# Kansas Administrative Regulations

## Department of Health and Environment

### Article 29.—Solid Waste Management—Part 7. Municipal Solid Waste Landfills.

**28-29-112. Groundwater monitoring systems; sampling and data analysis requirements.**

(a) The groundwater monitoring program shall include consistent sampling and analysis procedures to ensure that monitoring results provide data representative of groundwater quality in the zone being monitored.

(b) The owner or operator shall develop a sampling and analysis plan to submit to the department for approval that includes the following:

(1) a quality assurance and quality control program for field sampling procedures and laboratory analysis that provides:

(A) quantitative detection limits;

(B) the degree of error for analysis of each chemical constituent;

(C) equipment decontamination procedures; and

(D) other field quality assurance protocols;

(2) a sample preservation and shipment procedure that maintains the integrity of the sample collected for analysis;

(3) a chain of custody procedure to prevent tampering and contamination of the collected samples prior to completion of analysis;

(4) the sampling procedures and analytical methods that will be used, why they are appropriate for groundwater sampling and whether they accurately measure constituents in groundwater samples; and

(5) the statistical method or methods listed in subsection (h) of this regulation which will be used in evaluating monitoring data for each constituent detected.

(c) Groundwater samples shall not be field-filtered prior to laboratory analysis. The director may require field filtered samples in cases where turbidity affects the validity of the results.

(d) The owner or operator shall determine the rate and direction of groundwater flow each time groundwater is sampled. Groundwater elevations in wells that monitor the same waste-management area shall be measured within a period of time short enough to avoid temporal variations in groundwater flow that could preclude accurate determination of groundwater flow rate and direction.

(e) The owner or operator shall conduct quarterly groundwater monitoring for one year to determine background concentrations for each of the monitoring parameters or constituents required in the detection groundwater monitoring program, set out in K.A.R. 28-29-113(a).

(f) Background groundwater quality may be established at wells that are not located hydraulically upgradient from the MSWLF unit if:

(1) hydrogeologic conditions do not allow the owner or operator to determine what wells are hydraulically upgradient; or

(2) sampling at other wells will provide an indication of background groundwater quality that is as representative or more representative than that provided by the upgradient wells.

(g) The number of samples collected shall be consistent with the appropriate statistical procedures determined pursuant to this regulation.

(h) The following methods shall be acceptable statistical methods to be utilized in evaluating groundwater monitoring data, and shall be applied separately to each constituent detected in each well:

(1) a parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. This method shall include an estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent;

(2) an analysis of variance (ANOVA) based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. This method shall include an estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent;

(3) a tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of

each constituent in each compliance well is compared to the upper tolerance or prediction limit;

(4) a control chart approach that gives control limits for each constituent; or

(5) another statistical test method that meets the following performance standards:

(A) The statistical method used to evaluate groundwater monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters or hazardous constituents is shown by the owner or operator to be inappropriate for a normal theory test, then the data may be transformed or a distribution-free theory test may be used. If the distributions for the constituents differ, more than one statistical method may be needed.

(B) If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a groundwater protection standard, the test shall be done at a type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the type I experiment-wise error rate for each testing period shall be no less than 0.05; however, the type I error of no less than 0.01 for individual well comparisons must be maintained. This performance standard shall not apply to tolerance intervals, prediction intervals, or control charts.

(C) If a control chart approach is used to evaluate groundwater monitoring data, the specific type of control chart and its associated parameter values shall be protective of human health and the environment. The parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.

(D) If a tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval shall contain, shall be protective of human health and the environment. These parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.

(E) The statistical method shall account for data below the limit of detection with one or more statistical procedures that are protective of human health and the environment.

Any practical quantitation limit (pql) that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.

(F) If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

(i) Any owner or operator wishing to use an alternative statistical test shall seek the approval of the department and provide a justification for the alternative test. The justification shall demonstrate that the alternative method meets the performance standards listed in paragraph (h)(5) above.

(j) The owner or operator shall determine whether or not there is a statistically significant increase over background values for each parameter or constituent required in the particular groundwater monitoring program that applies to the MSWLF unit.

(1) The owner or operator shall submit the statistical analyses to the department within 45 days of receipt of analytical results.

(2) If requested by the department, the results of the statistical analyses shall be provided in electronic form via computer disc or other electronic means.

(3) If requested by the department, the raw analytical data shall also be provided.

(k) In determining whether a statistically significant increase has occurred, the owner or operator shall compare the groundwater quality of each parameter or constituent at each downgradient monitoring well to the background value of that constituent, according to the statistical procedures and performance standards specified in this regulation.

(Authorized by K.S.A. 1993 Supp. 65-3406; implementing K.S.A. 65-3401; effective Oct. 24, 1994.)

***** Authenticated Kansas Administrative Regulation *****