

**SCOPE OF WORK
FINAL COVER SYSTEM DESIGN**

**C&L LANDFILL
FAYETTEVILLE, ARKANSAS**

**ADEQ Contract Number:
4600011696**

**EnSafe Project Number:
0888808747**

Prepared for:



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List of Acronyms

ABA	Arkansas Building Authority
ADEQ	Arkansas Department of Environmental Quality
bgs	below ground surface
COPCs	chemicals of potential concern
COPECs	chemicals of potential ecological concern
CSI	Construction Specifications Institute
NOI	notice of intent
O&M	operation and maintenance
PAHs	polycyclic aromatic hydrocarbons
SB	soil boring – sample identification
SCA	Site Closure Assessment
SOW	scope of work
SP	seep – sample identification
SS	sediment – sample identification
SW	surface water – sample identification
SWPPP	Storm Water Pollution Prevention Plan
TDS	total dissolved solids



1.0 INTRODUCTION

This project-specific scope of work (SOW) has been prepared by EnSafe Inc. (EnSafe) for the Arkansas Department of Environmental Quality (ADEQ), Solid Waste Management Division. The SOW identifies the specific activities required by EnSafe to complete design of a final cover for the former C&L Landfill site (site) in Fayetteville, Arkansas. The design activities and requirements discussed in this document are based on the present condition of the site, results and approval of the recent Site Closure Assessment (SCA) work conducted by EnSafe, site visits by EnSafe and ADEQ, EnSafe review of ADEQ file information, and knowledge of past site environmental activities.

The goal of the final cover design is to provide engineering controls to close the landfill in accordance with Arkansas Pollution Control and Ecology Commission #014.00-022, Regulation 22 (effective April 26, 2008). The final cover design will include construction plans and specifications and estimates of probable cost for final cover construction and operation and maintenance of the closed landfill. The site is within the planned South Pass residential development and the planned use of the former C&L landfill is recreational.

The project schedule has been carefully considered in order to complete the final cover design in a timely fashion. The proposed project schedule is in Attachment A.

2.0 SITE DESCRIPTION AND PREVIOUS ACTIVITIES

The condition of the site, site hydrogeology, and previous environmental activities are some of the primary influences on the design, and ultimately the scope and cost of this project. Our understanding of the site and past activities is based upon site records and other information obtained from an EnSafe search of ADEQ online files, site visits conducted during field investigations, and the results of the approved SCA.

2.1 Site Description

The 33-acre former C&L landfill site is just west of the corner of Interstate Highway 540 and Cato Springs Road in Fayetteville, Arkansas. The wooded and grassy site sits at the base of Kessler Mountain, with ground surface sloping down from west to east. The site is accessed from County Road 200, a gravel road that connects South Cato Springs Road and two municipal water tanks that are situated on Kessler Mountain. This gravel road forms the eastern boundary of the site. The landfill is covered by open grassy areas that are interspersed with areas of trees and brush. Some solid waste, trash and debris dot the landfill surface, or are exposed where landfill cover is absent. The surface of the site property is dissected by two intermittent stream channels and numerous



gullies and depressions. Solid waste and debris are visible along some gullies and the intermittent stream channels. The stream channels drain east toward Cato Springs Creek, approximately 1 mile east. One former wooden maintenance building is on the west side of the property. A second wooden building is located near the southwest corner of the landfill. From this building, County Road 200 connects the site back to Cato Springs Road. Dense woods and brush surround the site to the south, west and north. The valley to the east is dotted with farms, residences, and open fields.

Site soils consist of fine sandy loam or stony loam over clay loam or clay fragipan. The thin layer of soils overlies sand and shale beds of the Fayetteville Formation. This Mississippian-age formation is divided into three distinct units: a lower black fissile shale, the intermediate Weddington Sandstone Member, and an upper light to dark gray fissile, sandy, fossiliferous shale unit. Thickness of the Fayetteville Formation beneath the landfill is believed to be 230 feet (Terracon, 2004). Based on site soil borings, the depths to bedrock range from 2 to 5 feet below ground surface (bgs) outside and in and along the edges of the landfill, and 14.5 to 15 feet inside the landfill cells and boundaries. Groundwater was found at approximately 3 to 7 feet bgs in monitoring wells completed inside the landfill and was encountered at approximately 15 to 20 feet bgs in the wells completed outside the landfill. Flow is to the east-southeast. The intermittent creeks flow to the east, draining portions of the property. Numerous intermittent surface water seeps were observed during previous investigations and during site visits and field investigations from 2007 to 2009. (EnSafe, 2009).

2.2 Site History, Previous Assessments and Investigations

The former C&L Landfill was operated under Arkansas Department of Pollution Control and Ecology Permit number 5-0015, 1322-WE from approximately 1972 until closure in 1976. The landfill reportedly received municipal solid waste and some construction/demolition debris from the City of Fayetteville, the University of Arkansas, and the Campbell Soup Company. The landfill was reportedly operated by cutting into the surrounding hillsides and filling a shallow valley trending south and east from the cut areas. Native borrow soil was used for fill cover and final capping material. The land owner reported that landfill operations did not extend beyond the present gravel road bordering the east side of the site. Before the 2007 – 2009 SCA investigation, a number of investigations and assessments were conducted from 1985 to 2005; brief summaries of these are presented in the SCA report. A summary of the SCA investigation and conclusions follows.



Site Closure Assessment Summary

The SCA investigation was conducted from 2007 to 2009 and included:

- Determining landfill extent with a geophysical survey
- Determining the existing landfill cover thickness
- Sampling and analysis of the existing soil cover for environmental contamination and geotechnical parameters
- Installing four 20-foot deep groundwater monitoring wells outside the landfill boundaries
- Sampling and analysis of groundwater in new and existing monitoring wells
- Sampling soil gas to evaluate potential for landfill gas
- Sampling and analysis of surface water and sediment
- Sampling and analysis of landfill seeps
- Performing human health and ecological risk surveys and evaluations

The sample analysis from the SCA identified both chemicals of potential concern (COPCs) for human health, and chemicals of potential ecological concern (COPECs) for ecological receptors. The density and distribution of the sampling allowed for the determination of both pervasive, site-wide COPCs and COPECs in site media; and for localized “hot spots,” or small areas with one or more samples containing at least one or more COPC or COPEC.

For human health, ammonia and phosphorous in groundwater and phosphorous in sediment are the only site-wide COPCs identified. There are five human health risk hot spots – in soil boring SB-19 for polycyclic aromatic hydrocarbons (PAHs); in sediment sample SS-04 for arsenic; in seep samples SP-07 for ammonia and vinyl chloride, SP-08 for ammonia, and SP-10 for iron, lead, and arsenic.

For ecological receptors, site-wide COPECs are present in surface water and seeps. In surface water, site-wide COPECs are sulfate, total dissolved solids (TDS), and lead. In seeps, site-wide COPECs are sulfate, chloride, TDS, and six metals. Hot spot risks for ecological receptors are present at nine locations. In soil, hot spots are at SB-02 for copper, SB-19 for PAHs and zinc, and SB-32 and SB-36 for zinc. In sediment, sediment sample SS-04 is a hot spot for five metals – lead, cadmium, zinc, arsenic, and nickel. In surface water, surface water sample SW-03 is a hot spot for chloride. In seeps, hot spots are at SP-06 for sulfate, SP-09 for bis 2-ethylhexyl phthalate, and SP-10 for five metals — aluminum, barium, copper, vanadium, and zinc.



The focused risk evaluation identified human health and ecological risks from site media at the C&L landfill for present and future site users under a residential scenario. Closure in accordance with Arkansas Regulation 22 (Reg.22.1301) will eliminate or mitigate the potential for continued risk to site users and/or future releases. Closure with a proper cap to cover the entire landfill area and any exposed landfill waste will reduce groundwater levels in the landfill, and limit or eliminate surface seeps. Assumed landfill-generated gases were not detected in significant concentrations; however, during preliminary design consideration will be given to a gas venting system since a proper cover could trap and hold gas that currently appears to be migrating through the cover soil into the atmosphere. Physical hazards, consisting of abandoned equipment, refuse and debris, pose a threat to trespassers and future site users and will be removed during final cover construction.

3.0 SCOPE OF WORK

To present an organized and complete SOW for design of a final cover, EnSafe has identified the phases of work required to complete the project. The phases are divided into more detailed subtasks explaining the work elements. The phases are based on the Arkansas Building Authority's (ABA) 2008 *Minimum Standards & Criteria* for design projects and landfill closure requirements as specified in Arkansas Regulation 22. Where appropriate, discussion is provided to identify the conditions and circumstances that influence the proposed activities. The costs associated with the tasks described in this SOW will be developed after discussion with ADEQ and approval of the work approach. The costs for each task will be based on the anticipated labor and any other direct costs (materials, equipment, services, and subcontractors).

PHASE 1 PROJECT ADMINISTRATION

The tasks in this phase include project management and procurement of subcontractors.

Task 1 Project Management

This task includes staffing and supporting the various project activities, responding to client questions and concerns, and reviewing, preparing, and submitting invoices. Progress reports will be completed, as required, under this task.

Task 2 Procurement and SOW

This task includes invoicing, procurement, and subcontractor management. EnSafe will subcontract with an Arkansas registered professional land surveyor to obtain a topographic survey of the former C&L landfill site.



In addition, EnSafe is currently working with ADEQ to complete this project-specific SOW for the final cover design. The SOW will be submitted to ADEQ for comment and refinement. The SOW will be reviewed by ADEQ and discussed with EnSafe. Changes to this SOW will be made following consideration and discussion by both parties. Once negotiation of the SOW has been completed, the project costs will be developed and the SOW will be finalized.

PHASE 2 SCHEMATIC DESIGN – 15% COMPLETE

As specified by the ABA, EnSafe will make a 15% complete submittal to ADEQ. ABA calls for a schematic design at the 15% complete stage. Since design of a landfill final cover system is not the standard ABA design project, EnSafe proposes to accomplish the following at the 15% complete stage:

- Obtain topographic survey of former C&L landfill site
- Prepare a base map of the site and preliminary grading plan
- Evaluate alternative cover designs

Task 1 Obtain Topographic Survey

EnSafe will work with the surveyor selected through our procurement process (Phase 1, Task 2) to obtain a topographic survey of the landfill. Survey boundaries will be based on landfill boundaries defined by recorded property boundary documents. Contours will be at 1-foot intervals and significant site features (e.g., streams, treelines, fences, buildings, major debris piles, monitoring wells, etc.) will be identified as well. The surveyor will be required to submit a drawing of the survey stamped and signed by an Arkansas-registered professional land surveyor and electronic drawing files in AutoCAD format.

Task 2 Prepare Base Map and Preliminary Grading Plan

EnSafe will use the topographic survey obtained in Task 1 to prepare the base map for the landfill cover system design. The base map will be developed using AutoCAD software. The base map will include the groundwater monitoring wells, soil sampling points, surface water and sediment sampling points, and landfill seep sampling points.

After the base map is complete, a preliminary grading plan showing the proposed contours of the top of the final cover system will be prepared. For this SOW, EnSafe anticipates that the final cover system will be the standard cover required by Regulation 22 — 24 inches thick consisting of 18 inches of barrier soil (maximum permeability of 1E-05) overlain by 6 inches of soil capable of supporting vegetation.



The preliminary grading plan will identify structures for demolition, locations and estimated quantities of debris to be removed, and areas where trees must be cleared. In addition, based on the assumption that only some of the existing groundwater monitoring wells outside the landfill boundaries will be maintained for post-closure monitoring, the preliminary plan will identify monitoring wells within the landfill footprint and outside the landfill boundaries for closure during the final cover construction. The preliminary plan will also show proposed drainage structures (e.g., piping, inlets).

Task 3 Evaluate Alternative Cover Designs

Recognizing that it may be difficult and expensive to obtain 24 inches of cover soil in the greater Fayetteville area, EnSafe will evaluate at least two alternative cover systems. Possible alternatives are a synthetic (polyethylene) liner overlain by 12 to 18 inches of protective cover soil. For the 33-acre landfill, each reduction of 6 inches of cover soil results in an estimated 27,000 cubic yards less soil required. By using the synthetic liner, a more permeable soil could be used to cover the liner, thus increasing the selection of potential borrow sources for cover soil and possibly reducing construction costs.

Besides looking at estimated costs for the final cover system alternatives, EnSafe will evaluate the alternatives using the Hydrologic Evaluation of Landfill Performance (HELP) model. The HELP model will provide a means of comparing the alternative covers' performance against the standard cover's (18 inches of barrier soil overlain by 6 inches of vegetative soil) performance.

PHASE 3 REVIEW MEETING

After submittal of the schematic design (15% complete), EnSafe proposes to have a face-to-face meeting with ADEQ Solid Waste Management Division to review the project approach, agree on the final cover design, and ensure that the proposed design meets ADEQ's criteria for closure of the former C&L landfill.

PHASE 4 DESIGN DEVELOPMENT – 50% COMPLETE

As specified by the ABA, EnSafe will make a 50% complete submittal to ADEQ. ABA calls for a design development package at the 50% complete stage. EnSafe proposes to complete and submit the following at the 50% complete stage:

- Draft final construction drawings
- Draft final drainage calculations



- Outline for Project Manual
- Estimates of probable construction cost and operation and maintenance (O&M) costs

Task 1 Draft Final Construction Drawings

A draft final set of construction drawings will be prepared under this task. It is anticipated that the drawing set will consist of the following sheets:

- Cover Sheet
- Existing Conditions (Base map with contours and significant site features)
- Demolition/Clearing and Grubbing Plan
- Groundwater Monitoring Well Closure Plan
- Barrier Soil Layer Grading Plan
- Vegetative Soil Layer Grading Plan
- Cross Sections
- Erosion Prevention and Sediment Control Plan
- Construction Details (e.g., silt fence, construction exit, rock check dams, slope protection, drainage pipe and inlet details)

Task 2 Drainage Calculations

EnSafe will perform drainage calculations to size drainage structures (e.g., swales/ditches, piping, inlets) to handle the surface water flow from the site as well as drainage from adjacent property that contributes to surface water runoff on the former C&L landfill property.

Task 4 Estimates of Probable Construction and O&M Costs

Under this task, EnSafe will prepare an estimate of probable construction cost based on the draft final construction drawings. In addition, we will develop an estimate of the probable O&M costs for the final cover system during post-closure care. Anticipated O&M costs include mowing, reestablishing vegetation as needed, repairing eroded areas if they occur, post-closure groundwater monitoring, etc.

Task 3 Project Manual

For the 50% submittal, EnSafe will prepare an outline/table of contents for the Project Manual. The Project Manual includes the administrative documents (e.g., invitation to bid, instructions to bidders, bid form, general conditions, etc.) and the technical specifications. As required by the ABA, specifications will follow the Construction Specifications Institute's (CSI) MasterFormat 2004 Edition format (49 divisions). It is anticipated that specifications from Division 02 – Existing



Conditions, Division 31 – Earthwork, and Division 33 – Utilities will be used. The technical specifications will address:

- General requirements (e.g., submittals, quality assurance, change orders)
- Site preparation
- Demolition
- Clearing and grubbing
- Groundwater monitoring well closure
- Earthwork including subgrade, soil barrier, and vegetative layer
- Trenching, backfilling, and compaction for piping
- Dust control
- Erosion prevention and sediment controls
- Drainage materials, piping, and structures
- Seeding and mulching

EnSafe assumes that ADEQ (or the ABA) will provide templates for the administrative specifications and guidance in preparing them to ensure that Arkansas requirements are met.

PHASE 5 CONSTRUCTION DOCUMENTS – 100% COMPLETE

As specified by the ABA, EnSafe will make a 100% complete submittal to ADEQ. At the 100% completion submittal, ABA calls for the construction documents to be ready to issue for bidding. EnSafe will incorporate ADEQ comments on the 50% submittal and complete the design documents package. EnSafe proposes to complete and submit the following at the 50% complete stage:

- Final construction drawings
- Final drainage calculations
- Final Project Manual
- Final estimates of probable construction and O&M costs
- Draft Storm Water Pollution Prevention Plan for Construction Activity

Task 1 Final Construction Drawings

The final (100% complete, bid-ready) set of construction drawings will be prepared under this task.

Task 2 Final Drainage Calculations

As needed, EnSafe will revise, refine, and finalize drainage calculations for the proposed drainage improvements.



Task 3 Final Estimates of Probable Construction and O&M Costs

Under this task, EnSafe will refine and finalize the estimates of probable construction cost and O&M costs for the final cover system.

Task 4 Final Project Manual

EnSafe will prepare the final Project Manual, which will include the required administrative documents and complete technical specifications in the required CSI format.

Task 5 Draft Storm Water Pollution Prevention Plan

Because more than 5 acres of land will be disturbed during the final cover construction, this project is classified as a large construction site. At least 2 weeks before construction begins, a notice of intent (NOI), Storm Water Pollution Prevention Plan (SWPPP) for Construction Activity, and a \$200 permit fee must be submitted to the ADEQ Permit Branch, Water Division.

EnSafe will prepare a draft SWPPP for Construction Activity using the template provide by ADEQ Permits Branch, Water Division. The contractor selected to construct the final cover system for the former C&L landfill will be required to finalize the SWPPP and submit it, along with the NOI and permit fee, to ADEQ.

PHASE 6 SUBMIT 100% DOCUMENTS TO ABA

Upon ADEQ's approval of the 100% submittal, EnSafe will provide copies of the construction drawings and the Project Manual for ADEQ to submit to the ABA Construction Section for review. The ABA requires at least 30 days for its review. The attached schedule does not allow for revisions to be made following the ABA review.

Attachment A
Proposed Project Schedule

**Outline of Scope of Work and Schedule
Final Cover Design
C&L Landfill
Fayetteville, Arkansas
February 19, 2010**

Task	Responsible Party	Completion Dates	Weeks
1. Submit Scope of Work	EnSafe	February 19, 2010	NA
2. Approve Scope of Work	ADEQ	March 5, 2010	2
3. Submit Design Fee Proposal	EnSafe	March 12, 2010	1
4. Approve Design Fee Proposal	ADEQ	March 26, 2010	2
5. 15% Complete – Schematic Design <ul style="list-style-type: none"> Obtain topographic survey of site Prepare base map Evaluate cover designs Preliminary grading plan – final cover Preliminary estimate of probable construction cost 	EnSafe	May 7, 2010	6
6. Review Meeting	ADEQ and EnSafe	May 21, 2010	2
7. 50% Complete – Design Development <ul style="list-style-type: none"> Refined estimate of probable construction cost Estimate of O&M costs Drainage calculations Draft final cap contours List of specification sections to be used 	EnSafe	July 2, 2010	6
8. Review and Comments on 50% Submittal	ADEQ	July 30, 2010	4
9. 100% Complete – Construction Documents <ul style="list-style-type: none"> Final estimate of probable construction cost Final estimate of O&M costs Final construction drawings Final specifications/Project Manual Construction Storm Water Pollution Prevention Plan 	EnSafe	August 27, 2010	4
10. Review and Approval of 100% Submittal	ADEQ	September 24, 2010	4
11. Submit 100% Plans to ABA Construction Section	EnSafe/ADEQ	September 29, 2010	3 work days
12. ABA Construction Section Review & Approval	ABA Construction Section	October 29, 2010	30 days
Post-Design Tasks			
13. Advertise for Construction Bids			
14. Open Construction Bids			
15. Complete Contract Negotiations with Construction Contractor & Issue Notice to Proceed			
16. Landfill Cover Construction	Construction Contractor		
17. Review & Approve Construction Contractor Submittals			
18. Periodic Construction Oversight Visits Approve Construction Contractor Pay Requests Submit Monthly Reports			
19. Submit Closure Certification Report			
20. Submit Required Documentation to ABA	ADEQ		