

## Chapter NR 508

## LANDFILL MONITORING, REMEDIAL ACTIONS AND IN-FIELD CONDITIONS REPORTS

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**NR 508.01 Purpose.** The purpose of this chapter is to help ensure that efficient, nuisance-free and environmentally acceptable solid waste management procedures are practiced in Wisconsin, to outline environmental monitoring requirements at solid waste facilities and to implement groundwater standards and remedial actions according to ch. NR 140. This chapter is adopted under ss. 144.43 to 144.47, and 227.11, Stats.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88.

**NR 508.02 Applicability.** (1) Except as otherwise provided, this chapter governs all solid waste facilities as defined by s. 144.43 (5), Stats., except hazardous waste facilities as defined in s. 144.61 (5m), Stats., and regulated under chs. NR 600 to 685, and metallic mining operations as defined in s. 144.81 (5), Stats., and regulated under ch. NR 182.

(2) This chapter does not apply to the design, construction or operation of industrial wastewater facilities, sewerage systems and waterworks treating liquid wastes approved under s. 144.04, Stats., or permitted under ch. 147, Stats., nor to facilities used solely for the disposal of liquid municipal or industrial wastes which have been approved under s. 144.04, Stats., or permitted under ch. 147, Stats., except for facilities used for the disposal of solid waste.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88; correction in (1) made under s. 13.93 (2m) (b) 7, Stats., Register, May, 1995, No. 473.

**NR 508.03 Definitions.** The terms used in this chapter are defined in s. NR 500.03.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88.

**NR 508.04 General monitoring requirements.** The department may require the owner or operator of any land disposal facility, or any person who permits the use of property for such purpose, to conduct monitoring of groundwater, the unsaturated zone, leachate, gas, surface water or other physical features in accordance with plans approved by the department. Monitoring is required at all new land disposal facilities and at expansions of existing facilities for which the plan of operation was not approved before February 1, 1988. Pursuant to s. 144.44 (4) (f), Stats., the department may require monitoring at existing facilities, regardless of whether the facility remains in operation.

(1) **GROUNDWATER, UNSATURATED ZONE AND LEACHATE MONITORING.** The department may require the installation of groundwater and leachate monitoring wells, suction lysimeters, moisture probes, collection basin lysimeters, and similar monitoring devices, and the implementation of a water quality sampling and analysis program as part of the plan review or relicensing process.

(a) All groundwater sampling devices shall be designed, located, installed and maintained so as to obtain reliable and representative information regarding aquifer characteristics, groundwater flow directions and chemical and physical characteristics of groundwater.

(b) All devices shall be constructed to minimize the potential for contaminants to enter the groundwater or to move from one major soil unit or bedrock formation to another.

(c) Leachate head wells shall be designed and installed to measure leachate levels at the base of the facility.

(d) The locations of all monitoring devices installed after the feasibility report is approved shall be approved by the department in writing prior to installation. The location and construction of any monitoring device may be submitted to the department for review and concurrence prior to installation.

(2) **GAS MONITORING.** The department may require the installation of gas monitoring devices and sampling and analysis programs to monitor for gas migration and determine the effectiveness of any gas venting systems. The gas monitoring program shall be implemented in accordance with plans approved by the department. If gas monitoring is required, the temperature, ground condition, barometric pressure and information as to whether the barometric pressure is rising or falling shall be recorded each time sampling is performed. Sample collection and analytical techniques shall be in accordance with standard methods.

(a) All gas monitoring probes shall be designed, located, installed and maintained so as to obtain reliable and representative information regarding soil conditions and gas concentrations.

(b) All gas monitoring probes shall be constructed with a shut-off valve to prevent the escape of gas from the

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sampling device and minimize the amount of inflow of air from the atmosphere.

(3) **SURFACE WATER MONITORING.** The department may require the monitoring of surface water runoff, leachate seeps, sumps, sedimentation ponds, any surface water bodies and other surface water discharges resulting from facility operation. The department shall specify sampling times and parameters and all sampling shall be implemented in accordance with plans approved by the department. All surface water sampling locations shall be surveyed in and permanently and clearly marked.

(4) **AIR QUALITY MONITORING.** The department may require monitoring of air quality for particulates, toxics or other constituents in the ambient air, from point sources or in buildings at or associated with the facility. The department shall specify sampling times and locations and all sampling shall be implemented in accordance with plans approved by the department.

(5) **ENVIRONMENTAL MONITORING AT LANDFILLS ACCEPTING RESIDUE PRODUCED BY BURNING MUNICIPAL SOLID WASTE.** (a) Monitoring shall be performed for cadmium and lead at any disposal facility accepting residue produced by burning municipal solid waste and shall be analyzed for as dissolved metals in the groundwater monitoring program and as total metals in the lysimeter and leachate monitoring programs.

(b) The department may require additional monitoring parameters or points at any disposal facility accepting residue produced by burning municipal solid waste.

(c) The department may require air monitoring for particulates at any disposal facility accepting residue produced by burning municipal solid waste.

(6) **OTHER MONITORING.** The department may require monitoring of landfill settlement; berm, sideslope and final cover stability; vegetative growth; drainage control structures; gradient control systems; or any other aspects of facility operation. All required monitoring shall be implemented in accordance with plans approved by the department. The department may require geophysical investigations to complement groundwater monitoring efforts.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88; renum. (5) to (6), cr. (5), Register, May, 1992, No. 437, eff. 6-1-92.

**NR 508.05 Well design and installation.** All monitoring devices shall be designed and installed in accordance with ch. NR 141 and the following requirements unless an alternate method is approved in writing by the department.

(1) **PROTECTIVE DEVICES.** All groundwater monitoring wells, leachate head wells, suction lysimeters, moisture probes, and other sampling devices shall have a cap to prevent contaminants from entering the monitoring device. All monitoring devices except leachate head wells in the active area of the facility shall have protective metal casings and locking lids. The lids shall be kept locked. The department may require additional protective devices such as rings of brightly colored posts around any monitoring device. All leachate head wells shall be protected to prevent damage during facility operation.

(2) **LABELING.** All monitoring devices shall be clearly and permanently labeled. At a minimum, the label shall include the well name and number.

(3) **DRILLING METHOD.** Drilling shall be performed in accordance with ss. NR 141.15, 141.17, 141.19 and the requirements of this section. The drilling method shall allow the driller to obtain undisturbed soil samples and perform standard penetration tests while drilling. If a drilling method using continuous sampling does not allow for standard penetration tests, then the consolidation of the recovered samples shall be measured in the field with a vane shear or pocket penetrometer.

(a) If the drilling method does not allow the required soil sampling to be performed, a separate boring shall be drilled adjacent to the monitoring well to provide the necessary information.

(b) Drilling fluids and water may be used to drill monitoring wells only when there are no reasonable alternatives. If drilling fluids are used, the driller shall document the type of fluids, any additives used and the chemical constituents of the mixture. If water is used, the source of the water shall be identified.

(c) When drilling equipment comes into contact with contaminants in the borehole or above ground, the driller shall clean the equipment thoroughly prior to any additional drilling.

(4) **BOREHOLE ABANDONMENT.** If any borehole is deeper than the well to be placed in it, the portions of the borehole below the well screen shall be properly sealed according to s. NR 508.07.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88; am. (3) (intro.), Register, January, 1990, No. 409, eff. 2-1-90.

**NR 508.06 Well development.** All groundwater monitoring wells shall be properly developed following installation. The development process shall cause water to flow rapidly into and out of the well screen for the purpose of dislodging and removing fine soil particles, drill cuttings and drilling fluids. Well development shall be considered complete when the water extracted from the well is chemically stable, and as free of sediment as possible. Well development shall follow the procedures in s. NR 141.21 and the requirements of this section.

(1) **SAMPLING AFTER DEVELOPMENT.** Once the water being extracted from the well is stabilized, a sample shall be tested for total suspended solids. If drilling fluids were used during well construction, the sample shall also be tested for COD.

(2) **WATER LEVEL MEASUREMENTS.** After development, all wells shall be pumped and successive water level measurements shall be taken until stabilized readings are obtained.

(3) **DOCUMENTATION.** All well development techniques shall be documented in writing according to ss. NR 141.23 and 508.11.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88; am. (intro.) and (3), Register, January, 1990, No. 409, eff. 2-1-90.

**NR 508.07 Boring and well abandonment.** Proper abandonment of borings and monitoring devices shall seal the well or borehole completely in order to prevent future contamination of groundwater. The sealing materials used shall be continuous, physically and chemically stable and have a hydraulic conductivity of less than  $1 \times 10^{-7}$  cm/sec. The exact location of abandoned wells and borings

and the date and the method of abandonment shall be documented in writing. The abandonment method shall also be documented by photographs. All monitoring wells and boreholes shall be abandoned and documented in accordance with ss. NR 141.25, 508.13 and this section.

(1) **TIMELINE.** All boreholes not instrumented with a well shall be abandoned immediately after drilling and completion of soil testing.

(2) **ABANDONMENT OF WATER SUPPLY WELLS.** Water supply wells which are required to be abandoned shall be abandoned and documented according to s. NR 812.26.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88; correction in (2) made under s. 13.93 (2m) (b) 7., Stats., Register, May, 1995, No. 473.

**NR 508.08 Inspections.** The facility owner or operator shall inspect all monitoring devices at least annually. Sampling personnel shall inspect all monitoring devices each time the device is sampled or a water level elevation is measured. If for any reason a monitoring device is destroyed or otherwise fails to function properly, the facility operator shall notify the department in writing within 10 days after discovery. The device shall be repaired if possible. If the device cannot be repaired, it shall be properly abandoned and replaced within 60 days unless otherwise approved in writing by the department. Unless otherwise approved, if a device is replaced, the replacement well shall be given the same number as the well it replaced followed by the letter "R" to indicate it is a replacement well. An additional "R" shall be added each time the well is replaced.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88.

**NR 508.09 Soil sampling.** All soil samples collected from borings installed after submittal of a feasibility report shall be collected and tested in accordance with this section unless otherwise approved in writing by the department.

(1) **SAMPLE COLLECTION.** Where conditions permit, samples shall be collected using undisturbed soil sampling techniques. Samples shall not be composited for testing purposes. In fine-grained soil environments, continuous samples shall be collected from the land surface to at least 25 feet below the anticipated or existing sub-base grade for the purpose of field classification. In uniform, coarse-grained soil environments and following the continuous sampling in fine-grained soil environments, samples shall be collected from each major soil unit encountered and at maximum 5-foot intervals. At least one soil sample shall be collected at the depth of any subsequently placed monitoring well screen. If borings are extended into bedrock, continuous core samples of the bedrock shall be taken and the rock properties including fracture frequency, rock quality designation and percent recovery shall be determined.

(2) **LABORATORY AND FIELD TESTING.** Laboratory and field analysis shall be conducted to identify the specific geologic and hydrogeologic conditions in the vicinity of the boring or monitoring well.

(a) The soil sample collected at the depth of any subsequently placed monitoring well screen shall be analyzed for grain size distribution by mechanical and hydrometer

test and Atterberg limits, as appropriate for the particular soil type. Each soil sample shall be described according to its physical texture, color, geologic origin and visually classified according to the unified soil classification system.

(b) An in-field test shall be conducted on each well to determine the in-situ hydraulic conductivity. The test shall be of long enough duration and include a sufficient amount of data to provide a representative estimate of the actual hydraulic conductivity. Boring logs shall be recorded for all borings. Each boring log shall include complete information as required in s. NR 508.11 (6).

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88.

**NR 508.10 Groundwater and leachate sampling and analysis.** The owner or operator shall implement a monitoring program at a land disposal facility in accordance with this section and the approved plan of operation unless otherwise approved in writing by the department.

(1) **NUMBER OF REQUIRED MONITORING POINTS.** The number of required monitoring points and the monitoring program shall be approved in writing by the department based on the facility size, waste types, facility design and hydrogeologic and geologic setting of the facility. The monitoring program shall be adequate to determine up-gradient and down-gradient water quality, horizontal and vertical gradients and to detect any impacts from the facility on groundwater quality.

(2) **SAMPLING OF WATER SUPPLY WELLS.** The department may require the owner or operator to sample public or private water supply wells and to determine water level elevations in such wells as part of a routine groundwater monitoring program or to determine the extent of groundwater contamination unless permission cannot be obtained from the well owner.

(3) **SAMPLING FREQUENCY.** The minimum sampling frequency shall be according to this subsection unless otherwise specified in writing by the department. Routine monitoring at facilities having a design capacity of 50,000 cubic yards or less shall be conducted semiannually, within 15 days of March 15 and September 15. Routine monitoring at facilities having a design capacity of greater than 50,000 cubic yards shall be conducted quarterly, within 15 days of March 15, June 15, September 15 and December 15. Alternative dates to those specified may be utilized if approved by the department in writing. Leachate head wells shall be measured at least monthly for leachate level elevations.

(4) **SAMPLING PARAMETERS.** Unless otherwise specified in writing by the department the following parameters shall be monitored:

(a) Water level elevation shall be measured and recorded to the nearest 0.01 foot in each groundwater or leachate monitoring well prior to sampling. The elevation shall be corrected to USGS datum. The measuring point shall be the top of the well casing and shall be identified on the well itself if the top of the casing is not level.

(b) The physical appearance of the water sample, including color, odor and turbidity, shall be recorded at the time of sampling of each monitoring device.

(c) Groundwater monitoring shall be conducted in accordance with Table 1. Both the uncorrected field conductivity and the field conductivity at 25°C shall be reported. Uncorrected field conductivity does not need to be reported if a meter which automatically corrects to 25°C is

used for sampling. The department may require analysis of additional parameters depending on the characteristics of the waste, the raw process materials used, or the provisions of ch. NR 140.

Table 1

Waste Type	Indicators	PARAMETERS	
		Public Welfare Standards	Public Health Standards
Municipal solid waste	Field temperature Field conductivity (uncorrected) Field conductivity (at 25°C) Field pH Alkalinity COD Hardness	Chloride Dissolved iron	
Paper mill sludge	Field temperature Field conductivity (uncorrected) Field conductivity (at 25°C) Field pH Alkalinity COD Hardness Ammonia-nitrogen	Chloride Dissolved iron Sulfates	Nitrate+ Nitrite (as N)
Fly or bottom ash	Field temperature Field conductivity (uncorrected) Field conductivity (at 25°C) Field pH Alkalinity Boron COD Hardness	Dissolved iron Sulfates	Selenium
Foundry waste	Field temperature Field conductivity (uncorrected) Field conductivity (at 25°C) Field pH Alkalinity COD Hardness Sodium		Fluoride
Municipal solid waste combustor residue	Field temperature Field conductivity (uncorrected) Field conductivity (at 25°C) Field pH Alkalinity Boron COD Hardness	Dissolved iron Sulfates Chloride	Cadmium Lead Selenium
Other solid waste	As specified in writing by the department		

(5) **SAMPLING PLAN.** A sampling plan for all monitoring devices at the facility shall be submitted to the department as part of the feasibility report and shall be implemented as approved in writing by the department. The department may require that any existing facility prepare a sampling plan. The sampling plan should follow department guidelines for groundwater sampling and shall comply with the requirements in s. NR 140.16. At a minimum, the following items shall be addressed:

(a) Procedures to purge wells prior to collecting samples; calculations which determine the volume of water to be removed from each well; the amount of time between purging and sampling; the equipment used to purge wells, measure water levels, retrieve samples and measure temperature, conductivity and pH in the field; procedures to clean the purging and sampling equipment between wells; the order of well sampling; volume of sample needed; procedures and equipment to filter samples for various pa-

rameters; procedures to physically and chemically preserve samples; quality assurance and quality control measures including blanks and duplicates; special procedures to sample leachate head wells or other devices; time to sample, filter, preserve and transport samples to the laboratory; chain of custody procedures, including persons responsible for sampling, methods for transporting samples to the laboratory, and the time elapsed before samples are analyzed in the laboratory. The plan shall specify the location where the in-field tests and sample preservation will be performed and the laboratory where the samples will be analyzed.

(b) A copy of the approved sampling plan shall be kept at the facility or at the office of the facility owner and a copy shall be provided to the sampling personnel for use during sampling. The sampling plan shall be followed unless a modification to the plan is approved in writing by the department.

(6) **ANALYTICAL METHODS.** All required chemical and physical groundwater and leachate analyses shall be conducted by a laboratory certified or registered under s. 144.95, Stats., and ch. NR 149. The laboratory shall use the analytical methods referenced in ch. NR 149 unless alternative methods are approved by the department in writing. Detection limits for all chemical analyses shall be in accordance with s. NR 140.16 (2). The following tests are excluded from the requirements of ch. NR 149 but must be performed using standard methods or procedures, if they exist:

- (a) Physical tests of soil,
- (b) Physical tests of wastes,
- (c) Air quality tests,
- (d) Gas tests,
- (e) Field pH tests,
- (f) Field conductivity tests,
- (g) Product quality testing,
- (h) Nutrient testing of soils and waste,
- (i) Turbidity tests,
- (j) Water elevation,
- (k) Temperature,
- (l) Leachate-liner compatibility testing.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88; am. (4) Table 1, Register, May, 1992, No. 437, eff. 6-1-92.

**NR 508.11 Well construction documentation.** The facility owner or operator shall document all well construction activities and report the information to the department as required in s. NR 141.23 and this section. Well construction shall be documented in all major plan submittals including initial site reports, feasibility reports, plans of operation, construction documentation or in-field conditions reports. If no major plan is being prepared at the time of well installation, documentation shall be submitted to the department within 60 days of well installation. All elevations shall be corrected to USGS datum. Elevations shall be recorded to the nearest 0.01 foot. The documentation shall be submitted on forms provided by the department which are supplemented by written descriptions. Documentation of well construction shall include the following information:

(1) **WELL PROTECTION.** The type of protective casing; the diameter, length and elevation of the top of the protective casing; the grout used between the well casing and the protective casing; the depth and width of surface plug below the land surface; the height of the plug above the land surface; and the type of cap and lock.

(2) **WELL DESIGN.** The well casing type, length, diameter and schedule; the type of joints used; the screen type, length, diameter and schedule; the screen slot type and size; the percent open area of the screen; the type of screen bottom; the distance the filter pack extends above the screen; elevations of the top of casing and land surface; depth from the land surface to and elevation of the bottom

of the borehole, the bottom of the well screen, and top and bottom of all seals; and well locations identified by the landfill coordinate system to the nearest foot.

(3) **MATERIALS USED.** A description of the filter pack material, including grain size analysis, quantity used, and manufacturer and product name or number; the well seal including the physical characteristics of the material; the type and quantity of annular space sealant including percentages of each specific material used for each well; drilling fluid including additives; and water added including the source and the results of the water quality analysis for parameters in Table 1.

(4) **INSTALLATION TECHNIQUES.** The drilling method used; type of drill rig; borehole diameter; inside diameter of the hollow stem auger, if used; cleaning procedures; sealing method; time between sealing the annular space and constructing well protection; and the date the well was drilled.

(5) **WELL DEVELOPMENT.** The date the well was developed; the date, time and the water level in the well both before and after development; the development method; time spent developing the well; volume of water removed and added; source of water; clarity of water before and after development; presence of sediment at the bottom of the well before and after development; volume of water purged; all readings of field temperature, field specific conductance, field pH and the times at which they were measured; analysis of total suspended solids and analysis of COD if drilling fluids were used during well construction.

(6) **SOILS INFORMATION.** Boring logs, soil testing results and driller's observations including any problems encountered or conditions that may affect the performance of the monitoring device or that may help in planning future well installations. Each boring log shall include soil and rock descriptions, method of sampling, sample depths and elevations, date of boring, land surface elevation, water level elevations and depths, elevation and depth of the bottom of the boring, the location of the well screen and soil test data. Soil and rock descriptions shall include geologic origin and any heterogeneities, soil structure, soil color, mottling, moisture, blow counts, layering, jointing, lenses, fractures, organic matter or voids. Each soil layer shall be classified according to the unified soil classification system. All elevations shall be corrected to USGS datum.

(7) **MISCELLANEOUS.** The raw data and calculated results of in-situ hydraulic conductivity tests; water level measurements and dates; computations of well yield, if determined; any changes in well construction, casing elevation or other features subsequent to drilling.

(8) **MAP.** An 8½ by 11 inch map, drawn to scale, showing facility boundaries, the design management zone, the location of all monitoring devices and borings, landfill coordinate system, scale, north arrow and key.

(9) **FORMS.** Groundwater monitoring well information form 4400-89, groundwater monitoring well construction form, boring log information form and other forms as required by the department completed as instructed.

## NR 508.11

**Note:** Copies of these forms may be obtained from the Department of Natural Resources, Bureau of Solid Waste Management, 101 South Webster Street, Natural Resources Building, P.O. Box 7921, Madison, WI 53707.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88; am. (intro.), Register, January, 1990, No. 409, eff. 2-1-90.

**NR 508.12 Sampling and analysis documentation.** Field records of all monitoring activities shall be prepared in sufficient detail to document whether the sampling plan has been followed and should follow department guidelines for groundwater sampling. The facility owner or operator shall retain all field records until the end of the long-term care period for the facility. Field records shall be available for department inspection on request. The owner or operator shall submit sampling results and water elevation data on forms supplied by the department within 60 days from the end of the sampling period. Forms designed by the facility owner may be approved by the department for use in submitting sampling results. Explanation of any deviation from the approved sampling plan or analytical procedures shall be submitted at the same time.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88.

**NR 508.13 Boring and well abandonment documentation.** Boring and well abandonment activities shall be documented in accordance with s. NR 141.25 (4) and this section on forms provided by the department in all major plan submittals including initial site reports, feasibility reports, plans of operation, construction documentation reports or in-field conditions reports. If no major plan is being prepared at the time of boring or well abandonment, documentation shall be submitted by the facility owner or operator to the department within 60 days of boring or well abandonment. Documentation shall include the exact location of the well or boring by landfill coordinate system, total depth of the well, date and method of abandonment, materials and volumes of backfill used, status of well casing removal and any special precautions taken. The method used to abandon the wells shall be documented using photographs. If the well is a public or private well, any forms required under s. NR 812.26, such as well abandonment report form 3300-5, shall be submitted. In any case, other forms previously submitted to the department, such as the groundwater monitoring well information form 4400-89, shall be revised to reflect the current condition of the monitoring system.

**Note:** These forms may be obtained from the Department of Natural Resources, Bureau of Solid Waste Management, 101 South Webster Street, Natural Resources Building, P.O. Box 7921, Madison, WI 53707.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88; corrections made under s. 13.93 (2m) (b) 7, Stats., Register, May, 1995, No. 473.

**NR 508.14 Background groundwater quality sampling.** Applicants for proposed facilities and the owner or operator of facilities with feasibility reports approved after October 1, 1985 shall establish background groundwater quality in accordance with subs. (1) to (4). Owners or operators of facilities with feasibility reports approved on or before October 1, 1985 or other facilities at which monitoring is required may be required by the department to establish background water quality in accordance with subs. (4) and (5).

**(1) BACKGROUND WATER QUALITY FOR INDICATOR PARAMETERS.** Background water quality shall be established at all wells outside the proposed limits of waste fill which were installed to evaluate the proposed facility and any

adjacent, related facility for each indicator parameter listed in Table 1 of s. NR 508.10 as appropriate for the particular waste types. Additional parameters may be required based on the proposed waste types and characteristics. A minimum of 8 samples shall be used to determine background water quality. A minimum of 4 samples, with at least 30 days between sampling rounds, shall be taken and analyzed and the results shall be submitted with the feasibility report. The remaining samples shall be taken on a quarterly basis and the results shall be submitted with the plan of operation unless otherwise approved in writing by the department.

**(2) BACKGROUND WATER QUALITY FOR PUBLIC HEALTH AND WELFARE GROUNDWATER QUALITY STANDARDS** Unless otherwise specified by the department, background water quality shall be established at all wells outside the proposed limits of waste fill which were installed to evaluate the proposed facility and any adjacent, related facility for the public health and welfare groundwater quality standards listed in Table 2. A minimum of 4 samples with at least 30 days between sampling rounds, shall be taken and analyzed and the results shall be submitted with the feasibility report. The department may revise the monitoring requirements in writing for specific parameters at specific wells after examining data from the first 2 sampling rounds.

Table 2

<u>Public Welfare Standards</u>	<u>Public Health Standards</u>
Chloride	Arsenic
Copper	Barium
Dissolved iron	Cadmium
Manganese	Chromium
Sulfate	Fluoride
Total dissolved solids	Lead
Zinc	Mercury
	Nitrate+ Nitrite (as N)
	Selenium
	Silver

**(3) BACKGROUND WATER QUALITY FOR VOLATILE ORGANIC COMPOUNDS (VOCs).** Background water quality shall be established for volatile organic compounds at all wells outside the proposed limits of waste fill which were installed to evaluate the proposed facility and any adjacent, related facility. Facilities designed solely to accept coal ash are exempt from this requirement. The compounds to be tested for include all VOCs listed in Table 1 of s. NR 140.10 plus any additional compounds specified by the department. Samples shall be taken from each well at the same time as the first and second sampling rounds for indicator parameters and public health and welfare groundwater quality standards. The analysis shall be done using a gas chromatograph/mass spectrophotometer in accordance with SW 846 method 8240 or EPA wastewater method 624. As an alternative the analysis may be performed using a gas chromatograph/photoionization detector/Hall detector in accordance with SW 846 methods 8010/8020 or EPA wastewater methods 601/602. Any wells which have VOC concentrations above the limits of quantification shall be resampled for those compounds detected during the following 2 sampling periods. The results of this sampling shall be submitted with the feasibility report.

Note: These publications may be obtained from: The superintendent of documents, U.S. government printing office, Washington, D.C. 20402.

**(4) BACKGROUND WATER QUALITY AT NEW OR REPLACEMENT MONITORING WELLS.** All new or replacement groundwater monitoring wells installed at a facility shall be sampled on a quarterly basis for the parameters specified in subs. (1) to (3) to establish background water quality.

**(5) BACKGROUND WATER QUALITY AT EXISTING FACILITIES.** The department may require additional sampling and analysis for indicator parameters, public health or welfare groundwater quality standards, volatile organic compounds and other parameters to establish background water quality at existing facilities or if the owner is proposing an expansion to an existing facility.

History: Cr. Register, January, 1988, No. 385, eff. 2-6-88.

**NR 508.15 Calculation of preventive action limits for indicator parameters.** The department shall calculate preventive action limits for indicator parameters. For each indicator parameter for which groundwater monitoring is required, the department shall establish the preventive action limit at all wells at the facility according to methodology specified in s. NR 140.20. The department may require the owner or operator to conduct additional sampling if the department determines that the data used to calculate a preventive action limit is not representative of background water quality.

History: Cr. Register, January, 1988, No. 385, eff. 2-6-88.

**NR 508.16 Point of standards application.** The point of standards application to determine if a preventive action limit or enforcement standard has been attained or exceeded are specified in s. NR 140.22 (2) and (3).

**(1) DESIGN MANAGEMENT ZONE.** The design management zone and waste boundary are defined in s. NR 140.22 (5) (a). The design management zone extends horizontally 150 feet beyond the waste boundary for solid waste disposal facilities which have feasibility reports approved after October 1, 1985. For all other solid waste disposal facilities the design management zone extends horizontally 300 feet beyond the waste boundary.

**(2) CHANGES TO THE DESIGN MANAGEMENT ZONE.** The department may consider an expansion or reduction of the design management zone in accordance with s. NR 140.22 (5) (b). The factors which shall be considered by the department are listed in s. NR 140.22 (5) (c) and (d). An owner or operator of a facility may submit a written request for approval of an expansion or reduction of the design management zone. The request shall include an evaluation of the factors listed in s. NR 140.22 (5) (c) and (d).

History: Cr. Register, January, 1988, No. 385, eff. 2-6-88.

**NR 508.17 Notification procedures for exceedances of enforcement standards and preventive action limits.** The owner or operator of a solid waste disposal facility shall notify the department in writing if an enforcement standard, preventive action limit or alternative concentration limit has been attained or exceeded at the point of standards application. This notification shall be given within 60 days from the end of the sampling period and shall be attached to the sampling results as specified in ss. NR 140.24 (1) (a) and 140.26 (1) (a). The notification shall specify the parameters for which standards have been

exceeded, the wells at which the exceedance occurred and provide a preliminary analysis of the cause and significance of the concentration.

History: Cr. Register, January, 1988, No. 385, eff. 2-6-88.

**NR 508.18 Responses when a groundwater standard is exceeded.** Upon receipt of a notification that an enforcement standard or preventive action limit has been attained or exceeded, the department shall evaluate the information. If further information is necessary to assess the cause and significance of the concentration, the department may require the owner or operator to prepare and submit a report within 60 days unless an alternative deadline is specified in writing by the department. The report shall assess the cause and significance of the exceedance based on consideration of the factors listed in s. NR 140.24 (1) (c) and shall propose a response to meet the objectives of s. NR 140.24 (2) or 140.26 (2). The department may also require that the report include any of the information contained in s. NR 508.20. The department shall respond to the report within 65 business days of receipt. Based on the evaluation of the report, if one is required, and the factors listed in s. NR 140.24 (1) (c), the department shall specify responses to be implemented by the owner or operator of the facility in accordance with s. NR 140.24 (2) or 140.26 (2).

Note: The range of responses for an exceedance of a preventive action limit are specified in Table 5 of s. NR 140.24 (4). The range of responses for an exceedance of an enforcement standard are listed in Table 6 of s. NR 140.26 (2). The criteria the department must use to determine which responses are appropriate are included in ss. NR 140.24 (2) to (6) and 140.26 (2), (4), (5) and (6).

History: Cr. Register, January, 1988, No. 385, eff. 2-6-88.

**NR 508.19 Exemptions. (1) EXEMPTIONS REQUIRED.** The department may not approve a feasibility report for a solid waste disposal facility at a location where a preventive action limit or enforcement standard has been attained or exceeded unless an exemption has been granted under s. NR 140.28. Criteria for granting exemptions and exemption procedures are described in s. NR 140.28.

**(2) EXEMPTION SUBMITTAL.** A request for an exemption under s. NR 140.28 shall be submitted in writing to the department and shall include the following:

(a) A list of the specific wells and parameters for which an exemption is being requested, and

(b) A discussion of how the circumstances relate to the criteria listed in s. NR 140.28 (2), (3) or (4).

**(3) COMPLETENESS.** An exemption request is not considered complete until the information required to make a decision under s. NR 140.28 is submitted.

**(4) ALTERNATIVE CONCENTRATION LIMITS.** The department may set alternative concentration limits in its response to the exemption request, if appropriate.

**(5) EXEMPTIONS WITHOUT A SUBMITTAL.** An owner may be granted an exemption without submitting a written request only under the following circumstances:

(a) The preventive action limits for indicator parameters are currently being calculated,

(b) The parameter for which an exemption is needed is elevated due to background conditions, and

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(c) The parameter is a public welfare standard.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88.

**NR 508.20 In-field conditions report.** The department, for good cause shown, may require pursuant to s. 144.431 (2) (b), Stats., or as a condition of a plan approval under ss. 144.44 to 144.47, Stats., the owner or operator of any solid waste land disposal facility, or any person who permits the use of property for such purpose, to submit an in-field conditions report to the department to determine if the facility poses a potential hazard to public health, safety or welfare, or the environment. All in-field conditions reports shall contain the following minimum information unless otherwise approved by the department in writing. Additional information contained in ch. NR 508 or 512 may also be required by the department.

(1) **GENERAL FACILITY INFORMATION.** An in-field conditions report shall identify the project title; name, address and phone number of the primary contacts including the facility owner and any consultants; present property owner; a general description of the facility location; the facility location by quarter-quarter section, township, range, town and county; total acreage of the property; the existing limits and thickness of fill; the active fill areas; all public and private wells within one-half mile of the facility and the owners of all public and private wells within 1,200 feet of the limits of waste filling. Well logs for all wells within 1,200 feet shall be included in the appendix of the report.

(2) **FACILITY HISTORY.** An in-field conditions report shall identify the dates the facility began and terminated waste acceptance; the type and volume of waste known to have been disposed, spilled or stored; the potential for the waste to biologically decompose and generate gas; the generators of the wastes disposed of at the facility; the area utilized and disturbed by waste handling and disposal; the methods of waste disposal and overall operation of the facility; the facility base grades and any engineering controls which were installed; and the history of any adjoining active or closed facilities or activities which may contribute to environmental contamination.

(3) **LAND USE INFORMATION.** The in-field conditions report shall discuss the present and former land uses at the facility and the surrounding area. A thorough discussion of land uses which may have affected groundwater or surface water quality shall be included. The report shall address all areas that may affect or be affected by the proposed facility. At a minimum, this will be the area within one mile of the facility. The discussions shall be supplemented with land use maps. At a minimum, the following items shall be addressed:

(a) Identification and location of the adjacent land owners. This information may be presented on a plat map. However, current ownership conditions shall be verified and any changes noted.

(b) A description of the present land uses in the area shall be included. Particular emphasis shall be placed on the discussion of known recreational, historical, archaeological or environmentally unique areas including natural or scientific areas, county forest lands and critical habitat. A letter from the department's bureau of endangered resources addressing the known presence of any endangered

or threatened species, critical habitat and natural or scientific areas shall be included.

(c) The present or proposed transportation routes and access roads including any weight restrictions shall be delineated.

(4) **REGIONAL GEOTECHNICAL INFORMATION.** An in-field conditions report shall discuss the regional setting of the facility to provide a basis for comparison and interpretation of information obtained through field investigations. This discussion may be limited to information available from publications such as a hydrologic investigations atlas, water supply papers, informational circulars and technical bulletins published by the Wisconsin state geologic and natural history survey, the United States geological survey, the Wisconsin department of natural resources, U.W.-extension, regional planning commissions and the soil conservation service. The regional setting to be described is the area which may affect or be affected by the facility. At a minimum, this will be the area within 5 miles of the limits of filling. The discussions shall be supplemented with available regional bedrock and glacial geology maps, USGS topographic maps, SCS soil maps and regional water table maps. The following items shall be specifically addressed:

(a) The existing topography including predominant topographic features.

(b) The surface water drainage patterns and significant hydrologic features such as surface waters, springs, surface water drainage basins, divides and wetlands.

(c) The origin, texture, nature and distribution of bedrock; the origin, texture, thickness and distribution of the unconsolidated units; and the texture and classification of the surficial soils.

(d) The depth to groundwater, groundwater flow directions and gradients, recharge and discharge areas, groundwater divides, aquifers and identification of the aquifers used by public and private wells in the region. An indication of which aquifer systems are most susceptible to contamination shall be made.

(e) Information on groundwater and surface water quality which is available from the USGS, WSGNHS, DNR, UW-Extension and regional planning commissions.

(5) **SPECIFIC FACILITY INVESTIGATIONS.** An in-field conditions report shall contain the results of field inspections and investigations which define the topography, subsurface soils, depth to bedrock, type of bedrock, depth to groundwater, groundwater flow direction and gradients at the facility, the extent and thickness of waste placement, background groundwater quality, surface water quality including the presence and location of any leachate seeps, gas generation and migration and the degree and extent of groundwater and surface water contamination. The results of this investigation shall be described in the narrative section of the in-field conditions report. All raw data such as boring logs, well construction diagrams, laboratory tests, field hydraulic conductivity test data, water quality information and water level measurements shall be included in the report appendix. At a minimum, the following investigations shall be performed unless an alternative geotechnical investigation program is approved by the department in writing:



(a) Borings shall be drilled at 10 separate locations for the first 10 or less acres of disposal area. Five additional borings shall be drilled for each additional 10 or less acres of disposal area. All borings shall be extended a minimum of 25 feet below the estimated sub-base grade or to bedrock, whichever is less. If regional information suggests that bedrock is within 75 feet of the land surface, a minimum of one boring shall be extended to bedrock. The borings shall be distributed so that requirements of this section are met. Samples shall be collected and boring logs prepared in accordance with s. NR 512.11 (1) (c) and (e). Borings not converted to wells shall be abandoned in accordance with s. NR 508.07.

(b) Water table observation wells shall be installed to adequately define the depth to groundwater and horizontal gradients. At a minimum, 5 water table observation wells shall be installed for the first 10 or less acres of disposal area and 2 additional wells for each additional 10 or less acres of disposal area. The wells shall be constructed such that the water table intersects the well screen at all times during the year. At a minimum, for each 10 or less acres of disposal area, a piezometer shall be installed adjacent to a water table observation well to create a well nest. In addition, in fine-grained soil environments, a well nest consisting of at least 2 piezometers shall be installed adjacent to a water table observation well for each 10 or less acres of disposal area. All wells shall be constructed, developed and documented in accordance with this chapter.

(c) A hydrogeologist or other qualified person shall observe and direct the drilling of all borings; the installation, development and abandonment of all wells and all in-field hydraulic conductivity tests. The hydrogeologist or other qualified person shall also visually describe and classify all geologic samples. Any odor associated with the samples shall also be noted.

(d) Laboratory and field analyses shall be conducted to identify the specific geologic and hydrogeologic conditions at the proposed facility in accordance with s. NR 512.11 (4) (a) to (d).

(e) Once the wells have been installed and properly developed, at least 3 rounds of water quality sampling shall be performed with a minimum of one month between sampling rounds. The samples shall be analyzed for the public health and welfare groundwater quality standards contained in Table 2 and all appropriate indicator parameters contained in s. NR 508.10 (3) (c) for the waste types present in the facility. Unless otherwise approved by the department, at the same time the first round of sampling is undertaken a sample from each well shall be analyzed for all volatile organic compounds listed in Table 1 of s. NR 140.10 and any additional compounds specified by the department. The testing shall be done using a gas chromatograph/mass spectrophotometer in accordance with SW 846 method 8240 or EPA wastewater method 624. As an alternative the analysis may be performed using a gas chromatograph/photoionization detector/Hall detector in accordance with SW 846 methods 8010/8020 or EPA wastewater methods 601/602. Any wells which have concentrations of VOC's above the limits of quantification shall be resampled during the following 2 sampling rounds. Any private wells within 1,200 feet of the estimated limits of

fill shall be sampled at the same time as the monitoring wells and for the same parameters.

Note: These publications may be obtained from: The superintendent of documents, U.S. government printing office, Washington, D.C. 20402.

(f) The waste types known to have been disposed of at the facility shall be evaluated for the potential for gas migration. Any facility which contains or is thought to contain wastes which can biologically decompose shall be instrumented with gas monitoring probes. The probes shall be installed to define the concentration and lateral extent of gas migration. The probes shall be installed in the soil units most likely to allow gas migration. The probes shall be sampled a minimum of 3 times for at least methane. The department shall be notified immediately if any gas probe exceeds the lower explosive limit for the particular gas tested.

(6) DATA PRESENTATION. The results of the subsurface investigations and water quality sampling shall be presented on 24 inch x 3 inch plan sheets unless an alternative size is approved by the department in writing, as follows:

(a) A topographic map of the area showing the estimated limits of filling, property boundaries, fencing, major utility corridors, homes, buildings, man-made features, adjacent or nearby wetlands, public and private water supply wells, the location of soil borings and groundwater monitoring or leachate head wells, the location of gas vents and gas monitoring probes, and the location of all leachate seeps. The base map shall consist of a map having a minimum scale of one-inch equals 200 feet with a 2 foot contour interval sufficient to show relief and drainage features. The map shall contain a local grid system with the location of the origin identified according to latitude and longitude or the state plane coordinate system.

(b) Geologic cross-sections shall be constructed through all borings both perpendicular and parallel to the facility baseline as well as along transects which include major geologic and geomorphic features such as ridges, buried valleys, and buried bedrock valleys. At least one cross-section shall be constructed parallel to groundwater flow. Where more than one interpretation can be reasonably made, conservative assumptions shall be used when evaluating heterogeneities within the unconsolidated deposits. Information on the geologic cross-sections shall be presented in accordance with s. NR 512.13 (2).

(c) At least one water table contour map shall be included. The maps shall be based on stabilized water levels recorded on a single day from all observation wells at the facility. All the wells and the measured water level at each well shall be shown on the water table maps. The topographic map shall be used on a base map. If more than one set of water levels has been taken, base the water table map on the set of data which indicates the highest water table.

(d) At least 3 iso-concentration maps shall be presented for the parameters which most accurately depict the degree and extent of contamination. The concentration of the particular parameter shall be presented for each well.

(7) MAP. An 8½ by 11 inch map shall be submitted. The map shall be drawn to scale and show the facility boundaries, the design management zone, the location of all mon-

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itoring devices and borings, the estimated limits of filling, the landfill coordinate system, the scale, a north arrow and a key.

(8) **FORMS.** The groundwater monitoring well information form 4400-89, the groundwater monitoring well construction form, the boring log information form and other forms as required by the department shall be completed as instructed.

(9) **WATER BUDGET.** A water budget shall be prepared for the facility. At a minimum, the following factors shall be considered in the preparation of the water budget:

- (a) Average monthly temperature,
- (b) Average monthly precipitation,
- (c) Evaporation,
- (d) Evapotranspiration,
- (e) Surface slope and topsoil texture,
- (f) Soil moisture holding capacity and root zone depth,
- (g) Runoff coefficients,
- (h) Moisture contribution from the waste, and any
- (i) Groundwater inflow.

**Note:** In most cases, this will require field investigations to accurately define several of the variables.

(10) **DATA ANALYSIS.** The results from the sub-surface investigations, water quality sampling, gas monitoring and regional geotechnical information shall be evaluated to determine:

- (a) Whether any groundwater standards have been attained or exceeded. If any preventive action limits or en-

forcement standards established under s. NR 140.10 or 140.12 have been exceeded, the cause and significance of the exceedances shall be addressed. If significant contamination appears to be present, the factors listed in s. NR 140.24 (1) (c) shall be addressed.

- (b) Whether surface water quality has been impacted by the facility.

(c) Whether gas migration is occurring and whether the concentrations exceed the limits established in ch. NR 506. If it is determined that gas migration is occurring, any residences, businesses, industries or other structures which have or may be affected by gas migration shall be identified.

(11) **PROPOSED REMEDIAL ACTIONS.** Based on an evaluation of the data generated, the types of remedial actions necessary to return the facility to compliance with the requirements of s. NR 504.04 (4) shall be proposed and shall be evaluated utilizing the process in ch. NR 722, including a practicability determination in accordance with s. NR 722.07 (5). Sections NR 140.24 (4) and 140.26 (2) outline the required set of remedial actions to address groundwater impacts depending on what parameters are affected and whether or not a preventive action limit or enforcement standard has been exceeded. Any soil contamination shall be addressed in compliance with the requirements of ch. NR 720. A long-term environmental monitoring program shall be proposed so the performance of the facility and the effects of any remedial action can be evaluated. The department may issue a determination that no further remedial action is necessary at the facility pursuant to ch. NR 726.

**History:** Cr. Register, January, 1988, No. 385, eff. 2-6-88; am. (11), Register, April, 1994, No. 460, eff. 5-1-94; am. (11), Register, April, 1995, No. 472, eff. 5-1-95.