KDHE’s Proposed C&D LFG Regulations

Dennis A. Degner, P.E., Chief, SW Permits Section

at
Kansas Landfill Association 6th Annual Convention & Trade Show
Junction City
October 8, 2009
Overview of Presentation

- What is C&D Waste?
- Why Considering Regulatory Changes?
- Review of Current Regulations
- What C&D Landfills Will be Subject to Increased Level of Regulation?
- Summary of Proposed LFG Control Regulations
- Future Schedule for Regulation Development
What is C&D Waste?

- Solid waste from construction, remodeling, repair & demolition of structures, roads, sidewalks & utilities
- Untreated wood & untreated sawdust
- Treated wood: construction & demo
- Vegetation: land clearing, utility maint., seasonal/storm cleanup
What is C&D Waste? (cont.)

- Furniture & appliances (freon extracted)

- Includes
  - Wood & wood products
  - Wall or floor coverings
  - Drywall
  - Construction related packaging
  - Roofing materials
How is LFG Generated?

- Biodegradation of organic wastes in the landfill
- Sheetrock/wallboard/drywall: consists of paper and gypsum (CaSO₄)
- Water
- Low levels of oxygen in landfill
What is LFG?

- Methane – CH$_4$
- Carbon Dioxide – CO$_2$
- Hydrogen Sulfide – H$_2$S
- Nitrogen – N$_2$
- Ammonia Nitrogen – NH$_3$
- Volatile Organic Compounds
Why is LFG a Major Concern?

- $\text{H}_2\text{S}$ is toxic to humans at low concentrations
- $\text{CH}_4$ is explosive at low concentrations
- What are these concentrations?
## Risk Based Comparison of H₂S Levels for Workers & Receptors

<table>
<thead>
<tr>
<th>Agency/Company</th>
<th>H₂S Exposure Standards, Guidelines &amp; Oper. System Data (ppmv)</th>
<th>Description of Risk at Various H₂S Concentrations &amp; Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIOSH</td>
<td>100</td>
<td>IDLH (Immediately dangerous to life or health)</td>
</tr>
<tr>
<td>OSHA</td>
<td>20</td>
<td>Worker exposure – 15 min. ceiling</td>
</tr>
<tr>
<td>NIOSH</td>
<td>10</td>
<td>Worker exposure – 10 min. ceiling</td>
</tr>
<tr>
<td>ATSDR</td>
<td>0.07</td>
<td>Acute minimal risk – 14 days cont. exposure</td>
</tr>
<tr>
<td>ATSDR</td>
<td>0.02</td>
<td>Intermediate minimal risk – 15-365 days of continuous exposure</td>
</tr>
<tr>
<td>USEPA</td>
<td>0.0014</td>
<td>Reference concentration – lifetime exposure</td>
</tr>
<tr>
<td>USEPA</td>
<td>0.0005</td>
<td>Odor detection threshold</td>
</tr>
</tbody>
</table>
## Risk Based Comparison of CH$_4$ Levels: Structures & Receptors

<table>
<thead>
<tr>
<th>Agency or Company</th>
<th>CH$_4$ Exposure Stds &amp; Operating System Data (%)</th>
<th>Description of Stds/Risk at Various CH$_4$ Concentrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>KDHE</td>
<td>40-60</td>
<td>Typical range for beneficial use of LFG</td>
</tr>
<tr>
<td>KDHE – Ref.</td>
<td>15</td>
<td>Upper Explosive Limit – Gas properties</td>
</tr>
<tr>
<td>KDHE – Ref.</td>
<td>5</td>
<td>Lower Explosive Limit – Gas properties</td>
</tr>
<tr>
<td>KDHE - Proposed</td>
<td>2.5 (50 % LEL)</td>
<td>Limit at the Facility Boundary</td>
</tr>
<tr>
<td>KDHE - Proposed</td>
<td>1.25 (25 % LEL)</td>
<td>Limit in Facility Structures</td>
</tr>
</tbody>
</table>
Gas Properties

Lower Explosive Limit (LEL)

- The lowest % volume of a mixture of explosive gases in air that will propagate (transmit) a flame at 25° C (77° F.) & atmospheric pressure (14.7 lbs./inch²)
Why Considering Regulatory Changes

- Exhibited releases of landfill gas:
  - Hydrogen Sulfide (toxic)
  - Methane (explosive)

- Known & Probable Locations associated with the releases are:
  - Large quarry landfills
  - Small publicly owned landfills in eastern Kansas
  - Privately owned landfills in eastern Kansas
## Average Annual Levels of H$_2$S Collected at a C&D LF

<table>
<thead>
<tr>
<th>Year</th>
<th>H$_2$S Levels</th>
</tr>
</thead>
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<tr>
<td>2008</td>
<td>56 ppmv is the collected gas concentration in the waste mass as the blower operates at 45 cubic feet/minute</td>
</tr>
<tr>
<td>2009</td>
<td>78 ppmv is the collected gas concentration in the waste mass as the blower operates at 45 cubic feet/minute</td>
</tr>
</tbody>
</table>
### Average Annual Levels of CH$_4$
#### Collected at a C&D LF

<table>
<thead>
<tr>
<th>Year</th>
<th>CH$_4$ Levels</th>
<th>Typical levels of LFG</th>
<th>Gas generation rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2008</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>36 %, LEL is 5%</td>
<td>in the range of 40 – 60%</td>
<td>45 cubic feet/min</td>
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<tr>
<td><strong>2009</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>55 %, LEL is 5%</td>
<td>in the range of 40 – 60%</td>
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Current C&D LF Regulations

- Major design features 28-29-304
  - storm water control – prevent flow onto active areas for a 25 yr, 24 h storm event
  - contact water control & management (one or more of the following)
    - Storage (outside the waste mass)
    - Beneficial use (no recirculation into waste)
    - Treatment on-site or haul off-site to WWTP
    - Discharge thru NPDES/WW Permit or Deep Well
Current Operational Regulations & Policies

- Major Operational requirements 28-29-308
  - Water management – storm water & contact water control (very important)
  - Access control
  - Cover – 1’ (every 2,000 T of waste accepted or every 120 days)
  - Waste screening – enhanced for larger C&D LFs
Enhanced Waste Screening Policy

- Applicable to Larger C&D LF s:
  - Accepting waste from out-of-state TS
    - Requires screening of every load
  - Facilities receiving > 100 T or 200 cu yds per day
    - Requires screening 1 load/ 50 T (100 cy) recd
- Non-compliant facilities
  - Revise screening plan in the FOP to a higher level
Essential Operational Needs!

- Conduct Operational and Safety Training for Supervisory and Operational Personnel
- Conduct Waste Screening
- Provide Operational Personnel the Proper Operating Equipment and Storage Containers for Waste That have been Removed by Screening
Current C&D Landfill Management Needs

- Have a consulting engineer on retainer to:
  - Review your phasing plan to ensure proper CQA occurs prior to disposal
  - Review your training plan
  - Review your operations annually
  - Help you prepare your annual closure and post-closure cost estimate
What is the Purpose of New C&D Landfill Regulations?

- **C&D Landfill Gas Monitoring and Control**
  - Improve design & operation of quarry & alluvial valley C&D LFs
  - Reduce infiltration of precipitation
  - Monitor gas emissions
  - If needed, implement corrective action to control release of LFG to air on-site and from migrating off-site
Contents: LFG Monitoring & Control (M & C)

- Applicability
- Landfill Design
- Landfill Operations
- Gas Monitoring System Design
- Gas Monitoring
- Gas Control
- Corrective Action
Contents: LFG Monitoring & Control (M & C)

- Record-keeping & Reporting
- Gas Monitoring System Design Plan
- Gas Monitoring Operations Plan
C&D LFG Monitoring & Control (M&C)

- **Applicability**

- Precipitation > 25 inches/yr

- Landfill of base is $1 \times 10^{-7}$ cm/sec
  
  - For comparison – concrete is $1 \times 10^{-12}$ cm/sec & a 60 mil HDPE geomembrane liner is $1 \times 10^{-14}$ cm/sec

- Unless the design & operation allows the contact water to exit the waste mass by gravity flow
### Distribution of Active C&D Landfills Known or Believed to be in Quarries

<table>
<thead>
<tr>
<th>Permit No.</th>
<th>County</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>Allen</td>
<td>Allen Co.</td>
</tr>
<tr>
<td>669</td>
<td>Dickinson</td>
<td>Blixt</td>
</tr>
<tr>
<td>118</td>
<td>Greenwood</td>
<td>Greenwood Co.</td>
</tr>
<tr>
<td>487</td>
<td>Johnson</td>
<td>APAC-KS</td>
</tr>
<tr>
<td>263</td>
<td>Johnson</td>
<td>Deffenbaugh</td>
</tr>
<tr>
<td>763</td>
<td>Johnson</td>
<td>Asphalt Sales</td>
</tr>
<tr>
<td>790</td>
<td>Johnson</td>
<td>O’Donnell &amp; Sons/SRC/DII</td>
</tr>
<tr>
<td>840</td>
<td>Johnson</td>
<td>Holland Corp./APAC</td>
</tr>
<tr>
<td>804</td>
<td>Leavenworth</td>
<td>American Roofing</td>
</tr>
<tr>
<td>862</td>
<td>Leavenworth</td>
<td>Larkin Excavating</td>
</tr>
<tr>
<td>515</td>
<td>Montgomery</td>
<td>Heartland Cement</td>
</tr>
<tr>
<td>851</td>
<td>Pottawatomie</td>
<td>Acres of CD Landfill</td>
</tr>
<tr>
<td>843</td>
<td>Riley</td>
<td>Tarkio CD Disposal</td>
</tr>
</tbody>
</table>
Located in an alluvial valley where groundwater or surface water could enter the waste during flooding
LFG M&C

- **Landfill Design**
- Final cover – 18” low permeability layer with permeability equal to or less than the base &
- A protective layer as thick as the frost depth
- Unless an alternate final cover is approved by KDHE
LFG M&C

- **Landfill Design (cont.)**

- **Drainage layer**
  - Overlay the base
  - 3’ thick
  - Consist of sand, gravel, clean rubble with high hydraulic conductivity – no soil

- **System to monitor depth of contact water & collect it**
LFG M&C

- Landfill Design (cont.)
- Pumps to remove contact water from drainage layer
- Control LFG so no off-site migration
LFG M&C

- **Landfill Operations**
- Apply cover at frequency to minimize infiltration into waste
- Construct temporary soil berms to divert & shed precipitation
- Pump contact water from drainage layer so no greater than 2’
LFG M&C

- **Gas Monitoring System Design**
  - At least one gas monitoring well between LF & each off-site building
  - Gas monitoring wells shall be placed along the property boundary - <500’
  - Each monitoring well shall monitor the soil & rock down to the depth of the LF
LFG M&C

- **Gas Monitoring**
- During active life & post-closure care period (30 yrs)
- All perimeter monitoring wells & buildings on LF
- Monitoring is req’d quarterly
- Gases – methane & hydrogen sulfide
LFG M&C

- **Gas Control**
  - Methane – not exceed 25% of LEL in bldgs on LF or not exceed 50% of LEL in soil at the property boundary
  - Hydrogen sulfide – not exceed one-hr average of 30 ppbv
LFG M & C

- Active gas controls may be required if concentration limits are exceeded on-site or at the property boundary
LFG M & C

- **Corrective Action (CA)**
  - Immediately assess potential danger to human health & environment & take steps to protect
  - Immediately notify local government health & public safety offices
  - In 7 days notify KDHE w/ gas levels & steps taken
Corrective Action (cont.)

In 60 days develop & submit a CA plan – active or passive gas management system

Upon approval of KDHE, implement the plan
Example of LFG Blower
LFG M&C

- **Record-keeping and Reporting**
- Gas monitoring data will be collected quarterly for records
- Report due to KDHE by March 1 for the preceding year
LFG M&C

- Gas Monitoring System Design Plan
- Description of the hydrogeology and topography at the facility & within 1 mile
- Description of the monitoring system including location of all gas wells & frequency of monitoring
LFG M&C

- Gas Monitoring System Design Plan (cont.)
- Drawing detailing the typical gas monitoring well depth & design depths and bottom elevations of each monitoring well
- Boring logs that support the design of each monitoring well
Gas Monitoring Operations Plan

- Shall become part of the facility operations plan (FOP)
- The plan shall define the monitoring locations, frequency, constituents to be monitored, monitoring methods to be used, and the monitoring methods that will be used at locations other than wells.
Estimated Schedule for Development

- October 2009 – Completed Draft
- October 2009 – Transmitted to Stakeholders & Public
- December 2009 – Review Completed by Stakeholders & Public
- February 2010 – Administrative Review Completed
Estimated Schedule for Development (cont’d)

- March 2010 – Place on Public Notice in KS Register
- April 2010 – Hold Public Hearing
- May 2010 – Review Comments & Revise where appropriate
- August 2010 – Publish Regulation in KS Register
Estimated Effective Date

- 6 months after regulations are published (estimated publication date - August 2010) documentation is required to evaluate geology & precipitation rate – P.G. or P.E.
  - Compare to the criteria for any unit where disposal has not yet been authorized
- Regulations effective – Feb. 2011
Questions?

- Dennis A. Degner, Ph.D., P.E.
- Chief, Solid Wastes Permits Section
- 1000 SW Jackson, Topeka 66612-1366
- P: 785-296-1601  F: 785-296-1592
- E: ddegner@kdheks.gov
- W: www.kdheks.gov/waste
Proposed New Regulation for C&D Landfill Gas Monitoring and Control
KAR 28-29-316