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Landfill Disposal of NORM Waste

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Government
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Landfill Disposal of NORM Waste

- **NORM Waste Terms/Units**
- **Legislation**
- **Classification of NORM waste**
- **Management of NORM waste**
- **NORM Waste at Landfills**



Landfill Disposal of NORM Waste

- **NORM Waste**

- **Naturally occurring radioactive material that is transported into the human environment and in which the naturally occurring radionuclides are concentrated.**



Landfill Disposal of NORM Waste

- **NORM Waste Terms/Units**

- **becquerel (Bq)**: Unit of activity in the International System— one disintegration per second; $1 \text{ Bq} = 27 \text{ pCi}$ (or $27 \times 10^{-12} \text{ Ci}$)
- **curie (Ci)**: The original unit used to describe the intensity of radioactivity in a sample of material. One curie equals thirty-seven billion disintegrations per second, or approximately the radioactivity of one gram of radium. This unit is no longer recognized as part of the International System of units. It has been replaced by the Becquerel
- **$1 \text{ Ci} = 37 \times 10^9 \text{ Bq}$** (smoke detector: $1.0 \text{ } \mu\text{Ci}$ or 37 kBq or $0.3 \text{ } \mu\text{g}$ of ^{241}Am ; $t_{1/2} = 432 \text{ yr}$)



Landfill Disposal of NORM Waste

- **NORM Waste Terms/Units**

- **Geiger counter:** A Geiger-Müller detector and measuring instrument. It consists of a gas-filled tube that discharges electrically when ionizing radiation passes through it and a device that records the events.
- **gray (Gy):** Unit of absorbed dose due to any type of radiation. An exposure to 1 gray results from radiation depositing one joule per kilogram of animal tissue or any other material.



Landfill Disposal of NORM Waste

- **NORM Waste Terms/Units**

- **rad** (Radiation Absorbed Dose): A former unit of an absorbed dose of ionizing radiation. One rad is equal to the absorption of radiation energy per gram of matter. It has been replaced by the gray (see above).
- **rem** (röntgen equivalent man): A measure of dose deposited in body tissue, averaged over the body. One rem is approximately the dose from any radiation corresponding to exposure to one röntgen of γ radiation. The rem is no longer accepted for use with the International System. **1 rem = 0.01 sievert.**



Landfill Disposal of NORM Waste

- **NORM Waste Terms/Units**

- **sievert (Sv)**: A measure of radiation dose (technically, dose equivalent) deposited in body tissue, averaged over the body. Such a dose would be caused by an exposure imparted by ionizing x-ray or gamma radiation undergoing an energy loss of 1 joule per kilogram of body tissue (1 gray).
- **1 Sv = 100 rem**



Landfill Disposal of NORM Waste

- **NORM Waste**
 - **Sludges**
 - **Scale Deposits → scrap metal**
 - **Equipment Deposits → scrap metal**
 - **Contaminated Soil**
 - **Coal Ash**
 - **Phosphogypsum**



Landfill Disposal of NORM Waste

- **NORM Waste Management**
 - **Encapsulation**
 - **Injection Well**
 - **Caverns**
 - **Landfills**
 - **Other**



Landfill Disposal of NORM Waste

- **NORM Waste Legislation**

Requires the classification and proper mgmt of NORM waste for compliance with

- Federal NSCA and Regulations
- Federal/Provincial TDGR
- Alberta EPEA/WCR or OGCA/D58
- HRE/WHMIS – OH&S Issues
- NORM Management – CGM NORM

} IAEA



Landfill Disposal of NORM Waste

- **Waste Control Regulation or D58**
 - **Generators required to identify, characterize, and classify waste Including NORM waste**
 - **Director's discretion if dispute arises**
 - **Characteristics of NORM waste referenced in Regulations/Guidelines**
 - **Test methods referenced in the *Guide*.**



Landfill Disposal of NORM Waste

- **Canada Guidelines for the Management of NORM (CGM NORM-HC)**
 - **Non-radioactive Hazards**
 - **Unconditional Derived Release Limits**
 - **Diffuse/Discrete/Surface** (Tables 5.1, 5.2 & 5.3)
 - **Unrestricted Classification**
 - **Release with Conditions**



Landfill Disposal of NORM Waste

- **Regulations for the Safety Transport of Radioactive Material (IAEA)**
 - Exempt Material
 - Exempt Consignments } § 236, 401-406
Table I
- **Adopted by TDGR and the NSCA (PTNSR)**



Landfill Disposal of NORM Waste

- **Restrictions on the Waste (if exceeded, TDGR applies and a specific assessment is required prior to landfill disposal):**
 - The activity concentration of the material does not exceed
 - 10 times the values specified in § 401 (b) or calculated in accordance with §§ 402-406 of the IAEA regulations,
 - 0.4 Bq/cm² for beta and gamma emitters and low toxicity alpha emitters, or 0.04 Bq/cm² for all other alpha emitters (§ 214 IAEA); or
 - the UDRL in Tables 5.2, 5.3, 5.4, as applicable, of the CGM NORM
- **Landfill Performance (to be respected at all times)**
 - Purpose-designed landfill/cells that ensure that the radiation constraint dose ≤ 0.3 mSv/year



Landfill Disposal of NORM Waste

- **OH&S**
 - **PPE**
 - **Detection/Measuring Devices**
 - **Radon and Radiation Surveys**
 - **Consultants**

Detailed information on these issues can be obtained from the Internet, the consultants identified in slide #19 or, if related to applicable legislation, by contacting Alberta Employment and Immigration, OH&S, “Ask an Expert” at <http://employment.alberta.ca/SFW/2874.html>.



Landfill Disposal of NORM Waste

- **Landfill Approval Required**
 - Amendment
 - Director's Written Authorization
- **Record Keeping, Recording, and Reporting**
 - Approval Holders (yearly quantity & accumulated)
 - Director's Notice to Authorization Holders (approvals, registration, PINs)



Landfill Disposal of NORM Waste

• REFERENCES

- **IAEA – International Atomic Energy Agency**
 - **Regulations for the Safe Transport of Radioactive Material – Safety Standards Series # TS-R-1, 2003**
http://www-pub.iaea.org/mtcd/publications/pdf/pub1225_web.pdf
 - **Radiation Protection and the Mgmt of Rad Waste in the O&G Industry – Safety Report No. 34**
http://www-pub.iaea.org/MTCD/publications/PDF/Pub1171_web.pdf
- **Canadian Guidelines for the Mgmt of NORM, 2000**
<http://www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/norm-mrn/index-eng.php>
- **A Regulatory Framework for NORM Mgmt – The Alberta Experience, 2008**
- **Technical Report on the Mgmt of NORM Waste, 2009**



Options other than Landfill Disposal

- **Acceptable Industry Practices**

- Beneficial use of wastes, or
- To wastes generated in small/large quantities by many generators or wastes difficult to manage may be managed according to acceptable industry practices. Examples include: aerosol cans, asbestos, coal ash, Hg wastes, sump waste, treated wood, etc.
- Published by AENV.
- Approved in writing by the Director.



Landfill Disposal of NORM Waste

- **CONSULTANTS** (Radon Gas, NORM, and Nuclear Radiation)
 - Alara Consultants Inc., 1 800 538 8138 or 780 944 2557, Edmonton, AB
 - Atomic Energy of Canada Ltd., 1 866 513 2325, Chalk River, ON
 - C5 Plus Group Ltd., 403 215 0040, Calgary, AB
 - Filipow Associates, 780 468 4833, Edmonton, AB
 - Monserco Ltd., 800 665 7736 or 905 450 3507, Brampton , ON
 - Normcan, 403 233 7565, Calgary, AB
 - Plains Environmental Inc., 306 728 3636, Melville, Sask
 - Radiation Safety Institute of Canada, 416 650 9090, Toronto, ON
 - Senes Consultants Ltd., 905-764-9380, Richmond Hill, ON
 - SNC-Lavalin Nuclear Inc., 905) 829-8808, Oakville, ON
 - Stuart Hunt & Associates, 780 458 0291, St. Albert, AB

This list provided as a convenience for those seeking radiation services, only. Inclusion of any name does not imply endorsement by the GOA. There may be other companies who provide similar services and are not included in the list.



Questions & Answers

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