

US EPA ARCHIVE DOCUMENT

Section 1

Introduction

1.1 Facility Description

The Buncombe County Solid Waste Management Facility, which is located approximately nine miles north of Asheville on Panther Branch Road, was opened in September 1997. The facility includes a Subtitle D landfill disposal area, a C&D landfill, a wood waste mulching facility, a convenience center for residential waste disposal, household hazardous waste and recycling, and a drop-off area for white goods and tires.

The Subtitle D landfill disposal area comprises approximately 100 acres of the more than 600-acre site. The landfill consists of 10 separate disposal cells that will be constructed sequentially over the estimated 30-year life of the facility. Cells 1 and 2, which comprised Phase I of the landfill, were constructed with the standard Subtitle D composite liner system (i.e., two feet of clay with a permeability less than or equal to 1×10^{-7} cm/sec in combination with a 60-mil HDPE synthetic liner).

The State of North Carolina allowed alternate liner systems to be used starting in 1998. Due to the substantial savings in construction costs, Buncombe County decided to construct Cells 3, 4, and 5 with an alternate composite liner system consisting of: 18-inches of 10^{-5} cm/sec clay, a geosynthetic clay liner (GCL), and a 60-mil HDPE synthetic liner.

Two feet of crushed stone was used to construct the protective cover/leachate collection and drainage system for Cells 1-5. The synthetic liner is protected against abrasion and puncture from the stone by a 28-oz. fabric cushion. Leachate is drained to a sump area located in each of the cells and then pumped to an on-site composite lined, leachate storage lagoon with 1.5 million gallons of capacity. Leachate is currently hauled approximately seven miles by tanker truck to a wastewater treatment plant owned and operated by the Metropolitan Sewerage District of Buncombe County (MSD). Cells 6-10 are not constructed at this time.

1.2 USEPA Project XL Final Project Agreement

The requirements of the project are provided in the Final Project Agreement (FPA) issued by the USEPA on September 18, 2000. This document, which is provided in Appendix A, describes in detail the project design, operation, and monitoring. It includes discussions on the acceptance criteria, the requested flexibility from federal regulations, the intentions for implementing the project, and the legal basis for the project. The FPA also reflects the commitment of the parties involved to carry out the plans for the project. References are made to the FPA throughout this report to demonstrate how the requirements of the FPA will be met by the proposed design.



1.3 Project Goals

Buncombe has operated the new Subtitle D landfill since its opening using conventional landfilling techniques. The County desires to incorporate a bioreactor process as an integral part of the landfill operation for the remaining life of the facility. A bioreactor process is a controlled means of increasing the moisture content of the in-place MSW with the goal of accelerating the decomposition of the organic fraction of the wastestream. The moisture content is increased by re-applying leachate that is collected from the leachate collection system into the landfill and adding additional water as necessary to obtain the optimal moisture content for microbial activity. The following objectives have been established by Buncombe County for the project as stated on pages 18-21 of the FPA:

- Obtain rapid organic waste stabilization leading to an overall reduction of the potential for uncontrolled releases of leachate and/or gas to contaminate the ground water or air during the post-closure phase should a containment system failure occur. This will result in a reduced need for post-closure monitoring and an increased potential for landfill mining.
- Maximize landfill gas capture for better and more efficient energy recovery and reduction of fugitive air emissions. Reduction in air quality impacts from the facility is of primary importance since air inversions and the resulting degradation in air quality are common in the mountains.
- Increase landfill disposal capacity due to rapid settlement during operational period that leads to more economical operations, deferred capital costs for additional landfill capacity, and delay in the siting and construction of a new facility.
- Improve leachate quality and eliminate offsite hauling of leachate. Research has shown that bioreactor operations provide more complete: decomposition of organic contaminants; adsorption of certain inorganic contaminants into the soil/waste matrix; and, chemical reactions such as metals precipitation. The bioreactor operation will eliminate the need for tanker trucks to haul leachate to the POTW thus creating a safer situation for nearby residents.

1.4 Regulatory Issues

Currently, the RCRA Subtitle D and State regulations restrict leachate recirculation to only those landfills that have been constructed with the standard composite liner system prescribed in the regulations (i.e., two feet of clay with a permeability of not more than 10^{-7} cm/sec and a 60-mil HDPE synthetic liner). Also, the prohibition of liquid wastes in 40 CFR 258.28 as interpreted by NCDENR restricts the application of water to waste in a landfill.



As a participant of US EPA Project XL program, Buncombe County has obtained site-specific regulatory flexibility from the prescriptive Subtitle D composite liner requirement and the liquid waste prohibition. The Project XL program's purpose is to develop innovative approaches to environmental protection. As stated on page 24 of the FPA, the County has the support of the state and federal regulatory agencies to proceed with the project and the County has committed the necessary funding, personnel, and senior management to ensure its successful implementation.

As stated on page 24 of the FPA, it is expected that this XL Project will demonstrate that leachate can be safely recirculated over equivalent, alternate liner systems (which in many cases are less expensive than the conventional Subtitle D composite liner system) and thus provide the basis for future regulatory changes that will allow this superior environmental performance to be achieved at similar facilities across the country.

NCDENR reviews bioreactor projects on a case-by-case basis during a 120-day trial period. However, since Buncombe County is already engaged in a long-term demonstration project through the US EPA Project XL program, NCDENR has decided that the State requirement of a 120-day trial period will be waived. If NCDENR determines that the project meets all of the applicable requirements, a permit to construct the first 5-year phase of the project will be issued.

1.5 Purpose of the Report

This permit application provides the design, operation, and monitoring concepts for the proposed bioreactor system. Bioreactor experts Dr. Morton Barlaz of North Carolina State University and Dr. Debra Reinhart of the University of Central Florida reviewed the application and their comments have been incorporated.

This application addresses the acceptance criteria included in the FPA. References to the FPA requirements are made in each section to demonstrate how the criteria are being met.

1.6 Modification of FPA Criteria

Certain criteria of the FPA have been modified at the request of Professors Reinhart and Barlaz to improve the bioreactor performance and monitoring and as a result of further research and consideration during design. The modifications are as follows:

- In Table 1 on page 12 of the FPA it is stated that chipped tires will be used in the gas collection system.

Crushed stone will be used in place of chipped tires because chipped tires are sensitive to overburden pressures due to the compressibility of the material and therefore can only be used in areas with shallow waste depths without



experiencing significant loss in permeability. Chipped tires provide much less support as a pipe bedding material and therefore significantly reduce the factor of safety against failure of the HDPE pipe.

- On page 4 of the FPA it is stated that water diverted from the French Broad River will be the only source of supplemental liquid.
- Buncombe County intends to use groundwater for direct application at the working face and for the surficial gravity trenches since their water truck loading station already uses an onsite groundwater well.
- Table 2 of the FPA states that leachate quality will be tested monthly during the first six months of bioreactor operation of a cell, quarterly during the second six months of operation, and semi-annually thereafter.

Dr. Reinhart and Dr. Barlaz recommend that the frequency be revised to monthly sampling and testing until such time the leachate quality stabilizes since leachate quality is one of the most critical parameters for monitoring the bioreactor. Once the bioreactor process for a given cell is firmly established in the methane producing stage and the leachate quality is not changing significantly then the sampling frequency can be reduced to annually.

Dr. Reinhart and Dr. Barlaz also recommended that the number of leachate parameters listed in Table 2 of the FPA be pared down to eliminate unnecessary parameters. The leachate parameters recommended by the professors are: pH, Biological Oxygen Demand, Chemical Oxygen Demand, and Ammonia.

- Table 2 of the FPA states landfill gas monitoring criteria that is inconsistent with NSPS.
- The monitoring parameters and frequencies have been revised to meet NSPS requirements.
- Table 2 of the FPA does not include monitoring for leak detection.

The leak detection zones beneath each cell will be checked monthly for liquid. If liquid is present it will be tested for conductivity to determine if it is leachate. If the nature of the liquid is still in question further testing will be performed to determine its source. The liquid will be pumped out and the volume will be recorded separately for each cell. Comparison of leakage quantities will be made between Cells 1 and 2, which have a Subtitle D composite liner system, and the other cells, which have an alternate composite liner system, to determine if there is a difference in performance.

- On page 17 of the FPA it is stated that at least several feet of waste will be present over the HIT when injecting liquid.

The actual depth of waste will be a minimum of 30-feet over a trench when injecting liquid to avoid excessive pore pressures that could lead to instability in the waste.

- Table 2 of the FPA states a monitoring frequency of annually for moisture content and does not list temperature.

Given the critical nature of these parameters it was mutually decided that moisture content and temperature would be monitored on a monthly basis.

1.7 Geotechnical Report

As stated on page 4 and discussed on page 13 of the FPA, a comprehensive landfill stability analysis was performed for the bioreactor condition that accounts for the addition of supplemental liquids. The report is under review by three nationally recognized geotechnical engineers experienced in landfill slope stability. Their comments will be incorporated in the final report. A copy of the analysis is provided in Appendix B.