PROPOSAL TO MONITOR RUNOFF FROM COMMERCIAL COMPOSTING FACILITIES IN NORTH CAROLINA

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By – Carolinas Composting Council, Water Oak Engineering, Inc.
For – NC Department of Environment and Natural Resources

The Carolinas Composting Council (CCC) proposes to monitor runoff from 3 composting facilities in North Carolina, each of types 1 through 3 of the 4 types described in 15A NCAC 13B .14. A type 4 facility will not be monitored, as nearly all of such sites in the State are under cover. Those sites not under cover were unable to allow monitoring. This document is organized as follows:

1. Proposed uses of Carolinas Composting Council's monitoring results
2. Parameters for analysis
3. Monitoring system goals
4. Selected monitoring sites
5. References

Section 1 – Proposed Uses of Carolinas Composting Council's Monitoring Results
NCDENR commented that CCC must propose how new monitoring data can be used in State regulatory processes. CCC is interested in a monitoring system that can be used to characterize process runoff from facilities of the feedstock types 1 through 3, as defined in 15A NCAC 13B .14. Understanding the difference in runoff quality between the different types of facilities can allow for a more efficient permitting process and better-engineered and more cost effective stormwater/wastewater treatment systems.

Currently, aspects of the permitting process for composting facilities are not fully defined. Facilities must apply for permits related to their solid waste handling activities as well as their wastewater and stormwater handling. In many cases runoff from areas where materials storage or waste processing is taking place is being considered wastewater. If the water is discharged into a local sanitary sewer system then local permitting rules apply. If the water is discharged into the groundwater, retained on site or contained and hauled off site, then permits must be obtained through DWQ as waste not discharged to surface waters. If the water will be discharged to surface waters, then NPDES permitting applies. Runoff from non-working areas of composting facilities can be permitted under stormwater regulations. In cases where site stormwater mixes with process runoff, the entire volume must be treated as wastewater. The design criteria and guidance for treatment in surface water and groundwater discharge scenarios is not rigidly defined. In some cases permit applications require engineering calculations including hydraulic and pollutant loading for each treatment unit. Some applications also require an analysis showing expected wastewater concentrations of (e.g. 15A NCAC 2T):

total organic carbon, 5-day biological oxygen demand, chemical oxygen demand, Nitrate-N, Ammonical-N, total Kjeldahl N, pH, chlorine, total phosphorus, phenols, total volatile organic compounds, fecal coliform, calcium, sodium, magnesium, sodium adsorption ratio, total tri-halomethanes, total dissolved solids

As existing data on runoff from composting facilities in North Carolina is limited, it is difficult to estimate hydraulic and pollutant loading into wastewater treatment devices. It is also difficult for an applicant to collect grab samples that are representative of the incoming waste stream to a proposed treatment device. Pollutant concentrations and hydraulic loading rates can change dramatically over a storm period. There is typically a higher pollutant concentration at the beginning of a storm as pollutants that have accumulated are washed away, followed by a period of lower concentrations once the pollutant buildup has been significantly removed, followed by a low flow period where rainwater that fell directly onto the compost piles is released as more concentrated leachate. Collecting a sample during one of these periods versus another can lead to dramatically different results. The runoff flow rates can also vary significantly during a storm and must be accounted for in determining a representative runoff sample for a storm event. Periods of higher flow must receive greater representation in the sample and lower flow less representation. Several other variables affect the results of runoff sampling from compost facilities, such as time of year, storm intensity, storm duration and storm depth.

CCC proposes to collect data that more closely represents the quality of runoff from composting facilities than that collected thus far in North Carolina. They will also collect useful hydraulic data from the facilities, particularly useful being the runoff and leachate volumes generated. This data can be used by NCDENR to help determine the most appropriate permit type and treatment methods at a given facility. It will also provide better input hydraulic and water quality design data to consultants than existing data or grab samples collected on site. This will lead to better design assumptions and then better performing, more cost effective treatment devices.

Section 2 – Parameters for Analysis

After reviewing monitoring requirements for solid waste facilities in NC and several other states and previous studies (includes all listed references), the following parameters are proposed for lab or field analysis at each site:

- Nitrate nitrogen (NO3-N)
- Total Kjeldahl Nitrogen (TKN)
- Ammonical nitrogen (NH4-N)
- Total phosphorus (TP)
- Total suspended solids (TSS)
- pH
- 5-day Biological oxygen demand (BOD_5)
- Total oil and grease

- Total Zinc (Zn)
- Total Copper (Cu)
- Total Lead (Pb)
- Pathogens (E. coli as indicator)

Section 5.3 of CH2MHill, 2004, entitled "Commercial Composting Water Quality Permit Development," was a particularly useful reference in determining this list of monitoring parameters. The document includes a summary of monitoring requirements at composting facilities in Oregon, Washington, Maine and California and provides recommendations for updates to the existing requirements in Oregon.

Section 3 – Monitoring System Goals

CCC has designed a monitoring scheme that will isolate runoff from the working areas of the compost facilities, collecting minimal or no runoff from non-working areas of the site. The working areas include material storage zones as well as active composting zones. The study will not distinguish between storage and active composting zones, but rather collect a lump sample for the entire working area of the facilities. The results can be applied in any combination of mixing of site stormwater and process runoff. Site stormwater can be represented using the much larger body of existing stormwater data and methodologies already being applied in North Carolina.

CCC proposes to monitor a total of 3 sites. Rainfall will be measured continuously at each site. Runoff flow rate will also be measured continuously to allow for runoff volume calculations and flow weighting of water quality samples. Composite samples will be collected at each site which will result in 1 sample per storm, per site. The sample will be a composite of many small samples taken during the storm, with more small samples taken during higher flow periods of the storm, thus giving periods of higher flow rates greater representation in the composite sample. Samples will be collected using automated sampling equipment. If flow rate cannot be measured at a selected site, a rain gage can be used to initiate sampling at a programmed time frequency until the storm ends or using rainfall intensity to determine sampling times. In such a scenario, runoff volumes can be estimated based upon rainfall and watershed characteristics. Grab samples will also be taken during each storm event for pathogen analysis, which will require an additional trip to that for the composite samples. The monitoring will take place over a period of 1 year to include each season. All sample analysis will be performed by a State-certified lab.

Section 4 – Selected Monitoring Sites

Table 1 shows the sites "fully permitted" by the Division of Waste Management. Several factors were considered when selecting the 3 monitoring sites, including:

- The owner must be willing to allow monitoring

- The sites should ideally be close to Raleigh, as that will make equipment installation, maintenance and sample collection more efficient. This is particularly true considering that pathogen samples may be taken, which must be analyzed within 6 hours of collection time.

- As described in section 3, the process runoff from the facilities should be isolated

- Samples should be collected from points of concentrated flow at the drainage outlet of the working area to allow for relatively accurate flow measurement

The following subsections describe the sites selected and details of the monitoring design. In each case, a representative portion of the site will be monitored as opposed to the entire facility. This is so the compost working area of the site can be isolated and flow can be measured.

Section 4.1 – Griffin Brothers Yard Waste Composting Facility (Type 1)
Location - Apex
Feedstock – yard waste
Watershed composition – composting windrows
Approximate watershed size – 2 acres
Flow measurement – weir

Contact person – Dan LaMontagne, RTP Market Manager (p - 919-367-2895)
Address – 5940 Old Smithfield Road, Apex, NC 27539-5351

This site is not shown on any of the lists of sites provided by DWM or DWQ. Figure 1 shows an aerial view of a portion of the facility along with an approximate watershed boundary. The owners have offered to construct a small berm to divert non-process water away from the monitoring point and to concentrate runoff from the watershed so that flow rate can be measured. Flow rate will be measured by installing a weir at the low point in the berm. The berm will be constructed and protected in a manner so that it does not erode. The entire facility will not drain through the weir and be sampled, however the section being sampled is believed to be representative of the process area of a type 1 composting facility.

Section 4.2 – Sun Gro Horticulture Processing (Type 2)
Location – Elizabeth City
Feedstock – pine bark, peanut hulls
Watershed composition – composting windrows, feedstock storage, work area
Approximate watershed size – 6.5 acres
Flow measurement – weir

Contact person – Steve Larson, General Manager (p - 252-338-5174)
Address – 841 Sun Gro Drive, Elizabeth City, NC 27909-2714

Figure 2 shows an aerial view of the watershed to be sampled, including the watershed boundary. There are lateral drainage ditches between the windrows that tie into a main ditch that leaves the site. A weir will be constructed at the sampling point in the main ditch for flow measurement and

flow-weighted composite sampling. The entire site will not be monitored, only this representative portion.

Section 4.3 – City of Sanford Composting Facility (Type 3)

Location – Sanford
Feedstock – yard waste, chicken manure
Watershed composition – composting windrows
Approximate watershed size – 1.5 acres
Flow measurement – weir/orifice

Contact person – Larry Craig, Refuse Superintendent (p – 919-775-8247)
Address – 601 N 5th Street, Sanford, NC 27330

Figure 3 shows an aerial view of the watershed to be sampled, including the watershed boundary. Runoff from the windrows is directed into earthen drop inlets and then through culverts and out to the sampling point. A weir/orifice device may be attached to the pipe outlet for flow measurement or a weir may be installed in the ditch immediately down from the pipe outfall, pending a more detailed hydraulic analysis. Again, a representative portion of the site will be monitored in order to isolate a working area.

Section 5 - References

Bartlett, Jerry. 2006. Storm Water Treatment Options at Composting Facilities. Biocycle. February, 2006.

CH2MHill. May 2004. Commercial Composting Water Quality Permit Development. Prepared for Oregon Department of Environmental Quality, Land Quality and Water Quality Divisions.

E&A Environmental Consultants, Seattle, WA. 1998. Evaluation of Compost Facility Runoff for Beneficial Reuse, Phase 2 Final Report. Clean Washington Center. July, 1998.

Kennedy/Jenks Consultants. November 2007. Compost Leachate Research. Prepared for Oregon Department of Environmental Quality, Land Quality Division.

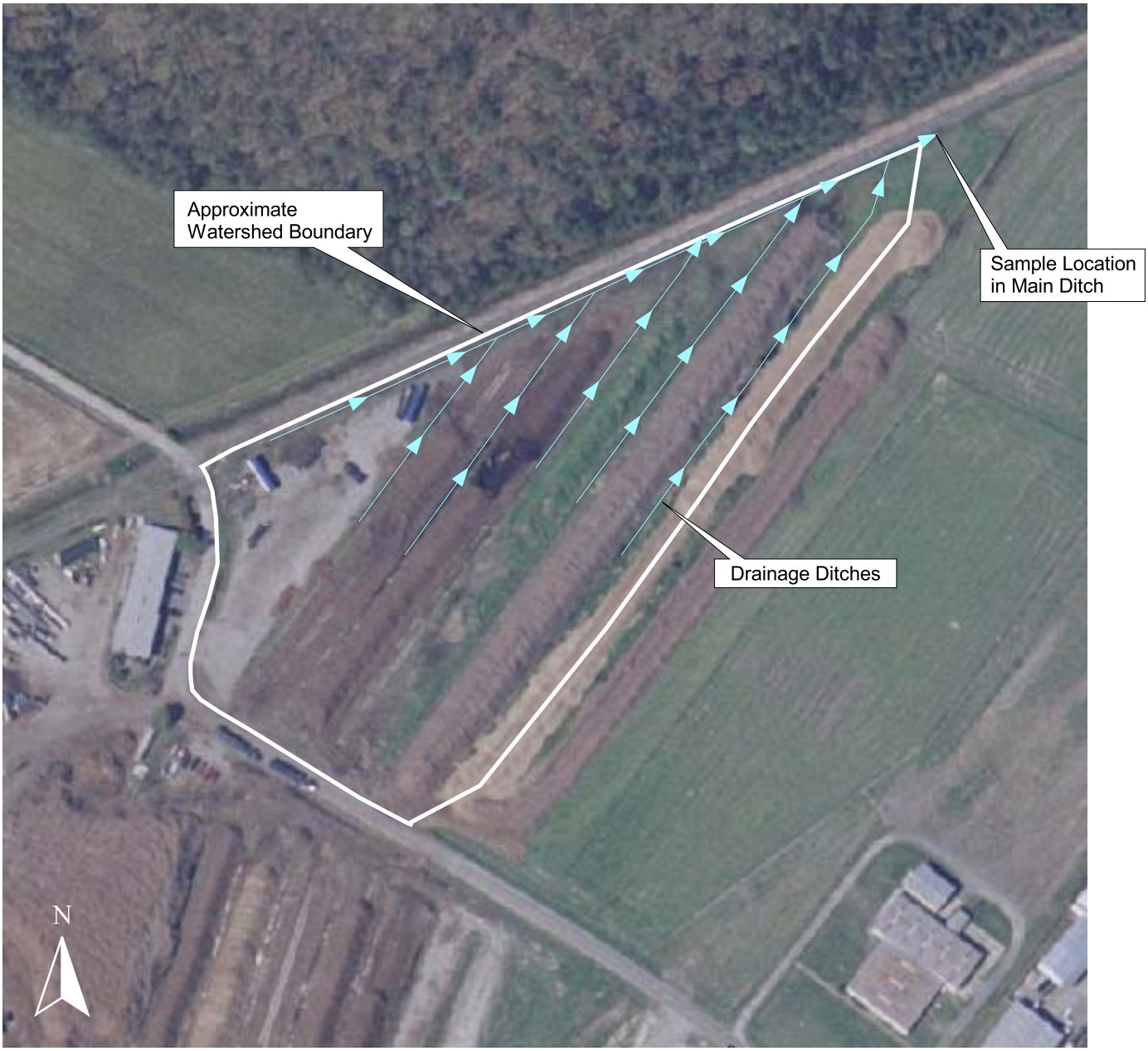
Table 1. Composting facilities "fully permitted" by the NC Division of Waste Management

TYPE 1		
Facility Name	**City (NC)**	**Size**
Tarheel Bark Company	Charlotte	L
Hwy 49 C&D Landfill	Cornelius	L
Todco, Inc Wood Recycling Facility	Lexington	L
Brunswick Co.	Bolivia	L
Reynolds Park Rd Compost Facility	Winston-Salem	L
Uwharrie Environmental Yard Waste Compost Facility	Mt. Gileade	L
Overdale Yard Waste Facility	Winston-Salem	L
Ingleside Compost Facilty – City of High Point	High Point	L
City of Greensboro	Greensboro	L
City of Winston-Salem	Winston-Salem	L
City of Hickory	Hickory	L
Coastal Regional Solid Waste Management Compost Facility	New Bern	L
Henson's Inc Mulch and More	Tryon	L
Compost Central – Mecklenburg County	Charlotte	L
New Bern Yard Waste Facility	New Bern	L
Carolina Resource Recovery	Mebane	L
Raleigh Yard Waste Center	Raleigh	L
TYPE 2		
Facility Name	**City (NC)**	**Size**
Bio-Comp, Inc	Edenton	L
SunGro Horticulture Processing	Elizabeth City	L
Vulcan Materials – South Fork	Winston-Salem	L
TYPE 3		
Facility Name	**City (NC)**	**Size**
Wallace Farm, LLC	Huntersville	L
Orbit Energy	Raleigh	S
N.C. Zoological Park	Asheboro	L
UNC Charlotte	Charlotte	S
Sunburst Trout Company	Canton	S
B&B Concrete Products	Franklin	S
Crowell Dairy Farms, Inc	Asheville	L
The Asheville School	Asheville	S
Dean Brooks Farm	Goldston	L
Caledonia Correctional Institution	Raleigh	S
City of Sanford	Sanford	L
Novozymes North America	Franklinton	L
Dixie Classic Fairgrounds	Winston-Salem	Sl
Brown Creek Correctional Institution	Raleigh	S
Rose Acre Farms – Hyde County Egg Farm	Seymour	L
Super Soil Systems USA	Clinton	S
Appalachian State University	Boone	S
Piedmont Soils LLC	Sampson Co.	L
TYPE 4		
Facility Name	**City (NC)**	**Size**
North Carolina State University	Raleigh	L
Camp Lejeune Marine Corps Base	Jacksonville	L
McGill Environmental Systems	New Hill	L

Figure 1. Griffin Brothers Composting Facility
Apex

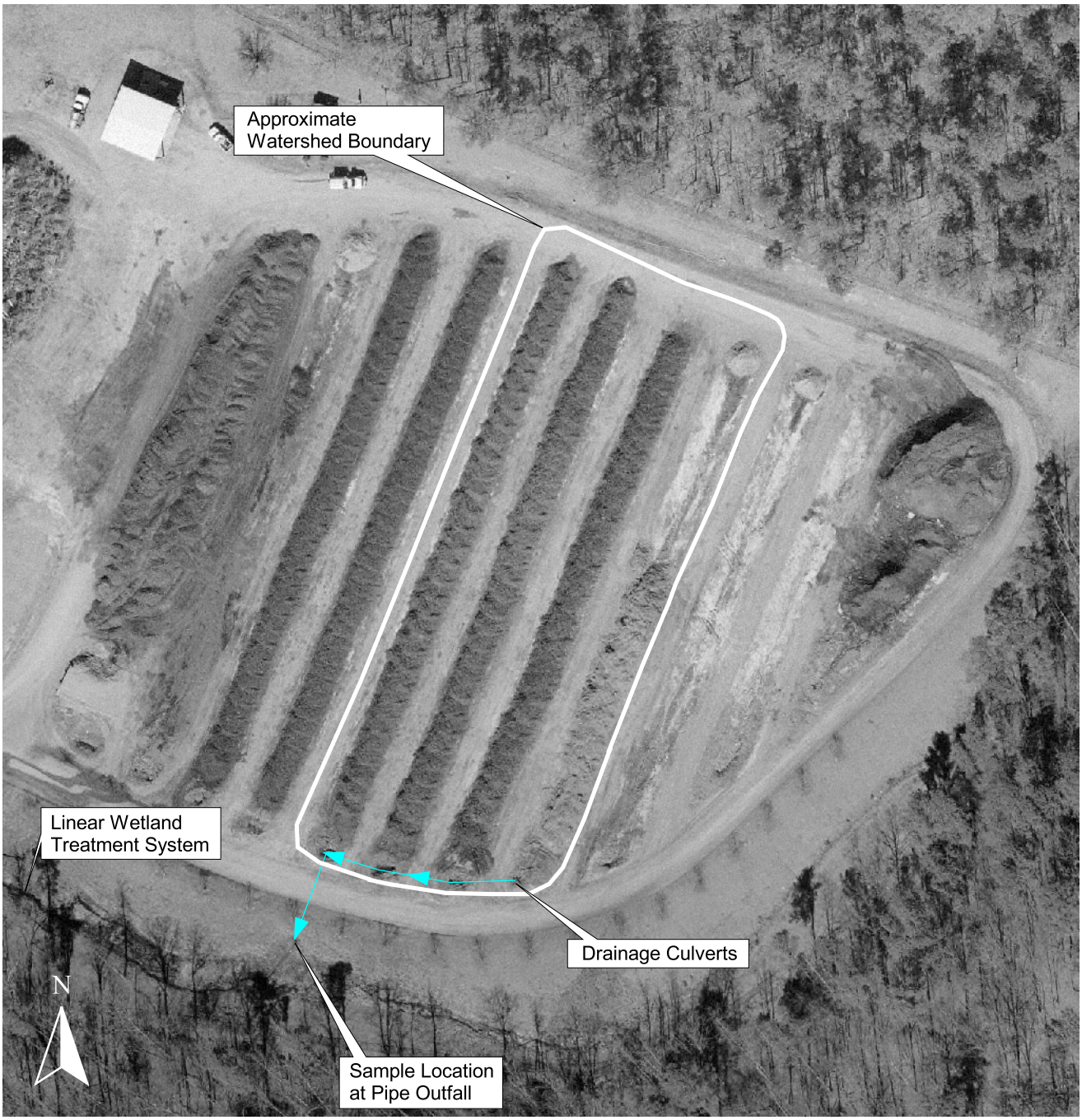
Type 1 Facility
Feedstock: Yard waste
Approximate watershed size: 2 acres
Watershed composition: Composting windrows
Flow measurement: weir

Figure 2. Sun Gro Horticulture Processing
Elizabeth City



Type 2 Facility
Feedstock: Pine bark, peanut hulls
Approximate watershed size: 6.5 acres
Watershed composition: Composting windrows, feedstock storage, work area
Flow measurement: weir

Figure 3. City of Sanford Composting Facility



Type 3 Facility
Feedstock: Yard waste, chicken waste
Approximate watershed size: 1.5 acres
Watershed composition: Composting windrows
Flow measurement: weir/orifice