SECTION 6.0

HYDROGEOLOGIC ASSESSMENT REPORT

6.0 HYDROGEOLOGICAL ASSESSMENT

The Hydrogeological Assessment for the Edge Moor Site II Ash Landfill, prepared by Conectiv Energy Engineering and Environmental and Duffield Associates, Inc., dated 2009, has been included in this submission. References within the 2009 document refer to sections within the 2009 Permit Renewal Application and not the current application package. No changes to the Hydrogeological Assessment are proposed as part of this submission.

The Hydrogeological Assessment has been included in its entirety for completeness.

HYDROGEOLOGICAL ASSESSMENT

SOLID WASTE MANAGEMENT FACILITY APPLICATION

EDGE MOOR POWER PLANT
SITE II ASH LANDFILL

Prepared by:

Conectiv Energy
Engineering and Environmental
P.O. Box 6066
Newark, DE 19714

&

Duffield Associates, Inc.
5400 Limestone Road
Wilmington, DE 19808

2009

HYDROGEOLOGICAL ASSESSMENT

A. Background

A detailed hydrogeological assessment of four potential ash disposal areas including Site II, was conducted by M. Baker, Inc. (Baker) as part of the original Application for Solid Waste Disposal Facility. The original hydrogeological assessment is presented in Tab 5, Attachment 5B (Solid Waste Disposal Plan).

Subsequent to Baker's pre-construction hydrogeological assessment, two other assessments have been made at the Site II Ash Landfill. The more detailed of these was DNREC's September 2000 Brownfield Preliminary Assessment II (BPA II) for the Salvage Yard Relocation Area I. Although this assessment evaluated an approximately fifty (50) acre tract that also included property to the north and south of Shellpot Creek, the focus of these DNREC investigations was the area of the Edge Moor Site II Ash Landfill. The second study was a Physical Setting Source Report prepared by Environmental Data Resources, Inc. (EDR) as part of Conectiv's November 2003 Ash Material Characterization Report (attached in Tab 11 of this application). The hydrogeological findings presented in the DNREC BPA II study are summarized below; a copy of EDR's 2003 investigation is presented in Attachment 6A, below.

B. Pre-Construction Hydrogeological Assessment

At the time Conectiv's heritage company Delmarva Power & Light Company conducted the preconstruction environmental studies and detailed hydrogeological assessments for potential future ash disposal sites, the Company was considering four separate sites in the vicinity of its Edge Moor Power Station. Site I, a small 3.6 acre site, was to be located north of Shellpot Creek. Site II is the current 14.8 acre Site II addressed in this application for permit renewal. Site III was to be located on Cherry Island at the present U.S. Army Corps of Engineers' dredge spoil disposal area, and a 5 acre Site IV was to be located north of Shellpot Creek and north of Site I. Only Site II was ultimately developed. However, as explained above, Baker's pre-construction hydrogeological assessment addresses all of the four sites.

In brief, Delmarva Power & Light Company's hydrogeological pre-construction studies found that the unconsolidated Columbia Formation of the Delaware Coastal Plain province is the sole aquifer existing on Cherry Island. Only Sites II and III are underlain by the aquifer, but in these areas the aquifer is confined above by 20 to 55 feet of low permeability soils. Ground water movement in the Columbia Formation is sluggish and generally toward the south. Due to the generally low permeabilities of the surficial soils, perched water tables lie near the surface, and infiltration to the aquifer will take decades.

C. DNREC's Salvage Yard Relocation Area I Brownfield Preliminary Assessment

DNREC's Site Investigation and Restoration Branch (SIRB), in cooperation with the USEPA, conducted a BPA II for the Salvage Yard Relocation Area I. The BPA II was intended to provide a general characterization of the environmental conditions present at the site. The 50 acre area investigated in the BPA II included the Site II Ash Landfill as well as property north of Shellpot Creek, but focused on the Site II property.

As described in the DNREC study, the proposed BPA II site is located within the Coastal Plain Province of Delaware. The elevation of the site ranges from approximately 5 to 35 feet above sea level; it is located approximately 0.75 mile southeast of the Piedmont Province Fall Zone. Four basic soil types occur beneath Site II: Recent deposits of estuarine sediments and fill material, Columbia sands and gravels, Pleistocene silts and clays, and weathered bedrock. The recent deposits of estuarine sediments are 25 to 30 feet thick. The top of the Columbia formation generally lies 20 to 30 feet below the surface. The Pleistocene silt and clays average 30 feet thick. The top of the weathered bedrock lies between 50 to 70 feet below sea level. The Columbia Formation is fluvial, and composed primarily of poorly sorted fluvial sands with some interbedded gravels, silts, and clays. Cross-sections indicate that the Columbia Formation splits into two sections toward the north end of the site, with 5 to 20 feet of fine Pleistocene silts and clays separating the two lenses.

DNREC's study also addressed the groundwater resources. As stated in the study, the potable water supply for this area is provided by the City of Wilmington Water Department, which utilizes surface water from Brandywine Creek for its primary water supply, with the closest intake lying above the dam in Brandywine Park. The nearest public water supply well is the Artesian Water Company's well at Collins Park approximately 4 miles south of the site. The Water Supply Branch of DNREC also conducted a Delaware Water Use Data System search for drinking water wells located within 4 miles of the site. The nearest domestic well is owned by the Delaware Solid Waste Authority, located within one mile of the site. There are no domestic wells within a quarter of a mile of the site, and only three domestic wells within the 1 to 4 mile radius. The nearest wellhead protection area is located approximately 3.5 miles south of the site.

D. EDR GeoCheck Report

EDR's hydrogeological assessment was prepared for Site II as part of Conectiv's Ash Material Characterization Study, and is shown in Attachment 6A. In brief, EDR verifies most of DNREC's assessment, and also included a review of the available data bases regarding the presence of permitted wells and regional groundwater flow. EDR's report does not indicate the presence of wells within a one mile radius in the expected downgradient direction (east and south) of Site II. A review of USGS Topographic Maps indicates that the expected regional groundwater flow

direction in the region would occur in a southeasterly direction, toward the Delaware River. The Delaware River is located approximately 0.75 mile to the east of Site II.

ATTACHMENT 6A

EDR GeoCheck Report
Edge Moor, DE

Prepared by:

Environmental Data Resources, Inc.
Southport, Connecticut

September 5, 2003

The EDR GeoCheck® Report

Edgemoor
200 Hay Road
Wilmington, DE 19801

Inquiry Number: 01042489.1r

September 05, 2003

Environmental Data Resources, Inc.

The Source For Environmental Risk Management Data

3530 Post Road
Southport, Connecticut 06890

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

FORM UEC

TABLE OF CONTENTS

SECTION **PAGE**

GEOCHECK ADDENDUM

Physical Setting Source Addendum **A-1**

Physical Setting Source Summary **A-2**

Physical Setting Source Map **A-7**

Physical Setting Source Map Findings **A-8**

Physical Setting Source Records Searched **A-10**

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Disclaimer
Copyright and Trademark Notice

This report contains information obtained from a variety of public and other sources. NO WARRANTY EXPRESSED OR IMPLIED, IS MADE WHATSOEVER IN CONNECTION WITH THIS REPORT. ENVIRONMENTAL DATA RESOURCES INC. SPECIFICALLY DISCLAIMS THE MAKING OF ANY SUCH WARRANTIES, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE. ALL RISK IS ASSUMED BY THE USER. IN NO EVENT SHALL EDR BE LIABLE TO ANYONE, WHETHER ARISING OUT OF ERRORS OR OMISSIONS, NEGLIGENCE, ACCIDENT OR ANY OTHER CAUSE, FOR ANY LOSS OR DAMAGE, INCLUDING, WITHOUT LIMITATION, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES.

Entire contents copyright 2003 by Environmental Data Resources, Inc. All rights reserved. Reproduction in any media or format, in whole or in part, of any report or map of Environmental Data Resources, Inc., or its affiliates, is prohibited without prior written permission.

EDR and the edr logos are trademarks of Environmental Data Resources, Inc. or its affiliates. All other trademarks used herein are the property of their respective owners.

GEOCHECK® - PHYSICAL SETTING SOURCE REPORT

TARGET PROPERTY ADDRESS

EDGEMOOR
200 HAY ROAD
WILMINGTON, DE 19801

TARGET PROPERTY COORDINATES

Latitude (North):	39.737701 - 39' 44' 15.7"
Longitude (West):	75.517799 - 75' 31' 4.1"
Universal Tranverse Mercator:	Zone 18
UTM X (Meters):	455630.8
UTM Y (Meters):	4398564.0
Elevation:	28 ft. above sea level

EDR's GeoCheck Report has been developed to assist the environmental professional with the collection of physical setting source information in accordance with ASTM 1527-00, Section 7.2.3. Section 7.2.3 requires that a current USGS 7.5 Minute Topographic Map (or equivalent, such as the USGS Digital Elevation Model) be reviewed. It also requires that one or more additional physical setting sources be sought when (1) conditions have been identified in which hazardous substances or petroleum products are likely to migrate to or from the property, and (2) more information than is provided in the current USGS 7.5 Minute Topographic Map (or equivalent) is generally obtained, pursuant to local good commercial or customary practice, to assess the impact of migration of recognized environmental conditions in connection with the property. Such additional physical setting sources generally include information about the topographic, hydrologic, hydrogeologic, and geologic characteristics of a site, and wells in the area.

Assessment of the impact of contaminant migration generally has two principle investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata. EDR's GeoCheck Report is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

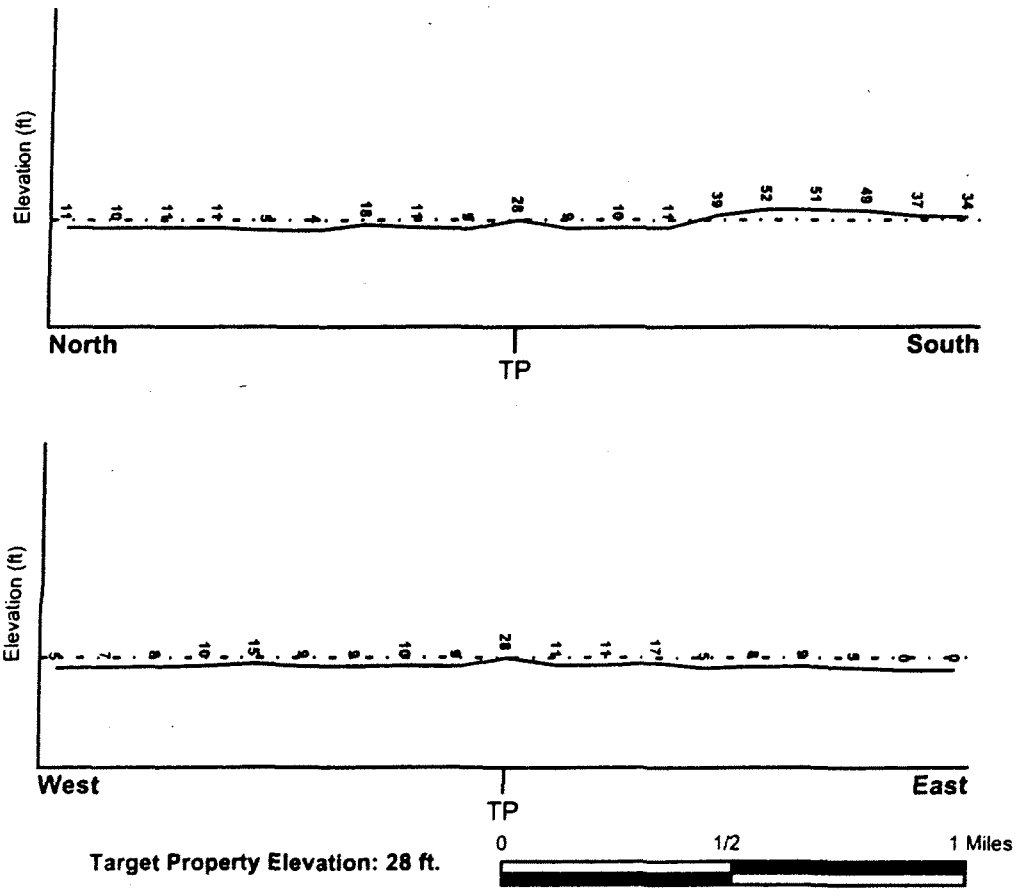
TOPOGRAPHIC INFORMATION

Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

USGS Topographic Map:	2439075-F5 WILMINGTON SOUTH, DE NJ
General Topographic Gradient:	General South
Source:	USGS 7.5 min quad index

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES



Target Property Elevation: 28 ft.

Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Target Property County	FEMA Flood Electronic Data
NEW CASTLE, DE	YES - refer to the Overview Map and Detail Map

Flood Plain Panel at Target Property:	10003C0160F
Additional Panels in search area:	10003C0069F 10003C0180F

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
WILMINGTON SOUTH	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Site-Specific Hydrogeological Data*:

Search Radius:	1.25 miles
Status:	Not found

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

* ©1996 Site-specific hydrogeological data gathered by CERCLIS Alerts, Inc., Bainbridge Island, WA. All rights reserved. All of the information and opinions presented are those of the cited EPA report(s) which were [illegible] a Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) investigation.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

Era: Paleozoic
System: Cambrian
Series: Cambrian volcanic rocks
Code: Cv *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Volcanic Rocks

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps. The following information is based on Soil Conservation Service STATSGO data.

Soil Component Name: URBAN LAND

Soil Surface Texture: variable

Hydrologic Group: Not reported

Soil Drainage Class: Not reported

Hydric Status: Soil does not meet the requirements for a hydric soil.

Corrosion Potential - Uncoated Steel: Not Reported

Depth to Bedrock Min: > 10 inches

Depth to Bedrock Max: > 10 inches

Soil Layer Information							
	Boundary			Classification			
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil	Permeability Rate (in/hr)	Soil Reaction (pH)
1	0 inches	6 inches	variable	Not reported	Not reported	Max: 0.00 Min: 0.00	Max: 0.00 Min: 0.00

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

OTHER SOIL TYPES IN AREA

Based on Soil Conservation Service STATSGO data, the following additional subordinant soil types may appear within the general area of target property.

Soil Surface Textures:	extremely gravelly - coarse sand silt loam loam
Surficial Soil Types:	extremely gravelly - coarse sand silt loam loam
Shallow Soil Types:	No Other Soil Types
Deeper Soil Types:	extremely gravelly - sand sand stratified clay loam loam sandy loam

ADDITIONAL ENVIRONMENTAL RECORD SOURCES

According to ASTM E 1527-00, Section 7.2.2, "one or more additional state or local sources of environmental records may be checked, in the discretion of the environmental professional, to enhance and supplement federal and state sources... Factors to consider in determining which local or additional state records, if any, should be checked include (1) whether they are reasonably ascertainable, (2) whether they are sufficiently useful, accurate, and complete in light of the objective of the records review (see 7.1.1), and (3) whether they are obtained, pursuant to local, good commercial or customary practice." One of the record sources listed in Section 7.2.2 is water well information. Water well information can be used to assist the environmental professional in assessing sources that may impact groundwater flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
1	USGS0193519	1/2 - 1 Mile ENE

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP

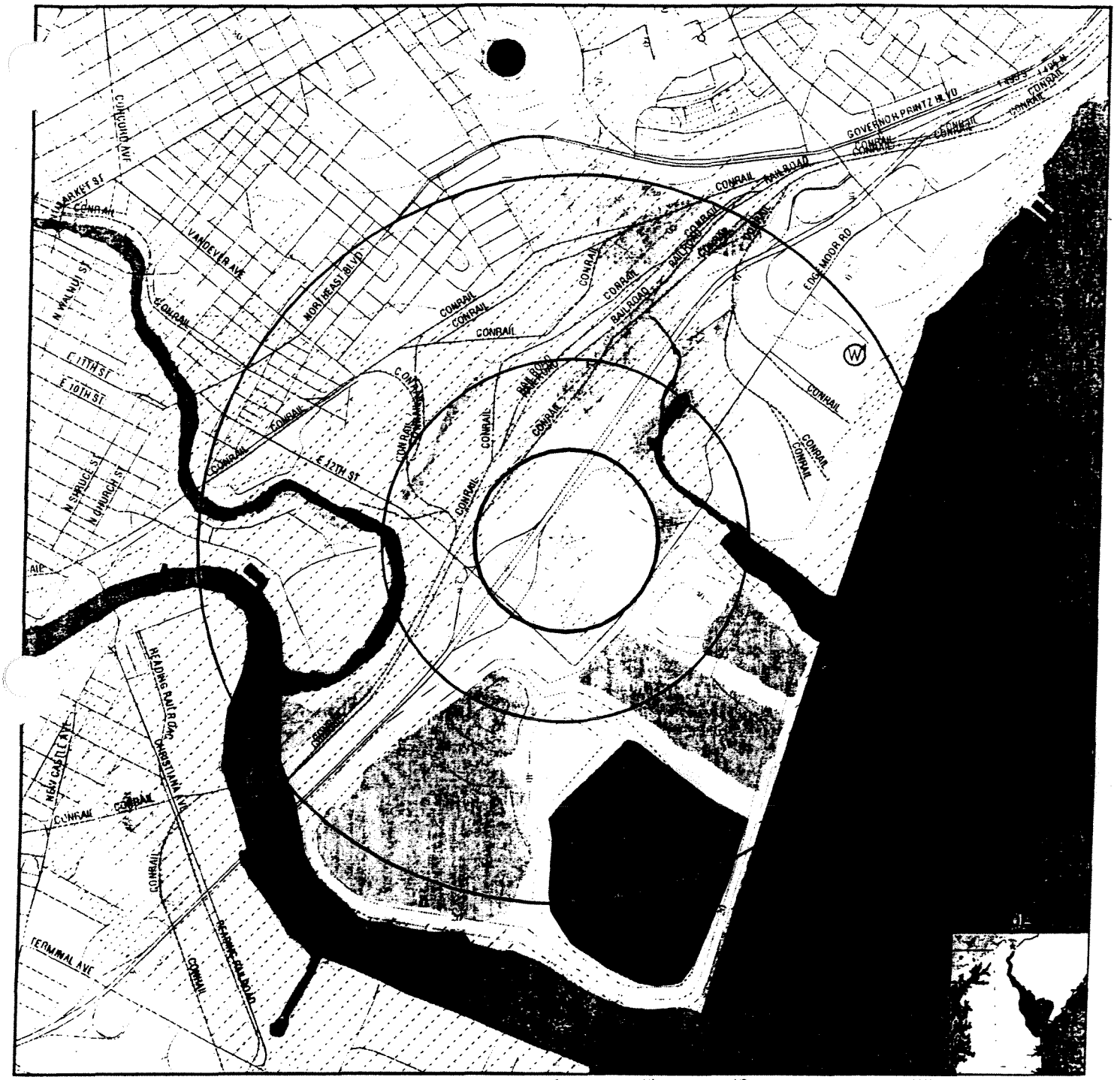
GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No PWS System Found		

Note: PWS System location is not always the same as well location.

PHYSICAL SETTING SOURCE MAP - 01042489.1r



0 1/4 1/2 1 Miles

County Boundary
Major Roads
Contour Lines
Earthquake epicenter, Richter 5 or greater
Water Wells
Public Water Supply Wells
Cluster of Multiple Icons

Groundwater Flow Direction
Indeterminate Groundwater Flow at Location
Groundwater Flow Varies at Location
Closest Hydrogeological Data
100-year flood zone
500-year flood zone
Wetlands

TARGET PROPERTY:	Edgemoor	CUSTOMER:	The EC Group, LLC
ADDRESS:	200 Hay Road	CONTACT:	Christopher Jaggie
CITY/STATE/ZIP:	Wilmington DE 19801	INQUIRY #:	01042489.1r
LAT/LONG:	39.7377 / 75.5178	DATE:	September 05, 2003 6:59 pm

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID Direction Distance Elevation		Database	EDR ID Number
1 **ENE** **1/2 - 1 Mile** **Lower**		**FED USGS**	**USGS0193519**

Agency:	USGS	Site ID:	394442075301301
Site Name:	Cd15-01		
Dec. Latitude:	39.74511		
Dec. Longitude:	-75.50325		
Coord Sys:	NAD83		
State:	DE		
County:	New Castle County		
Altitude:	20		
Hydrologic code:	02040205		
Topographic:	Not Reported		
Site Type:	Ground-water other than Spring		
Const Date:	Not Reported	Inven Date:	Not Reported
Well Type:	Single well, other than collector or Ranney type		
Primary Aquifer:	217NNMR		
Aquifer type:	Not Reported		
Well depth:	Not Reported		
Hole depth:	Not Reported	Source:	Not Reported
Project no:	Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

EPA Region 3 Statistical Summary Readings for Zip Code: 19801

Number of sites tested: 94.

Maximum Radon Level: 37.7 pCi/L.
Minimum Radon Level: 0.2 pCi/L.

pCi/L <4	pCi/L 4-10	pCi/L 10-20	pCi/L 20-50	pCi/L 50-100	pCi/L >100
81 (86.17%)	11 (11.70%)	1 (1.06%)	1 (1.06%)	0 (0.00%)	0 (0.00%)

Federal EPA Radon Zone for NEW CASTLE County: 2

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002. 7.5-Minute DEMs correspond to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps.

HYDROLOGIC INFORMATION

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 1999 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 from the U.S. Fish and Wildlife Service.

HYDROGEOLOGIC INFORMATION

AQUIFLOW[R] Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services
The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the national Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

ADDITIONAL ENVIRONMENTAL RECORD SOURCES

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

STATE RECORDS

Delaware Public and Industrial Wells
Source: Department of Natural Resources and Environmental Control
Telephone: 302-739-3665

RADON

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

EPA Region 3 Statistical Summary Readings
Source: Region 3 EPA
Telephone: 215-814-2082
Radon readings for Delaware, D.C., Maryland, Pennsylvania, Virginia and West Virginia.

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

SECTION 7.0

ENVIRONMENTAL ASSESSMENT REPORT

7.0 ENVIRONMENTAL ASSESSMENT

The Environmental Assessment for the Edge Moor Site II Ash Landfill, prepared by Conectiv Energy Engineering and Environmental, dated January 2004, has been included in this submission. This document was previously included in the 2009 Permit Application Renewal. No changes to the Environmental Assessment are proposed as part of this submission. The Environmental Assessment notes a temporary ash laydown area that was permitted under DNREC Beneficial Use Determination (BUD) #8/130313, which allowed the temporary stockpiling of bottom ash and transport and utilization of fly and bottom ash. Subsequent to the 2009 Permit Renewal Application, BUD #8/130313 expired on March 13, 2013, after which ash was no longer temporarily stockpiled or transported at the Edge Moor Site II Ash Landfill.

The Environmental Assessment has been included in its entirety for completeness.

ENVIRONMENTAL ASSESSMENT

SOLID WASTE MANAGEMENT FACILITY APPLICATION

EDGE MOOR POWER PLANT
SITE II ASH LANDFILL

Prepared by:

Conectiv Energy Engineering and Environmental
P.O. Box 6066
Newark, DE 19714

January 30, 2004

Table of Contents

		Page
Environmental Assessment		1
A.	Background	1
B.	Air Quality	1
C.	Water Quality	2
D.	Stream Flow	3
E.	Fish and Wildlife	3
F.	Vegetation	4
G.	Threatened and Endangered Species	4
H.	Water Uses	4
I.	Land Use	5
J.	Aesthetics	5
K.	Traffic	5
L.	Public Health and Safety	5
M.	Cultural, Recreational, and Natural Areas	6
N.	Historic Sites	6
O.	Social and Economic Factors	7
Attachment 7A	Emergency Response and Dust Control Plan	

ENVIRONMENTAL ASSESSMENT

A. Background

Conectiv's heritage company Delmarva Power & Light Company prepared and submitted a comprehensive environmental assessment of ash transport and disposal activities in its original Application for a Solid Waste Disposal Facility. The following sections summarize the principal findings of these detailed pre-construction site investigations, and provide an update, where appropriate, to reflect current environmental and land use conditions at Site II.

In brief, Conectiv's Edge Moor Site II Ash Landfill consists of the upland ash stockpile, which measures approximately 850 feet in length, by an average width of 200 feet. This stockpile is surrounded by berms, haul roads, and a stormwater collection system including a stormwater retention pond. The stockpiled ash material has a soil and a thick vegetation cover, and does not exhibit evidence of erosion or wind deposition in the surrounding areas. A small area on the northeastern portion of Site II is used for the temporary laydown of bottom ash. The site is located in a heavily industrialized area of Wilmington with various chemical and electric generating plants, a sewage treatment plant, and a large municipal landfill located within one-half mile radius of Site II. The nearest residential areas are located more than 3,500 feet to the northwest of the site, across from Interstate I-495, and the Amtrak rail corridor and maintenance yard, among others.

B. Air Quality

Conectiv's Edge Moor Site II Ash Landfill does not serve as a source for air pollutants. All ash operations are governed by Conectiv's Emergency Response and Dust Control Plan. During ash disposal operations, each ash disposal cell was covered with a layer of soil, then seeded as per DNREC's permit requirements. The soil cover continues to be inspected, and the vegetation continues to be maintained. As a result, a dense layer of herbaceous and shrub vegetation has become established across the entire ash stockpile since cessation of fly ash disposal activities. Only a small area on the northeastern corner of Site II is actively used to temporarily store excess bottom ash. However, the high moisture content of this bottom ash precludes this area as serving as source for fugitive dust. As a result of site maintenance, existing security measures, and the established soil and vegetation cover, Conectiv's Site II operations have proven not to be a source for fugitive dust or odors.

Similarly, Conectiv's ash that is stockpiled at Site II are not a source of odors. In fact, DNREC's Edge Moor Odor Roundtable, which was formed in 2003 to investigate odor issues in the Edge Moor Industrial and Cherry Island area, has made the determination that Conectiv's Edge Moor Site II Ash landfill is not a source of odor. Conectiv's Site II Ash Landfill was also not identified as one of the nearby facilities that serve as source for odors in Delaware Solid Waste Authority's June 2003 Cherry Island Air Quality Assessment.

A four-year study of prevailing wind direction was conducted by the City of Wilmington. The results of this study indicate that prevailing wind direction originates from the northwest and heads toward the southeast. The Edge Moor Site II Ash Landfill is located southeast of the City's residential areas, and therefore predominantly downwind of the City. As a result of the various dust control measures and stabilization of the stockpiled ash, as well as prevailing wind directions, Site II does not have any impacts to the air quality of New Castle County.

C. Water Quality

The Site II Ash landfill does not contain any natural surface waters. Shellpot Creek is located to the north of Site II, and a stormwater retention pond is located on the northern, downgradient portion of Site II. Based on its design and operating practices, the stormwater retention basin or other portions of Site II do not serve as source for discharge to offsite surface waters, and no monitoring of surface water quality is required. The Ash Management staff inspects the integrity of the retention pond and onsite ditches after severe storm events, and checks the water level in the pond. If necessary, excess water would be transported from the stormwater retention pond to the Edge Moor Power Station for treatment and disposal to the New Castle County sewer system after testing to ensure compliance with the Station's wastewater discharge permit.

Shellpot Creek is a small tributary to the Delaware River. Tidal influences on this small creek are controlled at a point approximately 500 feet east of Site II by a sluice gate located about 1,800 feet upstream from its confluence with the Delaware River. The water quality of Shellpot creek was sampled at two stations as part of the original landfill application. Analyses showed that Shellpot Creek had the poorest water quality when compared to other local surface waters such as the Delaware River, the Christina River, and Brandywine Creek, particularly in total and dissolved iron and manganese.

With regard to groundwater, the principal aquifer in the Cherry Island area consists of the Columbia Formation sands and gravels. As discussed in the original landfill application, underneath Cherry Island the Columbia Formation is essentially a confined aquifer due to the presence of thick Recent organic soils and dredge materials at the surface. Although a small degree of hydraulic connection exists between the Columbia Formation sands and this upper confining layer, the two units have separate and largely unrelated potentiometric surfaces. The surficial soils contain a perched water table which lies very close to the ground surface and whose shape is governed by the local topography and surface drainageways. The piezometric surface of the Columbia sand is governed predominantly by locations of recharge and discharge around the perimeter of Cherry Island.

The Columbia Formation is not presently used as a water source in the vicinity of Cherry island, and little documentation exists on yield potential in the area. The hydraulic conductivity of the aquifer at Cherry Island is somewhat lower than the average for the state, owing to the presence of silt and fine sand in the material. Based on detailed analyses and laboratory studies presented in the original Edge Moor landfill studies, the data indicate that a reasonable average permeability of the Columbia Formation in the Cherry island area is approximately 110 gallon per day per square foot. Moreover, continuous water level recorder readings showed only minor tidal fluctuations in the

groundwater, indicating that the Columbia sand is not directly connected hydraulically to the Delaware or Christina Rivers.

With regard to groundwater quality, Conectiv has conducted quarterly groundwater monitoring at Site II as part of its permit condition. Monitoring of groundwater levels and quality is performed as a normal part of Site II operations to insure that the aquifer (and thereby surface water bodies) are not affected as a result of the ash disposal or stockpiling operations. Monitoring locations at Site II coincide with the observation wells surrounding the site which were previously installed in preparation of site construction. One of these wells, monitoring well II-C (boring W-3) which is screened in the Columbia Formation, is used as the upgradient well. Wells II-A and II-B (boring W-1 and TB-1) in the same aquifer are used for downgradient water quality monitoring. The monitoring wells are constructed of 2- or 4-inch diameter PVC pipe with slotted PVC screen at the sampling interval.

Groundwater monitoring is conducted on a quarterly basis that started prior to the initiation of site construction. Monitoring wells II-A, II-B, and II-C are monitored semi-annually for groundwater elevations. Ground water quality is determined on a more frequent basis via quarterly sampling. Samples are tested for pH, total dissolved solids, sulfate, chlorine, specific conductivity, total suspended solids, calcium, magnesium, arsenic, barium, chromium, cadmium, copper, total iron, mercury, selenium, nickel, and vanadium. The results of these quarterly analyses are submitted to DNREC's Solid and Hazardous Waste Branch within 45 days of measurement. The results have been consistent, and indicate that the groundwater at Site II meets the primary drinking water standards for these metals and other parameters.

D. Stream Flow

No streams occur on Site II. Shellpot Creek is located immediately north of Site II. The average annual discharge of this creek is approximately 9 cubic feet per second. As stated above, tidal influences on this creek are controlled by a sluicegate located about 1,800 feet upstream from its confluence with the Delaware River, and approximately 500 feet east of Site II.

E. Fish and Wildlife

With the exception of a stormwater retention pond no surface waters occur on Site II. The closest aquatic habitat for fish is Shellpot Creek. Past ichthyological surveys of Shellpot Creek were conducted in the lower portion downstream of the sluicegate. The species list included a number of anadromous or tidal species such as herring, bay anchovy, silversides, and killifish, i.e., species that reflected the nearby Delaware River conditions. Other fish species collected below the sluicegate, but also expected to occur upstream in the vicinity of Site II, include common species such as American eel, carp, brown bullhead, pumkinseed, bluegill, and white perch.

The wildlife resources of Site II consist of common species adapted to urbanized habitats. As described above, the Site II Ash Landfill encompasses approximately 15 acres of ruderal land

bordered by Interstate I-495, the City of Wilmington's Wastewater Treatment Plant (WWTP), VFL's Beneficial Use Facility, and Hay Road. As a result, the area surrounding Site II supports primarily industrial land uses, and lacks ecologically valuable or unique habitats. The onsite stormwater retention pond and Shellpot Creek provide limited aquatic habitat, and several species of frogs, painted turtles, and snapping turtles are common in the retention pond and Shellpot Creek. The remaining site consists of densely vegetated upland areas that provide habitat for species such as white-tailed deer, raccoon, eastern cottontail, grey fox, opposum, and a variety of small mammals. Common bird species observed onsite include redwing, common grackle, starling, goldfinch, eastern catbird, eastern mockingbird, robin, and several species of sparrows.

F. Vegetation

The vegetation of Site II consists of a dense growth of herbaceous species, shrubs, and small stands of trees common to ruderal upland areas such as former spoil disposal and disturbed areas. Giant reed (Phragmites communis) covers most of the site's southern and northernmost portions, and cattail and reed covers the littoral zone of the stormwater pond. The interior of Site II is overgrown by a dense growth of nettle, thistles, ragweed, milkweed, cut-grass, pokeweed, Indian hemp, ironweed, dodder, multi-flora rose, Japanese honeysuckle, greenbriers, wild grape, broomsedge, beggarticks, daisy fleabane, goldenrod, sage, touch-me-not, poison ivy, dock, knotweed, and a variety of grasses. Woody species include arrow-wood, common elderberry, dogwood, blackgum, sweetgum, sumac, box elder, and maples. A zone of white pine has also been planted to provide a visual barrier along Interstate I-495.

G. Threatened and Endangered Species

No listed threatened or endangered species are known to occur on Site II or Cherry Island, and no such species are expected to occur at Site II based on the absence of ecologically unique or valuable habitats, or available acreage of natural habitat. Site II consists of a 15 acre, isolated area surrounded by industrial land uses, and separated from natural areas by urban habitat and transportation corridors.

H. Water Uses

No water uses of either surface or groundwater occurs on or in the vicinity of Site II. Site II is located in a designated Non-Critical Water Resource Area of New Castle County, and a review of available data bases regarding the presence of permitted wells and regional groundwater flow indicates that no wells are located within a one-mile radius in the expected downgradient direction of Site II, i.e., to the east and south. A review of USGS Topographic Maps further indicates that the expected regional groundwater flow direction would occur in a southeasterly direction toward the Delaware River.

I. Land Uses

Site II, dedicated to the stockpiling of CCPs generated at Conectiv's Edge Moor and Deepwater Power Stations, is situated in Zone M-2. No structures or activities other than CCP handling and stockpiling occur at the site. Land uses surrounding Site II consist of industrial or manufacturing facilities including Conectiv's Edge Moor Power Station and Hay Road Power Complex to the northeast, VFL's Northern Solid Waste facility to the east, the City of Wilmington's Wastewater Treatment Facility to the southeast, and the Cherry island Landfill to the south. Interstate I-495 and the Amtrack rail yard and corridor are located to the west. No residential areas are located in the vicinity of the site. The nearest residential areas are located approximately 3,500 feet to the northwest of the site across Interstate I-495, the Amtrack rail corridor, and U.S. Highway 13.

J. Aesthetics

No aesthetic resources or scenic view sheds are located on or adjacent to Site II. The ash landfill is located in Zone M-2, General Industrial, and surrounded by other industrial land uses. Fox Point Park is located 1.5 miles north of Site II. Moreover, in its present state and lacking any structures, Site II appears as a densely vegetated ruderal area, not an industrial facility.

K. Traffic

The operation of Site II does not adversely impact the surrounding transportation system. Ash generated at the Edge Moor Power Station is transported directly to Contractor's Solid Waste Facility via an approximately one mile segment of Hay Road. Ash transported from Deepwater Generating Station is transported via Interstate I-295 and Interstate I-495 to the Twelfth Street Interchange, then follows the Cherry Island landfill traffic to Hay Road and the VFL facilities. Based on Contractor's logs, approximately 18-20 truck roundtrips occur daily between the EMPP and Contractor's nearby Hay Road facilities, and 5-6 truck roundtrips between Contractor's Hay Road Solid Waste Faciility and the Deepwater Generating Station. This truck traffic does not adversely the existing level of service designations of these roadways.

L. Public Health and Safety

CCPs such as the fly ash and bottom ash generated at Conectiv's Edge Moor and Deepwater Generating Stations are classified as non-hazardous solid waste by the Environmental Protection Agency. In addition, Conectiv has instituted specific operating practices and monitoring programs designed to ensure that the Edge Moor Site II Landfill has no adverse effects on public health and safety. Site II operations are dedicated to the temporary stockpiling of Conectiv's CCPs, and no other industrial, or hazardous or municipal wastes, are handled or disposed of at the site.

Conectiv's as well as DNREC's concern for the public safety and welfare is reflected in Conectiv's Site II Ash Material Characterization study completed in November 2003. DNREC requested that Conectiv conduct a comprehensive ash characterization sampling and analytical program in order to characterize the ash material staged at the Edge Moor Site II Ash Landfill. The entire report is included in Section 11 of this application.

The results of this comprehensive ash characterization study indicate that, with the exception of arsenic, the concentrations of metals were all below the Uniform Risk-Based Human Health Standards as well as below the Restricted Use Human Health Standards. To further quantify the potential mobility of the total metals observed in the subsurface ash, a number of subsurface sample locations exhibiting the highest total metals were subjected to a Toxic Contaminant Leaching Procedure (TCLP) analysis. The results showed that those samples do not exhibit concentrations above regulatory limits as cited in 40 CFR Part 261.

With regard to the potential for radiation, field screening of the sample cores did not reveal elevated radiation levels within the ash material. In addition, gross gamma radiochemical analysis did not reveal radionuclides at concentrations of concern when compared to the EPA's Generic Inhalation of fugitive Dust Screening Levels, which are the most appropriate screening guideline with respect to Site II operations. Moreover, a recent four-year study of prevailing wind direction conducted by the City of Wilmington indicates that prevailing wind direction originates from the northwest and heads toward the southeast. The Edge Moor Site II Ash Landfill is located southeast of the City's residential areas, and therefor predominantly downwind of the City.

Based on the results of these detailed studies, and the existing Site II maintenance and operating plan, Conectiv's Site II is not deemed to have any potential public health and safety impacts.

M. Cultural, Recreational, and Natural Areas

No cultural, recreational, or natural areas are located on or in the vicinity of Site II. Fox Point Park is located 1.5 miles to the north, and separated from Site II by numerous heavy industry facilities. The Delaware River is located approximately one-half mile to the east of Site II, and separated from the latter by elevated spoil disposal areas, VFL's Northern Solid Waste facility, and other industrial land uses.

N. Historic Sites

No listed historic sites are located on or in the vicinity of Site II. The site is surrounded by other industrial land uses and transportation corridors, and its substrate are Recent soils, i.e., fill. As a result, not archaeological resources are expected to occur onsite.

O. Social and Economic Factors

Site II was licensed in 1982 as an ash disposal area for Edge Moor ash. The ash landfill is situated in the M-2 Zoning District, General Industrial, and represents an allowable use within the M-2 Zoning District as attested to by the City of Wilmington's Office of Zoning Administration. The EMPP Site II Ash Landfill use is consistent with surrounding industrial land uses, and its operation has no adverse impacts on local institutions or economy.

ATTACHMENT 7A

Emergency Response and Dust Control Plan

Effective Date: 9/83
Revision Date: 2/87
Revision Date: 12/08

LOCATION: Edge Moor Power Plant

SUBJECT: Emergency Response and Dust Control Plan

PURPOSE: To establish a written procedure for responding to dust problems at the Edge Moor Power Plant solid waste disposal sites.

SCOPE: Edge Moor Power Plant

PROCEDURE:

1.0 Normal Procedures for Dust Prevention and Detection

A. Working areas are limited in size to minimize the potential for dusting at the landfill.

B. Two water trucks are available for dust control, one is located at the plant and one is available as a standby.

C. All fly ash and bottom ash slopes and inactive areas shall be adequately sprayed with water. The active area of the landfill and haul roads shall be sprayed with water, as necessary to control dusting. Prior to weekends or other similar holidays, the permittee shall continue wetting operations, as during regular operations. At the end of the last disposal on a working day, fly ash and the bottom ash active areas shall be sprayed with water. After reaching an elevation of fifteen (15) feet, soil cover shall be applied and vegetation cover provided to control erosion. The ash disposal will proceed so that the minimum surface area is exposed for conditions of dusting.

D. Disposal operations may be modified as necessary to prevent dusting by applying more water to problem areas. Soil or wood chips may also be used to control dusting.

E. During period of active landfill operations, the condition of the disposal site is observed at least once during each working shift by a Conectiv qualified person and more often when required due to weather conditions. The Landfill Supervisor inspects the active areas of the landfill each work day to insure the adequacy of dust control measures implemented at the site.

F. A daily log report has been established to track the daily activity and condition of the disposal site. This report is completed by the Landfill Supervisor and submitted to Conectiv personnel for review daily.

2.0 Emergency Response Procedures for Dust Prevention and Detection

A. If during an inspection dusting is observed at the site, the Conectiv Shift Supervisor will be notified. He, in turn, will notify the Plant Superintendent, or his designee.

B. Upon notification, the Conectiv Plant Superintendent, or his designee, will immediately notify the Landfill Supervisor who will respond by arriving at the site within 60 minutes.

C. Upon arrival at the site, the Landfill Supervisor will immediately perform the following:

1. Mobilize the water truck which is filled with water at all times, and then spray the landfill and haul roads as necessary to control dusting. The dusting areas will be sprayed with water prior to leaving the site.

2. The back-up driver and water truck will be mobilized as required to assist in controlling dusting problems at the site.

D. Upon completion of the above steps, the Landfill Supervisor will notify the Conectiv Shift Supervisor that dusting has been suppressed.

E. An entry will be recorded on the daily log sheet. The emergency response procedures taken will be documented including the time the emergency response procedures began, and when they ended.

F. The Plant Superintendent, or his designee, shall notify the DNREC immediately if dusting occurs beyond Conectiv's property boundary.

State of Delaware Department of Natural Resources and Environmental Control, 24-hour notification number: 1-800-662-8802, 1-302-739-9401, and #367 for Verizon Wireless customers.

G. The Plant Superintendent, or his designee, will notify the Conectiv Engineering and Environmental Department of any communication between plant personnel and regulatory agencies as soon as possible.

H. If the plant should receive a complaint, the Plant Superintendent, or his designee, shall investigate the complaint, evaluate the problem, and notify the Landfill Supervisor as necessary. The Plant Superintendent or his designee shall assist the Landfill Supervisor in controlling dust as required. The Plant Superintendent, or his designee, shall submit a written report of the complaint to Environmental Affairs as soon as possible. Environmental Affairs shall transmit the written report to the DNREC within two weeks of completing the evaluation of the problem.

SECTION 8.0

PROOF OF ZONING APPROVAL AND FEDERAL, SITE, AND LOCATION PERMITS

8.0 INTRODUCTION

This section is to provide Delaware Department of Natural Resources and Environmental Control (DNREC) with proof of zoning for the Edge Moor Site II Ash Landfill (Site) and all applicable permits necessary for closure. The National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit closure documentation for this Site is provided with this submission. A Sediment and Stormwater Plan Approval is being pursued.

8.1 PROOF OF ZONING

Appendix 8-A illustrates the zoning of Zone 31 in New Castle County, Delaware, adopted in September 1998 and last revised on August 2018. The zoning of the Site is “Hometown Overlay” and does not appear to restrict the land use of the Site. However, there are no proposed changes, from the Permit Renewal Application in 2009, in the Site’s land use or zoning.

8.2 NPDES STORMWATER DISCHARGE PERMIT

Appendix 8-B includes documentation that the originally permitted NPDES outfall (outfall #014) was decommissioned in November 1992. Outfall #014 was the discharge of the stormwater detention pond to Shellpot Creek. No current NPDES permits exist for the Site and with the removal of the stormwater detention basin during the landfill closure construction, no new discharge outfalls are anticipated.

8.3 SEDIMENT AND STORMWATER PLAN APPROVAL

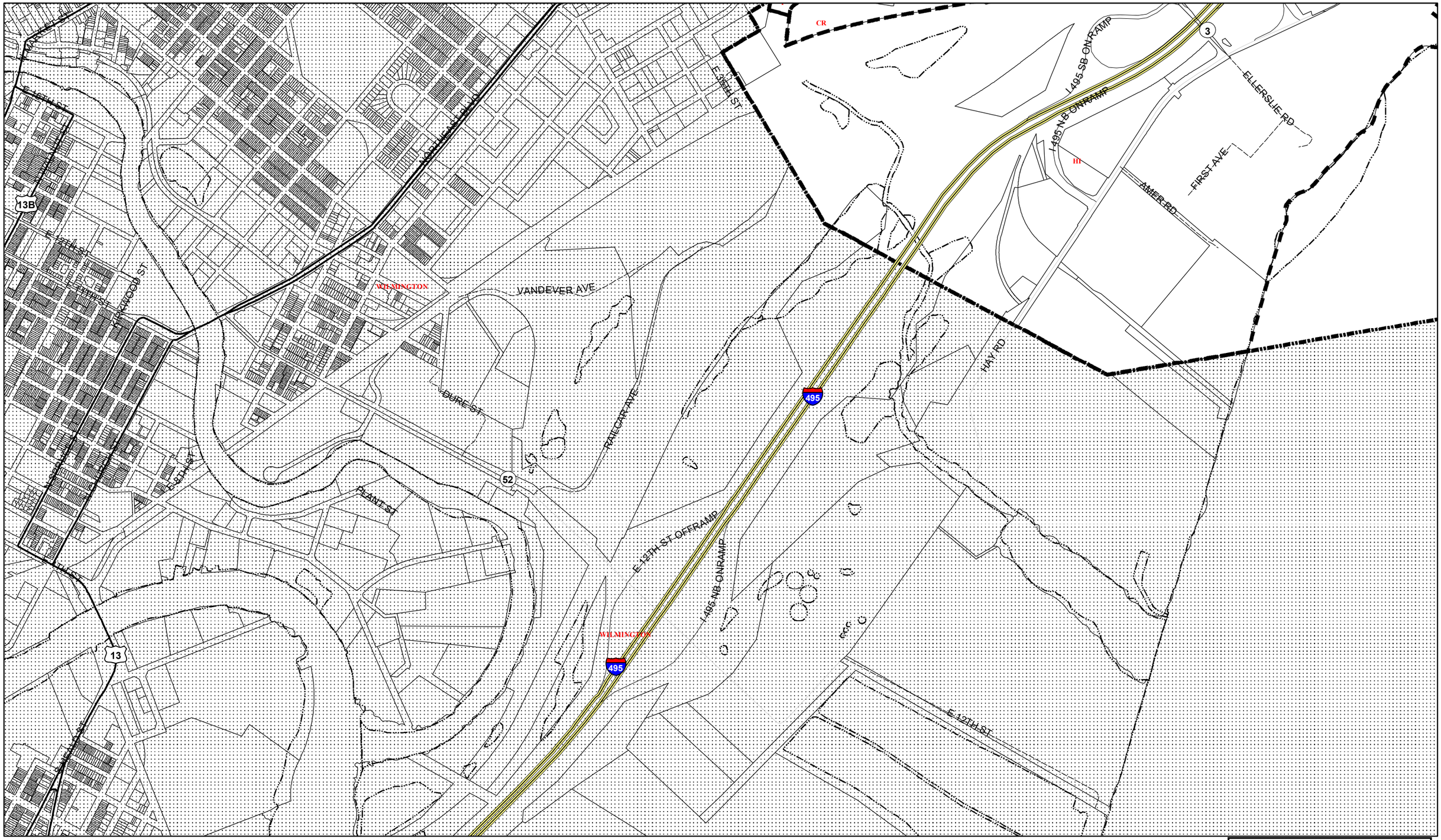
A Sediment and Stormwater Plan Approval is being pursued from DNREC’s Division of Watershed Stewardship alongside this submission. The Site has been given approval to submit an accelerated, combined Step 2 and 3 of the Sediment and Stormwater Plan. Once approval of the Plan has been received from the Division of Watershed Stewardship, an addendum will be sent to the Division of Waste and Hazardous Substances to accompany this submission.

8.4 DIVISION OF AIR QUALITY PERMIT

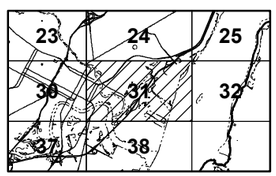
Shredding, crushing, and/or grinding materials may require a permit from DNREC’s Division of Air Quality. These processes will be determined during the bidding process. If it is determined that these processes are necessary, then a permit will be obtained at that time from DNREC’s Division of Air Quality.

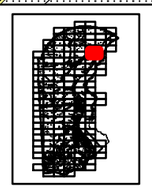
APPENDIX 8-A

PROOF OF ZONING



THIS MAP IN WHOLE OR IN PART MAY NOT BE PRODUCED IN ANY FORM OR BY ANY MEANS WITHOUT WRITTEN PERMISSION OF THE DEPARTMENT OF LAND USE OF NEW CASTLE COUNTY.





LEGEND

- ZONING LINE
- CORPORATE LIMIT LINE
- HYDROLOGY LINE
- PARCEL LINE
- ZONING EXHIBIT LINE
- 00/000 REZONING ORDINANCE
- SR ZONING CLASSIFICATION

ZONING CLASSIFICATIONS

NC2A	Single Family (2 ac.)	Ncap	Apartments	ON	Office Neighborhood
NC40	Single Family (40,000 sq. ft.)	Ncpud	Existing Planned Development	OR	Office Regional
NC21	Single Family (21,000 sq. ft.)	NCmm	Manufactured Mobile	BP	Business Park
NC15	Single Family (15,000 sq. ft.)	S	Suburban	I	Industrial
NC10	Single Family (10,000 sq. ft.)	ST	Suburban Transition	HI	Heavy Industrial
NC6.5	Single Family (6,500 sq. ft.)	SE	Suburban Estate	EX	Extraction
NC5	Single Family (5,000 sq. ft.)	SR	Suburban Reserve	OVERLAY DISTRICTS	
NCsd	Semi-Detached	TN	Traditional Neighborhood	H	Historic Preservation
NCth	Townhouses	CN	Commercial Neighborhood	AG	Agricultural Preservation
Ncga	Garden Apartments	CR	Commercial Regional	CL	Development Option
				HT	Hometown Overlay

N

NEW CASTLE COUNTY, DE
OFFICIAL ZONING MAP

ADOPTED SEPTEMBER 22, 1998

MAP NO. **31**

GRID BASED ON THE DELAWARE STATE PLANE COORDINATE SYSTEM

0 200 400 Feet

Revised: 8/28/2018

APPENDIX 8-B

NPDES STORMWATER DISCHARGE PERMIT

Delmarva Power

AU.02.03.01
~~EM.03.02.01~~
~~EM.02.06.01~~

November 24, 1992

Post-it™ brand fax transmittal memo 7671	# of pages ▸
To Denise Valitski	From Mark Elliott
Co.	Co.
Dept.	Phone #
Fax #	Fax #

Mr. Joe Kilby
Water Pollution Branch
DNREC
89 Kings Highway
P.O. Box 1401
Dover, DE 19903

RE: Edge Moor Power Plant, Outfall #014 Closure

Dear Mr. Kilby:

This letter is to notify you that Edge Moor Power Plant has closed-off NPDES outfall #014. Enclosed for your records are two photographs of this discharge showing the plate and weld used to close the outfall (Attachment A).

As you know, outfall #014 discharged water from Edge Moor's ash landfill stormwater detention pond to Shellpot Creek. The plant has determined that the volume of landfill stormwater runoff received by the pond from a 10 and 100 year design storm event can be fully contained within the pond and still provide sufficient free board to guard against overtopping (Attachment B). The pond outlet can therefore be closed and is no longer needed as an outlet to Shellpot Creek.

Please note that the enclosed storm event analyses have been provided and accepted by DNREC's Solid Waste Branch, and they have determined that the cessation of #014 is acceptable with respect to Edge Moor's landfill operating permit.

Recognizing that outfall #014 is closed, the plant will not be completing any future discharge monitoring reports (DMR) or other NPDES permit conditions surrounding this discharge. A copy of this letter is also being forwarded to Mr. John Defriece to notify DNREC's NPDES Permits Group that the other permit conditions (i.e. special conditions) for #014 are no longer applicable.

If you need any additional information regarding the above notification or have any questions, please call me at 452-6045.

Sincerely,

Frank F. Henshaw II

Frank F. Henshaw II
Environmental Affairs

Enclosures

CC: J. Defriece, DNREC

APPENDIX 8-C

SEDIMENT AND STORMWATER PLAN APPROVAL

A Sediment and Stormwater Plan will be submitted to the DNREC Division of Watershed Stewardship under a parallel process to the industrial landfill closure permitting. Confirmation of that plan approval will be provided to the Division of Waste and Hazardous Substances upon receipt.

SECTION 9.0

CLOSURE/POST-CLOSURE PLAN

Table of Contents

1.0 INTRODUCTION 1

1.1 Terms of Reference 1

1.2 Regulatory Requirements and Closure Plan Organization 1

1.3 Definitions 1

1.4 Overview of Closure and Post-Closure Activities 2

1.4.1 Introduction 2

1.4.2 Required Submittals and Notifications 2

1.4.3 Closure Construction Activities 3

2.0 METHODS, PROCEDURES, AND PROCESSES FOR LANDFILL CLOSURE 3

2.1 Introduction 3

2.2 Containment of Solid Waste Constituents 3

2.3 Leachate Management 4

2.4 Long-Term Landfill Maintenance 4

3.0 PRE-CLOSURE ACTIVITIES 4

4.0 DESCRIPTION OF CLOSURE SYSTEM COMPONENTS 5

4.1 Introduction 5

4.2 Stormwater Management System 5

4.2.1 Erosion and Sediment Control Measures 5

4.3 Final Cover System 5

5.0 POST-CLOSURE CARE 7

5.1 Regulatory Requirements 7

5.2 Post-Closure Period 7

5.3 Post-Closure Maintenance 7

5.3.1 Access Roads 7

5.3.2 Vegetation 7

5.3.3 Stormwater Management System 8

5.3.4 Environmental Monitoring System 8

5.3.5 Miscellaneous Site Activities 8

5.4 Post-Closure Monitoring 9

5.4.1 Introduction 9

5.4.2 Groundwater Monitoring 9

5.5 Post-Closure Use 9

5.6 Duration of Post-Closure Care 9

5.7 Facility Contact 10

6.0 COST ESTIMATES 10

6.1 Introduction 10

6.2 Closure Construction Cost Estimate 10

6.3 Post-Closure Care Cost Estimate 11

APPENDICES

APPENDIX 9-A
Operation and Maintenance Plan

APPENDIX 9-B
Construction Quality Assurance (CQA) Plan

APPENDIX 9-C
Contingency Plan

APPENDIX 9-D
Closure Schedule

APPENDIX 9-E
Closure and Post-Closure Costs

1.0 INTRODUCTION

1.1 Terms of Reference

As required by Delaware's Regulations Governing Solid Waste (DRGSW) Sections 6.10 (i.e., Closure) and 6.12 (i.e., Post-Closure Care), this Edge Moor Site II Ash Landfill Closure and Post-Closure Care Plan (Closure Plan) describes the procedures that will be used to close this landfill in a manner that minimizes long-term maintenance, as well as minimize the potential for post-closure migration of substances and leachate to surface water, groundwater, or atmosphere. The Edge Moor Site II Ash (industrial waste) Landfill (Site II Ash Landfill) is located in New Castle, Delaware, and owned by Conectiv Properties and Investments, Inc. (CPI).

A Closure/Post-Closure Plan was prepared by Conectiv Energy Engineering and Environmental and Duffield Associates, Inc. in 2009 and submitted to the Delaware Department of Natural Resources and Environmental Control (DNREC) at that time. This Closure Plan has been updated by Golder Associated Inc. (Golder) in January 2020 to address the current schedule for site closure and post-closure activities. This submission includes information provided from the 2009 Closure Plan, as well as additional and updated information based on the proposed closure measures.

1.2 Regulatory Requirements and Closure Plan Organization

This Closure Plan has been prepared to meet the closure and post-closure care requirements for industrial landfills, as defined in DRGSW §6.10 and §6.12, and related sections. Closure Plan content requirements are provided in DRGSW §6.10.3. Closure Plan content requirements, and the location where each requirement is addressed in this Closure Plan, are as follows:

- Section 1 presents definitions and an overview of closure and post-closure activities for the Site II Ash Landfill;
- Section 2 describes the methods, procedures, and processes that will be used during closure activities (DRGSW §6.10.3.1);
- Section 3 discusses pre-closure activities (DRGSW §6.10.3.3 and §6.10.3.4);
- Section 4 provides a description of the closure system components (DRGSW §6.10.3.2); and
- Section 5 presents the Post-Closure Plan for the Site II Ash Landfill (DRGSW §6.10.3.6, §6.10.3.8 and §6.12).

The standards for construction quality assurance (CQA) required for closure (DRGSW §6.10.3.9) are provided in the site CQA Plan (see Appendix 9-B). Please note that closure and post-closure cost estimates for the Site II Ash Landfill are provided in Appendix 9-E (DRGSW §6.10.3.5).

1.3 Definitions

The following definitions are used throughout this Closure Plan. These definitions are consistent with the definitions presented in DRGSW §3.0, but have been clarified to better describe activities that will be performed for closure and post-closure care of the Site II Ash Landfill.

- "Final Closure" is defined as completion of the final cover system over the last increment of the main body of ash required under DRGSW §6.8. The activities to be performed during final closure (as described in this section) are intended to minimize the maintenance of the landfill and to prevent the release of solid waste or leachate to the environment, as required by DRGSW §6.10.1.

- "Pre-Closure" is defined as closure activities that are performed after cessation of waste disposal operations, but before the Final Closure.
- "Post-Closure Care" is defined as the maintenance and monitoring activities that will be performed during the 30-year post-closure care period (as required by DRGSW §6.12). Post-closure care includes all activities that will be performed following closure, such as: (i) operation of the stormwater management system; (ii) long-term maintenance; and (iii) environmental monitoring.

In this Closure Plan, the "Drawings" refer to the drawings provided in of the Engineering Report Appendix 5-D, prepared by Golder Associates Inc., dated January 2020.

1.4 Overview of Closure and Post-Closure Activities

1.4.1 Introduction

The Site II Ash Landfill was developed and operated in conjunction with the Edge Moor Power Plant (EMPP). The Landfill served as a proximate, permitted (including zoning), and controlled site for the disposal of coal combustion residuals (CCRs) that were not transported directly to various beneficial reuse application locations. The utilization of the Site II Ash Landfill is consistent with the adjacent and surrounding land use pattern.

The Site II Ash Landfill will be closed according to the closure requirements of DRGSW. This section provides an overview of the activities that will be performed during closure and post-closure of the Site II Ash Landfill and references for the locations of these activities in this Closure Plan.

1.4.2 Required Submittals and Notifications

CPI will make several submittals and notifications, as required by DRGSW §6.10.2, to describe its intentions for closure and post-closure care to DNREC and the public. These submittals and notifications are identified below.

- As required under DRGSW §6.10.2.1, this Closure Plan was prepared, and is being submitted, as part of this permit modification application. The engineering design and layout of the final closure system are described in more detail in the Engineering Report.
- As required by DRGSW §6.10.2.2., since no waste has been accepted at the landfill since the late 1980s, a Letter of Intent to Close is being provided to DNREC along with the Closure Plan submittal. The written notification to DNREC will also include the Closure Plan and a projected closure schedule. Copies of these documents will be maintained at the CPI offices through the post-closure care period of the Site II Ash Landfill.
- CPI will not commence final closure of the Site II Ash Landfill until a closure permit has been issued, as required by DRGSW §6.10.2.4. After the final closure permit has been issued, the Closure Plan will be executed as described in the terms of the permit.
- In addition, CPI will notify DNREC at least thirty (30) working days prior to commencing closure construction activities. Following this notification, DNREC will perform a site inspection to assess the condition of the Site II Ash Landfill prior to closure activities. CPI will perform corrective work that is deemed necessary by DNREC.
- In addition, CPI will submit a final report within thirty (30) days of completion of the Site II Ash Landfill closure. The final report will certify the closure of the Site II Ash Landfill was completed in accordance with the closure plan. The final report will be certified by the CQA Engineer, who must be a Professional Engineer registered in the State of Delaware. DNREC will inspect the closure and provide feedback either in the form of a closure

approval letter or by identifying deficiencies. CPI will perform corrective work that is deemed necessary by DNREC.

1.4.3 Closure Construction Activities

Final closure of the Site II Ash Landfill will include several activities that are intended to minimize maintenance of the landfill and minimize the potential for release of industrial waste and leachate. Final closure construction activities will include the following features: (i) the final cover system; and (ii) the stormwater management system. Construction activities associated with each of these features are briefly described below.

- *Final Cover System.* CPI will construct a final cover system over the main body of ash after ash and soil in an area has been filled to the final closure design grades. The proposed final cover system grades are shown on the drawings. Closure activities will be performed over a period of approximately one (1) year. Closure schedule is not dependent on discontinuing of disposal operations, since disposal operations have been discontinued at the Site II Ash Landfill for several decades. However, the closure schedule is dependent on the replacement of several existing electrical transmission towers located within the ash landfill. These towers must be replaced prior to the construction of the final cover system.

- *Stormwater Management System.* Concurrent with the construction of the final cover system, the stormwater management system will be constructed. During construction of the final cover system at the Site II Ash Landfill, stormwater management features will also be used for sediment control. After closure (i.e., after all disturbed areas have been seeded and stabilized), temporary features will be decommissioned as necessary.

2.0 METHODS, PROCEDURES, AND PROCESSES FOR LANDFILL CLOSURE

2.1 Introduction

This Closure Plan provides a description of methods, procedures, and processes that will be used to close the Site II Ash Landfill area in accordance with DRGSW §6.10.1.1 and §6.10.1.2 requirements, which are as follows:

- Minimize maintenance of the landfill; and

- Minimize the post-closure escape of solid waste constituents and leachate to the surface water, groundwater, or atmosphere.

In the following sections, the methods, procedures, and processes that will be used to minimize the post-closure release of solid waste constituents (Section 2.2) and leachate (Section 2.3) to the surface water, groundwater, or atmosphere are described. Also, the need for long-term maintenance of the landfill is addressed in Section 2.4. Landfill gas mitigation is not applicable at this site.

2.2 Containment of Solid Waste Constituents

The design of the Site II Ash Landfill provided for containment of solid waste constituents throughout the period of landfill operation, closure, and post-closure care, and minimizes the possibility for release of solid waste constituents to the environment. As part of the closure process, additional wastes encountered onsite (e.g., wastes from landfill run-off collection ponds) during closure construction will be removed or disposed of in a manner consistent with applicable DRGSW requirements. The final cover system that will provide for containment of solid waste

constituents through the closure and post-closure periods is described in Section 4.3 and illustrated on the engineering drawings.

2.3 Leachate Management

The design of the final cover system for the Site II Ash Landfill provides an effective means for the reduction of leachate generation during the post-closure care period. A low permeability final cover system will be constructed over the main body of ash within the site. The final cover system will be maintained throughout the post-closure period. This cover system will reduce the amount of infiltration that enters the landfilled ash, thereby minimizing the amount of leachate that is generated from water percolating through the ash and into groundwater during the post-closure period.

2.4 Long-Term Landfill Maintenance

The Site II Ash Landfill closure system was designed to minimize maintenance throughout the post-closure care period, as required by DRGSW §6.10.1.1. The features of the design that minimize maintenance include the following:

- Relatively flat drainage channels to route drainage from the final cover system at low, non-erosive velocities;
- Durable, hearty grasses that limit stormwater runoff and, thus, minimize the potential for erosion of the final cover system soils; and
- Drainage features that transition gradually (instead of abruptly) to prevent concentrations of flow that may damage the final cover.

3.0 PRE-CLOSURE ACTIVITIES

Pre-closure activities as defined in Section 1.3 of this Closure Plan, are activities performed after cessation of waste disposal operations but before the Final Closure. Pre-closure activities will be performed in order to: (i) minimize generation of leachate; and (ii) enhance stormwater management. Pre-closure of the landfill may include any or all of the following activities:

- Replacement of the existing electrical transmission towers;
- Verifying site survey control and current topographic features;
- Installing temporary erosion and sedimentation controls;
- Clearing and grubbing of the existing vegetation; and
- Ash grading, as necessary, to support the construction of the final cover system contours as shown on the engineering drawings.

CPI will evaluate site conditions and will perform pre-closure activities as required to meet the following goals: (i) minimize the generation of leachate; and (ii) minimize the need for maintenance of the landfill final grading layer. CPI will discuss specific pre-closure activities with DNREC prior to implementation.

4.0 DESCRIPTION OF CLOSURE SYSTEM COMPONENTS

4.1 Introduction

After closure of the Site II Ash Landfill, the site will be maintained to present an acceptable appearance consistent with the surrounding area and the intended use of the land. The closure system will consist of several components, including a stormwater management system and a final cover system. This section describes the stormwater management and final cover system components of the closure system.

4.2 Stormwater Management System

At final closure, the stormwater management system at the Site II Ash Landfill will be modified to meet post-closure goals. During construction of the final closure, the system will have the dual purposes of stormwater management and erosion and sediment control. After final closure, the primary purpose of the system will shift from erosion and sediment control (because disturbed areas will be stabilized) to stormwater management (i.e., conveyance of stormwater to an engineered discharge location). The Site II Ash Landfill presently contains one inactive sedimentation basin located to the north of the landfill. The final closure construction will include the removal of the existing structure and the grading of perimeter stormwater conveyance channels at the toe of the landfill side slopes. Once the disturbed areas of the site are stabilized after construction is complete, the stormwater management features may be removed, as necessary. See Appendix 5-A of the Engineering Report for Hydrologic Analyses.

4.2.1 Erosion and Sediment Control Measures

Erosion and sediment control measures will manage surface water, minimize soil erosion, and control sediment during closure construction. The erosion and sediment control measures include the following:

- Perimeter stormwater swales will be graded at a 0.25% (max.) slope to route drainage from the final cover system at low, non-erosive velocities; and
- Final cover and disturbed areas will be seeded for stabilization.

The temporary erosion and sedimentation controls will be constructed prior to the start of construction and may be modified as the closure activities progress. Interim erosion and sediment control measures, such as sediment traps, will be installed during construction in addition to the permanent control measures installed as part of the closure system. Calculations for the erosion and sediment control measures are included in Appendix 5-A of the Engineering Report.

4.3 Final Cover System

The proposed final cover system at the Site II Ash Landfill will consist of the following components, listed from the top down:

- Vegetative layer of native perennial grasses;
- Minimum 6-inch layer of earthen material (i.e., topsoil) capable of sustaining native plant growth;
- Minimum 18-inch soil layer providing rooting depth and moisture for plant growth;
- Geosynthetic drainage layer (i.e., geocomposite) placed beneath the soil layer;

- 40-mil geosynthetic barrier layer (i.e., textured LLDPE or HDPE geomembrane) placed beneath the drainage layer; and
- Minimum 6-inch grading fill layer.

In addition, Golder proposes two alternate closure cap systems that which include the following major elements (from top to bottom):

Proposed Alternate Option No. 1:

- Vegetative layer of native perennial grasses;
- Minimum 6-inch layer of earthen material (i.e., topsoil) capable of sustaining native plant growth;
- Minimum 18-inch soil layer providing rooting depth and moisture for plant growth;
- 10 ounce per square yard (oz/sy) non-woven geotextile layer;
- 50-mil combination geomembrane/drainage layer (LLDPE or HDPE Agru Super GripNet®); and
- Minimum 6-inch grading fill layer.

Proposed Alternate Option No. 2:

- Vegetative layer of native perennial grasses;
- Minimum 6-inch layer of earthen material (i.e., topsoil) capable of sustaining native plant growth;
- Minimum 18-inch soil layer providing rooting depth and moisture for plant growth;
- 10 oz/sy non-woven geotextile layer;
- 50-mil combination geomembrane/drainage layer (LLDPE or HDPE Agru MicroDrain®); and
- Minimum 6-inch grading fill layer.

All three cover system configurations include deviations from the specified cover system stated in DRGSW requirements. The primary final cover system identified incorporates two additional layers not required by DRGSW. The two alternate final cover system options propose to use innovative materials while still meeting the requirements of DRGSW and the performance requirements of the design. The final cover system to be installed will be selected during bidding with the Contractor from the final cover system options approved by DNREC. All options have been engineered to provide long-term performance throughout the post-closure period. The design of the geosynthetic components of the final cover system is provided in the Engineering Report.

Details of the final cover systems are provided in the Drawings included in the Engineering Report. The final cover systems at the Site II Ash Landfill were designed to minimize stormwater infiltration into landfilled wastes and to provide a physical barrier layer between the finished ground surface and waste.

5.0 POST-CLOSURE CARE

5.1 Regulatory Requirements

As stated previously, upon completion of the landfill closure, CPI will submit a final report for DNREC's approval. The report will be certified by the CQA Engineer, a Professional Engineer licensed in the State of Delaware, and state that the landfill closure was completed in accordance with the approved Closure Plan. The report will also include copies of material acceptance documents, testing documents, inspection logs, and other documents that support the CQA Engineer's opinion that the landfill closure was accomplished in conformance with this Closure Plan, which addresses the requirements of DRGSW §6.10.3.6 and §6.12.

As required by DRGSW §6.12.2, post-closure maintenance will be performed for the final cover system, all vegetation associated with the Site II Ash Landfill, the stormwater management system, and other miscellaneous site features, as described below. The inspection frequencies for post-closure maintenance is included in the Operation and Maintenance Plan (Appendix 9-A). In addition, groundwater and surface water will be monitored as described in Section 5.4 of this Closure Plan. This section describes the operation, maintenance, and monitoring activities for the Site II Ash Landfill throughout the 30-year post-closure care period.

5.2 Post-Closure Period

Upon receipt of the post-closure care permit, the Site II Ash Landfill will enter the "post-closure care period". Post-closure care activities will be limited to maintenance of the passive final cover system and monitoring of the groundwater monitoring system as described in Sections 5.3 and 5.4, respectively.

5.3 Post-Closure Maintenance

5.3.1 Access Roads

On-site access roads will be maintained in a passable condition at all times during the post-closure period. As shown on the Drawings, the access roads will have stone surfaces and all access road conditions will be monitored with every inspection to identify conditions that would prevent passage of vehicles (such as ruts, ponded water, washouts, gullies, ice or other frozen precipitation, or obstacles). As needed, repairs will be made to keep the access roads at the Site II Ash Landfill passable.

5.3.2 Vegetation

All vegetation will be maintained in a condition that will minimize the potential for erosion. During the post-closure period, maintenance will consist of inspections, as outlined in the Operation and Maintenance Plan (Appendix 9-A) to identify locations of excessive erosion, washout, poor vegetation density, and damaged vegetation. If required, then the identified areas will be regraded and/or revegetated.

During inspections, all slopes will be inspected for stability. The inspector will specifically look for signs of sloughing, toe bulging, tension cracks at the tops of slopes, and other conditions that may indicate potential slope instability. If areas of potential instability are identified, then DNREC will be notified and appropriate remedial measures will be implemented.

Mowing of the vegetation on the final cover system will be performed semi-annually for the first two years and then at least annually thereafter to maintain the integrity of the geosynthetic components of the cover system. Woody vegetation will be removed to mitigate roots extending to the geosynthetic components of the cover system.

5.3.3 Stormwater Management System

The stormwater management system, consisting of all drainage ditches, terraces, channels, culverts, and sedimentation basins, will be maintained in a condition that allows continuous control of stormwater at the site. During the post-closure period, diversions, vertical channels, perimeters swales and other stormwater management features will be inspected as outlined in the Operation and Maintenance Plan (Appendix 9-A) for conditions that would restrict flow, such as:

- Washouts;
- Excessive sediment;
- Dislodged riprap; or
- Gullies or erosion.

Washouts, excessive erosion, and gullies will be repaired by regrading the areas to the proper elevations (as shown on the Drawings), revegetating, or applying riprap.

5.3.4 Environmental Monitoring System

The components of the environmental monitoring system (e.g., groundwater monitoring wells) will be inspected during each sampling event. The components will be inspected for damage and will be repaired or replaced, as necessary.

5.3.5 Miscellaneous Site Activities

Landfill inspections will be conducted by CPI personnel during the post-closure period. Maintenance of other site features will be performed during the post-closure period on a routine basis, as described below.

- The integrity and effectiveness of the landfill final cover will be inspected at least semi-annually.
- The landfill will be examined at least semi-annually for signs of settling or subsidence.
- During landfill inspections the condition of the electrical transmission line foundations will be noted.
- The site perimeter fence will be inspected at least semi-annually for breaks in the fence and to ensure that the gates are working properly. The fence and gates will be repaired as needed to provide continuous access control around the entire site.

Inspection sheets will be used during the landfill inspections to document the existing conditions, note unsatisfactory conditions, and to provide recommended actions to correct unsatisfactory conditions.

In addition, as required by DRGSW §6.12.3 the inspections will be used to verify the following:

- Standing water is not accumulating on the landfill;
- Open burning is not being performed on the landfill;
- Activities that have not been approved in advance by DNREC are not being performed at the landfill; and
- Access to the landfill is limited to only those persons who are engaged in approved post-closure activities.

5.4 Post-Closure Monitoring

5.4.1 Introduction

This section describes the activities that CPI will perform to monitor the Site II Ash Landfill throughout the post-closure care period. These activities include monitoring of groundwater. The sampling and analysis for environmental monitoring services will be performed by either CPI and/or a consultant for CPI. The specific monitoring procedures required by DRGSW §6.7 and §6.6.3 are presented below.

5.4.2 Groundwater Monitoring

Groundwater will be sampled as outlined in the Operation and Maintenance Plan (Appendix 9-A) at well locations surrounding the landfill throughout the post-closure care period, as required in DRGSW §6.7 and as specified in the permit. The site-specific groundwater monitoring requirements will be reviewed periodically during the post-closure care period.

- All monitoring wells will be maintained and protected in accordance with the "Regulations Governing the Construction and Use of Wells".
- Abandonment of monitoring wells due to construction activities will be performed in accordance with the terms of "Regulations Governing the Construction and Use of Wells".

5.5 Post-Closure Use

The future use of the Site II Ash Landfill is discussed in this section as required by DRGSW §6.10.3.6.3. The area is an active power transmission corridor that contains several different overhead powerlines that traverse the area. Several of the pole/foundations are incised into the ash mound. Prior to closure construction, these poles will be removed and upgraded to the current standard. In addition to the maintenance on these poles, work related to the landfill maintenance will include grass mowing, grass cover maintenance, inhibiting tree and shrub growth, and maintaining positive, but non-erosive, drainage.

5.6 Duration of Post-Closure Care

Post-closure care will be provided in accordance with the requirements of DRGSW §6.12. Section 6.12.1 of DRGSW defines the general requirements for post-closure care including specific post-closure care activities and the duration of the post-closure care period. The requirements regarding the duration of post-closure care include the following:

- The post-closure care period will last 30 years after the completion of closure;
- DNREC may remove required elements of the Post-Closure Plan if it determined that they are no longer needed to protect human health and the environment;
- At any time after the first five years of the post-closure period, DNREC may reduce the length of post-closure care if it determines that such care is not needed to protect human health and the environment;
- Prior to the end of post-closure care, DNREC may extend the post-closure care period if it determines that an extended period is necessary to protect human health and the environment; and
- DNREC will require actions to mitigate threats to human health and the environment if evidence exists of a contaminant release that could significantly threaten human health or the environment.

Based on these requirements, a performance-based approach will be applied to the duration of post-closure care at the Site II Ash Landfill. In general, this will consist of implementing the following approach.

- First, the requirements of the Post-Closure Plan, as described in Sections 5.1 through 5.5 of this Closure Plan, will be implemented beginning at the completion of closure. At any time after the first year of post-closure care, an evaluation will be made of the need to continue post-closure care for each of the three post-closure care components (i.e., groundwater monitoring, stormwater management systems, and final cover systems). The approach for evaluating the need for continued post-closure care is outlined in the Operation and Maintenance Plan (Appendix 9-A). Depending on the outcome of the evaluation, the Post-Closure Plan may be revised with approval by DNREC so that it better reflects the actual threat of the landfill to human health and the environment.
- If changes are made to the Post-Closure Plan as a result of the evaluation of the need for continued post-closure care, then a demonstration will be made to DNREC that the changes are reasonable based on the available information and the evaluations. No changes in post-closure care will be made before DNREC formally approves such changes to the Closure Plan and the permit for the facility. If the outcome of the evaluation is inconclusive (e.g., no change to the Post-Closure Plan is indicated by the data and evaluations), then post-closure care will continue as required in the Post-Closure Plan. Additional evaluations of the need for continued post-closure care may be performed when additional data exist that could result in a different outcome of the evaluation.

5.7 Facility Contact

The anticipated facility contact information for the post-closure period of the landfill is as follows:

Mr. Christopher Landes
Pepco Holdings
Environmental Management
88MK64, P.O. Box 231
Wilmington, Delaware 19899-0231
Phone: (302) 451-5059

6.0 COST ESTIMATES

6.1 Introduction

In this section, cost estimates are presented for final closure system construction and post-closure care for the Site II Ash Landfill. The cost estimates are presented to address the requirements of DRGSW §6.10.3.5.

6.2 Closure Construction Cost Estimate

An estimate of closure construction cost for the final cover system is included in Appendix 9-E. The closure cost estimates include those costs that will be incurred during: (i) construction of the 14.8-acre area final cover system for the Site II Ash Landfill; and (ii) establishment of the stormwater management systems. The updated closure construction cost for the facility is approximately $5,570,000.

6.3 Post-Closure Care Cost Estimate

An estimate of the post-closure care cost for maintenance of the candidate closure systems for the Site II Ash Landfill is presented in Appendix 9-E. The post-closure cost estimate includes the costs for the following:

- Environmental quality monitoring (e.g., sampling and analysis of groundwater);
- Inspection of the final cover system, stormwater management system, and perimeter road; and
- Maintenance of the above-referenced systems.

The updated post-closure care cost for the facility is approximately $155,000 annually, or about $6,287,606 as a minimum total cost accounting for 2 percent inflation. This estimate is based on a 30-year post-closure care period, as required by DRGSW §6.12.1.1. The post-closure care costs reflect the general and specific requirements as required by DRGSW §6.12. CPI will update these estimates yearly and submit them to DNREC as part of the annual reports as required by DRGSW §6.12. The costs will be based on meeting the post-closure care standards as described in DRGSW §6.10.

APPENDIX 9-A

OPERATION AND MAINTENANCE PLAN

Table of Contents

1.0 INTRODUCTION 1

2.0 SITE BACKGROUND 1

2.1 General Site Description 1

2.2 Ownership History 1

3.0 IMPLEMENTATION OF POST-CLOSURE CARE PLAN 1

3.1 Delaware Department of Natural Resources and Environmental Control (DNREC) 2

3.2 Conectiv Properties and Investments, Inc. (CPI) 2

3.3 O&M Coordinator 2

3.4 O&M Contractor 2

4.0 OVERVIEW OF FINAL CLOSURE PLAN 2

4.1 Final Cover System 3

4.2 Stormwater Management System 3

4.3 Access Roads 4

4.4 Site Access Controls 4

5.0 FINAL COVER SYSTEM 4

5.1 Inspections 4

5.2 Maintenance and Repair Activities 5

5.3 Periodic Mowing 6

6.0 STORMWATER MANAGEMENT SYSTEM 6

6.1 Inspection 6

6.2 Maintenance and Repair Activities 6

7.0 GROUNDWATER MONITORING 7

8.0 ACCESS ROAD INSPECTION 7

9.0 SITE-SPECIFIC HEALTH AND SAFETY MONITORING 7

10.0 REPORTING AND RECORD KEEPING 7

11.0 PLAN MODIFICATIONS 8

APPENDICES

APPENDIX A
Table 1 Site Inspection Checklist

APPENDIX B
Groundwater Monitoring Plan

1.0 INTRODUCTION

This Operation and Maintenance (O&M) Plan is for the Edge Moor Site II Ash Landfill (Site II Ash Landfill), which lies within an active Delmarva Power and Light Co. (DPL) electric transmission corridor located in Wilmington, Delaware. This O&M Plan is intended to fulfill the requirements of Delaware's Regulations Governing Solid Waste (DRGSW) §4.2.1.3 and §6.9, as they relate to the operation and maintenance of an industrial landfill. The Final Closure of the Site will be performed in accordance with DRGSW §6.10.

This O&M Plan describes the closure sequencing, final cover system, stormwater management system, and maintenance of the systems for the landfill. The final cover and stormwater management systems have been designed to minimize long-term maintenance and minimize infiltration of precipitation into the deposited coal ash and other adverse environmental impacts.

2.0 SITE BACKGROUND

2.1 General Site Description

The Site II Ash Landfill is located in parcel 2604600005 and is approximately 14.8 acres. It is owned by Conectiv Properties and Investments Inc. (CPI). The Site II Ash Landfill is bordered to the northeast by Shellpot Creek (a tributary to the Delaware River), to the south by Cherry Island Landfill, to the northwest by Interstate 495 and to the east by industrial landfills, a wastewater treatment plant and the Delaware River. Within the DPL transmission corridor, there are many electric transmission towers that surround the Site. These transmission towers carry overhead electric lines and are supported by concrete shallow spread foundations. DPL personnel and contractors access the transmission corridor for routine maintenance, vegetation management, and upgrades to the towers, foundations, and transmission lines.

2.2 Ownership History

Site II Ash Landfill was initially owned by Delmarva Power & Light Company, who then transferred the Edge Moor Generating Station to an affiliate, Conectiv Delmarva Generation, Inc., under the terms of an asset transfer agreement dated July 1, 2000. In December 2007, Conectiv Delmarva Generation, Inc. was converted to Conectiv Delmarva Generation, LLC. In June 2010, Conectiv Delmarva Generation, LLC. transferred ownership of the parcel containing the Site II Ash Landfill to Conectiv Properties and Investments, Inc. (CPI).

3.0 IMPLEMENTATION OF POST-CLOSURE CARE PLAN

The following parties are involved in the implementation of the Post-Closure Care Plan:

- Delaware Department of Natural Resources and Environmental Control (DNREC);
- Conectiv Properties and Investments, Inc. (CPI);
- O&M Coordinator; and
- O&M Contractor.

The roles and responsibilities of each of the parties are summarized below.

3.1 Delaware Department of Natural Resources and Environmental Control (DNREC)

DNREC will provide oversight and review of the Post-Closure Care activities for the final cover system, including review and approval of the annual inspection reports to be submitted by CPI.

3.2 Conectiv Properties and Investments, Inc. (CPI)

CPI is responsible for taking the necessary actions to maintain the closure cap. The CPI project manager is Christopher Landes. CPI shall notify the DNREC project coordinator of any changes to the project management/coordination positions.

3.3 O&M Coordinator

CPI will either utilize internal personnel or hire a qualified Engineering Consulting firm to execute the O&M Plan. This O&M Coordinator will hire O&M Contractor(s) as necessary to perform various activities associated with the routine maintenance of the final cover system and stormwater management systems. If the O&M Coordinator is notified of any repairs that require immediate attention that cannot be handled by the O&M Contractor, then the O&M Coordinator, with the consent of CPI, will also hire specialized Contractors capable of performing the specific repair issues in a timely manner.

The O&M Coordinator will review periodic inspection forms prepared by the O&M Contractor(s) and will make annual Site visits to verify that proper maintenance and operation of the final cover and stormwater management systems are being performed. The O&M Coordinator will provide copies of the inspection forms to CPI for inclusion in the annual inspection reports to be submitted to DNREC (See Section 10.0 for Reporting and Record Keeping).

3.4 O&M Contractor

The O&M Contractor may perform routine inspections, maintenance and repair activities for the various closure plan components described in Sections 5.0, 6.0, and 7.0 of this O&M Plan. The O&M Contractor shall notify the O&M Coordinator prior to the scheduled Site visits, and future repair and maintenance activities. In addition, the O&M Contractor shall notify the O&M Coordinator immediately of any suspicious activity occurring on-Site or any repair that requires immediate attention. The O&M Contractor shall complete relevant inspection forms and submit them to the O&M Coordinator for inclusion in the annual inspection report that will be submitted by CPI to DNREC.

4.0 OVERVIEW OF FINAL CLOSURE PLAN

The Final Closure Plan for the Site II Ash Landfill includes the following components:

- A final cover system over the ash to minimize infiltration and promote positive drainage;
- A stormwater management system to promote the runoff of stormwater from the cover system and minimize erosion of the cover soils;
- A system of access roads to provide access to the site for future inspections and maintenance; and
- Site access controls.

The components of the Final closure plan are described in the following sections.

4.1 Final Cover System

The primary component of the Final Closure of the Site II Ash Landfill is the construction of a final cover system, which includes the following major elements (from top to bottom):

- Vegetative layer of native perennial grasses;
- Minimum 6-inch layer of earthen material (i.e., topsoil) capable of sustaining native plant growth;
- Minimum 18-inch soil layer providing rooting depth and moisture for plant growth;
- Geosynthetic drainage layer (i.e., geocomposite) placed beneath the soil layer;
- 40-mil geosynthetic barrier layer (i.e., textured LLDPE or HDPE geomembrane) placed beneath the drainage layer; and,
- Minimum 6-inch grading fill layer.

In addition, Golder proposes two alternate closure cap systems that which include the following major elements (from top to bottom):

Proposed Alternate Option No. 1:

- Vegetative layer of native perennial grasses;
- Minimum 6-inch layer of earthen material (i.e., topsoil) capable of sustaining native plant growth;
- Minimum 18-inch soil layer providing rooting depth and moisture for plant growth;
- 10 ounce per square yard (oz/sy) non-woven geotextile layer;
- 50-mil combination geomembrane/drainage layer (LLDPE or HDPE Agru Super GripNet®); and
- Minimum 6-inch grading fill layer.

Proposed Alternate Option No. 2:

- Vegetative layer of native perennial grasses;
- Minimum 6-inch layer of earthen material (i.e., topsoil) capable of sustaining native plant growth;
- Minimum 18-inch soil layer providing rooting depth and moisture for plant growth;
- 10 oz/sy non-woven geotextile layer;
- 50-mil combination geomembrane/drainage layer (LLDPE or HDPE Agru MicroDrain®); and
- Minimum 6-inch grading fill layer.

4.2 Stormwater Management System

The Final Closure Plan includes a stormwater management system to manage runoff from the final cover system. The stormwater management system includes perimeter stormwater swales and sediment traps (See Section 6.0 for Stormwater Management System).

4.3 Access Roads

Access roads have been incorporated into the Final Closure Plan along the base of the landfill and on the north slope to provide access to the plateau. The access roads allow for the following:

- Access for inspection, maintenance, and repair of the cap and stormwater management systems within the Site.
- Access for inspection, maintenance, and repair of the transmission lines and towers within the Site II Ash Landfill.

4.4 Site Access Controls

Unauthorized access to the Site is controlled by the chain link fence and multiple gates around the Site II Ash Landfill property.

5.0 FINAL COVER SYSTEM

5.1 Inspections

A visual inspection of the conditions of the final cover system surface will be performed on a quarterly basis for the first two years concurrent with inspections of the stormwater management system. Thereafter, this frequency of inspections will be reduced to semi-annually as the cap vegetative cover is established and erosion becomes less of a concern. The final cover system will be inspected by traversing the final cover system limits in a maximum 100-foot-wide transect or by other methods that will ensure that the entire final cover system area will be visually inspected, observing signs of significant erosion features that may potentially lead to damage of the final cover or stormwater management systems.

If the visual inspections and monitoring indicate that the cap system is functioning in a proper order and there are no indications that issues will be prevalent, CPI may submit a request to DNREC to reduce the inspection frequency. Requests for such modifications will follow the guidelines outlined in Section 11.0 of this O&M Plan.

In order to easily identify any signs of erosion, the inspections will be performed parallel to the topographic contours (i.e., perpendicular to any erosional features). The inspection of the cap will include observations for the following:

- Disturbance of the vegetative support layer;
- Poor vegetation (e.g. bare or unvegetated areas);
- Presence of woody vegetation with the potential to develop deep root structures;
- Cracks that result in the channeling of surface water and the creation of erosions rills;
- Evidence of burrowing animals;
- Significant erosion features (area where erosion gullies are greater than 3 inches deep or areas of erosion that have quickly developed and appear to be increasing in width or depth;
- Presence of exposed geosynthetics;
- Presence of illegal dumping;

- Presence of excessive vegetation within the perimeter stormwater swales that may impede the flow of runoff, which could result in a failure of or washing out of the cover system; and
- Possible settlement; however, settlement and subsidence of the coal ash are not anticipated to occur due to the engineering properties of the coal ash.

Deficient areas identified in the field will be located by either staking and survey or hand-held GPS unit for identification on a figure for subsequent repair and recording of the repair areas. In addition to identifying the areas on a figure, photographs will be taken to show the extent of the damage and the condition immediately after repairs are performed. A Site Inspection Checklist will be completed during each inspection activity (see Table 1 attached).

5.2 Maintenance and Repair Activities

Potential maintenance and repair tasks are identified below:

- Reseeding areas having insufficient vegetation during routine final cover system inspections with the seed mixture approved for use on the Site. Where repeated re-seeding is unsuccessful, amendment of the soil may be needed to support vegetative growth. Alternately, regrading upgradient areas to re-direct stormwater runoff elsewhere may be an option for consideration.
- Repairing eroded areas of the cap by replacing the eroded soil back onto the final cover system limits or by importing clean fill with the consent of the O&M Coordinator and CPI. Any replaced, or placed, soil must be installed per the Specifications and vegetation should be re-established.
- Repairing cracks that might be promoting slope instability or erosion. Repairs will be accomplished by excavating any observed cracks to a depth of 6 inches below the finished grade or to the top of the installed geosynthetic liner and replacing and compacting the existing final cover system materials. Care shall be taken to avoid damaging the geosynthetic liner components. Any damage to the geosynthetic components will be repaired by a qualified geosynthetic installer in accordance with the original final cover system specifications. If necessary, additional cover soil material will be added to achieve grades that promote positive drainage and provide a minimum of 2-feet of soils above the geosynthetic liner components. The repaired areas will be subsequently seeded. Any areas in which the crack or erosion exposes the geosynthetic liner will be backfilled with the eroded soils and compacted to the necessary design grade and thickness.
- Repair locations of persistent erosion by adding turf reinforcement mat or installing additional stormwater controls, following the guidelines of the latest DNREC “Erosion and Sediment Control Handbook.”
- Repair of damages or disturbances by people, equipment, or animals.
- Removing illegally disposed materials.
- Removing undesirable vegetation encroaching onto the access roads along with the removal of woody vegetation that appears to be growing within the final cover system limits.
- Repairing washouts associated with the access roads on the cap or perimeter of the Site.

Maintenance or repair activities performed on the final cover system should be documented and noted on a figure for future reference.

5.3 Periodic Mowing

As a result of the final cover system being located within an overhead electric transmission corridor, periodic mowing of this site is customary. However, periodic mowing of the final cover system vegetation will be performed to prevent woody (i.e., trees and bushes) or deep-rooted vegetation from potentially causing damage to the final cover system. It is envisioned that such mowing will be performed in spring and fall for the first two years, then annually thereafter in the fall and/or immediately prior to an inspection. This frequency may be decreased or increased based upon weather (i.e. drought conditions), successful establishment of vegetation, and/or need for re-seeding.

6.0 STORMWATER MANAGEMENT SYSTEM

6.1 Inspection

A visual inspection of the conditions of the stormwater management system will also be performed in conjunction with other routine inspections on a quarterly basis for the first two years, then semi-annually thereafter. The perimeter stormwater swales will be inspected for the following:

- Any signs of significant erosion on the side slopes or stormwater swales;
- Presence of debris, sediment, and/or overgrown vegetation encroaching into the path of stormwater flow in the swales; and
- Signs of sediment build-up in the swales that may decrease storage capacity during future precipitation events and/or periods of snow-melt.

Deficient areas identified in the field will be located by either staking and survey or hand-held GPS unit for identification on a figure for subsequent repair and recording of the repair areas. In addition to identifying the areas on a figure, photographs will be taken to show the extent of the damage and the condition immediately after repairs are performed. A Site inspection checklist will be completed during each inspection activity.

6.2 Maintenance and Repair Activities

Potential maintenance and repair tasks for the stormwater management system are identified below:

- Remove accumulated sediment, debris, and overgrown vegetation in the swales to allow stormwater to flow unimpeded.
- Repair eroded areas within the swales by placing clean fill, topsoil, or riprap, as appropriate.
- Repair any damage caused by people, equipment, or animals.
- Repair any washouts that result from side walls breaching.

Areas that show repeated erosion should be upgraded to prevent future erosion, following consultation with CPI. All maintenance or repair activities performed on the stormwater management system should be documented and noted on a figure for future reference.

7.0 GROUNDWATER MONITORING

Groundwater will be sampled during cap inspections, on a quarterly basis for the first two years and semi-annually thereafter, at well locations surrounding the landfill throughout the post-closure care period, as required in DRGSW §6.7. The site-specific groundwater monitoring requirements are included in the Groundwater Monitoring Plan, included in Appendix B, and will be reviewed periodically during the post-closure care period. The "Regulations Governing the Construction and Use of Wells" will be used to properly maintain and potentially abandon the wells, if necessary.

8.0 ACCESS ROAD INSPECTION

Access roads will be inspected with every cap inspection to check for any signs of wear or damage caused over time. Any sections of road that has been damaged will be repaired or replaced as soon as practical to allow for continued authorized access to the Site. A Site inspection checklist will be filled out during each inspection activity.

9.0 SITE-SPECIFIC HEALTH AND SAFETY MONITORING

All inspection and repair activities will be performed in accordance with Site-specific health and safety monitoring. In particular a Site-Specific Health and Safety Plan (HASP) is required for performing any activities on the Site and will be prepared by the O&M Coordinator or O&M Contractor. The O&M Coordinator and/or O&M Contractor is responsible for monitoring working conditions during inspection, providing appropriate protective clothing, equipment, and facilities for their personnel, and/or establishing workplace procedures to ensure their safety. The O&M Coordinator and/or O&M Contractor is also responsible for enforcing the use of these procedures, equipment, and/or facilities.

If, at any time, CPI is apprised of a safety hazard that demands immediate attention because of its high potential for harm to the general public, persons on or about the Site, or public or private property, CPI shall have the right to order such safeguards to be erected and such precautions to be taken as necessary and the O&M Coordinator and/or O&M Contractor shall comply with such orders.

The O&M Coordinator and/or O&M Contractor shall immediately discontinue activities if unforeseen or suspicious activities are observed on-Site. The O&M Coordinator and/or O&M Contractor shall secure the area and notify CPI and follow procedures outlined in the O&M Coordinator and/or O&M Contractor Site-specific HASP.

10.0 REPORTING AND RECORD KEEPING

This section describes the reporting and record keeping procedures for inspection, maintenance, and monitoring activities during the post-closure care period. The results of Site inspections will be summarized in annual reports submitted by CPI to DNREC. The annual reports will be submitted no later than March 1st of each year and include an environmental monitoring report and financial assurance.

All scheduled maintenance and repair activities will be documented by CPI or the O&M Coordinator for performing the various maintenance activities. If significant repairs and/or upgrades require modification of the as-built drawings, the as-built drawings will be revised accordingly.

If an emergency situation or major failure occurs with the final cover system, the O&M Coordinator will notify CPI. CPI will report the incident to DNREC within 24 hours and respond to the incident as soon as reasonably possible.

CPI will also submit a written notification to DNREC within five (5) business days following the event. CPI will then submit a description of proposed corrective actions to DNREC within 30 days of reporting the incident.

Site records will be kept by the O&M Coordinator at their location. CPI will notify DNREC regarding the identity of the O&M Coordinator and/or O&M Contractor, when one has been selected. Changes in O&M Coordinator or O&M Contractor will likewise be reported to DNREC within ten (10) business days of any such changes.

11.0 PLAN MODIFICATIONS

CPI will continue to evaluate the inspection, maintenance, and monitoring activities as described in this O&M Plan. Modifications may be appropriate (e.g., reduction in monitoring frequency, data collection methods) based on changes in Site conditions or previous data and information collected. Should changes to existing procedures be necessary, a written detailed description of the proposed change(s) will be submitted to DNREC for their review. Modifications to the O&M Plan will be implemented upon receipt of approval from DNREC.

APPENDIX A

Table 1 Site Inspection Checklist

TABLE 1
O & M PLAN SITE INSPECTION CHECK LIST
FINAL COVER SYSTEM, SURFACE WATER MANAGEMENT SYSTEM, ACCESS ROADS, AND SITE ACCESS CONTROLS
EDGE MOOR SITE II ASH LANDFILL

Date of Inspection:_____ **Initials of Inspector:** _____

ITEM	YES/ REQUIRES ATTENTION	ADEQUATE	NO/ NOT OBSERVED	COMMENTS
A. General Conditions of Cover System				
a.) Areas that are constantly wet				
b.) Areas that are soft and muddy				
c.) Areas rutted during mowing events				
d.) Areas rutted by other vehicle traffic				
e.) Standing water observed				
f.) New ponding areas observed				
g.) Is the ponded water discolored				
h.) Does the ponded water drain or does the water remain stagnent				
i.) Presence of illegal dumping				
j.) Areas where surface drainage is is blocked or backed-up				
k.) Signs of open burning on landfill cover				
B. Settlement Control				
1.) Depressions				
a.) Bowl shaped areas observed				
b.) Observed "potholes" within the cap limits				
c.) Are the depressed areas holding water				
d.) Soil placement needed for repair				
C. Erosion Control				
1.) Erosion Rills				
a.) Soil cover washed away				
b.) Observed cracks in the soil cover				
c.) Soil needed to repair damage				
d.) Is eroded sediment leaving the site				
e.) Silt fence installation necessary				
f.) Bare spots observed				
D. Animal Damage				
1.) Burrows present				
2.) Above ground burrows				
3.) Animals damaging existing vegetation				
4.) Animals damage to structures (fence, etc.)				
E. Vegetative Growth				
1.) Bare spots located on the cap side slopes				
2.) Cap crown lacking areas with vegetative growth				
3.) Presence of woody vegetation with potential to develop deep roots				
4.) Dead or dying vegetation present				
5.) Access for mowing acceptable				
6.) Are reseeded areas displaying growth				
7.) Excessive growth within perimeter channels				
F. Surface Water Management Channels				
1.) Perimeter channel linings intact				
2.) Any accumulation of sediment				
3.) Evidence of erosion				
4.) Washouts				
G. Access Road				
1.) Road Condition if any rutting or damage				
2.) Observed ponding of water				
3.) Oberved differential settlement (uneven road sections)				

NOTES:
1.) Areas identified for repair should be amended prior to the next site inspection.
2.) Areas identified as in need of repair should also be approximately located on the attached site figure.
3.) Bare spots located on cap side slopes require immediate follow-up maintenance activities; bare spots located on the cap crown (i.e., flat sloped area) should be identified and monitored to determine if follow-up maintenance is required.
4.) Items designated as "Adequate" should be monitored for changes during follow up inspections. Changes to conditions may require repairs after subsequent inspections.

Additional Observations:

APPENDIX B

Groundwater Monitoring Plan

Groundwater Monitoring Plan

Edge Moor Site II Ash Landfill
Wilmington, Delaware

Submitted to:

Delaware Department of Natural Resources and Environmental Control
89 Kings Highway
Dover, Delaware 19901

Submitted by:

Golder Associates Inc.
200 Century Parkway, Suite C, Mt. Laurel, New Jersey, USA 08054
+1 856 793-2005

On behalf of:

Conectiv Properties and Investments, Inc.
630 Martin Luther King, Jr. Blvd
Wilmington, DE 19801

19129265

March 2020

Table of Contents

1.0 INTRODUCTION 1

1.1 Purpose 1

1.2 Background 1

2.0 MONITORING PROGRAM 1

2.1 Sample Locations 1

2.2 Analytical Program 2

2.2.1 Field Parameters 2

2.2.2 Laboratory Parameters 2

3.0 SAMPLING PROCEDURES 3

3.1 Water Level Measurements 3

3.2 Groundwater Sampling 3

3.2.1 Low-flow Groundwater Purging 3

3.2.2 Groundwater Sampling 4

4.0 FIELD DOCUMENTATION 4

4.1.1 Sampler Field Forms 4

4.1.2 Laboratory Field Forms 5

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) SAMPLES 5

6.0 DATA MANAGEMENT 5

7.0 REPORTING 5

FIGURES

Figure 1 – Site Location Map

Figure 2 – Monitoring Well Locations

APPENDICES

Appendix A - Groundwater Sample Field Information Form

Appendix B - Well Inspection Forms

Appendix C - Chain of Custody

1.0 INTRODUCTION

1.1 Purpose

Golder Associates Inc. (Golder) has prepared this Groundwater Monitoring Plan (Monitoring Plan) on behalf of Conectiv Properties and Investments, Inc. (CPI), an Exelon Company, in conjunction with the Closure Permit for the Edge Moor Site II Ash Landfill (Site).

1.2 Background

The Site is an inactive ash landfill operated during the 1980s under permit SW-86/05 issued by the Delaware Department of Natural Resources and Environmental Control (DNREC). The Site is approximately 14.8 acres and is located within an active Delmarva Power and Light (Delmarva Power) electric transmission corridor. The Site is currently vegetated, primarily with grasses and low shrubs.

See Figure 1 for Site Location Map.

2.0 MONITORING PROGRAM

2.1 Sample Locations

The quarterly monitoring program will include eight existing monitoring wells for both water level measurements and water quality monitoring. The monitoring wells in the program are summarized below:

Well ID	Screen Interval (feet below TOC)	Depth to Bottom (feet below TOC)	Well Diameter (inches)
PMW-01	23-33	33	4
PMW-02	23-33	33	4
PMW-03	25-35	35	4
PMW-04	15-25	25	4
PMW-05	15-25	25	4
PMW-06	27-37	37	4
PMW-07	15-25	25	4
PMW-08	29-39	39	4
Notes: TOC – Top of Casing			

See Figure 2 for Monitoring Well Locations.

2.2 Analytical Program

2.2.1 Field Parameters

The following information will be recorded in the Groundwater Sample Field Information Form for each sample prior to sampling:

- pH
- Specific Conductivity
- Temperature
- Oxidation Reduction Potential
- Turbidity
- Dissolved Oxygen

2.2.2 Laboratory Parameters

Groundwater samples will be analyzed for the following parameters by a Delaware-certified laboratory:

Analyte	Analytical Method	Containers	Preservation Requirements	Maximum Holding Time
Alkalinity	SM 2320B	1 x 250 mL wide mouth plastic or similar	Cool, 4°C	14 days
Chloride	SM4500-CL	1 x 250 mL wide mouth plastic or similar	Cool, 4°C	28 days
Fluoride	SM 4500-F	1 x 250 mL wide mouth plastic or similar	Cool, 4°C	28 days
pH	SM 4500-H	1 x 250 mL wide mouth plastic or similar	Cool, 4°C	15 Minutes
Specific Conductance	SM 2510B	1 x 250 mL wide mouth plastic or similar	Cool, 4°C	28 days
Sulfate	E 300.0	1 x 250 mL wide mouth plastic or similar	Cool, 4°C	28 days
Metals[1]	SM 6020B and SM 7470A (Mercury)	1 x 250 mL wide mouth plastic or similar	HNO_3, Cool, 4°C	6 months (28 days for mercury)
Total Dissolved Solids	SM 2540C	1 x 500 mL round plastic or similar	Cool, 4°C	7 days

Notes:

1. Metal analysis includes the following compounds: Arsenic, Barium, Boron, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickle, Potassium, Selenium, and Vanadium

3.0 SAMPLING PROCEDURES

3.1 Water Level Measurements

A synoptic round of water level monitoring from the monitoring wells will be completed prior to groundwater sampling. Groundwater level measurements will be made relative to a surveyed reference point. Depth to groundwater measurements will be made with a water level meter by lowering a decontaminated probe into the well until the meter indicates that the groundwater surface has been encountered. The probe will be raised above the water level and slowly lowered again until water is indicated. The cable will be held against the side of the inner protective casing at the point designated for water level measurements and a depth reading will be taken; where there is no visible point designated, water level measurements shall be taken at the highest point of the inner casing. This procedure will be followed until a consistent value is obtained. The value will be recorded to the nearest 0.01 foot. Once the water level value is recorded, the probe will be lowered to the bottom of the well to get the sounded well depth (total depth of the well).

3.2 Groundwater Sampling

Groundwater samples will be obtained from the monitoring wells using low-flow sampling techniques in accordance with the United States Environmental Protection Agency (USEPA) Region III document entitled Groundwater Sampling Procedure Low Stress (Low Flow) Purging and Sampling Procedures (October 1997). The low flow sampling procedure allows for the collection of representative groundwater samples from the selected aquifer with minimal disturbance to the aquifer and minimum amounts of purge water to manage and dispose. The following section discusses the equipment and sample collection procedures to be employed for collecting groundwater samples from Site monitoring wells.

3.2.1 Low-flow Groundwater Purging

Each well will be purged at a rate of approximately 200 to 500 milliliters per minute. During purging, the water level will be monitored and pumping rate adjusted such that the water level draw down is minimized (ideally no more than 0.3 feet drawdown during purge). If drawdown is excessive, the pump rate should be lowered to 200 ml/min (noting lowered purge rates on the field form). There must be at least 2 feet of water maintained over the pump intake to prevent the pump suction from being broken, or the entrainment of air in the sample. If there is risk of the water level dropping to within 2 feet above the pump, the purge should be terminated, and the well should be allowed to recharge sufficiently for sample collection.

A field decontaminated Horiba U-22 water quality meter (or equivalent) that has been calibrated in accordance with manufacturer's specifications and an in-line flow-through cell should then be attached to the discharge tubing. Measurements of temperature, turbidity, pH, specific conductance, ORP, and DO will be taken with the Horiba installed in the flow-through cell so that they are recorded prior to the sample being exposed to the atmosphere. The field parameters will be recorded approximately every 5 minutes (or at a minimum of one flow cell volume exchange) until the parameters have stabilized over three consecutive readings. Stabilization is considered achieved if:

- pH is within +/- 0.1
- conductivity is within +/- 3%
- temperature is within +/- 3%
- ORP is within +/- 10 mV

- turbidity is below 10 NTU
- DO is within +/- 10% (or within 0.1 mg/l when the DO is less than 1 mg/l)

Measurements will be recorded on the sample collection form or in field notebooks.

If after 2 hours of purging indicator field parameters have not stabilized, one of three optional courses of action may be taken:

1) Continue purging until stabilization is achieved.
2) Discontinue purging, do not collect samples, and record in log book that stabilization could not be achieved (documentation must describe attempts to achieve stabilization).
3) Discontinue purging, collect samples, and provide full explanation of attempts to achieve stabilization.

3.2.2 Groundwater Sampling

The pump flow rate may be as high as approximately 500 milliliters per minute depending on the well yield and turbidity of the sample.

Sample bottles will be filled by allowing the pump discharge to flow gently down the inside of the bottle with minimal turbulence. Each bottle will be carefully capped as it is filled. The bottles will be preserved according to the specifications listed in the analytical methods.

Immediately after sample collection, sample bottles will be placed on ice and maintained at approximately 4° Celsius (C) until transported to the laboratory. Samples must also be logged on a chain of custody (COC) form.

4.0 FIELD DOCUMENTATION

Significant field activity information will be recorded in a standard hardbound field book that is dedicated to the project and has been sequentially numbered and paginated or on applicable field forms. Field notes must be written with a waterproof pen or indelible marker, and entries must be legible. Errors must be crossed out with a single line and initialed.

General information should include at a minimum: date, project/site name, time of each data entry, description of work, names and affiliation of personnel, weather conditions, visual observations as needed, pertinent field data.

4.1.1 Sampler Field Forms

During the sampling event, Groundwater Sample Field Information Forms will be filled out to document the purge information at each monitoring well. See Appendix A for an example Field Information Form.

During the synoptic water level measurements, the sampler will also inspect the Site groundwater monitoring wells to evaluate their physical condition. The well purge data and inspection results will be evaluated to assess whether the well requires redevelopment or other evaluation/maintenance. See Appendix B for an example Well Inspection Form.

4.1.2 Laboratory Field Forms

Laboratory field forms typically include a COC form for samples collected in the field. COC forms must accompany the environmental samples. The COC form is typically pre-printed by the analytical laboratory. See Appendix C for an example COC.

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) SAMPLES

In addition to the primary samples described above, the following QA/QC samples will be collected to help achieve the data quality goals or objectives for the project:

- Temperature blank – used to verify acceptable cooler temperature
- Field rinsate blanks will be collected for required analyses at a frequency of one per day per type of decontamination event where non-dedicated equipment is used. Field rinsate blanks are prepared in the field using lab supplied demonstrated analyte free water. The water is poured over and through each type of sampling equipment and submitted to the laboratory for analysis of target analytes.
- Field duplicates will be collected for required analyses at a frequency of one per sampling event. Field duplicates are collected by sampling the same location twice, but the field duplicate is assigned a unique sample identification number.
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples will be collected for required analyses at a frequency of one each per sampling event. Additional sample volume is collected from a location and submitted to the laboratory for analysis. The laboratory will use the additional volume to prepare spiked samples to assess accuracy and precision.

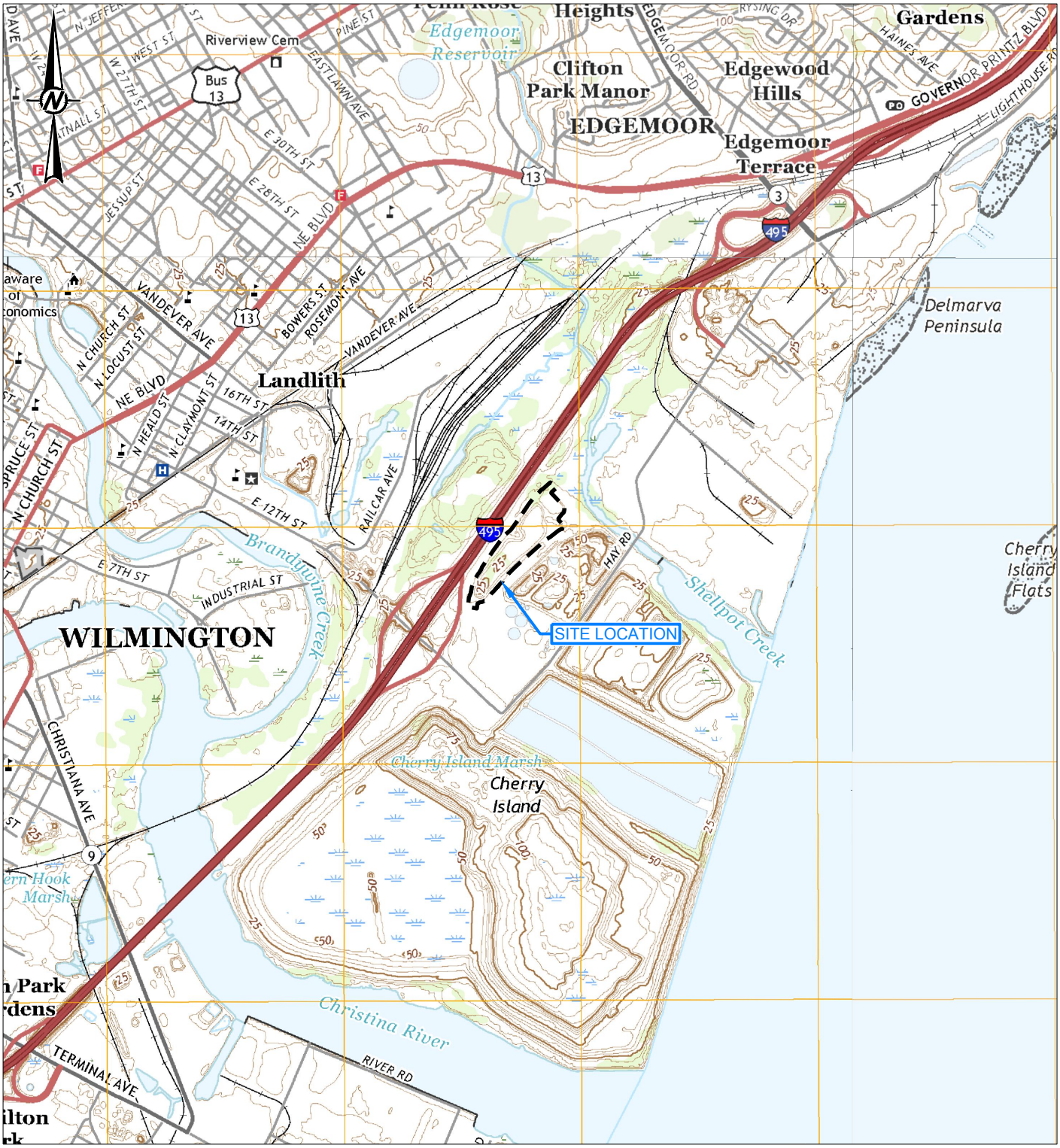
6.0 DATA MANAGEMENT

Data will be stored and managed electronically using a database program such as EQuIS to facilitate data evaluation and presentation. The analytical laboratory will provide all sample data using an Electronic Data Deliverables (EDD) format that will be uploaded directly into the database. Data in the database can be exported to other tools to create tables or to perform statistical analyses.

7.0 REPORTING

A report detailing the results of the groundwater sampling event will be submitted to DNREC within 30 days of the end of the quarter. These reports will be submitted annually, no later than March 1st, for following completion of Closure Plan. The reports will be prepared by an environmental professional and will include a discussion and evaluation of the data, and copies of the laboratory analytical results. New screening level exceedances will be called out in the quarterly report.

Golder and the G logo are trademarks of Golder Associates Corporation



LEGEND

LIMIT OF DISTURBANCE

REFERENCE(S)

1. MAPS FROM 7.5 MINUTE U.S.G.S. QUADRANGLES OF WILMINGTON NORTH, WILMINGTON SOUTH, DE-NJ (2019 AND 2016); MARCUS HOOK, PA (2019) AND PENNS GROVE, NJ (2019).

0 1000 2000
1" = 2000' FEET

CLIENT
CONECTIV PROPERTIES AND INVESTMENTS, INC.

PROJECT
GROUNDWATER MONITORING PLAN

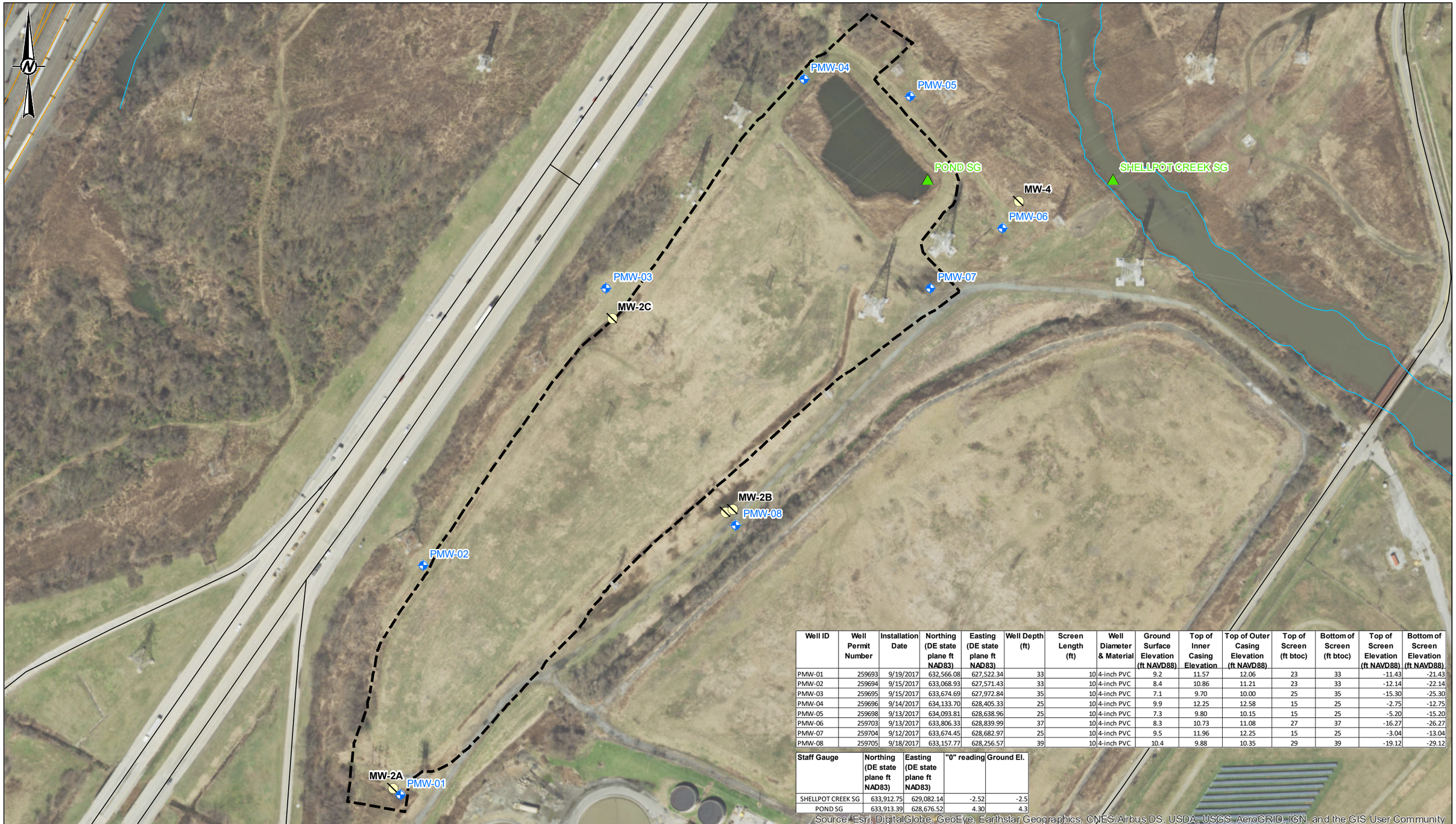
CONSULTANT
GOLDER
NJ Authorization #24GA28029100

YYYY-MM-DD	2020-03-30
DESIGNED	MLM
PREPARED	AM
REVIEWED	MLM
APPROVED	JBG

TITLE
SITE LOCATION MAP

PROJECT NO.	CONTROL	REV.	FIGURE
19129265	0002-001	0	1

Last Edited By: amorales Date: 2020-03-30 Time:3:26:22 PM | Printed By: AMorales Date: 2020-03-30 Time:3:37:16 PM
Path: \\Mtlaurel\CADD\Projects\PEPCO\edgemoore\99_projects\19129265\0002_closurepermitgwmonitoringplan\02_PRODUCTION\DWG\ | File Name: 19129265-0002-001.dwg
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



Well ID	Well Permit Number	Installation Date	Northing (DE state plane ft NAD83)	Easting (DE state plane ft NAD83)	Well Depth (ft)	Screen Length (ft)	Well Diameter & Material	Ground Surface Elevation (ft NAVD88)	Top of Inner Casing Elevation	Top of Outer Casing Elevation (ft NAVD88)	Top of Screen (ft btoc)	Bottom of Screen (ft btoc)	Top of Screen Elevation (ft NAVD88)	Bottom of Screen Elevation (ft NAVD88)
PMW-01	259693	9/19/2017	632,566.08	627,522.34	33	10	4-inch PVC	9.2	11.57	12.06	23	33	-11.43	-21.43
PMW-02	259694	9/15/2017	633,068.93	627,571.43	33	10	4-inch PVC	8.4	10.86	11.21	23	33	-12.14	-22.14
PMW-03	259695	9/15/2017	633,674.69	627,972.84	35	10	4-inch PVC	7.1	9.70	10.00	25	35	-15.30	-25.30
PMW-04	259696	9/14/2017	634,133.70	628,405.33	25	10	4-inch PVC	9.9	12.25	12.58	15	25	-2.75	-12.75
PMW-05	259698	9/13/2017	634,093.81	628,638.96	25	10	4-inch PVC	7.3	9.80	10.15	15	25	-5.20	-15.20
PMW-06	259703	9/13/2017	633,806.33	628,839.99	37	10	4-inch PVC	8.3	10.73	11.08	27	37	-16.27	-26.27
PMW-07	259704	9/12/2017	633,674.45	628,682.97	25	10	4-inch PVC	9.5	11.96	12.25	15	25	-3.04	-13.04
PMW-08	259705	9/18/2017	633,157.77	628,256.57	39	10	4-inch PVC	10.4	9.88	10.35	29	39	-19.12	-29.12

Staff Gauge	Northing (DE state plane ft NAD83)	Easting (DE state plane ft NAD83)	"0" reading	Ground El.
SHELLPOT CREEK SG	633,912.75	629,082.14	-2.52	-2.5
POND SG	633,913.39	628,676.52	4.30	4.3

LEGEND

- LIMIT OF DISTURBANCE
- SURVEYED WELL LOCATION
- SURVEYED STAFF GAUGE
- DECOMMISSIONED WELL LOCATION
- WATER FEATURES
- ROADS
- RAIL LINES

REFERENCE(S)
1. AERIAL FROM ARCGIS ONLINE.
2. PMW-01 THROUGH PMW-08 AND STAFF GAUGES SURVEYED BY VARGO ASSOCIATES, NOVEMBER 13, 2017.

200 100 0 200
1 " = 200 ' FEET

CLIENT
CONECTIV PROPERTIES AND INVESTMENTS, INC.

PROJECT
GROUNDWATER MONITORING PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-03-30
DESIGNED	MLM
PREPARED	AM
REVIEWED	MLM
APPROVED	JBG

TITLE
MONITORING WELL LOCATIONS

PROJECT NO.	CONTROL	REV.	FIGURE
19129265	0002-002	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0

PATH: W:\Projects\PEPCOEdgeMoorDE\99_PROJECTS\19129265\0002_ClosurePermit\GWMonitoringPlan\02_PRODUCTION\MXD\19129265-0-002-002rev.xd

APPENDIX A

Groundwater Sample Field Information Form

LOW FLOW GROUNDWATER PURGE/SAMPLE FIELD INFORMATION FORM

GOLDER

Site _____

Location: _____

Project Number: _____ Meter/Type/Serial #: _____

MONITORING WELL ID: _____ Meter Calibrated @: _____

Depth to Water Prior to Purging [ft-bmp]: _____ pH Calibration Check Measurment/Time*: _____

Well Casing Diameter [in]: _____ Sampling Date/Time: _____

Start Time (purging): _____ Sampler(s): _____

Purging Device: _____ Sampling Device: _____

Pump intake setting: _____ Sampling Purge Rate: _____

Well Screen Interval: _____ Sample Characteristics: _____

As-Built Construction Well Depth [ft-bmp]: _____ PID Measurement of Well Headspace (ppm): _____

Sounded Well Depth [ft-bmp]: _____ Analytical Parameters: _____

Weather Conditions:_____ Fe+2 result (field measurement):

Time [hh:mm]	**Temperature** [°C]	**pH** [std]	**Specific Conductance** [S/m] or [mS/cm]	**Turbidity** [ntu]	**Dissolved Oxygen** [mg/l]	**Redox Potential** **Note - Indicate if (+) or (-)** [mV]	**Depth To Water** [ft-bmp]	**Volume Purged** [liters]	**Approximate Purge Rate** [ml/min]	**Observations** (PID readings, sample characteristics, equipment problems, etc.)

Comments: * If the pH check differs by more than ± 0.2 S.U from the temperature adjusted pH buffer value, then the instrument will need to be recalibrated.

Signature:

NJ Cert: 03027

APPENDIX B

Well Inspection Forms

WELL INSPECTION FORM

Project Information

Site: _____

Location: _____

Location Sketch Map:

Project Number: _____

Inspector: _____

Well Information

Sampling Point I.D.: _____

Date/Time: _____

Well Depth (ft-btoc): _____

Static Groundwater Level (ft-btoc): _____

Inner Casing Diameter (inches): _____

Comments: _____

Well Inspection (Circle Y or N)		Comments:
Is well location correct on site map?	Y or N	
Is well located in dry area?	Y or N	
Is well readily accessible?	Y or N	
Is well labeled in a legible manner?	Y or N	
Is inner casing free of kinks or bends?	Y or N or N/A	
Above Grade Wells		
Is well protected with posts or boulders?	Y or N	
Above grade protective casing secure in concrete?	Y or N	
Is concrete surface seal intact?	Y or N	
Protective casing locked?	Y or N	
Does protective surface casing have weep hole?	Y or N	
Is lock in good condition?	Y or N	
Is inner well casing cap intact?	Y or N	
Is inner well casing vented?	Y or N	
Flush Mount Wells		
Is flush mount protective casing secure in concrete?	Y or N	
Is concrete surface seal intact?	Y or N	
Is flush mount lid secure with screws or bolts?	Y or N	
Is flush mount lid gasket intact?	Y or N	
Is inner well locking cap intact?	Y or N	
Is well locked and lock in good condition?	Y or N	
Does well have dedicated bailer or pump?	Y or N or N/A	
Is sampling equipment in good condition?	Y or N or N/A	
Is there any other damage to the well?	Y or N or N/A	
Additional Security Measures Intact? (i.e. fence)	Y or N or N/A	

APPENDIX C

Chain of Custody

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME	NO. OF CON-TAINERS	CONTAINER TYPE						REMARKS
SAMPLERS:									

SAMPLE	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CON-TAINERS							REMARKS

RELINQUISHED BY: (Signature)	Date / Time	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	Date / Time	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	Date / Time	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	Date / Time	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	Date / Time	RECEIVED FOR LABORATORY BY:	Date / Time	REMARKS:	

GOLDER

golder.com

APPENDIX 9-B

CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN

Table of Contents

1.0 INTRODUCTION 1

1.1 Purpose and Scope 1

1.2 References 1

1.3 Project Location 1

1.4 Ownership History 1

1.5 Closure Plan 2

2.0 DEFINITIONS 3

3.0 PROJECT PARTICIPANT RESPONSIBIILTIES AND QUALIFICATIONS 4

3.1 Owner 4

3.1.1 Responsibilities 4

3.2 Designer 4

3.2.1 Responsibilities 4

3.3 Contractor 5

3.3.1 Responsibilities 5

3.4 Delaware Department of Natural Resources & Environmental Control (DNREC) 5

3.4.1 Responsibilities 5

3.5 Geosynthetic Manufacturer 6

3.5.1 Responsibilities 6

3.6 Geosynthetics Installer 6

3.6.1 Responsibilities 6

3.6.2 Qualifications 6

3.7 Quality Assurance Consultant (QAC) 6

3.7.1 Responsibilities 6

3.7.2 Qualifications 7

3.7.3 Resident Manager (RM) and Quality Assurance Consultant (QAC) Monitor(s) 7

3.7.3.1 Responsibilities 7

3.7.3.2 Qualifications 8
3.7.4 Soils CQA Laboratory 8
3.7.5 Geosynthetics CQA Laboratory 8
4.0 DOCUMENTATION....9
4.1 Introduction....9
4.2 Daily Reports....9
4.2.1 QAC Monitor(s) 9
4.2.2 Resident Manager....9
4.3 Inspection and Test Logs and Reports 9
4.4 Problem Identification and Corrective Action Reports 10
4.5 Record Drawings....10
4.6 Final Record Documentation Report....10
4.7 Document Storage 12
5.0 SOILS CQA....12
5.1 Introduction....12
5.2 Pre-Construction 13
5.2.1 Borrow Selection and Testing 13
5.2.2 Material Requirements....14
5.2.2.1 General Requirements....14
5.2.2.2 Grading and General Fill....15
5.2.2.3 Structural Fill 15
5.2.2.4 Coarse Aggregate....15
5.2.2.5 Cover Soil....15
5.2.2.6 Vegetative Support Layer 15
5.3 Construction 15
5.3.1 Subgrade Preparation....15
5.3.2 Ash Grading 15
5.3.3 Grading and General Fill....16
5.3.4 Structural Fill 16

5.3.5 Coarse Aggregate 16
5.3.6 Cover Soil 17
5.3.7 Vegetative Support Layer 17
6.0 GEOTEXTILE 17
6.1 Introduction 17
6.2 Pre-Installation 17
6.2.1 Manufacturer's Quality Control (MQC) Certification 17
6.2.2 Inventory, Storage, and Handling 18
6.2.3 CQA Conformance Testing 18
6.3 Installation 19
6.3.1 Deployment 19
6.3.2 Seams and Overlaps 19
6.3.3 Repair 19
7.0 GEOMEMBRANE 19
7.1 Introduction 19
7.2 Pre-Installation 19
7.2.1 Manufacturer's Quality Control (MQC) Certification 19
7.2.2 Inventory, Storage, and Handling 19
7.2.3 CQA Conformance Testing 20
7.3 Installation 20
7.3.1 Deployment 20
7.3.2 Field Seaming 21
7.3.3 Trial Seam Testing 22
7.3.4 General Seaming 23
7.3.5 Defects and Repairs 23
7.3.6 Non-Destructive Testing 24
7.3.6.1 Introduction 24
7.3.6.2 Pressure Testing 24

7.3.6.3 Vacuum Testing 25
7.3.6.4 Spark Testing 25
7.3.7 Geomembrane Seam Destructive Testing 25
7.3.8 Laboratory Destructive Testing 25
8.0 GEOCOMPOSITE DRAINAGE LAYER 26
8.1 Introduction 26
8.2 Pre-Installation 26
8.2.1 Manufacturer's Quality Control (MQC) Certification 26
8.2.2 Inventory, Storage, and Handling 26
8.2.3 CQA Conformance Testing 27
8.3 Installation 27
8.3.1 Deployment 27
9.0 SURVEYING 28
10.0 PLAN MODIFICATION PROCEDURE 28

TABLES

Table 1: Soil Types and Their Test Methods 14

APPENDICES

APPENDIX A
Laboratory Testing Tables

1.0 INTRODUCTION

1.1 Purpose and Scope

This Construction Quality Assurance (CQA) Plan describes the procedures to be followed during CQA monitoring of activities associated with the construction of soil and geosynthetic components for the final cover system at the Edge Moor Site II Ash Landfill (Site II Ash Landfill) located in Wilmington, New Castle County, Delaware. This CQA Plan is intended as an implementation document for CQA monitoring personnel. This plan is intended to fulfill the requirements of Delaware's Regulations Governing Solid Waste (DRGSW) §4.2.1.4.5 and §4.2.2.2, as they relate to CQA planning of the landfill cap. The plan does not address design guidelines or construction means and methods to be employed by the Contractor.

1.2 References

This CQA Plan references test procedures of the American Society for Testing and Materials (ASTM) and the American Association of State Highway and Transportation Officials (AASHTO). The following documents were used in preparation of this CQA Plan:

- EPA/600/R-93/182, Technical Guidance Document, "Quality Assurance and Quality Control for Waste Containment Facilities," September 1993.
- EPA/600/2-88/052, "Lining of Waste Containment and Other Impoundments," April 2004.
- Closure and Post-Closure Plan for Edge Moor Site II Ash Landfill, dated January 2020, prepared by Golder Associates Inc.
- Technical Specifications, Engineering Report Appendix 5-C, dated January 2020, prepared by Golder Associates Inc.

1.3 Project Location

The Site II Ash Landfill is approximately 14.8 acres and is located within an active Delmarva Power and Light Co. (DPL) electric transmission corridor, which is bordered to the northeast by Shellpot Creek (a tributary to the Delaware River), to the south by Cherry Island Landfill, to the northwest by Interstate 495 and to the east by industrial landfills, a wastewater treatment plant and the Delaware River. Golder understands that several existing overhead electric transmission towers are located within the ash landfill and multiple high voltage line towers are located around the perimeter of the ash landfill. In addition to the overhead high voltage line towers, there are four (4) underground utility pipelines located along the eastern property boundary. Moving north from the southern property line there is a potable water supply pipeline operated by SUEZ Water, a Getty Pipeline Right-of-Way, an Energy Transporters Pipeline easement, and a decommissioned landfill gas pipeline originating at the nearby Cherry Island Landfill operated by the Delaware Solid Waste Authority.

1.4 Ownership History

The Site II Ash Landfill was initially owned by Delmarva Power & Light Company, who then transferred the Edge Moor Generating Station to an affiliate, Conectiv Delmarva Generation, Inc., under the terms of an asset transfer agreement dated July 1, 2000. In December 2007, Conectiv Delmarva Generation, Inc. was converted to Conectiv Delmarva Generation, LLC. In June 2010, Conectiv Delmarva Generation, LLC. transferred ownership of the parcel containing the Site II Ash Landfill to Conectiv Properties and Investments, Inc. (CPI)

1.5 Closure Plan

The project involves the implementation of the proposed Closure Plan for the existing coal ash landfill located within the Site II Ash Landfill. The Closure Plan includes the following items:

- Health and safety monitoring;
- Erosion and sediment control;
- Clearing and grubbing;
- Regrading of the coal ash mound;
- Placement of geosynthetic materials, placement of cover soil and vegetative layers, seeding and stabilization;
- Surveying;
- Access road construction;
- Installation or upgrading of stormwater management features.

This CQA Plan will address the final cover and stormwater management systems construction efforts as well as the roles and responsibilities of the various parties which will be involved in this component of the proposed remedy.

The proposed final cover system for the Site II Ash Landfill meets DRGSW requirements and includes the following major elements (from top to bottom):

- Vegetative layer of native perennial grasses;
- Minimum 6-inch layer of earthen material (i.e., topsoil) capable of sustaining native plant growth;
- Minimum 18-inch soil layer providing rooting depth and moisture for plant growth;
- Geosynthetic drainage layer (i.e., geocomposite) placed beneath the soil layer;
- 40-mil geosynthetic barrier layer (i.e., LLDPE or HDPE geomembrane) placed beneath the drainage layer; and,
- Minimum 6-inch grading fill layer.

In addition, Golder proposes two alternate closure cap systems that include the following major elements (from top to bottom):

Proposed Alternate Option No. 1:

- Vegetative layer of native perennial grasses;
- Minimum 6-inch layer of earthen material (i.e., topsoil) capable of sustaining native plant growth;
- Minimum 18-inch soil layer providing rooting depth and moisture for plant growth;
- 10 ounce per square yard (oz/sy) non-woven geotextile layer;

- 50-mil combination geomembrane/drainage layer (LLDPE or HDPE Agru Super GripNet®); and
- Minimum 6-inch grading fill layer.

Proposed Alternate Option No. 2:

- Vegetative layer of native perennial grasses;
- Minimum 6-inch layer of earthen material (i.e., topsoil) capable of sustaining native plant growth;
- Minimum 18-inch soil layer providing rooting depth and moisture for plant growth;
- 10 oz/sy non-woven geotextile layer;
- 50-mil combination geomembrane/drainage layer (LLDPE or HDPE Agru MicroDrain®); and
- Minimum 6-inch grading fill layer.

The final cover system will be determined at the time of construction based on contractor input and material availability.

2.0 DEFINITIONS

This section defines terms used throughout this CQA Plan.

- OWNER refers to Conectiv Properties and Investments, Inc. (CPI).
- OWNER's REPRESENTATIVE refers to a representative of CPI, identified in the Contract Agreement.
- DESIGNER refers to Golder Associates Inc. (Golder). The DESIGNER shall perform specified engineering functions including, but not limited to, review of submittals, including CQC documentation and confirmatory sampling activities, as outlined in the Contract Documents.
- CONTRACTOR refers to the company selected for the construction of the final cover and stormwater management systems cover systems in accordance with the Contract Drawings and Technical Specifications.
- Contractor Quality Control (CQC) refers to actions taken by the Contractor, or Installer, to determine and demonstrate compliance with the requirements for materials and workmanship as stated in the Contract Drawings and Technical Specifications.
- DNREC refers to the Delaware Department of Natural Resources and Environmental Control and their agents.
- MANUFACTURER refers to the company(ies) responsible for manufacturing geotextile, geocomposite, and geomembrane materials.
- Manufacturer Quality Control (MQC) refers to measures taken by the Manufacturer to determine and demonstrate compliance with the requirements for materials and workmanship as stated in the Contract Drawings and Technical Specifications.
- INSTALLER refers to the company responsible for the deployment, welding, non-destructive testing, and all other aspects of the geosynthetics installation.

- Construction Quality Assurance (CQA) refers to the means and actions employed by an independent third-party organization on behalf of the OWNER to assess whether the work being performed by the Contractor or Installer complies with the Contract Drawings, Technical Specifications, and contractual and regulatory requirements.
- Quality Assurance Consultant (QAC) refers to an independent third-party organization, to be contracted by the OWNER, to provide on-Site monitoring services to perform CQA services.
- Resident Manager (RM) refers to the on-Site representative of the QAC.
- Technical Specifications refers to those portions of the Bidding Documents consisting of written descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.
- Contract Documents include the Bid Form, the Technical Specifications, all Addenda, the Agreement, General Conditions, Supplemental Conditions, Permits, and Drawings.

3.0 PROJECT PARTICIPANT RESPONSIBIILTIES AND QUALIFICATIONS

3.1 Owner

3.1.1 Responsibilities

CPI, the OWNER or OWNER's REPRESENTATIVE, is responsible for implementation of the Closure Plan, and the construction to the final cover system. CPI shall appoint an individual to act as the "point of contact" for all issues related to construction. For the design, Golder was retained by the OWNER. Golder will assist CPI with design support during construction.

3.2 Designer

3.2.1 Responsibilities

Golder was the DESIGNER retained by the OWNER to develop the final cover and stormwater management systems design specified in the Closure Plan for the Site II Ash Landfill. The DESIGNER is a Professional Engineer registered in the State of Delaware and has extensive experience on previous coal ash landfill closure projects. During the construction phase Golder will provide the following services:

- Assist the OWNER in the selection of a CONTRACTOR;
- Submit design and specification changes or modifications to the Delaware Department of Natural Resources and Environmental Control (DNREC) for their review;
- Provide clarifications to the Contract Drawings and Technical Specifications; and
- Respond to requests for information from the CONTRACTOR.

All construction, design and specification change requests will be transmitted through the DESIGNER, OWNER, and DNREC for review and approval. Golder will document that DNREC has reviewed and approved of any design and specification changes or modifications to the plan. All design changes will be documented in the final report prepared by the QAC and the DESIGNER will certify that any changes do not diminish the pollution control systems or materials. Golder has and will continue to appoint an individual approved by the OWNER to act as the point of contact for issues related to the construction of the final cover and stormwater management systems.

3.3 Contractor

3.3.1 Responsibilities

The Contractor (CONTRACTOR) is responsible for the preparation of the Site II Ash Landfill, construction of the final cover and stormwater management systems, and maintenance of the quality of materials and workmanship employed by himself and all Subcontractors. The CONTRACTOR shall have the responsibility to protect installed pollution control systems and materials (including deployed geosynthetics) during the project.

The CONTRACTOR shall demonstrate that they have satisfactorily completed a minimum of ten (10) construction projects of similar size in the northeastern United States, with at least three (3) in the State of Delaware. The CONTRACTOR will assign a Project Manager as the responsible "person in charge" of all aspects of the project. The Project Manager will have a background in engineering or construction management, with significant experience in construction and contract administration. The CONTRACTOR's Project Manager shall have satisfactorily completed a minimum of five (5) construction projects of similar size in the northeastern United States, with at least two (2) in the State of Delaware.

The CONTRACTOR shall also designate a Site Superintendent (SS) who will be the full-time, on-Site representative for the CONTRACTOR. The SS will oversee the daily Site operations for the CONTRACTOR, and interface with the Quality Assurance Consultant (QAC) regarding status of daily and upcoming activities. The SS shall have experience with performing in this capacity for other comparable projects on behalf of the CONTRACTOR. The CONTRACTOR's SS shall have satisfactorily completed a minimum of five (5) construction projects of similar size in the northeastern United States, with at least two (2) in the State of Delaware.

Finally, the CONTRACTOR will assign a Project Administrator (PA) who will be responsible for preparing the submittals for proposed materials and substitutions and providing these submittals to the DESIGNER for favorable review. The submittals shall be formatted and completed as outlined in the Technical Specifications. This person may be the Project Manager or SS; however, the PA shall have sufficient experience with engineering and construction to compile complete submittals and shall have experience serving in this capacity on other comparable projects.

3.4 Delaware Department of Natural Resources & Environmental Control (DNREC)

3.4.1 Responsibilities

The DNREC staff has been and will be responsible for evaluating compliance with the Closure Plan, including the CQA Plan and for reviewing proposed design changes that could affect pollution control systems or materials. The DNREC staff will have the opportunity to attend preconstruction meetings, the geosynthetics kick-off meeting, and progress meetings and will do so as agency resources allow. DNREC shall be provided the qualifications of the Manufacturer, CONTRACTOR/Installer, QAC, Resident Manager (RM), QAC Monitoring Personnel, and the CQA laboratory (both soils and geosynthetics) for their review prior to construction. In addition, DNREC shall have access to the laboratory test results after they have been provided to the RM and OWNER or OWNER's Representative.

3.5 Geosynthetic Manufacturer

3.5.1 Responsibilities

The Geosynthetics Manufacturer (MANUFACTURER) of the geotextile, geocomposite, and geomembrane, shall meet the qualification requirements stipulated in the Technical Specifications. The MANUFACTURER is responsible for the production and Manufacturer's Quality Control (MQC) testing of the geosynthetic materials used on this project. The MANUFACTURER is responsible for providing copies of the MQC Certificates of Compliance to the CONTRACTOR in a timely manner. Different manufacturers for each component may be proposed by the CONTRACTOR. The reference to MANUFACTURER includes the manufacturers for the geosynthetic components for the project.

3.6 Geosynthetics Installer

3.6.1 Responsibilities

The Geosynthetics Installer (INSTALLER) is responsible for the deployment, welding, non-destructive testing, and all other aspects of the geosynthetics installation. The INSTALLER will provide a full-time on-Site field supervisor who will oversee the activities of the installation crew.

3.6.2 Qualifications

The INSTALLER shall be pre-qualified and approved by the OWNER. The INSTALLER shall provide qualified personnel to meet the demands of the project. The INSTALLER shall have a minimum of five (5) years continuous experience in installation of polyethylene geomembrane or experience totaling 2,000,000 square feet (sq ft) of installed polyethylene geomembrane for a minimum of ten (10) completed facilities. Personnel performing seaming operations for the geomembrane installation shall be qualified by experience or training and by successfully passing on-Site trial seaming tests. At least one Seamer shall have experience seaming a minimum of 2,000,000 sq ft of polyethylene geomembrane using the same type of seaming apparatus in use at the Site II Ash Landfill. The most experienced Seamer, or Master Seamer, shall provide direct supervision, as required, over less experienced Seamers.

In addition, the INSTALLER shall provide a Superintendent for the project. The Superintendent is assigned to oversee the activities of the installation crew. The Superintendent must have a minimum documented experience of 50 acres of successful geosynthetic systems installation on a minimum of five different projects.

3.7 Quality Assurance Consultant (QAC)

3.7.1 Responsibilities

The Quality Assurance Consultant (QAC) is an independent consultant responsible for implementation of the CQA Plan, including monitoring, testing, and documentation of all aspects of the cap system construction. The QAC will assign a RM, who will be responsible for field implementation of the CQA Plan and will remain on-Site throughout construction. Additional quality assurance (QA) Monitor(s) will be assigned to assist the RM as required by the number and type of construction activities in progress. The QAC will perform the following activities, listed below.

- Review the Contract Drawings, Technical Specifications, and related work plans;
- Review schedule of construction activities with the CONTRACTOR;
- Coordinate CQA testing activities;

- Monitor and document CQC activities performed by the CONTRACTOR and Subcontractors;
- Monitor and document CQA activities as required by the CQA Plan and the Contract Documents;
- Review corrective measures to be employed in the event of deviation from the Contract Documents;
- Evaluate the soils and geosynthetics laboratories to be used during this project; and
- Prepare and submit a Final Record Documentation Report as required by the Contract Documents.

3.7.2 Qualifications

The QAC shall be experienced with geosynthetic liner systems with an emphasis on polyethylene geomembranes. The QAC shall be experienced in the preparation of construction quality assurance documentation including quality assurance forms, reports, certifications, and manuals.

3.7.3 Resident Manager (RM) and Quality Assurance Consultant (QAC) Monitor(s)

The Resident Manager (RM) will be the on-Site representative of the QAC and will be responsible for field implementation of the CQA Plan. The RM will be thoroughly familiar with the project, Contract Drawings, and Technical Specifications. The RM will be assisted by additional QAC Monitor(s) in performance of the CQA tasks required by this CQA Plan and shall document that the project has been completed in substantial conformance with the Contract Documents.

3.7.3.1 Responsibilities

The RM's responsibilities include the following:

- Act as the on-Site representative of the OWNER;
- Attend project meetings and prepare project meeting summaries;
- Observe and document that required CQC testing has been performed in accordance with the Technical Specifications;
- Review shop drawings and other material submittals provided by the CONTRACTOR to verify that materials are in conformance with the Technical Specifications;
- Schedule and coordinate CQA activities;
- Obtain soil and geosynthetic samples for CQA laboratory conformance testing;
- Monitor, test, and document earthwork construction;
- Monitor and document the unloading and storage of geosynthetic materials;
- Monitor and document activities associated with geomembrane installation, including deployment, welding, repair, destructive testing, and non-destructive testing;
- Monitor and document all activities associated with nonwoven geotextile installation;
- Mark, obtain, and ship geomembrane seam destructive test samples;
- Monitor the methods used to protect installed pollution control systems and materials (including deployed geosynthetics);

- Direct and oversee activities of the QAC Monitor(s);
- Review CQA field data and daily reports of the QAC Monitor(s);
- Prepare daily reports describing construction progress, testing performed, and results of testing;
- Coordinate requests for design/specification clarifications and modifications with the DESIGNER and OWNER;
- Maintain on-Site CQA records; and
- Assist in the preparation of the Final Record Documentation Report.

The QAC Monitor(s) will:

- Assist in performance of CQA activities as directed by the RM; and
- Prepare written daily reports describing construction progress, sketches showing the locations of tests, testing performed, and results of testing.

Appointment of the RM and QAC Monitor(s) shall be subject to the approval of the OWNER.

3.7.3.2 Qualifications

The RM shall either hold a minimum Bachelor of Science (B.S.) Engineering degree or have performed such duties on at least five other projects of similar nature and difficulty. The Resident Manager shall be specifically experienced in the installation of geosynthetic liner systems with an emphasis on polyethylene geomembrane.

The QAC Monitor(s) shall be specifically trained in construction quality assurance for geosynthetic liner systems.

3.7.4 Soils CQA Laboratory

The Soils CQA Laboratory shall be an experienced, accredited (ASTM, AASHTO), geotechnical-testing laboratory approved by the OWNER, independent of the CONTRACTOR and MANUFACTURER, responsible for performing tests in accordance with the applicable standards on samples of soil materials used during construction of the containment system. The Soils CQA Laboratory will be capable of providing test results to the QAC in a timely manner in accordance with the Technical Specifications.

Additional soil testing will be required to demonstrate the imported soils meet applicable “clean fill” standards. The Soils CQA Laboratory may elect to subcontract this testing to a qualified analytical testing laboratory or the CONTRACTOR may elect to utilize a separate analytical testing laboratory to complete that testing. In either case, the proposed analytical testing laboratory shall be experienced and accredited with the applicable test methods and capable of providing test results to the QAC in a timely manner.

3.7.5 Geosynthetics CQA Laboratory

The Geosynthetics CQA Laboratory shall be an experienced geosynthetics testing laboratory approved by the OWNER, independent of the CONTRACTOR and MANUFACTURER, responsible for conducting tests in accordance with the applicable standards on samples of geosynthetic materials used during construction of the capping systems. The Geosynthetics CQA Laboratory will be accredited by the Geosynthetics Accreditation Institute-Laboratory Accreditation Program (GAI-LAP), (GSRI-GSI Accreditation), and will be capable of providing test results in a timely manner in accordance with the Technical Specifications. Geomembrane destructive seam

test results will be provided to the QAC within 48 hours of receipt of the sample at the laboratory throughout the project.

4.0 DOCUMENTATION

4.1 Introduction

The purpose of this section is to describe the CQA reports that shall be generated during construction of the final cover and stormwater management systems. Documentation must be thorough and sufficiently detailed to allow individuals who are not at Site II Ash Landfill on a daily basis to make informed judgments concerning the quality of the materials and work performed.

4.2 Daily Reports

4.2.1 QAC Monitor(s)

QAC Monitor(s) shall maintain quality assurance paperwork, describing the work performed, area of work, tests, and observations made, and the adequacy of the work. This paperwork shall be submitted to the Resident Manager (RM) daily for the RM's review of the quality and accuracy of the paperwork.

4.2.2 Resident Manager

The RM shall prepare a field monitoring summary report on a daily basis. This report shall incorporate the information provided by the QAC Monitor(s). The RM may incorporate their own monitoring activities and observations into this summary and is not required to prepare a separate field monitoring report. The field-monitoring summary shall contain at a minimum:

- Project identification;
- Description of weather conditions;
- Description of work performed, including area, personnel and equipment involved;
- Description of off-Site material received, including any quality control data;
- Description of CQA monitoring activities, including test performed, and observations made;
- Description of any damage observed on installed materials and corrective actions taken to repair the damage;
- Description of any problems encountered and corrective action taken;
- Summaries of meetings held and actions recommended or taken; and
- Summary of the quantities of all geosynthetic materials installed.

4.3 Inspection and Test Logs and Reports

All observations and results of field and laboratory tests shall be recorded on data sheets. These data sheets will include at a minimum:

- Project identification;
- Description of title of the monitoring activity;

- Location of monitoring activity or location from which the sample was obtained;
- Type of monitoring activity and procedure used;
- Recorded observation of test data;
- Results of monitoring activity; and
- Personnel involved in the monitoring.

4.4 Problem Identification and Corrective Action Reports

Should material or workmanship fail to meet project plans or specifications, the RM shall prepare a report describing the problem and corrective actions taken. This report will contain at a minimum:

- Project identification;
- Problem location;
- Problem description;
- Probable cause of the problem;
- How and when the problem was located;
- How long the problem has existed (where applicable);
- Any disagreement noted by the QAC Monitor between the QAC Monitor and the CONTRACTOR concerning the existence or cause of a problem;
- Suggested corrective measures; and
- Suggested methods to prevent similar problems (if applicable).

4.5 Record Drawings

Record Drawings will be prepared by the QAC as required by the Technical Specifications and included in the certification report.

4.6 Final Record Documentation Report

At the conclusion of the cap construction project, the QAC shall prepare a Final Record Documentation Report (Final Report) as required by the Contract Documents. The Final Report shall certify that the cap construction was completed in accordance with the approved Closure Plan, including the CQA plan, construction and material specifications, and design drawings. The Final Report shall be certified correct by the QAC, who is a Professional Engineer registered in the State of Delaware.

The Final Report shall contain a narrative describing the work performed, problems encountered, and measures taken to resolve those problems along with the CQA field and laboratory activities conducted during the construction phase. The Final Report shall include summaries of the field and laboratory CQA data and copies of the Record Drawings. A list of responsible parties involved with the construction, including pertinent contact information will be provided. The Final Report will be submitted in a general format that simplifies the review by DNREC. This standard

format includes a dated title page stating the name and location of the facility, table of contents, and numbered pages, sections, and paragraphs.

The closure construction will not be considered complete until DNREC has provided its written notification that the construction and the Final Report meet the requirements of the Closure Plan and applicable DNREC regulations.

The Final Report for the construction of the closure will include the following documentation:

- A narrative of the construction activities;
- A CQA officer's certification;
- CQA documentation for any subgrade preparation and testing including:
  - Subgrade acceptance documentation;
  - Laboratory testing results (if required); and
  - Field testing results (if required).
- CQA documentation for the geomembrane (or alternate combination geomembrane/drainage layer) and installation including:
  - Material inventory;
  - Manufacturer's material certifications; and
  - Geomembrane installation documentation including:
    - Documentation of deployment logs;
    - Documentation of trial seams;
    - Documentation of field seams;
    - Documentation of non-destructive testing;
    - Documentation of geomembrane repairs; and
    - Documentation of destructive testing.
- CQA documentation for the geotextile layer installation including:
  - Material inventory;
  - Manufacturer's material certifications;
  - CQA material conformance testing; and
  - Documentation of the geotextile installation observations.
- CQA documentation for the geocomposite drainage layer (where applicable) installation including:
  - Material inventory;

  - Manufacturer's material certifications;
  - CQA material conformance testing; and
  - Documentation of the geocomposite installation observations.
- CQA documentation for earthen material and vegetative support layer installations including:
  - Laboratory testing results; and
  - Field testing results.
- CQA documentation for stormwater controls such as channels, sediment traps, and riprap armoring;
- Documentation of any design modifications;
- Record drawings including:
  - A site plan;
  - A soil grading layer record drawing;
  - A geomembrane record drawing, including panel locations, destructive test locations, and repair locations;
  - A record drawing of the top of the final cap surface including the location of all stormwater controls; and
  - A thickness map illustrating the thickness of the combination of the earthen material and vegetative support layers, overlying the geosynthetic components of the cap system.

4.7 Document Storage

The RM shall maintain on-Site copies of all CQA and Manufacturer's Quality Control (MQC) conformance test results, field reports, and CQA data logs. Originals of all CQA documentation shall be forwarded to the office of the DESIGNER for review and storage. Final disposition of all project related documentation shall be performed in accordance with the Contract Documents.

5.0 SOILS CQA

5.1 Introduction

The purpose of this section is to describe the CQA monitoring, testing, and documentation requirements for the soil components of the containment and cap systems at the Site II Ash Landfill. The different classes of soil material used during construction of the final cover and stormwater management systems include the following:

- General Fill - Material used to backfill anchor trenches, pipe trenches, and foundations for structures such as manholes and vaults;
- Grading Fill – Material to be used immediately beneath the final cover system geosynthetics;
- Structural Fill – Material to be used for construction of roads and fills outside the cap and elsewhere as needed;
- Coarse Aggregate – Material to be used for gravel road;

- Cover Soil – Material used over the geosynthetic components of the final cover system to provide rooting depth for vegetation; and,
- Vegetative support layer – Material used to provide support for surface vegetation.

5.2 Pre-Construction

5.2.1 Borrow Selection and Testing

The CONTRACTOR shall identify soil sources and supplies for the various soil materials to be used during construction of the Site II Ash Landfill closure including the final cover and stormwater management systems. The CONTRACTOR shall arrange for testing of the proposed borrow material by a geotechnical testing laboratory approved by the OWNER in accordance with the Technical Specifications.

All soil types shall be pre-construction tested at a minimum frequency of one (1) per source. All imported soil materials must be clean fill and meet the applicable DNREC standards. Aggregate materials must have a certification from the quarry or supplier stating the aggregate is derived from virgin parent rock. Geotechnical testing requirements for each material type are shown below:

Table 1: Soil Types and Their Test Methods

Soil Types	Test Method
General Fill	Grain Size Analysis (ASTM D422) Atterberg Limits (ASTM D4318)
Structural Fill	Grain Size Analysis (ASTM D422) Standard Proctor (ASTM D698)
Grading Fill	Grain Size Analysis (ASTM D422)
Coarse Aggregate (DGA, #3, and #57 stone)	Grain Size Analysis (ASTM D422)
Cover Soil	Grain Size Analysis (ASTM D422) USCS Classification (ASTM 2487) Atterberg Limits (ASTM D4318) Specific Gravity (ASTM C128) Hydraulic Conductivity (ASTM D2434), where required
Vegetative Support Layer	Grain Size Analysis (ASTM D422) Atterberg Limits (ASTM D4318) pH (ASTM D4972) Organic Content (ASTM D2974) Soil Fertility (LaMotte, Baker Test, Penn State Approved test, or other approved soil fertility test)

A minimum of ten (10) business days prior to the use of the proposed material, the CONTRACTOR shall submit to the QAC two (2) 5-gallon buckets of each source sample of the material, for CQA laboratory testing. The DESIGNER shall review the test results to verify compliance with the Technical Specifications and issue a written acceptance that the materials sampled meet the Technical Specifications for use as fill in either the final cover or stormwater management systems. This documentation shall be included in the Final Report. Material requirements and pre-construction testing frequencies for each material type are discussed below. If, in the opinion of the QAC, the proposed material is unsuitable for the proposed application, the CONTRACTOR shall submit the above certification for material of another type, or from another source, for consideration by the QAC. Material samples submitted by the CONTRACTOR become the property of the OWNER. No soil shall be placed prior to approval by the QAC.

5.2.2 Material Requirements

5.2.2.1 General Requirements

General requirements for materials are as follows:

- Contain no frozen soil, organic materials, wood, trash, or other objectionable materials that may be compressible or cannot be properly compacted;
- Contain no rock fragments, broken concrete, masonry rubble, or similar material; and,
- Be readily spread and compacted (structural fill and low permeability layer) to the specified density.

5.2.2.2 Grading and General Fill

Requirements for grading and general fill materials are contained in Section 02223 of the Technical Specifications.

5.2.2.3 Structural Fill

Requirements for structural fill materials are contained in Section 02223 of the Technical Specifications.

5.2.2.4 Coarse Aggregate

Requirements for coarse aggregate are contained in Section 02233 of the Technical Specifications.

5.2.2.5 Cover Soil

Requirements for cover soil materials are contained in Section 02223 of the Technical Specifications.

5.2.2.6 Vegetative Support Layer

Requirements for vegetative support layer are contained in Section 02235 of the Technical Specifications. The CONTRACTOR shall submit certified seed mixtures from the seed supplier for the vegetative support layer to the QAC. The QAC shall review the submitted seed mixture for conformance with the Technical Specifications. This review must be documented and a written acceptance shall be issued for use of the seed mixture in the final cover system.

5.3 Construction

5.3.1 Subgrade Preparation

The RM shall visually inspect the condition of the subgrade. Areas determined by the RM to be unsuitable shall be amended or replaced with structural fill. No soil shall be placed above the subgrade without the approval of the RM.

5.3.2 Ash Grading

The control of the grading and compaction of the ash are critical for satisfactory performance of the cap. Essentially, ash is to be excavated on the side slopes to achieve the design grades and will be brought to the plateau for shaping and grading. The ash will be placed in 18-inch loose lifts and compacted. (No density testing of the compactive effort is required).

The top of the landfill is to be crowned and sloped to drain in accordance with the final cover system drawings. There is a ridge along the landfill plateau that extends along the longitudinal axis (north-south direction) and the plateau is graded at a 4% slope from the ridge. The slopes are graded from 7H:1V to 4H:1V from the edge of the landfill plateau to the toe of slope.

The side slopes, top slopes, and crown elevations and grades shall be surveyed by a professional land surveyor, licensed to practice in the State of Delaware, following the placement of each soil layer of the final cover and stormwater management systems. Grading shall be surveyed across the width of the landfill (east-west direction) at intervals not more than 200 feet apart, as measured along the longitudinal axis of the landfill. All side slope grades shall be graded at the design slope within a tolerance range of one (1) degree flatter or steeper. Plateau slopes shall be 4%, plus or minus 0.5%. Crown final elevation and subgrade elevation shall be as specified, plus or minus 0.1 foot (1.2 inches). Grade stakes may be used to establish grading compliance provided that the stakes are placed by professional land surveyor and clearly marked with final ash elevation, borrow elevation, and

topsoil elevation to guide grading activities. The QAC shall review the completed survey results or review the grading in relation to the elevations marked on grading stakes. The QAC shall issue written acknowledgement that the grades are as specified, and that cap material placement can commence.

5.3.3 Grading and General Fill

Grading and general fill shall be placed as indicated in the Contract Drawings. Fill shall not be placed until the subgrade or other component has been observed in place and approved by the RM. Fill shall be placed in relatively horizontal uniform lifts not exceeding 12 inches in loose thickness throughout the fill area. The RM, or QAC Monitors, shall continuously monitor and document the placement of fill materials. Refer to Section 02223 in the Technical Specifications for laboratory and field-testing. If, during placement of fill the RM has reason to suspect that the material has changed from that previously tested and approved, they shall immediately notify the CONTRACTOR's on-Site representative and arrange for additional laboratory testing. Material determined to be unsuitable by the RM shall be removed and replaced at the CONTRACTOR's expense. The CONTRACTOR shall also reimburse the QAC for the additional testing and monitoring of removing and replacing the unsuitable material.

5.3.4 Structural Fill

Structural fill shall be placed as indicated in the Contract Drawings. Fill shall not be placed until the subgrade or other component has been observed in place and approved by the RM. Fill shall be placed in relatively horizontal uniform lifts not exceeding 12 inches in loose thickness throughout the fill area. Fill shall be compacted to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor Test (ASTM D 698). Hand-operated plate type vibratory, or other suitable, equipment may be used in areas not accessible to larger rollers or compactors as long as the density criteria are met. The RM, or QAC Monitors, shall continuously monitor and document the placement of fill materials. RM, or QAC Monitors, shall conduct field density/moisture testing (ASTM D2922/D3017). Refer to Section 02223 in the Construction Specifications for laboratory and field-testing. If, during placement of fill, the RM has reason to suspect that the material has changed from that previously tested and approved, they shall immediately notify the CONTRACTOR's on-Site representative and arrange for additional laboratory testing. Material determined to be unsuitable by the RM shall be removed and replaced at the CONTRACTOR's expense. The CONTRACTOR shall also reimburse the QAC for the additional testing and monitoring of removing and replacing the unsuitable material. Grading tolerance for fill shall be -0.1 to + 0.2 feet for elevations, and -0.0 to +0.1 for thickness.

5.3.5 Coarse Aggregate

Coarse aggregate shall be used for drainage, structural foundation materials, and gravel roads. Coarse aggregate material shall be clean, sound, tough, durable, subangular, subrounded, or round stone, not lumpy, and free from slag, cinders, ashes, rubbish, or other deleterious material. The CONTRACTOR shall maintain a uniform gradation of coarse aggregate.

Aggregate shall be stored in designated areas approved by the RM. The CONTRACTOR is responsible for maintaining the aggregate free of contamination. The RM may at any time inspect the coarse aggregate in the on-Site stockpile for contamination and, if necessary, reject all or portions of the coarse aggregate.

Coarse aggregate shall be placed to the lines, depths, and grades as shown on the Contract Drawings. The RM shall continuously monitor and document the placement of all coarse aggregate. No material shall be placed unless approved by RM. Refer to Section 02233 in the Technical Specifications for laboratory and field-testing.

5.3.6 Cover Soil.

Eighteen (18) inches of cover soil shall be placed over the geosynthetic cover system. The cover soil shall be placed in one horizontal lift.

Cover soil shall be transported to the cap construction area over temporary haul roads constructed of material approved by the RM. Haul roads constructed over geosynthetics shall have a minimum of 36-inch thickness between the geosynthetics and the transporting equipment. Cover soil shall be placed at the toe of the slope by transporting equipment and pushed up slope by low ground pressure (LGP) bulldozers (< 5 psi). A minimum of 12-inches shall be maintained between geosynthetics and LGP equipment. Heavy transporting equipment shall, under no circumstances, be allowed on slopes. The RM shall monitor and document the placement of cover soil. Refer to Section 02223 in the Technical Specifications for laboratory and field-testing.

5.3.7 Vegetative Support Layer

Vegetative support layer shall be used in those areas specified in the Contract Drawings. No vegetative support layer shall be placed until placement of underlying cover soil layer is complete and approved by the RM. Vegetative support layer shall be placed in all areas indicated on the Contract Drawings and as directed by the DESIGNER to a thickness of 6 inches. The vegetative support layer shall be tracked perpendicular to the toe of slope with a low ground pressure tracked dozer prior to seeding. Heavy equipment transporting vegetative support layer material shall, under no circumstances, be allowed on slopes. Vegetative support layer material shall be placed at the toe of the slopes by transporting equipment and pushed up slope by LGP equipment.

The RM shall continuously monitor and document the placement of the vegetative support layer. The RM or a representative of the QAC shall review growth of vegetation on the landfill at least once per week for a period of two months following the placement of seed mixture. The RM shall also note evidence of erosion and all observations shall be logged. Soil shall be graded to blend in with existing grades and to prevent surface ponding or erosion. Mixing of underlying soil with the vegetative support layer during installation shall be avoided. Mixing excessive amounts of gravel sized or larger material from the substrate into the vegetative support layer, which may restrict growth of vegetation, shall be avoided. CPI shall receive written notification of areas of poor growth, low plant density, or erosion to identify areas in need of corrective action. These areas shall be reseeded, treated, or repaired as necessary to ensure adequate ground cover and erosion control. The minimum thickness of soil is as shown on the design drawings. Vegetative support layer thickness tolerance is 0.0 to +0.3 feet. Refer to the Technical Specifications for laboratory and field-testing.

6.0 GEOTEXTILE

6.1 Introduction

The purpose of this section is to describe the CQA monitoring, testing, and documentation requirements for the geotextile components of the closure cap system at the Site II Ash Landfill. Geotextile requirements are contained in the Technical Specifications.

6.2 Pre-Installation

6.2.1 Manufacturer’s Quality Control (MQC) Certification

The CONTRACTOR shall provide the QAC with copies of the MQC Certificates for the material supplied to the project prior to delivery of the material to Site II Ash Landfill. The QAC shall review these certificates to verify that

the material's properties comply with the Technical Specifications. Material properties and MQC testing frequencies for nonwoven geotextile are contained in Section 02595 of the Technical Specifications.

6.2.2 Inventory, Storage, and Handling

The CONTRACTOR shall be responsible for the proper storage and handling of the material. The CONTRACTOR shall designate and prepare a geosynthetics storage area prior to the arrival of the material. This area should be readily accessible and shall provide the geotextile with adequate protection against dirt, mud, sharp objects, impact, and other possible sources of damage. Upon arrival, the CONTRACTOR shall unload the geotextile in such a manner as to minimize the risk of damage to the material and place the rolls in the prepared storage area.

The RM shall verify that the geotextile storage area is adequate. The RM shall perform a physical inventory of all geotextile delivered to the Site II Ash Landfill for use in the final cover and stormwater management systems. The RM shall verify that the material delivered corresponds to the MQC Certificates. Upon arrival the RM shall record the following:

- Project identification;
- Date of arrival;
- Method of transport;
- Manufacturer's roll number;
- Condition of each roll; and
- All damage caused during unloading (if applicable).

6.2.3 CQA Conformance Testing

The RM shall collect and ship samples of the geotextile for CQA geosynthetics laboratory testing as soon as practicable after delivery. Samples shall be 3 feet long in the machine direction by the width of the roll and shall not be taken from the first 3 feet of the roll. The RM shall mark each sample with the Manufacturer's roll number and an arrow indicating the machine direction. Conformance testing of geotextile shall be performed in accordance with the Technical Specifications. Material properties and CQA conformance testing frequencies for nonwoven geotextile are summarized in the tables contained in Section 02595 of the Technical Specifications.

Upon receipt of CQA test results, the RM shall verify that the material meets project specifications. Should the material fail to meet project specifications, the RM shall notify the DESIGNER and the CONTRACTOR. The DESIGNER will review the results and, if appropriate, request approval from DNREC for a deviation from the Technical Specifications. If a deviation from the Technical Specifications is not appropriate or not approved by DNREC, the CONTRACTOR shall remove rejected material from the Site II Ash Landfill or store it at a location separate from accepted rolls until they can be removed from Site II Ash Landfill. The RM shall obtain and ship additional conformance test samples from the closest numerical rolls to the rejected material. Should either or both of these samples fail to meet project specifications, the CONTRACTOR shall continue to test the next closest numerical rolls until passing conformance tests are discovered. The cost of all additional testing and replacement of all non-conforming material shall be borne exclusively by the CONTRACTOR.

6.3 Installation

6.3.1 Deployment

Prior to deployment of the geotextile, the RM shall verify that the MQC certification and CQA Geosynthetics Laboratory conformance test results have been received, and that the material meets the project specifications.

The geotextile shall be placed in such a manner as to minimize the risk of damage to the material. It shall be laid smooth and free of tension, stress, folds, wrinkles, or creases. In the presence of wind, geotextile shall be weighted with sandbags or the equivalent. Refer to Section 02595 of the Technical Specifications for specific geotextile installation procedures.

6.3.2 Seams and Overlaps

Filter geotextile shall be sewn. All sewing shall be done using a polymeric thread with chemical and ultraviolet light resistance properties equal to or exceeding that of the geotextile. In general, no horizontal seams shall be allowed on steep slopes (>10%), except as part of a repair. Seams should be along, not across the line of maximum slope. The RM shall visually inspect each seam to verify continuity of stitching. The INSTALLER shall repair any sewing discontinuities at no additional expense to the OWNER.

6.3.3 Repair

The RM shall visually inspect the geotextile for damage. Damage shall be repaired by placing a piece of geotextile over the damaged area. The patch shall overlap the defect for a minimum of 3 feet in each direction and shall be continuously sewn around the edges.

7.0 GEOMEMBRANE

7.1 Introduction

The purpose of this section is to describe the CQA monitoring, testing, and documentation requirements for the geomembrane component of the final cover system. The geomembrane component consists of a 40-mil Linear-Low Density Polyethylene (LLDPE) or High-Density Polyethylene (HDPE) textured geomembrane or the 50-mil LLDPE or HDPE combination geomembrane/drainage layer options (Option No. 1 AGRU Super GripNet® or Option No. 2 AGRU MicroDrain®). The requirements for these geomembranes are contained in the Technical Specifications.

7.2 Pre-Installation

7.2.1 Manufacturer's Quality Control (MQC) Certification

The CONTRACTOR shall provide the QAC with copies of MQC Certificates for the material supplied to the project. The QAC shall review these certificates to verify that the material properties comply with the Technical Specifications. Material properties and MQC testing frequencies for geomembrane are included in the Technical Specifications.

7.2.2 Inventory, Storage, and Handling

The CONTRACTOR shall be responsible for the proper storage and handling of the material. The CONTRACTOR shall designate and prepare a geosynthetics storage area prior to the arrival of the material. This area should be readily accessible and shall provide the geomembrane with adequate protection against dirt, mud, sharp objects, impact, and other possible sources of damage. On arrival, the CONTRACTOR shall unload the

geomembrane in such a manner as to avoid the risk of damage to the material and place the rolls in the prepared storage area.

The RM shall verify that the geomembrane storage area is adequate. The RM shall perform a physical inventory of all geomembrane delivered to the Site II Ash Landfill for use in the final cover system. The RM shall verify that the material delivered corresponds to the previously submitted MQC Certificates. Upon arrival the RM shall record the following:

- Project identification;
- Date of arrival;
- Method of transport;
- Manufacturer's roll number;
- Condition of each roll; and
- All damage caused during unloading (if applicable).

7.2.3 CQA Conformance Testing

The RM shall collect and ship samples of the geomembrane for CQA Geosynthetics Laboratory testing as soon as practicable after delivery. Samples shall be 3 feet long in the machine direction by the width of the roll and shall not be taken from the first 3 feet of the roll. The RM shall mark each sample with the manufacturer's roll number and an arrow indicating the machine direction. Geomembrane conformance testing shall be performed in accordance with the Technical Specifications. Material properties and Quality Assurance conformance testing frequencies are included in the Technical Specifications.

Upon receipt of CQA Geosynthetics Laboratory test results, the RM shall verify that the material meets project specifications. Should the material fail to meet project specifications, the RM shall notify the DESIGNER and the CONTRACTOR. The DESIGNER will review the results and, if appropriate, request approval from DNREC for a deviation from the Technical Specifications. If a deviation from the Technical Specifications is not appropriate or not approved by DNREC, the CONTRACTOR shall remove rejected material from the Site II Ash Landfill or store it at a location separate from accepted rolls until they can be removed from Site II Ash Landfill. The RM shall obtain and ship additional conformance test samples from the closest numerical rolls bracketing the rejected material. Should either or both of these samples fail to meet project specifications, the CONTRACTOR shall continue to test the next closest numerical rolls until passing conformance tests are discovered. The cost of all additional testing, and replacement of all non-conforming material shall be borne exclusively by the CONTRACTOR

7.3 Installation

7.3.1 Deployment

Prior to deployment of a roll of geomembrane, the RM shall verify that the MQC Certificates and CQA Geosynthetics Laboratory conformance test results have been received and that the material meets the Technical Specifications.

Immediately prior to panel deployment, the INSTALLER and the RM shall confirm that the subgrade layer has a smooth surface, free of stones, sharp objects, debris, or excessive moisture that could damage the geomembrane

or adversely affect seaming operations. Any portion of the subgrade deemed unsuitable by either the INSTALLER or the RM shall be repaired or reworked by the CONTRACTOR at no additional cost to the OWNER, until it meets the Technical Specifications. During each day of geomembrane deployment, a subgrade certification will be completed and signed by the INSTALLER's superintendent and the RM.

Geomembrane deployment shall not proceed when the ambient air temperature measured 6-inches above the geomembrane are below 32^0F or above 104^0F unless otherwise directed by the DESIGNER. Geomembrane deployment shall not be performed during precipitation, or when winds exceed 20 mph, unless the Contractor pre-submits acceptable evidence (to be approved by the DESIGNER) that performance standards can be maintained under these conditions.

An All-Terrain Vehicle (ATV) may be used to assist with the deployment of the geomembrane under the following conditions:

1) Securely ballast the geosynthetic material with sandbags;

2) Install with the proper overlap;

3) Deploy the geosynthetic material in a manner that keeps the geosynthetic material in sufficient tension to avoid wrinkling and folding;

4) Take measures to avoid the entrapment of excessive moisture, dust, stones, and other objects in and under the geosynthetic material; and

5) Take care not to drag equipment across the exposed geosynthetic material.

The ATV may not be used to transport personnel or equipment across the geosynthetic material and no sudden stops/starts or turns are allowed.

QAC personnel shall closely monitor the use of ATVs to assist with deployment of the geosynthetics. If any of the above conditions are violated, the further use of ATVs for this purpose will be prohibited. In no case shall the ATV ride directly on top of the geosynthetic materials. A rub sheet should be used during deployment of textured geomembranes to prevent damage to the underside of the sheet from dragging against the subgrade.

During deployment, the INSTALLER shall write the panel and manufacturer's roll numbers on each panel. Panel numbers shall be marked numerically in the order they are installed. The RM, or their designee, shall maintain a log indicating the correlation between the panel number and the manufacturer's roll number. The RM shall complete a panel deployment log containing the panel number, the manufacturers roll number, the deployment date, the panel condition on deployment, the observed overlap, and the deployed length. The RM shall maintain a field sketch indicating the relative location of deployed panels.

The INSTALLER shall only deploy panels that can be welded during the same day. Panels deployed on side slopes shall be oriented along the maximum line of slope. Panels shall be deployed with the fewest possible wrinkles or fishmouths. The INSTALLER shall ensure that the deployment method avoids potential damage to the geomembrane, and that deployed panels are adequately protected against wind uplift and associated damage.

7.3.2 Field Seaming

For the geomembrane components of final cover system, field seams shall be of the following type:

- Fusion weld – A seam produced by melting the two intimate surfaces by running a hot metal wedge between the surfaces followed immediately by pressure to form a homogeneous bond. This seam has an integral air channel for non-destructive testing.
- Extrusion weld – A seam produced by extruding molten parent LLDPE or HDPE resin between or at the edge of two overlapped LLDPE or HDPE panels. A bonded seam is completed when extruded hot resins melt adjacent sheet resins to form a homogeneous bond.

Fusion Process

- All areas to be seamed shall be free of dust, dirt, and excessive moisture.
- In general, the geomembrane panels shall be aligned to have a nominal overlap of 6 inches.
- No solvent or adhesive shall be used during seaming.

Extrusion Process

- All areas to be seamed shall be free of dust, dirt, and excessive moisture.
- In general, the geomembrane panels shall be aligned to have a nominal overlap of 3 inches.
- Grinding shall be performed no more than one (1) hour prior to seaming.
- Clean dry welding rod shall be used for seaming.
- Exposed grinding adjacent to extrusion seams shall be kept to a minimum and shall at no point exceed ¼ inch.
- No solvent or adhesive shall be used during seaming.

7.3.3 Trial Seam Testing

Prior to production welding, each Seamer shall produce a trial seam. Trial seams shall be made at the beginning of each shift, following restart of welding equipment, upon a change of Seamers, and at least once each five hours of seaming that day.

Fusion and extrusion trial seams shall be a minimum of 5 feet long. Trial seams shall be welded under the same field conditions as production welding. Seamers shall produce trial seams for each machine. The Seamer shall mark each trial seam with the machine number, temperature, speed, date, and time the trial seam was produced, and the Seamer's initials or other means of identification.

The INSTALLER shall cut and test six (6) 1-inch wide coupons from each trial seam. Three coupons shall be tested for peel adhesion and three coupons shall be tested for bonded seam strength (also known as shear). Both the inside and outside weld of fusion welds shall be tested for peel adhesion. Coupons must meet project specifications for geomembrane seam destructive test samples as indicated in the Technical Specifications. If a trial seam fails to meet project specifications, the Seamer will weld a second trial seam. If the second trial seam fails to meet project specifications, the INSTALLER shall investigate the cause of the failures and take the necessary corrective action. Once the deficiency is corrected, the Seamer must produce two consecutive passing trial seams before being permitted to begin or resume production welding. If at any point during the day, a seamer fails three trial welds prior to acceptance for production welding, the Seamer and/or the seaming apparatus shall not be used for seaming that day.

The RM shall observe trial seam testing, and maintain a log containing the project identification, the date and time the trial seam was produced, ambient temperature, machine and Seamer identification, the machine temperature and speed, and the strength and mode of failure of each coupon.

7.3.4 General Seaming

The Master Seamer, as defined in the Technical Specifications, shall be on-Site at all times during production welding. Production welding shall be performed only by Seamers that have produced trial welds meeting Technical Specifications. Welding at night shall be avoided unless approved in writing by the DESIGNER.

Welding of geomembrane seams will not be performed during inclement weather. Emergency seams welded in unsuitable weather conditions will be removed and replaced or capped. Welding in temperatures less than 32°F or greater than 104°F shall be permitted only with the approval of the OWNER, or DESIGNER, and after the INSTALLER has demonstrated that welding can be successfully performed in those conditions.

Seams shall be lapped to produce a “shingle” effect. Temporary rub sheets may be used as conditions warrant; however, no rub sheet shall be left below the geomembrane. At the beginning of each seam, the Seamer shall record the date, start time, machine, and Seamer identification on the geomembrane. All seams shall be welded through the back of the anchor trench. The RM shall monitor and document welding operations. The RM shall employ a method of uniquely identifying each geomembrane seam. The RM shall maintain a log for each seam noting the project identification, the machine and Seamer identification, the start time, the machine start and end points, the approximate ambient temperature, and the length of the seam.

Fishmouths, or wrinkles at the seam overlaps, shall be cut along the ridge of the wrinkle to achieve a flat overlap. Cut wrinkles shall be overlapped a minimum of 3 inches and seamed, or patched, and any area where the overlap is inadequate shall be patched.

Geomembrane panels shall be staggered such that cross seams between panels are not continuous throughout the geomembrane area. Panel layouts shall be such that no horizontal seams (cross seams) are constructed on slopes steeper than ten (10) percent. No horizontal (cross seams) shall be within 5 feet from the toe or crest of the slope or areas of potential stress concentrations unless approved by the QAC.

7.3.5 Defects and Repairs

The RM shall observe the geomembrane panels and seams for any damage or deficiency that may adversely affect the performance of the geomembrane. The RM shall mark each defect with a unique identification code, and maintain a log noting at a minimum the defect location, and type.

Any portion of the geomembrane containing a defect or failed seam (destructive or non-destructive) shall be repaired by the INSTALLER at no additional cost to the OWNER. Available repair techniques include the following:

- Patching – used to repair all holes, intersections, tears, and contaminated areas in the geomembrane.
- Capping – used to repair a failed seam length area with either fusion or extrusion welding.
- Removal of bad seam and replacing area with new material welded into place.

Only those Seamers completing a successful trial weld shall perform repairs. All holes in the geomembrane shall be patched. Failed fusion or extrusion seam lengths shall be removed or capped. All panel “T” intersections shall

be patched. Use of the “grind and weld” repair technique shall be minimized to very small defects in the geomembrane as approved by the RM. Temporary repairs (e.g. emergency patches welded in the rain) shall be marked “Temp.” For each repair, the Seamer shall record the date, start time, and machine and Seamer identification on the geomembrane.

General Practices for performing repairs shall be as follows:

- Surface to be repaired shall be clean and dry.
- Surface to be extruded shall be abraded (ground) no more than one (1) hour prior to seaming.
- Patches shall extend a minimum of 6 inches beyond the edge of the defect on all sides with corners of the patch rounded.

The RM shall monitor and document the repair of each defect. Repair documentation shall include at a minimum the project identification, the date, approximate time, type, and size of the repair, and identification of the welding machine and Seamer.

7.3.6 Non-Destructive Testing

7.3.6.1 Introduction

This section discusses the non-destructive testing of fusion and extrusion welds. All production welds and repairs shall be non-destructively tested over their entire length. Non-destructive testing shall be performed as soon as possible after completion of the weld. Air pressure testing shall be performed prior to the removal of seam destructive test samples. Welds failing to meet the non-destructive test specifications shall be removed and replaced or capped at no additional cost to the OWNER.

7.3.6.2 Pressure Testing

All dual track fusion seams shall be non-destructively tested using the air pressure test method as described in the Technical Specifications. Both ends of the weld shall be sealed and the air channel pressurized to approximately 30 pounds per square inch (psi). After stabilization, the initial pressure shall be recorded. The pressure shall be monitored for a period of five (5) minutes, and the final pressure recorded. The test is considered to be passing if the pressure drop is less than or equal to four (4) psi for geomembrane during the five (5) minute interval. If the pressure test fails to meet project specifications, the INSTALLER shall determine the cause of the failure and correct the deficiency. The affected weld may be retested, removed, or capped.

At the conclusion of the test, the air channel shall be cut at the end opposite from the point of pressurization and the air channel depressurization noted. If the air channel does not depressurize, the INSTALLER shall identify and remove the source of the blockage and retest the affected seam.

The INSTALLER’s technician performing air pressure testing shall mark the date, the initial and final pressures, the test start and end times, and technician identification on the geomembrane.

The RM, or their designee, shall monitor and document all pressure testing. The RM shall maintain a pressure test log containing at a minimum the project identification, the date of the test, identification of the seam or portion of seam being tested, test start and end times, the initial and final test pressures, and the identification of the technician performing the test.

7.3.6.3 Vacuum Testing

All extrusion welds shall be non-destructively tested using the vacuum test method described in the Technical Specifications. The weld shall be wetted with a soapy water solution and an approved vacuum testing apparatus, capable of producing a minimum vacuum pressure of five (5) psi, shall be used. The vacuum shall be maintained for a minimum of ten (10) seconds. If no leaks (as indicated by a stream of bubbles) are detected, the vacuum will be released and the vacuum box advanced. A minimum overlap of 6 inches between tests shall be maintained. Where vacuum testing is not feasible, the spark testing method shall be employed.

The INSTALLER's Technician performing vacuum testing shall mark the date, technician identification, and a notation of the test result (e.g. "VT OK" for a passing test) on the geomembrane for all vacuum tests performed.

The RM, or their designee, shall monitor vacuum testing. The RM shall record at a minimum the project identification, the date, the repair number, the seam, or portion of seam, the technician identification and the test results for all vacuum testing.

7.3.6.4 Spark Testing

Spark testing shall be used to non-destructively test extrusion welds not readily testable by vacuum testing (e.g. pipe penetrations). A copper wire shall be inserted beneath the extrusion weld. An electric current is applied to the embedded wire, and a wire brush is passed over the weld. An alternative method is to apply the current to an insulated probe, and to pass the probe over the surface of the weld. Discontinuities (leaks) are detected by the presence of a stream of sparks moving between the embedded wire and the wire brush or probe.

The RM, or their designee, shall monitor all spark testing and record the project identification, the date, the repair number, the technician identification, and the test results for all spark testing.

7.3.7 Geomembrane Seam Destructive Testing

Destructive testing of fusion and extrusion welding shall be performed at a minimum rate of 1 per 1000 linear feet of weld for each welding machine, or as directed by the RM, to evaluate seam strength. This minimum frequency shall be determined as an average taken from the total linear footage of seaming, per machine, at the end of the geomembrane installation. Test locations shall be determined during seaming and may be prompted by suspicion of overheating, contamination, offset welds, or any other potential cause of inadequate welding. The RM will ensure that sufficient destructive test samples are taken for each machine to meet Technical Specifications. The RM shall assign each destructive test sample with a unique identification number, and mark and document the location of the sample. The sample shall be approximately 42 inches long and will be divided into three sections. Each section shall be marked with the destructive sample identification number, the seam number, machine and Seamer identification, the machine temperature and speed, and the date. The INSTALLER shall remove the sample in a timely manner and repair the resulting defect. One (1), 1-inch wide test strip shall be cut from each end of the sample to be tested in the field as specified for peel adhesion. If the test strips pass, the INSTALLER shall cut the sample into three (3) sections as indicated. One section will be retained as an archive by the INSTALLER, one section will be shipped to the Geosynthetics CQA Laboratory for testing, and the third will be retained as an archive by the OWNER. If one of the test strips fails, the sample shall be considered a failure and the seam should be repaired in accordance with 7.3.5 of this CQA Plan.

7.3.8 Laboratory Destructive Testing

Laboratory destructive testing shall include bonded seam strength (shear) and peel adhesion. The minimum acceptable values for these tests are included in the Technical Specification. A minimum of five (5) coupons shall

be tested for both peel adhesion and shear seam strength, with the coupons being selected alternatively by test from the sample. A passing test shall meet the minimum acceptable values and Film Tear Bond (FTB) in at least four (4) of five (5) coupons for each test method. Seam separation shall not extend more than 25 percent into the seam. Seam separation greater than 25 percent into the seam shall be considered failing.

In the event of a destructive test failure, the INSTALLER has two options:

- The INSTALLER can cap or remove the failed seam between two passing destructives.
- The INSTALLER can have the RM mark additional samples along the welding path a minimum of 10 feet from the failed test in each direction. These samples shall be marked, removed, and tested as indicated above. If both tests pass, the failed seam between the passing destructives shall be capped or removed. If one of both of the samples fail, the process is repeated until passing tests are achieved on both sides of the original failure to establish the area of the failed seam to be capped or removed.

All acceptable repaired seams must be bound by two passing laboratory destructive tests. Laboratory destructive samples must come from field seaming and shall be tracked back to previous days welding if necessary. Trial welds shall not be used for destructive samples to bind failed seaming.

8.0 GEOCOMPOSITE DRAINAGE LAYER

8.1 Introduction

The purpose of this section is to describe the CQA monitoring, testing, and documentation requirements for the geocomposite drainage layer of the final closure system at the Site II Ash Landfill. The geocomposite drainage layer requirements are contained in the Technical Specifications.

8.2 Pre-Installation

8.2.1 Manufacturer's Quality Control (MQC) Certification

The CONTRACTOR shall provide the QAC with copies of the MQC Certificates for the material supplied to the Site II Ash Landfill. The QAC shall review these certificates to verify that the material properties comply with the Technical Specifications. Material properties and MQC testing frequencies for the geocomposite drainage layer are contained in the Technical Specifications

8.2.2 Inventory, Storage, and Handling

The CONTRACTOR shall be responsible for the proper storage and handling of the material. The CONTRACTOR shall designate and prepare a geocomposite drainage layer storage area prior to the arrival of the material. This area should be readily accessible and shall provide the geocomposite with adequate protection against dirt, mud, sharp objects, impact, and other possible sources of damage. Upon arrival, the CONTRACTOR shall unload the geocomposite in such a manner as to minimize the risk of damage to the material and place the rolls in the prepared storage area.

The RM shall verify that the geocomposite storage area is adequate. The RM shall perform a physical inventory of all geocomposite delivered to the Site II Ash Landfill for use in the final cover system construction, and shall record the project identification, the date of arrival, the method of transport, the manufacturer's roll number, the condition of each roll on arrival, and all damage caused during unloading. Each roll shall be marked or tagged with the following information: manufacturer's name; project identification; lot number; roll number; roll dimensions. The RM shall verify that the material delivered corresponds to the MQC Certificates. Any damaged

rolls may be rejected. Rejected material is to be removed from the Site II Ash Landfill or stored at a location separate from accepted rolls until they can be removed from the Site II Ash Landfill. In addition, Geocomposite rolls that do not have proper manufacturer's documentation must be stored at a separate location until all documentation has been received and approved.

8.2.3 CQA Conformance Testing

The RM shall collect and ship samples of the geocomposite for CQA geosynthetics laboratory testing as soon as practicable after delivery. Samples shall be 3 feet long in the machine direction by the width of the roll and shall not be taken from the first 3 feet of the roll. The RM shall mark each sample with the Manufacturer's roll number and an arrow indicating the machine direction. Conformance testing of geocomposite shall be performed in accordance with the Technical Specifications. Material properties and Quality Assurance conformance testing frequencies for the geocomposite are located in the Technical Specifications.

Upon receipt of CQA test results, the RM shall verify that the material meets project specifications. Should the material fail to meet project specifications, the RM shall notify the DESIGNER and the CONTRACTOR. The DESIGNER will review the results and, if appropriate, request approval from DNREC for a deviation from the Technical Specifications. If a deviation from the Technical Specifications is not appropriate or not approved by DNREC, the CONTRACTOR shall remove rejected material from the Site II Ash Landfill or store it at a location separate from accepted rolls until they can be removed from Site II Ash Landfill. The RM shall obtain and ship additional conformance test samples from the closest numerical rolls to the rejected material. Should either or both of these samples fail to meet project specifications, the CONTRACTOR shall continue to test the next closest numerical rolls until passing conformance tests are discovered. Failed material shall be removed, by the CONTRACTOR, from the Site II Ash Landfill, or stored at a location separate from accepted rolls until they can be removed from the Site II Ash Landfill. The cost of all additional testing, and replacement of all non-conforming material shall be borne exclusively by the CONTRACTOR.

8.3 Installation

8.3.1 Deployment

Prior to deployment of a roll of geocomposite, the RM shall verify that the MQC Certificates and CQA Geosynthetics Laboratory conformance test results have been received and that the material meets the Technical Specifications.

Immediately prior to the installation of the geocomposite, the RM will monitor that all lines and grades have been verified by the CONTRACTOR and that the geomembrane has been installed in accordance with the specifications and all associated documentation has been completed.

An All-Terrain Vehicle (ATV) may be used to assist with the deployment of the geocomposite drainage layer under the following conditions:

1) Securely ballast the geosynthetic material with sandbags;

2) Install with the proper overlap;

3) Deploy the geosynthetic material in a manner that keeps the geosynthetic material in sufficient tension to avoid wrinkling and folding;

4) Take measures to avoid the entrapment of excessive moisture, dust, stones, and other objects in and under the geosynthetic material; and

5) Take care not to drag equipment across the exposed geosynthetic material.

The ATV may not be used to transport personnel or equipment across the geosynthetic material and no sudden stops/starts or turns are allowed.

The RM shall closely monitor the use of ATVs to assist with deployment of the geosynthetics. If any of the above conditions are violated, the further use of ATVs for this purpose will be prohibited. In no case shall the ATV ride directly on top of the geosynthetic materials. A rub sheet should be used during deployment of geocomposite over the textured geomembranes to prevent damage to the material from the textured surface.

During the placement of the geocomposite drainage layer, the RM, or their designee, will observe deployment and record all defects and defect corrective actions (panel rejected, patch installed, etc.) and verify that corrective actions are performed in accordance with the specifications. The RM will monitor that equipment used does not damage the geocomposite by handling, equipment transit, leakage of hydrocarbons, or other means and also monitor that crews working on the material do not smoke, wear shoes or engage in activities that could damage the geocomposite. The RM will also monitor that the geocomposite is securely anchored to prevent movement by the wind, monitor that adjacent panels are installed in accordance with the specifications, and examine the geocomposite drainage layer after installation to ensure that no potentially harmful foreign objects are present.

The RM, or their designee, shall inspect the completed work for holes, tears, small defective areas, large wrinkles, bridging, and any other defect and shall verify that repairs are made in accordance with the Technical Specifications. The repair procedures for the geocomposite include 1) patching to repair large holes, tears, and small defective areas, and 2) removal to replace large defective areas where patching is not appropriate.

9.0 SURVEYING

Surveying of lines and grades will be conducted by a professional land surveyor, licensed to practice in the State of Delaware, in accordance with the requirements of Section 01050 and other relevant portions of the Technical Specifications. The CONTRACTOR shall maintain at the Work Site a complete, accurate log of control and survey work as it progresses.

Upon completion of each phase of work requiring services of the Surveyor, the CONTRACTOR shall submit to the QAC Record Drawings and survey notes signed by the Surveyor stating that elevations and locations of site-constructed features are in conformance, or non-conformance with Contract Documents.

Upon completion of the work, all Record Drawings must be submitted to the OWNER by the CONTRACTOR for inclusion in the Final Report to be prepared by the QAC and submitted to DNREC for approval.

10.0 PLAN MODIFICATION PROCEDURE

Should this CQA Plan require modification, the proposed change will be submitted in writing to the DESIGNER and the OWNER for review. If the proposed modification is deemed appropriate, a letter requesting approval of the change will be submitted to DNREC. An addendum will be attached to copies of this CQA Plan following receipt of approval from DNREC.

APPENDIX A

Laboratory Testing Tables

APPENDIX 9-B CQA PLAN
TABLE 1
GEOSYNTHETIC LABORATORY CONFORMANCE TESTING SUMMARY
EDGE MOOR SITE II ASH LANDFILL CLOSURE
EDGE MOOR, DELAWARE

Test	Method	Frequency		Required Tests			Specification Requirement
		Conform.	Construct.	Conform.	Construct.	Total	
10 oz/yd Nonwoven Geotextile (min 1 per lot (assume same lot), est. 1/250,000 SF)							
Grab Tensile Strength	ASTM D4632	1/lot/250,000sf	-	3	0	3	≥270 lb (MD) ≥270 lb (TD)
Grab Tensile Elongation	ASTM D4632	1/lot/250,000sf	-	3	0	3	≥50% (MD) ≥50% (TD)
Trapezoidal Tear Strength	ASTM D4533	1/lot/250,000sf	-	3	0	3	105 lb (MD) 105 lb (TD)
CBR Puncture Strength	ASTM D6241	1/lot/250,000sf	-	3	0	3	120 lb
Apparent Opening Size	ASTM D4751	1/lot/250,000sf	-	3	0	3	≥100 (Sieve No)
Permittivity	ASTM D4491	1/lot/250,000sf	-	3	0	3	≥1.0 sec^{-1}
Mass Per Unit Area	ASTM D5261	1/lot/250,000sf	-	3	0	3	10 oz/yd^2
Drainage Layer							
Transmissivity	ASTM D4716	1/lot or 1/200,000 sf	-	4	0	4	0.0008 m^2/sec @ i=0.14
Interface Friction Angle	ASTM D5321	1/lot or 1/200,000 sf	-	4	0	4	19 degrees
HDPE Geomembrane (min. 1/lot (assume all same lot), 1/200,000 SF)							
Thickness	ASTM D5994	1/lot or 1/200,000 sf	-	4	0	4	38 mils (min. avg.)
Yield Strength	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	84 lb/in (MD) 84 lb/in (TD)
Break Strength	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	60 lb/in (MD) 60 lb/in (TD)
Yield Elongation	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	12% (MD) 12% (TD)
Break Elongation	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	100% (MD) 100% (TD)
Density	ASTM 1505 or D792	1/lot or 1/200,000 sf	-	4	0	4	0.94 g/cc
Carbon Black Content	ASTM D1603	1/lot or 1/200,000 sf	-	4	0	4	2.0 to 3.0%
Carbon Black Dispersion	ASTM D5596	1/lot or 1/200,000 sf	-	4	0	4	
Asperity Height	GRI GM12	1/lot or 1/200,000 sf	-	4	0	4	16 mils
Tear Resistance	ASTM D1004	1/lot or 1/200,000 sf	-	4	0	4	28 lb (MD) 28 lb (TD)
Puncture Resistance	ASTM D4833	1/lot or 1/200,000 sf	-	4	0	4	60 lb (min.)
Interface Shear Strength	ASTM D5321	1/project	-	1	0	1	Soil/GT = 19 deg GT/GM = 19 deg GM/Soil = 19 deg
LLDPE Geomembrane (min. 1/lot (assume all same lot), 1/200,000 SF)							
Thickness	ASTM D5994	1/lot or 1/200,000 sf	-	4	0	4	38 mils (min. avg.)
2% Modulus	ASTM D5323	1/lot or 1/200,000 sf	-	4	0	4	2400 lb/i) (MD) 2400 lb/in (TD)
Break Strength	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	60 lb/in (MD) 60 lb/in (TD)
Break Resistance Strain	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	30% (MD) 30% (TD)
Break Elongation	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	100% (MD) 100% (TD)
Density	ASTM 1505 or D792	1/lot or 1/200,000 sf	-	4	0	4	0.939 g/cc
Carbon Black Content	ASTM D1603	1/lot or 1/200,000 sf	-	4	0	4	2.0 to 3.0%
Carbon Black Dispersion	ASTM D5596	1/lot or 1/200,000 sf	-	4	0	4	
Asperity Height	GRI GM12	1/lot or 1/200,000 sf	-	4	0	4	16 mils
Tear Resistance	ASTM D1004	1/lot or 1/200,000 sf	-	4	0	4	22 lb (MD) 22 lb (TD)
Puncture Resistance	ASTM D4833	1/lot or 1/200,000 sf	-	4	0	4	44 lb (min.)
Interface Shear Strength	ASTM D5321	1/project	-	1	0	1	Soil/GT = 19 deg GT/GM = 19 deg GM/Soil = 19 deg

APPENDIX 9-B CQA PLAN
TABLE 1
GEOSYNTHETIC LABORATORY CONFORMANCE TESTING SUMMARY
EDGE MOOR SITE II ASH LANDFILL CLOSURE
EDGE MOOR, DELAWARE

Test	Method	Frequency		Required Tests			Specification Requirement
		Conform.	Construct.	Conform.	Construct.	Total	
HDPE MicroDrain (min. 1/lot (assume all same lot), 1/200,000 SF)							
Thickness	ASTM D5994	1/lot or 1/200,000 sf	-	4	0	4	47.5 mils (min. avg.)
Friction Spike Height	GM-12	1/lot or 1/200,000 sf	-	4	0	4	20 mils (min. avg.)
Drainage Stud Height	GM-12	1/lot or 1/200,000 sf	-	4	0	4	130 mils (min. avg.)
Yield Strength	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	110 lb/in (MD) 110 lb/in (TD)
Break Strength	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	110 lb/in (MD) 110 lb/in (TD)
Yield Elongation	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	12% (MD) 12% (TD)
Break Elongation	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	300% (MD) 300% (TD)
Density	ASTM 1505 or D792	1/lot or 1/200,000 sf	-	4	0	4	0.94 g/cc
Carbon Black Content	ASTM D1603	1/lot or 1/200,000 sf	-	4	0	4	2.0 to 3.0%
Carbon Black Dispersion	ASTM D5596	1/lot or 1/200,000 sf	-	4	0	4	
Tear Resistance	ASTM D1004	1/lot or 1/200,000 sf	-	4	0	4	38 lb (MD) 38 lb (TD)
Puncture Resistance	ASTM D4833	1/lot or 1/200,000 sf	-	4	0	4	80 lb (min. avg.)
Stress Crack Resistance	ASTM D5397	1/lot or 1/200,000 sf	-	4	0	4	500
LLDPE MicroDrain (min. 1/lot (assume all same lot), 1/200,000 SF)							
Thickness	ASTM D5994	1/lot or 1/200,000 sf	-	4	0	4	47.5 mils (min. avg.)
Friction Spike Height	GM-12	1/lot or 1/200,000 sf	-	4	0	4	20 mils (min. avg.)
Drainage Stud Height	GM-12	1/lot or 1/200,000 sf	-	4	0	4	130 mils (min. avg.)
Break Strength	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	105 lb/in (MD) 105 lb/in (TD)
Break Elongation	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	300% (MD) 300% (TD)
Density	ASTM 1505 or D792	1/lot or 1/200,000 sf	-	4	0	4	0.94 g/cc
Carbon Black Content	ASTM D1603	1/lot or 1/200,000 sf	-	4	0	4	2.0 to 3.0%
Carbon Black Dispersion	ASTM D5596	1/lot or 1/200,000 sf	-	4	0	4	
Tear Resistance	ASTM D1004	1/lot or 1/200,000 sf	-	4	0	4	30 lb (MD) 30 lb (TD)
Puncture Resistance	ASTM D4833	1/lot or 1/200,000 sf	-	4	0	4	55 lb (min. avg.)
Stress Crack Resistance	ASTM D5397	1/lot or 1/200,000 sf	-	4	0	4	500
HDPE SuperGripNet (min. 1/lot (assume all same lot), 1/200,000 SF)							
Thickness	ASTM D5994	1/lot or 1/200,000 sf	-	4	0	4	47.5 mils (min. avg.)
Friction Spike Height	ASTM D7466	1/lot or 1/200,000 sf	-	4	0	4	175 mils (min. avg.)
Drainage Stud Height	GM-12 or ASTM D7466	1/lot or 1/200,000 sf	-	4	0	4	130 mils (min. avg.)
Yield Strength	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	110 lb/in (MD) 110 lb/in (TD)
Break Strength	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	110 lb/in (MD) 110 lb/in (TD)
Yield Elongation	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	13% (MD) 13% (TD)
Break Elongation	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	200% (MD) 200% (TD)
Density	ASTM 1505 or D792	1/lot or 1/200,000 sf	-	4	0	4	0.94 g/cc
Carbon Black Content	ASTM D1603	1/lot or 1/200,000 sf	-	4	0	4	2.0 to 3.0%
Carbon Black Dispersion	ASTM D5596	1/lot or 1/200,000 sf	-	4	0	4	
Tear Resistance	ASTM D1004	1/lot or 1/200,000 sf	-	4	0	4	38 lb (MD) 38 lb (TD)
Puncture Resistance	ASTM D4833	1/lot or 1/200,000 sf	-	4	0	4	80 lb (min. avg.)
Stress Crack Resistance	ASTM D5397	1/lot or 1/200,000 sf	-	4	0	4	300

APPENDIX 9-B CQA PLAN
TABLE 1
GEOSYNTHETIC LABORATORY CONFORMANCE TESTING SUMMARY
EDGE MOOR SITE II ASH LANDFILL CLOSURE
EDGE MOOR, DELAWARE

Test	Method	Frequency		Required Tests			Specification Requirement
		Conform.	Construct.	Conform.	Construct.	Total	
LLDPE SuperGripNet (min. 1/lot (assume all same lot), 1/200,000 SF)							
Thickness	ASTM D5994	1/lot or 1/200,000 sf	-	4	0	4	47.5 mils (min. avg.)
Friction Spike Height	ASTM D7466	1/lot or 1/200,000 sf	-	4	0	4	175 mils (min. avg.)
Drainage Stud Height	GM-12 or ASTM D7466	1/lot or 1/200,000 sf	-	4	0	4	130 mils (min. avg.)
Break Strength	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	105 lb/in (MD) 105 lb/in (TD)
Break Elongation	ASTM D6693	1/lot or 1/200,000 sf	-	4	0	4	300% (MD) 300% (TD)
Density	ASTM 1505 or D792	1/lot or 1/200,000 sf	-	4	0	4	0.939 g/cc
Carbon Black Content	ASTM D1603	1/lot or 1/200,000 sf	-	4	0	4	2.0 to 3.0%
Carbon Black Dispersion	ASTM D5596	1/lot or 1/200,000 sf	-	4	0	4	
Tear Resistance	ASTM D1004	1/lot or 1/200,000 sf	-	4	0	4	30 lb (MD) 30 lb (TD)
Puncture Resistance	ASTM D4833	1/lot or 1/200,000 sf	-	4	0	4	55 lb (min. avg.)
Geocomposite (min. 1/lot (assume all same lot), 1/200,000 SF)							
Thickness	ASTM D5199	1/lot or 1/200,000 sf	-	4	0	4	250 mils (min.)
Density	ASTM D792	1/lot or 1/200,000 sf	-	4	0	4	0.94 g/cc
Carbon Black Content	ASTM D1603	1/lot or 1/200,000 sf	-	4	0	4	2.0 to 3.0%
Tensile Strength	ASTM D638	1/lot or 1/200,000 sf	-	4	0	4	55 lb/in (MD) 55 lb/in (TD)
DrainTube (min 1 per lot (assume same lot), est. 1/200,000 SF)							
Outside Diameter	ASTM D2122	1/lot/200,000sf		1	0	1	≥0.8 in
Stiffness at 5% Deflection	ASTM D2412	1/lot/200,000sf					≥435 psi
Grab Tensile Strength	ASTM D4632	1/lot/200,000sf	-	1	0	1	≥220 lb (MD) ≥220 lb (TD)
Trapezoidal Tear Strength	ASTM D4533	1/lot/200,000sf	-	1	0	1	90 lb (MD) 90 lb (TD)
CBR Puncture Strength	ASTM D6241	1/lot/200,000sf	-	1	0	1	600 lb
Apparent Opening Size	ASTM D4751	1/lot/200,000sf	-	1	0	1	≤0.18 mm
Mass Per Unit Area	ASTM D5261	1/lot/200,000sf	-	1	0	1	8 oz/yd^2
Destructive Seam Testing							
Thickness	Not Listed	-	1/500 LF	0	62	62	
Shear Strength Test	ASTM D6392		1/500 LF	0	62	62	≤80 lb/in
Peel Adhesion Test	ASTM D6392		1/500 LF	0	62	62	≤60 lb/in
Extrusion Test	ASTM D6392	-	1/500 LF	0	62	62	≤52 lb/in

Notes: (1) Based on 16.0 acres, 22.5-ft. wide panels, sampled every 500 ft, 1 failure, one layer, and 10 extrusion.

TABLE 02223-1
GEOTECHNICAL LABORATORY CONFORMANCE TESTING SUMMARY
EDGE MOOR SITE II ASH LANDFILL CLOSURE
EDGE MOOR, DELAWARE

Test	Method	Frequency		Specification Requirement
		Conform.	Construct.	
Structural Fill				
Soil Classification	ASTM D2487	1/source	-	
Sieve Analysis (w/ hydrometer)	ASTM D422	1/source	1/5,000cy	≤4 in
Atterberg Limits	ASTM D4318 (B)	1/source	1/5,000cy	≤25 PI
Moisture Content	ASTM D2216	1/source	1/5,000cy	
Field Density	ASTM D2922/2937	-	1/lift on 100' x 100' grid	≥ 95% of max. dry density
Field Mositure	ASTM D3017	-	1/lift on 100' x 100' grid	
Proctor Test	ASTM D698	1/source	1/5,000cy	
General Fill				
Soil Classification	ASTM D2487	1/source	-	
Sieve Analysis (w/ hydrometer)	ASTM D422	1/source	1/5,000cy	≤3 in
Atterberg Limits	ASTM D4318 (B)	1/source	1/5,000cy	
Moisture Content	ASTM D2216	1/source	1/5,000cy	
Grading Fill				
Soil Classification	ASTM D2487	1/source	-	
Sieve Analysis (w/ hydrometer)	ASTM D422	1/source	1/5,000cy	≤1 in
Atterberg Limits	ASTM D4318 (B)	1/source	1/5,000cy	
Moisture Content	ASTM D2216	1/source	1/5,000cy	
Thickness	Not listed	-	4/acre	≥6 in
Cover Soil				
Soil Classification	ASTM D2487	1/source	-	
Sieve Analysis (w/ hydrometer)	ASTM D422	1/source	1/5,000cy	≤1.5 in (Cover)
Atterberg Limits	ASTM D4318 (B)	1/source	1/5,000cy	≤25 PI
Moisture Content	ASTM D2216	1/source	1/5,000cy	
Thickness	Not listed	-	4/acre	≥18 in
Internal Angle of Friction	ASTM D3080	1/source/project	-	32 degrees
Vegetative Support Layer				
Grain Size (w/ hydrometer)	ASTM D422	1/source	1/5,000 cy	≤1.5 in
Internal Angle of Friction	ASTM D3080	1/source/project	-	32 degrees
Atterberg Limits	ASTM D4318	1/source	1/5,000 cy	≤25 PI
pH	ASTM D4972	1/source	1/5,000 cy	<7.6
Organic Matter	ASTM D2974	1/source	1/5,000 cy	
Soil Fertility	Mehlich 3 Test	1/source	1/5,000 cy	
Total Nitrogen	ASTM D2973	1/source	1/5,000 cy	
Aggregate				
Particle Size Testing	ASTM C136	1/source	-	≤2.5 in (AASHTO No. 3) ≤1.5 in (AASHTO No. 57) ≤1.5 in (Dense Grade)
Sodium Sulfate Soundness	ASTM C88	1/source	-	≤20% weight loss
Stone Riprap				
Sodium Sulfate Soundness	ASTM C88	1/source	-	≤20% weight loss

Notes: (1) Based on 16.0 acres.

APPENDIX 9-C

CONTINGENCY PLAN

Table of Contents

1.0 INTRODUCTION 1

2.0 CONTINGENCY PLAN 1

2.1 Site Information 1

2.1.1 General Facility Information 1

2.1.2 Conectiv Properties and Investments, Inc. (CPI) Representative 1

2.1.3 Notifications and Emergency Reporting 1

2.2 Spills 2

2.3 Dust Control 5

2.3.1 During Closure Construction 5

2.3.2 During Post-Closure Period 5

2.4 Erosion 5

2.5 Slope Failure 5

2.6 Surface Water Contamination 6

APPENDIX A
Emergency Response Contact Information

1.0 INTRODUCTION

The following Contingency Plan has been updated from a submission for a Plan of Operation dated January 2004, (later revised in September 2005), prepared by Conectiv Energy Engineering and Environmental for the Edge Moor Power Plant to fit the Closure and Post-Closure Care of the Site II Ash Landfill facility (Landfill). As the landfill closed in the late 1980's, the information provided herein will cover the Closure and Post-Closure period.

2.0 CONTINGENCY PLAN

The Contingency Plan will instruct employees and Contractors on the appropriate actions to take in the event of an emergency. The Plan will be provided to personnel during closure activities and maintenance during the post-closure care period.

2.1 Site Information

2.1.1 General Facility Information

1.	Name of Facility:	Site II Ash Landfill Edge Moor Power Plant Conectiv Properties and Investments, Inc. (CPI)
2.	Address:	Hay Road Wilmington, Delaware
3.	Mailing Address	Conectiv Properties and Investments, Inc. c/o Pepco Holdings 630 Martin Luther King Jr. Blvd. Wilmington, DE 19801
4.	Owner	Conectiv Properties and Investments, Inc.
5.	Operator	Conectiv Properties and Investments, Inc.
See Appendix A for a list of emergency contact information.		

2.1.2 Conectiv Properties and Investments, Inc. (CPI) Representative

In the event of an emergency, the O&M Coordinator shall serve as CPI's representative authorized to act on behalf of the company in regulatory discussions. The O&M Coordinator is listed at the top of the Emergency Response Contact Information in Appendix A of this Contingency Plan. CPI will report any changes to the contact information for this representative within ten (10) business days.

The O&M Coordinator will also serve as the Emergency Coordinator. An Alternate Emergency Coordinator is listed in Appendix A of this Contingency Plan. At least one Emergency Coordinator will be available at all times.

2.1.3 Notifications and Emergency Reporting

Conectiv shall notify the Department as soon as practicable, and in no case longer than 24-hours after discovery of the following:

a) Fire, explosion, or any other incident at the Site II facility that may have an impact on human health or the environment.

b) Any significant erosion of the waste or cover and/or release of waste from the landfill.

c) Any anomalous observations during monitoring events; this includes, but is not limited to, any damage to the monitoring well or well casings, well obstructions, well-integrity concerns, and well depth.

d) Surface water contaminated with waste.

If the event occurs during business hours, contact the Division of Waste and Hazardous Substances Compliance and Permitting Section at the number includes in Appendix A. At all other times contact DNREC's Emergency Response Branch at the number listed in Appendix A.

Conectiv shall submit a written notification to the Department within five (5) business days following any event requiring "Emergency Reporting." The notification shall include the following:

a) Date and time of occurrence/discovery.

b) Date and time of reporting.

c) Agencies notified.

d) Materials and quantities involved.

e) Narrative describing how the incident occurred and the actions taken by Conectiv and other response personnel.

f) Report of injuries/damage.

g) Proposal for follow-up, repair, or remedial actions required and schedule.

Reporting and follow up actions will be in accordance with the requirements of the Industrial Waste Landfill Closure Permit.

2.2 Spills

In the event that a spill or release is discovered at the Site, the Contractor/Subcontractor shall be required to adhere to CPI spill response procedures and undertake the following:

1) Identify the source of the leak or spill and immediately attempt to stop the flow, if practicable, without endangering personnel.

2) Contact emergency services if imminent threat of fire or other life-threatening situation is believed to be present. The phone number is 911. If necessary, contact a spill response contractor identified on Appendix A. First aid kits should be located in the Contractor trailer or be brought on-site during work. Personnel working at the Landfill are expected to carry communication devices, such as mobile telephones and radios.

3) For petroleum discharge, place sorbent materials and/or temporary diking to prevent petroleum from reaching navigable waters. Spill response kits will be located at the Site. Such materials should placed at catch basins and drainage systems and placed across downgradient pathways, if necessary, to impede the flow of materials.

4) In the event of a chemical spill, if the discharge exceeds the listed maximum allowable quantity, or the discharge is an unknown material, report the discharge to the appropriate CPI designee who will notify all of the following as soon as possible at the telephone numbers listed in Appendix A.

- City of Wilmington Department of Public Works:
- O & M Coordinator
- State of Delaware Department of Natural Resources and Environmental Control (DNREC) Emergency Response Branch
- Local Emergency Planning Commission (LEPC), Community Emergency Coordinator:
- National Response Center (NRC)

5) If greater than 25 gallons of petroleum substance (heating oil, motor fuel, or used oil) or 150 gallons of other petroleum substances is discharged to the environment, the appropriate CPI designee will immediately report the discharge to:

- City of Wilmington Department of Public Works:
- O & M Coordinator
- State of Delaware Department of Natural Resources and Environmental Control (DNREC) Emergency Response Branch

6) A discharge of petroleum or chemicals into a waterway that results in a film or sheen upon the surface of the water must be immediately reported by the appropriate CPI designee to:

- National Response Center (NRC) (number listed in Appendix A) and provide the following information to the NRC:
  - Name, address, and telephone numb of the individual filing the report;
  - Name, address, and telephone number of the facility;
  - Date, time, and location of the incident;
  - Type of material discharged;
  - A brief description of the circumstances causing the incident;
  - Description and estimated quantity by weight or volume of the materials involved;
  - An assessment of any contamination of land, water, or air that has occurred due to the incident;
  - Damages or injuries caused by the discharge;
  - Actions taken to stop, remove, and mitigate the effects of the discharge;
  - Whether an evacuation may be necessary; and
  - Names of individuals or organizations that have been contacted.
- Anticipate providing the following information to DNREC Emergency Response Branch and/or the National Response Center:
  - Facility name and/or location of the discharge;

- Type of incident;
- The chemical or substance involved with the incident of discharge;
- A quantity estimate;
- A beginning time and the duration of the discharge;
- The medium into which the discharge occurred;
- Any known or anticipated health risks **associated** with the discharge;
- Proper precautions to take as a result of the discharge;
- Name of the reporting person and a call back phone number; and
- Indication if this is a complete report. Incomplete reports must be completed when the information is available, but in no case more than 24 hours later than the initial contact

7) If DNREC determines that the discharge requires a written report, they may request its submission within 30 days. The report may be provided as a letter or by using the State of Delaware, "Reporting of a Discharge of a Pollutant or an Air Contaminant Incident Report." Suggested contents of the report include:

- Name, address, and phone number of the owner or operator;
- Actions taken to respond to and contain the discharge in the form of a chronology;
- Any known or anticipated acute or chronic health risks associated with the discharge;
- Where appropriate, advice regarding medical attention necessary for exposed individuals;
- Anticipated environmental impact;
- An evaluation of all pertinent prevention and response plans and policies in light of the discharge and the owner's or operator's response;
- A detailed identification of the pathway through which the discharge to the environment occurred with drawings; and
- Measures proposed to prevent such discharge from occurring in the future and to remedy the shortcomings in the prevention, detection, response containment, cleanup or removal plan components.
- Submit report to:
  - DNREC/DAWM, Central Repository, 89 Kings Highway, Dover, DE 19901, Attn: Reporting Regulation; and
  - City of Wilmington LEPC, Public Safety Building, 300 North Walnut Street, Wilmington, DE 19801

8) Should the facility:

- Discharge more than 1,000 gallons of petroleum into or upon the navigable waters of the United States or adjoining shorelines in a single discharge; or
- Discharge more than 42 gallons of petroleum in each of two discharges into or upon navigable waters of the United States or adjoining shorelines, occurring within any 12-month period.
- Then submit a report within 60 days to: Regional Administrator

  United States Environmental Protection Agency
  Region III
  1650 Arch Street (3PM52)
  Philadelphia, PA 19103-2029
  Telephone: (215) 814-5000
- The report may contain the following information:

- Name of the facility;
- Name of the owner or operator of the facility;
- Location of the facility;
- Maximum storage or handling capacity of the facility and normal daily throughput;
- Corrective action and countermeasures taken, including a description of material discharged, and equipment repairs and replacements;
- An adequate description of the facility, including maps, flow diagrams, and topographical maps, as necessary;
- The cause of such discharge, including a failure analysis of the system or subsystem in which the failure occurred;
- Additional preventive measures taken or contemplated to minimize the possibility of recurrence; and
- Such other information, as the Regional Administrator may reasonably require pertinent to the Plan or discharge.

2.3 Dust Control

2.3.1 During Closure Construction

The Contractor will provide continuous dust control during the closure construction process. Water trucks will be used to spray the roads and site entrance at Hay Road. The Contractor will inspect the facility on a regular basis to ensure no dust is generated nor any dust or dirt is carried off-site. During the ash excavation process, the exposed fly ash surface may be controlled by spraying the area with water from a water truck. Tarps or soil will be used to cover the surface of the ash overnight. Logs will be kept to document the water truck usage.

The O & M Coordinator, or designee, will notify DNREC if there are dusting conditions occur beyond the site property boundary. The O & M Coordinator, or his designee, will investigate the complaint, evaluate the problem, and notify the Contractor as necessary.

2.3.2 During Post-Closure Period

During the required inspections (outlined in the O & M Plan), the inspector will document any noticeable dust and report it to the O & M Coordinator. If there is significant dust, the O & M Coordinator will notify an appropriate emergency response contractor to mobilize and water the roads.

2.4 Erosion

As part of the required inspections (outlined in the O & M Plan), the slopes will be periodically inspected for erosion gullies and to ensure that a good vegetative cover has been established. The eroded areas will be regraded with a bulldozer or other appropriate equipment, and the area will be re-seeded. Wind erosion of any exposed fly ash will be controlled by re-wetting the exposed ash through the use of a water truck to be kept on the site and covered with soil as necessary.

2.5 Slope Failure

As part of the required inspections (outlined in the O & M Plan), the ash mound will be inspected for movement and slope stability. If there are issues indicated on the outside slopes of the ash mound, the area will be redressed, new cover material placed on the area, and the area will be reseeded. If failure occurs on inner

slopes, the area will be regraded and recompacted. Major or continuing exterior slope failure will be visually inspected by a qualified geotechnical engineer to determine causes of such failure and to make specific recommendations to mitigate future problems.

2.6 Surface Water Contamination

Surface waters contaminated with fly ash through accidental spillage of ash can be impounded by construction of a temporary dike. The impounded water can be pumped to a sedimentation pond or allowed to stand for a period of several hours to settle out the ash particles. After the water has been drained off or allowed to evaporate the remaining ash can be hauled to the ash mound or off-Site.

APPENDIX A

Emergency Response Contact Information

Emergency Response Contact Information

Owner	Telephone Number
O & M Coordinator/ Emergency Coordinator: Christopher Landes, Senior Environmental Project Manager, Pepco Holdings, Inc.	Office: (302) 451-5105 Cell: (267) 918-9623
Alternate Emergency Coordinator: Lisa Pfeifer, Environmental Management, Pepco Holdings, Inc.	Office: (302) 429-3545 Cell: (302) 547-4734
Spill Response Contractors	**Telephone Number**
Note: CPI, through association with Exelon, maintains contracts with several Spill Response Contractors and will engage a qualified Spill Response Contractor, as needed	
Regulatory Agencies	**Telephone Number**
DNREC – Emergency Response Branch	(302) 739-9401 or (800) 662-8802
National Spill Response Center	(800) 424-8802
Local Emergency Planning Commission (LEPC), Community Emergency Coordinator, DNREC	(866) 274-0884
DNREC WHS-CAPS Waste Management and Reduction Branch	(302) 739-9403
DNREC WHS-CAPS Tank Compliance Branch 391 Lukens Drive New Castle, DE 19720	(302) 395-2500
Hospital	**Telephone Number**
Christiana Care, Wilmington 501 West 14th Street Wilmington, DE 19801	(302) 428-2958
Fire/Medical Services	**Telephone Number**
Fire Department	911
Police Department	911
Emergency Medical Response	911
Municipal Services	**Telephone Number**
City of Wilmington, Department of Public Works – Main Office	(302) 576-3878

APPENDIX 9-D

CLOSURE SCHEDULE

Proposed Landfill Closure Schedule

Task	Date	Comments
Closure Plan Submission	January 6, 2020	
Closure Plan Review Process by DNREC	March 21, 2020	
Public Notice/Review Process		60 days for public notice/meeting + 15 day comment period
Landfill Closure - Notice of Intent submitted to DNREC	June 2020	After approval of Closure Plan, must be submitted at least 180 days prior to Closure Activity Commencement.
DNREC Approval of Closure Plan	May 1, 2020	
Electric Transmission Tower Replacement Construction	Fall 2020	See Note 1 below.
Closure Construction Bidding/Contractor Selection	Fall 2020	
Notice of Closure Activity Commencement	December 2020	At least 30 days prior to Closure Activity Commencement
Closure Activity Commencement (Closure Construction Start)	Spring 2021	
Closure Construction Completion	Fall 2021	
Closure Construction Certification Report Preparation	Fall 2021	
Final Record Documentation Report Submission to DNREC	Fall/Winter 2021	Within 30 days after closure construction is complete.
DNREC Review of Closure Construction Certification Report	Fall/Winter 2021	
DNREC Approval of Closure Construction Certification Report	Winter 2021-22	
Post-Closure Care Period	2022 - 2052	

Notes:

1. The project area is within an active and vital power transmission corridor where there will be a replacement of several towers. The commencement of closure activities is dependent on the completion of the transmission tower replacement project which is scheduled for the Fall of 2020. As at least four (4) of these existing towers will be replaced directly within the ash mound, closure construction cannot be started until the towers are installed and power is restored to this transmission corridor.

APPENDIX 9-E

CLOSURE AND POST CLOSURE COSTS

Table 1: Preliminary Construction Cost Estimate
Ash Landfill Cap
Edge Moor Ash Landfill, Wilmington, Delaware

Done: ZEG 12/23/2019
Checked: JPG 12/23/2019

Capital Construction Costs

Construction Tasks	Unit	Estimated Quantity	Unit Price	Extended Unit Price	Comments
Mobilization/Demobilization	LS	1	$ 153,600	$ 153,600	
Topographic Surveying*	Acre	16	$ 5,100	$ 81,600	See Note 11
Soil Erosion and Sediment Control	LS	1	$ 256,000	$ 256,000	
Health and Safety	LS	1	$ 20,480	$ 20,480	
Decommission Existing Basin	LS	1	$ 10,000	$ 10,000	
Clearing and Grubbing*	Acre	16	$ 8,380	$ 134,080	See Note 11
Ash excavation*	CY	28,260	$ 3.12	$ 88,171	See Note 11
Ash placement	CY	28,260	$ 3.00	$ 84,780	See Note 13
Provide Grading Layer (6 inches)	Tons	25,800	$ 15.00	$ 387,000	See Note 11 & 14
Install Grading Layer	CY	12,900	$ 5.00	$ 64,500	See Note 11
Provide Structural Fill for Basin Backfill	Tons	21,333	$ 15.00	$ 320,000	See Note 11 & 14
Install Basin Backfill	CY	10,667	$ 5.00	$ 53,333	See Note 11
Perimeter Access Road and Ramp	SY	6,000	$ 11.75	$ 70,481	
Access Ramp Over Final Landfill Grade	SY	430	$ 76.74	$ 32,998	
Site Preparation Subtotal				*$ 1,757,023*	
PRIMARY CAP					
Provide 40 mil Geomembrane	SF	766,656	$ 0.30	$ 229,997	See Note 9
Install 40 mil Geomembrane	SF	696,960	$ 0.25	$ 174,240	See Note 9
Provide 275 mil Geocomposite Drainage Layer	SF	766,656	$ 0.44	$ 337,329	See Note 9
Install 275 mil Geocomposite Drainage Layer	SF	696,960	$ 0.17	$ 118,483	See Note 9
Provide Cover Fill (18" inches)*	CY	38,720	$ 9.89	$ 382,941	See Note 11
Install Cover Fill Layer (18 inches)*	CY	38,720	$ 2.76	$ 106,867	See Note 11
Provide Vegetative Support Layer (6 inches)*	CY	12,910	$ 9.89	$ 127,680	See Note 11 & 14
Install Vegetative Support Layer (6 inches)*	CY	12,910	$ 2.76	$ 35,632	See Note 11
Primary Cap Subtotal				*$ 1,513,168*	
ALTERNATIVE CAP OPTION 1					
Provide 50 mil Super GripNet (Agru)	SF	766,656	$ 0.61	$ 467,660	See Note 9
Install 50 mil Super GripNet (Agru)	SF	696,960	$ 0.30	$ 209,088	See Note 9
Provide 10 oz/sy nonwoven geotextile	SF	766,656	$ 0.11	$ 84,332	See Note 9
Install 10 oz/sy nonwoven geotextile	SF	696,960	$ 0.12	$ 83,635	See Note 9
Provide Cover Fill (18 inches)*	CY	38,720	$ 9.89	$ 382,941	See Note 11
Install Cover Fill Layer (18 inches)*	CY	38,720	$ 2.76	$ 106,867	See Note 11
Provide Vegetative Support Layer (6 inches)*	CY	12,910	$ 9.89	$ 127,680	See Note 11 & 14
Install Vegetative Support Layer (6 inches)*	CY	12,910	$ 2.76	$ 35,632	See Note 11
Alternative Cap Option 1 Subtotal				*$ 1,497,835*	
ALTERNATIVE CAP OPTION 2					
Provide 50 mil MicroDrain (Agru)	SF	766,656	$ 0.58	$ 444,660	See Note 9
Install 50 mil MicroDrain (Agru)	SF	696,960	$ 0.28	$ 195,149	See Note 9
Provide 10 oz/sy nonwoven geotextile	SF	766,656	$ 0.11	$ 84,332	See Note 9
Install 10 oz/sy nonwoven geotextile	SF	696,960	$ 0.12	$ 83,635	See Note 9
Provide Cover Fill (18 inches)*	CY	38,720	$ 9.89	$ 382,941	See Note 11
Install Cover Fill Layer (18 inches)*	CY	38,720	$ 2.76	$ 106,867	See Note 11
Provide Vegetative Support Layer (6 inches)*	CY	12,910	$ 9.89	$ 127,680	See Note 11 & 14
Install Vegetative Support Layer (6 inches)*	CY	12,910	$ 2.76	$ 35,632	See Note 11
Alternative Cap Option 2 Subtotal				*$ 1,460,896*	

Provide DrainTube	SF	2,850	$ 0.90	$ 2,565	See Note 10
Install DrainTube	LS	1	$ 2,500.00	$ 2,500	
Perimeter Channel Grading	LF	3,445	$ 23.64	$ 81,453	See Note 12
Perimeter Channel Lining (ECB)*	SY	2,300	$ 2.03	$ 4,669	See Note 11
Provide and Install Landfill Lining (TRM)	SY	23,250	$ 25.38	$ 590,148	See Note 12
Provide and Install Landfill Lining (ECB)*	SY	22,150	$ 2.03	$ 44,965	See Note 11
Sediment Traps	LF	3,625	$ 9.63	$ 34,909	See Note 11
Riprap Outlets/Level Spreaders*	SY	315	$ 120	$ 37,800	See Note 11
Cap Terminations	LF	4,000	$ 18.43	$ 73,728	
Provide Perimeter Channel Aggregate Lining*	Tons	3,400	$ 15	$ 51,000	See Note 11 & 14
Install Perimeter Channel Aggregate Lining*	CY	1,700	$ 5	$ 8,500	See Note 11
Provide and Install Vertical Channel Lining (TRM)	SY	320	$ 25.38	$ 8,122	See Note 12
Provide Reno Mattress Lining at Vertical Channel Outlet*	Tons	630	$ 15	$ 9,450	See Note 11
Install Reno Mattress Lining at Vertical Channel Outlet*	SY	315	$ 47.27	$ 14,890	See Note 11
Stabilize and Seed	SY	85,440	$ 1.54	$ 131,236	See Note 12
Stormwater Management Subtotal				*$ 1,095,935*	
Performance Bond	LS	1	$ 20,000	$ 20,000	
Payment Bond	LS	1	$ 20,000	$ 20,000	
CQA Services			$ 434,359	$ 434,359	See Note 3
Construction Management/ Owner's Representative			$ 434,359	$ 434,359	See Note 3
Primary Cap Total				***$ 5,274,845***	
Alternative Cap Option 1 Total				***$ 5,259,512***	
Alternative Cap Option 2 Total				***$ 5,222,573***	

Notes:

1. In providing this rough cost estimate, it is recognized that Golder Associates does not have control over the costs of labor, equipment or materials, or over a contractor's method(s) of determining prices or bidding. The estimate is based on Golder's professional judgement and does not constitute a warranty, expressed or implied, that the contractor's bid or negotiated price will match or be within any percentage of this estimate.
2. Relocation of utilities (if any) is not included in this estimate.
3. Golder assumes that construction management and construction quality assurance oversight services can each cost approximately ten percent of the contractor's cost.
4. The length of cap termination, top cap drains, and perimeter channels are based upon the length of the perimeter of the landfill.
5. The subgrade cut volume is an assumed volume of existing ash regraded as part of the surface preparation.
6. The tonnage of the intermediate cover is based upon a unit weight of 115 pounds per cubic foot.
7. The length of downchutes was assumed to be 100 feet on each corner of the landfill.
8. The area of the landfill is 16 acres.
9. Geosynthetics cost provided by Agru American on December 11, 2019.
10. DrainTube material cost and shipping estimate provided by Inova Geosynthetics on December, 2019.
11. Unit pricing for items denoted with a * was taken from RS Means data, Wilmington, Delaware, 2019.
12. Unit pricing estimated using values from simliar, local projects.
13. Engineer's estimate from past experience.
14. Assume a one-way haul of 20 miles.

Table 2: Post-Closure Cost Estimate
Ash Landfill Cap
Edge Moor Ash Landfill, Wilmington, Delaware

Annual Operations and Maintenance Costs for Post-Closure Period

Construction Tasks	Unit	Estimated Quantity	Unit Price	Extended Unit Price
Annual Landfill Inspections				
a) Site Visit for Inspection (1)	Day	12	$ 870	$ 10,445
b) Prepare Inspection Report	Day	4	$ 1,434	$ 5,734
Cap Maintenance				
a) Repair Level Spreader/ Channel Outlet (2)	CY	10	$ 120	$ 1,200
b) Fill Erosion Rills (3)	SY	100	$ 12.3	$ 1,229
c) Reseed Repairs/ Bare Areas (4)	SY	2,420	$ 1.54	$ 3,717
d) Repair Damaged Geosynthetics (5)	SY	1210	$ 10.49	$ 12,693
e) Excavation/ Regrading (4)	CY	2420	$ 11.6	$ 28,072
f) Add Turf Reinforcement Mat (5)	SY	1210	$ 25.38	$ 30,713
g) Mowing (6)	AC	32	$ 410	$ 13,107
Miscellaneous Repairs - Fencing, Wells and Roadway around Landfill	LS	1	$ 5,632	$ 5,632
Annual Monitoring				
a) GW Sample Collection and Lab Analysis (7)	EA	4	$ 9,000	$ 36,000
b) Hydrogeologic Report	EA	1	$ 10,500	$ 10,500
Annual Letter of Credit Maintenance Fee	EA	1	$ 2,500	$ 2,500
TOTAL				**$ 161,542**

Notes:

1. Assumes that inspections are performed quarterly and each inspection entails 3 days.

2. In providing this preliminary cost estimate, it is recognized that Golder Associates does not have control over the costs of labor, equipment or materials, or over a contractor's method(s) of determining prices or bidding. The estimate is based on Golder's professional judgement and does not constitute a warranty, expressed or implied, that the contractor's bid or negotiated price will match or be within any percentage of this estimate.

3. Assumes 5 SY of total rip-rap replacement each year.

4. Assumes 1/2 acre total repairs each year.

5. Assumes 1/4 acre of advanced repairs required each year.

6. Assumes 2 mowing events per year (16 acres per event)

7. Assumes that groundwater monitoring is performed quarterly.

8. Unit pricing for Cap Maintenance items taken from RSMeans data, Wilmington, Delaware, 2019.

GOLDER

SECTION 10.0

FINANCIAL ASSURANCE

10.0 FINANCIAL ASSURANCE

The Closure and Post-Closure costs were calculated in Appendix 9-E for three (3) final cover options and the expected annual maintenance, respectively. The Edge Moor Site II Ash Landfill (Site II Ash Landfill) will provide documentation of compliance with the requirements of a State-approved Financial Assurance Mechanism for closure and post-closure care by December 31st of each year. The estimated closure construction is approximately $5,275,000. The annual post-closure maintenance cost is approximately $162,000 each year. For the required post-closure timeline of thirty (30) years, the total present worth cost for post-closure activities is approximately $6,553,449. The calculation for this bond amount can be found in Appendix 10-A.

APPENDIX 10-A

FINANCIAL ASSURANCE ESTIMATE

GOLDER	SUBJECT: Post-Closure Cost Estimate – Financial Assurance		
Project No.: 19129265	**By: JB**		**Sheet 1 of 6**
Phase:	**Checked: JPG**	**Date: 01/02/2020**	
Ref:	**Reviewed: PAW**		
	Revised: JPG		
	Checked: ZEG	**Date: 03/31/2020**	
	Reviewed: PAW		
	Revised: JPG	**Date: 04/07/2020**	
	Checked: ZEG	**Date: 04/07/2020**	
	Reviewed: PAW	4/7/2020	

Objective

Determine the value of the financial assurance to cover the estimated costs associated with 30 years of post-closure period.

Method

Calculate the average inflation rate for the last three (3) years using Table 1.1.9 – Implicit Price Deflators for Gross Domestic Product obtained from the U.S. Department of Commerce – Bureau of Economic Analysis. Use the inflation rate, the 30-year post-closure period, and the post-closure annual cost estimate to calculate the value of a current bond to account for the anticipated future costs.

1. Inflation Rate Calculation

IPD = Implicit Price Deflator (Gross Domestic Product) (Table 1.1.9 – BEA)

I R = Inflation Rate

I.R = ([{IPD 2016-IPD 2015} / IPD 2015] + [{IPD 2017-IPD 2016} / IPD 2016] + [{IPD 2018- IPD 2017} / IPD 2017])/ 3

I.R. = ([{105.801-104.717}/104.717] + [{107.794-105.801}/105.801] + [{110.420-107.794}/107.794]) / 3

I.R. = {[0.010] + [0.019] + [0.024]} /3

I.R. = 0.0177 * 100% **= 1.77%**

= Say 2% conservatively

2. Compound Interest Formula

Using the compound interest formula, calculate the future costs associated with post-closure.

$$F = A\frac{[(1+i)^n - 1]}{i}$$

Where:

A	=	Annual disbursement in uniform series
i	=	Interest Rate (2%, see Step 1)
n	=	Number of years (30 years)

The A value is taken from *Table 2 Post-Closure Cost Estimate* to be $161,542 per year.

$$F = 161{,}542\frac{[(1+0.02)^{30} - 1]}{0.02}$$

$$F = \$6{,}553{,}449$$

Conclusion

To account for inflation over the 30-year closure period, a total of $6,553,449 should be provided through financial assurance.

Attachment 1

Bureau of Economic Analysis Table 1.1.9

Table 1.1.9. Implicit Price Deflators for Gross Domestic Product

[Index numbers, 2012=100]
Last Revised on: December 20, 2019 - Next Release Date January 30, 2020

Line		2014	2015	2016	2017	2018
Line						
1	**Gross domestic product**	**103.638**	**104.717**	**105.801**	**107.794**	**110.420**
2	**Personal consumption expenditures**	**102.830**	**103.045**	**104.091**	**105.929**	**108.143**
3	Goods	98.920	95.885	94.318	94.586	95.232
4	Durable goods	95.429	93.359	91.136	89.040	87.533
5	Nondurable goods	100.599	97.076	95.858	97.427	99.299
6	Services	104.804	106.704	109.120	111.793	114.851
7	**Gross private domestic investment**	**102.872**	**103.826**	**103.745**	**105.370**	**107.968**
8	Fixed investment	103.172	104.187	104.234	106.057	108.507
9	Nonresidential	101.469	102.042	101.146	102.116	103.515
10	Structures	107.198	109.598	109.958	112.952	117.062
11	Equipment	99.169	98.672	97.436	97.287	97.396
12	Intellectual property products	100.791	101.677	100.464	101.742	103.282
13	Residential	111.118	114.129	118.148	123.510	130.488
14	Change in private inventories	---	---	---	---	---
15	**Net exports of goods and services**	---	---	---	---	---
16	Exports	100.272	95.385	93.455	95.850	99.104
17	Goods	98.308	91.301	87.725	89.963	93.186
18	Services	104.708	104.582	106.331	109.078	112.389
19	Imports	97.854	89.947	86.696	88.622	91.181
20	Goods	96.738	87.581	83.797	85.693	88.153
21	Services	103.558	102.286	101.861	103.943	107.026
22	**Government consumption expenditures and gross investment**	**104.435**	**104.705**	**105.050**	**107.647**	**111.403**
23	Federal	102.632	103.282	103.900	106.040	109.336
24	National defense	102.056	102.402	102.776	104.518	107.609
25	Nondefense	103.593	104.718	105.701	108.435	112.040
26	State and local	105.645	105.677	105.854	108.731	112.772
	Addendum:					
27	Gross national product	103.626	104.679	105.759	107.731	110.320

Attachment 2

Table 2 – Post-Closure Cost Estimate

Table 2: Post-Closure Cost Estimate
Ash Landfill Cap
Edge Moor Ash Landfill, Wilmington, Delaware

Annual Operations and Maintenance Costs for Post-Closure Period

Construction Tasks	Unit	Estimated Quantity	Unit Price	Extended Unit Price
Annual Landfill Inspections				
a) Site Visit for Inspection (1)	Day	12	$ 870	$ 10,445
b) Prepare Inspection Report	Day	4	$ 1,434	$ 5,734
Cap Maintenance				
a) Repair Level Spreader/ Channel Outlet (2)	CY	10	$ 120	$ 1,200
b) Fill Erosion Rills (3)	SY	100	$ 12.3	$ 1,229
c) Reseed Repairs/ Bare Areas (4)	SY	2,420	$ 1.54	$ 3,717
d) Repair Damaged Geosynthetics (5)	SY	1210	$ 10.49	$ 12,693
e) Excavation/ Regrading (4)	CY	2420	$ 11.6	$ 28,072
f) Add Turf Reinforcement Mat (5)	SY	1210	$ 25.38	$ 30,713
g) Mowing (6)	AC	32	$ 410	$ 13,107
Miscellaneous Repairs - Fencing, Wells and Roadway around Landfill	LS	1	$ 5,632	$ 5,632
Annual Monitoring				
a) GW Sample Collection and Lab Analysis (7)	EA	4	$ 9,000	$ 36,000
b) Hydrogeologic Report	EA	1	$ 10,500	$ 10,500
Annual Letter of Credit Maintenance Fee	EA	1	$ 2,500	$ 2,500
TOTAL				**$ 161,542**

Notes:

1. Assumes that inspections are performed quarterly and each inspection entails 3 days.

2. In providing this preliminary cost estimate, it is recognized that Golder Associates does not have control over the costs of labor, equipment or materials, or over a contractor's method(s) of determining prices or bidding. The estimate is based on Golder's professional judgement and does not constitute a warranty, expressed or implied, that the contractor's bid or negotiated price will match or be within any percentage of this estimate.

3. Assumes 5 SY of total rip-rap replacement each year.

4. Assumes 1/2 acre total repairs each year.

5. Assumes 1/4 acre of advanced repairs required each year.

6. Assumes 2 mowing events per year (16 acres per event)

7. Assumes that groundwater monitoring is performed quarterly.

8. Unit pricing for Cap Maintenance items taken from RSMeans data, Wilmington, Delaware, 2019.

GOLDER

SECTION 11.0

SITING CRITERIA

Table of Contents

1.0 SITING CRITERIA 1

1.1 Previous Submission 1

1.2 Additional Requirements 1

1.2.1 Introduction 1

1.2.2 Streams 1

1.2.3 Proximity to Airports 1

1.2.4 Fault Setback Requirements 1

1.2.5 Seismic Impact Zone Requirements 1

1.2.6 Unstable Areas 1

APPENDICES

Appendix 11-A - Siting Criteria Section from 2009 Permit Renewal Application

11.0 SITING CRITERIA

11.1 Previous Submission

The Siting Requirements submitted with the Solid Waste Management Facility Renewal Application by Conectiv Energy Engineering and Environmental and Duffield Associates, Inc. dated 2009 (2009 Permit Renewal Application) have been included in this section for reference. References within the 2009 document refer to sections within the 2009 Permit Renewal Application and not the current application package. As Golder understands it, the facility met the applicable siting criteria at the time of permitting and construction. Therefore, no changes to the siting criteria of the Edge Moor Site II Ash Landfill (Site II Ash Landfill) are proposed as part of this submission.

11.2 Additional Requirements

11.2.1 Introduction

The Site II Ash Landfill is no longer accepting new waste. These requirements are included for completeness and mirror the narrative responses provided in the 2009 Permit Renewal Application.

11.2.2 Streams

The closest flowing body of water to the Site II Ash Landfill is Shellpot Creek, which then flows into the Delaware River. All stormwater runoff is intended to be managed and infiltrated on-Site.

11.2.3 Proximity to Airports

The closest airport to the Site II Ash Landfill is the New Castle Airport, located about 8 miles away. The airport should not affect the closure of the Site II Ash Landfill in any way.

11.2.4 Fault Setback Requirements

As found from the Delaware Geological Survey, the closest earthquake occurred approximately 2 miles away in March 1998 (Delaware Earthquake Map, 2017).

11.2.5 Seismic Impact Zone Requirements

For a 2% probability of exceedance in 50 years, the maximum horizontal acceleration was 0.0986g, as shown in the Slope Stability Analysis for Final Cover in Appendix 5-C provided in the Engineering Report. This does not exceed 0.10g, as required by Delaware's Regulations Governing Solid Waste (DRGSW) §6.1.3.7.1.

11.2.6 Unstable Areas

The Site II Ash Landfill does not contain unstable areas such as poor foundation conditions with possible subsidence, susceptibility to mass movement, or karst terrain, as described in DRGSW §6.1.3.8.

APPENDIX 11-A

SITING REQUIREMENTS FROM 2009 PERMIT RENEWAL APPLICATION

SITING REQUIREMENTS

SOLID WASTE MANAGEMENT FACILITY APPLICATION

EDGE MOOR POWER PLANT
SITE II ASH LANDFILL

Prepared by:

Conectiv Energy
Engineering and Environmental
P.O. Box 6066
Newark, DE 19714

&

Duffield Associates, Inc.
5400 Limestone Road
Wilmington, DE 19808

2009

SITING REQUIREMENTS

The siting requirements for industrial landfills are listed in Section 6A of the Delaware Solid Waste Regulations. In brief, these siting requirements seek to ensure that "industrial landfill facilities are located only in areas where the potential for degradation of the quality of air, land, and water is minimal." As such, the regulations stipulate that no new cells of an industrial landfill be located in an area such that solid waste would at any time be deposited within any of eight specific resource areas. Consistency of Conectiv's Site II Ash Landfill with these potential resource concerns is clearly demonstrated in the following sections.

1. 100-Year Floodplain. Northeastern portions of the existing Site II Ash Landfill are located within the 100-year flood zone as shown on the Federal Emergency Management Agency's Flood Zone Map. However, the Site II Ash Landfill is surrounded by a berm that was designed to provide a minimum of 0.4 feet of freeboards during a 100-year flood event. This perimeter dike would preclude flooding of any of the landfilled ash.

2. Wetlands. No tidal or freshwater wetlands are located on the Site II Ash Landfill. The site is bounded by I-495 to the west, Twelfth Street and the Wilmington Wastewater Treatment Plant facilities to the south and southeast, and VFL Industry Corporation's facilities to the east. Although Shellpot Creek is located to the north of Site II, an established stormwater system allows for the collection of any stormwater runoff in the onsite stormwater retention pond to ensure that no runoff reaches the creek or its adjoining marsh areas.

3. Local Refuges and Parks. Conectiv's Site II Ash Landfill is located within a highly industrialized area, and no state or federal refuges, wildlife area, or parks are located within a mile of the site. Site II is not within the viewshed of Fox Point Park which is located more than 1.5 miles to the north, and separated from Site II by numerous heavy industry facilities.

4. Consistency with Land Use Plan and Zoning. The Site II Ash Landfill is consistent with the local land use plan and zoning, as certified by the City's Office of Zoning Administration (cf.: Section 9).

5. Wellhead Protection Area for Public Water Supply or Wellfield. No wellhead protection areas or wellfields are located in the vicinity of Site II. The results of the well search are provided in Section 6.

6. Valuable Aquifers. No valuable aquifers are underlying the Site II Ash Landfill.

7. Proximity to Facility Boundary. The Site II Ash Landfill is situated on a permitted site with the approved setbacks from the property boundary line. No conflicting land uses adjoin Site II to the north, south, east, or west.

8. Proximity to Environmentally Unique or Valuable Area. Site II is situated in a highly industrial area, and lacks environmentally unique of valuable areas or resources. In addition, Site II is isolated from any such areas due to a mile-wide belt of surrounding industrial uses and transportation corridors.