaluated the trial seams as follows:

- trial seams were welded under similar conditions as production seaming;
- test strips were cut from the trial seams at random locations with a die press;
- four (4) test strips were tested using a field tensiometer and compared to the passing criteria for the tests, which were as follows:

Fusion

- *Peel tests* - a minimum bonded seam strength of 50 lb/in (inside/outside); and
- *Shear test* - a minimum bonded seam strength of 60 lb/in.

Extrusion

- *Peel test* - a minimum bonded seam strength of 44 lb/in; and
- *Shear test* - a minimum bonded seam strength of 60 lb/in.

If trial welds failed, the machine or welding process was adjusted and two new trial seam were prepared. The new sample was tested to ensure compliance with the above strength requirements. The procedure was repeated, as needed, until strength criteria were met.

Trial seam samples were not archived. Details of the trial seams, including the trial seam test results, are included in Appendix P of this certification report.

5.2.2.4 Production Seams

Geomembrane production seaming operations were monitored by CQA personnel. The majority of the geomembrane production seams were fabricated using double-track fusion welders. Seam repairs were made using hand-held extrusion welders. Rub sheets were periodically used during production seaming to provide a clean surface to weld over. During or after fabrication, the geomembrane seams were visually examined for workmanship and continuity. Geomembrane production seam logs are included in Appendix Q of this certification report.

5.2.3 Nondestructive Seam Testing

5.2.3.1 Scope

Nondestructive testing of geomembrane seams was monitored by CQA personnel. All geomembrane seams were nondestructively tested for continuity by the installer using the air pressure procedure for double-track fusion seams and the vacuum-box test procedure for extrusion welded seams. Failed air pressure seams, if applicable, were capped and then retested using the nondestructive test appropriate for type of seaming device used for cap (i.e., fusion or extrusion). Leaks identified using the vacuum-box method were repaired and retested as described in Section 5.2.5.

5.2.3.2 Air Pressure Testing

Accessible double-track fusion seams were nondestructively tested using the air pressure test. The procedure used by the installer for air pressure testing was as follows:

- visually observe the integrity of the annulus of the section of seam being tested and isolate the section by sealing the ends using heat and pressure;
- insert the needle of a pressure test apparatus into the annulus at one end of the seam;
- inflate the annulus to a gauge pressure between 25-30 pounds per square inch (psi) with an air pump and maintain the gauge pressure for at least 5 minutes;
- repair faulty areas in accordance with Section 5.2.5 if the pressure loss exceeds 2 psi or if the pressure does not stabilize; and
- confirm airflow through the entire annulus by releasing the air from the seam at the opposite end from where the needle was inserted.

5.2.3.3 Vacuum-Box Testing

The vacuum-box was used by the installer to nondestructively test extrusion seams and repairs. The procedure used by the installer for vacuum testing was as follows:

- wet a strip of seam with a soapy solution;
- place the vacuum-box assembly over the wetted area, close the bleed valve and open the vacuum valve;
- force the box onto the sheet until a vacuum is observed and the gauge indicates a minimum vacuum of 5 psi;
- examine the seam through the viewing window for a period of approximately 15 seconds for the occurrence of air bubbles;
- if no air bubbles appear after 15 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum of 3 inch overlap, and continue the process over the entire length of the seam; and
- mark the location of any leaks for repair.

Nondestructive seam test results for the Phase 1 partial closure system are presented in the production seaming logs in Appendix Q of this certification report. If nondestructive testing indicated that repairs were necessary, repairs were made in accordance with procedures presented in Section 5.2.5. All extrusion welded repairs were tested using the vacuum-box test procedure.

5.2.4 Destructive Seam Sample Testing

5.2.4.1 Scope

In accordance with the CQA Documents, CQA personnel identified and collected geomembrane seam samples for destructive testing at a minimum frequency of 1 destructive sample for each 500 linear feet (lf) of seam. The samples were tested by the off-site geosynthetics laboratory, TRI. For a destructive seam sample to be considered as passing, the seam strength criteria described in Section 5.2.2.3 had to be met in at least four out of the five test specimens obtained from the sample.

5.2.4.2 Sampling Procedures

Prior to the removal of the full seam sample, two seam test strips were taken by the installer from either end of the proposed destructive sample. Each strip was peel-tested in the field by the installer using a calibrated tensiometer. A copy of the Tensiometer

calibration certificate is included in Appendix R. If the peel samples exhibited passing results, the adjacent destructive seam sample was removed and tested. At each destructive seam sample location, a test sample measuring approximately 12 inches (in.) across the seam and 42 in. along the seam was obtained. The sample was divided into three pieces and distributed to: (i) the off-site geosynthetics laboratory for testing, (ii) the installer, and (iii) the owner as an archive sample. Archive samples for the destructive seam samples are stored at the JED facility.

5.2.4.3 Test Results

Off-site laboratory testing of geomembrane seam samples was performed in accordance with the CQA Documents. At the off-site geosynthetics laboratory, five 1-in. wide test specimens were removed from the destructive seam sample using a die press. On a calibrated tensiometer, five test specimens were peel-tested for adhesion strength. For fusion seams, peel tests were performed on both the bottom (inside track) and top (outside track) edges. Additionally, five specimens were tested for shear strength. The seam acceptance/rejection criteria described in Sections 5.2.2.3 were used to evaluate the destructive seam samples.

The destructive seam test results for the liner installed for the Phase 1 partial closure are presented in Tables 5-2D. The destructive seam test logs for the geomembrane installed in the Phase 1 partial closure system are presented in Appendix S. The reports of laboratory destructive seam testing by TRI are presented in Appendix T. For the geomembrane installed in the Phase 1 partial closure system, one hundred-twelve (112) destructive seam samples were tested for a total seam length of 52,672 ft (approx.). The actual destructive seam test frequency of 1 test per 470 lf exceeded the minimum frequency of 1 per 500 lf of production seams required by the CQA Documents.

All geomembrane seam samples, which passed the field testing, were sent to TRI, the off-site CQA geosynthetics laboratory for destructive testing. All destructive seam samples taken during construction of the Phase 1 partial closure system met the strength criteria noted in Section 5.2.2.3.

5.2.5 Geomembrane Repairs

The repair procedures presented in this subsection were used by the installer to patch holes and tears, spot-extrude impact damage or other minor defects, and for grinding and extrusion welding small sections of failed fusion seams (if the exposed edge was accessible). In most cases patches or caps were used to repair the damaged geomembrane (i.e., small holes, tears, or on seams which failed nondestructive or destructive testing).

During the repair operations, the following procedures were implemented:

- technicians and seaming equipment used were required to pass trial welds;
- patches or caps extended at least 6 in. beyond the edge of the defect and all corners were rounded; and
- repairs were nondestructively tested and visually observed for continuity.

Repair summary logs prepared by Geosyntec during CQA activities are included in Appendix U of this certification report. The geomembrane panel record drawing indicating the layout of panels, location of seams, destructive samples, and repairs for the Phase 1 partial closure system is included in Appendix D.

5.3 CQA of Drainage Geocomposite

5.3.1 Conformance Testing and Documentation

The drainage geocomposite used was 8E-250-8E double-sided geocomposite manufactured by Agru America Inc. (Agru), Georgetown, South Carolina. The drainage geocomposite conformance samples were collected by TRI, which coordinated with the manufacturer to collect the CQA samples at the Agru manufacturing plant in Georgetown, South Carolina. TRI also performed the CQA conformance testing on the samples of drainage geocomposite collected.

The MQC certificates and test results and the CQA conformance test results were reviewed by CQA personnel and were found to be in compliance with the CQA Documents. The results of the MQC and CQA conformance tests for 431 rolls (1,250,000 ft^2) of geocomposite are summarized in Tables 5-3A, 5-3B, and 5-3C. Table 5-3A presents the CQA and MQC test results for the geocomposite rolls produced for the project. Table 5-3B presents the CQA and MQC test results for the geotextile rolls used to manufacture the geocomposite rolls produced for the project. Table 5-3C presents the MQC test results for the geonet rolls used to manufacture the geocomposite rolls for the project. The drainage geocomposite MQC Certificates and test results are included in Appendix V.

Table 5-3A presents the CQA and MQC test results for the drainage geocomposite rolls. Table 5-3A also indicates tests conducted, required test frequencies, and acceptance criteria in accordance with the CQA Documents. A total of seven (7) CQA conformance samples were tested for approximately 1,250,000 ft^2 of drainage geocomposite approved for installation in the Phase I partial closure system. The actual CQA test frequency of 1 test per 178,570 ft^2 (approx.) of the drainage geocomposite exceeded the minimum frequency of 1 test per 200,000 ft^2 required by the CQA Documents. As noted in Table 5-3A, a minimum of one conformance sample was tested during CQA from each drainage geocomposite lot.

It is noted that during CQA and MQC testing, the transmissivity of the drainage geocomposite was measured under compressive stresses of 500 psf for a period of 24 hours. The tests were performed with the drainage geocomposite sandwiched between 40-mil textured geomembrane and the soil actually used as part of the cap protective cover layer. The transmissivity of the geocomposite reported in Table 5-3A is the minimum transmissivity measured during the 24-hour tests. The measured transmissivity of the geocomposite was greater than 6.14×10^{-4} meter^2 per second in all samples which exceeds the requirement of the CQA Documents. The drainage geocomposite conformance test results (TRI) are presented in Appendix W.

Table 5-4B presents the CQA and MQC test results for the geotextile component of the drainage geocomposite rolls approved for the project. The 8 oz/yd^2 nonwoven geotextile fabric used in the drainage geocomposite was manufactured by Dalco Nonwovens, LLC of Conover, North Carolina. Several rolls of drainage geocomposite were manufactured from the same roll of geotextile. Approximately 2,673,750 ft^2 of geotextile was used to manufacture the drainage geocomposite rolls for the project. As part of the CQA testing, fourteen (14) geotextile rolls were tested for mass per unit area, grab strength, and trapezoidal tear strength. Apparent opening size and permittivity tests were performed on six (6) geotextile samples. The approximate CQA test frequencies of 1 test per 190,982 ft^2 or 445,625 ft^2 for the geotextile component of the drainage geocomposite exceeds the minimum frequencies of 1 test per 200,000 ft^2 or 500,000 ft^2 required by the CQA Documents, for the respective tests. The geotextile MQC Certificates and CQA conformance test results are presented in Appendix X and Y, respectively.

5.3.2 Field Monitoring Activities

5.3.2.1 Delivery and On-Site Storage

Upon delivery to the site, the drainage geocomposite rolls were inventoried and stored in an area located on top of the landfill at the southeast corner of the Phase 1 area. The rolls were transported by an off-road forklift or front end loader. CQA personnel monitored the installer's delivery, unloading, and storage procedures to ensure that the material was handled in an appropriate manner. The CQA personnel also compared the roll numbers of the drainage geocomposite rolls delivered to the manufacturer's bill of lading. Only rolls that were approved for installation based on MQC documentation and CQA test results were used for construction

5.3.2.2 Deployment

CQA personnel monitored the deployment of the drainage geocomposite for the following:

- manufacturing defects;

- damage that may have occurred during shipment, storage, and handling; and
- damage resulting from installation activities.

If the materials were observed to be damaged, the installer was notified and the damaged materials were either discarded or repaired. CQA personnel observed repair locations to verify conformance with the CQA Documents.

CQA personnel monitored the deployment of the drainage geocomposite, as well as its condition after installation, to confirm that the installer took measures to:

- unroll the geocomposite down the slope (i.e., rolls were aligned perpendicular to the slope contours) in a manner that kept the panel in sufficient tension to avoid excessive wrinkling;
- avoid entrapment of dust, stones, or other objects that would damage or clog the geocomposite;
- avoid damaging the underlying geomembrane during deployment;
- overlap the bottom geotextile edges;
- secure the geonet component of adjacent geocomposite panels with nylon fasteners, installed on a maximum 5-ft spacing laterally and at 1-ft spacing on end seams; and
- overlap and continuously sew the upper geotextile edges.

Any observed holes in the geotextile component of the drainage geocomposite were repaired by placing a patch of non-woven geotextile over the hole that extended at least one foot beyond the edge of the hole. These patches were continuously thermally bonded to the undamaged portion of the drainage geocomposite. This method was also used along the tie-in of end of panels and along trimmed panels. Any observed holes or tears in the geonet component of the composite were repaired by the installer by placing a patch of the same material over or under the hole or tear, at least 2-ft beyond the edges of the hole or tear. These patches were secured using nylon fasteners, followed by thermal bonding of the uppermost geotextile of the patch to the undamaged portion of the drainage geocomposite.

5.4 Interface Friction Testing

As discussed in Section 2, the Phase 1 partial closure system at the JED facility consists (from top to bottom) of the cap protective soil layers, geocomposite, geomembrane, and

prepared subgrade. Tests were performed in accordance with the CQA Documents to evaluate the interface shear strength for the various components of the cover system. All tests for interface shear strength were performed by SGI Testing Services.

The interface shear tests were performed as part of CQA testing. The tests were performed using samples of geosynthetics collected from rolls that were actually installed in the Phase 1 partial closure system. The CQA documents required that interface shear tests be performed at a frequency of 1 composite test per 10-acres of closure. The materials for the Cap Protective Cover and General Fill (subgrade) were obtained from the Bronson's borrow area and were representative of the same soils used in construction. The following rolls of geosynthetics were used for the CQA interface shear testing:

Test Series 1:

- Textured Geomembrane –Roll # 310219; and
- Geocomposite – Roll # 510575-09.

Test Series 2:

- Textured Geomembrane –Roll # 310119; and
- Geocomposite – Roll # 511188-09.

Test Series 3:

- Textured Geomembrane –Roll # 312451; and
- Geocomposite – Roll # 511601-09.

The interface shear strength testing using a composite (i.e., "sandwich") test for the components of the final cover system was tested at normal stresses of 100 psf, 300 psf, and 500 psf. Peak (at small displacement) and residual (at large displacements) shear strengths were measured at each normal stress. The interface shear "sandwich" tests were conducted under wetted/saturated conditions. The following liner system interfaces were tested in the "sandwich" test (from top to bottom):

- Cap Protective Cover / Drainage Geocomposite;
- Drainage Geocomposite / Textured geomembrane; and
- Textured geomembrane / General Fill (liner subbase)

The peak interface shear strength envelope for the "sandwich" required by the CQA Documents should equal or exceed an envelope characterized by an effective friction angle of 25.6° assuming no adhesion. The measured peak and residual shear strength data for all the tests performed by SGI are included in Appendix Z. The peak shear

strength friction angle for test series 1 and series 2 was 32 °, and 31 ° for test series 3. These results indicate that the peak shear strengths for the interface strength meet the requirements of the CQA Documents for the Phase 1 partial closure system.

Table 5-2A

CQA AND MQC TEST RESULTS FOR 40-mil TEXTURED LLDPE GEOMEMBRANE (AGRU)
RESIN LOT NO. CXF810160

	CONSTRUCTION QUALITY ASSURANCE (CQA)								MANUFACTURING QUALITY CONTROL (MQC)									
PROPERTY	Thickness (mil)	Density (g/cm³)	Carbon Black Content (%)	Carbon Black Dispersion	Yield Strength[2] (lb/in)	Break Strength[2] (lb/in)	Yield Elongation[2] (%)	Break Elongation[2] (%)	Thickness[1] (mil)	Density (g/cm³)	Carbon Black Content (%)	Carbon Black Dispersion	Yield Strength[2] (lb/in)	Break Strength[2] (lb/in)	Yield Elongation[2] (%)	Break Elongation[2] (%)	Tear Resistance[2] (lb)	Puncture Resistance (lb)
TEST STANDARD	ASTM D 5994	ASTM D 1505	ASTM D 4218	ASTM D 5596	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 5994	ASTM D 792	ASTM D 4218	ASTM D 5596	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 1004	ASTM D 4833
PROJECT SPECS.	≥ 40 / 36	≥ 0.93	2 to 3	See Note 3	N/A for LLDPE	≥ 60	N/A for LLDPE	≥ 250	≥ 40 / 36	≥ 0.93	2 to 3	See Note 3	N/A for LLDPE	≥ 60	N/A for LLDPE	≥ 250	≥ 22	≥ 44
TESTING FREQUENCY	1 per 100,000 ft²[4]								1 per 50,000 ft²[4]									

ROLL NUMBER	CQA REPORT ID	TEST RESULTS								TEST RESULTS										PASS/FAIL (P/F)	
																				CQA	MQC
310219	E2324-73-03	46/43	0.94	2.49	10	N/A	141	N/A	499	46/42	0.94	2.33	10	N/A	159	N/A	520.2	42.2	94.7	P	P
310220										44/41	0.94	2.33	10	N/A	151	N/A	520.2	42.2	94.7		P
310221										46/41	0.94	2.33	10	N/A	156	N/A	520.2	42.2	94.7		P
310222										44/41	0.94	2.33	10	N/A	152	N/A	520.2	42.2	94.7		P
310223										45/39	0.94	2.34	10	N/A	155	N/A	520.2	42.2	94.7		P
310224										46/42	0.94	2.34	10	N/A	156	N/A	520.2	42.2	94.7		P
310225	E2324-75-08	43/40	0.94	2.32	10	N/A	130	N/A	483	45/41	0.94	2.17	10	N/A	171	N/A	509.4	42.5	99.8	P	P
310226										41/40	0.94	2.17	10	N/A	156	N/A	509.4	42.5	99.8		P
310328										42/41	0.94	2.17	10	N/A	159	N/A	509.4	42.5	99.8		P
310329										42/41	0.94	2.17	10	N/A	158	N/A	509	42.5	99.8		P

Notes:
1 Thickness was measured for every roll.
2 Minimum property value in machine direction (MD) and transverse direction (TD).
3 Project requirements for carbon black dispersion are: 8 of 10 in Category 1 or 2 and all in Category 1,2, or 3. Results are for Category 1 or 2.
4 A minimum of 1 test per lot was required.
5 Average / Minimum thickness

Average Roll Area (23 ft x 630 ft): 14,490 ft²
No. of Rolls in Lot: 10
Area in Lot: 144,900 ft²

SHEET NO. 1 OF 6
CUMULATIVE NUMBER OF ROLLS: 10
CUMULATIVE AREA: 144,900 ft²

Table 5-2A (continued)

CQA AND MQC TEST RESULTS FOR 40-mil TEXTURED LLDPE GEOMEMBRANE (AGRU)
RESIN LOT NO. CXF810170

	CONSTRUCTION QUALITY ASSURANCE (CQA)								MANUFACTURING QUALITY CONTROL (MQC)									
PROPERTY	Thickness (mil)	Density (g/cm³)	Carbon Black Content (%)	Carbon Black Dispersion	Yield Strength[2] (lb/in)	Break Strength[2] (lb/in)	Yield Elongation[2] (%)	Break Elongation[2] (%)	Thickness[1] (mil)	Density (g/cm³)	Carbon Black Content (%)	Carbon Black Dispersion	Yield Strength[2] (lb/in)	Break Strength[2] (lb/in)	Yield Elongation[2] (%)	Break Elongation[2] (%)	Tear Resistance[2] (lb)	Puncture Resistance (lb)
TEST STANDARD	ASTM D 5994	ASTM D 1505	ASTM D 4218	ASTM D 5596	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 5994	ASTM D 792	ASTM D 4218	ASTM D 5596	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 1004	ASTM D 4833
PROJECT SPECS.	≥ 40 / 36	≥ 0.93	2 to 3	See Note 3	N/A for LLDPE	≥ 60	N/A for LLDPE	≥ 250	≥ 40 / 36	≥ 0.93	2 to 3	See Note 3	N/A for LLDPE	≥ 60	N/A for LLDPE	≥ 250	≥ 22	≥ 44
TESTING FREQUENCY	1 per 100,000 ft²[4]								1 per 50,000 ft²[4]									

ROLL NUMBER	CQA REPORT ID	TEST RESULTS								TEST RESULTS										PASS/FAIL (P/F)	
																				CQA	MQC
310330										44/41	0.93	2.28	10	N/A	175	N/A	520.3	42.5	99.8		P
310331										44/42	0.93	2.28	10	N/A	176	N/A	520.3	42.5	99.8		P
310332										45/40	0.93	2.26	10	N/A	178	N/A	520.3	42.5	99.8		P
310333	E2324-77-06	45/40	0.94	2.48	10	N/A	127	N/A	509	45/43	0.93	2.26	10	N/A	179	N/A	520.3	42.5	99.8	P	P
310334										45/41	0.93	2.26	10	N/A	179	N/A	520.3	42.5	99.8		P
310335										44/41	0.93	2.38	10	N/A	141	N/A	497.5	42.6	102.5		P
310336										44/41	0.93	2.38	10	N/A	143	N/A	497.5	42.6	102.5		P
310337										44/40	0.93	2.38	10	N/A	140	N/A	497.5	42.6	102.5		P
310338										45/40	0.93	2.26	10	N/A	144	N/A	497.5	42.6	102.5		P
310339										45/41	0.93	2.28	10	N/A	145	N/A	497.5	42.6	102.5		P
310440	E2324-77-06	46/44	0.94	2.42	10	N/A	135	N/A	501	44/42	0.93	2.2	10	N/A	153	N/A	502.1	42.6	102.5	P	P
310441										46/42	0.93	2.2	10	N/A	159	N/A	502.1	42.6	102.5		P
310442										45/42	0.93	2.2	10	N/A	156	N/A	502.1	42.6	102.5		P
310443										43/39	0.93	2.2	10	N/A	149	N/A	502.1	42.6	102.5		P
310444										42/39	0.93	2.2	10	N/A	145	N/A	502.1	42.6	102.5		P
310445										43/41	0.93	2.35	10	N/A	150	N/A	508.5	42.7	100.9		P
310446										41/39	0.93	2.35	10	N/A	142	N/A	508.5	42.7	100.9		P
310447	E2324-79-02	45/42	0.94	2.43	10	N/A	126	N/A	487	43/38	0.93	2.27	10	N/A	150	N/A	508.5	42.7	100.9	P	P
310448										42/39	0.93	2.27	10	N/A	145	N/A	508.5	42.7	100.9		P

Notes:
1 Thickness was measured for every roll.
2 Minimum property value in machine direction (MD) and transverse direction (TD)
3 Project requirements for carbon black dispersion are: 8 of 10 in Category 1 or 2 and all in Category 1,2, or 3. Results are for Category 1 or 2.
4 A minimum of 1 test per lot was required
5 Average / Minimum thickness

Average Roll Area (23 ft x 630 ft) 14,490 ft²
No. of Rolls in Lot 19
Area in Lot: 275,310 ft²

SHEET NO. 2 OF 6
CUMULATIVE NUMBER OF ROLLS: 29
CUMULATIVE AREA: 420,210 ft²

Table 5-2A (continued)

CQA AND MQC TEST RESULTS FOR 40-mil TEXTURED LLDPE GEOMEMBRANE (AGRU)
RESIN LOT NO. CXF810170

	CONSTRUCTION QUALITY ASSURANCE (CQA)								MANUFACTURING QUALITY CONTROL (MQC)									
PROPERTY	Thickness (mil)	Density (g/cm^3)	Carbon Black Content (%)	Carbon Black Dispersion	Yield Strength[2] (lb/in)	Break Strength[2] (lb/in)	Yield Elongation[2] (%)	Break Elongation[2] (%)	Thickness[1] (mil)	Density (g/cm^3)	Carbon Black Content (%)	Carbon Black Dispersion	Yield Strength[2] (lb/in)	Break Strength[2] (lb/in)	Yield Elongation[2] (%)	Break Elongation[2] (%)	Tear Resistance[2] (lb)	Puncture Resistance (lb)
TEST STANDARD	ASTM D 5994	ASTM D 1505	ASTM D 4218	ASTM D 5596	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 5994	ASTM D 792	ASTM D 4218	ASTM D 5596	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 1004	ASTM D 4833
PROJECT SPECS.	≥ 40 / 36	≥ 0.93	2 to 3	See Note 3	N/A for LLDPE	≥ 60	N/A for LLDPE	≥ 250	≥ 40 / 36	≥ 0.93	2 to 3	See Note 3	N/A for LLDPE	≥ 60	N/A for LLDPE	≥ 250	≥ 22	≥ 44
TESTING FREQUENCY	1 per 100,000 ft^2 [4]								1 per 50,000 ft^2 [4]									

ROLL NUMBER	CQA REPORT ID	TEST RESULTS								TEST RESULTS										PASS/FAIL (P/F)	
																				CQA	MQC
310449										42/38	0.93	2.27	10	N/A	146	N/A	508.5	42.7	100.9		P
310450										43/40	0.93	2.25	10	N/A	138	N/A	521.9	42.7	100.9		P
310451										41/40	0.93	2.25	10	N/A	132	N/A	521.9	42.7	100.9		P
310552										42/39	0.93	2.25	10	N/A	133	N/A	521.9	42.7	100.9		P
310553										42/41	0.93	2.36	10	N/A	133	N/A	521.9	42.7	100.9		P
310554	E2324-79-02	44/40	0.935	2.53	10	N/A	120	N/A	478	42/40	0.93	2.36	10	N/A	133	N/A	521.9	42.7	100.9	P	P
310555										42/40	0.93	2.31	10	N/A	164	N/A	504.7	40.6	99.4		P

Notes:
1. Thickness was measured for every roll.
2. Minimum property value in machine direction (MD) and transverse direction (TD).
3. Project requirements for carbon black dispersion are: 8 of 10 in Category 1 or 2 and all in Category 1,2, or 3. Results are for Category 1 or 2
4. A minimum of 1 test per lot was required
5. Average / Minimum thickness

Average Roll Area (23 ft x 630 ft): 14,490 ft^2
No. of Rolls in Lot: 7
Area in Lot: 101,430 ft^2

SHEET NO. 3 OF 6
CUMULATIVE NUMBER OF ROLLS: 36
CUMULATIVE AREA: 521,640 ft^2

Table 5-2A (continued)

CQA AND MQC TEST RESULTS FOR 40-mil TEXTURED LLDPE GEOMEMBRANE (AGRU)
RESIN LOT NO. CXF810180

	CONSTRUCTION QUALITY ASSURANCE (CQA)								MANUFACTURING QUALITY CONTROL (MQC)									
PROPERTY	Thickness (mil)	Density (g/cm^3)	Carbon Black Content (%)	Carbon Black Dispersion	Yield Strength[2] (lb/in)	Break Strength[2] (lb/in)	Yield Elongation[2] (%)	Break Elongation[2] (%)	Thickness[1] (mil)	Density (g/cm^3)	Carbon Black Content (%)	Carbon Black Dispersion	Yield Strength[2] (lb/in)	Break Strength[2] (lb/in)	Yield Elongation[2] (%)	Break Elongation[2] (%)	Tear Resistance[2] (lb)	Puncture Resistance (lb)
TEST STANDARD	ASTM D 5994	ASTM D 1505	ASTM D 4218	ASTM D 5596	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 5994	ASTM D 792	ASTM D 4218	ASTM D 5596	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 1004	ASTM D 4833
PROJECT SPECS.	≥ 40 / 36	≥ 0.93	2 to 3	See Note 3	N/A for LLDPE	≥ 60	N/A for LLDPE	≥ 250	≥ 40 / 36	≥ 0.93	2 to 3	See Note 3	N/A for LLDPE	≥ 60	N/A for LLDPE	≥ 250	≥ 22	≥ 44
TESTING FREQUENCY	1 per 100,000 ft² [4]								1 per 50,000 ft² [4]									

ROLL NUMBER	CQA REPORT ID	TEST RESULTS								TEST RESULTS										PASS/FAIL (P/F)	
																				CQA	MQC
312116										42/40	0.94	2.26	10	N/A	150	N/A	493.8	39.5	98.5		P
312117										44/40	0.94	2.26	10	N/A	156	N/A	493.8	39.5	98.5		P
312118										44/41	0.94	2.26	10	N/A	156	N/A	493.8	39.5	98.5		P
312119										43/39	0.94	2.35	10	N/A	151	N/A	493.8	39.5	98.5		P
312220										44/41	0.94	2.35	10	N/A	158	N/A	493.8	39.5	98.5		P
312221	E2324-92-09	44/38	0.931	2.44	10	N/A	130	N/A	504	43/40	0.94	2.3	10	N/A	150	N/A	510.9	39.5	98.5	P	P
312222										43/42	0.94	2.3	10	N/A	150	N/A	510.9	39.5	98.5		P
312223										44/41	0.94	2.3	10	N/A	151	N/A	510.9	39.5	98.5		P
312224										43/41	0.94	2.38	10	N/A	150	N/A	510.9	39.5	98.5		P
312225										41/39	0.94	2.38	10	N/A	143	N/A	510.9	39.5	98.5		P
312226										41/39	0.94	2.35	10	N/A	147	N/A	496.0	10.9	92.2		P
312227										42/39	0.94	2.35	10	N/A	149	N/A	496.0	40.9	92.2		P

Notes:
1. Thickness was measured for every roll
2. Minimum property value in machine direction (MD) and transverse direction (TD).
3. Project requirements for carbon black dispersion are: 8 of 10 in Category 1 or 2 and all in Category 1,2, or 3. Results are for Category 1 or 2.
4. A minimum of 1 test per lot was required.
5. Average / Minimum thickness.

Average Roll Area (23 ft x 630 ft) 14,490 ft²
No. of Rolls in Lot: 12
Area in Lot: 173,880 ft²

SHEET NO. 4 OF 6
CUMULATIVE NUMBER OF ROLLS: 48
CUMULATIVE AREA: 695,520 ft²

Table 5-2A (continued)

CQA AND MQC TEST RESULTS FOR 40-mil TEXTURED LLDPE GEOMEMBRANE (AGRU)
RESIN LOT NO. CYB811210

	CONSTRUCTION QUALITY ASSURANCE (CQA)								MANUFACTURING QUALITY CONTROL (MQC)									
PROPERTY	Thickness (mil)	Density (g/cm³)	Carbon Black Content (%)	Carbon Black Dispersion	Yield Strength[2] (lb/in)	Break Strength[2] (lb/in)	Yield Elongation[2] (%)	Break Elongation[2] (%)	Thickness[1] (mil)	Density (g/cm³)	Carbon Black Content (%)	Carbon Black Dispersion	Yield Strength[2] (psi)	Break Strength[2] (psi)	Yield Elongation[2] (%)	Break Elongation[2] (%)	Tear Resistance[2] (lb)	Puncture Resistance (lb)
TEST STANDARD	ASTM D 5994	ASTM D 1505	ASTM D 4218	ASTM D 5596	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 5994	ASTM D 792	ASTM D 4218	ASTM D 5596	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 1004	ASTM D 4833
PROJECT SPECS.	≥ 40 / 36	≥ 0.93	2 to 3	See Note 3	N/A for LLDPE	≥ 60	N/A for LLDPE	≥ 250	≥ 40 / 36	≥ 0.93	2 to 3	See Note 3	N/A for LLDPE	≥ 60	N/A for LLDPE	≥ 250	≥ 22	≥ 44
TESTING FREQUENCY	1 per 100,000 ft²[4]								1 per 50,000 ft²[4]									

ROLL NUMBER	CQA REPORT ID	TEST RESULTS								TEST RESULTS										PASS/FAIL (P/F)	
																				CQA	MQC
312228	E2324-93-05	45/41	0.931	2.43	10	N/A	123	N/A	480	43/39	0.93	2.35	10	N/A	153	N/A	496.0	40.9	92.2	P	P
312229										44/42	0.93	2.35	10	N/A	157	N/A	496.0	40.9	92.2		P
312230										43/40	0.93	2.35	10	N/A	154	N/A	496.0	40.9	92.2		P
312231										43/41	0.93	2.4	10	N/A	154	N/A	506.2	40.9	92.2		P
312232										43/41	0.93	2.4	10	N/A	154	N/A	506.2	40.9	92.2		P
312233										44/40	0.93	2.4	10	N/A	157	N/A	506.2	40.9	92.2		P
312234										44/40	0.93	2.4	10	N/A	156	N/A	506.2	40.9	92.2		P
312235	E2324-93-05	44/40	0.931	2.46	10	N/A	124	N/A	448	44/40	0.93	2.4	10	N/A	156	N/A	506.2	40.9	92.2	P	P
312236										43/40	0.93	2.47	10	N/A	145	N/A	503.4	40.3	87.9		P
312237										42/38	0.93	2.47	10	N/A	143	N/A	503.4	40.3	87.9		P
312239										43/39	0.93	2.47	10	N/A	147	N/A	503.4	40.3	87.9		P
312240										43/41	0.93	2.47	10	N/A	145	N/A	503.4	40.3	87.9		P
312243										43/39	0.93	2.43	10	N/A	135	N/A	519.0	40.3	87.9		P
312244										42/40	0.93	2.43	10	N/A	134	N/A	519.0	40.3	87.9		P
312245	E2324-95-09	43/39	0.935	2.37	10	N/A	126	N/A	476	43/40	0.93	2.43	10	N/A	135	N/A	519.0	40.3	87.9	P	P
312246										43/39	0.93	2.27	10	N/A	141	N/A	522.6	41.0	95.4		P
312247										44/41	0.93	2.27	10	N/A	142	N/A	522.6	41.0	95.4		P
312248										43/39	0.93	2.27	10	N/A	141	N/A	522.6	41.0	95.4		P
312249										42/37	0.93	2.44	10	N/A	136	N/A	522.6	41.0	95.4		P
312250										42/39	0.93	2.44	10	N/A	136	N/A	522.6	41.0	95.4		P

Notes:
1. Thickness was measured for every roll.
2. Minimum property value in machine direction (MD) and transverse direction (TD).
3. Project requirements for carbon black dispersion are: 8 of 10 in Category 1 or 2 and all in Category 1,2, or 3. Results are for Category 1 or 2.
4. A minimum of 1 test per lot was required.
5. Average / Minimum thickness.

Average Roll Area (411 ft x 23 ft): 14,490 ft²
No. of Rolls in Lot: 20
Area in Lot: 289,500 ft²

SHEET NO. 5 OF 6
CUMULATIVE NUMBER OF ROLLS: 68
CUMULATIVE AREA: 985,320 ft²

Table 5-2A (continued)

CQA AND MQC TEST RESULTS FOR 40-mil TEXTURED LLDPE GEOMEMBRANE (AGRU)
RESIN LOT NO. CYB811210

	CONSTRUCTION QUALITY ASSURANCE (CQA)								MANUFACTURING QUALITY CONTROL (MQC)									
PROPERTY	Thickness (mil)	Density (g/cm³)	Carbon Black Content (%)	Carbon Black Dispersion	Yield Strength[2] (lb/in)	Break Strength[2] (lb/in)	Yield Elongation[2] (%)	Break Elongation[2] (%)	Thickness[1] (mil)	Density (g/cm³)	Carbon Black Content (%)	Carbon Black Dispersion	Yield Strength[2] (psi)	Break Strength[2] (psi)	Yield Elongation[2] (%)	Break Elongation[2] (%)	Tear Resistance[2] (lb)	Puncture Resistance (lb)
TEST STANDARD	ASTM D 5994	ASTM D 1505	ASTM D 4218	ASTM D 5596	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 5994	ASTM D 792	ASTM D 4218	ASTM D 5596	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 6693	ASTM D 1004	ASTM D 4833
PROJECT SPECS.	≥ 40 / 36	≥ 0.93	2 to 3	See Note 3	N/A for LLDPE	≥ 60	N/A for LLDPE	≥ 250	≥ 40 / 36	≥ 0.93	2 to 3	See Note 3	N/A for LLDPE	≥ 60	N/A for LLDPE	≥ 250	≥ 22	≥ 44
TESTING FREQUENCY	1 per 100,000 ft² [4]								1 per 50,000 ft² [4]									

ROLL NUMBER	CQA REPORT ID	TEST RESULTS								TEST RESULTS										PASS/FAIL (P/F)	
																				CQA	MQC
312451										43/36	0.93	2.25	10	N/A	140	N/A	498.9	41.0	95.4		P
312452	E2324-97-03	42/39	0.935	2.5	10	N/A	124	N/A	438	44/40	0.93	2.25	10	N/A	145	N/A	498.9	41.0	95.4	P	P
312453										43/39	0.93	2.25	10	N/A	142	N/A	498.9	41.0	95.4		P
312454										42/39	0.93	2.25	10	N/A	137	N/A	498.9	41.0	95.4		P
312455										42/38	0.93	2.25	10	N/A	138	N/A	498.9	41.0	95.4		P
312456										43/40	0.93	2.55	10	N/A	141	N/A	491.3	40.6	96.4		P
312557										44/42	0.93	2.55	10	N/A	143	N/A	491.3	40.6	96.4		P
312558	E2324-97-03	41/38	0.935	2.52	10	N/A	122	N/A	467	43/39	0.93	2.55	10	N/A	142	N/A	491.3	40.6	96.4	P	P
312559										42/39	0.93	2.39	10	N/A	138	N/A	491.3	40.6	96.4		P
312560										43/41	0.93	2.39	10	N/A	142	N/A	491.3	40.6	96.4		P
312561										43/41	0.93	2.39	10	N/A	146	N/A	475.5	40.6	96.4		P
312562										42/38	0.93	2.39	10	N/A	143	N/A	475.5	40.6	96.4		P
312563										43/39	0.93	2.39	10	N/A	146	N/A	475.5	40.6	96.4		P
312564										42/39	0.93	2.29	10	N/A	143	N/A	475.5	40.6	96.4		P
312565	E2324-99-02	43/39	0.934	2.37	10	N/A	123	N/A	435	43/41	0.93	2.29	10	N/A	149	N/A	475.5	40.6	96.4	P	P
312566										42/38	0.93	2.12	10	N/A	134	N/A	501.6	38.5	86.4		P
312567										43/39	0.93	2.12	10	N/A	138	N/A	501.6	38.5	86.4		P
312568										43/39	0.93	2.12	10	N/A	135	N/A	501.6	38.5	86.4		P
312569										43/40	0.93	2.12	10	N/A	138	N/A	501.6	68.5	86.4		P

Notes:

1 Thickness was measured for every roll.
2 Minimum property value in machine direction (MD) and transverse direction (TD).
3 Project requirements for carbon black dispersion are: 8 of 10 in Category 1 or 2 and all in Category 1,2, or 3. Results are for Category 1 or 2.
4 A minimum of 1 test per lot was required.
5 Average / Minimum thickness.

Average Roll Area (411 ft x 23 ft): 14,490 ft²
No. of Rolls in Lot: 19
Area in Lot: 275,310 ft²

SHEET NO. 6 OF 6
CUMULATIVE NUMBER OF ROLLS: 87
CUMULATIVE AREA: 1,260,630 ft²

Table 5-2B

MQC TEST RESULTS FOR RESIN USED TO MANUFACTURE TEXTURED GEOMEMBRANE

	Product Name	Supplier Name	Density (g/cm^3)	Melt Index (g/10 min)	Percent of Reclaimed Polymer
TEST STANDARD			ASTM D1505	ASTM D 1238	
PROJECT SPECS.			≥ 0.915	≤ 1.0	0%
TESTING FREQUENCY			1 per Lot		

Geomembrane Lot Number	TEST RESULTS					PASS/FAIL (P/F)
CXF810160	Chevron Phillips	Agru	0.918	0.35	0%	P
CXF810170	Chevron Phillips	Agru	0.918	0.35	0%	P
CXF810180	Chevron Phillips	Agru	0.918	0.35	0%	P
CYB811210	Chevron Phillips	Agru	0.919	0.36	0%	P

Table 5-2C

MISCELLANEOUS MQC TEST RESULTS FOR 40-mil TEXTURED LLDPE GEOMEMBRANE (AGRU)

	Dimensional Stability (%)	Notched Constant Tensile Load (hrs)
TEST STANDARD	ASTM D 1204	ASTM D 5397
PROJECT SPECS.	≤ ± 2	≥ 200
TESTING FREQUENCY	1 per Lot	1 per 400,000

Geomembrane Lot Number	Geomembrane Roll Number	TEST RESULTS		PASS/FAIL (P/F)
CXF810160	310115	-0.66	Pass	P
CXF810170	310336	-0.70	Pass	P
CXF810180	324589-06	0.06	Pass	P
CYB811210	312336	-0.48	Pass	P

Table 5-2D

DESTRUCTIVE SEAM TEST RESULTS

Sample No.	Panel No.	Weld Type [1]	Peel Strength [2] (lb/in)										Shear Strength [3] (lb/in)					Failure Type [4]	Pass/Fail (P/F)
			Bottom Peel (inside)					Top Peel (outside)											
DP-1	P3/P4	F	109	102	106	105	101	104	104	102	108	105	119	118	117	117	115	FTB	P
DP-2	P5/P6	F	89	90	87	92	89	88	89	89	92	91	132	130	133	134	126	FTB	P
DP-3	P7/P8	F	108	107	104	106	111	99	96	96	98	98	124	125	125	127	125	FTB	P
DP-4	P10/P11	F	109	105	112	108	110	105	100	112	87	112	113	125	124	125	116	FTB	P
DP-5	P12/P13	F	105	100	97	109	103	108	105	104	107	104	124	122	122	124	125	FTB	P
DP-6	P13/P14	F	108	109	107	108	94	102	104	104	104	105	123	122	123	123	122	FTB	P
DP-7	P15/P16	F	101	106	103	100	104	88	89	86	90	91	121	120	123	120	122	FTB	P
DP-8	P16/P17	F	102	98	106	107	107	104	107	99	100	103	121	124	122	126	123	FTB	P
DP-9	P18/P19	F	98	100	100	100	101	103	103	109	104	98	119	122	124	124	124	FTB	P
DP-10	P22/P25	F	106	101	104	105	103	104	104	104	104	103	116	110	123	119	119	FTB	P
DP-11	P22/P23	F	107	105	104	103	101	101	105	104	105	98	127	127	126	126	123	FTB	P
DP-12	P24/P26	F	109	108	109	108	109	107	105	107	95	104	125	124	126	126	118	FTB	P
DP-13	TIE IN	E	117	113	134	100	125	N/A	N/A	N/A	N/A	N/A	135	126	123	113	128	FTB	P
DP-14	P28/P29	F	110	113	113	114	119	103	100	102	90	101	128	124	122	125	121	FTB	P
DP-15	P31/P32	F	108	108	109	105	105	110	113	103	111	112	117	118	119	120	122	FTB	P
DP-16	P33/P34	F	111	101	106	101	110	105	108	116	113	110	118	120	117	121	122	FTB	P
DP-17	P33/P34	F	111	118	112	110	111	109	111	107	104	102	118	120	120	120	122	FTB	P
DP-18	P35/P36	F	110	102	105	111	104	109	107	107	109	111	124	123	122	123	129	FTB	P
DP-19	P36/P37	F	112	104	104	105	104	88	86	85	86	87	122	122	121	126	120	FTB	P
DP-20	P37/P38	F	112	116	113	110	108	89	93	98	104	101	122	123	125	124	124	FTB	P
DP-21	P38/P39	F	115	102	111	113	116	103	116	107	114	115	129	125	129	126	123	FTB	P
DP-22	P40/P41	F	108	107	112	111	118	110	104	106	103	93	123	127	125	123	123	FTB	P
DP-23	P42/P43	F	109	115	107	109	110	102	111	100	106	103	128	123	124	123	125	FTB	P
DP-24	P42/P43	F	115	116	116	110	112	108	97	107	104	108	121	121	119	124	119	FTB	P
DP-25	P44/P45	F	105	99	98	109	98	107	103	105	114	103	126	122	123	122	122	FTB	P
DP-26	P46/P47	F	97	107	117	106	115	95	102	101	98	106	122	122	122	126	120	FTB	P
DP-27	P48/P49	F	110	107	107	107	108	117	114	116	114	112	123	126	122	128	120	FTB	P
DP-28	P49/P50	F	99	93	93	95	91	99	95	96	93	96	118	128	131	122	129	FTB	P
DP-29	P50/P51	F	97	102	106	96	99	102	93	91	107	99	123	125	122	121	122	FTB	P

Notes:

[1] "F" is fusion and "E" is extrusion weld.

[2] Specified peel strength: 50 lb/in for fusion and 44 lb/in for extrusion

[3] Specified shear strength: 60 lb/in for fusion and 60 lb/in for extrusion

[4] "FTB" is Film Tear Bond (maximum 10 percent seam separation).

Table 5-2D (continued)

DESTRUCTIVE SEAM TEST RESULTS

Sample No.	Panel No.	Weld Type [1]	Peel Strength [2] (lb/in)										Shear Strength [3] (lb/in)					Failure Type [4]	Pass/Fail (P/F)
			Bottom Peel (inside)					Top Peel (outside)											
DP-30	P51/P52	F	104	106	114	111	106	93	94	95	94	89	127	128	124	125	124	FTB	P
DP-31	P53/P54	F	99	101	105	105	100	101	104	95	99	95	122	123	126	124	121	FTB	P
DP-32	P55/P56	F	105	108	108	112	106	92	90	96	95	92	120	121	125	121	120	FTB	P
DP-33	P56/P57	F	110	111	107	109	116	105	106	109	110	116	124	126	123	121	121	FTB	P
DP-34	P28/P59	F	95	97	99	104	94	94	96	96	94	91	129	124	124	122	124	FTB	P
DP-35	P60/P61	F	110	109	102	109	112	110	109	109	100	107	122	121	119	118	124	FTB	P
DP-36	TIE IN	E	99	95	92	94	102	N/A	N/A	N/A	N/A	N/A	105	103	100	117	105	FTB	P
DP-37	P58/P65	F	114	110	110	113	110	114	112	109	109	110	122	127	123	122	124	FTB	P
DP-38	P67/P68	F	106	105	107	103	104	98	98	96	98	99	131	128	126	127	125	FTB	P
DP-39	P68/P69	F	105	94	109	106	106	107	103	109	109	107	127	123	125	131	124	FTB	P
DP-40	P70/P71	F	109	108	110	107	108	94	92	89	91	89	123	126	123	124	122	FTB	P
DP-41	P72/P73	F	95	97	99	102	91	101	97	102	101	98	121	118	118	117	119	FTB	P
DP-42	P66/P67	E	116	113	113	113	116	116	101	112	99	113	130	126	128	126	131	FTB	P
DP-43	P75/P76	F	104	89	94	107	101	94	97	91	99	101	122	125	119	119	119	FTB	P
DP-44	P73/ P74	F	110	99	105	100	100	107	101	106	106	102	107	101	106	106	102	FTB	P
DP-45	P77/P78	F	93	103	100	99	97	93	91	93	93	97	117	119	118	118	118	FTB	P
DP-46	P78/P79	F	96	104	99	102	99	103	94	96	95	89	117	121	119	121	121	FTB	P
DP-47	P81/P87	F	84	85	84	84	80	85	84	81	84	86	96	88	91	89	90	FTB	P
DP-48	TIE IN	E	105	106	107	105	108	N/A	N/A	N/A	N/A	N/A	99	98	95	110	92	FTB	P
DP-49	TIE IN	E	114	109	111	110	99	N/A	N/A	N/A	N/A	N/A	101	101	97	104	96	FTB	P
DP-50	TIE IN	E	111	109	113	107	108	N/A	N/A	N/A	N/A	N/A	104	106	103	97	103	FTB	P
DP-51	P88/P91	F	95	98	99	100	96	96	94	93	94	94	100	104	101	104	101	FTB	P
DP-52	P82/R-209	E	98	95	93	95	94	N/A	N/A	N/A	N/A	N/A	99	97	98	99	100	FTB	P
DP-53	P83/P84	F	104	102	106	105	108	85	91	97	96	89	118	117	115	113	116	FTB	P
DP-54	P99-P100	F	104	104	106	104	105	103	104	97	101	98	1114	114	97	101	98	FTB	P
DP-55	P85-P86	F	103	99	105	101	103	89	87	87	85	90	121	117	121	117	120	FTB	P
DP-56	P101-P102	F	104	105	106	107	101	97	91	91	91	93	119	120	118	119	119	FTB	P
DP-57	P102-P103	F	94	93	95	95	96	101	99	96	98	100	116	115	116	115	115	FTB	P
DP-58	P104-P105	F	107	103	106	104	105	90	87	87	88	90	115	117	115	118	117	FTB	P
DP-59	P107-P108	F	107	109	104	103	99	100	84	100	91	99	117	119	118	119	120	FTB	P

Notes:

1 "F" is fusion and "E" is extrusion weld.

2 Specified peel strength: 50 lb/in for fusion and 44 lb/in for extrusion

3 Specified shear strength: 60 lb/in for fusion and 60 lb/in for extrusion

4 "FTB" is Film Tear Bond (maximum 10 percent seam separation).

Table 5-2D (continued)

DESTRUCTIVE SEAM TEST RESULTS

Sample No.	Panel No.	Weld Type [1]	Peel Strength [2] (lb/in)										Shear Strength [3] (lb/in)					Failure Type [4]	Pass/Fail (P/F)
			Bottom Peel (inside)					Top Peel (outside)											
DP-60	P108-P115	F	93	95	93	97	95	96	95	91	92	91	105	95	96	102	95	FTB	P
DP-61	P113-P116	F	95	100	94	93	92	94	96	98	97	117	121	116	118	115	117	FTB	P
DP-62	P117-P118	F	101	88	100	96	103	103	93	99	93	97	114	119	118	114	114	FTB	P
DP-63	P118-P119	F	106	110	101	105	107	90	95	85	90	82	117	116	119	109	116	FTB	P
DP-64	P120-P121	F	103	96	97	95	110	103	104	106	104	105	119	115	120	115	117	FTB	P
DP-65	P124-P125	F	115	108	108	103	110	113	107	92	98	107	120	117	116	118	115	FTB	P
DP-66	P125-P126	F	101	100	96	106	98	109	94	93	95	87	116	110	111	113	111	FTB	P
DP-67	P127-P128	F	102	98	106	112	109	91	95	103	111	111	118	117	116	117	118	FTB	P
DP-68	P129-P130	F	95	96	99	93	104	101	87	101	91	95	114	107	116	114	106	FTB	P
DP-69	P130-P131	F	106	104	106	105	100	104	101	101	94	97	121	120	125	119	120	FTB	P
DP-70	P132-P133	F	104	106	110	106	105	93	92	94	99	96	114	109	111	112	109	FTB	P
DP-71	P134-P135	F	103	105	102	105	100	97	94	100	101	98	119	112	117	115	118	FTB	P
DP-72	P137-P138	F	98	100	100	96	97	97	98	95	98	99	109	112	106	112	106	FTB	P
DP-73	P139-P140	F	108	108	101	105	106	103	101	103	94	95	104	103	104	101	106	FTB	P
DP-74	P139-P149	F	90	93	92	92	90	86	88	90	94	91	104	108	98	92	89	FTB	P
DP-75	P149-P150	F	103	101	104	103	106	99	96	98	95	100	115	117	116	117	111	FTB	P
DP-76	P151-P152	E	101	96	93	92	94	91	92	95	101	97	122	119	124	118	120	FTB	P
DP-77	P153-P154	F	106	104	103	102	101	97	98	90	94	93	112	112	113	112	111	FTB	P
DP-78	P154-P155	F	99	96	97	98	98	95	102	95	96	92	111	112	112	112	111	FTB	P
DP-79	P156-P157	F	105	108	110	107	107	92	98	90	96	94	119	120	120	119	116	FTB	P
DP-80	P157-P158	F	111	101	110	102	103	105	101	104	103	101	116	116	117	115	117	FTB	P
DP-81	P159-P160	F	103	103	107	106	107	107	110	107	109	108	125	120	120	120	119	FTB	P
DP-82	P160-P161	F	101	101	97	101	95	96	101	98	99	98	115	117	117	115	114	FTB	P
DP-83	P162-P163	F	102	103	104	103	105	104	105	104	94	105	117	117	115	116	115	FTB	P
DP-84	P163-P164	E	104	101	103	103	101	98	88	999	87	103	117	117	117	115	113	FTB	P
DP-85	P165-P166	F	91	101	102	99	97	97	99	93	98	98	113	117	118	118	117	FTB	P
DP-86	P167-P168	F	101	102	105	103	103	92	89	91	91	94	117	116	117	117	116	FTB	P
DP-87	P168-P169	F	102	105	103	101	104	91	92	91	98	101	118	118	119	115	114	FTB	P
DP-88	P170-P171	F	100	108	95	104	107	108	108	104	104	101	117	117	116	115	118	FTB	P
DP-89	P172-P173	F	111	110	105	106	107	97	97	91	96	94	115	113	114	113	114	FTB	P

Notes:

[1] "F" is fusion and "E" is extrusion weld.

[2] Specified peel strength: 50 lb/in for fusion and 44 lb/in for extrusion

[3] Specified shear strength: 60 lb/in for fusion and 60 lb/in for extrusion

[4] "FTB" is Film Tear Bond (maximum 10 percent seam separation).

Table 5-2D (continued)

DESTRUCTIVE SEAM TEST RESULTS

Sample No.	Panel No.	Weld Type [1]	Peel Strength [2] (lb/in)										Shear Strength [3] (lb/in)					Failure Type [4]	Pass/Fail (P/F)
			Bottom Peel (inside)					Top Peel (outside)											
DP-90	P173-P174	F	102	95	92	89	102	98	98	99	98	96	113	117	116	114	113	FTB	P
DP-91	P175-P176	F	106	106	97	102	96	96	96	92	94	936	114	116	115	115	116	FTB	P
DP-92	P175-P176	F	108	103	99	95	96	109	113	102	103	104	116	117	115	115	117	FTB	P
DP-93	P178-P179	F	110	103	104	99	104	106	102	91	97	92	114	114	113	112	116	FTB	P
DP-94	P184-P189	F	100	103	92	107	91	96	107	108	91	100	115	114	116	115	117	FTB	P
DP-95	P180-P181	F	97	98	98	98	94	95	94	101	98	86	106	107	106	109	107	FTB	P
DP-96	P185-P186	F	110	109	110	110	106	94	95	90	84	90	116	118	117	118	119	FTB	P
DP-97	P187-P190	F	113	94	105	94	104	106	104	106	102	105	124	123	122	125	125	FTB	P
DP-98	P190-P191	F	99	91	97	93	92	104	96	93	98	99	120	120	122	121	123	FTB	P
DP-99	P192-P193	F	110	110	108	107	92	92	94	98	92	94	120	118	117	118	121	FTB	P
DP-100	P193-P194	F	96	105	93	107	93	97	97	95	97	102	116	121	118	114	120	FTB	P
DP-101	P196-P197	F	103	99	102	100	100	104	103	108	105	102	122	121	120	121	120	FTB	P
DP-102	P195-P196	F	104	106	96	106	98	90	88	92	93	89	118	118	116	117	118	FTB	P
DP-103	P198-P199	F	105	107	107	107	98	103	105	107	111	105	118	116	117	118	120	FTB	P
DP-104	P199-P200	F	108	105	108	111	93	98	99	100	105	102	116	114	114	116	117	FTB	P
DP-105	P201-P202	F	105	95	107	106	98	99	101	101	94	91	119	119	118	120	120	FTB	P
DP-106	P203-P205	F	104	106	106	101	102	108	106	93	99	98	121	120	121	122	119	FTB	P
DP-107	P204-P208	F	94	91	113	97	98	96	92	92	89	94	103	104	104	104	103	FTB	P
DP-108	P174-P175	E	110	130	139	121	105	N/A	N/A	N/A	N/A	N/A	107	108	106	110	106	FTB	P
DP-109	TIE IN	E	111	110	107	106	110	N/A	N/A	N/A	N/A	N/A	105	103	102	102	103	FTB	P
DP-110	TIE IN	E	106	108	109	108	109	N/A	N/A	N/A	N/A	N/A	97	102	99	99	101	FTB	P
DP-111	TIE IN	E	115	117	120	116	126	N/A	N/A	N/A	N/A	N/A	123	103	103	109	108	FTB	P
DP-112	P186-P187	F	94	89	89	92	92	94	94	95	94	93	99	98	100	94	95	FTB	P

Notes:

[1] "F" is fusion and "E" is extrusion weld.

[2] Specified peel strength: 50 lb/in for fusion and 44 lb/in for extrusion

[3] Specified shear strength: 60 lb/in for fusion and 60 lb/in for extrusion

[4] "FTB" is Film Tear Bond (maximum 10 percent seam separation).

Table 5-3A

CQA AND MQC TEST RESULTS FOR DRAINAGE GEOCOMPOSITE (AGRU)

	CONSTRUCTION QUALITY ASSURANCE (CQA)		MANUFACTURING QUALITY CONTROL (MQC)	
PROPERTY	GEOCOMPOSITE		GEOCOMPOSITE	
	Transmissivity (m^2/sec)	Ply Adhesion [1] (lb/in)	Transmissivity (m^2/sec)	Ply Adhesion [1] (lb/in)
TEST STANDARD	ASTM D 4716	ASTM D 7005	ASTM D 4716	ASTM D 7005
PROJECT SPECS.	$\geq 6.1 \times 10^{-4}$ at 500 psf	≥ 1.0	$\geq 6.1 \times 10^{-4}$ at 500 psf	≥ 1.0
TESTING FREQUENCY	1 per 200,000 ft^2 [2]		1 per 100,000 ft^2 [2]	

GEOCOMPOSITE ROLL NUMBER	LOT NO.	TEST RESULTS		TEST RESULTS		PASS/FAIL (P/F)	
						CQA	MQC
510575.09	97646	6.68×10^{-4}	4.2	6.77×10^{-4}	4.75	P	P
510692.09				6.77×10^{-4}	4.58		P
510615.09				7.01×10^{-4}	6.44		P
511101.09				7.01×10^{-4}	5.07		P
511123.09		6.38×10^{-4}	5.6	8.86×10^{-4}	2.25	P	P
511145.09				8.86×10^{-4}	3.97		P
511262.09				6.62×10^{-4}	6.25		P
511294.09	97603			6.62×10^{-4}	6.29		P
511317.09		9.29×10^{-4}	5.3	9.47×10^{-4}	5.49	P	P
511338.09				9.47×10^{-4}	5.08		P
511356.09				9.16×10^{-4}	3.75		P
511403.09		1.22×10^{-3}	6.2	1.19×10^{-3}	6.79	P	P
511481.09				9.16×10^{-4}	5.5		P
511525.09				1.19×10^{-3}	4.6		P
511546.09				1.11×10^{-3}	6.42		P
511572.09				1.11×10^{-3}	7.62		P
511572.09				1.11×10^{-3}	7.62		P
511693.09		1.17×10^{-3}	4.8	1.55×10^{-3}	6.44	P	P
511610.09				1.55×10^{-3}	5.52		P
513104.09				1.55×10^{-3}	4.21		P
513112.09				9.89×10^{-4}	4.08		P
513337.09	08L1099			9.89×10^{-4}	4.85		P
513354.09		9.46×10^{-4}	1.8	1.06×10^{-3}	2.69	P	P
513377.09				1.06×10^{-3}	6.08		P
513497.09				6.89×10^{-4}	5.86		P
513417.09				6.89×10^{-4}	4.99		P
513439.09		7.53×10^{-4}	4.5	1.15×10^{-3}	6.06	P	P
513556.09				1.15×10^{-3}	5.92		P

Notes:

[1] Smaller of top and bottom peel strength.

[2] A minimum of 1 test per lot was required.

Average Roll Area:	2,900	ft^2
Total No. of Rolls:	431	
Total Area of Rolls:	1,249,900	ft^2

Table 5-3B

CQA AND MQC TEST RESULTS FOR GEOTEXTILE (DALCO) USED TO MANUFACTURE DRAINAGE GEOCOMPOSITE (AGRU)

	CONSTRUCTION QUALITY ASSURANCE (CQA)					MANUFACTURING QUALITY CONTROL (MQC)						
PROPERTY	Mass per Unit Area [1] (oz/yd^2)	Grab Strength [2] (lb)	Trapezoidal Tear Strength [2] (lb)	Apparent Opening Size (mm)	Permittivity (sec^{-1})	Mass per Unit Area (oz/yd^2)	Grab Strength [2] (lb)	Trapezoidal Tear Strength [2] (lb)	Puncture Strength (lb)	Static Puncture Strength (lb/in^2)	Apparent Opening Size (mm)	Permittivity (sec^{-1})
TEST STANDARD	ASTM D 5261	ASTM D 4632	ASTM D 4533	ASTM D 4751	ASTM D 4491	ASTM D 5261	ASTM D 4632	ASTM D 4533	ASTM D 4833	ASTM D 6241	ASTM D 4751	ASTM D 4491
PROJECT SPECS.	≥ 8	≥ 200	≥ 75	≤ 0.21	≥ 0.5	≥ 8	≥ 200	≥ 75	≥ 90	≥ 500	≤ 0.21	≥ 0.5
TESTING FREQUENCY	1 per 200,000 ft^2			1 per 500,000 ft^2		1 per 100,000 ft^2					1 per 250,000 ft^2	

GEOTEXTILE ROLL NUMBER	TEST RESULTS					TEST RESULTS							PASS/FAIL (P/F)
1010172958	9.3	284	104			8.4	251	125	144	764	0.18	1.40	P
1010172973	8.2	256	90	0.125	1.68	8.3	227	123	139	725	0.18	1.40	P
1010172976	8.7	265	100	0.121	1.57	8.3	235	117	141	667	0.18	1.40	P
1010172991	8.2	252	91			8.3	237	115	140	679	0.18	1.40	P
1010172995	8.7	268	95			8.3	251	99	135	724	0.18	1.40	P
1010173010	9.0	268	100	0.125	1.41	8.4	252	103	139	774	0.18	1.40	P
1010170709	8.8	254	122	0.087	1.44	8.2	251	121	141	722	0.18	1.40	P
1010172865	8.8	252	118	0.087	1.70	8.3	235	95	144	694	0.18	1.40	P
1010170884	8.6	259	111			8.3	229	99	140	723	0.18	1.40	P
1010172886	8.9	252	118			8.3	247	101	145	738	0.18	1.40	P
1010172903	8.6	232	96			8.5	237	105	137	692	0.18	1.40	P
1010172921	9.1	246	115	0.081	1.54	8.5	231	115	151	718	0.18	1.40	P
1010172941	8.3	220	104			8.4	245	109	141	734	0.18	1.40	P
101017301034	8.9	263	119			8.1	233	105	147	764	0.18	1.40	P
101017301016	8.6	254	113	0.075	1.58	8.1	235	123	151	726	0.18	1.40	P
101017300927	8.9	262	111			8.5	235	112	151	699	0.18	1.40	P
101017300945	9.1	253	110			8.5	240	98	154	719	0.18	1.40	P
101017300964	8.7	246	102	0.075	1.6	8.1	249	105	155	709	0.18	1.40	P
101017300981	9.0	274	118			8.2	232	112	137	775	0.18	1.40	P
101017300997	9.0	268	108			8.1	232	105	141	723	0.18	1.40	P

Notes:

[1] Smaller of top and bottom average mass per unit area.

[2] Smaller value in machine or cross-machine direction.

Table 5-3C

MQC TEST RESULTS FOR GEONET USED TO MANUFACTURE DRAINAGE GEOCOMPOSITE (AGRU)

PROPERTY	Polymer Density (g/cm^3)	Carbon Black Content (%)	Thickness (mil)
TEST STANDARD	ASTM D 1505	ASTM D 1603	ASTM D 5199
PROJECT SPECS.	≥ 0.93	2 to 3	≥ 200
TESTING FREQUENCY	1 per 100,000 ft^2		

GEONET ROLL NUMBER	LOT NO.	TEST RESULTS			PASS/FAIL (P/F)
510575	97646	0.958	2.75	288	P
510692		0.954	2.74	285	P
510615		0.955	2.47	298	P
511101		0.958	2.56	295	P
511123		0.957	2.9	293	P
511145		0.954	2.55	297	P
511262		0.955	2.64	294	P
511294	97603	0.957	2.72	290	P
511317		0.955	2.45	303	P
511338		0.955	2.47	298	P
511356		0.956	2.4	297	P
511481		0.958	2.78	299	P
511403		0.954	2.21	297	P
511525		0.956	2.71	296	P
511546		0.956	2.66	292	P
511572		0.957	2.76	297	P
511693		0.956	2.53	298	P
511614		0.957	2.65	292	P
513104		0.955	2.61	305	P
513112		0.955	2.29	291	P
513337	08L1099	0.955	2.52	289	P
513354		0.952	2.38	298	P
513377		0.956	2.75	304	P
513497		0.955	2.42	298	P
513417		0.955	2.54	300	P
513439		0.954	2.4	301	P
513556		0.956	2.38	296	P

Area of Geonet Rolls:		1,249,900	ft^2
No. of Geonet Rolls Tested:		27	
Test Frequency:	1 per	46,293	ft^2

6. CONSTRUCTION QUALITY ASSURANCE - OTHER CONSTRUCTION ACTIVITIES

6.1 Perforated Drainage Header Pipe

To collect and remove storm water that percolates through the protective soil layers, a perforated header pipe was installed across the Phase 1 side slopes near the toe of the landfill side slope and at the bench at elevation 140-ft. The pipes consisted of 4-inch perforated corrugated HDPE piping with a factory installed geotextile filter sock. The pipes were installed in a saw-tooth pattern across the slopes. The high end of the pipe was capped to prevent soil intrusion and at each low point a T-connector was used to attach a discharge pipe which consisted of an approximately 8-ft long section of 4-in diameter smooth interior wall corrugated pipe. The MQC certificates provided by the Contractor were reviewed by the CQA personnel and were found to be in compliance with the CQA Documents. The pipes were installed as indicated on Drawing No. 11 of the CQA Documents and modified detail described in Section 3.3 of this report. The as-built pipe inverts are noted on the final as-built drawing in Appendix D of this certification report.

6.2 Storm Water Down Chute Pipes

A total of ten (10) storm water down chute pipes were installed as part of the storm water management system for the Phase 1 partial closure system. The pipes consisted of 18-inch smooth interior wall corrugated HDPE piping. The MQC certificates provided by the Contractor were reviewed by the CQA personnel and were found to be in compliance with the CQA Documents. The pipes were installed as indicated on Drawing Nos. 9 and 12 of the CQA Documents. The down chute pipes were connected to the existing storm water drainage structures located along the outer perimeter of the phase 1 area at toe of the side slopes. The as-built pipe inverts are noted on the final as-built drawing in Appendix D of this certification report.

6.2 Storm Water Inlet Structures

Forty-six (46) storm water inlet structures were installed as part of the storm water management system for the Phase 1 partial closure system. Thirty-six (36) were installed at the low points on the side slope drainage swales and ten (10) were constructed at the top of the closure area. The structures consisted of an approximately 5 ft by 8 ft, 6-inch thick concrete mitered end section with a protective galvanized steel grate. The locations of the structures are noted on the final as-built drawing in Appendix D of this certification report.

7. SUMMARY

Observation for the construction of the Phase 1 partial closure system was performed by Geosyntec during the period of 9 March 2009 to 23 November 2009. During this time, CQA personnel monitored the installation of the following components of the final cover system:

- earthwork to include the side-slope drainage swales;
- geosynthetics; and
- and ancillary features to include storm water management features.

During construction of the above components, CQA personnel verified that conformance and performance testing was performed at the frequencies required by the CQA Documents and that the installation met or exceeded the requirements of the CQA Documents. CQA personnel also verified that conditions or materials identified as not conforming to the CQA Plan were replaced, repaired, and/or retested, as described in this report.

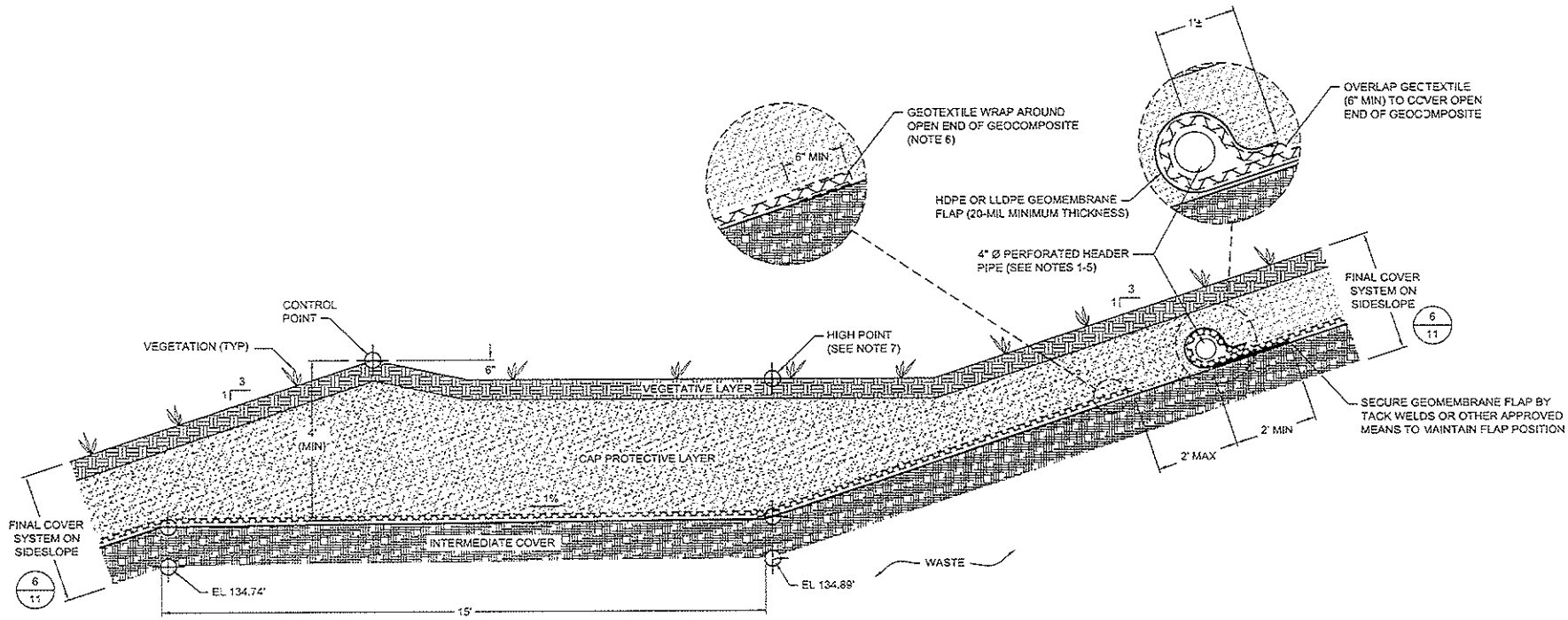
The results of the CQA activities undertaken by Geosyntec as described in this report indicate that the Phase 1 partial closure system and the storm water management system were constructed in accordance with the CQA Documents and the Permit issued for the Phase 1 partial closure at the JED facility.

Kirk Wills
CQA/Project Manager

Craig Browne, P.E. 12/7/09
CQA Engineer-of-Record
Florida P.E. No. 68613

APPENDIX A

REVISED DETAIL 2A/8 FOR THE DRAINAGE HEADER PIPE



2A / 8 DETAIL (TYPICAL)
FINAL COVER SYSTEM ON SIDE SLOPE BENCH AT HIGH POINT
SCALE: N.T.S.
FL1612.01X022b

NOTES:

1. HEADER AND DISCHARGE OUTLET PIPES SHALL BE CORRUGATED HDPE PIPE 4-IN IN DIAMETER. THE HEADER PIPE SHALL BE PERFORATED.
2. DISCHARGE OUTLET PIPES SHALL BE SPACED NO MORE THAN 250 FT APART.
3. HEADER PIPE SHALL BE INSTALLED AT A MINIMUM SLOPE OF 2%.
4. PIPE SHALL BE PROVIDED WITH AN OUTLET (T OR L) THAT DISCHARGES THE WATER INTO THE DRAINAGE SWALE.
5. HEADER PIPE SHALL BE TERMINATED WITH A CAP ON EITHER SIDE OF THE FINAL COVER DOWNCHUTES AND AT END LOCATIONS.
6. GEOTEXTILE WRAP SHALL EXTEND AT LEAST 6 INCHES ON BOTH SIDES OF GEOCOMPOSITE AND SHALL BE LEISTERED TO GEOCOMPOSITE GEOTEXTILE MATERIAL. ALTERNATIVELY, CONTRACTOR MAY SEW THE GEOCOMPOSITE GEOTEXTILES TOGETHER IF A MINIMUM OF 6 INCHES OF GEONET MATERIAL IS REMOVED.

Geosyntec consultants

TAMPA, FL

DATE:	FEB 2009	SCALE:	N.T.S.
PROJECT NO.	—	FILE NO.	FL1612.01X022a
DOCUMENT NO.	—	FIGURE NO.	1

APPENDIX B

SELECT CONSTRUCITON PHOTOS

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 1 Date: 9 March 2009 Direction: Northeast Comments: Construction of access road at SW corner of the Phase 1 Area (Cell 4).	
Photograph No.: 2 Date: 11 March 2009 Direction: East Comments: Dumping of general fill (intermediate cover) on landfill side slope.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 3 Date: 11 March 2009 Direction: East Comments: Spreading general fill (intermediate cover) on landfill side slope.	
Photograph No.: 4 Date: 13 March 2009 Direction: South Comments: Grading of intermediate cover layer w/GPS equipped bulldozer.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 5 Date: 17 March 2009 Direction: South Comments: Grading of intermediate cover layer using GPS equipped bulldozers.	
Photograph No.: 6 Date: 24 March 2009 Direction: West Comments: Dumping of general fill (intermediate cover) on landfill side slope.	

GEOSYNTEC CONSULTANTS
Photographic Record

Client: Omni Waste of Osceola County, LLC Project Number: FQ 1672

Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility

Project Location: Osceola County, Florida

Photograph No.: 7 Date: 27 March 2009 Direction: East Comments: Grading of intermediate cover layer using GPS equipped bulldozer.	
Photograph No.: 8 Date: 4 April 2009 Direction: North Comments: Grading of existing landfill surface (daily cover).	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 9 Date:1 April 2009 Direction: North Comments: Intermediate cover prepared surface.	
Photograph No.: 10 Date: 1 April 2009 Direction: South Comments: Surveyor performing as-built survey of intermediate cover layer.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 11 Date: 30 march 2009 Direction: North Comments: Excavation of anchor trench on upper bench (i.e., elevation 180-ft).	
Photograph No.: 12 Date: 20 march 2009 Direction: West Comments: Motor grader utilized to construct soil platforms for storage of geosynthetics.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 13 Date: 24 March 2009 Direction: N/A Comments: Front end loader utilized to unload rolls of geomembrane liner.	
Photograph No.: 14 Date: 24 march 2009 Direction: N/A Comments: Front end loader utilized to transport roll of geomembrane on site.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 15 Date: 27 March 2009 Direction: N/A Comments: Front end loader utilized to unload geocomposite rolls of delivery truck.	
Photograph No.: 16 Date: 8 April 2009 Direction: N/A Comments: Front end loader utilized to transport geocomposite rolls on site.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 17 Date: 27 March 2009 Direction: South Comments: Rolls of drainage geocomposite delivered for the closure project.	
Photograph No.: 18 Date: 15 April 2009 Direction: East Comments: Deployment of geomembrane on landfill side slope.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 19 Date: 7 May 2009 Direction: East Comments: Fusion welding adjacent geomembrane panels.	
Photograph No.: 20 Date: 11 May 2009 Direction: N/A Comments: Destructive seam test location marked on welded seam.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 21 Date: 15 April 2009 Direction: N/A Comments: Field testing of destructive test sample.	
Photograph No.: 22 Date: 17 April 2009 Direction: N/A Comments: Repair of liner where destructive test sample was removed.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 23 Date: 20 April 2009 Direction: North Comments: Bottom liner system exposed for tie-in of the cover system geomembrane.	
Photograph No.: 24 Date: 20 April 2009 Direction: South Comments: Bottom liner system exposed for tie-in of the cover system geomembrane.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 25 Date: 17 April 2009 Direction: North Comments: Extrusion welded tie-in connecting the cover system liner with the base liner.	
Photograph No.: 26 Date: 17 April 2009 Direction: East Comments: Gas system penetrations in cover system geomembrane.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 27 Date: 20 April 2009 Direction: East Comments: View of geosynthetics deployed on the west side of the Phase 1 area.	
Photograph No.: 28 Date: 16 April 2009 Direction: East Comments: Deployment of drainage geocomposite on landfill side slope.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 29 Date: 20 April 2009 Direction: N/A Comments: Installer connecting the geonet portion of adjacent geocomposite panels using nylon zip ties.	
Photograph No.: 30 Date: 21 May 2009 Direction: N/A Comments: Sewing of upper geotextile overlap of adjacent geocomposite panels.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 31 Date: 21 May 2009 Direction: East Comments: Installation of drainage geocomposite	
Photograph No.: 32 Date: 21 May 2009 Direction: East Comments: Installation of drainage geocomposite	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 33 Date: 2 June 2009 Direction: Southwest Comments: Wrapping geocomposite around 4-inch perforated drainage header pipe.	
Photograph No.: 34 Date: 7 May 2009 Direction: N/A Comments: Tack welding of geomembrane flap to the cover system geomembrane.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 35 Date: 2 June 2009 Direction: North Comments: Installation of the lower drainage header pipe.	
Photograph No.: 36 Date: 2 June 2009 Direction: N/A Comments: Geocomposite wrapped around drainage header pipe and secured with nylon zip ties.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 37 Date: 2 June 2009 Direction: North Comments: Leistering geotextile strip over open edge of the drainage geocomposite.	
Photograph No.: 38 Date: 21 May 2009 Direction: West Comments: View of completed drainage collection pipe system.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 39 Date: 2 April 2009 Direction: North Comments: 4-inch perforated sock covered drain pipe.	
Photograph No.: 40 Date: 30 March 2009 Direction: West Comments: HDPE corrugated pipe purchased for the partial closure project.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 41 Date: 8 April 2009 Direction: West Comments: View of Bronson's borrow area located to the west of the JED Facility.	
Photograph No.: 42 Date: 2 July 2009 Direction: Northwest Comments: Repair of erosion on intermediate cover layer.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 43 Date: 28 April 2009 Direction: Southeast Comments: Cap protective cover placement over geosynthetics.	
Photograph No.: 44 Date: 2 June 2009 Direction: N/A Comments: Completed gas system penetration	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 45 Date: 4 June 2009 Direction: East Comments: Installation of 18-inch HDPE down chute pipe.	
Photograph No.: 46 Date: 4 June 2009 Direction: N/A Comments: Installation of "Y" fitting as part of the drop inlet and down chute piping.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 47 Date: 4 June 2009 Direction: East Comments: Installation of 18-inch HDPE down chute pipe.	
Photograph No.: 48 Date: 4 June 2009 Direction: N/A Comments: Cleaning of existing storm water drainage structures at the base of the closure slopes.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 49 Date: 20 March 2009 Direction: East Comments: Screening of mulch.	
Photograph No.: 50 Date: 7 May 2009 Direction: N/A Comments: Mixing of screened organics and cap protective cover soils For use as vegetative layer soil.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 51 Date: 2 June 2009 Direction: Southeast Comments: Spreading of vegetative layer soils over cap protective cover.	
Photograph No.: 52 Date: 2 June 2009 Direction: Southwest Comments: Grading of vegetative layer soils utilizing GPS equipped bulldozer.	

GEOSYNTEC CONSULTANTS
Photographic Record

Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 53 Date: 2 June 2009 Direction: Southwest Comments: Surveyor performing as-built survey of the top of the vegetative soil layer.	
Photograph No.: 54 Date: 2 June 2009 Direction: East Comments: Sod installation on the closure slope.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 55 Date: 2 June 2009 Direction: North Comments: Grading of drainage swale.	
Photograph No.: 56 Date: 2 June 2009 Direction: South Comments: Drainage swale graded and installation of sod.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 57 Date: 4 June 2009 Direction: West Comments: View of storm water inlet pipe on side slope drainage swale.	
Photograph No.: 58 Date: 20 June 2009 Direction: N/A Comments: 6-in thick concrete pad cast over storm water inlet pipe.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph No.: 59 Date: 4 June 2009 Direction: North Comments: Grading of perimeter road swale.	
Photograph No.: 60 Date: 4 June 2009 Direction: North Comments: Sod placement in the perimeter road swale.	

GEOSYNTEC CONSULTANTS
Photographic Record

Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph: 61 Date: 6 November 2009 Direction: N/A Comments: Excavated drain pipe outlet pipe.	
Photograph: 62 Date: 16 November 2009 Direction : N/A Comments: Sealing of drain pipe with geotextile and duct tape.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph: 63 Date: 16 November 2009 Direction: East Comments. Placement of drainage gravel around drain pipe outlet.	
Photograph: 64 Date: 16 November 2009 Direction : N/A Comments: Geotextile Placed beneath drain pipe outlet. Drainage gravel placed over the geotextile.	

GEOSYNTEC CONSULTANTS
Photographic Record

Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph: 65 Date: 16 November 2009 Direction: N/A Comments. Carpenter's level utilized to ensure positive slope on drain pipe.	
Photograph: 66 Date: 16 November 2009 Direction : N/A Comments: Drainage gravel placed around drain pipe outlet.	

GEOSYNTEC CONSULTANTS Photographic Record	
Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph: 67 Date: 17 November 2009 Direction: N/A Comments. View of drain pipe outlet prior to overlap of geotextile and backfilling.	
Photograph:68 Date: 16 November 2009 Direction : West Comments: Geotextile wrapped around drainage gravel and pipe prior to backfilling.	

GEOSYNTEC CONSULTANTS
Photographic Record

Client: Omni Waste of Osceola County, LLC	Project Number: FQ 1672
Project Name: Phase 1 Partial Closure – J.E.D. Solid Waste Management Facility	
Project Location: Osceola County, Florida	

Photograph:69 Date: 16 November 2009 Direction: N/A Comments: Hand tamper utilized to compact lifts of fill placed over the completed gravel drain.	
Photograph:70 Date: 17 November 2009 Direction : N/A Comments: Drain pipe outlet after completion of backfilling.