



# Recommendations for Safe Re-occupancy of Marijuana Grow Operations



## Introduction

The following guide offers a practical approach to achieving safe re-occupancy of former marijuana grow operations (MGOs) and reviews possible exposures/hazards (tables 1 and 2). It is essential to make a clear distinction between risks associated with an “active” MGO and risks associated with a “shut down” MGO. An “active” MGO is linked to criminal activity, which in itself poses safety risks, while in a “shut down” MGO, this illegal activity is no longer a concern. This guide considers only the potential risks remaining after an MGO is dismantled, criminal activity has stopped, and all related material is removed (i.e., plants and bulk chemicals).

This guide is derived, in part, from the protocol outlined in the New York City Department of Health Guidelines for mould remediation<sup>1</sup> and from discussions with experts involved in mould, pesticide, and MGO investigations and remediation. Most available guidelines on mould remediation mirror the New York City guidelines and are partly based on consensus, survey information of “normal” levels in homes, and personal experience<sup>2</sup>.

Although remediation professionals may use this guide as a basis for their practice, it is only meant to orient public health and municipal staff to the hazards that may need to be addressed to ensure the safety of re-occupants. This guidance document is not intended as a step-by-step procedure for remediation professionals and homeowners.

## Potential safety concerns and remediation procedures

Each MGO is different and, as a result, a site assessment is required to determine the presence and extent of any hazards as well as the remediation and cleanup necessary. The assessment usually consists of a walk-through to identify potential safety and health hazards<sup>1,3-5</sup> related to structural damage or the presence of biological or chemical contaminants. An investigation by the Canada Mortgage and Housing Corporation (CMHC) included 12 former MGOs and found that safety concerns in MGOs may or may not be directly related to the presence of the grow operation<sup>3</sup>. During the walk-through of a former MGO, the initial assessor should be aware of the following:

- 1) hazards stemming from physical and structural changes to the building that have been made to accommodate the grow operation<sup>6,7</sup>;
- 2) hazards that originate from alterations to wiring and electric power<sup>6,7</sup>;
- 3) the presence of biological hazards such as mould due to excess moisture<sup>7</sup>;

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4) the presence of chemical hazards<sup>3</sup> related to chemical spills and residues from the use of pesticides, fertilizers, and solvents used for the extraction of tetrahydrocannabinol (THC).

Additional information regarding hazards and remediation procedures can be found in tables 1 and 2. Figure 1 provides a summary of the steps involved in the assessment and actions to be taken.

The hazards listed in tables 1 and 2 are not specific to MGOs and may be present in other residential properties as well. Therefore, the approach used in the remediation of these deficiencies in a former MGO is no different than one that would be used in other properties with similar problems. A general cleanup of the house using detergent and water is recommended, regardless of any other remediation actions related to possible biological and chemical hazards.

1) Hazards resulting from possible physical and structural changes to the residence (Table 1)

- Physical and structural changes are often made to buildings that house MGOs to accommodate the installation or may directly result from MGO-related activities. Alterations in the building structure such as cuts in walls and wood framing members can be made to provide larger growing areas or to change the ventilation<sup>3,6</sup>. Ventilation changes can include alterations to furnace and hot water vents<sup>6</sup> and gas appliances<sup>7</sup>.

**An inspection for possible structural and physical changes should be conducted. Any alterations that have resulted in violation of building or other codes should be corrected.**

- Elevated humidity and moisture problems can occur in any building and lead to mould growth and structural damage. In MGOs, elevated humidity/moisture can result from leaks or damage to the building structure and from plant growth, particularly in large-scale grow operations<sup>3</sup>.

**Any moisture or water damage should be identified, the underlying causes corrected, and water-damaged materials repaired or replaced.**

2) Hazards resulting from possible electrical alterations (Table 1)

In former MGOs, bypasses and additional wiring<sup>3,6,7</sup> necessary to produce the extra light requirements for optimal plant growth can overload the electrical system if not repaired.

**The electrical system should be checked and brought into compliance with code.**

3) Possible biological hazards (Table 2)

- **Mould**

The presence of mould/mildew inside homes is not specific to MGOs and can be quite common in non-MGOs homes, as shown by a survey completed in 24 North American communities<sup>9</sup>, with an overall mould/mildew occurrence of 36%. A comparable study has not been done on MGOs specifically. Mould/moisture may be more prevalent in MGOs, not only because of the cultivation of plants but also because older and poorly maintained homes are often used for such installation. However, all houses and buildings have a background concentration of settled spores. These spores result in mould growth if there is suitable temperature, humidity and substrate<sup>9</sup>. As adequate temperatures and the presence of nutrients are usually met in indoor environments, fungal growth usually results from a moisture problem<sup>10</sup>.

**An inspection for visible mould growth should be performed. Inspected areas should include forced air ducting and hidden cavities/attics where humid air may have vented. Any ongoing sources of humidity and moisture should be identified and corrected. Mould-contaminated materials should be cleaned, or where this cannot be done, materials should be replaced<sup>1</sup>.**

4) Possible chemical hazards (Table 2)

Chemical use inside homes is also common (e.g., cleaning products, paints, pesticides) and again is not specific to MGOs. Several studies performed in the US indicated the frequent presence of a measurable low-level airborne residue of pesticides, even for urban residences<sup>11-13</sup>. Pesticide residues have also been recovered from kitchen floor wipes and living room dust of urban residential apartments (Appendix 1, Table 3) with permethrin and chlorpyrifos being detected in kitchen floor wipes in all homes<sup>14</sup>.

Investigators of former MGOs may find signs of chemical spills or residues such as staining, odours, or mineral deposits. These residues may be present near drains, floor areas where water traveled towards drains, or in bathrooms and kitchens that have served as chemical mixing rooms for THC extraction, pesticides, fertilizers, and acids and bases.

In addition to difficulties in obtaining consistent wipe samples, there is no demonstrated relationship between environmental samples and exposure to occupants<sup>15</sup>. For this reason, routine wipe sampling for chemicals used in grow operations is not recommended.

Possible chemical hazards may include:

- **Pesticides**

In regular residential properties, pesticides from domestic indoor treatment have been shown to accumulate inside homes, especially in carpets<sup>11,13,16</sup>, carpet fibers, and binders<sup>17</sup> as well as other sorbent materials such as textiles<sup>18</sup>. Pesticides tracked indoors tend to have a longer half-life than those in an outdoor environment<sup>19</sup>, and indoor residues may contribute to the exposure of infants and toddlers through dermal contact or ingestion<sup>16,20</sup>. Examples of concentrations found in regular homes in kitchen floor and living room wipe samples are presented in Table 3 (Appendix 1).

Although customers prefer organically grown marijuana<sup>21</sup>, pesticides are sometimes used to control insects, powdery mildew, and other pests. In former MGOs, the major areas of concern are bathrooms, tubs, and kitchens where chemicals were mixed. However, based on discussion with experts who investigate MGOs from a health and safety perspective, the amount of residual pesticides found is often minimal or not detectable via wipe sampling. Most of the time, only small amounts of pesticides have been detected on the floor in the grow rooms or where spray water has drained from the grow room to the floor drains. Examples of concentrations found in former MGOs are summarized in Table 4 (Appendix 1). These data cannot be compared to the data obtained from residential homes (Table 3) due to differences in sampling methodologies. Wipe samples were collected at suspected areas of contamination in the MGO, whereas wipe samples were collected from random locations

in residential homes. However, the data still provide an idea of concentrations that may be found in both settings.

- **Fertilizers**

Fertilizers are often used to promote plant growth or flower production and are typical of those used in vegetable gardens or hydroponic cultures.

- **Other Chemicals**

Other chemicals that may be found on-site include solvents<sup>3</sup> used for THC extraction like isopropyl alcohol, methyl hydrate, naphtha, or ethanol.

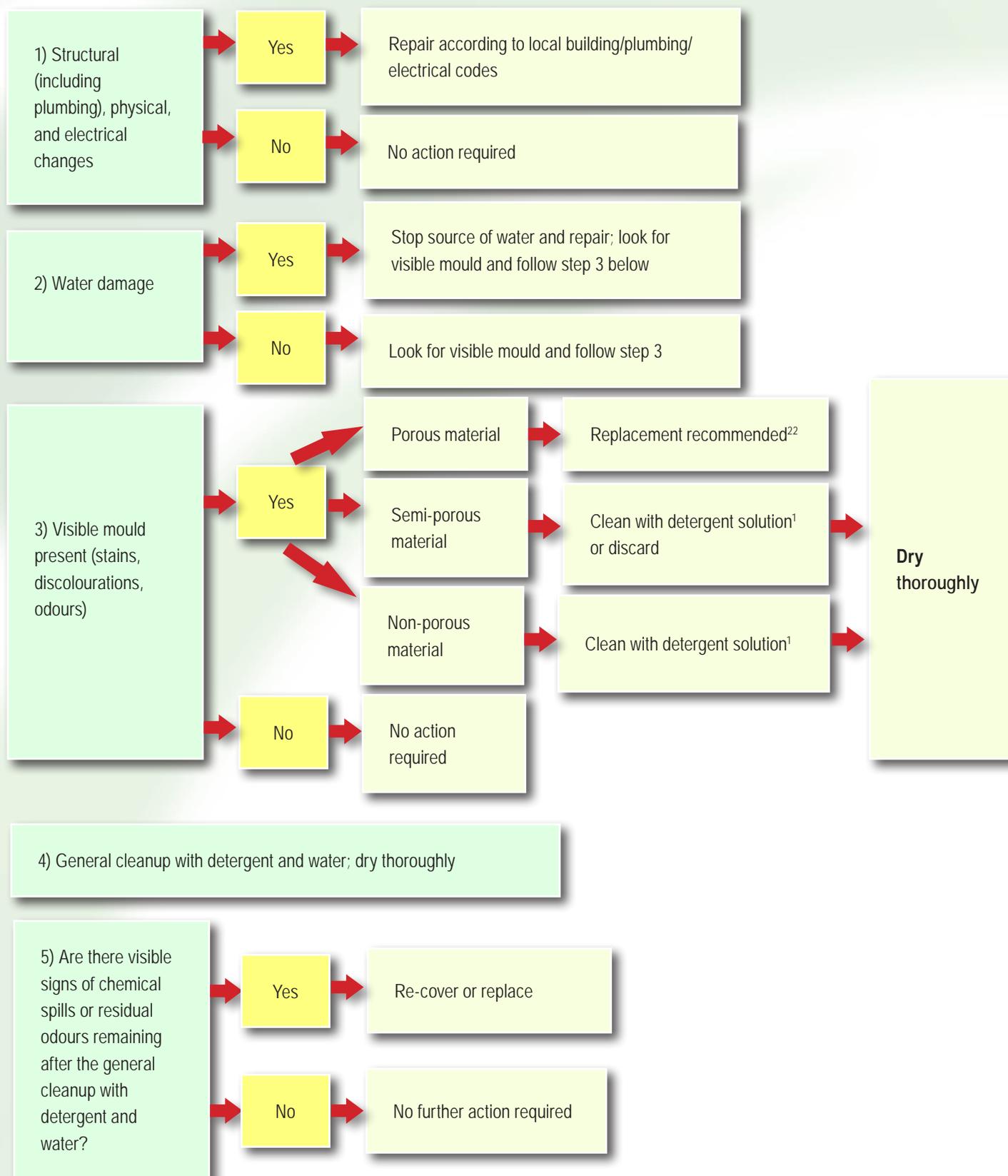
Acids and bases can also be used to change the pH of hydroponic solutions or soil. Grow areas and chemical mixing rooms (i.e., bathrooms and kitchens) are important areas to investigate for signs of contamination.

**Any chemicals found in an MGO should be removed and disposed of in accordance with local and provincial regulations. The locations, volumes, and identity of chemicals, where known, should be recorded. If this information is available to professionals performing the cleanup, it may provide a guide to locations in the house where clean-up efforts should be focused. If no information is available on chemicals found on-site, interior surfaces should be cleaned with detergent and water and dried thoroughly. If visible stains, discoloration, or residual odours can be detected on surfaces or articles after cleaning, materials can be re-covered or replaced.**

## Evidence gaps

This document is based on available evidence and expert opinion. To our knowledge, there are no published MGO remediation protocols based on pre- and post- remediation data, especially regarding pesticides. Additional data to verify the effectiveness of the protocols described in this document would be helpful. If individuals or organizations do have additional information, please contact the National Collaborating Centre for Environmental Health at the following e-mail address: [contact@nceh.ca](mailto:contact@nceh.ca).

Figure 1. Assessment and actions to be taken (Refer to tables 1 and 2 for further detail)



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## Appendix

Table 1. Possible physical and electrical hazards in MGOs and associated remediation procedures

Possible physical and electrical hazards	Description	Associated hazard	Proposed remediation strategy
Structural damage & physical changes			
<ul style="list-style-type: none"> <li>Alterations in the building structure</li> </ul>	<ul style="list-style-type: none"> <li>Holes and cuts in walls and ceilings to accommodate ventilation system<sup>3,6</sup></li> <li>Cuts in structural members (i.e., roof trusses, floor joists, and wall studs<sup>6</sup></li> <li>Structural damage on wood caused by moulds</li> </ul>	<ul style="list-style-type: none"> <li>Fall hazards</li> </ul>	<ul style="list-style-type: none"> <li>Repair according to current local building code</li> </ul>
<ul style="list-style-type: none"> <li>Makeshift to ventilation system</li> </ul>	<ul style="list-style-type: none"> <li>Disconnection of furnace exhaust duct to vent odour from plants<sup>6</sup></li> <li>Collection of carbon dioxide from furnace and hot water flues to improve plant growth<sup>7</sup></li> </ul>	<ul style="list-style-type: none"> <li>Carbon monoxide poisoning of residents</li> </ul>	<ul style="list-style-type: none"> <li>Repair and clean</li> </ul>
<ul style="list-style-type: none"> <li>Plumbing system</li> </ul>	<ul style="list-style-type: none"> <li>Possibility of chemicals, being caught in solids if discarded in the sink<sup>6</sup></li> <li>Leaks in the plumbing system</li> </ul>	<ul style="list-style-type: none"> <li>Release of chemical fumes</li> <li>Potential cross-contamination of the water supply</li> <li>Elevated humidity and water damage</li> </ul>	<ul style="list-style-type: none"> <li>Clean</li> <li>Stop leakage immediately and repair according to local plumbing code</li> </ul>
<ul style="list-style-type: none"> <li>Natural gas line</li> </ul>	<ul style="list-style-type: none"> <li>Makeshift sometimes added to provide natural gas supply<sup>7</sup></li> </ul>	<ul style="list-style-type: none"> <li>Fire and explosion</li> </ul>	<ul style="list-style-type: none"> <li>Repair according to applicable codes</li> </ul>
Electrical alterations			
	<ul style="list-style-type: none"> <li>Bypasses and additional wiring<sup>3,6,7</sup></li> </ul>	<ul style="list-style-type: none"> <li>Fires and electrocution</li> </ul>	<ul style="list-style-type: none"> <li>Repair in accordance to Canadian Electrical Code</li> </ul>

Table 2. Possible biological and chemical hazards in MGOs and associated remediation procedures

Possible biological and chemical hazards	Description	Location	Proposed remediation strategy
Mould	Moisture/humidity generated by: <ul style="list-style-type: none"> <li>• plant growth or water use</li> <li>• leaks in the plumbing system</li> <li>• leaks stemming from damage to infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Mould growth may occur in grow areas, basements<sup>3</sup>, forced air ducts, hidden cavities, and attics where water vapour is frequently vented. In addition mould growth may occur in fertilizer mixing rooms or areas of heavy water usage</li> </ul>	<ul style="list-style-type: none"> <li>• Immediately stop and dry any occurrence of water accumulation/infiltration; Repair building infrastructure so that water damage and moisture buildup does not recur</li> </ul> If visible mould present: <ul style="list-style-type: none"> <li>• Porous items (eg., carpets/padding, insulation, wallboards, material which has lost its structural integrity) – replacement recommended<sup>22</sup></li> <li>• Semi-porous items (eg., wood, plaster, concrete) – Clean with detergent solution and dry thoroughly<sup>1</sup> or discard</li> <li>• Non-porous items (eg., metal, glass and hard plastics) – Clean with detergent solution and dry thoroughly<sup>1</sup></li> </ul>
Chemicals <ul style="list-style-type: none"> <li>• Solvents</li> <li>• Unknown chemicals</li> </ul>	<ul style="list-style-type: none"> <li>• Used in tetrahydrocannabinol (THC) extraction (eg., isopropyl alcohol, methyl, naphtha, and ethanol)</li> <li>• Visible residues of spills may be discovered in MGOs, but no information is available to determine the material that was spilled</li> </ul>	<ul style="list-style-type: none"> <li>• Spills, especially near drains due to unsafe disposal, or containers on-site</li> <li>• Chemical mixing rooms (bathrooms, tubs, kitchens)</li> <li>• Near drains, on floor of grow area, chemical mixing rooms (i.e., bathrooms, kitchen)</li> </ul>	<ul style="list-style-type: none"> <li>• Surfaces and articles with any visible residue remaining after general cleaning with detergent and water should be re-covered or replaced</li> <li>• Discard material</li> </ul>

Table 2. Possible biological and chemical hazards in MGOs and associated remediation procedures (continued)

Possible biological and chemical hazards	Description	Location	Proposed remediation strategy
<ul style="list-style-type: none"> <li>Pesticides</li> </ul>	<ul style="list-style-type: none"> <li>May be used to control pests such as gnats, aphids, red spider mites, white flies, slugs, and snails or to control powdery mildew on the plants</li> </ul>	<ul style="list-style-type: none"> <li>Spills or containers left on-site</li> <li>Residues around marijuana grow areas, drains, or floor areas where water traveled towards drains and chemical mixing rooms (i.e., bathrooms and kitchens)</li> </ul>	<ul style="list-style-type: none"> <li>Surfaces and articles with any visible residue remaining after general cleaning with detergent and water should be re-covered or replaced</li> </ul>
<ul style="list-style-type: none"> <li>Fertilizers</li> </ul>	<ul style="list-style-type: none"> <li>Optimize plant growth and blooming stage</li> </ul>	<ul style="list-style-type: none"> <li>Containers left on-site, spills, chemical mixing rooms (i.e., bathrooms, tubs, kitchens)</li> </ul>	
<ul style="list-style-type: none"> <li>Acids/Bases</li> </ul>	<ul style="list-style-type: none"> <li>Used in pH adjustment of soil or hydroponic solutions</li> </ul>	<ul style="list-style-type: none"> <li>Spills, especially near drains due to unsafe disposal, or containers left on-site (i.e., in bathrooms, tubs, kitchens)</li> </ul>	

Table 3. Summary of pesticide loadings in kitchen and living room floor wipe samples<sup>(a)</sup> from standardized location in selected homes<sup>14</sup>

Pesticides	Median (µg/m <sup>2</sup> )	Maximum (µg/m <sup>2</sup> )	Median (µg/m <sup>2</sup> )	Maximum (µg/m <sup>2</sup> )
	Kitchen floor wipes (N=42)	Kitchen floor wipes (N=42)	Living room wipes (N=30)	Living room wipes (N=30)
Chlorpyrifos	0.3	19.5	0.49	7.7
Permethrin	6.8	226.5	5.97	74.6
Diazinon	0.4	556.2	0.35	16.3
Cypermethrin	3.7	330.7	3.80	63.2
Esfenvalerate	0.7	16.8	1.00	27.4
Cyfluthrin	1.1	567.1	3.70	56.9
Cyhalothrin	<LOD <sup>(b)</sup>	4.1	1.67	7.5
Tetramethrin	<LOD	5.9	8.19	8.6
Deltamethrin	<LOD	45.2	3.43	4.5
Bifenthrin	<LOD	0.2	<LOD	0.1
Sumithrin	<LOD	2.3	<LOD	0.4
Resmethrin	<LOD	0.05	<LOD	0.05

<sup>(a)</sup> According to a sampling protocol adapted from the National Human Exposure Assessment Survey in Arizona (NHEXAS-AZ)

<sup>(b)</sup> LOD: limit of detection

Table 4: Example of pesticide types and concentrations detected in samples collected from former marijuana grow operations from suspected areas of contamination (n=131)<sup>(a)</sup> (Kindly provided by Pacific Environmental Consulting, Vancouver)

Pesticides	Maximum (µg/m <sup>2</sup> )	Mean (µg/m <sup>2</sup> )
Permethrin (cis & Trans)	24.3	0.648
Carbaryl	5.4	0.0432
Imidacloprid	27	0.324
Malathion	196.56	2.052
Methoxychlor	10.26	0.108
Propoxur	2.16	0.0216
Dicofol	33.804	0.324
Chlorpyrifos	8.1	0.0648
Fenvalerate	0.54	0.00432
Cypermethrin	3.564	0.0324
Tetramethrin	7.56	0.054
Chlorothalonil	200.88	1.512

<sup>(a)</sup> According to EPA method 8081A and EPA method 8141A

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