National Museums of Scotland

SAQQARA PROJECT

REPORT

1997

National Museums of Scotland
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Jon Dittmer and Ian Mathieson

An interim report on the work carried out during the 1997 season covering the testing of ground conductivity equipment by repeating previous resistivity and electro-magnetic impulse scanning results and taking further survey profiles over areas of particular interest and completing research into past records at the Saqqara Necropolis of Memphis, Egypt

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THE NATIONAL MUSEUMS OF SCOTLAND

PRELIMINARY REPORT OF THE SAQQARA SURVEY PROJECT, 1997

By JON DITTMER and IAN MATHIESON

The aims of the National Museums of Scotland Project have been:

a) To produce an up-to-date archaeological and subsurface geophysical map of an interesting and relatively little-studied area of Saqqara the great necropolis of Memphis, the major city of Egypt from c.3000 BC to Hellenistic times. The area concerned comprises the Gisr el-Mudir ('the Great Enclosure') in the south, an area of the Old Kingdom tombs round the mastabas of Ptahhotep, the area of the Serapeum and its dependencies, part of the Archaic necropolis, and the Sacred Animal Necropolis complex near to the village of Abusir in the north (see Fig. 1).

b) To adapt and combine a series of well-known geophysical techniques to the special problems of plotting large monuments, cemeteries, catacombs and natural features in desert conditions where unexcavated and previously excavated monuments are buried either under drift-sand or the dumps of former excavations. These techniques incorporate resistivity survey, electro-magnetic impulse profiling, ground conductivity, proton magnetometer survey, sonic profiling, field inspection, archival research and test-excavation (for descriptions see 1992/3 Report pp. 1-4).

The National Museums of Scotland acknowledge with gratitude the help and co-operation of the Supreme Council for Antiquities with whose permission the Museum's work is carried out; the Chairman Dr Ali Gaballa, Mr Magdi at the Secretariat, Dr. Zahi Hawass at Giza, Mr Mohammad Hagras, Director of Saqqara, the Chief Inspector Mr Magdi el-Ghandoor and Mr Ragab Turki, the inspector attached to the mission. The October - December 1997 season has been undertaken with the generous financial support of grants from the National Museums of Scotland, the NMS Charitable Trust, and technical assistance in map reproduction by Survey and Development Services, Bo'ness, West Lothian. Professor Harry Smith is co-director and archaeological advisor.

The National Museums of Scotland field team comprised Ian J. Mathieson, field director and Dr Jon Dittmer, geophysicist. The 1997 season opened on the 1st October and continued until the 8th November.

Previous Fieldwork

During the 1990 season resistivity work was completed along the length of the concession area and four of the proposed cross-sections covering the large enclosure known as the Gisr el-Mudir were surveyed (Fig. 5). In 1991 the complete concession area was field-walked and all visible surface indications of structures and old excavations were located for inclusion on the base maps. Work was completed in 1992 on the observation of the resistivity data covering the southern two-thirds of the original concession area, from the northern access road to the Serapeum to the southern limit of the concession which lies some 100m south of the southern boundary of the Gisr el-Mudir[1]. In 1993 sondage trenches were opened on anomalies in the south-west corner of the Gisr-el-Mudir to check the resistivity data plotted at these points. A mud-brick platform was discovered inside the enclosure at the SW corner and the construction of the enclosure walls was investigated (Fig. 5, A7 & A8). In the 1994 season sondage trenches were opened to confirm the geophysical findings on profiles taken over the North Wall (Fig. 5-GMNWXS2) . The construction of the wall was found to extend to the North with a buttress formation on the North face, several graves were found on the South side of the wall, one of which had a stela of the Persian period deposited in the sub-structure (Reports 1990 - 1994)[2].

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[1] See I.J.Mathieson and A. Tavares, *JEA*79 (1993), 17-31.

[2] See I.J.Mathieson et al. *A Stela of the Persian period from Saqqara*. *JEA*81 (1995), 23-41.

During 1995 further sondage trenches were opened (Fig. 5, A9-14), to inspect anomalies over the south-west corner of the monument where the inside corner was located and surveyed.(Report 1995)[3]. In 1996 electro-magnetic impulse equipment, kindly loaned by ERA Technology of Leatherhead, Surrey, was used for the first time in Saqqara. Many scanning profiles were taken over existing resistivity surveys and the results confirmed the previous findings and gave a much enhanced interpretation of the sub-surface conditions (Report 1996).

The Objectives of the 1997 season were:

- To test the use of a new instrument, the Geonics ground conductivity meter EM31.
- To use the new instrument to verify results previously observed by resistivity and electro-magnetic impulse equipment.
- To carry out further observations on the position of the South and East Walls of the Gisr el-Mudir monument and to commence the survey of the complete site on a one metre grid.
- To test the instrument over the known mud-brick walls of the L-shaped enclosure West of the Ptah-Hotep tombs.

Fieldwork

The Geonics EM31 ground conductivity meter maps geological variations, man-made material intrusions and sub-surface structures associated with changes in the ground conductivity using a electromagnetic technique that makes measurements without electrodes or ground contact. With this inductive method, surveys are readily carried out in regions of high surface resistivity such as sand and gravel.

The effective depth of exploration is about six metres and important advantages of the EM31 over normal resistivity methods are the speed at which surveys can be conducted, the precision with which small changes in conductivity can be measured and the continuous readout while traversing the survey area. Two digital meters display both the quadrature-phase (conductivity) and the inphase components which are recorded simultaneously on the digital data recorder. The inphase component is useful for detecting ferrous and non-ferrous metallic debris. The 4m boom, digital recorder and method of carrying are shown in Fig. 2

Gisr el-Mudir (The Great Enclosure)

To utilise the ability of the equipment to record data at a steady walking speed and the absence of having to make ground contact it was decided to commence the complete survey of the Gisr el-Mudir site to a one metre grid. This would enable the team to cover the objectives of the South and East Walls, the verification of previous surveys and the detailed survey of the interior of the monument.

Figure 5 shows the extent of the grid taken to examine the central area for signs of sub-surface disturbance which might indicate the presence of a trench or sloping ramp similar to the Sekhemkhet complex and other early dynastic tomb structures. The profiles taken, over the grid area shown, confirm the resistivity results from previous investigations in that no material disturbance other than surface burials has been detected in this central area. The data clearly shows the shafts credited to De Morgan (1897)[4] which he had been investigating and give confidence in the results.

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[3] See I.J.Mathieson et al. *The National Museums of Scotland Saqqara Survey Project 1993-1995. JEA*83 (1997)

[4] De Morgan, J 1897. *Carte de la Nécropole Memphite* Plans Nos. 7 & 9

An interesting anomaly shows in the area between the mound and the East Wall (Figure 5, B275) and a further anomaly was detected between the West Wall and the area known as GMMT2 confirming the resistivity and electro-magnetic impulse profiles in this area (Fig. 5,A020).

Figure 5 also shows the grid surveyed over the south-west corner found in 1995 (Report 1995) and extending east along the assumed line of the south wall to the south-east corner and then north along the line of the East Wall. With the exception of previously identified shafts and surface exposures of the East Wall no additional structures were found in this survey area.

A total of 46 squares (50m x 50m) were surveyed in 18 field days giving 125,000 data points of information. With the use of specially written software the interpretations shown in Figs. 3 & 4 clearly indicate the value of this method of sub-surface survey.

L-Shaped enclosure (Fig. 6)

The L-shaped enclosure lies to the south of the Serapeum ring-road and west of the Ptah-Hotep group of tombs, and contains many surface indications of tombs within the remaining two limbs of what might be yet another large enclosure. The north-west corner has provided resistivity anomalies in the surveys undertaken in 1993 (Report 1993,Map sheet 2, & p.3) and it was decided to survey a two metre grid of profiles covering this area to augment the previous work. Figure 6 shows the grid of profiles which mainly confirmed the existence of mud-brick structures.

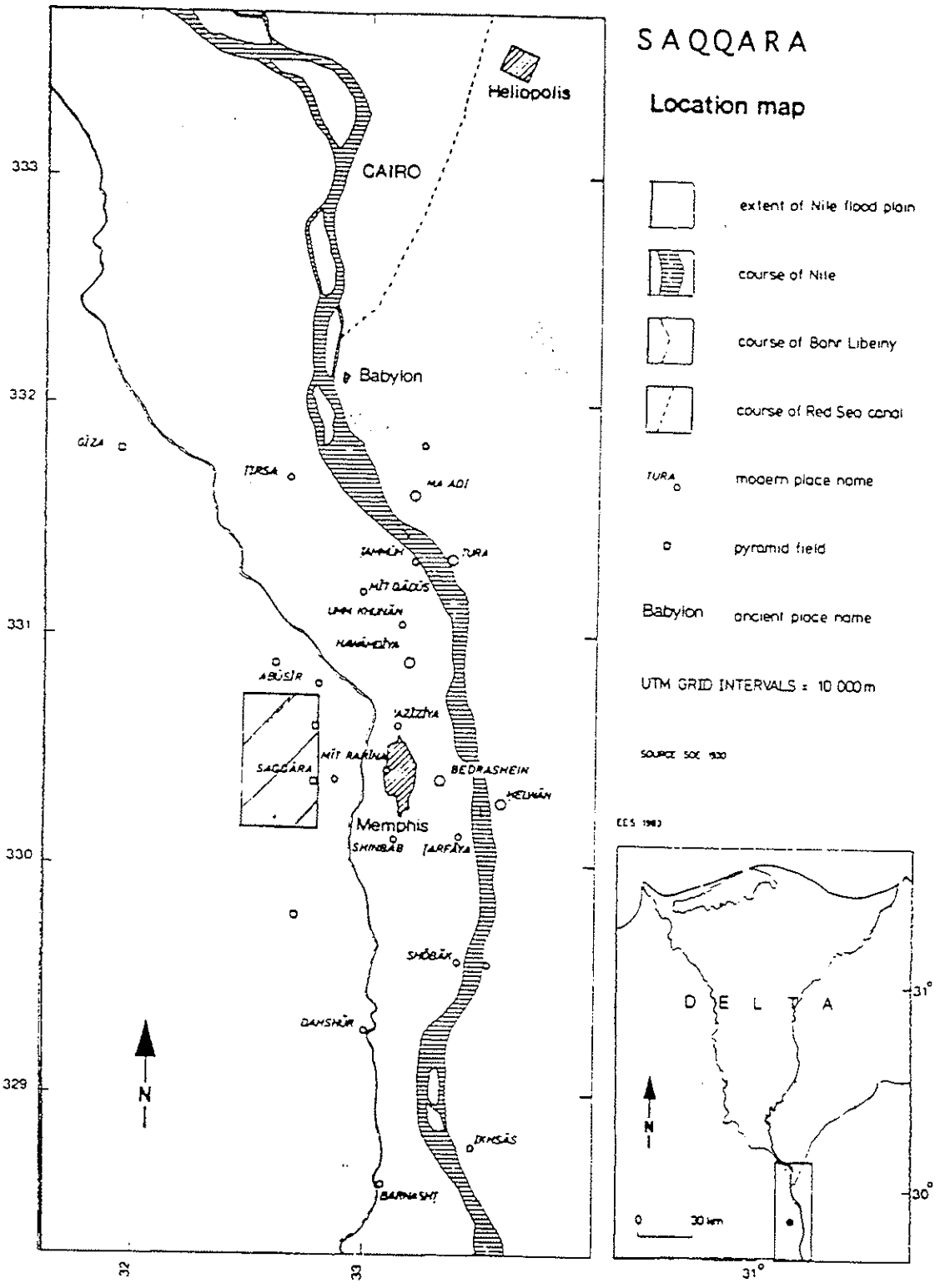
Conclusions

The EM31 conductivity equipment has shown that, when used in desert conditions, the equipment enables sub-surface surveys to be carried out to a depth of approximately six metres with great accuracy and at a very economical speed. Archaeologists can now plan to carry out quite large surveys, for example 500m square, within a seasons work, pinpoint anomalies, scan them with impulse equipment and make firm decisions as to whether to excavate or not.

The National Museums of Scotland have now commissioned a further two years work and the project team hope that with the support of the British Academy and other bodies, the excavations to test the anomalies found will be carried out and the further use of a Geonics EM31 ground conductivity meter will be made possible.

Ian J Mathieson

Project Director


SAQQARA
Location map
Heliopolis
CAIRO
Babylon
GIZA
TURA
extent of Nile flood plain
course of Nile
course of Bahr Libeiny
course of Red Sea canal
modern place name
pyramid field
Babylon
ancient place name
UTM GRID INTERVALS = 10 000 m
SOURCE SOC 1930
Memphis
SAQQARA
BEDRASHEIN
ABUSIR
DAHSHUR
N
32
33
329
330
331
332
333
D E L T A
31°
30°
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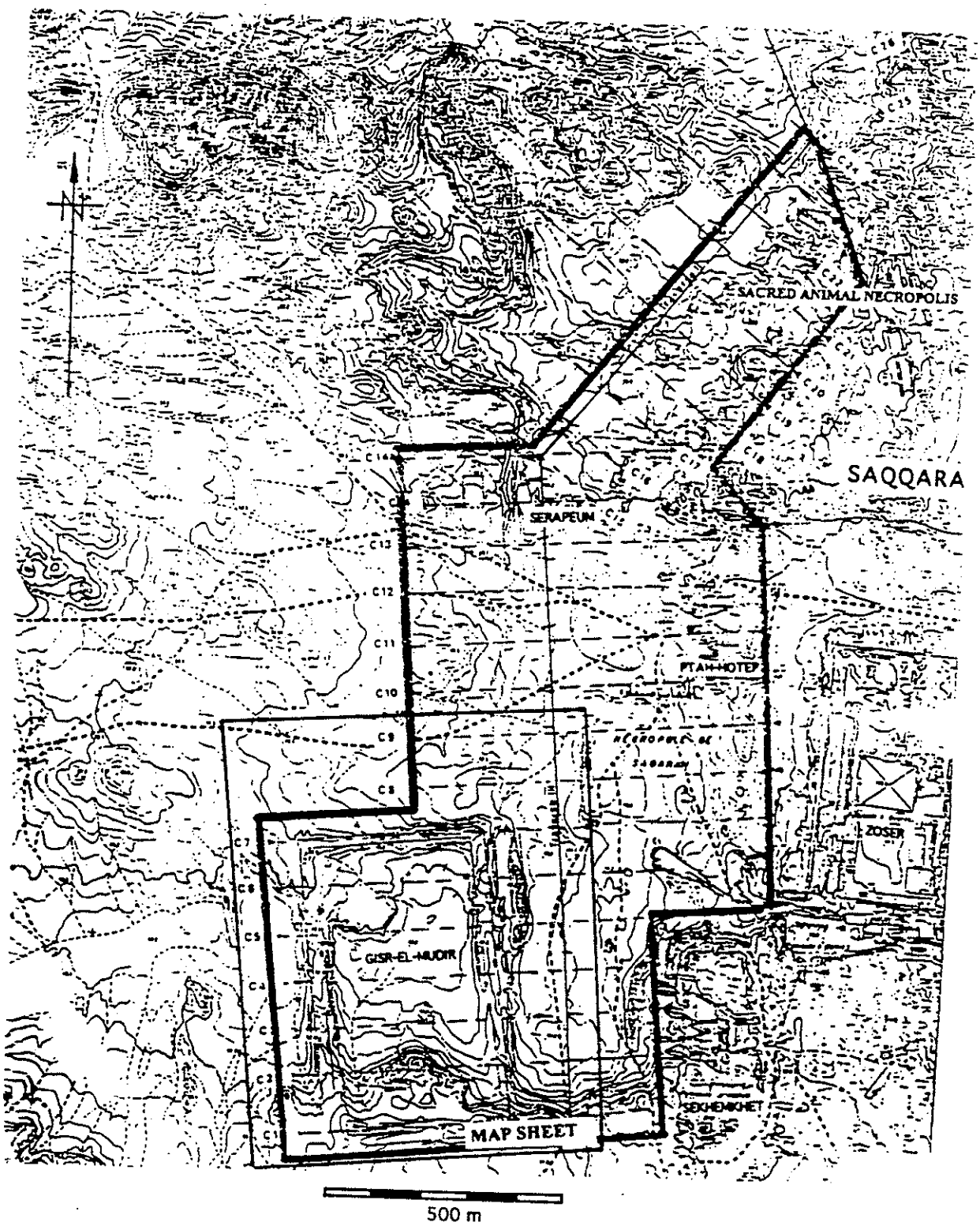
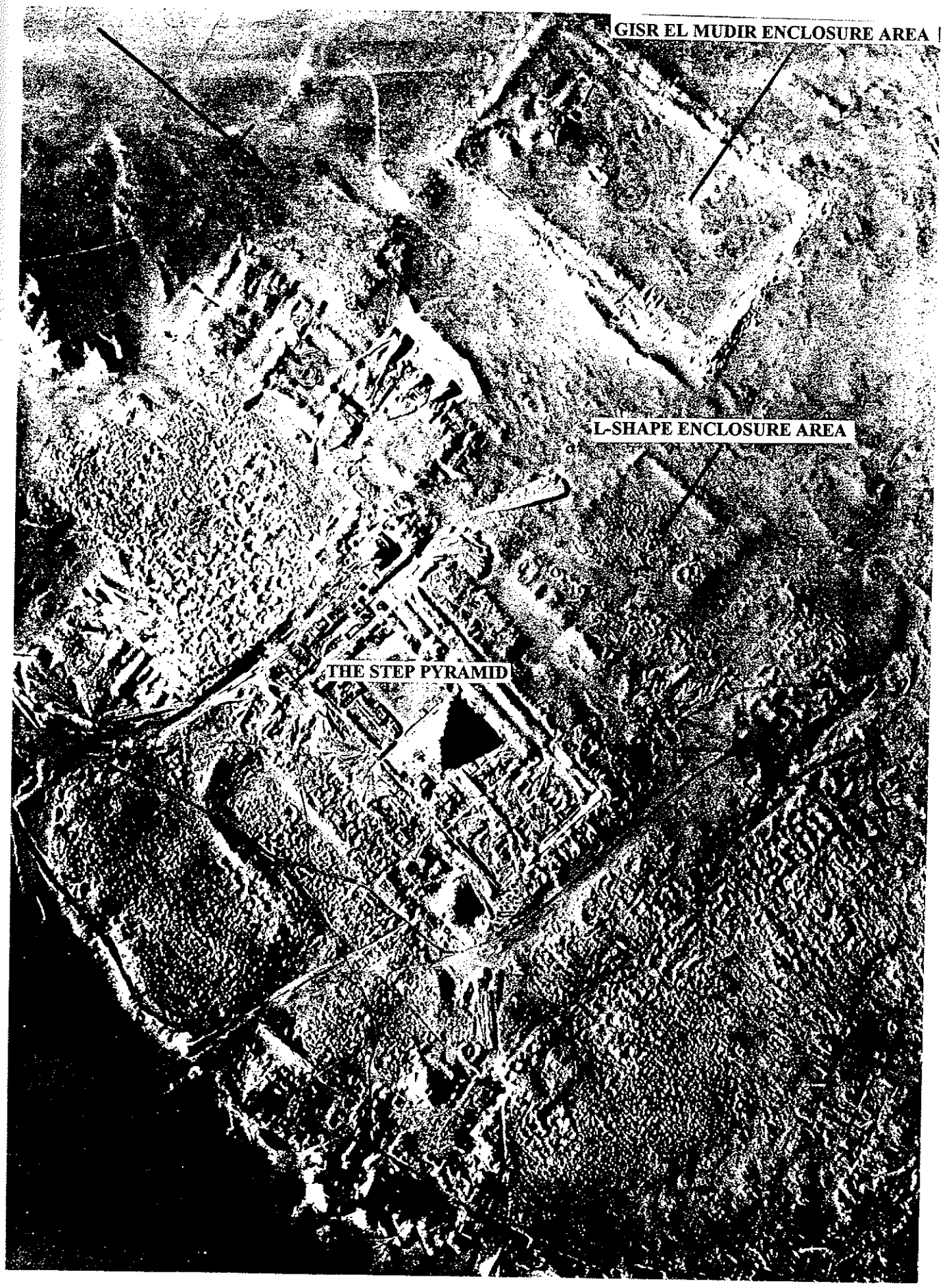
30 km



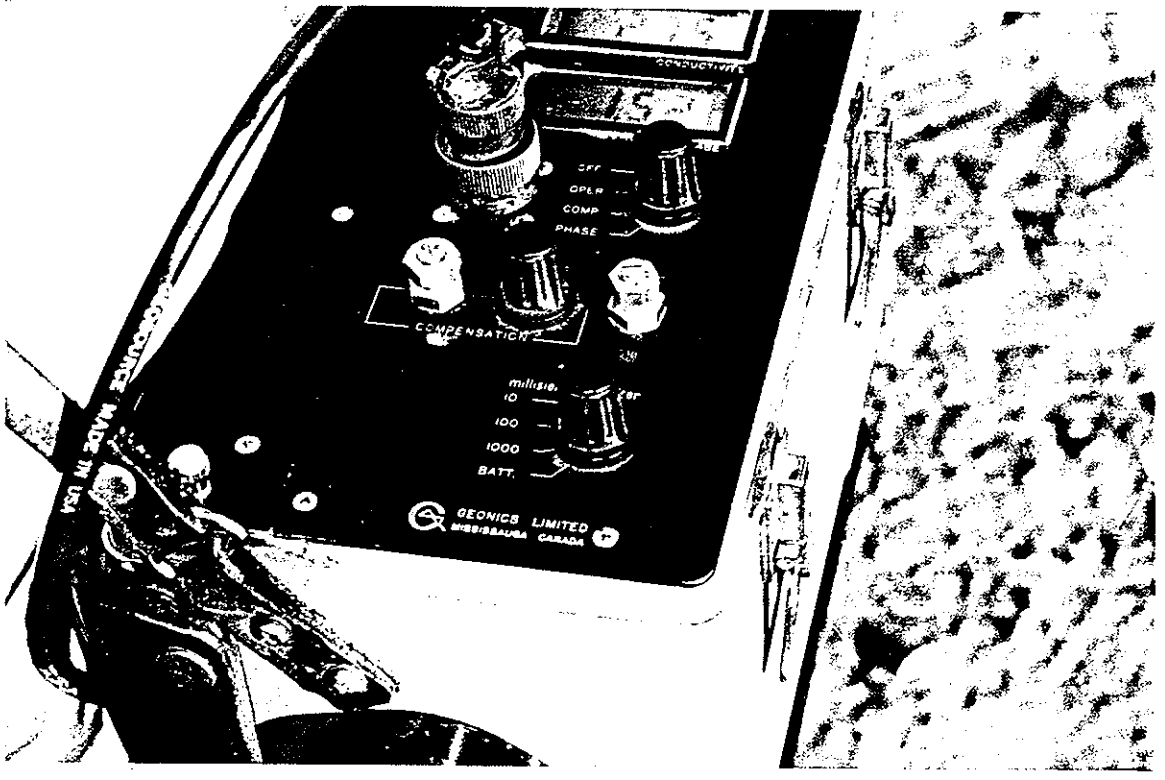
National Museums of Scotland Concession Area



GISR EL-MUDIR & L-SHAPED ENCLOSURES
IN RELATION TO THE STEP PYRAMID

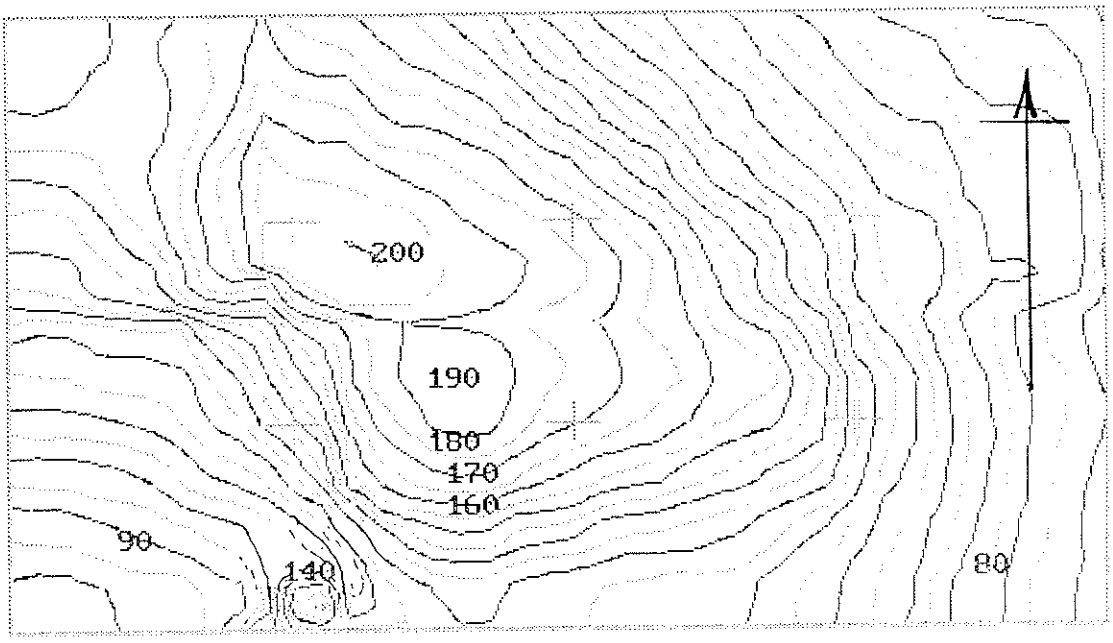
Fig. 1

EM 31 Conductivity Equipment

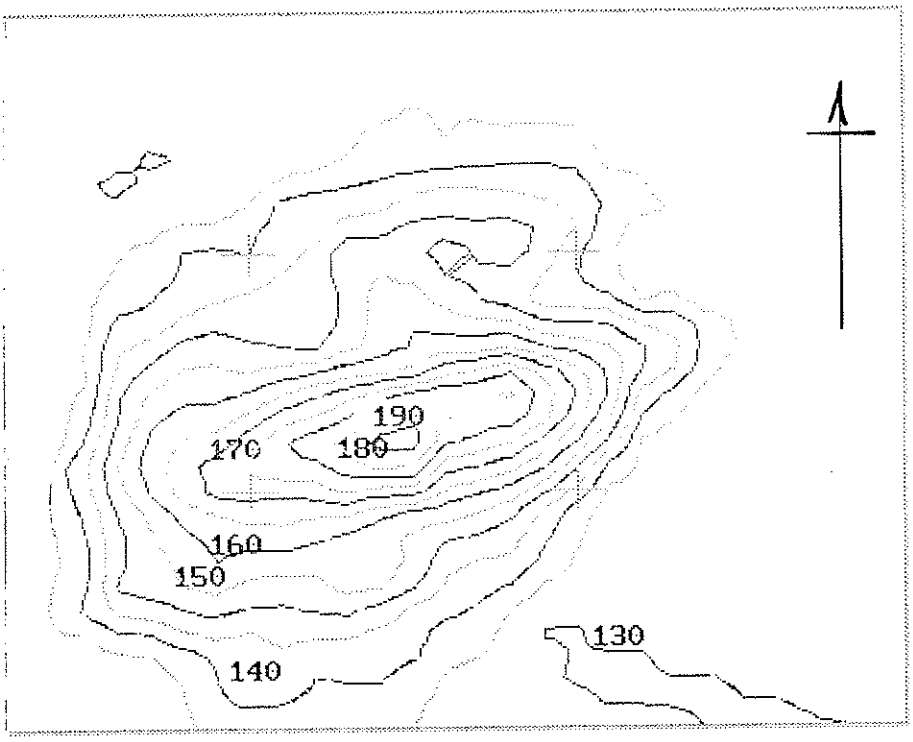


EM 31 Digital Recorder

Fig. 2

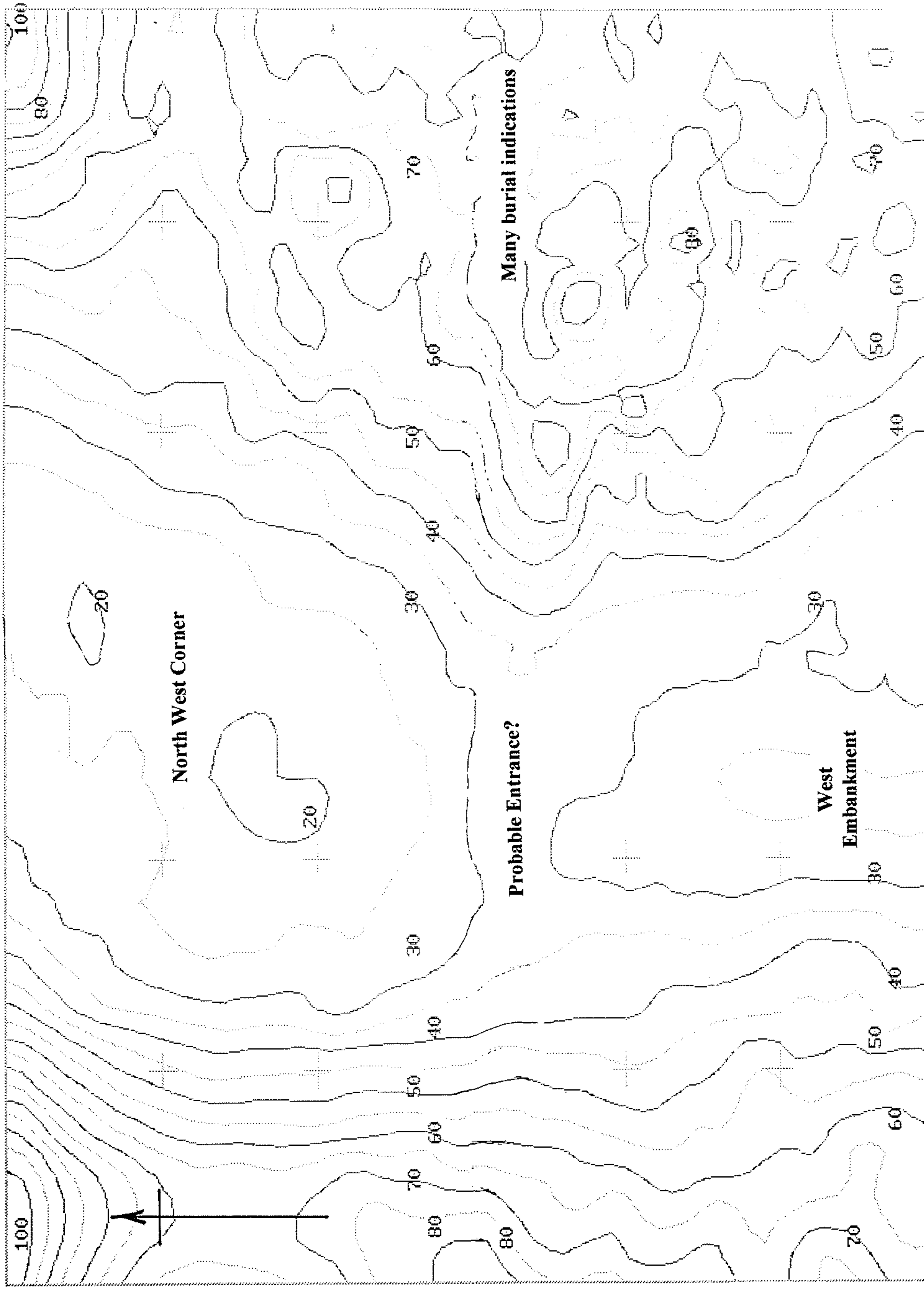


Anomaly GMMT2/A020 (see Fig. 5)
EM31 Conductivity contours
Scale 1:325



Anomaly B275 (see Fig. 5)
EM31 Conductivity Contours
Scale 1:325

Fig. 3



L-Shaped Enclosure (see Fig. 6)
EM31 Conductivity Contours
Approx. Scale 1:400

Fig. 4