County of Hawai`i
Integrated Solid Waste Management Plan Update

Residuals Management

December 15-16, 2008

CH2MHILL
in association with
GA GEOMETRICIAN ASSOCIATES
SKY VALLEY ASSOCIATES

Agenda

- **Residuals Management**
  - Existing conditions
  - Issues and concerns
  - Options
    - Material recovery and treatment
    - Landfill disposal

Existing Conditions
South Hilo Sanitary Landfill

- Located southeast part of Hilo
- Owned and operated by the County of Hawai`i
- In operation since the 1970's
- 40 acre site
- A former quarry
- Unlined
- 5 years of life remaining at current recycling rates (or through 2013)

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Existing Conditions
West Hawai`i Sanitary Landfill

- **Located southwest of Waikoloa at Pu`uanahulu**
- **Owned by Hawai`i County and operated with County personnel**
- **Managed by Waste Management of Hawai`i**
  - Construction and development of new landfill cells
  - Environmental monitoring
  - Closure and post-closure activities.
- **300 acre site that opened in 1993**
- **Subtitle-D Landfill**
  - Lined with a geomembrane
  - Engineered leachate collection system
  - Landfill gas collection and control system was installed in 2006
- **33 years of life remaining at current recycling rates**

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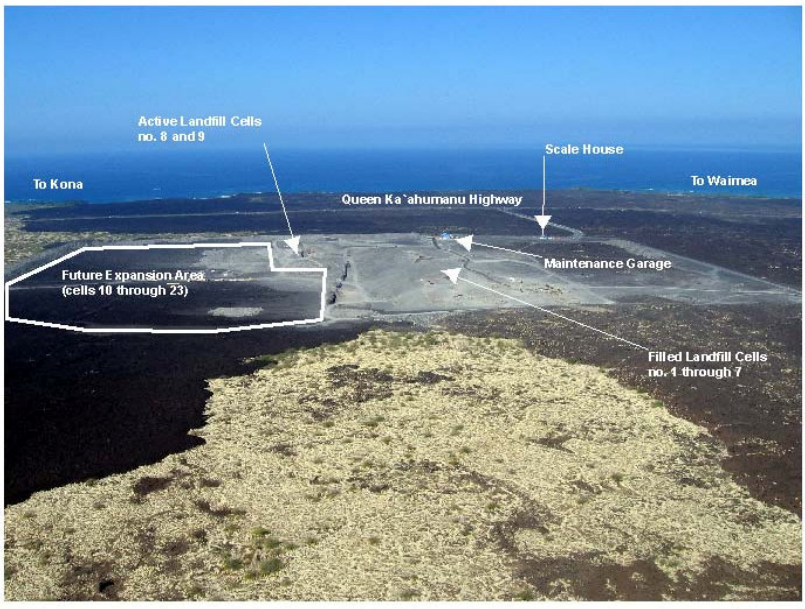

North

Exhibit 2
West Hawai`i Sanitary Landfill (at Pu`uanahulu)

Issues and Concerns

- Closed landfills at Kailua-Kona and Waimea
- Flow control
- East Hawaii residuals management when SHSL is full (2013)
- Recovery and treatment

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Kailua-Kona Closed Landfill

- Operated from the late 1970s until 1993
- Located east of the Queen Ka`ahumanu Highway approximately 3 miles north of Kailua-Kona
- Subsurface fires since 1991
- County is investigating fire suppression options
- Long term management options
  - Extinguishing the subsurface fires, repairing the cover, and managing the waste in place
  - Excavate the landfill, remove materials that can be recycled or composted, and transfer residuals to the WHSL

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Waimea Closed Landfill

- **Operated from the late 1960s until 1987**
- **Subsurface fires documented in 2006 and 2008**
- **Subsurface fires have been extinguished**
  - Limiting the amount of influx of oxygen to the subsurface of the landfill by backfilling and grading
- **Additional cover material will be applied to the surface to seal the landfill from the atmosphere in an effort to prevent further combustion**

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Private Facilities and Flow Control

- **Flow control ordinances**
  - Ensure that materials flow to facilities in which local government has significant capital investment and/or other interest
  - Common in U.S.
- **Proposed recovery facility by a private collection firm**
- **Concerns:**
  - Some added risk of increased commercial collection costs
  - Reduces the County's flexibility to adopt zero waste programs
  - Some loss of control and flexibility for County to choose a recovery and disposal technology that best meets the needs of the entire County rather than the interest of a single firm

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Overview
Recovery and Treatment

- **Definition: Thermal, biological, or chemical processing**
  - AFTER waste reduction, reuse, recycling, and bioconversion
  - BEFORE landfill disposal
- **"Conversion technologies" or "Alternative technologies"**
  - Tremendous current interest in U.S.
  - Many RFPs and studies in progress
- **European Union Landfill Directive**
  - Driving interest in thermal technologies and mechanical-biological treatment

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Thermal Technologies

- **Mass-burn Waste-to-Energy**
- **Refuse-derived fuel**
- **Gasification**
- **Pyrolysis**
- **Plasma Arc**

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Mechanical-Biological Treatment (MBT)

- **Biological treatment with RDF for combustion**
- **Biological treatment with composting**
- **Anaerobic digestion**

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Recovery and Treatment Key Issues

- **Only mass-burn WTE is common in U.S.**
  - About 10 RDF plants and 5 MBT plants in commercial operation in U.S.
  - About 150 MBT plants in Europe
  - No commercial-scale gasification, pyrolysis, plasma arc, or anaerobic digestion facilities processing municipal solid waste in US and very limited elsewhere
- **50-90%+ reduction in landfill disposal**
- **Most technologies are complex with high capital costs**
- **Consistent with zero waste principles?**
- **Costs for East Hawai`i**
  - WTE costs $120-145/ton
  - Other technologies
    - Highly uncertain
    - $80-$210 per ton

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Recovery and Treatment Key Issues (continued)

- **Beneficial uses: further recovery of metals and some recyclables possible, electricity, syngas, compost (usually poor quality)**
- **Greenhouse gas emissions**
  - Complex, but ¼ to ½ the GHG of landfill no/low LFG capture
- **Other air emissions**
  - All can meet U.S. EPA requirements
  - Gasification, pyrolysis, plasma arc – potential for lower emissions than mass-burn WTE
- **Water quality**
  - Most will reduce risk of long-term groundwater quality issues
- **Markets – cost effectiveness can depend on markets**

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Recovery/Treatment Option 1: No Action; Wait to Assess Success of Current Conversion Technology Projects

- **Monitor current developments**
- **Leave open as an option for future plans**
- **Would require committing to a landfill option for East Hawai`i**

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Recovery/Treatment Option 2: Waste-to-Energy Facility for East Hawai`i; Ash and Bypass Materials to SHSL

- **Reconsider Wheelabrator proposal or conduct another procurement**
- **Advantages**
  - Proven technology
  - Added metal recovery and electricity generation
  - Less land needed for landfilling
  - Reduced potential for water quality impacts from landfilling
  - Reduced greenhouse gases
- **Disadvantages**
  - Cost would be $50-75 per ton more than landfill
  - At 230 tpd, somewhat inconsistent with zero waste principles
  - Would meet regulatory requirements, but some air emissions would result

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Recovery/Treatment Option 3: Waste-to-Energy Facility for all County Residuals; Ash and Bypass Materials to WHSL

- **Same as Option 2, but larger facility**
- **Advantages**
  - Compared to Option 2, lower cost processing on a per-ton basis, but would those savings exceed the added cost of trucking?
  - Could size the plant to accommodate 50% recycling rate or higher
- **Disadvantages**
  - Same as Option 2
  - Added air emissions from trucking waste to the facility

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Recovery/Treatment Option 4: One or More Modular Waste-to-Energy Facilities in Rural Areas; Ash and Bypass Waste to SHSL and WHSL

- **Small 20 tpd modular facility**
- **Locate at the Waiohinu recycling and transfer station (with waste from Pahala, and Miloli`i)**
- **Cost $40 per-ton less to $50 per-ton more than landfill (net of trucking cost savings)**
- **Advantages**
  - Reduce County trucking by 20%
  - Could be combined with reconstruction of station
  - Some additional metal recovery
- **Disadvantages**
  - Would meet regulatory requirements, but some air emissions would result
  - Remote location could make electricity generation problematic
  - Added staff training and skills needed
  - Operating risks in a remote area

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Recovery/Treatment Option 5: Develop MBT Facilities at the SHSL and/or WHSL Sites

- **Advantages**
  - Potential for added recovery of recyclables
  - Reduced greenhouse gas emissions
  - Reduced potential for water quality impacts from landfilling
  - Beneficial use for low-quality compost (land reclamation, landfill cover)
- **Disadvantages**
  - Cost would be $30-130 more than landfill
  - Highest risk of system failure of any recovery option
  - Would require specialized operating expertise, sound preventive maintenance, and vigilant on-going odor management practices

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Landfill Option 1: Expand SHSL for East Hawai`i residuals; use WHSL for West Hawai`i residuals

- **Two sequenced expansions**
  - Lateral expansion
    - Lined cell adjacent to existing landfill
    - 9 years of capacity at existing recycling rates
  - New landfill
    - Lined landfill in on-site quarries
    - 38 years at existing recycling rates
- **Lateral expansion**
  - Active stormwater management to minimize leachate production
  - Regulations would require bottom liner with leachate collection and recovery system
    - two layers of heavy duty plastic geomembrane, placed above and below a geosynthetic clay liner
    - engineered drainage layer
  - Leachate treatment
    - Initial feasibility study showed that constructed wetlands could effectively treat leachate

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Landfill Option 1 (continued): Expand SHSL for East Hawai`i residuals; use WHSL for West Hawai`i residuals

- **New Landfill**
  - Siting study conclusions: *"The location adjacent to the South Hilo Sanitary Landfill …. rates highest"*
  - *On County-owned land used for quarry operations southeast of the existing landfill*
  - *The 75-acre quarry site is slightly larger than the existing landfill footprint (see Exhibit 1).*
  - *Would be operated using the same assumptions as the lateral expansion*

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Landfill Option 1 (continued): Expand SHSL for East Hawai`i residuals; use WHSL for West Hawai`i residuals

- **Advantages**
  - Relatively low risk technology compatible with any future recovery or treatment option
  - Relatively low capital investment -- consistent with zero waste principles
  - Few siting issues anticipated
  - Relatively low cost option (about $10-15/ton more than current SHSL cost)
- **Disadvantages**
  - Operational challenges associated with high rainfall
  - Worst greenhouse gas emission performance
  - Volatile organic compound (VOC) emissions
  - Some water quality risks

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Landfill Option 2 Landfill all County Waste at the WHSL

- **Transfer East Hawai`i residuals at the Hilo sort station and transport by truck to the WHSL**
- **12 trucks on average day (18 tons per truck)**
- **Cost**
  - About $26 per ton more than current SHSL
  - About $10-15 per ton more than Option 1
- **Advantages**
  - Similar to Option 1 with less technology risk and less potential for water quality impacts
- **Disadvantages**
  - Public opposition to trucking waste from East Hawai`i is likely
  - Added emissions from vehicles

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Landfill Option 3
Bale and Barge East Hawai`i Waste; WHSL for West Hawai`i

- **Bale and shrink-wrap residuals at Hilo sort station**
- **Barge to other island or to Mainland**
- **Honolulu County Procurement**
  - Award to Hawaiian Waste Systems (HWS) for landfill in eastern Washington State
  - Barge across Pacific and up Columbia River, then short truck-haul to landfill
  - Assumed backhaul of aggregates or other commodities
  - $99 per ton
  - Award is under protest

Landfill Option 3 (continued)
Bale and Barge East Hawai`i Waste; WHSL for West Hawai`i

- **Estimated cost**
  - HWS has suggested $85-100 per ton to County staff
  - With specific contract language, price would probably be higher
- **Advantages**
  - Appears to be technically feasible
- **Disadvantages**
  - Some people object to the principle of exporting waste
  - Added pricing risk for proposals dependent upon a secure and consistent backhaul
  - Added risk associated with shipping baled garbage across the Pacific Ocean
  - Added fuel emissions from lengthy barge transportation
  - Risk of delays in barge transportation – storage or backup disposal needed

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Which of These Options Do You Prefer?

- Rather than a "ballot", we'll conduct a multi-attribute utility analysis (value modeling) of options
- Discuss objectives and ways to measure how well each option meets each objective
- Weight relative importance of objectives at the February SWAC meeting
- Report results and discuss in March meeting

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