

From: Jennifer Opila
To: nielsen.david@cleanharbors.com
Date: 4/8/05 2:29PM
Subject: Standard Operating Procedures

David,

Your recent response dated April 7, 2005 states that the SOPs provided in Attachment A of the application are being reviewed and corrected and will be resubmitted. Your response of April 7, 2005 also states that procedures regarding contamination control in the treatment facility, leachate collection and treatment standard, and truck wash water collection and treatment are under development.

Additionally, in reviewing your response of April 7, 2005 it was noted that the survey procedures provided in the application do not include the use of all of the instruments described in your answer to comment 5 of the request for information. Additional procedures need to be submitted to describe the use of all of the instruments listed in your April 7, 2005 response.

Standard Operating Procedures are a key part of the license application and the permit renewal application. RH 3.9 of the Colorado Regulations requires the Department to determine the adequacy of the applicant's procedures in the approval process for a license application. We cannot evaluate the adequacy of your application without reviewing a complete set of finalized procedures.

In submitting these procedures please ensure that they have been reviewed and finalized by your Radiation Safety Officer and Management. The finalized procedures should contain all of the appropriate signatures.

Thank you,

Jennifer T. Opila, Health Physicist
Radiation Management Unit
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and Environment
303-692-3403

CC: SCHIEFFELIN, JOE; Tarlton, Steve



Clean Harbors Deer Trail, LLC
10855 East Highway 36
Deer Trail, CO 80105
Telephone: (970) 386-2293
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April 27, 2005

Mr. Steve Tarlton, Unit Leader
Radiation Management Unit
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530

RE: Transmittal of Radiation Protection Program and Standard Operating Procedures for Clean Harbors Deer Trail, LLC, Radioactive Materials License Application, Docket Number 5873

Dear Mr. Tarlton:

In my April 7, 2005 letter to you, I stated that Clean Harbors discovered inconsistencies in the terminology and references in some of the Standard Operating Procedures (SOPs) contained in Attachment A of the Clean Harbors Deer Trail, LLC, *Radioactive Materials License Application*, dated January 2005. As such, we have modified Section 7.0, the Occupational Radiation Protection portion of the application, as well as the SOPs, to address the inconsistencies in terminology and references and to incorporate and/or address comments from your staff. As such, please find enclosed a new Section 7.0 (revision 2, dated April 25, 2005) and a new Attachment A (revision 2, dated April 26, 2005) for your review.

If you have any questions, please feel free to me at (661) 762-6200.

Sincerely,

David B. Nielsen, PE
Director of Landfill Compliance
Clean Harbors Environmental Services, Inc.

DBN:dbn

Enclosure: Revised Section 7.0 and Attachment A
7.0

OCCUPATIONAL RADIATION PROTECTION

The Clean Harbors Deer Trail (CHDT) Naturally Occurring Radioactive Material (NORM)/ Technologically Enhanced Naturally Occurring Radioactive Material (TENORM) Radiation Protection Program establishes necessary precautions, procedures, and plans for working directly with NORM/TENORM waste during disposal operations. Existing protective measures for hazardous materials are generally suitable for protection from the levels of radiation found in NORM/TENORM waste. Every employee who works with and around ionizing radiation from NORM/TENORM waste must follow the plan and supporting policies and Standard Operating Procedures (SOPs). The Deer Trail Radiation Safety Officer (RSO) is responsible for ensuring that all employees have read, understand, and comply with the procedures and conditions in the Radiation Protection Plan. No Deer Trail employee will be allowed to work unsupervised with NORM/TENORM waste until they complete appropriate radiation safety training. The RSO will maintain a file containing signature sheets acknowledging that all new employees have received the appropriate radiation safety training within 10 days of employment. The facility will accept no other types or forms of radioactive material for disposal beyond NORM/TENORM materials and other radioactive materials that have been exempted, excluded, or cleared for unrestricted use by the public by Federal or State of Colorado agencies.

For exposure to NORM/TENORM waste, Deer Trail workers will be considered members of the public, and radiation exposures will be limited to no more than 100 mrem/yr, with a goal of 25 mrem/yr or less. The ALARA (As Low As Reasonably Achievable) process will be applied to limit potential radiation doses. If worker dosimetry results determine that selected worker doses could exceed 5 mrem in any two consecutive quarters, the worker will be re-assigned to a different job task to reduce exposures. If it is determined from worker dosimetry results that selected workers could exceed 25 mrem/yr, the RSO shall conduct an evaluation of the potential for other man-made exposures for these workers to ensure that maximum individual doses from man-made sources will not exceed 100 mrem/yr. This assessment will consider real individuals working at Deer Trail, not hypothetical members of the public.

As stated in the Deer Trail Resource Conservation and Recovery Act (RCRA) permit, waste acceptance criteria are set at 400 pCi/g of ^{226}Ra , measured on a per-shipment basis. The total activity of NORM/TENORM waste, including the alpha- and beta-emitting radionuclides in the uranium and thorium decay chains, will be enforced to the limit of 0.002 $\mu\text{Ci/g}$ (2,000 pCi/g)

used to define radioactive waste in Colorado (C.R.S. § 25-11-201), as long as the radium concentration limit of 400 pCi/g per shipment is maintained. CHDT proposes to accept naturally occurring uranium and thorium at concentrations that would be defined as source material (i.e., greater than 0.05% concentration by weight) at a total decay chain activity concentration of up to 2,000 pCi/g. The annual average concentrations received will be less than the activity limits imposed (probably about 10% of the peak concentration) and, therefore, average doses to workers will be also be less (probably about 10 mrem/yr), consistent with ALARA. This concentration limits equated to a gate monitor alarm set point of 100 μ R/h above background. Because that background is about 16 μ R/h, the alarm set point is 116 μ R/h. The alarm set point, which is about seven times the background level, will permit the detection of lost radiation sources in a waste shipment. Any waste that exceeds the alarm set point will be evaluated against the manifest and rejected. The Radiation Protection Program has been tailored to fit the type of NORM/ TENORM waste to be accepted, at low concentrations and dose rates, with application of the public dose limits to Deer Trail workers.

7.1 OCCUPATIONAL RADIATION EXPOSURES

The Radiation Protection Program at the CHDT RCRA landfill is designed to protect employees, the public, and the environment from the harmful effects of exposure to ionizing radiation from NORM/TENORM waste disposed of in accordance with its waste acceptance criteria. CHDT policy is to meet all applicable regulatory requirements imposed by the State and the Federal Government and to keep doses from NORM/TENORM material ALARA.

The Radiation Protection Program provides the following:

- Personal instruction in radiation safety from radiation safety staff and field supervisors,
- Relevant manuals, installation and test instructions, and SOPs for equipment and activities at the landfill,
- Radiation safety seminars,
- A personal monitoring system, as required (thermoluminescent dosimeters [TLDs]),
- Gate monitors, radiation monitors, air sampling, and portable radiation survey meters when required, and

- A Radiation Protection Program Plan.

The Radiation Protection Plan and supporting SOPs have been approved by the CHDT Senior Vice President, Compliance and Regulatory Affairs and the Deer Trail Radiation Safety Officer, and are included in Attachment A of this application. Although the RCRA Permit requires numerous SOPs, those specifically pertaining to safe handling and disposal of NORM/TENORM waste include:

- *Standard Operating Procedure on NORM/TENORM Worker Radiation Protection Records*
- *Standard Operating Procedure on Individual and Area Dosimetry*
- *Standard Operating Procedure on NORM/TENORM Airborne Monitoring*
- *Standard Operating Procedure on Estimating Inhalation Doses*
- *Standard Operating Procedure on NORM/TENORM Radiation Protection Training*
- *Standard Operating Procedure on Use of the Gate Monitoring System*
- *Standard Operating Procedure on Routine NORM/TENORM Radiation Surveys*
- *Standard Operating Procedure on NORM/TENORM Personnel Surveys*
- *Standard Operating Procedure on NORM/TENORM Equipment Surveys*
- *Standard Operating Procedure on NORM/TENORM Surveys Following Spills*
- *Standard Operating Procedure on Gamma Spectra Analysis*
- *Standard Operating Procedure on Use of the Alpha Beta Sample Counter*
- *Standard Operating Procedure on NORM/TENORM Landfill Operations*
- *Standard Operating Procedure on Waste Tracking*

The Deer Trail RCRA Permit Attachment 4, “Contingency Plan” (**CHDT 2004 – see Volume 4 of this application**)¹ contains general procedures for dealing with emergency situations such as spills or accidents. The Contingency Plan contains procedures for spill cleanup, notification of authorities, and other responses. It describes the equipment and staff available to deal with such situations. In the event of a radiological incident, such as a spill of NORM/TENORM

¹ For ease of review, references in **bold** are provided in Volumes 2 through 6 of this application.

waste, or another emergency potentially involving NORM/TENORM waste, the RSO and Deer Trail General Manager must be notified immediately. If there is doubt about whether such notification is necessary, notification should be made to enable the RSO and Deer Trail General Manager to assess the situation and initiate the appropriate response. If appropriate, the measures in the Contingency Plan will be implemented.

7.2 RADIATION SOURCES

This radioactive waste disposal license application allows for transfer of a specific and limited type of licensed radioactive material to CHDT for disposal. This application applies only to radioactive material consistent with the radionuclides in NORM/TENORM waste, with concentrations that are less than the Colorado statutory definition of radioactive waste.

However, because of waste-specific regulatory determinations, some of this waste might be licensed, requiring disposal in a licensed facility. The limited concentrations considered in this application comprise a total activity of less than 2,000 pCi/g (natural uranium and thorium decay chain products only), with a maximum ^{226}Ra concentration less than 400 pCi/g. CHDT proposes to accept naturally occurring uranium and thorium at concentrations that would be defined as source material (i.e., greater than 0.05% concentration by weight) at a total decay chain activity concentration of up to 2,000 pCi/g. These materials will have external dose rates that are generally less than 100 $\mu\text{R/h}$, exclusive of background. This application does not include radioactive waste in the broader definition of low-level radioactive waste, including other licensed forms of manmade radioactive materials.

7.3 RADIATION PROTECTION DESIGN FEATURES

Several design features of the Deer Trail facility ensure or enhance environmental or occupational radiation protection. However, most of the principal radiation protection design features described in Section 3.0 are largely mandated through the RCRA Permit process and are specific to meeting RCRA requirements. For environmental radiation protection, these include:

- Minimizing the infiltration of water into the disposal cells through proper closure design,
- Ensuring the integrity of disposal unit covers through engineering design and regulation,

- Providing structural stability of the disposal system through receipt and compaction of bulk waste,
- Minimizing contact of waste with standing water through contouring surface site features and operation of the Leachate Collection System,
- Providing adequate site drainage during operations and after closure,
- Facilitating site closure and stabilization,
- Minimizing the need for long-term maintenance,
- Providing adequate disposal site monitoring, and
- Providing an adequate buffer zone for monitoring and potential mitigative action.

Additional design features and operating procedures for the Deer Trail facility required by the RCRA Permit provide radiation protection functions for workers. These features, which are described in Sections 3.0 and 4.0, include:

- Shielding. Two primary sources of shielding are provided for routine operations: the steel roll-off boxes used to transport bulk waste and the daily soil cover required by the RCRA Permit. In addition, operational procedures ensure that the minimum number of workers will be in proximity to waste (i.e., waste sampling and in-cell disposal operations). Other workers, such as heavy equipment operators, have additional shielding provided by the steel construction of the equipment.
- Protective Clothing and Respiratory Protection. The RCRA Permit requires that workers in proximity to waste wear protective clothing and respiratory protection, as described in Section 4. The use of protective clothing reduces skin contact with the waste and is an effective contamination control measure. The use of respiratory protection reduces the potential for inhalation exposures for workers during in-cell operations.
- Bulk Disposal. Receipt, sampling, and disposal operations for bulk wastes minimize contact times and potential exposure durations for workers. This is an effective ALARA measure because it minimizes the number of workers who could be

exposed to NORM/ TENORM waste (compared to handling containerized waste), and because it minimizes exposure durations (through rapid unloading in the disposal cell).

Section 6.0 contains a summary of individual dose impacts with a comparison against the performance objective dose limits in 6 CCR 1007-1, Radiation Control, Part 14: *Licensing Requirements for Land Disposal of Low-Level Radioactive Waste*. All estimated radiation doses, bounding and best-estimate, are within the performance objectives cited for workers and members of the general public. The best-estimate values reflect expected conditions and provide assurance that doses can be maintained ALARA.

7.4 RADIATION PROTECTION PROGRAM

Attachment A of this application contains the Radiation Protection Program and the radiation protection SOPs. Section 1.4 describes the Company organizational structure. The responsibilities for maintaining radiation safety at the Deer Trail landfill are assigned to the RSO and Deer Trail employees. The duties and responsibilities of these individuals are described below.

7.4.1 Radiation Safety Officer

The Deer Trail RSO is charged by Clean Harbors Deer Trail, LLC to direct the Facility NORM/ TENORM Radiation Protection Program. The RSO is responsible for all aspects of radiation safety and for monitoring compliance with the radiation protection SOPs. He is responsible for: 1) developing the radiation safety SOPs and ensuring that the procedures are adequate to achieve their goals, 2) conducting radiological surveys and monitoring, and 3) keeping appropriate records. He is responsible for implementing the procedures and modifying or updating the procedures, if needed. He has the authority to cease operations in the landfill if it becomes evident that the radiation protection procedures are not being followed or do not achieve their radiological safety goals. Specifically, the Deer Trail RSO shall:

1. Direct the operations of the staff regarding radiation safety;
2. Be empowered to impose conditions of work, restrictions on work, and termination of work involving NORM/TENORM waste as necessary to protect personnel, the public, or the environment or to ensure regulatory compliance;

3. Review the NORM/TENORM Radiation Protection Program at least annually;
4. Serve as the CHDT's point of contact with state and federal regulatory agencies on all matters related to radiation safety;
5. Maintain a personnel dosimetry program, including evaluation of the need for issuance of dosimetry, maintain a contract for commercial dosimetry services, maintain dose records, and provide reports to individuals consistent with Colorado Regulations 6 CCR 1007-1, § 4.56 (Reports of Individual Monitoring);
6. Maintain radiation protection records including approved procedures, amendments, revisions and renewals consistent with Colorado Regulations 6 CCR 1007-1, § 4.40, 4.41, 4.42, 4.44, 4.47, and 4.50;
7. Provide radiation safety training for Company personnel;
8. Provide information and consultation on matters related to radiation safety.

7.4.2 Deer Trail Employees

Each CHDT employee who works with NORM/TENORM material must take responsibility for their own protection and for reporting any condition that, in the individual's opinion, constitutes unsafe or improper working conditions. Each individual is responsible for:

1. Maintaining their own exposures to radiation from NORM/TENORM waste ALARA;
2. Following procedures and accepted safe work practices so as not to endanger him or her, the public, or the environment;
3. Reporting any unsafe working conditions, violations of the rules prescribed in this document, or violations of the applicable regulations of the state to their supervisor and/or to the Deer Trail RSO and;
4. **Employees who may serve as visitor escorts shall point out any hazardous area that a visitor may be entering and shall ensure that all Company radiation safety rules and precautions are observed.**

7.4.3 Key Standard Operating Procedures

Of the 14 SOPs listed in Section 7.1 (included in Attachment A of this application), those on Individual and Area Radiation and Airborne Radioactivity Monitoring are key. These SOPs define general and specific methods and procedures for conducting operations at Deer Trail.

Individual dosimetry is required for all Deer Trail workers who could be exposed to radiation from NORM/TENORM waste and for identified areas in the landfill and the immediate area around the landfill. This dosimetry will determine individual worker doses from external radiation and background and ambient radiation levels. It is CHDT policy that individual and area dosimetry will verify maintenance of radiation doses to Deer Trail workers and members of the public at levels of 100 mrem/yr plus ALARA. The standard issue will be a TLD in a plastic case, consistent with the manufacturer's specifications and requirements. All Deer Trail workers in the proximity of radiation from NORM/TENORM waste as part of their routine employment will receive and wear an individual dosimeter. Dosimeters will be worn at the part on the body likely to receive the highest dose, consistent with manufacturer specifications (typically on the chest area or between the waist and the neck). Lost or damaged dosimeters will be reported to the RSO or his/her designee as soon as possible. Persons who have lost or damaged their dosimeters will be required to provide documentation of work activities and NORM/TENORM exposures as necessary for the RSO or his/her designee to assess doses. Dosimeters will be issued only to personnel formally instructed in their use, and will be worn only by those to whom the dosimeters were issued.

As part of the area monitoring program, quarterly dose rates will be measured in specific areas of the Deer Trail facility, using special-issue individual dosimeters in locations where:

- Workers are routinely in the proximity of NORM/TENORM waste such as the weigh station and disposal cell,
- It is unlikely that NORM/TENORM waste would be present such as the change room, lunch room, and maintenance areas to confirm contamination control, and
- Ambient background can be recorded without contribution from NORM/TENORM waste.

Inhalation radiation doses for workers exposed to airborne concentrations of NORM/TENORM waste will determine potential internal doses to landfill workers, and will be reported as part of the annual total committed effective dose equivalent to facility workers. It is CHDT policy to estimate inhalation doses to workers to verify that annual total committed effective dose equivalents are maintained below 100 mrem/yr. Radiation doses to workers will be maintained ALARA below this level. Airborne concentrations and NORM/TENORM waste radionuclide distributions will be established on a quarterly basis from the air sampling program, consistent with the SOP on Air Sampling (Attachment A of this application). The quarterly data will be specific to work location and will include background ambient concentrations to enable determination of localized net airborne concentrations of NORM/TENORM waste (i.e., background corrected concentrations).

Because air samplers provide the total activity on a sample (in pCi) by radionuclide, the average background corrected air concentration is found by dividing the net activity on the sample by the volume of air passing through the sampler to produce the average pCi/m³ in air. The volume of air passing through the sampler is the product of the rate of airflow (m³/hr) times the number of hours the sampler is in operation. This average value could underestimate workplace concentrations during receipt and disposal of NORM/TENORM waste because it includes lower air concentrations during periods of RCRA waste (i.e., non-NORM/TENORM waste) disposal, periods when the daily cover is in place and there is no possibility for airborne NORM/ TENORM material, and off-hour periods when no workers are present.

To correct for this potential underestimate of air concentration, the RSO or his designee will estimate the potential number of hours during the quarter that might pose an airborne hazard for NORM/TENORM waste. The airborne concentration during waste disposal operations is found by dividing the sample activity for each radionuclide by the volume of air passing through the sampler for the estimated number of hours of airborne NORM/TENORM hazard. This is expressed by the following equation:

$$C_{a,i} = S_{a,i} \div (V_{a,T} \times T)$$

where: $C_{a,i}$ = corrected airborne concentration of radionuclide i (picocuries per cubic meter),

$S_{a,i}$ = filter media activity for radionuclide (picocuries),

$V_{a,T}$ = volume airflow rate for the airborne monitor (cubic meters per hour), and

T = duration of airborne NORM/TENORM hazard (hours).

Once the estimated radionuclide mixtures and airborne contamination levels are established, individual worker intake by inhalation can be estimated. The intake from inhalation of a radionuclide i is estimated using:

$$I_i = T_w \times \text{Ventilation Rate} \times C_{a,i}$$

For each worker who is potentially exposed to airborne NORM/TENORM waste, an estimate shall be made of the amount of time the worker spends in a specific work location (T_w). This estimate shall account for time spent away from potential airborne NORM/ TENORM waste (for example, time conducting routine maintenance in unaffected areas, time in training, or time conducting offsite activities). For cases where an individual worker could have onsite exposures at many airborne NORM/TENORM waste or processing locations of different concentrations, the highest measured airborne NORM/TENORM waste concentration shall be used in estimating individual radionuclide intakes. Based on information provided by the International Commission on Radiation Protection (ICRP) in Publication 66, the adult male ventilation rate during light exercise is 1.5 cubic meters/hour (ICRP 1993).

Quarterly radiation CEDEs to workers shall be estimated using the following equation:

$$H_{E,50} = \sum_i \sum W_T H_{T,50,i}$$

where: $H_{E,50}$ = the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the CEDE to each of these organs or tissues,

W_T = weighting factors for each specific body tissue or organ, and

$H_{T,50,i}$ = CEDE for radionuclide i (millirem).

The CEDE for radionuclide i ($H_{T,50,i}$) is found by multiplying the intake of each radionuclide (I_i) by the unit intake committed dose conversion factor for each radionuclide and tissue or organ ($DCF_{T,i}$) as shown in the following equation:

$$H_{T,50,i} = I_i \times DCF_{T,i}$$

To streamline the process, and for consistency with the doses recorded by the external dosimetry program, unit intake effective dose coefficients by radionuclide i (i.e., $DCF_{E,i} = \sum_T DCF_{T,i}$, where T is for each tissue or organ) tabulated by the U.S. Environmental Protection Agency (EPA) shall be used. Modifying the above equations to account for the use of unit inhalation intake effective dose coefficients is shown in the following equation.

$$H_{E,50} = (T_w \times \text{Ventilation Rate}) \sum_i (C_{a,i} \times DCF_{E,i})$$

The unit inhalation intake effective dose coefficients, taken from Federal Guidance Report No. 11 (Eckerman et al. 1988) are provided in Attachment 1 for the NORM/TENORM waste radionuclides of concern. These values are the most conservative (highest) across all solubility classes considered by the EPA.

The Deer Trail RCRA permit requires the use of respiratory protection for all activities when workers are in close proximity to the waste. These activities include sampling, treatment (when required), and in-cell disposal. Full-face air-purifying respirators are used by Deer Trail workers for these activities. Consistent with 6 CCR-1007-1, § 4.24 and Part 4 - Appendix A, a respiratory protection factor of 50 shall be applied to all appropriate work when the use of respirators is mandatory.

7.5 REFERENCES CITED

6 CCR 1007-1 Radiation Control, § 4.24 and Part 4 - Appendix A

Clean Harbors Deer Trail (CHDT). 2004. *Permit Renewal Report for Incorporation of a Geosynthetic Clay Liner (GCL) in the Liner Section for Secure Cells 3 Through 7 and in the Cover Section for Secure Cells 1 Through 7 (the Permit Renewal Report – Provided in Volume 4 of this Application.*

C.R.S. Title 25, Article 11, *Radiation Control*, Part 2, *Radioactive Waste Disposal*, § 201, *Definitions*.

Eckerman, K. F., A. B. Wolbarst, and A. C. B. Richardson. 1988. *Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for*

Inhalation, Submersion, and Ingestion. Federal Guidance Report No. 11, EPA-520/1-88-020, U.S. Environmental Protection Agency, Washington, D.C.

International Commission on Radiation Protection (ICRP). 1993. *Human Respiratory Track Model for Radiological Protection.* ICRP Publication 66, Annals of the ICRP, Vol. 23, Nos. 1-3.

ATTACHMENT A

**CLEAN HARBORS DEER TRAIL
NORM/TENORM RADIATION PROTECTION PLAN AND
NORM/TENORM STANDARD OPERATING PROCEDURES**

INFORMATION ONLY

INTRODUCTION/APPROVAL

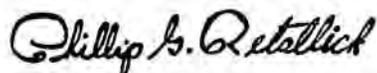
The naturally occurring radioactive material (NORM)/ technologically enhanced naturally occurring radioactive material (TENORM) Radiation Protection Program at the Clean Harbors Deer Trail, LLC RCRA Subtitle C landfill is designed to protect employees, as well as the public and the environment from the potentially harmful effects of exposure to ionizing radiation. from waste disposed in accordance with its license limits. Clean Harbors is committed to meeting all applicable regulatory requirements imposed by the State of Colorado and the U.S. government and to keeping doses from NORM/TENORM waste As Low As Reasonably Achievable (ALARA) - social, technological and economic factors taken into account. The license activity addressed by this Plan is the disposal of limited concentrations of NORM/TENORM waste under 6 CCR 1007-1, Part 14. Because of the site location, the engineered design of the disposal cells, and the low concentrations of NORM/TENORM to be disposed under the license, the relevant performance objectives will be met.

As part of Clean Harbor's NORM/TENORM Radiation Protection Program, the Company provides:

- Personnel instruction in radiation safety, as given by safety staff and field supervisors,
- Relevant manuals, installation and test instructions, and Standard Operating Procedures (SOPs) for equipment and activities at the Deer Trail landfill,
- Radiation safety seminars,
- A personnel monitoring system, as required (thermoluminescent dosimeters [TLD]),
- Gate monitors, radiation monitors, air sampling, and radiation survey meters when required, and
- This NORM/TENORM Radiation Protection Plan

This Plan has been approved by the Clean Harbors Deer Trail, LLC corporate staff and Deer Trail Landfill Radiation Safety Officer (RSO).

Approved by:



Senior Vice President Compliance and Regulatory Affairs



Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

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REFERENCED STANDARD OPERATING PROCEDURES

Standard Operating Procedure on NORM/TENORM Worker Radiation Protection Records
Standard Operating Procedure on Individual and Area Dosimetry
Standard Operating Procedure on NORM/TENORM Airborne Monitoring
Standard Operating Procedure on Estimating Inhalation Doses
Standard Operating Procedure on NORM/TENORM Radiation Protection Training
Standard Operating Procedure on Use of the Gate Monitoring System
Standard Operating Procedure on Routine NORM/TENORM Radiation Surveys
Standard Operating Procedure on NORM/TENORM Personnel Surveys
Standard Operating Procedure on NORM/TENORM Equipment Surveys
Standard Operating Procedure on NORM/TENORM Surveys Following Spills
Standard Operating Procedure on Gamma Spectra Analysis
Standard Operating Procedure on Use of the Alpha Beta Sample Counter
Standard Operating Procedure on NORM/TENORM Landfill Operations
Standard Operating Procedure on Waste Tracking

Standard Operating Procedures (SOPs) referenced in this Plan require approval by the Colorado Department of Public Health and Environment (CDPHE) prior to use or change.

1.0 PURPOSE AND SCOPE

The purpose of this NORM/TENORM Radiation Protection Plan is to establish all necessary precautions, procedures, and plans to be observed when working directly with NORM/TENORM waste during treatment and disposal operations. This plan and supporting policies and standard operating procedures shall be read, and all procedures set forth strictly adhered to, by each and every designated employee, site visitor, or outside contractor who works with and around ionizing radiation from NORM/TENORM waste at Deer Trail. It is the responsibility of the Clean Harbors Deer Trail (CHDT) Radiation Safety Officer (RSO) to ensure that all employees, visitors, or outside contractors have read, understand and will comply with the procedures and conditions defined in this NORM/TENORM Radiation Protection Plan. No Deer Trail employee shall be allowed to work unsupervised with NORM/TENORM waste until they complete appropriate radiation safety training (Section 6). The RSO shall maintain a file containing signature sheets acknowledging that the appropriate radiation safety training has been given to any and all new employees within 10 days of employment.

For exposure to NORM/TENORM waste, CHDT workers shall be considered as members of the public and radiation exposures shall be limited to 100 mrem/y, plus ALARA, with a goal of 25 mrem/y or less. Employee doses, both internal and external, shall be evaluated by the RSO on a quarterly basis and workers shall be re-assigned to different duties if their quarterly radiation doses equal or exceed 5 mrem in any two consecutive quarters. If it is determined from worker dosimetry results that selected worker doses could exceed 25 mrem/y, the RSO shall conduct an evaluation of the potential for other man-made exposures for these workers to ensure that maximum individual doses from man-made sources shall not exceed 100 mrem/y. This assessment shall consider real individuals working at Deer Trail, not hypothetical members of the public. As described in this plan, because of the low dose rates and administrative levels, selected provisions of 6 CCR 1007-1, Part 4, such as protection of an embryo/fetus during the entire pregnancy are implicitly covered.

As stated in the Deer Trail license application, CHDT requested a license to accept, treat, and dispose NORM/TENORM waste at concentrations that are less than the activity definition of Low Level Radioactive Waste in Colorado (i.e., 2,000 pCi/g). An upper activity concentration limit of ^{226}Ra of 400 pCi/g was provided to ensure that external dose rates for workers would be maintained ALARA. CHDT proposes to accept naturally occurring uranium and thorium at concentrations that would be defined as source material (i.e., greater than 0.05% concentration by weight) at a total decay chain activity concentration of up to 2,000 pCi/g. No other forms of radioactive waste, including man-made radionuclides in medical, research, U.S. Department of Energy, or commercial nuclear power radioactive waste, shall be accepted.

If applied as a peak value for purposes of setting the gate monitor alarms, it is recognized that the average concentrations received shall be less (likely about 10% of the peak concentration), and therefore the average doses to workers will be also be less (likely about 10 mrem/y or less), consistent with ALARA. The activity concentration limit, through modeling analysis, is initially equated to a gate monitor alarm set point of 100 $\mu\text{R}/\text{h}$ above background. Given that background is about 16 $\mu\text{R}/\text{h}$, the alarm set point is 116 $\mu\text{R}/\text{h}$. This alarm set point is about seven times the background level. The Deer Trail RSO shall periodically (at least annually) evaluate, confirm, or modify this alarm set point, as described in the CHDT *Standard Operating Procedure on Use of the Gate Monitoring System*. Finally, the total activity of NORM/TENORM waste, including the alpha and beta emitting radionuclides in the uranium and thorium decay chains, shall be enforced to the limit of 0.002 $\mu\text{Ci}/\text{g}$ (2,000 pCi/g) used to define radioactive waste in Colorado, as long as the radium concentration limit of 400 pCi/g per shipment is also maintained.

2.0 ORGANIZATION AND RESPONSIBILITIES

The responsibilities for maintaining radiation safety at the Deer Trail landfill are assigned to:

1) The Deer Trail General Manager, 2) the Deer Trail RSO, 3) the Deer Trail Environmental Manager, 4) the Deer Trail Plant Foreman, and 5) Deer Trail employees. The duties and responsibilities of these individuals are described below.

The General Manager

The Deer Trail General Manager is responsible for overall site operations. He shall ensure that supervisory and operating staff are trained in the procedures and understand them. He shall ensure that the staff have adequate resources to implement the SOPs. He shall ensure that proper procedures are followed. He has the authority to cease operations in the landfill if it becomes evident that the procedures are not being followed or do not achieve their goals. Basic NORM/TENORM disposal operations at Deer Trail are discussed in the CHDT *Standard Operating Procedure on NORM/TENORM Landfill Operations*. Note that these operations are consistent with those required for RCRA landfill operations, as tailored for the presence of NORM/TENORM waste.

Radiation Safety Officer (RSO)

The Deer Trail RSO is charged by Clean Harbors Deer Trail, LLC to direct the Facility NORM/TENORM Radiation Protection Program. The RSO is responsible for all aspects of radiation safety and for monitoring compliance with the radiation protection SOPs. He is responsible for: 1) developing the radiation safety SOPs and ensuring that the procedures are adequate to achieve their goals, 2) conducting radiological surveys and monitoring, and 3) keeping appropriate records. He is responsible for implementing the procedures and modifying or updating the procedures, if needed. He has the authority to cease operations in the landfill if it becomes evident that the radiation protection procedures are not being followed or do not achieve their radiological safety goals. Specifically, the Deer Trail RSO shall:

1. Direct the operations of the staff regarding radiation safety;
2. Be empowered to impose conditions of work, restrictions on work, and termination of work involving NORM/TENORM waste as necessary to protect personnel, the public, or the environment or to ensure regulatory compliance;
3. Review the NORM/TENORM Radiation Protection Program at least annually;
4. Serve as the CHDT's point of contact with state and federal regulatory agencies on all matters related to radiation safety;
5. Maintain a personnel dosimetry program, including evaluation of the need for issuance of dosimetry, maintain a contract for commercial dosimetry services, maintain dose records, and provide reports to individuals consistent with Colorado Regulations 6 CCR 1007-1, § 4.56 (Reports of Individual Monitoring);
6. Maintain radiation protection records including approved procedures, amendments, revisions and renewals consistent with Colorado Regulations 6 CCR 1007-1, § 4.40, 4.41, 4.42, 4.44, 4.47, and 4.50;
7. Provide radiation safety training for Company personnel;
8. Provide information and consultation on matters related to radiation safety.

Environmental Manager

The Environmental Manager shall report issues of environmental radiological noncompliance or other radiological issues to the RSO and the General Manager.

Plant Foreman

The plant foreman shall supervise the operating staff and make sure that proper radiation safety procedures are followed. He shall report any radiological noncompliance to the RSO and General Manager. He shall communicate problems in following the radiation procedures to the RSO and General Manager. He shall request resources to fully implement the SOPs, if needed, from the General Manager. He shall make sure that the operating staff are trained and understand the procedures. He shall suggest modification to the procedures, if needed.

Deer Trail Employees

Each Clean Harbors Deer Trail, LLC employee who works with NORM/TENORM waste as outlined in this plan shall take responsibility for his or her own protection and for reporting any condition, which, in the individual's opinion, constitutes unsafe or improper working conditions. Each individual is responsible for:

1. Maintaining their own exposures to radiation from NORM/TENORM waste ALARA;
2. Following procedures and accepted safe work practices so as not to endanger him or her, the public, or the environment;
3. Reporting any unsafe working conditions, violations of the rules prescribed in this document, or violations of the applicable regulations of the state to their supervisor and/or to the Deer Trail RSO and;
4. Employees who may serve as visitor escorts shall point out any hazardous area that a visitor may be entering and shall ensure that all Company radiation safety rules and precautions are observed.

3.0 CONTROL AND LIMITATION OF RADIATION EXPOSURES

State and federal regulations establish a system of radiation dose justification, limitation and optimization. Individual doses are limited to ensure that deterministic effects (such as radiation burns, or skin *erythema*) are avoided and that total lifetime risks of stochastic effects (such as cancer and hereditary effects) do not exceed overall health risks for those persons working in safe industries. However, regulations also require that licensees further optimize radiation doses to individuals and to groups of individuals to the extent practical, social, economic and technological factors taken into account. This concept or philosophy is given the special name ALARA, which is an acronym for As Low As is Reasonably Achievable.

Radiation Dose Limits For exposure to NORM/TENORM waste, Deer Trail workers shall be considered as members of the public and radiation exposures shall be limited to 100 mrem/y, plus ALARA, with a goal of 25 mrem/y or less. As outlined in the CHDT *Standard Operating Procedure on Individual and Area Dosimetry*, employee doses, both internal and external, shall be evaluated on a quarterly basis and workers shall be re-assigned to different duties if their quarterly radiation doses equal or exceed 5 mrem in any two consecutive quarters. If it is determined from worker dosimetry results that selected worker doses could exceed 25 mrem/y, an assessment shall be conducted of the potential for other man-made exposures for those workers to ensure that maximum individual doses from man-made sources shall not exceed 100 mrem/y. This assessment shall consider real workers at Deer Trail, not hypothetical members of the public.

Planned Special Exposures The provisions of 6 CCR 1007-1, § 4.11 require licensees to authorize an adult worker to receive doses in addition to and accounted for separately from the doses received under the limits under specified conditions. These provisions relate to the occupational dose limits of 5 rem/y plus ALARA. However, because public radiation dose limits shall be imposed on Deer Trail workers, and because of the limited concentrations of NORM/TENORM waste to be treated and disposed under

the license, it is highly unlikely that exposure situations will arise that could require imposition of these provisions. When special conditions are encountered, such as routine maintenance of equipment potentially contaminated with NORM/TENORM or other activities, exposure rates, contamination levels, and potential exposure conditions shall be determined in advance of performing the activity using the CHDT *Standard Operating Procedure on Routine NORM/TENORM Radiation Surveys*. The Deer Trail RSO shall evaluate the survey data and evaluate which controls will be required for a specific task. For example, the NORM/TENORM concentrations and dose rates associated with leachate from the disposal cells shall be determined and appropriate controls developed in prior to leachate processing. The goal will be to maintain dose rates during leachate processing to less than 100 $\mu\text{R/h}$ and maintain worker exposures ALARA.

Protection of the Embryo/Fetus The provisions of 6 CCR 1007-1, § 4.13 require licensees to ensure that the dose equivalent to an embryo/fetus during the entire pregnancy, due to the occupational exposure of a declared pregnant woman, does not exceed 500 mrem, with monitoring requirements imposed under § 4.18 for those that could be exposed in excess of 100 mrem. Because the site will be operating under an annual limit of 100 mrem plus ALARA, with a goal of 25 mrem/y or less, this requirement is implicitly met. However, declared pregnant worker exposures shall be tracked and reported under the CHDT *Standard Operating Procedure on Individual and Area Dosimetry*, evaluated by the Deer Trail RSO, and information about protection of the embryo/fetus shall be included in the CHDT training, as outlined in the CHDT *Standard Operating Procedure on NORM/TENORM Radiation Protection Training*.

Posting Because of the anticipated low dose rates (average dose rates of less than 0.1 mrem/hr), there should be no need for posting radiation areas because of dose rates. However, posting shall be required where licensed material is treated or disposed. This shall include areas within the treatment building, and the landfill cells, as discussed in the CHDT *Standard Operating Procedure on NORM/TENORM Landfill Operations*.

Routes of Exposure Exposures from NORM/TENORM waste may be received from radiation fields that are external to the body (external exposure) or from radioactive materials that are inside the body (internal exposure following inhalation) or both. Inhalation of dust particles is one of the primary routes of internal exposure.

Respiratory Protection Exposure of workers to airborne NORM/TENORM material shall be protected through the use of full-face masks that filter airborne particulate materials. These masks are required under the RCRA Permit as part of the Deer Trail Health and Safety Plan for in-cell disposal operations, waste sampling operations, and all operations in the treatment building. These masks are NIOSH approved for particulates under the 42 CFR 84 P100 classification and are 99.7% efficient in removing particles of 0.3 microns or greater in diameter. As described in 6 CCR 1007-1, § 4, Appendix A, these masks have a particulate protection factor of 50. An evaluation was conducted per the guidance in 6 CCR 1007-1, § 4.24.2.1 to determine the adequacy of this mandatory respiratory protection equipment. For this evaluation, natural uranium, with a specific activity of 2,000 pCi/g was assumed with the most restrictive DAC (i.e., Class Y material, with a value of $2\text{E-}11 \mu\text{Ci/mL}$ in air). For dusty outdoors operations, air concentrations range from about 100 to 500 $\mu\text{g/m}^3$ (NUREG/CR-5512; Kennedy and Strenge 1992). Assuming a conservative, long-term air concentration of 500 $\mu\text{g/m}^3$, the estimated activity concentration in air is $1\text{E-}12 \mu\text{Ci/mL}$. This concentration is about 5% of the DAC, which supports the conclusion that the respiratory protection would not be needed for protecting workers from airborne particulate NORM/TENORM material. However, since this equipment is mandatory under the RCRA Permit, further assurance is provided that worker inhalation exposures will be quite low. Procedures for estimating airborne concentrations are provided in the CHDT *Standard Operating Procedure on NORM/TENORM Airborne Monitoring*. To ensure that worker doses are low, procedures for estimating worker inhalation doses are provided in the CHDT *Standard Operating Procedure on Estimating Inhalation Doses*. Procedures for recording those doses, on a quarterly and annual basis, are provided in the CHDT *Standard Operating Procedure on Individual and Area Dosimetry*.

Determination of Internal Exposure As described in 6 CCR 1007-1, § 4.9, estimates of internal exposure shall be made using the measured airborne concentrations at appropriate work locations to perform an assessment of the committed effective dose equivalent. Procedures for airborne monitoring are provided in the CHDT *Standard Operating Procedure on Airborne Monitoring*. These airborne concentration estimates shall be used as described in the CHDT *Standard Operating Procedure on Estimating Inhalation Doses* and worker inhalation doses recorded on a quarterly and annual basis, as described in the CHDT *Standard Operating Procedure on Individual and Area Dosimetry*. Because of the relatively low concentrations of NORM/TENORM waste to be disposed, and because of the use of mandatory respiratory protection under the RCRA Permit, no bioassays will be conducted.

Means of Exposure Control Common external exposure controls include the use of time, distance, and shielding to minimize radiation doses. These concepts are thoroughly presented in Deer Trail radiation safety training courses but should also be continually reinforced by field personnel through daily or weekly radiation safety briefings. Common control measures to reduce inhalation exposures include the use of protective equipment and engineering controls. Personal Protective Equipment (PPE) required under the RCRA Permit, including disposable coveralls, gloves, and boot covers, provide protection against skin contamination. Required Protective equipment used in these operations is detailed in the Deer Trail Facility Health and Safety Plan. Engineering controls utilized to control exposure include dust control measures in the landfill cell, and the air filtration system in the treatment building.

Minors Minor visitors to the facility shall be escorted within the site and shall not be allowed in restricted areas. Minors are not employed at the Clean Harbors Deer Trail Facility.

Waste Tracking All waste that is received, treated, and disposed at the Deer Trail landfill is tracked through operational procedures, largely developed for the RCRA permit. These procedures are provided in the CHDT *Standard Operating Procedure on Waste Tracking*, which defines the procedures, electronic files, hardcopy forms and their use in tracking waste at CHDT.

4.0 RADIATION DOSIMETRY

The purpose of the radiation dosimetry program is to measure radiation dose equivalent received by Deer Trail employees during the handling and disposal of NORM/TENORM waste. The results serve to verify and document compliance with the applicable dose limits (see Section 3) and to identify problems and monitor the effectiveness of radiation safety controls. Radiation doses may be received in two ways: 1) from radioactive materials that are external to the body (external dose) or 2) from radioactive materials that are inside of the body (internal dose). These doses shall be monitored when required by regulation and as described below:

External Radiation Dosimetry

Radiation dosimeters shall be issued by the Deer Trail RSO and worn by individual workers, visitors, and outside contractors who have been appropriately trained and who may routinely come into contact or are in the proximity of NORM/TENORM waste being disposed, consistent with the Deer Trail *Standard Operating Procedure on Individual and Area Dosimetry*.

Internal Radiation Dose Assessment

Consistent with the Colorado Regulations 6 CCR 1007-1, § 4.9 (Determination of Internal Exposure), for purposes of assessing internal radiation doses from the inhalation of airborne NORM/TENORM waste, suitable and timely measurements of the concentrations of airborne materials in workplace air shall be made and recorded. Airborne concentrations shall be estimated consistent with the CHDT *Standard Operating Procedure on Airborne Monitoring*. These airborne concentrations, in combination with estimates of the duration of exposure and the impact of respiratory controls (as appropriate), with

assumptions about the physical and chemical nature of the airborne NORM/TENORM waste, shall be used to assess internal dose to workers from inhalation, in accordance with the CHDT *Standard Operating Procedure on Estimating Inhalation Doses*.

Records

All records of exposure, internal and external, are legal and personal documents and shall be controlled to preclude release of personnel information. All radiation protection records including individual worker records, approved procedures, amendments, revisions and renewals shall be maintained consistent with the Colorado Regulations 6 CCR 1007-1, § 4.40, 4.41, 4.42, 4.44, 4.47, and 4.50.

5.0 RADIATION SURVEYS AND INSTRUMENTATION

Radiation surveys are used to identify and quantify radiation hazards, verify contamination control, and to support the documentation of regulatory compliance. The Deer Trail RSO and all field personnel must work together to ensure safety in the workplace and to protect both the public and the environment from the harmful effects of radiation.

Types of Surveys

Several types of radiation surveys shall be performed supporting specific operations at Deer Trail. In summary, these include:

1. Waste Receipt – surveys shall be conducted to verify that waste will meet the Deer Trail NORM/TENORM waste acceptance criteria. The surveys shall include:
 - a. Gate Monitor Screening: Each shipment shall pass a gate monitor system as described in the CHDT *Standard Operating Procedure on Use of the Gate Monitoring System*.
 - b. Gamma Dose Rate Assessment described in the CHDT *Standard Operating Procedure on NORM/TENORM Gamma Dose Rate Analysis*.
 - c. Gamma Spectra Analysis as described in the CHDT *Standard Operating Procedure on NORM/TENORM Gamma Spectra Analysis*.
2. Area Surveys using the CHDT *Standard Operating Procedure on Routine NORM/TENORM Radiation Surveys*.
3. Personnel Surveys using the CHDT *Standard Operating Procedure on NORM/TENORM Personnel Surveys*.
4. Spill Response Surveys using the CHDT *Standard Operating Procedure on NORM/TENORM Surveys Following Spills*.
5. Equipment Surveys using the CHDT *Standard Operating Procedure on NORM/TENORM Equipment Surveys*.

Surveys may be conducted with portable, stationary, or laboratory survey equipment, as described in the Standard Operating Procedures. These surveys may be supported through the use of a portable gamma spectra analysis instrument for isotope identification, as described in the CHDT *Standard Operating Procedure on Gamma Spectra Analysis*, smear analysis, as described in the CHDT *Standard Operating Procedure on Use of the Alpha Beta Sample Counter*, or by sending samples offsite for laboratory analysis.

Requirements on Maintaining Radiation Detection Instrumentation

1. The Deer Trail RSO shall ensure that the facility maintain radiation detection equipment that is appropriate for detecting the types of radiations emitted by the NORM/TENORM waste received for disposal.

2. Portable and stationary radiation detectors, and the gate monitor shall be calibrated or response checked, as appropriate for the use of the instrument, at least annually or after repair of the instrument, to the manufacturer's specifications. Battery replacement is not cause for performing a calibration. The Deer Trail RSO shall perform such routine response checks at the request of any Deer Trail employee.

6.0 TRAINING

All Deer Trail employees, visitors, and outside contractors who work with or near NORM/TENORM waste are required to complete radiation safety training, as described in the CHDT *Standard Operating Procedure on NORM/TENORM Radiation Protection Training*. The depth of the training shall be commensurate with the level of hazard to which the individual is exposed. All training shall be documented. No individual shall be allowed to work unsupervised until that person completes appropriate NORM/TENORM radiation safety training.

Basic Radiation Safety Training

All individuals who work with NORM/TENORM waste are required to satisfactorily complete appropriate radiation safety training course offered by or at the direction of the Deer Trail RSO and/or demonstrate competence on that subject matter by scoring at least 70% on a test administered or directed by the Deer Trail RSO. Deer Trail RSO-provided refresher training shall be conducted at least once each year for all individuals who work with NORM/TENORM waste. All training shall be documented and maintained on file by the Deer Trail RSO. Training documentation shall include: Content of the training (outline, course description, etc.), Instructor name, Date and duration of training, Printed name of trainee(s), and Signature or initials of trainee(s). Copies of individual employee training records are available from the Deer Trail RSO. Visitors who work with NORM/TENORM waste shall be required to complete training similar to that of employees. Visitors who will not be working with NORM/TENORM waste but who will enter restricted areas shall be required to be escorted at all times and undergo basic training commensurate with the level of exposure they will undergo.

Hazard Communication Program

The Clean Harbors Deer Trail Facility has a hazard communication program as part of the Facility Health and Safety Plan maintained under the RCRA Permit. The hazard communication program utilizes waste profiles, MSDS's, labels and formal training to inform employees of any hazards of the waste materials with which they will be working. The hazard communication program shall be utilized to convey information on the specific hazards of NORM/TENORM waste handled at the facility.

7.0 INCIDENTS AND EMERGENCIES

General procedures for dealing with emergency situations such as spills or accidents are detailed in the Deer Trail RCRA Permit Attachment 4, "Contingency Plan." The Contingency Plan contains procedures for spill cleanup, notification of authorities, and other responses. It also provides a description of the equipment and staff available to deal with such situations. In the event of a radiological incident, such as a spill of NORM/TENORM waste, or other emergency potentially involving NORM/TENORM waste, the Deer Trail RSO shall be notified immediately. In instances where there is doubt about whether such notification is necessary, contact should be made to allow the Deer Trail RSO to assess the situation and initiate the appropriate response. If appropriate, the measures described in the Contingency Plan shall be implemented. Radiation surveys following spills of NORM/TENORM waste shall be conducted consistent with the guidance provided in CHDT *Standard Operating Procedure on NORM/TENORM Surveys Following Spills*.

What Constitutes an Incident or Emergency?

1. Loss, theft, or misuse of any NORM/TENORM waste.
2. High or potentially high radiation exposure to an individual or to a member of the public; for example greater than 10 mrem to any offsite member of the public from an incident.
3. Intake or potential intake of radioactive materials by inhalation, ingestion, or injection through skin or wound.
4. Deceptive or potentially deceptive exposure of a dosimeter.
5. Personnel contamination that cannot be completely removed after two washes with only soap and water.
6. Any personnel injuries that may involve radioactive contamination or radiation exposure.

8.0 RECORD KEEPING

Record keeping requirements vary and are maintained along with actual records by the Deer Trail RSO consistent with Colorado Regulations 6 CCR 1007-1, § 4.40, 4.41, 4.42, 4.44, 4.47, and 4.50. Records keeping requirements are provided in the CHDT *Standard Operating Procedure on NORM/TENORM Worker Radiation Protection*.

General Record-Keeping Requirements

1. The Deer Trail RSO shall maintain the following records in a clear, concise and orderly format. Retention periods are included in parentheses.
 - a. Radiation surveys, as required (3 years)
 - i. Radiation field surveys in areas in proximity to NORM/TENORM waste for disposal, and
 - ii. Ambient radiation field surveys in unaffected areas.
 - b. Survey instrument calibrations, as required by the manufacturer (3 years)
 - c. Personnel records (1 year)
 - i. Worker/user lists, and
 - ii. Training records
 - d. Operating and emergency procedures (current)
 - e. Procedure manuals from Deer Trail RSO (current)
2. In addition to maintaining duplicates of all records in step 1, the Deer Trail RSO shall maintain the following records, which are available for review during normal office hours.
 - a. Copies of current state regulations relating to NORM/TENORM waste,
 - b. Inspection reports and copies of all "Notices of Violation" issued by state regulatory agencies and the Deer Trail responses to those Notices,
 - c. Current version of all policy manuals and standard operating procedure manuals,
 - d. Dosimetry records, and
 - e. Survey instrument calibrations records.

Information Required on Specific Records

1. Radiation surveys
 - a. Records shall be in units of dpm, Ci, μ Ci, mR/h, mrem/h, etc., as appropriate. Units of "cpm" or "counts" are not acceptable for quantitative survey records,
 - b. Records shall uniquely identify the source of the radiation,
 - c. Records shall clearly indicate the areas surveyed,
 - d. Records shall indicate the person performing the survey and date of survey, and

- e. Records shall uniquely identify the survey instrument used, i.e., serial number, or other unique description.
2. Training records are specified in Section 6.

9.0 GLOSSARY OF TERMS

“Absorbed dose” means the energy imparted by ionizing radiation per unit mass of irradiated material. The unit of absorbed dose is the Rad.

“Activity” means the rate of disintegration or transformation or decay of radioactive material. The units of activity are “disintegrations per second (or minute)” (dps or dpm) and curie (Ci).

$$1 \text{ Ci} = 37,000,000,000 \text{ dps } (3.7 \times 10^{10} \text{ dps})$$

$$1 \text{ Ci} = 2,220,000,000,000 \text{ dpm } (2.22 \times 10^{12} \text{ dpm})$$

“Agreement State” means a state that has executed an agreement with the U.S. Nuclear Regulatory Commission transferring to the state the responsibility for regulating uses of certain radioactive materials within its borders. Colorado is an agreement state.

“Airborne radioactive material” means any radioactive material dispersed in the air in the form of dusts, fumes, particles, mists, vapors, or gases.

“As low as is reasonably achievable (ALARA)” means making every reasonable effort to maintain exposures to radiation as far below regulatory dose limits as is practical, consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to benefits to public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of ionizing radiation and licensed sources of radiation in the public interest.

“Background radiation” means radiation from cosmic sources; non-technologically enhanced naturally occurring radioactive material, including radon, except as a decay product of source or special nuclear material, and including global fallout as it exists in the environment from the testing of nuclear explosive devices. “Background radiation” does not include sources of radiation from radioactive materials regulated by the State of Colorado.

“Committed dose equivalent ($H_{T,50}$ or CDE)” means the dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

“Committed effective dose equivalent ($H_{E,50}$ or CEDE)” means the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to each of these organs or tissues ($H_{E,50} = \sum W_T H_{T,50}$).

“Curie (Ci)” means a unit of measurement of activity. One curie (Ci) is that quantity of radioactive material that decays at the rate of 3.7×10^{10} disintegrations per second (dps). Commonly used sub-multiples of the curie are the millicurie and the microcurie. One millicurie (mCi) = 1×10^{-3} curie = 3.7×10^7 dps. One microcurie (μCi) = 1×10^{-6} curie = 3.7×10^4 dps. One nanocurie (nC) = 1×10^{-9} curie = 3.7×10^1 dps. One picocurie (pCi) = 1×10^{-12} curie = 3.7×10^{-2} dps.

“Dose” is a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, total organ dose equivalent, or total effective dose equivalent.

“Dose equivalent (H_T)” means the product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are rem or mrem.

“Dosimeter” means devices designed to be worn by a single individual for the assessment of dose equivalent. Examples of individual monitoring devices are film badges, thermoluminescent dosimeters (TLDs), and pocket ionization chambers.

“Effective dose equivalent (H_E)” means the sum of the products of the dose equivalent to each organ or tissue (H_T) and the weighting factor (W_T) applicable to each of the body organs or tissues that are irradiated ($H_E = \sum W_T H_T$).

“Exposure rate” means the exposure per unit of time, typically milliroentgen per hour (mR/h) or microroentgen per hour (μ R/h).

“External dose” means that portion of the dose equivalent received from any source of radiation outside the body.

“Internal dose” means that portion of the dose equivalent received from radioactive material taken into the body.

“Ionizing radiation” means any electromagnetic or particulate radiation capable of producing ions, directly or indirectly, in its passage through matter. Ionizing radiation includes gamma rays and x rays, alpha and beta particles, high-speed electrons, neutrons, and other nuclear particles.

“Lost or missing source of radiation” means a source of radiation whose location is unknown. This definition includes licensed material that has been shipped but has not reached its planned destination and whose location cannot be readily traced in the transportation system, and sources that may be detected and recovered by the Deer Trail gate monitors.

“Natural radioactivity” means radioactivity of naturally occurring nuclides whose location and chemical and physical form have not been altered by man.

“Quality factor (Q)” means the modifying factor that is used to derive dose equivalent from absorbed dose.

<u>Radiation</u>	<u>Quality Factor</u>
beta	1
gamma	1
x-ray	1
alpha	20
neutron	varies from 3 - 10

“Rad” means the special unit of absorbed dose. One rad is equal to an absorbed dose of 100 ergs per gram.

“Radiation” means one or more of the following:

- (1) gamma and x rays; alpha and beta particles and other atomic or nuclear particles or rays;
or
- (2) stimulated emission of radiation from any electronic device to such energy density levels as to reasonably cause bodily harm.

“Radiation Safety Officer (RSO)” is an individual, designated by the Company, who has the required training, knowledge of, and authority and responsibility to apply appropriate NORM/TENORM radiation protection rules standards, and practices.

“Rem” means the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor.

“Roentgen (R)” means the special unit of exposure. One roentgen (R) equals 2.58×10^{-4} coulombs/kilogram of air.

“Sealed source” means radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent release and dispersal of the radioactive material under the most severe conditions that are likely to be encountered in normal use and handling.

“Survey” means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, and/or presence of sources of radiation. When appropriate, such evaluation includes, but is not limited to, tests, physical examination of location of materials and equipment, and measurements of levels of radiation or concentration of radioactive material present.

“Technologically Enhanced Naturally Occurring Radioactive Material (or TENORM)” means naturally occurring radioactive material whose radionuclide concentrations are increased by or as a result of past or present human practices. “TENORM” does not include:

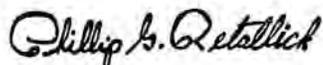
- (a) Background radiation or the natural radioactivity of rocks or soils;
- (b) “Byproduct material” or “source material,” as defined by Colorado statute or rule; or
- (c) Enriched or depleted uranium as defined by Colorado or federal statute or rule

“Total effective dose equivalent (TEDE)” means the sum of the deep dose equivalent (DDE) for external exposures and the committed effective dose equivalent for internal exposures.
TEDE = DDE + CEDE

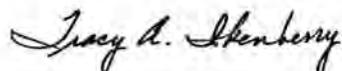
“Whole body” means for purposes of external exposure, head, trunk (including male gonads), arms above the elbow, or legs above the knees.

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
NORM/TENORM WORKER RADIATION PROTECTION RECORDS**

Approved by:



Senior Vice President Compliance and Regulatory Affairs



Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define general and specific NORM/TENORM worker radiation protection records that shall be generated and maintained for Deer Trail general employees who may be exposed to radiation from NORM/TENORM waste.
- 2.0 **SCOPE:** This procedure applies to all NORM/TENORM worker protection records generated for workers at the Deer Trail landfill. These records include:
- NORM/TENORM Protection Policy Statements,
 - NORM/TENORM Protection Plan,
 - Personnel training (course records and individual records),
 - Standard Operating Procedures covering NORM/TENORM waste, including:
 - *Standard Operating Procedure on NORM/TENORM Worker Radiation Protection Records*
 - *Standard Operating Procedure on Individual and Area Dosimetry*
 - *Standard Operating Procedure on NORM/TENORM Airborne Monitoring*
 - *Standard Operating Procedure on Estimating Inhalation Doses*
 - *Standard Operating Procedure on NORM/TENORM Radiation Protection Training*
 - *Standard Operating Procedure on Use of the Gate Monitoring System*
 - *Standard Operating Procedure on Routine NORM/TENORM Radiation Surveys*
 - *Standard Operating Procedure on NORM/TENORM Personnel Surveys*
 - *Standard Operating Procedure on NORM/TENORM Equipment Surveys*
 - *Standard Operating Procedure on NORM/TENORM Surveys Following Spills*
 - *Standard Operating Procedure on Gamma Spectra Analysis*
 - *Standard Operating Procedure on Use of the Alpha Beta Sample Counter*
 - *Standard Operating Procedure on NORM/TENORM Landfill Operations*
 - *Standard Operating Procedure on Waste Tracking*
 - Any other Standard Operating Procedures defined by the NORM/TENORM Radiation Protection Plan
 - Radiation survey results,

- Individual and area dosimetry results, and
 - Individual Radiation Doses.
- 3.0 POLICY: All records pertaining to Deer Trail worker activities associated with the receipt, treatment, and disposal of NORM/TENORM waste shall be maintained in their personnel files. All records of exposure, internal and external, are legal and personal and shall be controlled to preclude unauthorized release of personnel information. All radiation protection records including individual worker records, approved procedures, amendments, revisions and renewals shall be maintained consistent with the Colorado Regulations 6 CCR 1007-1, § 4.40, 4.41, 4.42, 4.44, 4.47, and 4.50.
- 4.0 RESPONSIBILITIES: Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer Trail NORM/TENORM Radiation Protection Plan.
- 5.0 NORM/TENORM WORKER PROTECTION RECORDS PROCEDURE:
- 5.1 Training: The Deer Trail Radiation Safety Officer (RSO) shall ensure that all staff training records are dispositioned, controlled, and maintained as described in this procedure:
- Upon completion of the training form (Attachment 1), it shall be checked for completeness, accuracy, and legibility before disposition:
 - Ensure the form has been signed and dated,
 - Ensure that changes to the document are legible, with a simple line through deletions, and clearly printed inserts. All deletions and insertions shall include the initials of the individual making the changes.
 - Training forms shall be filed as part of the Deer Trail administrative filing system and shall include:
 - Course Title, name of instructor, and date(s) of training,
 - Course completion rosters,
 - Course syllabus or content outline,
 - Test scores for each class member, and
 - Documentation of any waivers, exceptions, or extensions.
- 5.2 Radiological Survey Results: The Deer Trail RSO shall ensure that all NORM/TENORM radiation survey results obtained using the CHDT *Standard Operating Procedures on Radiation Surveys*, are recorded and filed in the Deer Trail administrative filing system.
- 5.3 Individual and Area Dosimetry Results: The Deer Trail RSO shall ensure that all NORM/TENORM individual worker and area dosimetry results obtained using the CHDT *Standard Operating Procedure on Individual and Area Dosimetry*, are recorded and filed in the Deer Trail administrative filing system:
- Individual dosimetry results shall be filed in each worker's personnel file, and in a separate administrative file showing quarterly data for all monitored staff, and
 - Area dosimetry results shall be filed in a separate administrative file so that trending analyses over time can be performed.

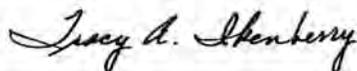
- 5.4 Individual Radiation Doses: The Deer Trail RSO shall ensure that all NORM/TENORM individual worker quarterly and annual radiation doses obtained using the CHDT *Standard Operating Procedure on Individual and Area Dosimetry*, and the CHDT *Standard Operating Procedure on Estimating Inhalation Doses*, are recorded on the appropriate forms and filed in the Deer Trail Administrative filing system. Individual radiation dose results shall be filed in each worker's personnel file, and in a separate administrative file showing quarterly data and annual doses for all monitored staff.

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
INDIVIDUAL AND AREA DOSIMETRY**

Approved by:



Senior Vice President Compliance and Regulatory Affairs



Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define general and specific methods and procedures for conducting individual and area dosimetry for Deer Trail.
- 2.0 **SCOPE:** Individual dosimetry for Deer Trail workers who may be exposed to radiation from NORM/TENORM waste and for identified areas within and in the immediate area around the Deer Trail landfill shall be performed:
 - To determine individual worker radiation doses from external radiation,
 - To monitor individual worker doses against the 25 millirem/year ALARA goal, and
 - To determine potential dose from background and ambient radiation levels.
- 3.0 **POLICY:** Individual and area dosimetry shall be performed to verify that radiation doses to Deer Trail workers and members of the public are maintained at levels as low as reasonably achievable (ALARA) but in no case exceeding 100 millirem/year, with an ALARA goal of 25 millirem/year. The standard issue Deer Trail dosimeter shall be a thermoluminescent dosimeter in a plastic case used in a manner consistent with the manufacturer's specifications and requirements.
- 4.0 **RESPONSIBILITIES:** Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer Trail NORM/TENORM Radiation Protection Plan.
- 5.0 **INDIVIDUAL DOSIMETER PROGRAM:**
- 5.1 **Dosimeter Issue:** All Deer Trail workers, visitors, and outside contractors who are in the proximity of radiation from NORM/TENORM waste as part of their routine employment shall be issued and wear an individual dosimeter. Dosimeters are issued to only one person; dosimeters shall not be shared. The individual dosimeters shall be worn at the location on the body likely to receive the highest dose, consistent with manufacturer specifications, which is typically on the chest area or between the waist and the neck. Lost or damaged dosimeters shall be reported to the Deer Trail RSO as soon as possible. Persons who have lost or damaged their dosimeters shall be required to provide documentation of work activities and NORM/TENORM exposures as necessary for the Deer Trail RSO to assess doses. Individual dosimeters shall be issued only to

personnel formally instructed in their use, and those dosimeters shall be worn only by those to whom the dosimeters were issued.

In addition, Deer Trail dosimeters shall not be:

- Deceptively exposed,
 - Employees shall notify the Deer Trail RSO immediately upon learning of possible deceptive exposures of dosimeters.
 - Intentional deceptive exposures of dosimeters are forbidden and may result in reprimands or termination of employment.
- Stored near sources of radiation,
- Exposed to high heat, chemical or physical insults, or washed in a washing machine,
- Worn while working for another employer or institution (employees shall notify the Deer Trail RSO if they are concurrently working for another employer and working with natural or man-made sources of ionizing radiation),
- Worn during medical or dental x-ray examinations,
- Worn during or after medical administration of radioactive materials (thyroid ablation therapy, cardiac stress tests, diagnostic nuclear medicine tests, etc.) until approved by the Deer Trail RSO.

5.2 Changes in Worker Job Status: If a worker's job status changes, the Deer Trail RSO shall:

- Remove the employee from the individual dosimeter program if the employee has terminated employment or if the employee's job has changed such that the worker is no longer in the proximity of radiation from NORM/ TENORM waste.
- Add an employee to the individual dosimeter program if the employee's job has changed such that the worker will now be working in the proximity of radiation from NORM/TENORM waste.

5.3 Nonoccupational Radiation Doses: Dosimeter users:

- Are responsible for ensuring that dosimeters are not exposed to nonoccupational sources of radiation (e.g., medical or security x-ray devices, therapeutic medical sources, or radiation from medical radionuclides injected into the body).
- Shall notify the Deer Trail RSO prior to receiving medical injections of radionuclides.
- Shall notify the Deer Trail RSO if their dosimeter is exposed to nonoccupational radiation sources.

The Deer Trail RSO shall:

- Determine a course of action that shall prevent exposure of an individual dosimeter and problems with personnel surveys for employees who report receiving medical injections of radionuclides.
- Will investigate the cause of the exposure from nonoccupational sources and determine the corrections that are necessary for recording the employee's radiation dose.

5.4 Exchanging Dosimeters: Employees shall return used dosimeters to the Deer Trail RSO promptly after receiving replacement dosimeters at the beginning of a new wear period. The Deer Trail RSO shall:

- Be responsible for establishing a program for dosimeter exchange, processing (consistent with the manufacturer's specifications), and recording and reporting of the results.
- Ensure dosimeters are exchanged on a quarterly basis, unless the Deer Trail RSO or his designee determines a change in exchange frequency is warranted to ensure radiation doses to workers and the public are maintained at levels ALARA but in no case exceeding 100 millirem/year, with an ALARA goal of 25 mrem/y.
- Verify that all dosimeters are exchanged and either note that dosimeters are in good condition or note the damage if they are not.
- Note the actual date of dosimeter exchange.
- Verify that all dosimeter results are recorded in a spreadsheet.
- Modify the quarterly doses to include potential inhalation doses, as estimated using the Deer Trail NORM/TENORM *Standard Operating Procedure on Estimating Inhalation Doses*.
- Develop and report all dose results to the employees on an annual basis.
- Serve as the Deer Trail point of contact for individual dosimetry issues.
- Ensure that individual worker doses are recorded, by quarter and annually using the form in Attachment 1, and maintained in their personnel file.
- Ensure that the doses to declared pregnant workers are tracked on the dosimetry forms in Attachments 1 and 2 and maintained at levels not to exceed 100 mrem during the pregnancy, plus ALARA.
- Ensure that a corporate record of worker doses, by quarter and annually, including doses to declared pregnant workers, is developed using the form in Attachment 2 consistent with the Deer Trail NORM/TENORM *Standard Operating Procedure on Records Management*.

- 5.5 RSO Evaluations: The RSO shall review all dosimetry records on a quarterly and annual basis and shall:
- Perform a dosimetry investigation if a worker's dosimeter cannot be read, is lost, has an anomalous result, or equals or exceeds an administrative control level of 5 millirem in any quarter.
 - Re-assign the work duties for individual workers whose quarterly radiation dose equals or exceeds 5 millirem in any two consecutive quarters to reduce their exposure to radiation from NORM/TENORM waste.
 - Monitor annual worker radiation doses against the 25 mrem/y ALARA goal and take appropriate measures, such as modifying job assignments or specific work procedures, when this goal is challenged.
- 5.6 Records Requests: Any person who handles or disposes of NORM/TENORM waste on behalf of Deer Trail may request a copy of his or her dosimetry records at any time. These records are maintained by and are available from the Deer Trail RSO upon written request. All contact with the dosimetry service provider is to be made through the Deer Trail RSO.
- 5.7 Employment Termination Dose Report: After termination of employment, a dose report (termination report) shall be provided to all persons who received doses exceeding 20% of the 25 mrem/y ALARA goal in the applicable reporting period. This report shall be provided using the latest copy of Attachment I found in the employees personnel file, updated to show doses through the date of employment termination.
- 6.0 AREA DOSIMETRY PROGRAM:
- 6.1 Program Requirements: Dose rates shall be measured on a quarterly or other basis, as determined by the Deer Trail RSO, using special-issue dosimeters in locations:
- Where workers are routinely in the proximity of NORM/TENORM waste such as the weight station and disposal cell,
 - Where it is unlikely that NORM/TENORM waste would be present such as the change room, lunch room, and maintenance areas to confirm contamination control, and
 - Remote from NORM/TENORM waste that will record the ambient background.
- 6.2 Responsibilities: The Deer Trail RSO shall:
- Determine the number and location of the area dosimeters in and around the Deer Trail landfill and provide a facility map indicating the location of each area dosimeter.
 - Ensure that each identified location has at least one area dosimeter.
 - Maintain a map of the location of each dosimeter.
 - Ensure that area dosimeters are placed 1 to 1.5 meters (40 to 60 inches) above the ground or floor level.

- Provide protection for area dosimeters against heat, moisture, and direct sunlight.
- Exchange the dosimeters, consistent with the exchange procedures for employees, on a quarterly or other basis, as determined by the Deer Trail RSO.
- Maintain records for each area dosimeter location in a dosimetry spreadsheet.
- Note any special conditions including tampering, damage, or loss of dosimeter, in the records.
- Investigate any missing or damaged dosimeters.
- Resolve anomalous data, and track and trend data for routine annual and other special reports, as required.
- Serve as the point of contact for area dosimetry issues. Ensure that a corporate record of area radiation doses, by quarter and annually, is developed using the form in Attachment 3 and maintained as a log consistent with the Deer Trail NORM/TENORM *Standard Operating Procedure on Records Management*.

Clean Harbors Deer Trail, LLC

SOP on Individual and Area Dosimetry

ATTACHMENT 1 – ANNUAL NORM/TENORM INDIVIDUAL DOSIMETRY RECORD

Clean Harbors Deer Trail LLC ANNUAL NORM/TENORM INDIVIDUAL DOSIMETRY RECORD					
Individual _____			Payroll No. _____		
Is this individual a declared pregnant worker? <input type="checkbox"/> Yes <input type="checkbox"/> No					
Exchange Dates for Calendar Year _____ ^(a)	Deployed:	Deployed:	Deployed:	Deployed:	
	Recovered:	Recovered:	Recovered:	Recovered:	
Individual/ (Dosimeter No.)	1 st Quarter Dose Rate (millirem)	2 nd Quarter Dose Rate (millirem)	3 rd Quarter Dose Rate (millirem)	4 th Quarter Dose Rate (millirem)	Annual Total Dose Rate (millirem)
Exchange Dates for Calendar Year _____ ^(a)	Deployed:	Deployed:	Deployed:	Deployed:	
	Recovered:	Recovered:	Recovered:	Recovered:	
Individual/ (Dosimeter No.)	1 st Quarter Dose Rate (millirem)	2 nd Quarter Dose Rate (millirem)	3 rd Quarter Dose Rate (millirem)	4 th Quarter Dose Rate (millirem)	Annual Total Dose Rate (millirem)
Exchange Dates for Calendar Year _____ ^(a)	Deployed:	Deployed:	Deployed:	Deployed:	
	Recovered:	Recovered:	Recovered:	Recovered:	
Individual/ (Dosimeter No.)	1 st Quarter Dose Rate (millirem)	2 nd Quarter Dose Rate (millirem)	3 rd Quarter Dose Rate (millirem)	4 th Quarter Dose Rate (millirem)	Annual Total Dose Rate (millirem)
<small>(a) Enter year of employment and provide exact dates for those employees whose deployment and exchange dates differ from the company standard.</small>					
Comments: (add additional pages, if necessary)					
<small>For declared pregnant workers, note the duration of the pregnancy relative to the recorded quarters.</small>					
Annual Log Completed By:			Annual Log Reviewed By:		
Name (Print) _____			Name (Print) _____		
Signature _____			Signature _____		

Clean Harbors Deer Trail, LLC

SOP on Airborne Monitoring

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
NORM/TENORM AIRBORNE MONITORING**

Approved by:

Phillip A. Retallick

Senior Vice President Compliance and Regulatory Affairs

Jacq A. Ikenberry

Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define NORM/TENORM waste airborne monitoring that shall be generated established, conducted, and maintained for Deer Trail operations involving NORM/TENORM waste to ensure that radiation doses from inhalation are maintained within limits.
- 2.0 **SCOPE:** This procedure applies to all NORM/TENORM waste treatment and disposal activities at the Deer Trail landfill. Workplace and ambient airborne monitoring programs are intended to measure and monitor the airborne concentrations of NORM/TENORM waste at the Deer Trail landfill:
- To document airborne concentrations of NORM/TENORM waste,
 - To detect changes in airborne concentrations, over time,
 - To detect any gradual buildup of airborne NORM/TENORM waste,
 - To verify the effectiveness of engineering controls in preventing or reducing levels of airborne NORM/TENORM waste, and
 - To produce results that shall be used to estimate internal radiation doses from inhalation to Deer Trail workers, as described in the *Standard Operating Procedure on Estimating Inhalation Doses* and the *Standard Operating Procedure on Individual and Area Dosimetry*.
- 3.0 **POLICY:** All Deer Trail activities that could result in airborne NORM/TENORM waste shall be subject to the airborne monitoring program.
- 4.0 **RESPONSIBILITIES:** Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer Trail NORM/TENORM Radiation Protection Plan.
- 5.0 **NORM/TENORM AIRBORNE MONITORING PROCEDURE:**
- 5.1 **Criteria for Determining NORM/TENORM Safety Training Requirements:** The Deer Trail RSO shall:
- Establish a technical basis document prior to receipt of waste for selecting, placing, and operating the airborne monitoring equipment which shall, at a minimum include information on:

- The selection criteria used when selecting a vendor,
 - Selection of filter media,
 - Selection of an analytical laboratory for evaluation of the samples,
 - Sample transport line losses, as applicable,
 - The rationale for placing airborne monitoring equipment,
 - A list of and facility map showing actual locations of airborne monitoring equipment (the locations should include areas where NORM/TENORM waste is sampled, treated, and disposed, as well as ambient locations such as the change room or lunch room, site boundary, and location for determining background levels),
 - Calibration and performance testing procedures consistent with the manufacturer's requirements,
 - Calibration records and maintenance requirements, and
 - Any deviations from this procedure.
- Ensure that airborne monitoring samples are evaluated and documented on a quarterly basis, or more frequently for dusty locations, as necessary,
 - Provide revised documentation and equipment locations when facility or operational changes occur that could affect airborne concentrations of NORM/TENORM waste, and
 - Oversee the use of the airborne monitoring results in the quarterly estimation of radiation doses to Deer Trail workers.
- 5.2 Performing Airborne Monitoring: Monitoring of airborne concentrations of NORM/TENORM waste shall be conducted using continuous air monitors with the following considerations:
- Determination and documentation of the elapsed filter exposure time prior to replacement of each air filter,
 - Estimates of occupancy time involving potential exposures to airborne NORM/TENORM waste shall be made for each filter exchange, for each monitoring location, by the Deer Trail RSO,
 - Maintaining flow rates consistent with the manufacturer's recommendations so that sample volumes can be accurately estimated, and
 - Maintaining calibration and testing according to the manufacturer's recommendations.
- 5.3 Preliminary Assessment: Upon removal of the air filter, a preliminary assessment shall be conducted using field instruments to determine gross contamination levels. If background levels of radon or thoron progeny interfere, prompt field assessments may not be possible; however, the intent of this preliminary assessment is to ensure that the contamination levels present are consistent with the sample receipt criteria for the analytical laboratory.
- 5.4 Analytical Results: The recovered filter media shall be sent to a qualified analytical laboratory for evaluation. The data and information for each recovered filter shall be recorded using the NORM/TENORM Airborne Monitoring record shown in Attachment 1. The information shall include: Specific monitor location, model number or identifier for the monitor, name of analytical laboratory, instrument sensitivity, collection efficiency, flow rate, filter medium, correction factors applied, exchange dates and times, monitoring duration, occupancy time, and

analytical results including gross sample activity, background activity, net activity, and total net activity, as well as estimated error, by radionuclide.

- 5.5 Estimate of Airborne Concentrations: Because laboratory analysis of airborne monitoring filter media provide the total activity on a filter (in picocuries) by radionuclide, the average, background-corrected air concentration is found by dividing the net activity on the filter (by radionuclide and total) by the volume of air passing through the monitor, to produce the average picocuries per cubic meter in air. This calculation is performed and entered on the NORM/TENORM Airborne Concentration Worksheet, shown in Attachment 2. The volume of air passing through the monitor is the product of the rate of airflow (cubic meters per hour) times the number of hours the monitor is in operation.
- 5.5 Trending: Airborne monitoring results shall be plotted on a quarterly basis for purposes of trending airborne concentrations. Such trending shall:
- Provide indication of the continued effectiveness of the existing exposure controls,
 - Warn of localized deterioration of control equipment or operating procedures, and
 - Identify long-term variations in airborne radioactivity levels.
- 6.0 DETERMINATION OF INHALATION RADIATION DOSES FROM NORM/TENORM WASTE: Radiation doses to Deer Trail workers from inhalation of airborne NORM/TENORM waste shall be evaluated on a quarterly basis, as described in the *Standard Operating Procedure on Estimating Inhalation Doses* and the *Standard Operating Procedure on Individual and Area Dosimetry*. The procedure on individual dosimetry relies on a determination of the corrected airborne concentration of each radionuclide, in units of picoCuries/cubic meter, using the information recorded on the form in Attachment 2.
- 7.0 RECORDS: The Deer Trail RSO shall maintain records of the workplace airborne concentration results for each monitoring location and record the information, quarterly and annually, on the form provided in Attachment 2.

Clean Harbors Deer Trail, LLC

SOP on Airborne Monitoring

ATTACHMENT 1 – NORM/TENORM AIRBORNE MONITORING RECORD

Clean Harbors Deer Trail LLC NORM/TENORM AIRBORNE MONITORING RECORD								
Sample Location: _____ Sampler Model No. _____								
Analytical Laboratory: _____ Sensitivity (Estimated Error): _____								
Collection Efficiency: _____ Flow Rate: _____								
Filter Medium: _____ Correction Factors: _____								
Exchange Dates for Calendar Year ^(a)	Date & Time							
	Deployed:		Deployed:		Deployed:		Deployed:	
	Recovered:		Recovered:		Recovered:		Recovered:	
Monitoring Duration	hr		hr		hr		hr	
Occupancy Time	hr		hr		hr		hr	
Gross Activity ^(b)	pCi		pCi		pCi		pCi	
Background Activity	pCi		pCi		pCi		pCi	
Total Net Activity	pCi		pCi		pCi		pCi	
Radionuclide	Net Activity by Radionuclide	Estimated Error						
	pCi		pCi		pCi		pCi	
	pCi		pCi		pCi		pCi	
	pCi		pCi		pCi		pCi	
	pCi		pCi		pCi		pCi	
	pCi		pCi		pCi		pCi	
	pCi		pCi		pCi		pCi	
	pCi		pCi		pCi		pCi	
	pCi		pCi		pCi		pCi	
	pCi		pCi		pCi		pCi	
	pCi		pCi		pCi		pCi	
Total:	pCi		pCi		pCi		pCi	
(a) For filters exchanged more often than once a quarter, note the frequency in the comment section and use additional forms, as required.								
(b) hr = hour; pCi = picocurie								
Comments: (add additional pages, if necessary)								
Annual Record Completed By:					Annual Record Reviewed By:			
Name (Print) _____					Name (Print) _____			
Signature _____					Signature _____			

Clean Harbors Deer Trail, LLC

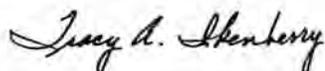
SOP on Estimating Inhalation Doses

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
ESTIMATING INHALATION DOSES**

Approved by:



Senior Vice President Compliance and Regulatory Affairs



Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define specific methods and procedures for estimating inhalation dose to Deer Trail workers from inhalation of radionuclides in NORM/TENORM waste.
- 2.0 **SCOPE:** Inhalation radiation dose estimates for workers exposed to airborne concentrations of NORM/TENORM waste shall be made:
 - To estimate the potential internal dose to Deer Trail landfill workers.
 - To be included and reported as part of the annual committed effective dose equivalent (CEDE) to Deer Trail workers.
- 3.0 **POLICY:** Estimates of inhalation dose to Deer Trail landfill workers shall be conducted to verify that annual CEDE to Deer Trail workers are maintained as low as reasonably achievable (ALARA) but in no case exceeding 100 millirem/year.
- 4.0 **RESPONSIBILITIES:** Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer Trail NORM/TENORM Radiation Protection Plan.
- 5.0 **GENERAL PROCEDURE FOR ESTIMATING RADIONUCLIDE INTAKE:**

Airborne concentrations and NORM/TENORM waste radionuclide distributions shall be established, on a quarterly basis, from the airborne monitoring program, consistent with the CHDT *Standard Operating Procedure (SOP) on Airborne Monitoring*. The quarterly data, in units of picocuries per cubic meter of air, shall be specific to work location and shall include background ambient concentrations so that localized net airborne concentrations of radionuclides in NORM/TENORM waste (i.e., background corrected concentrations) can be determined.

It is recognized that the estimated average air concentrations can underestimate the workplace concentrations during receipt and disposal of radionuclides in NORM/TENORM waste because it includes lower air concentrations during periods when Resource Conservation and Recovery Act (RCRA) waste (i.e., non-NORM/TENORM waste) is disposed, periods when the daily cover is in place when there is no possibility for airborne NORM/TENORM waste, and off hours periods when no workers are present.

To correct for this potential underestimate of airborne radionuclide concentrations, the Deer Trail Radiation Safety Officer shall make an estimate of the fraction of time during the quarter that could pose an airborne hazard for NORM/TENORM waste. The airborne concentration during waste disposal operations is then found by dividing the filter media activity for each radionuclide by the volume of air passing through the monitor for the estimated number of hours of airborne NORM/TENORM hazard. This is expressed by the following equation:

$$C_{a,i} = S_{a,i} \div (V_{a,T} \times T)$$

where:

- $C_{a,i}$ = corrected airborne concentration of radionuclide i (picocuries per cubic meter),
- $S_{a,i}$ = filter media activity for radionuclide (picocuries),
- $V_{a,T}$ = volume airflow rate for the airborne monitor (cubic meters per hour), and
- T = duration of airborne NORM/TENORM hazard (hours).

Once the estimated radionuclide mixtures and airborne contamination levels are established, individual worker intake by inhalation can be estimated. The intake from inhalation of a radionuclide i is estimated using:

$$I_i = T_w \times \text{Ventilation Rate} \times C_{a,i}$$

For each worker who is potentially exposed to airborne NORM/TENORM waste, an estimate shall be made of the amount of time the worker spends in a specific work location (T_w). This estimate shall account for time spent away from potential airborne NORM/ TENORM waste (for example, time conducting routine maintenance in unaffected areas, time in training, or time conducting offsite activities). For cases where an individual worker could have onsite exposures at many airborne NORM/TENORM waste or processing locations of different concentrations, the highest measured airborne NORM/TENORM waste concentration shall be used in estimating individual radionuclide intakes. Based on information provided by the International Commission on Radiation Protection (ICRP) in Publication 66, the adult male ventilation rate during light exercise is 1.5 cubic meters/hour (ICRP 1993).

6.0 GENERAL PROCEDURE FOR ESTIMATING INHALATION DOSE:

Quarterly radiation CEDEs to workers shall be estimated using the following equation:

$$H_{K,50} = \sum_i \sum_T W_T H_{T,50,i}$$

where:

- $H_{K,50}$ = the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the CEDE to each of these organs or tissues,
- W_T = weighting factors for each specific body tissue or organ, and
- $H_{T,50,i}$ = CEDE for radionuclide i (millirem).

The CEDE for radionuclide i ($H_{T,50,i}$) is found by multiplying the intake of each radionuclide (I_i) by the unit intake committed dose conversion factor for each radionuclide and tissue or organ ($DCF_{T,i}$) as shown in the following equation:

$$H_{T,50,i} = I_i \times DCF_{T,i}$$

To streamline the process, and for consistency with the doses recorded by the external dosimetry program, unit intake effective dose coefficients by radionuclide i (i.e., $DCF_{E,i} = \sum_T DCF_{T,i}$, where T is for each tissue or organ) tabulated by the U.S. Environmental Protection Agency (EPA) shall be used. Modifying the above equations to account for the use of unit inhalation intake effective dose coefficients is shown in the following equation.

$$H_{E,50} = (T_w \times \text{Ventilation Rate}) \sum_i (C_{a,i} \times DCF_{E,i})$$

The unit inhalation intake effective dose coefficients, taken from Federal Guidance Report No. 11 (Eckerman et al. 1988) are provided in Attachment 1 for the NORM/TENORM waste radionuclides of concern. These values are the most conservative (highest) across all solubility classes considered by the EPA.

7.0 RESPIRATORY PROTECTION:

The Deer Trail RCRA permit requires the use of respiratory protection for all activities when workers are in close proximity to the waste. These activities include sampling, treatment (when required), and in-cell disposal. Full-face air-purifying respirators are used by Deer Trail workers for these activities. Consistent with 6 CCR-1007-1, § 4.24 and Part 4 - Appendix A, a respiratory protection factor of 50 shall be applied to all appropriate work when the use of respirators is mandatory.

8.0 INHALATION DOSE WORKSHEET:

A worksheet for calculating inhalation CEDEs is provided in Attachment 2. The sum of the inhalation doses for each quarter is used to produce the annual inhalation dose estimate for each worker. This value is then added to the annual external dose for each worker to produce the estimated annual total CEDE.

REFERENCES

Eckerman, K. F., A. B. Wolbarst, and A. C. B. Richardson. 1988. *Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion*. Federal Guidance Report No. 11, EPA-520/1-88-020, U.S. Environmental Protection Agency, Washington, D.C.

International Commission on Radiation Protection (ICRP). 1993. *Human Respiratory Tract Model for Radiological Protection*. ICRP Publication 66, Annals of the ICRP, Vol. 23, Nos. 1-3.

**ATTACHMENT 1 – UNIT INTAKE COMMITTED EFFECTIVE DOSE
 EQUIVALENT COEFFICIENTS**

Radionuclides	$DCF_{E,i}^{(a)}$ (seiverts/becquerel inhaled)	$DCF_{E,i}^{(b)}$ (millirem/picocurie inhaled)
Uranium Series		
²³⁸ U	3.2E-5	1.2E-1
²³⁴ Th	9.5E-9	3.5E-5
²³⁴ U	3.6E-5	1.3E-1
²³⁰ Th	8.8E-5	3.3E-1
²²⁶ Ra	2.3E-6	8.5E-3
²¹⁴ Pb	2.1E-9	7.8E-6
²¹⁴ Bi	1.8E-9	6.7E-6
²¹⁰ Pb	3.7E-6	1.4E-2
²¹⁰ Bi	5.3E-8	2.0E-4
²¹⁰ Po	2.5E-6	9.3E-3
Actinium Series		
²³⁵ U	3.3E-5	1.2E-1
²³¹ Th	2.4E-10	8.9E-7
²³¹ Pa	3.5E-4	1.3E+0
²²⁷ Ac	3.5E-4	1.3E+0
²²⁷ Th	4.4E-6	1.6E-2
²²³ Ra	2.1E-6	7.8E-3
²¹¹ Pb	2.4E-9	8.9E-6
Thorium Series		
²³² Th	4.4E-4	1.6E+0
²²⁸ Ra	1.3E-6	4.8E-3
²²⁸ Ac	8.3E-8	3.1E-4
²²⁸ Th	9.2E-5	3.4E-1
²²⁴ Ra	8.5E-7	3.1E-3
²¹² Pb	4.6E-8	1.7E-4
²¹² Bi	5.8E-9	2.1E-5

(a) Based on data from Federal Guidance Report No. 11 (Eckerman et al. 1988).

(b) Converted from units of sievert per becquerel to units of millirem/picocurie by multiplying by a conversion factor of 3,700.

Clean Harbors Deer Trail, LLC

SOP on NORM/TENORM Radiation Protection Training

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
NORM/TENORM RADIATION PROTECTION TRAINING**

Approved by:

Phillip S. Retallick

Senior Vice President Compliance and Regulatory Affairs

Jacq A. Ikenberry

Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 OBJECTIVE: To define general and specific NORM/TENORM waste radiation safety training requirements for Deer Trail general employees to ensure that workers can safely perform assigned duties.
- 2.0 SCOPE: This procedure applies to all Deer Trail workers who may be exposed to radiation from NORM/TENORM waste. Additional radiation safety training beyond the scope of this procedure may be prescribed for the Deer Trail Radiation Safety Officer (RSO).
- 3.0 POLICY: All Deer Trail workers who may potentially be exposed to radiation from the treatment and disposal of NORM/TENORM waste shall attend an initial General Employee NORM/TENORM Radiation Protection Training course and refresher training each year, and demonstrate competence by scoring at least 70% on a test administered or directed by the Deer Trail RSO.
- 4.0 RESPONSIBILITIES: Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer Trail NORM/TENORM Radiation Protection Plan.
- 5.0 NORM/TENORM SAFETY TRAINING PROCEDURE:
- 5.1 Criteria for Determining NORM/TENORM Safety Training Requirements: Training requirements are based on job descriptions and types of areas that workers are required to access to perform their assigned duties. Training may be adjusted to be commensurate with the individual's job category, assigned duties, and previous training and experience. All Deer Trail workers who are in the proximity of radiation from NORM/TENORM waste as part of their routine employment shall be part of the General Employee NORM/TENORM Radiation Protection Training program. The following factors shall be considered to determine the appropriate level of knowledge and training for individual Deer Trail workers:
 - The individual's job assignment (i.e., activities in or near the weight station, waste sampling and analysis operations, waste treatment facility when NORM/TENORM waste could be present, and disposal cell operations),

- The nature of the NORM/TENORM hazards that could be present (dependent on waste form, type of treatment if any, and disposal configuration), and
 - The type and complexity of any protective actions that the individual might be expected to execute (i.e., the need to limit the duration of an activity, provide temporary shielding, , or observe special procedures for some types of NORM/TENORM waste). Note that Deer Trail workers in the landfill are required to wear personal protective equipment (PPE) and respiratory protection under the Resource Conservation and Recovery Act (RCRA) Permit.
- 5.2 Training Requirements for NORM/TENORM Workers: General employees whose job assignments indicate the potential for exposure to NORM/TENORM waste shall receive General Employee NORM/TENORM Radiation Protection Training prior to conducting those assignments. The Deer Trail RSO is responsible for ensuring that all workers receive the appropriate training before conducting their assigned duties.
- 5.3 Training for Site Visitors or Contractors: Visitors or contractors who work with NORM/TENORM waste at the landfill or who enter areas restricted because of the presence of NORM/TENORM or RCRA waste shall complete the training session required of employees. All other visitors shall be escorted by trained Deer Trail staff.
- 5.4 Evaluating the Adequacy of Current Training for Individual Deer Trail Workers: The Deer Trail RSO shall:
- Ensure that all new hires who will work in the proximity to NORM/TENORM waste receive General Worker NORM/TENORM Radiation Protection Training followed by annual refresher courses.
 - Periodically check the training records and determine current levels of NORM/TENORM Radiation Protection Training for individual workers and their training expiration dates to ensure that workers are adequately trained.
 - Compare the individual's current training to the required training, especially in cases where workers change job assignments.
 - Ensure that special periodic retraining occurs in the event of changes to Deer Trail policies, procedures, and practices that affect NORM/TENORM waste disposal.
- 5.5 Training Records: Records certifying completion of required training shall be maintained as part of the Deer Trail records retention program and within each individual worker's employment file, as required by the *Standard Operating Procedure (SOP) on NORM/TENORM Worker Radiation Protection Records*.
- 6.0 TRAINING SYLLABUS:
- The Deer Trail General Employee NORM/TENORM Radiation Protection Training program shall cover the following topics:
- Radioactivity and Radioactive Decay
 - Alpha Emission

- Beta Emission
- Gamma-Rays
- X-Rays
- Half-Life
- Units of Radioactivity
- Naturally Occurring Radioactivity
 - Cosmic Radiation
 - Cosmogenic Radioactivity
 - Radionuclides in the Earth
 - Summary of Natural Background Radiation
- Naturally Occurring Radioactive Material (NORM) and Technologically Enhanced Naturally Occurring Radioactive Material (TENORM)
 - Decay Chains and Radionuclides
 - Sources
 - Waste Forms
- Biological Effects of Radiation
 - Acute Effects
 - Chronic Effects
 - Dose Equivalent: The Rem
- Basic Radiation Protection Criteria
 - Time, Distance, and Shielding for External Radiation
 - Inhalation Protection
 - Fetal Protection
- Radiation Protection Guidelines and Standards
 - Philosophy of Radiation Protection
 - Deer Trail Regulations and Permit Conditions
 - Deer Trail Waste Acceptance Criteria
 - Posting
- Deer Trail Instrumentation and Their Operation
 - General Radiation Survey Equipment
 - Dose Rate Meters
 - Geiger Mueller (GM) Survey Equipment
 - Alpha/Beta Smear Sample Counter
 - Airborne Monitoring
 - Gate Monitor
- Deer Trail Individual Dosimetry Program
- Radiation Records
- Quiz

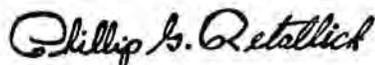
Clean Harbors Deer Trail, LLC

SOP on Use of the Gate Monitoring System

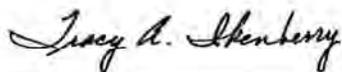
**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
USE OF THE GATE MONITORING SYSTEM**

Approved by:

Approved by:



Senior Vice President Compliance and Regulatory Affairs



Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define general and specific methods and procedures for conducting monitoring of incoming waste shipments using the Deer Trail gate monitoring system.
- 2.0 **SCOPE:** The Deer Trail gate monitoring system shall be used to screen:
 - Shipments of NORM/TENORM waste for concentrations within the waste acceptance criteria,
 - Non-NORM/TENORM waste shipments for radiation levels from man-made radioactive materials or radioactive material not acceptable for disposal at Deer Trail, and
 - Against the disposal of lost, sealed sources of radioactive material.
- 3.0 **POLICY:** Consistent with the Deer Trail Radioactive Materials License, it is Deer Trail's policy to receive only NORM/TENORM waste with a total activity of less than 2,000 picocuries per gram (pCi/g) (natural uranium and thorium decay chain products only), and with a maximum ²²⁶Ra concentration less than 400 pCi/g. Note that this may include limited concentrations of source material (i.e., uranium or thorium in excess of 0.05% by weight), with total activity concentrations not exceeding 2,000 pCi/g. All other types of licensed radioactive waste in the broader definition of low-level radioactive waste, including other licensed forms of man-made radioactive materials, are prohibited.
- 4.0 **RESPONSIBILITIES:** Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer Trail NORM/TENORM Radiation Protection Plan.
- 5.0 **PROCEDURES FOR USING THE DEER TRAIL GATE MONITOR:**
- 5.1 **Radiation Screening:** The Deer Trail facility shall operate scintillation-type radiation monitoring equipment that conforms to the specifications described in Appendix A of this procedure. The equipment shall be used to screen all incoming waste material for unacceptable levels of

radiation. Any deviation from either of these two specifications must receive prior approval from the Deer Trail RSO.

- 5.2 NORM-TENORM Waste: For NORM/TENORM waste, the Deer Trail Gate Monitor shall be operated in a manner to alarm at an initial alarm set point determined through modeling analysis to be 100 microroentgens per hour ($\mu\text{R/hr}$) above background. For an average background reading of 16 $\mu\text{R/h}$, this equates to a total dose rate of 116 $\mu\text{R/hr}$. This alarm set point shall be periodically re-evaluated for actual waste shipments, as described in Section 5.4 below. Each shipment shall come to a complete stop with the load between the detectors and remain stationary for a minimum of 10 seconds. During this time, the radiation monitoring equipment shall survey the truck for radiation to determine if it exceeds the alarm point for NORM/TENORM waste.
- 5.2.1 Waste Passing the Screening: For waste that passes the screening (i.e., within the alarm limits) and passes the other surveys upon receipt, the recorded dose rates, time and date of receipt, and other required information shall be recorded on the manifest consistent with the Records Management and Reporting requirements set forth in the Deer Trail Radiation Protection Plan, and the waste shall be cleared for disposal.
- 5.2.2 Waste Failing the Screening: If an alarm condition results during a scan of an incoming vehicle, then the waste shall be rejected consistent with the Enforcement Policy in Section 6.0 of this procedure.
- 5.3 Non-NORM/TENORM Waste Gate Monitor Set Point: For non-NORM/TENORM waste, the Deer Trail Gate Monitor shall be operated to alarm at an average background reading of 16 $\mu\text{R/h}$. All vehicles entering Deer Trail for disposal of non-NORM/TENORM waste (i.e., hazardous waste) shall drive through the gate monitor to confirm that the waste does not contain radioactive materials or lost sealed radioactive sources. Each shipment shall come to a complete stop with the load between the detectors and remain stationary for a minimum of 10 seconds. During this time, the radiation monitoring equipment shall survey the truck for radiation to determine if it exceeds the alarm point for non-NORM/TENORM waste.
- 5.3.1 Waste Passing the Screening: For non-NORM/TENORM waste that passes the screening (i.e., within the alarm limits) and other surveys upon receipt, the recorded dose rates, time and date of receipt, and other information shall be recorded on the manifest consistent with the Records Management and Reporting requirements set forth in the Deer Trail Resource Conservation and Recovery Act (RCRA) Permit, and the waste shall be cleared for disposal.
- 5.3.2 Waste Failing the Screening: If an alarm condition results during a scan of an incoming vehicle, then the waste shall be rejected consistent with the Enforcement Policy in Section 6.0 of this procedure.
- 5.4 Determination of the Alarm Set Point: Because of the variability of waste loads both in content and geometry, the Deer Trail RSO shall evaluate, confirm, or modify the alarm set point used as the gate monitor alarm set point for different waste shipments. The evaluation shall consist of recording the gate monitor response (initially determined through a modeling analysis to indicate 100 $\mu\text{R/h}$ for 2,000 pCi/g of total NORM/TENORM activity or 400 pCi/g of ^{226}Ra), obtaining waste samples for offsite analysis, and/or comparing the NORM/TENORM concentrations shown on the shipping manifest. The alarm set point will then be confirmed or modified based on the gate monitor response compared with the sample analysis or manifest information. The alarm set point shall be evaluated for:

- 5.4.1 Long-Term Clients: For clients that deliver a consistent, stable waste form and concentration resulting from industrial or other operations on a long-term basis, the alarm set point shall be established annually through sampling, or more frequently using the manifest information at the direction of the Deer Trail RSO. Note that more frequent analytical sampling may be performed at the discretion of the Deer Trail RSO when there is reason to believe that the routine operations that generate the waste have changed or been modified.
- 5.4.2 Episodic Wastes: For episodic wastes, such as arising from CERCLA cleanup operations, the Deer Trail RSO shall evaluate, confirm, or modify the alarm set point based on the pre-acceptance evaluation of the NORM/TENORM waste or additional sample analysis.
- 6.0 ENFORCEMENT POLICY: If an alarm condition results during a scan of an incoming vehicle, then the waste shall be rejected consistent with the following policy:
- 6.1 Radiation Alarm - General Level (dose rates greater than the alarm set point for NORM/TENORM Waste or 16 μ R/h above background for non-NORM/TENORM Waste):
- Step 1 - Record the radiation monitor reading on a Clean Harbors Waste Discrepancy Report along with the hauler's identity and truck number. If possible, also obtain and record the generator's identity.
- Step 2 - Inform the hauler that the load he is hauling exceeds Clean Harbor Deer Trail's policy limits for radioactive materials and that the load is being rejected.
- Step 3 - Record the date and time that the hauler leaves with the rejected load.
- Step 4 - File all discrepancy reports for radioactivity in a designated file for future reference.
- 6.2 Post-Alarm Follow-Up: It is reasonable to believe that very few incoming NORM/TENORM waste streams will fail to meet the Deer Trail waste acceptance criteria because of sampling controls placed on the generator/shipper under RCRA. In the event that this limit is exceeded and the load is rejected, follow-up action on the part of the landfill or hauler is advisable to prevent a reoccurrence of this problem. The following conditions and guidelines shall be implemented if a load is rejected due to radioactivity:
- Condition 1 - Outside Waste: Upon rejection of a load from a non-Clean Harbors source for exceeding the Clean Harbors Deer Trail radioactive limit, the RSO shall contact the hauling company as soon as possible and give date, time, and the reason for rejecting the load. A follow-up letter to the hauling company should then be sent confirming the telephone conversation and Clean Harbors Deer Trail policy on radioactive materials.
- Condition 2 - Clean Harbors Deer Trail-Hauled Waste: If the rejected load is hauled by Clean Harbors, the preferred approach is for the RSO to direct the District Manager or District Sales Manager to contact the generator by telephone as soon as possible after the time of load rejection. If necessary, a personal visit to the generator may be advisable to help the customer resolve the problem and prevent future loads from containing radioactive materials above the Clean Harbors Deer Trail waste acceptance criteria.

Clean Harbors Deer Trail, LLC

SOP on Use of the Gate Monitoring System

Condition 3 - Notification of Customers: For the Landfill and District - It is recommended that 45 days prior to initiating the radiation screening process, that the landfill and district notify their respective customers of Clean Harbors Deer Trail's policy on radioactive materials, the specific date on which radioactivity screening will begin, and the enforcement policy that will be implemented if the limits are exceeded.

ATTACHMENT A – GATE MONITOR SPECIFICATIONS

MECHANICAL/ENVIRONMENTAL

Size: Less than 12 x 12 x 12 inch (Readout Unit)
Less than 6 inch diameter x 12 inch (Detector Unit with Shield)

Operating Temperatures:

At least 40 degrees F - 90 degrees F (Readout Unit)
At least -30 degrees F to 120 degrees F (Detector Unit)

Radiological Shielding:

At least 1 inch of lead in approximately 3 π directions behind and around active detector area.

Weight:

Less than 10 pounds (Readout Unit)
Less than 75 pounds (Detector Unit with Shield)

Environmental:

Detector, Cable, and Connector shall be water resistant in the installed configuration.

Cables: 20 foot Coaxial Cable with Connectors between Detector Unit and Readout Unit. A.C. Power Cord.

ELECTRICAL/ELECTRONIC:

Power: 115 VAC (nominal) less than 2 amps current with internal 12-hour battery reserve. (Readout Unit) Detector Unit power supplied from Readout Unit.

Meter: Counts per minute display with a digital readout. Range at least 10 to 100,000 CPM.

Alarm: Tone Alarm, non-latching, adjustable over full range of meter scale above a minimum set point of not more than 250 cpm. Set point must be displayed or displayable on the meter scale.

Accuracy: Displayed value must be accurate to within +5% of a constant input signal over the entire range of the display.

Clean Harbors Deer Trail, LLC

SOP on Use of the Gate Monitoring System

Display/Alarm Time Constant:

The digital display should update at least every 6 seconds. Update times may be adjustable above or below 6 seconds.

High Voltage: Adjustable to supply Detector Unit.

Detector Failure Indicator: Readout Unit shall have a visible indicator other than the display that actuates it when the detector has not produced a signal for more than 15 seconds.

An automatic data-logger shall be included.

Discriminator: Readout Unit shall be able to discriminate against gamma energies below 200 keV in an adjustable manner. Readout Unit shall have a speaker with an adjustable volume that sounds with each incoming detector pulse.

RADIOLOGICAL

Detector Type: Two 2 inch by 2 inch thallium-doped NaI(Tl) crystal scintillators.

Minimum Sensitivity: Must be photon (gamma and x-ray) sensitive. Must alarm on a 100 μ Ci Cs-137 source at 10 feet within 15 seconds in a constant background field of 10 μ R/h of Ra-226 in equilibrium with progeny.

False Alarms: When set for the minimum sensitivity condition above, false alarms to normal background shall be less than once every three months.

Clean Harbors Deer Trail, LLC

SOP on Routine NORM/TENORM Radiation Surveys

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
ROUTINE NORM/TENORM RADIATION SURVEYS**

Approved by:



Senior Vice President Compliance and Regulatory Affairs



Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define general and specific methods and procedures for conducting routine and job or task-specific NORM/TENORM radiation surveys.
- 2.0 **SCOPE:** Radiation surveys for NORM/TENORM waste shall be performed to determine and document ambient radiation and contamination levels in locations around and within the Deer Trail landfill and to evaluate if controls are necessary when performing routine maintenance or other tasks that could encounter NORM/TENORM waste.
- 3.0 **POLICY:** NORM/TENORM radiation surveys shall be conducted to ensure that contamination control is maintained and to maintain the doses to Deer Trail workers at levels of 100 mrem/y, plus ALARA.
- 4.0 **RESPONSIBILITIES:** Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer Trail NORM/TENORM Radiation Protection Plan.
- 5.0 **GENERAL SURVEY METHODS:** Routine radiation surveys shall be conducted using a Ludlum Model 3 Portable survey Meter for localized (hot spot) measurements, a Ludlum Model 193-6 Survey Wand for large area scanning measurements, supported by CHDT laboratory sample analyses using the Ludlum 3030 alpha beta sample counter, as described below.
 - 5.1 **Count Rate Meter Instrument Check List:** Prior to use of the Ludlum Model 3 Survey Meter or the Ludlum Model 193-6 Survey Wand, the operation of the meter and probe used shall be checked using the following procedure:
 - Check Batteries
 - Turn the switch to "BAT" or flip the "BAT" switch to "ON."
 - The needle on the meter face should move to a position within or beyond the indicated area on the meter scale.
 - Replace batteries if needed before use.

- Check Count Rate Meter Speaker
 - Turn the audio switch, if present, to “ON.”
 - Set the Fast-Slow toggle switch to “f.”
 - Set the count rate meter scale to “X1.”
 - The rate meter should “chirp” or “click.”
 - If the speaker does not function, the survey meter can be used, but the surveyor will need to check the meter reading or display frequently.
 - Check Background
 - Go to an area removed from the NORM/TENORM waste. Note, the Ludlum Model 193-6 Survey Wand has a six inch diameter by one inch thick plastic scintillation detector which will automatically accumulate background to determine an alarm setting. The alarm setting shall be determined by the Deer Trail RSO as described in Section 5.3 below.
 - Note the background count rate when the count rate meter is set to the “X1” scale (this rate may vary from about 10 to 100 counts per minute).
 - Do not use the meter if it does not register a background reading.
 - Check Count Rate Meter Probe
 - Hold the supplied check source up to the probe window.
 - Note the count rate.
 - Do not use the survey meter if the counts per minute registered do not fall within $\pm 20\%$ of the expected reading for the source.
- 5.2 Exposure Rate Meter Check List: Prior to using the Ludlum Model 19 MicroR Meter, the instrument shall be checked using the following procedure:
- Check Batteries
 - Turn the meter on and check the battery using the battery test button.
 - The meter reading should be within the “BAT TEST” range on the meter display.
 - Replace batteries if needed before use (two standard D cell batteries are required).
 - Check Background
 - Turn the meter on and set the black range selector switch to the 0-25 range.
 - Set the Fast-Slow toggle switch to “f.”
 - The reading should be about 16 $\mu\text{R}/\text{h}$, \pm about 10 $\mu\text{R}/\text{h}$.
 - Do not use the meter if a background reading is not recorded.
- 5.3 Ambient Work Area Radiation Levels: Surveys using the Ludlum Model 19 MicroR Meter shall be performed in the landfill defined in the CHDT *Standard Operating Procedure on NORM/TENORM Landfill Operations*, where workers could receive a measured total effective dose equivalent. Surveys shall be performed in a manner and frequency that is representative of the receipt and disposal of NORM/TENORM waste. At a minimum, these surveys shall be performed daily when NORM/TENORM waste is received or where workers could be reasonably exposed (i.e., in the landfill) and recorded in units of $\mu\text{R}/\text{h}$ as the routine ambient work area radiation survey readings on the CHDT

survey form, shown in Attachment 1. Enter both the gross and net (background corrected) exposure rates.

- 5.4 Ambient Work Area Contamination Levels: For solid surfaces in the landfill or treatment building, combined fixed (or bulk) and removable surface contamination (when appropriate) shall be surveyed using the Ludlum Model 3 survey meter with a pancake GM probe for localized (hot spot) measurements, and the Ludlum Model 193-6 Survey Wand for large area scanning measurements. The survey limits shall be the detection of radiation levels above background. Removable contamination shall be measured at representative locations using a two inch diameter filter paper to wipe the surface. The filter paper shall be applied to the surface with moderate pressure, and shall wipe about 100 cm² (about four inches by four inches) of surface area. The filter paper shall then be held in close proximity of the count rate meter probe to determine the presence of elevated levels of removable NORM/ TENORM contamination. As shown in the survey form in Attachment 1, the measured counts per minute (cpm) shall be converted to disintegrations per minute (dpm), using a dpm/cpm conversion factor. Based on the manufacturer's specifications, for mixtures of natural uranium including radium, this conversion factor is about 0.2. The Deer Trail RSO will evaluate the instrument response and confirm or modify the detector efficiency, and determine the appropriate alarm setting for the Ludlum Model 193-6 Survey Wand. The gross and net (background corrected) results for both combined (fixed plus removable) and removable surface contamination shall be recorded in dpm per 100 cm² above background as the routine ambient work area radiation survey readings on the CHDT survey form, shown in Attachment 1. Locations where removable contamination is present shall be noted and those samples shall be sent to the laboratory for measurement using the Ludlum Model 3030 Alpha Beta Sample Counter. As a contamination control measure, any areas demonstrating contamination levels above background shall be decontaminated by sweeping the surface and collecting the material, or using soap and water, and paper towels. Any waste generated during decontamination shall be disposed in the landfill.
- 5.5 Ambient Clean Area Radiation Levels: For the purpose of ensuring contamination control, exposure rate surveys using the Ludlum Model 19 MicroR Meter shall be performed on a monthly basis in the areas of the facility that are defined as clean in the CHDT *Standard Operating Procedure on NORM/TENORM Landfill Operation*. The results of these surveys shall be recorded in units of $\mu\text{R/h}$ as the clean area radiation survey readings on the CHES survey log, shown in Attachment 2.
- 5.6 Ambient Clean Area Contamination Levels: Contamination level surveys shall be conducted on a monthly basis in areas of the facility defined as clean in the CHDT *Standard Operating Procedure on NORM/TENORM Landfill Operations*. Combined fixed (or bulk) and removable surface contamination (when appropriate) shall be surveyed using the Ludlum Model 3 survey meter with a pancake GM probe for localized measurements, and a Ludlum Model 193-6 Survey Wand for large area scanning measurements. These areas shall include the change room, lunch room, administrative offices, haul roads weight station and other areas that are identified as part of the Area Dosimetry program (see the CHDT *Standard Operating Procedure on Individual and Area Dosimetry*). The survey limits shall be the detection of radiation levels above background. As shown in the survey form in Attachment 2, the measured counts per minute (cpm) shall be converted to disintegrations per minute (dpm), using a dpm/cpm conversion factor. Based on the manufacturer's specifications, for mixtures of natural uranium including radium, this conversion factor is about 0.2. The Deer Trail RSO will

evaluate the instrument response and confirm or modify the detector efficiency, and determine the appropriate alarm setting for the Ludlum Model 193-6 Survey Wand. The gross and net (background corrected) results for both combined (fixed plus removable) and removable surface contamination shall be recorded in dpm per 100 cm² on the monthly radiation survey log shown in Attachment 2 and maintained in a log book controlled by the Deer Trail Radiation Safety Officer (RSO). An annual review of the survey data shall be conducted. Total or bulk contamination shall be measured directly at the surface of the contamination with the count rate meter held at close proximity to the surface, without direct contact with the probe. A slow scanning speed, of about 2 inches per second, shall be used for such direct measurements, and locations where readings are above background shall be noted. Removable contamination shall be detected and measured by using a two inch diameter filter paper to wipe the surface. The filter paper shall be applied to the surface with moderate pressure, and shall wipe about 100 cm² of surface area (about 4 inches by 4 inches). The filter paper shall then be held in close proximity of the count rate meter probe to determine the presence of elevated levels of removable NORM/TENORM contamination. Locations where removable contamination is present shall be noted and those samples shall be sent to the laboratory for measurement using the Ludlum Model 3030 Alpha Beta Sample Counter. Any areas demonstrating contamination levels above background in the clean areas of the facility shall be decontaminated by sweeping the surface or using soap and water, and paper towels. Any waste generated during decontamination shall be disposed in the landfill.

- 5.7 Work or Task Planning Surveys: For equipment that may become contaminated with NORM/TENORM radionuclides, or for work in close proximity to NORM/TENORM waste, special radiation surveys shall be conducted. The purpose of these surveys is to determine the exposure rates and/or contamination levels encountered for a specific work task, and to determine if special radiation work procedures need to be developed. The surveys shall be conducted as outlined in Sections 5.3 and 5.4 above, with the results entered into the CHDT survey form in Attachment 1. Following completion of the survey, the survey form shall be submitted to the Deer Trail RSO for evaluation. This evaluation shall determine which, if any, controls will be required to perform the specific job task. For example, the NORM/TENORM concentrations and exposure rates associated with leachate from the disposal cells shall be determined and appropriate controls developed prior to leachate processing. The goal will be to maintain exposure rates during leachate processing to less than 100 µR/h and maintain worker exposures ALARA.

6.0 REFERENCES

Instruction Manual Model 3 Survey Meter, Ludlum Measurements, Inc.

Instruction Manual Model 19 Micro R Meter, Ludlum Measurements, Inc.

Clean Harbors Deer Trail, LLC

SOP on Routine NORM/TENORM Radiation Surveys

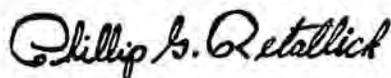
ATTACHMENT 1 – AMBIENT WORK AREA OR TASK PLANNING SURVEY LOG

Clean Harbors Deer Trail LLC NORM/TENORM SURVEY LOG			Survey No.	
Date	Time	Location		
Job Description				
Instrument/Probe Model	Ludlum Model 3 Meter with a Pancake GM Probe or Model 193-6 Wand	Ludlum Model 19 Micro R Exposure Rate Meter	Instrument Comments	
Serial No.				
Efficiency		N/A		
Correction Factor (dpm/cpm)		N/A		
Background Reading (Observed/Corrected)	cpm/ dpm	μR/h		
Ludlum Model 193-6 Alarm Set Point	% of full scale deflection			
	GROSS/NET EXPOSURE RATES		GROSS/NET CONTAMINATION LEVELS	
	Description	Gross/Net Exposure Rate (μR/h)	Gross/Net Fixed Contamination Level (dpm/ 100cm ²)	Gross/Net Removable Contamination Level (dpm/100 cm ²)
	/	/	/	
	/	/	/	
	/	/	/	
	/	/	/	
	/	/	/	
	/	/	/	
	/	/	/	
	/	/	/	
	/	/	/	
	/	/	/	
	/	/	/	
Comments: (add additional pages, if necessary)				
For laboratory smear sample analysis: samples counted for _____ minutes to determine removable contamination levels.				
Survey Conducted By:		Survey Report Reviewed By:		
Name (Print) _____		Name (Print) _____		
Signature _____		Signature _____		

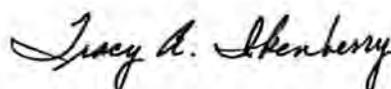
ATTACHMENT 2 – NORM/TENORM ROUTINE NON-WORK AREA SURVEY LOG

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
NORM/TENORM PERSONNEL SURVEYS**

Approved by:



Senior Vice President Compliance and Regulatory Affairs



Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define general and specific methods and procedures for conducting NORM/TENORM radiation surveys of Clean Harbor's personnel.
- 2.0 **SCOPE:** Radiation surveys for NORM/TENORM waste shall be performed to ensure that workers are free of NORM/TENORM waste contamination when leaving the NORM/TENORM areas as defined in the CHDT *Standard Operating Procedure on NORM/TENORM Landfill Operations*, and to support personnel decontamination.
- 3.0 **POLICY:** Personnel radiation surveys shall be conducted by trained Deer Trail staff to verify that personnel leaving the NORM/TENORM waste areas are free of NORM/TENORM contamination, and to document the effectiveness of decontamination procedures, when required.
- 4.0 **RESPONSIBILITIES:** Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer Trail NORM/TENORM Radiation Protection Plan.
- 5.0 **GENERAL SURVEY METHODS:** Personnel surveys shall be conducted using a Portable Ludlum Model 3 or Stationary Ludlum Model 177 Alarm Ratemeter, supported by CHDT laboratory sample analyses using the Ludlum 3030 alpha beta sample counter, as described below.
 - 5.1 **Ludlum Model 3 Portable Survey Meter Check List:** Prior to use of the Ludlum Model 3 Portable Survey Meter, the operation of the meter and probe will be checked using the following procedure:
 - Check Batteries
 - Turn the switch to "BAT" or flip the "BAT" switch to "ON."
 - The needle on the meter face should move to a position within or beyond the indicated area on the meter scale.
 - Replace batteries if needed before use.

- Check Count Rate Meter Speaker
 - Turn the audio switch, if present, to "ON."
 - Set the Fast-Slow toggle switch to "f."
 - Set the count rate meter scale to "X1."
 - The rate meter should "chirp" or "click."
 - If the speaker does not function, the survey meter can be used, but the surveyor will need to check the meter reading or display frequently.
- Check Background
 - Go to an area removed from the NORM/TENORM waste.
 - Note the count rate when the count rate meter is set to the "X1" scale (this rate may vary from about 10 to 100 counts per minute).
 - Do not use the meter if it does not register a background reading.
- Check Count Rate Meter Probe
 - Hold the supplied check source up to the probe window.
 - Note the count rate.
 - Do not use the survey meter if the counts per minute registered do not fall within $\pm 20\%$ of the expected reading for the source.

5.2 Ludlum Model 177 Stationary Alarm Ratemeter Check List: Prior to use of the Ludlum Model 177 Stationary Alarm Ratemeter, the operation of the meter and probe will be checked using the following procedure:

- Check Power supply
 - Turn the switch to "ON."
 - The needle on the meter face should move to a position representative of background readings in the X1 position.
- Check Count Rate Meter Speaker
 - Turn the audio switch, if present, to "ON."
 - Set the count rate meter scale to "X1."
 - The rate meter should "chirp" or "click."
 - If the speaker does not function, survey meter can be used, but the surveyor will need to check the meter reading or display frequently.
- Check Background
 - Note the count rate when the count rate meter is set to the "X1" scale (this rate may vary from about 10 to 100 counts per minute).
 - Do not use the meter if it does not register a background reading.
- Check Count Rate Meter Probe
 - Hold the supplied check source up to the probe window.
 - Note the count rate.
 - Do not use the survey meter if the counts per minute registered do not fall within $\pm 20\%$ of the expected reading for the source.

Note: although the surveys shall be conducted for the detection of radiation above background, the alarm set point shall be 60 counts per minute above background, or as

specified in the CHDT *Standard Operating Procedure on NORM/TENORM Equipment Surveys*.

- 5.3 **PERSONNEL SURVEYS:** Personnel surveys shall be conducted using a count rate survey meter and the following procedure:
- Turn on the meter and perform the checklist for the count rate meter (Sections 4.1 or 4.2 above).
 - The survey limits should be the detection of radiation levels above background.
 - Hold the probe 1 cm from the body surface being surveyed and move the probe slowly over the surface, approximately 2 inches per second.
 - If the count rate increases, pause for 5 to 10 seconds over the area to provide for adequate time for instrument response.
 - If count rates in excess of background are detected, decontamination according to the procedure in Section 5.4 shall be followed prior to re-surveying.
 - The survey order will be from head to foot, as follows:
 - Frisk the hands before picking up the probe (for the stationary meter, while the probe is still in the meter holder).
 - Head – pause at the mouth and nose for five seconds
 - Neck
 - Arms
 - Chest and abdomen
 - Back, hips, and seat of pants
 - Legs – pause at the knees and cuffs for five seconds
 - Tops of shoes
 - Bottom of shoes
 - Personal items – hats, gloves, notebooks, equipment, etc.
 - Determination of removable contamination shall be made using a two inch diameter filter paper to wipe a surface (i.e., clothes, shoes, or other items). The filter paper shall be applied to the surface with moderate pressure, and shall wipe about 100 cm² (about four inches by four inches) of surface area. The filter paper shall then be held in close proximity of the count rate meter probe to determine the presence of elevated levels of removable NORM/TENORM contamination. Verification of contamination may be accomplished by sending smear samples to the CHDT laboratory for analysis using the Ludlum 3030 Alpha Beta Sample counter.
- 5.4 **PERSONNEL DECONTAMINATION:** When decontamination is required, the initial and final results of the survey shall be recorded on the CHDT survey form shown in Attachment 1 to verify and document the effectiveness of personnel decontamination. NORM/TENORM waste on personnel shall be decontaminated and re-surveyed. As shown in the personnel decontamination survey form in Attachment 1, the measured counts per minute (cpm) shall be converted to disintegrations per minute (dpm), using a dpm/cpm conversion factor. Based on the manufacturer's specifications, for mixtures of

natural uranium including radium, this conversion factor is about 0.2. This factor shall be confirmed or modified by the Deer Trail RSO. The gross and net (background corrected) results for both combined (fixed plus removable) and removable surface contamination shall be recorded in dpm per 100 cm² above background on the survey form, shown in Attachment 1. The following are the procedures for personnel decontamination:

- Protective clothing may be removed and shoes or other items may be brushed clean. If clothing will not decontaminate, it shall be removed and exchanged with supplied coveralls or protective clothing.
- Skin contamination may be removed by washing the area with lukewarm water and mild soap. If contamination cannot be removed, contact the Deer Trail RSO.
- Personnel may flush ears/eyes/nose with cool, clear water to decontaminate those areas. If contamination cannot be removed, contact the Deer Trail RSO.
- Contaminated clothing can be hand washed, rinsed, and dried onsite prior to re-surveying. When the clothing is free of detectable contamination, it can be released. Collected wash and rinse water shall be managed as part of the leachate recovery system.

6.0 REFERENCES

Instruction Manual Model 3 Survey Meter, Ludlum Measurements, Inc.

Instruction Manual Model 177 Alarm Ratemeter, Ludlum Measurements, Inc.

Clean Harbors Deer Trail, LLC

SOP on NORM/TENORM Personnel Surveys

ATTACHMENT 1 – PERSONNEL DECONTAMINATION SURVEY FORM

Clean Harbors Deer Trail LLC PERSONNEL DECONTAMINATION SURVEY REPORT		Survey No.
Date	Time	Location
Individual's Name and Description of the Contamination Incident:		
Instrument/Probe Model	Ludlum Model 3 or Model 177 Meter with a Pancake GM Probe	Instrument Comments
Serial No.		
Efficiency		
Correction Factor		
Background Reading (Observed/Corrected)	cpm/ dpm	
	GROSS/NET CONTAMINATION LEVELS	
Measurement Description	Gross/Net Fixed Contamination Level (dpm/ 100cm ²)	Gross/Net Removable Contamination Level (dpm/100 cm ²)
	/	/
	/	/
	/	/
	/	/
	/	/
	/	/
	/	/
	/	/
Comments: (add additional pages, if necessary)		
For laboratory sample analysis: samples counted for _____ minutes to determine removable contamination levels.		
Survey Conducted By:		Survey Report Reviewed By:
Name (Print) _____		Name (Print) _____
Signature _____		Signature _____

Clean Harbors Deer Trail, LLC

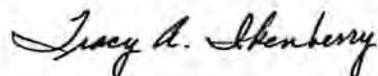
SOP on NORM/TENORM Equipment Surveys

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
NORM/TENORM EQUIPMENT SURVEYS**

Approved by:



Senior Vice President Compliance and Regulatory Affairs



Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define general and specific methods and procedures for conducting routine NORM/TENORM radiation surveys for release of equipment.
- 2.0 **SCOPE:** Radiation surveys for NORM/TENORM waste shall be performed to support release or decontamination of equipment.
- 3.0 **POLICY:** Radiation surveys of NORM/TENORM equipment, including trucks used to haul waste to the Deer Trail landfill, shall be conducted to verify waste concentrations meet unrestricted release limits, and to document the effectiveness of decontamination prior to unrestricted release.
- 4.0 **RESPONSIBILITIES:** Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer Trail NORM/TENORM Radiation Protection Plan.
- 5.0 **GENERAL SURVEY METHODS:** NORM/TENORM surveys of equipment shall be conducted using a Ludlum Model 3 Portable survey Meter for localized (hot spot) measurements, a Ludlum Model 193-6 Survey Wand for large area scanning measurements, supported by CHDT laboratory sample analyses using the Ludlum 3030 alpha beta sample counter, as described below.
 - 5.1 **Count Rate Meter Instrument Check List:** Prior to use of the Ludlum Model 3 Survey Meter or the Ludlum Model 193-6 Survey Wand, the operation of the meter and probe used shall be checked using the following procedure:
 - Check Batteries
 - Turn the switch to "BAT" or flip the "BAT" switch to "ON."
 - The needle on the meter face should move to a position within or beyond the indicated area on the meter scale.
 - Replace batteries if needed before use.
 - Check Count Rate Meter Speaker

- Turn the audio switch, if present, to "ON."
- Set the Fast-Slow toggle switch to "f."
- Set the count rate meter scale to "X1."
- The rate meter should "chirp" or "click."
- If the speaker does not function, the survey meter can be used, but the surveyor will need to check the meter reading or display frequently.
- Check Background
 - Go to an area removed from the NORM/TENORM waste. Note, the Ludlum Model 193-6 Survey Wand has a six inch diameter by one inch thick plastic scintillation detector which will automatically accumulate background to determine an alarm setting. The alarm setting shall be determined by the Deer Trail RSO as described in Section 5.2 below.
 - Note the background count rate when the count rate meter is set to the "X1" scale (this rate may vary from about 10 to 100 counts per minute).
 - Do not use the meter if it does not register a background reading.
- Check Count Rate Meter Probe
 - Hold the supplied check source up to the probe window.
 - Note the count rate.
 - Do not use the survey meter if the counts per minute registered do not fall within $\pm 20\%$ of the expected reading for the source.

5.2 **EQUIPMENT AND TRUCK SURVEYS:** Equipment surveys shall be conducted for equipment leaving the NORM/TENORM areas designated in the CHDT *Standard Operating Procedure on NORM/TENORM Landfill Operations*. These surveys shall be performed for trucks or containers leaving the disposal cells, and earthmoving equipment used to emplace and cover the waste. The survey limits shall be set to meet the levels in ANSI/HPS N13.12-1999, "Surface and Volume Radioactivity Standards for Clearance." These values are summarized in Table 1 for NORM/TENORM radionuclides or radionuclide mixtures. For example, using a detector efficiency of 0.2 for the Ludlum Model 3 survey meter and GM probe for uranium mixtures, and an average background rate of 100 cpm (500 dpm), the Group 1 value of 600 dpm per 100 cm² from Table 1 would equate to an instrument reading of 220 cpm (220 cpm minus 100 cpm background, divided by 0.2 equals 600 dpm). The Deer Trail RSO will evaluate the instrument response and confirm or modify the detector efficiency, and determine the appropriate alarm setting for the Ludlum Model 193-6 Survey Wand. Determination of alpha contamination (Group 2 radionuclides in Table 1) shall be accomplished by sending samples to the CHDT laboratory for analysis using the Ludlum 3030 Alpha Beta Sample counter. The general procedure for equipment and truck surveys is as follows:

- An area immediately outside to the landfill exit shall be designated as the survey/decontamination area. This area is located on the concrete road leading to the landfill. The area shall be marked and designated by signs, paint or chalk markings, traffic cones, barricades, or other means. The survey/decontamination area shall be used to conduct exit surveys, inspection, and decontamination of waste trucks exiting the landfill.
- For trucks, after the waste is unloaded and the truck bed is visually inspected, the truck shall exit the landfill and proceed to the decontamination area. Truck tires

shall have any visible soil particles removed by sweeping. Through the *Standard Operating Procedure on Landfill Operations*, truck tires should only come into contact with clean soil. The cargo space shall be surveyed using the survey limits described above using Ludlum Model 193-6 Survey Wand, supported by the Ludlum Model 3 survey meter and GM probe for localized (hot spot) measurements. When it is suspected that the truck tires may have become contaminated, they will be surveyed using the Ludlum Model 193-6 Survey Wand, supported by the Ludlum Model 3 survey meter and GM probe, as required, for localized (hot spot) contamination. If radioactive material is detected, the cargo space and/or tires shall be decontaminated as described in Section 5.3 below.

- A total of at least four representative smear samples shall be obtained from the cargo space and/or tires (when necessary) and sent to the CHDT laboratory for analysis using the Ludlum 3030 Alpha Beta Sample counter.
- For scanning surveys, hold the probe 1 cm from the surface being surveyed and move the probe slowly over the surface, approximately 2 inches per second.
- If the count rate increases, or if the alarm sounds, pause for 5 to 10 seconds over the area to provide for adequate time for instrument response.
- If surface contamination in excess of the Table 1 values is detected, the area shall be decontaminated as described in Section 5.3 below and surveyed again.
- Contaminated equipment shall be surveyed in a manner consistent with that described for Trucks above, with a focus on areas likely to retain NORM/TENORM contamination.

5.3 **EQUIPMENT DECONTAMINATION:** When decontamination of trucks or equipment is required, the initial and final results of the survey shall be recorded on the CHDT equipment decontamination survey form shown in Attachment 1 to verify and document the effectiveness of decontamination. For trucks, if radioactive material is detected, the cargo space and/or tires, when required, shall be decontaminated. The primary method will be to sweep surfaces clean followed by washing, if necessary. For equipment, dusty or dirty areas likely to retain NORM/TENORM contamination shall be swept clean or washed to remove surface contamination. Decontamination shall continue until the survey limits are met.

Table 1. Screening Levels for Clearance from ANSI/HPS N13.12 (1999)

Radionuclide Group	Screening Levels (S.I. Units)	Surface Screening Levels (Conventional Units)	Volume Screening Levels (Conventional Units)
	(Bq/cm ² or Bq/g)	(dpm/100 cm ²) ^(a)	(pCi/g) ^(a)
Group 1 Radium and Thorium: ²¹⁰ Po, ²¹⁰ Pb, ²²⁶ Ra, ²²⁸ Ra, ²²⁸ Th, ²³⁰ Th, ²³² Th, and associated decay chains ^(b)	0.1	600	3
Group 2 Uranium: ²³⁴ U, ²³⁵ U, ²³⁸ U, Natural Uranium ^(c) and associated decay chains	1	6,000	30

(a) Rounded to one significant figure.

(b) For decay chains, the screening levels represent the total activity (i.e., the activity of the parent plus the activity of all progeny) present.

(c) Where the Natural Uranium activity equals 48.9% from ²³⁸U, plus 48.9% from ²³⁵U, plus 2.25% from ²³⁴U.

6.0 REFERENCES

ANSI/HPS N13.12-1999 "Surface and Volume Radioactivity Standards for Clearance"

Instruction Manual Model 3 Survey Meter, Ludlum Measurements, Inc.

Clean Harbors Deer Trail, LLC

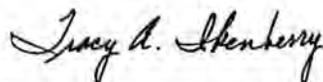
SOP on NORM/TENORM Surveys Following Spills

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
NORM/TENORM SURVEYS FOLLOWING SPILLS**

Approved by:



Senior Vice President Compliance and Regulatory Affairs



Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define general and specific methods and procedures for conducting NORM/TENORM radiation surveys following spills.
- 2.0 **SCOPE:** Radiation surveys for NORM/TENORM waste shall be performed to support and determine the effectiveness of any spill cleanup procedures that may be required.
- 3.0 **POLICY:** Radiation surveys shall be conducted to verify the effectiveness of cleanup operations following spills of NORM/TENORM waste.
- 4.0 **RESPONSIBILITIES:** Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer Trail NORM/TENORM Radiation Protection Plan.
- 5.0 **GENERAL SURVEY METHODS:** NORM/TENORM surveys following spills shall be conducted using a Ludlum Model 3 Portable survey Meter for localized (hot spot) measurements, a Ludlum Model 193-6 Survey Wand for large area scanning measurements, supported by CHDT laboratory sample analyses using the Ludlum 3030 alpha beta sample counter, as described below.
 - 5.1 **Count Rate Meter Instrument Check List:** Prior to use of the Ludlum Model 3 Survey Meter or the Ludlum Model 193-6 Survey Wand, the operation of the meter and probe used shall be checked using the following procedure:
 - Check Batteries
 - Turn the switch to "BAT" or flip the "BAT" switch to "ON."
 - The needle on the meter face should move to a position within or beyond the indicated area on the meter scale.
 - Replace batteries if needed before use.
 - Check Count Rate Meter Speaker
 - Turn the audio switch, if present, to "ON."
 - Set the Fast-Slow toggle switch to "F."

- Set the count rate meter scale to "X1."
- The rate meter should "chirp" or "click."
- If the speaker does not function, the survey meter can be used, but the surveyor will need to check the meter reading or display frequently.
- Check Background
 - Go to an area removed from the NORM/TENORM waste. Note, the Ludlum Model 193-6 Survey Wand has a six inch diameter by one inch thick plastic scintillation detector which will automatically accumulate background to determine an alarm setting. The alarm setting shall be determined by the Deer Trail RSO as described in Section 5.2 below.
 - Note the background count rate when the count rate meter is set to the "X1" scale (this rate may vary from about 10 to 100 counts per minute).
 - Do not use the meter if it does not register a background reading.
- Check Count Rate Meter Probe
 - Hold the supplied check source up to the probe window.
 - Note the count rate.
 - Do not use the survey meter if the counts per minute registered do not fall within $\pm 20\%$ of the expected reading for the source.

5.2 **SURVEYS FOLLOWING SPILLS:** Surveys shall be performed for areas where spills of NORM/TENORM waste have occurred. The survey limits shall be set to meet the levels in ANSI/HPS N13.12-1999, "Surface and Volume Radioactivity Standards for Clearance." These values are summarized in Table 1 for NORM/TENORM radionuclides or radionuclide mixtures. For example, using a detector efficiency of 0.2 for the Ludlum Model 3 survey meter and GM probe for uranium mixtures, and an average background rate of 100 cpm (500 dpm), the Group 1 value of 600 dpm per 100 cm² from Table 1 would equate to an instrument reading of 220 cpm (220 cpm minus 100 cpm background, divided by 0.2 equals 600 dpm). The Deer Trail RSO will evaluate the instrument response and confirm or modify the detector efficiency, and determine the appropriate alarm setting for the Ludlum Model 193-6 Survey Wand. Determination of alpha contamination (Group 2 radionuclides in Table 1) shall be accomplished by sending samples to the CHDT laboratory for analysis using the Ludlum 3030 Alpha Beta Sample counter. The general procedure for equipment and truck surveys is as follows:

- Turn on the meter and perform the checklist for the count rate meter (Section 5.1 above).
- Hold the probe 1 cm from the surface being surveyed and move the probe slowly over the surface, approximately 2 inches per second.
- If the count rate increases, or if the alarm sounds, pause for 5 to 10 seconds over the area to provide for adequate time for instrument response.
- Determination of alpha contamination (Group 2 radionuclides in Table 1) shall be accomplished by sending samples to the CHDT laboratory for analysis using the Ludlum 3030 Alpha Beta Sample counter.

5.2 **DECONTAMINATION FOLLOWING SPILLS:** If count rates in excess of the survey limits are detected, the area shall be decontaminated and surveyed again.

- Decontamination shall consist of removing or collecting spilled or contaminated material by sweeping or shoveling (for safe disposal in the landfill).
- Following decontamination, the spill area shall be surveyed again using the procedure provided in Section 5.2 above. If contamination levels still exceed the survey limits, the area shall be decontaminated again. This process shall be repeated until the survey limits are met.
- As a final verification, smear samples shall be sent to the CHDT laboratory for analysis using the Ludlum 3030 Alpha Beta Sample counter with comparison to the values in Table 1 (dpm/100 cm²).
- The initial and final results of the survey shall be recorded on the CHDT NORM/TENORM Spill Recovery form shown in Attachment 1 to verify and document the effectiveness of spill recovery methods.

Table 1. Screening Levels for Clearance from ANSI/HPS N13.12 (1999)

Radionuclide Group	Screening Levels (S.I. Units)	Surface Screening Levels (Conventional Units)	Volume Screening Levels (Conventional Units)
	(Bq/cm ² or Bq/g)	(dpm/100 cm ²) ^(a)	(pCi/g) ^(a)
Group 1 Radium and Thorium: ²¹⁰ Po, ²¹⁰ Pb, ²²⁶ Ra, ²²⁸ Ra, ²²⁸ Th, ²³⁰ Th, ²³² Th, and associated decay chains ^(b)	0.1	600	3
Group 2 Uranium: ²³⁴ U, ²³⁵ U, ²³⁸ U, Natural Uranium ^(c) and associated decay chains	1	6,000	30

(a) Rounded to one significant figure.

(b) For decay chains, the screening levels represent the total activity (i.e., the activity of the parent plus the activity of all progeny) present.

(c) Where the Natural Uranium activity equals 48.9% from ²³⁸U, plus 48.9% from ²³⁴U, plus 2.25% from ²³⁵U.

6.0 REFERENCES

Instruction Manual Model 3 Survey Meter, Ludlum Measurements, Inc.

Clean Harbors Deer Trail, LLC

SOP on NORM/TENORM Surveys Following Spills

ATTACHMENT 1 – NORM/TENORM SPILL RECOVERY SURVEY FORM

Clean Harbors Deer Trail LLC NORM/TENORM SPILL RECOVERY SURVEY REPORT		Survey No.
Date	Time	Location
Spill Location and Description of the Incident:		
Instrument/Probe Model	Survey Meter	Instrument Comments
Serial No.		
Efficiency		
Correction Factor (Convert to dpm)		
Background Reading	cpm dpm	
Ludlum Model 193-6 Alarm Set Point	% of full scale deflection	
Measurement Description	CONTAMINATION LEVELS	
	Gross/Net Contamination Level (dpm/100 m ²)	Gross/Net Removable Contamination Level (dpm/100 cm ²)
	/	/
	/	/
	/	/
	/	/
	/	/
	/	/
	/	/
Comments: (add additional pages, if necessary)		
For laboratory sample analysis: samples counted for _____ minutes to determine removable contamination levels.		
Survey Conducted By:		Survey Report Reviewed By:
Name (Print) _____		Name (Print) _____
Signature _____		Signature _____

Clean Harbors Deer Trail, LLC

SOP on NORM/TENORM Gamma Spectra Analysis

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
GAMMA SPECTRA ANALYSIS**

Approved by:

Phillip S. Retallick

Senior Vice President Compliance and Regulatory Affairs

Tracy A. Ikenberry

Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define general and specific methods and procedures for conducting gamma spectra analysis to identify radionuclides in waste received at the Deer Trail landfill.
- 2.0 **SCOPE:** Radiation surveys for NORM/TENORM waste shall be performed to ensure that waste received at the Deer Trail landfill is consistent with the NORM/TENORM waste acceptance criteria as defined in the CHDT *NORM/TENORM Radiation Protection Plan*, and to verify that licensed radioactive materials from other sources is rejected.
- 3.0 **POLICY:** Radiation surveys shall be conducted by trained Deer Trail staff for all waste shipments, and to verify that radioactive materials from other sources are not disposed at the Deer Trail landfill.
- 4.0 **RESPONSIBILITIES:** Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer Trail NORM/TENORM Radiation Protection Plan.
- 5.0 **GENERAL METHODS FOR SPECTRA ANALYSIS:** The Exploranium GR-135 Identifier (hand held gamma spectrometer) shall be used by trained Deer Trail staff to determine the relative contribution of radionuclides in waste received at the Deer Trail Landfill. The measurements shall not be used to establish personnel dose rates. Measurements shall be taken where the exposure rate is less than 2 mR/hour. When using the GR-135 spectrometer, the following procedure shall be used:
 - Verify that the GR-135 Identifier is seated in the charger with the display reading "SYSTEM READY."
 - Verify that the battery icon in the upper right corner of the display indicates the battery is at least ½ charged.
 - Remove the GR-135 Identifier from the charger.
 - The GR-135 Identifier will be in the "SEARCH" mode.

- Note that if the GR-135 is to be transported to another location, then it shall be shut down for transport and turned on again at the desired location. To turn off the GR-135 Identifier, push the thumb lever to the "OFF" position AND hold it there until the unit reads "TURNING OFF" AND counts down 3-2-1 AND the screen goes blank, then reverse the lever.
- To turn on the GR-135 Identifier, push the thumb lever to "ON" for 2 seconds, then release. The GR-135 should be in the "SEARCH" mode. If this does not occur, discontinue use and contact the Deer Trail RSO.
- In "SEARCH" mode, the GR-135 Identifier will display the current dose rate in $\mu\text{R}/\text{hour}$ in the bottom left corner of the display.
- The GR-135 will alarm when the dose rate increases above the initial level measured at the time the GR-135 was turned on.
- To characterize the type of material in a radioactive source, push the thumb lever to "ON" for approximately 2 seconds and release.
- The GR-135 will count for the time interval displayed on the left lower portion of the display (typically 1 minute).
 - If the box in the upper right portion of the display reads "OK," then allow the GR-135 to count until count is complete and the GR-135 beeps. The GR-135 will either display "NO NUCLIDES Detected" or display a list of radionuclides detected in the sample. The GR-135 will display a text message "SPECTRUM STORED AS #XX" at the bottom of the display window; record details for each collected spectrum for later reference and analysis on Attachment 1 – Exploranium GR-135 Data Log.
 - If the box in the upper right portion of the display reads "MOVE CLOSER," THEN move the GR-135 closer to the source of radiation being characterized until the display reads "OK." Go to the previous step for operation.
 - If the box in the upper right portion of the display reads "MOVE AWAY," THEN move the GR-135 farther away from the source being characterized until the display reads "OK."
 - Note that sometimes the radiation levels are too low to register in a one minute sample period, and the unit will show "NO NUCLIDES FOUND." In some cases, increasing the sample time will improve the analysis. If this occurs, or if a longer count time is wanted, push the thumb level to "OFF" and release it to obtain a longer sample count time.
 - To count a different sample, press the thumb lever momentarily to "OFF," which will switch the unit to the "SEARCH" mode. Repeat the above steps to count a new spectrum.
- When finished, place the GR-135 into the Docking Station.

6.0 SAVING A SPECTRUM TO A COMPUTER FOR ANALYSIS:

- On a personal computer with "Identiview 135" software installed, open the software. The computer will display download progress and count down the number of spectra remaining to be downloaded. The computer will display a box with the words "SO YOU WANT TO SAVE THE DATA?"
- Under a filename, input the data in YYYYMMDD format, followed by up to 30 characters and spaces of additional text to help identify the recorded spectrum.
- Enter this filename on Attachment 1 – Exploranium GR-135 Data Log.
- Click on the Save box.
- The computer will prompt "DATA STORED DO YOU WANT TO ERASE THE GR-135 MEMORY;" select "YES." The computer will prompt, "ARE YOU SURE?" Select "YES."
- The spectral data may be viewed, if desired. When finished, shut down the program by double clicking on the red "X" in the upper right hand corner of the Identiview software window. When finished, place the GR-135 in the charger to charge the batteries and stabilize the unit.

6.0 REFERENCES

GR-135 The Identifier System Manual, Part #87317, Exploranium, Inc.

Clean Harbors Deer Trail, LLC

SOP on Use of the Alpha Beta Sample Counter

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
USE OF THE ALPHA BETA COUNTER**

Approved by:

Phillip S. Retallick

Senior Vice President Compliance and Regulatory Affairs

Tracy A. Ikenberry

Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define general and specific methods and procedures for conducting sample analysis for detection of alpha and beta radiation on smear samples in support of NORM/TENORM waste disposal at the Deer Trail landfill.
- 2.0 **SCOPE:** Radiation surveys, including the analysis of removable surface contamination, for NORM/TENORM waste shall be performed to ensure that waste received at the Deer Trail landfill is consistent with the NORM/TENORM waste acceptance criteria as defined in the CHDT NORM/TENORM Radiation Protection Plan.
- 3.0 **POLICY:** Radiation surveys shall be conducted by trained Deer Trail staff to verify that radioactive materials from other sources are not disposed at the Deer Trail landfill.
- 4.0 **RESPONSIBILITIES:** Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer Trail NORM/TENORM Radiation Protection Plan.
- 5.0 **GENERAL METHODS FOR ALPHA BETA SAMPLE ANALYSIS:** Surface contamination samples shall be collected on two inch diameter filter media and transported to the CHDT laboratory in plastic bags for counting with the Ludlum Model 3000 Alpha Beta Scaler using the following procedure:
 - Verify that the Ludlum Model 3000 has power and is ready to count samples.
 - Perform the quality control daily check as described in the instrument manual.
 - Prior to sample counting, on a daily basis, background counts shall be made for 20 minutes. Typical alpha background is about 3-5 cpm. Typical beta-gamma background is 50 – 100 cpm.
 - Using the PC based software, perform system setup and calibration routines. Set the counter to the “DPM” mode and insert a 4 π Alpha efficiency of 39% (for ²³⁸U) and a 4 π Beta efficiency of 29% (for ¹³⁷Cs). Note, these efficiencies are initial settings provided

by the manufacturer, to be confirmed by the Deer Trail RSO. The Deer Trail RSO will establish the minimum detectable concentration for the Ludlum Model 3030 Alpha Beta Scaler using samples in the field.

- Set the "background subtract" mode to subtract background for alpha and beta radiation.
- Count the sample for 5 minutes and log the results using the software by inserting the sample number, date, time, alpha count, and beta count.
- Determine if the sample is less than the survey limits defined for the specific survey being conducted. For routine and personnel surveys, the survey limit is background. For spills and release of equipment, the survey limit is determined from Table 1. Note that the sum of fractions rule is used to determine overall compliance for alpha and beta emitting radionuclides.
- Using the PC based software, record details for each sample count for later reference and analysis. If the count results are in excess of the survey limit, notify the individual performing the survey and the Deer Trail RSO.

Table 1. Screening Levels for Clearance from ANSI/HPS N13.12 (1999)

Radionuclide Group	Screening Levels (S.I. Units)	Surface Screening Levels (Conventional Units)	Volume Screening Levels (Conventional Units)
	(Bq/cm ² or Bq/g)	(dpm/100 cm ²) ^(a)	(pCi/g) ^(a)
Group 1 Radium and Thorium: ²¹⁰ Po, ²¹⁰ Pb, ²²⁶ Ra, ²²⁸ Ra, ²²⁸ Th, ²³⁰ Th, ²³² Th, and associated decay chains ^(b)	0.1	600	3
Group 2 Uranium: ²³⁴ U, ²³⁵ U, ²³⁸ U, Natural Uranium ^(c) and associated decay chains	1	6,000	30

(a) Rounded to one significant figure.

(b) For decay chains, the screening levels represent the total activity (i.e., the activity of the parent plus the activity of all progeny) present.

(c) Where the Natural Uranium activity equals 48.9% from ²³⁵U, plus 48.9% from ²³⁴U, plus 2.25% from ²³⁸U.

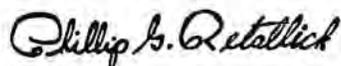
6.0 REFERENCES

ANSI/HPS N13.12-1999 "Surface and Volume Radioactivity Standards for Clearance"

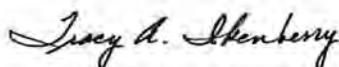
Instruction Manual Model 3030 Alpha Beta Sample Counter Meter, Ludlum Measurements, Inc.

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE FOR
NORM/TENORM LANDFILL OPERATIONS**

Approved by:



Senior Vice President Compliance and Regulatory Affairs



Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define operational procedures for control of NORM/TENORM waste.
- 2.0 **SCOPE:** This SOP defines and directs procedures for the proper operation of the landfill, and procedures for NORM/TENORM waste unloading operations. It also directs and prescribes procedures to prevent NORM/TENORM contamination from leaving the landfill.
- 3.0 **POLICY:** Landfill operations shall be performed as appropriate to prevent NORM/TENORM contamination from leaving the landfill. The goal is to prevent the spread of NORM/TENORM contamination to people, equipment and the environment and to keep other parts of the Deer Trail facility free from NORM/TENORM contamination.
- 4.0 **RESPONSIBILITIES:** Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer trail NORM/TENORM Radiation Protection Plan.
- 5.0 **DEFINITIONS:**
 - 5.1 **Landfill:** means the area or spaced located inside the landfill liner system.
 - 5.2 **Decon Area:** means an area immediately outside the landfill exit that will be used to conduct inspections, exit surveys, and/or decontamination of trucks exiting the landfill immediately after unloading NORM/TENORM materials. The area shall be marked and designated by signs, paint or chalk markings, traffic cones, barricades, or other means.
 - 5.3 **Bed Liner:** means a sheet of plastic material that is used to form an impervious liner in the bed of a dump truck, dump trailer, or roll-off box.
 - 5.4 **Clean Equipment:** means any CHDT trucks or equipment of which the equipment exterior does not come directly into contact with NORM/TENORM waste. Examples of this may include the CAT D8 Bulldozer, the Dresser Bulldozer, Volvo A-25 haul trucks, pickups, service trucks and other site equipment that does not directly contact NORM/TENORM waste.

- 5.5 NORM/TENORM Contaminated Equipment: means any CHDT trucks or equipment whose exteriors come into direct contact with NORM/TENORM waste. Examples include the CAT D6 Bulldozer and CAT 815 Compactor used in the landfill. NORM/TENORM equipment shall undergo decontamination procedures and a radiation survey, as defined in the CHDT *Standard Operating Procedure on NORM/TENORM Surveys for Equipment*, before it can be considered to be clean equipment.
- 5.6 Landfill Equipment: means earthmoving equipment (e.g., CAT D6 bulldozer and/or CAT 815 compactor) that is normally located inside the landfill and used in the landfill to push, spread and compact waste material.
- 5.7 Clean Area: means areas of the facility that are not associated with NORM/TENORM waste treatment or disposal and landfill areas that have been covered with two inches of soil to prevent individuals or equipment (e.g., trucks, earthmoving equipment, etc.) from potentially contacting NORM/TENORM waste.
- 6.0 LANDFILL OPERATIONS: The Deer Trail facility will be operated in two different modes, depending on the type of waste received. They are the NORM/TENORM mode and the non-NORM/TENORM mode. The following describes the two different modes of operation and the different operations that will occur in the landfill.
- 6.1 Non-NORM/TENORM Mode of operation will allow for the disposal of hazardous and nonhazardous waste in the landfill in accordance with the RCRA hazardous waste facility permit. After a load of hazardous waste or nonhazardous waste has met the waste acceptance criteria specified in the Waste Analysis Plan (WAP) in the RCRA hazardous waste permit, the truck will proceed to the landfill as directed by facility staff. The truck will enter the landfill via a dirt haul road. The truck will proceed to an area and discharge the waste load in an unloading area specified by facility personnel. The dirt haul road inside the landfill will be marked using signs, paint, chalk, traffic cones, barricades or some other means to direct truck traffic to the designated area. After the waste has been unloaded, the truck will exit the landfill, usually via the entrance road. In future cells, the landfill may be constructed with a separate entrance and exit dirt haul road(s). The waste in the unloading area will be pushed by a bulldozer or compactor to its burial location and compacted as described in Section 6.4 of this SOP. CHDT anticipates that the landfill will be operated mainly in this mode of operation. This mode of operation will not require an assessment for radionuclide contamination since the truck will be traveling on clean soil and will not contact NORM/TENORM contaminated material. In addition, the unloading area location and haul road(s) locations will be modified to support operations as the landfill is filled to capacity.
- 6.2 NORM/TENORM mode of operation shall consist of facility personnel directing the transporter to the landfill, the truck traveling on clean dirt haul roads inside the landfill, where the haul road(s) and unloading area shall be delineated as mentioned in the non-NORM/TENORM mode of operation in Section 6.1, and the waste being compacted as described in Section 6.4. As the truck exits the landfill, the truck shall be required to follow the procedures in Section 6.3 depending on whether or not the truck was transporting licensed or non-licensed NORM/TENORM waste material. Covering the NORM/TENORM burial area with clean soil may occur anytime during the operating day or at the end of the operating day depending on the time of day, the amount of hazardous and/or nonhazardous waste to be received, or the amount of NORM/TENORM waste be accepted. In any event, the burial area shall be covered with clean soil prior to

returning the landfill to the non-NORM/TENORM mode of operation. CHDT intends to coordinate its operations by having loads of NORM/TENORM scheduled for acceptance to limit the amount of time the landfill will be operated in the NORM/TENORM mode of operation.

6.3 Landfill Exiting Procedures for Trucks Transporting NORM/TENORM Wastes: the landfill exiting procedures for a truck transporting licensed or non-licensed NORM/TENORM waste are as follows:

6.3.1 Landfill Exiting Procedures for Trucks Transporting Non-licensed NORM/TENORM Waste Material: After a truck of NORM/TENORM waste material from a non-licensed source has unloaded in the landfill, the interior of the dump trailer or roll-off bin shall be inspected for visible evidence of residual waste. If residual waste is present, the waste shall be removed prior to the truck exiting the landfill. Typically, the truck dump trailer bed or interior of a roll-off-bin will be lined with a bed liner which prevents the waste from contacting the inside of the truck bed or roll-off bin. After all visible evidence of waste residue has been removed, the truck will travel to the decon area at the exit of the landfill.

The truck tires will not be routinely surveyed for radiation contamination since the truck is traveling on haul roads and unloading areas constructed of clean soil that separates the vehicle tires from NORM/TENORM wastes (i.e., truck tires will not contact NORM/TENORM waste) and since a survey of the haul roads soil will be performed in accordance with Section 6.6. If the truck tires contact NORM/TENORM (e.g., the truck driver accidentally backs over a pile of NORM/TENORM waste or drives off the clean soil onto NORM/TENORM contaminated areas) containing waste material, the truck tires shall be swept to remove soil particles. After sweeping, the truck tires shall be surveyed for the presence of radioactivity as defined in the CHDT *Standard Operating Procedure on NORM/TENORM Surveys for Equipment*. If radioactive material above the survey limit is detected, the truck tires shall be decontaminated and re-surveyed.

Since the truck is transporting non-licensed NORM/TENORM waste, CHDT does not anticipate surveying the interior of the truck dump trailer or roll-off bin for radionuclides following the visual inspection.

6.3.2 Landfill Exiting Procedures for Trucks Transporting Licensed NORM/TENORM Waste Material: After a truck of containing NORM/TENORM waste from a licensed source is unloaded and the interior of the truck bed or roll-off bin is inspected for residual waste material, the truck shall exit the landfill and proceed to the decon area. The truck bed will be inspected in the unloading area to verify that all of the licensed NORM/TENORM containing waste has been removed from the truck. Typically, the truck bed or roll-off-bin will be lined with a bed liner which prevents the waste from contacting the inside of the truck bed or roll-off bin. After all visible evidence of waste residue has been removed, the truck will travel to the decon area at the exit of the landfill.

The truck tires will not be surveyed for radiation contamination since the truck is traveling on haul roads and unloading areas constructed of clean soil that separates the vehicle tires from the NORM/TENORM waste (i.e., truck tires will

not contact NORM/TENORM waste) and since a survey of the haul road will be performed in accordance with Section 6.6. If the truck tires contact NORM/TENORM waste (e.g., the truck driver accidentally backs over a pile of NORM/TENORM waste or drives off the clean soil onto NORM/TENORM contaminated areas), the truck tires shall be swept to remove soil particles. After sweeping, the truck tires shall be surveyed for the presence of radioactivity as defined in the CHDT *Standard Operating Procedure on NORM/TENORM Surveys for Equipment*. If radioactive material is detected above the survey limits, the truck tires shall be decontaminated and re-surveyed.

For trucks transporting licensed radioactive materials, the interior of the truck dump trailer or roll-off bin will be surveyed for radionuclide contamination in accordance with the CHDT *Standard Operating Procedure on NORM/TENORM Surveys for Equipment*. If contamination is detected above the survey limit, the interior of the truck dump trail or roll-off bin trailer will be swept and/or washed, if necessary, until the interior of the truck dump trailer or roll-off bin is determined to meet the release criteria in the CHDT *Standard Operating Procedure on NORM/TENORM Surveys for Equipment*.

- 6.4 Waste Placement and Compaction: NORM/TENORM waste shall be placed in the landfill in lifts of 2-6 feet high. Waste locations are measured on a 50-foot by 50-foot grid system. The location of each load of waste shall be recorded. Location is determined by a number and letter sequence for north-south, and east-west grids. The grid location and the elevation level of the top of the lift will document the location of each load. Waste shall be compacted in place to meet the standards required by the RCRA permit. Multiple passes with the CAT D6 Bulldozer, the CAT 815 compactor, or other similar equipment shall accomplish compaction. Debris-like waste shall be mixed with soil like waste and compacted in place. Alternatively, size reduction of the debris waste shall be done using multiple passes with the compactor. All void spaces in the waste shall be filled with waste or eliminated through compaction. No debris placement shall be permitted near the liner. In order to protect the synthetic liner from possible punctures, a two-foot thick protective sand layer shall be placed on the immediate liner surface. The sand layer shall also provide a permeable surface whereby rainwater in the cell can migrate down the liner to the leachate sump and be removed. All waste placement and compaction shall be done in compliance with the requirements of the RCRA Operating permit.
- 6.5 Prevention of Wind Dispersal: Several mechanisms shall be used to prevent the wind dispersal of waste outside the landfill. Cover material shall be placed over the waste at the end of each landfill-operating day. Types of cover material may include 2 inches of soil, geotextile fabrics, spray foam, or other effective materials. The facility is equipped with a wind gauge and an alarm system which provides a warning if sustained wind speeds exceed 35 miles per hour. If the wind speed exceeds a sustained speed of 35 miles per hour, truck-unloading operations in the landfill will cease. A stockpile of cover material shall be kept in the landfill whenever waste placement is above the rim of the landfill liner system. If 35 mile per hour sustained wind speeds occur, any exposed areas of waste shall be covered within a two-hour period. Alternatively, the NORM/TENORM may be wetted with water to control dispersion until a cover material is applied to the landfill. The clean soil on the haul road and the dumping area shall be wetted down with water when necessary to control dust from truck traffic in the landfill.

- 6.6 Maintenance of Haul Roads: At the end of each operating day of NORM/TENORM waste disposal in the landfill, clean soil shall be brought into the landfill and spread over the haul road and the dumping area. Clean soil shall be placed using the clean equipment. NORM/ TENORM contaminated equipment shall stay off all designated clean areas. Landfill haul roads shall have dry soil placed on them after a precipitation event, if necessary. Area surveys shall be conducted each time clean soil is emplaced using the CHDT *Standard Operating Procedure on Area Surveys for NORM/TENORM* to ensure isolation of NORM/TENORM waste.
- 6.7 Removal of Landfill Equipment from the landfill: NORM/TENORM contaminated equipment (e.g., CAT D6 bulldozer, CAT 815 compactor) equipment shall be decontaminated before removal from the landfill. Alternatively, it may be transported to the treatment building for washing and decontamination.
- 6.8 CHDT Haul Trucks and Clean Equipment: Clean equipment may enter and leave the landfill, as needed, provided they only travel on areas of the landfill that are covered with clean soil. Frisk out shall not be done on this equipment unless it leaves the clean areas of the landfill.
- 6.9 RUN ON/RUN OFF CONTROL: Run On/Run Off Controls and procedures are presented in detail in Section VI of the RCRA operating permit.
- 6.10 LEACHATE COLLECTION: Requirements for leachate collection are presented in detail in Section VI of the RCRA operating permit
- 7.0 PERSONAL PROTECTIVE EQUIPMENT AND PERSONNEL DECONTAMINATION: Standard personal protective equipment (PPE) for use in the landfill consists of a full face air purifying respirator and combination cartridges, a porous disposable Tyvek suit, plastic liner gloves with cloth or leather over gloves, and boots. Personnel may leave the landfill whether on foot or on a vehicle. Persons entering the vehicle on clean vehicles may not leave the vehicle in the landfill except in clean areas such as the haul road and the dump area. Persons working in NORM/TENORM equipment or walking on the NORM/TENORM landfill surface shall be surveyed after leaving the landfill using the CHDT *Standard Operating Procedure on NORM/TENORM Personnel Surveys*. If the survey results determine that radioactive material is present, the PPE shall if be removed and disposed and the individual surveyed again. Reusable PPE such as boots and respirators may be decontaminated if contaminated. Other PPE may be used as long as they provide equivalent protection.

Clean Harbors Deer Trail, LLC

SOP on Waste Tracking

**CLEAN HARBORS DEER TRAIL LLC
STANDARD OPERATING PROCEDURE ON
WASTE TRACKING**

Approved by:

Phillip S. Retallick

Senior Vice President Compliance and Regulatory Affairs

Judy A. Ikenberry

Radiation Safety Officer

Date: April 25, 2005

Effective Date: Date License is Issued

- 1.0 **OBJECTIVE:** To define operational procedures for tracking waste through receipt, movement, treatment, and disposal at the CHDT facility.
- 2.0 **SCOPE:** This SOP defines the procedures, electronic files, hardcopy forms, and their use in tracking waste at CHDT. It does not cover documentation of laboratory analysis, wastewater treatment plant operations, and radiation surveys, which are covered in other procedures.
- 3.0 **POLICY:** All waste received from off site, or generated on site, will have its properties and disposition properly documented in compliance with the RCRA permit and Colorado regulations. All waste storage, movements, treatment, disposal, and shipment off site will be properly documented in compliance with the RCRA permit and Colorado regulations.
- 4.0 **RESPONSIBILITIES:** Responsibilities of the Deer Trail Radiation Safety Officer (RSO), management, and staff are defined in the Deer trail NORM/TENORM Radiation Protection Plan.
- 5.0 **TRACKING FORM FORMAT:** Tracking forms are subject to frequent revision in order to resolve new and unforeseen circumstances and to improve recordkeeping. Minor changes in form format may be made a any time.
- 6.0 **WASTE TRACKING FORMS:** Copies or examples of hardcopy tracking forms and records are provided in Appendix 1. CHDT utilizes hardcopy bound logbooks in addition to database records and hardcopy forms for tracking waste on site. These logbooks are not presented in this SOP.
- 7.0 **TRACKING PROCEDURES:** A step-by-step description of the waste tracking process follows.
 - 7.1 **Uniform Manifest:** A uniform hazardous waste manifest (shown in Attachment 1) will usually be used by the waste shipper to document the waste shipment and end facility. Alternatively, if applicable, a uniform radioactive waste manifest will be used. The utilization of these forms is governed by regulation. After a shipment is received at the facility, and any discrepancies are resolved, the manifest will be signed for by the facility, and a copy will be sent back to the waste generator.

- 7.2 Weight Ticket: Each shipment of waste is weighed at the truck scales at the front of the facility. Gross, tare, and net weight are shown on the weight ticket. Radiation dose rates determined by the portal monitor are recorded on the weight ticket (Attachment 2).
- 7.3 Gate Log: Information on each incoming waste shipment will be entered in the gate log electronic file, as shown in Attachment 3. Each operating day, a hardcopy printout of the gate log will be printed out and filed. Each incoming load is assigned a load number. This load number will be used as the identification number for filing all incoming load documentation.
- 7.4 Site Generated Log: Information on each quantity of site-generated waste will be entered in the site generated log electronic file (Attachment 4). Each operating day, a hardcopy printout of the site-generated log will be printed out and filed. Each incoming load is assigned a load number. This load number will be used as the identification number for filing all incoming load documentation.
- 7.5 Waste Receiving Report: Information is entered into the Clean Harbors Internet based company wide waste tracking system (WIN WEB), as shown in the example form in Attachment 5. A unique container id number is then generated and a Waste Receiving Report is printed out from this system. This report contains information about the shipment as well as the unique transport container number.
- 7.6 Waste Tracking Form: A Waste Tracking Form is generated. There are two types of waste tracking forms that are similar in nature and use. The Waste Tracking Form will be used to track onsite movements or creation of waste (Attachment 6). The Wastewater Tracking Form (Attachment 7) will be used to track the generation and movement of wastewater on site. The technician responsible for the waste generation and or movement must sign the form.
- 7.7 Work Orders: There are two types of work orders: Stabilization Work Orders (Attachment 8), and Landfill Work Orders (Attachment 9). These work orders will require prior authorization by the General Manager or his designee before the activity can occur. They direct waste treatment and landfill activities. After they are completed, the personnel responsible for the activity will sign and date the form and fill in any necessary information.
- 7.8 Stabilization Recipe: This form provides the information necessary for treatment operations; it contains mixing and reagent addition instruction and safety precautions.
- 7.9 Bulk Container Inventory: An inventory of bulk containers will be made each operating day (an example inventory form is shown in Attachment 10). The location identification and description of each bulk container will be entered in the Bulk Container Inventory form printed out each day. Each day's form will be filed.

Clean Harbors Deer Trail, LLC

SOP on Waste Tracking

ATTACHMENT 1 – UNIFORM MANIFEST

Please print or type. (Form designed for use on elite (12-pitch) typewriter.) Form Approved, OMB No. 2050-0039 Expires 6-30-99

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. Manifest Document No. 2. Page 1 of Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address A. State Manifest Document Number
B. State Generator's ID

4. Generator's Phone () C. State Transporter's ID

5. Transporter 1 Company Name 6. US EPA ID Number D. Transporter's Profile

7. Transporter 2 Company Name 8. US EPA ID Number E. State Transporter's ID

9. Designated Facility Name and Site Address 10. US EPA ID Number F. Transporter's Profile
G. State Facility's ID
H. Facility's Phone

11. US DOT Description (including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	13. Total Quantity	14. Unit (Wt/Vol)	15. Waste No.
a.				
b.				
c.				
d.				

I. Additional Descriptions for Materials Listed Above K. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment. OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name Signature Date
Month Day Year

17. Transporter 1 Acknowledgment of Receipt of Materials
Printed/Typed Name Signature Date
Month Day Year

18. Transporter 2 Acknowledgment of Receipt of Materials
Printed/Typed Name Signature Date
Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name Signature Date
Month Day Year

EPA Form 8700-22 (Rev. 9-86) previous editions obsolete SAFETY-CLEEN CORP.
90280 (Rev 11/98) 6

Please refer to the following instructions, gathering data, and completing and reviewing the form. Send comments regarding the burden estimates for reducing this burden, to Chief, Information Policy Branch, PH-223, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

INSTRUCTIONS FOR COMPLETION OF THIS FORM, REFER CODE OF FEDERAL REGULATIONS, 40, PART 262.20.

ORIGINAL - RETURN TO GENERATOR

Clean Harbors Deer Trail, LLC

SOP on Waste Tracking

ATTACHMENT 2 – WEIGHT TICKET

108555 East Highway 36 HCR-1
 Deer Trail, Colorado 80105-9611

Date _____, 19__

Container # _____
 W/S _____
 Manifest # _____
 Work Order # _____
 Trailer # _____

Gross
 Tare
 Net

Driver _____ [] ON [] OFF

Weighed By _____

=====
 Gate Monitor Readings For Radioactivity East _____ West _____
 =====

THREE-TIERED MANIFEST REVIEW PROCESS

THE HAZARDOUS WASTE MANIFEST
 HAS BEEN REVIEWED FOR COMPLETENESS AND ACCURACY

COMMENTS	SIGNATURE
	SAMPLE RECEIVING
	WASTE ACCEPTANCE MGR.
	SECURITY

SITE TRACKING

LOCATION	COMMENTS	TIME
____ SOLIDIFICATION		
____ CELL		
TRUCK WASH		
OTHER		

297-96

SOP on Waste Tracking

Clean Harbors Deer Trail, LLC

ATTACHMENT 5 - WASTE RECEIVING REPORT

Clean Harbors Environmental Services, Inc. Waste Receiving Report

Bulk

Plant Received Date: 3/3/2005 12:00:00AM
 Work Order #: D9927737
 Receiving Facility: Deer Trail Landfill (DR)
 Equipment: UNKNOWN

Generator: [REDACTED]
 Customer: [REDACTED]
 Manifest: [REDACTED] Crit: 1
 Generator EPA ID: [REDACTED] State EPA ID: [REDACTED]

Line Item	Shipping Name/US DOT Description	UN/NA Number	Container Size	Total Quantity	Unit	Wt/Vol	Profile Number	PKB Cpn	Hazard Class	Haz. Zone
11A	HAZARDOUS WASTE, LIQUID, N.O.S. (CHROMIUM, LEAD)	NA3082	I TT	41,000	P	CCS	CHZ8928B	III	9	MISCELLANEOUS HAZARDOUS MATERIAL

Profile Constituents (limited by Max %):
 WATERS: 70.00 METAL HYDROXIDES: 0.00 LEAD: 0.00 7.00
 CHROMIUM: 0.00 4.00 SELENIUM: 0.00 1.50

** THE PROFILE INDICATES THAT THIS WASTE CONTAINS AN OSHA REGULATED SUBSTANCE, CONTACT HEALTH & SAFETY PRIOR TO HANDLING.

Waste Codes	Outbound Profile	Description	Costs (V/N)					
0002	0007	0008	0010	Tank Cleanout	Tank Entry	None	CHI Providing Trans: Y	Quoted Tank Wash Price: [REDACTED]
LG	CCS-ARSENIC	HIGH Arsenic contaminated solids- SPECIAL TREATMENT	Y					
LG	LAC2	LIQUID ACID CONCENTRATED D002 ONLY	Y					
LG	LAC2D	LIQUID ACID CONCENTRATED, D002, D004-11	Y					
LG	LAC2DF	LIQUID ACID CONCENTRATED, D002, D004-11, F006-F012,	Y					
LG	LE2D	RYOLINE LIQUID/SLUDGE D002, D004-11	Y					
LG	LE2DF	RYOLINE LIQUID/SLUDGE D002, D004-11, F006-12, F019	Y					
LG	lg-47/57/14	ALKALINE LIQUID/SLUDGE D002, D004-11, F006-12, F019	Y					
LG	LG-CH51342	Milling/Grounding Sludge	Y					
LG	UN58-0149	SODIUM NITRATE LIQUID/ E.C.H.	Y					
LG	LND	343912 INORGANIC WASTEWATER-REG. WATER	Y					
LG	LND	NEUTRAL LIQUID/SLUDGE D004-11	Y					
LG	LND	NEUTRAL LIQUID/SLUDGE D002, D004-11, F006-12, F019	Y					
LG	SAD2DF	SOLID ACID D002, 4-11, F006-12, F019	Y					
LG	SBD	SOLID BASIC/NEUTRAL D002 & D004-11	Y					
LG	SBDNF	SOLID BASIC/NEUTRAL D004-11, F006-12, F019, F035 LOW	Y					

Restrictions:

Final Code	Qty	Cont. Type	H2O Mix (V/N)	Pb (Value)	lgm (V/N)	CN (+/-)	Sulfide (V/N)	PCB Value	Rad (V/N)	Oxid (V/N)	CC Insp	Chlorine (V/N)	Weight (pounds)	Comments
6543865	40,000	TT												

Item(s) printed for: CON5003-D9927737

ATTACHMENT 6 – WASTE TRACKING FORM

Load #			
Campaign #			
From:		To:	

Container Information

Box Number(s):			
# of Containers:	Total Weight:	Pounds	
Total Volume	Gallons		
Container Type(s):	Container Size:		
Drum Numbers:			

Waste Information

Waste Name:			
Profile #(s)			
EPA Codes:			
Radioactive? No	State/NRC Licensed Waste?	No	
Radionuclides Present: None			

Safety Information

PPE Requirements:	Level C	Special Handling:	N/A
Monitoring:	N/A	Spill Response:	Contain
Known Hazards:			
Fire Fighting:		Cell Exit Requirements:	
		Washout Requirements:	

Created by:	Date:	04/19/05
Transfer Tech:		
Actual Movement Date:		

ATTACHMENT 7 – WASTEWATER TRACKING FORM

Load #			
Campaign #			
From:		To:	
Waste Information			
Waste Name:			
Profile #(s)			
EPA Codes:			
Radioactive? No	State/NRC Licensed Waste?	No	
Radionuclides Present:	None		
Safety Information			
PPE Requirements:	Level C	Special Handling:	N/A
Monitoring:	N/A	Spill Response:	Contain
Known Hazards:		Cell Exit Requirements:	
Fire Fighting:		Washout Requirements:	
Transfer Information			
Gallons Transferred			
Method of pumping	Piping system	Vac Truck	Other
Created by:		Date:	04/19/05
Transfer Tech:			
Actual Movement Date:			

ATTACHMENT 8 – STABILIZATION WORK ORDER

Load #			
Campaign #			
From:		To:	

Container Information

Box Number(s):			
# of Containers:	Total Weight:	Pounds	
Total Volume:	Gallons:		
Container Type(s):	Container Size:		
Drum Numbers:			

Waste Information

Waste Name:			
Profile #(s)			
EPA Codes:			
Radioactive? No	State/NRC Licensed Waste?	No	
Radionuclides None Present			

Safety Information

PPE Requirements:	Level C	Special Handling:	N/A
Monitoring:	N/A	Spill Response:	Contain
Known Hazards:	Cell Exit Requirements:		
Fire Fighting:	Washout Requirements:		

Treatment Information

Treatment Formula			
Special Handling			
Equipment Required			
Instructions			

Created by:	Date:	April 19, 2005
Authorized by:	Date:	
Transfer Tech:	Date:	

ATTACHMENT 9 – LANDFILL WORK ORDER

Load #			
Campaign #			
From:		To:	

Container Information

Box Number(s):			
Number of Containers:		Total Weight:	_____ pounds
Container Type(s):		Container Size:	
Drum Numbers:			

Waste Information

Waste Name:			
Profile #(s)			
EPA Codes:			
Radioactive? No	State/NRC Licensed Waste?	No	
Radionuclides Present	None		

Safety Information

PPE Requirements:	Level C	Special Handling:	N/A
Monitoring:	N/A	Spill Response:	Contain
Known Hazards:	Cell Exit Requirements		
Fire Fighting:	Washout Requirements:		

Landfill Grids

Landfill Loads	Tier	Alp	Num	Initials	Time/Date
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Created by:		Date:	4/19/2005
Authorized by:		Date:	
Receiving/Transfer Tech:		Date:	

Clean Harbors Deer Trail, LLC

SOP on Waste Tracking

ATTACHMENT 10 – EXAMPLE BULK CONTAINER INVENTORY

Bulk Container Inventory										
7/31/2004		Prepared by: ██████████								
Type	Size	Container Number	Site # or Campaign #	Arrival Date	Days on Site	Location (A, B, or 10 Day)	Row	Order	Profile #	Comments or Car number
RO	20	UPCU410733	56024	5/21/2004	71	B	7	4	SNDEBRISO-KP-OFF	
RO	20	UPCU411688	56035	5/21/2004	71	B	7	5	SNDEBRISO-KP-OFF	
RO	20	USPC37176	56041	5/28/2004	64	B	7	6	SNDEBRISO-KP-OFF	
RO	20	UP410320	56085	6/26/2004	35	B	6	5	SNDEBRISO-KP	
RO	25	UPCU410377	56088	8/26/2004	-26	B	2	2	CH55488B	
RO	20	USPC30007	56089	6/28/2004	33	B	6	4	SNDEBRISO-KP	
RO	40	MSUU410119	56090	6/29/2004	32	B	6	3	SNDEBRISO-KP	
RO	40	UPCU411224	56092	6/29/2004	32	B	6	2	SNDEBRISO-KP	
RO	20	410714	56094	6/30/2004	31	B	6	1	SNDEBRISO-KP	
RO	25	UPCU410666	56103	7/8/2004	23	A	3	5	SNDEBRISO-KP	
RO	40	UPCU411150	56113	7/13/2004	18	B	1	2	SNDEBRISO-KP	
RO	40	MSUU410200	56114	7/13/2004	18	B	1	3	SNDEBRISO-KP	
RO	40	UPCU411718	56116	7/14/2004	17	B	3	2	SNDEBRISO-KP	
RO	40	UPCU411369	56117	7/14/2004	17	B	3	3	SNDEBRISO-KP	
RO	40	UPCU411089	56119	7/14/2004	17	B	3	1	SNDEBRISO-KP	
RO	20	UP220413	56120	7/14/2004	17	B	1	1	SNDEBRISO-KP	
RO	40	UPCU411312	56121	7/15/2004	16	B	4	2	SNDEBRISO-KP	
RO	40	UPCU419921	56122	7/15/2004	16	B	4	3	SNDEBRISO-KP	
RO	40	UPCU411293	56123	7/15/2004	16	B	5	3	SNDEBRISO-KP	
RO	40	UPCU411247	56124	7/15/2004	16	B	5	4	SNDEBRISO-KP	
RO	20	A413-25	56126	7/16/2004	15	A	3	7	AP309752KP	
RO	20	UPCU410816	56127	7/16/2004	15	B	5	2	SNDEBRISO-KP	
RO	25	UPCU410828	56128	7/16/2004	15	B	4	1	SNDEBRISO-KP	
RO	20	A517-25	56129	7/16/2004	15	A	3	6	AP309752KP	
RO	40	MSUU410258	56132	7/17/2004	14	A	6	10	SNDEBRISO-KP	
RO	20	LMF030003	56133	7/17/2004	14	A	6	11	SNDEBRISO-KP	
RO	20	35270	56134	7/17/2004	14	A	6	8	SNDEBRISO-KP	
RO	40	UPCU419947	56135	7/17/2004	14	A	6	9	SNDEBRISO-KP	
RO	20	UP220394	56136	7/19/2004	12	A	4	8	SNDEBRISO-KP	
RO	40	UPCU419920	56137	7/19/2004	12	A	4	9	SNDEBRISO-KP	
RO	20	LMF037218	56138	7/19/2004	12	A	4	7	SNDEBRISO-KP	
RO	40	MSUU410242	56139	7/20/2004	11	A	4	5	SNDEBRISO-KP	