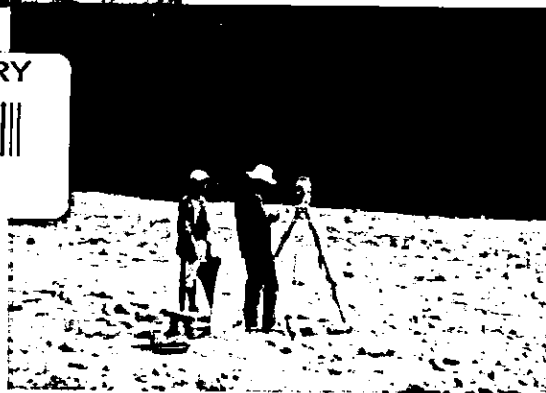


JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
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# Topographic Survey for the Supplementary Study on Environmental Impact Assessment (EIA) Study of Sindhuli Road Project Section III



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## FINAL REPORT

## VOLUME I - MAIN REPORT

March, 2005



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NPO

J R

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## CHAPTER - 1

# INTRODUCTION

## 1 INTRODUCTION

### 1.1 Background

Nepalthok – Khukot Section is one of the four Sections of Banepa – Sindhuli – Bardibas Road Project. The Project is being implemented with the grant assistance of Government of Japan. JICA is the implementing agency of the Project on behalf of Government of Japan whereas Department of Roads is the implementing agency on behalf of HMG/N. The project has been divided into four sections for the design and construction. The construction of Section I and Section IV have been completed. Section II is under construction. The Government of Japan intends to start the Basic Design of Section III in near future. For which HMG/N has started EIA Study of the Section III of Sindhuli Road Project (Nepalthok – Khurkot). The EIA Study is being carried out as per the Environment Protection Rules, 1997 of Nepal. To assist the EIA Study, the JICA, Nepal Office, initiated the detailed topographical study of the proposed road corridor of 50 m based on the after care Study of Sindhuli Road Project carried out in 1993.

JICA Nepal Office invited the proposal from some local Consulting firms to submit the technical and financial proposal for the topographical survey including GPS survey of the proposed road corridor in two separate envelopes. The Technical and Financial Proposal was submitted on February 1, 2005.

JICA awarded the topographic survey works to GEOCE Consultants (P.) Ltd. in the technical merit. The contract agreement on The Topographical Survey for EIA Study of Sindhuli Road Project Section III between JICA, Nepal Office and GEOCE was made on February 8, 2005.

### 1.2 Project Description

The proposed road passes through the Siwalik and Mahabharat Range, starting at Nepalthok (EL. 553.042), confluence of Sunkoshi River and Roshi Khola, the project runs along the Sunkoshi River and reaches Khurkot (EL 469.431), a small township in Sindhuli District. The total length of the proposed road is 31.023 km.

This section of the road passes from various settlements and six Village Development Committees. The proposed alignment passes through the vicinity of six VDCs namely: Bhimeswor (Chainage From -0+000 to 0+850), Majhuwa (Chainage From 0+850 to 4+700), Shitalpati (Chainage From 4+700 to -13+600). Purano Jhagajholi (Chainage From 13+600 to 18+200), Jhagajholi (Chainage From 18+200 to 25+000), and Kusheswor Dumja (Chainage From 25+000 to 31+023). The road passes from various settlements of the district. They are Khurkot, Bhayayetar, Dihiphat, Neupanetar, Khalte Chainpur, Shitalpati, Ghumaune Chainpur, Tinpokhare, Mulkot, Bhulkot, Ramtar, Katahare, Ratamate, Khareitole, Shaimajuwa, Gahulidaha and Nepalthok. The proposed alignment crosses nine major streams namely; Sadhi Khola (24+100), Dhamile Khola (21+350), Gangate Khola (19+500), Bhote Khola (16+100), Khahare Khola (11+500), Chainpure Khola (10+200), Gadauli Khola (5+600), Niguli Khola (4+700) and Bhalu Khola (0+600).

This road is a National Highway H 06, connects Mahottari, Dhanusha, Sindhuli and Kavre districts. Based on the classification and design standards issued by the Department of Roads for the National Highways, the right-of-way will be 25 m on either side of the road.

The location map of the proposed road alignment is shown in Figure 1.

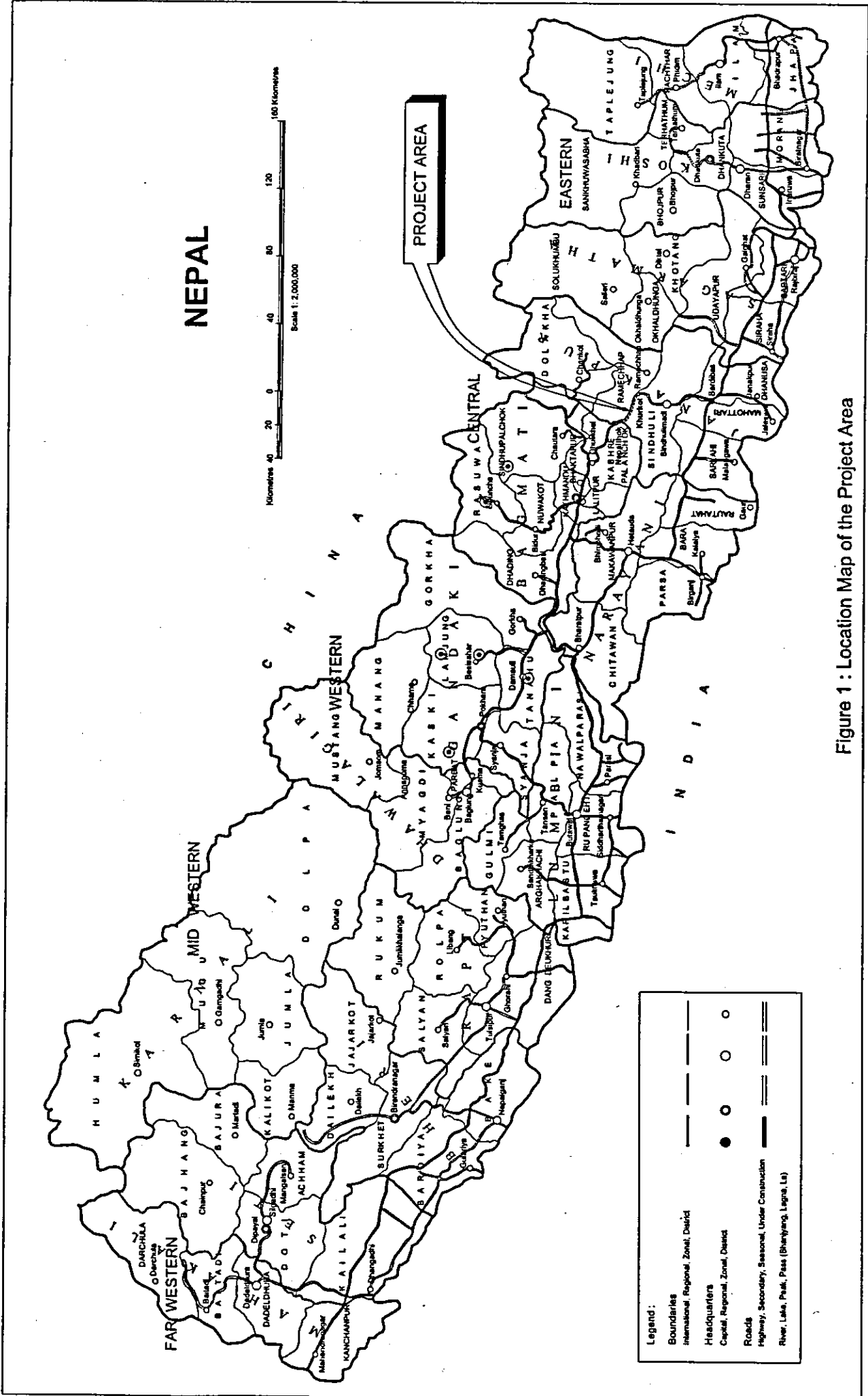


Figure 1 : Location Map of the Project Area

### 1.3 Objectives

The main objective of the survey was to assist the EIA Study of proposed road by preparing the detailed topographical map of the corridor of width 50 m so that the site specific impact assessment could be made and the appropriate mitigation and compensatory measures could be proposed.

### 1.4 Scope of Works

The Scope of works for the topographic survey are:

- Identification and location of the proposed road corridor
- Monumentation and GPS Survey of 6 GPS points within the proposed road corridor
- Monumentation of the Benchmarks and Survey Control points
- Benchmark survey along the proposed road corridor
- Traverse survey along the proposed road corridor
- Detailed topographic survey of proposed road corridor
- Detailed topographical survey of nine river crossing sites



CHAPTER -2

**METHODOLOGY AND RESULTS**

**2 METHODOLOGY AND RESULTS**

**2.1 Review of the Data and Maps**

The topographic map of the project area (scale 1:2000) and center line data of the proposed road alignment were collected. The proposed center line was plotted on the topographic map. The total length of the road was 31.023 km only. It was noted that the center line fall in the flood plain of Sunkoshi River at number of places and at some stretch the center line was located in the water way of Sunkoshi River. The matter was discussed with JICA Consultant and it was agreed that the topographical survey would be extended towards the hill side depending upon the site condition.

The coordinates of the GPS points at Nepalthok and Khurkot were collected from the consultant and presented in Table 1.

**Table 1 : Coordinates of the Existing GPS Points**

Reference No.	Northing	Easting	Location
GPS 10	3036336.0271	383099.8279	Nepalthok
GPS 9	3036361.0833	382847.3359	Nepalthok
GPS TK 36	3024263.705	400633.699	Khurkot
GPS 9909	3025104.687	399760.720	Khurkot

Similarly, the reduce level of the bench marks at Nepalthok (T S 308) and Khurkot (B M 670) were also collected. They were 553.042 m and 471.276 respectively.

**2.2 Reconnaissance Survey**

The purpose of reconnaissance was to locate the appropriate site for GPS points and field work planning such as location of the survey camps and logistic arrangement for the survey works. Three pairs of GPS points (one pair each) were located at Jhagajholi, Mulkot and Ghumaune Chainpur. Locations for the survey camps were finalized.

One of existing GPS point (D 9) located in Nepalthok was found missing whereas the both existing GPS points at Khurkot was found in place. Hence GPS observation was commenced from the two known points at Khurkot and closed at the existing GPS points at Nepalthok by reestablishing lost GPS point at Nepalthok.

The survey works were carried out in the following sequence.

- Setting of monuments for the survey control points
- Traverse survey
- Benchmarks Survey
- Layout of the center line
- Detailed topographic survey of the corridor
- Detailed topographic survey of the causeway sites

**2.3 Monumentation of the Survey Control Points**

Mainly four types of survey control points were used for the topographical survey works. They are namely:

- GPS survey points
- Benchmarks
- Traverse Control Points
- Offset Points

### 2.3.1 GPS Survey Points

As per the scope of the works, total six GPS points monumentation were to be carried out. However total seven GPS points were monumented by 1:2:4 cement concrete. They were located at Jhagajholi (2 nos), Mulkot (2 nos), Ghumaune Chainpur (2 nos) and Nepalthok (1 no). The size of the 6 GPS pillars is 30 cm x 30 cm x 50 cm with 2mm copper wire at the center. The size of GPS point at Nepalthok is 15 cm x 15 cm x 50 cm with 2mm copper wire at the center. Since the size of the pillars was too heavy to be carried, all the pillars were cast in situ. The description card of these monuments is presented in the separate volume Annex 5. All the GPS points are located on the given topographic map of scale 1:1000 in Volume II of this report.

### 2.3.2 Benchmarks

The benchmarks for survey were established at 500 m intervals along the proposed road corridor at secured and easily visible area. The size of the benchmarks were 15 cm x 15cm x 50cm long with 2 mm copper wire embedded flushed with top surface and made of 1:2:4 cement concrete. The benchmarks were kept about 5 cm above natural ground surface. Total 53 nos BMs were established. They have been numbered from BM 1 to BM 52. One of the BM has been numbered as BM 50 A. The average distance between two benchmarks is supposed to be 500 m. However it could not be maintained as some of the sections of the proposed road corridor were located on the flood plain of Sunkoshi River. The description card of BMs is presented in the separate volume Annex 5. All the BMs are located on the given topographic map of scale 1:1000 in Volume II of this report. All the BM pillars were cast in situ.

### 2.3.3 Traverse Control Points

The traverse control points were meant for horizontal control of the survey works. All together there are 185 traverse points along the proposed road corridor. They have been numbered from TP 101 to TP 285. The traverse points were made of concrete as well as wooden pegs. 84 were concrete pegs and 101 were wooden pegs. Concrete pegs have been established at 200 to 300 intervals at intermediate inter visible locations. These control points were also of 1:2:4 cement concrete. The size of these control points was 10 cm x 10 cm at top tapered to 15 x 15 cm at bottom and 40 cm long with 2 mm copper wire flushed with the top surface) or fixed with paint marks with iron nails at the center on surface of permanent structures. The pillars were precasted and carried to the site and monumented whereas the wooden pegs were of size 5 cm x 5 cm x 30 cm. All the traverse points are located on the given topographic map of scale 1:1000 in Volume II of this report.

### 2.3.4 Offset Points

The off set points are meant to pickup the detailed topographic features of the proposed road corridor. They have been established as per the requirement of the site conditions. All together there are 213 nos. of offset points. Out of which 205 points were made of wooden pegs of size 5 cm x 5 cm x 30 cm and 8 points were made of concrete of size 10 cm x 10 cm at top tapered to 15 x 15 cm at bottom and 40 cm long with 2 mm copper wire flushed with the top surface) or fixed with paint marks with iron nails at the center on surface of permanent structures. They have been numbered from OS 601 to OS 813. All the offset points are located on the given topographic map of scale 1:1000 in Volume II of this report

## 2.4 Survey Methodology

### 2.4.1 GPS Survey

GPS Survey Measurements was carried out in the following stages:

- Reconnaissance
- Survey Mission Planning
- Survey Measurements
- Post Processing of measured data.

#### (i) Reconnaissance

The basis for the selection of GPS points is governed by inter visibility and accessibility of twin points and also the reception of satellite signals during GPS Survey measurements. Since one of the existing GPS point at Nepalthok was not in place, the GPS survey was started from Khurkot where two known GPS points were available as the base station.

#### (ii) Mission Planning

The GPS survey mission planning was carried out for designing GPS network and consequent GPS survey observation plan. The proposed GPS network is designed as a closed network with triangles and rectangles connected to the existing twin GPS survey points at either extremities of the proposed road corridor as indicated in the Figure 2.

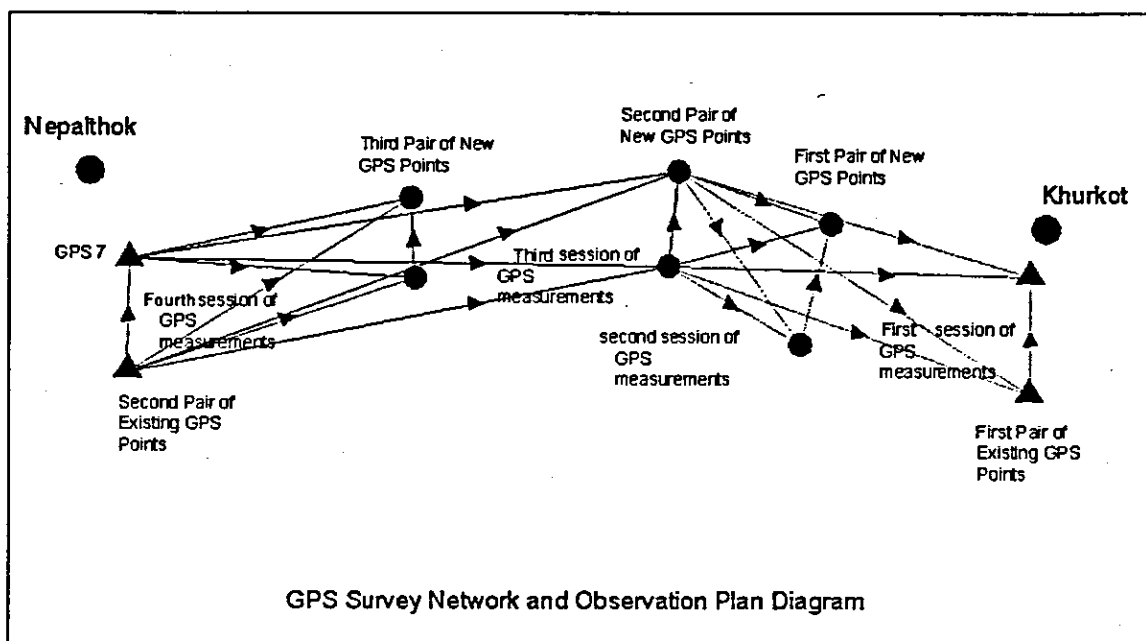


Figure 2 : GPS Survey Network and Observation Plan Diagram

Based on the network design in Figure 2, total four 4 separate observation sessions each of 2-3 hrs duration were carried out to complete the survey.

Ashtech GPS survey mission planning software was used to determine the availability of number of satellite and ideal satellite geometry (best PDOP value) during the day.

#### (iii) Measurements

During the 1<sup>st</sup> session of GPS observation, 2 GPS receivers were stationed at the existing twin GPS points at the starting end of proposed road corridor serving as a base stations and other 2 GPS receivers were stationed at the 1<sup>st</sup> pair of new GPS points along the road corridor serving as rover stations.

During the 2<sup>nd</sup> session of GPS observation, 2 units of GPS receivers fixed at 1<sup>st</sup> pair of GPS points were moved to the 2<sup>nd</sup> pair of new GPS points.

During the 3<sup>rd</sup> session of observation, 2 units fixed at existing twin GPS points were swapped to the 3<sup>rd</sup> pair of new GPS points and during the last session of GPS measurements two sets fixed at 3<sup>rd</sup> pair of GPS points were moved to twin GPS points (out of which one was existing and other was re established) at the other end of the proposed road corridor thus forming a closed GPS Survey network loop.

(iv) Method

Standard Static GPS Survey method was adopted and simultaneous measurements of 4 receivers was made for a duration of 2- 3 hrs giving 4 correlated vectors.

(v) Post Processing of Measured Data

All GPS survey measurements were downloaded and checked in to the GPS Survey database. During checking, information was verified against the field notes.

(vi) Processing and Coordinate Computation

The post processing of all GPS measurement of vectors was done using Ashtech Solutions GPS Post-processing Software using standard static method. Each vector was processed individually.

Analysis and adjustment of post processed data was made using Gemini Net /GPS Software. Broadcasted ephemerides was used. The closing error was found to be 41.6 cm in northing and 38.8 cm in easting in the stretch of about 31 km. A list of coordinates of the GPS points (after making correction of errors) is presented in Table 2.

Table 2 : List of Coordinates

S.No.	Site ID	Easting	Northing	Elevation	Remarks
1	GPS 1	387307.711	3034339.771	596.603	
2	GPS 2	387761.748	3034111.147	540.248	
3	GPS 3	393115.335	3032116.559	548.775	
4	GPS 4	393507.065	3032325.798	495.097	
5	GPS 5	397703.405	3029743.612	607.830	
6	GPS 6	397861.511	3029229.157	635.176	
7	GPS 7	382598.043	3036668.159	646.379	
8	D 10	383099.828	3036336.027	974.496	Closing Station
9	TK 36	400633.699	3024263.705	597.780	Base Station
10	9909	399760.720	3025104.687	572.415	Base Station

### 2.4.2 Benchmark Survey

The reduced level for the benchmark survey was carried from old BM of Section - IV at Nepalthok TS-308 having reduced level of 553.042 m. A double run split level survey was carried out by the auto level to provide the reduced level for all the benchmarks, traverse points and off set points. Calculation were checked in the field itself. If there were any difference in the level beyond the given acceptable limit, the survey was repeated. The derived reduced levels of the survey points were cross checked with the level computed by the traverse survey also.

The acceptable limit for Bench Mark survey was  $10\sqrt{S}$  mm where S is the distance leveling routes in km. The benchmark surveys were within the acceptable limit.

The benchmark survey was commenced from TS-308 at Nepalthok and closed at BM – 670 at Khurkot. It is understood that TS 308 was established during the construction of Section IV whereas BM-670 was established during the topographic survey of Section II in 1999. Reduced level for former point was carried from Dhulikhel and whereas the reduced level for later point was carried from Sindhuli Bazaar. From this survey, the level difference at BM-670 was found to be -1.845 m.

The co-ordinates and reduced level of the Benchmarks are presented in Annex-3.

### 2.4.3 Traverse Survey

The traverse survey was carried by total station SOKKIA Set 5F instrument with electronic data logger. Two sets of horizontal angle, two sets of vertical angle and two sets reciprocal distance were taken from each station.

The survey commenced from a pair of GPS points and closed to next pair of GPS points or traverse points having known coordinates. The survey data were recorded in the electronic data logger. They were down loaded in the computer by using PROLINK Software developed by SOKKIA Instrument. The software computed the closing error as well as make the necessary correction and give the co-ordinates as well as reduced level. The data logger computes the coordinates of the observed points. If the closing error of the survey works is within the permissible range, the coordinates of the observed points is calculated making the error distribution as per the international acceptable norms. Entire data processing is carried out by the data logger itself. The benchmarks were also used as the traverse points for the control survey. There were seven main traverse lines in the entire length of the traverse survey. Some additional sub traverse lines were also laid out within the main traverse for the detailed topographic survey works. There were 12 sub traverse line. Co-ordinates and levels of the traverse points are presented in Annex- 3. All together 185 nos. of traverse control points have been established. In addition 213 off set points were also set out to carry out the detailed topographic survey. The co-ordinate and reduced level of the off set points are presented in Annex - 4. The error and accuracy of main traverse line is presented in Table 3. The layout of the main traverse and sub traverse lines is presented from Figure 3 to 21. The survey error is within the tolerable error.

Table 3 : Details of Main Traverse Survey

Traverse Line	Section		No of Base Lines	Total Distance (Km)	Tolerable Error (cm)	Angle Misclosure (Grade)	Distance Error (cm)	Accuracy
	From	To						
1	D 10 – GPS 7	GPS 7 – D 10	13	6.215	104.88	0.001	38.00	1:147,386
2	T P 105 – BM 3	GPS 1 – GPS 2	19	4.864	111.13	0.0203	31.40	1:14,893
3	GPS 1 – GPS 2	GPS 3 –GPS4	30	7.373	163.72	0.0271	63.00	1:18,600
4	GPS 3 – GPS 4	GPS 5 -GPS6	15	6.844	116.32	0.021	31.20	1:20,218
5	GPS 5 –GPS 6	GPS 5 –GPS 6	15	5.286	104.05	0.0044	5.90	1:80,262
6	TP 235 –TP 236	TP 235 –TP 236	10	2.104	60.87	0.0091	1.70	1:105,124
7	TP 235 – BM 46	TK 36 – D 9909	22	5.537	125.37	0.0348	34.60	1:12,450

Tolerable Error  $15 \text{ cm.} + 10\sqrt{N}\sum S$

Where N is the no. of base lines

S is the sum of the distance in Km

The reduced levels computed by the traverse survey were compared with the leveling survey. It was found that the reduced level derived from leveling survey and traverse survey are almost same. It varied maximum of 2cm in few points otherwise they were found mostly equal.

### 2.4.4 Location and Layout of the Proposed Road Corridor

In order to carry out the detailed topographical survey of the proposed road corridor, the given center line of the proposed road had to be physically located on the ground. It was done by using the coordinates of the center line at 100 m interval of the proposed road corridor and traverse points established on the ground. The given coordinates of the proposed center line of the road are presented in Annex 5. The angle and distance of the center line of the proposed road with reference to the survey points were computed and they were relayed on the ground. The coordinates of the proposed road center line was based on the topographical map of the scale 1:2000 prepared during Feasibility Study of the Project in 1988 where as the coordinates of the traverse points were based on the coordinate system of Sindhuli Road Project Section II and Section IV. But both systems did not have a difference.

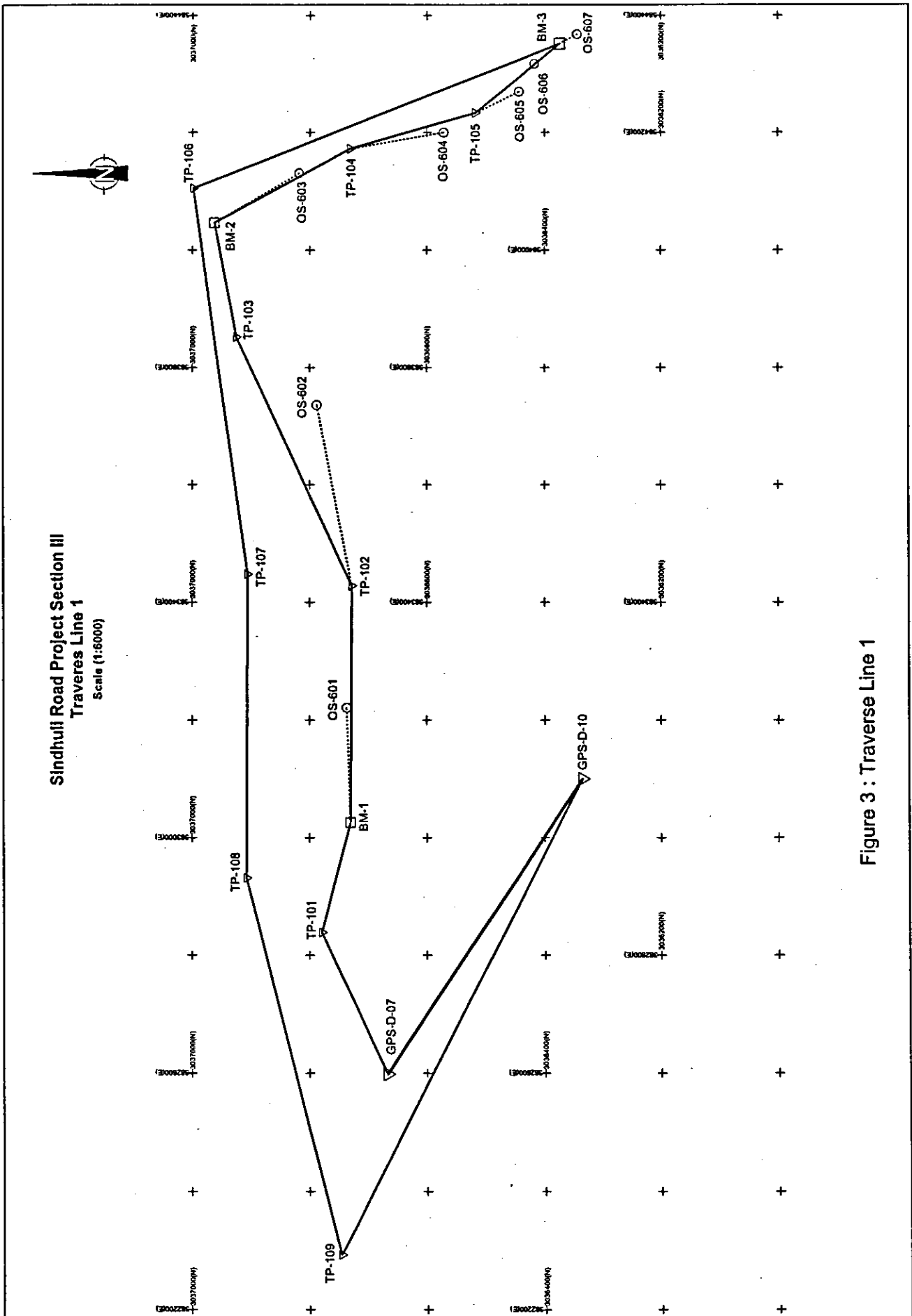


Figure 3 : Traverse Line 1

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 1**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
GPS-D-07	3036668.160	382598.043	645.262	PILLAR
GPS-D-10	3036336.030	383099.828	973.332	PILLAR
TP-101	3036779.550	382838.507	551.992	PILLAR
TP-102	3036728.760	383427.659	540.763	PILLAR
TP-103	3036925.600	383852.039	535.449	PILLAR
TP-104	3036732.070	384171.931	532.124	PILLAR
TP-105	3036518.720	384233.286	548.034	PILLAR
TP-106	3036998.580	384104.922	531.649	PEG
TP-107	3036906.330	383447.766	540.892	PEG
TP-108	3036908.040	382931.345	546.417	PEG
TP-109	3036746.470	382292.515	569.311	PEG
BM-1	3036730.910	383025.827	545.244	PILLAR
BM-2	3036962.480	384046.747	532.760	PILLAR
BM-3	3036374.410	384351.459	555.678	PILLAR
OS-601	3036737.370	383220.835	542.697	PEG
OS-602	3036788.170	383735.898	538.109	PEG
OS-603	3036819.110	384130.638	531.348	PEG
OS-604	3036572.030	384199.872	529.126	PEG
OS-605	3036444.910	384269.550	546.156	PEG
OS-606	3036417.990	384317.026	552.276	PEG
OS-607	3036344.690	384367.474	546.530	PEG

**CLOSING ERRORS**

Angle misclosure	0.0011g	
Difference in distance	0.038 m	
Difference in Northing	(-) 0.002 m	
Difference in Easting	0.038 m	
Difference in Elevation	(-) 0.022 m	
Accuracy	1:147386	
Total Traverse Length	6214.655	m
No. of Stations	14	
No. of base line	13	
Tolarable closing Error	104.884	cm

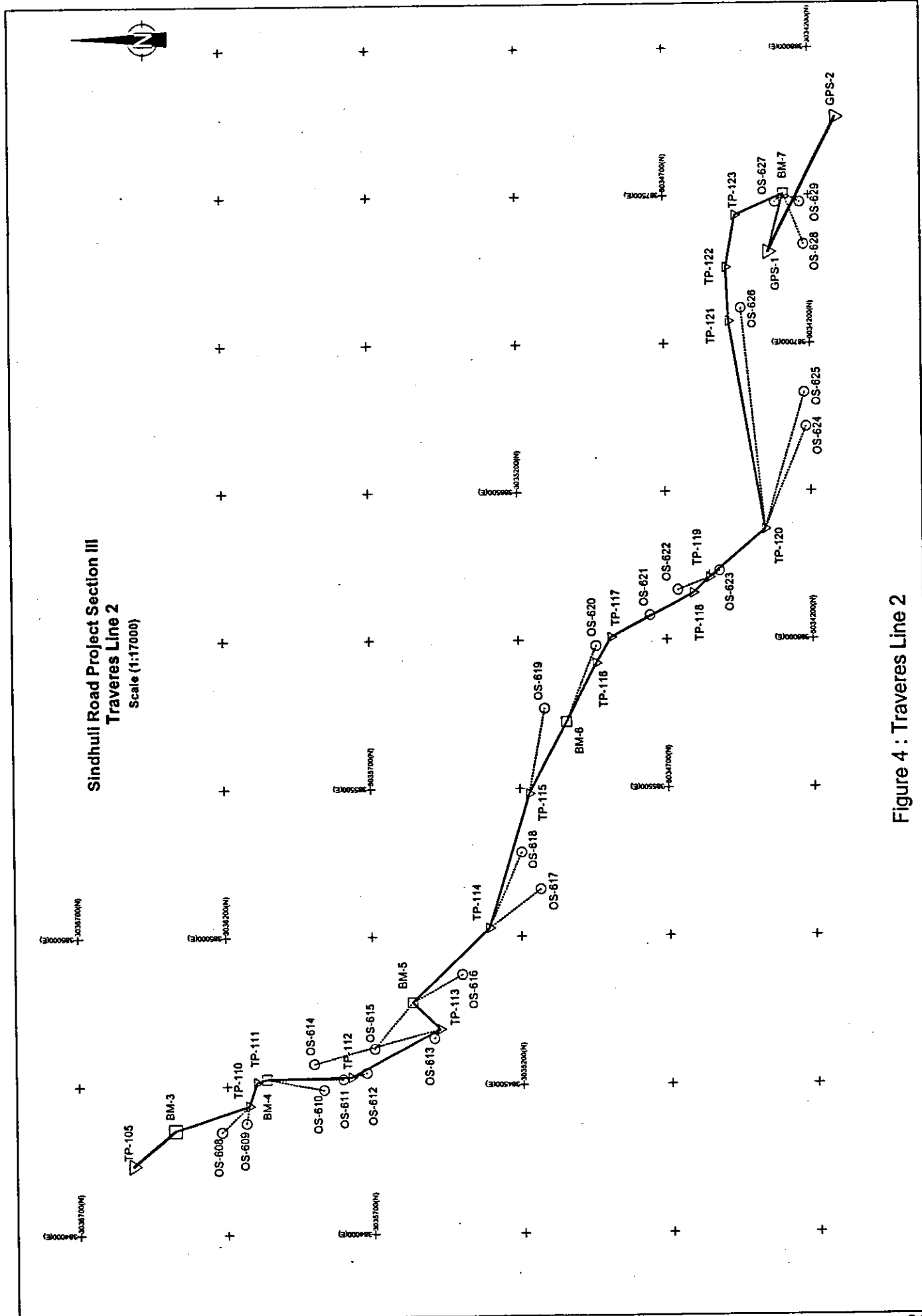


Figure 4 : Traverses Line 2



**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 2**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-105	3036518.730	384233.286	548.034	PILLAR
BM-3	3036374.410	384351.459	555.678	PILLAR
TP-110	3036126.600	384433.849	549.547	PILLAR
TP-111	3036098.790	384512.852	549.359	PEG
TP-112	3035773.160	384527.574	547.688	PILLAR
TP-113	3035475.380	384687.791	546.664	PEG
TP-114	3035307.080	385028.021	518.595	PILLAR
TP-115	3035168.740	385481.902	516.221	PILLAR
TP-116	3034938.780	385920.994	529.502	PILLAR
TP-117	3034888.080	386007.880	527.822	PILLAR
TP-118	3034607.160	386156.033	544.414	PEG
TP-119	3034551.060	386207.241	544.248	PILLAR
TP-120	3034356.830	386370.333	543.759	PILLAR
TP-121	3034477.390	387074.668	508.812	PEG
TP-122	3034486.210	387257.066	511.076	PILLAR
TP-123	3034452.460	387432.282	512.301	PILLAR
BM-4	3036063.950	384522.597	558.585	PILLAR
BM-5	3035565.170	384778.079	519.626	PILLAR
BM-6	3035040.960	385724.784	549.006	PILLAR
BM-7	3034284.910	387504.640	537.325	PILLAR
OS-608	3036219.220	384345.959	548.797	PILLAR
OS-609	3036136.160	384375.409	548.879	PEG
OS-610	3035869.430	384486.222	547.737	PILLAR
OS-611	3035802.610	384521.398	547.981	PEG
OS-612	3035722.640	384542.143	546.812	PEG
OS-613	3035495.820	384656.956	548.464	PEG
OS-614	3035901.730	384573.124	522.636	PILLAR
OS-615	3035694.790	384622.463	520.598	PEG
OS-616	3035400.050	384871.583	518.271	PEG
OS-617	3035132.810	385158.977	548.312	PEG
OS-618	3035197.120	385284.167	517.137	PEG
OS-619	3035113.700	385769.861	515.705	PEG
OS-620	3034938.540	385979.597	514.524	PEG
OS-621	3034754.970	386081.766	528.360	PEG
OS-622	3034660.060	386166.118	527.106	PEG
OS-623	3034516.790	386229.636	544.248	PEG
OS-624	3034215.180	386716.367	541.905	PEG
OS-625	3034220.540	386832.129	542.057	PILLAR
OS-626	3034434.850	387119.343	542.453	PILLAR
OS-627	3034313.840	387476.129	534.418	PEG
OS-628	3034219.115	387333.356	535.407	PEG
OS-629	3034231.104	387475.546	528.381	PEG
GPS-1	3034339.770	387307.711	595.294	PILLAR
GPS-2	3034111.150	387761.748	538.846	PILLAR

**CLOSING ERRORS**

Angle misclosure	0.0203 g	
Difference in distance	0.314 m	
Difference in Northing	(-) 0.291 m	
Difference in Easting	(-) 0.118 m	
Difference in Elevation	(-) 0.064 m	
Accuracy	1:14893	
Total Traverse Length	4863.730	m
No. of Stations	20	
No. of base line	19	
Tolarable closing Error	111.131	cm

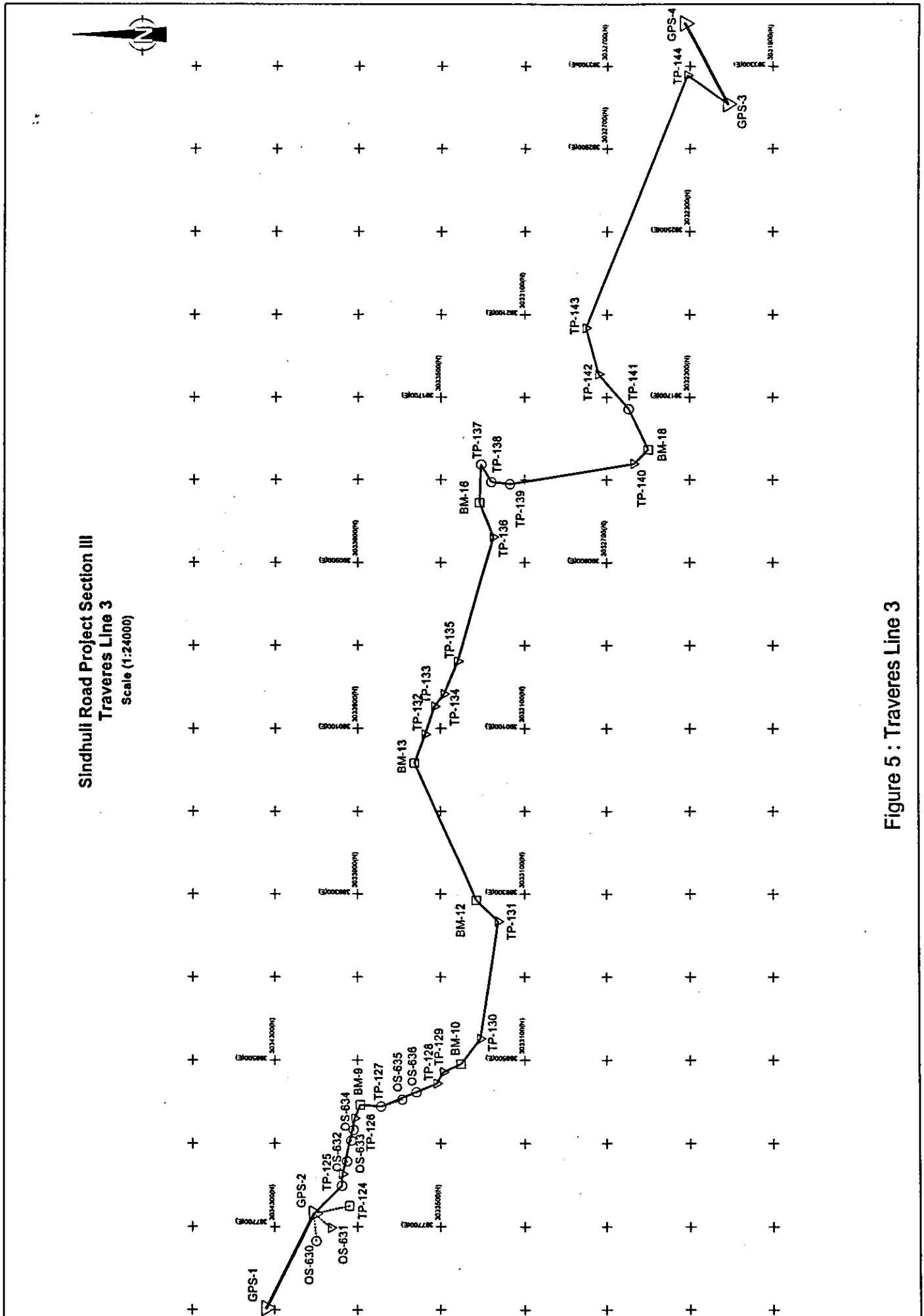


Figure 5 : Traverses Line 3

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 3**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
GPS-1	3034339.771	387307.711	595.294	PILLAR
GPS-2	3034111.147	387761.748	538.846	PILLAR
TP-124	3033975.452	387896.227	538.275	PEG
TP-125	3033973.158	387952.194	539.751	PILLAR
TP-126	3033914.612	388220.163	551.627	PILLAR
TP-127	3033785.571	388276.665	568.048	PEG
TP-128	3033518.780	388387.349	566.250	PILLAR
TP-129	3033487.409	388441.836	562.564	PILLAR
TP-130	3033312.768	388602.055	559.359	PILLAR
TP-131	3033228.671	389166.813	551.109	PILLAR
TP-132	3033574.965	390071.091	524.571	PILLAR
TP-133	3033529.674	390205.804	526.245	PILLAR
TP-134	3033484.191	390265.442	528.389	PILLAR
TP-135	3033421.304	390422.786	524.495	PILLAR
TP-136	3033251.953	391022.729	507.505	PILLAR
TP-137	3033308.947	391373.183	502.429	PEG
TP-138	3033261.425	391288.533	519.325	PEG
TP-139	3033171.415	391278.281	529.071	PEG
TP-140	3032570.991	391377.774	551.612	PILLAR
TP-141	3032595.227	391643.044	575.184	PEG
TP-142	3032740.371	391812.173	567.900	PILLAR
TP-143	3032802.181	392035.207	579.410	PILLAR
TP-144	3032312.698	393255.178	496.743	PILLAR
BM-8	3033937.729	387799.783	533.386	PILLAR
BM-9	3033886.464	388285.433	555.248	PILLAR
BM-10	3033405.603	388481.420	563.325	PILLAR
BM-12	3033331.601	389269.583	551.913	PILLAR
BM-13	3033624.764	389932.778	516.535	PILLAR
BM-16	3033316.312	391188.594	508.177	PILLAR
BM-18	3032500.344	391446.552	568.315	PILLAR
OS-630	3034099.545	387629.891	520.060	PEG
OS-631	3034026.568	387693.590	520.642	PILLAR
OS-632	3033951.161	388013.505	543.006	PEG
OS-633	3033931.188	388112.661	545.219	PEG
OS-634	3033919.699	388164.455	549.731	PEG
OS-635	3033684.040	388310.032	565.376	PEG
OS-636	3033614.847	388345.343	563.060	PEG
GPS-3	3032116.559	393115.335	546.975	PILLAR
GPS-4	3032325.798	393507.065	493.231	PILLAR

**CLOSING ERRORS**

Angle misclosure	0.0271 g	
Difference in distance	(-) 0.630 m	
Difference in Northing	(-) 0.626 m	
Difference in Easting	0.067 m	
Difference in Elevation		
Accuracy	1:18600	
Total Traverse Length	7372.669	m
No. of Stations	31	
No. of base line	30	
Tolerable closing Error	163.721	cm

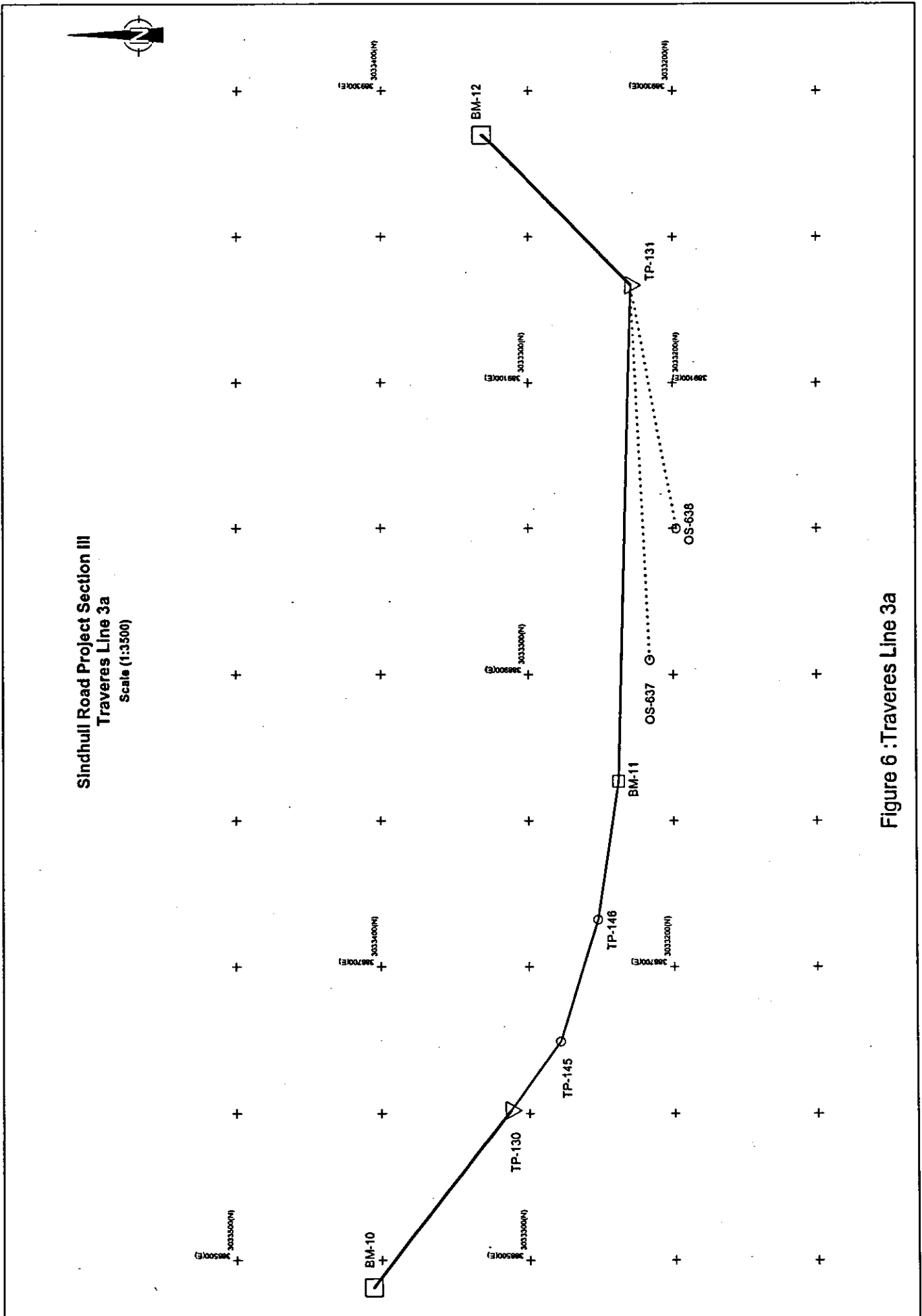


Figure 6 :Traverses Line 3a

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 3a**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-130	3033312.770	388602.053	559.359	PILLAR
TP-131	3033228.670	389166.811	551.109	PILLAR
TP-145	3033278.460	388648.910	557.803	PEG
TP-146	3033252.060	388732.163	556.118	PEG
BM-10	3033405.603	388481.420	563.325	PILLAR
BM-11	3033237.500	388827.142	553.730	PILLAR
BM-12	3033331.601	389269.583	551.913	PILLAR
OS-637	3033215.870	388909.955	551.996	PEG
OS-638	3033197.640	388999.786	550.347	PEG

**CLOSING ERRORS**

Angle misclosure	0.0040g	
Difference in distance	0.067 m	
Difference in Northing	(-) 0.067 m	
Difference in Easting	0.005 m	
Difference in Elevation	(-) 0.00 m	
Accuracy	1:10376	
Total Traverse Length	839.292 m	
Total Traverse Length	839.292	m
No. of Stations	7	
No. of base line	6	
Tolerable closing Error	37.440	cm

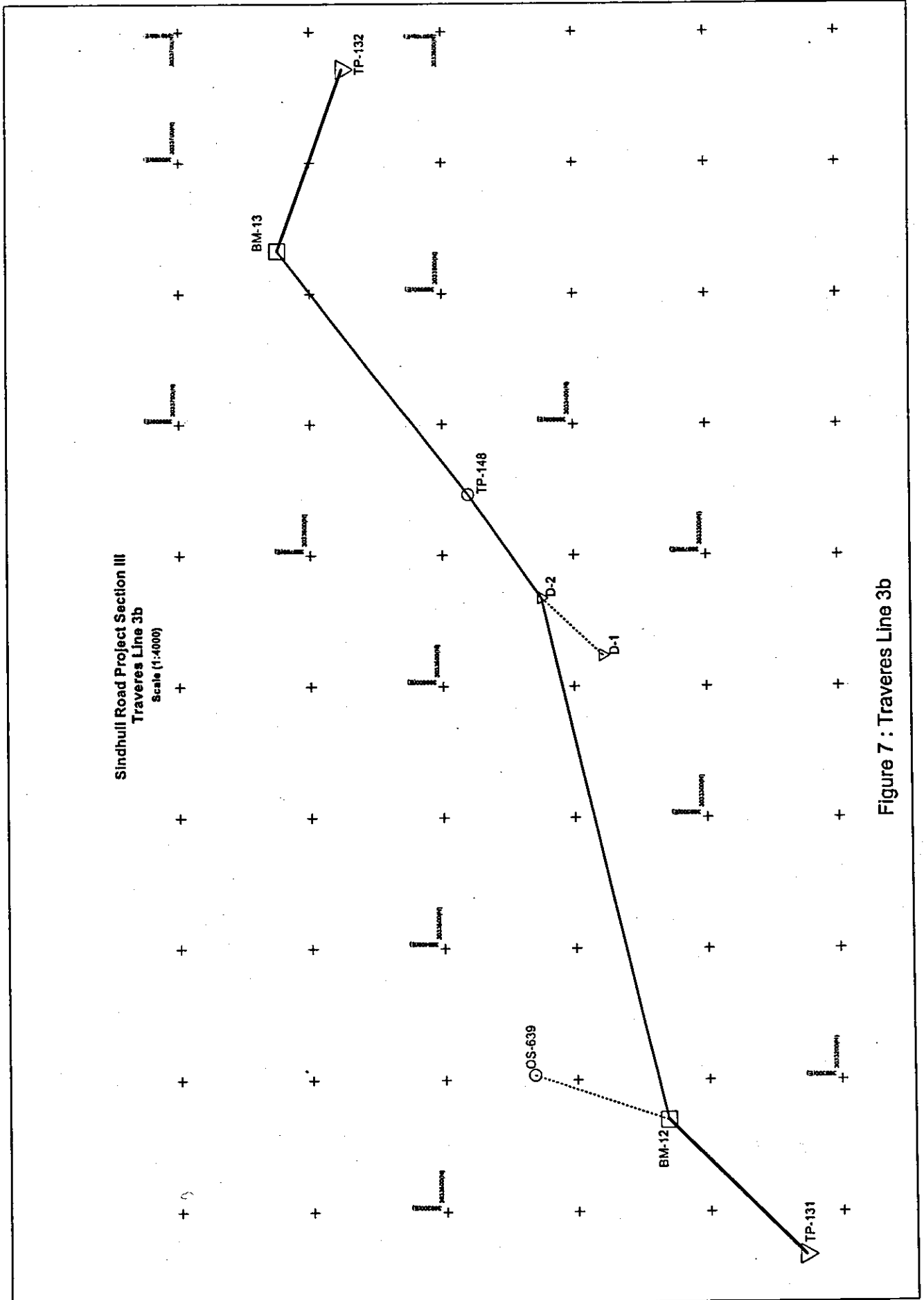


Figure 7 : Traverses Line 3b

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 3b**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-131	3033228.670	389166.811	551.109	PILLAR
TP-132	3033574.970	390071.088	524.571	PILLAR
TP-147 (D-2)	3033424.930	389667.147	520.329	PILLAR
TP-148	3033480.500	389746.139	521.545	PEG
BM-12	3033331.601	389269.583	551.913	PILLAR
BM-13	3033624.764	389932.778	516.535	PILLAR
D-1	3033378.280	389623.522	518.525	PILLAR
D-2	3033424.930	389667.147	520.329	PILLAR
OS-639	3033432.310	389303.521	510.703	PEG

**CLOSING ERRORS**

Angle misclosure	0.0060g	
Difference in distance	0.037 m	
Difference in Northing	(-) 0.034 m	
Difference in Easting	(-) 0.015 m	
Difference in Elevation	(-) 0.013 m	
Accuracy	1:20171	
Total Traverse Length	887.829 m	
Total Traverse Length	887.829	m
No. of Stations	6	
No. of base line	5	
Tolarable closing Error	36.069	cm

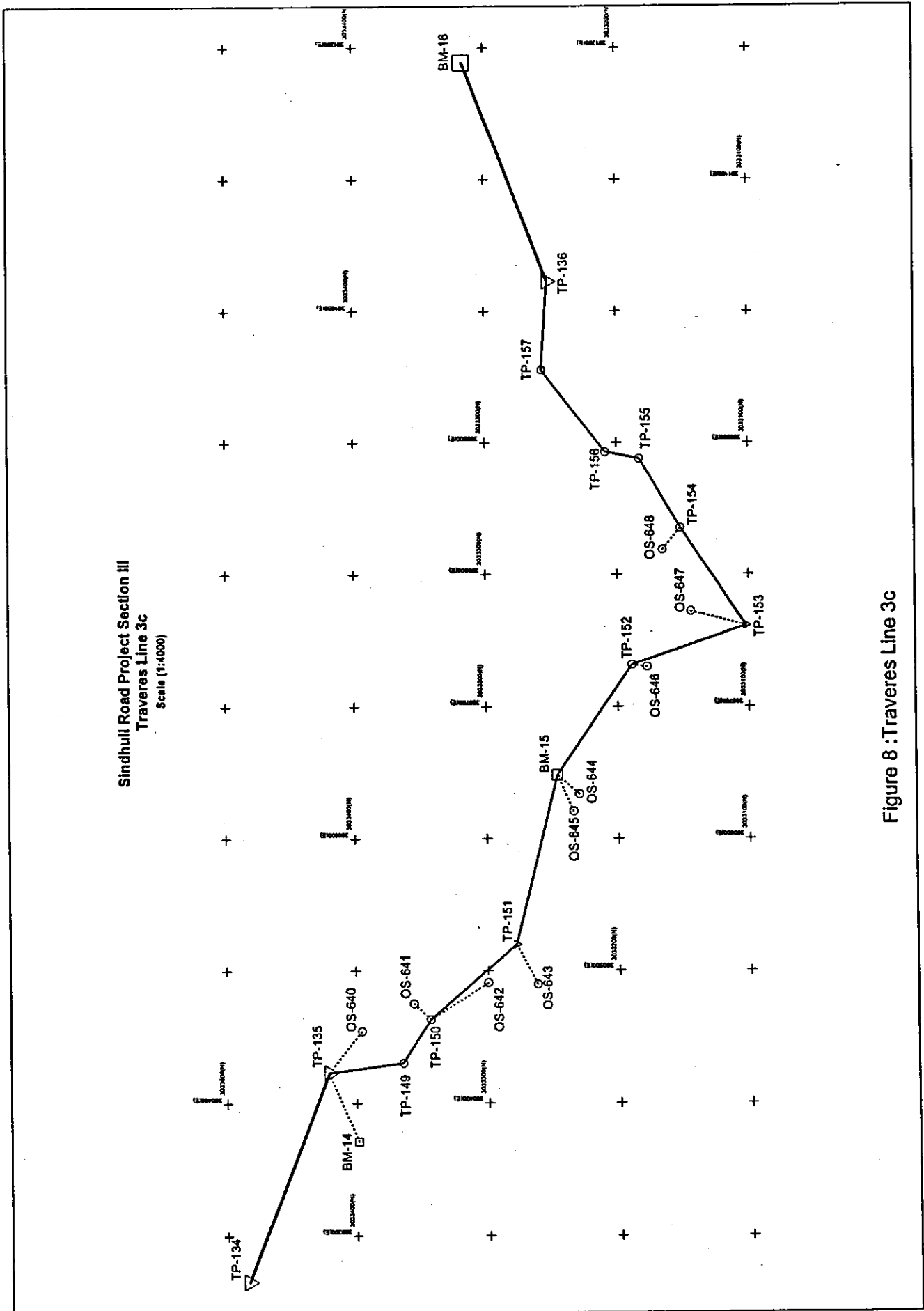


Figure 8 : Traverses Line 3c



**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 3C**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-134	3033484.190	390265.439	528.389	PILLAR
TP-135	3033421.310	390422.785	524.495	PILLAR
TP-136	3033251.950	391022.728	507.505	PILLAR
TP-149	3033364.670	390430.141	519.282	PEG
TP-150	3033343.770	390462.982	526.726	PEG
TP-151	3033278.350	390519.808	525.494	PILLAR
TP-152	3033189.210	390731.515	521.975	PEG
TP-153	3033102.330	390761.107	522.553	PILLAR
TP-154	3033152.260	390835.058	520.234	PEG
TP-155	3033182.910	390887.553	520.006	PEG
TP-156	3033208.190	390892.800	511.486	PEG
TP-157	3033256.250	390955.488	510.936	PEG
BM-14	3033398.630	390371.164	529.139	PILLAR
BM-15	3033245.750	390648.214	523.705	PILLAR
BM-16	3033316.312	391188.594	508.177	PILLAR
OS-640	3033395.720	390454.266	515.348	PEG
OS-641	3033356.150	390475.010	525.306	PEG
OS-642	3033300.190	390490.726	526.707	PEG
OS-643	3033262.180	390489.566	526.232	PEG
OS-644	3033229.370	390633.799	527.071	PEG
OS-645	3033233.770	390620.804	525.775	MARK ON WATERTANK
OS-646	3033178.030	390730.041	523.885	PEG
OS-647	3033144.430	390771.793	514.406	PEG
OS-648	3033165.710	390818.537	507.184	PEG

**CLOSING ERRORS**

Angle misclosure	(-)0.0039g
Difference in distance	0.052 m
Difference in Northing	(-) 0.051 m
Difference in Easting	(-) 0.007 m
Difference in Elevation	(-) 0.057 m
Accuracy	1:16025
Total Traverse Length	1007.751 m
Total Traverse Length	1007.751 m
No. of Stations	13
No. of base line	12
Tolarable closing Error	49.775 cm

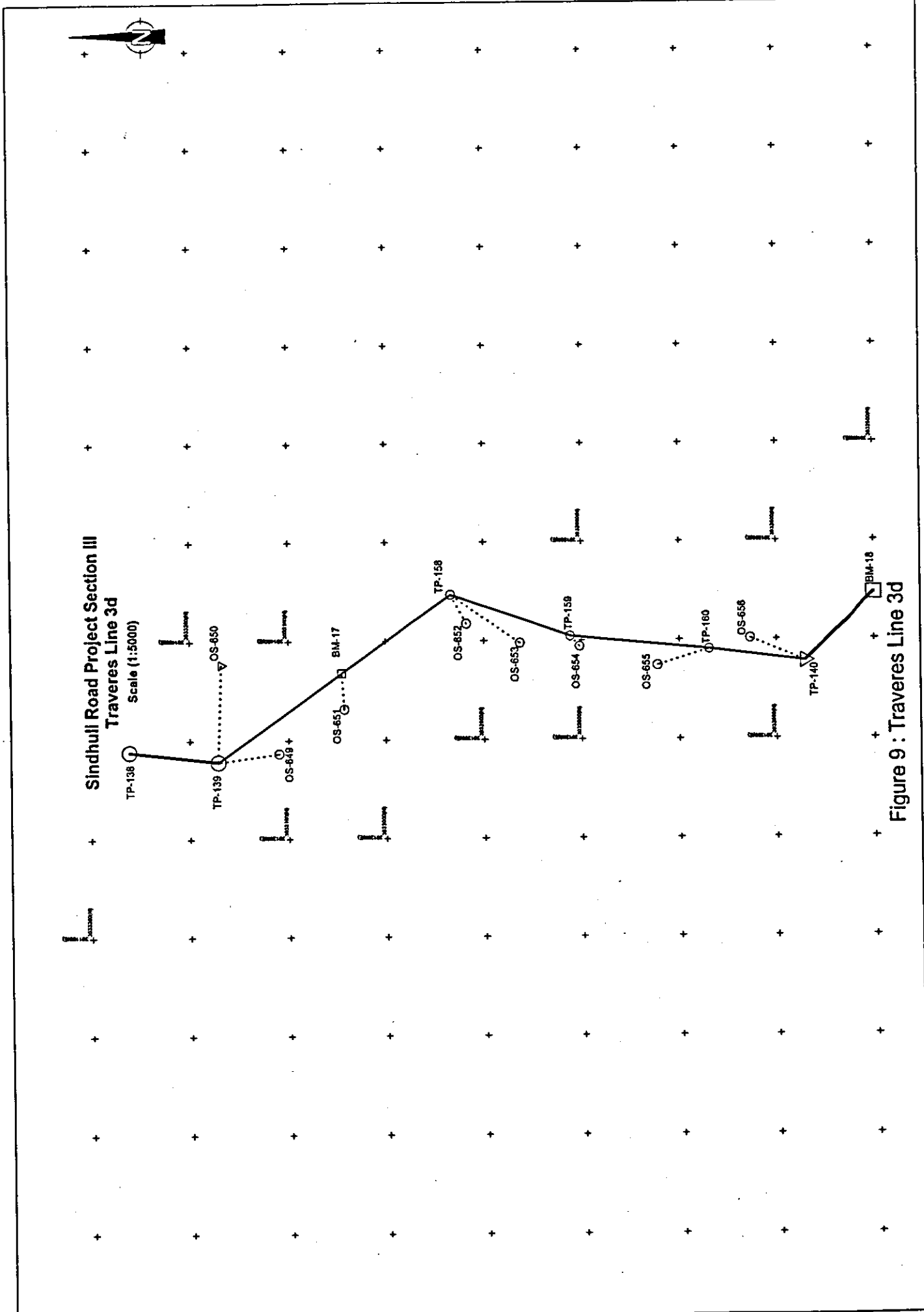


Figure 9 : Traverses Line 3d

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 3D**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-138	3033261.430	391288.532	519.325	PEG
TP-139	3033171.420	391278.279	529.071	PEG
TP-140	3032570.990	391377.773	551.612	PILLAR
TP-158	3032933.630	391446.422	539.835	PEG
TP-159	3032811.980	391404.194	547.428	PEG
TP-160	3032669.680	391390.226	553.625	PEG
BM-17	3033045.050	391367.627	534.888	PILLAR
BM-18	3032500.344	391446.552	568.315	PILLAR
OS-649	3033109.670	391286.555	531.511	PEG
OS-650	3033168.060	391376.789	527.662	PILLAR
OS-651	3033042.650	391331.164	532.649	PEG
OS-652	3032917.790	391417.190	538.683	PEG
OS-653	3032863.950	391397.370	543.638	PEG
OS-654	3032802.180	391393.838	546.755	PEG
OS-655	3032722.790	391374.220	548.253	PEG
OS-656	3032627.250	391401.011	553.966	PEG

**CLOSING ERRORS**

Angle misclosure	(-)0.0080 g	
Difference in distance	0.054 m	
Difference in Northing	(-) 0.053 m	
Difference in Easting	(-) 0.007 m	
Difference in Elevation	(-) 0.065 m	
Accuracy	1:12377	
Total Traverse Length	761.101 m	
Total Traverse Length	761.101	m
No. of Stations	6	
No. of base line	5	
Tolarable closing Error	34.508	cm

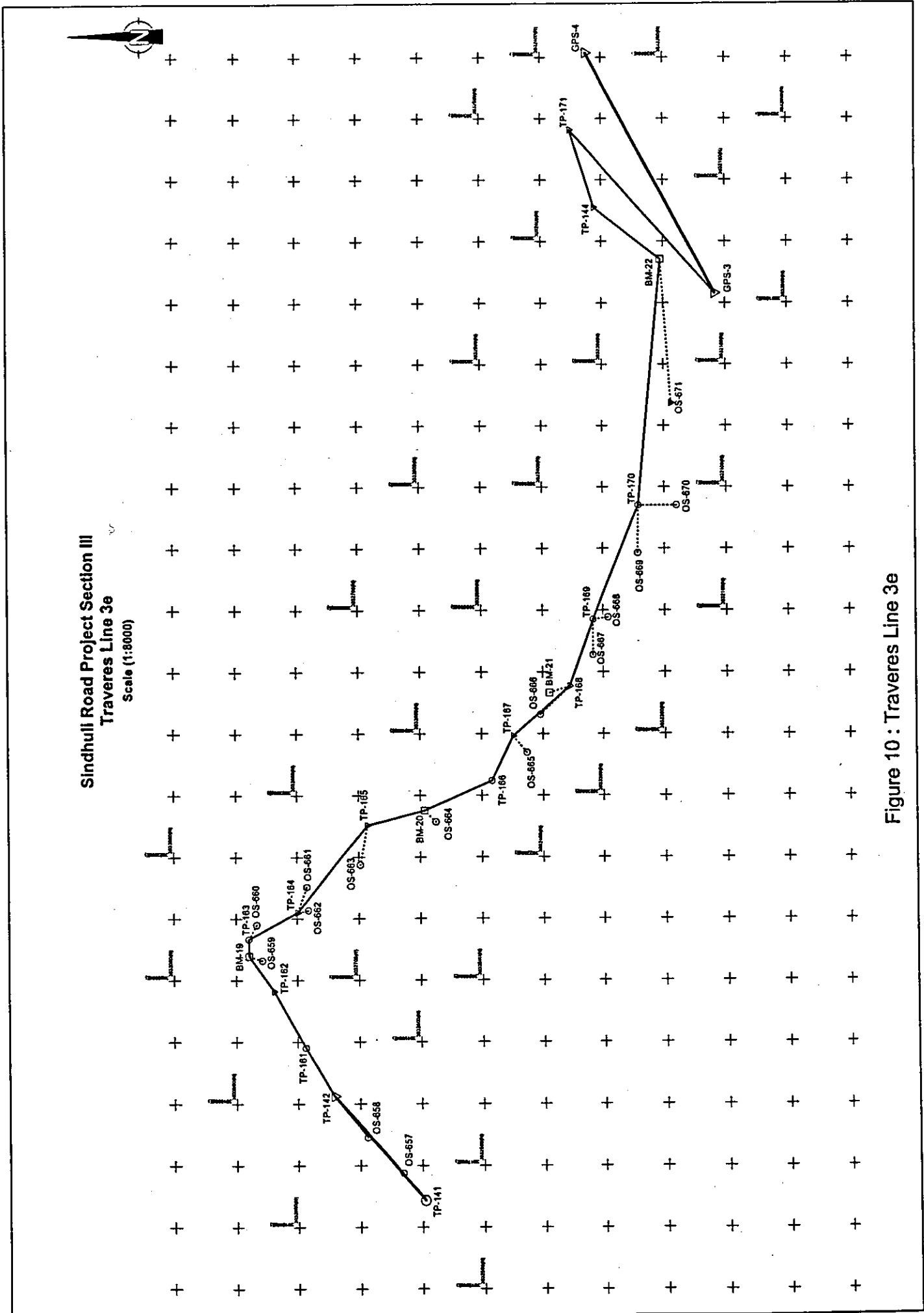


Figure 10: Traverses Line 3e

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 3E**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-141	3032595.230	391643.042	575.184	PEG
TP-142	3032740.370	391812.171	567.900	PILLAR
TP-144	3032312.700	393255.177	496.743	PILLAR
TP-161	3032787.380	391890.212	560.824	PEG
TP-162	3032837.900	391981.576	559.881	PILLAR
TP-163	3032879.380	392066.305	559.390	PEG
TP-164	3032799.580	392109.701	556.238	PILLAR
TP-165	3032685.740	392251.394	538.786	PILLAR
TP-166	3032483.910	392323.842	540.038	PEG
TP-167	3032449.070	392396.152	535.824	PILLAR
TP-168	3032355.280	392476.925	529.392	PILLAR
TP-169	3032316.950	392584.851	516.282	PEG
TP-170	3032241.460	392769.959	499.578	PEG
TP-171	3032351.870	393381.460	494.929	PILLAR
OS-657	3032630.680	391687.299	567.256	PEG
OS-658	3032688.280	391745.317	563.627	PEG
OS-659	3032857.280	392031.650	563.829	PEG
OS-660	3032866.250	392089.726	554.966	PEG
OS-661	3032784.520	392151.095	547.464	PEG
OS-662	3032782.100	392113.275	558.400	PEG
OS-663	3032697.630	392187.186	545.960	PEG
OS-664	3032574.220	392256.903	544.366	PEG
OS-665	3032426.370	392369.385	543.778	PEG
OS-666	3032404.530	392430.977	529.886	PEG
OS-667	3032317.240	392527.452	524.858	PEG
OS-668	3032291.650	392588.344	522.115	PEG
OS-669	3032242.540	392692.617	501.934	PEG
OS-670	3032179.920	392769.987	502.678	PEG
OS-671	3032187.910	392936.663	496.630	PILLAR
BM-19	3032878.580	392038.816	561.310	PILLAR
BM-20	3032592.670	392275.486	540.142	PILLAR
BM-21	3032389.040	392466.234	526.572	PILLAR
BM-22	3032204.790	393170.739	500.715	PILLAR
GPS-4	3032325.800	393507.065	493.231	PILLAR
GPS-3	3032116.560	393115.335	546.975	PILLAR

**CLOSING ERRORS**

Angle misclosure	(-)0.011g	
Difference in distance	0.218 m	
Difference in Northing	(-) 0.217 m	
Difference in Easting	(-) 0.022 m	
Difference in Elevation	0.020 m	
Accuracy	1:9612	
Total Traverse Length	2543.591 m	
Total Traverse Length	2543.591	m
No. of Stations	18	
No. of base line	17	
Tolarable closing Error	80.758	cm

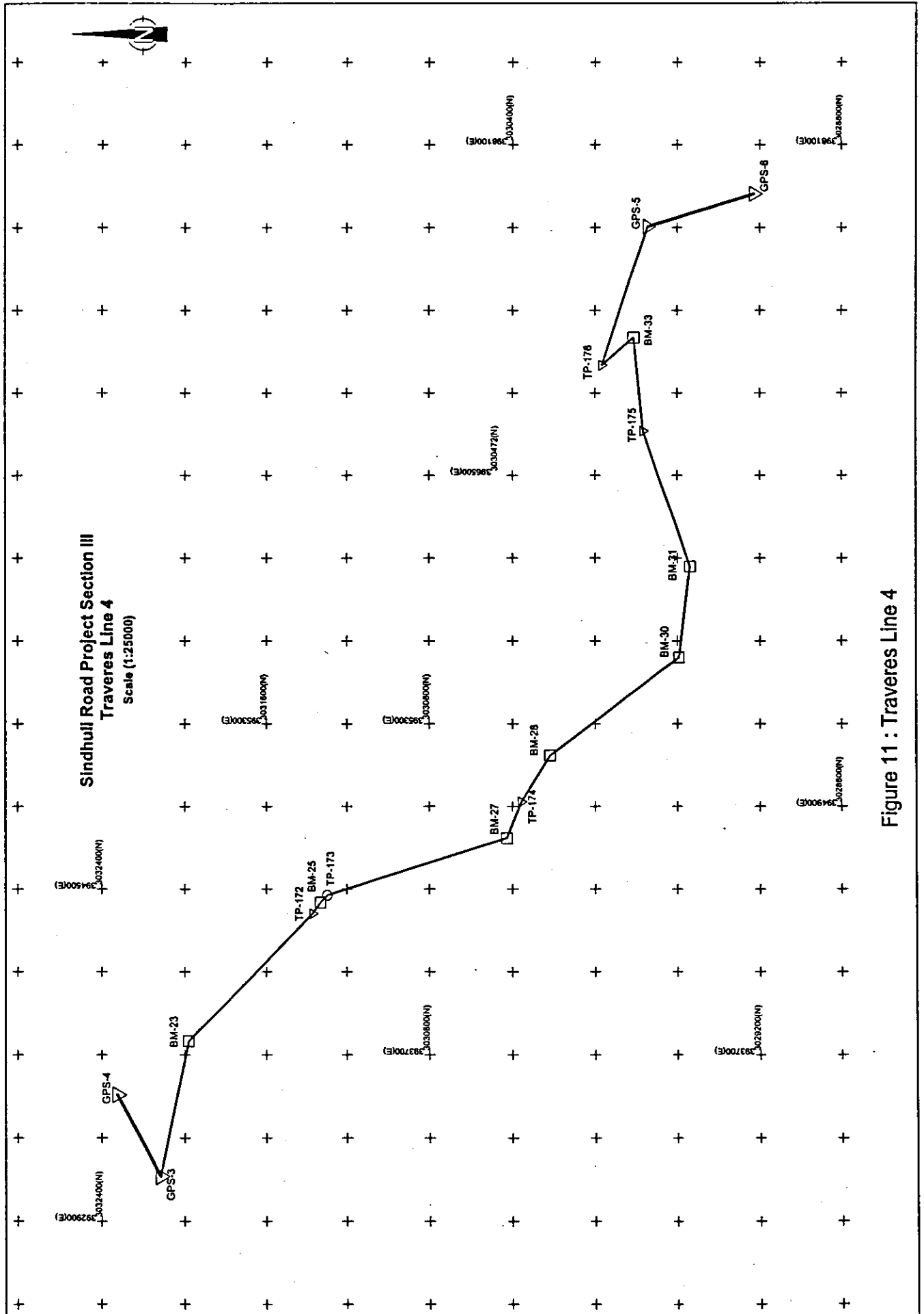


Figure 11 : Traverses Line 4

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 4**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-172	3031370.840	394380.353	535.227	PILLAR
TP-173	3031297.700	394469.656	536.761	PEG
TP-174	3030358.590	394921.698	602.484	PILLAR
TP-175	3029766.060	396714.719	478.734	PILLAR
TP-176	3029966.870	397033.680	487.600	PILLAR
BM-23	3031981.110	393766.618	486.932	PILLAR
BM-25	3031331.590	394434.412	544.121	PILLAR
BM-27	3030427.770	394746.579	648.428	PILLAR
BM-28	3030218.950	395146.507	553.325	PILLAR
BM-30	3029591.190	395619.852	518.728	PILLAR
BM-31	3029535.880	396058.410	480.674	PILLAR
BM-33	3029809.970	397166.979	504.361	PILLAR
GPS-3	3032116.560	393115.335	546.975	PILLAR
GPS-4	3032325.800	393507.065	493.231	PILLAR
GPS-5	3029743.610	397703.405	605.644	PILLAR
GPS-6	3029229.160	397861.511	633.064	PILLAR

**CLOSING ERRORS**

Angle misclosure	0.0021 g	
Difference in distance	0.312 m	
Difference in Northing	0.002 m	
Difference in Easting	0.312 m	
Difference in Elevation	0.021 m	
Accuracy	1:20218	
Total Traverse Length	6843.751	m
No. of Stations	16	
No. of base line	15	
Tolarable closing Error	116.319	cm

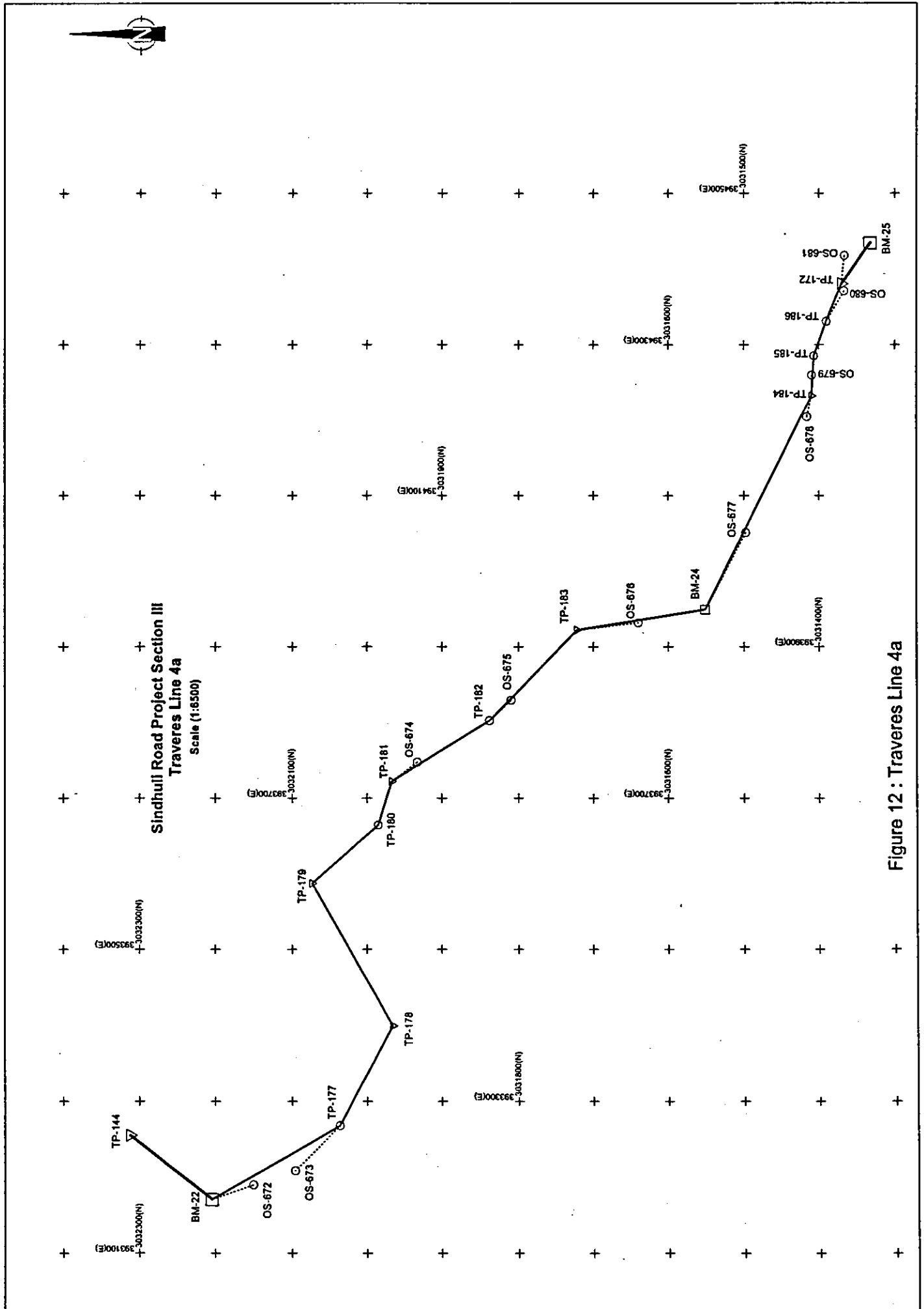


Figure 12 : Traverses Line 4a



**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO.4A**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-144	3032312.700	393255.177	496.743	PILLAR
TP-172	3031370.840	394380.353	535.227	PILLAR
TP-177	3032036.780	393267.855	506.128	PEG
TP-178	3031965.460	393398.975	498.372	PILLAR
TP-179	3032073.670	393587.184	494.079	PILLAR
TP-180	3031985.000	393664.320	491.367	PEG
TP-181	3031966.560	393722.134	487.812	PILLAR
TP-182	3031838.280	393802.674	489.146	PEG
TP-183	3031722.550	393922.163	487.054	PILLAR
TP-184	3031409.950	394232.049	523.516	PILLAR
TP-185	3031406.830	394285.120	521.720	PEG
TP-186	3031390.000	394330.729	527.695	PEG
OS-672	3032150.650	393190.126	501.813	PEG
OS-673	3032096.070	393208.756	503.546	PEG
OS-674	3031932.640	393747.613	487.861	PEG
OS-675	3031810.060	393829.602	487.270	PEG
OS-676	3031639.530	393931.760	483.227	PEG
OS-677	3031497.860	394050.649	511.380	PEG
OS-678	3031416.100	394204.384	520.628	PEG
OS-679	3031409.480	394259.715	523.174	PEG
OS-680	3031367.250	394371.080	535.291	PEG
OS-681	3031366.830	394417.715	535.475	PEG
BM-22	3032204.790	393170.739	500.715	PILLAR
BM-24	3031551.650	393949.019	515.856	PILLAR
BM-25	3031331.590	394434.412	544.121	PILLAR

**CLOSING ERRORS**

Angle misclosure	0.0040 g	
Difference in distance	0.060 m	
Difference in Northing	(-) 0.004 m	
Difference in Easting	0.060 m	
Difference in Elevation	(-) 0.038 m	
Accuracy	1:28375	
Total Traverse Length	1767.79 m	
Total Traverse Length	1767.79	m
No. of Stations	15	
No. of base line	14	
Tolarable closing Error	64.748	cm

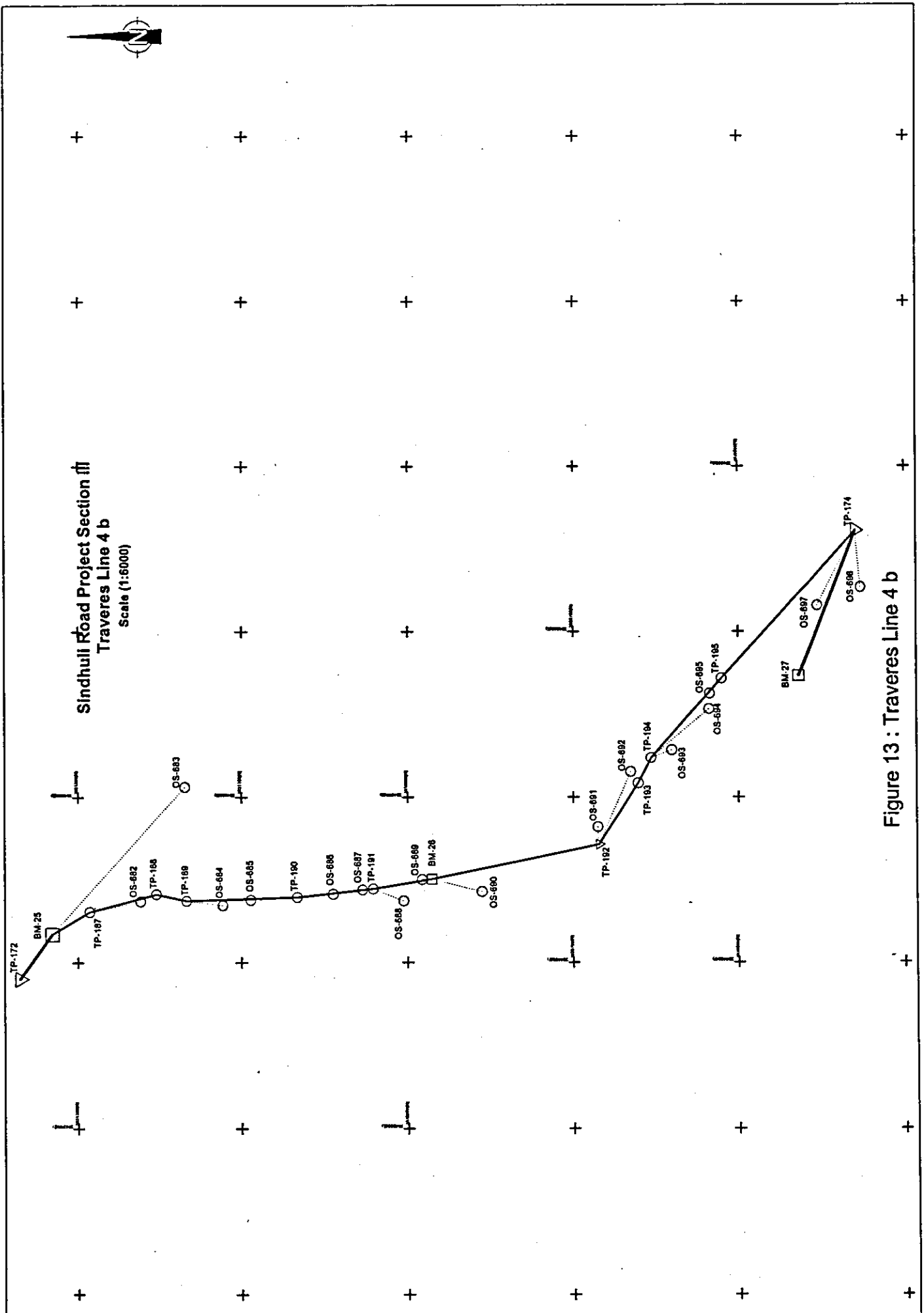


Figure 13 : Traverses Line 4 b

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO.4B**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-172	3031370.840	394380.353	535.227	PILLAR
TP-174	3030358.590	394921.698	602.484	PILLAR
TP-187	3031285.790	394461.109	544.013	PEG
TP-188	3031203.610	394482.603	554.721	PEG
TP-189	3031166.670	394474.536	560.092	PEG
TP-190	3031032.570	394478.977	580.222	PEG
TP-191	3030941.330	394489.101	581.351	PEG
TP-192	3030668.260	394542.628	618.764	PILLAR
TP-193	3030620.760	394616.838	613.726	PEG
TP-194	3030605.390	394647.452	615.884	PEG
TP-195	3030520.250	394743.341	605.858	PEG
BM-25	3031331.590	394434.412	544.121	PILLAR
BM-26	3030871.200	394500.747	589.778	PILLAR
BM-27	3030427.770	394746.579	648.428	PILLAR
OS-682	3031223.190	394473.896	551.422	PEG
OS-683	3031168.690	394612.570	488.393	PEG
OS-684	3031122.250	394469.181	561.383	PEG
OS-685	3031089.130	394475.621	565.537	PEG
OS-686	3030989.440	394482.764	576.212	PEG
OS-687	3030954.250	394487.914	580.313	PEG
OS-688	3030905.250	394474.533	583.499	PEG
OS-689	3030883.150	394500.290	588.006	PEG
OS-690	3030810.790	394485.611	592.702	PEG
OS-691	3030669.760	394563.919	607.688	PEG
OS-692	3030629.990	394630.659	604.725	PEG
OS-693	3030580.380	394656.758	616.946	PEG
OS-694	3030535.570	394706.400	603.813	PEG
OS-695	3030534.850	394725.016	604.734	PEG
OS-696	3030351.920	394853.088	630.495	PEG
OS-697	3030405.500	394831.131	603.224	PEG

**CLOSING ERRORS**

Angle misclosure	(-) 0.0031 g	
Difference in distance	0.028 m	
Difference in Northing	(-) 0.020 m	
Difference in Easting	(-) 0.019 m	
Difference in Elevation	0.084 m	
Accuracy	1:42457	
Total Traverse Length	1359.679 m	
Total Traverse Length	1359.679	m
No. of Stations	13	
No. of base line	12	
Tolarable closing Error	55.393	cm

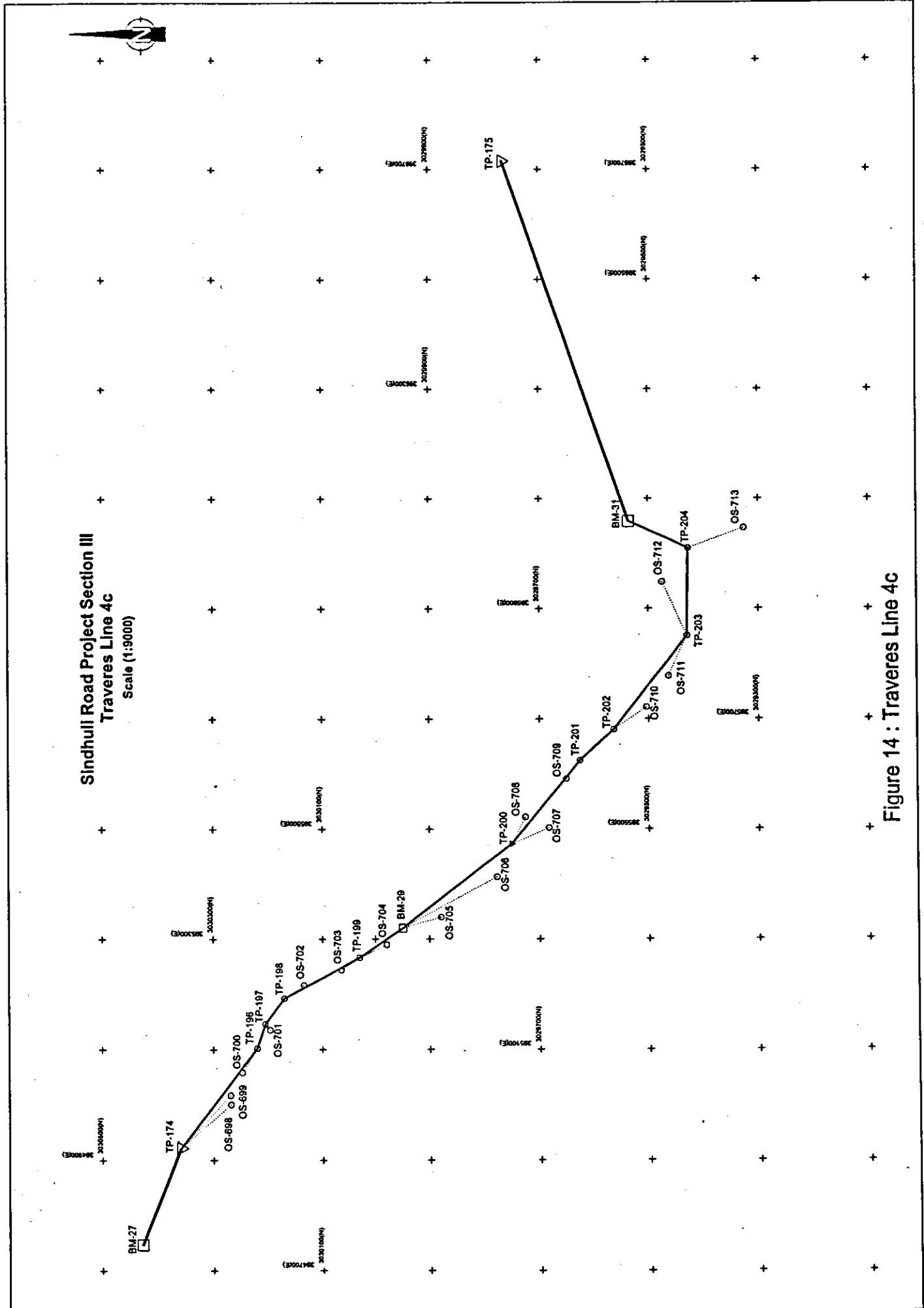


Figure 14 : Traverses Line 4c

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 4C**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-174	3030358.590	394921.698	602.484	PILLAR
TP-175	3029766.060	396714.719	478.734	PILLAR
TP-196	3030220.260	395102.291	570.836	PEG
TP-197	3030205.130	395146.028	558.098	PEG
TP-198	3030169.980	395192.371	537.358	PEG
TP-199	3030029.670	395265.936	527.527	PEG
TP-200	3029750.960	395472.879	534.649	PILLAR
TP-201	3029626.200	395624.441	502.579	PEG
TP-202	3029564.110	395680.582	504.293	PEG
TP-203	3029429.510	395850.695	493.713	PEG
TP-204	3029427.430	396009.289	486.521	PEG
BM-27	3030427.770	394746.579	648.428	PILLAR
BM-29	3029949.210	395319.990	530.891	PILLAR
BM-31	3029535.880	396058.410	480.674	PILLAR
OS-698	3030268.390	395000.599	577.630	PEG
OS-699	3030269.190	395017.364	576.088	PEG
OS-700	3030247.120	395058.352	570.455	PEG
OS-701	3030196.290	395135.349	568.662	PEG
OS-702	3030133.950	395216.054	529.759	PEG
OS-703	3030063.750	395243.763	524.520	PEG
OS-704	3029979.170	395289.780	531.025	PEG
OS-705	3029879.110	395339.788	546.896	PEG
OS-706	3029777.900	395412.882	538.243	PEG
OS-707	3029683.050	395502.163	528.671	PEG
OS-708	3029726.030	395521.738	502.067	PEG
OS-709	3029651.700	395591.342	496.625	PEG
OS-710	3029503.730	395721.155	506.220	PEG
OS-711	3029464.600	395777.607	490.899	PEG
OS-712	3029475.670	395948.096	480.957	PEG
OS-713	3029325.610	396046.187	492.721	STONE

**CLOSING ERRORS**

Angle misclosure	(-) 0.0049 g	
Difference in distance	0.059 m	
Difference in Northing	0.005 m	
Difference in Easting	0.059 m	
Difference in Elevation	0.43 m	
Accuracy	1:27438	
Total Traverse Length	2307.827 m	
Total Traverse Length	2307.827	m
No. of Stations	14	
No. of base line	13	
Tolarable closing Error	69.774	cm

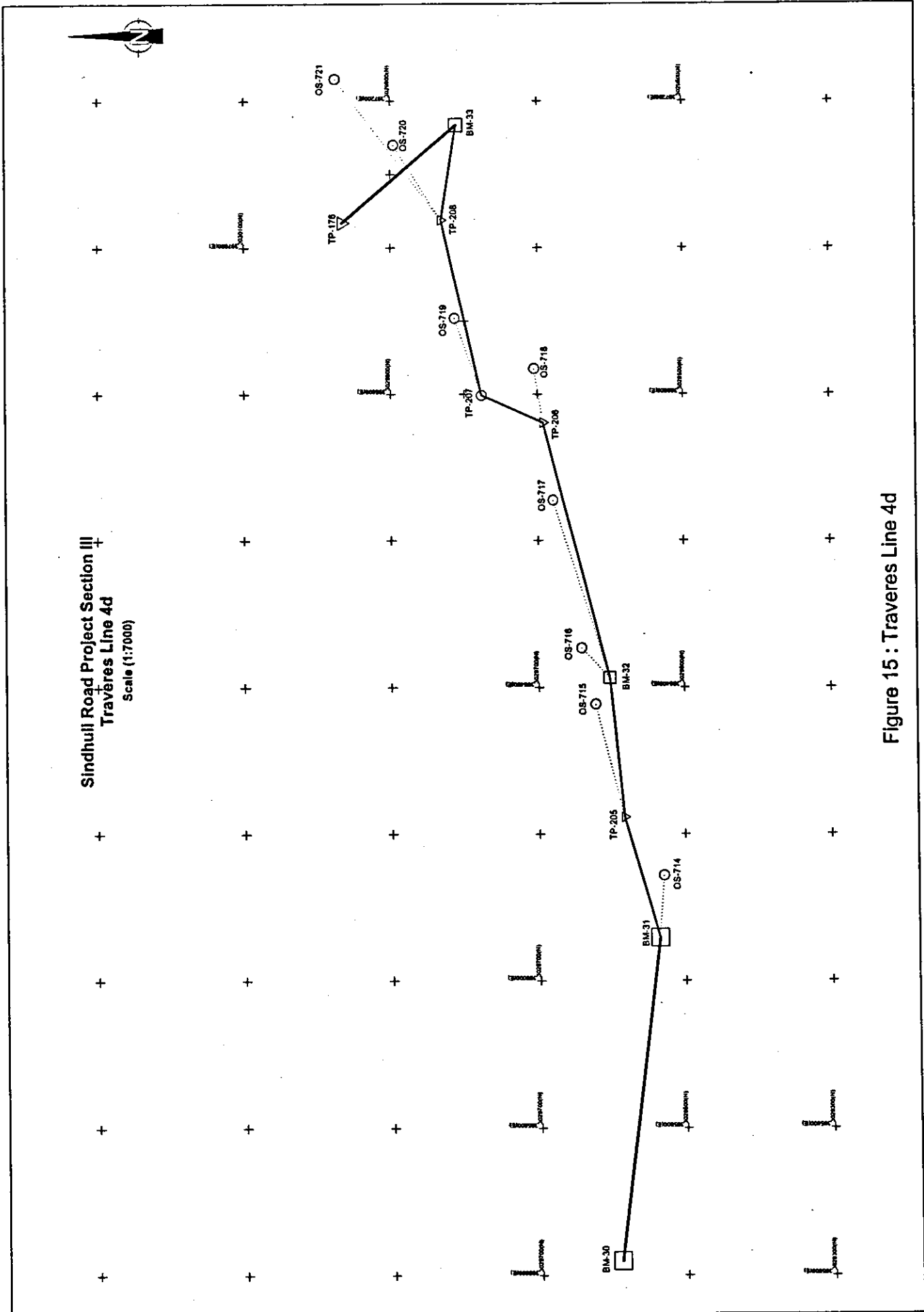


Figure 15 : Traveres Line 4d

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 4D**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-176	3029966.870	397033.680	487.600	PILLAR
TP-205	3029583.370	396222.859	478.910	PILLAR
TP-206	3029692.810	396760.803	491.129	PILLAR
TP-207	3029775.850	396798.281	480.573	PEG
TP-208	3029830.880	397037.491	485.909	PILLAR
BM-30	3029591.190	395619.852	518.728	PILLAR
BM-31	3029535.880	396058.410	480.674	PILLAR
BM-32	3029602.400	396412.999	504.398	PILLAR
BM-33	3029809.970	397166.979	504.361	PILLAR
OS-714	3029529.830	396143.158	479.218	PEG
OS-715	3029622.440	396376.934	477.427	PEG
OS-716	3029641.260	396453.340	478.602	STONE
OS-717	3029679.300	396654.834	477.340	PEG
OS-718	3029704.820	396834.881	494.060	PEG
OS-719	3029812.470	396903.782	482.661	PEG
OS-720	3029895.600	397139.814	490.079	PEG
OS-721	3029975.790	397230.385	501.369	PEG

**CLOSING ERRORS**

Angle misclosure	(-) 0.0001 g	
Difference in distance	0.057 m	
Difference in Northing	(-) 0.002 m	
Difference in Easting	0.057 m	
Difference in Elevation	0.014 m	
Accuracy	1:20923	
Total Traverse Length	1395.278	
Total Traverse Length	1395.278	m
No. of Stations	9	
No. of base line	8	
Tolarable closing Error	48.410	cm

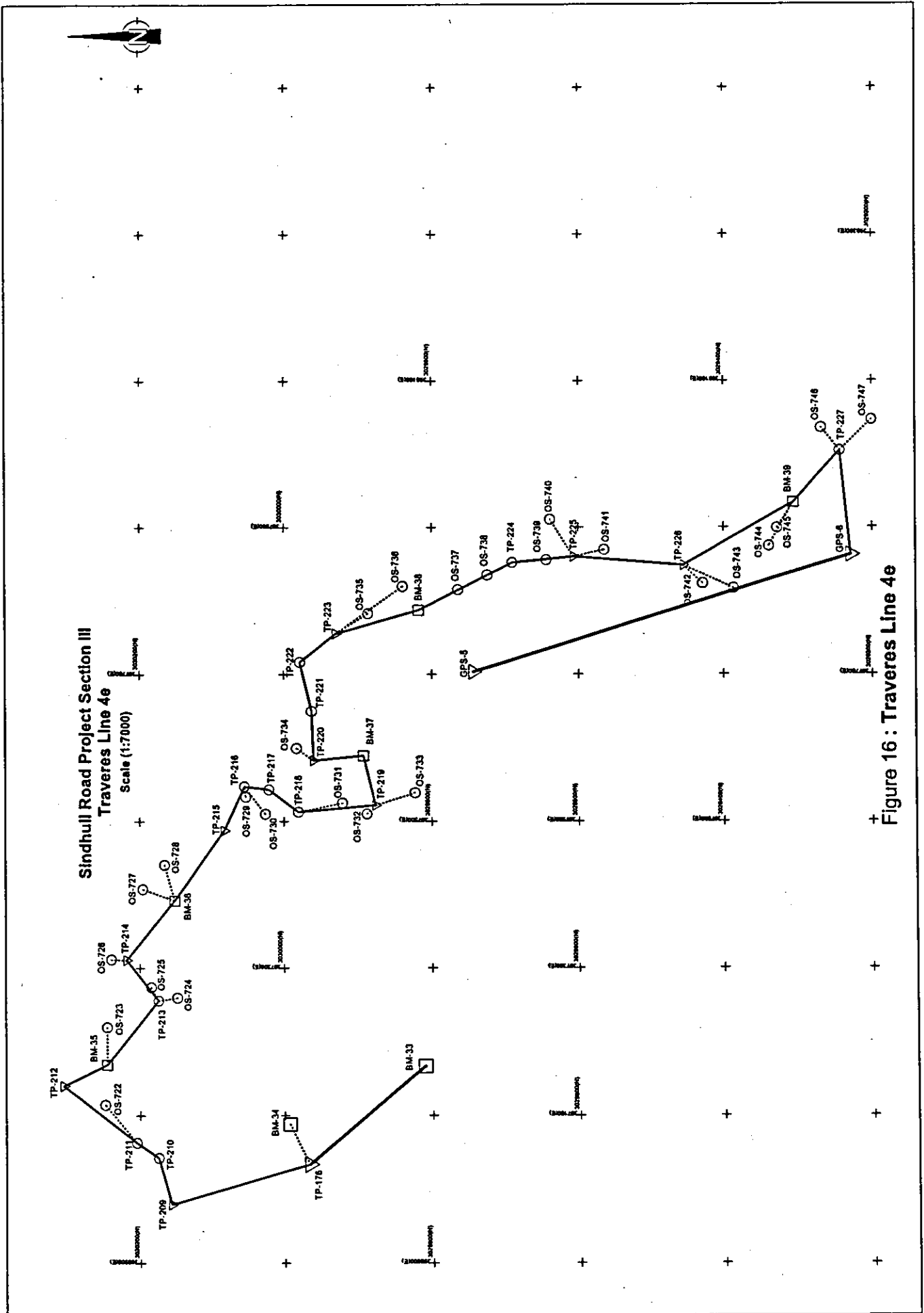


Figure 16 : Traverses Line 4e



**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 4E**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-176	3029966.870	397033.680	487.600	PILLAR
TP-209	3030156.150	396979.806	509.271	PILLAR
TP-210	3030174.370	397042.657	517.039	PEG
TP-211	3030204.960	397063.056	519.143	PEG
TP-212	3030305.430	397140.306	522.059	PILLAR
TP-213	3030174.070	397255.807	530.010	PEG
TP-214	3030218.620	397311.090	541.080	PILLAR
TP-215	3030081.970	397487.738	551.748	PILLAR
TP-216	3030054.140	397547.884	553.342	PEG
TP-217	3030020.680	397543.404	559.054	PEG
TP-218	3029980.350	397512.732	559.608	PEG
TP-219	3029875.820	397521.938	568.220	PILLAR
TP-220	3029960.060	397582.926	571.032	PILLAR
TP-221	3029962.770	397650.109	577.918	PEG
TP-222	3029978.190	397716.775	576.361	PEG
TP-223	3029930.030	397755.354	581.465	PILLAR
TP-224	3029691.140	397851.891	601.699	PEG
TP-225	3029606.990	397859.824	609.398	PILLAR
TP-226	3029455.240	397847.623	616.084	PILLAR
TP-227	3029243.450	398003.801	609.607	PEG
BM-33	3029809.970	397166.979	504.361	PILLAR
BM-34	3029993.160	397088.206	498.227	PILLAR
BM-35	3030245.670	397169.089	528.720	PILLAR
BM-36	3030151.020	397392.153	548.194	PILLAR
BM-37	3029892.480	397589.468	576.610	PILLAR
BM-38	3029817.420	397787.167	592.243	PILLAR
BM-39	3029305.370	397933.188	613.092	PILLAR
OS-722	3030248.640	397114.525	523.230	PEG
OS-723	3030245.760	397219.864	524.877	PEG
OS-724	3030147.740	397259.813	533.180	PEG
OS-725	3030184.070	397273.973	531.752	PEG
OS-726	3030239.670	397311.902	539.195	PEG
OS-727	3030195.870	397407.671	541.744	PEG
OS-728	3030165.020	397440.771	543.407	PEG
OS-729	3030052.270	397533.458	554.413	PEG
OS-730	3030025.590	397510.180	556.886	PEG
OS-731	3029921.170	397525.013	562.121	PEG
OS-732	3029887.690	397510.110	565.976	PEG
OS-733	3029822.630	397538.830	571.736	PEG
OS-734	3029982.740	397599.696	566.983	PEG
OS-735	3029886.000	397782.487	582.735	PEG
OS-736	3029838.810	397819.592	585.702	PEG
OS-737	3029764.210	397815.132	594.579	PEG
OS-738	3029724.470	397834.925	597.966	PEG
OS-739	3029644.300	397855.321	607.004	PEG
OS-740	3029639.130	397910.400	597.604	PEG
OS-741	3029563.990	397869.017	608.412	PEG
OS-742	3029428.950	397823.230	617.859	PEG
OS-743	3029386.390	397816.493	618.953	PEG
OS-744	3029338.080	397873.785	609.303	PEG
OS-745	3029327.040	397898.450	609.366	PEG
OS-746	3029267.800	398035.093	602.787	PEG
OS-747	3029200.300	398045.983	604.711	PEG
GPS-6	3029229.160	397861.511	633.064	PILLAR
GPS-5	3029743.610	397703.405	605.644	PILLAR

**CLOSING ERRORS**

Angle misclosure	0.0154 g	
Difference in distance	0.038 m	
Difference in Northing	(-) 0.014 m	
Difference in Easting	0.036 m	
Difference in Elevation	(-) 0.064 m	
Accuracy	1:62265	
Total Traverse Length	2932.879 m	
Total Traverse Length	2932.879	m
No. of Stations	27	
No. of base line	26	
Tolerable closing Error	102.324	cm

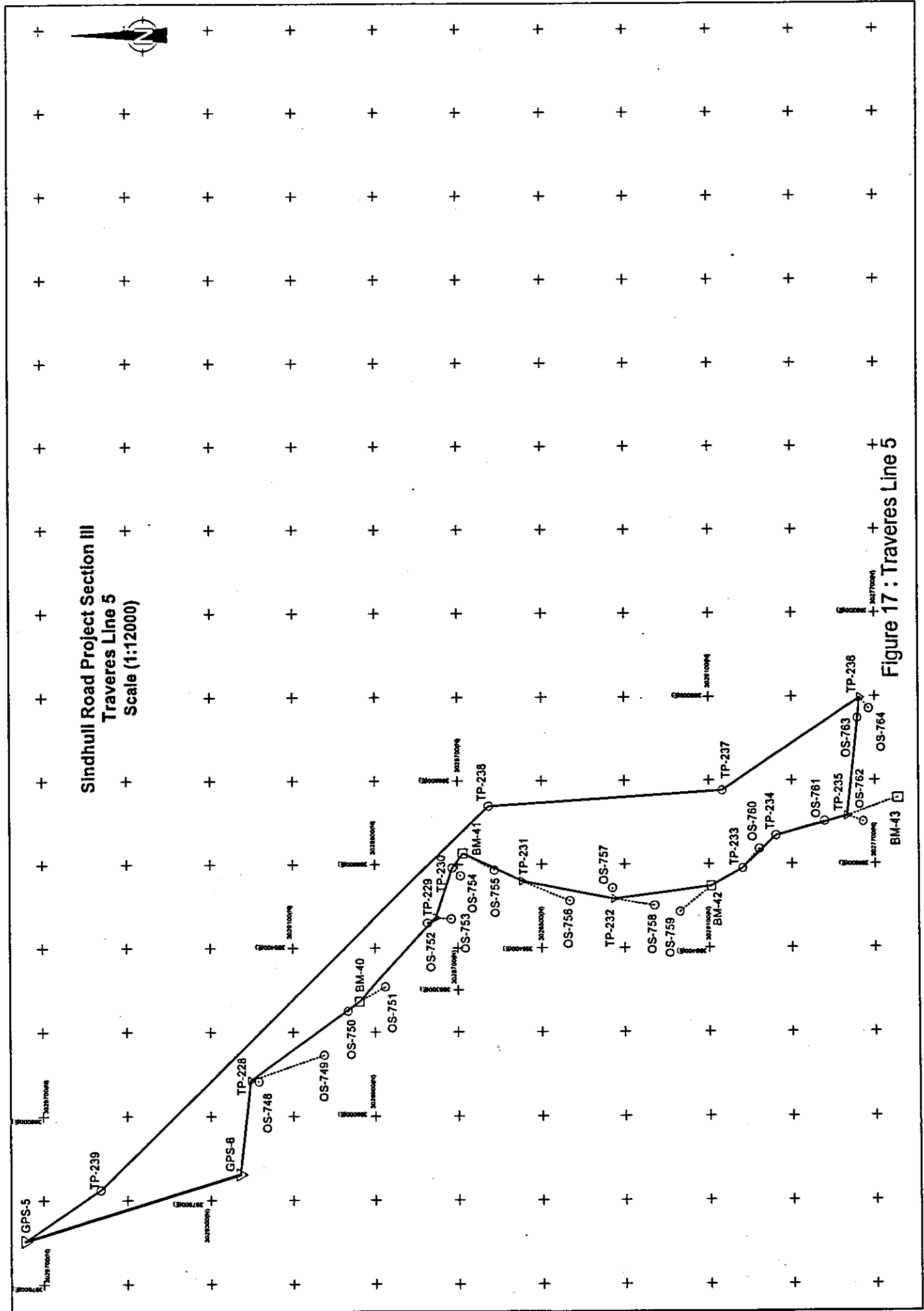


Figure 17 : Traverses Line 5

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 5**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
GPS-5	3029743.610	397703.405	605.644	PILLAR
GPS-6	3029229.160	397861.511	633.064	PILLAR
TP-228	3029203.240	398084.773	599.749	PILLAR
TP-229	3028752.950	398472.160	546.338	PILLAR
TP-230	3028713.480	398591.514	563.210	PEG
TP-231	3028548.370	398559.701	556.188	PILLAR
TP-232	3028325.860	398516.442	544.500	PILLAR
TP-233	3028018.080	398589.124	545.262	PEG
TP-234	3027937.440	398667.561	538.259	PEG
TP-235	3027768.420	398714.211	530.633	PILLAR
TP-236	3027737.620	398996.370	493.650	PILLAR
TP-237	3028067.120	398775.580	575.742	PEG
TP-238	3028627.020	398739.170	557.318	PEG
TP-239	3029564.090	397824.463	617.108	PEG
BM-40	3028938.810	398272.530	561.733	PILLAR
BM-41	3028687.440	398626.433	564.502	PILLAR
BM-42	3028094.760	398546.881	543.780	PILLAR
BM-43	3027646.870	398756.761	515.616	PILLAR
OS-748	3029183.800	398082.270	596.759	PEG
OS-749	3029025.590	398145.115	560.065	PEG
OS-750	3028967.440	398249.592	558.241	PEG
OS-751	3028874.610	398307.430	567.781	PEG
OS-752	3028772.430	398459.452	543.811	PEG
OS-753	3028715.800	398469.648	562.382	PEG
OS-754	3028693.570	398572.719	574.122	PEG
OS-755	3028614.180	398585.803	560.059	PEG
OS-756	3028431.970	398512.224	547.243	PEG
OS-757	3028329.200	398542.552	537.150	PEG
OS-758	3028229.660	398500.648	544.924	PEG
OS-759	3028169.890	398485.404	544.718	PEG
OS-760	3027977.670	398635.814	542.549	PEG
OS-761	3027822.220	398701.731	532.935	PEG
OS-762	3027728.860	398700.329	527.675	PEG
OS-763	3027743.240	398947.577	494.837	PEG
OS-764	3027714.190	398970.249	510.430	PEG

**CLOSING ERRORS**

Angle misclosure	0.0044	g
Difference in distance	0.059	m
Difference in Northing	(-) 0.056	m
Difference in Easting	(-) 0.019	m
Difference in Elevation	.046	m
Accuracy	1:80262	
Total Traverse Length	5286.336	m
Total Traverse Length	5286.336	m
No. of Stations	16	
No. of base line	15	
Tolerable closing Error	104.048	cm

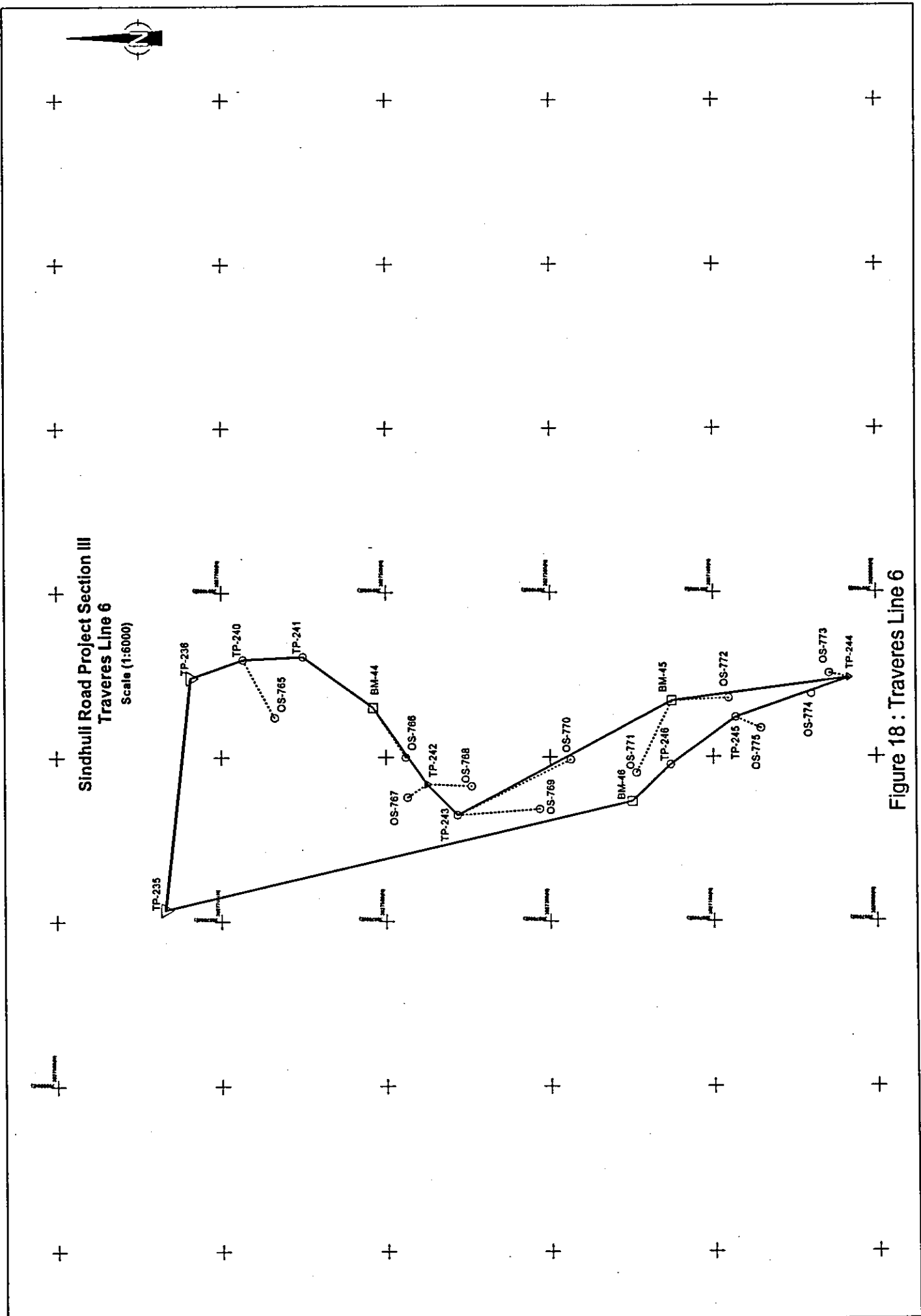


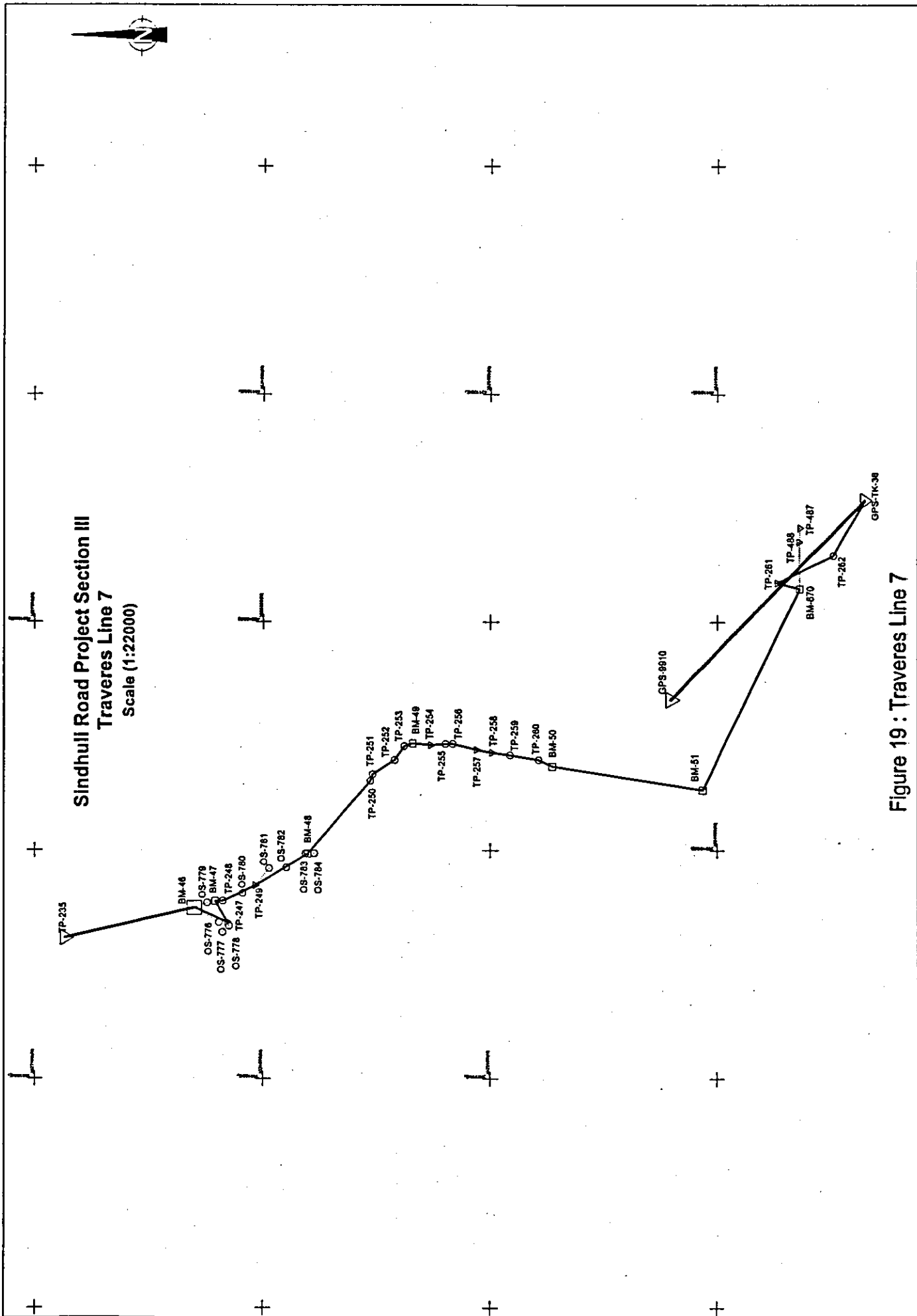
Figure 18 : Traverses Line 6

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 6**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-235	3027768.420	398714.211	530.633	PILLAR
TP-236	3027737.620	398996.370	493.650	PILLAR
TP-240	3027673.990	399018.521	497.958	PEG
TP-241	3027601.410	399021.887	488.799	PEG
TP-242	3027450.010	398866.975	494.402	PILLAR
TP-243	3027413.090	398829.257	493.260	PEG
TP-244	3026934.740	398995.554	512.145	PILLAR
TP-245	3027072.440	398947.883	497.280	PEG
TP-246	3027152.890	398890.499	503.816	PEG
BM-44	3027515.530	398960.049	489.857	PILLAR
BM-45	3027151.250	398968.166	483.642	PILLAR
BM-46	3027199.280	398846.147	511.193	PILLAR
OS-765	3027635.200	398948.024	517.988	PEG
OS-766	3027475.830	398899.579	493.642	PEG
OS-767	3027473.780	398850.755	506.738	PEG
OS-768	3027395.940	398864.579	482.429	PEG
OS-769	3027312.990	398836.637	482.047	PEG
OS-770	3027274.700	398896.786	481.169	STONE
OS-771	3027194.280	398880.559	492.496	PEG
OS-772	3027080.970	398971.174	490.847	PEG
OS-773	3026958.400	399000.853	497.882	PEG
OS-774	3026980.780	398976.091	500.742	PEG
OS-775	3027041.700	398934.313	506.746	PEG

**CLOSING ERRORS**

Angle misclosure	0.0091	g
Difference in distance	0.017	m
Difference in Northing	0.006	m
Difference in Easting	(-) 0.016	m
Difference in Elevation	0.009	m
Accuracy	1:105124	
Total Traverse Length	2103.886	m
Total Traverse Length	2103.886	m
No. of Stations	11	
No. of base line	10	
Tolarable closing Error	60.868	cm



Sindhuli Road Project Section III  
Traverse Line 7  
Scale (1:22000)

Figure 19 : Traverse Line 7

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 7**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-235	3027768.420	398714.211	530.633	PILLAR
TP-247	3027057.330	398782.916	535.986	PILLAR
TP-248	3027076.570	398876.511	537.692	PEG
TP-249	3026934.100	398944.446	544.705	PILLAR
TP-250	3026427.950	399404.638	488.126	PEG
TP-251	3026417.920	399433.736	479.737	PEG
TP-252	3026319.200	399495.458	480.493	PEG
TP-253	3026276.120	399557.125	468.695	PEG
TP-254	3026159.920	399561.444	475.425	PILLAR
TP-255	3026094.720	399566.537	480.440	PEG
TP-256	3026062.960	399567.086	479.722	PEG
TP-257	3025961.650	399541.157	476.515	PILLAR
TP-258	3025894.320	399528.803	468.035	PILLAR
TP-259	3025816.610	399517.623	468.811	PEG
TP-260	3025690.830	399497.044	472.197	PEG
TP-261	3024639.590	400272.173	463.269	PILLAR
TP-262	3024400.500	400392.841	573.287	PEG
TP-488	3024547.700	400452.102	475.978	OLD PILLAR
TP-487	3024542.620	400513.378	482.154	OLD PILLAR
BM-46	3027199.280	398846.147	511.193	PILLAR
BM-47	3027108.910	398875.192	532.800	PILLAR
BM-48	3026703.240	399084.789	563.793	PILLAR
BM-49	3026237.140	399569.525	468.853	PILLAR
BM-50	3025629.670	399468.703	485.171	PILLAR
BM-51	3024964.020	399364.956	464.682	PILLAR
BM-670	3024542.570	400246.790	469.431	OLD BM PILLAR
OS-776	3027093.270	398782.609	517.828	PEG
OS-777	3027077.530	398739.687	522.073	PEG
OS-778	3027049.510	398766.786	532.184	PEG
OS-779	3027145.140	398867.666	524.879	PEG
OS-780	3026989.650	398910.381	538.945	PEG
OS-781	3026873.860	399020.034	530.636	PEG
OS-782	3026797.530	399023.420	546.550	PEG
OS-783	3026713.310	399084.956	559.779	PEG
OS-784	3026675.270	399085.743	565.039	PEG
GPS-TK-36	3024263.710	400633.699	597.780	PILLAR
GPS-9909	3025104.690	399760.720	572.415	PILLAR

**CLOSING ERRORS**

Angle misclosure	0.0348 g	
Difference in distance	0.346 m	
Difference in Northing	(-) 0.338 m	
Difference in Easting	(-) 0.075 m	
Difference in Elevation	(-) 1.842 m	
Accuracy	1:12490	
Total Traverse Length	5536.594 m	
Total Traverse Length	5536.594	m
No. of Stations	23	
No. of base line	22	
Tolarable closing Error	125.365	cm

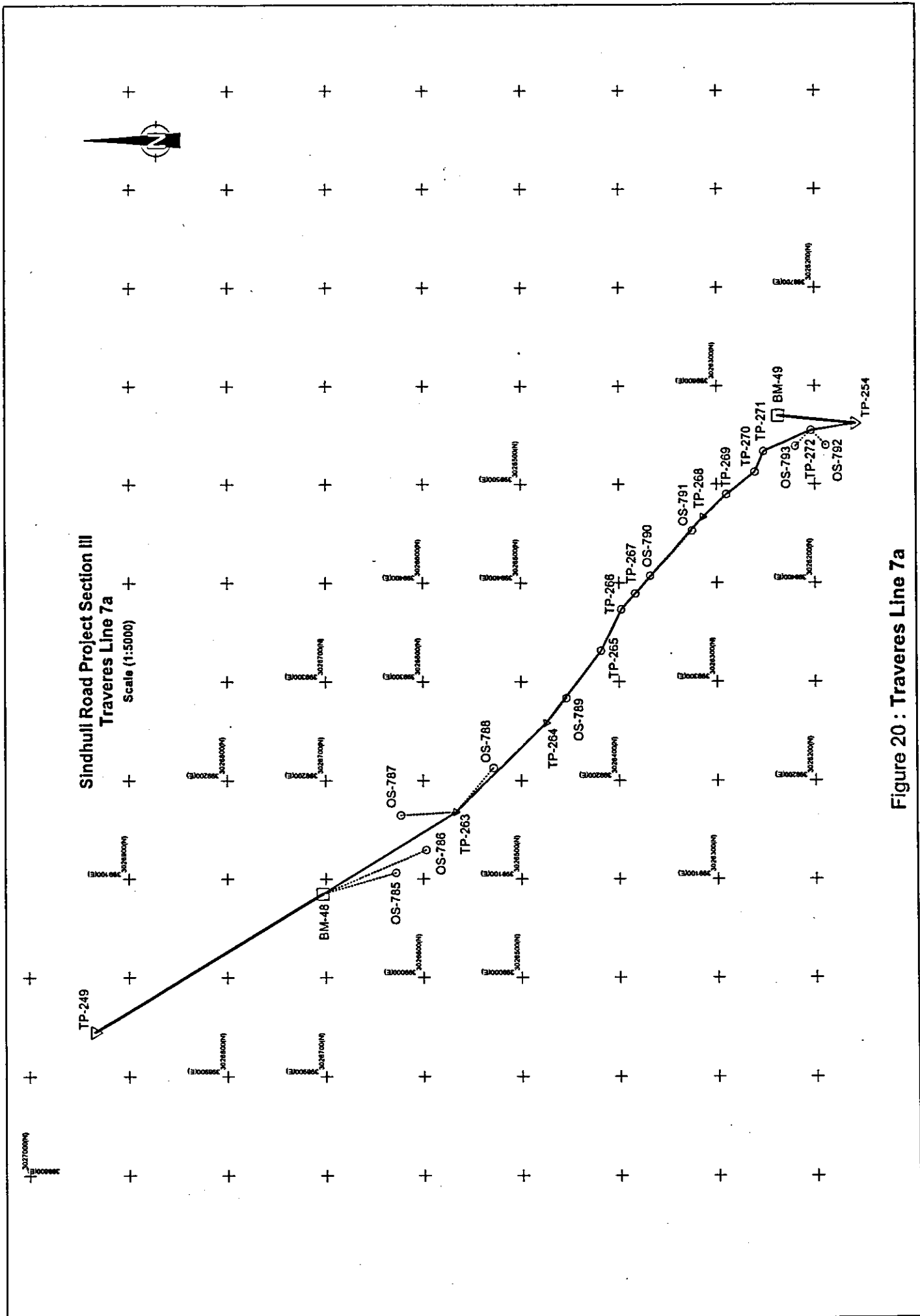


Figure 20 : Traverses Line 7a



**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 7A**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-249	3026934.100	398944.446	544.705	PILLAR
TP-254	3026159.920	399561.444	475.425	PILLAR
TP-263	3026566.560	399167.837	546.001	PILLAR
TP-264	3026474.580	399258.246	532.939	PILLAR
TP-265	3026418.420	399331.228	519.660	PEG
TP-266	3026397.650	399372.917	514.097	PEG
TP-267	3026383.280	399389.053	512.667	PEG
TP-268	3026314.690	399466.447	499.991	PILLAR
TP-269	3026290.060	399489.531	495.745	PEG
TP-270	3026261.060	399512.329	491.129	PEG
TP-271	3026252.090	399533.267	481.235	PEG
TP-272	3026203.310	399554.653	477.299	PEG
BM-48	3026703.240	399084.789	563.793	PILLAR
BM-49	3026237.140	399569.525	468.853	PILLAR
OS-785	3026628.300	399106.165	557.632	PEG
OS-786	3026597.130	399129.332	554.915	PEG
OS-787	3026623.126	399164.549	516.390	PEG
OS-788	3026527.792	399212.725	526.600	PEG
OS-789	3026453.810	399283.454	528.608	PEG
OS-790	3026368.000	399406.986	504.101	PEG
OS-791	3026325.390	399452.745	500.927	PEG
OS-792	3026188.620	399539.355	487.447	PEG
OS-793	3026219.410	399538.458	480.759	PEG

**CLOSING ERRORS**

Angle misclosure	(-) 0.0122 g	
Difference in distance	0.034 m	
Difference in Northing	(-) 0.033 m	
Difference in Easting	(-) 0.004 m	
Difference in Elevation	0.015 m	
Accuracy	1:22088	
Total Traverse Length	743.227 m	
Total Traverse Length	743.227	m
No. of Stations	14	
No. of base line	13	
Tolarable closing Error	46.084	cm

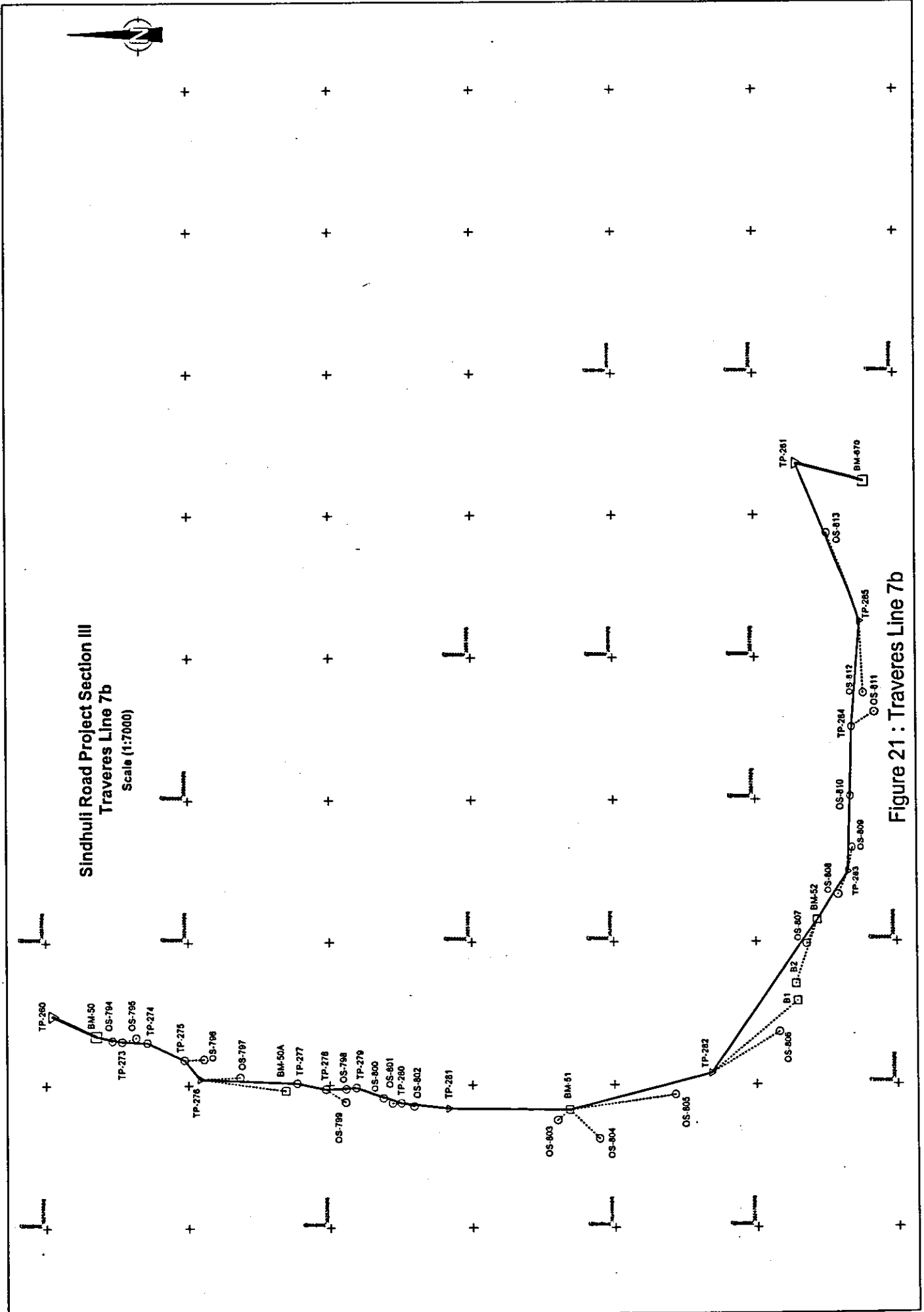


Figure 21 : Traverses Line 7b

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**TRAVERSE LINE NO. 7B**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-260	3025690.830	399497.044	472.197	PILLAR
TP-261	3024639.590	400272.173	463.269	PILLAR
TP-273	3025593.890	399461.244	482.613	PEG
TP-274	3025558.330	399459.857	478.627	PEG
TP-275	3025505.970	399435.453	477.055	PEG
TP-276	3025483.820	399408.844	482.800	PILLAR
TP-277	3025346.350	399402.587	471.085	PEG
TP-278	3025305.760	399394.066	470.875	PEG
TP-279	3025263.280	399396.097	463.247	PEG
TP-280	3025199.670	399374.419	468.685	PEG
TP-281	3025133.850	399366.898	464.375	PILLAR
TP-282	3024763.350	399415.828	462.266	PILLAR
TP-283	3024570.340	399697.672	478.614	PILLAR
TP-284	3024563.390	399901.281	461.255	PEG
TP-285	3024549.310	400049.706	467.985	PILLAR
BM-50	3025629.670	399468.703	485.171	PILLAR
BM-50A	3025361.890	399392.259	478.417	PILLAR
BM-51	3024964.020	399364.956	464.682	PILLAR
BM-52	3024613.270	399630.242	476.559	PILLAR
BM-670	3024542.570	400246.790	469.431	PILLAR
B1	3024641.110	399516.676	466.009	PILLAR
B2	3024643.320	399540.687	472.317	PILLAR
OS-794	3025607.330	399462.454	484.448	STONE
OS-795	3025574.110	399466.865	480.035	STONE
OS-796	3025477.960	399436.754	474.327	STONE
OS-797	3025426.460	399411.371	470.456	PEG
OS-798	3025277.170	399394.331	462.739	PEG
OS-799	3025277.760	399375.895	477.213	PEG
OS-800	3025224.540	399381.573	466.653	PEG
OS-801	3025212.230	399374.413	468.278	PEG
OS-802	3025181.900	399370.052	466.039	PEG
OS-803	3024981.000	399350.342	464.336	PEG
OS-804	3024921.980	399324.432	482.563	PEG
OS-805	3024814.060	399386.081	465.427	PEG
OS-806	3024667.250	399473.334	469.183	PEG
OS-807	3024628.090	399596.418	469.128	PEG
OS-808	3024583.920	399665.637	480.926	PEG
OS-809	3024563.300	399731.540	471.890	PEG
OS-810	3024565.700	399803.821	465.337	PEG
OS-811	3024529.130	399922.347	485.797	PEG
OS-812	3024544.400	399949.078	472.312	PEG
OS-813	3024596.970	400173.810	460.676	PEG

**CLOSING ERRORS**

Angle misclosure	0.0422 g	
Difference in distance	0.229 m	
Difference in Northing	(-) 0.203 m	
Difference in Easting	(-) 0.107 m	
Difference in Elevation	(-) 0.029 m	
Accuracy	1:7980	
Total Traverse Length	1831.066 m	
Total Traverse Length	1831.066	m
No. of Stations	18	
No. of base line	17	
Tolarable closing Error	70.793	cm

## 2.4.5 Detailed Topographic Survey

Detailed topographic survey will be carried out for proposed road corridor and causeway sites.

### 2.4.5.1 Proposed Road Corridor

The detailed topographic survey of the proposed road corridor of 50m width was carried by using 6 nos. of total station SOKKIA Set 5F instruments with electronic data logger. The instruments were set over the BM points, traverse points and offset points. The co-ordinates (x, y, z) of these points were already known from the traverse survey. The detail surveys were carried out from these points. Though the scope of work for the detailed topographic survey of road corridor covered only 50m (25m either side of the proposed centerline), the topographic survey was extended towards the hill side wherever the given corridor was located on the flood plain of Sunkoshi River or to cover the existing RTO track.

The survey data of detail points were directly recorded into the data logger. Which were down loaded into the Laptop computer by using PROLINK Software specially developed by SOKKIA Instrument. The software computed the coordinates (x, y, z) of the all the detail points. The detail survey points were located at an average distance of five meter. In other words the density of the survey points was 1 point in every 20 M<sup>2</sup> area. Additional points were also taken to show the topographical features specially the terraces of agriculture land. The detail points were plotted by using CREDO Software in the computer and digital terrain model (DTM) of the terrain was prepared in the site itself and the topographical map with contours were generated in the computer. The survey works and topographical maps were verified in the field itself. This methodology of survey have minimized the possible survey error great extent. The proposed road corridor followed following land use pattern.

Forest and bushes	12.320 km.
Cultivated land	12.038 km
Barren land	1.920 km.
Flood plains	4.755 km.

### 2.4.5.2 River Crossings

The given ToR had specified to carry out the detailed topographical survey 9 river crossings. As directed in the given terms of reference, concrete pillars were monumented at each bank of the proposed road alignment. The survey methodology was same as described for proposed road corridor in section 2.4.5.1.

## 2.5 Preparation of Topographic Maps

Data processing and preparation of digital topographic maps were carried out in the field itself. The maps were checked on the computer screen by the surveyor who actually carried out survey work to confirm the topographic condition. The topographic maps were finalized after going through these quality processes. The scale of the topographic map of the road corridor and river crossing sites is 1:1000 and 1 : 500 respectively.

ANNEXES

Annex - 1  
**Detail Calculation of GPS Survey**

## REPORT ON GPS SURVEY

### 1. General

The GPS survey work was carried out by four teams in the second week of Feb. 2005.

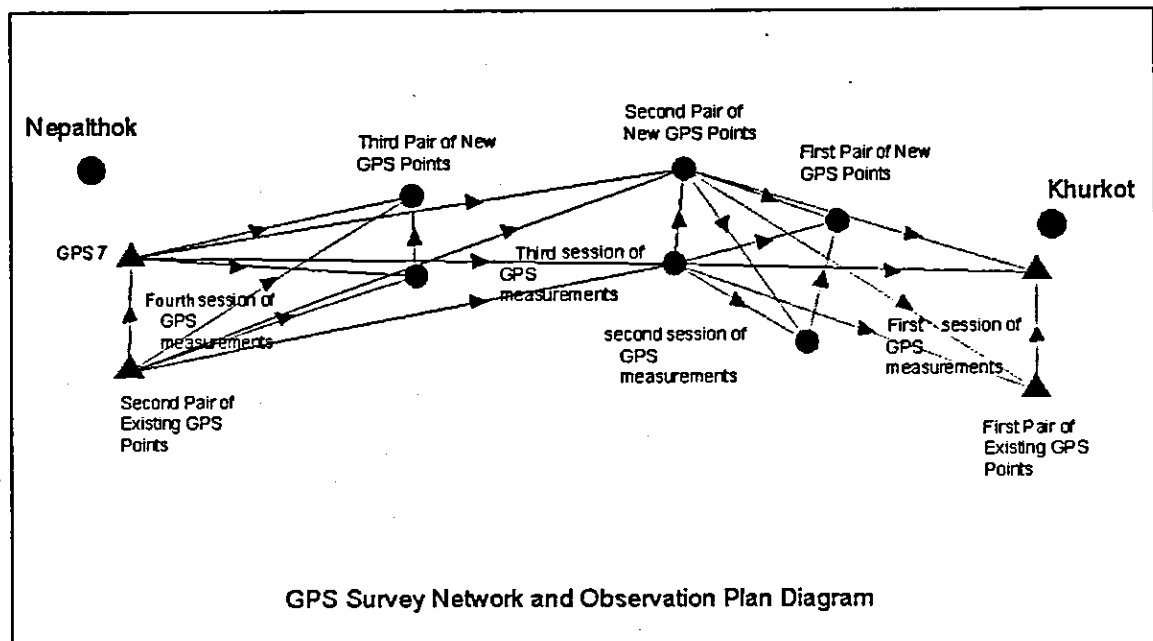
### 2. GPS Equipments

Receivers: 4 sets of ProMark 2 Ashtech Receivers.  
(Equipment s/n: CH003956, CH003841, CH003720, CH003969)  
Antennas: 4 sets of Ashtech external Antenna  
Tripods: 4 sets of Standard GPS tripods

The vectors would be processed as static vectors with a fix solution.  
Data logging interval: 10 seconds  
GPS Satellite Elevation Mask: 10 degrees  
PDOP Mask: 4

### 3. GPS Survey Mission Planning

The GPS survey mission planning was to carry out the design of GPS network and consequent GPS survey observations. The proposed GPS network was designed as a closed network with triangles and rectangles connected to the existing twin GPS survey points at either extremities of the proposed road corridor as indicated in the figure.



But the twin GPS points at Nepalthok were unavailable. Only a single point (D10) was found at the Nepalthok site. Due to this restriction of non-availability of twin points at Nepalthok site, the initial plan of starting the survey work from Nepalthok was abandoned and the survey work was carried out from the Khurkot section. Six locations, which were initially been monumented, were used for the new GPS points in between Nepalthok and Khurkot. One extra point (GPS 7) was monumented for providing twin points at the Nepalthok section.

For each station the observation session was carried for 2-3 hrs, time enough to collect the required data by the receiver. The PDOP value was one of the governing factors for the planning of time of observation. Ashtech GPS survey mission planning software was used to determine the availability of number of satellite and ideal satellite geometry (best PDOP value) during the day.

It took 4 separate observation sessions to complete the survey work based on the network design, as shown in figure above.

#### 4. GPS Survey Measurements

During the 1<sup>st</sup> session of GPS observation, one set (consisting of two receivers) of GPS receiver was stationed at the existing twin GPS points at Khurkot Section of proposed road corridor serving as base stations and other set of GPS receivers was stationed at the 1<sup>st</sup> pair of new GPS points along the road corridor serving as rover stations.

During the 2<sup>nd</sup> session of GPS observation, one set of GPS receivers was placed at previously observed 1<sup>st</sup> pair of GPS points and the second set was placed at the 2<sup>nd</sup> pair of new GPS points.

During the 3<sup>rd</sup> session of observation, one set of GPS receivers was placed at previously observed 2<sup>nd</sup> pair of GPS points and other set was placed at the 3<sup>rd</sup> pair of new GPS points.

During the 4<sup>th</sup> and the last session of observation, one set of GPS receivers was placed at previously observed 3<sup>rd</sup> pair of GPS points and one receiver was placed at known point (D-10) and the other receiver was placed at the newly monumented point (GPS 7).

#### 5. GPS Survey Method

Standard Static GPS Survey method was adopted and a simultaneous measurement of 4 receivers was made for duration of 2- 3 hrs giving 4 correlated vectors.

#### 6. Post Processing of Collected Data

##### Downloading

All GPS survey measurements were downloaded and checked in to the GPS Survey database. During checking, information was controlled against the field notes taken manually.

##### Data Processing

The post processing of all GPS measurement of vectors was done using Ashtech Solutions GPS Post-processing Software using standard static method, each vector being processed individually.

##### Analysis and Adjustment

A standard error method was used for carrying out the analysis. The twin known points at Khurkot were taken as seed sites (control sites) and the analysis was carried out to find the co-ordinates of the known point (D – 10) of Nepalthok. The error in easting was found to be 38.8 cm while the error in northing was found to be 41.6 cm for the entire reach of 32 Km of road corridor.

The method used for the adjustment used is least square method. For the adjustment purpose the third known point of Nepalthok was also added as a seed site and the analysis was run to find the adjusted co-ordinates of the intermediate stations.

##### Quality Analysis Tools

The quality analysis tools used are the Tau test and the site pair QA test.

#### 7. Conclusions

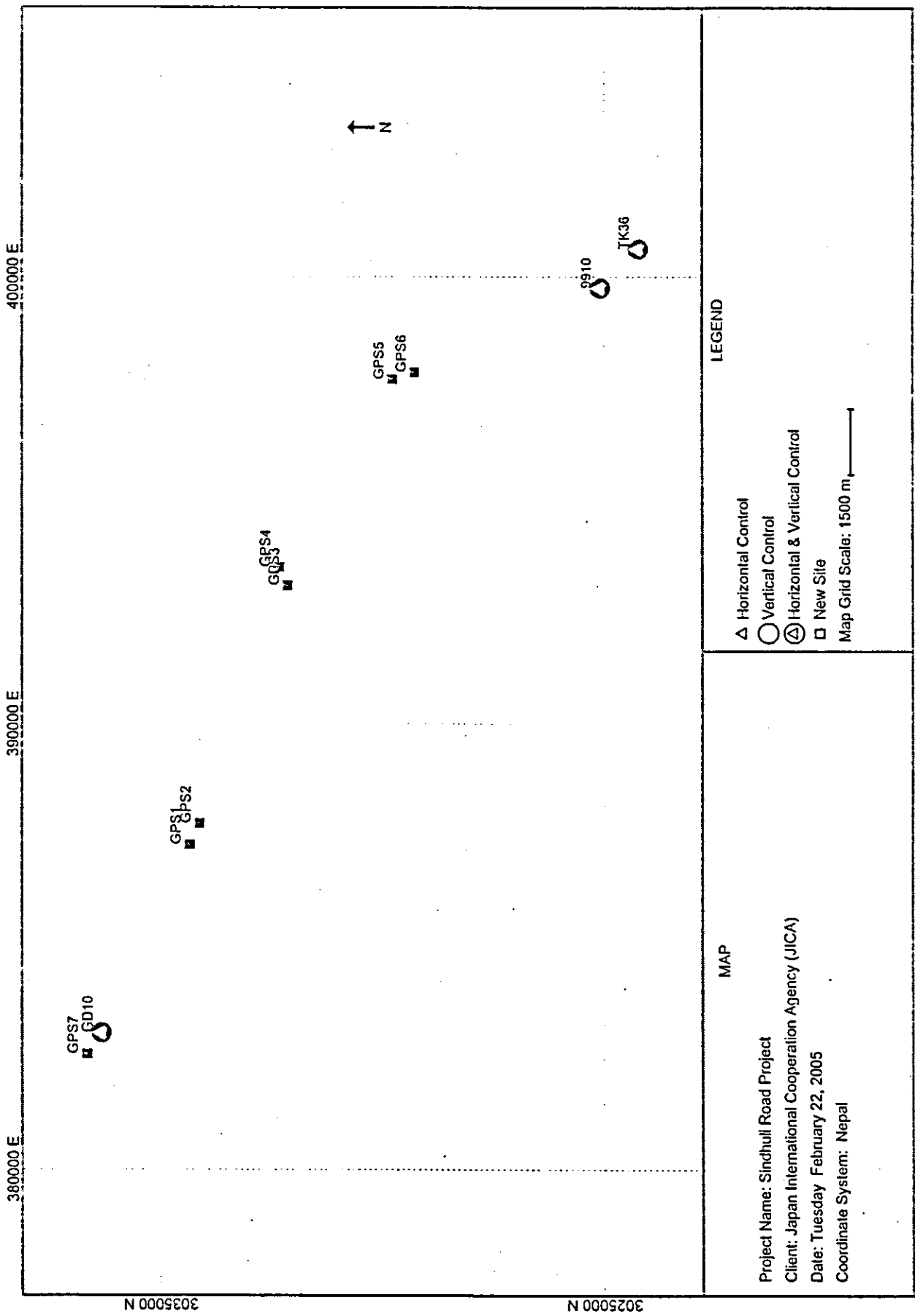
The value of error for the entire reach of road corridor was distributed to all the new stations in reference to the three known stations, thereby providing the adjusted coordinates to the new stations. The co-ordinates of the stations, the relative network accuracy after the adjustments etc. can be found in the Appendix section.



LIST OF COORDINATES

S.No.	Site ID	Easting	Northing	Elevation	Remarks
1	GPS 1	387307.711	3034339.771	596.603	
2	GPS 2	387761.748	3034111.147	540.248	
3	GPS 3	393115.335	3032116.559	548.775	
4	GPS 4	393507.065	3032325.798	495.097	
5	GPS 5	397703.405	3029743.612	607.830	
6	GPS 6	397861.511	3029229.157	635.176	
7	GPS 7	382598.043	3036668.159	646.379	
8	D 10	383099.828	3036336.027	974.496	Closing Station
9	TK 36	400623.699	3024263.705	597.780	Base Station
10	9910	399760.720	3025104.687	572.415	Base Station

# Appendix



**LEGEND**

- △ Horizontal Control
  - Vertical Control
  - ⊗ Horizontal & Vertical Control
  - New Site
- Map Grid Scale: 1500 m

**MAP**

Project Name: Sindhul Road Project  
 Client: Japan International Cooperation Agency (JICA)  
 Date: Tuesday February 22, 2005  
 Coordinate System: Nepal

**LIST OF COORDINATES**

S.N.	SITE ID	EASTING	NORTHING	ELEVATION	REMARKS
1	GPS-1	387307.711	3034339.771	596.603	PILLAR
2	GPS-2	387761.748	3034111.147	540.248	PILLAR
3	GPS-3	393115.335	3032116.559	548.775	PILLAR
4	GPS-4	393507.065	3032325.798	495.097	PILLAR
5	GPS-5	397703.405	3029743.612	607.830	PILLAR
6	GPS-6	397861.511	3029229.157	635.176	PILLAR
7	GPS-7	382598.043	3036668.159	646.379	PILLAR
8	GPS-D-10	383099.828	3036336.027	974.496	CONTROL STATION
9	GPS-TK-36	400633.699	3024263.705	597.780	CONTROL STATION
10	GPS-9910	399760.720	3025104.687	572.415	CONTROL STATION

## Adjusted Vectors Sindhuli Road Project

Vector Stage: Adjusted Date: 02/22/05  
 Horizontal Coordinate System: Nepal Project file: SRP.spr  
 Height System: Ellips. Ht.  
 Linear Units of Measure: Meters

	<u>Vector Identifier</u>		<u>Vector Length</u>	<u>Radial Resid.</u>		<u>Vector Components</u>	<u>Resid.</u>	<u>Tau Test</u>
1	GPS4-GPS3	2/13 9:10	447.366	0.005	X	399.286	0.001	
					Y	117.409	0.005	
					Z	-164.081	-0.002	
2	GD10-GPS7	2/16 8:41	685.432	0.002	X	471.359	0.000	
					Y	-477.725	0.002	
					Z	139.341	0.001	
3	GPS1-GPS2	2/16 1:08	511.487	0.005	X	-451.093	0.004	
					Y	86.108	-0.002	
					Z	-225.209	-0.002	
4	GPS6-GPS5	2/13 4:31	538.941	0.006	X	143.674	-0.001	
					Y	-271.026	-0.002	
					Z	443.125	-0.006	
5	TK36-GPS6	2/13 4:26	5687.508	0.014	X	2649.169	0.002	
					Y	-2429.434	-0.005	
					Z	4407.664	0.013	
6	GPS6-GPS3	2/13 9:19	5556.550	0.010	X	4660.825	-0.002	
					Y	-1720.429	-0.001	
					Z	2488.389	-0.010	
7	GPS6-GPS4	2/13 9:19	5345.462	0.011	X	4261.540	-0.005	
					Y	-1837.838	-0.006	
					Z	2652.470	-0.007	
8	GPS4-GPS2	2/16 0:58	6016.784	0.011	X	5692.159	-0.005	
					Y	-1168.837	-0.004	
					Z	1560.396	-0.009	
9	GPS4-GPS1	2/16 1:08	6519.419	0.012	X	6143.252	-0.009	
					Y	-1254.945	-0.001	
					Z	1785.605	-0.008	
10	GPS2-GPS7	2/16 8:42	5763.370	0.039	X	5096.899	-0.007	
					Y	-1435.060	-0.032	
					Z	2275.666	-0.021	
11	GD10-GPS2	2/16 8:42	5184.206	0.012	X	-4625.540	0.004	
					Y	957.335	-0.008	
					Z	-2136.325	0.008	

12	TK36-GPS5	2/13 4:31	6214.709	0.013	X	2792.843	0.005
					Y	-2700.461	0.002
					Z	4850.788	0.012
13	9910-GPS6	2/13 4:30	4541.546	0.023	X	1799.841	-0.012
					Y	-1963.472	-0.003
					Z	3678.449	-0.019
14	GPS6-GPS5	2/13 9:44	538.941	0.007	X	143.674	0.000
					Y	-271.026	0.000
					Z	443.125	0.006
15	GPS4-GPS5	2/13 9:44	4928.785	0.013	X	-4117.865	0.011
					Y	1566.811	-0.003
					Z	-2209.345	0.008
16	GPS4-GPS3	2/16 1:01	447.366	0.006	X	399.286	-0.003
					Y	117.409	-0.005
					Z	-164.081	0.002
17	GPS1-GPS3	2/16 1:08	6219.147	0.012	X	-5743.967	0.006
					Y	1372.354	-0.004
					Z	-1949.686	0.010
18	GPS1-GPS7	2/16 8:41	5254.289	0.006	X	4645.805	-0.004
					Y	-1348.952	-0.001
					Z	2050.457	-0.004
19	GD10-GPS1	2/16 8:41	4673.051	0.015	X	-4174.446	0.007
					Y	871.227	-0.014
					Z	-1911.116	0.001
20	GPS1-GPS2	2/16 8:42	511.487	0.005	X	-451.093	-0.004
					Y	86.108	0.002
					Z	-225.209	0.002
21	GPS2-GPS3	2/16 1:01	5713.384	0.011	X	-5292.873	0.002
					Y	1286.246	-0.002
					Z	-1724.477	0.010
22	9910-GPS5	2/13 4:31	5075.195	0.022	X	1943.515	-0.009
					Y	-2234.498	0.005
					Z	4121.574	-0.020
23	GPS5-GPS3	2/13 9:44	5166.094	0.016	X	4517.151	-0.007
					Y	-1449.403	0.006
					Z	2045.264	-0.013
24	TK36-9910	2/13 4:30	1212.532	0.035	X	849.328	0.015
					Y	-465.963	-0.003
					Z	729.214	0.031

Fail

**Adjustment Summary**  
**Sindhuli Road Project**

Project file: Sindhuli Road Project.spr

Date: 02/22/05

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Adjustment Type:	Fully Constrained
Variance of Unit Weight:	5.3
Adjustment scale factor:	1.00
Vectors Failing Tau Test:	1
Site Pairs Failing Relative Accuracy QA Test:	19
Vector Total:	24
Site Total:	10
Horizontally Constrained Sites:	3
Vertically Constrained Sites:	3
Horizontal Coordinate System:	Nepal
Height System:	Ellips. Ht.
Desired Horizontal Accuracy:	0.005m + 1ppm
Desired Vertical Accuracy:	0.010m + 2ppm
Confidence Level:	Std. Err.

**Network Relative Accuracy**  
Sindhuli Road Project

Desired Horizontal Accuracy: 0.005m + 1ppm  
 Desired Vertical Accuracy: 0.010m + 2ppm  
 Confidence Level: Std. Err.  
 Linear Units of Measure: Meters

Date: 02/22/05  
 Project file: SRP.spr

	<u>Site Pair</u>		<u>Relative Error</u>	<u>Allow. Error</u>	<u>Horizontal Relative Acc</u>	<u>Vertical Relative Acc</u>	<u>Distance</u>
1	GPS4	Lat	0.004	0.005	1:111840	1:19450	447.366
	GPS3	Lng	0.004	0.005			
		Elv	0.023	0.010			
2	GD10	Lat	0.017	0.005	1:40319	1:62312	685.432
	GPS7	Lng	0.012	0.005			
		Elv	0.011	0.010			
3	GPS1	Lat	0.004	0.005	1:127872	1:73070	511.487
	GPS2	Lng	0.004	0.005			
		Elv	0.007	0.010			
4	GPS6	Lat	0.003	0.005	1:134736	1:26947	538.941
	GPS5	Lng	0.004	0.005			
		Elv	0.020	0.010			
5	TK36	Lat	0.011	0.008	1:379166	1:40336	5687.508
	GPS6	Lng	0.015	0.008			
		Elv	0.141	0.015			
6	GPS6	Lat	0.015	0.007	1:347284	1:205798	5556.550
	GPS3	Lng	0.016	0.007			
		Elv	0.027	0.015			
7	GPS6	Lat	0.016	0.007	1:314439	1:242975	5345.462
	GPS4	Lng	0.017	0.007			
		Elv	0.022	0.015			
8	GPS4	Lat	0.013	0.008	1:401119	1:58415	6016.784
	GPS2	Lng	0.015	0.008			
		Elv	0.103	0.016			
9	GPS4	Lat	0.012	0.008	1:434628	1:60929	6519.419
	GPS1	Lng	0.015	0.008			
		Elv	0.107	0.016			
10	GPS2	Lat	0.012	0.008	1:384225	1:113007	5763.370
	GPS7	Lng	0.015	0.008			
		Elv	0.051	0.015			
11	GD10	Lat	0.019	0.007	1:272853	1:105800	5184.206
	GPS2	Lng	0.018	0.007			
		Elv	0.049	0.014			



12	TK36 GPS5	Lat Lng Elv	0.011 0.015 0.160	0.008 0.008 0.016	1:414313	1:38841	6214.709
13	9910 GPS6	Lat Lng Elv	0.011 0.015 0.141	0.007 0.007 0.014	1:302770	1:32209	4541.546
14	GPS4 GPS5	Lat Lng Elv	0.015 0.016 0.025	0.007 0.007 0.014	1:308049	1:197151	4928.785
15	GPS1 GPS3	Lat Lng Elv	0.012 0.015 0.085	0.008 0.008 0.016	1:414610	1:73166	6219.147
16	GPS1 GPS7	Lat Lng Elv	0.012 0.015 0.047	0.007 0.007 0.015	1:350286	1:111793	5254.289
17	GD10 GPS1	Lat Lng Elv	0.017 0.017 0.046	0.007 0.007 0.014	1:274885	1:101588	4673.051
18	GPS2 GPS3	Lat Lng Elv	0.013 0.015 0.081	0.008 0.008 0.015	1:380892	1:70535	5713.384
19	9910 GPS5	Lat Lng Elv	0.011 0.015 0.160	0.007 0.007 0.014	1:338347	1:31720	5075.195
20	GPS5 GPS3	Lat Lng Elv	0.014 0.015 0.041	0.007 0.007 0.014	1:344407	1:126002	5166.094
21	TK36 9910	Lat Lng Elv	0.000 0.000 0.000	0.005 0.005 0.010	1:0	1:0	1212.532

**Control Site Positions**  
Sindhuli Road Project

Horizontal Coordinate System: Nepal  
 Height System: Ellips. Ht.  
 Desired Horizontal Accuracy: 0.005m + 1ppm  
 Desired Vertical Accuracy: 0.010m + 2ppm  
 Confidence Level: Std. Err.  
 Linear Units of Measure: Meters

Date: 02/22/05  
 Project file: SRP.spr

Site ID	Control Site Descriptor	Position	Std Error	Control Type	Fix Status
1 GD10	NEPALTHOK	East. 383099.828	0.000	Hor/Ver	Fixed
		Nrth. 3036336.027	0.000		Fixed
		Elev. 974.496	0.000		Fixed
2 TK36	KURKOT.SAINIKDANDA	East. 400633.699	0.000	Hor/Ver	Fixed
		Nrth. 3024263.705	0.000		Fixed
		Elev. 597.780	0.000		Fixed
3 9910	SELEGHAT KOTDANDA	East. 399760.720	0.000	Hor/Ver	Fixed
		Nrth. 3025104.687	0.000		Fixed
		Elev. 572.415	0.000		Fixed

Site ID	Control Site Descriptor	Convergence	Scale Factor	Elevation Factor
1 GD10	NEPALTHOK	- 0 32.702	1.00006868	0.99984692
2 TK36	KURKOT.SAINIKDANDA	- 0 27.670	1.00002187	0.99990609
3 9910	SELEGHAT KOTDANDA	- 0 27.922	1.00002402	0.99991008

**Coordinate System Definition Summary**  
**Sindhuli Road Project**

Linear Units of Measure: Meters

Date: 02/22/05  
Project file: Sindhuli Road

Project.spr

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Geodetic Datum

Name: Nepal

Reference Ellipsoid: EVER  
a = 6377276.345m  
1/f = 300.801700000

Transformation Parameters:

X Translation	=	289.000m
Y Translation	=	734.000m
Z Translation	=	257.000m
X Rotation	=	0.000000"
Y Rotation	=	0.000000"
Z Rotation	=	0.000000"
Scale Diff. (ppm)	=	0.000000

Note: Parameters define transformation from LOCAL SYSTEM to WGS84

Grid System

Name: Nepal

Projection Type: TM83

Zone Name: Nepal

Zone Parameters:

Longitude of Central Meridian	=	087°00'00.00"E
Scale factor at Central Meridian	=	0.999900
Longitude of the grid origin	=	000°00'00.00"W
Latitude of grid origin	=	00°00'00.00"N
False easting (m)	=	500000.000
False northing (m)	=	0.000

**Observation Information**  
Sindhuli Road Project

Time System: Local Time (UTC+6.0) Date: 02/22/05  
 Linear Units of Measure: Meters Project file: Sindhuli Road  
 Project.spr

	<u>Site ID</u>	<u>Antenna Slant</u>	<u>Antenna Radius</u>	<u>Antenna Offset</u>	<u>Start Time</u>	<u>End Time</u>	<u>File Name</u>
1	GPS6	1.340	0.092	0.000	10:26:00 AM	12:25:50 PM	B1111A05.044
2	GPS2	1.397	0.092	0.000	06:52:10 AM	09:07:00 AM	B1111A05.047
3	GPS3	1.446	0.092	0.000	03:10:10 PM	05:40:50 PM	B1111B05.044
4	GPS7	1.416	0.092	0.000	02:41:30 PM	05:11:20 PM	B1111B05.047
5	GPS5	1.380	0.092	0.000	10:31:10 AM	12:29:40 PM	B2222B05.044
6	GPS1	1.512	0.092	0.000	07:08:10 AM	09:08:00 AM	B2222B05.047
7	GPS4	1.370	0.092	0.000	03:03:00 PM	05:38:20 PM	B2222C05.044
8	GD10	1.292	0.092	0.000	02:41:30 PM	05:06:20 PM	B2222C05.047
9	GPS4	1.465	0.092	0.000	06:58:00 AM	09:01:40 AM	B3333A05.047
10	GPS2	1.465	0.092	0.000	02:42:30 PM	05:16:30 PM	B3333B05.047
11	TK36	1.465	0.092	0.000	10:24:30 AM	12:29:50 PM	B3333C05.044
12	GPS6	1.465	0.092	0.000	03:19:30 PM	06:13:30 PM	B3333D05.044
13	9910	1.470	0.092	0.000	10:30:50 AM	12:31:40 PM	B4444A05.044
14	GPS3	1.609	0.092	0.000	07:01:50 AM	09:02:40 AM	B4444A05.047
15	GPS1	1.564	0.092	0.000	02:40:20 PM	05:14:40 PM	B4444B05.047
16	GPS5	1.593	0.092	0.000	03:44:00 PM	06:16:50 PM	B4444C05.044

## Project Files Sindhuli Road Project

Time System: Local Time (UTC+6.0)

Date: 02/22/05

Project file: Sindhuli Road Project.spr

	<u>File Name</u>	<u>Start Date &amp; Time</u>	<u>End Date &amp; Time</u>	<u>Recording Intrvl (sec)</u>	<u>Epochs</u>	<u>File Size (bytes)</u>	<u>Type</u>
1	B1111A05.044	02/13/2005 10:26:00 AM	02/13/2005	10.0	720	244365	L1 GPS
2	B1111A05.047	02/16/2005 06:52:10 AM	02/16/2005	10.0	810	252600	L1 GPS
3	B1111B05.044	02/13/2005 03:10:10 PM	02/13/2005	10.0	905	333935	L1 GPS
4	B1111B05.047	02/16/2005 02:41:30 PM	02/16/2005	10.0	900	309870	L1 GPS
5	B2222B05.044	02/13/2005 10:31:10 AM	02/13/2005	10.0	712	241799	L1 GPS
6	B2222B05.047	02/16/2005 07:08:10 AM	02/16/2005	10.0	720	232115	L1 GPS
7	B2222C05.044	02/13/2005 03:03:00 PM	02/13/2005	10.0	933	343931	L1 GPS
8	B2222C05.047	02/16/2005 02:41:30 PM	02/16/2005	10.0	870	333620	L1 GPS
9	B3333A05.047	02/16/2005 06:58:00 AM	02/16/2005	10.0	743	242896	L1 GPS
10	B3333B05.047	02/16/2005 02:42:30 PM	02/16/2005	10.0	925	317985	L1 GPS
11	B3333C05.044	02/13/2005 10:24:30 AM	02/13/2005	10.0	753	260191	L1 GPS
12	B3333D05.044	02/13/2005 03:19:30 PM	02/13/2005	10.0	1045	395465	L1 GPS
13	B4444A05.044	02/13/2005 10:30:50 AM	02/13/2005	10.0	726	250962	L1 GPS
14	B4444A05.047	02/16/2005 07:01:50 AM	02/16/2005	10.0	726	249527	L1 GPS
15	B4444B05.047	02/16/2005 02:40:20 PM	02/16/2005	10.0	927	331839	L1 GPS
16	B4444C05.044	02/13/2005 03:44:00 PM	02/13/2005	10.0	918	352026	L1 GPS

**Project Summary**  
**Sindhuli Road Project**

Project file: Sindhuli Road Project.spr

Date: 02/22/05

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Client Name:	Japan International Cooperation Agency
Project Name:	Sindhuli Road Project
Project Comments:	GPS Survey
Desired Horizontal Accuracy:	0.005m + 1ppm
Desired Vertical Accuracy:	0.010m + 2ppm
Confidence Level:	Std. Err.
Horizontal Coordinate System:	Nepal
Height System:	Ellips. Ht.
Linear Units:	Meters
Number of Sites:	10
Number of Vectors:	24
Survey Company Name:	Auto Carto Consults Pvt. Ltd.

## Processed Vectors Sindhuli Road Project

Vector Stage: Processed  
 Horizontal Coordinate System: Nepal  
 Height System: Ellips. Ht.  
 Desired Horizontal Accuracy: 0.005m + 1ppm  
 Desired Vertical Accuracy: 0.010m + 2ppm  
 Confidence Level: Std. Err.  
 Linear Units of Measure: Meters

Date: 02/22/05  
 Project file: SRP.spr

Vector Identifier	Vector Length	Std Error	Vector Components	Std Error	Process QA	SVs	PDOP	Meas. Type
1 GPS4-GPS3 2/13 9:10	447.364	0.002	399.285 117.404 -164.080	0.001 0.001 0.001		11	1.4	L1 GPS
2 GD10-GPS7 2/16 8:41	685.432	0.003	471.359 -477.727 139.340	0.001 0.002 0.002		10	1.5	L1 GPS
3 GPS1-GPS2 2/16 1:08	511.490	0.002	-451.098 86.110 -225.207	0.001 0.001 0.001		9	1.7	L1 GPS
4 GPS6-GPS5 2/13 4:31	538.945	0.002	143.676 -271.025 443.130	0.001 0.001 0.001		11	1.5	L1 GPS
5 TK36-GPS6 2/13 4:26	5687.495	0.012	2649.167 -2429.430 4407.651	0.006 0.007 0.007		11	1.4	L1 GPS
6 GPS6-GPS3 2/13 9:19	5556.555	0.013	4660.827 -1720.428 2488.399	0.007 0.008 0.008		11	1.3	L1 GPS
7 GPS6-GPS4 2/13 9:19	5345.468	0.013	4261.545 -1837.832 2652.477	0.006 0.008 0.008		11	1.4	L1 GPS
8 GPS4-GPS2 2/16 0:58	6016.790	0.012	5692.164 -1168.834 1560.405	0.006 0.007 0.007		10	1.7	L1 GPS
9 GPS4-GPS1 2/16 1:08	6519.428	0.013	6143.260 -1254.944 1785.614	0.007 0.007 0.008		10	1.6	L1 GPS
10 GPS2-GPS7 2/16 8:42	5763.376	0.013	5096.906 -1435.028 2275.687	0.006 0.008 0.008		10	1.7	L1 GPS
11 GD10-GPS2 2/16 8:42	5184.214	0.012	-4625.544 957.343 -2136.333	0.006 0.007 0.007		10	1.5	L1 GPS
12 TK36-GPS5 2/13 4:31	6214.698	0.013	2792.839 -2700.462 4850.776	0.007 0.008 0.008		11	1.4	L1 GPS
13 9910-GPS6 2/13 4:30	4541.565	0.009	1799.853 -1963.468 3678.469	0.005 0.006 0.006		11	1.4	L1 GPS
14 GPS6-GPS5 2/13 9:44	538.935	0.002	143.674 -271.027 443.118	0.001 0.001 0.001		13	1.2	L1 GPS

15	GPS4-GPS5	2/13 9:44	4928.798	0.011	X	-4117.876	0.006	11	1.3	L1 GPS
					Y	1566.814	0.007			
					Z	-2209.353	0.007			
16	GPS4-GPS3	2/16 1:01	447.371	0.002	X	399.289	0.001	11	1.5	L1 GPS
					Y	117.413	0.001			
					Z	-164.083	0.001			
17	GPS1-GPS3	2/16 1:08	6219.156	0.012	X	-5743.972	0.007	10	1.6	L1 GPS
					Y	1372.358	0.007			
					Z	-1949.696	0.007			
18	GPS1-GPS7	2/16 8:41	5254.294	0.013	X	4645.809	0.007	10	1.6	L1 GPS
					Y	-1348.952	0.008			
					Z	2050.461	0.008			
19	GD10-GPS1	2/16 8:41	4673.059	0.011	X	-4174.453	0.005	10	1.5	L1 GPS
					Y	871.241	0.007			
					Z	-1911.116	0.007			
20	GPS1-GPS2	2/16 8:42	511.484	0.002	X	-451.089	0.001	10	1.5	L1 GPS
					Y	86.106	0.001			
					Z	-225.211	0.001			
21	GPS2-GPS3	2/16 1:01	5713.389	0.011	X	-5292.875	0.006	10	1.7	L1 GPS
					Y	1286.248	0.006			
					Z	-1724.487	0.007			
22	9910-GPS5	2/13 4:31	5075.217	0.011	X	1943.525	0.006	11	1.4	L1 GPS
					Y	-2234.503	0.007			
					Z	4121.594	0.006			
23	GPS5-GPS3	2/13 9:44	5166.106	0.012	X	4517.158	0.006	11	1.4	L1 GPS
					Y	-1449.409	0.007			
					Z	2045.277	0.007			
24	TK36-9910	2/13 4:30	1212.501	0.003	X	849.313	0.002	11	1.4	L1 GPS
					Y	-465.960	0.002			
					Z	729.183	0.002			



**Site Positions**  
Sindhuli Road Project

Horizontal Coordinate System: Nepal  
 Height System: Ellips. Ht.  
 Project.spr  
 Date: 02/22/05  
 Project file: Sindhuli Road  
 Desired Horizontal Accuracy: 0.005m + 1ppm  
 Desired Vertical Accuracy: 0.010m + 2ppm  
 Confidence Level: Std. Err.  
 Linear Units of Measure: Meters

Site ID	Site Descriptor	Position	Std Error	Fix Status	Position Status
1 GPS6	BARBUTEDANDA	East. 397861.511	0.015		Adjusted
		Nrth. 3029229.157	0.011		
		Elev. 635.176	0.141		
2 GPS2	BARKOBOT	East. 387761.748	0.013		Adjusted
		Nrth. 3034111.147	0.019		
		Elev. 540.248	0.049		
3 GPS3	GHUMAUNE CHAINPUR	East. 393115.335	0.019		Adjusted
		Nrth. 3032116.559	0.016		
		Elev. 548.775	0.126		
4 GPS7	NEPALTHOK7	East. 382598.043	0.012		Adjusted
		Nrth. 3036668.159	0.017		
		Elev. 646.379	0.011		
5 GPS1,	BAR KO BOT	East. 387307.711	0.017		Adjusted
		Nrth. 3034339.771	0.017		
		Elev. 596.603	0.046		
6 GPS5	GHUMAUNE CHAINPUR	East. 397703.405	0.015		Adjusted
		Nrth. 3029743.612	0.011		
		Elev. 607.830	0.160		
7 GPS4	MULKOT	East. 393507.065	0.020		Adjusted
		Nrth. 3032325.798	0.017		
		Elev. 495.097	0.148		
8 GD10	NEPALTHOK	East. 383099.828	0.000	Fixed	Adjusted
		Nrth. 3036336.027	0.000	Fixed	
		Elev. 974.496	0.000	Fixed	
9 TK36	KURKOT.SAINIKDANDA	East. 400633.699	0.000	Fixed	Adjusted
		Nrth. 3024263.705	0.000	Fixed	
		Elev. 597.780	0.000	Fixed	
10 9910	SELEGHAT KOTDANDA	East. 399760.720	0.000	Fixed	Adjusted
		Nrth. 3025104.687	0.000	Fixed	
		Elev. 572.415	0.000	Fixed	

<u>Site ID</u>	<u>Site Descriptor</u>	<u>Convergence</u>	<u>Scale Factor</u>	<u>Elevation Factor</u>
1 GPS6	BARBUTEDANDA	- 0 28.496	1.00002877	0.99990022
2 GPS2	BARKOBOT	- 0 31.372	1.00005549	0.99991513
3 GPS3	GHUMAUNE CHAINPUR	- 0 29.853	1.00004101	0.99991379
4 GPS7	NEPALTHOK7	- 0 32.847	1.00007013	0.99989846
5 GPS1	BAR KO BOT	- 0 31.501	1.00005675	0.99990628
6 GPS5	GHUMAUNE CHAINPUR	- 0 28.546	1.00002917	0.99990451
7 GPS4	MULKOT	- 0 29.746	1.00003998	0.99992222
8 GD10	NEPALTHOK	- 0 32.702	1.00006868	0.99984692
9 TK36	KURKOT.SAINIKDANDA	- 0 27.670	1.00002187	0.99990609
10 9910	SELEGHAT KOTDANDA	- 0 27.922	1.00002402	0.99991008

**Co-ordinates and Reduce Level of the Benchmarks, Traverse Points and GPS**

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**BENCH MARK**  
**LIST OF COORDINATES**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
BM-1	3036730.910	383025.827	545.244	PILLAR
BM-2	3036962.480	384046.747	532.760	PILLAR
BM-3	3036374.410	384351.459	555.678	PILLAR
BM-4	3036063.950	384522.597	558.585	PILLAR
BM-5	3035565.170	384778.079	519.626	PILLAR
BM-6	3035040.960	385724.784	549.006	PILLAR
BM-7	3034284.910	387504.640	537.325	PILLAR
BM-8	3033937.729	387799.783	533.386	PILLAR
BM-9	3033886.464	388285.433	555.248	PILLAR
BM-10	3033405.603	388481.420	563.325	PILLAR
BM-11	3033237.500	388827.142	553.730	PILLAR
BM-12	3033331.601	389269.583	551.913	PILLAR
BM-13	3033624.764	389932.778	516.535	PILLAR
BM-14	3033398.630	390371.164	529.139	PILLAR
BM-15	3033245.750	390648.214	523.705	PILLAR
BM-16	3033316.312	391188.594	508.177	PILLAR
BM-17	3033045.050	391367.627	534.888	PILLAR
BM-18	3032500.344	391446.552	568.315	PILLAR
BM-19	3032878.580	392038.816	561.310	PILLAR
BM-20	3032592.670	392275.486	540.142	PILLAR
BM-21	3032389.040	392466.234	526.572	PILLAR
BM-22	3032204.790	393170.739	500.715	PILLAR
BM-23	3031981.110	393766.618	486.932	PILLAR
BM-24	3031551.65	393949.019	515.856	PILLAR
BM-25	3031331.590	394434.412	544.121	PILLAR
BM-26	3030871.200	394500.747	589.778	PILLAR
BM-27	3030427.770	394746.579	648.428	PILLAR
BM-28	3030218.950	395146.507	553.325	PILLAR
BM-29	3029949.21	395319.99	530.891	PILLAR
BM-30	3029591.190	395619.852	518.728	PILLAR
BM-31	3029535.880	396058.410	480.674	PILLAR
BM-32	3029602.4	396412.999	504.398	PILLAR
BM-33	3029809.97	397166.979	504.361	PILLAR
BM-34	3029993.16	397088.206	498.227	PILLAR
BM-35	3030245.67	397169.089	528.720	PILLAR
BM-36	3030151.02	397392.153	548.194	PILLAR
BM-37	3029892.48	397589.468	576.610	PILLAR
BM-38	3029817.42	397787.167	592.243	PILLAR
BM-39	3029305.37	397933.188	613.092	PILLAR
BM-40	3028938.81	398272.53	561.733	PILLAR
BM-41	3028687.44	398626.433	564.502	PILLAR
BM-42	3028094.76	398546.881	543.78	PILLAR
BM-43	3027646.87	398756.761	515.616	PILLAR
BM-44	3027515.53	398960.049	489.857	PILLAR
BM-45	3027151.25	398968.166	483.642	PILLAR
BM-46	3027199.28	398846.147	511.193	PILLAR
BM-47	3027108.91	398875.192	532.800	PILLAR
BM-48	3026703.24	399084.789	563.793	PILLAR
BM-49	3026237.14	399569.525	468.853	PILLAR
BM-50	3025629.67	399468.703	485.171	PILLAR
BM-50A	3025361.89	399392.259	478.417	PILLAR
BM-51	3024964.02	399364.956	464.682	PILLAR
BM-52	3024613.27	399630.242	476.559	PILLAR
BM-670	3024542.57	400246.79	469.431	OLD BM PILLAR

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**Traverse Points (TP) Co-ordinate Data**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-101	3036779.550	382838.507	551.992	PILLAR
TP-102	3036728.760	383427.659	540.763	PILLAR
TP-103	3036925.600	383852.039	535.449	PILLAR
TP-104	3036732.070	384171.931	532.124	PILLAR
TP-105	3036518.720	384233.286	548.034	PILLAR
TP-106	3036998.580	384104.922	531.649	PEG
TP-107	3036906.330	383447.766	540.892	PEG
TP-108	3036908.040	382931.345	546.417	PEG
TP-109	3036746.470	382292.515	569.311	PEG
TP-110	3036126.600	384433.849	549.547	PILLAR
TP-111	3036098.790	384512.852	549.359	PEG
TP-112	3035773.160	384527.574	547.688	PILLAR
TP-113	3035475.380	384687.791	546.664	PEG
TP-114	3035307.080	385028.021	518.595	PILLAR
TP-115	3035168.740	385481.902	516.221	PILLAR
TP-116	3034938.780	385920.994	529.502	PILLAR
TP-117	3034888.080	386007.880	527.822	PILLAR
TP-118	3034607.160	386156.033	544.414	PEG
TP-119	3034551.060	386207.241	544.248	PILLAR
TP-120	3034356.830	386370.333	543.759	PILLAR
TP-121	3034477.390	387074.668	508.812	PEG
TP-122	3034486.210	387257.066	511.076	PILLAR
TP-123	3034452.460	387432.282	512.301	PILLAR
TP-124	3033975.452	387896.227	538.275	PEG
TP-125	3033973.158	387952.194	539.751	PILLAR
TP-126	3033914.612	388220.163	551.627	PILLAR
TP-127	3033785.571	388276.665	568.048	PEG
TP-128	3033518.780	388387.349	566.250	PILLAR
TP-129	3033487.409	388441.836	562.564	PILLAR
TP-130	3033312.768	388602.055	559.359	PILLAR
TP-131	3033228.671	389166.813	551.109	PILLAR
TP-131	3033228.670	389166.811	551.109	PILLAR
TP-132	3033574.965	390071.091	524.571	PILLAR
TP-133	3033529.674	390205.804	526.245	PILLAR
TP-134	3033484.191	390265.442	528.389	PILLAR
TP-135	3033421.310	390422.785	524.495	PILLAR
TP-136	3033251.950	391022.728	507.505	PILLAR
TP-137	3033308.947	391373.183	502.429	PEG
TP-138	3033261.430	391288.532	519.325	PEG
TP-139	3033171.420	391278.279	529.071	PEG
TP-140	3032570.990	391377.773	551.612	PILLAR
TP-141	3032595.230	391643.042	575.184	PEG
TP-142	3032740.370	391812.171	567.900	PILLAR
TP-143	3032802.181	392035.207	579.410	PILLAR
TP-144	3032312.700	393255.177	496.743	PILLAR
TP-145	3033278.460	388648.910	557.803	PEG
TP-146	3033252.060	388732.163	556.118	PEG
TP-147 (D-2)	3033424.930	389667.147	520.329	PILLAR

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**Traverse Points (TP) Co-ordinate Data**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-148	3033480.500	389746.139	521.545	PEG
TP-149	3033364.670	390430.141	519.282	PEG
TP-150	3033343.770	390462.982	526.726	PEG
TP-151	3033278.350	390519.808	525.494	PILLAR
TP-152	3033189.210	390731.515	521.975	PEG
TP-153	3033102.330	390761.107	522.553	PILLAR
TP-154	3033152.260	390835.058	520.234	PEG
TP-155	3033182.910	390887.553	520.006	PEG
TP-156	3033208.190	390892.800	511.486	PEG
TP-157	3033256.250	390955.488	510.936	PEG
TP-158	3032933.630	391446.422	539.835	PEG
TP-159	3032811.980	391404.194	547.428	PEG
TP-160	3032669.680	391390.226	553.625	PEG
TP-161	3032787.380	391890.212	560.824	PEG
TP-162	3032837.900	391981.576	559.881	PILLAR
TP-163	3032879.380	392066.305	559.390	PEG
TP-164	3032799.580	392109.701	556.238	PILLAR
TP-165	3032685.740	392251.394	538.786	PILLAR
TP-166	3032483.910	392323.842	540.038	PEG
TP-167	3032449.070	392396.152	535.824	PILLAR
TP-168	3032355.280	392476.925	529.392	PILLAR
TP-169	3032316.950	392584.851	516.282	PEG
TP-170	3032241.460	392769.959	499.578	PEG
TP-171	3032351.870	393381.460	494.929	PILLAR
TP-172	3031370.840	394380.353	535.227	PILLAR
TP-173	3031297.700	394469.656	536.761	PEG
TP-174	3030358.590	394921.698	602.484	PILLAR
TP-175	3029766.060	396714.719	478.734	PILLAR
TP-176	3029966.870	397033.680	487.600	PILLAR
TP-177	3032036.780	393267.855	506.128	PEG
TP-178	3031965.460	393398.975	498.372	PILLAR
TP-179	3032073.670	393587.184	494.079	PILLAR
TP-180	3031985.000	393664.320	491.367	PEG
TP-181	3031966.560	393722.134	487.812	PILLAR
TP-182	3031838.280	393802.674	489.146	PEG
TP-183	3031722.550	393922.163	487.054	PILLAR
TP-184	3031409.950	394232.049	523.516	PILLAR
TP-185	3031406.830	394285.120	521.720	PEG
TP-186	3031390.000	394330.729	527.695	PEG
TP-187	3031285.790	394461.109	544.013	PEG
TP-188	3031203.610	394482.603	554.721	PEG
TP-189	3031166.670	394474.536	560.092	PEG
TP-190	3031032.570	394478.977	580.222	PEG
TP-191	3030941.330	394489.101	581.351	PEG
TP-192	3030668.260	394542.628	618.764	PILLAR
TP-193	3030620.760	394616.838	613.726	PEG
TP-194	3030605.390	394647.452	615.884	PEG
TP-195	3030520.250	394743.341	605.858	PEG

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**Traverse Points (TP) Co-ordinate Data**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-196	3030220.260	395102.291	570.836	PEG
TP-197	3030205.130	395146.028	558.098	PEG
TP-198	3030169.980	395192.371	537.358	PEG
TP-199	3030029.670	395265.936	527.527	PEG
TP-200	3029750.960	395472.879	534.649	PILLAR
TP-201	3029626.200	395624.441	502.579	PEG
TP-202	3029564.110	395680.582	504.293	PEG
TP-203	3029429.510	395850.695	493.713	PEG
TP-204	3029427.430	396009.289	486.521	PEG
TP-205	3029583.370	396222.859	478.910	PILLAR
TP-206	3029692.810	396760.803	491.129	PILLAR
TP-207	3029775.850	396798.281	480.573	PEG
TP-208	3029830.880	397037.491	485.909	PILLAR
TP-209	3030156.150	396979.806	509.271	PILLAR
TP-210	3030174.370	397042.657	517.039	PEG
TP-211	3030204.960	397063.056	519.143	PEG
TP-212	3030305.430	397140.306	522.059	PILLAR
TP-213	3030174.070	397255.807	530.010	PEG
TP-214	3030218.620	397311.090	541.080	PILLAR
TP-215	3030081.970	397487.738	551.748	PILLAR
TP-216	3030054.140	397547.884	553.342	PEG
TP-217	3030020.680	397543.404	559.054	PEG
TP-218	3029980.350	397512.732	559.608	PEG
TP-219	3029875.820	397521.938	568.220	PILLAR
TP-220	3029960.060	397582.926	571.032	PILLAR
TP-221	3029962.770	397650.109	577.918	PEG
TP-222	3029978.190	397716.775	576.361	PEG
TP-223	3029930.030	397755.354	581.465	PILLAR
TP-224	3029691.140	397851.891	601.699	PEG
TP-225	3029606.990	397859.824	609.398	PILLAR
TP-226	3029455.240	397847.623	616.084	PILLAR
TP-227	3029243.450	398003.801	609.607	PEG
TP-228	3029203.240	398084.773	599.749	PILLAR
TP-229	3028752.950	398472.160	546.338	PILLAR
TP-230	3028713.480	398591.514	563.210	PEG
TP-231	3028548.370	398559.701	556.188	PILLAR
TP-232	3028325.860	398516.442	544.500	PILLAR
TP-233	3028018.080	398589.124	545.262	PEG
TP-234	3027937.440	398667.561	538.259	PEG
TP-235	3027768.420	398714.211	530.633	PILLAR
TP-236	3027737.620	398996.370	493.650	PILLAR
TP-237	3028067.120	398775.580	575.742	PEG
TP-238	3028627.020	398739.170	557.318	PEG
TP-239	3029564.090	397824.463	617.108	PEG
TP-240	3027673.990	399018.521	497.958	PEG
TP-241	3027601.410	399021.887	488.799	PEG
TP-242	3027450.010	398866.975	494.402	PILLAR
TP-243	3027413.090	398829.257	493.260	PEG

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**Traverse Points (TP) Co-ordinate Data**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
TP-244	3026934.740	398995.554	512.145	PILLAR
TP-245	3027072.440	398947.883	497.280	PEG
TP-246	3027152.890	398890.499	503.816	PEG
TP-247	3027057.330	398782.916	535.986	PILLAR
TP-248	3027076.570	398876.511	537.692	PEG
TP-249	3026934.100	398944.446	544.705	PILLAR
TP-250	3026427.950	399404.638	488.126	PEG
TP-251	3026417.920	399433.736	479.737	PEG
TP-252	3026319.200	399495.458	480.493	PEG
TP-253	3026276.120	399557.125	468.695	PEG
TP-254	3026159.920	399561.444	475.425	PILLAR
TP-255	3026094.720	399566.537	480.440	PEG
TP-256	3026062.960	399567.086	479.722	PEG
TP-257	3025961.650	399541.157	476.515	PILLAR
TP-258	3025894.320	399528.803	468.035	PILLAR
TP-259	3025816.610	399517.623	468.811	PEG
TP-260	3025690.830	399497.044	472.197	PILLAR
TP-261	3024639.590	400272.173	463.269	PILLAR
TP-262	3024400.500	400392.841	573.287	PEG
TP-263	3026566.560	399167.837	546.001	PILLAR
TP-264	3026474.580	399258.246	532.939	PILLAR
TP-265	3026418.420	399331.228	519.660	PEG
TP-266	3026397.650	399372.917	514.097	PEG
TP-267	3026383.280	399389.053	512.667	PEG
TP-268	3026314.690	399466.447	499.991	PILLAR
TP-269	3026290.060	399489.531	495.745	PEG
TP-270	3026261.060	399512.329	491.129	PEG
TP-271	3026252.090	399533.267	481.235	PEG
TP-272	3026203.310	399554.653	477.299	PEG
TP-273	3025593.890	399461.244	482.613	PEG
TP-274	3025558.330	399459.857	478.627	PEG
TP-275	3025505.970	399435.453	477.055	PEG
TP-276	3025483.820	399408.844	482.800	PILLAR
TP-277	3025346.350	399402.587	471.085	PEG
TP-278	3025305.760	399394.066	470.875	PEG
TP-279	3025263.280	399396.097	463.247	PEG
TP-280	3025199.670	399374.419	468.685	PEG
TP-281	3025133.850	399366.898	464.375	PILLAR
TP-282	3024763.350	399415.828	462.266	PILLAR
TP-283	3024570.340	399697.672	478.614	PILLAR
TP-284	3024563.390	399901.281	461.255	PEG
TP-285	3024549.310	400049.706	467.985	PILLAR



**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**GPS Co-ordinate Data**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
GPS-1	3034339.771	387307.711	595.294	PILLAR
GPS-2	3034111.147	387761.748	538.846	PILLAR
GPS-3	3032116.560	393115.335	546.975	PILLAR
GPS-4	3032325.800	393507.065	493.231	PILLAR
GPS-5	3029743.610	397703.405	605.644	PILLAR
GPS-6	3029229.160	397861.511	633.064	PILLAR
GPS-7	3036668.160	382598.043	645.262	PILLAR
GPS-9910	3025104.690	399760.720	572.415	PILLAR
GPS-D-10	3036336.030	383099.828	973.332	PILLAR
GPS-TK-36	3024263.710	400633.699	597.780	PILLAR

**SINDHULI ROAD PROJECT**  
**SECTION III ( Nepalthok -Khurkot )**  
**KHOLA CROSSINGS**  
**LIST OF COORDINATES**

NAME	STATION	NORTHING	EASTING	ELEVATION	REMARKS
SADHI KHOLA	S-1	3034297.170	387475.010	531.848	PILLAR
	S-2	3034197.920	387485.879	527.156	PILLAR
DHAMILE KHOLA	D-1	3033378.281	389623.522	518.525	PILLAR
	D-2	3033424.928	389667.147	520.329	PILLAR
GANGATE KHOLA	G-1	3033292.250	391187.939	508.417	PILLAR
	G-2	3033285.320	391125.000	508.072	PILLAR
BHOTE KHOLA	B-1	3032134.212	393184.210	503.010	PILLAR
	B-2	3032108.344	393209.142	503.515	PILLAR
KHAHARE KHOLA	K-1	3029476.070	396062.751	484.984	PILLAR
	K-2	3029456.540	395998.329	484.130	PILLAR
CHAINPUR KHOLA	C-1	3029875.350	397178.642	490.428	PILLAR
	C-2	3029851.010	397155.659	491.016	PILLAR
NIGULI KHOLA	N-1	3027185.852	398922.826	484.304	PILLAR
	N-2	3027329.351	398864.243	481.230	PILLAR
BHALU KHOLA	B-1	3024641.110	399516.676	466.031	PILLAR
	B-2	3024643.320	399540.687	472.336	PILLAR

**SINDHULI ROAD PROJECT**  
**SECTION III ( Nepalthok -Khurkot )**  
**KHOLA CROSSINGS**

<b>NAME</b>	<b>CHANGE</b>
SADHI KHOLA	24+100
DHAMILE KHOLA	21+350
GANGATE KHOLA	19+500
BHOTE KHOLA	16+100
KHAHARE KHOLA	11+500
CHAINPUR KHOLA	10+200
GADEULI KHOLA	5+600
NIGULI KHOLA	4+700
BHALU KHOLA	0+850

**Co-ordinates and Reduced Level of the Off Set Points**

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**Off Set Points Co-ordinate Data**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
OS-601	3036737.370	383220.835	542.697	PEG
OS-602	3036788.170	383735.898	538.109	PEG
OS-603	3036819.110	384130.638	531.348	PEG
OS-604	3036572.030	384199.872	529.126	PEG
OS-605	3036444.910	384269.550	546.156	PEG
OS-606	3036417.990	384317.026	552.276	PEG
OS-607	3036344.690	384367.474	546.530	PEG
OS-608	3036219.220	384345.959	548.797	PILLAR
OS-609	3036136.160	384375.409	548.879	PEG
OS-610	3035869.430	384486.222	547.737	PILLAR
OS-611	3035802.610	384521.398	547.981	PEG
OS-612	3035722.640	384542.143	546.812	PEG
OS-613	3035495.820	384656.956	548.464	PEG
OS-614	3035901.730	384573.124	522.636	PILLAR
OS-615	3035694.790	384622.463	520.598	PEG
OS-616	3035400.050	384871.583	518.271	PEG
OS-617	3035132.810	385158.977	548.312	PEG
OS-618	3035197.120	385284.167	517.137	PEG
OS-619	3035113.700	385769.861	515.705	PEG
OS-620	3034938.540	385979.597	514.524	PEG
OS-621	3034754.970	386081.766	528.360	PEG
OS-622	3034660.060	386166.118	527.106	PEG
OS-623	3034516.790	386229.636	544.248	PEG
OS-624	3034215.180	386716.367	541.905	PEG
OS-625	3034220.540	386832.129	542.057	PILLAR
OS-626	3034434.850	387119.343	542.453	PILLAR
OS-627	3034313.840	387476.129	534.418	PEG
OS-628	3034219.115	387333.356	535.407	PEG
OS-629	3034231.104	387475.546	528.381	PEG
OS-630	3034099.545	387629.891	520.060	PEG
OS-631	3034026.568	387693.590	520.642	PILLAR
OS-632	3033951.161	388013.505	543.006	PEG
OS-633	3033931.188	388112.661	545.219	PEG
OS-634	3033919.699	388164.455	549.731	PEG
OS-635	3033684.040	388310.032	565.376	PEG
OS-636	3033614.847	388345.343	563.060	PEG
OS-637	3033215.870	388909.955	551.996	PEG
OS-638	3033197.640	388999.786	550.347	PEG
OS-639	3033432.310	389303.521	510.703	PEG
OS-640	3033395.720	390454.266	515.348	PEG
OS-641	3033356.150	390475.010	525.306	PEG
OS-642	3033300.190	390490.726	526.707	PEG
OS-643	3033262.180	390489.566	526.232	PEG
OS-644	3033229.370	390633.799	527.071	PEG
OS-645	3033233.770	390620.804	525.775	MARK ON WATERTANK
OS-646	3033178.030	390730.041	523.885	PEG

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**Off Set Points Co-ordinate Data**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
OS-647	3033144.430	390771.793	514.406	PEG
OS-648	3033165.710	390818.537	507.184	PEG
OS-649	3033109.670	391286.555	531.511	PEG
OS-650	3033168.060	391376.789	527.662	PILLAR
OS-651	3033042.650	391331.164	532.649	PEG
OS-652	3032917.790	391417.190	538.683	PEG
OS-653	3032863.950	391397.370	543.638	PEG
OS-654	3032802.180	391393.838	546.755	PEG
OS-655	3032722.790	391374.220	548.253	PEG
OS-656	3032627.250	391401.011	553.966	PEG
OS-657	3032630.680	391687.299	567.256	PEG
OS-658	3032688.280	391745.317	563.627	PEG
OS-659	3032857.280	392031.650	563.829	PEG
OS-660	3032866.250	392089.726	554.966	PEG
OS-661	3032784.520	392151.095	547.464	PEG
OS-662	3032782.100	392113.275	558.400	PEG
OS-663	3032697.630	392187.186	545.960	PEG
OS-664	3032574.220	392256.903	544.366	PEG
OS-665	3032426.370	392369.385	543.778	PEG
OS-666	3032404.530	392430.977	529.886	PEG
OS-667	3032317.240	392527.452	524.858	PEG
OS-668	3032291.650	392588.344	522.115	PEG
OS-669	3032242.540	392692.617	501.934	PEG
OS-670	3032179.920	392769.987	502.678	PEG
OS-671	3032187.910	392936.663	496.630	PILLAR
OS-672	3032150.650	393190.126	501.813	PEG
OS-673	3032096.070	393208.756	503.546	PEG
OS-674	3031932.640	393747.613	487.861	PEG
OS-675	3031810.060	393829.602	487.270	PEG
OS-676	3031639.530	393931.760	483.227	PEG
OS-677	3031497.860	394050.649	511.380	PEG
OS-678	3031416.100	394204.384	520.628	PEG
OS-679	3031409.480	394259.715	523.174	PEG
OS-680	3031367.250	394371.080	535.291	PEG
OS-681	3031366.830	394417.715	535.475	PEG
OS-682	3031223.190	394473.896	551.422	PEG
OS-683	3031168.690	394612.570	488.393	PEG
OS-684	3031122.250	394469.181	561.383	PEG
OS-685	3031089.130	394475.621	565.537	PEG
OS-686	3030989.440	394482.764	576.212	PEG
OS-687	3030954.250	394487.914	580.313	PEG
OS-688	3030905.250	394474.533	583.499	PEG
OS-689	3030883.150	394500.290	588.006	PEG
OS-690	3030810.790	394485.611	592.702	PEG
OS-691	3030669.760	394563.919	607.688	PEG
OS-692	3030629.990	394630.659	604.725	PEG

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**Off Set Points Co-ordinate Data**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
OS-693	3030580.380	394656.758	616.946	PEG
OS-694	3030535.570	394706.400	603.813	PEG
OS-695	3030534.850	394725.016	604.734	PEG
OS-696	3030351.920	394853.088	630.495	PEG
OS-697	3030405.500	394831.131	603.224	PEG
OS-698	3030268.390	395000.599	577.630	PEG
OS-699	3030269.190	395017.364	576.088	PEG
OS-700	3030247.120	395058.352	570.455	PEG
OS-701	3030196.290	395135.349	568.662	PEG
OS-702	3030133.950	395216.054	529.759	PEG
OS-703	3030063.750	395243.763	524.520	PEG
OS-704	3029979.170	395289.780	531.025	PEG
OS-705	3029879.110	395339.788	546.896	PEG
OS-706	3029777.900	395412.882	538.243	PEG
OS-707	3029683.050	395502.163	528.671	PEG
OS-708	3029726.030	395521.738	502.067	PEG
OS-709	3029651.700	395591.342	496.625	PEG
OS-710	3029503.730	395721.155	506.220	PEG
OS-711	3029464.600	395777.607	490.899	PEG
OS-712	3029475.670	395948.096	480.957	PEG
OS-713	3029325.610	396046.187	492.721	STONE
OS-714	3029529.830	396143.158	479.218	PEG
OS-715	3029622.440	396376.934	477.427	PEG
OS-716	3029641.260	396453.340	478.602	STONE
OS-717	3029679.300	396654.834	477.340	PEG
OS-718	3029704.820	396834.881	494.060	PEG
OS-719	3029812.470	396903.782	482.661	PEG
OS-720	3029895.600	397139.814	490.079	PEG
OS-721	3029975.790	397230.385	501.369	PEG
OS-722	3030248.640	397114.525	523.230	PEG
OS-723	3030245.760	397219.864	524.877	PEG
OS-724	3030147.740	397259.813	533.180	PEG
OS-725	3030184.070	397273.973	531.752	PEG
OS-726	3030239.670	397311.902	539.195	PEG
OS-727	3030195.870	397407.671	541.744	PEG
OS-728	3030165.020	397440.771	543.407	PEG
OS-729	3030052.270	397533.458	554.413	PEG
OS-730	3030025.590	397510.180	556.886	PEG
OS-731	3029921.170	397525.013	562.121	PEG
OS-732	3029887.690	397510.110	565.976	PEG
OS-733	3029822.630	397538.830	571.736	PEG
OS-734	3029982.740	397599.696	566.983	PEG
OS-735	3029886.000	397782.487	582.735	PEG
OS-736	3029838.810	397819.592	585.702	PEG
OS-737	3029764.210	397815.132	594.579	PEG
OS-738	3029724.470	397834.925	597.966	PEG

**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**Off Set Points Co-ordinate Data**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
OS-739	3029644.300	397855.321	607.004	PEG
OS-740	3029639.130	397910.400	597.604	PEG
OS-741	3029563.990	397869.017	608.412	PEG
OS-742	3029428.950	397823.230	617.859	PEG
OS-743	3029386.390	397816.493	618.953	PEG
OS-744	3029338.080	397873.785	609.303	PEG
OS-745	3029327.040	397898.450	609.366	PEG
OS-746	3029267.800	398035.093	602.787	PEG
OS-747	3029200.300	398045.983	604.711	PEG
OS-748	3029183.800	398082.270	596.759	PEG
OS-749	3029025.590	398145.115	560.065	PEG
OS-750	3028967.440	398249.592	558.241	PEG
OS-751	3028874.610	398307.430	567.781	PEG
OS-752	3028772.430	398459.452	543.811	PEG
OS-753	3028715.800	398469.648	562.382	PEG
OS-754	3028693.570	398572.719	574.122	PEG
OS-755	3028614.180	398585.803	560.059	PEG
OS-756	3028431.970	398512.224	547.243	PEG
OS-757	3028329.200	398542.552	537.150	PEG
OS-758	3028229.660	398500.648	544.924	PEG
OS-759	3028169.890	398485.404	544.718	PEG
OS-760	3027977.670	398635.814	542.549	PEG
OS-761	3027822.220	398701.731	532.935	PEG
OS-762	3027728.860	398700.329	527.675	PEG
OS-763	3027743.240	398947.577	494.837	PEG
OS-764	3027714.190	398970.249	510.430	PEG
OS-765	3027635.200	398948.024	517.988	PEG
OS-766	3027475.830	398899.579	493.642	PEG
OS-767	3027473.780	398850.755	506.738	PEG
OS-768	3027395.940	398864.579	482.429	PEG
OS-769	3027312.990	398836.637	482.047	PEG
OS-770	3027274.700	398896.786	481.169	STONE
OS-771	3027194.280	398880.559	492.496	PEG
OS-772	3027080.970	398971.174	490.847	PEG
OS-773	3026958.400	399000.853	497.882	PEG
OS-774	3026980.780	398976.091	500.742	PEG
OS-775	3027041.700	398934.313	506.746	PEG
OS-776	3027093.270	398782.609	517.828	PEG
OS-777	3027077.530	398739.687	522.073	PEG
OS-778	3027049.510	398766.786	532.184	PEG
OS-779	3027145.140	398867.666	524.879	PEG
OS-780	3026989.650	398910.381	538.945	PEG
OS-781	3026873.860	399020.034	530.636	PEG
OS-782	3026797.530	399023.420	546.550	PEG
OS-783	3026713.310	399084.956	559.779	PEG
OS-784	3026675.270	399085.743	565.039	PEG



**SINDHULI ROAD PROJECT**  
**SECTION III (Nepalthok -Khurkot)**  
**Off Set Points Co-ordinate Data**

POINT NO.	NORTHING	EASTING	ELEVATION	REMARKS
OS-785	3026628.300	399106.165	557.632	PEG
OS-786	3026597.130	399129.332	554.915	PEG
OS-787	3026623.126	399164.549	516.390	PEG
OS-788	3026527.792	399212.725	526.600	PEG
OS-789	3026453.810	399283.454	528.608	PEG
OS-790	3026368.000	399406.986	504.101	PEG
OS-791	3026325.390	399452.745	500.927	PEG
OS-792	3026188.620	399539.355	487.447	PEG
OS-793	3026219.410	399538.458	480.759	PEG
OS-794	3025607.330	399462.454	484.448	STONE
OS-795	3025574.110	399466.865	480.035	STONE
OS-796	3025477.960	399436.754	474.327	STONE
OS-797	3025426.460	399411.371	470.456	PEG
OS-798	3025277.170	399394.331	462.739	PEG
OS-799	3025277.760	399375.895	477.213	PEG
OS-800	3025224.540	399381.573	466.653	PEG
OS-801	3025212.230	399374.413	468.278	PEG
OS-802	3025181.900	399370.052	466.039	PEG
OS-803	3024981.000	399350.342	464.336	PEG
OS-804	3024921.980	399324.432	482.563	PEG
OS-805	3024814.060	399386.081	465.427	PEG
OS-806	3024667.250	399473.334	469.183	PEG
OS-807	3024628.090	399596.418	469.128	PEG
OS-808	3024583.920	399665.637	480.926	PEG
OS-809	3024563.300	399731.540	471.890	PEG
OS-810	3024565.700	399803.821	465.337	PEG
OS-811	3024529.130	399922.347	485.797	PEG
OS-812	3024544.400	399949.078	472.312	PEG
OS-813	3024596.970	400173.810	460.676	PEG

Annex – 4  
**Co-ordinates of the Proposed Centre Line**

**Sindhuli Road Section III  
Center Line Co-ordinates Data**

Ch	Co-ordinates		Remarks
	Easting	Northing	
0+000	400315.203	3024533.729	
0+100	400218.122	3024550.302	
0+200	400127.063	3024568.149	
0+300	400028.816	3024564.079	
0+400	399935.279	3024577.308	
0+500	399844.917	3024565.157	
0+600	399744.989	3024568.417	
0+700	399655.664	3024610.498	
0+800	399563.658	3024647.841	
0+900	399467.507	3024675.319	
1+000	399411.170	3024749.423	
1+100	399364.772	3024837.752	
1+200	399347.532	3024935.760	
1+300	399328.385	3025033.737	
1+400	399355.362	3025129.258	
1+500	399376.288	3025227.029	
1+600	399395.268	3025325.175	
1+700	399403.889	3025424.220	
1+800	399452.040	3025511.784	
1+900	399471.049	3025607.853	
2+000	399483.952	3025705.997	
2+100	399501.069	3025804.367	
2+200	399523.582	3025901.700	
2+300	399549.270	3025998.344	
2+400	399565.193	3026096.391	
2+500	399547.035	3026194.706	
2+600	399501.073	3026279.263	
2+700	399429.081	3026348.661	
2+800	399357.307	3026416.412	
2+900	399276.002	3026469.399	
3+000	399198.200	3026522.999	
3+100	399155.916	3026600.315	
3+200	399108.677	3026687.527	
3+300	399051.072	3026757.199	
3+400	398996.743	3026836.865	
3+500	398948.718	3026923.947	
3+600	398893.448	3027005.387	
3+700	398880.390	3027100.174	
3+800	398799.980	3027065.105	
3+900	398740.277	3027045.430	
4+000	398815.085	3027108.712	
4+100	398888.580	3027150.665	
4+200	398937.868	3027065.065	

**Sindhuli Road Section III  
 Center Line Co-ordinates Data**

Ch	Co-ordinates		Remarks
	Easting	Northing	
4+300	398992.495	3026982.263	
4+400	399031.795	3027003.555	
4+500	398974.059	3027078.730	
4+600	398940.972	3027172.868	
4+700	398882.350	3027248.095	
4+800	398860.549	3027345.690	
4+900	398886.909	3027431.194	
5+000	398943.821	3027510.917	
5+100	398989.880	3027598.441	
5+200	399015.326	3027683.772	
5+300	398939.074	3027728.668	
5+400	398864.021	3027678.418	
5+500	398778.249	3027665.957	
5+600	398678.997	3027672.104	
5+700	398682.129	3027757.146	
5+800	398682.804	3027848.896	
5+900	398645.630	3027941.590	
6+000	398581.094	3028017.761	
6+100	398520.353	3028096.709	
6+200	398482.947	3028188.230	
6+300	398535.833	3028270.453	
6+400	398517.097	3028366.107	
6+500	398521.340	3028465.821	
6+600	398573.499	3028549.700	
6+700	398598.210	3028646.457	
6+800	398561.643	3028719.793	
6+900	398466.804	3028740.835	
7+000	398396.254	3028811.706	
7+100	398316.927	3028871.207	
7+200	398253.780	3028943.016	
7+300	398166.446	3028981.611	
7+400	398078.524	3029020.052	
7+500	398058.976	3029112.635	
7+600	398041.621	3029193.786	
7+700	398006.336	3029278.602	
7+800	397923.570	3029323.619	
7+900	397878.120	3029387.270	
8+000	397831.049	3029471.084	
8+100	397860.991	3029562.630	
8+200	397882.603	3029656.501	
8+300	397846.562	3029749.779	
8+400	397805.665	3029840.907	
8+500	397752.546	3029925.621	

**Sindhuli Road Section III  
Center Line Co-ordinates Data**

Ch	Co-ordinates		Remarks
	Easting	Northing	
8+600	397676.893	3029979.693	
8+700	397582.243	3029956.654	
8+800	397572.499	3029860.847	
8+900	397516.090	3029900.686	
9+000	397520.334	3030000.595	
9+100	397487.054	3030088.944	
9+200	397416.778	3030160.086	
9+300	397346.502	3030231.229	
9+400	397284.643	3030197.091	
9+500	397219.860	3030197.434	
9+600	397156.630	3030267.844	
9+700	397071.191	3030224.502	
9+800	397007.114	3030151.920	
9+900	397072.603	3030079.574	
10+000	397121.618	3030000.869	
10+100	397210.315	3029960.983	
10+200	397178.687	3029875.312	
10+300	397106.475	3029807.108	
10+400	397008.000	3029791.357	
10+500	396909.252	3029776.551	
10+600	396825.119	3029724.372	
10+700	396727.870	3029714.671	
10+800	396645.482	3029657.996	
10+900	396553.678	3029626.621	
11+000	396454.580	3029639.200	
11+100	396358.608	3029618.672	
11+200	396272.196	3029568.343	
11+300	396183.764	3029521.741	
11+400	396091.135	3029484.170	
11+500	395995.316	3029455.657	
11+600	395897.212	3029438.129	
11+700	395799.076	3029454.358	
11+800	395712.805	3029503.871	
11+900	395638.531	3029570.826	
12+000	395544.928	3029598.704	
12+100	395509.312	3029679.970	
12+200	395463.077	3029733.104	
12+300	395388.721	3029773.695	
12+400	395335.406	3029831.754	
12+500	395298.632	3029921.947	
12+600	395245.666	3030006.762	
12+700	395190.665	3030071.394	
12+800	395157.820	3030162.534	

**Sindhuli Road Section III  
Center Line Co-ordinates Data**

Ch	Co-ordinates		Remarks
	Easting	Northing	
12+900	395085.986	3030230.491	
13+000	394994.233	3030265.535	
13+100	394906.607	3030244.560	
13+200	394930.645	3030336.048	
13+300	394869.300	3030362.028	
13+400	394806.381	3030438.918	
13+500	394751.592	3030521.958	
13+600	394661.391	3030513.789	
13+700	394660.098	3030599.078	
13+800	394588.499	3030664.161	
13+900	394524.718	3030741.024	
14+000	394495.837	3030835.774	
14+100	394489.179	3030927.767	
14+200	394491.753	3031027.720	
14+300	394474.973	3031125.702	
14+400	394472.483	3031223.957	
14+500	394443.630	3031319.117	
14+600	394359.003	3031366.146	
14+700	394261.237	3031387.163	
14+800	394166.735	3031417.705	
14+900	394078.957	3031465.229	
15+000	393995.557	3031519.793	
15+100	393917.614	3031582.248	
15+200	393869.676	3031669.278	
15+300	393835.725	3031762.152	
15+400	393808.711	3031855.928	
15+500	393749.879	3031936.731	
15+600	393666.472	3031990.699	
15+700	393576.433	3032033.548	
15+800	393481.909	3032005.759	
15+900	393387.696	3031979.387	
16+000	393302.117	3032031.306	
16+100	393224.399	3032092.776	
16+200	393156.880	3032166.321	
16+300	393059.931	3032177.680	
16+400	392960.125	3032171.467	
16+500	392860.318	3032165.253	
16+600	392762.370	3032176.582	
16+700	392686.515	3032240.815	
16+800	392606.542	3032297.787	
16+900	392508.511	3032317.438	
17+000	392441.386	3032388.052	
17+100	392368.086	3032455.510	

**Sindhuli Road Section III  
Center Line Co-ordinates Data**

Ch	Co-ordinates		Remarks
	Easting	Northing	
17+200	392290.152	3032518.169	
17+300	392247.630	3032606.588	
17+400	392192.300	3032689.175	
17+500	392136.006	3032771.493	
17+600	392090.733	3032860.556	
17+700	392013.443	3032871.441	
17+800	391937.784	3032808.064	
17+900	391846.866	3032766.425	
18+000	391774.581	3032705.727	
18+100	391755.340	3032606.540	
18+200	391666.031	3032571.511	
18+300	391567.069	3032557.144	
18+400	391468.395	3032552.308	
18+500	391406.955	3032628.389	
18+600	391385.842	3032723.481	
18+700	391403.771	3032821.861	
18+800	391421.699	3032920.241	
18+900	391390.786	3033008.893	
19+000	391311.959	3033069.904	
19+100	391299.265	3033154.737	
19+200	391382.020	3033193.588	
19+300	391325.521	3033265.167	
19+400	391230.284	3033294.902	
19+500	391131.070	3033285.543	
19+600	391032.211	3033270.481	
19+700	390938.616	3033240.486	
19+800	390861.731	3033176.544	
19+900	390784.821	3033112.631	
20+000	390741.785	3033174.098	
20+100	390655.737	3033220.631	
20+200	390568.881	3033262.300	
20+300	390494.757	3033290.288	
20+400	390462.975	3033375.761	
20+500	390382.678	3033435.362	
20+600	390293.433	3033479.241	
20+700	390198.710	3033511.298	
20+800	390103.987	3033543.354	
20+900	390008.806	3033573.883	
21+000	389909.446	3033579.508	
21+100	389813.678	3033552.306	
21+200	389732.100	3033495.273	
21+300	389664.306	3033421.770	
21+400	389588.209	3033359.522	

**Sindhuli Road Section III  
 Center Line Co-ordinates Data**

Ch	Co-ordinates		Remarks
	Easting	Northing	
21+500	389488.768	3033349.682	
21+600	389389.125	3033341.239	
21+700	389295.944	3033358.205	
21+800	389217.948	3033335.607	
21+900	389156.816	3033256.469	
22+000	389074.446	3033209.591	
22+100	388975.282	3033218.673	
22+200	388876.166	3033228.587	
22+300	388779.231	3033253.137	
22+400	388683.280	3033281.059	
22+500	388593.249	3033323.956	
22+600	388513.448	3033383.953	
22+700	388461.538	3033468.764	
22+800	388401.559	3033548.727	
22+900	388350.205	3033634.423	
23+000	388306.318	3033723.919	
23+100	388292.096	3033822.715	
23+200	388240.912	3033898.433	
23+300	388144.182	3033916.916	
23+400	388047.307	3033934.366	
23+500	387957.727	3033978.560	
23+600	387860.300	3033968.873	
23+700	387764.202	3033966.644	
23+800	387677.105	3034012.868	
23+900	387609.945	3034086.959	
24+000	387534.837	3034152.836	
24+100	387481.283	3034231.080	
24+200	387469.852	3034329.923	
24+300	387392.184	3034391.192	
24+400	387308.940	3034446.604	
24+500	387214.872	3034473.918	
24+600	387118.137	3034449.224	
24+700	387074.880	3034380.045	
24+800	386981.642	3034372.021	
24+900	386889.723	3034332.882	
25+000	386792.336	3034310.832	
25+100	386692.542	3034307.439	
25+200	386593.883	3034322.823	
25+300	386499.860	3034356.440	
25+400	386413.811	3034407.095	
25+500	386338.790	3034472.990	
25+600	386272.451	3034547.806	
25+700	386206.756	3034623.200	



**Sindhuli Road Section III  
 Center Line Co-ordinates Data**

Ch	Co-ordinates		Remarks
	Easting	Northing	
25+800	386146.479	3034702.720	
25+900	386104.497	3034793.427	
26+000	386057.526	3034881.123	
26+100	385973.199	3034932.503	
26+200	385879.564	3034967.611	
26+300	385800.871	3035027.343	
26+400	385716.671	3035078.559	
26+500	385617.707	3035092.710	
26+600	385519.570	3035111.826	
26+700	385420.796	3035126.929	
26+800	385321.454	3035138.383	
26+900	385222.112	3035149.837	
27+000	385126.694	3035176.274	
27+100	385036.650	3035219.773	
27+200	384949.475	3035268.639	
27+300	384868.744	3035327.303	
27+400	384802.472	3035402.113	
27+500	384731.478	3035471.597	
27+600	384655.320	3035534.917	
27+700	384604.661	3035620.571	
27+800	384550.324	3035700.559	
27+900	384532.888	3035798.992	
28+000	384470.214	3035865.654	
28+100	384443.259	3035941.750	
28+200	384497.129	3036014.933	
28+300	384481.429	3036102.080	
28+400	384388.235	3036100.626	
28+500	384355.378	3036112.238	
28+600	384279.155	3036157.091	
28+700	384271.775	3036216.757	
28+800	384336.661	3036289.710	
28+900	384360.752	3036385.444	
29+000	384284.231	3036445.576	
29+100	384210.741	3036383.292	
29+200	384225.115	3036454.393	
29+300	384220.625	3036540.446	
29+400	384168.396	3036625.268	
29+500	384136.630	3036720.069	
29+600	384105.688	3036815.161	
29+700	384048.907	3036896.098	
29+800	383968.188	3036948.293	
29+900	383901.700	3036881.586	
30+000	383820.555	3036839.737	

**Sindhuli Road Section III  
Center Line Co-ordinates Data**

Ch	Co-ordinates		Remarks
	Easting	Northing	
30+100	383722.466	3036826.072	
30+200	383630.610	3036786.545	
30+300	383538.772	3036746.973	
30+400	383445.843	3036710.313	
30+500	383346.766	3036700.755	
30+600	383247.918	3036715.685	
30+700	383148.456	3036715.759	
30+800	383049.081	3036706.009	
30+900	382954.189	3036734.662	
31+000	382864.569	3036779.026	
31+023.64	382843.413	3036789.524	

**Description Cards of the Survey Monuments (Separate Volume)**