1.0 INTRODUCTION

1.1 General

The state of Jharkhand almost comprises hilly terrain mostly of Chhotanagpur plateau and 30% of total area (79,714 sq km) is covered with forest. The normal annual rainfall is 1400 mm. These geographical factors provide a number of Small Hydro Power (SHP) potential sites at waterfalls and rapids in the streams and rivers of Jharkhand.

About 80% of villages in the Jharkhand are yet to see electrical power. It is prudential to harness the SHP potential sites for the electrification of its nearby villages.

In view of above, Jharkhand Renewable Energy Development Agency (JREDA) has entrusted MECON LIMITED for preparation of Preliminary Feasibility Report (PFR) for development of Small Hydro Power (SHP) at 22 sites in Jharkhand.

Senha SHP site is one of 22 SHP sites, located in the West-central part of Jharkhand. It is situated in the Block Senha of District Lohardaga. The Senha SHP is proposed to utilize the flow of South Koel river near village Parsatoli.

1.2 Benefits of Small Hydro Power

Harnessed energy has become a symbol of growth and instrument for development. Electric power particularly the small hydro power is a renewable, economically attractive, environment friendly, non-polluting and environmentally benign source of energy. Moreover, the Small Hydro Power is submergence free and has short gestation period. These benefits of SHP have now been sufficiently recognised. The need of the project comes from the benefits of SHP and utilization of resources.

1.3 Aim of report

Development of small hydro projects requires many stages of technical and financial study to determine if a site is technically and economically feasible. The viability of project is very site specific.

PFR is the first stage of work based on which Detailed Survey and Investigation (DSI) is recommended.

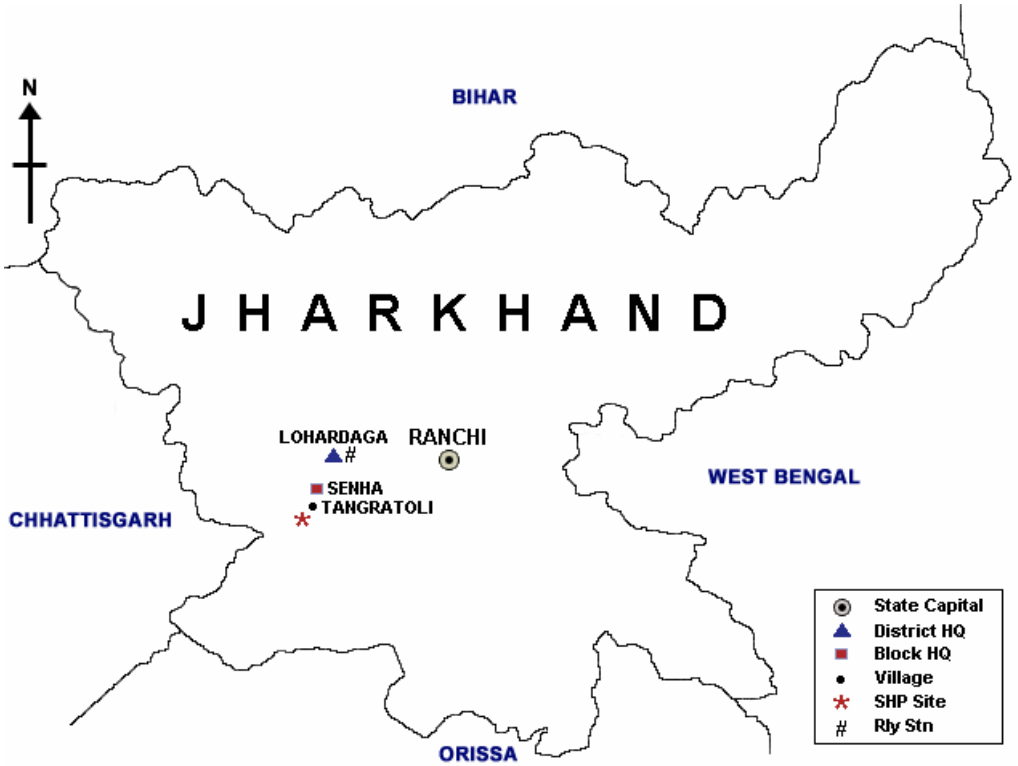
The aim of the report is to examine the adequacy for proceeding to the next stage of work; Detailed Survey & Investigation.

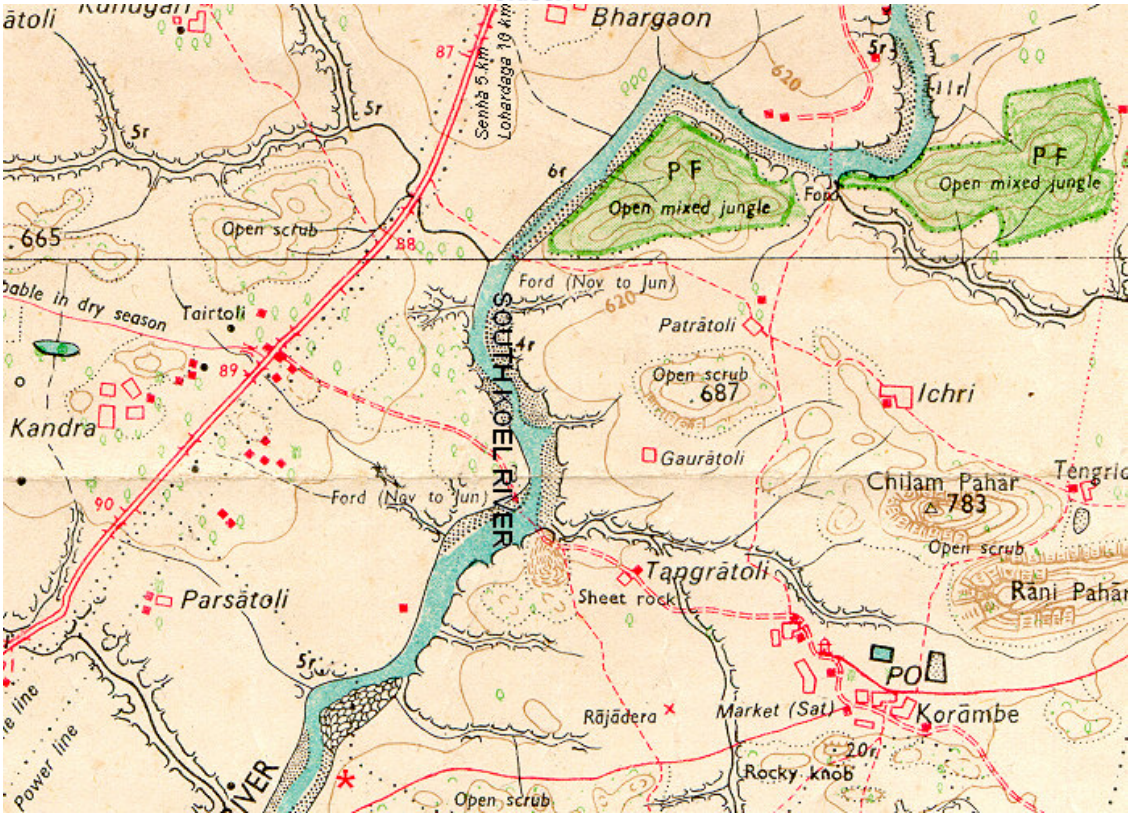
1.4 Scope of report

PFR covers the following activities.

a) Topo sheet study for tentative planning of general layout of project, delineation of drainage area, and for obtaining idea on the access to site.
b) Site visit for identification of location of the site, preliminary layout of SHP, preliminary assessment of head, duration of water availability in the stream, and electrification status of nearby villages.
c) To examine the adequacy for proceeding to the next stage of development.

2.0 INDEX MAP


N
BIHAR
J H A R K H A N D
LOHARDAGA
RANCHI
SENHA
TANGRATOLI
CHHATTISGARH
WEST BENGAL
ORISSA
State Capital
District HQ
Block HQ
Village
SHP Site
Rly Stn


Bhargaon
Senha 5 km
Lohardaga 19 km
Open mixed jungle
Open scrub
Ford (Nov to Jun)
Tairtoli
Patrātoli
Ichri
Kandra
Gaurātoli
Chilam Pahar
783
Tangrātoli
Sheet rock
Parsātoli
Rāni Pahar
PO
Korāmbe
Rājādera
Market (Sat)
Rocky knob
SOUTH KOEL RIVER
Power line
665
687

3.0 GENERAL INFORMATION

3.1 Location of site

The location of the site is shown in the Index Map. The details of location are as follows.

a) Village: Tangratoli

b) Block: Senha

c) District: Lohardaga

d) State: Jharkhand

e) Topo sheet No.: 73 A/11

f) Latitude: 23°38'29" N

g) Longitude: 84°19'34" E

3.2 Access to site

The access to Senha SHP site is as follows.

	Route		Direction of Destination from Origin	Type of approach	Distance (approx)
	Origin	**Destination**			
Road	Ranchi (State Capital)	Lohardaga (District HQ)	West	National Highway	75 km
Rail	Ranchi	Lohardaga	West	SER Purulia Ranchi Branch (Narrow gauge) Broad gauge under construction	70 km
Common	Lohardaga	Senha (Block HQ)	South	National Highway	5 km
	Senha	Kandra (village)	South	National Highway	8 km
	Kandra	**Senha SHP site**	East	Kuchha road	1 km

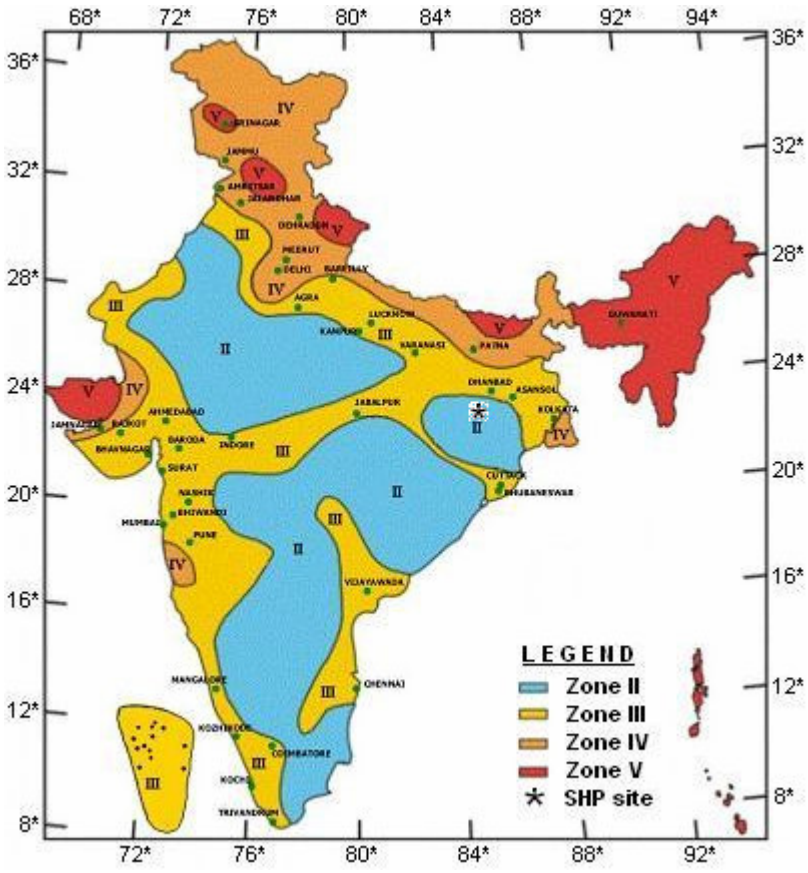
The nearest airport is at Ranchi.

3.3 Electrification status of nearby villages

The villages in vicinity of the SHP site, presently, do not have access to electrical power.

3.4 Geology & Seismicity

The site is located in Chotanagpur plateau, which is composed mainly of Archaic Gneiss and Granite rocks. The rocks are very old, hard and stable. Jharkhand has no moderate to large earthquakes in recent past, only small tremors have occurred in the region. According to the seismic hazard map of India updated by the Bureau of Indian Standards (BIS) in 2000, all of the southern districts of Jharkhand lie in Zone II.



4.0 HYDROLOGY

4.1 River / Stream

The Senha SHP will utilize the water from South Koel river near village Tangratoli.

a) Stream / river: South Koel river

b) Source: Rain fed

c) Catchment area: 1250 sq km (approx)

d) River basin: South Koel

4.2 Rainfall

The monthly rainfall (mm) of Senha is given in the table below.

Monthly Rainfall (mm) of Senha

Month	2000	2001	2002	2003
January	24.0	23.9	12.6	12.3
February	0.0	0.0	25.6	32.5
March	1.2	15.2	21.0	32.5
April	45.8	0.0	16.6	10.3
May	78.5	0.0	46.0	480.0
June	37.0	249.2	301.0	306.2
July	392.3	296.0	346.1	333.2
August	190.6	500.0	326.0	128.1
September	0.0	269.1	218.0	394.1
October	0.0	0.0	109.2	90.2
November	0.0	0.0	11.2	0.0
December	0.0	0.0	12.0	0.0
Total	**769.4**	**1353.4**	**144.5**	**1819.4**

4.3 Flow

The Senha SHP site was visited during the 3rd week of October 2004, and the flow of South Koel river near village Tangratoli was measured as 19.025 m^3/s. As understood from local people and seen from the rainfall data, the river is perennial, though there is lean flow only during summer season.

The flow data of South Koel river near village Tangratoli are not available. However, the following two bases are available to estimate the flow-duration.

a) Mean flow with catchment area of some streams in the South Koel river basin
b) Model of flow-duration, based on data of 22 streams scattered over Chhotanagpur plateau area in Jharkhand

The flow-duration of South Koel river near village Tangratoli has been estimated on above two bases and shown in the table below.

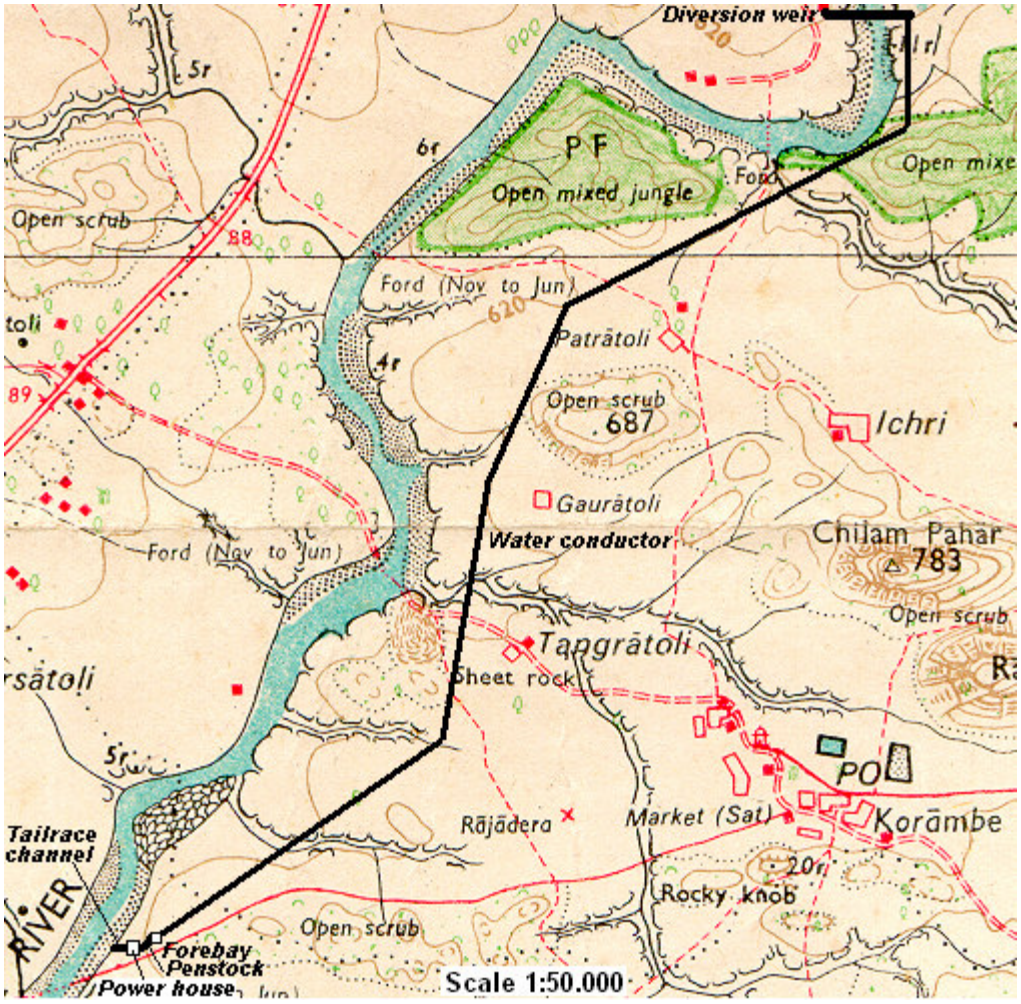
Flow-duration of South Koel river near village Tangratoli

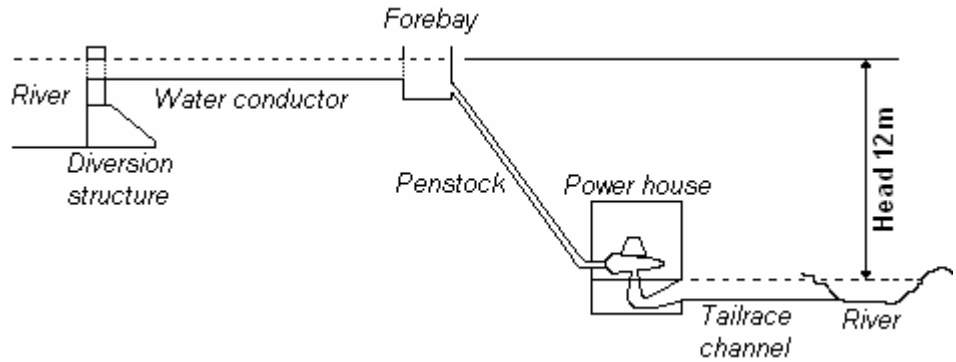
Exceedence Time (%)	Flow (m^3/s)
25	31.156
50	11.454
60	8.340
75	5.180
80	4.356
90	2.852

It has found that the flow measured (19.025 m^3/s) lies between the flow of exceedence times 25% and 50%, which indicates the correctness of flow-duration.

5.0 PRELIMINARY LAYOUT

The preliminary layout is outlined below in the relevant portion of the Toposheet. During the site visit the head was measured as 12 m and is indicated in the schematic sketch.





Schematic sketch

6.0 POWER POTENTIAL

6.1 Power

The flow for different exceedence times is given in column (2) of the table below. The net head is worked out as 11.4m, assuming the head loss of 5%, and is shown in column (3). Assuming the overall plant efficiency of 85%, the power potential is worked out and shown in column (4) of the following table.

(1)	(2)	(3)	(4)
% Exceedence Time	Flow (cumec)	Net Head (m)	Power Potential (kW)
25	31.156	11.4	2962
50	11.454	11.4	1089
60	8.340	11.4	793
75	5.180	11.4	492
80	4.356	11.4	414
90	2.852	11.4	271

6.2 Conclusion

The SHP site preliminary seems to have a very good power potential. The SHP can meet the electrical power requirement of nearby village and strengthen the local grid to an extent as well.

For firming up the potential, layout, etc., Detailed Survey and Investigation (DSI) of the site is recommended.