Texas Landfill Management, LLC Compost Facility at the San Antonio River Authority Martinez II Wastewater Treatment Plant

ODOR STUDY REPORT

September 9, 2019
Perkins Engineering Consultants, Inc. was engaged by Texas Landfill Management, LLC (TLM) in January of 2019 to design test parameters to assess odor conditions at and around the San Antonio River Authority (SARA) Martinez II TLM composting site.

The work, which was performed by Mark Perkins, PE, along with TLM staff, included extensive odor measurements being recorded both within and outside the permit boundaries.

Air samples were also sent to nationally-recognized, independent testing labs including St. Croix Sensory and ALS Laboratories.
Executive Summary Findings

- Hydrogen sulfide: In all cases, hydrogen sulfide concentrations measured outside the permit boundary were well below regulatory limits.
- Ammonia: Over 97% of readings outside the permit boundary were well below human detection thresholds, the remainder were at very low levels.
- Field Olfactometer Observations: Light compost odors were detected outside the permit boundary only infrequently at very low levels of no regulatory concern. Occasional background odors from surrounding sources were detected coming onto the TLM composting site.
- Air Sample Assessment: No offensive odor compounds were detected outside the permit boundary.
Executive Summary Findings

- All data collected indicates no off-site nuisance odor as determined by TCEQ protocols.
- No regulatory violations for nuisance odor conditions have been found relating to TLM operations since biosolids composting began on April 21, 2015 (despite at least 18 site investigations related to 14 complaints filed with TCEQ relating to TLM during that time).
- Optimization measures have been taken to further ensure odor and dust mitigation consistent with the March 9, 2019 Texas Landfill Management, LLC Compost and Recycling Facility Off Site Emissions Migration Operations Odor and Dust Control Plan.
Test hydrogen sulfide levels within and outside the Martinez II permit boundary using SARA’s Envirosuite® Monitors and handheld monitors to evaluate conditions offsite for compliance with regulatory standards (80 parts per billion averaged over 30 minutes at downwind residential or commercial properties and 120 parts per billion averaged over 30 minutes at downwind non-residential properties).

Test ammonia levels within and outside the Martinez II permit boundary using SARA’s Envirosuite® Monitors and handheld monitors to evaluate whether this indicator of compost odors is present at high levels.

Evaluate odors using field olfactometers (Nasal Ranger®) within and outside the Martinez II permit boundary to assess “total odors”.

Collect “bag samples” and “vacuum bottle samples” of air within and outside the Martinez II permit boundary for trained, independent third-party evaluation of sulfur and amine compounds that could indicate compost odors and for independent, blind professional assessments of odor intensity and offensiveness, to assess whether regulatory standards are being met.

Review all TCEQ inspection reports for the TLM compost facility and assess and evaluate all information obtained during odor complaint response.
Odor Testing and Results: Hydrogen Sulfide (H₂S)

- **Why:** H₂S can be indicative of biosolids / wastewater odors; practical to measure in the field; subject to regulation.
- Since March, TLM personnel onsite 24/7 have recorded more than 4,000 individual measurements of hydrogen sulfide concentration.
  - 16 sites within the TLM compost facility were monitored daily.
  - Numerous sites outside the permit boundary were monitored daily.
  - Hundreds of trucks unloading biosolids were monitored to ensure TLM practice of quickly covering biosolids after truck unloading was effective in abating localized odors.
- In all cases, no hydrogen sulfide concentrations of regulatory concern were detected.
On 16 sites within the permit boundary (shown by green dots in the photo to the left), \( \text{H}_2\text{S} \) readings are consistently well below even off-site regulatory limits.

- **Trimmed mean**: The average without the high and low 2.5% of all readings.
- **Confidence Interval**: 97.5% certainty that values fall within this range.
Odor Testing and Results: H$_2$S Measurements outside the permit boundary

- 753 individual readings were taken in a 1/2 to 3-mile radius outside the permit boundary (Perimeter Readings).
- TCEQ Limit: 80 ppb residential or commercial (120 ppb non-residential).
- Highest reading: 50 ppb (near Tessman Road Landfill).
- 97.5% of readings fall below 2.39 ppb.
- No regulatory violations were detected in over 4,000 measurements, inside or outside the permit boundary.

- Trimmed mean: The average without the high and low 2.5% of all readings.
- Confidence Interval: 97.5% certainty that values fall within this range.

![Graph showing H$_2$S levels before and after immediate cover]

The chart shows that H$_2$S levels are rapidly and significantly mitigated by TLM’s practice of covering biosolids with woodchips and mulch immediately after the biosolids are unloaded at the composting facility.

The numbers represent the average of all H$_2$S readings of freshly-delivered biosolids from the delivery trucks from SARA and SAWS.
Odor Testing and Results: Ammonia (NH$_3$)

- **Why:** Ammonia was tested inside and outside permit boundary because it is indicative of compost and biosolids odors, and is practical to measure in the field.

- Since March, TLM personnel have recorded **more than 4,000** individual measurements of ammonia concentration, both within the compost area and outside the permit boundary.
  - 16 sites within the TLM compost facility were monitored daily.
  - Numerous sites outside the permit boundary were monitored daily.
  - Hundreds of trucks unloading biosolids were monitored to ensure TLM practice of quickly covering biosolids after truck unloading was effective in abating localized odors.

- The vast majority of readings were below human detection thresholds, both on the TLM compost facility, and outside the permit boundary.

- No nuisance odor conditions related to ammonia were observed in testing.
Odor Testing and Results: NH$_3$ Sampling Results within the permit boundary

- Trimmed mean: The average without the high and low 2.5% of all readings.
- Confidence Interval: 97.5% certainty that values fall within this range.

Most readings were below a level of human detection. Readings at 16 sites (green dots on photo to left) within the permit boundary, and at sites outside the permit boundary gave no indication of nuisance odors. There is no specific numerical regulatory boundary limit for NH$_3$. 
Odor Testing and Results: NH₃ Measurements outside the permit boundary

- 769 readings taken outside the permit boundary within the 3 mile perimeter (Perimeter Readings).
- Highest reading: 4 ppm (near Martinez III WWTP- no longer in service).
- 97.5% of readings fall below 0.11 ppm.
- No specific numerical permit boundary regulation exists for NH₃.
- Most readings were below human detection threshold.
- No readings suggest any nuisance odor.

- Trimmed mean: The average without the high and low 2.5% of all readings.
- Confidence Interval: 97.5% certainty that values fall within this range.
The Benefits of TLM Management Practices: 
NH₃ Measurements – Freshly-Delivered Biosolids

The chart shows that NH₃ readings are rapidly and significantly mitigated by TLM’s practice of covering biosolids with woodchips and mulch immediately after the biosolids are unloaded at the composting facility.

The numbers represent the average of all NH₃ readings of freshly-dumped biosolids from the delivery trucks from SARA and SAWS.
Odor Testing and Results: Field Olfactometers

- **Why:** This method of evaluating odors with olfactometer odor sensitivity and monitoring equipment was selected by SARA consultants. It counts the number of times you need to dilute the air with carbon-filtered air in order for a normal person to not detect an odor. This method is used by some other states for regulatory purposes, but not by Texas. TLM made olfactometer readings in order to compare with data collected by SARA consultants.

- Trained and sensitivity-tested TLM personnel have made more than 600 individual field olfactometer measurements, both within the TLM compost facility and outside the permit boundary.

- Downwind readings on the TLM compost facility berm occasionally detected compost at low levels. Readings outside the permit boundary did not detect offensive odors.

- Multiple readings upwind of the TLM compost facility have indicated occasional background odors entering the facility from surrounding sources.

- While not a Texas regulatory standard, only infrequent, light and transient odors have been detected outside the permit boundary that could be attributed to TLM.

- No nuisance odor conditions were observed during testing.
Odor Testing and Results: 
Air Sample Assessment: Lab Odor Panel Testing

- **Why:** To provide independent, objective professional assessments of odor intensity and offensiveness, to assess whether regulatory standards are being met.
- 13 air samples were collected (upwind, downwind, inside and outside permit boundary) on three dates for evaluation by trained, objective, independent assessors at St. Croix Sensory’s laboratory in Stillwater, Minnesota.
- Each sample was scored and characterized by five odor specialists who did not know what they were smelling.
- All odors were identified as “low intensity” odors (3 or less on a 1-10 scale), even those collected inside the compost facility.
- Results had 2 to 4 of the panelists ranking the plastic smell of the sample bag as the strongest odor.
- Upwind samples indicated mild background odors.
- Individual descriptors (sulfur, decay, wood, earth) typically were detected by 1 or 2 of the 5 trained assessors, even for on-site samples.
- Strength of individual descriptors (sulfur, decay, wood, earth) typically rated <2 on a 1-10 scale on-site; <1 downwind at off-site locations. All indicative of light to very light intensity.
- The results provide no indication of offsite offensive odors (under TCEQ standards) attributable to TLM.
Odor Testing and Results: 
Air Sample Assessment: Vacuum Bottle Samples 
for Sulfur Series

- **Why:** To provide independent, analytical evaluation of 20 sulfur compounds commonly associated with wastewater, biosolids, and composting to determine whether these compounds are present at concentrations of concern (these compounds can be odorous at certain concentrations but are not specifically regulated by TCEQ).
- 13 vacuum bottle air samples were collected (upwind, downwind, inside and outside permit boundary) on three dates for testing for 20 compounds each by ALS Laboratories in Semi Valley, California (260 total tests).
- The samples were analyzed for twenty sulfur compounds per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD).
- 247 of the 260 tests had Non-Detect results.
- Eight samples showed low levels of carbonyl sulfide upwind, downwind, and within the facility at similar concentrations at all locations tested, indicating a source other than the Martinez II facilities.
- Dimethyl sulfide was detected at a low level in one sample between windrows, but in no samples outside the permit boundary.
- Carbon disulfide was detected below normal human detection threshold levels in two samples.
- Dimethyl disulfide was detected in one sample immediately adjacent to a biosolids truck being unloaded but not in any other samples within or beyond the facility boundary.
- The results provide no indication of offsite offensive odors (under TCEQ standards) attributable to TLM.
TCEQ records show that since the start of TLM biosolids composting operations at Martinez II on April 21, 2015, TCEQ has responded to 14 complaints concerning off-site odors potentially generated on-site at Martinez II. Those investigations included at least 18 TCEQ on-site investigations, from which there have been no Notices of Violation issued against either SARA or TLM.

### TCEQ Inspection/Investigation Report Summaries

**April 21, 2015 - July 30, 2019*  

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<th>Investigation Number</th>
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*per open records requests filed with TCEQ for records from the date of TLM’s first receipt of biosolids at the Martinez II site through July, 2019. Request for August records is pending.
Complaint Response During Odor Study Period

- Assembled a dedicated, trained, four person odor response team; at least one available at all times (24/7) to respond in a timely manner to complaints received.
- Maintained detailed logs of complaints to better assess operational and/or atmospheric causes, along with potential odor sources.
- Monitoring was conducted outside the permit boundary by each team member at least once per shift.
- Personnel used a field olfactometer, ammonia meter, low-range H₂S meter, and carbon masks.
- Consulting engineers and TLM executives visited the compost site numerous times to monitor odors and operations.

Trained TLM management and executive personnel in odor response to provide additional odor response support.

Created and communicated an ongoing TLM 24-hour complaint line with an immediate email notification to TLM staff. 888-837-4944.

Responded to each complaint received from TLM number and from SARA, usually within 15 minutes of receiving complaint.

- Called complainant to gather facts about the complaint.
- Traveled to complaint site, making personal assessments of odor conditions on the way and at the site.
- Took H₂S and NH₃ readings at the complaint site, “sniffed” with Nasal Ranger® and recorded observations.
- Upon returning to compost facility, took H₂S and NH₃ readings along the fence-line or on the perimeter berm that would most closely line up with the complaint site.
- Obtained wind direction, wind speed, H₂S and NH₃ readings from SARA Envirosuite® Monitors for the time the complainant observed odors.

- Identified more than 20 potential odor sources in the vicinity of Martinez II.
- Mapped all data with wind roses using highly accurate ortho imagery to show complaint site relative to wind direction and potential odor sources.
- Determine whether any operational adjustments needed to be made.
POTENTIAL ODOR SOURCES

TLM 9/6/2019

OTHER SOURCES IN AREA INCLUDE LARGE CATTLE HERDS AND HEAVY INDUSTRIAL ACTIVITIES
TLM mapped the wind direction of 75 complaints from 24 individual complaints at sites within 3 miles of Martinez II using SARA Envirosuite® Monitors data to identify potential odor sources for each complaint.

- 8 complainants specified that the odors came from other sources.
- 38 (51%) complaints mapped showed wind blowing from other potential odor sources to complainant’s property, not from the Martinez II site.
- 2 complaints were made when wind was blowing from the complaint site to the Martinez II composting facility.
- 35 (47%) complaint events occurred when Envirosuite® Monitors showed H₂S coming into the Martinez II facility from outside sources.
- 6 complaints showed wind direction across Martinez II, but also across multiple other potential odor sources.
- 21 (28%) complaints occurred when there was little or no wind, making it difficult to determine the potential odor sources.
- No offensive nuisance odors were detected outside the permit boundary.
TLM Continues to Make Operational Adjustments to Adapt to Changing Conditions, Consistent with TLM March 9, 2019 Operational Odor and Dust Control Plan

- **Enhanced Dust Control during dry, hot conditions**
  - Enhanced water truck capabilities; full-time position created for dust control.
  - Misting system deployed at screens.
  - Second mobile misting system on order (estimated arrival date 10/11/19).
  - On-site manager has authority to (and has) shut down operations if dust appears excessive within the permit boundary.
  - Arranging for additional water from SARA, consistent with lease.

- **Immediate Cover**
  - Biosolids received are covered and mixed immediately upon receipt (typically within 3-5 minutes).

- **Enhanced Mix Ratio**
  - Initial mix 3 parts mulch to 1 part biosolids at delivery.
  - 1 additional part mulch used as topping after initial row is formed.
  - Up to 2 additional parts compost topping added for odor control.
  - Mix ratio is periodically adjusted to optimize odor control and dust control depending upon wet or dry conditions.