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TITLE: Radiological Area Surveys

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RADIOLOGICAL AREA SURVEYS

RADIATION PROTECTION PROCEDURE

1.0 Purpose

This procedure describes the requirements for performing radiological area surveys (surveys) of land areas using a large area plastic scintillation detector (TSA VRM-1X) or hand held scintillation detectors. The purpose of a survey is to obtain qualitative data on the radiological conditions of the near surface soils of accessible facility property. For qualitative surveys it is not necessary to use a calibrated detector system. Quantitative surveys can be made for the naturally occuring radionuclids Ra-226, Th-232, and K-40. Calibration factors for these radionuclides were determined using the Department of Energy's calibration pads at Grand Junction, CO and at Morgantown, WV.

As each site or facility has different field conditions, it is necessary to design a survey to meet those conditions and survey requirements.

2.0 References

2.1 IT/NS-11-95 "Operations Manual for the TSA VRM-X1 Mobile Detector System an Internal Report" March 1996

3.0 Definitions

3.1 Calibration - The comparison and standardization of measurement devices against reference standards of known and documented intensity or concentration to ascertain proper correction factors over the range of usage.

3.2 Contamination - The presence of radioactive material in undesirable locations (i.e. on the surfaces of structures, areas, objects, or personnel).

3.3 Operational/Source Check - Test of measuring equipment against a source of known intensity or concentration to measure functionality. Typically performed daily or prior to use. An operational/source check is not a calibration.

3.4 Radiation - Particles (alpha, beta, neutrons) or photons (gamma) emitted from the nucleus of an unstable (radioactive) atom as a result of radioactive decay.

4.0 Responsibilities

4.1 The IT Technical Project Manager is responsible for the safe and effective implementation of this procedure, and for ensuring deviations from the contracted scope of work are reviewed and approved by the client.

4.2 The Field Coordinator is responsible for ensuring all land radiological survey activities are performed in compliance with this procedure.

4.3 The technician(s) is responsible for the performance of the work described in this procedure.

5.0 Safety Precautions

5.1 Personnel conducting surveys shall receive a site "indoctrination" which shall include awareness of the radiological and hazardous conditions of the areas to be surveyed.

5.2 All survey personnel will wear the appropriate personal protective equipment while conducting surveys.

5.3 Survey personnel shall attend a daily tailgate safety meeting.

6.0 Prerequisites

6.1 Survey instruments shall be background and source response checked on the day of use, and be visually inspected prior to use. Response check datat shall be entered onto a Source and Background Check Log Sheet (Attachment 1).

6.2 Personnel shall be trained on the proper operation, use, and application of the survey equipment.

7.0 Procedure

7.1 Surveys

The types of surveys required to ensure adequate identification of radiological conditions are described below. Surveys must be performed by individuals authorized by the IT Technical Project Manager, or designee.

Surveys shall be documented on a Radiological Survey Log Sheet (Attachment 2).

7.1.1 Surveys Using Hand Held Scintillation Detectors

Area surveys can be performed to qualitatively or quantitatively identify radioactive contamination in soil in land areas. Normal detectors used for surveys are sodium iodide or hand held plastic scintillation detectors. These detectors are designed to detect gamma radiations that emanate from radioactive material. Detection depth for contamination in the soil column is dependent on; gamma ray energy, soil density and moisture, concentration of the contaminant in soil, and distribution of the contaminant. Typically, for uniformly dispersed contaminants at >10 pCi/g concentrations the following depth of contaminant detection applies.

Gamma Energy	Depth of Detection
<300 keVγ	0-6 in.
>300 keV to < 600 keV γ	0-10 in.
>600 kev γ	0-15 in.

- Surveys are performed by holding the detector approximately 6 in. above the surface and moving the detector in a serpentine motion as the surveyor walks forward. Field of view using this technique is nominally 2 ft. in diameter. Speed of survey should be <2 ft. of detector movement per second.

- The detector should be operated with the speaker on, and when available, with the technician wearing earphones to listen to the audible signal. Changes in the audible signal will alert the technician to the changes in soil contaminant concentration.

- As increase count rates are noted the surveyor should slow the survey speed and determine the size of the affected area by moving the detector in a pattern that allows for finding the boundary, (i.e., the area where the count rate returns to background). This edge may be delineated if necessary using pin flags or paint or flagging.

7.1.2 Surveys Using Large Area Detectors

Surveys using the TSA VRM-X1 large area detector are typically performed for qualitative measurements of soil contaminants, an exception to this is when the nuclides of concern are Ra-226, or Th-232, or K-40. Surveys are conducted by moving the detector over the land area in near straight lines. Depth of contaminant detection for thiss detector is the same as for the hand held scintillator detectors. The detector field of view is dependent upon detector height. With the detector approximately 10 in. above the surface, the field of view is an oval 5 ft. long by 3 ft. wide. At a detector height of 2 ft. above the surface the field of view grows to 7 ft. by 4 ft. Distance between detector passes is dependent upon the detector height and the required density of the survey.

- A base station location shall be established with known latitude and longitude coordinates.

- The technician should set up visual markers to guide the detector survey. Typically this entails putting up lathe with survey flagging attached, however other options are allowed to meet field conditions.

- The detector, global positioning system, and base station are assembled, and system checks are performed as described in Reference 2.1. Method of transport, i.e., backpacks, jogger cart, 4X4 vehicle, etc., is project specific.

- Prior to starting a survey the technician should verify that the mobile and base station transmitters are communicating and data is being stored on the base computer.

- Both a source response check and a background check are made daily. Average count rates for both the source and background should be entered in Attachment 1. Newly acquired count rates should be compared to past count rates during the survey to ensure the detector is operating properly. (Note count rates should be ± 20% of the average count rates from previous days. If not within ± 20% after three tries, check the equipment connections and recheck background ans source response. If equipment fails to properly respond then send equipment for repair.)

- Maximum detector speed is 5 miles per hour. At this speed every second the detector will view a area 7 ft. long and the viewing width wide. Most surveys are conducted at speeds less than this.

- The technician transports the detector, via the project selected method, between the visual markers. As the detector passes over each marker the field technician should remove the marker to allow for ease of determining the next marker to aim for on succeeding passes.

7.2 Radiation Survey Instrumentation

7.2.1 Daily (when used) each instrument shall have the following conducted:

- A background check
- A source response check on the scale to be used
- A battery check
- A test of the audible response
- A check of the zero
- An examination for physical damage

7.2.2 Instruments failing operational checks in 7.2.1 shall be removed from service and repaired prior to use.

7.2.3 Each instrument shall be numbered to enable traceability to surveys and records.

8.0 Documentation/Records

8.1 A log shall be maintained of all surveys. Normally this log is project specific. An example is shown in Attachment 2. For the TSA large area detector the log will identify surveyed area and data file ID.

8.2 A project file shall be maintained for each instrument documenting its inspection, calibration, and maintenance history.

8.3 The following quality assurance records are generated by this procedure:

8.3.1 A figure of the site showing as measured radiological conditions.

8.3.2 All written records or electronic data files for radiological surveys.

8.3.3 Radiological Survey Log Sheets

8.3.4 Source and Background Check Log

9.0 Attachments

9.1 Attachment 1 - Radiological Source and Background Check Log (typical)
9.2 Attachment 2 - Radiological Survey Log Sheet (typical)

ATTACHMENT 1

SOURCE AND BACKGROUND CHECK LOG SHEET
(TYPICAL)

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SOURCE AND BACKGROUND CHECK LOG

Instrument ID_____ Source ID_____

DATE	INITIALS OF FIELD TECHNICIAN	BAT. OK (Y-N)	ZERO (Y-N)	AUDIBLE (Y-N)	SOURCE COUNT RATE	BACKGROUND COUNT RATE

ATTACHMENT 2

RADIOLOGICAL SURVEY LOG SHEET
(TYPICAL)

IT INTERNATIONAL TECHNOLOGY CORPORATION

RADIOLOGICAL SURVEY LOG

Instrument ID_____

SURVEY NUMBER	SURVEY DATE	SURVEY BY	DESCRIPTION