GREENBOW, LLC

7144 Lone Oak Road | Hogansville, GEORGIA 30230

TURKEY RUN MSW LANDFILL
COAL COMBUSTION RESIDUALS (CCR)
MANAGEMENT PLAN ANNUAL UPDATE
PERMIT #: 099-019D(MSWLF)

ANNUAL CCR MANAGEMENT PLAN AND DUST CONTROL REPORT

ATLANTIC COAST CONSULTING, INC.

March 2019
Revised April 2019

Table of Contents

This annual CCR management and dust control report was prepared in accordance with OCGA Solid Waste Management Rule 391-3-4-.07(5) and the Annual Coal Combustion Residuals (CCR) Management Plan and Dust Control Report Guidance Document provided by Georgia Department of Natural Resources, Environmental Protection Division (EPD) dated May 2018.

SUMMARY:

The Turkey Run Municipal Solid Waste Landfill (Turkey Run) received the solid waste Permit No. 099-19D(MSWL) on December 21, 2007. The current CCR Management Plan was established through a minor modification approved by Georgia's Environmental Protection Division (EPD) on May 22, 2017.

FACILITY LOCATION AND DESCRIPTION:

Turkey Run is located at 7144 Lone Oak Road, Hogansville, Georgia. The landfill sits on a 417.54 acre tract of land located in northwestern Meriwether County approximately four miles east of Hogansville, Georgia. The landfill entrance is locate approximately one mile east of Interstate 85.

CCR MANAGEMENT ACTIVITIES:

CCR and Non-CCR Waste Volumes:

Turkey Run currently receives CCR and non-CCR waste materials. The non-CCR waste materials may contain waste streams from municipal, industrial, commercial, and other special waste stream sources. All waste streams accepted at this facility are in accordance with accordance with OCGA Solid Waste Management Rule 391-3-4.

The facility is currently permitted to receive a maximum CCR to non-CCR waste ratio (by weight) of 1 to 9. This translates into an estimated annual weight of 51,650 tons of CCR material with an estimated daily maximum of 180 tons. These limits are defined in Section 1 of the current Operational Narrative shown on Sheet 32 of the Design and Operation (D&O) Plans. The CCR to non-CCR waste ratio limits were established by verifying that the facility's design is capable of withstanding the additional loads presented by the higher density CCR material. The basis of the design provided in the May 22, 2017 CCR Management Minor Modification was an overall waste mass density of 71.5 lb/CF. This density takes into account the elevated waste mass density with the introduction of the permitted upper limit of CCR into the waste stream.

The CCR material received at this facility between January 1, 2018 and December 31, 2018 had a total recorded weight of 5,526 tons. During this same period, the facility received 617,422 tons of non-CCR waste which translates into an overall CCR to non-CCR waste ratio (by weight) of 1 to 111. This ratio is below the upper limits established by the Operational Narrative and the facility's design calculations. Therefore, the presence of CCR material will not adversely affect the LF's global stability, base liner stability, leachate collection system capabilities or cause excessive base grade settlement.

The maximum amount of CCR received in any given day between January 1, 2018 and December 31, 2018 was 241 tons. This exceeds the estimated max daily weight of 180 tons shown in Section 1 of the Operational Narrative, but this single exceedance did not cause the overall ratios to exceed those used in the design verification. Therefore, no adjustments are needed to the plan or design components related to stability, leachate collection or base grade settlement.

CCR Source:

The only CCR material received at the facility was sourced from Southern Company facilities as required in Section 3 of the facility's Operational Narrative on Sheet 32 of the current Design and Operation Plan. The CCR interned at the landfill this year was from Southern Company whose material was used as the basis of design for the original CCR Management Permit. Additionally, its 'as received' physical condition has remained generally consistent throughout the disposal process and no new CCR waste streams were accepted by the facility during this reporting period.

CCR Characterization and Compatibility:

If operations indicate CCR reactivity with MSW, Section 3 of the Operational Narrative on Sheet 32 requires bulk samples of CCR from each source to be obtained for characterization and compatibility. Typically, samples will be tested for Toxicity Characteristic Leaching Procedure (TCLP) 8 RCRA Metals by SW-846 Method 1311 and a Paint Filter Test by SW-845 Method 9095 or equivalent method.

As noted above, the material source and general physical characteristics have remained consistent since the CCR Management permit's initial issue date and the customer has not notified the facility of any significant process changes. As such, additional testing to verify characterization and compatibility have not been required. Chemical composition of typical CCR material and compatibility of CCR material with MSW was evaluated and presented in detail in the CCR Management Plan approved by Georgia EPD and is included in Appendix A for reference. The Waste Compatibility Analysis presented therein is considered current and valid.

CCR Placement, Compaction and Cover:

The management of the working face and maximum area of 200 feet by 200 feet were maintained in accordance with approved CCR Management Plan. The facility co-mingled all of the CCR material received during this reporting period. The maximum area of the working face(s) and their management were conducted in accordance with Section 2 & 6 of the Operational Narrative on Sheet 32.

CCR material was co-mingled with non-CCR waste at the working face in ratios described above. The co-mingled CCR/non-CCR waste materials were placed, compacted, and covered as required in the Operational Narrative on Sheet 32 and 32A of the Design and Operation Plan.

No leachate outbreaks were observed in layers of waste containing co-mingled CCR/non-CCR.

Additionally, no CCR was co-mingled with non-CCR waste in the first ten feet of waste placed on the liner's protective cover, none of the previously placed CCR material was harvested for beneficial re-use and none of the CCR material was utilized for waste solidification.

Record Keeping:

Records of all waste transported to the site along with daily logs and operational records are retained at the facility's site office building. All record keeping is in accordance with the Georgia Rules for Solid Waste Management 391-3-4-.07(3)(u).

Fugitive Dust Control:

The operators at the facility typically spread and compact CCR material into the incoming waste stream as it was received. The operator would use the on-site water truck to maintain the CCR's moisture levels to control dust, on an as-needed basis. This procedure was determined to be an efficient and effective method to avoid fugitive dust generation.

The facility did not receive any complaints related to dust between January 1, 2018 and December 31, 2018 and has remained compliant with requirements established by Air Quality Rule 391-3-1-.02(2)(n)1.

Leachate Collection and Removal System:

The facility's leachate collection, removal and storage system is in good working order with no known issues related to the disposal of co-mingled CCR/non-CCR wastes.

Stormwater Management System:

The working face(s) were managed to ensure that surface water contacting CCR and non-CCR waste was not discharged into the stormwater management system. This was accomplished by placing and compacting material away from the side slopes, using soil diversion berms near side slopes and by sloping the working face into the waste mass.

Environmental Monitoring:

The environmental monitoring program for the facility was modified during development of the CCR Management Plan to include appropriate Appendix III/IV analytical parameters in accordance with United States Environmental Protection Agency recommendations and Georgia Environmental Protection Division Regulations. The monitoring network (consisting of groundwater wells, surface water, underdrain, and leachate monitoring points) and extended parameter list, based on data collected to date, remains suitable for detection of CCR related constituents. Current data does not suggest confirmed impacts at these monitoring points as a result of handling CCR material. The facility will continue implementing the CCR monitoring program and documenting results to EPD in semi-annual monitoring reports.

Emergencies:

The facility did not experience any events or circumstances that represented an operational or environmental emergency during this reporting period.

Documentation of Notification to Local Governments:

The operation of CCR disposal activities during this reporting period have been in compliance with the currently approved CCR management plans and design parameters. Therefore, no plan modifications or local government notifications are required at this time

CONCLUSION:

The current CCR Management routines required by the facility's Design and Operation Plan has proven to be effective in governing the proper handling and placement of CCR material as required by OCGA's Solid Waste Management Rule 391-3-4-.07(5) and the Guidance Document for Coal Combustion Residuals (CCR) Management Plans dated December 22, 2016.

CCR Compatibility and Characterization

IN THIS APPENDIX:

- Waste Compatibility Analysis

Prepared by:	**Z. Islam**	Date:	**3/30/2017**	Reviewed by:	**M. Saadi**	Date:	**4/4/2017**
Client:	**Waste Management**	Project:	**Turkey Run Landfill CCR Management Plan**	Project No.:	**GR6304**	Phase No.:	**02/01**

WASTE COMPATIBILITY ANALYSIS

INTRODUCTION

Georgia Environmental Protection Division (EPD) guidance document for Coal Combustion Residuals (CCR) Management Plans requires that the CCR Management Plan must address landfill design considerations to account for acceptance of CCR. The CCR Management Plan is requested to demonstrate that CCR waste is compatible with municipal solid waste (MSW) received at the facility, and that different CCR waste streams received are compatible with one another. A demonstration on the CCR waste compatibility at the Turkey Run Landfill is provided below.

SOURCES OF CCR WASTE STREAMS

Turkey Run Landfill has been receiving CCR from Southern Company. Based on the generator provided information for profiling of CCR accepted at the landfill, the composition of CCR consists of ash, coal, soils, and plant life. The enlisted processes from which the CCR material was generated, as described in the profile, include "Maintenance and Cleaning of Boilers, Buildings, Coal and Ash Handling Equipment and Facilities, Coal Piles and Grounds".

CHEMICAL ANALYSIS OF CCR WASTE STREAMS

CCR is generally produced from the burning of coal in coal-fired power plants. Different types of coal ash are produced based on the mineral components of the coal and the combustion technique used, for example, fly ash, bottom ash, flue gas desulfurization (FGD) material, boiler slag, etc. Fly ash is a fine powdered ferroaluminosilicate material trapped via a particulate control device in the chimney or stack of plants fired with coal. Bottom ash is a coarse and angular material and is too large to be carried in flue gas. FGD material is a natural gypsum-like product obtained from the process of reducing sulfur dioxide emissions from a coal-fired boiler. It is noted, however, that FGD will not be accepted at the Turkey Run Landfill facility and therefore is not considered further in this analysis. Boiler slag material is hard and glassy, and collected at the base of the slag tap and cyclone type furnaces.

The properties of CCR depend on different factors, for example, coal source and quality, combustion process, degree of weathering, particle size and age of the ash, etc. No site-specific chemical analysis was conducted on the CCR that is being received at the Turkey Run Landfill. However, generally, more than 90% of fly ash, bottom ash, and boiler slag is made up of silicon, aluminum, iron, and calcium in their oxide form (EPRI, 2009). Marginal constituents, for example, magnesium, potassium, sodium, titanium, and sulphur make up approximately 8% of the mineral component of these ashes, on the other hand, trace constituents such as arsenic, cadmium, lead, mercury, and selenium, together account for less than 1% of the total composition (EPRI, 2009). Table D-1 shows the typical range of constituents concentrations in fly ash and bottom ash.

Based on the comparative concentration of silicon dioxide, aluminum oxide, and iron oxide in coal, American Society for Testing and Materials (ASTM) classified coal combustion products into two classes: Class C and Class F. Class F ash contains more than 70% by weight of silicon dioxide, aluminum oxide, and iron oxide and has pozzolanic properties (Thomas, 2007). On the other hand, Class C ash generally contains 50–70% by weight of silicon dioxide, aluminum oxide, and iron oxide and has some self-cementing properties in addition to pozzolanic properties (Thomas, 2007). Class C ash is produced from burning younger lignite or sub-bituminous coal and Class F ash is produced from burning harder, older anthracite, and bituminous coal.

CCR-MSW REACTIVITY

It is noted that the Turkey Run Landfill will be accepting CCR and comingling with MSW with a maximum CCR to MSW ratio of 1:9, by weight. This maximum ratio reflects a relatively small quantity of CCR being comingled with MSW. It is further noted that the Turkey Run Landfill will not be accepting FGD material.

The power plants, from which Turkey Run Landfill is accepting CCR, generate both Class C and Class F fly ash. Both Class C and Class F fly ashes gain strength when they come in contact with water, but the strength gain happens slower in Class F ash compared to Class C ash. The gaining of strength is beneficial to the overall stability of the waste mass in a landfill. The reaction between fly ash constituents and water can generate heat depending on the type, quantity, and disposal method in a landfill. The generation of heat can be measured via landfill gas temperature monitoring. No excessively high temperatures were measured during the routine landfill gas temperature monitoring at the Turkey Run Landfill. Waste Management will be vigilant for higher observed temperature in landfill gas. If high temperature is noticed in the future during landfill gas monitoring, the cause of the high temperature will be evaluated and necessary measures will be taken if the cause is found to be related to addition of CCR in the landfill.

CONCLUSIONS

It is concluded that the CCR waste streams received at the Turkey Run Landfill are anticipated to be compatible with the MSW and that different CCR waste streams currently received at the site are anticipated to be compatible with each other based on observations of no reactivity, no excessive temperatures, and no excessive odors due to the site operations. Furthermore, the Design and Operation (D&O) Plan for the landfill has been modified (Section 3 on Sheet 32 of Attachment A) to include narrative for CCR Waste Characterization and Compatibility. As stated in the narrative "*If operations indicate CCR reactivity with MSW, bulk samples of CCR from each source will be obtained for characterization and compatibility. Typically, samples will be tested for Toxicity Characteristic Leaching Procedure (TCLP) 8 RCRA metals by SW-846 Method 1311 and a Paint Filter Test by SW-845 Method 9095, or current equivalent method. Other analysis may be conducted as requested by Waste Management Technical Service Center.*"

It is noted that the Turkey Run Landfill will be accepting CCR with a maximum CCR to MSW ratio of 1:9, by weight. The low percentage of CCR compared to the MSW, is anticipated to have negligible to no adverse effects on the overall waste properties at the landfill.

REFERENCES

EPRI (2009). "Coal Ash: Characteristics, Management and Environmental issues", EPRI Report 1019022, Electric Power Research Institute, 11 pp.

Thomas, M. (2007). "Optimizing the Use of Fly Ash in Concrete", Portland Cement Association.

TABLE

Prepared by: **Z. Islam** Date: **3/30/2017** Reviewed by: **M. Saadi** Date: **4/4/2017**

Client: **Waste Management** Project: **Turkey Run Landfill CCR Management Plan** Project No.: **GR6304** Phase No.: **02/01**

Table D-1. Element Concentrations (mg/kg) in Fly Ash and Bottom Ash (modified from EPRI, 2009)

Element	Fly Ash[1]	Bottom Ash[1]
Aluminum	70,000–140,000	59,000–130,000
Calcium	7,400–150,000	5,700–150,000
Iron	34,000–130,000	40,000–160,000
Silicon	160,000–270,000	160,000–280,000
Magnesium	3,900–23,000	3,400–17,000
Potassium	6,200–21,000	4,600–18,000
Sodium	1,700–17,000	1,600–11,000
Sulphur	1,900–34,000	BDL–15,000
Titanium	4,300–9,000	4,100–7,200
Antimony	BDL[2]–16	All BDL
Arsenic	22–260	2.6–21
Barium	380–5100	380–3600
Beryllium	2.2 - 26	0.21–14
Boron	120–1000	BDL–335
Cadmium	BDL–3.7	All BDL
Chromium	27–300	51–1100
Copper	62–220	39–120
Lead	21–230	8.1–53
Manganese	91–700	85–890
Mercury	0.01–0.51	BDL–0.07
Molybdenum	9.0–60	3.8–27
Nickel	47–230	39–440
Selenium	1.8–18	BDL–4.2
Strontium	270–3100	270–2000
Thallium	BDL–45	All BDL
Uranium	BDL–19	BDL–16
Vanadium	BDL–360	BDL–250
Zinc	63–680	16–370

Notes:

(1) Source for most fly ash and bottom ash data is EPRI CP-INFO Database. Beryllium, thallium, mercury (bottom ash only) and boron (bottom ash only) are from the EPRI PISCES Database

(2) BDL = Below Detection Limit