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CSA R111:21
National Standard of Canada

Solid waste sites in northern communities: From planning to post-closure

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Standards Update Service

CSA R111:21
May 2021

Title: *Solid waste sites in northern communities: From planning to post-closure*

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Published in May 2021 by CSA Group
A not-for-profit private sector organization
178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3

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ICS 93.030
ISBN 978-1-4883-3161-9

Contents

Preface

This is the first edition of CSA R111, *Solid waste sites in northern communities: From planning to post-closure.*

This Standard draws on industry expertise and best practices in Canada and internationally to address the requirements for solid waste management in the North, including the entire lifecycle of solid waste sites beginning with siting, to design, construction, operations, and management, and, finally, closure and decommissioning, and post-closure of municipal solid waste facilities.

Users of this Standard are reminded that additional and site-specific requirements could be specified by federal, territorial or provincial, regional, municipal, or other authorities or agencies, or by an owner. This Standard should not be considered a replacement for the requirements contained in any

a) applicable federal, territorial, or provincial statute;
b) regulation, licence, or permit issued pursuant to an applicable statute; or
c) contract that an owner has with a contractor.

CSA Group acknowledges that the development of this Standard was made possible, in part, by the financial support of Standards Council of Canada, as part of the Northern Infrastructure Standardization Initiative.

This Standard was prepared by the Subcommittee on Solid Waste Management (Northern Communities) under the jurisdiction of the Technical Committee on Northern Water and Waste and the Strategic Steering Committee on Natural Resources, and has been formally approved by the Technical Committee.

This Standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

Notes:

1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
3) *This Standard was developed by consensus, which is defined by* CSA Policy governing standardization — Code of good practice for standardization *as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity". It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*
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    a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
    b) *provide an explanation of circumstances surrounding the actual field condition; and*
    c) *where possible, phrase the request in such a way that a specific "yes" or "no" answer will address the issue.*

    Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization *and are available on the* Current Standards Activities *page at standardsactivities.csa.ca.*
5) *This Standard is subject to review within five years from the date of publication. Suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include "Proposal for change" in the subject line:*
    a) *Standard designation (number);*
    b) *relevant clause, table, and/or figure number;*
    c) *wording of the proposed change; and*

d) *rationale for the change.*

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0 Introduction

This Standard addresses measures for the management and mitigation of risks to human health and the environment associated with solid waste management, specifically, the management of municipal solid waste (MSW). The Standard includes consideration of the varied climate and ground conditions that are present in the North, including the likelihood of permafrost in many of Canada's northern communities.

The Standard considers the significant challenges associated with operating in the North, including issues with ongoing operations and maintenance, communities in remote locations, lack of operator capacity and training, cost of hauling, regulatory management, historic dumping, lack of background data, etc. Of particular importance, and considered specifically in this Standard, is that many of the smallest municipal solid waste sites in remote locations are experiencing the greatest number of challenges and have some of the worst conditions. The focus is to try to assist smaller communities to work towards improved conditions at their sites, while still recognizing their limitations in capacity. It is anticipated that many of the operational requirements for larger sites might, for the moment, remain aspirational for the smaller sites but, gradually, improvements will be implemented at the smaller sites. Of primary importance at existing sites will be an effort to implement best practices in operations, e.g., waste reduction, sorting, and cover.

Because proper siting and design are so important to the successful management of MSW facilities, considerable emphasis is placed on these considerations in the Standard. Siting and design will become progressively more important as existing MSW facilities become full and new sites are sought. Siting can be controversial where competing land uses are in close proximity, or in communities where suitable terrain is in short supply. Where siting cannot be optimized due to the lack of suitable locations, design can often be used to mitigate siting issues. Similarly, where existing or legacy sites are not ideally located, remedial designs can sometimes be useful in mitigating siting deficiencies. If mitigations are not possible, a risk-based decision can be made whether a site should remain operational or should be closed and reestablished in a better location.

The present and ongoing impact of climate change is also considered. Climate change is accelerating numerous land-based processes in Canada's North (ACIA 2013, IPCC 2014, NRC 2016, CSA PLUS 4011). Though all regions of Canada are experiencing environmental impacts that can be attributed to climate change, warming in Canada's North is taking place at a faster rate than the rest of Canada and more rapidly than many climate models predicted. Northern adaptations for changes in ground stability are likely to require the consideration of rapidly changing ice regimes and permafrost soils, particularly in regions with already-warm permafrost and/or ice-rich soils. These issues coincide with progressively increasing exposure to open-water erosive processes, and decreased sea-ice cover in most of northern Canada. Intensification of the hydrological cycle and associated changes to the groundwater regime is another climate change implication that is likely to affect landfilling in the northern regions.

Northern communities are also generally located in geographically-isolated and climatically-harsh regions, resulting in high construction and maintenance costs, as well as challenging logistics. Therefore, efficiency and resiliency are critical elements of built infrastructure in the North, mitigating the effects

of changes in ground stability whether related to natural processes, construction-related changes, or climate change-related processes. Planning MSW facilities for resilience in siting, design, operations, monitoring, and maintenance will help communities manage those processes more successfully.

Because poor MSW poses a threat to human health and the environment, proper solid waste management is an essential measure in managing the risks related to MSW. This Standard is organized according to the progression of steps that, if adopted in the legislation as the Standard in the jurisdiction, or by referencing the Standard (or parts thereof) in project specifications, must be undertaken to address the risks associated with the planning, siting, design, operations, and closure of solid waste management facilities, so that impacts to human health and the environment can be mitigated whenever possible. This Standard thereby encourages risk-based decision-making which prioritizes mitigating the greatest risks first with the resources available. This approach is consistent with the guidance provided in ECCC (2017), which identifies high-, medium- and lower-priority actions to reduce risks.

While there are numerous non-compulsory guidelines available to help the user design and manage municipal solid waste sites in the North, no unified compulsory Standard has yet been prepared specifically to address the issues in Canada's North. This Standard is intended to provide one specific document for solid waste management in the North, while also directing the reader as needed to existing guidelines and other Standards that provide additional information and direction. As noted in the Preface, each jurisdiction might also have additional requirements. The strategies available to proactively reduce the incidence and mitigate the effects of natural and human-produced hazards, to monitor, and to respond to the risks as required, depend on site-specific conditions and resources available to northern communities and facilities. The use of this Standard therefore requires a flexible approach and aims to provide solutions that can help improve solid waste management even in remote northern communities.

1 Scope

1.1 Purpose

This Standard applies to the management of northern MSW facilities, including the evaluation, planning, siting, design, implementation, monitoring, and maintenance of MSW facilities and includes pollution risk management strategies and mitigation measures for new and existing infrastructure in northern communities. This Standard provides

a) procedures for planning, siting, designing, constructing, operating, inspecting, monitoring, and maintaining solid waste management facilities as well as mitigation measures as applicable;
b) an outline of procedures for conducting an overall risk assessment, including infrastructure vulnerability;
c) factors to be considered in land use and infrastructure planning;
d) an overview of the typical drivers of natural and human-made hazards to which this Standard is applicable, including climate change;
e) closure and decommissioning requirements and best practices;
f) post-closure inspection, monitoring, maintenance, and management;
g) emergency response and contingency planning protocols;
h) a framework for community-based processes for addressing solid waste issues, human health, and environmental considerations; and

i) background information and relevant reference material.

Notes:

1) *Compliance with this Standard will allow users to demonstrate that the design and implementation of risk management strategies and mitigation measures take into consideration, and are compatible with, the preservation of permafrost or reduction of the disruptive effects of permafrost thaw. Because the performance of permafrost is often integral to the success of risk management strategies intended to protect human health and the environment at solid waste management facilities, compliance with this Standard will help mitigate impacts to infrastructure and the environment within and surrounding the project site.*
2) *Permafrost is not the only challenge faced by those who design and operate waste management facilities in the North, however. Often, the remote location of the communities mean that it is hard to hire and retain staff to manage the complex activities that underlie the safe operation of modern waste management sites. Communities might also find it expensive to undertake many of the measures described in this Standard. Those who embark on the development and operation of waste management facilities must be confident that they can access the monetary and non-monetary resources that the site will require throughout a facility life that could span several decades.*
3) *This Standard does not replace existing legislation or regulations (see Preface and Clause 4). It can be used in whole or in part to supplement existing regulations, or it can be adopted as jurisdictions see fit. The intent of the Standard is to help each jurisdiction improve the management of municipal solid waste. Annex C provides a list of existing legislation, guidelines, and other documents from each jurisdiction*

1.2 Users

This Standard is intended for use in Yukon Territory, Northwest Territories, Nunavut, and Nunavik, but other northern and remote jurisdictions might wish to adopt it as well. Furthermore, although this Standard was written specifically for communities, other generators of municipal-type waste might also find it useful, including privately-operated waste management facilities, such as mine sites, construction camps, or other generators that do not have access to an established municipal facility. This Standard is voluntary unless adopted by a jurisdiction. Users are intended to include

a) the owners and operators of MSW facilities;
b) the owners and operators of other community infrastructure for which the safe operation of the MSW facility is important;
c) contract administrators who oversee a MSW facility project;
d) site investigators (scientists and engineers) who evaluate the site conditions (existing and projected) and estimate the risks related to the development of the project;
e) design professionals and reviewers (consulting engineers and territorial, provincial, or regional technical services staff) who design, assess and approve, and oversee the implementation of engineering-based solutions;
f) contractors working on MSW facilities;
g) regulatory authorities, such as land and water boards and review boards;
h) compliance authorities, such as qualified building inspectors and qualified environmental inspectors;
i) land use planners and community planning officials;
j) educators, for the purposes of knowledge transfer; and
k) others with a vested interest in risk management or mitigative elements of MSW planning and/or construction projects, design and construction, and inspection of mitigation measures and plan implementation.

Note: *Very small generators of waste would ideally make use of the nearest MSW facility to dispose of their waste, e.g., small communities of a few houses, or as related to highway travel services (gas stations, motels). However, it is recognized that not all such localities might have the capacity to either transport their waste, or to manage it correctly on site. Where possible, local, regional, and territorial governments should encourage the adequate management of solid waste.*

1.3 Application

1.3.1 General

The management of municipal solid waste facilities requires the management of the risks that these facilities create. In this Standard, the management of risks is addressed by the use of two primary strategies: by requiring risk assessments as applicable to the various stages of the life cycle of a municipal solid waste facility, and in the specification and implementation of best practices to mitigate those risks throughout the lifecycle.

The requirements provided in this Standard are intended to address risks to

a) human health and the environment, due to proposed, existing, or closed MSW facilities; and
b) proposed, existing, or closed MSW facilities.

Risks to be considered can be generated by natural hazards and by the waste types in the community and within the facility itself. Risk is partly mitigated by assigning appropriate requirements to facilities according to their size classification (Clause 5). Requirements for the evaluation and management of risks include the potential impacts of climate change and other factors that are to be considered in the planning, siting, design, construction, operations, closure, and post-closure of a MSW facility (Clauses 6 through 17). This Standard applies to the entire life cycle of the infrastructure project or strategic planning cycles, including planning, siting, construction, operation and maintenance, closure and decommissioning, and post-closure, or until residual risk levels are deemed acceptable

1.3.2 Types of infrastructure

This Standard applies to the evaluation, planning and design, implementation, operations, maintenance, and monitoring of solid waste management facilities, as well as mitigation measures, during all phases of planning, design, construction, service life, closure and decommissioning, and post-closure of

a) MSW with segregated categories of waste;
b) landfills;
c) transfer stations;
d) public drop-off facilities;
e) composting facilities;
f) incinerators; and
g) expansions of any of these types of facilities or structures.

1.4 Terminology

In this Standard, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the Standard; “should” is used to express a recommendation or that which is advised but not required; and “may” is used to express an option or that which is permissible within the limits of the Standard.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.

Notes to tables and figures are considered part of the table or figure and may be written as requirements.

Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

