



Eco-Sand: The Endless End Market for Recycling Mixed Glass

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Focus on Recycled Glass Markets Technical Session
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Broward County Background:

- ❑ Demographically diverse population of 1.75 million people (15th largest in US)
- ❑ County seat is Fort Lauderdale
- ❑ Subtropical climate - tourism major driver of the County's economy

Fort Lauderdale



Broward Beaches = Big Bucks!



- ❑ Economic study from 1998* concluded that:
 - Beaches contribute \$550 million to Broward's economy
 - Beaches attract 7.2 million visitors per year who spend \$422 million
 - Beaches add \$1.4 billion to County's property values
 - Broward's beaches protect \$4 billion worth of shorefront properties and infrastructure from storm wave damage

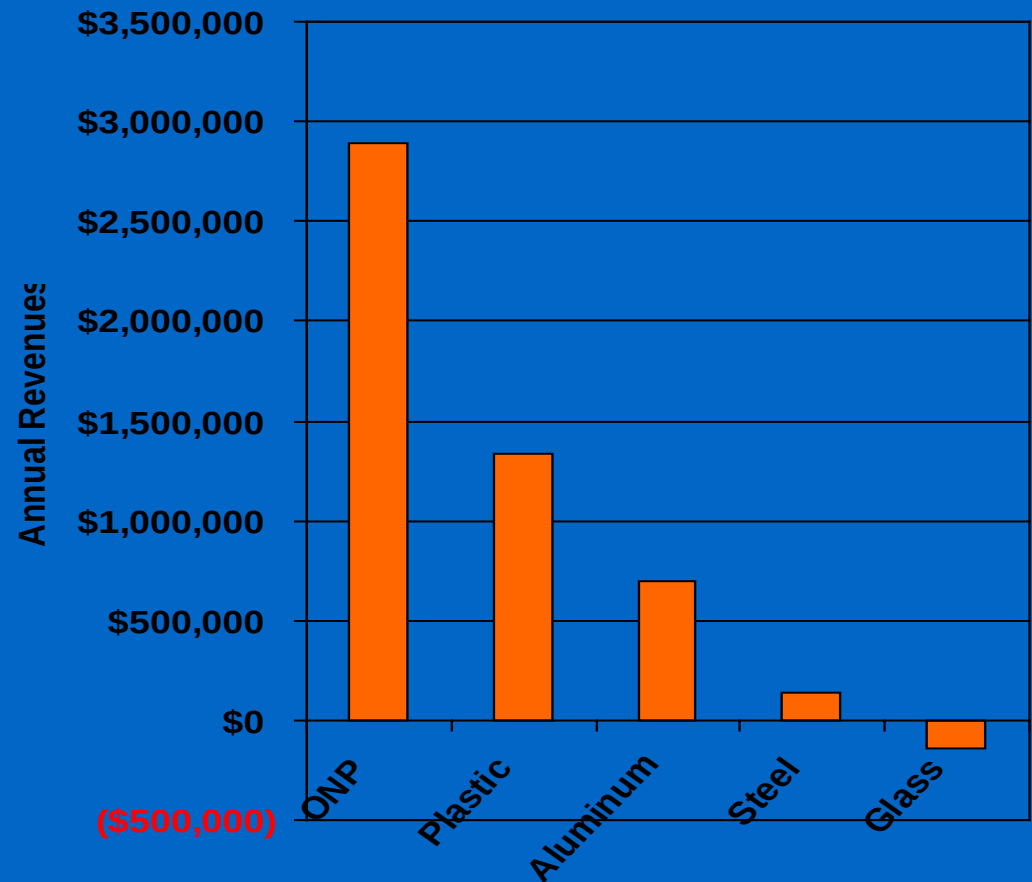
Broward County's Beach Management



- ❑ Some 21 of Broward's 24 miles of beaches are considered critically eroded
- ❑ County has implemented numerous beach renourishment programs since 1960s
- ❑ Current project - \$24 million – involves placing 1.7 million cubic yards of sand (dredged from offshore) on south Broward's eroded beaches

Broward County's Recycling Programs: *Glass Brings Up the Rear*

- ❑ Broward County Resource Recovery System Cities earned nearly \$5.5 million in recycling revenues in FY 2005
- ❑ Glass accounted for *negative* \$140,000
- ❑ Mixed broken glass (50-60% of total) unmarketable – used beneficially for road base material at regional landfill



Beach Glass Project Overview:

Matching Needs with Resources to Create a Win-Win

Broward County's coastline suffers from chronic beach erosion, which requires regular renourishment.

21 of 24 miles of beach critically eroded

Broward County has mixed glass with limited value in the marketplace.

Some 15,000 tons per year

Can mixed glass be used to supplement beach renourishment efforts?

Project History

- ❑ Glass recycling challenges addressed in 2002 Mixed Cullet Recycle & Reuse Study
 - *Glass costs RRS \$145,000 per year to recover*
- ❑ Beach Renourishment Pre-Feasibility Study – 2003
 - *Based largely on academic research - determined glass processed into sand could be viable alternative*
- ❑ Florida Dept. of Environmental Protection Innovative Grant awarded in November 2003 (\$570,000 matching grant)
- ❑ Goal is to provide readily available supply of cullet/sand mix for erosional “Hot Spot” applications

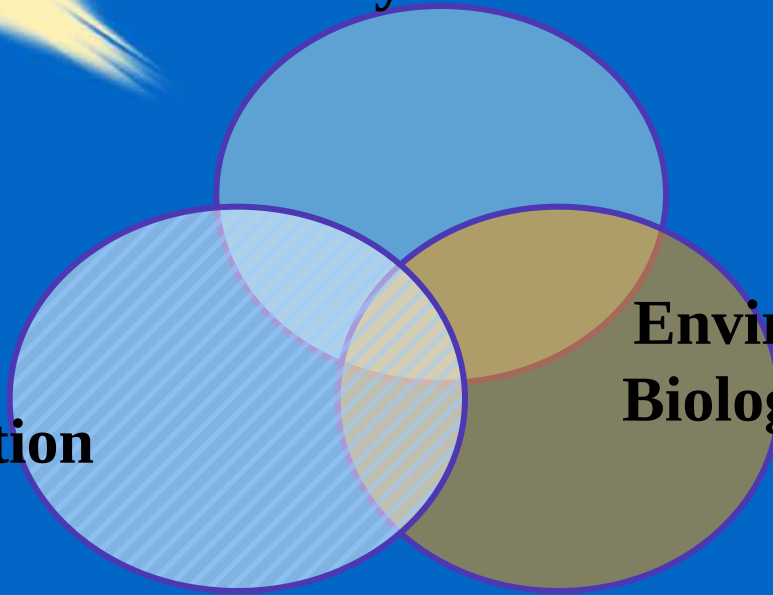


Beach Glass Project: Success = Sum of Three Parts

Technical Feasibility

Public Perception

**Environmental &
Biological Compatibility**



Technical Feasibility: Materials Sourcing

- ❑ Consultant & County identified glass processors and glass pulverizing equipment manufacturers in USA
- ❑ Consultant & County Staff Conducted Site Tours
 - Understand technologies;
 - Investigate product quality; and
 - Determine suitability to Broward County's needs.
- ❑ Requested samples from 4 processors/manufacturers (all non-Broward County)
- ❑ Samples used for geotechnical and biological studies and public perception phase

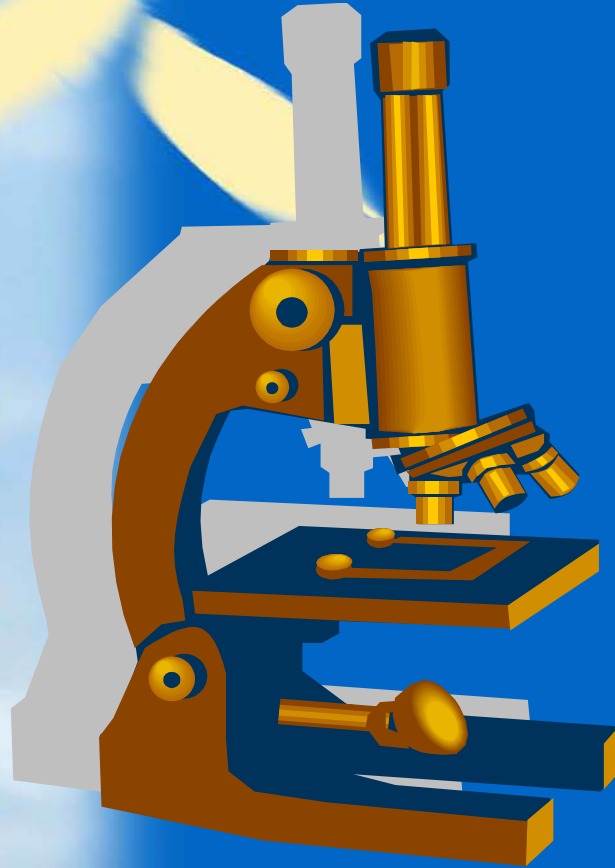
Technical Feasibility: Materials Sourcing



Technical Feasibility: Geotechnical Characterization

- ❑ Goal => to assess comparatively the geotechnical characteristics between sand and processed glass
- ❑ Analysis included:
 - Grain size distribution
 - Munsell color
 - Carbonate content
 - Grain angularity
- ✓ Results indicated that processed glass and natural sand are geologically compatible

Environmental & Biological Feasibility



- ❑ Analyses have included contaminants testing with findings showing that levels for contaminants such as sodium, petroleum hydrocarbons, coliform, semi volatile organics, mercury, etc. are either [REDACTED] or lower than [REDACTED] regulatory

Environmental & Biological Feasibility

- ❑ Tests performed using aquarium style tanks with various mixtures of cullet and natural sand to determine whether glass poses danger to crustaceans, fish & microinfauna. Results showed:
 - No significant differences in mortality rates between glass mixes and natural sand
 - Microorganisms colonized
- ❑ Studies also measured temperatures, organic content



Environmental & Biological Feasibility

- ❑ Loggerhead turtles nest along Broward beaches from May until October
- ❑ Potential impact is critical; key questions include:
 - Can sea turtles nest in glass/sand mix?
 - What would impact on mortality rates, hatchling sex ratios, etc?
- ❑ Much uncertainty exists over sea turtle permit application review and evaluation processes



Public Perception

The project has received significant media attention and praise over past year including:

- ❑ 2004's "Most Innovative Beach Management Project" from National Clean Beaches Council
- ❑ Extensive project coverage by local and national media including:
 - *Miami Herald*
 - *South Florida Sun Sentinel*
 - Fox News Channel
 - ABC-10
 - NBC-6
 - Washington, DC area radio stations



Public Perception

Project subconsultants performed initial targeted focus groups and public opinion telephone survey

Two Focus Groups:

- ❑ Beach Professionals
- ❑ Tourism Representatives

Phone Survey:

- ❑ 400+ County residents

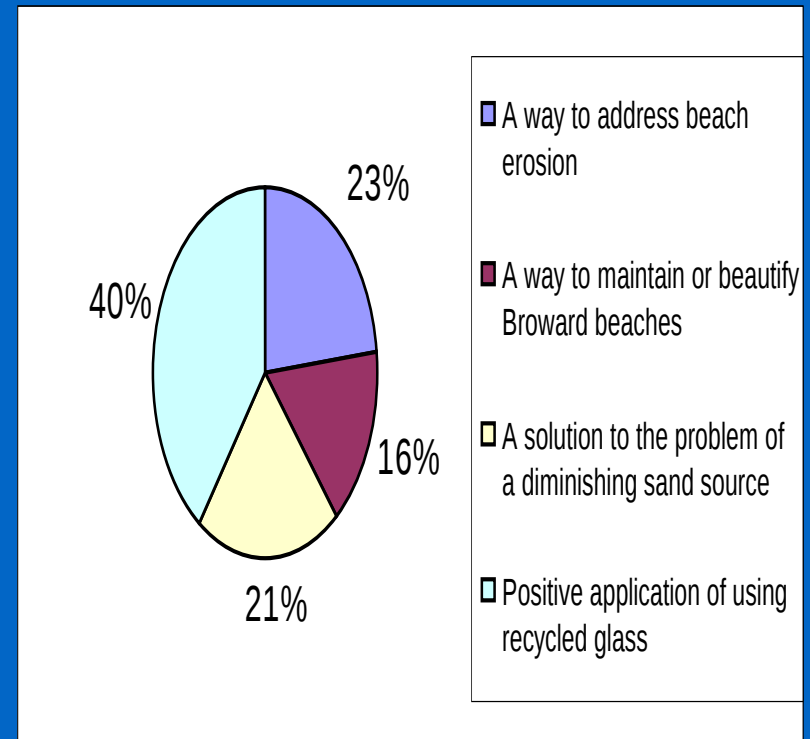
Public Perception: Concept is Generally Appealing

- ❑ Most found the concept interesting, appealing, and relevant.
 - 81% interested in the concept.
 - 72% found the concept appealing.
 - Nearly three quarters (72%) think the concept is relevant.
 - *Typical comments:*

“It’s a good solution for maintaining our beaches.” – Beach Professional

“Timely. It’s hard to find alternative sources of sand.” – Tourism Representative

“Treating erosion by getting rid of a extra glass is very innovative.” – Broward County Resident



Project Status Fall 2005

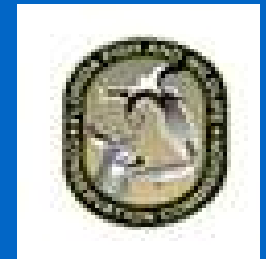
- ❑ In June 2005 County submitted application to FDEP for Field Permit to construct four 10' x 20' x 3' test pits in upland beach area in Hollywood
 - 100% sand & 0% glass
 - 25% - 75%
 - 50% - 50%
 - 75% - 25%
- ❑ Test pits would be used for biological, abiotic monitoring and additional public perception activities.
- ❑ County still awaiting official review and comments from permitting agencies
- ❑ May shift strategies and apply for Joint Coastal Permit to place material in intertidal zone / seaward side of beach



Project Status Fall 2005: Many Outstanding and Unresolved Issues

Regulatory Issues –

- ❑ State regulatory requirements have not been comprehensively stated – are a moving target
- ❑ Impact/sea turtle permitting requirements unresolved
- ❑ Future regulatory agency requirements (US Fish and Wildlife, Army Corps of Engineers) undefined

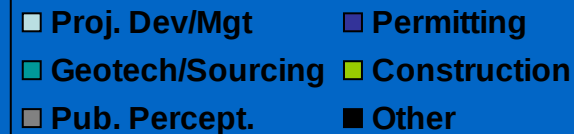
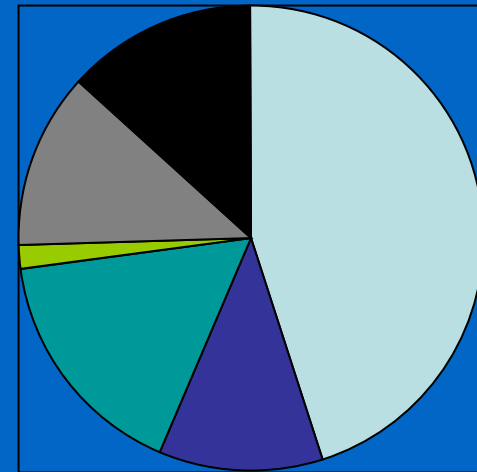


Project Status Fall 2005: Outstanding and Unresolved Issues

Overall Project Budget –

- ❑ Unplanned and additional testing requirements have increased project budget
- ❑ Nearly \$300,000 of \$570,000 has been spent to date
- ❑ Three-year costs now estimated at \$730,000+
- ❑ County's Resource Recovery Board has earmarked \$180,000 in additional funding; unknown as to whether State will provide additional funds

Beach Glass Project - Use of Funds To-Date



Eco-Sand: Conclusions

- ❑ Material looks like sand, feels like sand and comes from sand!
- ❑ However, there are still many unanswered questions including:
 - Regulatory
 - Environmental impacts
 - Project budget
 - Process economics
- ❑ Nevertheless, County stills views this as dual solution to erosion concerns and glass marketing concerns and will continue to move forward.



A large, stylized sun graphic in the top left corner, featuring a yellow circular center with a blue sky pattern and several yellow, elongated rays extending outwards.

Questions & Comments?