

**Prepared for:**

**Coastal Regional Solid Waste Management Authority  
P.O. Box 128  
Cove City, North Carolina 28523**

**JEI Project No. 618.1001.12, Task No. 03**



**COMPOSTING FACILITY APPLICATION**

**TYPE 1 – YARD WASTE COMPOSTING**

**COASTAL REGIONAL SOLID WASTE MANAGEMENT AUTHORITY  
CRAVEN COUNTY, NORTH CAROLINA  
PERMIT NUMBER 25-11**

**June 2010**

**Prepared by:**



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**Composting Facility Permit Application 2010**  
**Coastal Regional Solid Waste Management Authority Tuscarora Landfills**  
**Craven County, North Carolina**

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## **1.0 INTRODUCTION**

### **1.1 Purpose**

The purpose of the following document is to provide the information necessary for the operations of Permit Number 25-11, Yard Waste Composting Facility. The facility is currently operated by the Coastal Regional Solid Waste Management Authority (CRSWMA). The facility was last permitted on December 20, 2005 and must be re-permitted every 5 years. The permit number was changed in 2000 from its original number, No. 25-04, to allow the facility to be regulated separately from the landfill. The facility is currently permitted compost yard waste and to co-compost yard waste and sewage sludge. Renewal will not include Sewage Sludge (Type IV) as the facility sees no need to process this waste.

### **1.2 Location**

The facility is located within the property boundaries of the CRSWMA's Tuscarora site, immediately adjacent to the now closed Craven County Landfill to the east and to the Tuscarora Long-Term Regional Landfill to the north. The facility is accessed off of Route 1005, approximately 2 miles from Tuscarora. A Location Map is included in Appendix 1.

### **1.3 Existing Operations**

The CRSWMA facility was permitted to compost yard waste and to co-compost yard waste with sewage sludge. Since construction, the facility has only composted the yard waste and has not initiated the co-compost operations. It is not anticipated that the co-compost operations will begin in the near future. CRSWMA does not anticipate using the co-compost operations in the future and has decided not to apply for Type 4 Co-Composting. Over the past fiscal year, over 6,000 tons of yard waste was converted into compost. The average processing time was approximately 10 weeks, from grinding the waste through curing.

### **1.4 Contact Person**

For actions relative to this permit, the following individual is responsible:

Title:	Executive Director		
	Coastal Regional Solid Waste Management Authority		
Address for notification:	PO Box 128	or	7400 Old Hwy. 70W
	Cove City, NC 28523		New Bern, NC 28560
Phone:	(252) 633-1564		
Fax:	(252) 633-6515		

For contacts with the state for permit changes the following individual should be contacted:

Title: Compost & Land Application Branch Supervisor  
Agency: NC DENR - Division of Waste Management  
Composting & Land Application Branch  
Address: 401 Oberlin Road Suite 150, Raleigh, NC 27699  
Phone: (919) 508-8508

## **2.0 TYPE 1 – YARD WASTE COMPOSTING FACILITY**

### **2.1 Waste Quantities**

CRSWMA receives yard waste from the following localities: Craven County, Carteret County, and Pamlico County and this waste consists of brush, leaves, and other land clearing debris up to 24" in diameter, small stumps are accepted. Appendix 2 summarizes waste data available for the facility from July 2005 through April 2010, although this data is incomplete. Based on the data reported, the facility receives on average 520 tons of brush per month with the lowest tonnage (323.08 tons) received in October 2005 and the highest tonnage (980.32 tons) received in July 2008. Winter months tend to be somewhat lower in tonnage as would be expected.

This material is processed into compost. As review of the Table in Appendix 2 indicates, approximately 99% (based on weight) of the incoming materials is processed. The other 1 % is weight loss from processing.

### **2.2 Siting Requirements**

#### **2.2.1 Site Specific Requirements**

Appendix 3 summarizes the siting requirements for a Type I facility and includes the site-specific information for the CRSWMA facility. The facility meets all buffer requirements. Appendix 4 contains a 1"= 400' drawing illustrating the property line, and other items as required by Rule .1405(a)(1) which are within ¼ mile of the facility.

#### **2.2.2 Land Use**

Appendix 5 contains documentation from various Craven County agencies relative to land use. There are no zoning controls in effect that cover the area, thereby making the project consistent with local regulations. The compost facility is located within the 400 acres accepted for landfilling.

#### **2.2.3 Other Environmental Requirements**

- A. Surface Water (Rule.1404(a)(6)): The North Carolina Division of Environmental Management approved the Stormwater Management Plan for this facility on June 29, 1994. Discharges from the facility are permitted under General Permit No. NCG010000, Certificate of Coverage No. NCG011089 issued on June 24, 1994. During construction, the facility was also regulated under the Letter of Approval

issued by the Division of Land Resources, Land Quality Section, dated June 9, 1994 for erosion and sediment control. No changes have been made in the storm water control system.

The storm water is directed into a stormwater detention pond from which the water is discharged into Jumping Run Creek of the Neuse River Basin. This creek is classified as Class C/NSW which indicates "best usage" of aquatic life propagation and survival, fishing, wildlife, secondary recreation and agriculture; and a body of water that is "nutrient sensitive" which requires limitations on nutrient inputs. Because all the storm water is collected prior to discharge in the basin as described below, this stream should be protected to meet the classification requirements.

The stormwater detention pond basin was designed to meet the North Carolina Erosion and Sediment Control Planning and Design Manual requirements. The following stormwater quality features have been provided:

- A permanent water quality wet pool that meets State criteria.
- An extended detention pool and orifice in accordance with State criteria.
- A forebay at the high end of the basin and a reverse-sloped bench leading to the forebay that will meet the State requirement that stormwater have sufficient residence time in the basin to allow for particle settlement. The reverse-sloped bench also serves as the grassed buffer strip mentioned in the regulations.

The basin meets State stormwater quality control requirements. The two basin risers and barrel structures are adequately sized to pass the 25-years storm event. The two basin emergency spillways are adequately sized to pass the 100-year storm event without overtopping the dam. The extended detention orifice releases the water quality extended detention pool volume over the State required 48 hour to 5 day period.

At the site's wet ponds, routine and non-routine maintenance will occur. Routine maintenance includes seeding banks and slopes, mowing at least twice per year, inspecting monthly and after significant rainfall events, removing debris and litter and nuisance control. Non-routine maintenance will include structured repairs and sediment removal as necessary.

- B. Groundwater (Rule .1404(a)(10)): All compost operations are conducted over an impervious asphalt or concrete surface. The site will not contravene groundwater standards as established under 15A NCAC 2L.
- C. Sedimentation Pollution Control (Rule .1401 (c)(2)): The stormwater runoff is controlled in a collection basin as approved under the appropriate permits issued in 1994. The requirements of 15A NCAC 4 are met by the facility.

- D. Air Pollution (Rule .1404(c)(3)) Fugitive dust is controlled by appropriate moisture addition and odors are controlled through aeration. The requirements of 15A NCAC 2D are met by the facility.

## 2.3 Design Report

### 2.3.1 Design Capacities and Product Quality

The Type 1 CRSWMA facility currently receives an average of 520 tons per month of yard waste. For evaluating the facility's design, 520 tons per month or 6,247 tons per year were used. This material is stockpiled until sufficient material is available to produce a windrow. The material is ground and passed through a 5/8" screen prior to composting. Material that is greater than 5/8" becomes woodchips and mulch; material that is smaller than 5/8" is windrowed for compost. The Appendix 2 summarizes all available tonnage data for the facility. Based on this data, approximately 100% of the yard waste material is turned into compost and mulch products, and a negligible amount is sold for wood chips.

The following table summarizes the current utilization at the facility for the composting operation. As a factor of safety, it was assumed that the density of the product remains the same as the incoming waste stream.

Total waste stream (by weight)	6,247 tons (annual)
Total waste stream for composting (100%)	6,247 tons
Density (assumed average)	500 lb./cy
Composting waste stream (by volume)	24,988 cubic yards
Cross-section windrow 2' (top) x 18'(base) x 7'(ht)	70 square feet
Total length windrow utilized (maximum)	5,000 feet
Windrow: At half in spring and half in fall	2,500 feet
At 225' length	10 windrows used
With 18' base and 10' aisle, total acreage utilized	1.45 acres

The facility was originally designed with a working area for the Type 1 facility of 2.6 acres as illustrated in the Site Plan included in Appendix 6. Sufficient room is available for the operations. Based on the assumed values above, if the Receiving, Grinding, & Screening Area were relocated it would enable CRSMWA to reach their maximum design capacity for the composting facility. Currently over half of the work space is utilized. Doubling the current acreage used, 1.45 acres, would utilize the designed working area of 2.9 acres. By doing so, the facility can receive a total waste stream (weight) of 12,494 tons annually, a total waste stream for composting (100%) and use 20 windrows at the current size of each.

Yard waste generation is cyclical with the seasons; however the data collected to date indicates that the least amount of material provided in one month was 323 tons. Sufficient materials will be available to continue the process throughout the year. Materials will be stockpiled as necessary. High nitrogen content wastes such as grass will not be stockpiled and will be incorporated into the process within 48 hours of receipt or as soon as possible.

The facility does not use any bulking agent and compost is not recycled through the process. If the County determines that either of these processes are beneficial, DENR will be notified prior to implementation.

Appendix 7 contains a table summarizing product quality. The facility currently has the North Carolina Division of Agriculture analyze the compost on a periodic basis for various metals, nutrients, pH, soluble salts, C:N ratio and % solids.

### 2.3.2 Site Plan

A site plan at 1" = 40' is provided in Appendix 6. A complete set of the Record Drawings for the facility as original designed and constructed is attached to this narrative. The attached drawing was developed from the Record Drawing provided to CRSWMA by Joyce Engineering, Inc. (JEI). The original designer of the facility was Malcolm Pirnie, Inc. The drawing generally illustrates the final contours of the facility, the stormwater management system, structures, and operating areas. For details, the Record Drawings should be consulted. The facility is located within the property boundary of the CRSWMA landfill and the property line cannot be illustrated on the drawing due to the scale. A separate drawing indicating the setbacks, property boundary etc. is provided in Appendix 4.

The operating area consists of approximately 1.5 acres for off loading and grinding, and 3.0 acres for windrowing with the storm water directed to a storm water detention basin.

### 2.3.3 Process Flow Diagram

Appendix 8 contains the updated process flow diagram, which illustrates the complete operation including the type and size of equipment, feedstock flow streams, recommended operational parameters, monitoring requirements, and final product requirements. The facility records all data on the incoming and outgoing materials in tonnage. To provide the volumetric information, the waste was assumed to have an incoming density of 500 pounds per cubic yard and to maintain this density throughout the process. This allows for a conservative estimate of space requirements.

### 2.3.4 Compost Demonstrations

Compost demonstrations may be conducted at the facility with the approval of the Division with other organic material, additives, or processes.

## 2.4 Operations

### 2.4.1 General Description

The Type 1 facility has been in operation since 1997. Photographs of the operating facility are contained in Appendix 15. Operational records for the operations have been reviewed and are summarized for several windrows in Appendix 9. The following discussion on operations was taken from the original permit with additional detail added as necessary.

Incoming yard waste is weighed and directed to the operational area. The yard waste is stockpiled until a sufficient quantity is accumulated to form a windrow. On average approximately 1 windrow could be formed per month. It should be noted that this is a theoretical maximum as during the operations to date no more than 10 windrows have ever been curing at one time. The material is run through a Maxi Grinder which can process materials up to 24" or larger in diameter at a rate of 60 tons/hour. Grinding creates a product with a particle size of approximately 5/8" for composting after screening. Once ground, the material is formed into windrows using a front end loader. The windrows are spaced approximately 10 feet apart and each has a north/south orientation and the following geometry: 7 - 7 1/2 feet high x 18 feet wide at base x 2 feet wide at top.

Once the windrow is formed, it will be turned several times using a Scarab 18 windrow turner to mix the materials. The Scarab turner is capable of handling 2,000 tons per hour and is more than adequate for the facility. If necessary, water will be added as the windrow is constructed and then periodically during the stabilization process. CRSWMA uses an irrigation system from the adjacent sediment basins located north of the facility. The pile will be sprayed as it is turned by the windrow turner on an as needed basis. For optimum composting the moisture should be maintained between 45% and 60%. Drier than 45% and the microbial action is slowed; higher than 60% and the material becomes difficult to handle and difficult to aerate. Operation records indicate a moisture range of 50% - 65%. A copy of the recommended moisture log is contained in Appendix 5

The windrows are monitored for temperature at least twice a week and will be aerated as necessary. The temperatures are taken at in each quarter of the windrow (4 separate places) or a minimum of each third (3 separate places). It is suggested that the temperature be controlled by turning (aerating) to assure that the compostable material is maintained at an optimum range for decomposition (between 104°F and 113°F) and then allowed to elevate to 131°F where it must be maintained for a period of 3 consecutive days as required by Rule .1406(10). When the temperature within the windrow falls below 120 – 130°F during the final stages of composting, the windrow is turned. Windrow construction and turning frequency will be sufficient to maintain aerobic conditions to produce a compost product in the desired time frame. Separate records are kept for each windrow. Once a windrow is constructed, it is assigned an I.D. Number and folder which are used over the lifespan of the windrow. Every time windrow data is taken, it is documented and logged in the folder. A log will be kept of all temperature readings, which includes the location of the probes. A copy of the temperature log is contained in Appendix 5.

Tables have been provided in Appendix 11, to assist in the operations. These tables were developed by the Compost Council to assist operators with various calculations and parameter adjustments. The Compost Council's operation manual is incorporated by reference into this operations manual.

A nitrogen source is sometimes added to the yard waste if needed to promote the compost process. CRSWMA uses calcium nitrate when necessary. The calcium nitrate is spread by hand and mechanically mixed. To date, operations have shown that a 225 foot windrow requires approximately 25 fifty pound bags.

The process from grinding through stabilization was expected to take 24 weeks, however, existing operations compost in less than 10 weeks. The final time frame is a function of material density, material type, moisture and operational controls.

Once the windrow begins to cool indicating stabilization, CRSMWA screens the material and the larger particles are reused in the process or used as woodchips or mulch. By keeping the coarser materials in the compost, it enables more oxygen to get into the windrows and produces more compost in the finished product. The compost is now stockpiled. Depending on the end use requirements, the compost may be screened again prior to stockpiling if a finer screen is available. The larger particles would be either reused in the process or used as a coarser product.

If the material is free of sharp particles, has no offensive odor, and has minimal pathogens, it may be used in an unrestricted way. Prior to marketing the material to the public, the following testing is recommended by the Compost Council but not required by the State:

- Maximum particle size
- pH
- C:N ratio
- Total Nitrogen
- Soluble salts
- Metals as suggested by the Department of Agriculture

Once the compost meets the regulatory requirements for distribution to the public, it can be released for use. As the public obtains the material they must be given the information indicated in Section 2.4.14 (c).

#### 2.4.2 Personnel

The facility will be staffed by a compost facility supervisor and one heavy equipment operators. The facility supervisor will direct traffic, maintain records, and oversee operations. The heavy equipment operators will operate all equipment and maintain good housekeeping practices. A scale clerk assists both the landfill and composting operations by maintaining the weight and billing records.

#### 2.4.3 Hours of Operation

The compost facility will operate on the same schedule as the landfill. It will be open Monday - Friday from 7:30AM - 4:30PM and Saturday 7:30AM - 2:00PM.

#### 2.4.4 Access and Security Requirements                      Rule .1406 (5)

The site shall be secured to prevent unauthorized entry. A scale clerk will control access to the site at all times. An operator shall be on duty at the compost site at all times while the facility is open for public use to ensure compliance with operational requirements. The access road to the co-compost facility shall be maintained in good condition and provide access in all weather conditions.

#### 2.4.5 Waste Acceptance

Rule .1406 (6)

The Type 1 compost facility will accept only grass, leaves, brush, yard waste, and land clearing debris. No municipal solid waste (MSW), hazardous waste, asbestos containing waste or medical waste shall be accepted at the facility. CRSWMA accepts yard waste in a non-bagged state or in approved biodegradable bags. Deliveries are monitored at all sites. CRSWMA anticipates little contamination of the material.

Since the generation of yard waste is seasonal, it can be expected that a majority of the waste will be received during the spring, summer, and fall. It is expected that daily traffic flow to and from the facility will be approximately 10 trucks per day. Trucks will be directed to the paved loading/unloading area and dumped.

#### 2.4.6 Safety Requirements

Rule .1406 (7)

Open burning of solid waste is prohibited. All equipment will be provided with fire extinguishers. The windrow turner will have a fire suppression system. Periodic safety meetings will be held to review safety issues at the site. Personal protective equipment should include steel toe boots, eye and ear protection and dust masks when appropriate. Site personnel will be trained in facility specific safety issues as well as general safety issues. The local fire department would be called should a major fire break out.

#### 2.4.7 Nuisance Control

Rule .1405(10)(B)

Sources of noise will be on-site traffic and the facility equipment such as the front-end loader, Maxi grinder, trommel screen, and windrow turner. Noise can be controlled by appropriately operating and maintaining equipment. In addition, the facility is located next to a landfill operation and is buffered from other properties by distance and trees. Employees should wear hearing protection.

Vectors are animals, insects or other organisms that carry pathogens from one host to another like rats, flies, birds and mosquitoes. Vectors will be minimized by good housekeeping practices. The receiving area will be kept clean, water will not be allowed to accumulate and the drainage areas will be cleaned periodically. Material will be stored based on a "first in/first out" basis to prevent long term storage. Turning the windrows will also control vector flies and their larvae. If necessary, a commercial pest control service will be employed.

Dust will be controlled by good housekeeping practices and by dampening loads on the tipping floor as necessary. Moisture is necessary to enhance the composting process and will be monitored. Employees should wear dust masks.

Odors will be minimized by maintaining adequate aeration through turning the windrows.

#### 2.4.8 Sign Requirements

Rule .1406 (8)

A sign is provided at the entrance to the Tuscarora Regional Landfill stating facility operating hours, the permit number and other pertinent information. Additional signs will be

provided as necessary at the composting facility entrance stating dumping procedures for the facility. Traffic signs will be posted as necessary to promote orderly traffic patterns to and from the compost site. A sign will be posted at the entrance to the landfill site that states no hazardous waste, asbestos containing waste, or medical waste can be received at the compost facility.

#### 2.4.9 Monitoring Requirements

Rule .1406 (9)

Once the windrow is constructed, the pH, temperature and moisture content should be measured. It is also suggested that the C:N ratio be determined to evaluate the need for the addition of a nitrogen source. During the composting process pH, O<sub>2</sub> (if equipment available), moisture, and temperature will be monitored periodically. pH should be kept in the range of 5.5 - 8.5. Outside of this range, the biological process is impeded.

Moisture should be kept in the range of 45% - 60%. Water should be added as required to stay within this range. Moisture, pH, and O<sub>2</sub> should be monitored at a minimum weekly. Temperature will be monitored daily. To monitor temperature, the probe should be inserted 12"-24" every 50' along the windrow at a 45° - 90° angle.

At the end of the process and prior to marketing the materials to the public, it is recommended that the following tests be run:

- pH;
- C:N;
- Total Nitrogen;
- Metals (as suggested by the Department of Agriculture);
- Soluble Salts; and
- Moisture.

These tests are recommended by the Compost Council but not required by the State. CRSWMA also utilizes the "Hand Test" Method. The test is performed by taking a hand-full of compost material representative of the windrow and squeezing it. After you open your hand, if the material quickly breaks up, then the windrow is too dry. If you can squeeze the material and water is extracted, then the material is too wet. If squeezed and the material remains cohesive, then it is good; otherwise, the proper measures should be taken.

To date the NC Department of Agriculture has been running most of these tests for CRSWMA.

#### 2.4.10 Temperature Parameters

Rule .1406 (10)

For Type I facilities, the compost process must be maintained at or above 55°C (131°F) for 3 consecutive days and aerated to maintain elevated temperatures. Temperature will be monitored at least twice a week.

#### 2.4.11 Addition of Nitrogen Bearing Materials

Rule .1406 (13)

Nitrogen compounds may be added as necessary to adjust the nutrient balance for optimum product. Only approved waste materials (i.e. grass clippings, leaves) or chemical compounds may

be added. Nitrogen compounds increase odors and if using grass clippings, the material should be incorporated into the process immediately upon receipt.

To determine if nitrogen is necessary, the carbon to nitrogen ratio should be calculated. For proper composting, this ratio should be greater than 25:1, but less than 40:1 at the start of composting. Incoming materials have the following estimated ratios:

Grass clippings	12 - 15:1
Dry leaves	40:1
Paper and wood	200:1
Sawdust	200 - 500:1

Thus, adjustment may be necessary after grinding, screening and blending the feed stock materials.

#### 2.4.12 Contingency Plans

#### Rule .1405 (c) (1)

- A. **Equipment:** The four major pieces of equipment that are required for operations includes the grinder, windrow turner, trommel screen, and the front-end loader. These shall be maintained in accordance with the manufacturers' recommendations. If the grinder or screen breaks down, waste shall be stockpiled until the grinder is repaired. If there is a need for a grinder, one can be rented. If the windrow turner breaks down, the windrows can be turned with the front-end loader. If the front-end loader breaks down, one will be rented from a local contractor.
- B. **Air Pollution:** Dust and odor are the two primary air pollutants. Dust will be controlled through proper moisture control and odor will be controlled through proper aeration.
- C. **Nonconforming Waste:** Nonconforming waste shall be taken to the landfill assuming no hazardous materials or asbestos-bearing materials are present.
- D. **Spills:** Spills are not expected. Potential spills would include maintenance fluids for equipment, and fuel. Appropriate precautions will be taken to assure that equipment is serviced correctly to minimize spills or discharges. Should oil or gas spill onto the area, it shall be absorbed immediately and the absorbent disposed of appropriately. Major equipment maintenance and repairs are handled in the on-site maintenance garage. Off-spec product, incomplete compost, or compost which might spill off the curing pad will be collected and returned to the appropriate location.
- E. **Fires, noise, vectors, odors** are discussed under Section 2.3.4. Unusual traffic conditions shall be controlled by on-site personnel and the Craven County Sheriff's Department if necessary.

- F. Adverse weather conditions: The primary adverse weather conditions facing the CRSWMA facility include wind and rain. During periods of heavy wind, grinding and windrow turning will not be conducted and the top of the windrow will be kept moist to prevent blowing material. During periods of heavy rain, compost grinding and screening operations are not carried out in the rain. The operator monitors the site frequently to assure that stormwater controls are adequate and maintains the site as possible. During mild rainfalls, the operator may want to turn the windrow to incorporate moisture into the materials.

#### 2.4.13 Miscellaneous Requirements

Rule .1406 (14) (a) These requirements will be addressed below under Section 2.4.14.

Rule .1406 (14) (b) The quality of the product shall determine the allowable uses per Rule .1407.

Rule .1406 (14) (c) The final product shall be approved by the DENR Solid Waste Section. Non-compostable solid waste and unacceptable compost shall be disposed in the landfill, where it shall be used as intermediate cover, daily cover or in the top 6 inches of final cover.

The amount of composted stored at the facility will not exceed the designed storage capacity.

#### 2.4.14 Classification/Distribution of MSW Compost Products Rule .1407

##### A. Requirements

For unrestricted use, the finished Type I compost must meet the following criteria:

- Minimal pathogenic organisms
- Free from offensive odors
- Containing no sharp particles

If these criteria are met then the finished compost material will be marketed to local landscape firms and to residents of CRSWMA's member counties. CRSWMA transports some of the finished product to the transfer stations in Carteret and Pamlico Counties where it is convenient for residents and businesses to access the material.

##### B. Sampling

Prior to marketing the material to the public, a composite sample of the material should be obtained and the tested for the parameters outlined under Section 2.4.9. It is recommended that a copy of the test results and recommendations from the Department of Agriculture, Agronomic Division be provided to each individual using the material.

A composite sample is obtained by taking 3 evenly distributed samples along the windrow and compositing them into an airtight container or bag. Each sample should be approximately 1-2 cups each and taken from a hole dug into the windrow starting approximately 4' up and angling at 45° into the pile. More samples may be warranted per windrow if there is evidence of an inconsistent product (based on temperature or pH readings.)

A sketch indicating the location of each sample and a description of the sampling technique should be kept on each composite. Accurate record keeping is critical. Label each composite sample with the following information:

- Date sampled
- Time sampled
- Windrow identification
- Source of Sample
- Name of person taking sample
- Sample Preservation Technique
- Temperature of Sample
- pH of Sample

All information should be recorded in a sample logbook along with the following:

- Sample preparation
- Shipment record
- Tests to be conducted
- Laboratory to conduct tests

### C. Labeling

When the Type 1 compost material is to be marketed to the public, sufficient information should be provided to the public to:

- Inform users of the benefits of using compost
- Advise users on suggested uses of product
- Inform users of cautions in using product
- Inform users of composition of the material including nutrients and contaminants
- Inform users of source of feedstock.

Appendix 12 includes a copy of the information provided to the end users by the CRSWMA. It is also recommended that a copy of the test results (if available) be provided to the end user.

## 2.5 Recordkeeping

### 2.5.1 Record Keeping Requirements

Separate records will be maintained for each section of the facility as described below. Records shall be made and maintained for a minimum of five (5) years. Records shall be kept on a monthly basis.

### 2.5.2 Operating Records

Daily operating records shall include the following information (at a minimum).

- The quantity, type and source of waste received.
- The quantity and type of waste processed.
- The quantity and type of compost produced by product classification.
- The quantity and type of compost removed for use or disposal, by product classification and the market or permitted disposal facility.
- All operational information including date and number of times windrow(s) turned; date, type, quantity and method of addition of any amendments.
- Temperature data. Temperature data shall indicate the location of readings in the windrow and the length of the composting period. (A sample log is contained in Appendix 10.)
- Moisture testing including data, location of test and weather conditions at time of sampling. (A sample log is contained in Appendix 10.)
- All analytical results from compost testing described above.

### 2.5.3 Annual Reporting Requirements

Rule .1408 (3)

An annual report shall be submitted to the Solid Waste Division. The year shall be July 1 - June 30. The annual report will include the following:

- Facility name, address, and permit number
- Year covered
- Total quantity and type of waste in tons received at the facility during the year covered including tons of waste received by local government of origin.
- Total quantity and type of waste in tons, processed into compost during the year covered.

- Total quantity in tons and type of compost produced at the facility, by product classification, during the year covered.
- Total quantity in tons and type of compost removed for use or disposal from the facility, by product classification, along with a general description of the market for use during the year covered.
- Total quantity in tons, and the type of waste removed from the facility and disposed of.
- Condensed monthly temperature monitoring to support Rule. 1406 (9) (c).
- Summary of all testing completed on the compost as required by the Division.
- Condensed yearly totals of solid waste received and composted shall be reported back to the local government of origin for respective annual recycling reporting.

## **2.6 All Required Permits**

A copy of all required local, state and federal permits/approvals are enclosed as Appendix 13.

## **2.7 Equipment Specifications**

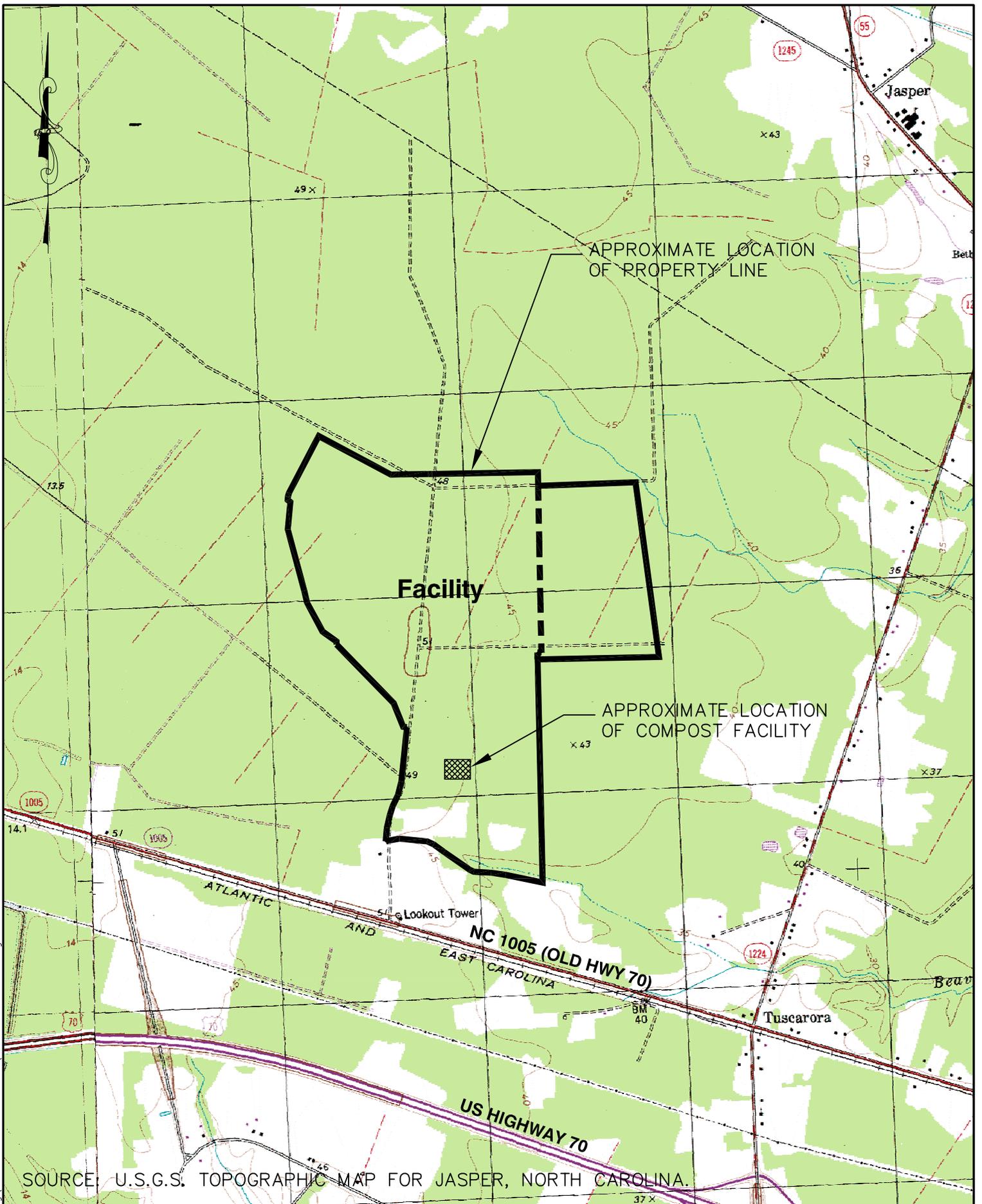
The four major pieces of equipment in use at the composting facility are a Maxi Grinder, Trommel Screen, Scarab Windrow Turner, and a Front-end Loader. Equipment specifications are enclosed in Appendix 14.

## **2.8 Operation Manual**

The operation manual for the facility is attached to this application as a separate volume.

## **APPENDIX 1**

### Location Map



SOURCE: U.S.G.S. TOPOGRAPHIC MAP FOR JASPER, NORTH CAROLINA.

FIGURE NO. 1



2211 WEST MEADOWVIEW ROAD  
 GREENSBORO, N.C. 27407  
 PHONE: (336) 323-0092  
 © 2010 Joyce Engineering, Inc.  
 All rights reserved.

SCALE  
 1" = 2000'

PROJECT NO.  
 618.1000.12.03

CRSWMA: TUSCARORA LANDFILL  
 SITE LOCATION MAP

L:\CRSWMA\dwg\COMPOSTING PERMIT 2010\SITE LOCATION MAP.dwg

## **APPENDIX 2**

### **Waste and Product Quantity Data**



MONTHLY TONNAGE REPORT

Project: Composting Facility & Operations Manual  
 Client: Coastal Regional Solid Waste Management Authority (CRSWMA)

Location: Tuscarora, NC

JEI Proj.: 618.1000.12  
 JEI Task: 03

MONTH/ YEAR	YARD WASTE RECEIVED PER COUNTY			MONTHLY TOTALS	YEARLY TOTALS	COMPOSTING SALES PER COUNTY			MONTHLY TOTALS	YEARLY TOTALS
	CRAVEN COUNTY	CARARET COUNTY	PAMLICO COUNTY			CRAVEN COUNTY	CARARET COUNTY	PAMLICO COUNTY		
Jul-05	357.06	401.67	12.06	770.79		58.48	21.50	25.83	105.81	
Aug-05	248.28	254.22	14.79	517.29		141.32	19.53	22.93	183.78	
Sep-05	585.57	112.75	64.11	762.43		90.65	5.34	9.34	105.33	
Oct-05	261.20	15.28	46.60	323.08		84.35	0.00	16.50	100.85	
Nov-05	629.51	239.94	7.70	877.15		99.80	3.16	23.18	126.14	
Dec-05	219.14	165.00	9.70	393.84		56.85	1.72	6.93	65.50	
Jan-06	210.45	213.78	16.39	440.62		77.84	16.95	7.06	101.85	
Feb-06	164.83	214.65	47.39	426.87		129.42	22.76	11.43	163.61	
Mar-06	323.66	338.15	23.61	685.42		288.24	83.71	55.67	427.62	
Apr-06	271.07	411.87	45.16	728.10		337.72	82.64	56.21	476.57	
May-06	250.31	300.34	31.30	581.95		206.13	76.67	74.17	356.97	
Jun-06	288.37	303.06	15.81	607.24	7114.78	234.86	34.59	22.25	291.70	2505.73
Jul-06	250.27	277.12	19.26	546.65		140.02	18.07	18.68	176.77	
Aug-06	255.11	222.28	16.71	494.10		172.00	20.45	54.93	247.38	
Sep-06	436.92	394.83	26.55	858.30		101.88	27.99	6.68	136.55	
Oct-06	263.03	207.74	15.12	485.89		65.12	12.12	24.24	101.48	
Nov-06	276.75	207.85	13.34	497.94		72.22	35.51	2.78	110.51	
Dec-06	200.76	251.66	6.03	458.45		38.83	8.79	3.16	50.78	
Jan-07	307.50	236.70	10.35	554.55		47.52	6.58	3.43	57.53	
Feb-07	126.57	255.07	8.10	389.74		101.94	20.86	26.23	149.03	
Mar-07	266.05	329.16	21.15	616.36		191.41	47.45	67.94	306.80	
Apr-07	205.98	410.38	21.80	638.16		502.86	60.16	43.11	606.13	
May-07	251.42	278.11	17.81	547.34		212.83	33.41	39.94	286.18	
Jun-07	217.89	303.97	15.64	537.50	6624.98	194.65	35.04	29.94	259.63	2488.77
Jul-07	181.00	259.18	15.05	455.23		83.50	19.23	25.54	128.27	
Aug-07	192.63	321.91	12.55	527.09		69.71	25.89	19.81	115.41	
Sep-07	141.77	208.19	21.53	371.49		65.88	45.23	12.47	123.58	
Oct-07	158.65	252.83	23.75	435.23		143.26	29.22	9.82	182.30	
Nov-07	173.17	245.91	22.98	442.06		108.52	42.98	20.40	171.90	
Dec-07	136.85	187.17	14.25	338.27		76.62	30.09	13.17	119.88	
Jan-08	146.88	185.94	43.31	376.13		95.26	32.65	6.99	134.90	
Feb-08	163.34	235.79	14.23	413.36		118.63	58.80	42.03	219.46	
Mar-08	149.70	382.73	31.47	563.90		313.23	92.27	66.54	472.04	
Apr-08	170.39	381.07	53.41	604.87		304.18	114.10	67.87	486.15	
May-08	191.12	432.13	28.21	651.46		236.22	67.50	82.93	386.65	
Jun-08	113.01	343.49	48.26	504.76	5683.85	166.02	79.76	32.76	278.54	2819.08



MONTHLY TONNAGE REPORT

Project: Composting Facility & Operations Manual  
 Client: Coastal Regional Solid Waste Management Authority (CRSWMA)

Location: Tuscarora, NC

JEI Proj.: 618.1000.12  
 JEI Task: 03

MONTH/ YEAR	YARD WASTE RECEIVED PER COUNTY			MONTHLY TOTALS	YEARLY TOTALS	COMPOSTING SALES PER COUNTY			MONTHLY TOTALS	YEARLY TOTALS
	CRAVEN COUNTY	CARARET COUNTY	PAMLICO COUNTY			CRAVEN COUNTY	CARARET COUNTY	PAMLICO COUNTY		
Jul-08	409.81	303.95	266.56	980.32		114.34	28.31	16.48	159.13	
Aug-08	161.10	271.15	17.47	449.72		171.50	49.65	15.47	236.62	
Sep-08	246.39	384.24	32.99	663.62		66.82	34.24	8.39	109.45	
Oct-08	235.40	267.63	12.04	515.07		142.17	46.33	36.80	225.30	
Nov-08	121.52	219.80	10.49	351.81		47.47	5.14	19.55	72.16	
Dec-08	136.27	186.38	11.81	334.46		53.22	31.32	4.51	89.05	
Jan-09	176.03	203.57	11.62	391.22		48.76	14.68	5.79	69.23	
Feb-09	76.44	266.27	17.08	359.79		112.25	50.18	58.83	221.26	
Mar-09	124.93	320.48	14.28	459.69		308.57	91.91	89.75	490.23	
Apr-09	100.51	408.52	18.78	527.81		379.87	79.23	191.28	650.38	
May-09	156.01	355.63	41.43	553.07		340.51	77.61	80.09	498.21	
Jun-09	106.06	340.24	30.23	476.53	6063.11	144.48	55.26	47.15	246.89	3067.91
Jul-09	155.96	264.34	24.66	444.96		146.23	20.93	18.89	186.05	
Aug-09	83.90	230.66	10.84	325.40		76.29	26.44	5.12	107.85	
Sep-09	125.01	261.28	21.67	407.96		94.63	15.59	16.70	126.92	
Oct-09	87.50	284.04	12.12	383.66		76.76	17.87	26.45	121.08	
Nov-09	144.01	208.09	24.47	376.57		53.25	5.27	1.03	59.55	
Dec-09	158.74	222.58	19.43	400.75		78.67	0.77	1.74	81.18	
Jan-10	167.89	263.31	8.72	439.92		57.58	7.13	6.94	71.65	
Feb-10	113.16	370.21	24.36	507.73		127.91	19.88	8.72	156.51	
Mar-10	252.39	464.25	38.12	754.76		407.04	128.20	65.74	600.98	
Apr-10	110.62	506.41	47.61	664.64		631.28	142.17	154.29	927.74	
				<b>TOTAL YARD WASTE</b>					<b>TOTAL SALES</b>	
<b>TOTALS</b>	12,235.86	16,384.95	1,572.26	30193.07		9,107.57	2,280.83	1,932.60	13321.00	
<b>AVERAGE (PER MON.)</b>	210.96	282.50	27.11	520.57		157.03	39.32	33.32	229.67	

**NOTES:**

- Each Fiscal Year consists of months from July of the previous year through June of the current year.
  - A negligible amount of Wood Chips was sold. Therefore, it can be estimated 99% of the yard waste is used composting.
- P:\CRSWMA\Old Folder Structure\618.09.03 General Consulting\Compost Facility Permit 2010\Appendix - Waste & Quantity Data 2005-2010.xls\CRSWMA - Monthly Tonnage Report

## **APPENDIX 3**

### Siting Criteria



**APPENDIX 3**  
**SITING REQUIREMENTS**  
**TYPE 1 FACILITY**

**CHECKLIST**

<b>Item</b>	<b>Requirement</b>	<b>Actual</b>
Flood Plain	<ul style="list-style-type: none"> <li>• Cannot Restrict 100-yr</li> <li>• Reduce Storage Capacity</li> </ul>	See FEMA Floodplain Map
Buffer to Property Lines	50'	90'
Buffer to Residence Lines or Dwellings not Owned by Permittee	200'	Property Line > 200' from facility except to east
Buffer to Wells (excluding Monitoring Wells)	100'	Over 600' to Maintenance facility and administrative offices
Buffer to Perennial Streams/Rivers	50'	Jumping Run Creek is closest perennial creek at approx. distance 3500'
Accordance w/ 15 ANCAC2B	Antidegradation	Controls in Place
Buffer to Swales/ Berm	25'	Meets Requirements

## **APPENDIX 4**

1" = 400' Drawing



## **APPENDIX 5**

### Acceptance Letters by Local Government



RESOLUTION

RESOLVED, that the Board of Commissioners of Craven County hereby grants approval of a site application for a municipal solid waste landfill to be established on approximately 514 acres, located near Tuscarora, Craven County, which acreage does not lie within any incorporated city or town, nor within the extraterritorial zoning jurisdiction of any city or town.

Adopted this the 21<sup>st</sup> day of October, 1996

Lee E. Allen  
Lee E. Allen, Chairman  
Craven County Commissioners

Gwendolyn M. Bryan  
Gwendolyn M. Bryan, Clerk

Board of Commissioners  
Charles T. Potter, Chairman  
Sidney E. French, Vice Chairman  
Edward F. Armstrong, II  
Roger R. Bell  
Benjamin J. Godette  
Albert H. Toon  
Earl Wright

Administrative Staff  
Tyler B. Harris, County Manager  
George B. Sawyer, Assistant Manager  
Allan M. Henderson, Finance Officer  
Ray H. Moter, Personnel Director

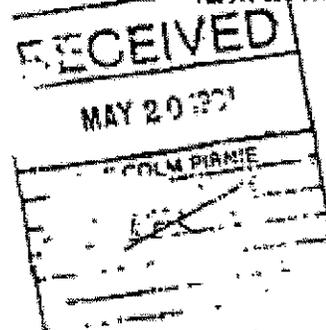
# County of Craven



Craven County  
Administration Building  
P.O. Office Box 1473  
406 Craven Street  
New Bern, NC 28561

Commissioners 919-636-6601  
Manager 919-636-6600  
Finance 919-636-6603  
Personnel 919-636-6602  
Fax 919-636-6618

May 10, 1991



Mr. Ken Kaper, P.E.  
Project Engineer  
Malcolm Pirnie, Inc.  
11832 Rock Landing Drive, Suite 400  
Newport News, Virginia 23606

Dear Mr. Kaper:

Pursuant to your letter of May 2, 1991, regarding the requirements of the North Carolina Solid Waste Rules, I offer you the following. The Craven County Board of Commissioners, met in regular session on Monday, May 6, 1991. During that session the Board took under advisement the recommendation for using the 400 acres dirt site adjacent to the current landfill on Old Highway 70 for the expansion project. Upon a motion by Commissioner Sidney French and a second by Commissioner Benjamin Godette, the Board voted to approve the site adjacent to the current Craven County Landfill for the expansion project for the Regional Landfill. The Board also agreed to ask the County Planner to issue a letter stating that this area is in compliance with any zoning restrictions which might exist.

If I can provide you with any additional information to assist you in expediting the submittal of the package to the Department of Environment, Health and Natural Resources, please do not hesitate to let me know.

Sincerely,

Charles T. Potter, Chairman  
Craven County Board of Commissioners

CTP:alf

Cc: Richard Stahl  
Tyler Harris  
Ken Windley  
Bill Rice  
Donald Baumgardner  
CRS/WNA Members

**THE COASTAL PARTNERSHIP**  
COASTAL REGIONAL SOLID WASTE MANAGEMENT AUTHORITY  
SERVING CARTERET, CRAVEN & FALCON COUNTIES

October 27, 1995

RECEIVED  
OCT 30 1995

402  
CHARLOTTE, N.C.

John M. Gardner, P.E.  
HDR Engineering, Inc. Of North Carolina  
128 S. Tryon Street  
Suite 1400  
Charlotte, NC 28202

RE: CRSWMA Long-Term Regional Landfill  
Craven County, North Carolina

Dear Mr. Gardner:

The purpose of this letter is to comply with North Carolina Regulation 1618(c)(5)(C). This regulation states that the operation and construction of the proposed landfill must conform to the Authority's solid waste management plan. The proposed Long-Term Regional Landfill is consistent with the Coastal Regional Solid Waste Management Authority's (CRSWMA) current solid waste management plan. Should the State of North Carolina change the regulations for the solid waste management plan in the future, we will modify the solid waste plan for the Long-Term Regional Landfill as required.

If you should have any questions or comments, please feel free to call me.

Sincerely,

*Lori A. Ditz*

Lori A. Ditz, P.E.  
Chief Engineer

LAD:smh



County of Craven

Office of Planning  
and  
Community Development



Donald R. Baumgardner  
Director

May 28, 1991

Ken Kaper, P.E.  
Project Engineer  
Malcolm Pirnie, Inc.  
11832 Rock Landing Drive, Suite 400  
Newport News, Virginia 23606

RECEIVED
MAY 31 1991
TIM PIRNIE
FILE 1453-60-1

(1,0)

Dear Mr. Kaper:

Pursuant to your request, I have reviewed the zoning for the 400 acre landfill expansion site adjacent to the current Craven County landfill. This is to advise that Craven County has no zoning controls in effect that covers this area, there by making this proposed expansion project consistent with local regulations in effect.

If I can be of further assistance, please advise.

Sincerely,

Donald R. Baumgardner  
Planning & CD Director

DRE/amb

cc: Tyler Harris  
George Sawyer  
Ken Windley  
Bill Rice  
Richard Stahr

## **APPENDIX 6**

### Site Plan



## **APPENDIX 7**

### **Product Quality Data**





Grower: Coastal Regional Solid Waste Antho  
 PO Box 128  
 Cove City, NC 28523  
 Copies to: Glasgow, Tom

# Waste Analysis Report



Farm:

Received: 06/09/2010 Completed: 06/11/2010 Links to Helpful Information Craven County

**Laboratory Results (parts per million unless otherwise noted)**

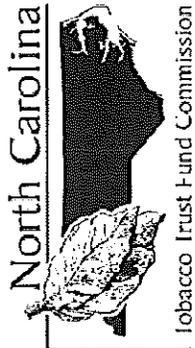
Sample ID:	Laboratory Results (parts per million unless otherwise noted)													
	N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	C
ROW 2	5016	730	1613	20047	902	593	739	45.4	50.2	16.2	10.4			162880
Waste Code:	-NH4													
MCY	-NO3													
Description:	OR-N													
Composted Yard Waste	Urea	283												
Recommendations:	Nutrients Available for First Crop													
Application Method	N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	Li
Broadcast	2.3	0.92	1.4	11.0	0.50	0.33	0.41	0.03	0.03	0.01	0.01			0.26
Soil Incorporate	2.8	1.2	1.6	13.8	0.62	0.41	0.51	0.03	0.03	0.01	0.01			0.26
Completed: June 10, 2010	Other Elements													
	Na	Ni	Cd	Pb	Al	Se	Li	Si	SS	C:N	DM%	CCE%	ALE(tons)	
	283								6.41	79	32.47	45.87		

**Laboratory Results (parts per million unless otherwise noted)**

Sample ID:	Laboratory Results (parts per million unless otherwise noted)													
	N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	C
ROW 3	4695	627	1735	24941	1020	617	819	62.0	56.7	16.4	12.9			148293
Waste Code:	-NH4													
MCY	-NO3													
Description:	OR-N													
Composted Yard Waste	Urea	297												
Recommendations:	Nutrients Available for First Crop													
Application Method	N <td>P <td>K <td>Ca <td>Mg <td>S <td>Fe <td>Mn <td>Zn <td>Cu <td>B <td>Mo <td>Cl <td>Li</td> </td></td></td></td></td></td></td></td></td></td></td></td>	P <td>K <td>Ca <td>Mg <td>S <td>Fe <td>Mn <td>Zn <td>Cu <td>B <td>Mo <td>Cl <td>Li</td> </td></td></td></td></td></td></td></td></td></td></td>	K <td>Ca <td>Mg <td>S <td>Fe <td>Mn <td>Zn <td>Cu <td>B <td>Mo <td>Cl <td>Li</td> </td></td></td></td></td></td></td></td></td></td>	Ca <td>Mg <td>S <td>Fe <td>Mn <td>Zn <td>Cu <td>B <td>Mo <td>Cl <td>Li</td> </td></td></td></td></td></td></td></td></td>	Mg <td>S <td>Fe <td>Mn <td>Zn <td>Cu <td>B <td>Mo <td>Cl <td>Li</td> </td></td></td></td></td></td></td></td>	S <td>Fe <td>Mn <td>Zn <td>Cu <td>B <td>Mo <td>Cl <td>Li</td> </td></td></td></td></td></td></td>	Fe <td>Mn <td>Zn <td>Cu <td>B <td>Mo <td>Cl <td>Li</td> </td></td></td></td></td></td>	Mn <td>Zn <td>Cu <td>B <td>Mo <td>Cl <td>Li</td> </td></td></td></td></td>	Zn <td>Cu <td>B <td>Mo <td>Cl <td>Li</td> </td></td></td></td>	Cu <td>B <td>Mo <td>Cl <td>Li</td> </td></td></td>	B <td>Mo <td>Cl <td>Li</td> </td></td>	Mo <td>Cl <td>Li</td> </td>	Cl <td>Li</td>	Li
Broadcast	2.1	0.77	1.5	13.4	0.55	0.33	0.44	0.03	0.03	0.01	0.01			0.27
Soil Incorporate	2.5	0.96	1.7	16.7	0.68	0.41	0.55	0.04	0.04	0.01	0.01			0.27
Completed: June 10, 2010	Other Elements													
	Na	Ni	Cd	Pb	Al	Se	Li	Si	SS	C:N	DM%	CCE%	ALE(tons)	
	297								6.59	52	31.59	44.66		



Sample Information		Laboratory Results (parts per million unless otherwise noted)													
Sample ID:		N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	C
ROW 7	Total	4985	789	1855	28746	1130	752	1842	58.7	51.9	13.4	18.3			156490
	IN-N														
	-NH4														
	-NO3														
	OR-N														
	Urea														
			Na	Ni	Cd	Pb	Al	Se	Li	pH	SS	C:N	DM%	CCE%	ALE(tons)
			376							6.24	72	31.39	67.57		
Recommendations:		Nutrients Available for First Crop													
Application Method		N	P2O5	K2O	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	Li
Broadcast		3.4	1.5	2.4	23.3	0.92	0.61	1.5	0.05	0.04	0.01	0.01			0.51
Soil Incorp		4.0	1.8	2.7	29.1	1.2	0.76	1.9	0.06	0.05	0.01	0.02			0.51
Sample Information		Laboratory Results (parts per million unless otherwise noted)													
Sample ID:		N	P	K	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	C
ROW 8	Total	5840	792	2077	28606	1109	774	1486	62.2	51.0	14.7	18.3			198010
	IN-N														
	-NH4														
	-NO3														
	OR-N														
	Urea														
			Na	Ni	Cd	Pb	Al	Se	Li	pH	SS	C:N	DM%	CCE%	ALE(tons)
			332							6.22	76	33.91	66.13		
Recommendations:		Nutrients Available for First Crop													
Application Method		N	P2O5	K2O	Ca	Mg	S	Fe	Mn	Zn	Cu	B	Mo	Cl	Li
Broadcast		3.9	1.4	2.6	22.7	0.88	0.61	1.2	0.05	0.04	0.01	0.01			0.44
Soil Incorp		4.6	1.8	3.0	28.4	1.1	0.77	1.5	0.06	0.05	0.01	0.02			0.44



Reprogramming of the laboratory-information-management system that makes this report possible is being funded through a grant from the North Carolina Tobacco Trust Fund Commission.

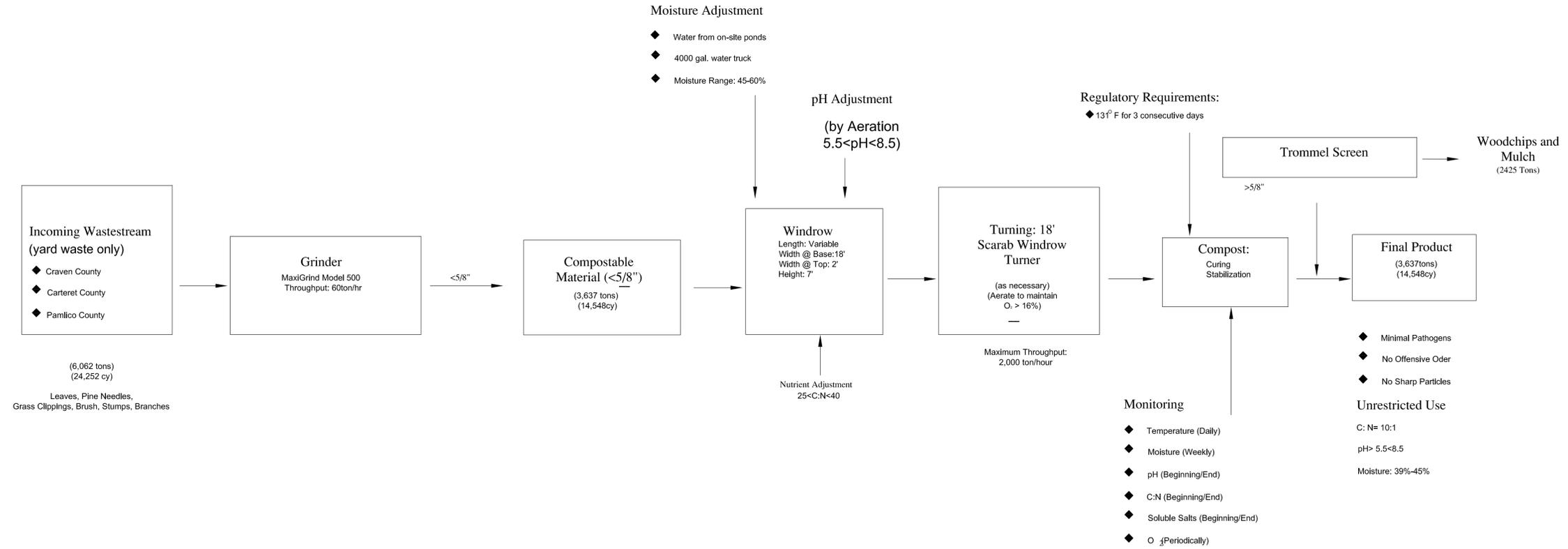
Thank you for using agronomic services to manage nutrients and safeguard environmental quality.  
- Steve Troxler, Commissioner of Agriculture

## **APPENDIX 8**

### Process Flow Diagrams

# PROCESS FLOW DIAGRAM

## Coastal Regional Solid Waste Management Authority TYPE 1 Composting Facility



**Notes:**

- ◆ Total tonnage estimates are based on average monthly tonnage times 12 as calculated from the Table contained in Appendix 2.
- ◆ Product tonnages based on percentage produced as calculated in the same table.
- ◆ Assumed daily density of incoming material: 500lb/cy

10-24 Weeks

<p><b>CRSWMA: TUSCARORA LANDFILL COMPOSTING FACILITY</b></p> <p><b>PROCESS FLOW DIAGRAM</b></p>	<p>DESIGNED: EA DRAWN: RWJ CHECKED: CM APPROVED: EA DATE: _____</p> <p>© 2010 Jayco Engineering, Inc. All rights reserved.</p>										
<p>PROJECT NO. <b>618.1001.12</b></p>	<p>REVISIONS AND RECORD OF ISSUE</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NO.</th> <th>BY</th> <th>DATE</th> <th>CK</th> <th>APP</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>	NO.	BY	DATE	CK	APP					
NO.	BY	DATE	CK	APP							
<p>SCALE <b>AS SHOWN</b></p>											
<p>DRAWING NO. <b>3</b></p>											

## **APPENDIX 9**

### Operational Records

## **APPENDIX 10**

### Moisture and Temperature Logs

# Coastal Region Solid Waste Management Authority

## Temperature Log

(Complete one (1) log per windrow)

---

Windrow ID Number

---

Date Windrow Started

---

General Location & Length

Date	√ if turned and number of times turned	Temp. Location #1	Temp. Location #2	Temp. Location #3	Temp. Location #4	Weather Conditions and Temperature	Initials
MM/DD/YYYY	√ 2 times	131° F	131° F	131° F	131° F	Sunny/90°	INT
		<div style="border: 1px solid black; padding: 2px; display: flex; justify-content: space-around;"> <span>×</span> <span>×</span> <span>×</span> <span>×</span> </div>					
		<div style="border: 1px solid black; height: 15px; width: 100%;"></div>					
		<div style="border: 1px solid black; height: 15px; width: 100%;"></div>					
		<div style="border: 1px solid black; height: 15px; width: 100%;"></div>					

\*Temperature must reach 131 °F for 48 hours.

\*Mark on where temperatures were taken.



## **APPENDIX 11**

### Operational Tables

**COMPOST FACILITY  
OPERATING GUIDE**

**DRAFT 2.0**

**8/1/93**

1993

First Edition

**THE COMPOSTING COUNCIL  
ALEXANDRIA, VIRGINIA**

### 3.1.4

## Feedstock Preparation/Control Moisture

Before facility-specific feedstock blending/moistening correlations have been established, such as during facility start-up and initial operations, assume a feedstock moisture content such as 35 percent, a 55 percent control point, and calculate water addition as follows:

$$\frac{F(f) + W}{F + W} = m$$

Where  $F$  = Feedstock weight, tons  
 $W$  = Added water weight, tons  
 $f$  = Feedstock moisture content, percent total weight  
 $m$  = Mixture (feedstock + added water) moisture content, percent total weight

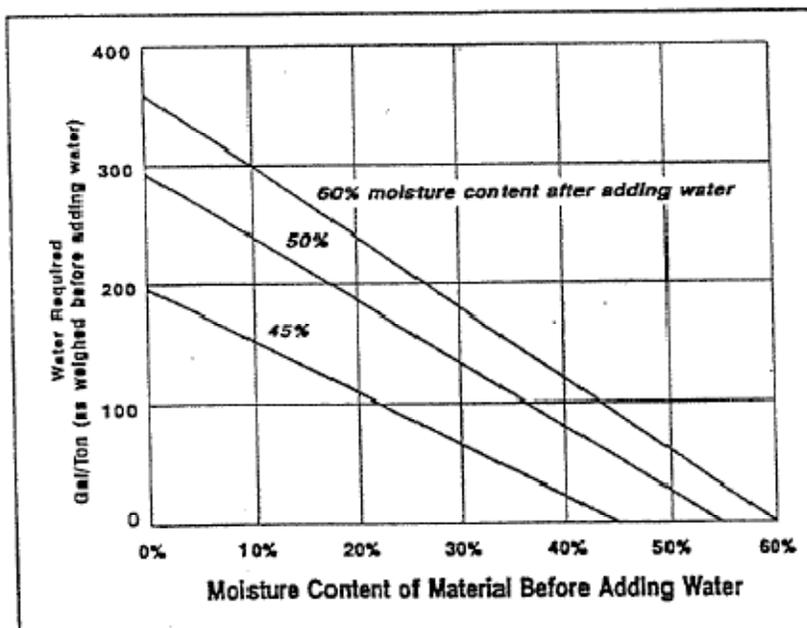


Figure 3.1.4-2 - Water addition requirements during preparation for resulting moisture contents of 45%, 55%, and 60%.

Solving this equation for water addition required gives:

$$W = F(m-f)/(1-m)$$

As an example, for moisture content of 30 percent in feedstock as received, 55 percent in the prepared feedstock mix, the water addition is 56 percent of the feedstock weight or 133 gallons per ton of feedstock. This relationship is depicted in Figure 3.1.4-2.

Table 3.1.4-1 lists moisture additions required (both gallons per ton and weight percent of feedstock) at various weights.

### 3.1.4

## Feedstock Preparation/Control Moisture

**Table 3.1.4-1**  
Water Required for Various Feed  
and Mixture Moisture Contents

Moisture Content (%)		Water Added to Feed
Feed (before adding water)	Mix (after adding water)	Gallons per Ton of Feed
0	45	196
5	45	175
10	45	153
15	45	131
20	45	109
25	45	87
30	45	65
35	45	44
40	45	22
45	45	0
0	55	293
5	55	267
10	55	240
15	55	213
20	55	187
25	55	160
30	55	133
35	55	107
40	55	80
45	55	53
50	55	27
55	55	0
0	60	360
5	60	330
10	60	300
15	60	270
20	60	240
25	60	210
30	60	180
35	60	150
40	60	120
45	60	90
50	60	60
55	60	30
60	60	0

#### ANALYTIC TEST METHOD

Moisture content (on percent total weight basis) is determined by weight loss on drying, and is calculated as:

$$\frac{(\text{wet weight of sample}) - (\text{dry weight of sample})}{(\text{wet weight of sample})}$$

The procedure is described in Section 6.1.2, TESTING.

#### REFERENCES

Golueke, Clarence G. *Principles of Composting*.

Martin, Alexander. *Introduction to Soil Microbiology*, 1977.

### 3.2.3

## Composting High Rate/Turning and Mixing

### OPERATING BOUNDARIES

#### OVERVIEW

Biological, marketing, and facility hygiene objectives are the leading reasons for **TURNING AND MIXING**. There are no objective measurements for determining operating boundaries for this step, so operators will need to learn from experience.

#### UNITS OF MEASURE

None.

#### CONTROL POINT: 1 TO 7 TIMES PER WEEK

Although several methods could be used to determine when **TURNING AND MIXING** is needed (as discussed below in Control Monitoring), most operators do not gather specific data. Instead, many facilities conduct **TURNING AND MIXING** on a schedule determined from operating experience with factors such as:

- the need to create space for new material
- water addition schedule
- clumping in material
- proportion of paper in material (paper contributes to clump formation)
- labor required for **TURNING AND MIXING**
- equipment required for **TURNING AND MIXING**
- vector control (flies)

At a minimum, **TURNING AND MIXING** should occur whenever water is added to distribute it evenly throughout the composting material. Depending on the composting system, **TURNING AND MIXING** frequency during **COMPOSTING HIGH RATE** can range from once per day to once per week. As a starting point, until facility-specific data are obtained, the operator can assume that aerated composting materials lose about 5 percent of their moisture content per day<sup>4</sup>, and that the moisture limits are 60 percent maximum (after mixing/rewetting) and 45 percent minimum (before mixing/rewetting). Figure 3.2.3-1 illustrates such a situation. As seen in Figure 3.2.3-1, a 5 percent daily loss of moisture content will dry the material from 60 percent to 45 percent moisture in five to six days, and would go as low as about 42 percent in

<sup>4</sup>This moisture loss is expressed as the "percentage loss of moisture content per day," not as the absolute loss of moisture content per day. Therefore, a loss of 5 percent of moisture content per day means that moisture content might be 60% in day 1, 57% in day 2, 54% in day 3, 51% in day 4, and 49% in day 5. Each day's moisture content is determined by multiplying the previous day's moisture content by 95%, not by subtracting 5% from the previous day's value.

### 3.2.3

## Composting High Rate/Turning and Mixing

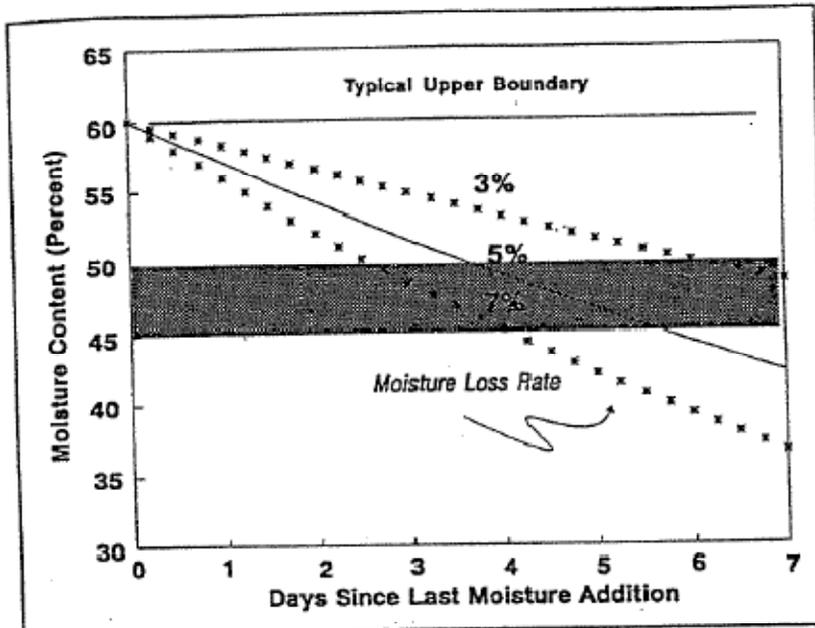


Figure 3.2.3-1 - Moisture losses over time at a starting moisture content of 60%. Shaded area represents range of typical lower boundaries.

seven days.

Figure 3.2.3-1 also shows that a daily moisture loss of 3 percent will dry material from 60 percent to about 50 percent in six days, and that a 7 percent daily loss will dry material from 60 percent to 50 percent in about 3 days. Figure 3.2.3-2 shows that to maintain a  $55 \pm 2.5$  percent

moisture level, the material should be turned and rewetted every day. To maintain moisture content between 45 percent and 60 percent would require turning and rewetting every 6 days.

Therefore, with the 5 percent loss of moisture content per day assumption, **TURNING AND MIXING** 60 percent moist material should occur in 6 days or less, when water must be added again. Facilities that need to control moisture within a closer range (such as between 57 percent and 53 percent) will need to add water more often. Therefore, the material must be turned and mixed more often. Likewise, facilities that **TURNING AND MIXING** more often (such as once per day) to create space in a processing area, may also add water more often (since material will be turned anyway) and maintain a tighter range of moisture content.

Figures 3.2.3-1 and 3.2.3-2 have two practical uses. You can use them to:

- Determine the day of the next **TURNING AND MIXING** operation at a specific initial moisture content (as in the example above).

### 3.2.3

## Composting High Rate/Turning and Mixing

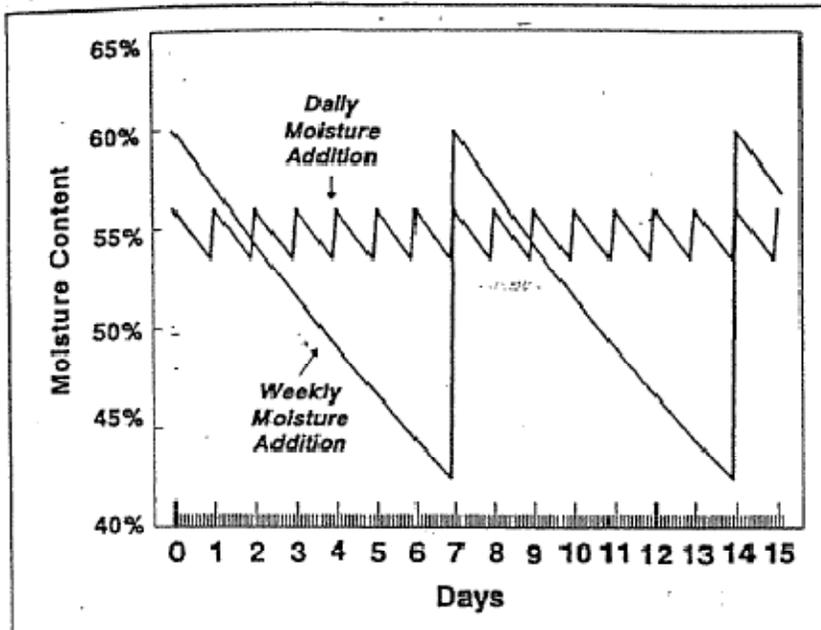


Figure 3.2.3-2 - How frequency of moisture addition affects operating boundaries.

- has a lower limit of 50 percent moisture, and
- the target moisture addition during mixing is unknown.

Using those assumptions, and following the 5 percent daily loss line on Figure 3.2.3-1, from 50 percent (3.5 days) backwards 3 days (to 0.5 days) shows that the starting moisture should be about 58 percent. With the same loss rate and lower boundary, the graph shows that turning every 6 days would require that the material be too wet just after turning or too dry just before turning.

The 5 percent per day drying rate may not be applicable to a specific facility or process, and that a facility-specific correlation should be established. Figure 3.2.3-1 shows the effect of moisture losses ranging from 3 percent/day to 7 percent/day — thus showing the typical sensitivity to moisture loss rate.

The drying rate also may not be uniform with time during the composting process. For example, composting material tends to dry out relatively slowly at the beginning of composting when the material is aerated less because it has not heated up. Similarly, moisture loss *after* TURNING AND MIXING may be lower than normal because the

- By reading the graphs backwards, determine the target moisture content for closer control or for facilities that TURNING AND MIXING according to a set schedule (such as the need to create space for new material).

To demonstrate, assume a facility:

- turns and mixes every 3 days,
- loses 5 percent of moisture content daily,

### 3.3.1

## Composting Stabilization/Control Moisture

**TABLE 3.3.1-1**  
**FREQUENCY OF MOISTURE ADDITION**  
**AT VARIOUS LOSS RATES (in Days)**

	Ending Moisture Content (%)	Starting Moisture Content (%)					
		40	45	50	55	60	65
3% Daily Loss	40	0	3	6	9	12	15
	45	0	0	3	6	9	12
	50	0	0	0	3	6	9
	55	0	0	0	0	3	6
	60	0	0	0	0	0	3
	65	0	0	0	0	0	0
5% Daily Loss	40	0	2	4	6	8	10
	45	0	0	2	4	6	8
	50	0	0	0	2	4	6
	55	0	0	0	0	2	4
	60	0	0	0	0	0	2
	65	0	0	0	0	0	0
7% Daily Loss	40	0	2	3	4	6	8
	45	0	0	2	3	4	6
	50	0	0	0	2	3	4
	55	0	0	0	0	2	3
	60	0	0	0	0	0	2
	65	0	0	0	0	0	0

surface area) will lose more moisture to evaporation than a narrow, high pile containing the same quantity of composting material.

- **Turning and Mixing.** Turning and mixing expose hot, wet materials to ambient air, leading to high evaporation rates.
- **Aeration.** Forcing (or drawing) air through composting materials decreases the moisture content by increasing microbial activity and by evaporating water into the moving air stream. Positively aerated composts (air *pushed upward* into the material) tend to dry first at the bottom. Negatively aerated composts (air *drawn downward* into the material) tend to dry first at the surface.

Moisture content falls naturally during the composting process as water evaporates into the air being forced through the composting material. If moisture content is too high, repeated turning and high rates of aeration can help dry the material more rapidly than normal. However, it is more difficult to turn and aerate material that is too wet.

#### WHEN

Makeup water will be required regularly during COMPOSTING STABILIZATION to counteract evaporation losses and to maintain sufficient moisture for nutrient distribution. Add water just before or during the TURNING AND MIXING process to distribute it uniformly throughout the material. Add water before any part of the material dries to 45 percent moisture or lower.

### 3.3.3

## Composting Stabilization/Control pH

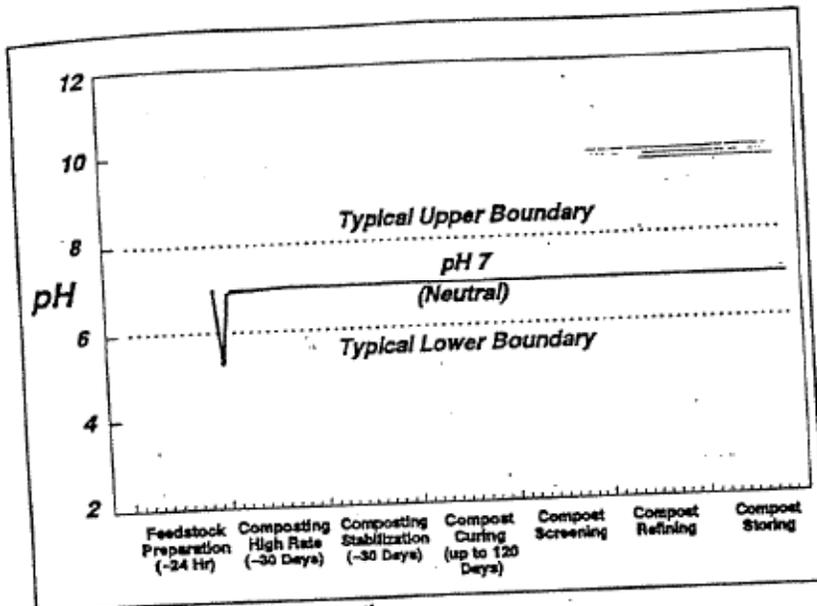


Figure 3.3.3-1 - pH during composting.

#### BIOLOGICAL

The pH of composting material affects the types of microorganisms active during the composting process. Bacteria are most abundant within a pH range of 6.0 to 7.5; fungi flourish between 5.8 to 8.0. Microbial activity is optimum when pH is between about 6.0 and 8.0.

If the oxygen supply during composting is

inadequate, anaerobic pockets may form. Anaerobic fermentation also forms organic acids, which can cause the pH to drop to 3.5 to 5.0, significantly slowing microbial activity. As organic material decomposes further and temperatures rise, the compost stabilizes naturally at a pH between 6.0 and 8.0. In addition, the decomposition of proteins contributes to the production of  $\text{NH}_3$  (ammonia), further neutralizing acids. Excess nitrogen in the feedstock or a high pH can drive off nitrogen in the form of  $\text{NH}_3$ .

At a neutral pH ( $7.0 \pm 1.0$ ), metabolic activity in the microbial colonies releases  $\text{CO}_2$ . With increased aeration, the release of  $\text{CO}_2$  to the atmosphere will help raise the pH.

#### COMPOST SAFETY STANDARDS

Compost having a pH between 5.5 and 8.5 meets compost safety standards developed by the Composting Council for General Use Compost. A pH lower than 5.5 and higher than 8.5 can adversely affect plants and the environment. Maintaining pH above 5.5 helps to prevent corroding metal in the feedstock and in facility equipment, and reduces the potential for metal contamination of the final product.

## 3.3.2 Composting Stabilization/Turning and Mixing

TABLE 3.3.2-1  
TYPICAL TURNING AND MIXING FREQUENCIES

Frequency	Feedstock Preparation	Composting High Rate	Composting Stabilization	Compost Curing	Compost Storing
Continuous	✓	■			
Daily	■	✓			
Several times per week		✓	■		
Weekly		■	✓	■	
Monthly				✓	✓
No turning and mixing					✓

Key: ✓ Most common. ■ Not as common.

### OBJECTIVE

#### OVERVIEW

The objectives of **TURNING AND MIXING** are to:

- blend makeup water uniformly throughout the compost
- homogenize the compost product by distributing various feedstock materials
- break up clumps in composting materials that can become anaerobic, too wet, or too dry
- break up air channels between clumps of composting materials that can over-dry areas near the channel and starve other areas of adequate air

- aid physical breakdown of materials
- kill fly larvae that may grow on the surface of the composting material
- move older material to make room for newer material
- expose all materials to high temperature during the **CONTROL PATHOGENS** step.

**TURNING AND MIXING**, combined with proper moisture, aeration, and nutrients, provides a hospitable environment for efficient decomposition of organic material.

#### BIOLOGICAL

The microbes that decompose organic matter require water, nutrients, and air in the correct proportions throughout the entire mass of composting material. **TURNING AND MIXING** helps distribute water, nutrients, and air uniformly to the microbes. If the material is not mixed, the added water may concentrate at the top or bottom of a composting material, making some parts too wet and leaving other parts too dry.

**TURNING AND MIXING** usually involves exposing each part of the composting material to the air, so the process also aerates and cools the composting material. Because of the high rate of oxygen consumption during decomposition, **TURNING AND MIXING** must be supplemented with forced aeration to supply enough oxygen to the microbes. (See 3.3.4, **COMPOSTING STABILIZATION/AERATE**.)

## **APPENDIX 12**

### Information on CRSWMA Composting



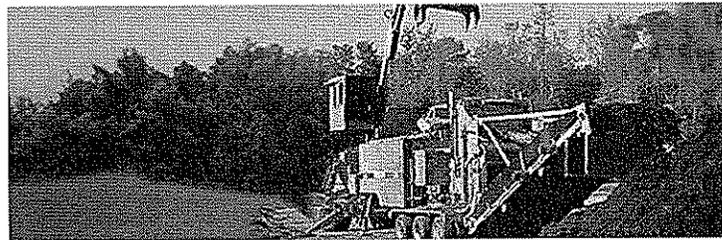
[Home Page](#) [How We Operate](#) [Waste Disposal](#) [Hazardous Household Waste](#) [Compost for Sale](#) [Rates Info](#) [Locations & Hours](#) [Landfill Gas](#) [Directors & Staff](#) [Tours & Speakers](#) [Links & Resources](#) [Photos & Videos](#) [Contact Us](#) [CEP News](#)

## Compost for Sale

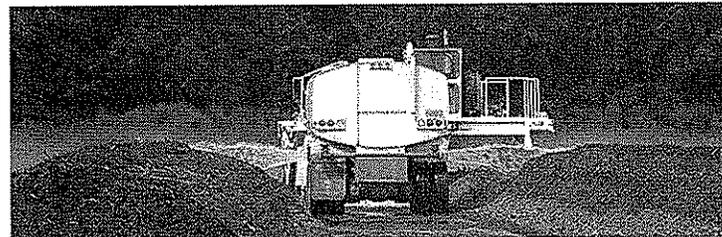
CEP produces a high-quality yard waste compost for sale to the public. This product, known as "CoastalGrow" is available in bulk for \$30.00 per ton at the Tuscarora Landfill, Grantsboro Transfer Station and Newport Transfer Station. Compost is an organic amendment to improve the chemical, physical and biological properties of soils. It is not normally considered a fertilizer as it is too low in nutrient content for all plant nutrient needs. However, compost has many benefits for soil improvement and plant growth.



CEP grinds only clean yard waste (leaves, limbs, etc.) for compost. No painted, pressure-treated or creosote wood is used.



After grinding, the material is laid out in windrows and nitrogen and water are added. The nitrogen speeds up the aerobic decomposition of the material and the internal temperature of the windrows rises to over 131 degrees, killing off weed seeds and other undesirable matter. As the compost continues to decompose, the windrows are kept moist and turned weekly to keep the process going.



Then the material is screened through a machine known as a trammel screen. The trammel screen separates small particles of yard waste from large particles. With openings only 5/8ths of an inch in the screen, only very small particles are used for compost.



After the compost has stabilized and matured, it is ready to sell. The larger particles are sold as mulch or used in other landfill operations. CoastalGrow has gained wide acceptance by landscapers and gardeners in the Carteret, Craven and Pamlico County area.

For additional information about CoastalGrow, please call (252) 633-1564 or [Email Us](#) to request a brochure with details on how this product should be used.

COASTAL ENVIRONMENTAL  
PARTNERSHIP

7400 Old Hwy. 70 West  
New Bern, NC 28562  
Tel: 252-633-1564  
Email: [info@cep.org](mailto:info@cep.org)

THE COASTAL ENVIRONMENTAL PARTNERSHIP, INC. (CRS/WMA) • 7400 Old Hwy. 70 West • New Bern, NC 28562 • 252-633-1564 • [Email Us](#)

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Web design: [Bruce Wise designs](#)

## **APPENDIX 13**

Permits

Prepared for:  
Coastal Regional Solid Waste Management Authority (CRSMWA)  
P.O. Box 128  
Cove City, North Carolina 28523

JEI PROJECT NO. 618.01, TASK 11

## COMPOSTING FACILITY APPLICATION

TYPE 1 – Yard Waste Composting  
TYPE 4 – Yard Waste/Sludge Co-Composting

CRAVEN COUNTY, NORTH CAROLINA

SEPTEMBER 2005  
Revised DECEMBER 2005



**APPROVED**  
DIVISION OF WASTE MANAGEMENT  
SOLID WASTE SECTION  
DATE 12/20/05 BY JL

Prepared by:



2301 West Meadowview Road, Suite 203  
Greensboro, North Carolina 27407  
(336) 323-0092



**North Carolina Department of Environment and Natural Resources**

Dexter R. Matthews, Director

Division of Waste Management

Michael F. Easley, Governor  
William G. Ross Jr., Secretary

December 20, 2005

Mr. Allen Hardison  
P.O. Box 128  
Cove City, NC 28523

DEC 22 2005

Dear Mr. Hardison:

Enclosed is the permit for the Coastal Regional Management Authority to operate a Solid Waste Compost Facility on Old Highway 70 in Craven County. Your permit number is SWC-25-11.

Please carefully read the permit conditions that are attached to the permit. The operation and maintenance information submitted with the application has been incorporated into the permit. Please note that a pre-operation inspection will be required prior to putting the Type IV portion of the facility into use.

Mr. Ray Williams, Regional Waste Management Specialist, will be responsible for oversight and inspection of the facility and related activities. Mr. Williams can be contacted at (910) 796-7388.

If you have any questions please feel free to contact me at 919-508-8508.

Sincerely,

Ted Lyon, Supervisor  
Composting & Land Application Branch

cc: Ray Williams, Waste Management Specialist, Wilmington Regional Office  
Joyce Engineering, Greensboro, NC 27407  
Central Files, Solid Waste Section, Div. of Waste Management

h:compost/permits/25-craven/25-11\_12-05\_repercl

Coastal Regional Solid Waste  
Management Authority (CRSWMA)

Composting Facility  
Permit Application

Permit 25-11

**APPROVED**  
DIVISION OF SOLID WASTE MANAGEMENT  
DATE 12/15/2000 BY TL

**TYPE 1**

Yard Waste Composting  
(in operation)

**TYPE 4**

Yard Waste/Sludge Co-Composting  
(originally permitted but not yet  
in operation)

June 23, 2000

Revision 1, August 11, 2000

Revision 2, September 12, 2000 (Permit #)

*Prepared by:*



**Draper Aden Associates**  
Engineering • Surveying • Environmental Services

2521 Schieffelin Road, Suite 106  
Apex, North Carolina 27502  
919-367-9997  
Fax: 919-367-9994  
Email: daa@daa.com



**Clayton, P.E.**  
2807 Neuse Blvd., Bldg. 5  
New Bern, North Carolina 28562  
252-672-0304  
Fax: 252-633-6551  
Email: ctc@cconnect.net

PERMIT 25-04  
MODIFICATION ISSUED JULY 5, 1994

STATE OF NORTH CAROLINA  
DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES  
DIVISION OF SOLID WASTE MANAGEMENT  
P.O. BOX 27687      RALEIGH, N.C. 27611

**SOLID WASTE PERMIT**

Coastal Regional Solid Waste Management Authority

Is hereby issued a permit to construct a

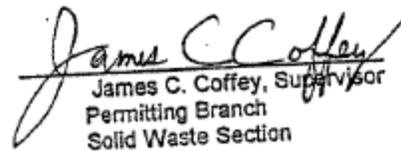
**MUNICIPAL SOLID WASTE COMPOST FACILITY**

located within the CRSWMA Interim Regional Landfill

located

SR 1005, Tuscarora,  
Craven County, North Carolina

in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit.

  
James C. Coffey, Supervisor  
Permitting Branch  
Solid Waste Section

#### CONDITIONS OF PERMIT

1. This facility shall be constructed in accordance with the approved plan and all pertinent rules and regulations. Any proposed modifications to the approved plan require prior approval by the Solid Waste Section.
2. All sedimentation and erosion control activities shall be conducted in accordance with the plan approved by the Division of Land Resources and the Sedimentation Control Act, codified at 15 NCAC 4.
3. Prior to receiving any waste at this facility, a permit to operate must be obtained. The following conditions shall be met in order to obtain a permit to operate this facility:
  - a. A site inspection shall be made by a representative of the Division of Solid Waste.
  - b. All requirements of 15 A NCAC 13B .1400 shall be met.
  - c. An Operation Plan must be prepared and submitted to the Section for approval. The Operation Plan must be submitted as a part of, and in a format for incorporation into, the Transition Plan.
4. This permit is not transferable.
5. This construction plan and narrative must be incorporated into the CRSWMA Interim Regional Landfill Transition Plan currently under review by this Section.
6. This approval for construction is valid only until such time as this construction plan is given final approval through the Transition Plan and does not imply or guarantee that any part of the Transition Plan will be approved, or approved without changes.

State of North Carolina  
Department of Environment,  
Health and Natural Resources  
Division of Environmental Management



James B. Hunt, Jr., Governor  
Jonathan B. Howes, Secretary  
A. Preston Howard, Jr., P.E., Director

**MEMORANDUM**

To: Ted Lyon, Supervisor  
Septage Management Branch

From: Don Saffrit, Assistant Chief  
Technical Support Branch

Subject: CRSWMA MSW Compost Facility Application

Date: July 12, 1994



After reviewing the information concerning the Coastal Regional Solid Waste Management Authority MSW compost facility the Division of Environmental Management has the following comments:

There does not appear to be an exclusion from 40 CFR Part 503 for wastewater sewage sludge composted with municipal solid waste. Sewage sludge disposed at a municipal solid waste landfill would be excluded however, this does not include composting with municipal solid waste. Therefore, the subject facility will need to meet all the requirements of 40 CFR Part 503 and not just the pathogen reduction requirement. This facility would be required to meet the following:

- a. ceiling concentrations for pollutants 40 CFR Part 503.13 (Table 1)
- b. monthly average concentrations for pollutants 40 CFR Part 503.13 (Table 3)
- c. pathogen reduction alternatives 40 CFR Part 503.15 (a)(3)
- d. vector attraction reduction alternatives 40 CFR Part 503.15 (b)(3)
- e. Certifications verifying pathogen and vector attraction reduction methods 40 CFR Part 503.17 (a)(6)
- f. labeling requirement 40 CFR Part 503.14 (e)
- g. monitoring and reporting frequency 40 CFR Part 503.16 (a)

I have attached an application form which the Permits and Engineering Unit will begin using for facilities which plan on composting (or Distribution and Marketing). This application takes into account all state and federal regulations regarding the use of municipal sewage sludge when it is distributed to the public for use in lawns or gardens. We are not advocating that a permit must be obtained from DEM, however, the requirements of 40 CFR Part 503 must be addressed prior to sign-off by the Water Quality Section.

If you need further information or would like to discuss this further, please contact myself or Mr. Michael Allen at 733-5083.

cc: Michael Allen  
Carolyn McCaskill

P.O. Box 29535, Raleigh, North Carolina 27629-2535  
An Equal Opportunity Affirmative Action Employer

Post-It™ brand fax transmittal memo 7871		# of pages	1
To	Lori Dutz	From	Ted Lyon
Co.		Co.	
Dept.		Phone	919-733-0692
Fax	919-633-6515	Fax	919-733-4810

State of North Carolina  
Department of Environment,  
Health and Natural Resources  
Washington Regional Office

James B. Hunt, Jr., Governor  
Jonathan B. Howes, Secretary  
Nancy W. Smith, Regional Manager



DIVISION OF ENVIRONMENTAL MANAGEMENT  
29 June 1994

CRSWMA  
c/o Ms. Lori A. Dietz  
P.O. Box 1166  
New Bern, North Carolina 28563

SUBJECT: STORMWATER APPROVAL  
Coastal Regional Solid Waste Management Authority  
Craven County

Dear Ms. Dietz:

The Washington Regional Office received your completed Stormwater Management Plan for the subject project on 16 June 1994. The project involves the construction of a compost facility at the existing Craven County Landfill site. Stormwater will be collected and treated in a 1.6 acre wet detention pond. Based upon our review, the project complies with the Stormwater Regulations set forth in Title 15 NCAC 2H.1000.

In order to assure that the proposed stormwater control facilities are constructed properly, this Division will require a professional engineer's certification upon completion of the project. The attached certification must be submitted within 60 days after completion of the facilities.

If you have any questions concerning this matter, please contact Mr. Bill Moore at (919) 946-6481.

Sincerely,

*Roger K. Thorpe*  
Roger K. Thorpe, P.E.  
Water Quality Regional Supervisor

cc: Bradley Bennett  
Malcolm Pirnie Inc.

Post-It® brand fax transmittal memo 7671		# of pages = 1	
To Lori A. Dietz	From Bill Moore		
Co. CRSWMA	Co. DEM-WQ		
Dept.	Phone # 946-6481		
Fax # 919-633-6515	Fax # 919-975-3766		

JUN 28 1994

State of North Carolina  
Department of Environment,  
Health and Natural Resources  
Division of Environmental Management

James B. Hunt, Jr., Governor  
Jonathan B. Howes, Secretary  
A. Preston Howard, Jr., P.E., Director



June 24, 1994

Ms. Lori A. Deitz  
Coastal Regional Solid Waste Management  
P.O. Box 1166  
New Bern, N.C. 28563

Subject: General Permit No. NCG010000  
Coastal Regional Solid Waste Management  
COC NCG011089  
Craven County

Dear Ms. Deitz:

In accordance with your application for discharge permit received on June 16, 1994, we are forwarding herewith the subject certificate of coverage to discharge under the subject state - NPDES general permit. This permit is issued pursuant to the requirements of North Carolina General Statute 143-215 .1 and the Memorandum of Agreement between North Carolina and the US Environmental Protection Agency dated December 6, 1983.

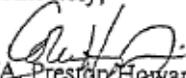
If any parts, measurement frequencies or sampling requirements contained in this permit are unacceptable to you, you have the right to request an individual permit by submitting an individual permit application. Unless such demand is made, this certificate of coverage shall be final and binding.

Please take notice that this certificate of coverage is not transferable except after notice to the Division of Environmental Management. The Division of Environmental Management may require modification or revocation and reissuance of the certificate of coverage.

This permit does not affect the legal requirements to obtain other permits which may be required by the Division of Environmental Management or permits required by the Division of Land Resources, Coastal Area Management Act or any other Federal or Local governmental permit that may be required.

If you have any questions concerning this permit, please contact Liz Kovasckitz at telephone number 919/733-5083.

Sincerely,

  
A. Preston Howard, Jr., P. E.

cc: Washington Regional Office

STATE OF NORTH CAROLINA  
DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES  
DIVISION OF ENVIRONMENTAL MANAGEMENT

GENERAL PERMIT NO. NCG010000  
CERTIFICATE OF COVERAGE NO. NCG011089

STORMWATER DISCHARGES

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provision of North Carolina General Statute 143-215.1, other lawful standards and regulations promulgated and adopted by the North Carolina Environmental Management Commission, and the Federal Water Pollution Control Act, as amended,

Coastal Regional Solid Waste Management Authority

is hereby authorized to discharge stormwater from land disturbing activities located at

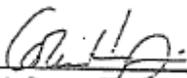
Co-Compost Facility  
SR 1005  
Tuscarora  
Craven County

to receiving waters designated as Jumping Run Creek in the Neuse River Basin  
in accordance with the effluent limitations, monitoring requirements, and other conditions set forth in Parts I, II, III  
and IV of General Permit No. NCG010000 as attached.

This Certificate of Coverage shall become effective June 24, 1994.

This Certificate of Coverage shall remain in effect for the duration of the General Permit.

Signed this day June 24, 1994.

  
\_\_\_\_\_  
At: Preston Howard, Jr., P.E., Director  
Division of Environmental Management  
By Authority of the Environmental Management Commission

# CERTIFICATE OF PLAN APPROVAL



The posting of this certificate certifies that an erosion and sedimentation control plan has been approved for this project by the North Carolina Department of Environment, Health, and Natural Resources in accordance with North Carolina General Statute 113A - 57 (4) and 113A - 54 (d) (4) and North Carolina Administrative Code, Title 15A, Chapter 4B.0007 (c). This certificate must be posted at the primary entrance of the job site before construction begins and until establishment of permanent groundcover as required by North Carolina Administrative Code, Title 15A, Chapter 4B.0027(b). **CONDOSING FACILITY**

**TASCARORA - CRAVEN Co.**

Project Name and Location

**6-9-99**

Date of Plan Approval

**Floyd Williams**

Regional Engineer

STATE OF NORTH CAROLINA  
DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES  
DIVISION OF ENVIRONMENTAL MANAGEMENT

GENERAL PERMIT

TO DISCHARGE STORMWATER UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

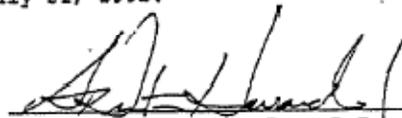
In compliance with the provision of North Carolina General Statute 143-215.1, other lawful standards and regulations promulgated and adopted by North Carolina Environmental Management Commission and the Federal Water Pollution Control Act as amended,

All owners or operators of stormwater point source discharges associated with construction activities including clearing, grading and excavation activities resulting in the disturbance of five or more acres of total land area are hereby authorized to discharge stormwater to the surface waters of North Carolina or to a separate storm sewer system conveying stormwater to the surface waters. Facilities disturbing less than five acres may be covered by this permit on a case-by-case basis if the discharges are a source of significant pollutants.

The General Permit shall become effective on September 1, 1992.

The General Permit shall expire at midnight on August 31, 1997.

Signed this day July 31, 1992.



A. Preston Howard, Jr., P.E., Acting Director  
Division of Environmental Management

By the Authority of the Environmental Management Commission

## **APPENDIX 14**

### Equipment Specifications

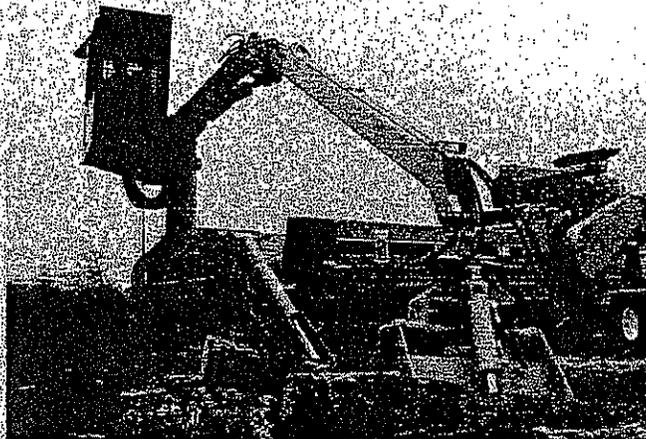
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OKLAHOMA CITY, U.S.A.



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VERSATILE



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PRACTICAL

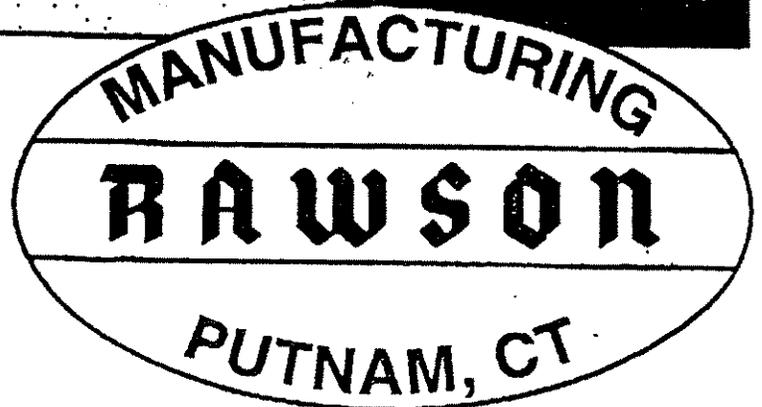
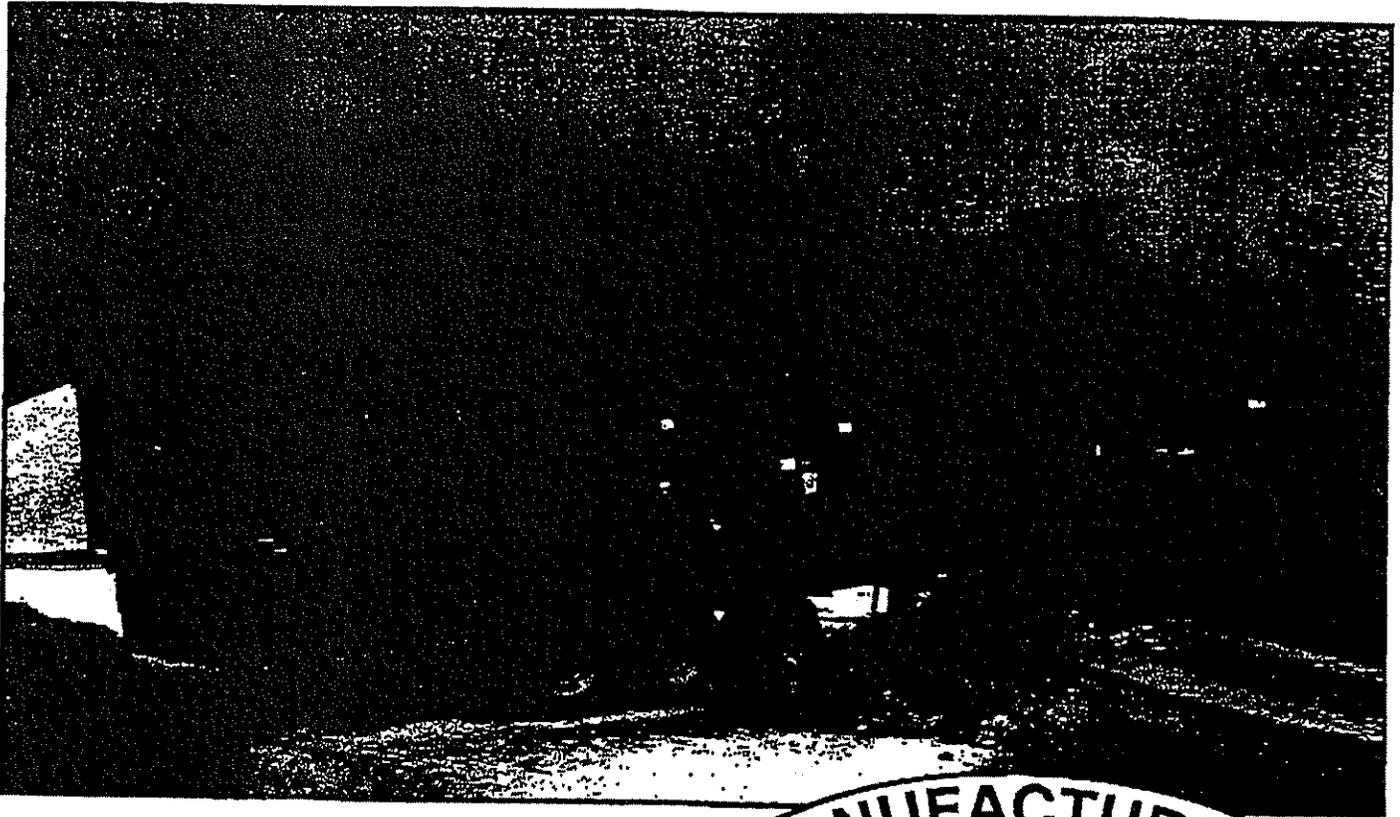


EFFICIENT



# RAWSON

## MODEL 613



### FEATURES

- 1) All Electric Drive
- 2) Easy Setup
- 3) Products Completely Separated
- 4) Remote Control to Dump Grizzly
- 5) 120 Volt Outlet
- 6) Extra Electric Power to Operate Additional Conveyors and Screens
- 7) Screen at Ground Level for Easy Maintenance
- 8) Conveyor Only Transports Screened Product

1-860-928-4458  
1-800-729-7660

[SuperScreener](#)[Trommels](#)[Vibratory Screens](#)[Windrow Composting Turners](#)

[Scarab 14-ENA-275](#)  
[Scarab 16](#)  
[Scarab 18](#)  
[Scarab 20HYD-525-RT](#)  
[Scarab 8E-100](#)

[Crushers](#)[C & D Recycling](#)[engcon Tiltrotators](#)[Demonstration & Used Screening Machines](#)

[Home](#) > [Crushing, Screening & Composting Equipment](#) > [Windrow Turners](#)

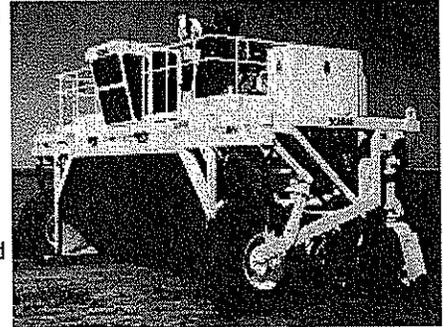
## Scarab Model 18 Windrow Composting Machine

### Features

Designed to be the most efficient and effective means to reduce organic waste back to a stable and useful form, the SCARAB is the best machine to meet your composting and soil remediation needs and site requirements.

### Specifications

- **Tunnel:** 18' x 7' (Approx.), rubber belting, lined to absorb impact and reduce sticking.
- **Engine:** Caterpillar, Tier II Series
- **Drum & Wheel Drives:** All machines equipped with hydraulic drive systems on the drum and wheel systems. SCARAB Automatic Digital Load Controller controls wheel speed to maintain proper drum pressure to prevent damage due to high pressures
- **Drive Systems:** Drive Wheels 23.1L x 26 - 28L x 26 - 67 x 34 - 66 x 43 Rear Casters w/ Single 16.5L x 16.1 or Dual 11L x 15
- **Optional:** Single 21.5L x 16.1 or Dual 16.5L x 16.1 SCARAB Full Track Assemblies, Four Track Drive, Four Wheel Drive
- **Drum:** 32" overall diameter, 1/2" drum wall thickness. Brackets designed with replaceable side plates, tear drop shaped brackets to prevent breakage, brackets designed to accommodate a variety of SCARAB flails.
- **Cab:** Designed and built specifically for the SCARAB. Air conditioned, heated, tilt console with controls electric over hydraulic, sound insulated, tinted safety glass, deluxe operator seat, foot rests, windshield wiper, and all gauges and controls easily accessible.
- **Warranty:** Standard Engine warranty, with extended warranty available. One year on remainder of machine on materials and workmanship. Limited Lifetime Drum Warranty against breakage of shafts and flail rackets.
- **Options:** Automatic Reversing Engine Fan, Automatic Fire Suppression Systems, figuration, Legal Load designs, and more...



## **APPENDIX 15**

### Photographs



1. The Grinder used for the existing composting facility operations.



2. The Grinder used for the existing composting facility operations.



3. Front-end Loader used for the composting facility operations.



4. Windrow Turner for the composting operations.



5. Recirculation system from the adjacent sediment basin for the existing operations.



6. The Screen and stockpiles yard waste for the composting facility operations.



7. Ground yard waste to be made into windrows.



8. Stockpiled mulch to be marketed to the public (outside of the Type 4 Building).



9. Stockpile of wood chips to be marketed to the public.



10. Stockpiled "Coastal Grow" to be marketed to the public.

## **APPENDIX 16**

40 CFR 503.13 Requirements

**§ 503.13**

**40 CFR Ch. I (7-1-07 Edition)**

site since July 20, 1993, and the cumulative amount of each pollutant applied to the site in the bulk sewage sludge since that date is known, the cumulative amount of each pollutant applied to the site shall be used to determine the additional amount of each pollutant that can be applied to the site in accordance with § 503.13(a)(2)(i).

(iv) If bulk sewage sludge subject to the cumulative pollutant loading rates in § 503.13(b)(2) has been applied to the site since July 20, 1993, and the cumulative amount of each pollutant applied to the site in the bulk sewage sludge since that date is not known, an additional amount of each pollutant shall not be applied to the site in accordance with § 503.13(a)(2)(i).

(f) When a person who prepares bulk sewage sludge provides the bulk sewage sludge to a person who applies the bulk sewage sludge to the land, the person who prepares the bulk sewage sludge shall provide the person who applies the sewage sludge notice and necessary information to comply with the requirements in this subpart.

(g) When a person who prepares sewage sludge provides the sewage sludge to another person who prepares the sewage sludge, the person who provides the sewage sludge shall provide the person who receives the sewage sludge notice and necessary information to comply with the requirements in this subpart.

(h) The person who applies bulk sewage sludge to the land shall provide the owner or lease holder of the land on which the bulk sewage sludge is applied notice and necessary information to comply with the requirements in this subpart.

(i) Any person who prepares bulk sewage sludge that is applied to land in a State other than the State in which the bulk sewage sludge is prepared shall provide written notice, prior to the initial application of bulk sewage sludge to the land application site by the applier, to the permitting authority for the State in which the bulk sewage sludge is proposed to be applied. The notice shall include:

(1) The location, by either street address or latitude and longitude, of each land application site.

(2) The approximate time period bulk sewage sludge will be applied to the site.

(3) The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) for the person who prepares the bulk sewage sludge.

(4) The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) for the person who will apply the bulk sewage sludge.

(j) Any person who applies bulk sewage sludge subject to the cumulative pollutant loading rates in § 503.13(b)(2) to the land shall provide written notice, prior to the initial application of bulk sewage sludge to a land application site by the applier, to the permitting authority for the State in which the bulk sewage sludge will be applied and the permitting authority shall retain and provide access to the notice. The notice shall include:

(1) The location, by either street address or latitude and longitude, of the land application site.

(2) The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) of the person who will apply the bulk sewage sludge.

**§ 503.13 Pollutant limits.**

(a) *Sewage sludge.* (1) Bulk sewage sludge or sewage sludge sold or given away in a bag or other container shall not be applied to the land if the concentration of any pollutant in the sewage sludge exceeds the ceiling concentration for the pollutant in Table 1 of § 503.13.

(2) If bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site, either:

(i) The cumulative loading rate for each pollutant shall not exceed the cumulative pollutant loading rate for the pollutant in Table 2 of § 503.13; or

(ii) The concentration of each pollutant in the sewage sludge shall not exceed the concentration for the pollutant in Table 3 of § 503.13.

(3) If bulk sewage sludge is applied to a lawn or a home garden, the concentration of each pollutant in the

**Environmental Protection Agency**

**§ 503.14**

sewage sludge shall not exceed the concentration for the pollutant in Table 3 of § 503.13.

(4) If sewage sludge is sold or given away in a bag or other container for application to the land, either:

(i) The concentration of each pollutant in the sewage sludge shall not exceed the concentration for the pollutant in Table 3 of § 503.13; or

(ii) The product of the concentration of each pollutant in the sewage sludge and the annual whole sludge application rate for the sewage sludge shall not cause the annual pollutant loading rate for the pollutant in Table 4 of § 503.13 to be exceeded. The procedure used to determine the annual whole sludge application rate is presented in appendix A of this part.

(b) *Pollutant concentrations and loading rates—sewage sludge.*—(1) *Ceiling concentrations.*

TABLE 1 OF § 503.13—CEILING CONCENTRATIONS

Pollutant	Ceiling concentration (milligrams per kilogram) <sup>1</sup>
Arsenic .....	75
Cadmium .....	85
Copper .....	4300
Lead .....	840
Mercury .....	57
Molybdenum .....	75
Nickel .....	420
Selenium .....	100
Zinc .....	7500

<sup>1</sup> Dry weight basis.

(2) *Cumulative pollutant loading rates.*

TABLE 2 OF § 503.13—CUMULATIVE POLLUTANT LOADING RATES

Pollutant	Cumulative pollutant loading rate (kilograms per hectare)
Arsenic .....	41
Cadmium .....	39
Copper .....	1500
Lead .....	300
Mercury .....	17
Nickel .....	420
Selenium .....	100
Zinc .....	2800

(3) *Pollutant concentrations.*

TABLE 3 OF § 503.13—POLLUTANT CONCENTRATIONS

Pollutant	Monthly average concentration (milligrams per kilogram) <sup>1</sup>
Arsenic .....	41
Cadmium .....	39
Copper .....	1500
Lead .....	300
Mercury .....	17
Nickel .....	420
Selenium .....	100
Zinc .....	2800

<sup>1</sup> Dry weight basis.

(4) *Annual pollutant loading rates.*

TABLE 4 OF § 503.13—ANNUAL POLLUTANT LOADING RATES

Pollutant	Annual pollutant loading rate (kilograms per hectare per 365 day period)
Arsenic .....	2.0
Cadmium .....	1.9
Copper .....	75
Lead .....	15
Mercury .....	0.85
Nickel .....	21
Selenium .....	5.0
Zinc .....	140

(c) *Domestic septage.* The annual application rate for domestic septage applied to agricultural land, forest, or a reclamation site shall not exceed the annual application rate calculated using equation (1).

$$AAR = \frac{N}{0.0026} \quad \text{Eq. (1)}$$

Where:

AAR=Annual application rate in gallons per acre per 365 day period.

N=Amount of nitrogen in pounds per acre per 365 day period needed by the crop or vegetation grown on the land.

[58 FR 9387, Feb. 19, 1993, as amended at 58 FR 9099, Feb. 25, 1994; 60 FR 54769, Oct. 25, 1995]

**§ 503.14 Management practices.**

(a) Bulk sewage sludge shall not be applied to the land if it is likely to adversely affect a threatened or endangered species listed under section 4 of the Endangered Species Act or its designated critical habitat.

**Prepared for:**

**Coastal Regional Solid Waste Management Authority  
P.O. Box 128  
Cove City, North Carolina 28523**

**JEI Project No. 618.1001.12, Task No. 03**



**OPERATIONS MANUAL  
COMPOSTING FACILITY**

**TYPE 1 – YARD WASTE COMPOSTING**

**COASTAL REGIONAL SOLID WASTE MANAGEMENT AUTHORITY  
CRAVEN COUNTY, NORTH CAROLINA  
PERMIT NUMBER 25-11**

**June 2010**

**Prepared by:**



**2211 WEST MEADOWVIEW ROAD, SUITE 101  
GREENSBORO, NORTH CAROLINA 27407  
PHONE: (336) 323-0092  
FAX: (336) 323-0093  
WWW.JOYCEENGINEERING.COM  
NORTH CAROLINA CORPORATE LIC: C-0782**

**Composting Facility Operation Manual 2010**  
**Coastal Regional Solid Waste Management Authority Tuscarora Landfills**  
**Craven County, North Carolina**

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**Composting Facility Operation Manual 2010**  
**Coastal Regional Solid Waste Management Authority Tuscarora Landfills**  
**Craven County, North Carolina**

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## **1.0 INTRODUCTION**

### **1.1 Purpose**

The purpose of the following document is to provide the information necessary for the operations of Permit Number 25-11, Yard Waste Composting Facility. The facility is currently operated by the Coastal Regional Solid Waste Management Authority (CRSWMA). The facility was last permitted on December 20, 2005 and must be re-permitted every 5 years. The permit number was changed in 2000 from its original number, No. 25-04, to allow the facility to be regulated separately from the landfill. The facility is currently permitted compost yard waste and to co-compost yard waste and sewage sludge. Renewal will not include Sewage Sludge (Type IV) as the facility sees no need to process this waste.

### **1.2 Location**

The facility is located within the property boundaries of the CRSWMA's Tuscarora site, immediately adjacent to the now closed Craven County Landfill to the east and to the Tuscarora Long-Term Regional Landfill to the north. The facility is accessed off of Route 1005, approximately 2 miles from Tuscarora. A Location Map is included in Appendix 1.

### **1.4 Contact Person**

For actions relative to this permit, the following individual is responsible:

Title: Executive Director  
Coastal Regional Solid Waste Management Authority  
Address for notification: PO Box 128 or 7400 Old Hwy. 70W  
Cove City, NC 28523 New Bern, NC 28560  
Phone: (252) 633-1564  
Fax: (252) 633-6515

For contacts with the state for permit changes the following individual should be contacted:

Title: Compost & Land Application Branch Supervisor  
Agency: NC DENR - Division of Waste Management  
Composting & Land Application Branch  
Address: 401 Oberlin Road Suite 150, Raleigh, NC 27699  
Phone: (919) 508-8508

### **1.4 Personnel**

The facility will be staffed by a compost facility supervisor and two heavy equipment operators. The facility supervisor will direct traffic, maintain records, and oversee operations. The heavy equipment operators will operate all equipment and maintain good housekeeping

practices. A scale clerk assists both the landfill and composting operations by maintaining the weight and billing records.

## **1.5 Hours of Operation**

The compost facility will operate on the same schedule as the landfill. It will be open Monday - Friday from 7:30AM - 4:30PM and Saturday 7:30AM - 2:00PM.

## **2.0 TYPE 1 – YARD WASTE COMPOSTING FACILITY**

### **2.1 Waste Quantities**

CRSWMA receives yard waste from the following localities: Craven County, Carteret County, and Pamlico County and this waste consists of brush, leaves, and other land clearing debris up to 24" in diameter, small stumps are accepted. Appendix 2 summarizes waste data available for the facility from July 2005 through April 2010, although this data is incomplete. Based on the data reported, the facility receives on average 520 tons of brush per month with the lowest tonnage (323.08 tons) received in October 2005 and the highest tonnage (980.32 tons) received in July 2008. Winter months tend to be somewhat lower in tonnage as would be expected.

Accurate records of incoming waste should be kept at the scale house. These records should differentiate between loads of brush (including all land clearing debris), clean wood and loads of leaves or grass clippings.

### **2.2 Design Consideration**

#### **2.3.1 Design Capacities and Product Data**

The Type 1 CRSWMA facility currently receives an average of 520 tons per month of yard waste. For evaluating the facility's design, 520 tons per month or 6,247 tons per year were used. This material is stockpiled until sufficient material is available to produce a windrow. The material is ground and passed through a 5/8" screen prior to composting. Material that is greater than 5/8" becomes woodchips and mulch; material that is smaller than 5/8" is windrowed for compost. The Appendix 2 summarizes all available tonnage data for the facility. Based on this data, approximately 100% of the yard waste material is turned into compost and mulch products, and a negligible amount is sold for wood chips.

The following table summarizes the current utilization at the facility for the composting operation. As a factor of safety, it was assumed that the density of the product remains the same as the incoming waste stream.

Total waste stream (by weight)	6,247 tons (annual)
Total waste stream for composting (100%)	6,247 tons
Density (assumed average)	500 lb./cy
Composting waste stream (by volume)	24,988 cubic yards
Cross-section windrow 2' (top) x 18'(base) x 7'(ht)	70 square feet
Total length windrow utilized (maximum)	5,000 feet
Windrow: At half in spring and half in fall	2,500 feet
At 225' length	10 windrows used
With 18' base and 10' aisle, total acreage utilized	1.45 acres

The facility was originally designed with a working area for the Type 1 facility of 2.6 acres as illustrated in the Site Plan included in Appendix 6. Sufficient room is available for the operations. Based on the assumed values above, if the Receiving, Grinding, & Screening Area were relocated it would enable CRSMWA to reach their maximum design capacity for the composting facility. Currently over half of the work space is utilized. Doubling the current acreage used, 1.45 acres, would utilize the designed working area of 2.9 acres. By doing so, the facility can receive a total waste stream (weight) of 12,494 tons annually, a total waste stream for composting (100%) and use 20 windrows at the current size of each.

Yard waste generation is cyclical with the seasons; however the data collected to date indicates that the least amount of material provided in one month was 323 tons. Sufficient materials will be available to continue the process throughout the year. Materials will be stockpiled as necessary. High nitrogen content wastes such as grass will not be stockpiled and will be incorporated into the process within 48 hours of receipt or as soon as possible.

The facility does not use any bulking agent and compost is not recycled through the process. If the County determines that either of these processes are beneficial, DENR will be notified prior to implementation.

Appendix 7 contains a table summarizing product quality. The facility currently has the North Carolina Division of Agriculture analyze the compost on a periodic basis for various metals, nutrients, pH, soluble salts, C:N ratio and % solids.

### 2.2.2 Site Plan

A site plan at 1" = 40' is provided in Appendix 6. A complete set of the Record Drawings for the facility as original designed and constructed is attached to this narrative. The attached drawing was developed from the Record Drawing provided to CRSMWA by Joyce Engineering, Inc. (JEI). The original designer of the facility was Malcolm Pirnie, Inc.

### 2.2.3 Process Flow Diagram

Appendix 4 contains the updated process flow diagram, which illustrates the complete operation including the type and size of equipment, feedstock flow streams, recommended operational parameters, monitoring requirements, and final product requirements. The facility

records all data on the incoming and outgoing materials in tonnage. To provide the volumetric information, as required by DENR, the operator should determine a bulk density for brush, leaves, grass, and final product periodically.

## **2.3 Operations**

### **2.3.1 General Description**

The Type 1 facility has been in operation since 1997. The following discussion on operations was taken from the original permit with additional detail added as necessary.

Incoming yard waste is weighed and directed to the operational area. The yard waste is stockpiled until a sufficient quantity is accumulated to form a windrow. On average approximately 1 windrow could be formed per month. It should be noted that this is a theoretical maximum as during the operations to date no more than 10 windrows have ever been curing at one time. The material is run through a Maxi Grinder which can process materials up to 24" or larger in diameter at a rate of 60 tons/hour. Grinding creates a product with a particle size of approximately 5/8" for composting after screening. Once ground, the material is formed into windrows using a front end loader. The windrows are spaced approximately 10 feet apart and each has a north/south orientation and the following geometry: 7 - 7 1/2 feet high x 18 feet wide at base x 2 feet wide at top.

Once the windrow is formed, it will be turned several times using a Scarab 18 windrow turner to mix the materials. The Scarab turner is capable of handling 2,000 tons per hour and is more than adequate for the facility. If necessary, water will be added as the windrow is constructed and then periodically during the stabilization process. CRSWMA uses an irrigation system from the adjacent sediment basins located north of the facility. The pile will be sprayed as it is turned by the windrow turner on an as needed basis. For optimum composting the moisture should be maintained between 45% and 60%. Drier than 45% and the microbial action is slowed; higher than 60% and the material becomes difficult to handle and difficult to aerate. Operation records indicate a moisture range of 50% - 65%. A copy of the recommended moisture log is contained in Appendix 5.

The temperatures are taken at in each quarter of the windrow (4 separate places) or a minimum of each third (3 separate places). It is suggested that the temperature be controlled by turning (aerating) to assure that the compostable material is maintained at an optimum range for decomposition (between 104°F and 113°F) and then allowed to elevate to 131°F where it must be maintained for a period of 3 consecutive days as required by Rule .1406(10). When the temperature within the windrow falls below 120 – 130°F during the final stages of composting, the windrow is turned. Windrow construction and turning frequency will be sufficient to maintain aerobic conditions to produce a compost product in the desired time frame. Separate records are kept for each windrow. Once a windrow is constructed, it is assigned an I.D. Number and folder which are used over the lifespan of the windrow. Every time windrow data is taken, it is documented and logged in the folder. A log will be kept of all temperature readings, which includes the location of the probes. A copy of the temperature log is contained in Appendix 5.

Tables have been provided in Appendix 6, to assist in the operations. These tables were developed by the Compost Council to assist operators with various calculations and parameter adjustments. The Compost Council's operation manual is incorporated by reference into this operations manual.

A nitrogen source is sometimes added to the yard waste if needed to promote the compost process. CRSWMA uses calcium nitrate when necessary. The calcium nitrate is spread by hand and mechanically mixed. To date, operations have shown that a 225 foot windrow requires approximately 25 fifty pound bags.

The process from grinding through stabilization was expected to take 24 weeks, however, existing operations compost in less than 10 weeks. The final time frame is a function of material density, material type, moisture and operational controls.

Once the windrow begins to cool indicating stabilization, CRSMWA screens the material and the larger particles are reused in the process or used as woodchips or mulch. By keeping the coarser materials in the compost, it enables more oxygen to get into the windrows and produces more compost in the finished product. The compost is now stockpiled. Depending on the end use requirements, the compost may be screened again prior to stockpiling if a finer screen is available. The larger particles would be either reused in the process or used as a coarser product.

If the material is free of sharp particles, has no offensive odor, and has minimal pathogens, it may be used in an unrestricted way. Prior to marketing the material to the public, the following testing is recommended by the Compost Council but not required by the State:

- Maximum particle size pH
- C:N ratio
- Total Nitrogen Soluble salts
- Metals as suggested by the Department of Agriculture

Once the compost meets the regulatory requirements for distribution to the public, it can be released for use. As the public obtains the material they must be given the information indicated in Section 2.4.14 (c).

### 2.3.2 Waste Acceptance Rule .1406 (6)

The Type 1 compost facility will accept only grass, leaves, brush, yard waste, and land clearing debris. No municipal solid waste (MSW), hazardous waste, asbestos containing waste or medical waste shall be accepted at the facility. CRSWMA accepts yard waste in a non- bagged state or in approved biodegradable bags. Deliveries are monitored at all sites. CRSWMA anticipates little contamination of the material.

### 2.3.3 Safety Requirements Rule .1406 (7)

Open burning of solid waste is prohibited. All equipment will be provided with fire extinguishers. The windrow turner will have a fire suppression system. Periodic safety meetings will be held to review safety issues at the site. Personal protective equipment should include steel toe boots, eye and ear protection and dust masks when appropriate. Site personnel will be trained

in facility specific safety issues as well as general safety issues. The local fire department would be called should a major fire break out.

#### 2.3.4 Nuisance Control

Rule .1405(10)(B)

Sources of noise will be on-site traffic and the facility equipment such as the front-end loader, Maxi grinder, trommel screen, and windrow turner. Noise can be controlled by appropriately operating and maintaining equipment. In addition, the facility is located next to a landfill operation and is buffered from other properties by distance and trees. Employees should wear hearing protection.

Vectors are animals, insects or other organisms that carry pathogens from one host to another like rats, flies, birds and mosquitoes. Vectors will be minimized by good housekeeping practices. The receiving area will be kept clean, water will not be allowed to accumulate and the drainage areas will be cleaned periodically. Material will be stored based on a "first in/first out" basis to prevent long term storage. Turning the windrows will also control vector flies and their larvae. If necessary, a commercial pest control service will be employed.

Dust will be controlled by good housekeeping practices and by dampening loads on the tipping floor as necessary. Moisture is necessary to enhance the composting process and will be monitored. Employees should wear dust masks.

Odors will be minimized by maintaining adequate aeration through turning the windrows.

#### 2.3.5 Monitoring Requirements

Rule .1406 (9)

Once the windrow is constructed, the pH, temperature and moisture content should be measured. It is also suggested that the C:N ratio be determined to evaluate the need for the addition of a nitrogen source. During the composting process pH, O<sub>2</sub> (if equipment available), moisture, and temperature will be monitored periodically. pH should be kept in the range of 5.5 - 8.5. Outside of this range, the biological process is impeded.

Moisture should be kept in the range of 45% - 60%. Water should be added as required to stay within this range. Moisture, pH, and O<sub>2</sub> should be monitored at a minimum weekly. Temperature will be monitored daily. To monitor temperature, the probe should be inserted 12"-24" every 50' along the windrow at a 45° - 90° angle.

At the end of the process and prior to marketing the materials to the public, it is recommended that the following tests be run:

- pH;
- C:N;
- Total Nitrogen;
- Metals (as suggested by the Department of Agriculture);
- Soluble Salts; and
- Moisture.

These tests are recommended by the Compost Council but not required by the State. CRSWMA also utilizes the “Hand Test” Method. The test is performed by taking a hand-full of compost material representative of the windrow and squeezing it. After you open your hand, if the material quickly breaks up, then the windrow is too dry. If you can squeeze the material and water is extracted, then the material is too wet. If squeezed and the material remains cohesive, then it is good; otherwise, the proper measures should be taken.

To date the NC Department of Agriculture has been running most of these tests for CRSWMA.

2.3.6 Temperature Parameters Rule .1406 (10)

For Type I facilities, the compost process must be maintained at or above 55°C (131°F) for 3 consecutive days and aerated to maintain elevated temperatures. Temperature will be monitored at least twice a week.

2.3.7 Addition of Nitrogen Bearing Materials Rule .1406 (13)

Nitrogen compounds may be added as necessary to adjust the nutrient balance for optimum product. Only approved waste materials (i.e. grass clippings, leaves) or chemical compounds may be added. Nitrogen compounds increase odors and if using grass clippings, the material should be incorporated into the process immediately upon receipt.

To determine if nitrogen is necessary, the carbon to nitrogen ratio should be calculated. For proper composting, this ratio should be greater than 25:1, but less than 40:1 at the start of composting. Incoming materials have the following estimated ratios:

Grass clippings	12 - 15:1
Dry leaves	40:1
Paper and wood	200:1
Sawdust	200 - 500:1

Thus, adjustment may be necessary after grinding, screening and blending the feed stock materials.

2.3.8 Contingency Plans Rule .1405 (c) (1)

- A. Equipment: The four major pieces of equipment that are required for operations includes the grinder, windrow turner, trommel screen, and the front-end loader. These shall be maintained in accordance with the manufacturers' recommendations. If the grinder or screen breaks down, waste shall be stockpiled until the grinder is repaired. If there is a need for a grinder, one can be rented. If the windrow turner breaks down, the windrows can be turned with the front-end loader. If the front-end loader breaks down, one will be rented from a local contractor.

- B. Air Pollution: Dust and odor are the two primary air pollutants. Dust will be controlled through proper moisture control and odor will be controlled through proper aeration.
- C. Nonconforming Waste: Nonconforming waste shall be taken to the landfill assuming no hazardous materials or asbestos-bearing materials are present.
- D. Spills: Spills are not expected. Potential spills would include maintenance fluids for equipment, and fuel. Appropriate precautions will be taken to assure that equipment is serviced correctly to minimize spills or discharges. Should oil or gas spill onto the area, it shall be absorbed immediately and the absorbent disposed of appropriately. Major equipment maintenance and repairs are handled in the on-site maintenance garage. Off-spec product, incomplete compost, or compost which might spill off the curing pad will be collected and returned to the appropriate location.
- E. Fires, noise, vectors, odors are discussed under Section 2.3.4. Unusual traffic conditions shall be controlled by on-site personnel and the Craven County Sheriff's Department if necessary.
- F. Adverse weather conditions: The primary adverse weather conditions facing the CRSWMA facility include wind and rain. During periods of heavy wind, grinding and windrow turning will not be conducted and the top of the windrow will be kept moist to prevent blowing material. During periods of heavy rain, compost grinding and screening operations are not carried out in the rain. The operator monitors the site frequently to assure that stormwater controls are adequate and maintains the site as possible. During mild rainfalls, the operator may want to turn the windrow to incorporate moisture into the materials.

#### 2.3.9 Classification/Distribution of MSW Compost Products Rule .1407

##### A. Requirements

For unrestricted use, the finished Type I compost must meet the following criteria:

- Minimal pathogenic organisms
- Free from offensive odors
- Containing no sharp particles

If these criteria are met then the finished compost material will be marketed to local landscape firms and to residents of CRSWMA's member counties. CRSWMA transports some of the finished product to the transfer stations in Carteret and Pamlico Counties where it is convenient for residents and businesses located there to access.

##### B. Sampling

Prior to marketing the material to the public, a composite sample of the material should be obtained and the tested for the parameters outlined under Section 2.3.5. It is recommended

that a copy of the test results and recommendations from the Department of Agriculture, Agronomic Division be provided to each individual using the material.

A composite sample is obtained by taking 3 evenly distributed samples along the windrow and compositing them into an airtight container or bag. Each sample should be approximately 1-2 cups each and taken from a hole dug into the windrow starting approximately 4' up and angling at 45° into the pile. More samples may be warranted per windrow if there is evidence of an inconsistent product (based on temperature or pH readings.)

A sketch indicating the location of each sample and a description of the sampling technique should be kept on each composite. Accurate record keeping is critical. Label each composite sample with the following information:

- Date sampled
- Time sampled
- Windrow identification
- Source of Sample
- Name of person taking sample
- Sample Preservation Technique
- Temperature of Sample
- pH of Sample

All information should be recorded in a sample logbook along with the following:

- Sample preparation
- Shipment record
- Tests to be conducted
- Laboratory to conduct tests

### C. Labeling

When the Type 1 compost material is to be marketed to the public, sufficient information should be provided to the public to:

- Inform users of the benefits of using compost
- Advise users on suggested uses of product
- Inform users of cautions in using product
- Inform users of composition of the material including nutrients and contaminants
- Inform users of source of feedstock.

Appendix 7 includes a copy of the information provided to the end users by the CRSWMA. It is also recommended that a copy of the test results (if available) be provided to the end user.

## 2.4 Recordkeeping

### 2.4.1 Record Keeping Requirements

Separate records will be maintained for each section of the facility as described below. Records shall be made and maintained for a minimum of five (5) years. Records shall be kept on a monthly basis.

### 2.4.2 Operating Records

Weekly operating records shall include the following information (at a minimum).

- The quantity, type and source of waste received. It is important to track the type of material closely.
- The quantity and type of waste processed.
- The quantity and type of compost produced by product classification.
- The quantity and type of compost removed for use or disposal, by product classification and the market or permitted disposal facility.
- All operational information including date and number of times windrow(s) turned; date, type, quantity and method of addition of any amendments.
- Temperature data. Temperature data shall indicate the location of readings in the windrow and the length of the composting period. (A sample log is contained in Appendix 5.)
- Moisture testing including data, location of test and weather conditions at time of sampling. (A sample log is contained in Appendix 5.)
- All analytical results from compost testing described above.

### 2.4.3 Annual Reporting Requirements

Rule .1408 (3)

An annual report shall be submitted to the Solid Waste Division of DENR. The fiscal year shall be July 1 - June 30. The annual report will include the following:

- Facility name, address, and permit number
- Year covered
- Total quantity and type of waste in tons received at the facility during the year covered including tons of waste received by local government of origin.

- Total quantity and type of waste in tons, processed into compost during the year covered.
- Total quantity in tons and type of compost produced at the facility, by product classification, during the year covered.
- Total quantity in tons and type of compost removed for use or disposal from the facility, by product classification, along with a general description of the market for use during the year covered.
- Total quantity in tons, and the type of waste removed from the facility and disposed of.
- Condensed monthly temperature monitoring to support Rule. 1406 (9) (c).
- Summary of all testing completed on the compost as required by the Division.
- Condensed yearly totals of solid waste received and composted shall be reported back to the local government of origin for respective annual recycling reporting.

## **2.5 All Required Permits**

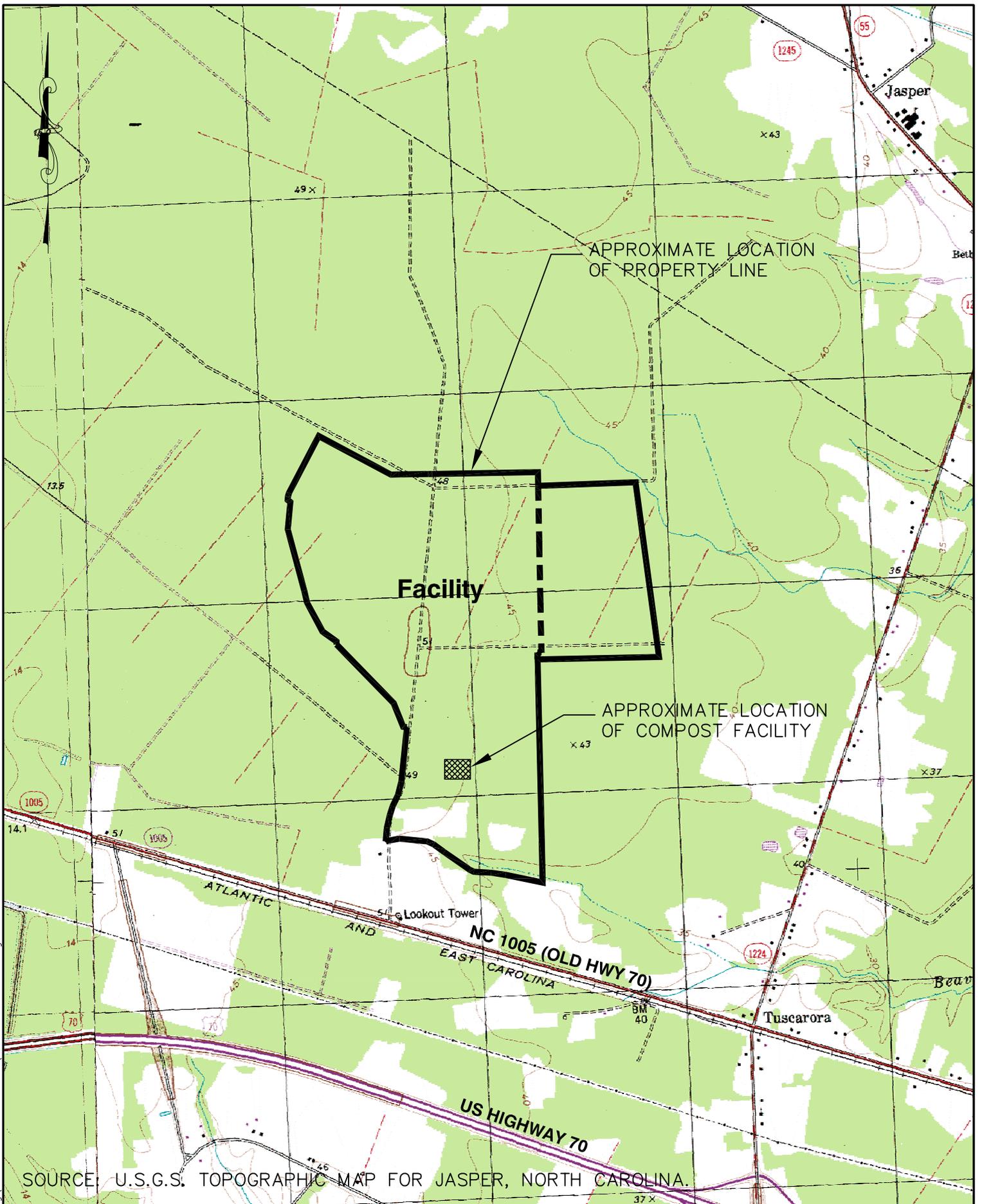
A copy of all required local, state and federal permits/approvals are included in the permit application. The permit application should be kept on site at all times.

## **2.6 Equipment Specifications**

The four major pieces of equipment in use at the composting facility are a Maxi Grinder, Trommel Screen, Scarab Windrow Turner, and a Front-end Loader. Equipment specifications are enclosed in Appendix 8.

## **APPENDIX 1**

### Location Map



SOURCE: U.S.G.S. TOPOGRAPHIC MAP FOR JASPER, NORTH CAROLINA.

FIGURE NO. 1



2211 WEST MEADOWVIEW ROAD  
 GREENSBORO, N.C. 27407  
 PHONE: (336) 323-0092  
 © 2010 Joyce Engineering, Inc.  
 All rights reserved.

SCALE  
 1" = 2000'

PROJECT NO.  
 618.1000.12.03

CRSWMA: TUSCARORA LANDFILL  
 SITE LOCATION MAP

L:\CRSWMA\dwg\COMPOSTING PERMIT 2010\SITE LOCATION MAP.dwg

## **APPENDIX 2**

### Waste and Production Quantity Data



MONTHLY TONNAGE REPORT

Project: Composting Facility & Operations Manual  
 Client: Coastal Regional Solid Waste Management Authority (CRSWMA)

Location: Tuscarora, NC

JEI Proj.: 618.1000.12  
 JEI Task: 03

MONTH/ YEAR	YARD WASTE RECEIVED PER COUNTY			MONTHLY TOTALS	YEARLY TOTALS	COMPOSTING SALES PER COUNTY			MONTHLY TOTALS	YEARLY TOTALS
	CRAVEN COUNTY	CARARET COUNTY	PAMLICO COUNTY			CRAVEN COUNTY	CARARET COUNTY	PAMLICO COUNTY		
Jul-05	357.06	401.67	12.06	770.79		58.48	21.50	25.83	105.81	
Aug-05	248.28	254.22	14.79	517.29		141.32	19.53	22.93	183.78	
Sep-05	585.57	112.75	64.11	762.43		90.65	5.34	9.34	105.33	
Oct-05	261.20	15.28	46.60	323.08		84.35	0.00	16.50	100.85	
Nov-05	629.51	239.94	7.70	877.15		99.80	3.16	23.18	126.14	
Dec-05	219.14	165.00	9.70	393.84		56.85	1.72	6.93	65.50	
Jan-06	210.45	213.78	16.39	440.62		77.84	16.95	7.06	101.85	
Feb-06	164.83	214.65	47.39	426.87		129.42	22.76	11.43	163.61	
Mar-06	323.66	338.15	23.61	685.42		288.24	83.71	55.67	427.62	
Apr-06	271.07	411.87	45.16	728.10		337.72	82.64	56.21	476.57	
May-06	250.31	300.34	31.30	581.95		206.13	76.67	74.17	356.97	
Jun-06	288.37	303.06	15.81	607.24	7114.78	234.86	34.59	22.25	291.70	2505.73
Jul-06	250.27	277.12	19.26	546.65		140.02	18.07	18.68	176.77	
Aug-06	255.11	222.28	16.71	494.10		172.00	20.45	54.93	247.38	
Sep-06	436.92	394.83	26.55	858.30		101.88	27.99	6.68	136.55	
Oct-06	263.03	207.74	15.12	485.89		65.12	12.12	24.24	101.48	
Nov-06	276.75	207.85	13.34	497.94		72.22	35.51	2.78	110.51	
Dec-06	200.76	251.66	6.03	458.45		38.83	8.79	3.16	50.78	
Jan-07	307.50	236.70	10.35	554.55		47.52	6.58	3.43	57.53	
Feb-07	126.57	255.07	8.10	389.74		101.94	20.86	26.23	149.03	
Mar-07	266.05	329.16	21.15	616.36		191.41	47.45	67.94	306.80	
Apr-07	205.98	410.38	21.80	638.16		502.86	60.16	43.11	606.13	
May-07	251.42	278.11	17.81	547.34		212.83	33.41	39.94	286.18	
Jun-07	217.89	303.97	15.64	537.50	6624.98	194.65	35.04	29.94	259.63	2488.77
Jul-07	181.00	259.18	15.05	455.23		83.50	19.23	25.54	128.27	
Aug-07	192.63	321.91	12.55	527.09		69.71	25.89	19.81	115.41	
Sep-07	141.77	208.19	21.53	371.49		65.88	45.23	12.47	123.58	
Oct-07	158.65	252.83	23.75	435.23		143.26	29.22	9.82	182.30	
Nov-07	173.17	245.91	22.98	442.06		108.52	42.98	20.40	171.90	
Dec-07	136.85	187.17	14.25	338.27		76.62	30.09	13.17	119.88	
Jan-08	146.88	185.94	43.31	376.13		95.26	32.65	6.99	134.90	
Feb-08	163.34	235.79	14.23	413.36		118.63	58.80	42.03	219.46	
Mar-08	149.70	382.73	31.47	563.90		313.23	92.27	66.54	472.04	
Apr-08	170.39	381.07	53.41	604.87		304.18	114.10	67.87	486.15	
May-08	191.12	432.13	28.21	651.46		236.22	67.50	82.93	386.65	
Jun-08	113.01	343.49	48.26	504.76	5683.85	166.02	79.76	32.76	278.54	2819.08



MONTHLY TONNAGE REPORT

Project: Composting Facility & Operations Manual  
 Client: Coastal Regional Solid Waste Management Authority (CRSWMA)

Location: Tuscarora, NC

JEI Proj.: 618.1000.12  
 JEI Task: 03

MONTH/ YEAR	YARD WASTE RECEIVED PER COUNTY			MONTHLY TOTALS	YEARLY TOTALS	COMPOSTING SALES PER COUNTY			MONTHLY TOTALS	YEARLY TOTALS
	CRAVEN COUNTY	CARARET COUNTY	PAMLICO COUNTY			CRAVEN COUNTY	CARARET COUNTY	PAMLICO COUNTY		
Jul-08	409.81	303.95	266.56	980.32		114.34	28.31	16.48	159.13	
Aug-08	161.10	271.15	17.47	449.72		171.50	49.65	15.47	236.62	
Sep-08	246.39	384.24	32.99	663.62		66.82	34.24	8.39	109.45	
Oct-08	235.40	267.63	12.04	515.07		142.17	46.33	36.80	225.30	
Nov-08	121.52	219.80	10.49	351.81		47.47	5.14	19.55	72.16	
Dec-08	136.27	186.38	11.81	334.46		53.22	31.32	4.51	89.05	
Jan-09	176.03	203.57	11.62	391.22		48.76	14.68	5.79	69.23	
Feb-09	76.44	266.27	17.08	359.79		112.25	50.18	58.83	221.26	
Mar-09	124.93	320.48	14.28	459.69		308.57	91.91	89.75	490.23	
Apr-09	100.51	408.52	18.78	527.81		379.87	79.23	191.28	650.38	
May-09	156.01	355.63	41.43	553.07		340.51	77.61	80.09	498.21	
Jun-09	106.06	340.24	30.23	476.53	6063.11	144.48	55.26	47.15	246.89	3067.91
Jul-09	155.96	264.34	24.66	444.96		146.23	20.93	18.89	186.05	
Aug-09	83.90	230.66	10.84	325.40		76.29	26.44	5.12	107.85	
Sep-09	125.01	261.28	21.67	407.96		94.63	15.59	16.70	126.92	
Oct-09	87.50	284.04	12.12	383.66		76.76	17.87	26.45	121.08	
Nov-09	144.01	208.09	24.47	376.57		53.25	5.27	1.03	59.55	
Dec-09	158.74	222.58	19.43	400.75		78.67	0.77	1.74	81.18	
Jan-10	167.89	263.31	8.72	439.92		57.58	7.13	6.94	71.65	
Feb-10	113.16	370.21	24.36	507.73		127.91	19.88	8.72	156.51	
Mar-10	252.39	464.25	38.12	754.76		407.04	128.20	65.74	600.98	
Apr-10	110.62	506.41	47.61	664.64		631.28	142.17	154.29	927.74	
				<b>TOTAL YARD WASTE</b>					<b>TOTAL SALES</b>	
<b>TOTALS</b>	12,235.86	16,384.95	1,572.26	30193.07		9,107.57	2,280.83	1,932.60	13321.00	
<b>AVERAGE (PER MON.)</b>	210.96	282.50	27.11	520.57		157.03	39.32	33.32	229.67	

**NOTES:**

- Each Fiscal Year consists of months from July of the previous year through June of the current year.
  - A negligible amount of Wood Chips was sold. Therefore, it can be estimated 99% of the yard waste is used composting.
- P:\CRSWMA\Old Folder Structure\618.09.03 General Consulting\Compost Facility Permit 2010\Appendix - Waste & Quantity Data 2005-2010.xls\CRSWMA - Monthly Tonnage Report

## **APPENDIX 3**

### Site Plan

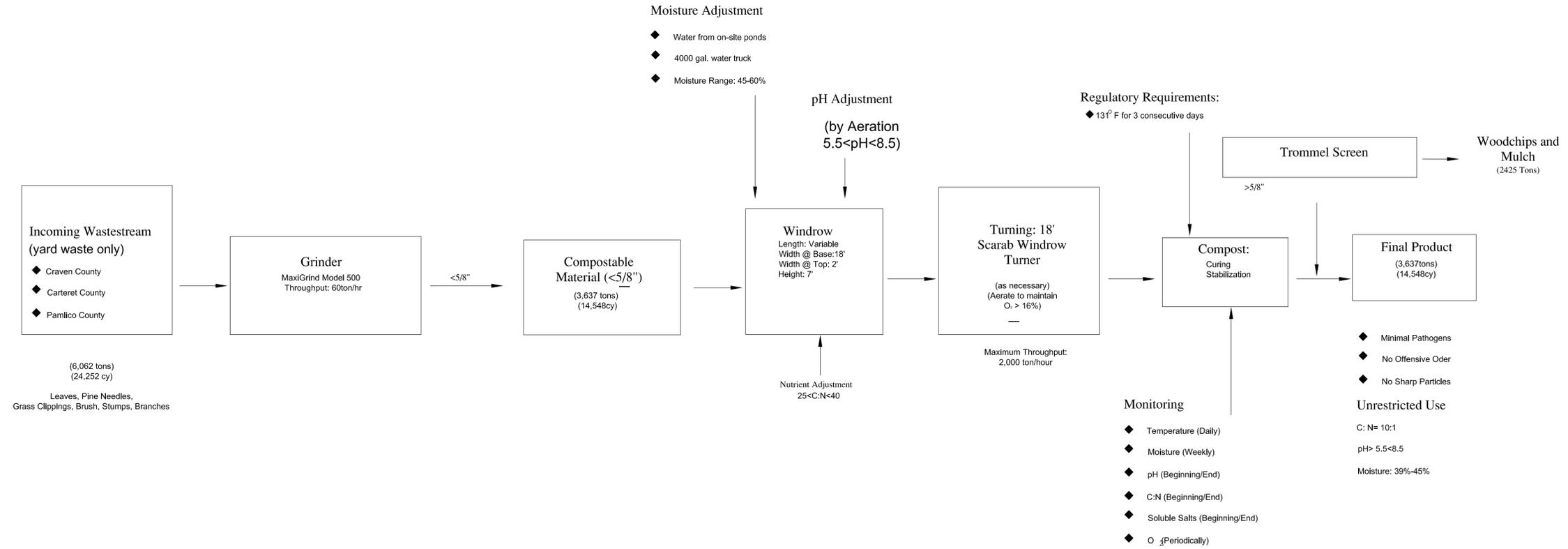


## **APPENDIX 4**

### Process Flow Diagram

# PROCESS FLOW DIAGRAM

## Coastal Regional Solid Waste Management Authority TYPE 1 Composting Facility



**Notes:**

- ◆ Total tonnage estimates are based on average monthly tonnage times 12 as calculated from the Table contained in Appendix 2.
- ◆ Product tonnages based on percentage produced as calculated in the same table.
- ◆ Assumed daily density of incoming material: 500lb/cy

10-24 Weeks

<p><b>CRSWMA: TUSCARORA LANDFILL COMPOSTING FACILITY</b></p> <p><b>PROCESS FLOW DIAGRAM</b></p>	<p>DESIGNED: EA DRAWN: RWH CHECKED: CM APPROVED: EA DATE: _____</p> <p>© 2010 Jayco Engineering, Inc. All rights reserved.</p>										
<p>PROJECT NO. <b>618.1001.12</b></p>	<p>REVISIONS AND RECORD OF ISSUE</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NO.</th> <th>BY</th> <th>DATE</th> <th>CK</th> <th>APP</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>	NO.	BY	DATE	CK	APP					
NO.	BY	DATE	CK	APP							
<p>SCALE <b>AS SHOWN</b></p>	<p>DRAWING NO. <b>3</b></p>										

## **APPENDIX 5**

### Moisture and Temperature Logs



# Coastal Region Solid Waste Management Authority

## Temperature Log

(Complete one (1) log per windrow)

---

Windrow ID Number

---

Date Windrow Started

---

General Location & Length

Date	√ if turned and number of times turned	Temp. Location #1	Temp. Location #2	Temp. Location #3	Temp. Location #4	Weather Conditions and Temperature	Initials
MM/DD/YYYY	√ 2 times	131° F	131° F	131° F	131° F	Sunny/90°	INT
		<div style="display: flex; justify-content: space-around; width: 100%;"> <span>×</span> <span>×</span> <span>×</span> <span>×</span> </div>					

\*Temperature must reach 131 °F for 48 hours.

\*Mark on where temperatures were taken.

## **APPENDIX 6**

### Operational Tables

**COMPOST FACILITY  
OPERATING GUIDE**

**DRAFT 2.0**

**8/1/93**

1993

First Edition

**THE COMPOSTING COUNCIL  
ALEXANDRIA, VIRGINIA**

### 3.1.4

## Feedstock Preparation/Control Moisture

Before facility-specific feedstock blending/moistening correlations have been established, such as during facility start-up and initial operations, assume a feedstock moisture content such as 35 percent, a 55 percent control point, and calculate water addition as follows:

$$\frac{F(f) + W}{F + W} = m$$

Where  $F$  = Feedstock weight, tons  
 $W$  = Added water weight, tons  
 $f$  = Feedstock moisture content, percent total weight  
 $m$  = Mixture (feedstock + added water) moisture content, percent total weight

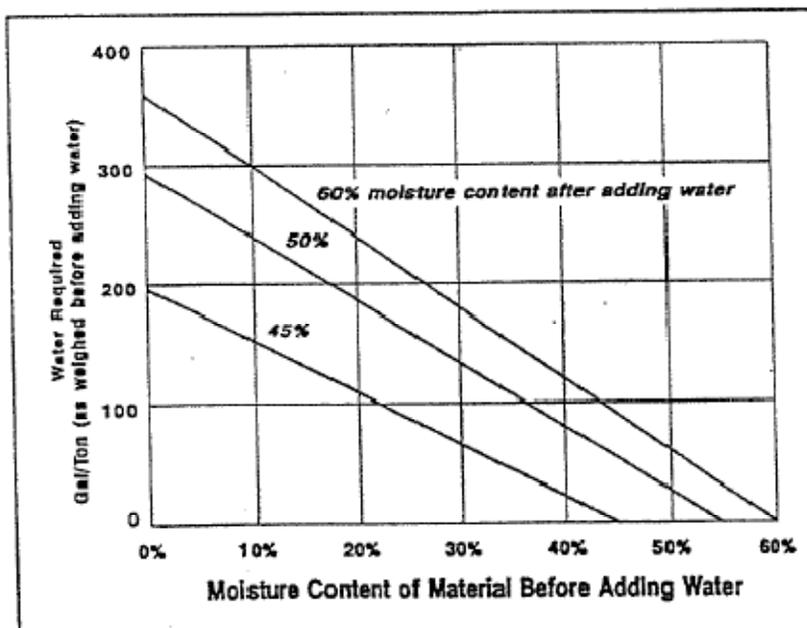


Figure 3.1.4-2 - Water addition requirements during preparation for resulting moisture contents of 45%, 55%, and 60%.

Solving this equation for water addition required gives:

$$W = F(m-f)/(1-m)$$

As an example, for moisture content of 30 percent in feedstock as received, 55 percent in the prepared feedstock mix, the water addition is 56 percent of the feedstock weight or 133 gallons per ton of feedstock. This relationship is depicted in Figure 3.1.4-2.

Table 3.1.4-1 lists moisture additions required (both gallons per ton and weight percent of feedstock) at various weights.

### 3.1.4

## Feedstock Preparation/Control Moisture

**Table 3.1.4-1**  
Water Required for Various Feed  
and Mixture Moisture Contents

Moisture Content (%)		Water Added to Feed
Feed (before adding water)	Mix (after adding water)	Gallons per Ton of Feed
0	45	196
5	45	175
10	45	153
15	45	131
20	45	109
25	45	87
30	45	65
35	45	44
40	45	22
45	45	0
0	55	293
5	55	267
10	55	240
15	55	213
20	55	187
25	55	160
30	55	133
35	55	107
40	55	80
45	55	53
50	55	27
55	55	0
0	60	360
5	60	330
10	60	300
15	60	270
20	60	240
25	60	210
30	60	180
35	60	150
40	60	120
45	60	90
50	60	60
55	60	30
60	60	0

#### ANALYTIC TEST METHOD

Moisture content (on percent total weight basis) is determined by weight loss on drying, and is calculated as:

$$\frac{(\text{wet weight of sample}) - (\text{dry weight of sample})}{(\text{wet weight of sample})}$$

The procedure is described in Section 6.1.2, TESTING.

#### REFERENCES

- Golueke, Clarence G. *Principles of Composting*.
- Martin, Alexander. *Introduction to Soil Microbiology*, 1977.

### 3.2.3

## Composting High Rate/Turning and Mixing

### OPERATING BOUNDARIES

#### OVERVIEW

Biological, marketing, and facility hygiene objectives are the leading reasons for **TURNING AND MIXING**. There are no objective measurements for determining operating boundaries for this step, so operators will need to learn from experience.

#### UNITS OF MEASURE

None.

#### CONTROL POINT: 1 TO 7 TIMES PER WEEK

Although several methods could be used to determine when **TURNING AND MIXING** is needed (as discussed below in Control Monitoring), most operators do not gather specific data. Instead, many facilities conduct **TURNING AND MIXING** on a schedule determined from operating experience with factors such as:

- the need to create space for new material
- water addition schedule
- clumping in material
- proportion of paper in material (paper contributes to clump formation)
- labor required for **TURNING AND MIXING**
- equipment required for **TURNING AND MIXING**
- vector control (flies)

At a minimum, **TURNING AND MIXING** should occur whenever water is added to distribute it evenly throughout the composting material. Depending on the composting system, **TURNING AND MIXING** frequency during **COMPOSTING HIGH RATE** can range from once per day to once per week. As a starting point, until facility-specific data are obtained, the operator can assume that aerated composting materials lose about 5 percent of their moisture content per day<sup>4</sup>, and that the moisture limits are 60 percent maximum (after mixing/rewetting) and 45 percent minimum (before mixing/rewetting). Figure 3.2.3-1 illustrates such a situation. As seen in Figure 3.2.3-1, a 5 percent daily loss of moisture content will dry the material from 60 percent to 45 percent moisture in five to six days, and would go as low as about 42 percent in

<sup>4</sup>This moisture loss is expressed as the "percentage loss of moisture content per day," not as the absolute loss of moisture content per day. Therefore, a loss of 5 percent of moisture content per day means that moisture content might be 60% in day 1, 57% in day 2, 54% in day 3, 51% in day 4, and 49% in day 5. Each day's moisture content is determined by multiplying the previous day's moisture content by 95%, not by subtracting 5% from the previous day's value.

### 3.2.3

## Composting High Rate/Turning and Mixing

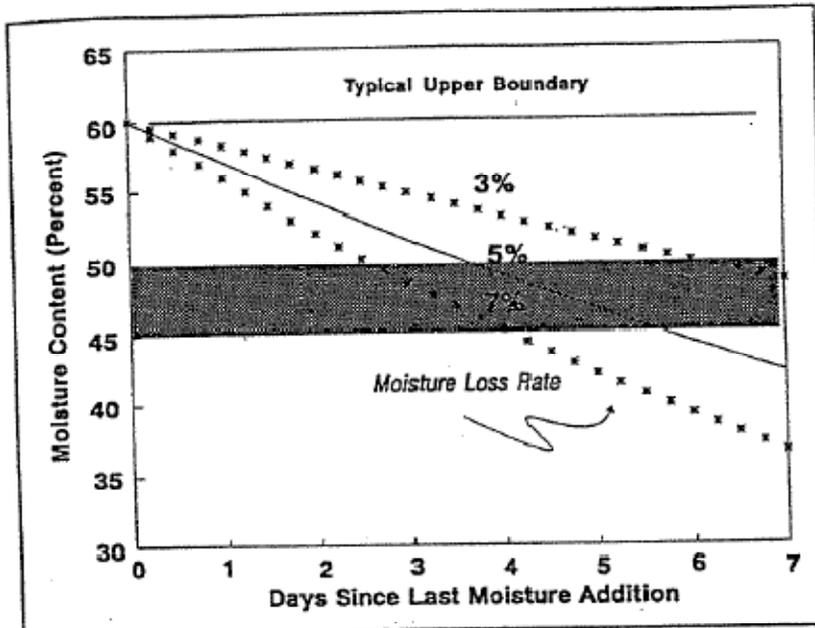


Figure 3.2.3-1 - Moisture losses over time at a starting moisture content of 60%. Shaded area represents range of typical lower boundaries.

seven days.

Figure 3.2.3-1 also shows that a daily moisture loss of 3 percent will dry material from 60 percent to about 50 percent in six days, and that a 7 percent daily loss will dry material from 60 percent to 50 percent in about 3 days. Figure 3.2.3-2 shows that to maintain a  $55 \pm 2.5$  percent

moisture level, the material should be turned and rewetted every day. To maintain moisture content between 45 percent and 60 percent would require turning and rewetting every 6 days.

Therefore, with the 5 percent loss of moisture content per day assumption, **TURNING AND MIXING** 60 percent moist material should occur in 6 days or less, when water must be added again. Facilities that need to control moisture within a closer range (such as between 57 percent and 53 percent) will need to add water more often. Therefore, the material must be turned and mixed more often. Likewise, facilities that **TURNING AND MIXING** more often (such as once per day) to create space in a processing area, may also add water more often (since material will be turned anyway) and maintain a tighter range of moisture content.

Figures 3.2.3-1 and 3.2.3-2 have two practical uses. You can use them to:

- Determine the day of the next **TURNING AND MIXING** operation at a specific initial moisture content (as in the example above).

### 3.2.3

## Composting High Rate/Turning and Mixing

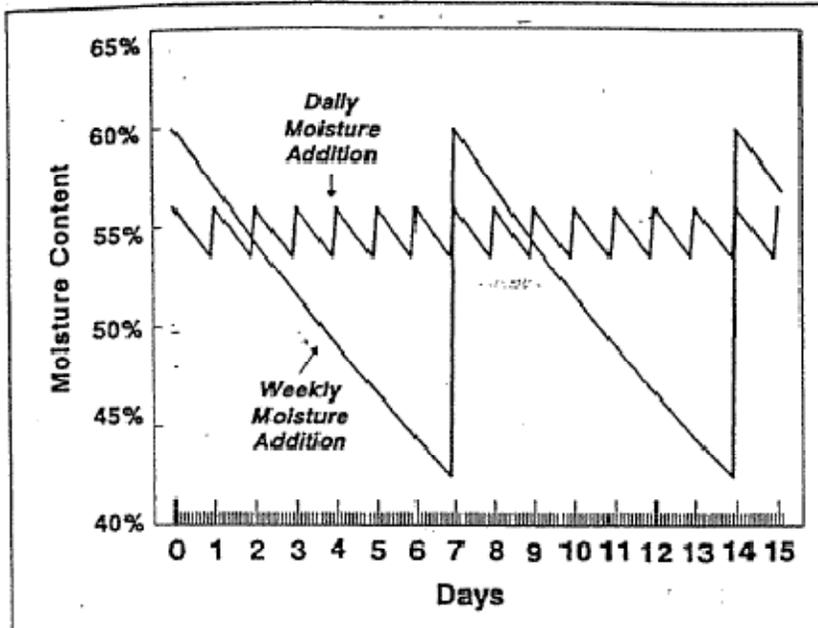


Figure 3.2.3-2 - How frequency of moisture addition affects operating boundaries.

- has a lower limit of 50 percent moisture, and
- the target moisture addition during mixing is unknown.

Using those assumptions, and following the 5 percent daily loss line on Figure 3.2.3-1, from 50 percent (3.5 days) backwards 3 days (to 0.5 days) shows that the starting moisture should be about 58 percent. With the same loss rate and lower boundary, the graph shows that turning every 6 days would require that the material be too wet just after turning or too dry just before turning.

The 5 percent per day drying rate may not be applicable to a specific facility or process, and that a facility-specific correlation should be established. Figure 3.2.3-1 shows the effect of moisture losses ranging from 3 percent/day to 7 percent/day — thus showing the typical sensitivity to moisture loss rate.

The drying rate also may not be uniform with time during the composting process. For example, composting material tends to dry out relatively slowly at the beginning of composting when the material is aerated less because it has not heated up. Similarly, moisture loss *after* TURNING AND MIXING may be lower than normal because the

- By reading the graphs backwards, determine the target moisture content for closer control or for facilities that TURNING AND MIXING according to a set schedule (such as the need to create space for new material).

To demonstrate, assume a facility:

- turns and mixes every 3 days,
- loses 5 percent of moisture content daily,

### 3.3.1

## Composting Stabilization/Control Moisture

**TABLE 3.3.1-1  
FREQUENCY OF MOISTURE ADDITION  
AT VARIOUS LOSS RATES (in Days)**

	Ending Moisture Content (%)	Starting Moisture Content (%)					
		40	45	50	55	60	65
<b>3% Daily Loss</b>	40	0	3	6	9	12	15
	45	0	0	3	6	9	12
	50	0	0	0	3	6	9
	55	0	0	0	0	3	6
	60	0	0	0	0	0	3
	65	0	0	0	0	0	0
<b>5% Daily Loss</b>	40	0	2	4	6	8	10
	45	0	0	2	4	6	8
	50	0	0	0	2	4	6
	55	0	0	0	0	2	4
	60	0	0	0	0	0	2
	65	0	0	0	0	0	0
<b>7% Daily Loss</b>	40	0	2	3	4	6	8
	45	0	0	2	3	4	6
	50	0	0	0	2	3	4
	55	0	0	0	0	2	3
	60	0	0	0	0	0	2
	65	0	0	0	0	0	0

surface area) will lose more moisture to evaporation than a narrow, high pile containing the same quantity of composting material.

- **Turning and Mixing.** Turning and mixing expose hot, wet materials to ambient air, leading to high evaporation rates.
- **Aeration.** Forcing (or drawing) air through composting materials decreases the moisture content by increasing microbial activity and by evaporating water into the moving air stream. Positively aerated composts (air *pushed upward* into the material) tend to dry first at the bottom. Negatively aerated composts (air *drawn downward* into the material) tend to dry first at the surface.

Moisture content falls naturally during the composting process as water evaporates into the air being forced through the composting material. If moisture content is too high, repeated turning and high rates of aeration can help dry the material more rapidly than normal. However, it is more difficult to turn and aerate material that is too wet.

#### WHEN

Makeup water will be required regularly during **COMPOSTING STABILIZATION** to counteract evaporation losses and to maintain sufficient moisture for nutrient distribution. Add water just before or during the **TURNING AND MIXING** process to distribute it uniformly throughout the material. Add water before any part of the material dries to 45 percent moisture or lower.

### 3.3.3

## Composting Stabilization/Control pH

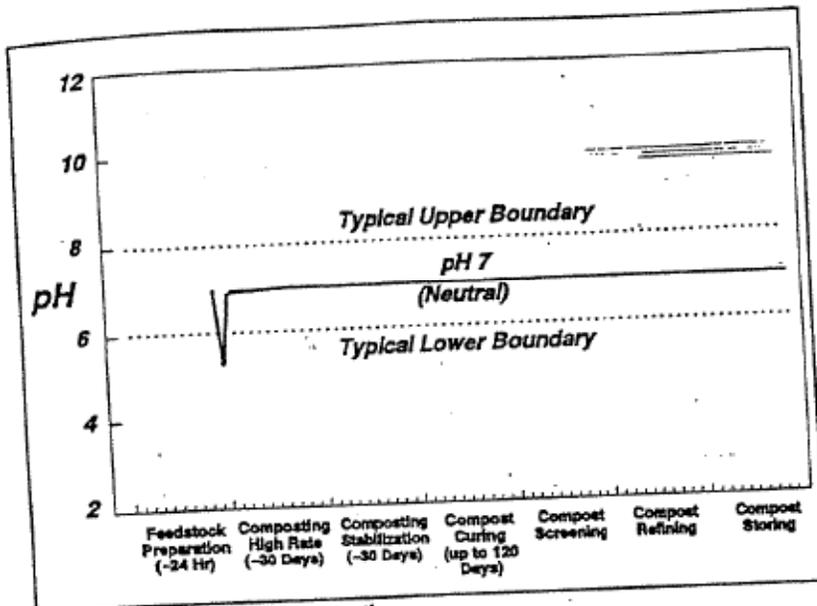


Figure 3.3.3-1 - pH during composting.

#### BIOLOGICAL

The pH of composting material affects the types of microorganisms active during the composting process. Bacteria are most abundant within a pH range of 6.0 to 7.5; fungi flourish between 5.8 to 8.0. Microbial activity is optimum when pH is between about 6.0 and 8.0.

If the oxygen supply during composting is

inadequate, anaerobic pockets may form. Anaerobic fermentation also forms organic acids, which can cause the pH to drop to 3.5 to 5.0, significantly slowing microbial activity. As organic material decomposes further and temperatures rise, the compost stabilizes naturally at a pH between 6.0 and 8.0. In addition, the decomposition of proteins contributes to the production of  $\text{NH}_3$  (ammonia), further neutralizing acids. Excess nitrogen in the feedstock or a high pH can drive off nitrogen in the form of  $\text{NH}_3$ .

At a neutral pH ( $7.0 \pm 1.0$ ), metabolic activity in the microbial colonies releases  $\text{CO}_2$ . With increased aeration, the release of  $\text{CO}_2$  to the atmosphere will help raise the pH.

#### COMPOST SAFETY STANDARDS

Compost having a pH between 5.5 and 8.5 meets compost safety standards developed by the Composting Council for General Use Compost. A pH lower than 5.5 and higher than 8.5 can adversely affect plants and the environment. Maintaining pH above 5.5 helps to prevent corroding metal in the feedstock and in facility equipment, and reduces the potential for metal contamination of the final product.

## 3.3.2 Composting Stabilization/Turning and Mixing

TABLE 3.3.2-1  
TYPICAL TURNING AND MIXING FREQUENCIES

Frequency	Feedstock Preparation	Composting High Rate	Composting Stabilization	Compost Curing	Compost Storing
Continuous	✓	■			
Daily	■	✓			
Several times per week		✓	■		
Weekly		■	✓	■	
Monthly				✓	✓
No turning and mixing					✓

Key: ✓ Most common. ■ Not as common.

### OBJECTIVE

#### OVERVIEW

The objectives of **TURNING AND MIXING** are to:

- blend makeup water uniformly throughout the compost
- homogenize the compost product by distributing various feedstock materials
- break up clumps in composting materials that can become anaerobic, too wet, or too dry
- break up air channels between clumps of composting materials that can over-dry areas near the channel and starve other areas of adequate air

- aid physical breakdown of materials
- kill fly larvae that may grow on the surface of the composting material
- move older material to make room for newer material
- expose all materials to high temperature during the **CONTROL PATHOGENS** step.

**TURNING AND MIXING**, combined with proper moisture, aeration, and nutrients, provides a hospitable environment for efficient decomposition of organic material.

#### BIOLOGICAL

The microbes that decompose organic matter require water, nutrients, and air in the correct proportions throughout the entire mass of composting material. **TURNING AND MIXING** helps distribute water, nutrients, and air uniformly to the microbes. If the material is not mixed, the added water may concentrate at the top or bottom of a composting material, making some parts too wet and leaving other parts too dry.

**TURNING AND MIXING** usually involves exposing each part of the composting material to the air, so the process also aerates and cools the composting material. Because of the high rate of oxygen consumption during decomposition, **TURNING AND MIXING** must be supplemented with forced aeration to supply enough oxygen to the microbes. (See 3.3.4, **COMPOSTING STABILIZATION/AERATE**.)

## **APPENDIX 7**

### **Information on CRSWMA Composting**



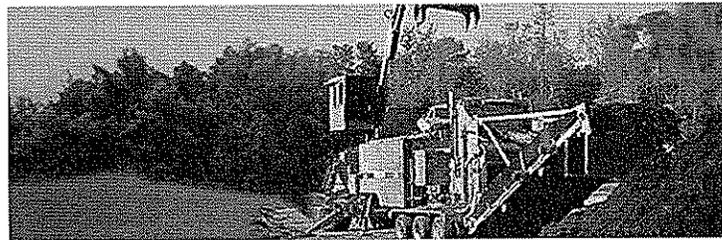
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## Compost for Sale

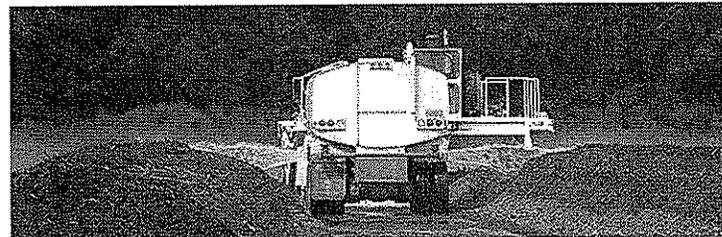
CEP produces a high-quality yard waste compost for sale to the public. This product, known as "CoastalGrow" is available in bulk for \$30.00 per ton at the Tuscarora Landfill, Grantsboro Transfer Station and Newport Transfer Station. Compost is an organic amendment to improve the chemical, physical and biological properties of soils. It is not normally considered a fertilizer as it is too low in nutrient content for all plant nutrient needs. However, compost has many benefits for soil improvement and plant growth.



CEP grinds only clean yard waste (leaves, limbs, etc.) for compost. No painted, pressure-treated or creosote wood is used.



After grinding, the material is laid out in windrows and nitrogen and water are added. The nitrogen speeds up the aerobic decomposition of the material and the internal temperature of the windrows rises to over 131 degrees, killing off weed seeds and other undesirable matter. As the compost continues to decompose, the windrows are kept moist and turned weekly to keep the process going.



Then the material is screened through a machine known as a trammel screen. The trammel screen separates small particles of yard waste from large particles. With openings only 5/8ths of an inch in the screen, only very small particles are used for compost.



After the compost has stabilized and matured, it is ready to sell. The larger particles are sold as mulch or used in other landfill operations. CoastalGrow has gained wide acceptance by landscapers and gardeners in the Carteret, Craven and Pamlico County area.

For additional information about CoastalGrow, please call (252) 633-1564 or [Email Us](#) to request a brochure with details on how this product should be used.

COASTAL ENVIRONMENTAL PARTNERSHIP

7400 Old Hwy. 70 West  
New Bern, NC 28562  
Tel: 252-633-1564  
Email: [info@cep.org](mailto:info@cep.org)

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## **APPENDIX 8**

### Equipment Specifications

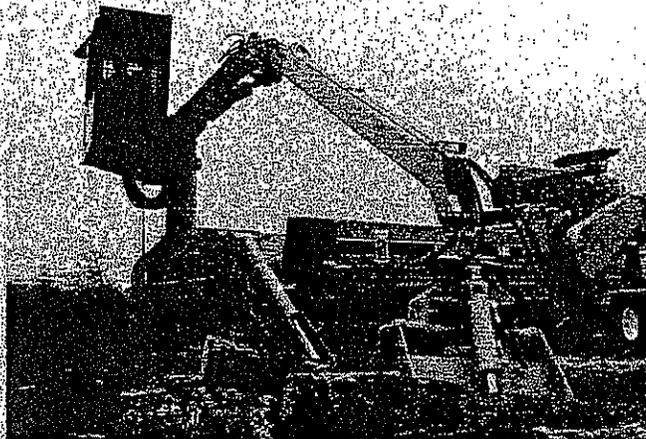
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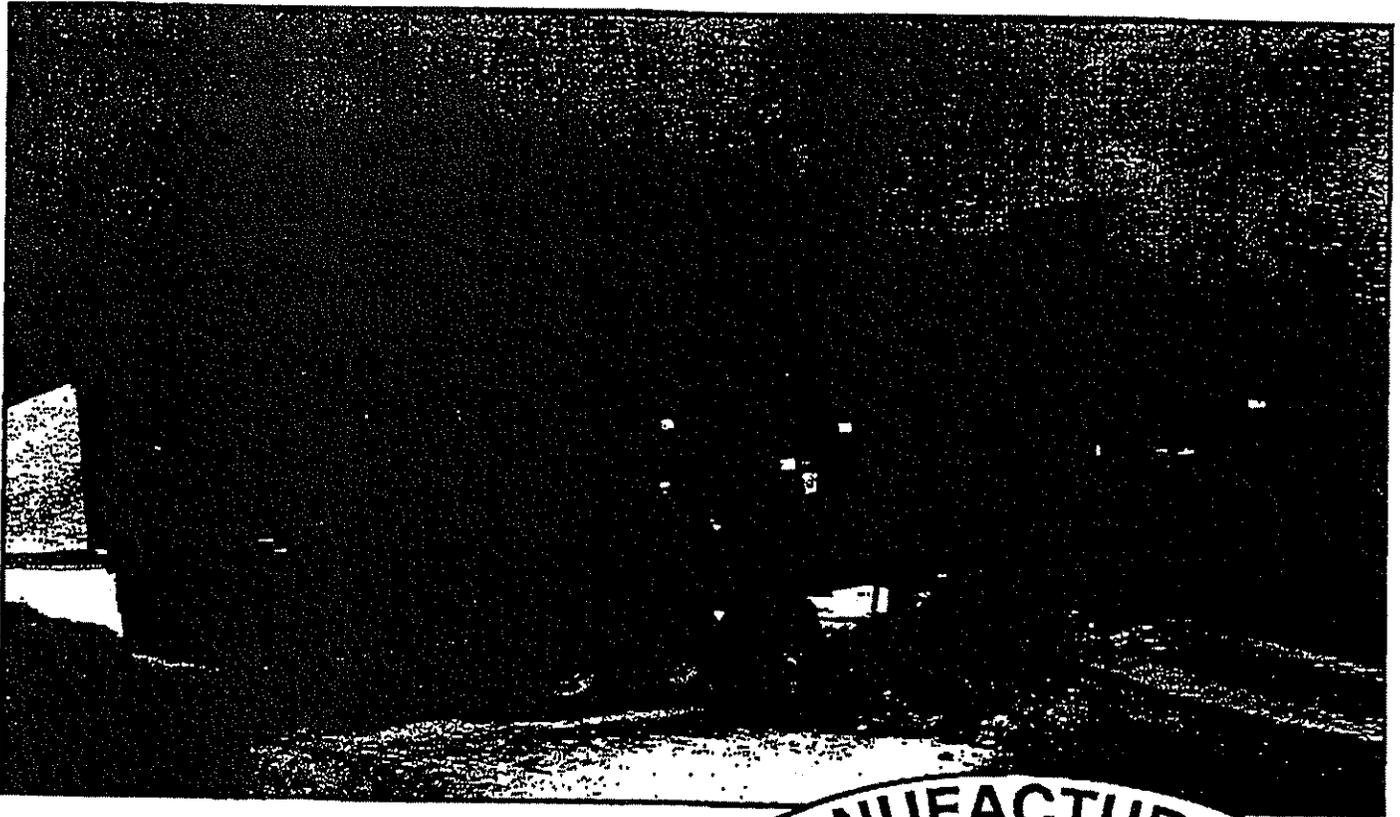


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## MODEL 613



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- 2) Easy Setup
- 3) Products Completely Separated
- 4) Remote Control to Dump Grizzly
- 5) 120 Volt Outlet
- 6) Extra Electric Power to Operate Additional Conveyors and Screens
- 7) Screen at Ground Level for Easy Maintenance
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## Scarab Model 18 Windrow Composting Machine

### Features

Designed to be the most efficient and effective means to reduce organic waste back to a stable and useful form, the SCARAB is the best machine to meet your composting and soil remediation needs and site requirements.

### Specifications

- **Tunnel:** 18' x 7' (Approx.), rubber belting, lined to absorb impact and reduce sticking.
- **Engine:** Caterpillar, Tier II Series
- **Drum & Wheel Drives:** All machines equipped with hydraulic drive systems on the drum and wheel systems. SCARAB Automatic Digital Load Controller controls wheel speed to maintain proper drum pressure to prevent damage due to high pressures
- **Drive Systems:** Drive Wheels 23.1L x 26 - 28L x 26 - 67 x 34 - 66 x 43 Rear Casters w/ Single 16.5L x 16.1 or Dual 11L x 15
- **Optional:** Single 21.5L x 16.1 or Dual 16.5L x 16.1 SCARAB Full Track Assemblies, Four Track Drive, Four Wheel Drive
- **Drum:** 32" overall diameter, 1/2" drum wall thickness. Brackets designed with replaceable side plates, tear drop shaped brackets to prevent breakage, brackets designed to accommodate a variety of SCARAB flails.
- **Cab:** Designed and built specifically for the SCARAB. Air conditioned, heated, tilt console with controls electric over hydraulic, sound insulated, tinted safety glass, deluxe operator seat, foot rests, windshield wiper, and all gauges and controls easily accessible.
- **Warranty:** Standard Engine warranty, with extended warranty available. One year on remainder of machine on materials and workmanship. Limited Lifetime Drum Warranty against breakage of shafts and flail rackets.
- **Options:** Automatic Reversing Engine Fan, Automatic Fire Suppression Systems, figuration, Legal Load designs, and more...

