

Standards and Guidelines



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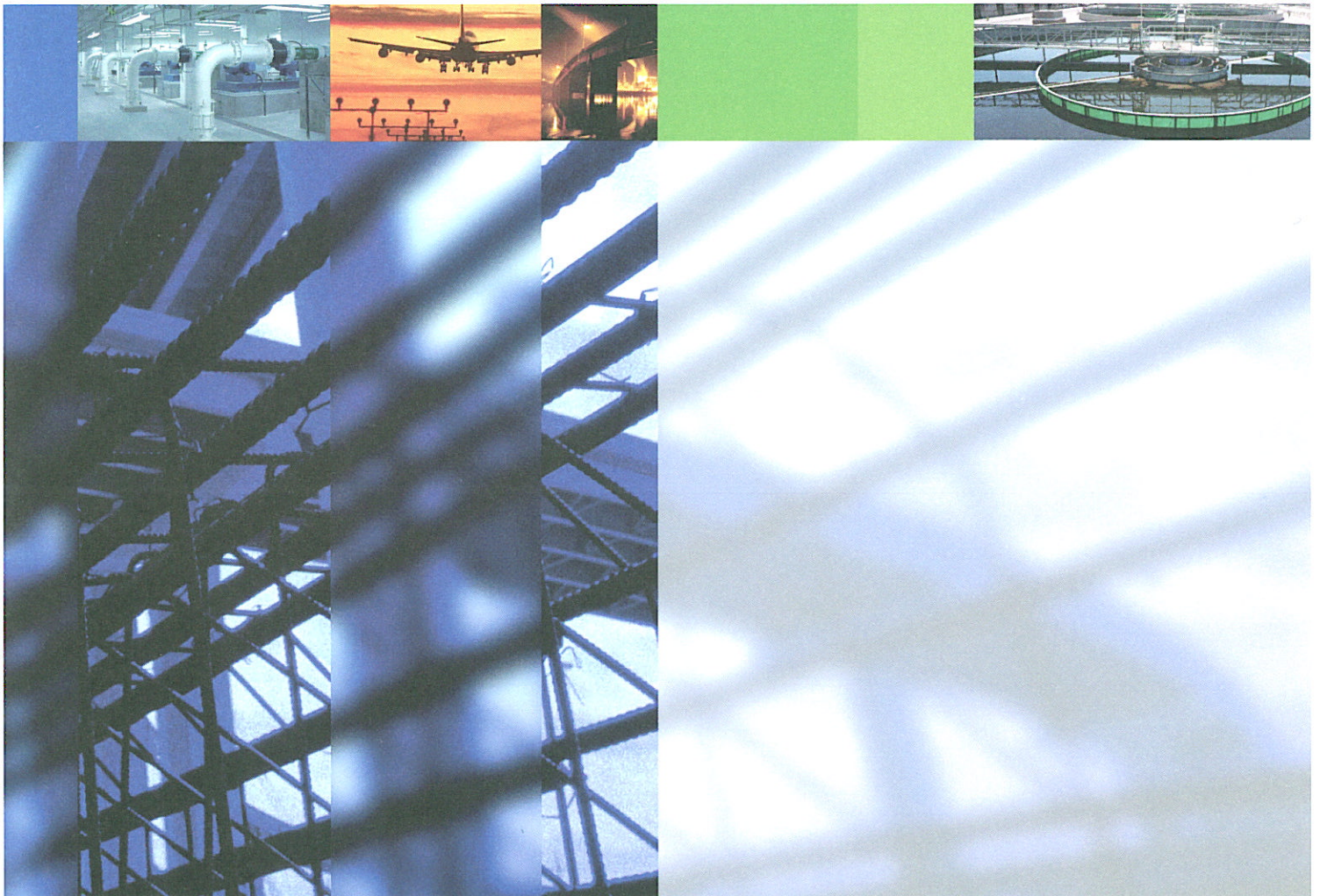
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Draft

Alberta Environment

Recommended Standards and Guidelines for Construction, Operation, and Monitoring of Septage Management Facilities

May 2008



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Definition of Terminology¹

Act: the Environmental Protection and Enhancement Act, R.S.A. 2000, c.E-12, as amended.

Aerobic: Condition characterized by the presence of free oxygen.

Aerobic process: Is a biological process that occurs in the presence of oxygen.

Aerobic digestion: A process used to stabilize primary sludge, secondary sludge, or a combination of these by long-term aeration.

Alkaline: Typically exhibiting a high pH (well above 7).

Anaerobic: Without free oxygen.

Anaerobic digestion: The biochemical degradation (oxidation) of complex organic substances in the absence of free oxygen.

Application site: A site that receives land application of septage.

Bacteria: Single-celled organism.

Biosolids: Nutrient rich organic material resulting from the treatment of domestic wastewater. Biosolids are typically produced from sewage sludge stabilized by digestion processes.

Casual application site: a site that receives only one application of septage per year.

¹ Source of Information:

Alberta Environment, 2000. Authorization to Dispose of Domestic Wastewater. Alberta Environment, Edmonton, Alberta.

Aidun, 2008. Personal Communication, Bijan Aidun, Alberta Environment. Regarding Septage Definitions.

SMAC 2004. Alberta Environment – Septage Management Advisory Committee. Technical and Regulatory Literature Review. Alberta Environment, Edmonton, Alberta.

Water Environment Federation (WEF) 1998. Design of Municipal Wastewater Treatment Plants. Manual of Practice No. 8. Alexandria, Virginia.

Commercial Wastes: Non-domestic wastewater from facilities such as dry cleaning institutions, gas stations, car washes, etc..

Composting: The aerobic decomposition of organic constituents at elevated temperatures (50 to 70°C) to produce a highly stable humus like material. Active composting time may be 21 to 28 days. Several composting techniques may be used.

Digestion: The process of decomposing organic matter in sewage by bacteria. Digestion systems may be anaerobic or aerobic. Typically mesophilic anaerobic digestion at 30-35°C for 20-30 days.

Designated application site: a site that receives more than one application of septage per year;

Disposer: the person named in a letter of authorization as being authorized to dispose of septage to a land application site.

Domestic wastewater: wastewater that is the composite of liquid and water carried wastes associated with the use of water for drinking, cooking, cleaning, washing, hygiene, sanitation or other domestic purposes, together with any infiltration and inflow wastewater, that is released into a wastewater collection system.

Equalization: The process of dampening hydraulic or organic variations in a flow so that nearly constant conditions can be achieved.

Equalization Tank: A basin or tank used for flow equalization.

Facultative lagoon: A lagoon or pond in which stabilization of wastewater occurs as a result of aerobic, anaerobic, and facultative bacteria.

Holding tank: a single compartment tank used to collect and store domestic wastewater from a residence, building, institution or development. Holding tanks do not have any discharge points and require emptying by vacuum truck.

Industrial Wastes: Non-domestic wastewater from industrial facilities such as oil refineries, chemical plants, pulp and paper mills.

Lagoon: An excavated basin or natural depression that contains water, wastewater or sludge.

Land Application: Disposal of wastewater or municipal solids onto land under controlled conditions.

Landfill: A waste disposal area that has been approved for the purpose of solid waste disposal and has approval from Alberta Environment.

Microorganism: Organisms observable only through a microscope.

Organic: Substances produced by the metabolism of a living organism. Chemically, it is described as a compound or molecule containing carbon bound to hydrogen.

Organic loading: The amount of organic matter applied to a treatment process.

Organic matter: Substances containing carbon compounds, usually of animal or vegetable origin.

Parasite: An organism living off a host organism, with the presence of the parasite usually being harmful to the host organism.

Pathogens: Organisms that can cause an infection or disease.

Pit Privy: An outdoor toilet facility in which the sewage receptacle consists of an excavation in the ground.

Process Wastewater: Commercial or industrial wastewater, which is of non-domestic origin.

Regulations: means the regulations issued pursuant to the Act, as amended.

Septage: A liquid or solid material removed from a septic tank, holding tank, pit toilet (pit privy), or similar system that receives only domestic wastes. This does not include wastes from grease traps, industrial or commercial processes.

Septage Receiving Facility: The point at which the transfer of septage from hauling vehicles to septage management facilities takes place.

Septage Treatment Facility: The processing facility that treats septage to render it acceptable for discharge to a municipal wastewater treatment facility or to the environment.

Septic tank: A two-compartment digestion chamber in which sewage sludge is retained in the first compartment, and the effluent is discharged from the second.

Sludge: Accumulated and concentrated solids generated within the wastewater treatment process that have not undergone a stabilization process.

Stabilization: Stabilization is a treatment method designed to reduce levels of pathogenic organisms.

Standards and Guidelines Document: The *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems*, published by Alberta Environment, as amended or replaced from time to time.

Vectors: Organisms such as flies, rats and birds that might transport pathogens off-site.

Viruses: The smallest life forms known that are not cellular in nature. They live inside the cells of animals, plants and bacteria and often cause disease.

Wastewater Treatment Plant (WWTP): The processing facility that treats wastewater to render it acceptable for discharge to the environment and which as a result produces biosolids and minor residuals. Does not include an on-site sewage disposal system or a septage stabilization lagoon.

1 Introduction

1.1 BACKGROUND

The treatment and disposal of human wastewater on private property is regulated under Alberta's Safety Code Act. However, when private sewage systems such as septic tanks, portable toilets, privy vaults, and holding tanks need to be cleaned out the resulting "septage" material needs to be disposed of in a manner that protects the environment. Alberta Environment regulates the management of septage through the Environmental Protection and Enhancement Act (EPEA):

"No person shall dispose of waste except

- a) at a waste management facility, or in a container the contents of which will be taken to a waste management facility, that is subject of appropriate approval, registration or notice required under this Act, or*
- b) in accordance with the written authorization of the Director."*

In 2004, Alberta Environment in partnership with the Septage Management Committee (SMAC) conducted a review of the status of septage management in Alberta. The partnership developed a document of recommendations to improve septage management and to address concerns about potential impacts of septage on human and environmental health in Alberta.

In 2006, the Alberta Onsite Wastewater Management Association (AOWMA) and the Alberta Association of Municipal district & Counties (AAMD&C), in partnership with Alberta Environment and Alberta Infrastructure and Transportation, followed-up on some of the SMAC recommendations and conducted an inventory of the septage hauling and receiving industry in Alberta. The inventory assessed the current and future needs for the industry and reviewed the practices and protocols in other jurisdictions.

Two of the key needs identified were:

- to increase access for septage haulers to approved wastewater treatment facilities; and
- to provide opportunities for septage management at private facilities.

The 2004 SMAC report estimated a total of 225,000 private sewage systems with 180,000 septic tanks and 45,000 holding tanks, generating 4,300,000 m³ of hauled wastes each year in the province. Septage haulers empty these private systems, and may discharge the waste to an approved wastewater facility. Also, haulers may obtain letters of authorization to apply the septage to land.

In keeping with Alberta Environment's goal of continuous improvement of its standards and regulations, Alberta Environment retained Associated Engineering to draft standards and guidelines for septage management facilities.

1.2 SCOPE OF WORK

The scope of work for the project was as follows:

1. Review background reports on the situational analysis of the present operational and management issues related to the handling of septage in Alberta;
2. Collaborate with stakeholders to obtain input on best practices, standards, and guidelines of septage management facilities at wastewater treatment plants and independent septage receiving facilities;
3. Review, guidelines, standards and regulations in other regional and international jurisdictions on septage management;
4. Prepare recommended standards and guidelines for the management of septage at municipal wastewater treatment plants and independent septage management facilities;
5. Make presentation(s) on the recommended standards and guidelines.

1.3 APPROACH

Alberta On-Site Wastewater Management Association (AOWMA) in association with the Alberta Association of Municipal Districts and Counties (AAMD&C) retained Jack Hayden Consulting Ltd, and Grossfield and Associates to complete an assessment of the septage hauling industry and wastewater receiving facilities. These standards and guidelines have been developed in keeping with the findings of the *“2007 Alberta Septage Hauler and Receiving Facility – Inventory, Needs Assessment and Best Practices Summary Report.”*

The AOWMA/AAMD&C report recognizes that legislation and economics drive the creation or refinement of technology, and geography plays a role in determining the technology used. Alberta Environment’s current standards and guidelines for municipal water and wastewater treatment facilities were developed to provide treatment options that optimize the benefits of health and environmental protection while minimizing costs within the constraints of technology limits.

The same approach was taken to develop these Septage Standards and Guidelines. They also have been based largely on the experience of the United States Environmental Protection Agency and other jurisdictions in Canada with allowance for the uniqueness of the climate, terrain and regulations in the Province of Alberta.

It is recommended that these draft standards and guidelines be reviewed periodically as more locally generated data and experience becomes available.

1.4 OBJECTIVE

The objective of these standards and guidelines is to provide guidance on acceptable practices for the following:

- Treatment and disposal of septage at wastewater treatment plants;
- Treatment and disposal of septage at independent septage management facilities;
- Odour control at septage management facilities; and
- Monitoring and reporting for septage management facilities.

It is recognized that wastewater including septage can be a resource, and that there can be significant benefits to its reuse as long as adequate procedures are put in place to eliminate or minimize risks to public health and the environment. However, reuse of biosolids, including stabilized septage is not addressed in these standards and guidelines.

This draft standards and guidelines document is a working document. Stakeholder input will be considered during further development of these standards and guidelines.

2 Scope of the Standards and Guidelines

These standards and guidelines have been developed for use by regulators, engineers, septage haulers, wastewater treatment plant operators, and septage treatment plant operators. For the purpose of these standards and guidelines, the term “septage” refers to the liquid, solid or semisolid material removed from septic tanks, portable toilets, privy vaults, and holding tanks that receive sewage from domestic sources.

These standards and guidelines exclude:

- Commercial or industrial wastes;
- Biosolids, which are organic solids, derived from municipal sewage (sludge) and septage treatment processes. The term is generally used to refer to those solids that have been stabilized to enable beneficial reuse;
- Sludge and organic solid wastes produced from industries;
- Transportation of septage;
- Reuse or land disposal of septage.

The reader in examining these draft recommended standards and guidelines also should be aware of the following:

1. The recommended standards and guidelines have provided design criteria from literature reviews. However, these serve only as a guide and design decisions regarding certain design criteria as noted in the document should be assessed by site specific requirements.
2. The Alberta Septage Hauler and Receiving Facility Inventory, Needs Assessment and Best Practices Summary Report (2007), recognized a lack of access to septage disposal sites, and needs of septage haulers. The recommended standards and guidelines attempts to address the recommendations outlined in this report.
3. The recommended standards and guidelines are not intended to address disposal of sludge or process wastewaters from commercial or industrial sources.
4. The recommended standards and guidelines are not intended to address the certification and permitting of septage haulers.
5. Municipal wastewater facility owners accepting hauled wastewater / septage may impose sewer-use by laws or hauled wastewater / septage discharge agreements to set limits for discharge to the septage receiving facility. Standards and guidelines for imposing hauling restrictions are not addressed by these draft recommended standards and guidelines.

6. The disposal of biosolids in solid waste management disposal facilities (landfills) is under the authority of the Environmental Protection and Enhancement Act. Standards and guidelines pertaining to the construction and operation of landfills are not within the scope of this document.
7. Composting facilities are governed by the Waste Control Regulation under the Environmental Protection and Enhancement Act. Standards and guidelines for facilities are provided in Alberta Environment's "Standards for Composting Facilities in Alberta" (2007). Standards and guidelines pertaining to the construction and operation of composting facilities are not within the scope of this document.
8. Development of standards and guidelines for land application of septage is not within the scope of this document.

3 Treatment and Disposal of Septage

Septage requires adequate treatment and disposal if odour, public health, and environmental problems are to be avoided. The management, treatment and disposal of septage are affected by its chemical and physical characteristics. Septage consists of high levels of grease, grit and hair, which makes it difficult and objectionable to handle and treat.

Many different factors affect the physical properties of septage including septic tank size, user habits, and pump-out frequency. Septage is anaerobic in nature and releases odorous gases. The material also contains parasites, viruses, and bacteria that can cause disease. Knowledge of septage characteristics and variability is important in determining acceptable disposal methods (WEF 1997).

The 2004 SMAC² report recommended the elimination of direct land application of septage except “in those cases where reasonable access to approved wastewater treatment facilities is not practical.”

The scope of this project is to develop standards and guidelines for the disposal of septage at:

- Wastewater treatment plants (WWTP's); and
- Independent septage treatment facilities.

The recommended standards and guidelines for the construction, operation and monitoring requirements for septage management facilities are presented in the following sections:

- Section 4 – Performance Standards
- Section 5 – Design Standards
- Section 6 – Design Guidelines

² SMAC 2004. Alberta Environment – Septage Management Advisory Committee. Recommendations for Septage Management in Alberta. Alberta Environment, Edmonton, Alberta.

4 Performance Standards - Septage Management Systems

4.1 EFFLUENT DISPOSAL CRITERIA

The septage treatment/receiving facility at a wastewater treatment plant (WWTP) or independent facility shall meet the effluent standards required for discharge to the receiving stream.

Figure 4-1 illustrates the process of a septage management system to meet the performance standards.

4.2 SEPTAGE DISPOSAL TO A MUNICIPAL WASTEWATER SYSTEM

4.2.1 Septage Discharge Standards

The discharge (effluent) standard for a septage receiving/treatment facility discharging to a WWTP (or sewage collection system) shall be based on the more stringent of the following:

- (i) Limit on the volume of septage received (Section 4.1.1.1);
- (ii) Wastewater treatment plant assessment (Section 4.1.1.2); or
- (iii) Sewer use by-law requirement (Section 4.1.1.3).

4.2.1.1 Septage Volume Based Standard

The maximum daily volume of septage received for co-treatment by a wastewater treatment plant (liquid stream) without completion of a pre-treatment assessment shall not exceed 1% of the average daily design flow for that facility. In no case shall the quantity or quality of septage received cause any design parameter or discharge license limit of that wastewater treatment plant to be exceeded, or have an adverse effect on sludge handling practices.

4.2.1.2 Wastewater Treatment Plant Septage Capacity Standard

Wastewater treatment plant based standards for septage shall be derived by calculating the maximum amount of septage that can be received such that the quantity or quality of septage would not cause any design parameters or discharge license limits to be exceeded, or have an adverse effect on sludge handling practices.

Determination of the Wastewater Treatment Plant Septage Capacity shall include an engineering evaluation as outlined in Section 5.2.4.

4.2.1.3 Sewer Use By-law Standard

The discharge quality for a septage receiving facility shall meet the limits imposed by a sewer-use by-law for a municipal wastewater system.

4.3 TREATED SEPTAGE EFFLUENT DISPOSAL TO SURFACE WATERS

The effluent quality for a surface water release from a septage receiving and treatment facility shall meet the municipal systems performance standards as outlined in the Standards and Guidelines Document.

4.4 TREATED SEPTAGE EFFLUENT DISPOSAL TO LAND

The effluent quality for disposal of treated effluent to land from a septage receiving and treatment facility shall meet the municipal systems performance standards as outlined in the Standards and Guidelines Document.

4.5 LAND APPLICATION OF TREATED SEPTAGE

Land application of stabilized septage shall be carried out in accordance with the latest edition of *"Guidelines for the Application of Municipal Wastewater Sludges to Agricultural Lands"* published by Alberta Environment.

SEPTAGE MANAGEMENT DESIGN PROCESS

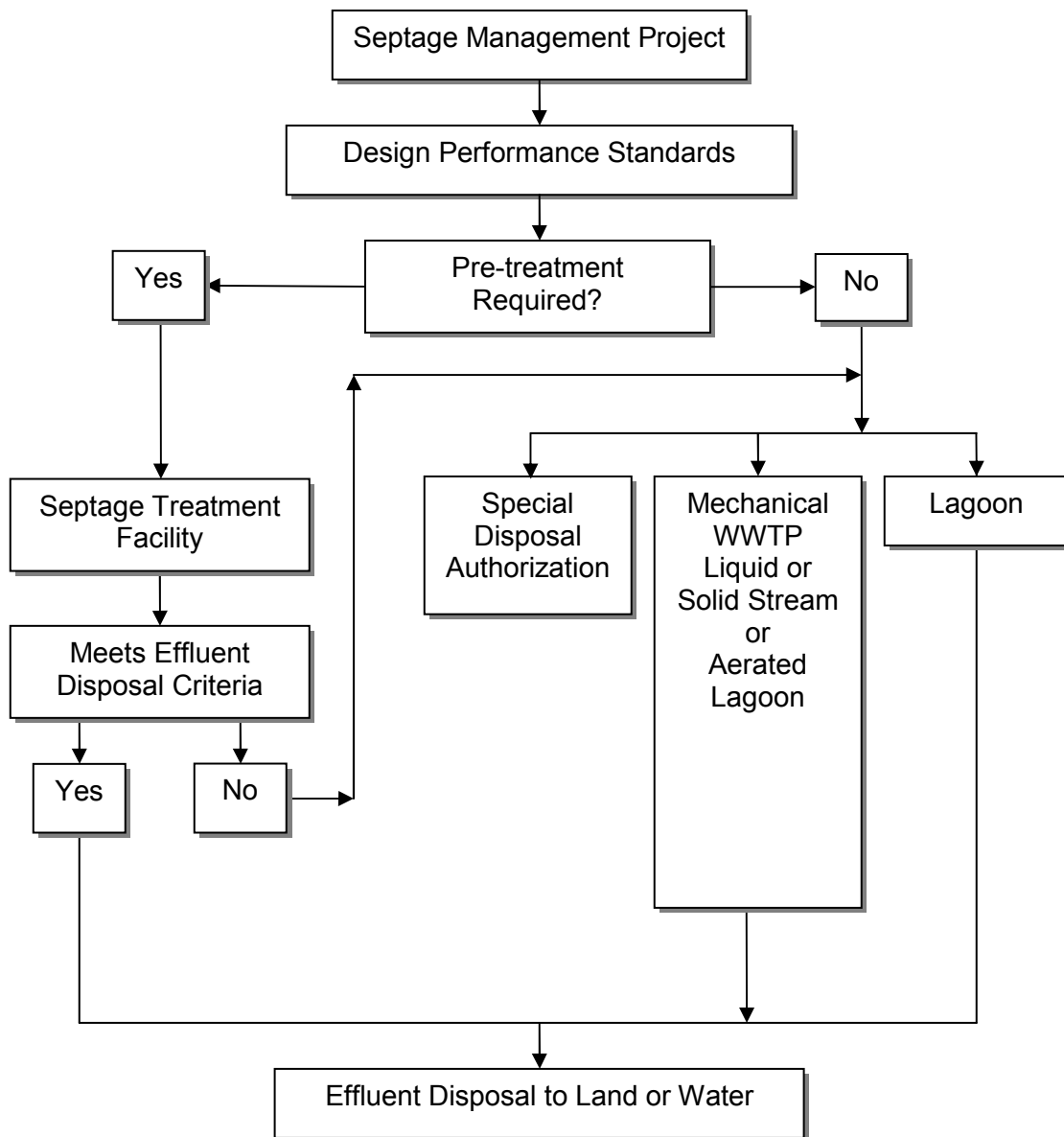


Figure 4.1: Septage Management System Design Process

5

Design Standards - Septage Management Systems

5.1 SEPTAGE MANAGEMENT FACILITIES

All new municipal wastewater treatment facilities over 200m³/d average day design flow shall include facilities to receive septage.

5.2 SEPTAGE RECEIVING FACILITY AT A MUNICIPAL WASTEWATER SYSTEM

5.2.1 General Requirements

- (i) Septage management facilities as part of municipal wastewater systems shall be designed such that the co-treatment of septage shall not adversely impact the wastewater collection or treatment processes.
- (ii) Wastewater systems shall have a designated area for receiving septage either in the collection system or at the wastewater treatment plant.
- (iii) Selection of the septage receiving station components shall consider the protection of treatment processes to prevent shock loadings and to prevent damage to equipment.
- (iv) The minimum design standards for septage receiving facilities shall consider:
 - 1. Physical, chemical, and biological treatment capacity limitations of the wastewater treatment facility;
 - 2. Maximum volume and discharge rate of hauled wastes.

5.2.2 Site Selection

Septage receiving/treatment facilities as part of municipal wastewater systems shall meet the applicable design requirements for wastewater lagoons or mechanical wastewater treatment plants as outlined in the Standards and Guidelines Document.

The location of the septage receiving facility shall not adversely impact plant activity or traffic flow through neighbourhood.

5.2.3 Design of Septage System Components and Configuration

If any design load associated with septage discharge is “significant” an engineering evaluation is required. “Significant” is defined as any loading parameter (e.g. instantaneous flow rate or mass loading of solids, metals or other containments) exceeding 10% of the WWTP capacity for that parameter. The engineering evaluation must include process impact analysis through process modelling, mass balances or other approved method.

5.2.3.1 Discharge to Wastewater Plant Liquid Stream

The design of septage management facilities discharging to the liquid stream of a wastewater treatment system shall include an appropriate level of pre-treatment and/or flow management, determined by an engineering evaluation, to minimize potential impacts to the treatment processes, including:

- (i) A means of excluding excessive grit and debris from entering the sewers and lift stations.
- (ii) A means of controlling odours to prevent nuisances for adjacent landowners.
- (iii) A means of monitoring the volume of septage.
- (iv) Security system to prevent unauthorized use and vandalism.
- (v) Septage pre-treatment lagoon cells or similar infrastructure.
- (vi) Flow equalization where septage quantities are predicted to exceed plant design flow rates.
- (vii) The prevention of direct discharge of septage to aerated lagoon cells or to treatment components in a mechanical wastewater treatment plant, except where an engineering evaluation shows no adverse effect on the wastewater treatment plant.

5.2.3.2 Septage Discharge to Wastewater Facility Solids Stream

The design of septage management facility discharging to the solids stream of a wastewater treatment facility shall include the same requirements as discharging to the liquid stream 5.2.3.1. In addition pre-treatment shall incorporate screening and degritting features for the removal of rags, rocks and heavy grit content.

5.2.4 Engineering Evaluation

The design of a new or upgraded septage receiving facility at a municipal wastewater treatment plant requires an engineering evaluation to determine the wastewater treatment plant septage capacity standards and the anticipated septage hydraulic and constituent loading impacts on the plant.

The following items must be included in the engineering evaluation as a minimum:

- (i) An evaluation of average and peak loading rates of domestic sewage and septage (hydraulic, organic, solids and other constituents as appropriate);
- (ii) An evaluation of the ability of the normal sewage influent to assimilate the addition of septage to the plant;
- (iii) An evaluation of the plant capacity at an existing wastewater treatment plant originally planned for future growth;

- (iv) An evaluation of the sensitivity of the existing treatment process to receiving septage and the potential impact on the effluent quality;
- (v) An evaluation of the impact of the septage handling and treatment on the capacity of the plant sludge handling and processing units and ultimate sludge disposal procedures;
- (vi) An evaluation of available plant operator staff and the staffing requirements necessary when septage is to be received;
- (vii) An evaluation of the impacts on the location of the septage receiving facility and the septage hauler unloading area on normal plant operations, odour control and traffic flow through the neighbouring area.

5.3 INDEPENDENT SEPTAGE MANAGEMENT FACILITY

5.3.1 Minimum Effluent Quality Standard

Independent septage management facilities shall be designed such that the effluent quality meets the performance standards stipulated under Section 4.2 if the septage is discharged to a municipal wastewater treatment plant, Section 4.3 if the effluent is discharged to surface waters, and the standards stipulated under Section 4.4 if the effluent is disposed to land, and Section 4.5 if the septage is treated and stabilized to enable its application to land.

5.3.2 Design Standards for an Independent Septage Management Facility

5.3.2.1 Septage Lagoons

Alberta Environment's design standards for lagoons as outlined in the Standards and Guidelines Document shall also apply to septage stabilization lagoons, evaporation lagoons and aerated lagoons for effluent disposal by irrigation to land or discharge to surface water.

5.3.2.2 Septage Wastewater Treatment Plant

Design standards for wastewater treatment plants as outlined in the Standards and Guidelines Document shall also apply to septage wastewater treatment plants.

5.4 SEPTAGE RECEIVING FACILITIES

The following section outlines the component configurations required to meet the minimum standards for septage receiving facilities.

The design of the septage receiving station at the sewage treatment plant or independent septage management facility shall provide the following elements:

- (i) Capability to control access to discharge site;
- (ii) A hard surface unloading ramp sloped to a drain to allow ready cleaning of any spillage and washing of the hauling truck. The ramp drainage must discharge to the treatment facilities and shall exclude excessive stormwater;
- (iii) Capability to monitor and track septage haulers discharging to the facility;
- (iv) Capability to collect a manifest from each septage hauler;
- (v) Capability to collect a representative sample of any truck load of waste accepted for discharge at the facility;
- (vi) Odour management system.

5.4.1 Monitoring and Reporting

Manifests from each hauled load shall be collected.

Manifests shall include the following information:

- (i) Name and addresses of septage collection locations;
- (ii) Volume and type (e.g. holding tank/septic tank) of septage collected from each location;
- (iii) Date septage collected;
- (iv) Name of septage receiving facility discharged to;
- (v) Date septage disposed to receiving facility;
- (vi) Name and address of septage hauling company.

The owner of the receiving facility shall summarize manifests monthly, and maintain on-site for a minimum period of 5 years. The monthly summary shall include at a minimum the following:

- (i) Daily septage volume received;
- (ii) Monthly septage volume received from each hauler and total monthly volume;
- (iii) Daily volume of septage added to the waste treatment stream (if different from(i)) ;
- (iv) Results of any inspections or testing;
- (v) Other observations where appropriate.

5.5 SLUDGE DISPOSAL

Sludge residuals resulting from the treatment of septage shall meet the standards as outlined in the Standards and Guidelines Document.

5.6 LAND APPLICATION OF STABILIZED SEPTAGE

The disposer of septage to land is defined as the person named in a letter of authorization from Alberta Environment as being authorized to dispose of septage to a land application site.

1. The disposer shall only dispose of septic or holding tank waste if the septic tank or holding tank receives only domestic wastewater.
2. The disposer shall haul all septic or holding tank waste in a contained vessel.

5.6.1 Application of Stabilized Septage

The disposer shall only apply stabilized septage to land between April and October of each year subject to the following provisions:

1. The disposer shall not apply septage when ice, snow or frozen conditions exist;
2. The disposer shall not apply septage to stream valleys and intermittent drainage areas; and
3. The disposer shall only apply septage to land that meets the requirements identified in Table 5.1.

**Table 5-1
Site Suitability Based on Soil Characteristics**

Soil Characteristic	Type of site			
	Casual application site		Designated application site	
	Acceptable	Unacceptable	Acceptable	Unacceptable
PH	-	-	>6.5	<6.5
Texture	All texture except sand & gravel	Sand & gravel	All texture except sand & gravel	Sand & gravel
Slope	<5%	>5%	<5%	>5%
Depth to potable aquifer	-	-	>2m	<2m

5.6.2 Separation Distances from Specified Features

The disposer shall apply septage in accordance with the separation distances from specified features set out in Table 5.2.

Table 5-2
Minimum Separation Distances from Specified Features

Feature	Minimum Distance (in metres)	Preferred Distance (in metres)
Rivers, Canals, Creeks, Intermittent Drainage Courses, Lakes, Sloughs, Dugouts	30	50
Water Wells	50	50
Areas Zoned Residential or Devoted to Urban Use	500	800
Occupied dwellings	60	100
Road Allowances	10	20
Public Building Perimeter	10	30
Public Buildings	60	100
School Yard Boundaries	200	500
Cemeteries, Playgrounds, Parks, Campgrounds	200	500
Property Boundary	60	100

5.6.3 Methods of Application

The disposer shall only apply septage by injection or surface application.

If surface application is employed, the disposer shall till the land within 48 hours of the surface application to incorporate the stabilized septage with the surface soil material.

5.6.4 Application Rates

The disposer shall not exceed the single and annual application rates for casual and designated application sites as specified in Table 5.3.

Table 5-3
Maximum Application Rates for Casual & Designated Application Sites

Waste type	Maximum Single and Annual Application Rates			
	Casual Application Rates		Designated Application Rates	
	Single application	Annual application	Single application	Annual application
Septic Tank	100 m ³ /ha	Not allowed	100 m ³ /ha	500 m ³ /ha
Holding Tank	100 m ³ /ha	Not allowed	100 m ³ /ha	300 m ³ /ha

5.6.5 Restrictions on Land Use after Application

The disposer shall only apply septage to land intended for the production of forages, oil seeds, small grains, trees and commercial sod.

The disposer shall not apply septage to land that is intended to be used for the production of root crops, vegetable and fruit crops, or dairy farming pasturing within three years of the application of the septage.

5.6.6 Requirement for Written Permission from Landowner

The disposer shall obtain written permission from the landowner prior to the application of septage.

5.6.7 Record Keeping

The disposer shall maintain a minimum of the following records:

1. Address of all clients;
2. Volume of waste collected from each client;
3. Land location of disposal of the waste collected;
4. Application rate of the waste disposed; and
5. Date of application of the waste disposed.

All records shall be kept at the business office of the disposer for a minimum of five (5) years from the date of the waste application.

6

Design Guidelines - Septage Management Systems

6.1 DESIGN CRITERIA

6.1.1 Estimating Septage Flows/Volume

The following outlines methodologies for quantifying septage volumes.

6.1.1.1 Septage Generation Rates

Septage generation rates may vary hourly, daily, monthly, and seasonally depending on hours of operation of the receiving facility, generation rates, weather conditions and other factors.

Flows may be established by:

- (i) Evaluating data from existing septage operations (haulers and receiving facilities);
- (ii) Estimating the types and number of on-site systems (septic tanks and holding tanks);
- (iii) Projecting septage volumes and characteristics, based on service population and published per capita generation rates.

Approaches for determining generation rates include:

- (i) Collecting historic information from haulers;
- (ii) Collecting information from existing receiving facilities; and
- (iii) Collecting information from other sources.

If existing data is not available, generation rates for the number of haulers and peak hourly loadings may be estimated. Flows/Volumes may be determined by estimating the number of septic tanks and holding tanks to be serviced, the size of tanks, and the frequency of pump outs.

Flow estimates must include both present and future population projections. Guidelines for estimating population projections are provided in the Standards and Guidelines Document.

6.1.2 Septage Characteristics

Data for local septage to be received should be collected for the design of septage receiving and treatment facilities. The characteristics of septage should be expected to vary widely from load to load depending on the source.

Septage from septic tanks often contains high levels of grease, hair, grit, solids and other extraneous debris. The characteristics of septage from septic tanks compared to domestic wastewater from a municipal sewer collection system and septage from holding tanks are relatively high for conventional wastewater parameters. If existing data is not available, Table 6-1 may be used to provide typical characteristics of septage.

**Table 6-1
Septage Characteristics (SMAC, 2004)**

Parameter	Septic Tank ^{1,2} mg/L	Holding Tank/ Typical Municipal Wastewater ^{1,2} mg/L	Pit Toilets ³ mg/L	Ratio of Septic Tank to Wastewater ⁴
Conventional Parameters				
Total Solids	34,100	720	78,140	56
Total Volatile Solids	23,100	365	60,582	68
Total Suspended Solids	12,900	220	-	68
Volatile Suspended Solids	9,000	165	-	61
Biochemical Oxygen Demand	6,500	220	-	32
Chemical Oxygen Demand	31,900	500	110,360	30
Total Kjeldahl nitrogen	590	40	8,070	18
Ammonia-N	97	25	3,920	6
Total phosphorus	210	31	3,730	31
Alkalinity	970	100	14,990	10
Oil and Grease	5,600	100	-	80
pH (pH units)	5.2-9.0 ⁵	-	-	-
Metals				
Aluminum	48	-	-	-
Arsenic	0.16	-	-	-
Cadmium	0.27	-	-	-
Chromium	0.92	-	-	-
Copper	8.27	-	-	-
Iron	191	-	-	-
Mercury	0.23	-	-	-
Manganese	3.97	-	-	-
Nickel	0.75	-	-	-

Parameter	Septic Tank ^{1,2} mg/L	Holding Tank/ Typical Municipal Wastewater ^{1,2} mg/L	Pit Toilets ³ mg/L	Ratio of Septic Tank to Wastewater ⁴
Lead	5.2	-	-	-
Selenium	0.076	-	-	-
Zinc	27.4	-	-	-
Organics				
Methyl alcohol	1	-	-	-
Isopropyl alcohol	1	-	-	-
Acetone	0	-	-	-
Methyl ethyl ketone	1	-	-	-
Toluene	0.005	-	-	-
Methylene chloride	0.005	-	-	-
Ethylbenzene	0.005	-	-	-
Benzene	0.005	-	-	-
Xylene	0.005	-	-	-

^{1,2} USEPA 1984, 1994

³ Environment Canada (1996)

⁴ Metcalf & Eddy, Inc., 1991

⁵ Canadian ranges reported by USEPA (1984). U.S. reported wider ranges are 1.5-12.6

6.1.3 Septage Receiving and Treatment Facility Capacity

In general, septage management facilities should be designed for a minimum period of 10 years with provision for expansion to handle 20 or 25-year design flow.

6.1.4 Septage Collection and Treatment Systems

Septage collection and treatment systems including pumping stations should be designed for peak septage design flows.

Septage treatment systems providing additional wastewater treatment facilities to meet the required performance standards should follow the guidelines provided in the Standards and Guidelines Document.

In addition, precautionary measures are recommended to control excessive generation of hydrogen sulphide so as to prevent complaints due to odours from sewers or lift stations, damage to equipment and hazardous conditions for operators. Chemical or physical treatment including ventilation may be necessary.

6.2 SEPTAGE TREATMENT

Septage treatment may be provided at a municipal wastewater system or a standalone/independent septage treatment facility as illustrated in Figure 6.1. Selection of septage treatment processes should consider the ultimate disposal method of the treated effluent and sludge residuals.

Water Environment Federation (WEF) Septage Handling – Manual of Practice No. 24 (1997), and United States Environmental Protection Agency (USEPA) Guide to Septage Treatment and Disposal (1994) provides additional design guidelines.

Precautionary measures are also recommended to control excessive generation of hydrogen sulphide at treatment plants where equipment and structural components can be subjected. Protective coatings and enclosure of all the pre-treatment components with provision of appropriate ventilation equipment should be considered.

6.2.1 At Municipal Wastewater Treatment Facility

At a Municipal Wastewater Treatment Plant (WWTP), septage may be treated by:

- (i) Co-treatment with discharge to headworks (or alternate locations) at the WWTP (liquid stream);
- (ii) Co-treatment with discharge to an upstream manhole (liquid stream);
- (iii) Co-treatment with waste activated sludge at WWTP (solids stream); or
- (iv) Combination of treatment with both WWTP liquid and solids streams.

Selection of the septage receiving station and pre-treatment components should consider the protection of treatment processes to prevent shock loadings and process upsets.

6.2.1.1 Engineering Evaluation

The design of a new or upgraded septage receiving facility at a municipal wastewater treatment plant requires an engineering evaluation of the plant treatment capacity and the anticipated septage hydraulic and organic impacts on the plant. In addition to items outlined in Section 5.2.4, the following items should also be considered in the engineering evaluation:

- (i) An appropriate plant design capacity relative to the septage loading, to prevent plant upsets and potential violation of effluent quality requirements.
- (ii) Septage discharges to the liquid stream at a wastewater treatment plant should consider the effects on the dilution capacity and hydraulic retention times (HRT). For example, small plants may require flow equalization or holding tanks with pumps, whereas at larger plants, the normal flow and HRT is already large and septage will not represent an instantaneous flow or loading impact.

- (iii) The space required for constructing septage receiving facilities.
- (iv) The location of the septage receiving facility and the septage hauler unloading area should consider site constraints and traffic flow.

6.2.1.2 Potential Concerns and Alternative Measures

Possible concerns with septage quantity or quality excursions beyond design limits or WWTP capabilities should be recognized and appropriate measures taken to address the concerns.

Table 6-2 provides potential concerns associated with septage treatment at municipal wastewater treatment plants and potential measures to mitigate harmful effects.

Table 6-2
Potential Concerns of Septage Receiving at WWTP

Potential Concern	Alternative Measures
▪ Adverse impacts from industrial contaminants (eg. BTEX or metals)	▪ Manifests collected from haulers and reviewed. ▪ Monitoring and future exclusion of problem haulers ▪ Discharge to aerated holding tank prior to release to WWTP
▪ Inability to handle high grit component	▪ Pre-treatment grit removal system ▪ Aerated grit chambers or cyclonic/ vortex-type devices
▪ Plant upset due to organic or solids peak loadings	▪ Flow equalization ▪ Pre-treatment ▪ Provision of primary clarifiers at WWTP ▪ Discharge upstream in collection system to help equalize load
▪ Odours during off loadings	▪ Remote siting ▪ Hard piped connections and tankage ▪ Odour control system
▪ Increased plant odours from septic wastewater	▪ Improved plant odour treatment ▪ Chemical addition to reduce H₂S odour (e.g. chemical oxidants)
▪ High solids loads	▪ Incorporate directly in the WWTP's solids treatment processes

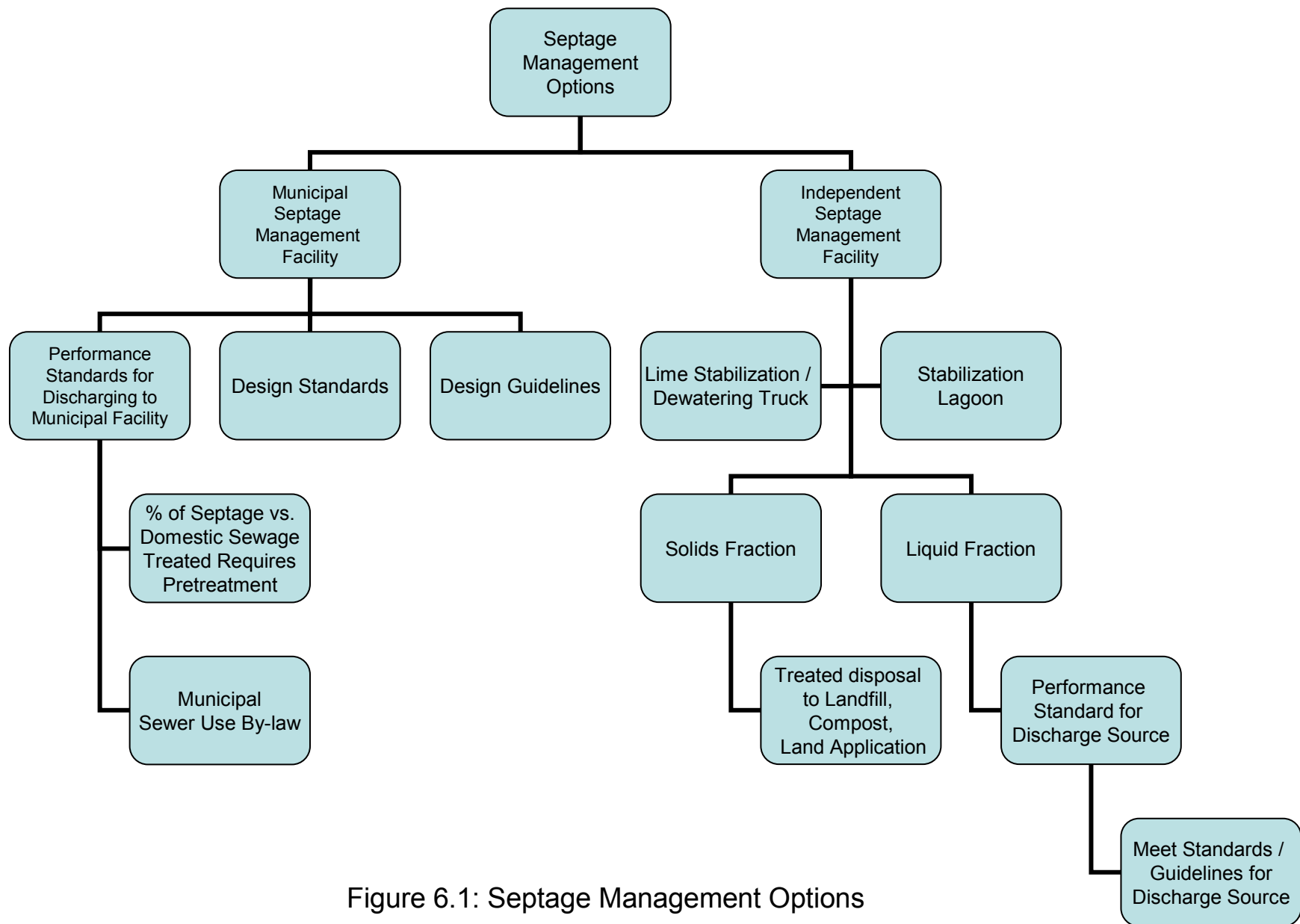


Figure 6.1: Septage Management Options

6.2.2 Treatment at Independent Septage Treatment Facilities

At standalone/independent septage treatment facilities process treatment options may include a combination of:

- (i) Alkaline stabilization
- (ii) Aerobic digestion
- (iii) Anaerobic digestion
- (iv) Dewatering facility
- (v) Mechanical facility
- (vi) Composting
- (vii) Aerated lagoons
- (viii) Stabilization (septage) lagoons; and
- (ix) Constructed wetlands.

Options for treatment at independent treatment facilities should consider the ultimate disposal and potential for beneficial reuse.

Septage consists of a liquid fraction and a solids fraction. Independent septage treatment systems should consider the ultimate disposal method for each stream:

Figure 6.2 illustrates an example of an independent septage treatment system consisting of a mechanical facility. This system provides pre-treatment to meet the performance standards required to discharge the liquid fraction to a municipal wastewater sewage collection system. The solids fraction is conditioned and dewatered prior to disposal at a landfill, approved to accept such wastes.

6.2.2.1 Liquid Fraction Treatment Options

The liquid fraction of treated septage may be further treated by municipal wastewater treatment facilities or additional treatment process as required to meet the required performance standards for disposal.

1. Stabilization Lagoons

Stabilization lagoons designed to treat septage according to Alberta Environment Standards and may be considered as an option for treating septage. Stabilization lagoons are best suited for rural areas where large areas of land are available.

2. Mechanical Facilities and Wastewater Lagoons

The guidelines for mechanical wastewater facilities and wastewater lagoons as outlined in the Standards and Guidelines Document also apply to mechanical septage facilities and septage treatment lagoons.

Selection and sizing of treatment processes should consider the differences of septage characteristics as compared to domestic sewage. Special attention should be given to ensuring the organic loading is accommodated in sizing liquid and solids treatment processes.

Septage lagoon systems should also take consideration the provision of preliminary treatment that is specially designed to handle the potentially unusual amounts of foreign objects, grit, etc. associated with septage as compared to domestic sewage. The preliminary treatment system should be designed to prevent excessive release of odours. The design should consider the inclusion of mechanical aeration as the wastewater has already undergone anaerobic treatment prior to being transported to the lagoons.

6.2.2.2 Solids Fraction (Residual Processing) Treatment Options

1. Digestion

The guidelines for residual sludge processing of the Standards and Guidelines Document also apply to septage treatment processes for aerobic digestion, and anaerobic digestion.

Septage may be added directly into an anaerobic or aerobic digester subject to loadings within the design criteria of the digester. Selection and sizing of solids handling processes should consider the septage characteristics and requirements for screening and dewatering prior to digestion.

2. Alkaline Stabilization

Alkaline stabilization may be considered as an option to treat septage prior to disposal by land application. To reduce pathogens, the alkaline stabilization process requires the addition of lime or alkali to untreated septage (before or after dewatering). Lime/alkali is added to raise the pH to 12 or higher, such that the pH remains at 12 or higher for 30 minutes without the addition of more alkaline material. The pH may be measured with pH indicator strips or calibrated pH meter.

Consideration should be given to type of alkaline material used, and method of addition. Mixing is required to ensure even distribution throughout the septage, and screening should be provided prior to land application. The USEPA "Guide to Septage Treatment and Disposal", (1994) provides guidelines for lime stabilization. The stabilized septage may be

applied to agricultural lands which have an Approval from Alberta Environment. Alberta Environment's "Guidelines for the Application of Municipal Wastewater Sludges to Agricultural Lands," as amended from time to time, also applies to stabilized septage.

3. Composting

Composting of septage is an option in some circumstances and may be considered by municipalities or private operators. Composting of septage may include aerated static pile composting or windrow composting. The composting process requires screening, dewatering and addition of bulking agents prior to placing the material in piles or rows. Aerated static piles use blowers and air distribution piping to force air through the piles to control temperature and moisture. Windrow composting uses a turning machine to control oxygen, moisture and temperature of the piles. During the process, the temperature of the pile will increase to 50 – 60 °C. Typical active composting time is 21 to 28 days, with additional time for curing as required.

Alberta Environment has not yet established septage treatment standards by composting. Standards and guidelines for composting facilities are provided in Alberta Environment's "Code of Practice for Compost Facilities (1997).

4. Dewatering

Dewatering of septage at an independent/standalone septage treatment facility may be considered as an option. The treatment by dewatering should consider pre-screening, prior to dewatering to separate the liquid from the solids. Additional treatment process may be required to meet the performance standards before final disposal of the liquid and solids fractions. The liquid fraction may be treated by additional wastewater treatment processes.

The guidelines for residual sludge processing of the Standards and Guidelines Document also apply to septage treatment processes for dewatering.

The separated solids may be disposed at approved landfill sites or applied on land by obtaining approval.

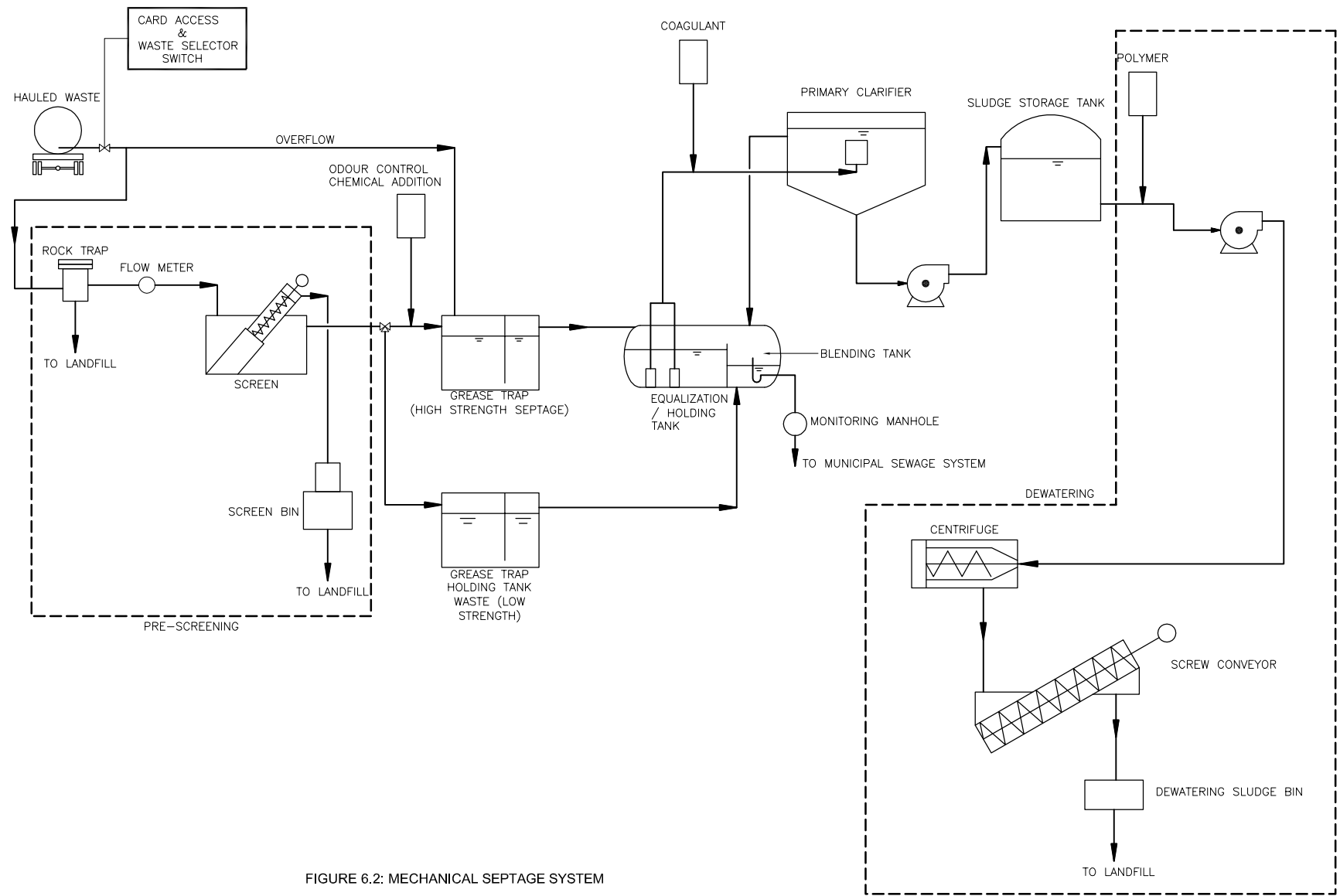


FIGURE 6.2: MECHANICAL SEPTAGE SYSTEM

6.3 SITE SELECTION

The factors outlined in the current version of the Standards and Guidelines Document should be considered when selecting the location for the septage receiving facility. In addition, the site location selection should also consider the following:

- (i) Operator requirements – independent treatment systems or systems located in the sewage collection system may require increased operator requirements compared to systems located at the WWTP.
- (ii) Security and controls – site location should take into consideration requirements for limiting access to authorized haulers, as well as providing adequate visibility to an operator.
- (iii) Odour control – the discharge location should be situated such that odours are not problematic for nearby residents and businesses or plant personnel. Consideration should be given to use of odour control systems to treat exhaust air.

6.4 SEPTAGE RECEIVING STATION

In addition to the components outlined in Section 5.4, the design of a septage receiving station at a municipal wastewater treatment plant or independent/standalone facility should consider the following elements:

- (i) A flexible hose fitted with easy connect coupling to provide for direct connection from the hauling truck outlet to minimize spillage and help control odours and/or a discharge chamber for trucks not equipped with proper hose fittings;
- (ii) Heating of discharge chamber and/or receiving piping;
- (iii) Electronic metering and billing systems to monitor septage received and provide accurate billing information to septage haulers and plant staff. These systems generally consist of a card reader or key pad for controlled access in combination with a flow meter and valve;
- (iv) Wash down water with ample pressure, hose, and spray nozzle for convenient cleaning of the septage receiving station and haul trucks;
- (v) Automated sampling systems to collect a representative sample of any truck load of septage accepted for discharge at the facility;
- (vi) Rock traps, grinding, screening, grit, and/or grease removal where appropriate to protect the downstream treatment units;
- (vii) Valving and piping for operational flexibility to allow the control of the flow rate and point of septage discharge to the plant; and
- (viii) Odour management system.

6.5 SEPTAGE TREATMENT EQUIPMENT

Guidelines provided for wastewater treatment equipment in the current version of the Standards and Guidelines should be considered in selection of septage treatment equipment.

Selection of treatment equipment for a receiving station or an independent treatment facility should also consider the harmful effects of aggressive chemical behaviour, high solids and unusual constituents. The effluent requirements of the receiving stream are also going to have a major influence on the treatment equipment selection.

Screening, and grit removal, should take into consideration the influent septage characteristics and be as automated as possible to reduce operator time.

Off-line septage receiving tanks (holding/equalization tank) should be sized to hold up to twice the maximum daily volume expected on a peak day or two to four days of average daily flow. Consideration should be given to mixing to prevent odours and solids setting. Holding tanks should also incorporate access to allow removal of rocks and grit if pre-treatment is not provided.

Design of septage pump stations should consider guidelines provided in the Standards and Guidelines document after taking into consideration the influent septage characteristics. Pumps for handling the septage should be of the non-clogging design and capable of passing 100 mm (4 in) diameter solids; chopper pumps should be considered due to the nature of the material. Adequate stand-by units should also be available to provide continuous operation.

6.6 SEPTAGE TREATMENT PROCESSES

Design of septage stabilization lagoons, aerated or facultative lagoons should refer to the guidelines provided in the Standards and Guidelines Document and take into consideration the strength of the influent septage.

6.7 ODOUR CONTROL

Requirements for odour control should be considered. Odour control systems may include a basic cam-lock hose connection to minimize splashing and odour release. Septage treatment systems located in an enclosed building or closed tankage may be provided with ventilation that induces slight negative pressure with the exhaust air going through odour control equipment. Odour control systems should be designed such that odours are not problematic for nearby residents and businesses or plant personnel.

Release of septage to anaerobic lagoons or lagoons dedicated to septage can produce offensive odours. Suitable strategies to vigorously aerate or release to ponds with dilution capacity are recommended.

6.8 OPERATING, MONITORING AND REPORTING

Access to the receiving site should be limited to approved haulers and each vehicle discharging to the septage receiving station should be accompanied by a manifest, indicating source and volume of load. To ensure proper manifests are provided, plant operators should require haulers to periodically verify information provided on the manifests.

Operators of lagoon systems may not be able to fully administer a manifest system so only trusted or pre-qualified haulers should be allowed access with consideration given to a suitable security system that can exclude unwanted use of the facility.

A sampling program should be developed to obtain representative data of the characteristics of the hauled wastes. Sampling may be completed for BOD, TSS, pH, oil and grease, metals, and organics.

Consideration should be given to automated, sampling and online analysis in addition to grab sample location. Consideration should also be given to providing capabilities of visual inspections for floating grease, petroleum odours, oily sheen, visible solids, and colours.

The factors affecting operating and monitoring outlined in the Standards and Guidelines Document also apply to septage management systems.

7

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