

~~This is a REF ID: A66540~~  
**ROCKY FLATS PLANT**  
**EMD OPERATING**  
**PROCEDURES MANUAL**

**Manual No.:** 5-21000-OPS-GT  
**Procedure No.:** Table of Contents, Rev 26  
**Page:** 1 of 2  
**Effective Date:** 09/30/92  
**Organization:** Environmental Management

**THIS IS ONE VOLUME OF A SIX VOLUME SET  
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REVIEWED FOR CLASSIFICATION/UCNI

By [Signature]  
 Date 10/8/92

**DOCUMENT CLASSIFICATION REVIEW WAIVER  
 PER R.B. HOFFMAN, CLASSIFICATION OFFICE  
 JUNE 11, 1991**

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This is a **CONTROLLED DOCUMENT** ENVIRONMENTAL MANAGEMENT DOCUMENT CHANGE NOTICE (DCN)  
 EG&G - ROCKY FLATS PLANT ENVIRONMENTAL MANAGEMENT

This is a RED Stamp  
 Procedure Number 5-21000-OPS-GT.18, Rev 2<sup>nd</sup>

Title <u>Surface Geophysical Surveys</u>	Date <u>9/17/92</u>	DCN Number <u>5-21000-OPS-GT.18</u> <u>92.01.01</u>
Expires <u>9/17/92</u>	Procedure Revision Required <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Scope Limitation <u>OUS</u>		

Item Number	Page	Step or Paragraph	Changes (Use DCN CONTINUATION SHEET for Additional Space)
1	24	5.4	INSERT ATTACHED SECTION 5.4 MAGNETICS

Justification (Reason for Change - Provide Numbers To Reference Corresponding Items Above)  
 OUS Work Plan Requires a magnetic survey (Surface Geophysics) which is not addressed in the surface geophysical SOP, but a Technical Memoranda (TM) has been written and submitted to the agencies for their approval. The TM covers both magnetic and EM surveys at OUS

Concurrence	Organization	Req	Date	Concurrence	Organization	Req	Date
	QAPM	X	9/30/92		User	X	9/17/92
	EOM	X	9-29-92		RPIJ		9/23/92
					DOE		9-29-92

  

Approval of Responsible Manager	Date <u>25-9-92</u>	Is Posting Req'd? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If Yes, By What Date?	Date Posted
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## OU5 SURFACE GEOPHYSICAL SURVEY DOCUMENT CHANGE NOTICE (DCN)

### 5.4 MAGNETICS

#### 5.4.1 Introduction

Magnetic geophysical surveys provide a rapid, non-invasive means of measuring the earth's magnetic field. The magnetic field strength and gradient at any location is due primarily to the earth's magnetic core, local geologic materials, and the latitude and longitude of the site of interest. Due to the presence of the solar magnetic field surrounding the rotating earth, a diurnal fluctuation in the magnetic field also occurs. A secondary magnetic field may arise from anthropogenic sources including adjacent surface ferromagnetic objects such as steel fencing and vehicles. Additionally, subsurface objects such as utility lines or metal-containing drain pipes are also a factor. Overhead electric power lines also generate magnetic interference.

The method involves the measurement of magnetic intensity (total magnetic field) in gammas ( $\gamma$ ),  $1 \gamma = 10^{-5}$  gauss at each ground survey station. Expected total magnetic field is approximately 50,000  $\gamma$ . Magnetic anomalies may have an intensity of 50 $\gamma$  or more. Magnetic noise originates from subsurface geologic materials and may be approximately 5 to 10 $\gamma$ .

Anthropogenic components should be discerned prior to survey initiation. Data for total magnetic field is to be recorded using electronic data loggers. During field magnetic measurements, a fixed base station magnetometer will measure diurnal magnetic variation to provide compensation to the roving magnetometer data record. Field data will be downloaded to hard and floppy disks.

This DCN specifies procedures for surface magnetic surveys utilizing the EDA Omni magnetometer instrument or equivalent for both the tripod-mounted base station and the field-roving magnetometer.

#### 5.4.2 Survey Design

##### 5.4.2.1 List of Necessary Field Equipment

The following is a list of equipment that will be necessary to complete a magnetic survey.

- \* Two EDA Omni magnetometers with integral data logger or equivalent;
- \* Tripod;
- \* Brunton compass or equivalent;
- \* Fiberglass tape, 300 feet;
- \* Field notebook;
- \* Black waterproof (permanent) pens;
- \* Flagging; and
- \* Wooden stakes.

### 5.4.2.2 Field Procedures

A standard field procedure is described below. Prior to magnetic data collection, five preliminary procedures must be conducted. These are:

- \* Design the appropriate field survey parameters given the purpose of coverage, contained areas of magnetic interference, grid-traverse spacing, direction of traverse, magnetometer reading interval.
- \* The surface geophysical survey grid-traverse lines will <sup>be</sup> controlled from the surveyed baseline provided by RFP plant personnel. The provided baseline will be staked each 25 feet. At these stakes grid-traverse line endpoints will be marked with flagged lath. The baseline and grid-traverse line stations of the magnetic survey will be transferred to the appropriate base map.
- \* The magnetic base station location will be selected, after consulting site utility maps, to assure minimal magnetic interference due to electric power lines, railroad, fencing, vehicular traffic, subsurface utilities, and air monitoring stations, ~~or other metallic objects.~~ The site should also be cleared with a portable magnetometer.
- \* The geophysical field instrument operator will check that personal clothing including watches, <sup>belt buckles</sup> and boots, do not contain interfering ferromagnetic materials.
- \* Initiate the magnetic survey only after an in situ gamma radiation survey has been completed by RFP plant personnel at each IHSS 115 and 133 groups.

Design of appropriate field parameters must consider the following:

- \* The roving magnetometer will be suspended on a staff 8 feet above ground surface at each station on the IHSS 115 survey area.
- \* The roving magnetometer will be suspended on a staff 4 feet above ground surface at each station on the IHSS 133 group survey area.
- \* Spacing between stations along each grid-traverse line stations will be 10 feet.
- \* Spacing between adjacent grid-traverse lines will be 25 feet at the IHSS 115 survey area.
- \* Spacing between adjacent grid-traverse lines will be 12 1/2 feet at the IHSS 133 group survey area.
- \* Grid-traverse line will be extended an additional 50 feet along significant anomaly indications. Where such anomalies are attributed directly to known pipeline, fences, or other visible and mapped anthropogenic ferromagnetic structures, the survey need not be extended.

- \* Definition of a magnetic anomaly requires three or more anomalous readings.
- \* Suspected anthropogenic interferences to the ambient magnetic field will be evaluated as to their mapped location and trend. Where utility line maps indicate pipelines and electric lines are present, the grid-traverse line will be oriented orthogonally where possible.

A standard field procedure for conducting a magnetic survey is indicated below.

- \* Perform a visual survey along the grid-traverse lines. The visual survey will include a review of: site utility plans, overhead electric lines, manhole collars, buried gas lines and their monuments. Plant personnel will confirm the presence of possible utility features. Note the location of any of these features in the field notebook and transfer their location to the appropriate map.
- \* Note in the field notebook ferromagnetic objects observed at the ground surface.
- \* Note in the field notebook large variations in topography or the proximity to buildings.
- \* Check the magnetometers and data loggers for sufficient battery charge and test the instruments using the manufacturers procedures.
- \* Setup and initiate the measurement of diurnal magnetic field variation using the tripod mounted base station magnetometer and data logger.
- \* Initiate a site survey along the grid-traverse line with the roving magnetometer. Magnetometer operation must follow manufacturer's operating procedure for total magnetic field and vertical magnetic gradient measurement.
- \* Check to determine if each magnetometer's measurements are being properly received and electronically stored in the data logger. Correlate the station number to the total magnetic and vertical magnetic gradient data entry with the grid location in the field notebook.
- \* In the field note book indicate the date and time of the start and end of each traverse made with the roving magnetometer.
- \* Continue the above procedure for each station along all grid-traverse lines.
- \* Label and/or number all notations on the field map corresponding to notes made in the field notebook.
- \* Download electronic data from the roving field magnetometer to a computer on a daily basis to hard drive and disk for further analysis.

- \* Download electronic data from the base station magnetometer to a computer on a daily basis to hard drive and disk.

#### 5.4.2.3 Data Processing and Interpretation

A standard procedure for processing and interpreting the magnetometer data is described below.

- \* Collected data is downloaded from the base station and roving magnetometers to the computer. Compensation of measurements of total magnetic field collected by the roving magnetometer are made using the record of diurnal variation measured by the base station magnetometer. The total magnetic field and vertical magnetic gradient data is then processed. Data is then plotted and contoured at the appropriate scale for the base map selected.
- \* Process total magnetic field and vertical magnetic data for each IHSS area using computer software with hardware capable of generating contoured, colored maps on 11-by 17-inch paper.
- \* Generate an archival-quality computer disk DXF file capable for CADD color plotting, gridding, and contouring of the total magnetic field and vertical magnetic data at a selectable map scale.
- \* Compare the results of the total magnetic field and the vertical magnetic gradient to determine if subsurface anomalies are present.