

**SWANA RECYCLING
TECHNICAL ASSISTANCE STUDY**

**CONCEPTUAL LAYOUT/SUMMARY FINDINGS REPORT
MECHANICSBURG BOROUGH AND SILVER SPRING TOWNSHIP
JOINT YARD WASTE COMPOSTING FACILITY**

Prepared for:

**BOROUGH OF MECHANICSBURG
CUMBERLAND COUNTY, PENNSYLVANIA**



Prepared by

GANNETT FLEMING, INC.



HARRISBURG, PENNSYLVANIA

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**MECHANICSBURG BOROUGH AND SILVER SPRING TOWNSHIP
JOINT YARD WASTE COMPOSTING FACILITY**

1.0 INTRODUCTION

The Borough of Mechanicsburg, in conjunction with Silver Spring Township, has agreed to explore the possibility of a joint yard waste composting site. The proposed compost site would be located on a currently unused portion of the Borough's Wastewater Treatment Plant (WWTP) site. Once constructed, the proposed yard waste compost site would be open to residents from both municipalities to drop off leaves and yard waste materials. After the composting of leaf waste and the chipping of brush is completed, the finished compost product and woodchips will be available for use by Mechanicsburg Borough and Silver Spring Township as well as their residents.

To further advance this project, the Borough requested expertise to help develop a conceptual layout of the proposed site. In addition, the Borough requested a preliminary capital cost estimate for the project. Gannett Fleming, Inc. (GF) worked with Mechanicsburg Borough to identify the following tasks for the joint composting project:

Study Scope

- Task #1** GF staff will work with Mechanicsburg Borough to gather pertinent background information from the Borough and Silver Spring Township. Specific project needs and/or problems associated with this project will be identified and considered.
- Task #2** GF will develop a conceptual layout for the proposed composting site, to be located at the Mechanicsburg Wastewater Treatment Plant site. GF will use available GIS information/ mapping to aid in completing this task.
- Task #3** GF will provide a preliminary capital cost estimate for constructing the compost site. The cost estimate will consider the possible shared use of Cumberland County composting equipment.
- Task #4** GF will prepare and provide Mechanicsburg and Silver Spring Township a brief summary report of findings.

2.0 BACKGROUND

Based on the 2000 U.S. Census, Mechanicsburg Borough has 9,042 residents. Silver Spring Township has 10,592 residents, for a combined total of 19,634 residents for the two municipalities. Both municipalities are mandated to recycle under PA Act 101. Act 101 mandates curbside recycling in communities with a population over 10,000 and in communities over 5,000 with a density of 300 persons per square mile. The existing waste and recycling collection services for each municipality are presented in the sections below.

3.0 EXISTING WASTE COLLECTION AND RECYCLING ACTIVITIES

3.1 Mechanicsburg Borough

Mechanicsburg Borough currently has over 9,000 residents and is mandated by Act 101 to provide curbside recycling services. Mechanicsburg recently contracted with Penn Waste, a hauler located in York County, to provide waste collection and recyclables collection services. Refuse collected by Penn Waste is taken to the York County Resource Recovery Facility, where it is burned to generate electricity at a disposal cost of about sixty dollars per ton. All recyclable containers, placed at curbside, are taken to Penn Waste's new recycling facility in Manchester, PA that opened in May 2002. The accepted curbside recyclables include:

- Glass (clear & colored)
- Aluminum cans
- Steel & bi-metal cans
- Aerosol cans
- #1 & #2 Plastics
- Newspaper
- Magazines/ Junk Mail

Leaves are collected at curbside by the Borough in the fall. The collected leaves are taken to the Mechanicsburg Borough WWTP and deposited in piles and allowed to stabilize over the winter. The leaves are then reloaded onto trucks, and land-applied on fields in the spring. As reported by Mechanicsburg Borough, the Borough collected 1,050 cubic yards of leaves in 2002, and 1,932 cubic yards in 2003.

3.2 Silver Spring Township

As stated above, Silver Spring Township is a mandated recycling community of nearly 11,000 residents. Silver Spring also contracts with Penn Waste to provide curbside waste collection and recyclables collection services. Recyclables are collected weekly on the same days as trash collection and include:

- Glass (clear & colored)
- Aluminum cans
- Steel & bi-metal cans
- #1 & #2 Plastics
- Newspaper, magazines, junk mail

As of 2003, leaves and brush are collected weekly by the Township at the curbside from mid-October through mid-December. The Township collects leaves and brush separately using a rear loading trash truck. The collected material is taken to Willow Mill Park, where the material is being temporarily stored in piles until it can be brought to the proposed yard waste composting facility. Residents are also permitted to drop off leaves and brush at a designated area of Willow Mill Park. In 2003, the first year of the Township's yard waste collection program, the Township collected 625 cubic yards of leaves and 1,650 cubic yards of brush.

4.0 YARD WASTE

Mandated municipalities are required to provide for the collection of "leaf waste" for residents as described by Chapter 271 of the PA Code. "Leaf waste" is defined in Chapter 271 as leaves, garden residues, shrubbery and tree trimmings, and similar material; leaf waste does not include grass clippings. Collection of other yard waste materials (such as grass clippings) is not required by the Act 101 recycling mandate, but clippings are sometimes accepted by mandated curbside recycling programs. It should be noted that a drop-off location is not an option for replacing curbside collection of "separated" materials in mandated communities, which includes "leaf waste" as defined in Act 101.

Grass can be the biggest yard waste component in the wastestream by weight, but it is often encouraged to be kept out of the compost stream. The state regulations require additional measures to be taken when accepting grass clippings at a yard waste composting site (regarding receipt, handling, and mixing of grass into yard waste piles). When incorporated into a compost pile, grass clippings may sometimes compact and restrict air flow throughout the pile. Due to high moisture content and density, grass clippings can sometimes turn anaerobic, generate malodors, and slow the composting process. Composting of grass clippings requires careful handling and management measures at yard waste composting sites.

Leaves are usually the biggest yard waste component by volume. Local yard waste generation rates vary dramatically based on yard size, percentage of the population in single-family housing, and various other related factors. Yard waste can be the largest component of municipal solid waste (MSW) during the summer and fall, with grass predominant in the Summer and leaves predominant in the fall. In general, yard waste can be one of the larger components of landfilled MSW by volume or weight. Because of this, diverting yard wastes to composting sites can significantly reduce tipping fee charges at disposal sites.

5.0 COMPOST SITE CRITERIA AND SIZING

5.1 General Yard Waste Siting Criteria

The PADEP Guidelines for Yard Waste Composting Facilities (effective date September 1, 1997) apply to yard waste composting facilities of less than five acres that adhere to certain siting, design, and operational requirements in the Guidelines. The Municipal Waste Management Regulations (Title 25 Pa Code, Section 271.103(h)) allow such yard waste composting facilities to operate under a “permit-by-rule” if they comply with the Guidelines. Compost facilities between five and fifteen acres in size may be allowed to operate under an existing PADEP General Permit (GP) for composting facilities, provided the proposed activities are consistent with the existing GP and approved by PADEP. For the 5-15 acre compost sites, PADEP requires the submittal of Form 27, “Acceptance of General Permit Conditions”, as part of this process. PADEP then makes a “Determination of Applicability” based on the information provided by the applicant requesting approval to operate under the GP.

The Guidelines (that apply to composting sites of less than five acres, and which will apply to this project) specify areas where yard waste composting facilities are restricted. The siting restrictions listed below, and noted with a “GUIDELINES” qualifier, indicate areas where yard waste composting is prohibited under the Guidelines, unless the operator takes special precautions and receives written authorization from the Pennsylvania Department of Environmental Protection (PADEP). Additional siting criteria are also listed below, and should be considered during the evaluation and selection of a yard waste composting site.

Yard Waste Siting Restrictions and Criteria

- Remote from residential areas (GUIDELINE – at least 300 feet from an occupied dwelling, unless a written consent waiver is obtained to be closer). Greater isolation distances and buffer zones desirable.
- Proximity to source of yard waste material. Minimize hauling distances.
- Sufficient size.
 - Approximately 3-5 acre site is recommended for 5,000-7,500 cy/yr of yard waste. GUIDELINE – maximum 3,000 cy/acre site loading, and limit composting (composting, curing and storage activities) to 5 acres maximum, or else Guidelines and permit-by-rule exemptions don’t apply. Buffer areas and non-composting areas not considered part of the 5-acre maximum.
 - Additional space allowance for expansion and/or alternate uses (e.g. recycling drop-off).
 - Windrow Layout: In order to minimize equipment maneuvering (e.g. number of passes), windrows are often designed to maximize their length across the available site area (which reduces total number of rows).
 - GUIDELINE – no composting or storage (other than curing) within 50 feet of a property line

- Ownership/ control of the site.
- Land – open/ vacant
 - Nearly level to moderate slopes. 2-4% slopes are considered ideal
 - Favorable soils – deep, well-drained, that perform well in wet seasons
- Drainage
 - GUIDELINE - No regional groundwater table within 3.3 feet of surface
 - GUIDELINE – Not within a 100-year flood plain
 - GUIDELINE – Not within 100 feet of a perennial stream
- Sensitive areas
 - GUIDELINE – Not in or within 300 feet of an exceptional value wetland, or in or within 100 feet of other wetlands
 - No historic sites
 - No rare/endangered species
 - No restricted lands
 - No sensitive “receptors” nearby (schools, nursing homes, etc.)
 - GUIDELINE – Not within 100 feet of a sinkhole or area draining into a sinkhole.
 - GUIDELINE - Not within 300 feet of a water source
 - Consider prevailing wind direction and potential downwind receptors
- Access
 - Easy access for vehicles and equipment into and throughout site
 - If public site access desired for dropoff of yard waste and pickup of finished compost, ease of access and area for same
 - Control of access to unauthorized persons and to unauthorized refuse dropoff
- Utilities
 - Water supply is the most critical utility service and should be readily available
 - Power supply is desirable
 - Stormwater management and discharge point may be required

5.2 Site Visit

A site visit of the Mechanicsburg Wastewater Treatment Plant site was conducted on January 29, 2004. GF evaluated the WWTP site based, in general, on the above site restrictions and criteria. The results are presented in Table 1 below. Overall, the site appears very favorable for the development of a yard waste composting operation. The site is nearly level (1/2-1% slopes) and the soil is mapped (County Soil Survey) as a well-drained Hagerstown Silt Loam (see Figure 1 at the end of report). As shown on Figure 3 and Figure 4 attached at the end of this report, the site contains an area of inert fill. It is assumed that some or all of this fill material may be used, if site development requires grading of the yard waste drop-off and composting areas. In its existing state, the proposed public yard waste receiving/ drop-off and compost areas will require very little clearing of brush and trees (see site photos in Figure 2). No buildings are located in the proposed area where site development will occur.

TABLE 1: MECHANICSBURG BOROUGH WWTP – COMPOST SITE CRITERIA

YARD WASTE SITE CRITERIA	MECH. BORO WWTP SITE RATING (+, 0, -)	ADDITIONAL COMMENTS
Remote from residential areas (recommended at least 300-foot buffer)	+	Fry Communications, Green Ray, Inc. and Norfolk Southern Railroad properties border the site.
Close Proximity to Yard Waste	+	Site is in a central location in western Mechanicsburg, just south of Silver Spring Twp. and will service approximately 19,000 residents.
Sufficient Size	+	Approximately 3-4 acres of level site area available. Suitable area available for composting, with proper 50-foot property line setback. Public dropoff/pickup area available.
Ownership/ Control of Site	0	Site is owned by WWTP. Access crosses Green Ray, Fry Communications and Monroe Twp ROW, will require new ROW agreements and wider ROW.
LAND		
Vacant	+	No buildings, site is mostly cleared.
Level to Moderate Slopes	+	Site has a ½-1% cross-slope and longitudinal slope. Site fill available on-site for grading.
Good Drainage, no High Water Table	+	Hagerstown silt loam (HaA & HaB): Deep, well-drained soils underlain by limestone.
Not within 100 feet of a Perennial Stream or within 300 feet of a Water Source	+	Yes, complies
Outside of Floodplain	+	Yes, complies
SENSITIVE AREAS		
No wetlands	+	none apparent. Mapped soils are deep and well-drained.
No historic sites	+	none visually noticeable upon physical site walk-through.
No rare/endangered species	+	none apparent
No restricted lands	+	none apparent
No sensitive “receptors” nearby	+	none apparent. Utility and industrial uses nearby.
No sinkhole areas (within 100 feet)	+	none visually noticeable upon physical site walk-through
ACCESS		
Easy access for vehicles and equipment, public access	0	Road access will be constructed along parcel boundary (widened ROW/agreement needed), alternate access through WWTP site, or from Fry parking lot.
Control of access to unauthorized persons	+	Main access along WWTP road will be gated if needed. A gate will be placed at entrance to compost area. Fencing will restrict access to composting area.
UTILITIES		
Water supply	+	Both potable and non-potable sources available nearby
Power supply	+	Extend from adjacent WWTP facility if needed
Stormwater Management	0	Area available for stormwater detention, catch basin nearby (on WWTP site) for pond discharge. Suitability of elevations and avoidance of other utility crossings/conflicts will need to be confirmed in final design and construction.

+ Positive 0 Neutral - Negative

6.0 YARD WASTE COMPOST SITE SIZING

6.1 Leaf Waste Generation Quantities

Combined, Mechanicsburg Borough and Silver Spring Township collected over 2,500 cubic yards of leaves in 2003. This equates to 52 pounds of leaves collected per capita per year for the two municipalities. Silver Spring also reported that the Township collected 1,650 cubic yards of brush in 2003. It is noted that 2003 was Silver Spring's first year in providing leaf and brush collection services for its residents. Yard waste collection tonnages for Silver Spring Township (and for Mechanicsburg) are expected to increase as their programs develop and as residential participation increases. The level of participation will significantly impact the total quantity of material generated each year. In addition, the amount of material to be composted may vary based on the types of yard waste materials accepted at the site (e.g. grass clippings, tree waste, etc.).

Generation of yard waste varies depending on the type of community (i.e. urban, suburban or rural) and the maturity of the leaf collection program. Typically, leaf waste generation rates per capita range from 100 to over 250 pounds per capita per year. The majority of Mechanicsburg and Silver Spring residents reside in suburban areas with medium sized to large sized lots. Gannett Fleming's yard waste planning experience with numerous urban and suburban communities of similar size in central Pennsylvania (Carlisle, Hanover, Columbia, Bloomsburg, Coal Township (near Shamokin) indicate per capita generation rates in startup programs of between 30 and 110 pounds per capita per year. Therefore, the 52 pounds per capita number is reasonable. However, it is important to plan for some growth in the quantities processed in the program as the system matures. For example, Camp Hill Borough is a very mature suburban community with a leaf collection program that has gone on for decades. In 2002, Camp Hill reported a combined leaf waste/brush/stumps generation rate of almost 400 pounds per capita per year (which includes a significant quantity of wood waste).

6.2 Compost Site Sizing

For sizing a yard waste composting facility for Mechanicsburg and Silver Spring, a reasonable leaf waste generation estimate is 120 pounds per capita per year, which represents a two-fold increase in current leaf waste collection rates. Using a population of 20,000, generating an average of 120 pounds of leaf waste per capita annually, with an assumed moist bulk density of 400 pounds per cubic yard, a community the size of Mechanicsburg and Silver Spring (combined) could be expected to generate about 6,000 cubic yards of leaf waste annually. The PADEP Guidelines require no more than 3,000 cubic yards of leaf waste to be composted, stored, or cured on one acre. Thus, the minimum site size required for this compost site is 2 acres, and more realistically, 3 to 5 acres including buffer and non-composting areas. This

acreage requirement is generally consistent with the available acreage at the WWTP site. A site of this size will serve not only the immediate needs of the two communities, but also future needs of the two communities in the coming years.

The site sizing and layout presented in this report proposes the use of a turned windrow system to process the yard waste quantities expected from Mechanicsburg Borough and Silver Spring Township. A turned windrow system accelerates composting through regular windrow turning with a loader or windrow turner, and will provide residents with a useable compost product. This type of system is low-technology, easily operated by municipal crews, and currently in use by municipalities at over 200 locations across Pennsylvania. Camp Hill, Carlisle, Shippensburg, and Lower Allen are just a few of the Cumberland County municipalities that use this technology. Operation of a turned windrow system in accordance with PADEP's Guidelines for Yard Waste Composting Facilities allows this project to operate under the permit-by-rule provisions of the Guidelines, which minimize regulatory requirements.

For conceptual sizing and layout purposes, a paired-windrow layout is proposed. With this layout, pairs of windrows are initially constructed next to each other. Within 1-2 months, each reduced-size pile pair is combined into one new windrow. This combination provides sufficient pile size to insulate the biological decomposition process, allowing pile breakdown to continue throughout the winter. The ideal windrow pile size that provides for optimal aerobic decomposition throughout the year, and allows equipment access for pile turning and mixing, is 7-8 feet tall and about 15 feet wide. Windrows of this size hold about 2 cubic yards of leaf waste per linear foot of pile. To accommodate 6,000 cubic yards of leaf waste annually (our design target quantity), the compost site needs to fit approximately 3,000 feet (total length) of windrows, or 1,500 feet length of windrow pairs. Waste dropoff and pickup, brush storage and processing, curing, truck maneuvering, buffers and setbacks, and utility/stormwater management areas need to be provided for, in addition to the windrow composting area requirements. Requirements for all of these activities need to be considered in laying out a yard waste composting operation for Mechanicsburg and Silver Spring.

If the Borough elects to purchase yard waste collection and or processing equipment, the site may need additional area to stage and store this equipment. However, it is the intent of Mechanicsburg and Silver Spring to utilize Cumberland County's shared-equipment program for yard waste processing, which currently includes tub and horizontal brush grinders, windrow turners, a compost product screen, and a top-dress applicator. For this reason, no allowance is necessary for equipment storage on site, other than actual processing areas.

7.0 FULL-SCALE CONCEPTUAL LAYOUT

7.1 General

The conceptual layout presented in this report is based on a full-scale, comprehensive composting operation that should meet the future needs (for both municipalities) of a mature composting program. The layout presented is conceptual only, and the design phase of the project will determine final layout and corresponding project details. The "full-scale" compost pad presented is approximately twice the size needed to handle current recorded leaf volumes (~3,000 cubic yard per year). The conceptual layout shows asphalt, rather than gravel, as preferred road and compost base for the access road, the yard waste receiving area, and compost pad.

The Mechanicsburg WWTP site has about 5 acres total site area available for this project, of which approximately 2 to 2.5 acres is available for composting and curing activities. A proposed conceptual layout for the full-scale yard waste and composting site is provided in Figure 3. Figure 4 presents the layout details of the composting site. The conceptual layout was developed based on site visit observations, discussions among GF, Mechanicsburg Borough and Silver Spring Township, and all information gathered and reviewed that related to the development of the site.

The proposed layout provides sufficient site area to accommodate easy site access, facilitates public and municipal dropoff of yard waste and brush, provides for public pickup of finished compost product, allows for processing areas and maneuverability of equipment, provides for leaf waste composting and curing, and provides for minimum setbacks as required by the PADEP Guidelines. An entrance sign will identify the site in accordance with the PADEP Guidelines. The layout reserves approximately ½ acre of land for stormwater detention, since the proposed new site paving will create additional site runoff. The actual stormwater storage requirements and details will need to be determined during final design of the project.

A total of seven pairs of windrow piles (14 windrows total) are shown on the site layout figures. These windrows as shown can accommodate approximately 6,200 cubic yards of leaf waste. In addition, the site is laid out to accommodate approximately 2,000 cubic yards of curing piles, where the composted leaves will be stacked and undergo final curing and stabilization, until used. This practice will allow the active composting area to be available for the new year's leaf waste by the next fall. In the initial years, when leaf waste quantities are smaller, their will be sufficient area to allow curing to occur in place.

The conceptual layout includes a receiving area that is fenced/gated off from the primary composting site. In the receiving area, residents will be permitted to drop off leaf waste and brush in bunker areas, where they will be temporarily stored until they are processed/composted.

This receiving area also will contain bunkers that will hold finished compost and chipped wood mulch, for pickup by residents. Residents who bring yard waste to the facility will be directed by signs to drop the material in the appropriate bunkers. Signs will also identify bunkers for the pickup of finished compost and mulch. Municipal brush delivery trucks will also deliver loads to a large, approx. 40-foot by 120-foot brush storage bunker at the dropoff area of the site.

Municipal trucks carrying leaf waste from Mechanicsburg and Silver Spring will enter the gated site in the fall, and will travel directly to the windrow pile and unload their payload. Figure 4 shows the access lanes that will be provided for delivery trucks and equipment, both between the pile pairs and at the perimeter of the site. The site is laid out for one-way circular access to and from the windrow piles. Truck access to the composting area is diverted away from the residential dropoff area, to minimize conflicts between the two activities. After leaves are delivered, they will be wetted as needed, and a front-end loader will be used to construct and shape the windrow piles. Leaves will be periodically turned and rewetted as needed, following the PADEP guidelines. The windrow piles are laid out to accommodate the use of the County's pull-behind, self-powered, windrow turner unit.

Recommended low-technology compost operational procedures over the 12-18 month composting/curing cycle are included in Appendix A.

7.2 Site Utilities and Infrastructure

Composting/Curing Pads – these will be asphalt, and will provide a good compost site base on which to operate the County windrow turner equipment. The site will be fenced and gated as needed to restrict unauthorized access. No composting will occur within 50 feet of the WWTP site property boundaries. Curing will occur (and is permitted in the Guidelines) within the 50-foot setback area. The proposed paved area at the site will be stripped of topsoil, and using existing fill piled just to the north of the compost pad, the site will be graded to enhance the existing site slopes (1/2 to 1%), to create a 1% south to north grade. The dropoff area will be sloped to drain into a storm sewer system as shown on Exhibit 4.

Stormwater Management – runoff from the paved site will, where feasible, be directed into a proposed stormwater pond. The discharge from this detention pond will be piped to an existing stormwater catch basin inlet on the WWTP site. The design requirements and details of this system are beyond the scope of this study, and will need to be confirmed during final design.

Water for Pile Wetting – The current plan envisions drilling an on-site well and connecting to new freeze-free yard hydrants along the perimeter of the composting pad. Proposed hydrant locations limit the length of hose required (for pile wetting) to about 200 feet. As an alternate to the use of well water for pile wetting, the WWTP also has existing non-potable

plant water hydrants located near the dropoff area of the compost site (see Figure 4), which could be used to rewet the piles. “Non-potable” refers to the treated and chlorinated plant effluent from the Mechanicsburg WWTP that is currently permitted for stream discharge. If non-potable water is used, the piping from the existing non-potable hydrants could be connected to and serve the proposed compost site yard hydrants. This practice would promote the recycling of treated plant water, and would conserve potable water.

As clarified by Marty Ferry, PADEP South-central Regional Office Water Quality Management Permit Chief, use of non-potable plant water for pile wetting may be acceptable to the Department for the Borough to use its WWTP effluent for the composting operation as long as the water would be used in a once-through manner, and not recollected after the wetting operation and recycled back to the compost. Therefore, use of non-potable water as described may not require inclusion in the WWTP’s NPDES permit, scheduled to be submitted for renewal around April of 2005. NPDES permit requirements related to this use should be confirmed with PADEP.

As indicated by Carl Hursh, PADEP Chief of Waste Reduction and Recycling, and Dan Lapato, PADEP Soil Scientist, a Compost Facility General Permit may be required for the Borough’s project if non-potable water (WWTP effluent) is used for pile wetting. If the Borough elects to pursue the non-potable pile wetting option, it will require further clarification from PADEP regarding the NPDES and General Permitting requirements.

Electricity – Electrical service from the WWTP site will be used to provide site lighting of the dropoff area of the site, as shown on Figure 4.

7.3 Site Access Scenarios

As part of developing the conceptual layout, we identified several site access alternatives, and selected what we believe is the best access road alternative to provide access to the yard waste dropoff/ receiving area and compost area. Five alternatives were reviewed with the Borough, including the following:

- 1. Through Treatment Plant road that passes through WWTP facility.**
 - It was agreed that this option would be a good alternate access road, but should not be the main access route since it may disrupt WWTP operations and potentially be unsafe.

- 2. Dropoff /pickup area for residents at gate at the front of WWTP**
 - It was determined that there was insufficient space available at the entrance of the WWTP to allow for a residential drop-off/ pick-up area. Additionally, residential activity at the entrance may interfere with access into the WWTP.

3. Construct new access road over Monroe Township easement

- This alternative is the selected alternative, and is further described below. The affected property owners include Monroe Township, Greenray, and Fry Communications. Initial discussions with all three affected parties concerning the construction of the access road are very favorable.
- Monroe Township easement
 - They appear to be in agreement regarding road construction over their sewer line. Monroe’s manholes will need to remain accessible.
 - Existing easement is 20’. Mechanicsburg will need to work with the adjoining landowners to extend existing easement to 30’.

4. Access site from Memorial Park over tracks to site

- Historically, it has been difficult to add any new traffic pattern that crosses the Norfolk Southern Railroad. It is anticipated that getting Norfolk Southern approval of this access option would be very difficult, and therefore, this option is not viable.

5. Drop-off/pick-up area at Memorial Park

- A residential yard waste drop-off/ pick-up area could possibly be established in an open area at Memorial Park. After being drop-off by residents, the yard waste would have to be loaded onto a truck and delivered to the proposed WWTP compost area. The site may not be able to be fully monitored and would require transport of the yard waste to the yard waste composting site. This is an inefficient method of handling of leaf waste and finished compost materials, and is not recommended unless no other public dropoff/pickup option is available.

The most feasible method of providing primary access to the site is by a new two-lane paved access road that parallels the south property border of the treatment plant site. The construction of a gravel access road is not recommended because the access road will border two adjacent landowners. Loose gravel, dust and road upkeep may become problematic for the Borough.

It is proposed that an existing 20-foot wide sewer easement owned by Monroe Township (a trunk sewer easement) be widened to 30-feet wide, to accommodate grading and construction considerations for the proposed 20-foot wide access driveway. The additional right-of-way will need to be obtained from GreenRay Industries and Fry Communications, and approval from Monroe Township will be needed to use their sewer right-of-way for road access. Initially, the site access road entrance will not be gated. If needed, a gate may be installed at the entrance of the access road (possibly opened only when the site is manned), to prevent any problems associated with persons using the access road, or persons improperly depositing materials at the dropoff area.

Also, an existing meter pit that houses equipment to meter Monroe Township’s flows to the treatment plant is located in the easement and within the proposed access road footprint. This meter pit, which extends one foot above the existing ground surface, will require modifications (new heavy duty road-rated access hatch, possible concrete chamber modifications, site grading changes) to accommodate placing the access road over the chamber. Manhole modifications to the trunk sewer may also be required.

The road passing through the WWTP was designated as a secondary access road, to be used only when necessary to provide compost site access.

8.0 YARD WASTE SITE PREPARATION AND OPERATION COSTS

There will be costs associated with preparing and operating a turned windrow yard waste receiving and compost site. Appendix B contains a preliminary project cost estimates for a full-scale project and for a reduced-scale (Phase I) project. The full-scale project is sized to handle up to 6,200 cubic yards of yard waste annually. The Phase I, reduced-scale facility, is sized to handle up-to 4,400 cubic yards of yard waste to accommodate the joint municipal needs in the initial years of implementation. For the Phase I project, the compost pad area holding four windrow piles and two curing piles on the eastern portion of the site have been eliminated. Two water hydrants have also be eliminated for the Phase I project/ cost estimate.

This following information in this report only reviews cost associated with the full-scale project. The full-scale site preparation costs include: clearing and grubbing, grading, excavating, windrow pad construction and processing area preparation, water line installation, stormwater protection, erosion control measures, access road construction and security (fencing and/or a gate), local permitting, legal, administrative, engineering, and financial costs. The preliminary cost estimate for the proposed site improvements and related costs is approximately \$825,000. It is assumed that there is no land cost for the composting site, since Mechanicsburg already owns the property, and it is assumed that the cost for the additional right-of-way for the access road is zero or nominal.

The project cost estimate also includes costs for on-site yard waste-handling equipment, including the cost of loaders (for pile building, brush and compost handling, curing pile stacking) and tractor equipment to tow the windrow turner as it turns the compost piles. The preliminary cost estimate for the proposed new rolling stock is \$200,000. The cost estimate assumes that Mechanicsburg and Silver Spring have existing equipment and trucks for 1) collecting leaf waste and delivering the leaf waste to the site, 2) delivering the County’s windrow turner to the composting site for use, and returning it after use, and 3) distributing the final compost product as needed. A truck with a pintle hitch, electric brakes, and capacity to tow 20-25,000 pounds

(with a 2000 +/- pounds tongue weight) is required to tow the County's windrow turner to and from the compost site. The municipalities need to determine the extent to which new equipment purchases are required to operate the compost site; to the extent that this equipment exists in their fleets and is available for use, new equipment may not need to be purchased for compost site operations.

Annual costs that are anticipated at the site include rental/agreement and fuel/operating costs for use of the County's windrow turner, tub and horizontal grinders and other yard waste equipment; staff time to operate and maintain the collection trucks; staff time and fuel/operating costs to maintain and operate a loader to turn windrows (typically 3-4 times per year between December and April), and to operate the other County equipment; water and electric utility costs; administrative costs of the program. Amortization costs for the portion of the project capital costs are not covered by PADEP Act 101 grant funding. Amortization cost are included in the cost estimate because it has been assumed these cost will be absorbed by the Borough and Silver Spring Township. Some staff time will also be required for miscellaneous tasks (e.g. watering piles, site clean up, equipment maintenance, etc.). The preliminary annual operating cost estimate, in 2004 dollars, to operate the compost site, is \$25,000. The operating cost estimate is included in Appendix B. The annual cost estimate does not include costs for educating its residents and businesses about the details of the proposed yard waste program. The Act 101 Section 902 grant program provides up to 90% reimbursement for eligible costs associated with providing recycling education.

9.0 CONCLUSIONS AND RECOMMENDATIONS

YARD WASTE COMPOSTING SITE SIZING AND LAYOUT

- It is recommended the proposed Mechanicsburg WWTP site be developed for yard waste composting of Mechanicsburg Borough and Silver Spring Township leaf waste, as conceptualized on Figure 3 and Figure 4. This site should allow sufficient area to accommodate easy site access, easy receipt of yard waste, maneuverability of equipment, material and equipment storage, residential dropoff and pickup activities, and provides for processing of increased future quantities of leaf waste, as the program expands and matures. The site may also be potentially be used for other uses (e.g. recycling drop-off events), if desired. The Borough site is less than 5 acres, and therefore, may be operated as a permit-by-rule facility under the PADEP Guidelines for Yard Waste Composting Facilities.

YARD WASTE COMPOSTING SITE COSTS

- It is estimated that the total capital project costs associated with yard waste site preparation and for procuring equipment will be approximately \$1,200,000. The annual operational cost estimate is \$25,000. During final design of this project,

specific project details will be refined and quantified, and a more accurate cost estimate prepared.

EDUCATION

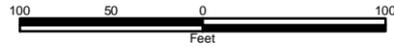
- If the Borough and Township move forward with the development of a yard waste composting site, residents and businesses should be informed well in advance of its opening. Ongoing education and public notices are recommended to keep participation rates high for the yard waste program. The program should use educational materials such as newsletters, brochures, and other sources of media that are available to inform residents of the new yard waste collection and composting, and dropoff and pickup procedures.

FUNDING

- The Borough should pursue state grant funding as necessary to help offset the costs of developing new or improving existing recycling and/or yard waste programs. Because grant funding is not guaranteed, Mechanicsburg Borough and Silver Spring Township should not rely on grant funding as the support mechanism for the joint yard waste program. The Borough should apply for 902 Grant funding for up to 90 percent reimbursement for costs associated with developing the composting site and purchasing equipment, and for educational outreach.

Note: In the final stages of completing this study, discussions with Mechanicsburg Borough and Silver Spring Township resulted in modifications to site details (use of well, removal of lighting, changes in gate types etc.). These modifications are NOT reflected on the figures for the conceptual layout for the full-scale project. The design phase of the project will determine the final layout and design details for this project.

Mechanicsburg Borough, PA
FIGURE 1
Soil Classifications



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March 2004

Projection: Stateplane
Datum: NAD 83
Zone: PA South

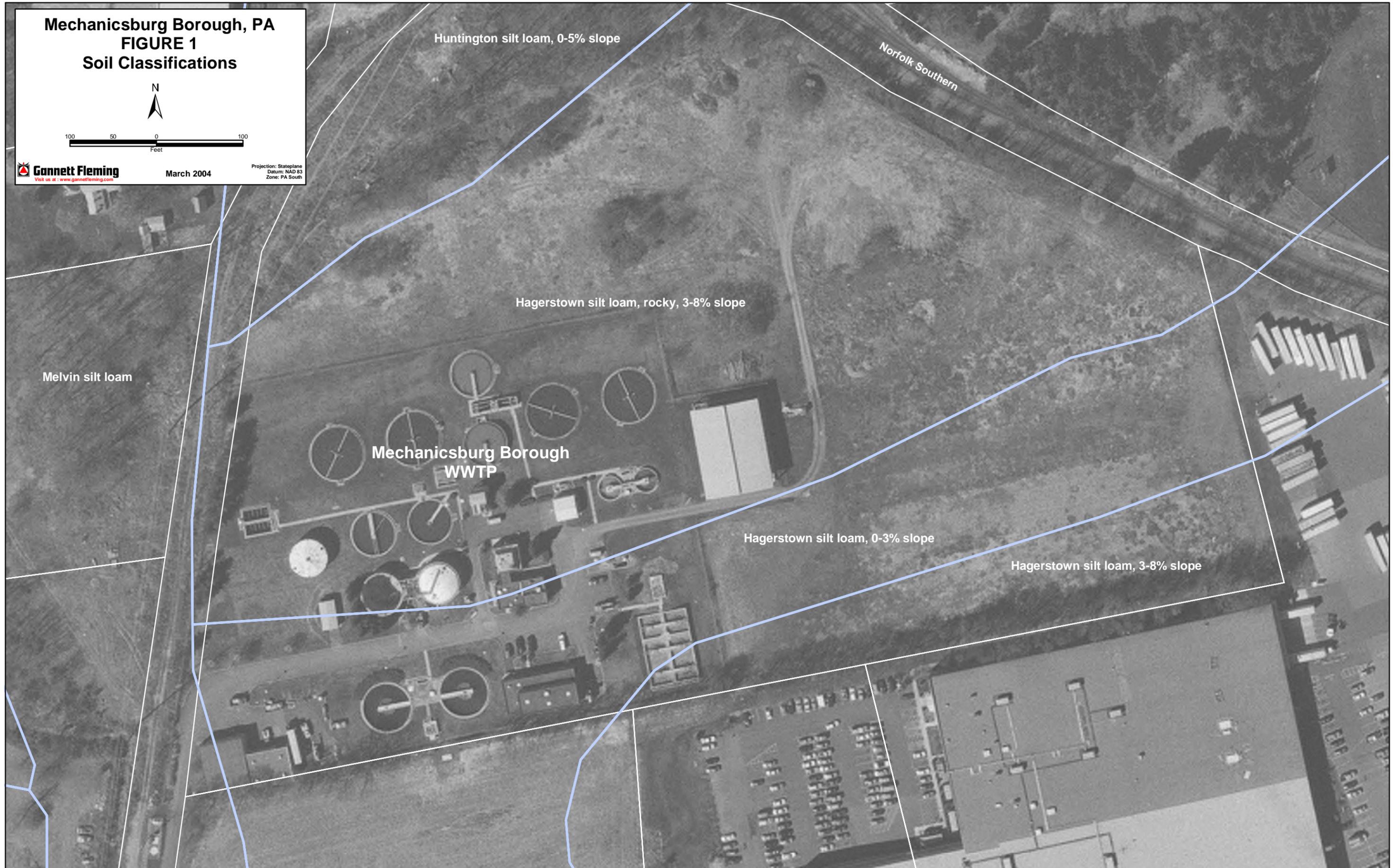


FIGURE 2 – SITE PHOTOGRAPHS



Proposed Residential Drop-off Area & Existing Fencing



Proposed Compost Area & Available Fill



**Dewatered Sludge Storage Pad – Non-potable Water Spigot
May Serve For Wetting Yard Waste**

FIGURES 3 & 4, Conceptual Layouts, are not included in the on-line version of this report.

APPENDIX A

TURNED WINDROW SYSTEM TECHNOLOGY

Although there are three main types of composting systems (i.e. mechanical reactor, static windrows, and turned windrows), this report focuses on the turned windrow system because it is most suitable to the needs of the Mechanicsburg Borough and Silver Spring Township joint composting site.

The turned windrow system is the conventional yard waste composting method. The term “turned” refers to the method of aeration used in this windrow system. The basic idea of the turned windrow system is to accelerate the compost process by building the compost pile/windrow, tearing it down, and rebuilding it. The turned windrow system is used primarily for yard wastes. The following information deals with the operational requirements of the turned windrow method. Figures 1 through 3 illustrate the key aspects of windrow construction and turning:

Construction

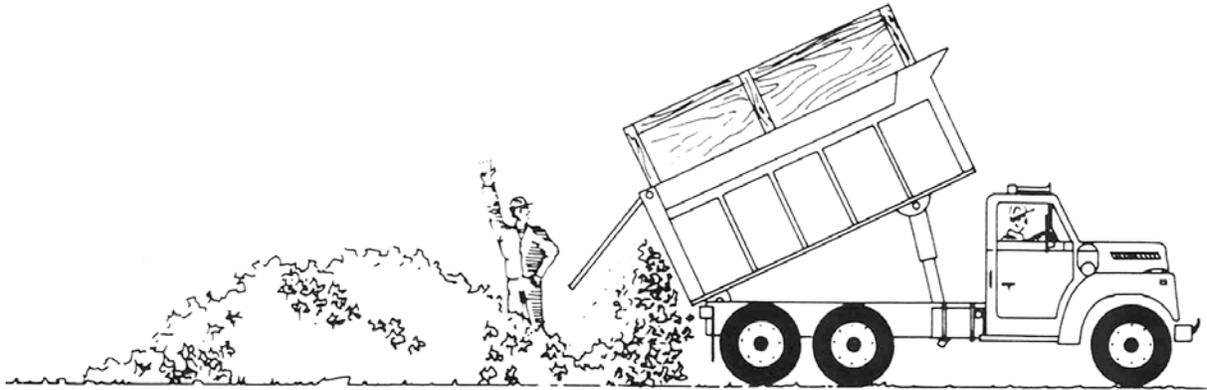
Windrow construction should occur within one week, but preferably within 1-2 days of delivery of the yard wastes. If several different types of waste are to be composted together, they should be thoroughly mixed. Grass clippings are sometimes placed on top of an existing windrow pile and incorporated into the pile. PADEP guidelines require grass clippings to be incorporated in partially decomposed windrow piles within 24 hours of grass delivery, at a ratio of no less than 3 parts leaves to 1 part grass. Mixing of yard wastes can be performed using a front-end loader, but when mixing with grass clippings, which tend to mat together, use of a windrow turner is recommended.

Watering during the pile construction period is important. Water should be added to reach the desired moisture content (between 40 and 60 percent moisture for leaf composting).

The form and shape of the windrow affects several key conditions of the composting process. For instance, if the piles are too large, oxygen cannot reach the center of the pile. If the piles are too small they will not reach optimum temperatures. The ideal windrow size varies with the substrate and with seasons of the year. In general, windrows of autumn leaves can be constructed 6 to 8 feet tall and 12 to 18 feet wide at the base; these piles may be built to 8 to 10 feet tall in mid-winter months. Larger or smaller piles can create problems for leaf composting operations. Windrows of grass clippings with leaves may need to be smaller, often only 5 feet high and 10 feet wide (however, with a 3:1 minimum ratio of leaves to grass, reduction of the windrow pile size is probably not necessary).

FIGURE 1

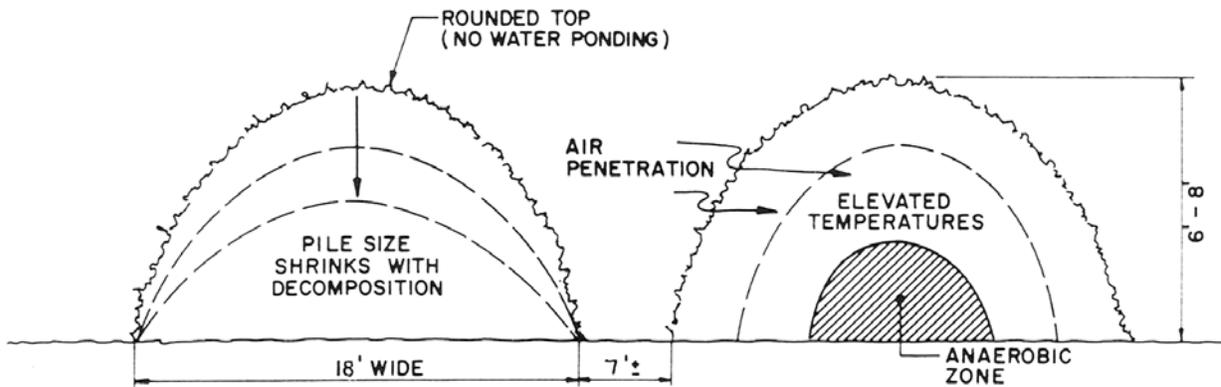
COMPOST SITE PROCEDURES



STEP 1. LEAF DELIVERY



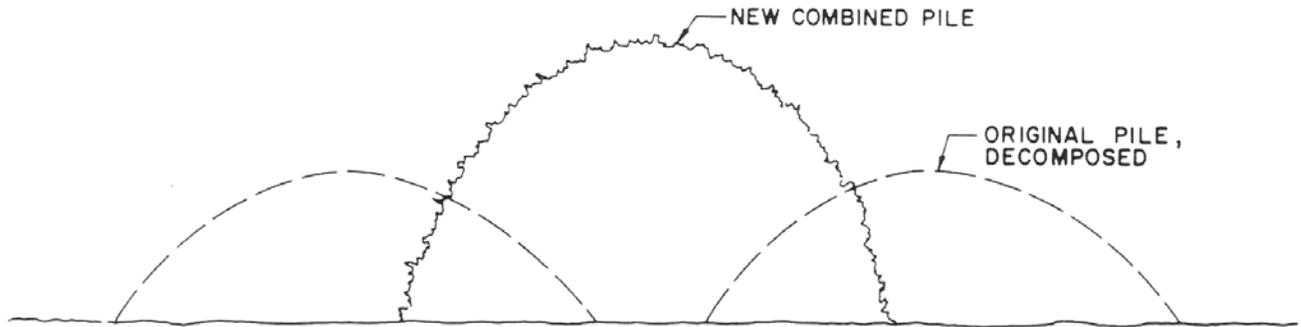
STEP 2. PILE CONSTRUCTION



STEP 3. COMPLETED PAIR OF WINDROW PILES

FIGURE 1a

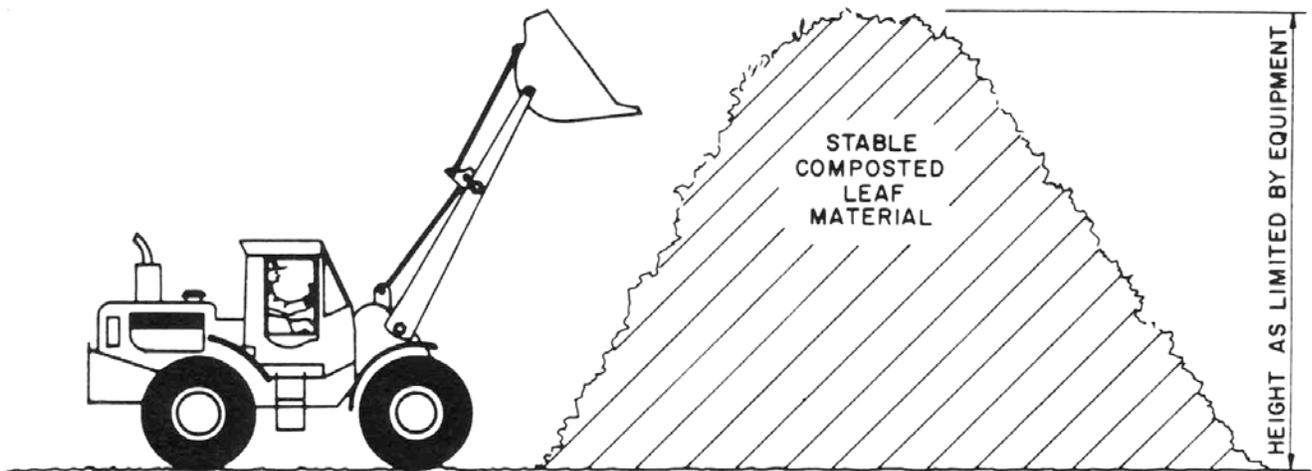
SITE PROCEDURES-CONTINUED



STEP 4. COMBINING PILES



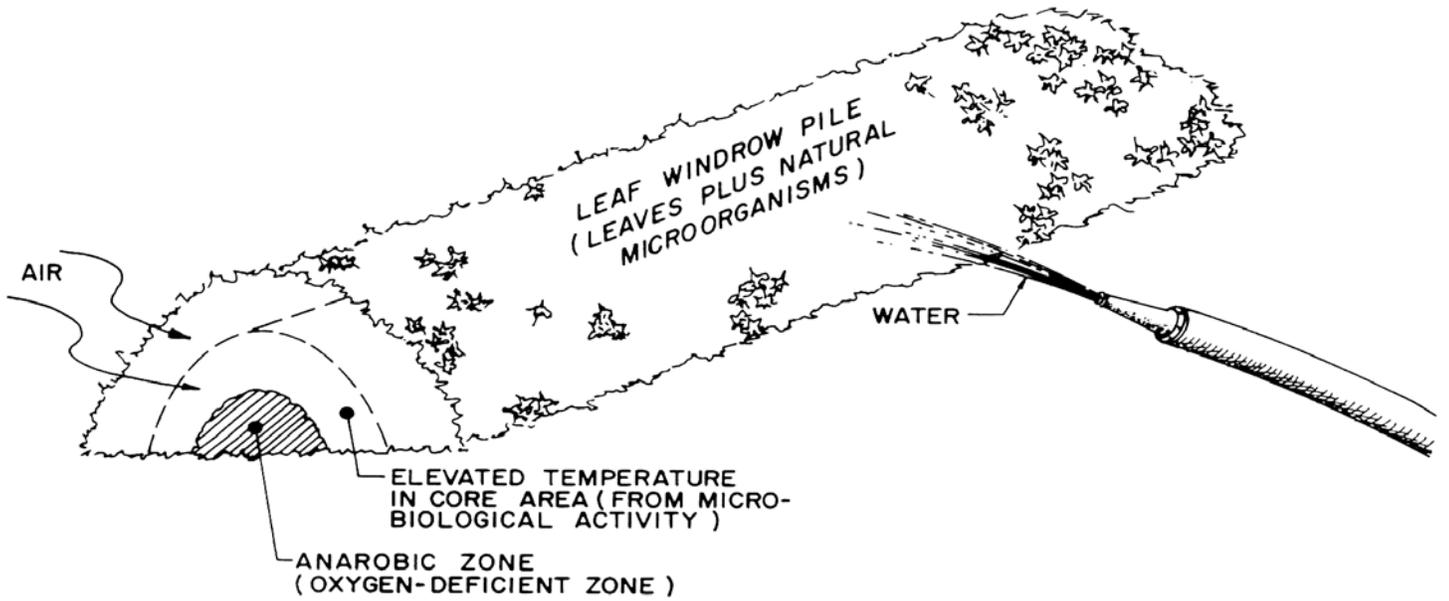
STEP 5. TURNING PILE IN PLACE



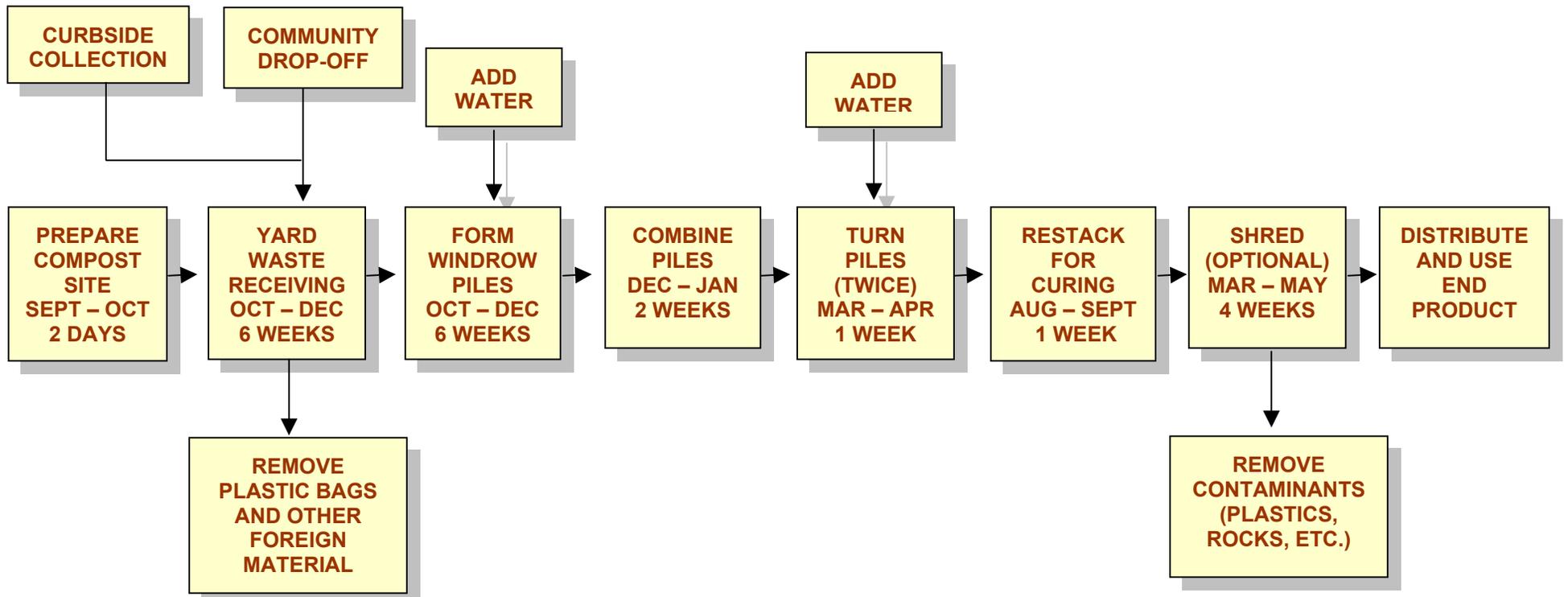
STEP 6. COMBINE AND RESTACK MATERIAL FOR FINAL CURING

FIGURE 2

LEAF COMPOSTING PROCESS



**FIGURE 3
SCHEMATIC OF LEAF
PROCESS OPERATION
LOW-LEVEL TECHNOLOGY (12-18 MONTH PROCESS)**



Keep in mind that many factors influence the size and number of piles including; seasonal volumes, equipment limitations, frequency of turning (i.e. increased/ decreased composition), moisture content, type(s) of material, etc.

In some Pennsylvania counties, municipalities share the use of the windrow turners, grinders, and other yard waste equipment among neighboring municipalities (via agreements). The municipalities gain use of equipment that would otherwise be too expensive to purchase and diffuse the overall cost for the equipment owner by sharing the operating and maintenance cost responsibilities. Annual use costs per municipality are very reasonable. For sites using a Scat-type mechanical turner, a windrow pile size of 6 feet high by 18 feet wide is optimal.

When constructing the windrow, care should be taken not to drive on or compact the material. The material should be allowed to cascade down from the bucket of a front-end loader to form a loose pile. Space permitting, it is recommended windrows be constructed in pairs for later **combining** of piles (if a Scat turner is used, a 7-foot clearance between piles is necessary for equipment passage). Allow approximately 15 feet to 25 feet between sets of pairs (see Figure 2). Typically, the piles can be combined after 2-4 months from receiving yard waste and adding it to the windrows. The piles will have experienced significant size reduction during the 2-4 month period. Combining the piles will mix the yard waste, creating a larger single pile that will usually improve the overall composting process.

Turning

The main goals of turning the compost pile are to promote decomposition by moving material from the outside to the inside of the pile, and to “fluff” the material so it will be more porous, allowing air to move freely through the pile. Turning the piles increases the rate of decomposition by mixing of materials and exposing new surface areas.

Turning frequency should be based on temperature, since temperature reflects decomposition taking place in the pile. Whenever temperatures drop below 90EF or exceed 140EF, turning should be performed. If the compost is staying within the 90E to 140EF range by itself, turning can still help accelerate decomposition. Windrows may be turned within 1 to 2 weeks after initial windrow construction. Windrows composed entirely of leaves may only need to be turned a few times a year, and should be left alone during winter months, as severe cold weather may decrease the decomposition rate. Windrows including grass clippings in the substrate will require more frequent turning to prevent odors caused by anaerobic conditions. However, if a 3:1 leaves: grass ratio is maintained, this should not be a major issue.

Should anaerobic conditions become apparent, turning the pile will temporarily add oxygen but will also create offensive odors. Before turning, try to identify the cause of the problem so remedial action can be taken as the pile is being turned. Turning of piles during breezy days with preferred prevailing wind directions will help dissipate offensive odors safely.

Although several types of equipment are available for turning windrows, front-end loaders may be the only equipment necessary for smaller composting facilities. When turning the piles with a front-end loader, let the compost cascade out of the bucket so that the materials drop through the air to keep it as loose as possible. As in initial construction, when turning/reconstructing the piles, care should be taken not to compact the material.

Windrows may only need to be turned 3-4 times between initial fall delivery (pile construction) and the middle of the next summer.

Curing

After a period of 8-10 months, decomposition in the windrows has slowed substantially. At this time, the material can be moved from the windrow composting area and stacked 10-12 feet high in curing piles (height limited by the capabilities of the site's front-end loader equipment). The material will slowly continue to stabilize. Further turning of the pile should not be necessary at this time, as long as the material stacked is stable due to proper windrow decomposition.

Screening

Often, finished yard waste compost is used as a mulch, soil amendment or conditioner, without further processing. To improve product quality, a mechanical screen or shredder may be used to size-reduce and/or size-separate various grades of material. This can improve demand and potential end-uses of the material.

Limitations

There are two potential limitations associated with the turned windrow system. These are odors and pathogens. Odors can periodically be a part of the composting process, even with appropriate operating procedures. Proper site and operations management will minimize odor occurrences. Pathogens are generally applicable to operations that involve the processing of wastewater sludges or residues from other animals, and should not be an issue in yard waste operations.

Monitoring Procedures

The key elements for successful composting include moisture content, oxygen, temperature, pH and substrate. These environmental factors work together to provide the desired extent and rate of decomposition. Frequent monitoring of the compost piles is important, as the pile characteristics are clues to the composting process. Good record-keeping practices allow the operator to study the monitoring results and better address problems and concerns. Standard monitoring parameters and record-keeping requirements are summarized below. At a minimum, the following parameters should be monitored:

Moisture - Water is essential to the survival of microorganisms. Excessive moisture, however, inhibits the flow of oxygen and anaerobic conditions start to develop. The optimal moisture content for leaf composting should be between 40 and 60 percent; this is about the consistency of a wrung-out sponge...the leaves should feel damp but with only a drop or two of water expelled when tightly squeezed. Leaves very often require water at the start of the composting process. As a rule of thumb, dry leaves initially need about 20 gallons of water for every cubic yard of leaves.

Temperature - As a key environmental factor affecting biological activity, the temperature should be monitored frequently; temperature readings should be taken at least two times per week along every 65 to 75 ft section of the pile. It is important to monitor temperatures and turn the compost when temperatures exceed 140EF to prevent problems. Turning the compost whenever temperatures get above or below the optimum range (90 - 140EF) will help produce a high quality compost in the shortest possible time. When the compost temperature drops below 70EF (21EC), the composting process is nearly complete.

Appearance - Visual inspection of the windrows should be conducted. Items of concern include ponding water and leachate discharges; pile reconstruction or turning may be necessary. When turning the piles, look to see whether the moisture content of the material looks uniform, or if portions are too wet or too dry; watering and/or mixing/turning methods may need to be modified. Look to see whether the decomposition looks uniform, or if portions look like they did when received while other portions look decomposed; again, watering and/or mixing/turning methods may need to be modified.

pH - Decomposition takes place most efficiently under neutral pH conditions, so the pH of the material should be monitored periodically. It is common for the pH to be low (down to 5.0) during the early stages of decomposition; then the pH begins to rise to near neutral conditions. By keeping the pile in an aerobic state, via proper turning methods, leaf composting operations should not present a pH (acidic) problem. Testing for pH can be done on-site with a soil pH testing kit.

Odor - Foul odors will develop under anaerobic conditions, and the rate of composting slows dramatically under anaerobic conditions. An adequate supply of oxygen is crucial to efficient composting. Should anaerobic conditions become apparent, turning the pile will temporarily add oxygen, but will also intensify offensive odors. Before turning, try to identify the cause of the problem so remedial action can be taken as the pile is being turned. For instance, problems other than lack of oxygen may include windrows that are too large and failure to construct windrows soon enough (i.e., storing leaves).

Record-keeping

Good record-keeping provides the operator of composting operations with readily available site-specific data. Such data can be used to better manage site operations and to address problems which may arise. Records should be kept for all windrows constructed. Information to be collected should include, but is not limited to, the following:

Initial Data (to be recorded upon pile construction)

- type and quantity of materials used as substrate
- method of size reduction
- method of mixing
- amount of water added and method of watering
- date of windrow construction
- size and shape of windrow

Process Data (to be recorded periodically or during turning as recommended)

- temperature (3-6 foot long temperature probe)
- pH
- moisture content
- oxygen levels (if equipment is available)
- odor
- texture