HIMACHAL PRADESH STATE ELECTRICITY BOARD Ltd.
"A STATE GOVT. UNDER TAKING"

No. HPSEBL.CE (I&P) DB-9-(RTI)/2013- 654 Dated:- 8-8-2013

To

Sh. Rahul Saxena
Village & Post Office. Kamlehar,
Teh. Palampur Distt. Kangra (H.P.)

Sub:- Information under RTI ACT 2005.

Ref:- Your application dated 08-08-.2013.

DearSir,

Enclosed, please fined herewith the copy of inspection report of Director (Projects), HPSEBL Shimla regarding shifting of projects components of Bajoli Holi HEP from the right bank of Ravi river to left bank in Distt. Chamba (HP) as desired vide your above referred letter please.

Yours faithfully,

DA. 54 Pages.

(Er.Sunil Kumar Puri)
Sr. Executive Engineer (PIO),
O/o Chief Engineer (I&P),
HPSEBL, Sundernagar.

HPSEBL

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Sub: Inspection Report of Bajoli Holi HEP.

The undersigned visited the project area of Bajoli Holi HEP on 18.07.2012. The visit was made in connection with the controversy regarding shifting of bank of the project to left side of Ravi river. In response to a letter from Deputy Commissioner, Chamba, the HPSEBL reaffirmed, after review, construction of the project on the Right Bank of the river. The proposal to shift the bank has given rise to a controversy and public unrest. The PIL filed in Hon'[ble High Court of Himachal Pradesh extensively quotes from the documents of HPSEEL in support of construction of project on Right Bank. It was, therefore, considered prudent to have a first hand appraisal of the project.

The Inspection Note records my observations and conclusions. In my opinion, construction of the project on Right Bank is a natural choice since left bank has all the orchards, cultivated fields, thick forests, road, helipad, school etc. whereas Right Bank is practically barren. There is nothing unusual in right bank option. Each problem raised by GMR has a solution.

The Note is enclosed for your information and record.

D(C)

o/o The C.E. (I&P)
HPSEB, Sundernagar
C.E.
Sr.E.I
Dy.
S.O.
D. No. 1301
Dt. 14/8/2012

Spl.PS/D(C)-470 A
13/8 30.07.2012

Director (Civil)
30/7/2012

Chief Engineer(I&P)

14/8/12 Copy to SE. Planning. S. Nagar for info.

cc: Chief Engineer(P&M)

No. HPSEBL/CE[illegible]/2012-1022 Dt. 18/8/2012

Copy of above is forwarded to the SE Planning Circle-I HPSEBL Sundernagar for information & n/a please.

[signature]

Sr. Executive Engineer,
O/o Chief Engineer (I. & [illegible])
HPSEB, Sunder Nagar (H.

Himachal Pradesh State Electricity Board Limited

180 MW BAJOLI HOLI HYDRO ELECTRIC PROJECT

PROPOSAL FOR SHIFTING OF BANK FROM RIGHT TO LEFT

SITE INSPECTION REPORT OF DIRECTOR (CIVIL)

(Date of Visit to Project Site: 18th July 2012)

1.0 Background

The 180 MW Bajoli Holi HEP has been envisaged by HPSEBL on the right bank of river Ravi in Chamba district of Himachal Pradesh. Water is proposed to be diverted at a location below village Bajoli. A 14.1 Km long tunnel will convey it to the power house situated in village Barola. The tunnel is proposed to be excavated through 5 adits of varying lengths.

The Project was allotted to GMR at PFR stage. The company did not accept alignment of the project on Right Bank. It proposed shifting of the project to Left Bank.

The Chief Engineer (PSP), HPSEB, through a letter dated 23.03.2009 advised the Govt. of HP that shifting the project to Left Bank should be considered and approved. The Principal Secretary (Power) permitted the company to shift the bank through his letter dated 09.04.2009.

Proposal for shifting caused public unrest. Local public opposed during public hearings construction of the project on left bank. A reference was made to HPSEBL by Deputy Commissioner, Chamba through letter dated 18.08.2010. The HPSEBL reviewed its proposal in the light of objections of GMR. It recorded in its letter of 12.02.2011 to the Deputy Commissioner that construction of the project on the Right Bank was indeed the superior alternative. The Principal Secretary (Power) through his letter of 24.06.2010 to the Deputy Commissioner, Chamba, had also expressed the opinion that the bank would be shifted only if the local residents approved it. He noted that GMR had been verbally informed that public opinion had to be respected.

A case was filed by some residents of the area in the Hon'ble High Court of Himachal Pradesh against the permission to shift the project. The petitioners extensively quoted from the documents of HPSEBL in support of their stand that the project should be constructed on the Right Bank. The HPSEBL verified the references in its submission to the Court.

Representatives of the GMR Energy Ltd. led by Shri Tarun Mahajan, Manager, met Director (Civil) in early July, 2012 to explain their point of view.

A trip to the project site was, therefore, undertaken for first hand appraisal of the layout. Superintending Engineer (Planning), Sunder Nagar, officiating as Chief Engineer (I&P); Sr Executive Engineer of the same office; Assistant Executive Engineer and Additional Assistant Engineer, Hydel Investigation Division, Chamba, accompanied.

Discussions were joined the next day by Sr Executive Engineer, Hydel Investigation Division, and other officials of the Division acquainted with the project area.

2.0 Grounds for Stand of HPSEBL

The layout of the project and location of Power House was finalized after a number of joint visits to project site conducted by a team of I & P Officers, Design unit, Field unit and Geological Survey of India. A Pit type Power House was recommended on the right bank by the Geological Survey of India.

HPSEBL carried out exploratory drillings by driving 3 drill holes at the proposed Power House site, the result of which has been appended in the DPR's Chapter No. VIII page 42 to 47. The log sheets clearly show presence of hard and compact moderately jointed phyllite with low permeability value, from El.1712.559m to El.1700.559m. Also the L-section developed through the Power House from the survey supplied by the field unit reveals a cut of 62.20 m i.e. from El.1758m to El1695.30m; instead of 205m as pointed out by the IPP. There is no need of shifting of Power House towards the hill side as pointed out by the IPP.

In case of HRT having very high covers, the tunnel alignment can be shifted towards the river side after detailed investigations, studies by design wing and comments from the Geologist.

HPSEBL has conceived the project on the right bank due to the following reasons:

1. Minimum disturbance to the local people living in the surrounding areas of the project.
2. To minimize the risk of drying of subsurface water sources, local lakes and ponds etc. by driving HRT on the left bank, as most of the population and their cultivated land is on the left bank.
3. Sara Dal (lake) is the religious place like Mani Mahesh Dal attached deeply with the religious sentiments of the people of surrounding areas and thus no risk can be taken to harm the Dal.
4. The left bank of the river appears to be more disturbed. During 1988, heavy landslides occurred in Andhrala and Dayothal villages due to floods caused by glacial melting. Also as per the GSI Inspection Note submitted during May, 2044, the Andhrala village is situated on an ancient land slide zone. The GSI reports quoted under reference described the presence of several ancient landslide scars in this area.

It is also pertinent to mention here that the project was allotted to M/s GEL Energy Ltd. through International competitive bidding by the HP Government with the project proposal on the right bank, as per the pre-feasibility report of the project.

3.0 Grounds for Stand of GMR Energy Ltd.

Details of the reasons advanced by GMR Energy Ltd. for re-location of the project are given in the Enclosure. Gist of the objections is as follows:-

1. GMR felt that the power house will have to be set deep in a pit further back from the pit proposed by HPSEB Ltd along side the

Ravi River. The back cut of the excavation excluding depth of the pit will be 155m. The back cut will have to be made in over-burden and weak phyllite rock posing stability problems.

2. Penstock on this back cut and overburden is also not feasible.

3. The surge shaft will have to be constructed through overburden and will be problematic, time and cost consuming.

4. If it is decided to locate the power house underground, it will have to be set deep inside the hill. Both the MAT and TRT will then be longer.

5. Further, in case of underground power house, the surge shaft will have to be shifted back, which will result in increasing the lengths of the project roads to its top and bottom.

6. One entire village Barola (23 houses) will be displaced at this location.

7. If right bank alignment is adopted nearly 50% length of the HRT will pass through very high cover zone. This will result in high stresses. In massive competent rock with low rock strengths, this results in spalling and slabbing. Also with high cover, squeezing ground may be encountered in reaches where shear seams, highly fractured rock and carbonaceous phyllite bands are intercepted.

8. The working facilities will have to be located on the left bank.

9. Topography is more rugged and valley slopes rise very steeply. As a result, the right bank slopes would be more susceptible to slides.

10. As approach road to site is available only on Left Bank and no access is available to entire water conductor system in case of right bank alignment. Since the HRT would be located about 200m above the river level, about 15 Km length of additional project road construction along the difficult terrain by cutting steep hill slope will be required to access to different adits of

HRT/PH. Stabilization of roads in such steep terrain is expected to be extremely difficult and will take much longer time.

11. Construction of approach road on the steep slope of right bank was likely to induce slides causing environmental problem. It may be noted that in the near past a huge slide occurred just upstream of the Holi Town and many other places. Cracks in the valley slopes have been noticed on the Right Bank and thus construction of road/excavation on these slopes is highly vulnerable/sensitive to the environment or stability of valley slopes.

12. Generally comparison is done with right bank alignment of Chamera-III project for locating the project on right bank. Due to high elevation difference between Ravi River and Road/adit location in case of Bajoli Holi, the scheme cannot be compared with Chamera-II & III or other Projects. In those projects, road is passing very close to Ravi River, thus approach road construction etc. is not complicated.

13. Hence in case of Bajoli-Holi, the right bank alignment would have involved quite elaborate infrastructure and thus requiring longer project schedule effecting over all techno commercial viability of the project.

14. Due to non availability of space for construction activities as well as dumping of muck, all activities will be concentrated on the left bank even if Project is located on the Right Bank.

15. Land requirement in the Right Bank option are more.

16. Though HPSEB has marked construction adit in the Kala Nala but Construction of 2.5 km approach road in the deep incise Nala is complicated job which would involve huge retaining wall and stabilization measures. In absence of this road, Construction of HRT is not possible as it would otherwise result in longer stretch of HRT to be excavated through limited number of adits causing ventilation problem apart from much delayed construction.

Reply of GMR to concern of villagers is reproduced in next section.

4.0 Concerns of the Villagers: Reply of GMR

From the interaction with the villagers, it is found that their major concern is that water resources will get dried due to tunnel activities in case the HRT is aligned on the left bank. In this connection following points are submitted:

1. Tunnel size is relatively small.
2. Tunnel is passing through deep inside the hill and away from the surface/villages/cultivated lands in most of the lengths.
3. The majority of the tunnel length being passing through mainly phyllite rock which is considered less water bearing and less pervious, there will not be much water seepage conditions during tunneling which would have been the main cause for depletion of groundwater conditions in the surrounding areas. Our technical assessments do not show considerable depletion of water table subsequent to tunneling. Even if there is any water seepage during tunneling, utmost care shall be taken during execution by means of cement grouting, shotcreting, concrete lining, etc. to seal the rock joints during the operation of the tunnel.
4. If any water resources get dried, GMR is committed to supply the water to villagers through tube well, Tanks/Ponds etc.
5. Drying of Sara Dal (lake) is also raised by Villagers. After detail study it is found that this lake is about 1.7 Km away from the tunnel alignment and thus there would not be any effect of tunneling on the lake.

5.0 Observations

1. During the visit it was seen that Right bank of Ravi consists of steep rock cliffs stretching practically in the whole length the proposed tunnel. The nallas in this reach are shallow and small. They have been unable to erode the rock to carve deep gulleys in

the mountain face. Only one nalla namely "Klah" or Kala divides the reach of the HRT and splits it into two parts. The nalla is wide and gentle as inferred from the relatively small size of boulders in the river bed. It lies directly in front of Holi village.

2. It was seen that left bank has thick green cover and relatively flatter slopes about 40° to 45° in general. Shear cliffs were visible only where road intersected a spur. The road was sinking in two or three places due to creep.

3. Most of the economic activities of the area are concentrated on this bank. The villagers, orchards, cultivated lands; small shops are all located on this bank. In contrast, the right bank was barren and had only one village.

4. The rock in the domain of the project appears sound with thick beds. The nalas cutting across are fewer and steeper. Large ingress of water into the tunnel is not anticipated. The GSI had forecast the rock class to vary from very good to good. Higher the quality of rock the higher can be the permissible rock cover.

5. The tunnel can run close to the rock face as cover requirements will be met at shallower setting in contrast to the left bank, where the tunnel will have to be set deeper as the mountain slopes are gentler, increasing the length of adits.

6. One more adit may have to be introduced between adits II and III to keep the stretch to be covered short, about 1.5 Km.

7. The Klah or Kala nalla can be negotiated by HRT very conveniently at a location lower than that given by HPSEBL. The shift will reduce the rock covers drastically.

8. The adit sites and work areas proposed by GMR will destroy the orchards, the houses, fields and the forest cover. Muck and drainage water from the tunnels will spoil and harm the landscape. Ingress of water is expected to be higher due to presence of more

nallas and forest cover (signifying higher ground water) in the left bank.

9. The surge shaft can also be converted into a surge tunnel opening in Oi Nala.

10. Plenty of space is available around the location of the powerhouse proposed at village Barola by HPSEB Ltd. A PWD road links village with the road on left bank. The powerhouse will come up on land which is uncultivated and has only three or odd single storey buildings. With proper planning, it may be possible to leave a large part of the village land undisturbed. In contrast, the powerhouse site proposed by GMR will destroy an orchard and other cultivated lands around the site, because it is the only land available around the location.

11. Movement of humans and transport vehicles is concentrated on the left bank.

6.0 Discussions

The right bank alignment of the project proposed by HPSEBL, in the light of my experience, does not pose any problem. It is true that construction of the project will take about a year to $1^{1/2}$ years longer since bridges and link roads will have to be constructed. There is nothing unusual in this. Similar arrangements have been adopted in Chamera II and III by NHPC; and in Luhri Project by SJVN Ltd. The HRT is 200 m above the road level only near adit V, and here the level difference does not matter because an HPPWD road is available, which may have to be made project worthy .

6.1 Infrastructure

In fact, construction of bridges and roads would have been completed by now, if, instead of raising objections, GMR had taken off with the project. Further, the bridges will be required during the limited period of construction of HRT. These can be retrieved thereafter and used elsewhere or even sold to another party. The total effective cost of

constructing access will not be significantly higher than the cost of building approaches on the left bank.

PWD roads pass very close to powerhouse area, the dam area and the Klah or Kala Nala area where Adit IV is proposed. The HPPWD bridges may have to be strengthened. Any public sector unit, being socially responsive, will not mind such improvement if it saves discomfort to public. Roads and connecting bridges will have to be constructed only in case of two adits, namely, adit II and III. Near these adits the river is narrow and has rock that appears strong. An additional adit may have to be inserted between adit III and adit IV.

6.2 HRT

Rock on the right bank appears robust and is qualitatively better in general. Geological Survey of India has classed it as very good to good. Occurrence of carbonaceous phyllite is occasional as per GSI Report. Number of nalas on right bank is few. In contrast, left bank has more nallas with higher flows. Therefore, lower ingress of water is expected, which will be an advantage in tunneling.

The HRT will be split into two portions by Klah or Kala nalla. Instead of crossing the nalla by tunneling, it will be preferable to cross the nalla by means of cut and cover sections. This has been done already in Nathpa Jhakri and Rampur HEPs. Alternatively, an inverted steel siphon can be provided, as done in Uhl Stage III HEP. The nalla provides plenty of space for a crushing plant and batching & mixing plant and also sufficient space for dumping, storing and parking of equipment. Adit No IV can be omitted.

The slopes on left bank are gentler, therefore, the HRT will have to be set farther in to the hill for attaining minimum cover requirement. Length of adits will increase. Length of adits and HRT on the left bank will be greater.

6.3 Surge Shaft

The surge shaft can be converted to a surge tunnel. Such a system was proposed for Rampur HEP and has been adopted in Luhri HEP by SJVNL. This will reduce length of roads to system and the surge tunnel will double as adit, eliminating Adit V. Even otherwise, excavation of surge shaft in overburden is not something unseen. The surge shaft of Nathpa Jhakri HEP runs in water charged overburden for almost 80 m depth. Its diameter is also 21.6 m which is relatively larger against 12 m in Bajoli Holi HEP. In Uhl III HEP of HPSEB Ltd, the surge shaft has been excavated in extremely weak rock using excavator.

6.4 Powerhouse

Height of back cut in the rock is also not abnormal. About 110 m high cut was made for the outfall in Nathpa Jhakri HEP. Out of this, about 60 m lay in overburden suffused with ground water. Alternatively, an underground power house can be thought of. Due to steepness of the mounting face it may be possible to locate it at a short distance from the mountain face. In case of power house of Tala Hydroelectric Project in Bhutan the rock was phyllitic quartzite not of a high quality, with ingress of water, and the power house is in operation today. Construction of powerhouse in such conditions is not a problem.

It may also be mentioned that the pit powerhouse proposed by HPSEB Ltd as depicted in GMR drawing enclosed with its Assessment Note deviates from the drawing made during Field Season by GSI Geologist. In the GMR drawing the powerhouse has been shown to be set deeper compared to GSI drawing. The GMR drawing although purporting to represent HPSEB layout actually depicts the powerhouse shifted towards the hill. The shift is responsible for the higher back cut predicted by GMR.

There is no need to shift the powerhouse back as proposed by consultants of GMR. Geological Survey of India has approved the site on the basis of field data. There should be no doubt about its soundness. GSI has vast experience of Indian geology. It has finalized the layouts of

almost all the major projects in India and Bhutan. Statements of consultants of GMR cannot be treated as absolute.

6.4 Penstock

Though buried penstocks are common, the penstock of Bajoli Holi HEP can be converted into a pressure shaft beginning a few meters away from the surge shaft and meeting powerhouse a few meter behind the powerhouse. This will reduce its length also and result in savings of steel. The angle of pressure shaft can be manipulated to avoid shifting of surge shaft.

Penstock proposed by GMR will pass through thick forest. Valvehouse will be constructed near Jundota village.

6.5 Working Areas

It is true that some yards, work and storage areas may have to be accommodated on the left bank. However, the activities will be limited to the right bank. Main disturbance to people, environment and ecology is caused by activities and not by passive location of some work areas. A large number of work areas will be located on the right bank, namely, at the dam site, in Klah or Kala nalla bed and the power house area. It is possible to carve out work areas in the river bed at places, both on the right and left banks.

By constructing the power house underground, dislocation of people of Barola village will be minimized. The penstock will run in a shaft. Work areas can be located in the lowermost bench of the village where there is no cultivation and there are only three or four non-residential buildings. It may be possible to construct the power house on this bench itself.

6.6 Environment

Green cover as well as habitation on right bank is insignificant. As such damage to environment and ecology will be negligible. The slides feared by GMR may not come true as the mountain face presents assuring view. There are umpteen cases in Himachal where half tunneling has been

stood for years. The rock slide at Holi is an aberration. Travel along the river does not present any other such slide up to dam site.

6.7 Other Issues

The Ministry of Environment and Forests has issued a No Objection Certificate to GMR. It cannot be construed as approval to shifting. As mentioned in the letter of Principal Secretary (Power), public opinion is to be respected. Moreover, in the present case, it is, what I would call, a 'speaking' site. Anybody visiting the project area will effortlessly notice the greenery of the left bank and barren ness of the right bank; the populated left bank and the uninhabited right bank. The natural conclusion would be to construct the project on right bank; what if a little more time and money have to be spent. One cannot destroy an oasis in a desert only because it is more convenient to work there.

Construction of project on right bank will insulate GMR from interference or fouling from movement of humans and traffic hazards encountered on the road on left bank. Blockade of road on the left side is quite common. Roads on the right bank will be stable in comparison. Day to day activities will not be hampered.

The job areas on right bank will be exclusive without interference.

6.8 General Inference

The GMR has articulated some problems resulting from right bank alignment. There are workable and proven solutions to all the problems raised by GMR. Case of the company for shifting the bank is weak. The arguments are built around the apparently concealed objective of convenience without regard to environmental and socio-economic costs. The proposal would have been acceptable if the right bank were equally green and populated, with cultivated fields, orchards and other economic activity. It is not so. The right side is barren, making it an ideal choice. The inconveniences to the company are short term and, in the overall framework of the project, insignificant.

7.0 Recommendations

The stand of HPSEB Ltd is underlined by the objective of conserving the environment, the ecology and causing least disturbance to the residents of the area. Land in the valley is scarce and is available only on left bank. Preservation of the land requires that project is constructed on right bank. Practically, the whole population is concentrated on this side of the valley. The side has all the orchards, fields, villages, schools, helipad. For example, the powerhouse proposed by GMR will destroy an orchard located at Tulang Nala. It may be emphasised that everything appears neat and tidy on paper. In fact, projects cause disturbance to much larger area. Damage to flora and fauna is extensive.

World over highest importance is now attached to R & R issues; this is followed by environmental issues; the technical issues are given lower importance because a large inventory of solutions is available for tackling technical problems. Stand of the HPSEB Ltd is in tune with global perspective as also with the stand of the Principal Secretary (Power).

Proposal of the company is guided by commercial advantages of left bank option, namely, short lead time to commencement of construction and savings in infrastructure. Had it started constructing the bridges and link roads in 2010, when it raised objections, the work would have been completed by now and construction of project proper begun. Had the project been allotted to NHPC or SJVN, it is unlikely that the issue would have been raised at all.

Technically, the proposal of HPSEB Ltd has no drawback or shortcoming, as clear from the examples given in preceding paragraphs. The proposal was developed in consultation with an organization no less than Geological Survey of India, and on the basis of field investigation. The HPSEB Ltd has not overlooked any aspect.

In view of the long life span of HEPs, an additional year or two of lead time and less than one percent increase in cost do not really matter. Further, discomfort to the company will be for a short period of 5 to 6

years. In contrast, losses to public and environment will be hard to be made up even over a long time.

The choice is between commercial cost and savings, and, social cost and savings. The answer is obvious. Commercial disadvantage should give in to social disadvantage. It is, therefore, recommended that the alignment of the project as proposed by HPSEBL should be retained.

Director (Civil)

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LIST OF ENCLOSED DOCUMENTS

Encl No	Reference Letter with Subject
1	Letter of Deputy Commissioner, Chamba dated 26.04.2010 to Principal Secretary (Power) intimating public resentment to change of Bank of the Project
	GMR Drawing purporting to show layout of powerhouse proposed by HPSEB Ltd. Actually it shows the powerhouse at a shifted location
2	Letter of Deputy Commissioner, Chamba dated 18.08.2010 to Chief Engineer (Projects cum Arbitrator) requesting point-wise reply to comments of GMR
	Letter of Principal Secretary Power dated 24.06.2010 to Deputy Commissioner, Chamba informing that IPP has been informed that local opinion should be respected. (Enclosed with the above letter)
	Letter of MoEF, Government of India, dated 02.12.2008 to GMR informing that Ministry has no objection for the proposal of locating the project components as stated above on left bank of the river Ravi instead of right bank.
3	Letter dated 4.10.2010 from S.E. I&P Chamba to Chief Engineer (I&P) containing point-wise reply
4	Letter from S.E. I&P Chamba dated 13.12.2010 to Chief Engineer (I&P), Sundernagar clarifying some of the points in '3'
5	Letter from SE, Planning Circle, Sundernagar dated 24.01.2011 to Chief Engineer (I&P), Sundernagar commenting on the points raised by GMR
6	Letter of Chief Engineer (I&P) dated 22.02.2011 to Deputy Commissioner, Chamba containing point-wise reply.
7	Letter from Chief Engineer (PSP) dated 23.03.2009 to Principal Secretary (Power) recommending approval of change of Bank.
8	Letter from Principal Secretary Power dated 09.04.2009 to GMR Energy Limited allowing shifting of the bank from right to left.
9	Table showing estimate of length of approach roads to adits.
10	Note on joint inspection Bajoli Holi HEP w.e.f. 06.06.2006 to 09.06.2006
11	Plates showing setting of the powerhouse submitted by Geologist of GSI
12	Drawing showing actual location and layout of Power House as proposed by HPSEB.

Enclosur

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NO: RRO/CBA/Bajol Holi HEP/2010 - 3425

From:

Deputy Commissioner,
Chamba District.

To,

The Principal Secretary (Power) to the
Govt. of Himachal Pradesh, Shimla.

Dated Chamba the 26th April, 2010

Subject: Present status of 260 MW Kutner HEP, 200 MW Bara Bhangal HE Project and 180 MW Bajol Holi HE Project-Regarding

Sir,

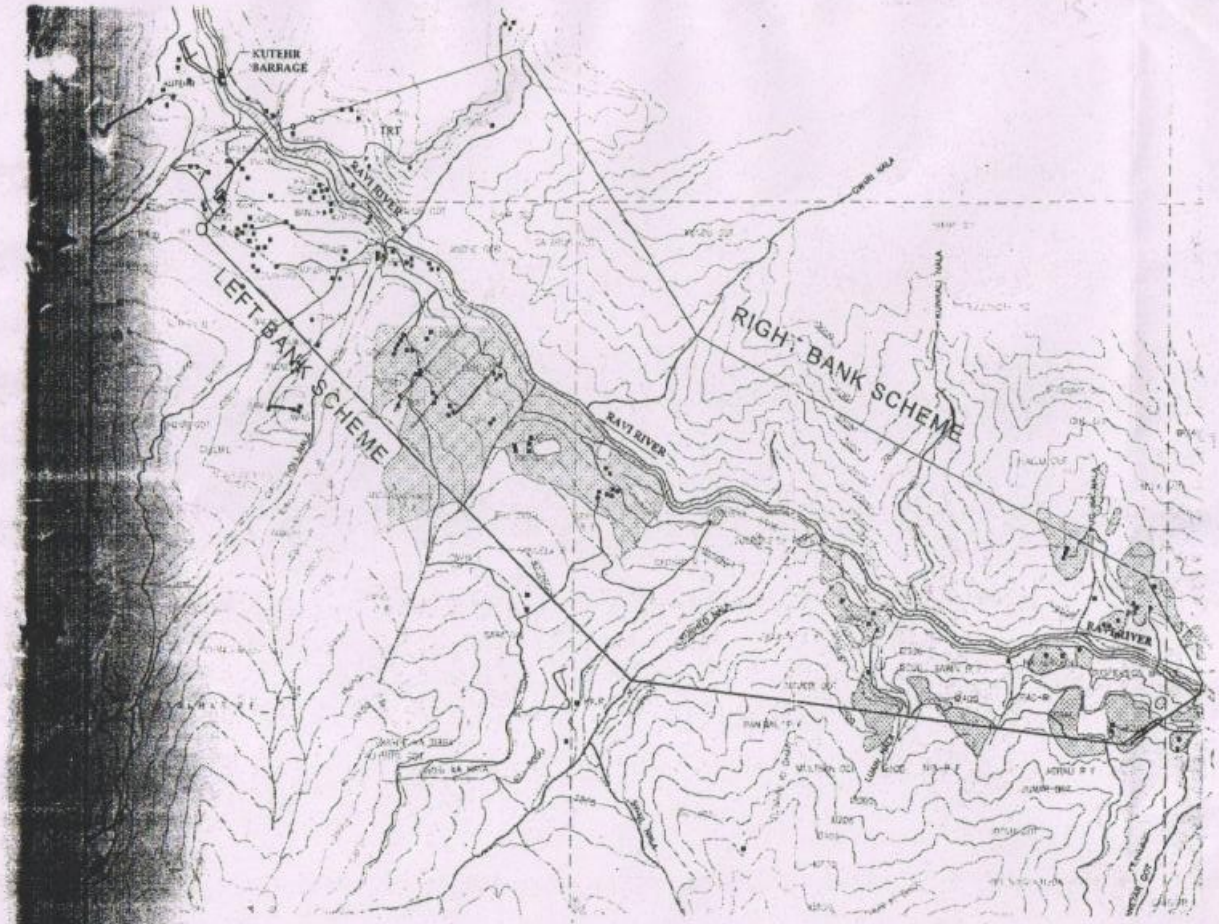
I would like to invite your kind attention towards your office letter No. MPP-F(2)-14/2007 dated 8.12.2009 vide which it was intimated that Implementation Agreements of subject cited HEPs has not been signed due to not receipt of techno-economic clearance.

In this regard, it is submitted that recently public hearing had been conducted in respect of Kuihed HEP & Bajol Holi HEP. In case of Bajol Holi HEP, none of the local people are interested to execute the project work at proposed site and requested to shift the project site to left bank of river Ravi at same location. This matter was telephonically discussed with your good self with the request to look into the mat immediately

In view of above, it is, therefore, requested to please supply the present status of implementation Agreements & techno-economic clearances of subject cited projects as well as status of shifting of project site to another bank of Ravi river at the earliest or if possible through return fax please.

Yours faithfully,

Deputy Commissioner,
Chamba District.



NOTES:
1 RIGHT BANK ALTERNATIVES INVOLVE HIGHER COST OF INFRASTRUCTURE

SCALE 1 : 50000 0.5 0 0.5 1.0 1.5 2.0 2.5Km

INCL-WALIN Engineering India

Client: GMR Energy Limited

Project: BAJOLI HOLI HYDROELECTRIC PROJECT (180 MW) Himachal Pradesh, India

Title: GENERAL ARRANGEMENT OF THE PROJECT BOTH ON RIGHT AND LEFT BANKS

43 Enclosur

15

NO: RRO/CBA/Bajoli Holi HEP/2010 -3975

From

Deputy Commissioner.
Chamba District.

To,

The Chief Engineer,
Projects –cum- Arbitrator,
HPSEB, Shimla, HP.

Dated Chamba, the 18th August, 2010

Sub:- Assessment note on location of Project Components of Right bank & left bank

Sir,

It is intimated that at the time of public hearing of 180 MW Bajoli Holi Hydroelectric Project, local people were not interested to construct the power house at the left bank of the river i.e. at proposed site. In view of these circumstances, the matter was referred to the Govt. for taking appropriate decision.

In this connection, decision of the Govt. has been received vide letter No. MPP-F(2)-14/2007-I dated 27.6.2010 that local opinion has to be respected and unless thay are convinced it will not be possible to allow construction on left bank and project will have to based on the initial parameters which envisaged work on the right bank (Copy enclosed).

In this regard, an assessment note of location of Project components of right bank & left bank received from representative of M/s GMR Bajoli Holi HE Project. As per the directions of worthy Deputy Commissioner, the matter was referred to the S.E. HPSEB, Chamba for their comments but they intimated that the investigation and prefeasibility of such Power Projects is being looked after by the project wing of HPSEB so the desired comments may be taken from the project wing of HPSEB.

In view of the above, copy of assessment note on location of project components on right bank and left bank is sent herewith with the request to supply the point wise comments on the assessment note at the earliest so that further action could be taken accordingly.

Encl: As above

Yours faithfully,

Assistant Commissioner
Deputy Commissioner,
Chamba District.

o/o The C.E. (I&P)
HPSEB, Sundernagar
C.E.
S.E.E.
2371
26/8/10
26-8-2010

D/B
26/8/10
ADE
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P.T.O.

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Government of Himachal Pradesh
Department of MPP & Power

From

The Principal Secretary (Power) to the
Government of Himachal Pradesh
Shimla-171002.

Dated 6-7-2010

To

The Deputy Commissioner,
Chamba,
Distt. Chamba.

Dated, Shimla-2 24th June, 2010

Subject Present Status of 260 MW Kuther HEP, 200 MW Bara Bhangal HE Project and 180 MW Bajoli Holi Project.

Sir

I am directed to refer to your letter no. RRO/CBA/Bajoli Holi HEP-2010-3425 dated 26th April, 2010 on the above cited subject and to say that proposal for shifting of project site from left site to right site has been received and the HPP of Holi Bajoli project was informed verbally that local opinion has to be respected and unless they are convinced it will not be possible to allow construction on left bank project will have to based on the initial parameters which envisaged works on the right bank

Yours faithfully

Joint Secretary (Power) to
Government of Himachal Pradesh

Dated, Shimla-171002, the th June, 2010

Endst. No. As above.

Copy to Sh. M. Krishnamoorthy, Associate Vice President, GMR Bajoli Holi Hydro Power Pvt. Ltd., Karthik House, Village Kuleth, Sub Tehsil Holi, Tehsil Bhermour, Distt. Chamba for favour of information.

Sd/-
Joint Secretary (Power) to the
Government of Himachal Pradesh

Vipin
RRO
5-7-2010

AC/RRO 2/7/10
DR 2/7/10

ANNE 49

Annexure -6

NOTE ON THE JOINT INSPECTION OF BAJOLI HOLI HEP (180 MW) AND SAL STAGE-I HEP (6.5 MW) W.E.F. 6.6.06 TO 9.6.06

A joint inspection of Bajoli Holi & Sal Stage-I HEP was carried out w.e.f. 06.06.2006 and 09.06.2006 by the following officers of HPSEB and GSI to freeze the layout of Bajoli Holi HEP & review the layout of Sal Stage-I HEP.

1. Er. Naresh Kumar, Chief Engineer (Designs), HPSEB, Sundernagar
2. Er. S.K. Gupta, Chief Engineer (I&P), hpseb, Sundernagar.
3. Er. S.P. Gautam, SE, S&I Circle No- II, HPSEB, Chamba.
4. Er. K.K. Goel, Director, P&D (C)-III, HPSEB, Sundernagar.
5. Er. K.K. Malhotra, Sr. XEN, P&D (C)-III, HPSEB, Sundernagar.
6. Er. Sanjeev Mahajan, Sr. XEN, HID, HPSEB, Bharmour.
7. Er. Anil Dhiman, Sr. XEN, Planning Circle No-I, HPSEB, S/Nagar.
8. Sh. Pradeep Singh, Resident Geologist, GSI, Chandigarh.

BAJOLI HOLI HEP

1 Diversion Structure

The proposed dam site was inspected and its feasibility with regard to geo-technical aspects was assessed. The proposed dam site was not considered feasible due to the following reasons-

i) The exploration by three drill holes drilled at the proposed dam site in the river bed has revealed that the overburden thickness on the river bed is more than 25m. Hence the dam foundation will have to be taken around 30m below the river bed and about 5 m stripping would be required on both the abutments which may be uneconomical.

ii) Gorge being narrow, enough space is not available for job facilities, stores, offices etc.

iii) Availability of insufficient storage capacity for peaking due to steep slopes on both the banks upstream of proposed dam axis.

iv) Space to provide required water way to pass the SPF may not be possible in the proposed dam section. For this some other alternative solution have to be proposed which would add to the cost of the diversion structure.

In the light of above observations, a reconnaissance survey was carried out d/s of the above proposed dam axis. Area upstream of the proposed dam axis was not traversed because the width of the river is narrow due to steep slopes on both banks and to utilize the discharge of Channi Nala which meets river Ravi around 200m u/s of the proposed dam axis. A site around 800m d/s of the above dam axis was found suitable for the Barrage because of large storage capacity available on account of wider course/flatter area at the u/s of the proposed barrage axis. Study in this regard is to be carried out. This change in proposal of Barrage is likely to result in reduction of head and subsequent

reduction in the installed capacity of the project. Field unit shall make available the following surveys/data for carrying out the above studies:-

i) Fresh contour plan of the area covering 100m u/s and 100m d/s of the new barrage axis and extending up to elevation 2020 m on both the banks of the river, in scale 1:500 with contour interval of 2 m.

ii) Three cross sections (actually observed) of Ravi river, one on the new axis of Barrage and other two @ 5 m u/s and d/s of this new Barrage axis.

Geologist opined that the rock may not be available at a reasonable depth and the Barrage can be founded on a pervious foundation. Prima facie it was observed that the right bank slopes are rocky with thin cover of overburden consisting of slope wash material. However, on the left bank, the rock is intermittently exposed and the slope in general is covered by loose debris.

In order to establish the rock profile along the new Barrage axis it was recommended to drill four exploratory holes. Out of these, two drill holes have to be drilled in the river bed, one in the center of the river and the other on the left bank edge. Other two drill holes shall be drilled on the left bank slope at 15 m & 30 m height from the river bed. All these drill holes have to be drilled up to a depth of 20 m and their permeability tests carried out simultaneously.

2. Surge Shaft & Penstock

Exploratory hole drilled at El. 2050 m has intercepted an overburden of soil and grit up to 20m depth, below this highly broken core pieces of phyllitic quartzite rock is intercepted with nil RQD values up to a depth of 75m. Going strictly by the drill hole record, the sound rock is encountered at a depth of 75m. As the core at many places appear to be broken due to mechanical drilling vibrations, it is difficult to make any reasonable guess about the depth of bed rock and the overburden thickness.

However, as the highly broken core pieces have been intercepted in the drill hole after a depth of 20m and no soil or sand wash has been reported, the depth of bed rock could be assumed to be around 20m. With the presumption that the bed rock is about 20 m deep, the location of Surge Shaft is OK. Detailed explorations would be needed at the time of detailed design for confirmation of the subsurface character of the strata and if sound rock is not found at about 20 m depth then the location of the Surge Shaft may have to be shifted towards up hill to reduce excavation in overburden.

Exploratory hole drilled at El. 1985 m for exploring the rock strata along p/s alignment reveal that phyllitic-quartzitic rock has been interrupted below about 15m thick overburden. The interpreted geological section based on the drill hole data and the rock exposure present on the slope face, it is suggested that the

penstock alignment would pass through overburden for a stretch of about 100 m before day lighting on the slope which shall have to be negotiated by providing a cut and cover section.

3. Power House Complex

At power house site 3 exploratory holes have been drilled to explore the foundation conditions. The phyllitic-quartizitic bed rock has been observed to be present at this site at El.± 1735 m below an overburden of river terrace material, which is about 15 m thick. Therefore the pit type power house can be founded on rock surface after removing this overburden.

Sd/-
1. Er. Naresh Kumar
Chief Engineer (Design)
HPSEB, Sundernagar

Sd/-
2. En. S.K. Gupta
Chief Engineer (I & p)

PROGRESS REPORT ON GEOLOGICAL INVESTIGATIONS OF BAJOLI HOLI HYDROELECTRIC PROJECT, CHAMBA DISTRICT, HIMACHAL PRADESH

(Field Season 2005-06 & 2006-07)

Pradeep Singh
Geological Survey of India

Abstract

1. The 180 MW capacity Bajoli Holi hydroelectric project proposed to be a run of the river across Ravi in Chamba district of Himachal Pradesh envisages construction of a Barrage across River Ravi near village Bajoli, a 14.1 Km long head race tunnel and a surface pit type power house on the right bank of Ravi about 2 Km downstream of Holi. The entire project lies on the southern limb of a regional synform in the interbedded sequence of quartzite and phyllite rock with occasional bands of carbonaceous phyllite belonging to Katarigalli formation.
2. The proposal of Dam site located about 50m downstream of the confluence of the Ravi river with Channi Nala was explored with two drifts excavated on each abutment and three drill holes in the river bed. The proposal was rejected due to presence of a thick overburden of more than 25m, restriction of space for creation of job facilities and availability of insufficient storage capacity.
3. At the Barrage site, the foundation grade rock is available in the river bed at a depth of about 16m. On the right abutment, a steep rock face is exposed whereas the left abutment is overlain by 1.5 to 14m thick slope wash debris. Acceptable foundation would has to be achieved by removing this debris material. The site conditions are favorable for a concrete gravity dam.
4. For the power house site, after detailed examination of various alternatives, it was decided to construct a pit type power house on the right bank of Ravi river just upstream of the Oi Nala by utilizing the rock bench at El. ±1740m leaving about 10 of rock ledge on the river side. The power house area has been explored by three drill holes. The bed rock foundation is about 15 to 20m deep beneath a overburden of river terrace deposit. The foundation surface is much above the highest flood level predicted at this location and there is no risk of the power house pit being affected by seepage from the river side. Behind the power house, the rock is exposed on the steep hill slope upto 150m height. Above the rocky face, the slopes are covered by slope wash debris which in turn are overlain by a huge glacial fan deposit. The hill slopes are prima-facie stable and not likely to pose any stability problem. The surface penstock is proposed on this hill slope. There will be about 75m long cut and cover section in the glacial deposit followed by a 170m long pressure shaft in the phyllitic rock.
5. At the Surge Shaft location a deep glacial fan deposit is present The drill hole drilled up to a depth of 100.5m at the top of the surge shaft at El. ± 2050m has

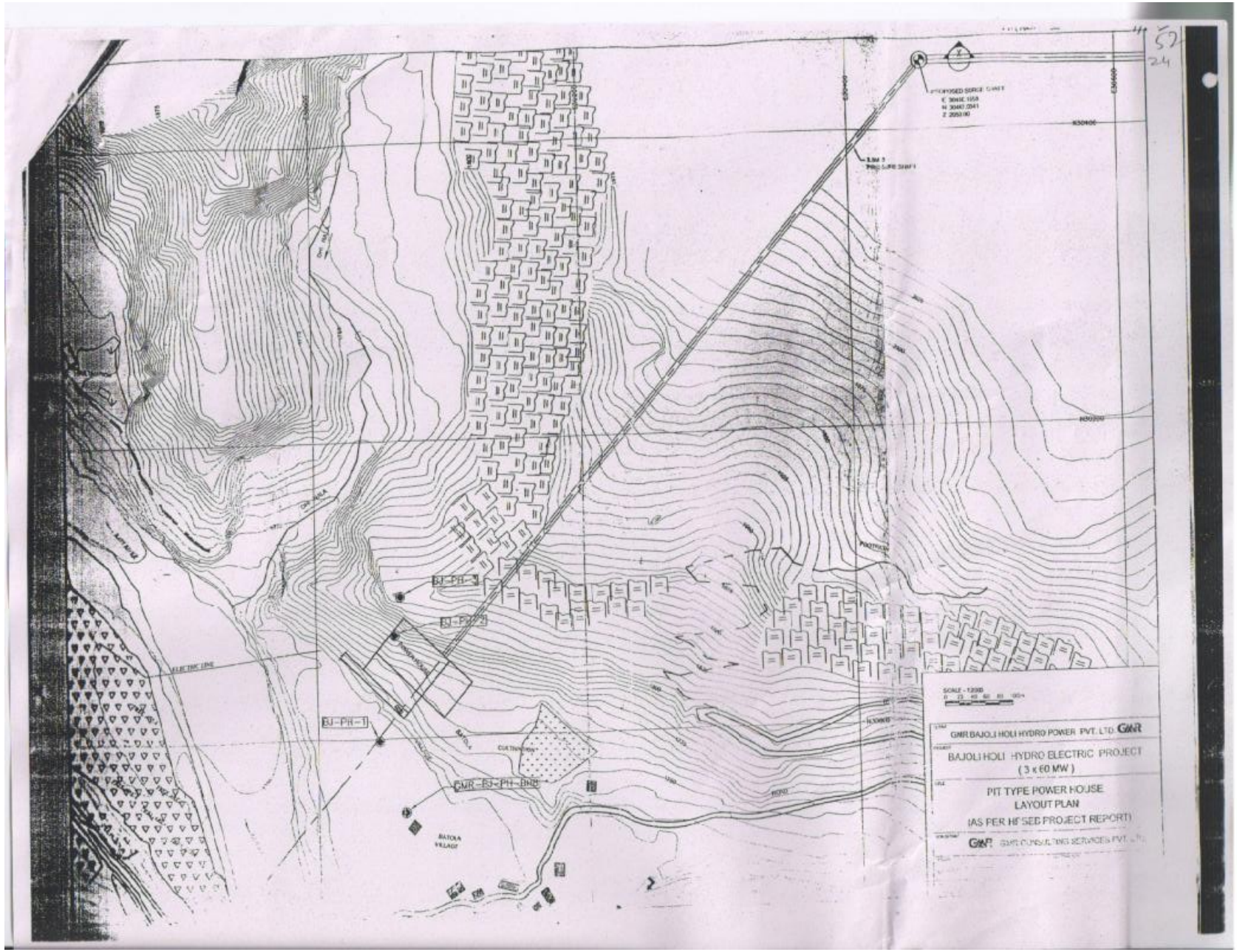
intercepted, an overburden of soil and grit up to 27m depth. Below this highly broken core pieces of phyllite and quartzite are intercepted with nil RQD up to a depth of 75m. As no drill hole wash has been reported below 27m depth, it can be assumed that bed rock is intercepted at 27m depth and the rock mass is poor in quality. However, it is possible that bed rock could be much deeper. Further explorations would be needed at the time of detailed design for establishing the bed rock profile and if it is found to be more than 27m deep then the Surge Shaft location may have to be shifted towards hill to reduce excavation in the overburden.

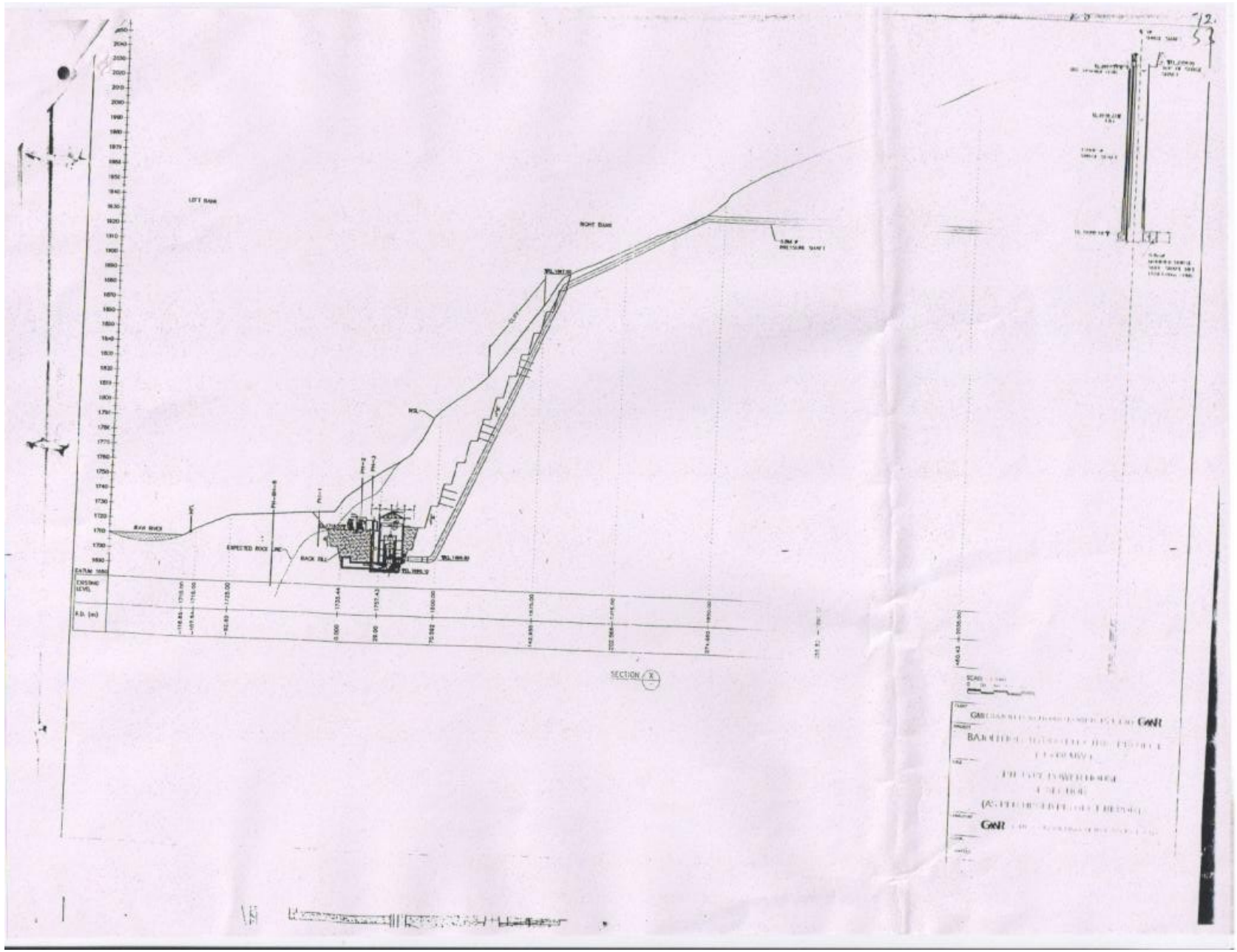
6. The 14.1 Km long head race tunnel and the five intermediate adits would be intercepted by interbedded sequence of quartzite and phyllite rock. In general rock mass would be very good to good. The occasional bands of carbonaceous phyllite as well as few shear seams 2 to 4m thick are also likely to be intercepted along the tunnel route. Beside some zones of discrete shearing 10 to 20 cm thick and fracturing are also likely to be intercepted along the tunnel route. All these features will render the rock mass poor and will require special treatment and support.

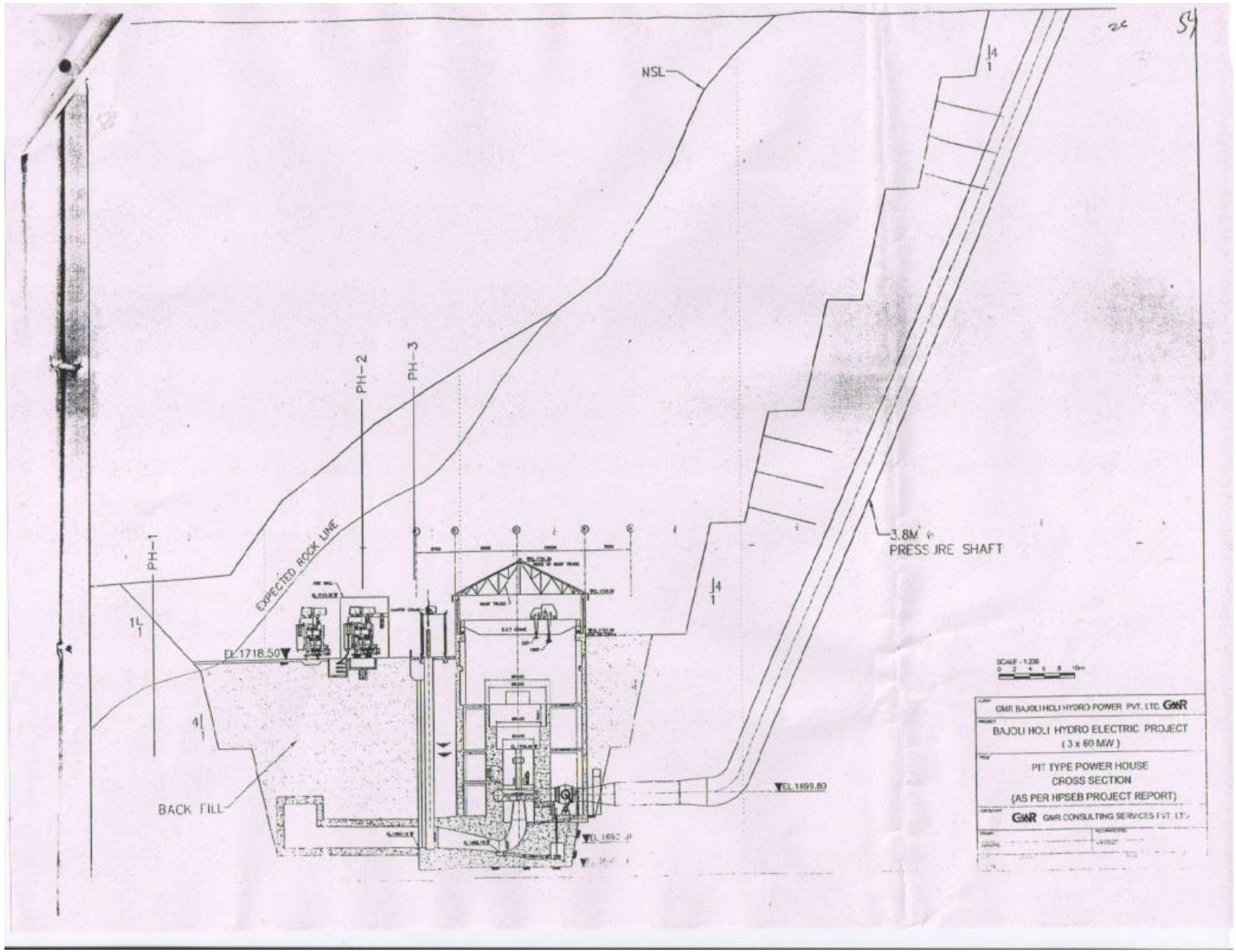
7. The head race tunnel has sections with very high cover up to 1300m. The cover is more than 500m for a total of about 7.5 km. This will result in high stresses. In massive competent rock with low intact rock strength this can result in spalling and slabbing. Also with high cover, the squeezing ground may be encountered in reaches where shear seams, highly fractured rock and carbonaceous phyllite bands are intercepted.

8. Exploration by drilling may have to be taken up in Kala Nala and depending upon the availability of suitable cover, shifting of the tunnel alignment towards the river side may be tried as it would result in reduced length of the tunnel including the construction adits and in reduced cover across the entire length of the tunnel.

9. The area lies in Zone V of the seismic zoning map of India characterized by high rate of seismic activity. Therefore, suitable seismic coefficients have to be incorporated in the design of the structures.


BJ-PH-3
BJ-PH-2
BJ-PH-1
GMR-BJ-PH-BNB
ELECTRIC LINE
RATOLA VILLAGE
GMR BAJOLI HOLI HYDRO POWER PVT. LTD.
BAJOLI HOLI HYDRO ELECTRIC PROJECT
(3 x 60 MW)
PIT TYPE POWER HOUSE
LAYOUT PLAN
(AS PER HPSEB PROJECT REPORT)


LEFT BANK
RIGHT BANK
EXPECTED ROCK LINE
BACK FILL
SECTION X


NSL
PH-1
PH-2
PH-3
EXPECTED ROCK LINE
EL 1718.50
BACK FILL
EL 1699.80
3.8M Ø
PRESSURE SHAFT
SCALE - 1:200
GMR BAJOLI HOLI HYDRO POWER PVT. LTD.
BAJOLI HOLI HYDRO ELECTRIC PROJECT
(3 x 60 MW)
PIT TYPE POWER HOUSE
CROSS SECTION
(AS PER HPSEB PROJECT REPORT)
GMR CONSULTING SERVICES PVT. LTD.