RCRA Requirements for Hazardous Waste Management Units

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Presentation Outline

- Resource Conservation and Recovery Act
  - Types of Land-based Units
  - RCRA Requirements that apply
    - Siting, Design, Operation and Closure
- WCS Landfill Design & Construction
Poll: Are you familiar with RCRA?
Types of Land-based Units

- Surface Impoundments
- Waste Piles (not common)
- Land Treatment Units
- Landfills
RCRA Standards that Apply to Land-based Units

- Location Standards
- Design Standards
- Operating Standards
- Closure Standards
- Post Closure Standards
Land Disposal Restrictions

Part 268

- Apply to Land based units
  - Surface impoundments
  - Waste Piles
  - Land Treatment Units
  - Landfills
- Waste must be treated to LDR’s prior to land disposal
Subpart B – General Facility Standards
264.18 – Location Standards

• Seismic considerations
  • must not be located within 200 ft of a fault which has had displacement in Holocene time
• Floodplain
  • May be located in floodplain if designed to prevent washout from a 100-year flood
• Salt Formations (domes, beds, mines and caves)
  • Liquids prohibited
Subchapter G
Location Standards for Hazardous Waste Storage, Processing, or Disposal (cont’)

• 335.204 – Unsuitable site characteristics for landfills
  • May not be located in:
    • Wetlands
    • Recharge zone of sole-source aquifer
Sole-source Aquifer

- An aquifer that has been designated by the EPA as the sole or principal source of drinking water for an area.
335.204

Unsuitable site characteristics

• A landfill may not be located:
  • in areas where soils within 5 ft of the containment structure have a Unified Soil Classification of GW, GP, GM, GC, SW, SP, or SM, or a \( k \) greater than 10-5 cm/sec unless:
    • it is in an area where the average annual evaporation exceeds average annual rainfall by more than 40 in; or
    • the soil unit is not sufficiently thick and laterally continuous to provide a significant pathway for waste migration.
# Unified Soil Classification System

Soils are visually classified for engineering purposes by the Unified Soil Classification System. Grain-size analyses and Atterberg Limits tests often are performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. Graphic symbols are used on boring logs presented in this report. For a more detailed description of the system, see "Standard Practice for Description and Identification of Soils (Visual- Manual Procedure)" ASTM Designation: D2488-84 and "Standard Test Method for Classification of Soils for Engineering Purposes" ASTM Designation: D2487-85.

<table>
<thead>
<tr>
<th>MAJOR DIVISIONS</th>
<th>GRAPHIC SYMBOL</th>
<th>GROUP SYMBOL</th>
<th>TYPICAL NAMES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CLEAN GRAVELS</strong></td>
<td></td>
<td>GW</td>
<td>Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures</td>
</tr>
<tr>
<td>(Less than 5% passes No. 200 sieve)</td>
<td></td>
<td>GP</td>
<td>Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures</td>
</tr>
<tr>
<td><strong>GRAVELS WITH FINES</strong></td>
<td>Limits plot below &quot;X&quot; line &amp; hatched zone on plasticity chart</td>
<td>GM</td>
<td>Silty gravels, gravel-sand-silt mixtures</td>
</tr>
<tr>
<td>(More than 12% passes No. 200 sieve)</td>
<td></td>
<td>GC</td>
<td>Clayey gravels, gravel-sand-clay mixtures</td>
</tr>
<tr>
<td><strong>CLEAN SANDS</strong></td>
<td></td>
<td>SW</td>
<td>Well graded sands, gravelly sands</td>
</tr>
<tr>
<td>(Less than 5% passes No. 200 sieve)</td>
<td></td>
<td>SP</td>
<td>Poorly graded sands, gravelly sands</td>
</tr>
<tr>
<td><strong>SANDS WITH FINES</strong></td>
<td>Limits plot below &quot;X&quot; line &amp; hatched zone on plasticity chart</td>
<td>SM</td>
<td>Silty sands, sand-silt mixtures</td>
</tr>
<tr>
<td>(More than 12% passes No. 200 sieve)</td>
<td></td>
<td>SC</td>
<td>Clayey sands, sand-clay mixtures</td>
</tr>
<tr>
<td><strong>SILTS OF LOW PLASTICITY</strong></td>
<td>Limits plot above &quot;X&quot; line on plasticity chart</td>
<td>ML</td>
<td>Inorganic silts, clayey silts of low to medium plasticity</td>
</tr>
<tr>
<td>(Liquid Limit less than 50)</td>
<td></td>
<td>MH</td>
<td>Inorganic silts, micaceous or diatomaceous silty soils, elastic silts</td>
</tr>
<tr>
<td><strong>SILTS OF HIGH PLASTICITY</strong></td>
<td>Limits plot above &quot;X&quot; line on plasticity chart</td>
<td>CL</td>
<td>Inorganic clays of low to medium plasticity, gravelly, sandy, and silty clays</td>
</tr>
<tr>
<td>(Liquid Limit 50 or more)</td>
<td></td>
<td>CH</td>
<td>Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity</td>
</tr>
<tr>
<td><strong>CLAYS OF LOW PLASTICITY</strong></td>
<td>Limits plot above &quot;X&quot; line on plasticity chart</td>
<td>OL</td>
<td>Organic silts and clays of low to medium plasticity, sandy organic silts and clays</td>
</tr>
<tr>
<td>(Liquid Limit less than 50)</td>
<td></td>
<td>OH</td>
<td>Organic silts and clays of high plasticity, sandy organic silts and clays</td>
</tr>
<tr>
<td><strong>CLAYS OF HIGH PLASTICITY</strong></td>
<td>Limits plot above &quot;X&quot; line on plasticity chart</td>
<td>PT</td>
<td>Organic soil matter (dark in color and organic odor)</td>
</tr>
<tr>
<td>(Liquid Limit 50 or more)</td>
<td></td>
<td></td>
<td>Peat</td>
</tr>
</tbody>
</table>
335.204
Unsuitable site characteristics

• A landfill may not be located in areas of active geologic processes unless the design, construction, and operational features of the facility will prevent adverse effects resulting from the geologic processes.
335.204
Unsuitable Site Characteristics

- A landfill may not be located within 1,000 ft of an area subject to active coastal shoreline erosion (if protected by a barrier island.)
- A separation distance from the shoreline to the facility must be at least 5,000 feet (if unprotected by a barrier island.)
Poll

• Which state generates the most hazardous waste?
  • California
  • New York
  • Louisiana
  • Texas
US Hazardous Waste Generation (2011)

- Texas: 15,683.41 thousand tons
- Louisiana: 4,399.52 thousand tons
- Mississippi: 1,828.89 thousand tons
- Ohio: 1,617.76 thousand tons
- Kansas: 1,238.34 thousand tons
- New Mexico: 1,042.39 thousand tons
- Arkansas: 922.73 thousand tons
- Indiana: 888.05 thousand tons
- Illinois: 675.53 thousand tons
- Alabama: 578.35 thousand tons

Hazardous waste in thousand tons
Gulf Coast Refineries

- Exxon Baytown
- Shell Deer Park
- Houston Refining
- Exxon Beaumont
- TOTAL Port Arthur
- NEDERLAND
- Motiva Port Arthur
- Valero Port Arthur
- Terminus of KXL pipeline
- Keystone XL Pipeline
- Phillips66 Lake Charles
- CITGO Lake Charles
- Lake Charles

- Houston
- Baytown
- Port Arthur

- Texas
- Louisiana
- Gulf of Mexico
Subsidence in Houston-Galveston Area
2017 HURRICANE SEASON TRACKS

AS OF SEPT. 30

T.D.  T.S.  HURRICANE  MAJOR

HARVEY
KATIA
FRANKLIN
EMILY
CINDY
IRMA
JOSE
GERT
MARIA
ARLENE
LEE
BRET
DDN
Subpart N – Landfills and 335.173 – Design and Operating Requirements

• Cover System
  • Promote long-term minimization of migration of liquids through the landfill
  • Have k less than or equal to the k of the bottom liner system
Landfill Operating Requirements

- Must maintain a run-on control system that prevents run-on from a 25-year storm
- Must maintain a runoff management system that will contain a 24-hour, 25-year event
Closure

Cover system

- Provide long term minimization of migration of liquids
- Promote drainage and minimize erosion
- Accommodate settling and subsidence
- K less than k of bottom liner
Post-closure care

- Maintain final cover
- Continue to operate the leachate collection and removal system/leak detection system
- Continue GW monitoring
- Prevent run-on and run-off from damaging cover system
Waste Control Specialists
Composite Liner System

2' PROTECTIVE GRANULAR SOIL

LEACHATE COLLECTION AND REMOVAL

1' SAND DRAINAGE LAYER

PRIMARY COMPOSITE LINER / LEAK DETECTION LAYER

GEOCOMPOSITE DRAIN

SECONDARY COMPOSITE LINER

60 MIL HDPE GEOMEMBRANE (FML) LINER

3' COMPACTED CLAY (RED BED SELECT MATERIAL)

60 MIL HDPE GEOMEMBRANE (FML) LINER

SECONDARY BARRIER LAYER

TYPICAL BOTTOM LINER SYSTEM COMPONENTS (BOTTOM)

NTS

20 MIL HDPE GEOMEMBRANE SACRIFICIAL LINER

GEOCOMPOSITE DRAIN (6 OZ. - DOUBLE SIDED)

60 MIL HDPE GEOMEMBRANE (FML) LINER (TEXTURED BOTH SIDES)

GEOCOMPOSITE DRAIN (6 OZ. - DOUBLE SIDED)

60 MIL HDPE GEOMEMBRANE (FML) LINER (TEXTURED BOTH SIDES)

3' COMPACTED CLAY (RED BED SELECT MATERIAL)

SECONDARY BARRIER LAYER

TYPICAL SIDEWALL LINER SYSTEM COMPONENTS (SIDE)

NTS
Proposed Composite Final Cover System

- 3-ft thick, compacted red bed clay with k of 1 x 10^-7 cm/sec or less.
- 60-mil HDPE smooth geomembrane
- Geocomposite drainage layer
- 2 ft of clean native granular material
- Variable thickness of compacted red bed clay
- 3 ft of caliche cobble
- 4 ft evapotranspiration layer
Groundwater Monitoring System
Questions?