# 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 rapids and waterfalls 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.

Basiya SHP site is one of 22 SHP sites, located in the south-western part of Jharkhand. It is situated in the Block Basiya of District Gumla. The Basiya SHP is proposed to utilize the rapid in Koel river.

## 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.

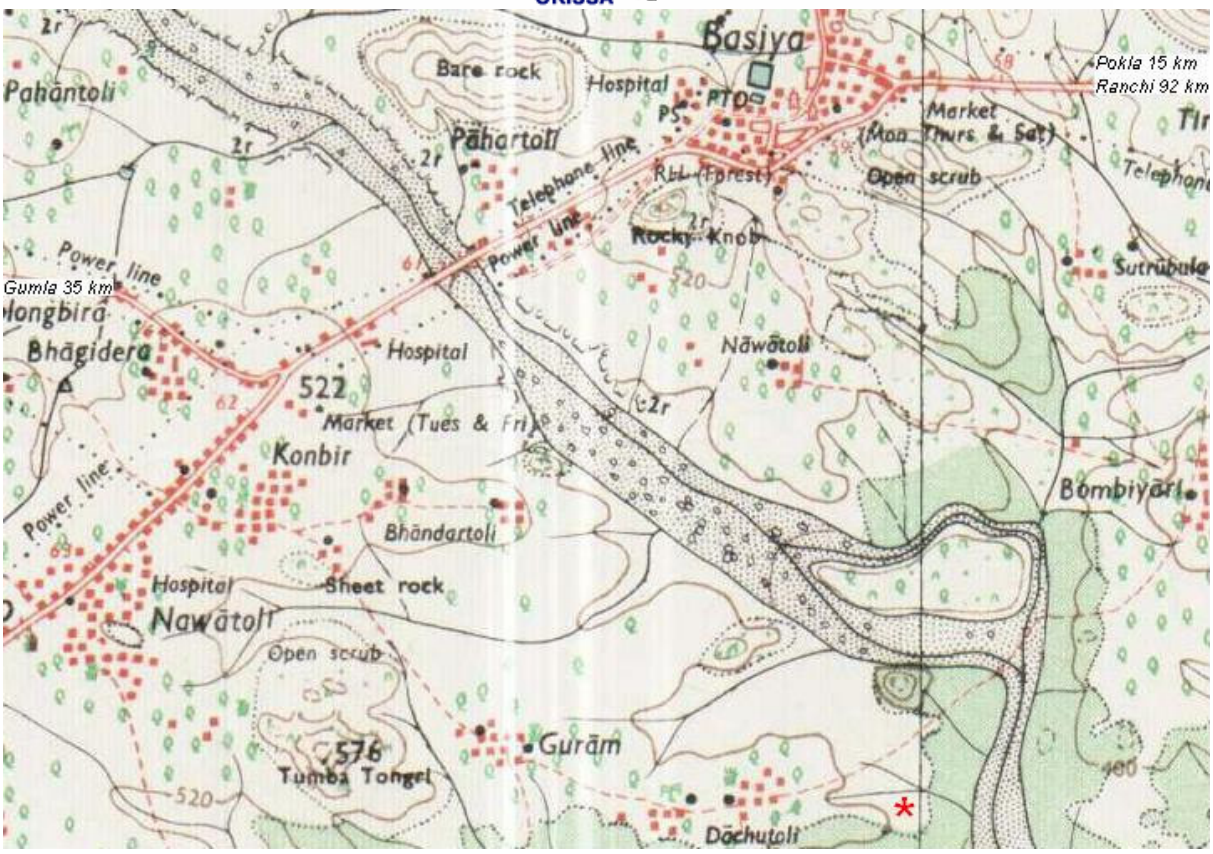
### 1.4 Scope of report

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, electrification status of nearby villages and power evacuation facilities.
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
RANCHI
WEST BENGAL
GUMLA
CHHATTISGARH
BASIYA
#POKLA
DOCHUTOLI
ORISSA
State Capital
District HQ
Block HQ
Village
SHP Site
Rly Stn


Basiya
Pahantoli
Bare rock
Hospital
PTO
Pahartoli
Telephone line
Power line
Rocky Knob
Open scrub
Market (Mon Thurs & Sat)
Pokla 15 km
Ranchi 92 km
Gumla 35 km
Bhagidera
Hospital
522
Market (Tues & Fri)
Konbir
Nawatoli
Bhandartoli
Hospital
Sheet rock
Nawatoli
Open scrub
576
Tumba Tongri
Gurām
Dochutoli
Bombiyari

# 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 (at power house): Dochutoli
b) Block: Basiya
c) District: Gumla
d) State: Jharkhand
e) Topo sheet No.: 73 B/13
f) Latitude: 22°15' N
g) Longitude: 85°10' E

## 3.2 Access to site

The access to Torpa SHP site from Ranchi is as follows.

| Approach | | Type of road | Distance (approx) |
|---|---|---|---|
| Ranchi | Khunti | State Highway | 35 km |
| Khunti | Basiya | State Highway | 59 km |
| Basiya | Bridge over Koel river | State Highway | 2 km |
| Bridge over Koel river | Dochutoli | Kuchha road & Footpath | 4 km |

The nearest railway station is at Pokla, which is about 16 km (with about 6 km of Jeepable kutcha road) away from Basiya town. However, the approach to the project site is convenient by road from Ranchi Railway Station, which is about 94 km from the project site. The nearest airport is also at Ranchi.

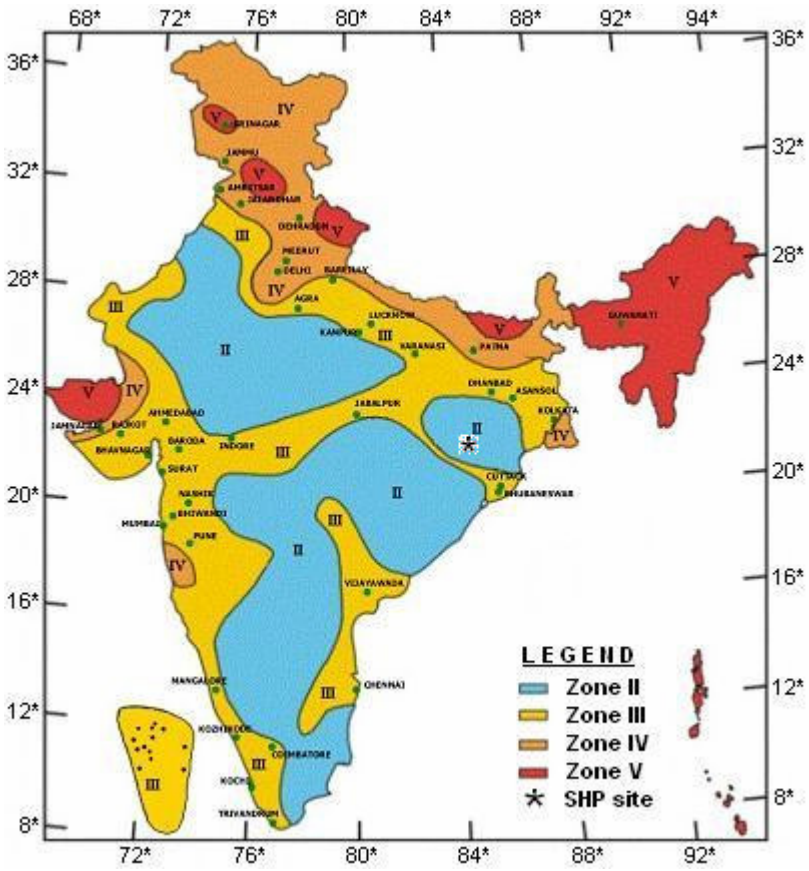
## 3.3 Nearby villages

There are 30 villages in vicinity of the site, having a total about 1500 houses. All these villages are within a radius of 5 km from the power house. Presently these villages do not have access to

electrical power. The nearest grid is at Kamadara, which is about 13 km away from the project site.

### 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 Stream / river

The Basiya SHP will utilize the water from Koel river near Bridge over Koel river at Basiya.

a) Stream / river: Koel Nadi

b) Source: Rain fed

c) Catchment area: 2300 sq km (approx)

d) River basin: South Koel

## 4.2 Flow

The daily flow data (Source: NHPC) of Koel river at a bridge (about 2 km from Basiya town on the road to Kolebira) is available. The average monthly flow ($m^3/s$) has worked out from the daily flow data and is given in the table below.

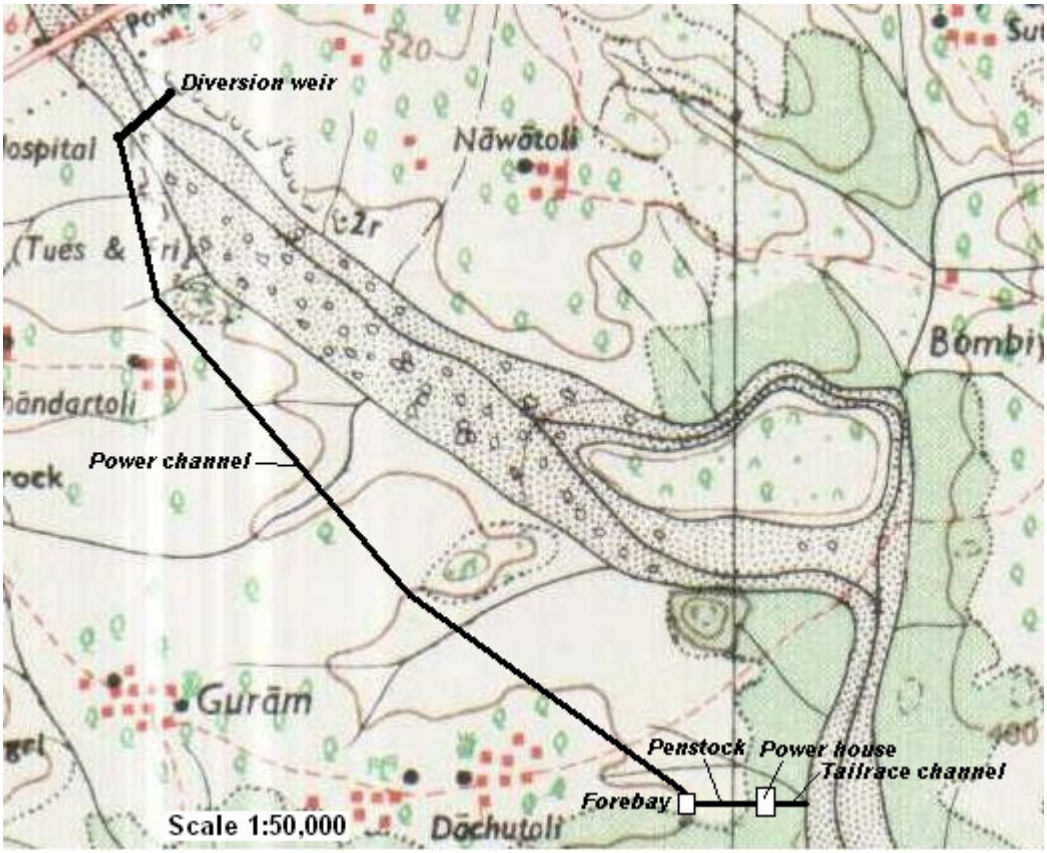
**Average Monthly Flow ($m^3/s$) of Koel river near the bridge**

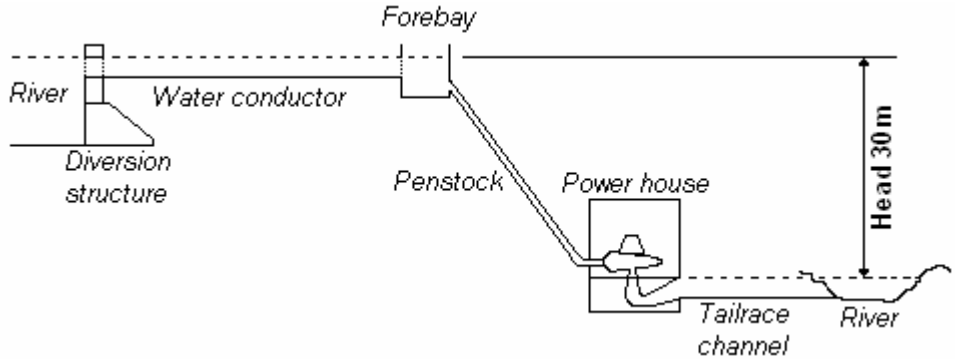
| Month | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|
| January | | 10.94 | Lean flow | Lean flow |
| February | | Lean flow | Lean flow | Lean flow |
| March | | Lean flow | Lean flow | Lean flow |
| April | | Lean flow | Lean flow | Lean flow |
| May | | Lean flow | Lean flow | |
| June | 41.75 | 29.63 | 115.36 | |
| July | 250.46 | 307.87 | 318.74 | |
| August | 237.24 | 93.93 | 132.58 | |
| September | 219.32 | 132.15 | 152.68 | |
| October | 109.99 | 43.68 | 118.00 | |
| November | 36.87 | 15.60 | Lean flow | |
| December | 15.68 | Lean flow | Lean flow | |

Lean flow is 4.50 $m^3/s$ or less.

## 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 30m and is indicated in the schematic sketch.




**Schematic sketch**

# 6.0 POWER POTENTIAL

## 6.1 Power

The flow for different exceedence times is estimated from the average flow data mentioned in para 4.2 of this report and given in column (2) of the table below. The net head is worked out as 28.5 m, 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) |
| 8.33 | 292.36 | 28.5 | 69478 |
| 16.67 | 168.05 | 28.5 | 39937 |
| 25.00 | 154.58 | 28.5 | 36736 |
| 33.33 | 90.56 | 28.5 | 21521 |
| 41.67 | 62.25 | 28.5 | 14793 |
| 50.00 | 18.99 | 28.5 | 4513 |
| 58.33 | 7.89 | 28.5 | 1876 |
| 66.67 | 5.65 | 28.5 | 1342 |
| 75.00 | 2.83 | 28.5 | 673 |
| 83.33 | 2.00 | 28.5 | 475 |
| 91.67 | 1.33 | 28.5 | 317 |
| 100.00 | 0.67 | 28.5 | 158 |

## 6.2 Conclusion

Keeping in mind that the streams / rivers in Jharkhand is rain fed, Basiya SHP site has a very good potential. Besides, supplying power to nearby 30 villages, it will strengthen the electrical grid. The project will go a long way in developing socio-economic condition of the people.

Preliminarily the project seems feasible and is recommended for carrying out Detailed Survey and Investigation.

The Basiya SHP will utilize a part of potential that is planned for Koel Karo Hydel Project. As such, Basiya SHP can only be considered in case Koel Karo Hydel Project is shelved.