

Chapter NR 214

LAND TREATMENT OF INDUSTRIAL LIQUID WASTES,
BY-PRODUCT SOLIDS AND SLUDGES

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Note: Chapter NR 214 as it existed on June 30, 1990 was repealed and a new ch. NR 214 was created effective July 1, 1990.

Subchapter I — General

NR 214.01 Purpose. The purpose of this chapter is to protect public health and welfare by restoring, maintaining and protecting the physical, chemical and biological integrity of the groundwater and all uses of state waters in accordance with ch. NR 140, and chs. 147 and 160, Stats.; to establish design and construction criteria for all land treatment systems that receive industrial wastes and require department approval of plans and specifications under ch. NR 108 and s. 144.04, Stats.; and to establish discharge limitations, monitoring requirements and operating standards for all industrial land treatment systems which require a permit under ch. 147, Stats. Under s. 147.02, Stats., a permit is required for the lawful discharge of any pollutant into the waters of the state, which include groundwater by the definition in s. 147.015 (13), Stats.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.02 Applicability. (1) **WASTES REGULATED.** This chapter applies to those discharges of industrial wastes to land treatment systems not regulated under ch. NR 518. This includes but is not limited to liquid wastes, by-product solids and sludges generated by: fruit and vegetable processing, dairy products processing, meat, fish and poultry products processing, mink raising operations, aquaculture, commercial laundromat and motor vehicle cleaning operations and any other industrial, commercial or agricultural operation which results in a point source discharge that has no detrimental effects on the soils, vegetation or groundwater of a land treatment system. Industrial by-product solids and sludges shall also have beneficial properties as a soil conditioner or fertilizer. Lime sludges containing radium may be regulated under this chapter.

(2) **RESPONSIBILITY.** The generator of these wastes shall be responsible for their handling and land application, except when an independent

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land application contractor has been issued a WPDES permit for the land treatment of these wastes. When the contractor is issued the WPDES permit, the independent contractor shall be responsible for the handling and application of these wastes to the land.

(3) **WASTES EXCLUDED.** The provisions of this chapter are not applicable to the following wastes.

(a) Alcohol fuel production wastes from systems defined as "private alcohol fuel production systems" under ss. 144.438 (1) and 147.017 (1), Stats., which are operated in accordance with ss. 144.438 (2) and 147.017 (2), Stats.

(b) Animal waste regulated under ch. NR 243, and liquid manure applied in accordance with sound agricultural practices.

(c) Domestic waste handled and disposed of in accordance with ch. NR 113.

(d) Domestic sewage from systems defined as "private sewerage systems" in s. 145.01 (12), Stats.

(e) Effluent from publicly owned wastewater treatment works regulated under ch. NR 206.

(f) Mining wastes backfilled or otherwise disposed of in a prospecting excavation or a mine in accordance with a prospecting permit or a mining permit issued under ch. NR 131 or 132, except runoff, leachate, decantate or other wastewater collected for disposal on land outside of the permitted prospecting or mining site.

(g) Noncontact cooling water free of chemical additives.

(h) Liquid wastes from sweet corn silage stacks which are utilized for direct livestock feeding, have less than 150 tons present on a site at any one time, and are located such that surface water and groundwater pollution does not occur.

(i) Sludge from publicly or privately owned wastewater treatment works regulated under ch. NR 204.

(j) Sludges which are disposed of in a landfill, a land disposal site or an incinerator licensed and operated in accordance with chs. NR 500 and 518.

(k) Uncontaminated lime sludges which are generated by pulp or paper mills or water supply treatment facilities and are exempted from regulation under s. NR 518.04 (3).

(l) Wet and semi-liquid wastes disposed of in a site regulated under ch. NR 500 or 518, except runoff, leachate, decantate or other wastewaters collected for disposal on land outside of the regulated disposal site.

(m) Wastes from sites and facilities used solely for research purposes under the direction of a Wisconsin registered professional engineer or a scientist employed by a university located within this state provided the following requirements are met:

1. The net site area, excluding site borders and buffer strips, does not exceed 4 acres;

2. The available nitrogen, chloride and heavy metal additions averaged over the total plot area may not exceed the rates specified by the department in ch. NR 204 for municipal sewage sludges or those identified in the literature as being toxic to specific plants or plant groups;

3. The site is developed, operated, monitored and maintained in a safe, nuisance free manner; and

4. Copies of the research proposal are submitted to the department in advance of initiation of the research and any reports and publications on the research are provided to the department.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.03 Definitions. The following definitions are applicable to terms used in this chapter. Definitions of other terms and meanings of abbreviations are in ch. NR 205.

(1) "Alternate concentration limit" means the concentration of a substance in groundwater established for a site by the department to replace a preventive action limit or an enforcement standard, or both from s. NR 140.10 or 140.12, when an exemption is granted in accordance with s. NR 140.28.

(2) "ASTM" means the American Society for Testing and Materials. Copies of ASTM standards referenced in this chapter are available for inspection at the offices of the department of natural resources, the secretary of state's office and the office of the revisor of statutes. ASTM standards may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

(3) "Bedrock" means rock that is exposed at the earth's surface or underlies soil material and is encountered when weathered in-place consolidated material, larger than 2 mm in size, is greater than 50% by volume.

(4) "By-product solids" means waste materials from the animal product or food processing industry including, but not limited to; remains of butchered animals, paunch manure and vegetable waste materials such as leaves, cuttings, peelings and actively fermenting sweet corn silage.

(5) "Cation-exchange capacity" means the sum total of exchangeable cations that a soil can absorb, expressed in milliequivalents per 100 grams of oven dry soil.

(6) "Community public water supply system" means a water supply system having at least 15 service connections used by year-round residents or regularly serving at least 25 year-round residents. Any water supply system serving 7 or more homes, 10 or more mobile homes, 10 or more apartment units, or 10 or more condominium units shall be considered a community public water supply system unless information is available to indicate that 25 year-round residents will not be served.

(7) "Composting facility" means a facility where organic material is biologically degraded to produce a stabilized end product.

(8) "Department", when used without qualification, means the department of natural resources.

(9) "Design management zone" means a 3 dimensional boundary surrounding each regulated facility, practice or activity established under s. NR 140.22 (5).

(10) "Detrimental effect" means contamination of the lands or waters of the state, or making the same injurious to public health, harmful for commercial or agricultural use, or deleterious to animal or plant life.

(11) "Enforcement standard" or "ES" means a numerical value expressing the concentration of a substance in groundwater which is adopted under ss. 160.07 and 160.09, Stats., and ss. NR 140.10 and 140.12.

(12) "Environmental pollution" has the meaning specified under s. 144.01 (3), Stats.

(13) "Floodplain" means the land which has been or may be covered by flood water during the regional flood as specified under s. NR 116.03 (16).

(14) "Floodway" means the portion of a river or stream required to carry the regional flood as specified under s. NR 116.03 (22).

(15) "Food-chain crop" means a crop grown for human consumption or pasture, forage and feed grains for animals whose products are consumed by humans. Tobacco is considered a crop grown for human consumption.

(16) "Groundwater" means any of the waters of the state, as defined in s. 144.01 (19), Stats., occurring in a saturated subsurface geological formation of rock or soil.

(17) "Groundwater monitoring" means measuring the groundwater level and analyzing samples of water taken from the ground.

(18) "Hazardous wastes" has the meaning specified under s. NR 181.12.

(19) "Hydraulic application rate" means the volume of liquid waste evenly spread over a designated acreage of the land treatment system divided by a period of time as specified in the WPDES permit. The rate is calculated by dividing the volume discharged during the waste loading period by the acreage of land loaded and then dividing by the total time in the load/rest cycle.

(20) "Incinerator" has the meaning specified under s. NR 500.03 (65).

(21) "Infiltration rate" means the rate of liquid movement through the soil surface into the ground.

(22) "Incorporation" means the mixing of a waste with topsoil by injecting, dising, moldboard plowing, chisel plowing or rotary tilling to a minimum depth of 4 inches.

(23) "Intensity of application" means the instantaneous rate, reported as inches per hour, at which liquid waste is applied to land.

(24) "Land treatment system" means a system that utilizes the physical, chemical and biological abilities of the soil to decompose pollutants in the wastes. Land treatment systems include:

- (a) Absorption or seepage pond systems,
- (b) Ridge and furrow systems,
- (c) Spray irrigation systems,
- (d) Overland flow systems,
- (e) Subsurface absorption field systems,
- (f) Landspreading systems for liquid wastes or organic by-product solids,
- (g) Sludge spreading systems, and
- (h) Any other land area receiving liquid wastes, by-product solids or sludge discharges.

(25) "Landfill" has the meaning specified under s. NR 500.03 (73).

(26) "Landspreading system" means a system where a controlled quantity of liquid waste or by-product solid is uniformly applied onto, or incorporated into, the soil surface of designated sites by means of a vehicle with a spreader bar, spray gun or subsurface injector. The wastes are to be applied for the benefit of the vegetative cover. Landspreading systems also include those systems where liquid wastes are occasionally applied through temporary irrigation piping at a frequency similar to that of application by vehicles.

(27) "Liquid waste" means process wastewater and waste liquid products, including silage leachate, whey, whey permeate, whey filtrate, contact cooling water, cooling or boiler water containing water treatment additives, and wash water generated in industrial, commercial and agricultural operations which result in a point source discharge to a land treatment system.

(28) "Load/rest cycle" means a schedule of operation in which a certain volume of waste is loaded on a portion of the treatment system and then that portion is rested to allow the soil to reaerate and the soil microorganisms to break down the waste material.

(29) "Nested well system" means a group of 2 or more wells installed within 10 feet of each other at the ground surface and constructed to varying depths.

(30) "Overland flow system" means a land treatment system in which the applied wastewater flows uniformly down grassy sloped terrain having very low permeability soils and is collected at the bottom of the slope for subsequent discharge.

(31) "Permeability" means the rate of liquid movement through a porous medium.

(32) "Potable water supply well" means a well supplying water for human consumption, sanitary use or food product preparation.

(33) "Preventive action limit" or "PAL" means a numerical value expressing the concentration of a substance in groundwater which is adopted under s. 160.15, Stats., and s. NR 140.10, 140.12 or 140.20.

(34) "Sludge" means the accumulated solids generated during the biological, physical or chemical treatment, coagulation or sedimentation of water or wastewater.

(35) "Soil" means the unconsolidated material that overlies bedrock and has been physically and chemically derived from organic material or bedrock by nature.

(36) "Soil moisture holding capacity" means the volume of water available for plant growth in a unit depth of soil. It is measured by the difference in water volume retained in a unit depth of soil between the pore pressures of field capacity (1/10 to 1/2 atmospheres) and the wilting point (15 atmospheres).

(37) "Unsaturated zone" means the zone between the land surface and the water table in which the pore spaces contain water at less than atmospheric pressure, as well as air and other gases.

(38) "Wetland" as defined in s. 23.32 (1), Stats., means an area where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.04 Prohibitions. (1) The discharge of toxic or hazardous substances to land treatment systems shall be prohibited unless the owner or operator demonstrates to the department that the discharge of such pollutants will be in such small quantities that no environmental pollution will result and standards established in ch. NR 140 will not be exceeded. The demonstration criteria used shall include, but not be limited to: the toxicity of the pollutant or waste, degradability, the usual or potential presence of the pollutant or waste in the existing environment, site characteristics and other relevant factors. This prohibition applies to sludges which are classified as toxic or hazardous wastes.

(2) The discharge of hazardous wastes to land treatment systems is prohibited as specified in s. NR 181.45.

(3) The underground injection of any pollutant through a well is prohibited as specified in s. NR 112.20.

(4) Liquid wastes, sludges or by-product solids that contain viable pathogens, such as those from meat or poultry processing, may not be applied on fields used for growing crops that may be consumed raw by humans.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.05 Additional limitations. Discharges of industrial liquid wastes, by-product solids and sludges to land treatment systems shall be operated to prevent detrimental effects on surface waters, wetlands and critical habitat areas. The department may impose additional limitations on land treatment systems as follows:

(1) The requirements of this chapter may be supplemented or superseded by standards or prohibitions for toxic or hazardous substances;

(2) The requirements of this chapter may be supplemented or superseded by more stringent requirements, including pretreatment require-

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ments, more stringent discharge limitations, and more frequent or stringent effluent or groundwater monitoring requirements, if:

(a) There is an increased possibility of surface water or groundwater contamination, due to system location, loading rates, soil types, geologic or other conditions;

(b) The wastewaters contain any substance or concentration of substances not normally associated with the type of discharge identified in s. NR 214.02 (1); or

(c) The wastewaters cause a public nuisance.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.06 Exemptions from requirements of this chapter. (1) The department may exempt a land treatment system from specific requirements of this chapter if the owner or operator can demonstrate that the requirement is more stringent than necessary to comply with the provisions of ch. NR 140 and ch. 160, Stats. As required in s. 160.19 (2), Stats., this chapter defines design and management practice criteria for land treatment systems to minimize the level of substances in groundwater to the extent technically and economically feasible and to comply with the groundwater preventive action limits established in ch. NR 140. The concepts of matching the waste loading to the soil conditions, uniform wastewater distribution, a load/rest cycle and nutrient removal by crop uptake are essential in order to minimize the groundwater impacts from waste treatment on land. However, there may be site specific factors that determine how these concepts are best applied to a specific facility. To justify an exemption from a requirement of this chapter, the owner or operator shall demonstrate the following:

(a) That site specific factors, such as pollutant-soil interactions, higher than normal crop nutrient uptake or pollutant dilution, dispersion or degradation within the design management zone, justify an exemption from the requirements of this chapter. The influence of site specific factors shall be demonstrated in an evaluation of the waste loading, hydrogeologic conditions, soil type and treatment capabilities of the site to present grounds for an exemption. Soil investigation information such as that specified in s. NR 214.20 may be required as part of the treatment system evaluation;

(b) That increases of substances in the groundwater from land treatment on the site will be minimized to the extent technically and economically feasible; and

(c) That the applicable groundwater limits will not be exceeded. The following evidence shall be part of the exemption request for each of the following groups of land treatment systems:

1. Existing systems with groundwater monitoring wells. The owner or operator shall demonstrate compliance with the appropriate groundwater standards in all monitoring wells by presenting groundwater monitoring data from the land treatment system. The department may require installation of and data from additional monitoring wells if the groundwater monitoring well network is believed to not adequately represent the impacts from land treatment of wastes on the site.

2. Existing systems without groundwater monitoring wells and flows above 15,000 gpd. The department may require the owner or operator of a system which has had a monthly average liquid waste flow to land treatment equal to, or greater than, 15,000 gallons per day (gpd), anytime during the previous year, to demonstrate compliance with the appropriate groundwater standards by installing a department approved monitoring well system. The monitoring well system installation will be required through the modification or reissuance of the discharge permit for the system.

3. Existing systems without groundwater monitoring wells and flows below 15,000 gpd. The owner or operator of a system which has monthly average liquid waste flows to land treatment of less than 15,000 gpd shall demonstrate that granting the exemption will result in the treatment system having a low potential for exceeding the groundwater standards of ch. NR 140. The department shall require all feasible upgrading and operational improvements that will optimize the performance of the existing land treatment system and minimize groundwater impacts. Such improvements may include, but are not limited to, operational changes, site modifications and minimizing the waste loading. Systems in this size category that the department judges as having a high potential for groundwater contamination will be required to install a groundwater monitoring well system. The department shall consider pollutant loading rates, soil types and system location in assessing the potential for groundwater contamination.

4. New or expanded land treatment systems. The owner or operator of a new or expanded land treatment system may utilize information from research studies, literature or similar existing land treatment systems in the demonstration for a variance. The department may require the installation of a groundwater monitoring well network to check for groundwater impacts from land treatment on the site.

(2) **SUBMITTING AN EXEMPTION REQUEST.** The owner or operator of a land treatment system shall request an exemption from a requirement of this chapter by submitting facts to the department:

(a) In the application for issuance, reissuance or modification of a WPDES permit, or

(b) In plans and specifications for a new or expanded land treatment system or during the 90-day plan approval period as specified in s. 144.04, Stats., or

(c) During the 30-day public comment period following public notice by the department of intent to issue, reissue or modify a WPDES permit under s. 147.09, Stats., or

(d) At a public hearing held under s. 147.13 or 147.20, Stats.

(3) **WRITTEN EXEMPTIONS.** All exemptions issued under this section shall be granted in writing.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.07 Exemptions from groundwater standards. (1) Land treatment systems shall be designed and operated to minimize the level of substances in the groundwater and to prevent exceedance of the groundwater preventive action limits (PAL) to the extent technically and economically feasible. Register, June, 1990, No. 414

nomically feasible. Groundwater preventive action limits are listed in ss. NR 140.10 and 140.12.

(2) **RESPONSES WHEN THE PREVENTIVE ACTION LIMIT IS EXCEEDED.** For a facility where a PAL has been exceeded in a groundwater monitoring well, the department may require a variety of responses as listed in Table 5 of ch. NR 140, such as requiring a change in the operation or design of the treatment system, requiring clean-up of the groundwater, or granting an exemption from the limit in accordance with s. NR 140.28. An exemption may be granted only after the department determines that the concentration of the substance in the groundwater has been minimized to the extent technically and economically feasible. Best management practices, waste reduction, wastewater pretreatment and alternative treatment systems used by other dischargers within the same industrial category will be considered in making the determination of what is technically and economically feasible.

(3) **RESPONSES WHEN THE ENFORCEMENT STANDARD IS EXCEEDED.** For a facility where an enforcement standard has been exceeded at a point of standards application, the department may require a variety of responses as listed in Table 6 of ch. NR 140, such as requiring a change in the operation or design of the treatment system, requiring an alternate treatment system, requiring clean-up of the groundwater, or requiring closure of the land treatment system. An exemption may be granted in accordance with s. NR 140.28 only after it has been determined that the background concentration of the substance in the groundwater has caused exceedence of the enforcement standard.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.08 Abandonment. Land treatment systems, which will no longer be used, shall be properly abandoned within 2 years of the date on which waste material was last applied. The department may require a plan that includes removal and proper disposal of any accumulated solid matter and any landscaping necessary to prevent groundwater impacts, accumulation of standing water or runoff. The department may require groundwater monitoring for a period of time after abandonment of the land treatment system to assess groundwater impacts. Any groundwater monitoring wells which are no longer necessary shall be abandoned in accordance with ch. NR 141.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.09 Sampling and analytical methods. Unless otherwise specified in the WPDES permit for a land treatment system:

(1) The procedures for measuring flow and taking samples of discharges shall be those in ch. NR 218,

(2) The methods of analysis for substances contained in discharges shall be those specified in ch. NR 219, and

(3) All laboratory monitoring data which is submitted to the department shall include a certification that the laboratory adhered to the provisions of ch. NR 149, which specifies minimum requirements and criteria for laboratory methodology, quality control procedures, and records keeping procedures.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

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NR 214.10 General permits. Under s. 147.023, Stats., the department may issue a general or statewide WPDES permit for discharges from specified categories or classes of point sources. The department is considering the issuance of general WPDES permits to cover certain classes of land treatment systems, such as low volume liquid waste or by-product solid landspreading. Information to determine eligibility for coverage under a general WPDES permit shall be submitted before the facility is authorized by the department to discharge under the general permit. Any person who has an individual WPDES permit for a discharge is not covered by a general WPDES permit for that discharge. The department may withdraw a discharge from the coverage of a general WPDES permit and issue an individual WPDES permit pursuant to s. 147.023, Stats., on its own motion, or upon the petition of any general permittee, affected state, or 5 or more persons affected by the disposal practices of a general permittee. If the department determines that a discharge covered by a general WPDES permit is better regulated by a specific WPDES permit, it shall notify the affected person in writing of the need to apply for a specific permit and shall provide the person with an application form. Any person so notified shall submit that application form within 60 days of receipt of the notice and application form.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

Subchapter II — Requirements for Specific Land Treatment Systems

NR 214.12 Absorption pond systems. (1) SITE LOCATION CRITERIA. (a) The absorption pond system shall be located at least 500 feet from the nearest inhabited dwelling, except that this distance may be reduced with the written consent of any affected owners and occupants. The department may require a greater distance depending on the potential for aesthetic and public health impacts.

(b) The system shall be located at least 1,000 feet from a well serving a community public water supply system and at least 250 feet from other potable water supply wells.

(c) The bottom of the absorption pond shall be at least 5 feet from bedrock and the calculated groundwater level. The calculated groundwater level is the elevation of the natural groundwater level plus the calculated mound height.

(d) The system may not be located in the floodway as specified in ch. NR 116. Any system located in the floodplain shall conform to ch. NR 116 and may not be operated when the floodplain is flooded.

(e) Systems shall be constructed in locations other than groundwater recharge areas, whenever possible.

(2) DESIGN AND CONSTRUCTION CRITERIA. (a) Absorption pond systems shall consist of either 2 or more cells which can be alternately loaded and rested, or one cell preceded by an effluent storage or stabilization pond system. Where only one cell is provided, the storage or stabilization pond shall be operated on a fill and draw basis and have sufficient capacity to allow intermittent loading of the absorption pond.

(b) In systems with more than one cell, the wastewater distribution system shall be arranged so that individual cells within the absorption

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pond system can be taken out of service for resting without interrupting the discharge to the remaining cells.

(c) The wastewater discharge system shall be designed to provide even distribution and prevent erosion of the pond bottom.

(d) The shape of each absorption cell shall be such that there are no narrow or elongated portions and no islands, peninsulas or coves.

(e) The minimum top width of an embankment or dike shall be 8 feet. Outside embankment and dike slopes may not be steeper than 3 horizontal to one vertical and shall be properly seeded with a mixture of perennial grasses to prevent erosion. Inside embankments and dikes may not be steeper than 2 horizontal to one vertical and shall be ripped to prevent erosion.

(f) The bottom of the absorption pond shall be level.

(g) The system shall be constructed in such a manner as to prevent surface runoff from entering the system.

(h) Precautions shall be taken during construction of the system to minimize compaction of absorption areas to prevent a reduction in soil infiltration rate. Project specifications shall detail the specific precautions which will be taken.

(i) Erosion control measures shall be taken during construction to prevent erosion of soil into a surface water.

(3) **DISCHARGE LIMITATIONS.** (a) The discharge to an absorption pond system may not exceed the hydraulic, organic, nitrogen, chloride or other limitations specified in a WPD ES permit or plans developed pursuant to a permit requirement. In determining discharge limitations, the department shall consider past operating performance, the ability of the soils to treat the pollutants in the discharge, hydrogeologic characteristics of the site such as permeability and infiltration rates, and other relevant information.

(b) The concentration of any wastewater parameter that may impact groundwater quality shall be limited at the point of discharge to a value that will minimize the concentration of the substance in the groundwater to the extent technically and economically feasible and prevent exceedance of the preventive action limit (PAL) in the groundwater. This will be especially important for parameters, such as dissolved chloride, that do not receive significant treatment in the system.

(c) Since all forms of nitrogen in wastewater can be converted to nitrate-nitrogen in the groundwater moving away from an absorption pond, the average concentration of the sum of all nitrogen species in the absorption pond discharge shall be limited to a value that will minimize the concentration of nitrate-nitrogen in the groundwater to the extent technically and economically feasible and will prevent exceedance of the nitrate plus nitrite-nitrogen PAL in the groundwater.

(d) The average concentration of BOD₅ discharged to an absorption pond system shall be restricted to the amount that can be removed in the treatment system.

(e) The hydraulic application rate shall be established based on hydrogeologic conditions, soil texture, soil permeability and waste char-

acteristics. Systems which are to receive more than 10,000 gallons per acre per day are required to perform additional soil testing requirements as specified in s. NR 214.20 (7).

(f) Discharge to the system shall be limited so that the discharge volume combined with the precipitation from a 10-year frequency, 24-hour duration rainfall event does not reduce the available freeboard to less than one foot below the top of the dike.

(g) No discharge to the system may have physical or chemical characteristics which prevent the proper operation of the system.

(4) **DISCHARGE MONITORING REQUIREMENTS.** (a) The discharge to each absorption pond cell shall be monitored for total daily discharge volume.

(b) The department may require in a WPDES permit that the discharge be monitored for BOD₅, total suspended solids, forms of nitrogen, chloride, metals or any other pollutant that may be present. The department shall select the pollutants to be monitored and the required frequency of monitoring on a case-by-case basis by considering the potential public health impacts, probable environmental impact, soil and geologic conditions, past operating performance, concentrations and characteristics of pollutants in the discharge and other relevant information.

(5) **OPERATING REQUIREMENTS.** (a) The absorption pond cells shall be loaded intermittently to allow sufficient resting periods to maintain the absorptive capacity of the soil.

(b) **Management plan.** The department shall require each absorption pond system owner or operator to submit a management plan for optimizing treatment system performance and demonstrating compliance with the requirements of this chapter. Following approval by the department, the treatment system shall be operated in conformance with the management plan. If the facility wishes to operate differently than specified in the approved plan, a written request shall be submitted to the department for approval to amend the management plan. The plan shall specify information on pretreatment processes, load and rest schedules, scheduled maintenance, weed control and removal, operational strategies for periods of adverse weather, monitoring procedures and any other pertinent information.

(6) **SOIL INVESTIGATION AND GROUNDWATER MONITORING REQUIREMENTS.** The soil investigation and groundwater monitoring requirements for absorption pond systems are specified in ss. NR 214.20 and 214.21.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.13 Ridge and furrow systems. (1) **SITE LOCATION CRITERIA.** (a) The ridge and furrow system shall be located at least 500 feet from the nearest inhabited dwelling, except that this distance may be reduced with the written consent of any affected owners and occupants. The department may require a greater distance depending on the potential for aesthetic and public health impacts.

(b) The ridge and furrow system shall be located at least 1,000 feet from a well serving a community public water supply system and at least 250 feet from other potable water supply wells.

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(c) The bottom of the furrows shall be at least 5 feet above bedrock and groundwater.

(d) The system may not be located in the floodway as specified in ch. NR 116. Any system located in the floodplain shall conform to ch. NR 116 and may not be operated when the floodplain is flooded.

(2) DESIGN AND CONSTRUCTION CRITERIA. (a) Ridge and furrow systems shall be constructed on sites with soils having 50% or more of the soil particles passing a No. 200 sieve, except that coarser textured soils may be approved on a case-by-case basis depending on system design and wastewater strength. Suitable soils shall extend at least 3 feet below the base grade of the furrow bottoms.

(b) The system shall consist of at least 2 cells which can be alternately loaded and rested, unless there is sufficient storage or pretreatment to allow loading and resting of a single cell.

(c) The system shall be sized and constructed in order to allow sufficient resting to allow soil conditions to become unsaturated and aerobic prior to being loaded.

(d) The shape of each ridge and furrow cell within the system shall be such that a minimum of soil disturbance is necessary to form the system.

(e) The wastewater distribution system shall be constructed so that individual cells within the system can be taken out of service for resting without interrupting the discharge to the remaining cells.

(f) The ridge and furrow system shall be constructed in a manner which provides equal liquid distribution during loading of each cell. The header ditch shall be designed to allow complete drainage after each wastewater loading or lined to prevent wastewater seepage. The header ditch drainage and the grading of the furrows for equal liquid distribution shall be tested before seeding the ridges with grasses.

(g) All outside embankments and dikes may not be steeper than 3 horizontal to one vertical. Inside embankments and dikes may not be steeper than 2 horizontal to one vertical. All embankments and dikes shall be properly seeded with perennial grasses to prevent erosion.

(h) All ridge tops shall be a minimum of 6 feet wide to allow mechanical removal of grasses.

(i) The furrows of the ridge and furrow system shall be one foot deep and one foot wide at the furrow bottom.

(j) Furrow side slopes may not be steeper than one horizontal to 2 vertical.

(k) All areas within a ridge and furrow system shall be accessible for maintenance equipment.

(l) The system shall be constructed to prevent surface runoff from entering the system.

(m) The ridges shall be seeded with perennial grasses which are suited to wet soil conditions. A nurse crop shall be used to seed new or modified systems. In addition, the grass cover shall be established to at least a 2-inch length before the system is used for wastewater treatment.

(n) Precautions shall be taken during construction to minimize compaction of absorption areas to prevent a reduction in soil infiltration rate. Project specifications shall detail the specific precautions which will be taken.

(o) Erosion control measures shall be taken during construction to prevent erosion of soil into a surface water.

(3) **DISCHARGE LIMITATIONS.** (a) The discharge to a ridge and furrow system may not exceed the hydraulic, organic, nitrogen, chloride or other limitations specified in a WPDES permit or plans developed pursuant to a permit requirement. In determining discharge limitations, the department shall consider past operating performance, the ability of the soils to treat the pollutants in the discharge, hydrogeologic characteristics of the site such as permeability and infiltration rates, and other relevant information.

(b) The concentration of any wastewater parameter that may impact groundwater quality shall be limited at the point of discharge to a value that will minimize the concentration of the substance in the groundwater to the extent technically and economically feasible and will prevent exceedance of the preventive action limit (PAL) in the groundwater. This will be especially important for parameters, such as dissolved chloride, that do not receive significant treatment in the system.

(c) The total pounds of nitrogen applied per acre per year shall be limited to the annual nitrogen need of the cover crop plus demonstrable nitrogen losses, such as from denitrification or ammonia volatilization occurring in the treatment system. Determination of the annual pounds of nitrogen applied to the land treatment system shall include the nitrogen supplied by the wastewater, organic nitrogen becoming available to plants and any supplemental fertilizers used.

(d) The average hydraulic application rate may not exceed 10,000 gallons per acre per day for the system.

Note: Based upon the department's experience, the recommended range for the average hydraulic application rate for ridge and furrow systems is 2,000 to 5,000 gallons per acre per day.

(e) Discharge to the system shall be limited so that the discharge volume combined with the precipitation from a 10-year frequency, 24-hour duration rainfall event does not overflow the boundary of the system.

(f) The volume of discharge shall be limited to prevent inundation of the ridges except for temporary conditions following precipitation events.

(4) **DISCHARGE MONITORING REQUIREMENTS.** (a) The discharge to each cell of the ridge and furrow system shall be monitored for total daily flow.

(b) The department may require in a WPDES permit that the discharge be monitored for BOD₅, total suspended solids, forms of nitrogen, chloride, metals or any other pollutant that may be present. The department shall select the pollutants to be monitored and the required frequency of monitoring on a case-by-case basis by considering the potential public health impacts, probable environmental impact, soil and geologic conditions, past operating performance, concentrations and characteristics of pollutants in the discharge and other relevant information.

(5) **OPERATING REQUIREMENTS.** (a) Each spring, the ridge top grasses shall be either cut and removed, or the grasses shall be burned. In addition, the grasses shall be cut and if possible removed at least once later in the growing season.

(b) The discharge shall be alternately distributed to individual sections of the ridge and furrow system to allow sufficient resting periods to maintain the treatment capability of the soil.

(c) The system shall be operated so that individual ridge and furrow sections have sufficient resting to allow soil conditions to become unsaturated and aerobic prior to being loaded.

(d) The system may be used only when at least 5 feet of separation exists between the bottom of the furrows and the groundwater.

(e) **Management plan.** The department shall require each ridge and furrow system owner or operator to submit a management plan for optimizing treatment system performance and demonstrating compliance with the requirements of this chapter. Following approval by the department, the treatment system shall be operated in conformance with the management plan. If the facility wishes to operate differently than specified in the approved plan, a written request shall be submitted to the department for approval to amend the management plan. The plan shall specify information on pretreatment processes, load and rest schedules, scheduled maintenance, vegetative cover control and removal, operational strategies for periods of adverse weather, monitoring procedures and any other pertinent information.

(6) **SOIL INVESTIGATION AND GROUNDWATER MONITORING REQUIREMENTS.** The soil investigation and groundwater monitoring requirements for ridge and furrow systems are specified in ss. NR 214.20 and 214.21.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.14 Spray irrigation systems. (1) **SITE LOCATION CRITERIA.** (a) A spray irrigation system shall be located at least 1,000 feet from a well serving a community public water supply system and at least 250 feet from other potable water supply wells.

(b) The nearest edge of wastewater spray shall be separated by at least 500 feet from the nearest inhabited dwelling, except that this distance may be reduced with the written consent of any affected owners and occupants. The department may require a greater distance depending on the type of distribution system and potential for aesthetic and public health impacts.

(c) The ground surface of the system shall have a minimum separation distance to bedrock and groundwater of at least 5 feet.

(d) A spray irrigation system may not be located in the floodway as specified in ch. NR 116. Any system located in the floodplain shall conform to ch. NR 116 and may not be operated when the floodplain is flooded.

(2) **DESIGN AND CONSTRUCTION CRITERIA.** (a) The spray application of wastewater to the land surface shall be designed to prevent ponding or runoff and to incorporate a load/rest cycle that optimizes wastewater treatment on the site. The wastewater application intensity shall be limited to the rate that can infiltrate into the soil surface as it is sprayed.

The wastewater loading volume shall be designed so the wastewater will be absorbed and held in the top foot of the soil column for treatment. Following wastewater loading, the acreage shall be rested to provide time for soil organisms to biologically decompose organic pollutants in the wastewater, for organic solids on the ground surface to decompose and for the soil column to reerate.

(b) Table 1 provides values acceptable to the department for the intensity of wastewater spray and the wastewater application volumes for specific soil textures under optimum conditions. Alternate values that can be justified through soil testing results may be approved by the department. The volume applied and the intensity sprayed may be restricted by the department to values less than those listed in Table 1 if site conditions warrant.

Table 1

Soil Texture (USDA - SCS)	Maximum Volume Applied Per Load Cycle	Maximum Intensity of Application
Sands	0.65 inches	1.00 in/hr
Sandy Loams	0.90 inches	0.90 in/hr
Loams	1.30 inches	0.45 in/hr
Silt Loams	1.40 inches	0.45 in/hr
Clay Loams	1.10 inches	0.40 in/hr
Clays	0.70 inches	0.40 in/hr

(c) The spray irrigation equipment shall be capable of isolating individual sections of the treatment system for resting without interrupting discharge to acreage scheduled to be loaded with wastewater.

(d) The spray nozzles shall be arranged so that the wastewater will be evenly distributed over the acreage being loaded.

(e) The spray nozzle openings shall be sized to prevent plugging and located as near to the ground surface as practical to minimize wind drift of the wastewater.

(f) The spray irrigation system shall be seeded with a mixture of perennial grasses, such as reed canary grass, tall fescue and orchard grass. New seedings shall also contain a nurse crop. The department may approve the use of other types of cover crops but will restrict the use of such sites to times when the cover crop is actively growing. There shall be sufficient land area with a grass cover crop to adequately treat wastewater flows during wet weather conditions.

(g) The department may require reduced hydraulic application rates or grass buffer strips, or both around the perimeter of the site to absorb runoff during rainfall events.

(3) DISCHARGE LIMITATIONS. (a) The discharge to a spray irrigation system may not exceed the hydraulic, organic, nitrogen, chloride or other limitations specified in a WPDES permit or plans developed pursuant to a permit requirement. In determining discharge limitations, the department shall consider past operating performance, the ability of the soils to treat pollutants in the discharge, the ability of the vegetative cover to take up nutrients, hydrogeologic characteristics of the site such as permeability and infiltration rates, and other relevant information.

(b) The concentration of any wastewater parameter that may impact groundwater quality shall be limited at the point of discharge to a value that will minimize the concentration of the substance in the groundwater to the extent technically and economically feasible and will prevent exceedance of the preventive action limit (PAL) in the groundwater. This will be especially important for parameters, such as dissolved chloride, that do not receive significant treatment in the system.

(c) The total pounds of nitrogen applied per acre per year shall be limited to the annual nitrogen need of the cover crop plus demonstrable nitrogen losses, such as from denitrification or ammonia volatilization occurring in the treatment system. Determination of the annual pounds of nitrogen applied to the land treatment system shall include the nitrogen supplied by the wastewater, organic nitrogen becoming available to plants and any supplemental fertilizers used.

(d) The hydraulic application rate for each system shall be based on topography, cover crop, wastewater characteristics, hydrogeologic conditions, and soil texture, permeability and cation exchange capacity. The average hydraulic application rate may not exceed 10,000 gallons per acre per day.

Note: Based upon the department's experience, the recommended range for a spray irrigation system average hydraulic application rate is 2,000 to 7,000 gallons per acre per day.

(e) The intensity of irrigation spray shall be limited on a day-to-day basis to prevent ponding, except for temporary conditions following rainfall events.

(f) Wastewater spraying shall be limited to prevent the runoff of any wastewater mixed with rainwater. Wastewater may not be sprayed during any rainfall event that causes runoff from the site. Uncontaminated storm water may be allowed to drain from a spray irrigation field.

(g) The department may restrict spray irrigation during times of the year when the cover crop is dormant or not actively taking up water and nutrients.

(h) The department may limit the fecal coliform bacteria in the discharge from meat and poultry processing operations to protect human and animal health.

(4) DISCHARGE MONITORING REQUIREMENTS. (a) The discharge to spray irrigation systems shall be monitored for total daily flow.

(b) The department may require in a WPDES permit that the discharge be monitored for BOD₅, total suspended solids, forms of nitrogen, chloride, metals or any other pollutant that may be present. The department shall select the pollutants to be monitored and the required frequency of monitoring on a case-by-case basis by considering the potential public health impacts, probable environmental impact, soil and geologic conditions, past operating performance, concentrations and characteristics of pollutants in the discharge and other relevant information.

(5) OPERATING REQUIREMENTS. (a) Spray irrigation systems shall be operated in a load/rest cycle that will provide time for the soil organisms to biologically decompose the organic pollutants in the wastewater, for organic solids on the ground surface to decompose and for the soil column to reerate.

(b) The spray irrigation system cover crop shall be cut and removed at least twice a year to stimulate growth of vegetation and removal of nutrients from the system. Corn or other crops may be harvested only once as long as the applied nutrients are limited accordingly.

(c) The soil at each individual spray irrigation field shall be tested annually for available nitrogen, available phosphorus, available potassium and pH. The results of these analyses shall be submitted to the department and used to determine if the nutrients applied to the site are meeting the agronomic needs of the cover crop.

(d) Management plan. The department shall require each spray irrigation system owner or operator to submit a management plan for optimizing treatment system performance and demonstrating compliance with the requirements of this chapter. Following approval by the department, the treatment system shall be operated in conformance with the management plan. If the facility wishes to operate differently than specified in the approved plan, a written request shall be submitted to the department for approval to amend the management plan. The plan shall specify information on pretreatment processes, load and rest schedules, scheduled maintenance, vegetative cover management and removal, scheduling of annual soil nutrient testing, operational strategies for periods of adverse weather, monitoring procedures and any other pertinent information.

(6) SOIL INVESTIGATION AND GROUNDWATER MONITORING REQUIREMENTS. The soil investigation and groundwater monitoring requirements for spray irrigation systems are specified in ss. NR 214.20 and 214.21.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.15 Overland flow systems. (1) SITE LOCATION CRITERIA. (a) An overland flow system shall be located at least 500 feet from the nearest inhabited dwelling, except that this distance may be reduced with the written consent of any affected owners and occupants. The department may require a greater distance depending on the type of system and potential for aesthetic and public health impacts.

(b) An overland flow system shall be located at least 1,000 feet from a well serving a community public water supply system and at least 250 feet from other potable water supply wells.

(c) The ground surface of the system shall have a minimum separation distance to bedrock and groundwater of at least 5 feet.

(d) The system may not be located in the floodway as specified in ch. NR 116. Any system located in the floodplain shall conform to ch. NR 116 and may not be operated when the floodplain is flooded.

(2) DESIGN AND CONSTRUCTION CRITERIA. (a) Overland flow systems shall be underlain by at least one foot of heavy textured soils such as clays or clay loams to retard leakage through the base.

(b) The downslope flow distance shall be 100 feet or greater.

(c) The downslope gradient for the overland flow fields shall be between 2% and 8%.

(d) The system shall consist of at least 2 cells of approximately equal area which can be alternately loaded and rested. Where self-propelled

equipment which operates on a continuous basis is installed and division into identifiable cells is impossible, its movement shall be regulated to provide alternate loading and resting of the soil.

Note: It is recommended that an overland flow cell be rested for at least one third of the total time in the load/rest cycle.

(e) The overland flow treatment system design shall evaluate the interaction between the primary factors influencing system performance and efficiency, such as temperature, downslope flow distance, wastewater hydraulic application rate and the rest period, to optimize treatment on the site.

(f) The overland flow system shall be arranged so that individual cells within the system can be taken out of service for resting without interrupting the discharge to the remaining cells.

(g) The distribution equipment shall be arranged so that the wastewater will be evenly distributed over the entire area of an overland flow cell and the wastewater travels down the slope in non-channelized flow.

(h) The wastewater distribution equipment shall be located at or near the ground level.

Note: A pressurized distribution system is recommended for ease of operation.

(i) The wastewater distribution system shall be designed to allow easy cleaning of the distribution orifices. Flexibility to adjust the flow from individual orifices shall be provided to allow the system to be hydraulically balanced to minimize flow channeling.

(j) An impermeable channel shall be provided for collecting runoff from the overland flow fields. The collection system shall be able to remove the effluent and the rain from a 10-year frequency, 24-hour duration rainfall event with only temporary backing up of water onto the fields.

(k) The overland flow fields shall be vegetated with a water tolerant mixed perennial grass cover crop such as reed canary grass, tall fescue and orchard grass. A nurse crop shall be used to establish the perennial grass cover. The grass cover shall be maintained by frequent resting.

(l) Erosion control measures shall be taken during construction to prevent erosion of soil into a surface water.

(3) DISCHARGE LIMITATIONS. (a) The discharge to an overland flow system may not exceed the hydraulic, organic, nitrogen or other limitations specified in a WPDES permit or plans developed pursuant to a permit requirement. In determining discharge limitations, the department shall consider past operating performance, the ability of the system to treat the pollutants in the discharge, hydrogeologic characteristics of the site such as permeability and infiltration rates and other relevant information.

(b) The flow rates in Table 2 shall be used as a guide to establish discharge limitations. The discharge flow rate is expressed as a flow per unit width of slope.

Table 2

Design	Discharge Flow Rate
Conservative	0.16 gpm/ft
Average	0.33 gpm/ft
Maximum	0.60 gpm/ft

(c) The concentration of any wastewater parameter that may impact groundwater quality shall be limited at the point of discharge to a value that will minimize the concentration of the substance in the groundwater to the extent technically and economically feasible and will prevent exceedance of the preventive action limit in the groundwater.

(d) The discharge flow rate shall be limited to prevent erosion when the vegetative cover has not developed sufficiently to anchor the soil and create the filter mat necessary for effective wastewater treatment. This condition may occur during original or springtime system startup.

(e) Winter operation may be allowed as long as the soil surface remains unfrozen. Since treatment efficiency decreases in the winter, the department may require storage or additional treatment of the runoff during cold weather.

(4) DISCHARGE MONITORING REQUIREMENTS. (a) The overland flow system discharge shall be monitored for total daily flow.

(b) The department may require in a WPDES permit that the discharge be monitored for BOD₅, total suspended solids, forms of nitrogen, chloride, metals or any other pollutant that may be present. The department shall select the pollutants to be monitored and the required frequency of monitoring on a case-by-case basis by considering the potential public health impacts, probable environmental impact, soil and geologic conditions, past operating performance, concentrations and characteristics of pollutants in the discharge and other relevant information.

(5) OPERATING REQUIREMENTS. (a) The discharge shall be alternately distributed to individual sections of the system in a regular load/rest cycle that allows sufficient resting to dry accumulated solids and maintain a complete grass cover.

(b) The crop shall be cut and the cuttings removed at least twice per year, to stimulate grass growth and enhance nutrient removal from the system.

(c) The department shall require each overland flow system owner or operator to submit a management plan for optimizing treatment system performance and demonstrating compliance with the requirements of this chapter. Following approval by the department, the treatment system shall be operated in conformance with the management plan. If the facility wishes to operate differently than specified in the approved plan, a written request shall be submitted to the department for approval to amend the management plan. The plan shall specify information on pre-treatment processes, load and rest schedules, scheduled maintenance, vegetative cover management and removal, operational strategies for periods of adverse weather, monitoring procedures and any other pertinent information.

(6) **SOIL INVESTIGATION AND GROUNDWATER MONITORING REQUIREMENTS.** The soil investigation and groundwater monitoring requirements for overland flow systems are specified in ss. NR 214.20 and 214.21.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.16 Subsurface absorption systems. Subsurface absorption systems may not be used to treat commercial laundry, laundromat, motor vehicle cleaning and motor vehicle maintenance wastewaters unless the owner or operator can demonstrate and the department determines that specific factors exist which will allow the wastewater to be adequately treated in a subsurface absorption system.

(1) **SITE LOCATION CRITERIA.** (a) A subsurface absorption system shall be located at least 25 feet from the nearest inhabited dwelling and 5 feet from any property boundary.

(b) The system shall be located at least 1,000 feet from a well serving a community public water supply system and at least 250 feet from other potable water supply wells.

(c) The bottom of the soil absorption system may not be closer than 5 feet to bedrock or groundwater.

(d) A new subsurface absorption system may not be located in the floodway as specified in s. ILHR 83.04. Section ILHR 83.04 also contains requirements for replacement of existing systems in the floodway, and for systems in the flood fringe and floodplain.

(2) **DESIGN AND CONSTRUCTION CRITERIA.** (a) The system shall be constructed to prevent surface runoff from entering the system.

(b) Precautions shall be taken during construction of the absorption field system to minimize compaction of absorption areas to prevent a reduction in soil infiltration rate. Project specifications shall detail the specific precautions which will be taken.

(c) Erosion control measures shall be taken during construction to prevent erosion of soil into a surface water.

(d) A conventional subsurface soil absorption system shall be constructed in accordance with design criteria contained in s. ILHR 83.13.

(e) A subsurface pressure distribution system shall be constructed in accordance with design criteria contained in s. ILHR 83.14.

(f) A subsurface mound system shall be constructed in accordance with design criteria contained in s. ILHR 83.23.

(3) **DISCHARGE LIMITATIONS.** (a) The discharge to a subsurface absorption system may not exceed the hydraulic, organic, nitrogen, chloride or other limitations specified in the WPDES permit or plans developed pursuant to a permit requirement. In determining discharge limitations, the department shall consider past operating performance, the ability of the soils to treat the pollutants in the discharge, hydrogeologic characteristics of the site such as permeability and infiltration rates and other relevant information.

(b) The concentration of any wastewater parameter that may impact groundwater quality shall be limited at the point of discharge to a value that will minimize the concentration of the substance in the groundwater

to the extent technically and economically feasible and will prevent exceedance of the preventive action limit in the groundwater. This will be especially important for parameters, such as dissolved chloride, that do not receive significant treatment in the system.

(c) Prior to discharge to a subsurface absorption field, all wastewater shall be pretreated in a system approved by the department.

(d) The volume of discharge to the system shall be limited to prevent the discharge of liquid wastes to the ground surface, to an agricultural drain tile, to any waters of the state or back-up of the wastes into any structure served by the system.

(e) The monthly average hydraulic application rate may not exceed 10,000 gallons per acre per day for the system.

(4) **DISCHARGE MONITORING REQUIREMENTS.** (a) The discharge to the subsurface absorption system shall be monitored for total daily discharge volume.

(b) The department may require in a WPDES permit that the discharge to the system be monitored for BOD₅, total suspended solids, forms of nitrogen, chloride, metals or any other pollutant that may be present. The department shall select the pollutants to be monitored and the required frequency of monitoring on a case-by-case basis by considering the potential public health impacts, probable environmental impact, soil and geologic conditions, past operating performance, concentrations and characteristics of pollutants in the discharge and other relevant information.

(5) **OPERATING REQUIREMENTS.** The department shall require each system owner or operator to submit a management plan for optimizing treatment system performance and demonstrating compliance with the requirements of this chapter. Following approval by the department, the treatment system shall be operated in conformance with the management plan. If the facility wishes to operate differently than specified in the approved plan, a written request shall be submitted to the department for approval to amend the management plan. The plan shall specify information on pretreatment processes, monitoring procedures and any other pertinent information.

(6) **SOIL INVESTIGATION AND GROUNDWATER MONITORING REQUIREMENTS.** The soil investigation and groundwater monitoring requirements for subsurface absorption systems are specified in ss. NR 214.20 and 214.21.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.17 Landspreading systems for liquid wastes and by-product solids. (1) **EXEMPTION FOR LESS THAN 10% INDUSTRIAL WASTE IN MANURE PITS.** Industrial liquid wastes mixed into liquid manure at a volume less than 10% of the volume of the mixture at the time it is landspread may be exempted in writing by the department on a case-by-case basis from the requirements of s. NR 214.17 (2), (3), (4) and (7) if the liquid waste mixture has beneficial properties as a soil conditioner or fertilizer, is applied in accordance with accepted agricultural practices and does not cause detrimental effects. However, liquid manure storage facilities used to store less than 10% industrial liquid waste shall meet the USDA SCS technical bulletin section IV design criteria 313 (2/86) or 425

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(10/83) or equivalent sealing specifications acceptable to the department.

(2) **SITE LOCATION CRITERIA.** (a) All landspreading sites shall be approved by the department prior to waste spreading.

(b) Landspreading sites shall be located at least 500 feet from the nearest inhabited dwelling, except that this distance may be reduced to 200 feet if the waste is incorporated with the soil and any affected owners and occupants give their written consent for the reduced separation distance. The department may require a greater separation distance depending on the type of waste material and potential for aesthetic and public health impacts.

(c) Wastes may not be landspread closer than 1,000 feet from a well serving a community public water supply system and 250 feet from other potable water supply wells.

(d) Landspreading sites may not be located in the floodway as specified in ch. NR 116. Any site located in the floodplain shall conform to ch. NR 116 and may not be used when the floodplain is flooded.

(e) Landspreading sites shall be limited to cultivated cropland, tree plantations, pasture or hayland. Other sites may be reviewed and approved on a case-by-case basis.

(f) Landspreading sites shall be limited to a slope of 12% or less when the soil temperatures are above freezing. When the ground is frozen or snow covered, landspreading shall be restricted to sites with slopes of 2% or less. Sites with slopes of 2-6% may be approved for winter time spreading on a case-by-case basis.

(g) Wastes may not be landspread closer than 200 feet from any surface water, except that the minimum separation distance may be reduced, to a minimum of 100 feet, when a vegetative buffer strip is maintained between the site and the surface water. If the waste is incorporated with the soil, the separation distance from any surface water may be reduced to 50 feet.

(h) Landspreading sites shall have at least 36 inches of separation between the ground surface and bedrock or groundwater. However, the department may allow a reduced separation distance to a minimum of 18 inches on a case-by-case basis provided the rate of waste application is reduced.

(3) **VEHICLE AND STORAGE CRITERIA.** (a) Vehicles used for landspreading shall be equipped with a distribution system capable of spreading the waste evenly over the site.

(b) If the vehicle is equipped with a high pressure spray nozzle, the openings shall be sized to prevent plugging and located to minimize wind drift of the waste.

(c) Any system used for the storage or stacking of wastes prior to landspreading shall be designed and constructed in accordance with ch. NR 213, or other design criteria as approved in the landspreading management plan. Plans and specifications shall be submitted to the department for approval of such storage or stacking systems.

(d) Storage or stacking systems shall be sited and operated to minimize odors or other public nuisance conditions:

(4) DISCHARGE LIMITATIONS. (a) The discharge to a landspreading system may not exceed the hydraulic, organic, nitrogen, chloride or other limitations specified in the WPDES permit or plans developed pursuant to a permit requirement. In determining discharge limitations, the department shall consider the past operating performance, nutrient uptake of the cover crop, site conditions, the ability of the soils to treat the pollutants in the discharge, permeability and infiltration rate of the soil, other soil and geologic characteristics, the concentrations and characteristics of pollutants in the discharge and other relevant information.

(b) The concentration of any wastewater parameter that may impact groundwater quality shall be limited at the point of discharge to a value that will minimize the concentration of the substance in the groundwater to the extent technically and economically feasible and will prevent exceedance of the preventive action limit in the groundwater.

(c) Liquid wastes or by-product solids containing viable pathogens, such as those from meat or poultry processing operations, may not be applied on fields used for growing crops that may be consumed raw by humans.

(d) Discharge limitations for liquid wastes. 1. The volume of liquid waste landspread may not alter the characteristics or structure of the soil such that the crop is adversely affected or erosion or permeability problems occur.

2. The volume of liquid waste landspread shall be limited to prevent ponding, except for temporary conditions following rainfall events. If ponding occurs, all spreading shall cease immediately.

3. The volume of liquid waste landspread shall be limited to prevent runoff. If runoff occurs, all spreading shall cease immediately.

4. In order to prevent runoff or control odor, the department may require the waste to be incorporated into the soil.

5. The maximum daily volume of liquid waste applied shall be limited to 13,500 gallons per acre per day ($\frac{1}{2}$ inch) except that when the ground is frozen or snow covered it shall be limited to 6,800 gallons per acre per day ($\frac{1}{4}$ inch).

6. The maximum weekly volume of liquid waste applied shall be limited according to Table 3.

Table 3.

Maximum Weekly Volume of Liquid Waste to be Applied to
Landspreading Sites (gal/ac/wk or in/wk)

Soil Texture	18"-36" Depth to Groundwater or Bedrock	Greater than 36" Depth to Groundwater or Bedrock
Sand	6,750 (¼ in.)	13,500 (½ in.)
Sandy Loam	13,500 (½ in.)	27,000 (1 in.)
Loam	13,500 (½ in.)	27,000 (1 in.)
Silt Loam	13,500 (½ in.)	27,000 (1 in.)
Clay Loam	13,500 (½ in.)	20,000 (¾ in.)
Clay	6,750 (¼ in.)	13,500 (½ in.)

7. The total pounds of chloride applied shall be limited to 170 pounds per acre per year or 340 pounds per acre per 2 year period.

8. The total pounds of sodium applied may be limited to prevent alteration of soil properties or groundwater contamination.

9. The total pounds of nitrogen applied per acre per year shall be limited to the nitrogen needs of the cover crop minus any other nitrogen, including fertilizer or manure, added to the landspreading site. Nitrogen applied can be calculated on the basis of plant available nitrogen, as long as the release of nitrogen from the organic material is credited to future years.

10. For whey, not including whey by-products, where the nitrogen content has not been determined through sampling and analysis, the nitrogen application rate shall be limited by limiting the yearly hydraulic application rate for a site to 27,150 gallons per acre (1 inch) the first year, 20,360 gallons per acre (¾ inch) the second year, and 13,600 gallons per acre (½ inch) the third and succeeding years.

(e) Discharge limitations for by-product solids. 1. The volume of by-product solids landspread may not alter the characteristics or structure of the soil such that the crop is adversely affected or erosion or permeability problems occur.

2. The total quantity of by-product solids applied to the soil shall be within acceptable agricultural practices taking into account the carbon to nitrogen ratio, total nitrogen and the moisture content of the by-product solid.

3. The volume of by-product solids landspread shall be limited to prevent surface runoff of solids or leachate, leaching of contaminants to groundwater and objectionable odors.

4. The total pounds of chloride applied shall be limited to 170 pounds per acre per year or to 340 pounds per acre per 2 year period.

5. The total pounds of sodium applied may be limited to prevent alteration of soil properties or groundwater contamination.

6. The total pounds of nitrogen applied per acre per year shall be limited to the nitrogen needs of the cover crop minus any other nitrogen, including fertilizer or manure, added to the landspreading site. Nitrogen applied can be calculated on the basis of plant available nitrogen, as long

as the release of nitrogen from the organic material is credited to future years.

7. The by-product solids shall be plowed, disced, injected or otherwise incorporated into the surface soil layer as specified in the WPDES permit or approved management plan.

8. If it is necessary to stockpile solids in the field, the piles shall be spread within 72 hours or less as specified in the WPDES permit or management plan.

(5) **DISCHARGE MONITORING REQUIREMENTS.** (a) The discharge to landspreading systems shall be monitored for total daily discharge volume.

(b) The department may require in a WPDES permit that the discharge to the system be monitored for BOD₅, total suspended solids, forms of nitrogen, chloride, metals or any other pollutant that may be present. The department shall select the pollutants to be monitored and the required frequency of monitoring on a case-by-case basis by considering the potential public health impacts, probable environmental impact, soil and geologic conditions, past operating performance, concentrations and characteristics of pollutants in the discharge and other relevant information.

(6) **OPERATING REQUIREMENTS.** (a) Vehicles used for transporting or landspreading the waste shall be maintained to prevent spillage or leakage.

(b) The landspreading vehicle shall be moving forward at all times of application unless it is equipped with a high pressure spray nozzle which evenly distributes the waste over the land.

(c) **Management plan.** The department shall require each landspreading system owner or operator to submit a management plan for optimizing system performance and demonstrating compliance with the requirements of this chapter. Following approval by the department, the treatment system shall be operated in conformance with the management plan. If the facility wishes to operate differently than specified in the approved plan, a written request shall be submitted to the department for approval to amend the management plan. The plan shall specify information on pretreatment processes, site identification on plat and soil maps, aerial photographs, if available, description of all site limitations, vegetative cover management and removal, availability of storage, type of transporting and spreading vehicle, load and rest schedules, monitoring procedures, contingency plans for periods of adverse weather or odor or nuisance abatement and any other pertinent information.

(7) **SOILS INVESTIGATION AND GROUNDWATER MONITORING REQUIREMENTS.** Soil investigation and groundwater monitoring requirements are specified in ss. NR 214.20 and 214.21.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.18 Sludge spreading systems. (1) **APPLICABILITY.** Only sludges which have been exempted from regulation under ch. NR 518 and have been shown to have beneficial properties as a soil conditioner or fertilizer and not have detrimental effects on the soil, crops or groundwater may

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be spread on the land. A WPDES permit is required for the spreading of sludge on land.

(2) **SITE LOCATION CRITERIA.** (a) All sites shall be approved by the department prior to sludge being spread.

(b) Sludge may not be spread within 500 feet of any residence, except that this distance may be reduced to 200 feet if the sludge is incorporated with the soil and any affected owners and occupants give their written consent for the reduced separation distance.

(c) Sludge may not be spread within 1000 feet of a well serving a community public water supply system or within 250 feet of any other potable water supply well.

(d) Sludge may not be surface spread within 200 feet from any surface water course, dry run or wetlands, except that if a vegetative buffer strip is maintained between the site and the surface water, the department may approve a reduced separation distance to 100 feet. If the sludge is incorporated in the soil, the separation distance from any surface water may be reduced to a minimum of 50 feet.

(e) Sludge may not be spread on wetlands or on areas subject to flooding or ponding.

(f) Sludge spreading sites shall be limited to a slope of 12% or less when the soil temperatures are above freezing. When the ground is frozen or snow covered, the landspreading shall be restricted to sites with slopes of 2% or less. Sites with slopes of 2-6% may be approved for winter time spreading on a case-by-case basis.

(g) Sludge spreading sites shall have at least 36 inches of separation between the ground surface and bedrock or groundwater. However, the department may allow a reduced separation distance to a minimum of 18 inches on a case-by-case basis provided the rate of application is reduced.

(3) **VEHICLE AND STORAGE CRITERIA.** (a) Vehicles used for spreading shall be equipped with a distribution system capable of spreading the sludge evenly over the site.

(b) Any system used for the storage or stacking of sludge prior to spreading shall be designed and constructed in accordance with ch. NR 213, or other design criteria as approved in the sludge management plan. Plans and specifications shall be submitted to the department for approval of such storage or stacking systems.

(c) Storage or stacking systems shall be sited and operated to minimize odors or other public nuisance conditions.

(4) **DISCHARGE LIMITATIONS.** (a) The discharge to a sludge spreading site may not exceed the hydraulic, organic, nitrogen, chloride or other limitations specified in a WPDES permit or plans developed pursuant to a permit requirement. In determining discharge limitations, the department shall consider past operating performance, the ability of the soils to treat the pollutants in the discharge, nutrient uptake of the cover crops, hydrogeologic characteristics of the site such as permeability and infiltration rates, and other relevant information.

(b) The sludge application rate shall be limited so that any parameter that may impact groundwater quality is restricted to minimize the con-

centration of the substance in the groundwater to the extent technically and economically feasible and to prevent exceedance of the preventive action limit in the groundwater.

(c) In order to prevent surface runoff and leaching and to control objectionable odors, the department may require liquid sludge to be incorporated into the soil surface within a time period specified in the WPDES permit. Cake sludge shall be incorporated in the soil in accordance with the time period specified in the sludge spreading management plan.

(d) The total amount of any nutrient applied per year may not exceed the nutrient needs of the crop to be grown minus available nutrients in the soil or applied as fertilizer.

(e) The pH of the sludge and soil mixture shall be 6.5 or higher at the time that the sludge is spread. If the concentration of cadmium in the sludge is 2 mg/kg (dry weight) or less, the soil pH may be less than 6.5.

(f) No more than 0.45 pounds per acre of cadmium may be spread annually on land used for production of food chain crops.

(g) The cumulative amount of cadmium, copper, lead, nickel and zinc spread on any site may not exceed the levels listed in Table 4.

Table 4

Maximum Cumulative Cadmium, Copper, Lead, Nickel and Zinc Application for a Landspreading Site

	Soil Cation Exchange Capacity (meq/100g)			
	Less than 5 lbs/ac	5-10 lbs/ac	10-15 lbs/ac	Greater than 15 lbs/ac
Lead	445	890	1,335	1,750
Zinc	225	445	670	890
Copper	110	220	335	445
Nickel	45	90	135	180
Cadmium				
Soil pH < 6.5	4.5	4.5	4.5	4.5
Soil pH ≥ 6.5	4.5	9.0	13.5	18

(h) Sludge containing concentrations of PCBs equal to or greater than 10 mg/kg (dry weight) shall be incorporated into the soil when applied to land used for producing animal feed, including pasture crops for animals raised for the purpose of producing milk. The department may allow surface application of the sludge if it is assured that the PCB content is less than 0.2 mg/kg (actual weight) in animal feed or less than 1.5 mg/kg (fat basis) in milk from animals consuming the feed.

(i) The department may limit or prohibit the land application of sludges containing additional pollutants such as, but not limited to phenolics, pesticides and bioaccumulative organics. Any such limit or prohibition shall be based on waste characteristics, soil cation exchange capacity, type of crop grown and other relevant factors.

(5) DISCHARGE MONITORING REQUIREMENTS. (a) The discharge shall be monitored for total daily discharge volume.

(b) The department may require in a WPDES permit that the sludge spreading discharge be monitored for total suspended solids, forms of nitrogen, chloride, metals or any other pollutant that may be present. The department shall select the pollutants to be monitored and the required frequency of monitoring on a case-by-case basis by considering the potential public health impacts, probable environmental impact, soil and geologic conditions, past operating performance, concentrations and characteristics of pollutants in the discharge and other relevant information.

(c) The department may require the submittal of monitoring reports to include the following information for each site utilized during the reporting period:

1. The amount of sludge applied in tons per acre on a dry weight basis.
2. The amount of nitrogen applied in pounds per acre on a dry weight basis.
3. The amount of each metal applied in pounds per acre on a dry weight basis.
4. Other site monitoring information as specified in the sludge management plan or WPDES permit.
5. A description of any adverse environmental, health or social effects that occurred due to sludge application during the preceding reporting period.
6. A description of any violation of the sludge management plan.

(6) OPERATING REQUIREMENTS. (a) Spillage or leakage from vehicles used for transporting or spreading sludge shall be prevented.

(b) The vehicle shall be moving forward at all times of application unless it is equipped with a high pressure spray nozzle which evenly distributes the sludge over the land.

(c) Management plan. The department shall require each sludge spreading system owner or operator to submit a management plan for optimizing system performance and demonstrating compliance with the requirements of this chapter. Following approval by the department, the system shall be operated in conformance with the management plan. If the facility wishes to operate differently than specified in the approved plan, a written request shall be submitted to the department for approval to amend the management plan. The plan shall specify information on: sludge volumes and characteristics, beneficial or nondetrimental fertilizer or soil conditioner properties, production and pretreatment processes, description of all site limitations, vegetative cover control and removal, availability of storage, type of transportation and spreading vehicle, sludge application rates, load and rest schedules, contingency plans for periods of adverse weather, odor and nuisance abatement or any other pertinent information.

(7) SOIL INVESTIGATION AND GROUNDWATER MONITORING REQUIREMENTS. Soil investigation and groundwater monitoring requirements are specified in ss. NR 214.20 and 214.21.

Subchapter III — Site Investigation and Monitoring

NR 214.20 Soil investigation requirements. (1) APPLICABILITY. This section is applicable to all new, expanded or modified land treatment systems receiving liquid wastes, by-product solids and sludges from industrial facilities for which a plan approval under s. 144.04, Stats., and ch. NR 108 or a WPDES discharge permit under ch. 147, Stats., is required. It is also applicable to those existing dischargers which need to demonstrate according to s. NR 214.06 (1) that their land treatment system complies with groundwater protection requirements although the system does not meet each specific design standard.

(2) PROFESSIONAL QUALIFICATIONS. The department shall accept soil test pit evaluations, soil classifications and soil boring logs performed by a qualified soil scientist, engineer or other qualified individual. Qualifications shall include a degree from an accredited institution of higher education or field experience in soil investigation, interpretation and classification.

(3) TECHNICAL PROCEDURES. All technical procedures used to investigate a wastewater disposal facility shall be the current standard procedures as specified by the American society for testing and materials, United States geologic survey, standard methods for the examination of water and wastewater, or other equivalent or appropriate methods approved by the department. Test procedures used shall be specified. Any deviation from a standard method shall be explained in detail with reasons provided.

(4) SOIL EVALUATIONS FOR LANDSPREADING AND SLUDGE SPREADING SYSTEMS. The following soil related information shall be submitted for sludge spreading systems or landspreading systems for liquid waste or organic by-product solids:

(a) Individual treatment site locations identified on topographic maps, plat maps or aerial photographs,

(b) Relevant, existing soil survey information such as that assembled by the U.S. department of agriculture, soil conservation service including the soil names, percent slope, relative permeability, available water capacity, organic matter content and current land use,

(c) A detailed soils map displaying the location of the various soils on the site at a scale of not more than 2,000 feet to the inch,

(d) Laboratory determined or estimated soil cation exchange capacity,

(e) Agronomic soil nutrient testing results for making fertilizer and liming recommendations for cover crop growth using procedures such as those employed by the university of Wisconsin - cooperative extension program,

(f) Additional soil related information that may be required by the department on a case-by-case basis.

(5) TREATMENT SYSTEMS WHERE GROUNDWATER MONITORING WELLS ARE NOT REQUIRED. For absorption pond, ridge and furrow, spray irrigation, overland flow and subsurface absorption systems where groundwater monitoring wells are not required, or for those sites which are being investigated for potential future use as such systems, the soils

evaluation shall contain the following information and investigation, at a minimum:

(a) The location, soil survey, soil cation exchange capacity and soil nutrient content information as specified for landspreading systems in sub. (4).

(b) A sufficient number of soil test pits shall be excavated to adequately define the soil conditions found on the site.

1. Prior to soil test pit construction, the treatment site owner or operator and the department shall agree on the number and location of test pits to be excavated dependent upon the size of the land treatment site and uniformity of soils and geology.

2. The soil test pits shall be large enough to allow visual inspection and documentation of soil layers and shall be excavated to a depth of 5 feet below the final base grade of the system. The U.S. occupational health and safety administration requires that test pits with more than 5 feet of standing wall shall not be entered unless provision is made to prevent caving of the walls.

3. The department shall be notified at least 24 hours prior to excavation of the soil test pits to allow inspection by department personnel.

(c) Soil samples from the test pits shall be collected and analyzed at each significant change in soil characteristics or lithology for the following:

1. Soil textural classification in accordance with the U.S. department of agricultural classification system.

2. Particle size analysis performed in accordance with ASTM D422-72 to determine particle size distribution. With department approval, soil samples may be composited, or the particle size determined by a sieve analysis to reduce repetitive testing of similar soil samples.

3. The soil moisture holding capacity by direct measurement or as specified through reference to literature values for different soil textures.

(d) Following soil sample collection, the test pits shall be deepened to the extent practical with a backhoe to check for bedrock, the water table or for soil layers that would restrict the downward movement of water. This shall be visual check from the land surface, unless the test pits are protected from caving in accordance with U.S. occupational safety and health administration requirements. All soil test pits shall be refilled with excavated material following deepening for the bedrock, water table and impervious layer check.

(6) TREATMENT SYSTEMS WITH REQUIRED GROUNDWATER MONITORING. For land treatment systems where groundwater monitoring wells are required, the soils evaluation shall contain the following information and investigation, at a minimum:

(a) A preliminary site investigation report shall be assembled that contains the site location, soil survey, soil cation exchange capacity and soil nutrient content information as specified for landspreading systems in sub. (4). Also, a limited number of test pits may be constructed to provide preliminary soils information, such as that specified in sub. (5).

(b) The treatment system owner or operator shall submit the results of the preliminary site investigation and propose a full scale treatment site investigation plan.

(c) The full scale treatment site investigation shall consist of a combination of soil test pits and soil borings to adequately define the soil, groundwater and bedrock conditions at the site.

1. Prior to construction of test pits and soil borings, the treatment site owner or operator and the department shall agree on the number and location of soil borings and test pits dependent upon the size of the site and uniformity of soils and geology.

2. The soil test pits shall be investigated as specified in sub. (5).

3. The soil sampling in borings shall be performed in accordance with ASTM D1586-84 or ASTM D1587-83.

4. The soil borings shall extend to the groundwater table, be terminated upon encountering bedrock, or be drilled to a minimum depth agreed upon in the preliminary site investigation plan. The department may require the borings to extend to a minimum depth of 25 feet below the final base grade of the land treatment system when groundwater or bedrock is not encountered first.

(d) Soil samples which are above the normal groundwater level and are contained in the unsaturated zone shall be collected from the test pits and soil borings and analyzed at each significant change in soil characteristics or lithology as specified in sub. (5) (c). Hydrogeologic testing requirements are specified in s. NR 214.21 (2) (e).

(7) HIGH RATE ABSORPTION POND SYSTEMS. For absorption pond systems having a design hydraulic application rate greater than 10,000 gpd/acre, the minimum soil, groundwater and bedrock related information and requirements are those listed in sub. (6), with the following additional requirements:

(a) At least 2 saturated hydraulic conductivity tests shall be performed on the soils located at the final base grade of the system using a field permeability test. In some cases, the department may allow laboratory permeability tests on hydrated and saturated samples compacted at the same approximate density as exists in the in-field condition. These laboratory tests may be performed on molded or core samples, and separate tests shall be performed using tap water, wastewater or sludge extract. The permeability shall be based on stabilized inflow and outflow rates during the test. All preparation work and information detailing the test apparatus shall be submitted along with all results obtained.

(8) DATA PRESENTATION. The results from the subsurface investigation shall be presented in accordance with ch. NR 108 as follows:

(a) Existing site conditions and surrounding natural and man-made conditions shall be presented on a baseline topographic map.

(b) Cross-sections shall be developed and presented to illustrate subsurface geologic and geomorphic conditions. At least one cross-section shall be developed parallel to groundwater flow. The cross-sections shall present documented and inferred stratigraphic, soil, groundwater and

bedrock conditions of the site. Soil test pit and soil boring information shall be correlated to each cross-section developed.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.

NR 214.21 Groundwater monitoring requirements. (1) APPLICABILITY. The department may require the generator of a liquid waste, the owner or operator of a liquid waste land treatment system or an independent liquid waste-handling contractor, if applicable, to design and install a groundwater monitoring well system depending upon the type and strength of liquid waste, the volume of discharge, the type of land treatment system, the rate of discharge to the land treatment system and the site characteristics of the land treatment system. This section applies to discharges of liquid wastes and does not apply to sites used for spreading sludge or by-product solids; groundwater monitoring may be required around sludge or by-product solid spreading sites in special cases as specified in s. NR 214.05.

(a) For land treatment systems which receive liquid wastes and have a flow to land treatment equal to or greater than 1.0 million gallons per day, the generator of the wastewater, the independent contractor who uses the system or the owner or operator of the system shall install a comprehensive multi-level groundwater monitoring system. The monitoring system shall contain one or more well nests to monitor groundwater elevation, flow and quality.

(b) For absorption pond, ridge and furrow, spray irrigation and sub-surface absorption systems which receive any type of liquid waste and have a flow to land treatment of 15,000 gallons per day or more, but less than 1.0 million gallons per day, the generator of the wastewater, the independent contractor who uses the system or the owner or operator of the system shall install a single level groundwater monitoring system.

(c) The department may require the generator of the liquid waste, an independent contractor who uses the system or the owner or operator of a land treatment system which receives any flow of liquid wastes to install a single level or a multi-level groundwater monitoring well system. Factors to be considered for this determination include waste strength and characteristics, volume of waste, dosage schedule, geology of the area (depth to groundwater and bedrock), soil type, and the ratio of the groundwater flow velocity to the hydraulic application rate.

(d) The department may waive the requirement to install a groundwater monitoring well system for a land treatment system. Factors to be considered for granting this waiver may include: whether the system is operated at nutrient and hydraulic application rates which do not exceed the agronomic needs of the cover crop, whether the geology, soils and proposed hydraulic loading rate indicate that groundwater contamination is unlikely, the ratio of the groundwater flow velocity to the hydraulic application rate and the density of the waste material.

(2) DESIGN, CONSTRUCTION, INSTALLATION, TESTING, DOCUMENTATION AND ABANDONMENT OF MONITORING WELLS. (a) Groundwater monitoring systems shall be installed in accordance with approved plans and specifications. The department will accept plans and specifications prepared by and submitted under the signature of a qualified hydrogeologist, soil scientist, engineer or other qualified individual. Qualifications shall include a degree from an accredited institution of higher education and field ex-

perience on soil investigation, interpretation and classification of geologic or hydrogeologic information.

(b) Minimum acceptable standards for the design, construction, installation, documentation, development and abandonment of groundwater monitoring wells shall be in accordance with ch. NR 141.

(c) The groundwater monitoring well system shall consist of an adequate number of wells to define groundwater flow direction and to judge the groundwater impacts from land treatment on the site. A background monitoring well shall be located upgradient and far enough away from the land treatment system that no impact from the treatment system is measured. The other monitoring wells shall be located downgradient from the land treatment system in the possible directions of groundwater flow. In the event the groundwater flow direction is not known, the department may require the downgradient wells to be installed approximately equal distance from each other and around the perimeter of the system.

(d) Downgradient groundwater monitoring wells shall be located at least 10 feet beyond the outer edge of the waste application area. The department may require monitoring wells to be placed within, at or beyond the land treatment system design management zone.

(e) The groundwater monitoring wells shall be tested to provide information on the hydrogeology of the site.

1. The saturated hydraulic conductivity of the aquifer around at least 3 of the monitoring wells shall be estimated by performing in-field tests. All preparation work, analysis and information describing the use of the in-field test shall be submitted along with the results obtained. The test shall be of sufficient duration and include enough data to provide a representative estimate of the actual hydraulic conductivity.

2. The horizontal and, if possible, the vertical hydraulic gradient shall be calculated using measured groundwater elevations from on-site wells.

3. The aquifer thickness and type of bedrock shall be determined through use of reliable reference material or by actual measurement.

(e) As-built plans shall be submitted to the department after the wells are installed. The plans shall contain the following information:

1. A map shall be drawn to a specific scale and indicate the location of the land treatment system, all well location and elevation requirements as specified in s. NR 141.065, and the direction of groundwater flow. Land surface contours of the land treatment system and the elevations of the groundwater shall be referenced to the U.S. geological survey or the U.S. national geodetic survey.

2. Well and borehole construction documentation listed in s. NR 141.23.

(3) PLAN MAP. An 8½" by 11" plan map drawn to scale according to a horizontal grid system shall be submitted that indicates the location of the land treatment system, the adjacent property boundaries and the location of all wells, wetlands, streams and lakes within 0.5 miles of the land treatment system.

(4) GROUNDWATER SAMPLE COLLECTION, ANALYSIS AND MONITORING REQUIREMENTS. (a) All groundwater monitoring well samples shall be collected, preserved and analyzed in accordance with procedures specified by the department in the "groundwater sampling guidelines," dated February 1987, and in accordance with s. NR 140.16.

(b) All groundwater samples, except those analyzed for volatile organic compounds, shall be filtered through a standard 0.45 micron filter prior to analysis. If the groundwater sample is to be analyzed for metals, filtering shall be performed in the field immediately following sample collection. For all other types of analysis, filtering shall be performed in the field immediately following sample collection, unless the sample is cooled to 4°C and filtering is performed at the laboratory within 24 hours of sample collection.

(c) Sulfuric acid preservation of groundwater samples to be analyzed for the nitrogen series and nitric acid preservation of groundwater samples to be analyzed for metals shall be performed immediately after the sample is filtered.

(d) Monitoring shall be in accordance with the requirements of the plan approval or WPDES permit. For seasonal operations, groundwater monitoring shall be performed at a minimum of once prior to the startup of the land treatment system and 2 times during or within 2 months after the time the wastewater treatment system is used. The department shall specify in the WPDES permit the month during which the groundwater monitoring is to be performed and may adjust the frequency of groundwater monitoring for any land treatment system on a case-by-case basis.

(e) The department may require groundwater monitoring for any of the following parameters: elevation, depth to groundwater, organic nitrogen, ammonia nitrogen, nitrate and nitrite nitrogen, chlorides, sulfates, dissolved solids, alkalinity, hardness, field pH, field specific conductance, BOD₅, COD, sodium, calcium, magnesium, iron and manganese. Those facilities which have shown little or no measurable impact on groundwater quality may receive reduced parameter sampling requirements.

(f) Monitoring for any other pollutant parameters may be required on a case-by-case basis dependent on the waste characteristics of the wastewater applied to the land treatment system and the potential for groundwater contamination.

History: Cr. Register, June, 1990, No. 414, eff. 7-1-90.