County Landfill Eco-Park

Prince William County
Department of Public Works
Solid Waste Division
January 28, 2015
Unique Opportunities

- Award winning 1000 acre landfill with extensive environmental controls receiving 1000 tons/day of refuse.
- 383 acres of buffer, mostly forested with a number of species of plants, trees and wildlife.
- Wetlands on site with a large wetlands mitigation project underway.
- Large open space of landfill closed areas.
- Supportive community and County commitment.
Eco-Park Concepts

- Environment
  - Sustainability
  - Environmental Protection

- Energy
  - Renewable Technologies

- Education
  - STEM
  - Ecology
Environment
The County’s Solid Waste Facilities (Landfill and Balls Ford Road Composting facility) have been designated as an Extraordinary Environmental Enterprise (E4) participant in the Virginia Environmental Excellence Program (VEEP) effective February 18, 2011.

Only active landfill to have received this recognition.
Lined Landfill Cell
Landfill Liner
Lined Landfill Cap
Groundwater Monitoring
Surface Water Quality

Surface Water Monitoring Program

- Surface water in Lake Montclair (Powell’s Creek) sampled routinely for analysis of metals and water quality indicator parameters.
- Stormwater basins at Landfill sampled routinely per permit requirement for analysis of permit-required constituents.

Wetlands Project

- Stream relocation - 3800 feet of new stream channel.
- Creation of 5 acres of wetlands
Energy
## Energy - Opportunities Summary

### Resources
- Solar Radiation
- Wind
- Landfill Gas

### Conversion Technologies
- Photovoltaic
  - Monocrystalline
  - Polycrystalline
  - Thin Film (Rigid or Flexible)
- Wind Turbines
- Gas Engines, Turbines, Micro Turbines, Boilers

### Markets
- Electricity Sales
  - NOVEC
  - Dominion
  - On-site Users
- Heating/Cooling
  - High School
  - County School Board Facility
  - Greenhouses
  - Detention Center
  - Future Church
The landfill has over 100 extraction wells for collection of landfill gas.
Landfill Gas to Energy Program

Existing Energy Recovery Facility

- NEO Prince William (Fortistar) installed a landfill gas collection facility and a 1.9 MW energy recovery facility became operational in November 1998.

- Fortistar expanded plant in November 2013 – facility now generates a total of 6.7 MW – enough power for approximately 5000 homes.

- County receives 5% of energy sales plus payment for gas rights.
Landfill Gas to Energy Program

The landfill gas is converted to electricity to produce 6.7 megawatts of power.
Landfill Gas to Energy Program
Other Beneficial Uses of LFG

- Approximately 200+ scfm of excess landfill gas is still available even with the operation of the additional engines.
- Direct use of landfill gas is viable.
- A gas pipeline has been installed to provide landfill gas to heat the Fleet Maintenance Building and provide fuel to the Animal Shelter incinerator to replace propane.
- School bus garage added in 2014.
Public Works is Replacing Propane with Landfill Gas, a Renewable Fuel Resource
Direct Use of Landfill Gas – Future Projects

- Evaluating potential to provide landfill gas for heating, cooling and power to Kelly Leadership Center other adjacent County and School facilities.

- BioCNG for vehicle fuel.
Board entered into a Phase 1 Agreement with LEEP Holdings, LLC to host a demonstration project of an innovative municipal solid waste (MSW) conversion technology.

Process/Sort mixed solid waste into various useable components

- Recyclables (Cardboard, Metals etc) – Sold to markets
- Organics - Fuel Pellet (eRDF)
- Plastic - Lightweight Aggregate (Balkrete)
- Residue (Fines) – Landfill
Renewable Energy Project – Waste Conversion

- Engineering and Financing are in progress with due date of January 30, 2015
- Processing Throughput
  - Years 1 and 2 – 250 tons/day
  - Years 3 – 300 tons/day
  - Years 4 to 13 – 400 tons/day
Landfill Site – Waste Conversion
Waste Conversion Schematic

Progress Submittal - November 14, 2014
Isometric View From The South
## Future Solar and Wind Site Opportunities

<table>
<thead>
<tr>
<th>Phase</th>
<th>Part</th>
<th>Base Area (acres)</th>
<th>Open (year)</th>
<th>Close (year)</th>
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<tbody>
<tr>
<td>Existing</td>
<td>--</td>
<td>57</td>
<td>1972</td>
<td>1991</td>
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<tr>
<td>Phase I</td>
<td>1,2,3</td>
<td>39.5</td>
<td>1990</td>
<td>2011</td>
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<td>2016</td>
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<tr>
<td></td>
<td>3</td>
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<tr>
<td></td>
<td>2</td>
<td>15.09</td>
<td>2024</td>
<td>2028</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>13.08</td>
<td>2028</td>
<td>2032</td>
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Solar and Wind

- Private interest expressed in developing solar power at landfill site.
- RFP was issued on April 24, 2013
- Negotiating with private company and NOVEC to phase project with net metering to supply power to buildings on site (1.3 MW).
  - Power to Juvenile Detention Home
  - Power to Fleet/Admin Facility
  - Cost is primary issue
- Additional solar generation possible
Solar Panels
Eco-Park Concepts

Education
Current Education and Outreach

- Work with Solid Waste Citizen Advisory Group to be a good neighbor.
- Use of buffer for environmental studies with local 4H Club and Master Gardeners.
- Landfill community events and tours.
- Adjacent school sites (Coles, Benton and New 12th HS).
Education Goals

- County Adopted Strategic Plan - Education
  - The County will provide an education environment rich in opportunities to increase education attainment for workforce readiness, post-secondary education, and lifelong learning.

- School Draft Strategic Plan – January 2015
  - 1.2.4 - Students will be provided with opportunities to apply technology effectively to gain knowledge, develop skills, and create and disseminate products that reflect their understanding.
  - 3.1 – Engage families, community and employees in partnerships that promote student learning.
Landfill Site - Education
Partnership with School Staff

Meeting with school administration and curriculum staff.

- Working on curriculum for 12th high school as to include a unique whole school environmental/ecological sciences program.
- Science curriculum staff developing ideas for incorporating landfill facility into environmental curriculum for elementary, middle and high school students.
- Working to coordinate project/gain input from George Mason and Catholic Universities.
- Solid Waste Citizen Advisory Group participating in discussions.
Living Building Challenge

- Reuse and Recycle energy, water, resource, and waste flows that are currently in use
  - Restore the natural systems balances that have been altered by human mismanagement; Integrate renewable energy, ecological systems, and materials flows in sustainable patterns
  - Create future-proof and resilient designs that are more closely wedded to natural systems and will be able to adapt in the face of change
Education Center - Casting A Wider Net

- Why limit the facility to local colleges & universities when the research has worldwide value?
- Harness the diverse research universities in the area to bring in their local, national and international partners to perform field research.
- Provide a flexible facility that encourages researchers (local, nationally and internationally) to travel to the area presents an exciting opportunity.
# Education Center Program Basis

<table>
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<tr>
<th>Target Users</th>
<th>Purpose</th>
<th>Frequency and Duration</th>
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| Community (citizens)  | • Education  
                        | • Meetings  
                        | • Recreation                                                 | • Night and weekend opportunities  
                        | • Perform research on a unique opportunity  
                        | • Share research with local students  | • As needed for events  
                        | • Learn about green buildings  
                        | • Learn about reuse/waste  
                        | • Learn how researchers work  | • Field trips (weekdays)  
                        | • Offices  
                        | • Training  
                        | • Meetings  | • Organized trips (weekends)  
                        | • Daily research  |
| Researchers (non-profits, universities) | • Field trips (weekdays)  
                        | • Organized trips (weekends)  | • Daily work  
                        | • Daily work  
                        | • Weekly training  |
Programmed Spaces: Adjacency Diagram

- Multi-Purpose Room/Auditorium
- Lab/Classrooms
- Exhibit Space
- Landfill Employees
- Education Center Employees
Interior Functional Spaces
Approximately: 10,000 sq. ft.

- Lobby Area
  - Including Educational Displays
- Exhibit/ Gallery space
  - For Education & Research Use
- Multi-Purpose/Auditorium
  - For 150 people
- Lab/Classrooms space
  - 2 rooms for 30 people each
- Catering Kitchen
- Roof top observation deck

- County Office Space
  - For 11-15 Employees
  - Conference/Training Room
  - Break Room/Employee Lockers

- Eco-Park Staff
  - Offices for 1-2 people
  - Small kitchen area
  - Small conference room

- Utility Space
  - Restrooms
  - Storage
  - Circulation
Exterior Functional Spaces

- Greenhouse
- Urban Agriculture
- Site parking
- Electric and/or alternative fuel vehicle fueling stations
- Bus Drop Off & Wait Area
- Composting Area
- Rainwater harvesting cisterns
- Stormwater Swales
- Native and adapted species plant demonstration in swales
- Trails
Education Center Site
Education Center Site Layout

Site Plan: Project Area ~73,000 SF; FAR = ~0.14
Education Center Site
STEM Education Center
Eco Park Annex

Balls Ford Road Yard Waste Compost Facility
Balls Ford Road Yard Waste Site
Balls Ford Road Project Opportunity

- Increase County recycling
- Improve County management of organic wastes
  - Yard waste
  - Food scraps
  - Wood waste
  - Other organics – biosolids, animal and agriculture wastes
- Enhance Balls Ford Road Operations
Agreement Awarded January 20th

- Board awarded Agreement to Freestate Farms, LLC
  - Proposed Project Technologies:
    - Anaerobic Digestion (AD) of food waste—30,000-45,000 ton/yr
    - Advanced Composting of yard waste—30,000-50,000 ton/yr
    - Combined heat and power—electricity generation
    - Commercial Greenhouses—2 acres
    - Mulching of wood waste
  - Proposed Expansion—Phase II
    - Anaerobic Digestion—125,000 ton/yr
    - Composting—85,000 ton/yr
  - Includes transition period
Questions and Comments?