Landfill Gas Monitoring Guidance

SWANA Conference

Wilmington, NC

October 18-21, 2010

North Carolina Division of Waste Management

Solid Waste Section


LFG
Landfill Gas

Outline

- Introduction
- Factors Influencing Gas Generation and Migration
- NC Rules
- Well Installation and Construction
- Gas Monitoring Instrumentation
- Hazards, Incidents and Explosions

Introduction

- MSW landfills (.1600 rules) - quarterly monitoring for landfill gas (methane)
- C&D and other sanitary landfills (.0500 rules) - quarterly monitoring for landfill gas (methane AND other explosive gases such as H2S)
- Monitoring is required to ensure that LFG does not exceed the lower explosive limit (LEL) at the property boundary and 25% of the LEL in facility structures
- To ensure these performance standards are met a landfill gas monitoring plan is necessary
- If there is an exceedance, immediate action must be taken and the action procedures submitted to the SWS

Typical Gas Composition

- 50-55% Methane (CH_4)
- 45-50% Carbon Dioxide (CO_2)
- Less than 5% Nitrogen (N_2)
- Less than 1% Non-Methane Organic Compounds
- Hydrogen sulfide (H_2S) is also a component, especially in C&D landfills

Factors Influencing Gas Generation & Migration

- Waste Composition
- Moisture Content
- Temperature
- Age of Landfill
- Landfill Cap Design
- Water table Variations
- Man-made and Natural Conduits
- Landfill Liner Conditions
- Weather Conditions

North Carolina Solid Waste Rules

- http://portal.ncdenr.org/web/wm/sw/rules

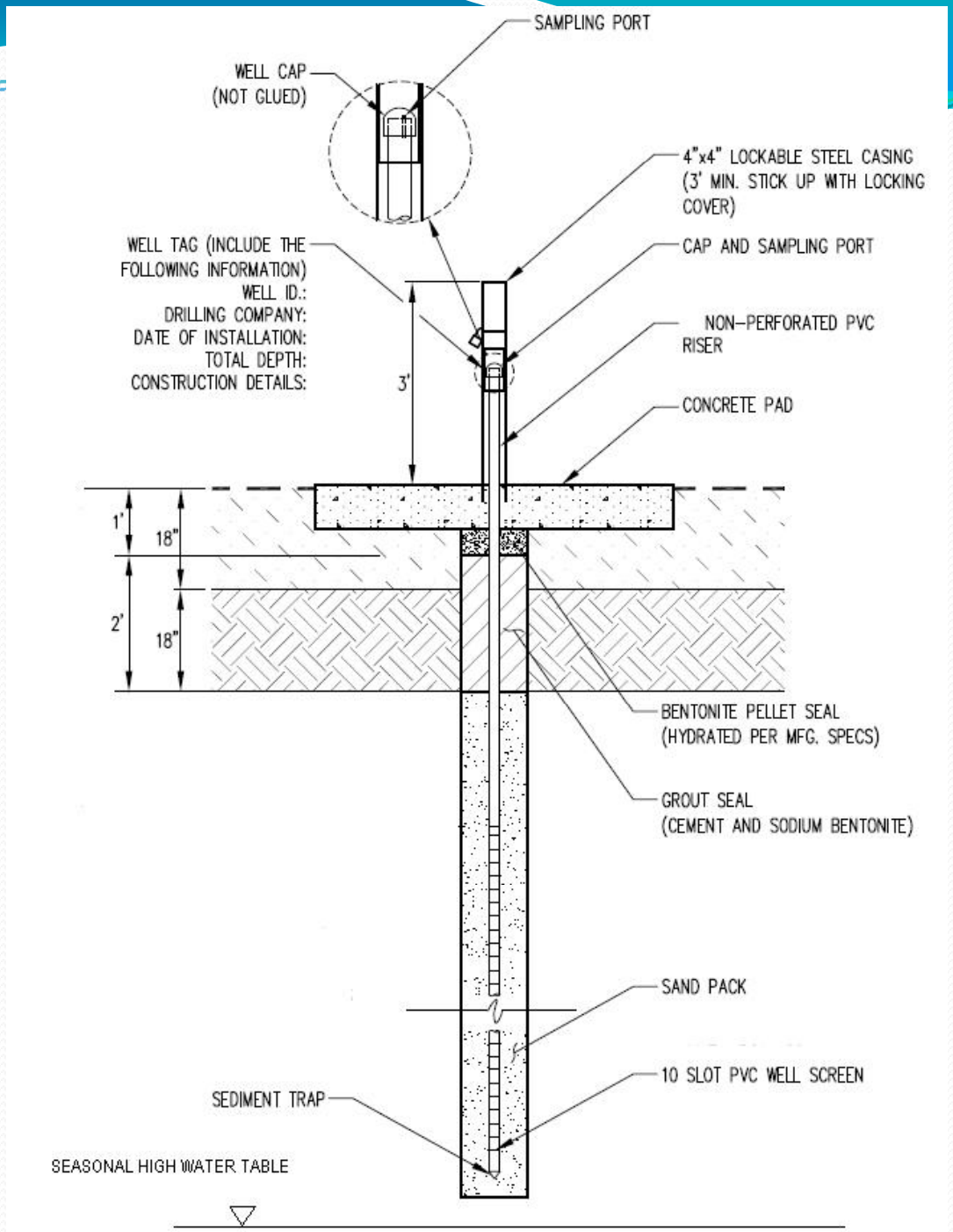
- 15A NCAC 13B .0101 – Definitions
- 15A NCAC 13B .0503 – Industrial Landfills
- 15A NCAC 13B .0543 & .0544 – C&D Landfills
- 15A NCAC 13B .0566 – LCID Landfills
- 15A NCAC 13B .1626 & .1627 – MSW Landfills

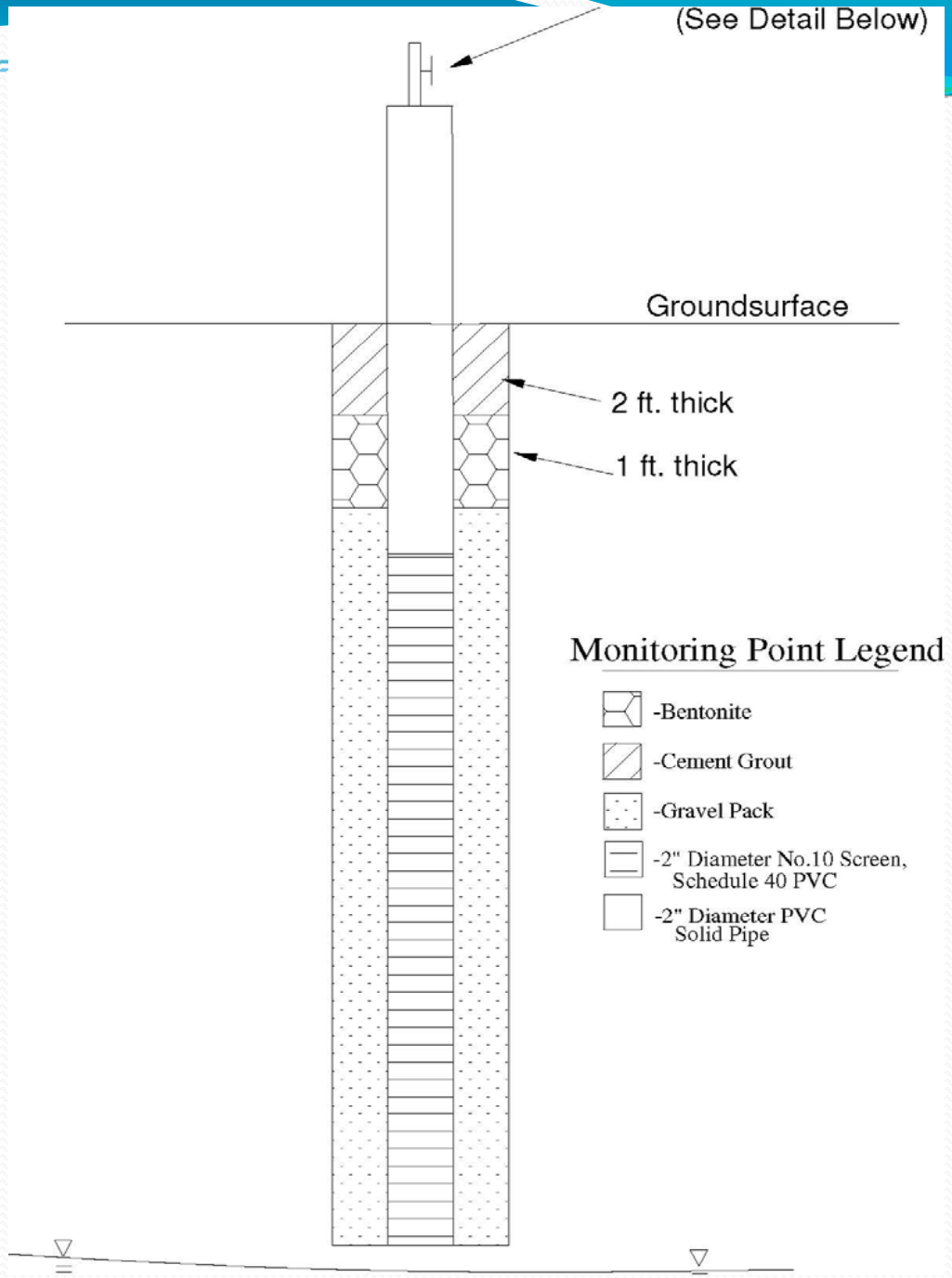
Landfill Gas Monitoring Well Locations

- The location of each LFG monitoring well will be site specific depending upon:
  - Site geology
  - Depth to groundwater
  - Surface water features
  - Onsite & offsite structures
  - Sensitive receptors
- LFG monitoring wells should be spaced no more than 500 feet apart depending on site specifics

Landfill Gas Monitoring Well Construction

- The construction of LFG monitoring wells is similar to groundwater monitoring wells with two exceptions:
  - Installed within the unsaturated zone above the seasonal high water table
  - Well cap is equipped with a stopcock valve or a quick connect coupling
- Drillers should follow 15A NCAC Subchapter 2C
- Typically 2” PVC piping and screen should be used
- Depth of each well will be site specific
- Screen length will be site specific, but span most of the unsaturated zone
- For unsaturated zones 45 feet or greater, nested/clustered wells may be required


SAMPLING PORT
WELL CAP
(NOT GLUED)
4"x4" LOCKABLE STEEL CASING
(3' MIN. STICK UP WITH LOCKING
COVER)
WELL TAG (INCLUDE THE
FOLLOWING INFORMATION)
WELL ID.:
DRILLING COMPANY:
DATE OF INSTALLATION:
TOTAL DEPTH:
CONSTRUCTION DETAILS:
CAP AND SAMPLING PORT
NON-PERFORATED PVC
RISER
3'
CONCRETE PAD
1'
18"
2'
18"
BENTONITE PELLET SEAL
(HYDRATED PER MFG. SPECS)
GROUT SEAL
(CEMENT AND SODIUM BENTONITE)
SAND PACK
10 SLOT PVC WELL SCREEN
SEDIMENT TRAP
SEASONAL HIGH WATER TABLE


(See Detail Below)
Groundsurface
2 ft. thick
1 ft. thick
Monitoring Point Legend
-Bentonite
-Cement Grout
-Gravel Pack
-2" Diameter No.10 Screen, Schedule 40 PVC
-2" Diameter PVC Solid Pipe

Quick Connect Coupling

Stopcock Valve

Gas Monitoring Instrumentation

- There are several different gas meters on the market with Landtec being the most common seen by the SWS
- The person conducting the LFG sampling must be trained in the proper operating procedures of the instrument
- Calibration and sampling procedures must be followed per the manufacture's specifications because each unit will be different
- LFG monitoring data forms and results must be maintained at the facility unless an exceedance has occurred and/or the SWS requests a copy

Landfill Gas Monitoring Data Form

- Facility Name
- Permit Number
- Date of Sampling
- NC Landfill Rule (.0500 or .1600)
- Name and Position of Sample Collector
- Pump Rate of Gas Meter
- Ambient Air Temperature
- Barometric Pressure
- Type and Serial Number of Gas Meter
- Calibration Date of Gas Meter
- Date and Time of Field Calibration
- Type of Field Calibration Gas (15/15 or 35/50)
- Expiration Date of Field Calibration Gas Canister
- General Weather Conditions

Field Calibration Gas

- 15/15 verses 35/50
  - When expecting low methane concentrations, use the 15/15 (15% CO2/ 15% CH4) gas canister
  - When expecting high methane concentrations, use the 35/50 (35% CO2 / 50% CH4) gas canister

Location or LFG Well ID	Sample Tube Purge	Time	Time Pumped (s)	Initial %LEL	Stabilized %LEL	%CH4 by Volume	%O2	%CO2	Notes

Hazards, Incidents & Explosions

- Potential reactions involving unknown chemicals can cause landfill fires (surface and subsurface)
- Discarded consumer products – pesticides, paints, solvents, cleaners, etc. can cause chemical releases
- Collection of LFG gas in confined spaces and low lying areas can cause fires and explosions
- Hydrogen Sulfide (H2S) can cause eye and respiratory irritation and eventually asphyxiation
- Greenhouse gas concerns
- Infiltration into groundwater causing vinyl chloride and other VOC contamination

Acknowledgements

- Section Hydrogeologists
  - Zinith Barbee
  - Jackie Drummond
  - Ervin Lane
  - Christine Ritter
  - Brian Wootton
- Safety Consultant Brian Polk

Thank you for you attention!!

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