END USE OF A CLOSED AND CAPPED RUBBLE CELL, FREDERICK COUNTY, MARYLAND

NATURAL WOOD WASTE RECYCLING PAD (NWWR) 2008 CONSTRUCTED OF RECYCLED ASPHALT PAVEMENT (RAP)

Executive Summary: - Most closed municipal landfills or rubblefills are open grassy areas. Not in Frederick County, Maryland. A suitable end use of a closed and properly capped disposal site is sustainable which does not condemn land. For years, a yard waste and mulch processing operation was collocated with rubble waste disposal activity. One feeding off the other – diverting wood waste away from rubble waste and in turn compacting rubble waste mass with its surcharged load in turn providing additional airspace. Then came time to cease rubble disposal operation and cap the rubblefill footprint. For this period, processing was temporarily shifted to another location. Once a cap and the pad were designed and constructed to withstand loads, the wood waste processing was parked back on top.

The days when compost was given away in trying to divert a little more from landfills are no more. The markets are favorable for high quality material which promotes the use of compost for soil conditioning, erosion control, slope stabilization, and water quality protection. Frederick County recognized the changing markets, and has taken a critical look at composting. With an active Transfer Station and Processing Facility, the County is keen to identify other opportunities to recover valuable materials from its waste streams. County residents frequently stop by at the wood grinding operation co-located at the Reichs Ford Road disposal and recycling facilities.

1.) Design of Composting System:

Since 2008, the Frederick County Department of Solid Waste Management located at 9031 Reichs Ford Road operates a Natural Wood Waste Recycling (NWWR) center on top of a closed Rubble cell. The 17 acre Rubble cell operated between 1994 to 2001 with a mulching operation over it. Rubble waste, up to 40% of incoming waste stream was disposed in this unlined disposal unit. The Rubblefill accepted approximately 700,000 tons of waste since 1995 until it ceased operation in 2001. Changes to Maryland Solid Waste Management regulations at COMAR 26.04.07.17D, which were adopted September 12, 1997; require that any unlined rubblefill stop operating and begin closure by July 1, 2001.
The NWWR is authorized to process, chip and store natural wood waste, as defined in Code of Maryland Regulations (COMAR) 26.04.09.02, including tree stumps, brush, and limbs, root mats, logs, unadulterated wood wastes and other natural vegetative materials. The NWWR converts this wood waste into recyclable products, such as mulch, wood chips, compost, and fire wood.

**The Composting Pad**

This section specifically discusses the design of the Pad on which the Composting System operates. Discussion on composting system is under title ‘Planning’.

The Rubblefill is comprised of 12 acres in side slopes plus 5 acres of relative flat grades on top allowing the relocation of the NWWR on top of a capped and closed Rubble cell. As set forth in COMAR 26.04.07.21 a closure cap system was constructed and employs the following components from top to bottom on the 5 acre portion (see figure 1)

- 6” Recycled Asphalt Pavement
- 4” Graded Aggregate Subbase
- 12” lime stabilized Soil
- Drainage Layer - a composite drainage net (CDN) layer
- 12” Hydraulic Barrier Layer – a low permeability soil barrier layer cap
- 24” Final Cover Layer – a layer of soil cover placed over the last lift of rubble waste.

Per a site investigation, an active gas extraction, collection, and control system for the rubblefill is unnecessary. During cap construction the following was achieved.

1. Existing ‘Natural Wood Waste Recycling’ operating over the existing closed rubblefill was temporarily relocated to accommodate cap construction.
2. The site was cleared and grubbed of existing vegetation and topsoil.
3. The subgrade was prepared in accordance with the specifications to provide a firm foundation.
4. A soil cap was placed over the subgrade. A low permeability soil barrier layer cap made up of natural fine grained material having an in-place permeability less than or equal 1 x 10^{-5} cm/sec was used for the closure of the rubblefill.
5. A geosynthetic composite drainage net (CDN) layer was placed over the hydraulic barrier layer.
6. A 24” minimum vegetative support layer was placed over the drainage layer consisting of a 20” cover soil followed by 4” of organic topsoil and seeding.
7. A stabilized operations pad was constructed to accommodate the Natural Wood Waste Recycling operation. The depth to the barrier layer in this area was a minimum of three feet.
8. Drainage controls consisting of diversion berms and channel downchutes were provided to handle surface runoff.

FIGURE 1
Merits of the system

The merits of this system are that the top of the now closed rubblefill will continued to operate as a Natural Wood Waste Recycling operation on a Recycled Asphalt Pavement pad that allows for the additional loading that may be encountered during its operation. The end use of a closed and capped Rubblefill for composting which otherwise would have remained an open grassy area is in itself an innovative and unique aspect of this composting system. The reuse of 24,422 square yards of recycled asphalt as pavement surface is yet another reason why this system is different from the rest. By doing so, costs associated with rising liquid asphalt index - the price posted by the Maryland State Highway Administration at time of paving was avoided thereby saving up to 50% in construction costs.

In place sediment and erosion controls with stormwater management and having a composting operation on a capped surface protects the environment. Having separate access roads for public and employees, making the operations pad compatible with the closure cap design and having an MDE approved system prove the system protects the environment by resource conservation.

2.) Regulatory Compliance

The 5 acre pad is gently sloped with a crown elevation of 512.00. The surface drainage is controlled through a side ditch along its perimeter that runs into downchutes and then into holding ponds. Groundwater monitoring is in accordance with the MDE approved plan and the discharge permit. There is one upgradient well with four downgradient and compliance wells. Sampling and Analysis is performed semiannually. The pad is situated within the confines of 530 acre landfill property which also include two closed and one active disposal units, a transfer station and processing center, a recycling & citizen drop-off center, an active landfill gas extraction & flaring system, an on-site leachate treatment facility and auxiliary administration and maintenance facilities. Thus the composting system is integrated and complimentary to other local solid waste management systems.
The following are the processing conditions at NWWR:-

All natural wood waste processing areas are located at least five hundred (500) feet from any property line. At no time have the natural wood waste, wood chips, mulch or other wood wastes accumulated outside the designated areas. The stockpiles of recyclable materials are kept in check not to exceed unacceptable levels. Dust resulting from this facility's operation has always been controlled at all times with water trucks. All wood waste is confined to the approved unloading, processing, or storage areas at this facility. All raw material receipt and storage, processing activities, and product storage occurs on suitable ground surfaces. No operations occur outside of the capped rubblefill footprint.

The following are the operating procedures at NWWR:-

The system does not create any nuisance that is conducive to insect and rodent infestation or the harboring of animals. It does not cause a discharge of constituents derived from natural wood waste into the air. Neither does it cause a discharge of constituents derived from natural wood waste to waters of the State. The system does not create other hazards to public health, safety or comfort.

Maintain the integrity of the final cover

The cap and the NWWR pad are inspected at regular intervals for evidence of subsidence. So far no areas of significant subsidence have occurred requiring any evaluation of the cap. Depressions and ponding water as a result of subsidence will be corrected and drained to a stable outlet.

Correcting Effects of Erosion: The cap on sideslopes is inspected quarterly and after each major storm. Areas of erosion are filled with suitable soil and stabilized with seed, mulch, erosion control mat or stone as required. Eroded surfaces on the flat RAP pad surface receive crush and milled recycled asphalt as required.

Maintaining a Stable Vegetative Cover Layer: A stable vegetative cover is maintained over the entire area (side slopes) of the closure cap except the area for the Natural Wood Waste Recycling operation. This operation sits on a 10” deep RAP & aggregate sections & 12” deep stabilized operations pad. Vegetative cover is placed in accordance with the Maryland Standards and Specifications for Vegetative Stabilization. The vegetative cover consists of mixtures typically used
on low maintenance areas, including tall fescue and bluegrass. The vegetative cover is inspected quarterly and is mowed twice a year. Areas of settlement or erosion will be backfilled with topsoil and re-seeded if insufficient vegetation exists to maintain surface stabilization. Inspection and mowing prevents the growth of trees or other undesirable plants that could impact the integrity of the rubblefill cap. Thus the site is in environmental compliance for operating a composting system.

3.) Planning

FIGURE 2
Description of the design & effectiveness of the facility’s planning process (see figure 2)

Unprocessed Natural Wood Waste Material: - Natural wood waste is stored on site for no longer than thirty (30) days before it is initially processed. Unprocessed natural wood waste piles is surrounded on all sides by an all-weather fire lane at least twelve (12) feet wide and capable of supporting emergency equipment. The distance between any two unprocessed natural wood waste piles is a minimum of twenty (20) feet wide and negotiable by emergency vehicles, loaded delivery vehicles or other vehicle transportation. The distance between unprocessed natural wood waste piles and property boundaries is a minimum of five hundred (500) feet. The maximum height of each unprocessed natural wood waste pile does not exceed twenty (20) feet. The maximum width of each unprocessed natural wood waste pile does not exceed fifty (50) feet at any time.

Processed Natural Wood Waste (Wood Chip/Mulch/Compost) Windrows: - Windrows are composed only of wood chip, mulch, or compost. Windrows are surrounded on all sides by a fire lane at least twelve (12) feet wide and capable of supporting emergency equipment. The distance between any two windrows is a minimum of twenty (20) feet wide and negotiable by emergency vehicles, loaded delivery vehicles or other vehicle transportation. The distance between windrows and property boundaries is a minimum of five hundred (500) feet. The maximum height of a windrow does not exceed ten (10) feet at any time. The maximum width of each windrow does not exceed fifty (50) feet at any time.

Operating Procedures: - In order to ensure that aerobic conditions are maintained and controlled during processing of natural wood waste, the operators turn wood chip/mulch windrows and piles at least monthly; take daily temperature readings and turn the wood chip/mulch windrows and piles when daily temperature readings reach 140 ° F; and take weekly oxygen levels and turn wood chip/mulch windrows and piles when weekly oxygen readings go below 10 percent. A log demonstrating maintenance of temperature and aerobic conditions as required in this permit must be maintained on site at all times. Any additives used in processing natural wood waste must be approved by the Department before use.
All natural wood waste shall be transformed and removed within 1 year of date of initial processing.

4.) Performance, Economics & Cost-Effectiveness

Frederick County's Premium Mulch and Compost Yard trimmings, brush, landscape debris and other valuable organic matter are kept out of the landfill by Frederick County's advanced composting program. Staff carefully monitors incoming materials, modern equipment is used to process them and the finished result is a high-quality horticultural product that will beautify your landscape. Mulch and premium compost are available for sale at the Reichs Ford Road Yard Trim Site at the following prices:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost/Cubic Yard</th>
<th>Cost/Ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compost</td>
<td>$8.50</td>
<td>$15.00</td>
</tr>
<tr>
<td><strong>Premium</strong> Double Ground Mulch</td>
<td>$8.50</td>
<td>$15.00</td>
</tr>
<tr>
<td>Residential Single Ground Mulch</td>
<td>$4.60</td>
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</tr>
<tr>
<td>Commercial Single Ground Mulch</td>
<td>$6.80</td>
<td>$12.00</td>
</tr>
</tbody>
</table>

The compost has been aged and monitored and regularly undergoes quality and content testing, performed by independent laboratories at the Pennsylvania State University.

Please note however, that at times, the mulch may be freshly processed and not yet aged. Care should be used when using any freshly-mulched product around young plants as the mulch may compete for nitrogen as it goes through the biological breakdown process.

The Reichs Ford Road Yard Trimmings/Mulch and Compost Site is open Monday through Saturday from 7 am - 4:30 pm. The Yard Trim Site no longer closes for lunch. Large quantity sales are available by advanced arrangements. A single-ground mulch product continues to be available **free of charge while supplies last**. This product is not actively monitored or screened.
5.) Utilization of Equipment/Systems and Technologies

Types of equipment being utilized are a horizontal grinder powered by 1000 hp operates for approximately 600 hours per year. A tub grinder powered by 650 hp operates for approximately 300 hour per year. Other equipments utilized are a Scarab windrow turner, a front-end loader, a screen and a water truck.

6.) Worker Health & Safety

Emergency Preparedness Manual: The emergency preparedness manual approved by the Department is maintained at this facility at all times. This emergency preparedness manual contains:

A list of names and telephone numbers of the persons to contact in the event of a fire, flood, or other emergency situation at this facility; a list of emergency response equipment available for use at this facility, the location of the equipment, and how the equipment shall be used in the event of a fire or other emergency; procedures for personnel to follow from discovery of an emergency until the situation is corrected, including measures to minimize the occurrence, recurrence, or spread of fires, explosions, and releases.

7.) Public Acceptance, Appearance and Aesthetics

**Brush and Yard Waste Generation:** The 2010 Census predicts Frederick County’s population at 243,220, with 82,247 households. In 2008 total municipal solid waste generation for the County is approximately 232,262 tons. Of this amount, an estimated 84,492 tons is residential waste, 66,147 are commercial and an estimated 13,224 tons is yard waste material.

The composting process utilizes a windrow system. Based on an evaluation of site needs, a minimum of 4 acres is required to provide adequate space for the facility. Actual site size requirements vary depending on site topography, existing site uses, infrastructure needs and other factors. The requirements for the facility are described below.
a) Entrance facility  
b) Material Preparation Area  
c) Windrow processing  
d) Material curing and market preparation  
e) Storm water control  
f) Buffer

**Land Use and Other Criteria**

The site atop a closed and capped Rubble cell is proven to be technically feasible for a compost operation; a non issue as far as land use compatibility is concerned. Compost facilities, if not operated properly can result in some level of nuisance. These nuisances can include blowing material from stockpiles or grinders; noise from equipment operations (grinders, windrow turners and loaders); odors if the operation goes anaerobic; and increased truck traffic. Specific criteria that should be considered are presented below.

a) Current and future land use  
b) City boundaries  
c) Property ownership  
d) Permit issues

**A SUMMARY OF REGULATORY REQUIREMENTS**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>Location Issue</td>
<td>The facility is located at the closed Rubble Cell south of capped Reichs Ford Landfill. Finished product is stored at the Pad. There is space for expansion on this site.</td>
</tr>
</tbody>
</table>
Protection of surface water

Two ponds are located on the site to meet this design requirement. Storm water collected in the ponds is recycled for dust suppression, used as process water in the windrows.

Protection of groundwater

Pad area is lined at the windrow processing and curing areas. This is equivalent to approximately 5 acres of lined area.

Visual Screening

Effective visual screening exists along the entire periphery of the site. Nearest neighbors are to the south of the facility, approximately 500 feet to/from the property boundary.

Access and security

Some existing fence is on the site and can be moved to reduce total fence costs. Staff is on-site to visually inspect feedstock materials being imported to prevent contamination of acceptable feedstock.

Nuisance conditions and Aerobic

Good operations are designed to reduce potential nuisances. This includes maintaining aerobic conditions.

Facility sign

The facility includes signs all along from the entrance to the site to the pad.

**CAPITAL COSTS FOR THE COMPOST OPERATION $667,444.50**

<table>
<thead>
<tr>
<th>Material</th>
<th>Qty</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Est. Total</th>
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<tr>
<td>4&quot; 2A Modified</td>
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<td>Syds</td>
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<td>$ 137,984.30</td>
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<td>LS</td>
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</tbody>
</table>
FACILITY OPERATIONS

Figure 2 and the figure on the front page and illustrates the flow of materials to the site. The following presents a summary of the facility’s operation.

**Material Preparation**

Wood chips and brush are delivered to the facility via a separate entrance located along Reichs Ford Road. The entrance is a secure, gated entrance with appropriate truck or vehicle inspection capability for screening and security purposes.

**Windrow Processing**

Material is composted on a lined pad. Piles are created using a front-end loader. A SCARAB windrow turner is used to periodically turn the materials. Front-end loaders move ground wood chips from grinding areas to the compost windrows. Once aerobically processed to achieve a mature product, it is transported to the curing area. Open air condition at the site a way to reduce the impacts of rainfall on the operation. Temporary compost covers, which are specialized tarps, are used to reduce costs while reducing rainfall impacts.

**Material Marketing**

The finished product is sold to local residents and businesses at the material recovery facility site. If the County were to continue to market their chipped brush, it may want to consider other markets for this material to increase revenues.

**Labor**

Two people are required for the operation of the compost facility. Their tasks include operations of equipment for grinding, material processing, and monitoring materials coming into the facility, and conducting testing. Final product sales take place at the Scalehouse. Staff is responsible for proper maintenance of the compost sale areas.
Material Marketing

There are several potential markets for compost produced by the County. It is assumed that approximately 20,000 cubic yards of material will be generated annually. The estimated value of the compost is an average of $8 per cubic yard. This is equivalent to $140,000 per year. Producing a bagged product is another option for increasing sale price.

The actual cost of constructing the facilities using private construction contracts is approximately $667,444. The County recognizes the environmental benefits of composting, and is monitoring the future status of the economy of scale, and end-use markets for compost.
Appendix - RAP Construction Sequence

Site Work

- Scarify existing pad area
- Re-stake area to final completion grades established for Lime Stabilized pad
- Re-grade and compact area and test for 95% compaction
- Place and compact 4” 2A modified stone subbase across the entire site. Material will be placed through paving machine to achieve consistent depth of stone across the pad. Stone will be compacted with one 10 ton vibratory and one 8 ton vibratory finish roller
- Place and compact 6” lift of Recycled Asphalt Product (RAP) material. Material will be placed and compacted in the same manner of the modified base. A small asphalt roller will be used for final placement to ensure any imperfections are removed from the blacktop.

RAP Material Preparation Procedures

Asphalt stockpile consists of various types of asphalt product from 37mm base material down to 9mm wear material and straight milling from road projects. The amount of virgin asphalt product contained in the stockpile makes it ideal for the pad installation because of the high amount of petroleum binder still contained in the asphalt. The procedure for prepping the material for transport and placement on site is as follows;

- The material will be run through and impact crusher and triple deck screen to remove any deleterious material and to size the material to a consist product in line with approximately 19mm asphalt. The material will be loaded into the crusher with a PC 400 excavator. The use of an excavator bucket will allow the equipment operator to pre-screen the material to kick-off any un-usable material. The material will be loaded from the crusher to the screen by use of two, Cat 621 Front End loaders.
- Material from the screen plant will be loaded onto tri-axle dump trucks. The crushing and screening process will begin the process of making the material pliable for placement. The tri-axles will all have heated beds to keep the material re-generated during transport to the site.
- Once on site the material will be placed through traditional pavers that have propane heaters in-line.

If a test pad is required, an approximate 100’x100’ pad will be placed after the installation of the stone base. This will allow The Owner to evaluate the effectiveness of the pad utilizing site equipment.