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.

Mahuadanr SHP site is one of 22 SHP sites, located in the western part of Jharkhand. It is situated in the Block Mahuadanr of District Latehar. The Mahuadanr SHP is proposed to utilize the flow of Burha Nadi on the upstream of Burhaghagh (Lodh) waterfall.

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.

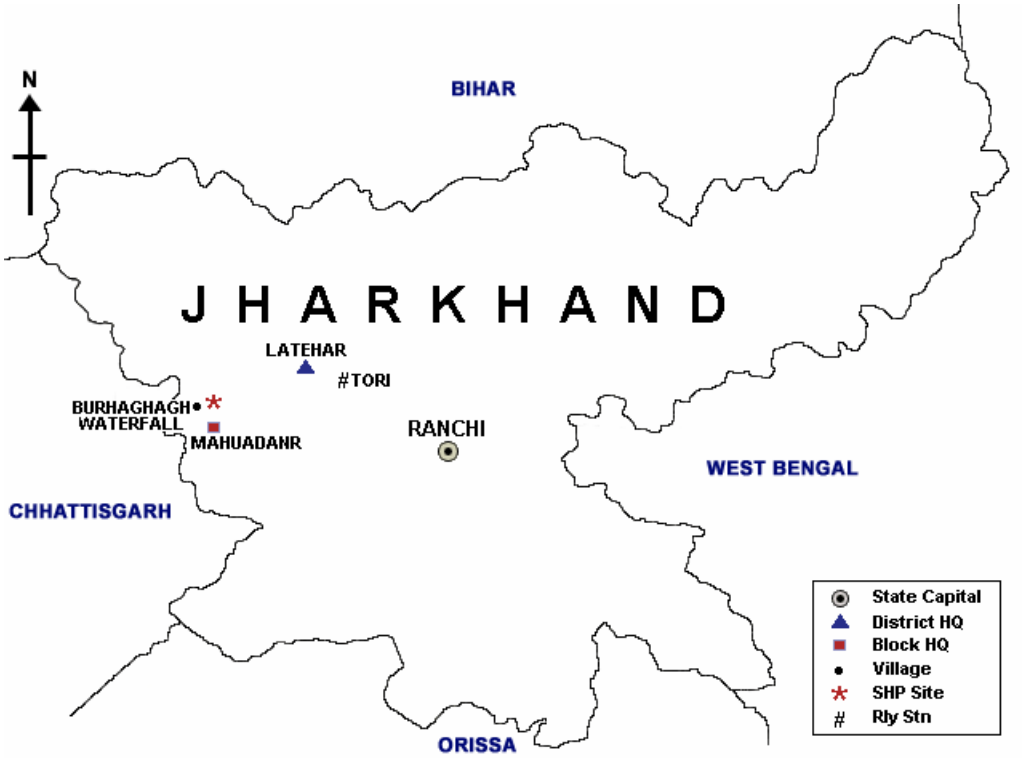
The aim of the report is to examine the adequacy for proceeding to the next stage of work; Detailed Survey & Investigation.

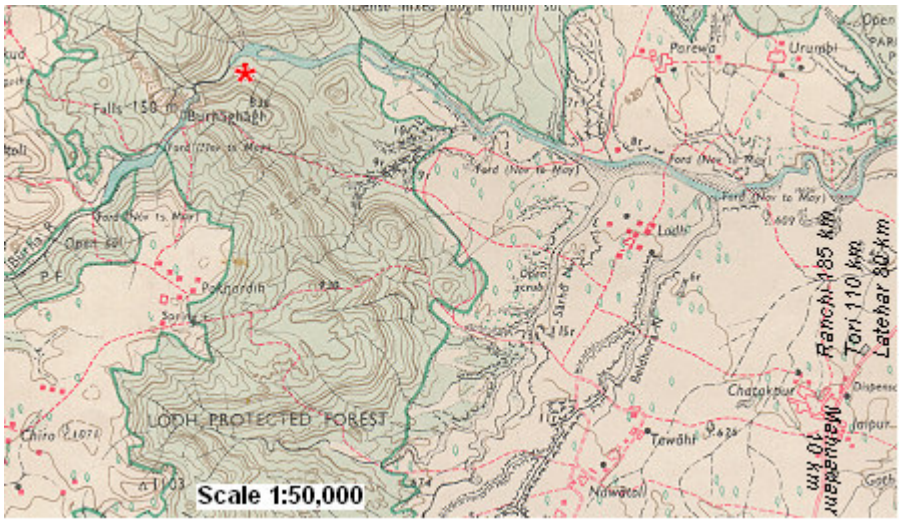
1.4 Scope of report

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
LATEHAR
#TORI
BURHAGHAGH WATERFALL
MAHUADANR
RANCHI
WEST BENGAL
CHHATTISGARH
ORISSA
State Capital
District HQ
Block HQ
Village
SHP Site
Rly Stn


Falls 150 ft
Burhaghagh
Porewa
Urumbi
Lodhi
Pakhardih
LODH PROTECTED FOREST
Tewahi
Chatakpur
Jaipur
Ranchi 185 km
Tori 110 km
Latehar 80 km
Mahuadanr 10 km
Scale 1:50,000

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: Lodh

b) Block: Mahuadanr

c) District: Latehar

d) State: Jharkhand

e) Topo sheet No.: 73 A/3

f) Latitude: 23°28'54" N

g) Longitude: 84°01'36" E

3.2 Access to site

The access to Mahuadanr SHP site from village Chatakpur is highlighted in the Index Map. The access to Chatakpur from The State capital, District HQ, Block HQ and the nearest Railway Station are as follows.

Place		Type of approach	Distance (approx)
Origin	Destination		
Ranchi (State Capital)	Tori (Nearest Rly Stn)	National Highway (NH 75)	75 km
Tori / Chandwa	Latehar (District HQ)	National Highway (NH 75)	30 km
Latehar	Chatakpur (Village)	State Highway	80 km
Mahuadanr (Block HQ)	Chatakpur	State Highway	10 km

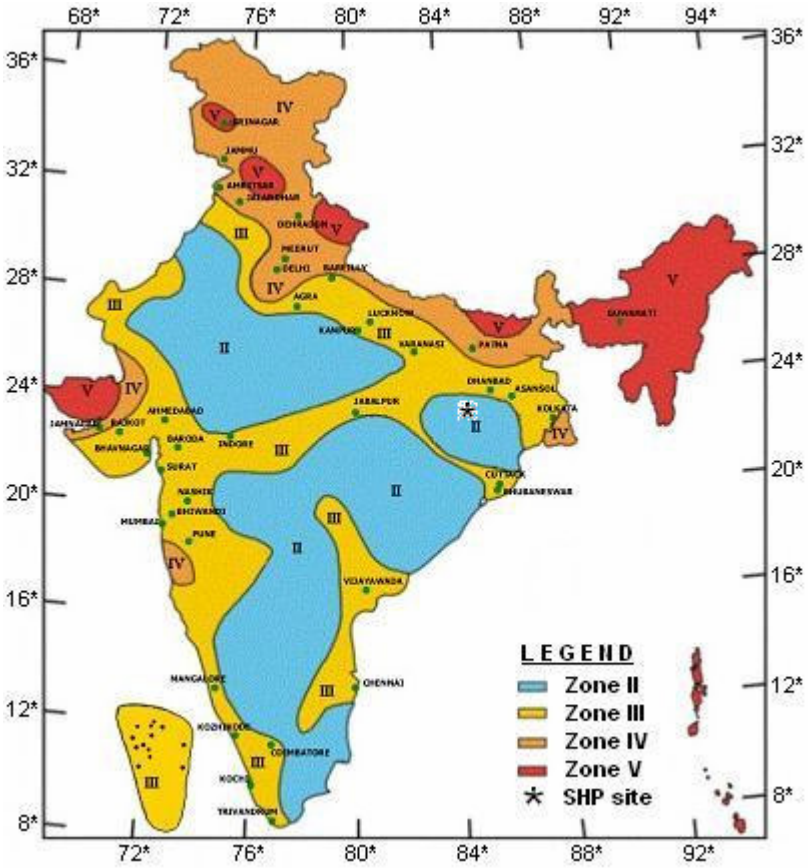
Tori Rly Stn is in Barun Daltongunj Branch of Eastern Railway. The nearest airport is at Ranchi.

3.3 Electrification status of nearby villages

There are about 20 villages having about 600 houses nearby the SHP site, which 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 Mahuadanr SHP will utilize the water from Burha Nadi on the upstream of Burhaghagh (Lodh) waterfall.

a) Stream / river: Burha Nadi

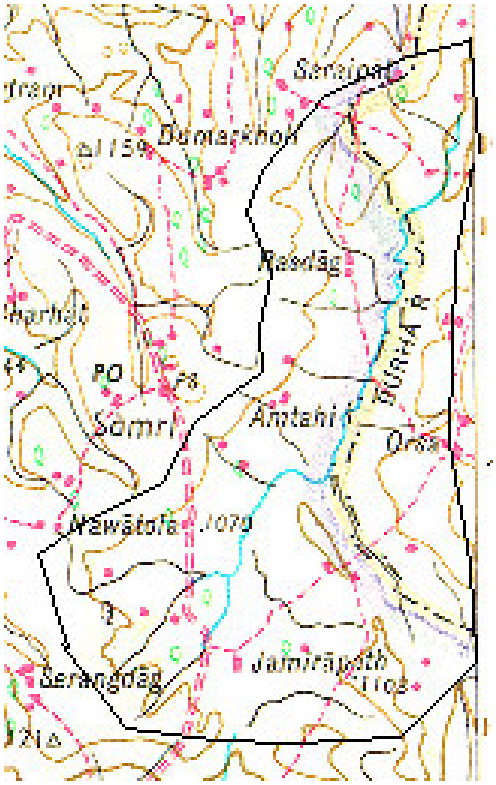
b) Source: Rain fed

c) Catchment area: 90 sq km (approx)

d) River basin: North Koel river

4.2 Catchment area

The catchment area is delineated on the topo sheet as shown below.



4.3 Rainfall

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

Monthly Rainfall (mm) of Mahuadanr

Month	2000	2001	2002	2003
January	11	0	14	0
February	28	0	22	0
March	9	2	4	0
April	2	6	5	0
May	0	3	0	0
June	151	242	344	109
July	368	162	474	270
August	156	209	309	339
September	157	364	196	379
October	33	47	97	38
November	35	55	67	84
December	21	7	5	26
Total	**972**	**1096**	**1536**	**1245**

4.4 Flow

The Mahuadanr SHP site was visited during the 4th week of November 2004, and the flow of Basa Nadi near village Basatoli was measured as 0.396 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 Burha Nadi on the upstream of Burhaghagh fall are not available. However, the following two bases are available to estimate the flow-duration.

a) Mean flow with catchment area of 22 streams scattered over Chhotanagpur plateau area in Jharkhand.
b) Model of flow-duration, based on data of 22 streams scattered over Chhotanagpur plateau area in Jharkhand.

The flow-duration of Burha Nadi on the upstream of Burhaghagh fall has been estimated on above two bases and shown in the table below.

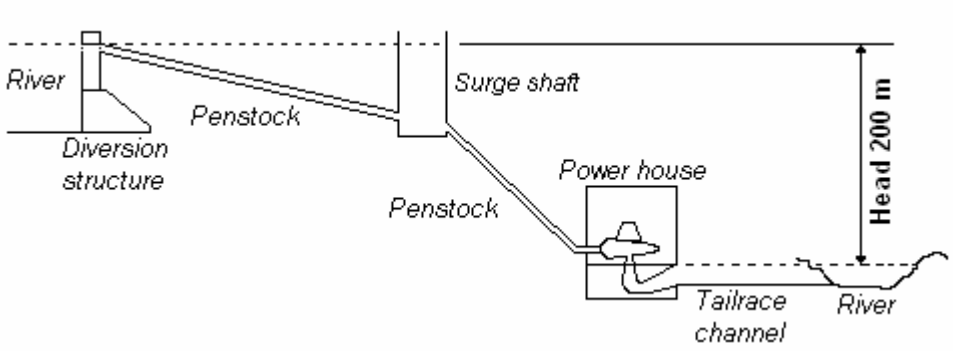
Flow-duration of Burha Nadi on U/s of Burhaghagh waterfall

Exceedence Time (%)	Flow (m^3/s)
25	1.110
50	0.408
60	0.297
75	0.185
80	0.155
90	0.102

It has found that the flow measured (0.396 m^3/s) is close to the flow of exceedence time 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 200m 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 190m, 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	1.110	190	1759
50	0.408	190	647
60	0.297	190	471
75	0.185	190	292
80	0.155	190	246
90	0.102	190	161

6.2 Conclusion

The SHP site preliminarily seems to have good potential. Seeing the nature of rainfall and availability of water in the river almost through out the year, with a little storage the power potential can be further increased. Also exact availability of water for power generation over different periods of a year will be measured during Detailed Survey and Investigation (DSI).

However, most of the project area will fall inside the Lodh Protected Forest. Hence, it will require clearance from the concerned forest authority.

Therefore, it is recommended to carry out the next stage of development of The SHP, namely; Detailed Survey and Investigation (DSI).