

**15A NCAC 13B .0544 MONITORING PLANS AND REQUIREMENTS FOR C&DLF FACILITIES**

(a) The owner or operator of a C&DLF unit shall submit a water quality monitoring plan to the Division in the application for the permit to construct in accordance with Rule .0535(a)(1) of this Section that shall apply to all C&DLF units. The water quality monitoring plan shall be prepared in accordance with this Rule, and shall include information on the proposed groundwater monitoring systems, surface water sampling locations, sampling and analysis requirements, and detection monitoring requirements provided in Paragraphs (b) and (c) of this Rule.

(b) Groundwater monitoring shall be as follows:

- (1) A groundwater monitoring system shall be installed that consists of no less than one background and three downgradient wells installed at locations and depths that yield groundwater samples from the uppermost aquifer that:
  - (A) represent the quality of the background groundwater that has not been affected by leakage from the unit. Determination of background water quality shall be based on sampling of a well or wells that are hydraulically upgradient of the waste management area. However, the determination of background water quality may include sampling of wells that are not hydraulically upgradient of the waste management area where hydrogeologic conditions do not allow the owner and operator to determine which wells are hydraulically upgradient, or hydrogeologic conditions do not allow the owner and operator to place a well in a hydraulically upgradient location, or sampling at other wells will provide an indication of background groundwater quality that is as representative as that provided by the upgradient well(s); and
  - (B) represent the quality of groundwater passing the relevant point of compliance as approved by the Division. The downgradient monitoring system shall be installed at the relevant point of compliance to ensure detection of groundwater contamination in the uppermost aquifer. The relevant point of compliance shall be established no more than 250 feet from a waste boundary, or shall be at least 50 feet within the facility property boundary, whichever point is closer to the waste boundary. In determining the relevant point of compliance, the Division shall consider recommendations made by the owner and operator based upon consideration of at least the hydrogeologic characteristics of the facility and surrounding land; the quantity, quality, and direction of flow of the groundwater; the proximity and withdrawal rate of the groundwater users; the existing quality of the groundwater, including other sources of contamination and their cumulative impacts on the groundwater, and whether the groundwater is currently used or expected to be used for drinking water; public health, safety, and welfare effects; and practicable capability of the owner and operator.
  - (C) A water quality monitoring plan shall include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide an accurate representation of groundwater quality at the background and downgradient wells. The plan shall include procedures and techniques for sample collection; sample preservation and shipment; chain-of-custody control; and quality assurance and quality control.
  - (D) The detection groundwater monitoring program shall include sampling and analytical methods for groundwater sampling that accurately measure target constituents and other monitoring parameters in groundwater samples. Detection monitoring shall be conducted at C&DLF units at all groundwater monitoring wells that are part of the detection monitoring system as established in the approved water quality monitoring plan. The detection groundwater monitoring program shall include monitoring for the constituents listed in Appendix I of 40 CFR 258, and the following constituents: mercury, chloride, manganese, sulfate, iron, specific conductance, pH, temperature, alkalinity, and total dissolved solids. The monitoring frequency for all detection monitoring constituents shall be no less than annual during the active life of the facility, and during closure and the post-closure period. To establish baseline, no less than four independent samples from each background and downgradient monitoring well shall be collected within a twelve-month period and analyzed for the constituents required in this Paragraph, with no less than one sample collected from each new monitoring well before waste placement in each new cell or phase. The water quality monitoring plan shall include a description of the procedures used to establish baseline at the C&DLF unit. No less than one sample from each background and downgradient monitoring well shall be collected and analyzed

during subsequent annual sampling events. C&DLF units shall comply with the groundwater quality standards set forth in 15A NCAC 02L .0202 and the groundwater protection standards established in Rule .0545(c) of this Section.

- (E) The sampling procedures and frequency shall be protective of human health and the environment.
- (2) Each time groundwater is sampled, elevations shall be measured in each well prior to purging. Groundwater elevations in wells which monitor the same waste management area shall be measured within a 24-hour period of time to avoid temporal variations in groundwater flow that could preclude accurate determination of groundwater flow rate and direction. In order to determine accurate groundwater elevations for each monitoring well, the wells shall have been surveyed by a licensed professional land surveyor if required by G.S. 89C. The survey of the wells shall conform to the following levels of accuracy: horizontal location to the nearest 0.1 foot, vertical control for the ground surface elevation to the nearest 0.01 foot, and vertical control for the measuring reference point on the top of the inner well casing to the nearest 0.01 foot. In order to determine the rate of groundwater flow, the owner or operator shall provide data for hydraulic conductivity and porosity for the formation materials at each of the well locations.
- (3) The owner or operator shall establish existing conditions of groundwater quality in hydraulically upgradient or background well(s) for each of the monitoring parameters or constituents required in Part (1)(D) of this Paragraph. Statistical analysis used to establish existing conditions of groundwater quality shall be in accordance with Subparagraphs (4) and (5) of this Paragraph and the minimum number of samples required by the statistical method used shall be met.
- (4) Should the owner or operator choose to perform statistical analysis of groundwater quality data for the purpose of establishing background concentrations or to determine if there is an exceedance of the groundwater quality standards established in 15A NCAC 02L .0202 or the groundwater protection standards established in Rule .0545(c) of this Section, the owner or operator shall select one of the following statistical methods to be used in evaluating groundwater monitoring data for each constituent of concern. The statistical test chosen shall be conducted separately for each constituent of concern in each well.
  - (A) A parametric analysis of variance (ANOVA) followed by multiple comparisons 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 mean levels for each constituent.
  - (B) A parametric analysis of variance (ANOVA) based on ranks followed by multiple comparisons 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 median levels for each constituent.
  - (C) 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.
  - (D) A control chart approach that gives control limits for each constituent.
  - (E) Another statistical test method that meets the performance standards of this Rule. The owner or operator shall submit a justification for an alternative test method to the Division for approval to determine compliance with this Rule. The justification shall demonstrate that the alternative statistical test method meets the performance standards in Subparagraph (5) of this Paragraph. If approved, the owner or operator shall place a copy of the justification for an alternative test method in the operating record.
- (5) Any statistical method chosen to evaluate groundwater monitoring data shall comply with the following performance standards:
  - (A) The statistical method used to evaluate groundwater monitoring data shall be appropriate for the distribution of chemical parameters or constituents of concern. If the distribution of the chemical parameters or constituents of concern is shown by the owner or operator or the Division to be inappropriate for a normal theory test, then the data shall be transformed or a distribution-free theory test shall be used. If the distributions for the constituents differ, more than one statistical method shall be considered.
  - (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 shall be maintained. This performance standard does 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 by the analyst 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 by the analyst 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.
- (6) Within 120 days of completing a groundwater sampling event, the owner or operator shall submit to the Division a monitoring report in an electronic format that is accessible and viewable by the Division that includes information from the sampling event including field observations relating to the condition of the monitoring wells; field data; a summary of the laboratory analytical data report; statistical analysis (if utilized), field sampling methods and quality assurance and quality control data; information on groundwater flow direction; calculations of groundwater flow rate; and for each well, any constituents that exceed groundwater quality standards set forth in 15A NCAC 02L .0202 or the groundwater protection standards established in Rule .0545(c) of this Section.
- (7) If the owner or operator determines upon evaluation of laboratory data or by a verification sampling event that there is an exceedance of the groundwater quality standards established in accordance with 15A NCAC 02L .0202, or the groundwater protection standards established in accordance with Rule .0545(c) of this Section for one or more of the constituents being monitored at any monitoring well, the owner or operator:
- (A) shall, within 14 days of this finding, report to the Division and place a notice in the operating record indicating which constituents have exceeded groundwater quality standards established in accordance with 15A NCAC 02L .0202, or the groundwater protection standards established in accordance with Rule .0545(c) of this Section;
  - (B) shall establish an assessment monitoring program in accordance with Rule .0545 of this Section except as provided for in Part (C) of this Subparagraph; and
  - (C) may demonstrate that a source other than a C&DLF unit caused the exceedance, or the exceedance resulted from an error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. A report documenting this demonstration shall be submitted to the Division for review. If required by G.S. 89C or G.S. 89E, a licensed professional engineer or licensed geologist shall prepare these documents. [Note: The North Carolina Board of Examiners for Engineers and Surveyors and the Board of Licensing of Geologist has determined, via letters dated July 16, 2010 and November 30, 2010 respectively, that preparation of documents pursuant to this Paragraph constitutes practicing engineering or geology under G.S. 89C and G.S. 89E.] A copy of this report shall also be placed in the operating record. If a successful demonstration is made, documented, and approved by the Division, the owner or operator may continue detection monitoring. If after 90 days of the initial determination of exceedance, a successful

demonstration is not made, the owner or operator shall initiate an assessment monitoring program as required by Rule .0545 of this Section.

- (8) Monitoring wells shall be designed and constructed in accordance with 15A NCAC 02C.
    - (A) Owners and operators shall obtain approval from the Division for the design, installation, development, and decommission of any monitoring well or piezometer. Documentation shall be placed in the operating record and provided to the Division.
    - (B) The monitoring wells and piezometers shall be operated, maintained, and accessible so that they perform to design specifications throughout the life of the monitoring program.
  - (9) The number, spacing, and depths of groundwater monitoring points shall be determined based upon site-specific technical information that shall include an investigation of:
    - (A) aquifer thickness, groundwater flow rate, and groundwater flow direction, including seasonal and temporal fluctuations in groundwater flow; and
    - (B) thickness, stratigraphy, lithology, hydraulic conductivities, porosities, and effective porosities of the saturated and unsaturated geologic units, including fill materials overlying and comprising the uppermost aquifer.
  - (10) In addition to groundwater monitoring wells, the use of alternative monitoring systems may be:
    - (A) required by the Division at sites where the owner or operator does not control the property from any landfill unit to the groundwater discharge features; or
    - (B) allowed by the Division at sites with hydrogeologic conditions favorable to detection monitoring by alternative methods.
  - (11) Owners and operators of C&DLF units shall comply with the groundwater monitoring, assessment, and corrective action requirements under Rules .0544 and .0545 of this Section according to the following schedule:
    - (A) new C&DLF units shall be in compliance with the requirements before waste can be placed in the unit; and
    - (B) lateral expansions to existing C&DLF units shall be in compliance with the requirements before waste can be placed in the expansion area.
  - (12) Groundwater quality standards established under 15A NCAC 02L .0202 and groundwater protection standards established in accordance with Rule .0545(c) of this Section shall not be exceeded.
- (c) Surface water monitoring shall meet the following criteria:
- (1) The monitoring shall include sample collection from surface water features on or bordering the facility property and include no less than one upstream and one downstream sampling location. Surface water samples shall be analyzed for constituents that include those listed in Part (b)(1)(D) of this Rule. The monitoring frequency shall be no less than annual during the active life of the facility, and no less than annual during the closure and post-closure care period.
  - (2) Responsibility for sample collection and analysis shall be defined as a part of the monitoring plan.
  - (3) Information used for the development of the surface water monitoring system shall include:
    - (A) drainage patterns and other hydrological conditions in the area;
    - (B) proximity of surface water to the facility;
    - (C) uses that are being or may be made of any surface water that may be affected by the facility; and
    - (D) any other factors that relate to the potential for surface water impacts from the facility.
  - (4) The C&DLF unit shall not cause an exceedance of the surface water standards established under 15A NCAC 02B .0200.
- (d) The owner or operator of a C&DLF unit shall submit a landfill gas monitoring plan to the Division prepared in accordance with this Rule that shall apply to all C&DLF units. Landfill gas monitoring shall be as follows:
- (1) Owners and operators of C&DLF units shall ensure that:
    - (A) the concentration of explosive gases generated by the facility does not exceed 25 percent of the lower explosive limit in on-site facility structures, excluding gas control or recovery system components; and
    - (B) the concentration of explosive gases does not exceed the lower explosive limit at the facility property boundary.
  - (2) Owners and operators of all C&DLF units shall implement a routine landfill gas monitoring program to ensure that the standards of Subparagraph (1) of this Paragraph are met as follows:

- (A) The type of monitoring shall be determined based on soil conditions, the hydrogeologic conditions under and surrounding the facility, the hydraulic conditions on and surrounding the facility, the location of facility structures and property boundaries, and the location of all off-site structures adjacent to property boundaries.
  - (B) The concentration of methane in landfill gas shall be monitored. The monitoring shall be conducted at a frequency of no less than quarterly.
  - (C) The Division may also require quarterly monitoring of landfill gas for explosive gases other than methane, such as hydrogen sulfide, if it is necessary to ensure compliance with Subparagraph (1) of this Paragraph. If the Division requires monitoring of additional explosive gases, the Division shall provide written notice to the facility of the requirement.
- (3) If explosive gas levels exceeding the limits specified in Subparagraph (1) of this Paragraph are detected, the owner and operator shall:
- (A) upon discovery of detection, notify the Division and take any steps that may be necessary to ensure protection of human health, such as evacuation or monitoring of offsite structures for explosive gases;
  - (B) within seven days of detection, place in the operating record the explosive gas levels detected and a description of the steps taken to protect human health; and
  - (C) within 60 days of detection, implement a remediation plan for the explosive gas releases, place a copy of the plan in the operating record, and notify the Division that the plan has been implemented. The plan shall describe the nature and extent of the problem and the proposed remedy.
- (4) The owner or operator may submit a request in writing to the Division for an extension or alternate schedule for compliance with Parts (3)(B) and (3)(C) of this Paragraph, and the request shall include a justification for the alternate schedule. In making the determination on approval of the request, the Division shall consider the following factors:
- (A) the justification submitted by the owner or operator;
  - (B) actions taken by the owner or operator upon discovery of the exceedances;
  - (C) the explosive gas levels measured and reported; and
  - (D) the circumstances and use of properties surrounding the facility.
- (e) Owners or operators of C&DLF units shall develop and implement a waste screening plan as required by G.S. 130A-295.6(g) in accordance with the effective date and applicability requirements of S.L. 2007-550, s. 9.(b). The plan shall meet the same requirements as municipal solid waste landfills set forth in 40 CFR 258.20 and shall include screening for the wastes prohibited by Rule .0542(e) of this Section. Owners and operators of C&DLF units that are not subject to G.S. 130A-295.6(g) shall develop and implement a waste screening plan that shall comply with 40 CFR 258.20, and shall include screening and a contingency plan for the wastes prohibited by Rule .0542(e) of this Section.
- (f) The water quality monitoring plan shall include any other monitoring plan or program which is necessary according to the operating plan or the effective permit.
- (g) Water quality monitoring plans and landfill gas monitoring plans shall be prepared under the charge of and bear the seal of a licensed professional engineer or licensed geologist if required by G.S. 89C or 89E, respectively.
- (h) Water quality monitoring plans and landfill gas monitoring plans shall be capable of providing detection of any release of monitored constituents from any point in a disposal cell or leachate surface impoundment to the uppermost aquifer, air, surface waters, or proximal area.
- (i) Water quality monitoring plans and landfill gas monitoring plans shall be submitted to the Division for review. The Division shall date and stamp the water quality monitoring plan and landfill gas monitoring plan "approved" if they meet the requirements of this Rule. A copy of the approved monitoring plan shall be placed in the operating record.
- (j) Once established at a C&DLF facility, all monitoring shall be conducted throughout the active life and post-closure care period for all C&DLF units.

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