

Appendix A-6

NJDEP Guidelines for Groundwater Sampling Procedures

(b) The Department shall approve a multiunit ground water monitoring system instead of separate ground water monitoring systems for each MSWLF when the facility has several units, provided the multiunit ground water monitoring system meets the requirement of (a) above and shall be as protective of human health and the environment as individual monitoring systems for each MSWLF, based on the following factors:

1. The number, spacing, and orientation of the sanitary landfills;
2. The hydrogeologic setting;
3. The site history;
4. The engineering design of the sanitary landfills; and
5. The type of waste accepted at the sanitary landfills.

(c) Monitoring wells shall be cased in a manner that maintains the integrity of the monitoring well bore hole. This casing shall be screened or perforated and packed with gravel or sand, where necessary, to enable collection of ground water samples. The annular space (that is, the space between the bore hole and well casing) above the sampling depth shall be sealed to prevent contamination of samples and the ground water. In addition to these general well construction standards, all monitoring wells shall be constructed in accordance with the edition of the Department's "Field Sampling Procedures Manual" applicable at the time of construction, an alternate method approved by the Department, or as set forth in the NJPDES-DGW permit.

1. The owner or operator of a sanitary landfill shall notify the Department that the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices documentation has been placed in the records maintained by the facility; and

2. The monitoring wells, piezometers, and other measurement, sampling, and analytical devices shall be operated and maintained so that they perform to design specifications for the duration of the monitoring program.

(d) The number, spacing, and depths of monitoring systems shall be:

1. Determined based upon site specific technical information that shall include thorough characterization of:

- i. Aquifer thickness, ground water flow rate, ground water flow direction including seasonal and temporal fluctuations in ground water flow; and

- ii. Saturated and unsaturated geologic strata and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining bed defining the lower boundary of the uppermost aquifer including but not limited to:

thickness, stratigraphy, lithology, hydraulic conductivity, porosity and effective porosity.

(e) The ground water monitoring system shall perform in accordance with the standards established in this section, and shall consist of a minimum of four monitoring wells, placed such that there is one background quality well, and three hydraulically downgradient wells, located in the uppermost aquifer into which a discharge or leak is likely to occur.

(f) In addition to the minimum number of wells stated in (e) above, additional wells may be required in order to satisfy the performance standards for a ground water monitoring system in N.J.A.C. 7:14A-9.3(a). The number and spacing of these additional wells shall be capable of intercepting a contaminant plume emanating from a leachate leak located at the most downgradient edge of the waste area. This spacing shall be determined as specified in (d) above.

(g) The Department shall waive the requirements of (e) and (f) above based upon one of the following:

1. Performance of geophysical methods of analysis such as resistivity/conductivity that indicate or confirm that there are no contaminant leaks, or when there are leaks or discharges, that wells are placed in the most concentrated zones of any and all contaminant plumes emanating from the landfill; or

2. Another acceptable method approved in advance by the Department that demonstrates that the minimum number of monitoring wells is not necessary to indicate whether or not the landfill is leaking. A high quality contaminant transport model is one example of an acceptable method.

(h) The adequacy of the monitoring system shall be certified by a qualified ground water scientist and/or approved by the Department. The certification shall indicate that the performance standards of this section, or of the permit, are met. Within 14 days of this certification, the owner or operator shall notify the Department that the certification has been placed in the records maintained by the facility.

7:14A-9.4 General ground water monitoring well requirements

(a) In addition to monitoring requirements specified elsewhere in this subchapter, the following requirements shall apply to installation, maintenance, sampling and closure of monitoring wells:

1. Ground water monitoring wells shall be constructed in accordance with the edition of the Department's "Field Sampling Procedures Manual" applicable at the time of well construction, an alternate method approved by the Department, or as set forth in the NJPDES-DGW permit.

2. A well permit, as required by N.J.S.A. 58:4A-1 et seq., shall be obtained prior to the installation of any ground water monitoring well. A clear and accurate record or base map providing any monitoring well location, depth, elevation and achievable pumping rate shall be kept at the facility by the owner or operator and be made available to the Department.

3. Ground water sampling shall be conducted in accordance with the edition of the Department's "Field Sampling Procedures Manual" applicable at the time of well sampling, an alternate method approved by the Department, or as set forth in the NJPDES-DGW permit.

4. Wells shall be capped to prevent precipitation from entering the well bore hole or introduction of extraneous material and substances into the well which might invalidate analytical results. All monitoring wells shall be cased in a manner that maintains the integrity of the monitoring well bore hole. Wells shall be screened and packed with gravel or sand where necessary to enable sample collection at depths where appropriate. The annular space (that is, the space between the bore hole and well casing) above the sampling depth shall be sealed with a suitable material (for example, cement grout or bentonite slurry) to prevent contamination of samples and ground water.

5. The elevation of the top of the well casing for each ground water monitoring well shall be established and said elevation shall be permanently marked on the well casing. The elevation established shall be in relation to the New Jersey Geodetic Control Survey datum. Each monitoring well casing shall be permanently marked with a number assigned or approved by the Department. This number will typically be the well permit number issued with the permit to construct the well.

7:14A-9.5 Ground water monitoring program requirements for sanitary landfills

(a) The ground water monitoring program shall include sampling and analysis procedures that are designed to ensure monitoring results that provide an accurate representation of ground water quality at the background and down-gradient wells installed in compliance with N.J.A.C. 7:14A-9.3(a). The owner or operator shall notify the Department, pursuant to the NJPDES permit, that the sampling and analysis program documentation has been placed in the operating record and the program shall include procedures and techniques for:

1. Sample collection;
2. Sample preservation and shipment;
3. Analytical procedures;
4. Chain of custody control; and
5. Quality assurance and quality control.

(b) The ground water monitoring program shall include sampling and analytical methods that are appropriate for ground water sampling and that accurately measure hazardous constituents and other monitoring parameters in ground water samples. Ground water samples shall not be field filtered prior to laboratory analysis.

(c) The sampling procedures and frequency shall be protective of human health and the environment.

(d) Ground water elevations shall be measured in each well immediately prior to purging, each time ground water is sampled. The owner or operator shall determine the rate and direction of ground water flow each time ground water is sampled. Ground water elevations in wells which monitor the same area shall be measured within a period of time short enough to avoid temporal variations in ground water flow which could preclude accurate determination of ground water flow rate and direction.

(e) The owner or operator shall establish background ground water quality in a hydraulically upgradient or background well(s) for each of the monitoring parameters or constituents required in the particular ground water monitoring program that applies to the sanitary landfill, as determined pursuant to N.J.A.C. 7:14A-9.7(a) or 9.8(a). Background ground water quality may be established at wells that are not located hydraulically upgradient from the sanitary landfill if it meets the requirements of N.J.A.C. 7:14A-9.3(a)1.

(f) The number of samples collected to establish ground water quality data shall be consistent with the appropriate statistical procedures determined pursuant to (g) below. The sampling procedures shall be those specified under N.J.A.C. 7:14A-9.7(b) for detection monitoring, N.J.A.C. 7:14A-9.8(b) and (d) for assessment monitoring, and N.J.A.C. 7:14A-9.9(b) for corrective measures.

(g) The owner or operator shall specify in the records maintained by the facility one of the following statistical methods to be used in evaluating ground water monitoring data for each hazardous constituent. The statistical test shall be conducted separately for each hazardous constituent in each well. Guidance for selecting and conducting the appropriate tests, and for evaluating the results of the tests is described in detail in Statistical Analysis of Ground Water Monitoring Data At RCRA Facilities—Interim Final Guidance Document, 4/89 (NTIS #PB 89-151-047. EPA/530-SW-89-026).

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

7:14A-7.7 Ground water sampling procedures and statistical analysis requirements

(a) The person responsible for conducting the Ground Water Protection Program established pursuant to N.J.A.C. 7:14A-7.6 shall conduct ground water sampling in accordance with the edition of the Department's Field Sampling Procedures Manual applicable at the time of sampling, an alternate method approved by the Department, or as set forth in the NJPDES-DGW permit.

(b) When statistical data evaluations are specified by the Department to implement the Ground Water Protection Program, the statistical test chosen shall be conducted separately for each specified constituent in each well, and one of the following statistical methods shall be used to evaluate ground-water monitoring data for each specified constituent:

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

2. An analysis of variance (ANOVA) based on ranks followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method shall include estimation and testing of the contrasts between each compliance well's median and the background water quality 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 water quality 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 performance standards of (c) below, and has been approved by the Department in writing.

(c) Any statistical method chosen under this section shall comply with the following performance standards, as appropriate:

1. The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of parameters. If the distribution of the parameters is shown by the permittee to be inappropriate for a normal theory test, then the data must be transformed or a distribution free theory test used. If the distributions for the constituents differ, more than one statistical method may be needed.

2. If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background water quality constituent concentrations or a ground-water 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 comparison shall be maintained. The performance standard does not apply to tolerance intervals, prediction intervals or control charts.

3. If a control chart approach is used to evaluate ground-water 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 water quality data base, the data distribution, and the range of the concentration values for each constituent of concern.

4. If a tolerance interval or a prediction interval is used to evaluate ground-water 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 water quality data base, the data distribution, and the range of the concentration values for each constituent of concern.

5. 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 level (PQL) as defined in N.J.A.C. 7:9C 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.

6. 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.

(d) When conducting a leak detection monitoring program, the permittee shall determine whether or not there is a statistically significant increase over background water quality values for each parameter or constituent required in the permit.

1. In determining whether a statistically significant increase has occurred, the permittee shall compare the ground water quality of each parameter or constituent at each compliance point monitoring well designated pursuant to the permit to the background water quality value of that constituent, according to the statistical procedures and performance standards specified under this section.

2. Within the period of time specified in the NJPDES discharge to ground water permit, and after completing sampling and analysis, the permittee shall determine whether there has been a statistically significant increase over background water quality at each monitoring well.



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