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Evaluating Impacts from LFG in a Litigation Setting

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Topics to Cover

- Background
- Regulatory Requirements
- Case Studies
  - Landfill #1---VOC Fingerprinting
  - Landfill #2---Use of Models
  - Landfill #3---Risk Assessment
  - Landfill #4---Educate the Jury
- Conclusions

Background

- LFG emissions or migration are like other forms of contamination when it comes to litigation
- Impacts to neighboring properties possible for methane, toxics, and odorous substances in LFG
- Environmental lawsuits have been filed against landfills, including:
  - Toxic tort
  - Odor/nuisance
  - Trespass
  - Class action or individual plaintiff

Background (cont.)

- Regulatory action is always possible if regulatory criteria exceeded
  - Although most defendant landfills were in compliance at the time of lawsuit
- Defending a landfill can be expensive even if the landfill prevails
  - Recovery of legal fees unusual
- Various tools are available/have been used to:
  - Confirm the impact is from LFG
  - Assess the magnitude of release/off-site migration
  - Determine level of impact at receptor locations

Regulatory Requirements

- Subsurface Flammable Gas (methane)
  - Fairly limited, related to subsurface gas migration
  - RCRA Subtitle D or state equivalent
  - 5% methane at the landfill boundary
  - 1.25% methane in on-site structures
  - Monitoring of probes and structures
- Toxics
  - No requirement to test for toxics in subsurface LFG unless groundwater impacts known or suspected
  - Toxics requirements for air emissions vary by state/local jurisdiction

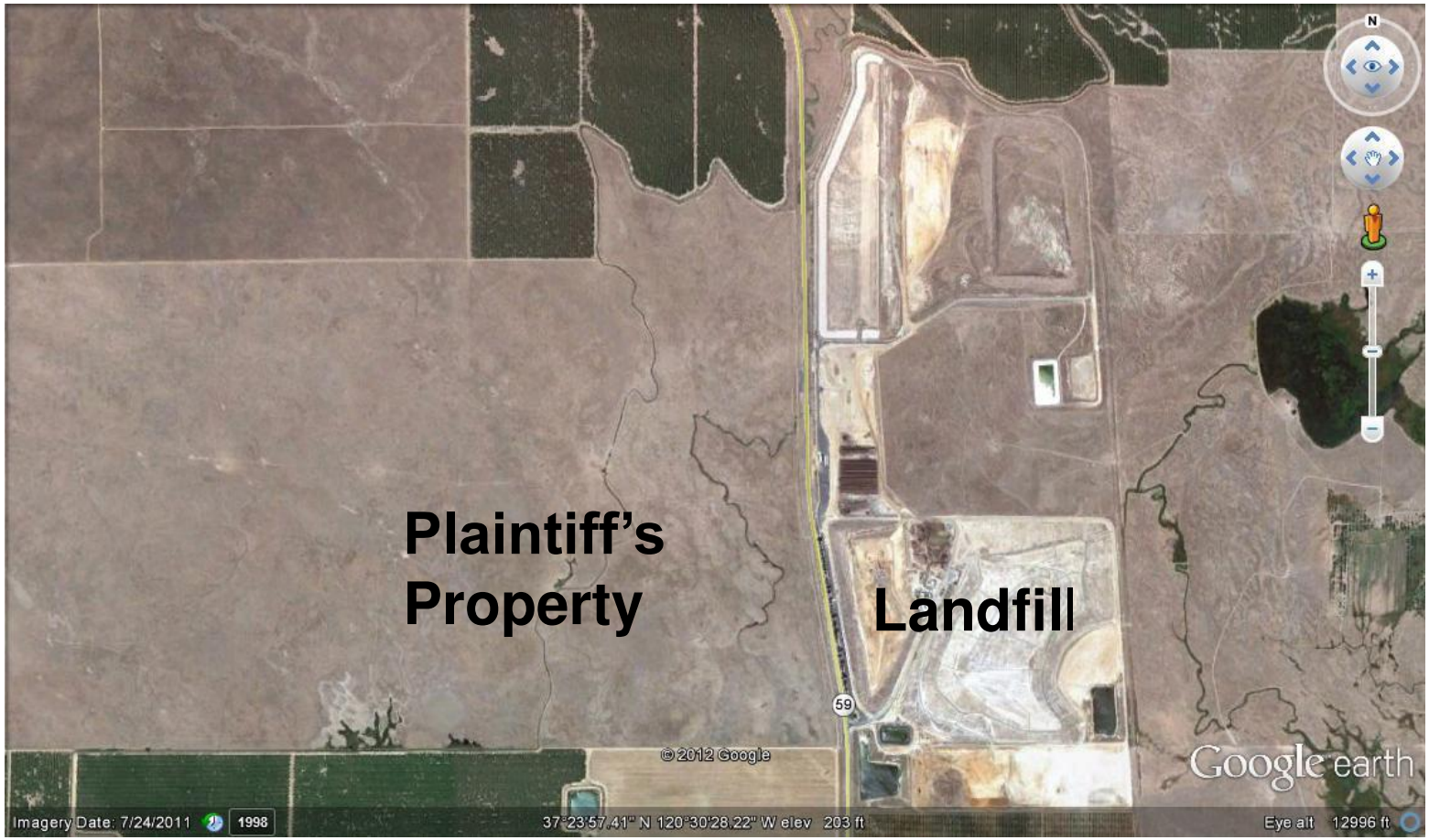
Regulatory (cont.)

- Odorous Substances
  - State solid waste agencies have general odor/nuisance requirements
  - Every air jurisdiction has similar requirements
  - Requirements are non-numeric and subjective
  - Driven by odor complaints by citizens or inspections
  - Enforcement action is highly variable and driven by agency policy not regulation (and sometimes politics)
  - No agreed upon approach for testing, modeling, and limits

Landfill #1-VOC Fingerprinting

- 609 acre facility in rural area
- In operation since 1973 – 4 unlined cells
- Known LFG impacts onsite (CH_4 & CO_2)
  - Predominant VOCs: CFCs and PCE → VC solvents
- Known groundwater VOC impacts onsite
  - Almost Exclusively CFCs and solvents
- GW impacts due to LFG migration

Landfill #1 (cont.)



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Landfill #1 (cont.)

- Adjacent landowner filed suit claiming diminished property value
- At time of suit, Plaintiff had no data; based suit entirely on public landfill records
- Plaintiff eventually collected 3 soil gas samples by differing methods
- Claimed that VOCs detected on property were from landfill simply because LFG contains those same chemicals

Landfill #1 (cont.)

- Major Data Problems
  - Plaintiff's gas samples detected BTEX-related VOCs, in some cases above LFG concentrations
  - Methane not detected or not analyzed
  - CFCs and other halogenated VOCs not found
  - Data were not consistent between dates/samples
  - Sampling methods were flawed
  - Analytical methods were incomplete (no CH_4 & CO_2)
  - QA/QC was poor and results were not duplicated

Landfill #1 (cont.)

- Plaintiff's Suit Failed Because:
  - Plaintiff's gas sample results did not match landfill's LFG "fingerprints"
  - Plaintiff's data were deemed "indefensible" due to poor procedures
  - Plaintiff failed to show alleged property impacts were from landfill
  - Plaintiff failed to show diminished property value
  - Plaintiff failed to look at other possible sources of VOCs

Landfill #1 (cont.)

VOC "FINGERPRINT" COMPARISON OF LANDFILL GAS PROBE GW-9
TO SOIL GAS SAMPLES FROM CRANE PROPERTY

VOC DETECTED IN GW-9[1]	GW-9 AVERAGE CONCENTRATION[2] 1998 – 2009 (ppbv)	GW-9 AVERAGE CONCENTRATION[2] 2008 – 2009 (ppbv)	AMEC SV-2 8/27/2008 (ppbv)	AMEC MW-1V 5/11/2010 (ppbv)	AMEC MW-2V 5/11/2010 (ppbv)	AMEC MW-1V 6/11/2010 (ppbv)	AMEC MW-2V 6/11/2010 (ppbv)
Freon 12	84.05	176.23	ND	ND	ND	ND	ND
Toluene	42.56	13.00	55	ND	ND	1.2 (B)	ND
Freon 11	29.00	49.75	ND	ND	ND	ND	ND
Chloromethane	25.48	4.70	ND	ND	ND	ND	ND
Freon 114	17.44	27.50	ND	ND	ND	ND	ND
Methylene Chloride	16.00	16.00	ND	ND	ND	ND	ND
Xylenes	11.99	2.75	30.5	ND	ND	5.3 (B)	ND
Acetone	11.00	NA	270	11	3.6	16.4	5.9
1,2,4-TMB	9.52	ND	6.7	ND	ND	5.1	ND
Freon 113	9.04	14.00	ND	ND	ND	ND	ND
PCE	7.60	2.50	ND	ND	ND	ND	ND
Ethylbenzene	6.45	ND	6.3	ND	ND	ND	ND
Ethanol	5.30	NA	39	ND	5.5	4.8 (B)	5.1 (B)
1,3,5-TMB	4.93	ND	1.7	ND	ND	1.6	ND
cis-1,2-DCE	4.70	ND	ND	ND	ND	ND	ND
TCE	4.55	ND	ND	ND	ND	ND	ND
1,4-DCB	3.90	ND	ND	ND	ND	ND	ND
Benzene	3.53	ND	6.6	ND	ND	ND	ND
Heptane	3.10	NA	9.5	2.9	ND	ND	ND
Vinyl Chloride	2.30	ND	ND	ND	ND	ND	ND
Tetrahydrofuran	1.90	NA	1.4	0.82	2.2	3.6 (B)	ND
Hexane	1.20	NA	8.2	0.75	ND	ND	ND

CFCs
Chlorinated Solvents
Fuel Components

[1]VOCs detected in LFG Probe GW-9 from September 1998 through December 2009
[2]Average concentration for all detections during period - does not include non-detects
ND = Not Detected
NA = Not analyzed during this period
(B) = Analyte also detected in QA/QC blank sample

Landfill #1 (cont.)

THE COURT RULED:

- In favor of Defendant
- That the case was frivolous as to damages
- Awarded attorney's fee to Defendant
- Although the Court ruled for the Defendant, the cost for defense was over $500,000.
- Lesson Learned
  - Just because VOCs are found, does not mean they are from LFG
  - Make sure the plaintiff is using good data

Landfill #2 – Use of Models

- Landfill #2 is an active refuse disposal site in California
  - Similar cases in California, Oklahoma, and Pennsylvania
- Litigation was brought against the landfill owner in 2013 for odor/nuisance impacts on nearby properties---class action
- Plaintiff relied on LFG models/other estimation methods to assess LFG emissions and subsequent offsite impacts
- But ignored other sources in the area, which could cause the same impacts

Landfill #2 (cont.)

- The defendant was able to demonstrate that the methodology used by the plaintiff had serious flaws
- Through on-site flux testing, the defendant was able to refute the findings of the plaintiff and demonstrate much lower emissions and impacts.
- Defendant's analyses also identified other potential sources of odor and nuisance

Landfill #2 (cont.)

- Fundamental errors:
  - Inaccurate use of a default value for LFG collection efficiency
  - LFG generation model instead of on-site flux rate sampling
  - No consideration for oxidation/attenuation
  - Odor concentration from landfills in another country instead of on-site testing data
  - Use of PTE emissions instead of actual values
  - Other potential sources of odor were ignored, discounted, or not subjected to the same level of analysis as the landfill

Landfill #2 (cont.)

- Flux chamber study completed by the defendant measured an odor flux from LFG and other sources
  - LFG flux 6 times lower than what was estimated by the plaintiff's experts through models
  - Modeled odor impacts (i.e., dilution to threshold, D/T) are reduced by a proportionate amount, resulting in impacts well below any relevant odor thresholds
  - LFG flux was much lower than nearby wastewater plant and other "natural" sources

Landfill #2 (cont.)

- Ruling in favor of the defendant : proposed class was not certified for a class action lawsuit
  - Not all similar cases have ended in same fashion
- Despite this success, the landfill owner has borne significant costs for the litigation defense
- And the litigation has had a detrimental effect on a proposed expansion of the landfill
- Lesson Learned:
  - The use of models, estimation methods, and non site-specific data to predict actual exposure and impacts can be highly criticized

Landfill #3 – Risk Assessment

- MSW site; operated from 1970 to 1990
- LFG system in 1992; expanded in 1995
- Closure in 1995 included synthetic cap
  - LFG migration got worse
- Family took residence adjacent to landfill in 1989; domestic water well on property
- Starting in 2000, municipality that owned landfill recognized LFG impacts to well
- Potable water supplied for drinking and cooking
- Later, family filed lawsuit claiming health impacts

Landfill #3 (cont.)

- In defense of lawsuit, traditional risk assessment tools used to assess impacts and health risks
- Groundwater data directly used for potable water impacts---non-drinking
- U.S. EPA LandGEM used for LFG emissions
- U.S. EPA ISC-ST air dispersion model used to assess off-site impacts of emissions
- Modified version of Johnson & Ettinger model used for soil gas impacts to indoor air
  - Had to account for gas under pressure
- U.S. EPA and CA DTSC risk models/guidance

Landfill #3 (cont.)

Receptor	Hazard Index (HI)	HI Threshold	Cancer Risk (CR)	CR Threshold
Child Resident (highest year)	0.28	1.0	2.1E-07	1.0E-06
Adult Resident (highest year)	0.11	1.0	2.1E-07	1.0E-06
Child Resident (14 years)	0.12	1.0	8.4E-08	1.0E-06
Adult Resident (14 years)	0.04	1.0	8.4E-08	1.0E-06

Landfill #3 (cont.)

- Despite risks below regulatory thresholds (HI< 1 and CR<1 in million), defendant settled lawsuit and purchased property
- Total costs of lawsuit over $750,000, including legal/expert fees and property
  - Nothing recoverable
- Poll of jury indicated defendant would have won case but afraid of jury settlement
- Lesson learned:
  - Even if impacts have occurred, they may not have caused damages significant enough to be held legally liable

Landfill #4 – Educate the Jury

- Landfill #4 is a small, old, closed landfill in Southern California
- Since closure, it had been used for many years as a trailer park for both mobile homes and storage of vehicles/equipment
- A former mobile home park resident sued the current property owners (not the original landfill owners) for various health effects due to exposure from LFG
- Health effects included both physical and mental effects

Landfill #4 (cont.)

- Plaintiff had legitimate health concerns but unclear if due to LFG
- Jury trial in downtown Los Angeles; no jurors with technical or scientific background
- Since former trailer directly on refuse, plaintiff assumed exposure was occurring based on subsurface monitoring data for LFG
- Various analyses/comparisons conducted to gauge level of exposure in the absence of real data

Landfill #4 (cont.)

- Old (closed for 30 years before plaintiff on-site), small (250,000 tons of refuse) landfill
  - Limited LFG generation (less than 30 cfm)
- Low VOCs in LFG compared to other sites (ppbv)

Chemical	Maximum On-Site	USEPA AP-42	Waste Industry Air Coalition (WIAC)
Benzene	109	1,910	972
Tetrachloroethylene	43	3,730	1,193
Vinyl chloride	11	7,340	1,077
Toluene	424	39,300	25,405

Landfill #4 (cont.)

- Maximum LFG emissions very low and concentrations in ambient air much less than in raw LFG

Year	Benzene (lb./year)	Toluene (lb./year)
1965	0.65	2.98
1996	0.35	1.60
2008	0.28	1.26
2010	0.27	1.21

Site Location	Concentration (ppbv)
Highest Detected in Raw LFG	424
Under One of the Mobile Homes	18.9
In Ambient Air	<10 (non-detect)

Landfill #4 (cont.)

- Completed air intrusion modeling/risk assessment
  - Risks orders of magnitude lower than thresholds
- Testimony walked jury step by step through analysis including LFG 101
- Medical professionals determined that there was no causation between LFG/plaintiff's health issues
- Defendant was successful in litigation
  - Although 4 jurors still voted for damages to plaintiff
- Insurance coverage for defense costs but no recovery from plaintiff
- Lessons Learned: Educate the jury and disconnect the dots of plaintiff case

Conclusions

- Landfills are easy targets
- LFG migration/emission can and do occur
  - But off-site impacts are not always LFG-derived
  - And not all LFG impacts cause health impacts or property damage
  - The level of exposure matters
- Assessment tools for LFG impacts exist
  - Sampling/monitoring for LFG presence
  - Modeling for LFG generation

Conclusions (cont.)

- Assessment tools (cont.)
  - Exposure and air dispersion models
  - Gas "fingerprinting" and comparisons
  - Isotopic analyses
  - Tracer studies
  - Odor sampling, monitoring, panels, etc.
  - Methods for surface emissions flux (e.g., optical remote sensing, flux chambers, etc.)
  - Risk assessment methods

Conclusions (cont.)

- Defend yourself against litigation
  - Very difficult for plaintiffs to show definitive impacts
  - Burden of proof is on plaintiff
  - Many plaintiffs are hoping for quick settlement; make them work for it
- Understand the value and limitations of the various assessment techniques
- Recognize litigation can be costly even if you win

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