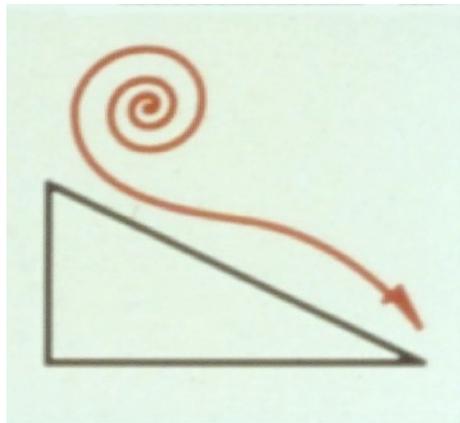
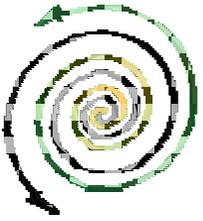


Siting and Site Design

Compost Operators Training Certificate Course





Siting and Site Design

Overview

- Site Planning
- Odor and Site Design
- Neighborhood Public Relations
- Capacity and Sizing
- Site Layout
- Site Selection
- Site Design
- Site Management Plan



Siting and Site Design

Introduction

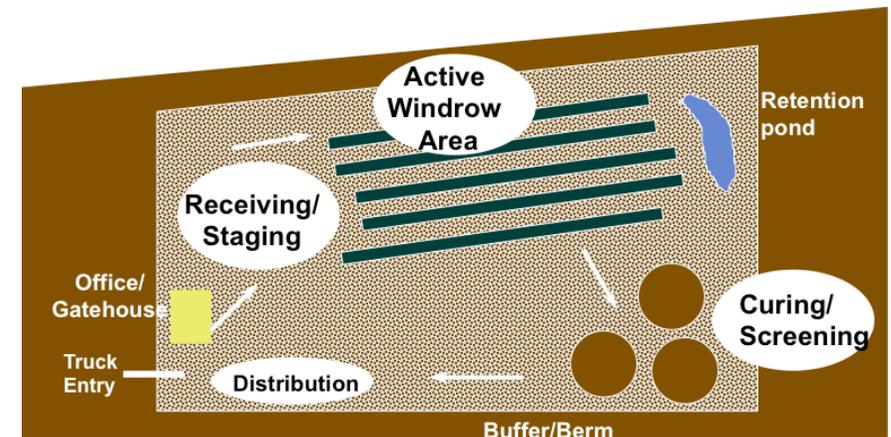
- Good site design can prevent
 - Odor problems
 - Excessive processing costs
 - Program failure
 - Stormwater contamination
- Good site design is essential and often goes overlooked



Siting and Site Design

Preliminary Site Planning

- Identify key areas and factors which will affect operations
 - traffic flow
 - wind direction
 - runoff patterns
 - surrounding land uses
 - wetlands/water bodies
- Develop preliminary sketch of facility
- Understand local and state permitting and regulations

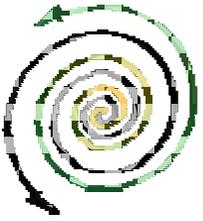




Siting and Site Design

Permitting and Regulation

- Michigan PA 451, Part 115
 - Materials allowed for composting include:
 - leaves
 - grass clippings
 - brush/wood chips
 - food scraps
- Local zoning and material acceptance
- Site and building plan approval
- Surface and ground water regulations
- Federally based NPDES requirements



Siting and Site Design

Factors that Affect Odor

- High intensity processing
(high volumes at small site)
- Puddles
- Lack of retention pond maintenance
- Proximity to neighbors / minimal screening
- Poor Site Design!



Siting and Site Design

Typical Odors

- Ammonias and sulfides (rotten egg smell)
 - Due to excess moisture
- Amines (fishy smell) and Volatile Fatty Acids (VFA' s)
 - Due to anaerobic conditions/unstable process
 - Anaerobic byproducts can cause acidity , which can cause metal leaching from pile



Siting and Site Design

Odor Prevention

- Site Location and Size
 - Setbacks from “sensitive receptors”
 - 200 ft from residents
 - 500 ft from schools, hospitals
 - Adequately sized site
- Site Surface and Drainage Design
 - Proper slopes, pad preparation, runoff control
- Other Controls
 - Biofilters for in-vessel or enclosed systems



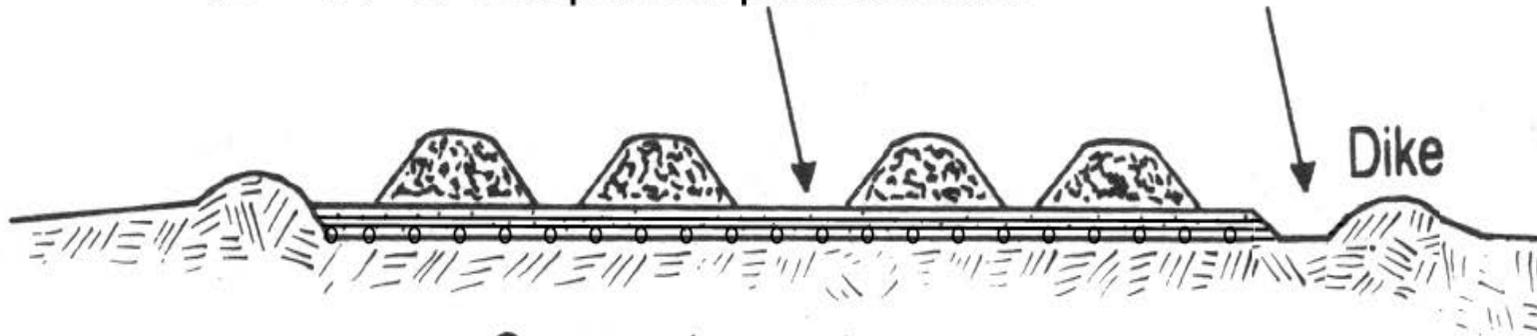
Siting and Site Design

Drainage Design

- Collect and manage run-off
 - Slope pad to facilitate moisture runoff away from compost piles, surface slope: 1%-2%
- Bio-swales/ditches to convey runoff
 - Simple Design, Easy Cleanout
- Retention Pond
 - For medium to large sites (5 acres+), or as required
 - Reduce offsite flow
 - Allow sedimentation to occur before re-use or release
 - Require periodic maintenance

12" - 14" of compacted pad material

Runoff diversion channel

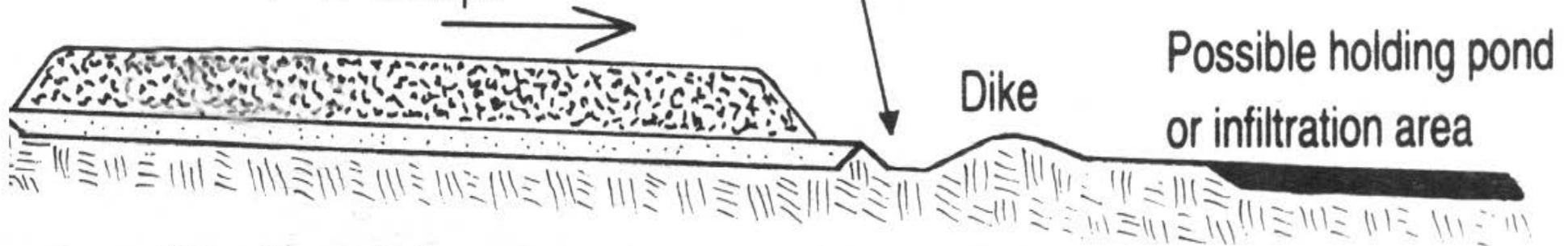


Composting pad cross section

Pad length and windrow/pile length

1 - 2 % slope

Pad runoff collection channel



View through the composting pad length

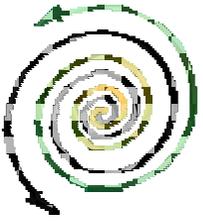












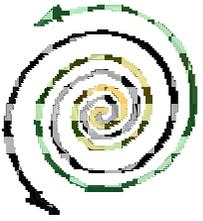
Siting and Site Design

Site Layout - Objectives

- Safety and Security
- Provide for good housekeeping and ease of maintenance
- Minimize system delays and material handling
- Maintain flexibility
- Separate feedstock piles to allow precise combining of materials
- Utilize personnel and space efficiently
- Access to quality end products







Siting and Site Design

Neighborhood Public Relations

- Isolate screening activity
- Locate grinding operations away from property line
- Install noise/dust suppression systems
- Install air exchange equipment for indoor operations (up to 5 exchanges per hour)
- Minimize and control odors; use of biofilters
- Stormwater management



Siting and Site Design

Optimal Processing Volumes

<i>Processing</i>	<i>Annual Material Volume</i>
Low intensity	3,000 cy/acre/yr
Medium intensity	5,000 cy/acre/yr
High intensity	8,000 cy/acre/yr

Note: Michigan compost rules state a limitation of 5,000 CY per acre **at any one time**



Siting and Site Design

Site Layout - Process Flow

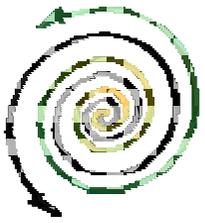
- Site Access / Maneuvering
 - Safety/Security – lighting, fencing
 - Signage
- Receiving and Storage
- Mixing and Loading
- Active Composting - access to water
- Curing and Screening
- Storage and Marketing



Siting and Site Design

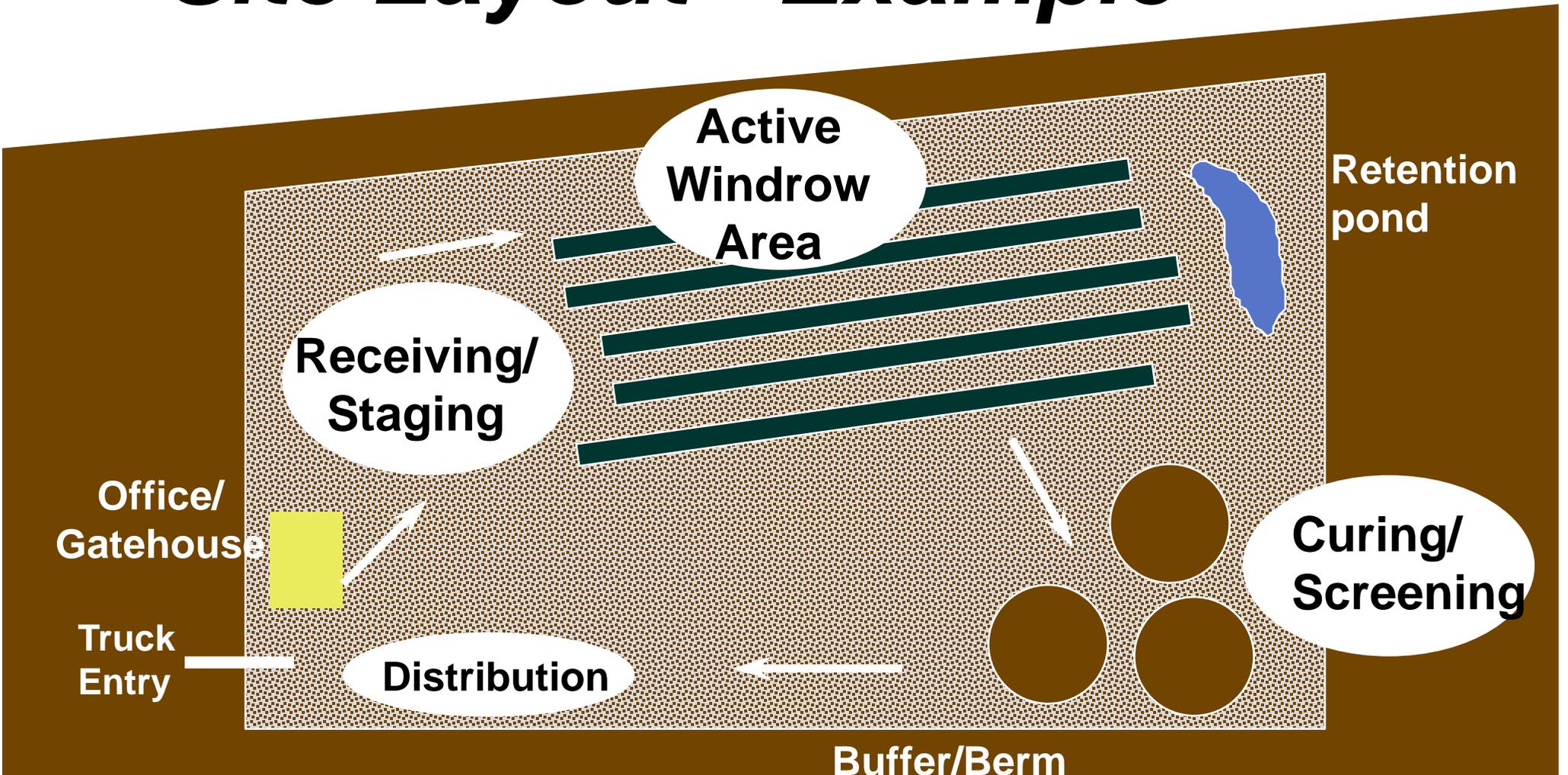
Site Layout - Regulations

- Follow regulatory setback requirements for
 - distance from residences
 - distance from wells
 - distance from bodies of water
- Follow local zoning requirements for
 - Setbacks
 - Buffer/berms
 - Site/road access
 - Utilities



Siting and Site Design

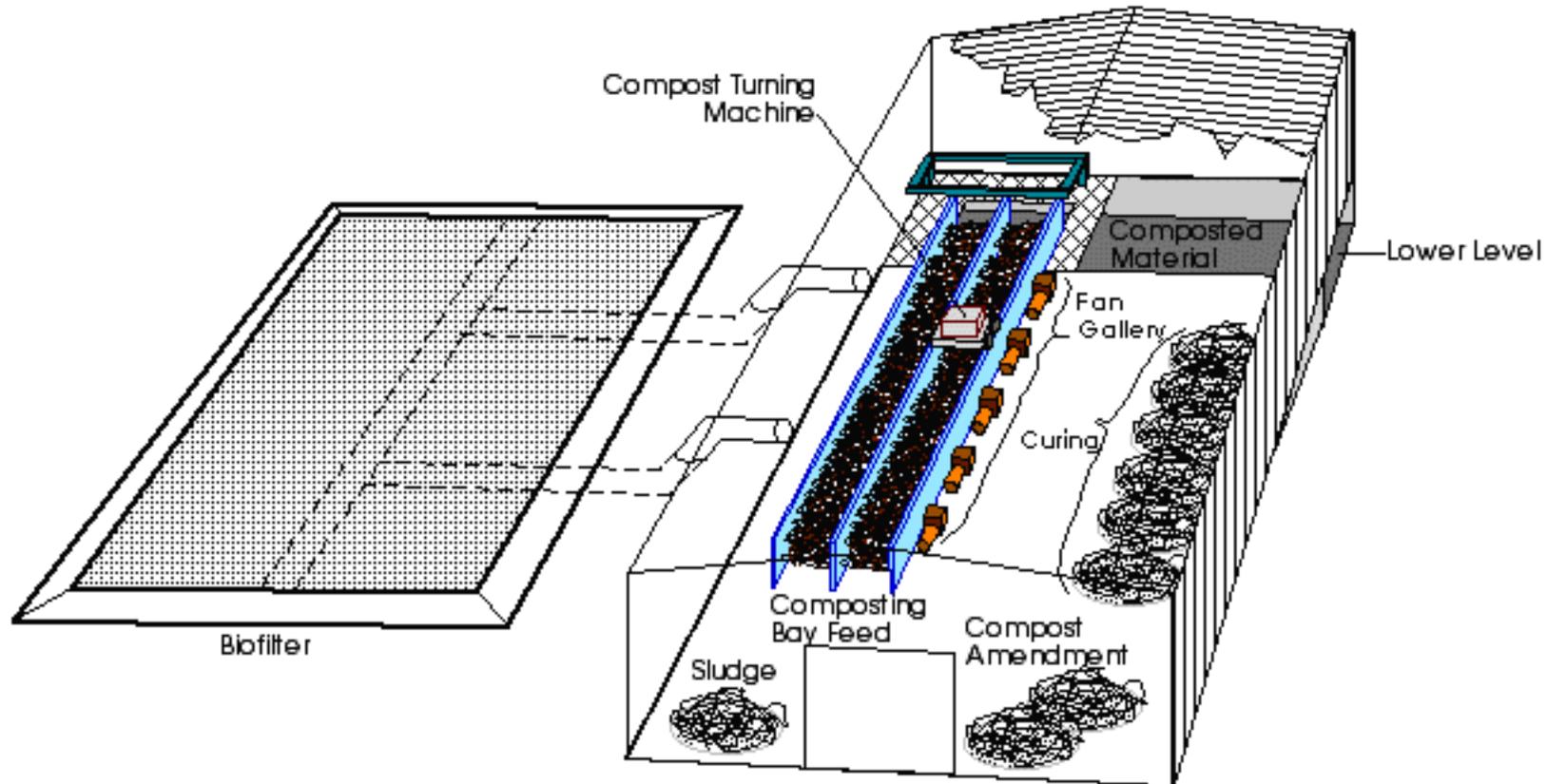
Site Layout - Example





Siting and Site Design

Site Layout - Example



FLINT COMPOST SITE DETAIL PLAN

Site Located at Corner of W Kearsley and Stevenson Streets

CITY OF FLINT

Resource Recycling Systems, Inc.
Ann Arbor, Michigan

Prepared by:
K Sandford
Date:
08/28/2009
Scale:
1" = 100'



Railroad ROW

ENTRANCE

Attendant Shed

Stevenson St

SCREENED MATERIAL

LEAF PILE

WINDROWS

WINDROWS

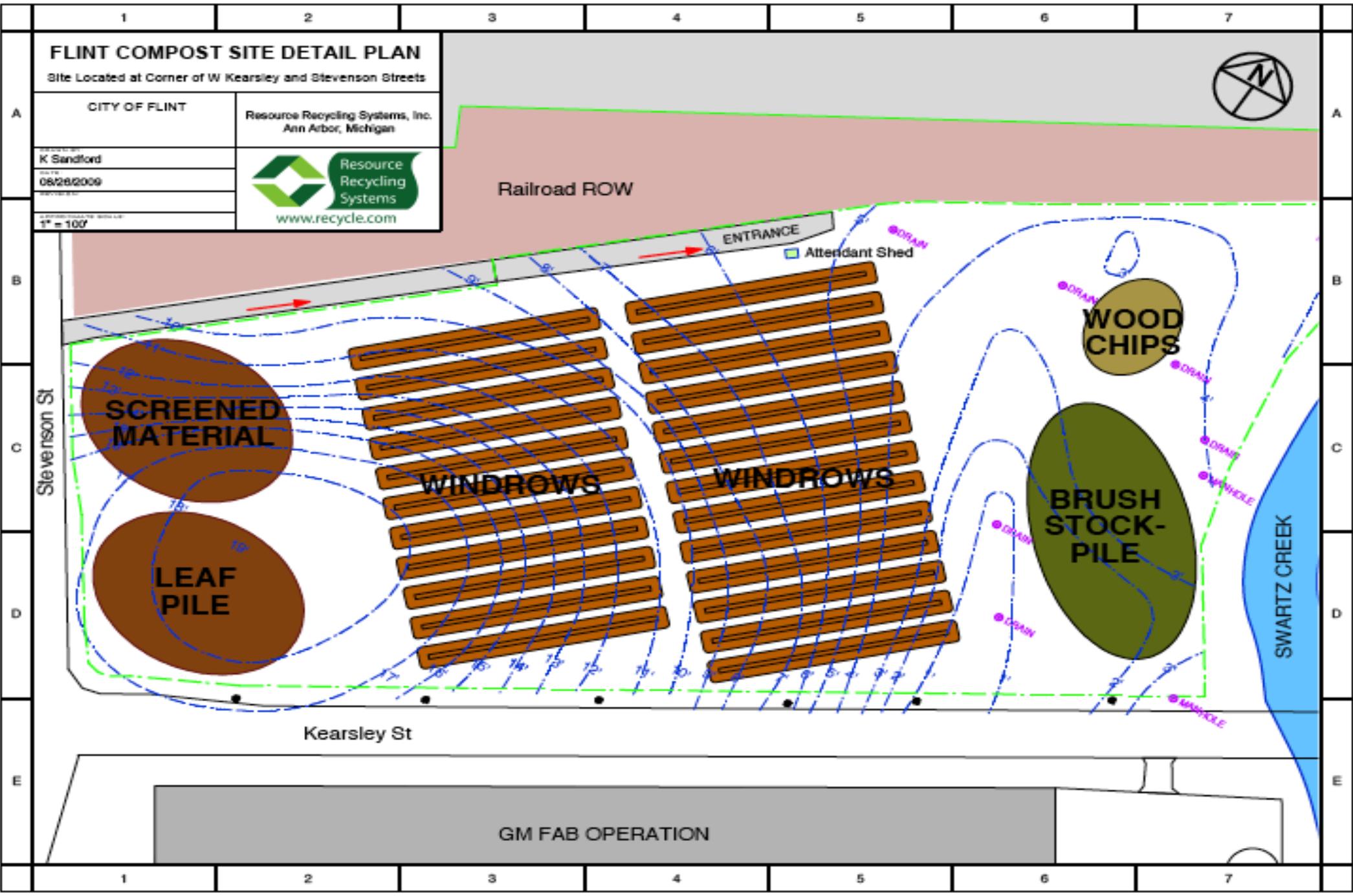
WOOD CHIPS

BRUSH STOCK-PILE

SWARTZ CREEK

Kearsley St

GM FAB OPERATION

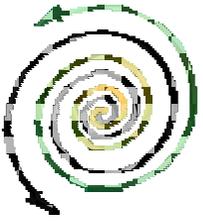












Siting and Site Design

Site Layout - Area Requirements

- Staging/Receiving: 20-30% of site
- Processing: 55-65%
- Curing/Storage: 10-20%

Also consider space for site access,
equipment movement, storage, unloading
and loading, fall leaf stockpile

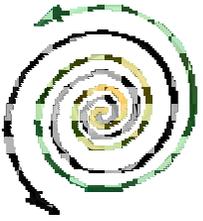


Siting and Site Design

Site Layout – Active Compost

- Estimate peak volumes
- Number of windrows and aisle space needed
 - Depends on turning equipment
 - Depends on material type and processing requirements
- Indoor or in-vessel active composting area needs are different

**See Compost Pad Area
Calculation Worksheet**



Siting and Site Design

Site Selection Criteria

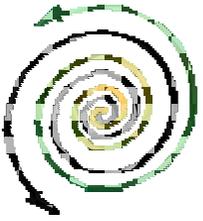
- Public Acceptance
- Proximity to generators and customers
- Proximity to transportation corridors
- Access Roads - firm surface to support vehicles under varying weather conditions
- Size/Opportunity for expansion - bigger is better
- Cost to develop and use
- Drainage, runoff control



Siting and Site Design

Site Selection Criteria (con't.)

- Zoning and surrounding land use - agriculture or industrial zones are the best locations
- FAA regulations prohibit the existence of compost facilities within 10,000 feet of any airport.
- Odor Considerations:
 - Prevailing winds
 - Proximity to residential areas
 - Appearance (perception: “if it looks clean, it smells clean”)



Siting and Site Design

Site Selection Criteria (con't)

- Setbacks
 - Sensitive receptor (e.g. hospitals, churches, schools, nursing homes)
 - Residences
 - Active wells
 - Natural or artificial wetlands
 - Property lines
- Buffers block the effects of noise, odor, and visual impacts of the site from neighbors
 - Walls, trees, berms



Siting and Site Design

Site Options

ADVANTAGES OF POTENTIAL SITES FOR PROPOSED COMPOST PROGRAM

Advantage	Site 1	Site 2	Site 3	Site 4
Sufficient space to site in-vessel operation	✓		✓	✓
Centrally located to campus	✓	✓		
Educational opportunities			✓	
Long-term site potential			✓	
Lack of regulatory hurdles			✓	✓
Available supply of wood chips	✓	✓		
Utilities available	✓	✓	✓	



Siting and Site Design

Site Design/Engineering

- Balance utility and cost
- Base materials under pavement or gravel
- Sub-base preparation (organic removal, compaction, etc.) usually required
- Pad maintenance includes clearing aisles; grading or eliminating ruts
- Consider if buildings, enclosed vessel equipment or biofilter is needed (biosolids or food waste)



Siting and Site Design

Typical Site Construction Costs

Pad Type	Average Cost per acre
• Earth Pad (no fill)	\$7,000 – 10,000
• Gravel/Slag	\$30,00 – 50,000
• Asphalt Pad	\$65,000 – 100,000
• Concrete Pad	\$150,000 and up







GA Compost Facility







Siting and Site Design

Site Surface Design

- Pad Surface Material and Design
 - Year round access and stability
 - Paved, gravel or asphalt working surface
 - Engineered fill on stripped ground
- Pad Surface Slope
 - Asphalt surface slope greater than 1%
 - Gravel/slag surface slope greater than 2%
- Engineered pads have less problems with mud, ruts, and anaerobic conditions.



Siting and Site Design

Pad Surface Material

- Strip topsoil, compact ground surface
- Add geotextile where underlying wet clays are present
- Add appropriate base and sub base material of gravel (8 inches)
- Final layer
 - Rigid pavement if permeable and water table is within 4 feet, or for mixing raw material with bucket loader
 - Otherwise, gravel or slag















Siting and Site Design

Site Management Plan

- Materials acceptance criteria
- Site layout and design parameters
- Operations details
- Equipment and staffing requirements
- Marketing plans for finished product



Siting and Site Design

Thank you! Questions?

Nicole Chardoul, P.E.
RRS Principal | Vice President
nchardoul@recycle.com
734-417-4387



RECYCLE.COM

Managing Change in a Resource-Constrained World.



Resource Recycling Systems



@recycle_com