Plan Review Approach: Landfill Gas Monitoring Program

Submittal | Exemptions | Alternatives

Under California Code of Regulations, Title 27 (27 CCR), Division 2, Subdivision 1, Chapter 3, Subchapter 4, Article 6, sections 20917 et seq., CalRecycle requires monitoring of landfill gas (LFG) to determine if LFG is migrating beyond the permitted facility boundary.

The law requires operators of active landfills to submit LFG program plans that demonstrate compliance with the monitoring criteria for review and approval.

Submittal

The operator must submit a plan demonstrating that the existing or proposed LFG monitoring system complies with the standards. All plans may include, but not be limited to:

- LFG well/probe as-builts
- Boring logs
- Plot plans showing existing and proposed well locations/spacing
- A discussion and map regarding surrounding land uses
- Drawing showing typical LFG well/probes
- Geologic cross-sections and map
- Landfill gas monitoring results
- Any other pertinent evidence

The regulations do not require the development of new information if existing information adequately documents the LFG monitoring system's compliance with the standards. Existing information may be located in the joint technical document (JTD) or closure/postclosure maintenance plan and could be referenced in the submittal.

A detailed and complete plan will limit the need for staff to request additional information to support a proposal.

Additionally, the plan should include a summary table indicating:

- Well designation/number (i.e., GP1, MW3, LFGP2, etc.); location (Lat and Long)
- Wellhead elevation LFG plan (MSL)
- Total well/bore depth
- Depth/screen length of each probe (shallow, intermediate, deep)
- Elevation of bottom of waste (deepest part of refuse) and
- Spacing between wells (as measured around the compliance boundary)

The plan shall be based on and designed for:

- Local hydrogeological, hydrological, and soil and rock conditions
- Location of buildings and structures relative to the disposal area
- Adjacent land use and inhabitable structures within 1,000 feet of the permitted facility boundary
- Man-made pathways such as underground construction and
- The nature and age of the waste and its potential to generate LFG.

The monitoring system needs to be designed (signed and stamped) by a registered civil engineer or certified engineering geologist.

The plan needs to delineate the proposed compliance boundary. It must be within the permitted facility boundary, but may be closer to the LF footprint.

For example, if (1) a landfill is located on a corner of a much larger parcel and/or there is a substantial buffer zone or (2) there are impediments to installing wells at or near the permitted boundary (e.g., lack of access, drainage channel, significant vegetation, intervening structures, landfill development phases, etc.), the operator may elect to establish the compliance boundary closer to the waste footprint and establish the compliance boundary with the wells located along this boundary.
This would provide cost savings to the operator since fewer wells would be necessary. Also, monitoring wells closer to the landfill footprint would provide an

early indication of LFG migration prior to LFG impacting adjacent properties and/or structures. This would allow the operator to take the necessary corrective action before significant impacts would occur. Several alternative compliance boundaries have already been approved.

Finally, plans that demonstrate compliance with the prescriptive standards:
(1) wells at least every 1,000 feet around the entire compliance boundary;
(2) wells to the depth of waste; and
(3) sufficient number of probes based on well depth would simplify review and compliance. Several plans have been approved that comply with the prescriptive standards.

Exemptions

Municipal Solid Waste Landfills (MSWLF). Under both State and Federal regulations, there are no blanket exemptions from the LFG monitoring requirements for municipal solid waste landfills (MSWLFs, i.e., RCRA Subtitle D LFs). However, MSWLFs may apply to the Enforcement Agency (EA) and CalRecycle to achieve alternative compliance pursuant to the regulations governing the location of wells, their spacing, and their depths (27 CCR 20925). In an exceptional case, a landfill may be able to demonstrate to the satisfaction of the EA and CalRecycle that no monitoring wells are required for the site based on the location, spacing, and depth criteria specified in 27 CCR 20925.

Non-Municipal Solid Waste Landfills. Non-MSWLFs may apply for an exemption to all or any part of the LFG monitoring criteria if the landfill can demonstrate that there is no potential for adverse impacts on public health and safety and the environment due to: the amount, nature, and age of refuse; projected LFG generation; remoteness of disposal site; and other pertinent information (27 CCR 20918). Such exemptions must be reviewed at least every 5 years, and, for sites that have solid waste facilities permits, review shall occur at the time of the 5-year permit review.

Alternatives

The criteria for alternatives for the location, spacing, and depth of LFG wells are outlined in 27 CCR 20925. To request an alternative the operator would need to

demonstrate to the satisfaction of EA and CalRecycle that there is no potential for adverse impacts on public health and safety or the environment that would result from satisfying the requirements through an alternative. This demonstration could include a description of how the current or proposed LFG monitoring system meets the criteria for part of the requirements subject to the alternative request. Evidence could include, but not be limited to: site geology, hydrogeology, boring logs, plot plans, and any other pertinent evidence. The regulations do not require the development of new information if existing information is satisfactory to justify the proposed alternative(s). The alternative(s) are to be reviewed at least every five years and either extended or terminated.

Location Alternative

In those cases when an operator believes monitoring along all or a portion of the compliance boundary is not necessary, the operator shall demonstrate to the satisfaction of EA and CalRecycle that LFG migration could not occur due to geologic or hydrologic barriers and that no habitable structure or other property or land use, such as agricultural lands, within 1,000 feet of the disposal site permitted facility boundary is threatened by LFG migration [27 CCR 20925(a)(1)]. The demonstration shall be specific to the portion of the perimeter that the operator proposes not to monitor.

The submittal would need to demonstrate through geologic and/or hydrogeologic data that there is an impermeable barrier to LFG migration between the landfill footprint and the compliance boundary. For a hydraulic barrier, the operator would need to demonstrate that the barrier exists from ground level to the regional ground water table. An example of a location alternative would be those cases where a portion of the landfill permitted boundary is contiguous with a bay or ocean, which provides a hydraulic barrier to further LFG migration. Another example would be a stream that is in hydraulic continuity with the regional aquifer. Several partial alternatives have been approved especially for landfills located on bays where hydraulic barriers were demonstrated.

For a geologic barrier, the operator would need to demonstrate through geologic investigations that the barrier is impermeable and competent. Fractured bedrock or fine-grained soil interbedded with sand layers would not likely meet the alternative standard of an impermeable barrier. In their Technical Manual Solid

Waste Disposal Facility Criteria (November 1993), the Federal Environmental Protection Agency stated that "…unless finer-grained soils are fully saturated, landfill gases also can migrate in a "semi-saturated' zone."

Spacing Alternative

Well spacing and location alternatives are interlinked. Spacing between wells of greater than 1,000 feet is generally limited to those areas that qualify for a location alternative. Areas with structures or other sensitive uses within or near the facility permitted boundary would most likely require monitoring well spacing at less than 1,000 feet. Pursuant to 27 CCR 20925(b)(3) CalRecycle or EA may require closer well spacing to protect persons and structures threatened by landfill gas migration.

Well Depth Alternative

If an operator proposes an alternate system of equivalent well depths, the proposal must demonstrate to the satisfaction of EA and CalRecycle that site conditions limit the practicality **or** do not warrant the installation depth criteria and probes located at the proposed depths are sufficient to detect migrating LFG and provide protection to public health and safety and the environment consistent with 27 CCR 20925(c)(2). Pursuant to both State and Federal requirements, landfill operators must monitor LFG to ensure that the concentration of LFG does not exceed regulatory standards including gas at the property boundary at any depth. Wells that are not constructed to the required depth may not be able to meet the State and Federal standards for ensuring that gas migration does not exceed compliance levels. If the probes in the wells are not at adequate depths, the existing wells do not need to be abandoned but can be supplemented with additional wells or probes.

An example of where alternative depth wells may be appropriate is the case where at a canyon landfill a preferential LFG migration pathway (e.g., sand/gravel or decomposed granite layer) lies just above a bedrock plane that travels along the canyon wall toward the sides and head of the canyon. In this case, if an operator could demonstrate, with sufficient data, that any LFG migration would be through the permeable layer, the monitoring of this layer would provide the best monitoring of LFG migration. As long as this monitoring alternative indicates a low level of LFG migration, this monitoring would be considered sufficient.

However, should this alternative monitoring indicate that LFG is migrating at significant levels, additional monitoring wells at deeper depths may be necessary to determine the extent of the LFG migration.

The preferential pathway alternative may also be applicable at non-canyon fill sites under similar circumstances (i.e., shallow bedrock with highly permeable preferential pathway). This alternative may also be applicable to the location alternative. An alternative of this type with appropriate documentation has been approved.

An operator who has installed LFG monitoring wells at an active landfill that were in compliance with the previous depth standard (i.e., depth of waste within 1,000 feet of the well location) may propose a depth alternative for these wells supported by geologic data indicating that the well depth is sufficient to detect migrating gas and will be protective of public health and safety and the environment.

For an operator to propose that an alternative depth is appropriate due to shallow ground water, the plan must demonstrate the historical low seasonal ground water level. The data must take into consideration seasonal and historical fluctuations and must consider the regional aquifer. Plans proposing shallower well depths based on ground water elevations, need to demonstrate the maximum seasonal low ground water level. Data based on limited or one-time data collection are insufficient to demonstrate historical ground water levels. In areas of tidal influences, larger screened intervals may need to be provided so that during the driest periods, the entire unsaturated zone is captured. Several landfills have received approval for both monitoring wells and cutoff trench systems based on historical ground water levels.

Also, LFG monitoring must be conducted both above and below perched ground water [27 CCR 20925(c)(1)(E)].

Probe Number Alternative

Monitoring wells deeper than 30 feet require a minimum of three (3) probes. To demonstrate that fewer than the minimum required number of probes is appropriate, the operator would need to demonstrate that there are fewer LFG pathways to be monitored than probes required. An example would be an area

where the LFG migration barrier is incomplete due to defined zone(s) of LFG migration (e.g., preferential pathway). Substantial geologic data would need to be submitted to demonstrate this condition. Another example is where wells are less than approximately ten to 15 feet usually only one probe is needed.

Overall Review Approach

The LF operator is to submit the proposed LFG plan to EA for its review and approval. If EA does not approve the system, the operator would need to revise the system and resubmit it to EA. Upon approval, EA will forward the proposed system to CalRecycle for review. CalRecycle will then either concur or object to the system. If CalRecycle objects to the system, the operator would need to revise it and resubmit it to the EA and CalRecycle.

To facilitate the review, the operator may request that the LEA submit the LFG plan to CalRecycle for a parallel review. If plans are reviewed in parallel, the CalRecycle comments will be provided to LEA. CalRecycle's formal review and action will not take place until after LEA has approved the LFG plan and submitted it to CalRecycle with a request for concurrence.

CalRecycle review is a three-phase process: completeness, compliance with state minimum standards, and alternatives. The initial phase consists of a completeness review of the submittal. This step typically occurs during the EA review if a parallel review is done. A complete submittal describes all wells and probes and provides evidence that the proposed monitoring system complies with the regulatory standards. Furthermore, supporting information is required if an alternative design is requested. If any items are missing, the submittal is returned with an explanation of why it is incomplete, and the operator will be requested to submit the necessary information to allow for an adequate review.

The second level of review is a determination of whether the proposed wells and probes comply with state minimum standards contained in the regulations (e.g., installed to depth of waste; wells spacing ≤ 1,000 feet; single, double, or triple probes depending upon depth; wells surround entire landfill perimeter at compliance boundary).

The third level of review is the determination whether sufficient and appropriate data has been submitted to demonstrate that a proposed alternative meets the criteria contained in the regulations.

CalRecycle comments, concurrences, requests for additional information, or denials will be sent to the EA with copies to the operator. In the case where CalRecycle is the EA, comments, denials, and approvals will be sent to the operator.

Exemption/Alternative Review Approach

CalRecycle staff review of either alternative (modification of the standards with respect to depth, location, and spacing of gas wells) or exemption (installing no gas wells) proposals is based on site-specific data and regulatory criteria and does not consider plan preparer, landfill, County, EA, operator, or operator type (private or public).

LFG plans are reviewed to determine whether adequate information has been provided to justify proposed exemption/alternative(s). The entire plan content is reviewed to understand each site. Site visits are conducted, as necessary, to observe both site conditions and the efficacy of the existing landfill gas monitoring wells especially if existing wells are proposed in the plan or if previous monitoring results obtained from these wells are used as justification for lack of gas movement.

When reviewing alternative requests prepared by licensed professionals, CalRecycle accepts plan statements at face value and then determines whether the statement is consistent with the regulatory criteria for an alternative.

- If the statement is not consistent, no further detailed review related to that statement is conducted (e.g., large buffer zone does not support location alternative).
- If the statement is consistent with the alternative criteria, then CalRecycle staff evaluates if the statement is justified by supporting data (e.g., proposed well depth is based on historical ground water levels).

Site Description and Adjacent Land Use

The site description information is reviewed to understand the general site conditions. Is it a site with multiple phases and units comprised of older (unlined cells) and newer (Subtitle D lined) waste units? Furthermore, where is the site located? What is next to it? Is it surrounded by structures, sensitive receptors, or vacant and/or agricultural lands? Adjacent land use, both existing and proposed, is important since the location alternative may be allowed only if it is shown that gas migration cannot occur due to geological and hydrogeological barriers **and** no receptors are located within 1,000 feet of the permitted landfill property boundary.

Geology, Hydrogeology, and Hydrology

Since geology and hydrogeology form the basis for alternatives (e.g., migration barriers), these plan sections are reviewed in detail. Staff protocol is to accept what the plan states (if the statements make sense and are sound). As mentioned above, these plans are prepared by registered professionals who state the facts and known information regarding the site's underlining formation.

The plans are reviewed to determine if site-specific data has been submitted to justify any alternative requests. Alternatives based on regional, not site-specific data, are unlikely to be approved since it is difficult to justify site-specific conditions with regional data. For example, if the plan states that a site is underlain by a geological formation that would prevent gas from migration/movement, the review determines whether supporting facts/data are included.

Hydrogeologic and hydrologic data is reviewed if a water barrier is proposed as a reason for an alternative design. This data is reviewed to determine the appropriate depth to which probes are to be installed and to determine if ground water could be a barrier to gas migration. Hydrology is reviewed to determine whether surface waters (creeks, drainage, etc.) located at or around the site could prevent gas migration.

Existing Landfill Gas Monitoring System

The condition of the existing compliance gas monitoring system and the monitoring results (if monitoring has been performed and the results are available) is reviewed. The boring logs for all of the existing gas wells are

reviewed to see how these wells had been constructed. If there is an existing gas migration occurring, alternatives are less likely to be approved. Additionally, spacing of wells closer than 1,000 feet may be appropriate.

Related Links

- Landfill Gas
- Landfill Gas Monitoring and Control
- Training
- LEA Central Home
- Solid Waste Facilities Home

For more information contact: LEA Support Services, PermitTrainingAssistance@calrecycle.ca.gov