Eye in the Sky
Monitoring Airspace Utilization with Drones
Todd E. Stiggins, P.E.
Spenser J. Harvey, P.E.
Eye in the Sky

Summary

• Landfills Are:
  • Assets
  • Investments

• Surveying:
  • Old Vs. New
  • Benefits for You

• Drones for Landfills
Landfills Are Assets

A Landfill’s Product

- What is the service
  - Not Trash
  - “Airspace”
Landfills Are Assets

Quantify Product

- Quantity
  - Volume?
  - Weight?
Landfills Are Assets

Conserve Product

- How to Conserve
- Proper Unloading
Landfills Are Assets

Conserve Product

• How to Conserve
  • Proper Unloading
Landfills Are Assets

Conserve Product

• How to Conserve
  • Proper Unloading
  • Operations
Landfills Are Assets

Conserve Product

- How to Conserve
  - Proper Unloading
  - Operations
Landfills Are Assets

Conserve Product

- How to Conserve
  - Proper Unloading
  - Operations
  - Compaction
Landfills Are Investments

Capital Cost Analysis

• Land and Title
• Permitting
• Infrastructure
• Equipment
Landfills Are Investments

Land and Title

- Average Facility Size ~250 Acres
  - Rural Land ~$3,500/Acre
  - Gulf Coast ~ $12,000/Acre
- Fatal Flaw Analysis Study

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<thead>
<tr>
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Landfills Are Investments

Permitting

- Survey
- Geology Report
- Engineer Design
- Engineer Permit Preparation
- Engineer Response to Comment

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Landfills Are Investments

Infrastructure

- First Portion of Landfill
- Scale House
- Maintenance and Storage
- Utilities and Improvements

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**TOTAL** ~$10,400,000
Landfills Are Investments

Equipment

- Two Landfill Compactors
- Two Dozer

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~$14,000,000
Landfills Are Investments

Break Even

- Why Run A Landfill?
  - Initial Costs
  - Break Even
  - Profitability
Landfills Are Investments

Profitability

- Two Rates
  - Cost Rate
  - Revenue Rate
- Reality Vs Theory
  - Fee Increases
  - Future Capital
  - Sudden Maintenance

Revenue Rate

Operation Cost
Landfills Are Investments

The “Getting There”

- Uncapped
  - Costs
- Capped
  - Revenue
  - (Permitted Capacity)
  - Better Operations
Surveying
Old Vs New

The Old

• Traditional Surveying
  • Grid Based
  • Links and Chains
  • Site Lines
Surveying
Old Vs New

How Surveying Works

• Traditional Surveying
  • Grid Based
  • Links and Chains
  • Site Lines
Surveying
Old Vs New

The Modern

- Modern Surveying
  - GPS Controlled
  - Grid Based
  - More Efficient
    - Limited Data
Surveying
Old Vs New

The New

• Drone Surveying
  • Photo Based
  • Photogrammetry
  • Trigonometry Based
Surveying
Old Vs New

The New

• Drone Surveying
  • Photo Based
  • Photogrammetry
  • Trigonometry Based
Surveying
Old Vs New

The New

- Drone Surveying
  - Why Drone Surveying
  - Data
Surveying

Benefits for you

• Operations Review
• Site Life Projections
• Reduce Losses
Surveying Benefits For You

Operations Review

- Compaction Calculation
- Settlement
Surveying Benefits For You

Site Life Projections

- Plan Capital Improvements
- Plan For Closure
Surveying Benefits For You

Reduce Losses

- Catch and Resolve Issues
- Monitor Compaction
Drones for Landfills

Objective of a Landfill

- Continue Waste Operations
- Other Site Operations
- Increase Profitability
Drones for Landfills

Continue Operations

- Drone Surveying:
  - Spots Issues Fast
  - Extend Cell Life
Drones for Landfills

Other Site Operations

- Drone Surveying:
  - Captures Soil Stockpiles
  - Captures Waste Diversion
  - Tracks Erosion Conditions
Drones for Landfills

Profitability

- Drone Surveying:
  - Maximize Compaction
  - Minimize Cover Placement
  - Extended Facility Life
Eye in the Sky

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  - Investments
- Surveying:
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