



SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 3/25/85

Project No. E-20-604

School ~~XXXX~~ Civil Engineering

Includes Subproject No.(s) \_\_\_\_\_

Project Director(s) Dr. Frederick G. Pohland GTRC  
~~XXX~~ / ~~XXX~~

Sponsor U. S. Environmental Protection Agency

Title Acquisition Refurbishing and Startup of Simulated Landfill Test Facility

Effective Completion Date: 12/31/84 (Performance) 12/31/84 (Reports)

Grant/Contract Closeout Actions Remaining:

- None
- Final Invoice or Final Fiscal Report
- Closing Documents
- Final Report of Inventions
- Govt. Property Inventory & Related Certificate - (Before Closing Project Please Contact OCA)
- Classified Material Certificate
- Other \_\_\_\_\_

Continues Project No. \_\_\_\_\_ Continued by Project No. \_\_\_\_\_

COPIES TO:

Project Director  
 Research Administrative Network  
 Research Property Management  
 Accounting  
 Procurement/EES Supply Services  
 Research Security Services  
~~Reports Coordinator (OCA)~~  
 Legal Services

Library  
 GTRI  
 Research Communications (2)  
 Project File  
 Other Heysor; Jones

# Georgia Institute of Technology

A UNIT OF THE UNIVERSITY SYSTEM OF GEORGIA

ATLANTA, GEORGIA 30332

SCHOOL OF  
CIVIL ENGINEERING

TELEPHONE  
(404) 894-2265

March 6, 1985

Mr. B. Vincent Salotto, Chemist  
Land Pollution Control Division  
Hazardous Waste Engineering Research  
Laboratory  
U.S. Environmental Protection Agency  
Cincinnati, OH 45268

Re: Final Report; Acquisition,  
Refurbishing, and Start-up  
of Simulated Landfill Test  
Facility, CR-811690 (E-20-604)

Dear Vince:

Enclosed find a brief final report on the subject cooperative agreement. I apologize for the delay in submitting this to you, but we had hoped that the liner inserts for the test columns would have been received by now. However, since they will not be received until the end of March, I have decided to complete the report and include the liner installation as part of the start-up activities associated with our new codisposal research initiative. All of the other project activities have been completed and are discussed in the report.

I trust that you will find this report to be acceptable and to sufficiently reflect our accomplishments on the project. If you require any additional information, please contact me accordingly.

Sincerely,

Frederick G. Pohland  
Professor of Civil Engineering

FGP:es  
Enclosure

cc: J. E. Fitzgerald, CE  
Brian Lindberg, OCA  
OCA Reports Coordinator

SCEGIT-85-103  
February 1985

FINAL REPORT

ACQUISITION, REFURBISHING, AND START-UP OF  
SIMULATED LANDFILL TEST FACILITY

by

Frederick G. Pohland

School of Civil Engineering  
Georgia Institute of Technology  
Atlanta, GA 30332

U.S. EPA Cooperative Agreement CR811690  
Georgia Tech Project No. E-20-604

Project Officer  
B. Vincent Salotto  
Land Pollution Control Division  
Containment Branch  
Hazardous Waste Engineering Research Laboratory  
Cincinnati, OH 45268

OFFICE OF RESEARCH AND DEVELOPMENT  
U.S. ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, DC 20460

## ABSTRACT

This report details the activities associated with the receipt, modification, installation and refurbishing of nine simulated landfill columns to be used for continuation research on the codisposal of municipal refuse and hazardous wastes. The original columns were obtained from the Waterways Experiment Station of the U.S. Corps of Engineers in Vicksburg, MS. They have been installed in an environmental engineering processes laboratory on the campus of the Georgia Institute of Technology and have been modified to increase the effective depth of the columns and to accept appurtenances necessary for landfill stabilization investigations with and without leachate containment and recycle. Accordingly, the columns have been cleaned for lining with a high density polyethylene liner, equipped with leachate and gas management/sampling and in-line pH, temperature and ORP measurement appurtenances, and fitted with covers to isolate and seal the units for gas collection during the proposed research investigations. The project period covered by this report commenced on June 1, 1984 and terminated on December 31, 1984.

## CONTENTS

	<u>Page</u>
Abstract.....	ii
Figures.....	iv
1. Introduction.....	1
2. Conclusions and Recommendations.....	2
3. Materials and Methods.....	3
Space allocation and preparation.....	3
Landfill column acquisition and refurbishing.....	6
4. Results and Discussion.....	8

## FIGURES

<u>Number</u>		<u>Page</u>
1	Location Plan for Simulated Landfill Columns Within High Bay Laboratory Area.....	4
2	Schematic Diagram of Simulated Landfill Facility.....	5
3	Dimensions of Simulated Landfill Column Extensions.....	6

## SECTION 1

### INTRODUCTION

The impetus for this project was derived from a recognition that many of the questions concerning landfill disposal of solid and hazardous wastes at both existing and proposed sites are highly controversial and/or remain essentially unanswered. This is distinctly evident for municipal landfills throughout the U.S. where codisposal with industrial wastes is occurring without sufficient attention being given to existing and potential environmental impacts. Moreover, the reduction of the small generator exemption from 1000 to 100 kg/month of hazardous wastes regulated under RCRA tends to assure a continuing use of municipal landfills as ultimate receptors of small quantities of hazardous wastes. Therefore, it was considered appropriate to continue to focus on codisposal issues within both a diagnostic and developmental perspective. The acquisition, modification and refurbishing of the already available simulated landfill columns described in this report provide such an initiative, including a basis for further research investigation.

## SECTION 2

### CONCLUSIONS AND RECOMMENDATIONS

As indicated in the subsequent sections of this report, receipt, modification and refurbishing of nine simulated landfill columns and their location in a high bay laboratory area have been completed. No particular difficulties were encountered and excellent cooperation was obtained from Waterways Experiment Station and U.S. Environmental Protection Agency personnel. In addition, although fabrication and installation of the high density polyethylene liners have not been completed, receipt of the liners is imminent and at no cost from the manufacturer (Poly-America, Inc.). Therefore, no unforeseen delays are anticipated in making the simulated landfill facility operational.

Based upon the successful relocation, modification and refurbishing of the nine landfill columns, and in anticipation of the desirability of performing research studies in duplicate, it is recommended that consideration be given to increasing the number of units to at least ten. In addition, since the units are or will soon be operational, the process toward their use as an active research facility should be accelerated. Approval and funding of proposed research on codisposal of municipal and industrial wastes containing selected organic and inorganic priority pollutants as described briefly in Section 4 would help make this goal a reality.

## SECTION 3

### MATERIALS AND METHODS

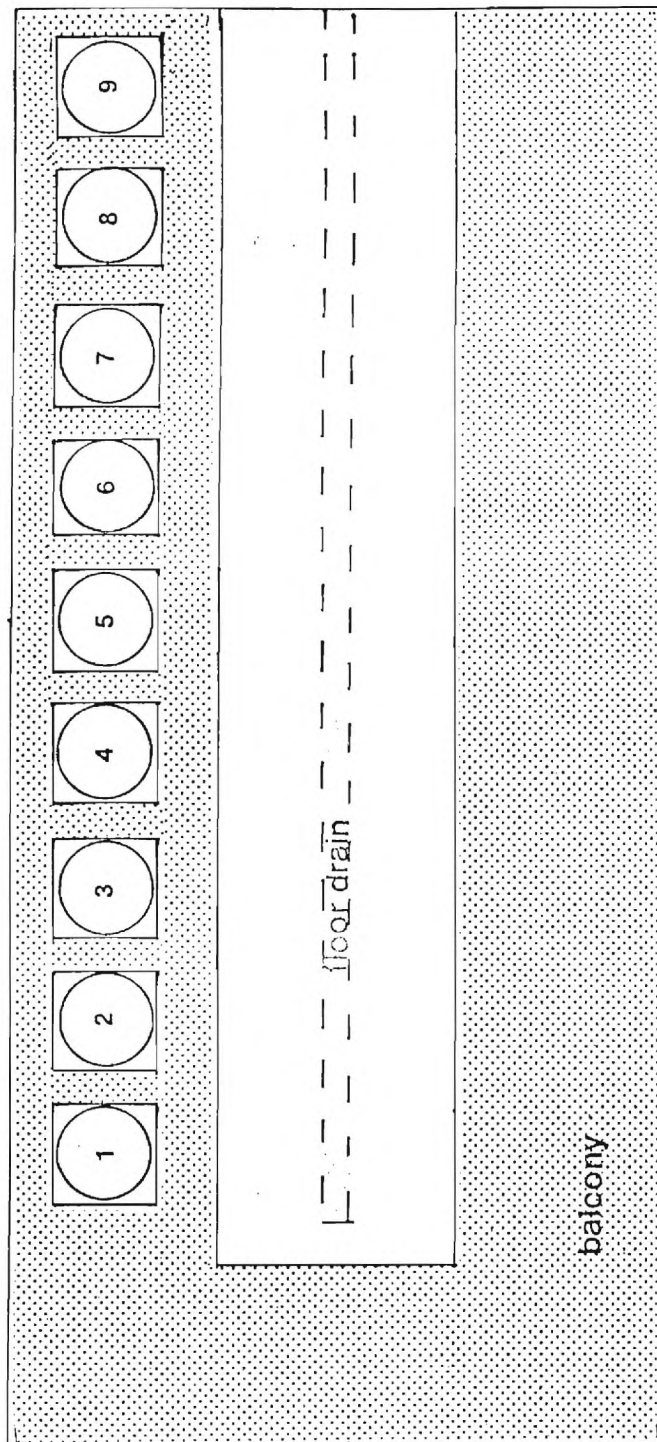
Because research on the separate and combined disposal of industrial hazardous wastes and/or municipal refuse has been performed for over a decade at Georgia Tech, the acquisition of an expanded research facility at a minimum cost for the use of already available and experienced research personnel and associated analytical resources was particularly justified. Moreover, these latter experiences reinforced the merit of providing an ability to perform duplicative investigations when seeking confirmation of new and innovative technologies for landfill containment and control including an emphasis on liner and cover systems, gas and leachate collection and management options, and requirements for design, operation and maintenance in accordance with regulatory and environmental concerns.

Based upon the preceding justification, the major thrust of the project was directed toward the research facility development and preparations for a subsequent research initiative described briefly in the following sections.

#### SPACE ALLOCATION AND PREPARATION

Prior to receipt of the original simulated landfill columns, it was necessary to acquire a sufficient research area to house the units. This was accomplished with the assignment of a high bay laboratory area to the School of Civil Engineering at Georgia Tech for the use of the Environmental Engineering Program. This area had originally been designated as a chemical engineering processes laboratory, which made it particularly well suited for the location of the simulated landfill facility. The laboratory area, illustrated schematically in Figures 1 and 2, is approximately 22 feet wide by 64 feet long with a vertical clearance at the center of about 20 feet. A 7-foot wide balcony extends around three sides, ten feet above the floor. The newly acquired laboratory area is also located adjacent to the existing Environmental Engineering Laboratory which will help facilitate analyses during the conduct of the contemplated landfill simulation studies.

To accommodate the installation of the nine simulated landfill columns, various physical modifications of the area were required. These included relocation of a fire protection sprinkler system from below the balcony to its outer edge, relocation of a water supply conduit underneath the balcony to the ceiling, and uncovering the floor drain, fabricating a metal mesh cover and opening the drain for access to a sump beneath the laboratory floor. In addition, as illustrated in Figure 1, openings were cut in the balcony floor on one side of the area to accommodate location and extension of the landfill simulator columns.



1-9 Existing  
Landfill Columns

Figure 1. Location Plan for Simulated Landfill Columns Within High Bay Laboratory Area

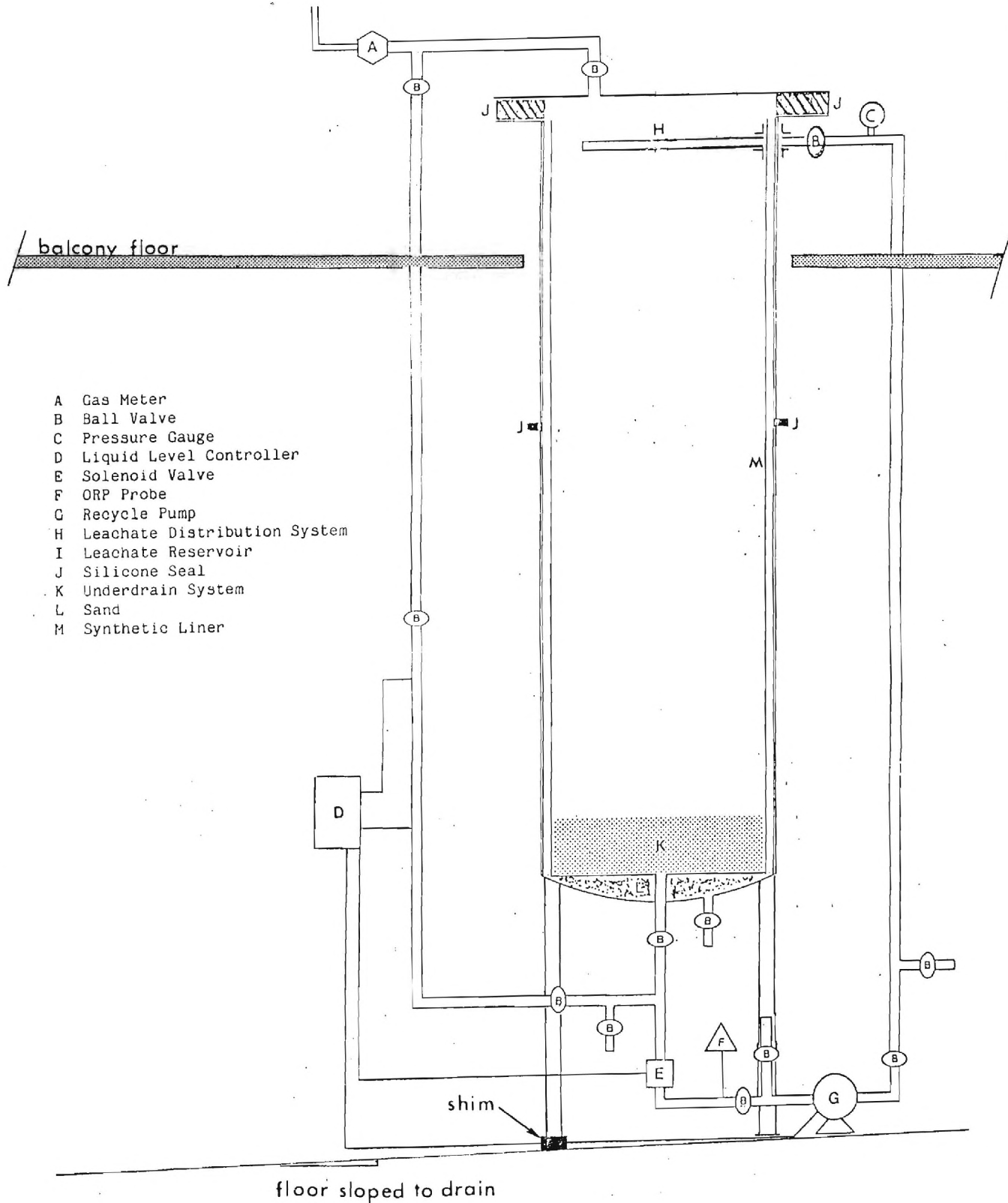


Figure 2. Schematic Diagram of Simulated Landfill Facility

## LANDFILL COLUMN ACQUISITION AND REFURBISHING

The nine 2.0-foot diameter by 6.0 feet tall landfill simulation columns and covers were received from the U.S. Corps of Engineers Waterways Experiment Station in Vicksburg, MS on June 4, 1984. Unloading and placement within the high bay area were commenced on the following day.

All existing hardware and fittings were initially removed from the columns and the areas around the inlet and exit ports were cleaned and ground to bare metal. With the exception of the two outlets in the bottom plates of each column, all ports which had previously accommodated appurtenances were welded shut to help ensure a completely sealed column structure. Each column exterior was then cleaned by sanding to remove rust and grime, after which they were primed and covered with an exterior latex paint.

Due to the relatively short height of the effective landfill section of each original column, it was decided to lengthen each by adding a new 4.0-foot section. Accordingly, these sections (Figure 3) were designed and constructed to bolt to the original columns through the one-inch flange located at the top

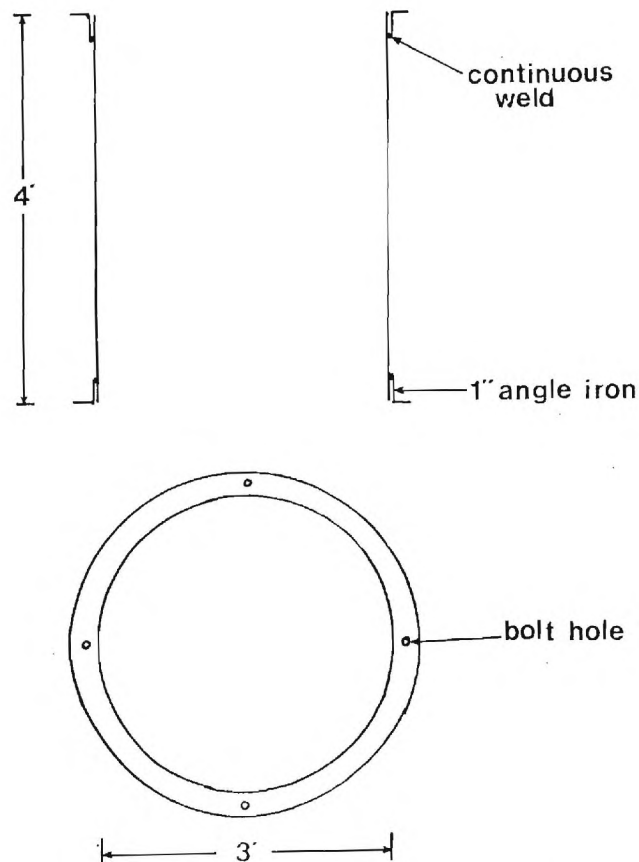


Figure 3. Dimensions of Simulated Landfill Column Extensions

of each. The column sections were fabricated of 20-gauge steel with a matching 1/8-inch by one-inch angle iron flange at one end. The flanges were continuously welded to the column sections to make them both liquid and gas tight. Upon receipt from the fabricator, the sections were coated with metal primer and painted white to match the original columns.

Since the laboratory area assigned to house the landfill columns was constructed with the floor sloped from the sides to the central floor drain, it was also necessary to fabricate and place shims under the feet of the landfill simulators to assure that the columns would remain perpendicular. The shims consisted of 1/4-inch or 1/2-inch thick metal plates, six inches wide by four inches long. The original columns were then centered below the nine openings cut into the balcony floor, adjusting the shim plates as necessary. The top of each column was then examined for roundness and a hydraulic jack was used to align the respective flanges.

The extension sections were raised to the balcony with a fork lift and set in place on the top of the columns, utilizing a portable A-frame and chain hoist. Silicone caulk/sealant was then placed between the adjoining flanges and the extensions were lowered and clamped prior to being bolted in place. A bead of silicone sealant was then added around the inside of each column at the point of connection to help provide a leak-free joint. The extensions and original columns were also sealed with a primer coat on the inside to minimize corrosion and or leaching from the structure during the proposed experimental studies.

To help contain waste/leachate and facilitate eventual removal of the wastes to be used during the experimental studies, 30-mil high density polyethylene liners (Poly-America, Inc.) have been designed and are being fabricated for insertion into each column (Figure 2). The lower one-foot section of each of these liners will also serve as a leachate reservoir or storage system. A factory-installed pipe attached to the base of each liner will extend through the bottom of the column structure for leachate delivery either to a storage container in the case of single pass operation or to a pump for recycle operation. A port, equipped with a flange fitting and cut into the upper six inches of the column extension and through the liner, will accommodate the leachate recycle and liquid (water addition) management systems. A textile fabric has been obtained and will be used to provide a snug and firm cushion between the liner and the inner walls of each column. Gas collection will be facilitated by connections to ports cut into the cover of each column. The covers will be placed and sealed after the loading phase of the proposed experimental studies has been completed.

All hardware and plumbing fixtures for installation of the leachate collection/recycle, gas recovery, and in-line pH, ORP and temperature monitoring systems have been assembled and will be installed upon receipt of the liners from the fabricator. These systems have been tested for functionality and utilization during the experimental phase of the anticipated research investigations.

## SECTION 4

### RESULTS AND DISCUSSION

Although no direct research activity was associated with the project, the rationale used in developing the test facility involved a prior determination of a research plan to be accommodated by the simulated landfill columns. The impetus for this initiative derived from a recognition that the formation and uncontrolled migration of leachate and gas from landfill disposal sites can result in adverse environmental impacts, particularly in situations where hazardous wastes are involved. Moreover, comprehensive investigations at Georgia Tech on the patterns of leachate and gas formation from simulated landfills receiving both municipal and industrial wastes have resulted in a better understanding of the landfill stabilization process in general and the development of innovative leachate and gas management techniques. Therefore, the landfill column acquisition and refurbishing activities described herein were planned and performed to allow for the continuation of such research investigations, with specific emphasis on the behavior of organic and inorganic hazardous wastes codisposed with municipal refuse.

A primary requisite of these studies is an experiment facility that can isolate the waste mixtures in a containment structure amenable to external management and control of leachate and gas. This has been provided by equipping the columns with appurtenances permitting operation under simulated rainfall conditions with either single-pass leaching or with leachate collection and recycle. This latter strategy will accelerate the process of waste stabilization and interaction between the leachate components and waste mass and thereby yield information crucial to the understanding of reaction mechanisms and selection of a best management practice. Hence, the newly developed research facility is of the size and flexibility sufficient to accommodate investigations not only on the determination of the relative acceptability of various leachate and gas management options during the active life of a landfill, but also on the possibility and requirements of sequenced operations and the scheduling and implementation of closure and post closure activities.

The transfer, modification and refurbishing of the simulated landfill columns have established both the facility and logic for continuation studies on landfill disposal of solid and hazardous wastes. These studies have been formally proposed to the U.S. Environmental Protection Agency per cooperative agreement, CR-812158; "The Behavior and Assimilation of Organic Priority Pollutants Codisposed with Municipal Refuse".