REMIT HYDRO
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Regd No. 129557/071/072

Expression of Interest (EOI)

For

Updated Feasibility Study and Detailed Engineering Design of Ghunsa Khola Hydroelectric Project

Job No: 02/73/74

Issued on: 2074/01/14 (2017/4/27)

Remit Hydro Ltd.
Babarmahal, Kathmandu, Nepal
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REMIT HYDRO LIMITED

Babarmahal, Kathmandu

(Subsidiary Company of Jalvidhyut Lagani Tatha Bikas Company Limited)

NOTICE FOR EXPRESSION OF INTEREST (EOI)

For

Updated Feasibility Study and Detailed Engineering Design of Ghunsa Khola Hydroelectric Project

First date of Publication: 2074/01/14 (2017/4/27)

1. Remit Hydro Ltd. (RHL) is developing Ghunsa Khola Hydroelectric Project (GKHEP) of 71.5 MW installed capacity in Taplejung district. RHL intends to procure consulting services for Updated Feasibility Study and Detailed Engineering Design ("the services") of GKHEP ("the project").
2. This Invitation for Expression of Interest (EoI) is made to invite applications from interested and eligible National or International Consulting firms and/or their joint ventures (JV) for the services. The total number of JV partners shall not exceed three (3).
3. The applying consulting firm must have at least 7 years of experience in Feasibility Study/Detailed Engineering Design/ preparation of Detailed Project Report (DPR) and Preparation of Tender Documents for hydropower projects.
   Note: Experience and qualification of other firms, whether parent or subsidiary firm, will not be considered for evaluation. Likewise, qualification and experience of the consulting firm associated as a sub-consultancy will not be considered for evaluation for short listing.
4. The international consulting firm shall apply as JV including at least one (1) national consulting firm as JV partner.
5. The scope of the services shall include, but are not limited to the following:
   - Updated Feasibility Study of the project.
   - Detailed engineering survey, investigation and design of overall project components and preparation of Detailed Project Report.
   - Preparation of cost estimates, necessary drawings and tender documents for the project.
6. The services of the consultant are required for a period of eighteen (18) calendar months in total.
7. Eligible interested consulting firms must provide information regarding description of completed similar assignments and availability of appropriate professional staff etc. including documentary evidence that they are qualified to perform the services. Such information must also include a brief description of the firm together with the organization structure and staffing. In particular, the information must include experience of the firm in feasibility study, detailed engineering survey, design, cost estimate and preparation of Detailed Project Report (DPR) and tender documents of hydropower projects. The consulting firms must provide information on jobs undertaken at least in the past 7 years giving a brief description of each job undertaken and information on the employer. The firm's experience must be supported by client's/employer's reference.

8. Each consulting firm is permitted to submit only one EOI either single or in a JV. Failing to comply with this provision shall prevent the firms from being shortlisted. Firms participating as JV must mention the name of the lead partner also.
9. Three to six highest ranked short listed firms with the most appropriate qualifications and references will be invited to submit the Request for Proposal (RFP).
10. Brief description and further information of the services and evaluation criteria for short-listing of the firms can either be collected from the address mentioned below during office hours or be referred from http://www.hidcl.org.np/.
11. EOI must be submitted in hard copy to the address mentioned below during office hours on or before 17:00 hrs local time on Baisakh 28, 2074 (May 11, 2017). If the deadline falls on a public holiday it shall be extended to the next working day. The submission shall be made in sealed envelope with the following title.
    "Expression of Interest (EOI) for Updated Feasibility Study and Detailed Engineering Design of Ghunsa Khola Hydroelctric Project"
12. RHL reserves the right to cancel the whole process at any time and it is not bound to accept any or all EOIs received without incurring any liability to the firms.

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2. INSTRUCTIONS TO APPLICANTS

2.1 GENERAL

2.1.1 Scope of the Service

Remit Hydro Limited (RHL) intends to obtain Expression of Interest (EOI) from eligible national firms or Joint Venture (JV) of national firms or JV of International firms including at least one (1) national form as JV partner for Updated Feasibility Study and Detailed Engineering Design of Ghunsa Khola Hydroelectric Project- ***("the Services")*** of Ghunsa Khola Hydroelectric Project (GKHEP) at Taplejung District.

The selected consultant will complete "the services" within 18 calendar months from the date of commencement of the Services as stated in Contract Agreement.

2.1.2 Sources of Funds

Remit Hydro Limited, a subsidiary company of Jal Vidyut Lagani Tatha Bikas Company Ltd., will finance the cost for the services from its own resources.

2.1.3 Clarification on EoI Document

Applicants requiring any clarification on this EoI document may seek clarification by contacting RHL during office hours on all working days prior to the deadline for EoI submission at the address below.

Remit Hydro Ltd.
Babarmahal, Kathmandu, Nepal
Tel: +977-1-4257024/25
Email: info@hidcl.org.np

2.1.4 Amendment to EoI Document

- At any time prior to the deadline for the submission of the completed EoI document, RHL may amend the EoI, for any reason, whether on its own initiative or in response to a clarification requested by an applicant.
- All applicants will be notified in writing about the amendments. All applicants will be bound by the amendments. Applicants will be required to acknowledge receipt of any amendment within three business days of such receipt. Otherwise, RHL will assume that the information contained in the amendment is taken into account by the Applicant in its Application.

2.1.5 Cost of Preparing EoI and Liability

Applicant shall bear all costs associated with the preparation and submission of the EoI document. RHL in any case will not be responsible or liable for these costs, or have any other liability to any Applicant, regardless of the conduct or outcome of the EoI process.

2.1.6 Joint Liability for Joint Venture Application

By submitting an EoI in joint venture, the applicant represents that, if qualified and if awarded the contract after the RFP process, the applicant with its constituent members shall be jointly responsible to perform the obligations of such contract.

2.2 Deadline for Submission of EoI Document

The completed EoI document should be submitted to RHL office at the mentioned address within 15th day from the first day of publication of this notice.

2.3 Withdrawal of EoI Document

Applicants shall not be permitted to withdraw the EoI application that has been submitted.

2.4 Preparation of EoI Document

Detail procedure for preparation of EoI documents is given in Section – 3.

2.5 Evaluation Process

RHL will carry out evaluation of the EoI documents based on the criteria approved by RHL. Anything not mentioned in this document regarding the EoI process shall be governed by the prevailing Public Procurement Acts and Regulations of the Government of Nepal.

The evaluation of EoI documents will be done in two stages (i) Screening of EoI Application of all firms for eligibility; and (ii) Evaluation of EoI document of eligible firms.

i) Screening of EoI Application

i	Copy of Company Registration certificates of consulting firm
ii	Copy of VAT certificate
iii	Copy of Income Tax Clearance Certificate for fiscal year 072/73
iv	Self Declaration as per clause 40 – 2 (e) of Public Procurement Rule, 2064 mentioning their eligibility, non-conflict of interest, non receipt of any punishment while doing consulting business (In case of JV, the firm should submit Self Declaration either separately or jointly by signing each member of JV mentioning information requested in Self Declaration)

Note: Each member of the JV shall submit above documents. Failing to provide those documents will not be considered for further evaluation.

In case of Joint Venture following Documents shall be provided.

i	Joint Venture agreement between JV partners signed and stamped by company seal by each member and clearly mentioning the name of lead firm, name of JV partners, roles and responsibilities of each member and signature of authorized signatories
ii	Power of attorney of authorized signatories of JV agreement from their respective firm with signature & seal for each member of JV.
iii	The total number of consulting firms including the lead firm should not exceed a maximum of three (3) in joint venture
iv	The minimum share percentage of the lead firm should be at least 40% and that of other JV partners should be at least 20%.

Note: In any case, the firms are not allowed to enter into more than one joint venture for same job.

Consulting firm or any member of joint venture, failing to submit the above mentioned documents and not meeting the eligibility criteria mentioned above will be considered as non-eligible and will not be considered for further evaluation.

ii) Evaluation of EoI Document of Eligible Firms

The basic criteria for the evaluation of EoI documents are as follows:

Marks Allotted for Evaluation

S.N	Description
i	Financial Capability of the Firm- 20 Marks
ii	Experience of the Firm -40 Marks
iii	Key Professional Staffs to be Deployed for the Project (Qualification and Experience)- 40 marks

Detail Evaluation Criteria of the EoI document are as follows:

S.N	Description		Marking	Weightage
A	**Financial Capability of the Firm**		**20**	
	I	Average Annual Turn Over in millions (in NRs.) of best three years of last five consecutive fiscal years		20.00
	a	>150	100%	
	b	100-150	85%	
	c	50 to 100	70%	
	d	<50	0%	
B	**Experience of the Firm**		**40**	
	I	**General Work Experience of the Firm**		8.00
		More than 15 Years of Experience	100%	
		11-15 Years of Experience	85%	
		7-10 Years of Experience	70%	
		Less than 7 Years of Experience	0%	
	II	**Work experience of the firm in Detailed Engineering Design/Preparing Detailed Project Report of Hydropower Projects in last 7 Years.**		24.00
	a	At least one project with capacity more than 50 MW	100%	
	b	At Least one Project of capacity 30-50 MW	85%	
	c	At least one project of capacity 10-30 MW	70%	
	d	Less than 10 MW	0%	
	III	Work experience of the firm in Feasibility Study of Hydropower Projects in last 7 Years.		8.00
	a	At least one project of capacity greater than 50 MW	100%	
	b	At least one project of capacity 30-50 MW	85%	
	c	At least one project of capacity 10-30 MW	70%	
	d	Less than 10 MW	0%	
C	**Key Professional Staffs to be Deployed for the Service**		**40**	
	I	**Qualification of the Key Personnel**: Marks will be equally distributed among the list of key Personnel/Professionals		6
	a	Ph. D. / Master Degree Holders	100%	
	b	Bachelor Degree Holders	85%	

	II	**Experience of the Key Professional**		34
		Team Leader (Minimum 20 years of experience after graduation and should have qualification of Masters degree in relevant subject)	1*3=3	
		Hydropower Engineer (2 nos) Structural Engineer Contract /Procurement Specialist (2 nos) (Minimum 15 years of experience after graduation and should have qualification of Masters degree in relevant subject)	5*2=10	
		Engineering Geologist Geotechnical Engineer (2 nos) Seismologist Economist/ Financial Analyst Environmental Engineer/ Environmentalist Sociologist/Anthropologist (Minimum 10 years of experience after graduation and should have qualification of Masters degree in relevant subject)	7*1.5=10.5	
		Hydrologist Hydraulic Engineer (2 nos) Road Engineer Civil Engineer (2 nos) Electrical Engineer Mechanical Engineer Costing Engineer (Minimum 7 years of experience after graduation and should have qualification of Bachelor degree in relevant subject)	9*1=9	
		Senior Surveyor GIS expert (Minimum 7 years of experience after graduation and should have qualification of at equivalent to Bachelor degree in relevant subject)	2*0.75=1.5	
Total			**100**	

Note:

a) In case of JV, average annual turnover of the JV shall be evaluated taking into account the shareholding percentage for the service as stated in the JV agreement for the EoI. If the JV agreement is not clear about the percentage of shareholding, the marks allocated for Financial Capability of the Firm shall be evaluated as zero.

b) The experience of the firm should be supported with evidence/proof of experience/ completion certificates showing the project size and date of completion of the assignment. The experience of the firm without evidence/proof or experience certificate or approval letter will not be considered for evaluation.

c) Same key personnel should not be proposed for more than one designation of the service. If proposed so, marks will not be given for such professional.

2.6 List of Key Professional Staffs to be Deployed for the Service

S.N	Designation	Required no.
1	Team Leader	1
2	Hydropower Engineer	2
3	Engineering Geologist	1
4	Geotechnical Engineer	2
5	Seismologist	1
6	Hydrologist	1
7	Senior Surveyor	1
8	Hydraulic Engineer	2
9	Structural Engineer	1
10	Civil Engineer	2
11	Road Engineer	1
12	Electrical Engineer	1
13	Mechanical Engineer	1
14	Costing Engineer	1
15	Economist/Financial Analyst	1
16	Contract Procurement Specialist	2
17	Environmental Engineer/Environmentalist	1
18	Sociologist	1

2.7 Screening of EoI Document

Initially, screening of received EoI document will be done based on approved eligibility criteria mentioned in section 2.5 (i). Each Consultant must 'pass' each and every criteria of eligibility. Any Consultant not complying with any one of these criteria will be considered as non-eligible for further evaluation.

2.8 Short Listing of Consulting Firm

After initial screening the consulting firms will be further evaluated based on the Evaluation Criteria as mentioned in Section 2.5(ii). Applicants obtaining at least 70 % marks in the EoI evaluation process shall be shortlisted as per the approved EoI Document for this Job. Three to six highest ranked firms with the most appropriate qualifications and references will be invited to submit the Request for Proposal (RFP).

2.9 Clarification during Evaluation

During the evaluation, RHL may request the Applicant for necessary clarifications. The Applicant shall furnish necessary clarifications expeditiously by post/courier/fax/e-mail or by any other means of communication to RHL office at the address given in EOI notice.

Failure to provide information essential clarification, or to provide timely clarifications or substantiation of the information furnished, RHL can declare such Applicant as non-responsive and reject his/her application.

2.10 Rejection of Application

i) RHL reserves the right to accept or reject any or all EoI proposals with or without giving any reason whatsoever and is not liable for any losses to the applicants due to such rejection.

ii) Providing false or wrong information, document or evidence by any firm or joint venture will result in rejection of the EoI document of the firm or their joint ventures.

2.11 Indicative ToR

The information regarding the project area, brief description about the project, scope of works etc are provided in Annexes with this document.

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3. EXPRESSION OF INTEREST SUBMISSION FORM

The EoI document shall be structured in accordance with the outlines given in the EoI form and must contain accurate and complete information as requested in the EoI form. The EoI document shall have no overwriting, except as necessary to correct errors made by the Consulting firm itself. Any such correction must be initialed by the person authorized to sign the application and stamped with the firm's seal.

3.1 Documents to be submitted

The completed EoI documents to be submitted by the applicants shall comprise of the following documents:

Form Type	Description/Content
Form A	General Information
Form A-1	Letter of Submission
Form A-2 (if applicable)	Joint Venture (JV) Information (Attach JV Agreement, Power of Attorney, Share Percentage)
Form A-3	Self Declaration Form
Form A-4	Eligibility Document (Attach Registration Certificate, VAT, Income Tax Clearance
Form A-5	Identification of Consulting Firm
Form A-6	Financial Capability of Consulting Firm (Attach Audit report of last 5 consecutive fiscal years)
Form B	Relevant Work Experience of Consulting Firm in Feasibility Study, Detailed Engineering Design/Detail Project Report of Hydropower Projects
Form C	Details of Key Professional Staffs to be Deployed for this Study

Note: The EoI Document should be prepared and submitted in above mentioned sequence including supporting documents with respective information

FORM A-1: LETTER OF SUBMISSION

Date: .....

To,
Remit Hydro Limited,
Babarmahal, Kathmandu

Dear Sirs,

We, the undersigned, offer to provide the consultancy services for "***Updated Feasibility Study and Detailed Engineering Design of Ghunsa Khola Hydroelctric Project***" in accordance with your invitation for Expression of Interest dated ... and we hereby submit our Expression of Interest.

We are submitting our interest declaring that all the information and statements made in this EOI are true and accept that any misinterpretation contained in it may lead to our disqualification.

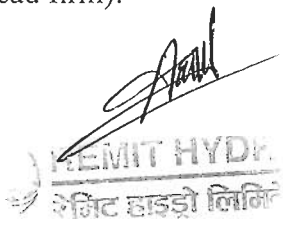
This application is made in the full understanding that:

- RHL and its authorized representatives are authorized to contact any of the signatories to this letter for any further information.
- All decisions by RHL related to this EOI are final, binding and not subject to review.
- We are fully aware of the locations of the project and
- We fully understand the Evaluation Criteria.
- RHL shall not be liable for any decisions or actions related to this EOI and shall be under no obligation to inform the applicant of the reasons for its decisions or actions.
- We hereby provide our willingness and commitment to abide by all applicable laws, regulations, and other requirements having the effect of law in the execution of this study, if selected.

Yours Sincerely,

Authorized signature:

Name and title of signatory/authorized representative:
Name of firm/JV:
Address:
Phone No.:
Fax:
Email:
Firm stamp (lead firm):



FORM A-2: JOINT VENTURE INFORMATION

S.N	Name of the Firm	Postal Address, Telephone, Fax and Email	Name of the Contact Person	Telephone of Contact person	Share Percentage in JV
1	Lead Firm				
2	Partner Firm				
3					

Note:

1. Maximum three (3) Firms can make Joint Venture.

2. In case of JV, the minimum share percentage of lead firm must be 40% and that of partner firms must be 20%. The lead firm should hold the power of attorney.

3. Provide duly signed and stamped joint venture agreement and power of attorney of the signatories by each member in the JV

FORM A-3: SELF DECLARATION FORM

[Letterhead paper of the Applicant, In case of Joint Venture, by the Lead Firm)

Date: .....

To: Remit Hydro Limited,
Babarmahal, Kathmandu
Nepal

Dear Sir,

We, the undersigned, on behalf of (Name of firm/name of all firms of Joint Venture in case of JV) declare that we are legally eligible to participate in the procurement process of consulting services for ***"Updated Feasibility Study and Detailed Engineering Design of Ghunsa Khola Hydroelctric Project"***.

We also declare that we do not have any conflict of interest in the proposed assignment. We hereby also declare that we have not received any punishment while doing consulting business.

(In case any member of the consulting firm is not eligible to participate in procurement process or have conflict of interest in the proposed assignment or have received any punishment while doing consulting business or litigation history if any should be clearly mentioned in this self-declaration form with reasons whatsoever.)

Signature

Name

Designation For and on behalf of (Name of Applicant or Lead Firm of joint venture)

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FORM A-4: ELIGIBILITY DOCUMENT

i	Copy of Company Registration certificates of consulting firm
ii	Copy of VAT certificate
iii	Copy of Income Tax Clearance Certificate for fiscal year 072/73
iv	Self Declaration as per clause 40 – 2 (e) of Public Procurement Rule, 2064 mentioning their eligibility, non-conflict of interest, non receipt of any punishment while doing consulting business (In case of JV, the consultants should submit Self Declaration either separately or jointly by signing each member of JV mentioning information requested in Self Declaration)
v	Joint Venture agreement between JV partners signed and stamped by company seal by each member and clearly mentioning the name of lead firm, name of JV partners, roles and responsibilities of each member and signature of authorized signatories
vi	Power of attorney of authorized signatories of JV agreement from their respective firm with signature & seal for each member of JV.
vii	Power of Attorney to lead firm from JV partners.

FORM A-5: IDENTIFICATION OF CONSULTING FIRM

Full Name of firm:

Address:

(Please attach location of your office)

Telephone number: Fax number: Email: Others:	Year of establishment: Number of year of establishment:
Corporate registration: Date of registration: Registration No.:	VAT registration: Date of registration: VAT registration No.:
Date of last renewal: Valid up to:	
Name and address of contact person: Name and designation of contact person: Address: Telephone number (office): Telephone number (residence): Fax: Email:	

FORM A-6: FINANCIAL CAPABILITY OF THE CONSULTING FIRM

Full name of the Consulting Firm:

Turnover of the last five consecutive fiscal years

Description	FY ----------	FY ----------	FY ----------	FY ----------	FY ----------
Turn Over					
Turn Over in NRs. for National Firms and USD for International Firms					

Turn Over of best three years

Description	FY ----------	FY ----------	FY ----------	Average Annual
Turn Over in NRs. for National Firms and USD for International Firms				

Note:

1. Provide similar information for each member in case of joint venture.

2. Submit Audited Reports of last five consecutive fiscal years

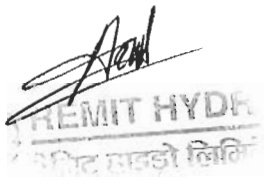
FORM B: EXPERIENCE OF THE FIRM

Relevant Work Experience of the firm in Feasibility Study, Detail Engineering Design/Detail Project Report of Hydropower Projects (in last 7 years)

Using the format below, please provide information on each assignment for which the firm and each associate was legally contracted either individually as a corporate entity or as one of the major companies within joint venture/an association, for carrying out consulting services similar to the ones requested under this assignment.

S.N.	Name of project	Location	Name and address of client	Value of contract	Year of completion	Project duration (months)	Description of the relevant work carried out

To substantiate the above, the applicant shall submit the copies of reference letters.



INDICATIVE TERMS OF REFERENCE (TOR)

The Scope of Works for Updated Feasibility Study and Detailed Engineering Design of Ghunsa Khola Hydroelctric Project shall include but not necessarily be limited to the following:

1. Collection and review of previous study reports, manuals, standards, guidelines, legislations, policies & plans, maps, drawing etc. all necessary for preparation of the Detailed Project Report and the contract documents.
2. Conduct desk study and site visit, analyze the available data and identify data gap of previous study & recommend the further additional study needed to prepare bankable and implementable detail design.
3. Update existing feasibility study conducted in 2012 and prepare detailed feasibility study.
4. Conduct detailed engineering survey and field investigation for topographical surveys, hydro-meteorological surveys, sediment studies, study of impacts of climate change, geological, geophysical & geotechnical investigations including drilling and test adits (if any), seismicity/seismic study, construction materials survey, communication surveys, construction power survey, project internal road, power evacuation survey and transmission line surveys as per requirements for detailed engineering design.
5. Conduct hydraulic physical modeling after review feasibility study and make necessary changes before finalizing the design of the headworks.
6. Compile and analyze the outcome of the field survey and investigation, prepare required specific maps and reports and use these maps, data & parameters for detail design.
7. Prepare and establish design criteria for the detailed design of all major project components and associated structures as per recognized best practices.
8. Prepare final layout & design and conduct optimization of the components and associated structures.
9. Conduct detailed engineering design of civil structures, hydro-mechanical equipment, electro-mechanical equipment and associated structures of the optimized options.
10. Conduct detailed design and construction drawings for project internal road.
11. Conduct detailed design of switchyard, transmission line and substation.
12. Prepare Site plan for all the necessary facilities including but not limited to water supply, substation for construction power, distribution lines, camp facilities for the developer, consultant and the contractor, construction yard, parking lots, landscaping plan of the headworks and powerhouse area etc.

13. Review of the EIA Report and prepare supplementary EIA report if required by the law.
14. Utilize the recommendations of the environment report in detailed design.
15. Prepare tender drawings and detail construction drawings.
16. Conduct rate analysis, prepare quantity estimate & cost estimate based on the district rate and projecting it to the project sites.
17. Prepare construction plan/schedule and project implementation with due consultation with the client.
18. Conduct economic and financial analysis including sensitivity and risk analysis.
19. Analyze and propose appropriate contract/implementation model and institutional arrangement for project implementation.
20. Prepare tender documents for civil structures, hydro-mechanical equipment, electro-mechanical equipment and associated structures all or separately if needed.
21. Prepare tender documents for preparatory works (camp site, project road, bridge, water supply, power supply & other facilities) and transmission line and associated substation.
22. Prepare a complete, bankable and implementable detailed design report of the project including associated structures.

PROJECT DESCRIPTION

1. Background

Ghunsa Khola Hydroelectric Project (GKHEP) was identified through a screening and ranking study of 5 to 10 MW hydropower projects conducted by Department of Electricity Development in 2001. This study proposed the project as a simple run-of-river (RoR) scheme with an installed capacity of 10 MW generated through a gross head of 150 m and a design discharge of 10.83 m^3/s. In this scheme, a 30 m long weir with a side intake diverted river water to a desanding basin on the right bank of the river. From the desanding basin, a 1.5 km long open canal, a forebay and a pair of 1.2 m diameter, 250 m long penstock pipes conveyed water to a surface powerhouse proposed on an old terrace along the river. DoED's screening and ranking study estimated the gross average annual energy of GKHEP at 76.3 GWh. It proposed the power generated from the project to be evacuated to the Integrated Nepal Power System (INPS) through an interconnection at Dhankuta through a new 60 km long, 66 kV transmission line.

In order to assess the suitability of the project for further development, DoED initiated the feasibility study and environmental impact assessment (EIA) of GKHEP in 2007. On behalf of DoED, these studies were conducted by the joint venture of Shah Consult International (P.) Ltd. and SILT Consultants (P.) Ltd. under a contract signed on August 5, 2007. The feasibility study of GKHEP was carried out as per contractual requirements and in accordance with various DoED guidelines, international codes of practice, guidelines and manuals and standard engineering practices. Likewise, the EIA was conducted as per contractual requirements and in accordance with the Environmental Protection Rule 1997. Feasibility Study Report (FSR) of the project was submitted in May 2012.

GKHEP is a Run-of-River type of hydropower project envisaged to be developed in Lelep and Tapethok VDCs of Taplejung district of Eastern Development Region, utilizing the flow of Ghunsa Khola, a tributary of Tamor River. The Ghunsa Khola river basin is located between the co-ordinates of latitudes 27° 31' 55" to 27° 54' 25" North and Longitudes 87°49' 50" to 88°12'25" East. Large part of the basin spans across the north-eastern part of the district.

The scheme is a 71.5 MW (installed capacity) hydropower project with a gross head of 358

m and design discharge of 25.25 cumecs at 40% flow exceedance level. The major structures of the project are a 9 m high and 49.5 m long weir and two intakes (4 m x 3.68 m). A two chambered underground desanding basin of 76 m length is proposed. The headrace tunnel is 3.7 km long, which will lead to a 30 m high surge shaft. The design flow will be directed towards the underground powerhouse through a 345 m high vertical shaft followed by a 215 long horizontal penstock tunnel. The annual energy generation from the project will be 389.82 GWh and the electricity generated will be evacuated through the Koshi Corridor.

2. Description of the Project Area

The project site can be accessed from Fungling towards the North-South Olangchung Gola road. The distance from Fungling towards Olangchung Gola road via Ghhate Khola is approximately 46 km. The headworks location is at a distance of 8.4 km from Ghhatte Khola. All season motorable road is available upto Fungling. From Fungling, track has been opened up toThiwa located at 32 km, where only four wheel drive vehicles operated by local expert drivers can ply safely. However, there is practically no motorable access from Fungling to the project sites. However, only off-road vehicles with 4 wheel drive facility can travel on it. The 3 km long track from Thiwa to Chiruwa is badly damaged and requires major drainage as well as slope stabilization works in practically all of its stretch. The access from Chhiruwa to the confluence of Ghunsa Khola with Tamor and the 8-9 km long project access road from the confluence to the damsite via Japantar is required to be constructed. The headworks site of the project can be accessed after an additional 3 hours walk from Japantar. The project site location is presented in Figure 1.

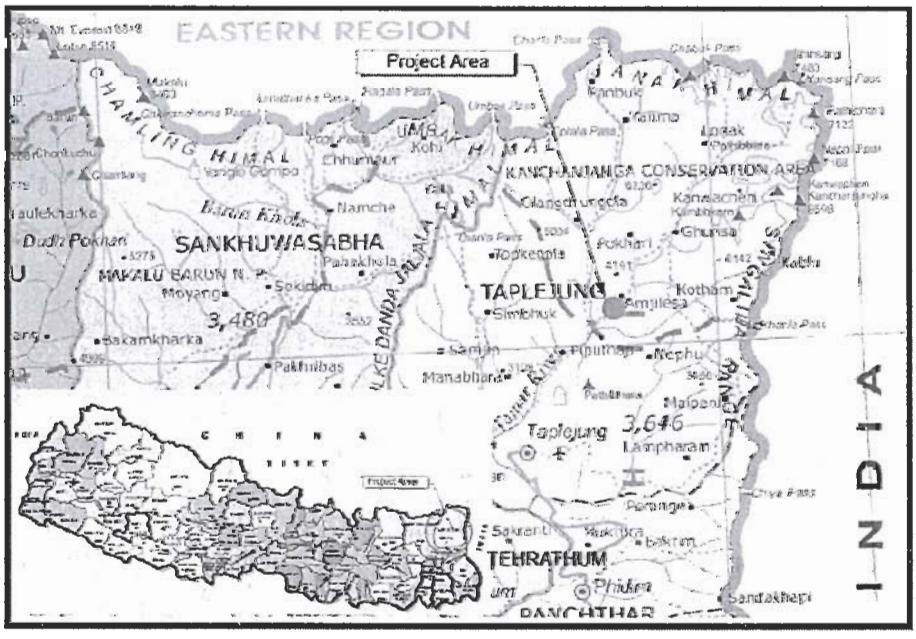


Figure 1: Location of the Project Site

Air transport facility is also available from Kathmandu up to Suketar airport, (approx. 45 km from the project site) and upto Bhadrapur Airport (approximately 255 km from the project site). The services of the airport at Suketar are not reliable owing to persistent adverse climatic conditions.

Ghunsa Khola is a tributary of Tamor River which is a snow fed Perennial River originating from the high Himalayan range of Taplejung district. The altitude of the river basin varies between about 500 m above mean sea level near the confluence of Ghunsa Khola and Tamor River to about 8,598 m above mean sea level at the river source. The highest mountain in the basin is Mt. Kanchanjunga, which has an elevation of about 8,598 m above mean seal level.

The catchment area of the river at the proposed intake site is about 738 km^2. A major portion of this area, about 448 km2, lies above an elevation of 5,000 m and is characterized by permanent snowfall and glacial lakes. About 290 km2 of this area between 3,000 m and 5,000 m witnesses temporary snowfall. Only 25 km2 of the entire catchment is located below 3,000 m. The climate of Ghunsa Khola basin varies from temperate to alpine. Most areas along the hill slopes are warm, but the upper slopes are cool. May, June and July are the hottest months of the year. The average maximum temperature of the project area ranges from 16.8 °C to 26.1 °C, while its average minimum temperature varies between 3.9 °C and 18.3 °C.

3. Salient Features of the Project:

Name of the River	:	Ghunsa
Location	:	Taplejung District, Nepal
Layout	:	Right bank
Type of Scheme	:	Run-of-river
District	:	Taplejung
Latitude	:	27^0 30'45"N to 27^0 34' 15"N
Longitude	:	87^0 10' 00"E to 87^0 13' 00"E
Type of Power Generation	:	Run-of-river

Catchment area at intake site	:	738 Km^2
Gross Head	:	358 m
Net Head	:	341.6 m
Design Discharge (Q40)	:	25.25 m^3/s
Weir	:	49.5 m long, 9 m high
River Intake	:	Two Nos., 4 m wide and 3.68 m high
Connecting Tunnels	:	2 Nos., 4 m wide and 4.75 m high
Desanding Basin	:	Underground, 2 chambered, 76 m long
Headrace Tunnel	:	3.675 km long
Surge Shaft	:	Underground, 30 m high
Vertical Shaft	:	345 m high
Horizontal Penstock Tunnel	:	215 m long
Powerhouse	:	Underground
Tailrace Tunnel	:	350 m long
Installed Capacity	:	71,513 kW
Total Annual Energy (GWh)	:	395.99
Firm Annual Energy (GWh)	:	123.64
Secondary Annual Energy (GWh)	:	272.35
Dry Energy (GWh)	:	49.68
Wet Energy (GWh)	:	346.31
Power Evacuation	:	Proposed Koshi Corridor

4. Description of the Major Project Components:

a) Weir / Intake

A suitable site for diversion weir as shown in the figure is at a narrow section at the right bank of the river at an elevation of 1942 m amsl, downstream of Amjilosa. The proposed weir is 49.5 m long. It will be designed to pass 1 in 500 years flood safely. There will be provision undersluice and appurtenant structures. Side intake with two openings and suitable dimensions will be provided with trash racks to prevent floating materials from passing through the gates.

b) Connecting Tunnel

Connecting tunnel of suitable length will connect the river intake to the desanding basin.

c) Desanding Basin

A desanding basin with a continuous flushing arrangement has been proposed on the right bank of the river to ensure that water entering the waterway is free of sediments that can damage the penstock and turbine due to abrasion. The length of the basin will be 76 m.

d) Headrace Tunnel

The proposed headrace canal will convey water with a design discharge of 25.25 cumec to the surge shaft. The approximate length of the headrace canal is 3.675 m.

e) Surge Tank and Vertical Shaft

A surge shaft is proposed in the ridges on the right bank of Ghunsa Khola near Japantar. It is designed to cater to the upsurge and down surge in the conveyance system due to sudden closure and opening of governor gates. The surge shaft is approximately 30 m. high. A 345 m high vertical shaft connects the surge tank with the horizontal penstock tunnel.

f) Penstock Tunnel

The horizontal penstock tunnel which runs on the stable slope of the project areas connects the vertical shaft to the powerhouse. It is proposed to be 215 m long.

g) Powerhouse

The underground powerhouse will be located in Japantar on the right bank of Ghunsa Khola. The topography of this area is steep to moderately steep. The natural hill slope in the area

appears stable.

h) Power Evacuation

The energy generated from the project will be evacuated to the Koshi Corridor Transmission line which has been proposed to be developed by NEA.

i) Construction Planning

Considering the construction planning of similar projects, the project can be expected to be constructed within about 48 months' time. The construction schedule will be presented after the feasibility study.

j) Power and Energy Production

The installed capacity of the power plant is 71,513 kW at a gross head of 358 m and a net head of 341.6 m. The annual energy production is estimated to be 395.99 GWh. The dry energy is 49.68 GWh and the wet energy is 346.31 GWh. Accounting for auxiliary consumption, transmission losses and forced outages, the net energy generation from the project works out to 382.13 GWh.

5. Topographic study

During the feasibility study, topographic survey of 207.5 ha (33.2 ha at headworks, 25.38 ha along headrace tunnel, 91.09 ha at powerhouse area and 57.83 ha along access road) of land was carried out for the various project structures like headworks, headrace tunnel, powerhouse and access road.

Tacheometric procedures were used to map the topography of the headworks, surge tank, penstock, powerhouse and tailrace areas. For this purpose, horizontal and vertical distance measurements were made with a total station through radial surveys from the control points or from setup points established through traverses run with reference to the control points. During the survey, the locations of different field features were recorded using a coding system to facilitate data processing using mapping software. The surveys were conducted in sufficient detail to permit the preparation of topographic maps at the required scales.

A strip survey of the tunnel alignment covering a corridor of 60 to 100 m was conducted. Detailed sections of cross drainages lying across the tunnel were also surveyed. A total of 3.17 km of land was mapped along the tunnel alignment.

The longitudinal profile of the river was surveyed from 200 m upstream of the weir axis to 680 m downstream of the tailrace axis. The total length of the longitudinal river profile surveyed was 6.4 km.

River cross-sectional surveys were performed along the axes of the dam and tailrace sites. These surveys were also carried out to 500 m upstream and 500 m downstream of the axes at the two sites at intervals ranging between 50 m to 100 m.

Road alignment survey was conducted from the confluence of Ghunsa Khola and Tamor River to the headworks site. This survey was generally carried out along the existing trail covering a corridor of 100 m from its centerline. Detailed surveys of cross drains and other important features along the alignment were also performed.

For the transmission line, a walkover survey was conducted from the powerhouse site to the proposed Kabeli A Hydroelectric Project, from where Nepal Electricity Authority (NEA) proposes to construct a 132 kV transmission line to the national grid. The survey was carried out using 1:50,000 scale topographic maps (Map Nos. 2787 08, 2787 11A to 11D and 2787 12A to 12D). During the survey, notes on the socio-environmental hazards, including forested areas, along the proposed routes were taken.

The topographic data collected from the field were compiled and reduced, and the required topographic maps, longitudinal profiles and cross-sections were prepared using the mapping software SOFTWEL_DTM® and AutoCAD®. The detailed topographical mapping of the headworks and powerhouse sites was carried out to the required scale.

6. Hydrology, Meteorology and Sediment Studies

Hydrological field investigations were conducted to record river stages and discharges at the headworks and powerhouse sites during the study period and thereby develop rating curves for these sites. For this purpose, the following activities were conducted: a. Stream gauging at the headworks and powerhouse sites. b. Direct discharge measurements in the river during low and medium flow periods.

Stream gauging was initiated from the last week of November 2009. For this purpose, two hydrometric stations, each with four one-meter staff gauges, were established at Lamatar near the intake site and at Japantar near the powerhouse site.

Direct discharge measurements were carried out in March 2010, October 2010 and January 2011 based on the area-velocity method. The measurements were performed by the wading method at the suspension bridge at Japantar during low and medium flows.

Rating curves for the hydrometric stations were developed using the stage-discharge records and the cross-sections and longitudinal profiles of the river at these locations. High flows at the hydrometric stations were computed by Steven's method and the slope-area method.

Sampling for suspended sediment was carried out during the 2010 monsoon period (June 14 to September 23, 2010). The collected samples were tested for mineral particle size distribution analysis and mineral content analysis.

Long term time series data are not available for Ghunsa Khola. Empirical methods were used to determine the flow in the river. The mean monthly and annual average flows at the intake are estimated indirectly using the following methods:

1. Transposition of regional long-term flows
2. Transposition of average long-term flows of Tamor River
3. Transposition of long-term flows at Station No. 690 (Mulghat) on Tamor
4. MIP method
5. WECS/DHM method

The average annual flow (31.39 m^3/s) and minimum mean monthly (6.48 m^3/s in March) flow computed by the Regional UAF approach were selected as the design flows for Ghunsa Khola at the GKHEP intake.

Considering the fact that no stream gauging stations or rainfall stations are present on Ghunsa Khola, the floods for the design of hydraulic structures were derived indirectly from the following approaches:

1. Transposition of regional floods
2. Transposition of average floods of Tamor River
3. Transposition of floods at Station No. 690 (Mulghat) on Tamor
4. Intensity-based approach
5. Regional empirical approaches

The following regional empirical methods were used to estimate the Ghunsa Khola floods:

a) WECS/DHM Method
b) Medium Hydropower Study Project (MHSP) Method
c) Dicken's Modified Method

The flood values from Regional UAF have been adopted. According to this method, the flood discharge for 100 years return period that has been adopted is 735 m^3/sec adopted as design flood discharge.

According to the Feasibility Study Report, considering the sediment data from field investigations, a maximum sediment concentration 1,000 ppm has been adopted for the design of the project.

6. Geology

The Ghunsa Khola flows through the eastern region of the Nepal Himalaya. Stratigraphically, the rocks present in the Ghunsa region of the Nepal Himalaya are divided into four major successions, viz. Tethys Sediments, Higher Himalayan Crystallines, Lesser Himalayan Crystallines and Lesser Himalayan Metasediments.

Most of the project area is covered with dense forests. Bedrocks are exposed in steep slopes mainly along riverbeds of Ghunsa Khola, its tributaries and Tamor, while gentle slopes are mostly covered with colluviums. The bedrocks appear to be competent, massive, representing gneisses of the higher Himalayan zone. Bedrocks exposed along the left bank of Ghunsa Khola near its confluence with Tamor seem to dip eastwards, against the flow. Likewise, bedrocks exposed along the left bank of Sumbun Khola have three sets of joints, implying that the exposed rock mass is blocky. The straight nature of Tamor, Ghunsa Khola and Bakim Khola suggest existence of two active faults in the Ghunsa Khola area. Active or dormat landslides are rare in the project area. An active landslide is observed along the left bank of Simbuwa Khola, while a dormant landslide appears to exist on the left bank of Tamor at its confluence with Tamewa Khola. Tectonically, the Ghunsa Khola basin is divided into two zones named the Ghunsa Nappe and the Tamor Nappe). These zones are separated by a thrust plane dipping north and running slightly south of Silap and Thyangyan The Ghunsa Nappe lies above the Tamor Nappe. A few hundred meters northeast of Amjilosa, a sheared magmatite zone of about 25 m thick is developed. The sheared plane appears to be gently dipping north. The rocks are highly distorted, and carbonaceous material is present in the sheared zone. Coarse-grained black biotite schists and quartzites are developed above the sheared zone, but quartz-feldspathic layers, reflecting the effects of migmatization, are present in places. The quartzose schists appear to be tectonized with crosscutting pegmatites in it.

7. Construction materials

Potential quarry sites for coarse and fine aggregates are present on both banks of Ghunsa Khola from Japantar to Lamatar. Test pitting carried out within the riverbeds and terrace deposits show that the deposits along the riverbanks consist of 3 to 5 m of sandy gravel. The gravels are mainly composed of pebble, cobble and bouldery clasts of quartzites and gneisses while the sands are composed of mainly quartz grains with very little amount of feldspars and mica. Results indicate that the coarse and fine materials quarried from the river deposits along riverbanks and flood-plain are suitable for the concrete aggregate. Being of the same origin and nature, the materials from the river deposits all along the riverbeds and banks of the site also appear suitable for concrete aggregates. It should be noted that coarse aggregates can also be obtained from the muck of material of underground excavation. As such, extraction of river deposits for coarse aggregates can be reduced. The estimated quantities of coarse and fine aggregates required for the construction are about 200,000 m^3 and 45,000 m^3, respectively. Therefore, the construction materials available from the river deposits will be more than sufficient.

8. Road network

The project site can be accessed from Fungling towards the North-South Olangchung Gola road. The distance from Fungling towards Olangchung Gola road via Ghhate Khola is approximately 46 km. The headworks location is at a distance of 8.4 km from Ghhatte Khola. All season motorable road is available upto Fungling. From Fungling, track has been opened up to Thiwa located at 32 km, where only four wheel drive vehicles operated by local expert drivers can ply safely. However, there is practically no motorable access from Fungling to the project sites. However, only off-road vehicles with 4 wheel drive facility can travel on it. The 3 km long track from Thiwa to Chiruwa is badly damaged and requires major drainage as well as slope stabilization works in practically all of its stretch. The access from Chhiruwa to the confluence of Ghunsa Khola with Tamor and the 8-9 km long project access road from the confluence to the damsite via Japantar is required to be constructed. The headworks site of the project can be accessed after an additional 3 hours walk from Japantar.

Air transport facility is also available from Kathmandu up to Suketar airport, (approx. 45 km from the project site) and upto Bhadrapur Airport (approximately 255 km from the

project site). The services of the airport at Suketar are not reliable owing to persistent adverse climatic conditions.

9. Transmission line

The feasibility study has shown that among the alternatives considered, interconnection of the project to the Kabeli Substation was most feasible. A walkover survey was undertaken between the GKHEP powerhouse and the proposed interconnection site to select the transmission line alignment. The basic considerations in selecting the route were proximity to access roads, avoidance of populated villages and dense forests, geological stability, minimization of environmental impacts, etc.

The transmission line starts from the GKHEP substation and terminates at the proposed Kabeli Substation. It has two major river crossings, two across Tamor River and one across Kabeli River. The total length of this line is 42 km up to the proposed 132 kV sub-station at Kabeli.

10. Environmental study

Environmental Impact Assessment of GKHEP was carried out as per the Environment Protection Rules, 1997. The EIA was mandated because the project has an installed capacity of over 50 and because it lies within the Kanchanjunga Conservation Area. The EIA, which covers only the generation component of the project including the access road, was conducted with the following objectives:

- Establishment of baseline data on the physical, biological and socioeconomic and cultural conditions in order
- Identification of the adverse, positive and cumulative impacts of the project in terms of the expected magnitude, extent and duration
- Preparation of an environmental management plan and environmental monitoring and auditing plans

A multidisciplinary team of experts, drawn from the physical, biological, social, cultural and economic environment sectors, conducted the EIA. The EIA included data collection through desk studies and field surveys, stakeholder consultations, compilation and interpretation of collected data and preparation of appropriate management, monitoring and auditing plans. The desk studies included review of the following documents:

- Available topographical and geological maps and data
- Technical documents prepared as part of the present study
- Documents published by various national and district level agencies
- Relevant policies, acts, rules, regulations and conventions

Fieldworks related to the EIA were conducted from November 15 to December 8, 2010. For the physical environment, the field studies were carried out through walkover surveys at different project components. During these surveys, information on slope stability, rock types, soil erosion patterns, weathering patterns, land use patterns and pollution levels were collected through direct measurements and observations Field surveys for the biological environment included the following activities:

- Survey of tree and plant species by placing quadrate (10 m × 10 m) at different project components
- Ethno-botanical survey using questionnaires and interviews with local people
- Survey of mammals, birds and reptile through direct and indirect observations as well as information gathered from local people
- Fish sampling with the help of cast net

Likewise, the surveys for the social, cultural and economic environments were conducted using the following techniques:

- Collection of household level data through household surveys
- Stakeholder consultation
- Consultations with Kanchanjunga Conservation Area Management Council (KCAMC) and district level agencies

The major positive impacts in the project area resulting from the implementation of the project include employment to around 1,100 people, increase in economic opportunities, enhancement of technical skills of local people, project-induced development and revenue generation. The project will also contribute to national development through supply of renewable energy. During construction, the project will have the following major adverse impacts on the project area environment:

- Changes in land use of 28.75 ha
- Changes in topography and landscape due to excavation and slope cutting works
- Slope instability and soil erosion due to excavation and spoil dumping
- Air, noise and water pollution
- Drying and degradation of natural springs
- Permanent acquisition of 18.12 ha of government forest land belonging to KCAMC and 3.21 ha private forest/Kharbari land belonging to local people
- Temporary acquisition of 2.09 ha government forest land
- Loss of 3,303 standing trees of 28 species
- Increase in demand of fuel wood and timber
- Loss of non-timber forest products, ecological goods and services due to removal of vegetation
- Loss of natural habitat
- Construction disturbances
- Increased hunting and poaching
- Permanent acquisition of 8.04 ha private land
- Relocation of one house
- Permanent reduction in food grain production and loss of fodder trees
- Impact on health and sanitation, occupational safety and on gender and vulnerable groups
- Conflicts of interest and law and order.

During the operation of the project, the following major impacts are anticipated:

- Changes in hydrology and sedimentation, riverbank erosion and waste disposal
- Reduction in river flow
- Withdrawal in economic activities, release of water in downstream and health and safety hazards.

The EIA report mentions the mitigation measures to mitigate the adverse environmental impacts include preventive, corrective and compensatory measures. It also consists of the Environmental Management Plan.

As per the EIA, the project will have low impact on the physical environment and moderate impacts on the biological and socioeconomic resources of the area, and construction of the proposed project is environmentally feasible if the recommended mitigation measures and

monitoring plans are implemented. The study also shows that the project will help to foster economic and industrial growth in the areas surrounding the project area.

11. The Conclusion and Recommendations Made in the Feasibility Study:

The main conclusions that can be drawn based on the feasibility study are as follows:

1. A hydroelectric development on Ghunsa Khola, identified through a screen and ranking study conducted by DoED and developed further in the present study, is technically feasible. In the present study, GKHEP is designed as a simple run-of-river scheme. Its optimized capacity is 78 MW generated through a rated head of 358 m and a design discharge of 27.31 m^3/s. The plant can produce 414.853 GWh of average annual energy.
2. The capital cost of the project is NRs. 8.773 billion without the transmission line, and NRs. 7.508 billion with these costs added.
3. Economic analysis for the case with access road and transmission line costs included results in a B/C ratio 1.82 at 10% discount rate and an EIRR is 19.77%. Without the transmission line, these figures stand at 2.1 and 23.2%, respectively.
4. Financial analysis of the project, determined from the perspective of a private-sector developer, considering an equity debt ratio of 30:70, results in a B/C ratio of 1.08 at 10% discount rate and an FIRR is 11.55%. Under the conditions assumed, the project appears to be financially viable only at an energy sale rate of NRs. 5.60 per kWh.
5. An Environmental Impact Assessment (EIA) of the project was produced as a separate report. The EIA study confirms that the project will have minimal to moderate adverse environmental and social impacts, typical of a simple run-of-river scheme. There are no upstream or downstream irrigation facilities or community water supply schemes that could be affected by the project. The main impacts of the scheme are as follows:

- The project will acquire 75.854 ha (permanent: 48.7 ha, temporary: 27.1 ha) of land for the project facilities.
- No households will be relocated, though plots of cultivated land will be acquired
- Two protected species, Sal and Simal, are present in the project area, but endangered species of flora and fauna were not found in the project area.
- Direct positive impacts of the project include employment on a long- and short term basis, road and local power supply, as well as contribution to local and regional development due to increased education, health facilities, industrialization, and a general enhancement of the quality of life.

6. The time from start of the detailed design to the commissioning of the first unit is approximately six years. The actual period for commissioning of the first unit is about four and a quarter years.

Considering the current level of investigations and design, the following recommendations are made for the detailed design of the project:

1. The road between Lelep and the initial point of the project access road (proposed bridge across Tamor) is of immediate importance for the overall implementation of the project. Therefore, necessary steps must be undertaken to advance the access road to a detailed design level. Further, concerned agencies should start the implementation of the access road at the earliest such that it shall be ready at the time of initiation of civil construction works of the project.
2. Hydrologic and sediment investigations should be continued.
3. In order to obtain additional subsurface information needed for the detailed design, further geological, geophysical and geotechnical investigations should be performed at the weir site and the locations of all underground structures. These investigations should include core drilling in the river bed and left bank at the weir axis (about 30 m each), at the desanding basin (about 100 m), at the powerhouse (about 200 m) and at the tailrace (about 100 m). Tests adits should be constructed at the locations of the underground powerhouse and the desanding basin to undertake suitable rock mechanics investigations, such as in-situ stress measurements, plate jacking, hydro-fracturing, etc.
4. Model studies will be required to determine the optimum configuration of the weir, river intake, desanding basin, including the approach tunnel, transition and gated flushing structure for continuous flushing. Alternatively, a detailed mathematical model, either numerical or analytical, can be set up for this purpose and the intake and desanding arrangements can be specified as per these results. A comprehensive model of the intake should also be constructed to investigate the sedimentation patterns in the pondage area and the nature and frequency of the flushing operation through the undersluice gate.