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A Report on the Operations Carried Out By Survey of India Team During Eleventh Indian Expedition to Antarctica

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Abstract

Survey of India participated in Indian Antarctic Programme for the second year in succession to extend ground control points further south of SeJiifittacher Oasis into the deeper, mountainous terrains of Central Queen Maud Land, Antarctica. Also, help was extended to couple of other Scientific organisations.

Introduction

The appreciable development in the scientific activities of Indian missions to Antarctica necessitated provision of geodetic and geophysical control points in and around Schumacher Oasis, East Antarctica.. As a follow-up, a team of four scientists from Survey of India participated in the Antarctica expedition during austral summer of 1990-91. They provided geographical control points and took magnetic and gravity observations in Schirmacher Oasis and nearby nunataks. The work was carried forward to deeper mountainous areas of Wohlthat mountains during the following season.

Objectives

Prioritywise, the following objectives were identified for the SOI during austral summer of 1991 -92 :

Priority I

Provision of ground control points by GPS receivers at various locations in Wohlthat mountains viz. Gruber, Petermann I, II and III, and Humboldt

Priority II

Survey of 'Maitri and Environs' on scale 1:5,000 with 5 metre contour interval. This job was to be taken up only if time permitted (after completion of task at Priority I).

In addition to above, scientists of other disciplines were assisted in their work by adopting following job approach :

- surveying the snout of D.G. Glacier in Schinnacher Oasis for GSI team by taking EDM measurements,
- providing a control point for IMD observatory, in the vicinity of Maitri station.

Sdiitiflc Operations**Global Positioning System (GPS) Control Work:**

After landing at Maitri, the Indian station at Antarctica, fresh almanac was observed for both GPS receivers as the almanac data already stored in EEPROM was more than a month old and necessitated updation. A reconnaissance sortie was taken to the Wohlthat mountains for carrying out the appreciation of GPS work involved. Later, during the course of expedition, following GPS control points were provided in translocation mode :

- (a) Two points in Gruber massif (only one point in translocation mode).
- (b) One point in Petermann I mountain
- (c) One point in Petermann II mountain
- (d) One point in Petermann III mountain
- (e) One point in Humboldt mountain
- (0) :One point in Dakshin Gangotri (DG) Glacier area of Schirmacher Oasis.

The coordinates of the above points are given in Annexure-I and a sketch showing the configuration of these points is given in Fig 1.

Survey of Maitri and Environs :

A control point provided by SOI during the previous expedition, was used as the origin of survey and following arbitrary values were assigned to it:

Easting = 10,000 metres

Southing = 5,000 metres

Height = 117 metres

Ground control points were generated with respect to the above origin, by using EDM Instrument (DI3S) for the subsequent survey on scale 1 :S,000 with

5 m contour interval. In all 17 control points were provided. The configuration of the control points is given in Annexure II and the listing of the coordinates is given in Annexure III. The break-down of the control points is as under:

Trigonometric points - 4 EDM offsets - 2 Intersected points - 11

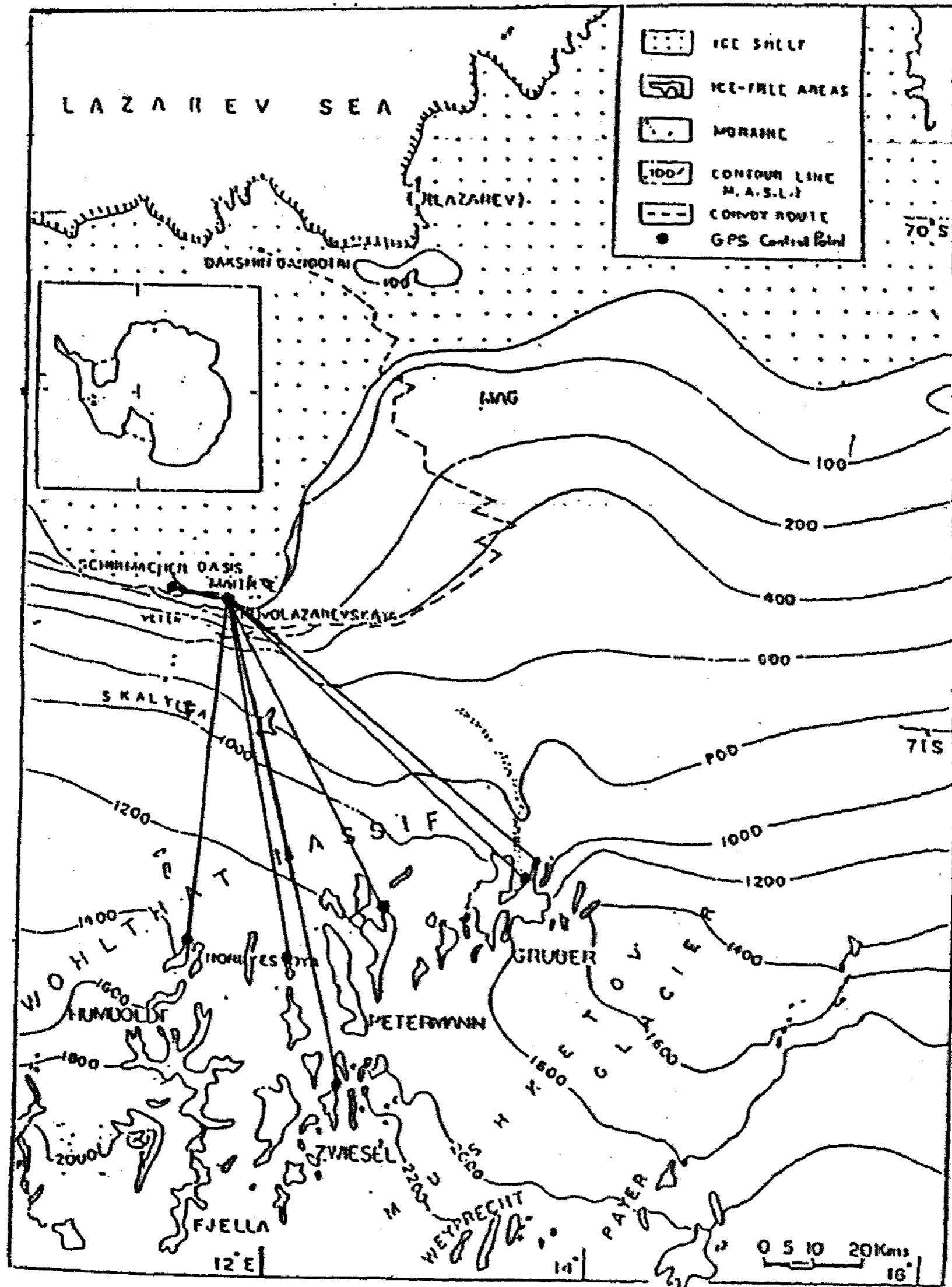


Fig 1; Sketch showing position of GPS control points in Schumacher Oasis and Wohlthat mountains.

The distribution of control points, for the extent of the area for which 1 :5,000 scale surveys were to be carried out, was planned in such a way that any height in the area of work could be computed with respect to the control points. It was seen that this aspect reasonably contributed to the accuracy of contours.

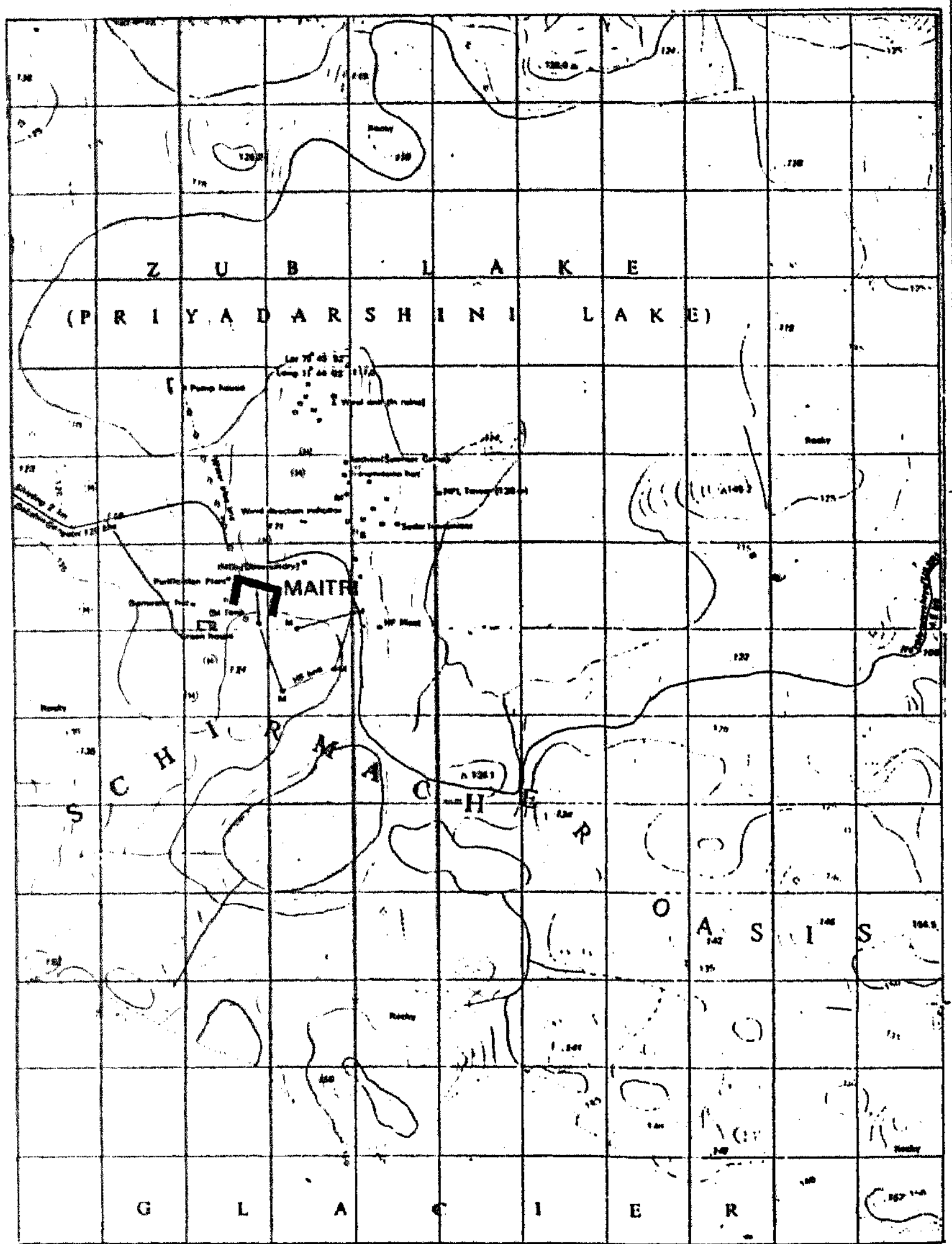


Fig 2 : Topographical map showing Maitri and its environs

A map of 'Maitri and Environs' was finally prepared which is enclosed as Fig.2; this being the first Indian production of a topographic map of any part of Antarctica.

Assistance to scientist members from other organisations

Mapping of the snout of Dakshin Gangotri Glacier:

Geological Survey of India projected a requirement for survey and preparation of snout map for the DG Glacier in Schirmacher Oasis. The work involved a number of measurements using EDM instrument (DI 3S) to fix the limits of a part of DG Glacier and its proglacial lake. The measurements had to be taken with respect to an existing point (GSI control point) which is marked on an in situ rock outcrop.

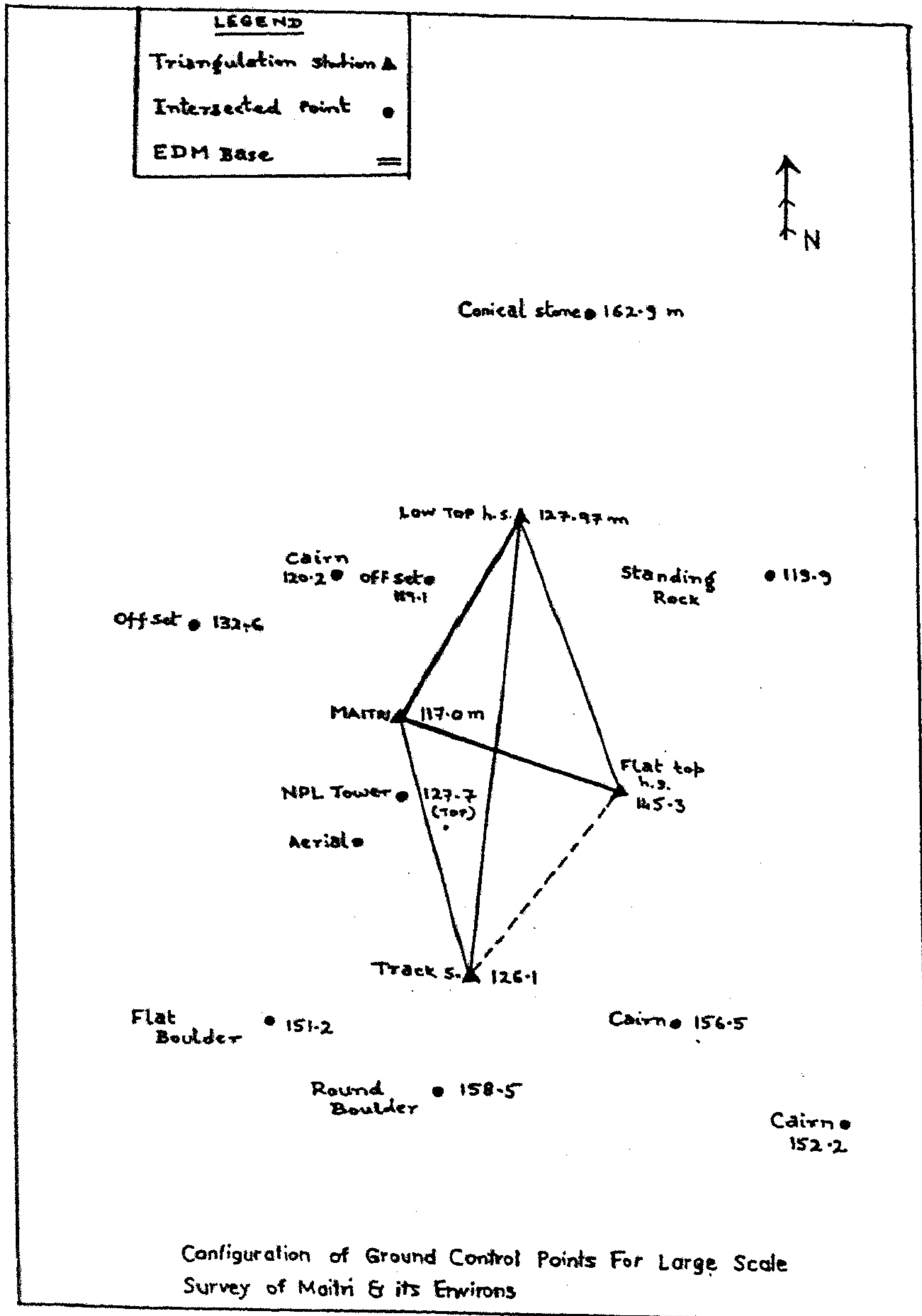
Providing control point for IMD:

A requirement was projected by IMD for the fixation of a control point within their observatory area near Maitri station. In addition to the provision of the point, SOI also provided bearing of the line joining the control point with a fixed detail (a hill top). The bearing was required by IMD to study the trajectory of balloons released by them for meteorological observations.

Acknowledgements

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ANNEXURE-II



ANNEXURE-I

List of Coordinates of GPS Stations

Sl.No.	Name of Station	Longitude(E)	Latitude(S)	Height(m)
1.	GUBR11	13°40'	71°16:	Not in translocation mode
2.	GUBR12	13°32 46.93	71° 11'35.08 ^M	825.76
3.	DG GLACIER	11° 34' 39.21	70° 45'25.74"	19.25
4	PET 14	12° 48'30.70"	71° 19' 25.97"	1173.30
5.	PET 3-15	12° 08'51.81"	71° 27' 33.58"	1341.25
6.	PET 16	12° 29'51.03"	71° 38' 34.02"	1590.51
7.	HOMB 17	11° 32'51.69"	71° 26' 09.71"	1380.78

ANNEXURE-III

List of Coordinates and Heights of Stations and Points

Sl.No	Station or Point	Eastings	Soothing	Height Above MSL		Classification
				Ground	Top	
Stations						
1.	MAITRI S	1000000.00	500000.00	117.00		
2,	LOW TOP h.s.	1000267.80	500338.52	127.97		
3.	FLAT TOP h.s.	1000443.69	499856.20	145.25		
4.	TRACKS	1000131.92	499530.64	126.11		
Intersected Points						
1.	IP 1/92 Cairn Top (Old station)	1001384.70	49907438	152.20		A
2.	IP 2/92 Cairn Top 'E' of hill	1000693.55	499350.82	156.52		A
3.	IP 3/92 Round Boulder on Hill Top 'S'of Lake	1000108.30-	499202.78		158.48	A
4.	IP 4/92 NFL Tower •	999994.94	499854.24		127.68	A
5.	IP 5/92 Hat Boulder on Top 'S' of Maitri	999722.44	499304.09		151.19	A
6.	IP 6/92 Aerial on Top' of Maitri	999889.44	499750.98		136.71	A
7.	IP 9/92 Shivling	994933.95	498753.36	342.06		B