# Recirculation-To-Energy
# Crow Wing County, Minnesota

## RTE . . . Small Landfill . . . Big Results

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**EPA Bioreactor Workshop**

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# Outline

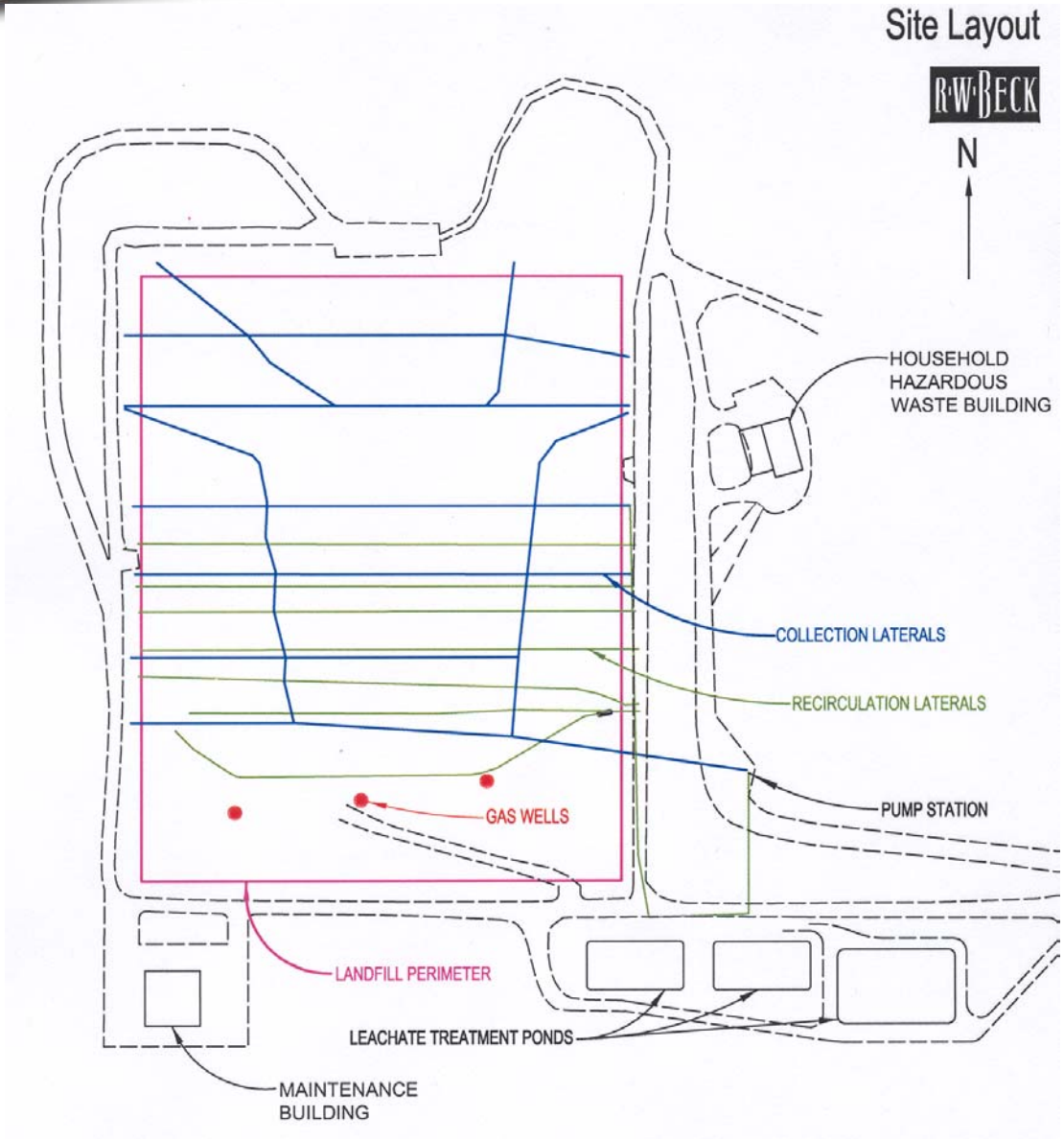
- Site Background
- Visual Tour
- Project Goals and Supporting Data
- Nitrification - Denitrification
- RTE Development
- The Future

# Site Background

- Began Operation in 1991
- 40,000 tons/year
- Annual Precipitation - 30 inches
- 3 cells
  - 7.8 acres open
  - Remaining Life - 20+ years
- Integrated Public System
  - Recycling
  - Yard waste
  - Demolition Debris
  - HHW
  - Industrial Waste
  - MSW Disposal

# Leachate Management

- Pretreatment
- Hauling to WWTP
- Land Application - 1996
- Recirculation - 1998


Site Layout
R·W·BECK
N
HOUSEHOLD
HAZARDOUS
WASTE BUILDING
COLLECTION LATERALS
RECIRCULATION LATERALS
PUMP STATION
GAS WELLS
LANDFILL PERIMETER
LEACHATE TREATMENT PONDS
MAINTENANCE
BUILDING

# RTE Operation Goals

- Minimize leachate hauling
- On-site responsibility
- Optimize airspace
- Minimize long-term liability
- Energy recovery

# Leachate Generation and Disposal

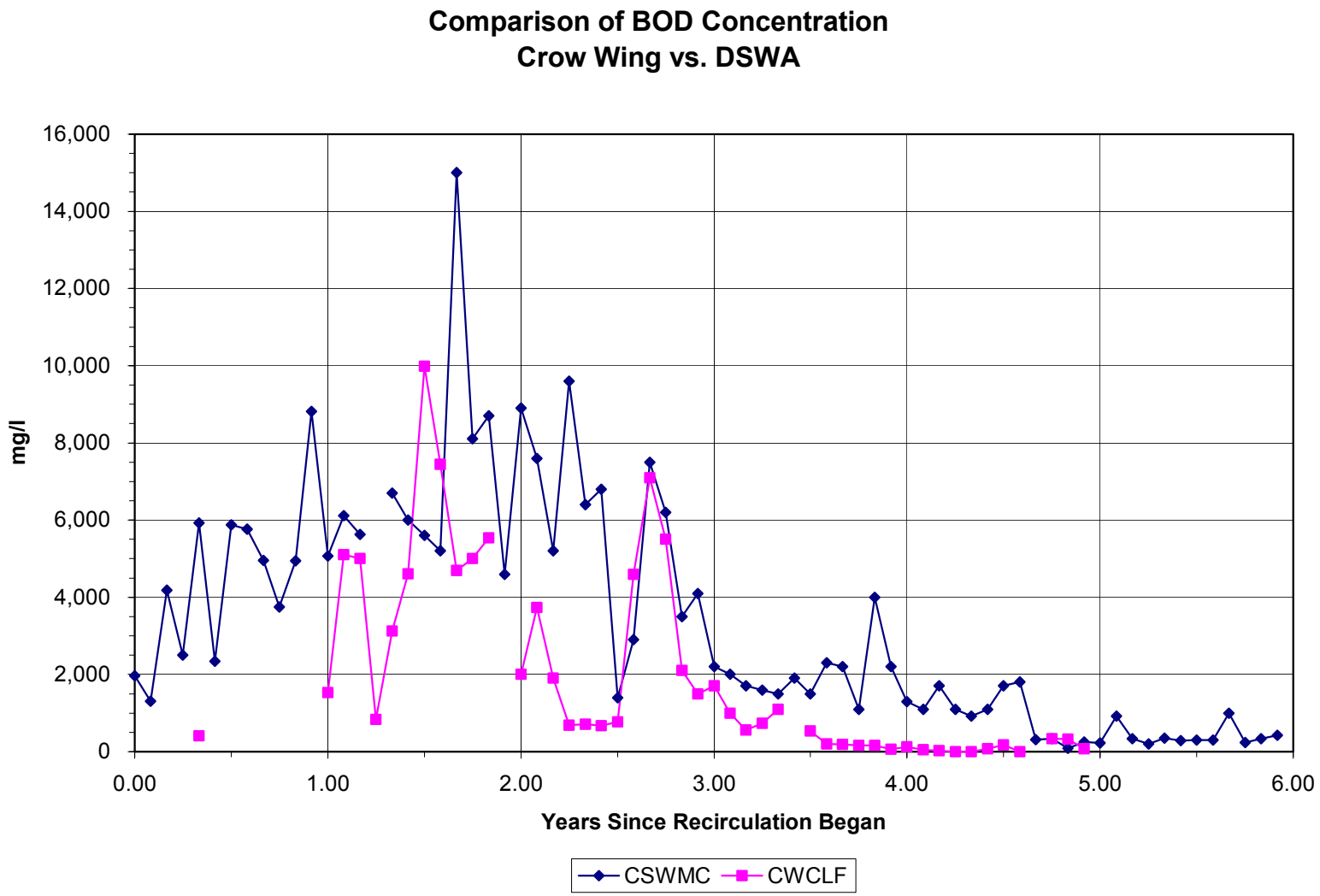
| Year | Total Leachate Generated (gallons) | Leachate Hauled (gallons) | Leachate Land Applied (gallons) | Leachate Recirculated (gallons) |
|---|---|---|---|---|
| 1992 | 1,900,000 | 1,600,000 | NA | NA |
| 1993 | 2,200,000 | 2,000,000 | NA | NA |
| 1994 | 1,600,000 | 1,700,000 | NA | NA |
| 1995 | 2,200,000 | 2,000,000 | 24,000 | NA |
| 1996 | 2,800,000 | 500,000 | 1,500,000 | NA |
| 1997 | 2,600,000 | 1,000,000 | 1,700,000 | 36,000 |
| 1998 | 2,200,000 | 0 | 1,800,000 | 400,000 |
| 1999 | 2,000,000 | 0 | 2,500,000 | 900,000 |
| 2000 | 1,700,000 | 0 | 1,600,000 | 900,000 |
| 2001 | 2,000,000 | 0 | 2,800,000 | 1,400,000 |
| 2002 | 4,400,000 | 200,000 | 4,200,000 | 2,300,000 |

NA = Not Available

## Recirculation Volume per Ton Disposed

| Year | Recirculation Volume (gal) | Tonnage Disposed | Gallons per Ton |
|---|---|---|---|
| 1998 | 434,830 | 33,110 | 13.1 |
| 1999 | 877,675 | 33,174 | 26.5 |
| 2000 | 869,988 | 35,731 | 24.2 |
| 2001 | 1,395,782 | 38,673 | 36.1 |
| 2002 | 2,276,015 | 42,863 | 53.1 |
| Total | 5,848,290 | 183,551 | 31.9 |
| DSWA | | | 6.8 |

Field Capacity: 50 to 130 Gallons/ton


Comparison of BOD Concentration
Crow Wing vs. DSWA
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
mg/l
0.00
1.00
2.00
3.00
4.00
5.00
6.00
Years Since Recirculation Began
CSWMC
CWCLF