GUIDELINES FOR LAND APPLICATION AND STORAGE OF MUNICIPAL BIOSOLIDS IN NOVA SCOTIA

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NOVA SCOTIA
Environment

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1.0 INTRODUCTION

The purpose of this document is to define quality standards for municipal biosolids, to facilitate the use and storage of municipal biosolids on land and to establish when such land application and storage would require an Approval from the Department. In cases where the Department does not require a person to obtain an Approval prior to land application, the Department recommends that the person follow the requirements of this document prior to and during land application.

This document outlines the criteria which must be met before Class B municipal biosolids can be considered for land application.

For clarification, the term "Municipal Biosolids" refers to an organic, stabilized material produced during the treatment of domestic sewage and septage sludge which have undergone secondary treatment to reduce pathogen content. Municipal biosolids generally do <u>*not*</u> include sludges from industry facilities, although industrial sludges may be found in some municipal biosolids. Municipal biosolids differ from sewage and septage sludges through the treatment process that it undergoes to reduce pathogen content. Due to their nutrient content, municipal biosolids can be applied to land as a fertilizer or soil amendment, a process which is referred to as *land application*. Land application of municipal biosolids can be beneficial by improving crop production and soil properties, reducing requirements for inputs such as fertilizers and irrigation, reclaiming lands (strip mines, quarries, gravel pits, etc.), and enriching forest lands.

For the purposes of this document, the Department considers there to be two separate and distinct classifications of municipal biosolids, Class A and Class B.

Class A municipal biosolids are treated and stabilized municipal biosolids that meet a very high standard for pathogen, metal and contaminant concentrations. For clarification, as a result of the extensive treatment process and quality of the municipal biosolids, the Department does not consider Class A municipal biosolids to be generated waste, wastewater, or wastewater sludge that would require an Approval in accordance with section 23 of the *Activities Designation Regulations*.

Class B municipal biosolids are not treated and stabilized to the same extent as Class A municipal biosolids. These municipal biosolids meet a lower quality standard for metal, pathogen and contaminant concentrations. Due to the composition of Class B municipal biosolids, the Department considers a Class B municipal biosolid as a generated waste that requires an Approval in accordance with section 23 of the *Activities Designation Regulations*.

1.1 Purpose

The purpose of these Guidelines is to:

a) Establish quality standards with which to classify municipal biosolids for land application, and

b) Provide guidance in determining how, when and where Class B municipal biosolids may be land applied under an Approval.

1.2 Applicability

a) These Guidelines establish the quality standards for municipal biosolids produced during the treatment of municipal wastewater or septage, **as well as any mixture that contains municipal biosolids** and that is covered under an Approval. Any facility approved to use sewage sludge or municipal biosolids as part of the end product it produces, must as a minimum meet quality standards for Class A municipal biosolids.

b) These Guidelines apply to any person who intends to apply for an Approval to land apply or store Class B municipal biosolids.

c) Municipal biosolids that meet the Class A criteria do not require an Approval for land application provided the facility producing the Class A municipal biosolids has a valid Approval from Nova Scotia Environment. Regular monitoring and sampling of municipal biosolids will be required to ensure that they continue to meet the Class A municipal biosolids criteria.

d) Municipal biosolids that meet the Class B criteria require an Approval for land application. Strict controls on the use and management of Class B municipal biosolids will be imposed through the Approval process.

1.3 Legislation

a) Section 50(2) of the Environment Act, S.N.S. 1994-95, c. 1, reads as follows:

"*No person shall commence or continue any activity designated by the regulations as requiring an Approval, unless that person holds the appropriate approval*".

b) Section 3(1) of the Activities Designation Regulations (O.I.C. 95-286) reads as follows:

"*Any activity designated in these regulations requires an approval from the Minister or an Administrator designated by the Minister*".

c) Section 23 of the Activities Designation Regulations (O.I.C. 95-286) reads:

"*The application to land of non-livestock generated wastes, wastewater and wastewater sludges is designated as an activity*".

d) Section 8(2)(b) of the Environment Act, S.N.S. 1994-95, reads as follows:

Duties of Minister

8(2) *The Minister, for the purposes of the administration and enforcement of this Act, and after engaging in such public review as the Minister considers appropriate, shall*

b) *establish and administer policies, programs, standards, guidelines, objectives, codes of practice, directives and approval processes pertaining to the protection and stewardship of the environment.*

2.0 APPLICATIONS FOR APPROVAL

Any person who wishes to store or apply Class B municipal biosolids to land must first complete and submit an application form for an Approval to Nova Scotia Environment and follow the requirements set out in the *Approval Procedure Regulations*., N.S. Reg. 48/95.

a) If the applicant wishes to have the Approval apply to more then one land application site, the applicant should identify this in the application process.

b) If after receiving an Approval from Nova Scotia Environment the approval holder wishes to add additional land application sites not contained in the Approval, the approval holder must first notify Nova Scotia Environment. Nova Scotia Environment will review the information and will decide to either reject the additional land request, amend the Approval, or provide written authorization to the approval holder.

c) In addition to the requirements listed in section 5 of the *Approval Procedure Regulations*, an applicant for an Approval, must also submit all the necessary documentation listed in Schedule 2 of these Guidelines. Nova Scotia

Environment will review the documentation to determine whether all the necessary information has been submitted prior to making a decision on the Approval.

3.0 MUNICIPAL BIOSOLIDS STABILIZATION

Nova Scotia Environment will only issue Approvals for stabilized municipal biosolids. Stabilization reduces pathogen concentration, helps minimize odour generation, and reduces vector attraction potential. In order to be considered as a stabilized municipal biosolid, one of the following conditions must be met:

a) volatile solids in sewage sludge have been reduced by at least 38% during treatment.

b) the specific oxygen uptake rate (SOUR) of the sewage sludge is less than 1.5 mg O_2/hr/g. of total sludge on a dry weight basis corrected to 20 ºC. This test is only applicable to liquid aerobic municipal biosolids withdrawn from an aerobic process.

c) sufficient alkaline material has been added to the sewage sludge in order to produce a homogenous mixture with a minimum pH of 12 after 2 hours of vigorous mixing. Facilities adding supplemental alkaline material must maintain the pH of the sludge during interim sludge storage periods.

The following are recognized by Nova Scotia Environment as suitable stabilization methods:

composting,

aerobic digestion,

anaerobic digestion,

alkaline/lime stabilization,

heat drying,

heat treatment,

and pasteurization.

Any person who wishes to use a different stabilization method, may submit the method to Nova Scotia Environment for its review and approval.

Municipal biosolids generators are responsible for the stabilization and verification of any municipal biosolids intended for land application. Approval holders must provide sufficient information acceptable to demonstrate that the municipal biosolids have been

effectively stabilized to meet the pathogen reduction requirements outlined in Table 2.

4.0 MUNICIPAL BIOSOLIDS QUALITY CRITERIA

Municipal biosolids quality is determined by the pathogen and metal content and is dependent on the wastewater characteristics and the type of treatment. Municipal biosolids acceptable for land application and/or storage in Nova Scotia will fall into one of two categories, depending on the metal and pathogen content: Class A or Class B.

4.1 Metals

All municipal biosolids contain variable amounts of metals, some of which are essential plant nutrients (micronutrients). When applied to soils in excessive amounts, metals may accumulate in soils. Soil loadings of metals must therefore be controlled in municipal biosolids application. The metal concentration in municipal biosolids intended for land application must not exceed the *Maximum Acceptable Metal and Selected Contaminant Concentrations* in Table 1. Metal and contaminant levels that exceed maximum concentrations for Class B biosolids, are not acceptable for land application.

Table 1: Maximum Acceptable Metal and Selected Contaminant Concentrations in Municipal Biosolids (mg/kg of dry weight)

Metal	Class A	Class B
Arsenic	13	75
Cadmium	3	20
Chromium	210	1060
Cobalt	34	150
Copper	400	760
Mercury	0.8	5
Molybdenum	5	20
Nickel	62	180
Lead	150	500
Selenium	2	14

Metal	Class A	Class B
Zinc	700	1850
Dioxins and Furans	0.000017	0.00005
PCB's	0.8	

Schedule 3 lists in detail the sampling and analysis requirements for municipal biosolids, groundwater and soils.

4.2 Pathogens

Pathogens are disease causing organisms, such as bacteria, viruses, and parasites and exist in all municipal biosolids. The pathogen reduction requirements for each of the two categories of municipal biosolids are listed in Table 2.

Table 2: Pathogen Reduction Requirements

Class A	Class B
Fecal Coliform: <1000 MPN*/g total solids (dry weight) OR Salmonella: <3 MPN*/4g total solids (dry weight)	Fecal Coliform: <2,000,000 MPN* per gram of total solids (dry weight)

Note: * MPN (most probable number)

5.0 CLASS B MUNICIPAL BIOSOLIDS: SOIL AND SITING REQUIREMENTS

Any person seeking an Approval to apply on land Class B municipal biosolids must ensure that the following requirements can be met at the proposed application site. Nova Scotia Environment recommends that the following criteria also be used by any person applying Class A municipal biosolids to land.

5.1 Soil Requirements

5.1.1 pH

Soils intended for Class B municipal biosolids application must have a pH between 6.0 and 8.0, to minimize metal leaching. Alkaline stabilized sludges may be applied to soil with a lower pH, provided they will raise the soil pH to at least 6.0 after application of municipal biosolids. The pH of the soil should be maintained between 6.0 to 8.0 for at least two years following the end of municipal biosolids application.

5.1.2 Metals

Table 3 identifies the *Maximum Acceptable Metal Concentrations in Soils*. Municipal biosolids must not be land applied if metals in the soil exceed these concentrations.

Table 3: Maximum Acceptable Metal Concentrations in Soils (mg/kg of dry weight)

Metal	Maximum Acceptable Concentrations in Soils
Arsenic	12
Cadmium	1.4
Chromium	64
Cobalt	20
Copper	63
Mercury	0.5
Molybdenum	4
Nickel	32
Lead	60
Selenium	1.6
Zinc	200

5.2 Separation Distances

Prior to submitting an application for land application sites for Class B municipal biosolids, the applicant must ensure that the minimum separation distances identified in Table 4 are met or exceeded. It is recommended that these separation distances also be

used for Class A municipal biosolids. The separation distances are designed to protect water quality, both surface and groundwater, and reduce exposure to humans.

Table 4 - Minimum Separation Distances (meters)

Type of Feature	Minimum Separation Distance
Public Drinking Water Wells	150 [1]
Private Drinking Water Wells	90 [1]
Property Line	10
Bedrock Outcrops	10
Dwellings	90 [1]
Institutional Buildings (i.e, schools and hospitals)	200 [1]
Commercial buildings	90
Uninhabited Buildings (i.e., sheds, barns, etc.)	30
Public Areas (i.e., parks and playgrounds)	90
Perennial Water Bodies & Watercourses	90 [2]
Intermittent Water Bodies & Watercourses	60 [2]
Swales and Man-Made Drainage Ditches	15
Primary and Secondary Roads	30
Unimproved Dirt Roads	10

Note: 1 - 300 m required for temporary (less than one week) and permanent municipal biosolids storage areas at land application sites

2 - refer to section 5.3 below

5.3 Land Slope

If the sustained slope of the land is less than 3%, the required minimum separation distance between the land application site and the adjacent intermittent and perennial watercourses is as noted in Table 4. However, if the sustained slope of the land is between 3% and 6% towards the watercourse, the required minimum separation distance between the land application site and adjacent intermittent and perennial watercourses is 125 meters, or if the sustained slope of the land is between 6% and 8%

the required minimum separation distance between the land application site and adjacent intermittent and perennial watercourses is 180 meters. If the sustained slope of the land exceeds 8%, approval for the land application of Class B municipal biosolids will not be granted and not recommended for Class A municipal biosolids.

5.4 Depth to Groundwater and/or Bedrock

For soils with a lower permeability ($\leq 8x10^{-6}$ m/s) such as clay and silt, approval to land apply Class B municipal biosolids where the depth to the groundwater table and/or bedrock is less than 1 meter below the soil surface will not be granted. For soils with a higher permeability ($>8x10^{-6}$ m/s) such as sand and gravel, approval to land apply Class B municipal biosolids where the depth to the groundwater table and/or bedrock is less than 1.5 meters below the soil surface will not be granted.

The depth to the water table and/or bedrock can be estimated by excavating test pits. The depth to the water table should be determined at a time when the water table is at its highest level. The water tables in Nova Scotia typically have peak values in the late Fall and/or late Spring-early Summer. The number of test pits to be excavated across the site is dependent on the size of the application site and topography. Contact Nova Scotia Environment prior to excavating the test pits in order to determine the number of test pits required.

5.5 Flood Risk Areas

Additional controls are required when municipal biosolids are applied in flood risk areas. A flood risk area is a flat or gently sloping area beside a watercourse which may be subjected to flooding. The land application of Class B municipal biosolids in a flood risk area, which may experience flooding once in 20 years, must not occur before the risk of flood has passed, any flood waters have returned to their normal level, and the soil is adequately drained to support application equipment. This management practice is recommended for Class A municipal biosolids as well when applied in flood risk areas. Class B municipal biosolids applied to land within flood risk areas must be directly injected into the soil or surface applied followed by incorporation (within 24 hours of spreading). The storage of Class B municipal biosolids is not permitted in a flood risk area.

5.6 Conformity with Municipal By-Laws

An application for Approval of land application and/or storage of Class B municipal biosolids must include a letter from the municipality stating that the proposed activity is

in conformity with municipal by-laws as outlined in Schedule 3. Proponents must also obtain any required municipal approval, permit, or other authorization from the local municipality. Applicants must check with municipalities to identify the location(s) of source water protection areas and to determine whether or not land application and/or storage of Class B municipal biosolids is permitted in these areas.

6.0 CLASS B MUNICIPAL BIOSOLIDS: SITE RESTRICTIONS

6.1 Land Use Restrictions and Waiting Periods

Approval for a Class B municipal biosolids land application must as a condition, include the waiting periods listed in Table 5.

No Approval will be issued for a Class B municipal biosolids for use on agricultural lands.

No Approval will be issued for a Class B municipal biosolids for use on residential lawns and gardens.

Nova Scotia Environment recommends that the waiting periods listed in Table 5 be followed for the land application of Class A municipal biosolids.

Table 5: Minimum Waiting Periods

Land Use	Waiting Period
Reclamation and Remediation Sites	2 months before public access
Public Lands (eg parks, trails)	6 months before public access
Forestland	2 months before public access
Construction sites (eg roadways, building sites etc)	2 months before public access
Recreational lands (eg golf courses)	6 months before public access
Commercial sod	12 months before harvest

6.2 Signage Requirements for Application Sites

A person holding an Approval for land application of a Class B municipal biosolids is required to post appropriate signage to identify the site as having received Class B municipal biosolids. Signs must be placed at all four corners of the application site as

well as on each access road or path into the site. Signs must remain in place for the duration of the minimum waiting period indicated in Table 5, following the most recent application. Typical signage shall include the following wording:

Class B Municipal Biosolids Application Site

Proponent Name

Identify Municipal Biosolids Source(s)

Field No. 1; NE Corner

The signage must be maintained so that it remains in place and can be easily read for the required time period.

7.0 CLASS B MUNICIPAL BIOSOLIDS: APPLICATION RATE AND METHODOLOGY

7.1 Nutrient and Land Management Plans

Land application of Class B municipal biosolids must only occur in accordance with instructions contained in a Land Application Plan prepared by a qualified professional, as a term and condition of approval.

It is recommended that a Land Management Plan be used for land application of Class A municipal biosolids on land other than that used for agricultural purposes, i.e., reclamation sites, parkland, forest land. Land application of Class A municipal biosolids on agricultural land should follow a Nutrient Management Plan prepared by a certified Nutrient Management Planner.

7.1.1 Nutrient Management Plan (NMP)

The nutrient management plan (NMP) should outline crop requirements and municipal biosolids parameters (i.e., nutrients and organics). The NMP should determine the municipal biosolids application rate based on the agronomic rate (municipal biosolids should be applied at a rate that is equal to or less than the agronomic rate). The agronomic rate is the municipal biosolids application rate (on a dry weight basis) that is designed to provide the amount of nutrients that are needed by the crop, while minimizing the amount of nutrients that may leach into the groundwater. Municipal biosolids should be applied as close to the time of maximum nutrient uptake by crops as

feasible. The application rate should ensure that metal concentrations in soils do not exceed the limits specified in Table 3.

7.1.2 Land Application Plan (LAP)

The Land Application Plan (LAP) should outline crop/vegetation/soil/site requirements and municipal biosolids parameters (i.e., nutrients and organics), and should determine application rates based on nutrient and organic matter requirements. The rate of application must ensure that the appropriate amount of nutrients is applied to the soil in order to prevent groundwater contamination. The application rate should ensure that metal concentrations in soils do not exceed the limits specified in Table 3.

7.2 Acceptable Application Methods

The land application of municipal biosolids should be done in such a manner that minimizes the risk of odours and bioaerosol release. The Class A municipal biosolids may be land applied by surface spreading as a top dressing or through incorporation, or by injection below the surface of the soil. Class B municipal biosolids shall be surface spread followed by incorporation, or injected below the surface of the soil. For surface spread Class B municipal biosolids, incorporation shall take place within 24 hours of spreading.

The land application of municipal biosolids must not occur when the ground is frozen, snow covered, or saturated. Municipal biosolids must not be applied to land during or immediately following heavy rains or when heavy precipitation is forecasted, which may adversely affect the environment, through surface water run-off, and/or the ability to effectively spread and incorporate the municipal biosolids on the field(s).

8.0 CLASS B MUNICIPAL BIOSOLIDS: STORAGE

The storage of Class B municipal biosolids may be required at times when land application is not possible due to inclement weather, unsuitable soil conditions or other adverse conditions. Class B municipal biosolids with a minimum solids content of 20% or greater may be stockpiled, or stored temporarily (< 1 week), at the application site prior to land application, provided that the municipal biosolids are intended for use at that location. Sufficient storage should be available to retain municipal biosolids during these circumstances. Class B municipal biosolids must be stored in a manner that minimizes the risk of odour or bioaerosol release. An application for Approval of land application and/or storage of Class B municipal biosolids must identify existing and proposed municipal biosolids temporary storage areas as outlined in Schedule 3.

Class B municipal biosolids may be stored under Approval for more than one week only if they are fully covered with an impermeable material, such as a tarp. Stockpiles must be located to minimize contact with surface water run-off and to prevent infiltration of precipitation and the generation of leachate. Class B municipal biosolids with a solids content of 20% or greater, may be stored for more than one week on top of an impermeable surface such as a concrete pad or clay liner at the application site prior to land application. The impermeable surface shall have curbed sidewalls or berms on all sides constructed of the same material. Clay liners shall have a minimum thickness of 0.5 meters and an in-situ coefficient of permeability of $1.3x10^{-6}$ cm/sec. In addition, such storage areas must be located to minimize contact with surface water run-off and to prevent infiltration of precipitation and the generation of leachate.

The storage of Class A and Class B municipal biosolids with a solids content of less than 20% must be in lagoons only. Storage lagoons must be designed by a qualified professional engineer licensed to practice in Nova Scotia and in accordance with the *Atlantic Canada Standards and Guidelines Manual for the Collection, Treatment, and Disposal of Sanitary Sewage*. Municipal biosolids may be stored temporarily (storage of less than 72 hours) in a tank approved by Nova Scotia Environment on land application sites.

9.0 MONITORING, REPORTING AND RECORD KEEPING

9.1 Monitoring

9.1.1 Municipal Biosolids Quality

An approval holder must provide written proof of municipal biosolids quality as described in Schedule 4.

9.1.2 Soil Quality

An approval holder must monitor the quality of the receiving soils. Prior to the initial application of Class B municipal biosolids, a composite soil sample must be collected from the application site and analyzed for the parameters identified in Schedule 3 of these Guidelines. The results of the analysis must be submitted to, and approved by Nova Scotia Environment, before land application may proceed.

Once an Approval has been issued, the approval holder must re-sample and analyze the application site after a maximum of five biosolilds applications. The composite soil sample(s) collected must be representative of the application site, collected following a consistent and acceptable sampling procedure, and shall be

analyzed by a SCC/CAEAL (Standards Council of Canada/Canadian Association for Environmental Analytical Laboratories) accredited laboratory with the parameters of concern being listed on the laboratory's scope of accreditation.

9.1.3 Groundwater Quality

Nova Scotia Environment may request that the approval holder collect groundwater samples from domestic wells located within 500 meters of the land application and/or storage sites, with the consent of the homeowner. Each well must be analyzed quarterly for total and fecal coliform and annually for the parameters listed in Schedule 3 of these Guidelines. Samples should be collected prior to the initial application of municipal biosolids, and analyzed for the parameters identified in Schedule 3 of these Guidelines, in order to establish baseline data. Following receipt of the sample results, a copy of the analysis shall be provided to the well owner. In addition, Nova Scotia Environment may increase the monitoring frequency if necessary.

Nova Scotia Environment may request that the approval holder install monitoring well(s) at the application site and/or storage area. These wells must be monitored annually for the parameters identified in Schedule 3 of these Guidelines. In addition, Nova Scotia Environment may increase the monitoring frequency if in the opinion of Nova Scotia Environment, there is an increased risk of groundwater contamination.

All groundwater samples must be collected following a consistent and acceptable sampling procedure, and shall be analyzed by a SCC/CAEAL (Standards Council of Canada/Canadian Association for Environmental Analytical Laboratories) accredited laboratory with the parameters of concern being listed on the laboratory's scope of accreditation.

9.2 Reporting

Under the terms and condition of the Class B municipal biosolids land application Approval, there will be a requirement for the approval holder to submit an annual report to Nova Scotia Environment. The information that must be included in the report is listed in Schedule 4 of these Guidelines.

9.3 Record Keeping

The approval holder must maintain all records for a minimum of five years following municipal biosolids application and must make all records available to Nova Scotia Environment upon request. In addition to the information required in Schedule 4, the approval holder must make available, the following information:

- detailed information regarding land use and purpose of application (eg. Cover at reclamation site, forest fertilization, construction site rehabilitation)
- record of complaints and how they were handled
- any other information required or specified in the Approval

10.0 CONTINGENCY PLAN

Applications for Approval for land application and/or storage of municipal biosolids must be accompanied by a contingency plan identified in Schedule 2. The contingency plan shall identify remedial measures to be taken in the event that situations such as municipal biosolids runoff, groundwater and/or surface water impacts, public complaints, and spills are encountered.

11.0 PUBLIC CONSULTATION

Prior to submitting an application for Class B municipal biosolids land application, the applicant must consult with the public. The public consultation shall be representative of the community in which the proposed land application and/or storage of municipal biosolids will take place.

SCHEDULE 1
GLOSSARY OF TERMS

Aerobic Digestion — The degradation of organic matter brought about through the action of micro-organisms in the presence of oxygen for purposes of stabilization, volume reduction, and pathogen reduction.

Agricultural Land — Land on which food, feed, or fibre crops are grown. This includes range land and/or land used as pasture.

Agronomic Rate — the application rate designed to provide the amount of nutrients needed by a crop or vegetation and to minimize the leaching of nutrients into the water table.

Alkaline Stabilization — See "lime stabilization".

Anaerobic Digestion — The degradation of organic matter brought about through the action of micro-organisms in the absence of oxygen for purposes of stabilization, and pathogen reduction.(Mesophilic operating range 35-38 ^{o}C. Thermophilic operating range greater than 55 ^{o}C.)

Application Site — See "land application site"

Approval holder – An approval holder means the holder of an Approval for the land application of Class B municipal biosolids.

Beneficial Use — Taking advantage of the nutrient content and soil conditioning properties of a municipal biosolids product to supply some or all of the fertilizer needs of an agronomic crop or for vegetative cover (in land reclamation, silviculture, landfill cover, or similar ventures).

Composting — A stabilization process where organic material undergoes biological degradation to a stable end product. Municipal biosolids that has been composted properly is a sanitary, nuisance-free, humus-like material. Approximately 20% to 30% of the volatile solids are converted to carbon dioxide and water. As the organic material in the municipal biosolids decomposes, the compost heats to temperatures in the pasteurization range of 50 to 70°C, and enteric pathogenic organisms are destroyed.

Department — The Nova Scotia Environment.

Heat Drying — Heat drying of municipal biosolids involves the supply of auxiliary heat to mechanic drying processes in order to increase the vapour holding capacity of the ambient air and to provide the latent heat necessary for evaporation. Temperatures greater than 80°C are required.

Heat Treatment — Heat treatment is a continuous process in which municipal biosolids are heated in a pressure vessel to temperatures up to 260°C for approximately 30 minutes. This serves as both a stabilization process and a conditioning process. It conditions the municipal biosolids by rendering the solids capable of being dewatered without the use of chemicals. When municipal biosolids are subjected to the high temperatures and pressures, the thermal activity releases bound water and results in the coagulation of solids. In addition, hydrolysis of proteinaceous materials occurs, resulting in cell destruction and release of soluble organic compounds and ammonia nitrogen.

Land Application — The spreading of municipal biosolids to any land following the agronomic rate specified in the nutrient management plan or land application plan that has been prepared by a qualified professional.

Land Application Site — An area of land covered by an Approval on which municipal biosolids are applied to condition the soil, fertilize crops, or promote vegetative growth.

Lime Stabilization — A process in which sufficient lime or other alkaline material is added to municipal biosolids to produce a highly alkaline sludge (pH of 12 after two hours of contact). Also called alkaline stabilization.

Municipal Biosolids — An organic, stabilized material produced during the treatment of domestic sewage and septage sludges. They include the solid, semi-solid, and liquid residue removed from primary, secondary, or advanced wastewater treatment processes, but do *not* include screenings and grit normally removed during the preliminary treatment stages of these processes. They do *not* include sludges from industrial processes, although industrial sludges may be found in some municipal biosolids. Municipal biosolids differ from sewage and septage sludges in that they have been treated to reduce pathogen content.

Nutrient — Any substance that is required for plant growth. The term generally refers to nitrogen, phosphorus, and potassium in agriculture, but can also apply to other essential and trace elements.

Nutrient Management Planner — A professional Agrologist who has successfully completed an appropriate course of study that includes certification in nutrient management planning.

Pasteurization — Municipal biosolids are heated to 70°C for 30 minutes to destroy pathogens.

Pathogens — Organisms such as bacteria, protozoa, viruses, and parasites causing disease in humans and animals. Examples of pathogens that can be present in municipal biosolids are salmonella, coliform, shigella, escherichia coli, hepatitis A virus, rotavirus, polio viruses, cryptosporidium and giardia lamblia. Indicator pathogens are typically used to test for pathogens. Fecal coliform is mainly used as an indicator, however salmonella sp. may also be used.

Public drinking water supply— a water supply system, including any source, intake, treatment, storage, transmission or distribution, that is intended to provide the public with potable, piped water and that

(i) has at least 15 service connections,

(ii) regularly serves 25 or more persons per day for at least 60 days of the year, or

(iii) serves any of the following for at least 60 days of the year:

(A) a day care facility licensed in accordance with the Day Care Act,

(B) a permanent food establishment licensed in accordance with the Health Protection Act,

(C) a commercial property for the accommodation of the travelling or vacationing public comprising land used for camping or for overnight parking of recreational vehicles or containing a separate building or buildings containing at least 1 room to be used as an alternate form of accommodation in a campground,

(D) a commercial property for the accommodation of the travelling or vacationing public containing more than 4 rental units, including cottages or cabins;

Qualified Professional — an individual with professional certification and qualifications to prepare nutrient management plans and/or land application plans. (eg Professional Agrologist, Forest Engineer, Nutrient Management Planner, Reclamation Specialist)

Separation Distances (Set-backs) — a required minimum distance between the application site and nearby receptors (i.e., humans) and pathways (i.e., drinking water wells and surface water features), designed to protect environmental quality and human health.

Septage Sludge — The solid or semi-solid organic materials removed from septic tanks, holding tanks, vault privies, etc.

Sewage Sludge — The solid, semi-solid, or liquid residue generated during the wastewater treatment process.

Soil amendment — Anything that is added to the soil (i.e., lime, gypsum, inorganic fertilizers and organic material, including municipal biosolids) to improve its physical or chemical condition for plant growth.

Stabilization — Stabilization of municipal biosolids that reduces pathogen concentration, helps minimize odour generation, and reduces vector attraction potential.

Storage — A site at which Class A or Class B municipal biosolids are stockpiled longer than one week for land application.

Vector Attraction — The characteristic of municipal biosolids that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents, such as pathogens.

Waiting Period — Required elapsed time between land application and general public access at a site where Class B municipal biosolids are applied.

SCHEDULE 2
SUPPORTING DOCUMENTATION SUBMISSION REQUIREMENTS

As stated in Section 2.0, and pursuant to Section 5(1) of the *Approval Procedure Regulations,* N.S. Reg. 48/95 an application for Approval for land application and/or storage of Class B municipal biosolids must be accompanied by the following information:

1. Source(s) of municipal biosolids and treatment process
2. A description of the municipal biosolids stabilization method(s)
3. Proposed land application method(s) and final land use.
4. Class B municipal biosolids quality analysis, including both a summary table, with comparison to the criteria stated in this Guideline, and the laboratory certificates of analysis; samples must be collected and analyzed as per Schedule 3 of these Guidelines; samples must be taken every 1000 tonnes of production or as otherwise required under approval
5. Soil quality analysis, including both a summary table, with comparison to the metals stated in these Guidelines, and the laboratory certificates of analysis; samples must be collected and analyzed as per Schedule 3 of these Guidelines
6. Physical soil analysis including soil texture, soil permeability and depth to bedrock
7. A scaled site plan, which identifies the property in question and a minimum of a 1 kilometer radius surrounding the property; the plan shall identify the following:
    - application site(s)
    - existing and proposed municipal biosolids storage areas, if applicable
    - surface water features, including perennial and intermittent water bodies and watercourses, swales, and manmade drainage ditches
    - degree and direction of land surface slope
    - roads, including primary, secondary, and dirt roads
    - neighboring land uses, including the location of residential areas
    - property boundaries
    - dwellings, schools, churches, businesses, etc.
    - uninhabited buildings
    - drinking water supply wells, both private and municipal, within 500 meters
7. Scaled topographical map
8. Aerial photograph
9. Depth to groundwater and bedrock, and the methods utilized to obtain this data
10. Letter from the local municipality stating that the proposed activity is in conformity with municipal planning regulations/by-laws.

11. If applicable, the construction details of municipal biosolids storage areas. For storage lagoons, a letter from a professional engineer licensed to practice in Nova Scotia stating that the lagoon has been constructed as per these Guidelines is required.
12. Contingency plan
13. Public consultation plan and results

SCHEDULE 3
REQUIRED SAMPLING PARAMETERS

PARAMETER	MEDIUM		
	Biosolids	**Soil**	**Groundwater**
moisture content	√		
total coliform (MPN)			√
fecal coliform (MPN)			√
fecal coliform or salmonella (MPN)	√		
alkalinity			√
ammonia			√
arsenic	√	√	√
cadmium	√	√	√
calcium			√
chloride			√
cobalt	√	√	√
conductivity			√
copper	√	√	√
chromium	√	√	√
total organic carbon			√
iron			√
lead	√	√	√
magnesium			√
manganese			√
mercury	√	√	√
molybdenum	√	√	√
nickel	√	√	√

PARAMETER	MEDIUM		
	Biosolids	Soil	Groundwater
nitrate			√
nitrite			√
pH	√	√	√
potassium			√
sodium			√
selenium	√	√	√
sulphate			√
total dissolved solids			√
total kjeldahl nitrogen			√
total phosphorus			√
zinc	√	√	√
thallium	√		
Industrial Chemicals *	√		
Alkylphenols & Ehtoylates*	√		
Flame Retardents*	√		
Pharmaceutical Compounds*	√		
Hormones & Steroids	√		
Personal Care Products*	√		
Other Substances*	√		

*** Selection of specific composite sampling and analysis that will be requested every 10,000 tonnes as part of ongoing approvals for monitoring purposes.**

SCHEDULE 4
ANNUAL REPORTING REQUIREMENTS

Each year, prior to land application of Class B municipal biosolids, the Approval holder must submit to Nova Scotia Environment an annual report. The report shall contain the following information.

a) The total quantity of municipal biosolids received in the past year, date of receipt, the source(s) of the municipal biosolids, and the quantity of municipal biosolids received from each source

b) Municipal biosolids stabilization method(s), if applicable

c) The details of sampling undertaken for municipal biosolids quality (when the sample was collected, how, and by whom), a summary of the analytical results in comparison to the criteria outlined in this Guideline, and the laboratory certificates of analyses

d) A detailed list of all fields or other areas authorized for application or spreading in that calendar year

e) A site plan which identifies the location(s) of municipal biosolids application

f) Municipal biosolids application details for each application site, including the date(s) municipal biosolids were applied, the area to which municipal biosolids were applied, the application rate, and the volume of municipal biosolids applied

g) The details of the soil sampling undertaken on each application site (when the sample was collected, how, and by whom), a summary of the analytical results in comparison to the criteria outlined in this Guideline, and the laboratory certificates of analyses

h) The details of the water sampling undertaken at domestic wells (when the sample was collected, how, and by whom), a summary of the analytical results in comparison the Guidelines for Canadian Drinking Water Quality, and the laboratory certificates of analyses

i) A copy of the nutrient management or land management plan

In addition to submission of the annual report, the Applicant must also arrange for a site visit with representatives of Nova Scotia Environment.