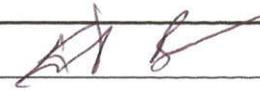


Approved by:		
	General Manager	Radiation Safety Officer

STANDARD OPERATING PROCEDURE

15.OPS.14

SPILL SURVEYS

1.0 OBJECTIVE

To define general and specific methods and procedures for conducting radiation surveys at locations of spills of radioactive materials at the Clean Harbors Deer Trail (CHDT) landfill or other job sites.

2.0 SCOPE

This standard operating procedure (SOP) applies to radiological surveys of areas where spills of radioactive materials have occurred. Both initial response surveys (to characterize the extent of the spill) and post-cleanup survey (to verify that cleanup criteria are met) are addressed.

3.0 POLICY

Inadvertent or unplanned releases of radioactive materials in the form of spills can present both real and perceived contamination concerns. Spills of radioactive materials will be managed to prevent the spread of radioactive contamination and keep worker and public exposures as low as reasonably achievable (ALARA).

4.0 RESPONSIBILITIES

Responsibilities of the CHDT Radiation Safety Officer (RSO), management, and staff are defined in the CHDT Radiation Protection Plan (15.RPP.01).

5.0 GENERAL SURVEY METHODS

Direct surveys of areas with spills may be conducted using a Ludlum Model 44-9 Geiger Mueller (GM) "pancake"-type probe with Ludlum Model 3 survey meter (or equivalent) for surface beta-gamma measurements; a Ludlum 43-93 alpha-beta scintillation detector with Ludlum 2360 survey meter (or equivalent) for surface alpha-beta measurements; a Ludlum Model 19 (or equivalent) for ambient exposure rate measurements; a Ludlum Model 193-6 Survey Wand (or equivalent) for large area gamma scanning measurements; a Ludlum 44-2 gamma scintillation detector (or equivalent) for ambient gamma scanning measurements; or any other radiation measuring instrument appropriate for the task. Spill surveys may be supported by smear sample analyses for removable radioactivity using the Ludlum 3030 alpha-beta sample counter (or equivalent).

5.1 Pre-Survey Instrument Check List

Prior to use of any field instrument, the operation of the probe and survey meter used shall be checked using the following general procedure. Specific direction for quality control measurements is provided in the SOP for each individual instrument.

- 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 the F position (for fast response).
 - 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.
- Background Check
 - Conduct background check during daily quality control (QC) measurements.
 - On most instruments, the background count rate is observed when the survey meter scale is set to the lowest scale setting – X0.1 or X1.
 - Prior to conducting surveys, verify background at that location.
 - Most surveys rely upon the technician to identify contamination above background. Therefore, *the survey technician must have a strong understanding of what background is for the instrument being used.*
 - Do not use the meter if it does not register a background reading.
- Source Check
 - Conduct source check during daily QC measurements.
 - Use the same source in the same geometry for all QC measurements.
 - The technician should be familiar with the detector response to a source.
 - Do not use the instrument if the QC falls out of requirements.

5.2 Initial Response Surveys

Before any initial response surveys are performed, the following actions should be taken when a spill occurs:

- If the spill is liquid, immediately stop the flow of liquid using towels, absorbent materials, or other means
- Isolate the area using tape, rope, signs, or other means to warn others and prevent access
- Notify the CHDT RSO, facility general manager, and/or plant foreman

After the above steps are performed, initial response surveys will be performed to determine the extent and radioactivity levels of the spill to aid in cleanup planning. Survey data shall be recorded in ink on appropriate survey forms, which shall document the following:

- Time and date of the survey
- Technician(s) performing the survey
- Instrument(s) used, with serial number, calibration due date
- Measurement locations, with pictures or drawings as necessary
- Background and efficiency information for the instruments, as appropriate
- Raw measurements, including measurement type and count time (if necessary)

Where necessary, surveys may be documented in a field logbook in the absence of a survey form. Pictures, photographs, or drawings of impacted equipment or areas may be used to facilitate documentation.

Static measurements for fixed contamination, smear samples for removable contamination, exposure rate measurements, and scanning measurements should be collected to adequately characterize the area. As spills may vary in size and type, no specific number of measurements is prescribed; rather the CHDT RSO should be consulted as to the appropriate level of effort to provide sufficient data.

Generally, areas that require cleanup following a spill are those with above-background surface radioactivity levels. Maintaining contamination controls to an indistinguishable from background standard will ensure that exposures are ALARA. In limited cases following a spill, dose-based release criteria (Section 6.3) may be applicable.

5.3 Decontamination Support and Verification Surveys

Radiological surveys should be conducted to support decontamination efforts (performed per SOP 15.OPS.18, *Decontamination of Surfaces and Equipment*) to verify successful removal or cleanup of contamination. Following decontamination to background levels (or other criteria, as directed by the CHDT RSO), a final verification survey should be performed and appropriately documented on a survey form or in a field logbook.

If necessary, the CHDT RSO will use the data from spill surveys to evaluate worker or public dose during the response actions.

6.0 STANDARDS AND CRITERIA

6.1 Indistinguishable from Background

The majority of personnel contamination surveys will be performed with the criterion of no contamination present, or no radioactivity above background. Therefore, the technician must have a clear understanding of the appropriate background levels for the instrument being used and for the location of the survey.

6.2 Data Conversion

For comparison with the measurement criteria listed in Section 6.3, surface measurements in counts per minute (cpm) must be converted to units of decays per minute per 100 square centimeters (dpm/100cm²). Procedures for data conversion are provided in SOPs 15.OPS.08, *Operation of Alpha-Beta Scintillation Detector*, and 15.OPS.09, *Operation of GM Pancake Probe*. The Ludlum 3030 used at CHDT provides measurements in units of dpm.

6.3 Surface Contamination Levels

Removable activity measured by smear samples will be evaluated against the values listed in Table 1, from ANSI/HPS N13.12-1999 (ANSI/HPS 1999). In the absence of radionuclide data to establish the appropriate screening group, the most conservative screening levels will be used.

Table 1 – Surface Contamination Limits for Free Release Surveys

Radionuclide Group	Surface Screening Levels (Bq/cm ²)	Surface Screening Levels (dpm/100cm ²) ^(a)	Removable Contamination Limits (dpm/100cm ²)
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	60 alpha
Group 2 Uranium: ²³⁴ U, ²³⁵ U, ²³⁸ U, natural uranium ^(c) , and associated decay chains	1	6,000	600 alpha
Group 3 General Beta-Gamma Emitters: ²⁴ Na, ³⁶ Cl, ⁵⁹ Fe, ¹⁰⁹ Cd, ¹³¹ I, ¹²⁹ I, ¹⁴⁴ Ce, ¹⁹⁸ Au, ²⁴¹ Pu, and others	10	60,000	600 beta
Group 4 Other Beta-Gamma Emitters: ³ H, ¹⁴ C, ³² P, ³⁵ S, ⁴⁵ Ca, ⁵¹ Cr, ⁵⁵ Fe, ⁶³ Ni, ⁸⁹ Sr, ⁹⁹ Tc, ¹¹¹ In, ¹²⁵ I, ¹⁴⁷ Pm, and others	100	600,000	600 beta

(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.

6.4 Quality Control

In addition to the daily QC measurements required by each individual instrument SOP, survey forms must be reviewed and approved by the CHDT RSO or designee. The frequency of review and approval will be dictated by the frequency of the surveys.

7.0 REFERENCES

ANSI/HPS 1999. Surface and Volume Radioactivity Standards for Clearance.