GOVERNMENT OF KHYBER PAKHTUNKHWA
IRRIGATION DEPARTMENT

TORs/Guidelines for submission of Proposal
For

Design Review and Construction supervision of Ghozhezai Small Dam Tribal Sub Division Tank

Issued to: _____

Assistant Director
Small Dams Merged Area
Irrigation Deptt.

PROJECT DIRECTOR PSU SMALL DAMS, MERGED AREAS

DIRECTORATE GENERAL SMALL DAMS

January 2022

INFROMATION TO CONSULTANTS REGARDING GHOZHEZAI SMALL DAM TRIBAL SUB DIVISION TANK

1.0 LOCATION

The Ghozhezai Dam is proposed on Ghozhezai Algad and is 4km downstream of Ghorobo and Ghozhezai Algads a tributary of Galarah Nulah. The dam site is located 2km upstream of village Sheikhan Killi and Kunkare. The proposed Ghozhezai Dam falls in the Survey of Pakistan (SoP) Topo sheet No. 38 L/01, 02,05,06 and falls on latitude and longitude i.e. 32°27'13"N, 70°19'29"E respectively. Ghozhezai Algad carries run-off produced solely by rainfall and the dam is proposed to store water for irrigation and drinking purposes.

2.0 HYDROLOGY

The dam axis is proposed on Ghozhezai Algad a tributary of Galarah Nulah. The catchment area of the Ghozhezai dam site is 17.60 Sq. Km(6.79 Sq. mile).The annual inflow at project site is estimated from SCS method. Estimated average annual inflow is 1937.6AF from rainfall with addition of sub-surface flow which is estimated as (2.25 Cusecs) which would generate 1,625AF runoff per annum at project site. Design flood is estimated from SCS unit hydrograph using 24-hour maximum rainfall data.For spillway, design discharge of 114.9 m3/s (4,056 cusec) has been selected based on flood of 500 year return period. Reservoir storage capacity at conservation level of 584.65 m amsl is 1982.4 AF and dead storage corresponding to 569.0 m amsl is 197 AF. About 575 hectares(1420.86 acre) command area can be irrigated at annual demand of about 1,961 acre-ft at 118 % cropping intensity. Useful life of reservoir is above 82 years.

3.0 DAM EMBANKMENT

It is proposed to construct a 28m (91.86 ft) high and 280 m (918.64 ft) long Earth Core Rock fill Dam (ECRD) type of dam to store the flood water. This dam would create a gross storage of 2179.8 AF out of which 1982.4 AF is live storage.

Topography, size and shape of valley favour the construction of earthen dam embankment with the spillway and intake tower as allied structure. Foundation investigations indicate that the abutment rock is exposed on both sides. Sandstone material has been observed interbedded with Clay stone on left and right

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abutments. In Nullah bed, overburden with gravel boulders is present in range of 4 to 6 meters depth followed by layered Clay stone and Sand Stone. Keeping in view the foundation and abutments conditions along with efficient Pore water pressure dissipation and economy, Earthen Core Rock fill Dam (ECRD) seems better option. Selection of ECRD is made due to:

- An inherent advantage of the material availability from excavations and available borrow material access that fulfils the requirements of the dam body.
- ECRD can be built with conventional equipment and procedures.

4.0 SPILLWAY DESIGN

Spillways are provided to release surplus or flood water that cannot be contained in the Reservoir. The excess water is drawn from the top of the reservoir and conveyed through a constructed waterway back to the river or to some natural drainage channel. In addition to providing sufficient capacity, the spillway must be hydraulically and structurally adequate, and must be located properly so that discharges do not erode or undermine the downstream toe of the dam. Usually, a stilling basin is required to dissipate the energy of the water at the bottom of spillway. For Ghozhezai dam, Baffled chute spillway has been designed. Baffle piers dissipate the energy as the water flows down the chute. At the end of baffled chute, stone apron with bed bar arrangement has been proposed to protect the spillway from scouring effect.

The spillway consists 16 m long overflow type un gated. Design discharge for spillway is taken as 114.9 cumecs (4,056 cusecs) for 500-year design flood and spillway crest is kept as 584.65 m amsl.

5.0 OUTLET WORKS

The outlet works are located on left side of the dam about 30 m from the left abutment of dam. The outlet works comprise three major components namely: (i) Intake Structure, (ii) irrigation Conduit, and (iii) Outlet Control Structure with energy dissipation. Intake structure of Ghozehzai Dam is proposed as a vertical type tower extended up to crest level of the dam. Trash rack is provided at front of the tower. Access bridge connect top of the tower to the crest of the dam. The approach of the intake tower is at the elevation of 569 m amsl. The intake structure has base at El.

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567.0 m amsl and top El. 589 m amsl. Conduit pipe of 0.4 m diameter will run beneath the dam which deliver water from reservoir to downstream control section. Total length of conduit is 130 m with the invert level of El. 569 m amsl which correspond to 10 years of silt load in comparison to dead storage of 0.24 MCM. The outlet discharge is controlled by a guard valve and regulating valve installed at the end of the conduit before energy dissipation structure. An impact type stilling basin is provided after the valves to dissipate energy. Stabilizing pound is provided just downstream of impact type stilling basin to stabilize water emerging from stilling basin. Irrigation canal off take from stabilizing pound at invert level of El. 566.07 m amsl.

6.0 IRRIGATION NETWORKS

Fixation of alignment of a canal in hilly terrain plays a pivotal role in achieving hydraulic efficiency with structural economy with ease of construction. The Consultants have worked on various options in order to design the best possible alignment of irrigation system best suited as per topographic survey of site, hence adopted the most feasible option. The canal crossings for water shed depressions; X-Sections of cross drainage works required to be addressed while planning a canal alignment, prior to designing of canal and proposed cross drainage structures.

The capacity adopted for channel design is based on maximum crop water requirement for a specific period of keen demand. It is basically on 10 daily bases as per Crop Water Requirements which have been computed on the base of weather and agricultural routine of crops in the area. The maximum monthly requirement for the keen demand period for the Canal system is 0.142 cumec for 575 ha and the main canal is designed to accommodate 10-daily maximum demand also as well as regular supplies accordingly.

The longitudinal water surface slope for Canal is adopted as 1 in 300 m and 1 in 500 mto provide water for irrigating max command area. Adaptation of a suitable flatter slope after providing necessary drops ensure irrigation to maximum command area by terrace irrigation practices being the norms of the local inhabitants.

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7.0 ECONOMIC ANALYSIS

The project will be implemented in three years. The project is estimated to cost Rs.1,268.043millionincluding escalation of 73.743 million rupees on civil works. The results of the economic analysis showthat the project is economically viable for base cost with EIRR value of 11.11%. The financial analysis also indicates the investment viable with FIRR of 12.02%.

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SALIENT FEATURE OF GHOZHEZAI SMALL DAM TRIBAL SUB DIVISION BANNU

Sr.	Feature	Ghozhezai Dam Project
i	Location	F.R Tank, Pakistan
ii	Coordinates	Northing: 32°27'12.99", Easting: 70°19'28.97"
iii	Name of Stream	Ghozhezai Algad
iv	Purpose of the Project	Storage Reservoir for Irrigation
2	**HYDROLOGY**	
i	Catchment area	17.60 Km^2 (6.79 Sq. Mile).
ii	Annual flows	2.39 MCM (1937.6 AF)
iii	Gross storage	2.69 MCM (2179.8AF)
iv	Live storage	2.45 MCM (1982.4 AF)
v	Dead storage	0.24 MCM (197 AF)
vi	Reservoir area	0.22 Km^2
vii	Reservoir life	82 Years
3	**DAM**	
i	Type	Earth Core Rock Fill Dam
ii	Crest level	589 m asl
iii	Dam Length	280 m (918.6 ft)
iv	Dam Height	28 m (91.86 ft)
4	**SPILLWAY**	
i	Type	Baffled chute spillway
ii	Design Discharge	114.9 cumecs (4057.66 cusecs)
iii	Frequency	500-year
iv	Width	16 m
v	Spillway crest level	584.65 m asl
vi	Energy Dissipator	Chute incorporated with baffled blocks
5	**OUTLET**	
i	Intake type	Vertical Tower
ii	Discharge	0.142 cumecs (5 cusecs)
6	**WATER SUPPLY**	
i	Agriculture supply	2.39 MCM (1,939 AF)
ii	Drinking supply	17.75 AF
iii	Livestock supply	3.99 AF
iv	Total demand	2.41 MCM (1961 AF)
7	**IRRIGATION**	
i	CCA	575 ha (1420.86 acre)
ii	Canals No.	01
iii	Canal length	5,185 m (17011.15 ft)
iv	No. of outlets	07
8	**ECONOMICS**	
i	Project capital cost	Rs. 1,268.043 million
ii	Annual O&M cost	Rs. 12.7 million
iv	EIRR	11.19%
v	FIRR	12.02%

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INSTRUCTIONS REGARDING SUBMISSION OF PROPOSALS

1. Two copies of the technical and one copy of financial proposals in stippled/fixed binded form are required to be submitted. Proposal should be in a sealed envelop indicating original or copy on each enclosure, as appropriate.
2. The proposals shall be valid for a period of 180-days after the last date of submission, which is extendable on the expiry of above period through mutual agreement.
3. The technical and financial proposals of the consultants will be evaluated according to criteria for procurement of consultancy services of the Government of Khyber Pakhtunkhwa, applying weight-age formula of 80:20 for technical and financial proposals respectively.
4. Financial proposals "Technically Qualified" consulting firm will be considered and opened by competent forum in presence of the competitive firms representatives. The contract agreement will be governed by laws and regulations of the Govt. of Khyber Pakhtunkhwa.
5. Any observation on the TOR and LOI must be brought into the notice of the department before last date of submission of the proposals. No objection will be entertained after the submission of Technical and Financial proposals.
6. The employer reserves the right for any addition alteration or amendment in the TOR of the Project.
7. Consultants shall be responsible for payment of all taxes in vogue time to time by Govt in respect of personnel and other activities with no liability to the client.
8. Originally signed CVs of the proposed personnel having contact number and postal address along with availability certificate of the personnel for the Project shall be annexed in the Technical proposal.
9. The consultants shall quote the fee including detailed breakup cost and unit cost of all type of studies/investigations including review of previous studies, topographic surveys, Hydrological, Geological, Geo-technical, Environmental, Social and all other surveys, studies required for the assignment.
10. Payment for the personnel will be made as per actual time consumed on the Project but not in excess of the provision of man months made in the T.O.R. of consultancy.
11. Payment to the consultants for Geo-technical investigation and other investigation will be made as per actual work done at the site on the unit cost quoted by the consultant.
12. On the satisfactory performance of the services, the payment to the consultants shall be made as per actual inputs, while in case of incomplete assignment; the payment will be made for the work done in accordance with the breakup of the services submitted by the consultants.

Other Conditions: -

1) Security deposit and income tax/sale tax etc will be deducted as per the prevailing Government rules notified during period of agreement.

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2) The consultant shall establish Project Manager Office at Peshawar.

3) Consultants shall appear in Project meetings and site visits and shall also make presentation if so directed by the department for which no TA/DA, boarding, lodging and claim for incidental charges etc, shall be entertained.

4) The consultant except with prior approval of the department shall not sublet the study or any part thereof.

5) The consultancy charges shall be inclusive of all costs of topographic survey, subsurface investigations, geophysical surveys and construction materials investigations etc.

6) The consultants will provide undertaking for the effect that the key staff would not be employed on the other projects during the currency of this agreement. Any violation will liable the contract for termination.

7) If the consultant fails to complete any activity or part of activity the client reserve the right to execute the same at the consultant risk & cost.

8) If a project or part of project is dropped due to any reason, man months of the consultant key staff and logistics will be curtailed proportionally.

9) Consultant shall quote cost/fees for each stage of study separately i.e. Design Review & Construction Supervision,

10) Single agreement will be signed for both stages (Review & Design). However separate letter for supervision will be issued after actual work start at site.

11) As per KPPRA rule (Para 24.2 standard procedure for selection of Consultant) successful consultant is required to submit performance security in form of Pay order , demand draft or bank guarantee @ 3 % of bid cost.

12). If the client (Irrigation Department) suffers any lose due to proven Design/ Supervision fault by the consultant. The consultant will be liable to punitive action as per invoke PEC/KPPRA.

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EVALUATION CRITERIA OF PROPOSALS

Proposals of the consultancy firms will be evaluated as under

S.No	Description	Maximum Marks
A	Qualification & Experience of Technical Key Personnel	50
B	Experience of firm in undertaking Projects of dam & Hydraulic structures of similar nature & complexity	30
C	Work Plan/Manning Schedule & Methodology	20
	Total	**100**

Note

- Each page of the proposal must be numbered, sealed & signed by the owner of firm
- Passing marks in each category will be 60%
- Proposals must be stippled binded. Ring binding will not be considered.
- Client reserves the right to make any change in TORs & marking criteria which is commonly applicable to all proposals
- Any observation/clarification required should be brought in notice of the Client / Employer before submission of the proposal during clarification meeting.
- Proposals shall be submitted in two copies (Marked as Original & Copy)
- Any mis-statement or false information provided in the technical or financial proposal will render the proposal as non-responsive and shall make the firm liable for punitive action under the relevant rules.

A. Qualification & Experience of Technical Key Personnel

ii. Marking criteria of Personnel

S.No	Description	Marks	Criteria
1	Qualification	20	B.Sc Civil Eng. or M.Sc in relevant category (16 Years Education)=80%, MS or M.Phil.=90%, Ph.D.=100%
2	Languages	05	Pashto=2 (R W S) Urdu=1.5 (R W S) English=1.5 (R W S)
3	Experience	30	
	General Experience	7.5	Experience after completion of 16 Years education (15 years of general experience will carry full marks)
	Relevant Experience	15	Experience of particular discipline(10 years of general experience will carry full marks)
	Similar (DAM) Projects	7.5	Full marks for 10 Projects
4	Experience of Local Environment	05	Khyber Pakhtunkhwa=03 Pakistan=02
	Total	**60**	**Will be adjusted to 50**

iii. This proforma must be available on top of each CV in addition to the information to be provided as per standard format, Otherwise will not be considered.

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1	2	3	4	5	6		
S#	Position	Proposed Personnel	Qualification	Knowledge of Languages	Experience		
					General	Relevant	Dam Projects
7	8	9					
Working Environment/Location	Cell No	Duration with firm					

Note.

- The proposals must contain salary details, last degree, PEC registration certificates of the key staff
- The Personnel & owner of the firm must sign each CV in Original.
- Personnel above the age of 70 will not be eligible

B. EXPERIENCE OF FIRM.

S.No	Description	Maximum Marks
1	Relevant/Specific Experience of Firm (Completed/In progress Dam Projects in last 10 Years)	18 Feasibility Study= 25% marks, Detailed Design= 25% Marks, Procurement= 10% Marks Construction supervision= 40% Marks Total= 100% Marks
2	General Experience of Firm (Any completed Project of Hydraulic Structures in last 10 Years)	12 Feasibility Study= 25% marks, Detailed Design= 25% Marks, Procurement= 10% Marks Construction supervision= 40% Marks Total= 100% Marks

Note

- Five (05) Projects in each category will entitle the firm for full marks as per details stated below
- Consultancy Services of the Projects with cost less than Rs 300 million (Construction Cost) will not be considered.
- Award & completion documents must be available in support of projects claimed as experience
- Below proforma must be attached for any projects of sr No 1& 2 in addition to standard format.

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1	2	3	4	5	6	7
S#	Name of Project	Location with Province & Country	Client	Address, Phone & Fax No of Client	Handled as: • Single Firm/ : • Lead Firm/ : • Joint Venture : Partner	Cost of Project
8	9	10		11		
Cost of Services	Scope of services • Feasibility • Detailed design • Procurement • Construction Supervision	Scope of Work				

UNDERTAKING

It is hereby certified that the above are true statements based on facts and we take full responsibility for the correctness and accuracy of the information supplied herein to the best of our knowledge and belief. This is also to certify that the owner/partners/directors working solely for the consulting engineering profession. This is further to certify that we are independent consulting engineer and have no interest in any construction and conflicting commercial industrial and business activities which are likely to influence our professional independence and neutrality. We also undertake to fully abide by KPPRA act/rules & the Pakistan Engineering Council (Conduct and Practice of Consulting Engineers) Byelaws 1986 & registered with Khyber Pakhtunkhwa Revenue Authority

TERMS OF REFERENCE FOR DESIGN REVIEW

1. Carry out additional topographic Geodetic, Geophysical surveys (if required and with approval of the client) for the detailed design of dam, appurtenant structures, command area, reservoir area, irrigation system and access road at appropriate scales for construction of the dam project.
2. Carry out additional sub-surface geo-technical investigation (if required and with approval of the client) at dam site and appurtenant structures, reservoir area, CCA and Irrigation network. The investigation will include necessary drilling of bore boles (core drilling) and collection of core samples excavation of test pits, trenches, collection of surface and sub-surface sampling field and laboratory analysis & testing.
3. Carry out review of the Project components including dam embankment, spillway, irrigation conduit, intake and outlet structures, irrigation network, intake structure for drinking water supply, road and buildings etc including the prospects & validity of future rising of the Dam.
4. Physical investigation of dam & reservoir periphery within 500-meter proximity of reservoir / Dams for studying and reporting behavior of seepage through dam/ reservoir

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5. Sediment Study & modeling for estimation of appropriate sedimentation & life of reservoir
6. Seismic criteria for resistance against earthquake on Dams and allancillary components shall be applied in the review/ updation.
7. Prepare and submit draft design review report, specifications, tender drawings and tender documents.
8. Prepare and submit Review of Design Report, specification, tender drawings and tender documents.
9. Revision of PC-I due to cost overruns, changes in design approach with time or change in physical scope of work& submission of Revised PC-I in required number.
10. Prepare and submit construction drawings.
11. Periodic review of the construction drawings in accordance with latest site situation & requirements as proposed by the consultants/client from time to time.
12. Carry out Detail Command Survey & layout of canal network.
13. Preparation of chakbandi & warabandi system for Irrigation system.
14. Submission of complete Detail design calculations of all component of Dam in separate chapters.
15. Backup data for all design calculation will be provided to client
16. Keep provision of future risingof Dam in design if required/possible.
17. Determine capital cost, recurrent cost estimate of various components of the project using current schedule of rates (MRS 2021 Khyber Pakhtunkhwa or any other approved by Government of Khyber Pakhtunkhwa).
18. Preparation of construction Schedule, CPM and Cash Flows.
19. The consultant shall submit separate comprehensive report on revalidation/ authentication of all aspects of the detail design already completed.

TERMS OF REFERENCE FOR CONSTRUCTION SUPERVISION

1. Review of Design documents for any omission / correction etc before start of construction activities.
2. Review of Construction Drawings.
3. Assist the employer in Tendering Process/Bid Evaluation.
4. Approval of construction schedule submitted by contractor.
5. Supervise construction of the project in the capacity of Engineers Representative, to ensure that the project including all components are being constructed satisfactorily in accordance with approved drawing design specifications and required quality. Incase of any variation a detail report duly supported with document, laboratory tests be submitted to the Client / Employer, through the Engineer for the project.
6. Submission of Revised Construction Drawings in accordance with actual site conditions including detail survey for project component/additional project component.

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7. Supervise and check the setting out of all component structures and general layout of the project.
8. Recommend to the client the source of appropriate construction material, for approval.
9. Coordinate between contractor and employer to implement the project in accordance with the contract.
10. Supervise the material testing in contactor's field laboratory and keep record of respective test reports.
11. Provide adequate technical assistance, consultation and advice to the Client / Employer in matters that crop up during execution, may include redesigning and connected issues.
12. Prepare and submit Monthly Progress Report to the Client / Employer.
13. Participation and Coordination in progress meeting convened at site and in Regional or Divisional offices at Peshawar or any other place as and when required.
14. Furnish "Detail Cost Estimate" and make periodic updating of the cost of project along with reasons for increase/decrease of cost of individual items.
15. Revision of PC-I if cost of the project over runs beyond approved cost or if there is a substantial change in the scope of work but the project cost remains within the approved cost.
16. Verification/checking of contractors statements of executed quantities for making progressive payment to the contractor.
17. Verification and checking of the interim and final payment to the contractor for approval of the employer.
18. Provide adequate consultation and advice to the employer on contractual issues/corrigendum (s).
19. Initiation and Issuance of variation order after approval of the employer.
20. To provide sufficient and appropriate technical and support staff at site as per requirement or as directed by Client / Employer in the interest of work.
21. Preparation of chakbandi and warabandi for outlets in the Irrigation system.
22. To submit duly verified as built drawings.
23. The consultants shall provide assistance during the defect liability period and visit the project from time to time for pointing out any defect etc. the same shall be reported to the employer in the form of punch list and monitor its rectification.
24. To appear, if required, and assist the client in the court of law, in case of any litigation by the contractor or stakeholder.

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REPORTING AND DOCUMENTATION FOR

REVIEW OF DESIGN

i. Preparation of draft design review report, draft construction drawing, draft tender documents and specifications (05 copies).

ii. Preparation final updated detail design review report, construction drawing, tender documents and specifications documents (05 copies).

iii. Preparation of regular monthly progress report (05 copies).

CONSTRUCTION SUPERVISION

i. Preparation of regular monthly progress report (05 copies).

ii. Preparation and submission of as built drawings in (05 copies).

iii. All correspondence, surveys, lab test results and construction drawings along with soft copies in binded form.

iv. Preparation of Chakbandi and Warabandi.

v. Preparation of operation and maintenance manual for the project.

vi. Preparation of PC-IV for the project (05 copies).

vii. Preparation of draft revised PC-I Proforma in (05 copies) and final revised PC-I Proforma in required numbers if required as directed by the client.

viii. Preparation and submission of Punch list in deficit liability period.

MODE OF PAYMENT

Review of Design (Completion period 03-months)

I. Submission of draft updateddesign review report, draft construction drawing, draft tender documents and specifications. 50%

II Submission of final updated detail design report, construction drawing, tender documents and specifications documents. 50%

Construction Supervision (Completion period 33-months)

I. Payment will be made to the consultants as per actual physical & personnel inputs regardless of the approval/award of submitted proposals.

II. No other expenses as Remunerations or Direct cost will be paid to the consultants by the client.

III. 5% of each running payment shall be withheld by the employer as security deposit, which shall be released on satisfactory completion of services and submission of all reports/documents stipulated in TOR and admittance, thereof by the employer.

Note: The mode of payment indicated is tentative subject to alteration and is not to be considered as the cost of any activity but it is progressive payment for the facilitation of the consultants.

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PROFESSIONALS/ KEY PERSONNEL's REQUIREMENTS

Consultant Bid Cost will be sum of Key Personnel's & Logistic requirement as per below details. Payment of survey, other investigation & vehicle (Running & maintenance) will be made as per actual inputs & will be adjusted in the end of study

Sr. No.	BILL NO.C-1 (DESIGN REVIEW & CONSTRUCTION SUPERVISION) Description of Items	Unit	Quantity	Rate (Pak Rs)	Amount (Pak Rs)
A	**Design Review Stage (03 Months)**				
A-1	**Key Staff**				
	Team Leader/ Project Manager	Month	3.000		
	Dam Specialist / Geo-Tech Engineer	Month	2.000		
	Hydraulic/Structure Engineer	Month	2.000		
	Geologist	Month	2.000		
	Hydrology Expert	Month	2.000		
	Irrigation Engineer	Month	2.000		
	Contract Engineer	Month	1.000		
	Soil and Agriculture Expert	Month	1.000		
	Support Staff				
	CAD Operator	Month	3.000		
	Quantity Surveyor	Month	3.000		
	Sub Total:-A-1				
A-2	**Logistics for Design Review (03Months)**				
	Site Office & Camp	Month	3.000		
	Furnished Office & Camp Accommodation	Month	3.000		
	Electricity, Water & Gas Charges	Month	3.000		
	Office Supplies & Stationary	Month	3.000		
	Fax, Postage, Courier & Telephone Charges	Month	3.000		
	Mobilization & Demobilzatiom	LS	1.000		
	Geotechnical Investigation(Drilling) Drilling by diamond drilling, holes of minimum 75mm dia, vertical or at specified inclination using diamond core drilling bit, double barrel tube in masonry, concrete or rock including cost of all materials, machinery, labour, water, collection of core samples, logging & labeling samples, supplying wooden core box and re-drilling in case of collapse of side etc, complete excluding cost of mobilization & demobilization (For depth 0 to 50 m and inclined at 0^0 to 10^0 vertically downward	Meter	150.000		
	Laboratory Testing	LS	1.000		
	Transport Including running & Maintenance, i/c POL	Month	3.000		
	Sub Total:- A-2				
	Total:- A-1+A-2 (Design Review Stage)				-

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B	**Construction Supervision Stage (33Months)**				
B-1	**Key Staff**				
	Project Manager/Team Leader	Month	18.000		
	Dam Specialist / Geo-Tech Engineer	Month	2.000		
	Senior Design Engineer/Structure Engineer	Month	2.000		
	Resident Engineer	Month	33.000		
	Geologist	Month	4.000		
	Material Engineer	Month	12.000		
	Non Key Staff				
	Assistant Resident Engineer	Month	33.000		
	Lab technician	Month	33.000		
	Quantity Surveyor	Month	18.000		
	Surveyor	Month	33.000		
	Inspectors 02 No's	Month	66.000		
	Inspectors DLP	Month	12.000		
	Support Staff				
	CAD Operator	Month	33.000		
	Computer Operator	Month	33.000		
	Naib Qasid	Month	33.000		
	Chowkidar 02 No's	Month	66.000		
	Drivers 02 No's	Month	66.000		
	Sub Total: B-1				
B-2	**Logistics for Design Review & Supervision stage (33Months)**				
	Site Office & Camp	Month	33.000		
	Furnished Office & Camp Accommodation	Month	33.000		
	Electricity, Water & Gas Charges	Month	33.000		
	Office Supplies & Stationary	Month	33.000		
	Fax, Postage, Courier & Telephone Charges	Month	33.000		
	Transport Including running & Maintenance i/c POL	Month	33.000		
	Sub Total:B-2				
	Sub Total:B-1 + B-2				
	G.TOTAL FOR BILL NO.A+B				-

QUALIFICATIONS AND EXPERIENCE OF CONSULTANT'S KEY PERSONNEL

Consultants will assign adequately qualified key personnel to carry out the implementation of the Project as described in TOR, person-month inputs for which are indicated above. The key personnel should possess the qualifications and experience as indicated against each position.

1. **Project Manager/Team Leader**

- Should have at least a Bachelor Degree in Civil Engineering from a recognized university. Additional qualification will carry extra marks.
- Should be able to lead the team of consultations and assist PSU Small Dams in timely completion of the services with quality output.

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- Overall experience should be 15-years with 5-years in design related activities and 02-years as Team Leader for the Projects.

2. **Dam Specialist**

- Should have Master degree in Geo-Technical Engineering from recognized university with basic qualification B.Sc Civil Engineering.
- Post Master qualification in related discipline will be given additional weight age.
- He should have at least overall experience of 15-years with 5-years' experience in exposure to the design related activities.

3. **Hydraulic Specialist**

- Should have Master degree in Water Resources / Hydraulics from recognized university.
- Post Master qualification in related discipline will be given additional weight age.
- He should have at least overall experience of 15-years with 5-years' experience in exposure to the design related activities.

4. **Geologist**

- Should have Master/M. Phil degree in Geology from recognized university.
- Post Master qualification in related discipline will be given additional weight age.

Should have at least overall experience of 15 years with 5-years' experience in exposure to the related activities

5. **Hydrology Expert**

- Should have Master degree in Water Resources from recognized university.
- Post Master qualification in related discipline will be given additional weight age.
- He should have at least overall experience of 15-years with 5-years' experience in exposure to the design related activities.

6. **Irrigation Engineer**

- Should have Master degree in Irrigation/Water Resources from recognized university.
- Post Master qualification in related discipline will be given additional weight age.
- He should have at least overall experience of 15-years with 5-years' experience in exposure to related activities.

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7. **Contract Engineer**

- Should have at least a Bachelor Degree in Civil Engineering from a recognized university. Additional qualification will carry extra marks
- Should be command on contractual material and assist PSU Small Dams in contract related issues.

  Overall experience should be 15-years with 5-years as contract specialist on mega project

8. **Soil and Agriculture Expert**

- Should have Master degree in Agriculture or equivalent qualification in the field from recognized university.
- Post Master qualification in related discipline will be given additional weight age.
- He should have at least overall experience of 15-years with 5-years' experience in exposure to related activities.

9. **Material Engineer**

- Should have at least a Bachelor Degree in Civil Engineering from a recognized university. Additional qualification will carry extra marks
- Should have experience in material quality testing and mix design of concrete.

  Overall experience should be 15-years with 5-years in design related activities and 02-years as Team Leader for the Projects

10. **Resident Engineer**

- Resident Engineer will be a graduate Civil Engineer. He will have at least 15 years of professional experience in the similar type of projects &preference will be given to the similar projects supervised in merged area.

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ANNEXURE-I

I. DETAIL FOR (GEO-TECHNICAL INVESTIGATION)

1. DRILLING

Core drilling in all kind sub-surface formation, vertical and angle hole (at five locations).

a. Abutments & Nullah Bed = 05 holes

b. Spillway fall = 3 holes (crest, fall & exit)

c. Upstream of main Dam axis in Nullah bed (300-500 meter u/s of the main centerline of dam body, or as directed by Client.

NOTE:

All the bore holes shall be selected in consultation with the Engineer for the project. All kind of drilling activities/sub-surface investigations should be supervised by an experienced Geologist.

DRILLING MACHINE

Straight rotary rig (Portable)

HOLE DIA

N-Q size (76 mm inner dia)

CASING

Drilling through casing in overburden materials, using casing shoe bit (101 mm inner dia)

DRILLING DEPTH

a. Both Abutments: - Height of dam.

b. Nullah bed: - Up to top bed rock +5 meter penetration in bed rock or equal to Dam Height or at least 1-1/2 times the base width of Dam.

c. Spillway: - At least 5 Meter penetration in bed rock.

d. U/s of Dam body: At least 20 meter deep & if rock encountered at shallow depth then 6 meter penetration in bed rock.

DRILLING FLUID

Plain water is allowed whereas bentonit is not allowed as a drilling fluid however cement can be used as per site condition and as per instructions by the client.

FIELD TEST

(a) At constant head (03-meters interval depth)

(b) At falling head (03-meters interval depth)

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Calculation of K Values

ii. Water pressure test/LUGEON test at 03-meters interval.

iii. Collection of UDS by Shelby/Denison/Pitcher sampler.

iv. Standard penetration tests SPT using split spoon sampler.

v. Assessment of %age core recovery.

vi. RQD assessment.

vii. Water samples collection.

viii. Preservation of core samples in core boxes.

ix. Preservation of soil samples in plastic jars.

x. SPT, CPT or Denison test as per encountered sub-surface formation at 1-1.5 meters interval depth or as directed by the site Engineer/Geologist.

Preservation of rock core samples in core boxes, labeling packing and storage along with transportation of core boxes to core shed PD PSU Small Dams Merged Areaor as directed by Engineer.

Transportation of selected rock core samples for testing to CMTL Laboratory WAPDA Lahore for the required test.

Taking of water samples from the bore hole and transportation to CMTL Laboratory WAPDA Lahore for chemical analysis.

Installation of 3-inch dia PVC pipe in line the drilled hole as a pizometer and or sounding purpose .

Excavation of test pits at 4-locations 6×6 feet up to maximum 15-feet deep below ground level or up to the bed rock/ground water, including back filling of pits to original ground level.

Collection of composite bulk samples from test pits including their labeling, packing, storage and transportation to testing Lab, CMTL, WAPDA Lahore.

Excavation of trenches 3-5 feet/up to bed rock and 10-feet long including backfilling of the trenches to original ground condition.

Collection of disturbed samples from trenches including their labeling, packing, storage and transportation to testing lab, CMTL, WAPDA Lahore.

Providing photographs of core and core boxes.

LABORATORY TESTING CONSTRUCTION MATERIAL STUDIES

S.NO	DESCRIPTION	QTY
1	Sieve Analysis/Gradation of coarse & fine Aggregates	15
2	Flakiness and Elongation Index	8
3	Atterberg Limits (LL, PL, PI)	8

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4	Specific Gravity wet and dry	6
5	Sodium sulphate soundness test	6
6	Los Angeles Abrasion Test (Coarse Aggregate)	6
7	Un-confined compression and direct shear tests of clay samples	6
8	Crushing Strength of rock and rip rap some samples	5
9	Direct shear (rock and soil)	6
10	Swell potential of soil samples	6
11	Uniaxial Compressive strength test with Modulus of Elasticity	6
12	Water Absorption test of coarse and find aggregates	4
13	Alkali Silica Reaction tests	4
14	Organic impurity test	4
15	Complete chemical analysis of water sample i/c TDC, Cl, SO4 ad pH	4
16	Coefficient of permeability	4
17	Abrasion test	3

LABORATORY TESTING CONSTRUCTION MATERIAL STUDIES

S.NO	DESCRIPTION		QTY
1	Grain Size Analysis		8
2	Hydrometer Analysis		8
3	Atterberg Limits (LL, PL, PI)		5
4	NMC		6
5	Un-confined compression test	Dry condition	6
		Saturated condition	6
6	Unconsolidated Un-drained Traixial Test (UU0		4
7	Consolidated Un-drained Test (CU)		4
8	Consolidation Characteristics		4
9	Swell Potential of Dam Core Materials		4
10	Standard Proctor Compaction		4
11	Modified Proctor Compaction		5
12	Geo physical survey(refraction survey) parallel to Dam axis & at least 2 cross section at the valley floor perpendicular to Dam axis (300-500 meter in depth)		
13	Providing photographs of core & core boxes		

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