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. Besides this, there are few dams in Jharkhand catering to irrigation demand of the local area through canal system. There is possibility of utilizing the reservoir water fed to irrigation canals for power generation by putting up SHPs downstream of the dams.

About 80% of villages in the Jharkhand are yet to see electrical power. It is prudent 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.

Malay Dam Toe SHP site is one of 22 SHP sites, located in the western part of Jharkhand. It is situated in the Block Satbarwa of District Palamu. The Malay Dam Toe SHP is proposed to utilize the water that is supplied to canal from the reservoir.

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.

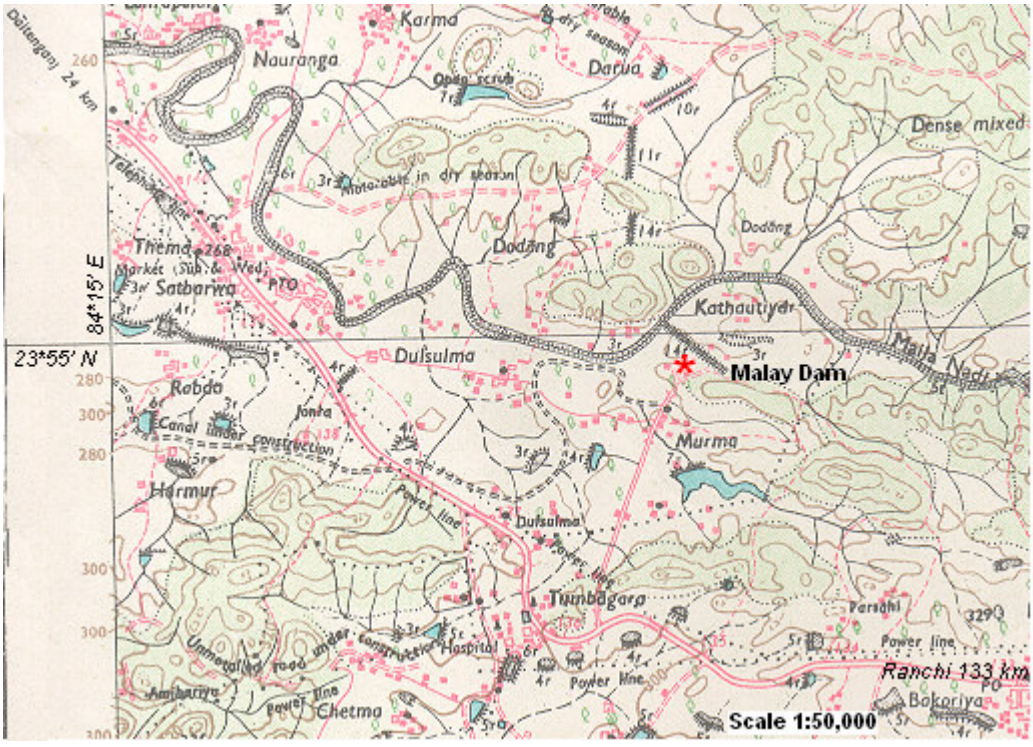
1.4 Scope of report

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
DALTONGUNJ
SATBARWA
MURMA
RANCHI
WEST BENGAL
CHHATTISGARH
ORISSA
State Capital
District HQ
Block HQ
Village
SHP Site
Rly Stn


Karma
Nauranga
Darua
Dense mixed
Thema
Satbarwa
PTO
Dodong
Kathautiyar
Dulsulma
Malay Dam
Maila Nadi
Murma
Robda
Harmur
Tumbagara
Hospital
Ranchi 133 km
Bokoriya
Chetma
Scale 1:50,000
84°15' E
23°55' N

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: Murma
b) Block: Satbarwa
c) District: Palamu
d) State: Jharkhand
e) Topo sheet No.: 73 A/5
f) Latitude: 23°54'55" N
g) Longitude: 84°17'12" E

3.2 Access to site

The access to Malay Dam Toe SHP site is highlighted in the Index Map. The nearest airport is at Ranchi.

3.3 Malay Dam

The salient features of Malay dam is as follows.

a) Length of Dam 1714.20m (5624 ft)
b) Top level of Dam 298.40m (979 ft)
c) Full Reservoir Level 293.37m (962.50 ft)
d) Dead water level 279.96m (918.50 ft)
e) Live storage capacity 3231.84 Ha m (26,200 Acre Ft)
f) Dead storage capacity 37 Ha m (300 Acre Ft)
g) Length of Spillway 117.65m (386 ft)
h) Discharge in Main canal 10.22 cumec (361 cusec)
i) Max water level in Main canal 281.03 m (922 ft)
j) Normal water level in Main canal 280.87 m (921.5 ft)

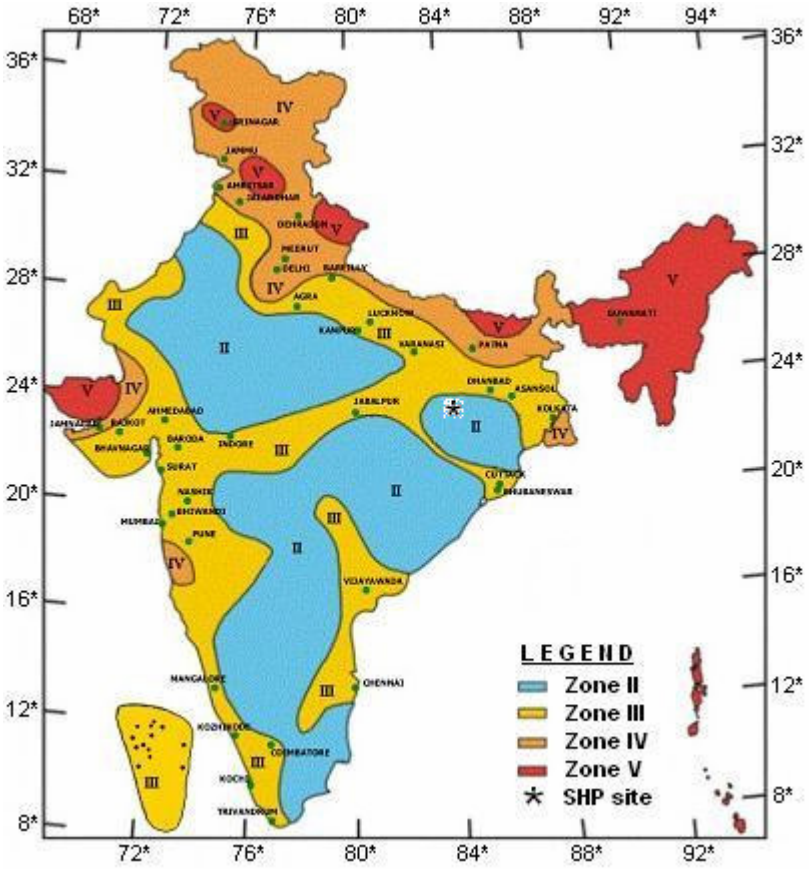
k) Depth of water in main canal 1.22m (4 ft)

3.4 Electrification status of nearby villages

The village Murma having 100 houses close to SHP site, presently, do not have access to electrical power.

3.5 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

a) Stream / river: Maila Nadi

b) Source: Rain fed

c) Catchment area: 400 sq km (approx)

d) River basin: North Koel river

4.2 Flow

The water from Malay reservoir is utilized for irrigation purpose through a canal system. The discharge capacity of the canal is **10.22 cumec** (361 cusecs). Water is fed through this canal for almost 8 months in a year. As understood during interaction with local people, Kharif (mid July to September) and Rabi (from Octorber to February) water is released through the canal for irrigation purpose at almost full capacity of the canal.

4.3 Head

The water for the SHP is proposed to be drawn from the Malay reservoir and discharged back to the canal after power generation. The head available for power generation is as follows.

Full Reservoir Level (FRL) = 293.37m (962.50 ft)

Minimum Draw Down Level (MDDL) = 279.96m (918.50 ft)

Design Reservoir Level (DRL) = MDDL + (2/3) (FRL – MDDL)

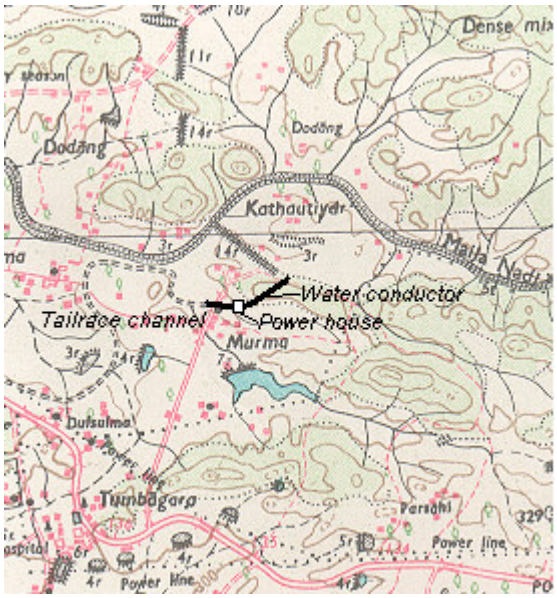
= 288.90 m

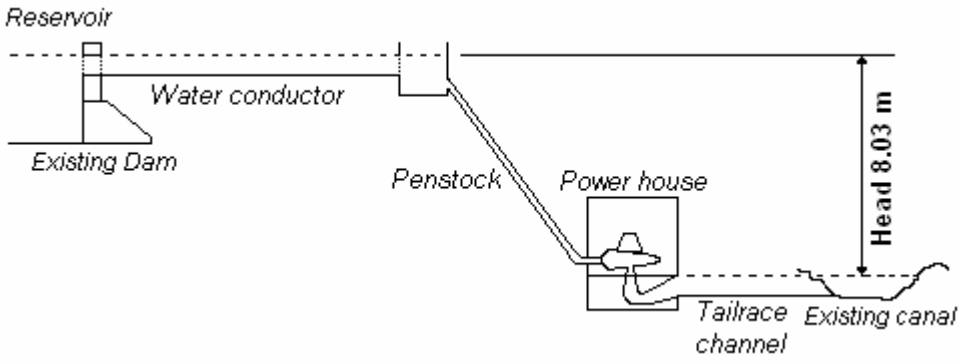
Tail water Level (TWL) = 280.87 m (921.5 ft) (Full Supply Level of canal)

Available Gross Head = DRL – TWL = **8.03 m**

5.0 PRELIMINARY LAYOUT

The SHP plant is proposed to utilize the discharges into the existing canal and the surplus discharges through the spillway. The scheme has been prepared such that the water from SHP is discharged back into the canal as per irrigation requirement or discharged back to the river through an escape. Whenever the SHP plant is under shut down the present canal gate would be utilized for irrigation discharges to the canal as necessary. The preliminary layout is outlined below in the relevant portion of the Toposheet.





Schematic sketch

6.0 POWER POTENTIAL

6.1 Power

The flow is expected to be fairly constant during the 8 months of irrigation discharge and nil for rest 4 months of the year. The net head is worked out as 7.63m, 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)
Period in months	**Flow (cumec)**	**Net Head (m)**	**Power Potential (kW)**
8	10.22	7.63	650
4	0	--	0

6.2 Conclusion

The SHP site is planned to utilize the canal irrigation discharge and surplus discharges through the spillway. The power house will operate without antagonizing the irrigation requirement. Water will be discharged to the canal mostly through the power house and when the power house is under shutdown through the canal gates.

Since the SHP project is proposed to utilize the existing irrigation dam, so the project economics will be attractive. In addition to electrifying the local villages, the power generated will strengthen the local grid at Tumbagara.

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