

## GLASS RECYCLING EFFORTS

RANDY WATKINS  
LANDFILL MANAGER

SANTA FE SOLID WASTE  
MANAGEMENT AGENCY

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### Glass Recycling Topics Covered

- Why Recycle Glass?
- Glass Recycling Facts
- Recycling at BuRRT
- Glass Crushing System
- The Landfill Gas Collection System
- Local Glass Markets
- Potential Glass Markets

### Why Recycle Glass?

- Glass is 100% recyclable
- Recycled glass melts at lower temperatures than new glass, saving a great deal of energy and conserving resources
- Glass can be turned into usable products:


Landscaping Material	Water Filtration Media
Abrasives	Sandblast Media
Hydroponics	Glascrete
Road Base Material	Glasphalt

### Glass Recycling Facts


- For every ton of crushed glass (cullet) used in the manufacturing process, 1.2 tons of raw materials are saved
- Recycling one ton of glass saves about nine gallons of fuel oil
- Recycling one glass bottle saves enough energy to light a 100-watt bulb for four hours
- Glass produced from recycled materials reduces related air pollution by 20% and water pollution by 50%
- Manufacturing glass from recycled materials saves 68% energy and 50% of the water normally required in the manufacturing process

\* Ohio Department of Natural Resources

### Buckman Road Recycling and Transfer Station (BuRRT)



### Glass Crushing System



### Glass Crushing System at BuRRT

- Manufactured by Andela Products of Richfield Springs, NY
- System Components:
  - Pulverizer Model GP-1
  - Trommel
  - 4 cubic yard surge hopper
  - In-feed and out-feed conveyors
  - Cross belt magnet

### Metering Surge Hopper

- Designed to be loaded with a front end loading vehicle or similar equipment
- Prevents a large surge of material from overloading the conveyor and pulverizer
- Features a reciprocating plate feeder device with adjustable door to control the discharge rate

### Pulverizer Model GP-1

- Accepts all kinds of whole or broken glass
- Pulverizes glass into an aggregate the consistency of sand and fine gravel

### Trommel Separator

- A rotating barrel screen with two screen sizes
- Barrel receives the glass that is mixed with trash
- Material < 1/8" falls through first screen
- Material < 3/8" passes through second screen
- Remaining material exits at the end of the trommel

### Glass Crushing System

- Estimated Production Rate :           8 tons/hr
- Electrical Energy Requirement:
 

Total HP for GP-1 System	25 HP
Total kW for System	18.7 kW
Electrical Cost/kWh	\$0.17/kWh
Electrical Cost per Hour	\$3.18/hr
<b>Electrical Cost per Ton</b>	<b>\$0.40/ton</b>

### Glass Crushing System

- Wear Parts Cost Requirement:
 

Wear Parts Cost per Hour	\$7.60/hr
<b>Wear Parts Cost per Ton</b>	<b>\$0.95/ton</b>
- Labor Cost Requirement (1.5 personnel):
 

Labor Cost per Hour	\$26.25/hr
<b>Labor Cost per Ton</b>	<b>\$3.28/ton</b>

### Glass Crushing System

□ Glass Crusher Cost Requirement (\$190,000):

Glass Crusher Cost per Hour \$19.00/hr  
**Glass Crusher Cost per Ton \$2.38/ton**

□ Loader Cost Requirements:

Loader Cost per Hour \$50.00/hr  
**Loader Cost per Ton \$6.25/ton**

### Glass Crushing System

□ Total Operating Cost Requirements:

■ Electrical	\$0.40/ton
■ Wear Parts	\$0.95/ton
■ Labor	\$3.28/ton
■ Glass Crusher	\$2.38/ton
■ Loader	\$6.25/ton
<b>Total Operating Cost per Ton</b>	<b>\$13.26/ton</b>

### Landfill Gas Collection System



### Landfill Gas Collection System

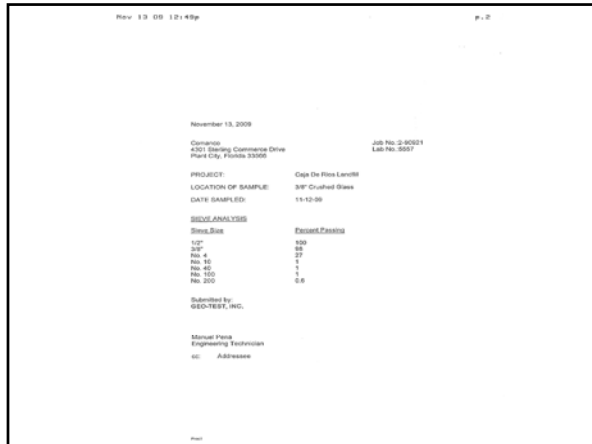


### Pipe Bedding Contract Specifications

- **Sand Bedding** shall be placed and compacted beneath and around HDPE pipe as shown on the construction plans. May be available from trench spoil or supplied from a...borrow source provided that such material meets the requirements specified herein
- **Sand Bedding** material shall be course-grained with little or no fines, non-cohesive material classified as SW, SP, GW, PP, GM, or GP-GM in the Unified Soil Classification System and with maximum particle size of 2 inches in any dimension

### Pipe Bedding Contract Specifications

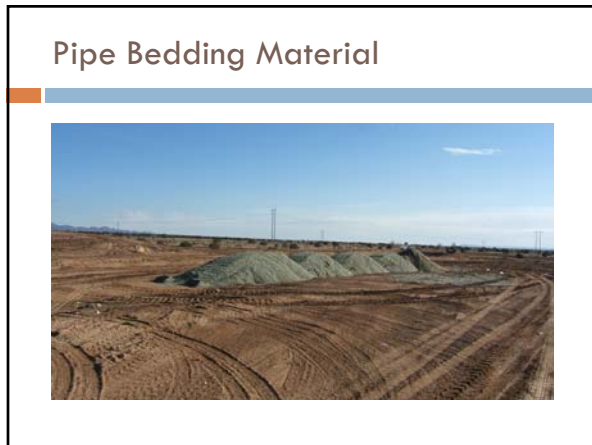
- Plasticity Index (PI) less than 4 as measured by ASTM D 4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- Shall not contain stone, rock or gravel larger than two (2) inches in any dimension, and free of debris, waste, vegetation, organic materials, roots and other deleterious matter



### Crushed Glass as Pipe Bedding

3/8" size crushed glass met specifications:

- Maximum particle size of 1/2" (sieve analysis)
- Low Plasticity Index (no clays)
- Minimal paper content



### Pipe Bedding



### Local Glass Markets

- New Mexico Recycling Task Force experimented with glasphalt and glasscrete in 2003 without success – plant could not switch between glass for one mix and aggregate in another mix
- El Dolrado Transfer Station, Santa Fe County – mixed with base course material
- Earthstone – cleaning and sanding products, insulation material that mitigates blast waves from bullets
- Growstone – hydroponic products
- American Clay – custom interior surfaces
- Los Alamos County - ballast for alternate daily cover plastic sheeting at landfill

### Potential Glass Markets

Glass Cullet Use for Soil-Aggregate Base Course  
AASHTO Designation: M 318-02

Physical properties and deleterious substances in glass cullet:

- Consist of broken food and beverage containers  
China dishes, ceramics, or plate glass limited to 5%
- Cullet shall be crushed and screened if necessary so that 100 percent of cullet passes the 3/8" sieve

### Potential Glass Markets

- Cullet shall be free of odor
- Container tops, paper, labels, food residue, foil, wood, and other deleterious materials shall be limited to a maximum of one percent by mass of the glass cullet of which no more than 0.05 percent by mass of paper shall be permitted. Extraneous soil-like materials shall be limited to a maximum of two percent by mass of the glass cullet. Glass cullet shall be free of TV or other cathode ray tubes, fluorescent light bulbs, and any hazardous materials

### Potential Glass Markets



### Potential Glass Markets





### LCRS Gravel (Coarse Gravel)

- **Gravel** for LCRS Trench shall consist of a clean, hard, durable, uniform product, free of limestone, organic, and other deleterious material.
- **Gravel** shall conform to the following gradation as determined by Sieve Analysis (ASTM D 422):

U.S Standard Sieve	Percent Passing by Weight
□ 1/2 inch	100
□ 200	<15

### Percent Passing by Weight

Sieve Analysis (Cullets)	Crushed Basalt	Crushed Glass
□ 1/2 inch	100%	100%
□ 200	8.3%	0.6%

### LCRS Gravel (Coarse Gravel)

- Cell 4A-6A
  - ▣ 20,000 cy @ \$12.00/cy = \$240,000
  
- Cell 4B
  - ▣ 28,500 cy @ \$14.50/cy = \$413,250

### LCRS Gravel (Coarse Gravel)

- Cell 5B-6A
  - ▣ To be constructed in FY-14
  - ▣ 20,000 cy of LCRS gravel needed
  
- ▣ 1,700 tons/yr collected at BuRRT

### The End

Contact information:

Randy Watkins  
(505) 424-1850 x130  
rwatkins@sfswma.org

Santa Fe Solid Waste Management Agency  
149 Wildlife Way  
Santa Fe, NM 87506