Wisconsin Department of Natural Resources
Septage Operator Certification Program

Septage Operator Servicing Handbook and Study Guide for Grade L Certification

Revised January 2026

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1.0 Preface

1.1 Overview

The "Septage Operator Handbook and Study Guide for Grade L Certification" study guide is an important resource for operators preparing for the "Grade L" septage operator certification exam. Every septage operator must demonstrate sufficient knowledge of the principles underlying septage servicing and disposal to:

- Ensure the highest quality standards established by the industry (Wisconsin Liquid Waste Carriers Association),
- Protect public health from unsanitary and unhealthful practices and conditions, and
- Protect surface waters and groundwaters of the state from contamination by septage (reference s. NR 113.01, Wis. Adm. Code).

The purpose of this handbook and study guide is to present practical information on the servicing, transport, storage, and disposal (land application, POTW, etc.) of septage. Material is presented in a concise, recommendation-oriented format for:

- Aspiring septage operators preparing to take the septage exam, and
- Reference material for existing operator, master operators, and managers of septage storage facilities.

This document is arranged by different sections. Each section consists of key informational concepts needed to know for the operator certification exams. This study guide also serves as a septage primer that can be used as a reference on the subject. Any diagrams, pictures, or references included in this study guide are included for informational purposes and do not constitute endorsement of any sources by the Wisconsin Department of Natural Resources (hereafter referred to as DNR or department). Lastly, the material contained should be used as a study supplement to Wisconsin Administration Code chapters NR 113 and NR 114.

Note: Operators should prepare for the Certified Operator Grade T exam by using the "*Septage Operator Handbook and Study Guide for Grade T Certification*."

1.2 Exam Preparation

When preparing for the operator certification exam, the department recommends the following actions:

- **Study the material!** Review chs. NR 113 and NR 114, Wis. Adm. Code. Review the "Septage Operator Handbook and Study Guide for Grade L Operators." Make sure that all concepts are fully understood and committed to memory.
- **Learn with others**! Take the septage master operator class, attend DNR training workshops, attend WLWCA conferences and training workshops, etc. to improve understanding and knowledge of the key subject.
- **Learn even more!** For an even greater understanding and knowledge of the subjects, the department recommends reviewing the below additional sources:

    - Wisconsin DNR "Septage Business License Requirements" webpage,
    - Wisconsin DNR "Septage Servicing Operator Certification" webpage,
    - Wisconsin DNR "Operator Certification" webpage,
    - Wisconsin DNR "Plan Review Procedures for Large Septage Storage Facilities" webpage,
    - Wisconsin DNR "Storage of Domestic Septage" WPDES general permit webpage,
    - USEPA "Guide to Septage Treatment and Disposal," and
    - USEPA 40 CFR 503.
- **Ask for help!** Contact your regional DNR septage coordinator (email or phone) to ask any septage-related questions. Contact the DNR Septage Certification coordinator for any septage operator-related questions.

1.3 Exam Application

The DNR certification exams contain multiple choice questions that offer four answer choices from which you are to choose the correct, or best answer. There is only one best answer.

Currently, DNR offers in-person exams at various locations across the State of Wisconsin. In the future, DNR may consider computer-based testing options. For up-to-date information, visit the DNR Operator Certification "Exams" webpage.

Generally, an applicant should follow the below steps to register for an exam:

1. Complete "Septage Service Operator Certification Exam Application" (form 3400-841). Note: This application can be found on the DNR Operator Certification "Exams" webpage.
2. Exam application forms and fees may only be submitted by mail, and must be postmarked no later than four weeks prior to the requested exam date.
3. Exam application fees can be paid for by check, money order, or cash. Please write all checks to "Wisconsin DNR."
4. Submit the completed exam application and fee(s) to the mailing address listed on the DNR "Operator Certification Exams" webpage.
5. The DNR Operator Certification Program will review and process complete exam applications within 10 business days of receipt.

1.4 Testing Strategies

Consider the following strategies during the septage operator exam:

- **Pace yourself!** It is important to pace yourself so that you will not spend too much time on one question. If you don't readily know the answer, skip the question, and return to it later. Applicants will have up to 3 hours to take the exam, although most operators have completed the exam within 60 minutes.
- **Read each question carefully.** It important that you understand what each question is asking. Some questions may require you to go through more than one step to find the

correct answer. Some questions can be answered quickly based on your acquired knowledge.

- **Answer the easy questions first.** The best strategy for taking the exam is to answer the easy questions and skip the questions you find difficult. After answering all the easy questions, go back and answer the more difficult questions.
- **Use logic to answer difficult questions.** When you return to the more difficult questions, try to use logic to eliminate incorrect answers to a question. Compare the answer choices to each other and note how they differ. Such differences may provide clues as to what the question requires. Eliminate as many incorrect answers as you can, then make an educated guess from the remaining answers.
- **Review your work!** If there is time left after you have answered every question in an exam, go back and check your work in that exam.
- **Answer every question!** Your score on the exam will be based on the number of questions that you answered correctly. Make sure you answer all the questions—even if you have to guess. A question that is missing an answer is marked wrong and will count against your score.
- **Have a positive mindset!** Although what you know will determine how well you do on the exam, your attitudes, emotions, and physical state may also influence your performance. The following tips will help you do your best on the exam.
    - Be confident in your ability to do well on the exam,
    - Be prepared to work hard on the exam,
    - Know what to expect on test day,
    - Prepare well in advance of the exam,
    - Get plenty of rest the night before the test,
    - Plan to arrive one-half hour before test time,
    - Dress comfortably, and
    - Bring your photo ID (driver's license), #2 pencils, and a calculator. *Note: Cellphones are not permitted to be on and may not be used as your calculator.*

1.5 American Disabilities Act (ADA) and Hardship Requests

If an exam applicant requires ADA accommodations or any other legitimate, documented reason for being unable to complete an exam at a larger-group exam session, please contact the Operator Certification coordinator to request a one-person session at DNROpCert@wisconsin.gov with the subject line "Hardship exam session request - [*YOUR LAST NAME*]".

2.0 Key Definitions (Grade L Exam)

IMPORTANT: This section includes key definitions for operators to reference when reviewing for the "Grade L" septage operator exam. The below list is not a comprehensive list of definitions. Operators should refer to ss. NR 113.03 and NR 114.152, Wis. Adm. Code for a complete list of definitions. Definitions relating to the "Grade T" septage operator exam are included in "Septage Operator Handbook and Study Guide for Grade T Certification."

1. Agricultural land: land on which a food crop, a feed crop, or fiber crop will be grown within 12 months after septage is applied to the land. This includes range land and land used as pasture (referenced from s. NR 113.03(1), Wis. Adm. Code).

2. Agronomic rate: the total septage application rate (dry weight basis) designed to provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or other vegetation grown on the land and designed to minimize the amount of nitrogen in the septage that passes the root zone of the crop or vegetation grown on the land to ground water (referenced from s. NR 113.03(2), Wis. Adm. Code).

3. Application rate: the hydraulic loading limits placed on a landspreading site or field normally expressed as gallons/acre/week (referenced from s. NR 113.03(3), Wis. Adm. Code).

4. Approved site: property approved by the department or its agent for the disposal, recycling, and storage of septage (referenced from s. NR 113.03(4), Wis. Adm. Code).

5. Available Water Capacity: means the amount of water which is readily held by the soil and available for plant uptake (referenced from s. NR 113.03(6), Wis. Adm. Code). Available water holding capacity shall be calculated using the below table or other method acceptable to the department.

Textural Classification System	**Factor for Use in Calculation of Available Water Capacity**
USDA	**(inch/inch)**
Sand	0.02
Loamy Sand	
Sandy Loam	0.10
Loam	0.20
Silt Loam	0.22
Silt	
Sandy Clay Loam	0.19
Clay Loam	
Silty Clay Loam	
Sandy Clay	0.17
Silty Clay	
Clay	
Note: The following method can be used to show that the soil meets the 5 inches of available water capacity requirement:	
Multiply the number of inches of each soil texture in the soil profile (above groundwater and bedrock) by the appropriate factor given above.	

6. Bedrock: means the rock that is exposed at the earth's surface or underlies soil material and includes any of the following:
    a. Weathered in-place consolidated material, larger than 2 mm in size and greater than 50 percent by volume, or
    b. Weakly consolidated sandstone at the point of increased resistance to penetration of a knife blade (referenced from s. NR 113.03(7), Wis. Adm. Code).

7. Community well: means a public well which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. Any public well

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 well unless information is available to indicate that 25 year-round residents will not be served (referenced s. NR 113.03(10), Wis. Adm. Code).

8. Dormant field: means a field that is not currently used or will not be used within 12 months after septage has been applied to the field for the harvesting of a crop. A field may have a vegetative cover crop grown on it, and a need for increased organic matter (referenced from s. NR 113.03(14), Wis. Adm. Code.

9. Dry run: means a drainage pathway, either natural or artificial, with definable banks, which contains a confined flow during periods of runoff (referenced from s. NR 113.03(16), Wis. Adm. Code).

10. Feed crop: means a forage-producing plant deliberately cultivated for livestock consumption. *Note: this term is not defined under ch. NR 113, Wis. Adm. Code.*

11. Food crops: means tobacco and crops grown for human consumption (referenced from s. NR 113.03(20), Wis. Adm. Code). Example food crops include, but are not limited to corn, soybeans, and wheat.

12. Grazing: means a method in which domestic livestock are allowed to roam a field and consume wild vegetation in order to convert cellulose within grass (and other forages) into meat, milk, wool, and other animal products. *Note: this term is not defined under ch. NR 113, Wis. Adm. Code.*

13. Groundwater: any of the waters of the state, as defined in s. 281.01(18), Wis. Stats. and s. 299.01(5), Wis. Stats., occurring in a saturated subsurface geological formation of permeable rock or soil (referenced from s. NR 113.03(22), Wis. Adm. Code).

14. High groundwater level: the higher of either the elevation to which the soil is saturated as observed as a free water surface in an unlined hole, or the elevation to which the soil has been seasonally or periodically saturated as indicated by soil color patterns throughout the soil profile (referenced from s. NR 113.03(23), Wis. Adm. Code).

15. High use field: a field that is approved by the department to receive more than 39,000 gallons per acre of septage per crop year and the volume applied is limited to the crop nutrient requirements (referenced from s. NR 113.03(24), Wis. Adm. Code).

16. Hydraulic loading rate: the volume of waste discharged per unit area per unit time (referenced from s. NR 113.03(27), Wis. Adm. Code). Example: Gallons per acre per week (gal/ac/week).

17. Incorporation: the mixing of septage with topsoil, by methods such as discing, mold-board plowing, chisel plowing or rototilling to a minimum depth of 4 inches (referenced from s. NR 113.03(28), Wis. Adm. Code).

18. Injection: the subsurface placement of septage to a depth of 4 to 12 inches (referenced from s. NR 113.03(30), Wis. Adm. Code).

19. Land application (or "landspreading" or "land applied" or "landspread"): the spreading of septage onto the land surface, the injection of septage below the land surface, or the incorporation of septage into the soil, so that the septage can either condition the soil or fertilize crops or vegetation grown in the soil (referenced from s. NR 113.03(31), Wis. Adm. Code).

20. Litter free: the absence of nonbiodegradable material such as plastics or glass of 2 inches or greater in length on the soil surface (referenced from s. NR 113.03(33), Wis. Adm. Code).

21. Low use field: means a field that is department approved to receive 39,000 gallons or less of septage per acre per crop year (referenced: s. NR 113.03(34), Wis. Adm. Code).

22. Management plan: means the permittee's or licensee's "playbook," or written procedure for how septage is serviced, transported, landspread, tracked, and reported to demonstrate compliance with ch. NR 113, Wis. Adm. Code. *Note: this term is not defined under ch. NR 113, Wis. Adm. Code.*

23. Manure: has the meaning given under s. NR 151.015(12), Wis. Adm. Code (referenced from s. NR 113.03(34d), Wis. Adm. Code).

24. Nuisance: means any source of filth or probable cause of sickness not in compliance with ch. NR 113, Wis. Adm. Code (referenced from s. NR 113.03(35), Wis. Adm. Code).

25. Nutrients: means plant nutrients derived from commercial fertilizers, manure, organic wastes, soil reserves, legumes, or other sources (referenced from s. NR 113.03(35g), Wis. Adm. Code.

26. Pasture crop: means a crop such as legumes, grasses, grain stubble, or stover which is consumed by animals while grazing (referenced from s. NR 113.03(37), Wis. Adm. Code.

27. Pathogens: means disease causing organisms. This includes certain bacteria, protozoa, viruses and viable helminth ova (referenced from s. NR 113.03(38), Wis. Adm. Code).

28. Permeability: means the rate of movement of liquid through the soil (referenced from s. NR 113.03(39), Wis. Adm. Code. Permeability shall be calculated using the below table or other method acceptable to the department.

Textural Classification System	
USDA	**Permeability Inches/Hour**
Sand Loamy Sand	Greater Than 6
Sandy Loam	2.0 - 6.0
Loam	0.6 - 2.0
Silt Loam Silt	0.6 - 2.0
Sandy Clay Loam Clay Loam Silty Clay Loam	0.6 - 2.0
Sandy Clay Silty Clay Clay	0.1 - 2.0

29. pH: means the logarithm of the reciprocal of the hydrogen ion concentration measured at 25 degrees Centigrade or measured at another temperature and then converted to an equivalent value at 25 degrees Centigrade (referenced from s. NR 113.03(39m), Wis. Adm. Code).

30. Ponding: means the presence of free liquid over an area of 4 square feet or more, visible 2 hours after application of the septage. An example of a 4 square foot area would be an area 4 feet by 1 foot (referenced from s. NR 113.03(40), Wis. Adm Code).

31. Posting: means the placement of signs on the perimeter of the site or field that contain a notice of septage application, name, address, and telephone number of the hauler spreading the septage and are not placed more than 500 feet apart (referenced from s. NR 113.03(42), Wis. Adm Code).

32. Public contact site: means land with a high potential for contact by the public (examples include: public parks, ballfields, cemeteries, plant nurseries, turf farms, and golf courses) (referenced from s. NR 113.03(44), Wis. Adm Code).

33. Recreational site: means a designated area clearly identified and maintained for the purpose of providing an opportunity for recreational activity (referenced from s. NR 113.03(50), Wis. Adm Code).

34. Restricted public access: means private property or the limiting of entry for a period of time by means such as signs, traditional agricultural fencing, or remote location (referenced from s. NR 113.03(51), Wis. Adm Code).

35. Site: means property consisting of one or more fields used for the recycling, disposal, or storage of septage (referenced from s. NR 113.03(58), Wis. Adm Code).

36. Site evaluation: means an evaluation of land slope, topographic or other features, or other limiting characteristics (referenced from s. NR 113.03(58m), Wis. Adm Code).

37. Soil: means the naturally occurring pedogenically developed and undeveloped regolith overlying unconsolidated material that overlies bedrock (referenced from s. NR 113.03(60), Wis. Adm Code).

38. Soil evaluation: means a field observation and report of soil morphology including a map showing locations of each soil evaluation (referenced from s. NR 113.03(61m), Wis. Adm Code).

39. Soil profile: means the vertical arrangement of unconsolidated materials into distinct layers or horizons which overlie the bedrock (referenced from s. NR 113.03(63), Wis. Adm Code).

40. Soil saturation: means that the soil pore space is filled with water (referenced from s. NR 113.03(64), Wis. Adm Code).

41. Soil scientist: a person that meets any of the following criteria: (a) Holds a professional soil scientist license issued under ch. GHSS 4; (b) Holds a certified soil tester classification from DSPS issued under ch. SPS 305; (c) Holds a bachelor of science degree in soil science from a 4-year accredited college; or (d) Is a certified professional soil scientist in good standing with the American society of agronomy (referenced from s. NR 113.03(64m), Wis. Adm. Code).

42. Standard operating procedures (or "SOPs"): means a set of step-by-step instructions compiled by a business to help workers carry out complex routine operations (referenced from s. NR 113.03(65m), Wis. Adm. Code).

43. Surface application: spreading septage on the surface of the land without mixing the septage with the soil (referenced from s. NR 113.03(66), Wis. Adm. Code).

44. Surface water: those portions of Lake Michigan and Lake Superior within the boundaries of Wisconsin, all lakes, bays, rivers, streams, springs, ponds, impounding reservoirs, marshes, water courses, drainage systems and other surface water, natural or artificial, public or private within the state or under its jurisdiction, except those waters which are entirely confined and completely retained upon the property of a facility (referenced from s. NR 113.03(67), Wis. Adm. Code).

45. Turf: means the grass and surface layer (soil) held together by its roots. *Note: this term is not defined under ch. NR 113, Wis. Adm. Code.*

46. Uniform application: means evenly spreading septage over a site through the use of a splash plate, injector, or other department approved spreading method (referenced from s. NR 113.03(68m), Wis. Adm. Code).

47. Vector attraction: means the characteristics of septage that attract rodents, flies, mosquitos, or other organisms capable of transporting infectious agents (referenced from s. NR 113.03(69), Wis. Adm. Code).

48. Wetlands: those areas where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation, and which have soils or vegetation indicative of wet conditions (referenced from s. NR 113.03(71), Wis. Adm. Code).

3.0 Acronyms

1. AWC: Available Water Capacity
2. DNR: Wisconsin Department of Natural Resources (also known as "department")
3. DOJ: Wisconsin Department of Justice
4. DSPS: Wisconsin Department of Safety and Professional Services (formerly a part of the Department of Commerce)
5. GPS: Global Positioning System
6. OIC: Operator-in-Charge
7. OIT: Operator-in-Training
8. PC: Pathogen Control
9. POTW: Publicly Owned Treatment Works
10. POWTS: Private On-Site Wastewater Treatment System
11. PRSA: Portable restroom servicing assistant
12. NON: Notice of Noncompliance
13. NOV: Notice of Violation
14. NRCS: Natural Resources Conservation Service
15. SOP: Standard Operating Procedure
16. SU: Standard Units
17. USEPA: United States Environmental Protection Agency
18. VAR: Vector Attraction Reduction
19. WLWCA: Wisconsin Liquid Waste Carriers Association

20. WPDES: Wisconsin Pollutant Discharge Elimination System

21. WWTF: Wastewater Treatment Facility

4.0 Septage Land Application Overview

4.1 Overview

All septage businesses in the State of Wisconsin that landspread septage (septic tanks, holding tanks, sanitary grease interceptors, portable restrooms, privies, etc.) shall be licensed pursuant to ch. NR 113, Wis. Adm. Code. Each vehicle used for servicing septage shall be inspected and properly registered pursuant to s. NR 113.06, Wis. Adm. Code. Every business shall comply with the septage disposal requirements specified under s. NR 113.07, Wis. Adm. Code.

Each septage business that landspreads septage must have an operator-in-charge (OIC) with a "Grade L" master operator certification. All operators that landspread septage must have a "Grade L" certification. Operators-in-training (OIT) may landspread septage under the direction of the OIC. The OIC is ultimately responsible for the actions of their certified operators and OITs (references: ss. NR 114.153(5) and NR 114.16(2)(b), Wis. Adm. Code).

Note: A Portable Restroom Servicing Assistant (or "PRSA") must work under the direction of the OIC and are limited to only servicing portable restrooms and disposal of septage at WPDES permitted facilities approved to receive portable restroom waste. PRSAs cannot landspread septage (reference: s. NR 114.16(3), Wis. Adm. Code). PRSAs may dispose of portable restroom waste at a WPDES permitted facility such as a wastewater treatment facility.

4.2 Beneficial Reuse of Septage

The beneficial use of septage and its recycling to the land as a fertilizer or soil conditioner (additional carbon) is encouraged (reference: s. NR 113.01, Wis. Adm. Code). Landspreading septage offers farmers an economical substitute for commercial fertilizers.

Inorganic (commercial) fertilizers are synthetic or mineral-based fertilizers that provide essential nutrients to plants. Inorganic fertilizers are often concentrated and applied quickly, providing immediate nutrients to the intended crop. When commercial fertilizers are landspread too far in advance of planting (example: fall or early spring), these nutrients can infiltrate past the root zone (potentially impacting groundwater). In contrast, septage is an organic-based fertilizer that slowly breaks down in the soil (via microbial activity). The slow release of nutrients is available to the intended crop throughout the growing season. These organic forms of nutrients are less water soluble, and therefore, are less likely to leach into groundwater or runoff the field into surface waters.

The farmer benefits from a relatively free source of valuable nutrients (compared to purchasing commercial fertilizers) when using septage.

Key nutrients in septage that can be utilized by crops include:

- Nitrogen: Septage contains organic and inorganic nitrogen, which are essential for plant growth. Nitrogen is a crucial nutrient for crops and helps improve soil fertility.
- Phosphorus: Phosphorus plays a significant role in plant development, especially in root growth and flowering.
- Potassium: Potassium contributes to overall plant health, water regulation, and disease resistance.
- Micronutrients: Septage may contain trace elements such as iron, zinc, copper, and manganese. These micronutrients are essential for plant health and are often deficient in agricultural soils.

Septage can be beneficially landspread as an organic soil amendment. These materials can increase the organic matter content within the soil profile, improving:

- Infiltration rates,
- Reduce soil loss,
- Increase soil structure stability and water retaining porosity,
- Decrease bulk density thereby increasing water holding capacity, plant-available water, cation exchange capacity, etc., and
- Provide a carbon and energy source for soil microbes.

Septage may be surface applied with alkali (lime) treatment, raising the pH of the septage-lime mixture to greater than 12.0 su. This mixture is often used to raise the soil pH to:

- Neutralize soil acidity,
- Improve nutrient availability,
- Enhance soil health, and
- Ultimately lead to improved crop years.

In some parts of the state, landspreading of septage is the most cost-effective disposal option. Rural wastewater treatment facilities are often too far from POTWS and/or have limited capacity to accept septage. Landspreading of septage done in accordance with ch. NR 113, Wis. Adm. Code, is protective of public health and the waters of the State (surface water and groundwater).

4.3 Concerns with Improper Septage Land Application

Improper land application of septage can create several environmental and public health problems. Therefore, land application is carefully regulated under Section 281.48 of State Statutes and Chapter NR 113 of the Wisconsin Administrative Code.

Human Borne Diseases. Humans can be exposed to pathogens by direct or indirect contact with untreated or improperly landspread septage. A pathogen is an organism capable of causing disease to a host (example: human). Pathogens that propagate in the intestinal or urinary systems of humans and are excreted in feces or urine pose the greatest risk to public health. The four main types of human pathogenic organisms include:

- Bacteria (examples: *Salmonella, Escherichia coli, Sigella sp.*),
- Viruses (examples: Hepatitis A virus, Norwalk virus, Rotavirus),
- Protozoa (examples: Cryptosporidium, Giardia lamblia, Toxoplasma gondii), and
- Helminths (examples: Ascaris lumbricoides, Toxocara canis, Trichuris trichiura).
- *Note: The species and quantity of pathogenic organisms vary based on many factors, including not limited to 1) type of system serviced (septic tank vs holding tank vs grease interceptor) and health of individuals utilizing these systems.*

Humans could be exposed to pathogens by direct or indirect contact with untreated or improperly landspread septage. To protect public health, pathogen control and vector attraction reduction methods must be employed by businesses that landspread septage (see Section 6.0 "Pathogen Control and Vector Attraction Reduction" for more details).

Surface Water. Improperly landspread septage may impact surface water. Septage contains nitrogen and phosphorus. If these nutrients runoff the land into surface water (lakes, ponds, rivers, and streams), then these nutrients can trigger overgrowth of algae. The overgrowth of algae blocks sunlight from underwater plants. When the algae eventually die, bacteria consume oxygen in the water to decompose the algae. This may lead to low oxygen (hypoxic) in the water and can kill aquatic life (fish, macroinvertebrates, etc.). *Note: Septage landspreading must meet certain setback distances from surface water, drainageways, etc. to ensure septage does not runoff into surface water (reference: ss. NR 113.01 and 113.07, Wis. Adm. Code.).*

Groundwater. Excess nitrogen in groundwater can cause health problems when the groundwater is used for consumption. Nitrogen in septage that is landspread is converted to nitrates (NO_3) by soil bacteria. Nitrate dissolves easily in water and does not adsorb onto the soil. It can easily be carried into the groundwater by rainwater and melting snow as it percolates through the soil and bedrock into the underlying aquifer. There is public health concern when private and community wells pull water from these aquifers. High levels of nitrates in drinking water can reduce the ability of the blood to transport oxygen leading to methemoglobinemia or "blue baby syndrome".), thyroid disease, colon cancer, etc. *Note: Septage landspreading must meet certain setback distances from private and community wells to ensure septage does impact those wells. Septage must be landspread on soils that can hold, treat, and reuse nutrients (reference: ss. NR 113.01 and 113.07, Wis. Adm. Code.).*

Odors. Anaerobic decomposition of organic matter in septage may produce unpleasant odors. Odors can be mitigated by:

- Properly treating septage with lime,
- Injecting waste to a minimum depth of 4 inches, or
- Incorporating waste (minimum depth of 4 inches) within 6 hours of application.

5.0 Septage Land Application Site Request and Approval Process

5.1 Overview

A septage business shall only apply septage to land application sites that meet the requirements of ch. NR 113, Wis. Adm. Code (reference: s. NR 113.11(1), Wis. Adm. Code). Each business disposing of septage to a land application site shall, at least 7 days prior to using a land application site, submit a site request package to the department.

5.2 Land Application Site Request Submittal

The permittee or licensed septage business must submit a complete *"Land Application Site Request"* (form 3400-053 AKA "53 form") with accompanying documents. A copy of the 53 form is located on the DNR "Septage Business" webpage under the "Septage Related Forms" tab.

Generally, a land application site request package includes the following information:

- Completed 53 form,
- Aerial photograph identifying site/field boundaries, private wells, residences, wetlands, waterways, etc.,
- Soil map unit map (Note: this map may be combined with the aerial photograph),
- Proof of ownership (example: copy of the tax parcel showing the property owner along with the parcel map displaying the parcel location), and
- Other relevant site information (example: field data/surveys).

It is recommended that the site request package be scanned and submitted electronically via email to the appropriate DNR Regional Septage Coordinator. For a list of regional septage coordinators, please see the DNR "Septage Business" webpage.

Incomplete site request packages may be rejected and returned. Applications submitted on modified or altered "53 forms" will not be processed.

5.3 Department Review of Land Application Site Request

The department's review process considers several factors, including but not limited to:

- Landspreading method (surface application, injection, incorporation, etc.),
- Proximity to houses and wells (private and community), streams, wetlands, drainageways, and recreational areas,
- Ability of the soil to hold and treat pollutants (permeability and available water holding capacity),
- Depth to restrictive layers (bedrock and groundwater),
- Slope and soil erodibility,
- Other relevant information necessary to protect public health and the environment.

Landspreading sites meeting ch. NR 113, Wis. Adm. Code requirements are issued a "*Site Approval and Discharge Limits Form"* (form 3400-122 AKA "122 form") and DNR approval maps. These documents identify:

- The approved area(s) on the field,
- The restricted area(s) of the field,
- Site-specific requirements and limitations necessary to protect public health and the environment.

5.4 Land Application Site Limitations

Any person who land applies septage shall comply with the minimum separation distances and soil restrictions specified under s. NR 113.07, Wis. Adm. Code. A summary table of site review criteria is provided below (referenced from Form 3400-055):

Table A—Septage s. NR 113.07 and Table 3, Wis. Adm. Code

Site Criteria	Surface	Incorporation/Injection
Minimum depth to bedrock/groundwater-subd. NR 113.07(b)12. and Table 3	3 ft.	3 ft.
Slope 0 to 12%-s. NR 113.07 Table 3	0-6% allowed	0-12% allowed
Slopes >6 and >12%-s. NR 113.07 Table 3	>6% not allowed	>12% not allowed
Distance to wells		
Community water supply or school-s. NR 113.07 Table 3	1000 ft.	1000 ft.
Other-s. NR 113 Table 3	250 ft.	250 ft.
Minimum distance to residence, business or recreation area-s. NR 113 Table 3	500 ft.	200 ft.
Minimum distance to residence or business with permission-s. NR 113 Table 3	250 ft.	100 ft.
Minimum distance to rural schools and health care facilities-s. NR 113 Table 3	1000 ft.	1000 ft./500 ft.
Minimum distance to property line-s. NR 113.07 Table 3	50 ft.	25 ft.
Minimum distance to streams, lakes, ponds, wetlands or channelized waterways connected to a stream, lake, pond or wetland:		
Slope 0 to < 6%-s. NR 113.07 Table 3	200 ft.	150 ft./100 ft.
Slope 6 to <12%-s. NR 113.07 Table 3	Not Allowed	200 ft./150 ft.
Minimum distance to grass waterways, or dry run with a 50 foot range grass strip:		
Slope 0 to <6%-s. NR 113.07 Table 3	100 ft.	50 ft./25 ft.
Slope 6 to <12%-s. NR 113.07 Table 3	Not Allowed	100 ft./50 ft.
Soil permeability range (in/hr)-sub. NR 113.07(3)	0.2-6.0	0.2-6.0
Frozen or snow covered ground special application rules:		
Slope 0 to 2%-sub. NR 113.07(1)	Allowed	Not Applicable
Slope >2%-sub. NR 113.07(1)	Not Allowed	Not Applicable
Application rate-sub. NR 113.07(1)	<10,000 gal/acre	Not Applicable
Min. distance to surface water, wetland or floodplain-sub. NR 113.07(1)	750 ft.	Not Applicable

The maximum weekly hydraulic loading rate (non-winter conditions) shall be limited by soil characteristics and application method. The maximum weekly hydraulic rate is limited to 13,000 gallons per acre per week except that injection and incorporation on sites of 6 percent slope or less may be increased per sub. NR 113.09(5), Wis. Adm. Code.

Permeability. Septage may not be land applied on soils which have a permeability rate greater than 6 inches per hour within the top 36 inches, unless it is demonstrated that the soil has a water holding capacity of greater than 5 inches above the groundwater and bedrock. In no case may greater than 60 inches in a soil profile be used to determine the 5 inches of water holding capacity (reference: s. NR 113.07(3)(b), Wis. Adm. Code). *Note: See textural classification system table under Section 2.0 "Key Definitions Grade L Exam").*

Available Water Holding Capacity (AWC). AWC is an estimate of the amount of water which is readily held by the soil and available for plant uptake (reference: NR 113.03(6), Wis. Adm. Code. *Note: See textural classification system table under 2.0 "Key Definitions Grade L Exam").*

Bedrock. Septage shall be land applied to soils with greater than 3 feet separation to bedrock. Bedrock is the rock that is exposed at the earth's surface or underlying soil. Bedrock includes weather in-place consolidated material larger than 2 mm in size and greater than 50% by volume, or weakly consolidated sandstone at the point of increased resistance to penetration of a knife blade (reference: s. NR 113.03(7), Wis. Adm. Code).

Groundwater. Septage shall be land applied to soils with greater than 3 feet separation to groundwater. Groundwater means any waters of the state occurring in a saturated subsurface geological formation of permeable rock or soil (reference: s. NR 113.03(22), Wis. Adm. Code).

Slope. While not defined under s. NR 113.03, Wis. Adm. Code, slope can generally be defined as rise over run. Lower slope values indicate flatter ground. Higher slope values indicate inclined ground. Slope is restricted to less than:

- 6% when septage is surface applied, and
- 12% when septage is injected or incorporated.

5.5 Soil Investigations

Morphological soil investigations shall be conducted by a soil scientist for all of the following situations:

- High use field (see Section 11.0 "Septage High Use Fields"),
- Low use fields when detailed soil conservation or survey maps are not available, or
- When there are conflicting results of soil conservation or soil maps (reference: s. NR 113.08(1)(b), Wis. Adm. Code).
- *Note: A soil scientist may also evaluate soil map units with potential site limitations (examples: shallow groundwater less than 36" from soil surface, shallow bedrock less than 36" from surface, rapid permeability (greater than 6"), and low water holding capacity (less than 5 inches within top 60 inches of soil profile).*

A soil scientist is defined as a person that meets any of the following criteria:

- Holds a professional soil scientist license issued under ch. GHSS 4, Wis. Adm. Code,
- Holds a certified soil tester classification from DSPS issued under ch. SPS 305, Wis. Adm. Code,
- Holds a Bachelor of Science degree in soil science from a 4-year accredited college, or
- Is a certified professional soil scientist in good standing with the American Society of Agronomy (reference: s. NR 113.03(64m), Wis. Adm. Code).

5.6 Site Approval Information Required in Land Application Vehicles

When disposing at a land application site, all of the following site related information shall be kept in the vehicle cab pursuant to s. NR 113.06(3)(g), Wis. Adm. Code:

- A copy of the site request and related submittal information specified under s. NR 113.11(1), Wis. Adm. Code;
- A copy of the site approval issued by the department (form 3400-122 AKA "122 form"); and
- A copy of site approval maps issued by the department under s. NR 113.11(1), Wis. Adm. Code.

6.0 Pathogen Control and Vector Attraction Reduction (PC/VAR) Requirements

6.1 Overview

Pathogens are disease-causing organisms (examples: bacteria, viruses, protozoa, and helminths). Pathogens that exist in enteric (intestinal) and urinary systems of humans and are discharged through feces or urine can pose significant risks to public health. The intent of pathogen control is to utilize treatment and/or management practices (in situ treatment or natural attenuation) to protect public health.

Direct contact with pathogens may occur when:

- Touching septage which may lead to infection of skin, or pathogens finding their way into the mouth through contaminated hands,
- Walking through a field shortly after septage land application,
- Handling soil that recently received septage, or
- Contact within septage because of a spill, servicing event, etc.

Indirect contact with pathogens may occur when:

- Consuming crops contaminated with septage,
- Consuming milk or meat products from livestock contaminated during grazing on a field recently receiving septage,
- Contacting septage via vectors.

Vectors are organisms that can spread disease by carrying and transferring pathogens. Examples of vectors include rodents, pets, and insects. Vectors may be attracted to the septage as a food source.

6.2 Pathogen Control (PC) Requirements

Pathogen control is required by both 40 CFR 503 and ch. NR 113, Wis. Adm. Code. Pathogen control requirements attempt to reduce pathogen densities in the septage. Proper liming practices

and environmental influences such as sunlight and cold temperatures can limit the density of pathogens. Lime treatment includes raising the septage mixture to a temperature corrected pH of 12.0 SU at a temperature of 25 ºC and maintaining a pH of 12.0 SU for no less than 30 minutes**.**

Additional Site Restrictions. Septage businesses shall comply with the additional site restrictions (food crop, livestock grazing, turf, and public access) specified under s. NR 113.07(3)(d), Wis. Adm. Code.

- Site Restrictions for **Surface Application** of Septage (with Alkali Addition):
    - The pH of septage applied to agricultural land, forest, or a reclamation site shall be raised to 12.0 or higher by alkali addition and, without the addition of more alkali, shall remain at 12.0 or higher for 30 minutes.
    - Food crops with harvested parts that touch the septage/soil mixture and are totally above the land surface may not be harvested for 14 months after application of septage.
    - Food crops with harvested parts below the surface of the land may not be harvested for 20 months after application of septage when the septage remains on the land surface for 4 months or longer prior to incorporation into the soil.
    - Food crops with harvested parts below the surface of the land may not be harvested for 38 months after application of septage when the septage remains on the land surface for less than 4 months prior to incorporation into the soil.
    - Food crops, feed crops and fiber crops may not be harvested for 30 days after application of septage.

- Site Restrictions for **Incorporation** or **Injection** of Septage:
    - Food crops with harvested parts that touch the septage/soil mixture and are totally above the land surface may not be harvested for 14 months after application of septage.
    - Food crops with harvested parts below the surface of the land may not be harvested for 20 months after application of septage when the septage remains on the land surface for 4 months or longer prior to incorporation into the soil.
    - Food crops with harvested parts below the surface of the land may not be harvested for 38 months after application of septage when the septage remains on the land surface for less than 4 months prior to incorporation into the soil.
    - Food crops, feed crops and fiber crops may not be harvested for 30 days after application of septage.
    - Animals may not be allowed to graze on the land for 30 days after application of septage.
    - Turf grown on land where septage is applied may not be harvested for one year after application of the septage when the harvested turf is placed on either land with a high potential for public exposure or a lawn, unless otherwise specified by the department.
    - Public access to land with a high potential for public exposure shall be restricted for one year after application of septage.
    - Public access to land with a low potential for public exposure shall be restricted for 30 days after application of septage.

pH Measurements. Septage businesses may use narrow range pH paper (example: 10.1 to 13.0 SU) to measure pH. To achieve accurate pH monitoring results, businesses should use 3 lots of narrow range pH paper or strips with 3 distinct log numbers.

Septage businesses may also use temperature correcting pH meters, provided these meters are routinely calibrated. To achieve accurate pH monitoring results when using pH meters, the meters must be frequently calibrated with appropriate buffer solutions (7.0 su and 10.01 su). It may be helpful to maintain any instructions for use and/or any documentation that came with the meter should there be any issues while calibrating the meter. The department has created a template *"Septage: Weekly pH Meter Calibration Log"* (form 3400-229 AKA "229 form").

Standard Operating Procedures (SOPs). The septage business must provide a description for SOP of how pathogen reduction requirements are met (reference: per s. NR 113.11(3)(c)3.h. Wis. Adm. Code). See PC/VAR SOPs in Section 16.0 "*Appendix*."

6.3 Vector Attraction Reduction (VAR) Requirements

There are three different methods of vector attraction reduction (VAR) allowed for septage (per ss. NR 113.07(3)(e)1., 2., and 3., Wis. Adm. Code). Two methods are barrier methods and include incorporation and injection (as defined under ss. NR 113.03(28) and (30), Wis. Adm. Code). One method requires further treatment of septage (treatment with alkali addition).

Incorporation. Septage must be incorporated into the soil to a depth of at least 4 inches within 6 hours after application to or placement on the land per s. NR 113.03(28) and s. NR 113.07(3)(e)2., Wis. Adm. Code. Date and time of incorporation must be included on the daily log book and invoice record systems.

Injection. Septage must be injected (subsurface placement of septage) to a depth of 4 to 12 inches per s. NR 113.03(30), Wis. Adm. Code.

Treatment with Alkali Addition (pH Measurements). The single VAR treatment includes lime or alkaline treatment to a temperature corrected pH of 12.0 SU at a temperature of 25ºC and maintained at a pH of 12.0 SU for no less than 30 minutes. Septage businesses may use narrow range pH paper (example: 10.1 to 13.0 SU) to measure pH. To achieve accurate pH monitoring results, businesses should use 3 lots of narrow range pH paper or strips with 3 distinct log numbers.

Septage businesses may also use temperature correcting pH meters, provided these meters are routinely calibrated. The department recommends calibrating meters weekly. The department has created a template *"Septage: Weekly pH Meter Calibration Log"* (form 3400-229 AKA "229 form").

Each licensed business shall keep lime purchase receipts and make these records available to department representatives upon request to verify VAR (reference: s. NR 113.11(3)(c)4., Wis. Adm. Code).

Standard Operating Procedures (SOPs). Septage business must provide a description for SOP of how vector attraction reduction requirements are met (reference: per s. NR 113.11(3)(c)3.i. Wis. Adm. Code). See PC/VAR SOPs in Section 16.0 "*Appendix*."

7.0 Nitrogen

7.1 Overview

Nitrogen is an essential building block for plant growth. However, nitrogen is usually a limiting factor in plant growth because most available nitrogen is not in a form that plants can use.

The main reservoir of nitrogen is in the atmosphere as diatomic nitrogen (N_2). Bacteria in the soil can convert atmospheric nitrogen into a useable form through the process of nitrogen fixation. Legumes, like alfalfa, clover and soybeans, generally add plant-available nitrogen to the soil because these plants have nitrogen-fixing bacteria associated with their root nodules. Other plants such as corn, small grains and grasses must rely on nitrogen stored in the soil. Industrial nitrogen fixation is used to produce commercial fertilizers with plant-available ammonium (NH_4^+). Septage, like manure, contains nitrogen which can be used by crops where landspreading occurs.

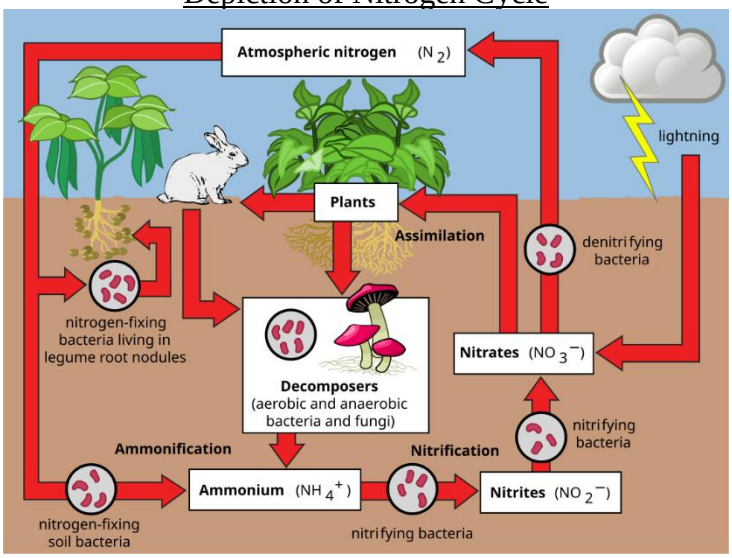
In Wisconsin, contamination of groundwater with nitrates has been a worsening problem. Soil bacteria convert nitrogen in fertilizers, manure, and septage, to nitrates (NO_3). If there is not enough plant-available nitrogen in the soil, crop yields may decrease, but if there is too much nitrogen in the soil, it can leach into the groundwater. Consumption of well water contaminated with nitrates presents serious health risks to humans and livestock.

7.2 Nitrogen Cycle

The nitrogen cycle is a biogeochemical process that converts nitrogen into various forms, moving it through the Earth's atmosphere, soil, and organisms. Key steps in the nitrogen cycling include:

- Nitrogen fixation. Conversion of atmospheric nitrogen into a form that plants can use.
- Assimilation. Incorporation of nitrogen into plants.
- Ammonification. Conversion of organic nitrogen compounds into ammonia.
- Nitrification. Conversion of ammonia into nitrate.
- Denitrification. Conversion of nitrate back into atmospheric nitrogen.

Depiction of Nitrogen Cycle



www.wikipedia.com

7.3 Nitrogen Application Rate

Loading rates for landspreading of septage are based in part on protecting groundwater from nitrate leaching. Septage may only be applied to agricultural lands and may not be applied at rates that will supply available nitrogen at amounts greater than the agronomic need for the crop (per s. NR 113.09(1)(b), Wis. Adm. Code). The nitrogen recommendations shall be in accordance with the University of Wisconsin - Extension bulletin A-2809, or other soil nutrient determination (reference: s. NR113.07(3)(b)11.b. Wis. Adm. Code).

Note: Leguminous crops that can fix nitrogen have an annual recommended rate of zero (A2809 bulletin). However, leguminous crops will utilize available nitrogen (if available) rather than fixing nitrogen. Therefore, septage may be applied to most leguminous crops at a rate of 200 lbs/acre, but the application rate for soybeans is limited to 140 lbs/acre (per s. NR 113.09(3), Wis. Adm. Code).

Under the federal nitrogen hydraulic formula, approximately 2.5 pounds of nitrogen is available in 1,000 gallons of septage. Septage businesses may use the below formula to calculate the annual agronomic rate (reference: s. NR 113.09(4), Wis. Adm. Code):

$$\text{Annual Agronomic Rate (gallons/acre/year)} = \frac{\text{Pounds Nitrogen (Required Expected Crop Yield)}}{0.0026}$$

Other Sources of Nitrogen. Other sources of nitrogen, including manure and commercial fertilizer, must be tracked and reported on the "Annual Land Application Report" (from 3400-055 for "55 form"). *Note: If no other sources of nitrogen are supplied, then the business should report "0" (instead of leaving this column blank).*

Example: Smith Pumping LLC landspread septage on DNR# 12345 (site/field: 1-1). Prior to landspreading septage, Smith Pumping LLC talks to the property owner (Dan Brown) to identify if any manure or commercial fertilizer has been landspread during the current crop year. Mr. Brown indicated that ~50 pounds Nitrogen/acre of commercial fertilizer has been applied to field 1-1 during the 2024 crop year. Smith Pumping LLC then landspreads on this field. At the end of the year, Smith Pumping LLC talks with Mr. Brown to determine if any other nitrogen has been applied to field 1-1. During this conversation Smith Pumping LLC advises Mr. Brown of the Nitrogen supplied from their septage applications. Mr. Brown has not applied any additional fertilizer or manure during the 2024 crop year. Smith Pumping LLC reports "50 lbs/acre nitrogen" under the "Other Sources of N (lbs/acre)" column of the Annual Land Application Report (3400-053 form).

7.4 Example Nitrogen Calculation Scenarios

Nitrogen Calculation Scenario 1. Nitrogen Loading Rate Based on Low-Use Field Yearly Hydraulic Loading Rate

Landspreading information:

- Field used: DNR# 54321
- Application method: surface application with alkali adjustment
- Corn (nitrogen need is 165 lbs/acre/crop year based on UW Extension A2809)
- Other sources of nitrogen: 0 pounds nitrogen/acre

Question: What is the nitrogen loading rates (pounds/acre/crop year) based on the maximum low-use field hydraulic loading rate? *Note: Maximum rate is 39,000 gals/ac/year for septic tank and holding tank waste.*

$$\text{Annual Agronomic Rate (Gallons/Acre./Year)} = \frac{\text{(Pounds of Nitrogen Required for Expected Crop Yield)}}{0.0026}$$

$$39{,}000 \text{ gallons/acre/year} = \frac{\text{(Pounds of Nitrogen Required for Expected Crop Yield)}}{0.0026}$$

$$39{,}000 \text{ gallons/acre/year} = \frac{\text{(Pounds of Nitrogen Required for Expected Crop Yield)}}{0.0026}$$

101.4 pounds nitrogen/acre/crop year

Conclusions. The maximum application rate (gallons/acre/crop year) may not exceed 39,000 gallons/acre/crop year. At this maximum rate, the field receives ~100 pounds nitrogen/acre/crop year; this is well below the need of the intended crop (corn). The site owner and/or farmer may consider supplementing the field with additional sources of nitrogen (examples: manure and commercial fertilizer).

The business/permittee reports this information on the Annual Land Application Report ("ALAR"; form 3400-055). *Note: The business/permittee also reports on the ALAR the intended crop (corn), recommended nitrogen (165 pounds N/acre), and other sources of nitrogen (if applicable).*

Nitrogen Calculation Scenario 2. Nitrogen Loading Rates 2020 Crop Year (Surface Application)

Landspreading information:

- Field used: DNR# 54321(low use field)
- Application method: surface application with alkali adjustment
- Corn (nitrogen need is 165 lbs/acre/crop year based on UW Extension A2809)
- Total volume landspread: 1,200,000 gallons
- Total acres landspread: 40 acres
- Other sources of nitrogen: 0 pounds nitrogen/acre

Question: How many pounds of nitrogen were applied to DNR# 54321 in the 2020 crop year?

Gallons/Acre = 1,200,000 gallons / 40 acres = 30,000 gallons/acre

$$\text{Annual Agronomic Rate (Gallons/Acre./Year)} = \frac{\text{(Pounds of Nitrogen Required for Expected Crop Yield)}}{0.0026}$$

$$0.0026$$

$$30{,}000 \text{ gallons/acre/year} = \frac{\text{(Pounds of Nitrogen Required for Expected Crop Yield)}}{0.0026}$$

$$30{,}000 \text{ gallons/acre/year} = \frac{\text{(Pounds of Nitrogen Required for Expected Crop Yield)}}{0.0026}$$

78.0 pounds nitrogen/acre/crop year

Conclusions. The maximum application rate (gallons/acre/crop year) for a low use field may not exceed 39,000 gallons/acre/crop year. This business landspread well below this yearly hydraulic limit. The field received ~78 pounds nitrogen/acre/crop year; this is well below the need of the intended crop (corn). The site owner and/or farmer may consider supplementing the field with additional sources of nitrogen (examples: manure and commercial fertilizer).

The business/permittee reports this information on the Annual Land Application Report ("ALAR"; form 3400-055). *Note: The business/permittee also reports on the ALAR the intended crop (corn), recommended nitrogen (165 pounds N/acre), and other sources of nitrogen (if applicable).*

Nitrogen Calculation Scenario 3. Nitrogen Loading Rates 2020 Crop Year (Other Sources of Nitrogen)

Landspreading information:

- Field used: DNR# 54321 (low use field)
- Application method: surface application with alkali adjustment
- Corn (nitrogen need is 165 lbs/acre/crop year based on UW Extension A2809)
- Total volume landspread: 900,000 gallons
- Total acres landspread: 40 acres
- Other sources of nitrogen: 100 pounds nitrogen/acre

Question 1: The site owner and/or farmer landspreads ~100 pounds nitrogen/acre of nitrogen fertilizer. What is the maximum yearly hydraulic loading rate?

Pounds Nitrogen Required for Corn = 165 pounds – 100 pounds (fertilizer) = 65 pounds [target value]

$$\text{Annual Agronomic Rate (Gallons/Acre./Year)} = \frac{\text{(Pounds of Nitrogen Required for Expected Crop Yield)}}{0.0026}$$

$$\text{Annual Agronomic Rate (Gals/Acre/Year)} = \frac{\text{(65 Nitrogen Required for Corn)}}{0.0026}$$

Annual Agronomic Rate (Gals/Acre/Year) = 25,000 gallons/acre

Question 2. The septage business/permittee landspread 900,000 gallons of septage on 40 acres. How many pounds of nitrogen were applied to DNR# 54321 in the 2020 crop year?

Gallons/Acre = 900,000 gallons / 40 acres = 22,500 gallons/acre

$$\text{Annual Agronomic Rate (Gals/Acre/Year)} = \frac{\text{(Pounds of Nitrogen Required for Expected Crop Yield)}}{0.0026}$$

$$22{,}500 \text{ gallons/acre/year} = \frac{\text{(Pounds of Nitrogen Required for Expected Crop Yield)}}{0.0026}$$

$$22{,}500 \text{ gallons/acre/year} = \frac{\text{(Pounds of Nitrogen Required for Expected Crop Yield)}}{0.0026}$$

58.5 pounds nitrogen/acre/crop year

Conclusions. The maximum application rate (gallons/acre/crop year) for a low use field may not exceed 39,000 gallons/acre/crop year. The significant addition of fertilizer (100 pounds nitrogen/acre) restricts the maximum yearly hydraulic application rate to 25,000 gallons/acre/year.

This business landspreads ~59 pounds nitrogen/acre/crop year. The business/permittee reports this information on the Annual Land Application Report ("ALAR"; form 3400-055). *Note: The business/permittee also reports on the ALAR the intended crop (corn), recommended nitrogen (165 pounds N/acre), and other sources of nitrogen (100 pounds nitrogen/acre).*

8.0 Hydraulic Application Rate

8.1 Overview

Hydraulic application rate or "application rate" means the hydraulic loading rate placed on a landspreading site or field normally expressed as gallons/acre/week (reference: s. NR 113.03(3), Wis. Adm. Code).

It is critical for septage permittees and licensees to periodically calibrate landspreading equipment to ensure septage is uniformly applied at an acceptable rate (gallons/acre/week). Exceeding this acceptable rate may impact:

- Nearby surface water and wetlands due to potential ponding and runoff of septage,
- Groundwater if application rates exceed the capacity of the soil to hold and treat septage applied, and/or
- Public health due to impacts to surface water or groundwater.

Ultimately, accurate tracking of application rate ensures the accurate calculation of nitrogen suppled from septage (See Section 7.0 "Nitrogen" for more details).

8.2 Hydraulic Application Rates (Weekly and Yearly)

Weekly Hydraulic Application Rate. The maximum weekly hydraulic rate of septage application shall be limited by soil characteristics and application method. The maximum weekly hydraulic rate is limited to 13,000 gallons/acre/week (reference: s. NR 113.09(5), Wis. Adm. Code and "Table 4" below).

Table 4
Summary of Maximum Loading Rates

	Maximum Weekly Hydraulic Loading		Low Use Field[2] Yearly Hydraulic Loading		High Use Field Yearly Hydraulic Loading
	Gal/Ac	Inches	Gal/Ac	Inches	
Non–Holding Tank POWTS Wastewater	13,000[3]	1/2	39,000	1–1/2	Loading is based on crop requirements[1]
Non–Holding Tank POWTS Wastewater (75% or More) with Grease Trap Wastewater (25% or Less)	13,000[3]	1/2	39,000	1–1/2	"
Holding Tank POWTS Wastewater	13,000[3]	1/2	39,000	1–1/2	"
Holding Tank Non–POWTS Wastewater	13,000[3]	1/2	39,000	1–1/2	"
Holding Tank POWTS Wastewater (75% or More) Grease Trap Wastewater (25% or Less)	13,000[3]	1/2	39,000	1–1/2	"
Grease Trap Wastewater (All or Greater than 25% of a Mixed Load of Septage)	4,300	1/6	12,900	1/2	N/A

Note: This weekly application rate may be increased with department approval (see Section 13.0 "Alternative Hydraulic Application Rates" for more details).

Yearly Hydraulic Application Rate (Low Use Fields). The yearly hydraulic application rate for low use fields depends on the type of septage land applied.

- Yearly application for sanitary grease is 12,900 gallons/acre/year.
- Yearly application rate for septic tank, holding tank, and grease interceptor waste is 39,000 gallons/acre/crop year.

Note: See "Table 4" under s. NR 113.09, Wis. Adm. Code, for more details.

8.3 Calibration of Application Equipment

Septage businesses may need multiple hydraulic rate calculations if 1) vehicle(s) utilize different injectors, 2) spreading vehicles drive at variable speeds, and/or 3) spreading vehicles have differing tank capacities. These calculations may be required in a landspreading management plan per s. NR 113.12(7)(d), Wis. Adm. Code. Alternatively, the department recommends that the septage business retain these calculations as part of its SOPs in the office and in each septage vehicle.

Some tractors/injectors measure flow with an on-board flow meter. The department recommends that these meters are calibrated on an annual basis.

Some businesses utilize dragline hose systems. The spill plan should include SOPs for containing minor and major spills associated with dragline equipment.

8.4 Equipment Calibration Examples (Surface Application and Injection)

Section 16.0 "*Appendix*" contains walkthrough (visual) examples for calculating the hydraulic application rate for a splash plate and injector.

8.5 Equipment Calibration Scenarios

Equipment Calibration Scenario 1. Calibration of Vehicle with Splash Plate

Landspreading information:

- Field used: DNR# 54321
- Application method: surface application with alkali adjustment
- Vehicle capacity: 4,000 gallons
- Contents of tank: combination of septic tank and holding tank wastes
- Vehicle speed: 2.5 mph
- Spread Width (observed): 20 feet
- Spread Length (observed): 700 feet

Area Landspread
Area = length x width
Area = 20 feet x 700 feet
Area = 14,000 square feet

Convert Square Feet to Acres (Note: There is 43,560 square feet in one acre).
Acres = (14,000 square feet) x (1 acre/43,560 square feet)
Acres = 14,000/43,560
Acres = 0.321 Acres

Hydraulic Application Rate (Gallons/Acre)
Application Rate = 4,000 gallons/0.321 acres
Application Rate = 12,460 gallons/acre

Conclusions: This vehicle traveling at 2.5 mph complies with the weekly hydraulic application rate of 13,000 gallons/acre/week.

Equipment Calibration Scenario 2. Calibration of Tractor with Injector (No Flow Meter)
Landspreading information:

- Field used: DNR# 54321
- Application method: injector
- Vehicle capacity: 4,000 gallons
- Contents of tank: combination of septic tank and holding tank wastes
- Vehicle speed: 2.5 mph
- Spread Width (observed): 15 feet
- Spread Length (observed): 1,300 feet

Area Landspread
Area = length x width
Area = 15 feet x 1.300 feet
Area = 19,500 square feet

Convert Square Feet to Acres (Note: There is 43,560 square feet in one acre).
Acres = (19,500 square feet) x (1 acre/43,560 square feet)
Acres = 19,500/43,560
Acres = 0.448 Acres

Hydraulic Application Rate (Gallons/Acre)
Application Rate = 4,000 gallons/0.448 acres
Application Rate = 8,928 gallons/acre

Conclusions: This vehicle traveling at 2.5 mph complies with the weekly hydraulic application rate of 13,000 gallons/acre/week.

9.0 Septage Field Management

9.1 Overview

The following sections detail field management requirements as specified under ch. NR 113, Wis. Adm. Code. The department recommends that the OIC develop written SOPs including but not limited to:

- Identify ponding or runoff conditions,
- Verify that the field has been left litter free,
- Identify restricted areas,
- Ensure uniform landspreading of septage, and
- Identify winter conditions.

9.2 Ponding, Runoff, and Litter

Land application vehicles shall be moving forward at all times while septage is being uniformly spread. Ponding of septage is prohibited per s. NR 113.07(3)(b)6., Wis. Adm. Code. "Ponding"

means the presence of free liquid over an area of 4 square feet or more, visible 2 hours after application of the septage. An example of a 4 square foot area would be an area 4 feet by 1 foot (reference: s. NR 113.03(40), Wis. Adm. Code). The operator must cease landspreading if ponding conditions are observed.

Septage shall be landspread in a manner to prevent surface runoff per s. NR 113.07(3)(b)5., Wis. Adm. Code. Septage may not be landspread on saturated soils during rainfall events or in areas of ponded water. The operator must cease landspreading if runoff conditions are observed.

All landspreading fields shall be left in a litter free condition. "Litter free" means the absence of nonbiodegradable material such as plastics or glass of 2 inches or greater in length on the soil surface (reference: s. NR 113.03(33), Wis. Adm. Code). Some businesses install screens on their landspreading equipment to remove litter. Some businesses use small onsite septage storage to screen septage. Some businesses remove litter manually after landspreading septage.

9.3 Crop Year

A crop year is a period of time from one year's harvest to the next for an agricultural commodity (examples: alfalfa, corn grain, corn silage, hay, soybeans, and wheat). The crop year varies for each commodity, depending on the life cycle of the plant, harvesting schedule, etc. A crop year may or may not coincide with a calendar year. Example: A business landspreads septage in the fall of 2025 after the corn harvest. While landspreading occurred during the 2025 calendar year, the nutrients applied would be utilized by the next year's crop (2026 crop year).

9.4 Identification of Restricted Areas

A septage operator employs SOPs to identify, mark, and avoid restricted areas on agricultural fields. Clearly marking these locations ensures that the business' landspreading activities comply with ch. NR 113, Wis. Adm. Code.

Restricted areas include setbacks from residences, wells (private and community), surface waters, wetlands, and dry runs.

Restricted areas also include NRCS soil map units with potential limiting factors such as potential shallow bedrock, shallow groundwater, steep slope, rapid to very rapid permeability, low available water holding capacity, etc.

These restricted areas are often identified with GPS units, rangefinders, measuring tapes, etc. Operators use cones, flags, posts etc. to clearly identify the boundaries for these areas. The department recommends that these supplies be present on each landspreading vehicle.

The OIC should routinely verify that these boundaries are appropriately measured, identified, etc. The OIC should routinely inspect each field to evaluate the presence of new potential restricted areas (example: construction of a new nearby residence).

9.5 Uniform Application

Septage must be uniformly landspread on department-approved fields. Uniform application means evenly spreading septage over a site through use of a splash plate, injector, or other department approved spreading method (references: s. NR 113.03(68m) and s. NR 113.07(3)(b)6., Wis. Adm. Code)

Often permittees/licensees landspread on fields over a longer-period of time (weeks, growing season, etc.). In many instances, several calendar days may pass between land application "events." In these situations it is critical to mark the "stop" location of each spreading event. For example, a septage business landspread via splash plate. After the vehicle has emptied its tank, the operator places a construction cone to mark the last location landspread. This location then becomes the "start" location for the next landspreading event. Operators commonly use construction cones, construction flags, and/or note these locations using GPS units.

9.6 Septage Application to Frozen or Snow-Covered Ground

The land application of septage is strongly discouraged during months when the ground is frozen or snow covered. The ground is considered frozen when the frost depth exceeds 4 inches (minimum depth for incorporation and injection).

Septic tank waste which has been pumped due to an emergency or waste which has been removed from a frequently pumped system may be land applied on frozen or snow-covered ground. Septic tank waste which is pumped due to routine maintenance may not be land applied on frozen or snow-covered ground (reference: s. NR 113.07(1)(b), Wis. Adm. Code).

The DNR recognizes that emergencies such as freeze-ups or failures occur in parts of the state where disposal into a wastewater treatment plant is not available or feasible (nearest plant may be miles away). Land application of septic tanks during winter months will be allowed as long as more stringent conditions are adhered to during emergencies, including:

- Sites used shall have slopes less than or equal to 2%,
- Wastes shall be applied at a rate of less than 10,000 gallons/acre,
- Application is not allowed with 750 feet of any surface water or wetland.
- Application is not allowed in a floodplain.
- *Important Note: Due to frozen ground conditions, vector attraction reduction must be met with alkali addition. See Section 6.0 ("Pathogen Control and Vector Attraction Reduction") for more details.*

In addition, land application of frequently pumped (every 6 months or less) septic systems is also conditionally allowed (reference: NR 113.07(1)(c), Wis. Adm. Code). Waste from these systems will continue to be considered like holding tank waste for regulatory purposes because it is not as high strength as standard septic tank waste. Land application of holding tanks during winter

months will be allowed as long as more stringent conditions are adhered to during emergencies, including:

- Sites used shall have slopes less than or equal to 2% (2-6% slope may be considered with the submittal of a site management plan),
- Wastes shall be applied at a rate of less than 10,000 gallons/acre,
- Application is not allowed within 750 feet of any surface water or wetland,
- Application is not allowed in a floodplain.

9.7 Soil Compaction

Soil compaction may occur when heavy vehicles drive over the soil on a landspreading site. When the soil becomes compacted, the infiltration rate will be lowered, and any rainfall or additional applications of septage may cause ponding or runoff. Soil compaction may also lower crop yields and make it more difficult for the landowner to cultivate the land.

Soil compaction can be prevented by avoiding driving on wet fields, staying well within the hydraulic loading rates, not driving on the same areas repeatedly, and by the landowner maintaining a grass or cover crop rather than bare soil.

Often deep tillage or subsoiling (tractor mounted flat lifter utilized for deep tillage) is considered when compaction problems are severe. Some farmers routinely subsoil as a form of primary tillage.

10.0 Daily Log Book and Invoice Record Systems

10.1 Overview

Each business engaging in septage servicing shall maintain daily log book and invoice records systems pursuant to s. NR 113.11(3), Wis. Adm. Code. These records shall be made available to department representatives upon request (per s. NR 113.11(3)(c), Wis. Adm. Code).

IMPORTANT: Incomplete (non-compliant) daily log book and invoice records systems are the most common compliance issue identified with septage businesses. Septage businesses are encouraged to work with the DNR Regional Septage Coordinator to ensure these records meet ch. NR 113, Wis. Adm Code, requirements.

10.2 Daily Log Book and Invoice Records Requirements

Daily log book and invoice record systems must comply with the requirements of s. NR 113.11(3)(c), Wis. Adm. Code. At a minimum, daily log book and invoice record systems must contain all of the following information (reference s. NR 113.11(3)(c)3., Wis. Adm Code):

- Name, address, and identifying description of service location. *Note: If an address does not exist, alternative identifying information to record the location shall be provided*;
- Date and time of servicing for each service location (*Notes: Date must include the calendar year. Time must include AM/PM*);
- Type of system and description of all wastes pumped;
- Gallons collected. *Note: The records for vehicles used solely for servicing portable restrooms shall record the total gallons collected at each service location*;
- Disposal location;
- Date and time of disposal;
- Written certification by the designated OIC (if applicable);
- A description or SOP of how pathogen reduction requirements are met (if applicable); and
- A description or SOP of how vector attraction reduction requirements are met (if applicable).

Written Certification Statement. A written certification of the daily log book or invoice record systems is required for all business that land apply septage (per s. NR 113.11(3)(c)7.a., Wis. Adm. Code). For a business that does not land apply, a written certification is not required (per s. NR 113.11(3)(c)7.b., Wis. Adm. Code).

In Cab Requirements. Daily log book and invoice record systems shall be kept in the vehicle for a minimum of 2 days after servicing a system. Records are not required to be kept in the vehicle cab if the vehicle is used solely to service portable restrooms, the records are available at the business location, and the records are made available to the department upon request (per s. NR 113.11(3)(c)2., Wis. Adm. Code).

Landspreading Record Requirements. When disposing at a land application site, specific site related information shall be kept in the vehicle cab pursuant to s. NR 113.06(3)(g), Wis. Adm. Code. This information includes:

- A copy of the site request and related submittal information,
- A copy of the site approval issued by the department, and
- A copy of site maps approved or issued by the department.

Record Retention. All servicing records shall be kept on file and available for inspection for a period of 5 years per s. NR 113.11(3)(c)6., Wis. Adm. Code.

Electronic Format for Daily Log Book and Invoice Record System. Daily log book and invoice record systems may be maintained in electronic format by the business, and shall meet the requirements of ch. NR 113, Wis. Adm. Code (reference: s. NR 113.11(3)(c)9., Wis. Adm. Code).

10.3 Template Daily Log Book and Invoice Records (Landspreading)

The department has created optional template daily log and invoice record systems for land application (form 3400-227 AKA “227 form”).

Notes: The above form is available on the DNR "Septage Business License Requirements" webpage under the "Septage Related Forms" tab. Septage businesses are allowed to create and use their own daily log and invoice record system format provided these records meet ch. NR 113, Wis. Adm. Code requirements. Septage businesses are encouraged to reach out to their DNR Regional Septage Coordinator to verify that daily log book and invoice records comply with s. NR 113.11, Wis. Adm. Code requirements.

10.4 Description or SOP Pathogen Reduction

The OIC must include a description or SOP of how pathogen reduction requirements are met with the daily log book and invoice records. See Section 16.0 "*Appendix*" for further details.

10.5 Description or SOP for Vector Attraction Reduction

The OIC must include a description or SOP of how vector attraction reduction requirements are met with the daily log book and invoice records. See Section 16.0 "*Appendix*" for further details.

11.0 Septage High Use Fields

11.1 Overview

A "high use field" is approved by the department to receive more than 39,000 gallons per acre of septage per crop year and the volume applied is limited to the crop nutrient requirements (reference: s. NR 113.03(24), Wis. Adm. Code).

The benefits of high use fields include:

- Spreading nitrogen to meet the intended crop need (Note: This is especially important for crops that require greater than 100 pounds Nitrogen/crop year), and
- Maximizing landspreading acreage (volume landspread/field) to ensure economic septage disposal.

11.2 "High Use" Septage Field Submittal

An applicant must submit a morphological soil evaluation pursuant to s. NR 113.08(1)(b), Wis. Adm. Code. Morphological soil evaluations shall be conducted by a soil scientist.

Soil scientists include:

a) professional soil scientist licensed under ch. GHSS 4, Wis. Adm. Code,
b) certified soil tester classified from DSPS (ch. SPS 305, Wis. Amd. Code),

c) an individual holding a Bachelor of Science degree in soil science from a 4-year accredited college, or
d) a certified professional soil scientist in good standing with the American Society of Agronomy (reference s. NR 113.03(64m), Wis. Adm. Code).

11.3 "High Use" Septage Field Approval

The department issues a "Site Approval and Discharge Limits Form" (form 3400-122) and approval maps for each high use field.

Once approved, the volume of septage landspread on a high use field may not exceed the nitrogen need of the crop to be grown (reference: s. NR 113.09(2), Wis. Adm. Code). In addition, the permittee/licensee shall obtain soil samples for nutrient analysis. Soil sampling requirements and nitrogen guidelines for crops are detailed in the University of Wisconsin-Extension Bulletin A2809 ("*Nutrient Application Guidelines for Field, Vegetable, and Fruit Crops in Wisconsin*").

IMPORTANT: Septage may be applied to most leguminous crops at a volume sufficient to supply 200 pounds/acre of available nitrogen. If septage is applied to soybeans, the loading rate shall be limited to 140 pounds/acre of available nitrogen (reference: s. NR 113.09(3), Wis. Adm. Code).

12.0 Management Plans (Landspreading)

12.1 Overview

Management plans are a collection of detailed procedures relating to intake and storage, mixing, conveying, land applying, and/or disposal of septage pursuant to ch. NR 113, Wis. Adm. Code. Management plans are required for septage storage facilities. Management plans may be required when permittees/licensees elect to landspread at a higher alternative hydraulic application rate (per s. NR 113.09(5), Wis. Adm. Code).

12.2 Management Plans

The management plan typically serves as a standard operating procedure (SOP) for the permittee's or licensee's employees to reference and implement. This document is also utilized by department staff to ensure that the septage storage facility meets WPDES permit and/or ch. NR 113, Wis. Adm. Code, requirements.

Owners or operators of <u>all</u> septage storage facilities are required to develop a management plan (reference: s. NR 113.12(2)(d), Wis. Adm. Code). The management plan includes information for:

- Influent volume tracking,
- Septage storage location(s), inspections, and maintenance,
- Type of septage conveyance (or transportation),
- Land application site identification (DNR approval forms and maps),
- Land application vehicles, equipment, and SOPs (pathogen control, vector attraction reduction, odor and nuisance abatement, etc.),
- Alternative hydraulic application rates (pursuant to s. NR 113.09, Wis. Adm. Code) *Note: See Section 13.0 "Alternative Hydraulic Application Rates:" for more details.*,
- Contingency plans for adverse or inclement weather,
- Spill response procedures,
- Daily record keeping,
- Annual reporting requirements, and
- Any other pertinent information relating to the day-to-day operations of the storage facility.

IMPORTANT: Once the management plan is approved by the department, operations must conform with the approved management plan. Should the permittee or licensee wish to operate differently than specified in the approved management plan, the permittee/licensee may submit a modified written plan for department review and approval prior to implementing proposed modifications (reference: s. NR 113.12(7)(d)1., Wis. Adm. Code).

For more details on management plans, please refer to the "Septage Management Plans: How to Review and Approve" guidance document. This document is available on the DNR "Septage Business" webpage.

13.0 Alternative Hydraulic Application Rates

13.1 Overview

Hydraulic loading is the volume of septage landspread on a site or field and the rate is the volume landspread in a unit area, such as acres. Maximum hydraulic application rates have been established to protect groundwater from nitrate contamination. Under certain circumstances, businesses can pursue an alternative maximum hydraulic application rate under s. NR 113.09, Wis. Adm. Code.

13.2 Alternative Hydraulic Application Rates

The maximum weekly hydraulic application rate of septage land application is limited by soil characteristics and application method. Typically, the maximum weekly application rate of septage (septic tank, holding tank, and portable restroom waste) is limited to 13,000 gallons/acre/week (references: "Table 4" under s. NR 113.09(1) and s. NR 113.09(5), Wis. Adm. Code). *Note: Grease interceptor waste is limited to 4,300 gallons/acre/week.*

Table 4
Summary of Maximum Loading Rates

	Maximum Weekly Hydraulic Loading		Low Use Field[2] Yearly Hydraulic Loading		High Use Field Yearly Hydraulic Loading
	Gal/Ac	Inches	Gal/Ac	Inches	
Non-Holding Tank POWTS Wastewater	13,000[3]	1/2	39,000	1-1/2	Loading is based on crop requirements[1]
Non-Holding Tank POWTS Wastewater (75% or More) with Grease Trap Wastewater (25% or Less)	13,000[3]	1/2	39,000	1-1/2	"
Holding Tank POWTS Wastewater	13,000[3]	1/2	39,000	1-1/2	"
Holding Tank Non-POWTS Wastewater	13,000[3]	1/2	39,000	1-1/2	"
Holding Tank POWTS Wastewater (75% or More) Grease Trap Wastewater (25% or Less)	13,000[3]	1/2	39,000	1-1/2	"
Grease Trap Wastewater (All or Greater than 25% of a Mixed Load of Septage)	4,300	1/6	12,900	1/2	N/A

The revised ch. NR 113, Wis. Adm. Code (dated September 2021), provides a mechanism for septage permittees and licensees to increase the weekly hydraulic loading rate of septage application based on soil characteristics, slope, and application method (surface application, incorporation, or injection).

In some instances, septage permittees/licensees may desire to land apply septage at a hydraulic rate greater than 13,000 gallons/acre/week. The permittee/licensee can demonstrate to the department that the soils present on the field have the capability to hold and treat the increased hydraulic load (gallons/acre) while still protecting groundwater. Benefits of spreading at an increased hydraulic rate include:

- Reducing landspreading events (saving time and resources),
- Hiring a contract for a shorter period of time to landspread septage, and
- Using different equipment to reduce soil compaction, reduced odors, etc.

This hydraulic application rate may be increased provided:

- Septage is injected or incorporated with the soil,
- Field slope does not exceed 6%,
- Weekly application rate does not exceed 27,000 gallons/acre/week for sandy loam, loam, and silt loam soil map units,
- Weekly application rate does not exceed 20,000 gallons/acre/week for clay loam soil map units, and

- A written request is submitted to the department for an increase in weekly hydraulic loading rate (reference: s. NR 113.09(5), Wis. Adm. Code). *Note: The written request must include supporting information for the land application site as specified under s. NR 113.11(1), Wis. Adm. Code).*

DNR staff will evaluate the written request to increase the weekly hydraulic application rate and provide a written response to the permittee/licensee. If the request is approved, the department may require a management plan update. See Section 12.0 "*Management Plans (Landspreading)"* for more details.

14.0 Septage Annual Land Application Reports

14.1 Overview

All septage disposal activities (land application and disposal) must be recorded and reported to the department per s. NR 113.11, Wis. Adm. Code. Common methods of disposal include, but are not limited to:

- Land application of septage on department-approved fields, and
- Disposal of septage to WPDES permitted facilities (example: POTW),
- Disposal of septage to Wisconsin licensed businesses that are approved to receive, mix, and/or treat septage,
- Disposal of septage to a manure storage unit (pursuant to s. NR 113.12(3)(g), Wis. Adm. Code), or
- Hauling of septage to out-of-state facilities (examples: Illinois, Indiana, Iowa, Michigan, and Minnesota).

Each business engaging in septage servicing shall submit and certify the following applicable reports when the business land applies septage and/or uses other methods of septage disposal (per s. NR 113.11(3), Wis. Adm. Code):

- Annual Land Application Report (form 3400-055 AKA "55 form"); and
- Other Method of Disposal or Distribution Report (form 3400-052 AKA "52 form").

IMPORTANT: Successful completion of the "55 form" and "52 form" include validation, submittal, and certification by no later than January 31.

14.2 Annual Land Application Report (Form 3400-055)

The Annual Land Application Report ("55 form") shall be submitted to the department electronically (via DNR Switchboard) by January 31, following the calendar year in which land application occurs by those businesses that land apply (per s. NR 113.11(3)(a), Wis. Adm. Code). For example, the 2024 Annual Land Application Report is due by January 31, 2025.

The "55 form" contains the following information:

- DNR number;
- Site/Field name;
- Landowner;
- Acres land applied (Example: A site is approved for 25 acres, but the business only landspreads on 5 of the acres. The business would indicate "5 acres land applied" for this column in the 55 form.);
- Outfall (septic tank, holding tank, grease interceptor, or portable restroom);
- Amount of waste land applied (in gallons);
- Nitrogen supplied from waste (pounds/acre/crop year);
- Other sources of nitrogen (examples: manure, commercial fertilizer, legume carryover);
- Crop code (reference: University of Wisconsin A2809 "Nutrient Application Guidelines for Field, Vegetable, and Fruit Crops in Wisconsin");
- Nitrogen recommended for intended crop (pounds/acre/crop year); and
- Method of application (surface application, incorporation, or injection).

The following "Outfall" numbers are designated for septage:

- Septic tank waste (Outfall 990),
- Holding tank waste (Outfall 995),
- Grease interceptor waste (Outfall 997), and
- Portable restroom waste (Outfall 998).

If multiple waste types (example: septic and holding tank wastes) were applied on the same field, then the information must be entered on <u>separate lines</u> (use a separate line for each outfall number) of the "55 report."

If there are spring and fall applications to the same field, enter data on two separate lines and distinguish them by the different crop years (ie, spring application for 2023 crop year and fall application for 2024 crop year).

<u>Nitrogen Recommended Column</u>. The yearly nitrogen requirement for each crop must be reported on the Annual Land Application Report per s. NR 113.11(3)(a)2., Wis. Adm. Code. Businesses should reference the UW Extension A2809 "*Nutrient Application Guidelines for Field, Vegetable, and Fruit Crops in Wisconsin*." This information is reported under the "Nitrogen Rec. (lbs/acre)" column of the Annual Land Application Report.

Example: Smith Pumping LLC landspread septage on DNR# 12345 (site/field: 1-1). The intended crop for field 1-1 is grass (hay). Previous soil nutrient tests for field 1-1 have confirmed a soil organic matter content of ~4%. When referring to the UW Extension A2809 Table 6.3, Smith Pumping LLC identifies that this field may receive up to 130 pounds N/acre. Smith Pumping LLC reports "130 lbs/acre nitrogen" under the "Nitrogen Rec. (lbs/acre)" column of the Annual Land Application Report (3400-053 form).

15.0 Preparation Outline Grade L Exams

15.1 Overview

The below outline identifies key knowledge and principles for Grade L operator exams. Additional knowledge and concepts for Grade L operators are listed in the "Septage Operator Handbook and Study Guide for Grade T Certification".

15.2 Outline Grade L Operator Exam

1. **Key Definitions**
    a. Agricultural land
    b. Agronomic rate
    c. Application rate
    d. Approved site
    e. Food crop
    f. Hydraulic loading rate
    g. Incorporation
    h. Injection
    i. Land application
    j. Litter free
    k. Nuisance
    l. Nutrients
    m. Pathogens
    n. pH
    o. Ponding
    p. Soil
    q. Standard operating procedures
    r. Surface application
    s. Uniform application
    t. Vector attraction
2. **Septage Land Application Overview**
    a. What are the benefits of landspreading septage to agricultural fields?
    b. What are the concerns with improper septage land application?
3. **Septage Land Application Site Request and Approval Process**
    a. What are the components of a septage land application site request package?
    b. What factors does DNR consider when reviewing a land application site?
    c. Do setback requirements change based on anticipated land application method (surface, injection, incorporation)?
    d. What are the setback requirements for
        i. Residences,
        ii. Wells (private and community), and
        iii. Streams and wetlands.
    e. When is a soil investigation required for a field? What are the qualifications for a "qualified" soil scientist?

f. Detail the information that must be kept in a septage land application vehicle.

4. Pathogen Control and Vector Attraction Reduction

a. What are pathogens?
b. Provide examples of direct and indirect contact with pathogens.
c. What are vectors? Provide examples of vectors.
d. Detail the site restrictions necessary to meet pathogen control for fields surface applied (alkali addition) with septage.
e. Detail the site restrictions necessary to meet pathogen control for fields injected with septage. *Note: These requirements would be the same for fields in which septage is incorporated.*
f. Detail pH monitoring requirements.
g. Detail the three different methods allowed to meet vector attraction reduction (VAR).
h. Become familiar with PC/VAR SOPs in Section 16.0.

5. Nitrogen

a. Detail the importance of nitrogen for anticipated crops.
b. Understand the steps of the Nitrogen Cycle.
c. Become familiar with the federal nitrogen hydraulic formula. *Note: There are several example calculations provided under Section 7.0.*
d. Often fields receive other sources of nitrogen. Provide some examples of these sources.

6. Hydraulic Application Rate

a. What is hydraulic application rate? Why is it critical for a grade L operator to know this rate?
b. What is the weekly hydraulic application rate for
    i. Septic tank waste?
    ii. Holding tank waste?
    iii. Portable restroom waste?
    iv. Grease interceptor (>25%) waste?
c. What is the yearly hydraulic application rate (for low use fields) for the above-mentioned wastes?
d. Become familiar with the equipment calibration procedures. *Note: There are several example calibrations procedures provided under Section 8.0 and Section 16.0.*

7. Septage Field Management

a. Define ponding, and runoff.
b. What is litter? How can a field be left litter free?
c. Define crop year.
d. Detail how an operator can identify restricted area(s) for a landspreading field.
e. Detail how an operator can ensure uniform spreading on a field.
f. Define winter. Can septic tank waste be winter applied? Holding tank?
g. How can soil compaction be minimized?

8. Daily Log Book and Invoice Record Systems

a. Detail the requirements for a landspreading daily log book and invoice record system.
b. Is a written certification statement required for businesses that land apply septage?
c. Review the minimum requirements for a landspreading daily log.
d. What are the in-cab log requirements for businesses that land apply septage?
e. Detail the information that must be kept in a septage land application vehicle.

f. Become familiar with PC/VAR SOPs in Section 16.0.

9. Septage High Use Fields

a. What is a high use field?
b. What information must be submitted for a high use field request?
c. The volume of septage landspread on a high use field is limited to the nitrogen need of the intended crop. Review the UW Extension A2809 for nutrient testing and nitrogen guidelines.

10. Management Plans (Landspreading)

a. Detail the purpose of a management plan.
b. Detail when a management plan is required.
c. Detail the landspreading components of the management plan.
d. Review the "Septage Management Plans: How to Review and Approval" guidance document (available on DNR "Septage Business Requirements" webpage).

11. Alternative Hydraulic Application Rates

a. Under what circumstances could a septage business apply for an alternative hydraulic application rate?
b. What is the alternative hydraulic application rate for
    i. Sandy loam soil map units?
    ii. Silt loam soil map units?
    iii. Clay soil map units?

12. Septage Annual Land Application Reports

a. What report is required for a business that land apply septage?
b. What is the due date for this report?
c. What are the outfall numbers for septic tank, holding tank, grease interceptor, and portable restroom waste?
d. Utilize the UW Extension A2809 to determine the nitrogen recommends for corn and grass crops.

16.0 Appendix

16.1 PC/VAR SOP Guidelines for Surface Application (Alkali Treatment), Incorporation, and Injection)

Written SOPs are helpful for operators to reference and implement. A clear and concise SOP can minimize compliance issues and demonstrate compliance with ch. NR 113, Wis. Adm. Code. The department recommends that the OIC periodically review these written SOPs with operators that landspread septage. The department recommends that the OIC periodically review and update these written SOPs as necessary. The following subsections include information that the OIC should consider when developing a PC/VAR SOP for septage landspreading via:

- Surface application (with alkali addition) [Section 16.2],
- Incorporation [Section 16.2], and
- Injection [Section 16.3].

16.2 Surface Application (with Alkali Addition) SOPs

1. Ensuring landspreading practices meet pathogen control requirements (ss. NR 113.07(3)(d)2.a. through d., Wis. Adm. Code) for food, feed, and fiber crops. The OIC should consider asking the below questions prior to septage landspreading.
    a. What type of crop (examples: corn grain, soybeans, hay, and alfalfa) is the site owner or farmer growing this crop year?
    b. What type of crop does the site owner or farmer anticipate growing for the next 2 crop years?
    c. **IMPORTANT:** Harvesting restrictions may apply if the property owner/farmer anticipates planting:
        i. Food crops (examples: sweet corn, peas, potatoes, strawberries, and tomatoes),
        ii. Feed crops (examples: corn grain, soybeans, wheat, and hay), or
        iii. Fiber crops (examples: hemp, cotton, jute, and flax).
2. Verifying field and inspection procedures (recommended annually)
    a. How does my surface application equipment achieve uniform distribution of septage? Uniform application means evenly spreading septage over the site through the use of a splash plate, injector, or other department approved spreading method (reference: s. NR 113.03(68m), Wis. Adm. Code).
    b. Is my surface application equipment well maintained? What is my backup plan if repairs to the splash plate are necessary?
    c. Routine hydraulic application rate calibration procedures
        i. What is the hydraulic application rate of my surface application equipment? (example: 13,000 gallons/acre)?
        ii. *Note: "Table 4" (s. NR 113.09(6)(b), Wis. Adm. Code) identifies the maximum weekly hydraulic application rate for septage (example: holding tank waste is limited to 13,000 gallons/acre/week).*
3. Developing Standard Operating Procedures (SOPs) for alkali addition

a. Determine standard lime "dosing" for each vehicle.
    i. Example #1: 32 + pounds lime/1,000 gallons for septic tank
    ii. Example #2: 16 + pounds lime/1,000 gallons for holding tank
b. Add alkali (lime) to vehicle. *Note: Timing of lime addition can be very important…see "Representative sampling (pH readings) for septage" section below*
c. Agitate vehicle tank. *Note: Duration of tank agitation can be very important…see representative septage sample collection below.*
d. Detail septage testing procedures and equipment:
    i. **pH paper.**
        1. Narrow range pH paper strips (Example: Sanitation Tools pH strips with range 11.0 su to 13.0 su).
        2. OIC should use pH strips from at least 3 separate lots.
    ii. **Temperature correcting pH meter.**
        1. Verify (meter product manual) that pH meter temperature corrects pH.
        2. Ensure meter is well maintained and routinely calibrated.
e. If septage pH ≥12.0 su, record initial pH reading and time (daily log book or invoice record system). pH reading must be recorded to three significant digits (example: 12.3 su).
    i. If septage pH <12.0 su, then add more lime and retest.
    ii. Once septage pH ≥12.0 su, then the 30-minute timer begins.
f. After 30 minutes from initial pH test, retest septage.
    i. Record pH reading and time (daily log book or invoice record system). pH reading must be recorded to three significant digits (example: 12.3 su).
    ii. If septage pH ≥12.0 su, then commence landspreading septage.
    iii. If septage pH <12.0 su, then add more lime and retest.
        1. Record initial pH and time.
        2. Record second pH (30 minutes later) and time.

4. Documenting field verification and inspection procedures. The department recommends that the OIC document verification and inspection procedures, including:
    a. Date(s),
    b. Individual(s),
    c. Written observations,
    d. Photographs, and
    e. Description of potential changes to improve compliance.
5. Importance of representative sampling (septage pH readings) to ensure septage complies with pathogen control and vector attraction reduction requirements (references: ss. NR 113.07(3)(d) and (e), Wis. Adm. Code).
    a. Indicators of improper or insufficient alkali addition (lime) include, but are not limited to:
        i. Do I notice odors when landspreading septage?
        ii. Have I received odor complaints?
        iii. Has the DNR been notified of odor complaints?
    b. How am I representatively sampling my septage to determine field pH?
    c. What field verification and established SOPs do I have to minimize potential for odor complaints?
    d. Review of septage pH testing supplies and equipment.

i. **pH paper strips**
    1. Narrow range (example Sanitation Tools pH Strips with range 11.0—13.0 su).
    2. To achieve accurate pH monitoring results, use 3 lots of narrow range pH paper/strips with 3 distinct lot numbers. *Note: If there is a discrepancy between pH results from Lot 1 and Lot 2, use Lot 3 pH as a tie breaker.*
    3. Replace pH paper strips on an annual basis.

ii. **Temperature correcting pH meter**
    1. Weekly calibration.
    2. Record calibration results (recommended DNR form # 3400-229).
    3. Ensure buffer solutions have not expired.
    4. Retain "backup" pH meter(s)…typically the same model for easier calibration.
    5. Consider replacement of temperature correcting pH meters if meter has been damaged, has difficulty holding a battery charge, and/or is difficult to calibrate.

iii. Verification of representative sample collection location
    1. Do I add and mix enough lime in the vehicle's tank?
        a. Depends on the volume, and
        b. Depends on the type of waste (septic tank, holding tank, grease interceptor, portable restroom).
    2. Do I agitate the vehicle's tank enough to allow thorough mixture of lime/septage? *Note: Many businesses add lime after last client, and then drive to the landspreading field. The length of the drive often provides adequate mixing of lime and septage.*
    3. Where and when do I collect my pH sample?
    4. How can I ensure my sample is representative?
        a. Consider collecting three evenly spaced grab samples and measure the pH of each grab.
        b. All three grab samples should have a pH result of $\geq$ 12.0 su.
        c. Document grab sample results.
        d. Analyze results.
            i. How do I know I am code compliant throughout the entire landspreading event?
            ii. If any grab sample is less than 12.0 su, then identify potential causes, including insufficient lime addition and/or insufficient mixing of lime with septage.
            iii. You may need to adjust the timing of lime addition to the tank. Example scenario: Septage business services domestic holding tanks at two businesses (5,000 gallons total). Then business adds 80 lbs. lime on the way to landspreading field. Tank is agitated ~15-20 minutes (during transit) before initial pH test. Previous field verification (grab samples) supports sufficient lime and agitation to meet code requirements.

6. Review of daily log book and invoice record system. Does the daily log book comply with s. NR 113.11(3)(c), Wis. Adm. Code? **IMPORTANT**: <u>This is the most common issue with landspreading records</u>!
    a. Landspreading field (DNR# or site/field name) clearly identified? Example: DNR# 12345 (site/field name: SMITH-1).
    b. Application method (surface application) clearly identified?
    c. Initial pH time and reading?
    d. Second pH time (30 minutes later) and reading?
    e. Additional pH measurements (if necessary)?
    f. pH results reported to three significant digits?
    g. Date/time of landspreading completed?
    h. Pathogen control and vector attraction reduction certification statement? Signed?
    i. Descriptions for meeting pathogen control and vector attraction reduction?
    j. Some operators tally spreading events (daily AND weekly). This practice allows the operator to know when the site is reaching its maximum weekly AND annual application rates.
7. Review of alkali (lime) storage
    a. Is the lime storage area adequately protected from the elements?
    b. Do I maintain an adequate supply of lime?
    c. How do I ensure there is an ample supply of lime? When should I reorder lime to prevent running out of lime during landspreading season?
    d. **IMPORTANT:** Lime purchase receipts must be retained and provided upon department request.
        i. OIC should verify that copies of lime receipts are provided from lime distributor.
        ii. OIC should ensure lime receipts are retained within the office for a period of five calendar years.

16. 3 Incorporation SOPs

1. Review of pathogen control requirements (ss. NR 113.07(3)(d)2.a. through h., Wis. Adm. Code)? Do my fields meet any of the below categories? The OIC should consider asking the below questions prior to septage landspreading.
    a. What type of crop (examples: corn grain, soybeans, hay, and alfalfa) is the site owner or farmer growing this crop year?
    b. What type of crop does the site owner or farmer anticipate growing for the next 2 crop years?
    c. <u>Food, Feed, and Fiber Crops?</u> **IMPORTANT:** Harvesting restrictions may apply if the property owner/farmer anticipates planting:
        i. Food crops (examples: sweet corn, peas, potatoes, strawberries, and tomatoes),
        ii. Feed crops (examples: corn grain, soybeans, wheat, and hay), or
        iii. Fiber crop (examples: hemp, cotton, jute, and flax).

d. Animal grazing? *Note: Livestock animals (examples: cows and horses) may not graze on land for 30 days after land application of septage. The OIC may need to discuss grazing restrictions further with the site owner and/or farmer*.
e. Turf? *Note: Turf may not be harvested for one year after land application of septage, unless otherwise specified by the department.*
f. Public access to land with a high potential for public exposure? **IMPORTANT:** High potential sites must restrict access for one year after application of septage.
g. Public access to land with a low potential for public exposure? **IMPORTANT:** Low potential sites must restrict access for 30 days after application of septage.

2. Routine field verification and inspection procedures (recommended annually)
    a. Does the disc/plow or other department-approved digging equipment mix soil to a minimum depth of 4 inches?
        i. In some instances, the septage business may not own this equipment, and delegates this task to one (or more) farmers. Field verification may need to occur for multiple pieces of equipment.
        ii. Verify that the farmer is incorporating the waste within 6 hours of surface application. While the septage business may have delegated the task of incorporation, the septage business is still responsible for ensuring incorporation of septage within 6 hours after septage land application.
    b. Is each disc/plow well maintained? What is my backup plan if repairs to the plow are necessary?
        i. Example 1: The septage business has other equipment that can be used on a field site when equipment is being repaired.
        ii. Example 2: The business has an agreement with the farmer to incorporate septage in an emergency situation.
        iii. Example: 3: The business hauls septage to a wastewater treatment facility (WWTF) when equipment is being repaired. In this situation, the OIC should include this back-up plan in the standard operating procedure.
    c. Is any septage visible on the land surface after incorporation?
    d. Does my surface application equipment achieve uniform distribution of septage? Uniform application means evenly spreading septage over the site through the use of a splash plate, injector, or other department approved spreading method (reference: s. NR 113.03(68m), Wis. Adm. Code).
    e. Is my surface application equipment well maintained? See *"Surface Application"* section above.
    f. What is the hydraulic application rate of my surface application equipment? (example: 13,000 gallons/acre)?
        i. *Note: "Table 4" (s. NR 113.09(6)(b), Wis. Adm. Code) identifies the maximum weekly hydraulic application rate for septage (example: holding tank waste is limited to 13,000 gallons/acre/week).*
    g. Documenting field verification and inspection procedures. The department recommends that the OIC document verification and inspection procedures, including:
        i. Date(s),
        ii. Individual(s),
        iii. Written observations,

iv. Photographs, and
v. Description of potential changes to improve compliance.

3. Review of daily log book and invoice record system. Does the daily log book comply with s. NR 113.11(3)(c), Wis. Adm. Code? **IMPORTANT**: <u>This is the most common issue with landspreading records</u>!
    a. Landspreading field (DNR# or site/field name) clearly identified? Example: DNR# 12345 (site/field name: SMITH-1).
    b. Application method (incorporation) clearly identified?
    c. Date/time of landspreading completed?
    d. Date/time of incorporation completed? Individual who completed incorporation list?
    e. Pathogen control and vector attraction reduction certification statement? Signed?
    f. Descriptions for meeting pathogen control and vector attraction reduction?
    g. Some operators tally spreading events (daily AND weekly). This practice allows the operator to know when the site is reaching its maximum weekly AND annual application rates.

16.4 Injection SOPs

1. Do my landspreading practices meet pathogen control requirements (ss. NR 113.07(3)(d)2.a. through h., Wis. Adm. Code)? The OIC should consider asking the below questions prior to septage landspreading.
    a. What type of crop (examples: corn grain, soybeans, hay, and alfalfa) is the site owner or farmer growing this crop year?
    b. What type of crop does the site owner or farmer anticipate growing for the next 2 crop years?
    c. <u>Food, Feed, and Fiber Crops?</u> **IMPORTANT:** Harvesting restrictions may apply if the property owner/farmer anticipates planting:
        i. Food crops (examples: sweet corn, peas, potatoes, strawberries, and tomatoes),
        ii. Feed crops (examples: corn grain, soybeans, wheat, and hay), or
        iii. Fiber crop (examples: hemp, cotton, jute, and flax).
    d. <u>Animal grazing</u>? *Note: Livestock animals (examples: cows and horses) may not graze on land for 30 days after land application of septage. The OIC may need to discuss grazing restrictions further with the site owner and/or farmer*.
    e. <u>Turf</u>? *Note: Turf may not be harvested for one year after land application of septage, unless otherwise specified by the department.*
    f. <u>Public access to land with a high potential for public exposure?</u> **IMPORTANT:** High potential sites must restrict access for one year after application of septage.
    g. <u>Public access to land with a low potential for public exposure</u>? **IMPORTANT:** Low potential sites must restrict access for 30 days after application of septage.
2. Routine field verification and inspection procedures (recommended annually)
    a. Does my injector place septage to a minimum depth of 4 inches?
        i. Depth depends on type of injector unit
        ii. Example: An injector with spring loaded shanks (2,200 pounds of down pressure) will stay at a consistent depth (greater than 4 inches) unless a rock is

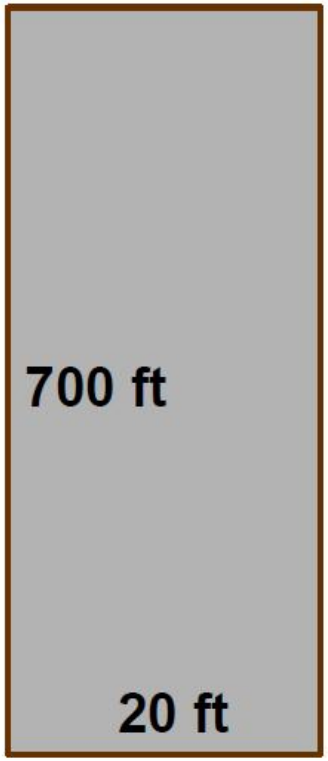
hit. If a rock is hit, the injection will come up and snap right back into the soil.

b. Are all of my injector hoses, knives, etc. properly connected and well maintained?
    i. What is my backup plan if repairs to equipment are necessary?
    ii. Some operators keep spare parts in the tractor (example: shear bolts) for quick repairs in the field.
    iii. Consider hoses and connections with cam lock fittings, if the hose or tip is damaged the operator can cap the hose and finish for the day. The repair can then occur at a later date.
    iv. Some operators walk around and inspect the injector after each spreading event. If there is a problem with the hoses (leak), then the equipment is often wet around the hoses.
c. Is any septage visible on the land surface >1 hours after injection?
d. Does my injector achieve uniform distribution of septage? Uniform application means evenly spreading septage over the site through the use of a splash plate, injector, or other department approved spreading method (reference: s. NR 113.03(68m), Wis. Adm. Code). *Note: Clogs, holes in pipes/tubing, and/or disconnected injection hoses may result in non-uniform land application of septage.*
e. What is the hydraulic application rate of my injector application equipment? (example: 13,000 gallons/acre)?
    i. *Note: "Table 4" (s. NR 113.09(6)(b), Wis. Adm. Code) identifies the maximum weekly hydraulic application rate for septage (example: holding tank waste is limited to 13,000 gallons/acre/week).*
    ii. Flow meter (measured volume). *Note: A flow meter is not required for injectors under ch. NR 113, Wis. Adm. Code.*
        1. Has the flow meter recently been calibrated? DNR <u>recommends</u> annual calibration of flow meters.
        2. Do I have (or can I readily obtain) a "backup" flow meter?
        3. Calculated hydraulic application rate (metered volume divided by acres landspreading) must meet weekly and yearly hydraulic loading rate limits. *Note: Accurate rate is contingent on accurate estimate of acres landspread.*
    iii. Estimated volume (field verification).
f. Documenting field verification and inspection procedures. The department recommends that the OIC document verification and inspection procedures, including:
    i. Date,
    ii. Individual(s),
    iii. Written observations,
    iv. Photographs, and
    v. Description of potential changes to improve compliance.

3. Review of daily log book and invoice record system. Does the daily log book comply with s. NR 113.11(3)(c), Wis. Adm. Code? **IMPORTANT**: <u>This is the most common issue with landspreading records</u>!
    a. Landspreading field (DNR# or site/field name) clearly identified? Example: DNR# 12345 (site/field name: SMITH-1).

b. Application method (injection) clearly identified?
c. Date/Time of landspreading completed?
d. Pathogen control and vector attraction reduction certification statement? Signed?
e. Descriptions for meeting pathogen control and vector attraction reduction?
f. Some operators tally spreading events (daily AND weekly). This practice allows the operator to know when the site is reaching its maximum weekly AND annual application rates.

16.5 Hydraulic Application Rate Calculation (Surface Application)



Application Method: Splash Plate

Truck Capacity: 4,000 gallons

Area Spread

Area = length x width

Area = 14,000 sq. ft.

Convert Square Feet to Acres

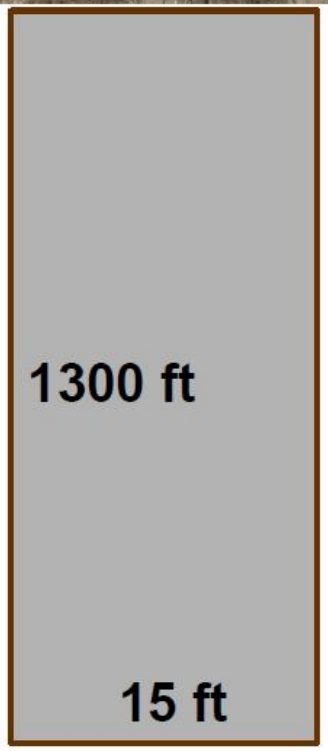
14,000 sq. feet x 1 acre/43,560 sq. feet

14,000/43,560= 0.321 Acres

Hydraulic rate

4,000gal/0.321acre= **12,460 gallons/acre**

16.6 Hydraulic Application Rate Calculation (Injection)



Application Method: Injector

Truck Capacity: 4,000 gallons

Area Spread

Area = length x width

Area = 19,500 sq. ft.

Convert Square Feet to Acres

19,500 sq. feet x 1 acre/43,560 sq. feet

19,500/43,560= 0.448 Acres

Hydraulic rate

4,000gal/0.448acre= **8,928 gallons/acre**

17.0 Acknowledgements

The “Septage Operator Servicing Handbook and Study Guide for Grade L Operators” was the result of a collaborative effort between the WLWCA and WDNR. The document was reviewed and updated by the WDNR Septage Work Group, composed of Fred Hegeman (Co-Coordinator), Steve Warrner (Co-Coordinator), Michelle Balk Ludwig (WW PMT Co-Sponsor), Heidi Schmitt Marquez (WW PMT Co-Sponsor), Alison Canniff, Peter Carlson, Teresa Hall, Kassie Schultz, Taylor Schutz, and Zana Sijan. For any questions regarding this handbook and study guide please contact the WDNR Septage Work Group coordinators, Fred Hegeman and Steve Warrner.