ORDER OF THE STATE OF WISCONSIN NATURAL RESOURCES BOARD
AMENDING AND CREATING RULES

The Wisconsin Natural Resources Board proposes an order to amend ss. NR 504.06(5)(d), (e) and (t), 504.07(6)(a), and 520.04(4)(a); and to create ss. NR 500.03(100m), (120g), (120r), (124e), (185m) and (222m), 514.07(11), 504.06(5)(cm), (dm), (j)4., 5., (tm), (6), 506.07(8), 504.095, 506.135, 507.215, 512.09(6), 514.06(14m), 514.07(1)(L), (6)(c), (d), (7) to (9), 514.10, 516.07(2)(d), 516.08, and Table 5 of NR 520 pertaining to landfilling of solid waste.

WA-47-04

Analysis prepared by the Department of Natural Resources

1. Statutes Interpreted

ss. 289.24, 289.30 and 289.61, Stats.

2. Statutory Authority

ss. 289.05, 289.06 and 289.07, Stats.

3. Explanation of Agency Authority to Promulgate the Proposed Rule under the Statutory Authority

In ss. 289.05, 289.06 and 289.07, Stats., the department has the duty and authority to promulgate rules implementing ch 289, Stats., and to conduct or direct investigations and studies related to solid waste disposal.

4. Related Statute or Rule

None

5. Plain Language Analysis of the Proposed Rule

These proposed rule revisions will allow longer leachate lines in municipal solid waste (MSW) landfills, improve landfill design and construction standards, and require that measures be taken by MSW landfill owners to reduce the long-term risk of their landfills. The proposed rules also allow for approval of trials that may involve addition of liquids to foster quicker biodegradation, changes in final cover requirements, and introduction of run-on water from precipitation events.

6. Summary of and Preliminary Comparison of Existing or Proposed Federal Regulations that is Intended to Address the Activity to be Regulated by the Proposed Rule

No federal rules address the maximum length of leachate collection pipes. Federal rules allow recirculation of leachate and the introduction of other liquids on an experimental basis.

7. Comparison of Similar Rules in Adjacent States (MN, Iowa, IL and MI)

None of surrounding states' rules address the maximum length of leachate collection pipes. Leachate recirculation has been widely practiced in many states. All states are subject to the recently promulgated federal research, demonstration, and development (RD&D) rule.

8. Summary of the factual data and analysis methodologies that the agency used in support of the proposed rules and how any related findings support the regulatory approach chosen for the proposed rule.

The revised leachate collection length standard and proposals related to recirculation of leachate and introducing liquids into municipal solid waste landfills to facilitate quicker stability in the landfills were the product of work groups composed of department staff and external stakeholders. Many of the members have experience in numerous other states and countries. The cumulative solid waste management experience of the groups' members was multiple hundreds of years.

9. Any analysis and supporting documentation that the agency used in support of the agency's determination of the proposed rule's effect on small business under s. 227.114, Stats., or that was used when the agency prepared an economic impact report.

In the past (pre-1985), there were a large number of small landfills in Wisconsin. With the enactment of the Federal RCRA sub-title D regulations, small landfills started to close due to the requirement and the cost of compliance. Presently, there are no active landfills that meet the definition of a small business.

10. Anticipated Cost Incurred by Private Sector

The overall costs to counties and private companies that own, operate and develop landfills will be reduced. Allowing longer leachate lines (up to 2000 feet) will result in the following:

- Lower development cost per cubic yard of landfill volume and potentially lower disposal costs to landfill users,
- Reduced need to buy additional land to develop new landfills (better existing land use),
- Allow for better infra-structure use (associated roads, gas recovery, structures, etc.),
- Investment in construction materials, training, and labor to operate more complex landfill systems, and
- Potentially negative impacts on recycling interests.

11. Effect on Small Businesses

No small businesses are affected by this rule.

12. Agency Contact Person

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SECTION 1. NR 500.03(100m), (120g), (120r), (124e) and (222m) are created to read:

NR 500.03(100m) "HDPE" means high density polyethylene.

(120g) "Landfill organic stability" means a landfill has reached an organically stable state when landfill gas production has effectively ceased, landfill leachate levels have no significant organic component, the organic fraction of the waste mass will not readily decompose when placed in ideal moisture and temperature conditions, and there is no longer any measurable settlement of the landfill surface.

(120r) "Landfill stability" means a landfill has reached a stable state when maintenance and engineering systems are no longer necessary to protect human health and the environment.

(123m) "Leachate drainage basin" means the areal extent of the liner over which leachate gravity drains to a single extraction point, generally a sump and sideslope riser, as well as all of the waste vertically overlying this area.

(124e) "Leachate recirculation" means the controlled introduction into the waste mass of a landfill of leachate derived from the same landfill.

(185m) "PVC" means polyvinyl chloride.

SECTION 2. NR 504.06(5)(cm) is created to read:

NR 504.06(5)(cm) Pipe fittings selected for use with PVC and HDPE pipe shall be secured to the leachate collection pipe. PVC fittings and pipe shall be solvent-welded. HDPE fittings and pipe shall be fusion welded.

SECTION 3. NR 504.06(5)(d) is amended to read:

NR 504.06(5)(d) Leachate collection trenches for clay liners shall be designed as rectangular trenches. Leachate collection trenches for composite liners shall be designed as vee–trenches, with a minimum depth of 18 inches and with sideslopes no steeper than 3 horizontal to one vertical. The clay component of vee–trenches shall be smooth–drum rolled such that the clay in the trenches is smooth prior to placement of the membrane. ~~A geotextile shall be used to line the base and sidewalls of all leachate collection trenches and shall be placed directly over the geomembrane component of a composite liner or the clay component of a clay liner. The geotextile shall have a minimum weight of 12 oz/yd2, and may not be overlapped over the top of the trench.~~

SECTION 4. NR 504.06(5)(dm) is created to read:

NR 504.06(5)(dm) A geotextile shall be used to line the base and sidewalls of all leachate collection trenches and shall be placed directly over the geomembrane component of a composite liner or the clay component of a clay liner. The geotextile shall have a minimum weight of 12 oz/yd^2, and shall not be overlapped over the top of the trench. The geotextile specifications, including manufacturer's data for grab and puncture strength, shall be used to demonstrate that the geotextile can resist damage due to impact and puncture when aggregate is placed over the geotextile.

SECTION 5. NR 504.06(5)(e) is amended to read:

NR 504.06(5)(e) The bedding material utilized in backfilling the leachate collection pipe trenches shall have a uniformity coefficient of less than 4, a maximum particle diameter of 1½ inches, a maximum of 5% of the material which passes the number 4 sieve and consist of rounded to subangular gravel. A minimum depth of 4 inches of gravel shall be placed in the trenches prior to installation of the leachate pipes. The backfill shall also be placed such that a minimum of 6 inches of material exists above the top of the pipe and within the trenches. An additional ~~6~~ 12 inches of material shall be mounded above the

trench. In cases where the particle size of the drainage blanket is significantly less than the collection trench bedding, a properly designed graded soil filter or geotextile shall be utilized to minimize the migration of the drainage blanket material into the collection trenches. Limestone and dolomite ~~may~~ shall not be used in the leachate collection system unless no other suitable material is reasonably available.

SECTION 6. NR 504.06(5)(j)4. is created to read:

NR 504.06(5)(j)4. The minimum diameter of the sideslope riser shall be 18 inches. The geometry of the sideslope riser at the junction of the sump and sidewall shall be selected to assure passage of the pump and associated hardware and to assure correct positioning of the intake of the pump.

SECTION 7. NR 504.06(5)(j)5. is created to read:

NR 504.06(5)(j)5. The area of the sump and depth of gravel fill shall be sized to allow remedial installation of access and hardware for removal of leachate in the event of failure of the sideslope riser and pump system. The base of the sump shall be protected by polyethylene plate.

SECTION 8. NR 504.06(5)(t) is amended to read:

NR 504.06(5)(t) A minimum one foot thick granular drainage blanket shall be placed on top of the geomembrane component of a composite liner and on top of the clay component of a clay liner. For composite lined landfills, if the drainage blanket contains gravel greater than 1/4 inch, then a nonwoven geotextile shall be installed below the drainage blanket. The geotextile shall have a minimum weight of 12 oz/yd^2 and shall be certified to be needle-free. The granular drainage blanket shall contain no more than 5% material by weight which passes the number 200 sieve~~, have a uniformity coefficient of less than 4 for gravel soils and less than 6 for sandy soils, and a hydraulic conductivity which is greater than or equal to 1x10^{-2} cm/sec at the anticipated field density~~.

SECTION 9. NR 504.06(5)(tm) is created to read:

NR 504.06(5)(tm) Leachate collection blankets shall have a minimum hydraulic conductivity of 1 cm/sec for any site that accepts any amount of municipal solid waste and 1x10^{-2} cm/sec for landfills which do not accept municipal solid waste. The gradation of the granular drainage blanket and associated hydraulic conductivity shall be selected to maintain the maximum head in the drain within the drain thickness.

SECTION 10. NR 504.06(6) is created to read:

NR 504.06(6) ADDITIONAL REQUIREMENTS FOR LANDFILLS WITH EXTENDED COLLECTION LINES. (a) Landfills shall meet the requirements of pars. (b) to (f) where they will accept municipal solid waste and contain leachate collection lines that exceed 1,200 feet from the end of each cleanout to the toe of the opposite slope. Where the requirements of this subsection differ from other requirements of this chapter, these requirements shall take precedence.

(b) The maximum length of leachate collection lines from the access point at one end to the toe of the opposite slope may not exceed 2,000 feet.

(c) The minimum slope on all leachate collection pipes and associated pipe trenches at the base of the landfill shall designed and constructed to be 0.5% after accounting for primary and secondary settlement of the subgrade. The minimum design slope shall be selected following computation of 100% of the primary consolidation settlement and the secondary consolidation settlement of the compressible

materials beneath the facility, which includes, as applicable, in-situ soil, added geologic material, structural fill material, and compacted clay liner. Secondary settlement shall be calculated using a 100-year time frame.

(d) Pipe bedding material shall be composed of coarse, uniform gravel with a hydraulic conductivity that is greater than or equal to the hydraulic conductivity of the leachate collection blanket specified in s. NR 504.06(5)(tm), in addition to meeting the other requirements of s. NR 504.06(5)(e).

(e) The maximum anticipated construction, operation and post-closure overburden loads over the leachate collection piping shall be calculated and utilized in selecting the pipe material and wall thickness, based on 6-inch pipe diameter and an appropriate in-field consolidated density.

(f) All components of the leachate collection system shall incorporate all of the following design features:

1. Sweep bends at all changes of alignment, using a minimum radius of 10 pipe diameters, consisting of prefabricated PVC sweep bends or smooth pipe bends or prefabricated sweep bends for HDPE or other pipe materials.

2. Pipe alignments that minimize horizontal and vertical alignment changes for the entire leachate collection pipe length.

3. Elimination or minimization of obstructions or artifacts of construction which impose drag on pipe cleaning jetter hose or nozzles.

SECTION 11. NR 504.07(6)(a) is amended to read:

NR 504.07(6)(a) For all landfills, a drainage layer shall be designed immediately above the capping layer. The drainage layer shall consist of a minimum of one foot of sand with a minimum hydraulic conductivity of $1x10^{-3}$ cm/sec or a geosynthetic drain layer of equivalent or greater ~~transmissivity~~ flow capacity. The design shall include an analysis which demonstrates whether the maximum head in the drain layer will be confined within the thickness of the drain. Drain calculations shall include infiltration rates based on saturated characteristics of the topsoil and rooting zone and a hydraulic gradient of one through the topsoil and rooting zone.

SECTION 12. NR 504.095 is created to read:

NR 504.095 Design criteria for landfills that recirculate leachate. (1) GENERAL. Leachate recirculation systems shall be designed to meet the following requirements:

(a) Leachate recirculation shall be limited to municipal solid waste landfills that are designed with a composite liner and leachate collection system meeting the minimum requirements of s. NR 504.06.

(b) Leachate recirculation shall be limited to areas of the landfill where the leachate collection drainage blanket has a hydraulic conductivity of 1 cm/sec or greater. The department may approve leachate recirculation in existing cells with lower permeability leachate collection blankets, provided that the operator can demonstrate that the maximum leachate head on the liner can be maintained at less than 12 inches and that the recorded leachate head has not exceeded 12 inches in the past.

(c) Leachate shall be recirculated only in areas of the landfill which are connected to the active gas extraction systems and are capable of collecting the additional gas expected to be generated. Active gas extraction shall commence in those areas no later than the initiation of leachate recirculation.

(d) Leachate recirculation distribution systems shall not discharge leachate within 100 lateral feet of the exterior sideslope final grades unless otherwise approved by the department in writing.

(e) A minimum depth of 20 feet of waste shall be maintained between the landfill base and lowest point of leachate distribution.

(f) Operating controls and instructions for leachate recirculation distribution systems shall be prepared to apply to operations expected to be encountered in all weather and seasons. Instructions shall include cessation of leachate recirculation upon discovery of seeps and other surface expressions of recirculated leachate, excessive pressures within the waste mass, saturated conditions in the waste mass, inadequate shear strength of the waste mass or other conditions indicative of instability.

(2) SURFACE APPLICATION. In addition to the general requirements, surface application systems for leachate recirculation shall meet the following requirements:

(a) The leachate distribution system shall be designed so that leachate is not introduced into the waste in a manner that causes ponding or surface runoff of leachate. Open surface trenches or ponds shall not be utilized.

(b) The leachate distribution system shall be designed to minimize evaporation of the leachate and volatilization of compounds in leachate. The leachate distribution system shall be designed to distributed the leachate in a manner that results in its absorption into the waste mass after application. Spray irrigation systems that are designed to promote evaporation shall not be utilized.

(3) VERTICAL DISTRIBUTION SYSTEMS. Vertical distribution systems for leachate recirculation shall meet the following requirements:

(a) Wells designed solely for the gas extraction system shall not be used for leachate recirculation.

(b) Vertical distribution systems shall utilize vertical wells placed into the waste mass. Distribution well design need not comply with the requirements of s. NR 504.08(1) or ch. NR 141 or 812. Well spacing shall be determined based on leachate flow rates, pumping characteristics, permeability of the waste mass, and ability of the waste to accept liquid without being pressurized.

(c) Leachate distribution wells shall be designed with a surface seal to control odors and landfill gas.

(d) Pumping pressures and pumping intervals for distribution wells shall be designed to prevent surface emergence of leachate. Pumping pressures and hydrostatic pressures shall be limited to prevent excessive pressures to prevent separation of waste layers or short-circuiting of leachate to the leachate collection system.

(e) The leachate distribution system shall be designed to achieve a uniform distribution of leachate throughout the zone of influence of the wells.

(f) Leachate distribution wells may be designed to also extract landfill gas.

(4) HORIZONTAL DISTRIBUTION SYSTEMS. Horizontal distribution systems shall meet the following requirements:

(a) The leachate distribution piping shall be designed to distribute the leachate consistently along its length.

(b) Distribution systems shall be designed with a permeable bedding material that is capable of rapidly dissipating recirculated leachate into the waste mass.

(c) Distributions systems shall be designed with bedding material which is capable of maintaining its structure and characteristics during the expected operational life of the system.

(d) Distribution systems shall be designed to operate with specific distribution periods with landfill gas extracted in the interval between those distribution periods, unless otherwise approved by the department in writing. The length of the leachate distribution periods and the intervals of gas extraction shall be determined in a manner that minimizes uncontrolled landfill gas emissions.

(e) Pumping pressures and pumping intervals shall be designed to prevent surface emergence of leachate. Pumping pressures shall be limited to prevent excessive pressures to prevent separation of waste layers or seeps or other leachate discharges.

SECTION 13. NR 506.07(5)(d) to (5)(h) are created to read:

(d) All leachate collection lines shall be cleaned with water jet cleanout devices initially after placement of the leachate drain layer using pipe cleaning procedures that insert cleanout devices from each access point to, at a minimum, the toe of the opposite sideslope.

(e) A video camera inspection shall be conducted on all leachate collection pipes after the initial pipe cleaning activities required in par. (5)(d) and at five year intervals, following the annual pipe cleaning required in para. (5)(c). The video camera inspection shall extend a minimum of 300 feet unto the base grades of each leachate collection line.

(f) All blockages of leachate collection pipes, pipe breaks or any impedances to passage of pipe cleaning equipment shall be investigated, defined and a remediation proposed for review and approval by the Department.

(g) A summary report shall be submitted after each pipe cleaning and each video camera inspection event. The report shall summarize any specialty equipment or chemicals used in collection pipe cleaning. The report shall include a description of all observations, including recording tape or disk of the video camera inspection. The report shall summarize the investigation of blockages or other difficulties in cleaning pipes. The report shall propose remediation if the leachate collection pipes are not restored to function and blockages are not cleared.

(h) A summary report shall be submitted after the removal of dams or barriers used to separate clean water in a prepared cell from solid waste and leachate. The report shall document the removal of the separation features and the connection of any separated pipe lengths.

SECTION 14. NR 506.135 is created to read:

NR 506.135 Leachate recirculation. (1) GENERAL. Leachate recirculation operations shall comply with the following requirements:

(a) Leachate recirculation distribution systems shall not discharge leachate within 100 lateral feet of the exterior sideslope final grades, unless otherwise approved by the department in writing.

(b) Leachate shall not be introduced in areas with less than 20 feet of waste over the leachate collection system.

(c) Leachate shall not be recirculated in areas that do not have active gas extraction systems installed. The gas extraction systems shall be operated in accordance with the approved leachate recirculation plan to control any additional gas generated by leachate recirculation and minimize release of uncontrolled gas.

(d) Leachate recirculation shall be suspended upon discovery of warning symptoms, as identified in the approved leachate recirculation plan. Leachate recirculation shall not resume in the area where the problem occurred until changes are made to the system or the warning symptoms have declined to acceptable levels. The operator shall notify the department in writing within 7 days of the discovery of warning symptoms and suspension of leachate recirculation. Alternative notification procedures may be approved by the department in writing.

(e) Leachate recirculation shall be suspended whenever any of the failure thresholds identified in the approved leachate recirculation plan are exceeded. Leachate recirculation shall not resume until the department has reviewed and approved changes to the system that will result in meeting the thresholds. The operator shall notify the department within 3 days of the discovery of exceeding any failure threshold. Alternative notification procedures may be approved by the department in writing.

(f) The operation of the gas extraction system shall be amended as necessary to counteract any increased incidence or intensity of odors.

(g) The landfill operator shall maintain in the landfill's written operating record the liquid mass balance for each leachate drainage basin, including leachate extracted, leachate recirculated and precipitation, in all areas where leachate is recirculated, in accordance with the requirements of s. NR 507.215. All warning symptoms, terminations of leachate recirculation and other problems and their solutions shall be recorded.

(h) Leachate shall not be recirculated where daily or intermediate cover consists of low permeability clay soil or low permeability wastes, unless the daily or intermediate cover is removed or scarified.

(i) Measures shall be taken to prevent cold weather freeze up of leachate distribution equipment if used during the winter months.

(2) SURFACE APPLICATION. Surface application shall comply with the following requirements in addition to those in sub. (1):

(a) Leachate shall not be applied in a manner that results in ponding of leachate on the surface.

(b) Leachate shall not be applied in a manner that allows runoff of leachate beyond the application area.

(c) Leachate shall not be applied using a spray system or any other distribution system that promotes evaporation of leachate or volatilization of compounds in leachate. Spray systems such as spray bars on the back of a tanker truck may be acceptable if the spray is directed downward.

(d) Leachate application shall be limited to the active area of the landfill.

(e) Leachate shall not be applied during wet or windy conditions that would prevent containment of the leachate to the application area.

(f) Truck traffic shall be routed around the application area until such time as the application area is covered to prevent tracking of leachate.

(g) Areas of the landfill where leachate has been applied shall be covered with newly placed waste or soil as soon as possible, but in no case later than the end of the same working day that leachate is applied.

(3) VERTICAL DISTRIBUTION SYSTEMS. Vertical distribution systems shall comply with the following requirements in addition to those in sub. (1):

(a) Gas extraction wells designed independent of the leachate recirculation system shall not be used for leachate distribution.

(b) Landfill gas may be extracted through leachate distribution wells to supplement the permanent gas extraction system.

(4) HORIZONTAL DISTRIBUTION SYSTEMS. Horizontal distribution systems shall comply with the following requirements in addition to those in sub. (1): Leachate shall not be discharged continuously to individual distribution pipes. Periodic rest periods shall be incorporated into the operating schedule to allow for absorption of leachate into the waste mass and for extraction of landfill gas.

(2) Landfill gas may be extracted through leachate distribution pipes to supplement the permanent gas extraction system.

(5) ANNUAL REPORTING FOR LEACHATE RECIRCULATION. An annual report shall be submitted to the department by April 30th of each year for leachate recirculation activities occurring during the previous calendar year. The report shall include:

(a) The results of the liquid mass balance measurements for each leachate drainage basin.

(b) The leachate head levels for each leachate drainage basin.

(c) Graphs showing the volumes of leachate extracted and recirculated and precipitation received for each leachate drainage basin.

(d) Graphs over the time period since leachate recirculation was initiated, for each parameter required to be sampled in s. NR 507.215.

(e) Summary of warning symptoms, terminations, resumptions of leachate recirculation after termination, and any operating problems and resolutions.

(f) Documentation drawings or diagrams showing the installed details of the leachate distribution system added or revised since the previous annual report, including but not limited to piping, pumps and distribution media.

SECTION 15. NR 507.215 is created to read:

NR 507.215 Leachate recirculation monitoring. The owner or operator of a solid waste facility that recirculates leachate shall sample for, maintain records of, and report to the department as required the following:

(1) LIQUID MASS BALANCE. The volumes of leachate extracted from each leachate drainage basin, the volumes of leachate recirculated into each leachate drainage basin and monthly precipitation records from on-site instrumentation or the nearest national weather system station.

(2) LEACHATE HEAD. The monthly level of leachate head on the liner in each leachate drainage basin where recirculation has been implemented.

(3) LEACHATE CHARACTERISTICS. Samples of leachate shall be taken quarterly from the sump or leachate collection tanks. Those samples shall be tested semiannually for a VOC scan and quarterly for the following parameters:

(a) BOD.

(b) COD.

(c) Ammonia-nitrogen.

(d) Field pH.

(e) Field specific conductance.

(f) Alkalinity.

(g) Hardness.

(4) LANDFILL GAS. (a) The monthly total volume of gas extracted from each leachate drainage basin. Gas volumes shall be recorded for a period of at least 3 years beyond the termination of leachate recirculation.

(b) An annual assessment of the liquid level in each gas extraction well.

SECTION 16. NR 512.09(6) is created to read:

NR 512.09(6) ADDITIONAL REQUIREMENTS FOR LANDFILLS WITH EXTENDED COLLECTION LINES. (a) Landfills shall meet the requirements of pars. (b) to (c) where they will accept municipal solid waste and contain leachate collection lines that exceed 1,200 feet from the end of each cleanout to the toe of the opposite slope. Where the requirements of this subsection differ from other requirements of this chapter, these requirements shall take precedence.

(b) A minimum of one boring in the area of each proposed cell shall be drilled to physically characterize subbase conditions for landfill foundation assessment of stability and settlement. Borings shall be extended to a minimum of 50 feet below proposed subbase grades or to competent bedrock, whichever is shallower. Borings shall include standard penetration testing. Samples shall be taken at each significant soil layer. A minimum of one sample from each fine grained layer and from each soft or compressible coarse grained layer shall be subjected to geotechnical testing to define parameters used in assessments of stability and settlement of the liner.

(c) Consolidation testing data shall be included with the data summarized by major soil unit in the table required by s. NR 512.10(1)(d).

SECTION 17. NR 514.06(14m) is created to read:

NR 514.06(14m) The report shall include an assessment of the shear strength and slope stability of soils and wastes in the following scenarios:

(a) Interim and final waste slopes, incorporating in-field waste densities, settlement, leachate recirculation, precipitation and any other factors that affect strength of waste or final cover. The analyses shall include interior slopes between filling phases and exterior slopes after attainment of waste final grades.

(b) Haul roads and access ramps on interim slopes at waste final grades and on final cover, including passive load of cover soils and dynamic loads due to construction, hauling and maintenance vehicles.

SECTION 18. NR 514.07(1)(L) is created to read:

NR 514.07(1)(L) A construction quality assurance plan for conducting a leak location survey on the installed geomembrane. The leak location survey shall be conducted after placement of the leachate collection layer for a composite liner. The quality assurance plan shall include continuous observation of all aspects of the leak location survey testing by qualified professional engineers or technicians. The quality assurance plan shall include use of nondestructive methods to detect, locate and verify repairs of defects in geomembrane. The quality assurance plan may include electrical resistivity testing or other testing methods acceptable to the department.

SECTION 19. NR 514.07(6)(c) is created to read:

NR 514.07(6)(c) Documentation of the strength of the selected resin, diameter and wall thickness of the sideslope riser pipe, with regard to maximum overburden weight over the sumps of municipal solid waste or industrial waste at field capacity. The plan of operation shall include a description of physical and hydraulic specifications of commercially available pumps that are able to traverse any bend or elbow in the riser pipe to reach design pump intake position, for both placement and removal. The description shall include cross-sections of the riser pipe bends and the pumps when wheels, connectors, hoses, electrical leads and head level controls are attached. Pump selection shall be based on the maximum pumping capacity needed for the highest calculated leachate flow rates, including potential leachate recirculation.

SECTION 20. NR 514.07(7) is created to read:

NR 514.07(7) LEACHATE RECIRCULATION PLANS. The plan of operation for any landfill that proposes to recirculate leachate shall include a leachate recirculation plan. The leachate recirculation plan shall include, at a minimum, the following elements:

(a) A narrative which explains the design rationale for the proposed system. The design rationale shall address the leachate loading rate; distribution frequency; leachate distribution system including well or pipe spacing and placement, well or pipe length, screened interval, sealing material and bedding material; anticipated flow characteristics; and restricted areas where leachate will not be recirculated. The design shall incorporate, as appropriate, the requirements of s. NR 504.095.

(b) Plan sheets to show the conceptual layout of the leachate recirculation distribution system and design details.

(c) Calculations of proposed loading rates. Proposed loading rates for leachate recirculation shall be calculated for each leachate drainage basin. Calculation methods shall be defined so that supplemental calculations can be performed to accommodate changes due to field observations, waste characteristics, weather and other factors. Factors to be addressed shall include recirculated volumes of leachate, precipitation based on local records and on-site data, field capacities and absorptive capacities of the landfilled waste, waste filling rates, separation distances and elevations of distribution piping or wells, and loss of water by waste decomposition processes and water vapor in landfill gas.

(d) Calculation of effects on flow rates in the leachate collection system and maximum leachate head on the liner. The location of leachate head level monitoring devices relative to the collection pipes and base grade slope lengths shall be used to determine the maximum leachate head in the facility. Proposed loading rates for leachate recirculation shall be determined which limit maximum leachate head on the liner to 12 inches.

(e) An operational plan which addresses the daily operations; how leachate seeps, odors and build-up will be prevented or contained and actions to be taken if nuisance conditions occur; how any enhanced methane production will be managed by gas extraction systems; and care and maintenance of the tanks, pumps and distribution systems.

(f) A description of warning symptoms and failure thresholds which will be used to initiate investigation, stand-by, termination and changes to the leachate recirculation system. The operational plan shall identify warning symptoms and failure threshholds, including but not limited to elevated leachate heads on the liner, significant and persistent odors, excessively acidic leachate chemistry or other monitoring data indicate poor waste decomposition conditions, seeps and other surface expressions of recirulated leachate, excessive pressures within the waste mass, saturated conditions in the waste mass, reduced shear strength of the waste mass and any other warning symptom conditions appropriate to the site. Warning symptoms shall result in a suspension of leachate recirculation, investigation and changes to be implemented before resuming leachate recirculation. Failure thresholds shall result in termination of leachate recirculation, investigation and changes that will be submitted to the department for review and approval in writing prior to resumption of leachate recirculation.

(g) A monitoring plan which tracks volumes of leachate extracted and recirculated and volumes of precipitation in each leachate drainage basin; leachate heads on the liner; gas volumes; and leachate characteristics. The monitoring plan shall incorporate, as appropriate, the requirements of s. NR 507.215.

(h) A plan which specifies documentation and record-keeping of the construction, operation and monitoring of the leachate recirculation system. This plan shall specify the information that will be sent to the department and the frequency of those submittals.

(i) Landfill gas extraction. The plan of operation shall include diagrams and narrative concerning gas extraction equipment, fittings and devices to be used to extract gas produced as a result of leachate recirculation. The plan of operation shall contain a schedule of operation of the gas extraction system in those cells which are subject to leachate recirculation.

(j) A description of the circumstances under which leachate will be diverted to a wastewater treatment plant rather than recirculated.

SECTION 21. NR 514.07(8) is created to read:

NR 514.07(8) ADDITIONAL REQUIREMENTS FOR LANDFILLS WITH EXTENDED COLLECTION LINES. (a) Landfills shall meet the requirements of pars. (b) to (i) where they will accept municipal solid waste and contain leachate collection lines that exceed 1,200 feet from the end of each cleanout to the toe of the opposite slope. Where the requirements of this subsection differ from other requirements of this chapter, these requirements shall take precedence.

(b) The design calculations required by s. NR 514.06(14) shall include assessments of the landfill foundation for stability and settlement, using parameters determined from samples taken from borings in the subgrade below the proposed fill area.

(c) The report shall describe the design rationale for the layout of the leachate collection system and its alignment. This description shall include:

1. A discussion of the pipe strength calculations for the design overburden weight and the required pipe materials, including considerations for wet unit weights, densified waste after consolidation and decomposition and the potential use of leachate recirculation.

2. A demonstration that the design minimizes changes in alignment of leachate collection trenches and leachate collection pipe.

3. A hydraulic capacity analysis that demonstrates the ability of the leachate collection system to contain design flows within the collection trench and sump system. The hydraulic capacity analysis shall include the following, at a minimum:

a. Design specifications for the leachate collection blanket, leachate collection trench dimensions, backfill for the leachate collection trench, slopes of landfill base and sideslopes, slopes of pipe and trenches, and the liner area draining to each sump.

b. Active filling life assessment based on precipitation rate of 2 inches per month, with and without leachate recirculation.

c. Post-closure assessment based on hydraulic conductivities of 10% or less of the design hydraulic conductivities for the leachate collection blanket and leachate collection trench backfill and an assumed annual leachate collection rate of one inch per year.

d. Sump dimensions and pump specifications selected to maintain maximum leachate accumulation within the sumps and intersecting leachate collection trenches, with examples of commercially available pumps.

(d) The report shall include the calculations for the maximum anticipated overburden loads as calculated under s. NR 504.06(6)(e) and selected leachate collection pipe materials to comply with these calculated loads. Calculations shall be performed demonstrating the leachate collection pipe and bedding material as placed possess structural strength to support maximum loads imposed by the overlying materials and equipment. The calculations shall demonstrate that the pipe is designed to maintain its wall integrity and not deform under expected maximum loads to the extent that the loading or deformation negatively affect the performance and cleaning of the leachate collection systems.

(e) Specifications and construction methods for bedding of leachate collection pipes shall be included, to maximize competent support of the pipes, eliminate bridging and maintain design slope of the pipe.

(f) The report shall include specifications for the use of sweep bends at all changes of alignment of leachate collection pipes, construction methods to provide support for pipe and sweep bends, and measures to be taken to minimize obstructions to or friction with pipe cleaning equipment.

(g) The report shall include a construction quality assurance plan to be followed by the registered professional engineer and qualified technician responsible for evaluating construction of the collection trench and leachate collection piping and ensuring that the fabrication and installation meet the design specifications. The construction quality assurance plan shall include continuous observation of all aspects of collection trench construction and collection pipe installation activities by qualified engineers or technicians. The construction quality assurance plan shall include use of observations, survey measurements, and testing frequencies in accordance with those specified in ch. NR 516. The quality assurance plan shall include proposed methods for verifying the acceptability of the collection trench, collection pipe alignment, collection pipe materials and sweep bends, and adaptations by the owner or contractors to unforeseen conditions.

(h) The report shall describe proposed equipment and methods which are capable of inserting cleanout devices through all leachate collection pipes, from insertion at each access point to, at a minimum, the toe of the opposite sideslope.

(i) The report shall include procedures for soil borings and laboratory consolidation testing to verify settlement analyses.

SECTION 22. NR 514.07(9) is created to read:

NR 514.07(9) The plan of operation for all new and expanded municipal solid waste landfills submitted to the department after January 1, 2007 shall include a plan for significantly reducing the amount of degradable organic material remaining after site closure in order to materially reduce the amount of time the landfill will take to achieve landfill organic stability. All municipal solid waste landfills that have a plan of operation approved between January 1, 2004 and January 1, 2007 shall submit a plan modification to the department no later than January 1, 2007 for significantly reducing the amount of degradable organic material remaining after site closure in order to materially reduce the amount of time the landfill will take to achieve landfill organic stability.

SECTION 23. NR 514.10 is created to read:

NR 514.10 Research, development and demonstration plan. The plan of operation for any landfill which proposes a research, development and demonstration program shall include the items specified in this subsection.

(1) GENERAL. (a) . 1. No landfill owner or operator may initiate a research, development and demonstration plan without prior approval by the department in writing. Items that research, development and demonstration plans are applicable to may include addition of liquids in addition to leachate and gas condensate from the same landfill for accelerated decomposition of the waste mass, allowing run-on water to flow into the landfill waste mass, and allowing testing of the construction and infiltration performance of alternative final cover systems. The research, development and demonstration plan may be proposed for other measures to be taken to enhance stabilization of the waste mass.

2. No landfill owner or operator may continue to implement a research, development, and demonstration plan beyond any time limit placed in the initial plan approval or any renewal without

issuance of written approval by the department. Justification for renewals shall be based upon information in annual and final reports as well as research and findings in technical literature.

(b) Research, development and demonstration plans shall meet the following requirements:

1. Research, development and demonstration plans shall be restricted to licensed solid waste landfills. Landfills for disposal of municipal solid waste shall be designed with a composite liner and a composite capping layer. For existing landfills, the effectiveness of the liner system and leachate collection system shall be demonstrated in the plan. For all landfills, the effectiveness of the liner system and leachate collection system shall be assessed at the end of the testing period, with comparison to the effectiveness of the systems at the start of the testing period.

2. Research, development and demonstration plans may be submitted for new landfills, expansions of existing landfills or closed landfills.

3. Research, development and demonstration plans may not include changes to the approved design and construction of subgrade preparation, liner system, leachate collection and removal systems, final cover system, gas and leachate systems outside limits of waste, run-off controls, run-on controls or environmental monitoring systems exterior to the waste mass.

4. An annual report shall be prepared for each year of the testing period and a final report shall be prepared for the end of the testing period. These reports shall assess the attainment of goals proposed for the process selected for testing, recommend changes, recommend further work, and summarize problems and their resolution. Reports shall include a summary of all monitoring data, testing data and observations of process or effects and shall include recommendations for continuance or termination of the process selected for testing. Annual reports shall be submitted to the department within 3 months after the anniversary date of the written approval by the department. Final reports shall be submitted by the end of the testing period.

5. Implementation of an approved research, development and demonstration plan shall comply with the specific conditions of approval for the initial testing period and any renewal.

6. Structures and features exterior to the waste mass or waste final grades shall be removed at the end of the testing period, unless otherwise approved by the department in writing.

(2) OTHER REQUIREMENTS A research, development and demonstration plan shall include the following details and specifications. Processes other than adding liquids to the waste mass and leachate recirculation may be practiced in conjunction with the research, development and demonstration plan.

(a) Initial applications for research, development and demonstration plans shall be submitted for review and approval prior to the initiation of the process to be tested. Plans shall specify the process that will be tested, describe preparation and operation of the process, describe waste types and characteristics that the process will affect, describe desired changes and end points that the process is intended to achieve, define testing methods and observations of the process or waste mass that are necessary to assess effectiveness of the process, and include technical literature references and research which support use of the process. The plans shall specify the time period for which the process will be tested. The plans shall specify the additional information, operating experience, data generation or technical developments that the process to be tested is expected to generate.

(b) The test period for the initial application shall be limited to a maximum of 3 years.

(c) Renewals of testing periods shall be limited to a maximum of 3 years each. The maximum number of renewals shall be limited to 3.

(d) Renewals shall require department review and approval of reports of performance and progress on achievement of goals specified in the research, development and demonstration plan.

(e) Research, development and demonstration plans that evaluate introduction of liquids in addition to leachate or gas condensate from the same landfill shall propose measures to be integrated with any approved leachate recirculation plan and compliance with requirements for leachate recirculation.

(f) Research, development and demonstration plans shall include a description of warning symptoms and failure thresholds which will be used to initiate investigation, stand-by, termination, and changes to the process and any other landfill systems that might be affected by the process, such as gas extraction and leachate recirculation. Warning symptoms shall result in a reduction or suspension of liquids addition, leachate recirculation, investigation and changes to be implemented before resuming the process being tested. Failure thresholds shall result in termination of the process being tested, investigation and changes that will be submitted to the department for review and approval in writing prior to resumption of the process being tested.

(g) Research, development and demonstration plans shall include an assessment of manner in which the process to be tested might alter the impact that the landfill may have on human health or environmental quality. The assessment shall include both beneficial and deleterious effects that could result from the process.

(h) Research, development and demonstration plans shall include a geotechnical stability analysis of the waste mass and an assessment of the changes that implementation of the plan are expected to achieve. The geotechnical stability analysis and assessment shall be repeated at the end of testing period, with alteration as needed to include parameters and parameter values derived from field measurements. The plan shall define relevant parameters and techniques for field measurement.

(i) Research, development and demonstration plans shall propose monitoring parameters, frequencies, test methods, instrumentation, record-keeping and reporting to the department for purposes of tracking and verifying goals of the process selected for testing.

(j) Research, development and demonstration plans shall propose monitoring techniques and instrumentation for potential movements of waste mass and settlement of waste mass, including proposed time intervals and instrumentation, pertinent to the process selected for testing.

(k) Research, development and demonstration plans shall propose construction documentation, construction quality control and construction quality assurance measures, and recordkeeping for construction and equipment installation that is part of the process selected for testing.

(L) Research, development and demonstration plans shall propose operating practices and controls, staffing, monitoring parameters and equipment needed to support operations of the process selected for testing.

(m) Research, development and demonstration plans that include aeration of the waste mass shall include a temperature monitoring plan, a fire drill and safety program, instructions for use of liquids for control of temperature and fires in the waste mass, and instructions for investigation and repair of damage to the liner and leachate collection system.

(n) Research, development and demonstration plans for alternate final cover systems shall include side-by-side test sections with approved final cover systems and a means to quantify exfiltration from the alternate final cover and approved final cover test sections.

(3) TERMINATION. The department may require modifications to or immediate termination of the process being tested if any of the following conditions occur:

(a) Significant and persistent odors.

(b) Significant leachate seeps or surface exposure of leachate.

(c) Significant leachate heads on the liner.

(d) Excessively acidic leachate chemistry or gas production rates or other monitoring data indicate poor waste decomposition conditions.

(e) Instability in the waste mass.

(f) Other persistent and deleterious effects.

SECTION 24. NR 516.07(2)(d) is created to read:

NR 516.07(2)(d) Leak location testing of the installed geomembrane shall be completed by or observed by the quality assurance engineer or qualified technician. Leak location testing shall be conducted after the leachate collection layer has been placed on the base grades and lower half of the sideslopes. Documentation of the testing method shall include description of the procedures and photo documentation. Documentation of all detected defects and repairs shall include the testing data for geomembrane sheet and welding and photo documentation of the defect prior to and after repairs.

SECTION 25. NR 516.08 is created to read:

NR 516.08 Testing requirements for landfills with extended collection lines. (1) Landfills shall meet the requirements of pars. (2) to (3) where they will accept municipal solid waste and contain leachate collection lines that exceed 1,200 feet from the end of each cleanout to the toe of the opposite slope. Where the requirements of this section differ from other requirements of this chapter, these requirements shall take precedence.

(2) PIPE AND TRENCH. In addition to the information specified in s. NR 516.04(3)(d), reports documenting the construction of all new landfill areas shall include the following information, at a minimum:

(a) Observations of collection trench and leachate collection pipe installation. Observations shall verify that collection pipe is handled and placed in a manner that prevents holes from being blocked by mud and that assures that holes are located 45 degrees from the springline. Records shall note any changes in alignment of collection trenches or leachate collection pipes and construction methods which produce obstructions or interference with pipe cleaning equipment. Specifications of pipe, specialty fittings and sweep bends installed in construction shall be included in tables or appendices to reports. Documentation of sweep bends shall include the fabricated or field-achieved radius of bend and conformance with minimum radii of bend specified by approved plans or required by the department's plan approval. Reports shall describe methods used to provide support and cover for collection pipe, specialty fittings and sweep bends.

(b) Documentation of the presence of registered engineers or qualified technicians providing quality assurance monitoring during all aspects of installation of leachate collection pipe and pipe bedding and placement of aggregate cover over the pipe.

(c) Documentation of initial leachate collection pipe cleaning after placement of the leachate collection layer. This documentation shall include, at a minimum:

1. The equipment, methods and chemicals that were used successfully to insert cleanout devices through all leachate collection pipes from each access point to, at a minimum, the toe of the opposite sideslope.

2. The necessary minimum hose or machine pressures, nozzles, hose materials and other features necessary to achieve successful cleaning of leachate collection pipes.

3. Any significant adaptations needed to complete pipe cleaning, and any problems encountered in pipe cleaning and their resolution.

4. Any repairs or modifications made to the collection piping in response to the pipe cleaning operation.

5. Recommendations to the operator for the necessary equipment, specifications, and operating conditions for future pipe cleaning.

(3) SOIL TESTING. Testing shall be performed during the construction of any landfill areas. At a minimum, this testing shall include test results from a minimum of one hydraulic conductivity test performed on representative samples of drainage media used for the leachate collection blanket and for the leachate collection trench backfill. The test procedure and any adaptations used to accommodate high-capacity drainage material shall be identified.

SECTION 26. NR 520.04(4)(a) is amended to read:

NR 520.04(4)(a) Plan review fees shall be charged in accordance with Tables ~~2 and 3~~ 2, 3 and 5.

SECTION 27. NR 520 Table 5 is created to read:

TABLE 5
FEE SCHEDULE - LANDFILLS AND SURFACE IMPOUNDMENTS
Plan Review Fees

Facility type	**Type of submittal**	**Plan review fee**
Municipal solid waste landfills	Landfill stability plan	$2500 (1)(2)
All solid waste landfills	Research, development and demonstration plan	$2500 (1)(2)
All landfills	Annual report	$500 (3)

(1) These fees apply if the submittal is not proposed as part of the plan of operation. These fees apply to proposed renewal submittals for research, development and demonstration plans after approval of initial submittal.
(2) A landfill stability plan submitted under s. NR 514.07(9) or a research, development and demonstration submitted under s. NR 514.10, as referred to in Table 5, are plan modifications which propose to modify a feasibility report, plan of operation, or closure plan.
(3) This fee applies to all annual reports for landfill unless the report is also a renewal submittal for a research, development and demonstration plan.

SECTION 28. INITIAL APPLICABILITY. This rule applies to the regulation of landfills.

SECTION 29. EFFECTIVE DATE. This rule shall take effect on the first day of the month following publication in the Wisconsin administrative register as provided in s. 227.22(2) (intro), Stats.

SECTION 30. BOARD ADOPTION. This rule was approved and adopted by the State of Wisconsin Natural Resources Board on March 23, 2005.

Dated in Madison, Wisconsin_____

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

By _____
Scott Hassett, Secretary

(SEAL)