TAL

53008

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Application for a Permit to Construct a Solid Waste Digester for the Production of Compost at the Sumter County Solid Waste Management Facility

PREPARED FOR:

Sumter County

SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS
209 NORTH FLORIDA STREET
BUSHNELL, FLORIDA 33513

021100.000

December 24, 1996

Springstead Engineering, inc.

Consulting Engineers – Architects – Planners – Surveyors
727 South 14th Street
Leesburg, Florida 34748
Lake (352) 787-1414
Sumter (352) 793-3639 Fax (352) 787-7221

Springstead Engineering, inc.
Consulting Engineers — Planners — Surveyors

727 South 14th Street
Leesburg, Florida 34748

Lake (904) 787-1414
Sumter (904) 793-3639
Fax (904) 787-7221

December 24, 1996

Ms. Susan Pelz, E.I.
Southwest District
Florida Department of Environmental Protection
3804 Coconut Palm Drive
Tampa, Florida 33619

RE: Solid Waste Management Facility
Application for a Permit to Construct a Solid Waste Digester for the Production of Compost at the Sumter County Solid Waste Management Facility
921100.000

Dear Ms. Pelz:

Please find enclosed six (6) copies of the "Application for a Permit to Construct a Solid Waste Digester for the Production of Compost", six (6) copies of all attachments necessary to support this application as outlined in the Completeness Check on pages 2 and 3 of 5 of the application, six (6) sets of plans, a letter which authorizes Mr. Garry Breeden to sign as agent, a letter and resolution regarding fees for small counties and check in the amount of $100.00.

Should you have any questions, please contact our office.

Very truly yours,

SPRINGSTEAD ENGINEERING, INC.

12/24/96

David W. Springstead, P.E.
Florida Registration No.: 48229

DWS/jal

cc Garry Breeden - Sumter County Public Works

(December 23, 1996 - a:cover.ltr)

Sumter County Government

Board of Sumter County Commissioners
209 North Florida Street, Bushnell, Florida 33513 Room 206 **Telephone** (352)793-0200 **Suncom** 665-0200 **FAX** (352)793-0207

December 22, 1996

Ms. Susan Pelz, EI
Department of Environmental Protection
3804 Coconut Palm Drive
Tampa, Florida 33619

RE: Solid Waste Management Facility
Application for a Permit to Construct a Solid Waste Digester for Production of Compost at the Solid Waste Management Facility

Dear Ms. Pelz

In compliance with Chapter 94-278, Florida Statutes, relating to permit fees for small counties, you will find attached herewith a resolution duly adopted by the Board of Sumter County Commissioners in open session.

I certify that the attached resolution specifically applies to the project listed above and request that the provisions of the statute be used to calculate the appropriate permit fee.

Please contact me at the telephone number or letterhead address if you need additional information or clarification of this request.

Very truly yours,

OFFICE OF COUNTY ADMINISTRATOR

BY Bernard Dew
BERNARD DEW
COUNTY ADMINISTRATOR

BD:th

Enclosure

SUMTER COUNTY RESOLUTION

A RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF SUMTER COUNTY, FLORIDA, CERTIFYING A FISCAL HARDSHIP JUSTIFYING A WAIVER OR REDUCTION IN FEES BY FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION AND WATER MANAGEMENT DISTRICTS AND AUTHORIZING COUNTY ADMINISTRATOR BERNARD DEW TO APPLY FOR SUCH WAIVERS AND EXEMPTIONS PURSUANT TO SENATE BILL 1780.

WHEREAS, Sumter County has been at the 10 mil ad valorem limit for several years, and

WHEREAS, the Board has been required to pay various permit fees to Florida Department of Environmental Protection (DEP) and Southwest Florida Water Management District (SWFWMD), which permit fees have presented a fiscal hardship to the Board, and

WHEREAS, the Florida Legislature adopted Senate Bill 1780 which provides for exemptions and waivers of such permit fees to qualified counties and cities, and Sumter County qualifies under Section 1, subsection (4) and possibly other subsections.

NOW, THEREFORE, BE IT RESOLVED by the Board of County Commissioners of Sumter County, Florida, as follows:

1. Sumter County does hereby certify that the cost of permit processing fees from DEP and SWFWMD is a fiscal hardship due to the fact that Sumter County has been at the 10 mil ad valorem cap for the past several years.

2. County Administrator Bernard Dew is hereby authorized to formally apply for waivers and exemptions from such permit processing fees.

2. A copy of this resolution shall be spread among the minutes of this Board and shall be furnished to the DEP, SWFWMD

and such other appropriate authorities and agencies as needed.

DONE and RESOLVED at Bushnell, Sumter County, Florida, this 24th day of May, 1994.

ATTEST: SARA H. MASON
Clerk of Circuit Court

By: Jan Kirkpatrick
Deputy Clerk

BOARD OF COUNTY COMMISSIONERS
OF SUMTER COUNTY, FLORIDA

Jim Allen
Jim Allen - Chair

BOARD OF COUNTY COMMISSIONERS SEAL SUMTER COUNTY BUSHNELL, FL

Sumter County Government

Board of Sumter County Commissioners
209 North Florida Street, Bushnell, Florida 33513 Room 206 **Telephone** (352)793-0200 **Suncom** 665-0200 **FAX** (352)793-0207

December 22, 1996

Ms. Susan Pelz, EI
Department of Environmental Protection
3804 Coconut Palm Drive
Tampa, Florida 33619

RE: Solid Waste Management Facility
Application for a Permit to Construct a Solid Waste Digester for the Production of Compost at the Sumter County Solid Waste Management Facility

The Board of Sumter County Commissioners took action at their meeting of October 18, 1994, to authorize Mr. Garry Breeden, Director of Public Works to execute permit applications as their authorized agent. A copy of the minutes of the Board Meeting are attached for your reference.

If you have any questions or need additional information regarding this matter, please do not hesitate to contact me.

Very truly yours,

OFFICE OF COUNTY ADMINISTRATOR

BY Bernard Dew
BERNARD DEW
COUNTY ADMINISTRATOR

BD:th

APPLICATION FOR A PERMIT TO CONSTRUCT A SOLID WASTE MANAGEMENT FACILITY FOR THE PRODUCTION OF COMPOST

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

DER Form # 17-709.900(1)
Form Title Application for a Permit to Construct/Operate a Solid Waste Management Facility for the Production of Compost
Effective Date November 21, 1988
DER Application No. _____ (Filled in by DER)

Application for a Permit to Construct [X] Operate [ ] A Solid Waste Management Facility for the Production of Compost

General Requirements

Solid Waste Management Facilities for the production of compost shall be permitted pursuant to Section 403.707, Florida Statutes, and in accordance with Rule 17-709, Florida Administrative Code. A minimum of six copies of the application shall be submitted to the Department District Office having jurisdiction over the facility. Complete appropriate sections for the type of facility for which application is made. Entries should be typed or printed in ink. All blanks should be filled in or marked not applicable. The application shall include all information, drawings, and reports necessary to evaluate the facility. Information required to support the application is listed on the attached pages of this form.

Facility Type: [ ] Existing [X] Proposed

Materials Processed: [ ] Yard Trash [ ] Manure [ ] Other Solid Wastes [XX] Other Solid Wastes with Sludge

1. a. Facility Name: Sumter County Solid Waste Management Facility

   b. Facility Location (main entrance): 835 CR 529 Sumterville, Florida; 1 mile East of I-75 on CR 470

   Section 15/22 Township 20 , Range 22 Latitude 28 ° 44 ' 30 " Longitude 82 ° 05 ' 20 "

2. a. Applicant Name (operating authority): Sumter County Department of Public Works

   b. Address: 319 E. Anderson Avenue (Street / PO Box) Bushnell, (City) Florida (State) 33513 (Zip Code)

   c. Contact Person: Garry Breeden (Name) (352) 793-0240 (Telephone Number)

3. a. Authorized Agent/Consultant: Springstead Engineering, Inc. (Name) (352) 787-1414 (Telephone Number)

   b. Address: 727 S. 14th Street (Street / PO Box) Leesburg, (City) Florida (State) 34748 (Zip Code)

   c. Contact Person: David W. Springstead, P.E. (Name) (352) 787-1414 (Telephone Number)

4. a. Landowner (if different than applicant): _____

   b. Address: _____ (Street / PO Box) (City) (State) (Zip Code)

5. Estimated Cost of Construction, Total: $ 1,600,000

6. Anticipated Construction Starting and Completion Dates From: 12/1/96 To: 1/31/97

Northwest District
160 Governmental Center
Pensacola, Florida 32501-5794
904-436-8300

Northeast District
3426 Bills Rd
Jacksonville, Florida 32207
904-798-4200

Central District
3319 Maguire Blvd Suite 232
Orlando, Florida 32803-3767
407-894-7555

Southwest District
4520 Oak Fair Blvd
Tampa, Florida 33610-7347
813-623-5881

South District
2269 Bay St
Fort Myers, Florida 33901-2896
813-332-2667

Southeast District
1900 S Congress Ave Suite A
West Palm Beach, Florida 33406
407-964-9668

DER Form # 17-709.900(1)
Form Title: Application for a Permit to Construct, Operate or Modify a Solid Waste Main Fac. for the Prod. of Compost
Effective Date: November 21, 1988
DER Application No. _____ (Filled in by DER)

Required Attachments for Construction/Operation Permit for a Solid Waste Management Facility Producing Compost

General

Permit application and supporting information shall include the following (17-709.310(2), F.A.C.):

	Completeness Check
1. A letter of transmittal to the Department;	X
2. A table of contents listing the main section of the application	X
3. The permit fee specified in Florida Administrative Code Rule 17-4.05 in check or money order payable to the Department;	X
4. Six copies, at minimum, of the completed application form, all supporting data, and reports;	X
5. Engineer seal;	X
6. Engineer's letter of appointment if applicable;	X
7. Copy of any lease agreement, or any other agreement between operator and property owner by which the closing of the facility may be affected; and	X
8. Proof of publication of notice of application for the proposed activity in a newspaper of general circulation.	

Specific Attachment Item

The following information items must be included in the application. Please explain if they are not applicable.

NOTE: For facilities that have been satisfactorily constructed in accordance with their construction permit, the information required does not have to be resubmitted for an operation permit if the information has not changed during the construction period.

1. **Facility Design** (17-709.500, F.A.C.): X

NOTE: All maps, plan sheets, drawings, or aerial photographs shall be legible; be signed and sealed by the registered professional engineer responsible for their preparation; be of appropriate scale to show clearly all required details; be numbered, referenced to narrative, titled, have a legend of symbols used, contain horizontal and vertical scales (where applicable), and specify drafting or origination dates; and use uniform scales as much as possible, contain a north arrow, and use NGVD for all elevations.

a. A map or aerial photograph of the area, no more than 1 year old, unless not substantially changed from older map or photograph, showing land use and zoning within 1 mile of the facility. (17-709.500(2)(a), F.A.C.) X

b. Site Plan (17-709.500(2)(b), F.A.C.) X

NOTE: The site plan shall be on a scale not greater than 200 feet to the inch showing the following:

(1) Dimensions of the site X

(2) Plan for receiving, processing, production, curing (if any) and storage areas X

(3) Fencing or other measures to restrict access X

c. Topographic Maps (17-709.500(2)(c), F.A.C.) X

NOTE: The topographic maps, which may be combined with the plot plan (item 1b), on a scale not greater than 200 feet to the inch showing the following:

(1) Five foot contour intervals X

(2) Access roads X

(3) Grades required for proper drainage X

(4) Special drainage devices X

(5) Other pertinent information based on intended use of facility X

d. Report (17-709.500(2)(d), F.A.C.) X

(1) Designed capacity of the proposed facility X

(2) Anticipated type and source of solid waste X

(3) Any additives to be used in the production of compost X

DER Form # 17-709.900(1)
Form Title: Application for a Permit to Construct, Operate or Modify a Solid Waste Management Facility for the Production of Compost
Effective Date: November 21, 1988
DER Application No. _____ (Filled in by DER)

Completeness Check

2. **Facility Performance and Design Standards** (17-709.500, F.A.C.)
   - a. Support for operation (17-709.500(1), F.A.C.) [X]
     - (1) Material type (soil, synthetic, other) [X]
     - (2) Adequate base support [X]
   - b. Leachate control and removal system performance (17-709.500(6), F.A.C.) [X]
     - (1) Construction materials [X]
     - (2) Strength and thickness [X]
     - (3) Measures to prevent clogging [X]
     - (4) Central collection point for reuse, or treatment and disposal [X]
     - (5) Equivalency to design standards [X]
   - c. Stormwater management system performance (17-709.500(3), F.A.C.) [X]
     - (1) Prevention of surface water flowing onto receiving, processing, and curing (if any) areas [X]
     - (2) Stormwater run-off controls; retention, detention ponds [X]
     - (3) Equivalency to design standards [X]
     - (4) Design to minimize ponding of solid waste, composting material and finished compost [X]
     - (5) Water management district approval [X]

3. **Operational Features and Appurtenances** (17-709.500(4), F.A.C.) [X]
   - a. Effective barrier [X]
   - b. All weather access road [X]
   - c. Signs indicating name of operating authority, traffic flow, hours of operation, contact in cases of emergencies and charges (if any) [X]
   - d. Scales [X]
   - e. Dust control method [X]
   - f. Litter control devices (if needed) [X]
   - g. Fire protection and control provisions [X]
   - h. Odor control devices, methods or practices [X]

4. **Additional Operation Criteria** (17-709.510(c), F.A.C.) [X]
   - a. Attendant [X]
   - b. Communication devices [X]

5. **Operations Plan** (17-709.500(5), F.A.C.) [X]
   - a. Designation of responsible person(s) [X]
   - b. Proposed equipment [X]
   - c. Contingency operations [X]
   - d. Controlling the type of waste received at the site; [X]
   - e. Weighing incoming waste [X]
   - f. Vehicle traffic control and unloading [X]
   - g. Method and sequence of processing the waste [X]
   - h. Operations of leachate, and stormwater controls [X]
   - i. Designation of backup disposal site(s) [X]

6. **Water Quality Standards** (17-709.500(3) & (6)(c), F.A.C.) [X]
   Describe how surface runoff and leachate will be handled to meet water quality standards of Florida Administrative Code Rules 17-3 and 17-4

7. **Compost Facility Data Form** [X]

8. **Certification by Applicant and Engineer or Public Officer** [X]

DER Form # 17-708.900(1)
Form Title: Application for a Permit to Construct, Operate or Modify a Solid Waste Management Facility
Effective Date: November 21, 1988
DER Application No. _____ (Filled in by DER)

Compost Facility Data Form

Permit No.: SC60-132071 Issue Date: 12/16/92 Expires: 11/1/97

Facility No. (DER Identification): 4060C00092

DER Action: ☐ Add ☐ Delete ☐ Change ☐ Deactivate Site ☒ Other Modify

1. County: Sumter	2. Facility Name: Sumter County Solid Waste Management Facility
3. Date Form Completed: 7/31/96	4. Facility Address: 835 CR 529 Sumterville, Florida
4a. Facility Phone Number: (352) 793-3368	4b. Facility Site Supervisor: Mr. Terry Hurst

5. Facility Type
☒ Composting ☐ In-vessel ☐ Static Pile ☐ Windrow ☐ Other. Describe _____

6. Month/Year Begun: 10/88	7. Area within Site Boundary: 120 Acres	8. Area within Property Boundary: 120 Acres
9. Security to Prevent Unauthorized Use: ☒ Yes ☐ No		10. Weighing Scales: ☒ Yes ☐ No
11. Waste Processed Per Operational Day: 60 tons		
12. Maximum Processing Rate: 100 tons/day		
13. Charge/ton: 49.00	14. Days Operated: S M T W T F S	15. Hours/Day Operated: 8

16. Types of Waste Received
☒ Residential ☒ Commercial ☒ Industrial ☐ Agricultural ☐ Septic Tank ☐ Sludge ☒ Yard Trash ☐ Sewage Sludge
☒ Other Institutional

17. Leachate Recycled: ☒ Yes ☐ No	17a. Treatment Method Used: Recirculation
17b. Discharges to: ☐ Surface Waters ☐ Underground N/A	17c. Class Receiving Water: N/A
18. Final Residue is: 30 % of waste intake	18a. Residue is disposed of at (site name): Lake County Incinerator

19. Surface Runoff Collected: ☒ Yes ☐ No	19a. Type of Runoff Treatment: Dry Retention	19b. Class of Receiving Waters: G-II
20. Number of Staff: 20±	21. Attendant: ☒ Yes ☐ No	

22. Name and Title of Person Completing Form: David W. Springstead, P.E.

Note: All blanks for the numbered items must be filled or marked as not applicable.

DER Form # 17-709.900(1)
Form Title App for a Permit to Construct, Operate & Solid Waste Man Fac for the Prod of Compost
Effective Date November 21, 1989
DER Application No _____ (Filled in by DER)

Certification by Applicant and Engineer or Public Officer

A. Applicant

The undersigned applicant or authorized representative of the Sumter County Board of County Commissioners is aware that statements made in this form and attached information are an application for a Solid Waste Management Facility for the production of compost Permit from the Florida Department of Environmental Regulation and certifies that the information in this application is true, correct and complete to the best of his knowledge and belief. Further, the undersigned agrees to comply with the provisions of Chapter 403, Florida Statutes, and all rules and regulations of the Department. It is understood that the Permit is not transferable, and, the Department will be notified prior to the sale or legal transfer of the permitted facility.

Signature of Applicant or Agent

Garry Breeden, Director of Public Works
Name and Title

Date: _____

Attach letter of authorization if agent is not a governmental official, owner, or corporate officer.

B. Professional Engineer Registered in Florida or Public Officer as Required in Section 403.707 and 403.7075, Florida Statutes

This is to certify that the engineering features of this solid waste management facility have been designed/examined by me and found to conform to engineering principals applicable to such facilities. In my professional judgement, this facility, when properly maintained and operated, will comply with all applicable statutes of the State of Florida and rules of the Department. It is agreed that the undersigned will provide the applicant with a set of instructions of proper maintenance and operation of the facility.

Signature

David W. Springstead, P.E.
Name and Title (please type)

Florida Registration No. 48229

(please affix seal)

727 S. 14th Street
Mailing Address

Leesburg, Florida 34748
City, State, Zip Code

Telephone No. (352) 787-1414

Date: 12/20/96

Construction Cost Estimate: _____

Permit Number: _____ Issue Date: _____

Review Date: _____ Expiration Date: _____

REPORT

1.0 INTRODUCTION AND SCOPE

Purpose

This document has been prepared under the direction of the Sumter County Board of County Commissioners - Department of Public Works for the purpose of submitting an application to the Florida Department of Environmental Protection (FDEP) to permit the construction of equipment to enhance the composting operation at the Sumter County Solid Waste Management Facility (SCSWMF).

This permit application is being submitted as the second of three phases of the new materials recovery/composting facility being designed and constructed for facility expansion.

Site Location

The subject facility is located at 835 CR 529, Sumterville, Sumter County, Florida (Sections 15 and 22, Township 20 South, Range 22 East) which is south of County Road 470 and approximately 1 mile east of Interstate Highway 75. The general site location is shown on the Site Location Map presented in Figure 1.

Site History

This solid waste facility site was originally permitted by FDER as a Class I landfill in 1975. As the landfill began to reach capacity and the State of Florida passed laws requiring recycling, the officials of Sumter County realized the need for a different approach to the County's methods of treatment of solid waste.

After reviewing the options which were available at the time for treating solid waste, Sumter County chose the process of MSW composting to provide solid waste management along with extensive resource recovery to separate and retrieve recyclables. It was the County's intent to plan for the future by establishing environmentally acceptable and economically feasible methods to process solid waste. As the site Class-I landfill was being closed, the County constructed one of the first resource recovery/MSW solid waste composting facilities in the state. Sumter County began composting Class I

solid waste in 1988. Since beginning operation, this facility has provided continuous processing of solid waste by recovering recyclables, composting, and ultimately disposing of inert solid waste at FDEP approved facilities. Additional composting pad space, process areas and processing equipment were systematically added to streamline the resource/recovery and composting process.

In 1993, Sumter County purchased 80 acres of property, 40 acres to the north and 40 acres to the south, adjacent to the existing solid waste facility for expansion. A new materials recovery facility was permitted and constructed as the phase I portion of the planned recovery/composting facility construction. This permit application is for the construction of a digester which will reduce the incoming volume of material to be composted, accelerate the composting process, provide the required pathogen destruction and generate an improved mixture of compost.

Current Facility Status

General

The Sumter County Solid Waste Management Facility is the only public collection center for solid waste in the county. The site is centrally located in Sumterville to provide convenient access to all residents of the county. The facility is open six days a week (Monday through Saturday) between the hours of 7:00 AM and 4:00 PM. Operation and maintenance of the facility is provided by Sumter County. The facility director is Mr. Terry Hurst.

Operations

The operational process at the facility generally consists of dropping off clean recyclables prior to crossing the scale, being weighed, and proceeding to the materials recovery facility tipping floor. Material tipped in the building is observed for large and bulky items which are removed. The material is then pushed into a hopper and on to a belt conveyor. The material then passes by

sorting stations where corrugated cardboard and other bulky items are removed. The material then passes through a bag breaker where plastic garbage bags are torn open and the contents of the bags and the rest of the material fall onto another conveyor. The material passes by sorting station pickers who remove film plastic and then passes under a belt magnet which removes ferrous articles. The material then passes over a disc-screen where material less than 2 inches in size drops through and lands on another belt conveyor which leads to the end of the sorting line. The material passing over the disc-screen proceeds to a conveyor where sorting station pickers remove recyclables. At the end of the sorting conveyor, all of the material passes over magnetic head-pulleys to remove any remaining ferrous. The material is combined and then passes through an eddy-current separator to remove aluminum. The remaining material passes to a conveyor which leads to the proposed digester ram-pit to load the digester. This permit encompasses construction of the digester from the ram-pit in-feed to the discharge of material at the end of the digester. The material will spend a minimum of 72 hours in the digester. After the compost is discharged from the digester, the compost will be placed into windrows in the finish building, which is the Phase III portion of the recovery/composting facility.

Recyclables in the waste stream including metals, plastics, glass, used oil, tires, batteries, and other items are segregated and placed in areas designated for each item. The recyclables are sold to vendors then removed from the site.

Construction and Demolition (C&D) debris is generally not received at the site. Any C&D which is received is segregated, loaded and hauled to an FDEP approved disposal site.

Hazardous waste is not accepted at the facility.

Currently all material received at the facility is placed on the tipping floor, loaded and hauled to an FDEP approved disposal facility. The three existing site composting pads are not in use.

The design of this facility is based on processing 100 tons of solid waste per day in an 8-hour shift.

Waste Components

Based on past operational information from the facility, approximately 70% of the solid waste which enters the facility is eventually recycled. Of this 70%, approximately 10% of the incoming material is sorted and sold directly to recycling companies and approximately 60% is composted and sold. The remaining 30% is hauled to an approved FDEP facility for disposal. These percentages should increase upon completion of the recycling/composting facility.

The facility also has a lined emergency storage cell. The cell is empty at this time.

Permit Application

A permit application is being submitted to FDEP to construct proposed composting facilities. This permit application is for construction of a new solid waste digester and appurtenant structures to facilitate the digester. The application for construction is presented in Appendix A with specific attachment items. The necessary permit information is presented in this report. The numbered information presented in the report corresponds to the question number designated in the permit application. The permit application includes the proposed digester only. The Phase I portion of the project has been completed and an additional application will be submitted for the Phase III portion of the project which is currently under design.

2.0 SPECIFIC ATTACHMENT ITEMS

1. FACILITY DESIGN

   a. Zoning Map

   A recently revised map of the area showing use and zoning within one (1) mile of facility is presented in Figure 3.

b. **Site Plan**

A site plan of the existing facility is presented in Figure 2 and shows the following:

(1) Dimensions of site;

(2) Plan for receiving, processing, production curing and storage areas;

(3) Fencing or other measures to restrict access.

c. **Topographic maps**

A topographic map prepared from a recent aerial photograph was prepared and is enclosed in the accompanying set of drawings. The topographic map shows the following:

(1) One (1) foot contour intervals;

(2) Access roads;

(3) Grades required for proper drainage;

(4) Special drainage devices;

(5) Other pertinent information based on intended use of the facility.

d. **Report**

(1) **Design capacity of the facility**

The design capacity of the facility is one hundred (100) tons per day.

(2) **Anticipated type and source of solid waste**

Sumter County contracted with TIA Solid Waste Management Consultants to conduct a study of the composition of the county's municipal solid waste. The results of the study were submitted to the Sumter County Board of County Commissioners in a report titled **Sumter County Waste Composition Study - January 1991**

Table 3-5 of the above report identified the types and percentages of waste as follows:

1.	Newsprint	7.9

2.	Fine Paper	4.2
3.	Misc. Paper	9.0
4.	Corrugated	8.7
5.	Plastic Film	4.4
6.	Plastic (PET)	0.8
7.	Plastic (HDPE)	0.5
8.	Plastic (BOT)	1.4
9.	Plastic (Other)	3.8
10.	Textiles	1.5
11.	Yard Waste	13.8
12.	Food Waste	5.4
13.	Wood Lumber	0.5
14.	Glass	4.1
15.	Rubber	0.4
16.	Steel Cans	3.1
17.	Other Ferrous	0.5
18.	Non-Ferrous (Aluminum)	0.5
19.	OBW	0.0
20.	Construction	15.6
21.	Sweepings	0.0
22.	Other	14.0

Also, footnote 3 in Table 3-5 indicate the source of waste as follows:

1.	Residential	54%
2.	Commercial / Industrial	43%
3.	Institutional	3%

(3) **Any additives to be used in the composting process**

Domestic waste biosolids may be used in the production of compost. Moisture control will be provided by leachate from the MRF building lift-station and separately contained biosolids. Any make-up water needed to provide moisture

control will come from the site water system which is also currently under construction.

2. FACILITY PERFORMANCE AND DESIGN STANDARDS

a. Support for Operation

(1) Material Type (soil, synthetic, other)

The existing MRF building floor is constructed of concrete. The composting digester will be supported on individual spread footings. Roadways and parking drive areas are constructed of recycled asphaltic pavement (RAP) placed on a compacted subgrade.

(2) Adequate base support

The native soil materials beneath the proposed composting pad, screening building and roadways will provide an adequate base support. The geotechnical soil evaluation performed for the site is attached.

b. Leachate control and removal system performance

As the entire proposed composting process is under roof, no generation of leachate other than from the material as it enters the facility is anticipated. All leachate generated will be used for moisture control in the digester composting process. No excess leachate volume is anticipated.

c. Stormwater management system performance

(1) Prevention of surface water flowing into receiving, processing and curing areas

The ground around the base of the MRF building slopes away from the building to prevent stormwater runoff from entering the building. The digester is an elevated steel tube which does not allow any surface water contact with the material being processed.

(2) **Stormwater run-off control; retention, detention ponds**
No stormwater run-off will be generated due to the construction of the digester. The site stormwater management system has been permitted by the Southwest Florida Water Management District (SWFWMD).

(3) **Equivalency to design standards**
The stormwater management system for the facility meets the requirements of SWFWMD.

(4) **Design to minimize ponding of solid waste, composting material and finished product**
The surface of the processing areas are sloped such that any water on the floor of the building will drain to the catch basin and flow to the lift station.

(5) **Water management district approval**
An Environmental Resources Permit has been obtained from SWFWMD. A modification will be applied for prior to construction of the Phase III portion of the project.

3. OPERATIONAL FEATURES AND APPURTENANCES

a. **Effective barrier**
The entire solid waste complex is surrounded by fencing, with entry being controlled by locking gates.

b. **All weather access road**
Roads that provide access between public roads or highways and the Sumter County Landfill are maintained so as to be passable in ordinary inclement weather. The west access road between CR 470 and the proposed buildings is paved with asphaltic concrete. The east access road between CR 470 and the proposed buildings is paved with RAP.

c. **Signs indicating name of operating authority, traffic flow, hours of operation, contact in cases of emergencies and charges (if any)**
A sign indicating the name of the facility and operator is located on CR 470. Numerous instructional signs pertaining to traffic flow are

erected at the facility. Signs specifying rates and acceptable wastes are visible to patrons approaching the scales. Signs are posted directing traffic back to the scales after depositing waste and out of the facility. Signs are posted indicating the hours of daily operation, indicating that the facility is closed on Sundays, that solid waste transported from outside Sumter County is not permitted and that Hazardous materials are not accepted.

d. **Scales**

State approved weigh scales are provided at the entrance to the solid waste complex. Measurement of all material received at the facility provides data for planning, forecasting and a basis for establishment of fees.

e. **Dust control method**

As the digester is completely enclosed and the material is at approximately 50 moisture content, dust control measures are not anticipated to be needed.

f. **Litter control devices**

Litter will be controlled by cleaning the processing building at the end of the day. Fences around the perimeter of the building will prevent litter from blowing out. Litter is regularly picked-up around the facility.

g. **Fire protection and control provisions**

Suitable measures will be taken to prevent and control fires. A well for potable and fire supply has been permitted through SWFWMD and constructed. The water treatment system is currently being designed and will be permitted shortly. Fire hydrants will be located around the new and the existing facility. A FDEP dry-line permit has been received for construction of the lines. Suitable fire extinguishers, maintained in working order, are located at several locations around the facility. The Lake Panasoffkee Fire Department is located approximately three (3) miles from the site.

h. **Odor control devices, methods or practices**

Odor control will be provided by the use of a scrubber and a biofilter which collects the air from the in-feed area of the conveyor. The body of the digester is not open to the atmosphere.

4. ADDITIONAL OPERATIONAL CRITERIA

a. **Attendant**

An attendant is on duty during all operating hours at the scale house. The facility director is also on duty at the facility during all hours of operation. Tipping floor personnel are on duty during operating hours to help with unloading operations and inspect the solid waste stream.

b. **Communication devices**

Communication is provided at the facility by telephones, two-way radios, direct voice communication and hand signals.

5. OPERATIONS PLAN

a. **Designation of responsible persons**

Mr. Garry Breeden
Sumter County Director of Public Works
222 East McCollum Avenue
Bushnell, Florida 33513

b. **Proposed equipment**

The proposed equipment will include a solid waste digester to provide maceration, volume reduction, and composting of the organic portion of the material stream. Plans from the manufacturer showing the digester equipment are attached.

c. **Contingency operations**

The operation contingency for the composting process is to load and haul the organic portion of the material to an FDEP permitted disposal facility.

d. **Controlling the type of waste received at the site**

Incoming solid waste is inspected at four check points as follows:

1. The attendant at the scale house looks at all incoming waste loads. The scale house attendant takes the following actions in the event that non-acceptable waste is identified:
   a. Tells the person hauling the waste that the waste is not acceptable and cannot be disposed of at this facility;
   b. Insures that the non-acceptable waste leaves the facility with the hauler.
2. Tipping floor personal are notified by the scale house attendant of the presence of non-acceptable waste. The notified personnel will observe the dumping of the load and insure that the non-acceptable waste is not tipped. Tipping floor personnel will insure that the non-acceptable waste is on the vehicle when it leaves the tipping floor and insure that the vehicle proceeds directly to the scale house.
3. The scale house attendant will insure that the non-acceptable waste is on the vehicle when it leaves the site.
4. The attendant responsible for inspecting solid waste as it is placed on the processing conveyor belt will visually inspect for non-acceptable waste. If the source of the non-acceptable waste can be identified, responsible parties will be notified and required to remove the non-acceptable waste from the facility. If the source of the non-acceptable waste cannot be identified, it will be separated from the normal material stream. Sumter County will contract with a commercial enterprise to provide pickup and removal of any non-acceptable waste within 72 hours or

transport the material to a disposal facility which is permitted for acceptance of the non-acceptable waste.

e. **Weighing incoming waste**

Provisions exist for weighing the solid waste delivered to the facility for processing. State certified scales are located at the scalehouse. The only materials which are not weighed when entering the site are clean recyclables which can be dropped off prior to weighing. Measurement of all material received at the facility provides data for planning, forecasting and a basis for establishment of fees.

f. **Vehicle traffic control and unloading**

Signs direct commercial and non-commercial patrons to the proper entrances to the facility. Signs are posted directing commercial haulers to the commercial tipping floor and individuals to the area of the tipping floor for people hauling their own material. Signs are also posted directing haulers of construction debris, white goods and tree stumps to the proper off-loading location. Assistance is provided for unloading as part of the ongoing inspection of the material being introduced to the facility.

g. **Method and sequence of processing waste**

The process at the facility consists of dropping off clean recyclables prior to crossing the scale, weighing, and proceeding to the materials recovery facility tipping floor (commercial separated from individual). Material tipped in the building is observed for non-acceptable material. The large and bulky items are removed. The material is then pushed into on to a belt conveyor. The material passes by sorting stations where corrugated cardboard and other bulky items are removed. The material then passes through a bag breaker where plastic garbage bags are torn open and the material passes to another conveyor. The material passes by sorting station pickers who remove the film plastic and then passes under a belt magnet which removes ferrous objects. The material then passes over a disc-screen where material less than 2-inches in size passes

through to a lower conveyor leading to the end of the sorting line. The material passing over the disc-screen proceeds to a conveyor where sorting station pickers remove recyclables. At the end of the sorting conveyor, all of the material passes over magnetic head-pulleys to remove any remaining ferrous. The material from the upper (sorting) conveyor and lower conveyor is combined and then passed through an eddy-current separator to remove aluminum. The remaining material passes to a conveyor which leads to the proposed digester ram-pit to load the digester. Moisture will be added to the material as it is placed in the digester to achieve optimum decomposition. The material will spend a minimum of 72 hours in the digester. After the compost is discharged from the digester, the compost will be placed into windrows in the finish building, which is the Phase III portion of the recovery/composting facility. The material will be further composted until it is mature. The compost is screened to remove foreign matter. The compost is then placed in piles, tested, typed and sold. The foreign matter is disposed of at an FDEP approved disposal facility.

Recovered materials from the sorting lines are baled and stored in the old materials recovery building until sold.

h. **Operations of leachate and stormwater controls**
No leachate is generated during the digester composting process. Any leachate generated in the materials recovery building will be added to the digester as compost moisture control.

i. **Designation of backup disposal site(s)**
Backup disposal sites include, but are not limited to, the Lake County Incinerator, located 12 miles east of the site in Okahumpka, Florida.

6. WATER QUALITY STANDARDS

Surface stormwater runoff will be directed to stormwater retention ponds which will provide treatment as required by the SWFWMD permit. As the entire proposed process is under roof, no generation of leachate other than from the material is anticipated. All leachate generated will be used in the digester composting process. No excess leachate volume is anticipated.

7. COMPOST FACILITY DATA FORM

Completed Facility Data Form is page 4 of 5 of the application for permit.

8. CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICIAL

Certifications by Applicant and Engineer or Public Officer is page 5 of 5 of the application for permit.

3.0 DETAILED OPERATIONAL PLAN FOR NEW FACILITIES

The operation consists of dropping off clean recyclables prior to crossing the scale, weighing, and proceeding to the materials recovery facility tipping floor (commercial separated from individual). Material tipped in the building is observed for non-acceptable material. The large and bulky items are removed. The material is then pushed into on to a belt conveyor. The material passes by sorting stations where corrugated cardboard and other bulky items are removed. The material then passes through a bag breaker where plastic garbage bags are torn open and the material passes to another conveyor. The material passes by sorting station pickers who remove the film plastic and then passes under a belt magnet which removes ferrous objects. The material then passes over a disc-screen where material less than 2-inches in size passes through to a lower conveyor leading to the end of the sorting line. The material passing over the disc-screen proceeds to a conveyor where sorting station pickers remove recyclables. At the end of the sorting conveyor, all of the material passes over magnetic head-pulleys to remove any remaining ferrous. The material from the upper (sorting) conveyor and lower conveyor is combined and then passed through an eddy-current separator to remove aluminum. The remaining material passes to a conveyor which leads to the proposed digester ram-pit to load the digester. Moisture will be added to the material as it is placed in the digester to achieve optimum decomposition. The material will spend a

minimum of 72 hours in the digester. After the compost is discharged from the digester, the compost will be placed into windrows in the finish building, which is the Phase III portion of the recovery/composting facility. The material will be further composted until it is mature. The compost is screened to remove foreign matter. The compost is then placed in piles, tested, typed and sold. The foreign matter is disposed of at an FDEP approved disposal facility.

Recovered materials from the sorting lines are baled and stored in the old materials recovery building until sold.

All material will be composted to meet the FDEP requirements for disinfection and all other requirements as stated in FDEP Regulation 62-709.

Records of compost distribution will be maintained in the facility office at the scale house.

4.0 MODIFICATION OF GROUNDWATER MONITORING PLAN

The proposed construction is located outside of the monitoring wells currently in use in the groundwater monitoring plan for the closed landfill. The following discussion presents Springstead Engineering, Inc.'s evaluation of the site and the groundwater monitoring plan.

Based on the passed groundwater data, the general direction of groundwater flow to the north and northwest.

The composting at the facility will occur in a closed environment. The proposed facility not being exposed to the weather has very little potential to generate leachate. It is our opinion that the existing groundwater monitoring program is sufficient for detecting parameter data which might result from the composting process. As discussed in Section 2.0, leachate from the material being tipped or processed in the MRF building will be collected and placed into the digester for moisture control.

Due to the nature of the proposed construction, it is our opinion that additional monitoring locations are not necessary at the facility.

SUBSURFACE EXPLORATION

AT

SOUTH 40 ACRE PARCEL
SUMTER COUNTY SOLID WASTE
MANAGEMENT FACILITY
SUMTERVILLE, SUMTER COUNTY, FLORIDA

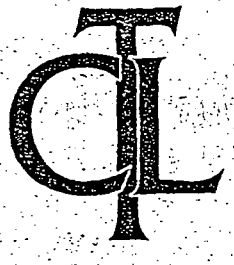
SUBSURFACE EXPLORATION

AT

SOUTH 40 ACRE PARCEL
SUMTER COUNTY SOLID WASTE
MANAGEMENT FACILITY
SUMTERVILLE, SUMTER COUNTY, FLORIDA

FOR

SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS
DEPARTMENT OF PUBLIC WORKS



CENTRAL TESTING LABORATORY
LEESBURG, FLORIDA

DECEMBER 15, 1994
92-1100.003

Central Testing Laboratory

Engineering and Materials Testing

Reply to:
Leesburg

December 15, 1994

Sumter County Board of County Commissioners
Department of Public Works
222 E. McCollum Avenue
Bushnell, Florida 33513

Attn: Mr. Garry Breeden, Director

RE: Subsurface Soil Exploration
South 40-Acre Parcel
Sumter County Solid Waste Management Facility
Sumterville, Sumter County, Florida
Job. No 92-1100.003

Dear Mr. Breeden:

Central Testing Laboratory (CTL) has completed a subsurface soil exploration for the above referenced project. The purposes of performing this exploration were to explore and evaluate the general subsurface conditions within the site. This report documents CTL's findings and presents our engineering recommendations.

Site Location and Proposed Construction

The subject site is located ½ mile south of County Road 470 approximately 1 mile east of the intersection of CR 470 and Interstate Highway I-75 (Section 22, Township 20 South, Range 22 East) in Sumterville, Sumter County, Florida. The general site location is shown on the 1958 Bushnell, Florida, USGS Quadrangle Map and is presented in Figure 1.

It is CTL's understanding that the proposed development for the site consists of a covered composting pad building and screening building for processing the compost along with additional features including paved parking/drive areas and stormwater retention areas.

The subject site has been cleared and the soil materials have been removed from the site to an approximate elevation of 71.5 feet NGVD since performance of the field exploration borings.

Review of Soil Survey Maps

Based on the 1988 Soil Survey for Sumter County, Florida as prepared by the U.S. Department of Agriculture, Soil Conservation Service, the predominate soil types at the site are identified as the "Astatula fine sand, 0 to 8 percent slopes" soil series, the "Astatula fine sand, rolling" soil series and the "Apopka fine sand, 0 to 5 percent slopes" soil series.

The "Astatula fine sand" soil series consists of fine sands and slightly silty fine sands to a depth of 80 inches. The internal drainage of the "Astatula fine sand" is characterized as being excessively drained and the soil permeability is greater than 20 inches per hour. According to the Soil Survey, the seasonal high water table for the "Astatula fine sand" is typically greater than 6 feet below the natural ground surface.

The "Apopka fine sand" soil series consists of fine sands and slightly silty fine sands to a depth of 54 inches underlain by a clayey fine sand to a depth of 80 inches. The internal drainage of the "Apopka fine sand" is characterized as being well drained and the soil permeability is from 6 to 20 inches per hour for the fine sands and slightly silty fine sands and from 0.6 to 2.0 inches per hour for the clayey fine sands. According to the Soil Survey, the seasonal high water table for the "Apopka fine sand" is typically greater than 6 feet below the natural ground surface.

Site Geology

The geology of the site may be described as a layer of clastic material (sand, silt and clay) overlying carbonates (limestone and dolomite). The thickness of the clastic layer is probably from between 30 to 80 feet thick. The limestone is several thousand feet thick. The upper, more recently deposited limestones make up the Floridan Aquifer. The thickness of the Floridan Aquifer probably nears 1500 feet in this area. The limestone formations beneath the site listed from youngest to oldest are:

The Ocala Group of the Late Eocene Epoch dated approximately 38 million years old. The Ocala Group is made up of the Crystal River Formation and the Williston Formation. Some sources also include the Inglis Formation.

The Avon Park Limestone of the middle Eocene Epoch dated approximately 41 to 48 million years old.

The Oldsmar Limestone of the Middle and Early Eocene Epoch dated approximately 48 to 53 million years old.

The Cedar Keys Formation of the Late Paleocene Epoch and the Early Eocene Epoch dated approximately 53 to 60 million years old.

The Oldsmar Limestone and the Cedar Keys Formation are not considered to be a part of the Floridan Aquifer. Some sources include the Lake City Limestone as part of the Floridan Aquifer, placed between the Avon Park Limestone and the Oldsmar Limestone.

References used in the geology section are:

Column No. 30, Gulf Coast Regional Chart, Correlation of Stratigraphic Units of North America (COSUNA) American Association of Petroleum Geologists.

Geologic Highway Map of the Southeast Region, American Association of Petroleum Geologists and the United States Geological Survey.

Hydrology of Lake Panasoffkee, Sumter County, Florida, United States Geological Survey, Water Resources Investigation No. 77-88.

Site Hydrogeology

It appears that no surficial aquifer is present beneath the site. The subject site is directly underlain by the Floridan Aquifer consisting of the Ocala Group and Avon Park Group of limestones. Due to the relatively thin layers of overlying deposits, the potentiometric surface of the upper Floridan Aquifer is above the top of the aquifer in this area. In addition, the potential exists for temporary perched water tables on top of impermeable clay layers present above the potentiometric surface. Due to the relatively thin overlying deposits, the site is thought to have moderate capabilities to recharge the Floridan Aquifer by local rainfall.

The subject site is located in the eastern edge of the Tsala Apopka Plain physiographic element. This element is characterized as a low-lying terrain from which moderate surface runoff occurs. The land surface is poorly to moderately well drained and the potentiometric surface of the upper Floridan Aquifer is generally close to the land surface.

References used in the hydrology section are:

Water-Resources Information for the Withlacoochee River Region, West Central Florida, United States Geological Survey, Water-Resources Investigations 81-11.

Reconnaissance of Geohydrologic Areas and 1981 Low-Flow Conditions, Withlacoochee River Basin, Southwest Florida Water Management District, United States Geological Survey, Water-Resources Investigations Report 86-4203.

Field Exploration Program

The field exploration program consisted of performing 5 Standard Penetration Test (SPT) borings. The locations of these borings are illustrated on the Boring Location Plan presented in Figure 2. The boring locations were determined in the field based on measurements using a cloth tape from the approximate location of the property lines. The locations should be considered accurate only to the degree implied by the method of measurement used.

The SPT borings were performed at selected locations on the site. The borings were advanced to depths ranging from 35 to 70 feet below the ground surface using the methodology outlined in ASTM D-1586. This field procedure is outlined in the method summary presented in Appendix I.

Samples recovered during performance of the SPT borings were visually classified in the field and representative portions of the samples were placed in containers and transported to our laboratory for further analysis.

The groundwater level at each of the boring locations was measured upon completion of drilling to document the water table conditions at the site.

All of the borings were grouted to the ground surface with neat cement grout at the completion of drilling.

Laboratory Testing Program

Soil samples from the borings were classified in the field and transported to the laboratory for further testing and classification. The soil samples were visually classified in general accordance with the Unified Soil Classification System (ASTM D-2488) with the soil colors being determined from the Munsell Soil Color Chart. The resulting soil descriptions are shown on the soil boring profiles presented in Appendix II.

Results of Field Exploration

The results of the field exploration are graphically shown on the soil boring logs presented in Appendix II. These profiles represent CTL's interpretation of the field boring logs and the results of the laboratory analysis of the recovered samples. The

stratification lines represent the approximate boundary between soil types. The actual change may be more gradual than suggested.

The results of the borings indicate that the general soil profile is as follows:

Elevation	Description
100-55	Loose to medium dense fine sands and slightly silty fine sands
55-45	Medium dense clayey fine sands and clays
45-	Loose to very dense limerock

Limerock was not encountered in Boring B-4 to an Elevation of 23 feet NGVD where the boring was terminated.

The above soil profile is outlined in general terms only. Please refer to the boring logs in Appendix III for soil profile details.

The borings were allowed to remain open on the date drilled to determine the level of the groundwater. The groundwater was encountered in the borings at elevations ranging from 42.5 to 45.0 NGVD at the time of drilling.

Changes in groundwater levels should be expected throughout the year due to seasonal differences in rainfall and other factors that may vary from the time the borings were conducted.

Typical Seasonal High Water Table

The typical seasonal high water table each year is the water level in the August-September period at the end of the rainy season. The seasonal high water table is affected by a number of factors. The drainage characteristics of the soils, the land surface elevation, the presence and distance to relief points such as lakes, rivers, swamp areas, etc., are some important factors which have an influence on the seasonal high water table.

Based on CTL's interpretation of the site conditions using our boring logs, it is anticipated that the seasonal high water table in the retention pond area will be at a depth of greater than 6 feet below the existing ground surface (below elevation 65.5 feet NGVD).

Evaluations and Recommendations

The results of CTL's exploration indicate that, with proper site preparation as recommended in this report, the existing soils are suitable for supporting the proposed structures on conventional shallow foundations such as spread footings or thickened edge slabs.

Recommendations for foundation site preparation which in CTL's opinion are best suited for the proposed facility and existing soil conditions are presented below. The recommendations are made as a guide for the design engineer and/or architect. Parts of these recommendations should be incorporated into the project's specifications.

Recommended Site Preparation

Stripping and Grubbing

Based on a visual observation of the site, the proposed construction areas have been previously stripped and grubbed.

Proof-rolling

Proof-rolling is recommended to: (1) locate any soft areas or unsuitable surface or near surface soils, (2) to increase the density of the soils within the top 3 to 4 feet, and (3) to prepare the existing surface for the addition of fill soils (if required). Proof-rolling of the building and parking/drive areas should consist of at least 10 passes of a self-propelled vibratory compactor capable of delivering a minimum impact force of 30,000 to 35,000 pounds per drum to the soil. Each pass of the compactor should overlap the preceding pass by 30 percent to insure complete coverage. If deemed necessary, in areas that continue to "yield", remove all deleterious material and replace with a clean, compacted sand backfill. The proof-rolling should occur after cutting and before filling.

The proof-rolling should produce a density equivalent to 95% of the modified Proctor (ASTM D-1557) maximum dry density value for a depth of 2 feet in the building areas and 1 foot in the parking/drive areas. Additional passes of the compaction equipment may be required if this density requirement is not achieved.

Suitable Fill Material and the Compaction of Fill Soils

All fill materials should be free of organics such as roots and/or vegetation. CTL recommends using fill with between 3 to 12 percent by dry weight of material passing the U.S. Standard

No. 200 sieve size. Soils with greater than 10 to 12 percent passing the No. 200 sieve will be difficult to compact due to their inherent nature to retain soil moisture. The existing fine sand soils available at the site should be suitable for use as fill soils.

Structural fill should be placed in level lifts not thicker than 12 inches (uncompacted). Each lift should be compacted to at least 95 percent of the modified Proctor (ASTM D-1557) maximum dry density value. If hand-held compaction equipment is used, reduce the uncompacted lift thickness to 6 inches. The filling and compaction operation should continue in lifts until the desired elevation is attained.

Foundation Support

Excavate the foundations to the proposed bottom of the footing elevations and verify the in-place compaction for a depth of 2 feet below the footing bottoms. If necessary, compact the bottoms of the excavations to achieve a minimum dry density equivalent to 95 percent of the modified Proctor maximum dry density (ASTM D-1557) value for a depth of 2 feet below the footing bottoms.

Based on the existing soil conditions, and assuming the above outlined proof-rolling and compaction criteria is implemented, an allowable soil bearing pressure of 2500 pounds per square foot (p.s.f.) may be used in the foundation design. This bearing pressure should result in foundation settlements within tolerable limits (i.e., 1 inch or less).

All bearing wall foundations should be a minimum of 24 inches wide and column foundations 36 inches wide. A minimum soil coverage of 24 inches should be maintained from the bottom of the exterior foundations to the adjacent outside finished grades.

Compaction beneath all floor slabs should be verified for a depth of 12-inches and meet the 95 percent criteria (modified Proctor, ASTM D-1557).

Moisture entry from the underlying subgrade soils should be minimized. An impervious membrane placed between the subgrade soils and floor slab will help to accomplish this. A polyethylene film (6 mil) is commonly used for this purpose. Care should be used so that the membrane is not punctured when placing reinforcing steel (or mesh) and concrete.

Expansion joints should be used around columns if they are isolated from the floor slab. The expansion joints should be sealed with a water-proof sealant.

Based on the groundwater conditions encountered, dewatering should not be required to achieve the necessary stripping and ensuing construction, backfilling, and compaction requirements presented in this report.

Typical Pavement Section

Site Preparation

All areas to be paved should be stripped and grubbed of surficial debris including vegetation, roots and organic matters. The natural ground surface should then be compacted to achieve a density equivalent to 95 percent of the modified Proctor (ASTM D-1557, AASHTO T-180) maximum dry density value for a depth of 12 inches.

Limerock Base

A limerock base course 8 inches thick overlying a 12-inch thick stabilized subgrade can be used provided that grading and drainage plans preclude periodic saturation of the base material. The periodic saturation of a limerock base material could lead to premature pavement distress. The limerock must be compacted to 98 percent of the modified Proctor (ASTM D-1557, AASHTO T-180) maximum density value and have a minimum Limerock Bearing Ratio of 100 percent.

A 12-inch thick subgrade must be placed beneath the limerock base and stabilized with suitable clayey soil or limerock mixed with soil. The stabilized subgrade must be compacted to 98 percent of the modified Proctor maximum dry density (ASTM D-1557, AASHTO T-180) value and have a minimum Limerock Bearing Ratio of 40 percent.

Wearing Surface

Install a minimum of 1-1/4 inch of FDOT Type S-1 asphaltic concrete having a minimum Marshall Stability of 1,500 lbs. For truck parking and drive areas, increase the minimum thickness to 2 inches of Type S-1 asphaltic concrete. Specific requirements for the Type S-I asphaltic concrete wearing surface are outlined in Section 331 in the Florida Department of Transportation, Standard Specifications for Road and Bridge Construction, 1991 Edition.

The latest specifications of Florida Department of Transportation shall govern the design and placement of the limerock base and asphaltic concrete wearing surface.

Preliminary Evaluation of Sinkhole Potential

The prediction of the development of sinkholes in a specific area is not an exact science. However, certain areas are known to be more susceptible to sinkhole development than others due to hydrogeologic conditions favoring the development of sinkholes. In general, Central Florida is considered a sinkhole - prone area.

Based on CTL's area study and review of relevant USGS Quadrangle maps, The subject site does not display features indicative of sinkhole depressions. Based on the results of the shallow borings performed for this exploration, no soil conditions indicative of sinkhole activity were encountered.

This study is based on a relatively shallow exploration. A deep subsurface exploration with a more comprehensive scope of work would be necessary for a more detailed sinkhole evaluation.

Quality Control

CTL recommends establishing a comprehensive quality control program to insure that site preparation and foundation construction is conducted according to plans and specifications. The materials testing and inspection services should be provided by Central Testing Laboratory.

An engineering technician should be on-site to monitor all stripping and grubbing, to verify that all deleterious materials have been removed, and observe the proof-rolling to make sure that the appropriate number of passes are applied to the subgrade. Density testing should be performed during backfilling and below all footings and floor slabs to check the required densities. Field density values should be compared to laboratory Proctor moisture-density results for each different natural and fill soil encountered.

For the pavements, the results of stripping, grubbing and proof-rolling should be verified by on-site inspections and observations. Natural ground and subgrade densities and LBR values should be measured. The base course should be tested for LBR value, density and thickness. Samples of the asphaltic concrete should be obtained and tested in the laboratory for Marshall stability, flow, asphalt content, and aggregate gradation. Also, the in-place asphaltic concrete thickness should be verified in the field.

Inspection and testing the construction materials for the foundations and other structural componehts is also recommend.

Closure

The analyses and recommendations stated within this report are based upon the data obtained from the soil borings in Appendix II and the assumed loading conditions. Variations may be present adjacent to or between the borings which were not apparent in the boring logs. If variations are encountered during construction, it will be necessary to reevaluate the recommendations made in this report.

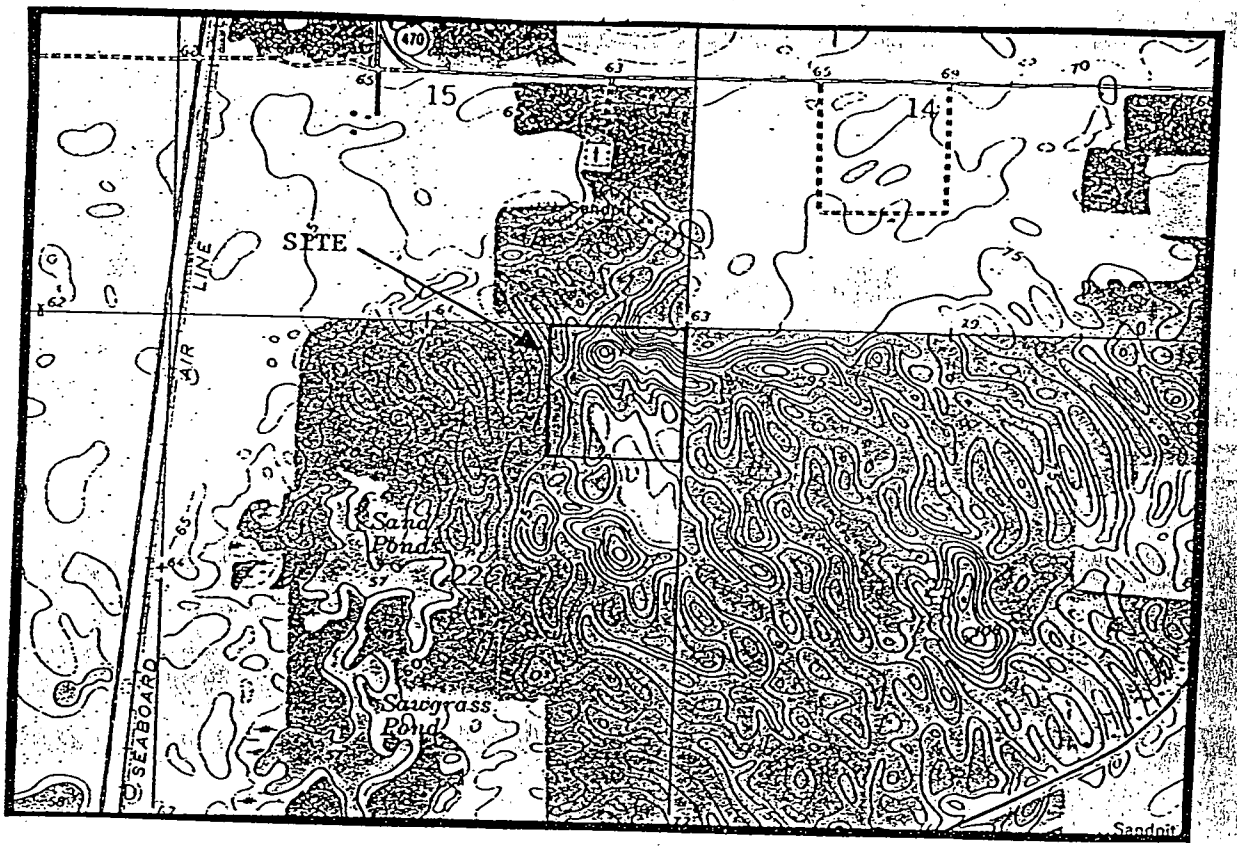
Generally accepted geotechnical and hydrogeological engineering practices were employed in the preparation of this report. CTL should review the conclusions and recommendations made in this report if changes occur in the design of the proposed project.

CTL is pleased to be of assistance to you on this phase of your project. If we may be of further service to you or should you have any questions, please contact us.

Very truly yours,
Central Testing Laboratory

Theodore J. Strouse, P.E.
Branch Manager
Florida Registration No. 48220

David W. Springstead, P.E.
Engineer
Florida Registration No. 48229



SOURCE: 1958 BUSHNELL, FLORIDA USGS QUADRANGLE MAP

N

CENTRAL TESTING LABORATORY

ENGINEERING AND MATERIALS TESTING

P.O. BOX 883
FLORAL CITY, FLORIDA 32636
(904) 726-6447

727 SOUTH 14th STREET
LEESBURG, FLORIDA 34748
(904) 787-1268

SITE LOCATION MAP
SUMTER COUNTY SOLID WASTE
MANAGEMENT FACILITY
SUMTERVILLE, SUMTER COUNTY, FLORIDA

Drawn By: TJS

Checked By: DWS

Date: DECEMBER 15, 1994

Job Number: 92-1100.003

Sec. 22 Twp. 20S Rge. 22E

FIGURE 1 OF 2

APPENDIX I

CENTRAL TESTING LABORATORY

ENGINEERING - MATERIALS TESTING - QUALITY CONTROL

LEESBURG - FLORAL CITY - OCALA

THE STANDARD PENETRATION TEST
ASTM D 1586

The Standard Penetration Test, commonly called a soil boring, provides small soil samples and standard penetration resistances (blow counts) from selected depth intervals. The samples are used for soil classification and the penetration resistances provide a general indication of soil strength and density. All of this data is used to estimate soil bearing capacity and settlement.

The borings are advanced to the desired test depth by a dry rotary drilling process using a flight auger. When it becomes necessary, drilling mud is used. Drilling mud, in this application, is a mixture of clay and water with a specific gravity of 1.05 to 1.10. Drilling mud is heavier than water, consequently, the drilling mud prevents ground water from entering the bore and provides support to the walls of the bore, minimizing wall collapse.

The sampler is driven into the bottom of the boring with a 140 pound hammer dropping thirty (30) inches. The blows are counted for three (3) consecutive six (6) inch increments for a total of eighteen (18) inches. The first six (6) inches are to assure that the sampler is in undisturbed soil. The number of blows for the remaining twelve (12) inches is recorded and is termed the N value or blow counts. This is performed in each soil stratum, but at maximum intervals of five (5) feet.

This procedure gives an minimally disturbed sample that is classified by a technician, packaged in suitable containment, and transported to the laboratory. The samples are examined by an engineer or a geologist to verify the field classifications.

The boring data are shown as soil classifications and penetration resistances in blow counts. The symbols used to show the various soils encountered are explained in the legend accompanying the Boring Logs. The blow counts are shown as blow count(s) per six (6) inches of penetration, i.e. 22/6. The color of the soil is determined by using the Munsell Soil Color Charts and is given in code such as 10YR 6/3. This information is used to prepare Boring Logs as necessary.

APPENDIX II

BORING LOG

BORING NO. 1

PROJECT: SUMTER COUNTY SOLID WASTE FACILITY, SOUTH 40

BORING NO.: 1 ELEV.: 99.8 DATE: 4-13-1993

BORING LOCATION: FROM NW COR OF S 40 ACRES, APPROX. 568' S, 899' E

BORING METHOD: ASTM D 1586 DRILLER: J. WEBB / D. ALFORD

CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS

DEPTH TO - Water: 53.3 DEPTH OF COLLAPSE: NONE

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	FIELD CLASSIFICATION	DETAILS
100 — 0 95 — 5 90 — 10 85 — 15 80 — 20 75 — 25 70	1/6 0/6 1/6 1/6 1/6 1/6 1/6 1/6 2/6 2/6 1/6 1/6 1/6 1/6 2/6 2/6 1/6 2/6 3/6 2/6 4/6 4/6 5/6 8/6 7/6 7/6 11/6 3/6 4/6 6/6 4/6 4/6 7/6 Boring Continues	POORLY GRADED SANDS OR GRAVELLY SANDS LITTLE OR NO FINES	LIGHT GRAY 10YR 7/1 FINE SAND @ 1' VERY PALE BROWN 10YR 6/3 FINE SAND @ 3' VERY PALE BROWN 10YR 7/4 FINE SAND @ 4.5' YELLOW 10YR 7/6 FINE SAND @ 6' VERY PALE BROWN 10YR 7/4 FINE SAND @ 7.5' VERY PALE BROWN 10YR 8/3 FINE SAND @ 9' VERY PALE BROWN 10YR 7/3 FINE SAND PALE BROWN 10YR 6/3 FINE SAND

BORING LOG

BORING NO. 1

PROJECT: SUMTER COUNTY SOLID WASTE FACILITY. SOUTH 40

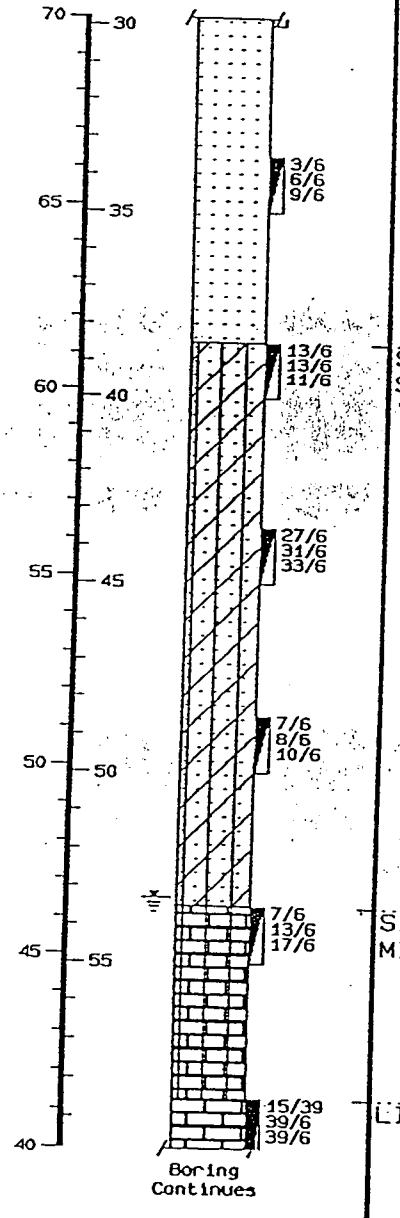
BORING NO.: 1 ELEV.: 99.8 DATE: 4-13-1993

BORING LOCATION: FROM NW COR OF S 40 ACRES. APPROX. 568' S. 899' E

BORING METHOD: ASTM D 1586 DRILLER: J. WEBB / D. ALFORD

CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS

DEPTH TO - Water: 53.3 DEPTH OF COLLAPSE: NONE



FIELD CLASSIFICATION	DETAILS
	YELLOW-BROWN 10YR 5/4 FINE SAND
SILTY-CLAYEY SANDS SAND-SILT-CLAY MIXES	WHITE 10YR 8/1 - 8/2 FINE CLAYEY SAND WITH SOME HIGHLY PLASTIC INC.
	PALE BROWN 10YR 6/3 FINE SAND WITH WHITE 10YR 8/1 HIGH PLASTIC INCLUSIONS
SILT AND LIMESTONE MIXED	WHITE 10YR 8/1 SILT WITH LIMESTONE
LIMESTONE	WHITE 10YR 8/1 LIMESTONE

BORING LOG

BORING NO. 1

PROJECT: SUMTER COUNTY SOLID WASTE FACILITY, SOUTH 40
BORING NO.: 1 ELEV.: 99.8 DATE: 4-13-1993
BORING LOCATION: FROM NW COR OF S 40 ACRES, APPROX: 568' S, 899' E
BORING METHOD: ASTM D 1586 DRILLER: J. WEBB / D. ALFORD
CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS
DEPTH TO - Water: 53.3 DEPTH OF COLLAPSE: NONE

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	FIELD CLASSIFICATION	DETAILS
40 — 60 35 — 65	13/6 12/6 12/6		

BORING LOG

BORING NO. 2

PROJECT: SUMTER COUNTY SOLID WASTE FACILITY, SOUTH 40

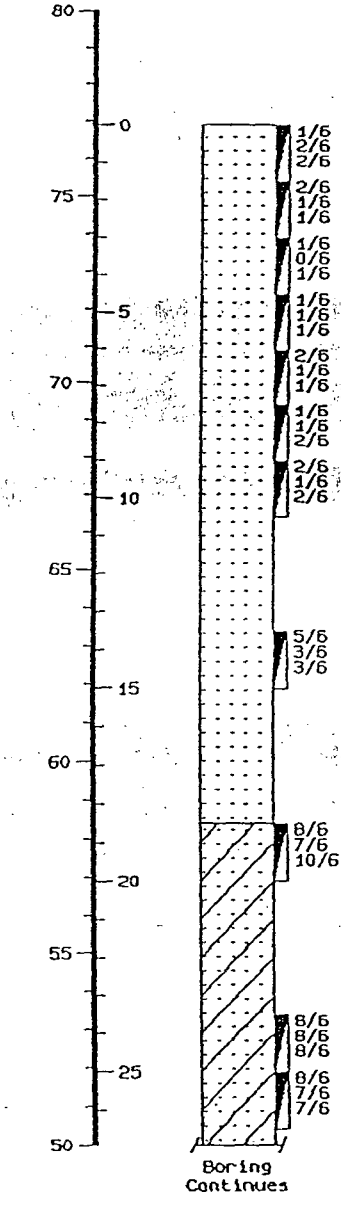
BORING NO.: 2 ELEV.: 76.9 DATE: 4-12-1993

BORING LOCATION: FROM NW COR OF S 40 ACRES, APPROX. 1018' S, 966' E

BORING METHOD: ASTM D 1586 DRILLER: J. WEBB / D. ALFORD

CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS

DEPTH TO - Water: 30.7 DEPTH OF COLLAPSE: NONE



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	FIELD CLASSIFICATION	DETAILS
		POORLY GRADED SANDS OR GRAVELLY SANDS LITTLE OR NO FINES	DARK GRAY-BROWN 10YR 4/2 FINE SAND @ 1.5' LIGHT GRAY-BROWN 10YR 6/2 FINE SAND @ 4.5' VERY PALE BROWN 10YR 7/3 FINE SAND @ 9' PALE BROWN 10YR 6/3 FINE SAND
			DARK BROWN 7.5YR 3/4 FINE SAND
		CLAYEY SANDS SAND-CLAY MIXES	WHITE 10YR 8/2 HIGHLY PLASTIC MIX OF SILTY, CLAYEY FINE SAND WHITE 10YR 8/1 - 8/2 HIGHLY PLASTIC MIX OF SILTY, CLAYEY FINE SAND

BORING LOG

BORING NO. 2

PROJECT: SUMTER COUNTY SOLID WASTE FACILITY, SOUTH 40

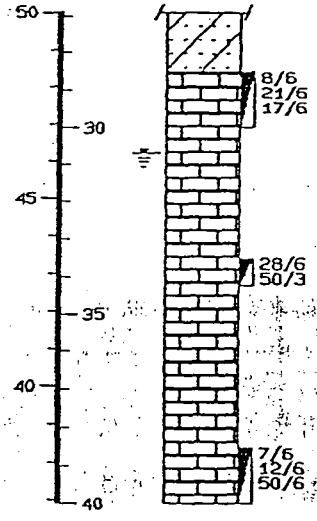
BORING NO.: 2 ELEV.: 76.9 DATE: 4-12-1993

BORING LOCATION: FROM NW COR OF S 40 ACRES, APPROX. 1018' S, 966' E

BORING METHOD: ASTM D 1586 DRILLER: J. WEBB / D. ALFORD

CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS

DEPTH TO - Water: 30.7 DEPTH OF COLLAPSE: NONE

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	FIELD CLASSIFICATION	DETAILS
50		LIMESTONE	WHITE 10YR 8/1 LIMESTONE WITH SOME SILT
30			
45			WHITE 10YR 8/1 LIMESTONE
35			
40			
40			

BORING LOG

BORING NO. 3

PROJECT: SUMTER COUNTY SOLID WASTE FACILITY, SOUTH 40

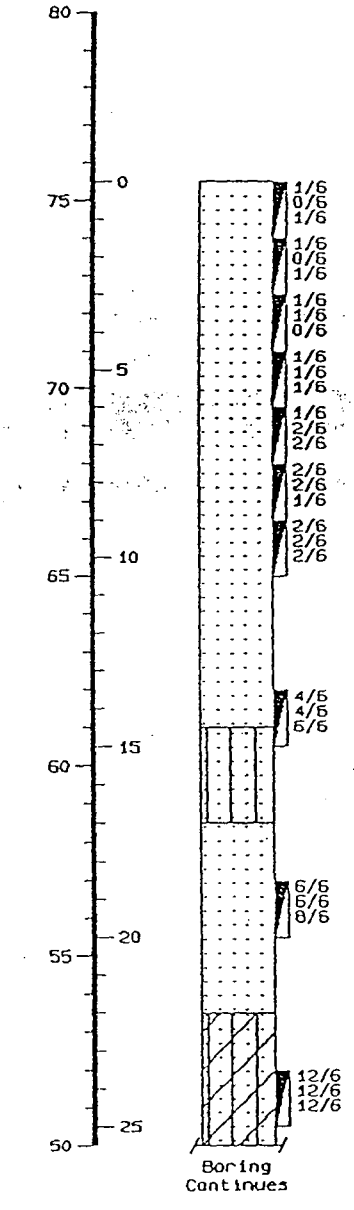
BORING NO.: 3 ELEV.: 75.5 DATE: 4-9-1993

BORING LOCATION: FROM NW COR OF S 40 ACRES, APPROX. 611' S, 126' E

BORING METHOD: ASTM D 1586 DRILLER: J. WEBB / D. ALFORD

CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS

DEPTH TO - Water: 30.0 DEPTH OF COLLAPSE: NONE



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	FIELD CLASSIFICATION	DETAILS
		POORLY GRADED SANDS OR GRAVELLY SANDS LITTLE OR NO FINES	BROWN 10YR 5/3 FINE SAND @ 1.5' VERY PALE BROWN 10YR 7/3 FINE SAND @ 3' VERY PALE BROWN 10YR 7/4 FINE SAND @ 4.5' VERY PALE BROWN 10YR 8/3 FINE SAND @ 6' WHITE 10YR 8/2 FINE SAND @ 7.5' VERY PALE BROWN 10YR 8/3 FINE SAND @ 9' VERY PALE BROWN 10YR 7/3 FINE SAND
		SILTY SANDS SAND-SILT MIXES	VERY PALE BROWN 10YR 7/4 FINE SAND @ 14.5' LIGHT YELLOW-BROWN 10YR 6/4 SILTY, CLAYEY FINE SAND
		POORLY GRADED SANDS OR GRAVELLY SANDS LITTLE OR NO FINES	WHITE 10YR 8/1 FINE SAND
		SILTY-CLAYEY SANDS SAND-SILT-CLAY MIXES	YELLOW-BROWN 10YR 5/4, STRONG BROWN 7.5YR 5/6 SILTY FINE SAND WITH WHITE 10YR 8/1 HIGHLY PLASTIC INCLUSIONS

BORING LOG

BORING NO. 3

PROJECT: SUMTER COUNTY SOLID WASTE FACILITY. SOUTH 40

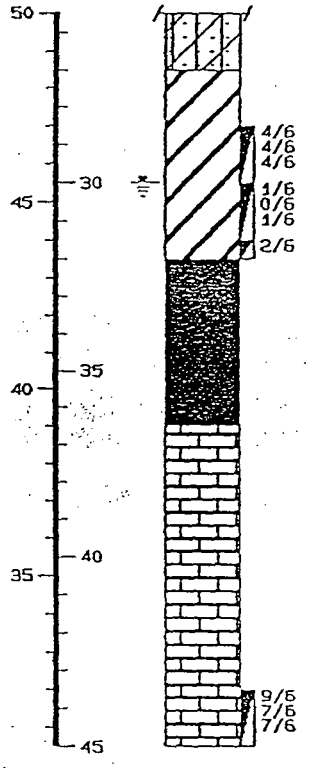
BORING NO.: 3 ELEV.: 75.5 DATE: 4-9-1993

BORING LOCATION: FROM NW COR OF S 40 ACRES. APPROX. 611' S. 126' E

BORING METHOD: ASTM D 1586 DRILLER: J. WEBB / D. ALFORD

CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS

DEPTH TO - Water: 30.0 DEPTH OF COLLAPSE: NONE



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	FIELD CLASSIFICATION	DETAILS
		INORGANIC CLAYS OF HIGH PLASTICITY	WHITE 5Y 8/1 HIGHLY PLASTIC CLAY
		ZONE OF LITTLE OR NO BEARING	********** ROD DROPPED TO 36.5'
		LIMESTONE	WHITE 10YR 8/1 LIMESTONE
			WHITE 10YR 8/1 LIMESTONE WITH SOME SILT

BORING LOG

BORING NO. 4

PROJECT: SUMTER COUNTY SOLID WASTE FACILITY, SOUTH 40

BORING NO.: 4 ELEV.: 93.2 DATE: 4-6-1993

BORING LOCATION: FROM NW COR OF S 40 ACRES, APPROX. 52° S, 520° E

BORING METHOD: ASTM D 1586 DRILLER: J. WEBB / D. ALFORD

CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS

DEPTH TO - Water: 45.4 DEPTH OF COLLAPSE: NONE

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	FIELD CLASSIFICATION	DETAILS
95 / 0	1/6, 2/6, 1/6	POORLY GRADED SANDS OR GRAVELLY SANDS LITTLE OR NO FINES	VERY PALE BROWN 10YR 7/4 FINE SAND
90 / 5	2/6, 1/6, 1/6		@ 4.5' VERY PALE BROWN 10YR 7/3 FINE SAND
	1/6, 1/6, 1/6		@ 6' VERY PALE BROWN 10YR 8/4 FINE SAND
	2/6, 1/6, 1/6		@ 7.5' VERY PALE BROWN 10YR 7/3 FINE SAND
85 / 10	1/6, 2/6, 1/6		
	2/6, 2/6, 2/6		
	3/6, 2/6, 5/6		
80 / 15	5/6, 6/6, 6/6		PALE BROWN 10YR 6/3 FINE SAND
75 / 20	7/6, 9/6, 10/6		LIGHT YELLOW-BROWN 10YR 6/4 FINE SAND
70 / 25	9/6, 10/6, 10/6		PALE BROWN 10YR 6/3 FINE SAND
65	Boring Continues		

BORING LOG

BORING NO. 4

PROJECT: SUMTER COUNTY SOLID WASTE FACILITY. SOUTH 40

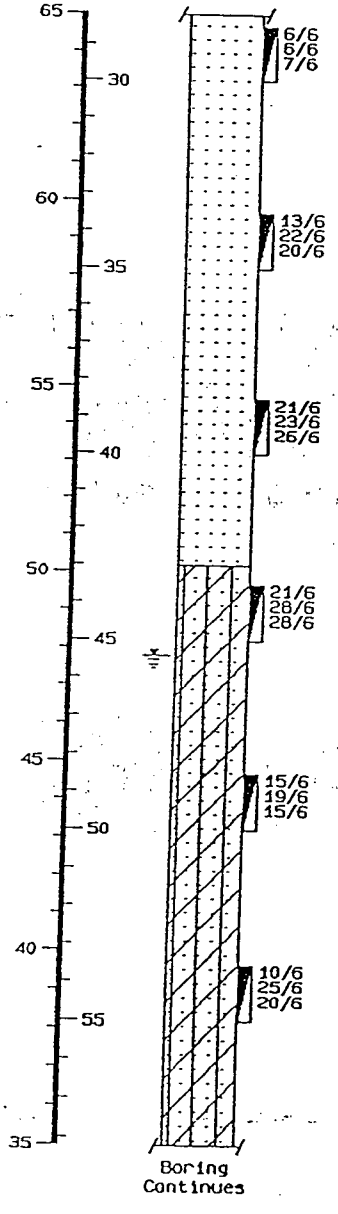
BORING NO.: 4 ELEV.: 93.2 DATE: 4-6-1993

BORING LOCATION: FROM NW COR OF S 40 ACRES. APPROX. 52° S. 520° E

BORING METHOD: ASTM D 1586 DRILLER: J. WEBB / D. ALFORD

CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS

DEPTH TO - Water: 45.4 DEPTH OF COLLAPSE: NONE



FIELD CLASSIFICATION	DETAILS
	LIGHT YELLOW-BROWN 10YR 6/4 FINE SAND
SILTY-CLAYEY SANDS SAND-SILT-CLAY MIXES	VERY PALE BROWN 10YR 7/4 AND WHITE 10YR 8/1 MIX OF SILTY, CLAYEY FINE SAND
	WHITE 10YR 8/1, YELLOW 10YR 7/6 AND VERY PALE BROWN 10YR 7/3 MIX OF SILT, CLAY AND FINE SAND
	VERY PALE BROWN 10YR 8/4 AND LIGHT BROWN-GRAY 10YR 6/4 MIX OF SILT, CLAY AND FINE SAND
	VERY PALE BROWN 10YR 8/4, LIGHT BROWN-GRAY 10YR 6/4, PALE BROWN

BORING LOG

BORING NO. 4

PROJECT: SUMTER COUNTY SOLID WASTE FACILITY, SOUTH 40

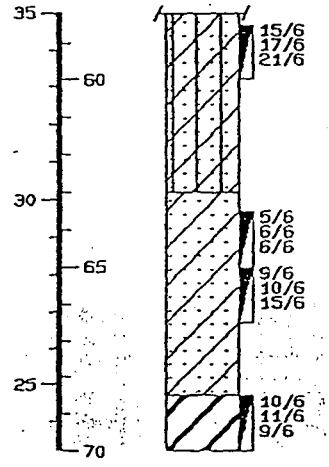
BORING NO.: 4 ELEV.: 93.2 DATE: 4-6-1993

BORING LOCATION: FROM NW COR OF S 40 ACRES, APPROX. 52' S, 520' E

BORING METHOD: ASTM D 1586 DRILLER: J. WEBB / D. ALFORD

CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS

DEPTH TO - Water: 45.4 DEPTH OF COLLAPSE: NONE

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	FIELD CLASSIFICATION	DETAILS
35 / 60			10YR 6/3 AND WHITE 10YR 8/1 MIX OF SILT, CLAY AND FINE SAND
30 / 65		CLAYEY SANDS SAND-CLAY MIXES	WHITE 10YR 8/2 AND GRAY-BROWN 10YR 5/2 HIGHLY PLASTIC MIX OF SILT, CLAY AND FINE SAND
25 / 70		INORGANIC CLAYS OF HIGH PLASTICITY	PINK-GRAY 7.5YR 6/2 HIGHLY PLASTIC CLAY

BORING LOG

BORING NO. 5

PROJECT: SUMTER COUNTY SOLID WASTE FACILITY, SOUTH 40

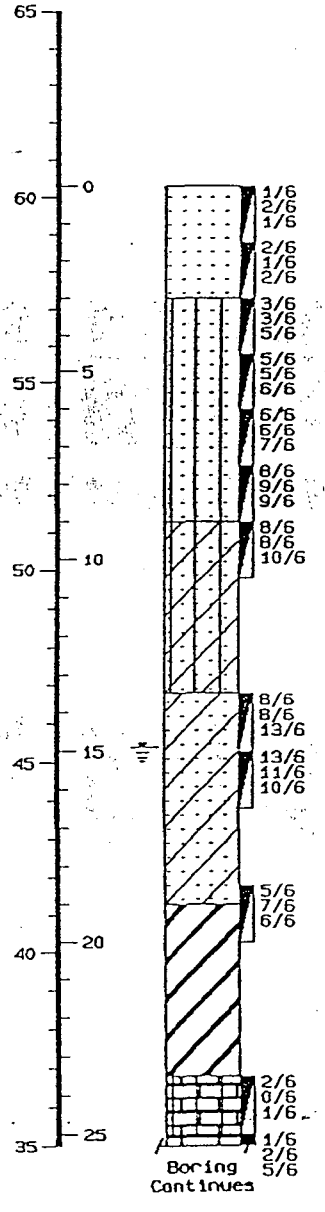
BORING NO.: 5 ELEV.: 60.3 DATE: 4-19-1993

BORING LOCATION: FROM NW COR OF S 40 ACRES, APPROX. 93' S, 1153' E

BORING METHOD: ASTM D 1586 DRILLER: J. WEBB / D. ALFORD

CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS

DEPTH TO - Water: 14.9 DEPTH OF COLLAPSE: NONE



FIELD CLASSIFICATION	DETAILS
POORLY GRADED SANDS OR GRAVELLY SANDS LITTLE OR NO FINES	BROWN 10YR 5/3 FINE SAND @ 1' VERY PALE BROWN 10YR 7/4 AND YELLOW-BROWN 10YR 5/4 FINE SAND
SILTY SANDS SAND-SILT MIXES	@ 3' YELLOW 10YR 7/6 AND WHITE 10YR 8/1 SLIGHTLY PLASTIC MIX OF SILT, CLAY AND FINE SAND @ 4.5' WHITE 10YR 8/2 AND LIGHT YELLOW-BROWN 10YR 6/Y SLIGHTLY PLASTIC MIX OF SILT, CLAY AND FINE SAND
SILTY-CLAYEY SANDS SAND-SILT-CLAY MIXES	@ 7.5' LIGHT YELLOW-BROWN 10YR 6/4 SLIGHTLY PLASTIC MIX OF SILT, CLAY AND FINE SAND @ 9' WHITE 10YR 8/2 PLASTIC MIX OF SILT, CLAY AND FINE SAND
CLAYEY SANDS SAND-CLAY MIXES	WHITE 10YR 8/1.5 HIGHLY PLASTIC MIX OF SILT, CLAY AND FINE SAND
INORGANIC CLAYS OF HIGH PLASTICITY	WHITE 10YR 8/1 HIGHLY PLASTIC CLAY
SILT AND LIMESTONE MIXED	@ 23.5' WHITE 10YR 8/1 SILT AND LIMESTONE
LIMESTONE	@ 25' WHITE 10YR 8/1 LIMESTONE

BORING LOG

BORING NO. 5

PROJECT: SUMTER COUNTY SOLID WASTE FACILITY, SOUTH 40

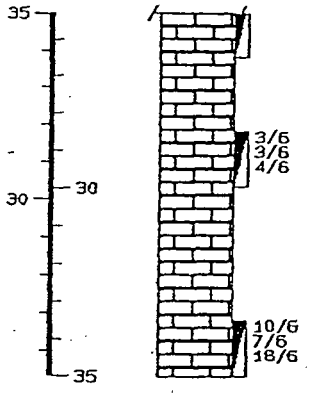
BORING NO.: 5 ELEV.: 60.3 DATE: 4-19-1993

BORING LOCATION: FROM NW COR OF S 40 ACRES, APPROX. 93' S, 1153' E

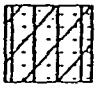
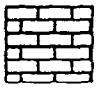
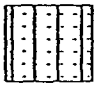
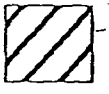
BORING METHOD: ASTM D 1586 DRILLER: J. WEBB / D. ALFORD

CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS

DEPTH TO - Water: 14.9 DEPTH OF COLLAPSE: NONE

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	FIELD CLASSIFICATION	DETAILS
35			
30			
35			

Legend:

Symbol:	Description:	Symbol:	Description:
	POORLY GRADED SANDS OR GRAVELLY SANDS LITTLE OR NO FINES		SILTY-CLAYEY SANDS SAND-SILT-CLAY MIXES
	SILT AND LIMESTONE MIXED		LIMESTONE
	CLAYEY SANDS SAND-CLAY MIXES		SILTY SANDS SAND-SILT MIXES
	INORGANIC CLAYS OF HIGH PLASTICITY		ZONE OF LITTLE OR NO BEARING
 7/6 5/6	STANDARD PENETRATION TEST. 140 lb. HAMMER DROPPED 30".		GROUNDWATER TABLE MEASURED AT COMPLETION OF BORING

Notes:

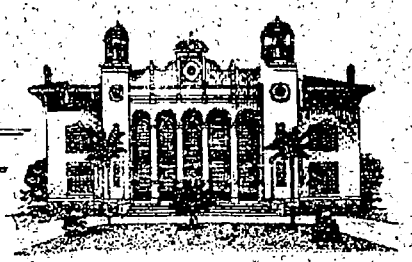
1. BORINGS ADVANCED WITH A 4" CONTINOUS FLIGHT AUGER.
2. ELEVATIONS REPORTED ON LOGS PROVIDED BY CLIENT.
3. THESE LOGS ARE SUBJECT TO THE LIMITATIONS, CONCLUSIONS, AND RECOMMENDATIONS IN THIS REPORT. DUE TO POSSIBLE VARIANCES IN THE SUBSURFACE BETWEEN THE LOCATIONS OF THE BORINGS, AND THE VARYING DEGREE OF DISTURBANCE, THE DESCRIPTIONS GIVEN ARE GOOD ONLY FOR THE MATERIALS REMOVED DURING THE CONSTRUCTION OF EACH BORING.
4. RELATIVE DENSITY (sand-silt)
   VERY LOOSE - Less than 4 blows/ft. LOOSE - 4 to 10 blows/ft.
   MEDIUM - 10 to 30 blows/ft. DENSE - 30 to 50 blows/ft.
   VERY DENSE - More than 50 blows/ft.
5. CONSISTENCY (clay)
   VERY SOFT - Less than 2 blows/ft. SOFT - 2 to 4 blows/ft.
   MEDIUM - 4 to 8 blows/ft. STIFF - 8 to 15 blows/ft.
   VERY STIFF - 15 to 30 blows/ft.
   HARD - More than 30 blows/ft.
6. COLORS ARE DETERMINED BY USING THE MUNSELL SOIL COLOR CHART AND THE VALUES ARE GIVEN IN CODE SUCH AS 10YR 3/4.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

REQUEST FOR ADDITIONAL INFORMATION
COMPOSING FACILITY EXPANSION - DIGESTER

PREPARED FOR

Sumter County



SUMTER COUNTY
BOARD OF COUNTY COMMISSIONERS
209 NORTH FLORIDA STREET
BUSHNELL, FLORIDA 33513

FEBRUARY 17, 1997

921100.000

Springstead Engineering, inc.

Consulting Engineers – Architects – Planners – Surveyors
727 South 14th Street
Leesburg, Florida 34748
Lake (352) 787-1414
Sumter (352) 793-3639 Fax (352) 787-7221

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

REQUEST FOR ADDITIONAL INFORMATION
COMPOSING FACILITY EXPANSION - DIGESTER

PREPARED FOR

SUMTER COUNTY
BOARD OF COUNTY COMMISSIONERS
209 NORTH FLORIDA STREET
BUSHNELL, FLORIDA 33513

FEBRUARY 17, 1997

921100.000

Springstead Engineering, inc.
Consulting Engineers — Planners — Surveyors

D.E.P.
FEB 18 1997

727 South 14th Street
Leesburg, Florida 34748

Lake (904) 787-1414
Sumter (904) 793-3639
Fax (904) 787-7221

February 17, 1997

Ms. Susan J. Pelz, P.E.
Southwest District - Solid Waste Section
Florida Department of Environmental Protection
3804 Coconut Palm Drive
Tampa, Florida 33619

RE: Composting Facility Expansion - Digester
Pending Permit No. SC60-298996, Sumter County
921100.000

Dear Ms. Pelz:

We are in receipt of your Request for Additional Information (RAI) regarding the above referenced project; please find the following responses:

GENERAL:

1. Please provide four copies of all requested information. All copies must include the signature and seal of the professional who prepared them.

1. Noted

2. Due to limited storage capacity, please provide plan sheets which are 22" x 34" or 24" x 36", if available. Oversized aerial photos are acceptable.

2. Noted

ENGINEER'S REPORT:

1. (Page 3) The information states, "Currently all material received at the facility is placed on the tipping floor, loaded and hauled to an FDEP approved disposal facility." Please clarify if the material is hauled offsite after processing through the MRF. Are recyclable materials which are removed from the waste stream also disposed of?

1. At this time the material is processed and the recyclables are baled and stored for sale. The material not recovered is hauled to approved facility for disposal.

2. (Page 6, #1.d(3)) The information indicates that biosolids may be used in the production of compost. Please provide operational procedures for receiving, storing, and processing the biosolids. Please include details on the origin of the waste, the impact on the composting process, the impact on odor production at the facility, and other operational details as appropriate.

2. **The overall system is designed to use biosolids in the composting process. Sumter County does not have the necessary funding to the biosolids portion of the system in place at this time. Water to replace the moisture the biosolids would provide will come from the leachate system with need and make-up water coming from the potable/fire protection water system.**

3. (Page 8, #2.c(2)) Please provide the SWFWMD permit number for the facility.

3. **SWFWMD Permit No. 442092.05**

4. (Page 9, #3.g.) The information states, "The water treatment system is currently being designed and will be permitted shortly." Please clarify to what "water treatment system" this refers. Please provide the "suitable measures" which will be taken to prevent and control fires at the facility. In the event of a fire at the facility, what steps will be taken?

4. **The water treatment system refers to a well, aeration and chlorination system to provide potable water and fire protection water treatment system for the entire facility. Suitable measures to prevent and control fires at the facility include prohibiting smoking inside the processing facility. In the event of fire, facility employees will initially attempt to put-out the fire using the fire extinguishers located in the building while contacting the fire department via 911.**

5. (Page 10, #3.h.) Please provide complete operational and design details of the odor control system, including equipment, operational methods, etc. Manufacturer's cut sheets may be included to assist in clarifying this item.

5. **The cut sheets for the scrubber and biofilter are attached. In addition, we have also attached an article written by Larry Finn and Robert Spencer of Bedminster Bioconversion Corporation which discusses the use of a biofilter.**

Operations Plan:

6. (Page 10, #5.b.) Please provide complete operations and maintenance plans for the digester system. These plans shall include written instructions for the daily operation and maintenance of the facility. Please provide a description of (and sample forms, if available) the records which will be maintained for the digester unit. Please provide a general description of how the digester functions in the composting process. Manufacturer's cut sheets may be included to assist in clarifying this item. See also comment #8, below.

6. **The O & M manual for the digester system has been requested and will be forwarded to the Department upon receipt.**

7. (Page 10, #5.c.) Please specify the maximum time equipment will be inoperable prior to the material being removed offsite for disposal (i.e. implementing the contingency plan). Please explain if alternate equipment will be obtained in the event of equipment failure.

7. **If equipment is inoperable for more than seventy-two (72) hours, material will be moved off-site to a FDEP permitted disposal facility. Equipment (trucks, loaders) are available on-site to facilitate the removal of material.**

8. (Page 13, #5.g.) Since the Phase III composting/finishing building will not be constructed at this time, please provide interim operational procedures for managing the material which will exit the digester.

8. **If the finishing building is not in place at the completion of construction of the digester, as an interim measure, prior to construction of the finishing building being built, the north compost pad will be used to windrow the compost. The leachate generated will be placed back into the digester and onto the pad of maturing compost for moisture control.**

Drawings:

9. Sheet 2 of 5. Please provide a legend for this sheet. It does not appear that fencing is shown on this sheet (as indicated in the Engineering Report, page 5, #1.b.). Please show

the location of the biosolids storage area. Please explain the purpose/function of the "annular depth gauge". Please provide additional details on the piping north of the digester which extends to the biofilter.

9. The fence around the facility is shown on Sheet 5 of 5 and highlighted. The attached set of shop drawings should provide the requested information.

10. Sheet 5 of 5. Please specify the date and reference for the contours shown.

10. The contours shown are from an aerial topographic survey performed in March 1994.

11. Sheet SUM-ELO1. Since the drawing submitted refers to several other drawings, the Department cannot fully evaluate the system. Please provide a complete set of drawings for the digester system, biofilter, and appurtenances. Is the digester unit welded or bolted construction? Is the unit stainless steel, or have a protective coating (outside and inside)? How is leachate prevented from discharging from the unit?

11. A complete set of shop drawings are attached. No leachate is generated by the digester. Moisture may need to be added in the third chamber to insure that the material has the correct moisture content for optimum composting.

We hope that this information meets your needs at the present time. Please feel free to contact our office if you have any further questions.

Sincerely,

SPRINGSTEAD ENGINEERING, INC.

2/17/97

David W. Springstead, P.E.
Engineer
Florida Registration No. 48229

cc Garry Breeden - Sumter County
Terry Hurst- Sumter County
Mitch Kessler - TIA

REGULATORY COMPLIANCE

MANAGING BIOFILTERS FOR CONSISTENT ODOR AND VOC TREATMENT

Monitoring biofilter performance provides critical information for operators, regulators and facility designers.

Larry Finn and Robert Spencer

BIOFILTERS are recognized by an increasing number of state air quality regulatory agencies as Best Available Control Technology (BACT) for treatment of Volatile Organic Compounds (VOCs) and odor. This has been the case for two cocomposting facilities permitted in Cobb County, Georgia and Marlborough, Massachusetts. Both are in ozone nonattainment areas, as defined by the federal Clean Air Act, and therefore, since such operations have the potential to emit VOCs, air quality permits are required.

Potential VOC emissions from MSW composting plants are estimated to be only 0.05 percent of total MSW tonnage processed[3,5]. Although there is little published data on VOC emission rates from biosolids composting, it has been estimated that composting of biosolids generates only 0.2764 lbs/dry ton of VOC emissions[2]. Despite these low emission rates, they are enough to trigger regulatory review for facilities such as the Cobb cocomposting plant, which is designed to process 300 tons/day of MSW with 150 tons/day of municipal biosolids, thereby creating the potential to emit approximately 49 tons/year of VOCs. Other literature documents biofilter treatment efficiencies for VOCs of 65 percent to 99 percent[1,7,8].

To maintain a biofilter in optimal operating condition requires considerable management to provide food, air and water to the macro and microscopic biological organisms — the work horses of this pollution control technology. Once a biofilter is operating at reduced rates of odor removal efficiency, the difficult decision becomes determining the point at which it is necessary to take more extensive corrective action than adding new media. In locations where there are residences or businesses within "smelling distance" of the operation, it is a sure bet the decision will be heavily influenced by those neighbors.

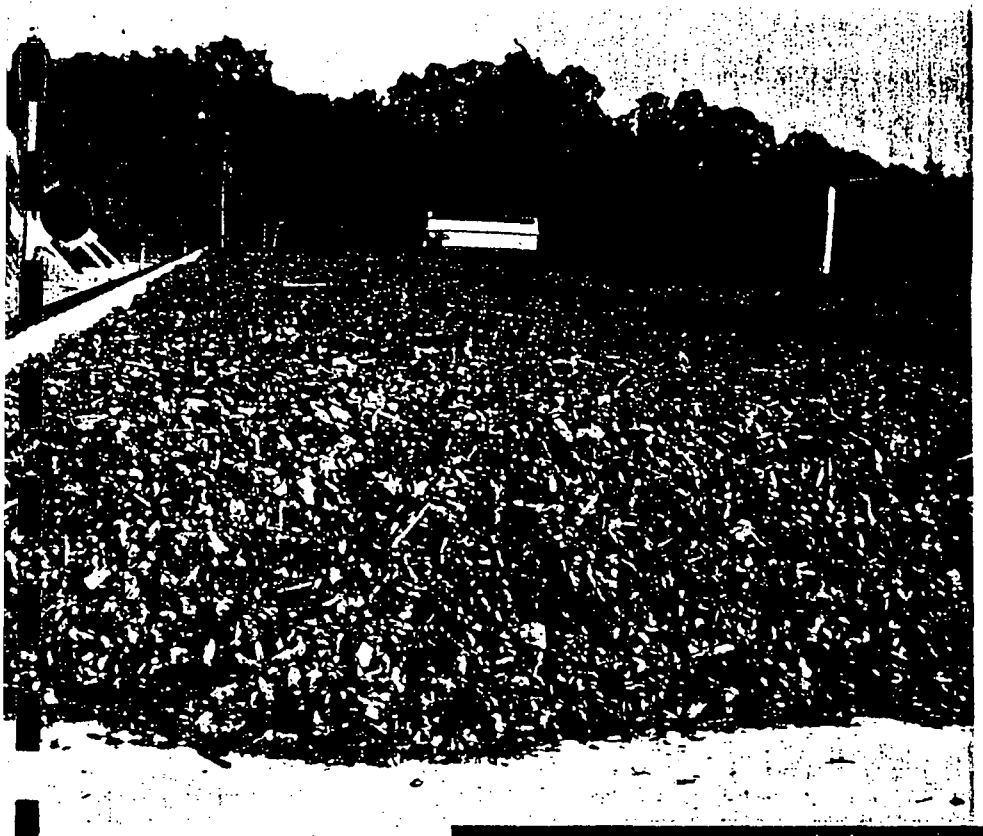
Corrective actions to rejuvenate a biofilter are usually performed in the following order: 1. Adding more media to the top of the biofilter to compensate for settling; 2. Remixing of the media to regain porosity and distribute moisture; 3. Replacement of the media once mixing is no longer effective; and 4. Reconstruction of the underlying air distribution system. Considering that conventional biofilter design has media overlaying a system of air distribution pipes, remixing and replacement of media require costly excavation of the biofilter. For larger biofilters, such as the 30,000 square foot conventional biofilter previously employed at the Sevierville, Tennessee cocomposting facility, such maintenance activity proved to be necessary more frequently than originally planned.

The other downside of such remedial maintenance is the time it takes to do the work, and the fact that a substantial portion of the air treatment system may have to be taken off-line for at least several days, further taxing the remaining biofilters. In the Sevierville situation, since there were three separate biofilters, sufficient redundancy remained to allow for continued treatment of exhaust air during such maintenance. However, many composting facilities are served by a single biofilter which is not designed and constructed to allow for maintenance on a portion of the filter while the remaining portions still function.

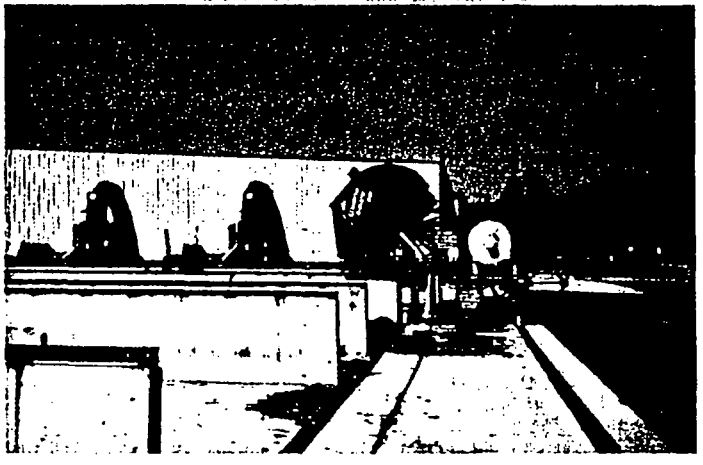
ROOM FOR IMPROVEMENT

The experience with the biofilters at the Sevierville facility provided valuable lessons for subsequent installations both at that plant and the ones in Cobb County and Marlborough. The upgrade in 1995 also enabled the operator to obtain performance data that could be given to regulators as part of other permitting efforts.

During the design phase of the Sevierville facility in 1989, the prevailing wisdom of consultants and literature was that at a loading rate of 4 to 8 cfm/sf, the media in a biofilter would only have to be replaced every three to five years. This information was based primarily on biosolids composting facilities, not MSW composting, and the fact that there are biofilters at biosolids composting operations which function well with older media. However, the Sevierville biofilter degraded the wood chip/bark mulch/compost media within two years, to the point that a sample of hardwood chips from the filter media could be squeezed with two fingers into a mineralized pile of humus. The reason for such a high rate of degradation is not known, but it may be that the exhaust gases from MSW composting provide a food supply for the organisms which results in a more diverse range of organisms, functioning at a higher metabolic rate.



Photos courtesy of Bedminster Bioconversion Corporation



A 39,000 sq ft above ground biofilter was installed at the cocomposting plant in Cobb County, Georgia. An agitator is used to fluff and remix the media. Humidification towers, located between the building and the biofilter, remove particulates and VOCs, and reduce the temperature of the exhaust gases.

Another problem was drying of the media, which in some situations resulted in development of cracks — something that surface irrigation could not reverse. Apparently, the warm building exhaust gases, combined with exothermic heat released by the microorganisms, resulted in differential rates of drying on the lower side of the biofilter, which set off an exponential drying effect. Such differential drying is attributed to two "spiral effects," noted by Ned Ostojic of Odor Science & Engineering, such that moisture migrates to areas of lesser air flow, with those areas becoming more moist, further reducing air flow rates. Simultaneously, at different locations, drier areas with less flow resistance become even more dry[1].

Operations at the Sevierville facility also showed a build up of fine dust particulate in the pipes, the underside of the filter fabric (which was intended to keep biofilter media from washing down to pipes), and the media itself. This contributed to increased back pressure as air flow was impeded by the accumulation of dust particles. These realities took their toll on the first generation of Sevierville biofilters, and the company spent considerably more money than anticipated replacing and rebuilding the biofilters in the first four years of operation. This led Bedminster Bioconversion Corporation, the plant operator, to explore other options, and resulted in a patented, above ground biofilter design that was installed in both Sevierville and Cobb County, Georgia.

Experience also showed that pretreating the air stream before it enters the biofilter can result in better performance and dust management. At the Cobb County facility, each of the six blowers which feed the biofilter with 35,000 cfm of exhaust air force cocurrent air and water through six humidification towers packed with plastic media. This pretreatment step is intended to humidify the air stream; scrub out particulates; reduce temperature of the exhaust gases; and remove VOCs. The decision to install the humidification towers at the Cobb plant was based on the successful results of a pilot scrubber unit installed at the Sevierville facility to treat exhaust gases from one of digesters.

Unlike the Cobb biofilter, Sevierville's biofilter does not yet have a humidification pretreatment system. Instead, the media is kept moist by condensation, surface irrigation, and by turning with a Compost-A-Matic machine. Some form of prehumidification may be added in the future, but after 12 months of operation, the filter is performing very well, even without the humidification towers.

MEASURING BIOFILTER PERFORMANCE

To document the performance of the new Sevierville biofilter, Bedminster contracted with E&A Environmental Consultants of Cary, North Carolina to take air flow measurements, quantify VOC removal rates, and collect samples for odor panel analysis of biofilter inlet and outlet gases. The E&A monitoring was performed in late February, 1996, three months after the new biofilter began operating.

The Sevierville biofilter consists of five rectangular bays, approximately 200 feet in length and 20 feet wide, with an average media depth of 3 feet, and a total surface area of 20,000 square feet. Two 40,000 cfm blowers deliver 80,000 cfm of building exhaust air into the base of the filter, resulting in a loading rate of 4 cfm/square foot, with a design residence time for the gases of 45 seconds.

The consultants determined that the average removal rate of total nonmethane VOCs was 93.5 percent, based on an average inlet VOC concentration of 33 ppmv, and an outlet (top of biofilter) VOC concentration of 2.15 ppmv (results reported as concentrations in parts per million on a volumetric bases of total nonmethane organics per EPA Method 25C). E&A's report concluded that "the data clearly justifies the need for VOC treatment of exhaust gases from the facility, and that the biofilter system is working very effectively at reducing the quantity of VOCs discharged." The average odor removal effi-

COMPARING A NEW ODOR POLICY TO PERMIT CONDITIONS AT A MASSACHUSETTS COMPOSTING FACILITY

THE MASSACHUSETTS Department of Environmental Protection (DEP) has developed a draft Composting Odor Policy and Technical Guidance (see "Odor Policy for Composting Facilities," *BioCycle*, December,1995). The odor policy will become final at the same time as DEP's composting facility regulations, which are anticipated to become final in the spring of 1997. A municipal solid waste/biosolids composting plant in Marlborough, Massachusetts is the first project that had to follow the new odor policy (see accompanying article). The following analysis compares the odor policy to selected permit conditions for the Marlborough project.

Loading Rate: The design loading rate to the biofilter is 2.5 cubic feet per minute/square foot (cfm/sq ft) with all cells of the biofilter operating. This loading is consistent with the odor policy which states that loadings to biofilters shall not exceed 3 cfm/sq ft. The maximum loading rate to the biofilter allowed by the permit (when two of the five cells are down for repair and media depth is 32 inches) is 4.2 cfm/sq ft.

Biofilter Surface Emissions: The odor emissions limit at the surface of the biofilter is 50 dilutions to threshold (D/T). This is the same as the odor policy which states that emissions from biofilters should be assumed to be no less than 50 D/T.

Odor Sampling: The permit states that "during the first year of operation, samples of the air from the biofilter shall be subjected to odor panel analysis monthly to determine compliance with the 50 (D/T) emissions standard. After the first year of operation and upon request from the ... (facility), DEP will evaluate a reduction in the frequency of analysis."

The odor policy requires that facilities have odor emissions sources sampled and analyzed for D/T levels twice per year or at a frequency determined by DEP. The site in question had a previous history of odor complaints. Conducting odor sampling at a frequency other than twice per year on a case-by-case basis is consistent with the odor policy.

Dispersion Model And Maximum Off-Site Impact: The ISCST3 air dispersion model was used, as required by the odor policy. The model was run in a "rural" setting and adjusted for building downwash effects. Hourly meteorological data was obtained from two airports — one providing surface conditions and the other upper air conditions.

The maximum off-site impact as predicted by dispersion modeling is 3 D/T, which meets the odor policy requirement of no impacts greater than 5 D/T.

Averaging Time: When used for predicting odors, the ISCST model predicts the odor (D/T) impact levels at various locations on and off the composting facility site. These results are considered by many (but not all) in the field of odor dispersion modeling to represent the average odor levels over a 60 minute time period.

Therefore, the maximum D/T level predicted off-site also can be considered to be an odor level averaged over 60 minutes at the most highly impacted location. Such a 60 minute impact may occur infrequently or frequently at any given location depending on local meteorology and other factors. The consultant for this project also addressed the issue of whether a 60 minute averaging time might miss some odor nuisance events. Such a situation could occur if peak odor levels lasting, for example, for 10 to 15 minutes were high enough to create nuisance levels even though the overall 60 minute average odor level is predicted to be at a non-nuisance level. The more frequently such conditions are predicted to occur, the more concern there would be.

Based on studies of peak odor incidents and their correlation to odor complaints, the project developer's consultant used an adjustment factor to convert the 60 minute averaging time impacts predicted by the model to 10 minute average levels. This was done by multiplying (increasing) the impacts predicted by the model by a factor of 1.82 (which resulted in the predicted peak off-site impact of 3 D/T).

The formula normally used to convert from 60 minute average impacts to 10 minute average impacts will yield different conversion factors depending on whether the odor emissions point is from a stack such as the Marlborough facility (where the biofilter will be enclosed) or from a ground level source such as an unenclosed biofilter. The conversion from 60 minutes averaging time to 10 minutes averaging time for an unenclosed biofilter would be expected to be a factor of about 1.43 (as opposed to 1.89 for the stack at Marlborough). This is because ground level sources such as biofilters generally create the greatest odor impact under stable atmospheric conditions. The difference between 10 minute or 15 minute and 60 minute impacts is not as great for ground level emission sources because there is less variability under stable meteorological conditions. The odor policy does not specify averaging time; instead, it will be addressed on a case-by-case basis.

Property Line and General Nuisance: Per the odor policy, the permit requires that "the facility shall be operated at all times in such a manner as to prevent odors in excess of 5.0 D/T at the property line." In addition, the permit — as stated in the odor policy — requires that "the facility shall be operated in a manner to prevent the occurrence of dust or odor conditions which cause or contribute to a condition of air pollution as defined in Regulation 310 CMR 7.09."

Maximum Back Pressure: The maximum back pressure of the biofilter is eight inches of water, as allowed by the permit; however, when the back pressure reaches six inches of water, facility personnel are required to take corrective action (fluff or lift the biofilter media). This requirement is design specific and therefore is not directly addressed by the odor policy.

Selected Monitoring Requirements: The back pressure at the inlet of the biofilter has to be monitored daily. The following has to be monitored weekly: Total VOC removal as measured by a portable organic vapor meter; moisture in the biofilter; and depth of the biofilter.

—Thomas Mahin

Tom Mahin is a section chief at with the Massachusetts Department of Environmental Protection's Northeast Regional Office. For a copy of the DEP's odor policy (including the technical guidance document), contact the author at Massachusetts DEP, 10 Commerce Way, Woburn, MA 01801. tmahin@state. ma.us.

ciency was found to be 91 percent, based on an odor panel determination of 354 dilutions to threshold (D/T) of the inlet air and 32 D/T of the outlet air (top of biofilter).

Redminster's contract with Cobb County establishes an odor performance standard of 10 D/T at the facility property line, which is as close as 150 feet from the biofilter at one point. The 39,000 square feet of biofilter is designed to treat 210,000 cfm, for an average loading rate of 5.4 cfm/sf. Although the Cobb facility was shut down by a fire this last August and is anticipated to reopen by the summer of 1997, independent odor monitoring was conducted at the facility during the first three months of operation. On several occasions, air samples were collected at eight points around the facility property line and sent out for odor panel analysis. The results of odor panel testing of these samples consistently revealed compliance with the 10 D/T performance standard. (The plant did experience negative odor impacts beyond the property line, which eventually led to a temporary shut down prior to the August fire. Attempts were made to quantify off-site odor levels related to the odor events but were not successful.)

To document the humidification tower/biofilter performance, one set of samples was taken to compare the odor concentration of inlet air to the biofilter with off-gases from the biofilter, revealing a 92 percent odor removal efficiency, based on an inlet concentration of 216 D/T and a biofilter outlet odor concentration of 17 D/T.

AIR QUALITY PERMITS

The Atlanta metro region has been designated by the U.S. EPA as an ozone nonattainment area, and therefore, the Cobb County cocomposting facility was required to submit an air quality permit application as a potential source of VOC emissions. For the purpose of the air quality permit application to the Georgia Environmental Protection Division, it was assumed that the biofilters (not factoring in the humidification towers) would impart 75 percent treatment efficiency for VOCs.

The following major permit conditions are intended to keep the biofilter in optimal operating condition:

- The temperature of the air stream flowing to the biofilter shall not exceed 113°F during any operation of the facility.
- The pressure drop across the biofilter shall not exceed eight inches of water during any operation of the facility.
- The average bed depth of each biofilter bay shall not be less than 30 inches during any operation of the facility.
- A water sprinkling system shall be installed for the purpose of maintaining the proper bed moisture content.

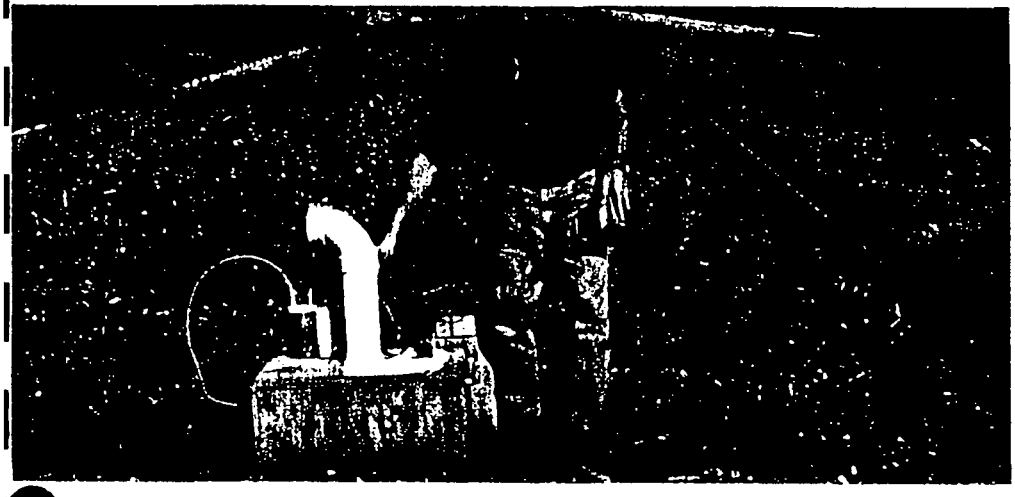
The permit requires continuous recording of temperature and pressure drop, and daily recording of the bed depth in each of the sev-

Apparently, the warm building exhaust gases, combined with exothermic heat released by the microorganisms, resulted in differential rates of drying on the lower side of the biofilter, which set off an exponential drying effect.

en biofilter bays. There are no emission monitoring requirements in the permit, and there is no regulated odor standard in Georgia.

For a new project in Marlborough, Massachusetts (80 tpd MSW and 40 tpd biosolids), solid waste and air permits were received in November, 1996. As in metro Atlanta, the Commonwealth of Massachusetts is designated nonattainment for ozone, and therefore, potential emissions of VOCs are a regulatory concern. For the Marlborough project, however, the primary interest of the Massachusetts Department of Environmental Protection's (DEP) air quality division is odor control. The agency recently completed a "Guidance and Policy for the Evaluation of Odors at Composting Facilities" (see sidebar); Marlborough is the first project in the state to be permitted using the new guidance (it is expected to be formally adopted, along with the state's composting regulations, in 1997). It proposes that composting facilities use 5 D/T as the minimum design standard for odor at the property line (or most sensitive receptor if approved by the DEP), based on literature references, which cite a D/T of five to 10 as the level at which complaints can begin to be expected at many sites. The policy requires use of air quality dispersion modeling (EPA approved ISCST model), and for biofilters, the assumed odor emission should not be less than 50 D/T on average, unless other adequate information is submitted.

Air velocity is measured to determine flow rate through the biofilter. A hand held organic vapor meter quantifies VOC concentrations.



The Massachusetts policy requires use of air quality dispersion modeling, and for biofilters, the assumed odor emission should be less than 50 D/T on average, unless other adequate information is submitted.

The Massachusetts DEP guidance document also recommends that biofilters be designed as follows:

- Loading rate not to exceed 3 cfm/sf.
- Prescrubbing to prevent excessive ammonia and particulate loading.
- Empty bed detention time of 45 to 60 seconds, with three to four feet of media.
- Provide for short term contingency for routine replacement of the media, or catastrophic failure.

The design proposed and permitted for the City of Marlborough facility complies with these recommended design standards. The air quality permit application assumed a biofilter emission rate of 50 D/T, even though actual emissions as measured at the Sevierville facility were 32 D/T, and 17 D/T at Cobb facility.

The major air permit conditions for the Marlborough facility include:

- Back pressure shall not exceed eight inches of water.
- Media depth shall be maintained between 32 and 36 inches.
- The air flow loading rate shall not exceed 4.2 cfm/sf, with 38 seconds retention time (that represents a worst case scenario, e.g. during maintenance when a portion of the biofilter has been shut down).
- Odor concentration at the facility property line shall not exceed 5 D/T.
- Weekly monitoring of the biofilter for VOC removal efficiency, moisture content of media, depth of media, and functioning of surface irrigation spray nozzles.
- Monthly odor panel testing for the first year of operation to document compliance with the 50 D/T emission rate policy.

For additional odor insurance, the Marlborough biofilter will be enclosed and two roof vents used to further dilute and disperse the biofilter off-gases. It is anticipated that this facility will be operational in late 1997. ■

Larry Finn is vice president of engineering and Bob Spencer is director of project development for Bedminster Bioconversion Corporation in Marietta, Georgia.

REFERENCES

1. Amirhon, P. & G.A. Kuter. Performance Evaluation of Biofilter at Dartmouth, MA Biosolids Composting Facility. Presented at the New England Water Environment Association Annual Meeting, Boston, MA, February 1994.
2. E&A Environmental Consultants. Unpublished data prepared for permitting Phelps Dodge Composting Facility. Brooklyn, N.Y. 1994.
3. Eitzer, B.D. "Emissions of Volatile Organic Chemicals from Municipal Solid Waste Composting Facilities." Environ. Sci. Techol. 29(4): pp 896-902. 1995.
4. Goldstein, N. "Odor Control Experiences: Lessons From the Biofilter." *BioCycle*, Vol. 37, No.4. April 1996.
5. Kissel, J.C.; C.L. Henry & R.B. Harrison. 1992. "Potential Emissions of Volatile and Odorous Organic Compounds From Municipal Solid Waste Composting Facilities." *Biomass & Bioenergy*, Vol 3, Nos 3-4, pp 181-194, Pergamon Press Ltd. 1992.
6. Massachusetts Department of Environmental Protection, Guidance and Policy for the Evaluation of Odors at Composting Facilities. Boston. 1996.
7. Wheeler, M.L. Proactive Odor Management. The Evolution of Odor Control Strategies at the Hamilton, Ohio Wastewater Treatment and Sludge Composting Facility. Biofilter details and data presented at the *BioCycle National Conference, St. Louis, MO, May* 1994.
8. Williams, T.O. & F.C. Miller. "Odor Control Using Biofilters." *BioCycle*, Vol. 33, No.10. pp 72-76. October 1992.

Department of Environmental Protection

Lawton Chiles
Governor

Southwest District
3804 Coconut Palm Drive
Tampa, Florida 33619

Virginia B. Wetherell
Secretary

January 22, 1997

Mr. Garry Breeden, Director
Sumter County Department of Public Works
319 East Anderson Ave.
Bushnell, FL 33513

RE: Composting Facility Expansion - Digester
Pending Permit No. SC60-298996, Sumter County

Dear Mr. Breeden:

This is to acknowledge receipt of your permit application dated December 24, 1996, prepared by Springstead Engineering, to construct a digester system for the composting of solid waste at the existing solid waste composting facility, referred to as the Sumter County Solid Waste Management Composting Facility.

This letter constitutes notice that a permit will be required for your project pursuant to Chapter(s) 403, Florida Statutes.

Your application for a permit is incomplete. Please provide the information listed below promptly. Evaluation of your proposed project will be delayed until all requested information has been received.

The following information is needed in support of the solid waste application [Chapters 62-701 and 62-709, Florida Administrative Code (F.A.C.)]:

GENERAL:

1. Please provide four copies of all requested information. All copies must include the signature and seal of the professional who prepared them.

2. Due to limited storage capacity, please provide plan sheets which are 22" x 34" or 24" x 36", if available. Oversized aerial photos are acceptable.

ENGINEER'S REPORT:

1. (Page 3) The information states, "Currently all material received at the facility is placed on the tipping floor, loaded and hauled to an FDEP approved disposal facility." Please clarify if the material is hauled offsite after processing through the MRF. Are recyclable materials which are removed from the waste stream also disposed of?

2. (Page 6, #1.d(3)) The information indicates that biosolids may be used in the production of compost. Please provide operational procedures for receiving, storing, and processing the biosolids. Please include details on the origin of the waste, the impact on the composting process, the impact on odor production at the facility, and other operational details as appropriate.

3. (Page 8, #2.c(2)) Please provide the SWFWMD permit number for the facility.

4. (Page 9, #3.g.) The information states, "The water treatment system is currently being designed and will be permitted shortly." Please clarify to what "water treatment system" this refers. Please provide the "suitable measures" which will be taken to prevent and control fires at the facility. In the event of a fire at the facility, what steps will be taken?

5. (Page 10, #3.h.) Please provide complete operational and design details of the odor control system, including equipment, operational methods, etc. Manufacturer's cut sheets may be included to assist in clarifying this item.

Operations Plan:

6. (Page 10, #5.b.) Please provide complete operations and maintenance plans for the digester system. These plans shall include written instructions for the daily operation and maintenance of the facility. Please provide a description of (and sample forms, if available) the records which will be maintained for the digester unit. Please provide a general description of how the digester functions in the composting process. Manufacturer's cut sheets may be included to assist in clarifying this item. See also comment #8, below.

7. (Page 10, #5.c.) Please specify the maximum time equipment will be inoperable prior to the material being removed offsite for disposal (i.e. implementing the contingency plan). Please explain if alternate equipment will be obtained in the event of equipment failure.

8. (Page 13, #5.g.) Since the Phase III composting/finishing building will not be constructed at this time, please provide interim operational procedures for managing the material which will exit the digester.

Drawings:

9. <u>Sheet 2 of 5</u>. Please provide a legend for this sheet. It does not appear that fencing is shown on this sheet (as indicated in the Engineering Report, page 5, #1.b.). Please show the location of the biosolids storage area. Please explain the purpose/function of the "annular depth gauge". Please provide additional details on the piping north of the digester which extends to the biofilter.

10. <u>Sheet 5 of 5</u>. Please specify the date and reference for the contours shown.

11. Sheet SUM-EL01. Since the drawing submitted refers to several other drawings, the Department cannot fully evaluate the system. Please provide a complete set of drawings for the digester system, biofilter, and appurtenances. Is the digester unit welded or bolted construction? Is the unit stainless steel, or have a protective coating (outside and inside)? How is leachate prevented from discharging from the unit?

The following comment is for information only, at this time, and does not require an immediate response:

1. (Engineering Report, page 5) The information indicates that the type and source of solid waste is based on a January 1991 report prepared by TIA Solid Waste Management Consultants. Since this report is several years old, and the facility has increased its recycling efforts and developed more detailed recordkeeping procedures, the information in the 1991 report should be supplemented and updated by actual data developed by the facility.

"NOTICE! Pursuant to the provisions of Section 120.60, F.S., if the Department does not receive a complete response to this request for information within 30 days of the date of this letter, the Department may issue a final order denying your application. You need to respond within 30 days after the date of this letter, responding to all of the information requests and indicating when a response to any unanswered questions will be submitted. If the response will require longer than 30 days to develop, you should develop a specific time table for the submission of the requested information for Department review and consideration. Failure to comply with a time table accepted by the Department will be grounds for the Department to issue a Final Order of Denial for lack of a timely response. A denial for lack of information or response will be unbiased as to the merits of the application. The applicant can reapply as soon as the requested information is available."

You are requested to submit your response to this letter together, as one complete package. If there are points which must be discussed and resolved, please contact me at (813) 744-6100 ext. 386.

Sincerely,

Susan J. Pelz, P.E.
Solid Waste Section
Southwest District

sjp
cc: David Springstead, P.E., Springstead Engineering, 727 S. 14th St.
Leesburg, FL 34748
Robert Butera, P.E., FDEP, Tampa
Steve Morgan, FDEP, Tampa (e-mail)

Springstead Engineering, inc.
Consulting Engineers — Planners — Surveyors

727 South 14th Street
Leesburg, Florida 34748

Lake (904) 787-1414
Sumter (904) 793-3639
Fax (904) 787-7221

February 19, 1997

Ms. Susan J. Pelz, P.E.
Southwest District - Solid Waste Section
Florida Department of Environmental Protection
3804 Coconut Palm Drive
Tampa, Florida 33619

RE: Composting Facility Expansion - Digester
Pending Permit No. SC60-298996, Sumter County
921100.000

Dear Ms. Pelz:

As stated in our letter of 2/17/97; please find the following information:

Operations Plan:

6. (Page 10, #5.b.) Please provide complete operations and maintenance plans for the digester system. These plans shall include written instructions for the daily operation and maintenance of the facility. Please provide a description of (and sample forms, if available) the records which will be maintained for the digester unit. Please provide a general description of how the digester functions in the composting process. Manufacturer's cut sheets may be included to assist in clarifying this item. See also comment #8, below.

6. Please find attached the requested O & M manual for the digester system.

We hope that this information meets your needs at the present time. Please feel free to contact our office if you have any further questions.

Sincerely,

SPRINGSTEAD ENGINEERING, INC.

David W. Springstead, P.E.
Engineer
Florida Registration No.: 48229

cc Garry Breeden - Sumter County w/o attachment
Terry Hurst- Sumter County w/o attachment
Mitch Kessler - TIA w/o attachment

TAL

BEDMINSTER®
Bioconversion Corporation

BEDMINSTER
DIGESTER SYSTEM
OPERATION AND MAINTENANCE

Prepared for:
Sumter County Solid Waste
Composting, Processing and Recycling Facility
(SWCPRF)
Sumter County, Florida

The content of this document is confidential
and contains proprietary information
that is not to be shared outside the
confines of this contractual relationship.

Bedminster Bioconversion Corporation
145 Church Street, Suite 201
Marietta, GA 30060
January 13, 1997

TAL

Table of Contents

INTRODUCTION

This document is to address and provide guidance in the setup and routine operation of the Eweson Digester and associated support equipment as specified in the contract.

Training will be provided in the areas specified in the contract Schedule VI, 5.0.

The information in this manual is provided so that the operator will not only know how to perform assigned tasks, but to give a better understanding of the importance and purpose of that task . It is essential that the operator have an intimate knowledge and understanding of this information. It will also be essential that procedural matters be followed. If ways are found in which to improve these procedures, discuss it with management. If the improvement is verifiable, procedures will be changed accordingly. No change to operating methods are to be made until it is specified in a written procedure approved by the Plant Management. A suggested form for such change is provided as an attachment to this document.

The Composting Council, out of Alexandria, Virginia, has identified what is becoming accepted as the standard phases of a commercial composting operation. These phases consist of:

- Feedstock Recovery - the physical process of separating the compostable material from the non-compostable, hazardous and recyclable material.
- Feedstock Preparation - feedstock is processed to attain proper moisture, particle size, content mix, oxygen exposure and proper carbon to nitrogen ratio. May include amendments to aid or accelerate biological population growth.
- Composting High Rate phase - most intensive decomposition phase involving high oxygen consumption and heat generation. The "Process to Further Reduce Pathogens" (PFRP)begins early in this phase. This can take between four to forty days depending on technology applied.
- Stabilization - begins after rate of biological activity has stabilized and begun to decline. May continue at relatively high temperatures and oxygen demand. Phytotoxic acids break down, nitrogen demand drops off to point it will not deplete nitrogen in soil, inorganic chemicals become concentrated.
- Curing - an extension of the stabilization phase, biological activity still evident but changes much slower, often extending many months. Gradually converts elemental carbon to carbon dioxide leaving humus. May be incorporated into soil prior to completion of this phase, depending on application.

At other facilities, The Bedminster Process accepts material at the initial phases of Feedstock Recovery, after obvious bulky and hazardous materials have been removed, and produces high quality compost from this grade of feedstock.

The Sumter MRF is designed to provide feedstock to the Bedminster Process at the end of the **Feedstock Recovery phase** and the early Feedstock Preparation phase. This results from the front-end separation of non-compostables, oversized materials and hazardous materials in the Materials Recovery Facility upstream of the Bedminster Process.

The first compartment of the digester completes the **Feedstock Preparation Phase** with the physical breakdown of the feedstock providing surface area for the bacteria and exposure to moisture and oxygen.

PLANT OBJECTIVES

COMPOST AND RECYCLE SOLID WASTE

- Accept and process 50 Tons Per Day (TPD) of municipal solid waste (MSW) and up to 25 TPD of wastewater biosolids, in accordance with BBC contract with Sumter County, Florida Solid Waste Management Authority.
- Attain and surpass State of Florida recycling goals.
- Minimize Sumter County's reliance on landfills for disposal of solid waste.
- Provide long term stability to Sumter County costs of solid waste disposal.
- Help maintain and improve the quality of soils in Sumter County and the State of Florida.

PRODUCE HIGH QUALITY COMPOST

PROCESS

Assumes acceptable MSW and sludge feedstock in accordance with Schedule VI, 4-1 of the contract between BBC and Sumter County.

Operate the facility at optimal mixes of waste inputs, which is approximately one wet ton of biosolids for each two wet tons of MSW.

CONTROL

Constantly monitor the compost process and make operational adjustments as needed.

Maintain all equipment in excellent operating condition to avoid down-time and injuries.

STAFFING & JOB DESCRIPTION(S)

At the capacity described in the contract, the owner should anticipate approximately ten (10) labor hours per day to operate the digester system Normally, the discharge operation begins roughly four hours prior to the charging process. The workload may be split between two employees addressing the discharge, transferring and charging responsibilities or a single person with occasional support in the areas of moisture testing, depth readings and routine maintenance.

Job functions consist of:

- Inspect and adjust lubrication levels of all rotating equipment.
- Take samples and determine moisture content of sludge and digester contents daily, or more often as needed.
- Take readings of temperatures in each digester compartment each day or more often as needed.
- Take readings of oxygen levels in digester compartments as needed to monitor health of biological activity, daily or as needed.
- Operate discharge gates and meter out the rough compost from the exit end of the digester.
- Operate the feed ram system and charge the feedstock into the first compartment of the digester.

- Inspect, monitor and perform routine maintenance on feed ram hydraulic system.
- Operate transfer doors and monitor and control transfer of digester contents through the compartments of the digester.
- Complete daily data records on temperatures, levels, oxygen levels, discharge rates and transfer rates, weights of MSW, sludge and any water required, weights of discharge and other data as deemed necessary by the system owner.
- Daily housekeeping including under and around the digester feed ram, under the digester/ram seal, under the man ways and sample ports, and around the discharge area.
- Monitoring and cleanup of any lubricant seepage around shafts and seals on the digester drive and support systems.

TRAINING

Train Sumter County staff and operations personnel in the provisions specified in the contract Schedule VI, 5.0. as follows:

1. How to proportion and load digesters with municipal solid waste, sludge, and inoculant.
2. How to compute theoretical moisture content of a batch of compost.
3. How to transfer material from one compartment to another.
4. How to discharge the digester.
5. How to perform the daily monitoring requirements including temperature, moisture, and oxygen.
6. Technique for estimating moisture content of incoming MSW.
7. How to analyze sludge samples, and moisture content.
8. Setting up daily tracking and reporting logs (to be furnished by Bedminster).
9. Setting up daily tracking and reporting logs (to be furnished by Sumter County).

Training will be provided at operating Bedminster facilities and on site at the Sumter County facility during start-up and shakedown of the digester system through the acceptance testing.

REQUIRED PROCESS SUPPORT EQUIPMENT

In order to accomplish the procedures necessary, certain pieces of equipment are required of the owner of the system, such as:

- Microwave oven for drying samples of sludge and compost to determine moisture content.
- Scale (digital or balance beam) with capacity to handle 100 gram sample plus container and sensitivity to 1/10 gram.
- CO_2 and/or O_2 meter with probe capability or reagent set to enable carbon dioxide or oxygen level monitoring of digester contents. (May be combined with confined space gas analyzer below).
- OSHA approved gas analyzer to measure atmosphere prior to comply with confined space entry requirements.

SAFETY

There are no known safety risks specific to the Bedminster Process or associated equipment. Normal industrial safety measures are expected in operation of any large, powered mechanized equipment.

Typical hazards may include (but are not limited to):

- Confined Space Entry - The Eweson Digester fits the OSHA definition of a Confined Space and appropriate precautions should be followed to conform to OSHA regulations.
- Protrusions - There are devices that protrude from the surface of the digester such as door actuators, thermometers, galvanic meters, water lines and valves. The digester rotates quietly and at slow speeds and it is easy to become casual and persons may be struck by the apparatus that protrudes from the surface of the digester. Hard hats should be worn when working around the digesters and workers must avoid familiarity breeding complacency.
- Change in direction - When working around the digesters, a person needs to be aware of a possible sudden change in rotation of the digesters upon shutdown. Workers in the area of the digesters should be alert and work far enough away from protrusions so that no one will be hurt should the digester shut down for any reason.
- Power Lockout - When working on the digesters, the digesters must be locked out, per the OSHA Lockout/Tagout Procedures.
- Automatic Start - The feed rams cycle automatically and could cause severe injury if an employee were to fall in the chute or were working on the apparatus. Become familiar with company Lockout procedures as applied to all powered equipment.
- Projectiles from discharge doors - The digester rotates with the discharge doors open and objects may fall out and strike a person too close to the active discharge door. Discharge is a Hard Hat area.

PROCESS FLOW

RECEIVING WASTE

UNACCEPTABLES

The Eweson Digester is designed to accept a broad range of materials typically found in MSW. There are, however, certain materials that can be hazardous to personnel, equipment and process. Common items of this nature include propane tanks used in home gas grills, gasoline cans, ammunition (even artillery shells have been discovered), insecticides or lawn chemicals (can kill bacterial population in digester),and bio-medical waste.

Prior to loading into the digester, the feedstock must be visually inspected for hazardous waste. This is defined as material that is explosive, volatile, radioactive, toxic, corrosive, flammable, reactive, which generate pressure through decomposition, etc. (more specific examples will be included in training). If such material should be discovered, every effort should be made to identify the source to prevent recurrence. Proper disposition and correction will be directed by the Plant Management.

Visually inspect garbage for unacceptables listed below and remove them.

- Pathogenic waste. If any medical waste comes in, notify the Plant Manager immediately. DO NOT allow these items to go into the digester.
- Water treatment residues.
- Tree stumps or limbs over two inches (2") in diameter or in excess of three feet (3') in length.
- Waste oil or other oily substances.
- Machinery (other than small household appliances) or equipment including, without limitation, discarded "white goods" such as freezers, refrigerators, washing machines, etc.
- Industrial waste.
- Matter or material (excluding corrugated boxes) longer than three feet (3'), particularly hose, cable, and other stringy items.
- Firearms, shells, or other explosives.
- Other large, bulky or unsuitable items such as mattresses, beds, furniture, carpets, bicycles, baby carriages, and the like.

PROPORTIONING AND LOADING FEEDSTOCK

Technique for Estimating Moisture Content of Incoming MSW

Due to the heterogeneous nature of MSW as received in a waste processing facility, moisture analyzing techniques are seldom adequate. Moisture content can vary based on weather conditions, changing sources from day to day, or seasonal changes. The most successful method for evaluating the moisture content of incoming MSW revolves around maintaining records of the moisture samples taken from the first compartment of the digester and comparing that data with records of the materials fed into the digester that provided the sample. In a relatively short time, patterns of moisture levels vs. material

source become clear, and the operator will be able to visually estimate the moisture content of incoming MSW.

For initial or default values, an industry average of thirty per cent moisture is appropriate. Experience will enable the operator to adjust from this point in response to changing conditions.

Sludge

The plant will receive liquid sludge. Solid (dewatered) sludge typically will contain a minimum of 15% solids -- typically 20-30% solids. The liquid sludge is projected to be between seven and nine per cent solids.

Studies have shown that microbial activity slows or even stops at moisture levels below about 40%[1]. At moisture levels approaching 60% or more, the spaces between the particles become clogged, air circulation decreases and conditions become anaerobic. Therefore, biologically, the acceptable moisture range is between 40% and 60% with an optimum of approximately 50%. There are other physical factors that further reduce the acceptable range, however. For example, some screening devices will clog or "blind" at moisture levels of 50% or more. This reduces the acceptable moisture level range to a high end of 50%, regardless of the biological optimum. This means that moisture content of the feedstock must be controlled which requires consistent moisture monitoring with adjustments as needed.

Analyzing Sludge Samples and Moisture Content

Sludge from water treatment facilities can vary. It is a simple process to determine the moisture content by weighing a sample from an incoming batch, desiccating it with a microwave oven, reweighing the dried sample. The weight lost is determined by subtracting the weight of the dried sample from the initial weight of the sample. The weight lost represents the water driven off by the heating process. Divide the weight of water by the initial sample weight to determine the moisture percentage in the initial sample.

How Dry is Dry?

To determine how long to heat a sample to consider it "dry" is dependent upon the particular microwave oven being used. An acceptable protocol would be to take a 100 gram sample, place it in a non absorptive open top container and heat it for two minutes. Weigh the sample again and record the weight. Stir the sample and re-heat for 30 seconds. Weigh and record the weight again. Repeat the thirty second heating cycles until no more weight loss is observed between heating cycles.

When no more weight is lost, the total time heated becomes the standard time for future samples. This time should be split into two cycles with gentle stirring between to ensure there is not a protected pocket or compacted particle that could give erroneous figures.

Whatever time is determined appropriate for the equipment used, it is important that the same time be used for each sample to ensure consistency. The procedure for determining the appropriate heating cycle time may be repeated periodically to ensure accuracy, but avoid changes between samples being compared.

How to Compute Theoretical Moisture Content of a Batch of Compost

In each compartment of the digester there is an eight inch diameter hole with a sliding cover that provides access to the digester interior. To extract a sample, open the port (this can be done while the digester is in rotation), and using a small garden trowel, clear the packed

[1]Standards Committee of the Composting Council, *Compost Facility Operating Guide, 1994*

material from the port and extract a representative mixture of the loose material into a container with a sealable top (a "Tupperware" type container is typical). Cover the sample to avoid moisture loss until the sample can be weighed.

There is a natural tendency to remove pieces of glass, plastic, etc. from the sample prior to weighing and drying the sample. While, ideally the sample should be representative of the contents of the digester, which does contain inorganics, the sample is so small compared to the volume in the digester that it becomes an insignificant point. The samples should be consistent, from one sample to the next, however, and removing as much of the inorganic material as possible does help maintain the consistency between samples.

One exception to leaving some inorganic particles in the sample is metal. Every effort should be made to avoid pieces of metal in the microwave. If the sample is to be dried by heating in a microwave, ***metal pieces (pop tops from soda can for example) will become extremely hot and may ignite the organic portion of the sample as it dries.*** If this occurs, a new sample should be run, depending upon how much of the sample was burned. Also, be aware that smoldering compost can be very difficult to extinguish and care should be used to avoid fires caused by hot embers being accidentally dumped in a waste can.

At least once a day, usually first thing in the morning, a sample of material is removed from the sample port in the first compartment of the digester (100 gram or 10 gram samples make the math easier). Using the same protocol described for the sludge sample above, this sample is weighed, dried (usually in a microwave oven), then re-weighed. The difference in weights used to calculate the moisture content of the material in the first section. This moisture content is compared to the desired levels and to the previous day's material that was loaded into the digester. From this information, adjustments can be made to the current day's mixture being charged into the digester to ensure moisture levels are within the target range.

The optimum moisture level for the facility must be determined. Major changes in MSW characteristics will trigger additional testing and calculation of moisture content. Such changes occur due to such things as precipitation, seasonal yard maintenance, and holidays or vacation periods.

Moisture content must be evaluated frequently during early phases of operation to optimize the biological requirements with the physical constraints of the equipment. For example, if the plan calls for 50 tons of MSW and 25 tons of (sludge) per day, but the moisture level of the sludge results in a moisture level of the compost high enough that it blinds the trommel, adjustments must be made. Such adjustments might involve using drier sludge, using less sludge, or increasing the air throughput in the digester, or a combination of such options.

How to Proportion & Load MSW, Sludge and Inoculant

Water from the sludge tank is metered into the digesters by a pump. To determine the amount of liquid to be pumped into the digesters in order to attain a moisture content of about 52%, the Tipping Floor Operators factor in the moisture content of the de-watered sludge available that day, and they estimate the moisture content of the MSW, which is usually about 30%, based upon historical industry averages.

Based on this information, determine how many gallons of liquid from the sludge tank should be metered in during the period that the digester is being loaded. The capacity of the pump determines how long and at what intervals the water should be injected into the first section of the digester.

Compute Amount of Water to be Added

Assume 50 Tons of MSW is received with a moisture content estimated at 30%. Assume also that you are mixing 25 Tons of dewatered sludge at 92% moisture content. The moisture content of any compost recycled as innoculate or

amendment is 30%. Assume the water/liquid sludge pump operates at 50 gallons per minute.

Remember that the water content of the sludge will be part of the water contained in the compost process. Therefore, you must determine how much of the required water is being supplied by the sludge before you can determine how much liquid water, if any, that you must pump into the digester to achieve the desired moisture level. Remember also that the target moisture content is the content of the combined weight of the MSW, the sludge, and the recycled compost plus any water added in liquid form.

Moisture content of the sample is determined by the process described above. The difference between this figure and the desired moisture content determines the amount of water to be added or the amount of drier to be added to the sludge.

If the desired moisture percentage is 55%, the water to be added equals the total feedstock times the difference between existing and desired water content divided by the inverse of the desired moisture content.

To figure how much water will be needed per batch, the following formula is used:

A = E (B-C)/(D-B)

A= Amount of water/liquid sludge required in tons.

B= Desired moisture content of the mixture in the digester.

C= The moisture content of the MSW, the inoculant, sludge combined.

D= The moisture content of the water/liquid sludge.

E= The amount of MSW, inoculant and C/N modifier combined, in tons.

To figure how long to run the water pump to add the proper amount of water:

Assume a pump capacity of 50 gallons per minute, digester loading time of 120 minutes and a desired pump run time of five minutes.

Divide the total water needed by 250 gallons (5 minutes x 50 gallons per min.). Divide this number into 120 minutes. The answer will give you how often to run the pump for five (5) minutes intervals.

Moisture Content Calculation Model

	Tons	% Moisture	Tons of Water
MSW	50	30.0%	15
DW Sludge	25	90.0%	22.5
Recycled Compost (10%)	7.5	30.0%	2.25
Water/Liquid Sludge	0	100.0%	0
Total to Digester	82.5	48.2%	39.75

Divide Total Tonnage by Tons of Water to determine the starting moisture %.

Desired Moisture %	52.0%
Starting Moisture %	48.2%
Difference in Moisture	3.8%

To determine tons of water to add, apply the formula.

A = E(B-C) / (D-B)

Tons of water to add	6.6

To confirm amount of water to add, enter the above figure to the Water/Liquid Sludge* cell in the spreadsheet.

	Tons	% Moisture	Tons of Water
MSW	50.0	30.0%	15.0
DW Sludge	25.0	90.0%	22.5
Recycled Compost	7.5	30.0%	2.3
Water/Liquid Sludge	6.6	100.0%	6.6
Total to Digester	89.1	52.0%	46.3

After adding the water, note the agreement in %Moisture with Desired Moisture %.

To determine how long to run the pump to add the required water:

Weight of water / gallon	8.4	Lb/gal
Additional gallons needed	2000	gal
Throughput of pump.	50	Gal/Min
Minutes to run pump during digester loading.	40	Minutes

** This computer spreadsheet model will be provided upon request to enable simple plugging in of the numbers.*

DIGESTER STRUCTURE

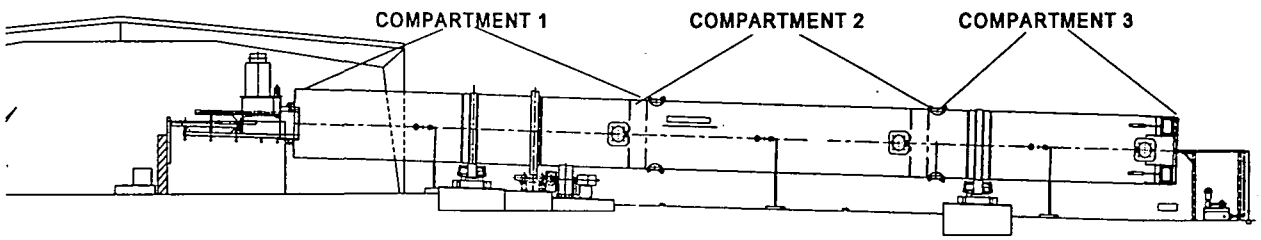


Figure 3

Body

The Digester is a three compartmented, cylindrical vessel, 12.5' in diameter and 185' in length, very similar to a lime or cement kiln. At this size, the digester has the capacity to process 50 tons per day of MSW and approximately 25 tons per day of sewage sludge.

The shell is comprised of ASTM A-36 carbon steel plate, 3/4" thick the entire length, except at the tires and bull gear where the plating thickens to not less than 1.375" and up to 2.0" as required by design drawings and industry standards in certain sections after machining. The heavy plating under the riding tires is machined to exact diameter to ensure the proper clearance with the rings, eliminating any filler bars. The exterior of the shell is cleaned and coated with an inorganic zinc primer for corrosion resistance. There are steel plated bulkheads located at both the feed and discharge end of the digester, the feed end bulkhead containing the feed opening and connection to the feed ram unit.

The exterior of the digester is coated with a layer of sprayed-on polyurethane insulation which is in turn coated with a multi-mil elastomeric coating. This final coating serves to defray much of the destructive ultraviolet rays from the sun that cause coating breakdown.

Drive

The digester can operate continuously at rotation speeds between one-half and one RPM on two (2) normalized, forged steel riding tires approximately 24" wide and approximately 7" thick and one (I) 24" wide, rigid flange mounted, toothed helical bull gear of Falk manufacture or equal. The drive system is powered by a 150 HP 1800 RPM variable speed electric motor with a Falk (or equal) grid type high and low speed coupling into a Falk (or equal) A style gear box. The drive includes a Falk forged steel, helical 20" face width pinion with shaft and roller bearings.

Interior

The digester is equipped internally with 1/2" thick X 2" wide steel flat bar longitudinal stiffeners on 7" centers. These bars provide containment for an insulation barrier of compacted compost. However, these bars are not included in the strength calculation. Also internally, the digester is equipped with (2) patented transfer mechanisms to move the compost material from compartment one to two and from

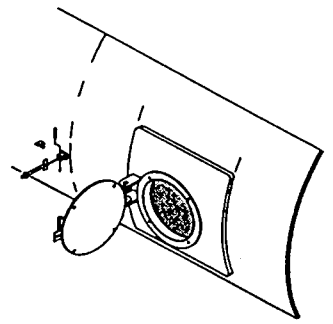


Figure 4 - Manway hatch

compartment two to three. The two door, transfer mechanism is comprised of structural steel and steel plate and integrally welded to the shell plating. The transfer mechanisms are fitted with manways (manholes) for access to the doors, as well as the digester itself.

The interior is protected by magnesium anodes providing sacrificial protection from the corrosive environment.

Access to the interior of each compartment is provided by through round hatches distributed along the length of the digester.

Supports (Trunnions)

The digester is supported on (2) steel reinforced concrete piers upon which are mounted (2) approximately 26" wide normalized cast/forged steel carrying rollers. The rollers are mounted on a structural steel frame base and include (2) approximately 18" X 22" journals with brass liner type bearings. The digester is also equipped with (I) approximately 36" diameter by 7 " thick face width cast steel thrust roller assembly for proper rotational operation.

Transfer Doors

Each of the two baffles separating the interior into three compartments contains two transfer doors that control the passage of the material from one compartment to the next. On the uphill, or loading side of the baffle, the door is in the form of a scoop that picks up approximately one and one half yards of material with each rotation. The scoop extends through to the downhill, or discharge side of the partition. As the scoop begins the downward travel of the rotation, there is a door that opens and allows the material to fall out into the lower compartment if the door actuator is in the open position.

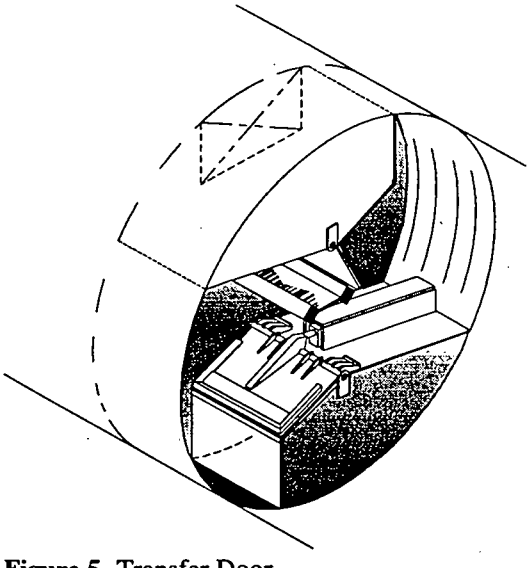


Figure 5 -Transfer Door

The door is held in the closed position by a steel cylinder that butts up against the back rib of the door and prevents the door from swinging on the hinge as the door begins the downward cycle of the rotation. This cylinder is moved in and out (locking and releasing the door) by use of crank handle on the exterior of the digester that drives a screw to move the cylinder.

It is critical that these door actuators be closed properly to ensure that material does not move to the next compartment before its time. Too much material in a compartment reduces the tumbling action, reduces exposure of the material to the air flow, and can even pack the digester to the point that it does not discharge properly.

Discharge Doors

The discharge end of the digester is fitted with (4) sliding discharge doors to allow for the emptying of the third and final compartment. These doors are opened and closed by cylinders activated by water pressure.

Steel water piping is connected to the digester by means of a universal joint at the discharge end bulkhead to provide water pressure to activate discharge door mechanism. It also enables the operator to modify the moisture level within the third compartment, if necessary.

Air Injection System

Also attached to the discharge end of the digester is the air and water supply system. Air is introduced into the digester (to provide fresh air to the microbes as well as to maintain proper temperature ranges) by means of a positive displacement blower. This blower is coupled to a steel piping system with a discharge into the third compartment of the digester.

The system comes equipped with an exhaust air port in the first compartment, which is the 72" throat of the ram feed assembly. To manage the air being forced through the digester, the ram also comes equipped with an "in-the-throat" air pick up, where the air that is pumped through the digester is captured and transferred to the scrubber and then to the bio filter to accomplish the treatment of any potentially offensive air emissions.

Liquid Injection System

The digester is also fitted with a universal pipe joint in the feed end bulkhead to allow for the pumping in of high liquid content sewage sludge, septage, or waste. The liquid is pumped from a holding/storage tank by means of an electric pump and piping system equipped with in-line shut off valves. The liquid is metered into the digester with a pump which allows the operator to activate/deactivate the system according to need.

Monitoring Devices

Each of the three compartments contains an externally read temperature gauge and manually operable sampling port for testing and sample taking.

The temperature port consists of an internal sealed tube filled with oil to ensure consistent readings and to protect the thermometer probe.

There is a galvanometer mounted on the exterior of the digester shell which measures the degree of corrosive activity going on between the shell structure and the contents of the digester.

The sample port is an eight inch hole covered with a rotating sliding hatch through which the operator removes daily samples for moisture analysis.

There is a 3/8" hole with a beveled interior opening for insertion of a wire probe to determine the depth of material inside the compartment. It is also sized to enable a plastic probe from a gas sampling meter to be inserted to measure O_2 levels and to test for hazardous gasses prior to entry per applicable OSHA regulations.

DIGESTER OPERATION

The routine daily operation of the digester begins with discharging the contents of the third section of the digester. This makes room for the contents of the second section to be transferred to the third and the contents of the first compartment to be transferred to the second, leaving the first compartment empty, awaiting the charging of the new day's material.

Section three of the digester contains "rough" compost, organic material broken down physically to a topsoil-like material. Mixed with this organic material are the inorganic components such as plastic bottles, cans, bowling balls, glass, plastic bags and fabrics.

Discharging the Digester

Safety

The Discharge Operation is a "Hard Hat" area. The unloading operator should stay out of the way of the direct line of the gate openings on the digester, since heavy objects may occasionally fall out and could cause serious injury.

Due to the risk of head injury by piping and other attachments to the outside of the third digester compartment, be very careful when ducking under any turning digester.

Procedure

Increase the rotational speed of the digester to 60 revolutions per hour to help discharge and transfer. Note the speed and advise your supervisor if it is not at the right setting.

Ensure that all process components downstream from the discharge operation are operational and running, such as the discharge conveyor, the trommel loading conveyor, the trommel itself, and so on. If this is not the case, determine the cause and correct the situation before opening the discharge doors or a large backup of material can occur resulting in hours of clean up.

Open the valve to allow water pressure to reach the discharge door actuators.

Discharge Door Operation

Using the water pressure actuators, open two of the sliding gate valves on opposite sides of the digester about half way. The goal is to get a relatively even flow of material out of the digester onto the discharge conveyor.

Additional gates can be opened as flow rates allow. Operating experience will indicate optimum combinations of the number of gates on the digester to open, and the width of those openings. Sometimes it may discharge better with all four of the gates partially open, than to have only two gates wide open.

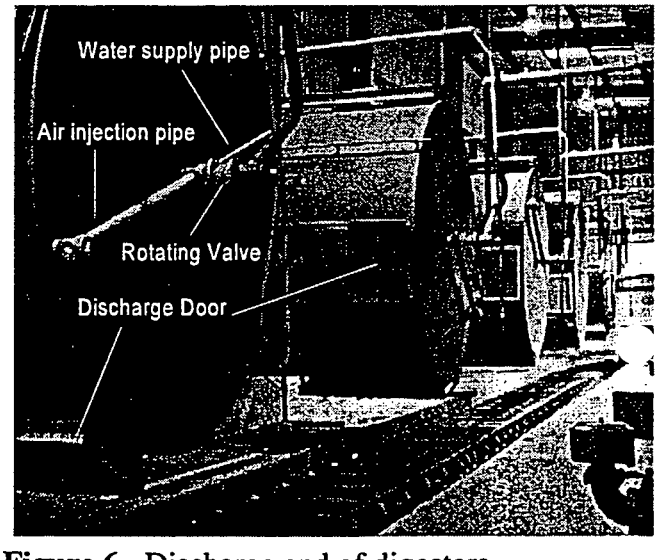


Figure 6 - Discharge end of digesters

Discharge Rate

The key to determining how fast to unload a digester is the depth of the material on the discharge conveyor. Take care not to overload the discharge conveyors since they may stop working, or any downstream screening operations may become overloaded and shut down. Either situation will stop the process.

Overloading discharge conveyors can also overload the trommel which then will not be able to screen as efficiently. This allows compost to pass over the screen and end up in the residuals. This unnecessarily increases the weight of the residuals which end up in the landfill and also reduces the amount of compost product available for sale.

On the other hand, if the rate at which material is unloaded onto the conveyor is too slow, it will take too long to unload the digester. Exercise good judgement.

Hairballs

Balls of textiles, wire, hose, etc. can form in the digester and is normal to a certain degree. When these become too large, these tangles (affectionately known as "hairballs") can block the digester unloading gates.

With proper sorting and removal of undesirable feedstock, such as with a properly operated MRF in the Feedstock Recovery phase, "hairballs" should be minimized or even eliminated. However, due to their potential negative impact on the compost recovery process, the operator must be aware of this potential problem.

Normally, these tangles will work their way out over the course of several (many) rotations of the digester. If they do not work their way out, they must be manually removed. Several options include fully opening one or two gates to allow the ball to work its way out, cutting portions off as it hangs out of the digester, or physically wrestling it out. Use caution and contact your supervisor if you need assistance. If necessary, the digester can be stopped to work on the hairball.

It is important that the unloading operator monitor the "hairball" situation and remove impending problems before they can cause problems downstream from the discharge operation.

Controlling Airborne Dust

Add Moisture

If the compost is too dry (less than 40% moisture) dusty conditions may be created in the discharge process. If dusty conditions are created, water can be added to the contents of the third compartment by turning on the valve on the side of the third compartment of the digester for 5 to 10 minutes. Repeat, if necessary, to control dusting. It may be necessary to close the discharge doors and allow this water to be mixed with the compartment contents for a period of time. It is permissible to allow this water to run during the discharge process to control dust, but the moisture level of the compost being discharged must be monitored to ensure it is within tolerances. The water injection system must be closed in order to shut the sliding discharge door which helps to ensure that the water injector is not left on unattended. If you have occasion to inject water with the discharge doors closed, **be sure to turn off the water injection valve before shutting down the discharge operation.** If allowed to inject water too long, it can result in the compost becoming saturated and packing into the digester to such a degree that it does not readily come out of the discharge door. It also may allow leachate to leak out into the plant.

Reduce Air Flow

Normal discharge operations call for the positive displacement blowers to be turned off during the active discharge process. This is to avoid materials being blown out of the digester through the open discharge doors.

DAILY MAINTENANCE

Digester Air Injection Pipe

After a digester is unloaded and before the discharge gates have been closed, shut off the Digester Blower and remove the two plugs in the air line. Using the rod provided, clean out the air line going into the digester. Check the air line that runs from the swivel hub at the center of the end face of the digester to the perimeter of the digester and clean that also if necessary. When the air lines are cleaned out and the pipe plug is replaced, the positive discharge blowers must again be turned on.

Rotating Valve

Grease discharge door tracks and swivel joints per preventative maintenance schedule. This swivel joint is an interface with a fixed pipe joint and a rotating joint. If not lubricated properly, it may bind and actually unscrew the fitting. This will release water or blower air, or both, into the work area.

INTER-COMPARTMENT TRANSFERRING

When the flow of material has almost stopped from compartment three, indicating that the compartment is almost empty (depth of material is 2-3 feet), it is time to open the transfer doors between compartment two and three. This helps push out the remaining compost in compartment three.

The discharge operator will be able to see the material through the discharge doors and should consider the compartment empty when the contents are about even with the vertical flange (ring dam) between the digester compartment and the discharge door compartment.

When material is being transferred into compartment three from compartment two concurrently with the discharge operation, compartment three is considered empty when small hairballs and plastic material transferring down from compartment two start to appear at the discharge gate. This usually takes about 15 minutes from the time the doors between compartments two and three are opened for this material to begin appearing. At this time, close and secure the discharge slide door on compartment three.

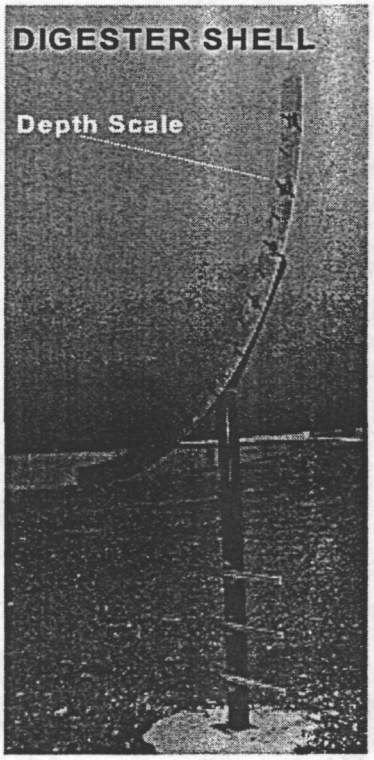
Transfer Timing

The transfer of material from one compartment of the Eweson Digester to the next is one of the most critical phases of the process. The Bedminster process involves keeping the materials in each compartment of the digester for a prescribed period of time. To control this, there are baffles between each of the sections. Each baffle contains two transfer doors to allow material to be transferred from one section to the next at controlled times.

It is important to pay attention to the time that the transfer doors are left open and to the levels of material in the compartments at the beginning and end of the transfer cycle. This is particularly important if both sets of transfer doors are open and sections one and two are transferring concurrently.

If the doors are not closed at the proper time, material transferring from compartment one to compartment two may continue into compartment three. This can cause multiple problems.

First, the material is not detained for the proper time in the proper compartment, which results in the waste being inadequately exposed to the higher temperatures attained in compartment two.



Second, the doors open and close by gravity during the rotation of the digester. If material is packed into the receiving compartment to the point that it cannot pass through the transfer door, the doors themselves can become stuck in the open position and cannot be closed until the lower compartment is emptied. This again breaks down the control of the detention time in each compartment which can result in inferior product.

Further, and a more immediate problem, the material can become packed into the third compartment to the point that it will not fall out when the discharge door is opened. This requires the material to be manually loosened using such things as rakes, pitchforks and even pick axes. Proper attention to the transfer process is much easier.

Measuring Compartment Depth

The depth of material in the digester is determined by an operator taking depth readings through the probe port (a 3/8" hole) through the side of each digester compartment.

A twelve inch length of stiff wire is inserted into the digester through this hole at the upper quadrant of the down running side of the digester. At this point, the probe is above the material in the digester. As the digester rotates downward, the probe begins to contact the material inside and the operator is able to feel this. When the probe contacts the material inside, the operator observes the readings on the adjacent gauge on the outside of the digester and records the depth reading. This gauge is calibrated with markings aligned with the slope of the material inside the rotating digester. If the there is not clearly positive contact with material inside, the probe may have to be repeated two or more times to get consistent readings. Record depth and time on the daily log.

This procedure may take several rotations depending on the nature of the material that happens to be at the position of the probe port at the time of the sample. It is possible that on a given rotation, the probe may fit into a void or empty space and an inaccurate or inconclusive reading may occur.

Depth is measured in each compartment at least once each day and maybe several times in compartment one during the course of loading the digester.

Transfer Times

When the first compartment reaches nine feet, loading should cease. This is to retain "void" space within the compartment to permit the contents to tumble and thereby more efficiently break down into smaller pieces. It is normal to allow the digester to rotate for an additional several hours and then to "top off" with more MSW if necessary to clear the tipping floor. Before beginning the transfer from one compartment to the next, the operator should measure the depth in the receiving compartment at the beginning and end of the transfer. This is first to ensure that there is capacity in the receiving compartment, and then to determine how fast the material is transferred through the transfer doors. Excessive time for material to move from one compartment to the next is an indication that one or both of the transfer doors are blocked. If this occurs, it may be necessary to enter the digester to

remove the blockage. This will be discussed in detail later in this document. A Digester Data Sheet is provided in the appendix to assist the operator in tracking this data.

Concurrent Compartment Transferring

Open both transfer doors between compartments two and three, as described above. Initially, until the operator has accumulated experience with the equipment, it may be best to transfer in discrete stages if time allows. This means the operator should empty compartment three before opening the transfer doors between compartments two and three. Similarly, complete the transfer from compartment 2 into 3 before beginning transfer of compartment 1 into 2. This is to ensure that the transfer doors can be closed properly and to allow accurate determination of transfer times.

With more experience and predictable transfer times, transfer of the three compartments can be overlapped in time, allowing partially concurrent transfers and reducing the daily process time. About 30 minutes after the doors to compartment three have been opened, the doors between compartments 1 and 2 may be opened so that transfer between compartments can proceed almost simultaneously.

The level in any compartment should not be more than 10 feet deep, as indicated by the gauges on the outside of the digesters.

CHARGING THE DIGESTER

With the digester discharged and the upper compartments transferred, the first compartment is ready to receive the day's input.

Procedure

Each day, approximately 50 tons of MSW (depending on its density) can be loaded into the first compartment of the digester, along with 25 tons of de-watered sludge. In addition, an inoculation of raw, uncured compost culture mix should be mixed in to reintroduce fresh bacteria to the first compartment. This inoculation should consist of approximately ten per cent of the day's weight of MSW. Remember to include the moisture content of this inoculant in the total moisture going into the digester. The exact ratio of sludge to MSW should be adjusted to meet the moisture content requirements.

Evenly distribute the day's sludge throughout the day's garbage. Some adjustments may be needed to keep inventory of "Culture Mix" constant.

Measuring Depth

It is important for this information to be communicated to the operator loading the digester to avoid over filling the compartment. A certain amount of empty space is necessary to provide room for the contents to tumble inside and thereby break up the contents and provide room for air flow to control oxygen content, temperature and moisture levels. Overfilling the compartment reduces the effectiveness of the digester process.

The first compartment of each digester is to be loaded until filled to about three quarters depth, indicated by a nine foot depth as measured by the gauge on the outside of the first compartment. This is considered "full" for normal operational purposes. When the garbage is at this level, stop loading.

As the digester rotates, the volume of the MSW in the first compartment is reduced by the physical break up of the material that has been loaded. About an hour later, check the level of the garbage in the digester previously loaded. Add enough additional MSW and sludge to bring the depth level back to nine feet, or as specified by the supervisor.

HOUSEKEEPING

Compared to housekeeping requirements in a well run MRF, the Bedminster Digester System does not create any conditions requiring special handling or treatment.

Spillage - Digester Contents

The process of opening the sampling port for moisture samples, opening the manways for access to the interior of the digester, and spillage or dust occurring during the discharge operation can result in material falling out of the digester. This can result in odors, and depending on the stage of decomposition, vector attraction (mice, flies), and litter (plastic film, paper pieces).

These situations can be avoided by prompt cleaning of any spillage that occurs during normal sampling procedures.

Spillage - Feed Ram Assembly

Feedstock can overflow and become entangled in the tracks of the ram guides. This can result in mis-tracking and potential jamming of the rollers of the digester loading system. Attempting to continue to run the ram system after it begins to bind can create uneven forces and wear on both external parts (rollers, guides) and internal parts (hydraulic cylinders and pistons) with resulting expensive repairs that could be avoided by simple housekeeping.

Periodic cleaning of debris before it accumulates to a damaging degree should be part of routine cleanup and maintenance.

Leakage - Lubricants

A small amount of oil or grease leakage between rotating shafts and seals is normal. This can be controlled by periodic external cleanup using such things as oil sorbants or dry compost itself to absorb the leaking material. This material may be reintroduced into the digester as a means of disposal. The microbes in the digester will consume these small amounts of petroleum products with no ill effects to the compost or the environment.

If leakage appears to be excessive, it is indicative of improper seal placement or shaft wipers on the interior surfaces of the shafts and gears. These are normal maintenance items and should be examined and adjusted as required on a routine basis.

Leakage - Digester Seals

If the digester seal becomes damaged, wears too far, or if the air bag inflation is faulty, material may be squeezed out of the first compartment of the digester between the front face of the digester and the fixed seal ring on the feed ram assembly. This can also be caused by overfilling the first compartment of the digester during the loading process. At this early stage in the digester process, this is essentially raw garbage with all of the associated health and odor risks.

Once again, there is no special risk to this type or clean up, but prompt attention will avoid odor and health risks. The material gathered in the clean up process can be reloaded into the digester for disposal.

DIGESTER MAINTENANCE

This section is to emphasize the need and value of maintenance and to provide an outline of recommended intervals and materials to forestall potential problems, particularly in the start up phase of operation. It is *not* meant to replace detailed maintenance procedures provided by the component manufacturers, nor is it meant to be a detailed preventive maintenance program.

There is a tendency when dealing with machinery of this size to think in terms of sledge hammers as appropriate tools for adjustment. It is important to understand that adjustments of a few thousandths of an inch can move the entire digester uphill.

There is also a tendency to think, when dealing with machinery that rotates a mere one RPM (at top speed!), that the lubrication requirements are not as critical as rapidly rotating machinery. It is important to realize that while the motion is slow, the forces between machine surfaces are tremendous when dealing with equipment of this size, and therefore proper lubrication is critical.

The digester will be installed and adjusted in stages including running empty to evaluate balance, thrust and alignment, and then again under load to fine tune these factors. Once established, the digester should function for years with minimum adjustment and routine maintenance.

DRIVE SYSTEM

Lubrication

The gear box requires approximately 142 gallons of industrial Rust & Oxidation Inhibiting (R & O) or Extreme Pressure (EP) gear oil. ISO rating (thickness) will depend on ambient temperatures. Typical viscosity would be an ISO viscosity Grade of 220 for an environment between 50 and 125 degrees Fahrenheit[2].

Use industrial *gear* oil. It is important to consider all of the oil's characteristics. For example it is possible to buy a compressor oil with an ISO viscosity grade of 220, but its major properties are designed to dissipate heat, not to protect against compression as would be the requirement in this type of equipment.

Inspection & Service Intervals

Start-up -

Check for obvious leaks and fastener tightness. Check for any signs of gear wear. Despite the expected long life of components of this nature, galling and undue wear can occur very quickly if there should be any misalignment of internal gear shafts, placement of the gear housing out of level conditions, or improper lubricant.

Listen for changes in gear noise. Increase in pitch (frequency) is normal with increase in revolution speed associated with the variable speed drive, but "howl" or "whine" sounds, particularly a significant change between one speed and another are indications of imperfections and must be investigated.

Analytical techniques include analysis of oil samples and/or acoustic analysis of tape recordings taken at specified locations around the gear box and can provide very precise identification of the source of a given sound. If potential problems should arise, contact your Bedminster representative at the earliest sign.

[2]Manual 128-010, Table 5, The Falk Corp., April 1994.

First Month -

Drain and flush gear box. Replace with fresh oil.

Periodically -

Inspect oil levels with digester stopped. Use dipstick on back of gearbox. Do not over fill above the mark on the dipstick.

Oil changes can be based on oil analysis or time interval. Change every 2500 operating hours or six months. When evaluating oil based on analysis, use the following guidelines to determine when to change the oil:[3]

- when water content is greater than .05% (500 ppm).
- when iron content is greater than 150 ppm
- when silicon (dust/dirt) is greater than 25 ppm
- when viscosity changes more than 15%

Using a *hand powered* grease gun, at least every six months purge contaminated grease from all seals by pumping NLGI # 2 grease until a slight indication of fresh grease flows out along the shafts. Do not over grease. Do not use powered grease gun due to increased risk of damage to grease seals and resultant loss of lubrication. Even the hand powered grease guns are capable of damaging grease seals, so use with caution.

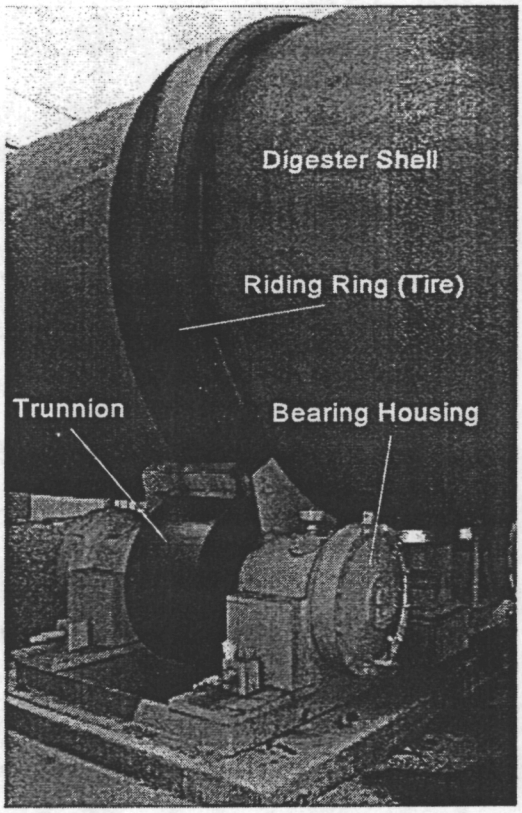


Figure 8- Support Roller Assembly

SUPPORT ROLLERS (TRUNNIONS)

Lubrication -

Oil level.

Check horizontal pipe to ensure it is not plugged. If it does become plugged, the vertical oil filler pipe will give erroneous readings of oil depth. The depth indicator may indicate sufficient oil, but a blockage In the bottom of the oil sump may hide an empty sump and you may be reading the oil depth in the pipe only.

Oil Type

The digester manufacturer recommends Mobile *Gear 632 oil at an ISO Viscosity Grade of 320 for* this equipment. This provides an SSU rating of 1620 at 100 degrees, a Pour Point of zero degrees, and a Timken load rating of 40. Other brand names of equivalent properties are acceptable.

[3]Manual 128-010, Page 3, The Falk Corp., April 1994

DRIVE COUPLINGS -

The couplings allow and compensate for minor alignment variance between the gear box and the pinion gear of the digester drive and between the drive shaft of the motor and the high speed shaft of the gearbox.

Lubrication -

Grease Type

Due to the relatively high speeds of the coupling, *do not use regular grease.* The centrifugal forces tend to separate the soap thickeners from the lubricating oils and excessive wear and failure of the coupling can occur. Use a grease designed for high centrifugal forces, specified for couplings.

DIGESTER THRUST ADJUSTMENT

Drive Gear Mesh

Moving the trunnions in or out (horizontally) raises or lowers the digester cylinder. This changes the depth that the teeth of the pinion and the teeth of the ring gear of the digester drive engage each other. These components are adjusted carefully for proper clearances during installation and it is important that whatever adjustments are made to the support rollers do not *increase* the depth of engagement of the pinion teeth to the ring gear teeth. For this reason, adjustments should be made by moving the appropriate trunnion *inward* whenever possible. Moving the trunnion outward lowers the digester and increases the depth of engagement of the drive gears with the potential of the gear teeth bottoming out against each other. This results in excessive wear and overheating.

Support Rollers (Trunnions)

Trunnions are rotating points of support upon which the digester cylinder rests.

Changing the position of one or more of these trunnions will actually move the entire digester cylinder uphill or downhill depending on the position relative to each other.

There are two sets of two trunnions each that support the digester cylinder. The alignment of these support rollers (trunnions) relative to the digester is critical to a few thousandths of an inch. During the setup of the digester, these trunnions will be aligned to a certain degree, but as the assembly rotates during break-in and again after the digester is filled and is running under a full load, the alignment must again be adjusted.

These trunnions are supported in bearings bathed in oil. The oil level is maintained and monitored by the depth in a vertical pipe that enters the bottom of the oil sump in the base of the bearing housing.

Thrust Rollers

Thrust rollers are horizontally rotating steel wheels rotating on vertically mounted shafts seated in an oil lubricated bushing. Their job is to limit the amount of movement of the cylinder, uphill or downhill, created by the alignment of the support rollers.

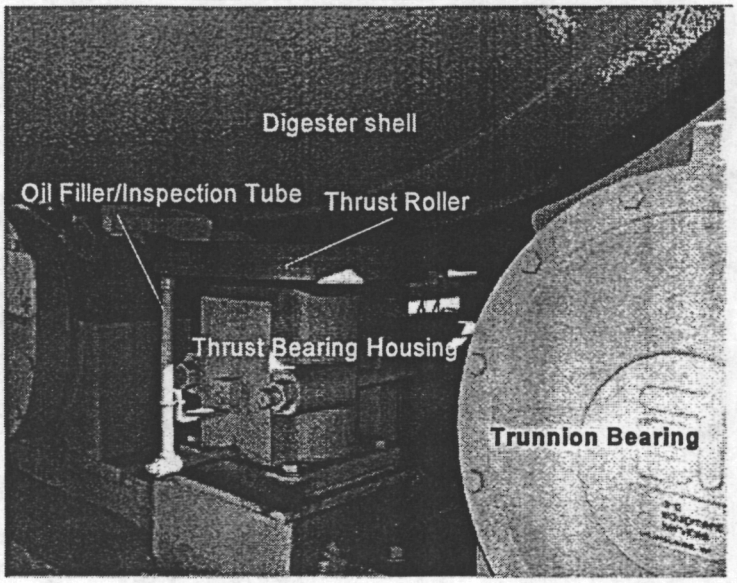


Figure 9 - Thrust Roller Assembly

If the support rollers were perfectly parallel with the long axis of the digester cylinder, the cylinder would move toward the discharge end as a result of gravity and the slope of the digester. A support roller on the downhill side of the riding ring (tire) would intercept this downhill movement and hold the cylinder in place. This, however, creates extreme pressures on the thrust roller and also forces the tire in an uphill direction creating undue stresses on the digester shell and tire assembly.

The support rollers should be adjusted to provide just enough uphill thrust such that the tire contacts the downhill thrust roller approximately half the time.

Adjustment

Moving one of the support roller shaft's bearing and pillow block changes the angle at which the roller bearing contacts the support ring (tire). The axis of the support roller and the digester are no longer parallel and they will thrust against each other. Because the digester shell is "floating" on the rollers and is able to move, and the rollers are fixed to the ground and cannot move, the digester will attempt to move in response to the thrusting forces. By adjusting the degree to which they are out of alignment with each other, the thrust of the digester and resulting movement of the digester can be controlled.

Identifying Thrust

Keeping in mind the "equal and opposite reaction" law of physics, if the support rollers are pushing the digester uphill, the digester is pushing the support rollers downhill. This means that the support roller shafts should be pressing against the downhill surface of the bearing housing. This can be confirmed by striking the outer shell of the bearing housing with a heavy hammer at the end of the roller shaft. If the shaft is indeed pressing against the bearing housing at this point, the sound will be a dead "thump". If the shaft is not pressed firmly against the housing, the sound will be a more hollow sound.

While it seems that an operator could simply look at the thrust roller to determine the thrust of the support rollers, in reality that simply shows the direction of the total thrust. What may be the case is one or two rollers could be thrusting heavily uphill and two or three of the rollers could be thrusting lightly downhill, or vice versa. This results in severe stresses on both the support rings (tires) and the internal surfaces of the support roller assembly with resulting overheating, wear and premature failure.

Correcting Thrust

By checking the thrust condition of each end cap of the support roller bearing housings, the operator can detect changes in the alignment of the system due to settling, changes in load

in the digester or binding or excessive wear in a component of the support system. To determine how to adjust the thrust roller to correct a given situation, there is a rule of thumb (almost literally) that will help.

Stand facing the support bearing. Extend your hands with the palms facing the direction of the digester shell rotation (palms up on the uprunning side and palms down on the down running side) and extend your fingers. To move the digester in the direction of your *right* thumb, you would move the *right* bearing inward (the direction your fingers are pointing).

These adjustments can (and should) be done with the digester in full operation with a full load. Actual procedures are best accomplished under the guidance of an experienced rotary vessel technician until in-house expertise can be developed.

FEED RAM SYSTEM

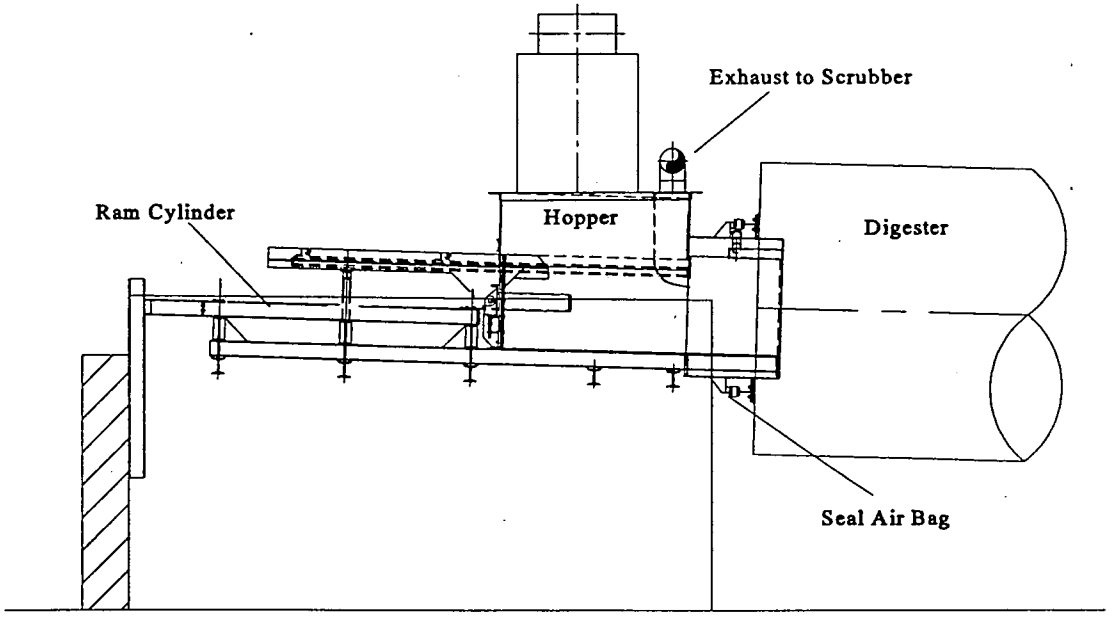


Figure 10 - Feed Ram Assembly

PURPOSE

To enable the MSW and high solid content sewage sludge to be charged into the digester's first compartment at a steady, predictable rate by means of a hydraulically operated feed ram assembly. The feed ram system is designed to enable the loading of the ram pit regardless of the position of the ram in its thrust cycle.

MECHANICS

The ram unit has an overall length of approximately 23.5', a width of approximately 6', and a height of 6.5' and is constructed as a complete structural steel frame/skid unit. The unit is secured to carbon steel embed plates within the reinforced concrete tip floor pits (construction by others) and by 8" wide flange structural steel cross beams within the pit.

The unit is comprised of a structural steel base and frame with gussets and braces which house the ram piston, the piston push plate, the material loading void, as well as the side support members and the hydraulic tubing, valves and photoelectric eyes. All the structural steel components are coated with a zinc rich primer and top coated with a high build finish coat to inhibit corrosion.

OPERATION

To operate, MSW is dropped from above into the ram pit, which houses the ram unit. In the open position, the ram unit has a capacity of approximately 3.4 cubic yards of material.

Once the material has been dropped into the pit, the hydraulic pump and fluid force the 3" diameter piston rod from its cylinder toward the feed end of the digester.

The steel push plate affixed to the piston end serves to push the material forward through the openings in the ram pit end and the digester feed end bulkhead.

The digester ram assembly comes complete with a feed hopper which allows for continuous feeding of the ram, even while the ram is stroking. As the ram is stroking forward, pushing a load into the digester, the incoming feedstock piles on top of the surface of the ram shroud. The piston continues to extend, pushing the material into the digester until its full 10' stroke has been reached. A photoelectric cell is activated and the piston is retracted back into the cylinder. As the piston is retracted, the material on top of the ram shroud drops down in front of the ram. Another photoelectric cell determines when the back stroke has reached its end and the cycle begins again and another load of feedstock is pushed into the digester with the forward cycle of the ram.

The full ram cycle can be varied, generally between twenty to thirty seconds, thus, allowing for full loading in approximately two hours time.

Hydraulic System

The unit is powered by a 20 HP hydraulic motor with a stainless steel, high strength tubing and valve network and (1) approximately 20 gallon fluid reservoir. The hydraulic system pressure is rated at approximately 3000 psi.

RAM/DIGESTER SEAL

PURPOSE

Since the feed ram and the front of the first compartment of the digester is freshly introduced feedstock, it is essentially raw garbage with all of the associated odors and risks. The seal is to provide a tight interface between the rotating vessel (the digester), and the stationary device (the feed ram) and keep this material and associated odors inside the digester.

OPERATION

The seal assembly consists of four major components:

- A ring of stainless steel on the rotating digester face.
- A ring of HDPE affixed to the stationary ram feed assembly that mates with the ring on the digester face.
- A series of pneumatic air bags
- A compressor to pressurize the air bags.

The seal wear ring is comprised of six sections of HDPE bolted to a steel mounting ring with HDPE all-thread of material identical to the wear ring itself. By using identical material for the screws, as the wear ring is worn away, the screws wear at the same rate. The wear rings are easily replaced as they wear down, without dismantling the feed apparatus.

The ring on the feed ram assembly is pressed against the stainless steel ring on the rotating digester by inflated air bags. This provides a tight seal between the two devices even as the gap between the stationary feed ram and the digester varies with the rotation and change in weight (load) of the digester. These are sacrificial seals and will wear away over time. They are scheduled to be replaced approximately once a year. If physical damage occurs to a part of the seal, it is recommended that the whole seal be replaced to ensure consistent wear across the face of the seals.

The six air bags are inflated by an air compressor through 1/4" air lines leading to each of the bags. Operation of the seal consists of turning on the compressor and ensuring that the airlines to each of the bags are tight and functional.

Once the seals are in place, there is nothing required for the operation of the seals other than routine cleaning of debris that might become wedged between the seal faces and create an opening, and observation of the compressor and air lines to ensure that there is appropriate pressure applied to the inflatable bags.

MAINTENANCE

Ensure that the air compressor is functioning properly and providing air to the inflatable bags that press the two seal rings together.

Inspect the 1/2" lines that run around the circumference of the ring and the 1/4" air lines and fittings that supply the inflatable bags.

Inspect the HDPE ring from the inside of the digester periodically to ensure there is not wear occurring from the inside due to feedstock rubbing against it through any gaps between the feed ram and the digester face.

Inspect the area under the digester seals for leakage of solid waste, or rough compost, which may indicate a leak due to inadequate inflation of an air bag, or uneven wear of the seal.

AIR SCRUBBER SYSTEM

OBJECTIVE

- Remove VOC's from air stream.
- Add moisture to air stream.
- Remove particulates from air stream.
- Cool the air stream.

OPERATION

The scrubber is a "counter current" style in which exhaust gasses are drawn in to the scrubber from the input of the digester. These gases enter the scrubber at the bottom and are forced upwards through the media where it is moisturized by a flow of water from nozzles at the top. This spray of water passes downward through synthetic (plastic or fibreglass) obstacles. These obstacles may be in the form of balls, basket-like structures or multi-branched pieces which provide high surface areas on which the passing gasses can react with the water. In some environments, microbes colonize on these surfaces and provide a biological as well as a physical filtering of the passing gasses.

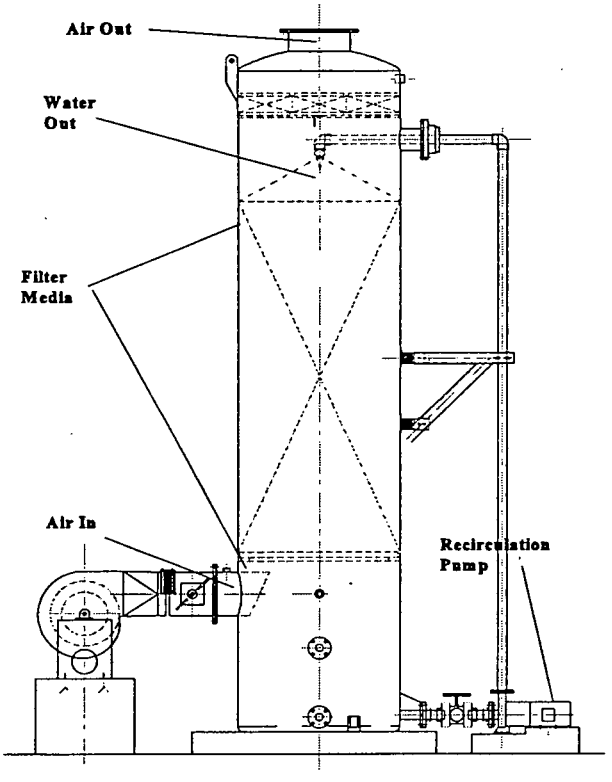


Figure 11 - Scrubber

Exhaust gases

These gases are generated by the decomposition of the organics in the digester and are driven to the feed end of the digester by the air flow pumped through the digester by the positive discharge blowers at the discharge end. These gases can be a prime source of odor.

Flow rate

Adjust flow rate of the recirculating water to the point that the blow down water drains at a constant trickle. The rate must be adjusted such that the out flow water is not severely discolored which would indicate excessive detention time and overloading of the water with contaminants. This is a trial and error process to find the precise drain rate and may in fact be changed depending on seasonal or even batch variations in the digester.

Spray Nozzle

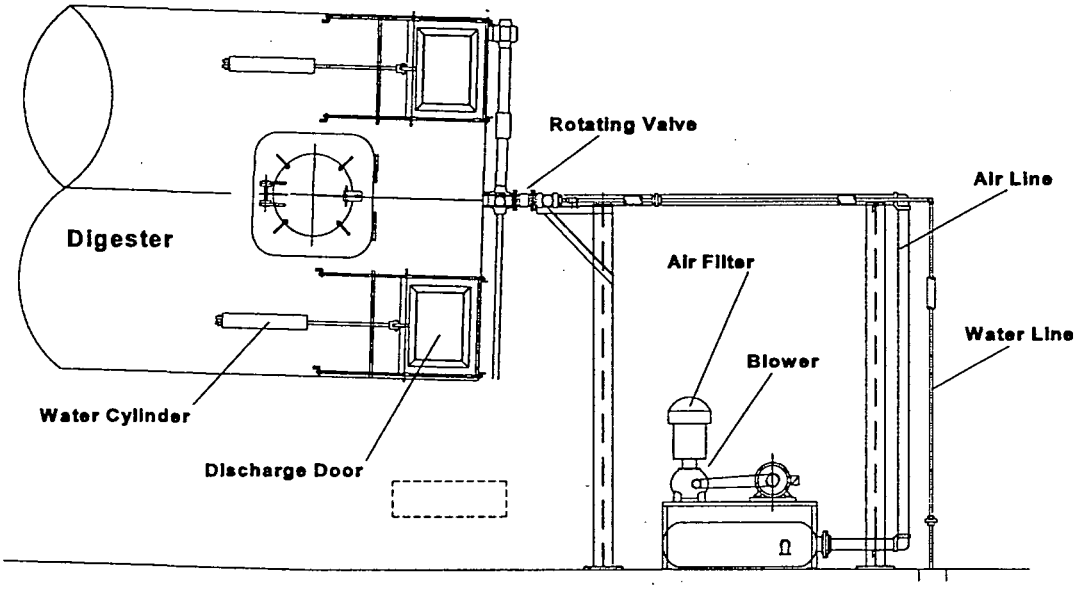
Roughly once per month, the manway to the interior of the scrubber should be opened and the nozzle assembly that provides the water to the scrubber should be examined and cleaned if necessary. This is to prevent scale and biological buildup on the nozzle to the

point that it could clog or divert the water flow which could result in portions of the dispersion media receiving insufficient water and reducing the treatment efficiency of the scrubber.

Media Suspension Screen Inspection

In conjunction with the spray nozzle inspection, the operator should examine the screen upon which the dispersion media rests. In some environments a "slime" of biological growth similar in appearance to a brown algae develops on the screen. This build up can accumulate up to the point that it restricts the flow of the blowdown water and can result in flooding of the scrubber. It is recommended that a chlorine compound (swimming pool chlorine, for example) be applied once or twice a year as necessary to control such build up.

AIR BLOWERS



PURPOSE

Each digester has one Positive Displacement Air Blower, located at the discharge end of the digester. The blowers push air through the discharge end of the digesters, counter current to the flow of solid waste. The air is heated by the mass of composting material as it flows through compartments 3 and 2, and then into compartment 1, where it actually heats up the fresh cool batch of MSW and sludge which helps activate the microbes.

The air blowers also provide oxygen to keep the mass of solid waste within the digester in an aerobic state which helps to minimize odors and potential generation of methane gas.

OPERATION

The amount of time that each air blower is on can be varied. Usually, the digester functions best if the blowers are on most of the time. When the digester is being unloaded, the blower should be off to minimize material and dust being blown out of the discharge doors.

As a means of temperature control, if temperatures in the compartments are too low, it may help to reduce the amount of air blown in or vice versa.

Air Filtration

Servicing the air filters is one of the most important maintenance operations you can perform on a positive displacement blower. Changing or cleaning the filter is not a time dependent

procedure. Visual observation is an obvious procedure to determine change frequency. A differential pressure indicator installed across the inlet filter with a continuous reading gauge is the preferred indicator.

Lubrication

A positive displacement blower operates by rotating two lobed impellers which fit against the walls of the housing and against each other with extemely close tolerances.

Drive End

Lubricate with a NLGI Grade 2 Extreme Pressure grease.

Gear End

Oil viscosity used depends on the output temperature of the air. Refer to the service manual of the particular model blower in question. An oil with rust and oxidation (R & O) anti-foaming characteristics is needed.

Oil should be drained and renewed at 1500 hours of operation under normal circumstances.

MONITORING

MOISTURE

The moisture content of the material loaded during the previous day should be tested each morning by taking samples from the first compartment. The samples are removed through a sampling port on the digester. The goal is to have a moisture content of 52%, with an acceptable range of 45%-55%. If more moisture is needed, it can be added with the sludge pump and mixed in before being transferred to the second compartment.

Moisture content can also be sampled through ports on the other compartments, but experience has shown that this is not normally needed. If more moisture is needed after a batch is in the second or third compartment, it can be added through two water valves on each of the third compartment.

The procedure used to measure moisture content of the compost in the digester was described in the process flow chapter.

Moisture content in the first compartment of each digester should be recorded each day on the digester weekly data sheet provided (see copy). These data will build a correlation between the moisture level and the prior day's MSW and sludge load.

TEMPERATURE

Each morning and late afternoon, read the temperature on the gauges mounted on the outside wall of each compartment and record them on the weekly data sheet (see copy).

- Temperatures for the first compartments should be between 100°F-120°F;
- The second compartment should be between 130°F-160°F;
- The third compartment should be between 120°F-140°F.

If you observe a temperature outside these ranges, notify your supervisor.

CARBON DIOXIDE/OXYGEN

Electronic Sampling Meter

Carbon dioxide monitoring is typically accomplished with a simple hand held 0_2 Meter. Simply insert the probe into the compost, press the button, wait 15-20 seconds and read the meter.

Flue-gas meter

This is a chemical process utilizing an hour glass shaped plastic meter filled with reagent. The sample is taken by first inserting the sample probe through the rubber gasket provided in the side of the digester at the center of each compartment. The hose from the hand operated bulbous air pump is then slipped over the end of the probe, and a sample of the air in the midst of the compost mass is pumped into the meter. By inverting the meter three times, the air sample is mixed with the reagent, and a direct reading of the percent carbon dioxide is the result.

This test should be taken with the digester in the slow speed. Oxygen levels can be calculated in the same manner by using the corresponding meter, but one can be determined from the other since their total will be about 21 percent.

It is desirable to maintain CO_2 concentrations in the first compartment near 10% and progressively lower in compartments two and three. These levels are adjusted by increasing or decreasing the amount of air introduced into the discharge end of the digester with the positive displacement blowers, as described below. CO_2 levels should be recorded on the daily log sheet.

TAL

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Request for Additional Information

Composting Facility Expansion - Digester
Pending Permit No. SC60-298996
Sumter County

PREPARED FOR:

Sumter County

SUMTER COUNTY BOARD OF COUNTY COMMISSIONERS
209 NORTH FLORIDA STREET
BUSHNELL, FLORIDA 33513

921100.004

April 14, 1997

Springstead Engineering, inc.
Consulting Engineers – Architects – Planners – Surveyors
727 South 14th Street
Leesburg, Florida 34748
Lake (352) 787-1414
Sumter (352) 793-3639 Fax (352) 787-7221

Springstead Engineering, inc.
Consulting Engineers – Architects – Planners – Surveyors

EB - 0001723
AA - 0002820
LB - 0001723

727 South 14th Street
Leesburg, Florida 34748

Lake (352) 787-1414
Sumter (352) 793-3639
Fax (352) 787-7221

April 14, 1997

Ms. Susan J. Pelz, P.E.
Solid Waste Section
Division of Waste Management
Department of Environmental Protection
3804 Coconut Palm Drive
Tampa, Florida 33619

RE: COMPOSTING FACILITY EXPANSION - DIGESTER
PENDING PERMIT NO. SC60-298996, SUMTER COUNTY
SEI FILE NO. 921100.004

Dear Ms. Pelz:

We are in receipt of your request for additional information regarding the above referenced project. Please find the following responses. Springstead Engineering, Inc's (SEI) comments are shown in bold. Comments provided by Bedminster Bioconversion Corporation (BBC) are shown in italics.

Engineer's Report:

1. **Emergency Procedures, Fire Control.** The Department is aware of other facilities which have installed similar digester/biofilter systems which have experienced fires at the facility. The information submitted states, "In the event of fire, facility employees will initially attempt to put out the fire using the fire extinguishers located in the building while contacting the fire department via 911." (Page 2) The Operation and Maintenance Manual prepared by Bedminster does not appear to address fire prevention and control measures. Please provide <u>detailed</u> procedures for the prevention and control of fires at the facility. Please provide procedures in case of explosions within the digester unit. How will potential explosions within the digester be handled? Although the Operation and Maintenance Manual indicates that explosive items should be removed prior to the waste being discharged to the digester, it seems reasonable to expect that a minimal amount of combustible or explosive materials may reach the digester (e.g. aerosol cans, household batteries, etc.).

1. **Fire prevention is and will be a priority of the site personnel for the facility. The operators and staff at the site will perform preventative inspections on a daily basis to identify potential fire causing/fire enriching situations. These situations include dust buildup, litter buildup, etc, or any situation which would provide easy start-up for fires or would allow easy growth for a fire. Preventative measures will also include observation of the composting area to identify if a smoldering situation exists which might lead to a fire. If identified, this situation would be extinguished immediately and monitored so that no fire would result. As described in the O & M manual, all explosive items will be removed prior to entering into the digester. Bedminster Bioconversion Corporation (BBC) has provided additional information relative to potential for explosions inside the digester.**

In Bedminster's 25 years of operating experience with Ewson digesters we have never had an explosion or a fire involving a digester. There may be small, non-detectable explosions of aerosol cans, but we have never heard a noise indicating such an explosion.

Neither of the two 1996 fires at the Cobb County plant involved the digesters as either causes or contributors of the fires. In one of the fires that HDPE piping used to vent the exhaust air off of the digester did burn but was not considered as a cause of the fire. Hence the HDPE piping has been replaced at the Sumter County Facility with PVC.

The reason that explosions are not a problem include:

A. ***We do not utilize shredding equipment to process solid waste, which can cause sparks. Instead, the digester pulps the solid waste by the constant tumbling action of the waste in the digester.***

B. ***The atmosphere in the digester is very moist with relative humidity in the range of 90% - 100%, which inhibits combustion.***

C. ***The oxygen levels maintained in the digester are not sufficient to maintain a fire.***

D. ***The digester is constructed of 3/4" thick steel plates which would effectively contain any small aerosol explosions should they occur.***

2. **Odor Control.** The information states, "The cut sheets for the scrubber and biofilter are attached. In addition, ... an article... which discusses the use of a biofilter... [is attached]." (page 2)

a. Drawings SUM-EL01, and IE96218-2 appear to show the scrubber. However, manufacturer's cut sheets (which include a general description of the scrubber's function, performance, etc.) do not appear to have been provided for the scrubber.

a. ***The drawing IE96218-2 was the manufacturer's drawing for the new scrubber that we changed to the reconditioned unit. Drawing IE95135-1, enclosed is the manufacturer's drawing for the unit to be used. The drawing references a packing media of Jaeger 3.5" Tri-pack, which was needed when the unit was used as a test unit. However, for Sumter County's application it will be packed with 2" HIFLOW Rings. There are no manufacturer's data sheets for the scrubber unit available.***

b. It does not appear that manufacturer's cut sheets have been provided for the biofilter. Sheet SUM-EL01 states, "See SUM-SP01 for Site Layout of Biofilter." Sheet SUM-SP01 states, "Proposed biofilter provided by owner". Sheet M201-025 indicates that the biofilter details are on sheet SUM-EL02. Sheet SUM-EL02 (and SUM-EL03 and SUM-

EL04) does not appear to have been provided. Please provide construction details of the biofilter system, including piping, filter media, filter bed, etc. See also comment #6 below.

b. ***The biofilter provided by Bedminster to the County has been designed to specifically meet the needs of Sumter county. The biofilter is not a standard manufactured system, hence there are no manufacturer's cut sheets available. However, we have enclosed the 11 x 17 copies of the drawings SUM-BF01 & SUM-BF02, which are the construction details for the biofilter.***

Also, enclosed are revised drawings SUM-SP01. The drawing was revised to show the new location of the biofilter and to reflect the fact that Bedminster is providing the biofilter. The location of the biofilter was changed at the request of the County.

Drawing number M201-025, not enclosed, references drawing SUM-EL02, copy enclosed, regarding the biofilter. When Bedminster was under the assumption that the biofilter and its related detail drawings would be provided by Sumter County, drawing SUM-EL02 was the drawing used to convey the design concepts to Sumter County. When it was clarified that Bedminster would provide the biofilter, drawing, SUM-EL02 was replaced with Drawings SUM-BF01 & SUM-BF02, enclosed.

Drawing SUM-EL03, copy enclosed, was used to convey information from Bedminster to it's contractor EPCON-Lemoine Company and was never issued to Sumter County.

Drawing SUM-EL04, copy enclosed, was also issued to EPCON-Lemoine for their information and was incorporated into their drawings. Drawing SUM-EL04 has been deleted.

c. The article provided indicates that maintenance is required for the biofilter to provide effective operation. The article also indicates that an air discharge permit has been required in other states for the biofilter system. Please clarify if the Department's Air Resources Section has been contacted to assess the requirement for an air permit for the biofilter and scrubber.

c. ***In areas designated by the U.S. EPA as ozone non-attainment zones, such as Massachusetts and Metro Atlanta, Georgia, air permits have been required for the Bedminster biofilters. However, in February 1996, the Florida DEP, Southeast District, issued a determination that an air permit was not required for a Bedminster facility for the City of Miami, an ozone non-attainment zone. That facility will process 783 tons per day of MSW and biosolids. A copy of that letter of determination is attached (See Appendix A).***

Also, attached is one of the documents prepared for permitting of the Miami facility, which summarizes much of the literature which documents the performance of biofilters

in treating VOCs and odor. The document is entitled, "Odor Management at the Bedminster Bioconversion Corporation Facility in Dade County," and it was prepared by EAS Engineering, with assistance from Bedminster (See Appendix A).

d. It appears that the Operation and Maintenance Manual prepared by Bedminster does not include operational or maintenance procedures for the biofilter, and the information provided for the scrubber does not appear to be complete. Please provide complete operational and design details of the odor control system (i.e. biofilter and scrubber), including equipment, piping, filter media, operational methods, etc. Manufacturer's cut sheets may be included to assist in clarifying this item.

d. ***The Operation & Maintenance manual information for the biofilter is enclosed within this package (See Appendix B). The complete fabrication drawing IE95135-1, previously mentioned, is enclosed within this package. This drawing provided by Indusco Environmental Services, lists the operating parameters for the scrubber. This drawing, in conjunction with the drawing produced by EPCON-Lemoine showing the construction details of the scrubber, are all that exist in the way of manufacturer's information.***

The make-up of air from the digester is unknown at this time. The experiment of processing the air will include using the scrubber, biofilter, neither or both units depending on the resulting air quality from the system in use at that time. Evaluation parameters will include olfactory measurements of the odors generated from the system, the level of volatiles, in the air less methane using an FID/OVA, and, if necessary, the concentration of contaminants in the air using sampling and analytical testing procedures. The testing will be performed to determine pre- and post- results of the system operating in order to determine the effectiveness of the system.

Sumter County will experiment with the blend for compost to determine the best combination of the items to be processed in the digester. The volume and type of organic feedstock from the recovery line, the volume and concentration of biosolids, the use of urea or other nitrogen rich additive, the time spent in the digester, and the moisture content of the mixture will be evaluated to determine what combination results in the best compost from the system. This trial period to determine the ultimate mix and ratio of compost to additive for the best mix will take some time to execute and evaluate. It is anticipated that this process will take from 1 to 2 years after normal operation of the digester is permitted. The operations (storage and handling) of additives is discussed in Item No. 3 below.

Each separate mix will be isolated from any previous or subsequent mix in order to control the testing. The County will keep the Department informed via letter, when the mix is going to change and what the new mix will include. Any additional handling operations will be identified in the letter, if other than the solid and liquid

handling described in this response. The Department will also be provided with the test results of the previous mix.

Operations Plan:

3. **Biosolids.** The information indicates that Sumter County will not be including biosolids in the composing process at this time. (Engineer's Report, page 2) The bedminster Operation and Maintenance Manual indicates that "optimal mixes of waste inputs, [are] approximately one wet ton of biosolids for each two wet tons of MSW... (Operation Manual, page 6) [and] The plant will receive liquid sludge. (Operations Manual, page 10)" Please clarify if the facility will utilize biosolids in the composting process. If the facility will not receive biosolids, please evaluate the impact on the digester system and the composting process (since the biological activity of the biosolids will not be included).

3. **The plant will receive biosolids or some type of high nitrogen material in order to achieve the optimum composting process from the digester. Attached you will find a plan depicting the location and operation of the system to handle the liquid biosolids introduced into the system.**

Initially for start-up/shake-down, the facility will use a dewatered sludge (23% solids) with the added water to obtain the optimum sludge additive for the acceptance testing of the equipment. Temporary operating procedures for the dewatered sludge will include placing the biosolids on conveyor C-107 at the correct volume/weight proportion prior to being loaded into the digester through the hopper. The additional water needed to bring the sludge to the correct percent of solids and correct moisture content will be added by a supply pipe spraying into the digester. The sludge solids will be unloaded and stored on the floor in the digester end of the building. A plan showing the proposed system to handle the liquid sludge is attached.

The liquid sludge storage/handling system will consist of using two (2) diaphragm pumps (for reliability) with valving to unload trucks and load the digester from a 10,500 gallon polyethylene tank sitting on the existing slab behind the pushwall. The tank will also receive any accumulation from the lift station in the floor of the digester/MRF building. The manufacturer's sheet on the polyethylene tank is presented in Appendix C.

It is a proven fact that MSW can be composted without the use of biosolids, provided that the other requirements of air and moisture are satisfied. The only impact on the process is the rate of decomposition. Bedminster is not aware of any literature that quantifies nor has Bedminster performed any research that quantifies the amount of change in the rate of decomposition, based on the amount of biosolids used.

4. **Scrubber.** Please provide operational procedures for the scrubber. Please provide

information on the purpose of the scrubber, i.e. what contaminants are expected to be removed, and the expected performance. Will the influent and effluent air be monitored? What parameters will be monitored? How is the wastewater which is generated by the scrubber managed? Will the wastewater quality be monitored, for what parameters and frequency?

Sumter County does not know exactly how much of the biofilter/scrubber system will be utilized for the digester process. As described in Item No. 2 above, the county is planning to experiment with the use of the scrubber/biofilter to determine how much this equipment will affect the system or will be needed.

As no facility (in current use) has the same feed stock that the county plans to generate and the amount and type of additives that the county plans to use, it is unknown what odor problems will occur. The County requests that this area of operation be included in the experimental window to determine the proper use and need of the equipment.

Please see item 2d.

5. **Bedminster Operations and Maintenance Manual.**

a. Pages 9-10. The information indicates that water treatment residues should be removed prior to loading waste into the digester (page 9). However, later information provides procedures for determining the moisture content for "sludge from water treatment facilities..." (page 10). Please clarify this discrepancy.

a. ***The information, on page 9, regarding the "water treatment residues" is referring to Water Treatment Facility residues, not wastewater residue, biosolids.***

b. The information (page 17) indicates that all downstream equipment such as the discharge conveyor, trommel loading conveyor, trommel, etc. must be operating prior to discharging from the digester. It does not appear that the pending permit application has included this equipment. The operations procedures for this equipment have not been provided and construction/installation details have not been provided on the drawings. Please clarify if the pending application is intended to include the discharge conveyor, trommel, etc. If so, please provide details and operational/maintenance procedures for this equipment.

b. ***The Eweson Digester system does not depend on the downstream equipment to perform it's intended functions. The only downstream equipment***

necessary for the Digester to work is some piece of equipment to move material away from the discharge of the digester.

Future downstream equipment is not a part of this permit application. A permit modification will be submitted for the construction and operation of the future finishing building.

Temporary operating procedures prior to completion of the finishing building will consist of the County placing a conveyor with a large hopper under the discharge end of the digester. The conveyor will be used to load trucks which will haul the immature compost to the existing north pad where the compost will be dumped and formed into windrows. The load-out area for the trucks will be made impervious with plant asphalt mix to facilitate any clean-up which may be necessary. The windrows will be kept on the pad for at least 30 days with the material being turned periodically.

The composting operation on the north pad will continue until the finishing building is designed, permitted and constructed. It is anticipated that this will take from 1 to 2 years to complete. In addition to compost finishing, the north pad will also be used to screen and store finished compost until test results are obtained to classify the material. After testing, the finished compost will be moved to the middle or north pad for storage and loading. The size of the north pad will accommodate the compost finishing process and screening process. It is anticipated, at this time, that the windrow compost finishing portion of the process will take 30 days. This time for windrowing is also a variable in the process which has to be fine tuned, as no compost feedstock similar to the one anticipated at the Sumter facility has previously been used.

c. The information states, "The Bedminster process involves keeping the materials in each compartment of the digester for a prescribed period of time." (page 19) However, this prescribed period of time was not provided. Please provide a description of how the digester functions in the composting process. This description should include, but not be limited to, a discussion of time required for composting, loading rates, material balance, quality of material exiting the digester, management of material exiting the digester, volume reduction, expected performance, etc.

c. ***Primary functions of the digester are to act as a wet pulping machine to increase the surface area of the material and to initiate the biological composting process. In doing so the digester also serves to homogenize the organic materials.***

Materials can be retained in the digester for as little as two days or as many as nine days depending on the amount of waste available and the degree of

degradation required. A typical detention time is a nominal three days and a typical daily loading would include as much as 50 tons of MSW and 25 tons of biosolids.

In regard to a mass balance, the losses from the digester amount to mostly carbon dioxide and water and amount to a combined loss of 2% to 5% by weight in a normal three day process.

Material exiting the digester is considered to be an immature compost and is homogenized and the soft organics are reduced in size so that they can be screened from some of the man-made inorganic material.

Volume reduction in the digester is largely dependent on waste received, but can be as much as 50% in some cases.

The expected performance is to reduce the soft organics so that they can be separated from the larger man-made inerts by using a mechanical screening device and to accelerate the early "high rate" phase of the composting process.

d. The information states, "The process of opening the sampling port for moisture samples, opening the manways for access to the interior of the digester and spillage or dust occurring during the discharge operation can result in material falling out of the digester." (page 22) Please clarify if impervious areas (e.g. concrete or asphalt) will be constructed below the access points (manways, discharge area, sampling points) to contain spillage. How will material which exits the digester be managed such that spillage does not occur? The drawings do not appear to show a truck loading facility for the material discharging from the digester.

d. At this time we do not anticipate constructing impervious areas at the testing and sampling points on the digester. Any material which does spill out will be immediately cleaned up and placed back into the loading hopper to reenter the digester.

The proposed operation for the discharge end of the digester is presented in 5b above.

The amount of spillage which occurs from a digester sampling port or manway is minimal and is pointed out in the O&M Manual so that such material should be cleaned up after the port or manway is closed.

Sumter County will be providing the equipment to collect and move material away from the discharge of the digester.

Drawings:

6. Sheet 2 of 5. Please provide additional details on the piping north of the digester which extends to the biofilter.

6. The sheets showing the biofilter piping and location are attached.

Additional, biofilter drawings SUM-BF01 & SUM-BF02 are enclosed.

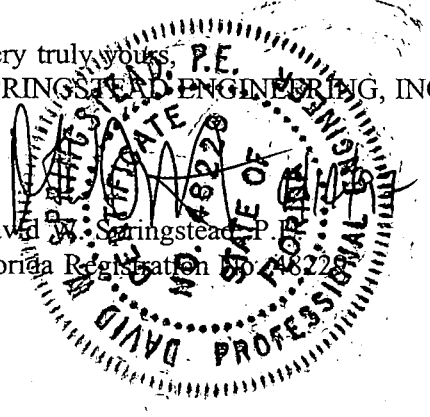
7. Sheet SUM-EL01. Since the drawing submitted refers to several other drawings, the Department cannot fully evaluate the system. Please provide sheets SUM-EL02, SUM-EL03, and SUM-EL04. See also comment #2.b., above.

7. The sheets referred to are discussed in the answer to question 2b.

Also attached, as you requested, please find in Appendix D, the criteria for the acceptance testing for the digester. The dates will be revised to reflect the actual date of startup after FDEP's site construction review.

Should you have any further comments or questions, please feel free to contact our office.

Very truly yours,
SPRINGSTEAD ENGINEERING, INC.



David W. Springstead, P.E.
Florida Registration No. 48228

DWS/jal

cc: Mr. Garry Breeden - Sumter County
Mr. Terry Hurst - Sumter County
Mr. Mitch Kessler - TIA

APPENDIX A

Department of Environmental Protection

received 2-26-96

Lawton Chiles
Governor

Southeast District
P.O. Box 15425
West Palm Beach, Florida 33416

Virginia B. Wetherell
Secretary

FEB 22 1996

CERTIFIED MAIL

Mr. Robert L. Spencer
Director of Project Development
Bedminster Seacor Services Miami Corporation
145 Church Street, Suite 201
Marietta, GA 30060

DEP File No. 0250662-001-AC
Dade County
Project: Bedminster Seacor Services Miami Corp.
Solid Waste/Co-Composting Facility

RE: Separate Air Pollution Permit Not Required

Dear Mr. Spencer:

We have reviewed the application received July 26, 1995, and the additional information received October 4, 1995 and January 2, 1996, for the project described as follows:

A solid waste composting facility to process 522 tons per day of municipal solid waste and 261 tons per day of biosolids into recyclable material, non-processable solid waste, and organic compost, with air emissions exhausted through a biofilter system.

This project has been permitted under Department permit number SC 13-275037. This permit sufficiently addresses the Department's requirements for air pollution emissions. Based on the information you submitted, at this time no separate permit is required for your project by the Department's air pollution program. Any significant changes in your plans or process should be submitted for review, as changes may result in a separate air permit being required. Also, if future information reveals that air pollution emissions are higher than characterized in your application, or air emissions exceed any applicability requirements of the Department's rules, a separate air permit may be required . This letter does not relieve you from the need to obtain any other permits (local, state, or federal) which may be required.

If you have any questions, please contact me at (407) 433-2650, extension 136.

Sincerely,

Joseph Kahn, P.E.
Air Permitting Engineer

cc: Ewart Anderson, P.E., DERM
Edward A. Swakon, P.E., EAS Engineering

ODOR MANAGEMENT AT THE BEDMINSTER BIOCONVERSION CORPORATION FACILITY IN DADE COUNTY

Submitted by:

EAS ENGINEERING, INC.
55 Almeria Avenue
Coral Gables, Florida 33134

August 17, 1995

ODOR MANAGEMENT AT THE BEDMINSTER BIOCONVERSION CORPORATION FACILITY IN DADE COUNTY

Executive Summary

Despite great efforts in trying to reduce and recycle municipal solid wastes (MSW), garbage continues to be a source for major environmental, social, and economic problems for municipalities.

Most of the MSW are biodegradable organic substances whose handling has always been associated with unpleasant odors. Conversion of these materials into reusable resources through composting has always been considered the best solution in managing organic MSW. Bedminster Seacor Services Miami Corporation has entered into a contract with the City of Miami to process 183,000 tons/year (t/y) of MSW. Additional 90,000 t/y of wastewater biosolids can be recycled through the facility.

The projected facility, to be located in NW Dade County, will process wastes through biofiltration, an air pollution control technology that uses a biologically active, solid media bed (biofilter) to absorb and/or adsorb compounds from the air stream and retain them for their subsequent biological oxidation. This is a highly efficient aerobic method that controls odors and volatile organic compounds (VOCs). Its effectiveness as such has been confirmed by independent studies in the last few years.

Bedminster's technological excellence, the careful site selection for the facility, and the company's track record as a socially responsible corporation, are the foundations to predict its success in this new venture.

ODOR MANAGEMENT AT THE BEDMINSTER BIOCONVERSION CORPORATION FACILITY IN DADE COUNTY

1. GENERAL INTRODUCTION

Municipalities in the United States generate 180 million tons of solid waste each year of which at least 60% is reusable organic material. Currently, only 13% (24 million tons) of municipal solid waste (MSW) is recovered annually. Despite efforts to decrease the amount of solid waste generated and increase recycling, landfills will still be receiving 50% of the waste stream by the year 2000 (Gillis 1992)[1].

Florida has 5% of the USA population (ranks fourth among states), but produces about 10% of the solid waste. Despite increasing statewide recycling to almost 27% of the MSW, the amount of solid waste produced annually increased to about 20.3 million tons in 1992 (DEP 1993)[2]. This figure represents more than 8 pounds per resident per day or about 1.5 tons per resident per year, i.e., twice the national average of about 4 pounds per person per day. This may be due to the impact of 40 million tourists, as well as construction and demolition debris associated with a rapidly expanding population. Nevertheless, the total exceeded the 18.4 million tons projected in 1988 for 1994.

Perceived problems with landfills and incineration are encouraging composting. Biodegradable organic substances that could be composted comprise almost 60% of the total MSW or about 11.2 million tons annually (Smith 1994)[3].

Additionally, the U.S. Environmental Protection Agency (EPA) estimated in 1989 that approximately 15,300 publicly owned treatment works (POTWs) generated 7.7 million dry metric tons of biosolids annually, equivalent to about 64 lb. dry solids (ds) per person per year in the U.S. (EPA 1989)[4]. The volume of sludge is expected to double by the year 2000 due to population growth, stricter wastewater treatment requirements, and improvements in POTW operation (Haug 1993)[5].

Bedminster Seacor Services Miami Corporation has entered into a contract with the City of Miami to process 183,000 tons/year (t/y) of municipal solid waste for the city. In addition, 90,000 t/y of wastewater biosolids can be recycled through the facility, and discussions are underway with Dade County to process biosolids from the Virginia Key Sewage wastewater treatment plant. The facility will process MSW and biosolids into a valuable compost product and recover aluminum and ferrous metals.

Another public benefit will be a reduction in drying bed odors and problems at the Virginia Key wastewater treatment plant. Similar Bedminster plants in Arizona and Tennessee have been very

successful and are strongly endorsed by the communities they serve.

Despite these advantages, a facility such as this requires great care in selecting an appropriate site because it is a solid waste processing facility. Public complaints regarding odor pollution ("bad smells") have resulted in severe difficulties for other types of composting facilities throughout the United States, with problems ranging from poor relations with the local communities to being shutdown by the authorities.

Unpleasant odors, which hinder public acceptance of composting facilities, generally are associated with anaerobic processes. In contrast, the projected facility for Miami will optimize aerobic conditions and harmful biological aerosols do not proliferate in the environment necessary for most composting (Anonymous 1995)[6].

The purpose of this document is to show that the Bedminster facility planned for Dade County, Florida, has been designed to effectively control odor pollution. This evaluation is supported on technical, legal/regulatory, and public perception grounds.

Basic information on odor science and the terminology associated with it is presented in Appendix I.

2. APPROACHES TO ODOR MANAGEMENT

2.1. An overview

A variety of techniques are available to reduce the odor concentration in exhaust gases generated during composting. They include absorption, condensation, adsorption, oxidation by thermal, chemical, or biological means, and use of masking and neutralizing chemicals. One of those biological techniques is biofiltration, i.e., the process to be used by Bedminster for the City of Miami Co-Composting Facility to be located in NW Dade County.

One significant advantage of biofilters, compared to wet scrubbers, for example, is that they do not require frequent maintenance. Also, when biofilters are performing well for odor treatment, they are also performing well for Volatile Organic Compounds (VOCs) treatment. Experience has shown that olfactory observations of the biofilters by Bedminster plant management are an excellent and inexpensive means of monitoring biofilter performance.

2.2. Biofiltration

Biofiltration is an air pollution control technology that uses a biologically active, solid media bed (biofilter) to absorb and/or adsorb compounds from the air stream and retain them for their subsequent biological oxidation. Biofilters are used primarily for the treatment of odors and VOCs. Soil covers or filters have been used since antiquity to reduce odors. Today, soil covers for landfills and septic systems are widely recognized for control of odors from these sources. Many advances in this technology have come from Europe, particularly Germany and the Netherlands, where biofilter technology is widely used for VOC and odor control for composting facilities, as well as offer industrial applications.

2.2.1. Process

In order to reduce odors, the facility will be maintained under a negative atmosphere in a controlled environment. A soil biofilter will be the primary air pollution control device for the proposed Dade County solid waste and municipal biosolids composting facility. The tip floor will have roof vents electronically connected to CO monitors. These roof fans will be activated by carbon monoxide sensors when concentrations exceed recommended OSHA standards due to vehicle exhaust from the front-end-loaders and delivery vehicles. Otherwise, the fans will be turned off.

Odor control begins on the tip floor area. There, an air collection system at the feed end of the digesters will collect off-gases that escape when the ram feed is loading the digester with raw MSW and wastewater biosolids. This digester process air is collected by overhead duct work and pumped through piping as make up air for the first sections of the aeration floor bay. The

tip floor and the digester discharge areas use a flow through air treatment process. Fresh air enters through wall louvers and is pulled through the building by exhaust fans that feed the outdoor biofilter. Exhaust gasses from other portions of the facility, except the maintenance shop, are also blown to the biofilter. The biofilter, thus, treats the process and facility air (see Design and Operations (D&O) drawings, attached).

2.2.3. Filter media

The biofilter is composed of a blend of media which provides a proven combination of organic substrate, porosity, and moisture retention. Bedminster's preferred material is a combination of washed gravel, shredded bark, yard waste, wood chips, and compost. A series of diffuser pipes made of PVC, blower fans and manifolds deliver the air from the building to the biofilter where it is processed as it passes through the media. The fans are enclosed in moisture-resistent housings to prevent corrosion and deterioration from the humid process exhaust air.

The Bedminster biofilter utilizes a depth of 36 inches of media. It is conservatively designed for an air flow rate of 4 scfm/ft^2, assuming a media porosity of 40 to 50%. This provides sufficient residence time for gaseous odor compounds to be absorbed in the layer of moisture surrounding the filter media and be oxidized by microorganisms in that liquid interface.

2.2.2. Management prevention

Recently (Zmuda 1994)[7] the advantages of biofilters for VOC control, as well as the importance of proper operation of the filters have been pointed out:

> Biological filters vent air streams containing biodegradable VOCs through biologically active material, where the pollutants are broken down. While biological filters offer significant advantages - high removal efficiencies, relatively low costs and the ability to handle variations in concentrations - they are vulnerable to the same types of drawbacks of any system using active microorganisms.

Thus, it is important to maintain the biofilter in proper operating condition. A biofilter moisture content of 40-50% by weight should be maintained so that microbial degradation of odors and VOCs in the exhaust air will occur continuously, and so that channeling does not occur if the filter becomes too dry. Given the design residence time, VOCs, and other odorous contaminants will diffuse into a wet, biologically active layer which surrounds the filter media particles. Aerobic degradation of pollutants will occur in this layer if the microorganisms, mainly bacteria, are present and can metabolize them. End products from the biodegradation are CO_2,

water, and microbial biomass.

Exhaust air from the composting building is humidified just prior to the biofilters media. This provides moisture to the bottom of the filter where the exhaust gasses are blown into the filter, and where most of the microbial activity occurs. These exothermic biological reactions will dry the filter media if sufficient moisture is not added to the inlet air. The humidification also serves to scrub dust particles out of the air in order to minimize clogging of the filter.

A basin beneath the biofilter media collects irrigation water which percolates through or around the biofilter, as well as rain water. This basin is the primary source of the water used to irrigate the biofilter. Particles of filter media which fall down into the water in the basin, as well as dust scrubbed from the air, will be pumped out with the irrigation water and back into the biofilter. Periodically, the basin can be cleaned out to avoid a build up of particulate.

Bedminster will periodically monitor the moisture content of the biofilter media at random locations to determine moisture content, which should be about 40 to 50 percent. Moisture will be added as needed with a system of sprinklers mounted above the filter bed.

The biofilter design for the Dade facility (Sheet 13) includes liners at the base of the filter in order to prevent irrigation water from infiltrating into the ground at the site. In order to minimize compaction, fences will be installed around the biofilters to discourage walking on the filter.

Routine monitoring of biofilters also includes the filter media depth. The biofilter media is turned periodically by an automatic agitator and new filter media is added as needed. Sheet 9 of the D&O drawings illustrate the design of the biofilter and operation of the agitator.

One of the main drawbacks of biofilters is the decrease in treatment efficiency which occurs over the life of the filter, due to decomposition and associated compaction of the media, variable moisture gradients in the media, and clogging from dust and particulate in the air stream.

To address these potential problems, Bedminster has made some modifications to the original design, as follows.

An automatic windrow turning machine will agitate and remix the biofilter media as needed. Instead of allowing the filter media to degrade to the point that it becomes compacted, which then results in channeling as the air seeks the path of least resistance, the filter media will be replenished with fresh media and remixed on a periodic basis, thus sustaining optimal operating conditions.

Another design feature is the incorporation of an air plenum beneath the biofilter media, instead of an aeration pipe manifold system. The plenum air delivery system allows for improved air distribution through the media, reduced back pressure on the fans which feed the air to the biofilter, the capability to scrub dust from the air stream, and accessibility for maintenance.

An additional design feature of the facility air handling system is that exhaust air from the digesters, along with tipping floor building air, both of which contain the highest concentrations of VOCs, will be used as make up air for positive aeration of compost on the aeration floor, and VOCs will be degraded. A portion of the air which passes through the compost pile will be recirculated to the compost, while the other portion is directed to the biofilter.

This pre-treatment step is a design improvement compared to venting the digester exhaust air directly to the biofilter since the exhaust gases will be passed through at least twice the depth of material than a 3-foot deep biofilter. In addition, the aeration floor compost is operated at higher temperatures which sustain thermophylic microbes, compared to the mesophilic organisms in the biofilter. These higher temperatures will volatilize more VOCs than lower temperatures associated with the biofilter.

If a break down should occur in one of the blowers from the aeration floor to the biofilters, the computer system which monitors the plant operations would signal the plant manager, through a beeper, of the situation, and it would be repaired with the spare parts stocked on the site. Since there are two blowers for each aeration floor area, the other blower would maintain a reduced air flow to the biofilter.

The biofilter is comprised of eight bays, each of which can be shut down form maintenance and the air stream diverted to other bays. The loading rate on the entire eight bays is 4 cubic feet per minute per square foot (cfm/sf) of filter media (59,400 sf of filter which treats 240,000 cfm of air flow).

If one of the eight bays is shut down, the loading rate on the remaining seven bays increases to 4.6 cfm/sf, an insignificant increase. This would be a typical maintenance scenario, with one bay receiving regularly scheduled maintenance.

Should it be necessary to temporarily shut two bays, the loading rate would increase to 6 cfm/sf.

2.2.4. Past experiences

A large number of facilities use biofilters and consider them

proven and effective. Haug (1993)[5] observed biofilters at MSW composting facilities in Europe operating with inlet gas concentrations as high as 25,000 to 50,000 ED_{50} (see Appendix 1 for definitions). Outlet concentrations were reported to be 50 to 200 ED_{50}, more than 99% removal efficiency. Hartenstein & Allen (1986)[8] have reported high removal efficiencies for specific compounds such as H_2S (>99%), methyl mercaptan, dimethyl sulfide (DMS), dimethyl disulfide (DMDS) (>90%), and various terpenes (>98%).

At two of Bedminster's reference facilities, biofilters have proven to be very effective in treatment of odors generated by handling and processing of solid waste and biosolids. The newest facility, in Sevierville, Tennessee, will have completed three full years of operation in October 1995. It is similar in design and operation as the proposed for Dade County facility, except that Sevierville processes 150 tpd (tons per day) of MSW and 75 tpd of municipal biosolids, compared to the Dade County facility's design capacity of 500 tpd of MSW and 250 tpd of biosolids.

The success of Bedminster's Sevierville facility in controlling odors has been acknowledged (Segall & Redd 1994)[9]. This paper, which examines the odor control situation at a number of U.S. MSW and municipal biosolids composting facilities, states that "...odor control has been less of an issue at facilities such as the Bedminster facility in Sevierville, Tenn., where biofilters have been operating effectively from the start."

The other reference facility, in Pinetop-Lakeside, Arizona, has been successfully operating since 1991, processing 12 tpd of MSW and 6 tpd of municipal biosolids. It too has successfully controlled odors through use of soil biofilters.

Based on the highly successful operating experience of biofilters at these facilities, as well as at other facilities in the U.S. and abroad, Bedminster is proposing to utilize a soil biofilter at the Dade County facility. The D&O shows the location of the biofilter at the proposed Dade facility. Sheet 7 shows the exhaust system, including an Air Flow Strategy table with the cfm of air flow from each area of the building, and the discharge point. Sheet 8 provides details on the exhaust blowers to the biofilters. Sheet 9 provides a section of the biofilter.

The Bedminster biofilter system has had positive reviews from independent sources (Goldstein 1993, 1994; Muirhead et al 1993a,b; Williams & Miller 1992a,b; Worthy 1988)[10,11,12] as well as to clearly establish the advantages of this system over others (Anonymous 1993, Riggle 1994)[13].

Bedminster's experience with biofilters at their reference facilities has confirmed what is a general consensus in the literature, i.e., it is very important to properly design, operate, and maintain biofilters to sustain high removal efficiencies of

potential air pollutants. The Engineering Report submitted with the D&O plans discusses monitoring parameters.

2.2.5. Odor and VOCs Emission Control

Although a number of articles document the applicability of biofiltration with soil media for control of odors and other composting process emissions, there is relatively little data on VOC emissions from MSW composting facilities, or the capabilities of biofilters to control VOC emissions. However, current literature indicates substantial potential control of VOCs by biofiltration.

The Composting Council sponsored a research project in 1993 with the goal of "identification of VOCs which are emitted during composting and the approximate determination of their concentrations in air at different locations within the facilities."

A total of eight U.S. MSW composting facilities was included in the Composting Council study (Eitzer 1995)[14], ranging in operating sizes from 5 to 600 tpd, with five of those facilities using biofilters to reduce odorous and VOCs emissions.

As far as occupational health and safety from VOC emissions at MSW composting facilities, the report concluded:

> It is important to note that even the highest concentrations from the compost piles remain well below the exposure guidelines, in most cases by several orders of magnitude. Also, these maximum concentrations represent worst cases (particularly when all samples are considered). Samples were taken directly from waste and compost piles so that the extremely high concentration might be localized while workers would be exposed to a more mixed air sample and therefore lower average concentrations.

Total VOCs concentrations at the various facilities were found to "remain within an order of magnitude at the different facilities for most chemicals."

Given that there are not other literature sources with VOCs emission data from MSW composting facilities, the author compares his findings to published estimates, as follows:

> There are no other reports on VOCs emissions from MSW composting, but it is interesting to compare the concentrations determined in these samples with those based on theoretical consideration as determined by Kissel et al. They use the literature on VOCs emissions

> on MSW and landfills and a fugacity-based model to estimate emissions from a 165 ton/day facility receiving waste which had 0.05% VOCs. His model resulted in a steady state total VOCs concentration ranging from 20mg/m3 to 150 mg/m3 depending on where in the facility VOCs were released. These numbers are quite consistent with the data reported here.....This good agreement with theoretical considerations gives confidence that the developed analytical method is providing a true first order estimation on the concentration of VOCs in air samples taken at the sample facilities.

Kissel et al (1992)[15] have developed the estimate of 0.05% VOC content, by weight, state that most of the VOCs are released during the first days of the composting process:

> most of the input VOCs should volatilize within one or two days even given nominal biodegradation (rapid volatilization is consistent with preliminary field data discussed above). Therefore a conservative assumption, for purposes of assessing air pathway risk, is that the entire VOC content of the feedstock would be released into the waste sorting and active composting buildings (assuming an enclosed operation).

This assessment is relevant to Bedminster's proposed Dade County composting facility in that most of the VOCs would be released on the tipping floor and in the digesters since these areas are where the first three to four days of processing occur. Consequently, the exhaust gases from these processing components should contain the highest concentrations of VOCs.

Based on both the Composting Council study of VOC emissions from 8 MSW composting facilities in the U.S., and Kissler et al (1992)[15], for the purpose of this application to Florida DEP, Bedminster is assuming 0.05% VOCs concentration by weight in MSW delivered to the Dade County composting facility.

For the purpose of this air permit application, Bedminster is assuming that the VOC emission rate from composting of wastewater biosolids is 0.2764 lbs/dry tons. This is based on unpublished data prepared for permitting of the Phelps Dodge Composting Facility in Brooklyn, New York (E&A Environmental Consultants 1994)[16]. That VOC emissions rate is an average based on emissions data from four sludge composting facilities.

2.2.6. Biofilter Efficiencies

The effectiveness of biofilters in treating VOCs emissions from composting facilities is better documented. A number of researchers have determined the removal capacities of biofilters for a variety of compounds, as shown in Table 1. Easily

biodegradable odorous compounds such as aldehydes, organic acids, sulfur dioxide, nitrous oxides and hydrogen sulfide can be removed to a level of 98 to 99 percent or more with biofilters (Williams & Miller 1992a)[11].

Williams & Miller (1992b)[12] cited a study which demonstrated removal efficiencies ranging from 65 to 92 percent for specific compounds such as methanol, methyl acetate, ethyl acetate and methyl ethyl ketone.

Data from a biosolids composting facility in Hamilton, Ohio, as shown in Table 2, indicate that the biofilter was accomplishing substantial removal of nine VOCs, ranging from 99.6% for acetone to 70% for carbon disulfide (Wheeler 1992)[17]. He showed that biofilters are also a very effective removal technology for sulfur compounds generated at the Hamilton facility (Table 3).

The most recent published data on biofilter effectiveness reviewed by Bedminster, indicated that the Dartmouth, Massachusetts biosolids composting facility was accomplishing excellent removal efficiencies for a number of compounds as well as odor (Amirhon & Kuter (1994)[18] (Table 4). The variations in flow rates were part of the evaluation, and indicate those removal rates for dimethyl disulfide (DMDS) and methyl mercaptan (MM) were high at "virtually all flow rates," with 98 to 99 percent with air flows between 0.87 and 2.2 cfm/ft^2. The removal efficiency of dimethyl sulfide (DMS) through the biofilter varied with the airflow rate, but stayed in the 80 percent removal range for air flows between 0.87 and 5.4 cfm/ft^2.

Ammonia removal rates were also very high at all flow rates tested, ranging between 98 percent and 99 percent.

3. LOCATION

Bedminster searched for an appropriate location to build this solid waste composting facility. The search included twelve different sites in Dade County, and a property in the City of Pensuco, also in Dade County, as the proposed site.

The selected site was identified after almost two years of site evaluation, and Bedminster has an option to purchase the property subject to granting of the required permits for the facility.

The site is in an industrial area of northwest Dade County with excellent access for delivery of the solid waste and biosolids from either the Turnpike or Okeechobee road. The nearest residential areas are almost one mile to the east. Prevailing wind is from the southeast, and therefore away from the nearest residential areas. As a result, an appropriate site will be far removed from residential, institutional, commercial and recreational land uses.

The proposed site is a 40-acre tract of land, located in an area designated for industrial land use in the Dade County Land Use Plan. It is only 15 miles from the City of Miami, and has excellent access to U.S. 27 (Okeechobee Road) and the Florida Turnpike. The site is not located in any designated wetland basin, nor is it within the cone of influence of any major wellfield. The nearest residential community is Hialeah Gardens, approximately 1/2 mile to the east, across U.S. 27.

The property has been used for pasturage for many years, is surrounded by pastures and rock quarries, and there are no other odor-producing facilities in this area. It satisfies all of the selection criteria.

A weather station mounted on top of the building will feed hourly information to the computer on temperature, wind speed/direction, humidity, and dew point. This information will be printed out each week and filed.

4. STANDARDS AND PUBLIC PERCEPTION

Unlike specific VOCs such as solvents, odors are not nearly as easily quantified. A plant could conceivably be in compliance with regulations concerning measurable air pollutants, yet be out of compliance in regard to odor emissions. Some states have regulatory odor thresholds. The only mention to odors as an environmental nuisance in Florida is regulation 209.

Whether an industry is targeted by the state for odor emissions, can largely depend on complaints from the surrounding community. In Florida, as well as in most parts of the United States, authorities respond to public complaints about odors by field inspections and if those inspections confirm the public's complaints, then they order corrective action.

The vastly different human response to odors further complicates the matter. The EPA report, "Reference Guide to Odor Thresholds for Hazardous Air Pollutants Listed in the Clean Air Act Amendments of 1990," charts the graphic variances of human panelists' responses to the odors of such chemicals as benzene, carbon tetrachloride, methyl ethyl ketone, methyl alcohol and methyl isobutyl ketone, to name a few. In addition, only 10 to 15 percent of the population may be sensitive to the odor being regulated. However, once complaints are made, even if only by few people, it's usually enough to galvanize a regulatory response.

Historically, environmental regulatory agencies report that odor complaints make up a large number of the citizens' complaints received. In general, the public does not understand the relationship between odor and risk and believes that "if it smells, it must be bad." However, there is not scientific evidence that the odor generated from a composting facility produces health

problems. There is high risk in assuming that these perceptions can be effectively countered with logic, technical presentations, or public education. As a result, an appropriate site must be far removed from residential, institutional, commercial and recreational land uses.

Some cities have started to develop more quantitative approach to odor management. Thus, the City of Sacramento established a fence line objective of 2 ED_{50} with an occurrence no more than 3.3 days per year and 5 ED_{50} no more than 0.5 days/yr. $5_{50}ED$ was the estimated threshold complaint level and 10 ED_{50} the definite complaint level. This means that predicted odor concentrations at the plant boundary would be below the threshold complaint level 99.8% of the time at all receptors beyond the plant boundary.

Currently many other U.S. and European cities are developing (or are already implementing) odor standards based on a variety parameters and dispersion model studies.

5. MANAGEMENT OF PUBLIC AWARENESS

Bedminster will follow in Dade County the same basic guidelines that have allowed the company to maintain good relationships with its neighbors elsewhere. Those guidelines can be summarized as follows:

1. Any complaints about odors should be recorded on the sheet provided (Appendix II). A summary listing of odor complaints should be maintained in the file.

2. A note should be added to the file describing the operational and weather conditions which contributed to the odor event. This will help determine the odor ramifications of operations.

3. If an activity at the plant is expected to generate an unusual odor, it should be done during the peak heating period of the day when odor dispersement conditions are better.

4. If someone calls to report odors as a result of an activity at the plant which generates odors, then the person should be advised what we are doing to correct the situation.

5. Neighbors of the plant should be encouraged to visit the plant with prior notification to the plant supervisor.

6. All odor complaints should be directed to either Process Engineer or Plant Manager. If another plant employee receives an odor complaint, they should be courteous, take their name and telephone number, and inform the caller that someone will return their call.

If a complaint is received, the weather conditions should be

noted on the Record of Odor Complaint Form (Appendix I), and an evaluation made of wind direction in relation to location of person registering the complaint.

6. CONCLUSIONS

Based on all of the above we conclude that:

1. The Bedminster Bioconversion Corporation project in Dade County will utilize an improved biofilter design and handling system for odor reduction and control.

2. BBC has not only established a positive track record in odor management, but also has demonstrated that costs are not an obstacle for BBC to specify the one proposed now.

3. BBC has demonstrated a track record of maintaining a proactive relationship with the local communities, regulatory agencies, environmental organizations, and the media based on openness and "good neighbor" policies.

7. APPENDIX I

7.1. THE BASICS OF ODOR SCIENCE

7.2. Odors as natural elements in nature and composting

All living systems, both plants and animals, excrete odorous molecular compounds on a nearly continuous basis. The atmosphere contains a mix of these odorous molecules present in minute concentrations. All starting substrates for composting are derived from plant and animal materials. Therefore, it is reasonable to assume that these substrates will contain many compounds that are potentially odorous.

Additionally, the metabolic pathways will produce many intermediate compounds that are odorous. The end products of an anaerobic metabolism such as hydrogen sulfide (H_2S), volatile organic acids, mercaptans, and methyl sulfides, are extremely odorous. Although composting that is fully aerobic is much less odorous than its anaerobic counterpart, many low molecular weight, odorous intermediaries are produced even during aerobic composting. Bedminster projected facility for the City of Miami will be aerobic in nature which is contrast with others previously permitted for Dade County which were anaerobic.

Most odor sources are characterized by a wide variety of components whose composition is usually unknown. To manage odors properly, it is necessary to quantify and measure them. If the number of compounds in a gas stream is limited, it is possible to determine the concentration of each odor-causing compound. The main organic odorant substances produced during the aerobic composting process are fatty acids (e.g., acetic acid), amines, aromatic compounds, inorganic sulfide (e.g., hydrogen sulfide (H_2S)), organic sulfides (e.g., mercaptans), terpenes, and ammonia (NH_3) (Wilber & Murray 1990)[19].

However, a human nose is still the accepted standard for detecting and determining odor intensity. It is a human receptor that senses odor and no machine has yet been able to simulate the human response(Haug 1993)[5].

7.3. Definitions

The sensory perception of odorant substances has four major dimensions: detectability, intensity, character, and hedonic tone.

Detectability or Threshold Odor Concentration (TOC): This refers to the theoretical minimum concentration of odorant stimulus necessary for detection in some specified percentage of the population. Usually 50% is taken, but the range goes from 10 to 100% in the definitions. Threshold values are not fixed physiological facts or physical constants but statistical points representing the best

estimate value from a group of individual responses. As such, it may be interpolated concentration value and not necessarily one that was actually presented.

Three types of thresholds are evaluated: the *detection or absolute perception* threshold, the *recognition* threshold, and the *objectionability* threshold. The detection threshold is the lowest concentration of odorant that will elicit an olfactory response without reference to odor quality in a specified percentage of a given population. In test procedures it is the minimum concentration of a stimulus detected by a specific percentage of the panel members. Additionally, Russian literature defines detection thresholds as absolute thresholds (i.e., the lowest concentration that will produce any measurable physiological change [e.g., as an electroencephalogram response] in the most sensitive human subject).

The detection threshold is identified by an awareness of the presence of an added substance. The recognition threshold is defined as the minimum concentration that is recognized as having a characteristic odor quality by a specific percentage (usually 50% of the population). This threshold is usually 1.5 to 10 times higher than the detection threshold (Hellman & Small 1974)[20].

The objectionability threshold is a purely subjective index based on what is an intolerable smell (see below).

Odor *intensity* refers to the perceived strength of the odor sensation. Intensity increases as a function of concentration.

Odor intensity is usually determined by referencing the odor sensation to an equivalent sensation from a reference odorant at a known concentration. Practice in the U.S. is to use ASTM E544 which specifies 1-butanol vapor as the referent odorant. The smell of the odorous sample is correlated to the concentration of 1-butanol that smells as strong as the sample. The odor intensity of the sample is then referenced as equal to the particular ppmv (parts per million by volume) concentration of 1-butanol. Odor panel candidates are presented with an ascending series of aqueous butanol concentrations and are required to pick the solution with an equivalent intensity to the odor sample.

The relationship between perceived strength (intensity) and concentration can often be expressed as a power function, as follows (Steven's Psychophysical Law):

$$I = k\ C^n$$

where I = perceived intensity of sensation, k = y-intercept, C = physical intensity of a stimulus (odorant concentration), and n = exponent of psychophysical function, typically less than 1.0 (Stevens 1957, Dravnieks 1972)[21]. The annoyance potential of odors

is directly related to the perceived odor intensity and odor character (what it smells like).

The third dimension of an odor is the *character (quality)*, in other words, what the substance smells like. An American Society for Testing and Materials (ASTM) publication (Dravnieks 1985)[22] presents character profiles for 180 chemicals using 146 descriptors, rated on a scale of zero to five. The descriptors include such terms as fishy, hay, nutty, creosote, turpentine, rancid, sewer, and ammonia. However, odor character has not been routinely measure in odor studies conducted at composting or wastewater facilities.

The fourth dimension is *hedonic tone*. Hedonic tone represents a judgement of the relative pleasantness of the odor. Perception of hedonic tone outside the laboratory is influenced by factors such as subjective experience, frequency of occurrence, odor character, odor intensity, and duration. There are a number of techniques for measuring hedonic tone, but normal practice is to compare the odorant to a range of standard odorants, for example, from very unpleasant (isovaleric acid) to very pleasant (vanillin). Conventional practice is to consider any odor as a potential nuisance regardless of its hedonic tone (Dravnieks & O'Neill 1979)[23]. Hedonic tone has not been routinely measured in odor studies at composting facilities.

Another factor is adaptation to an odor or olfactory fatigue. This described a temporary desensitation after smelling an odor. For this reason alone, odor threshold measurement's studies must be carefully designed.

Olfactory acuity in the population conforms to a normal distribution. Most people, assumed to be about 96% of the population is predictably hypersensitive while 3% is insensitive

7.4. Dilution techniques

Dilution techniques are often used to measure the detection threshold, particularly where many odorant substances are involved. Threshold Odor Number (TON) is the number of times a given volume of a gas sample has to be diluted with clean, odorless air to bring it to the threshold level. At least five different nomenclatures are in used to define the number of required dilutions:

1) The odor unit (ou)

2) The effective dose at the 50% level (ED_{50})

3) The Dilutions to the threshold (D/T)

4) The dilution ratio Z (named after H. Zwaardemaker, a Dutch pioneer in the field, and adopted in the ASTM Standards).

5) The dilution ratio K of K_{50}.

All of these mean essentially the same and are numerically equivalent. Odor units (ou) and ED_{50} are the most common. The ED terminology has one advantage in that the panel response level is clearly defined. For example, ED_5 is the effective dose resulting in a 5% positive panel response. ED_{50} a very common standard, refers to a 50% of the panel showing response to a specific odor.

7.5. Measurement Techniques

Although subjective, the human olfactory system is generally more sensitive than currently available analytical measurement systems and is sensitive to a wide variety of chemical structures. Thus, what is actually measured are human responses to odors. Such methods are called organoleptic.

There are not well established standards to measure odor or odor threshold values. That is because there is no agreement about type of data source, differences in experimental methodology, and the characteristics of human olfactory response, which demonstrate a great deal of interindividual variability.

Odor panels are the most common technique. A panel of subjects (between five and 10) is exposed to odor samples that have been diluted with odor-free air. The number of dilutions required to achieve a 50% positive response by panel members is termed the threshold odor number. This is taken to be the minimum concentration detectable by the average person. Thus, if nine volumes of diluting air added to one volume of an odor sample generate a positive response by half the panel, the odor concentration is reported as 10 dilutions to TOC. It is common to view the required dilution as a pseudo concentration of 10 ou or 10 ED_{50}. An odorous compound at its TOC has, by definition, a concentration of one ou. For example, a 1 m^3 sample with TOC of 100 ous requires dilution by 99 m^3 of odor free air to reach the threshold concentration. With the appropriate screening of the panelists for their general olfactory acuity, their ability to detect the odors of interest and their ability to match odor intensities, corrections for the statistical variability of a human nose can be made.

Although there are variances of human panelists' responses to the odors of such chemicals as benzene, carbon tetrachloride, methyl ethyl ketone, methyl alcohol and methyl isobutyl ketone, to name a few (EPA 1992)[4] this is the technique most frequently used in composting facilities.Other methods such as field tests have proven to be less statistically reliable.

8. Literature Cited

[1]Gillis, A.M. 1992. Shrinking the trash heap. BioScience 42(2):90-93.

[2]DEP. Department of Environmental Protection. 1993. Annual Report. Tallahassee, Fl.: Florida Department of Environmental Protection.

[3]Smith, W.H. 1994. Recycling Composted Organic Materials in Florida. Gainesville, Fl.: University of Florida, report BP-2.

[4]EPA. 1992. **Reference Guide to Odor Thresholds for Hazardous Air Pollutants Listed in the Clean Air Act Amendments of 1990.** Research Triangle Park, NC: 3-14pp.

[5]Haug, R.T. 1993. The Practical Handbook of Composting Engineering. Boca Raton, Fl.: Lewis Publishers, 717.

[6]Anonymous. 1995. Composting: Odors do not present a health threat, but comprehensive research needed. Solid Waste Report, June 15, 1995.

[7]Zmuda, J. 1994. Controlling VOCs and Odor. Poll. Eng. July.

[8]Hartenstein, H.U. & E.R. Allen. 1986. Biofiltration, An Odor Control Technology for a Wastewater Treatment Facility. Jacksonville, Fl.: City of Jacksonville.

[9]Segall, L. & A. Redd. 1994. Controlling Odors in Solid Waste Composting Facilities. Waste Age, July:115-119.

[10]Goldstein, N. 1993. Odor control progress for sludge composting. BioCycle, March 1993 34(3):56-59. Goldstein, N. 1994. Odor control progress at composting sites. BioCycle, Feb 1994 35(2):64-67. Muirhead, T.; P. La Fond & D. Dennis. 1993a. Odor control for biosolids composting. BioCycle, Feb 1993 34(2):64-69. Muirhead, T.; P. La Fond & D. Dennis. 1993b. Air handling and scrubber retrofits optimize odor control. BioCycle, March 1993 34(3):68-75. Worthy, W. 1988. New molecular sieves eliminate odors. Chemical & Engineering News, May 30, 1988 66(22):30-31.

[11]Williams, T.O. & F. C. Miller. 1992a. Odor control using biofilters. BioCycle, Oct 1992 33(10):72-76.

[12]Williams, T.O. & F. C. Miller. 1992b. Biofilters and facility operations. BioCycle, Nov 1992 33(11):75-79.

[13]Anonymous. 1993. Exosite bans secret odors for sure. American City & County, July 1993 108(8):S9. Riggle, D. 1994. Pulverized pallets become compost amendment. BioCycle, Jan 1994 35(1):40.

[14]Eitzer, B.D. 1995. Emissions of Volatile Organic Chemicals from

Municipal solid Waste Composting Facilities. Environ. Sci. Technol. 29(4):896-902.

[15]Kissel, J.C.; C.L. Henry & R.B. Harrison. 1992. Biomass Bioenergy 3(3-4):181.

[16]E&A Environmental Consultants. 1994. Unpublished data prepared for permitting Phelps Dodge Composting facility. Brooklyn, NY.

[17]Wheeler, M.L. 1992. Proactive Odor Management. The Evolution of Odor Control Strategies at the Hamilton, Ohio Wastewater Treatment and Sludge Composting Facility. Biofilter details and data presented at the BioCycle National Conference, St. Louis, Mo., May.

[18]Amirhon, P. & G.A. Kuter. 1994. Performance Evaluation of Biofilter at Dartmouth, MA, Biosolids Composting Facility. Presented at the New England Water Environment Association Annual Meeting, Boston, MA., February.

[19]Wilber, C. & C. Murray. 1990. Odor Source Evaluation. BioCycle 31(3).

[20]Hellman, T.M. & F.H. Small. 1974. Characterization of Odor Properties of 101 Petrochemicals Using Sensory Methods. J. Air Pollut. Control Ass. 24:979-982.

[21]Dravnieks, A. 1972. Odor perception and odorous air pollution. Tappi 55:737-742. Stevens, S.S. 1957. On the Psychophysical Law. Psychol. Rev. 64(3):153-181.

[22]Dravnieks, A. 1985. **Atlas of odor character profiles.** Philadelphia, PA: American Society for Testing and Materials.

[23]Dravnieks, A. & H.J. O'Neill. 1979. Annoyance Potentials of Air Pollution Odors. J. Amer. Ind. Hyg. Assoc. 40(february).

(9509.063)

APPENDIX B

Operation of Scrubber In Conjunction With Biofilter System

April 4, 1997

This information is provided to Sumter County to describe the function of the scrubber, and the importance of maintaining the scrubber in proper operating condition. Operating and maintenance procedures for the scrubber are presented in the O&M Manual.

The primary functions of the scrubber are to humidify the air stream, remove dust particulate, adsorb VOC's/odors, and cool air flowing into the base of the biofilter.

Humidification - One of the greatest enemies of biofiltration is drying of the media. Unless the media is kept at a moisture content of at least 40%, high rate biological degradation of the odor compounds in the exhaust gas will not occur, and treatment efficiency declines. Approximately 90% of odor degradation has been documented as occurring in the first 1 foot of biofilter media, and the resulting exothermic heat from the microbial activity will contribute to drying of the media.

A related problem is that as one portion of the biofilter dries out, air flow to that area increases since it takes less pressure for air to flow through areas of drier media. This differential air flow is termed channeling, and lesser treated air finds a quicker route out of the biofilter bed. As the media becomes more and more dry it can also contract, cracks develop, and gas traveling that route reaches the atmosphere essentially untreated. Even with surface irrigation, if substantial drying is occurring at the base of the biofilter, such channeling can develop. This is why it is important to monitor moisture content at various depths of the biofilter.

Cooling - Although exhaust gas from the digester has high relative humidity (>90%), it is also quite warm (105-125 degrees F), and can therefore contribute to drying of the lower parts of the biofilter. The scrubber not only serves to boost the moisture content of the air, it also will cool the air if the water in the unit is cooler than the exhaust air. The cooling capability is a function of exhaust gas temperature, temperature of the water supplied to the scrubber, and the rate at which fresh water is introduced to the unit, i.e. how much blowdown water is released. Actual measurement of gas temperatures in and out of the scrubber will be required to determine the cooling impact.

Particulate - Another enemy of biofilters are dust particles blown into the base of the biofilter since they can clog pipes and media. The scrubber can be very effective in removing dust particles from the air stream. Although we do not have air testing documentation of such removal rates, the blowdown water from the scrubbers at the Cobb plant contained significant amounts of visible dust particles, and the attached water quality testing data, total suspended solids and BOD, indicates the presence of dust. For this reason, as discussed below, blowdown water from the scrubber requires some treatment before release to the environment.

VOC's- Volatile organic compounds (VOC's) are also adsorbed into the water in the scrubber. Many VOC's are also odor compounds, and therefore there is some pre-treatment benefit from use of the scrubber prior to the biofilter. As some amount of odor is removed from the air (transferred to the water), the total loading on the biofilter is reduced, and thus the life expectancy of the biofilter should be increased. Bedminster estimates that approximately 50% of total non-methane VOC's may be removed by the scrubber. The down-side of this is that odor compounds have now been transferred to the water, and will require treatment prior to release to the environment.

Scrubber Water Quality - The attached testing data from ERM-Southeast was for the purpose of determining the concentration of VOC's in the blowdown water, and estimating the amount of VOCs which would be released by agitating the water. This data was from a scrubber unit treating exhaust gasses drawn directly out of a digester. The other water quality data by V.O.C. Analytical Laboratories is from a sample of the oxidation pond water prior to treatment with aerators.The Cobb oxidation pond received blowdown water as well as a lesser proportion of biofilter leachate. Note that BOD was 310 mg/l and total suspended solids 120 mg/l.

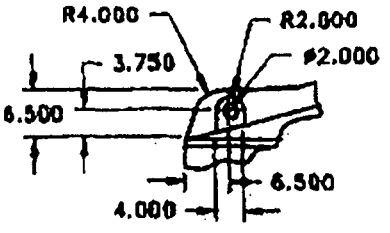
The organic matter and oxygen concentration of the scrubber water is sufficient for growth of a biological "slime" on the media, the screen supporting the media, and the walls of the scrubber. If this growth is not periodically controlled, as discussed in the O&M manual, performance of the scrubber will be reduced.

This water quality information also indicates that some form of water treatment or disposal is required for blowdown water from the scrubber, as well as for leachate from the biofilter. The water will also become increasingly eutrophic if left un-treated in an open pond. That is why Bedminster provided aerators in the Cobb oxidation pond.

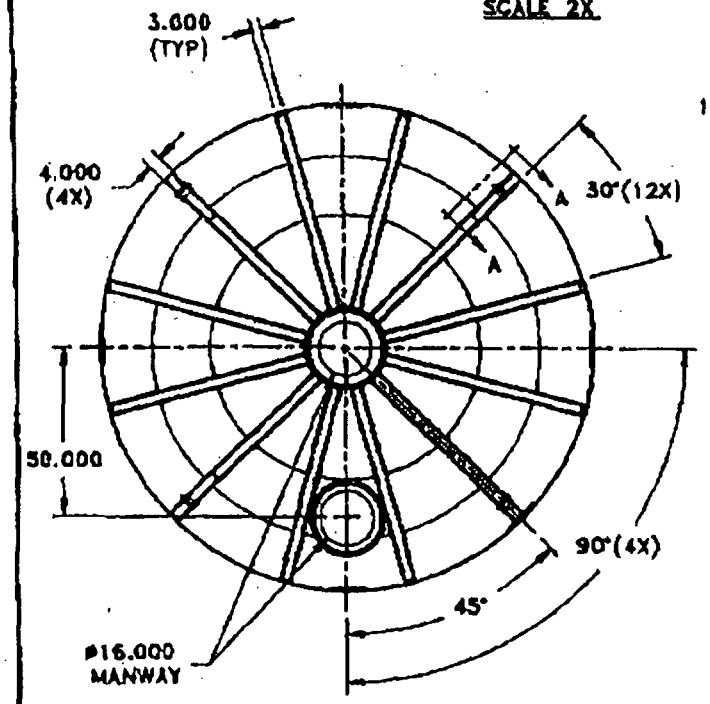
Conclusions- For the above reasons Bedminster recommends that the scrubber be kept in good operating condition as a pre-treatment step for the biofilter. If the scrubber is not maintained in good operating condition, there is increased risk that the performance of the biofilter will decline, and the longevity of the biofilter media will be reduced.

APPENDIX C

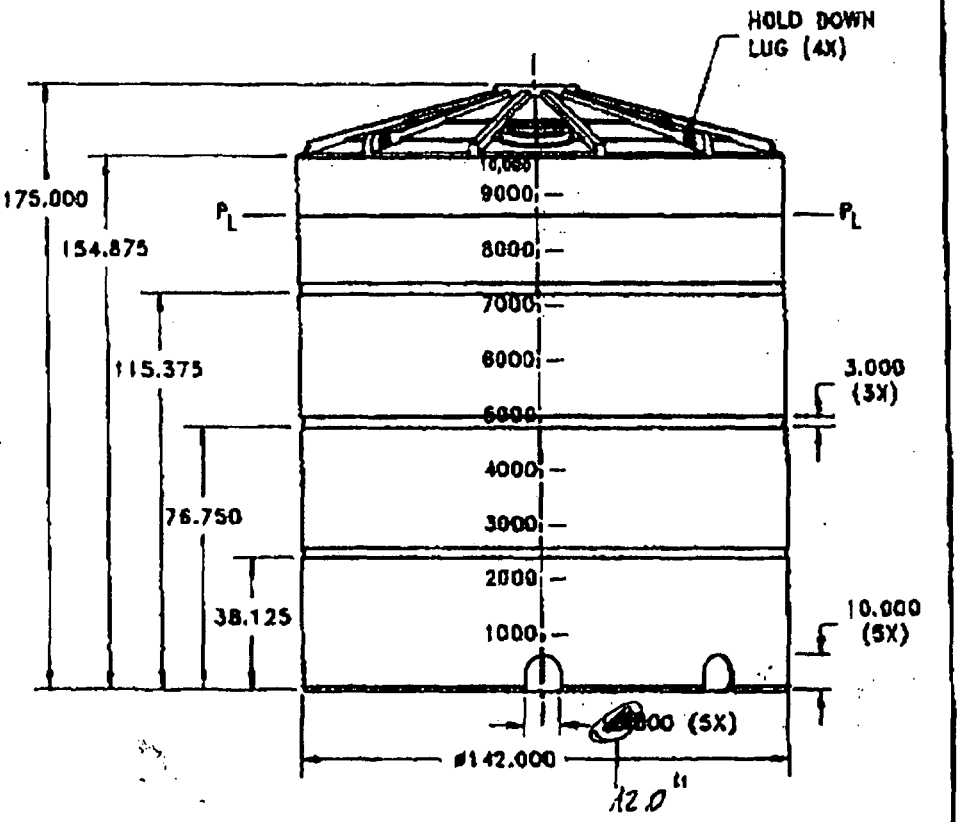
ACE_261



VIEW A-A
SCALE 2X



TOP VIEW



SIDE VIEW

CUSTOMER AUTHORIZED APPROVAL _____ DATE _____

REV	DESCRIPTION	DATE	APPRD

ALL DIMENSIONS ARE IN DECIMAL INCHES
TOLERANCES UNLESS OTHERWISE SPECIFIED
± .XX @ 90° ±

DRAWN / DATE
CPB/4/15/96
APPRD. / DATE

MATERIAL / SHOT WEIGHT

M111	M156	U615	P934
2409			

NOTES:
1. 2.7% SHRINK ALLOWANCE
2. COLOR - T.B.D.

ACE ROTO-MOLD, INC.
HIGHWAY 69 SOUTH, HOSPERS, IOWA

CLIENT / DESCRIPTION
ACE / 10,000 GAL. TANK

SCALE N.S

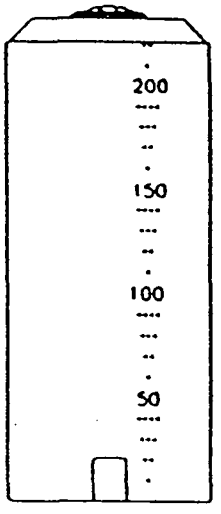
PART NO. VT10000-142

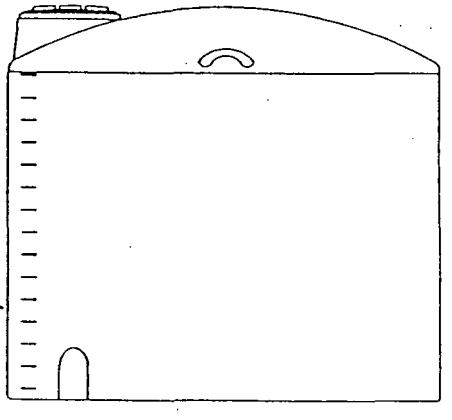
1.9 2800 LB

Vertical Polyethylene Storage Tanks

American Tank offers a wide selection of vertical storage tanks to meet your demanding applications. They are translucent with gallon indicators and integrated tie-downs molded right into the tanks. The tanks contain UV stabilizers and are in stock, ready for shipment.

Part No.	Capacity (Gallons)	Diameter (Inches)	Height (Inches)	Fill Opening (Inches)
V00022	22 Gallon	17	23	6
V00065	65 Gallon	23	42	5
V00100	100 Gallon	28	42	5
V00110	110 Gallon	32	36	5
V00160	160 Gallon	28	66	5
V00175	175 Gallon	31	52	5
V00210	210 Gallon	40	48	8
V00225	225 Gallon	31	72	8
V00265	265 Gallon	31	84	8
V0030035	300 Gallon	35	77	16
V0030042	300 Gallon	42	54	8
V00425	425 Gallon	42	72	8
V00500	500 Gallon	46	76	16
V00550	550 Gallon	52	66	8
V00600	600 Gallon	46	88	16
V00700	700 Gallon	69	48	16
V00850	850 Gallon	48	120	16
V01000	1000 Gallon	64	81	16
V01050	1050 Gallon	85	52	16
V01350	1350 Gallon	85	64	16
V0150064	1500 Gallon	64	115	16
V0150085	1500 Gallon	85	69	16
V01650	1650 Gallon	85	74	16
V02000	2000 Gallon	90	81	16
V02050	2050 Gallon	64	164	16
V02500	2500 Gallon	90	100	16
V03000	3000 Gallon	90	118	16
V03350	3350 Gallon	95	116	18
V04200	4200 Gallon	102	129	18
V05150	5150 Gallon	102	162	16
V06250	6250 Gallon	120	142	16
V07650	7650 Gallon	142	122	18
V08900	8900 Gallon	120	193	18
V09800	9800 Gallon	120	212	18
V1050015	10,500 Gallon 1.50 SPG	142	175	16
V10500175	10,500 Gallon 1.75 SPG	142	175	16
V1050019	10,500 Gallon 1.90 SPG	142	175	16
V1250015	12,500 Gallon 1.50 SPG	142	197	18
V15000XL	15,000 Gallon - Crosslink	142	233	18
V22000XL	22,000 Gallon - Crosslink	142	333	18





• Sizes Available in Cross-Link Polyethylene • Optional Colors Available • Optional SPG-Rated Tanks

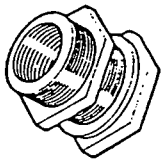
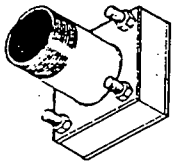
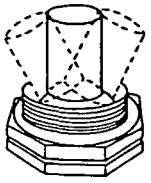
TANK ACCESSORIES AVAILABLE

TOLL FREE 1-888-283-8265

ATE-TANK

Specifications Subject to Change Without Notice

Bulkhead Fittings - EPDM Gaskets Standard

COMPRESSION STYLE

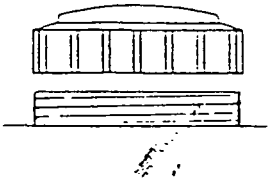
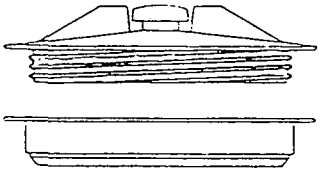
Description	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	3"	4"	6"
PVC Tank Adaptor	455012	455034	45501	455114	455112	45502	45503	45504	45506
CPVC Tank Adaptor	455012C	455034C	45501C	455114C	455112C	45502C	45503C	45504C	45506C
Black PPL Tank Adaptor	BH050	BH075	BH100	BH125	BH150	BH200	BH300	-	-
Black PPL Heavy Duty Tank Adaptor	BH050HD	BH075HD	BH100HD	BH125HD	BH150HD	BH200HD	-	-	-

BOLT-IN STYLE

Description	1/2"	3/4"	1"	1 1/2"	2"	3"	4"
Stainless Steel Male Tank Adaptor	-	BDSM075	BDSM100	BDSM150	BDSM200	BDSM300	BDSM400
Stainless Steel Female Tank Adaptor	-	BDSF075	BDSF100	BDSF150	BDSF200	BDSF300	BDSF400
Black PPL Female Tank Adaptor	BD050	BD075	BD100	BD150	BD200	BD300	-

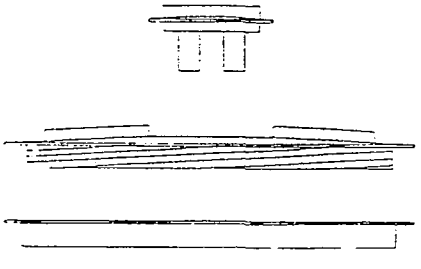
CPVC SELF-ALIGNING STYLE (COMPRESSION)

Part No.	Size	Description
45501SA	1"	Self Aligning PVC
45502SA	2"	Self Aligning PVC
45503SA	3"	Self Aligning PVC

LIDS

Part No.	Size	Description
TL04TL	4"	Twist Lock Lid
TL05S0	5"	Spin On Lid
TL08TH	8"	Threaded Lid w/Vent
TL12TH	12"	Threaded Lid NO Vent
TL16TH	16"	Threaded Lid w/Vent
TL22TH	22"	Threaded Lid w/Vent



COMPLETE LINE OF TANK ACCESSORIES

TOLL FREE 1-888-ATE-TANK

283-8265

Specifications Subject to Change Without Notice

APPENDIX D

DRAFT

Sumter County Acceptance Test Protocol by Date
Bedminster Bioconversion Corp.

3/11/97

04/12/97 Day 1 **Startup/Shakedown**

PRIOR TO LOADING

Test internal component operation (Transfer Doors)

Discharge Doors

Maintenance

Bearing Temps

Lube Levels

Belt Maintenance

Door Operation

Test subtractive weighing scheme

Tare Weights on Containers

Calibrate Feed Conveyor

Begin Loading

25 Tons MSW and 12.5 Tons sludge (est.)

Innoculation * * Requres sludge or approved source of nitrogen, MSW as carbon source, moisture

04/13/97 Day 2 **Shakedown**

Load digester

25 Tons MSW and 12.5 Tons sludge (est.)

Verify accuracy of MSW / Sludge ratio.

Maintenance

Bearing Temps

Lube Levels

Belt Maintenance

Door Operation

Clean Up

Monitoring

Calculate Moisture Content

Monitor/calibrate feed rates as necessary

Temperatures

O2

04/14/97 Day 3 **Shakedown**

Test and confirm Sludge Pump can deliver 25TPD.

Load Digester

50 Tons MSW and sludge to proper moisture %.

Verify accuracy of MSW / Sludge ratio.

Monitoring

Calculate Moisture Content

Monitor/calibrate feed rates as necessary

Temperatures

O2

Transfer Procedures

Record times and depths during transfer

Maintenance

Bearing Temps

Lube Levels

Belt Maintenance

Door Operation

Clean Up

04/15/97 Day 4 **Shakedown**

Demonstrate that can handle 50 T / 5 hr period

Load Digester

50 Tons MSW and sludge to proper moisture %.

Verify accuracy of MSW / Sludge ratio.

Transfer Procedures

Record times and depths during transfer

Monitoring

Calculate Moisture Content

Monitor/calibrate feed rates as necessary

Temperatures

O2

Maintenance

Bearing Temps

Lube Levels

Belt Maintenance

Door Operation

Clean Up

Confirm Digester Alignment (adjust if necessary)

04/16/97 Day 5 **Sim Acceptance Day 1**

Operate Digester under Full Load (50T)

Load Digester - adjust loading to reduce level to 50%

Verify accuracy of MSW / Sludge ratio.

Check for overheating and alignment between thrust rollers.

Check digester alignment and adjust if necessary

Monitoring

Calculate Moisture Content

Temperatures

O2

Transfer Procedures

Record times and depths during transfer

Maintenance

Bearing Temps

Lube Levels

Belt Maintenance

Door Operation

Clean up
Shakedown trommel screen and discharge conveyor
Discharge (to 50% volume)
Practice Screen (Develop protocol) * * *Containers, number and size, quantity of material, screening equipment unknown at this time.*
Practice Sort
Practice Weigh
Record & evaluate time requirements

04/17/97 Day 6 **Sim Acceptance Day 2**

Operate Digester at 50% Load
Verify accuracy of MSW / Sludge ratio.
Check for overheating and alignment between thrust rollers.
Check digester alignment and adjust if necessary
Monitoring
Calculate Moisture Content
Temperatures
O2
Transfer Procedures
Record times and depths during transfer
Maintenance
Bearing Temps
Lube Levels
Belt Maintenance
Door Operation
Clean up
Shakedown trommel screen and discharge conveyor
Discharge (to 50% volume)
Practice Screen (Develop protocol) * * *Containers, number and size, quantity of material, screening equipment unknown at this time.*
Practice Sort
Practice Weigh
Record & evaluate time requirements

04/18/97 Day 7 **Sim Acceptance Day 3**

1 RPM @ 50% full (4.5 to 5')with 50% to 52% moisture
Electrical current draw will not exceed 85% of nameplate current.
Check for overheating and alignment between thrust rollers.
Monitoring
Calculate Moisture Content - Compartment 1
Monitor/calibrate feed rates as necessary
Temperatures
O2
Accumulate Report Data

04/19/97 Day 8 **Sim Acceptance Day 4**

1 RPM @ 50% full (4.5 to 5')with 50% to 52% moisture
Electrical current draw will not exceed 85% of nameplate current.
Check for overheating and alignment between thrust rollers.
Monitoring
Calculate Moisture Content - Compartment 1
Temperatures
O2
Accumulate Report Data

04/20/97 Day 9 **Acceptance Test - Day 1**

Discharge - begin 4 AM
Must discharge within 6 hrs.
Transfer -
Accomplish within 2.5 hrs each.
Load - begin 1 PM
Verify accuracy of MSW / Sludge ratio.
Load 50 Tons over 5 hour period *
Monitoring
Calculate Moisture Content - Compartment 1
Temperatures
O2
Ph (discharge material only)
Screen and determine percentage of organics
Accumulate Report Data

04/21/97 Day 10 **Acceptance Test**

Discharge - begin 4 AM
Must discharge within 6 hrs.
Transfer -
Accomplish within 2.5 hrs each.
Load - begin 1 PM
Verify accuracy of MSW / Sludge ratio.
Load 50 Tons over 5 hour period *
Monitoring
Calculate Moisture Content - Compartment 1
Temperatures
O2
Ph (discharge material only)
Screen and determine percentage of organics
Accumulate Report Data

04/22/97 Day 11 **Acceptance Test**

Discharge - begin 4 AM
Must discharge within 6 hrs.

Transfer -

Accomplish within 2.5 hrs each.

Load - begin 1 PM

Verify accuracy of MSW / Sludge ratio.

Load 50 Tons over 5 hour period *

Monitoring

Calculate Moisture Content - Compartment 1

Temperatures

O2

Ph (discharge material only)

Screen and determine percentage of organics

Accumulate Report Data

04/23/97 Day 12 **Acceptance Test**

Discharge - begin 4 AM

Must discharge within 6 hrs.

Transfer -

Accomplish within 2.5 hrs each.

Load - begin 1 PM

Verify accuracy of MSW / Sludge ratio.

Load 50 Tons over 5 hour period *

Monitoring

Calculate Moisture Content - Compartment 1

Temperatures

O2

Ph (discharge material only)

Screen and determine percentage of organics

Accumulate Report Data

04/24/97 Day 13 **Acceptance Test**

Discharge - begin 4 AM

Must discharge within 6 hrs.

Transfer -

Accomplish within 2.5 hrs each.

Load - begin 1 PM

Verify accuracy of MSW / Sludge ratio.

Load 50 Tons over 5 hour period *

Monitoring

Calculate Moisture Content - Compartment 1

Temperatures

O2

Ph (discharge material only)

Screen and determine percentage of organics

Accumulate Report Data

04/25/97 Day 14 **Acceptance Test**

Discharge - begin 4 AM

Must discharge within 6 hrs.

Transfer -

Accomplish within 2.5 hrs each.

Load - begin 1 PM

Verify accuracy of MSW / Sludge ratio.

Load 50 Tons over 5 hour period *

Monitoring

Calculate Moisture Content - Compartment 1

Temperatures

O2

Ph (discharge material only)

Screen and determine percentage of organics

Accumulate Report Data

04/26/97 Day 15 **Acceptance Test**

Discharge - begin 4 AM

Must discharge within 6 hrs.

Transfer -

Accomplish within 2.5 hrs each.

Load - begin 1 PM

Verify accuracy of MSW / Sludge ratio.

Load 50 Tons over 5 hour period *

Monitoring

Calculate Moisture Content - Compartment 1

Temperatures

O2

Ph (discharge material only)

Screen and determine percentage of organics

Accumulate Report Data

04/27/97 Day 16 **Acceptance Test**

Discharge - begin 4 AM

Must discharge within 6 hrs.

Transfer -

Accomplish within 2.5 hrs each.

Load - begin 1 PM

Verify accuracy of MSW / Sludge ratio.

Load 50 Tons over 5 hour period *

Monitoring

Calculate Moisture Content - Compartment 1

Temperatures

O2

Ph (discharge material only)

Screen and determine percentage of organics

Accumulate Report Data

04/28/97 Day 17 **Acceptance Test -**

Discharge - begin 4 AM

Must discharge within 6 hrs.

Transfer -

Accomplish within 2.5 hrs each.

Load - begin 1 PM

Verify accuracy of MSW / Sludge ratio.

Load 50 Tons over 5 hour period *

Monitoring

Calculate Moisture Content - Compartment 1

Temperatures

O2

Ph (discharge material only)

Screen and determine percentage of organics

Accumulate Report Data

04/29/97 Day 18 **Acceptance Test**

Discharge - begin 4 AM

Must discharge within 6 hrs.

Transfer -

Accomplish within 2.5 hrs each.

Load - begin 1 PM

Verify accuracy of MSW / Sludge ratio.

Load 50 Tons over 5 hour period *

Monitoring

Calculate Moisture Content - Compartment 1

Temperatures

O2

Ph (discharge material only)

Screen and determine percentage of organics

Accumulate Report Data

04/30/97 Day 19 **Acceptance Test**

Discharge - begin 4 AM

Must discharge within 6 hrs.

Transfer -

Accomplish within 2.5 hrs each.

Load - begin 1 PM

Verify accuracy of MSW / Sludge ratio.

Load 50 Tons over 5 hour period *

Monitoring

Calculate Moisture Content - Compartment 1

Temperatures

O2

Ph (discharge material only)

Screen and determine percentage of organics

Accumulate Report Data

05/01/97 Day 20 **Acceptance Test**

Discharge - begin 4 AM

Must discharge within 6 hrs.

Transfer -

Accomplish within 2.5 hrs each.

Load - begin 1 PM

Verify accuracy of MSW / Sludge ratio.

Load 50 Tons over 5 hour period *

Monitoring

Calculate Moisture Content - Compartment 1

Temperatures

O2

Ph (discharge material only)

Screen and determine percentage of organics

Accumulate Report Data

05/02/97 Day 21 **Acceptance Test**

Discharge - begin 4 AM

Must discharge within 6 hrs.

Transfer -

Accomplish within 2.5 hrs each.

Load - begin 1 PM

Verify accuracy of MSW / Sludge ratio.

Load 50 Tons over 5 hour period *

Monitoring

Calculate Moisture Content - Compartment 1

Temperatures

O2

Ph (discharge material only)

Screen and determine percentage of organics

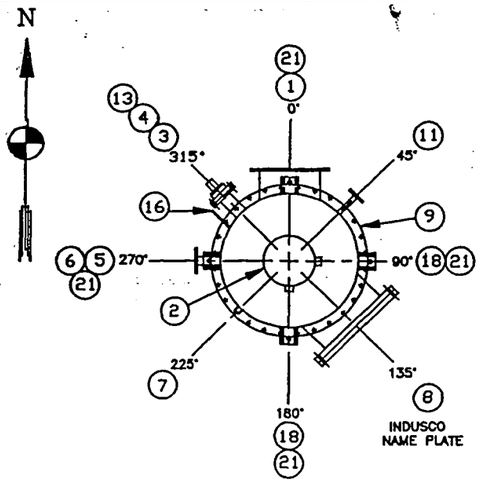
Accumulate Report Data

05/03/97 Day 22 **Compile Acceptance Test Report**

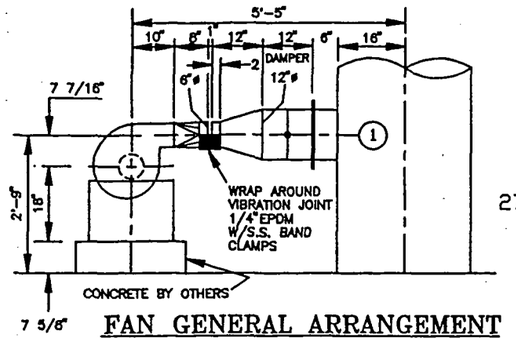
05/04/97 Day 23 **Compile Acceptance Test Report**

05/05/97 Day 24 **Compile Acceptance Test Report**

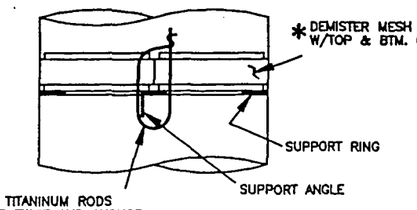
05/06/97	Day 25	Review Acceptance Test Report
05/07/97	Day 26	Review Acceptance Test Report
05/08/97	Day 27	Review Acceptance Test Report
05/09/97	Day 28	Review Acceptance Test Report
05/10/97	Day 29	Review Acceptance Test Report / Certificate of Approval



PLAN VIEW

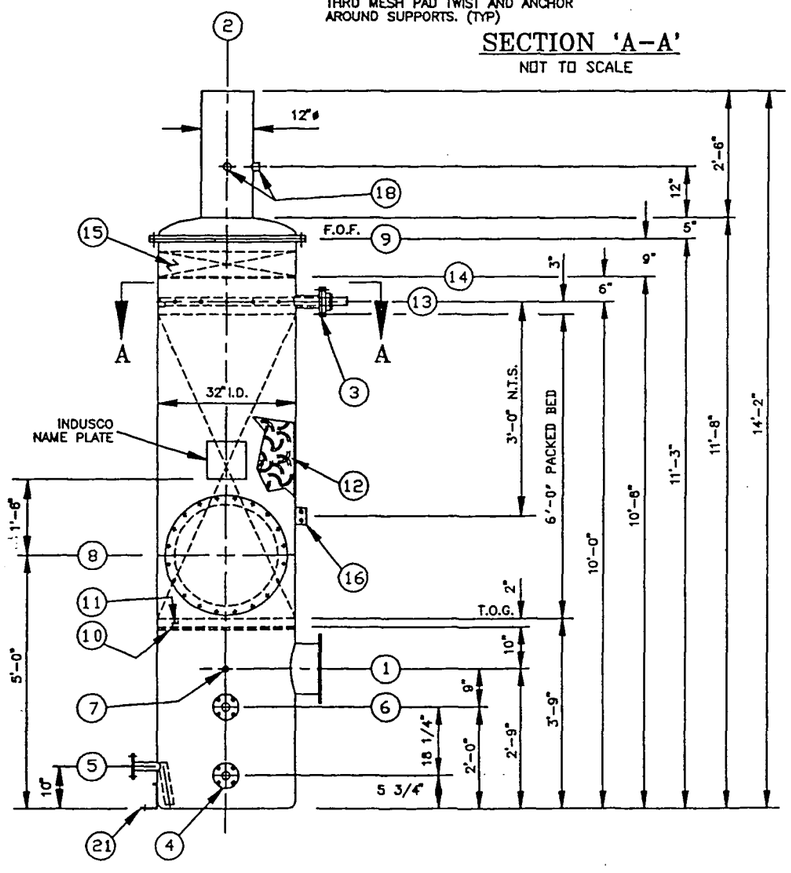


FAN GENERAL ARRANGEMENT

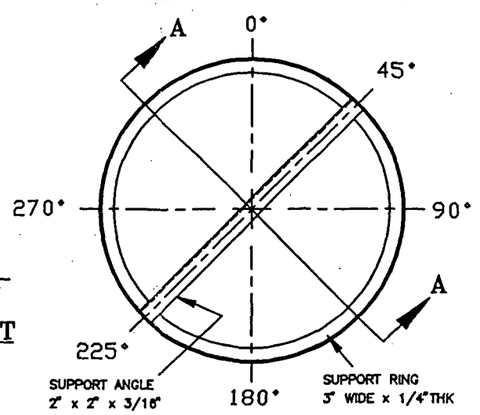


* INSERT 3/16"ø TITANINUM RODS THRU MESH PAD TWIST AND ANCHOR AROUND SUPPORTS. (TYP)

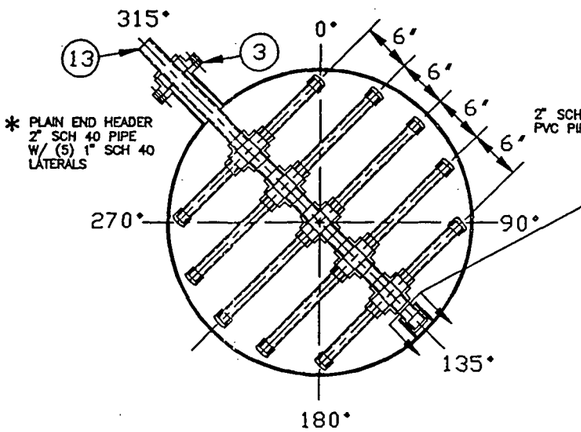
SECTION 'A-A'
NOT TO SCALE



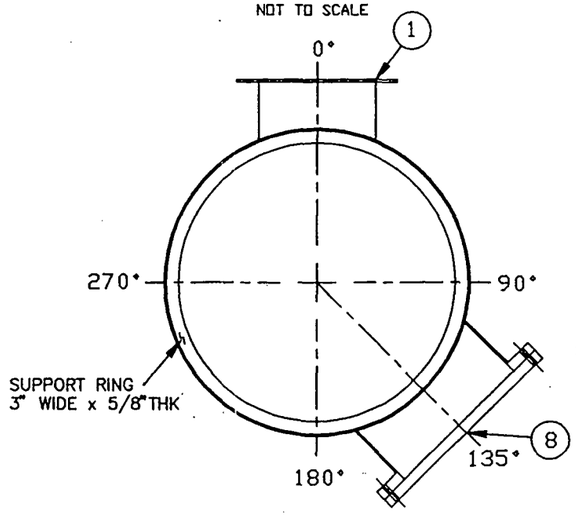
ELEVATION VIEW
SEE PLAN VIEW FOR CORRECT ORIENTATION



DEMISTER SUPPORT 14
DEMISTER NOT SHOWN THIS VIEW
NOT TO SCALE



SECTION 'A-A'
NOT TO SCALE



PACKING SUPPORT RING 10
NOT TO SCALE

ITEM	QTY.	DESCRIPTION	SIZE & TYPE	DIAMETER FLANGE	THICKNESS FLANGE	DIAMETER BOLT CIRCLE	NUMBER BOLTS	DIAMETER HOLES	BOLT DIAMETER
1	1	AIR INLET	12" DUCT	16 3/8	3/8	18	12	1/2	3/8-16 UNC
2	1	AIR OUTLET	12" DUCT	--	--	--	--	--	--
3	1	RECIRC. LIQUID INLET	4" 150LB	9	1/2	7 1/2	8	3/4	5/8-11 UNC
4	1	PUMP SUCTION	3" 150LB	8	1/2	6	4	3/4	5/8-11 UNC
5	1	SIPHON DRAIN	3" 150LB	8	1/2	6	4	3/4	5/8-11 UNC
6	1	OVERFLOW	3" 150LB	8	1/2	6	4	3/4	5/8-11 UNC
7	1	H_2O MAKE-UP	1" NPT	PVC FULL COUPLING W/ INTERNAL CLOSED NIPPLE AND 90° ELBOW					
8	1	LOWER ACCESS MANWAY	16" SPECIAL	23	3/4	22 3/4	16	5/8	1/2-13 UNC
9	1	BODY FLANGE SET W/GASKET	32" DUCT	36 3/8	1	35	36	5/8	1/2-13 UNC
10	1	PACKING SUPPORT RING, 3" WIDE x 5/8" THICK							
* 11	1	PACKING SUPPORT PLATE, 2 x 2 x 2 CR GRATING							
** 12	35.0 cf	PACKING MEDIA, JAEGER 3.5"TRI-PACK, POLYPROPYLENE							
* 13	1	LIQUID DISTRIBUTOR, LATERAL TYPE PVC							
14	1	DEMISTER SUPPORT RING, 3" WIDE x 1/4" THK. W/ ONE 2" x 2" x 3/16" ANGLE BEAM							
* 15	1	DEMISTER UNIT, MESH PAD W/ TOP & BOTTOM SUPPORT, POLYPROPYLENE							
16	1	PIPE SUPPORT CLIP, FRP							
17	4	HOLD-DOWN LUGS,							
18	2	1 1/2" HALF COUPLINGS W/PLUG, PVC							

* = ITEMS SHIPPED LOOSE FOR FIELD INSTALLATION

FABRICATION NOTES & COMMENTS

1. NOZZLES TO BE FULL FACE & BACKED FACED FOR SAE WASHER, NOZZLES 6" AND SMALLER TO HAVE PLATE GUSSETS.
2. BOLT HOLE TO STRADDLE VESSEL NATURAL CENTERLINES.
3. ALL DIMENSIONS ARE MEASURED FROM BASE/BOTTOM OF SCRUBBER UNIT. ALL NOZZLES ARE LOCATED IN PLAN VIEW.
4. ALL EXTERIOR NOZZLE PROJECTIONS TO BE 6" FROM INTERIOR WALL WITH MINIMUM INTERIOR PROJECTION, UNLESS NOTED ON SHOP DRAWINGS.
5. ALL NOZZLES TO BE PROTECTED WITH PLYWOOD COVERS DURING TRANSIT AND STORAGE.

NAMEPLATE / DESIGN DATA

PROJECT NUMBER: ID344168

CUSTOMER/COMPANY: BEDMINSTER BIOCONVERSION
JOB-SITE LOCATION: SEVIERVILLE, TENNESSEE
PURCHASE ORDER No.:
EQUIPMENT NAME: PILOT ODOR CONTROL SCRUBBER

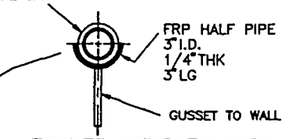
DESIGN ACFM: VARIABLE
DESIGN TEMP: 105 DEG. F.
DESIGN PRESSURE: -8" W.G.
DESIGN DP: 3.4 S.P.W.G.
H2S, MERCAPTANS, ETC.
AIR STREAM TEMP: 100 DEG. F.

SCRUBBER SOLUTION: WATER W/BIOLOGICAL CELLS
SOLUTION TEMP: AMBIENT
RECYCLE FLOW, GPM: 50 GPM @ 25' TDH
SOLUTION FLOW, GPM: AS REQUIRED
SUMP OVERFLOW, GPM: CONTINUOUS
SUMP CAPACITY: 100 GALLONS

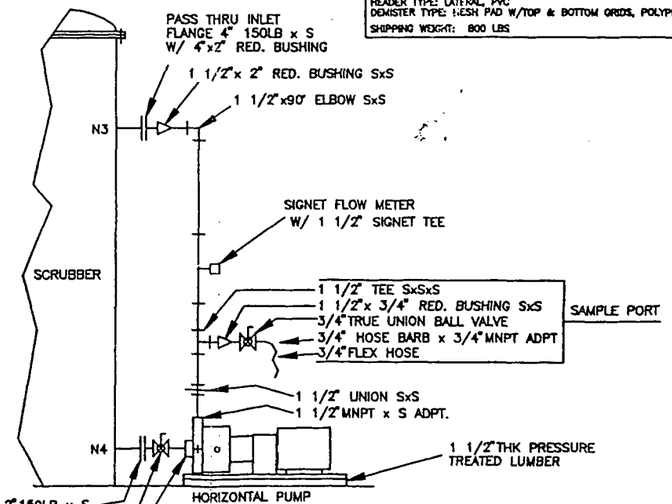
MATERIAL OF CONSTRUCTION: FRP PER PS15-69
CORROSION LINER: HETRON FR992 W/ NEXUS VEIL
STRUCTURAL TYPE: HETRON FR992 W/ANTIMONY TRIOXIDE
MINIMUM WALL THICKNESS: 1/4"
MINIMUM BOTTOM THICKNESS: 1/4"
MINIMUM HEAD THICKNESS: 1/4"
EXTERIOR FINISH/COLOR: SMOOTH, WHITE

PACKING MEDIA/TYPE: JAEGER 3.5" TRI-PACK, POLYPROPYLENE
HEADER TYPE: LATERAL, PVC
DEMISTER TYPE: MESH PAD W/TOP & BOTTOM GRIDS, POLYPROPYLENE

SHIPPING WEIGHT: 800 LBS



HEADER SUPPORT CLIP



* RECIRC. PIPING SCHEMATIC
NOT TO SCALE
NOTE: ALL PIPING ITEMS SHIPPED LOOSE FOR FIELD INSTALLATION

REV.	DATE	DRAWING STATUS	BY
		DRAWING RELEASED FOR APPROVAL	jmg
		DRAWING RELEASED FOR FABRICATION	TAJ
		DRAWING RELEASED FOR CONSTRUCTION	

COMMENTS & NOTES:

INDUSCO ENVIRONMENTAL SERVICES INC.

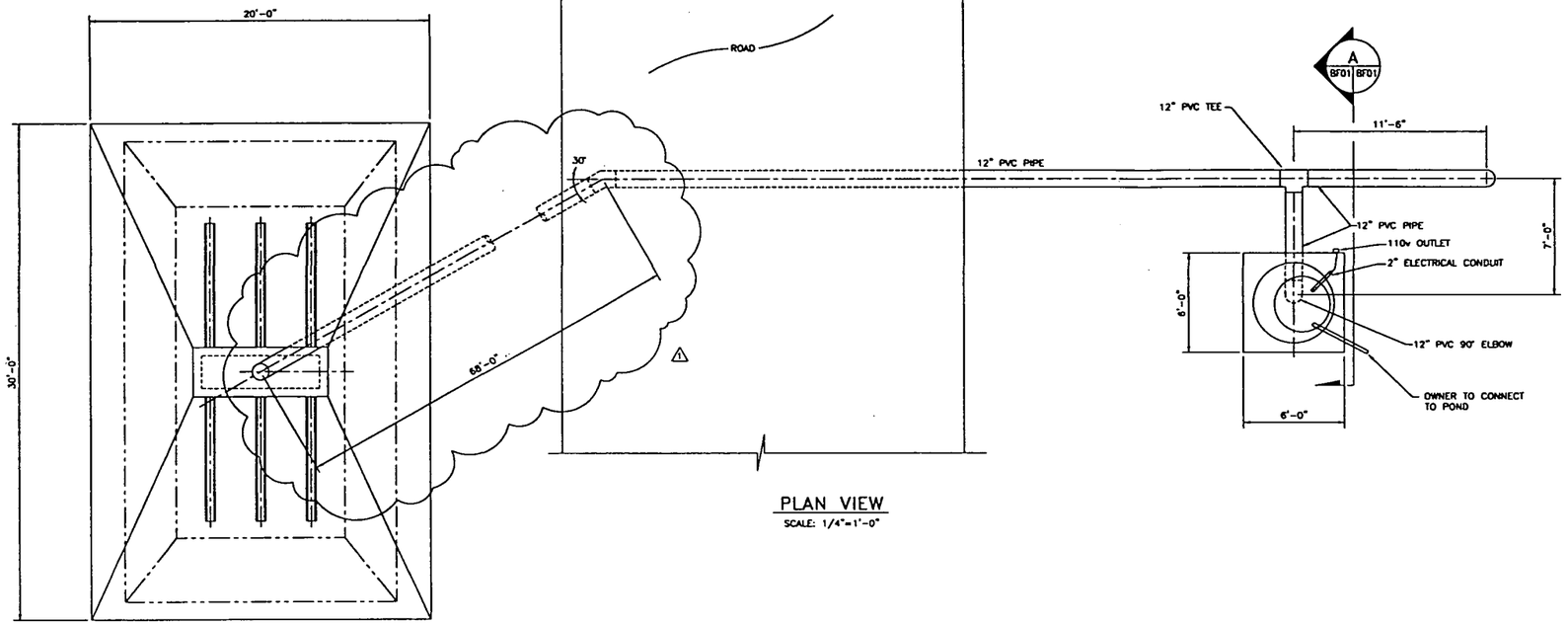
P.O. BOX 723365
ATLANTA, GA. 31139
(404) 730-5928

DRAWN GAS
CHECKED
APPROVED

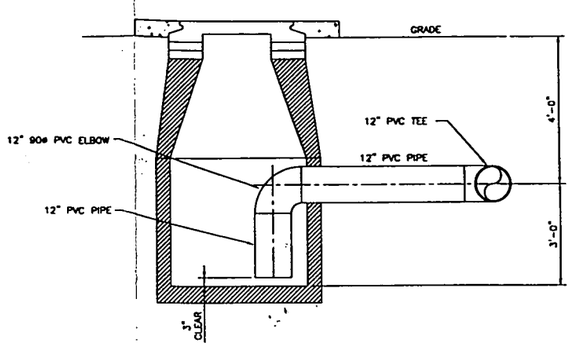
CUSTOMER: BEDMINSTER BIOCONVERSION
SEVIERVILLE, TENNESSEE
P.O. No.: 5004

TITLE: PILOT PACKED BED SCRUBBER UNIT

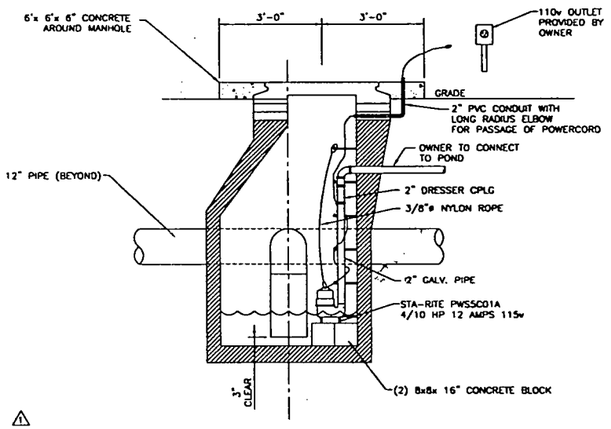
SCALE 3/4"=1'-0" (PLOT @ 1=16) | SHT. 1 OF 1
RELEASE DATE 3/21/95 | DWG No. IE95135-1 | REV. A



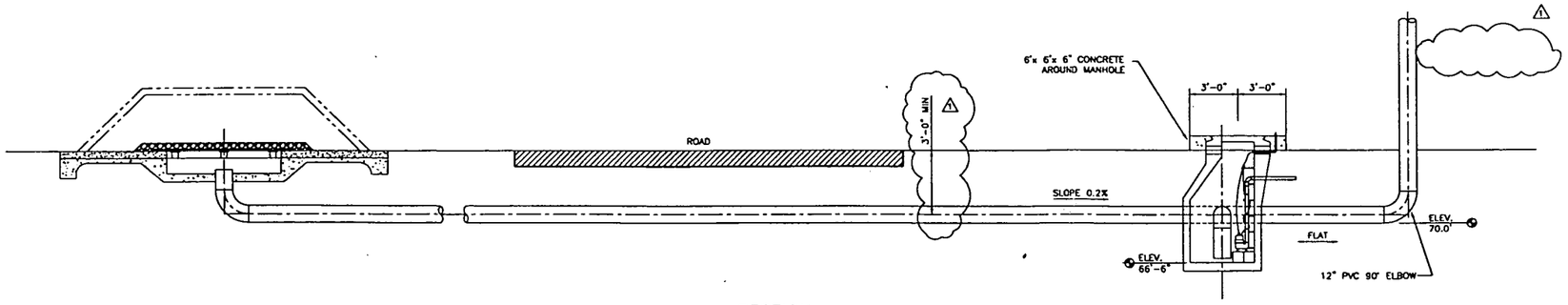
PLAN VIEW
SCALE: 1/4"=1'-0"



A BF01 BF01 SECTION
SCALE: 1/2"=1'-0"



ENLARGED VIEW
SCALE: 1/2"=1'-0"



SECTION
SCALE: 1/4"=1'-0"

REFERENCE DRAWINGS:
SUM-BF02 BIOFILTER PLAN AND SECTIONS

REV.	DESCRIPTION	DATE	BY	APP'D
1	REMOVED MANOMETER REVISED LOCATION OF BIOFILTER - ADDED 30° ELBOW, 68'-0" ADDITIONAL PVC PIPE	3/26/97	SWP	KDS

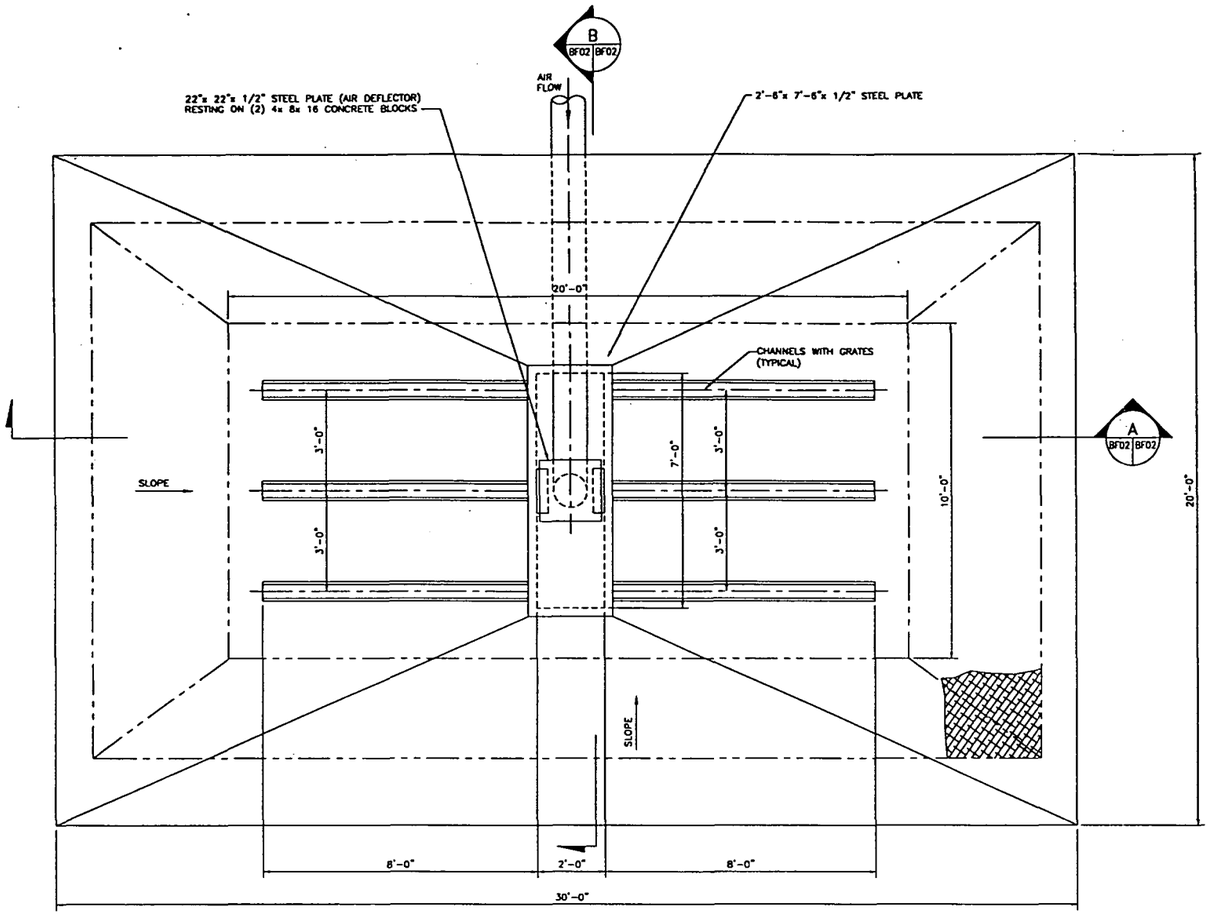
MUNICIPAL SOLID WASTE
CO-COMPOSTING FACILITY
FOR
SUMTER COUNTY, FL

BIOFILTER GENERAL ARRANGEMENT

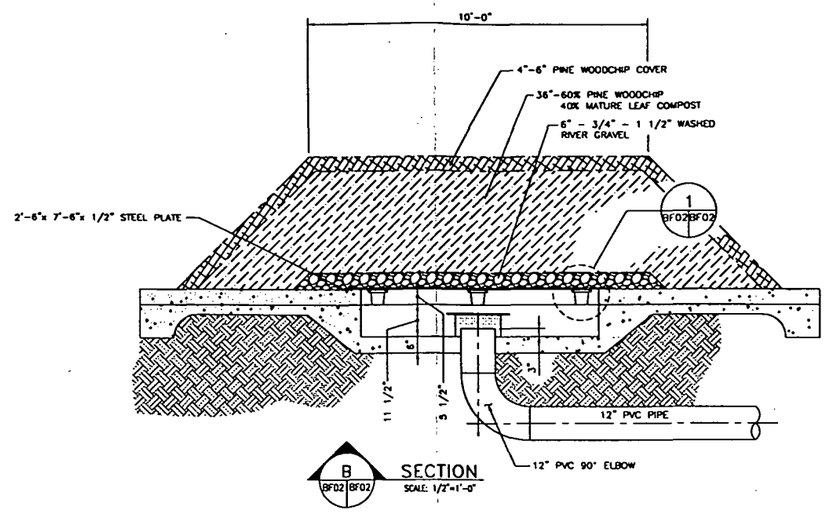
SCALE: AS SHOWN	DESIGN: L.F.	APVD: K.D.S.
DATE: 2/29/97	DRAWN: S.W.P.	

BEDMINSTER® Bioconversion Corporation

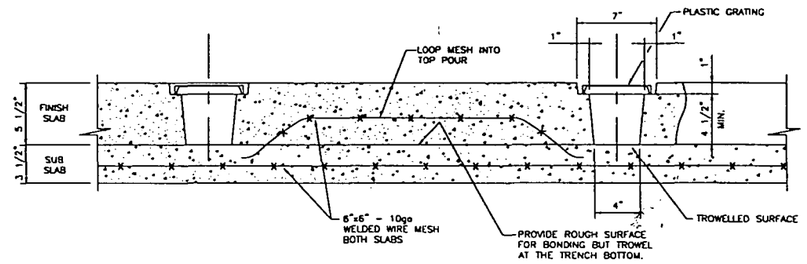
DRAWING NUMBER: SUM-BF01 REV. 1



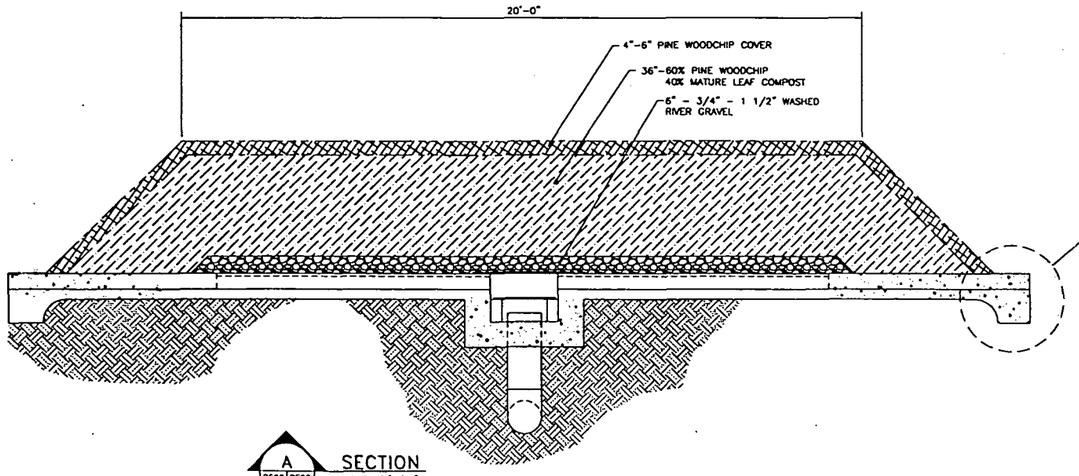
PLAN
SCALE: 1/2"=1'-0"
ROTATED 90° FROM
GENERAL ARRANGEMENT



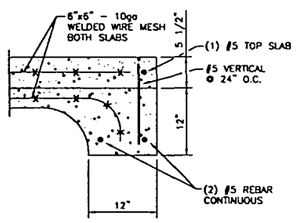
B
BF02 BF02 SECTION
SCALE: 1/2"=1'-0"



1
BF02 BF02 TRENCH DETAIL
SCALE: 4x



A
BF02 BF02 SECTION
SCALE: 1/2"=1'-0"



TURNDOWN DETAIL
SCALE: 1"=1'-0"

NOTES:

1. ALL CONCRETE 3,000 PSI
COMPACTED SUB-GRADE BY SUMTER COUNTY.
TRENCH GRATING BY BEDMINSTER BIOCONVERSION CORP.

REFERENCE DRAWING:

SUM-EL01 BIOFILTER GENERAL ARRANGEMENT

REV.	DESCRIPTION	DATE	BY	APP'D
1	ADDED NOTES, SEE ABOVE	3/26/97	SWP	KDS

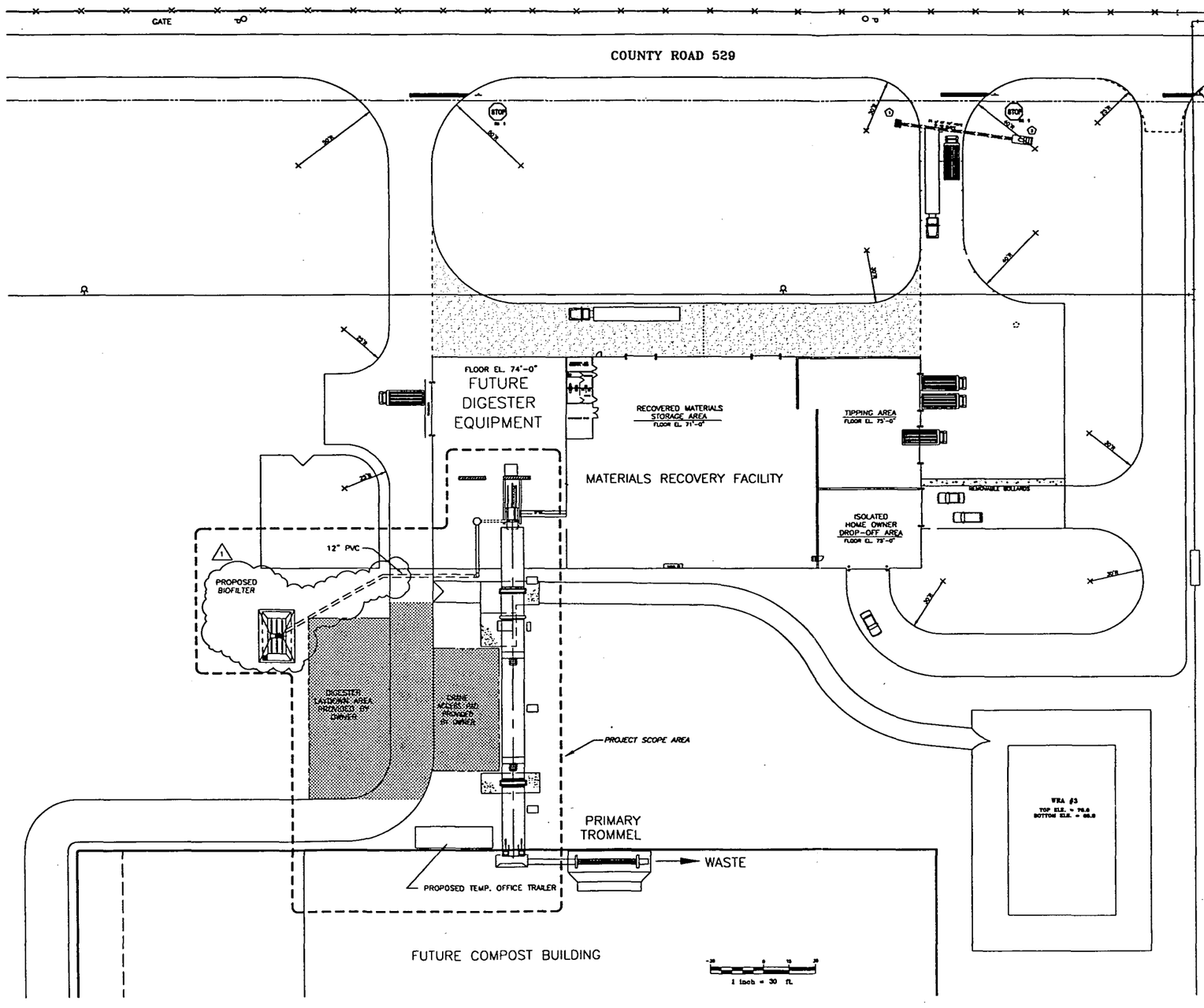
MUNICIPAL SOLID WASTE CO-COMPOSTING FACILITY FOR SUMTER COUNTY, FL

BIOFILTER PLAN AND SECTIONS

SCALE: AS SHOWN	DESIGN: L.F.	APV'D: K.D.S.
DATE: 2/26/97	DRAWN: S.W.P.	

BEDMINSTER® Bioconversion Corporation

DRAWING NUMBER: SUM-BF02 REV. 1



NOTE:
SHADED AREA TO BE PREPARED FOR CRANE ACCESS IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS.

REV.	DESCRIPTION	DATE	BY	APP'D
1	REVISED LOCATION OF BIOFILTER	3/26/97	SWP	KDS

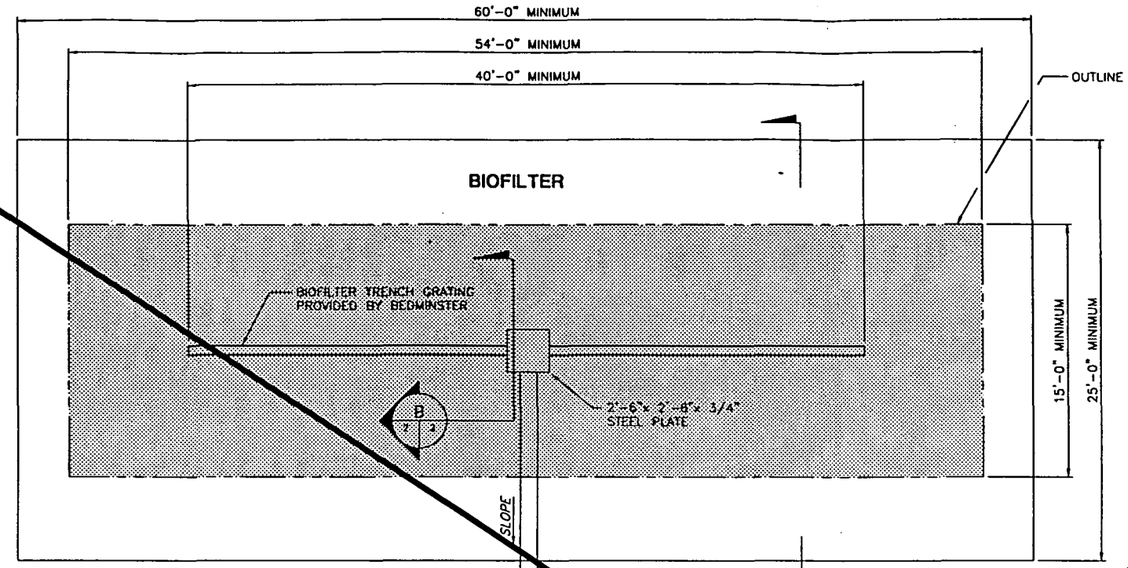
SUMTER COUMTY
BOARD OF COUNTY COMMISSIONERS
SOLID WASTE MANAGEMENT FACILITY
MATERIALS RECOVERY FACILITY

SITE PLAN

SCALE: AS SHOWN	DESIGN:	APVD: K.D.S.
DATE: 11/4/96	DRAWN: S.W.P.	

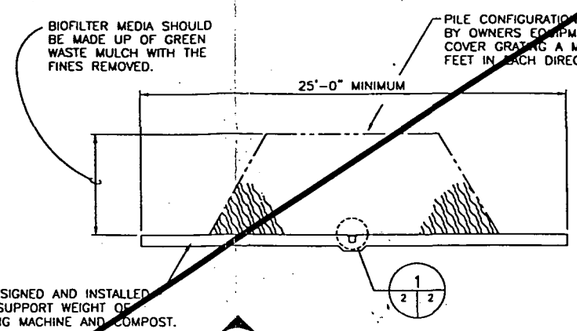
BEDMINSTER Bioconversion Corporation

DRAWING NUMBER:	REV.
SUM-SP01	1

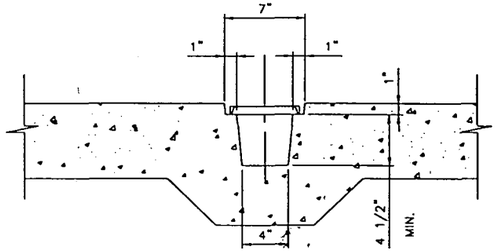


PAVED AREAS AT BOTH ENDS OF THE BIOFILTER PAD ARE NOT SHOWN BUT MAY BE ADDED AT THE OWNERS OPTION FOR PROPER OPERATION OF THE OWNERS EQUIPMENT.

NOT USED
REPLACED WITH
SUM-BF01 & BF02



A 2 2 CROSS SECTION OF BIOFILTER
SCALE: 1/4"=1-0"



1 2 2 TRENCH DETAIL
SCALE: 1 1/2"=1-0"

NOTE:
DESIGN OF THE BIOFILTER SLAB IS TO BE BY THE OWNER. BEDMINSTER RECOMMENDS AT A MINIMUM THAT THE AREA SUPPORTING THE GRATING BE CAST-IN-PLACE CONCRETE.

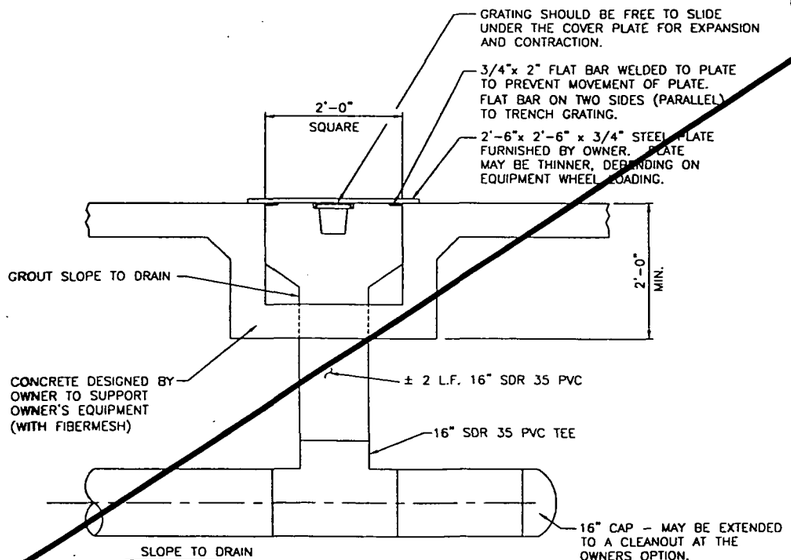
NOTE:

ALL WORK SHOWN ON THIS DRAWINGS IS TO BE PROVIDED BY SUMTER COUNTY WITH THE EXCEPTION OF THE GRATING, WHICH IS PROVIDED BY BEDMINSTER.

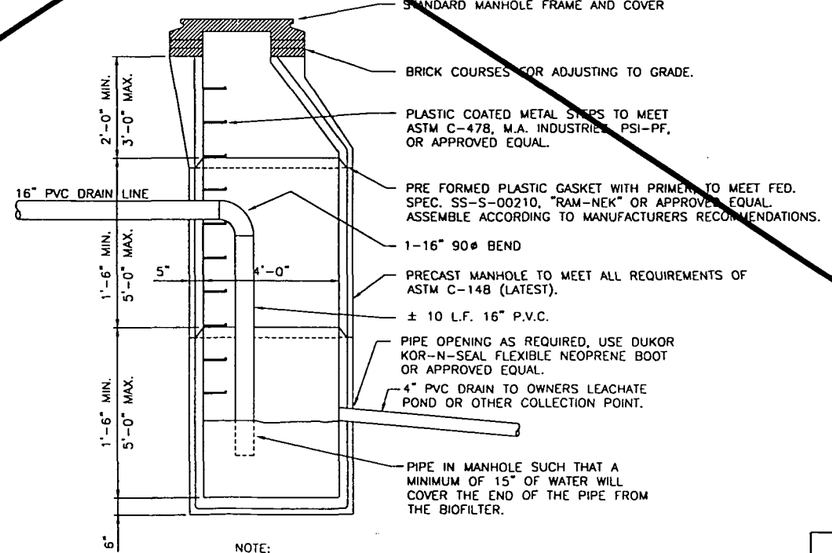
DISCHARGE POINT OF AIR LINE AT THE BIOFILTER SHOULD BE WITHIN 150 FEET OF THE FEED END OF THE DIGESTER.

EXACT LAYOUT OF AIR AND DRAIN LINE PIPING AND LOCATION OF THE BIOFILTER TO BE DESIGNED BY SUMTER COUNTY.

16" PIPE DIAMETER SHOWN IS A MINIMUM. IF THE OWNER WOULD LIKE TO USE LARGER PIPING FOR FUTURE EXPANSION PLEASE ADVISE.



B 2 2 SECTION-MANIFOLD CONNECTION POINT
SCALE: 1"=1-0"



NOTE:
ALL MANHOLES SHALL BE ECCENTRIC CONE TYPE. VERTICAL SIDE WITH STEPS TO BE POSITIONED OVER INVERT SHELF.

C 2 2 SECTION - PRECAST MANHOLE SUMP
SCALE: NONE

REV.	DESCRIPTION	DATE	BY	APP'D

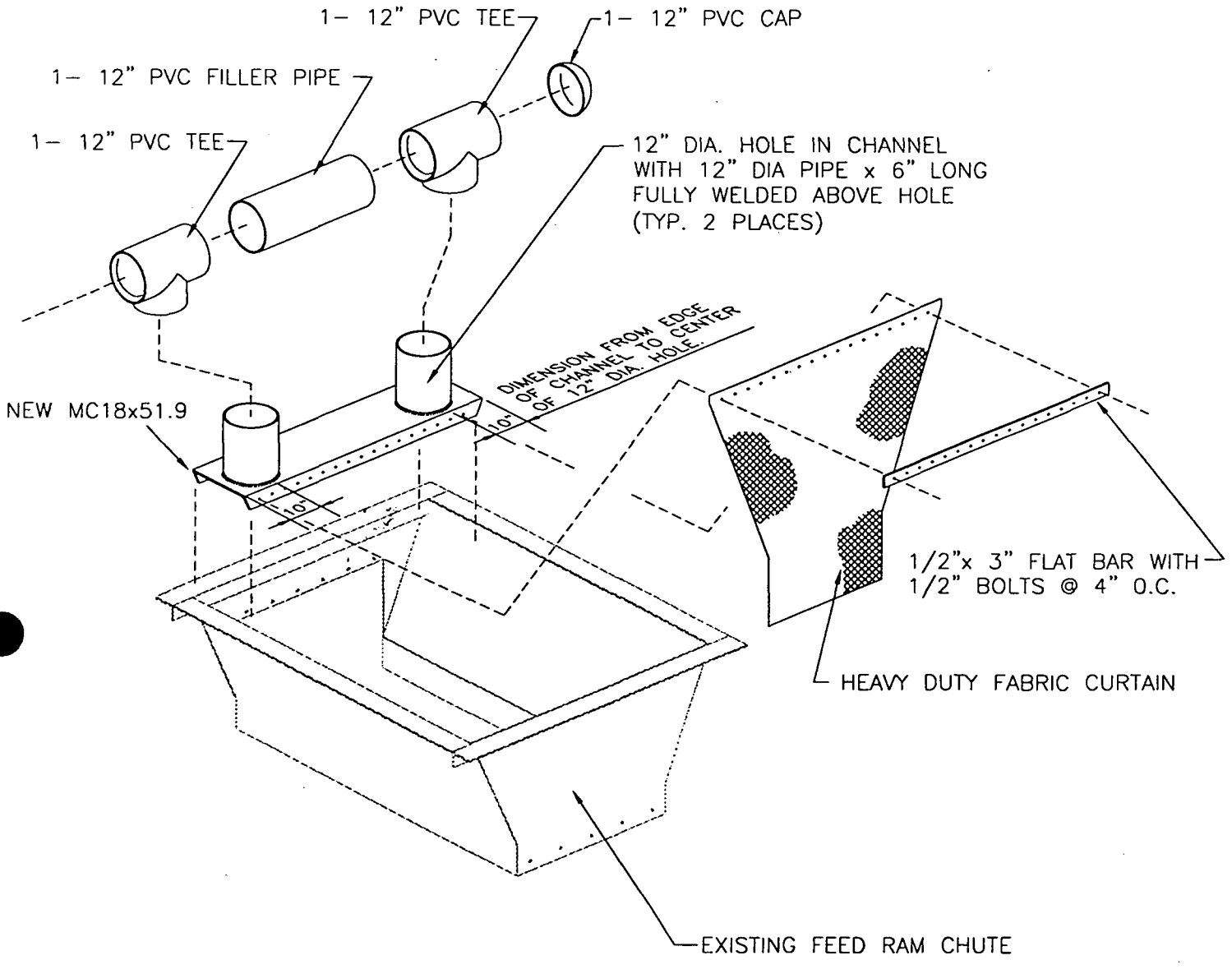
MUNICIPAL SOLID WASTE
CO-COMPOSTING FACILITY
FOR
SUMTER COUNTY, FL.

BIOFILTER PLAN AND DETAILS

SCALE: AS SHOWN	DESIGN: L.J.F.	APPVD: K.D.S.	
DATE: 10/14/98	DRAWN: S.W.P.		

BEDMINSTER® Bioconversion Corporation

DRAWING NUMBER: SUM-EL02 REV. A



REV.	DESCRIPTION	DATE	BY	APP'D

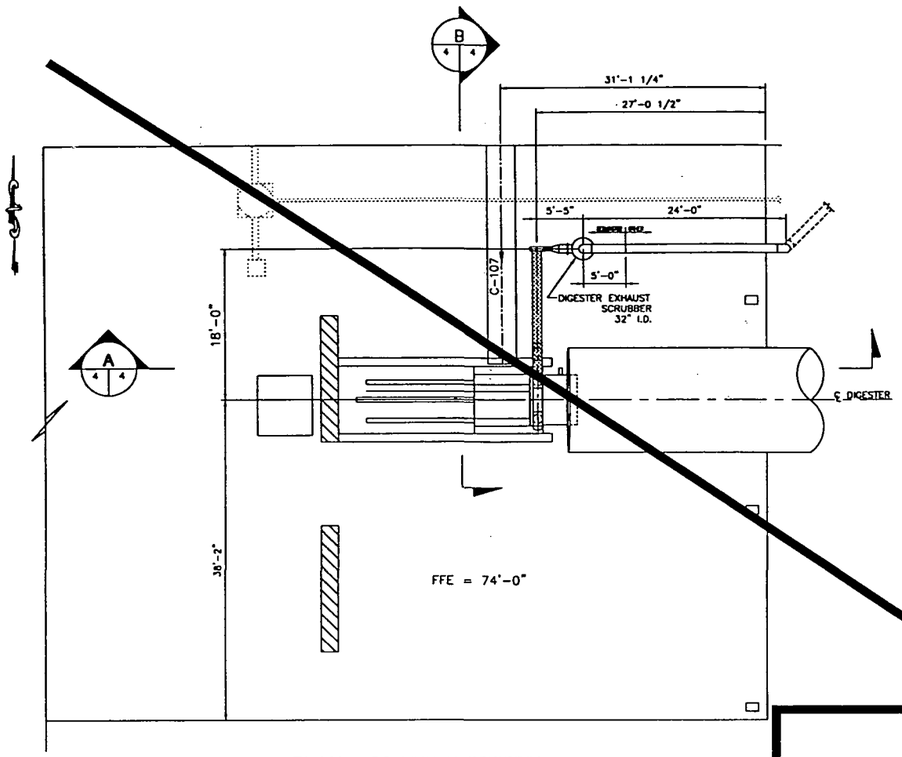
MUNICIPAL SOLID WASTE
CO-COMPOSTING FACILITY
FOR
SUMTER COUNTY, FL.

EXPLODED ASSEMBLY - SCRUBBER MANIFOLD

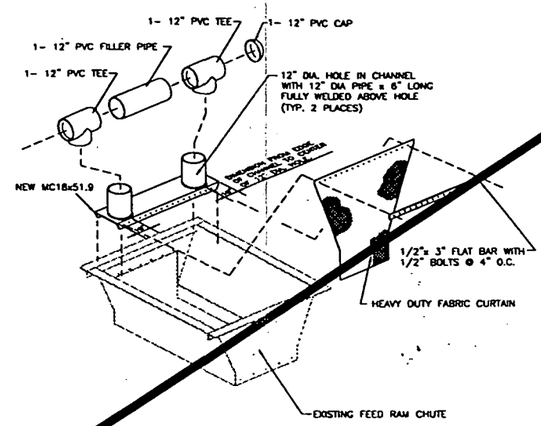
SCALE: NONE	DESIGN: K.D.S.	APVD: K.D.S.
DATE: 10/16/96	DRAWN: S.W.P.	

BEDMINSTER® Bioconversion Corporation

DRAWING NUMBER:	REV.
SUM-EL03	A

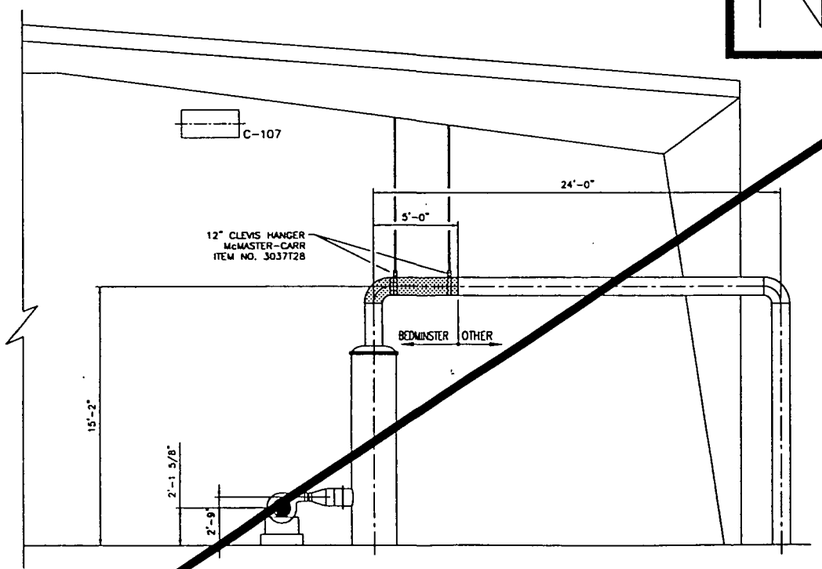


PLAN - 50 TPD DIGESTER
SCALE: 1/8" = 1'-0"

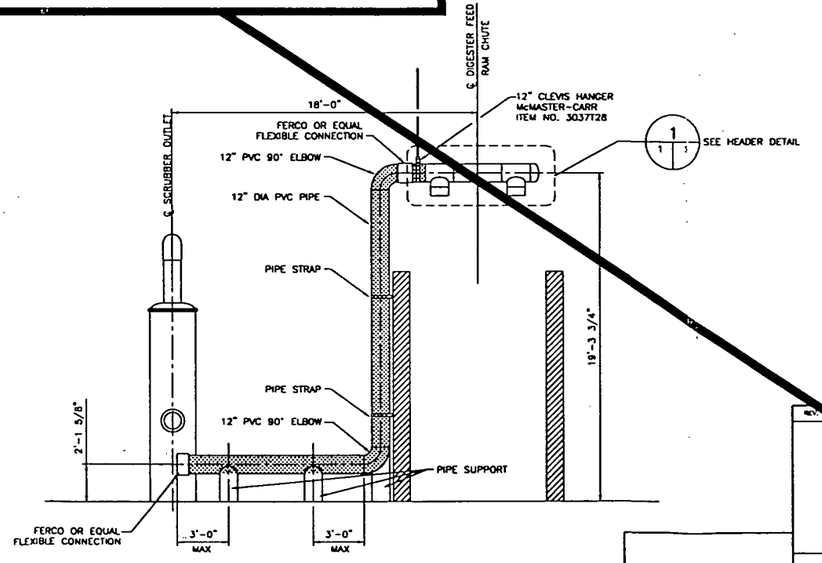


1 4 4 HEADER DETAIL
SCALE: NONE

NOT USED



A 4 4 PARTIAL SECTION
LOOKING NORTH
SCALE: 1/8" = 1'-0"



B 4 4 PARTIAL SECTION
SCALE: 1/4" = 1'-0"

REV.	DESCRIPTION	DATE	BY	APP'D

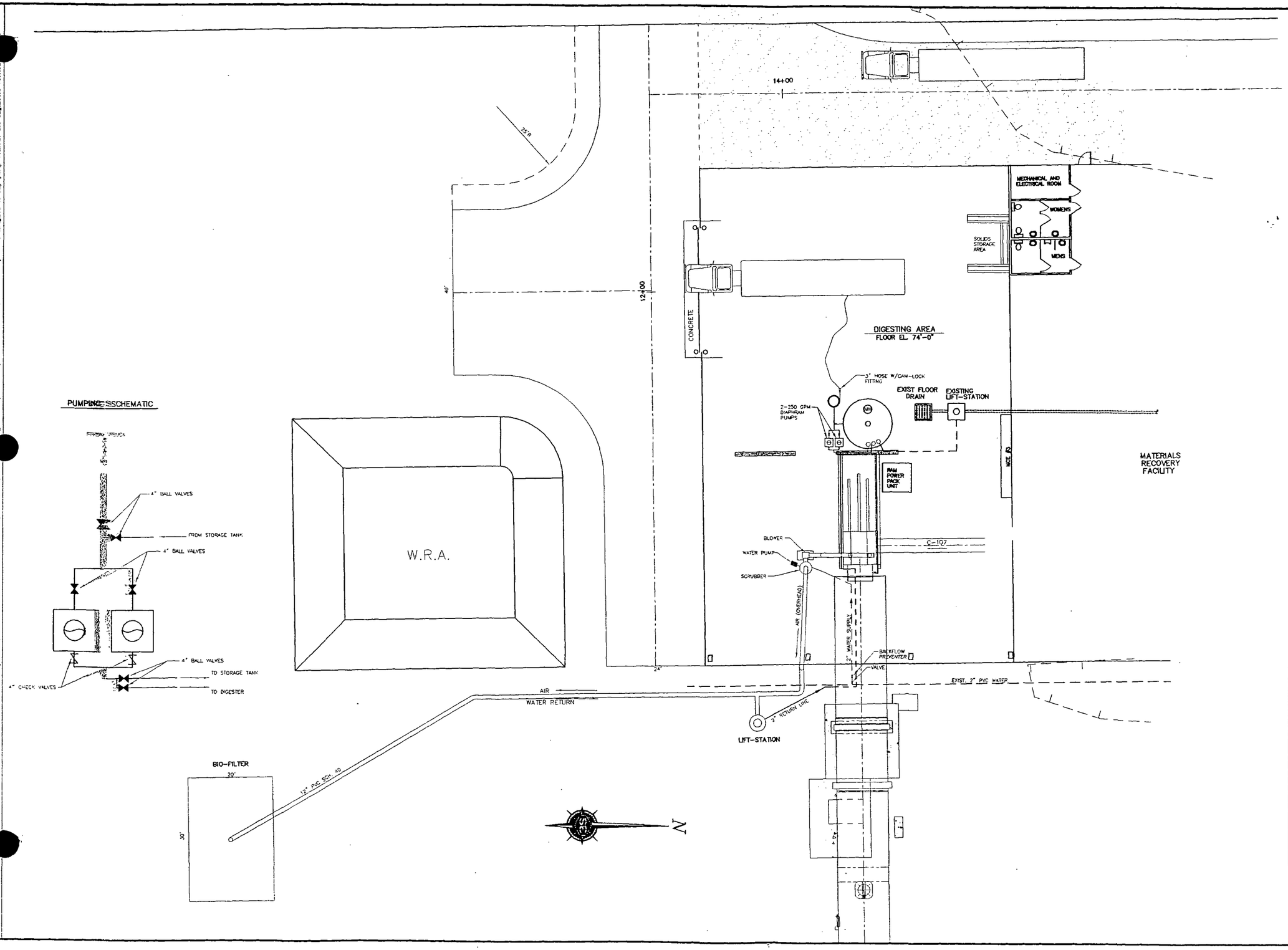
MUNICIPAL SOLID WASTE
CO-COMPOSTING FACILITY
FOR
SUMTER COUNTY, FL

DIGESTER EXHAUST SCRUBBER PIPING

SCALE: AS SHOWN	DESIGN:	APP'D: K.D.S.
DATE: 10/16/96	DRAWN: S.W.P.	

BEDMINSTER® Bioconversion Corporation

DRAWING NUMBER: SUM-EL04
REV. A



CLIENT: SUMTER COUNTY BOARD OF COUNTY COMMISSIONS

PROJECT: SUMTER RECYCLING, PROCESSING AND COMPOSTING FACILITY

DRAWING: PIPING PLAN

1 of 1

REV. BY:	DESCRIPTION	DATE:	DRAWN

Springstead Engineering, Inc.

Consulting Engineers
Architects
Planners
Surveyors

727 South 14th Street
Leesburg, Fl. 34748
(352) 787-1414

SCALE:	FILE:	DATE:
1" = 10'	SITE10	3/25/97
DESIGN: CLD	DRAWN: USE	CHECKED: CLD

DRAWING: PIPING PLAN

CLIENT: SCBCC

JOB NO.:	SHEET: 1
92-1100.004	OF: 1

Springstead Engineering, inc.
Consulting Engineers — Planners — Surveyors

727 South 14th Street
Leesburg, Florida 34748

Lake (904) 787-1414
Sumter (904) 793-3639
Fax (904) 787-7221

TAL

RECEIVED
MAY 07 1997
D E P

May 6, 1997

Ms. Susan J. Pelz, P.E.
Department of Environmental Protection
3804 Coconut Palm Drive
Tampa, Florida 33619

RE: Response to Comments; Pending Permit No. SC60-298996
Sumter County Composting Processing and Recycling Facility
SEI File No 92-1100.004

Dear Ms. Pelz:

Please find below the responses to the items discussed with you on the telephone on April 29 and May 1, 1997.

1. You requested the tables referenced in Bedminster's report on Odor Management as presented to you in Appendix A of the April 14, 1997 submittal for the subject project.

1. Tables 1,2,3 and 4 are attached.

2. You requested the testing data from ERM-Southeast for the scrubber water quality as referenced in the scrubber operation comments in Appendix B of the April 14, 1997 submittal for the subject project.

2. The report of testing data is attached.

3. You questioned where the air is exhausted from the collection header the if the scrubber is not in use.

3. There is no outlet for exhausting the air designed in the system. A "T" and valve will be placed in the line leading to the biofilter to allow this air to be exhausted.

4. You asked what happens to the discharge water from the scrubber.

4. The discharge water will be piped to the collection manhole for the biofilter and be pumped back into the holding tank. The attached drawing depicts the proposed piping.

5. You asked for clarification that the 12" pipe carries both the air from the scrubber to the biofilter and the drainage water from the biofilter to the manhole to be pumped into the holding basin.

5. Your understanding of the piping is correct.

6. You commented that the air section at FDEP will be sending the County a letter requesting an air permit for the facility. You also indicated that this permitting process

should not affect our schedule for the start-up/shakedown, equipment acceptance testing process.

6. **Neither the County or SEI has received the letter from the air permits section.**

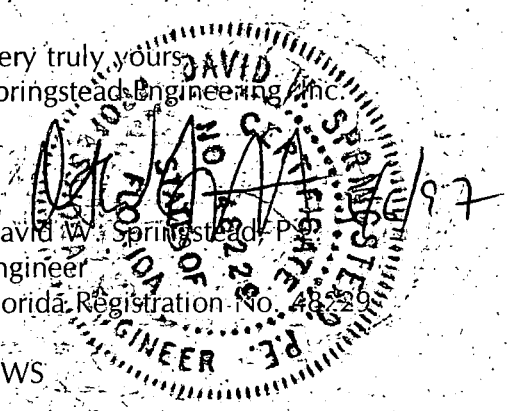
7. You requested information as to what happens if the digester shuts down when no one is at the plant. You questioned what are the potential for fire and what problems would the material in the drum create if it were not turning.

7. **I called Keith Sanders to discuss this item with him. He stated that normally the facilities do not have employees on duty 24 hours a day. The Sevierville facility does have someone working there 24 hours a day at this time, but that it is due to the abundance of work with the operation, not to watch the digesters. Keith said that the facility in Cobb County, Georgia was not designed to have 24 hour employees but that the system notifies a central controller if power is lost at a digester or at the facility. Keith said that there is no more potential for fire or explosion if there is a loss of power than when the digester is operating. If the power is out, the blower will stop but air will move out of the digester through the ram feed unit as the seals are not air-tight. The variable frequency drive unit has the capability to determine when power is lost, so the time required to process can be completed when the unit comes back on line.**

In addition, we have changed the configuration of the sludge holding/mixing/pumping basin to utilize secondary sludge. This will give us better control of the moisture content in the first chamber of the digester. A schematic is attached showing the configuration. We anticipate that the construction and procurement of the materials can be achieved in 1 week. We are proceeding at this time.

We hope that the provided information meets your needs at the present time. Please contact me if you have any questions or need additional information.

Very truly yours,
Springstead Engineering, Inc.



5/6/97

David W. Springstead, P.E.
Engineer
Florida Registration No. 48229

DWS

Attachments 1. Tables
2. Test Data

cc: Garry Breeden
Terry Hurst
Mitch Kessler/Allison Searcy

Table 1
Removal Capacities of Various Compounds Through Biofilters

Compound	Maximum Removal Rate	Reference
Methylformate	35.0 g/kg dry media/day	Van Lith et al., 1990
Hydrogen Sulfide	5.0 g S/kg dry peat/day	Cho et al., 1991
Butylacetate	2.41 g/kg dry peat/day	Ottengraf, 1986
Butanol	2.41 g/kg dry peat/day	Ottengraf, 1986
N-butanol	2.40 g/kg dry compost/day	Helmar, 1984
Ethylacetate	2.03 g/kg dry peat/day	Ottengraf, 1986
Toluene	1.58 g/kg dry peat/day	Ottengraf, 1986
Methanol	1.35 g/kg dry media/day	Van Lith et al., 1990
Methanethiol (Methyl Mercaptans)	0.90 g S/kg dry peat/day	Cho et al., 1991
Dimethyl Disulfide	0.68 g S/kg dry peat/day	Cho et al., 1991
Dimethylsulfide	0.38 g S/kg dry peat/day	Cho et al., 1991
Ammonia	0.16 g N/kg day peat/day	Shoda, 1991

Source: Williams, Todd O., and Miller, Frederick C. "Odor Control Using Biofilters, PartI," BioCycle, Vol. 33. No. 10 p.72-77, October 1992.

TABLE 2
TYPICAL VOC ANALYSIS
HAMILTON, OHIO SLUDGE COMPOSTING FACILITY 1992

Compound	Biofilter Inlet (ppb)	Biofilter Outlet (ppb)
Acetone	2450	9.7
Carbon disulfide	17	5.1
2-Butanone	545	ND
Toluene	9.3	1.9
2-Hexanol	5.5	ND
Styrene	4.6	ND
m & p Xylenes	1.8	TRACE
1,4-Dichlorobenzene	1.4	TRACE
Methylene chloride	ND	TRACE

Source: Wheeler, M.L. Proactive Odor Management, The Evolution of Odor Control Strategies at the Hamilton, Ohio Wastewater Treatment and Sludge Composting Facility. Biofilter Details and Data presented at the BioCycle National Conference, St. Louis, MO. May 1992.

TABLE 3
TYPICAL SULFUR COMPOUND ANALYSIS
HAMILTON, OHIO SLUDGE COMPOSTING FACILITY 1992

Compound	Biofilter Inlet (ppb)	Biofilter Outlet (ppb)
Carbonyl sulfide ---	47	3.4
Methyl mercaptan	550	ND
Carbon disulfide	26	5.5
Dimethyl sulfide	294	ND
Dimethyl disulfide	266	ND
Hydrogen sulfide	60	ND

Source: Wheeler, M.L. Proactive Odor Management, The Evolution of Odor Control Strategies at the Hamilton, Ohio Wastewater Treatment and Sludge Composting Facility. Biofilter Details and Data presented at the BioCycle National Conference, St. Louis, MO. May 1992.

TABLE 4
DARTMOUTH BIOFILTER
SUMMARY OF REMOVAL RATES FOR ODOR AND ODOROUS COMPOUNDS

			TRS (2)				
Sample date	Flow SCFM/FT 2	Odor(1) (ED-50)	Total	DMS(3)	DMDS(4)	MM (5)	Ammonia
May 12, 1993	0.87	96.9	>98	>89.3	>99.3	>98	98.3
	5.44	84.5	>89	47.4	87.5	>99	98.5
	5.9	75.6	>80.7	58.3	73.3	>97.1	97.7
September 17, 1993	2.2	>97.1	98.4	>98.2	>99.3	98	>99.9
	5.4	77.3	96.3	82	>99.3	76.7	>99.8
	10.9	47.3	62.9	32.2	94	0	>99.9

1. The detection threshold is synonymous with the effective dosage (ED) of odorant necessary for a certain percentage of the population to detect a difference between the odor stimuli and the odor-free air. Most commonly this percentage is 50, hence the term ED 50.

2. Sulfur compounds

3. Dimethyl sulfide

4. Dimethyl disulfide

5. Methyl Mercaptans

Source: Amirhon, Parviz, and Kuter, Geoffrey A., Performance Evaluation of Biofilter at Dartmouth, MA, Biosolids Composting Facility. Presented at the New England Water Environment Association Annual Meeting, Boston, MA., February 1994.

ERM-Southeast, Inc.

215 Centerview Drive
Suite 110
Brentwood, TN 37027
(615) 373-3350
(615) 373-2392 (Fax)

November 20, 1995

Mr. Robert Spencer
Bedminster Bioconversion Corporation
145 Church Street
Suite 201
Marietta, GA 30060

ERM.

Dear Bob:

Attached are the results of the VOC analysis of water from the scrubber at the Sevierville facility. As a manipulation one liter of this water was transferred into a 2-liter beaker and gently mixed with a magnetic stirrer that was operated at approximately two revolutions per second. The mixing was performed at room temperature (approximately 25°C). The surface area of the water in the beaker was approximately 20 in^2. Samples were collected initially at the time the sample was collected (0-hour), after 24 hours of gentle mixing (24-hour) and after 54 hours of gentle mixing (54-hour). The analytical results should be considered tentative. I will forward final results to you when they are available.

Sincerely,

Leslie F. Vantrease
Chemist

Enclosure
LFV/gsq

Offices of
ERM-Southeast, Inc. in

Brentwood, TN (Nashville)
Kennesaw, GA (Atlanta)
Charlotte, NC
Mobile, AL
Memphis, TN
Charleston, SC
Oak Ridge, TN

REPORT OF ANALYSIS

November 17, 1995
Sample # : 60375-95-1

Mr. Les Vantreuse
ERM-Southeast, Inc.
215 Centerview Dr Suite 110
Brentwood TN 37027

Date Received: November 9, 1995
Description : Water Sample - Bedminster
Sevierville, TN
Project : #4568
Sample Location: Scrubber Water - 0 Hour
Collection Date/Time : 11/03/95 0900

Parameter		Result	Units	Method	Date Analyzed	QC Qual
Volatile Organics						
Library Search Report (TIC)			mg/l	8240	11/13/95	
Acetone		38	mg/l	8240	11/13/95	P
Benzene	<	0.20	mg/l	8240	11/13/95	P
Bromodichloromethane	<	0.20	mg/l	8240	11/13/95	P
Bromoform	<	0.20	mg/l	8240	11/13/95	P
Bromomethane	<	0.20	mg/l	8240	11/13/95	P
Carbon disulfide	<	0.20	mg/l	8240	11/13/95	P
Carbon tetrachloride	<	0.20	mg/l	8240	11/13/95	P
hlorobenzene	<	0.20	mg/l	8240	11/13/95	P
hlorodibromomethane	<	0.20	mg/l	8240	11/13/95	P
Chloroethane	<	0.20	mg/l	8240	11/13/95	P
Chloroform	<	0.20	mg/l	8240	11/13/95	P
Chloromethane	<	0.20	mg/l	8240	11/13/95	P
1,1-Dichloroethane	<	0.20	mg/l	8240	11/13/95	P
1,2-Dichloroethane	<	0.20	mg/l	8240	11/13/95	P
1,1-Dichloroethylene	<	0.20	mg/l	8240	11/13/95	P
trans-1,2-Dichloroethylene	<	0.20	mg/l	8240	11/13/95	P
1,2-Dichloropropane	<	0.20	mg/l	8240	11/13/95	P
cis-1,3-Dichloropropene	<	0.20	mg/l	8240	11/13/95	P
trans-1,3-Dichloropropene	<	0.20	mg/l	8240	11/13/95	P
Ethylbenzene	<	0.20	mg/l	8240	11/13/95	P
2-Hexanone	<	2.5	mg/l	8240	11/13/95	P
2-Butanone (MEK)		15	mg/l	8240	11/13/95	P
Methylene chloride	<	0.20	mg/l	8240	11/13/95	P
4-Methyl-2-pentanone (MIBK)	<	2.5	mg/l	8240	11/13/95	P
Styrene	<	0.20	mg/l	8240	11/13/95	P
1,1,2,2-Tetrachloroethane	<	0.20	mg/l	8240	11/13/95	P
Tetrachloroethylene	<	0.20	mg/l	8240	11/13/95	P
Toluene		0.28	mg/l	8240	11/13/95	P

Sample # : 60375-95-2
Sample Location: Scrubber Water - 0 Hour
Page # : 2

ERM-Southeast, Inc.

Parameter		Result	Units	Method	Date Analyzed	QC Qual
1,1,1-Trichloroethane	<	0.20	mg/l	8240	11/13/95	F
1,1,2-Trichloroethane	<	0.20	mg/l	8240	11/13/95	F
Trichloroethylene	<	0.20	mg/l	8240	11/13/95	F
Vinyl chloride	<	0.10	mg/l	8240	11/13/95	F
Xylenes, Total	<	0.60	mg/l	8240	11/13/95	F

Dewey Klahn
Laboratory Manager

Please review all information in this report for accuracy and completeness.
Contact our office within 10 days if there are any questions.

REPORT OF ANALYSIS

Mr. Les Vantreuse
ERM-Southeast, Inc.
215 Centerview Dr Suite 110
Brentwood TN 37027

November 17, 1995
Sample # : 60376-95-1

Date Received: November 9, 1995
Description : Water Sample - Bedminster
Sevierville, TN
Project : #4568
Sample Location: Scrubber Water - 24 Hour
Collection Date/Time : 11/04/95 0900

Parameter		Result	Units	Method	Date Analyzed	QC Qual
Volatile Organics						
Library Search Report (TIC)			mg/l	8240	11/13/95	
Acetone	<	2.5	mg/l	8240	11/13/95	F
Benzene	<	0.20	mg/l	8240	11/13/95	F
Bromodichloromethane	<	0.20	mg/l	8240	11/13/95	F
Bromoform	<	0.20	mg/l	8240	11/13/95	F
Bromomethane	<	0.20	mg/l	8240	11/13/95	F
Carbon disulfide	<	0.20	mg/l	8240	11/13/95	F
Carbon tetrachloride	<	0.20	mg/l	8240	11/13/95	F
Chlorobenzene	<	0.20	mg/l	8240	11/13/95	F
Chlorodibromomethane	<	0.20	mg/l	8240	11/13/95	F
Chloroethane	<	0.20	mg/l	8240	11/13/95	F
Chloroform	<	0.20	mg/l	8240	11/13/95	F
Chloromethane	<	0.20	mg/l	8240	11/13/95	F
1,1-Dichloroethane	<	0.20	mg/l	8240	11/13/95	F
1,2-Dichloroethane	<	0.20	mg/l	8240	11/13/95	F
1,1-Dichloroethylene	<	0.20	mg/l	8240	11/13/95	F
trans-1,2-Dichloroethylene	<	0.20	mg/l	8240	11/13/95	F
1,2-Dichloropropane	<	0.20	mg/l	8240	11/13/95	F
cis-1,3-Dichloropropene	<	0.20	mg/l	8240	11/13/95	F
trans-1,3-Dichloropropene	<	0.20	mg/l	8240	11/13/95	F
Ethylbenzene	<	0.20	mg/l	8240	11/13/95	F
2-Hexanone	<	2.5	mg/l	8240	11/13/95	F
2-Butanone (MEK)	<	2.5	mg/l	8240	11/13/95	F
Methylene chloride	<	0.20	mg/l	8240	11/13/95	F
4-Methyl-2-pentanone (MIBK)	<	2.5	mg/l	8240	11/13/95	F
Styrene	<	0.20	mg/l	8240	11/13/95	F
1,1,2,2-Tetrachloroethane	<	0.20	mg/l	8240	11/13/95	F
Tetrachloroethylene	<	0.20	mg/l	8240	11/13/95	F
Toluene	<	0.20	mg/l	8240	11/13/95	F

ample # : 60376-95-1
ample Location: Scrubber Water - 24 Hour
age # : 2

EKM-Southeast, Inc.

ameter		Result	Units	Method	Date Analyzed	QC Qual
,1,1-Trichloroethane	<	0.20	mg/l	8240	11/13/95	F
,1,2-Trichloroethane	<	0.20	mg/l	8240	11/13/95	F
richloroethylene	<	0.20	mg/l	8240	11/13/95	F
inyl chloride	<	0.10	mg/l	8240	11/13/95	F
ylenes, Total	<	0.60	mg/l	8240	11/13/95	F

Dewey Klahn
Laboratory Manager

Please review all information in this report for accuracy and completeness.
Contact our office within 10 days if there are any questions.

REPORT OF ANALYSIS

Mr. Les Vantreuse
ERM-Southeast, Inc.
215 Centerview Dr Suite 110
Brentwood TN 37027

November 17, 1995
Sample # : 60377-95-1

Date Received: November 9, 1995
Description : Water Sample - Bedminster
Sevierville, TN
Project : #4568
Sample Location: Scrubber Water - 54 Hour
Collection Date/Time : 11/05/95 1500

Parameter		Result	Units	Method	Date Analyzed	QC Qual
Volatile Organics						
Library Search Report (TIC)			mg/l	8240	11/13/95	
Acetone		2.6	mg/l	8240	11/13/95	P
Benzene	<	0.20	mg/l	8240	11/13/95	P
Bromodichloromethane	<	0.20	mg/l	8240	11/13/95	P
Bromoform	<	0.20	mg/l	8240	11/13/95	P
Bromomethane	<	0.20	mg/l	8240	11/13/95	P
Carbon disulfide	<	0.20	mg/l	8240	11/13/95	P
Carbon tetrachloride	<	0.20	mg/l	8240	11/13/95	P
Chlorobenzene	<	0.20	mg/l	8240	11/13/95	P
Chlorodibromomethane	<	0.20	mg/l	8240	11/13/95	P
Chloroethane	<	0.20	mg/l	8240	11/13/95	P
Chloroform	<	0.20	mg/l	8240	11/13/95	P
Chloromethane	<	0.20	mg/l	8240	11/13/95	P
1,1-Dichloroethane	<	0.20	mg/l	8240	11/13/95	P
1,2-Dichloroethane	<	0.20	mg/l	8240	11/13/95	P
1,1-Dichloroethylene	<	0.20	mg/l	8240	11/13/95	P
trans-1,2-Dichloroethylene	<	0.20	mg/l	8240	11/13/95	P
1,2-Dichloropropane	<	0.20	mg/l	8240	11/13/95	P
cis-1,3-Dichloropropene	<	0.20	mg/l	8240	11/13/95	P
trans-1,3-Dichloropropene	<	0.20	mg/l	8240	11/13/95	P
Ethylbenzene	<	2.5	mg/l	8240	11/13/95	P
2-Hexanone	<	2.5	mg/l	8240	11/13/95	P
2-Butanone (MEK)	<	0.20	mg/l	8240	11/13/95	P
Methylene chloride	<	2.5	mg/l	8240	11/13/95	P
4-Methyl-2-pentanone (MIBK)	<	0.20	mg/l	8240	11/13/95	P
Styrene	<	0.20	mg/l	8240	11/13/95	P
1,1,2,2-Tetrachloroethane	<	0.20	mg/l	8240	11/13/95	P
Tetrachloroethylene	<	0.20	mg/l	8240	11/13/95	P
Toluene	<	0.20	mg/l	8240	11/13/95	P

Sample # : 60377-95-1
Sample Location: Scrubber Water - 54 Hour
Page # : 2

ERM-Southeast, Inc.

Parameter		Result	Units	Method	Date Analyzed	QC Qual
1,1,1-Trichloroethane	<	0.20	mg/l	8240	11/13/95	F
1,1,2-Trichloroethane	<	0.20	mg/l	8240	11/13/95	F
Trichloroethylene	<	0.20	mg/l	8240	11/13/95	F
Vinyl chloride	<	0.10	mg/l	8240	11/13/95	F
Xylenes, Total	<	0.60	mg/l	8240	11/13/95	F

Dewey Klahn
Laboratory Manager

Please review all information in this report for accuracy and completeness.
Contact our office within 10 days if there are any questions.

REPORT OF ANALYSIS

Mr. Les Vantreuse
ERM-Southeast, Inc.
215 Centerview Dr Suite 110
Brentwood TN 37027

November 17, 1995
Sample # : 60378-95-1

Date Received: November 9, 1995
Description : Water Sample - Bedminster
Sevierville, TN
Sample Location: Scrubber Water
Collection Date : 10/31/95

Project : #4568

Parameter	Result	Units	Method	Date Analyzed	QC Qual
pH	3.8	S.U.	150.1	11/10/95	
Acidity	460	mg/l	305.1	11/16/95	

Dewey Klahn
Laboratory Manager

Please review all information in this report for accuracy and completeness. Contact our office within 10 days if there are any questions.

Our Quality Control Is Your Quality Assurance

RECEIVED 7/3

Client #: FTL-96-060101
Address: Bedminster Bioconversion Corp.

145 Church St. Ste. 201
Marietta, GA 30060
Attn: Brian Bailey

Page: Page 1 of 1
Date: 06/27/96
Log #: L7409-1

Sample Description:

Pond Water

COBB OXIDATION POND

Label: PW3
Date Sampled: 06/19/96
Time Sampled: 15:06
Date Received: 06/20/96
Collected By: Client

Parameter	Results	Units	Method	Reportable Detect Limit	Extr. Date	Analysis Date	Analyst
Metals							
Cadmium	BDL	mg/l	3010/6010	0.10	06/24/96	06/24/96	VF
Copper	0.17	mg/l	3010/6010	0.10	06/24/96	06/24/96	VF
Lead	BDL	mg/l	3010/6010	0.10	06/24/96	06/24/96	VF
Zinc	0.41	mg/l	3010/6010	0.10	06/24/96	06/24/96	VF
Inorganics/Other							
BOD	310	mg/l	405.1	100	06/20/96	06/25/96	LH
General Chemistry							
Total Suspended Solids	120	mg/l	160.2	4.0	06/24/96	06/24/96	ING

BDL = Below Detection Limits
* Compounds are Screened Only, with an estimated detection limit.
All analyses were performed using EPA, ASTM, USGS, or Standard Methods

QAP# 900376G
SUB HRS# 86122,86109,E86048
SC CERT# 96031
TN CERT# 02985
ELPAT# 13801
VA CERT# 00395
MA CERT# M-FL449
ND CERT# R-148

HRS# E86240,86356
ADEM ID# 40850
NC CERT# 444
CT CERT# PH-0122
CA CERT# I-1068
AZ CERT# AZ0529
USACE CERT

Respectfully submitted,

Marino Hernandez JB
Laboratory Director

L7409-1

TOTAL VOC's OFF DIGESTER
300 ppm (NON METHANE)
PORTABLE ORGANIC VAPOR ANALYZER

Our Quality Control Is Your Quality Assurance

RECEIVED 6/7

Client #: FTL-96-060101
Address: Bedminster Bioconversion Corp.

145 Church St. Ste. 201
Marietta, GA 30060
Attn: Brian Bailey

Page: Page 1 of 3
Date: 06/11/96
Log #: L6593-1

Sample Description:

Oxidation Pond

COBB OXIDATION POND AIR PULLED OFF AERATION FLOOR

Label: PWI
Date Sampled: 05/31/96
Time Sampled: 14:22
Date Received: 06/01/96
Collected By: Client

Parameter	Results	Units	Method	Reportable Detect Limit	Extr. Date	Analysis Date	Analyst
Inorganics/Other							
BOD	70	mg/l	405.1	70	06/03/96	06/08/96	LJH
Purgeable Hydrocarbons							
Bromodichloromethane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Bromoform	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Bromomethane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Carbon Tetrachloride	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Chloroethane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
2-Chloroethylvinyl Ether	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Chloroform	1.8	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Chloromethane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Dibromochloromethane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
1,2-Dichlorobenzene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
1,3-Dichlorobenzene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
1,4-Dichlorobenzene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Dichlorodifluoromethane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Chlorobenzene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Vinyl Chloride	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
1,1-Dichloroethane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
1,2-Dichloroethane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
1,1-Dichloroethene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Cis-1,2-Dichloroethene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Trans-1,2-Dichloroethene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
1,2-Dichloropropane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Cis-1,3-Dichloropropene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ

Client #: FTL-96-060101
Address: Bedminster Bioconversion Corp.

145 Church St. Ste. 201
Marietta, GA 30060
Attn: Brian Bailey

Page: Page 2 of 3
Date: 06/11/96
Log #: L6593-1

Sample Description:

Oxidation Pond

Label: PWI
Date Sampled: 05/31/96
Time Sampled: 14:22
Date Received: 06/01/96
Collected By: Client

Parameter	Results	Units	Method	Reportable Detect Limit	Extr. Date	Analysis Date	Analyst
Purgeable Hydrocarbons (continued)							
Trans-1,3-Dichloropropene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Methylene Chloride	BDL	ug/l	5030/8260	4.0	06/03/96	06/03/96	TJ
1,1,2,2-Tetrachloroethane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Tetrachloroethene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
1,1,1-Trichloroethane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
1,1,2-Trichloroethane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Trichloroethene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Trichlorofluoromethane	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Benzene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Toluene	1.3	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
MTBE	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Ethylbenzene	BDL	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Total Xylenes	1.0	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Total BTEX	2.3	ug/l	5030/8260	1.0	06/03/96	06/03/96	TJ
Dilution Factor	1.0		5030/8260		06/03/96	06/03/96	TJ
Surrogate Recoveries:							
4-Bromofluorobenzene	93.0	%	5030/8260	76-130	06/03/96	06/03/96	TJ
Dibromofluoromethane	97.0	%	5030/8260	58-146	06/03/96	06/03/96	TJ
Toluene-D8	107	%	5030/8260	76-119	06/03/96	06/03/96	TJ
1,4-Difluorobenzene	n/a	%	5030/8260	49-136	06/03/96	06/03/96	TJ
Bromochloromethane	n/a	%	5030/8260	64-137	06/03/96	06/03/96	TJ
General Chemistry							
Total Organic Carbon	100	mg/l	415.1	0.10	06/05/96	06/05/96	ING
Total Suspended Solids	20	mg/l	160.2	4.0	06/04/96	06/04/96	ING

Client #: FTL-96-060101
Address: Bedminster Bioconversion Corp.

145 Church St. Ste. 201
Marietta, GA 30060
Attn: Brian Bailey

Date: 06/11/96
Log #: L6593-1

Sample Description:

Oxidation Pond

Label: PWI
Date Sampled: 05/31/96
Time Sampled: 14:22
Date Received: 06/01/96
Collected By: Client

Parameter	Results	Units	Method	Reportable Detect Limit	Extr. Date	Analysis Date	Analyst

General Chemistry (continued)

BDL = Below Detection Limits
* Compounds are Screened Only, with an estimated detection limit.
All analyses were performed using EPA, ASTM, USGS, or Standard Methods

QAP# 900376G
SUB HRS# 86122,86109,E86048
SC CERT# 96031
TN CERT# 02985
ELPAT# 13801
VA CERT# 00395
MA CERT# M-FL449
ND CERT# R-148

HRS# E86240,86356
ADEM ID# 40850
NC CERT# 444
CT CERT# PH-0122
CA CERT# I-1068
AZ CERT# AZ0529
USACE CERT

Respectfully submitted,

Marino Fernandez
Laboratory Director

L6593-1

14+00

12+00

40'

75'R

24'

W.R.A.

MECHANICAL AND ELECTRICAL ROOM

WOMENS

MENS

DIGESTING AREA
FLOOR EL 74'-0"

6" WIDE X 4" HIGH LIP

DRY SLUDGE TRANSPORT TRUCK

DRY SLUDGE STORAGE AREA
18'X18'X4'

EXISTING LIFT-STATION

2-250 GPM DIAPHRAM PUMPS

18' x 8' x 3'-4" MIXING/PUMPING BASIN

EXIST FLOOR DRAIN

RAM POWER PACK UNIT

3" HOSE W/CAM-LOCK FITTING

MATERIALS RECOVERY FACILITY

BLOWER

WATER PUMP

SCRUBBER

AIR (OVERHEAD)

C-107

1" WATER SUPPLY

BACKFLOW PREVENTER

VALVE

EXIST 2" PVC WATER

AIR
WATER RETURN

2" RETURN LINE
2" DRAIN LINE

LIFT-STATION

BIO-FILTER

30'

30'

12" PVC SCH. 40

PUMPING SCHEMATIC

FROM TRUCK (IF NEEDED)

4" BALL VALVES

FROM MIXING/PUMPING TANK

4" BALL VALVES

4" BALL VALVES

TO STORAGE TANK

4" CHECK VALVES

TO DIGESTER

N

REV. BY:	DESCRIPTION	DATE:	DRAWN
DWS	MODIFY SLUDGE STORAGE	5/2/97	DWS

CLIENT: SUMTER COUNTY BOARD OF COMMISSIONS

PROJECT: SUMTER RECYCLING, PROCESSING AND COMPOSTING FACILITY

DRAWING: PIPING PLAN

1 of 1

Springstead Engineering, Inc.

Consulting Engineers
Architects
Planners
Surveyors

727 South 14th Street
Leesburg, Fl. 34748
(352) 787-1414

SCALE:	FILE:	DATE:
1" = 10'	SITE10	3/25/97
DESIGN:	DRAWN:	CHECKED:
GLD	USF	GLD

DRAWING: PIPING PLAN

CLIENT: SOBCC

JOB NO.:	SHEET: 1
92-1100.004	OF: 1