



**MANAGER OF LANDFILL OPERATIONS**  
**BODY OF KNOWLEDGE**  
**CANADIAN EDITION**

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# BODY OF KNOWLEDGE

## Introduction

“Body of Knowledge” (BoK) is a term used to represent the complete set of concepts, terms, and activities that make up a professional domain, as defined by a relevant industry professional society or trade association. In the case of this BoK, the defining organization is the Solid Waste Association of North America (SWANA).

With guidance from industry, SWANA developed the Manager of Landfill Operations (MOLO) BoK to define the core competencies and associated skill sets required of a successful MOLO. The BoK organizes job knowledge areas across four major categories: Foundational, Technical, Strategic, and Management.

The MOLO BoK is a public industry resource. Current and aspiring MOLOs should use the BoK to self-assess their knowledge and skills and fill any gaps. Hiring managers may use it to develop and refine job announcements and job descriptions. Individuals seeking to become SWANA-certified MOLOs should use it to assess their readiness to sit for the Manager of Landfill Operations certification exam.

## The Role of Manager of Landfill Operations

The Manager of Landfill Operations is responsible for overseeing the daily management and operation of a landfill waste disposal facility. As such, the MOLO must be knowledgeable of the operation, permitting, maintenance, monitoring, and regulatory compliance of each facet of the landfill facility. While a MOLO may not be involved with the siting and construction of a new site or the closure of a site at the end of its life, MOLOs should understand the entire lifecycle of a landfill and how each step affects current and future operations.

A sanitary landfill facility may be very simple, focusing only on waste disposal, or it may be more complex, encompassing the core landfill along with a materials recovery facility, a transfer station, organics processing, landfill gas to energy (LFGTE), or other related operations. While these other facilities may have their own dedicated operators, as the host of these other facilities, the MOLO must be knowledgeable of the basic needs of these facilities to ensure conflict-free operations of all on-site facilities. It is important that the MOLO have at least a basic understanding of all the activities taking place at the landfill. This broad understanding ensures the efficiency and safety of the overall operation.

## Uses of the Manager of Landfill Operations Body of Knowledge

Creating a well-crafted BoK was an important reference that can be used in a variety of ways by various members of the waste disposal industry. This BoK goes beyond the overarching abstract concept of waste disposal. It is also a practical tool, one that will help shape the profession of MOLO. It provides a foundation of understanding for those new to the profession, and the necessary framework for experienced MOLOs and all associated staff to better understand each of their roles. This BoK can be used by both employers and MOLOs to assess their or their employees' knowledge and skills and identify areas that need additional training or experience. The BoK also assists certification entities, such as SWANA, in creating training and exams to certify MOLOs. It provides a guide for educational organizations, whether formal, secondary education, trade associations, or individual organizations, to further create relevant training content for MOLOs.

## Guiding Factors Shaping the Future of Landfill Management and the Role of Landfill Manager

As we move into the third decade of the 21<sup>st</sup> century, we can expect to see technological advances and new global challenges continue to challenge businesses of all types. For the waste industry, environmental resources, changing regulatory environments, the ongoing need to develop staff, and an urgent focus on safety will continue to drive changes and innovations. Even in a world that pushes toward increasing waste diversion goals, landfills will continue to be critical components of the solid waste management system.

Landfills and landfill managers will be under increased pressure to minimize environmental impacts while dealing with declining tonnage, changing waste streams, and diversification of on-site ancillary activities. New technology, whether drones for airspace planning, Global Positioning System (GPS) systems on heavy equipment, customer-facing apps, or new safety technology, will require that MOLOs continue to learn and expand their knowledge base and perspective.

Increasingly, there will be more focus on and need for MOLOs who can deal with interpersonal challenges, be transparent in communication, and lead by example. As the industry evolves and the roles of individual facilities and staff change, MOLOs must be able to understand the many job functions related to running a landfill and be able to effectively delegate and manage those functions.

# MOLO JOB CATEGORIES

<b>Foundational</b>	<b>Strategic</b>
<ol style="list-style-type: none"> <li>1. General Knowledge</li> <li>2. Regulation and Permitting</li> <li>3. General Safety</li> </ol>	<ol style="list-style-type: none"> <li>4. Financial Management</li> <li>5. Equipment and Assets</li> <li>6. Short- and Long-Term Planning</li> <li>7. Disaster and Contingency Planning</li> <li>8. Process Improvement</li> <li>9. Safety and Operational Training</li> </ol>
<b>Technical</b>	<b>Management</b>
<ol style="list-style-type: none"> <li>10. Landfill Phase Development</li> <li>11. Scale Operations</li> <li>12. Waste Handling and Active Cell Operations</li> <li>13. Cover Applications</li> <li>14. Hazardous and Non-Hazardous Materials Management</li> <li>15. Ancillary Activities</li> <li>16. Leachate Management</li> <li>17. Landfill Gas Management</li> <li>18. Other Environmental Management and Controls</li> <li>19. Groundwater Monitoring</li> <li>20. Stormwater Control</li> <li>21. Infrastructure and Site Maintenance</li> <li>22. Closed Landfill Management</li> </ol>	<ol style="list-style-type: none"> <li>23. Communication Skills</li> <li>24. Human Resources and Staffing</li> <li>25. Management and Leadership</li> <li>26. Personal and Professional Development</li> </ol>

# MOLO Category: Foundational

## Job Function 1: General Knowledge

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Basic Mathematics	<ul style="list-style-type: none"> <li>▪ Basic mathematical principles</li> <li>▪ Basic statistics</li> <li>▪ Geometry (for shapes, volumes, etc.)</li> <li>▪ Algebra (for various calculations, conversions, ratios, etc.)</li> </ul>
b. Basic Science	<ul style="list-style-type: none"> <li>▪ Basic scientific principles</li> <li>▪ Basic biology</li> <li>▪ Basic units of measurement for mass, temperature, distance, volume, etc.</li> <li>▪ Basic chemistry                             <ul style="list-style-type: none"> <li>• pH levels, acids, bases</li> <li>• Expressions of the concentrations of substances in soil or water including parts per million, billion, or trillion</li> </ul> </li> <li>▪ Earth/environmental science                             <ul style="list-style-type: none"> <li>• Decomposition, biodegradable materials</li> <li>• Aerobic vs. anaerobic processes</li> <li>• Organic vs. inert materials</li> <li>• Soil properties</li> </ul> </li> </ul>
c. Basic Engineering	<ul style="list-style-type: none"> <li>▪ Geology and hydrogeology                             <ul style="list-style-type: none"> <li>• Basic soil types (gravel, sand, silt, clay, etc.)</li> <li>• Groundwater basics (depth, usage, flow direction, etc.)</li> </ul> </li> <li>▪ Basic construction estimating and costing</li> <li>▪ Basic surveying</li> <li>▪ Mechanics of materials                             <ul style="list-style-type: none"> <li>• Concrete, soil, plastic pipe and liner material, metal, etc.</li> </ul> </li> <li>▪ Units and conversions                             <ul style="list-style-type: none"> <li>• Volume (metric), such as millilitres, litres</li> <li>• Volume (imperial), such as ounce, pint, quart, gallon</li> <li>• Distance (metric), such as millimetres, centimetres, metres, kilometres</li> <li>• Distance (imperial), such as inches, feet, yards, miles</li> <li>• Weight (metric), such as grams and kilograms</li> <li>• Weight (imperial), such as ounces, pounds, and tons</li> </ul> </li> <li>▪ Logical skills                             <ul style="list-style-type: none"> <li>• Critical thinking</li> <li>• Problem solving</li> </ul> </li> <li>▪ Basic understanding of how to read engineering reports, drawings, and specifications</li> <li>▪ Understanding of engineering components, including scales, slopes, contours, profiles, etc.</li> <li>▪ Basic understanding of statics, forces, pressure, and loading</li> </ul>
d. Communication	<ul style="list-style-type: none"> <li>▪ Ability to read, write, and understand technical material</li> <li>▪ Basic communication principles</li> <li>▪ The importance of effective communication</li> <li>▪ Ways to communicate effectively</li> <li>▪ Public education and outreach</li> </ul>
e. Overview of Solid Waste	<ul style="list-style-type: none"> <li>▪ Basic industry terms and definitions (e.g., municipal solid waste, construction and demolition, and household hazardous waste)</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Solid waste management components, including aboveground and belowground infrastructure, environmental controls, staffing, equipment, and traffic management</li> <li>▪ Collections</li> <li>▪ Transfer stations and drop-off centers</li> <li>▪ Materials recovery facility</li> <li>▪ Landfills</li> <li>▪ Basic landfill principles, including basic siting criteria</li> <li>▪ History of solid waste management regulatory and industry practices</li> </ul>
f. Current State of the Industry	<ul style="list-style-type: none"> <li>▪ The current state of the solid waste industry</li> <li>▪ Basic statistics related to types of waste facilities</li> <li>▪ Overview of safety statistics as related to solid waste operations</li> <li>▪ Basic knowledge of new technologies and processes or managing the waste stream</li> </ul>

## Rationale

For MOLOs to effectively do the job, they must have several foundational skills. These include basic, high school-level math, science, and engineering skills. They must also understand the basics of how various solid waste facilities operate and how to efficiently dispose of waste in an economical and environmentally safe way at a landfill. In addition, MOLOs must understand the current state of the solid waste industry, including basic safety statistics, recycling markets, and emerging technologies related to the effective operation of modern landfills. MOLOs are responsible for a broad range of activities and tasks and need a solid foundation in general knowledge subject areas. MOLOs must be aware of how the landfill operations fit into the overall solid waste management system of their jurisdiction, agency, or organization.

## Examples of Skills Applied in Real-World Settings

- Landfill sites are sited, permitted, constructed, operated, and closed with a multi-disciplinary team of individuals, with varying technical and educational backgrounds, skills, and abilities. To successfully manage these processes, a MOLO must understand them *and* be able to communicate with and engage all stakeholders.
- Operation of the landfill will require periodic mapping for planning construction projects, calculating consumed/remaining airspace, and other purposes. The MOLO must understand the basic concepts of measurement to interpret maps, plans, reports, and various performance indicators related to the volume of soil excavation, soil cover, and consumed airspace; basic density calculations; horizontal offsets for waste filling; fuel storage; and other critical measurements.



## MOLO Category: Foundational

### Job Function 2: Regulation and Permitting

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Federal Regulations	<ul style="list-style-type: none"> <li>▪ The federal regulations pertaining to solid waste landfills, including the Canadian Environmental Protection Act (CEPA), Transportation of Dangerous Goods Act, Fisheries Act, Migratory Birds Convention Act and Regulation, Canadian Weights and Measures Act, Canada Labour Code, Occupational Health and Safety Regulations</li> <li>▪ Guidance documents from CCME pertaining to solid waste landfills</li> <li>▪ Indigenous and Northern Affairs Canada and how it regulates landfills on First Nations lands</li> <li>▪ Federal regulations and how they have affected landfill operations</li> <li>▪ Basic understanding of administrative law and delegated authority to provinces/territories</li> <li>▪ Federal agencies that regulate solid waste landfills</li> </ul>
b. Provincial/Territorial /Local Regulations	<ul style="list-style-type: none"> <li>▪ Provincial/territorial and local (including but not limited, to municipal, district authority, regional authority, regional district, county, and special areas) regulations, guidelines and criteria pertaining to solid waste landfills</li> <li>▪ How provincial/territorial regulations are developed in acknowledgment of relevant Federal obligations</li> <li>▪ Provincial/territorial agencies that regulate solid waste landfills and enforce provincial/territorial regulations, guidelines, and criteria</li> </ul>
c. Permits	<ul style="list-style-type: none"> <li>▪ Regulatory permits and the permitting process</li> <li>▪ The process of obtaining the required regulatory permits for a landfill facility in accordance with federal, provincial/territorial, and local requirements</li> </ul>
d. Recordkeeping	<ul style="list-style-type: none"> <li>▪ Typical recordkeeping requirements contained in a landfill operating permit</li> </ul>

### Rationale

Environmental regulations and standards are critical to the safe operation of modern landfills. Regulations help protect human health; the environment; and cultural, historical, and natural resources. The regulatory framework across Canada is varied. Each province and territory is responsible for legislation and guidelines for waste management, in addition to regulations for protection of air, water, and land. It is important for MOLOs to understand the various levels of regulations, including federal, provincial and territorial, and local requirements, particularly the various provincial solid waste regulations and air, water, and land regulations that pertain to the region. Noncompliance can lead to citations, orders, fines, and even civil or criminal court action. Further, noncompliant landfills may be severely limited in terms of future development, expansion, or operation.

Permits are based on compliance with existing regulations and must be approved by several regulatory agencies. For a landfill to be operated legally, it must have the necessary permits and then be designed, constructed, operated, and closed in accordance with those permit requirements. Otherwise, the site will

be subject to legal actions including fines, criminal prosecution, additional oversight, forced remedial and corrective actions, including site closure. In some cases, landfill staff—particularly management—may be held personally liable for serious, intentional infractions. This could result in many adverse effects to the solid waste system of the local authority or the landfill owner.

## **Examples of Skills Applied in Real-World Settings**

- One of the most common responses from regulators is that they wish “Landfill operators would read and understand their permit documents.” This comes back to the basic need for a MOLO to have good reading and cognitive skills. The MOLO must also be able to conceive a plan, develop a schedule, and coordinate all stakeholders so that the right things get done at the right time, on budget, and in compliance with all policies and regulations. Ignorance of permit requirements is not an acceptable excuse and can lead to serious consequences.
- The MOLO must understand the basis for virtually all regulations, that is, to protect human health and the environment. Further, they must understand how compliance with a specific regulation may affect the ability to comply with another regulation, and how certain regulations might have social, political, environmental, and financial impacts on local communities and the landfill. MOLOs must also be able to participate in compliance audits and inspections with regulatory bodies.

## MOLO Category: Foundational

### Job Function 3: General Safety

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Common Landfill Safety Hazards for Employees, Contractors, Vendors, and Other Site Users	<ul style="list-style-type: none"><li>Common safety hazards present at landfills</li><li>The different types of safety hazards faced by different landfill users</li></ul>
b. General Safety Planning	<ul style="list-style-type: none"><li>General safety planning and its major components</li><li>The requirements for safety planning as outlined by Health Canada and Canadian Centre for Occupational Health and Safety (CCOHS) or its provincial/territorial equivalents</li><li>Safety planning best management practices for landfills</li></ul>
c. General Operational Safety	<ul style="list-style-type: none"><li>General operational safety throughout the landfill operation</li><li>Industry standard safety plans</li><li>Development of standard operating procedures (SOP)</li><li>Implementation of robust and recurring safety training</li><li>Commonly used personal protective equipment (PPE)</li></ul>

### Rationale

The solid waste industry consistently ranks among the top 5 to 6 most dangerous industries in the United States. Fatalities, injuries, and equipment damage at landfills are common occurrences, and both landfill staff and customers are often involved in accidents due to a lack of clear safety policies or because of non-compliance with safety policies and requirements. It is imperative that MOLOs understand the basic safety risks present in the waste industry as a whole and at landfills specifically. MOLOs also need to understand the regulatory and best management practices for safety because of the great liability involved with non-compliance.

### Examples of Skills Applied in Real-World Settings

- Eye injuries, cuts and abrasions, slips, trips, and falls are some of the more common types of landfill injuries. Often, these are minor injuries that could be prevented with basic training, housekeeping, and proper use of appropriate PPE.
- Most serious accidents and fatalities at landfills happen at the tipping pad because this is where trucks, tractors, and people interact. Drivers are exiting their trucks to remove tarps, unlatch tailgates, or clean up after dumping. Traffic directors may be working near trucks, examining loads for prohibited materials. People may be walking around this busy area doing various jobs or, in some cases, violating rules by scavenging.
- MOLOs must identify and mitigate unsafe conditions at the landfill. They should also have a foundational knowledge of CPR and basic first aid and provide this important training to the staff.

## MOLO Category: Strategic

### Job Function 4: Financial Management

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Revenue	<ul style="list-style-type: none"><li>Primary revenue sources, such as tipping fees and tax assessments for waste disposal</li><li>Sales revenue from diversion products (e.g., crushed concrete, compost, and mulch)</li><li>Revenue from Landfill Gas to Energy (LFGTE) facility</li><li>The effect of diversion programs on landfill revenue</li><li>How to calculate differential rates for various waste types</li></ul>
b. Budgeting	<ul style="list-style-type: none"><li>Basic budgeting for landfills</li><li>How to follow a budget and adjust based on tonnage, regulations, or other changes</li><li>How to communicate with upper management about budgetary adjustments</li><li>Long-term budgeting for landfill closure financial assurance</li></ul>
c. Basic Landfill Economic Calculations	<ul style="list-style-type: none"><li>Tipping fee calculations</li><li>Equipment operating and maintenance costs</li><li>Landfill design and permitting costs</li><li>Landfill construction costs</li><li>Landfill operation costs</li><li>Costs associated with closure and long-term care</li></ul>
d. Waste Receipts and Tonnage Reports	<ul style="list-style-type: none"><li>The importance of tracking waste tonnage</li><li>The importance of tracking all other inbound material tonnage</li><li>The scale software and how to access data for reporting and analysis</li></ul>
e. Airspace Value Planning	<ul style="list-style-type: none"><li>The importance of airspace value planning</li><li>Financial impacts of airspace value planning</li><li>Maximizing use of airspace</li><li>Calculating the cost and value of airspace</li></ul>
f. Collect and Maintain Other Facility Data	<ul style="list-style-type: none"><li>Types of information and data that are required to be maintained under applicable regulations</li><li>Types of information and data helpful for a landfill operator to maintain</li></ul>

### Rationale

Depending on the size of the landfill's organizational structure, a landfill manager may be responsible for varying degrees of financial planning and management. Regardless of how involved landfill managers are required to be, it is imperative that they understand the overall financial picture of their facility and how planning, airspace management, staffing, and equipment management will affect finances. A MOLO also needs to understand how to calculate the costs associated with closure and long-term care of closed facilities, as those costs can be quite large and must be factored into the overall budgeting and financial management over the long-term life of the active landfill in many solid waste management systems.

### Examples of Skills Applied in Real-World Settings

- Many landfills will struggle financially because of competition, increased recycling efforts, and economic recessions. All these factors have decreased inbound tonnage and revenue. The MOLO must have the ability to balance cost reductions and rate increases and must

understand how various decisions will affect the landfill's financial status.

- MOLOs need to accurately project their budgetary needs based on their full operations for both their operating and capital budgets and must continually monitor their expenditures. There are ramifications in not having a sufficient budget or not following budgets. MOLOs also need to be able to understand and prepare reports related to revenue and site life forecasts.

## MOLO Category: Strategic

### Job Function 5: Equipment and Assets

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Assessing Need	<ul style="list-style-type: none"><li>▪ Various buying and financing options</li><li>▪ How to evaluate rent/lease vs. buy options</li><li>▪ Equipment procurement</li><li>▪ Preparing bid specifications and related documents</li><li>▪ Regulatory requirements related to equipment (e.g., emissions)</li><li>▪ The difference between primary and support equipment</li></ul>
b. Sizing	<ul style="list-style-type: none"><li>▪ The relationship between tonnage, type of materials, and number/size of machines needed</li><li>▪ How to evaluate unique landfill site conditions to determine the optimal machine size and type</li></ul>
c. Service and Maintenance	<ul style="list-style-type: none"><li>▪ Basic maintenance requirements</li><li>▪ Walk-around, pre-trip inspections</li><li>▪ The importance of regular maintenance</li><li>▪ How maintenance and safety are interconnected</li><li>▪ Development of a maintenance program and schedule</li><li>▪ Utilizing machine telemetry</li></ul>
d. Utilization	<ul style="list-style-type: none"><li>▪ Developing and applying a range of operator training</li><li>▪ The components of basic equipment operation</li><li>▪ The basic concepts of equipment utilization</li><li>▪ Selecting machines that provide multi-purpose usage</li><li>▪ Best management practices for using equipment</li><li>▪ How operation techniques affect equipment utilization</li><li>▪ The various technologies that can be used to gather data for utilization</li></ul>

### Rationale

Landfill equipment can be divided into two types: primary equipment and support equipment. Primary equipment is usually the refuse-handling and excavation equipment. Refuse-handling equipment is used to push, place, compact, trim, and cover the refuse. Excavation equipment is used to excavate and transport cover material from stockpiles or excavation areas to the active landfill. Support equipment may include motor graders, water trucks, forklifts, hydroseeders, smaller dump trucks and front-end loaders, backhoes, and specialized equipment to apply alternative daily cover (ADC) and support the primary landfill equipment. Understanding the differences between the different types, sizes, and capabilities of equipment, which scenarios require which pieces of equipment, and how to best utilize the equipment at the landfill are important skills for a MOLO.

### Examples of Skills Applied in Real-World Settings

- A landfill may plan to purchase a new bulldozer to replace an aging machine. Several heavy equipment manufacturers may submit bids covering a broad range of options including various service programs and options to rent/lease or buy. The various options have a direct and immediate impact in terms of cash outlay. But the decision must also factor in the landfill's ability to provide future service, maintenance, and repair. The MOLO must be able to assess those impacts, make a decision that works financially, and determine what can be supported by the landfill's infrastructure (i.e., shop, mechanics, service truck, etc.)

- Equipment that is not rightsized can end up costing more to maintain and operate, and equipment fleets that are too large can mean operators are running a machine to just keep busy, whether there is real work to do or not. MOLOs must be able to identify the type and size of equipment that are needed and maximize utilization to get the most out of every piece of equipment.

## MOLO Category: Strategic

### Job Function 6: Short- & Long-Term Planning

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Annual Fill Sequence Planning	<ul style="list-style-type: none"> <li>▪ The importance of short-term fill sequence planning</li> <li>▪ How fill sequence planning affects both the day-to-day filling of the Various survey methods (GPS, drone, UAV, total station, etc.) for general surveying, topographic maps, and documentation</li> </ul>
b. Airspace Utilization Optimizing and Planning	<ul style="list-style-type: none"> <li>▪ Soil management planning</li> <li>▪ Waste density and its impact on disposal capacity</li> <li>▪ Calculation of waste density</li> <li>▪ Role of cover soil in waste density calculations</li> </ul>
c. Overall Facility Layout Planning	<ul style="list-style-type: none"> <li>▪ The development of the overall facility layout plan and how it affects future site development</li> <li>▪ Planning for future cell development in relation to other infrastructure, such as stormwater management systems</li> </ul>
d. Winterization Planning	<ul style="list-style-type: none"> <li>▪ Identifying specific stormwater systems required</li> <li>▪ Reviewing design of stormwater control systems</li> <li>▪ Scheduling various activities necessary for winter prep</li> <li>▪ Constructing and maintaining stormwater controls</li> </ul>
e. Trends Analysis and Forecasting	<ul style="list-style-type: none"> <li>▪ Waste flow projections</li> <li>▪ Impacts to waste composition from population, housing, industrial growth, and recycling</li> <li>▪ Cover material sources and supply</li> </ul>
f. Closure Planning	<ul style="list-style-type: none"> <li>▪ Closure financial planning</li> <li>▪ Post-closure uses</li> <li>▪ Options for post-closure use of old landfills</li> <li>▪ Safety concerns for public use of old landfills</li> <li>▪ How to adapt closed landfill management and maintenance to regulatory changes</li> </ul>
g. Contract Management	<ul style="list-style-type: none"> <li>▪ General contract management and review</li> <li>▪ Contract management with vendors, including: material recovery facilities, collection haulers, municipalities, equipment providers, suppliers, and consultants</li> <li>▪ How a well-designed contract can drive efficiency and safety</li> </ul>

### Rationale

Managing a modern landfill is essentially a long-term construction project in which the primary “asset” is airspace. Without a long-term, strategic plan, the MOLO has no roadmap to guide the development of the site and most strategically manage airspace. Even if a landfill is relatively new or has many decades of life left, the MOLO must think about the inevitable closure of the landfill, post-closure uses, and how closure financial planning must be integrated into the long-term planning. The MOLO must be prepared for changing conditions that could affect the needs of the landfill operation, including staffing, equipment and cover material needs, disposal capacity, and changing waste characteristics over time.

Many MOLOs will also need to be able to effectively negotiate with contractors and manage contracts, whether with consultants, maintenance providers, or haulers. While not all MOLOs will be personally



responsible for all of the planning components, they need to understand what the components are and how they contribute to the overall successful operation of a landfill.

## Examples of Skills Applied in Real-World Settings

- A MOLO's failure to understand contracts may result in many negative outcomes, including work designated to be executed in the contract not being done; overpayments; contractual disputes after award; additional work orders after the award; additional effort to accomplish work thought to be included, but is not; and interference with daily landfill operations and traffic.
- As part of the landfill's development, a massive excavation is required. The soil must be stockpiled someplace for use in future modules. Rather than just pointing to a likely spot, the MOLO should perform soil management planning to identify when that soil will be utilized, and what the current and future transportation costs will be based on haul distance, slope, and machine type. By evaluating these construction, scheduling, and economic factors, a MOLO can determine the optimum location(s) for stockpiling soil for future use.
- A landfill has fine-grained soil. This is a good thing for preventing infiltration through placement of intermediate cover soil, but it also means that, during the wet season, roads and tipping pads may become muddy and impassable. So, some roads and tipping pads must be surfaced to provide wet weather access. To provide adequate wet weather access, the MOLO must develop a short-term fill sequencing plan that identifies specific fill areas for use during periods of wet weather, ensuring adequate fill capacity for the tonnage received during the wet season. They must also develop alternate dry weather fill areas that can be accessed during dry periods. A well-conceived Fill Sequence Plan ensures adequate wet weather access, with the option of moving to non-surfaced (and less costly) fill areas during the dry season.

## MOLO Category: Strategic

### Job Function 7: Disaster and Contingency Planning

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Disaster Planning and Response	<ul style="list-style-type: none"><li>Criteria to receive funding for federal or provincial/territorial disaster funding</li><li>Disaster planning relevant to local conditions</li><li>Regulatory requirements for disaster planning</li><li>How disasters can affect landfill infrastructure</li><li>Public relations and communications during disasters</li><li>The long-term impacts of disasters, including tonnage fluctuations, staffing issues, and the environment</li></ul>
b. Emergency Response	<ul style="list-style-type: none"><li>Emergency response planning specific to disasters common to the locale</li><li>Emergency response coordination with provincial/territorial and local agencies</li><li>Regulatory requirements for emergency response planning</li><li>Emergency response training and drills</li><li>Public relations and communications during emergencies</li></ul>
c. Cross-Training	<ul style="list-style-type: none"><li>The importance of cross-training staff to minimize operational disruption</li><li>Ongoing cross-training vs. emergency cross-training</li></ul>
d. Contingency Planning	<ul style="list-style-type: none"><li>Regulatory requirements for safety and contingency planning</li><li>Basic elements of a contingency plan</li><li>Preparation of SOPs for dealing with potential prohibited or special wastes</li><li>Possible airspace volume and timing required before it can be utilized</li></ul>

### Rationale

Regardless of where a landfill is located geographically, the likelihood of a disaster—man-made or natural—is always present. Whether a wildfire, earthquake, hurricane, flood, act of terrorism, pandemic, or tornado, no landfill is exempt from the risk of a disaster. There may also be other types of issues that could disrupt the landfill's daily operation, including loss of electricity, fuel shortages, a vehicular accident on the site's main access road, temporary closure due to being a crime scene or site of an accident, or breakdown of critical equipment. A MOLO must understand how to properly plan for and respond to various types of disasters and understand how they can affect both infrastructure and operations. Cross-training staff and contingency planning are integral components of planning for disasters.

### Examples of Skills Applied in Real-World Settings

- If there were some sort of site-specific disaster or severe emergency problem at a landfill that necessitated the closure of the site, the ramifications and impacts to the overall solid waste collection system could be extreme. What would happen to the solid waste on the vehicles on the way to the site? Where could it be diverted? MOLOs need to plan for the "worst-case scenario" to be prepared for disasters and emergencies.
- When a massive wildfire occurs within the landfill's service area, nearly a million tons of debris is generated, almost overnight. This includes burn debris from structures destroyed in the fire, most of it resembling charred construction and demolition (C&D) waste. Massive

amounts of concrete are also generated from damaged foundations and cracked slabs. Lots of potentially contaminated (non-hazardous) soil is generated as the top 4” to 6” of building sites are scraped in preparation for rebuilding. This unexpected surge in waste tonnage can be a great windfall of revenue, but it may also consume much of the landfill’s reserve airspace, perhaps even exceeding currently lined airspace. Planning for natural disasters that could occur in the landfill’s region is an important part of the MOLO’s job.

## MOLO Category: Strategic

### Job Function 8: Process Improvement

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Operational Reviews	<ul style="list-style-type: none"><li>▪ Ongoing operational reviews</li><li>▪ How to apply process improvement to various functions of a landfill's operation</li><li>▪ Various types of operational assessment</li></ul>
b. Implementing Operational Changes	<ul style="list-style-type: none"><li>▪ Developing practical SOPs to ensure implementation of operational and safety changes throughout the landfill</li><li>▪ How to deal with resistant or defiant staff</li><li>▪ The importance of training to implement changes</li></ul>
c. Industry Standard Performance Metrics	<ul style="list-style-type: none"><li>▪ How to develop baseline production rates</li><li>▪ How to establish a matrix of Key Performance Indicators (KPI)</li><li>▪ The various systems for tracking performance metrics</li><li>▪ How to apply the data to real-world settings</li></ul>

### Rationale

A typical landfill allocates approximately 60% to 70% of its overall budget to day-to-day operations. Unidentified inefficiencies in the operational activities of the landfill can lead to a loss of resources, including time and money. MOLOs need to understand how to conduct ongoing evaluation—using process improvement tools—to apply continuous improvement. MOLOs also need to be able to effectively implement operational changes, deal with resistant or defiant staff, and track various performance metrics over time to gauge improvements or areas that need to be addressed. In addition, all operational improvements must be made within the context of the regulatory and permitting framework, while also remaining financially feasible.

### Examples of Skills Applied in Real-World Settings

- Recent increases in tonnage may lead a MOLO to consider purchasing another landfill compactor. However, the MOLO may consider whether the nearly \$1 million cost is worth the additional airspace savings. To answer that question, a MOLO may need to conduct a detailed compaction density test. The test results can generate a production curve, showing density vs. tons per hour processed by the compactor. This will then allow for calculations of compactor cost vs. airspace saved. By selecting the optimum configuration, the MOLO can make the decision that best meets the goals of conserving airspace, minimizing operating cost, and maximizing overall revenue.

## MOLO Category: Strategic

### Job Function 9: Safety and Operational Training

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Safety and Operational Training and Implementation	<ul style="list-style-type: none"><li>▪ Training required by regulations</li><li>▪ Training in industry best practices</li><li>▪ Training methods, including online, classroom, and field training</li><li>▪ Required frequency of initial and refresher training</li><li>▪ Standard operating procedures (SOP)</li><li>▪ Customer education</li><li>▪ How to create an equipment operator training program</li><li>▪ How to collaborate and coordinate with safety officers/managers in the organization</li></ul>
b. Training Recordkeeping	<ul style="list-style-type: none"><li>▪ Recordkeeping required by regulations</li><li>▪ Recordkeeping recommended by industry best practices</li></ul>

### Rationale

Ongoing training for all levels of landfill employees is critical to achieve a high level of efficiency and safety. Some training is mandated by federal, provincial/territorial or local regulations. Ongoing training is an industry best practice and, when combined with diligent recordkeeping, can help reduce liability. While the MOLO may not directly administer training, they need to understand that employees should receive regular training and be able to work with outside providers and instructors to ensure consistent, regular training.

### Examples of Skills Applied in Real-World Settings

- The MOLO is ultimately responsible for the safety of staff, customers, visitors, and contractors. The MOLO must ensure that the landfill has a comprehensive and detailed safety program, including standard operating procedures, ongoing training, and a system of enforcement. If an injury or fatality occurs at a landfill, the impacts will go far beyond the financial implications; the site could face regulatory fines, the MOLO could be sued personally, and a court case could cost millions of dollars in attorney fees. Worst of all, the emotional impact on the staff team will create long-lasting issues. It is imperative that the MOLO take a proactive approach to safety to prevent incidents from occurring in the first place.

## MOLO Category: Technical

### Job Function 10: Landfill Phase Development

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Subgrade Excavation and Preparation	<ul style="list-style-type: none"> <li>▪ Geology/hydrogeology</li> <li>▪ Grading</li> <li>▪ Identification of basic soil types</li> <li>▪ Gradation requirements</li> <li>▪ Compaction density and moisture content</li> <li>▪ Soil management and phasing/excavation optimization (maximize efficiency and minimize cost)</li> </ul>
b. Cell Floor Liners	<ul style="list-style-type: none"> <li>▪ Different types of liners, including clay, synthetic, geosynthetic clay liners (GCL)</li> <li>▪ Liner protection from moisture, freeze/thaw, equipment, etc.</li> <li>▪ Liner installation timing</li> <li>▪ Liner installation procedures</li> </ul>
c. Leachate Collection and Recovery System	<ul style="list-style-type: none"> <li>▪ Different types of systems (drainage medium, piping)</li> <li>▪ Understanding the slope and leachate flow</li> <li>▪ Static head (30cm maximum) over the leachate collection system</li> <li>▪ Liner penetration vs. pumping</li> </ul>
d. Protective Layer	<ul style="list-style-type: none"> <li>▪ Installing protective or ops layer/drainage material</li> </ul>
e. Stormwater Management and Planning	<ul style="list-style-type: none"> <li>▪ Timing opening of new phases with seasonal weather fluctuations</li> <li>▪ Managing stormwater to prevent excess stormwater from entering the new area and the leachate collection system</li> </ul>
f. Quality Assurance/Quality Control (QA/QC)	<ul style="list-style-type: none"> <li>▪ Pre-established QA/QC plan</li> <li>▪ The party(ies) responsible for QA/QC</li> <li>▪ The basic steps of quality assurance</li> <li>▪ The basic steps of quality control</li> <li>▪ Certified, third-party for approval by regulatory entity</li> </ul>
g. Initial Waste Disposal Lift	<ul style="list-style-type: none"> <li>▪ Identifying select waste and placement methodology, including lift thickness and type/size of machine</li> <li>▪ Select appropriate waste to protect the liner and leachate collection system from damage</li> <li>▪ Proper filling sequence to increase leachate collection and minimize stormwater intrusion</li> </ul>

### Rationale

While it may be rare for a current MOLO to be involved with the development of a brand-new landfill, many MOLOs will be involved in new phase development at existing sites. Understanding how landfills are developed can also assist MOLOs with identifying any potential underlying operational issues related to liner design, stormwater management, and leachate collection and recovery. For a landfill not to adversely affect the environment, it is essential that the landfill cell is properly prepared to accept waste in accordance with all applicable regulations, permits, and approved plans and specifications. Correcting a flawed construction after the fact, i.e., once landfilling has started, is extremely expensive and difficult and may not even be feasible, depending on the quantity of waste landfilled.

## Examples of Skills Applied in Real-World Settings

- Required construction procedures or methods must be clear and in writing and MOLOs must ensure that the appropriate stakeholders have access to the appropriate information. As an example, a geomembrane installer who was on-site stated that they had always done the installation a certain way. When informed that the required procedure was described in the Special Provisions, they stated that they had never seen the procedure as the firm's estimator had never forwarded it to them. Possible worst case scenarios should be considered and discussed in the Special Provisions before a problem occurs. If not previously agreed upon, then state how to resolve unknowns or disagreements, e.g., contacting specified third-party experts.
- As part of a lateral expansion, the MOLO must work with the designer to ensure that liner construction is completed and ready before the existing available airspace is consumed. The work must occur within the window of the local construction season. MOLOs must also look at the design of the next lined area to determine how much of the liner is able to receive a layer of waste, to provide surface flow away from the liner prior to the rainy season. Otherwise, the lined area may fill with stormwater which could mix with leachate and overload the leachate collection system's capacity. The MOLO must also work with the designer to ensure that adequate material is on the liner to prevent underlying clay or geosynthetic clay liners from freezing or becoming saturated.

## MOLO Category: Technical

### Job Function 11: Scale Operations

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Scale Maintenance	<ul style="list-style-type: none"><li>Scale house functions and activities</li><li>Basic scale house layouts</li><li>Maintenance and repair of scale</li></ul>
b. Financial Transactions and Receipts	<ul style="list-style-type: none"><li>Collecting and maintaining waste receipts and tonnage records</li><li>Developing systems for handling accounts, credit cards, and cash</li><li>Developing appropriate security systems to guard against robbery and/or employee theft</li><li>Integrating security cameras into the scalehouse design and operation</li></ul>
c. Software	<ul style="list-style-type: none"><li>The various types of weight-based and load software systems, e.g., RFID, magnetic scan card, and licence plate recognition</li><li>Various financial processing software, including credit card processing systems</li></ul>
d. Customer Communication	<ul style="list-style-type: none"><li>Safety and personal protective equipment policies</li><li>Load checking plans and policies as mandated by provincial/territorial and federal law, specifically, the Canada Weights and Measures Act</li><li>Communication of fees, prohibited materials, and on-site procedures</li><li>Customer educational and safety training (videos, brochures, verbal communication)</li></ul>

### Rationale

The scale house is often the first point of contact for landfill customers. Not only is the scale house the financial infrastructure for the day-to-day running of the business of a landfill, but it is also where landfill staff can communicate safety policies, site rules, and site layout information most directly to customers. The MOLO needs to ensure that scale house operations run smoothly and that accurate information is conveyed to customers. The MOLO also needs to understand the software for financial transactions and how to maintain the scale to ensure a high level of accuracy.

### Examples of Skills Applied in Real-World Settings

- Unfortunately, there have been instances of scale house impropriety regarding charging customers, the collecting and depositing of monies, and overlooking restricted or prohibited waste. The MOLO needs to clarify policies so scale house staff can provide accurate communication to customers.
- On weekends, the landfill may receive hundreds of self-haul customers, most paying with cash. As a result, by the end of the day, the scale attendant may have more than \$10,000 on-site in cash. The MOLO must manage the system to ensure that employee theft does not occur, which can be prevented by having good accounting practices and a robust video camera system (with audio) that records vehicle licence plates, vehicle loads (via overhead cameras), scale weights, and the cash drawer for every transaction.
- The MOLO must also ensure that proper security measures are in place to prevent robbery.



These measures may include strong, lockable exterior doors; a bank-style drive-up window with a secure drawer for transactions; and a microphone/speaker system to allow customer interaction without exposing the scale attendant to risk.

## MOLO Category: Technical

### Job Function 12: Waste Handling and Cell Operations

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Waste Placement and Cell Construction	<ul style="list-style-type: none"> <li>▪ The concept and objective of a short-term and long-term filling sequence</li> <li>▪ Factors that influence the sequence of waste filling</li> <li>▪ Basic surveying techniques</li> <li>▪ Methods for identifying limits of waste placement</li> <li>▪ Advanced controls, such as GPS and machine control</li> <li>▪ Reading, understanding, and following engineering design plans, including plan scales and topographic contours, and specifications for in-house work</li> <li>▪ Overseeing and monitoring contractors</li> <li>▪ How to calculate airspace and slopes</li> </ul>
b. Primary Roles of Heavy Equipment	<ul style="list-style-type: none"> <li>▪ Different types and sizes of equipment</li> <li>▪ Different applications of various types and sizes of equipment</li> <li>▪ Safe and efficient machine operating techniques</li> <li>▪ High danger zones and how to minimize risk</li> <li>▪ Surveyor's construction stakes</li> <li>▪ Maintaining safety at the tipping pad</li> </ul>
c. Integrating Waste into the Cell	<ul style="list-style-type: none"> <li>▪ Pushing techniques</li> <li>▪ Regulatory and permit requirements for slopes</li> <li>▪ Techniques for determining appropriate grades and slopes</li> <li>▪ Basic surveying techniques</li> <li>▪ Segregating waste by type, texture, and moisture content</li> <li>▪ Methods for identifying limits of waste placement</li> <li>▪ Settlement and how it affects future phases of fill</li> <li>▪ Procedures for the landfilling of permitted special and hard-to-handle waste, e.g., bioslids, bulky items, baled waste, and Styrofoam</li> </ul>
d. Compaction Techniques	<ul style="list-style-type: none"> <li>▪ How proper compaction impacts consumption of landfill airspace</li> <li>▪ Basic compaction equipment</li> <li>▪ Compaction techniques</li> <li>▪ The concept of waste density and what values can be achieved with modern compaction equipment</li> <li>▪ Advances in compaction equipment</li> <li>▪ Equipment maintenance</li> <li>▪ Proper selection, utilization, maintenance, and training</li> </ul>
e. Operational Safety Practices	<ul style="list-style-type: none"> <li>▪ Traffic director safety</li> <li>▪ Customer safety</li> <li>▪ Traffic management</li> <li>▪ Organization and layout of unloading area</li> <li>▪ Blind spot training</li> <li>▪ Communication and enforcement of safety policies at the active face</li> <li>▪ "No Scavenging" policy</li> </ul>

## Rationale

At a landfill, the most important asset is airspace. To effectively manage that asset, the landfill manager must understand how cell construction, compaction, and short- and long-term planning affect how efficiently airspace is consumed. Effectively managing airspace can extend the lifetime of the landfill and delay costs related to expansion. In terms of safety risks, the active face is the most high-risk area at the landfill, a place where self-haul traffic, commercial haulers, spotters, and heavy equipment interact in close quarters. MOLOs need to understand how to efficiently place waste *and* how to ensure that everyone present at the active face always remains safe.

## Examples of Skills Applied in Real-World Settings

- A recent increase in tonnage may cause the active cell to fill up more quickly. The MOLO must adjust the short-term fill sequence planning and ensure that the compactor operator is up-to-speed with the changes.
- A landfill's equipment ages and periodically needs to be replaced. If a water truck that is 15 years old needs to be replaced, the MOLO will need to evaluate the current needs of the landfill and upgrade the water truck based on the landfill's need for dust control, fire response, hauling leachate, construction projects, and other tasks. Should the new water truck be larger? Should it be all-wheel drive? Should it be a water pull instead of a standard truck? All these questions must be answered by the MOLO, in collaboration with the landfill staff, all in consideration of long-term changes anticipated for the landfill.

## MOLO Category: Technical

### Job Function 13: Cover Applications

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Daily Cover	<ul style="list-style-type: none"> <li>▪ The reasons for the application of daily cover</li> <li>▪ Regulatory requirements for daily cover application</li> <li>▪ The impact of different types of cover material on landfill operations and performance</li> <li>▪ The impact of daily cover material selection on landfill capacity</li> <li>▪ The removal and reuse of cover soil</li> <li>▪ How cover soil affects other systems, including gas collection and leachate collection</li> </ul>
b. Alternative Daily Cover (ADC)	<ul style="list-style-type: none"> <li>▪ The reasons for the application of alternative daily cover</li> <li>▪ Regulatory requirements for alternative daily cover application</li> <li>▪ The impact of alternative daily cover material on landfill operations, performance, and cost</li> <li>▪ Options for alternative cover materials and techniques</li> <li>▪ The pros and cons of various types of ADC, and how to select the best one(s) for specific landfills</li> <li>▪ The impact of alternative cover material selection on landfill capacity</li> </ul>
c. Intermediate Cover	<ul style="list-style-type: none"> <li>▪ The reasons for the application of intermediate cover</li> <li>▪ Regulatory requirements for intermediate application</li> <li>▪ The impact of intermediate cover material on landfill operations and performance</li> <li>▪ Long-term impact of intermediate cover on landfill gas collections (waste compartmentalization) and leachate control (leachate flow and seeps)</li> </ul>
d. Final Cover	<ul style="list-style-type: none"> <li>▪ The reasons for the application of final cover</li> <li>▪ Regulatory requirements for final cover application</li> <li>▪ The impact of final cover material types/designs on landfill operations and performance</li> <li>▪ Types and causes of landfill final cover failures</li> <li>▪ Landfill final caps and why/when they are necessary</li> </ul>
e. Cover Repair and Maintenance	<ul style="list-style-type: none"> <li>▪ Maintenance of final cover to prevent differential settlement, exposed waste, infiltration, erosion, vegetation management, wildfire protection, and burrowing animals</li> <li>▪ Mitigation of common final cover problems</li> <li>▪ Sediment control</li> <li>▪ Primary causes of landfill seeps</li> <li>▪ Mechanisms for addressing and repairing seeps</li> </ul>

### Rationale

The proper application of daily, intermediate, and final cover at a landfill is a critical part of maintaining regulatory compliance and properly handling disposed waste. It is also one of the most obvious and visible aspects of a well-run site. Landfills can use a variety of cover materials, including soil, tarps, foam, and other materials. A MOLO should understand the various types of covers available and how their use will vary depending on the specific site conditions and needs of the landfill. If the landfill is utilizing cover soil, the MOLO must understand how to efficiently utilize soil as cover to avoid using up precious airspace

and increasing overall operating costs. If a MOLO is responsible for installing or maintaining final cover, they must understand the potential issues related to erosion and seeps and how to rectify issues.

The better the erosion control, the less stormwater management is required, the less sediment control is required, and the better the quality of any surface discharge. Preventing erosion is more effective than sediment control and is most likely more cost effective. Any effort to control the leachate seeps is a fraction of the effort and cost to correct the problem once the seeps enter the storm water management system.

## Examples of Skills Applied in Real-World Settings

- Many of the problems that show up during the post-closure maintenance period are a result of operational practices during the landfill's active life. Two common problems (leachate seeps and landfill gas migration) can result from excessive use of daily and/or intermediate cover soil and the practice of not removing soil before placing the next lift of waste. Those thick layers of soil can cause compartmentalization within the waste mass, thereby limiting the effectiveness of the landfill gas collection system, or direct leachate laterally instead of downward toward the liner and leachate collection system, which is a common cause of leachate seeps. The MOLO must determine if additional standard operating procedures or training are necessary to ensure proper placement and removal of cover soil. Alternatively, the landfill may need to adopt the use of one or more types of alternative daily cover in lieu of cover soil.

## MOLO Category: Technical

### Job Function 14: Hazardous and Non-Hazardous Materials Management

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Understand and Identify Hazardous and Non-Hazardous Material	<ul style="list-style-type: none"> <li>▪ The definition of a regulated hazardous waste and hazardous recyclable material</li> <li>▪ How hazardous waste and hazardous recyclable material is classified under the Transportation of Dangerous Goods Act and applicable provincial/territorial regulations</li> <li>▪ Possible environmental and human risks posed by toxic, hazardous, or dangerous materials being improperly disposed of at landfills</li> <li>▪ The regulatory requirements regarding identifying and screening for hazardous waste and hazardous recyclable material</li> <li>▪ Provincial/territorial regulations and operating permit requirements regarding identifying and screening for materials that are designated as prohibited or require special handling</li> <li>▪ The appearance, characteristics, and nature of frequently encountered hazardous materials, prohibited materials, and materials requiring special handling</li> <li>▪ Load checking programs to identify and remove hazardous materials, prohibited materials, or requiring special handling</li> <li>▪ The definition of liquid waste, including the paint filter test</li> </ul>
b. Removal/Storage/ Disposal of Hazardous, and Non-Hazardous Material	<ul style="list-style-type: none"> <li>▪ Training requirements for landfill workers regarding recognition, extraction, and storage of hazardous waste and hazardous recyclable materials, prohibited materials, and materials requiring special handling</li> <li>▪ Federal, provincial/territorial and local regulatory requirements for transporting, storing and disposing of hazardous materials, prohibited materials, and materials requiring special handling, including asbestos, beneficial use materials, contaminated soils, sludge, biosolids, septage, dead animals, medical waste, and liquid, and semi-solid wastes from oil and gas</li> <li>▪ Alternative disposal locations and procedures for hazardous materials, prohibited materials, and materials requiring special handling</li> <li>▪ Requirements for spill containment protection and emergency/contingency plans</li> <li>▪ The challenges of handling hazardous material, prohibited materials, and materials requiring special handling (disaster debris, caustic or toxic chemicals, asbestos, treated wood)</li> <li>▪ Federal, provincial/territorial, and local regulatory requirements for the extraction and/or storage of paint, motor oil, cars, electronic waste, regulated hazardous waste, household hazardous waste, and universal waste, including batteries, pesticides, mercury-containing equipment, lamps, and aerosol cans</li> </ul>
c. Hazardous Materials, Prohibited Materials and	<ul style="list-style-type: none"> <li>▪ Federal, provincial/territorial, and local regulatory requirements for reporting hazardous materials, prohibited materials, and</li> </ul>

Materials Requiring Special Handling Recordkeeping	<p>materials requiring special handling</p> <ul style="list-style-type: none"> <li>▪ Permit requirements for materials that are designated as prohibited or require special handling</li> <li>▪ Regulatory recordkeeping requirements for hazardous materials, prohibited materials, and materials requiring special handling</li> </ul>
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## Rationale

Individual waste types accepted at a landfill are specific to its operating permit and can be different for similar landfills. The acceptance, management, storage, and disposal of many types of hazardous and non-hazardous waste and recyclables, materials prohibited locally, and materials requiring special handling may be unsafe for the employees, customers, and neighbours of a site, either as an acute or chronic risk factor. These types of materials can also potentially adversely affect the leachate collection system and/or environment. In addition, the acceptance of prohibited waste may result in legal proceedings for violating permit requirements and be a criminal offence for those who allowed the illegal on-site disposal or mishandling of the waste. MOLOs must understand what materials they can accept and dispose of and what materials must be restricted or removed from the waste stream. They must also understand the parameters of their specific permit(s) and local, provincial/territorial, and federal regulations regarding hazardous materials, materials prohibited locally, and materials requiring special handling

## Examples of Skills Applied in Real-World Settings

- Asbestos is a hazardous waste if airborne. However, if kept solid or prevented from becoming airborne, many sites are permitted to accept asbestos with the proper precautions to avoid airborne release and if disposed of at a specific documented location within the site.
- The MOLO may have to deal with potentially hazardous, prohibited, or restricted material in the waste stream. As an example, suspect material might be in a large metal drum, with no visible label. It may have been damaged during the dumping process and it could be slowly leaking clear liquid onto the ground near the edge of the tipping pad. Perhaps the spotter detected a strong chemical odour before moving away and calling management. What is the proper response to this potential emergency? The MOLO should immediately evacuate people upwind from the area, detain the driver, call the generator, and try to determine the contents. If it is hazardous, prohibited, or restricted, the MOLO should notify the generator to send their hazmat response team or call 911 to bring in the local government hazmat team. Eventually, the MOLO must ensure the material is safely removed and mitigated based on the instructions of the hazmat team. The MOLO is also responsible for notifying the provincial/territorial regulator of this occurrence and document the event, including the response.

## MOLO Category: Technical

### Job Function 15: Ancillary Activities

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Diversion/Material Recovery/Recycling	<ul style="list-style-type: none"><li>▪ Handling, processing, grinding, composting, and repurposing green waste, yard trimmings, food waste, and other acceptable organic materials</li><li>▪ Diversion and recovery activities</li><li>▪ Collection of appliances and removal of refrigerant</li><li>▪ Tire collection, processing, and storage</li><li>▪ Storage and management of diverted/recovered materials</li><li>▪ Maintaining diverted materials to avoid threat of theft, contamination, or fire</li></ul>
b. Additional Facilities and Processes	<ul style="list-style-type: none"><li>▪ Transfer station activities</li><li>▪ Public convenience center/containers for dumping waste</li><li>▪ Leachate treatment processing</li><li>▪ Waste-to-energy</li><li>▪ Landfill Gas to Energy (LFGTE) facility</li><li>▪ Compost facility</li><li>▪ Yard waste drop-off</li><li>▪ Recycling drop-off</li><li>▪ Education center</li><li>▪ Re-use/re-purpose centers</li><li>▪ Landfill gas facility</li><li>▪ Maintenance building</li><li>▪ Storage facilities</li><li>▪ Household Hazardous Waste (HHW) collection center</li><li>▪ Public buy-back or loadout operation</li><li>▪ Wheel wash / vehicle cleaning station</li></ul>

### Rationale

In 2021 and beyond, many landfills have moved beyond simply accepting and disposing of waste and now have many varying types of ancillary activities adjacent to the landfill or within the property boundary of the site. While MOLOs may not directly oversee these activities, they need to understand how they fit into the overall operation of the landfill. Many ancillary activities are related to the diversion of recyclable materials or the removal of potentially hazardous/restricted/prohibited materials. Other ancillary activities may be related to community outreach and education. Even if not directly responsible for these ancillary activities, the MOLO must understand the importance of permitting and local, provincial/territorial, and federal regulations for these activities.

### Examples of Skills Applied in Real-World Settings

- As the number of on-site ancillary activities increase, the MOLO will face more complex responsibilities and tasks that require greater knowledge and preparation. Often, the greater the number of different types of waste that can be accepted at a landfill—whether for on-site disposal or collection/storage for subsequent transfer offsite for proper treatment/disposal—the better the public service.
- In response to new recycling regulations, the landfill may need to adopt an organics diversion program. It may include the composting of yard, agricultural, and food waste, and then selling



the compost to local residents. The MOLO would be responsible for setting up the composting program. Before selecting the size, type, and number of machines necessary, the MOLO might first conduct a waste stream analysis to determine how much organic material currently comes in and the nature of the material. This information will be important when it comes to designing the overall layout of the compost area, based on the number of windrows, and how quickly material can be processed from raw feedstock to finished product. The MOLO may also consider seasonal trends for the generation of feedstock, when the material is most likely to sell, and how long finished material must be stored on-site until it can be sold. In addition to the operational considerations, MOLOs must also think about fire prevention and control.

## MOLO Category: Technical

### Job Function 16: Leachate Management

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Leachate Overview	<ul style="list-style-type: none"> <li>▪ The processes that result in the formation of leachate</li> <li>▪ The importance of removing leachate from the landfill</li> <li>▪ The chemical characteristics of landfill leachate</li> <li>▪ The occurrence and repair of landfill seeps</li> <li>▪ Regulatory requirements for landfill leachate treatment, storage, and disposal</li> <li>▪ Minimizing nuisance odour from on-site leachate</li> </ul>
b. System Development	<ul style="list-style-type: none"> <li>▪ Basic understanding of the operation of a leachate collection, treatment, and disposal system</li> <li>▪ Landfill leachate collection designs and configurations</li> <li>▪ Maintenance of the collection pipes, pump stations, flow meters, force mains, and other collection equipment</li> <li>▪ Typical construction of leachate collection and recovery systems</li> <li>▪ Storage, treatment, and disposal options                             <ul style="list-style-type: none"> <li>• Evaporation</li> <li>• On-site treatment</li> <li>• Recirculation</li> <li>• Applying for dust control</li> </ul> </li> <li>▪ Techniques for inspecting, cleaning, and repairing leachate collection systems</li> <li>▪ Economic considerations of leachate handling</li> </ul>
c. Leachate Use and Disposal	<ul style="list-style-type: none"> <li>▪ The concept of a bioreactor landfill</li> <li>▪ Objectives of leachate recirculation</li> <li>▪ Regulatory issues with leachate recirculation</li> <li>▪ Techniques for recirculation of leachate</li> <li>▪ Operating leachate recirculation systems</li> <li>▪ Deep well injection</li> <li>▪ Regulatory and permitting requirements for leachate uses</li> <li>▪ Requirements for discharge to a Public Owned Treatment Plant</li> </ul>
d. Leachate Sampling/Monitoring	<ul style="list-style-type: none"> <li>▪ Common monitoring parameters for landfill leachate</li> <li>▪ Protection and maintenance of groundwater wells and gas extraction wells</li> <li>▪ Leachate monitoring program to review leachate</li> <li>▪ Groundwater monitoring</li> </ul>

### Rationale

Leachate is the principal way in which groundwater at a landfill is contaminated. Designing, constructing, operating, and maintaining a leachate collection system will minimize that possibility and is much more cost effective than attempting to rectify the problem and to remediate the groundwater after the fact. MOLOs need to understand the various methods of managing leachate and the specific provincial/territorial regulations that require landfills to collect leachate.

### Examples of Skills Applied in Real-World Settings

- Older open dumps and landfills with little leachate control may be required to collect and treat contaminated groundwater to mitigate the environmental impact of the contamination. Past

remediation efforts have required landfill owners whose landfills have contaminated potable water sources to supply bottled water, extend a municipal water system, or build a groundwater treatment facility. A MOLO must be aware of the far-reaching potential consequences of contamination.

- During a periodic inspection of the closed portion of the landfill, the MOLO may notice leachate seeps. Leachate may be emerging from the landfill above the toe of the slope. The odourous and discoloured liquid may run down the slope toward a perimeter stormwater channel. The MOLO should immediately contact the landfill designer and verify the type of final and intermediate cover system used at this location. To determine the cause of the leachate seep, the MOLO may review past aerial topographical maps and fill sequence plans and meet with the operator who was working on-site when that area was filled with waste. Based on the response from the designer and the operator, the MOLO can proceed with plans to repair the seep. But, before beginning work, the MOLO must also notify the provincial/territorial regulator of the seep and the plan to mitigate it. Because this work would occur on a closed portion of the landfill, regulatory approval will likely be necessary.

## MOLO Category: Technical

### Job Function 17: Landfill Gas Management

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Landfill Gas Overview	<ul style="list-style-type: none"><li>▪ The basics of waste decomposition in landfills and biogas production</li><li>▪ How the waste stream impacts landfill gas production</li><li>▪ The characteristics and risks of landfill gas</li><li>▪ Regulatory requirements for landfill gas</li><li>▪ Typical gas collection techniques</li><li>▪ Gas condensate, its consequences, and its management</li><li>▪ Supervisory control and data acquisition (SCADA) systems</li></ul>
b. Landfill gas containment, migration, and mitigation	<ul style="list-style-type: none"><li>▪ Operating techniques for landfill gas extraction systems</li><li>▪ Types of wells and extraction trenches</li><li>▪ Understanding how liner and final cover contain landfill gas</li><li>▪ Regulatory requirements for the monitoring of gas migration</li><li>▪ How to address common migration factors (path of least resistance)</li><li>▪ Signs of gas migration (stressed vegetation, subsurface fires)</li><li>▪ Mitigation efforts</li><li>▪ How to prevent and identify subsurface fires</li></ul>
c. Monitor, operate, and maintain landfill gas treatment and processing system	<ul style="list-style-type: none"><li>▪ Systems and equipment for monitoring landfill gas</li><li>▪ Types of landfill gas flare options and their operation</li><li>▪ Options for landfill gas to energy, both on-site and off-site uses</li><li>▪ Landfill blowers and operations</li><li>▪ Long-term monitoring of landfill gas systems, i.e., at closed landfills</li><li>▪ Common problems and solutions for landfill gas systems</li><li>▪ Fire risks and control considerations for landfill gas collection systems</li></ul>

### Rationale

The management of landfill gas is a critical part of the MOLO's job. While the complexity and type of landfill gas collection system will vary from site-to-site, the bottom line is that the MOLO must know how to properly manage LFG and identify potential issues. In addition to possibly increasing greenhouse emissions or contaminating groundwater, uncontrolled LFG can be explosive in the right concentration if there were a spark. Properly managing LFG is both an environmental and safety issue.

### Examples of Skills Applied in Real-World Settings

- Over the years there have been instances where LFG has caused injuries, fatalities, and destruction of property due to asphyxiation or explosions due to uncontrolled LFG in confined locations, whether on-site or off-site.
- The MOLO just got the call that smoke is emerging from a settled area on the landfill slope. After a brief investigation, it appears to indicate a subsurface landfill fire. Further investigation reveals that to control off-site (sub-surface) migration of landfill gas, the landfill recently increased the vacuum on several gas extraction wells along the perimeter of the landfill in that area. Apparently, this created a scenario in which air was drawn through the cover soil and into the anaerobic environment within the landfill. This accelerated the decomposition process,

increased the heat, and caused a subsurface fire. What should the MOLO do? Immediately contact the provincial/territorial regulator(s) and the landfill gas system operator. Close off all gas wells in the vicinity of the subsurface fire. Barricade that portion of the landfill to prevent workers or customers from approaching the subsurface fire. Develop a plan of action to address the issue.

## MOLO Category: Technical

### Job Function 18: Other Environmental Management and Controls

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Litter Planning and Management	<ul style="list-style-type: none"><li>▪ Potential problems associated with windblown or water-borne litter</li><li>▪ Common sources of windblown and/or water-borne litter</li><li>▪ Techniques for minimizing and controlling windblown and/or waterborne litter on-site and off-site</li><li>▪ Methods and strategies for removal of windblown and/or waterborne litter</li><li>▪ The role of wind modeling and short- and long-term planning for litter management</li></ul>
b. Bird and Vector Management	<ul style="list-style-type: none"><li>▪ Specific types of birds and vectors present at the landfill</li><li>▪ Habitat and potential attractants for birds and vectors</li><li>▪ How to create a bird and/or vector management plan</li><li>▪ Operational considerations to minimize birds and/or vectors</li><li>▪ Regulatory requirements related to bird and/or vector control</li></ul>
c. Odour Management	<ul style="list-style-type: none"><li>▪ Sources of odours</li><li>▪ Potential downwind receptors of</li><li>▪ Potential risk and liability associated with odour</li><li>▪ How to implement processes to minimize generation and release of odours</li><li>▪ Odour control strategies and techniques</li></ul>
d. Dust Management	<ul style="list-style-type: none"><li>▪ Sources of dust</li><li>▪ Potential risk and liability associated with dust</li><li>▪ How to implement processes to minimize generation and release of dust</li><li>▪ Potential downwind receptors of dust</li><li>▪ How levels of nuisance dust are measured</li><li>▪ Dust control strategies and techniques</li></ul>
e. Noise Management	<ul style="list-style-type: none"><li>▪ Sources of excessive noise</li><li>▪ How to identify potential receptors of nuisance noise</li><li>▪ The potential risk and liability associated with noise</li><li>▪ Noise control strategies and techniques</li></ul>

### Rationale

Modern landfills are subject to many regulations regarding environmental impacts such as dust, odours, and litter, and must co-exist with neighbouring businesses and communities. Although these environmental controls may not seem as “critical” as some other controls, they are more visible and more likely to be the source of complaints from customers, regulators, neighbours, and the public. They also often indicate poor landfill operation and may also be indicative of deeper issues. Because of this, MOLOs must understand the origins of these types of issues and how to manage them effectively.

### Examples of Skills Applied in Real-World Settings

- Back-up alarms on heavy equipment are known to be disturbing to an adjacent neighbourhood, so the MOLO may need to identify methods to mitigate noise migration off-

site.

- The amount of labour needed to pick up a truckload of windblown paper by hand is staggering, especially when it gets off-site. If it blows into trees or travels to adjacent neighbours, it can create even more of a nuisance. The MOLO needs to create a litter management and mitigation plan for windy days.
- As an example, a landfill has received its fifth notice of violation in one year for litter. The landfill's neighbours are up in arms and threatening civil action if the landfill does not address the issue. It is truly up to the MOLO to figure out a plan of action and fix this problem. MOLOs must consider the types of litter control systems currently have in place. The MOLO may have to hire an outside consultant to conduct a comprehensive litter control assessment that might start with a field assessment that looks at the waste stream since some types of waste are more susceptible to creating litter. The consultant may also conduct a broad range of computer-based, wind-flow modeling exercises, along with field verification of windspeed, direction and historical litter pathways. The consultant will provide the MOLO a series of recommendations that include operational changes, implementation of control devices, and a set of litter-control standard operating procedures (SOPs) for the crew so they all know how to put a lid on windblown litter. The MOLO must then confer with their team and decide how to proceed with implementation.

## MOLO Category: Technical

### Job Function 19: Groundwater Sampling/Monitoring

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Groundwater Monitoring Well Placement	<ul style="list-style-type: none"> <li>▪ Purpose of installing groundwater monitoring wells</li> <li>▪ Groundwater monitoring well placement</li> <li>▪ Geologic and hydro-geologic conditions, including groundwater flow direction, groundwater quality, depth to groundwater, and downgradient receptors</li> </ul>
b. Groundwater Monitoring System Design, Construction, Maintenance, and Management	<ul style="list-style-type: none"> <li>▪ Groundwater monitoring system design and engineering</li> <li>▪ Groundwater monitoring well construction techniques</li> <li>▪ Protection of groundwater monitoring wells</li> <li>▪ Groundwater monitoring system security</li> <li>▪ Ongoing maintenance of groundwater monitoring systems, including remediation</li> <li>▪ Groundwater monitoring requirements as established in a monitoring plan incorporated as part of the operating permit for the landfill</li> </ul>
c. Groundwater Sampling	<ul style="list-style-type: none"> <li>▪ Basic groundwater sampling and groundwater level measuring techniques and procedures</li> <li>▪ Basic characteristics/indicators, e.g., pH, temperature, and electrical conductivity</li> <li>▪ Chain of custody control</li> <li>▪ Quality assurance and quality control at collection and during lab processing</li> </ul>
d. Regulatory Requirements	<ul style="list-style-type: none"> <li>▪ Basic understanding of groundwater monitoring, sampling, and reporting</li> <li>▪ Basic trend analysis</li> <li>▪ Current federal, provincial/territorial, and local regulatory requirements related to groundwater sampling, monitoring, and reporting</li> <li>▪ Regulatory requirements as outlined in the CEPA, Fisheries Act, provincial/territorial regulations and site permit.</li> </ul>

### Rationale

A properly sited, designed, constructed, and operated site should not contaminate the groundwater. If there are potable groundwater wells in the vicinity or downgradient, rectifying any groundwater contamination and/or preventing any further contamination may or may not be feasible—technically or financially. Addressing such contamination will incur a huge dollar cost.

### Examples of Skills Applied in Real-World Settings

- If a nearby potable well becomes contaminated, the owner's first option will be to blame the landfill. However, there are occasions when it is discovered that the contaminated well is upgradient and/or the owner repaired vehicles close to his well. It is important for the MOLO to have a big picture perspective when it comes to the management of groundwater.
- The MOLO is responsible for reviewing the results of the groundwater monitoring program and notices one of the monitoring wells has a slightly increased level of chloride and a minor



drop in pH. Neither level is extreme. Nonetheless, the MOLO should understand that these results may be an early indicator that landfill leachate could potentially be reaching groundwater. The next quarter lab results indicate Trichloroethylene (TCE) at a concentration that exceeds the minimum contaminant level (MCL). This could be a serious problem. Before the MOLO jumps to conclusions, the first response should be to contact the consultant who pulled that sample, ask that the well be re-sampled, and run it back through the lab. It is important to confirm the results since sampling mistakes can happen. The MOLO may also want to contact their primary regulator to discuss the issue.

## MOLO Category: Technical

### Job Function 20: Stormwater Management and Control

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Stormwater Management	<ul style="list-style-type: none"><li>▪ The importance of proper stormwater management at operating landfill units</li><li>▪ Stormwater drainage systems at landfills</li><li>▪ Techniques for controlling stormwater at operating landfill units</li><li>▪ Maintenance of stormwater control systems</li></ul>
b. Erosion and Sediment Control	<ul style="list-style-type: none"><li>▪ The process of erosion, including flow, slope, length of slope, soil type, and ground covering</li><li>▪ Universal soil loss equation (USLE)</li><li>▪ Erosion-control techniques</li><li>▪ Management practices to reduce, control, and mitigate sediment</li><li>▪ Sedimentation pond design/locations</li><li>▪ How stormwater ponds function to treat stormwater to meet regulatory discharge standards</li></ul>
d. Regulations Related to Discharge	<ul style="list-style-type: none"><li>▪ Canadian Environmental Protection Act</li><li>▪ Fisheries Act</li><li>▪ Migratory Birds Convention Act and Regulation</li><li>▪ Provincial/territorial water quality and quantity regulations</li><li>▪ Landfill operating permit and any discharge agreements</li><li>▪ National Pollutant Release Inventory (NPRI)</li><li>▪ Local Conservation Authority requirements</li></ul>

### Rationale

One of the primary goals of a properly run modern landfill is to minimize the impacts the landfill makes on the surrounding environment, including nearby groundwater and above-water sources. Rainfall, snowfall, and water migration through the landfill is normal and must be taken into consideration when designing the landfill and operating it on a day-to-day basis. A MOLO needs to understand the basic techniques for managing stormwater to minimize impacts on the site infrastructure and surrounding environment.

### Examples of Skills Applied in Real-World Settings

- Sediment is a pollutant and needs to be controlled at the source. Besides the obvious visual impact on a waterway, it can adversely affect aquatic life and affect recreational use, e.g., swimming and boating channels. Excessive sediment from a sediment basin is an obvious visible indication of surface water contamination. Erosion control is more effective than sediment control, i.e., if you stop or minimize erosion, there is less or no sediment to control. Sediment control depending on the soil types may not be that effective.
- To develop on-site stormwater control systems that protect surface waters, aquatic habitat, and associated species, the MOLO must understand the purpose of stormwater control systems, including the basics of how they are permitted, designed, and constructed. To accomplish this, the MOLO must understand the protections set forth in the provincial/territorial regulations and/or landfill operating permit. These protections may include the design, installation and maintenance of ditches, culverts, down-drains, erosion control

systems, stormwater detention basins, stormwater sampling and testing, and related systems.

## MOLO Category: Technical

### Job Function 21: Infrastructure and Site Maintenance

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Administration Building	<ul style="list-style-type: none"> <li>▪ Administrative needs for landfill</li> <li>▪ Landfill staff facility requirements including, but not limited, lunchroom, restrooms, dispatch office</li> </ul>
b. Water Supply System	<ul style="list-style-type: none"> <li>▪ On-site water supply systems and tanks</li> <li>▪ Overhead loadout tank systems for dust/fire control</li> </ul>
c. Landfill Road Development and Maintenance	<ul style="list-style-type: none"> <li>▪ Road construction techniques and materials</li> <li>▪ Road maintenance techniques</li> <li>▪ Roadway systems at landfills</li> <li>▪ Temporary vs. permanent access roads</li> </ul>
d. Traffic Management	<ul style="list-style-type: none"> <li>▪ How road design can affect traffic flow</li> <li>▪ Traffic flow throughout the site</li> <li>▪ Clear and up-to-date signage</li> </ul>
e. Site Appearance	<ul style="list-style-type: none"> <li>▪ Types of structures and facilities that may be located at a landfill site</li> <li>▪ Importance of maintaining site appearance</li> <li>▪ Use of buffers and visual screens</li> </ul>
f. Site Security	<ul style="list-style-type: none"> <li>▪ The site security requirements outlined in provincial/territorial regulations and/or the landfill's operating permit</li> <li>▪ The importance of securing a landfill against unlawful or unregulated trespass that could result in theft, vandalism, fire, injury, or liability</li> <li>▪ Various levels of security</li> <li>▪ Wildfire fuel break placement and maintenance</li> </ul>
g. Shop and Equipment Maintenance Facilities	<ul style="list-style-type: none"> <li>▪ Heavy equipment/truck shop layout and maintenance</li> <li>▪ Fuel storage systems and safety protocols</li> <li>▪ Safe storage for supplies and materials</li> <li>▪ Outdoor staging area for trucks and tractors</li> </ul>

### Rationale

A modern landfill should not look like a dump but should instead be organized and well-maintained. MOLOs should understand the basics of road development and maintenance and how to manage traffic to minimize congestion and improve safety. The MOLO also needs to understand how to best secure the landfill to prevent theft, vandalism, or injury. Maintaining the site by managing vegetation can also help prevent wildfires, which can damage landfill equipment and infrastructure.

### Examples of Skills Applied in Real-World Settings

- An unsecured site may result in the illegal dumping of unacceptable, prohibited, or hazardous materials, joyriding in equipment, irreparable damage to facilities or exposed liner systems, and adverse environmental impacts. In addition to monetary costs, even if there were insurance, there may be unacceptable delays with significant ramifications, e.g., destruction to liner materials or installation of a new active phase that must be completed by a certain deadline due to a lack of capacity.
- A MOLO may have to step in to manage a relatively new landfill that began operating from an

old refurbished one that was on-site when the land was purchased. The MOLO is responsible for constructing a new administration building, shop, and other permanent facilities. The MOLO should begin the process by talking with their team about current needs and future needs. If landfill tonnage is expected to increase, more staff and equipment will be needed. The MOLO could reach out to other MOLOs in the surrounding area to learn about what they have and how it works. There will also be meetings with a landfill engineer to discuss the pros and cons of size, design, and location of these facilities. For example, today it would make sense to put the shop, fuel storage and other heavy equipment support systems near the scale, because that is where the active filling area is currently located. But if these facilities have an anticipated 25-year life, the MOLO must look ahead in time to see where the active area will be over that period. The heavy equipment shop/fuelling station in the optimal area could save hundreds of cumulative kilometres in travel and a significant amount of money over time. It is imperative that the MOLO understand the big picture of the landfill's site layout.

## MOLO Category: Technical

### Job Function 22: Closed Landfill Management

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. General Closed Landfill Maintenance, Management, and Control	<ul style="list-style-type: none"> <li>▪ Performing general site maintenance and control at closed portions of active landfills and on closed landfill sites, including repairing leachate seeps, erosion and sediment control, stormwater management, and regrading</li> <li>▪ Maintenance and environmental issues involved with long-term care of closed landfills</li> <li>▪ Landfill settlement and its impact on the management of a closed landfill</li> <li>▪ Site security</li> <li>▪ Long-term financial management</li> <li>▪ Vegetation management, including wildfire defense</li> <li>▪ Management of closed landfill based on end use goals</li> </ul>
b. Leachate and Gas Management at Closed Landfills	<ul style="list-style-type: none"> <li>▪ Importance of removing leachate from the closed landfill</li> <li>▪ Landfill leachate collection designs and configurations</li> <li>▪ Regulatory requirements for landfill leachate treatment, storage, and disposal at closed landfills</li> <li>▪ Leachate treatment, storage, and disposal techniques</li> <li>▪ Maintenance issues with leachate management systems</li> <li>▪ Operating and monitoring techniques for landfill gas extraction systems</li> <li>▪ Gas condensate, its consequences, and its management</li> <li>▪ Regulatory requirements for landfill gas</li> <li>▪ Equipment and processes of monitoring landfill gas</li> </ul>
c. Closed Landfill Regulation and Permits	<ul style="list-style-type: none"> <li>▪ Regulatory requirements for landfill closure</li> <li>▪ Regulatory requirements for landfill post-closure care</li> </ul>

### Rationale

Not all MOLOs will be responsible for managing a closed landfill. But some will close a landfill, and some will work through the process of closing a landfill or sections of a landfill to varying degrees. It is important that a MOLO understand how the final closure of a site needs to be factored into the operational and financial management of the active site.

### Examples of Skills Applied in Real-World Settings

- A MOLO of an active site may also be responsible for a closed landfill that was once operated by the organization. Perhaps it was capped with a monolithic (soil only) final cover and tends to produce a very dense growth of vegetation each year. Recognizing the potential fire danger and risk that a wildfire might pose to the surface piping of the landfill gas collection system, the MOLO may need to proactively address the overgrown vegetation. There are several options to weigh, including the use of a broad-spectrum herbicide, which would require permits and create potential negative impacts to groundwater and/or surface water. The MOLO could also hire a temporary crew of “weed whackers” to cut all the vegetation. The HR department might suggest bringing them in as “contract” workers to reduce work for the payroll department, but they will then have to sit through a range of safety training before they can work on-site. Another option that does not include humans is to bring in a weed-control

company that utilizes a herd of approximately 200 goats to eliminate the vegetation naturally and safely. There are other options, like renting a bobcat with a big deck mower, but that could damage the gas collection piping system. There are also other risks. If it is done too soon, the weeds will re-grow. If it has done too late when the vegetation has thoroughly died, the weed whackers could potentially spark a fire. The MOLO must be able to weigh all these considerations and the potential impacts to make an informed decision.

## MOLO Category: Management

### Job Function 23: Communication

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Effectively Communicate with Landfill Staff	<ul style="list-style-type: none"> <li>▪ The importance of effective communication</li> <li>▪ Ways to communicate clearly and effectively</li> <li>▪ How to maintain open communication with landfill staff</li> <li>▪ How to listen effectively</li> </ul>
b. Effectively Communicate with Landfill Customers	<ul style="list-style-type: none"> <li>▪ The importance of effective communication</li> <li>▪ Ways to communicate clearly and effectively</li> <li>▪ Maintaining open communication with landfill customers</li> <li>▪ How to listen effectively</li> <li>▪ Selection of the appropriate communication medium (signs, email, talking, video)</li> <li>▪ Conflict resolution and de-escalation techniques</li> </ul>
c. Effectively Communicate with Senior Management, Boards of Supervisors, and Consultants	<ul style="list-style-type: none"> <li>▪ The importance of effective communication</li> <li>▪ Ways to communicate effectively</li> <li>▪ How to communicate facts <i>and</i> feelings</li> <li>▪ Basic negotiation skills</li> <li>▪ Various presentation techniques</li> </ul>
d. Effectively Communicate with Regulators	<ul style="list-style-type: none"> <li>▪ The importance of effective communication</li> <li>▪ Ways to communicate effectively and transparently</li> <li>▪ Basic negotiation skills</li> </ul>
e. Public Relations	<ul style="list-style-type: none"> <li>▪ The various roles within the organization and who is officially allowed to speak as a representative of the organization</li> <li>▪ Public relations with landfill adjacent neighbours</li> <li>▪ Public relations with the general public</li> <li>▪ The role of public relations on future landfill phasing and permitting processes</li> <li>▪ How to listen effectively</li> <li>▪ Selection of the appropriate communication medium (signs, email, talking, video)</li> <li>▪ Communicating your message clearly and to the point (<i>headlines or soundbites</i>)</li> </ul>
f. Community Relations	<ul style="list-style-type: none"> <li>▪ The importance of regular and ongoing community relations, both with directly adjacent neighbours and with the community as a whole</li> <li>▪ Overall understanding of current political climate</li> <li>▪ How to communicate to the press for fair reporting</li> <li>▪ Providing opportunities for the community to offer feedback and submit complaints</li> <li>▪ The role of community relations on future landfill phasing and permitting processes</li> <li>▪ Communicating your message clearly and to the point (<i>headlines or soundbites</i>)</li> </ul>

### Rationale

MOLOs must interact with a wide range of people daily, from employees and customers to regulators and members of the adjacent communities. In addition to the day-to-day communication and training with



employees, landfill managers must also communicate with members of the public about landfill policies, safety procedures, and general waste disposal information. Landfill managers must clearly communicate with regulatory agents to remain in compliance. Landfill managers must also be able to communicate with community members and local politicians on issues such as odour complaints, landfill expansion, or permitting.

## Examples of Skills Applied in Real-World Settings

- A global pandemic causes shutdowns, mask mandates, and increases the risk of exposure to a potentially deadly virus. Employees face reduced hours, higher risks at work, and uncertainty. The MOLO must be able to answer questions in a timely, honest, and knowledgeable manner.
- A landfill is nearing capacity and is in the process of completing an expansion. Adjacent neighbours are angry about the landfill's footprint extending closer to their homes. The MOLO may need to attend many public meetings and engage in often volatile conversations with community members. The MOLO should recognize the potential for lots of negative attention as local residents form a "Not in My Back Yard" (NIMBY) attitude. The MOLO's approach to this issue should be direct and honest. In many cases, it is a good idea to call a public meeting and invite all interested parties to attend, including the neighbouring community members, the landfill designer, provincial/territorial and local regulators, and other experts who can accurately address public questions. At these types of public meetings, the goal is to express partnership and gratitude for the community's involvement. The MOLO would want to identify all the protective measures that will be integrated into the expansion, including addressing all concerns regarding odours, dust, noise, litter, birds, groundwater, and other issues that may be raised. Provincial/territorial and local regulators would explain the landfill's track record of compliance and environmental responsibility with the existing landfill. Finally, the MOLO may explain how the landfill will be providing local jobs, contributing to important community activities, and will eventually become a nature preserve with hiking trails.
- A MOLO recognizes the need for on-site training for the site's heavy equipment operators, but the cost for this training requires upper management approval. The MOLO must make the case for this training and outline the costs and potential for return of investment. This includes stating the underlying regulatory requirements for training and the potential risk of injury, death, or liability if training is not provided. The MOLO should be able to communicate to upper management that the landfill crew operates heavy equipment costing millions of dollars, and controls airspace valued at hundreds of millions, which are important reasons to provide ongoing training.

## MOLO Category: Management

### Job Function 24: Human Resources and Staffing

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Succession Planning	<ul style="list-style-type: none"><li>▪ The basic components of a succession plan</li><li>▪ The importance of succession planning to make staffing transitions seamless for all staff, including the MOLO</li><li>▪ Development of procedural systems</li></ul>
b. Cross-Training	<ul style="list-style-type: none"><li>▪ The importance of cross-training staff to minimize operational disruption</li><li>▪ The importance of cross-training among similar departments where applicable, e.g., the landfill, public works, and parks and recreation</li><li>▪ Ongoing cross-training vs. emergency cross-training</li><li>▪ Development of standard operating procedures</li></ul>
c. Staff Hiring, Development, and Retention	<ul style="list-style-type: none"><li>▪ General staffing issues and compliance with organizational human resource policies</li><li>▪ How to conduct interviews of potential new hires</li><li>▪ Your organization's progressive discipline policy</li><li>▪ How to discipline employees that are in violation of organizational policies</li><li>▪ Anti-discrimination laws</li><li>▪ Various training topics required, e.g., organizational policies, non-discrimination, and communication</li><li>▪ How to conduct performance evaluations and give feedback</li></ul>

### Rationale

As a professional who takes pride in their work, a MOLO will want to see their work as a legacy and desire that it will be continued by a team that is well-trained, capable, and able to succeed without them. The MOLO must be involved in the process of interviewing and hiring new employees and remain aware of the various laws and organizational processes for new hires. The relationship between the MOLO and employees will need to include ongoing performance reviews and feedback.

### Examples of Skills Applied in Real-World Settings

- While the MOLO is a critical component of the day-to-day running of a landfill, the ultimate goal should be to create a team that can stand alone and still get the work done.
- The MOLO determines that the landfill needs additional staff, including two heavy equipment operators, a supervisor, and a mechanic's helper. The MOLO will need to prepare a presentation to deliver to the board of supervisors to justify these additional positions and may need to speak with the finance department to affirm that long-term landfill revenue is expected due to increased tonnage and the rising sales of organic products (e.g., compost) created on-site. The human resources department will need to be in the loop regarding the process of hiring new employees. There may be specific guidelines for advertising, interviewing, screening, and hiring. The MOLO will have to be involved with reviewing the official job description to make sure the right person is hired. Once hired, new employees may need to undergo drug testing and a medical physical exam. Finally, there will be a series of training and orientations the new employees must go through before being allowed to start

work at the landfill. The MOLO must be involved in the entire process to ensure that an adequate number of staff are available when needed.

## MOLO Category: Management

### Job Function 25: Management and Leadership

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Interpersonal Communication and Relationship-Building	<ul style="list-style-type: none"><li>▪ Clear communication of goals and expectations</li><li>▪ The importance of active listening</li><li>▪ Diversity, equity, and inclusion</li><li>▪ Conflict resolution</li><li>▪ Identifying and developing strengths of individual staff members</li></ul>
b. Problem-Solving Skills	<ul style="list-style-type: none"><li>▪ Ability to think creatively</li><li>▪ How to tap into the creativity of the entire team and engage them in brainstorming</li><li>▪ The importance of research and data gathering</li><li>▪ Being adaptable and flexible</li></ul>
c. Emotional Intelligence	<ul style="list-style-type: none"><li>▪ Care and empathy for others</li><li>▪ Sharing appropriate information (good/bad) with team</li><li>▪ Ability to give honest feedback</li><li>▪ The importance of being trustworthy and fair</li></ul>
d. Good Decision-Making	<ul style="list-style-type: none"><li>▪ Analyzing available data, e.g., financial, regulatory, and policy</li><li>▪ Gaining insight and input from others in the organization and industry</li><li>▪ Prioritizing decisions based on context<ul style="list-style-type: none"><li>• Long-term planning</li><li>• Short-term planning</li><li>• Crisis management and emergency response</li></ul></li></ul>

### Rationale

Regardless of how many individuals work at a landfill site, if the MOLO is not respected and is not perceived as a leader, it will make it much more difficult to properly construct and operate the landfill in accordance with the permits and standards associated with a state-of-the-art landfill. A MOLO cannot operate a landfill by themselves but needs a TEAM, a team that needs to be led by a qualified and capable individual whom others respect.

### Examples of Skills Applied in Real-World Settings

- The MOLO sets the underlying tone of how the landfill operates, not just in terms of which machines process the trash, but also as relates to the acceptable attitudes, work environment, and critical relationships between managers and workers. The MOLO must understand how to lead a team made up of many different personalities, backgrounds, and skill sets. The MOLO must also take time to learn about each person's strengths and goals. If MOLOs expect to be effective managers, they need to lead from a servant attitude that puts the welfare of the people they manage first. According to a poll conducted by the Gallup organization, the happiness of a worker is not based on their job, their pay, or their perks. The happiness of most workers comes down to the relationship they have with their immediate manager. The MOLO carries a heavy responsibility to build a solid team.

## MOLO Category: Management

### Job Function 26: Personal and Professional Development

Specific Knowledge and Skills	To be qualified for the given task, an individual should have an understanding or knowledge of:
a. Continuing Education	<ul style="list-style-type: none"><li>Continuing education opportunities—both formal and informal—to remain current with the latest developments, skills, and new technologies required for the role of MOLO</li><li>How to strengthen areas of deficiency</li><li>How to improve areas of strength</li></ul>
b. Networking	<ul style="list-style-type: none"><li>Networking opportunities to build relationships—professional and personal—with other professionals in the waste industry both locally, nationally, and internationally</li></ul>

### Rationale

Landfilling is not a static field as there are continuing technical innovations and improved techniques for the state-of-the-art landfill of which a MOLO needs to stay abreast. MOLOs also need to remain informed of ongoing regulatory changes.

Since the 1990s, landfilling regulations and requirements have increased to protect the environment. As a result, landfills have become technically and managerially more complex. As more innovations are introduced, MOLOs need to stay abreast of developments that could make their sites more efficient and state-of-the-art. Rather than "reinvent the wheel," the MOLO can connect with someone in their network who may offer insight into new options and solutions to challenges.

### Examples of Skills Applied in Real-World Settings

- To do the best possible job, the MOLO should regularly pursue continuing education. This might include reading books on management, leadership, development of staff, and several other topics that deal with these vital skills for a MOLO. The MOLO might attend management classes sponsored by their organization and attend industry conferences to learn how other MOLOs handle common challenges. If MOLOs earn a certification from SWANA or another organization, they will need to continue receiving a certain number of continuing education credits to maintain their certification. The MOLO must recognize that the landfill industry is constantly evolving. The MOLO must find ways to keep up with those changes.

## Learning Pathways

There are a number of ways to acquire skills and knowledge. Below are a set of learning pathways.

- On-the job training
- Formal accreditation: diploma, or degree or certification
- Online courses and webinars
- SWANA education and training courses, including:
  - Manager of Landfill Operations (MOLO)
  - Household Hazardous Waste & CESQG
  - Collection Operations
  - Landfill Gas Systems Operations & Maintenance
  - Managing Composting Programs
  - Managing Construction & Demolition Materials
  - Managing Integrated Solid Waste Management Systems
  - Managing Leachate Recirculation & Bioreactor Landfills
  - Managing MSW Collection Systems
  - Managing Recycling Systems
  - Transfer Station Management
  - Zero Waste Principles & Practices
  - Additional programs and courses delivered by the local SWANA chapter
- Education and training from other professional organizations (including, but not limited to, regional recycling and extended producer responsibility associations)
- Vendor training, materials, and resources
- On-site training from consultants, equipment manufacturers and suppliers  
Trade association meetings, conference sessions and conventions
- Trade publications
- Training from the Canadian Centre for Occupational Health and Safety (CCOHS) and other government entities
- Training from provincial/territorial/local regulatory entities
- Mentoring programs from mentoring others or being mentored
- Local community college workforce development courses or operator training