GOVERNMENT OF KHYBER PAKHTUNKHWA
IRRIGATION DEPARTMENT

TORs/Guidelines for submission of Proposal
For

FEASIBILITY STUDY, DETAILED ENGINEERING DESIGN OF GREATER WATER SUPPLY SCHEME NASHPA BLOCK DISTRICT KARAK

Issued to: _____

KOHAT IRRIGATION DIVISION, KOHAT

November, 2022

INFORMATION TO CONSULTANT

District Karak is one of the most deprived districts regarding drinking water availability. Almost 65% of underground water of District Karak is saline. In Nashpa block ground water potential either feeble or saline. The present population of Nashpa block consists of 11 villages and with population of about 19,000 persons. To resolve the issue of drinking water of the proposed area it is proposed to hire qualified and reputable consultants to submit technical and financial proposals for conducting feasibility study, detail design of the above project.

The scope of work is to conduct feasibility study (Hydrology study, Geological study, Geotechnical investigation, topographic survey and environmental study), and subsequently detailed engineering design of Dam and its different components, different constituent of water supply scheme for Nashpa block to utilize the surface water down stream of Zaibi dam which will be stored in shape of Nashpa dam and subsequently be utilized for drinking purpose after proper treatment through treatment plant. In addition, detailed design of water supply components comprising sedimentation tank (of the required capacity) slow sand filters, staff quarter, supply main, distribution system and surface/overhead reservoirs of the required capacities at suitable places. Submission/preparation of PC-1/cost estimate and subsequently tender documents.

INSTRUCTION REGARDING SUBMISSION OF PROPOSALS

1. Two copies of the technical and one copy of financial proposals are required to be submitted. Proposal should be in a sealed envelope indicating original or copy on each enclosure, as appropriate.
2. The proposals shall be valid for a period of 120-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 are also required to be submitted along with the technical proposals in separate envelopes/covers and the financial proposal of "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 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 the survey and 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 will be deducted as per the prevailing Government rules.

2) The consultant shall establish Project Manager Office at relevant project sites.

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) In case the consultants without sound reasons fail to complete the assignments according to the time schedule, the consultants shall pay compensation and damages to the department equal to 1% of the consultancy fee per day to a maximum of 10%.
6) The consultancy charges shall be inclusive of all costs of topographic survey, subsurface investigations, geophysical surveys and construction materials investigations etc.
7) 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.
8) 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.
9) 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.
10) Unfeasible site will be replace through addendum with the same term and condition with same bid cost after approval of the client.

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.
- 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. Eng. or M.Sc. (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 relevant discipline (10 years of relevant 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.

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= 30% marks, Detailed Design= 40% Marks, Procurement= 10% Marks Construction supervision= 20% Marks Total= 100% Marks
2	General Experience of Firm (Any completed Project of Hydraulic Structures in last 10 Years)	12 Feasibility Study= 30% marks, Detailed Design= 40% Marks, Procurement= 10% Marks Construction supervision= 20% 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 S.No 1& 2 in addition to standard format.

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) Bylaws 1986 & registered with Khyber Pakhtunkhwa Revenue Authority.

TERM OF REFERENCE (TORs)

A. FEASIBILITY STUDIES

1. Collection/evaluation of all available topographic, hydro-metrological, geological, geo-technical and agriculture data necessary for planning of the project.
2. Based on the existing data its review and site visit by the experts, preparation of a detailed review report showing finding/recommendations regarding the potential of the project. If the project is found having less or

no potential, further studies shall be stopped and if the site is found potentially favorable for further studies , recommendations for Detail Design or otherwise shall be clearly made.

3. Collection/ Evaluation of topographic, chemical, biological Drinking water requirement data necessary for planning of the project.
4. Carry out detailed topographic survey for the dam, appurtenant structures, drinking water treatment plant and distribution networks at the scales and contour intervals as notified in the IMO or as directed by the client in addition to the survey carried out at pre-feasibility stage, Reservoir area survey through cross-section at intervals suitable for capacity estimation. Installation of survey monuments along reservoir periphery, Irrigation system alignment, command area, approach road, relocated roads (if any) with establishment and fixing of temporary bend marks according to the standard Design and specification of S.O.P at suitable intervals or as directed by the Engineer/Client.
5. Study of the catchment area sediment carrying potential, sedimentation in the reservoir and remedial Measures.
6. Carry out hydrological studies, including water availability/accumulation, reservoir operation, floods/flood routing, Estimation of the maximum design flood estimation on 500 years and 1000 years return periods. The study also includes data collection, analysis, rainfall and runoff Gauges at appropriate places.
7. Detail geological mapping at the dam site, reservoir area and appurtenant structures.
8. Carry out detail sub-surface geo-technical investigation at dam site and appurtenant structure, reservoir area, and distribution networks. The investigation shall include necessary drilling of bore holes with providing P.V.C pipes (core drilling) and collection of core samples excavation of test pits, trenches, collection of surface and sub-surface sampling and laboratory testing, complete in all respects as per Annex-I (Minimum requirements).

9. Identification of construction material suitability, transportation and loads etc.
10. Seismic risk evaluation to determine seismic design parameters for various project components.
11. Study for alignment of water distribution networks and proposal for its installation.
12. To study the possibility of providing irrigation water supply from the proposed dam through independent inlet/outlet/ water channel as per requirement for the command area.
13. To assess potential for Power Generation.
14. Detailed Chapter on Assessment of social implication of the project. To carry out environmental impact studies (Direct & Indirect employment, benefits income, health, sanitation, forestation etc). Recommended mitigation measures if any for the adverse impacts and proposed environmental management plan (EMP)/Resettlement Action Plan (RAP)
15. Including a comprehensive Chapter on the social aspect of the acceptance/otherwise of the proposal for Small Dams by both the affecties and beneficiaries respectively.
16. To study the possibility of future raising of the dam and incorporation in the design criteria.
17. Prepare design criteria for various components of project
18. Feasibility level design of the dam, appurtenant structures, distribution network and water treatment plants.
19. Preparation of long section and x-section of Dam embankment, distribution network, Access/Relocate roads and its allied structures.
20. Determine capital cost, recurrent cost estimate of various components of the project using current MRS of Khyber Pakhtunkhwa with allowable premium.
21. Assess NPW & economic indicators (B/C Ratio and EIRR) including sensitivity analysis.
22. Preparation of construction Schedule and Cash Flows.

23. Assess managerial and staffing implications during construction and recurrent operational charges for all components of the project with indication of government agency in charge, also assessment of the employment opportunities during construction and after project completion.
24. Preparation of inception report.
25. Preparation of Draft Feasibility Report.
26. Preparation of Final Feasibility Report for individual project.
27. Preparation of Feasibility level PC-I Proforma for individual project in required number of copies.

C. DETAIL DESIGN

1. Carry out additional detail topographic survey for the detailed design of dam, appurtenant structures, reservoir area, distribution system and Access/Relocated roads at suitable scales for the project as per directions of the Engineer/Client.
2. Carry out additional sub-surface geo-technical investigation if required and with approval of the client at dam site and appurtenant structure, reservoir area, and distribution network as per directions of the Engineer/Client. 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 testing. Complete in all respects as per Annex-I (Minimum Requirements).
3. Carry out detailed design of the Project components including dam, spillway, intake and outlet structures for drinking water supply, distribution network, intake structure for irrigation water supply (if any), Access/Relocated roads and buildings etc including future raising of dam and incorporation in the design criteria.
4. Application of Seismic impact in detailed Design of all the components of the Dam and System.

5. Prepare and submit draft design report, specifications, tender drawings and tender documents in required Nos. of copies.
6. Prepare and submit Final Design Report, specifications, tender drawings and tender documents in required Nos. of copies.
7. Revision of PC-I if cost of the project over runs beyond approved cost or if there is substantial changes in the scope or design , with or without any variation in the approved cost of work.
8. Prepare and submit construction drawings in required Nos. of copies.
9. Periodical review of the construction drawings due to Technical and site reasons as per requirement by the client.

COMPLETION TIME

Completion time will be six (06) months

Mode of Payment

Note: The mode of payment is tentative and is not to be considered as the cost of any activity but is progressive payment for the facilitation of consultant. Gap may occur during the execution of different stages.

A. Feasibility Study (40% of total cost of consultancy, Completion Period 02 months)

I.	Upon Establishment of Project office.	15%
II.	Upon submission of review report.	15%
III.	Upon submission of Inception report.	20%
IV	Submission of draft feasibility report	25%
V.	Submission of final feasibility report and draft PC-I.	25%

B. Detail Design (60% of total cost of consultancy, Completion Period 04 months)

I	Submission of draft design report, draft construction Drawing, draft tender documents and specifications.	30%
II.	Submission of final detail design report, construction Drawing, tender documents and specifications documents	30%
III.	Submission of Draft PC-I .	20%
IV.	Submission of final PC-I .	20%

REPORTING AND DOCUMENTATION

a. Review report in five (05) copies.

b. Preparation of an inception report (05) copies.

c. Preparation of regular monthly progress report (10 copies), covering proposed modification, future actions as per client views.

d. Preparation of draft feasibility study report (05 copies) of the project to enable client concurrence.

e. Preparation of final feasibility study report (10 copies) of the project.

f. Submission of draft design report, draft construction Drawing, draft tender documents and specifications. (05 copies)

g. Submission of final detail design report, construction drawing, tender documents and specifications documents (05 copies)

f. Preparation of draft PC-I Proforma (05 copies)

g. Preparation of final PC-I Proforma (in required number) along with soft copy

PROFESSIONALS/ KEY PERSONNELS REQUIRMENTS

A. FOR FEASIBILITY STUDY.

S.No	Position	Man Months	Rate (Rs).	Amount
1	Project Manager/Dam Engineer	2.0		
2	Hydrologist	2.0		
3	Hydraulic Engineer	2.0		
4	Mechanical Engineer	2.0		
5	Environmentalist	1.0		
6	Economist	1.0		
7	Geologist	2.0		
8	Sociologist	1.0		
9	Geotechnical Engineer	2.0		
10	Principle Surveyor	2.0		
Support Staff				
1	Auto cad Operator	4.0		
2	Computer Operator	4.0		
3	Peon Chowkidar (02 No)	4.0		
4	Driver (02 No)	4.0		

Total	**16.0**		

2	**Direct Cost for Main Office, Field Office**			
S.No	Description	Unit	Rate (Rs).	Amount
I	Project Office Peshawar			
1	Furnished Office Accommodation	2		
2	Electricity, Water & Gas Charges	2		
3	Office Supplies & Stationary	2		
4	Fax, Postage, Courier & Telephone Charges	2		
5	Transport Including running & Maintenance of vehicle	2		
	Sub-Total-I			
II	Site Office & Camp			
1	Furnished Office & Camp Accommodation	2		
2	Electricity, Water & Gas Charges	2		
3	Running & Maintenance of Office & Office equipment	2		
4	Office Supplies & Stationary	2		
5	Fax, Postage, Courier & Telephone Charges	2		
6	Topographic/ Contour Survey (For Five Dam Sites)	Lum Sum		
6	EPA Clearance Fees	Lum Sum		
	Sub-Total-II			
	Grand Total (I+II)			
	In Million			

Note; Payment of Geotechnical Investigation & Laboratory Tests (Annexure-I) will be made as per actual. Consultant should consider Annexure-I in financial Proposal. Otherwise bid will be rejected.

B. FOR DETAIL DESIGN

S.No	Position	Man Months	Rate (Rs).	Amount
1	Project Manager/Dam/Structure Engineer	4.0		
2	Hydrologist	2.0		
3	Hydraulic Engineer	2.0		
4	Mechanical Engineer	2.0		
5	Economist	2.0		
6	Geologist	2.0		
7	Seismic Specialist	2.0		

8	Geotechnical Engineer	2.0		
9	Principle Surveyor	4.0		
Support Staff				
1	Autocad Operator	4.0		
2	Computer Operator	4.0		
3	Peon Chowkidar (02 No)	8.0		
4	Driver (02 No)	8.0		
Total		**24.0**		

2	**Direct Cost for Design Office, Field Office**			
S.No	Description	Months	Rate (Rs).	Amount
I	Design Office			
1	Furnished Office Accommodation	4		
2	Electricity, Water & Gas Charges	4		
3	Office Supplies & Stationary	4		
4	Printing & Photocopying Charges	4		
5	Fax, Postage, Courier & Telephone Charges	4		
6	Transport Including running & Maintenance	4		
	Sub-Total-I			
II	Site Office & Camp			
1	Furnished Office & Camp Accommodation	4		
2	Electricity, Water & Gas Charges	4		
3	Office Supplies & Stationary	4		
4	Fax, Postage, Courier & Telephone Charges	4		
5	Transport Including running & Maintenance & Driver	4		
	Sub-Total-II			
	Grand Total (I+II)			
	In Million			

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, man-month inputs for which are indicated above. The key personnel should possess the qualifications and experience as indicated against each position.

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 Small Dams Organization in timely completion of the services with quality output.
- Overall experience should be 15-years with 5-years in design related activities and 05-years as Team Leader for the Projects.

Hydrologist

- Should have Master degree in Hydrology/WRE 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 05 years experience in exposure to the related activities.

Mechanical Engineer

- Should have Master degree in Mechanical 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 05-years experience in exposure to the design related activities.

Dam Specialist

- Should have Master degree in Dam Engineering/WRE 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 05-years experience in exposure to the design related activities.

Hydraulics Engineer

- Should have Master degree in Hydraulics 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 04-years experience in exposure to the design related activities.

Geo-tech Engineer

- He should have Master in Geotech Engineering 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 05-years experience in exposure to the design related activities.

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.

Economist

- Should have Master/M. Phil degree in Economics or equivalent qualification in the field 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 05-years experience in exposure to the related activities.

Environmental Engineer/Environmentalist

- Should have Master degree in Environmental Engineering/ Environmental Sciences 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 05-years experience in exposure to the related activities.

Sociologist

- Should have Master degree in Sociology or equivalent qualification in the field 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 05-years experience to exposure to the related activities.

Principal Survey Engineer

- Should have at least a B.Sc degree in Civil Engineering from a recognized university.
- Should have at least 15-years with 05-years experience in exposure to the related projects.

Contract Specialist

- Should have a Bachelor Degree in Civil Engineering/Contract Management from a recognized university.
- Should have at least 15-years experience with at least 5-years experience in contracts and contract administration.

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.

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)

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 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.

GEOTECHNICAL INVESTIGATION (BILL OF QUANTITIES)					
Sr.No	Description	Unit	Qty.	Rate (Rs)	Amount
A	**FIELD INVESTIGATION**				
A1	Mobilization and demobilization including shifting from borehole to borehole and set up at each site	L.S	5		
A2	Drilling in soil / overburden through percussion boring with minimum bore dia of 12 inches (0-30m)	L.M	150		
A3	Drilling in soil / overburden through Straight rotary with minimum bore dia of 4 inches (0-30m)	L.M	150		
A4	Core Drilling in Rock with minimum of NX dia including preservation of core in core boxes and back filling of boreholes. a) From 0 to 30m of depth b) From 31 to 60m of depth c) From 61 to 120m of depth	 L.M L.M L.M	 300		
A5	Inclined Core Drilling in overburden / Rock with required bore dia at any angle.	L.M	10		
A6	Collection of Rock Core samples from drill holes including their waxing, labeling, packing, storage & transportation to an approved laboratory	No	18		
A7	Performance of Standard Penetration Tests (SPTs) in boreholes along with collection of SPT samples at 1 m interval in general, or as transportation to an approved testing laboratory.	No	14		
A8	Collection of Undisturbed Samples (UDS) from boreholes, including their labeling, packing, storage & transportation to an approved laboratory.	No	5		
A9	Performance of Permeability tests in boreholes.	No	5		
A10	Performance of Water pressure tests with 3 to 5 m column in drilled holes	No	20		

A11	Excavation of test pits up to 3.0 m depth below ground level including backfilling of pits to original condition.	L.M	25		
A12	Performance of insitu density tests in test pits by sand replacement method including sampling for moisture content determination, their labeling, packing, storage & transportation to an approved laboratory.	No	8		
A13	Collection of Undisturbed Samples (Block Samples) from test pits, including their labeling, packing, storage & transportation to an approved laboratory.	No	5		
A14	Collection of composite bulk samples from test pits including their labeling, packing, storage & transportation to an approved laboratory.	No	15		
A15	Installation and development of Piezometers in drilled holes.	No	5		
Sub-Total A					

J. LABORATORY TESTING CONSTRUCTION MATERIAL STUDIES.

S.NO	DESCRIPTION	QTY	Rate (Rs)	Amount
1	Sieve Analysis/Gradation of coarse & fine Aggregates	15		
2	Flakiness and Elongation Index	8		
3	Atterberg Limits (LL, PL, PI)	8		
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, CI, SO4 ad pH	4		
16	Coefficient of permeability	4		
17	Abrasion test	4		

J. LABORATORY TESTING CONSTRUCTION MATERIAL STUDIES.

S.NO	DESCRIPTION		QTY	Rate (Rs)	Amount
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		4		
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)		01		
13	Providing photographs of core & core boxes.		01		